PHILIPS

R.F. power transistors and modules

S6 1986

PHILIPS

Data handbook

Electronic components and materials

Semiconductors

Book 6 1986

R.F. power transistors and modules

R.F. POWER TRANSISTORS AND MODULES

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DATA HANDBOOK SYSTEM

Our Data Handbook System comprises more than 60 books with specifications on electronic components, subassemblies and materials. It is made up of four series of handbooks:

ELECTRON TUBES	BLUE
SEMICONDUCTORS	RED
INTEGRATED CIRCUITS	PURPLE
COMPONENTS AND MATERIALS	GREEN

The contents of each series are listed on pages iv to vii.

The data handbooks contain all pertinent data available at the time of publication, and each is revised and reissued periodically.

When ratings or specifications differ from those published in the preceding edition they are indicated with arrows in the page margin. Where application information is given it is advisory and does not form part of the product specification.

Condensed data on the preferred products of Philips Electronic Components and Materials Division is given in our Preferred Type Range catalogue (issued annually).

Information on current Data Handbooks and on how to obtain a subscription for future issues is available from any of the Organizations listed on the back cover.
Product specialists are at your service and enquiries will be answered promptly.

ELECTRON TUBES (BLUE SERIES)

The blue series of data handbooks comprises:

T1	**Tubes for r.f. heating**
T2a	**Transmitting tubes for communications, glass types**
T2b	**Transmitting tubes for communications, ceramic types**
T3	**Klystrons**
T4	**Magnetrons for microwave heating**
T5	**Cathode-ray tubes** Instrument tubes, monitor and display tubes, C.R. tubes for special applications
T6	**Geiger-Müller tubes**
T8	**Colour display systems** Colour TV picture tubes, colour data graphic display tube assemblies, deflection units
T9	**Photo and electron multipliers**
T10	**Plumbicon camera tubes and accessories**
T11	**Microwave semiconductors and components**
T12	**Vidicon and Newvicon camera tubes**
T13	**Image intensifiers and infrared detectors**
T15	**Dry reed switches**
T16	**Monochrome tubes and deflection units** Black and white TV picture tubes, monochrome data graphic display tubes, deflection units

SEMICONDUCTORS (RED SERIES)

The red series of data handbooks comprises:

S1	**Diodes** Small-signal silicon diodes, voltage regulator diodes (< 1,5 W), voltage reference diodes, tuner diodes, rectifier diodes
S2a	**Power diodes**
S2b	**Thyristors and triacs**
S3	**Small-signal transistors**
S4a	**Low-frequency power transistors and hybrid modules**
S4b	**High-voltage and switching power transistors**
S5	**Field-effect transistors**
S6	**R.F. power transistors and modules**
S7	**Surface mounted semiconductors**
S8a	**Light-emitting diodes**
S8b	**Devices for optoelectronics** Optocouplers, photosensitive diodes and transistors, infrared light-emitting diodes and infrared sensitive devices, laser and fibre-optic components
S9	**Power MOS transistors**
S10	**Wideband transistors and wideband hybrid IC modules**
S11	**Microwave transistors**
S12	**Surface acoustic wave devices**
S13	**Semiconductor sensors**
*S14	**Liquid Crystal Displays**

*To be issued shortly.

INTEGRATED CIRCUITS (PURPLE SERIES)

The NEW SERIES of handbooks is now completed. With effect from the publication date of this handbook the "N" in the handbook code number will be deleted.
Handbooks to be replaced during 1986 are shown below.

The purple series of handbooks comprises:

IC01	**Radio, audio and associated systems** Bipolar, MOS	new issue 1986 IC01N 1985
IC02a/b	**Video and associated systems** Bipolar, MOS	new issue 1986 IC02Na/b 1985
IC03	**Integrated circuits for telephony** Bipolar, MOS	new issue 1986 IC03N 1985
IC04	**HE4000B logic family** CMOS	new issue 1986 IC4 1983
IC05N	**HE4000B logic family – uncased ICs** CMOS	published 1984
IC06N	**High-speed CMOS; PC74HC/HCT/HCU** Logic family	published 1986
IC08	**ECL 10K and 100K logic families**	New issue 1986 IC08N 1984
IC09N	**TTL logic series**	published 1986
IC10	**Memories** MOS, TTL, ECL	new issue 1986 IC7 1982
IC11N	**Linear LSI**	published 1985
Supplement to IC11N	**Linear LSI**	published 1986
IC12	**I^2C-bus compatible ICs**	not yet issued
IC13	**Semi-custom** Programmable Logic Devices (PLD)	new issue 1986 IC13N 1985
IC14N	**Microprocessors, microcontrollers and peripherals** Bipolar, MOS	published 1985
IC15	**FAST TTL logic series**	new issue 1986 IC15N 1985
IC16	**CMOS integrated circuits for clocks and watches**	first issue 1986
IC17	**Integrated Services Digital Networks (ISDN)**	not yet issued
IC18	**Microprocessors and peripherals**	new issue 1986*

* The Microprocessors were included in handbook IC14N 1985, so IC18 will replace that part of IC14N.

COMPONENTS AND MATERIALS (GREEN SERIES)

The green series of data handbooks comprises:

C2	**Television tuners, coaxial aerial input assemblies, surface acoustic wave filters**
C3	**Loudspeakers**
C4	**Ferroxcube potcores, square cores and cross cores**
C5	**Ferroxcube for power, audio/video and accelerators**
C6	**Synchronous motors and gearboxes**
C7	**Variable capacitors**
C8	**Variable mains transformers**
C9	**Piezoelectric quartz devices**
C11	**Varistors, thermistors and sensors**
C12	**Potentiometers, encoders and switches**
C13	**Fixed resistors**
C14	**Electrolytic and solid capacitors**
C15	**Ceramic capacitors**
C16	**Permanent magnet materials**
C17	**Stepping motors and associated electronics**
C18	**Direct current motors**
C19	**Piezoelectric ceramics**
C20	**Wire-wound components for TVs and monitors**
C22	**Film capacitors**

SELECTION GUIDE

TYPE NUMBER SURVEY

LINE-UPS

The following tables present our complete range of transmitting transistors and modules, grouped according to main r.f. power application area. The data in each table is further grouped according to voltage and (within each voltage group) arranged in order of increasing power.

s.s.b. class-AB; f = 28 MHz; d_3; d_5 < −30 dB

P_L (P.E.P.) W	V_{CE} V	G_P dB	envelope	type number	page
10	13,5	18	SOT-48/2	BLY88A	983
10	13,5	18	SOT-120	BLY88C	991
10	13,5	18	SOT-123	BLV11	263
15	13,5	18	SOT-56	BLY89A	999
15	13,5	18	SOT-120	BLY89C	1009
15	13,5	18	SOT-123	BLW87	703
30	12,5	18	SOT-56	BLW60	559
30	12,5	18	SOT-120	BLW60C	573
30	12,5	18	SOT-123	BLW85	669
80	12,5	12,5	SOT-121	BLW99	767
10	28	20	SOT-48/2	BLY92A	1041
10	28	20	SOT-120	BLY92C	1049
10	28	20	SOT-123	BLV21	279
25	28	18	SOT-56	BLX13	773
25	28	18	SOT-120	BLX13C	785
25	28	18	SOT-123	BLW83	651
40	28	17	SOT-120	BLX39	825
45	28	17	SOT-123	BLW86	681
50	28	13	SOT-55	BLX14	795
80	28	13	SOT-121	BLW76	585
100	28	19	SOT-121	BLW78	613
130	28	12	SOT-121	BLW77	599
175	28	11,5	SOT-121	BLW97	749
50	50	18	SOT-123	BLW50F	549
150	50	14	SOT-55	BLX15	809
160	50	14	SOT-121	BLW95	727
200	50	13,5	SOT-121	BLW96	737

s.s.s. class-A; f = 28 MHz; d_3; d_5 < −40 dB

P_L (P.E.P.) W	V_{CE} V	G_P dB	envelope	type number	page
1	12	18	SOT-48/2	BLY87A	967
1	12	18	SOT-120	BLY87C	975
1	12	18	SOT-123	BLV10	255
2	12	18	SOT-48/2	BLY88A	983
2	12	18	SOT-120	BLY88C	991
2	12	18	SOT-123	BLV11	263
6	12	18	SOT-56	BLY89A	999
6	12	18	SOT-120	BLY89C	1009
6	12	18	SOT-123	BLW87	695
1,3	26	20	SOT-48/2	BLY91A	1025
1,3	26	20	SOT-120	BLY91C	1033
1,3	26	20	SOT-123	BLV20	271
2,5	26	20	SOT-48/2	BLY92A	1041
2,5	26	20	SOT-120	BLY92C	1049
2,5	26	20	SOT-123	BLV21	279
8	26	18	SOT-56	BLX13	773
8	26	20	SOT-120	BLX13C	785
10	26	20	SOT-123	BLW83	651
15	26	18	SOT-120	BLX39	825
17	26	20	SOT-123	BLW86	681
30	26	18	SOT-121	BLW78	613
16	45	19,5	SOT-123	BLW50F	549
50	40	19	SOT-121	BLW96	737

	P_L W	V_{CE} V	f MHz	G_P dB	envelope	type number	page
v.h.f. base stations; class-B operation	1	28	175	15	TO-39/1	2N3866	1097
	4	28	175	10	TO-39/1	BFS23A	67
	8	28	175	12	SOT-48/2	BLY91A	1025
	8	28	175	12	SOT-120	BLY91C	1033
	8	28	175	12	SOT-123	BLV20	271
	15	28	175	10	SOT-48/2	BLY92A	1041
	15	28	175	10	SOT-120	BLY92C	1049
	15	28	175	10	SOT-123	BLV21	279
	25	28	175	9	SOT-56	BLY93A	1057
	25	28	175	9	SOT-120	BLY93C	1065
	25	28	175	9	SOT-123	BLW84	661
	45	28	175	7,5	SOT-120	BLX39	825
	45	28	175	7,5	SOT-123	BLW86	681
	50	28	175	7	SOT-55	BLY94	1073
	80	28	175	6,5	SOT-121	BLV80/28	407
	80	28	108	8	SOT-121	BLW76	585
	100	28	150	6	SOT-121	BLW78	613
	130	28	87,5	7,5	SOT-121	BLW77	599
	150	50	108	7,5	SOT-55	BLX15	809
	160	50	108	7	SOT-121	BLW95	727
	200	50	108	6,5	SOT-121	BLW96	737
v.h.f. mobile transmitters; class-B operation	1	12	175	10	TO-39/1	2N4427	1097
	2	13,5	175	11	TO-39/1	BFQ42	41
	4	13,5	175	8	TO-39/1	BFS22A	59
	4	13,5	175	12	TO-39/3	BFQ43	51
	4	13,5	175	12	TO-39/3	BFQ43S	51
	8	13,5	175	9	SOT-48/2	BLY87A	967
	8	13,5	175	12	SOT-120	BLY87C	975
	8	13,5	175	9	SOT-123	BLV10	255
	15	13,5	175	10	SOT-120	BLW29	503
	15	13,5	175	7,5	SOT-48/2	BLY88A	983
	15	13,5	175	7,5	SOT-120	BLY88C	991
	15	13,5	175	7,5	SOT-123	BLV11	263
	25	13,5	175	6	SOT-56	BLY89A	999
	25	13,5	175	6	SOT-120	BLY89C	1009
	25	13,5	175	6	SOT-123	BLW87	695
	28	13,5	175	9	SOT-120	BLW31	511
	45	12,5	175	6,5	SOT-119	BLV45/12	365
	45	12,5	175	5	SOT-56	BLW60	559
	45	12,5	175	5	SOT-120	BLW60C	573
	45	12,5	175	4,5	SOT-123	BLW85	669
	50	12,5	175	5	SOT-55	BLY90	1017
	75	12,5	175	6,5	SOT-119	BLV75/12	397

	P_L W	V_B V	f MHz	G_p dB	envelope	type number	page
v.h.f. modules for mobile transmitters	2	9,5	68– 88	17,5	SOT-182	BGY93A	141
	2	9,6	136–156	17,5	SOT-182	BGY93B	141
	2	9,6	148–174	17,5	SOT-182	BGY93C	141
	5	9,6	68– 88	21,5	SOT-182	BGY94A	143
	5	9,6	132–156	21,5	SOT-182	BGY94B	143
	5	9,6	148–174	21,5	SOT-182	BGY94C	143
	13	12,5	148–174	19,4	SOT-132B	BGY43	109
	18	12,5	68– 88	22,6	SOT-132B	BGY32	91
	18	12,5	80–108	22,6	SOT-132B	BGY33	91
	18	12,5	132–156	20,8	SOT-132B	BGY35	91
	18	12,5	148–174	20,8	SOT-132B	BGY36	91
	30	12,5	68– 88	20,0	SOT-183	BGY45A	117
	30	12,5	148–174	20,0	SOT-183	BGY45B	121
u.h.f. modules for mobile transmitters	1,4	9,6	400–440	15,0	SOT-181	BGY46A	125
	1,4	9,6	430–470	15,0	SOT-181	BGY46B	125
	3,2	9,6	400–440	18,0	SOT-181	BGY47A	127
	3,2	9,6	460–512	18,0	SOT-181	BGY47F	127
	2,5	12,5	420–480	17,0	SOT-75A	BGY22A	75
	2,5	13,5	380–512	17,0	SOT-75A	BGY22	75
	2,5	7,5	825–845	21,0	SOT-200	BGY95A	147
	2,5	7,5	890–915	21,0	SOT-200	BGY95B	147
	2,5	9,6	825–845	21,0	SOT-200	BGY96A	149
	2,5	9,6	890–915	21,0	SOT-200	BGY96B	149
	5,0	9,6	400–440	21,5	SOT-182	BGY48A	129
	5,0	9,6	430–470	21,5	SOT-182	BGY48B	129
	5,0	9,6	460–512	21,5	SOT-182	BGY48C	129
	7	13,5	380–480	4,5	SOT-75A	BGY23	83
	7	12,5	420–480	4,5	SOT-75A	BGY23A	83
	7,5	12,5	400–440	18,8	SOT-132C	BGY40A	101
	7,5	12,5	400–470	18,8	SOT-132C	BGY40B	101
	7,5	12,5	806–890	15,7	SOT-197	BGY90A	133
	7,5	12,5	870–950	15,7	SOT-197	BGY90B	137
	13	12,5	400–440	19,4	SOT-132C	BGY41A	101
	13	12,5	440–470	19,4	SOT-132C	BGY41B	101

	P_L W	V_{CE} V	f MHz	G_p dB	envelope	type number	page
air communication class-B transmitters (225–400 MHz)	30	28	400	10	SOT-161	BLU50	209
	45	28	400	9	SOT-161	BLU51	211
	60	28	400	8	SOT-161	BLU52	213
	100	28	400	6	SOT-161	BLU53	215

u.h.f. base stations class-B operation

P_L W	V_{CE} V	f MHz	G_p dB	envelope	type number	page
1	28	470	7	TO-39/1	2N3866	1097
1	28	470	11	SOT-48/3	BLX91A	887
2	28	470	12	SOT-122	BLW89	703
2,5	28	470	11	SOT-48/3	BLX92A	901
4	28	470	11	SOT-122	BLW90	711
7	28	470	8,5	SOT-48/3	BLX93A	911
10	28	470	9	SOT-122	BLW91	719
25	28	470	6	SOT-48	BLX94A	921
25	28	470	6,5	SOT-122	BLX94C	921
40	28	470	4,5	SOT-56	BLX95	931

u.h.f. mobile transmitters class-B operation

P_L W	V_{CE} V	f MHz	G_p dB	envelope	type number	page
2	12,5	470	6	TO-39/1	BLX65	839
2	12,5	470	9	TO-39/3	BLX65E	851
2	12,5	470	9	SOT-122	BLW79	627
2,5	12,5	470	8,5	SOT-48/3	BLX67	855
4	12,5	470	8	SOT-122	BLW80	635
5	12,5	470	10,5	SOT-122	BLU99	243
7	12,5	470	8,5	SOT-122	BLU97	227
7	12,5	470	5	SOT-48/3	BLX68	867
10	12,5	470	6	SOT-122	BLW81	643
20	12,5	470	6,5	SOT-119	BLU20/12	185
20	13,5	470	4	SOT-48/2	BLX69A	879
30	12,5	470	5,7	SOT-119	BLU30/12	193
45	12,5	470	4,8	SOT-119	BLU45/12	201
60	12,5	470	4,4	SOT-119	BLU60/12	219

900 MHz base stations class-B operation

P_L W	V_{CE} V	f MHz	G_p dB	envelope	type number	page
2	24	900	9	SOT-172	BLV99	495
14	24	900	8,5	SOT-171	BLV98	487
30	24	900	7	SOT-171	BLV97	479

900 MHz mobile transmitters class-B operation

P_L W	V_{CE} V	f MHz	G_p dB	envelope	type number	page
0,5	12,5	900	8,5	SOT-103	BLU98	235
0,75	7,5	900	7,0	SOT-172	BLT90/SL	167
1	12,5	900	7,5	SOT-172	BLV90	417
1,5	7,5	900	6,0	SOT-172	BLT91/SL	175
2	12,5	900	6,5	SOT-172	BLV91	433
3	7,5	900	7,0	SOT-122	BLT92/SL	183
4	12,5	900	7,0	SOT-122	BLU99	243
4	12,5	900	7,5	SOT-171	BLV92	449
8	12,5	900	6,5	SOT-171	BLV93	457
15	12,5	900	6	SOT-171	BLV94	467
22	12,5	900	5,5	SOT-171	BLV95	477

	P_L W	V_{CE} V	f MHz	G_P dB	envelope	type number	page
f.m. broadcast transmitters class-B operation	1	28	87,5–108	18	TO-39/3	2N3866	1097
	4	28	87,5–108	20	SOT-122	BLW90	711
	15	28	87,5–108	15	SOT-123	BLV21	279
	45	28	87,5–108	11	SOT-120	BLX39	825
	45	28	87,5–108	11	SOT-123	BLW86	681
	100	28	87,5–108	8	SOT-121	BLW78	613
	175	28	87,5–108	10,5	SOT-119	BLV25	287

	P_o sync W	V_{CE} V	f MHz	G_P dB	d_{im} dB	I_C mA	envelope	type number	page
TV transposer circuits; band III; class-A operation	0,25	24	225	17	−60	200	SOT-115	BGY55	**)
	0,45	24	225	17	−55	200			
	1,5	25	225	18	−60	460	SOT-122	BLV30	295
	5	25	225	15	−58	800	SOT-122	BLV31	307
	10	25	225	16	−55	1500	SOT-160	BLV32F	317
	16	25	225	13,5	−55	3200	SOT-119	BLV33F	339
	19	25	225	9	−55	3200	SOT-147	BLV33	327
TV transmitter circuits; band III; class-AB operation	85*	28	225	10,5	–	4250	SOT-119	BLV33F	339
	90*	28	225	6,5	–	4460	SOT-147	BLV33	327
	120	28	225	10	–	2x3900	SOT-161	BLV36	353
TV transposer circuits; band IV-V; class-A operation	0,12	10	860	10	−60	70	SOT-37	BFR96S	**)
	0,3	15	860	11	−60	120	SOT-122	BFQ34	**)
	0,5	25	860	11	−60	150	SOT-122	BLW32	519
	0,7	15	860	10	−60	240	SOT-122	BFQ68	**)
	1,0	25	860	10	−60	300	SOT-122	BLW33	529
	1,8	25	860	9	−60	600	SOT-122	BLW34	539
	3,5	25	860	6,5	−60	850	SOT-122	BLW98	757
	6	25	860	8	−60	2x850	SOT-161	BLV57	373
TV transmitter circuits; band IV-V; class-AB operation	30*	25	860	7,0	–	3000	SOT-171	BLV59	387

	P_L (P.E.P.) W	V_{DS} V	G_P dB	envelope	f MHz	type number	page
R.F. power MOSFET	5	28	> 13	SOT-123	175	BLF242	155
	15	28	> 13	SOT-123	175	BLF244	159
	30	28	> 13	SOT-123	175	BLF245	163
	80	28	> 18	SOT-121	28	BLF146	151

* At 1 dB power gain compression
** See Handbook "Wideband transistors and hybrids".

In this alphanumeric list we present all transmitting transistors and modules mentioned in this handbook together with the most important data.

type	envelope	mode of operation	V_{CE} V	frequency MHz	output power W		power gain dB	page
BFQ42	TO-39/1	c.w.; class-B	13,5	175	2		> 11	41
			12,5	175	2		typ. 10,5	
BFQ43	TO-39/3	c.w.; class-B	13,5	175	4		> 12	51
			12,5	175	4		typ. 12	
BFQ43S	TO-39/3	c.w.; class-B	13,5	175	4		> 12	51
			12,5	175	4		typ. 12	
BFS22A	TO-39/1	c.w.; class-B	13,5	175	4		> 8	59
			12,5	175	4		typ. 8	
BFS23A	TO-39/1	c.w.; class-B	28	175	4		> 10	67
BGY . . .	see Modules page 15							
BLF . . .	see MOSFETs page 14							
BLT90/SL	SOT-172	c.w.; class-B	7,5	900	0,75		> 7,0	167
BLT91/SL	SOT-172	c.w.; class-B	7,5	900	1,5		> 6,0	175
BLT92/SL	SOT-122	c.w.; class-B	7,5	900	3		> 7,0	183
BLU20/12	SOT-119	c.w.; class-B	12,5	470	20		> 6,5	185
BLU30/12	SOT-119	c.w.; class-B	12,5	470	30		> 5,7	193
BLU45/12	SOT-119	c.w.; class-B	12,5	470	45		> 4,8	201
BLU50	SOT-161	c.w.; class-B	28	400	30		> 10	209
BLU51	SOT-161	c.w.; class-B	28	400	45		> 9	211
BLU52	SOT-161	c.w.; class-B	28	400	60		> 8	213
BLU53	SOT-161	c.w.; class-C	28	400	100		> 7	215
BLU60/12	SOT-119	c.w.; class-B	12,5	470	60		> 4,4	219
BLU97	SOT-122	c.w.; class-B	12,5	470	7		> 8,5	227
BLU98	SOT-103	c.w.; class-B	12,5	900	0,5		> 8,0	235
BLU99	SOT-122	c.w.; class-B	12,5	470	5		> 10,5	243
			12,5	900	4		typ. 7,0	
BLV10	SOT-123	c.w.; class-B	13,5	175	8		> 9	255
			12,5	175	8		typ. 10,5	
		s.s.b.; class-A	12	28	1	(note 3)	18	
BLV11	SOT-123	c.w.; class-B	13,5	175	15		> 8,0	263
			12,5	175	15		typ. 7,5	
		s.s.b.; class-A	12	28	2	(note 3)	18	
		s.s.b.; class-AB	13,5	28	10	(note 4)	18	
BLV20	SOT-123	c.w.; class-B	28	175	8		> 12	271
		s.s.b.; class-A	26	28	1,3	(note 3)	20	
BLV21	SOT-123	c.w.; class-B	28	175	15		> 10	279
		s.s.b.; class-A	26	28	2,3	(note 3)	20	
BLV25	SOT-119	c.w.; class-B narrow band	28	108	175		> 10	287

Notes: see next page.

type	envelope	mode of operation	V_{CE} V	frequency MHz	output power W	power gain dB	page
BLV30	SOT-122	lin. ampl., class-A	25	225	1,5 (note 1)	> 18	295
			25	225	1,7 (note 1)	typ. 20	
BLV31	SOT-122	lin. ampl., class-A	25	225	5 (note 1)	> 15	307
			25	225	7 (note 1)	typ. 16,5	
BLV32F	SOT-160	lin. ampl., class-A	25	225	10 (note 2)	> 16	317
			25	225	12,5 (note 2)	typ. 17,2	
BLV33	SOT-147	lin. ampl., class-A	25	225	19 (note 2)	> 9	327
			25	225	26 (note 2)	typ. 9,7	
		class-AB	28	225	90 (note 2)	typ. 6,5	
BLV33F	SOT-119	lin. ampl., class-A	25	225	16 (note 2)	> 13,5	339
			25	225	22 (note 2)	typ. 14,8	
		class-AB	28	225	85 (note 2)	typ. 10,5	
BLV36	SOT-161	lin. ampl., class-AB	28	225	115	> 10	353
			28	225	115	typ. 13,0	
			12,5	175	8	typ. 10,5	
BLV45/12	SOT-119	c.w.; class-B	12,5	175	45	> 6,5	365
BLV57	SOT-161	lin. ampl., class-A	25	860	6 (note 2)	> 8,0	373
			25	860	12 (note 2)	typ. 9	
		c.w.; class-AB	25	860	38	typ. 6,5	
BLV59	SOT-161	lin. ampl., class-AB	25	860	35 (note 2)	8	387
BLV75/12	SOT-119	c.w.; class-B	12,5	175	75	> 6,5	397
BLV80/28	SOT-121	c.w.; class-B	28	175	80	> 6,5	407
BLV90	SOT-172	c.w.; narrow band	12,5	900	1	> 7,5	417
BLV90/SL	SOT-172	c.w.; narrow band	12,5	900	1	> 7,5	425
BLV91	SOT-172	c.w.; narrow band	12,5	900	2	> 6,5	433
BLV91/SL	SOT-172	c.w.; narrow band	12,5	900	2	> 6,5	441
BLV92	SOT-171	c.w.; narrow band	12,5	900	4	> 7,5	449
BLV93	SOT-171	c.w.; narrow band	12,5	900	8	> 6,5	457
BLV94	SOT-171	c.w.; narrow band	12,5	900	15	> 6,0	467
BLV95	SOT-171	c.w.; narrow band	12,5	900	22	> 5,5	477
BLV97	SOT-171	c.w.; narrow band	24	900	30	> 7,0	479
BLV98	SOT-171	c.w.; narrow band	24	900	14	> 8,5	487
BLV99	SOT-172	c.w.; narrow band	24	900	2	> 8,0	495

Notes

1. $P_{o\ sync}$ at $d_{im} < -60$ dB.
2. $P_{o\ sync}$ at $d_{im} < -55$ dB.
3. P.E.P. at $d_3 < -40$ dB.
4. P.E.P. at d_3 typ. -30 dB.

type	envelope	mode of operation	V_{CE} V	frequency MHz	output power W	power gain dB	page
BLW29	SOT-120	c.w.; class-B	13,5	175	15	> 10	503
			12,5			typ. 10,5	
BLW31	SOT-120	c.w.; class-B	13,5	175	28	> 9	511
			12,5	175	28	typ. 9,5	
BLW32	SOT-122	lin. ampl., class-A	25	860	0,5 (note 1)	> 11	519
			25	860	0,63 (note 1)	typ. 12,2	
BLW33	SOT-122	lin. ampl., class-A	25	860	1,0 (note 1)	> 10	529
			25	860	1,15 (note 1)	typ. 10,5	
BLW34	SOT-122	lin. ampl., class-A	25	860	1,8 (note 1)	> 9	539
			25	860	2,15 (note 1)	typ. 10,2	
BLW50F	SOT-123	s.s.b.; class-A	45	1,6-28	0-16 (note 3)	> 19,5	549
		s.s.b.; class-AB	50	1,6-28	10-65 (note 4)	typ. 18	
BLW60	SOT-56	c.w.; class-B	12,5	175	45	> 5,0	559
		s.s.b.; class-AB	12,5	1,6-28	3-30 (note 4)	typ. 19,5	
BLW60C	SOT-120	c.w.; class-B	12,5	175	45	> 5	573
		s.s.b.; class-AB	12,5	1,6-28	3-30 (note 4)	typ. 19,5	
BLW76	SOT-121	s.s.b.; class-AB	28	1,6-28	8-80 (note 4)	> 13	585
		c.w.; class-B	28	108	80	typ. 7,9	
BLW77	SOT-121	s.s.b.; class-AB	28	1,6-28	15-130 (note 4)	> 12	599
		c.w.; class-B	28	87,5	130	typ. 7,5	
BLW78	SOT-121	c.w.; class-B	28	150	100	> 6	613
		s.s.b.; class-A	26	28	35 (note 3)	typ. 19,5	
		s.s.b.; class-AB	28	28	100 (note 4)	typ. 19,0	
BLW79	SOT-122	c.w.; class-B	12,5	470	2	> 9,0	627
			12,5	175	2	typ. 13,5	
BLW80	SOT-122	c.w.; class-B	12,5	470	4	> 8,0	635
			12,5	175	4	typ. 15	
BLW81	SOT-122	c.w.; class-B	12,5	470	10	> 6,0	643
			12,5	175	10	typ. 13,5	
BLW83	SOT-123	s.s.b.; class-A	26	1,6-28	0-10 (note 3)	> 20	651
		s.s.b.; class-AB	28	1,6-28	3-30 (note 4)	typ. 21	
BLW84	SOT-123	c.w.; class-B	28	175	25	> 9	661
BLW85	SOT-123	c.w.; class-AB	12,5	175	45	> 4,5	669
		s.s.b.; class-AB	12,5	1,6-28	3-30 (note 4)	typ. 19,5	
BLW86	SOT-123	c.w.; class-B	28	175	45	> 7,5	681
		s.s.b.; class-AB	28	1,6-28	5-47 (note 4)	typ. 19	
		s.s.b.; class-A	26	1,6-28	17 (note 3)	typ. 22	

Notes

1. $P_{o\ sync}$ at $d_{im} < -60$ dB.
2. $P_{o\ sync}$ at $d_{im} < -55$ dB.
3. P.E.P. at $d_3 < -40$ dB.
4. P.E.P. at d_3 typ. −30 dB.

type	envelope	mode of operation	V_{CE} V	frequency MHz	output power W	power gain dB	page
BLW87	SOT-123	c.w.; class-B	13,5	175	25	> 6	695
BLW89	SOT-122	c.w.; class-B	28	470	2	> 12	703
BLW90	SOT-122	c.w.; class-B	28	470	4	> 11	711
BLW91	SOT-122	c.w.; class-B	28	470	10	> 9	719
BLW95	SOT-121	s.s.b.; class-AB	50	1,6-2,5	20-160 (note 4)	> 14	727
BLW96	SOT-121	s.s.b.; class-AB	50	1,6-28	25-200 (note 4)	> 13,5	737
		c.w.; class-B	50	108	200	typ. 6,5	
		s.s.b.; class-A	40	28	50 (note 3)	typ. 19	
BLW97	SOT-121	s.s.b.; class-AB	28	1,6-28	175 (note 4)	> 11,5	749
BLW98	SOT-122	lin. ampl., class-A	25	860	3,5 (note 1)	> 6,5	757
			25	860	4,4 (note 1)	typ. 7,0	
BLW99	SOT-121	s.s.b.; class-AB	12,5	1,6-28	80 (note 4)	> 12,5	767
BLX13	SOT-56	s.s.b.; class-A	26	28	0-8 (note 3)	> 18	773
		s.s.b.; class-AB	28	28	25 (note 4)	> 18	
		c.w.; class-B	28	70	25	typ. 17	
BLX13C	SOT-120	s.s.b.; class-A	26	1,6-28	0-8 (note 3)	> 20	785
		s.s.b.; class-AB	28	1,6-28	3-25 (note 4)	typ. 21	
BLX14	SOT-55	s.s.b.; class-A	28	1,6-28	25 (note 3)	> 13	795
		s.s.b.; class-AB	28	1,6-28	7,5-50 (note 4)	> 13	
		c.w.; class-B	28	70	50	> 7,5	
		c.w.; class-B	28	30	50	typ. 16	
BLX15	SOT-55	s.s.b.; class-AB	50	1,6-28	20-150 (note 4)	> 14	809
		s.s.b.; class-A	40	1,6-28	30 (note 3)	> 14	
		c.w.; class-B	50	70	150	> 10	
		c.w.; class-B	50	108	150	typ. 7,4	
BLX39	SOT-120	c.w.; class-B	28	175	45	> 7,5	825
		s.s.b.; class-AB	28	1,6-28	5-42,5 (note 4)	typ. 19	
		s.s.b.; class-A	26	1,6-28	15 (note 3)	typ. 20	
BLX65	TO-39/1	c.w.; class-B	13,8	470	2	typ. 7	839
			12,5	470	2	> 6	
			12,5	175	2	typ. 12	
BLX65E	TO-39/3	c.w.; class-B	12,5	175	2	typ. 16	851
			12,5	470	2	> 9	
BLX65ES	TO-39/3	c.w.; class-B	12,5	175	2	typ. 16	851
			12,5	470	2	> 9	
BLX67	SOT-48/3	c.w.; class-B	13,8	470	1,5	typ. 10	855
			13,8	470	3,0	typ. 9,3	
			12,5	470	2,5	> 8,5	
			12,5	175	3,0	typ. 20	

Notes

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2. $P_{o\,sync}$ at $d_{im} < -55$ dB.
3. P.E.P. at $d_3 < -40$ dB.
4. P.E.P. at d_3 typ. -30 dB.

type	envelope	mode of operation	V_{CE} V	frequency MHz	output power W	power gain dB	page
BLX68	SOT-48/3	c.w.; class-B	13,8	470	7	$>$ 5,4	867
			13,8	470	7,8	typ. 5,9	
			12,5	470	7,0	$>$ 5,0	
			12,5	175	7,2	typ. 12,6	
BLX69A	SOT-48/2	c.w.; class-B	13,5	470	20	$>$ 4	879
			12,5	470	17	$>$ 4	
			12,5	175	17	typ. 11	
BLX91A	SOT-48/3	c.w.; class-B	24	470	0,85	typ. 12,3	887
			28	470	1,0	$>$ 11	
			28	470	1,45	typ. 12,6	
			28	1000	1,4	typ. 5,4	
BLX91CB	SOT-48/3	video cathode driver	28	"V_{CESM} max. 65 V; C_c typ. 3 pF"			897
BLX92A	SOT-48/3	c.w.; class-B	24	470	2,4	typ. 10,8	901
			28	470	2,5	$>$ 11	
			28	470	3,0	typ. 11,7	
			28	1000	2,5	typ. 5,5	
BLX93A	SOT-48/3	c.w.; class-B	24	470	7,0	typ. 8,5	911
			28	470	7,0	$>$ 8,5	
			28	470	8,0	typ. 9,0	
			28	1000	5,0	typ. 5,2	
BLX94A	SOT-48/2	c.w.; class-B	28	470	25	$>$ 6	921
BLX94C	SOT-122	c.w.; class-B	28	470	25	$>$ 6,5	921
BLX95	SOT-56	c.w.; class-B	28	470	40	$<$ 4,5	931
			28	175	40	typ. 11	
BLX96	SOT-48/3	class-A	25	860	0,5 (note 1)	$>$ 6	941
			25	860	0,6 (note 1)	typ. 7	
BLX97	SOT-48/3	class-A	25	860	1,0 (note 1)	$>$ 5,5	949
			25	860	1,1 (note 1)	typ. 6,5	
BLX98	SOT-48/2	class-A	25	860	3,5 (note 1)	$>$ 5,0	957
			25	860	4,0 (note 1)	typ. 5,5	

Notes

1. $P_{o\ sync}$ at $d_{im} < -60$ dB.
2. $P_{o\ sync}$ at $d_{im} < -55$ dB.
3. P.E.P. at $d_3 < -40$ dB.
4. P.E.P. at d_3 typ. -30 dB.

type	envelope	mode of operation	V_{CE} V	frequency MHz	output power W	power gain dB	page
BLY87A	SOT-48/2	c.w.; class-B	13,5	175	8	> 9	967
			12,5	175	8	typ. 9	
BLY87C	SOT-120	c.w.; class-B	13,5	175	8	> 12	975
			12,5	175	8	typ. 11,5	
BLY88A	SOT-48/2	c.w.; class-B	13,5	175	15	> 7,5	983
			12,5	175	15	typ. 7,5	
BLY88C	SOT-120	c.w.; class-B	13,5	175	15	> 8,0	991
			12,5	175	15	typ. 7,5	
BLY89A	SOT-56	c.w.; class-B	13,5	175	25	> 6	999
BLY89C	SOT-120	c.w.; class-B	13,5	175	25	> 6	1009
BLY90	SOT-55	c.w.; class-B	12,5	175	50	> 5,0	1017
BLY91A	SOT-48/2	c.w.; class-B	28	175	8	> 12	1025
BLY91C	SOT-120	c.w.; class-B	28	175	8	> 12	1033
BLY92A	SOT-48/2	c.w.; class-B	28	175	15	> 10	1041
BLY92C	SOT-120	c.w.; class-B	28	175	15	> 10	1049
BLY93A	SOT-56	c.w.; class-B	28	175	25	> 9	1057
BLY93C	SOT-120	c.w.; class-B	28	175	25	> 9	1065
BLY94	SOT-55	c.w.; class-B	28	175	50	> 7	1073
2N3375	TO-60	c.w.; class-B	28	100	7,5	> 8,8	1081
			28	400	> 3	> 4,8	
2N3553	TO-39/1	c.w.; class-B	28	175	2,5	> 10	1081
2N3632	TO-60	c.w.; class-B	28	175	> 13,5	> 5,9	1081
2N3866	TO-39/1	c.w.; class-B	28	400	1	> 10	1097
2N3924	TO-39/1	c.w.; class-B	13,5	175	4	> 6	1105
2N3926	TO-60	c.w.; class-B	13,5	175	7	> 5,4	1105
2N3927	TO-60	c.w.; class-B	13,5	175	12	> 4,8	1105
2N4427	TO-39/1	c.w.; class-B	12	175	1	> 10	1097

type (MOSFETs)	envelope	mode of operation	V_{DS} V	frequency MHz	output power W	power gain dB	page
BLF146	SOT-121	S.S.B.; class-A-B	28	28	80	> 18	151
BLF242	SOT-123	c.w.; class-B	28	175	5	> 13	155
BLF244	SOT-123	c.w.; class-C	28	175	15	> 13	159
BLF245	SOT-123	c.w.; class-B	28	175	30	> 13	163

type (modules)	envelope	mode of operation	$V_{S1,S2}$ V	frequency MHz	output power W	power gain dB	page
BGY22	SOT-75A	c.w.	13,5	380–512	> 2,5	17	75
BGY22A	SOT-75A	c.w.	12,5	420–480	> 2,5	17	75
BGY23	SOT-75A	c.w.	13,5	380–480	> 7,0	4,5	83
BGY23A	SOT-75A	c.w.	12,5	420–480	> 7,0	4,5	83
BGY32	SOT-132	c.w.	12,5	68–88	> 18	22,6	91
BGY33	SOT-132	c.w.	12,5	80–108	> 18	22,6	91
BGY35	SOT-132	c.w.	12,5	132–156	> 18	20,6	91
BGY36	SOT-132	c.w.	12,5	148–174	> 18	20,8	91
BGY40A	SOT-132	c.w.	12,5	400–440	> 11,5	18,8	101
BGY40B	SOT-132	c.w.	12,5	440–470	> 10	18,8	101
BGY41A	SOT-132	c.w.	12,5	400–440	> 15,6	19,4	101
BGY41B	SOT-132	c.w.	12,5	440–470	> 15	19,4	101
BGY43	SOT-132	c.w.	12,5	148–174	> 13	19,4	109
BGY45A	SOT-183	c.w.	12,5	68–88	> 30	20,0	117
BGY45B	SOT-183	c.w.	12,5	148–174	> 30	20,0	121
BGY46A	SOT-181	c.w.	9,6	400–440	> 1,4	15,0	125
BGY46B	SOT-181	c.w.	9,6	430–470	> 1,4	15,0	125
BGY47A	SOT-181	c.w.	9,6	400–470	> 3,2	18,0	127
BGY47F	SOT-181	c.w.	9,6	460–512	> 3,2	18,0	127
BGY48A	SOT-182	c.w.	9,6	400–440	> 5,0	21,5	129
BGY48B	SOT-182	c.w.	9,6	430–470	> 5,0	21,5	129
BGY48C	SOT-182	c.w.	9,6	460–512	> 5,0	21,5	129
BGY90A	SOT-197	c.w.	12,5	806–890	> 7,5	15,7	133
BGY90B	SOT-197	c.w.	12,5	870–950	> 7,5	15,7	137
BGY93A	SOT-182	c.w.	9,6	68–88	> 2,0	17,5	141
BGY93B	SOT-182	c.w.	9,6	136–156	> 2,0	17,5	141
BGY93C	SOT-182	c.w.	9,6	148–174	> 2,0	17,5	141
BGY94A	SOT-182	c.w.	9,6	68–88	> 5,0	21,5	143
BGY94B	SOT-182	c.w.	9,6	132–156	> 5,0	21,5	143
BGY94C	SOT-182	c.w.	9,6	148–174	> 5,0	21,5	143
BGY95A	SOT-200	c.w.	7,5	825–845	> 2,5	21,0	147
BGY95B	SOT-200	c.w.	7,5	890–915	> 2,5	21,0	147
BGY96A	SOT-200	c.w.	9,6	825–845	> 2,5	21,0	149
BGY96B	SOT-200	c.w.	9,6	890–915	> 2,5	21,0	149

In this section we present information on recommended circuit line-ups in the main r.f. power application areas. A comprehensive range of output power levels is indicated together with our recommended types in the particular line-up configuration. The necessary drive power level for each line-up is indicated in the first column.

More detailed application information as well as computer aided design parameters are available on request.

S.S.B. TRANSMITTERS (1,5 MHz – 30 MHz)

input power mW	1st stage		2nd stage	3rd stage	P_L (P.E.P.) W	V_{CE} V	stud S flange F
30	BLY87C	*	2 x BLY89C		**30**	13	S
30	BLV10	*	2 x BLW87		**30**	13	F
50	BLY88C	*	2 x BLW60C		**50**	13	S
50	BLV11	*	2 x BLW85		**50**	13	F
100	BLY89C	*	4 x BLW60C		**100**	13	S
100	BLW87	*	4 x BLW85		**100**	13	F
140	2 x BLW87	*	2 x BLW99		**150**	13	F
50	BLY91C	*	2 x BLX13C		**50**	28	S
50	BLV20	*	2 x BLW83		**50**	28	F
150	BLW83	*	2 x BLW76		**150**	28	F
250	2 x BLW83	*	2 x BLW77		**250**	28	F
220	2 x BLW86	*	2 x BLW97		**300**	28	F
500	2 x BLW86		4 x BLW77		**450**	28	F
680	2 x BLW78	*	4 x BLW97		**600**	28	F
300	2 x BLX13C	**	2 x BLX15		**250**	50	S
300	2 x BLW83	**	2 x BLW96		**350**	50	F
600	2 x BLX39	**	4 x BLX15		**500**	50	S
600	2 x BLW50F	*	4 x BLW95		**500**	50	F
40	BLY91C	**	2 x BLW78**	8 x BLX15	**1000**	50	S/F
40	BLV20	**	4 x BLW50F	8 x BLW96	**1200**	50	F

MILITARY COMMUNICATION TRANSMITTERS (25 MHz – 80 MHz)

input power mW	1st stage		2nd stage	3rd stage	P_L W	V_{CE} V	stud S flange F
5	BFR96 ●	*	2 x BFQ42		**2**	7,5	–
15	2N4427	*	2 x BLW80		**6**	13	S
50	BLW79	*	2 x BLW29		**25**	13	S
50	BLW89	*	2 x BLY92C		**25**	28	S
20	2N3866	*	2 x BLY91C	2 x BLX39	**90**	28	S
20	2N3866	*	2 x BLV20	2 x BLW86	**90**	28	F

● See Handbook wideband transistors and hybrids.
* Class-A operation.
** 28 V supply voltage; class-A operation.

MOBILE TRANSMITTERS (68 MHz – 87,5 MHz)

input power mW	1st stage	2nd stage		P_L W	V_{CE} V	stud S flange F
20	2N4427	BLY87C		8	13	S
20	2N4427	BLV10		8	13	F
35	2N4427	BLW29		14	13	S
10	BSX19 ●	BGY32		18	13	F
70	BFQ42	BLW31		28	13	S
160	BFQ43	BLW60C		45	13	S
160	BFQ43	BLW85		45	13	F
190	BLV10	BLV75/12		75	13	F

BASE STATIONS (68 MHz – 87,5 MHz)

input power mW	1st stage	2nd stage	3rd stage	P_L W	V_{CE} V	stud S flange F
65	BFS23A	BLY93C		25	28	S
65	BFS23A	BLW84		25	28	F
125	BLX92A	BLX39		50	28	S
15	2N3866	BLV21	BLW78	100	28	F
50	2N3866 **	BLY93C **	BLX15	150	50	S
50	2N3866 **	BLW84 **	BLW95	150	50	F

F.M. BROADCAST TRANSMITTERS (87,5 MHz – 108 MHz)

input power mW	1st stage	2nd stage	3rd stage	P_L W	V_{CE} V	stud S flange F
100	BLW90	BLX39		50	28	S
40	2N3866	BLV21	BLW78	100	28	F
100	BLW90	BLW86	2 x BLV25	300	28	F
500	BLV21	BLW78	4 x BLV25	500	28	F

→

A.M. AIRCRAFT TRANSMITTERS (118 MHz – 136 MHz)

input power mW	1st stage	2nd stage	3rd stage	$P_{L(carr)}$ W	V_{CE} V	stud S flange F
110	BLX92A	BLY93C		6	13/28	S
240	BLY91C	BLX39		12	13/28	S
240	BLV20	BLW86		12	13/28	F
100	BLX92A	BLY93C	BLW78	25	13/28	S/F
100	BLX92A	BLW84	BLW78	25	13/28	S/F

● See Handbook small signal transistors.
** 28 V supply voltage.

PORTABLE AND MOBILE TRANSMITTERS (132 MHz – 174 MHz)

input power mW	1st stage	2nd stage	3rd stage		P_L W	V_{CE} V	stud S flange F
40	2N4427	BFQ43			2	7,5	–
100	2N4427	BLY87C			8	13	S
100	2N4427	BLV10			8	13	F
125	BFQ42	BLW29			14	13	S
150	BGY36				18	13	F
250	BFQ43	BLW31			28	13	S
100	2N4427	BLW29	BLV45/12		45	13	S/F
115	BGY43	BLV45/12			45	13	F
120	BFQ42	BLW29	BLV75/12		75	13	S/F

BASE STATIONS (132 MHz – 174 MHz)

input power mW	1st stage	2nd stage	3rd stage		P_L W	V_{CE}	stud S flange F
200	BLY91C	BLY93C			25	28	S
200	BLV20	BLW84			25	28	F
25	2N3866	BLY91C	BLX39		50	28	S
25	2N3866	BLV20	BLW86		50	28	F
200	BFS23A	BLY93C	2 x BLX39		100	28	S
200	BFS23A	BLW84	2 x BLW86		100	28	F

TV TRANSPOSERS (Band III: 174 MHz – 230 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	$P_{o\,sync}$ W	$P_{o\,sat}$ W	V_{CE} V
6	BGY55 ●	2 x BLV31			10	10	25
7	BLV30	2 x BLV32F			20	20	25
3	BGY55 ●	2 x BLV31	2 x BLV33		30	40	25
6	BLV30	2 x BLV33F	4 x BLV33		60	75	25
2	BGY55 ●	2 x BLV31	4 x BLV33	8 x BLV33	100	140	25

TV TRANSMITTERS (Band III: 174 MHz – 230 MHz)

input power mW	1st stage	2nd stage	3rd stage		$P_{o\,sync}$* W		V_{CE} V
8	BGY55 ●	2 x BLV31	2 x BLV33F		130		28
10	BLV30	2 x BLV32F	2 x BLV36		250		28
35	BLV30	2 x BLV33F	4 x BLV36		470		28
75	2 x BLV30	4 x BLV33F	8 x BLV36		900		28

*With linearity correction.

● See handbook wideband transistors and hybrids.

PORTABLE AND MOBILE TRANSMITTERS (400 MHz – 512 MHz)

input power mW	1st stage	2nd stage	3rd stage		P_L W	V_{CE} V	stud S flange F
15	BFR96 ●	BLW79	BLW80		2	7,5	S
45	BLV90	BLU99			3	7,5	S
100	BGY40A BGY40B				7,5	12,5	F
15	BFR96S	BLU99	BLW81		10	13	S
150	BGY41A BGY41B				13	12,5	F
400	BLU99	BLU20/12			20	13	S/F
100	BGY40A/B	BLU30/12			30	13	F
280	BLU99	BLU20/12	BLU45/12		45	13	S/F
400	BLU99	BLU20/12	BLU60/12		60	13	S/F

BASE STATIONS (400 MHz – 470 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	P_L W	V_{CE} V	stud S flange F
45	BLX91A	BLW91	BLX94C		25	28	S
250	BLW90	BLX94C	BLX95		40	28	S
45	BLX91A	BLW91	BLX94C	2 x BLX95	70	28	S

TV TRANSPOSERS (Band IV/V: 470 MHz – 860 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	$P_{o\ sync}$ W	$P_{o\ sat}$ W	V_{CE} V
5	BFQ34 ●	BFQ68 ●	2 x BFQ68●		1,4	1,4	15
6	BLW32	BLW33	2 x BLW34		4,4	5,7	25
2	BLW32	BLW33	2 x BLW34	2 x BLW98	8	8	25
3	BLW32	BLW33	2 x BLW34	2 x BLV57	13	15	25
10	BFQ68 ●	2 x BLW34	2 x BLW98	4 x BLV57	23	30	25
14	BFQ68 ●	2 x BLW34	2 x BLV57	8 x BLV57	38	60	25

TV TRANSMITTERS (Band IV/V: 470 MHz – 860 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	$P_{o\ sync}$* W		V_{CE} V
12	BFR96S ●	BFQ68 ●	2 x BLW34	2 x BLV59	60		28
30	BFQ34 ●	2 x BLW33	2 x BLV57	4 x BLV59	120		28
80	BFQ68 ●	2 x BLW34	4 x BLV57	8 x BLV59	240		28

*With linearity correction.
● See handbook "Wideband transistors and hybrids".

MOBILE TRANSMITTERS (800 MHz – 960 MHz)

input power mW	1st stage	2nd stage	3rd stage	4th stage	P_L W	V_{CE} V	stud S flange F
60	BLU98	BLV91	BLV93		**8**	13	S/F
100	BLV90	BLV92	BLV94		**15**	13	S/F
50	BLU98	BLV91	BLV93	BLV95	**22**	13	S/F
120	BLV90	BLV92	BLV94	2 x BLV95	**40**	13	S/F

BASE STATIONS (800 MHz – 960 MHz)

input power mW	1st stage	2nd stage	3rd stage		P_L W	V_{CE} V	stud S flange F
250	BLV99	BLV98	2 x BLV97		**60**	24	S/F

Notes

1. For TV transposers and transmitters, the input powers quoted relate to the peak sync levels.
2. $P_{o\ sync}$ for transposers is the peak sync output power for a three-tone intermodulation distortion of −54 dB (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB) without pre-correction.
3. $P_{o\ sync}$ is the peak sync output power of a transposer before the sound carrier has been added. After addition of the sound carrier the peak output power will be approximately twice $P_{o\ sync}$. In transposers with pre-correction the intermodulation distortion is reduced and therefore $P_{o\ sync}$ can be increased. However there is a limit formed by the saturated output power of the transistor. Taking this into account $P_{o\ sat}$ is the maximum value of $P_{o\ sync}$ in pre-corrected systems.
4. In the transmitter line-ups the output stage operates in class-AB, the driver stages in class-A.
5. $P_{o\ sync}$ for transmitters is the peak sync output power at 1 dB power gain compression.

GENERAL

Type designation
Rating systems
Letter symbols
s-parameters
Mounting recommendations

PRO ELECTRON TYPE DESIGNATION CODE FOR SEMICONDUCTOR DEVICES

This type designation code applies to discrete semiconductor devices – as opposed to integrated circuits –, multiples of such devices and semiconductor chips.

"Although not all type numbers accord with the Pro Electron system, the following explanation is given for the ones that do."

A basic type number consists of:

TWO LETTERS FOLLOWED BY A SERIAL NUMBER

FIRST LETTER

The first letter gives information about the material used for the active part of the devices.

A. GERMANIUM or other material with band gap of 0,6 to 1,0 eV.
B. SILICON or other material with band gap of 1,0 to 1,3 eV.
C. GALLIUM-ARSENIDE or other material with band gap of 1,3 eV or more.
R. COMPOUND MATERIALS (e.g. Cadmium-Sulphide).

SECOND LETTER

The second letter indicates the function for which the device is primarily designed.

A. DIODE; signal, low power
B. DIODE; variable capacitance
C. TRANSISTOR; low power, audio frequency ($R_{th\ j\text{-}mb} > 15$ K/W)
D. TRANSISTOR; power, audio frequency ($R_{th\ j\text{-}mb} \leq 15$ K/W)
E. DIODE; tunnel
F. TRANSISTOR; low power, high frequency ($R_{th\ j\text{-}mb} > 15$ K/W)
G. MULTIPLE OF DISSIMILAR DEVICES – MISCELLANEOUS; e.g. oscillator
H. DIODE; magnetic sensitive
L. TRANSISTOR; power, high frequency ($R_{th\ j\text{-}mb} \leq 15$ K/W)
N. PHOTO-COUPLER
P. RADIATION DETECTOR; e.g. high sensitivity phototransistor
Q. RADIATION GENERATOR; e.g. light-emitting diode (LED)
R. CONTROL AND SWITCHING DEVICE; e.g. thyristor, low power ($R_{th\ j\text{-}mb} > 15$ K/W)
S. TRANSISTOR; low power, switching ($R_{th\ j\text{-}mb} > 15$ K/W)
T. CONTROL AND SWITCHING DEVICE; e.g. thyristor, power ($R_{th\ j\text{-}mb} \leq 15$ K/W)
U. TRANSISTOR; power, switching ($R_{th\ j\text{-}mb} \leq 15$ K/W)
X. DIODE: multiplier, e.g. varactor, step recovery
Y. DIODE; rectifying, booster
Z. DIODE; voltage reference or regulator (transient suppressor diode, with third letter W)

SERIAL NUMBER

Three figures, running from 100 to 999, for devices primarily intended for consumer equipment.*
One letter (Z, Y, X, etc.) and two figures, running from 10 to 99, for devices primarily intended for industrial/professional equipment.*
This letter has no fixed meaning except W, which is used for transient suppressor diodes.

VERSION LETTER

It indicates a minor variant of the basic type either electrically or mechanically. The letter never has a fixed meaning, except letter R, indicating reverse voltage, e.g. collector to case or anode to stud.

SUFFIX

Sub-classification can be used for devices supplied in a wide range of variants called associated types. Following sub-coding suffixes are in use:

1. VOLTAGE REFERENCE and VOLTAGE REGULATOR DIODES: *ONE LETTER and ONE NUMBER*
   The LETTER indicates the nominal tolerance of the Zener (regulation, working or reference) voltage
   A. 1% (according to IEC 63: series E96)
   B. 2% (according to IEC 63: series E48)
   C. 5% (according to IEC 63: series E24)
   D. 10% (according to IEC 63: series E12)
   E. 20% (according to IEC 63: series E6)
   The number denotes the typical operating (Zener) voltage related to the nominal current rating for the whole range.
   The letter 'V' is used instead of the decimal point.

2. TRANSIENT SUPPRESSOR DIODES: *ONE NUMBER*
   The NUMBER indicates the maximum recommended continuous reversed (stand-off) voltage V_R. The letter 'V' is used as above.

3. CONVENTIONAL and CONTROLLED AVALANCHE RECTIFIER DIODES and THYRISTORS: *ONE NUMBER*
   The NUMBER indicates the rated maximum repetitive peak reverse voltage (V_{RRM}) or the rated repetitive peak off-state voltage (V_{DRM}), whichever is the lower. Reversed polarity is indicated by letter R, immediately after the number.

4. RADIATION DETECTORS: *ONE NUMBER,* preceded by a hyphen (–)
   The NUMBER indicates the depletion layer in μm. The resolution is indicated by a version LETTER.

5. ARRAY OF RADIATION DETECTORS and GENERATORS: *ONE NUMBER,* preceded by a stroke (/).
   The NUMBER indicates how many basic devices are assembled into the array.

* When these serial numbers are exhausted the serial number for consumer types may be extended to four figures, and that for industrial types to three figures.

RATING SYSTEMS

The rating systems described are those recommended by the International Electrotechnical Commission (IEC) in its Publication 134.

DEFINITIONS OF TERMS USED

Electronic device. An electronic tube or valve, transistor or other semiconductor device.

Note
This definition excludes inductors, capacitors, resistors and similar components.

Characteristic. A characteristic is an inherent and measurable property of a device. Such a property may be electrical, mechanical, thermal, hydraulic, electro-magnetic, or nuclear, and can be expressed as a value for stated or recognized conditions. A characteristic may also be a set of related values, usually shown in graphical form.

Bogey electronic device. An electronic device whose characteristics have the published nominal values for the type. A bogey electronic device for any particular application can be obtained by considering only those characteristics which are directly related to the application.

Rating. A value which establishes either a limiting capability or a limiting condition for an electronic device. It is determined for specified values of environment and operation, and may be stated in any suitable terms.

Note
Limiting conditions may be either maxima or minima.

Rating system. The set of principles upon which ratings are established and which determine their interpretation.

Note
The rating system indicates the division of responsibility between the device manufacturer and the circuit designer, with the object of ensuring that the working conditions do not exceed the ratings.

ABSOLUTE MAXIMUM RATING SYSTEM

Absolute maximum ratings are limiting values of operating and environmental conditions applicable to any electronic device of a specified type as defined by its published data, which should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking no responsibility for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the device under consideration and of all other electronic devices in the equipment.

The equipment manufacturer should design so that, initially and throughout life, no absolute maximum value for the intended service is exceeded with any device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, equipment control adjustment, load variations, signal variation, environmental conditions, and variations in characteristics of the device under consideration and of all other electronic devices in the equipment.

DESIGN MAXIMUM RATING SYSTEM

Design maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under the worst probable conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device, taking responsibility for the effects of changes in operating conditions due to variations in the characteristics of the electronic device under consideration.

The equipment manufacturer should design so that, initially and throughout life, no design maximum value for the intended service is exceeded with a bogey device under the worst probable operating conditions with respect to supply voltage variation, equipment component variation, variation in characteristics of all other devices in the equipment, equipment control adjustment, load variation, signal variation and environmental conditions.

DESIGN CENTRE RATING SYSTEM

Design centre ratings are limiting values of operating and environmental conditions applicable to a bogey electronic device of a specified type as defined by its published data, and should not be exceeded under normal conditions.

These values are chosen by the device manufacturer to provide acceptable serviceability of the device in average applications, taking responsibility for normal changes in operating conditions due to rated supply voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all electronic devices.

The equipment manufacturer should design so that, initially, no design centre value for the intended service is exceeded with a bogey electronic device in equipment operating at the stated normal supply voltage.

LETTER SYMBOLS FOR TRANSISTORS AND SIGNAL DIODES

based on IEC Publication 148

LETTER SYMBOLS FOR CURRENTS, VOLTAGES AND POWERS

Basic letters

The basic letters to be used are:

I, i = current
V, v = voltage
P, p = power.

Lower-case basic letters shall be used for the representation of instantaneous values which vary with time.
In all other instances upper-case basic letters shall be used.

Subscripts

A, a	Anode terminal
(AV), (av)	Average value
B, b	Base terminal, for MOS devices: Substrate
(BR)	Breakdown
C, c	Collector terminal
D, d	Drain terminal
E, e	Emitter terminal
F, f	Forward
G, g	Gate terminal
K, k	Cathode terminal
M, m	Peak value
O, o	As third subscript: The terminal not mentioned is open circuited
R, r	As first subscript: Reverse. As second subscript: Repetitive. As third subscript: With a specified resistance between the terminal not mentioned and the reference terminal.
(RMS), (rms)	R.M.S. value
S, s	As first or second subscript: Source terminal (for FETS only) As second subscript: Non-repetitive (not for FETS) As third subscript: Short circuit between the terminal not mentioned and the reference terminal
X, x	Specified circuit
Z, z	Replaces R to indicate the actual working voltage, current or power of voltage reference and voltage regulator diodes.

Note: No additional subscript is used for d.c. values.

Upper-case subscripts shall be used for the indication of:

a) continuous (d.c.) values (without signal)

Example I_B

b) instantaneous total values

Example i_B

c) average total values

Example $I_{B(AV)}$

d) peak total values

Example I_{BM}

e) root-mean-square total values

Example $I_{B(RMS)}$

Lower-case subscripts shall be used for the indication of values applying to the varying component alone:

a) instantaneous values

Example i_b

b) root-mean-square values

Example $I_{b(rms)}$

c) peak values

Example I_{bm}

d) average values

Example $I_{b(av)}$

Note: If more than one subscript is used, subscript for which both styles exist shall either be all upper-case or all lower-case.

Additional rules for subscripts

Subscripts for currents

Transistors: If it is necessary to indicate the terminal carrying the current, this should be done by the first subscript (conventional current flow from the external circuit into the terminal is positive).

Examples: I_B, i_B, i_b, I_{bm}

Diodes: To indicate a forward current (conventional current flow into the anode terminal) the subscript F or f should be used; for a reverse current (conventional current flow out of the anode terminal) the subscript R or r should be used.

Examples: I_F, I_R, i_F, $I_{f(rms)}$

Subscripts for voltages

Transistors: If it is necessary to indicate the points between which a voltage is measured, this should be done by the first two subscripts. The first subscript indicates the terminal at which the voltage is measured and the second the reference terminal or the circuit node. Where there is no possibility of confusion, the second subscript may be omitted.

Examples: V_{BE}, v_{BE}, v_{be}, V_{bem}

Diodes: To indicate a forward voltage (anode positive with respect to cathode), the subscript F or f should be used; for a reverse voltage (anode negative with respect to cathode) the subscript R or r should be used.

Examples: V_F, V_R, v_F, V_{rm}

Subscripts for supply voltages or supply currents

Supply voltages or supply currents shall be indicated by repeating the appropriate terminal subscript.

Examples: V_{CC}, I_{EE}

Note: If it is necessary to indicate a reference terminal, this should be done by a third subscript

Example : V_{CCE}

Subscripts for devices having more than one terminal of the same kind

If a device has more than one terminal of the same kind, the subscript is formed by the appropriate letter for the terminal followed by a number; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{B2} = continuous (d.c.) current flowing into the second base terminal

V_{B2-E} = continuous (d.c.) voltage between the terminals of second base and emitter

Subscripts for multiple devices

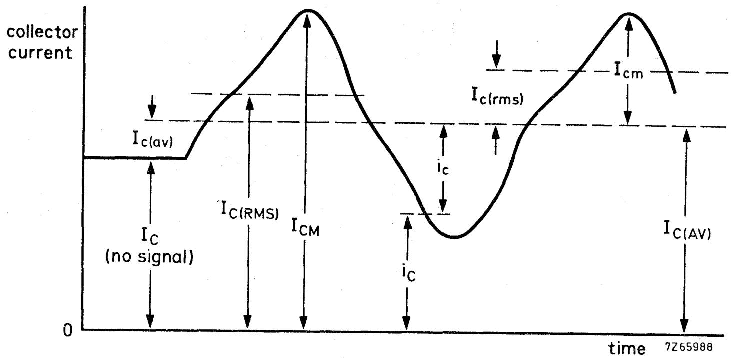
For multiple unit devices, the subscripts are modified by a number preceding the letter subscript; in the case of multiple subscripts, hyphens may be necessary to avoid misunderstanding.

Examples: I_{2C} = continuous (d.c.) current flowing into the collector terminal of the second unit

V_{1C-2C} = continuous (d.c.) voltage between the collector terminals of the first and the second unit.

Application of the rules

The figure below represents a transistor collector current as a function of time. It consists of a continuous (d.c.) current and a varying component.



LETTER SYMBOLS FOR ELECTRICAL PARAMETERE METERS

Defenition

For the purpose of this Publication, the term "electrical parameter" applies to four-pole matrix parameters, elements of electrical equivalent circuits, electrical impedances and admittances, inductances and capacitances.

Basic letters

The following is a list of the most important basic letters used for electrical parameters of semiconductor devices.

B, b = susceptance; imaginary part of an admittance

C = capacitance

G, g = conductance; real part of an admittance

H, h = hybrid parameter

L = inductance

R, r = resistance; real part of an impedance

X, x = reactance; imaginary part of an impedance

Y, y = admittance;

Z, z = impedance;

Upper-case letters shall be used for the representation of:

a) electrical parameters of external circuits and of circuits in which the device forms only a part;

b) all inductances and capacitances.

Lower-case letters shall be used for the representation of electrical parameters inherent in the device (with the exception of inductances and capacitances).

Subscripts

General subscripts

The following is a list of the most important general subscripts used for electrical parameters of semiconductor devices:

F, f = forward; forward transfer
I, i (or 1) = input
L, l = load
O, o (or 2) = output
R, r = reverse; reverse transfer
S, s = source

Examples: Z_S, h_f, h_F

The upper-case variant of a subscript shall be used for the designation of static (d.c.) values.

Examples : h_{FE} = static value of forward current transfer ratio in common-emitter configuration (d.c. current gain)
R_E = d.c. value of the external emitter resistance.

Note: The static value is the slope of the line from the origin to the operating point on the appropriate characteristic curve, i.e. the quotient of the appropriate electrical quantities at the operating point.

The lower-case variant of a subscript shall be used for the designation of small-signal values.

Examples: h_{fe} = small-signal value of the short-circuit forward current transfer ratio in common-emitter configuration

$Z_e = R_e + jX_e$ = small-signal value of the external impedance

Note: If more than one subscript is used, subscripts for which both styles exist shall either be all upper-case or all lower-case

Examples: h_{FE}, y_{RE}, h_{fe}

Subscripts for four-pole matrix parameters

The first letter subscript (or double numeric subscript) indicates input, output, forward transfer or reverse transfer

Examples: h_i (or h_{11})
h_o (or h_{22})
h_f (or h_{21})
h_r (or h_{12})

A further subscript is used for the identification of the circuit configuration. When no confusion is possible, this further subscript may be omitted.

Examples: h_{fe} (or h_{21e}), h_{FE} (or h_{21E})

Distinction between real and imaginary parts

If it is necessary to distinguish between real and imaginary parts of electrical parameters, no additional subscripts should be used. If basic symbols for the real and imaginary parts exist, these may be used.

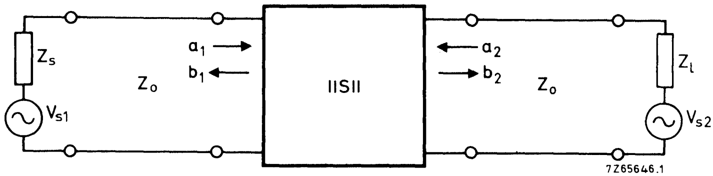
Examples: $Z_i = R_i + jX_i$
$y_{fe} = g_{fe} + jb_{fe}$

If such symbols do not exist or if they are not suitable, the following notation shall be used:

Examples: Re (h_{ib}) etc. for the real part of h_{ib}
Im (h_{ib}) etc. for the imaginary part of h_{ib}

SCATTERING PARAMETERS

In distinction to the conventional h, y and z-parameters, s-parameters relate to travelling wave conditions. The figure below shows a two-port network with the incident and reflected waves a_1, b_1, a_2 and b_2.



$$a_1 = \frac{V_{i1}}{\sqrt{Z_o}} \qquad a_2 = \frac{V_{i2}}{\sqrt{Z_o}}$$

$$b_1 = \frac{V_{r1}}{\sqrt{Z_o}} \qquad b_2 = \frac{V_{r2}}{\sqrt{Z_o}} \qquad [1)]$$

Z_o = characteristic impedance of the transmission line in which the two-port is connected.

V_i = incident voltage

V_r = reflected (generated) voltage

The four-pole equations for s-parameters are:

$$b_1 = s_{11}a_1 + s_{12}a_2$$
$$b_2 = s_{21}a_1 + s_{22}a_2$$

Using the subscripts i for 11, r for 12, f for 21 and o for 22, it follows that:

$$s_i = s_{11} = \left.\frac{b_1}{a_1}\right| a_2 = 0$$
$$s_r = s_{12} = \left.\frac{b_1}{a_2}\right| a_1 = 0$$
$$s_f = s_{21} = \left.\frac{b_2}{a_1}\right| a_2 = 0$$
$$s_o = s_{22} = \left.\frac{b_2}{a_2}\right| a_1 = 0$$

1) The squares of these quantities have the dimension of power.

The s-parameters can be named and expressed as follows:

$s_i = s_{11}$ = Input reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$.

$s_r = s_{12}$ = Reverse transmission coefficient.
The complex ratio of the generated wave at the input and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

$s_f = s_{21}$ = Forward transmission coefficient.
The complex ratio of the generated wave at the output and the incident wave at the input, under the conditions $Z_l = Z_o$ and $V_{s2} = 0$

$s_o = s_{22}$ = Output reflection coefficient.
The complex ratio of the reflected wave and the incident wave at the output, under the conditions $Z_s = Z_o$ and $V_{s1} = 0$.

RECOMMENDATIONS FOR MOUNTING FLANGE R.F. POWER TRANSISTORS

Flange r.f. transistors are easy to mount but for optimum performance we offer the following recommendations:

- Holes or tapped holes in the heatsink should be free from burrs and spaced at 18,42 mm (+ 0,05; −0,05) between centres. They must have a depth of at least 6 mm.
  Recommended screw: for SOT-119, SOT-121 and SOT-161 cheese-head 4-40 UNC/2A, for SOT-123 and SOT-160 also M3. A washer to spread the joint pressure is also recommended.
- For transistors dissipating up to 80 W the heatsink thickness should be at least 3 mm copper (> 99,9%, ETP-Cu) or 5 mm aluminium (> 99,0% Al). For transistors dissipating more power, the thickness should be increased proportionally.
- The flatness of the heatsink mounting surface must be > 0,02 mm with a surface roughness $R_a < 0,5$ μm (preferably by grinding or lapping).
- The sparing use of evenly distributed heatsink compound on the transistor flange is recommended. Suitable heatsink compound brands are: Dow Corning 340, Eccotherm TC-5 (E&C), Wakefield 120.
- The screws through the flange holes should first both be tightened to 0,05 Nm (finger tight), and then tightened to 0,6 to 0,75 Nm, to achieve the published thermal resistance between the mounting base and heatsink.
- When a transistor is removed from the heatsink, the flange will almost certainly have been distorted by the joint pressure. Grinding or lapping of the flange according to the information above is necessary if the transistor is remounted.

RECOMMENDATIONS FOR MOUNTING ¼", ⅜" AND ½" CAPSTAN HEADERS AS USED FOR R.F. POWER TRANSISTORS

A nickel plated brass nut is supplied with each transistor for securing it to a heatsink.

Screw threads, diameter and nuts:

mounting base diameter	thread	maximum diameter of threaded stud	nut thickness
¼"	8-32UNC-2A(B)	4,14 mm	3,5 and 5 mm
⅜"	10-32UNF-2A(B)	4,80 mm	5 mm
½"	¼" x 28UNF-2A(B)	6,33 mm	5,5 mm

To ensure optimum heat transfer and to avoid damage to the threaded stud of the transistor the following recommendations should be observed.

— Diameter of the mounting hole in the heatsink:

¼" stud diameter 4,15 +0,05; −0 mm
⅜" stud diameter 4,85 +0,05; −0 mm
½" stud diameter 6,35 +0,05; −0 mm

Heatsink surfaces at the mounting hole to be flat, parallel, and free of burrs or oxidation.

— Mounting nut torque:

¼" nut minimum 0,75 Nm (7,5 kg cm) maximum 0,85 Nm (8,5 kg cm)
⅜" nut minimum 1,5 Nm (15 kg cm) maximum 1,7 Nm (17 kg cm)
½" nut minimum 2,3 Nm (23 kg cm) maximum 2,7 Nm (27 kg cm)

— Recommended distance from the surface of the heatsink to the top surface of the printed-circuit board:

¼" capstan header 2,9 + 0; −0,2 mm
⅜" capstan header 3,8 + 0; −0,2 mm
½" capstan header 4,8 + 0; −0,2 mm

It is important that the above maximum printed-circuit board mounting heights are not exceeded in order to prevent stress being applied to the encapsulation. Upward lead bending, in particular, can damage the encapsulation and impair the sealing of the header.

— Experience indicates that flux or flux solutions can penetrate even hermetically sealed ceramic-capped transistors. To prevent this, tin and wash the printed-circuit boards before mounting the power transistors, then solder the transistors in place without using flux.

— The leads may be tinned by dipping them, full length, into a solder bath at about 230 °C. Note, no flux should be used during tinning.

— The full mounting-nut torque (specified above) should be applied only once during the life of the transistor. For pre-assembly testing, apply no more than two thirds of the specified torque.

— Since locking washers are much harder than most heatsink materials, their locking action might deteriorate during the life of the transistor. The use of locking washers is therefore not recommended. Instead, tighten the nuts to their specified torque, allow about 30 minutes for them to bed down, then re-tighten. After this, apply locking paint.

DEVICE DATA

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. The BFQ42 is especially suited as a driver transistor for the BLW29 in a two-stage wideband or semi-wide-band v.h.f. amplifier delivering 15 W output power.

It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

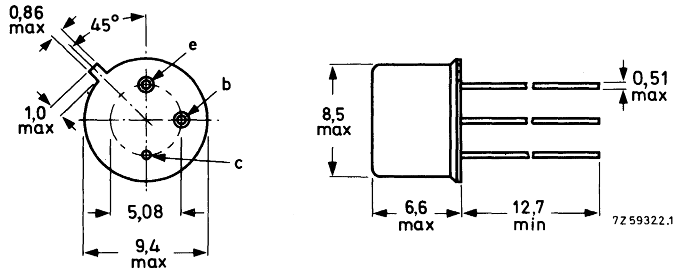
R.F. performance up to T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 32 K/W

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w. class-B	**13,5**	**175**	**2**	**> 11**	**> 60**	**7,8 − j4,6**	**22 − j18**
c.w. class-B	12,5	175	2	typ. 10,5	typ. 65	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.

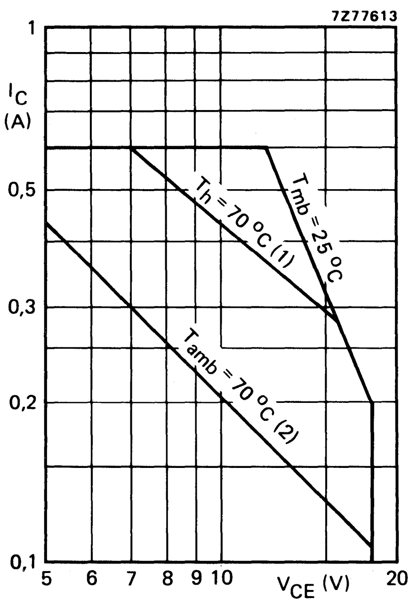


Maximum lead diameter is guaranteed only for 12,7 mm.

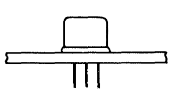
RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0,6	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	1,8	A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	7,2	W
Storage temperature	T_{stg}		−65 to + 200	°C
Junction temperature	T_j	max.	200	°C



(1) Mounted on a heatsink.



(2) Free-air operation; using a spring cooling clip.

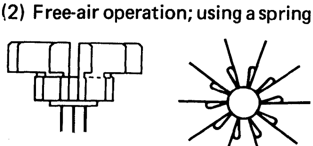
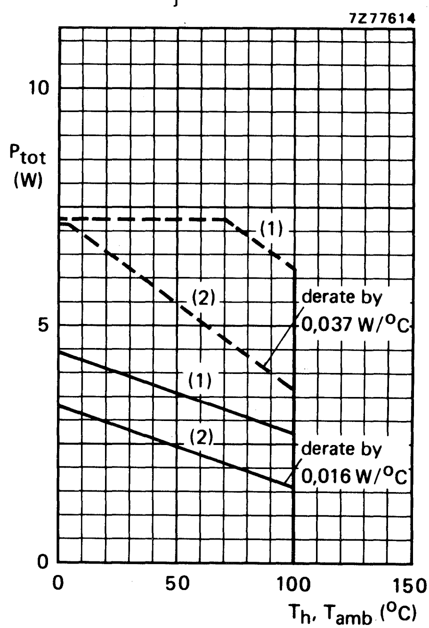


Fig. 2 D.C. SOAR.



(1) Short-time r.f. operation during mismatch; $R_{th\ mb\text{-}h}$ = 3 K/W; $R_{th\ c\text{-}a}$ = 32 K/W; f ⩾ 1 MHz.

(2) Continuous d.c. and r.f. operation; $R_{th\ mb\text{-}h}$ = 3 K/W; $R_{th\ c\text{-}a}$ = 32 K/W.

Fig. 3 Total power dissipation; V_{CE} ⩽ 16,5 V.
– – – Mounted on a heatsink.
—— Free-air operation; using a spring cooling clip having a thermal resistance of 32 K/W.

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	24 K/W
From junction to case	$R_{th\ j\text{-}c}$	=	29 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	3 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage $V_{BE} = 0$; I_C = 2 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 25 mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; V_{CE} = 18 V	I_{CES}	<	1 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5 mJ
R_{BE} = 10 Ω	E_{SBR}	>	0,5 mJ
D.C. current gain * I_C = 0,25 A; V_{CE} = 5 V	h_{FE}	typ.	30
			10 to 60
Collector-emitter saturation voltage* I_C = 0,75 A; I_B = 0,15 A	V_{CEsat}	typ.	0,9 V
Transition frequency at f = 100 MHz * $-I_E$ = 0,25 A; V_{CB} = 13,5 V	f_T	typ.	750 MHz
$-I_E$ = 0,75 A; V_{CB} = 13,5 V	f_T	typ.	625 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; V_{CB} = 13,5 V	C_c	typ.	8,6 pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 13,5 V	C_{re}	typ.	3,8 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.

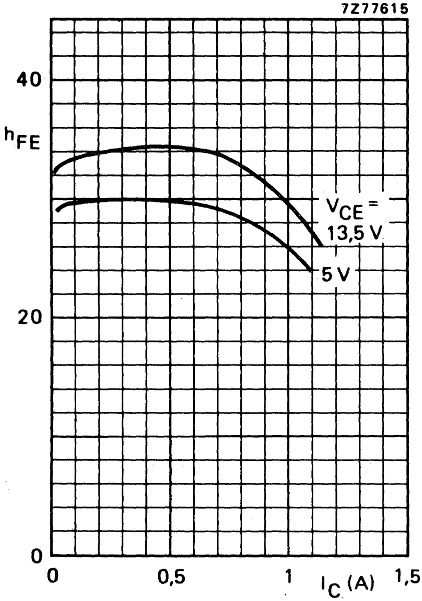


Fig. 4 Typical values; T_j = 25 °C.

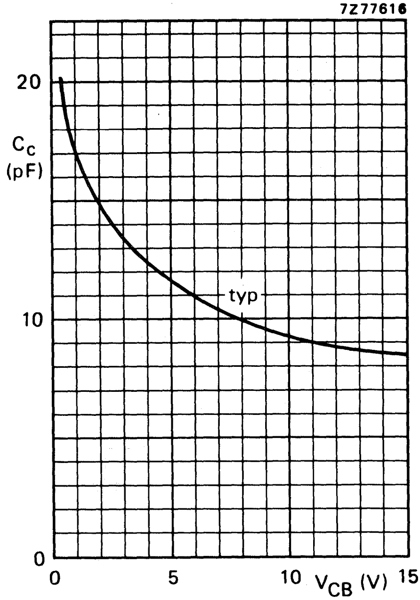


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

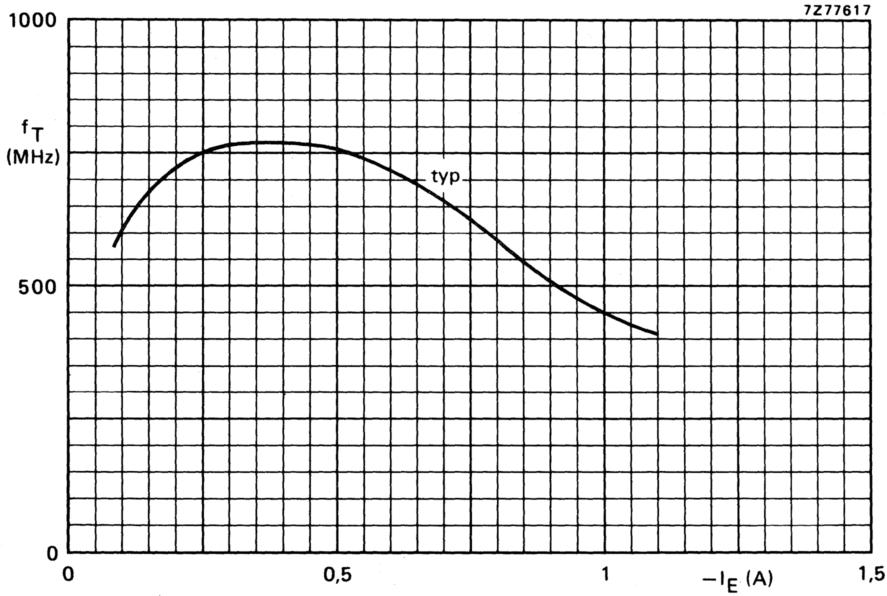


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 32 °C/W

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**2**	**< 0,16**	**> 11**	**< 0,25**	**> 60**	**7,8 − j4,6**	**22 − j18**
175	12,5	2	−	typ. 10,5		typ. 65	−	−

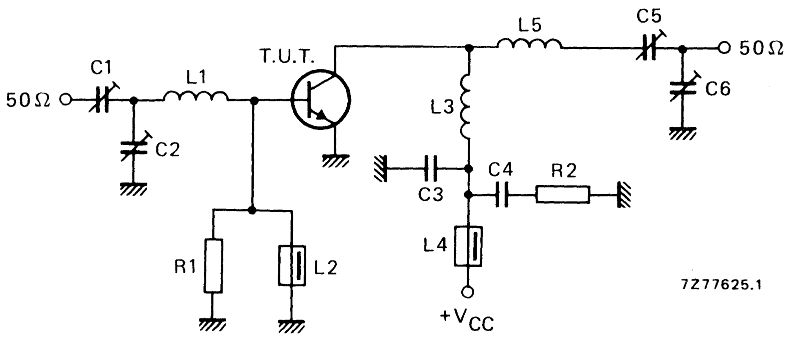


Fig. 7 Test circuit; c.w. class-B.

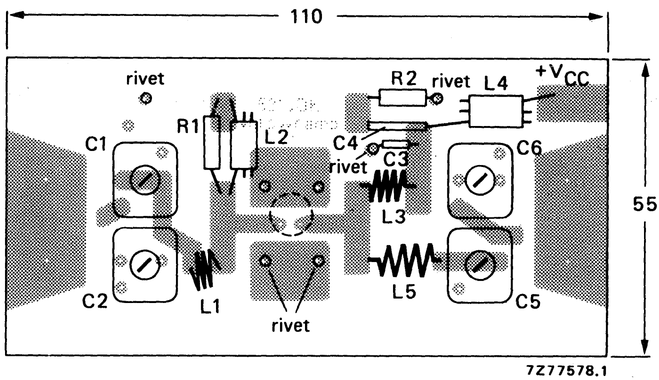
List of components:
C1 = C2 = C5 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 100 pF ceramic capacitor
C4 = 100 nF polyester capacitor
C6 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)

L1 = 3 turns enamelled Cu wire (1,0 mm); int. dia. 4,0 mm; length 4 mm; leads 2 x 5 mm
L2 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L5 = 4 turns Cu wire (1,0 mm); int. dia. 6,0 mm; length 6 mm; leads 2 x 5 mm

R1 = 220 Ω carbon resistor
R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



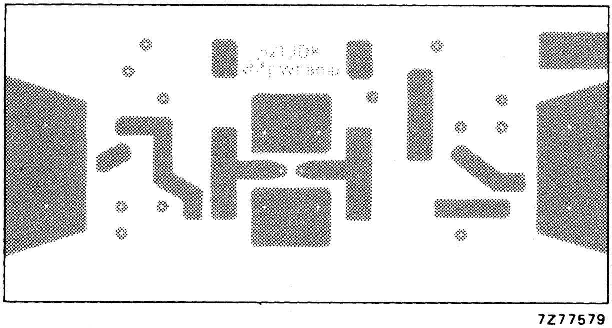


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

Material of printed-circuit board: 1,6 mm epoxy fibre-glass.

The length of the external emitter lead is 1,2 mm.

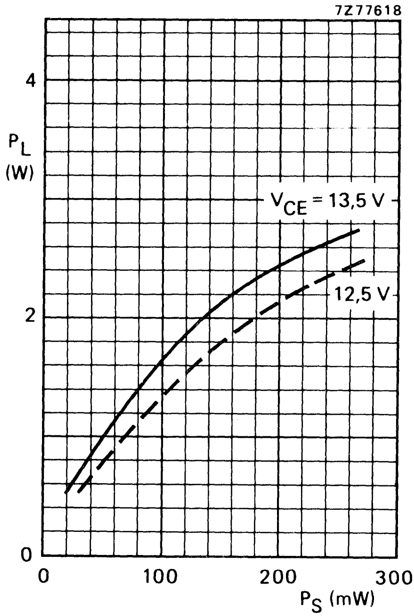


Fig. 9 Typical values; f = 175 MHz; T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 32 K/W.

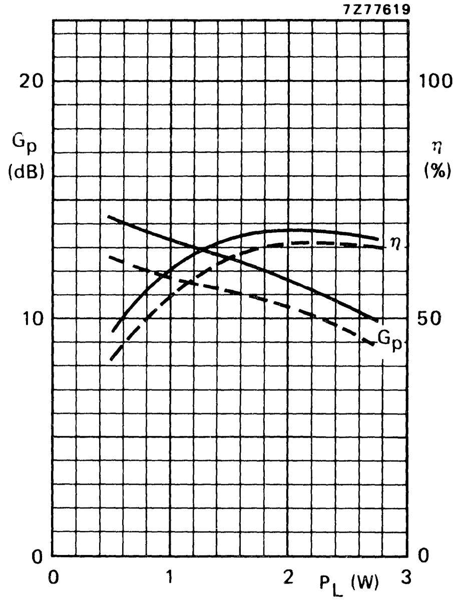


Fig. 10 Typical values; f = 175 MHz; T_{amb} = 25 °C; —— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V; $R_{th\ c\text{-}a}$ = 32 K/W.

APPLICATION INFORMATION (continued)

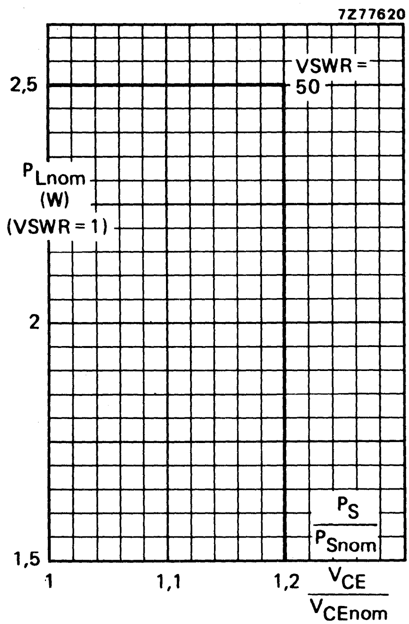


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 3 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

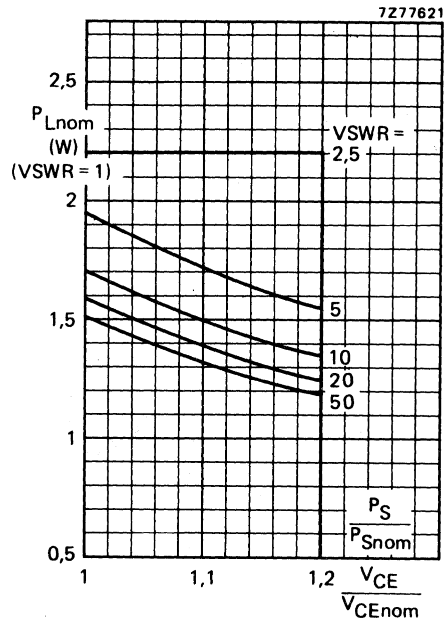


Fig. 12 R.F. SOAR (short-time operation during mismatch); f = 175 °C; T_{amb} = 70 °C; $R_{th\ c\text{-}a}$ = 32 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

Note to Figs 11 and 12:
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 100 MHz a base-emitter resistor of 22 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

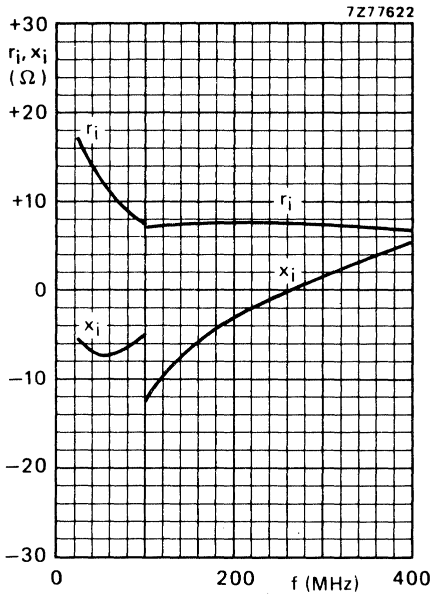


Fig. 13.

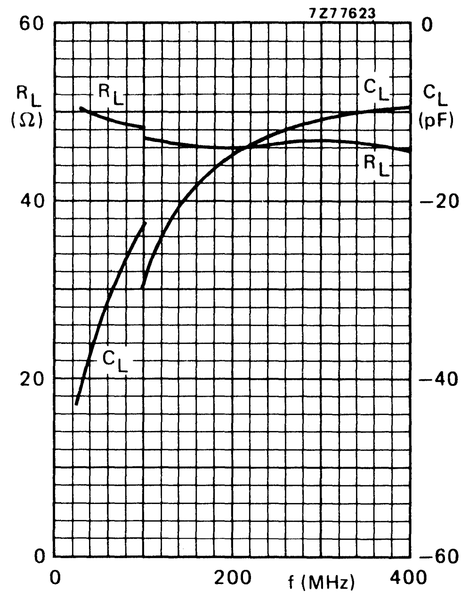
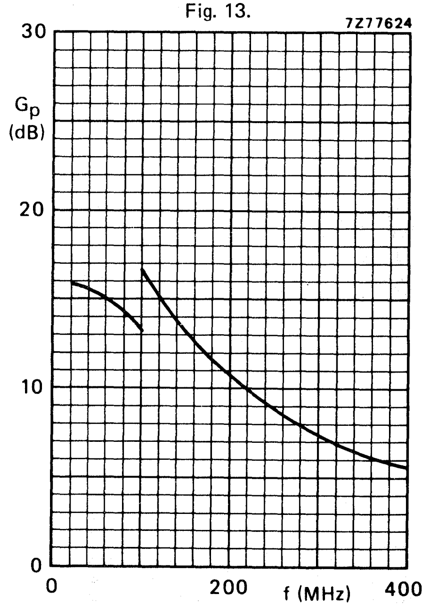


Fig. 14.



Conditions for Figs 13, 14 and 15:

Typical values; V_{CE} = 13,5 V; P_L = 2 W; T_{amb} = 25 °C; $R_{th\ c\text{-}a}$ = 32 K/W.

Fig. 15.

V.H.F. POWER TRANSISTORS

N-P-N silicon planar epitaxial transistors intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. The transistors are resistance stabilized and guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. The BFQ43 and BFQ43S are especially suited as driver transistors for the BLW31 in a two-stage wideband or semi-wideband v.h.f. amplifier delivering 28 W output power.

The BFQ43 and BFQ43S have a TO-39 metal envelope with the emitter connected to the case which enables excellent heatsinking and emitter grounding.

QUICK REFERENCE DATA

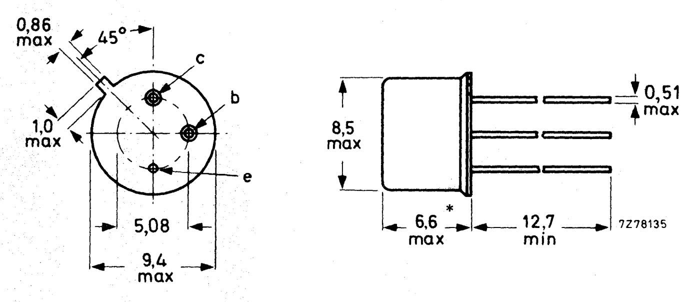
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w. class-B	**13,5**	**175**	**4**	**> 12**	**> 55**	**3,2 + j0,03**	**53 – j29**
c.w. class-B	12,5	175	4	typ. 12	typ. 60	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; emitter connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

* Max. 4,9 for BFQ43S.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	1,25	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	3,75	A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	12	W
Storage temperature	T_{stg}		−65 to + 175	°C
Operating junction temperature	T_j	max.	200	°C

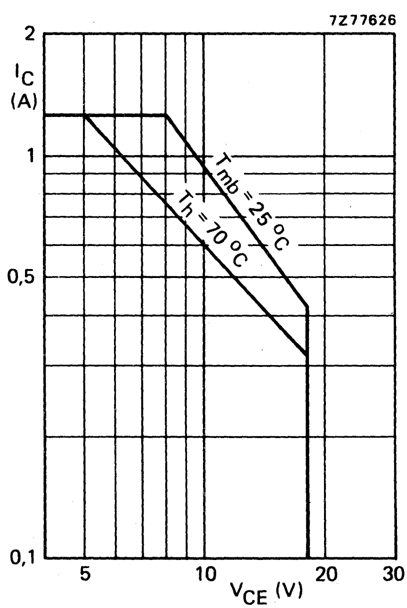
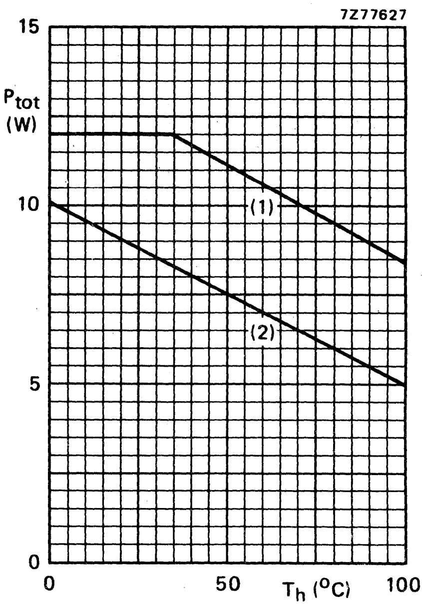


Fig. 2 D.C. SOAR.



(1) Short-time r.f. operation during mismatch; f ⩾ 1 MHz.
(2) Continuous d.c. and r.f. operation; derate by 0,05 W/°C.

Fig. 3 Total power dissipation; $V_{CE} \leqslant 16{,}5$ V.

THERMAL RESISTANCE (dissipation = 4 W; T_{mb} = 82 °C, i.e. T_h = 70 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	18	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	3	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 5 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	0,5	mJ
D.C. current gain * I_C = 0,5 A; V_{CE} = 5 V	h_{FE}	typ.	40 10 to 80	
Collector-emitter saturation voltage * I_C = 1,5 A; I_B = 0,3 A	V_{CEsat}	typ.	0,9	V
Transition frequency at f = 100 MHz * $-I_E$ = 0,5 A; V_{CB} = 13,5 V	f_T	typ.	750	MHz
$-I_E$ = 1,5 A; V_{CB} = 13,5 V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 13,5 V	C_c	typ.	15	pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 13,5 V	C_{re}	typ.	7,3	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

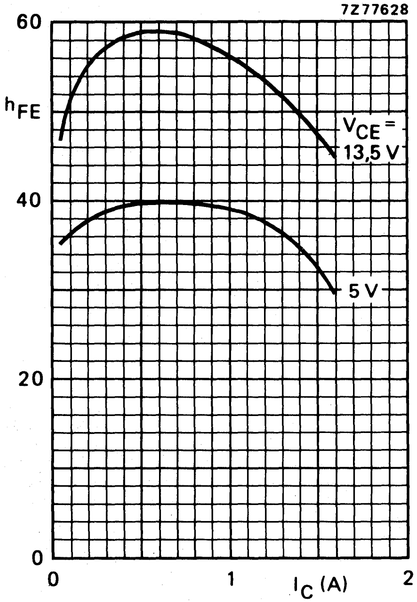


Fig. 4 Typical values; T_j = 25 °C.

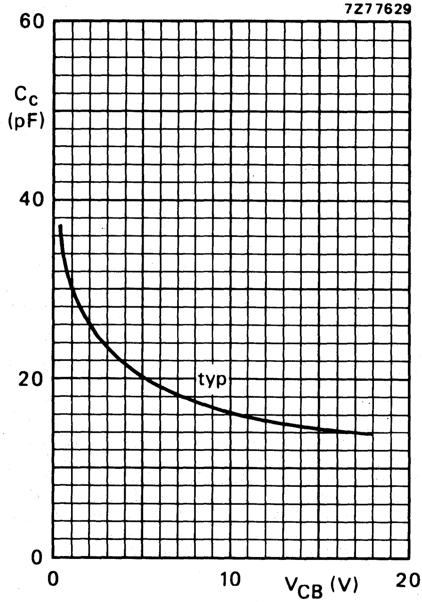


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

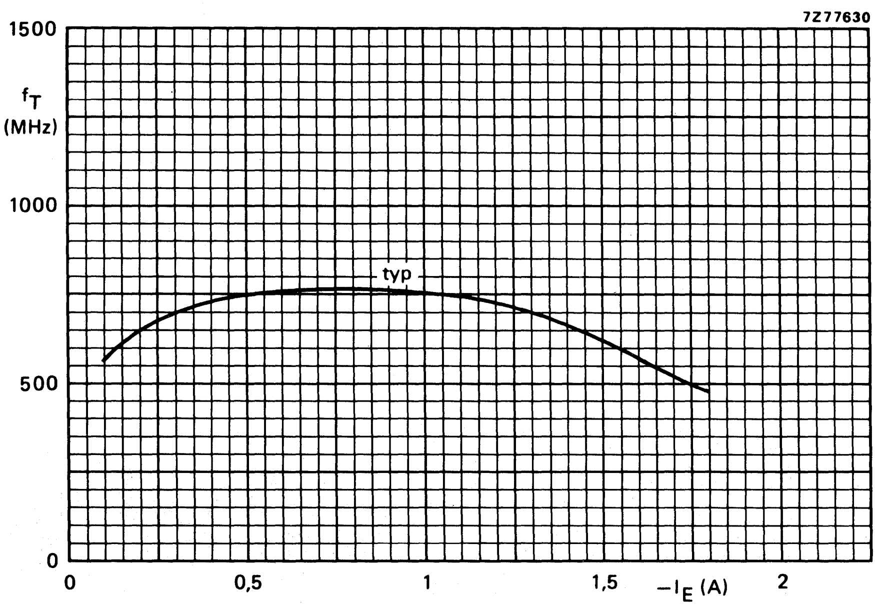


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**4**	**< 0,25**	**> 12**	**< 0,54**	**> 55**	**3,2 + j0,03**	**53 – j29**
175	12,5	4	–	typ. 12	–	typ. 60	–	–

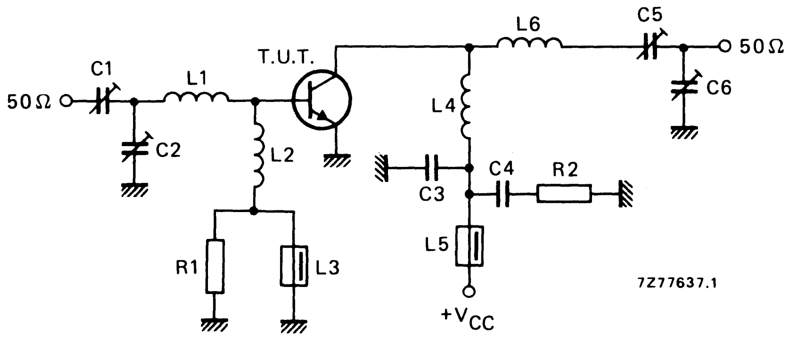


Fig. 7 Test circuit; c.w. class-B.

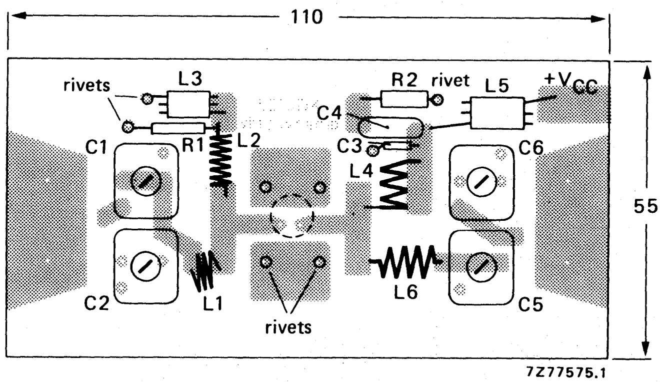
List of components:
C1 = C5 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 100 pF ceramic capacitor
C4 = 100 nF polyester capacitor

L1 = 2 turns Cu wire (1,0 mm); int. dia. 4,0 mm; length 3 mm; leads 2 x 5 mm
L2 = 7 turns enamelled Cu wire (0,5 mm); int. dia. 3,0 mm; length 4 mm; leads 2 x 5 mm
L3 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 4 turns enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; length 5 mm; leads 2 x 5 mm
L6 = 5 turns enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; length 7,5 mm; leads 2 x 5 mm

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



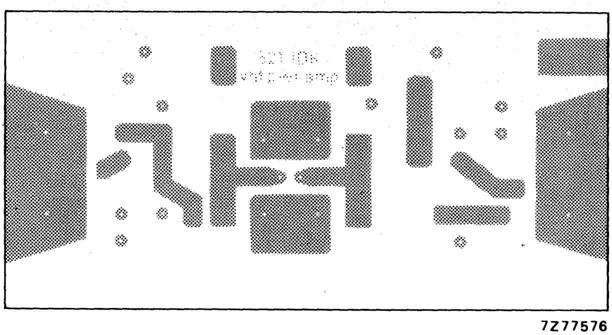


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

Material of printed-circuit board: 1,6 mm epoxy fibre-glass.

The case is directly grounded on the printed-circuit board.

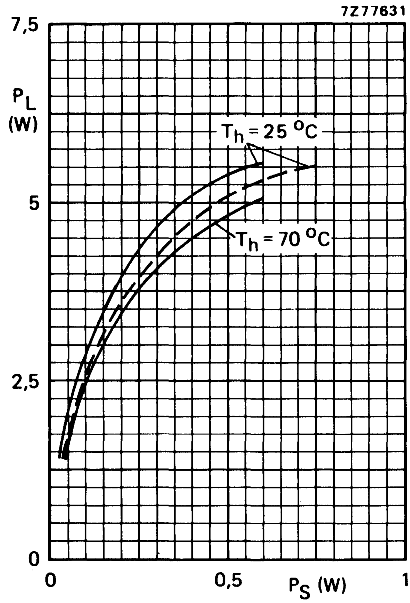


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

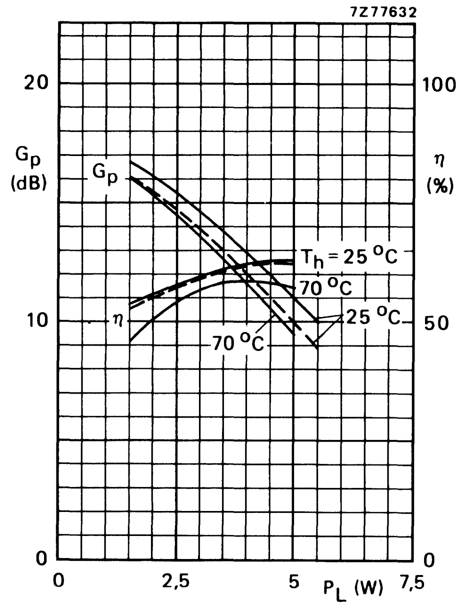


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

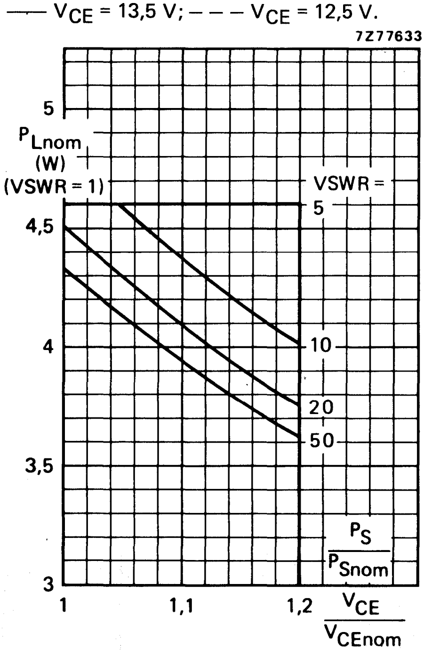


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C.
$R_{th\ mb\text{-}h}$ = 3 K/W; V_{CEnom} = 13,5 or 12,5 V;
$P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 140 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

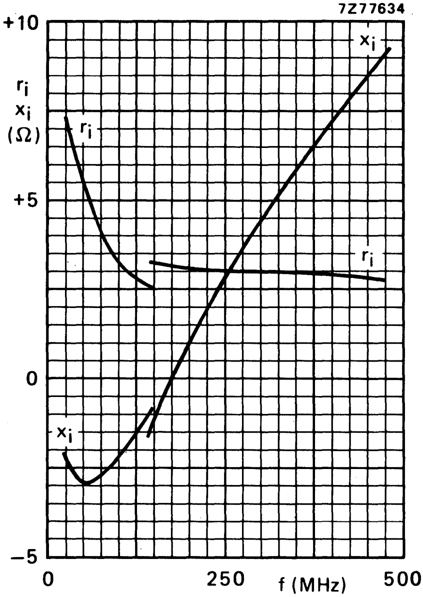


Fig. 12.

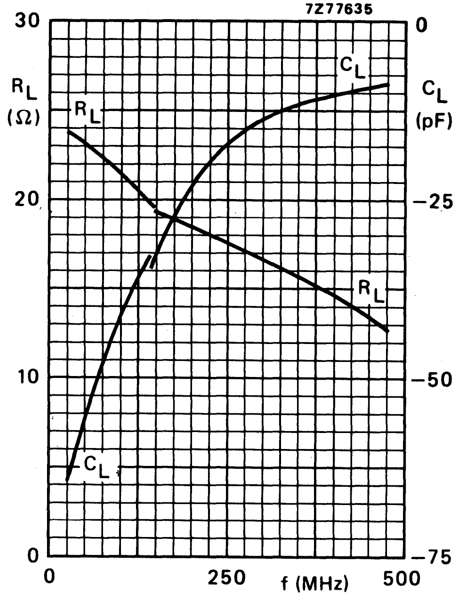
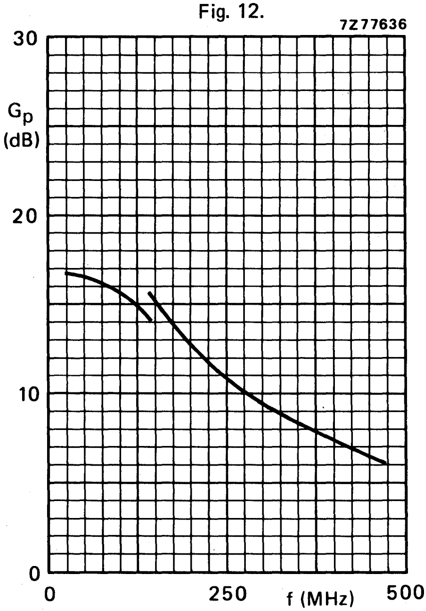


Fig. 13.



Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 4 W; T_h = 25 °C.

Fig. 14.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

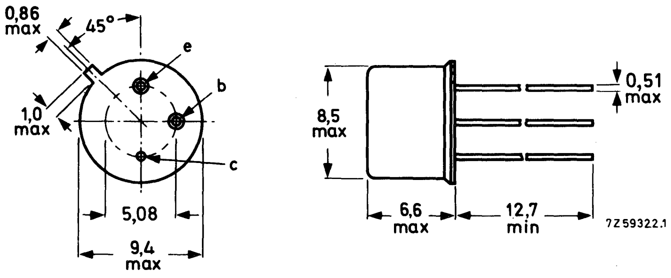
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,5	175	4	> 8	> 60	3,9 + j2,2	37 − j22
c.w.	12,5	175	4	typ. 8	typ. 60	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.

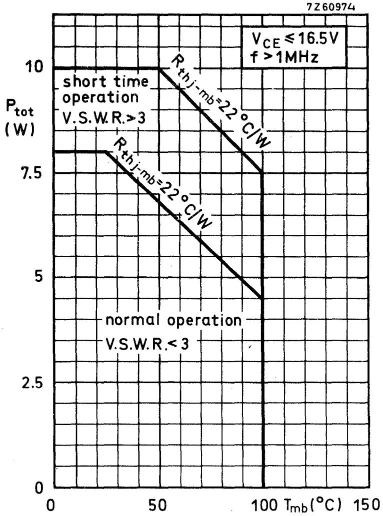


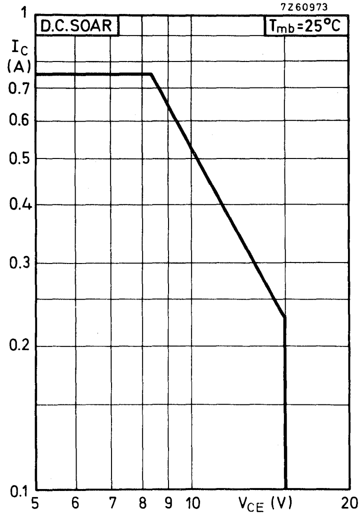
Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0.75	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2.25	A
Total power dissipation up to T_{mb} = 25 °C f > 1 MHz	P_{tot}	max.	8	W





Storage temperature	T_{stg}		-65 to +200	°C
Operating junction temperature	T_j	max.	200	°C

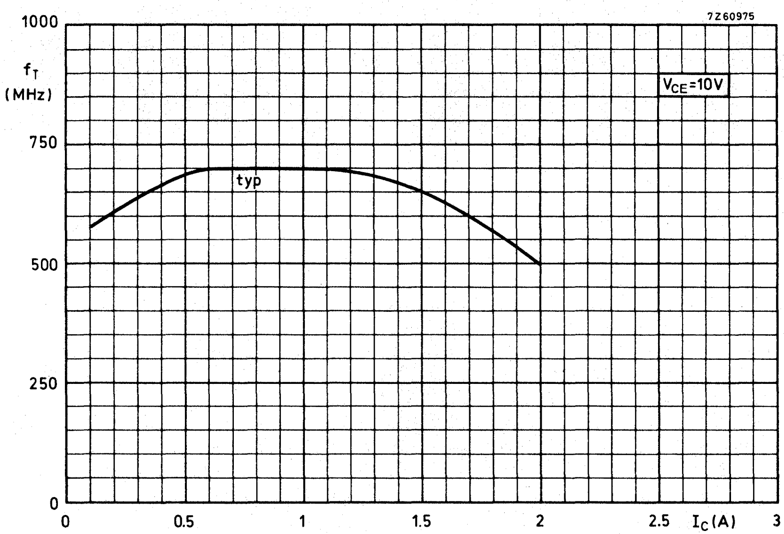
THERMAL RESISTANCE

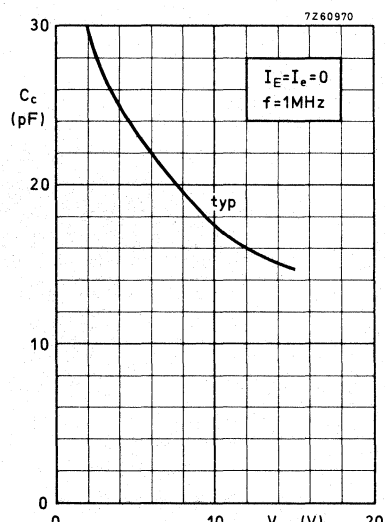
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	22	K/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th\ mb\text{-}h}$	=	2.5	K/W

CHARACTERISTICS

T_j = 25°C unless otherwise specified

Collector cut-off current				
I_B = 0; V_{CE} = 14 V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter, I_C = 1 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base, I_C = 10 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, I_E = 1 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	mS
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	0.5	mS
D.C. current gain				
I_C = 500 mA; V_{CE} = 5 V	h_{FE}	>	5	
Transition frequency				
I_C = 350 mA; V_{CE} = 10 V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 15 V	C_c	typ.	15	pF
		<	20	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 15 V	$-C_{re}$	typ.	11	pF


7Z60975
1000
f_T
(MHz)
750
500
250
0
0
0.5
1
1.5
2
2.5
I_C (A)
3
V_{CE}=10V
typ


7Z60970
30
C_c
(pF)
20
10
0
0
10
V_{CB} (V)
20
$I_E = I_e = 0$
f = 1MHz
typ

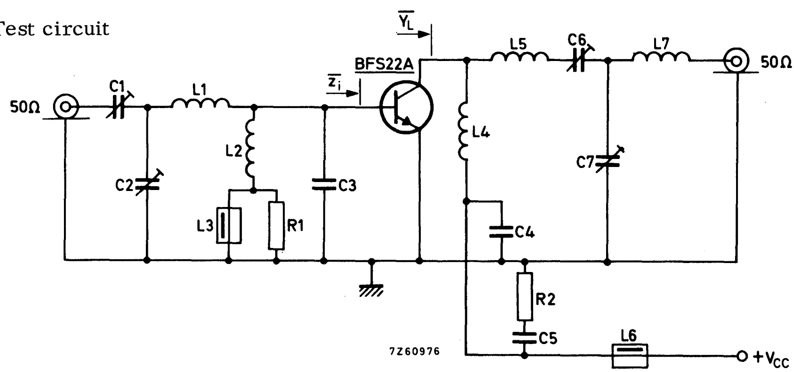
APPLICATION INFORMATION

R. F. performance in c.w. operation (unneutralised common-emitter class B circuit)

f = 175 MHz; T_{mb} up to 25 °C

V_{CC}(V)	P_S(W)	P_L(W)	I_C(A)	G_p(dB)	η(%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$(mS)
13.5	< 0.63	4	< 0.49	> 8	> 60	3.9+j2.2	37−j22
12.5	typ. 0.63	4	typ. 0.53	typ. 8	typ. 60	−	−

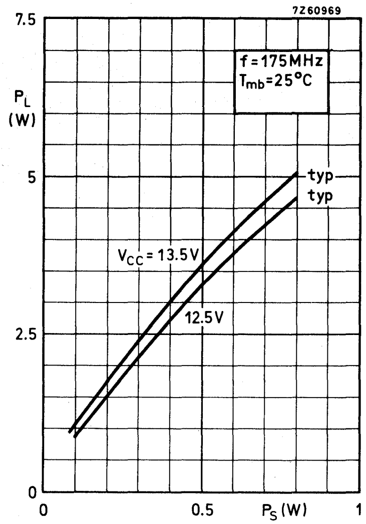
Test circuit

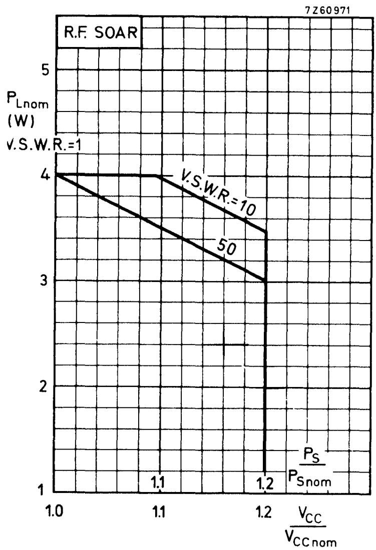


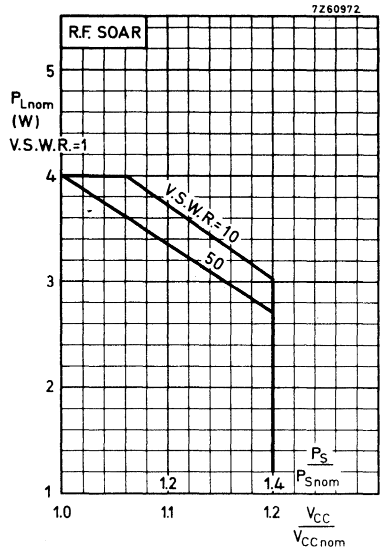
C1 = C6 = 4 to 29 pF air trimmer with insulated rotor
C2 = C7 = 4 to 29 pF air trimmer with non-insulated rotor
C3 = 39 pF ceramic
C4 = 100 pF ceramic
C5 = 15 nF polyester

L1 = 1 turn enamelled Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm
L2 = 6 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
L3 = L6 = ferroxcube choke (code number 4312 020 36640)
L4 = 8 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
L5 = 5 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 8 mm; leads 2 x 10 mm
L7 = 7 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 6 mm; leads 2 x 5 mm

R1 = R2 = 10 Ω carbon


7Z60969
7.5
P_L
(W)
5
2.5
0
f = 175 MHz
T_{mb} = 25 °C
typ
typ
V_{CC} = 13.5 V
12.5 V
0
0.5
P_S (W)
1



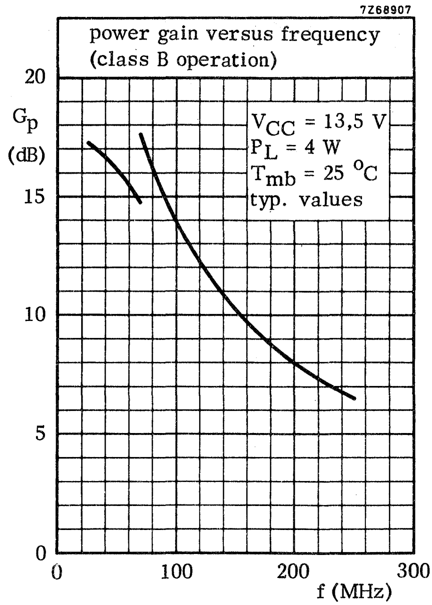


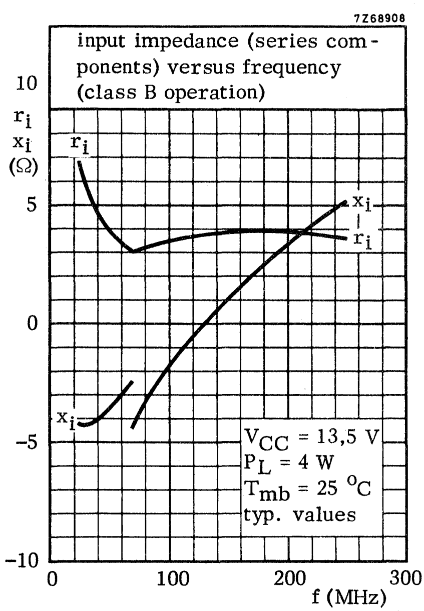
Conditions for R.F. SOAR:

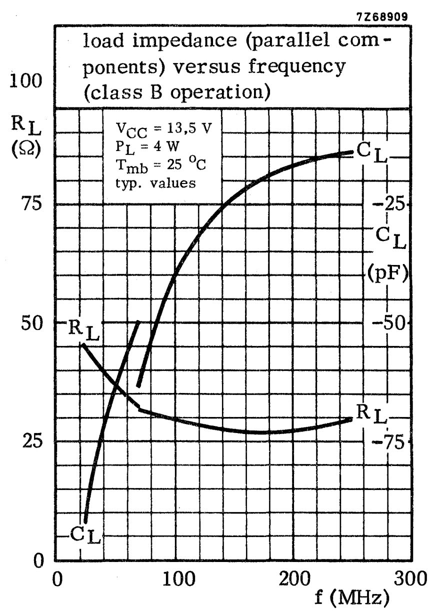
f = 175 MHz $\quad P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.S. = 1
T_{mb} = 70 °C
V_{CCnom} = 12.5 or 13.5 V

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V. S. W. R. as parameter.
The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.
The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).
Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions.

It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

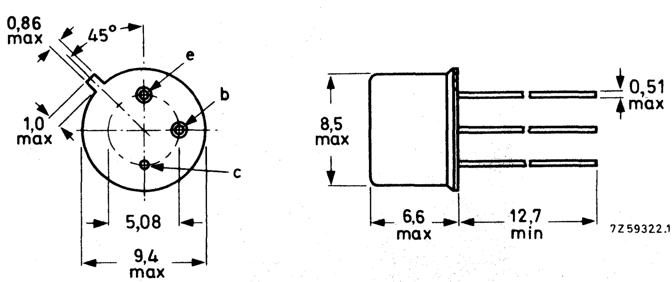
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	4	> 10	> 65	2,3 + j1,6	8,9 − j18,1

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.

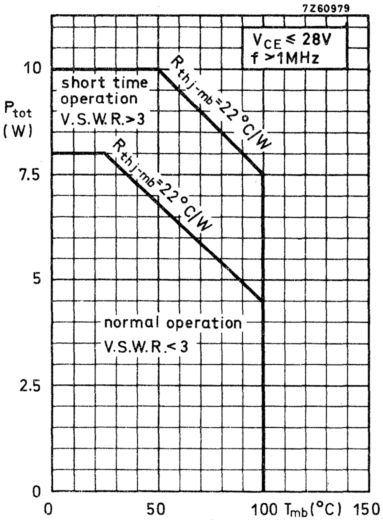


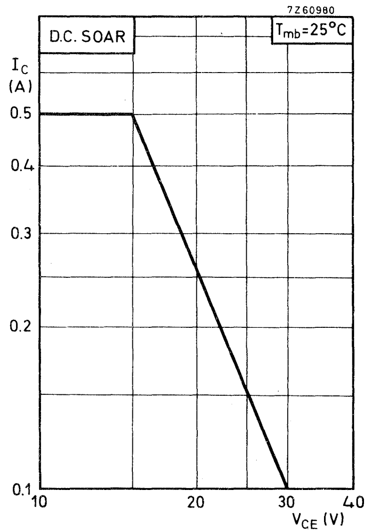
Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0.5	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	1.5	A
Total power dissipation up to T_{mb} = 25 °C f > 1 MHz	P_{tot}	max.	8	W





Storage temperature	T_{stg}	−65 to	+200	°C
Operating junction temperature	T_j	max.	200	°C

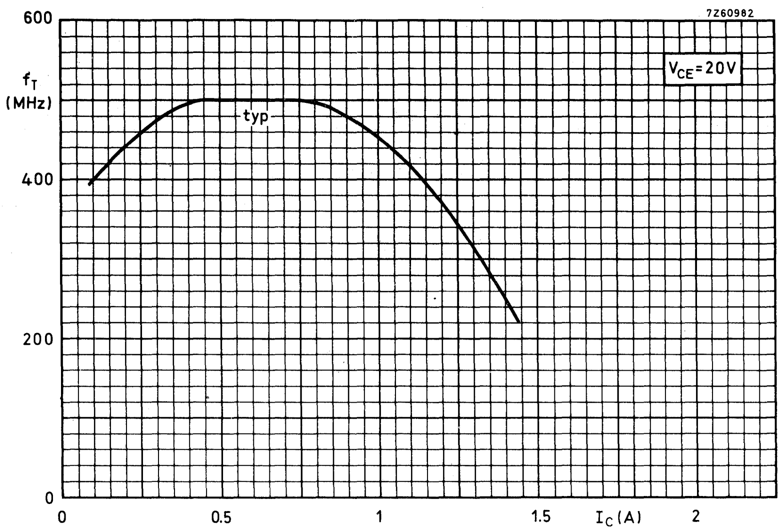
THERMAL RESISTANCE

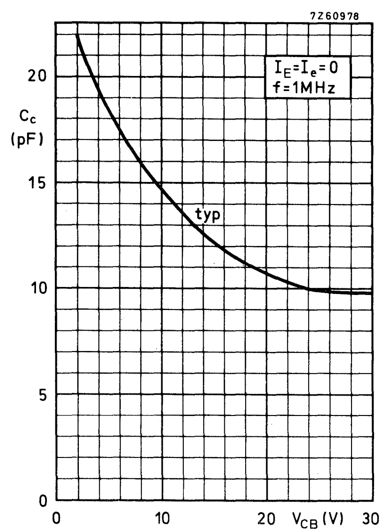
From junction to mounting base	$R_{th\,j\text{-}mb}$	=	22	K/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th\,mb\text{-}h}$	=	2.5	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 28$ V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter, $I_C = 1$ mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, $I_C = 10$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	ms
$-V_{BE} = 1.5$ V; $R_{BE} = 33\ \Omega$	E	>	0.5	ms
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 400$ mA; $V_{CE} = 20$ V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 30$ V	C_c	typ.	10	pF
		<	15	pF
Feedback capacitance at f = 1 MHz				
$I_C = 25$ mA; $V_{CE} = 30$ V	$-C_{re}$	typ.	7.5	pF


7Z60982
600
f_T
(MHz)
400
200
0
0
0.5
1
1.5
I_C (A)
2
typ
V_{CE} = 20V


7Z60978
20
C_c
(pF)
15
10
5
0
0
10
20
V_{CB} (V)
30
typ
$I_E = I_e = 0$
f = 1MHz

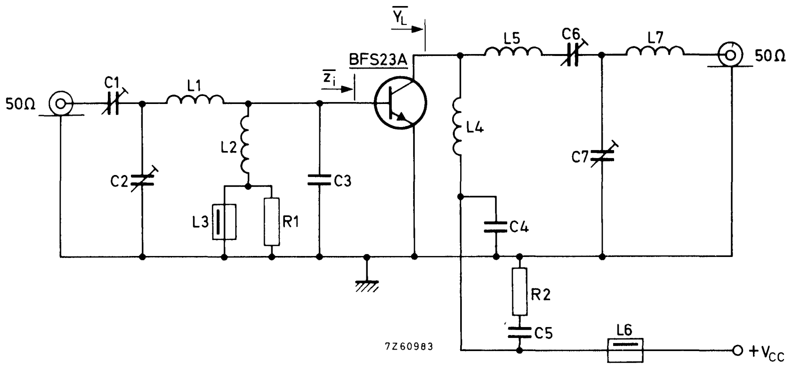
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralised common-emitter class B circuit)

V_{CC} = 28 V; T_{mb} up to 25 °C

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	< 0.40	4	< 0.22	> 10	> 65	2.3+j1.6	8.9 − j18.1

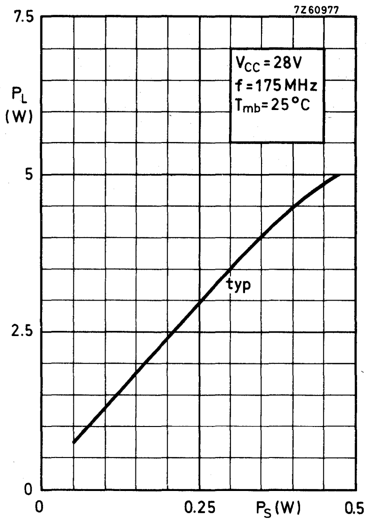
Test circuit

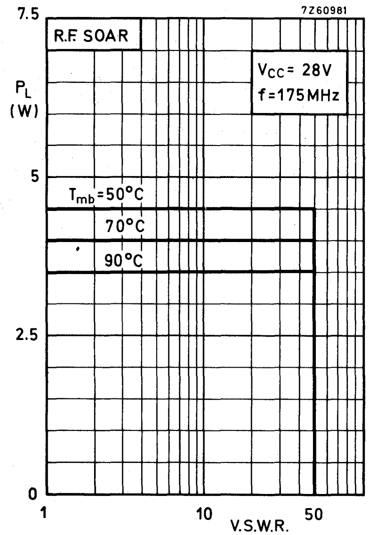


C1 = C6 = 4 to 29 pF air trimmer with insulated rotor
C2 = C7 = 4 to 29 pF air trimmer with non-insulated rotor
C3 = 39 pF ceramic
C4 = 100 pF ceramic
C5 = 15 nF polyester

L1 = 1 turn enamelled Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm
L2 = 6 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
L3 = L6 = ferroxcube choke (code number 4312 020 36640)
L4 = 8 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 10 mm
L5 = 5 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 8 mm; leads 2 x 10 mm
L7 = 4 turns enamelled Cu wire (1.0 mm); winding pitch 1.0 mm; int. diam. 6 mm; leads 2 x 5 mm

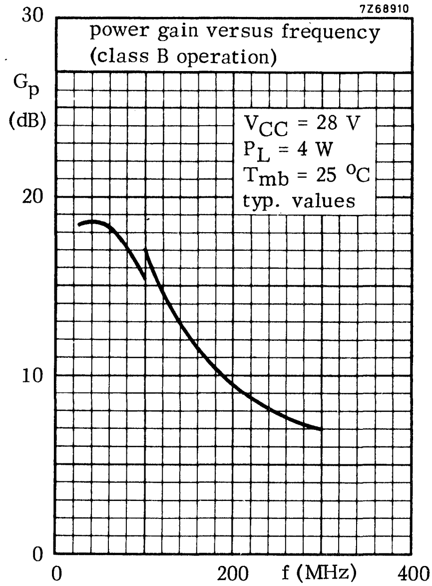
R1 = R2 = 10 Ω carbon

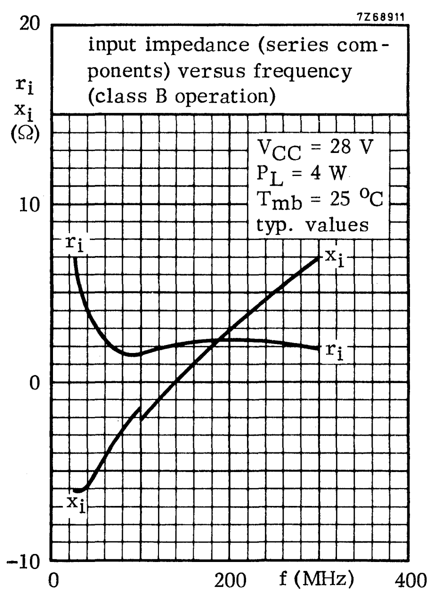


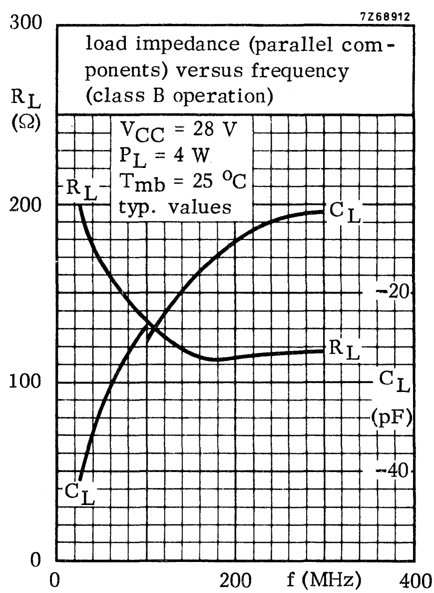


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







U.H.F. POWER AMPLIFIER MODULES

Broadband amplifier modules primarily designed for mobile applications operating directly from 12 V vehicle electrical systems. The module will produce 2,5 W output into a 50 Ω load over the bands 380 to 512 MHz for the BGY22, and 420 to 480 MHz for the BGY22A.

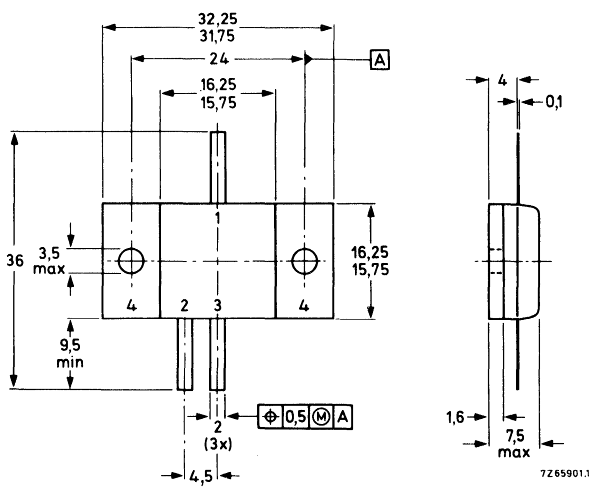
QUICK REFERENCE DATA

type number	mode of operation	freq. range MHz	V_B V	P_D mW	P_L W	η %	$Z_S = Z_L$ Ω
BGY22	c.w.	380 to 512	13,5	50	> 2,5 typ. 2,9	> 40 typ. 50	50
BGY22A	c.w.	420 to 480	12,5	50	> 2,5	> 40	50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-75A.



Lead reference

1 = Input
2 = $+V_B$
3 = Output
4 = Earth

To ensure good thermal contact between mounting base and heatsink, burrs or thickening at the edges of the heatsink holes should be removed and the package bolted down onto a flat surface.

Devices may be soldered directly into a circuit with a soldering iron at a maximum iron temperature of 245 °C for 10 seconds at least 1 mm from the plastic.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. voltages (with respect to flange)

Supply terminal	V_B	max.	18	V
Input terminal	$\pm V_I$	max.	25	V
Output terminal	$\pm V_O$	max.	25	V

Current

Supply current (d.c.)	I_{tot}	max.	800	mA

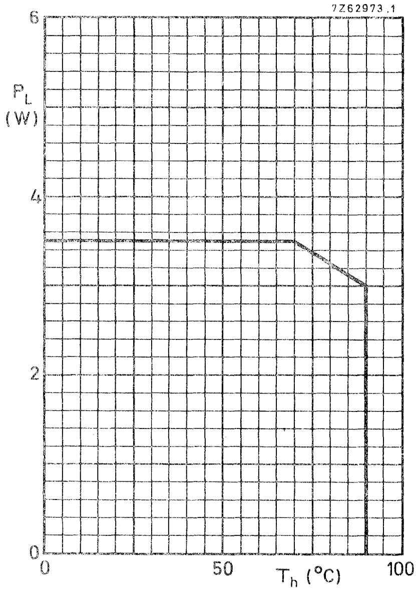
Drive power

$V_B = 13,5$ V; $Z_L = 50\ \Omega$	P_D	max.	150	mW

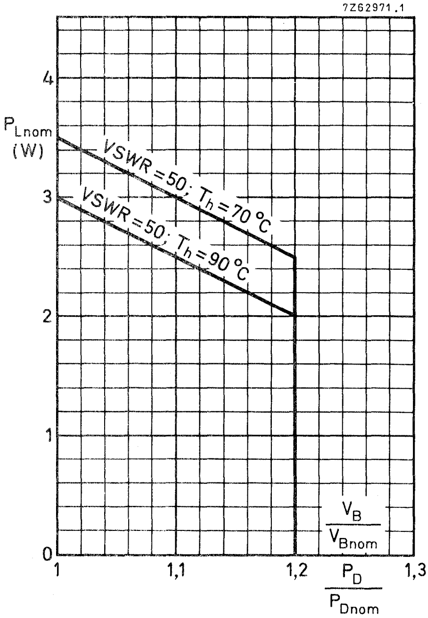
Temperatures

Storage temperature	T_{stg}	−40 to +100		°C
Operating heatsink temperature	T_h	max.	90	°C

P_L for normal operation



P_L for fault condition



Where $P_{Lnom} = P_L$ at $V_B = 13,5$ V; $Z_L = 50\ \Omega$ (BGY22)
and $P_{Lnom} = P_L$ at $V_B = 12,5$ V; $Z_L = 50\ \Omega$ (BGY22A)

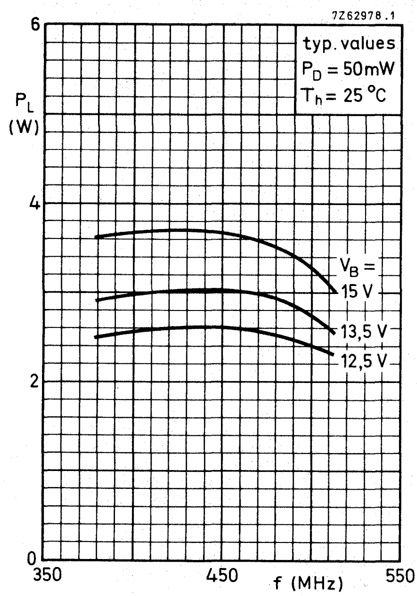
CHARACTERISTICS

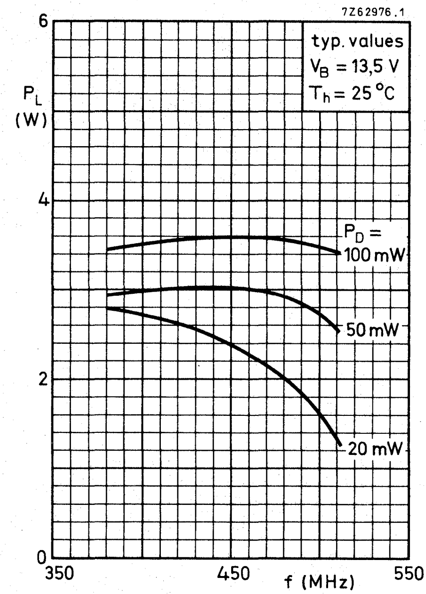
T_h = 25 °C unless otherwise specified

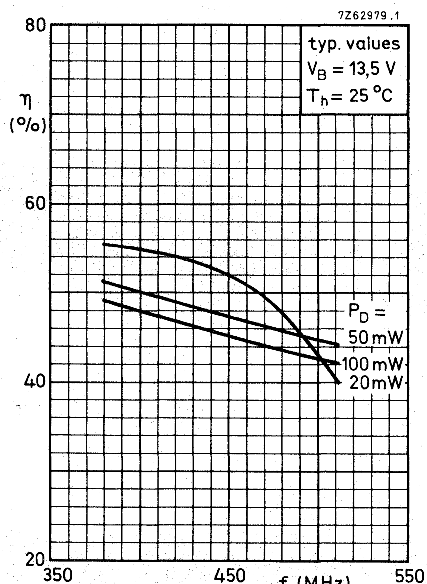
Reference planes at r.f. input and output terminals are 1 mm from the plastic encapsulation.

Frequency range 380-512 MHz; V_B = 13,5 V (BGY22)
Frequency range 420-480 MHz; V_B = 12,5 V (BGY22A)

Quiescent current				
P_D = 0	I_{BQ}		4,0 to 12,0	mA
Load power				
P_D = 50 mW	P_L		2,5 to 3,5	W
Efficiency				
P_D = 50 mW	η	>	40	%
Supply current				
P_D = 50 mW	I_{tot}	typ.	475	mA
Harmonic content				
P_D = 50 mW	Any harmonic is at least 20 dB down relative to carrier			
Input VSWR with respect to 50 Ω				
P_D = 50 mW	VSWR	<	2	
Temperature coefficient of P_L				
P_D = 50 mW; T_h = 25 to 70 °C		typ.	−10	mW/°C
Stability				
V_B = 10,5 to 15 V; P_D = 10 mW to 100 mW T_h = −40 to +90 °C				
Output load VSWR ≤ 3, all phases		No instabilities		
Output load VSWR ≤ 10, all phases		No appreciable instabilities		


7Z62978.1
typ. values
P_D = 50mW
T_h = 25 °C
P_L (W)
6
4
2
0
V_B =
15 V
13,5 V
12,5 V
350
450
550
f (MHz)


7Z62976.1
typ. values
V_B = 13,5 V
T_h = 25 °C
P_L (W)
6
4
2
0
P_D =
100 mW
50 mW
20 mW
350
450
550
f (MHz)


7Z62979.1
typ. values
V_B = 13,5 V
T_h = 25 °C
η (%)
80
60
40
20
P_D =
50 mW
100 mW
20mW
350
450
550
f (MHz)

APPLICATION INFORMATION

R.F. performance in c.w. operation; T_h = 25 °C

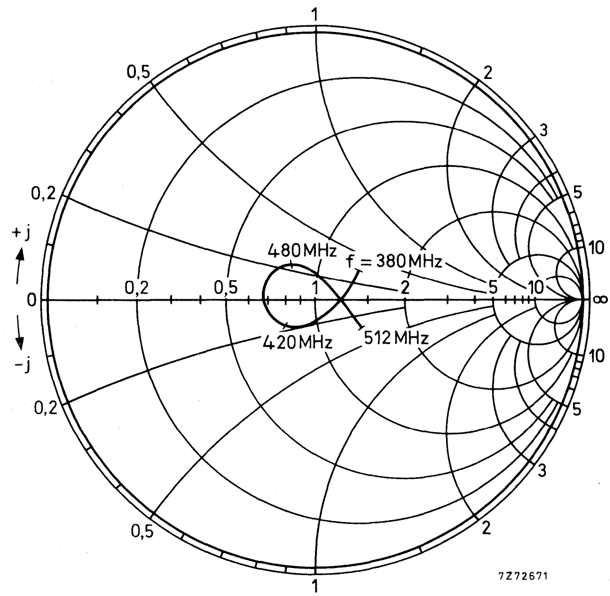
Drive source and load impedance $Z_S = Z_L = 50\ \Omega$

type number	f MHz	V_B V	P_D mW	P_L W	η %
BGY22	380 to 512	15,0	50	typ. 3,5	typ. 47
		13,5		> 2,5	> 40
		13,5		typ. 2,9	typ. 47
		12,5		typ. 2,5	typ. 47
BGY22A	420 to 480	12,5	50	> 2,5	> 40

The modules are designed to withstand full load mismatch under the following conditions:

$P_D = P_{Dnom}$ + 20%; T_h = 70 °C
V_B = 16,5 V **(BGY22)**
V_B = 15,0 V **(BGY22A)**
VSWR = 50 at any phase

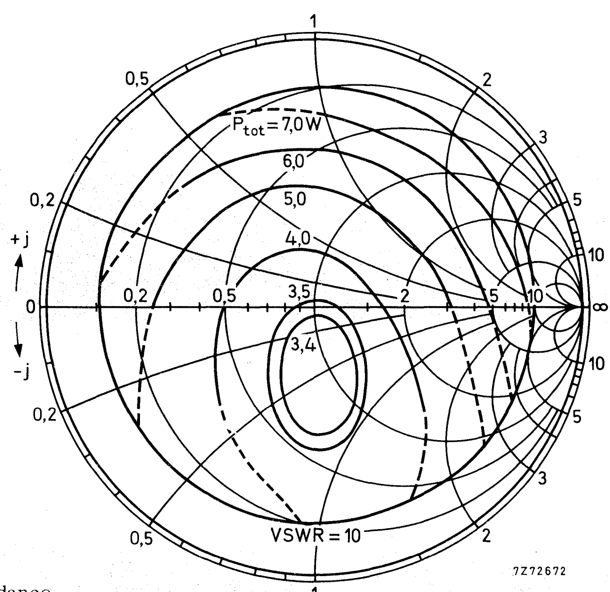
where $P_{Dnom} = P_D$ for 2,5 W module output under nominal conditions.



Typical variation of input impedance with frequency

V_B = 13,5 V

f = 470 MHz

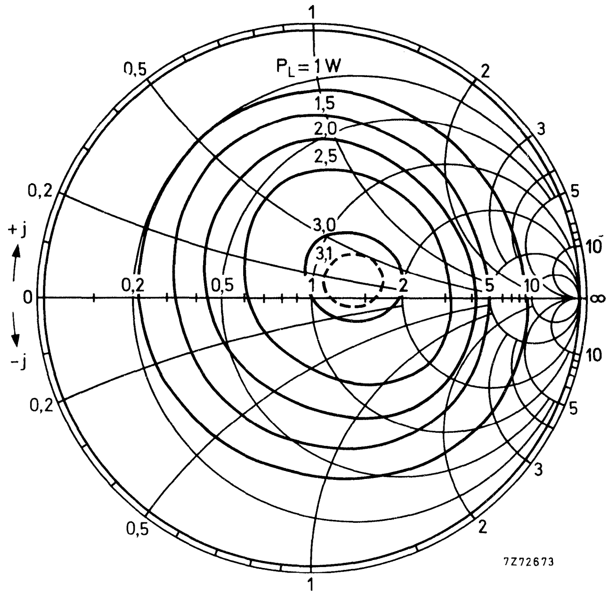


Typical variation of power dissipation with load impedance

V_B = 13,5 V

P_D = 50 mW

f = 470 MHz

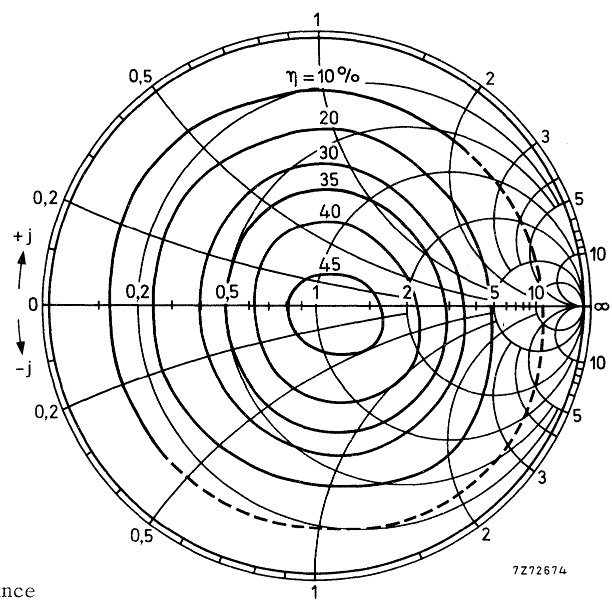


Typical variation of load power with load impedance

V_B = 13,5 V

P_D = 50 mW

f = 470 MHz



Typical variation of efficiency with load impedance

U.H.F. POWER AMPLIFIER MODULES

Broadband amplifier modules primarily designed for mobile applications operating directly from 12 V vehicle electrical systems. The modules are suitable for driving directly from the BGY22 and BGY22A respectively, and when so driven will produce 7 W output into a 50 Ω load over the band 380 to 480 MHz for the BGY23, and 7 W over the band 420 to 480 MHz for the BGY23A.

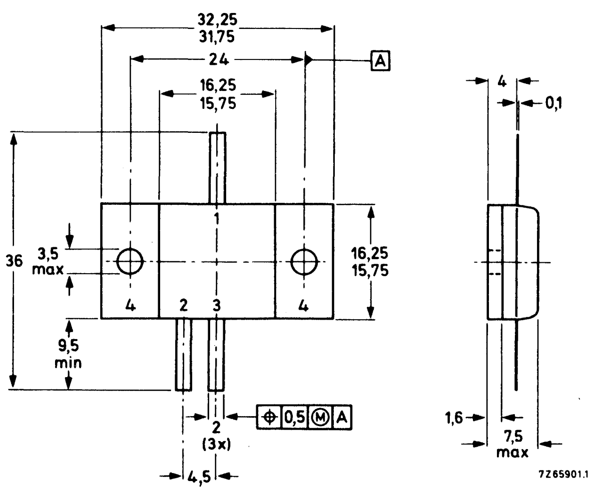
QUICK REFERENCE DATA

type number	mode of operation	freq. range MHz	V_B V	P_D W	P_L W	η %	$Z_S = Z_L$ Ω
BGY23	c.w.	380 to 480 380 to 480 480 to 512	13,5	2,5	> 7,0 typ. 8,3 typ. 7,5	> 60 typ. 71 typ. 69	50
BGY23A	c.w.	420 to 480	12,5	2,5	> 7,0	> 60	50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-75A.



Lead reference

1 = Input
2 = $+V_B$
3 = Output
4 = Earth

To ensure good thermal contact between mounting base and heatsink, burrs or thickening at the edges of the heatsink holes should be removed and the package bolted down onto a flat surface.

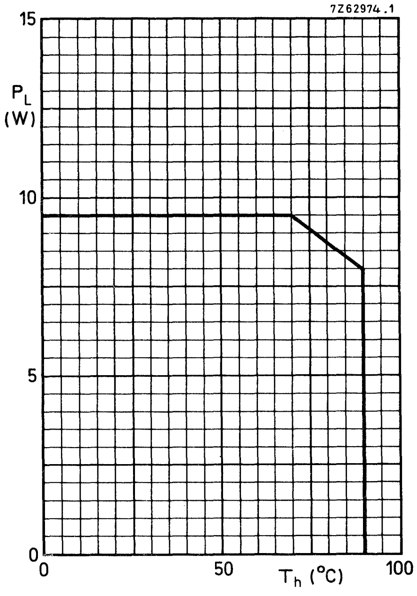
Devices may be soldered directly into a circuit with a soldering iron at a maximum iron temperature of 245 °C for 10 seconds at least 1 mm from the plastic.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

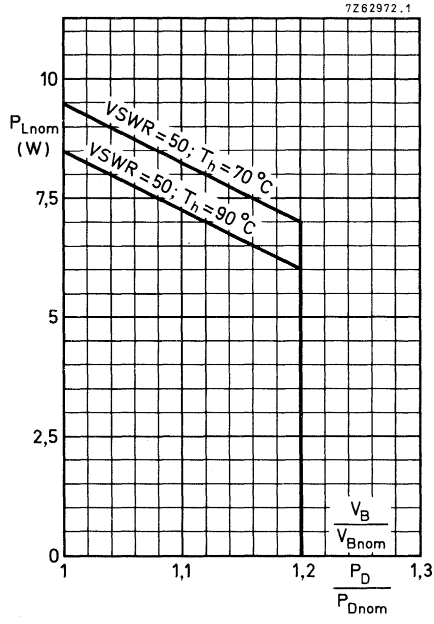
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)
(with respect to flange)

Supply terminal	V_B	max.	18	V
Input terminal (no external d.c. connection)	$\pm V_I$	max.	0,5	V
Output terminal	$\pm V_O$	max.	25	V
Supply current (d.c.)	I_{tot}	max.	1,7	A
V_B = 13,5 V; Z_L = 50 Ω	P_D	max.	3,5	W
Storage temperature	T_{stg}	−40 to +100		°C
Operating heatsink temperature	T_h	max.	90	°C

P_L for normal operation



P_L for fault condition



Where P_{Lnom} = P_L at V_B = 13,5 V; Z_L = 50 Ω (BGY23)
and P_{Lnom} = P_L at V_B = 12,5 V; Z_L = 50 Ω (BGY23A)

CHARACTERISTICS

T_h = 25 °C unless otherwise specified.

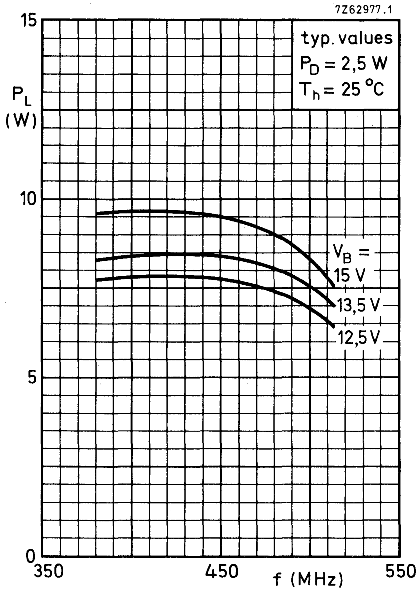
Reference planes at r.f. input and output terminals are 1 mm from the plastic encapsulation.

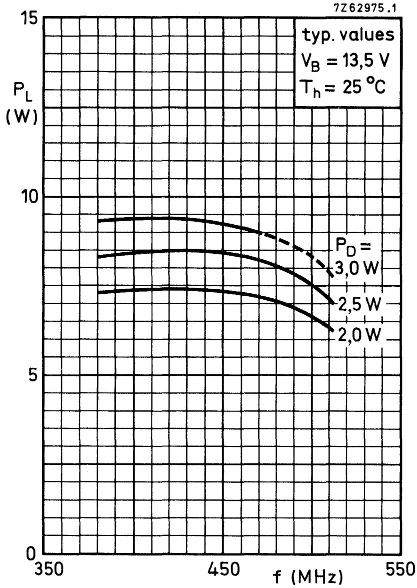
Frequency range 380-512 MHz; V_B = 13,5 V (BGY23)
Frequency range 420-480 MHz; V_B = 12,5 V (BGY23A)

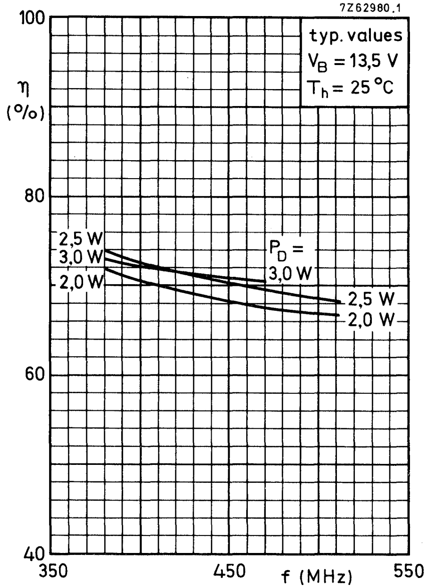
Quiescent current					
$P_D = 0$		I_{BQ}	<	5,0	mA
Load power					
P_D = 2,5 W; f = 380-480 MHz	BGY23	P_L		7,0 to 9,5	W
P_D = 2,5 W; f = 480-512 MHz	BGY23	P_L	typ.	7,5	W
P_D = 2,5 W; f = 420-480 MHz	BGY23A	P_L		7,0 to 9,5	W
Efficiency					
P_D = 2,5 W		η	>	60	%
Supply current					
P_D = 2,5 W		I_{tot}	typ.	900	mA
Harmonic content					
P_D = 2,5 W		Any harmonic is at least 20 dB down relative to carrier			
Input VSWR with respect to 50 Ω					
P_D = 2,5 W		VSWR	<	2	
Temperature coefficient of P_L					
P_D = 2,5 W; T_h = 25 to 70 °C			typ.	−20	mW/°C

Stability

V_B = 10,5 V to 15 V; P_D = 1 W to 3,5 W
T_h = −40 °C to +90 °C
Output load VSWR ≤ 3, all phases — No instabilities
Output load VSWR ≤ 10, all phases — No appreciable instabilities


7Z62977.1
typ. values
P_D = 2,5 W
T_h = 25 °C
P_L
(W)
V_B =
15 V
13,5 V
12,5 V
15
10
5
0
350
450
550
f (MHz)


7Z62975.1
typ. values
V_B = 13,5 V
T_h = 25 °C
P_L
(W)
P_D =
3,0 W
2,5 W
2,0 W
15
10
5
0
350
450
550
f (MHz)


7Z62980.1
typ. values
V_B = 13,5 V
T_h = 25 °C
η
(%)
2,5 W
3,0 W
2,0 W
P_D =
3,0 W
2,5 W
2,0 W
100
80
60
40
350
450
550
f (MHz)

APPLICATION INFORMATION

R.F. performance in c.w. operation; T_h = 25 °C

Drive source and load impedance $Z_S = Z_L$ = 50 Ω

Type number	f (MHz)	V_B (V)	P_D (W)	P_L (W)	η (%)
BGY23	380 to 512	15,0	2,5	typ. 9,0	typ. 65
BGY23	380 to 480	13,5	2,5	> 7,0	> 60
BGY23	380 to 480	13,5	2,5	typ. 8,3	typ. 71
BGY23	480 to 512	13,5	2,5	typ. 7,5	typ. 69
BGY23	380 to 512	12,5	2,5	typ. 7,4	typ. 70
BGY23A	420 to 480	12,5	2,5	> 7,0	> 60

Connection of the BGY22/BGY22A to the BGY23/BGY23A respectively can be either by 50 Ω transmission line or directly with a total lead length not greater than 2 mm.

The modules are designed to withstand full load mismatch under the following conditions:

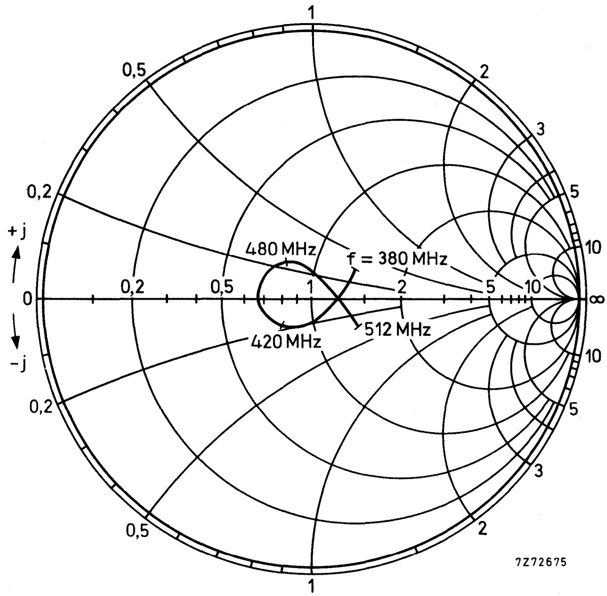
$P_D = P_{Dnom}$ + 20%; T_h = 70 °C

V_B = 16,5 V (BGY23)

V_B = 15,0 V (BGY23A)

VSWR = 50 at any phase

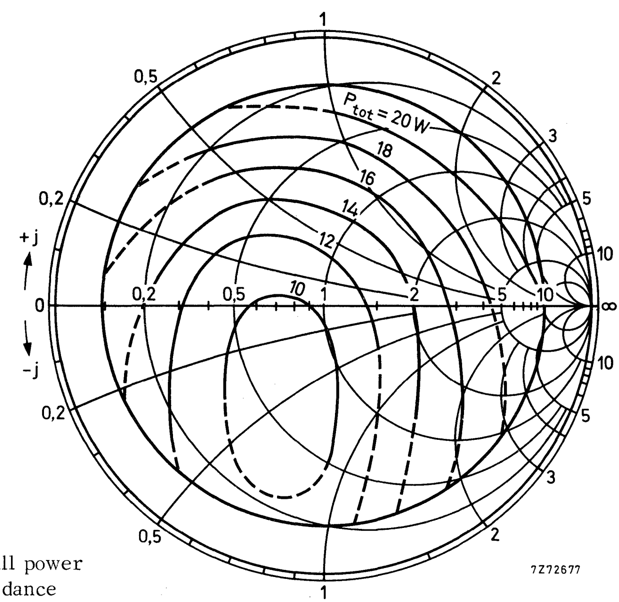
where $P_{Dnom} = P_D$ for 7,0 W module output under nominal conditions.



Typical variation of input impedance with frequency

V_B = 13,5 V
f = 470 MHz

BGY22/23 or
BGY22A/23A
cascaded amplifier

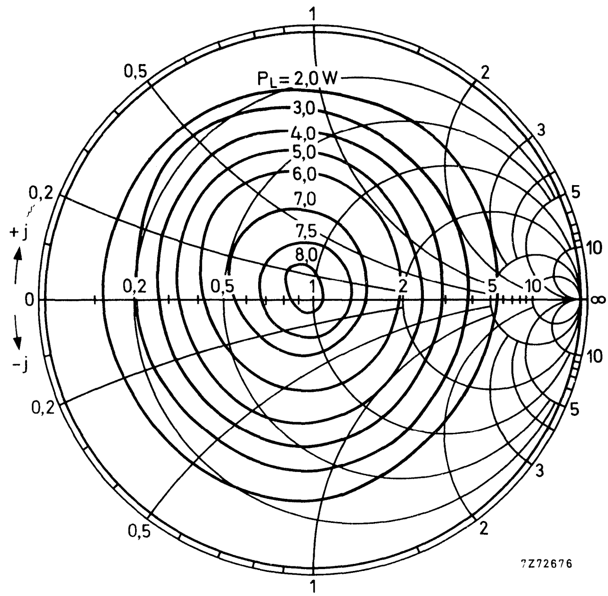


Typical variation of overall power dissipation with load impedance

V_B = 13,5 V

f = 470 MHz

BGY22/23 or
BGY22A/23A
cascaded amplifier

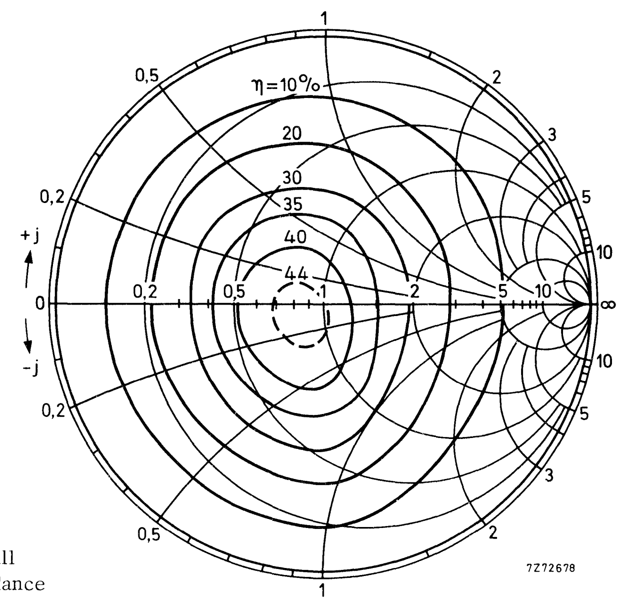


Typical variation of load power with load impedance

V_B = 13,5 V

f = 470 MHz

BGY22/23 or
BGY22A/23A
cascaded amplifier



Typical variation of overall efficiency with load impedance

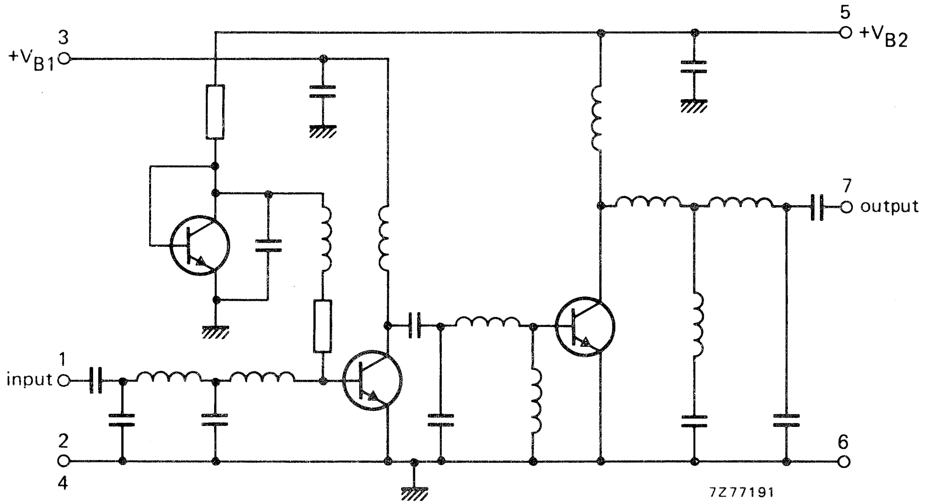
V.H.F. POWER AMPLIFIER MODULES

A range of broadband amplifier modules designed for mobile communications equipments, operating directly from 12 V vehicle electrical systems. The devices will produce 18 W output into a 50 Ω load. The modules consist of a two stage r.f. amplifier using n-p-n transistor chips, together with lumped-element matching components.

QUICK REFERENCE DATA

type number	mode of operation	frequency range f (MHz)	nominal supply voltages $V_{B1} = V_{B2}$ (V)	drive power P_D (mW)	load power P_L (W)	nominal input impedance z_i (Ω)	nominal load impedance Z_L (Ω)
BGY32	c.w.	68 to 88	12,5	100	> 18 typ 23	50	50
BGY33	c.w.	80 to 108	12,5	100	> 18 typ 22	50	50
BGY35	c.w.	132 to 156	12,5	150	> 18 typ 22	50	50
BGY36	c.w.	148 to 174	12,5	150	> 18 typ 21	50	50

CIRCUIT DIAGRAM

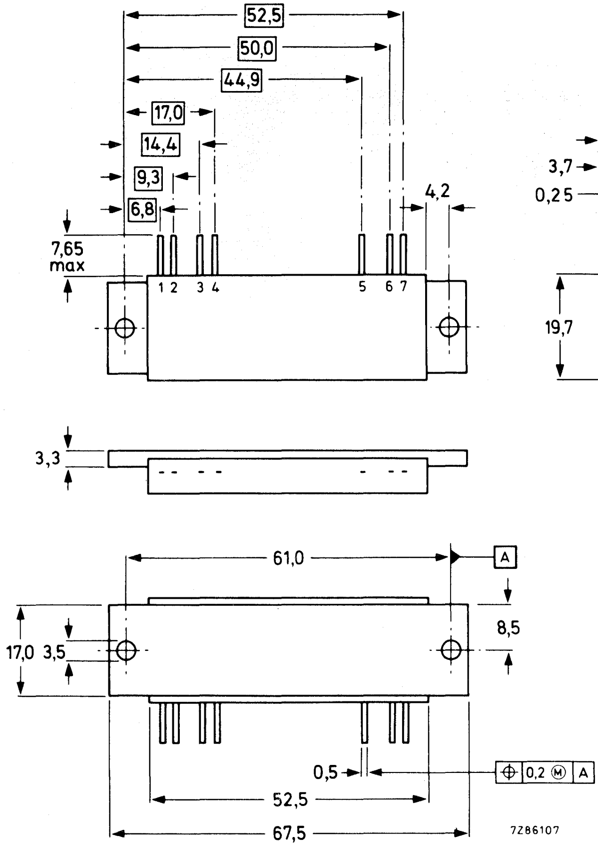


PRODUCT SAFETY This device incorporates beryllium oxide, the dust of wich is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Fig. 1 SOT-132B.

Dimensions in mm



Lead reference

1 = Input
2 = Earth
3 = Supply $+V_{B1}$
4 = Earth
5 = Supply $+V_{B2}$
6 = Earth
7 = Output

Mounting and soldering recommendations

To ensure good thermal transfer the module should be mounted using heatsink compound onto a heatsink with a flat surface; if an isolation washer is used heatsink compound should be used on both sides of the insulator. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to torques of 0,5 Nm minimum.

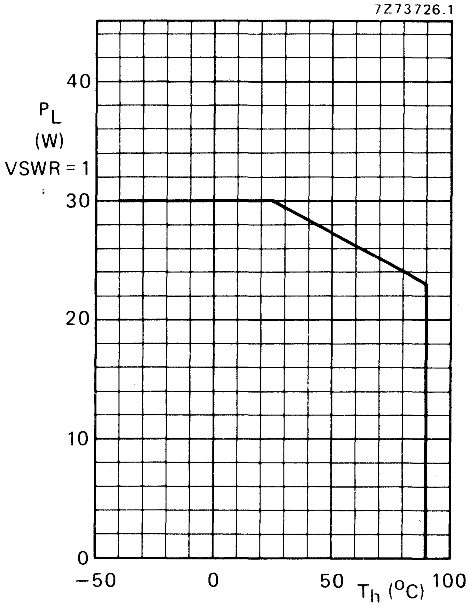
Devices may be soldered directly into a circuit with a soldering iron at maximum iron temperature of 245 °C for 10 seconds at least 1 mm from the plastic.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. voltages (with respect to flange)

D.C. supply terminals	V_{B1} and V_{B2}	max	15	V
R.F. input terminal	$\pm V_I$	max	25	V
R.F. output terminal	$\pm V_O$	max	25	V
Input drive power BGY32 and BGY33	P_D	max	200	mW
Input drive power BGY35 and BGY36	P_D	max	300	mW
Load power	P_L	max	30	W



Storage temperature	T_{stg}		−40 to 100	°C
Operating heatsink temperature	T_h	max	90	°C

CHARACTERISTICS

T_h = 25 °C

			BGY32	BGY33	BGY35	BGY36	
Quiescent current $V_{B1} = V_{B2}$ = 12,5 V; P_D = 0; $R_S = R_L$ = 50 Ω	I_{BQ1}	typ	6	6	6	6	mA
	I_{BQ2}	typ	13	13	13	13	mA
Frequency range	f	>	68	80	132	148	MHz
		<	88	108	156	174	MHz
Load power $V_{B1} = V_{B2}$ = 12,5 V; $R_S = R_L$ = 50 Ω; **BGY32** and **BGY33**; P_D = 100 mW	P_L	>	18	18	–	–	W
		typ	23	22			W
	η	>	40	40	–	–	%
		typ	50	50			%
BGY35 and **BGY36**; P_D = 150 mW	P_L	>	–	–	18	18	W
		typ			22	21	W
	η	>	–	–	40	40	%
		typ			50	50	%

Harmonic output — Any single harmonic will be at least 25 dB down relative to carrier

Input VSWR with respect to 50 Ω — typ 1,5

Stability — The module is stable with load VSWR up to 3 (all phases) when operated with matched output power greater than 6 W.

Ruggedness

The modules are capable of withstanding load mismatch of up to 50 VSWR for short period overload conditions, with P_D, V_{B1} and V_{B2} at maximum values providing the combination does not result in the matched r.f. output power rating being exceeded.

APPLICATION INFORMATION

Supply

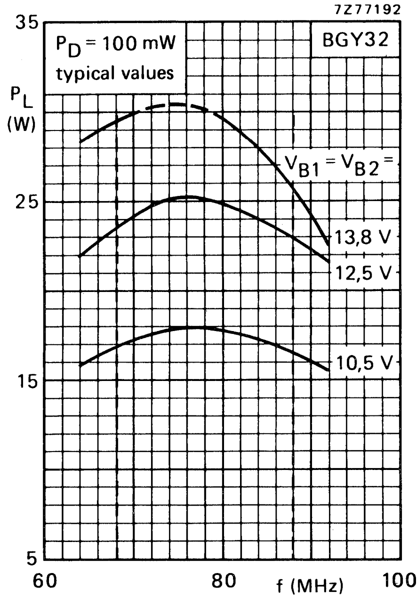
An electrolytic capacitor of 10 µF (25 V), in parallel with a polyester capacitor of 100 nF to earth, is recommended as decoupling arrangement for each power supply pin.

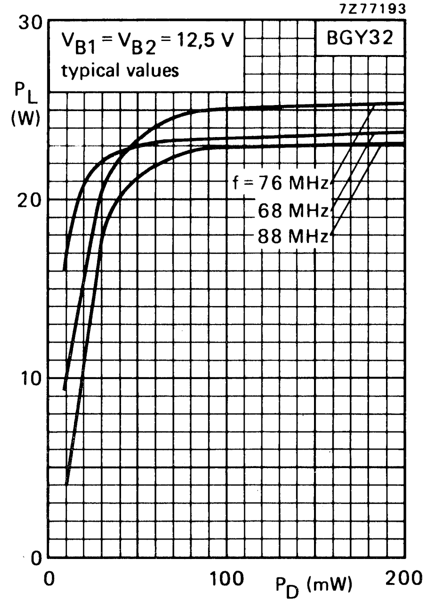
Power rating

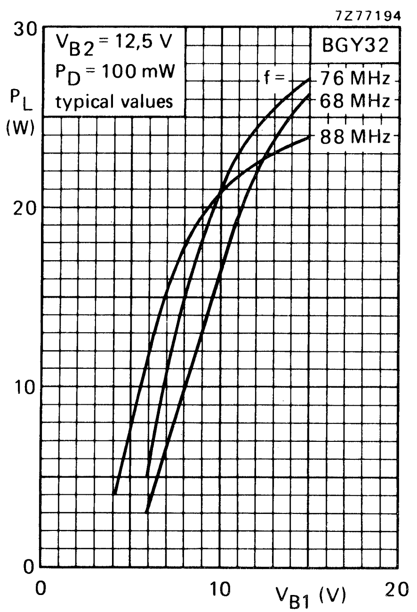
In general it is recommended that the output power from the module under nominal design conditions should not exceed 23 W in order to provide adequate safety margin under fault conditions.

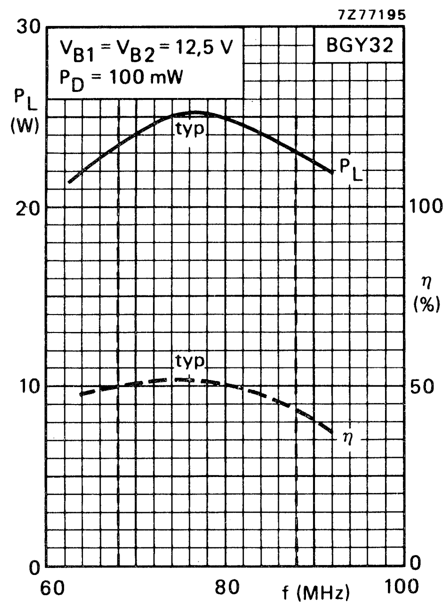
Gain control

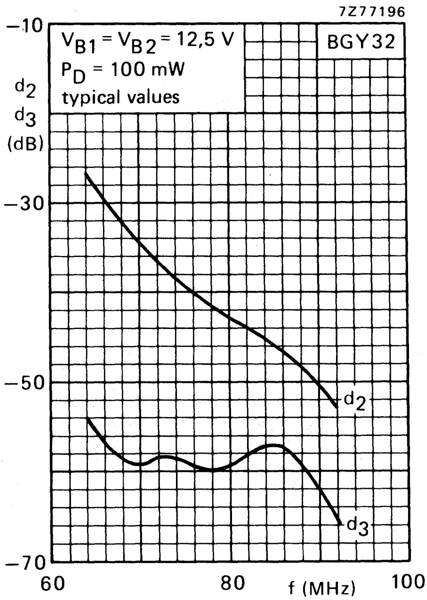
Power output can be controlled by variation of the driver stage supply voltage V_{B1}. The supply required is a voltage regulator with a current rating of 0,75 A, and an output voltage range of 3 V to 12 V.

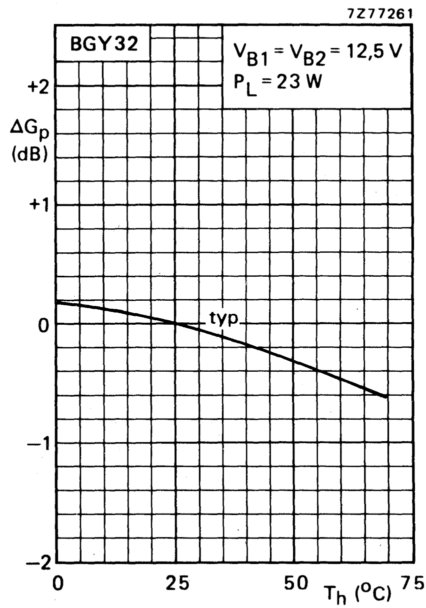

7Z77192
PD = 100 mW
typical values
BGY32
PL
(W)
VB1 = VB2 =
13,8 V
12,5 V
10,5 V
35
25
15
5
60
80
f (MHz)
100

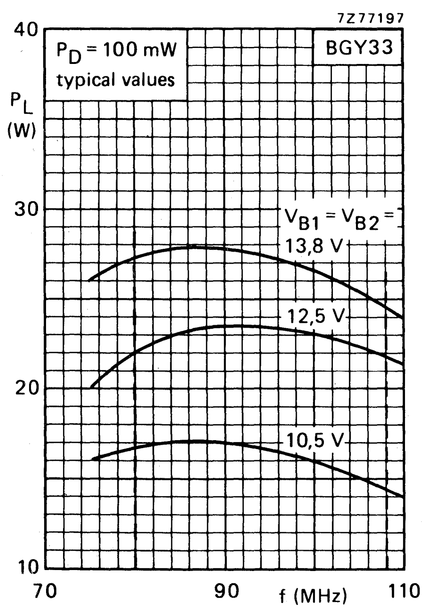

7Z77193
VB1 = VB2 = 12,5 V
typical values
BGY32
PL
(W)
f = 76 MHz
68 MHz
88 MHz
30
20
10
0
0
100
PD (mW)
200

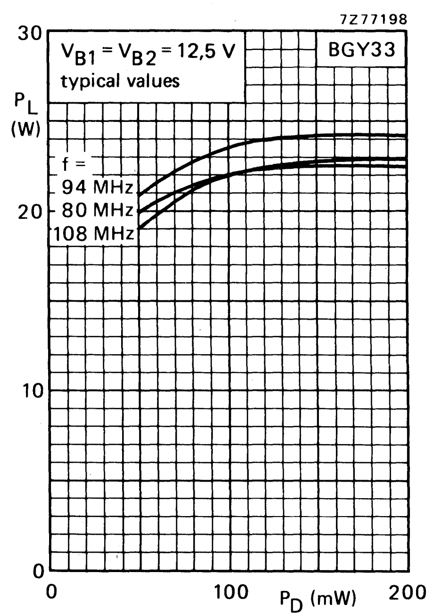

7Z77194
VB2 = 12,5 V
PD = 100 mW
typical values
BGY32
PL
(W)
f =
76 MHz
68 MHz
88 MHz
30
20
10
0
0
10
VB1 (V)
20

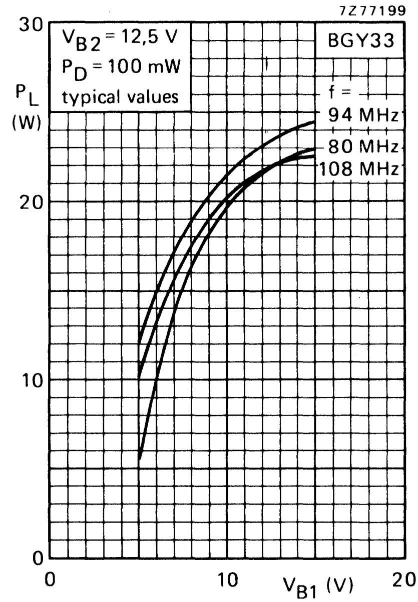

7Z77195
VB1 = VB2 = 12,5 V
PD = 100 mW
BGY32
PL
(W)
typ
PL
typ
η
η
(%)
30
20
10
0
100
50
0
60
80
f (MHz)
100

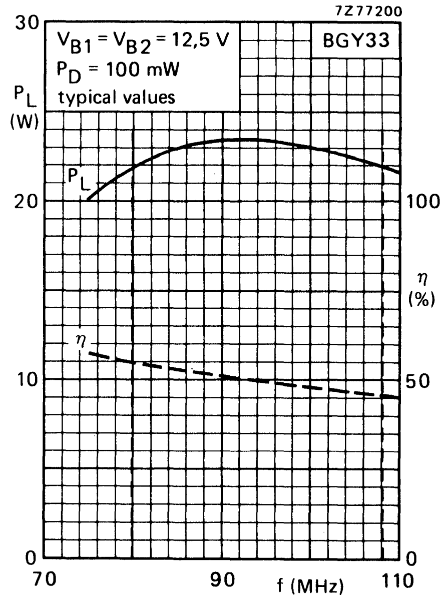

7Z77196
$V_{B1} = V_{B2} = 12,5$ V
P_D = 100 mW
typical values
BGY32
d_2
d_3
(dB)
−10
−30
−50
−70
60
80
100
f (MHz)
d_2
d_3

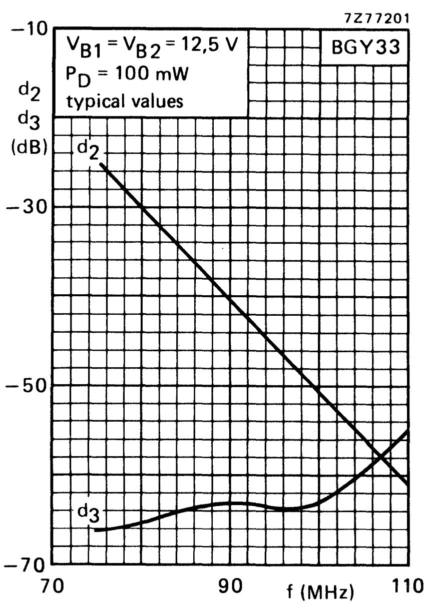

7Z77261
BGY32
$V_{B1} = V_{B2} = 12,5$ V
P_L = 23 W
ΔG_p
(dB)
+2
+1
0
−1
−2
typ
0
25
50
75
T_h (°C)

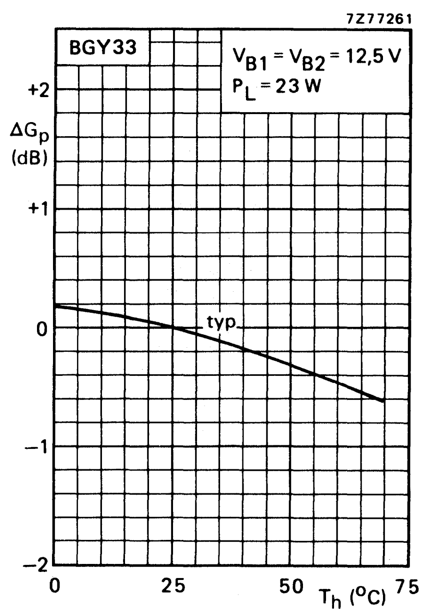

7Z77197
P_D = 100 mW
typical values
BGY33
P_L
(W)
40
30
20
10
$V_{B1} = V_{B2} =$
13,8 V
12,5 V
10,5 V
70
90
110
f (MHz)

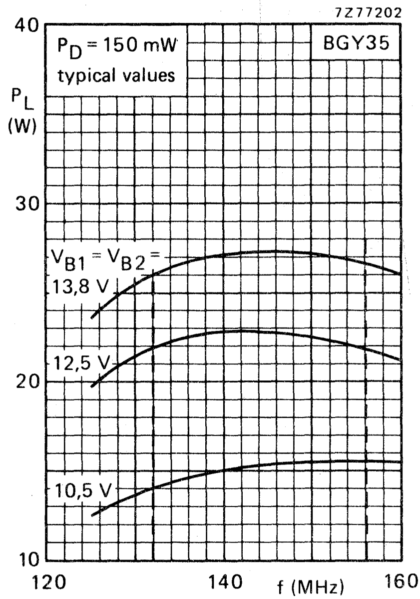

7Z77198
$V_{B1} = V_{B2} = 12,5$ V
typical values
BGY33
P_L
(W)
30
20
10
0
f =
94 MHz
80 MHz
108 MHz
0
100
200
P_D (mW)

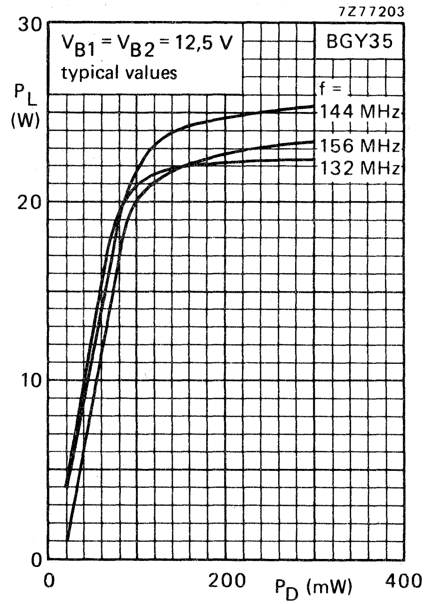

7Z77199
V_{B2} = 12,5 V
P_D = 100 mW
typical values
BGY33
f =
94 MHz
80 MHz
108 MHz
P_L (W)
V_{B1} (V)
30
20
10
0
0
10
20

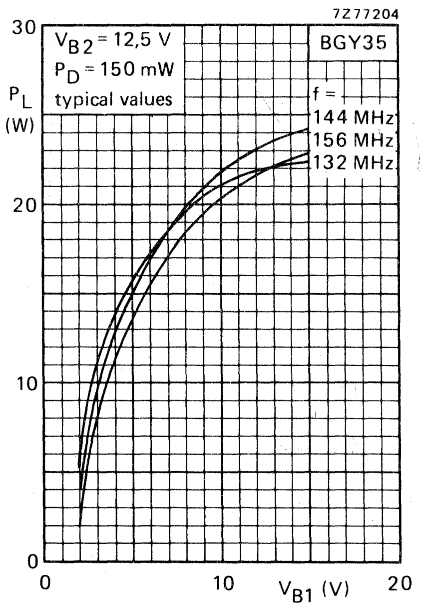

7Z77200
$V_{B1} = V_{B2}$ = 12,5 V
P_D = 100 mW
typical values
BGY33
P_L
η
P_L (W)
η (%)
f (MHz)
30
20
10
0
100
50
0
70
90
110

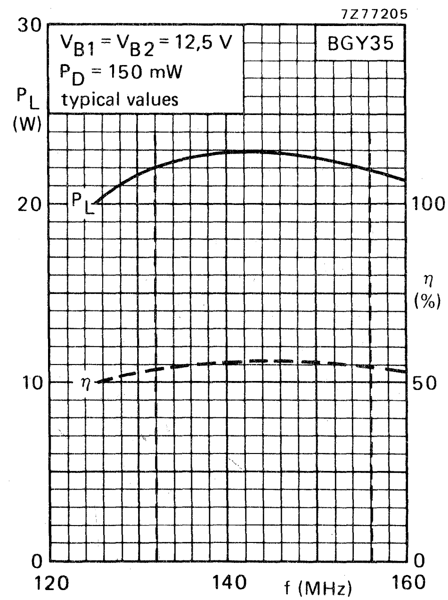

7Z77201
$V_{B1} = V_{B2}$ = 12,5 V
P_D = 100 mW
typical values
BGY33
d_2
d_3
d_2 d_3 (dB)
f (MHz)
−10
−30
−50
−70
70
90
110

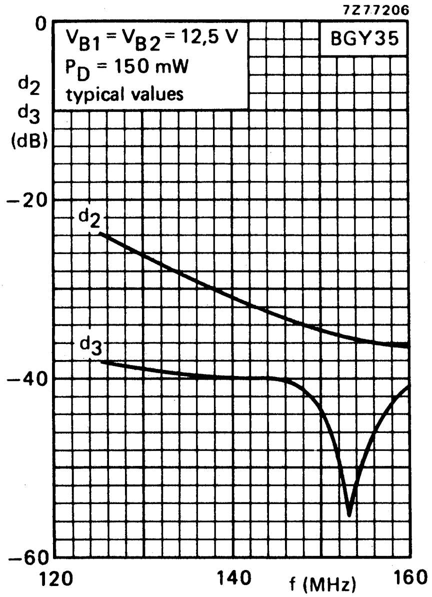

7Z77261
BGY33
$V_{B1} = V_{B2}$ = 12,5 V
P_L = 23 W
typ
ΔG_p (dB)
T_h (°C)
+2
+1
0
−1
−2
0
25
50
75

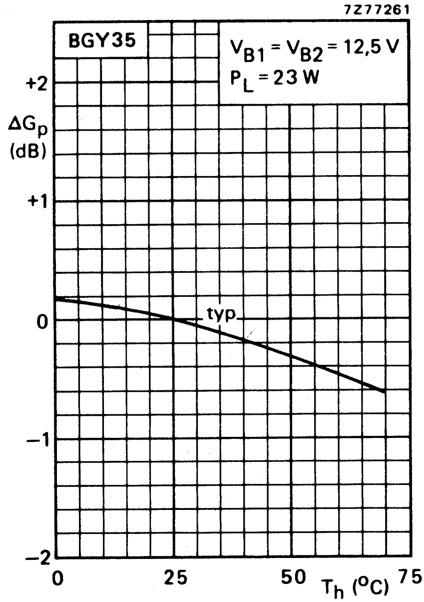

7Z77202
PD = 150 mW
typical values
BGY35
PL
(W)
VB1 = VB2 =
13,8 V
12,5 V
10,5 V
40
30
20
10
120
140
f (MHz)
160

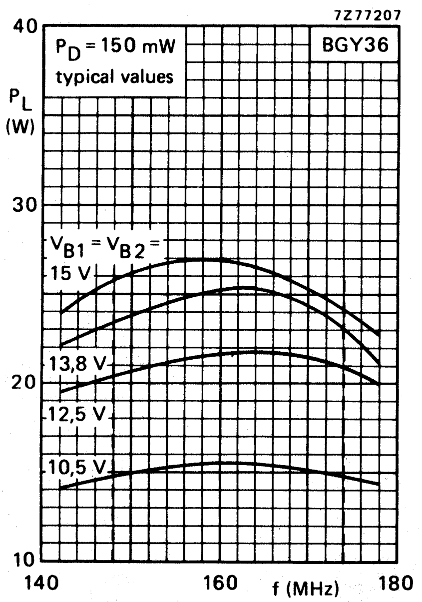

7Z77203
VB1 = VB2 = 12,5 V
typical values
BGY35
PL
(W)
f =
144 MHz
156 MHz
132 MHz
30
20
10
0
0
200
PD (mW)
400

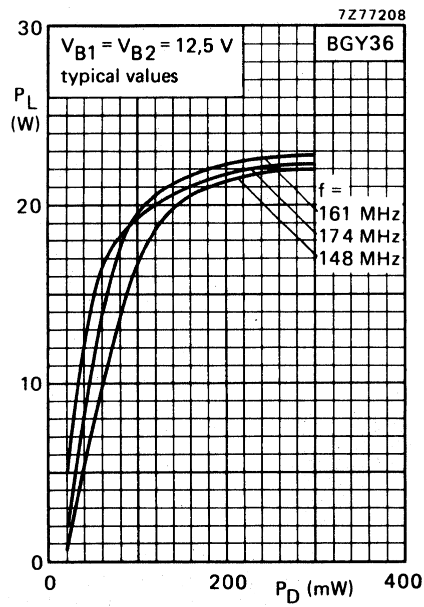

7Z77204
VB2 = 12,5 V
PD = 150 mW
typical values
BGY35
PL
(W)
f =
144 MHz
156 MHz
132 MHz
30
20
10
0
0
10
VB1 (V)
20

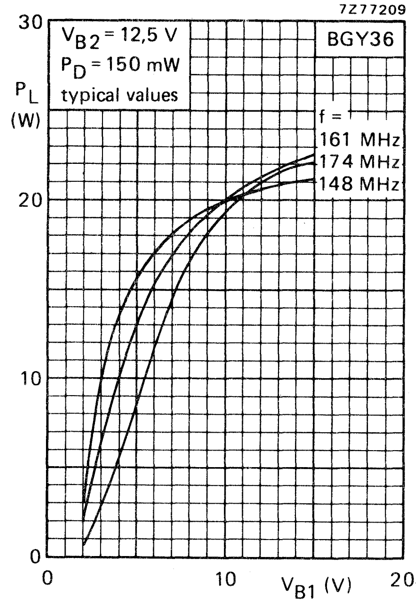

7Z77205
VB1 = VB2 = 12,5 V
PD = 150 mW
typical values
BGY35
PL
(W)
η
(%)
30
20
10
0
100
50
0
120
140
f (MHz)
160

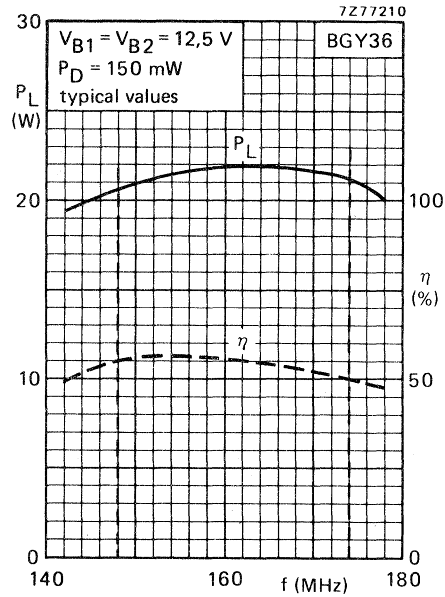

7Z77206
$V_{B1} = V_{B2} = 12,5$ V
$P_D = 150$ mW
typical values
BGY35
d_2
d_3
(dB)
0
−20
−40
−60
120
140
160
f (MHz)

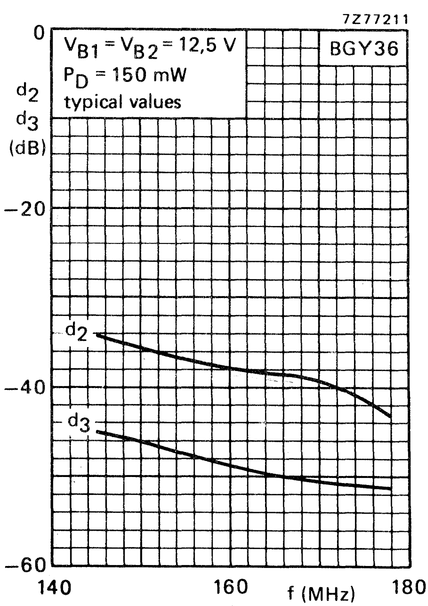

7Z77261
BGY35
$V_{B1} = V_{B2} = 12,5$ V
$P_L = 23$ W
ΔG_p
(dB)
+2
+1
0
−1
−2
typ
0
25
50
75
T_h (°C)

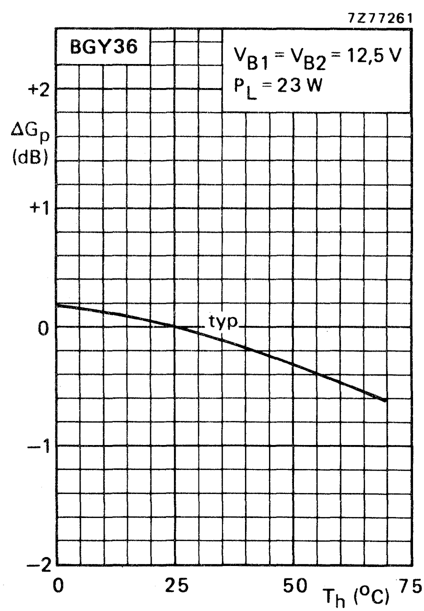

7Z77207
$P_D = 150$ mW
typical values
BGY36
P_L
(W)
$V_{B1} = V_{B2} =$
15 V
13,8 V
12,5 V
10,5 V
40
30
20
10
140
160
180
f (MHz)


7Z77208
$V_{B1} = V_{B2} = 12,5$ V
typical values
BGY36
P_L
(W)
f =
161 MHz
174 MHz
148 MHz
30
20
10
0
0
200
400
P_D (mW)


7Z77209
BGY36
V_{B2} = 12,5 V
P_D = 150 mW
typical values
P_L
(W)
f =
161 MHz
174 MHz
148 MHz
30
20
10
0
0
10
20
V_{B1} (V)


7Z77210
BGY36
V_{B1} = V_{B2} = 12,5 V
P_D = 150 mW
typical values
P_L
(W)
P_L
η
η
(%)
100
50
0
30
20
10
0
140
160
180
f (MHz)


7Z77211
BGY36
V_{B1} = V_{B2} = 12,5 V
P_D = 150 mW
typical values
d_2
d_3
(dB)
0
−20
−40
−60
140
160
180
f (MHz)


7Z77261
BGY36
V_{B1} = V_{B2} = 12,5 V
P_L = 23 W
ΔG_p
(dB)
typ
+2
+1
0
−1
−2
0
25
50
75
T_h (°C)

U.H.F. POWER AMPLIFIER MODULES

A range of broadband u.h.f. modules, primarily designed for mobile communication equipment, operating directly from 12 V electrical systems.
The BGY40,41 series produce minimum output powers of 7.5 W and 13 W respectively in the u.h.f. communications bands, the 'A' types covering 400 to 440 MHz and the 'B' types covering 440 to 470 MHz.
The modules consist of a three-stage r.f. amplifier using n-p-n transistor chips with lumped element matching components in a plastic stripline encapsulation.
The negative supply is internally connected to the flange.

QUICK REFERENCE DATA

Mode of operation			c.w.	
Supply voltages	V_{S1}, V_{S2}	nom.	12.5	V
Input impedance	Z_i	nom.	50	Ω
Output load impedance	Z_L	nom.	50	Ω

R.f. performance

		BGY40A	BGY41A	BGY40B	BGY41B	
Frequency of operation	f	400 to 440		440 to 470		MHz
Typical drive power	P_D	75	150	100	150	mW
Typical load power	P_L	11.5	15.6	10	15	W
Typical efficiency	η	40	40	40	40	%

MECHANICAL DATA (see Fig. 15)

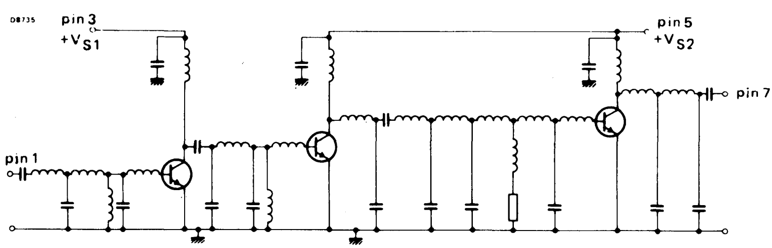


Fig. 1 Circuit of the u.h.f. modules.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages (with respect to flange)

D.C. supply terminals		V_{S1} and V_{S2}	max.	16.5	V
R.F. input terminal		$\pm V_{in}$	max.	25	V
R.F. output terminal		$\pm V_{out}$	max.	25	V
Load power (see Fig.2)	BGY40A, 40B	P_L	max.	12	W
	BGY41A, 41B	P_L	max.	16.5	W
Input drive power	BGY40A, 40B	P_D	max.	150	mW
	BGY41A, 41B	P_D	max.	200	mW
Storage temperature range		T_{stg}		−40 to +100	°C
Operating heatsink temperature		T_h	max.	90	°C

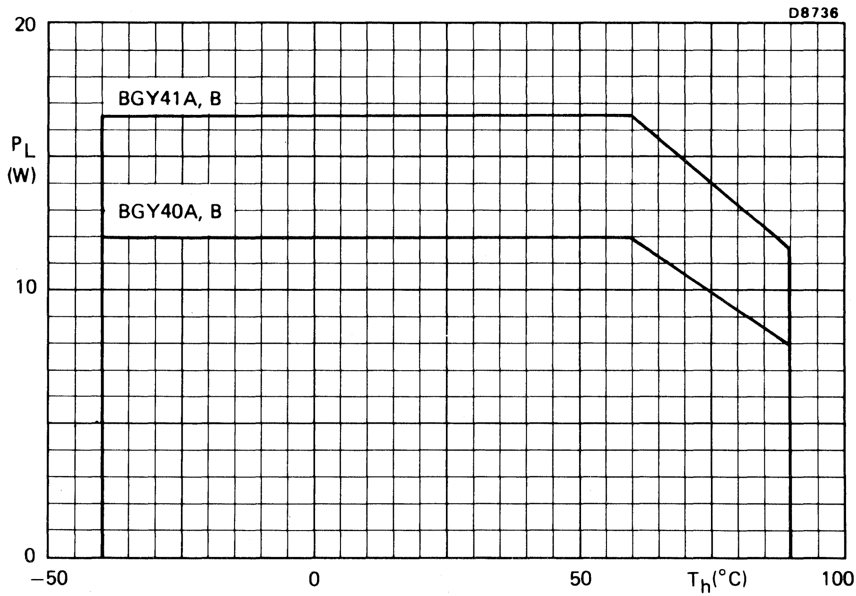


Fig.2 Load power derating; VSWR = 1

CHARACTERISTICS

T_h = 25 °C unless otherwise specified;

$V_{S1} = V_{S2}$ = 12.5 V; R_S = 50 Ω; R_L = 50 Ω

		BGY40A	BGY41A	BGY40B	BGY41B	
Frequency of operation	f	400 to 440		440 to 470		MHz
Minimum load power	P_L	7.5	13	7.5	13	W
Nominal drive power	P_D	100	150	100	150	mW
Minimum efficiency	η	35	35	35	35	%
Typical load power	P_L	11.5	15.6	10	15	W
Typical drive power	P_D	75	150	100	150	mW
Typical efficiency	η	40	40	40	40	%

Harmonic output Any single harmonic will be at least 40 dB down from the carrier.

Input VSWR (with respect to 50 Ω) typ. 1.5

Stability

The modules are stable with load VSWR up to 3 (all phases) when operated within the following limits:

BGY40A, BGY40B	BGY41A, BGY41B
P_D = 30 to 150 mW	P_D = 30 to 200 mW
$V_{S1} = V_{S2}$ = 8 to 16.5 V	$V_{S1} = V_{S2}$ = 8 to 16.5 V
P_L = 5 to 12 W	P_L = 5 to 16.5 W

Ruggedness

The modules will withstand load VSWR of 50 (all phases) for short period overload conditions with P_D, V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power rating being exceeded.

Mounting

To ensure good thermal transfer, the module should be mounted onto a heatsink with a flat surface, with heat conducting compound between module and heatsink. If an isolation washer is used, heatsink compound should be applied to both sides of the washer. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to a torque of 0.5 Nm.
Devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

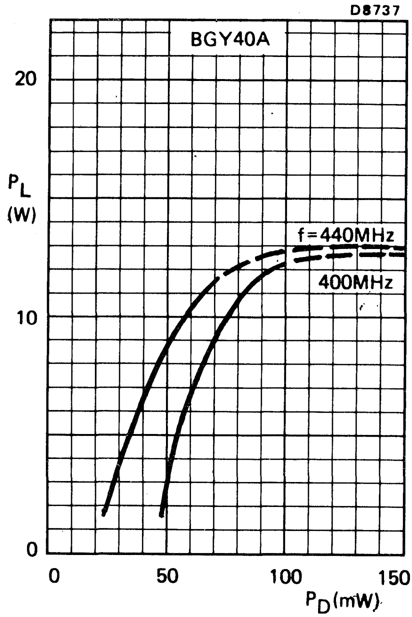


Fig.3 Typical values; $V_{S1} = V_{S2} = 12.5$ V

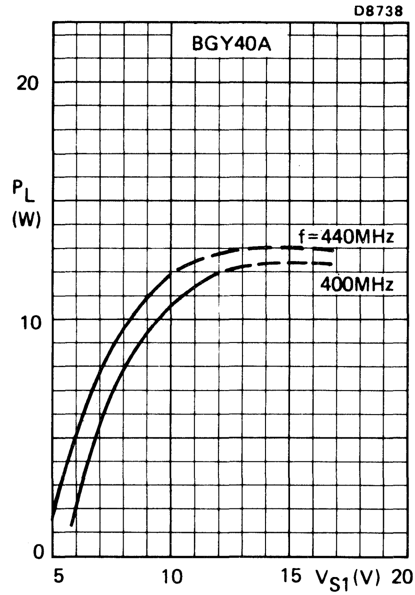


Fig.4 Typical values; $V_{S2} = 12.5$ V; $P_D = 100$ mW

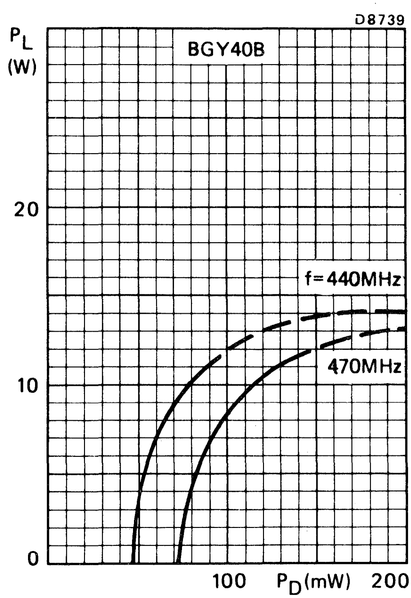


Fig.5 Typical values; $V_{S1} = V_{S2} = 12.5$ V

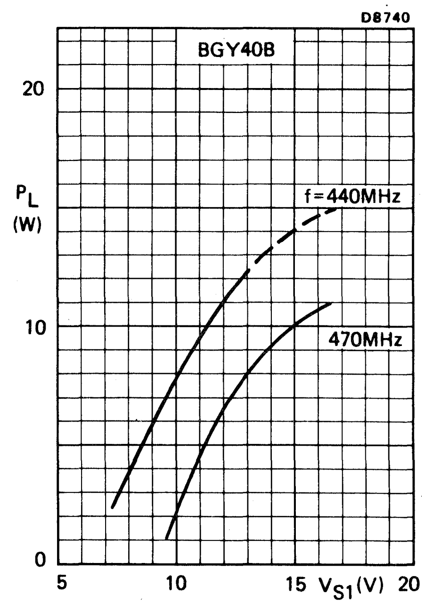


Fig.6 Typical values; $V_{S2} = 12.5$ V; $P_D = 100$ mW

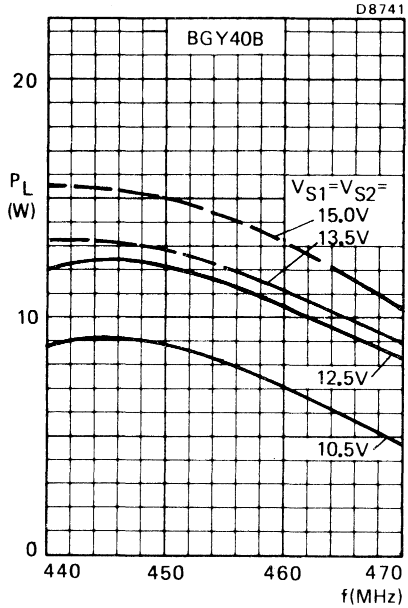


Fig.7 Typical values; P_D = 100 mW

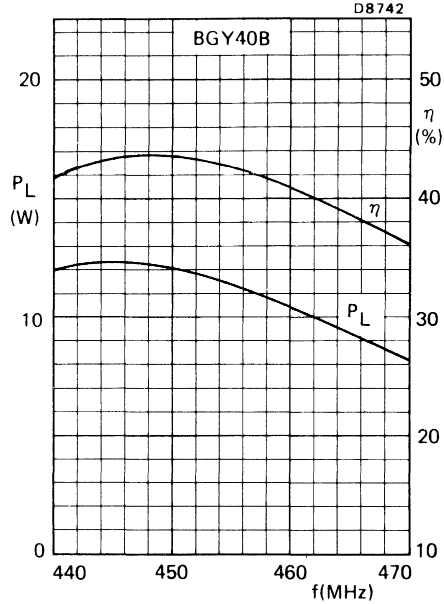


Fig.8 Typical values; $V_{S1} = V_{S2}$ = 12.5 V; P_D = 100 mW

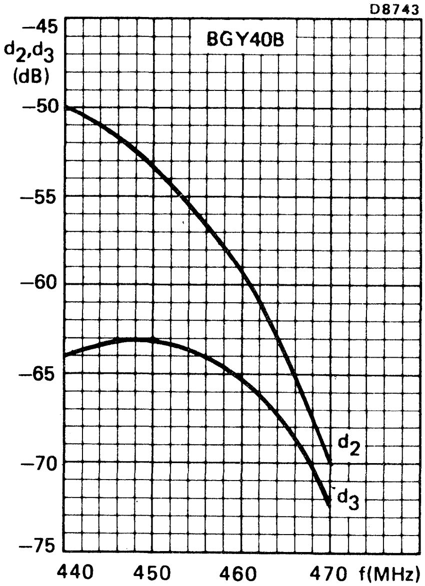


Fig.9 Typical values; $V_{S1} = V_{S2}$ = 12.5 V; P_D = 100 mW

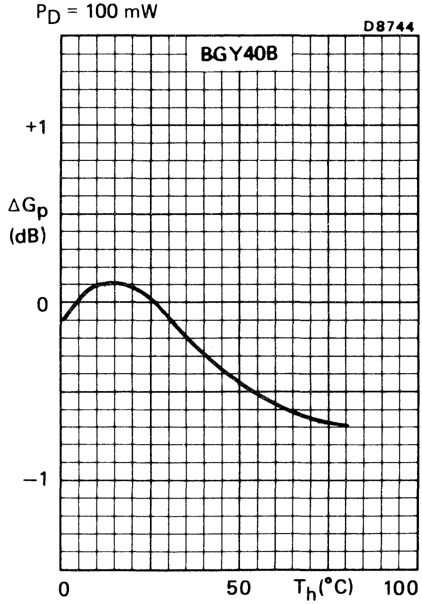


Fig.10 Typical values; $V_{S1} = V_{S2}$ = 12.5 V; P_D = 100 mW

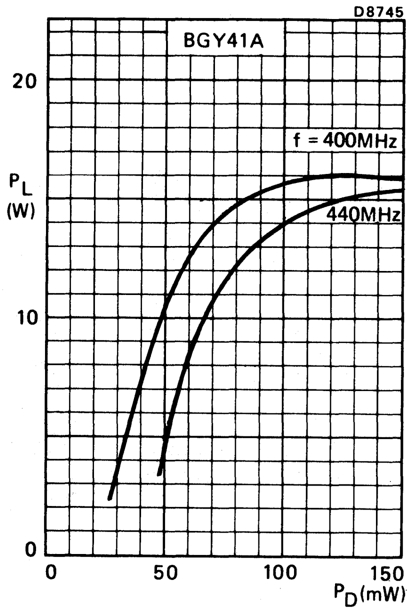


Fig.11 Typical values; $V_{S1} = V_{S2} = 12.5$ V

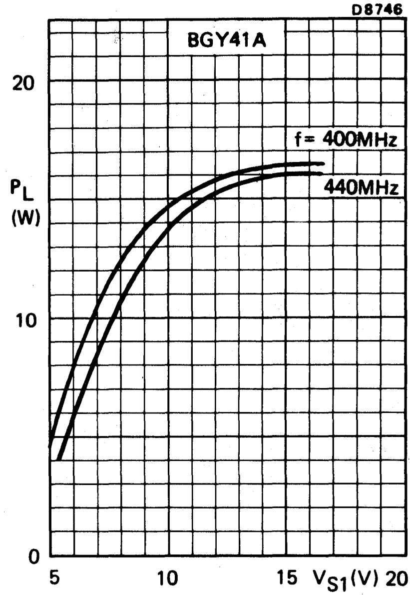


Fig.12 Typical values; $V_{S2} = 12.5$ V; $P_D = 150$ mW

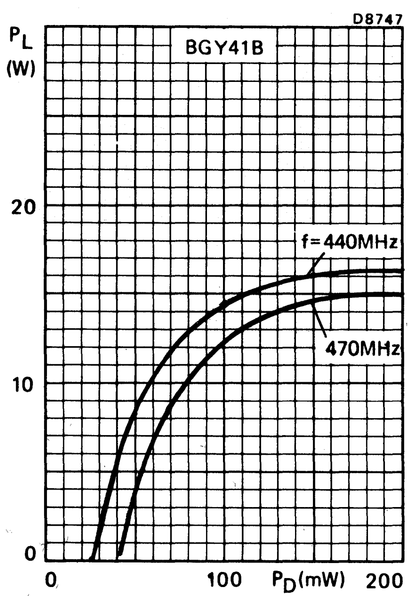


Fig.13 Typical values; $V_{S1} = V_{S2} = 12.5$ V

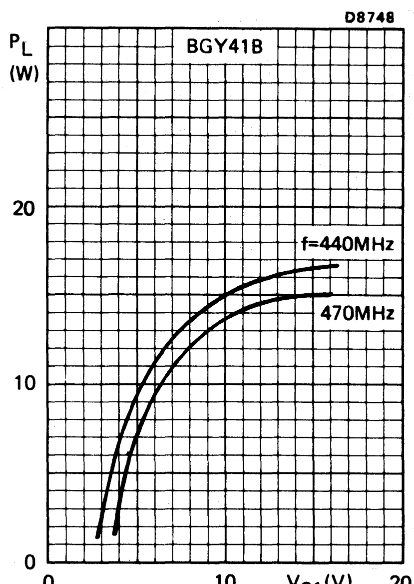
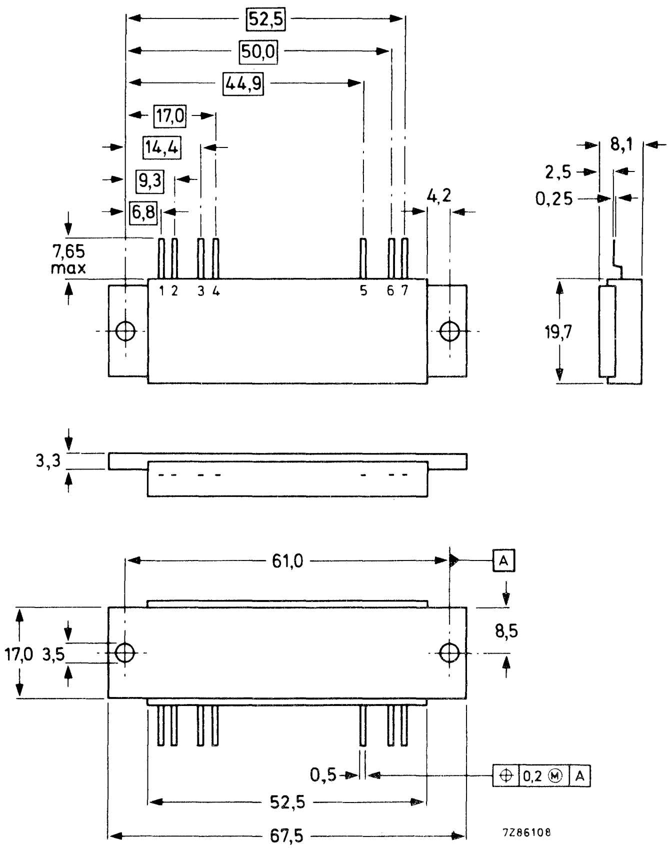


Fig.14 Typical values; $V_{S2} = 12.5$ V; $P_D = 150$ mW

MECHANICAL DATA

Dimensions in mm

Fig. 15 SOT-132C.



Lead reference

1 = Input
2 = Earth
3 = V_{S1}
4 = Earth
5 = V_{S2}
6 = Earth
7 = Output

V.H.F. POWER AMPLIFIER MODULE

A broadband v.h.f. amplifier module primarily designed for mobile communications equipment, operating directly from 12 V electrical systems. The module will produce a minimum output of 13 W into a 50 Ω load over the frequency range 148 to 174 MHz.
The module consists of a two stage r.f. amplifier using n-p-n transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

QUICK REFERENCE DATA

Mode of operation			c.w.	
Frequency range	f		148 to 174	MHz
Drive power	P_D	max.	150	mW
	P_D	typ.	80	mW
Load power	P_L	>	13	W
Supply voltages	V_{S1} and V_{S2}	nom.	12.5	V
Input impedance	z_i	nom.	50	Ω
Output load impedance	Z_L	nom.	50	Ω

MECHANICAL DATA (see Fig. 10)

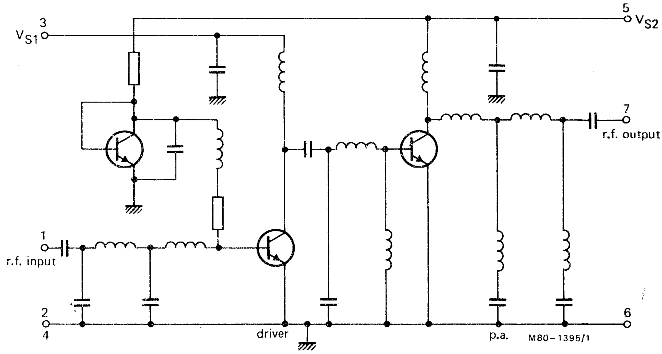


Fig. 1 Circuit of the v.h.f. module.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages (with respect to flange)

D.C. supply terminals	V_{S1} and V_{S2}	max.	16.5	V
R.F. input terminal	$\pm V_i$	max.	25	V
R.F. output terminal	$\pm V_o$	max.	25	V
Load power (see below)	P_L	max.	18	W
Input drive power	P_D	max.	300	mW
Storage temperature range	T_{stg}		−40 to +100	°C
Operating heatsink temperature	T_h	max.	90	°C

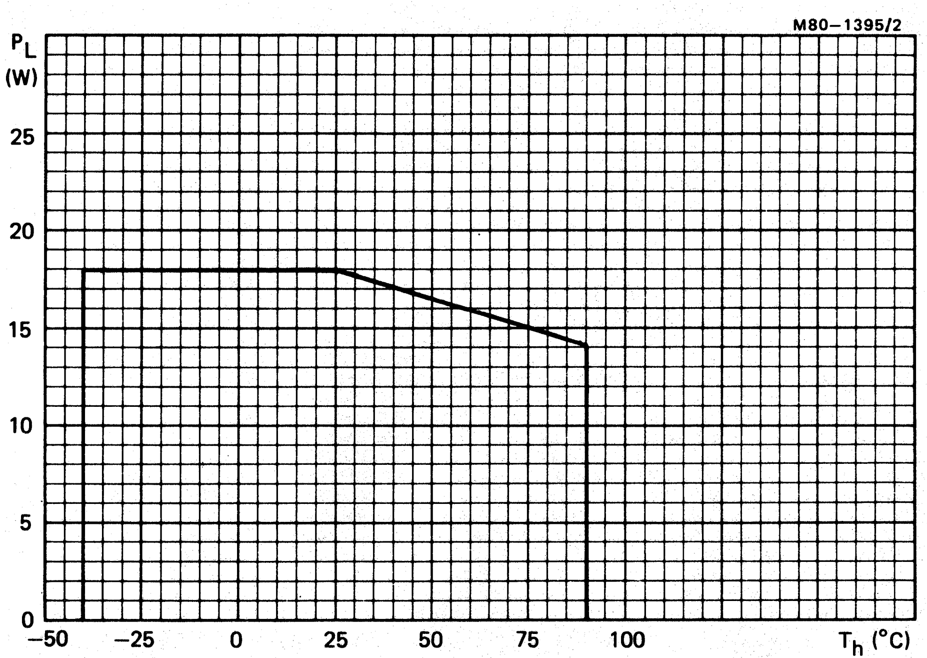


Fig.2 Load power derating; VSWR = 1

CHARACTERISTICS

T_h = 25 °C unless otherwise specified

$V_{S1} = V_{S2}$ = 12.5 V; R_S = 50 Ω; frequency range 148 to 174 MHz; R_L = 50 Ω

Quiescent currents				
$P_D = 0$	I_{Q1}	typ.	5	mA
	I_{Q2}	typ.	15	mA
R.F. drive power				
P_L = 13 W	P_D	$<$	150	mW
	P_D	typ.	80	mW
Efficiency				
P_L = 13 W	η	$>$	40	%
	η	typ.	48	%
Harmonic output	Any single harmonic will be at least 25 dB down from the carrier, with typical rejection of 34 dB.			
Input VSWR (with respect to 50 Ω)		typ.	1.5	

Stability

The module is stable with load VSWR up to 3 (all phases) when operated with:

$V_{S1} = V_{S2}$ = 10 to 16.5 V; f = 148 to 174 MHz; P_D = 30 to 300 mW; $P_L \leqslant$ 18 W (matched)

Ruggedness

The modules will withstand load VSWR of 50 for short period overload conditions, with P_D, V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power rating being exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface, with heat conducting compound between module and heatsink. If an isolation washer is used, heatsink compound should be applied to both sides of the washer. Burrs and thickening of the holes in the heatsink should be removed and 3 mm bolts tightened to a torque of 0.5 Nm.
Devices may be soldered directly into a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

APPLICATION INFORMATION

A technical publication (M80–0056) entitled 'Transmitter design using v.h.f. broadband amplifier modules' is available on request.

Power rating

In general it is recommended that the output power from the module under nominal conditions should not exceed 16 W in order to provide adequate safety margin under fault conditions.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1}. The supply required is a voltage regulator with a current rating of 0.75 A, and an output voltage range of 3 V to 12 V.

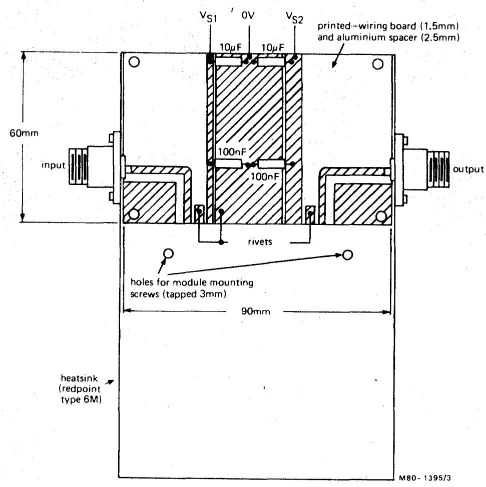


Fig.3 Test jig for v.h.f. modules

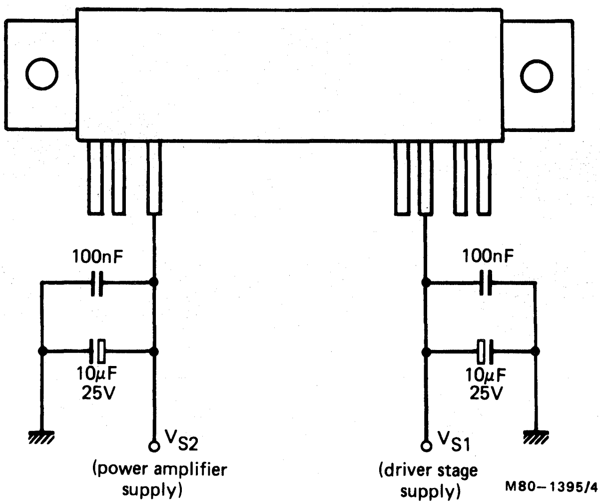


Fig.4 Recommended decoupling arrangement

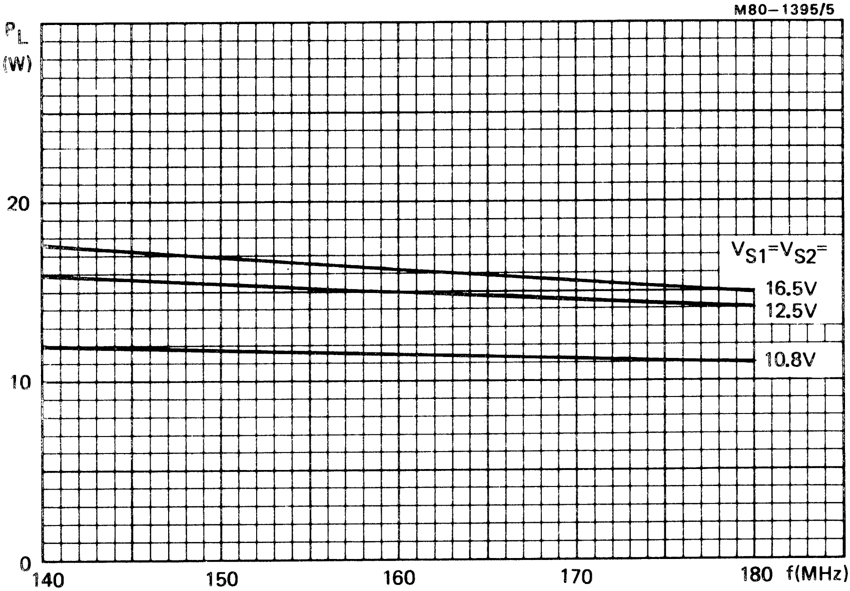


Fig.5 Typical values; P_D = 150 mW

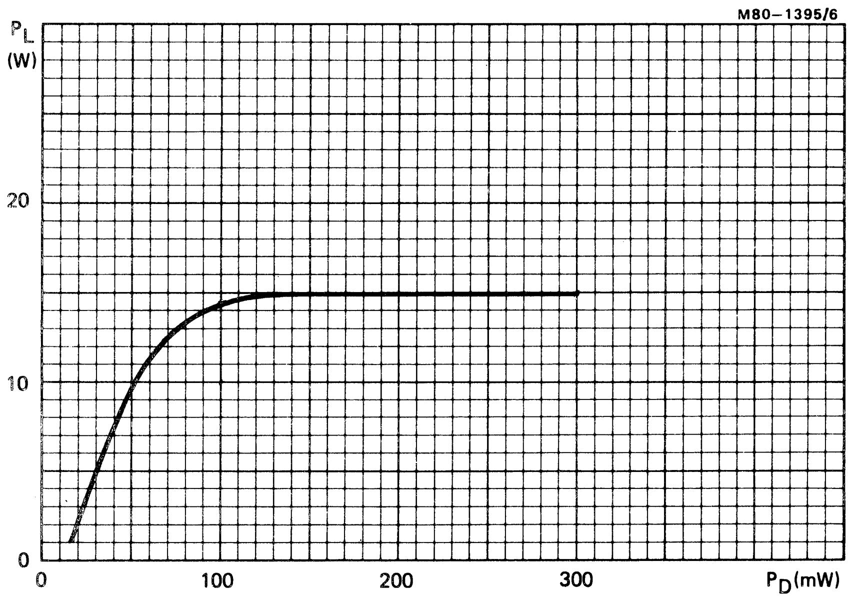


Fig.6 Typical values; $V_{S1} = V_{S2}$ = 12.5 V; f = 160 MHz

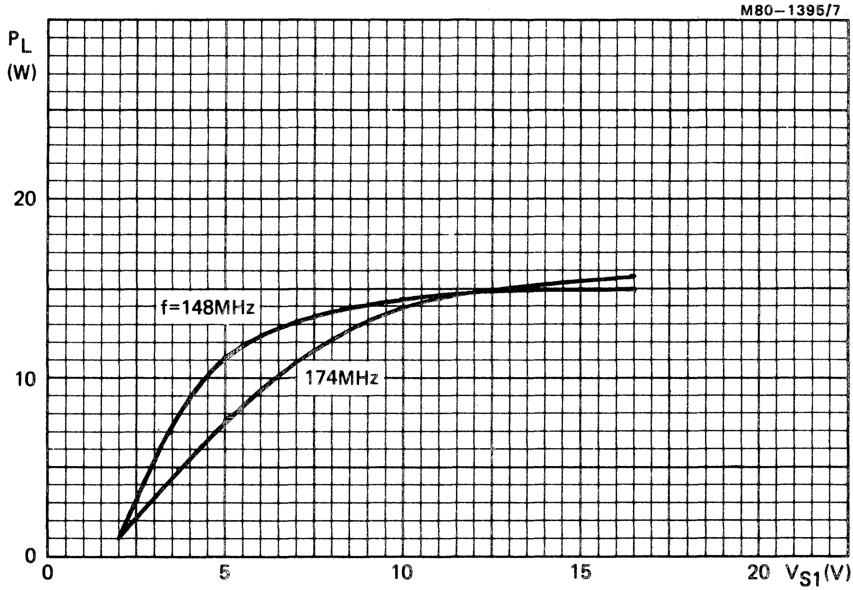


Fig.7 Typical values; V_{S2} = 12.5 V; P_D = 150 mW

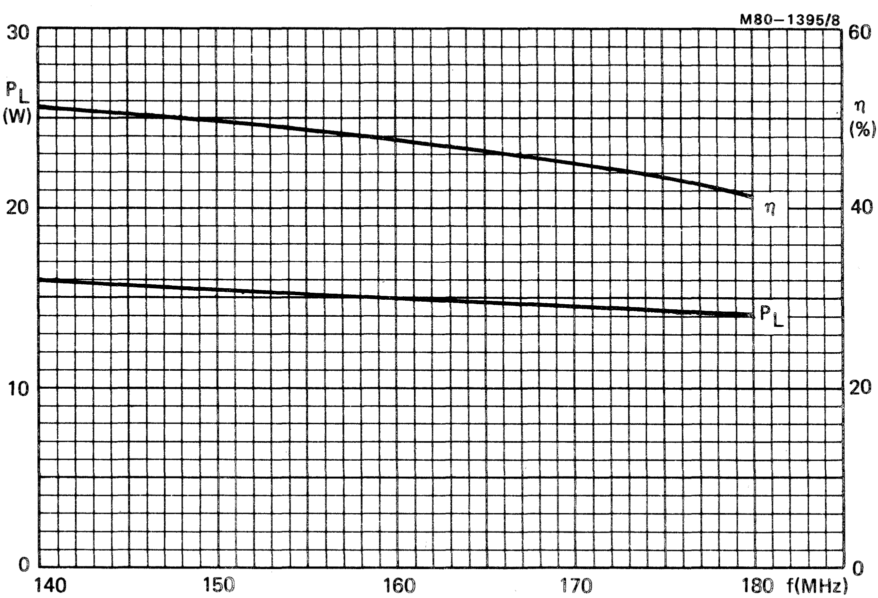


Fig.8 Typical values; V_{S1} = V_{S2} = 12.5 V; P_D = 150 mW

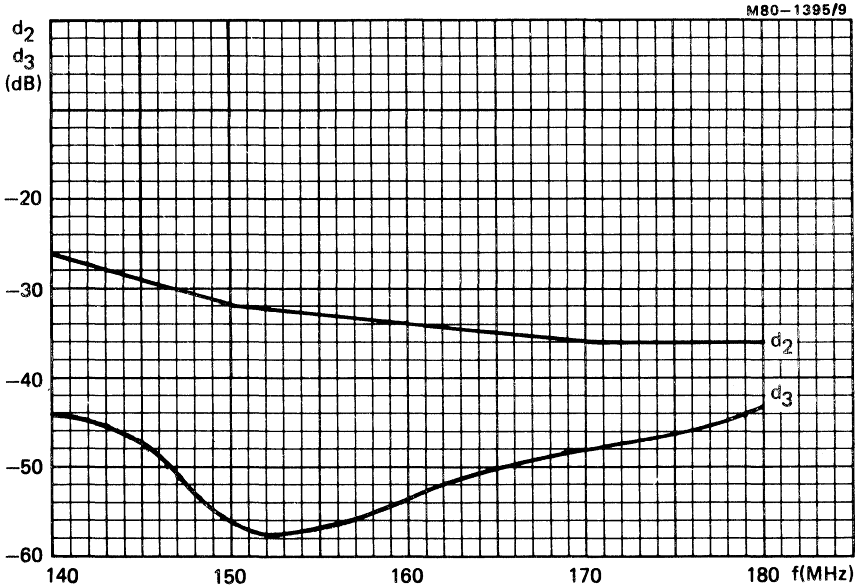
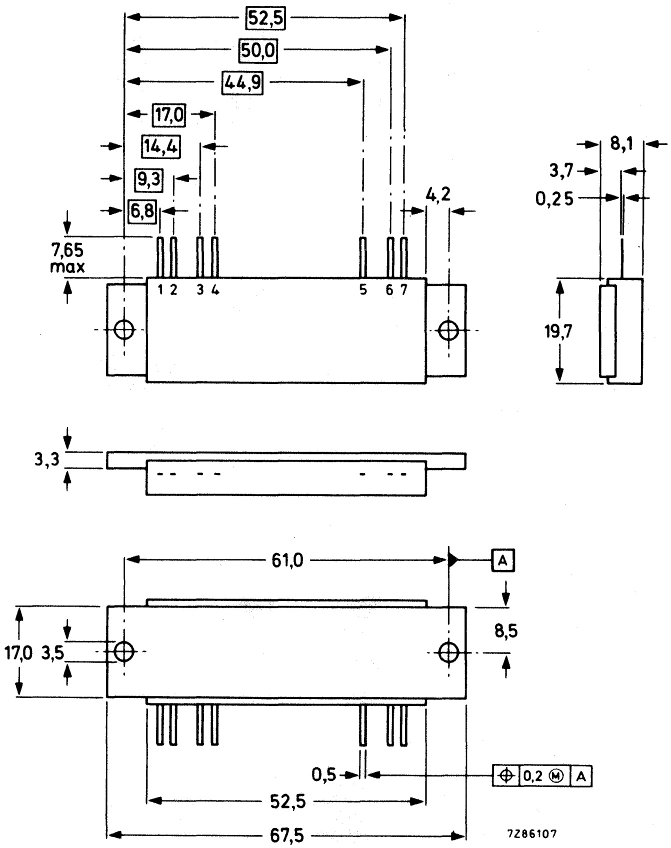


Fig.9 Typical values; $V_{S1} = V_{S2} = 12.5$ V; $P_D = 150$ mW

MECHANICAL DATA

Fig. 10 SOT-132B.

Dimensions in mm



Lead reference

1 = Input
2 = Earth
3 = V_{S1}
4 = Earth
5 = V_{S2}
6 = Earth
7 = Output

V.H.F. BROADBAND POWER MODULE

V.H.F. broadband power amplifier module primarily designed for mobile communications equipment, operating directly from 12,5 V systems. The module will produce a minimum output of 30 W into a 50 Ω load over the frequency range 68 to 88 MHz.

The module consists of a two-stage amplifier using n-p-n transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

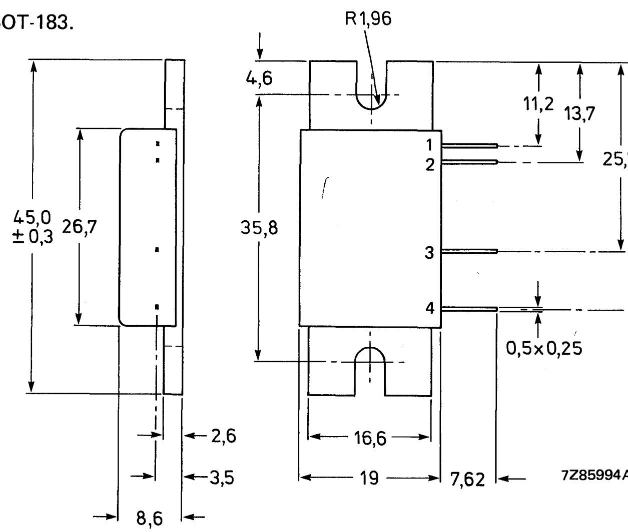
QUICK REFERENCE DATA

Mode of operation			c.w.	
Frequency range			68 to 88	MHz
D.C. supply voltage (terminal 2)	V_{S1}		12,5	V
D.C. supply voltage (terminal 3)	V_{S2}		12,5	V
Drive power	P_{DR}	typ.	50	mW
		max.	150	mW
Load power	P_L		30	W
Efficiency	η	typ.	40	%
Operating heatsink temperature	T_h	max.	90	°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-183.



Lead reference

1 = input
2 = V_{S1}
3 = V_{S2}
4 = output
Flange is ground

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1}; V_{S2}	max.	16,5 V*
Input terminal voltage*	$\pm V_i$	max.	25 V*
Output terminal voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	40 W**
Drive power	P_{DR}	max.	300 mW
Storage temperature	T_{stg}		−40 to 100 °C
Operating temperature	T_h	max.	90 °C

CHARACTERISTICS

→ $V_{S1} = V_{S2} = 12,5$ V; $Z_S = Z_L = 50\ \Omega$; $T_h = 25\ ^oC$

Quiescent currents $P_{DR} = 0$	I_{Q1}	typ.	10 mA
	I_{Q2}	typ. max.	25 mA 35 mA
Frequency range	f		68 to 88 MHz
Efficiency $P_L = 30$ W	η	min. typ.	37 % 40 %
R.F. drive power $P_L = 30$ W	P_{DR}	typ. max.	50 mW 150 mW
Second-harmonic rejection $P_L = 30$ W		typ. min.	45 dB 30 dB
Input VSWR with respect to 50 Ω		typ. max.	1,5 : 1 2,0 : 1

Stability

The module is stable with load VSWR up to 3 : 1 (all phases) when operated within the following conditions:

$V_{S1} = 6$ to 16,5 V; $V_{S2} = 10$ to 16,5 V; f = 68 to 88 MHz; P_D = 30 to 300 mW

provided the maximum ratings of the module are not exceeded.

Ruggedness

The modules will withstand load VSWR of 20 : 1 for short overload conditions, with P_{DR}, V_{S1} and V_{S2} at maximum values, providing the combination does not cause the matched r.f. output power rating to be exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound sparingly applied between module and heatsink. Any burrs on the heatsink should be removed. The connectors may be soldered directly onto a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

* With respect to the flange. ** See Fig. 2.

Power rating

In general, it is recommended that the output power from the module under nominal condition should not exceed 35 W in order to provide adequate safety margins under fault conditions.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1}. The supply needed is a voltage regulator with a current rating of 1,2 A and an output voltage range of 4 V to 12,5 V.

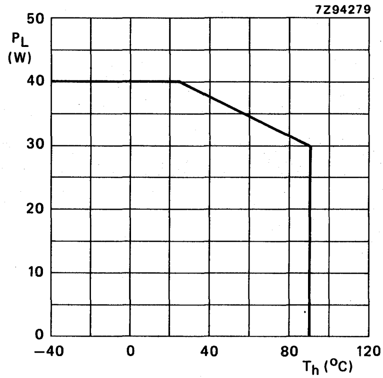


Fig. 2 Load power derating; VSWR = 1 : 1.

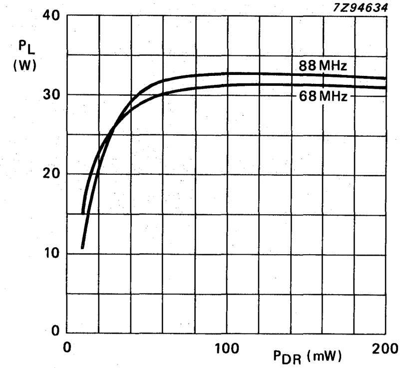


Fig. 3 $V_{S1} = V_{S2} = 12{,}5$ V; $T_h = 25$ °C; typ. values.

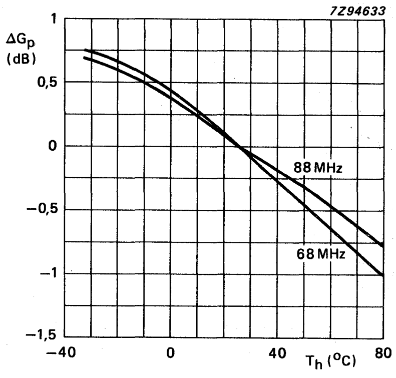


Fig. 4 $P_{DR} = 150$ mW; $V_{S1} = V_{S2} = 12{,}5$ V; typ. values.

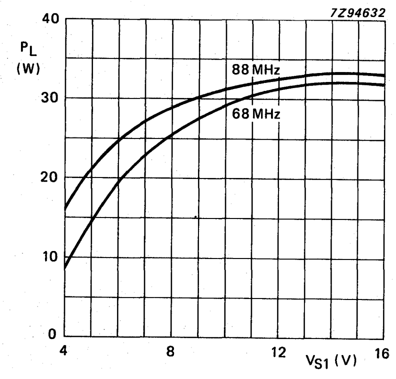


Fig. 5 $P_{DR} = 150$ mW; $V_{S2} = 12{,}5$ V; typ. values.

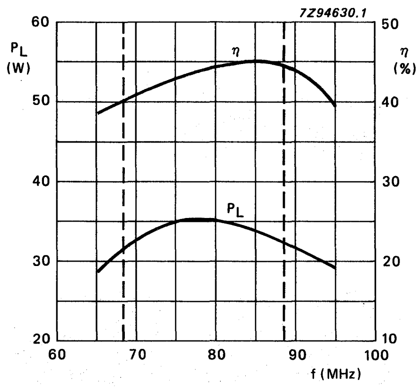


Fig. 6 $V_{S1} = V_{S2} = 12{,}5$ V; $P_{DR} = 150$ mW; typ. values.

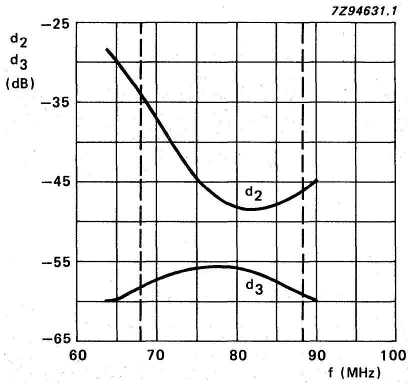


Fig. 7 $V_{S1} = V_{S2} = 12{,}5$ V; $P_L = 30$ W; typ. values.

V.H.F. BROADBAND POWER MODULE

V.H.F. broadband power amplifier module primarily designed for mobile communications equipment, operating directly from 12,5 V systems. The module will produce a minimum output of 30 W into a 50 Ω load over the frequency range 148 to 174 MHz.

The module consists of a two-stage amplifier using n-p-n transistor chips with lumped-element matching components in a plastic stripline encapsulation. The negative supply is internally connected to the flange.

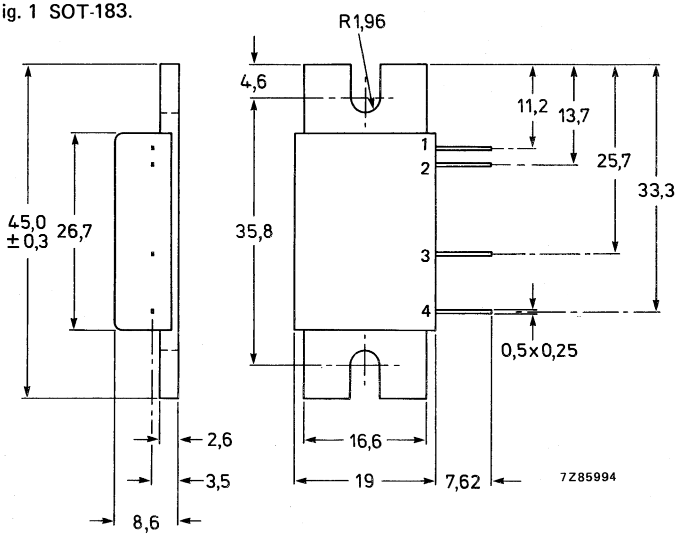
QUICK REFERENCE DATA

Mode of operation			c.w.	
Frequency range			148 to 174	MHz
D.C. supply voltage (terminal 2)	V_{S1}		12,5	V
D.C. supply voltage (terminal 3)	V_{S2}		12,5	V
Drive power	P_{DR}	typ.	150	mW
		max.	300	mW
Load power	P_L		30	W
Efficiency	η	typ.	45	%
Operating heatsink temperature	T_h	max.	90	°C

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-183.



Lead reference

1 = input
2 = V_{S1}
3 = V_{S2}
4 = Output
Flange is ground

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1};V_{S2}	max.	16,5	V*
Input terminal voltage*	$\pm V_i$	max.	25	V*
Output terminal voltage*	$\pm V_o$	max.	25	V*
Load power	P_L	max.	40	W**
Drive power	P_{DR}	max.	400	mW
Storage temperature	T_{stg}		−40 to 100	°C
Operating temperature	T_h	max.	90	°C

CHARACTERISTICS

→ $V_{S1} = V_{S2} = 12,5$ V; $Z_S = Z_L = 50\ \Omega$; $T_h = 25^oC$

Quiescent currents $P_{DR} = 0$	I_{Q1}	typ.	10	mA
	I_{Q2}	typ.	25	mA
		max.	35	mA
Frequency range	f		148 - 174	MHz
Efficiency $P_L = 30$ W	η	min.	40	%
		typ.	45	%
R.F. drive power $P_L = 30$ W	P_{DR}	max.	300	mW
		typ.	150	mW
Second-harmonic rejection $P_L = 30$ W		typ.	35	dB
		min.	30	dB
Input VSWR with respect to 50 Ω		typ.	1,5 : 1	
		max.	2,0 : 1	

Stability

The module is stable with load VSWR up to 3 : 1 (all phases) when operated within the following conditions:

V_{S1} = 6 to 16,5 V; V_{S2} = 10 to 16,5 V; f = 148 to 174 MHz; P_D = 150 to 400 mW provided the maximum ratings of the module are not exceeded.

Ruggedness

The modules will withstand load VSWR of 20 : 1 for short overload conditions, with P_{DR}, V_{S1} and V_{S2} at maximum values, providing the combination does not cause the matched r.f. output power rating to be exceeded.

Mounting

To ensure good thermal transfer the module should be mounted onto a heatsink with a flat surface with heat-conducting compound sparingly applied between module and heatsink. Any burrs on the heatsink should be removed. The connectors may be soldered directly onto a circuit using a soldering iron with a maximum temperature of 245 °C for not more than 10 seconds at a distance of at least 1 mm from the plastic.

* With respect to the flange. ** See Fig. 2.

Power rating

In general, it is recommended that the output power from the module under nominal condition should not exceed 35 W in order to provide adequate safety margins under fault conditions.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1}. The supply needed is a voltage regulator with a current rating of 1,2 A and an output voltage range of 3 V to 12 V.

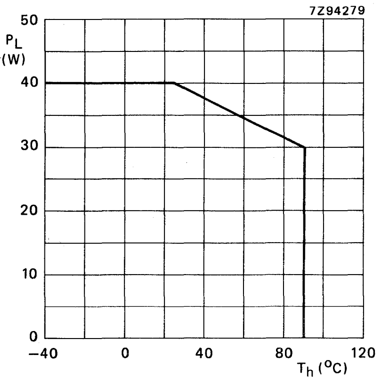


Fig. 2 Load power derating.

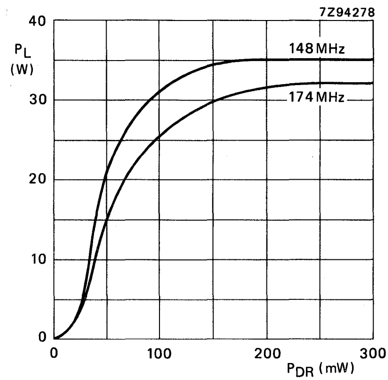


Fig. 3 $V_{S1} = V_{S2} = 12,5$ V; $T_h = 25$ °C; typ. values.

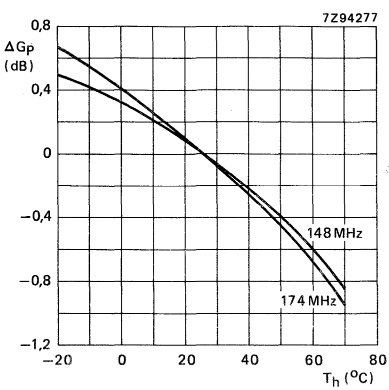


Fig. 4 $P_{DR} = 300$ mW; $V_{S1} = V_{S2} = 12,5$ V; typ. values.

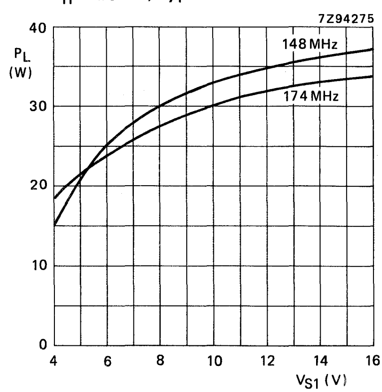


Fig. 5 $P_{DR} = 300$ mW; $V_{S2} = 12,5$ V; typ. values.

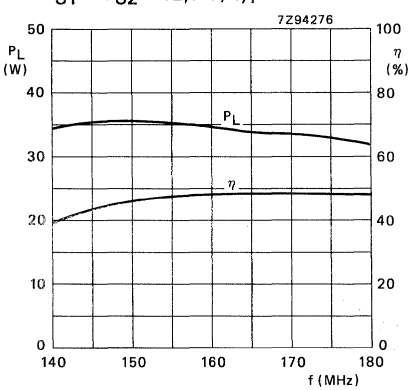


Fig. 6 $V_{S1} = V_{S2} = 12,5$ V; $P_{DR} = 300$ mW; typ. values.

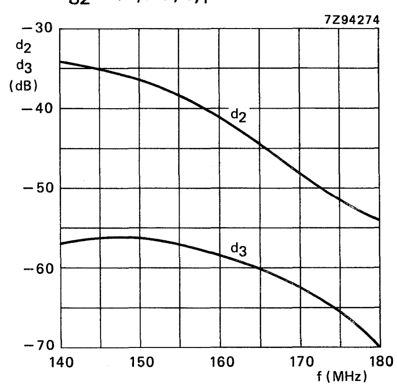


Fig. 7 $V_{S1} = V_{S2} = 12,5$ V; $P_{DR} = 300$ mW; typ. values.

U.H.F. AMPLIFIER MODULES

U.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers using n-p-n transistors mounted on thin-film metallized alumina substrates with stripline matching circuits.

The BGY46A and BGY46B will produce a minimum of 1,4 W into a 50 Ω load over the 400 to 440 MHz and 430 to 470 MHz frequency ranges respectively.

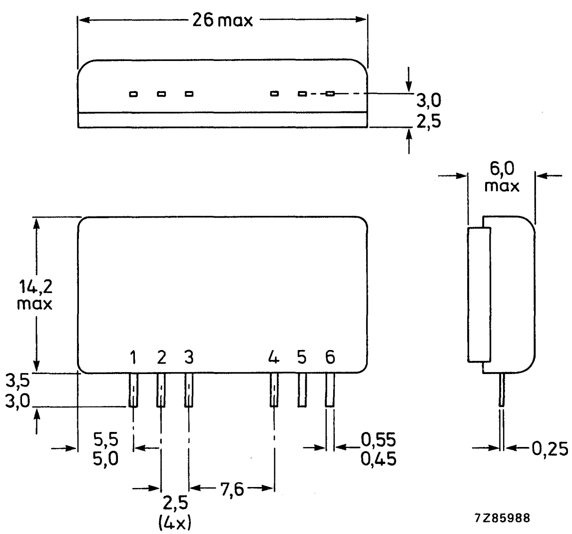
QUICK REFERENCE DATA

Mode of operation		continuous wave		
Frequency range	BGY46A		400 to 440	MHz
	BGY46B		430 to 470	MHz
R.F. load power				
V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_{DR} = 45 mW		>	1,4	W
R.F. drive power				
V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_L = 1,4 W		<	45	mW
Input and output impedances		nom.	50	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-181.



Lead reference

1. R.F. input
2. Earth
3. V_{S1}
4. V_{S2}
5. Earth
6. R.F. output

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	12 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	2,5 W
Drive power	P_{DR}	max.	90 mW
Storage temperature	T_{stg}		−40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_{DR} = 0; T_h = 25 °C	I_{Q1} I_{Q2}	< <	7 mA 0,1 mA
Efficiency V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_{DR} = 45 mW; $R_S = R_L$ = 50 Ω	η	>	40 %
Harmonic output V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_{DR} = 45 mW; $R_S = R_L$ = 50 Ω	any harmonic	<	−30 dB
Input VSWR V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_{DR} = 45 mW; $R_S = R_L$ = 50 Ω	VSWR	max.	2

Stability

The modules will produce no spurious signals with a load mismatch of up to 5 VSWR (all phases) when operated within the following conditions:

V_{S1} = 4 to 12 V; V_{S2} = 6 to 12 V; P_{DR} = 17 to 70 mW.

Ruggedness

The modules will withstand a load mismatch VSWR of 50 (all phases) when operated within the following conditions:

$V_{S1} < 12$ V; $V_{S2} < 12$ V; $P_{DR} < 70$ mW; $T_h < 90$ °C.

* With respect to flange.

U.H.F. AMPLIFIER MODULES

A range of U.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers using n-p-n transistors mounted on thin-film metallized alumina substrates with stripline matching circuits.

QUICK REFERENCE DATA

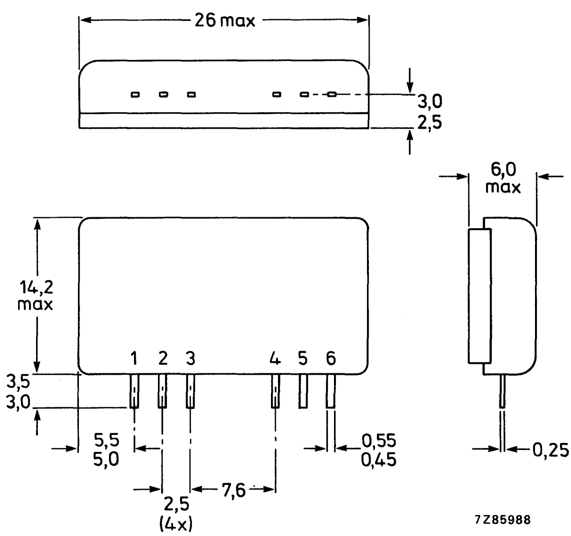
Mode of operation frequency modulation

R.F. performance	f MHz	V_{S1} V	V_{S2} V	P_{DR} mW	P_L W
BGY47A	400 to 470	7,5	7,5	< 50	> 2,0
BGY47F	460 to 512	7,5	9,6	< 50	> 3,2

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-181.



Lead reference

1. R.F. input
2. Earth
3. V_{S1}
4. V_{S2}
5. Earth
6. R.F. output

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	12	V*
R.F. input voltage*	$\pm V_i$	max.	25	V*
R.F. output voltage*	$\pm V_o$	max.	25	V*
Load power	P_L	max.	5	W
Drive power	P_{DR}	max.	90	mW
Storage temperature	T_{stg}	−40 to 100		°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

Quiescent currents

V_{S1} = 7,5 V; V_{S2} = 9,6 V;
P_{DR} = 0; T_h = 25 °C

	I_{Q1}	<	7	mA
	I_{Q2}	<	0,1	mA

Efficiency

When operated under nominal conditions

BGY47A	η	>	40	%
→ BGY47F	η	>	36	%

Harmonic output

$V_{S1} = V_{S2}$ = 9,6 V; P_{DR} = 50 mW

BGY47A	any harmonic	<	−30	dB

V_{S1} = 7,5 V; V_{S2} = 9,6 V; P_{DR} = 50 mW

→ BGY47F	any harmonic	<	−30	dB

Stability

The modules will produce no spurious signals with a load mismatch of up to 5 VSWR (all phases) when operated within the following conditions:

V_{S1} = 6 to 12 V; V_{S2} = 8 to 12 V; P_{DR} = 25 to 100 mW.

Ruggedness

The modules will withstand a load mismatch VSWR of 50 (all phases) when operated within the following conditions:

$V_{S1} < 12$ V; $V_{S2} < 12$ V; $P_{DR} < 100$ mW; $T_h < 90$ °C.

* With respect to flange.

U.H.F. AMPLIFIER MODULES

A range of U.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V electrical supply. The modules are three-stage amplifiers consisting of bipolar silicon n-p-n transistors and lumped element matching circuits.

The BGY48A, BGY48B and BGY48C will produce a minimum of 5 W into a 50 Ω load over the 400 to 440 MHz, 430 to 470 MHz and 460 to 512 MHz frequency ranges respectively.

QUICK REFERENCE DATA

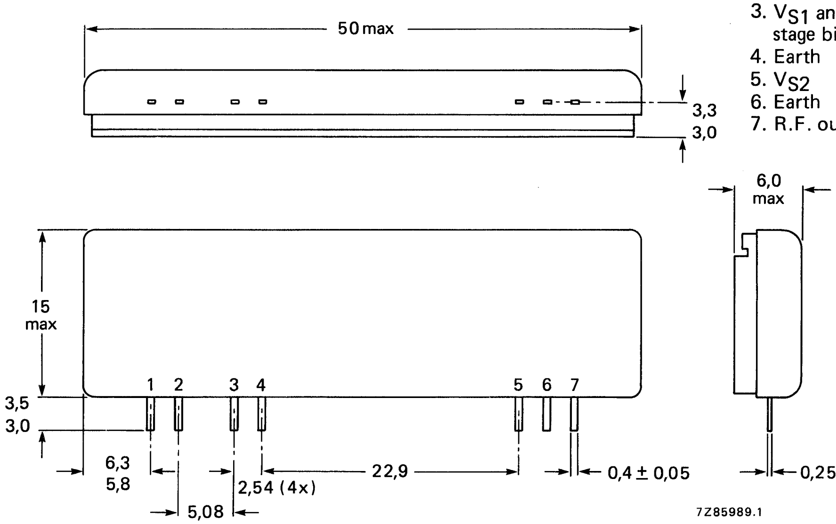
Mode of operation		continuous wave		
Frequency range	BGY48A		400 to 440	MHz
	BGY48B		430 to 470	MHz
	BGY48C		460 to 512	MHz
R.F. load power $V_{S1} = V_{S2} = 9{,}6$ V; $P_{DR} = 50$ mW		>	5,0	W
R.F. drive power $V_{S1} = V_{S2} = 9{,}6$ V; $P_L = 5{,}0$ W		<	35	mW
Input and output impedances		nom.	50	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-182.

Lead reference
1. R.F. input
2. Earth
3. V_{S1} and second stage bias
4. Earth
5. V_{S2}
6. Earth
7. R.F. output



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	13,5	V*
R.F. input voltage*	$\pm V_i$	max.	25	V*
R.F. output voltage*	$\pm V_o$	max.	25	V*
Load power	P_L	max.	9	W
Drive power	P_{DR}	max.	70	mW
Storage temperature	T_{stg}		−40 to 100	°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

Quiescent currents				
second stage current with first stage open circuit $V_{S2} = 9,6$ V; $P_{DR} = 0$; $R_S = R_L = 50\ \Omega$; $I_{S1} = 0$	I_{Q2}	<	0,5	mA
	I_{Q2}	typ.	0,1	mA
first stage current $V_{S1} = 7,1$ V; $V_{S2} = 9,6$ V; $P_{DR} = 0$; $R_S = R_L = 50\ \Omega$	I_{Q1}	typ.	2	mA
Efficiency $V_{S1} = V_{S2} = 9,6$ V; $P_L = 5,0$ W; $R_S = R_L = 50\ \Omega$	η	>	40	%
		typ.	42	%
Harmonic output $V_{S1} = V_{S2} = 9,6$ V; $P_{DR} = 35$ mW; $R_S = R_L = 50\ \Omega$	any harmonic (relative to carrier)	<	−40	dB
		typ.	−50	dB
Input VSWR $V_{S1} = V_{S2} = 9,6$ V; $P_{DR} = 35$ mW; $R_S = R_L = 50\ \Omega$	VSWR	max.	2	

Stability

The modules will produce no signals at frequencies other than that of the carrier and harmonics of the carrier frequency when operated with a load mismatch of 5 VSWR (all phases) and when operated within the following conditions:

$V_{S1} \leqslant V_{S2} = 4$ to 11,2 V; $P_{DR} = 17$ to 70 mW; $P_L < 9,0$ W.

Ruggedness

The modules will withstand a load VSWR of 50 for short period overload conditions, with P_D, V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power derating curve being exceeded. $T_h = 90$ °C.

* With respect to earth pins.

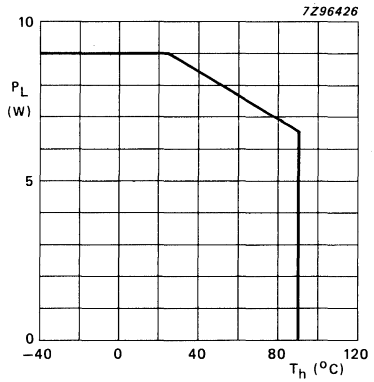


Fig. 2 Load power derating; VSWR = 1 : 1.

DEVELOPMENT DATA

U.H.F. POWER MODULE

The BGY90A is a two stage u.h.f. power module designed for use in mobile transmitting equipment operating from a 12 V power supply.

The module consists of two n-p-n silicon planar transistors mounted on a metallized ceramic substrate together with matching and bias circuitry. The module produces an output of 7,5 W into a 50 Ω load over the frequency range of 806 to 890 MHz when operated under nominal conditions.

QUICK REFERENCE DATA

D.C. supply terminal voltages	$V_{S1};V_{S2}$	nom.	12,5	V
Frequency	f		806 to 890	MHz
R.F. load power at P_D = 200 mW	P_L	>	7,5	W
R.F. input drive power at P_L = 7,5 W	P_D	<	200	mW
Input and output impedance	$Z_S;Z_L$	nom.	50	Ω

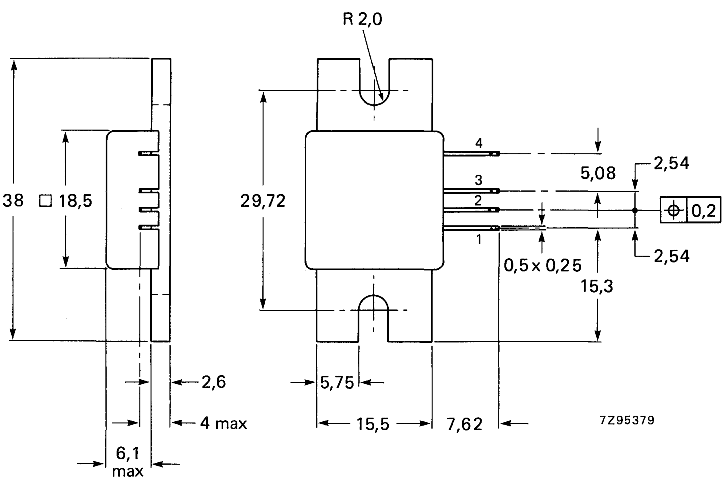
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-197.

Lead reference:

1 = r.f. input
2 = V_{S1}
3 = V_{S2}
4 = r.f. output



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. terminal supply voltages	V_{S1};/V_{S2}	max.	16,5	V
D.C. voltage on r.f. input	$\pm V_i$	max.	25	V
D.C. voltage on r.f. output	$\pm V_o$	max.	25	V
Load power (r.f.)	P_L	max.	9	W
Drive power (r.f.)	P_D	max.	400	mW
Storage temperature	T_{stg}		−40 to +100	°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

$V_{S1} = V_{S2} = 12{,}5$ V; f = 806 - 890 MHz; $Z_S = Z_L = 50\ \Omega$ unless otherwise specified

Quiescent currents $P_D = 0$	I_{Q1}	typ.	40	mA
	I_{Q2}	typ.	25	mA
R.F. input drive power at $P_L = 7{,}5$ W	P_D	<	200	mW
R.F. output power at $P_D = 200$ mW	P_L	>	7,5	W
Efficiency at $P_L = 7{,}5$ W		>	35	%
→ Harmonic rejection at $P_L = 7{,}5$ W		>	35	dB

Stability

The module will produce no spurious signals with a load mismatch of up to 3 VSWR when operated within the following conditions:

$V_{S1} = 0$ to 15 V; $V_{S2} = 6$ to 15 V; $P_D = 0$ to 400 mW; $T_h < 90$ °C; P_L (into 50 Ω) $\leqslant 9$ W.

Ruggedness

The module will withstand a load mismatch VSWR of 50 when operated within the following conditions:

$V_{S1} = 15$ V max.; $V_{S2} = 15$ V; $P_D = 400$ mW max.; $T_h < 90$ °C; providing the module is adjusted for $P_L < 9$ W (into 50 Ω). This adjustment may be performed by control of either P_D or V_{S1}.

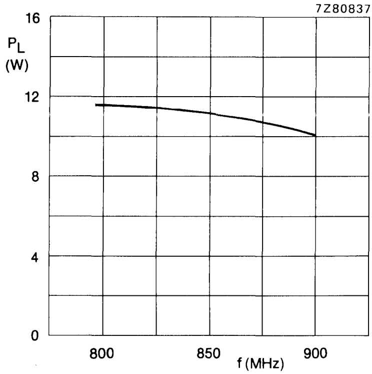


Fig. 2 Output power versus frequency; P_D = 200 mW; V_S = 12,5 V; typical values.

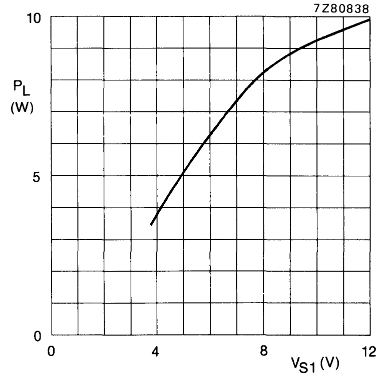


Fig. 3 Output power versus 1st stage supply voltage; f = 850 MHz; P_D = 200 mW; V_{S2} = 12,5 V; typical values.

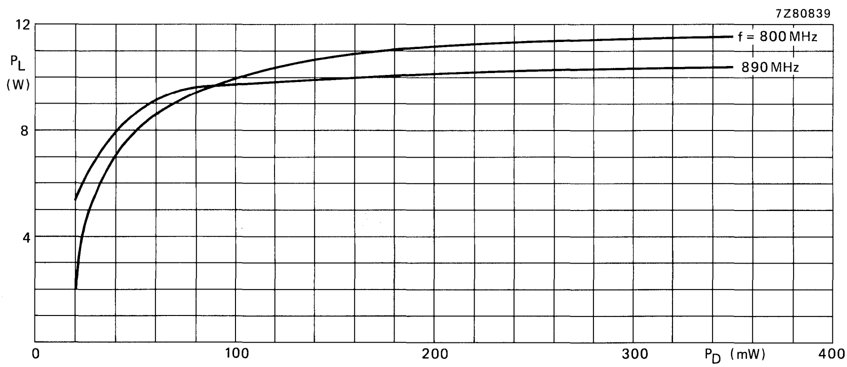


Fig. 4 Output power versus input drive power; V_S = 12,5 V; typical values.

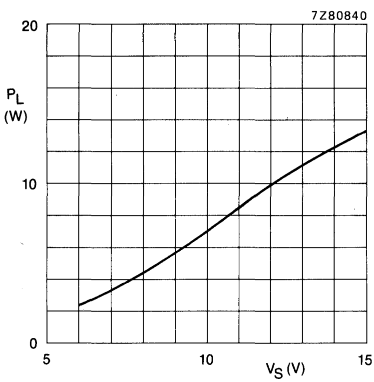


Fig. 5 Output power versus supply voltage; P_D = 200 mW; typical values.

U.H.F. POWER MODULE

The BGY90B is a two stage u.h.f. power module designed for use in mobile transmitting equipment operating from a 12 V power supply.

The module consists of two n-p-n silicon planar transistors mounted on a metallized ceramic substrate together with matching and bias circuitry. The module produces an output power of 7,5 W into a 50 Ω load over the frequency range of 870 to 950 MHz when operated under nominal conditions.

QUICK REFERENCE DATA

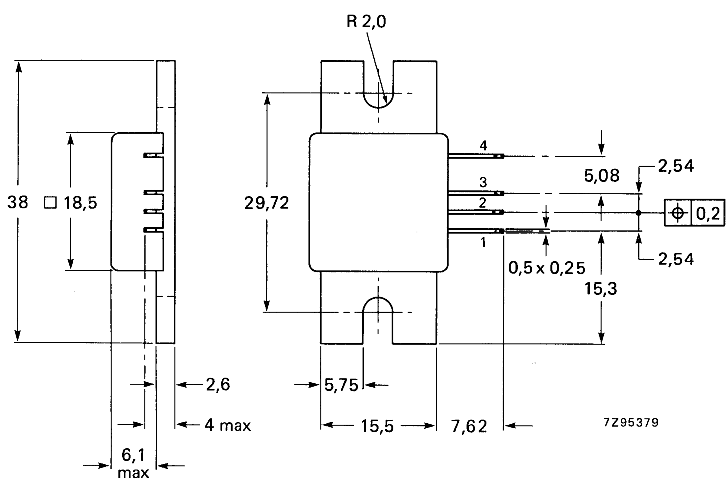
D.C. supply terminal voltages	V_{S1};V_{S2}	nom.	12,5	V
Frequency	f		870 to 950	MHz
R.F. load power at P_D = 200 mW	P_L	>	7,5	W
R.F. input drive power at P_L = 7,5 W	P_D	<	200	mW
Input and output impedances	Z_S;Z_L	nom.	50	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-197.

Lead reference:
1 = r.f. input
2 = V_{S1}
3 = V_{S2}
4 = r.f. output



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. terminal supply voltages	$V_{S1};V_{S2}$	max.	16,5	V
D.C. voltage on r.f. input	$\pm V_i$	max.	25	V
D.C. voltage on r.f. output	$\pm V_o$	max.	25	V
Load power (r.f.)	P_L	max.	9	W
Drive power (r.f.)	P_D	max.	400	mW
Storage temperature	T_{stg}		−40 to +100	°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

$V_{S1} = V_{S2} = 12,5$ V; f = 870 - 950 MHz; $Z_S = Z_L = 50\ \Omega$ unless otherwise specified

Quiescent currents $P_D = 0$	I_{Q1}	typ.	15	mA
	I_{Q2}	typ.	25	mA
R.F. input drive power at $P_L = 7,5$ W	P_D	<	200	mW
R.F. output power at $P_D = 200$ mW	P_L	>	7,5	W
Efficiency at $P_L = 7,5$ W	n	>	35	%
Harmonic rejection at $P_L = 7,5$ W		>	35	dB

Stability

The module will produce no spurious signals with a load mismatch of up to 3 VSWR when operated within the following conditions:

$V_{S1} < V_{S2} = 0$ to 15 V; $P_D = 0$ to 400 mW; $T_h < 90$ °C; providing maximum ratings are not exceeded.

Ruggedness

The module will withstand a load mismatch VSWR of 50 when operated within the following conditions:

$V_{S1} = 15$ V max.; $V_{S2} = 15$ V; $P_D = 400$ mW max.; $T_h < 90$ °C; providing the module is adjusted for $P_L < 9$ W (into 50 Ω). This adjustment may be performed by control of either P_D or V_{S1}.

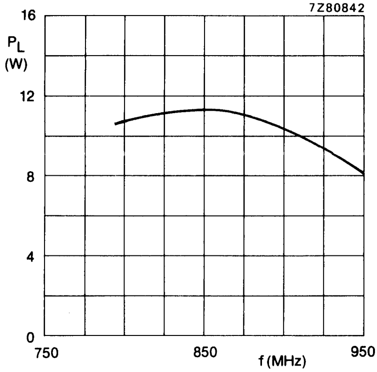


Fig. 2 Output power versus frequency;
P_D = 200 mW; V_{S1} = V_{S2} = 12,5 V;
typical values.

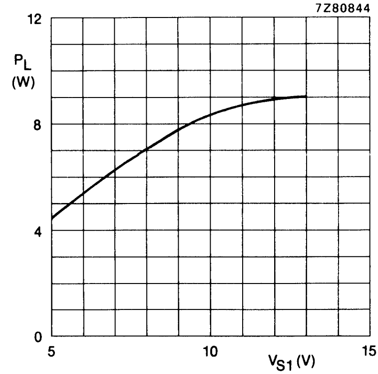


Fig. 3 Output power versus 1st stage
supply voltage; V_{S2} = 12,5 V; f = 890 MHz,
P_L = 9 W (at 890 MHz); typical values.

DEVELOPMENT DATA

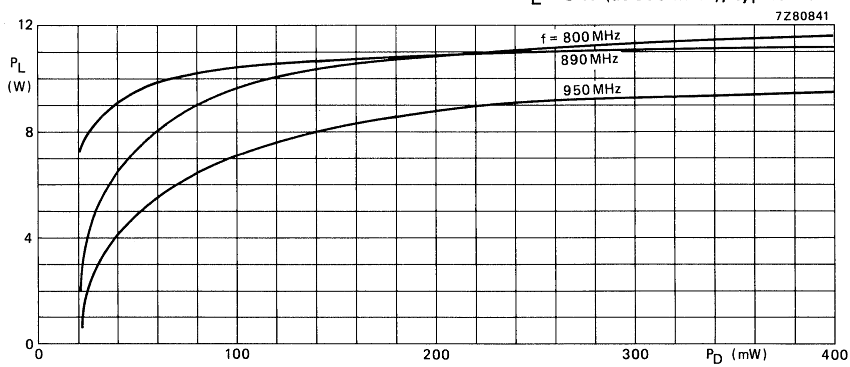


Fig. 4 Output power versus input drive power; V_{S1} = V_{S2} = 12,5 V; typ. values.

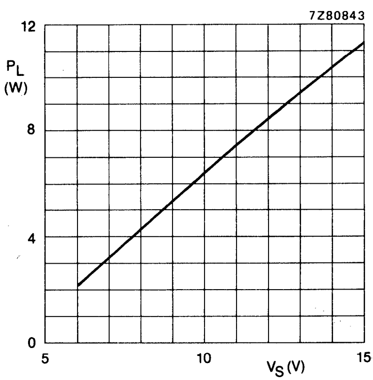


Fig. 5 Output power versus supply voltage;
V_S = V_{S1} = V_{S2}; f = 890 MHz;
P_L = 9 W (at 890 MHz); typ. values.

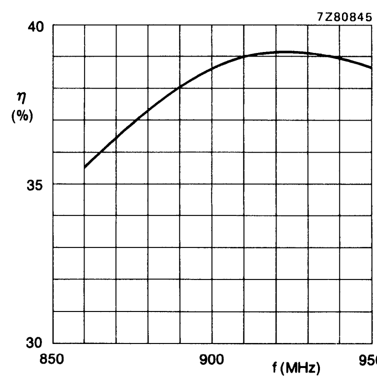


Fig. 6 Efficiency versus frequency;
V_{S1} = V_{S2} = 12,5 V; P_L = 7,5 W;
typical values.

V.H.F. AMPLIFIER MODULES

A range of V.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers consisting of n-channel FET crystals and lumped element matching circuits.

The BGY93A, BGY93B and BGY93C will produce a minimum of 2 W into a 50 Ω load over the 68 to 88 MHz, 136 to 156 MHz and 148 to 174 MHz frequency ranges respectively.

QUICK REFERENCE DATA

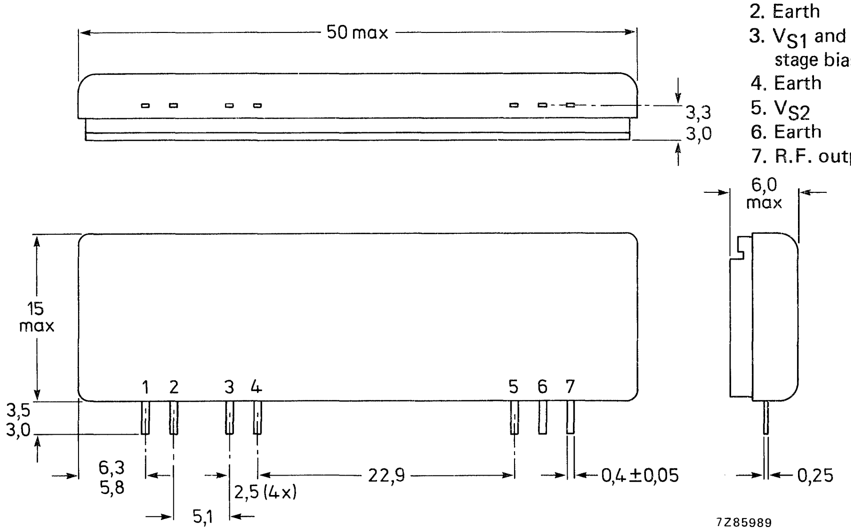
Mode of operation			continuous wave
Frequency range	BGY93A		68 to 88 MHz
	BGY93B		136 to 156 MHz
	BGY93C		148 to 174 MHz
R.F. load power $V_{S1} = V_{S2} = 9{,}6$ V; $P_{DR} = 35$ mW		>	2,0 W
R.F. drive power $V_{S1} = V_{S2} = 9{,}6$ V; $P_L = 2{,}0$ W		<	35 mW
Input and output impedances		nom.	50 Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-182.

Lead reference
1. R.F. input
2. Earth
3. V_{S1} and second stage bias
4. Earth
5. V_{S2}
6. Earth
7. R.F. output



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	13,5 V*
R.F. input voltage*	$\pm V_i$	max.	25 V*
R.F. output voltage*	$\pm V_o$	max.	25 V*
Load power	P_L	max.	4 W
Drive power	P_{DR}	max.	70 mW
Storage temperature	T_{stg}		−40 to 100 °C
Operating heatsink temperature	T_h	max.	90 °C

CHARACTERISTICS

Quiescent currents			
Second stage current with first stage open circuit V_{S2} = 9,6 V; P_{DR} = 0; $R_S = R_L$ = 50 Ω; I_{S1} = 0	I_{Q2}	typ. <	0,1 mA 0,5 mA
Second stage current with first stage connected V_{S1} = 9,3 V; V_{S2} = 9,6 V; P_{DR} = 0; $R_S = R_L$ = 50 Ω	I_{Q2}	typ.	270 mA
First stage current V_{S1} = 9,3 V; V_{S2} = 9,6 V; P_{DR} = 0; $R_S = R_L$ = 50 Ω	I_{Q1}	typ.	70 mA
Efficiency $V_{S1} = V_{S2}$ = 9,6 V; P_{DR} = 35 mW; $R_S = R_L$ = 50 Ω		>	40 %
Harmonic output $V_{S1} = V_{S2}$ = 9,6 V (relative to carrier); P_{DR} = 35 mW; $R_S = R_L$ = 50 Ω	any harmonic	<	−30 dB
Input VSWR $V_{S1} = V_{S2}$ = 9,6 V; P_{DR} = 35 mW; $R_S = R_L$ = 50 Ω	VSWR	max.	2

Stability

The modules will produce no signals at frequencies other than that of the carrier frequency when operated with a load mismatch of 8 VSWR (all phases) and when operated within the following conditions:

$V_{S1} \leqslant V_{S2}$ = 4 to 11,2 V; P_{DR} = 17 to 70 mW.

Ruggedness

The modules will withstand a load mismatch VSWR of 50 (all phases) when operated within the following conditions:

$V_{S1} \leqslant V_{S2} \leqslant$ 11,2 V; $P_{DR} <$ 70 mW; $T_h \leqslant$ 90 °C.

* With respect to flange.

V.H.F. AMPLIFIER MODULES

A range of V.H.F. amplifier modules designed for use in portable transmitters operating from a 9,6 V supply. The modules are two-stage amplifiers consisting of n-channel FET crystals and lumped element matching circuits.

The BGY94A, BGY94B and BGY94C will produce a minimum of 5 W into a 50 Ω load over the 68 to 88 MHz, 132 to 156 MHz and 148 to 174 MHz frequency ranges respectively.

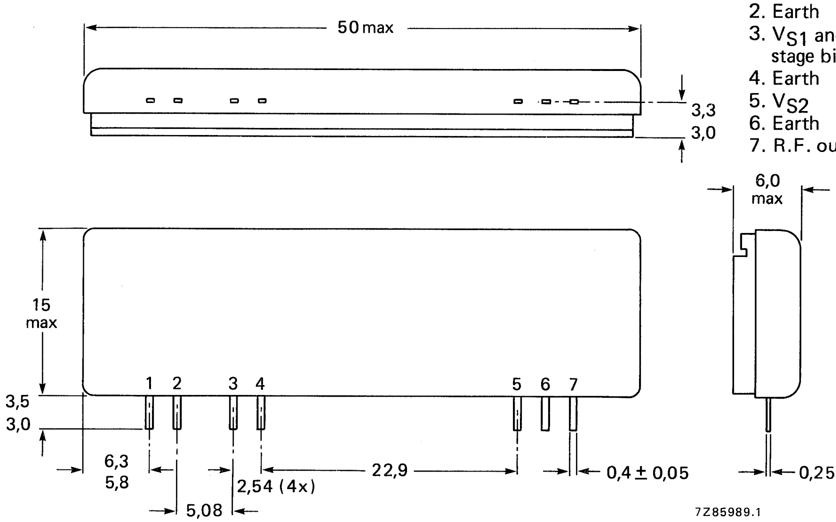
QUICK REFERENCE DATA

Mode of operation		continuous wave		
Frequency range	BGY94A		68 to 88	MHz
	BGY94B		132 to 156	MHz
	BGY94C		148 to 174	MHz
R.F. load power $V_{S1} = V_{S2} = 9{,}6$ V; $P_{DR} = 50$ mW		>	5,0	W
R.F. drive power $V_{S1} = V_{S2} = 9{,}6$ V; $P_L = 5{,}0$ W		<	35	mW
Input and output impedances		nom.	50	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-182.



Lead reference
1. R.F. input
2. Earth
3. V_{S1} and second stage bias
4. Earth
5. V_{S2}
6. Earth
7. R.F. output

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

D.C. supply terminal voltages*	V_{S1}/V_{S2}	max.	13,5	V*
R.F. input voltage*	$\pm V_i$	max.	25	V*
R.F. output voltage*	$\pm V_o$	max.	25	V*
Load power	P_L	max.	9	W
Drive power	P_{DR}	max.	70	mW
Storage temperature	T_{stg}		−40 to 100	°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

Quiescent currents				
second stage current with first stage open circuit V_{S2} = 9,6 V; P_{DR} = 0; $R_S = R_L$ = 50 Ω; I_{S1} = 0	I_{Q2}	<	0,5	mA
first stage current $V_{S1} = V_{S2}$ = 9,6 V; P_{DR} = 0; $R_S = R_L$ = 50 Ω	I_{Q1}	typ.	125	mA
Efficiency $V_{S1} = V_{S2}$ = 9,6 V; P_L = 5 W; $R_S = R_L$ = 50 Ω	η	>	40	%
Harmonic output $V_{S1} = V_{S2}$ = 9,6 V; P_{DR} = 35 mW; $R_S = R_L$ = 50 Ω	any harmonic (relative to carrier)	<	−35	dB
Input VSWR $V_{S1} = V_{S2}$ = 9,6 V; P_{DR} = 35 mW; $R_S = R_L$ = 50 Ω	VSWR	max.	2	

Stability

The modules will produce no signals at frequencies other than that of the carrier frequency when operated with a load mismatch of 8 VSWR (all phases) and when operated within the following conditions:

$V_{S1} \leqslant V_{S2}$ = 4 to 11,2 V; P_{DR} = 17 to 70 mW; P_L = 9,0 W (matched)

Ruggedness

The modules will withstand a load VSWR of 50 for short period overload conditions, with P_D, V_{S1} and V_{S2} at maximum values, providing the combination does not result in the matched r.f. output power derating curve being exceeded. T_h = 90 °C.

Gain control

Power output can be controlled by variation of the driver stage supply voltage V_{S1}. The supply required is a voltage regulator with a current rating of 0,25 A and an output voltage range of 4,0 V to 9,6 V. V_{S1} must not exceed V_{S2}.

* With respect to earth pins.

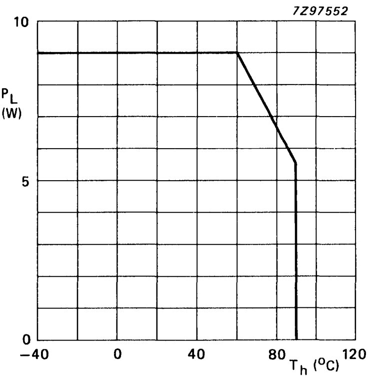


Fig. 2 Load power derating; VSWR = 1 : 1.

U.H.F. AMPLIFIER MODULE

The BGY95 is a three-stage u.h.f. amplifier module designed primarily for mobile transmitting equipment operating from a nominal 7,5 V power supply.

The module consists of three N-P-N silicon planar transistors mounted on a metallized ceramic substrate, together with matching and bias circuitry. The BGY95A and BGY95B produce an output power of 2,5 W into a 50 Ω load over the frequency band 825-845 MHz and 890-915 MHz respectively. The output power can be controlled by means of a DC voltage (V_{S1}).

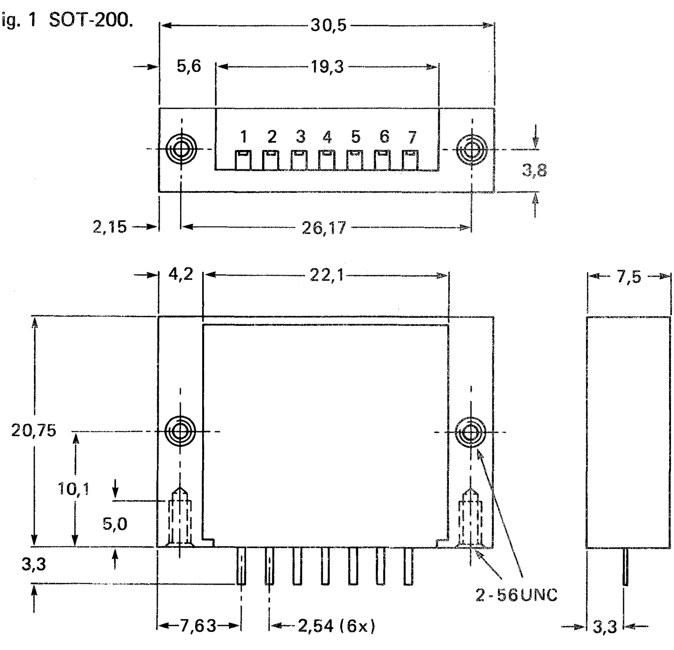
QUICK REFERENCE DATA

Mode of operation				c.w.	
Frequency range	BGY95A	f		825-845	MHz
	BGY95B	f		890-915	MHz
R.F. power output					
$V_{S1} = V_{S2} = V_{S3} = 7,5$ V; $P_D = 20$ mW		P_L	min.	2,5	W
R.F. input drive power					
$V_{S1} = V_{S2} = V_{S3} = 7,5$ V; $P_L = 2,5$ W		P_D	≤	20	mW
Output load impedance		Z_L	nom.	50	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-200.



Lead reference

Pin 1 = r.f. input
2 = V_{S1}
3 = not connected
4 = V_{S2}
5 = V_{S3}
6 = not connected
7 = r.f. Earth
case = Earth

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages with respect to case				
r.f. input pin	V_{in}	max.	± 25	V
r.f. output pin	V_{out}	max.	± 25	V
Supply pins	V_{S1}	max.	8	V
	V_{S2}	max.	11	V
	V_{S3}	max.	11	V
R.F. output power	P_L	max.	3,55	W
R.F. input drive power	P_D	max.	40	mW
Storage temperature	T_{stg}	−40 to	+ 100	°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

Performance:
BGY95A: f = 825-845 MHz; $R_S = R_L = 50\ \Omega$; $V_{S1} = V_{S2} = V_{S3} = 7,5$ V
BGY95B: f = 890-915 MHz; $R_S = R_L = 50\ \Omega$; $V_{S1} = V_{S2} = V_{S3} = 7,5$ V

R.F. output power $P_D = 20$ mW	P_L	min.	2,5	W
R.F. input drive power $P_L = 2,5$ W	P_D	≤	20	mW
Efficiency $P_L = 2,5$ W	η	min.	35	%
Harmonic rejection $P_L = 2,5$ W		min.	30	dB
Input VSWR with respect to 50 Ω; $P_D = 20$ mW	VSWR	typ. max.	1,5 2,0	
Gain control: $P_D = 20$ mW;				
at $V_{S1} = 0,5$ V	P_L	max.	6	mW
at $V_{S1} = 6,0$ V	P_L	min.	2,5	W

Stability:
The module will produce no spurious signals with a load mismatch VSWR < 3 : 1 when operated with $V_{S1} = 0,5$ to 7,5 V, $V_{S2} = V_{S3} = 6$ to 10 V, $P_D = 10$ to 40 mW and $T_h \leq 90$ °C, provided maximum ratings are not exceeded.

Ruggedness:
The module will withstand a load mismatch of 50 : 1 when operated with $V_{S1} = 0$ to 8 V, $V_{S2} = V_{S3} = 0$ to 11 V, $P_D = 0$ to 40 mW and $T_h = 90$ °C, provided maximum ratings are not exceeded.

U.H.F. AMPLIFIER MODULE

The BGY96 is a three-stage u.h.f. amplifier module designed primarily for mobile transmitting equipment operating from a nominal 9,6 V power supply.

The module consists of three N-P-N silicon planar transistors mounted on a metallized ceramic substrate, together with matching and bias circuitry. The BGY96A and BGY96B produce an output power of 2,5 W into a 50 Ω load over the frequency band 825-845 MHz and 890-915 MHz respectively. The output power can be controlled by means of a DC voltage (V_{S1}).

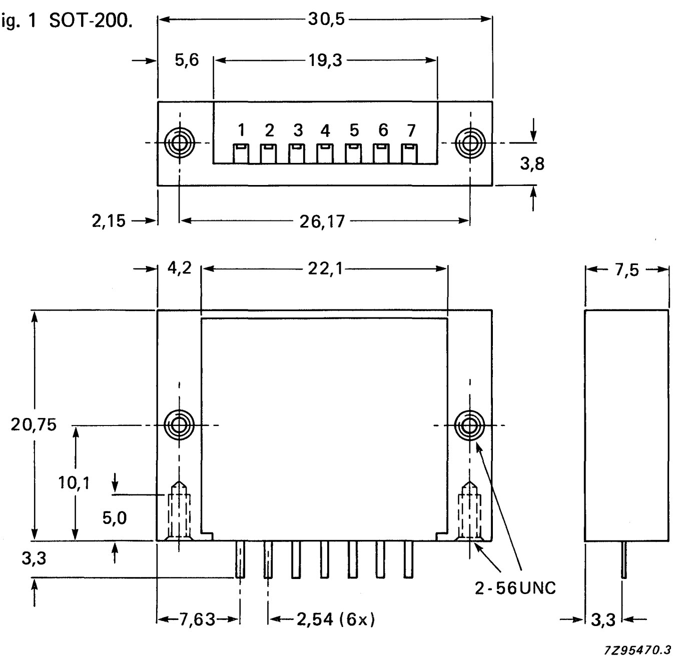
QUICK REFERENCE DATA

Mode of operation				c.w.	
Frequency range	BGY96A	f		825-845	MHz
	BGY96B	f		890-915	MHz
R.F. power output V_{S1} = 6 V; V_{S2} = V_{S3} = 9,6 V; P_D = 20 mW		P_L	min.	2,5	W
R.F. input drive power V_{S1} = 6 V; V_{S2} = V_{S3} = 9,6 V; P_L = 2,5 W		P_D	≤	20	mW
Output load impedance		Z_L	nom.	50	Ω

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-200.



Lead reference

Pin 1 = r.f. input
2 = V_{S1}
3 = not connected
4 = V_{S2}
5 = V_{S3}
6 = not connected
7 = r.f. output
case = Earth

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages with respect to case				
r.f. input pin	V_{in}	max.	± 25	V
r.f. output pin	V_{out}	max.	± 25	V
Supply pins	V_{S1}	max.	8	V
	V_{S2}	max.	13	V
	V_{S3}	max.	13	V
R.F. output power	P_L	max.	3,55	W
R.F. input drive power	P_D	max.	50	mW
Storage temperature	T_{stg}	−40 to + 100		°C
Operating heatsink temperature	T_h	max.	90	°C

CHARACTERISTICS

Performance:
BGY96A: f = 825-845 MHz; $R_S = R_L = 50\ \Omega$; $V_{S1} = 6$ V; $V_{S2} = V_{S3} = 9{,}6$ V
BGY96B: f = 890-915 MHz. $R_S = R_L = 50\ \Omega$; $V_{S1} = 6$ V; $V_{S2} = V_{S3} = 9{,}6$ V

R.F. output power $P_D = 20$ mW	P_L	min.	2,5	W
R.F. input drive power $P_L = 2{,}5$ W	P_D	$\leqslant$	20	mW
Efficiency $P_L = 2{,}5$ W	η	min.	35	%
Harmonic rejection $P_L = 2{,}5$ W		min.	30	dB
Input VSWR with respect to 50 Ω; $P_D = 20$ mW	VSWR	typ. max.	1,5 2,0	
Gain control: $P_D = 20$ mW;				
at $V_{S1} = 0{,}5$ V	P_L	max.	6	mW
at $V_{S1} = 6{,}0$ V	P_L	min.	2,5	W

Stability:
The module will produce no spurious signals with a load mismatch VSWR < 3 : 1 when operated with $V_{S1} = 0{,}5$ to 6 V, $V_{S2} = V_{S3} = 7{,}9$ to 12 V, $P_D = 10$ to 40 mW and $T_h \leqslant 90$ °C, provided maximum ratings are not exceeded.

Ruggedness:
The module will withstand a load mismatch of 50 : 1 when operated with $V_{S1} = 0$ to 8 V, $V_{S2} = V_{S3} = 0$ to 13 V, $P_D = 0$ to 50 mW and $T_h = 90$ °C, provided maximum ratings are not exceeded.

DEVELOPMENT DATA

This data sheet contains advance information and specifications are subject to change without notice.

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the HF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-121). All leads are isolated from the flange.

QUICK REFERENCE DATA

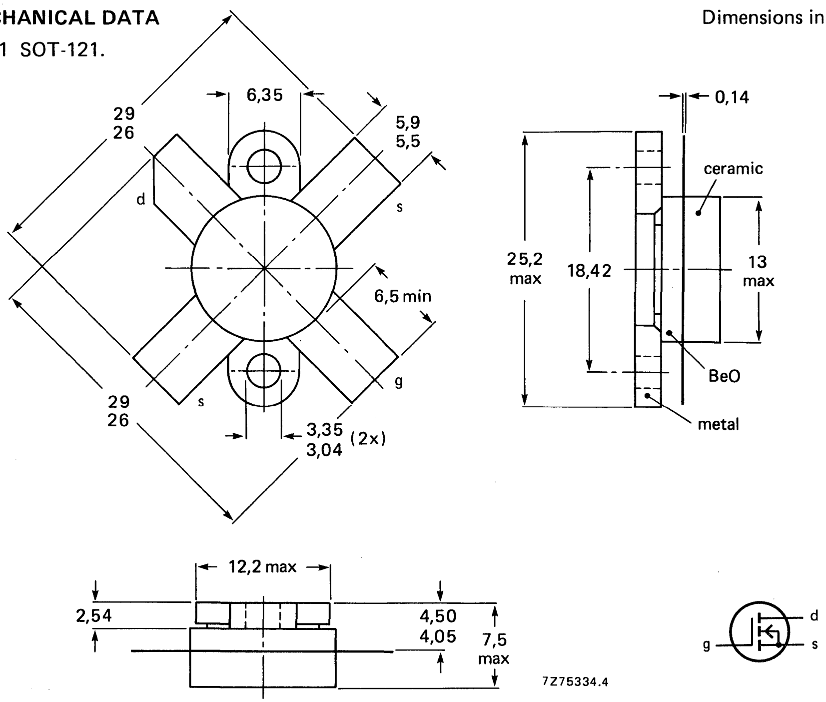
R.F. performance at T_h = 25 °C in common-source class-AB circuit.

mode of operation	f MHz	V_{DS} V	P_L (PEP) W	G_p db	η (2-tone) %	d_3 dB
S.S.B.	28	28	80	> 18	> 35	< –30

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Note: Protect the gate-source input against static charge during transport or handling.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (D.C.)	I_D	max.	7 A
Total power dissipation T_{mb} = 25 °C	P_{tot}	max.	130 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,35 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,2 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Drain-source breakdown voltage I_D = 50 mA; V_{GS} = 0	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current V_{DS} = 28 V; V_{GS} = 0	I_{DSS}	max.	2,5 mA
Gate-source leakage current $\pm V_{GS}$ = 20 V, V_{DS} = 0	I_{GSS}	max.	1 µA
Gate threshold voltage I_D = 50 mA; V_{DS} = 10 V	$V_{GS(th)}$		2 to 4,5 V
Forward tranconductance I_D = 5 A; V_{DS} = 10 V	G_{fs}	min.	3 S
		typ.	3,8 S
Drain-source ON resistance I_D = 5 A; V_{GS} = 10 V	$R_{DS(on)}$	typ.	0,2 Ω
On-state drain current V_{DS} = 10 V; V_{GS} = 10 V	I_{DSX}	typ.	22 A
Input capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{iss}	typ.	260 pF
Output capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0 V	C_{oss}	typ.	180 pF
Feedback capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{rss}	typ.	25 pF

APPLICATION INFORMATION

R.F. performance in SSB operation (common-source class-AB circuit)

f_1 = 28.000 MHz; f_2 = 28.001 MHz; T_h = 25 °C; I_{DQ} = 0,6 A; R_{GS} = 18 Ω

mode of operation	f MHz	V_{DS} V	P_L (PEP) W	G_p db	η (2-tone) %	d_3 dB
S.S.B.	28	28	80	> 18	> 35	< −30

Optimum load impedance: 3,3 + j 0,5 Ω

The intermodulation products are measured with respect to the level of one tone.

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power and supply voltage (T_h = 25 °C).

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the VHF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-123). All leads are isolated from the flange.

QUICK REFERENCE DATA

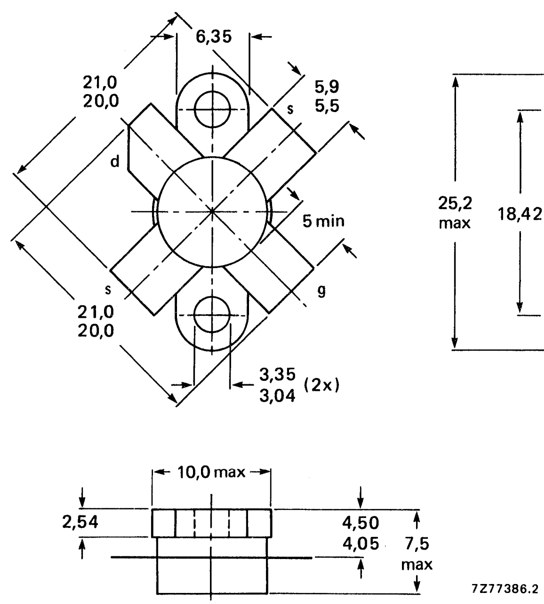
R.F. performance at T_h = 25 °C in common-source class-B circuit.

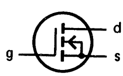
Mode of operation	V_{DS} V	f MHz	P_L W	G_p dB	η %
narrow band; c.w.	28	175	5	> 13	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Note: Protect gate-source input against static charge during transport or handling.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (D.C.)	I_D	max.	0,5 A
Total power dissipation T_{mb} = 25 °C	P_{tot}	max.	16 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	11 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,3 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Drain-source breakdown voltage I_D = 0,1 mA; V_{GS} = 0	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current V_{DS} = 28 V; V_{GS} = 0	I_{DSS}	max.	0,01 mA
Gate-source leakage current $\pm V_{GS}$ = 20 V; V_{DS} = 0	I_{GSS}	max.	1 μA
Gate threshold voltage I_D = 3 mA; V_{DS} = 10 V	$V_{GS(th)}$		2 to 4,5 V
Forward tranconductance I_D = 0,3 A; V_{DS} = 10 V	G_{fs}	min.	0,16 S
		typ.	0,24 S
Drain-source ON resistance I_D = 0,3 A; V_{GS} = 10 V	$R_{DS(on)}$	typ.	3,3 Ω
On-state drain current V_{DS} = 10 V; V_{GS} = 10 V	I_{DSX}	typ.	1,4 A
Input capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{iss}	typ.	14 pF
Output capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0 V	C_{oss}	typ.	9,4 pF
Feedback capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{rss}	typ.	1,7 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-source class-B circuit)

f = 175 MHz; T_h = 25 °C; I_{DQ} = 10 mA; R_{GS} = 46 Ω

mode of operation	V_{DS} V	P_L W	P_S W	G_p dB	I_D A	η %
narrow band; c.w.	28	5	< 0,25	> 13	< 0,36	> 50
	28	5	typ. 0,12	typ. 16	typ. 0,3	typ. 60

Optimum load impedance : 19 + j 38 Ω

Input impedance : 9,4 − j 22 Ω

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power and supply voltage (T_h = 25 °C).

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the VHF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-123). All leads are isolated from the flange.

QUICK REFERENCE DATA

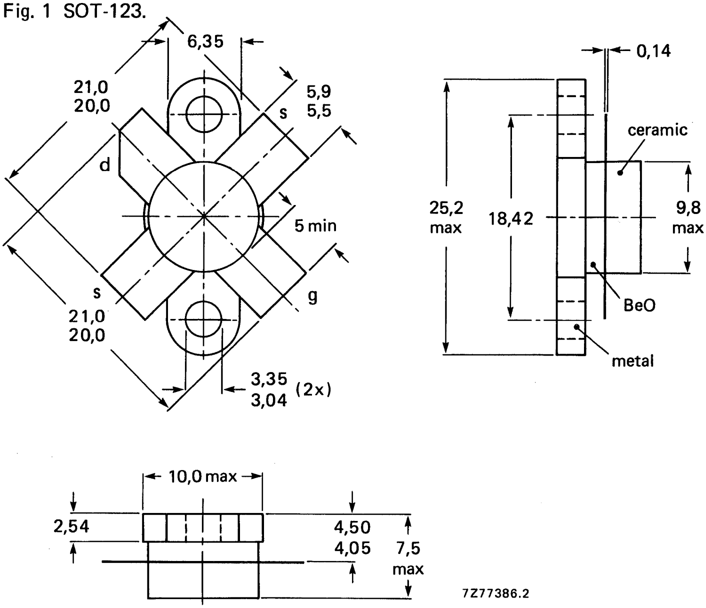
R.F. performance at T_h = 25 °C in common-source class-C circuit.

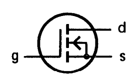
mode of operation	V_{DS} V	f MHz	P_L W	G_p dB	η_d %
narrow band; c.w.	28	175	15	> 13	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Note: Protect the gate-source input against static charge during transport or handling.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.)	I_D	max.	1,5 A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	30 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	5,8 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,3 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Drain-source breakdown voltage I_D = 5 mA; V_{GS} = 0	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current V_{DS} = 28 V; V_{GS} = 0	I_{DSS}	max.	1 mA
Gate-source leakage current $\pm V_{GS}$ = 20 V; V_{DS} = 0	I_{GSS}	max.	1 μA
Gate threshold voltage I_D = 5 mA; V_{DS} = V_{GS}	$V_{GS(th)}$		2 to 4,5 V
Forward transconductance V_{DS} = 10 V; I_D = 0,6 A	G_{fs}	min. typ.	0,5 S 0,8 S
On-state drain current V_{DS} = 10 V; V_{GS} = 10 V	I_{DSX}	typ.	4,5 A
Input capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{iss}	typ.	60 pF
Output capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0 V	C_{oss}	typ.	40 pF
Feedback capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0 V	C_{rss}	typ.	4 pF
Drain-flange capacitance	C_{df}	typ.	2 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-source class-C circuit) f = 175 MHz; T_h = 25 °C; V_{GS} = 1,8 V

mode of operation	V_{DS} V	P_L W	P_S W	G_p dB	I_D A	η_d %
narrow band; c.w.	28	15	< 0,75	> 13	< 1,07	> 50
	28	15	typ. 0,3	typ. 17	typ. 0,9	typ. 60

Optimum load impedance : 6,4 + j9,7 Ω
Input impedance : 2,4 − j11 Ω

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power and supply voltage (T_h = 25 °C).

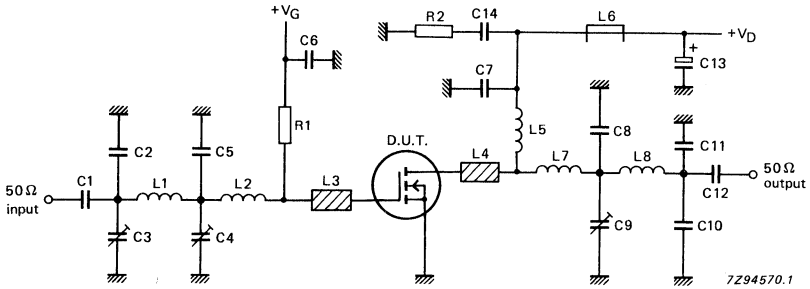


Fig. 2 Class-C test circuit at f = 175 MHz.

DEVELOPMENT DATA

List of components:

R1	= 23 Ω, metal film (46,4 Ω // 46,4 Ω, 2 x ¼ W)
R2	= 10 Ω, metal film
C1	= 680 pF, ATC chip
C2	= 20 pF, ATC chip
C3, C4	= 5-60 pF, PTFE trimmer, cat. no. 2222 809 08003
C5	= 75 pF, ATC chip
C6	= 10 nF, chip capacitor, cat. no. 2222 852 47103
C7	= 100 pF ATC chip
C8	= 47 pF, ATC chip
C9	= 5-60 pF, PTFE trimmers, cat. no 2222 809 08003
C10, C11	= 11 pF, ATC chip
C12	= 680 pF, ATC chip
C13	= 2,2 μF, tantalum electrolytic capacitor
C14	= 100 nF, chip capacitor, cat. no. 2222 852 47104
L1	= 32 nH, 4 turns of enamelled Cu-wire (1 mm) int. diam. 3 mm, leads: 2 x 5 mm, length: 6,3 mm
L2	= 12,2 nH, 1 turn of enamelled Cu-wire (1 mm) int. diam. 5,6 mm, leads: 2 x 5 mm
L3, L4	= 30 Ω striplines, width 6,0 mm, length 15 mm
L5	= 118,8 nH, 6 turns of enamelled Cu-wire (1 mm) int. diam. 6 mm, leads: 2 x 5 mm, length: 10,4 mm
L6	= RF choke, grade 3B, cat. no. 4312 020 36640
L7	= 19 nH, 2 turns of enamelled Cu-wire (1 mm) int. diam. 3 mm, leads: 2 x 5 mm, length: 2,4 mm
L8	= 28,5 nH, 4 turns of enamelled Cu-wire (1 mm) int. diam. 3 mm, leads: 2 x 5 mm, length: 8,5 mm

P.C.B. material: epoxy fibre glass, thickness 1/16 inch, ϵ_r = 4,5

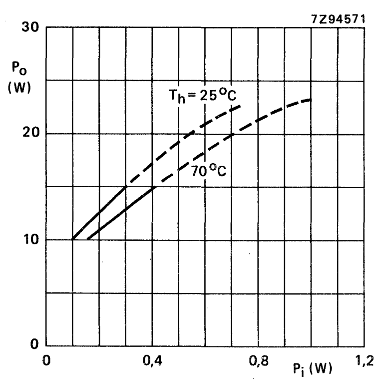


Fig. 3 Output power versus input power.
f = 175 MHz; V_{DS} = 28 V.

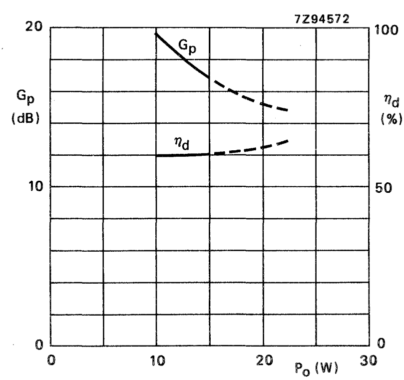


Fig. 4 Power gain and drain efficiency versus output power.
f = 175 MHz; V_{DS} = 28 V; T_h = 25 °C.

R.F. POWER MOSFET

N-channel enhancement mode vertical D-MOS transistor intended for use in professional transmitters in the VHF range.

The transistor has a 4-lead flange envelope with a ceramic cap (SOT-123). All leads are isolated from the flange.

QUICK REFERENCE DATA

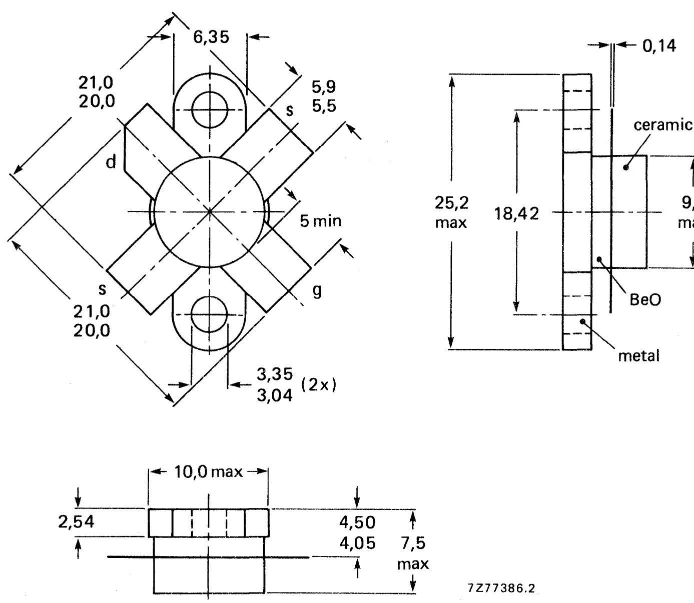
R.F. performance at T_h = 25 °C in common-source class-B circuit.

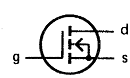
mode of operation	V_{DS} V	f MHz	P_L W	G_p dB	η_D %
narrow band; c.w.	28	175	30	> 13	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Drain-source voltage	V_{DS}	max.	65 V
Gate-source voltage	$\pm V_{GS}$	max.	20 V
Drain current (d.c.)	I_D	max.	3 A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	55 W
Storage temperature	T_{stg}	−65 to +	150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	3,2 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,3 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Drain-source breakdown voltage I_D = 10 mA; V_{GS} = 0	$V_{(BR)DS}$	min.	65 V
Drain-source leakage current V_{DS} = 28 V; V_{GS} = 0	I_{DSS}	max.	2,5 mA
Gate-source leakage current $\pm V_{GS}$ = 20 V; V_{DS} = 0	I_{GSS}	max.	1 μA
Gate threshold voltage I_D = 10 mA; V_{DS} = V_{GS}	$V_{GS(th)}$		2 to 4,5 V
Forward transconductance V_{DS} = 10 V; I_D = 1,5 A	G_{fs}	min.	1,1 S
		typ.	1,6 S
On-state drain current V_{DS} = 10 V; V_{GS} = 10 V	I_{DSX}	typ.	8,5 A
Input capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{iss}	typ.	110 pF
Output capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0 V	C_{oss}	typ.	70 pF
Feedback capacitance at f = 1 MHz V_{DS} = 28 V; V_{GS} = 0	C_{rss}	typ.	6 pF
Drain-flange capacitance	C_{df}	typ.	2 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-source class-B circuit) f = 175 MHz; T_h = 25 °C; I_{DQ} = 50 mA

mode of operation	V_{DS} V	P_L W	P_S W	G_p dB	I_D A	η_D %
narrow band; c.w.	28	30	< 1,5	> 13	< 2,14	> 50
	28	30	typ. 0,7	typ. 16	typ. 1,6	typ. 65

Optimum load impedance : 5,1 + j5,0 Ω
Input impedance : 2,0 – j6,5 Ω

LOAD MISMATCH

The device is capable of withstanding a full load mismatch (VSWR of 50, varied through all phases) at rated load power and supply voltage (T_h = 25 °C).

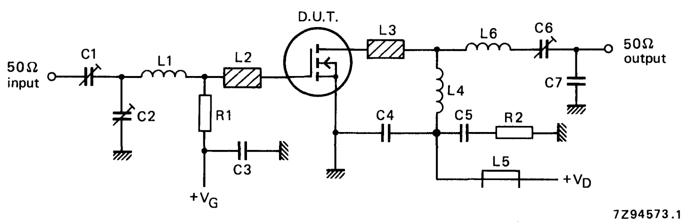


Fig. 2 Class-B test circuit at f = 175 MHz.

DEVELOPMENT DATA

List of components:

R1 = 1 kΩ, metal film
R2 = 10 Ω, metal film
C1 = 4-40 pF, PTFE trimmer
C2 = 5-60 pF, PTFE trimmer
C3 = 100 pF chip + 100 nF chip
C4 = 100 pF ceramic plate cap.
C5 = 100 nF polyester
C6 = 5-60 pF, PTFE trimmer + 18 pF chip
C7 = 27 pF chip + 24 pF chip
L1 = 18 nH; 3 turns of 0,5 mm copper wire, int. diam. 2 mm, length 3,3 mm leads: 2 x 5 mm
L2 = 30 Ω stripline; W = 6 mm, L = 10 mm
L3 = 30 Ω stripline; W = 6 mm, L = 10 mm
L4 = 100 nH; 6 turns of 1,5 mm enamelled copper wire, int. diam. 5 mm, length 12,6 mm, leads: 2 x 5 mm
L5 = Ferroxcube RF choke, grade 3B, cat. no. 4312 020 36640
L6 = 27 nH; 2 turns of 1,5 mm enamelled copper wire int. diam. 5 mm, length 4,1 mm, leads: 2 x 5 mm

P.C.B. material: epoxy fibre glass, thickness 1/16 inch, ϵ_r = 4,5

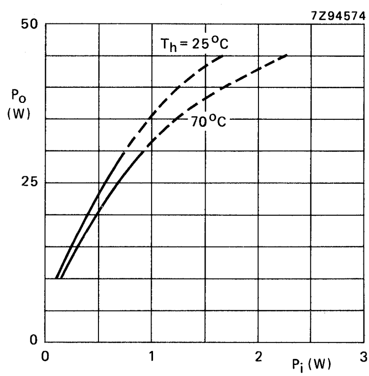


Fig. 3 Output power versus input power.
f = 175 MHz; V_{DS} = 28 V.

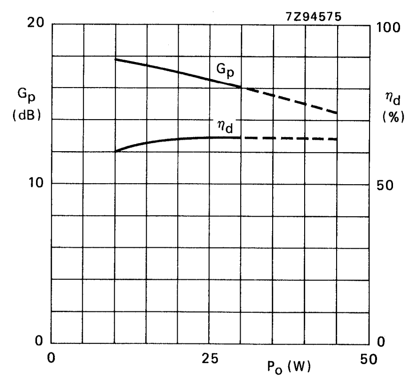


Fig. 4 Power gain and drain efficiency versus output power.
f = 175 MHz; V_{DS} = 28 V; T_h = 25 °C.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

Features:

- the device can be applied at rated load power without an external heatsink when it is mounted on a printed circuit board (see Fig. 4).
- gold metallization ensures excellent reliability.

The transistor has a 4-lead studless envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

R.F. performance at T_a = 25 °C in a common-emitter class-B circuit.*

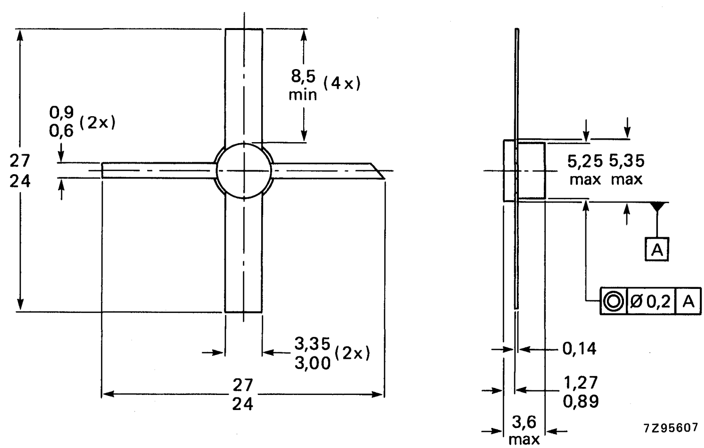
mode of operation	V_{CE} V	f MHz	P_O W	G_p dB	η_C %
c.w. (class-B)	7,5	900	0,75	> 7,0	> 50

* Device mounted on a printed circuit board (see Fig. 4).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current				
average	I_C; $I_{C(AV)}$	max.	250	mA
(peak value); f > 1 MHz	I_{CM}	max.	750	mA
Total power dissipation				
at T_{amb} = 50 °C; f > 1 MHz*	$P_{tot(rf)}$	max.	2,3	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

Dissipation = 2,5 W; T_{mb} = 25 °C

From junction to ambient* (f > 1 MHz)	$R_{th\ j\text{-}a(rf)}$	max.	65	K/W
From junction to mounting base (f > 1 MHz)	$R_{th\ j\text{-}mb(rf)}$	max.	25	K/W

* Device mounted on a printed circuit board (see Fig. 4).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 2,5 mA	$V_{(BR)CBO}$	>	20 V
Collector-emitter breakdown voltage open base; I_C = 5 mA	$V_{(BR)CEO}$	>	10 V
Emitter-base breakdown voltage open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 10 V	I_{CES}	<	1 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0,3 mJ
D.C. current gain I_C = 0,15 A; V_{CE} = 5 V	h_{FE}	>	25
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 7,5 V	C_c	typ.	2,8 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 7,5 V	C_{re}	typ.	1,6 pF
Collector-mounting base capacitance	C_{c-mb}	typ.	0,5 pF

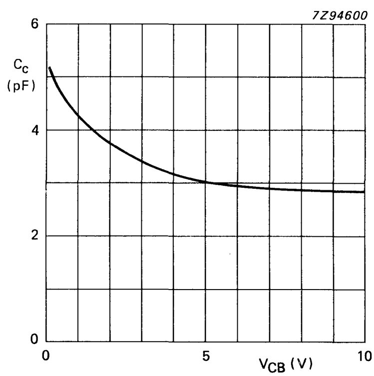


Fig. 2 $I_E = i_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_a = 25 °C

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	7,5	0,75	>7,0 typ. 8,5	>50 typ. 63

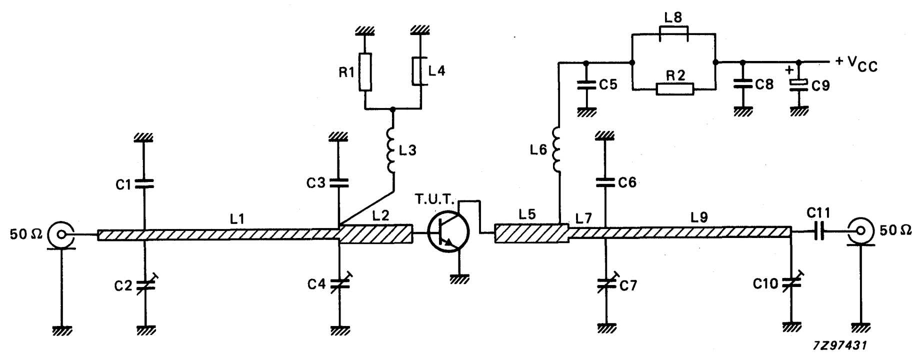


Fig. 3 Class-B test circuit at f = 900 MHz.

List of components:

C1 = 3 pF multilayer ceramic chip capacitor*
C2 = C4 = C7 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)
C3 = C6 = 3,9 pF multilayer ceramic chip capacitor*
C5 = C8 = C11 = 180 pF multilayer ceramic chip capacitor
C9 = 1 μF (35 V) tantalum capacitor
L1 = 50 Ω stripline (38 mm x 2,4 mm)
L2 = L5 = 35 Ω stripline (14 mm x 4 mm)
L3 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36642)
L6 = 50 nH; 5 turns closely wound enamelled Cu wire (0,6 mm); int. dia. 3 mm; leads 2 x 5 mm
L7 = 50 Ω stripline (12,2 mm x 2,4 mm)
L9 = 50 Ω stripline (30,5 mm x 2,4 mm)
R1 = R2 = 10 ± 5%; 0,25 W metal film resistor

The striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

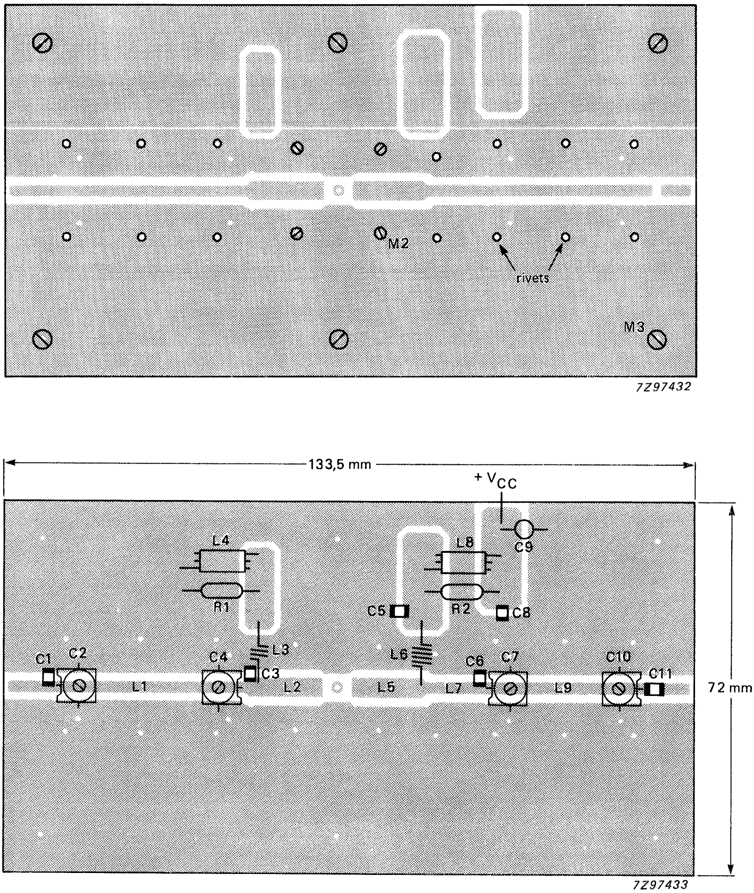


Fig. 4 Printed circuit board and component lay out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

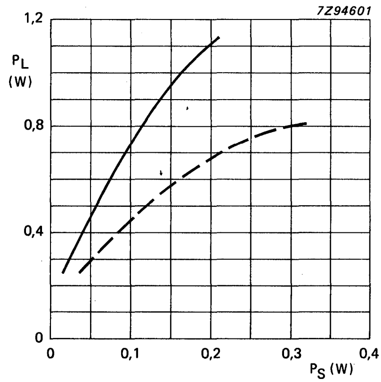


Fig. 5 Load power vs. source power.

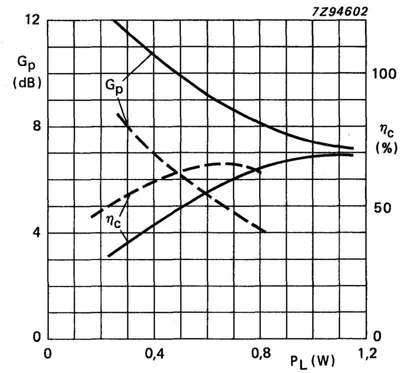


Fig. 6 Power gain and efficiency vs. load power.

Conditions for Figs 5 and 6:

f = 900 MHz; T_a = 25 °C; class-B operation; typical values.

V_{CE} = 7,5 V (———); V_{CE} = 5,0 V (---------)

(transistor mounted on printed circuit board, shown in Fig. 4, without applying an external heatsink).

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 9,0 V at T_a = 25 °C. Device mounted on a printed circuit board (see Fig. 4).

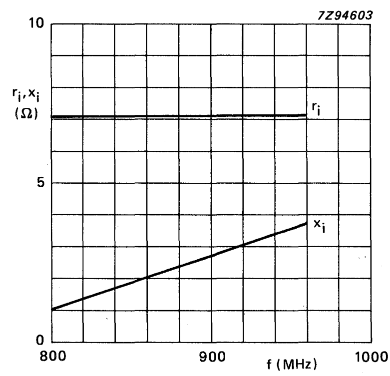


Fig. 7 Input impedance (series components).

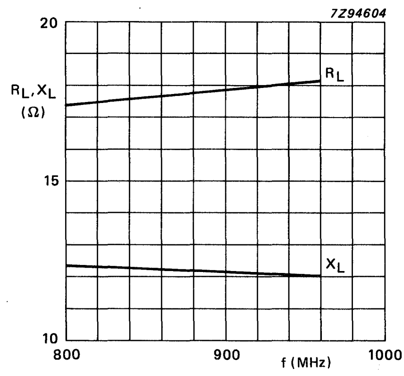


Fig. 8 Load impedance (series components).

Conditions for Figs 7, 8 and 9:

V_{CE} = 7,5 V; P_L = 0,75 W; f = 800 - 960 MHz; T_a = 25 °C; class-B operation; typical values.

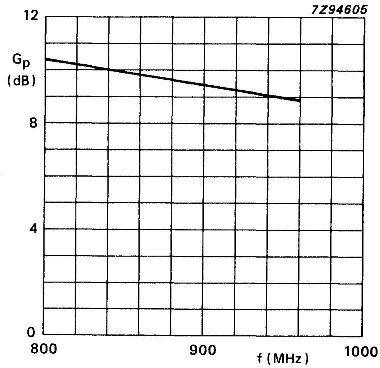


Fig. 9 Power gain vs. frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

Features:

- the device can be applied at rated load power without an external heatsink when it is mounted on a printed wiring board.
- gold metallization ensures excellent reliability.

The transistor has a 4-lead studless envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

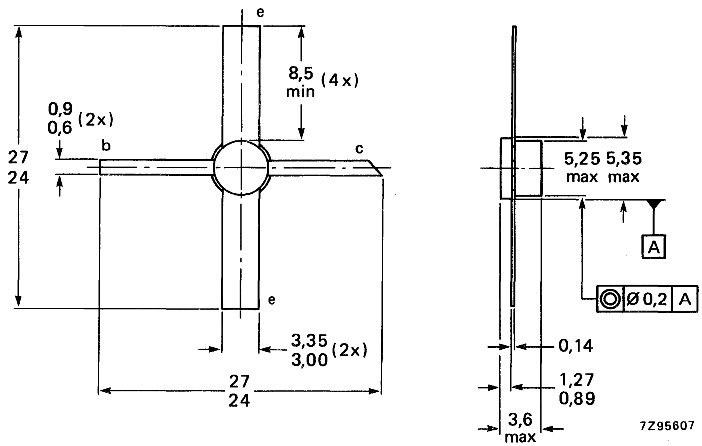
R.F. performance at T_a = 25 °C in a common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w. (class-B)	7,5	900	1,5	> 6,0	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current				
→ average	I_C; $I_{C(AV)}$	max.	500	mA
(peak value); f > 1 MHz	I_{CM}	max.	1500	mA
Total power dissipation				
at T_{amb} = 50 °C; f > 1 MHz*	$P_{tot(rf)}$	max.	3,0	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

Dissipation = 4,5 W; T_{mb} = 25 °C

From junction to ambient* (f > 1 MHz)	$R_{th\ j\text{-}a(rf)}$	max.	50	K/W
From junction to mounting base (f > 1 MHz)	$R_{th\ j\text{-}mb(rf)}$	max.	20	K/W

* Device mounted on a printed wiring board (see Fig. 4).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 5 mA	$V_{(BR)CBO}$	>	20 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	>	10 V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 10 V	I_{CES}	<	2,5 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0,55 mJ
D.C. current gain I_C = 300 mA; V_{CE} = 5 V	h_{FE}	>	25
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 7,5 V	C_c	typ.	4,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 7,5 V	C_{re}	typ.	3 pF
Collector-mounting base capacitance	C_{c-mb}	typ.	0,5 pF

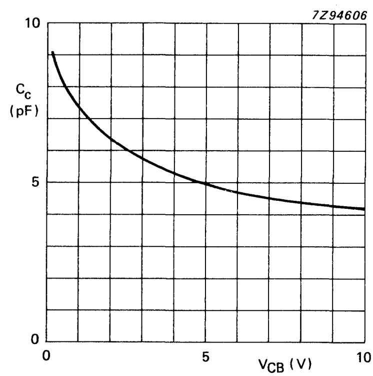


Fig. 2 $I_E = i_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_a = 25 °C

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	7,5	1,5	> 6,0 typ. 7,0	> 50 typ. 65

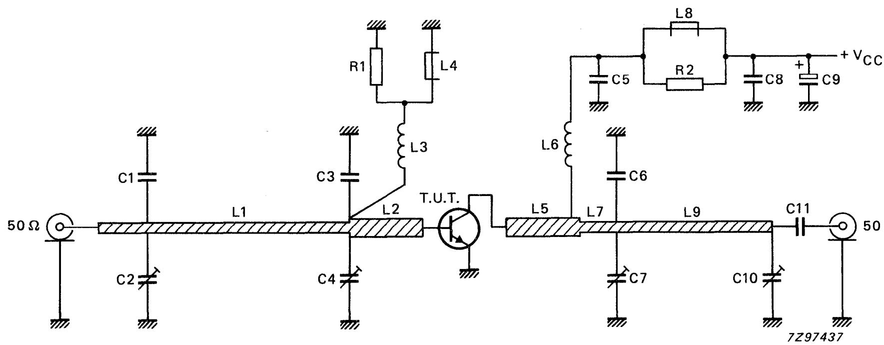


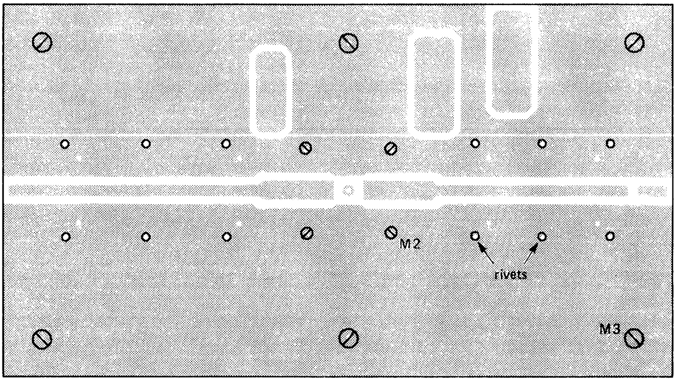
Fig. 3 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C6 = 2 pF multilayer ceramic chip capacitor*
C2 = C4 = C7 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 4,7 pF multilayer ceramic chip capacitor*
C5 = C8 = C11 = 180 pF multilayer ceramic chip capacitor
C9 = 1 μF (35 V) tantalum capacitor
L1 = 50 Ω stripline (40 mm x 2,4 mm)
L2 = L5 = 35 Ω stripline (14 mm x 4,0 mm)
L3 = 100 nH; 8 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36642)
L6 = 30 nH; 2 turns Cu wire (1,0 mm); int. dia. 5,5 mm; length 4,5 mm; leads 2 x 5 mm.
L7 = 50 Ω stripline (6,0 mm x 2,4 mm)
L9 = 50 Ω stripline (30,3 mm x 2,4 mm)
R1 = R2 = 10 Ω ± 5%; 0,25 W metal film resistor

The striplines on a double Cu-clad printed wiring board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



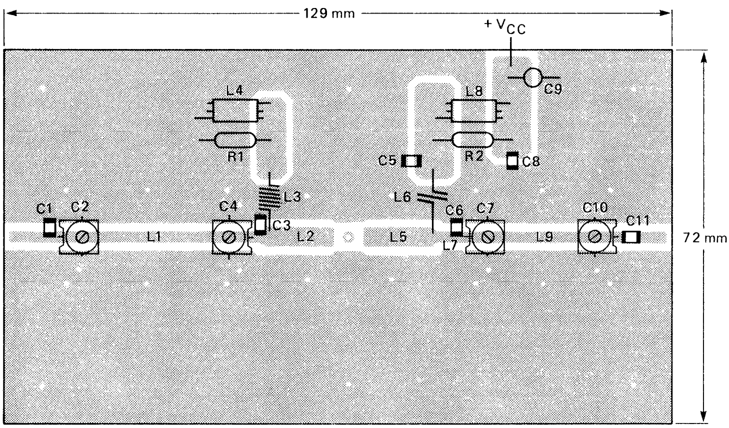


Fig. 4 Printed wiring board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as a groundplane. Earth connections are made by hollow rivets and also by fixing screws and copper straps under the emitters to provide a direct contact between the copper on the component side and the groundplane.

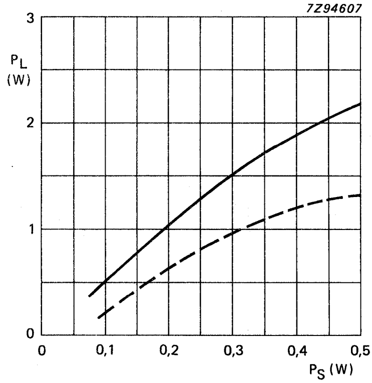


Fig. 5 Load power vs. source power.

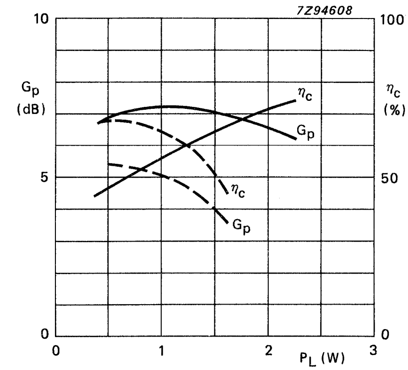


Fig. 6 Power gain and efficiency vs. load power.

Conditions for Figs 5 and 6:

f = 900 MHz; T_a = 25 °C; class-B operation; typical values.

V_{CE} = 7,5 V (———); V_{CE} = 5,0 V (---------)

(transistor mounted on printed wiring board, shown in Fig. 4, without applying an external heatsink).

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 9,0 V at T_a = 25 °C.

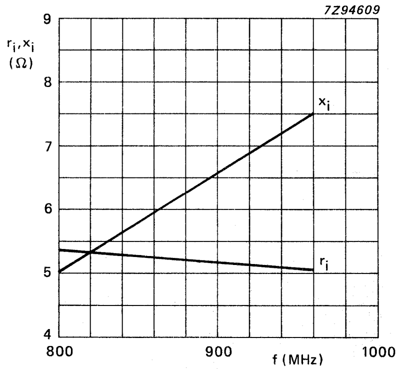


Fig. 7 Input impedance (series components).

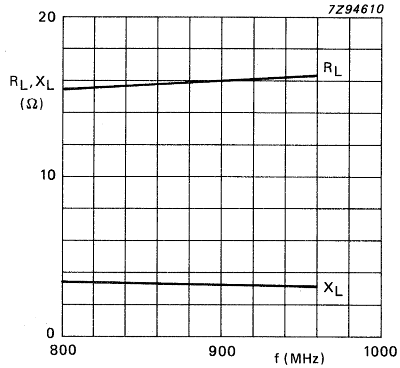


Fig. 8 Load impedance (series components).

Conditions for Figs 7, 8 and 9:

V_{CE} = 7,5 V; P_L = 1,5 W; f = 800 - 960 MHz; T_a = 25 °C; class-B operation; typical values.

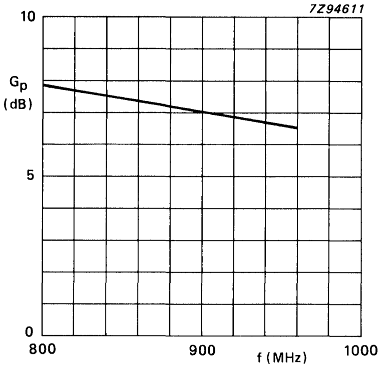


Fig. 9 Power gain vs. frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in handheld radio stations in the 900 MHz communications band.

This device has been designed specifically for class-B operation.

The transistor has a 4-lead studless envelope with a ceramic cap (SOT-122D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

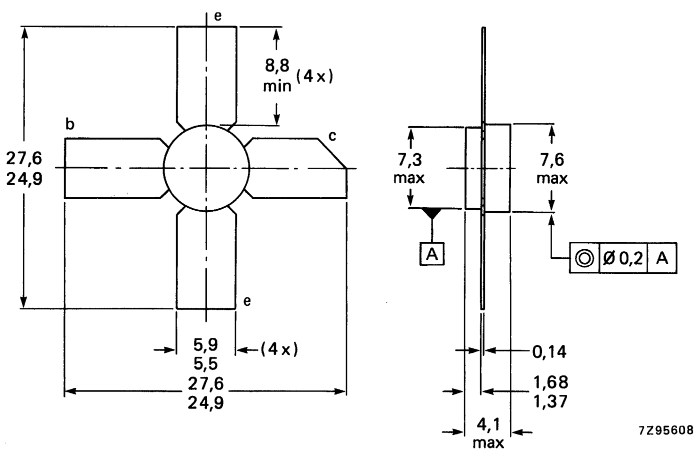
R.F. performance at T_{mb} = 25 °C in a common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w. (class-B)	7,5	900	3	> 7,0	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122D.



PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	20	V
Collector-emitter voltage (open base)	V_{CEO}	max.	10	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current (peak value); f > 1 MHz	I_{CM}	max.	1,8	A
Total power dissipation at T_{mb} = 65 °C; f > 1 MHz	$P_{tot(rf)}$	max.	10	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base (f > 1 MHz)	$R_{th\ j\text{-}mb}$	max.	6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

D.C. current gain I_C = 0,6 A; V_{CE} = 5 V	h_{FE}	min.	25

Ruggedness

The device is capable of withstanding a full load mismatch (VSWR = 50 through all phases) at 3 W load power up to a supply voltage of 9,0 V and T_{mb} = 25 °C.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.
- internal matching to achieve an optimum wideband capability and high power gain.

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

Envelope	SOT-119			
Mode of operation	class-B; c.w.			
Collector-emitter voltage (d.c.)	V_{CE}		12,5	V
Frequency	f		470	MHz
Load power	P_L		20	W
Power gain	G_P	>	6,5	dB
Collector efficiency	η_C	>	55	%
Heatsink temperature	T_h		25	^oC

MECHANICAL DATA

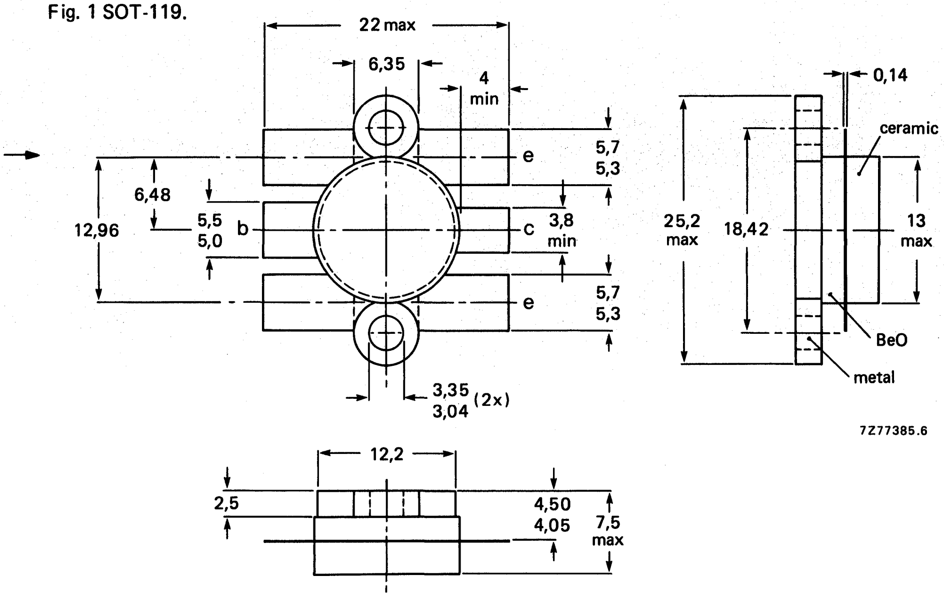
SOT-119 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Collector-base voltage (open emitter)				
peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C	max.	4	A
(peak value); f > 1 MHz	I_{CM}	max.	12	A
Total power dissipation				
at T_{mb} = 25 °C	P_{tot} (d.c.)	max.	38	W ←
f > 1 MHz; T_{mb} = 25 °C	P_{tot} (r.f.)	max.	44	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

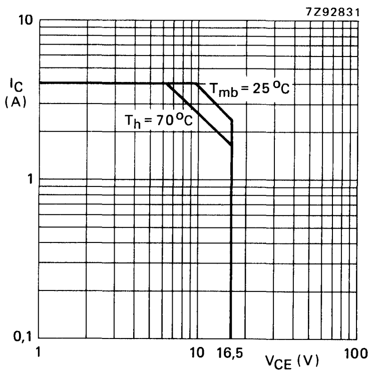


Fig. 2 D.C.SOAR.
$R_{th\ mb\text{-}h}$ = 0,2 K/W

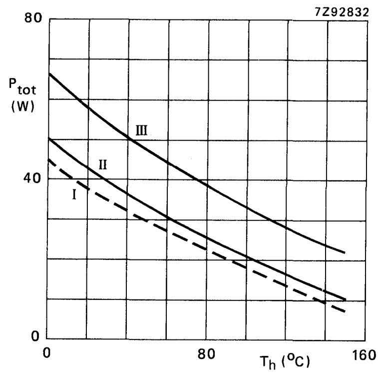


Fig. 3 Power/temperature derating curves
I Continuous operation
II Continuous operation (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE (dissipation = 37 W; T_{mb} = 25 °C, i.e. T_h = 18 °C

From junction to mounting base				
(d.c. dissipation)	$R_{th\ j\text{-}mb(d.c.)}$	max	4,6	K/W ←
(r.f. dissipation)	$R_{th\ j\text{-}mb(r.f.)}$	max	4,1	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 25 mA; open emitter	$V_{(BR)CBO}$	>	36 V
Collector–emitter breakdown voltage I_C = 50 mA; open base	$V_{(BR)CEO}$	>	16,5 V
Emitter–base breakdown voltage I_E = 5 mA; open collector	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 20 V	I_{CES}	<	12,5 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	5,3 mJ
D.C. current gain I_C = 2,7 A; V_{CE} = 10 V	h_{FE}	> typ.	15 60
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	53 pF
Feed-back capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	33 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

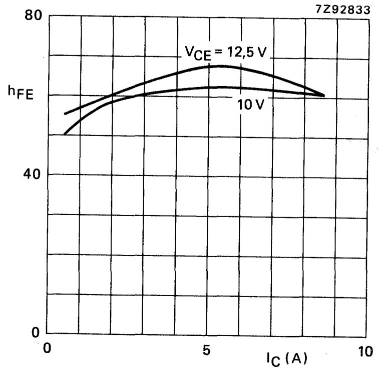


Fig. 4 T_j = 25 °C; typ. values.

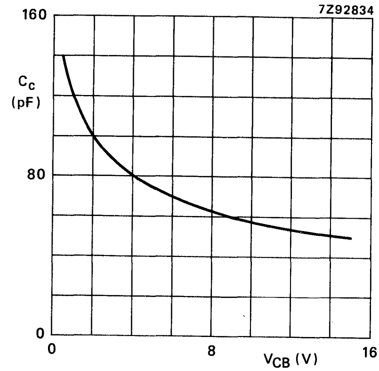


Fig. 5 $I_E = i_e = 0$; f = 1 MHz; typ. values.

APPLICATION INFORMATION

Mode of operation	in narrow band test circuit; class-B; c.w.		
Colletor-emitter voltage (d.c.)	V_{CE}		12,5 V
Frequency	f		470 MHz
Load power	P_L		20 W
Power gain	G_p	>	6,5 dB
		typ.	7,8 dB
Collector efficiency	η_c	>	55 %
		typ.	64 %
Heatsink temperature	T_h		25 °C

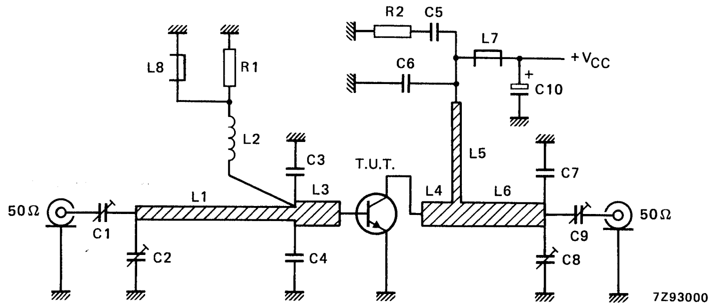


Fig. 6 Class-B test circuit at f = 470 MHz.

List of components:

C1 = C9 = 1,8 to 10 pF film dielectric trimmer (cat.no. 2222 809 05002)
C2 = 2 to 9 pF film dielectric trimmer (cat.no. 2222 809 09002)
C3 = C4 = 8,2 pF multilayer ceramic chip capacitor (100A type) *
C5 = 100 nF polyester film capacitor
C6 = 120 pF multilayer ceramic chip capacitor
C7 = 8,2 pF multilayer ceramic chip capacitor (100B type) *
C8 = 2 to 18 pF film dielectric trimmer (cat.no. 2222 809 09003)
C10 = 2,2 μF electrolytic capacitor

L1 = 50 Ω stripline (43,5 mm x 4,0 mm)
L2 = 100 nH; 5 turns closely wound enamelled Cu-wire (0,5 mm); int. diam. 4 mm; leads 2 x 5 mm
L3 = 37,6 Ω stripline (8,0 mm x 6,0 mm)
L4 = 37,6 Ω stripline (9,0 mm x 6,0 mm)
L5 = 74,4 Ω stripline (22,5 mm x 2,0 mm)
L6 = 37,6 Ω stripline (18,0 mm x 6,0 mm)
L7 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36642)

R1 = 1 Ω ± 5%; 0,4 W metal film resistor (MR25 type)
R2 = 10 Ω ± 5%; 0,4 W metal film resistor (MR25 type)

L1, L3, L4, L5 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16 inch.

* American Technical Ceramics capacitor or capacitor of same quality.

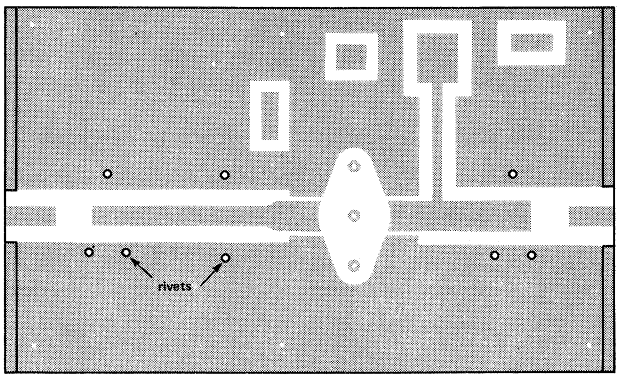


Fig. 7 P.C. board for 470 MHz, class-B test circuit.

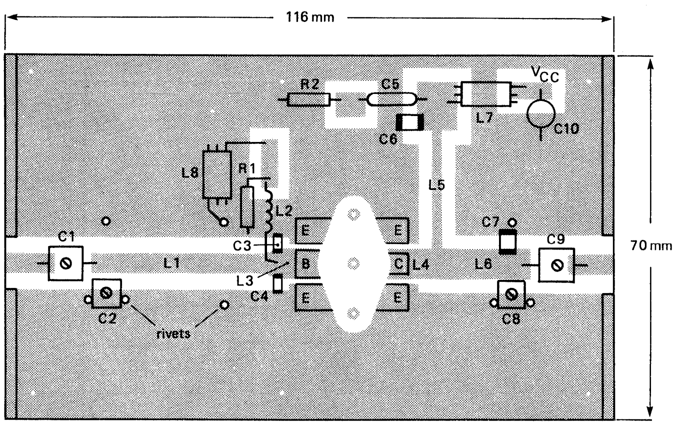


Fig. 8 Component lay-out of 470 MHz, class-B test circuit.

Note:

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by copper straps under the emitters and around the board to provide a direct contact between the copper on the component side and the ground plane.

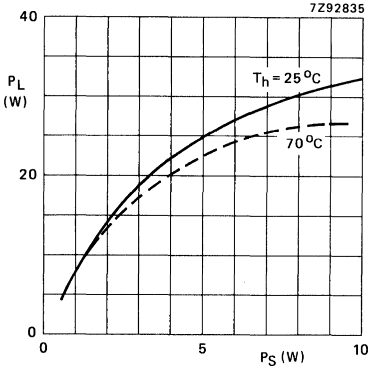


Fig. 9 Load power vs. source power.

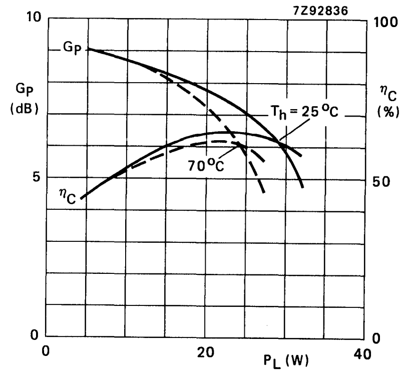


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs. 9 and 10:

V_{CE} = 12,5 V; f = 470 MHz; class-B operation; T_h = 25 °C and 70 °C; $R_{th\ mb-h}$ = 0,2 K/W; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) up to 25 W under the following conditions:
V_{CE} = 15,5 V; f = 470 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0,2 K/W.

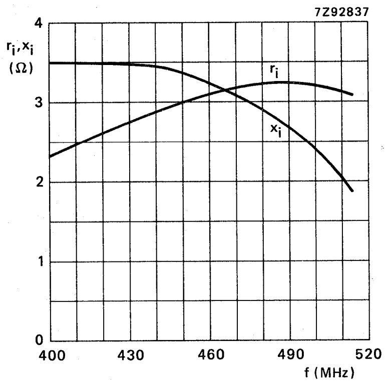


Fig. 11 Input impedance (series components).

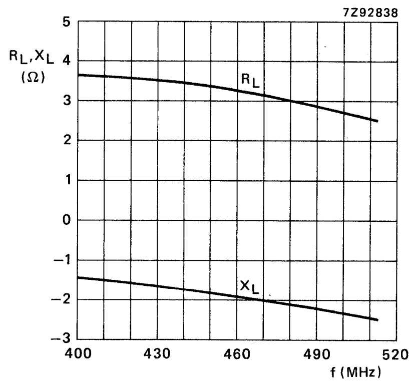


Fig. 12 Load impedance (series components).

Conditions for Figs. 11, 12 and 13:

V_{CE} = 12,5 V; P_L = 20 W; f = 400–512 MHz; T_h = 25 °C; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W; typical values.

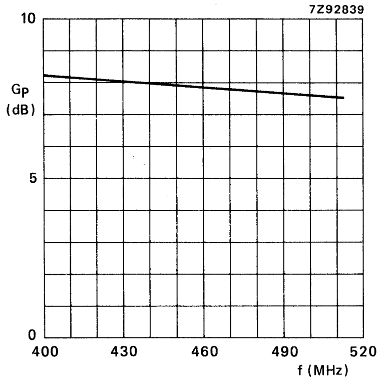


Fig. 13 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

Envelope	SOT-119			
Mode of operation	class-B; c.w.			
Collector-emitter voltage (d.c.)	V_{CE}		12,5	V
Frequency	f		470	MHz
Load power	P_L		30	W
Power gain	G_p	>	6,0	dB
Collector efficiency	η_C	>	55	%
Heatsink temperature	T_h		25	^oC

MECHANICAL DATA

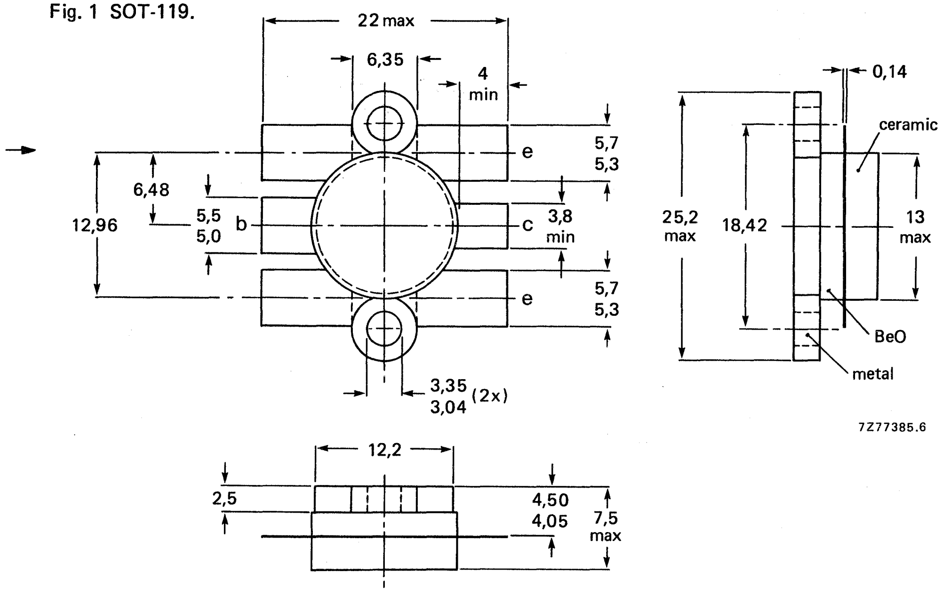
SOT-119 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C	max.	6	A
(peak value); f > 1 MHz	I_{CM}	max.	18	A
Total power dissipation f > 1 MHz; T_{mb} = 25 °C	P_{tot} (r.f.)	max.	65	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

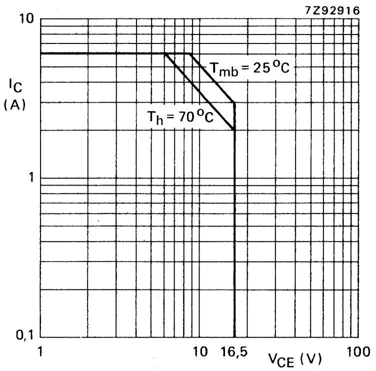


Fig. 2 D.C. SOAR.
$R_{th\ mb\text{-}h}$ = 0,2 K/W

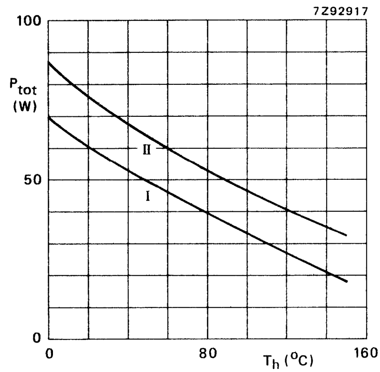


Fig. 3 Power/temperature derating curves
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE (dissipation = 45 W; T_{mb} = 25 °C).

From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(r.f.)}$	max.	2,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage I_C = 50 mA; open emitter	$V_{(BR)CBO}$	>	36	V
Collector-emitter breakdown voltage I_C = 100 mA; open base	$V_{(BR)CEO}$	>	16,5	V
Emitter-base breakdown voltage I_E = 10 mA; open collector	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	22	mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain I_C = 4 A; V_{CE} = 10 V	h_{FE}	> typ.	15 60	
Collector capacitance at f = 1 MHz* $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	85	pF
Feed-back capacitance at f = 1 MHz* I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	52	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

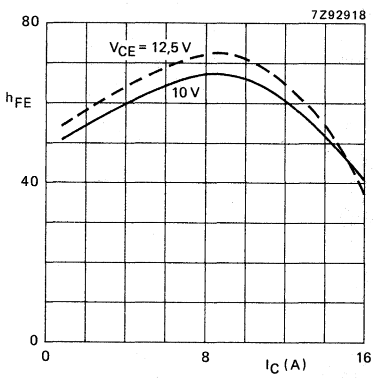


Fig. 4 T_j = 25 °C; typ. values.

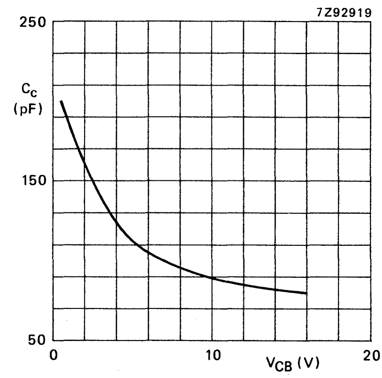


Fig. 5 $I_E = i_e$ = 0; f = 1 MHz; typ. values.

* Device mounted in SOT-119 envelope without inputmatching.

APPLICATION INFORMATION

Mode of operation	In narrow-band test circuit; class-B; c.w.			
Collector-emitter voltage (d.c.)	V_{CE}		12,5	V
Frequency	f		470	MHz
Load power	P_L		30	W
Power gain	G_P	>	6,0	dB
		typ.	7,4	dB
Collector efficiency	η_C	>	55	%
		typ.	66	%
Heatsink temperature	T_h		25	°C

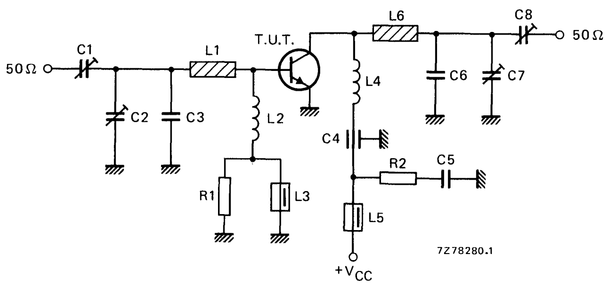


Fig. 6 Class-B test circuit at f = 470 MHz.

List of components:

C1 = C2 = C7 = C8 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C6 = 3,9 pF ceramic capacitor (500 V)
C4 = 100 pF feed-through capacitor
C5 = 100 nF polyester film capacitor

L1 = stripline (24,0 mm x 6,7 mm)
L2 = 10 turns closely wound enamelled Cu-wire (0,4 mm); int. diam. 4 mm
L3 = 2 turns enamelled Cu-wire (0,6 mm); Ferroxcube tube core, grade 3B5 (cat. no. 4313 020 15170)
L4 = 12,6 nH; 2,5 turns enamelled Cu-wire (0,7 mm); int. diam. 4 mm; length 3 mm; leads 2 x 5 mm
L5 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L6 = stripline (28,4 mm x 6,7 mm)

R1 = R2 = 10 Ω carbon resistor

L1 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16 inch.

Component lay-out and printed-circuit board for 470 MHz test circuit are shown in Figs 7 and 8.

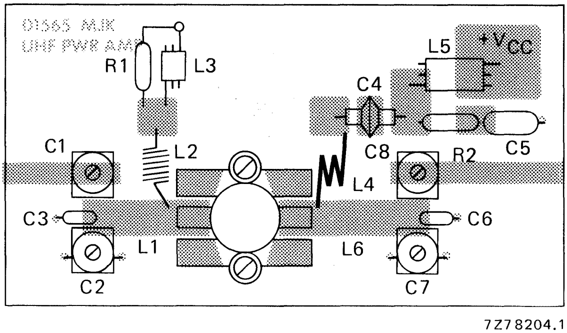
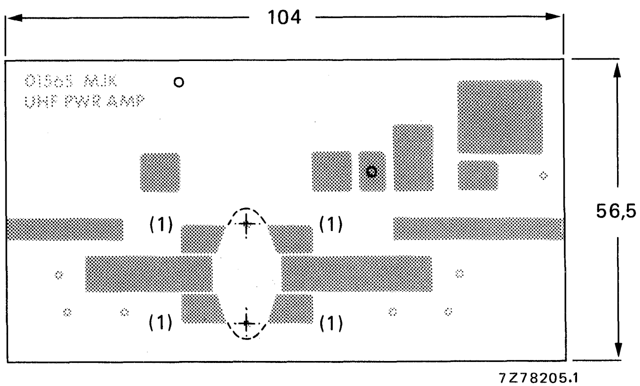


Fig. 7 Component lay-out of 470 MHz, class-B test circuit.



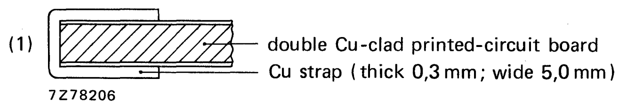


Fig. 8 P.c. board for 470 MHz, class-B test circuit.

Note:

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side fully metallized serving as groundplane. Earth connections are made by hollow rivets and also by copper straps under the emitter to provide a direct contact between the copper on the component side and the ground plane.

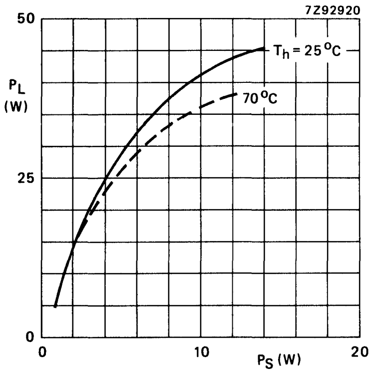


Fig. 9 Load power vs. source power.

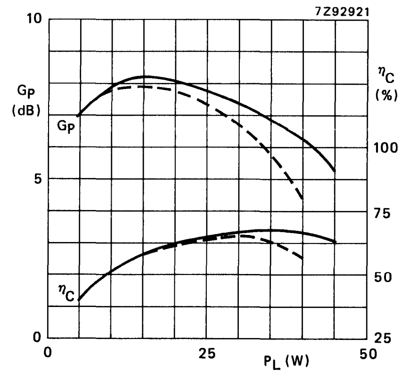


Fig. 10 Power gain and efficiency vs. load power.
——— $T_h = 25\,^oC$;
– – – $T_h = 70\,^oC$.

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; f = 470 MHz; class-B operation; T_h = 25 ^oC and 70 ^oC; $R_{th\ mb\text{-}h}$ = 0,2 K/W; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) up to 38 W under the following conditions:
V_{CE} = 15,5 V; f = 470 MHz; T_h = 25 ^oC; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

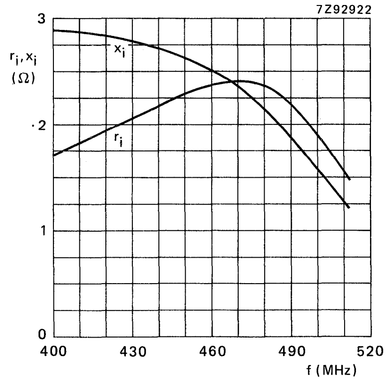


Fig. 11 Input impedance (series components).

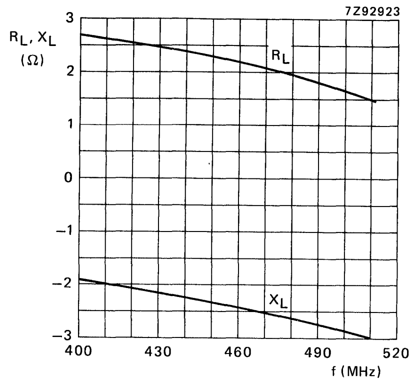


Fig. 12 Load impedance (series components).

Conditions for Figs 11, 12 and 13:

V_{CE} = 12,5 V; P_L = 30 W; f = 400–512 MHz; T_h = 25 °C; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W; typical values.

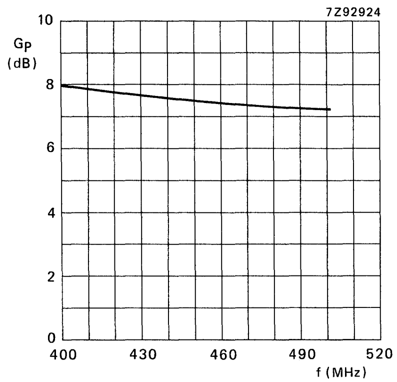


Fig. 13 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-119 envelope primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- internal matching to achieve an optimum wideband capability and high power gain.
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	45	> 4,8	> 55

MECHANICAL DATA

Dimensions in mm

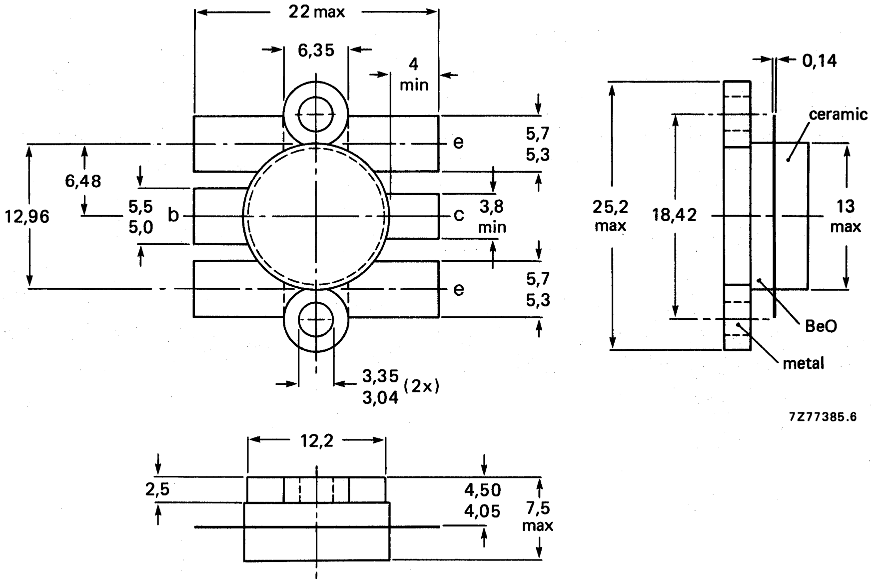
SOT-119 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-119



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C	max.	9 A
(peak value); f > 1 MHz	I_{CM}	max.	27 A
Total power dissipation at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	87 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

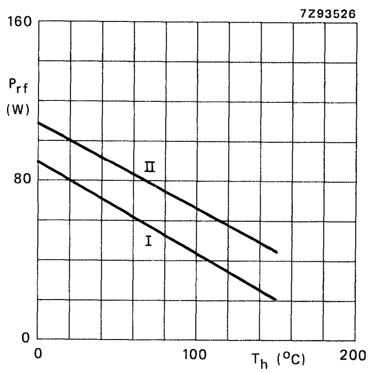


Fig. 2 Power/temperature derating curves.

I Continuous operation (f > 1 MHz).
II Short-time operation during mismatch (f > 1 MHz).

MAXIMUM THERMAL RESISTANCE

Dissipation = 54 W; T_{amb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	max.	1,7 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,2 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 100 mA	$V_{(BR)CBO}$	min.	36 V
Collector-emitter breakdown voltage open base; I_C = 200 mA	$V_{(BR)CEO}$	min.	16,5 V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	min.	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	44 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	15 mJ
D.C. current gain V_{CE} = 10 V; I_C = 8 A	h_{FE}	min. typ.	15 60
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	170 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5	C_{re}	typ.	100 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

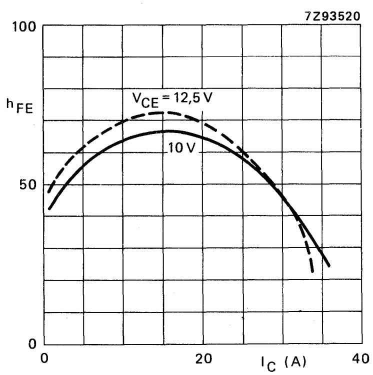


Fig. 3 D.C. current gain versus collector current; T_j = 25 °C.

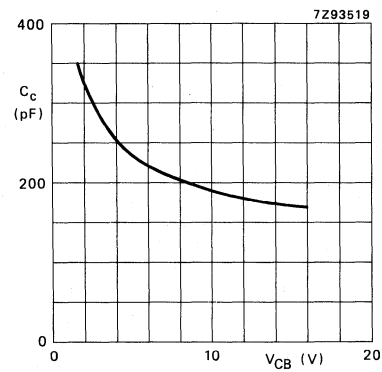


Fig. 4 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	45	> 4,8 typ. 5,8	> 55 typ. 61

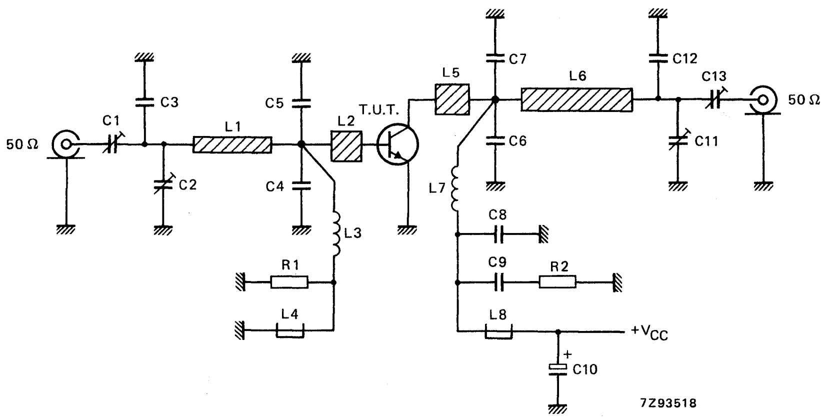


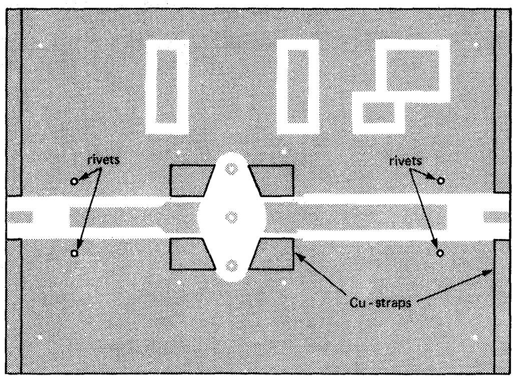
Fig. 5 Class-B test circuit at f = 470 MHz.

List of components:

C1 = C13 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C2 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 12 pF multilayer ceramic chip capacitor*
C4 = C5 = 8,2 pF multilayer ceramic chip capacitor**
C6 = C7 = 15 pF multilayer ceramic chip capacitor*
C8 = 110 pF multilayer ceramic chip capacitor*
C9 = 3 x 100 nF multilayer ceramic chip capacitor in parallel
C10 = 2,2 μF (35 V) electrolytic capacitor
C12 = 5,6 pF multilayer ceramic chip capacitor*
L1 = 34,6 Ω stripline (17 mm x 4 mm)
L2 = L5 = 25,3 Ω stripline (6 mm x 6 mm)
L3 = 45 nH; 4 turns, closely wound enamelled Cu-wire (0,5 mm); int. dia. 2,5 mm; leads 2 x 5 mm
L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L6 = 29,2 Ω stripline (25,5 mm x 5 mm)
L7 = 10 nH; 1 turn Cu-wire (1,0 mm); int. dia. 5 mm; leads 2 x 5 mm
R1 = 1 Ω ± 5% (0,4 W) metal film resistor
R2 = 10 Ω ± 5% (1,0 W) metal film resistor

* American Technical Ceramics capacitor type B or capacitor of the same quality.
** Idem type A.

Striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (E_r = 2,2); thickness 1/32 inch.



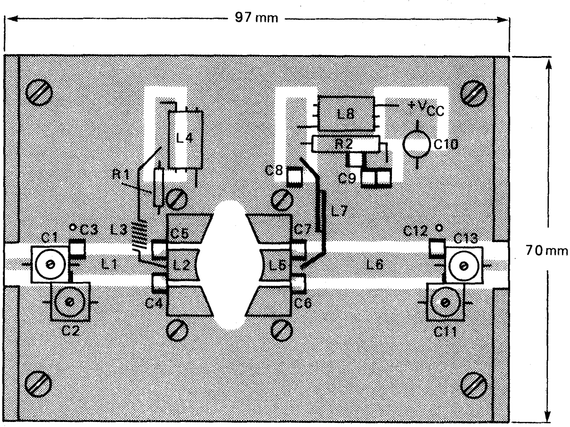


Fig. 6 Printed circuit board and component layout for 470 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

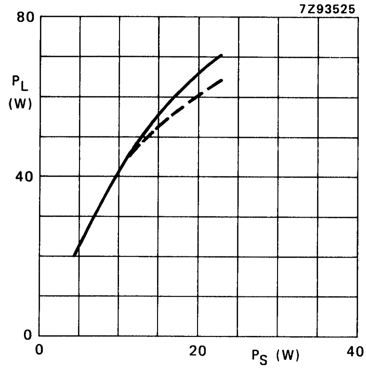


Fig. 7 Load power versus source power.

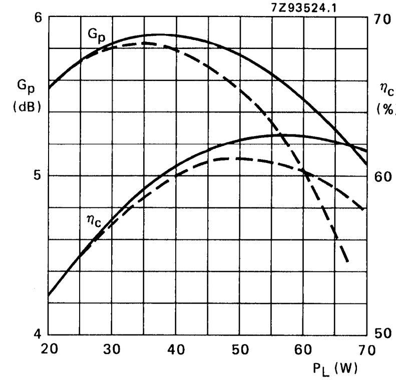


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; V_{CE} = 12,5 V; f = 470 MHz; T_h = 25 °C (——) and 70 °C (– – –); $R_{th\ mb\text{-}h}$ = 0,2 K/W; class-B operation.

RUGGEDNESS

The BLU45/12 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) up to 55 W under the following conditions: V_{CE} = 15,5 V; f = 470 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

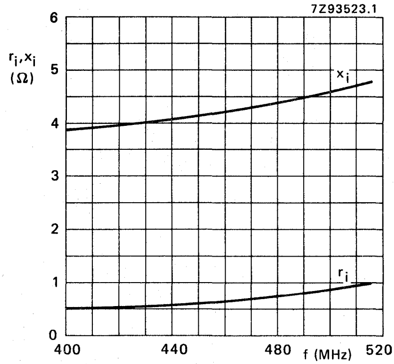


Fig. 9 Input impedance (series components).

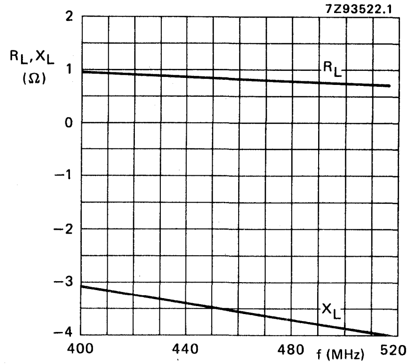


Fig. 10 Load impedance (series components).

Conditions for Figs 9, 10 and 11 (class-B operation):

Typical values; V_{CE} = 12,5 V; P_L = 45 W; f = 400 to 512 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0,2 K/W.

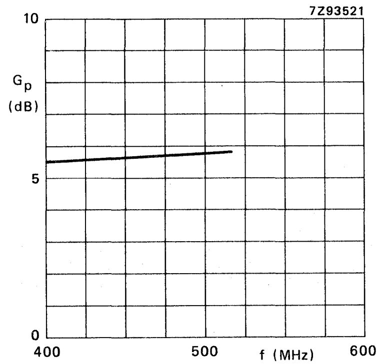


Fig. 11 Power gain versus frequency.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

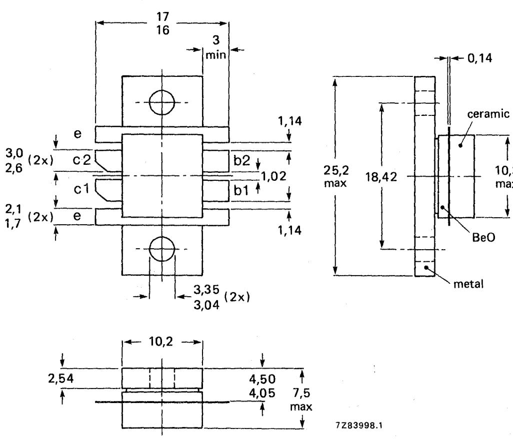
R.F. performance in a common-emitter class-B wideband (100–400 MHz) circuit at T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
c.w.	28	400	30	>10	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be sparingly applied and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	60 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	2 x 1,8 A
Total power dissipation * at T_{mb} = 75 °C	P_{tot}	max.	45 W*
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE (total device)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,7 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	60 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	3,5 V
Collector-base capacitance $I_E = i_e$ = 0; V_{CB} = 28 V	C_{cb}	typ.	2 x 10 pF

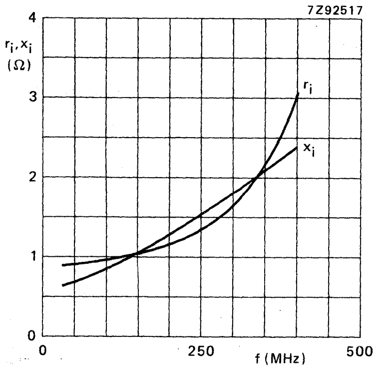


Fig. 2 Input impedance
(series components; either section).

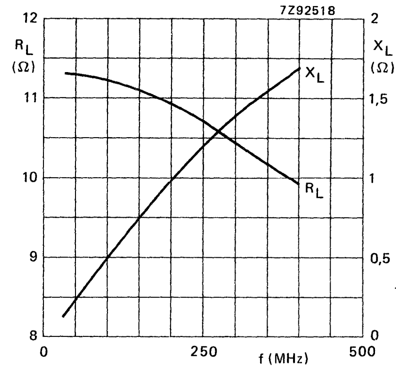


Fig. 3 Load impedance
(series components; either section).

Conditions for Figs 2 and 3:
Typical values; V_{CE} = 28 V; P_L = 30 W; T_h = 25 °C; class-B operation.

* Dissipation of either transistor section should not exceed half rated dissipation.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

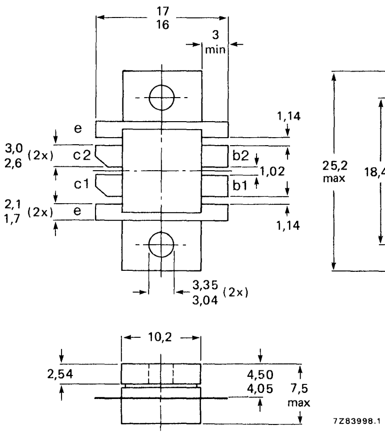
R.F. performance in a common-emitter class-B wideband (100—400 MHz) circuit at T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
c.w.	28	400	45	> 9	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be sparingly applied and evenly distributed

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	60 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	2 x 2,5 A
Total power dissipation* at T_{mb} = 75 °C	P_{tot}	max.	65 W*
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE (total device)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 20 mA	$V_{(BR)CES}$	>	60 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	3,5 V
Collector-base capacitance $I_E = i_e = 0$; V_{CB} = 28 V	C_{cb}	typ.	2 x 15 pF

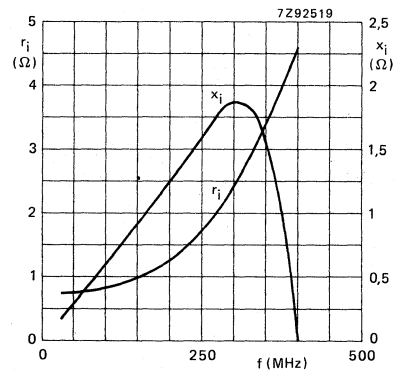


Fig. 2 Input impedance (series components; either section).

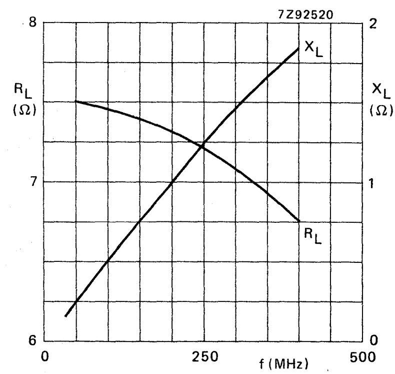


Fig. 3 Load impedance (series components; either section).

Conditions for Figs 2 and 3:
Typical values; V_{CE} = 28 V; P_L = 45 W; T_h = 25 °C; class-B operation.

* Dissipation of either transistor section should not exceed half rated dissipation.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

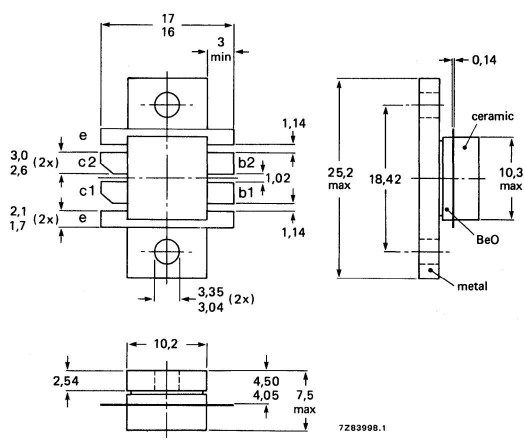
R.F. performance in a common-emitter class-B wideband (100–400 MHz) circuit at T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	400	60	> 8	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be sparingly applied and evenly distributed

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	60	V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current d.c.	I_C	max.	2 x 4	A
Total power dissipation* at T_{mb} = 75 °C	P_{tot}	max.	95	W*
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE (total device)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,3	K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 20 mA	$V_{(BR)CES}$	>	60	V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	3,5	V
Collector-base capacitance $I_E = i_e = 0$; V_{CB} = 28 V	C_{cb}	typ.	2 x 22	pF

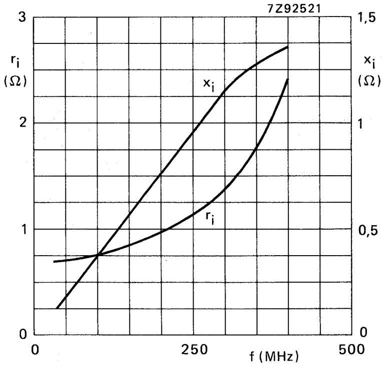


Fig. 2 Input impedance
(series components; either section).

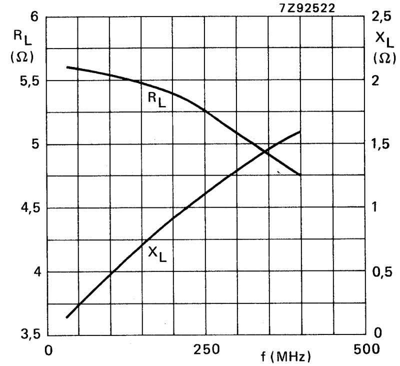


Fig. 3 Load impedance
(series components; either section).

Conditions for Figs 2 and 3:
Typical values; V_{CE} = 28 V; P_L = 60 W; T_h = 25 °C; class-B operation.

* Dissipation of either transistor section should not exceed half rated dissipation.

V.H.F./U.H.F. PUSH-PULL POWER TRANSISTOR

N-P-N silicon planar epitaxial push-pull transistor designed for use in military and professional wideband applications in the 30 to 400 MHz range.

Features:

- Diffused emitter ballasting resistors providing excellent current sharing and ruggedness;
- Gold metallization ensures excellent reliability;
- Multicell geometry giving good balance of dissipated power and low thermal resistance;
- Internal input matching to achieve an optimum wideband capability and high power gain.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

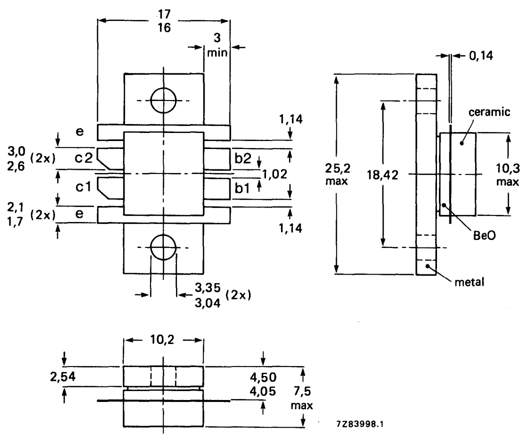
R.F. performance in a common-emitter class-C wideband circuit at T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	225–400	100	> 7	> 55
c.w.	28	100–400	100	> 6	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,60 Nm (6,0 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be sparingly applied and evenly distributed

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	60 V
Collector-emitter voltage (R_{BE} = 10 Ω)	V_{CER}	max.	45 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current d.c.	I_C	max.	2 x 5 A
Total power dissipation* at T_{mb} = 75 °C	P_{tot}	max.	125 W*
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE (total device)

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	1,0 K/W

CHARACTERISTICS

T_{mb} = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 100 mA	$V_{(BR)CES}$	>	60 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	3,5 V
Collector-base capacitance $I_E = i_e$ = 0; V_{CB} = 28 V	C_{cb}	typ.	2 x 30 pF

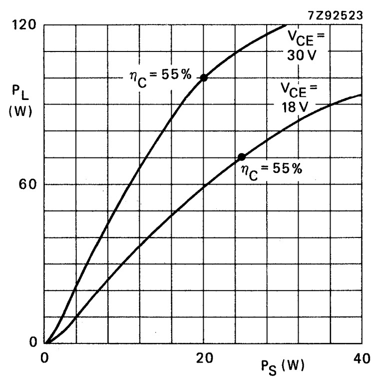


Fig. 2 Load power vs. source power.

* Dissipation of either transistor section should not exceed half rated dissipation.

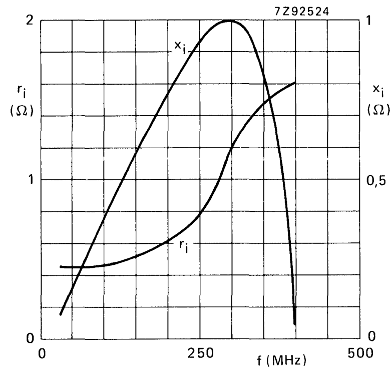


Fig. 3 Input impedance
(series components; either section).

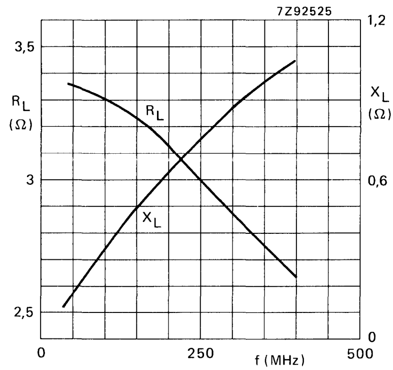


Fig. 4 Load impedance
(series components; either section).

Conditions for Figs 3 and 4:
Typical values: V_{CE} = 28 V; P_L = 100 W; T_h = 25 °C; class-C operation.

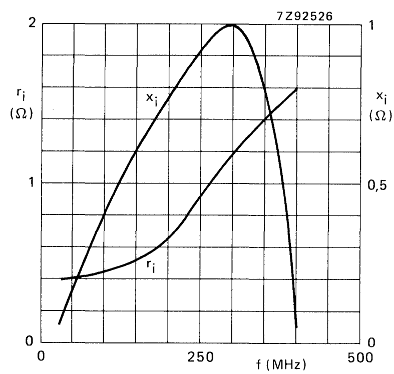


Fig. 5 Input impedance
(series components; either section).

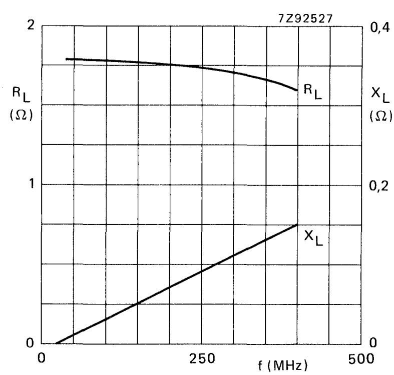


Fig. 6 Load impedance
(series components; either section).

Conditions for Figs 5 and 6:
Typical values: V_{CE} = 18 V; P_L = 70 W; T_h = 25 °C; class-C operation.

APPLICATION INFORMATION

R.F. performance in a common-emitter class-C wideband circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
c.w.	28	100–400	100	> 6	> 50
c.w.	28	225–400	100	> 7	> 55

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-119 envelope primarily intended for use in mobile radio transmitters in the 470 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- internal matching to achieve an optimum wideband capability and high power gain.
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	60	> 4,4	> 55

MECHANICAL DATA

Dimensions in mm

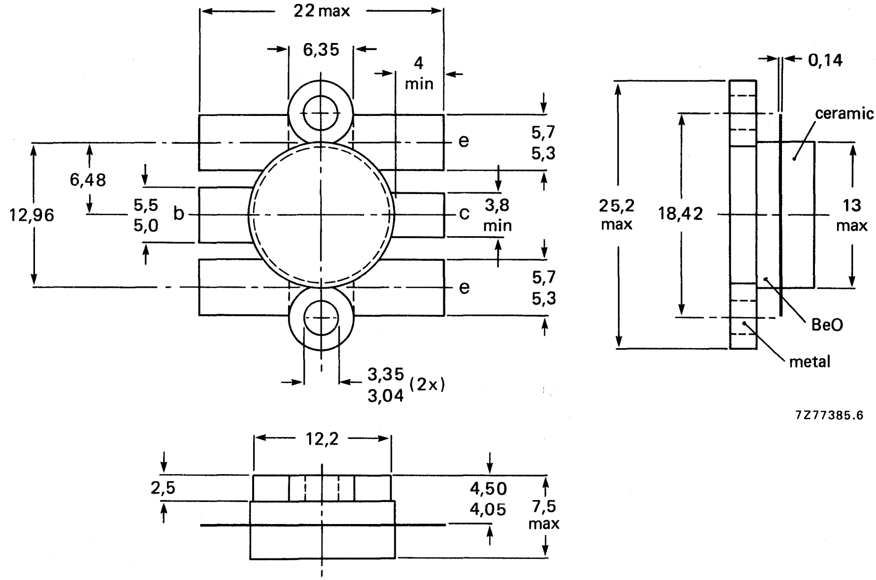
SOT-119 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average	I_C	max.	12 A
(peak value); f > 1 MHz	I_{CM}	max.	36 A
Total power dissipation at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	110 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

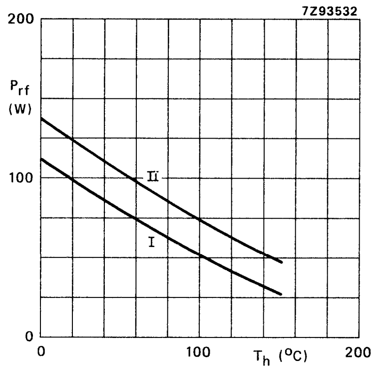


Fig. 2 Power/temperature derating curves.

I Continuous operation (f > 1 MHz).

II Short-time operation during mismatch (f > 1 MHz).

MAXIMUM THERMAL RESISTANCE

Dissipation = 72 W; T_{amb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	max.	1,4 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,2 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 100 mA	$V_{(BR)CBO}$	min.	36 V
Collector-emitter breakdown voltage open base; I_C = 200 mA	$V_{(BR)CEO}$	min.	16,5 V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	min.	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	44 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	15 mJ
D.C. current gain V_{CE} = 10 V; I_C = 8 A	h_{FE}	min. typ.	15 60
Collector capacitance at f = 1 MHz I_E = i_e = 0; V_{CB} = 12,5 V	C_c	typ.	170 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5	C_{re}	typ.	100 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

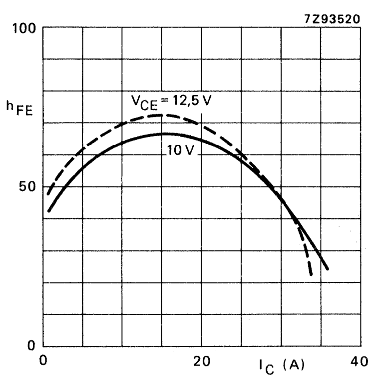


Fig. 3 D.C. current gain versus collector current; T_j = 25 °C.

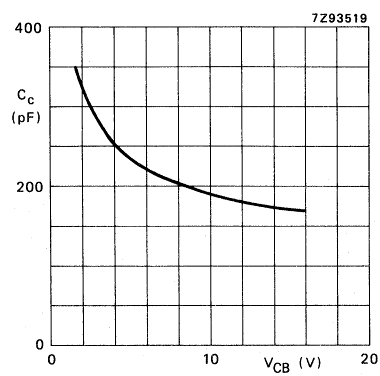


Fig. 4 Output capacitance versus V_{CB}; I_E = i_e = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	470	60	> 4,4 typ. 5,5	> 55 typ. 62

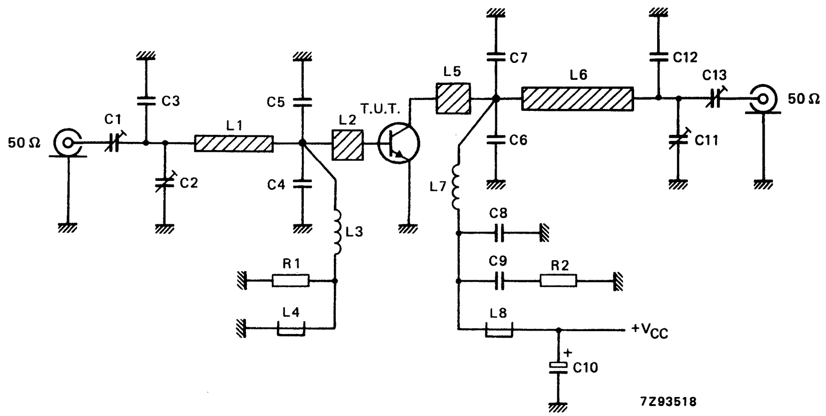


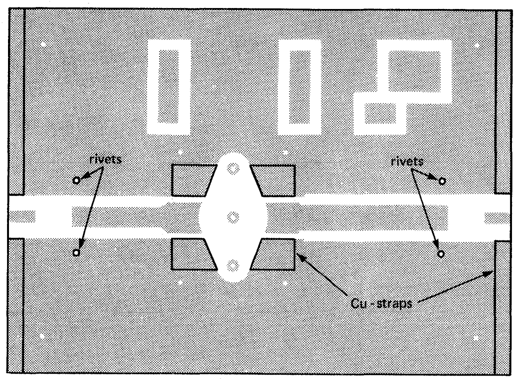
Fig. 5 Class-B test circuit at f = 470 MHz.

List of components:

C1 = C13 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C2 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 12 pF multilayer ceramic chip capacitor*
C4 = C5 = 8,2 pF multilayer ceramic chip capacitor**
C6 = C7 = 15 pF multilayer ceramic chip capacitor*
C8 = 110 pF multilayer ceramic chip capacitor*
C9 = 3 x 100 nF multilayer ceramic chip capacitor in parallel
C10 = 2,2 μF (35 V) electrolytic capacitor
C12 = 5,6 pF multilayer ceramic chip capacitor*
L1 = 34,6 Ω stripline (17 mm x 4 mm)
L2 = L5 = 25,3 Ω stripline (6 mm x 6 mm)
L3 = 45 nH; 4 turns, closely wound enamelled Cu-wire (0,5 mm); int. dia. 2,5 mm; leads 2 x 5 mm
L4 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L6 = 29,2 Ω stripline (25,5 mm x 5 mm)
L7 = 10 nH; 1 turn Cu-wire (1,0 mm); int. dia. 5 mm; leads 2 x 5 mm
R1 = 1 Ω ± 5% (0,4 W) metal film resistor
R2 = 10 Ω ± 5% (1,0 W) metal film resistor

* American Technical Ceramics capacitor type B or capacitor of the same quality.
** Idem type A.

Striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (E_r = 2,2); thickness 1/32 inch.



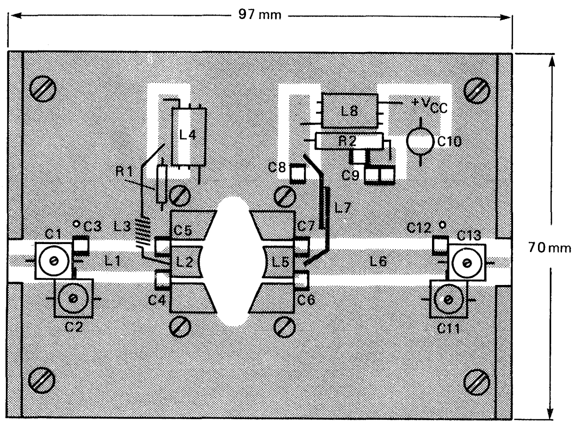


Fig. 6 Printed circuit board and component layout for 470 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

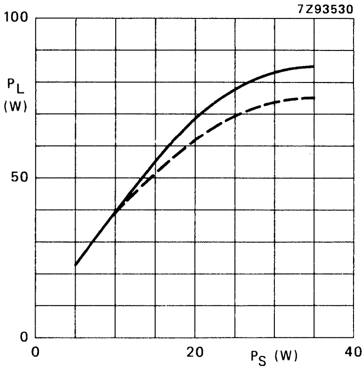


Fig. 7 Load power versus source power.

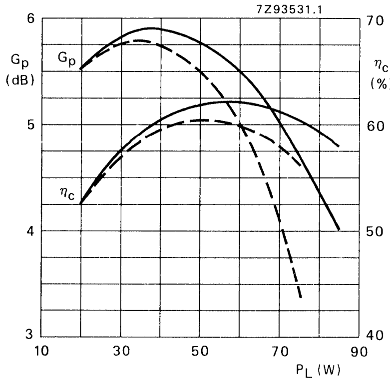


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; V_{CE} = 12,5 V; f = 470 MHz; T_h = 25 °C (——) and 70 °C (– – –); $R_{th\ mb\text{-}h}$ = 0,2 K/W; class-B operation.

RUGGEDNESS

The BLU60/12 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) up to 70 W under the following conditions; V_{CE} = 15,5 V; f = 470 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

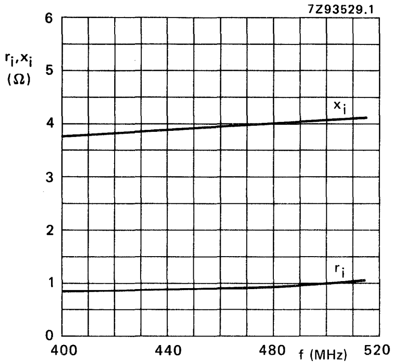


Fig. 9 Input impedance (series components).

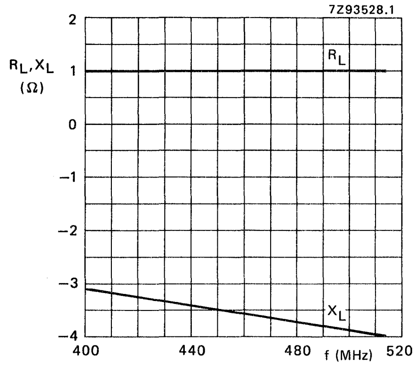


Fig. 10 Load impedance (series components).

Conditions for Figs 9, 10 and 11 (class-B operation):

Typical values; V_{CE} = 12,5 V; P_L = 60 W; f = 400 to 512 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

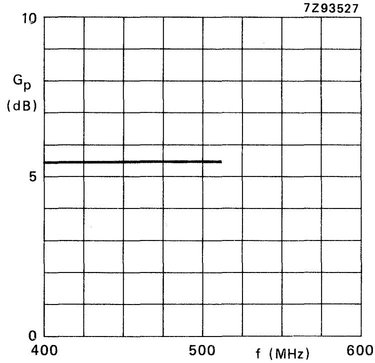


Fig. 11 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 470 MHz band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-122). All leads are isolated from the stud.

QUICK REFERENCE DATA

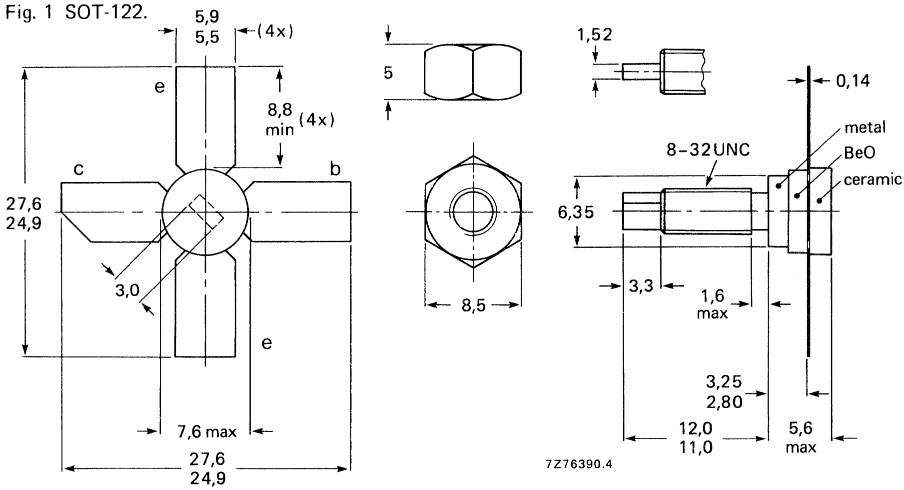
R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	470	7	> 8,5	> 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg.cm)
max. 0,85 Nm (8,5 kg.cm)
When locking is required an adhesive is preferred instead of a lock washer.

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
Deburring must leave surface flat; do not chamfer or countersink either end of hole.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	I_C	max.	1,2 A
(peak value); f > 1 MHz	I_{CM}	max.	3,6 A
Total power dissipation			
at T_{mb} = 52 °C	$P_{tot(d.c.)}$	max.	17 W
f > 1 MHz; T_{mb} = 52 °C	$P_{tot(r.f.)}$	max.	22,5 W
Storage temperature	T_{stg}	−65 to +150 °C	
Operating junction temperature	T_j	max.	200 °C

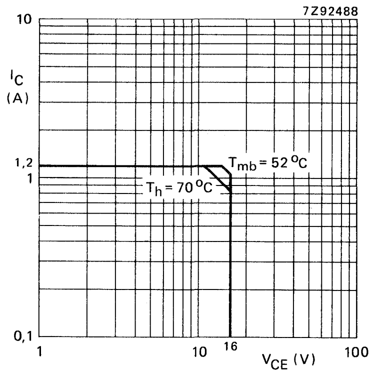


Fig. 2 D.C. SOAR.
$R_{th\ mb\text{-}h}$ = 0,6 K/W.

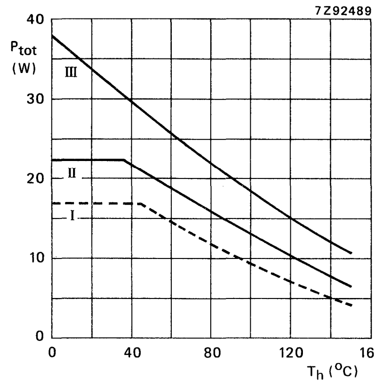


Fig. 3 Power/temperature derating curves.
I Continuous operation
II Continuous operation (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz).

THERMAL RESISTANCE

Dissipation = 15 W; T_{mb} = 25 °C

From junction to mounting base			
(d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	7,5 K/W
(r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	5,6 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage, open emitter; I_C = 15 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage, open base; I_C = 30 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage, open collector; I_E = 1,5 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current, V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	7,5 mA
Second breakdown energy, L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	2,3 mJ
D.C. current gain, I_C = 0,9 A; V_{CE} = 10 V	h_{FE}	>	25
		typ.	100
Transition frequency at f = 500 MHz*, $-I_E$ = 0,9 A; V_{CB} = 12,5 V	f_T	typ.	4,0 GHz
Collector capacitance at f = 1 MHz, $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	10 pF
Feed-back capacitance at f = 1 MHz, I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	7 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF

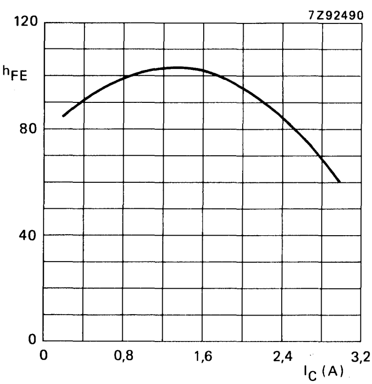


Fig. 4 T_j = 25 °C; V_{CE} = 10 V; typical values.

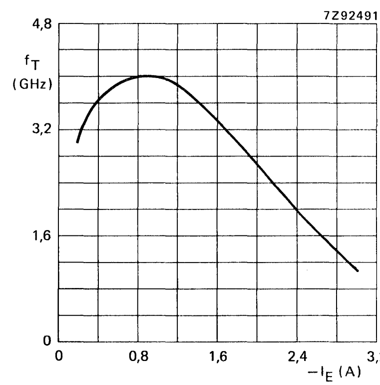


Fig. 5 V_{CB} = 12,5 V; f = 500 MHz; t_p = 50 μs; T_j = 25 °C; typical values.

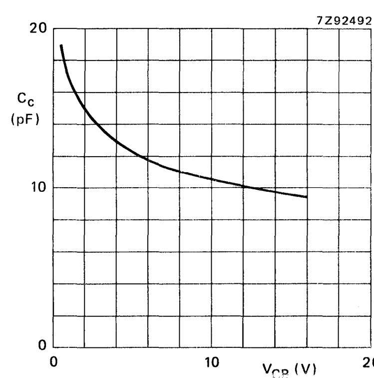


Fig. 6 $I_E = i_e$ = 0; f = 1 MHz; typical values.

* Measured under pulse conditions: t_p = 50 μs; δ < 1%.

APPLICATION INFORMATION

R.F. performance in common-emitter circuit; class-B: f = 470 MHz; T_h = 25 °C

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	7	< 0,99 typ. 0,55	> 8,5 typ. 11,0	< 1,0 typ. 0,8	> 55 typ. 70

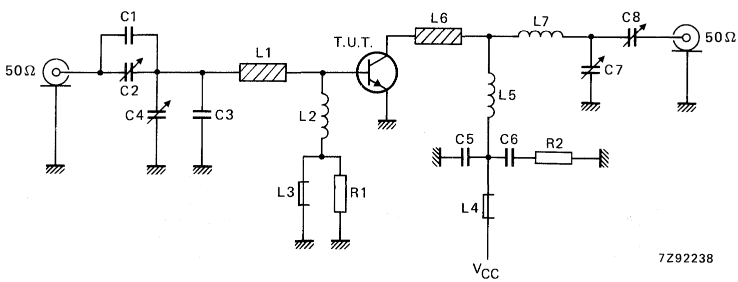


Fig. 7 Class-B test circuit at f = 470 MHz.

List of components:

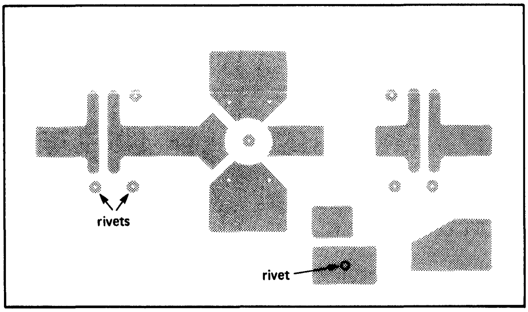
C1 = 2,7 pF multilayer ceramic chip capacitor*
C2 = C7 = C8 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 7,5 pF multilayer ceramic chip capacitor*
C4 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C5 = 100 pF multilayer ceramic chip capacitor
C6 = 100 nF metallized film capacitor

L1 = 38 Ω stripline (22,5 mm x 6,0 mm)
L2 = 15 nH; 1 turn Cu wire (1,0 mm); int. dia. 5 mm; leads 2 x 5 mm
L3 = L4 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L5 = 29 nH; 2 turns enamelled Cu wire (1,0 mm); int. dia. 6 mm; length 3,5 mm; leads 2 x 5 mm
L6 = 38 Ω stripline (10,0 mm x 6,0 mm)
L7 = 7 nH; 1/2 turn Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 5 mm

R1 = R2 = 10 Ω ± 10%; 0,25 W metal film resistor

L1 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



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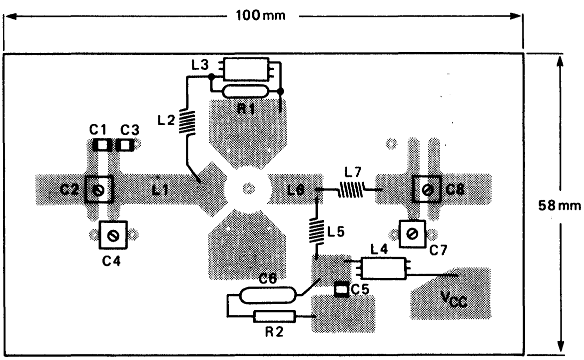

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Fig. 8 Printed circuit board and component lay-out for 470 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by hollow rivets and also by copper straps under the emitters.

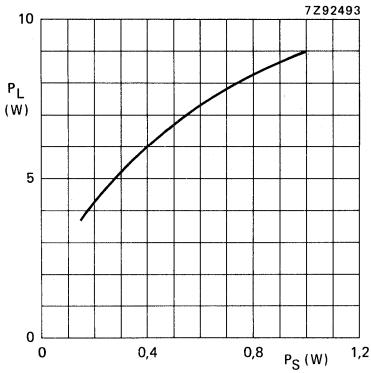


Fig. 9 Load power vs. source power.

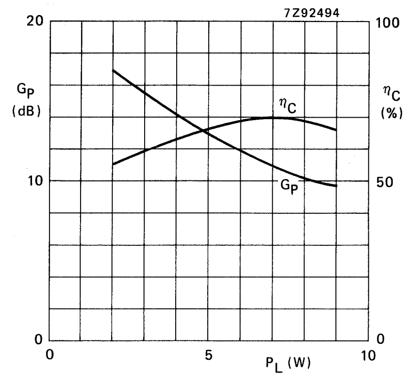


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; f = 470 MHz; T_h = 25 °C; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and T_h = 25 °C.

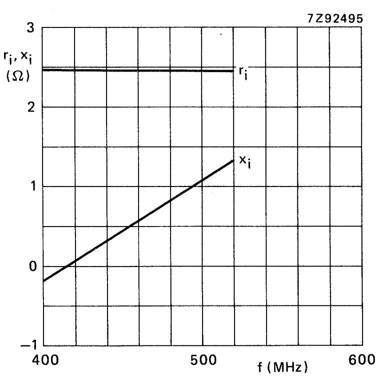


Fig. 11 Input impedance (series components).

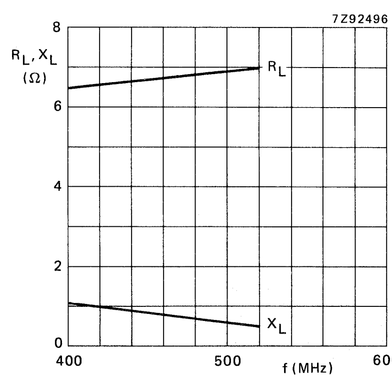


Fig. 12 Load impedance (series components).

Conditions for Figs 11 and 12:

V_{CE} = 12,5 V; P_L = 7 W; f = 400-520 MHz; T_h = 25 °C; class-B operation; typical values.

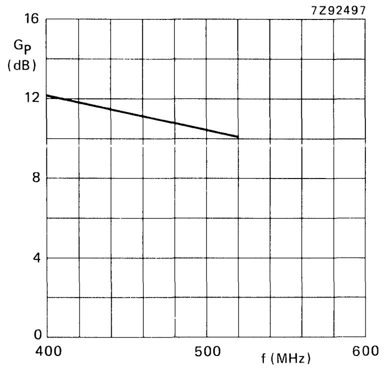


Fig. 13 Power gain vs. frequency.
V_{CE} = 12,5 V; P_L = 7 W; f = 400-520 MHz; T_h = 25 °C;
class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.

The transistor is encapsulated in a subminiature plastic transfer-moulded cross package (SOT-103).

QUICK REFERENCE DATA

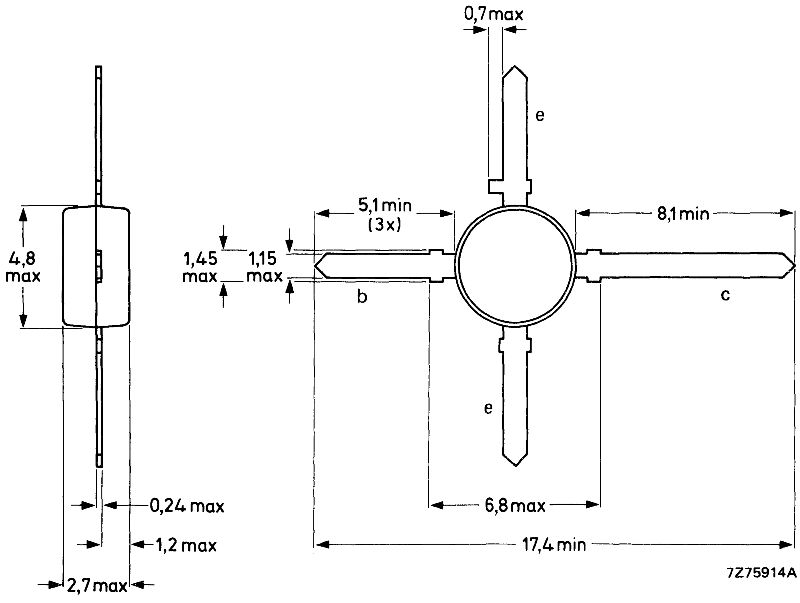
R.F. performance at T_{amb} = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	0,5	> 8,0	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-103.



RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current d.c. or average	I_C	max.	150	mA
(peak value); f > 1 MHz	I_{CM}	max.	500	mA
Total power dissipation at $T_{coll.\ tap}$ = 75 °C	P_{tot}	max.	1,65	W
Total power dissipation* at T_{amb} = 25 °C	P_{tot}	max.	1,0	W
Storage temperature	T_{stg}	−65 to +150		°C
Operating junction temperature	T_j	max.	175	°C

THERMAL RESISTANCE*

From junction to collector tap (d.c.)	$R_{th\ j\text{-}ct(dc)}$	=	60	K/W
From junction to ambient (d.c.)	$R_{th\ j\text{-}a(dc)}$	=	150	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 2,5 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	>	16	V
Emitter-base breakdown voltage open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	>	3	V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	1	mA
D.C. current gain I_C = 100 mA; V_{CE} = 10 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz** $-I_E$ = 100 mA; V_{CB} = 12,5 V	f_T	typ.	4,0	GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	2,1	pF
Feed-back capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	1,3	pF

* Transistor mounted on a p.c. board with a collector area of 50 mm².
** Measured under pulse conditions: t_p = 50 μs; δ < 1%.

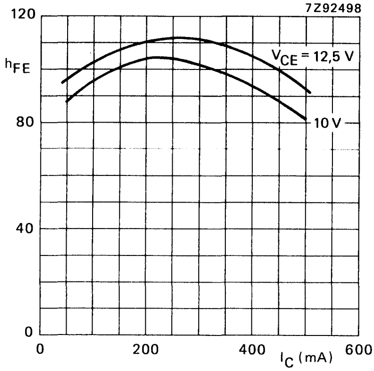


Fig. 2 T_j = 25 °C; typical values.

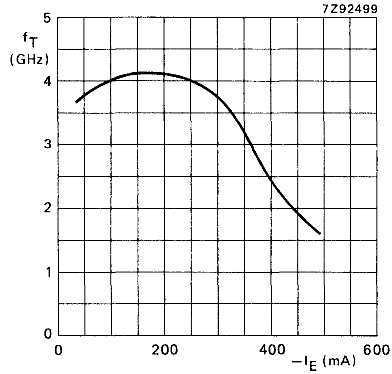


Fig. 3 V_{CB} = 12,5 V; f = 500 MHz;
T_j = 25 °C; typical values.

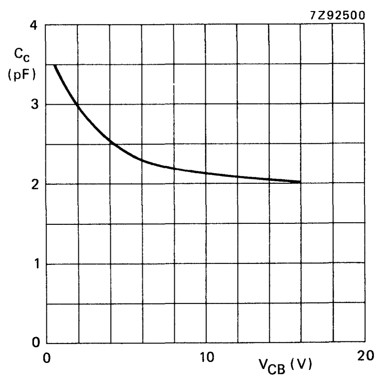


Fig. 4 $I_E = i_e = 0$; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_{amb} = 25 °C

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C mA	η_C %
narrow band; c.w.	12,5	0,5	< 0,079 typ. 0,056	> 8,0 typ. 9,5	< 80 typ. 62	> 50 typ. 65

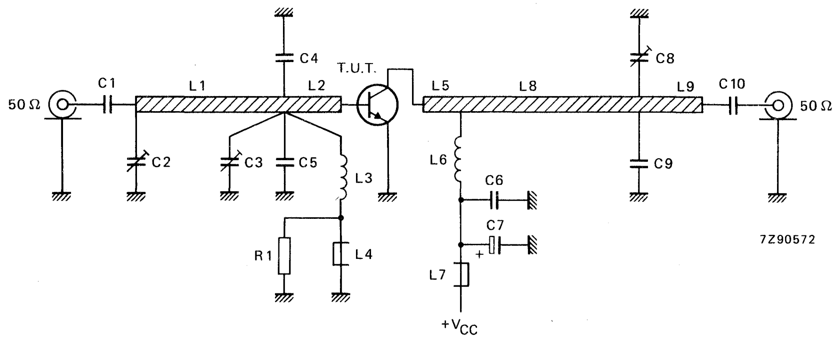


Fig. 5 Class-B test circuit at f = 900 MHz.

List of components:

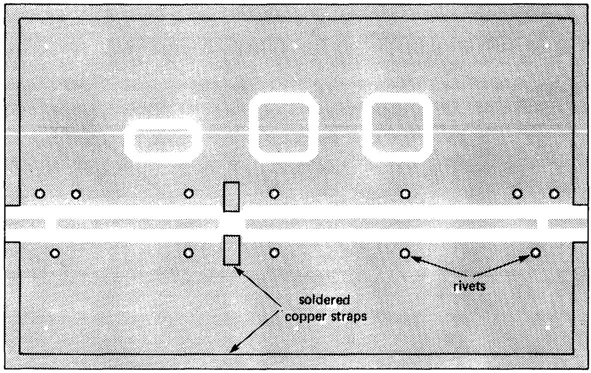
C1 = C6 = C10 = 330 pF multilayer ceramic chip capacitor
C2 = C3 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C4 = C5 = 6,8 pF multilayer ceramic chip capacitor*
C7 = 6,8 μF (63 V) electrolytic capacitor
C8 = 1,0 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
C9 = 1,2 pF multilayer ceramic chip capacitor*

L1 = 50 Ω stripline (24,0 mm x 2,4 mm)
L2 = 50 Ω stripline (8,0 mm x 2,4 mm)
L3 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L4 = L7 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L5 = 50 Ω stripline (14,0 mm x 2,4 mm)
L6 = 245 nH; 9 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5 mm; leads 2 x 3 mm
L8 = 50 Ω stripline (32,5 mm x 2,4 mm)
L9 = 50 Ω stripline (10,0 mm x 2,4 mm)

R1 = 10 Ω ± 10%; 0,25 W metal film resistor

L1, L2, L5, L8 and L9 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



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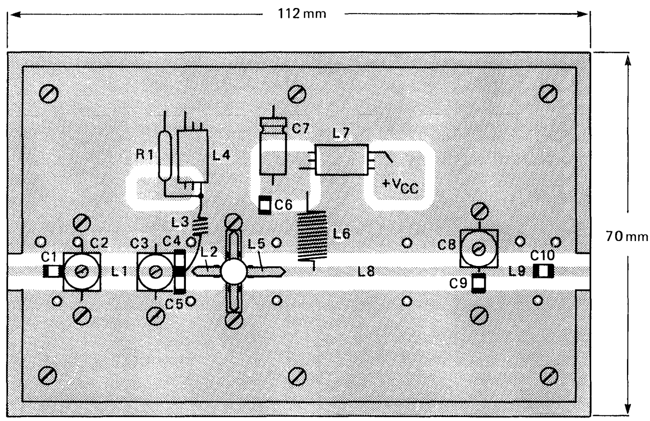

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Fig. 6 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

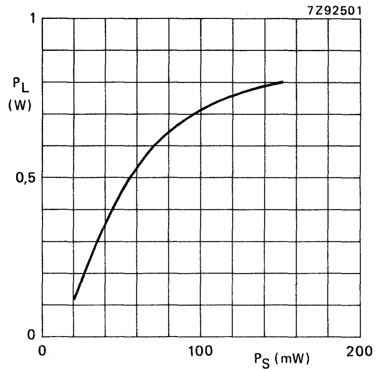


Fig. 7 Load power vs. source power.

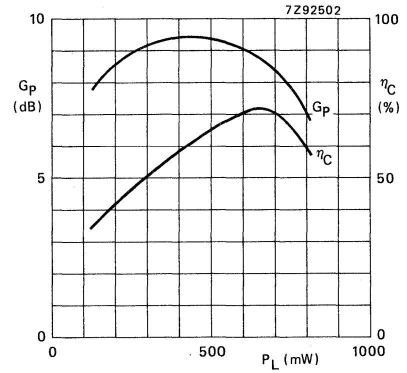


Fig. 8 Power gain and efficiency vs. load power.

Conditions for Figs 7 and 8:

V_{CE} = 12,5 V; f = 900 MHz; T_{amb} = 25 °C; class-B operation; test circuit tuned at P_L = 0,5 W; typical values.

RUGGEDNESS

The transistor is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and T_{amb} = 25 °C.

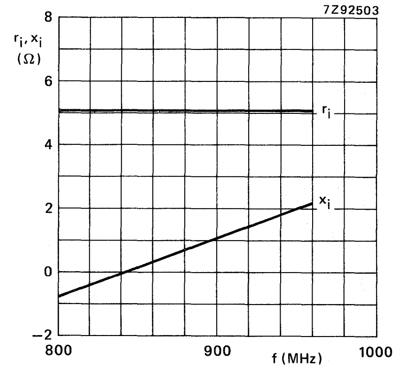


Fig. 9 Input impedance (series components).

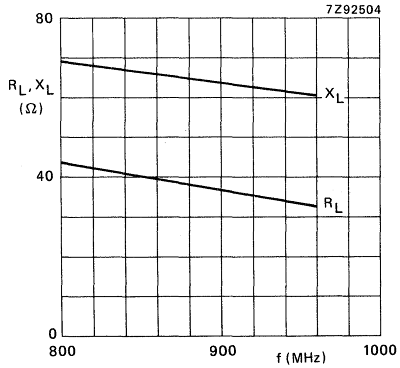


Fig. 10 Load impedance (series components).

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; P_L = 0,5 W; f = 800-960 MHz; T_{amb} = 25 °C; class-B operation; typical values.

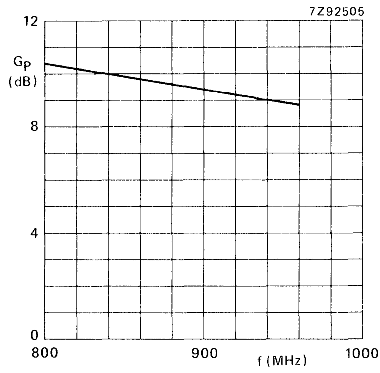


Fig. 11 Power gain vs. frequency.

V_{CE} = 12,5 V; P_L = 0,5 W; f = 800-960 MHz; T_{amb} = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the u.h.f. band. The transistor is also very suitable for application in the 900 MHz mobile radio band.

Features:

- multi-base structure and diffused emitter-ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-122). All leads are isolated from the stud.

QUICK REFERENCE DATA

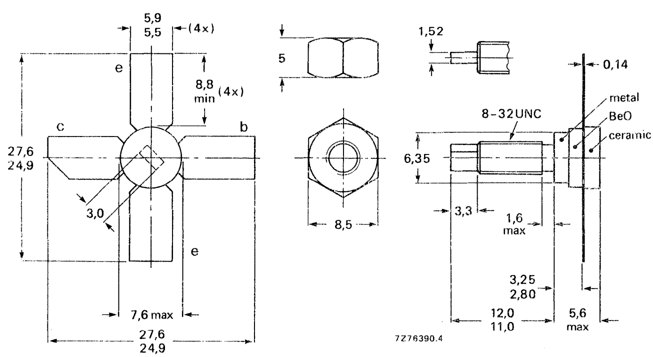
R.F. performance at $T_h = 25\ ^oC$ in a common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_c %
narrow band; c.w.	12,5	470	5	> 10,5	> 60
	12,5	900	4	typ. 7,0	typ. 60

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg.cm) max. 0,85 Nm (8,5 kg.cm)

Diameter of clearance hole in heatsink: max. 4,2 mm
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	$I_C; I_{C(AV)}$	max.	0,8 A
peak value; f > 1 MHz	I_{CM}	max.	2,5 A
→ D.C. power dissipation up to T_{mb} = 50 °C	$P_{tot\ (d.c.)}$	max.	12,5 W
R.F. power dissipation			
→ f > 1 MHz; T_{mb} = 25 °C	$P_{tot\ (r.f.)}$	max.	19 W
Storage temperature	T_{stg}	−65 to +150 °C	
Operating junction temperature	T_j	max.	200 °C

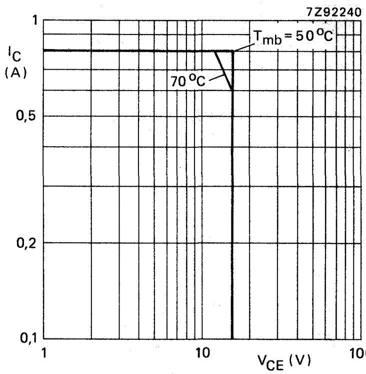


Fig. 2 D.C. SOAR.
$R_{th\ mb-h}$ = 0,6 K/W.

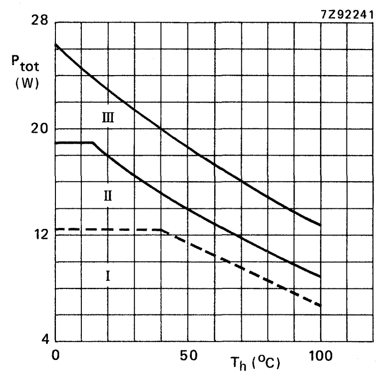


Fig. 3 Power/temperature derating curves.

I Continuous d.c. operation.
II Continuous r.f. operation (f > 1 MHz).
III Short-time r.f. pperation during mismatch; (f > 1 MHz).

THERMAL RESISTANCE (dissipation = 9 W; T_{mb} = 25 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j-mb(dc)}$	=	10 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j-mb(rf)}$	=	7,5 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 10 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 20 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	5 mA
Second breakdown energy; L = 25 mH; f = 50 Hz R_{BE} = 10 Ω	E_{SBR}	>	1 mJ
D.C. current gain** I_C = 0,6 A; V_{CE} = 10 V	h_{FE}	> typ.	25 100
Transition frequency at f = 500 MHz* I_C = 0,6 A; V_{CE} = 12,5 V	f_T	typ.	4,0 GHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 12,5 V	C_c	typ.	7,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	5 pF
Collector-stud capacitance	C_{cs}	typ.	1,2 pF ←

* Measured under pulse conditions: t_p = 50 μs; $\delta < 0,01$.
** Measured under pulse conditions: t_p = 300 μs; $\delta < 0,01$.

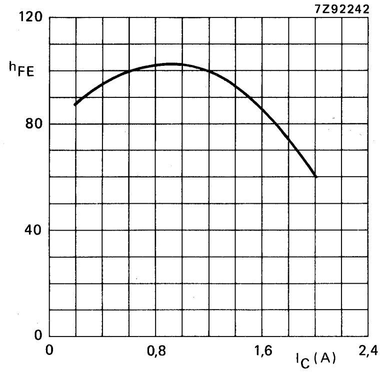


Fig. 4 V_{CE} = 10 V; T_j = 25 °C; typ. values.

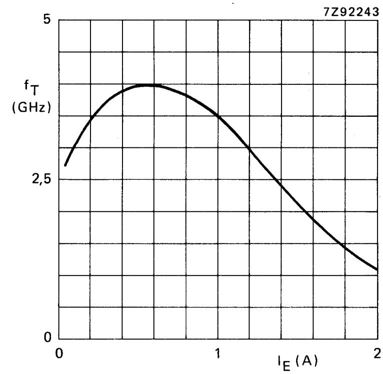


Fig. 5 V_{CB} = 12,5 V; f = 500 MHz; T_j = 25 °C; typ. values.

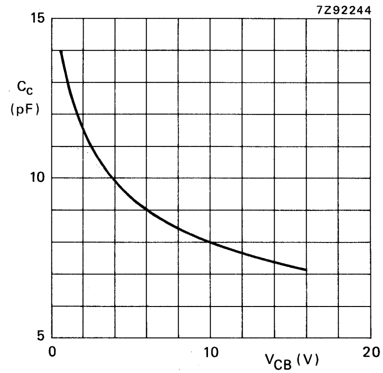


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; typ. values.

APPLICATION INFORMATION (part I)

R.F. performance in c.w. operation (common-emitter class-B circuit) at f = 470 MHz; T_h = 25 °C.

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	5	< 0,45 typ. 0,32	> 10,5 typ. 12	< 0,665 typ. 0,60	> 60 typ. 66

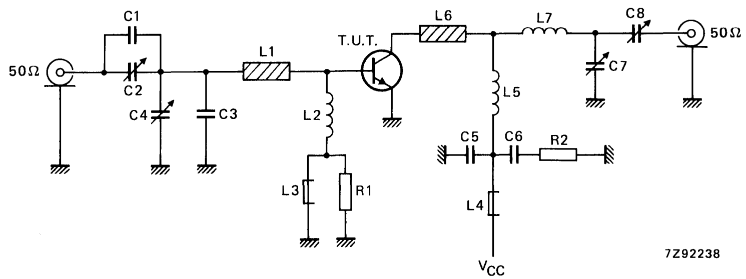


Fig. 7 Class-B test circuit at f = 470 MHz.

List of components:

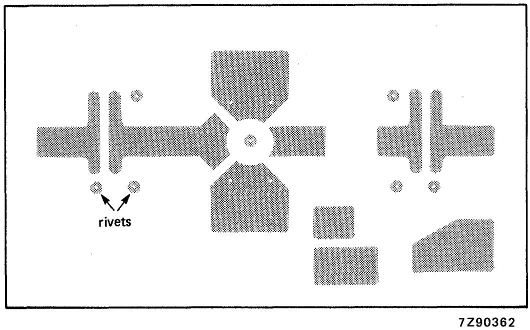
C1 = 2,7 pF multilayer ceramic chip capacitor*
C2 = C7 = C8 = 1,4-5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)
C3 = 7,5 pF multilayer ceramic chip capacitor*
C4 = 2-9 pF film dielectric trimmer (cat.no. 2222 809 09002)
C5 = 100 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13101)
C6 = 100 nF metallized fllm capacitor (cat. no. 2222 352 45104)

L1 = stripline, 22,5 mm x 6,0 mm
L2 = 1 turn Cu-wire (1,0 mm), int. dia. 5,5 mm, leads 2 x 5 mm
L3 = L4 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L5 = 4 turns enamelled Cu-wire (1,0 mm), int. dia. 6 mm, length 7,5 mm, leads 2 x 5 mm
L6 = stripline, 10,0 mm x 6,0 mm
L7 = 1 turn Cu-wire (1,0 mm), int. dia. 5 mm, leads 2 x 5 mm

R1 = R2 = 10 Ω metal film resistor, 0,25 W

L1 and L6 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74) and a thickness of 1/16 inch.

* American Technical Ceramics capacitor type 100 A or capacitor of same quality.



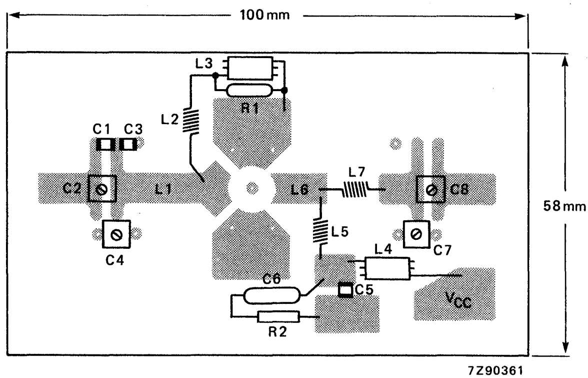


Fig. 8 Printed circuit board and component layout for 470 MHz.

The circuits and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper to serve as ground plane. Earth connections are made by hollow rivets.

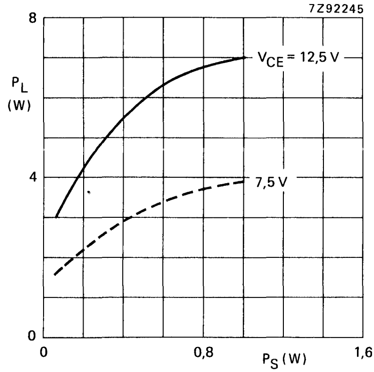


Fig. 9 Output power.

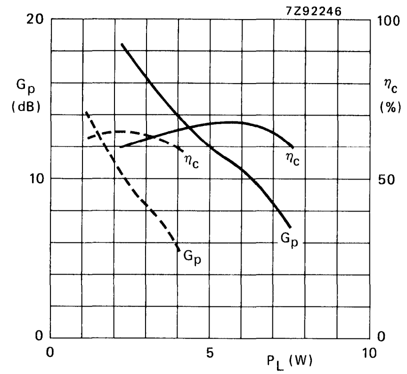


Fig. 10 Power gain and efficiency;
——— : V_{CE} = 12,5 V
– – – – : V_{CE} = 7,5 V.

Conditions for Figs 9 and 10:

f = 470 MHz; class-B operation; T_h = 25 °C; typ. values.

RUGGEDNESS:

The device is capable of withstanding a load mismatch with VSWR = 50 (all phases) up to a supply voltage of 15,5 V at rated load power.

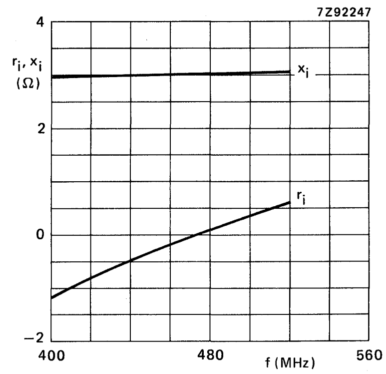


Fig. 11 Input impedance (series components).

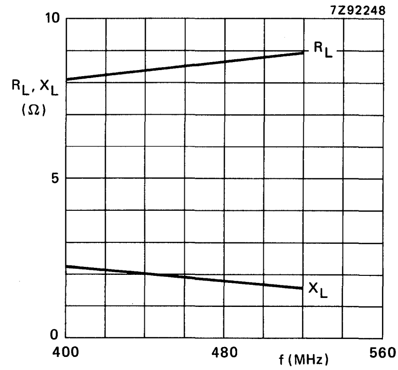


Fig. 12 Load impedance (series components).

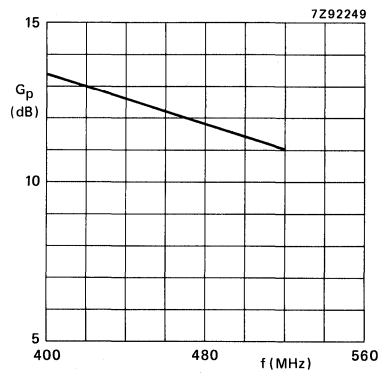


Fig. 13 Power gain.

Conditions for Figs 11, 12 and 13:
V_{CE} = 12,5 V; P_L = 5 W; T_h = 25 ^oC; f = 400-520 MHz; typical values.

APPLICATION INFORMATION (part II)

R.F. performance in c.w. operation (common-emitter class-B circuit) at f = 900 MHz; T_h = 25 °C

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	4	typ. 0,8	typ. 7,0	typ. 0,54	typ. 60

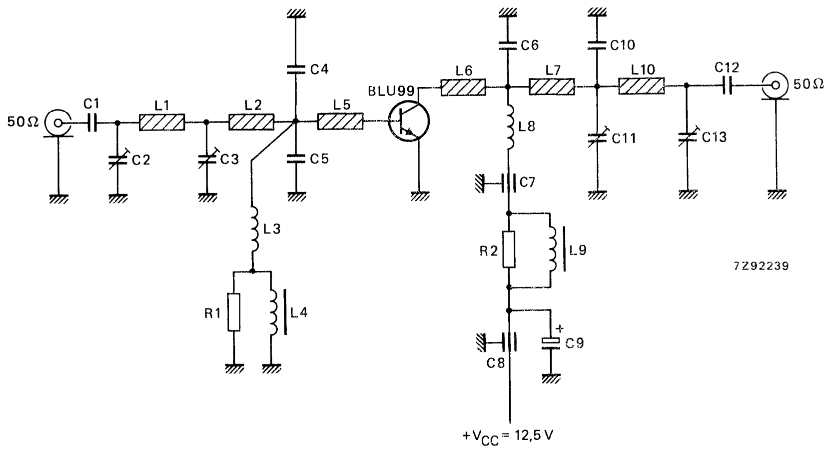


Fig. 14 Class-B test circuit at f = 900 MHz.

List of components:

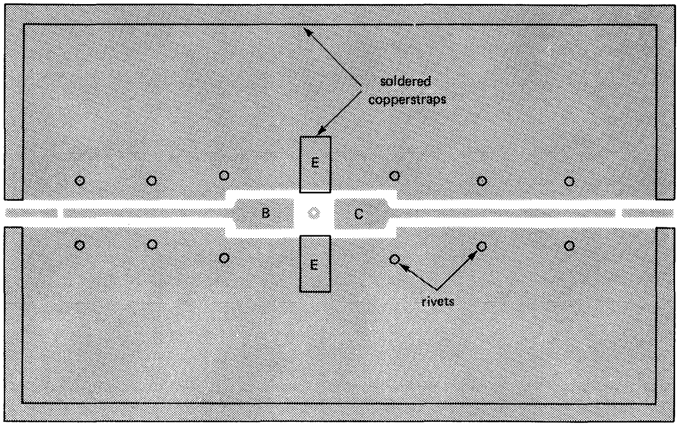
C1 = C12 = 33 pF multilayer ceramic chip capacitor*
C2 = C13 = 1,4-5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = C11 = 1,2-3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
C4 = C5 = C10 = 6,2 pF multilayer ceramic chip capacitor*
C6 = 1 pF multilayer ceramic chip capacitor*
C7 = 10 pF ceramic feed-through capacitor
C8 = 330 pF ceramic feed-through capacitor
C9 = 2,2 μF tantalum electrolytic capacitor

L1 = stripline, 21,0 mm x 1,85 mm
L2 = stripline, 5,0 mm x 1,85 mm
L3 = 60 nH, 4 turns enamelled Cu-wire (0,4 mm), close wound, int. dia. 3 mm
L4 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no 4312 020 36642)
L5 = stripline, 11,3 mm x 6,0 mm
L6 = stripline, 10,0 mm x 6,0 mm
L7 = stripline, 15,9 mm x 1,85 mm
L8 = 280 nH, 15 turns enamelled Cu-wire (0,4 mm), close wound, int. dia. 3 mm
L10 = stripline, 28,0 mm x 1,85 mm

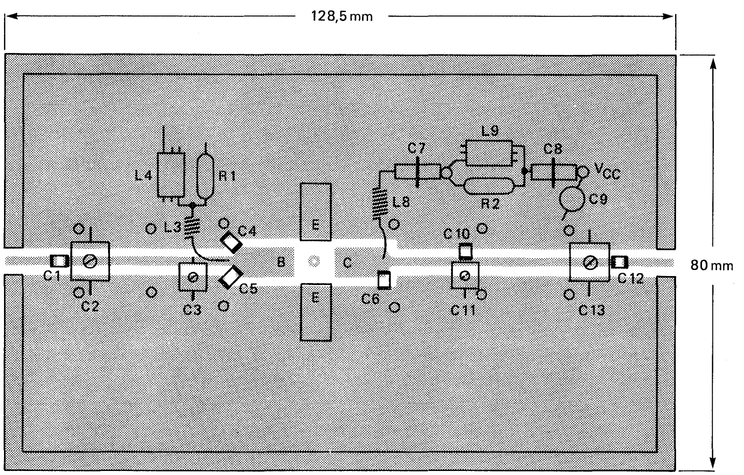
R1 = R2 = 10 Ω metal film resistor, 0,25 W

L1, L2, L5, L6, L7 and L10 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74) and thickness of 1/32 in.

* American Technical Ceramics capacitor type 100 A or capacitor of same quality.



7Z90363



7Z90364

Fig. 15 Printed circuit board and component layout for a 900 MHz test circuit.

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper to serve as a ground plane. Earth connections are made by hollow rivets and also by fixing screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

RUGGEDNESS

The device is capable of withstanding a load mismatch with VSWR = 50 (all phases) up to a supply voltage of 15,5 V at rated load power.

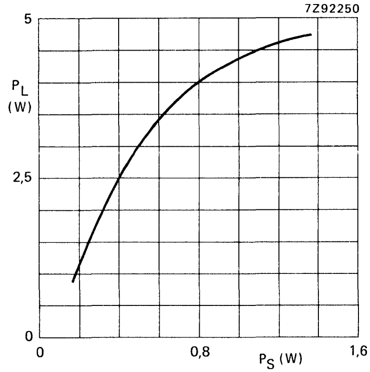


Fig. 16 Output power.

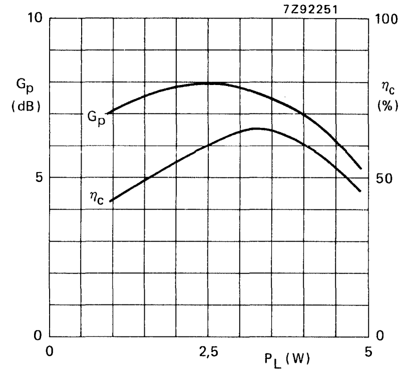


Fig. 17 Power gain and efficiency.

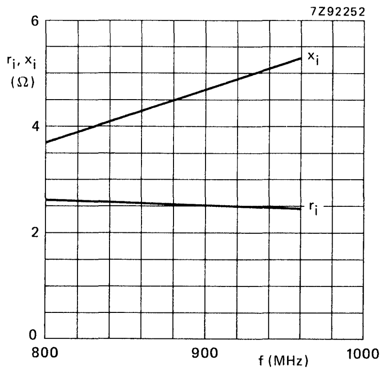


Fig. 18 Input impedance (series components).

Conditions for Figs 16 and 17:
f = 900 MHz; V_{CE} = 12,5 V; class-B operation;
T_h = 25 °C; typ. values.

Conditions for Figs 18 and 19:
f = 800-960 MHz; V_{CE} = 12,5 V; P_L = 4 W;
T_h = 25 °C; typ. values.

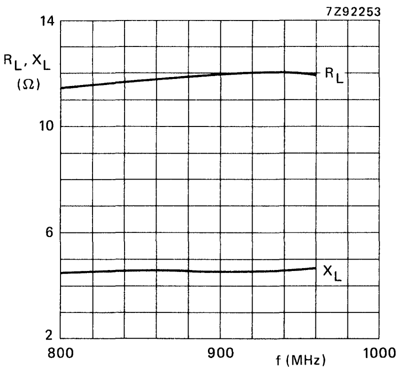


Fig. 19 Load impedance (series components).

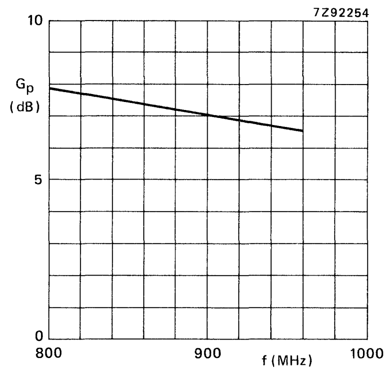


Fig. 20 Power gain.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

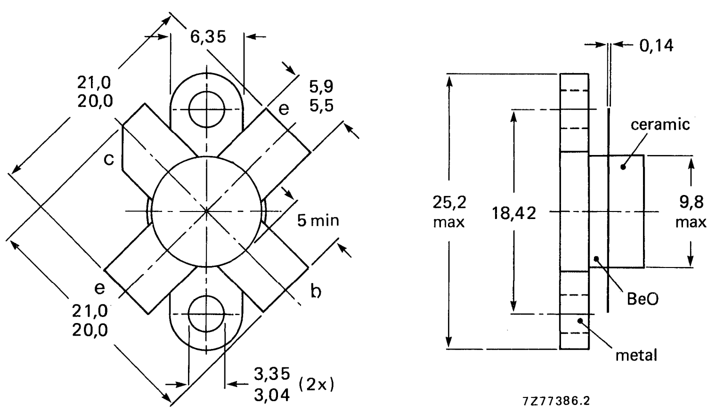
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

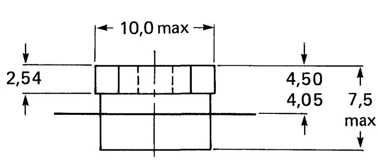
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**8**	**> 9,0**	**> 70**	**2,8 + j1,2**	**76 − j16**
c.w.	12,5	175	8	typ. 10,5	typ. 75	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	1,5 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	4,0 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	20 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

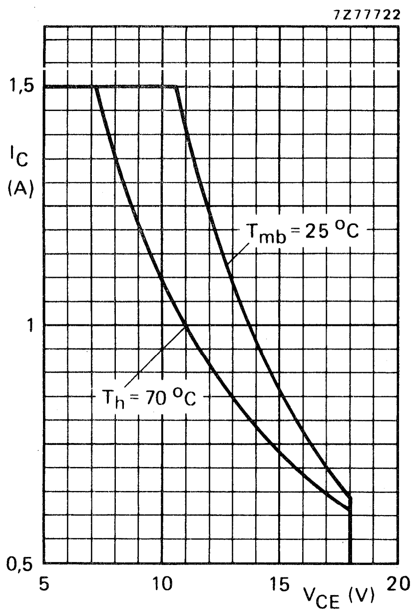


Fig. 2 D.C. SOAR.

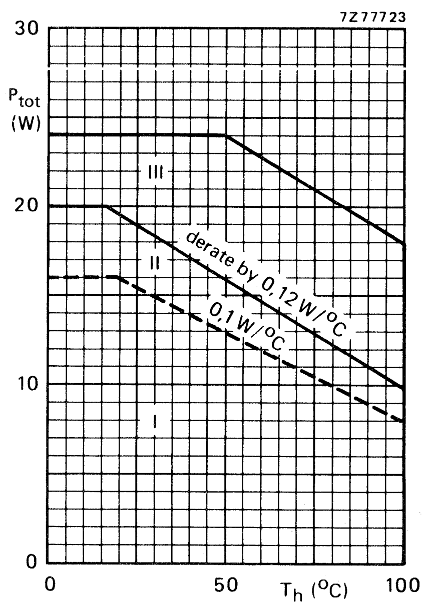


Fig. 3 R.F. power dissipation; $V_{CE} \leq 16,5$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 8 W; T_{mb} = 72,4 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	10,7 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	2 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5 mJ
D.C. current gain * $I_C = 0,75$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40 10 to 100
Collector-emitter saturation voltage * $I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,85 V
Transition frequency at f = 100 MHz * $-I_E = 0,75$ A; $V_{CB} = 13,5$ V	f_T	typ.	950 MHz
$-I_E = 2$ A; $V_{CB} = 13,5$ V	f_T	typ.	850 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	16,5 pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	12 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

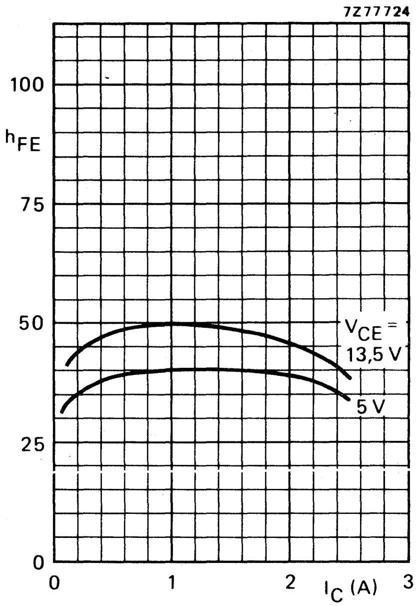


Fig. 4 Typical values; T_j = 25 °C.

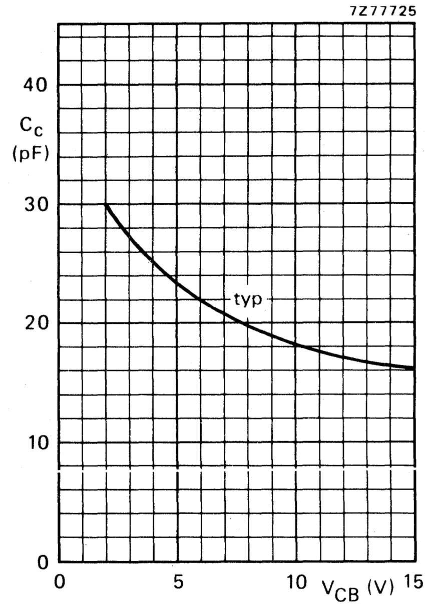


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

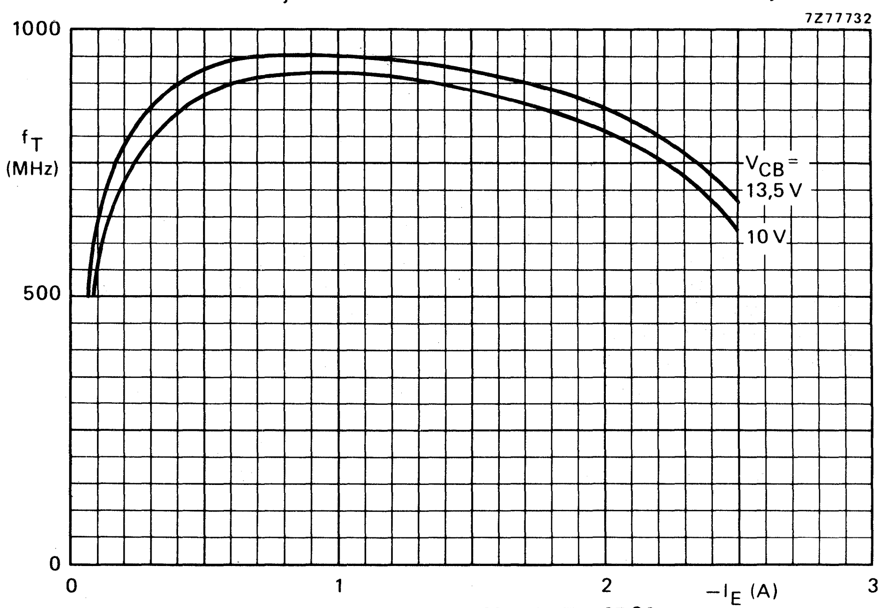


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**8**	**< 1,0**	**> 9,0**	**< 0,85**	**> 70**	**2,8 + j1,2**	**76 – j16**
175	12,5	8	–	typ. 10,5	–	typ. 75	–	–

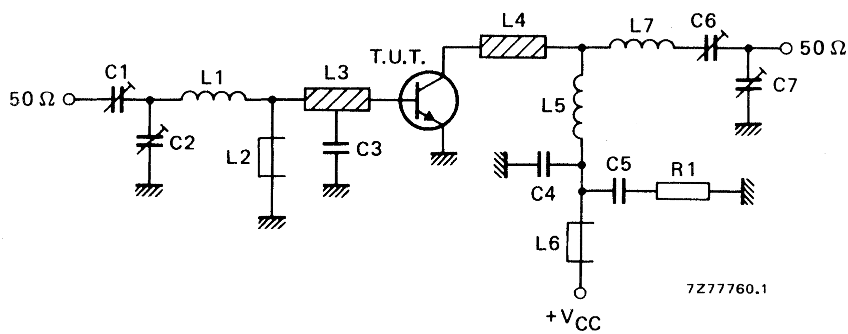


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm
L2 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L5 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm
L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

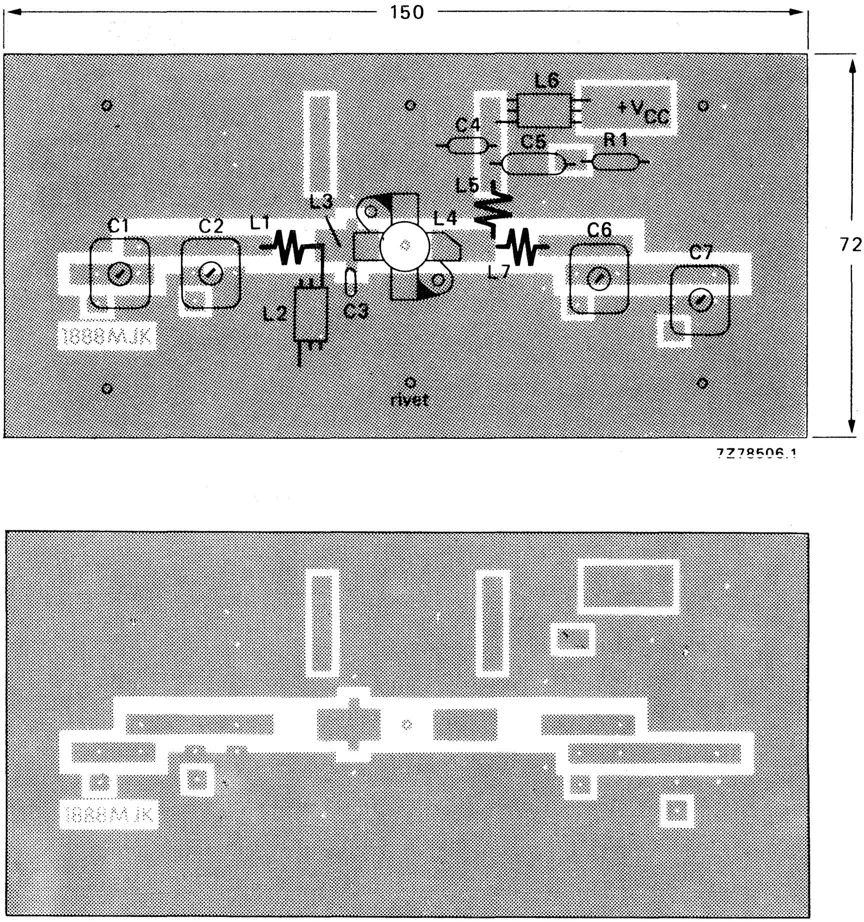


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

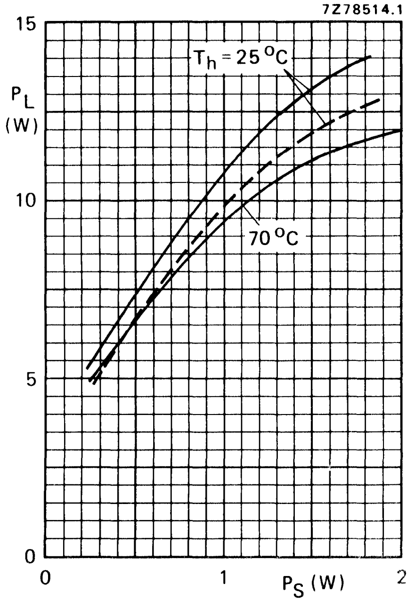


Fig. 9 Typical values; f = 175 MHz;
——— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

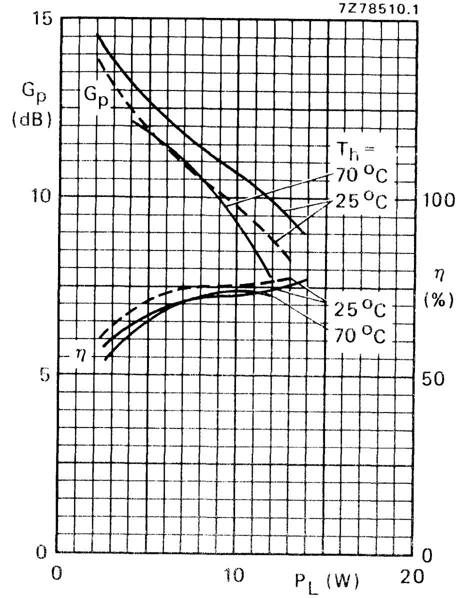


Fig. 10 Typical values; f = 175 MHz;
——— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

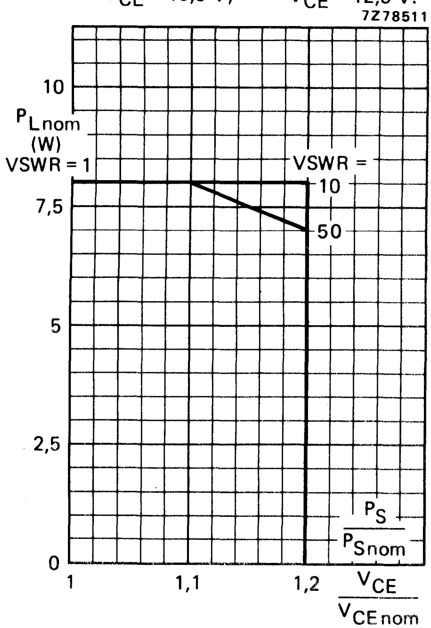


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\,mb-h}$ = 0,3 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

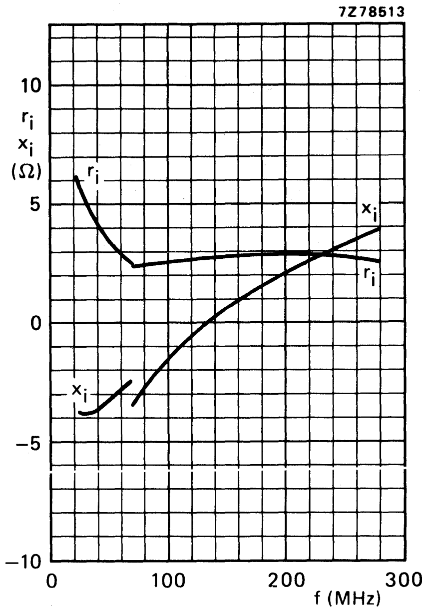


Fig. 12 Input impedance (series components).

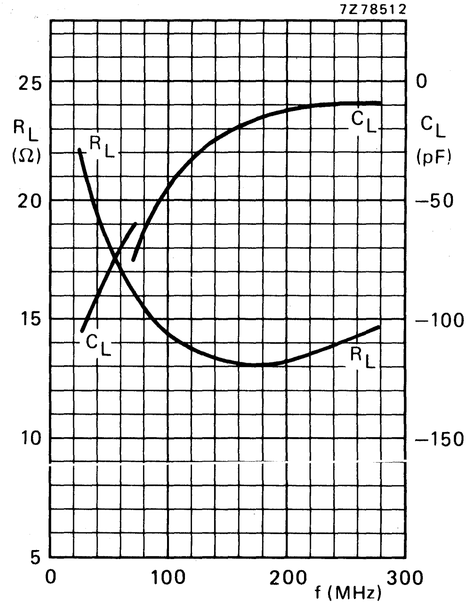


Fig. 13 Load impedance (parallel components).

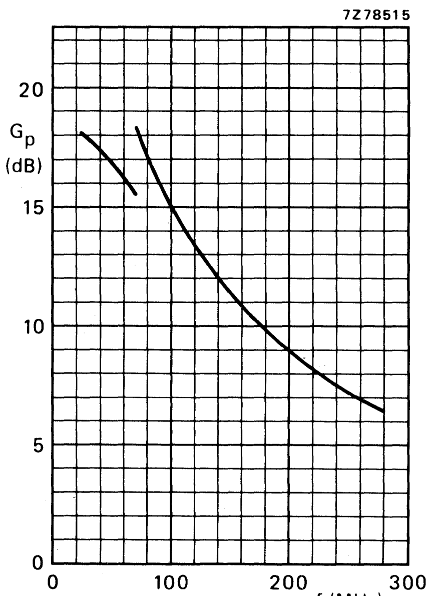


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 8 W; T_h = 25 °C.

OPERATING NOTE

Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

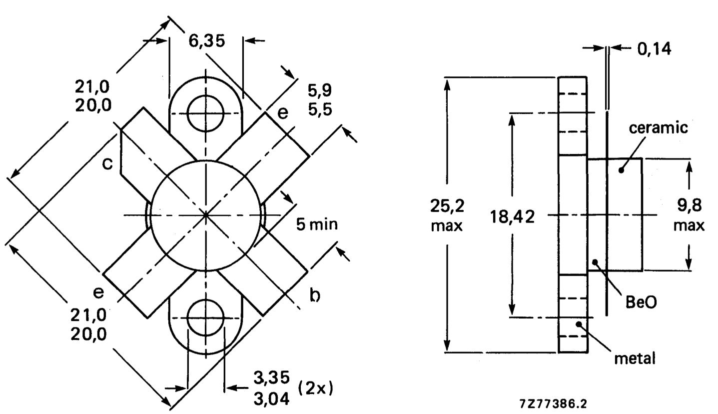
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

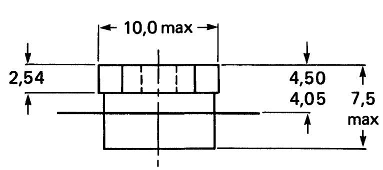
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**15**	**> 8,0**	**> 60**	**2,3 + j2,2**	**130 − j4,4**
c.w.	12,5	175	15	typ. 7,5	typ. 67	−	−

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	3 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	8 A
R.F. power dissipation (f > 1 MHz); $T_{mb} = 25\ ^oC$	P_{rf}	max.	36 W
Storage temperature	T_{stg}	−65 to + 150	^oC
Operating junction temperature	T_j	max.	200 ^oC

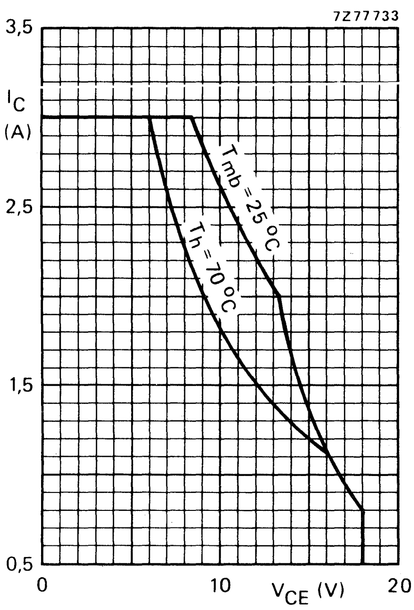


Fig. 2 D.C. SOAR.

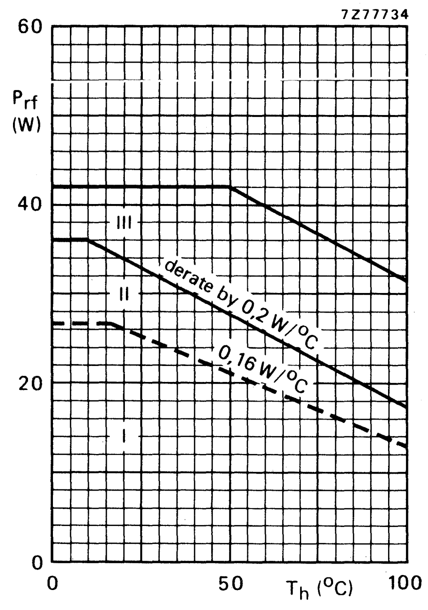


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16,5$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; $T_{mb} = 74,5\ ^oC$, i.e. $T_h = 70\ ^oC$)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	6,55 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	4,95 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage				
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage				
open collector; $I_E = 4$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	2,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2,5	mJ
D.C. current gain *				
$I_C = 1{,}5$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40	
			10 to 100	
Collector-emitter saturation voltage *				
$I_C = 4{,}5$ A; $I_B = 0{,}9$ A	V_{CEsat}	typ.	1,0	V
Transition frequency at f = 100 MHz *				
$-I_E = 1{,}5$ A; $V_{CB} = 13{,}5$ V	f_T	typ.	850	MHz
$-I_E = 4{,}5$ A; $V_{CB} = 13{,}5$ V	f_T	typ.	800	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 13{,}5$ V	C_c	typ.	32	pF
Feedback capacitance at f = 1 MHz				
$I_C = 200$ mA; $V_{CE} = 13{,}5$ V	C_{re}	typ.	23	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.

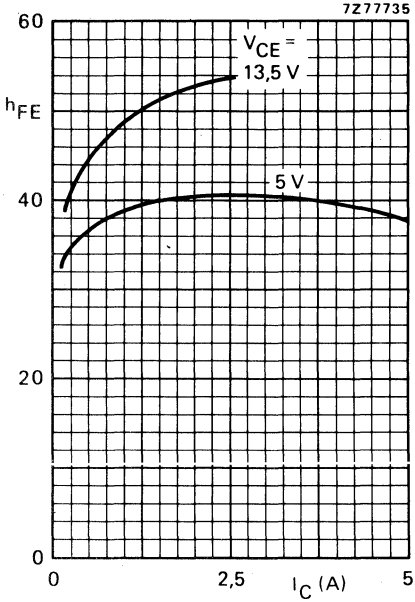


Fig. 4 Typical values; T_j = 25 °C.

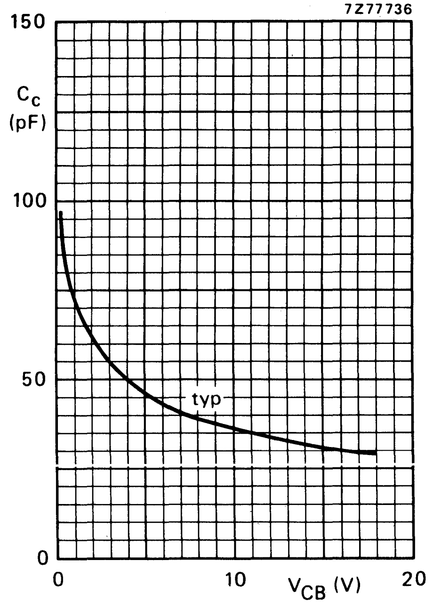


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

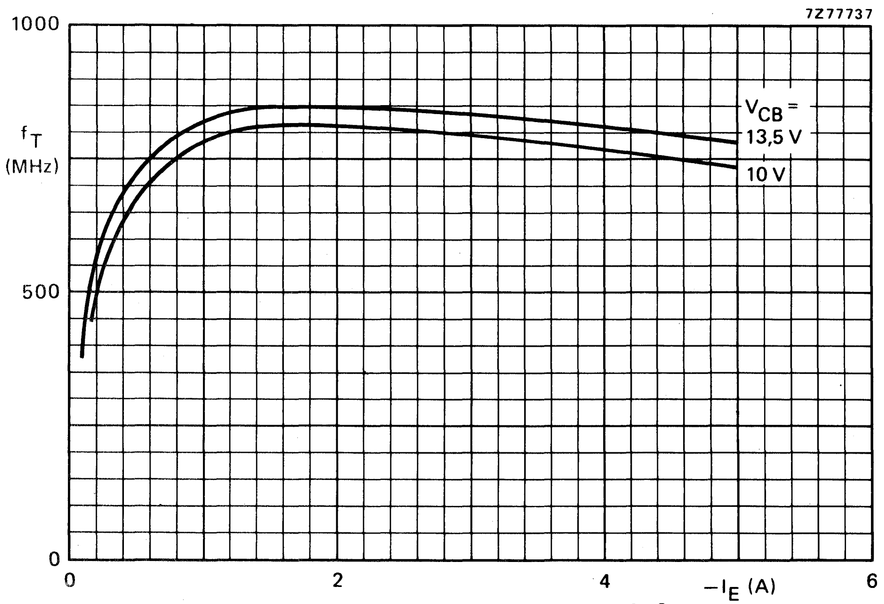


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C .

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**15**	**< 2,4**	**> 8,0**	**< 1,85**	**> 60**	**2,3 + j2,2**	**130 – j4,4**
175	12,5	15	–	typ. 7,5	–	typ. 67	–	–

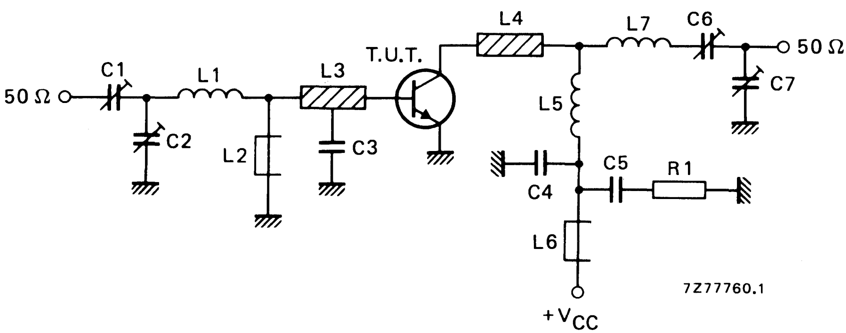


Fig. 7 Test circuit; c.w. class-B.

List of components:

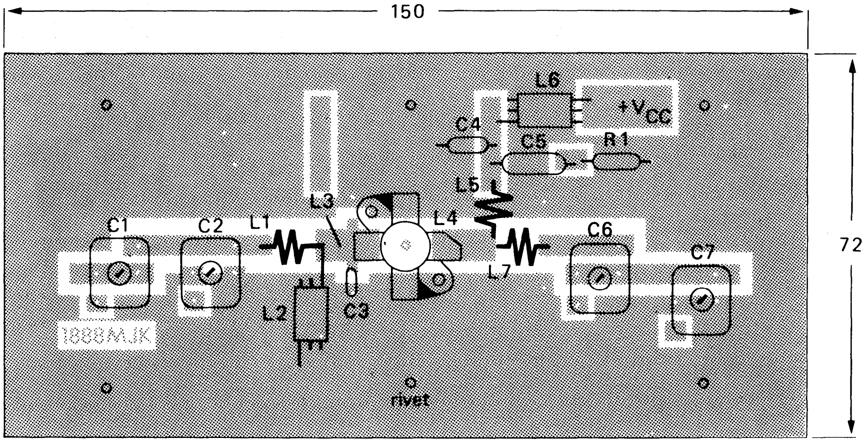
C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm
L2 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L5 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm
L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



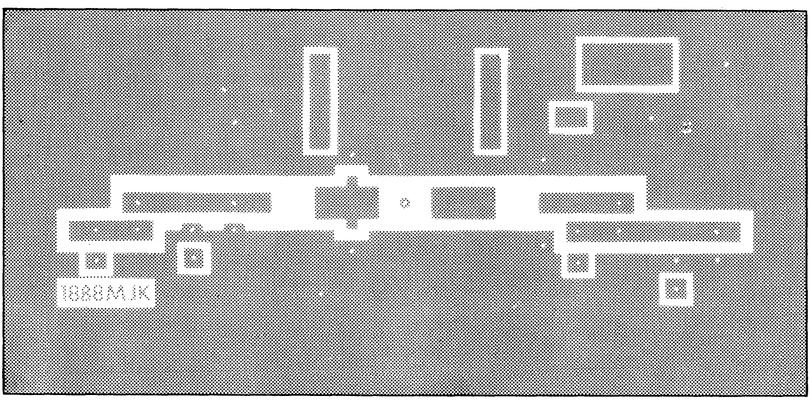


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

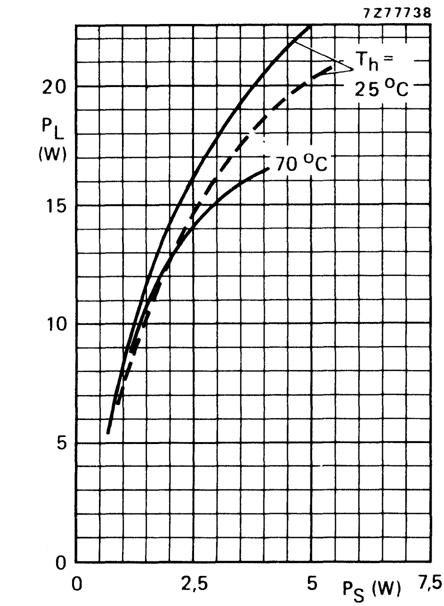


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

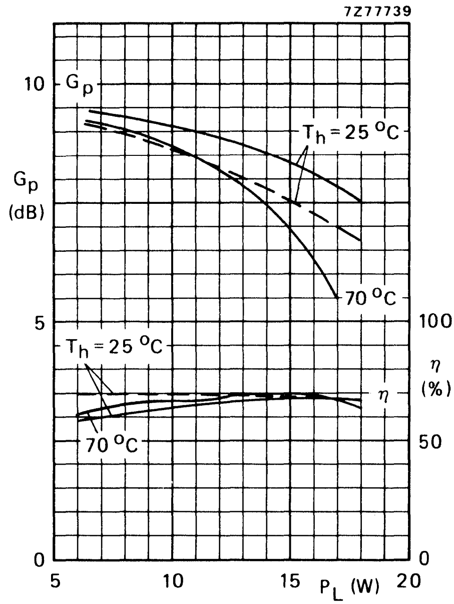


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

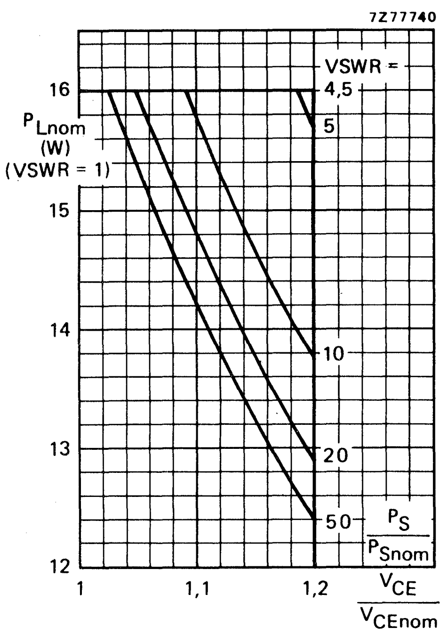


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,3 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

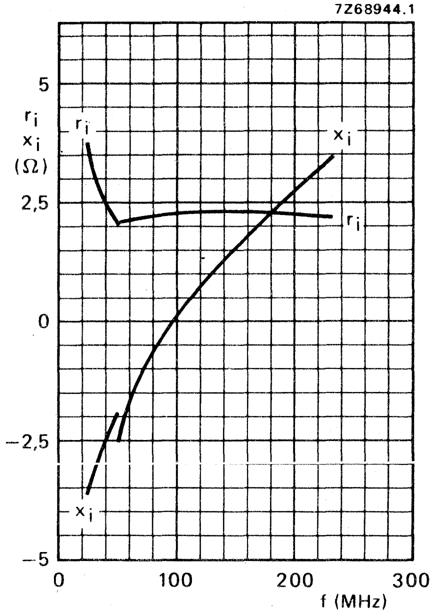


Fig. 12 Input impedance (series components).

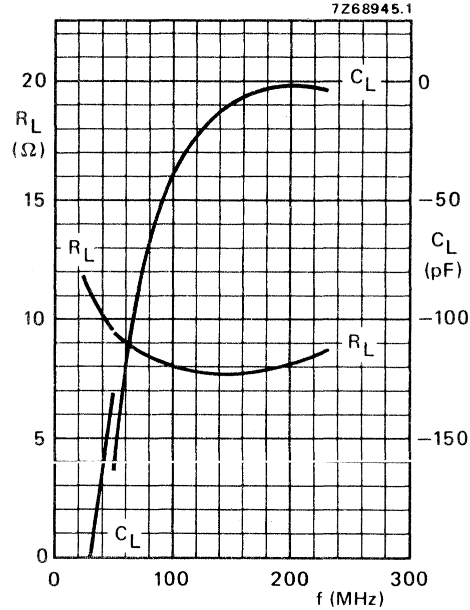
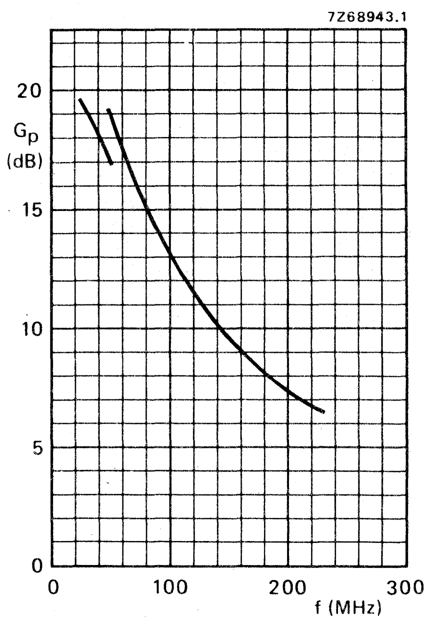


Fig. 13 Load impedance (parallel components).



Conditions for Figs 12, 13 and 14:

Typical values: V_{CE} = 13,5 V; P_L = 15 W; T_h = 25 °C.

OPERATING NOTE

Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation.
This resistor must be effective for r.f. only.

Fig. 14.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

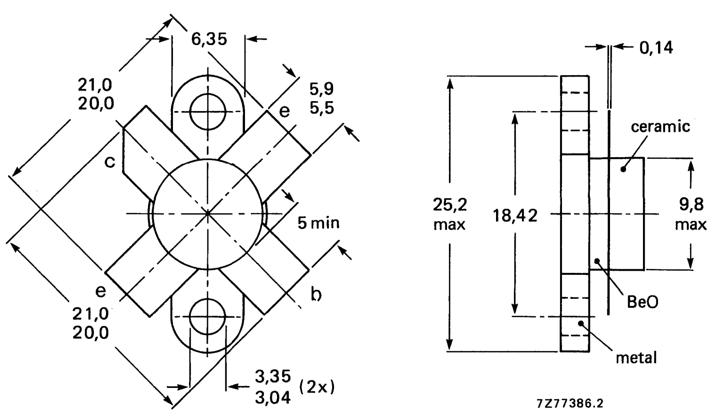
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

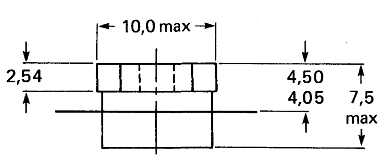
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	8	> 12	> 65	1,8 + j0,7	18 – j20

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	36 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	0,9 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	2,5 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	20 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

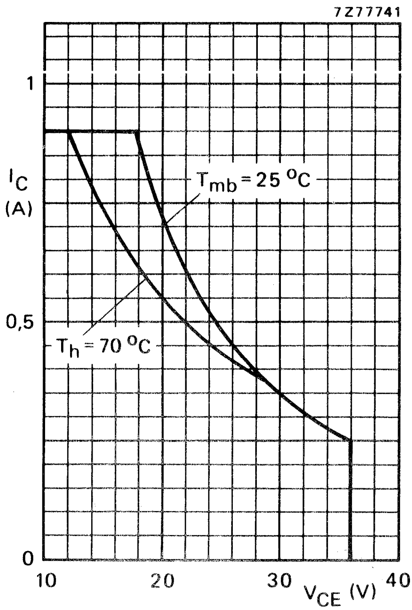


Fig. 2 D.C. SOAR.

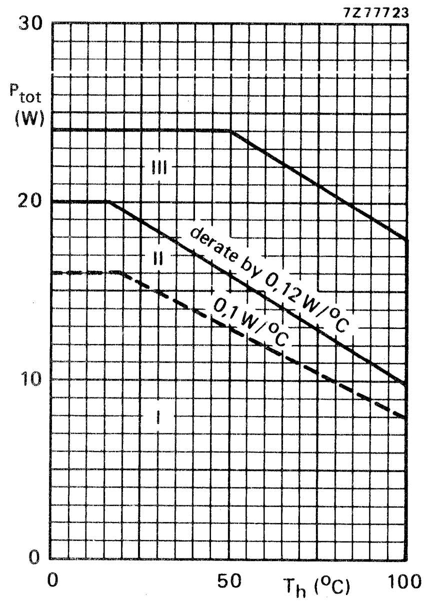


Fig. 3 R.F. power dissipation; V_{CE} ≤ 28 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 8 W; T_{mb} = 72,4 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	10,7 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 2 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; I_C = 10 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	1	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	0,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	0,5	mJ
D.C. current gain *				
I_C = 0,4 A; V_{CE} = 5 V	h_{FE}	typ.	50	
			10 to 100	
Collector-emitter saturation voltage *				
I_C = 1,25 A; I_B = 0,25 A	V_{CEsat}	typ.	0,8	V
Transition frequency at f = 100 MHz *				
$-I_E$ = 0,4 A; V_{CB} = 28 V	f_T	typ.	600	MHz
$-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	520	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	10	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 28 V	C_{re}	typ.	7,1	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.

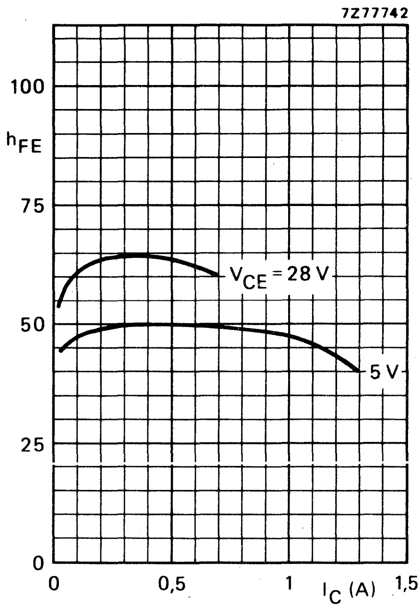


Fig. 4 Typical values; T_j = 25 °C.

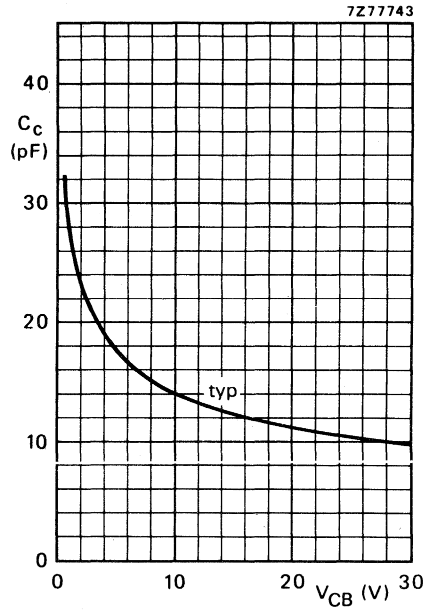


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

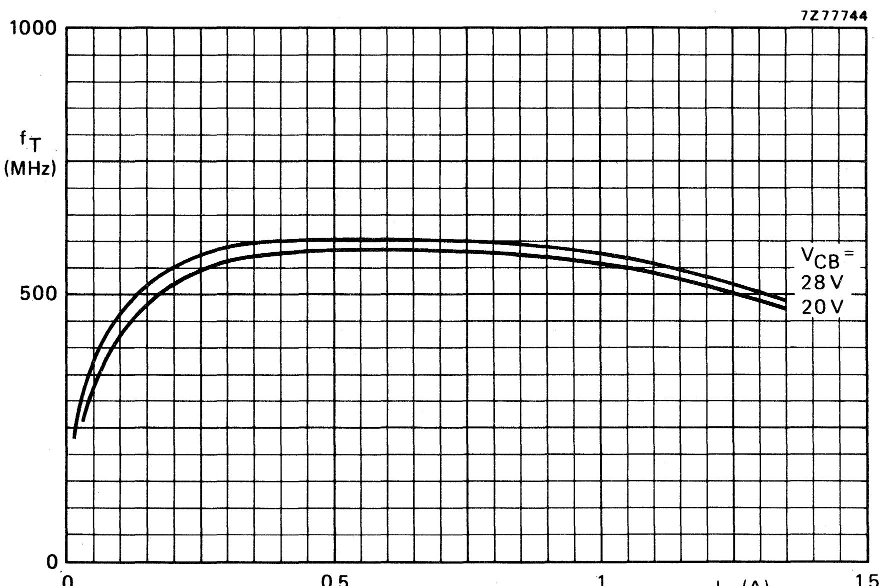


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	8	< 0,5	> 12	< 0,44	> 65	1,8 + j0,7	18 – j20

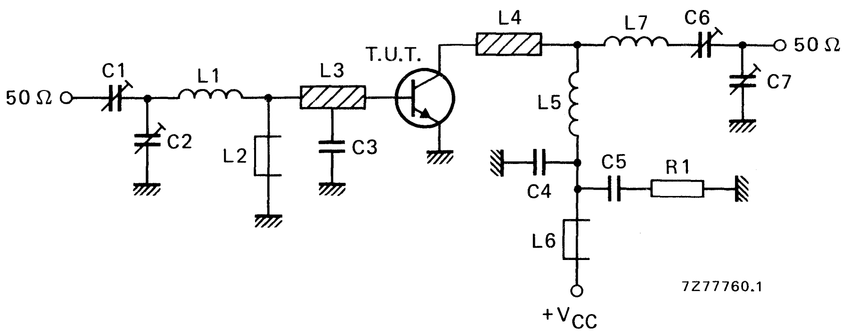


Fig. 7 Test circuit; c.w. class-B.

List of components:

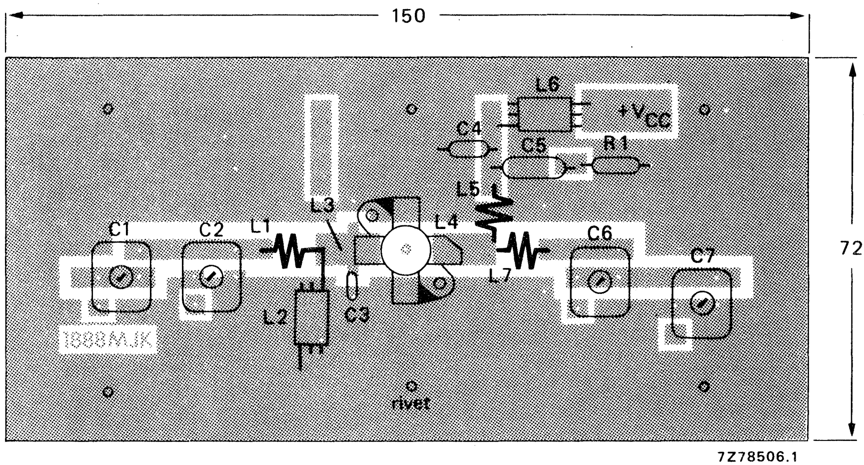
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3 = 27 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L6 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



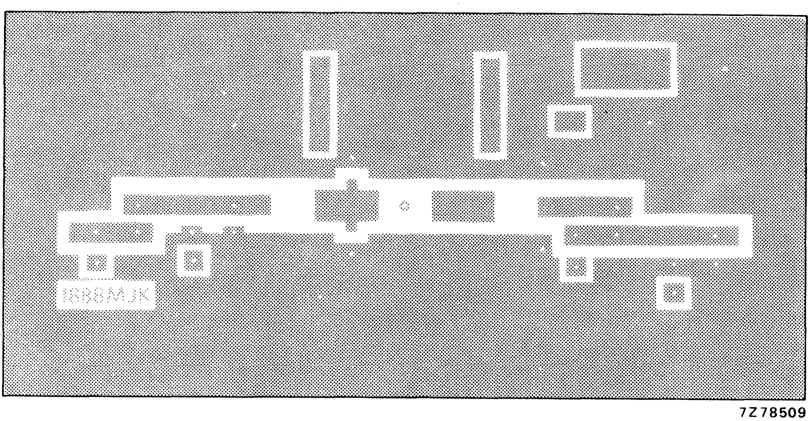


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

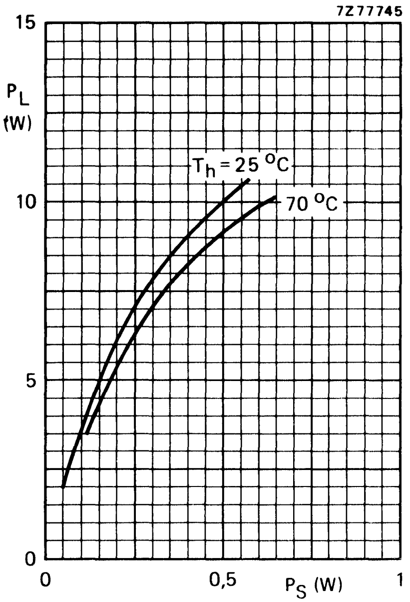


Fig. 9 Typical values; V_{CE} = 28 V; f = 175 MHz.

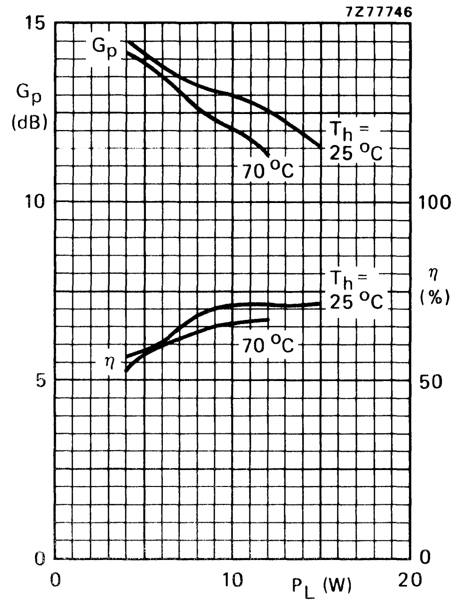


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

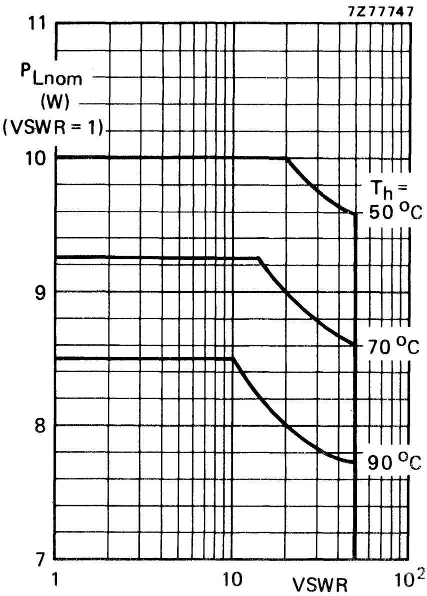


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,3 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

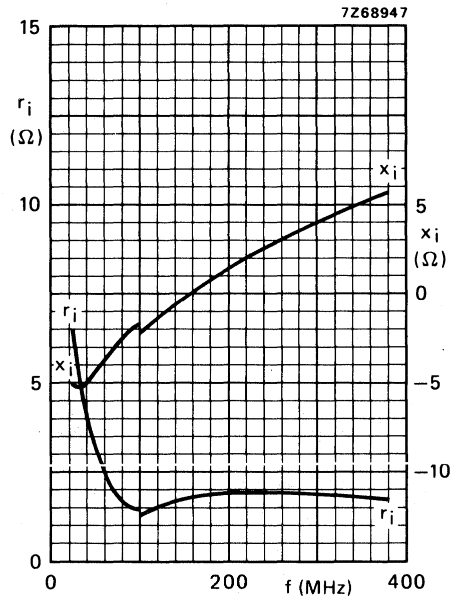


Fig. 12 Input impedance (series components).

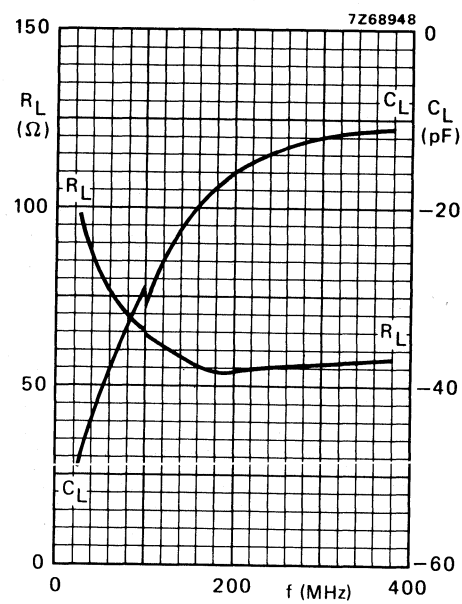


Fig. 13 Load impedance (parallel components).

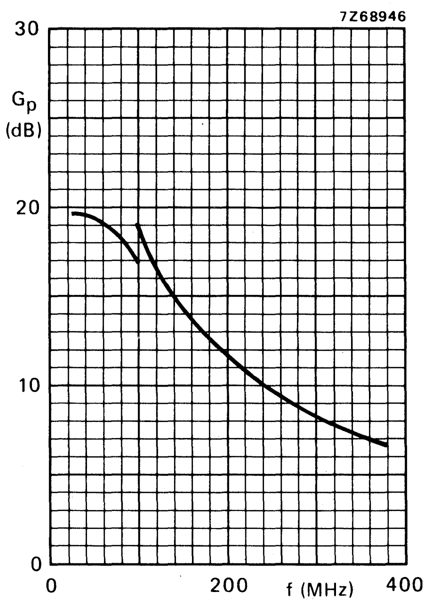


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; V_{CE} = 28 V; P_L = 8 W;
T_h = 25 °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation.
This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

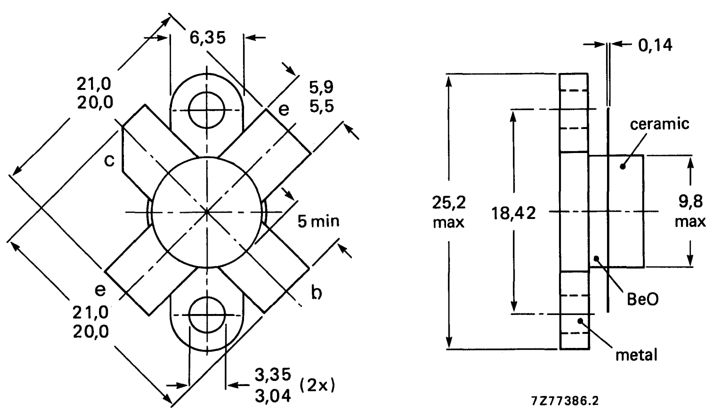
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

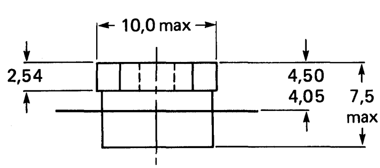
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	15	> 10	> 65	1,4 + j1,85	33 – j27,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	1,75	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	5,0	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	36	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

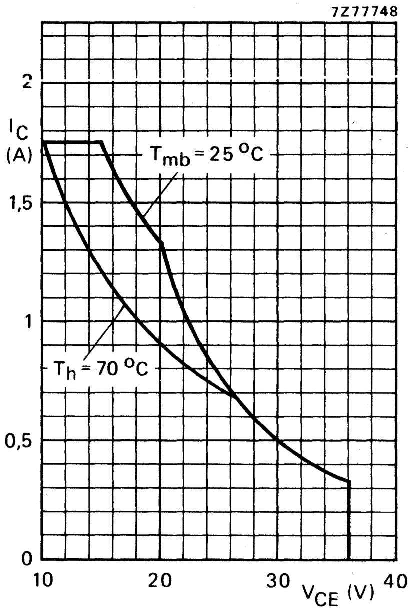


Fig. 2 D.C. SOAR.

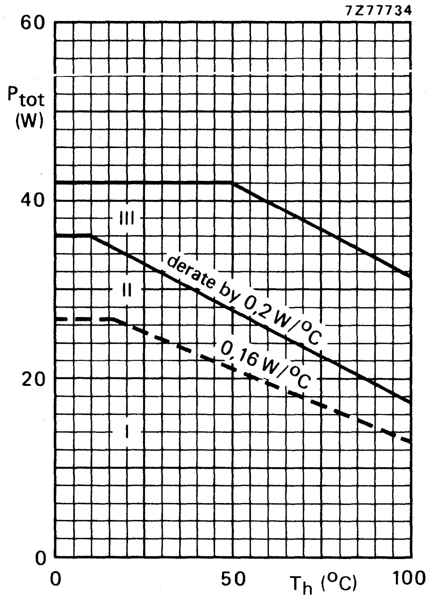


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; T_{mb} = 74,5 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	6,55	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	4,95	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage open collector; $I_E = 2$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	2,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2,5	mJ
D.C. current gain * $I_C = 0,7$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50	
			10 to 100	
Collector-emitter saturation voltage * $I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,65	V
Transition frequency at f = 100 MHz * $-I_E = 0,7$ A; $V_{CB} = 28$ V	f_T	typ.	650	MHz
$-I_E = 2$ A; $V_{CB} = 28$ V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	18	pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 28$ V	C_{re}	typ.	12,8	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

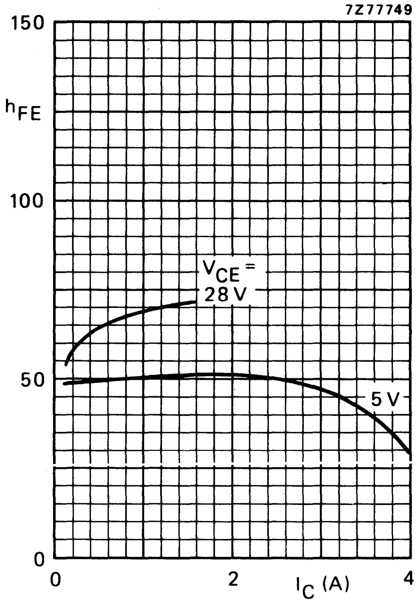


Fig. 4 Typical values; T_j = 25 °C.

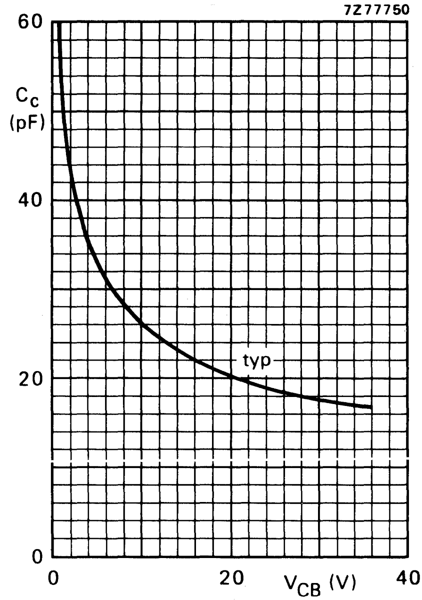


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

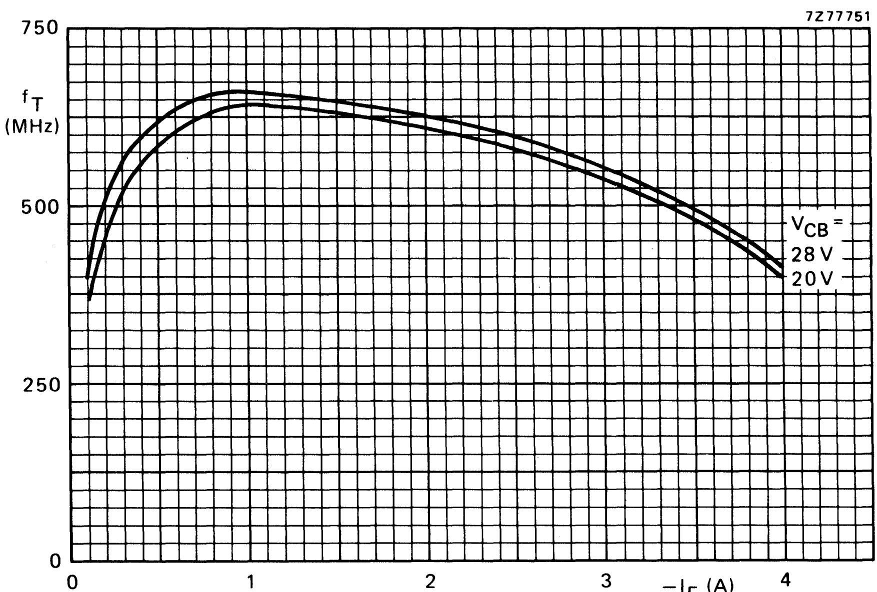


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	15	< 1,5	> 10	< 0,83	> 65	1,4 + j1,85	33 − j27,5

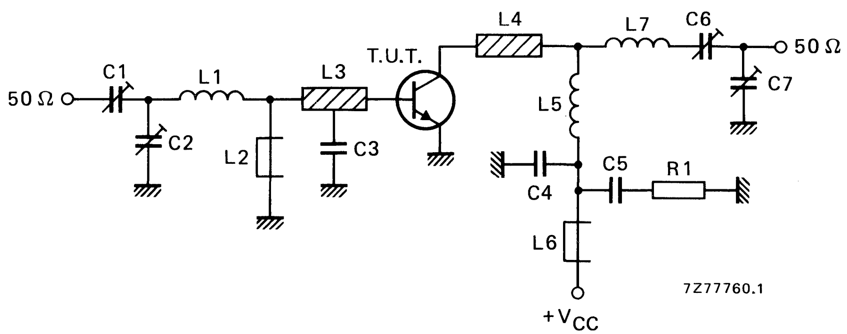


Fig. 7 Test circuit; c.w. class-B.

List of components:

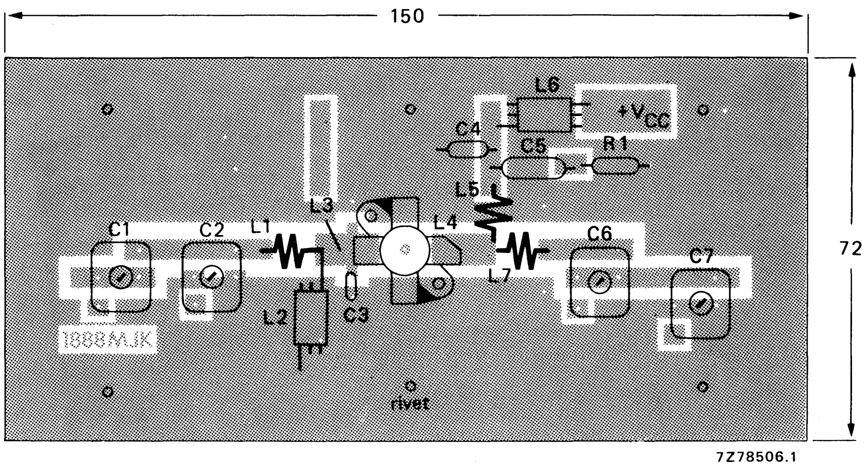
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3 = 27 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L6 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



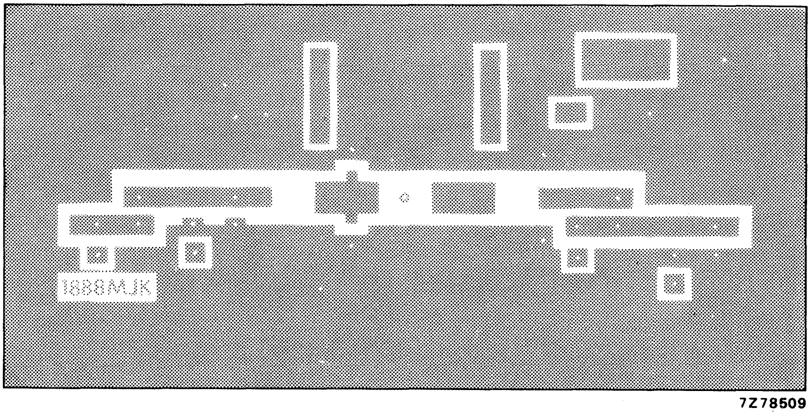


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

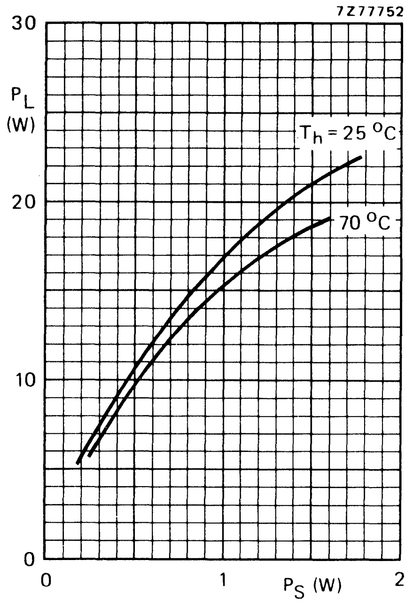


Fig. 9 Typical values; V_{CE} = 28 V;
f = 175 MHz.

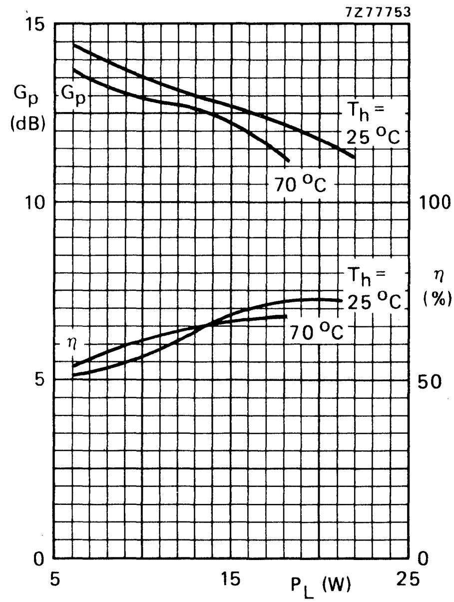


Fig. 10 Typical values; V_{CE} = 28 V;
f = 175 MHz.

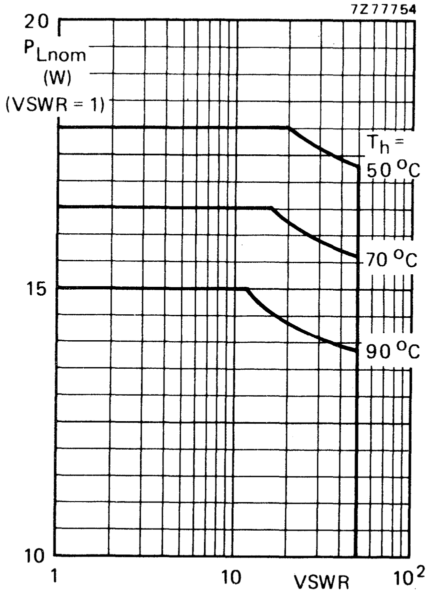


Fig. 11 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,3 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

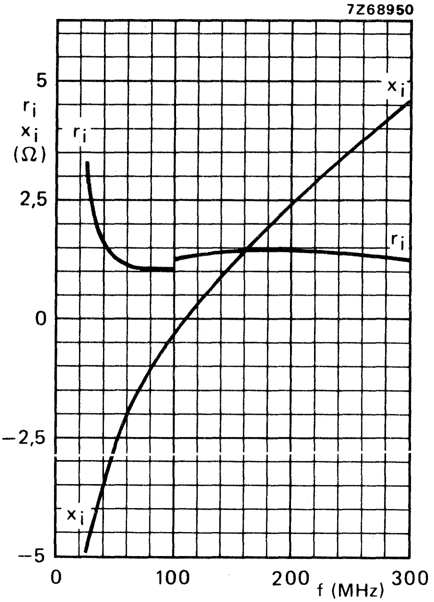


Fig. 12 Input impedance (series components).

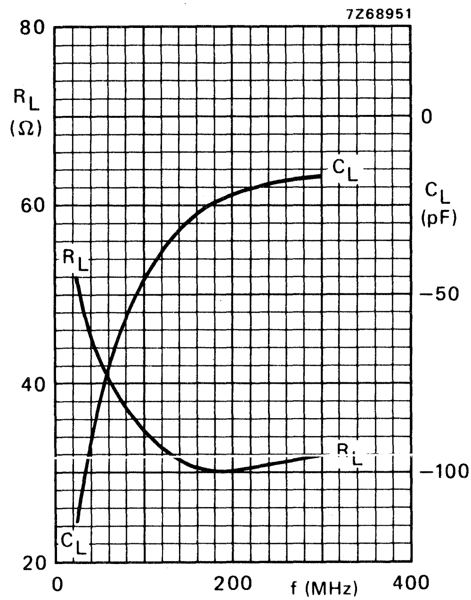


Fig. 13 Load impedance (parallel components).

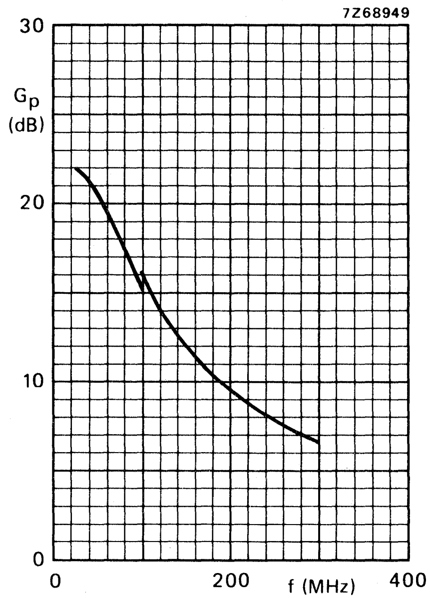


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; V_{CE} = 28 V; P_L = 15 W; T_h = 25 °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation.
This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily for use in v.h.f.-f.m. broadcast transmitters.

Features:

- internally matched input for wideband operation and high power gain;
- multi-base structure and diffused emitter ballasting resistors for an optimum temperature profile;
- gold-metallization ensures excellent reliability.

The transistor has a ½in 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit.

mode operation	V_{CE} V	f MHz	P_L W	P_S W	G_p dB	η %
narrow band; c.w.	28	108	175	< 17,5	> 10,0	> 65

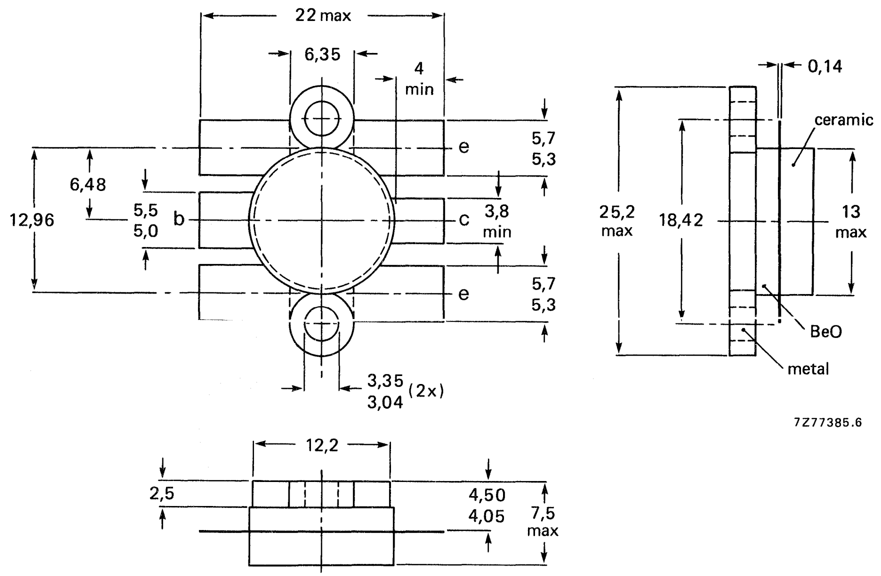
MECHANICAL DATA

SOT-119 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

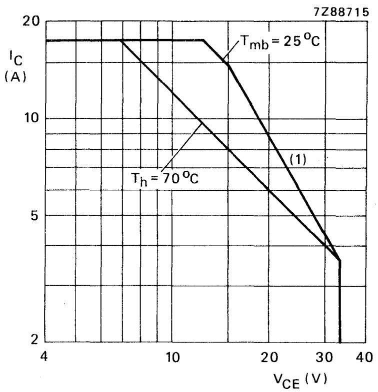
Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	17,5	A
(peak value); f > 1 MHz	I_{CM}	max.	35	A
Total power dissipation at T_{mb} = 25 °C	$P_{tot\ (d.c.)}$	max.	220	W
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	$P_{tot\ (r.f.)}$	max.	270	W
R.F. power dissipation (f > 1 MHz); T_h = 70 °C	$P_{tot\ (r.f.)}$	max.	146	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

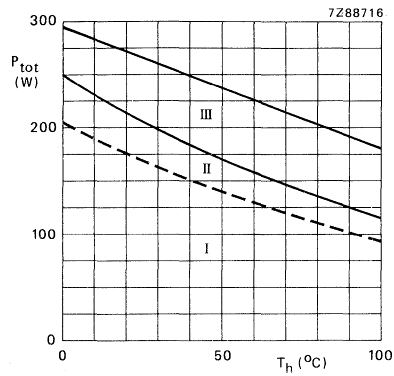


Fig. 3 Power derating curves vs. temperature.

I Continuous d.c. operation
II Continuous r.f. operation (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz).

THERMAL RESISTANCE (dissipation = 150 W; T_{mb} = 72 °C, i.e. T_h = 42 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	max	0,85	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	max	0,60	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max	0,2	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	65 V
open base; I_C = 200 mA	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 33 V	I_{CES}	<	25 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	20 mJ
R_{BE} = 10 Ω	E_{SBR}	>	20 mJ
D.C. current gain*			
I_C = 8,5 A; V_{CE} = 25 V	h_{FE}	typ.	50
			15 to 100
Collector-emitter saturation voltage*			
I_C = 20 A; I_B = 4,0 A	V_{CEsat}	typ.	1,6 V
Transition frequency at f = 100 MHz**			
$-I_E$ = 8,5 A; V_{CB} = 25 V	f_T	typ.	600 MHz
$-I_E$ = 20 A; V_{CB} = 25 V	f_T	typ.	600 MHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	275 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 25 V	C_{re}	typ.	155 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

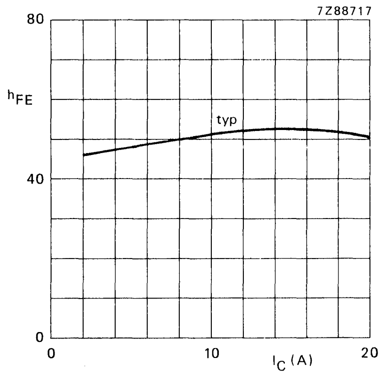


Fig. 4 V_{CE} = 25 V; T_j = 25 °C.

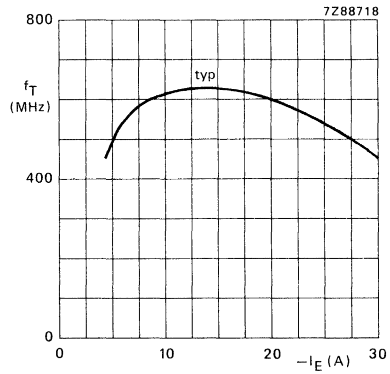


Fig. 5 V_{CB} = 25 V; f = 100 MHz; T_j = 25 °C.

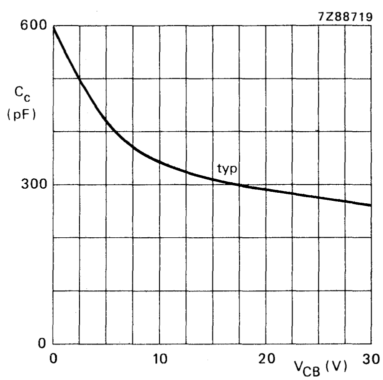


Fig. 6 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in narrow band c.w. operation (common-emitter class-B circuit) T_h = 25 °C

f MHz	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η %
108	28	175	< 17,5 typ. 13,9	> 10,0 typ. 11,0	< 9,6 typ. 8,9	> 65 typ. 70

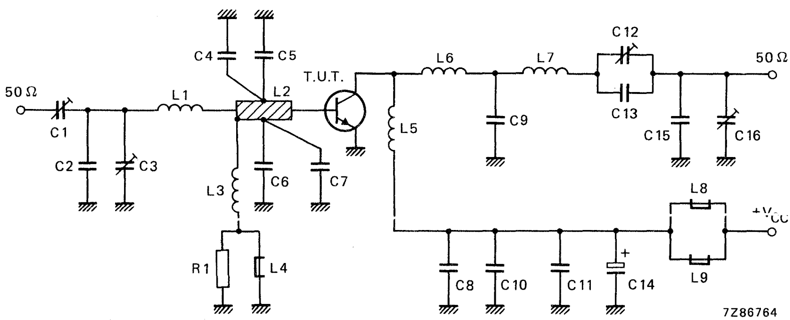


Fig. 7 Class-B test circuit at f = 108 MHz.

List of components

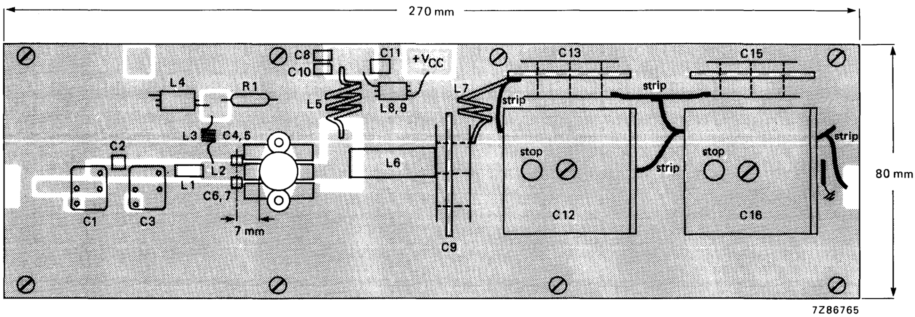
C1 = C3 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)
C2 = C4 = C5 = C6 = C7 = 100 pF (500 V) multilayer ceramic chip capacitor (ATC▲); except for C2 these capacitors are placed 7 mm from transistor edge
C8 = C10 = 470 pF multilayer ceramic chip capacitor (cat. no. 2222 856 13471)
C9 = C15 = 40 pF, parallel connection of 4 x 10 pF lead feed-through capacitors (cat. no. 2222 702 05109)
C11 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 852 59104)
C12 = C16 = 7 to 47 pF precesion tuning capacitor (cat. no. 2222 805 00174)
C13 = 19 pF, parallel connection of 4 x 4,7 pF lead feed-through capacitors (cat. no. 2222 702 04478)
C14 = 6,8 μF/63 V electrolytic capacitor

L1 = Cu strip (10 mm x 4 mm x 0,5 mm)
L2 = strip on printed-circuit board
L3 = 7 turns closely wound enamelled Cu wire (0,3 mm); int. dia. 3,0 mm; leads 2 x 6 mm
L4 = L8 = L9 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = 3 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 9 mm; leads 2 x 5 mm
L6 = Cu strip (27 mm x 9 mm x 0,5 mm)
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 9 mm; leads 2 x 10 mm

L2 is strip on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 in.

R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.



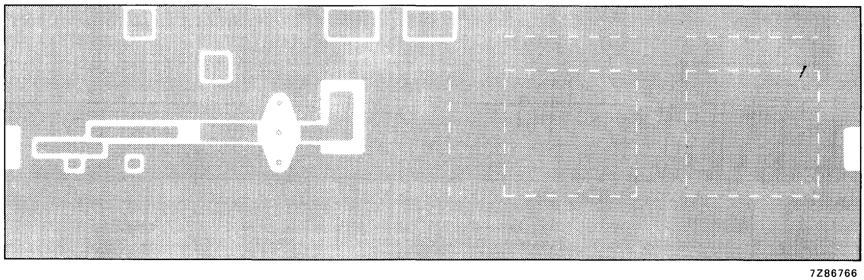


Fig. 8 Component layout and printed-circuit board for 108 MHz class-B test circuit. (Dimensions in mm.)

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by means of fixing screws. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

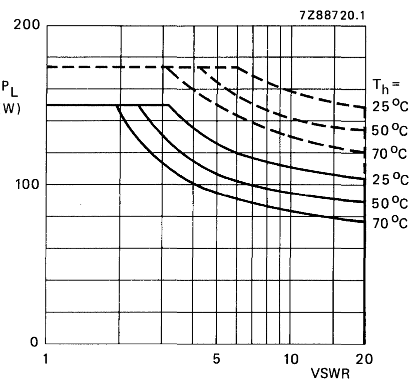


Fig. 9 R.F. SOAR. ——— f > 1 MHz (continuous);
– – – – short time operation during mismatch (f > 1 MHz).

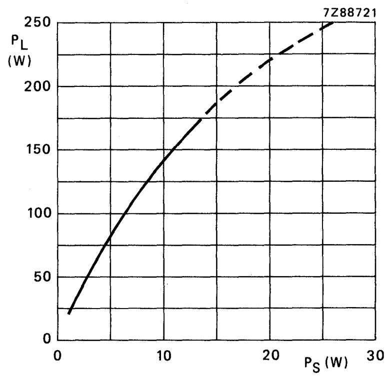


Fig. 10 Load power as a function of source power.

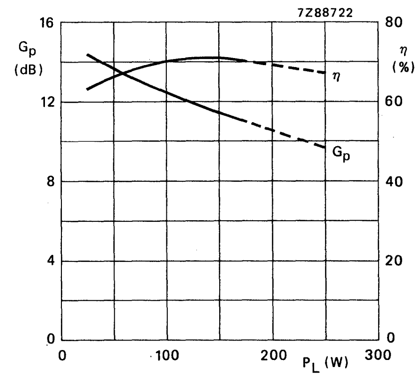


Fig. 11 Power gain and efficiency as a function of source power.

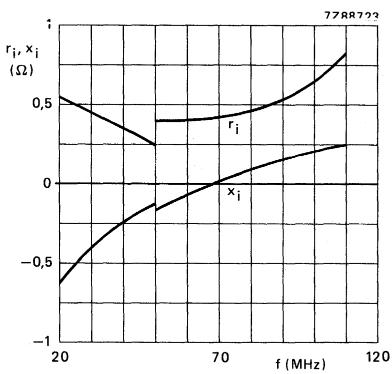


Fig. 12 Input impedance (series components).

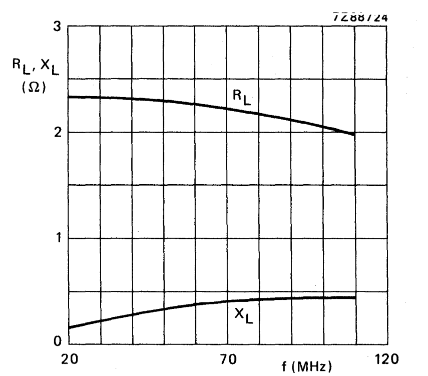


Fig. 13 Load impedance (series components).

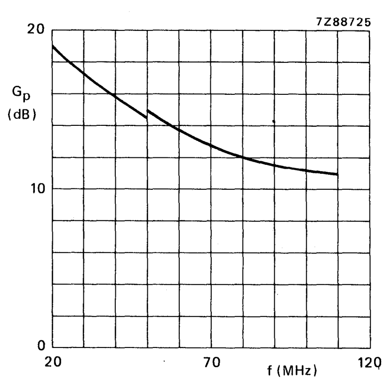


Fig. 14 Power gain as a function of frequency.

Conditions for Figs 10 and 11:

Test circuit tuned for each power level; typical values; V_{CE} = 28 V; f = 108 MHz; T_h = 25 ^{o}C; class-B operation.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 175 W; T_h = 25 ^{o}C; class-B operation.

OPERATING NOTE for Figs 12, 13 and 14:

Below 50 MHz a base-emitter resistor of 4,7 Ω is recommended to avoid oscillation.
This resistor must be effective for r.f. only.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers. Diffused emitter ballasting resistors and the application of **gold sandwich metallization** ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

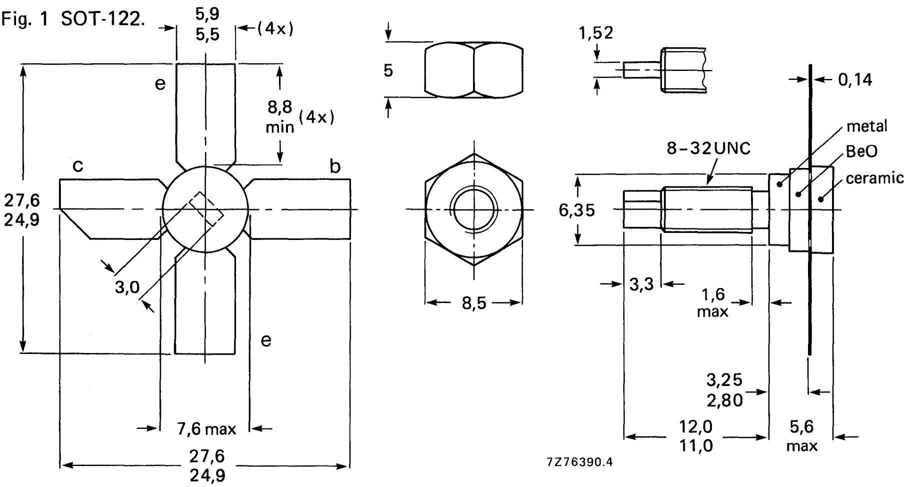
R.F. performance mode of operation	f_{vision} MHz	V_{CE} V	I_C A	T_h °C	d_{im}* dB	$P_{o\,sync}$* W	G_p dB
class-A; linear amplifier	224,25	25	0,46	70	–60	> 1,5	> 18
	224,25	25	0,46	25	–60	typ. 1,7	typ. 20

* Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

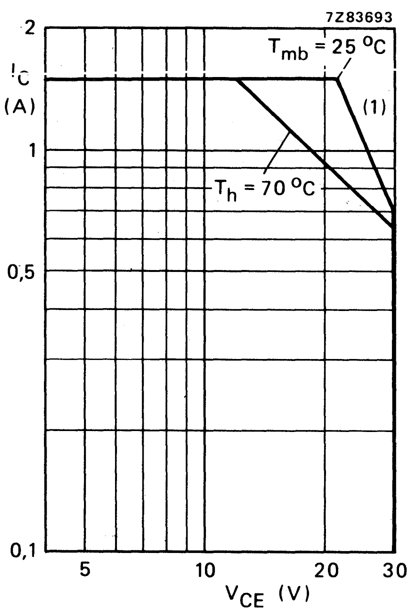
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	60	V
open base	V_{CEO}	max.	30	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	1,5	A
(peak value); f > 1 MHz	I_{CM}	max.	3,5	A
Total power dissipation at T_{mb} = 25 °C	P_{tot}	max.	32,5	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

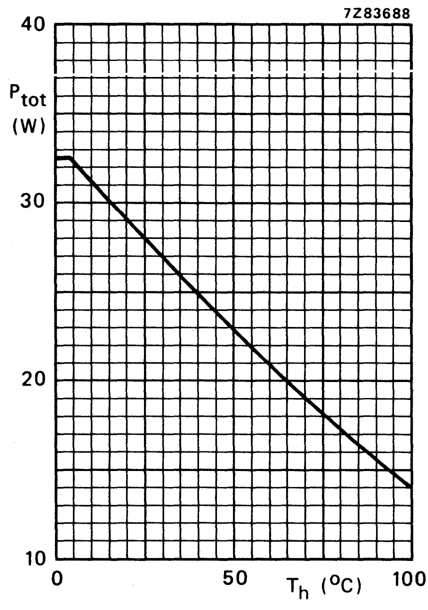


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 12 W; T_{mb} = 77 °C; i.e. T_h = 70 °C)	$R_{th\ j\text{-}mb}$	=	5,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

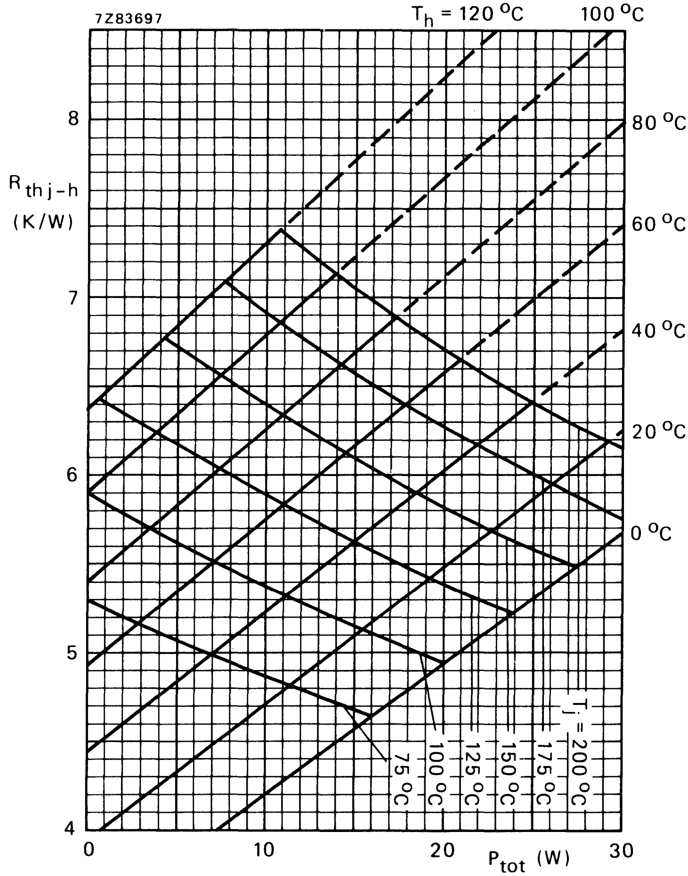


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb\text{-}h}$ = 0,6 K/W).

Example

Nominal class-A operation; V_{CE} = 25 V; I_C = 0,46 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\,j\text{-}h}$	max.	6,13 K/W
	T_j	max.	140,5 °C
Typical device:	$R_{th\,j\text{-}h}$	typ.	5,45 K/W
	T_j	typ.	133 °C

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	60 V
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	2 mJ
R_{BE} = 10 Ω	E_{SBR}	>	2 mJ
D.C. current gain *			
I_C = 0,5 A; V_{CE} = 25 V	h_{FE}	typ.	65
			15 to 120
Collector-emitter saturation voltage *			
I_C = 1,0 A; I_B = 0,1 A	V_{CEsat}	typ.	0,8 V
Transition frequency at f = 500 MHz **			
$-I_E$ = 0,5 A; V_{CB} = 25 V	f_T	typ.	1,20 GHz
$-I_E$ = 1,0 A; V_{CB} = 25 V	f_T	typ.	1,15 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	18 pF
Feedback capacitance at f = 1 MHz			
I_C = 20 mA; V_{CE} = 25 V	C_{re}	typ.	9,2 pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0,02$.
** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0,01$.

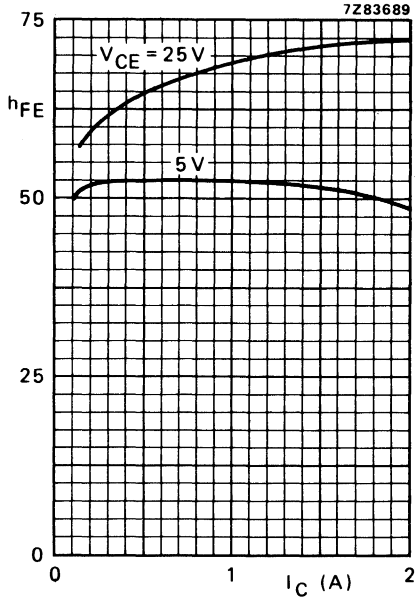


Fig. 5 Typical values; T_j = 25 °C.

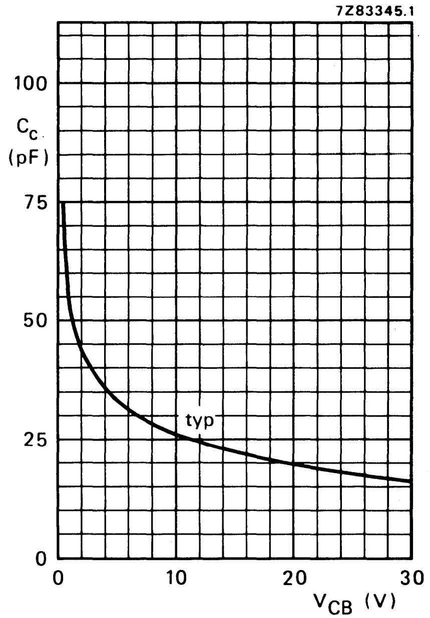


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

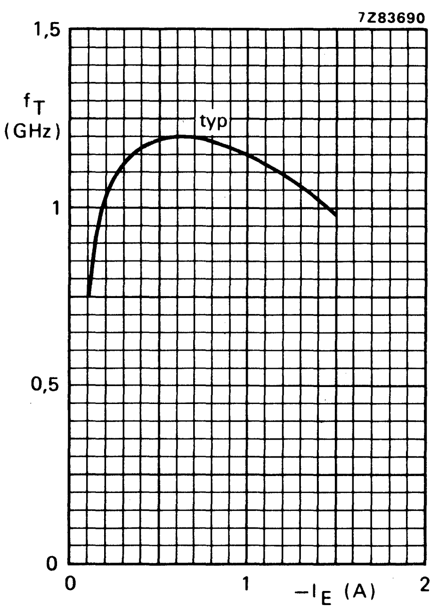


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (A)	T_h (°C)	d_{im} (dB) *	$P_{o\ sync}$ (W) *	G_p (dB)
224,25	25	0,46	70	−60	> 1,5	> 18
224,25	25	0,46	70	−60	typ. 1,7	typ. 19,5
224,25	25	0,46	25	−60	typ. 1,8	typ. 20

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

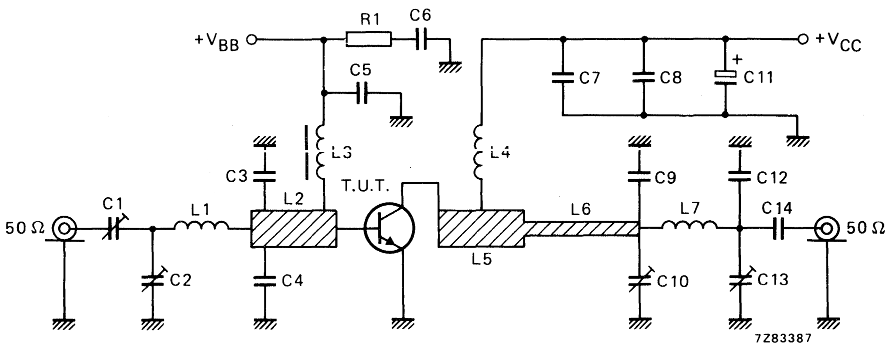


Fig. 8 Test circuit at f_{vision} = 224,25 MHz.

List of components:

C1 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C4 = 82 pF multilayer ceramic chip capacitor (ATC▲), placed 7 mm from transistor edge
C5 = C7 = C14 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C6 = C8 = 330 nF polyester capacitor
C9 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C10 = C13 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C11 = 10 μF/40 V solid aluminium electrolytic capacitor
C12 = 18 pF (500 V) multilayer ceramic chip capacitor (ATC▲)

L1 = 49 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,6 mm; length 6,3 mm; leads 2 x 5 mm
L2 = L5 = 30 Ω stripline (10,0 mm x 6,0 mm)
L3 = 0,1 μH; microchoke (cat. no. 4322 057 01070)
L4 = 130 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,0 mm; length 10,7 mm; leads 2 x 5 mm
L6 = 60 Ω stripline (50,5 mm x 2,0 mm)
L7 = 30 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,0 mm; length 7,9 mm; leads 2 x 5 mm

L2, L5 and L6 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16".

R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

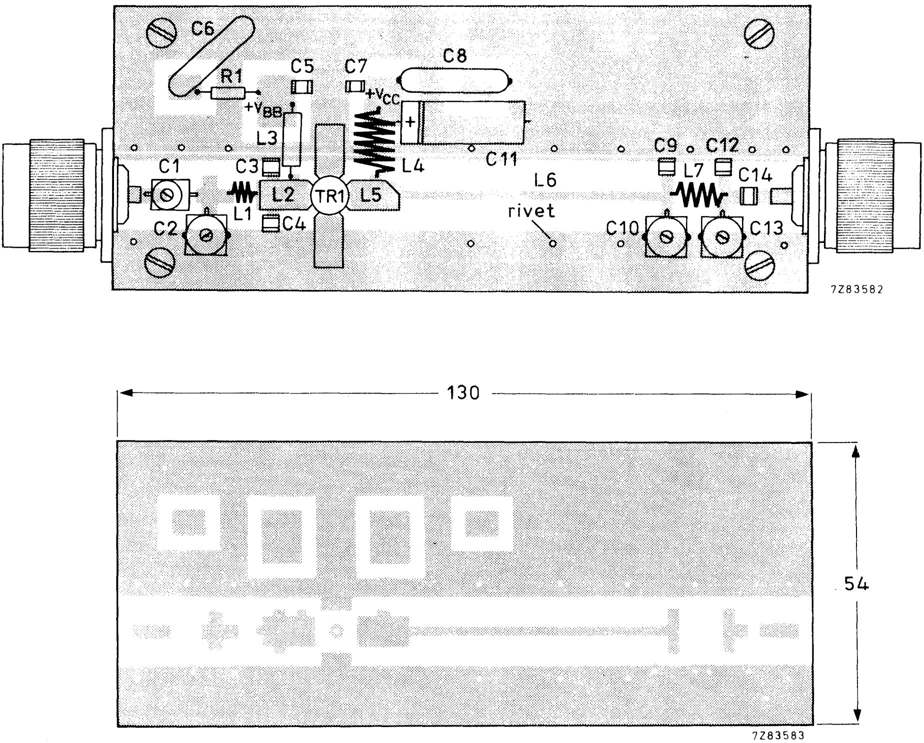


Fig. 9 Component layout and printed-circuit board for 224,25 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

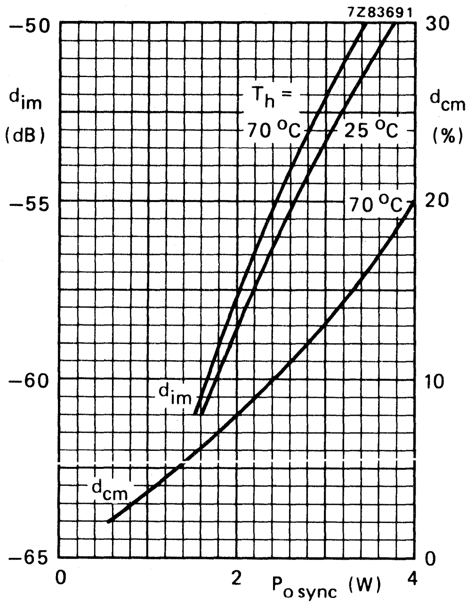


Fig. 10 Intermodulation distortion (d_{im}*) and cross-modulation distortion (d_{cm}**) as a function of output power.

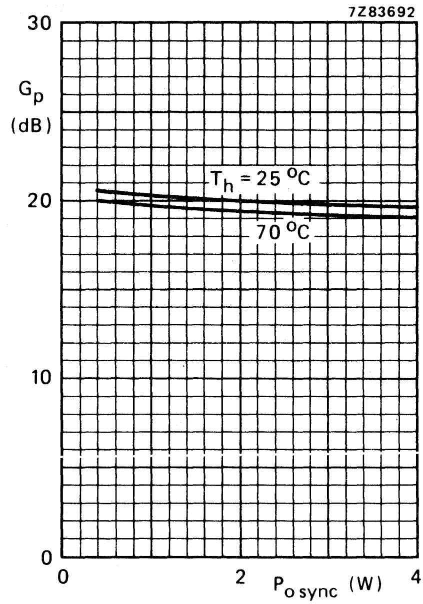


Fig. 11 Power gain as a function of output power.

Conditions for Figs 10 and 11:

Typical values; V_{CE} = 25 V; I_C = 0,46 A; f_{vision} = 224,25 MHz.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ≤ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

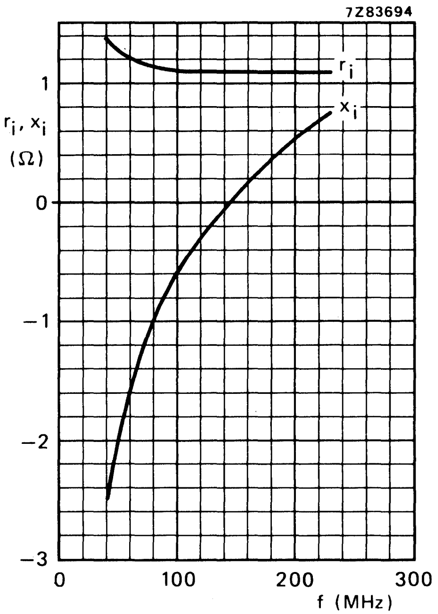


Fig. 12 Input impedance (series components).

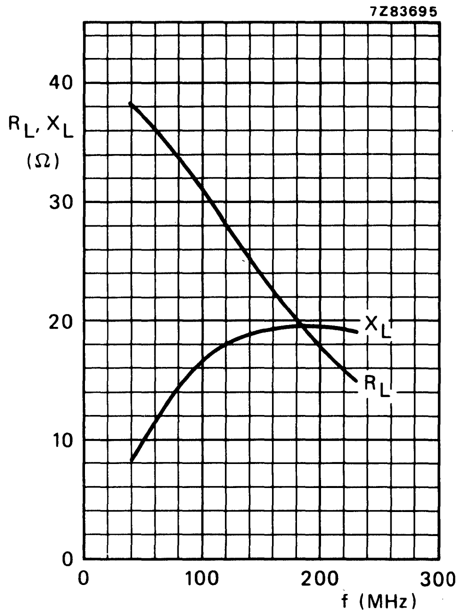


Fig. 13 Load impedance (series components).

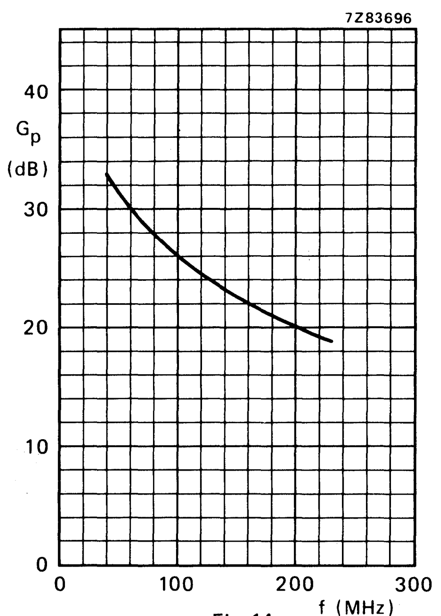


Fig. 14.

Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 25 V; I_C = 0,46 A;
T_h = 70 °C.

NOTES

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers. Diffused emitter ballasting resistors and the application of **gold sandwich metallization** ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance

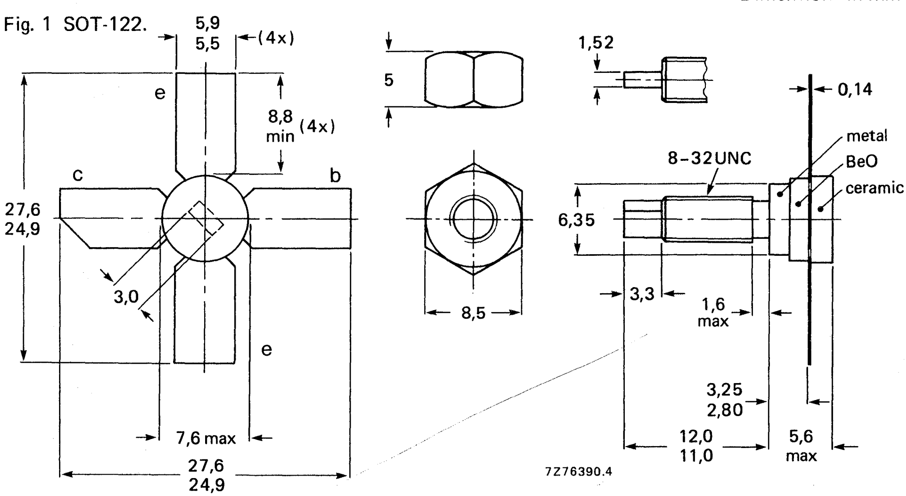
mode of operation	f_{vision} MHz	V_{CE} V	I_C A	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A; linear amplifier	224,25	25	0,8	70	−58	> 5	> 15
	224,25	25	0,8	25	−58	typ. 7	typ. 16,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

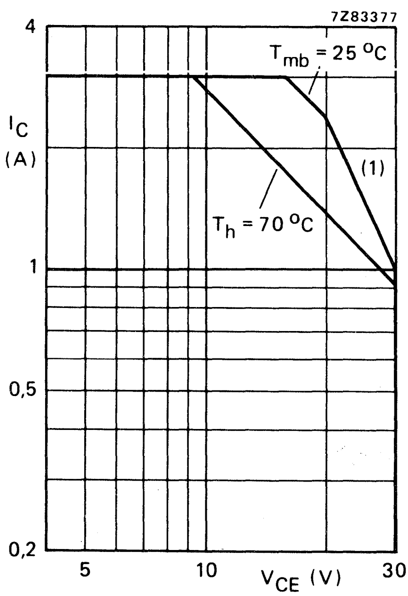
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	60 V
open base	V_{CEO}	max.	30 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	3 A
(peak value); f > 1 MHz	I_{CM}	max.	6 A
Total power dissipation at $T_{mb} = 25\ ^oC$	P_{tot}	max.	48 W
Storage temperature	T_{stg}	−65 to + 150	^oC
Operating junction temperature	T_j	max.	200 ^oC



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

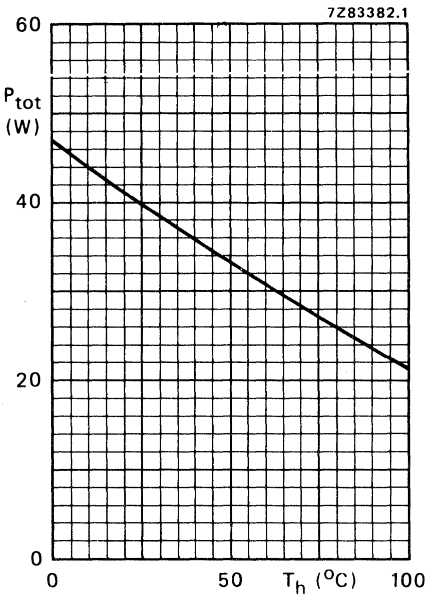


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 20 W; $T_{mb} = 82\ ^oC$; i.e. $T_h = 70\ ^o$)	$R_{th\ j\text{-}mb}$	=	3,45 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

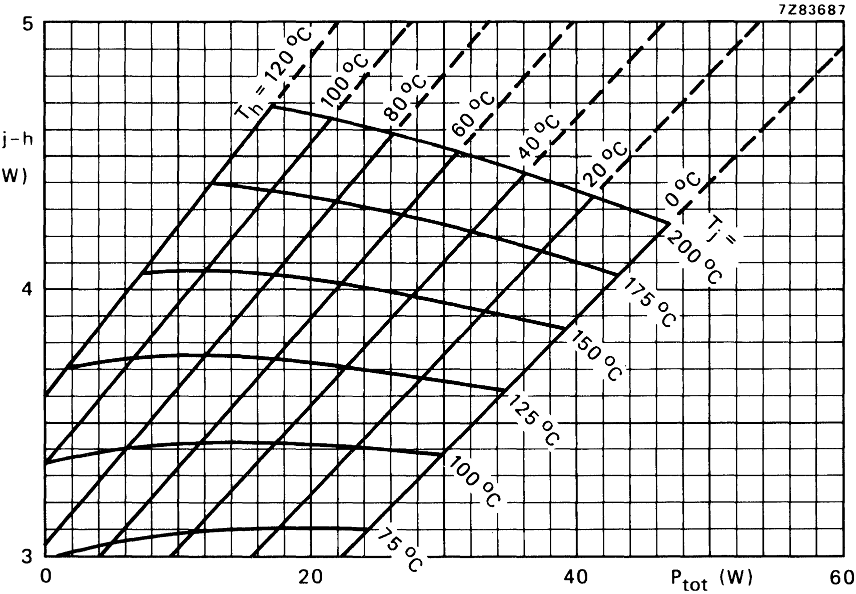


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 0,8 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	4,05 K/W
	T_j	max.	151 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	3,80 K/W
	T_j	typ.	146 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	60 V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	3 mJ
R_{BE} = 10 Ω	E_{SBR}	>	3 mJ
D.C. current gain *			
I_C = 0,8 A; V_{CE} = 25 V	h_{FE}	typ.	75
			15 to 120
Collector-emitter saturation voltage *			
I_C = 2,0 A; I_B = 0,2 A	V_{CEsat}	typ.	1,0 V
Transition frequency at f = 500 MHz **			
$-I_E$ = 0,8 A; V_{CB} = 25 V	f_T	typ.	1,0 GHz
$-I_E$ = 2,0 A; V_{CB} = 25 V	f_T	typ.	1,1 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	35 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 25 V	C_{re}	typ.	20 pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

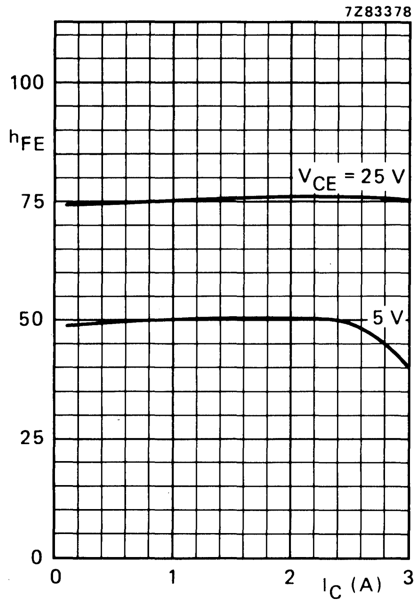


Fig. 5 Typical values; T_j = 25 °C.

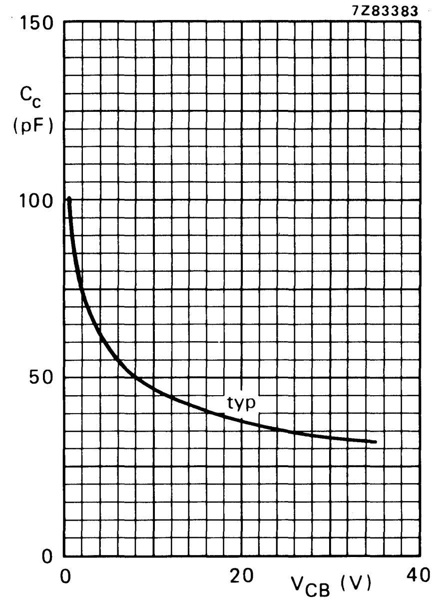


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

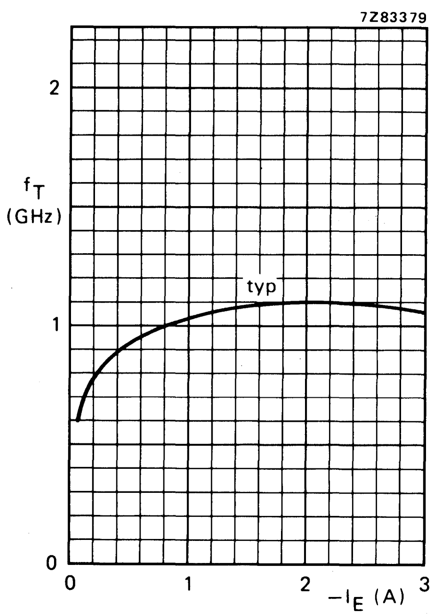


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (A)	T_h (°C)	d_{im} (dB)*	$P_{o\ sync}$ (W)*	G_p (dB)
224,25	25	0,8	70	−58	> 5	> 15
224,25	25	0,8	70	−58	typ. 5,8	typ. 16,2
224,25	25	0,8	25	−58	typ. 7	typ. 16,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

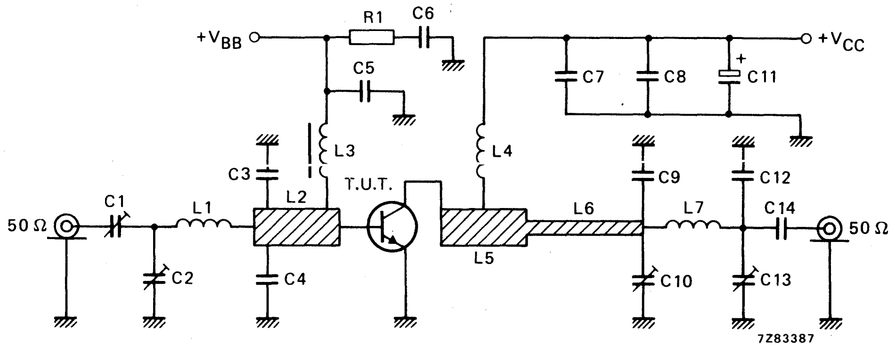


Fig. 8 Test circuit at f_{vision} = 224,25 MHz.

List of components:

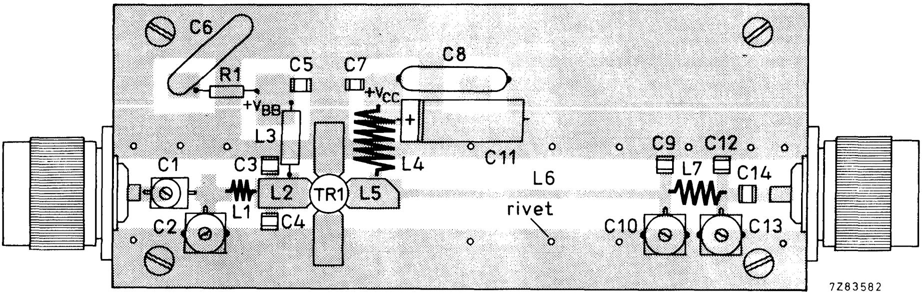
C1 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C4 = 82 pF multilayer ceramic chip capacitor (ATC▲), placed 7 mm from transistor edge
C5 = C7 = C14 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C6 = C8 = 330 nF polyester capacitor
C9 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C10 = C13 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C11 = 10 μF/40 V solid aluminium electrolytic capacitor
C12 = 18 pF (500 V) multilayer ceramic chip capacitor (ATC▲)

L1 = 49 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,6 mm; length 6,3 mm; leads 2 x 5 mm
L2 = L5 = 30 Ω stripline (10,0 mm x 6,0 mm)
L3 = 0,1 μH; microchoke (cat. no. 4322 057 01070)
L4 = 130 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,0 mm; length 10,7 mm; leads 2 x 5 mm
L6 = 60 Ω stripline (50,5 mm x 2,0 mm)
L7 = 30 nH; 4 turns enamelled Cu wire (1,0 mm); int. dia. 3,0 mm; length 7,9 mm; leads 2 x 5 mm

L2, L5 and L6 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16″.

R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.



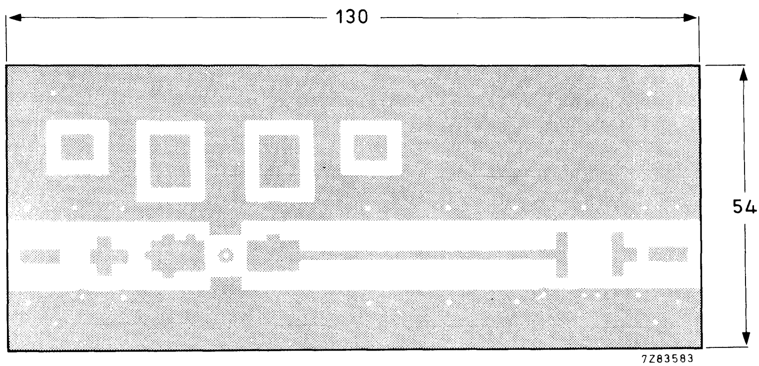


Fig. 9 Component layout and printed-circuit board for 224,25 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

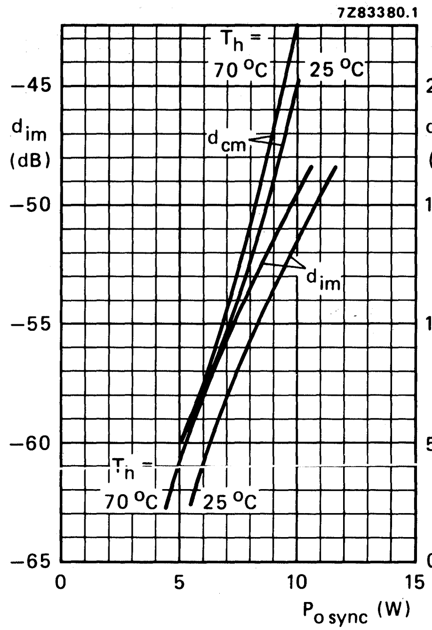


Fig. 10 Intermodulation distortion (d_{im}*) and cross-modulation distortion (d_{cm}**) as a function of output power.

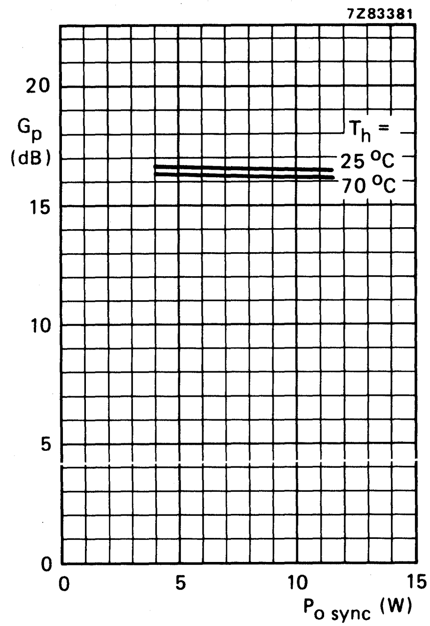


Fig. 11 Power gain as a function of output power.

Conditions for Figs 10 and 11:

Typical values; V_{CE} = 25 V; I_C = 0,8 A; f_{vision} = 224,25 MHz.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ≤ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

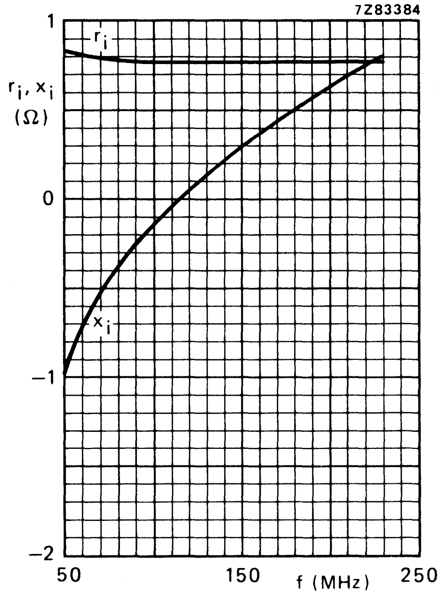


Fig. 12 Input impedance (series components).

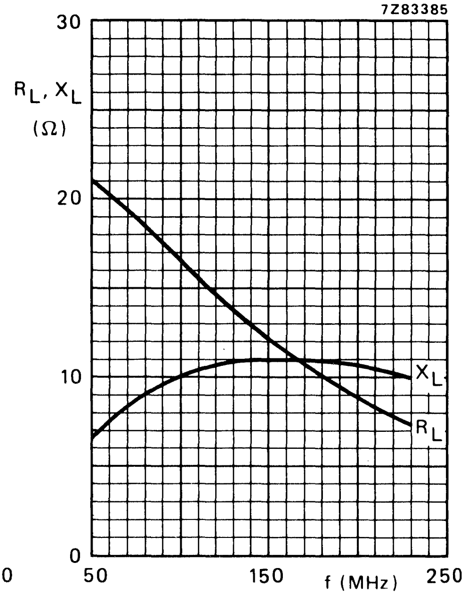


Fig. 13 Load impedance (series components).

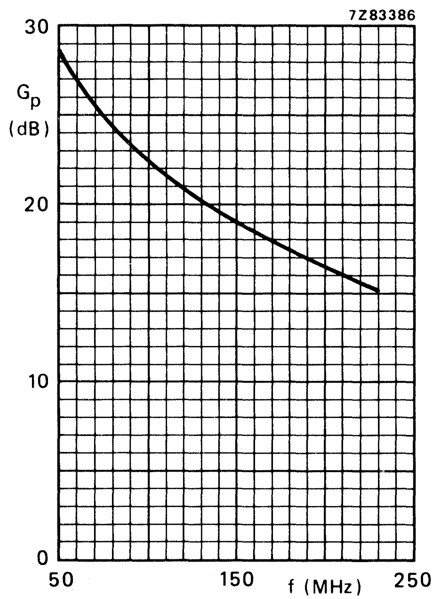


Fig. 14.

Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 25 V; I_C = 0,8 A; T_h = 70 °C.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers of television transmitters and transposers.

Features:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 3/8" 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f_{vision} MHz	V_{CE} V	I_C A	T_h °C	d_{im}* dB	$P_{o\,sync}$* W	G_p dB
class-A	224,25	25	1,5	70	−55	> 10	> 16
class-A	224,25	25	1,5	25	−55	typ. 12,5	typ. 17,2

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

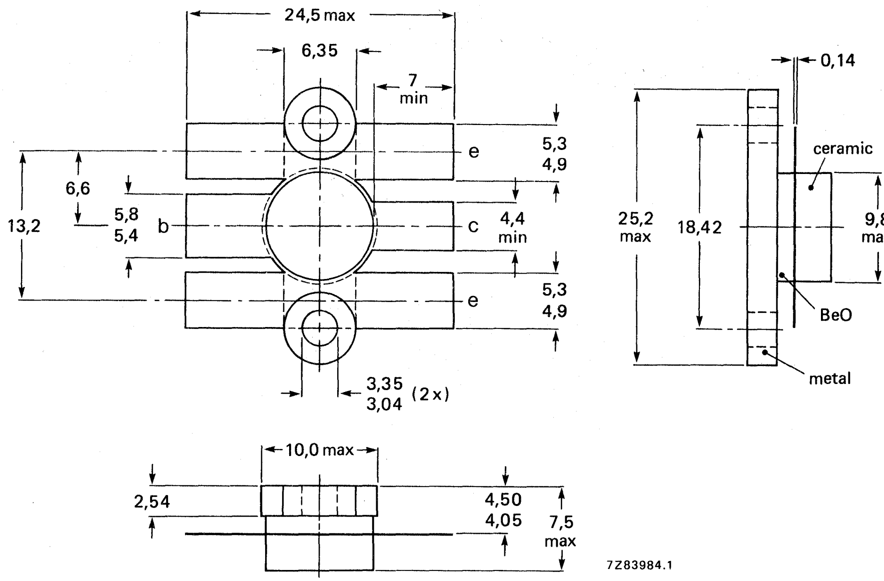
SOT-160 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-160.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

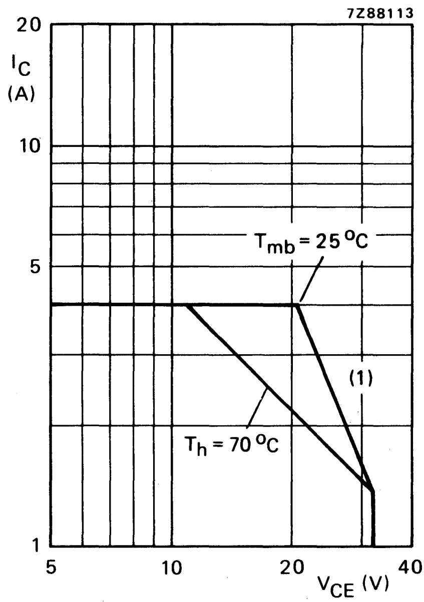
Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	60 V
open base	V_{CEO}	max.	32 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	4 A
(peak value); f > 1 MHz	I_{CM}	max.	12 A
Total power dissipation at $T_{mb} = 25\ ^oC$	P_{tot}	max.	82 W
R.F. power dissipation (f > 1 MHz); $T_{mb} = 25\ ^oC$	P_{rf}	max.	100 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

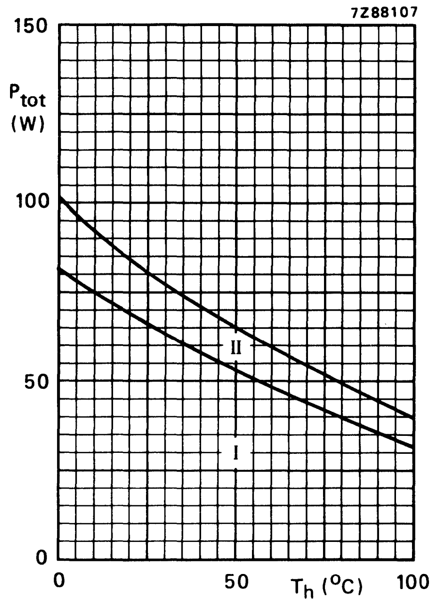


Fig. 3 Power derating curves vs. temperature.

I Continuous d.c. (including r.f. class-A) operation

II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 37,5 W; $T_{mb} = 82\ ^oC$, i.e. $T_h = 70\ ^oC$)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,55 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,10 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

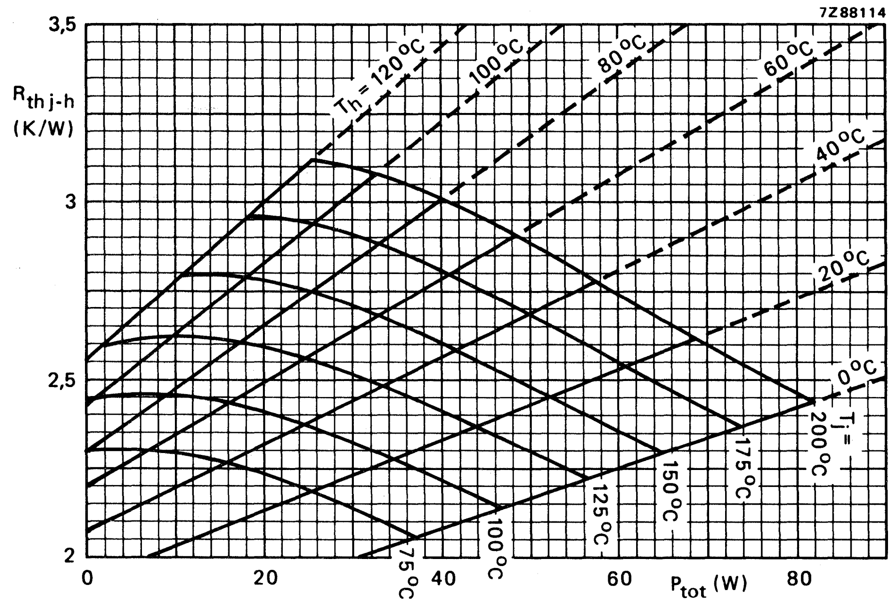


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb-h}$ = 0,3 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 1,5 A; T_h = 70 °C.

Fig. 4 shows: $R_{th\,j-h}$ max. 2,85 K/W
T_j max. 177 °C

Typical device: $R_{th\,j-h}$ typ. 2,30 K/W
T_j typ. 156 °C

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 15 mA	$V_{(BR)CES}$	>	60 V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	32 V
Emitter-base breakdown voltage			
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 32 V	I_{CES}	<	5 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	4,5 mJ
R_{BE} = 10 Ω	E_{SBR}	>	4,5 mJ
D.C. current gain*			
I_C = 1,6 A; V_{CE} = 25 V	h_{FE}	typ.	50
			20 to 120
Collector-emitter saturation voltage*			
I_C = 3,5 A; I_B = 0,35 A	V_{CEsat}	typ.	1,4 V
Transition frequency at f = 500 MHz**			
$-I_E$ = 1,6 A; V_{CB} = 25 V	f_T	typ.	2 GHz
$-I_E$ = 3,5 A; V_{CB} = 25 V	f_T	typ.	2 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	50 pF
Feedback capacitance at f = 1 MHz			
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	31 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

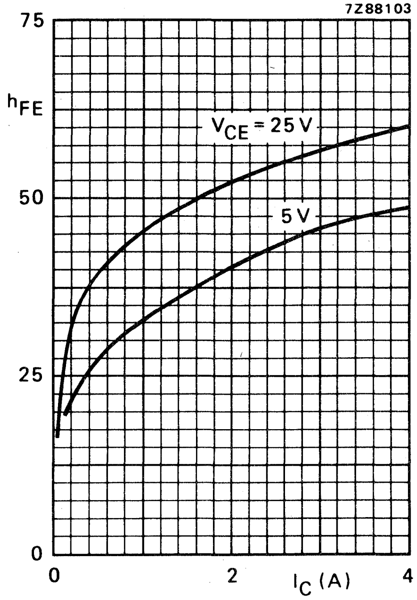


Fig. 5 Typical values; T_j = 25 °C.

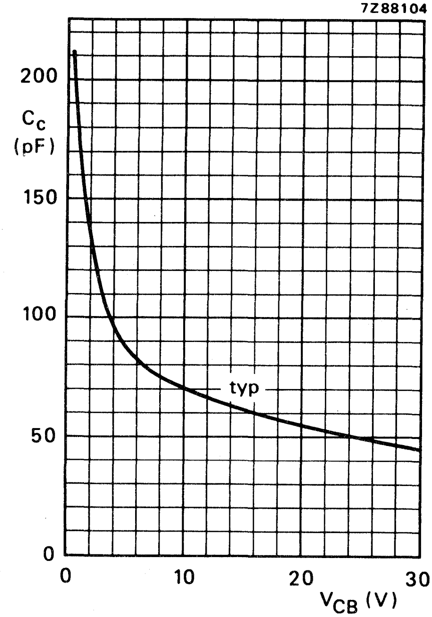


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

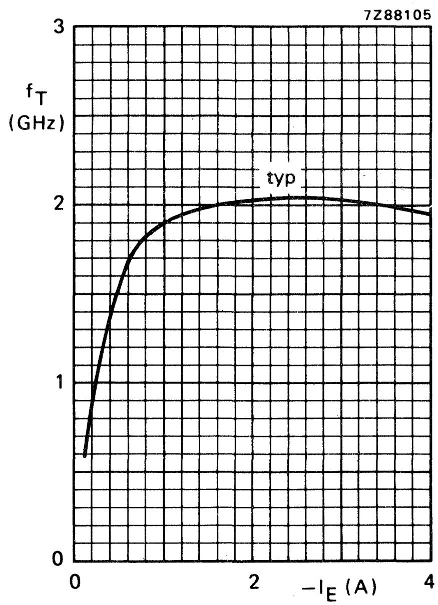


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

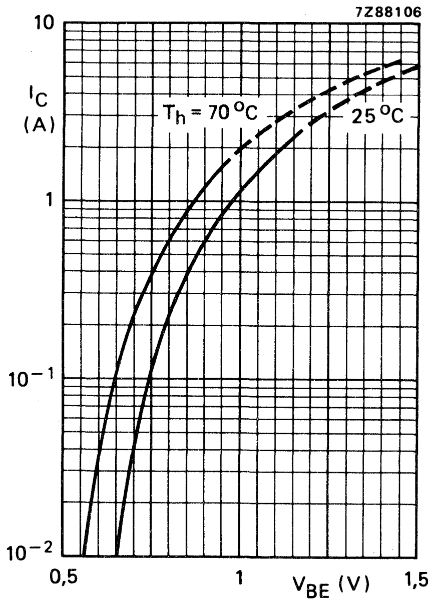


Fig. 8 Typical values; V_{CE} = 25 V.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)*	I_C (A)	T_h (°C)	d_{im} (dB)**	$P_{o\,sync}$ (W)**	G_p (dB)
224,25	25	1,5	70	–55	> 10	> 16
			70	–55	typ. 11	typ. 16,8
			70	–52	typ. 13	typ. 16,8
			25	–55	typ. 12,5	typ. 17,2

* The transistor is capable of operating up to 28 V.

** Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), zero dB corresponds to peak sync level.

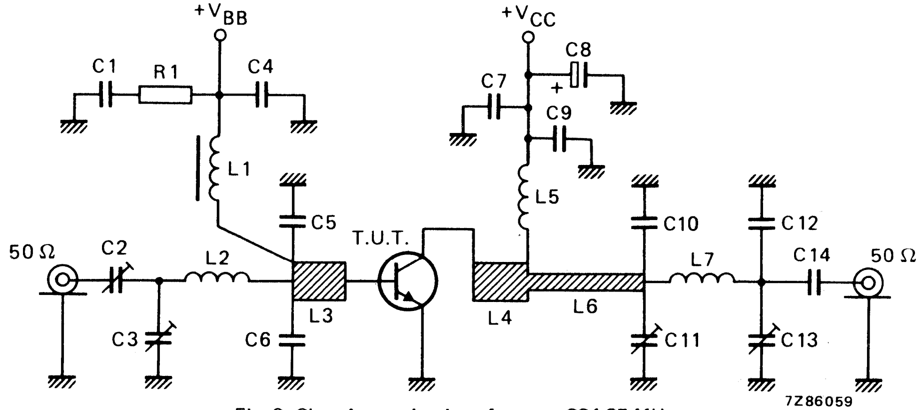


Fig. 9 Class-A test circuit at f_{vision} = 224,25 MHz.

List of components:

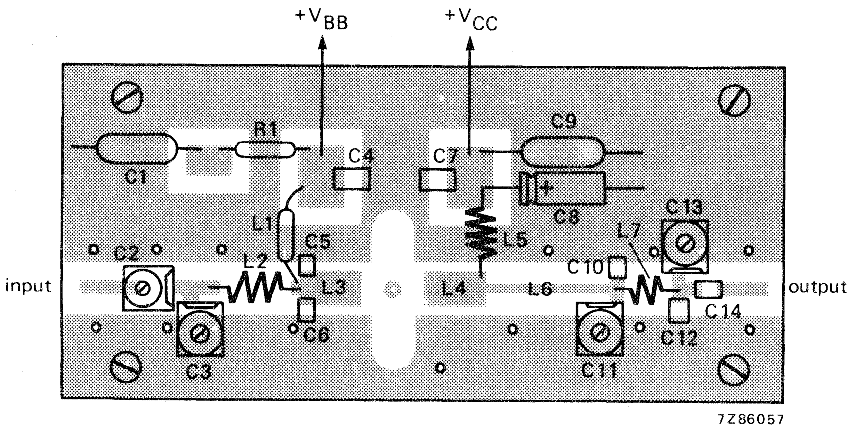
C1 = C9 = 330 nF polyester capacitor
C2 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 05003)
C3 = C11 = C13 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C4 = C7 = C14 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C5 = C6 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C8 = 10 μF/63 V solid tantalum capacitor
C10 = 82 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C12 = 30 pF (500 V) multilayer ceramic chip capacitor (ATC▲)

L1 = 1 μH microchoke (cat. no. 4322 057 01080)
L2 = 3 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 14,0 mm; leads 2 x 3 mm
L3 = L4 = 32 Ω stripline (6,0 mm x 10,0 mm)
L5 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 5,5 mm; length 10,0 mm; leads 2 x 2 mm
L6 = 62 Ω stripline (2,0 mm x 22,5 mm)
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 4,0 mm; leads 2 x 3 mm

L3, L4 and L6 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16″.

R1 = 27 Ω carbon resistor

▲ ATC means American Technical Ceramics.



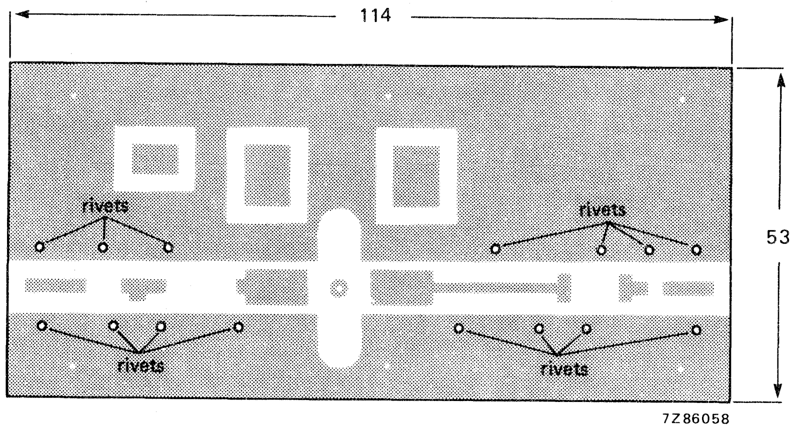


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

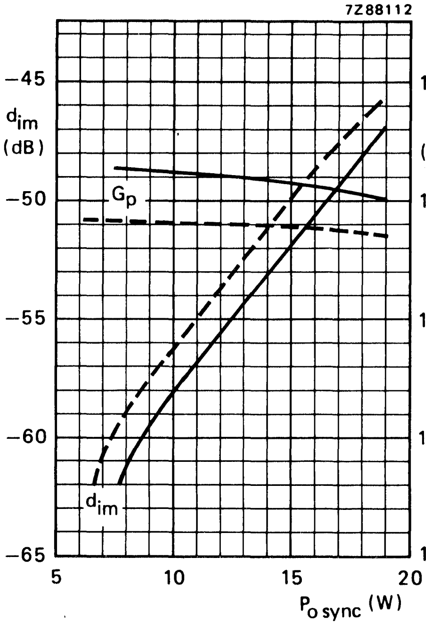


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

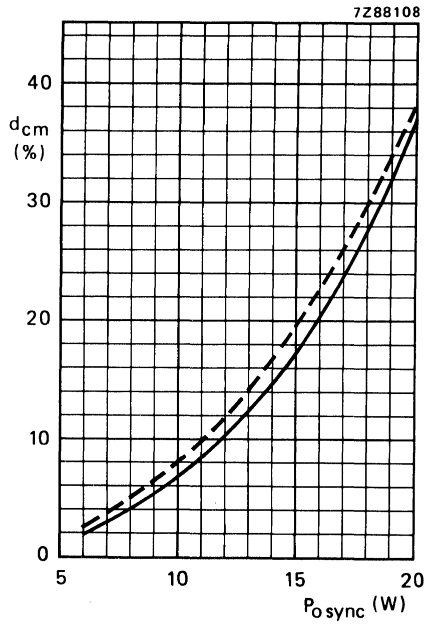


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 1,5 A; ——— T_h = 25 °C; – – – T_h = 70 °C; f_{vision} = 224,25 MHz.

Ruggedness in class-A operation

The BLV32F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 15 W (r.m.s. value) or 20 W (P.E.P.) under the following conditions:
V_{CE} = 25 V; I_C = 1,5 A; T_h = 70 °C; f = 224,25 MHz; $R_{th\,mb\text{-}h}$ = 0,3 K/W.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ≤ −70 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

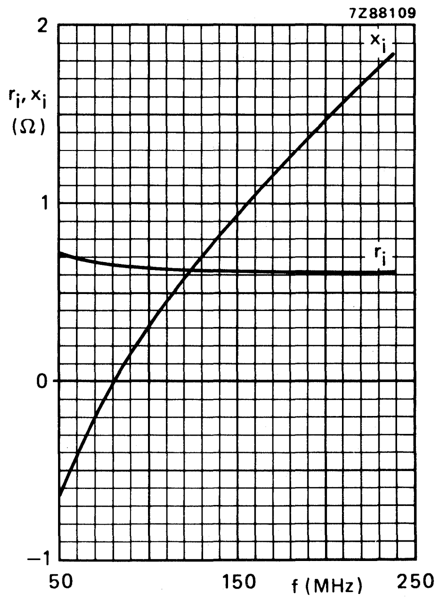


Fig. 13 Input impedance (series components).

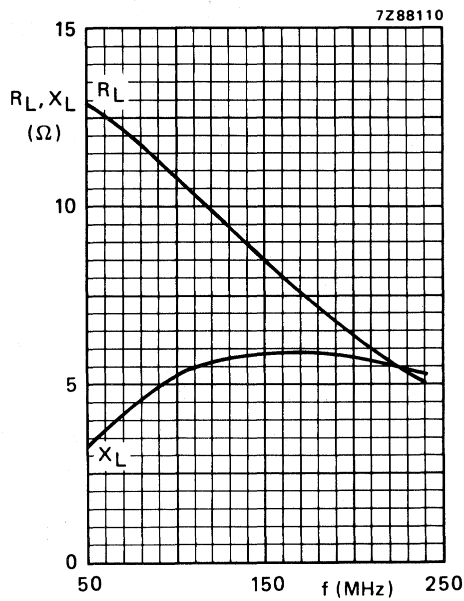


Fig. 14 Load impedance (series components).

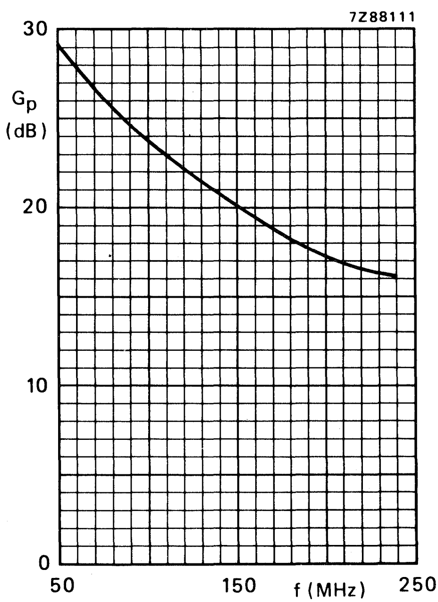


Fig. 15.

Conditions for Figs 13, 14 and 15:

Typical values; V_{CE} = 25 V; I_C = 1,5 A; class-A operation; T_h = 70 °C.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers. Diffused emitter ballasting resistors and the application of **gold sandwich metallization** ensure an optimum temperature profile and excellent reliability properties.

The transistor has a ½" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f_{vision} MHz	V_{CE} V	I_C $I_{C(ZS)}$ A	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB	sync compr.** sync in (%)/sync out (%)
class-A	224,25	25	3,20	70 25	−55 −55	> 19 typ. 26	> 9 typ. 9,7	
class-AB	224,25	28	0,10	70		typ. 90	typ. 6,5	30/25

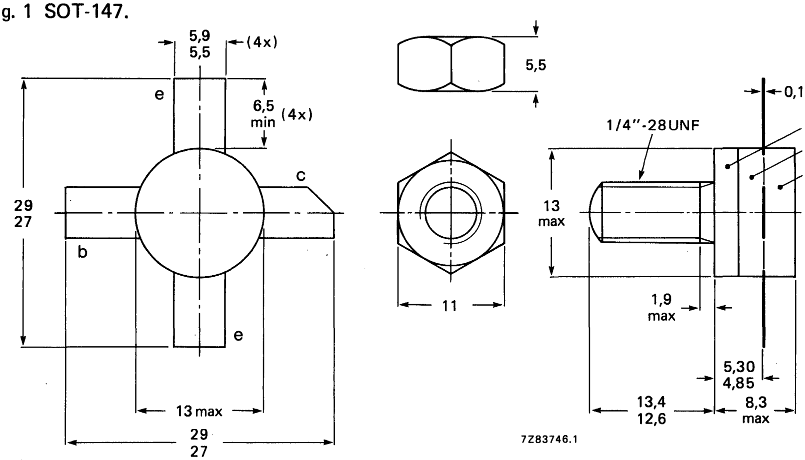
* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

** Television service (negative modulation, C.C.I.R. system).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-147.



Torque on nut: min. 2,3 Nm
(23 kg cm)
max. 2,7 Nm
(27 kg cm)

Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

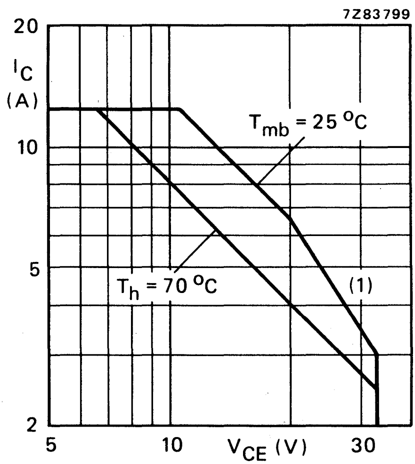
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	12,5	A
(peak value); f > 1 MHz	I_{CM}	max.	20	A
Total power dissipation at T_{mb} = 25 °C	P_{tot}	max.	132	W
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	165	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

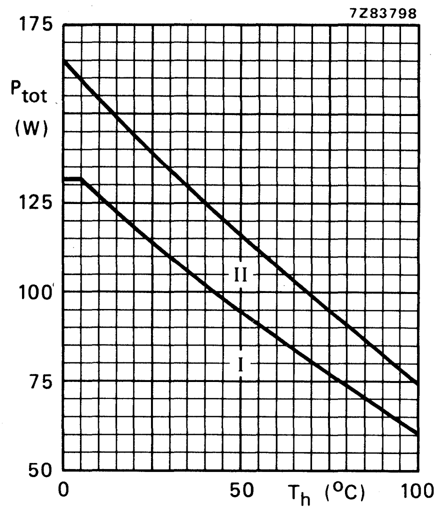


Fig. 3 Power derating curve vs. temperature.

I Continuous d.c. (including r.f. class-A) operation
II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 80 W; T_{mb} = 82 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,46 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,17 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,15 K/W

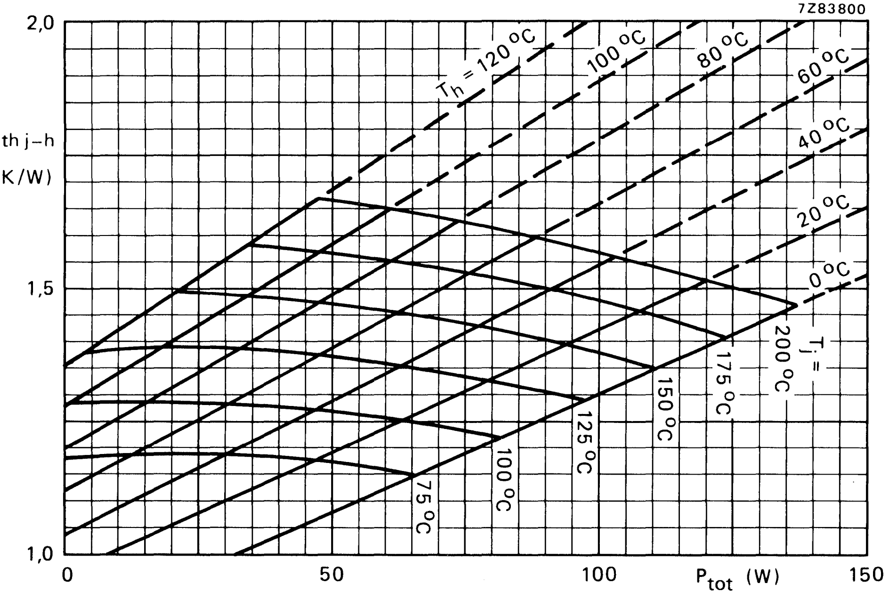


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb-h}$ = 0,15 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 3,2 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\,j-h}$	max.	1,60 K/W
	T_j	max.	198 °C
Typical device:	$R_{th\,j-h}$	typ.	1,50 K/W
	T_j	typ.	190 °C

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	65	V
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	33	V
Emitter-base breakdown voltage				
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 30$ V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	12,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	12,5	mJ
D.C. current gain*				
$I_C = 3,0$ A; $V_{CE} = 25$ V	h_{FE}	typ.	50	
			15 to 100	
Collector-emitter saturation voltage*				
$I_C = 6,0$ A; $I_B = 0,6$ A	V_{CEsat}	typ.	0,75	V
Transition frequency at f = 100 MHz**				
$-I_E = 3,0$ A; $V_{CB} = 25$ V	f_T	typ.	680	MHz
$-I_E = 6,0$ A; $V_{CB} = 25$ V	f_T	typ.	750	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 25$ V	C_c	typ.	155	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 25$ V	C_{re}	typ.	88	pF
Collector-stud capacitance	C_{cs}	typ.	3	pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

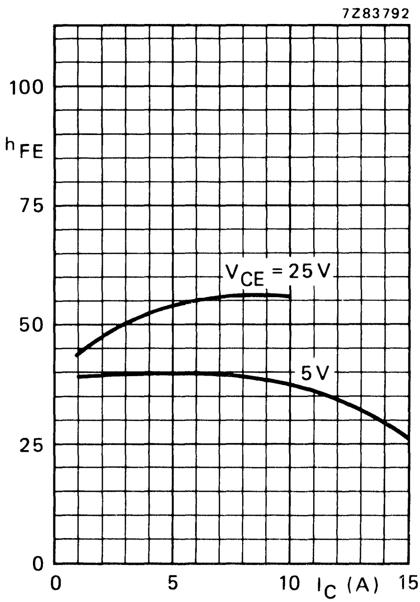


Fig. 5 Typical values; T_j = 25 °C.

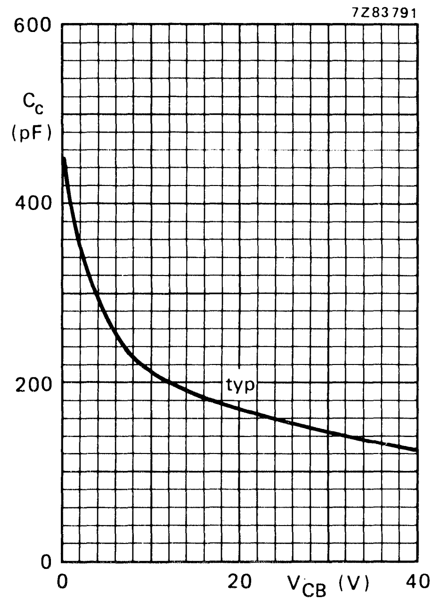


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

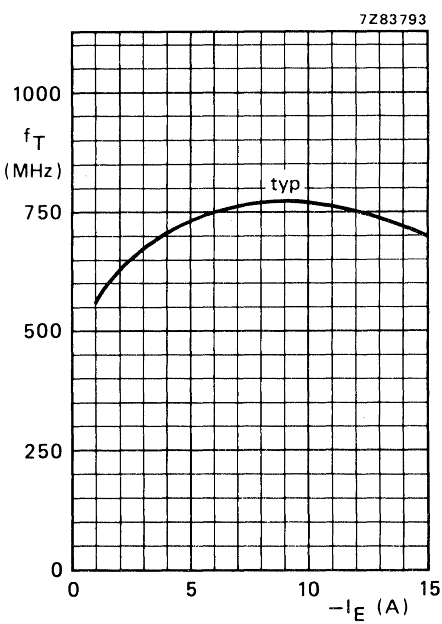


Fig. 7 V_{CB} = 25 V; f = 100 MHz; T_j = 25 °C.

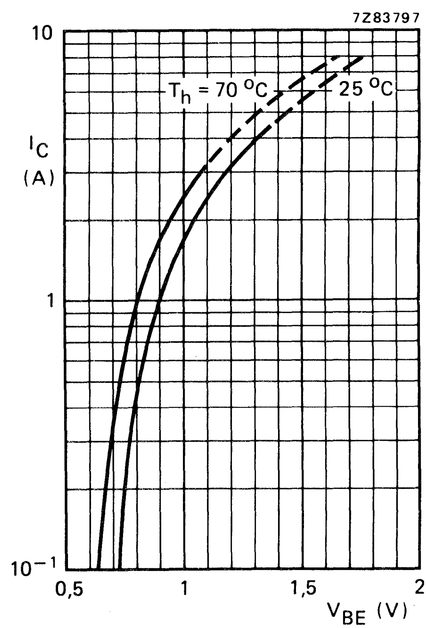


Fig. 8 Typical values; V_{CE} = 25 V.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (A)	T_h (°C)	d_{im} (dB)*	P_o sync (W)*	G_p (dB)
224,25	25	3,2	70 70 70 25	−55 −55 −52 −55	> 19 typ. 22 typ. 26,5 typ. 26	> 9 typ. 9,3 typ. 9,3 typ. 9,7

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

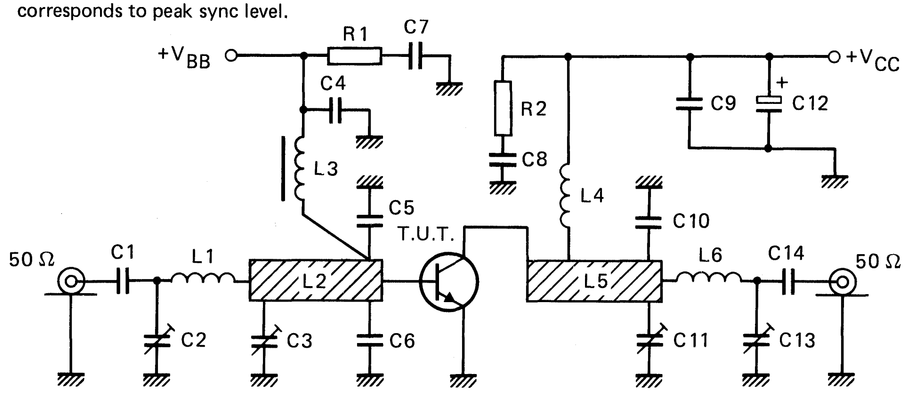


Fig. 9 Class-A test circuit at f_{vision} = 224,25 MHz.

List of components:

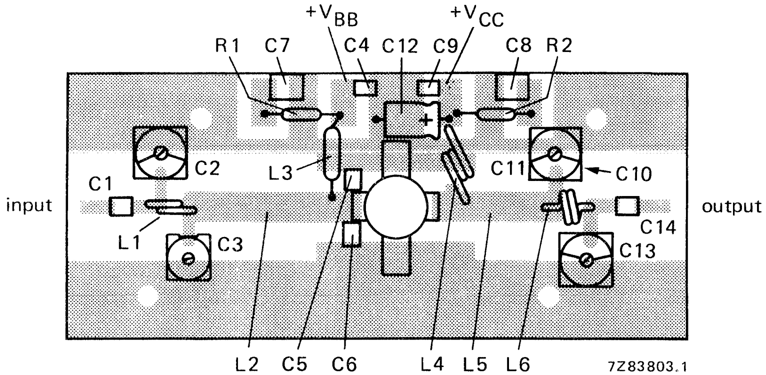
C1 = C14 = 680 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = C11 = C13 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C4 = C9 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C5 = C6 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲), placed 2 mm from transistor edge
C7 = C8 = 470 nF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 856 48474)
C10 = 24 pF (500 V) multilayer ceramic chip capacitor (ATC▲), positioned under C11
C12 = 10 μF/40 V solid aluminium electrolytic capacitor

L1 = 1½ turns closely wound enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; leads 2 x 3 mm
L2 = 30 Ω stripline (6,0 mm x 32,7 mm)
L3 = 1 μH microchoke (cat. no. 4322 057 01080)
L4 = 27 nH; 2 turns enamelled Cu wire (1,1 mm); int. dia; 4,5 mm; length 2,9 mm; leads 2 x 5 mm
L5 = 30 Ω stripline (6,0 mm x 24,0 mm)
L6 = 19 nH; 2 turns enamelled Cu wire (1,1 mm); int. dia. 3,5 mm; length 3,5 mm; leads 2 x 5 mm

L2 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16″.

R1 = R2 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.



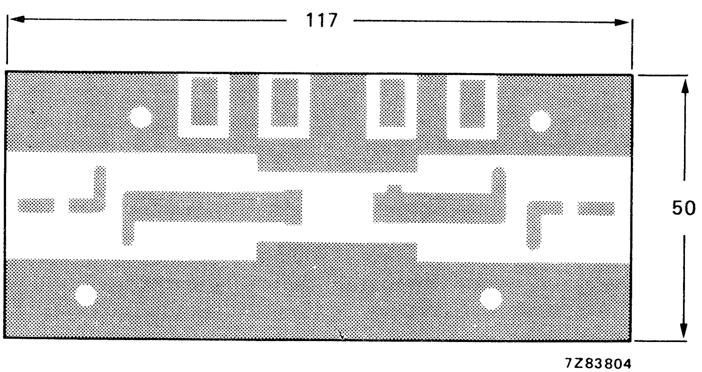


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as earth. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

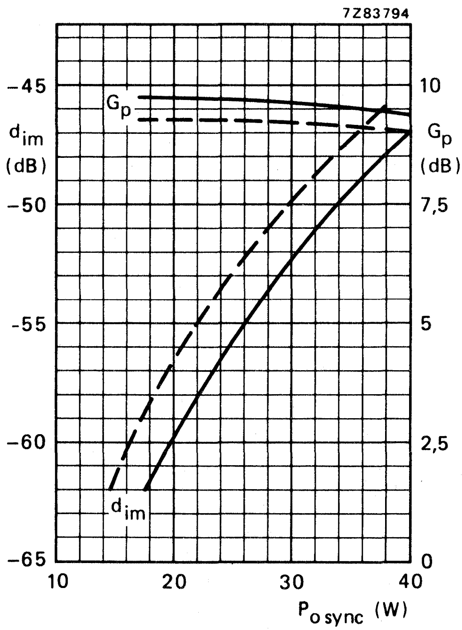


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

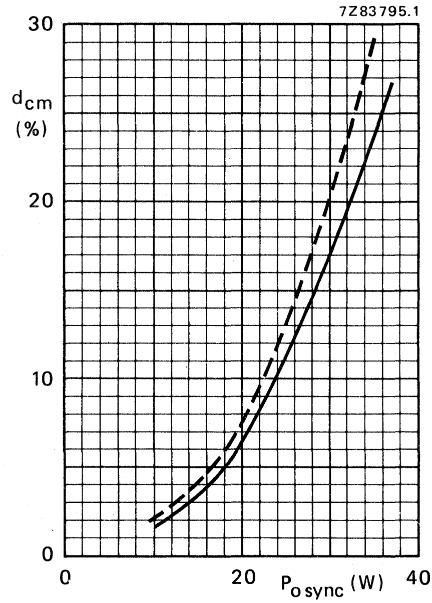


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 3,2 A; —— T_h = 25 °C; – – – T_h = 70 °C; f_{vision} = 224,25 MHz.

Ruggedness in class-A operation

The BLV33 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 30 W (r.m.s. value) or 40 W (P.E.P.) under the following conditions:
V_{CE} = 25 V; I_C = 3,2 A; T_h = 70 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,15 K/W.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ⩽ −70 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

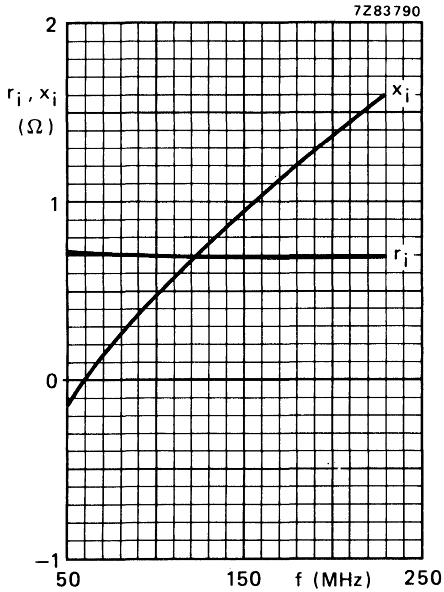


Fig. 13 Input impedance (series components).

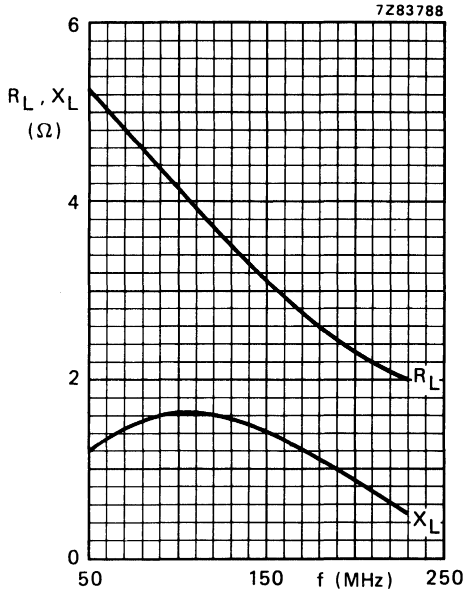


Fig. 14 Load impedance (series components).

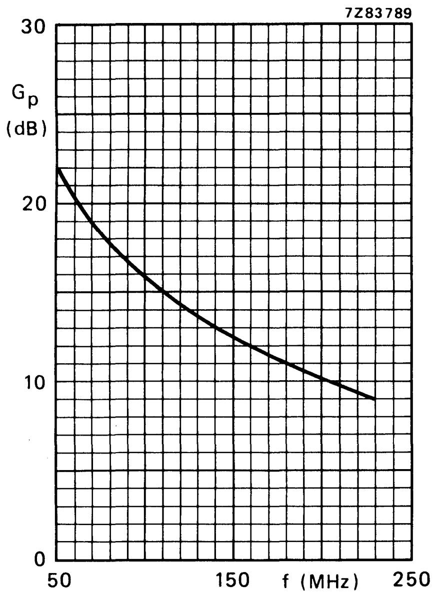


Fig. 15.

Conditions for Figs 13, 14 and 15:
Typical values; V_{CE} = 25 V; I_C = 3,2 A; class-A operation; T_h = 70 °C.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{C(ZS)}$ (A)	T_h (°C)	P_L (W)	I_C (A)	η (%)	G_p (dB)*
224,25	28	0,1	70	40	typ. 2,60	typ. 55	typ. 7,5
				90	typ. 4,46	typ. 72	typ. 6,5

* Gain compression point of 1 dB is at typical 90 W (minimum 80 W). Using a 3rd-order amplitude transfer characteristic, 1 dB compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

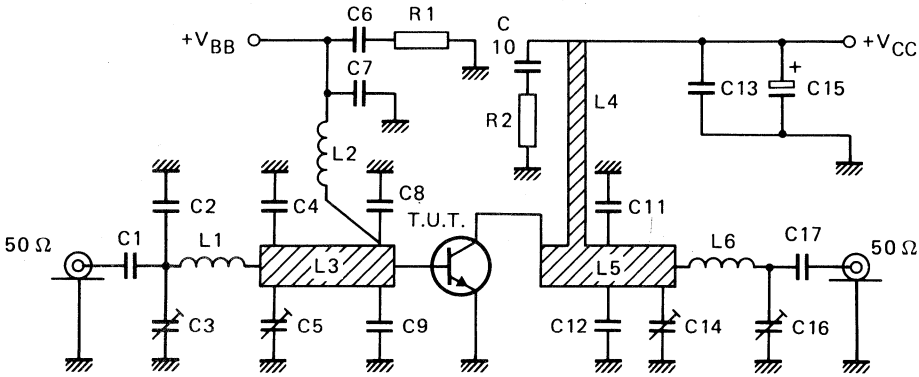


Fig. 16 Class-AB test circuit at f_{vision} = 224,25 MHz. 7Z83802

List of components:

C1 = C17 = 680 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = 39 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C3 = C16 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C4 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C5 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
C6 = C10 = 330 nF polyester capacitor
C7 = C13 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C8 = C9 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 2,5 mm from transistor edge
C11 = C12 = 27 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 7 mm from transistor edge
C14 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 08003)
C15 = 10 μF/40 V solid aluminium electrolytic capacitor

L1 = 25 nH; 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,3 mm; length 3,4 mm; leads 2 x 5 mm
L2 = 120 nH; 4 turns closely wound enamelled Cu wire (1,1 mm); int. dia. 6,0 mm; leads 2 x 5 mm
L3 = 30 Ω stripline (6,0 mm x 48,8 mm)
L4 = 48 Ω stripline (3,0 mm x 27,0 mm) at 3 mm from transistor edge
L5 = 30 Ω stripline (6,0 mm x 42,9 mm)
L6 = 24 nH; 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,0 mm; length 3,4 mm; leads 2 x 5 mm

L3, L4 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4{,}5$); thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

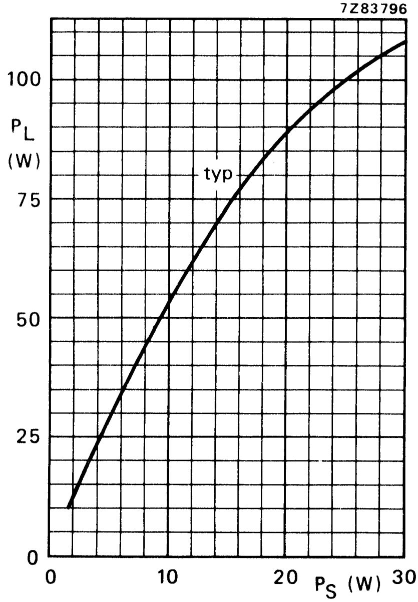


Fig. 17 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A; T_h = 70 °C; f_{vision} = 224,25 MHz.

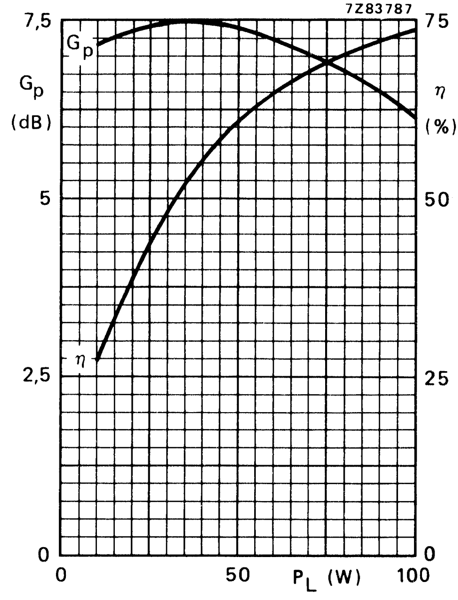


Fig. 18 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A; T_h = 70 °C; f_{vision} = 224,25 MHz; typical values.

Ruggedness in class-AB operation

The BLV33 is capable of withstanding a load mismatch (VSWR ⩽ 2 through all phases) up to 60 W (r.m.s. value) and 90 W (P.E.P.) under the following conditions:
V_{CE} = 28 V; T_h = 70 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,15 K/W.

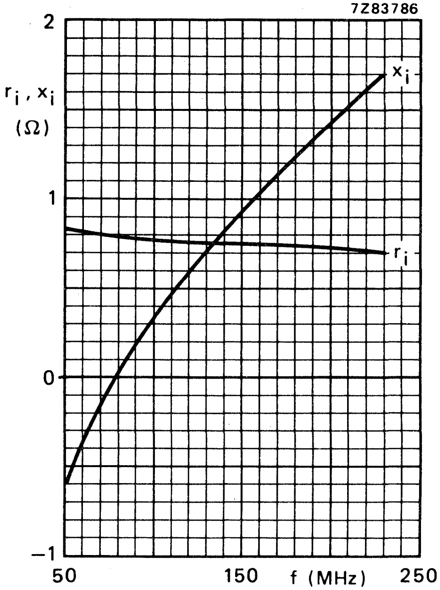


Fig. 19 Input impedance (series components).

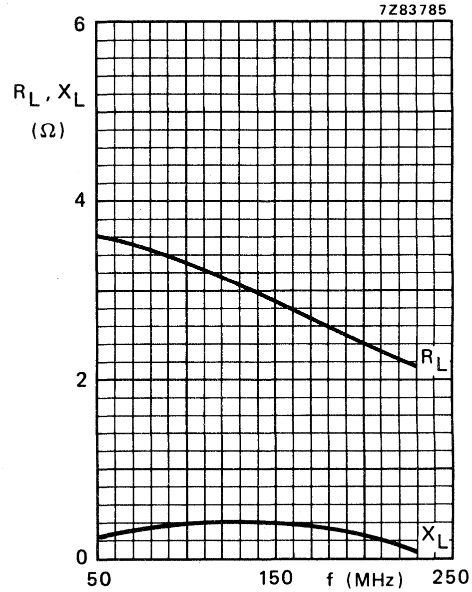


Fig. 20 Load impedance (series components).

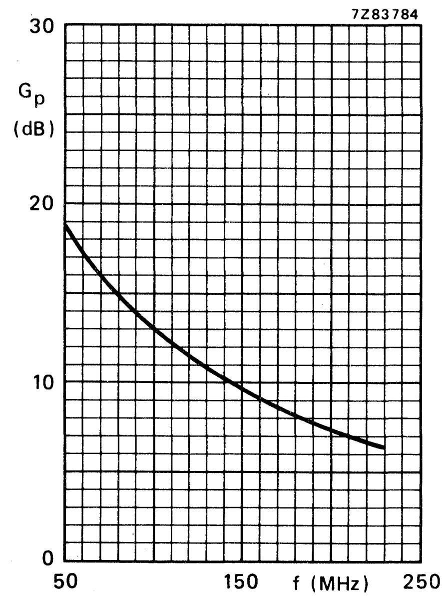


Fig. 21.

Conditions for Figs 19, 20 and 21:

Typical values; V_{CE} = 28 V; P_L = 80 W (P.E.P.); class-AB operation; T_h = 70 °C.

V.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear v.h.f. amplifiers for television transmitters and transposers.

Features of this product:

- internally matched input for wideband operation and high power gain;
- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a ½" 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f_{vision} MHz	V_{CE} V	I_C $I_{C(ZS)}$ A	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB	sync compr.** sync in (%)/sync out (%)
class-A	224,25	25	3,20	70	−55	> 16	> 13,5	
				25	−55	typ. 22	typ. 14,8	
class-AB	224,25	28	0,20	70		typ. 85	typ. 10,5	30/25

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

** Television service (negative modulation, C.C.I.R. system).

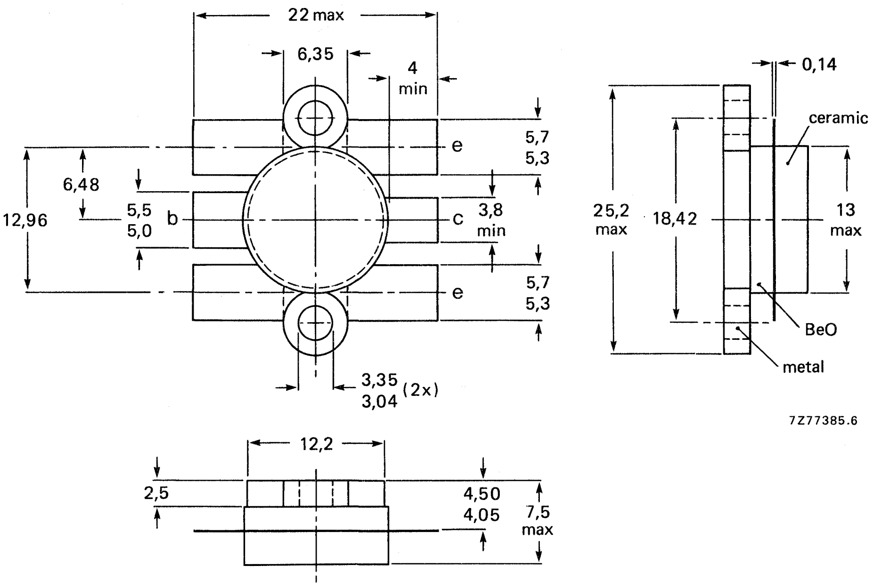
MECHANICAL DATA

SOT-119 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

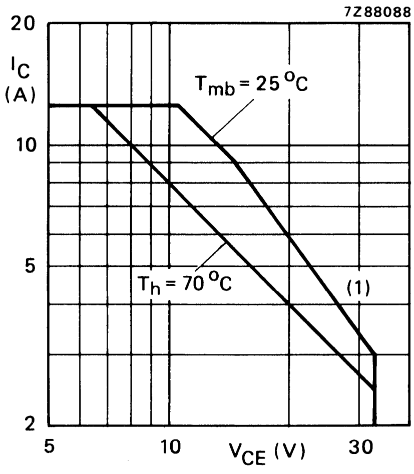
Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	12,5	A
(peak value); $f > 1$ MHz	I_{CM}	max.	20	A
Total power dissipation at $T_{mb} = 25$ °C	P_{tot}	max.	133	W
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	162	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

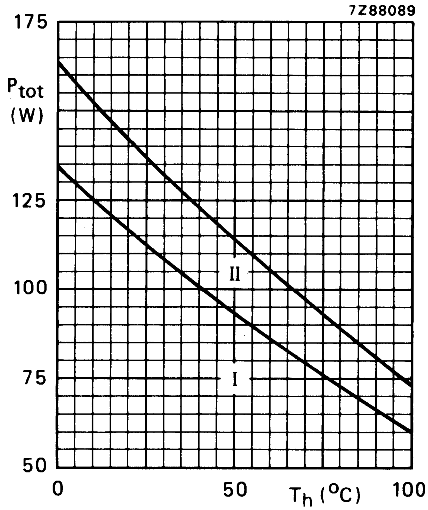


Fig. 3 Power derating curve vs. temperature.

I Continuous d.c. (including r.f. class-A) operation

II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 80 W; $T_{mb} = 86$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,43	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,17	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

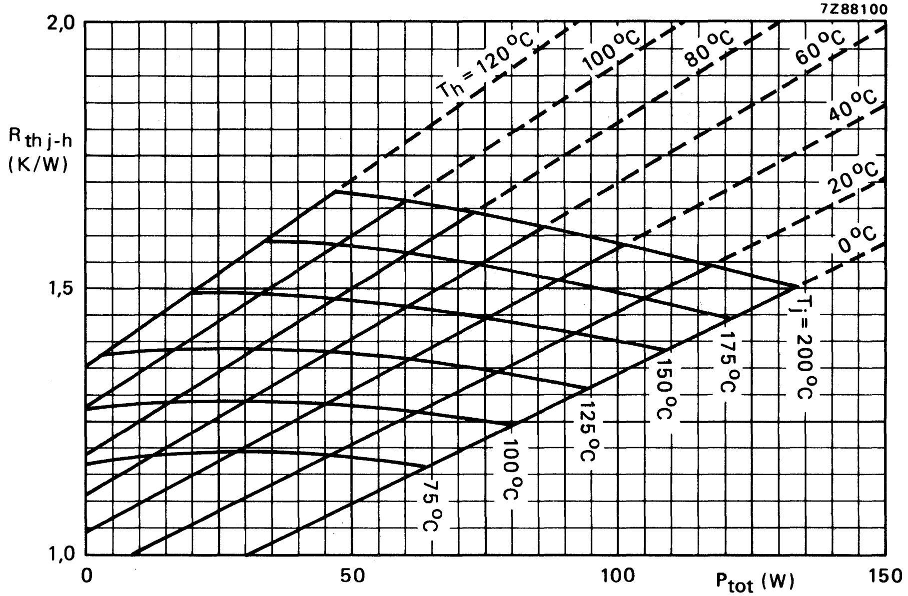


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,2 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 3,2 A; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	1,63 K/W
	T_j	max.	200 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	1,53 K/W
	T_j	typ.	192 °C

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65	V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	12,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	12,5	mJ
D.C. current gain*				
I_C = 3,0 A; V_{CE} = 25 V	h_{FE}	typ.	50	
			15 to 100	
Collector-emitter saturation voltage*				
I_C = 6,0 A; I_B = 0,6 A	V_{CEsat}	typ.	0,75	V
Transition frequency at f = 100 MHz**				
$-I_E$ = 3,0 A; V_{CB} = 25 V	f_T	typ.	680	MHz
$-I_E$ = 6,0 A; V_{CB} = 25 V	f_T	typ.	750	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	155	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	88	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

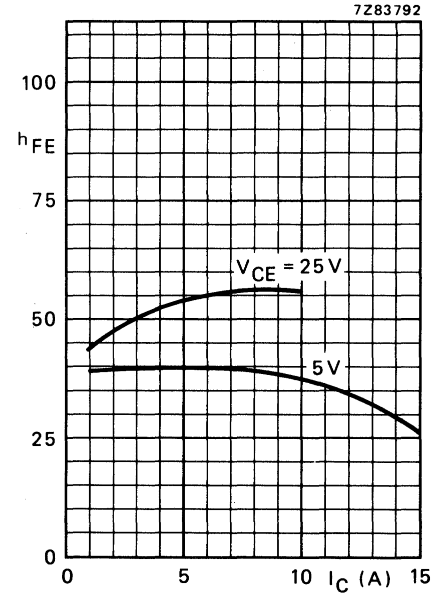


Fig. 5 Typical values; T_j = 25 °C.

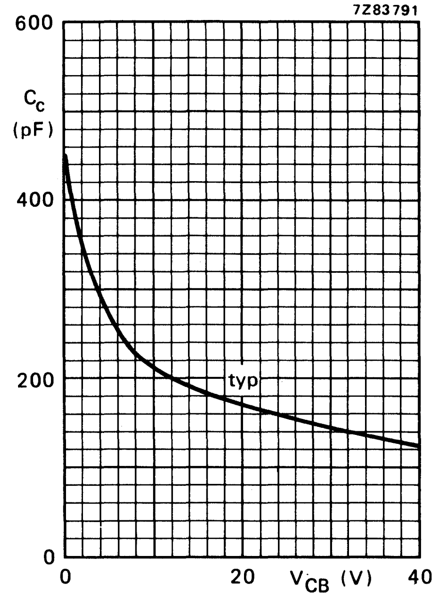


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

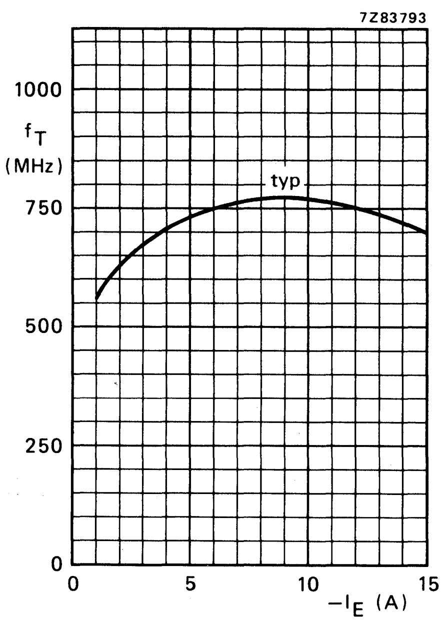


Fig. 7 V_{CB} = 25 V; f = 100 MHz; T_j = 25 °C.

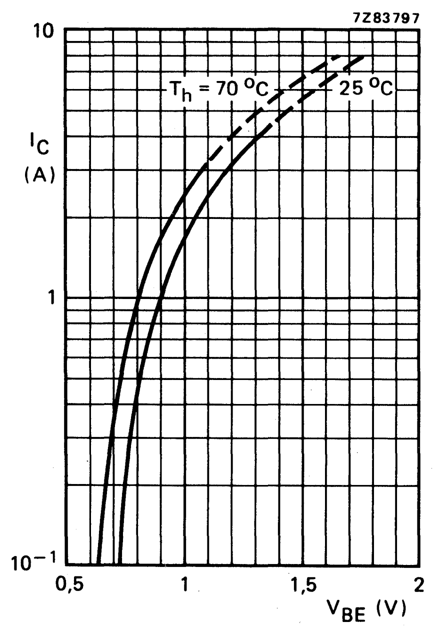


Fig. 8 Typical values; V_{CE} = 25 V.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (A)	T_h (°C)	d_{im} (dB)*	$P_{o\ sync}$ (W)*	G_p (dB)
224,25	25	3,2	70	−55	> 16	> 13,5
			70	−55	typ. 17,5	typ. 14,5
			70	−52	typ. 22	typ. 14,5
			25	−55	typ. 22	typ. 14,8

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

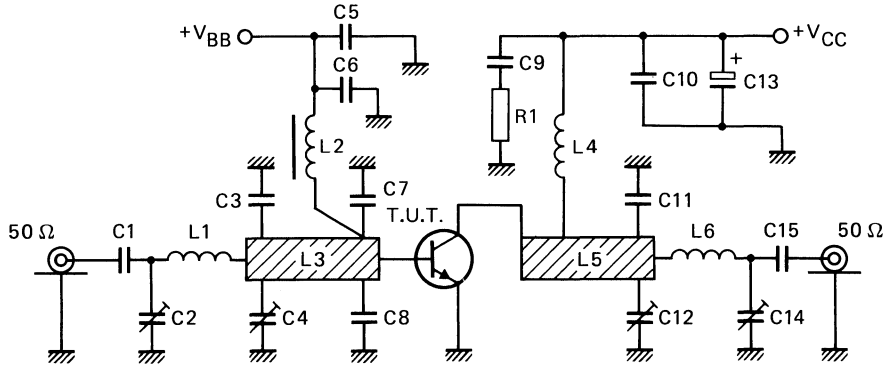


Fig. 9 Class-A test circuit at f_{vision} = 224,25 MHz.

List of components:

C1 = C15 = 560 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = C4 = C12 = C14 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
C3 = 10 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C5 = 470 nF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 856 48474)
C6 = C10 = 680 pF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 852 13681)
C7 = C8 = 47 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 8 mm from transistor edge
C9 = 330 nF polyester capacitor
C11 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C13 = 6,8 μF/35 V solid tantalum capacitor

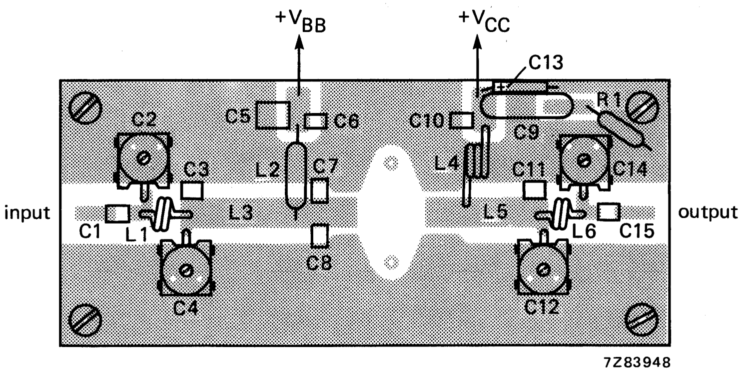
L1 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 5,0 mm; leads 2 x 3 mm
L2 = 1 μH microchoke (cat. no. 4322 057 01080)
L3 = 30 Ω stripline (6,0 mm x 32,7 mm)
L4 = 2 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 10 mm
L5 = 30 Ω stripline (6,0 mm x 24,0 mm)
L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,0 mm; length 4,5 mm; leads 2 x 3 mm

L3 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4{,}5$); thickness 1/16″.

R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 224,25 MHz class-A test circuit are shown in Fig. 10.

▲ ATC means American Technical Ceramics.



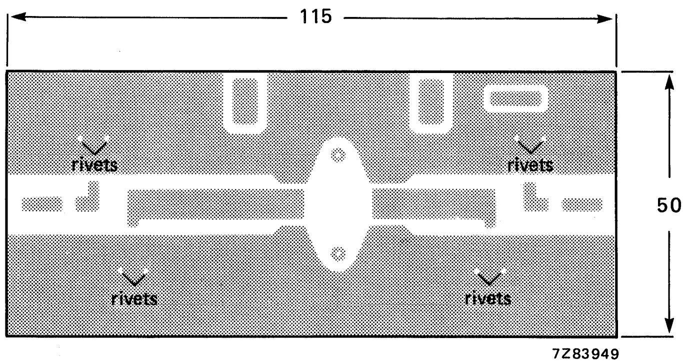


Fig. 10 Component layout and printed-circuit board for 224,25 MHz class-A test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as earth. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

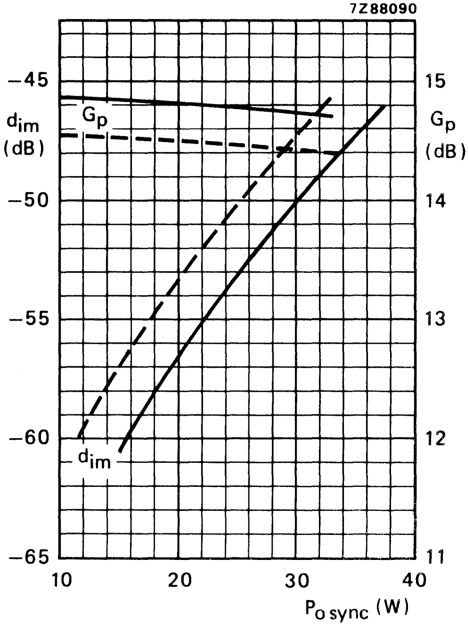


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

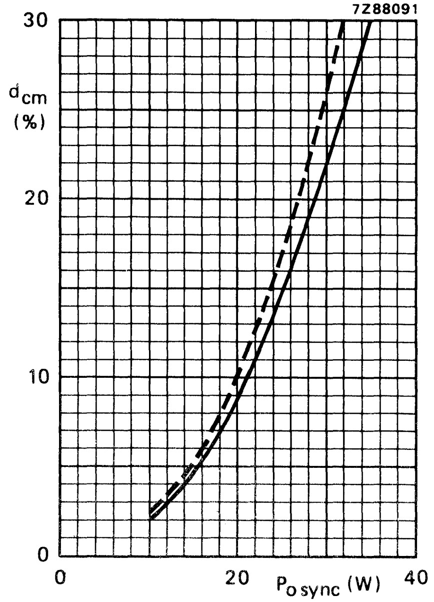


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 3,2 A; —— T_h = 25 °C; – – – T_h = 70 °C; f_{vision} = 224,25 MHz.

Ruggedness in class-A operation

The BLV33F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 30 W (r.m.s. value) or 40 W (P.E.P.) under the following conditions:
V_{CE} = 25 V; I_C = 3,2 A; T_h = 70 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ⩽ −70 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

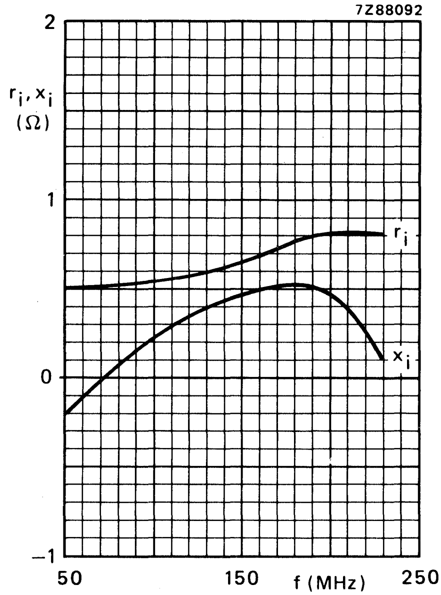


Fig. 13 Input impedance (series components).

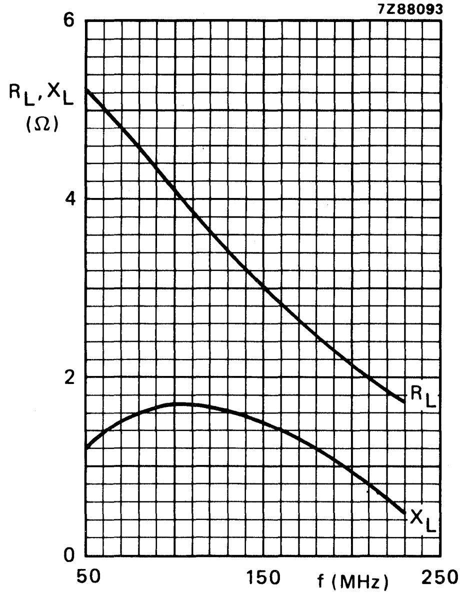


Fig. 14 Load impedance (series components).

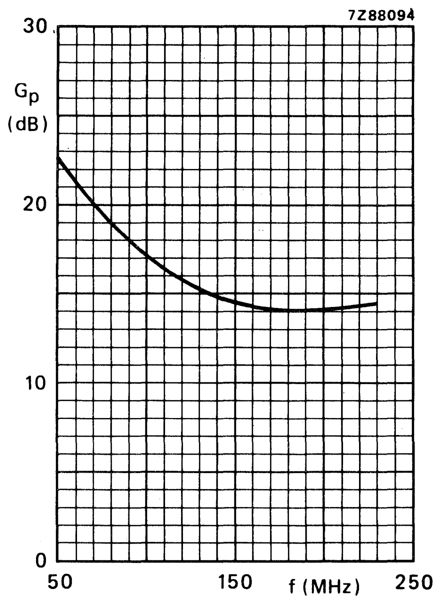


Fig. 15.

Conditions for Figs 13, 14 and 15:

Typical values; V_{CE} = 25 V; I_C = 3,2 A; class-A operation; T_h = 70 °C.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{C(ZS)}$ (A)	T_h (°C)	P_L (W)	I_C (A)	η (%)	G_p (dB)*
224,25	28	0,2	70	40 85	typ. 2,75 typ. 4,25	typ. 52 typ. 71	typ. 11,5 typ. 10,5

* Gain compression point of 1 dB is at typical 85 W (minimum 75 W). Using a 3rd-order amplitude transfer characteristic, 1 dB compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

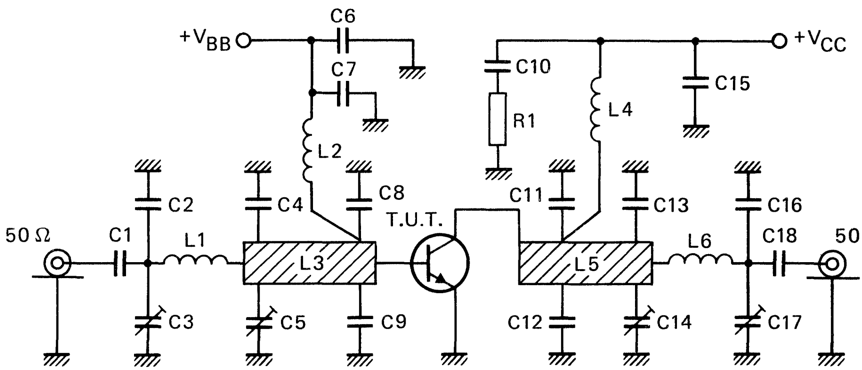


Fig. 16 Class-AB test circuit at f_{vision} = 224,25 MHz. 7Z83946

List of components (component layout and p.c.b. class-AB test circuit see Fig. 17):

C1 = C18 = 620 pF (100 V) multilayer ceramic chip capacitor (ATC▲)
C2 = 27 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C4 = 30 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C5 = C14 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002)
C6 = C10 = 470 nF (50 V) multilayer ceramic chip capacitor (cat. no. 2222 856 48474)
C7 = C15 = 680 pF (50 V) multilayer ceramic chip capacitor (2222 852 13681)
C8 = C9 = 68 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 6,4 mm from transistor edge
C11 = C12 = 43 pF (500 V) multilayer ceramic chip capacitor (ATC▲); placed 10 mm from transistor edge
C13 = 39 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C16 = 3,3 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C17 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)

L1 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 4,0 mm; leads 2 x 4 mm
L2 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 7 mm
L3 = 30 Ω stripline (6,0 mm x 47,8 mm)
L4 = 2 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,0 mm; leads 2 x 8 mm
L5 = 30 Ω stripline (6,0 mm x 42,9 mm)
L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,0 mm; length 4,0 mm; leads 2 x 3 mm

L3 and L5 are striplines on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric ($\epsilon_r \approx 4,5$); thickness 1/16″.

R1 = 10 Ω carbon resistor

▲ ATC means American Technical Ceramics.

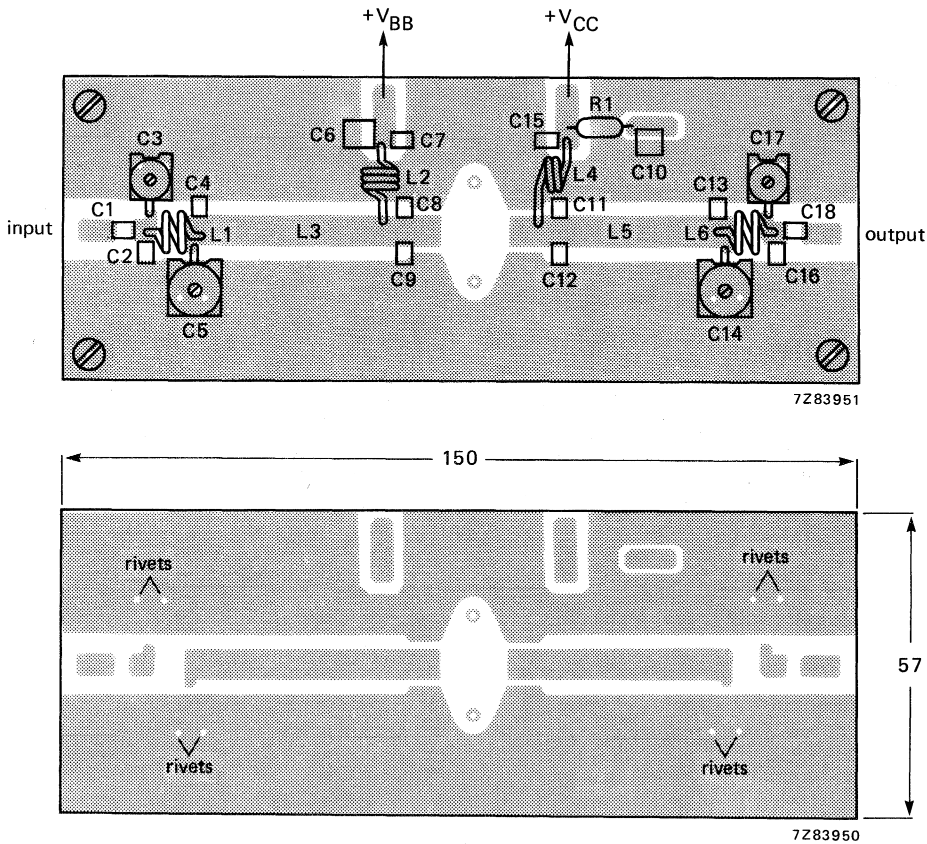


Fig. 17 Component layout and printed-circuit board for 224,25 MHz class-AB test circuit.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as earth. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

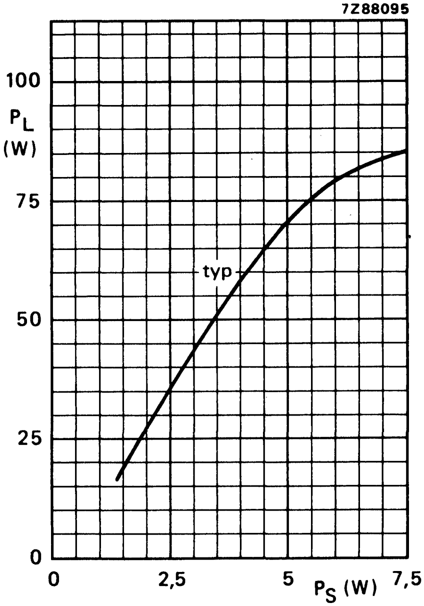


Fig. 18 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,2 A; T_h = 70 °C; f_{vision} = 224,25 MHz.

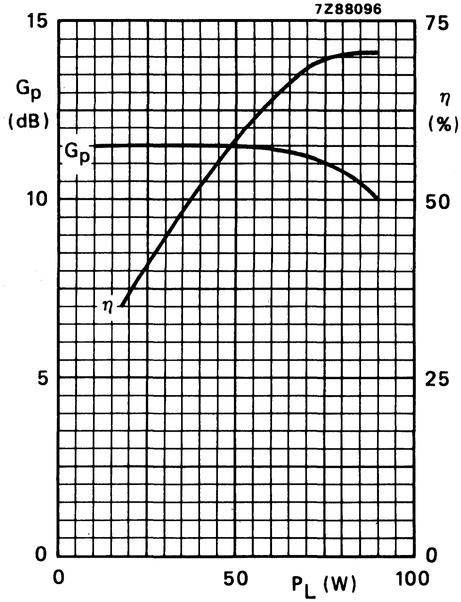


Fig. 19 V_{CE} = 28 V; $I_{C(ZS)}$ = 0,2 A; T_h = 70 °C; f_{vision} = 224,25 MHz; typical values.

Ruggedness in class-AB operation

The BLV33F is capable of withstanding a load mismatch (VSWR ⩽ 2 through all phases) up to 60 W (r.m.s. value) and 85 W (P.E.P.) under the following conditions:
V_{CE} = 28 V; T_h = 70 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

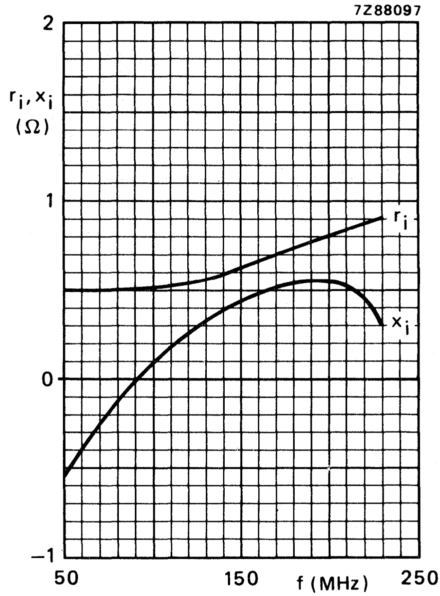


Fig. 20 Input impedance (series components).

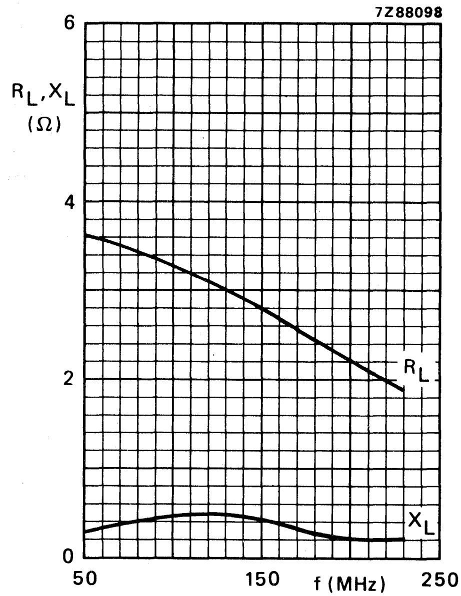


Fig. 21 Load impedance (series components).

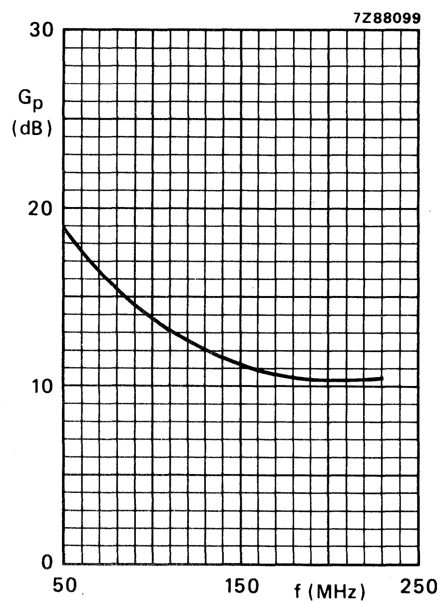


Fig. 22.

Conditions for Figs 20, 21 and 22:

Typical values; V_{CE} = 28 V; P_L = 80 W (P.E.P.); class-AB operation; T_h = 70 °C.

V.H.F. LINEAR PUSH-PULL POWER TRANSISTOR

Two N-P-N silicon planar epitaxial transistor sections in one envelope to be used as a push-pull amplifier. This device is primarily intended for use in linear v.h.f. television transmitters and transposers (vision or sound amplifier).

Features:

- internally matched input for wideband operation and high power gain;
- internal midpoint (r.f. ground) reduces negative feedback and improves power gain;
- increased input and output impedance (compared with single-ended transistors) simplify wideband matching;
- length of external emitter leads is not critical;
- diffused emitter balancing resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in push-pull amplifier

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	T_h °C	G_P dB	η_C %	gain compression dB
c.w.; class-AB	28	2 x 0,25	224,25	115	25	⩾ 11,0 typ. 13,0	⩾ 48 typ. 55	⩽ 1,0 *

* Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

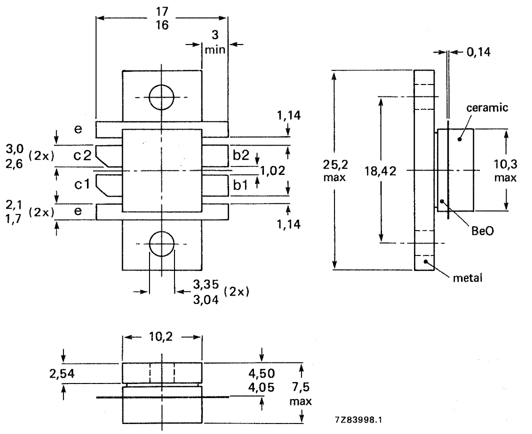
MECHANICAL DATA

SOT-161 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-161.



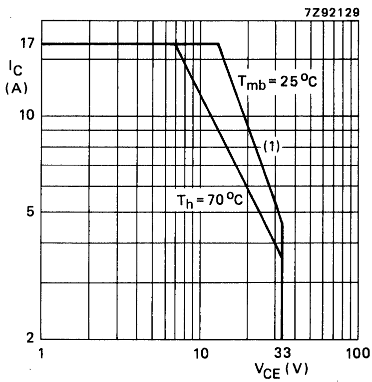
Torque on screw: min. 0,60 Nm
max. 0,75 Nm

Recommended screw: cheese-head 4-40 UNC/2A
Heatsink compound must be sparingly applied and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (peak value);				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current per transistor section				
d.c. or average	I_C, $I_{C(AV)}$	max.	8,5	A
(peak value); f > 1 MHz	I_{CM}	max.	17,5	A
Total d.c. power dissipation; $T_{mb} = 25\ ^oC$	$P_{tot(d.c.)}$	max.	218	W*
R.F. power dissipation f > 1 MHz; $T_{mb} = 25\ ^oC$	$P_{tot(r.f.)}$	max.	270	W*
Storage temperature	T_{stg}	–65 to +150		^oC
Operating junction temperature	T_j	max.	200	^oC



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

Conditions for Figs 2 and 3:
$R_{th\ mb\text{-}h} = 0{,}25$ K/W; Total device*.

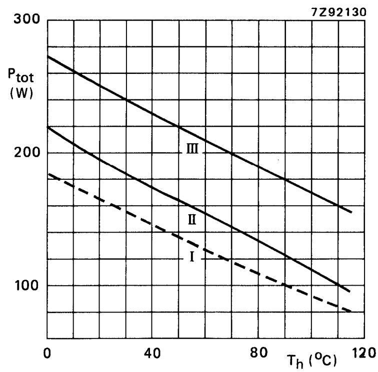


Fig. 3 Power/temperature derating curves.

I Continuous d.c. operation
II Continuous r.f. operation; (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE

(dissipation = 180 W; $T_{mb} = 25\ ^oC$)**

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,85	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,64	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,25	K/W

* Dissipation of either transistor section shall not exceed half rated power.
** Both transistor sections equally loaded.

CHARACTERISTICS

Apply to either transistor section unless otherwise specified. $T_j = 25\ ^oC$.

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	65 V
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 33$ V	I_{CES}	<	10 mA
Second-breakdown energy; L = 25 mH; f = 50 Hz			
$R_{BE} = 10\ \Omega$	E_{SBR}	>	10 mJ
D.C. current gain*			
$I_C = 3,5$ A; $V_{CE} = 25$ V	h_{FE}	typ.	45
		15 to	100
Transition frequency at f = 100 MHz*			
$-I_E = 3,3$ A; $V_{CB} = 25$ V	f_T	typ.	575 MHz
$-I_E = 10$ A; $V_{CB} = 25$ V	f_T	typ.	600 MHz
Collector capacitance at f = 1 MHz			
$I_E = i_e = 0$; $V_{CB} = 25$ V	C_c	typ.	155 pF
Feedback capacitance at f = 1 MHz			
$I_C = 50$ mA; $V_{CE} = 25$ V	C_{re}	typ.	88 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.

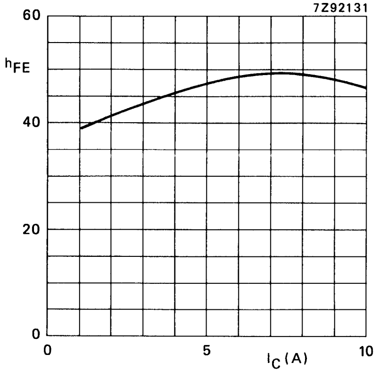


Fig. 4 V_{CE} = 25 V; T_j = 25 °C; typ. values.
typ. values.

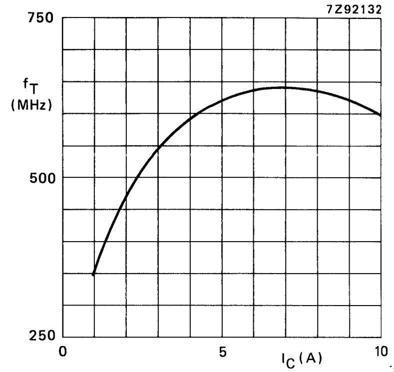


Fig. 5 V_{CE} = 25 V; f = 100 MHz;
T_j = 25 °C; typ. values.

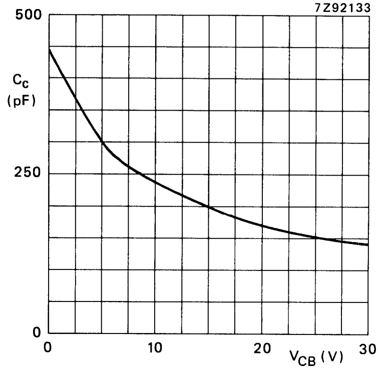


Fig. 6 $I_E = i_e = 0$; f = 1 MHz;
typ. values.

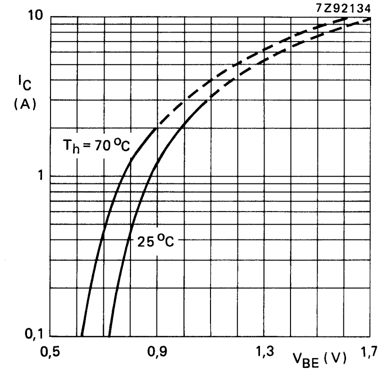


Fig. 7 V_{CE} = 25 V; typ. values.

The above graphs apply to either transistor section.

APPLICATION INFORMATION

R.F. performance in v.h.f. class-AB operation (linear push-pull power amplifier) V_{CE} = 28 V; T_h = 25 °C; f = 224,25 MHz

mode of operation	P_L W	$I_{C(ZS)}$ A	G_P dB	η_C %	gain compression dB
class-AB; c.w.	115	2 x 0,15	≥ 11,0 typ. 13,0	≥ 48 typ. 55	≤ 1,0* typ. 0,5*

* Assuming a 3rd order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

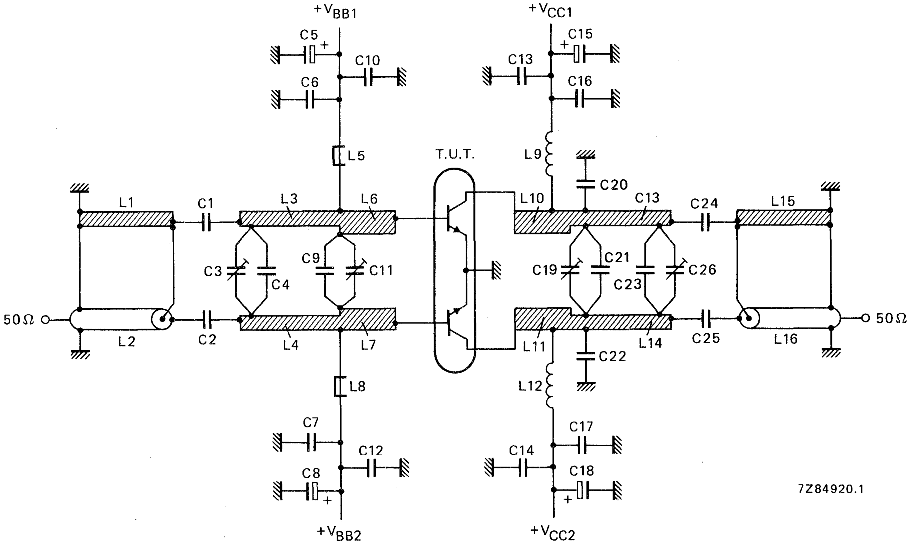


Fig. 8 Class-AB test circuit at 234,25 MHz.

List of components:

C1 = C2 = C24 = C25 = 68 pF (500 V) multilayer ceramic chip capacitor.**
C3 = C11 = C26 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 08002).
C4 = 33 pF (500 V) multilayer ceramic chip capacitor.**
C5 = C8 = 4,7 μF (63 V) electrolytic capacitor.
C6 = C7 = C16 = C17 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 855 48104).
C9 = 2 x 47 pF (500 V) multilayer ceramic chip capacitors in parallel.**
C10 = C12 = C13 = C14 = 470 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13471).
C15 = C18 = 10 μF (63 V) electrolytic capacitor.
C19 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 0003).
C20 = C22 = 3,3 pF (500 V) multilayer ceramic chip capacitor.**
C21 = parallel connection of 2 x 27 pF (500 V) ceramic chip capacitors.**
C23 = 5,6 pF (500 V) multilayer ceramic chip capacitor.**

(C9 and C11 are connected 11 mm from transistor edge and C19 and C21 18 mm from transistor edge.)

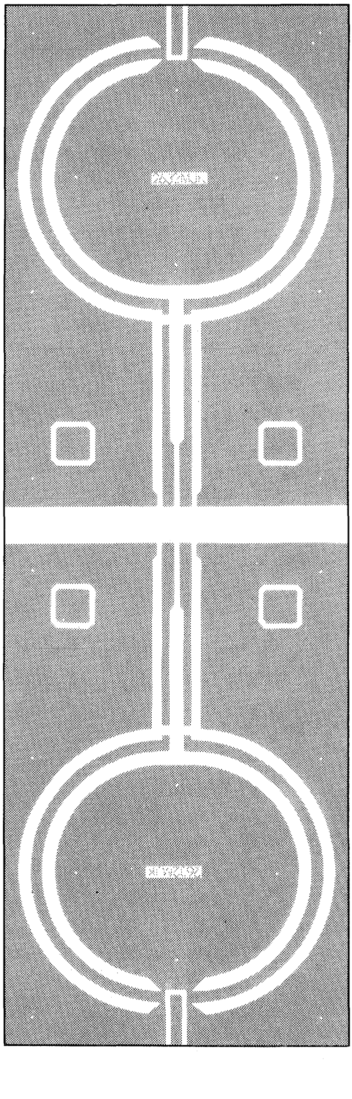
** American Technical Ceramics capacitor type 100A or capacitor of same quality.

L1 = L15 = 50 Ω stripline (2,8 mm x 91,3 mm).
L2 = L16 = 50 Ω semi-rigid cable; outer diameter 2,2 mm; outer conductor length 91,3 mm.
L3 = L4 = L13 = L14 = 60 Ω stripline (2,0 mm x 27,9 mm).
L5 = L8 = 100 nH microchoke.
L6 = L7 = L10 = L11 = 48 Ω stripline (3,0 mm x 14,6 mm).
L9 = L12 = 20,5 nH; 2 turns enamelled Cu wire (1,0 mm); int. dia. 4,5 mm; length 3 mm; leads leads 2 x 10 mm; connected 15 mm from transistor edge.

L1, L3, L4, L6, L7, L10, L11, L13, L14 and L15 are striplines on a double Cu-clad p.c. board with epoxy fibre-glass dielectric (ϵ_r = 4,5); thickness 1/16 inch.

The printed circuit board and component layout for a 224,25 MHz, class-AB test are given in Fig. 9 and Fig. 10 respectively.

The circuit and the components are on one side of the epoxy fibre-glass board; the other side is unetched copper to serve as ground plane. Earth connections are made by hollow rivets and in addition by fixing screws and also by copper straps under the emitters and at the input and output.



7Z90217

Fig. 9 Printed circuit board for 224,25 MHz class-AB test circuit.

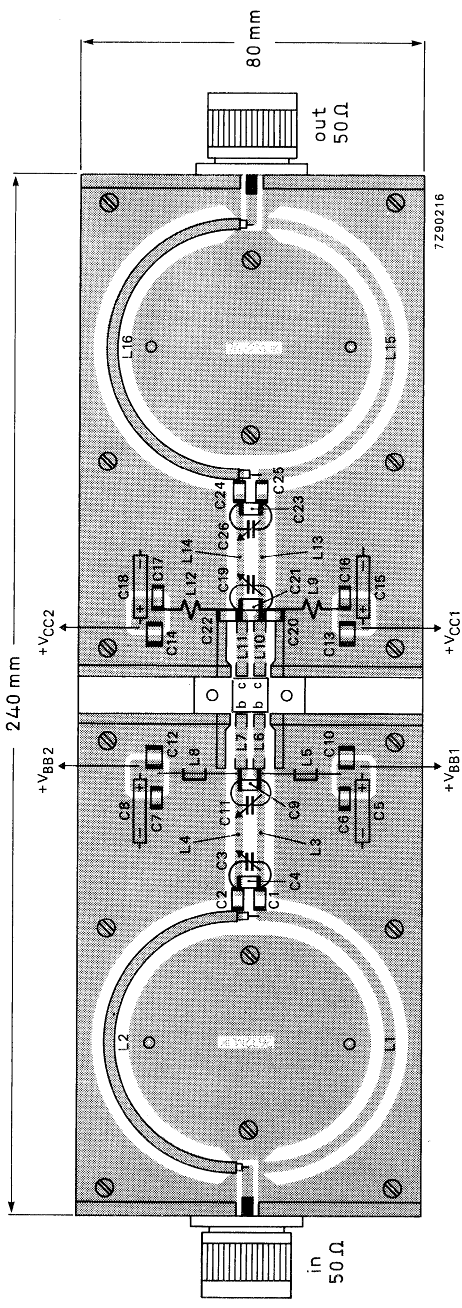


Fig. 10 Component layout of a 224,25 MHz class-AB test circuit.

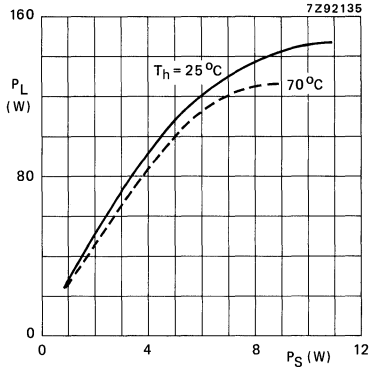


Fig. 11 Output power; typ. values.

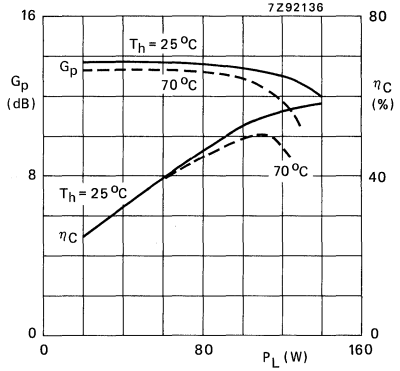


Fig. 12 Power gain and efficiency; typ. values.

Conditions for Figs 11 and 12:
V_{CE} = 28 V; $I_{C(ZS)}$ = 2 x 0,15 A; f = 224,25 MHz; class-AB.

RUGGEDNESS

The BLV36 is capable of continuously withstanding a load mismatch (VSWR = 5, through all phases) up to 80 W under the following conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 2 x 0,15 A; T_h = 25 °C; f = 224,25 MHz; $R_{th\ mb\text{-}h}$ = 0,25 K/W.

The instantaneous collector current should not exceed 10 A.

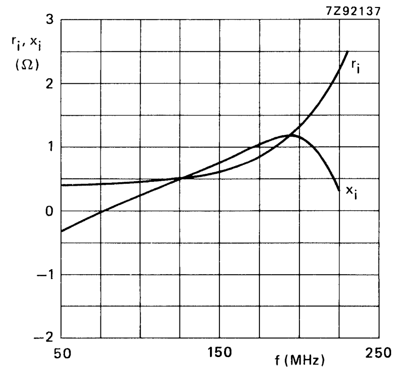


Fig. 13 Input impedance (series components); typ. values.

Conditions for Figs 13, 14 and 15:

The graphs apply to either transistor section assuming class-AB push-pull operation
V_{CE} = 28 V; $I_{C(ZS)}$ = 0,15 A; P_L = 70 W;
T_h = 25 °C.

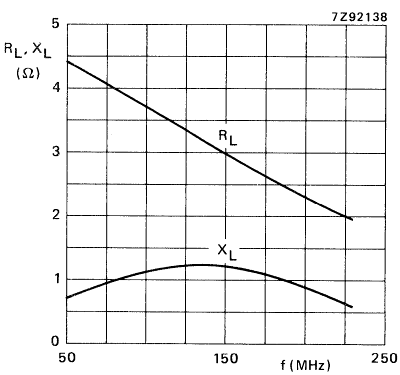


Fig. 14 Load impedance (series components); typ. values.

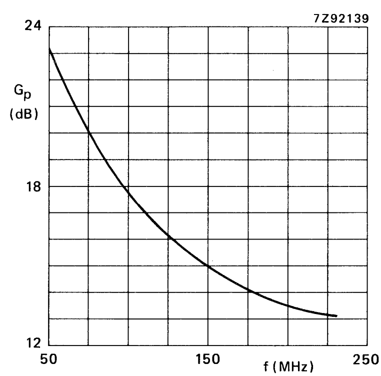


Fig. 15 Power gain; typ. values.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 175 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	175	45	> 6,5	> 55

MECHANICAL DATA

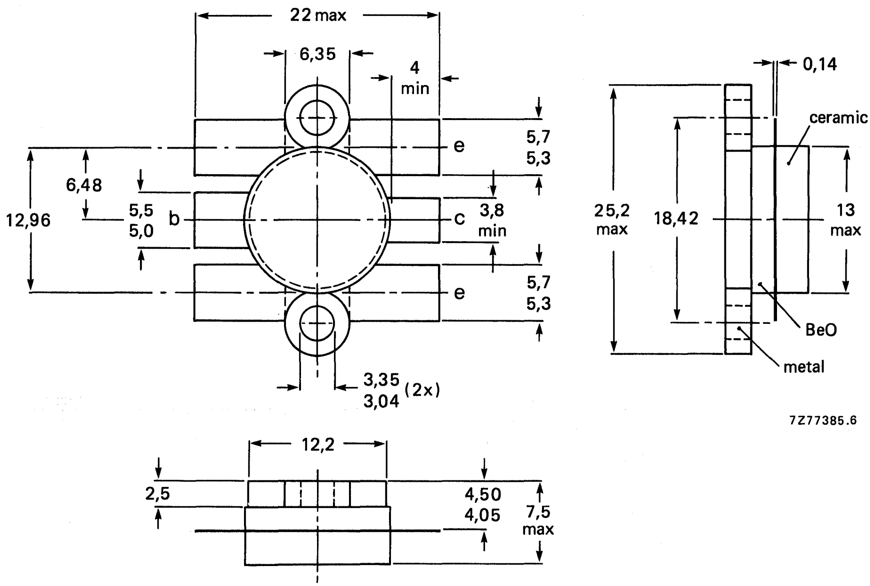
SOT-119 (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm
max. 0,75 Nm

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current d.c. or average	I_C	max.	9	A
peak value; f > 1 MHz	I_{CM}	max.	27	A
Total power dissipation at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	90	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

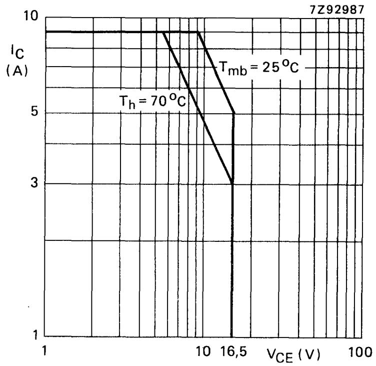


Fig. 2 D.C. soar.
$R_{th\ mb-h}$ = 0,2 K/W.

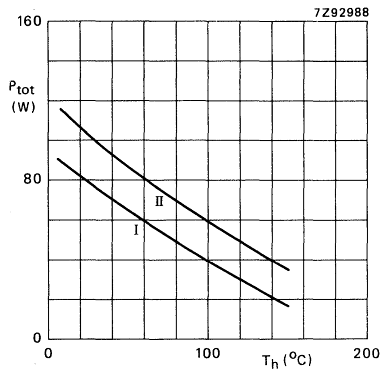


Fig. 3 Power/temperature derating curves; $R_{th\ mb-h}$ = 0,2 K/W.
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 68 W; T_{mb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	=	1,58	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	16,5 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	22 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	12,5 mJ
D.C. current gain V_{CE} = 10 V; I_C = 6 A	h_{FE}	> typ.	15 55
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	130 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	80 pF

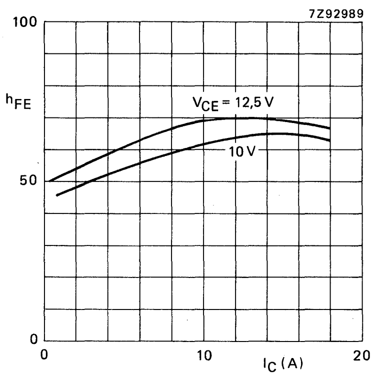


Fig. 4 D.C. current gain versus collector current; T_j = 25 °C.

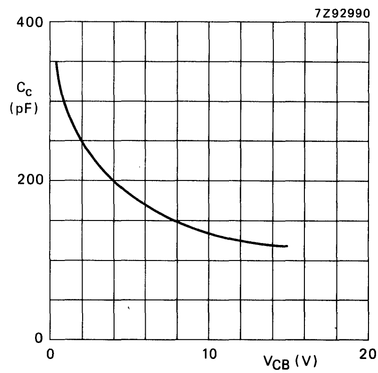


Fig. 5 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1MHz; T_j = 25 °C

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
f = 175 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0,2 K/W

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	45	> 6,5 typ. 8,0	> 55 typ. 67

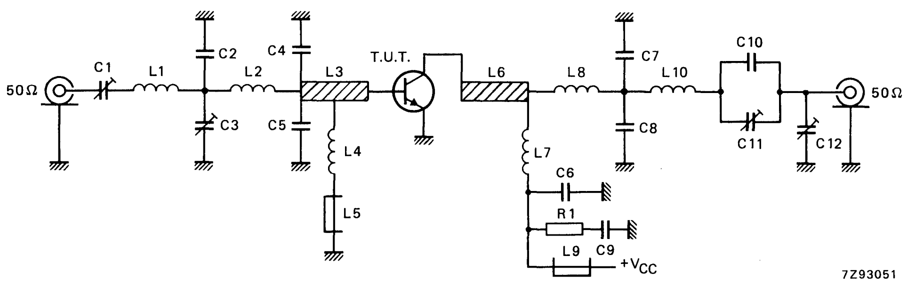


Fig. 6 Class-B test circuit at f = 175 MHz.

List of components:

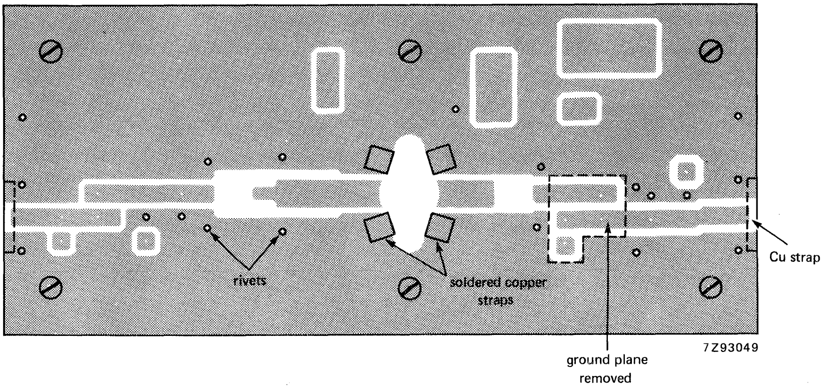
C1 = C11 = C12 = 4 to 40 film dielectric trimmer (cat.no. 2222 809 07008)
C2 = C10 = 10 pF multilayer ceramic chip capacitor *
C3 = 2,5 to 20 pF film dielectric trimmer (cat.no. 2222 809 07004)
C4 = C5 = 91 pF multilayer ceramic chip capacitor *
C6 = 820 pF multilayer ceramic chip capacitor *
C7 = C8 = 2 x 4,7 pF multilayer ceramic chip capacitors* in parallel
C9 = 100 nF polyester capacitor

L1 = strip, 28 mm x 4 mm
L2 = 4 turns Cu wire (1,0 mm); int.dia. 4,0 mm; length 7,5 mm; leads 2 x 3,5 mm
L3 = strip, 22 mm x 6 mm
L4 = 1 turn Cu wire (0,8 mm); int.dia. 3,0 mm; leads 2 x 9 mm
L5 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat.no. 4312 020 36640)
L6 = strip, 12 mm x 6 mm
L7 = 2 turns enamelled Cu wire (1,6 mm); int.dia. 5,0 mm; length 7,0 mm; leads 2 x 5 mm
L8 = 2 turns enamelled Cu wire (1,6 mm); int.dia. 5,0 mm; length 7,0 mm; leads 2 x 3 mm
L10 = strip, 18 mm x 4 mm

L1, L3, L6 and L10 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 inch.

R1 = 4,7 Ω ± 10%, carbon resistor

* American Technical Ceramics capacitor type 100B or capacitor of same quality.



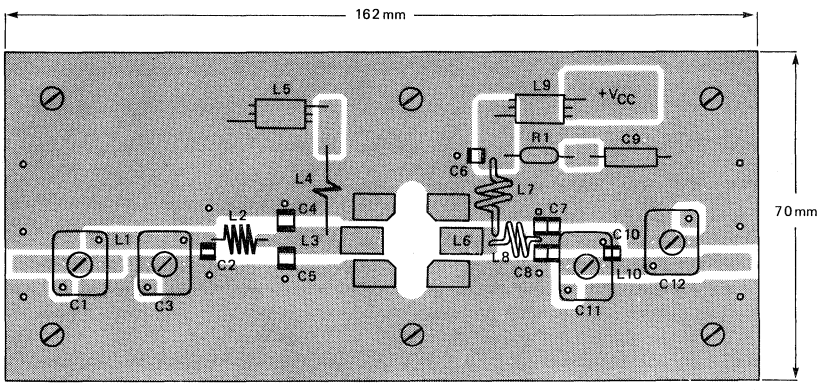


Fig. 7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

The circuit and components are on one side of the epoxy fibre-glass board. The other side, except for the area indicated by the dotted line, is unetched copper serving as a ground plane.
If the p.c.b. is in direct contact with the heatsink, the heatsink area within the dotted line has to be raised al least 0,5 mm to minimize the dielectric losses.
Earth connections are made by hollow rivets and additionally by fixing screws and copper straps under the emitters to provide a direct contact between the copper of the component side and the ground plane.

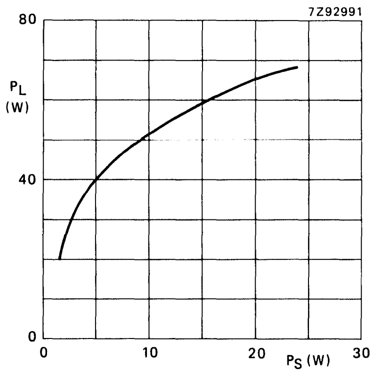


Fig. 8 Load power versus source power.

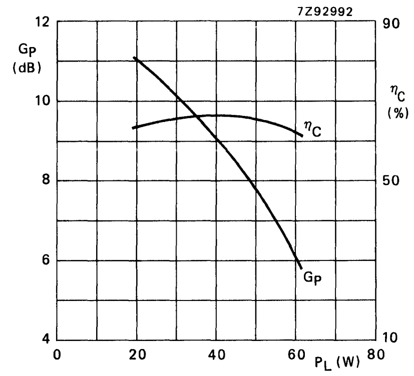


Fig. 9 Power gain and efficiency versus load power.

Condition for Figs 8 and 9:

Typical values; V_{CE} = 12,5 V; f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Ruggedness in class-B operation

The BLV45/12 is capable of withstanding a load mismatch (VSWR = 20 through all phases) at rated load power up to a supply voltage of 15,5 V; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Power slump

If T_h is increased from 25 °C to 70 °C the output power slump for constant P_S amounts to typ. 7 % (V_{CE} = 12,5; f = 175 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W).

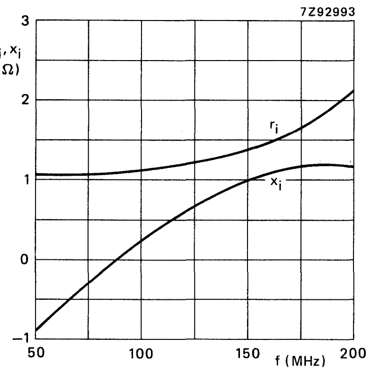


Fig. 10 Input impedance
(series components).

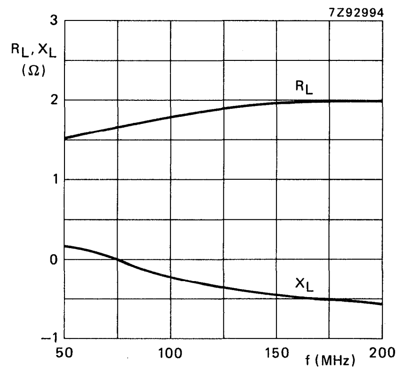


Fig. 11 Load impedance
(series components).

Conditions for Figs 10, 11 and 12:

Typical values; V_{CE} = 12,5 V; P_L = 45 W; f = 50 to 200 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

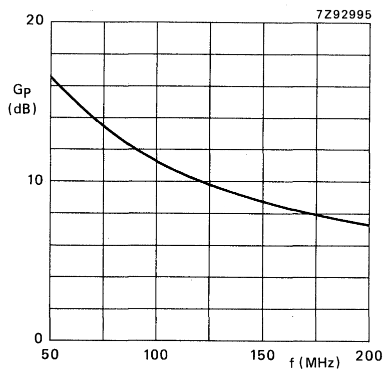


Fig. 12 Power gain versus frequency.

U.H.F. LINEAR PUSH-PULL POWER TRANSISTOR

Two n-p-n silicon planar epitaxial transistor sections in one envelope to be used as push-pull amplifier, primarily intended for use in linear u.h.f. television transmitters and transposers.

Features:

- internally matched input for wideband operation and high power gain;
- internal midpoint (r.f. ground) reduces negative feedback and improves power gain;
- increased input and output impedances (compared with single-ended transistors) simplify wideband matching;
- length of the external emitter leads is not critical;
- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The envelope is an 8-lead flange type with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

mode of operation	f_{vision} MHz	V_{CE} V	$I_{C1} = I_{C2}$ A	$I_{C(ZS)}$ A	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	P_L W	G_p dB
class-A	860	25	0,85	–	70 25	–60 –55	> 6 typ. 12	–	> 8,0 typ. 9,0
class-AB	860	25	1,25	2 x 0,1	25	–	–	typ. 38**	typ. 6,5**

* Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), zero dB corresponds to peak sync level.

** Power gain compression is 1 dB.

MECHANICAL DATA

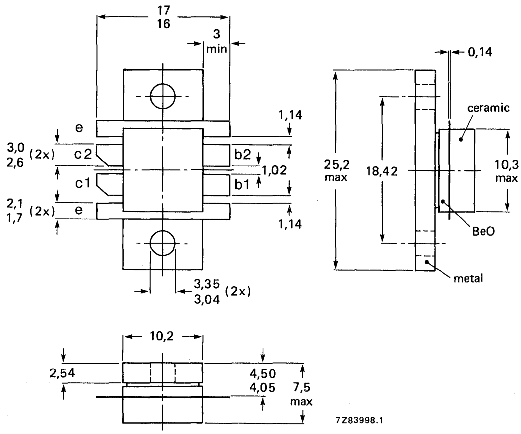
SOT-161 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-161.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

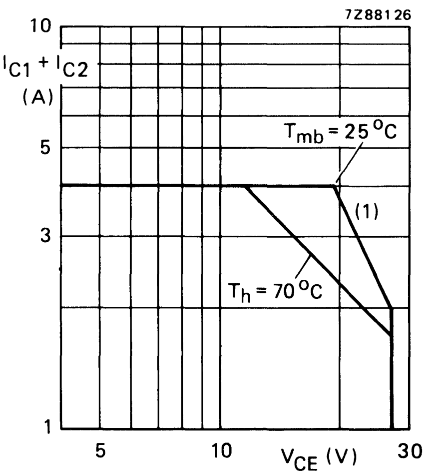
Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50	V
open base	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current per transistor section				
d.c. or average	I_C; $I_{C(AV)}$	max.	2	A
(peak value); f > 1 MHz	I_{CM}	max.	4	A
Total power dissipation at T_{mb} = 25 °C*	P_{tot}	max.	77	W*
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C*	P_{rf}	max.	93	W*
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.*

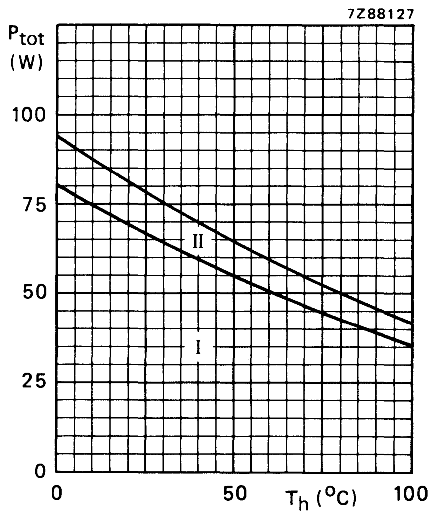


Fig. 3 Power derating curves vs. temperature.*

I Continuous d.c. (including r.f. class-A) operation

II Continuous r.f. operation

THERMAL RESISTANCE (dissipation = 42 W; T_{mb} = 80,5 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,43	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,91	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,25	K/W

* Dissipation of either transistor section should not exceed half rated dissipation.

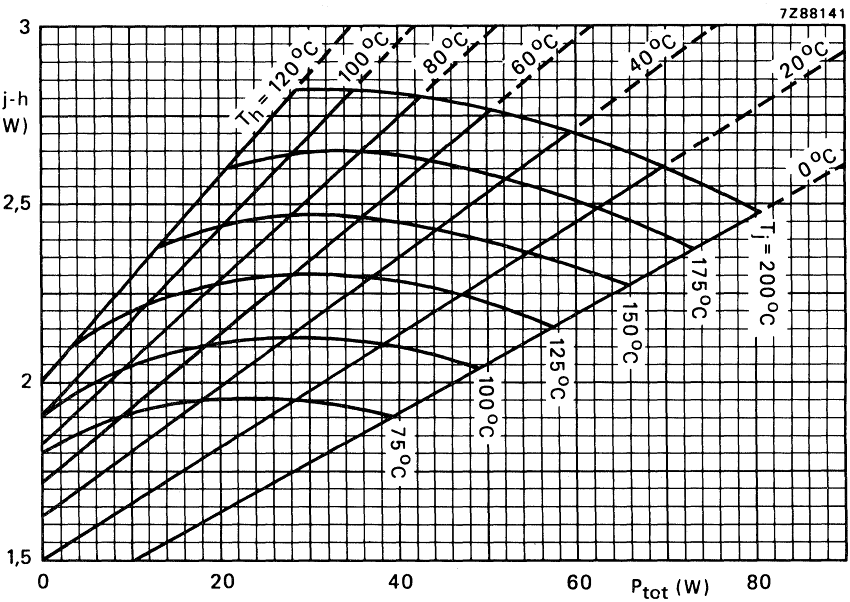


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,25 K/W.)

Example

Nominal class-A push-pull operation (without r.f. signal): V_{CE} = 25 V; $I_{C1} = I_{C2}$ = 0,85 A; T_h = 70 °C.

Fig. 4 shows: $R_{th\ j\text{-}h}$ max. 2,68 K/W
T_j max. 184 °C

Typical device: $R_{th\ j\text{-}h}$ typ. 2,28 K/W
T_j typ. 167 °C

CHARACTERISTICS apply to either transistor section unless otherwise specified

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	50 V
open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	27 V
Emitter-base breakdown voltage			
open collector; $I_E = 5$ mA	$V_{(BR)EBO}$	>	3,5 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 27$ V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	2 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2 mJ
D.C. current gain*			
$I_C = 0,85$ A; $V_{CE} = 25$ V	h_{FE}	>	15
		typ.	40
D.C. current gain ratio of transistor sections			
$I_C = 0,85$ A; $V_{CE} = 25$ V		0,67 to 1,5	
Collector-emitter saturation voltage*			
$I_C = 1,7$ A; $I_B = 0,17$ A	V_{CEsat}	typ.	0,75 V
Transition frequency at f = 100 MHz**			
$-I_E = 0,85$ A; $V_{CB} = 25$ V	f_T	typ.	2,5 GHz
$-I_E = 1,7$ A; $V_{CB} = 25$ V	f_T	typ.	2,5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 25$ V	C_c	typ.	24 pF
		<	30 pF
Feedback capacitance at f = 1 MHz			
$I_C = 50$ mA; $V_{CE} = 25$ V	C_{re}	typ.	15 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

The graphs apply to either transistor section.

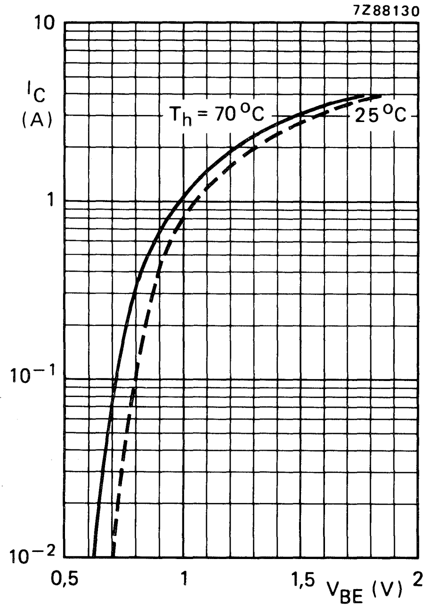


Fig. 5 Typical values; V_{CE} = 25 V.

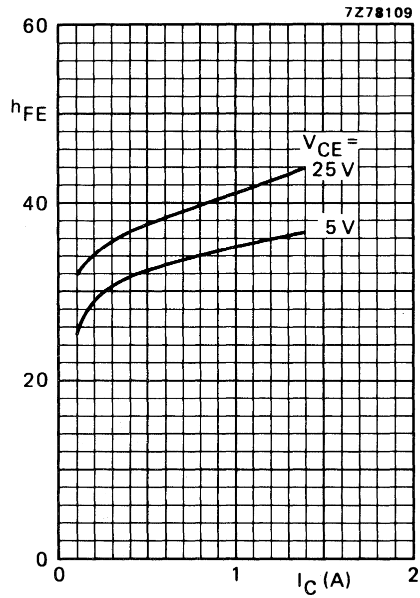


Fig. 6 Typical values; T_j = 25 °C.

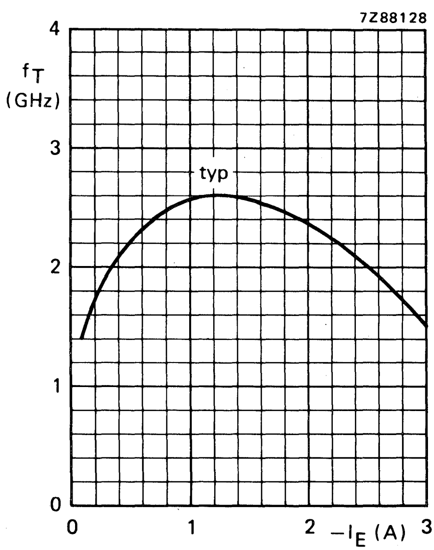


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

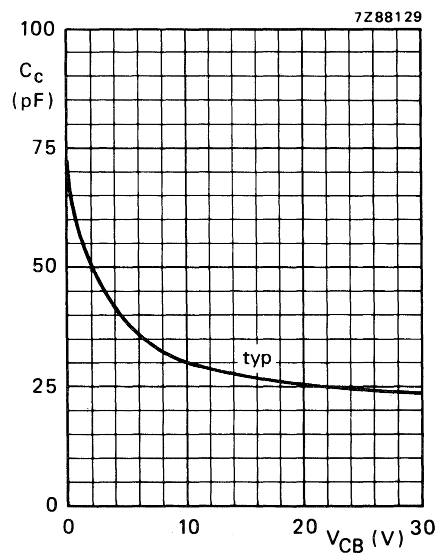


Fig. 8 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear push-pull power amplifier)

f_{vision} (MHz)	V_{CE} (V)	$I_{C1} = I_{C2}$ (A)	T_h (°C)	d_{im}* (dB)	$P_{o\ sync}$* (W)	G_p (dB)
860	25	0,85	70	−60	> 6	> 8,0
			70	−60	typ. 7,5	typ. 8,5
			70	−55	typ. 10	typ. 8,5
			25	−55	typ. 12	typ. 9,0

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

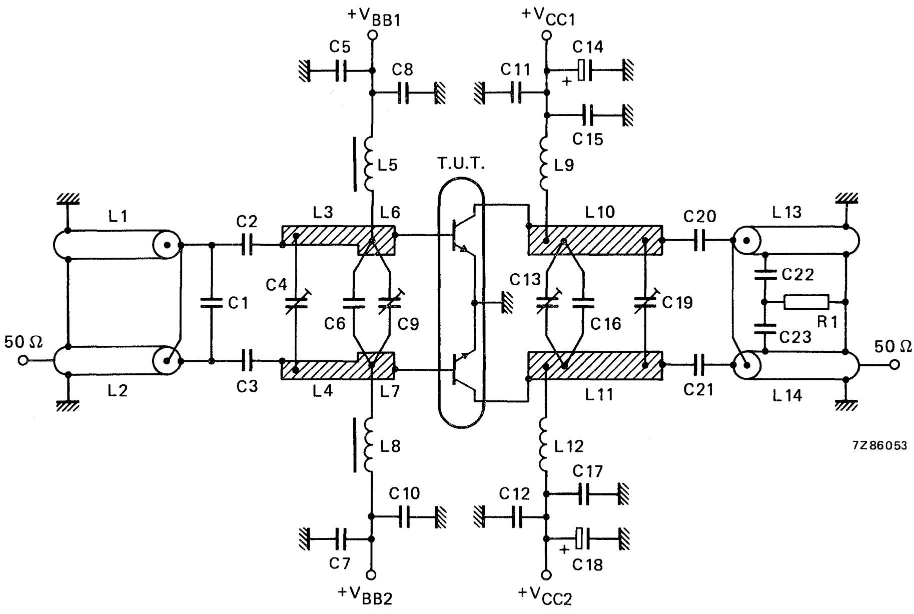


Fig. 9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

C1 = C6 = C16 = 4,7 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = C3 = C20 = C21 = 33 pF multilayer ceramic chip capacitor (cat. no. 2222 851 13339)
C4 = C9 = C13 = C19 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
C5 = C7 = C15 = C17 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 852 59104)
C8 = C10 = C11 = C12 = 220 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13221)
C14 = C18 = 6,8 μF/40 V solid aluminium electrolytic capacitor
C22 = C23 = 1 pF (500 V) multilayer ceramic chip capacitor (ATC▲)

C9 and C13 are placed 8,0 and 14,0 mm from transistor edge, respectively.

▲ ATC means American Technical Ceramics.

L1 = L2 = L13 = L14 = 50 Ω semi-rigid cable; outer diameter 2,2 mm; length 29,0 mm. These cables are soldered on 75 Ω striplines (1,1 mm x 28,0 mm). The centre conductors of the cables L1 and L13 are not connected.
L3 = L4 = 52 Ω stripline (2,0 mm x 16,5 mm)
L5 = L8 = 470 nH microchoke
L6 = L7 = 39 Ω stripline (3,1 mm x 8,0 mm)
L9 = L12 = 1 turn Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 3,5 mm
L10 = L11 = 39 Ω stripline (3,1 mm x 34,0 mm)

L3, L4, L6, L7, L10 and L11 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/32".

R1 = 10 Ω carbon resistor

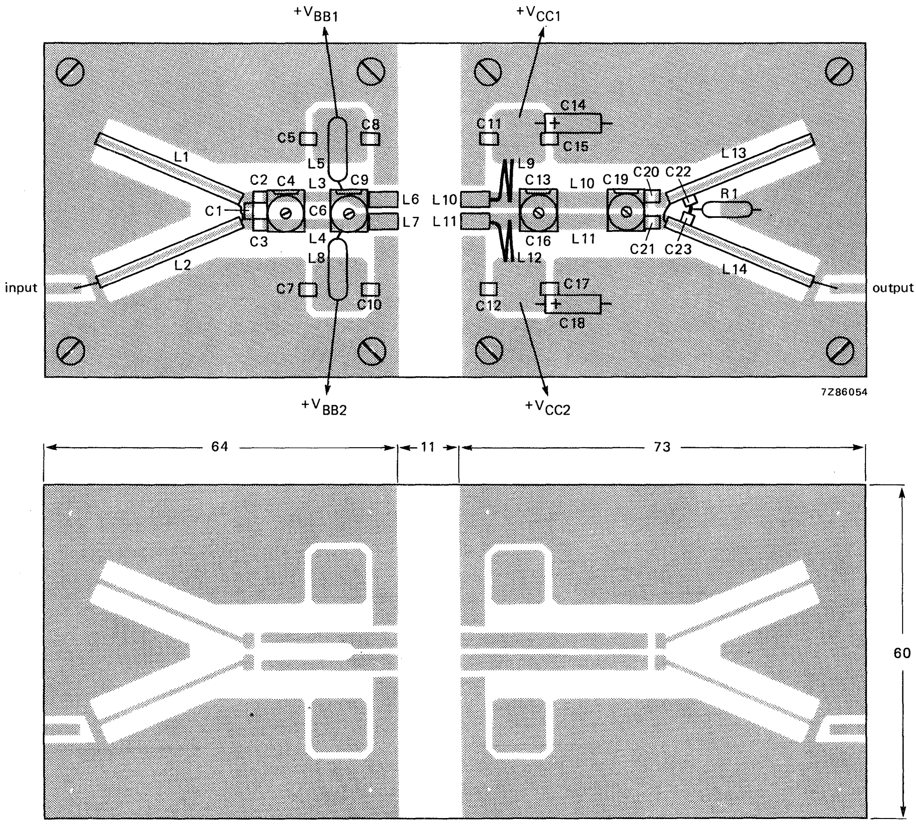


Fig. 10 Component layout and printed-circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by means of bolts. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

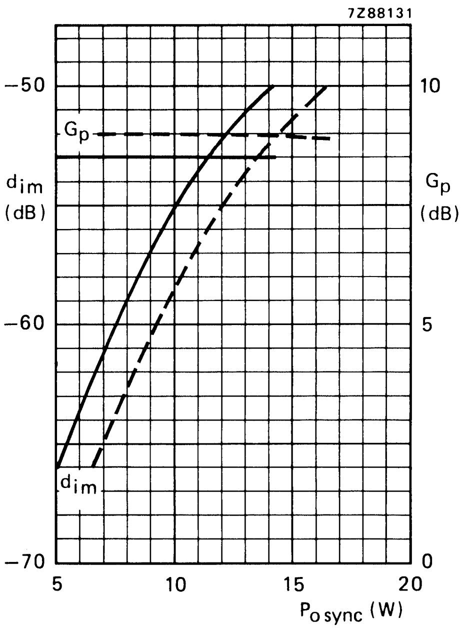


Fig. 11 Intermodulation distortion (d_{im})* and power gain as a function of output power.

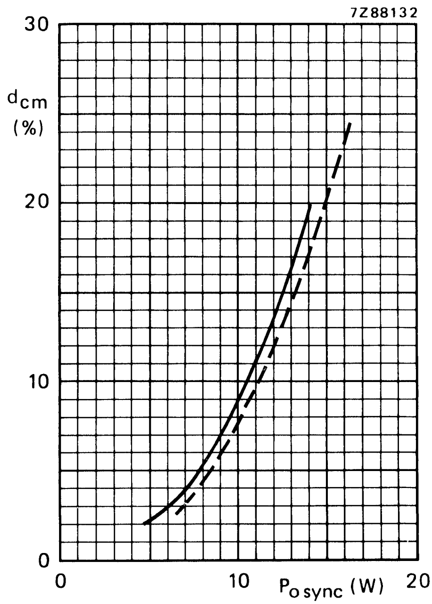


Fig. 12 Cross-modulation distortion (d_{cm})** as a function of output power.

Conditions for Figs 11 and 12:

Typical values; V_{CE} = 25 V; I_C = 2 x 0,85 A; — — — T_h = 25 °C; ——— T_h = 70 °C; f_{vision} = 860 MHz.

Ruggedness in push-pull class-A operation

The BLV57 is capable of withstanding full load mismatch (VSWR = 50 through all phases) under the following conditions:
V_{CE} = 25 V; I_C = 2 x 0,85 A; T_h = 70 °C; $P_{o\ sync}$* ⩽ 12,5 W; f = 860 MHz; $R_{th\ mb\text{-}h}$ = 0,25 K/W.
At any other composition of the output signal: P_L (r.m.s. value) ⩽ 5 W.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ⩽ −70 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

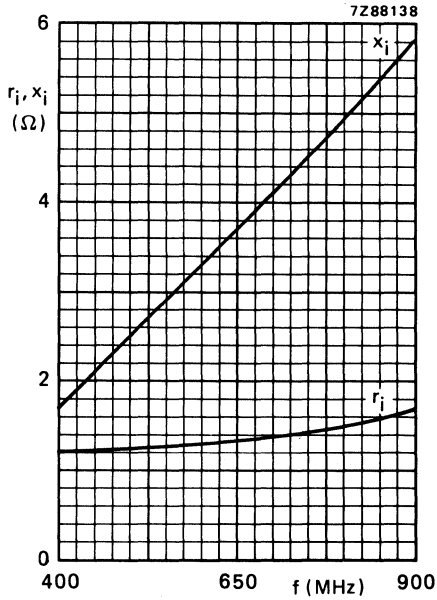


Fig. 20 Input impedance (series components).

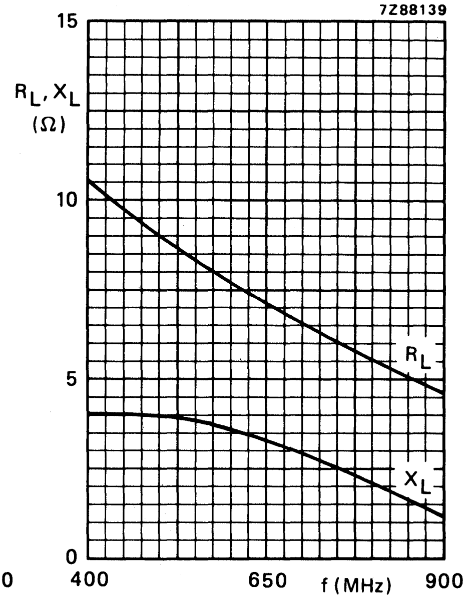


Fig. 21 Load impedance (series components).

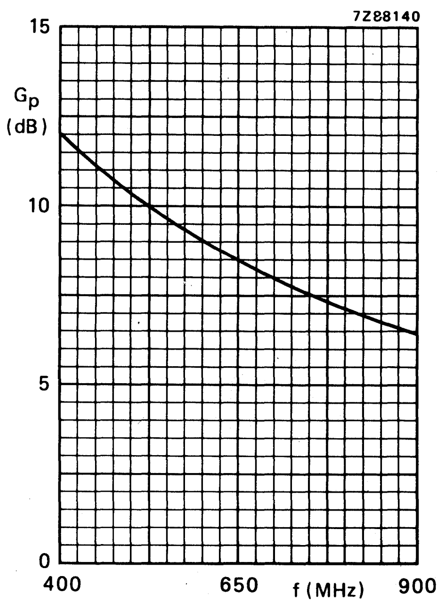


Fig. 22.

Conditions for Figs 20; 21 and 22:

The graphs apply to either transistor section assuming class-AB push-pull operation.
Typical values; V_{CE} = 25 V; $I_{C(ZS)}$ = 0,1 A; P_L = 17,5 W (P.E.P.); T_h = 70 °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-AB operation (c.w.)

f_{vision} (MHz)	V_{CE} (V)	$I_{C(ZS)}$ (A)	T_h (°C)	P_L (W)	$I_{C1} = I_{C2}$ (A)	η (%)	G_p* (dB)
860	25	2 x 0,1	25	12,5 38	typ. 1,25	typ. 60	typ. 7,5 typ. 6,5
860	25	2 x 0,1	70	12,5 30	typ. 1,10	typ. 55	typ. 7,0 typ. 6,0

* Typical values are based on 1 dB gain compression. Using a 3rd order amplitude transfer characteristic, 1 dB compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

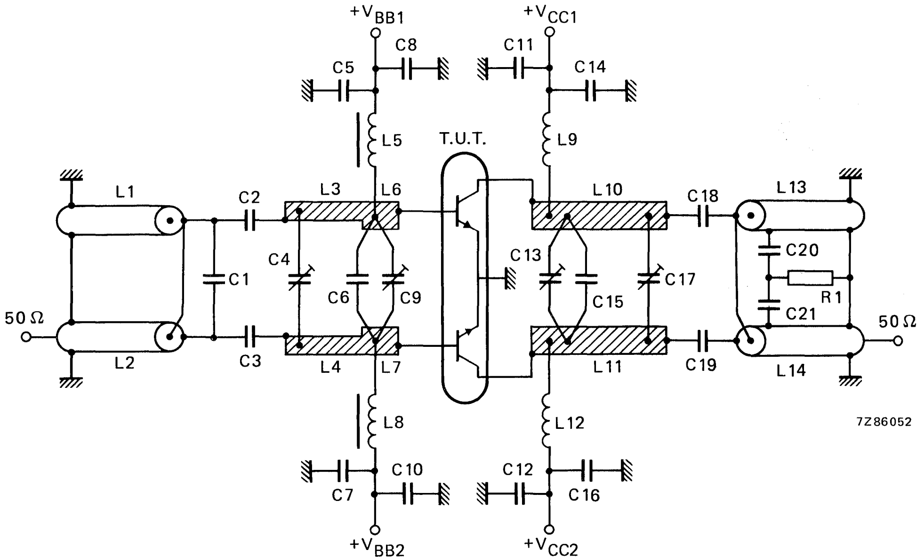


Fig. 16 Class-AB test circuit at f_{vision} = 860 MHz.

List of components:

C1 = C6 = C15 = 4,7 pF (500 V) multilayer ceramic chip capacitor (ATC▲)
C2 = C3 = C18 = C19 = 33 pF multilayer ceramic chip capacitor (cat. no. 2222 851 13339)
C4 = C9 = C13 = C17 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
C5 = C7 = C14 = C16 = 100 nF multilayer ceramic chip capacitor (cat. no. 2222 852 59104)
C8 = C10 = C11 = C12 = 220 pF multilayer ceramic chip capacitor (cat. no. 2222 852 13221)
C20 = C21 = 1 pF (500 V) multilayer ceramic chip capacitor (ATC▲)

C9 and C13 are placed 8,0 and 14,0 mm from transistor edge, respectively.

▲ ATC means American Technical Ceramics.

L1 = L2 = L13 = L14 = 50 Ω semi-rigid cable; outer diameter 2,2 mm; length 29,0 mm. These cables are soldered on 75 Ω striplines (1,1 mm x 28,0 mm). The centre conductors of the cables L1 and L13 are not connected.
L3 = L4 = 52 Ω stripline (2,0 mm x 16,5 mm)
L5 = L8 = 470 nH microchoke
L6 = L7 = 39 Ω stripline (3,1 mm x 8,0 mm)
L9 = L12 = 1 turn Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 3,5 mm
L10 = L11 = 39 Ω stripline (3,1 mm x 34,0 mm)

L3, L4, L6, L7, L10 and L11 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/32″.

R1 = 10 Ω carbon resistor

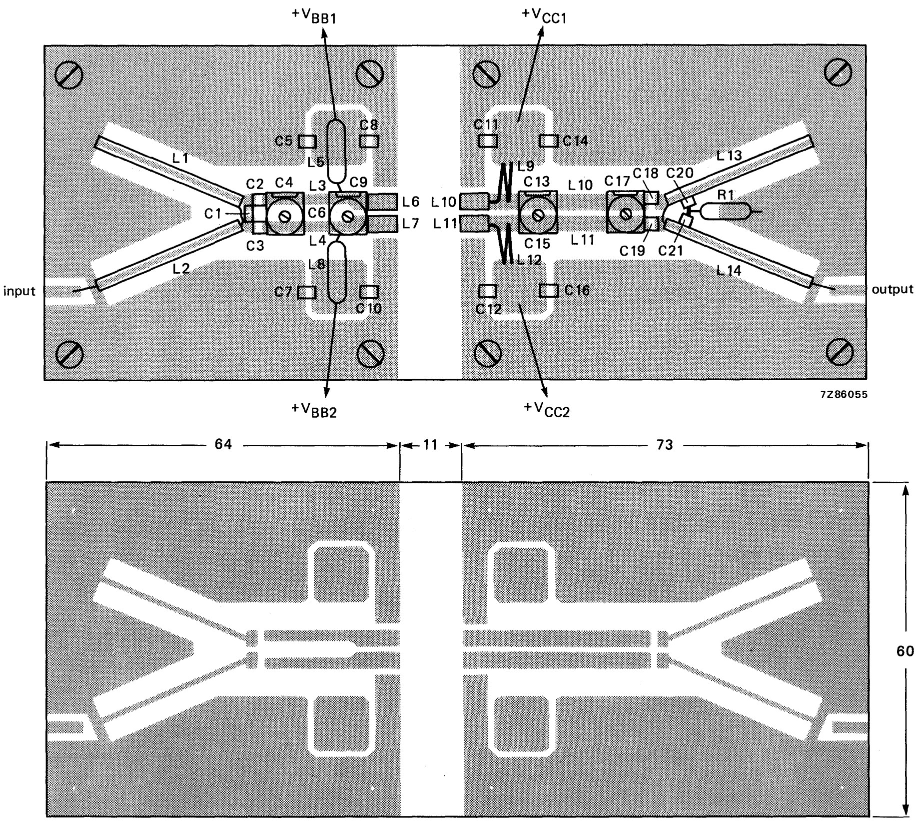


Fig. 17 Component layout and printed-circuit board for 860 MHz class-AB test circuit.

The circuit and the componenets are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by means of bolts. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

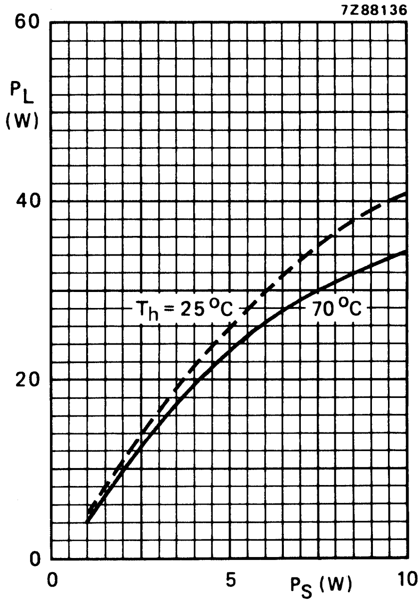


Fig. 18 Typical values; V_{CE} = 25 V; $I_{C(ZS)}$ = 2 x 0,1 A; f_{vision} = 860 MHz.

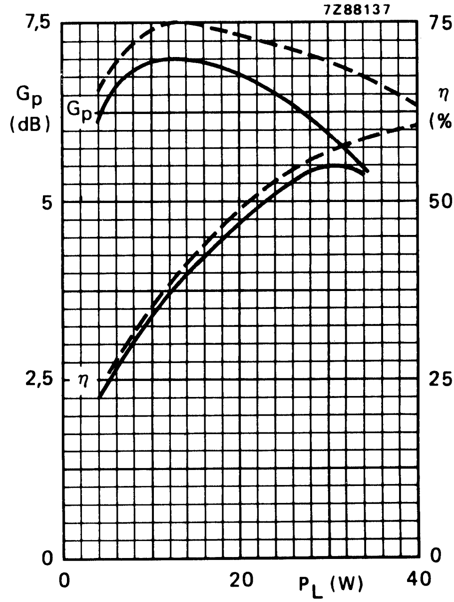


Fig. 19 Typical values; V_{CE} = 25 V; $I_{C(ZS)}$ = 2 x 0,1 A; – – – T_h = 25 °C; ——— T_h = 70 °C; f_{vision} = 860 MHz.

Ruggedness in class-AB operation

The BLV57 is capable of withstanding a load mismatch (VSWR ⩽ 2 through all phases) up to 30 W (r.m.s. value) or (VSWR ⩽ 50 through all phases) up to 19 W under the following conditions: V_{CE} = 25 V; T_h = 70 °C; f = 860 MHz; $R_{th\ mb\text{-}h}$ = 0,25 K/W.

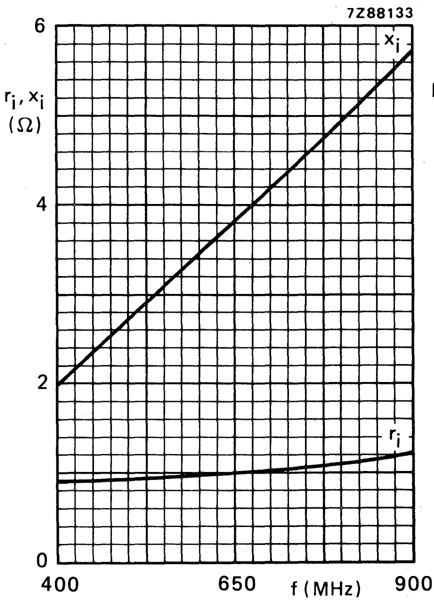


Fig. 13 Input impedance (series components).

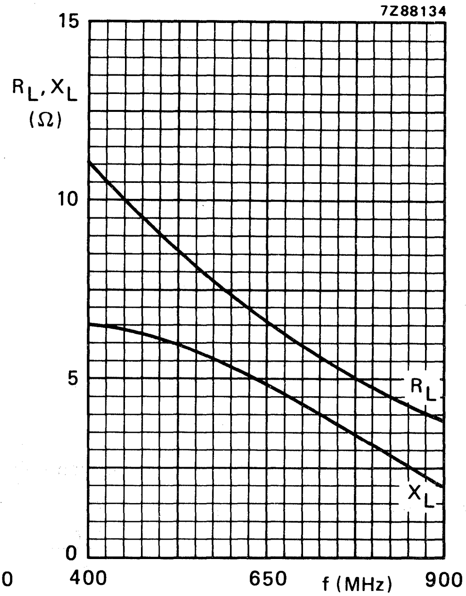


Fig. 14 Load impedance (series components).

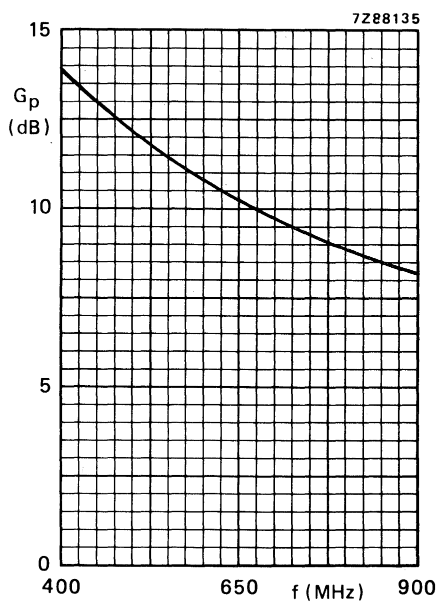


Fig. 15.

Conditions for Figs 13, 14 and 15:

The graphs apply to either transistor section assuming class-A push-pull operation. Typical values; V_{CE} = 25 V; I_C = 0,85 A; T_h = 70 °C.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope primarily intended for use as linear amplifier in u.h.f. television transmitters.

Features:

- internal input matching to achieve an optimum wideband capability and high power gain
- emitter-ballasting resistors for lower junction temperatures.
- titanium-platinum-gold ensures long life and excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in common emitter class-AB circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
class AB; c.w.	25	860	30	min. 7,0	min. 50

MECHANICAL DATA

Dimensions in mm

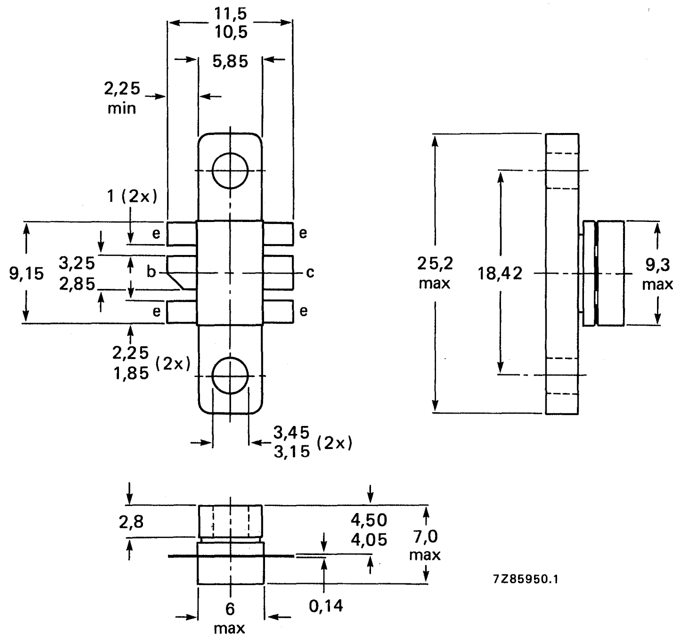
SOT-171 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw : cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
d.c. or average	I_C	max.	3 A
(peak value); f > 1 MHz	I_{CM}	max.	9 A
Total power dissipation			
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	70 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

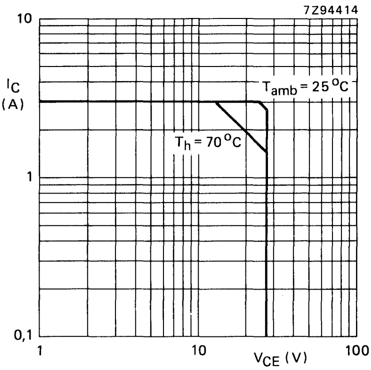


Fig. 2 D.C. SOAR; $R_{th\ mb\text{-}h}$ = 0,4 K/W.

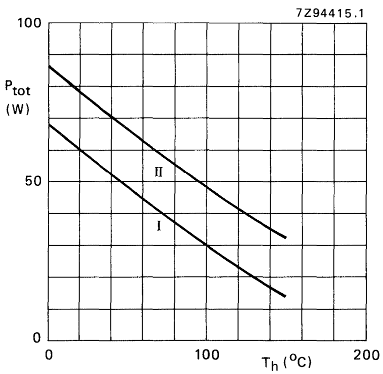


Fig. 3 Power/temperature derating curves versus heatsink temperature.
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch (f > 1 MHz)

MAXIMUM THERMAL RESISTANCE

Dissipation = 50 W; T_{amb} = 25 °C

From junction to mounting base	$R_{th\ j\text{-}mb}$	max.	2,3 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,4 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	min.	50 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	min.	27 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector leakage current V_{BE} = 0; V_{CE} = 27 V	I_{CES}	max.	10 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	4 mJ
D.C. current gain V_{CE} = 20 V; I_C = 2 A	h_{FE}	min.	15
Collector capacitance at f = 1 MHz I_E = i_e = 0; V_{CB} = 25 V	C_c	typ.	44 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 25 V	C_{re}	typ.	30 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

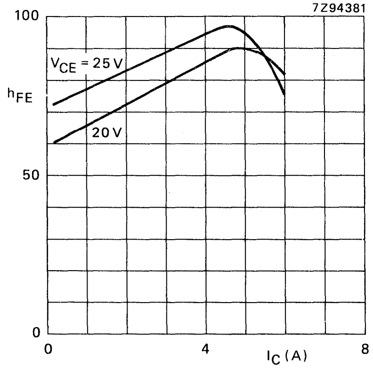


Fig. 4 D.C. current gain versus collector current; T_j = 25 °C.

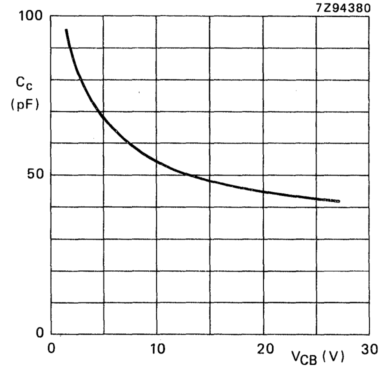


Fig. 5 Output capacitance versus V_{CB}; I_E = i_e = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance up to T_h = 25 °C in common emitter class-AB circuit (c.w.); $R_{th\ mb\text{-}h}$ = 0,4 K/W

f (MHz)	V_{CE} (V)	$I_{C(ZS)}$ (mA)	G_p (dB)	P_L (W)	η (%)	ΔG_p (dB)▲
860	25	60	min. 7,0 typ. 8,5	30	min. 50 typ. 55	max. 1,0 typ. 0,2

▲ Assuming a 3rd-order amplitude transfer characteristic, 1 dB gain compression corresponds with 30% sync input/25% sync output compression in television service (negative modulation, C.C.I.R. system).

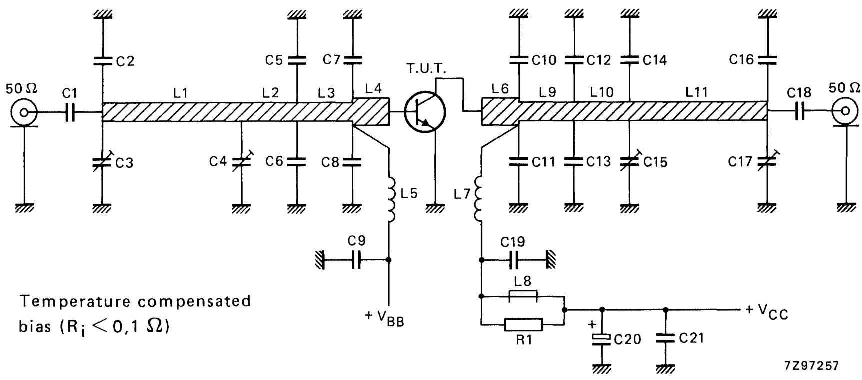


Fig. 6 Class-AB test circuit at f = 860 MHz.

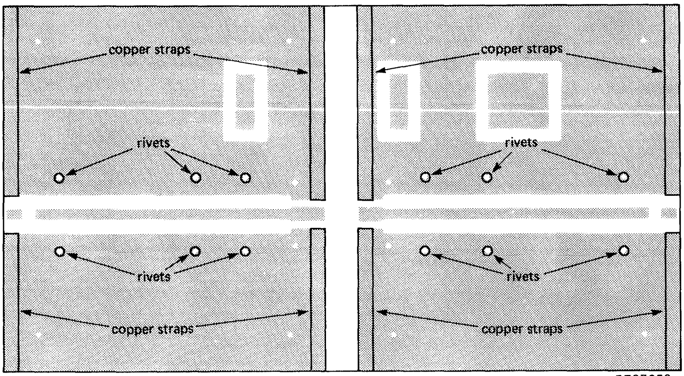
List of components:

C1 = C18 = 33 pF multilayer ceramic chip capacitor*
C2 = C14 = C16 = 3,6 pF multilayer ceramic chip capacitor*
C3 = C4 = C15 = C17 = 1,4 – 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C5 = C6 = 1,8 pF multilayer ceramic chip capacitor*
C7 = C8 = 6,2 pF multilayer ceramic chip capacitor*
C9 = C21 = 330 pF multilayer ceramic chip capacitor*
C10 = C11 = 5,6 pF multilayer ceramic chip capacitor**
C12 = 5,6 pF multilayer ceramic chip capacitor*
C13 = 6,2 pF multilayer ceramic chip capacitor*
C19 = 10 pF multilayer ceramic chip capacitor*
C20 = 6,8 μF (63 V) electrolytic capacitor
L1 = L11 = 50 Ω stripline (26 mm x 2,4 mm)
L2 = L3 = 50 Ω stripline (9,5 mm x 2,4 mm)
L4 = 42,6 Ω stripline (6,0 mm x 3,0 mm)
L5 = 60 nH; 4 turns closely wound enamelled Cu-wire (0,4 mm) int. dia. 3 mm; leads 2 x 5 mm.
L6 = 42,6 Ω stripline (4,0 mm x 3,0 mm)
L7 = 45 nH; 4 closely wound enamelled Cu-wire (1 mm); int. dia. 4 mm; leads 2 x 5 mm
L8 = Ferroxcube h.f. choke, grade 3B (cat.no. 4312 020 36642)
L9 = 50 Ω stripline (9,0 mm x 2,4 mm)
L10 = 50 Ω stripline (13,5 mm x 2,4 mm)
R1 = 10 Ω ± 5%, 1 W metal film resistor

The striplines are on a double Cu-clad printed circuit board with a P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics type 100B or capacitor of the same quality.

** American Technical Ceramics type 100A or capacitor of the same quality.



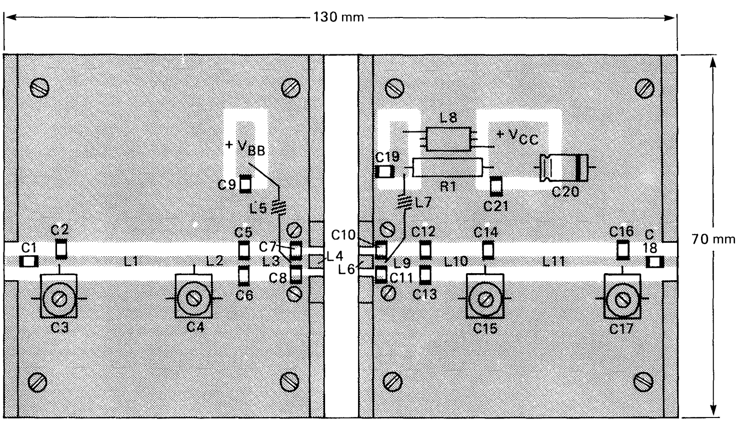


Fig. 7 Printed circuit board and component layout for 860 MHz class-AB test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

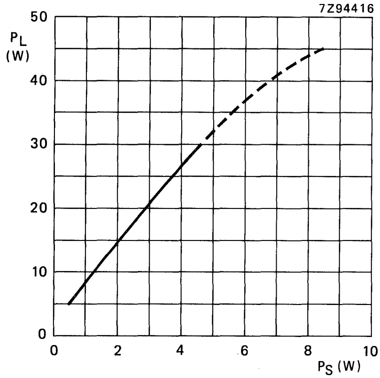


Fig. 8 Load power versus source power.

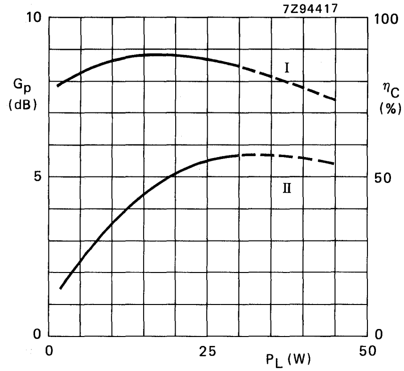


Fig. 9 Power gain (I) and efficiency versus load power (II).

Conditions for Figs 8 and 9:

Typical values; V_{CE} = 25 V; f = 860 MHz; $I_{C(ZS)}$ = 60 mA; T_h = 25 °C
$R_{th\ mb\text{-}h}$ = 0,4 K/W; class-AB operation.

RUGGEDNESS

The BLV59 is capable of withstanding load mismatch (VSWR = 10 through all phases) at rated load power under the following conditions; V_{CE} = 25 V; f = 860 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,4 K/W; $I_{C(ZS)}$ = 60 mA (class-AB operation).

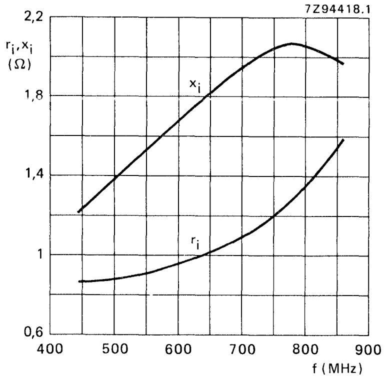


Fig. 10 Input impedance (series components).

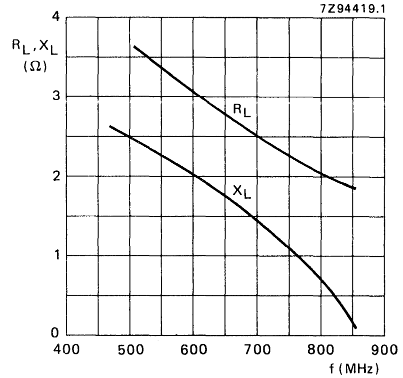


Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12

Typical values; V_{CE} = 25 V; P_L = 30 W; f = 470 to 860 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,4 K/W; $I_{C(ZS)}$ = 60 mA; class-AB operation.

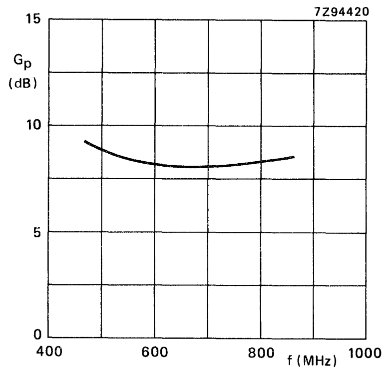


Fig. 12 Power gain versus frequency.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 175 MHz communications band.

Features

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal matching to achieve an optimum wideband capability and high power gain

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-119). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	175	75	> 6,5	> 55

MECHANICAL DATA

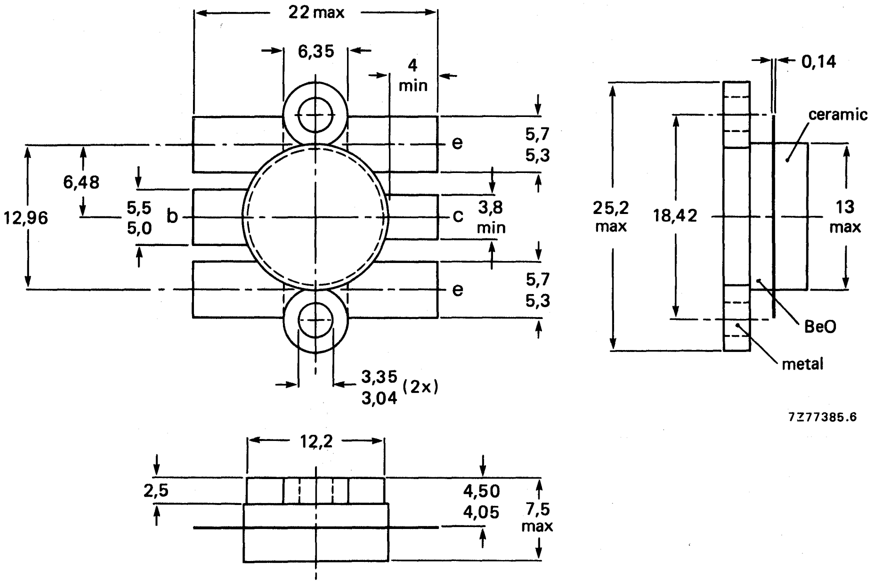
Fig. 1 SOT-119 (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-119.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)			
peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16,5 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C	max.	15 A
peak value; f > 1 MHz	I_{CM}	max.	45 A
Total power dissipation			
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	150 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

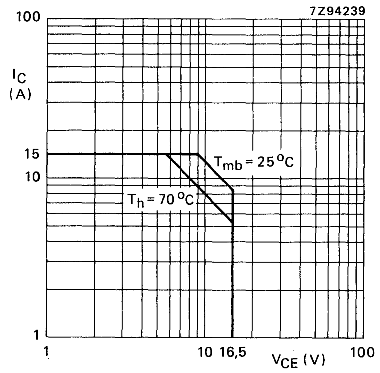


Fig. 2 D.C. soar.
$R_{th\ mb-h}$ = 0,2 K/W.

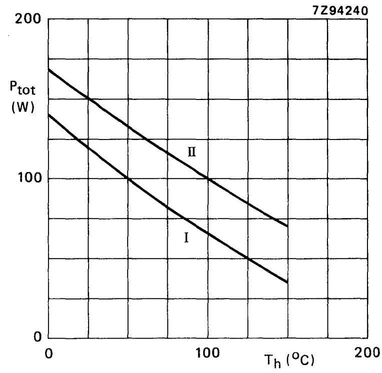


Fig. 3 Power/temperature derating curves; $R_{th\ mb-h}$ = 0,2 K/W.
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch; (f > 1 MHz).

THERMAL RESISTANCE

Dissipation = 96 W; T_{mb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j-mb}$	=	1,05 K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 100 mA	$V_{(BR)CBO}$	min.	36	V
Collector-emitter breakdown voltage open base; I_C = 200 mA	$V_{(BR)CEO}$	min.	16,5	V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	min.	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	44	mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	20	mJ
D.C. current gain V_{CE} = 10 V; I_C = 10 A	h_{FE}	min. typ.	15 55	
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	240	pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	150	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

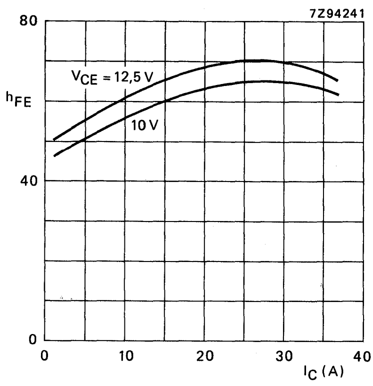


Fig. 4 D.C. current gain versus collector current; T_j = 25 °C.

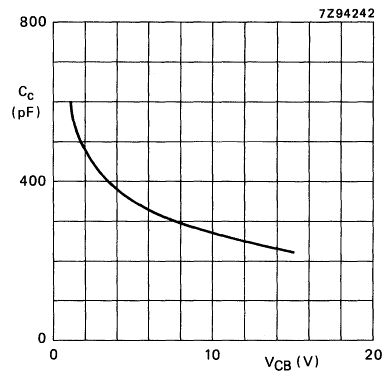


Fig. 5 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W

mode of operation	V_{CE} V	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	75	> 6,5 typ. 7,5	> 55 typ. 63

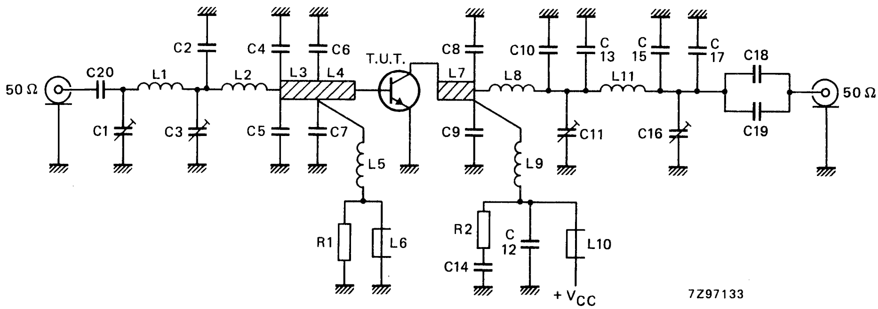


Fig. 6 Class-B test circuit at f = 175 MHz.

List of components:

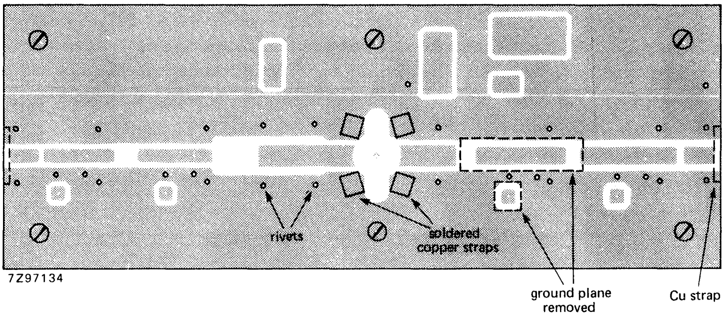
C1 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C2 = 10 pF multilayer ceramic chip capacitor*
C3 = C16 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C4 = C5 = 75 pF multilayer ceramic chip capacitor
C6 = C7 = 100 pF multilayer ceramic chip capacitor*
C8 = C9 = 2 x 75 pF multilayer ceramic chip capacitors* in parallel
C10 = C13 = 39 pF multilayer ceramic chip capacitor*
C11 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C12 = 2 x 820 pF multilayer ceramic chip capacitors in parallel*
C14 = 100 nF polyester capacitor
C15 = C17 = 12 pF multilayer ceramic chip capacitor*
C18 = C19 = 470 pF multilayer ceramic chip capacitor*
C20 = 820 pF multilayer ceramic chip capacitor*

* American Technical Ceramics capacitor type 100B or capacitor of the same quality.

L1 = 1 turn silver-plated Cu-wire (2,0 mm); int. dia. 10 mm; leads 2 x 4 mm
L2 = 1 turn silver-plated Cu-wire (2,0 mm); int. dia. 1 mm; leads 2 x 6 mm
L3 = strip (14 mm x 6 mm)
L4 = strip (8 mm x 6 mm)
L5 = 100 nH, 7 turns closely wound enamelled Cu-wire (0,5 mm); int. dia. 3 mm; leads 2 x 7 mm
L6 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640)
L7 = strip (12 mm x 6 mm)
L8 = silver-plated copper U-shaped inductance (7 + 15 + 7) mm x 4 mm x 0,5 mm
L9 = silver-plated copper U-shaped inductance (8 + 8,5 + 6) mm x 4 mm x 0,5 mm
L10 = modified Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36640) with 3 parallel connected Cu wires (0,8 mm)
L11 = 2 turns silver-plated Cu-wire (2,0 mm); int. dia. 9 mm; length 7,5 mm; leads 2 x 3,5 mm

L3, L4 and L7 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, (ϵ_r = 4,5) thickness 1/16 inch).

R1 = 10 Ω ± 10%, carbon resistor
R2 = 4,7 Ω ± 10%, carbon resistor



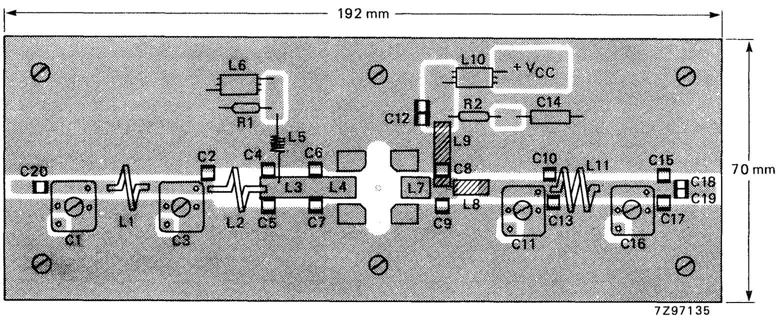


Fig. 7 Printed circuit board and component lay-out for 175 MHz class-B test circuit.

The circuit and components are on one side of the epoxy fibre-glass board. The other side, except for the area indicated by the dotted line, is unetched copper serving as a ground plane.
If the p.c.b. is in direct contact with the heatsink, the heatsink area within the dotted line has to be raised at least 0,5 mm to minimize the dielectric losses.
Earth connections are made by hollow rivets and additionally by fixing screws and copper straps under the emitters to provide a direct contact between the copper of the component side and the ground plane.

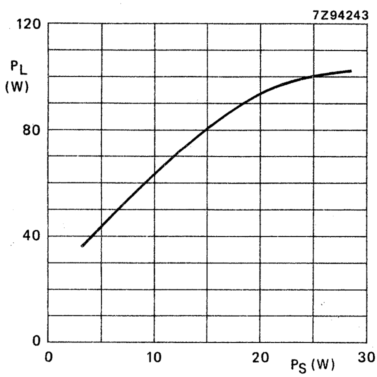


Fig. 8 Load power versus source power.

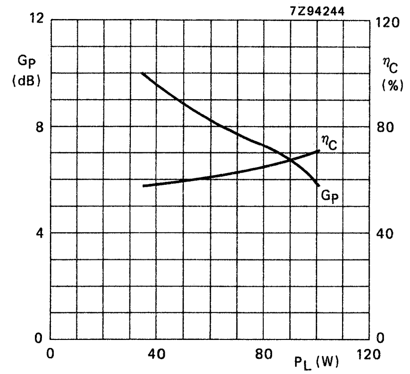


Fig. 9 Power gain and efficiency versus load power.

Condition for Figs 8 and 9:

Typical values; V_{CE} = 12,5 V; f = 175 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Ruggedness in class-B operation

The BLV75/12 is capable of withstanding a load mismatch (VSWR = 20 through all phases) at rated load power up to a supply voltage of 12,5 V; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

Power slump

If T_h is increased from 25 °C to 70 °C the output power slump for constant P_S amounts to typ. 7% (V_{CE} = 12,5; f = 175 MHz; $R_{th\ mb\text{-}h}$ = 0,2 K/W).

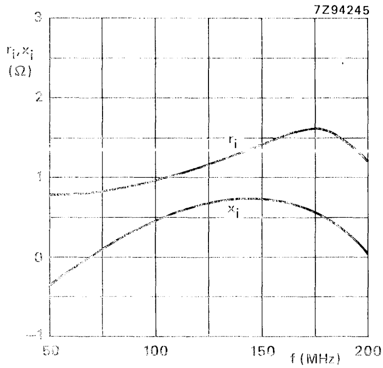


Fig. 10 Input impedance (series components).

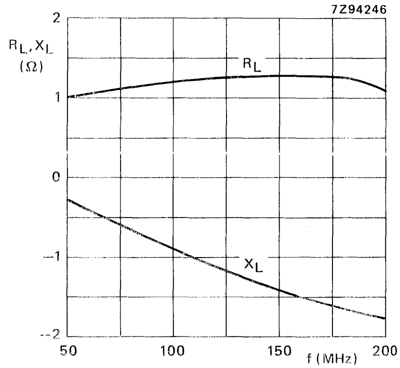


Fig. 11 Load impedance (series components).

Conditions for Figs 10, 11 and 12:

Typical values; V_{CE} = 12,5 V; P_L = 75 W; f = 50 to 200 MHz; class-B operation; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

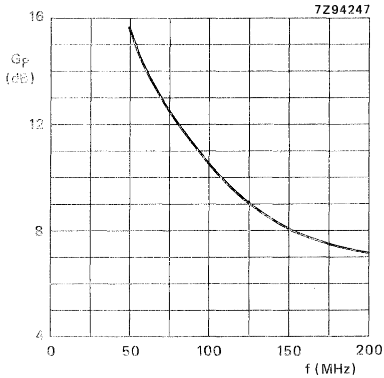


Fig. 12 Power gain versus frequency.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in base stations in the v.h.f. mobile radio band.

Features:

- multi-base structure and diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 1/2 in. 4-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	P_S W	G_p dB	η %
narrow band; c.w.	28	175	80	< 17,9	> 6,5	> 70

MECHANICAL DATA

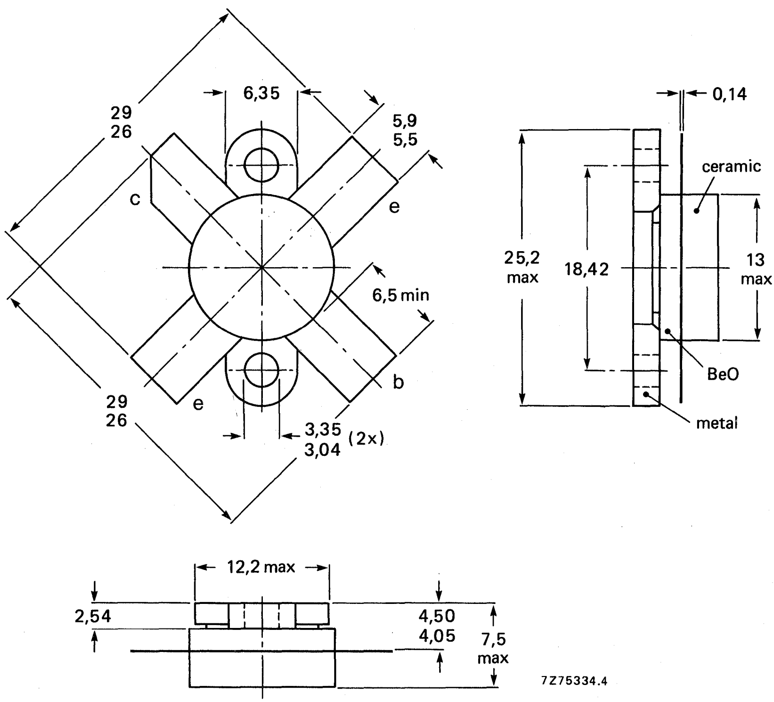
SOT-121 (see Fig. 1)

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,60 Nm (6,0 kg cm)
max. 0,75 Nm (7,5 kg cm)

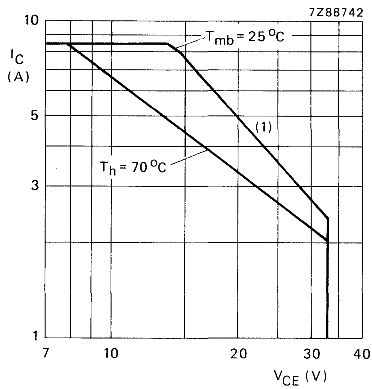
Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (peak-value);			
$V_{BE} = 0$	V_{CESM}	max.	65 V
open base	V_{CEO}	max.	33 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	8,5 A
(peak value); f > 1 MHz	I_{CM}	max.	17,5 A
Total power dissipation at T_{mb} = 25 °C	P_{tot}	max.	116 W
R.F. power dissipation			
f > 1 MHz; T_{mb} = 25 °C	P_{rf}	max.	144 W
f > 1 MHz; T_h = 70 °C	P_{rf}	max.	80 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C



(1) Second breakdown limit.

Fig. 2 D.C. SOAR.

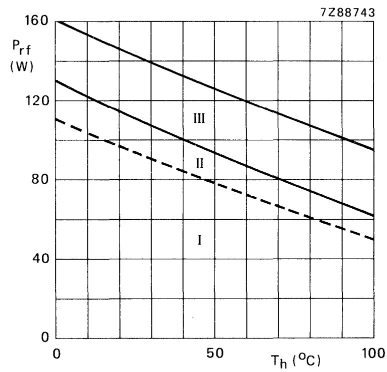


Fig. 3 Power derating curve vs. temperature.

I Continuous d.c. operation
II Continuous r.f. operation; (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE (dissipation = 90 W; T_{mb} = 60 °C, i.e. T_h = 33 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,50 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,30 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65 V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 33 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	10 mJ
R_{BE} = 10 Ω	E_{SBR}	>	10 mJ
D.C. current gain*			
I_C = 3,5 A; V_{CE} = 25 V	h_{FE}	typ.	45
			15 to 100
Collector-emitter saturation voltage*			
I_C = 10 A; I_B = 2 A	V_{CEsat}	typ.	1,6 V
Transition frequency at f = 100 MHz*			
$-I_E$ = 3,5 A; V_{CB} = 25 V	f_T	typ.	575 MHz
$-I_E$ = 10 A; V_{CB} = 25 V	f_T	typ.	600 MHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	155 pF
Feedback capacitance at f = 1 MHz			
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	88 pF
Collector-flange capacitance	C_{cf}	typ.	4,5 pF

* Measured under pulse conditions: $t_p > 300$ μs; $\delta < 0{,}02$.

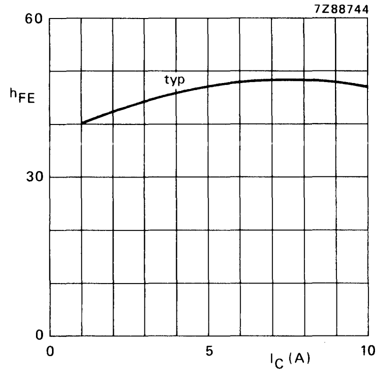


Fig. 4 V_{CE} = 25 V; T_j = 25 °C.

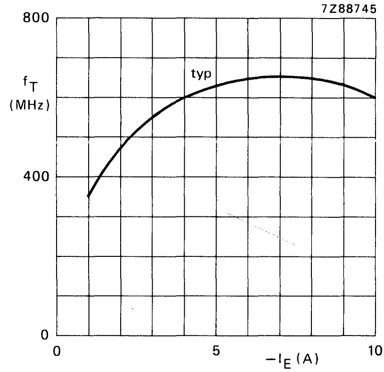


Fig. 5 V_{CB} = 25 V; f = 100 MHz; T_j = 25°C.

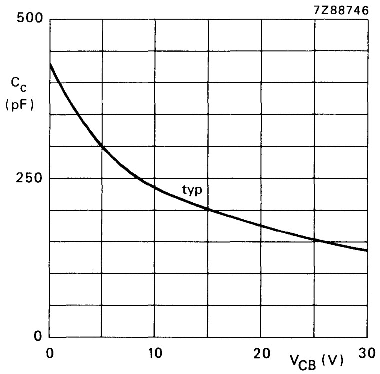


Fig. 6 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter class-B circuit)
f = 175 MHz; T_h = 25 °C

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η %
narrow band; c.w.	28	80	< 17,9 typ. 16,0	> 6,5 typ. 7,0	< 4,1 typ. 3,8	> 70 typ. 75

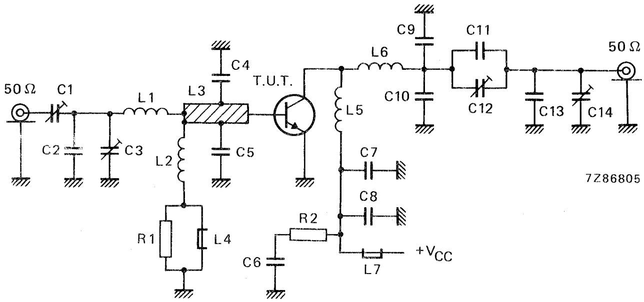


Fig. 7 Class-B test circuit at f = 175 MHz.

List of components:

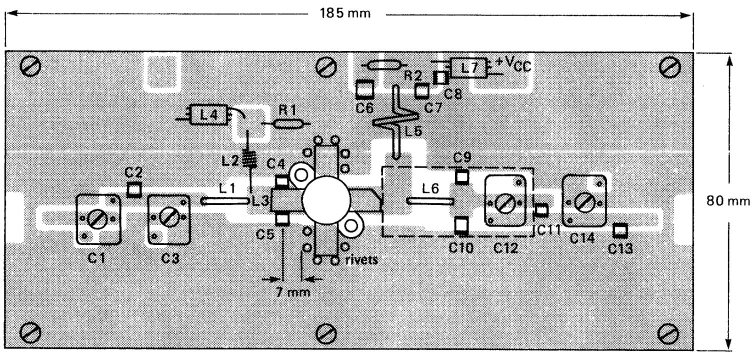
C1 = C12 = C14 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C2 = 30 pF (500 V) multilayer ceramic chip capacitor*
C3 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C4 = C5 = 56 pF (500 V) multilayer ceramic chip capacitor*
C6 = 100 nF (50 V) multilayer ceramic chip capacitor
C7 = C8 = 220 pF (50 V) multilayer ceramic chip capacitor
C9 = C10 = 10 pF (500 V) multilayer ceramic chip capacitor*
C11 = 24 pF (500 V) multilayer ceramic chip capacitor*
C13 = 13 pF (500 V) multilayer ceramic chip capacitor*

L1 = Cu wire (1,8 mm); length 15 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 7 mm
L3 = strip (15 mm x 8 mm); taps for C4 and C5 at 7 mm from transistor edge
L4 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = 1 turn Cu wire (1,8 mm); int. dia. 9 mm; leads 2 x 10 mm
L6 = 1/2 turn Cu wire (1,8 mm); int. dia. 13 mm; leads 2 x 5 mm

L3 is a strip on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16 in.

R1 = R2 = 10 Ω (± 10%) carbon resistor (0,25 W)

* American Technical Ceramics capacitors or capacitors of same quality.



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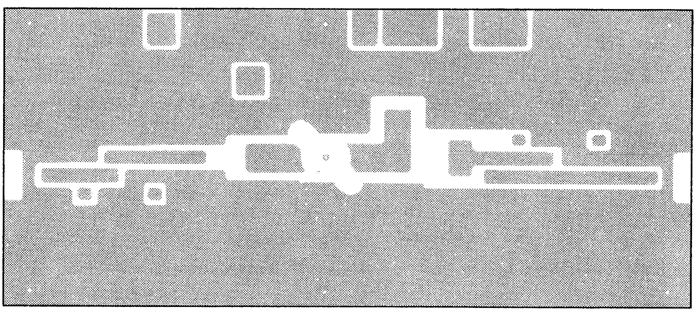


7Z86807

Fig. 8 Component layout and printed-circuit board for 175 MHz.

The circuit and the components are on one side of the epoxy fibre-glass board, the other side is unetched copper to serve as ground-plane. Earth connections are made by hollow rivets and additionally by fixing screws and copper straps at the input and output to provide direct contact between the copper on the component side and the ground-plane.

To minimize the dielectric losses, the ground-plane under the interconnections of L6, C9, C10, C11 and C12 has been removed.

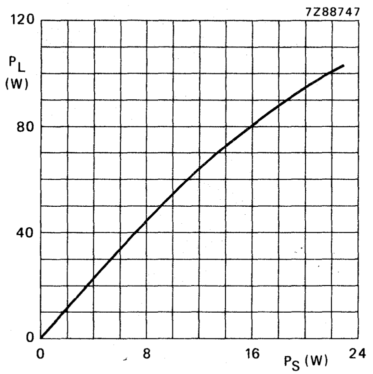


Fig. 9 Load power as a function of source power.

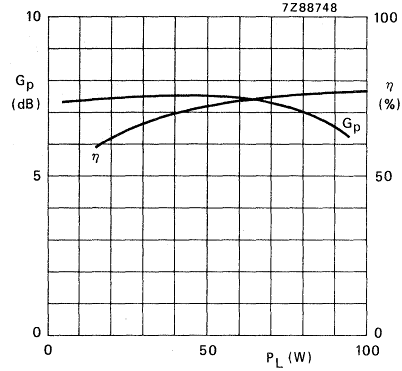


Fig. 10 Power gain and efficiency as a function of load power.

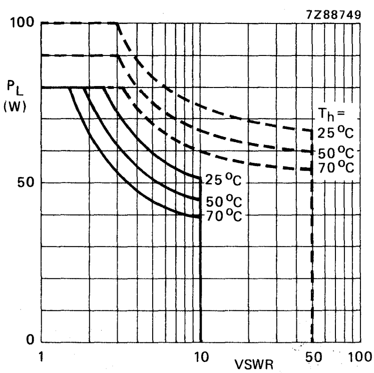


Fig. 11 R.F. SOAR at V_{CE} = 28 V.
——— f > 1 MHz (continuous);
– – – – short time operation during mismatch (f > 1 MHz).

Conditions for Figs 9 and 10:

Test circuit tuned for each power level; typical values; V_{CE} = 28 V; f = 175 MHz; T_h = 25 °C; class-B operation.

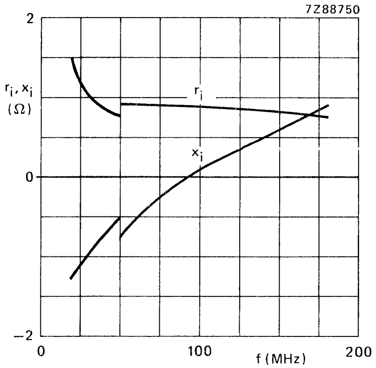


Fig. 12 Input impedance (series components).

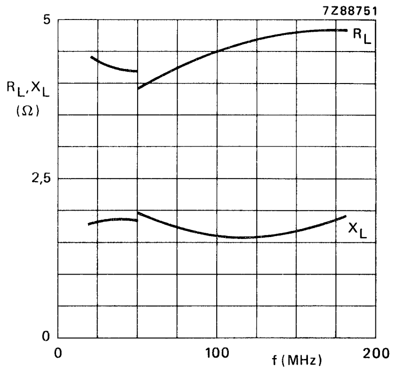


Fig. 13 Load impedance (series components).

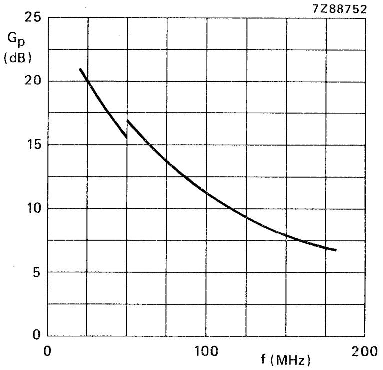


Fig. 14 Power gain as a function of frequency.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C; class-B operation.

OPERATING NOTE for Figs 12, 13 and 14:

Below 50 MHz a base-emitter resistor of 4,7 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- diffused emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-172). All leads are isolated from the stud.

QUICK REFERENCE DATA

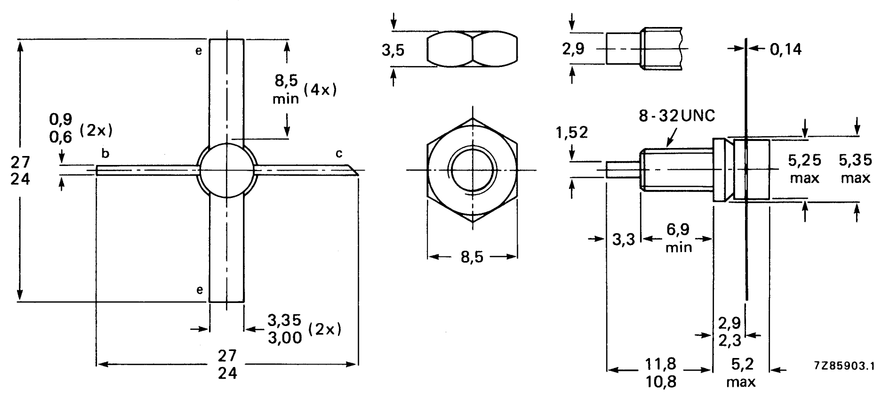
R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	900	1	> 7,5	> 50
	9,6	900	0,75	typ. 7,9	typ. 61

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172A1.



Torque on nut: min. 0,75 Nm (7,5 kg.cm)
max. 0,85 Nm (8,5 kg.cm)

When locking is required an adhesive is preferred instead of a lock washer.

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
Deburring must leave surface flat; donot chamfer or countersink either end of hole.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	0,2 A
(peak value); f > 1 MHz	I_{CM}	max.	0,6 A
D.C. power dissipation at T_{mb} = 115 °C	$P_{tot(dc)}$	max.	2,25 W
R.F. power dissipation f > 1 MHz; T_{mb} = 105 °C	$P_{tot(rf)}$	max.	3,5 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

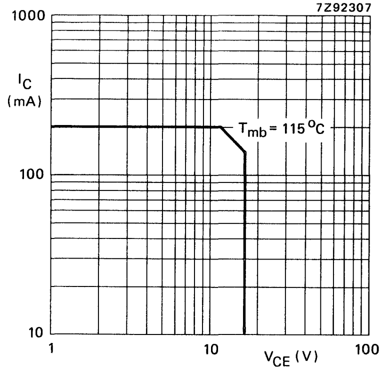


Fig. 2 D.C. SOAR.

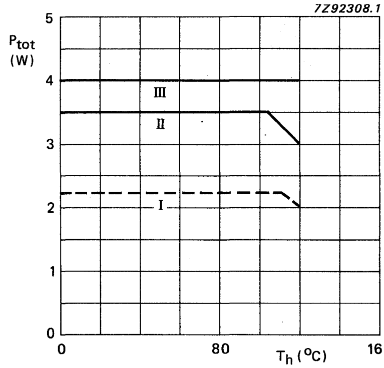


Fig. 3 Power/temperature derating curves.
I Continuous d.c. operation
II Continuous r.f. operation (f > 1 MHz)
III Short-time r.f. operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 2,25 W; T_{mb} = 25 °C.

From junction to mounting base			
(d.c. dissipation)	$R_{th\ j\text{-}mb(d.c.)}$	max.	25 K/W
(r.f. dissipation)	$R_{th\ j\text{-}mb(r.f.)}$	max.	19 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,8 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage, open emitter; I_C = 2,5 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter breakdown voltage, open base; I_C = 10 mA	$V_{(BR)CEO}$	>	16	V
Emitter-base breakdown voltage, open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	>	3	V
Collector cut-off current, V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	1	mA
Second breakdown energy, L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0,3	mJ
D.C. current gain, I_C = 0,15 A; V_{CE} = 10 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz*, $-I_E$ = 0,15 A; V_{CB} = 12,5 V	f_T	typ.	4,8	GHz
$-I_E$ = 0,5 A; V_{CB} = 12,5 V	f_T	typ.	1,4	GHz
Collector capacitance at f = 1 MHz, I_E = i_e = 0; V_{CB} = 12,5 V	C_c	typ.	1,8	pF
Feedback capacitance at f = 1 MHz, I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	1,0	pF
Collector-stud capacitance	C_{cs}	typ.	0,5	pF

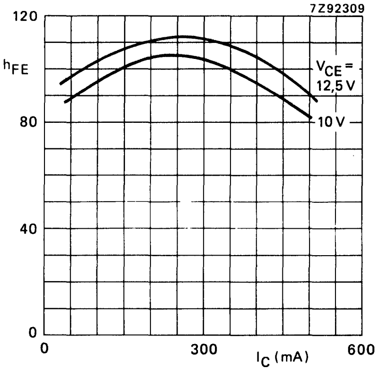


Fig. 4 T_j = 25 °C; typical values.

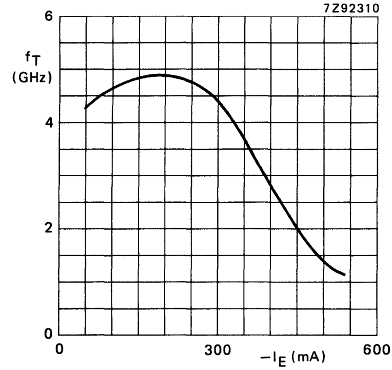


Fig. 5 V_{CB} = 12,5 V; f = 500 MHz; T_j = 25 °C; typical values.

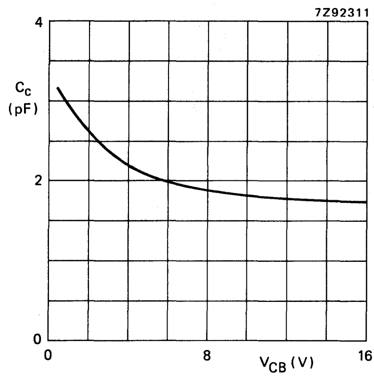


Fig. 6 I_E = i_e = 0; f = 1 MHz; typical values.

* Measured under pulse conditions: t_p = 50 μs; δ < 1%.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_h = 25 °C.

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	1	< 0,178 typ. 0,126	> 7,5 typ. 9,0	< 0,160 typ. 0,133	> 50 typ. 60
	9,6	0,75	typ. 0,122	typ. 7,9	typ. 0,128	typ. 61

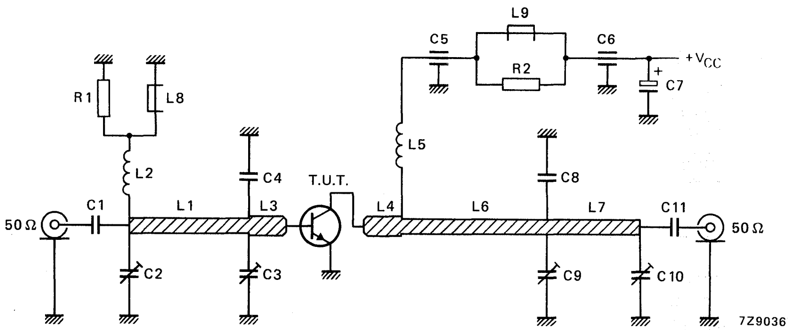


Fig. 7 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C11 = 33 pF multilayer ceramic chip capacitor
C2 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = C9 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
C4 = 5,6 pF multilayer ceramic chip capacitor*
C5 = 10 pF ceramic feed-through capacitor
C6 = 330 pF ceramic feed-through capacitor
C7 = 2,2 μF (35 V) tantalum electrolytic capacitor
C8 = 3,9 pF multilayer ceramic chip capacitor*

L1 = L7 = 50 Ω stripline (28,2 mm x 4,0 mm)
L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = 38 Ω stripline (14,6 mm x 6,0 mm)
L4 = 38 Ω stripline (10,0 mm x 6,0 mm)
L5 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L6 = 50 Ω stripline (37,7 mm x 4,0 mm)
L8 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

R1 = R2 = 10 Ω ± 10%; 0,25 W metal film resistor

L1, L3, L4, L6 and L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

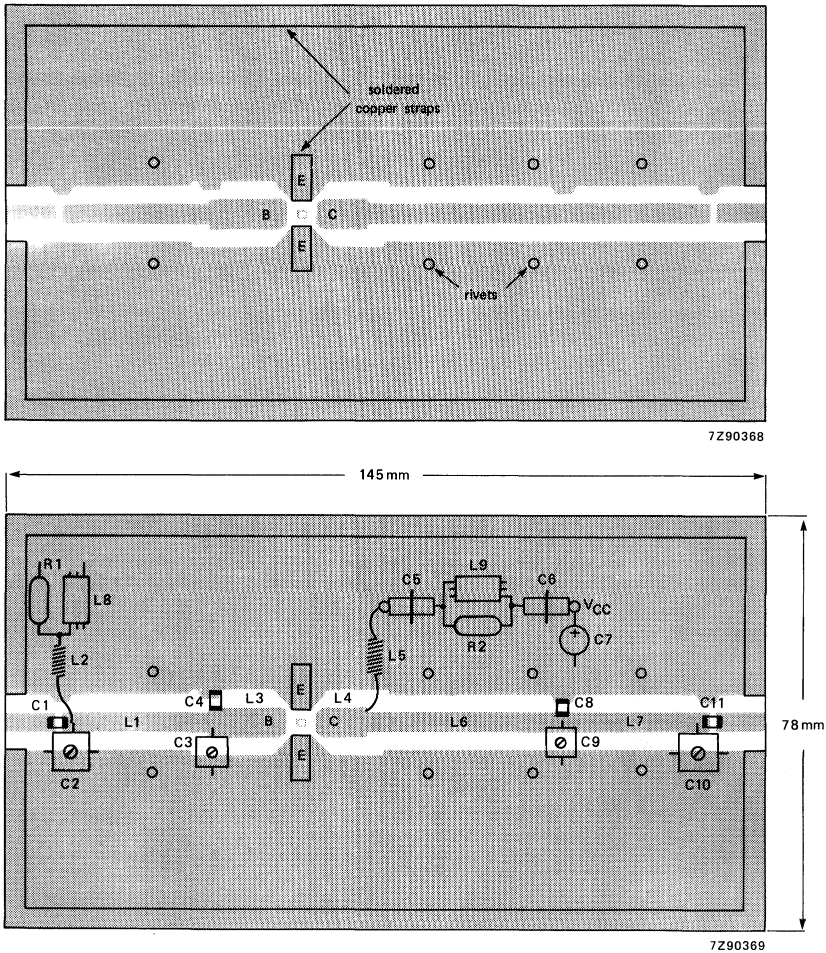


Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

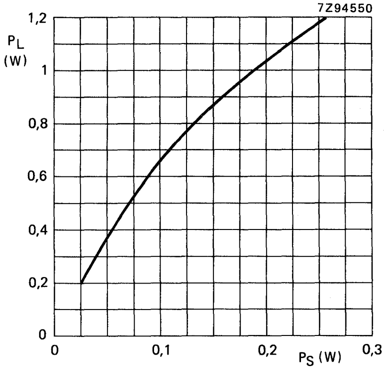


Fig. 9 Load power vs. source power.

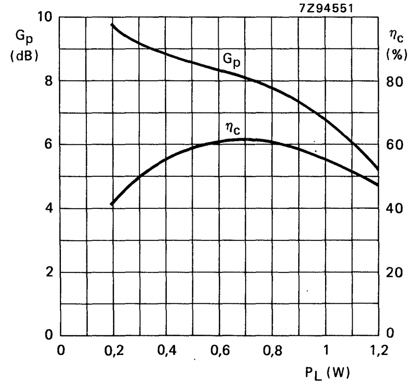


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:
V_{CE} = 9,6 V; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

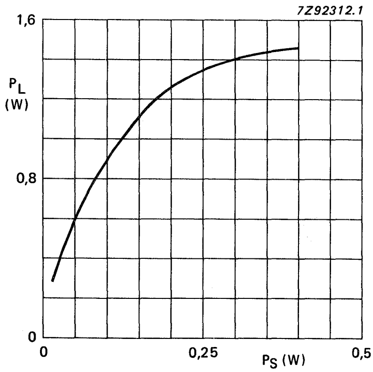


Fig. 11 Input impedance (series components).

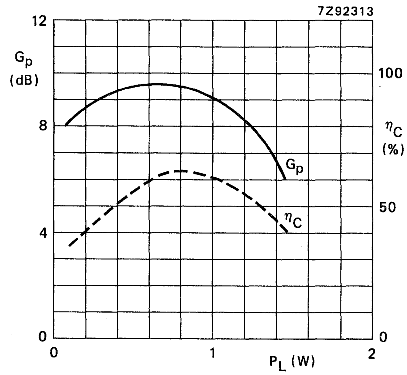


Fig. 12 Load impedance (series components).

Conditions for Figs 11 and 12:
V_{CE} = 12,5 V; P_L = 1 W; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V at T_h = 25 °C.

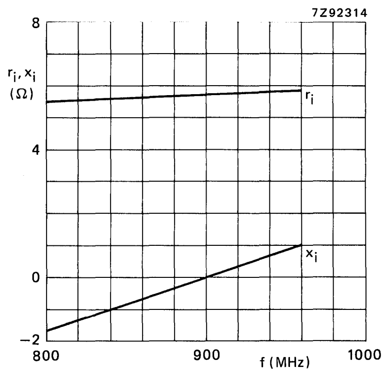


Fig. 13 Input impedance (series components).

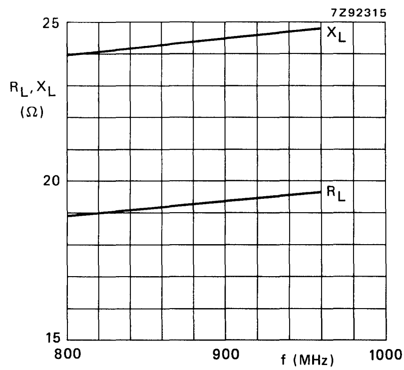


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:
V_{CE} = 12,5 V; P_L = 1 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

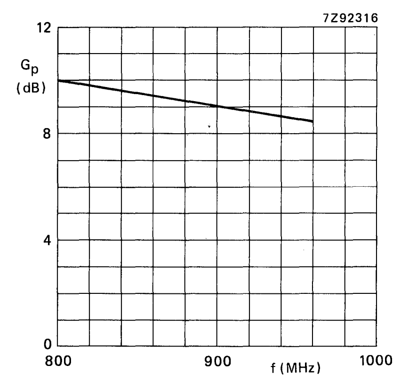


Fig. 15 Power gain vs. frequency.
V_{CE} = 12,5 V; P_L = 1 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- diffused emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at rated output power without an external heatsink when it is mounted on a printed circuit board (see Fig. 6).

The transistor has a 4-lead envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

R.F. performance at T_a = 25 °C in a common-emitter class-B circuit.*

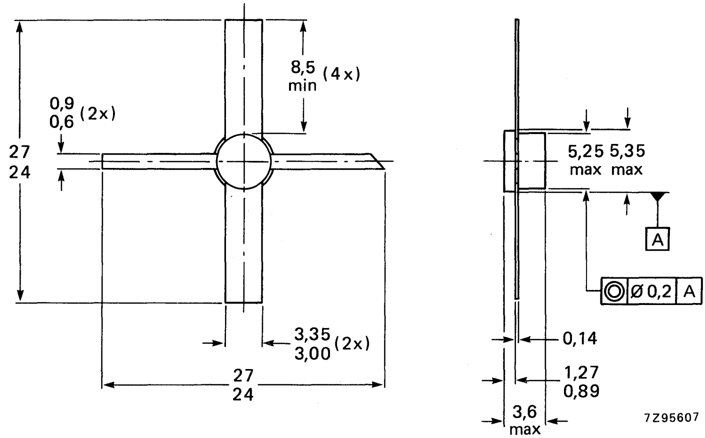
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
Narrow band; c.w.	12,5	900	1	> 7,5	> 50
	9,6	900	1	typ. 7,0	typ. 57

* Device mounted on a printed circuit board (see Fig. 6).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	0,2 A
(peak value); f > 1 MHz	I_{CM}	max.	0,6 A
Total power dissipation			
f > 1 MHz; T_{mb} < 105 °C	$P_{tot(rf)}$	max.	3,5 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

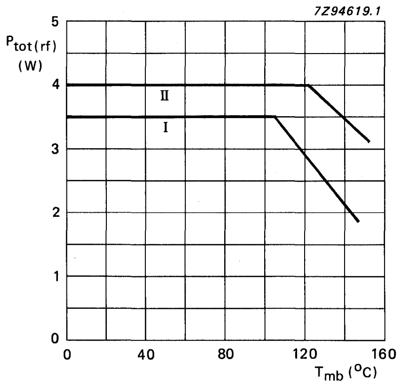


Fig. 2 Power/temperature curve

I Continuous r.f. operation (f > 1 MHz)
II Short-time r.f. operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 2,25 W

From junction to ambient* (f > 1 MHz) T_a = 25 °C	$R_{th\ j\text{-}a\ (r.f.)}$	max.	60 K/W
From junction to mounting base T_{mb} = 25 °C (f > 1 MHz)	$R_{th\ j\text{-}mb\ (r.f.)}$	max.	19 K/W

* Device mounted on a printed circuit board (see Fig. 6).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 2,5 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	1 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0,3 mJ
D.C. current gain I_C = 0,15 A; V_{CE} = 10 V	h_{FE}	>	25
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	1,8 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	1,0 pF
Collector-mounting base capacitance	$C_{c\text{-}mb}$	typ.	0,5 pF

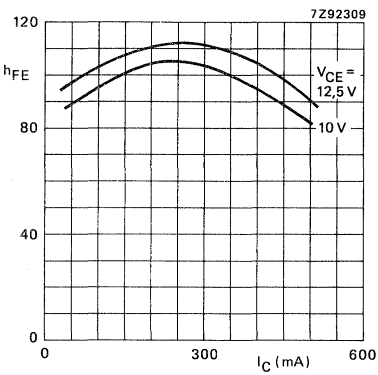


Fig. 3 T_j = 25 °C; typical values.

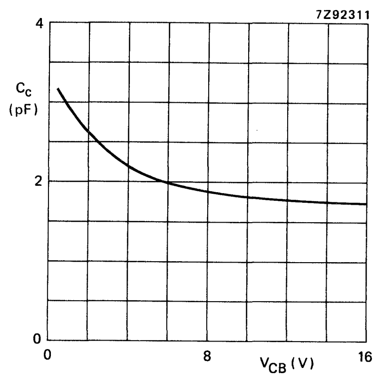


Fig. 4 $I_E = i_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_a = 25 °C

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	1	> 7,5 typ. 9,0	> 50 typ. 60
	9,6	1	typ. 7,0	typ. 57

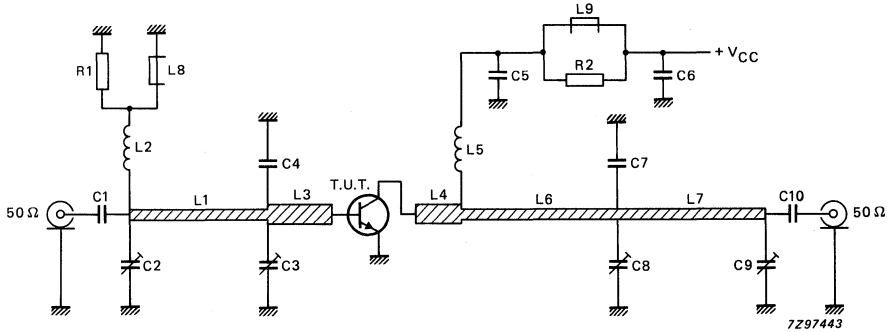


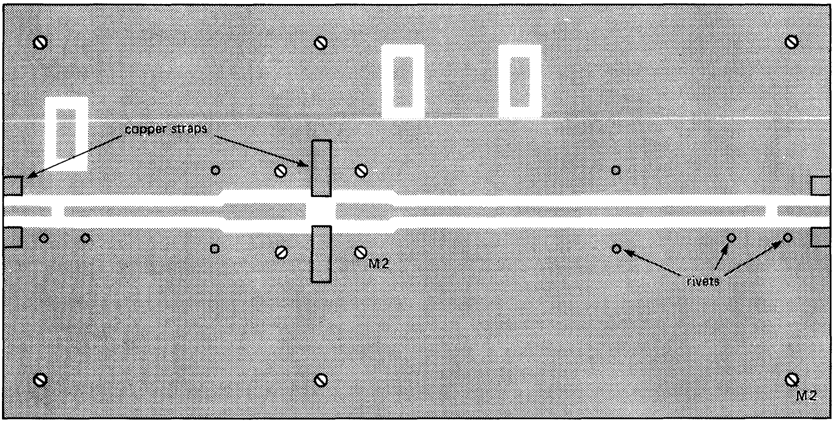
Fig. 5 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C10 = 33 pF multilayer ceramic chip capacitor
C2 = C9 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C4 = 5,6 pF multilayer ceramic chip capacitor*
C5 = 10 pF multilayer ceramic chip capacitor
C6 = 330 pF multilayer ceramic chip capacitor
C7 = 3,9 pF multilayer ceramic chip capacitor*
C8 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
L1 = L7 = 50 Ω stripline (30,8 mm x 2,4 mm)
L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = 38 Ω stripline (16,0 mm x 3,5 mm)
L4 = 38 Ω stripline (11,0 mm x 3,5 mm)
L5 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L6 = 50 Ω stripline (41,2 mm x 2,4 mm)
L8 = L9 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
R1 = R2 = 10 Ω ± 5%; 0,25 W metal film resistor

L1, L3, L4, L6 and L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.
** Device mounted on a printed circuit board (see Fig. 6).



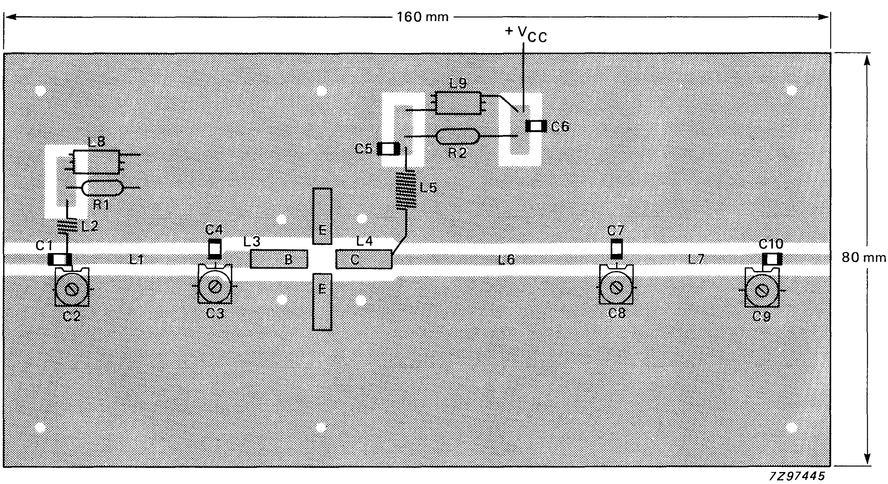


Fig. 6 P.c. board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

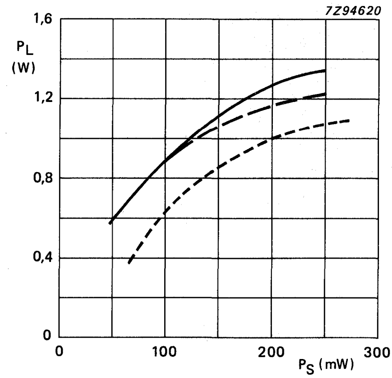


Fig. 7 Load power versus source power.

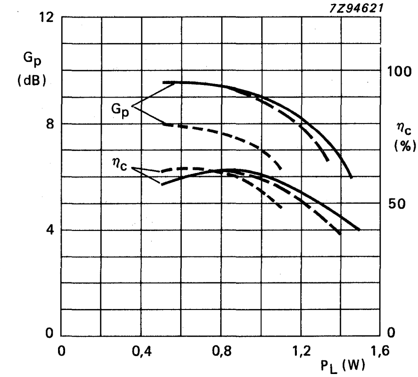


Fig. 8 Power gain and efficiency versus load power

Conditions for Figs 7 and 8:

f = 900 MHz; class-B operation; typical values.

(——— T_{mb} = 25 °C; V_{CE} = 12,5 V; – – – – T_a = 25 °C; V_{CE} = 12,5 V; -------- T_a = 25 °C; V_{CE} = 9,6 V)

RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V at T_a = 25 °C. Device mounted on a printed circuit board (see Fig. 6).

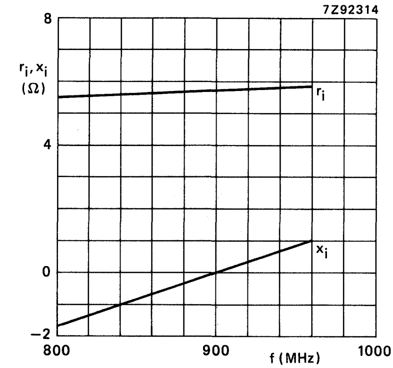


Fig. 9 Input impedance (series components).

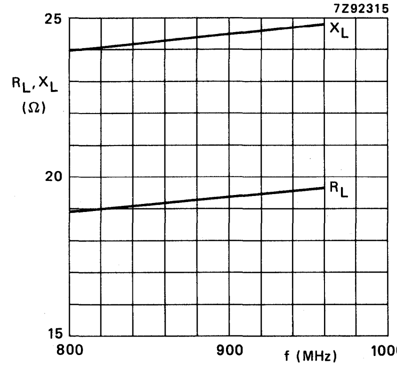


Fig. 10 Load impedance (series components).

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; P_L = 1 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

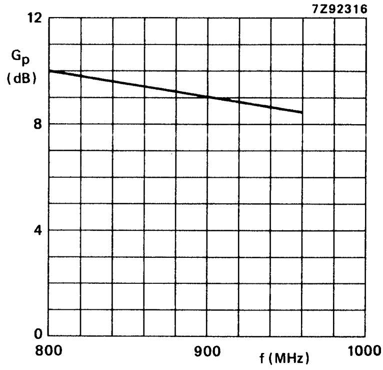


Fig. 11 Power gain versus frequency.

V_{CE} = 12,5 V; P_L = 1 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- multi-base structure and diffused emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability.

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-172). All leads are isolated from the stud.

QUICK REFERENCE DATA

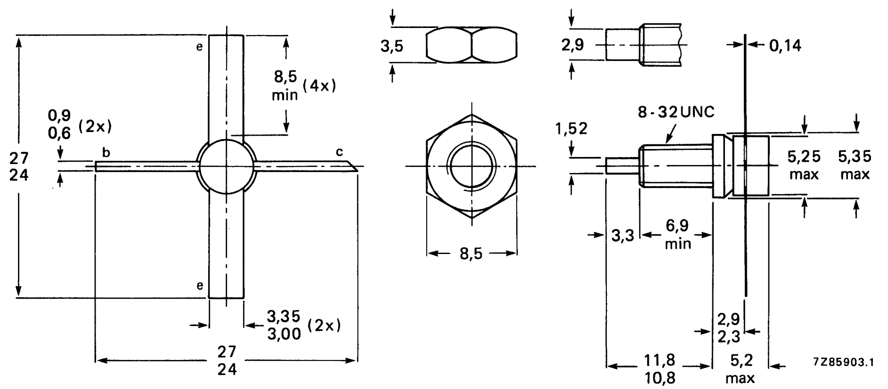
R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	900	2	> 6,5	> 50
	9,6	900	1,5	typ. 6,6	typ. 60

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172A1.



Torque on nut: min. 0,75 Nm
(7,5 kg.cm)
max. 0,85 Nm
(8,5 kg.cm)
When locking is required an adhesive is preferred instead of a lock washer.

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
Deburring must leave surface flat; donot chamfer or countersink either end of hole.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	0,4 A
(peak value); f > 1 MHz	I_{CM}	max.	1,2 A
D.C. power dissipation at T_{mb} = 90 °C	$P_{tot(dc)}$	max.	4,5 W
R.F. power dissipation f > 1 MHz; T_{mb} = 90 °C	$P_{tot(rf)}$	max.	6 W
Storage temperature	T_{stg}	–65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

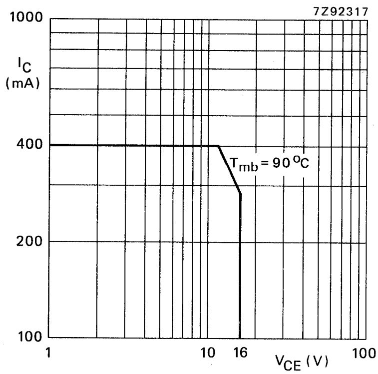


Fig. 2 D.C. SOAR.

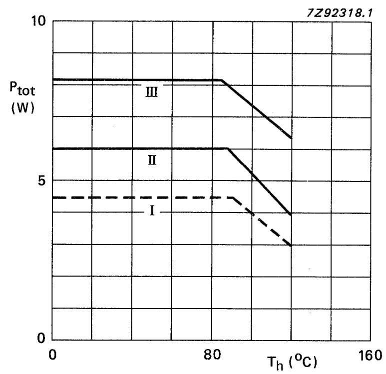


Fig. 3 Power/temperature derating curves
I Continuous d.c. operation
II Continuous r.f. operation (f > 1 MHz)
III Short-time r.f. operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 4,5 W; T_{mb} = 25 °C

From junction to mounting base			
(d.c. dissipation)	$R_{th\ j\text{-}mb(d.c.)}$	max.	20 K/W
(r.f. dissipation)	$R_{th\ j\text{-}mb(d.c.)}$	max.	15 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,8 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage, open emitter; I_C = 5 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter breakdown voltage, open base; I_C = 10 mA	$V_{(BR)CEO}$	>	16	V
Emitter-base breakdown voltage, open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	>	3	V
Collector cut-off current, V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	2,5	mA
Second breakdown energy, L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0,55	mJ
D.C. current gain, I_C = 0,3 A; V_{CE} = 10 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz*, $-I_E$ = 0,3 A; V_{CB} = 12,5 V	f_T	typ.	4	GHz
$-I_E$ = 1,0 A; V_{CB} = 12,5 V	f_T	typ.	1	GHz
Collector capacitance at f = 1 MHz, $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	3,5	pF
Feed-back capacitance at f = 1 MHz, I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	2,0	pF
Collector-stud capacitance	C_{cs}	typ.	0,5	pF

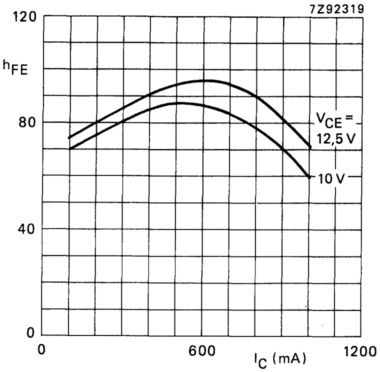


Fig. 4 T_j = 25 °C; typical values.

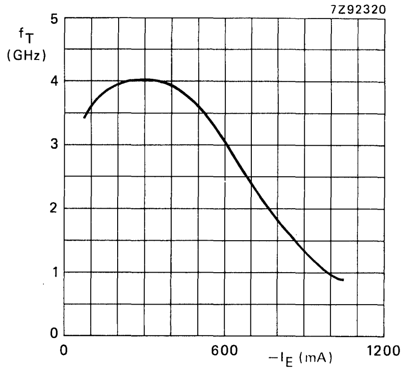


Fig. 5 V_{CB} = 12,5 V; t_p = 50 μs; T_j = 25 °C; typical values.

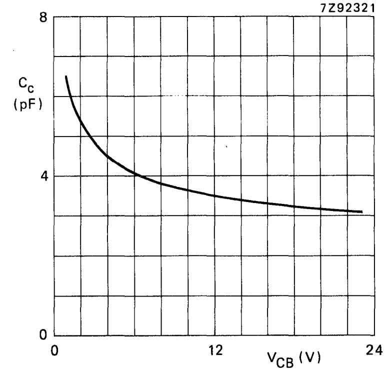


Fig. 6 $I_E = i_e$ = 0; f = 1 MHz; typical values.

* Measured under pulse conditions: t_p = 50 μs; δ < 1%.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_h = 25 °C.

mode of operation	V_{CE}	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	2	< 0,450 typ. 0,332	> 6,5 typ. 7,8	< 0,320 typ. 0,267	> 50 typ. 60
	9,6	1,5	typ. 0,328	typ. 6,6	typ. 0,260	typ. 60

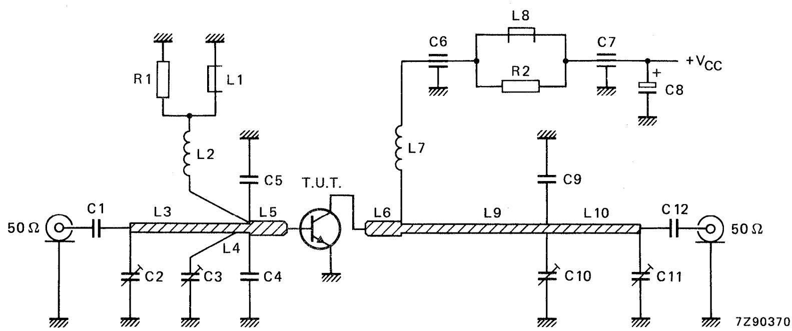


Fig. 7 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C12 = 33 pF multilayer ceramic chip capacitor
C2 = C3 = C11 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C4 = C5 = 5,6 pF multilayer ceramic chip capacitor*
C6 = 10 pF ceramic feed-through capacitor
C7 = 330 pF ceramic feed-through capacitor
C8 = 2,2 μF (35 V) tantalum electrolytic capacitor
C9 = 3,9 pF multilayer ceramic chip capacitor*
C10 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)

L1 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = 50 Ω stripline (23,3 mm x 1,85 mm)
L4 = 50 Ω stripline (4,0 mm x 1,85 mm)
L5 = L6 = 29 Ω stripline (14,0 mm x 4,0 mm)
L7 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L9 = 50 Ω stripline (22,7 mm x 1,85 mm)
L10 = 50 Ω stripline (28,0 mm x 1,85 mm)

R1 = R2 = 10 Ω ± 10%; 0,25 W metal film resistor

L3, L4, L5, L6, L9 and L10 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,74); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.

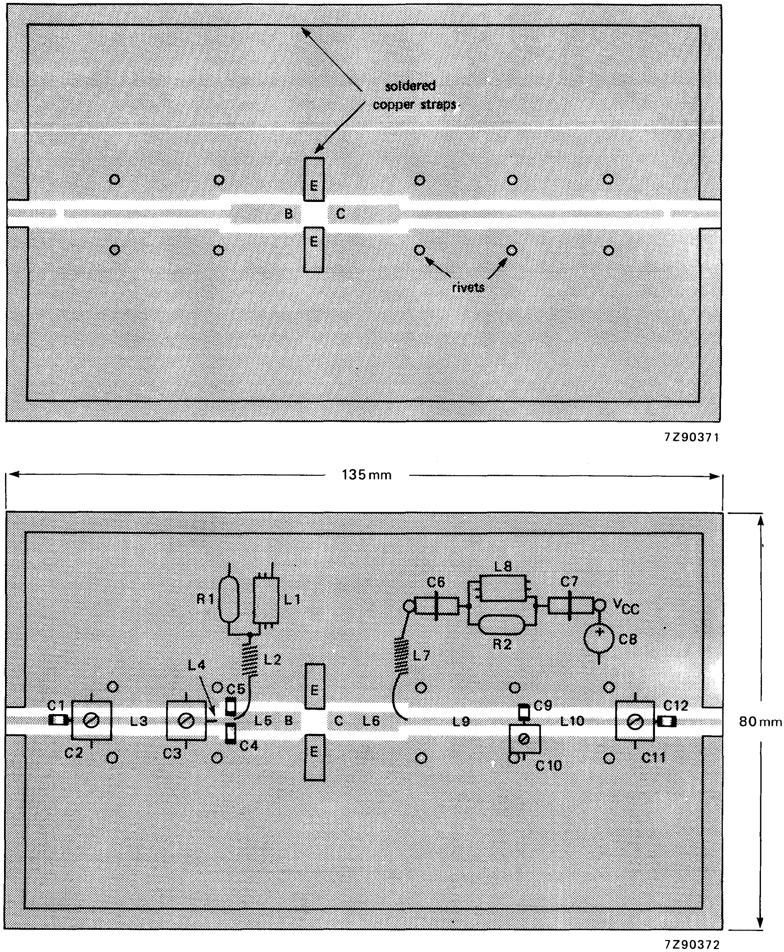


Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

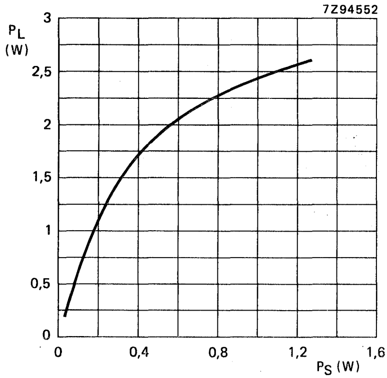


Fig. 9 Load power vs. source power.

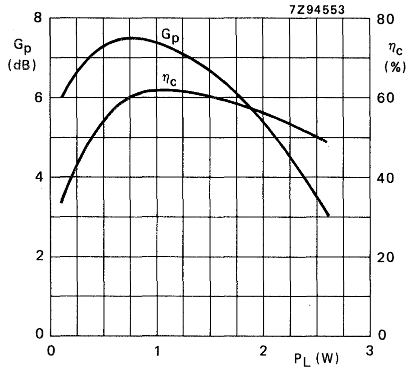


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:
V_{CE} = 9,6 V; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

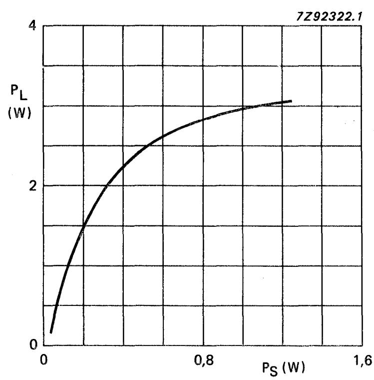


Fig. 11 Input impedance (series components).

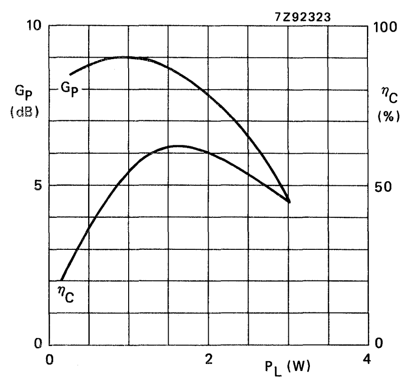


Fig. 12 Load impedance (series components).

Conditions for Figs 11 and 12:
V_{CE} = 12,5 V; P_L = 2 W; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V at T_h = 25 °C.

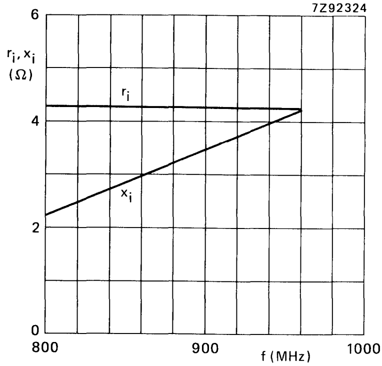


Fig. 13 Input impedance (series components).

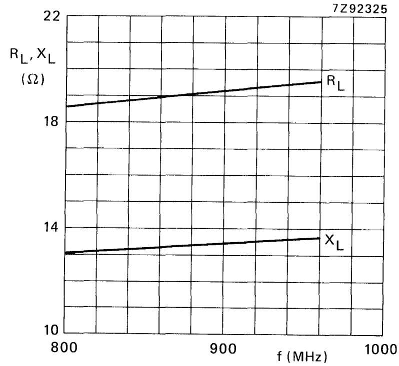


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:
V_{CE} = 12,5 V; P_L = 2 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

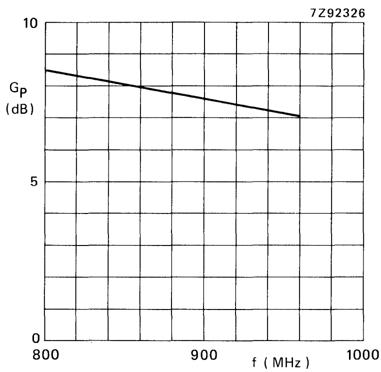


Fig. 15 Power gain vs. frequency.
V_{CE} = 12,5 V; P_L = 2 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in mobile radio transmitters in the 900 MHz band.

Features:

- diffused emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.
- the device can be applied at rated load power, without an external heatsink, when it is mounted on a printed circuit board (see Fig. 6).

The transistor has a 4-lead envelope with a ceramic cap (SOT-172D). All leads are isolated from the mounting base.

QUICK REFERENCE DATA

R.F. performance in a common-emitter class-B circuit.

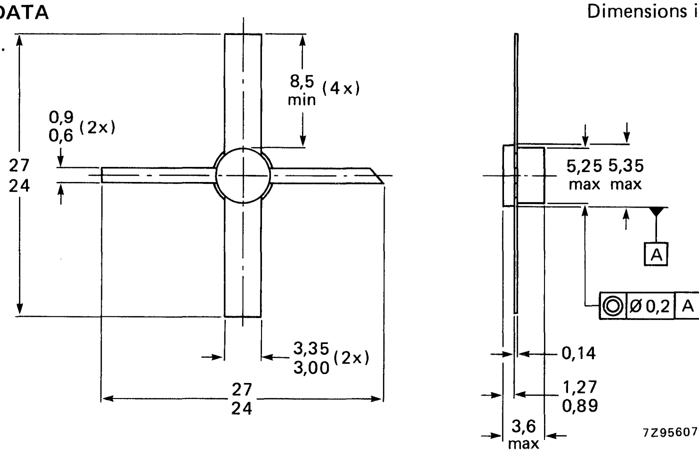
mode of operation	T °C	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	T_{mb} = 25	12,5	900	2	> 6,5	> 50
	T_a = 25*	12,5	900	1,5	> 6,5	> 50
	T_a = 25*	9,6	900	1,5	typ. 6,6	typ. 60

* Device mounted on a printed circuit board (see Fig. 6).

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172D.



PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	0,4	A
(peak value); f > 1 MHz	I_{CM}	max.	1,2	A
Total power dissipation				
f > 1 MHz; $T_{mb} \leqslant 90$ °C	$P_{tot(rf)}$	max.	6	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

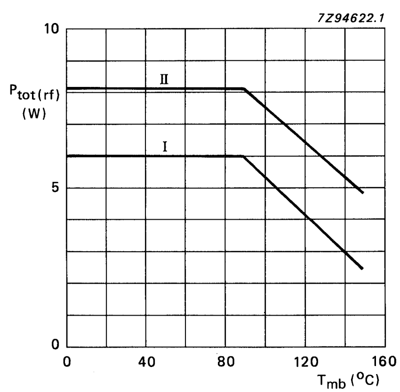


Fig. 2 Power/temperature curve.

I Continuous r.f. operation (f > 1 MHz)
II Short-time r.f. operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 4,5 W

From junction to ambient* (f > 1 MHz)				
T_a = 25 °C	$R_{th\ j\text{-}a\ (r.f.)}$	max.	55	K/W
From junction to mounting base				
T_{mb} = 25 °C (f > 1 MHz)	$R_{th\ j\text{-}mb\ (r.f.)}$	max.	15	K/W

* Device mounted on a printed circuit board (see Fig. 6).

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 5 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	2,5 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	0,55 mJ
D.C. current gain I_C = 0,3 A; V_{CE} = 10 V	h_{FE}	>	25
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	3,5 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	2,0 pF
Collector-mounting base capacitance	$C_{c\text{-}mb}$	typ.	0,5 pF

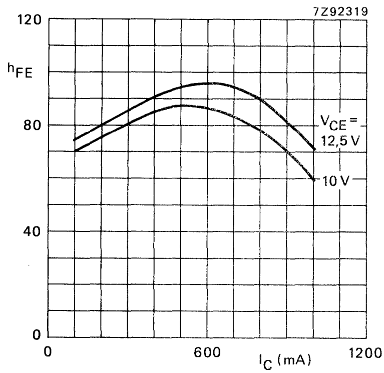


Fig. 3 T_j = 25 °C; typical values.

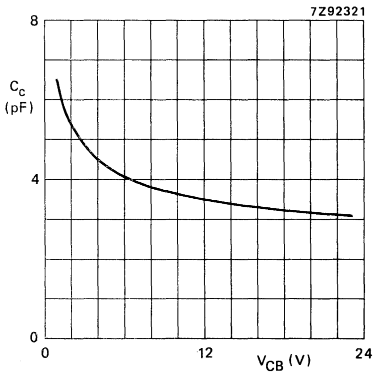


Fig. 4 $I_E = i_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz

mode of operation	V_{CE} V	P_L W	G_p dB	η_C %	T °C
narrow band; c.w.	12,5	2	> 6,5	> 50	T_{mb} = 25
	12,5	2	typ. 7,8	typ. 60	T_{mb} = 25
	12,5	1,5	> 6,5	> 50	T_a = 25**
	9,6	1,5	typ. 6,6	typ. 60	T_a = 25**

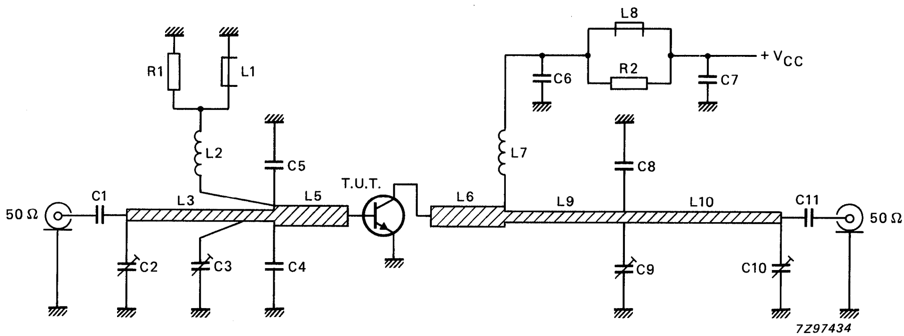


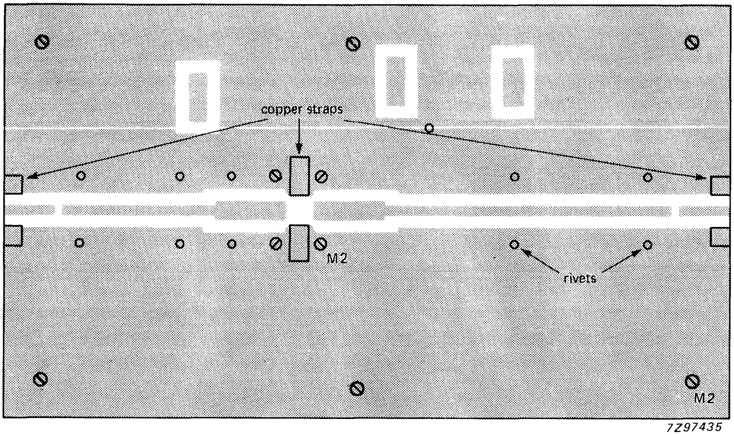
Fig. 5 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C11 = 33 pF multilayer ceramic chip capacitor
C2 = C3 = C10 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C4 = C5 = 5,6 pF multilayer ceramic chip capacitor*
C6 = 10 pF multilayer ceramic chip capacitor
C7 = 330 pF multilayer ceramic chip capacitor
C8 = 3,9 pF multilayer ceramic chip capacitor*
C9 = 1,2 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001)
L1 = L8 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)
L2 = 60 nH; 4 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = 50 Ω stripline (25,4 mm x 2,4 mm)
L4 = 50 Ω stripline (4,4 mm x 2,4 mm)
L5 = L6 = 34 Ω stripline (14,0 mm x 4,0 mm)
L7 = 280 nH; 15 turns closely wound enamelled Cu wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L9 = 50 Ω stripline (24,8 mm x 2,4 mm)
L10 = 50 Ω stripline (30,5 mm x 2,4 mm)
R1 = R2 = 10 Ω ± 5%; 0,25 W metal film resistor

L3, L4, L5, L6, L9 and L10 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch; thickness of copper-sheet 2 x 35 μm.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.
** Device mounted on a printed circuit board (see Fig. 6).



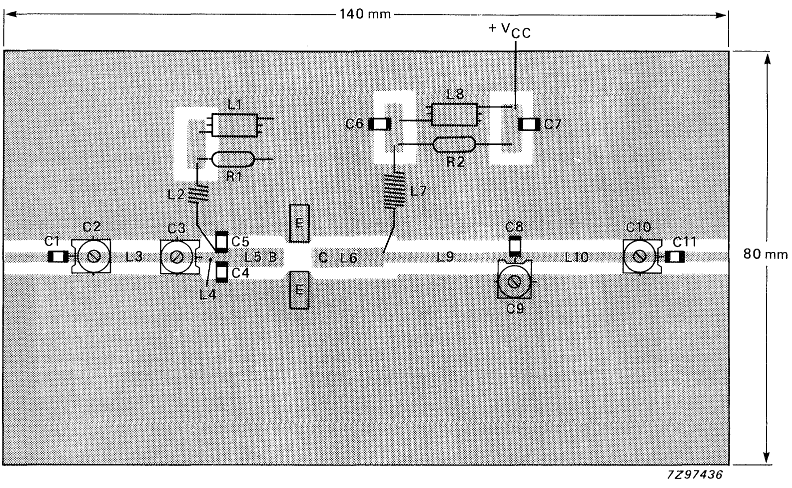


Fig. 6 P.c. board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as groundplane. Earth connections are made by hollow rivets and also by fixing-screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the groundplane.

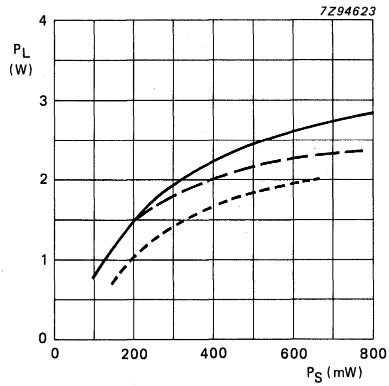


Fig. 7 Load power versus source power.

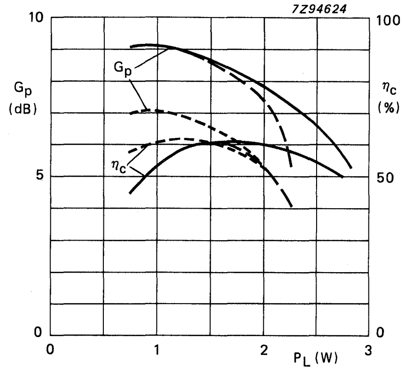


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

f = 900 MHz; class-B operation; typical values.

(—— T_{mb} = 25 °C; V_{CE} = 12,5 V; – – – T_a = 25 °C; V_{CE} = 12,5 V; -------- T_a = 25 °C; V_{CE} = 9,6 V)

RUGGEDNESS

The device is capable to withstand a full load mismatch (VSWR = 50; all phases) at P_L = 1,5 W up to a supply voltage of 15,5 V at T_a = 25 °C. Device mounted on a printed circuit board (see Fig. 6).

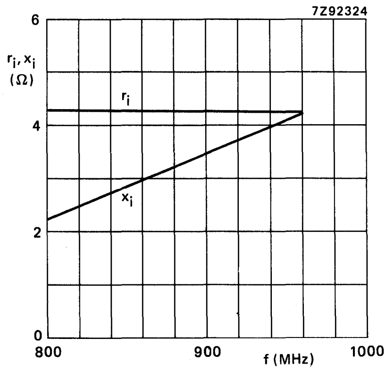


Fig. 9 Input impedance (series components).

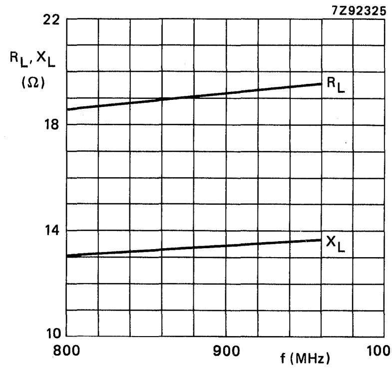


Fig. 10 Load impedance (series components).

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; P_L = 2 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

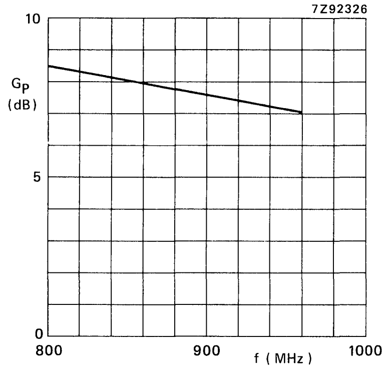


Fig. 11 Power gain versus frequency.

V_{CE} = 12,5 V; P_L = 2 W; f = 800 - 960 MHz; T_{mb} = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 900 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- internal input matching to achieve an optimum wideband capability and high power gain
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-171). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance at T_h = 25 °C in a common-emitter class-B test circuit

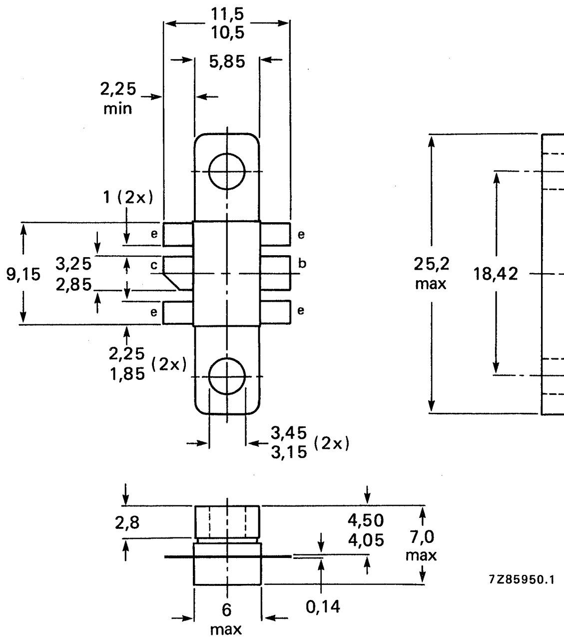
mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	900	4	> 7,5	> 50
	9,6	900	3	typ. 7,3	typ. 56

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A.

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current d.c. or average	I_C	max.	0,8 A
(peak value); f > 1 MHz	I_{CM}	max.	2,4 A
Total power dissipation at T_{mb} = 94 °C	$P_{tot(dc)}$	max.	9 W
at T_{mb} = 94 °C; f > 1 MHz	$P_{tot(rf)}$	max.	12 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

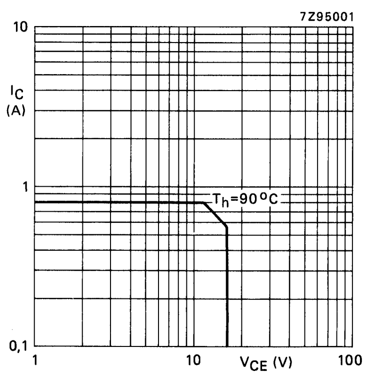


Fig. 2 D.C. SOAR.

$R_{th\ mb\text{-}h}$ = 0,4 K/W.

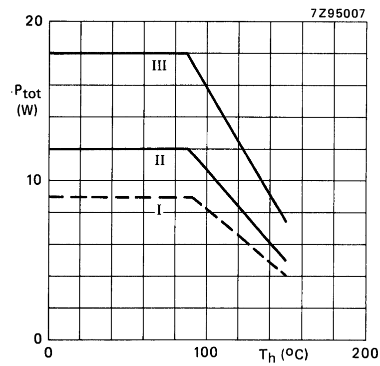


Fig. 3 Power/temperature derating curves.

I Continuous operation
II Continuous operation (f > 1 MHz)
III Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 6 W; T_{mb} = 128 °C

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	max.	12 K/W
(r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	max.	9 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,4 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage, open emitter; I_C = 10 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter breakdown voltage, open base; I_C = 20 mA	$V_{(BR)CEO}$	>	16	V
Emitter-base breakdown voltage, open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	3	V
Collector cut-off current, V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	5	mA
Second breakdown energy, L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	1	mJ
D.C. current gain, I_C = 0,6 A; V_{CE} = 10 V	h_{FE}	>	25	
Transition frequency at f = 500 MHz*, $-I_E$ = 0,6 A; V_{CE} = 12,5 V	f_T	typ.	4	GHz
Collector capacitance at f = 1 MHz, $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	8	pF
Feed-back capacitance at f = 1 MHz, I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	5	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

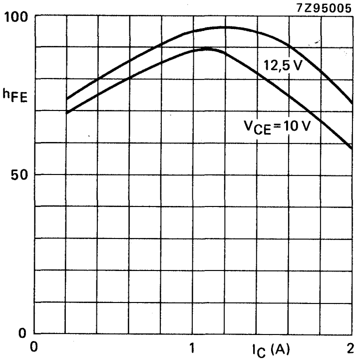


Fig. 4 T_j = 25 °C; typical values.

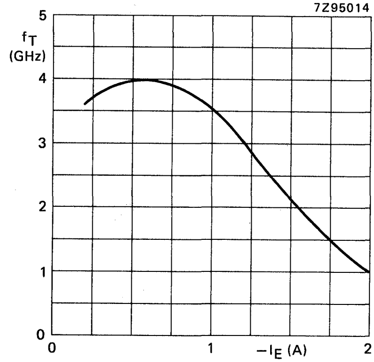


Fig. 5 V_{CB} = 12,5 V; f = 500 MHz; T_j = 25 °C; typical values.

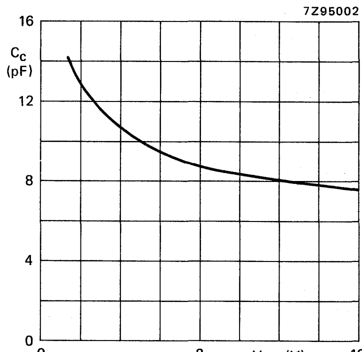


Fig. 6 $I_E = i_e$ = 0; f = 1 MHz; typical values.

* Measured under pulse conditions: t_p = 50 μs; δ < 1%.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_h = 25 °C.

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	4	< 0,71 typ. 0,57	> 7,5 typ. 8,5	< 0,64 typ. 0,56	> 50 typ. 57
	9,6	3	typ. 0,56	typ. 7,3	typ. 0,56	typ. 56

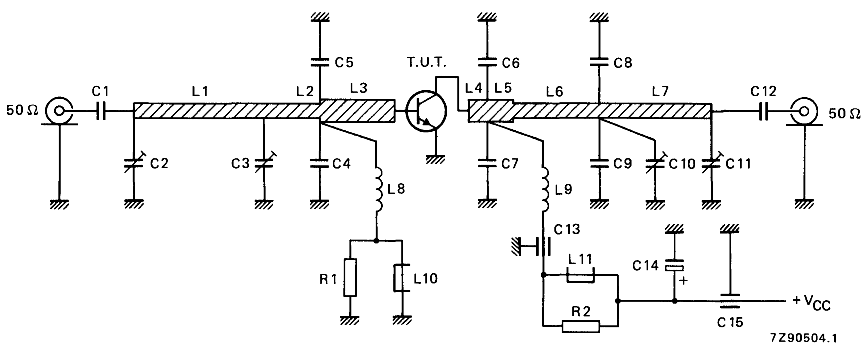


Fig. 7 Class-B test circuit at f = 900 MHz.

List of components:

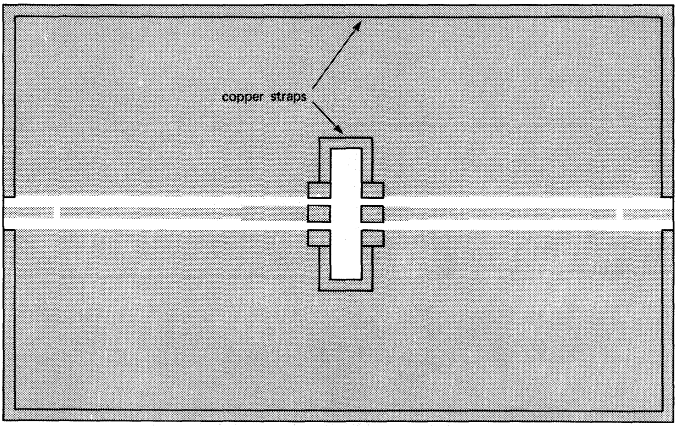
C1 = C12 = 33 pF multilayer ceramic chip capacitor
C2 = C3 = C10 = C11 = 1,4 to 5,5 pF film dielectric trimmer
(cat. no. 2222 809 09001)
C4 = C5 = 3,9 pF multilayer ceramic chip capacitor*
C6 = C7 = C8 = C9 = 6,2 pF multilayer ceramic chip capacitor*
C13 = 10 pF ceramic feed-through capacitor
C14 = 6,8 μF (63 V) electrolytic capacitor
C15 = 330 pF ceramic feed-through capacitor

L1 = 50 Ω stripline (29,5 mm x 2,4 mm)
L2 = 50 Ω stripline (5,5 mm x 2,4 mm)
L3 = 42,7 Ω stripline (16,8 mm x 3,0 mm)
L4 = 42,7 Ω stripline (7,5 mm x 3,0 mm)
L5 = 42,7 Ω stripline (2,0 mm x 3,0 mm)
L6 = 50 Ω stripline (8,5 mm x 2,4 mm)
L7 = 50 Ω stripline (28,0 mm x 2,4 mm)
L8 = 60 nH; 4 turns closely wound enamelled Cu-wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L9 = 45 nH; 4 turns enamelled Cu-wire (1,0 mm); length 6 mm; int. dia. 4 mm; leads 2 x 5 mm
L10 = L11 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

R1 = R2 = 10 Ω ± 10%; 0,25 W, metal film resistor

L1 to L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics capacitors type 100A or capacitor of same quality.



7Z90502

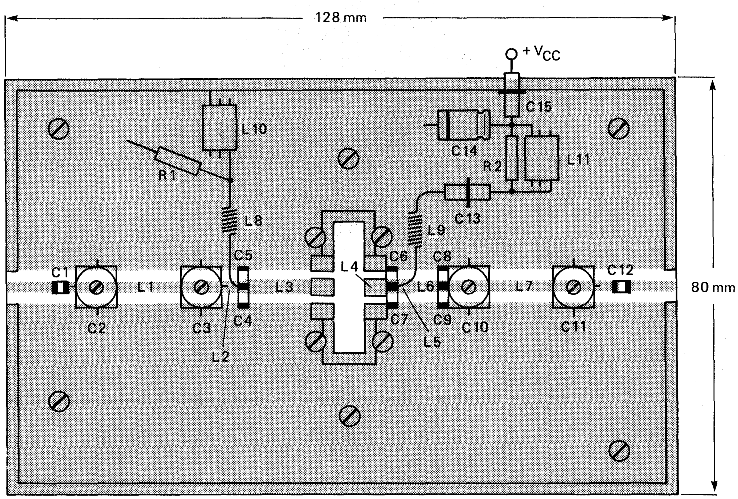


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Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by fixing screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

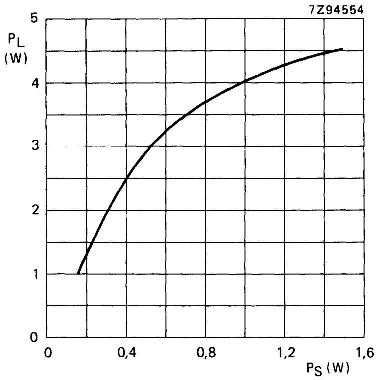


Fig. 9 Load power vs. source power.

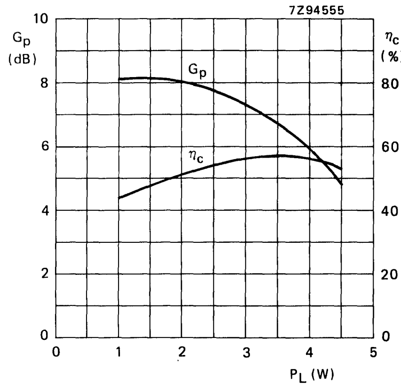


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:

V_{CE} = 9,6 V; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

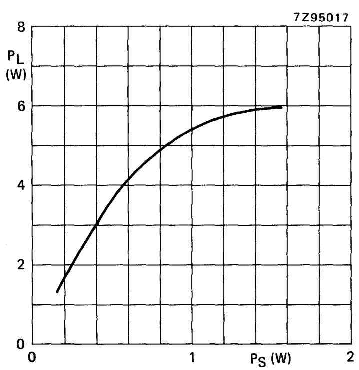


Fig. 11 Load power vs. source power.

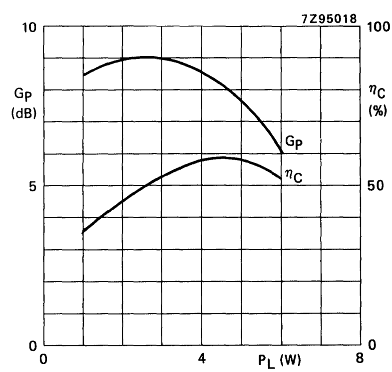


Fig. 12 Power gain and efficiency vs. load power.

Conditions for Figs 11 and 12:

V_{CE} = 12,5 V; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and at T_h = 25 °C.

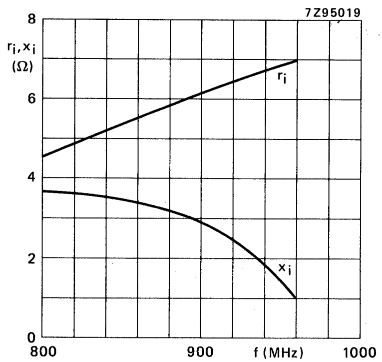


Fig. 13 Input impedance (series components).

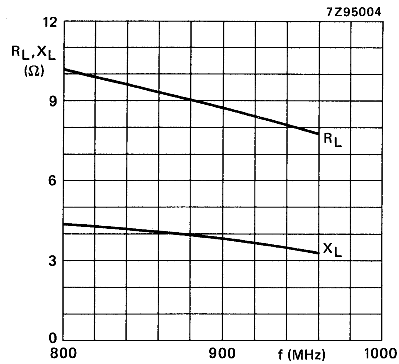


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:
V_{CE} = 12,5 V; P_L = 4 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

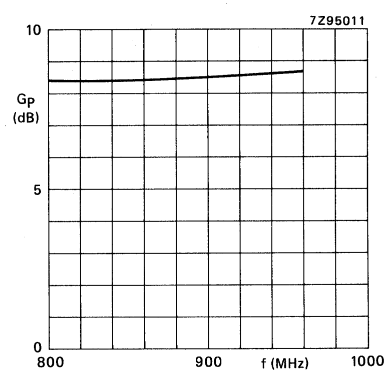


Fig. 15 Power gain vs. frequency.

V_{CE} = 12,5 V; P_L = 4 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in mobile radio transmitters in the 900 MHz communications band.

Features:

- multi-base structure and emitter-ballasting resistors for an optimum temperature profile
- internal input matching to achieve an optimum wideband capability and high power gain
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-171). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance at T_h = 25 °C in a common-emitter class-B test circuit

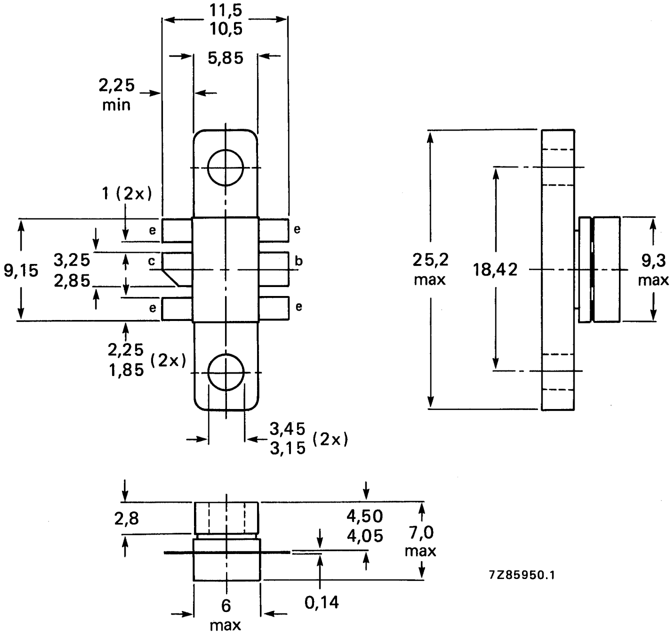
mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	900	8	> 6,5	> 50
	9,6	900	6	typ. 6,0	typ. 59

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3 V
Collector current d.c. or average	I_C; $I_{C\,AV}$	max.	1,6 A
(peak value); f > 1 MHz	I_{CM}	max.	4,8 A
Total power dissipation at T_{mb} = 67 °C	$P_{tot(dc)}$	max.	18 W
at T_{mb} = 67 °C; f > 1 MHz	$P_{tot(rf)}$	max.	24 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

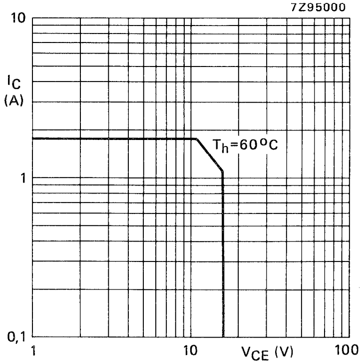


Fig. 2 D.C.-SOAR.

$R_{th\,mb-h}$ = 0,4 K/W

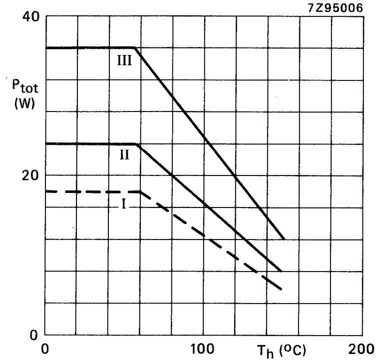


Fig. 3 Power/temperature derating curves.

I Continuous operation

II Continuous operation (f > 1 MHz)

III Short-time operation during mismatch; (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 12 W; T_{mb} = 112 °C

From junction to mounting base (d.c. dissipation)	$R_{th\,j-mb(dc)}$	max.	7,0 K/W
(r.f. dissipation)	$R_{th\,j-mb\,(rf)}$	max.	5,2 K/W
From mounting base to heatsink	$R_{th\,mb-h}$	max.	0,4 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 20 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 40 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	3 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	<	10 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	>	2 mJ
D.C. current gain I_C = 1,2 A; V_{CE} = 10 V	h_{FE}	>	25
Transition frequency at f = 500 MHz* $-I_E$ = 1,2 A; V_{CE} = 12,5 V	f_T	typ.	4 GHz
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	15 pF
Feed-back capacitance at f = 1 MHz I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	9 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

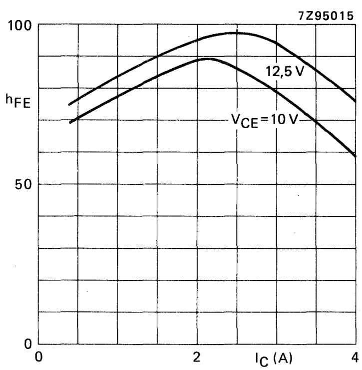


Fig. 4 T_j = 25 °C; typical values.

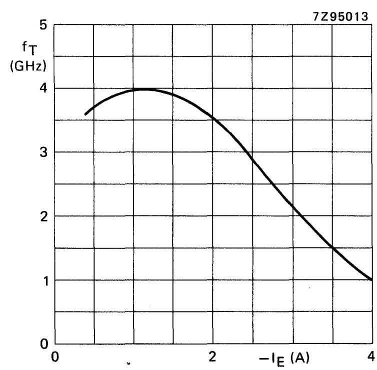


Fig. 5 V_{CB} = 12,5 V; f = 500 MHz; T_j = 25 °C; typical values.

* Measured under pulse conditions: t_p = 50 μs; δ < 1%.

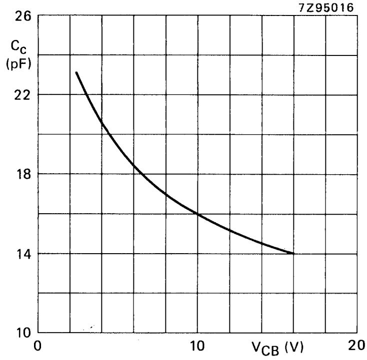


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B): f = 900 MHz; T_h = 25 °C.

mode of operation	V_{CE} V	P_L W	P_S W	G_P dB	I_C A	η_C %
narrow band; c.w.	12,5	8	< 1,8 typ. 1,5	> 6,5 typ. 7,3	< 1,28 typ. 1,1	> 50 typ. 58
	9,6	6	typ. 1,5	typ. 6,0	typ. 1,05	typ. 59

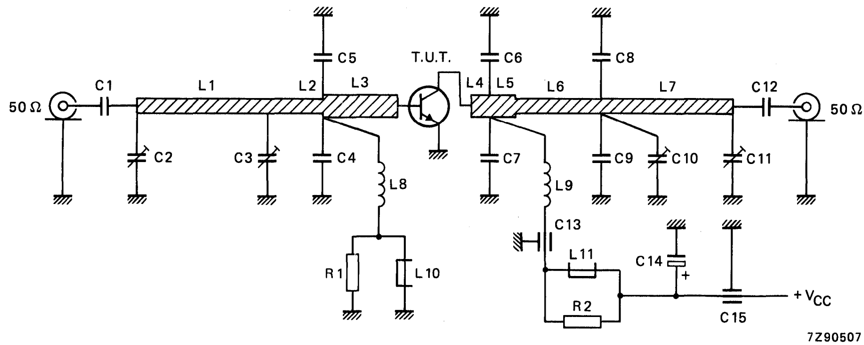


Fig. 7 Class-B test circuit at f = 900 MHz.

List of components:

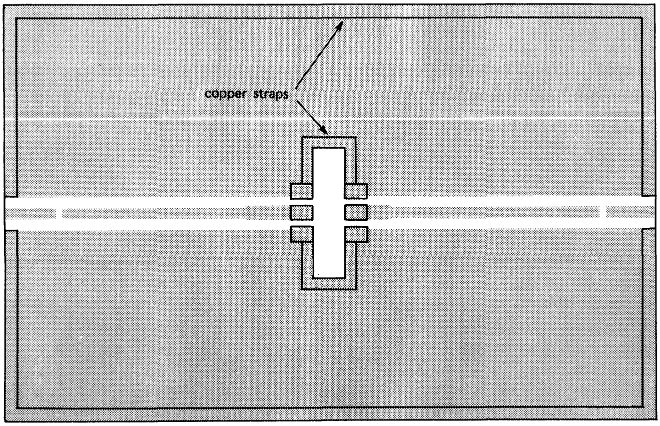
C1 = C12 = 33 pF multilayer ceramic chip capacitor
C2 = C3 = C10 = C11 = 1,4 to 5,5 pF film dielectric trimmer
(cat. no. 2222 809 09001)
C4 = C5 = 4,7 pF multilayer ceramic chip capacitor*
C6 = C7 = 5,6 pF multilayer ceramic chip capacitor*
C8 = C9 = 3,3 pF multilayer ceramic chip capacitor*
C13 = 10 pF ceramic feed-through capacitor
C14 = 6,8 μF (63 V) electrolytic capacitor
C15 = 330 pF ceramic feed-through capacitor

L1 = L7 = 50 Ω stripline (29,0 x 2,4 mm)
L2 = 50 Ω stripline (6,0 mm x 2,4 mm)
L3 = 42,7 Ω stripline (13,1 mm x 3,0 mm)
L4 = 42,7 Ω stripline (4,4 mm x 3,0 mm)
L5 = 42,7 Ω stripline (4,6 mm x 3,0 mm)
L6 = 50 Ω stripline (11,0 x 2,4 mm)
L8 = 60 nH; 4 turns closely wound enamelled Cu-wire (0,4 mm); int. dia. 3 mm; leads 2 x 5 mm
L9 = 45 nH; 4 turns enamelled Cu-wire (1,0 mm); length 6 mm; int. dia 4 mm; leads 2 x 5 mm
L10 = L11 = Ferroxcube wideband h.f. choke, grade 3B (cat. no. 4312 020 36642)

R1 = R2 = 10 Ω ± 10%; 0,25 W, metal film resistor

L1 to L7 are striplines on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of same quality.



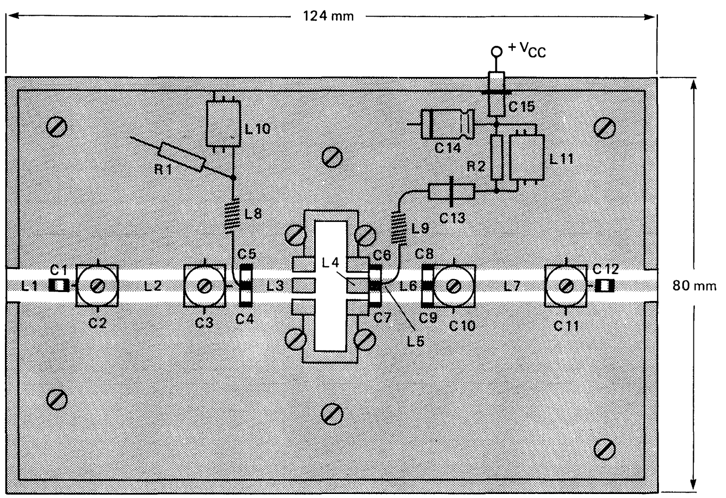


Fig. 8 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

Note

The circuit and the components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as ground plane. Earth connections are made by fixing screws and copper straps around the board and under the emitters to provide a direct contact between the copper on the component side and the ground plane.

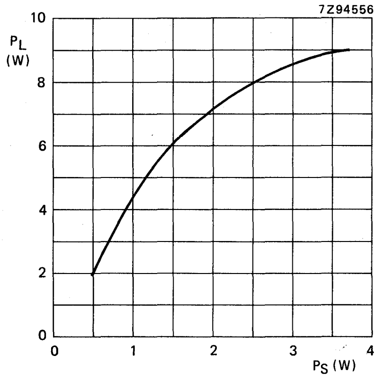


Fig. 9 Load power vs. source power.

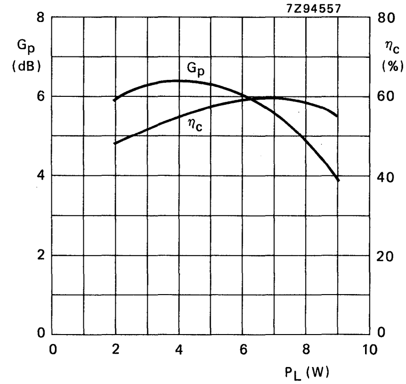


Fig. 10 Power gain and efficiency vs. load power.

Conditions for Figs 9 and 10:
V_{CE} = 9,6 V; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

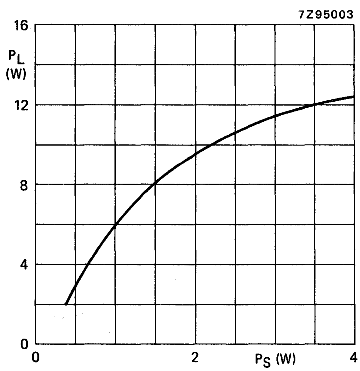


Fig. 11 Load power vs. source power.

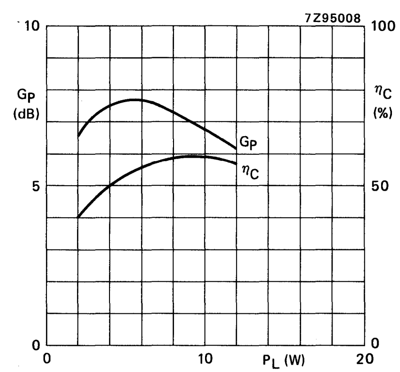


Fig. 12 Power gain and efficiency vs. load power.

Conditions for Figs 11 and 12:
V_{CE} = 12,5 V; f = 900 MHz; T_h = 25 °C; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases) at rated load power up to a supply voltage of 15,5 V and at T_h = 25 °C.

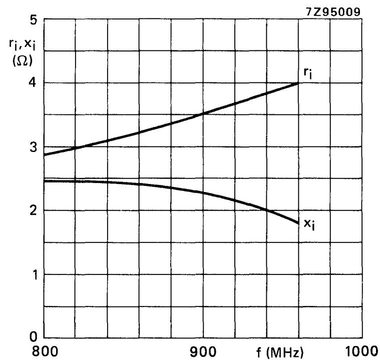


Fig. 13 Input impedance (series components).

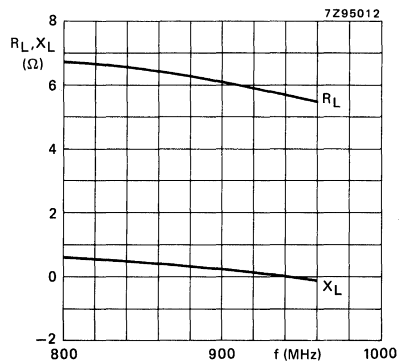


Fig. 14 Load impedance (series components).

Conditions for Figs 13 and 14:

V_{CE} = 12,5 V; P_L = 8 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

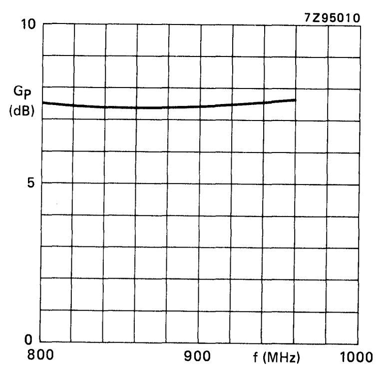


Fig. 15 Power gain vs. frequency.

V_{CE} = 12,5 V; P_L = 8 W; f = 800–960 MHz; T_h = 25 °C; class-B operation; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for common base, class-B operation in mobile radio transmitters for the 900 MHz communication band.

Features:

- emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability
- internal input matching to achieve an optimum wideband capability and stable operation

The transistor has a 6-lead flange envelope with a ceramic cap (SOT-171). All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in a common-base class-B circuit

mode of operation	V_{CB} V	f MHz	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	900	15	> 6	> 50

MECHANICAL DATA

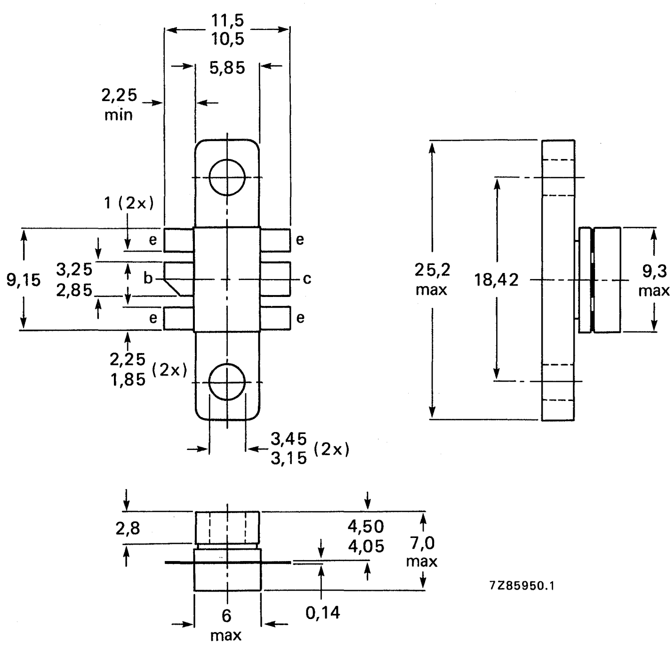
SOT-171 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw:	min. 0,6 Nm (6 kg.cm) max. 0,75 Nm (7,5 kg.cm)
Recommended screw:	cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	16	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current				
d.c. or average	I_C	max.	3	A
peak value; f > 1 MHz	I_{CM}	max.	9	A
Total power dissipation				
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	45	W
Storage temperature	T_{stg}	−65 to +150		°C
Operating junction temperature	T_j	max.	200	°C

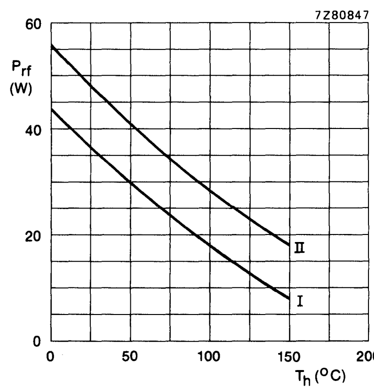


Fig. 2 Power/temperature derating curves;
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch;
(f > 1 MHz)

THERMAL RESISTANCE

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	max.	4	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,4	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 25 mA	$V_{(BR)CBO}$	min.	36 V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	min.	16 V
Emitter-base breakdown voltage open collector; I_E = 5 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector cut-off current V_{BE} = 0; V_{CE} = 16 V	I_{CES}	max.	10 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	4,5 mJ
D.C. current gain V_{CE} = 10 V; I_C = 2 A	h_{FE}	min. typ.	15 65
Collector capacitance at f = 1 MHz I_E = i_e = 0; V_{CB} = 12,5 V	C_c	typ.	33 pF
Feedback capacitance at f = 1 MHz I_E = 0; V_{CB} = 12,5 V	C_{rb}	typ.	9 pF
→ Collector-flange capacitance	C_{cf}	typ.	2 pF

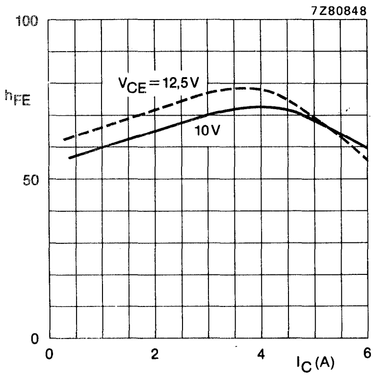


Fig. 3 D.C. current gain versus collector current; T_j = 25 °C. Typical values.

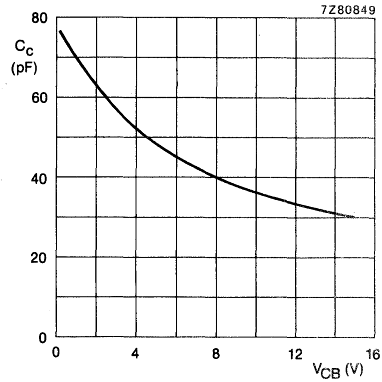


Fig. 4 Output capacitance versus V_{CB}; I_E = i_e = 0; f = 1 MHz. Typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-base circuit; class-B)
f = 900 MHz; T_h = 25 °C

mode of operation	V_{CB} V	P_L W	G_p dB	η_C %
narrow band; c.w.	12,5	15	> 6,0 typ. 7,0	> 50 typ. 61

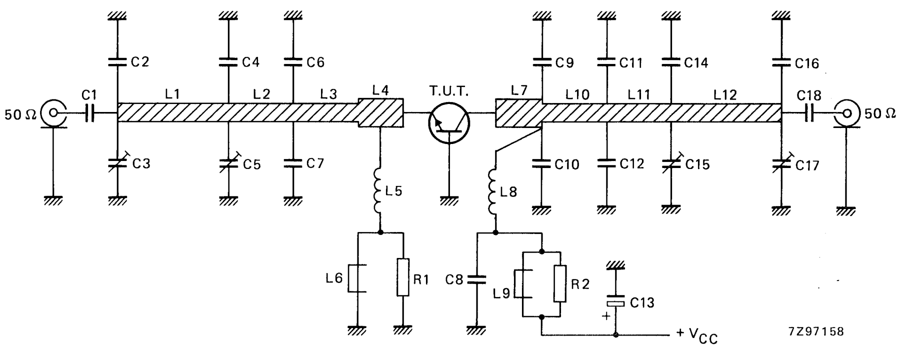


Fig. 5 Class-B test circuit at f = 900 MHz.

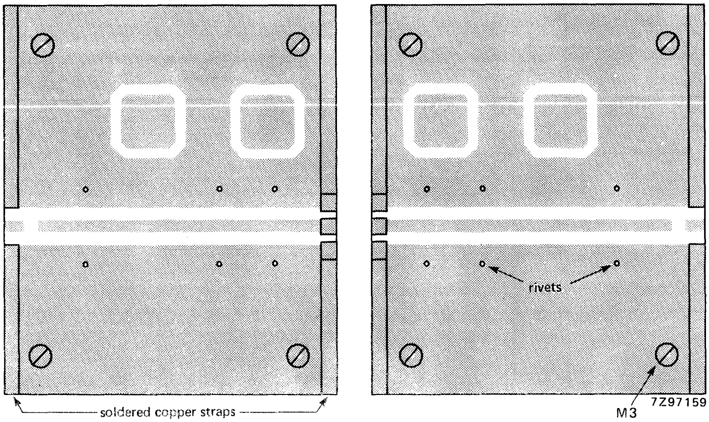
List of components:

$C_1 = C_{18}$ = 330 pF multilayer ceramic chip capacitor *
$C_2 = C_4 = C_{16}$ = 5,6 pF multilayer ceramic chip capacitor *
$C_3 = C_5 = C_{15} = C_{17}$ = 1,4 to 5,5 pF film dielectric trimmer
(cat. no. 2222 809 09001)
$C_6 = C_7$ = 4,3 pF multilayer ceramic chip capacitor *
C_8 = 330 pF multilayer ceramic chip capacitor
$C_9 = C_{10}$ = 5,6 pF multilayer ceramic chip capacitors **
$C_{11} = C_{12}$ = 6,2 pF multilayer ceramic chip capacitor *

C_{13} = 6,8 μF (63 V) electrolytic capacitor
C_{14} = 2,2 pF multilayer ceramic chip capacitor *
$L_1 = L_{12}$ = 50 Ω stripline (24 mm x 2,4 mm)
$L_2 = L_{11}$ = 50 Ω stripline (10 mm x 2,4 mm)
L_3 = 50 Ω stripline (8 mm x 2,4 mm)
$L_4 = L_7$ = 41 Ω (3 mm x 3,2 mm)
$L_5 = L_8$ = 4 turns Cu-wire (1,0 mm); int. dia. 4 mm; length 5 mm; leads 2 x 7 mm
$L_6 = L_9$ = Ferroxcube wideband h.f. choke; grade 3B (cat. no 4312 020 36642)
L_{10} = 50 Ω stripline (7 mm x 2,4 mm)

$R_1 = R_2$ = 10 Ω ± 10 %; 0,25 W, metal film resistor
The striplines are on a double Cu-clad printed circuit board with P.T.F.E. fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100B or capacitor of the same quality.
** Idem type 100A.



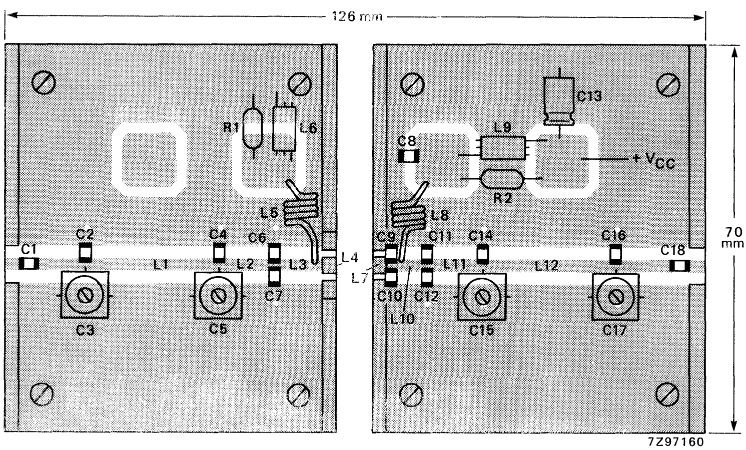


Fig. 6 Printed circuit board and component lay-out for 900 MHz class-B test circuit.

The circuit and components are on one side of the P.T.F.E. fibre-glass board; the other side is unetched copper serving as a ground plane.
Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper of the component side and the ground plane.

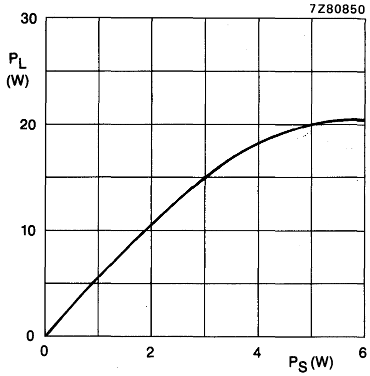


Fig. 7 Load power versus source power.

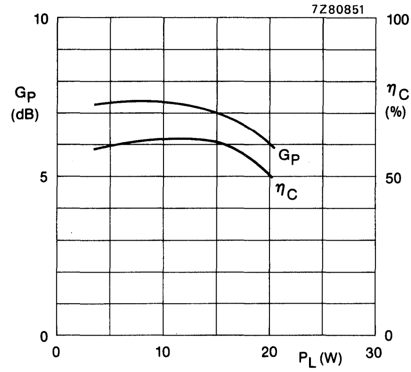


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

V_{CB} = 12,5 V; f = 900 MHz; T_h = 25 °C; class-B operation;
$R_{th\ mb\text{-}h}$ = 0,4 K/W; typical values.

RUGGEDNESS

The BLV94 is capable of withstanding a load mismatch (VSWR = 50 through all phases) at rated load power up to a supply voltage of 15,5 V at T_h = 25 °C and $R_{th\ mb\text{-}h}$ = 0,4 K/W.

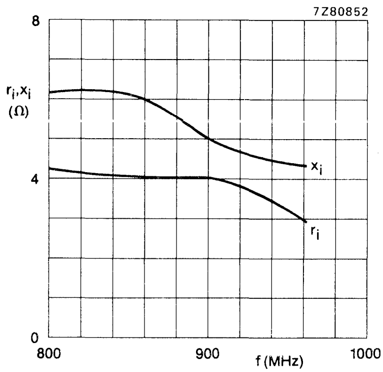


Fig. 9 Input impedance (series components).

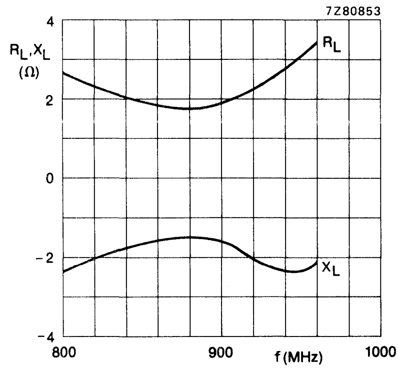


Fig. 10 Load impedance (series components).

Conditions for Figs 9, 10 and 11:

Typical values; V_{CE} = 12,5 V; P_L = 15 W; f = 800 to 960 MHz;
$R_{th\ mb\text{-}h}$ = 0,4 K/W; T_h = 25 °C.

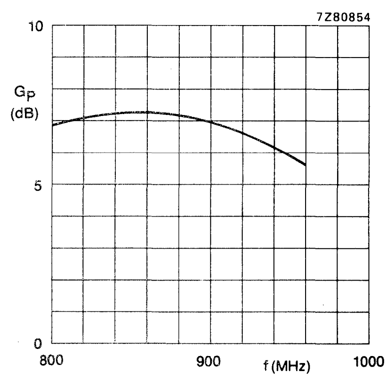


Fig. 11 Power gain versus frequency.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope and intended for use in class-B operated mobile radio transmitters in the 900 MHz communications band.

Features:

- internal input matching to achieve an optimum wideband capability and stable operation;
- emitter-ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

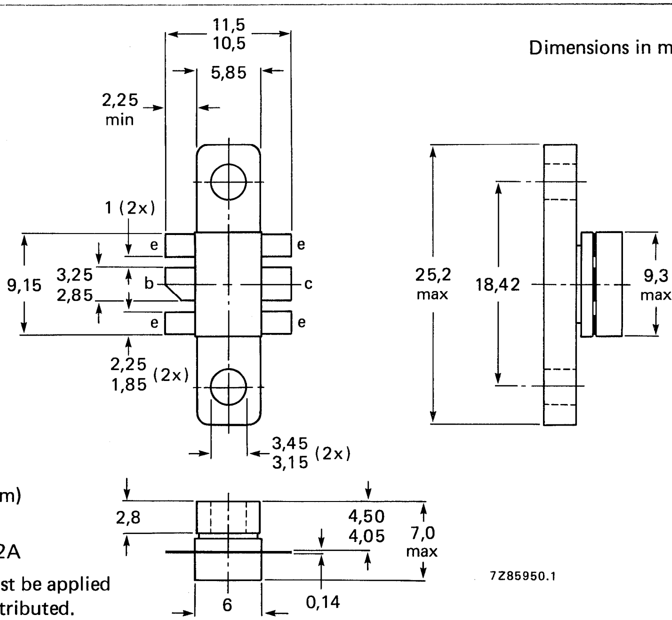
R.F. performance at T_h = 25 °C in a common-base class-B circuit

mode of operation	V_{CB} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	12,5	900	22	> 5,5	> 50

MECHANICAL DATA

Fig. 1 SOT-171.

Dimensions in mm



Torque on screw:
min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw:
cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current; d.c.	I_C	max.	5 A
Total power dissipation at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	70 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	3,5 V
D.C. current gain V_{CE} = 10 V; I_C = 3,5 A	h_{FE}	>	15
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 12,5 V	C_c	typ.	62 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

RUGGEDNESS

The device is capable of withstanding a load mismatch (VSWR = 10; all phases) at rated load power up to a supply voltage of 15,5 V and T_h = 25 °C.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope intended for use in class-B operated base station transmitters in the 900 MHz communications band.

Features

- internal matching to achieve an optimum wideband capability and stable operation.
- emitter-ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 ^oC in common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	24	900	30	> 7,0	> 55

MECHANICAL DATA

Dimensions in mm

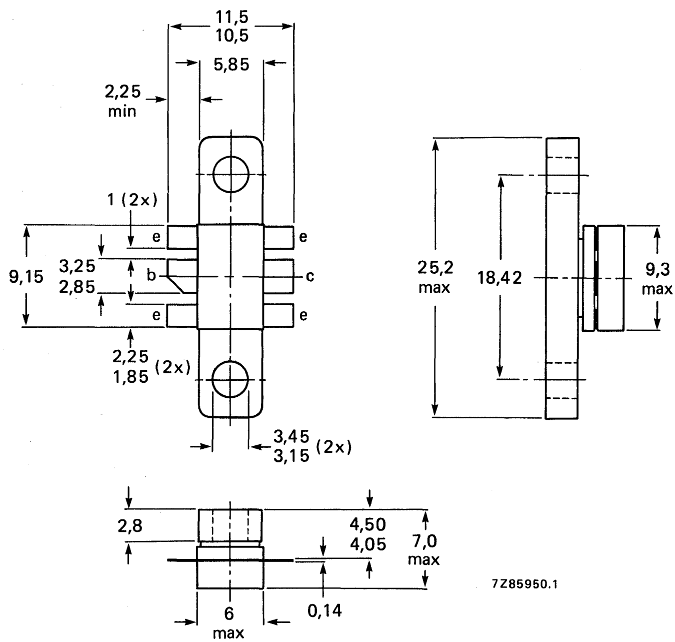
Fig. 1 SOT-171.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
d.c. or average	I_C	max.	3 A
peak value; f > 1 MHz	I_{CM}	max.	9 A
Total power dissipation			
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	60 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

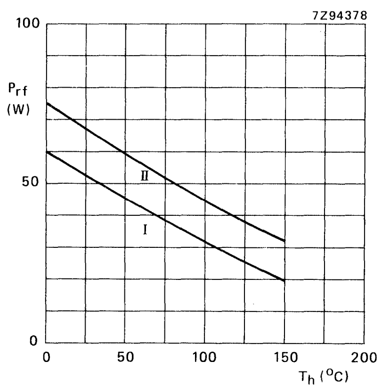


Fig. 2 Power/temperature derating curves.
I Continuous operation (f > 1 MHz)
II Short-time operating during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 60 W; T_{amb} = 25 °C.

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	max.	2,9 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,4 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

Collector-base breakdown voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	min.	50 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	min.	27 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector-emitter leakage current V_{BE} = 0; V_{CE} = 27 V	I_{CES}	max.	10 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	4 mJ
D.C. current gain V_{CE} = 20 V; I_C = 2 A	h_{FE}	min.	15
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 24 V	C_c	typ.	44 pF
Feedback capacitance at f = 1 MHz I_E = 0; V_{CB} = 24 V	C_{rb}	typ.	14 pF
→ Collector-flange capacitance	C_{cf}	typ.	2 pF

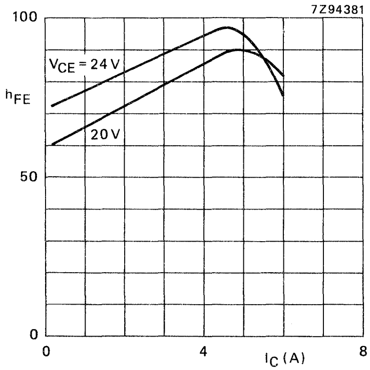


Fig. 3 D.C. current gain versus collector current; T_j = 25 °C.

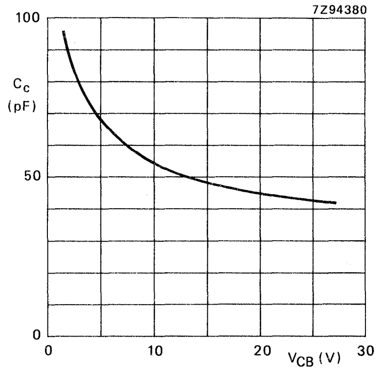


Fig. 4 Collector capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance at T_h = 25 °C in common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	24	900	30	> 7,0 typ. 8,0	> 55 typ. 63

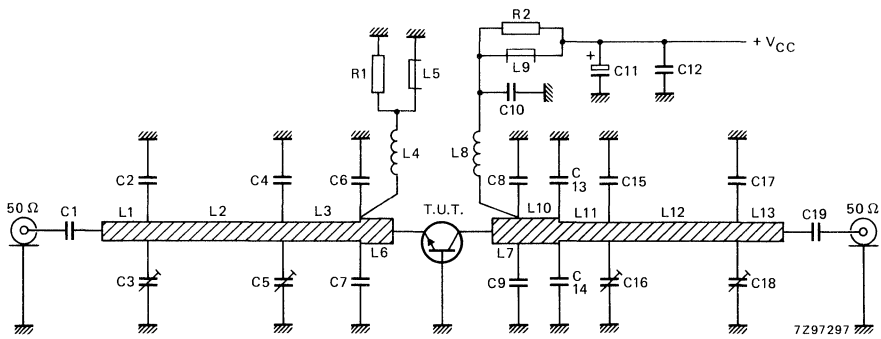


Fig. 5 Class-B test circuit at f = 900 MHz.

List of components:

C1 = C10 = C19 = 330 pF multilayer ceramic chip capacitor
C2 = C4 = C13 = C14 = C15 = C17 = 6,2 pF multilayer ceramic chip capacitor*
C3 = C5 = C16 = C18 = 1,4 to 5,5 pF dielectric trimmer (cat. no. 2222 809 09001)
C6 = 6,2 pF multilayer ceramic chip capacitor**
C7 = C8 = C9 = 6,8 pF multilayer ceramic chip capacitor*
C11 = 2,2 μF (63 V) electrolytic capacitor
C12 = 3 x 100 nF multilayer ceramic chip capacitor in parallel
L1 = L13 = 50 Ω stripline (9,0 mm x 2,4 mm)
L2 = 50 Ω stripline (24,0 mm x 2,4 mm)
L3 = 50 Ω stripline (13,0 mm x 2,4 mm)
L4 = 250 nH; 9 turns closely wound enamelled Cu-wire (1,0 mm) int. dia. 4 mm; leads 2 x 7 mm
L5 = L9 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 26642)
L6 = 43 Ω stripline (5,5 mm x 3,0 mm)
L7 = 43 Ω stripline (3,0 mm x 3,0 mm)
L8 = 65 nH; 5 turns closely wound enamelled Cu-wire (1,0 mm) int. dia. 4 mm; leads 2 x 7 mm
L10 = 43 Ω stripline (7,5 mm x 3,0 mm)
L11 = 50 Ω stripline (8,0 mm x 2,4 mm)
L12 = 50 Ω stripline (24,0 mm x 2,4 mm)
R1 = 1 Ω ± 5% (0,25 W) metal film resistor
R2 = 10 Ω ± 5% (0,25 W) metal film resistor

The striplines are on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* Americal Technical Ceramics capacitor type 100B or capacitor of the same quality.
** Idem type 100A.

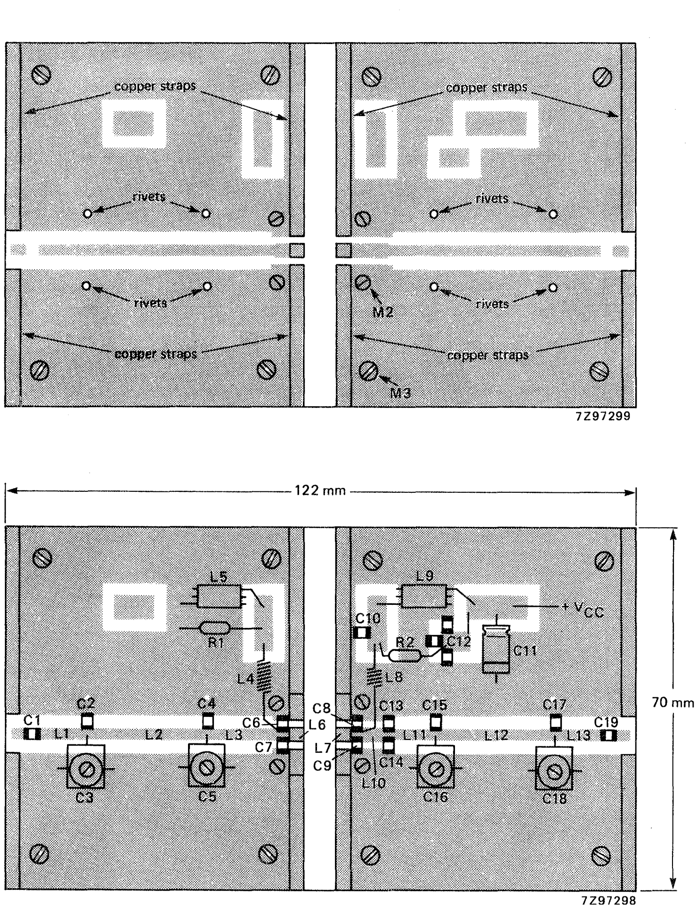


Fig. 6 Printed circuit board and component layout for 900 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

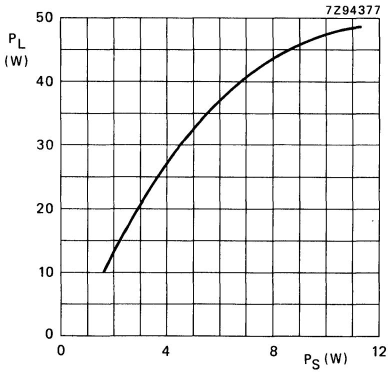


Fig. 7 Load power versus source power.

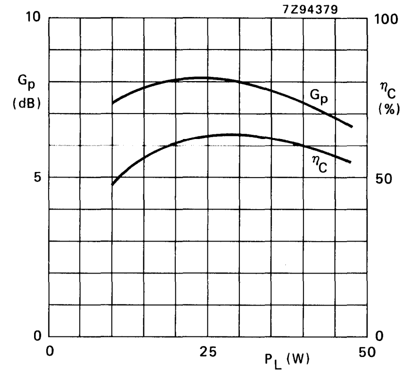


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; V_{CB} = 24 V; f = 900 MHz; T_h = 25 °C; class-B operation; $R_{th\ mb\text{-}h}$ = 0,4 K/W.

RUGGEDNESS

The BLV97 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) at rated load power and supply voltage; when T_h = 25 °C and $R_{th\ mb\text{-}h}$ = 0,4 K/W.

INPUT AND LOAD IMPEDANCES

$\overline{Z}_i$ = 1,6 + j 4,4 Ω and $\overline{Z}_L$ = 1,20 + j 3,0 Ω (series components).
Conditions: V_{CB} = 24 V; P_L = 30 W; f = 900 MHz, T_h = 25 °C; class-B operation; $R_{th\ mb\text{-}h}$ = 0,4 K/W; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor in SOT-171 envelope intended for use in class-B operated base station transmitters in the 900 MHz communications band.

Features

- internal matching to achieve an optimum wideband capability and stable operation.
- emitter ballasting resistors for an optimum temperature profile.
- gold metallization ensures excellent reliability.

The transistor has a 6-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C in common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	24	900	14	> 8,5	> 55

MECHANICAL DATA

Dimensions in mm

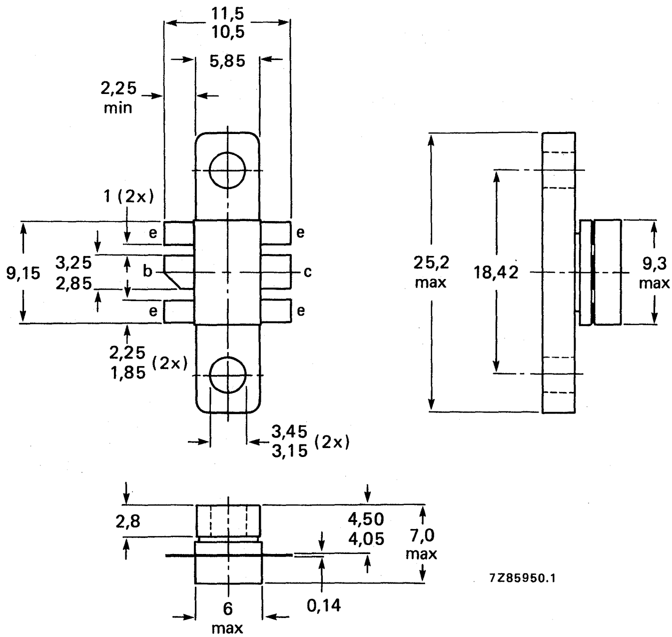
Fig. 1 SOT-171.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-171.



Torque on screw: min. 0,6 Nm (6 kg.cm)
max. 0,75 Nm (7,5 kg.cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
d.c. or average	I_C	max.	1,5 A
peak value; f > 1 MHz	I_{CM}	max.	4,5 A
Total power dissipation			
at T_{mb} = 25 °C; f > 1 MHz	P_{tot}	max.	40 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

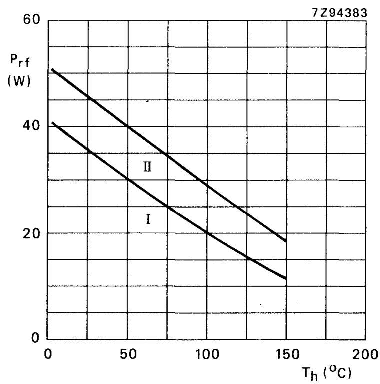


Fig. 2 Power/temperature derating curves.
I Continuous operation (f > 1 MHz)
II Short-time operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 40 W; T_{amb} = 25 °C

From junction to mounting base (r.f. operation)	$R_{th\ j\text{-}mb}$	max.	4,4 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,4 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 25 mA	$V_{(BR)CBO}$	min.	50 V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	min.	27 V
Emitter-base breakdown voltage open collector; I_E = 5 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector-emitter leakage current V_{BE} = 0; V_{CE} = 27 V	I_{CES}	max.	5 mA
Second breakdown energy L = 25 mH; f = 50 Hz; R_{BE} = 10 Ω	E_{SBR}	min.	2 mJ
D.C. current gain V_{CE} = 20 V; I_C = 1 A	h_{FE}	min.	15
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 24 V	C_c	typ.	23 pF
Feedback capacitance at f = 1 MHz I_E = 0; V_{CB} = 24 V	C_{rb}	typ.	7 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

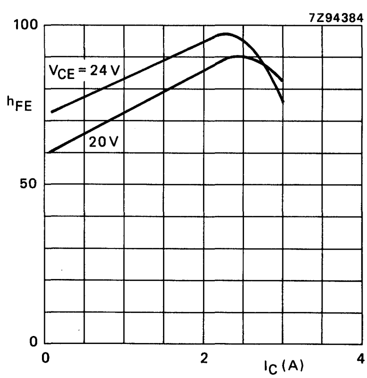


Fig. 3 D.C. current gain versus collector current; T_j = 25 °C.

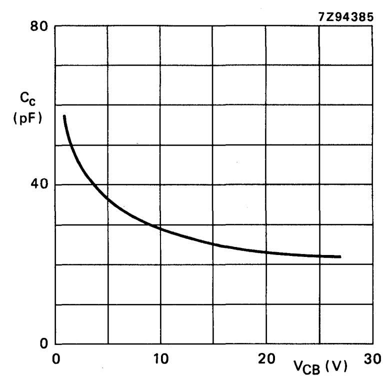


Fig. 4 Output capacitance versus V_{CB}; $I_E = i_e$ = 0; f = 1 MHz.

APPLICATION INFORMATION

R.F. performance at T_h = 25 °C in common-base class-B circuit.

mode of operation	V_{CB} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	24	900	14	> 8,5 typ. 10,0	> 55 typ. 65

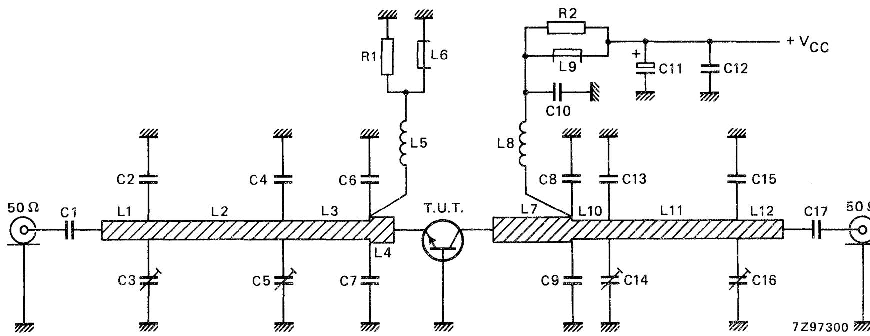


Fig. 5 Class-B test circuit at f = 900 MHz.

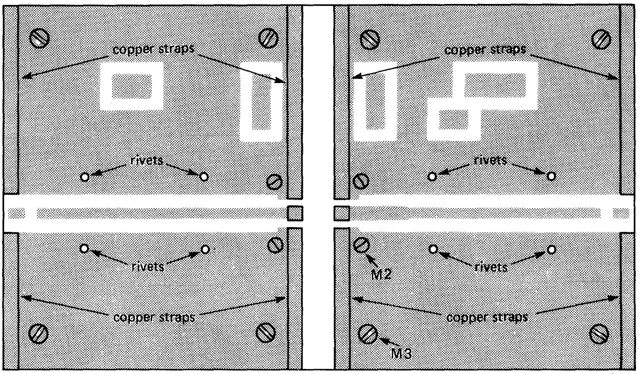
List of components:

C1 = C10 = C17 = 330 pF multilayer ceramic chip capacitor
C2 = C13 = 3,3 pF multilayer ceramic chip capacitor*
C3 = C5 = C14 = C16 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C4 = C8 = C9 = C15 = 6,2 pF multilayer ceramic chip capacitor*
C6 = C7 = 6,2 pF multilayer ceramic chip capacitor**
C11 = 2,2 μF (63 V) electrolytic capacitor
C12 = 3 x 100 nF multilayer ceramic chip capacitors in parallel
L1 = L12 = 50 Ω stripline (9,0 mm x 2,4 mm)
L2 = L11 = 50 Ω stripline (24,0 mm x 2,4 mm)
L3 = 50 Ω stripline (16,0 mm x 2,4 mm)
L4 = 43 Ω stripline (3,0 mm x 3,0 mm)
L5 = 88 nH; 9 turns closely wound enamelled Cu-wire (0,8 mm); int. dia. 3 mm length 12 mm; leads 2 x 5 mm
L6 = L9 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36642)
L7 = 43 Ω stripline (14,5 mm x 3,0 mm)
L8 = 53 nH; 4 turns enamelled Cu-wire (1,0 mm); int. dia. 4 mm; length 5 mm; leads 2 x 5 mm
L10 = 50 Ω stripline (4,5 mm x 2,4 mm)

R1 = 1 Ω ± 5% (0,25 W) metal film resistor
R2 = 10 Ω ± 5% (0,25 W) metal film resistor

The striplines are on a double Cu-clad printed circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* Americal Technical Ceramics capacitor type 100B or capacitor of the same quality.
** Idem type 100A.



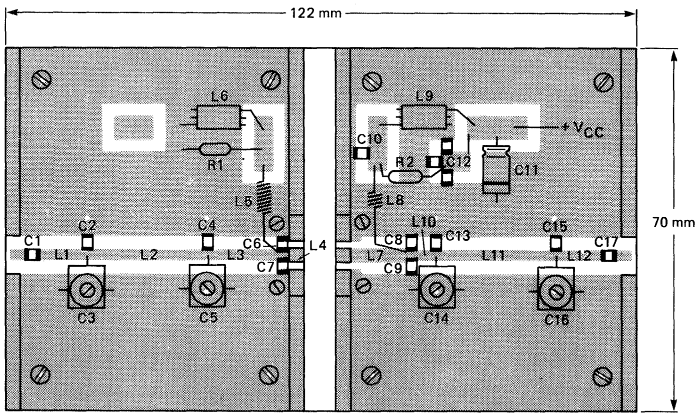


Fig. 6 Printed circuit board and component layout for 900 MHz class-B test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by fixing screws, hollow rivets and copper straps around the board and under the bases to provide a direct contact between the copper on the component side and the ground plane.

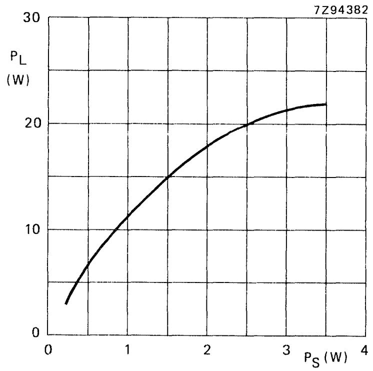


Fig. 7 Load power versus source power.

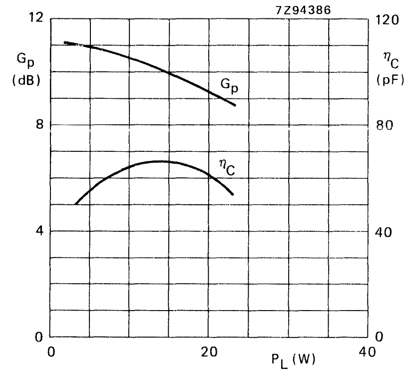


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

Typical values; V_{CB} = 24 V; f = 900 MHz; T_h = 25 °C; class-B operation; $R_{th\ mb\text{-}h}$ = 0,4 K/W.

RUGGEDNESS

The BLV98 is capable of withstanding a full load mismatch (VSWR = 50 through all phases) at rated load power and supply voltage; when T_h = 25 °C and $R_{th\ mb\text{-}h}$ = 0,4 K/W.

INPUT AND LOAD IMPEDANCES

$\overline{Z}_i$ = 5,1 + j 4,5 Ω and $\overline{Z}_L$ = 2,2 + j 3,0 Ω (series components).
Conditions: V_{CB} = 24 V; P_L = 14 W; f = 900 MHz, T_h = 25 °C; class-B operation; $R_{th\ mb\text{-}h}$ = 0,4 K/W; typical values.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use as a driver-stage in base stations in the 900 MHz communications band.

Features:

- emitter-ballasting resistors for an optimum temperature profile
- gold metallization ensures excellent reliability

The transistor has a 4-lead stud envelope with a ceramic cap (SOT-172). All leads are isolated from the stud.

QUICK REFERENCE DATA

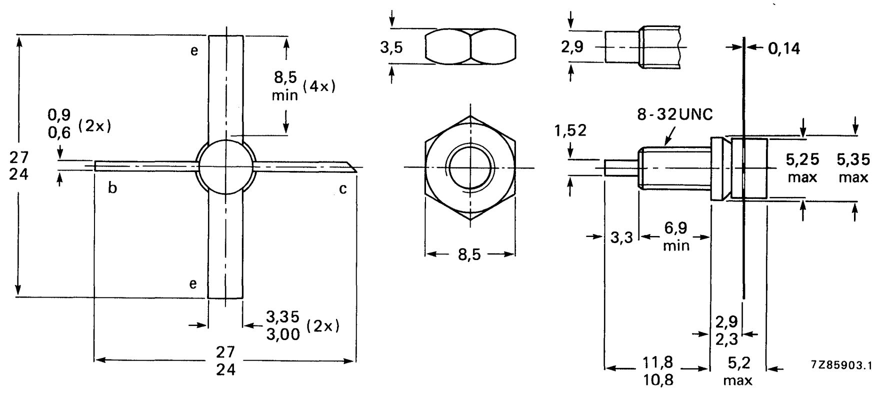
R.F. performance at T_h = 25 °C in a common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	24	900	2	> 8,0	> 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-172.



Torque on nut: min. 0,75 Nm (7,5 kg.cm)
max. 0,85 Nm (8,5 kg.cm)
When locking is required an adhesive is preferred instead of a lock washer.

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
Deburring must leave surface flat; donot chamfer or countersink either end of hole.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.	50 V
Collector-emitter voltage (open base)	V_{CEO}	max.	27 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current; d.c.	I_C	max.	0,2 A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	0,6 A
Total power dissipation at T_{mb} = 50 °C; f > 1 MHz	P_{tot}	max.	6 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

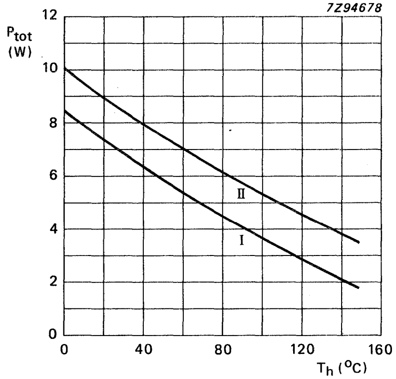


Fig. 2 Power/temperature derating curves.

I continuous r.f. operation (f > 1 MHz)
II short-time r.f. operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

P = 4,5 W; T_{mb} = 25 °C

From junction to mounting base (f > 1 MHz)	$R_{th\ j\text{-}mb}$	max.	20 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	max.	0,8 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 5 mA	$V_{(BR)CBO}$	min.	50 V
Collector-emitter breakdown voltage open base; I_C = 10 mA	$V_{(BR)CEO}$	min.	27 V
Emitter-base breakdown voltage open collector; I_E = 0,5 mA	$V_{(BR)EBO}$	min.	3,5 V
Collector-emitter leakage current V_{BE} = 0; V_{CE} = 27 V	I_{CES}	max.	2 mA
Second breakdown energy at f = 50 Hz L = 25 mH; R_{BE} = 10 Ω	E_{SBR}	min.	0,5 mJ
D.C. current gain I_C = 150 mA; V_{CE} = 20 V	h_{FE}	min.	25
Collector capacitance at f = 1 MHz $I_E = i_e$ = 0; V_{CB} = 24 V	C_c	typ.	3 pF
Feedback capacitance at f = 1 MHz I_C = 0; V_{CE} = 24 V	C_{re}	typ.	1,3 pF
Collector-stud capacitance	C_{cs}	typ.	0,5 pF

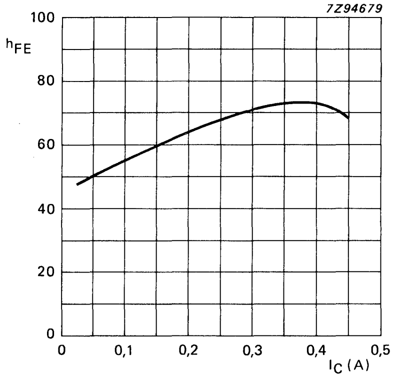


Fig. 3 V_{CE} = 20 V; T_j = 25 °C; typical values.

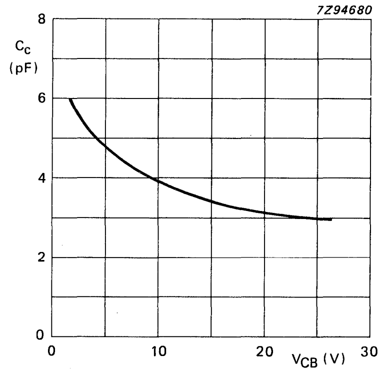


Fig. 4 $I_E = i_e$ = 0; f = 1 MHz; typical values.

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class-B)
f = 900 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ = 0,8 K/W

mode of operation	V_{CE} V	f MHz	P_L W	G_P dB	η_C %
narrow band; c.w.	24	900	2	min. 8,0 typ. 9,3	min. 55 typ. 63

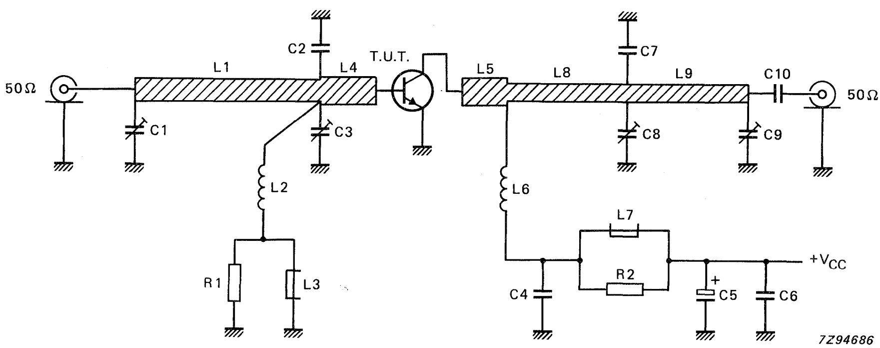


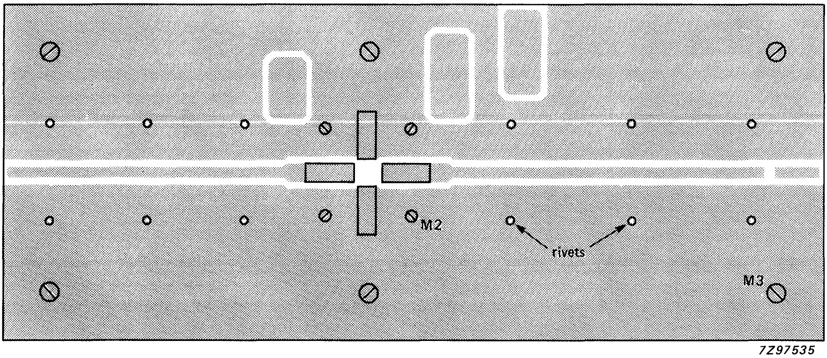
Fig. 5 class-B test circuit at f = 900 MHz.

List of components

C1 = C3 = C8 = C9	1,4 — 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C2	4,7 pF multilayer ceramic chip capacitor*
C4 = C6 = C10	220 pF multilayer ceramic chip capacitor
C5	1 μF (63 V) electrolytic capacitor
C7	2,2 pF multilayer ceramic chip capacitor*
L1	50 Ω stripline (48 mm x 2,4 mm)
L2	60 nH; 7 turns closely wound enamelled Cu-wire (0,4 mm); int. dia. 2 mm; leads 2 x 5 mm
L3 = L7	Ferroxcube wide-band h.f. choke; grade 3B; (cat. no. 4312 020 36642)
L4 = L5	35 Ω stripline (14 mm x 4,0 mm)
L6	120 nH; 6 turns Cu-wire (1,0 mm); int. dia. 6 mm; length 10 mm leads 2 x 5 mm
L8	50 Ω stripline (31 mm x 2,4 mm)
L9	50 Ω stripline (29 mm x 2,4 mm)
R1 = R2	10 Ω ± 5% (0,4 W) metal film resistor

The striplines are on a Cu-clad printed-circuit board with a PTFE fibre-glass dielectric (ϵ_r = 2,2); thickness 1/32 inch.

* American Technical Ceramics capacitor type 100A or capacitor of the same quality.



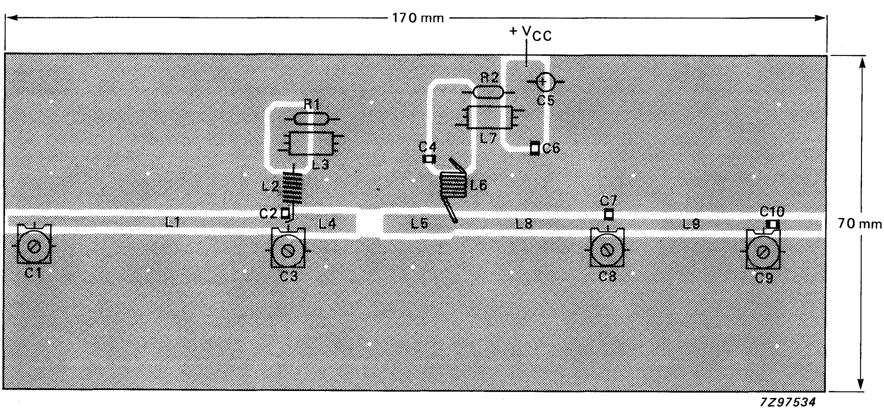


Fig. 6 Printed-circuit board and component layout for 900 MHz class-B test circuit.

Note:

The circuit and the components are on one side of the PTFE fibre-glass board; the other side is unetched copper serving as a ground plane. Earth connections are made by hollow rivets and also by fixing screws and copper straps under the emitters to provide a direct contact between the copper on the component side and the ground plane.

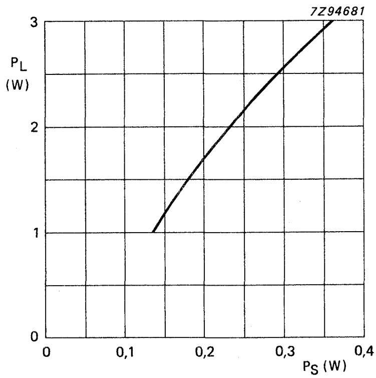


Fig. 7 Load power versus source power.

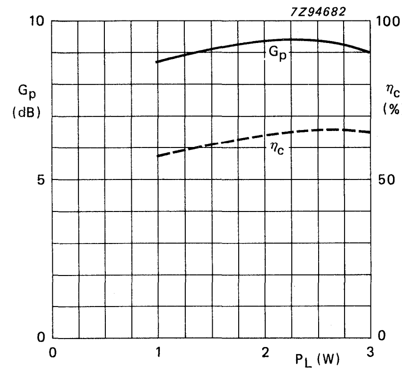


Fig. 8 Power gain and efficiency versus load power.

Conditions for Figs 7 and 8:

V_{CE} = 24 V; f = 900 MHz; T_h = 25 °C; $R_{th\,mb\text{-}h}$ = 0,8 K/W; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50) through all phases, at rated load power and supply voltage (T_h = 25 °C; $R_{th\,mb\text{-}h}$ = 0,8 K/W).

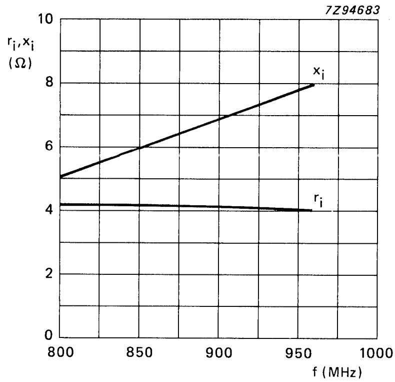


Fig. 9 Input impedance (series components).

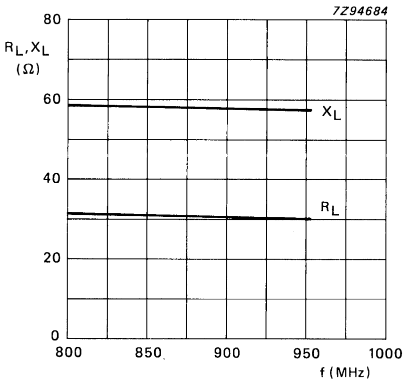


Fig. 10 Load impedance (series components).

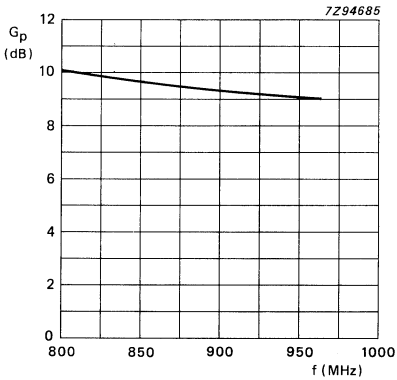


Fig. 11 Power gain versus frequency.

Conditions for Figs 9, 10 and 11:

V_{CE} = 24 V; P_L = 2 W; f = 800 – 960 MHz; $R_{th\ mb\text{-}h}$ = 0,8 K/W; T_h = 25 °C; class-B operation; typical values.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. Because of the high gain and excellent power handling capability, the transistor is especially suited for design of wide-band and semi-wide-band v.h.f. amplifiers. Together with a BFQ42 driver stage, the chain can deliver 15 W with a maximum drive power of 120 mW at 175 MHz. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

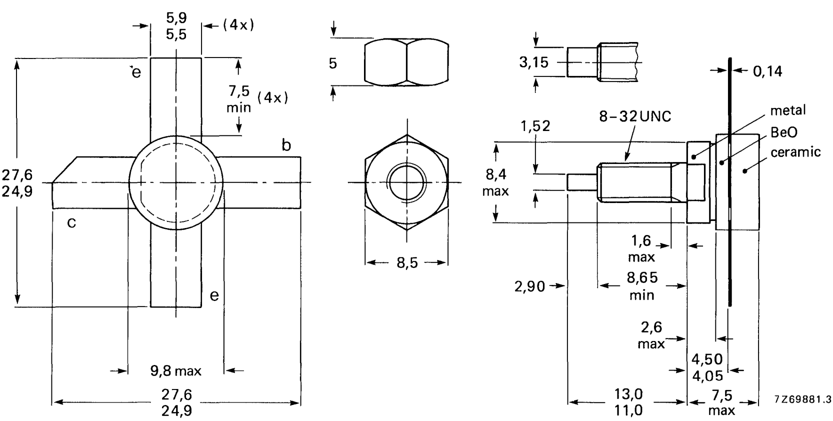
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w. class-B	**13,5**	**175**	**15**	**> 10**	**> 60**	**1,3 + j0,68**	**180 − j54**
c.w. class-B	12,5	175	15	typ. 10,5	typ. 67	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	2,75 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	8 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	53 W
Storage temperature	T_{stg}		–65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

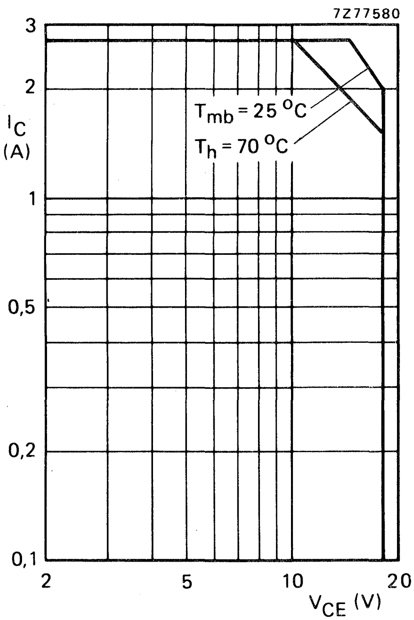


Fig. 2 D.C. SOAR.

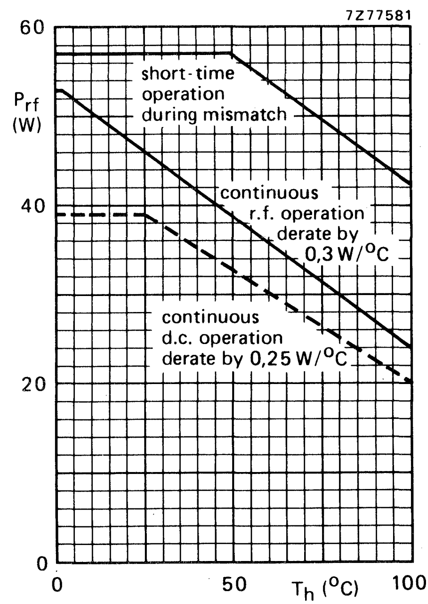


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16,5$ V; f ⩾ 1 MHz.

THERMAL RESISTANCE (dissipation = 15 W; T_{mb} = 77 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,7 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	3,05 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 15$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 5$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	5 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	4 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	4 mJ
D.C. current gain* $I_C = 1,75$ A; $V_{CE} = 5$ V	h_{FE}	typ. 	40 10 to 80
Collector-emitter saturation voltage* $I_C = 5$ A; $I_B = 1$ A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz* $-I_E = 1,75$ A; $V_{CB} = 13,5$ V	f_T	typ.	900 MHz
$-I_E = 5$ A; $V_{CB} = 13,5$ V	f_T	typ.	825 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	43 pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	27 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

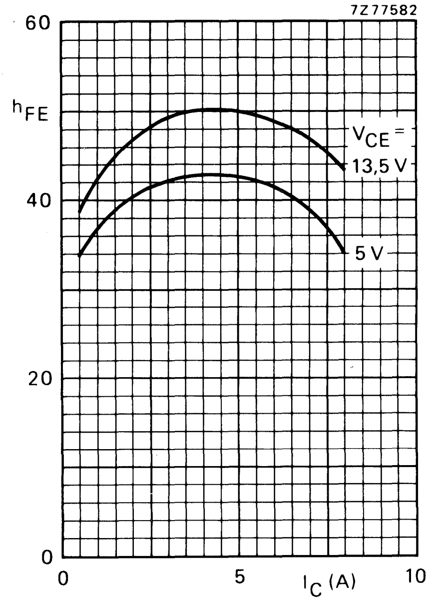


Fig. 4 Typical values; T_j = 25 °C.

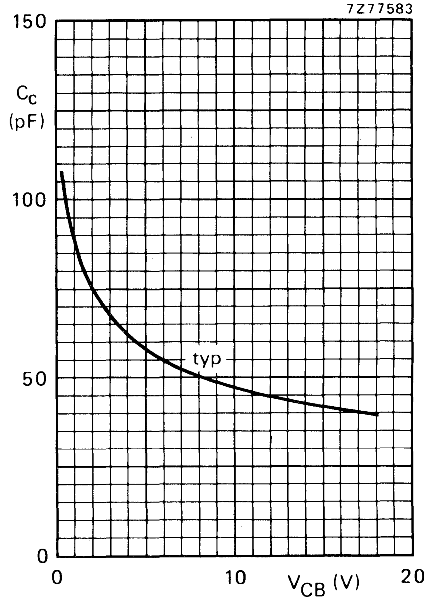


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

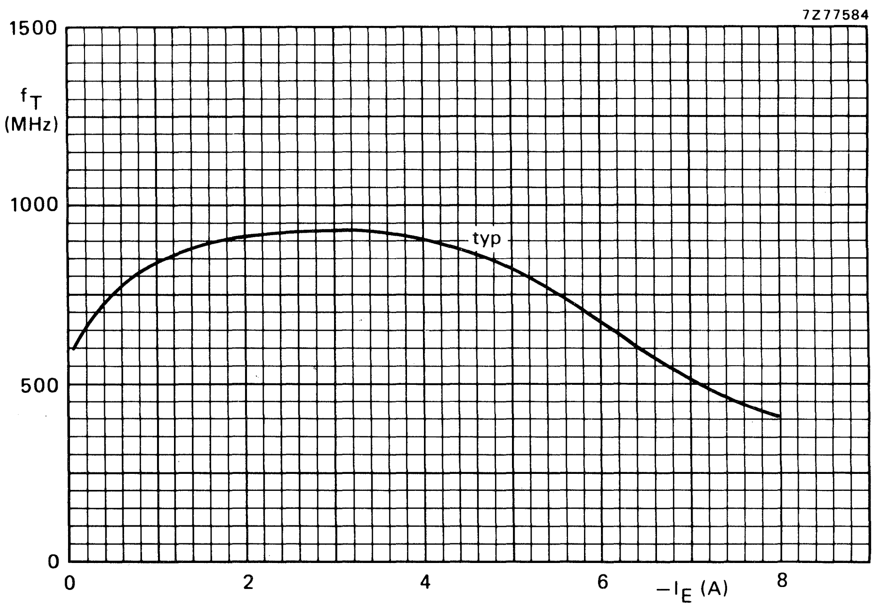


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**15**	**< 1,5**	**> 10**	**< 1,85**	**> 60**	**1,3 + j0,68**	**180 – j54**
175	12,5	15	typ. 1,34	typ. 10,5	typ. 1,8	typ. 67	–	–

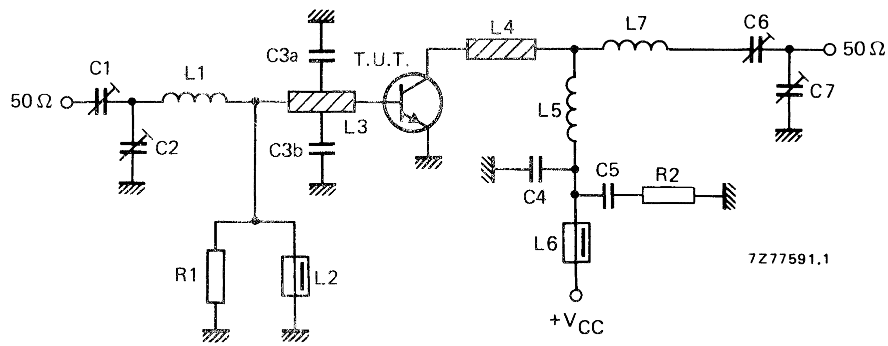


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 1 nF ceramic capacitor
C5 = 100 nF polyester capacitor

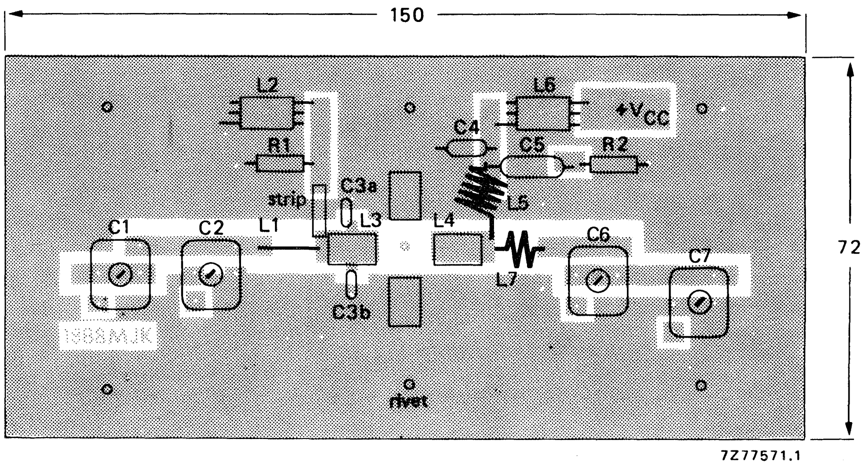
L1 = ½ turn Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm
L2 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L4 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L5 = 4½ turns closely wound enamelled Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm
L7 = 2 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



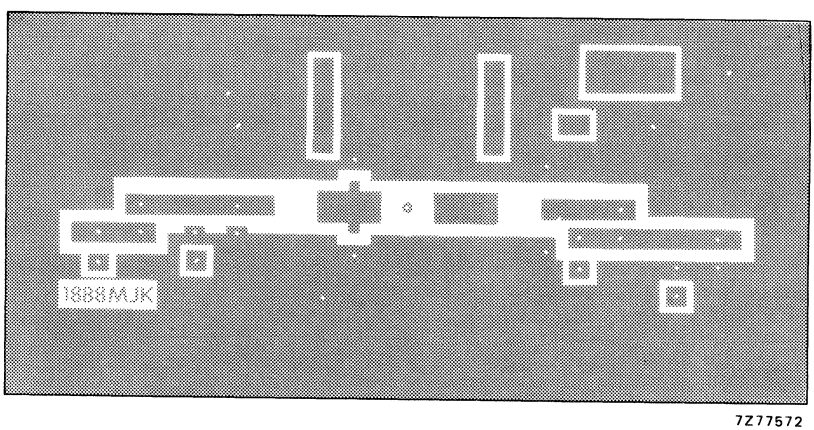


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

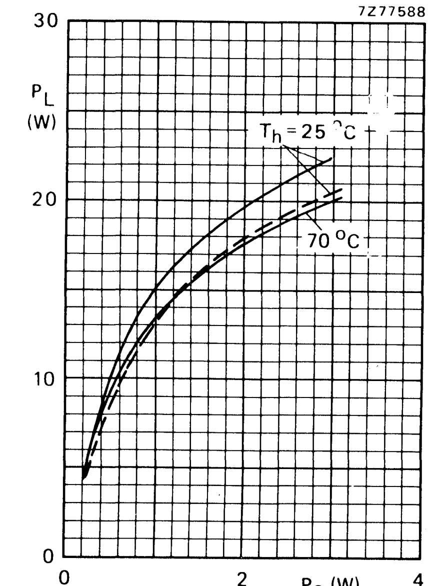


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

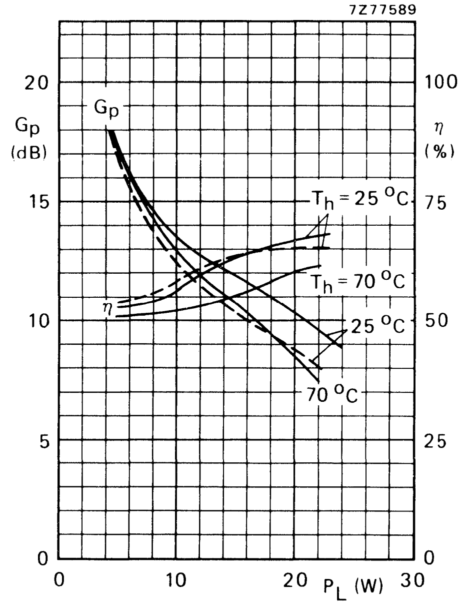


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

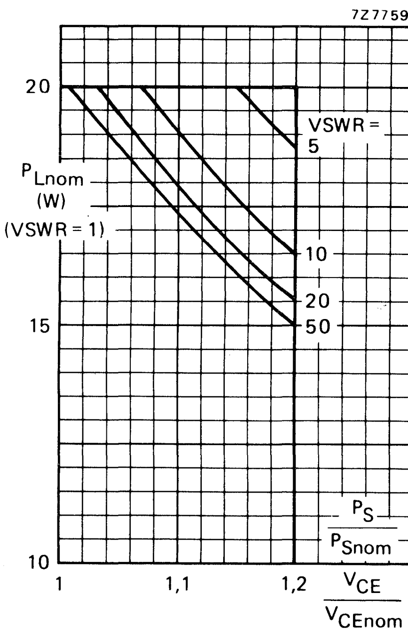


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 ^oC; $R_{th\ mb\text{-}h}$ = 0,45 K/W ; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

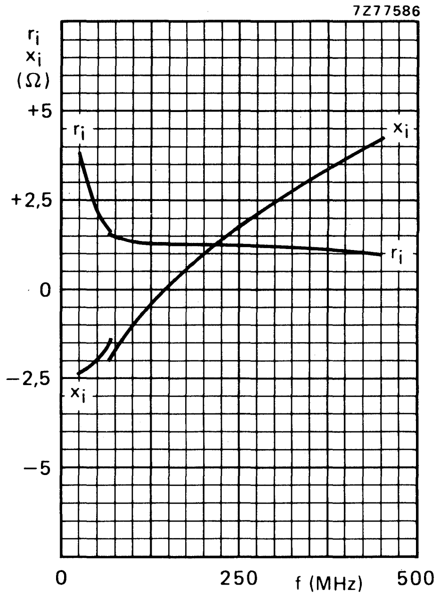


Fig. 12.

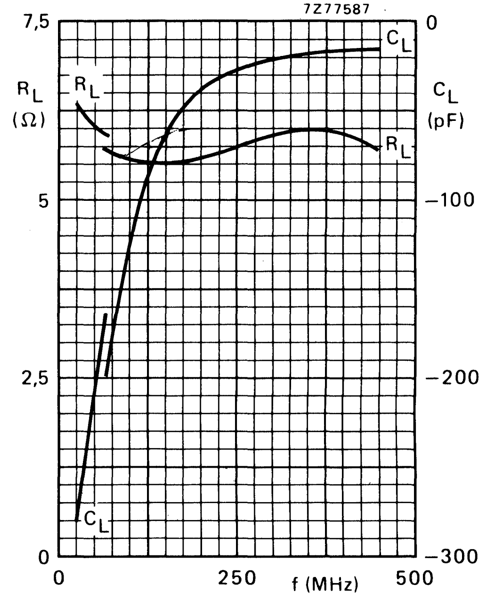
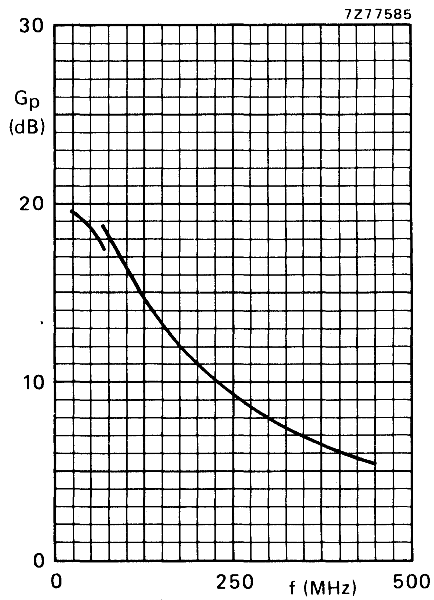


Fig. 13.



Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 15 W; T_h = 25 °C.

Fig. 14.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B or C operated mobile transmitters with a nominal supply voltage of 13,5 V. Because of the high gain and excellent power handling capability, the transistor is especially suited for design of wide-band and semi-wide-band v.h.f. amplifiers. Together with a BFQ43 driver stage, the chain can deliver 28 W with a maximum drive power of 250 mW at 175 MHz. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

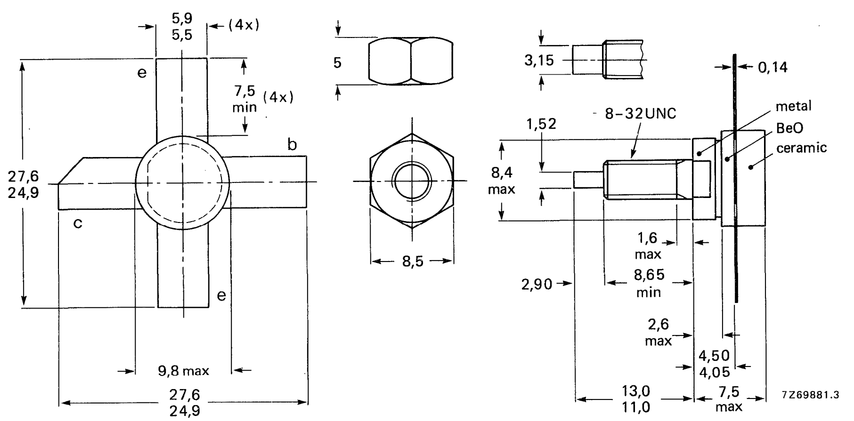
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w. class-B	**13,5**	**175**	**28**	**> 9**	**> 60**	**0,9 + j0,9**	**380 + j40**
c.w. class-B	12,5	175	28	typ. 9,5	typ. 70	—	—

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	6	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	15	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	96	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

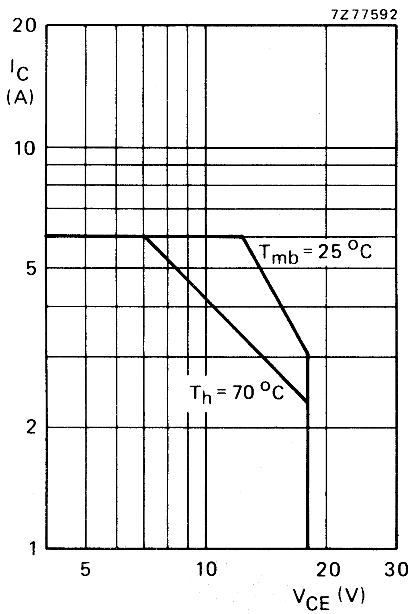


Fig. 2 D.C. SOAR.

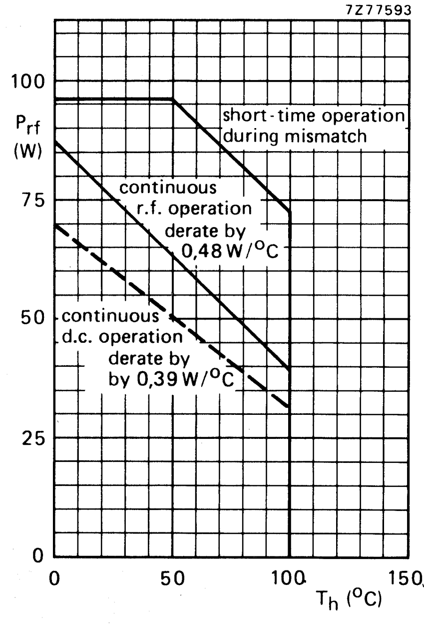


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f $\geqslant$ 1 MHz.

THERMAL RESISTANCE (dissipation = 25 W; T_{mb} = 81 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,4	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,85	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage				
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain*				
I_C = 3,5 A; V_{CE} = 5 V	h_{FE}	typ.	40	
			10 to 80	
Collector-emitter saturation voltage*				
I_C = 10 A; I_B = 2 A	V_{CEsat}	typ.	1,8	V
Transition frequency at f = 100 MHz*				
$-I_E$ = 3,5 A; V_{CB} = 13,5 V	f_T	typ.	850	MHz
$-I_E$ = 10 A; V_{CB}= 13,5 V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 13,5 V	C_c	typ.	92	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 13,5 V	C_{re}	typ.	58	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

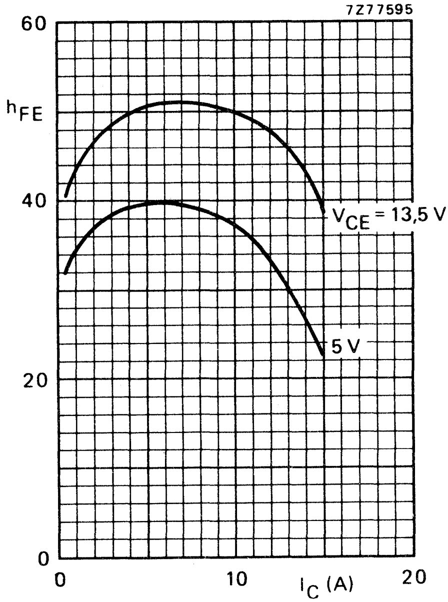


Fig. 4 Typical values; T_j = 25 °C.

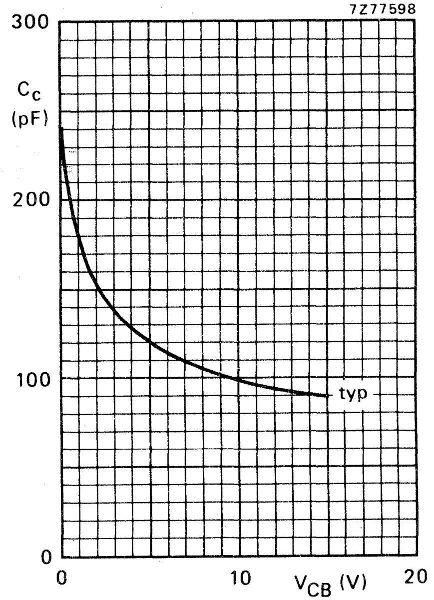


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

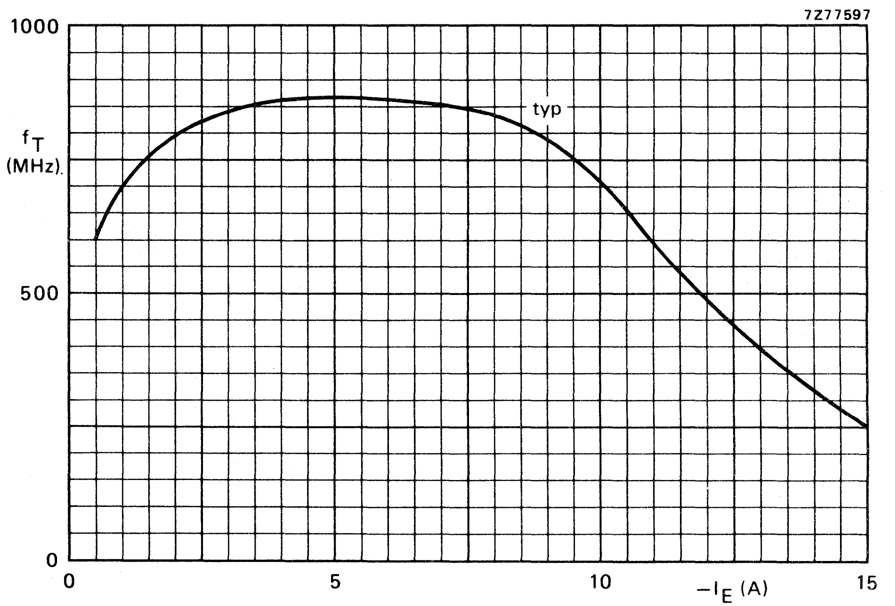


Fig. 6 V_{CB} = 13,5 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**28**	**< 3,5**	**> 9**	**< 3,45**	**> 60**	**0,9 + j0,9**	**380 + j40**
175	12,5	28	typ. 3,15	typ. 9,5	typ. 3,2	typ. 70	–	–

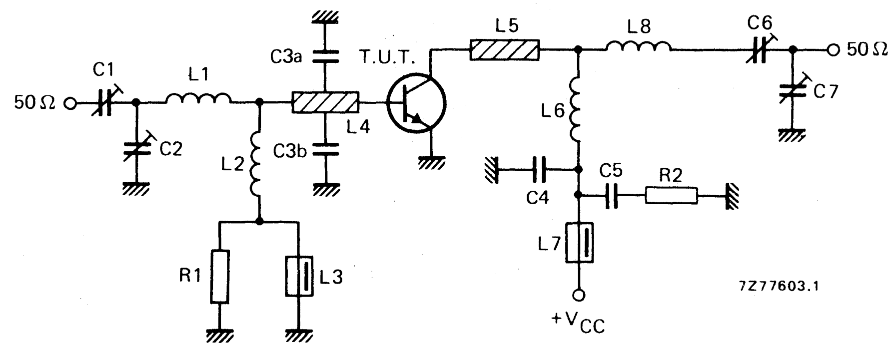


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)

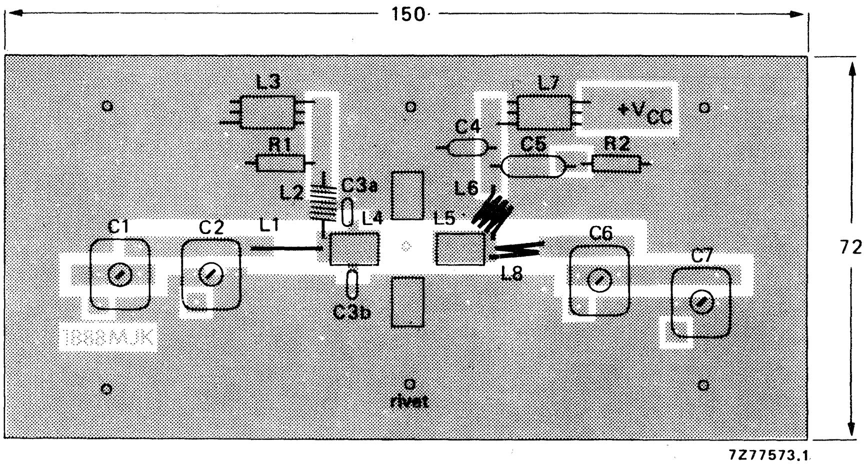
L1 = ½ turn Cu wire (1,6 mm); int. dia. 6,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 3½ turns closely wound enamelled Cu wire (1,6 mm) int. dia. 6,0 mm; leads 2 x 5 mm
L8 = 1 turn Cu wire (1,6 mm) int. dia. 6,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



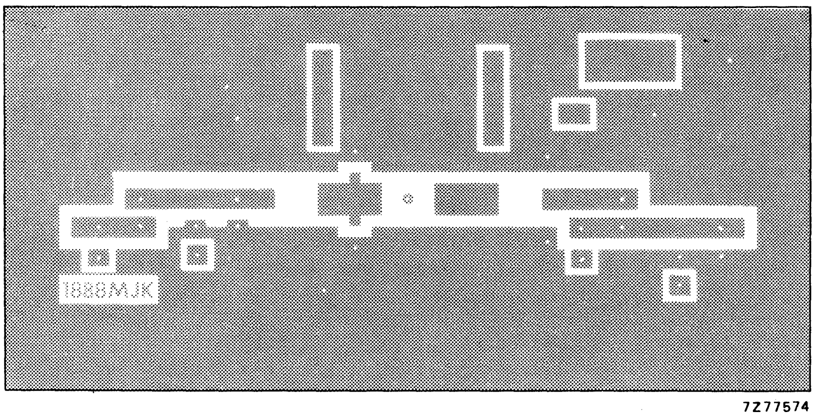


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

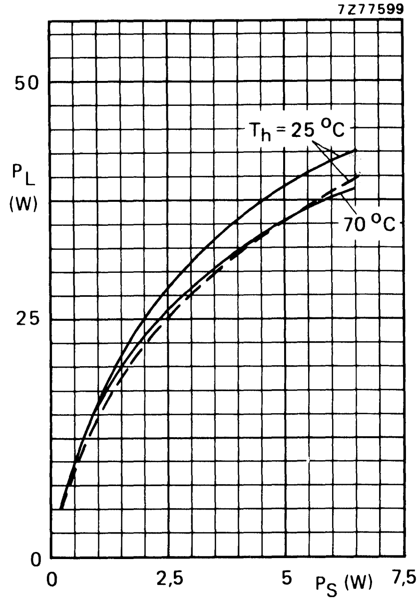


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

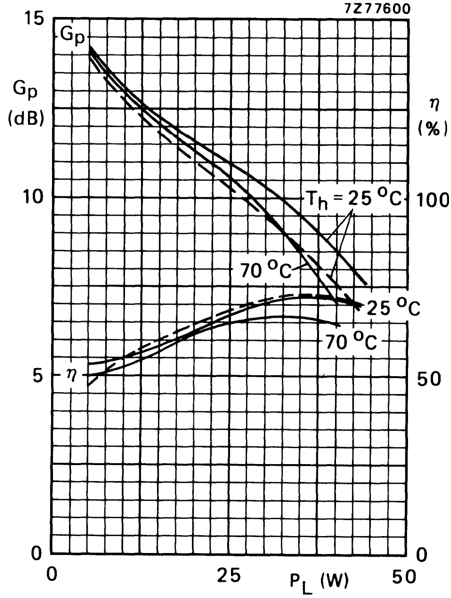


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

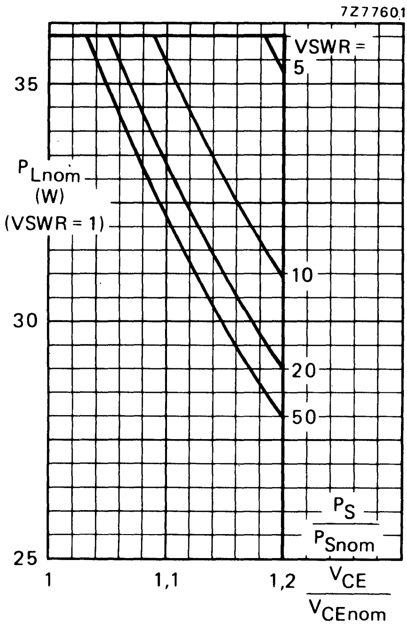


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W; V_{CEnom} = 13,5 V or 12,5 V; P_S = P_{Snom} at V_{CEnom} and VSWR = 1

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

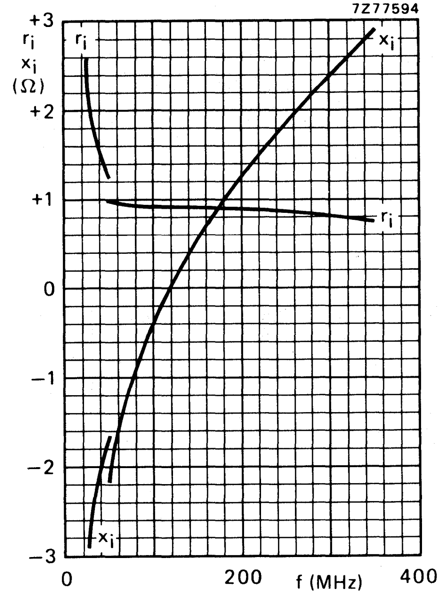


Fig. 12.

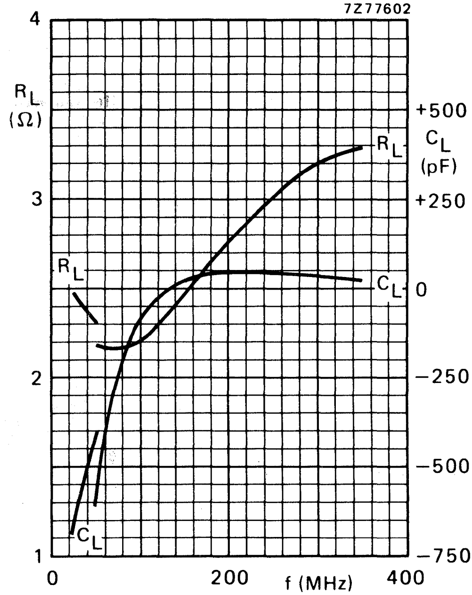
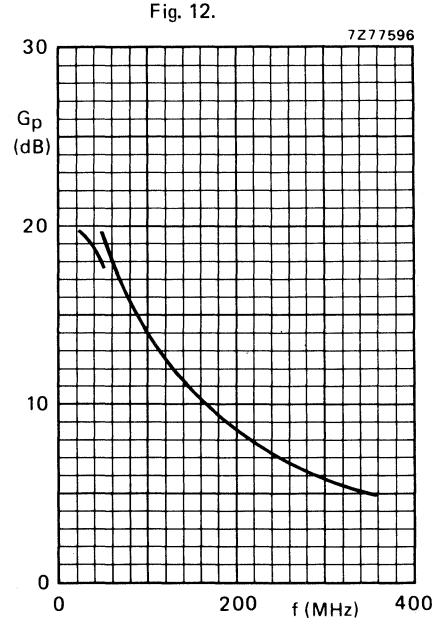


Fig. 13.



Conditions for Figs 12, 13 and 14:
Typical values; V_{CE} = 13,5 V; P_L = 28 W; T_h = 25 °C.

Fig. 14.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in **linear u.h.f. amplifiers** for television transmitters and transposers. The **excellent d.c. dissipation properties** for class-A operation are obtained by means of diffused emitter ballasting resistors and a multi-base structure, providing an optimum temperature profile on the crystal area. The combination of optimum thermal design and the application of **gold sandwich metallization** realizes excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

R.F. performance

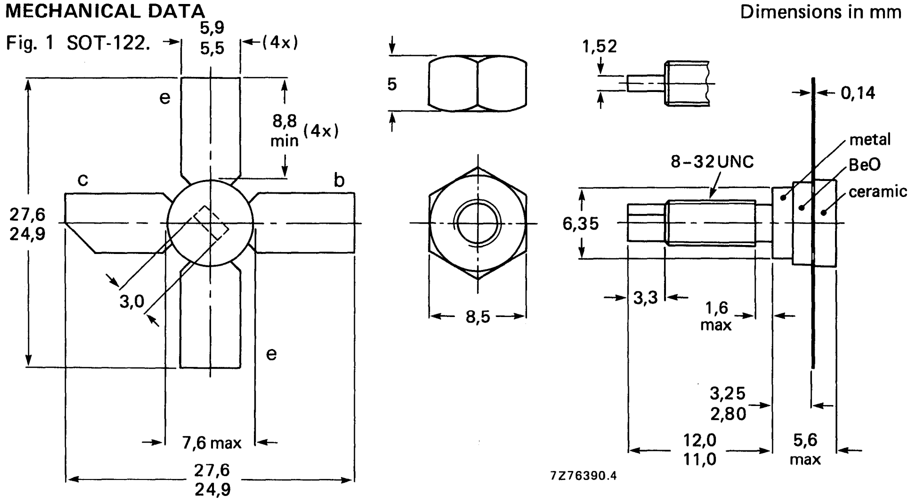
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} * dB	$P_{o\ sync}$ * W	G_p dB
class-A; linear amplifier	860	25	150	70	−60	> 0,5	> 11
	860	25	150	25	−60	typ. 0,63	typ. 12,2

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

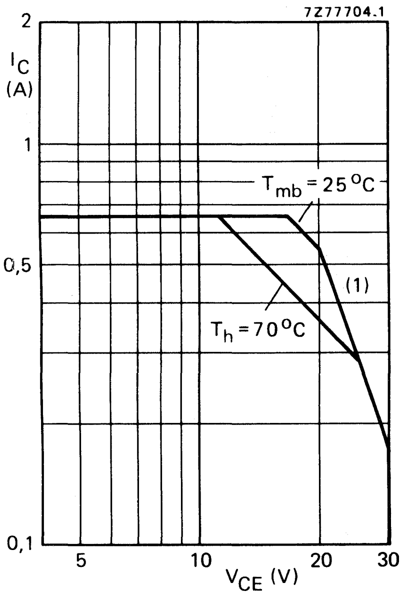
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50	V
open base	V_{CEO}	max.	30	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C	max.	650	mA
(peak value); f > 1 MHz	I_{CM}	max.	1000	mA
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	10,8	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

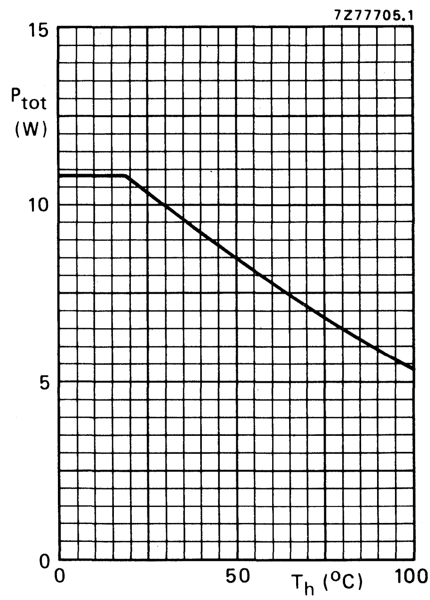


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 3,75 W; T_{mb} = 72,3 °C; i.e. T_h = 70 °C)	$R_{th\ j\text{-}mb}$	=	15,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

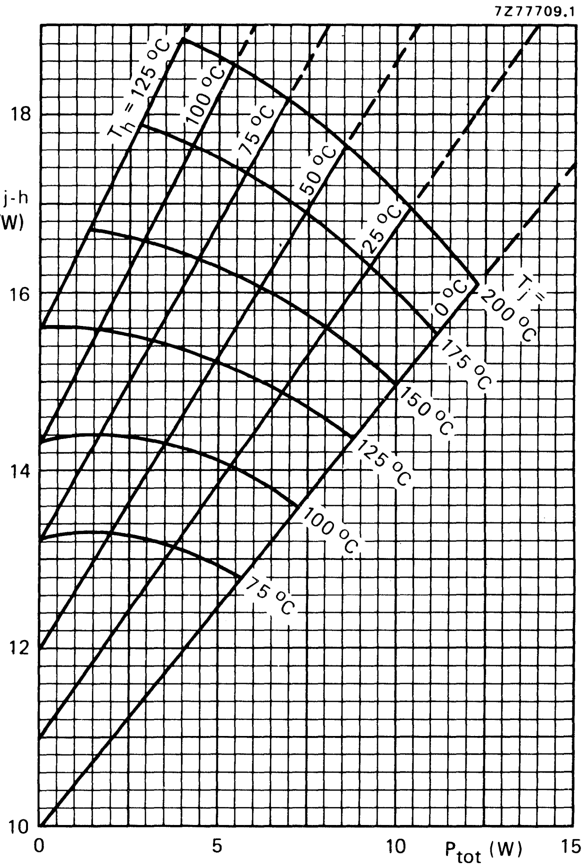


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 150 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j-h}$	max.	15,6 K/W
	T_j	max.	130 °C
Typical device:	$R_{th\ j-h}$	typ.	13,5 K/W
	T_j	typ.	120 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 2 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 15 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 1 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	0,5 mA
V_{BE} = 0; V_{CE} = 30 V; T_j = 175 °C	I_{CES}	<	1,2 mA
D.C. current gain *			
I_C = 150 mA; V_{CE} = 25 V	h_{FE}	>	20
		typ.	40
I_C = 150 mA; V_{CE} = 25 V; T_j = 175 °C	h_{FE}	<	120
Collector-emitter saturation voltage *			
I_C = 300 mA; I_B = 30 mA	V_{CEsat}	typ.	500 mV
Transition frequency at f = 500 MHz **			
$-I_E$ = 150 mA; V_{CB} = 25 V	f_T	typ.	3,5 GHz
$-I_E$ = 300 mA; V_{CB} = 25 V	f_T	typ.	3,4 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	3,7 pF
Feedback capacitance at f = 1 MHz			
I_C = 10 mA; V_{CE} = 25 V	C_{re}	typ.	1,9 pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

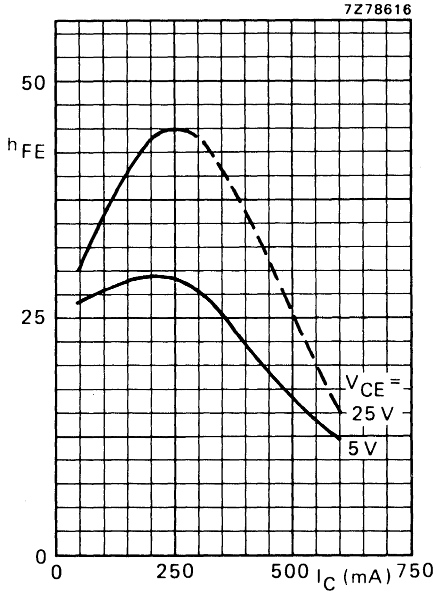


Fig. 5 Typical values; T_j = 25 °C.

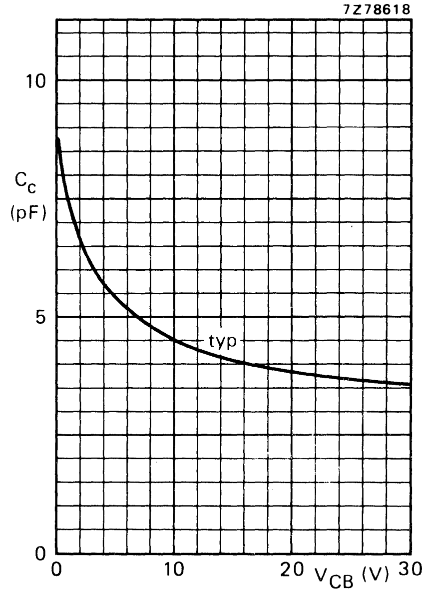


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

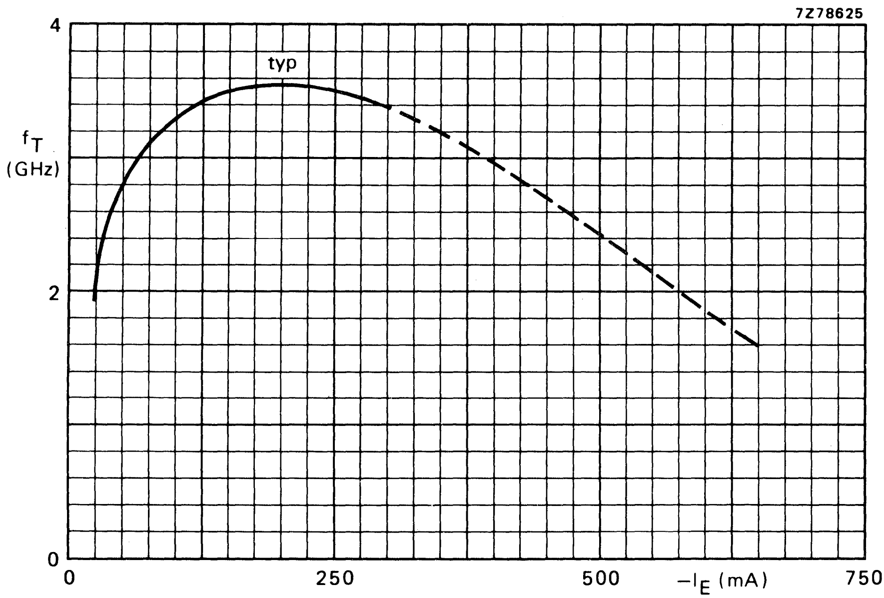


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB) *	$P_{o\,sync}$ (W) *	G_p (dB)
860	25	150	70	−60	> 0,5	> 11
860	25	150	70	−60	typ. 0,58	typ. 12,2
860	25	150	25	−60	typ. 0,63	typ. 12,2

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

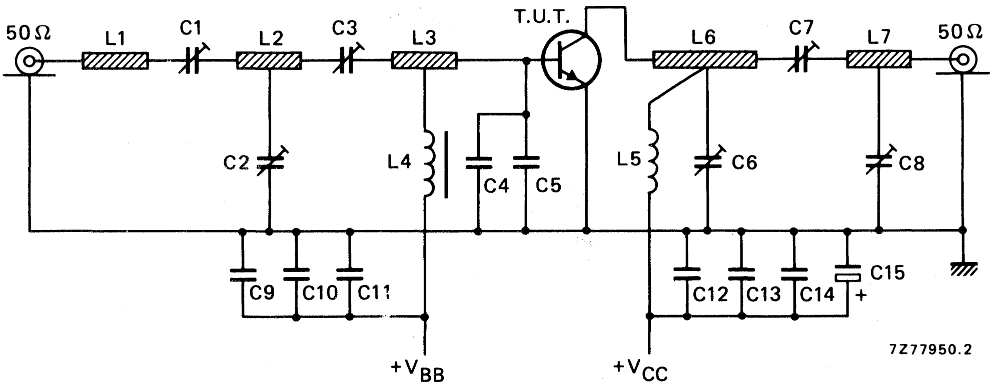


Fig. 8 Test circuit at f_{vision} = 860 MHz.

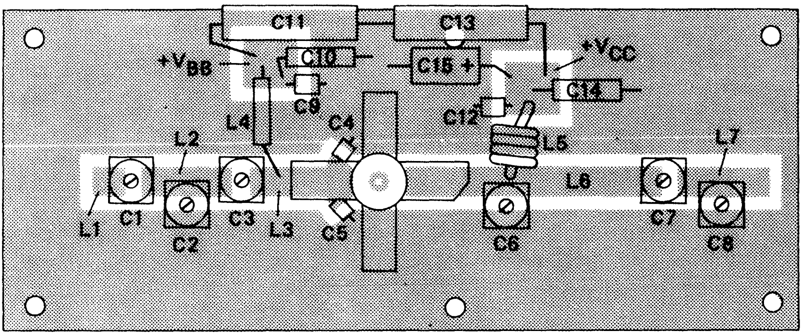
List of components:

C1 = C7 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 05003)
C2 = C6 = C8 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001) placed 24 mm, 17 mm and 45 mm respectively from transistor edge
C3 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C4 = C5 = 3 pF multilayer chip capacitor (ATC 100A-3RO-C-PX-50)
C9 = C12 = 1 nF chip capacitor
C10 = 100 nF polyester capacitor
C11 = C13 = 470 nF polyester capacitor
C14 = 10 nF polyester capacitor
C15 = 3,3 μF/40 V solid aluminium electrolytic capacitor

L1 = stripline (5,0 mm x 4,5 mm)
L2 = stripline (13,2 mm x 4,5 mm)
L3 = stripline (15,0 mm x 4,5 mm)
L4 = micro choke 0,47 μH (cat. no. 4322 057 04770)
L5 = 4 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 4 mm
L6 = stripline (37,0 mm x 4,5 mm)
L7 = stripline (13,5 mm x 4,5 mm)

L1; L2; L3; L6 and L7 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

Component layout and printed-circuit board for 860 MHz test circuit are shown in Fig. 9. For bias circuit see Fig. 10.



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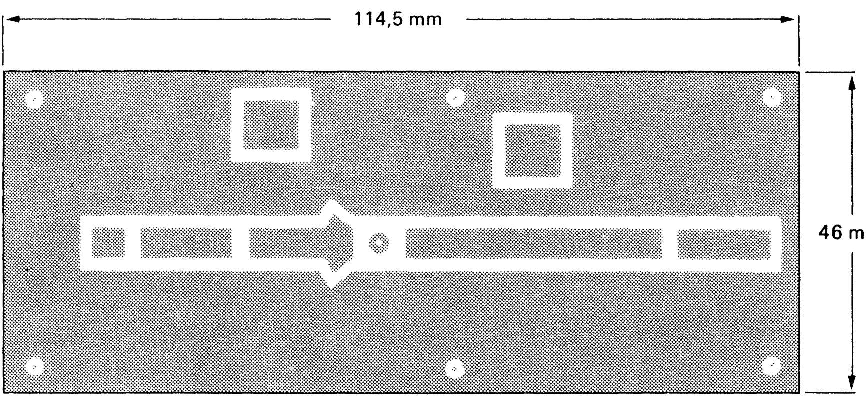

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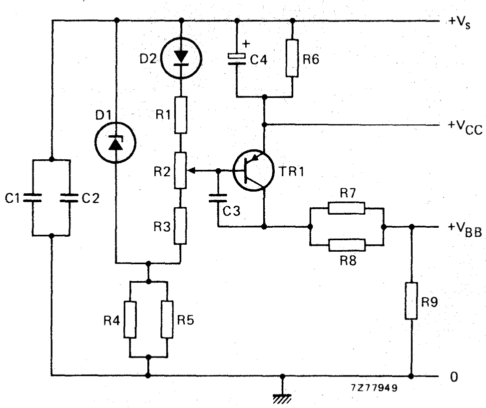
Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.



List of components:

C1 = 100 pF ceramic capacitor
C2 = C3 = 100 nF polyester capacitor
C4 = 10 μF/25 V solid aluminium electrolytic capacitor
R1 = 150 Ω carbon resistor (0,25 W)
R2 = 100 Ω preset potentiometer (0,1 W)
R3 = 82 Ω carbon resistor (0,25 W)
R4 = R5 = 2,2 kΩ carbon resistor (0,25 W)
R6 = 12 Ω carbon resistor (0,5 W)
R7 = R8 = 820 Ω carbon resistor (0,25 W)
R9 = 33 Ω carbon resistor (0,25 W)

D1 = BZY88-C3V3
D2 = BY206
TR1 = BD136

Fig. 10 Bias circuit for class-A amplifier at f_{vision} = 860 MHz.

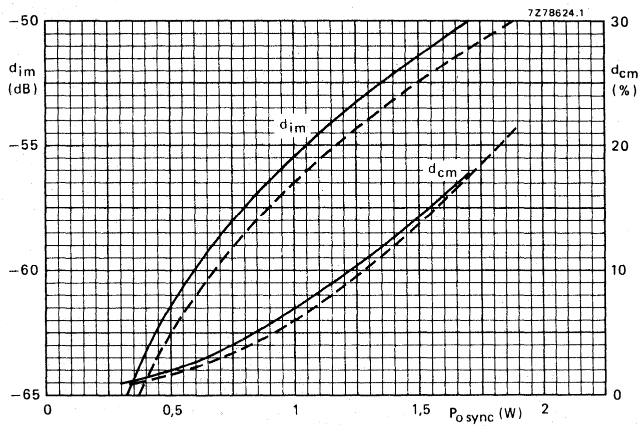


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; V_{CE} = 25 V; I_C = 150 mA; f_{vision} = 860 MHz; ––– T_h = 25 °C; —— T_h = 70 °C.

Information for wideband application from 470 to 860 MHz available on request.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ⩽ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

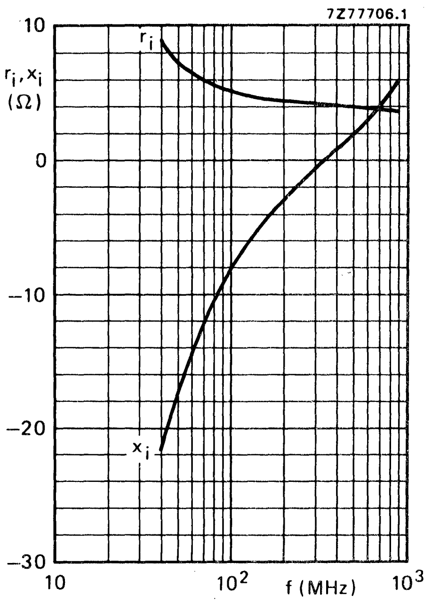


Fig. 12 Input impedance (series components).

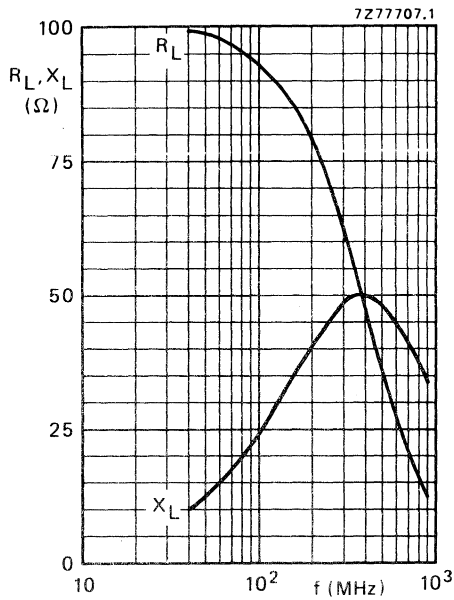


Fig. 13 Load impedance (series components).

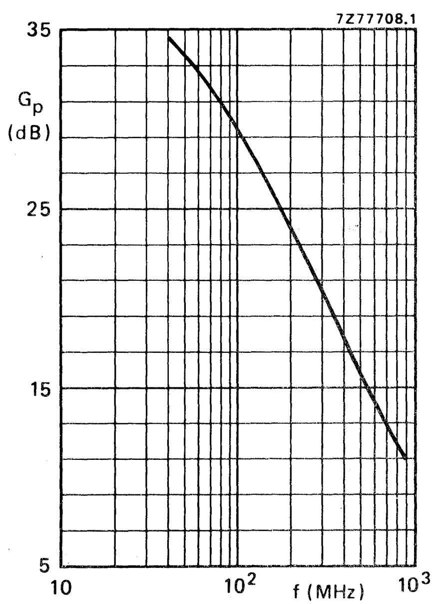


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 150 mA; T_h = 70 °C.

Ruggedness

The BLW32 is capable of withstanding a load mismatch (VSWR = 50 through all phases) under the following conditions:

f = 860 MHz; V_{CE} = 25 V; I_C = 150 mA; T_h = 70 °C and P_L = 1 W.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in **linear u.h.f. amplifiers** for television transmitters and transposers. The **excellent d.c. dissipation properties** for class-A operation are obtained by means of diffused emitter ballasting resistors and a multi-base structure, providing an optimum temperature profile on the crystal area. The combination of optimum thermal design and the application of **gold sandwich metallization** realizes excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

R.F. performance

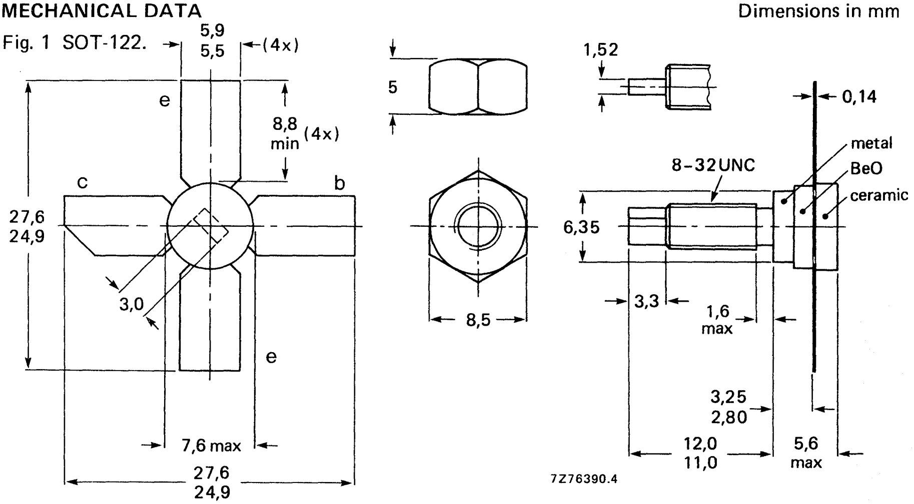
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} * dB	$P_{o\ sync}$ * W	G_p dB
class-A; linear amplifier	860	25	300	70	−60	> 1,0	> 10,0
	860	25	300	25	−60	typ. 1,15	typ. 10,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

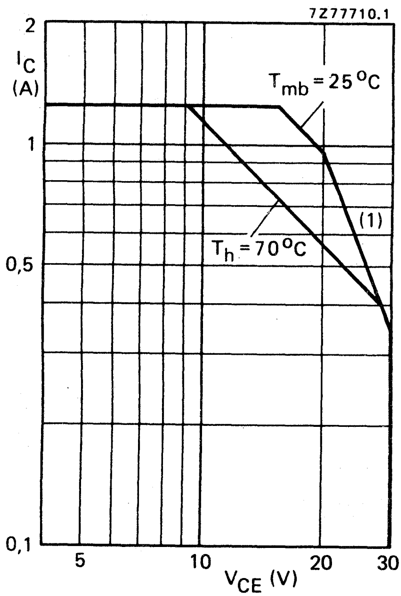
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50 V
open base	V_{CEO}	max.	30 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C	max.	1,25 A
(peak value); f > 1 MHz	I_{CM}	max.	1,9 A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	19,3 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

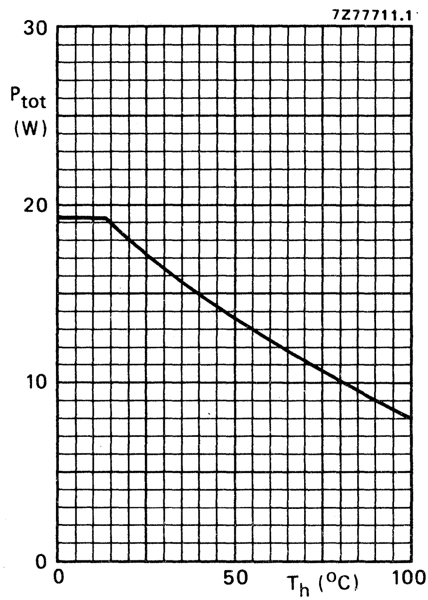


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 7,5 W; T_{mb} = 74,5 °C; i.e. T_h = 70 °C)	$R_{th\ j\text{-}mb}$	=	10,1 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

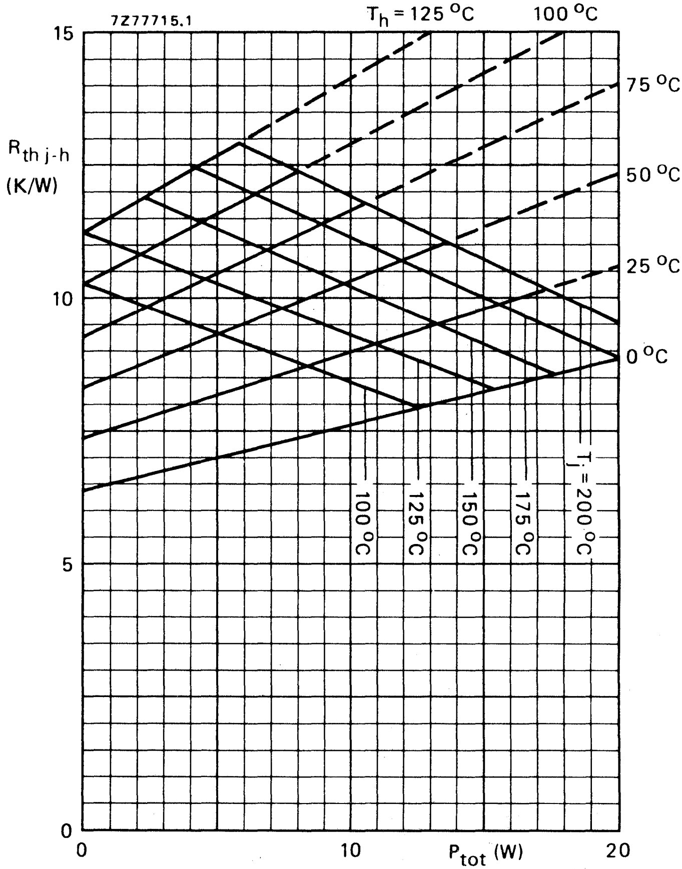


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 300 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	10,7	K/W
	T_j	max.	150	°C
Typical device:	$R_{th\ j\text{-}h}$	typ.	8,25	K/W
	T_j	typ.	132	°C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 4 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 30 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	1,0 mA
V_{BE} = 0; V_{CE} = 30 V; T_j = 175 °C	I_{CES}	<	2,5 mA
D.C. current gain			
I_C = 300 mA; V_{CE} = 25 V	h_{FE}	>	20
		typ.	40
I_C = 300 mA; V_{CE} = 25 V; T_j = 175 °C	h_{FE}	<	120
Collector-emitter saturation voltage *			
I_C = 600 mA; I_B = 60 mA	V_{CEsat}	typ.	450 mV
Transition frequency at f = 500 MHz **			
$-I_E$ = 300 mA; V_{CB} = 25 V	f_T	typ.	3,4 GHz
$-I_E$ = 600 mA; V_{CB} = 25 V	f_T	typ.	3,1 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	6,6 pF
Feedback capacitance at f = 1 MHz			
I_C = 20 mA; V_{CE} = 25 V	C_{re}	typ.	3,5 pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leq 300\ \mu s$; $\delta \leq 0,02$.

** Measured under pulse conditions: $t_p \leq 50\ \mu s$; $\delta \leq 0,01$.

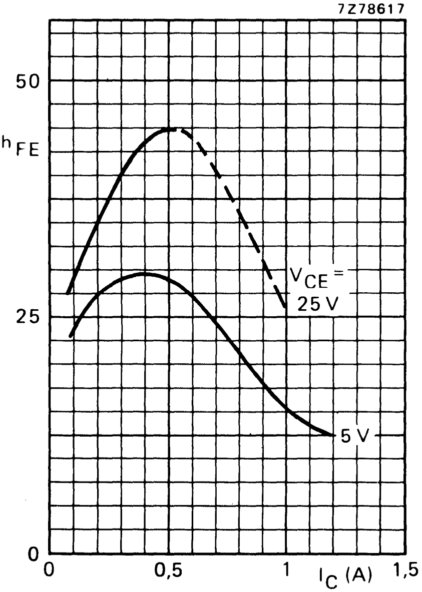


Fig. 5 Typical values; T_j = 25 °C.

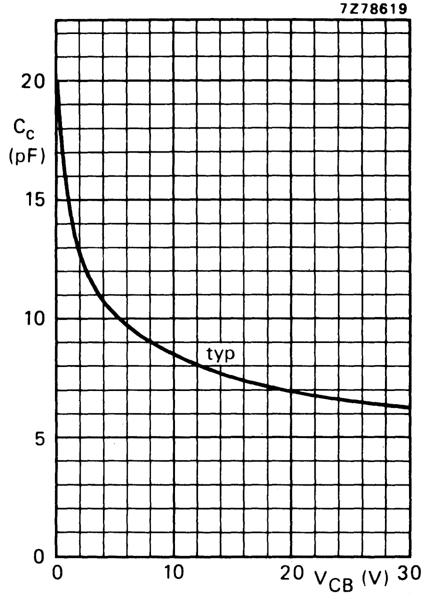


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

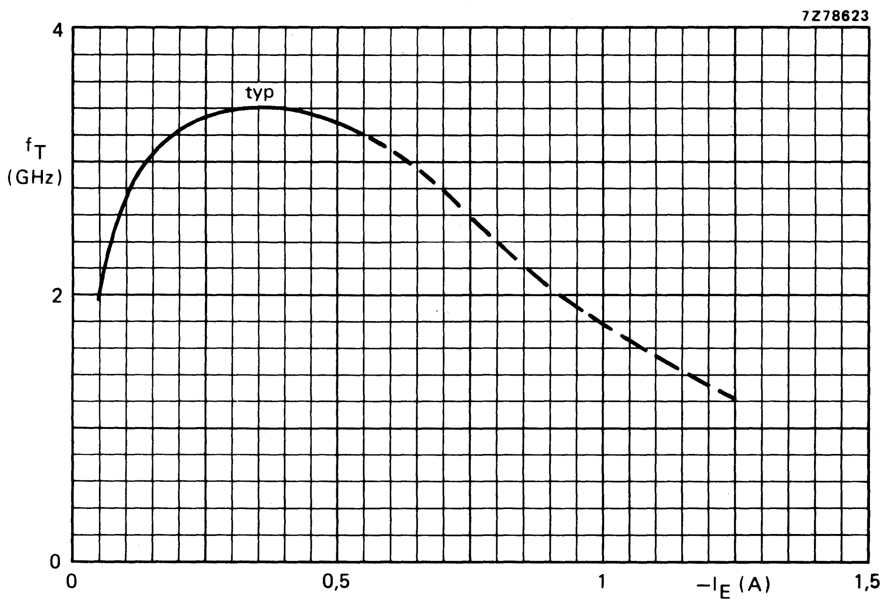


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB) *	$P_{o\,sync}$ (W) *	G_p (dB)
860	25	300	70	−60	> 1,0	> 10
860	25	300	70	−60	typ. 1,07	typ. 10,5
860	25	300	25	−60	typ. 1,15	typ. 10,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

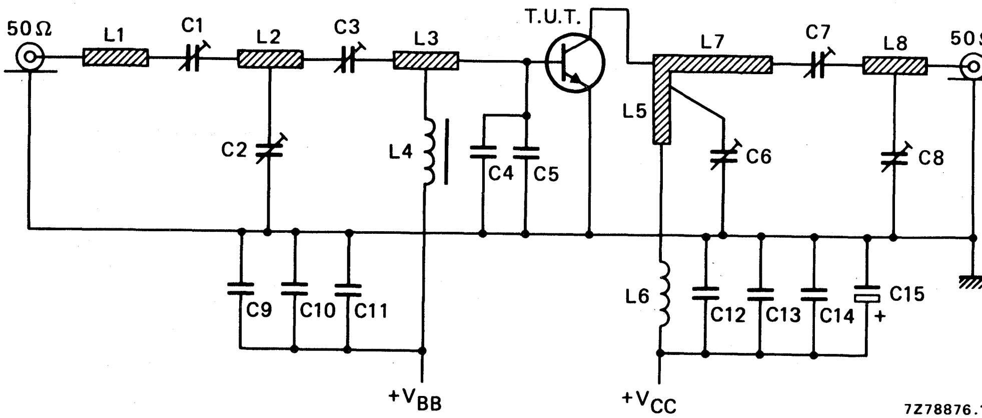


Fig. 8 Test circuit at f_{vision} = 860 MHz.

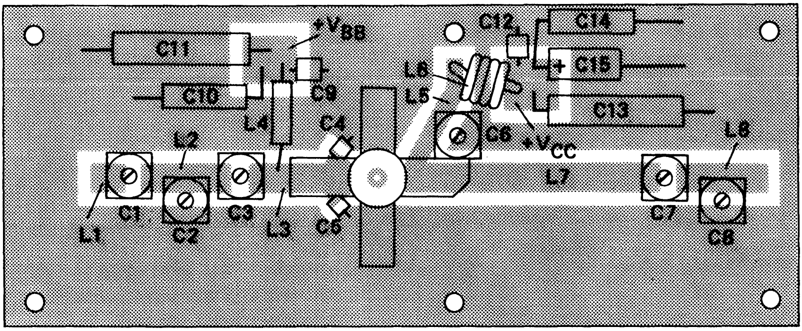
List of components:

C1 = C3 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 05003)
C2 = C6 = C8 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001) placed 24 mm, 8 mm and 46 mm respectively from transistor edge
C4 = C5 = 4,3 pF multilayer chip capacitor (ATC 100A-4R3-C-PX-50)
C7 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C9 = C12 = 1 nF chip capacitor
C10 = 100 nF polyester capacitor
C11 = C13 = 470 nF polyester capacitor
C14 = 10 nF polyester capacitor
C15 = 3,3 μF/40 F solid aluminium electrolytic capacitor

L1 = stripline (5,2 mm x 4,5 mm)
L2 = stripline (13,2 mm x 4,5 mm)
L3 = stripline (15,0 mm x 4,5 mm)
L4 = micro choke 0,47 μH (cat. no. 4322 057 04770)
L5 = stripline (see Fig. 9 printed-circuit board layout)
L6 = 4 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 5,5 mm; leads 2 x 4 mm
L7 = stripline (37,0 mm x 4,5 mm)
L8 = stripline (13,5 mm x 4,5 mm)

L1; L2; L3; L5; L7 and L8 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16″.

For bias circuit see Fig. 10.



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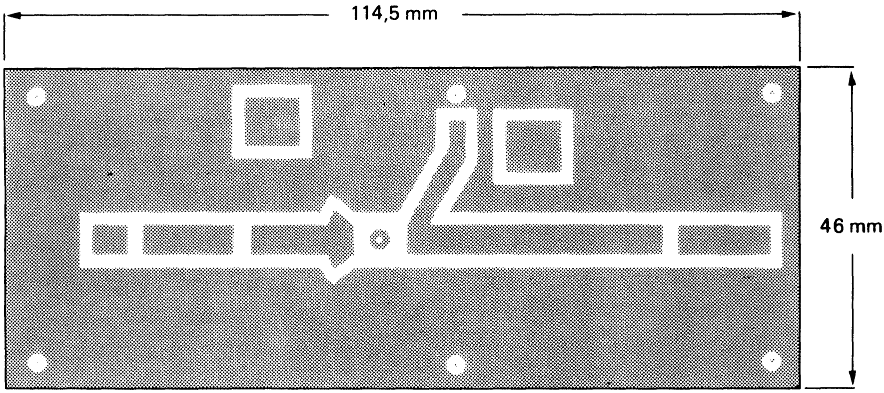

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Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

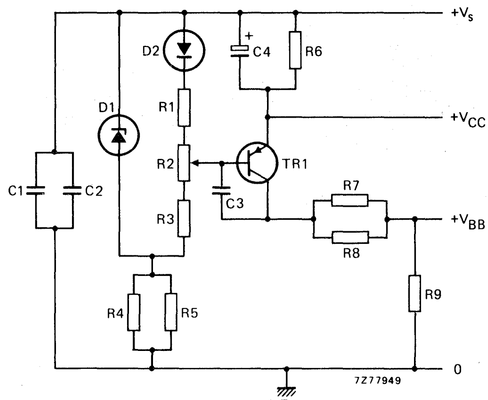


Fig. 10 Bias circuit for class-A linear amplifier at f_{vision} = 860 MHz.

List of components:

C1 = 100 pF ceramic capacitor
C2 = C3 = 100 nF polyester capacitor
C4 = 10 μF/25 V solid aluminium electrolytic capacitor
R1 = 150 Ω carbon resistor (0,25 W)
R2 = 100 Ω preset potentiometer (0,1 W)
R3 = 82 Ω carbon resistor (0,25 W)
R4 = R5 = 2,2 kΩ carbon resistor (0,25 W)
R6 = 6 Ω; parallel connection of 2 x 12 Ω carbon resistors (0,5 W each)
R7 = R8 = 820 Ω carbon resistor (0,25 W)
R9 = 33 Ω carbon resistor (0,25 W)

D1 = BZY88-C3V3
D2 = BY206
TR1 = BD136

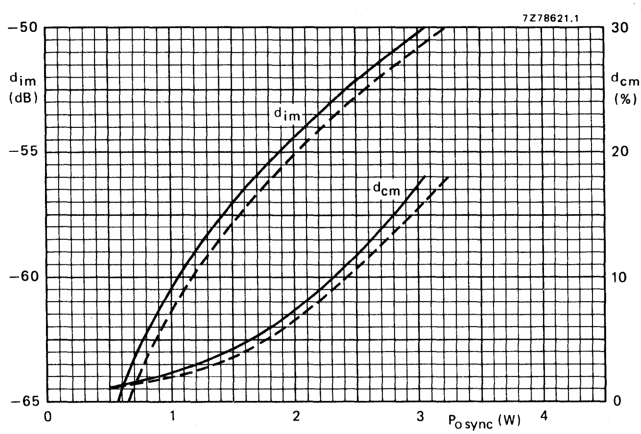


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; V_{CE} = 25 V; I_C = 300 mA; f_{vision} = 860 MHz; ---- T_h = 25 °C; —— T_h = 70 °C.

Information for wideband application from 470 to 860 MHz available on request.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ≤ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

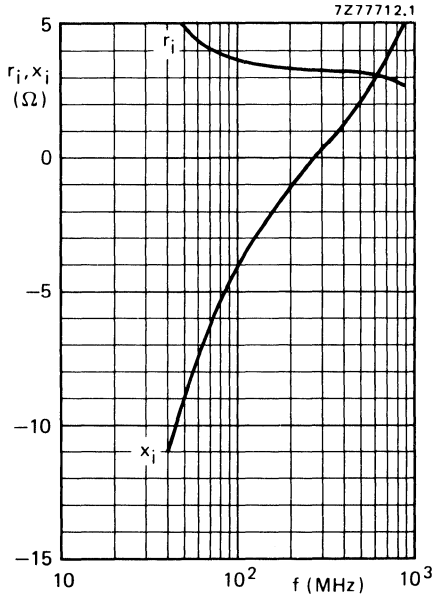


Fig. 12 Input impedance (series components).

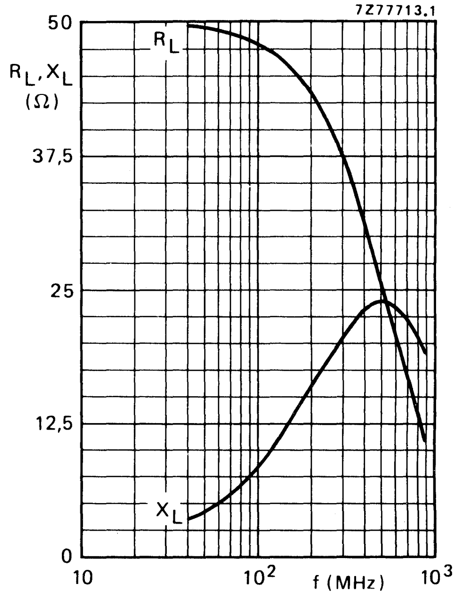


Fig. 13 Load impedance (series components).

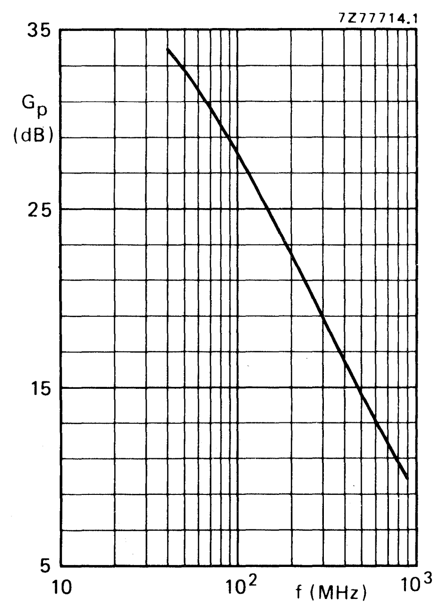


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 300 mA; T_h = 70 °C.

Ruggedness

The BLW33 is capable of withstanding a load mismatch (VSWR = 50 through all phases) under the following conditions:

f = 860 MHz; V_{CE} = 25 V; I_C = 300 mA; T_h = 70 °C and P_L = 2 W.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in **linear u.h.f. amplifiers** for television transmitters and transposers. The **excellent d.c. dissipation properties** for class-A operation are obtained by means of diffused emitter ballasting resistors and a multi-base structure, providing an optimum temperature profile on the crystal area. The combination of optimum thermal design and the application of **gold sandwich metallization** realizes excellent reliability properties.

The transistor has a ¼" capstan envelope with ceramic cap.

QUICK REFERENCE DATA

R.F. performance

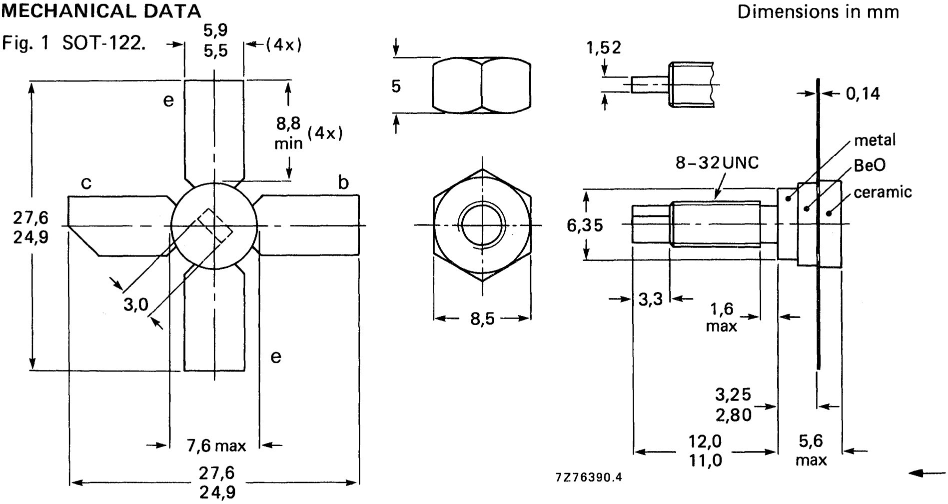
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im} * dB	$P_{o\ sync}$ * W	G_p dB
class-A; linear amplifier	860	25	600	70	−60	> 1,8	> 9
	860	25	600	25	−60	typ. 2,15	typ. 10,2

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

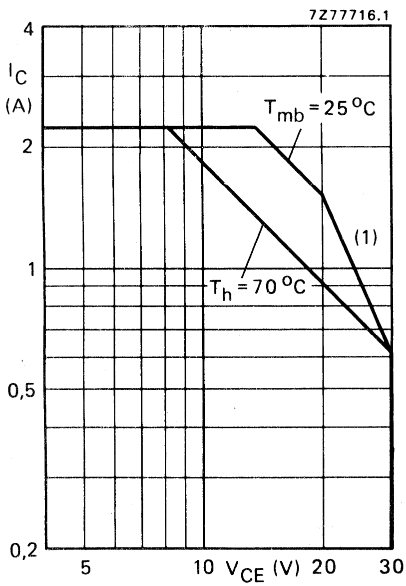
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50 V
open base	V_{CEO}	max.	30 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C	max.	2,25 A
(peak value); f > 1 MHz	I_{CM}	max.	3,5 A
Total power dissipation at $T_{mb} = 25\ ^oC$	P_{tot}	max.	31 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

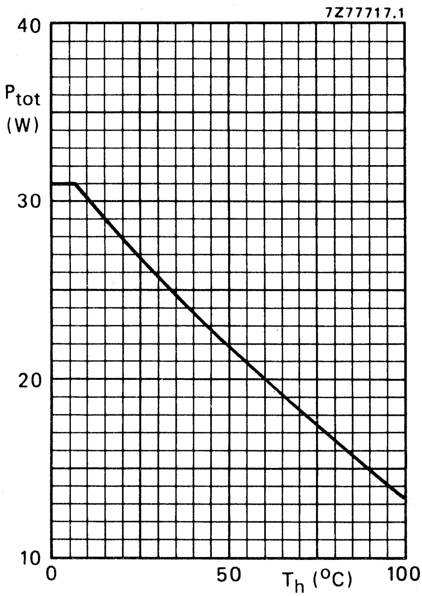


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (see Fig. 4)

From junction to mounting base (dissipation = 15 W; $T_{mb} = 79\ ^oC$; i.e. $T_h = 70\ ^oC$)	$R_{th\ j\text{-}mb}$	=	6,2 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

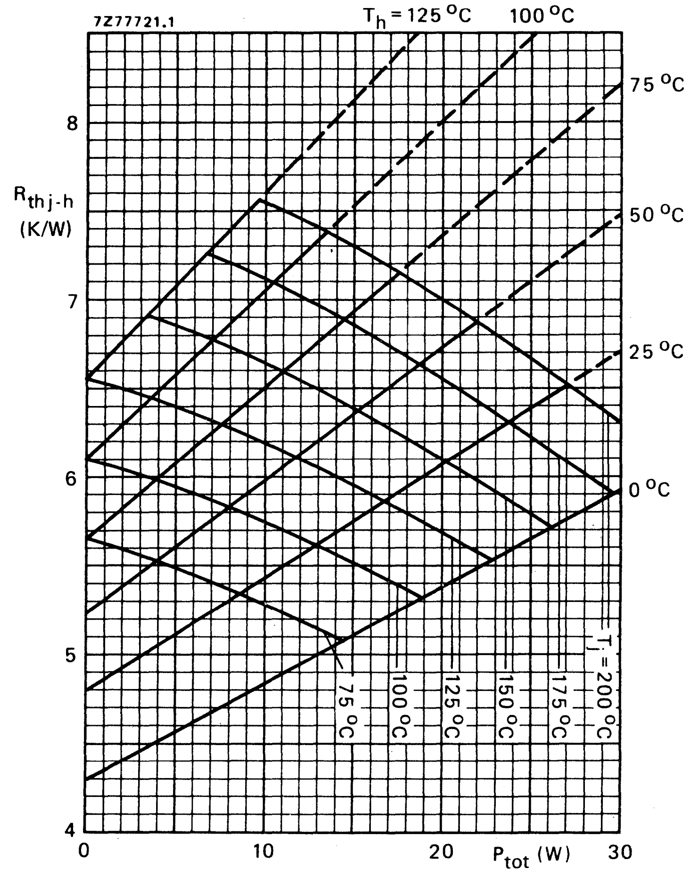


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\,mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation: V_{CE} = 25 V; I_C = 600 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\,j\text{-}h}$	max. 6,75 K/W
	T_j	max. 170 °C
Typical device:	$R_{th\,j\text{-}h}$	typ. 5,45 K/W
	T_j	typ. 152 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 8 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 60 mA	$V_{(BR)CEO}$	>	30 V
Emitter-base breakdown voltage			
open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	2,0 mA
V_{BE} = 0; V_{CE} = 30 V; T_j = 175 °C	I_{CES}	<	5,0 mA
D.C. current gain			
I_C = 600 mA; V_{CE} = 25 V	h_{FE}	>	20
		typ.	40
I_C = 600 mA; V_{CE} = 25 V; T_j = 175 °C	h_{FE}	<	120
Collector-emitter saturation voltage *			
I_C = 1,2 A; I_B = 0,12 A	V_{CEsat}	typ.	450 mV
Transition frequency at f = 500 MHz **			
$-I_E$ = 0,6 A; V_{CB} = 25 V	f_T	typ.	3,3 GHz
$-I_E$ = 1,2 A; V_{CB} = 25 V	f_T	typ.	3,0 GHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	13,5 pF
Feedback capacitance at f = 1 MHz			
I_C = 40 mA; V_{CE} = 25 V	C_{re}	typ.	8,4 pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

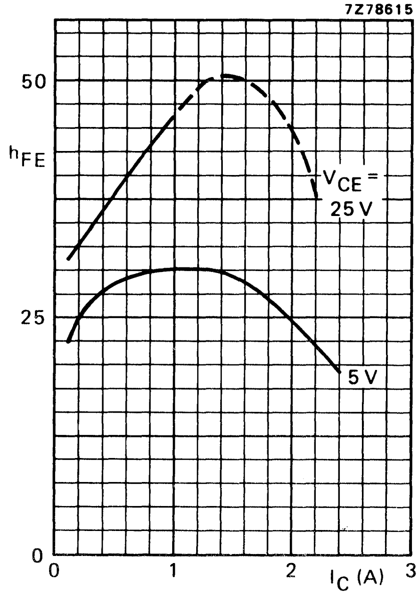


Fig. 5 Typical values; T_j = 25 °C.

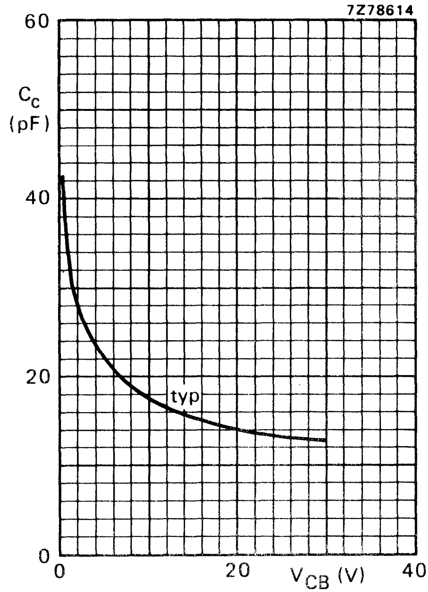


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

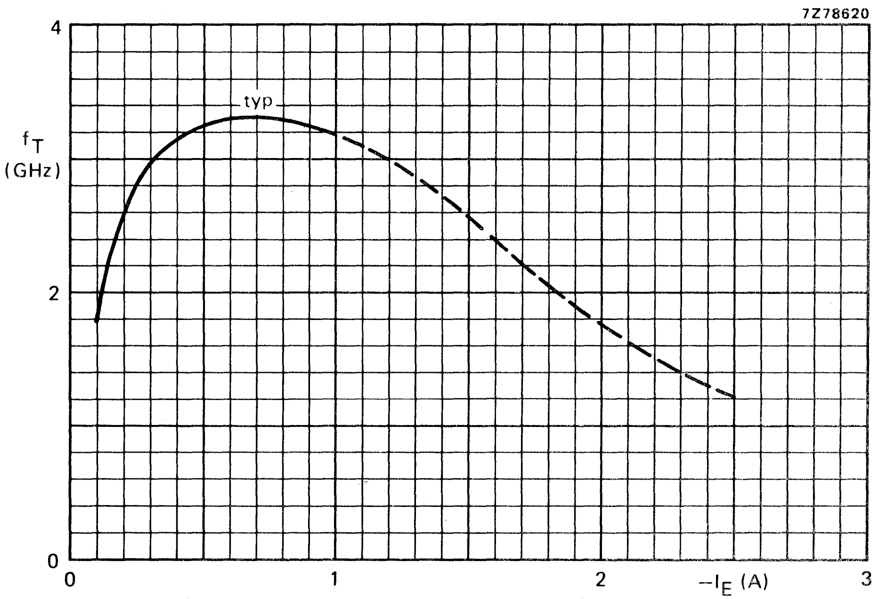


Fig. 7 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C

APPLICATION INFORMATION

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB) *	$P_{o\,sync}$ (W) *	G_p (dB)
860	25	600	70	−60	> 1,8	> 9
860	25	600	70	−60	typ. 1,9	typ. 10,2
860	25	600	25	−60	typ. 2,15	typ. 10,2

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

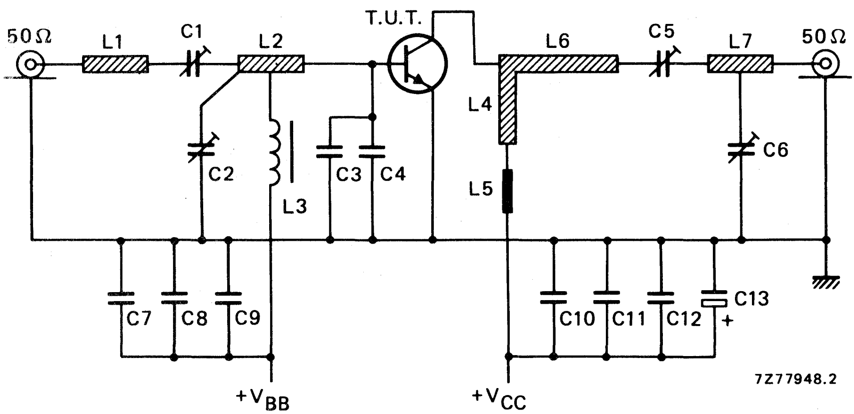


Fig. 8 Test circuit at f_{vision} = 860 MHz.

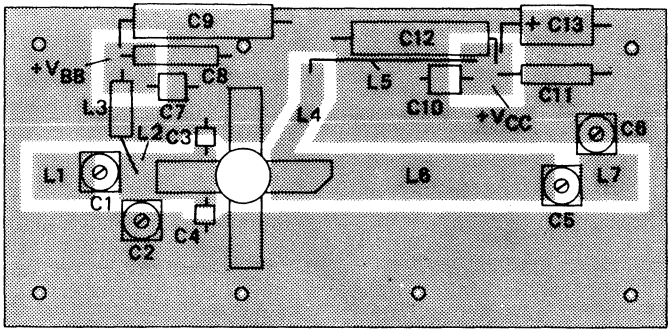
List of components:

C1 = C5 = 1,8 to 10 pF film dielectric trimmer (cat. no. 2222 809 05002)
C2 = C6 = 1 to 3,5 pF film dielectric trimmer (cat. no. 2222 809 05001) placed 13,5 mm and 46 mm respectively from transistor edge
C3 = C4 = 2 pF multilayer chip capacitor (ATC 100A-2RO-C-PX-50)
C7 = C10 = 1 nF chip capacitor
C8 = 100 nF polyester capacitor
C9 = C12 = 470 nF polyester capacitor
C11 = 10 nF polyester capacitor
C13 = 3,3 μF/40 V solid aluminium electrolytic capacitor

L1 = stripline (9,2 mm x 7,0 mm)
L2 = stripline (14,2 mm x 7,0 mm)
L3 = micro choke 0,47 μH (cat. no. 4322 057 04770)
L4 = stripline (see Fig. 9 printed-circuit board layout)
L5 = 34 mm straight Cu wire (1,0 mm); height above print 3,3 mm
L6 = stripline (41,0 mm x 7,0 mm)
L7 = stripline (8,7 mm x 7,0 mm)

L1; L2; L4; L6 and L7 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16″.

Component layout and printed-circuit board for 860 MHz test circuit are shown in Fig. 9. For bias circuit see Fig. 10.



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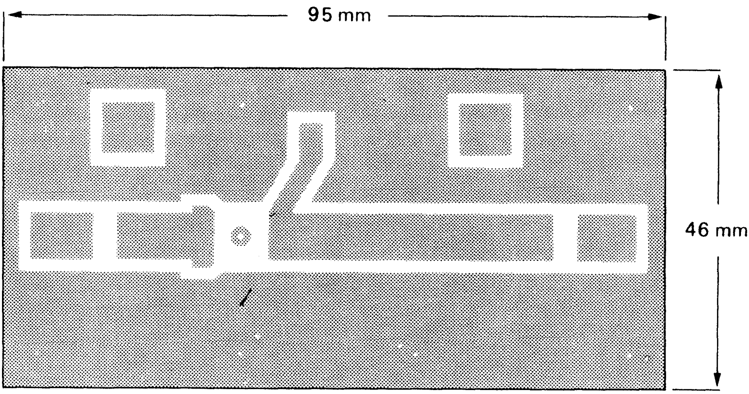
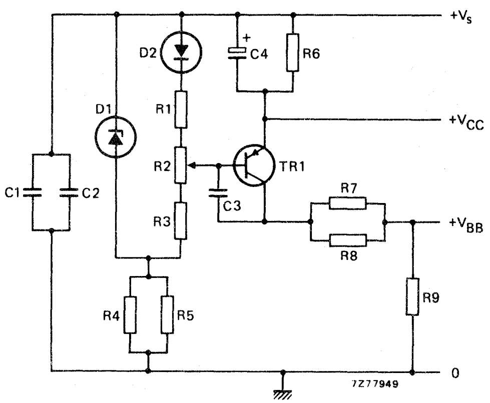


7Z78877

Fig. 9 Component layout and printed-circuit board for 860 MHz test circuit.

The circuit and the components are situated on one sode of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.



List of components:

C1 = 100 pF ceramic capacitor
C2 = C3 = 100 nF polyester capacitor
C4 = 10 μF/25 V solid aluminium electrolytic capacitor
R1 = 150 Ω carbon resistor (0,25 W)
R2 = 100 Ω preset potentiometer (0,1 W)
R3 = 82 Ω carbon resistor (0,25 W)
R4 = R5 = 2,2 kΩ carbon resistor (0,25 W)
R6 = 2,8 Ω; parallel connection of 2 x 5,6 Ω carbon resistors (0,5 W each)
R7 = R8 = 820 Ω carbon resistor (0,25 W)
R9 = 33 Ω carbon resistor (0,25 W)

D1 = BZY88-C3V3
D2 = BY206
TR1 = BD136

Fig. 10 Bias circuit for class-A linear amplifier at f_{vision} = 860 MHz.

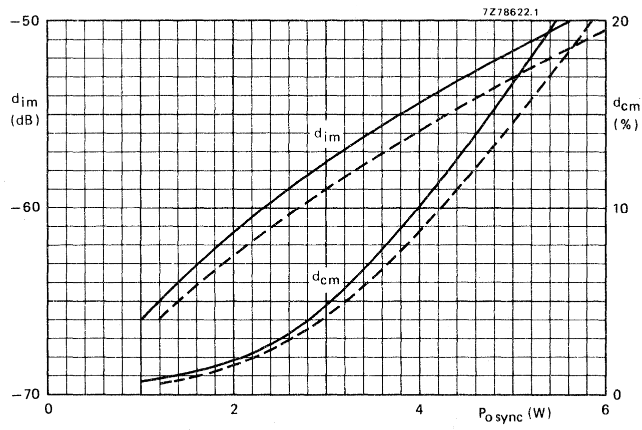


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of output power. Typical values; V_{CE} = 25 V; I_C = 600 mA; f_{vision} = 860 MHz; – – – T_h = 25 °C; —— T_h = 70 °C.

Information for wideband application from 470 to 860 MHz available on request.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ≤ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

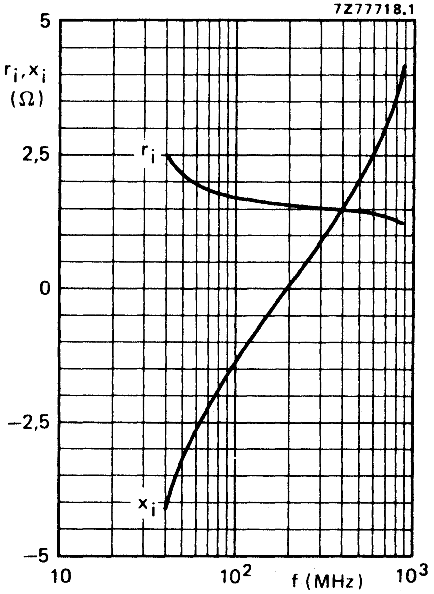


Fig. 12 Input impedance (series components).

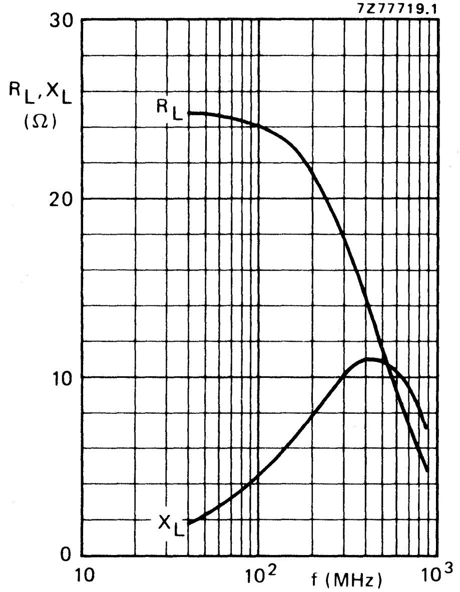


Fig. 13 Load impedance (series components).

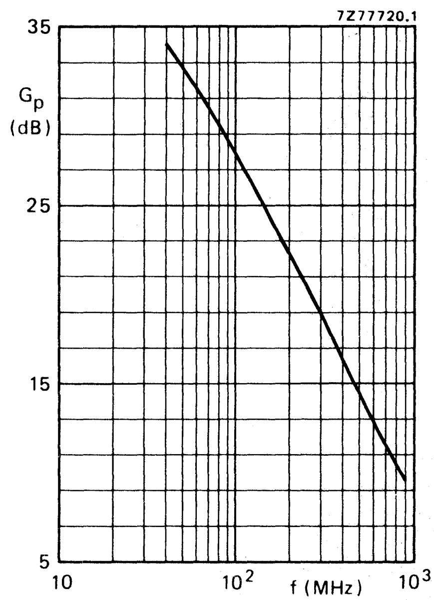


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 600 mA; T_h = 70 °C.

Ruggedness

The BLW34 is capable of withstanding a load mismatch (VSWR = 50 through all phases) under the following conditions:

f = 860 MHz; V_{CE} = 25 V; I_C = 600 mA; T_h = 70 °C and P_L = 4 W.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in class-A, AB and B operated, industrial and military transmitters in the h.f. and v.h.f. band. Resistance stabilization provides protection against device damage at severe load mismatch conditions. Matched h_{FE} groups are available on request.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance

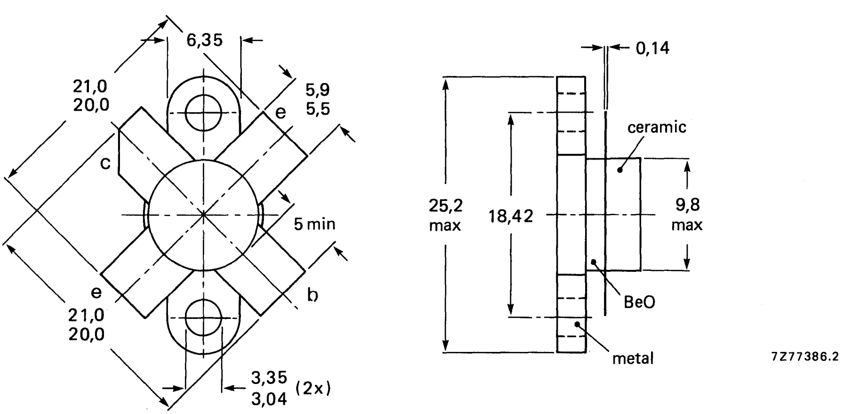
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	$I_{C(ZS)}$ mA	d_3 dB	T_h °C
s.s.b. (class-A)	45	1,6 - 28	0 - 16 (P.E.P.)	> 19,5	–	1,2	–	< −40	70
s.s.b. (class-AB)	50	1,6 - 28	10 - 65 (P.E.P.)	typ. 18	typ. 45*	1,45	50	typ. −30	25

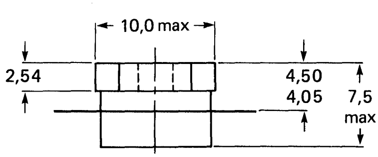
* At 65W P.E.P.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	110	V
Collector-emitter voltage (open base)	V_{CEO}	max.	55	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	2,5	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	7,5	A
D.C. and r.f. (f > 1 MHz) power dissipation; T_{mb} = 25 °C	P_{tot}; P_{rf}	max.	94	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

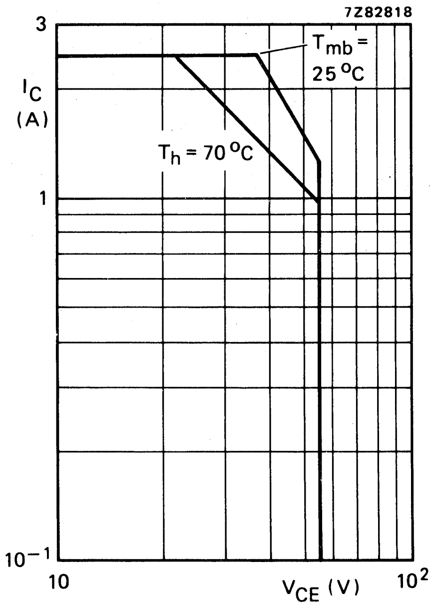


Fig. 2 D.C. SOAR.

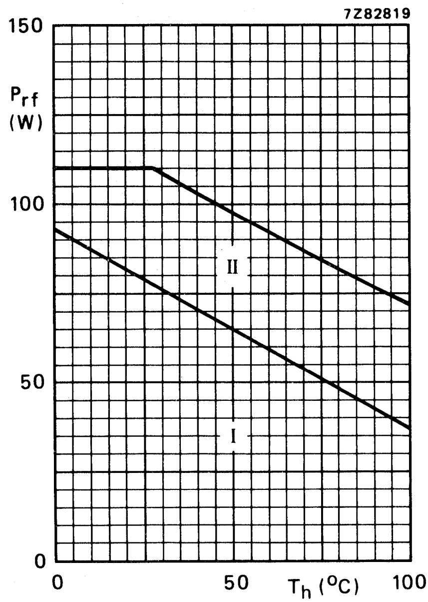


Fig. 3 Power derating curves vs. temperature.
I Continuous d.c. and r.f. operation
II Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 54 W; T_{mb} = 86 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. and r.f. dissipation)	$R_{th\ j\text{-}mb}$	=	2,1 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	110	V
Collector-emitter breakdown voltage				
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	55	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 55 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain*				
I_C = 1,2 A; V_{CE} = 5 V	h_{FE}	typ.	25	
			15 to 100	
D.C. current gain ratio of matched devices*				
I_C = 1,2 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage*				
I_C = 3,0 A; I_B = 0,6 A	V_{CEsat}	typ.	1,2	V
Transition frequency at f = 100 MHz*				
$-I_E$ = 1,2 A; V_{CB} = 45 V	f_T	typ.	490	MHz
$-I_E$ = 4,0 A; V_{CB} = 45 V	f_T	typ.	540	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 45 V	C_c	typ.	53	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 45 V	C_{re}	typ.	35	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

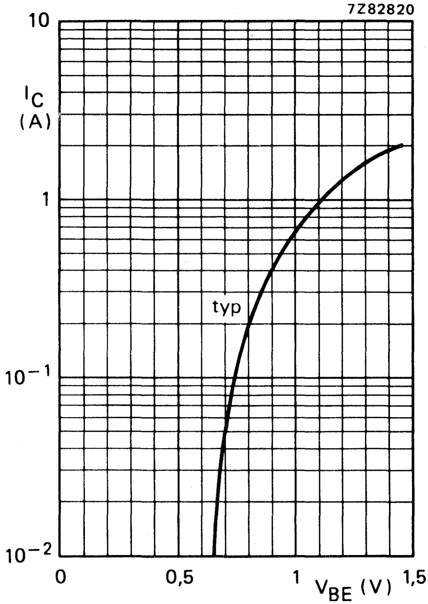


Fig. 4 V_{CE} = 40 V; T_{mb} = 25 °C.

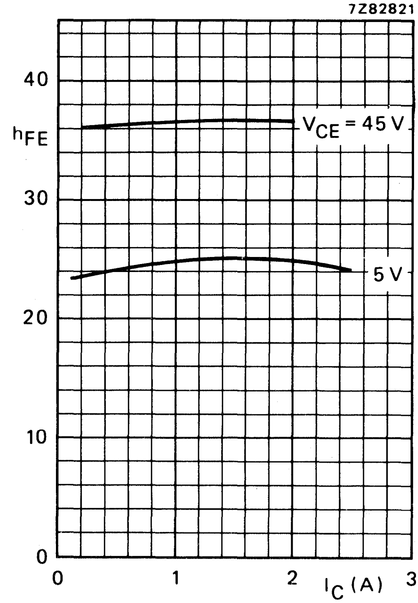


Fig. 5 Typical values; T_j = 25 °C.

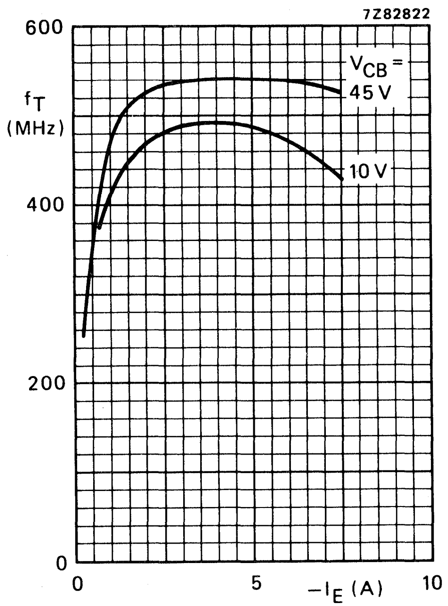


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

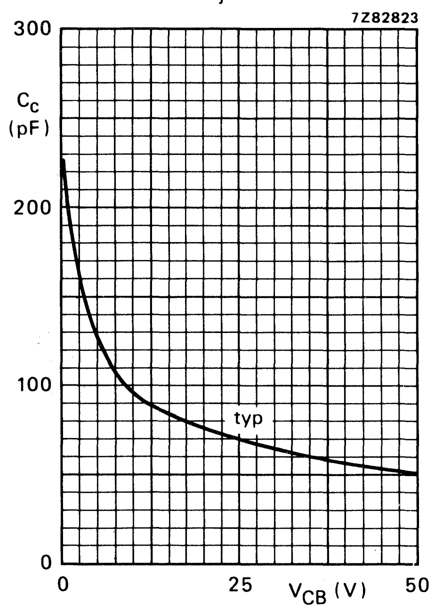


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 45 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3* dB	d_5* dB	T_h °C
> 16 (P.E.P.)	> 19,5	1,2	−40	< −40	70
typ. 17 (P.E.P.)	typ. 20,5	1,2	−40	< −40	70

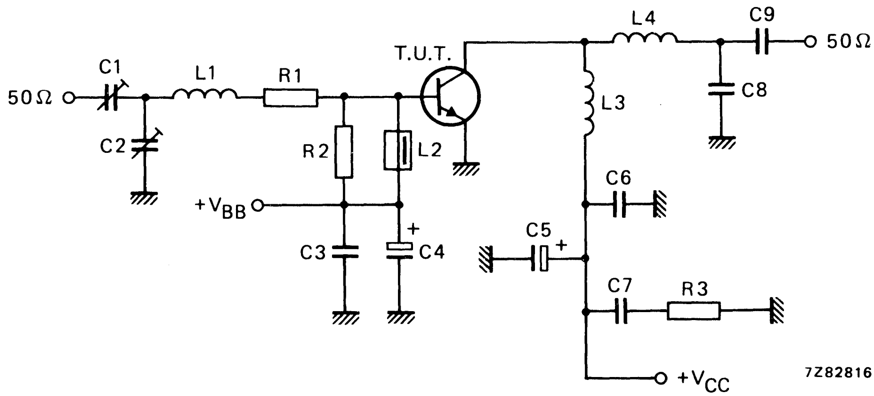


Fig. 8 Test circuit; s.s.b. class-A.

List of components in Fig. 8:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = 22 nF ceramic capacitor (63 V)
C4 = 4,7 μF/16 V electrolytic capacitor
C5 = 1 μF/75 V solid tantalum capacitor
C6 = C7 = 47 nF polyester capacitor (100 V)
C8 = 68 pF ceramic capacitor (500 V)
C9 = 3,9 nF ceramic capacitor

L1 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 1,05 μH; 15 turns enamelled Cu wire (1,0 mm); int. dia. 10,0 mm; length 17,4 mm; leads 2 x 5 mm
L4 = 162 nH; 6 turns enamelled Cu wire (1,0 mm); int. dia. 7,0 mm; length 11,6 mm; leads 2 x 5 mm

R1 = 1,6 Ω; parallel connection of 3 x 4,7 Ω carbon resistors (± 5%; 0,125 W)
R2 = 47 Ω carbon resistor (± 5%; 0,25 W)
R3 = 4,7 Ω carbon resistor (± 5%; 0,25 W)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

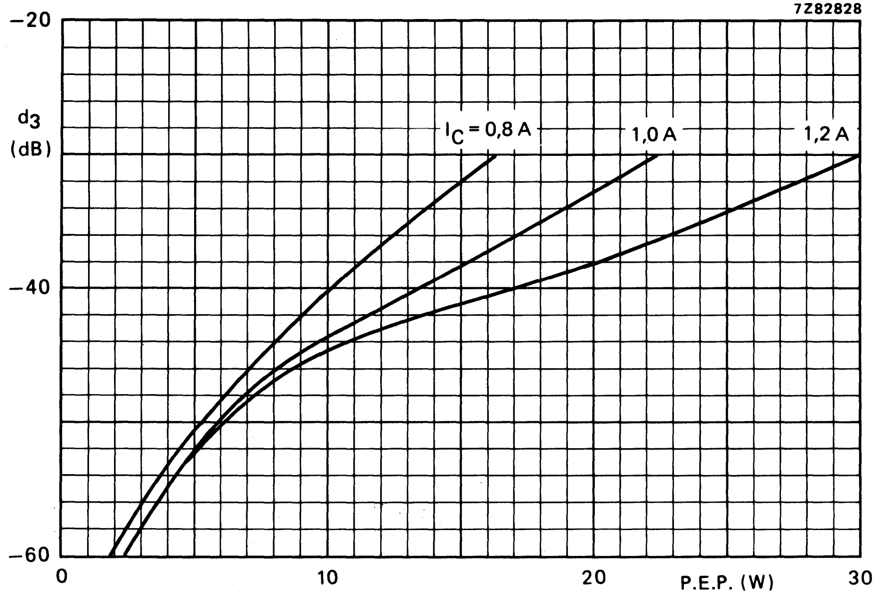


Fig. 9 Intermodulation distortion (see note on page 5) as a function of output power. Typical values; V_{CE} = 45 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 50 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 65 W P.E.P.	I_C (A) at 65 W P.E.P.	d_3* dB	d_5* dB	$I_{C(ZS)}$ mA	T_h °C
10 to 65 (P.E.P.)	typ. 18	typ. 45	typ. 1,45	typ. −30	< −30	50	25

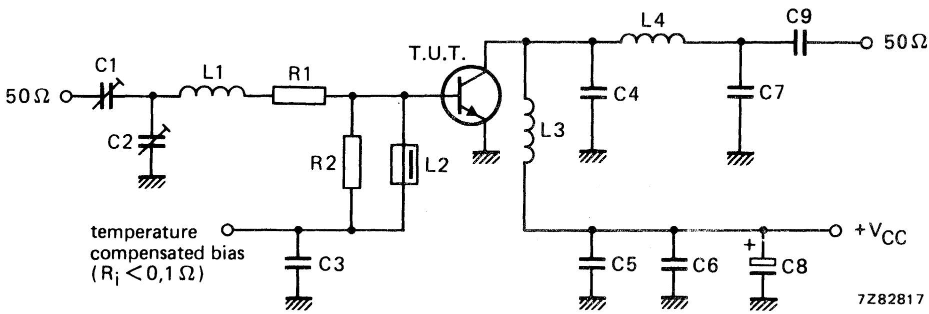


Fig. 10 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = C5 = C6 = 220 nF polyester capacitor
C4 = 120 pF ceramic capacitor (500 V)
C7 = 150 pF ceramic capacitor (500 V)
C8 = 47 μF/63 V electrolytic capacitor
C9 = 3,9 nF ceramic capacitor

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 9 turns enamelled Cu wire (1,0 mm); int. dia. 10 mm; length 14,5 mm; leads 2 x 5 mm
L4 = 6 turns enamelled Cu wire (1,0 mm); int. dia. 6,5 mm; length 11,0 mm; leads 2 x 5 mm

R1 = 2,4 Ω; parallel connection of 2 x 4,7 Ω carbon resistors
R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

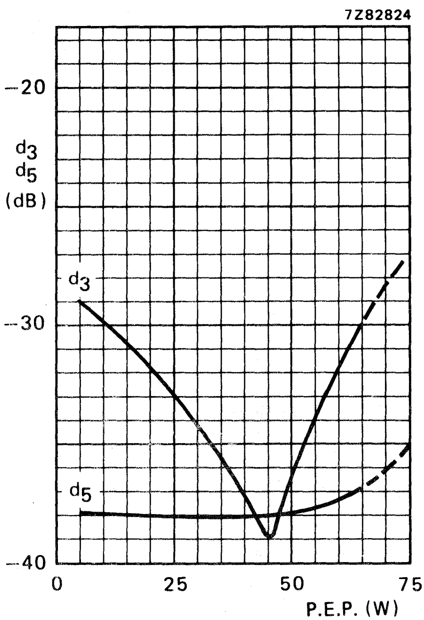


Fig. 11 Intermodulation distortion as a function of output power*.

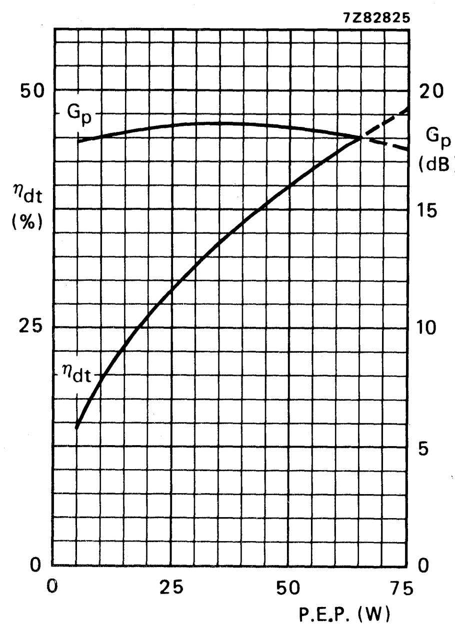


Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 11 and 12:

V_{CE} = 50 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

Ruggedness in s.s.b. operation

The BLW50F is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 45 W (P.E.P.) under the following conditions:
V_{CE} = 50 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,3 K/W.

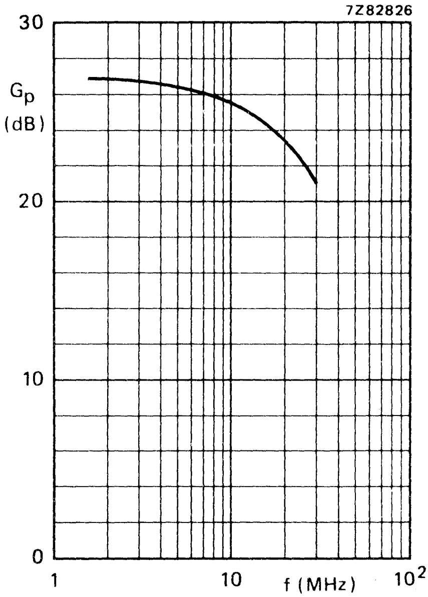


Fig. 13 Power gain as a function of frequency.

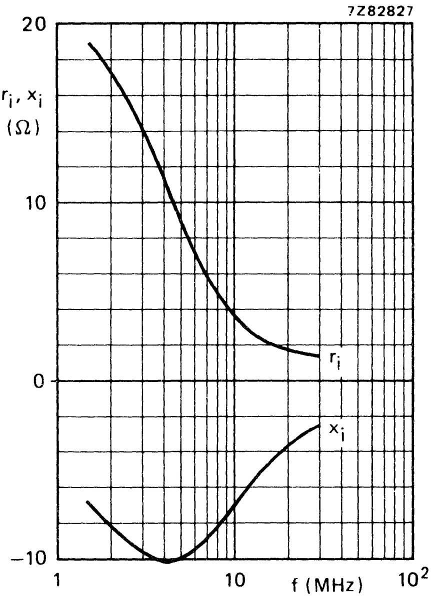


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions for Figs 13 and 14:

V_{CE} = 50 V; $I_{C(ZS)}$ = 50 mA; P_L = 60 W; T_h = 25 °C; Z_L = 16 Ω.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 15 V. Matched h_{FE} groups are available on request.

It has a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

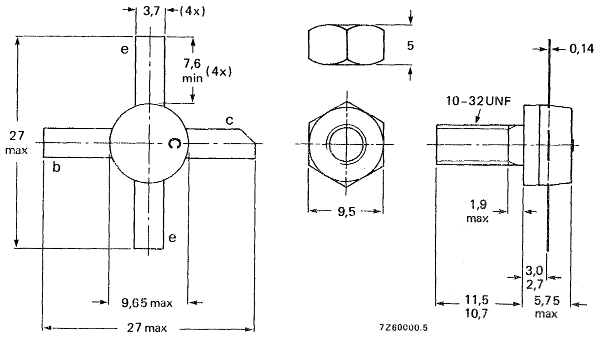
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω	d_3 dB
c.w. (class-B)	**12,5**	**175**	**45**	**> 5,0**	**> 75**	**1,2 + j1,4**	**2,6 − j1,2**	**–**
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ. 19,5	typ. 35	–	–	typ. −33

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



When locking is required an adhesive is preferred instead of a lock washer.

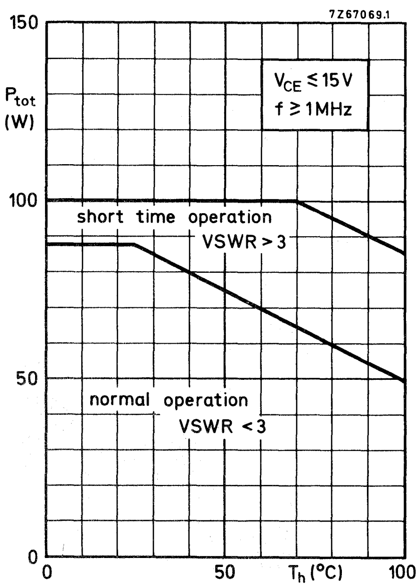
Torque on nut: min. 1,5 Nm (15 kg cm)
max. 1,7 Nm (17 kg cm)

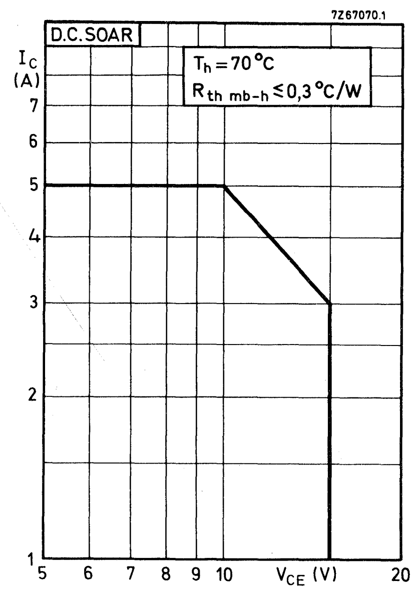
Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	8	A
Collector current (peak value); f ≥ 1MHz	I_{CM}	max.	20	A
Total power dissipation at T_h = 70 °C f ≥ 1 MHz; V_{CE} ≤ 15 V; $R_{th\ mb-h}$ ≤ 0,3 K/W Derate by 0,5 W/K for 50 °C ≤ T_h ≤ 100 °C	P_{tot}	max.	65	W



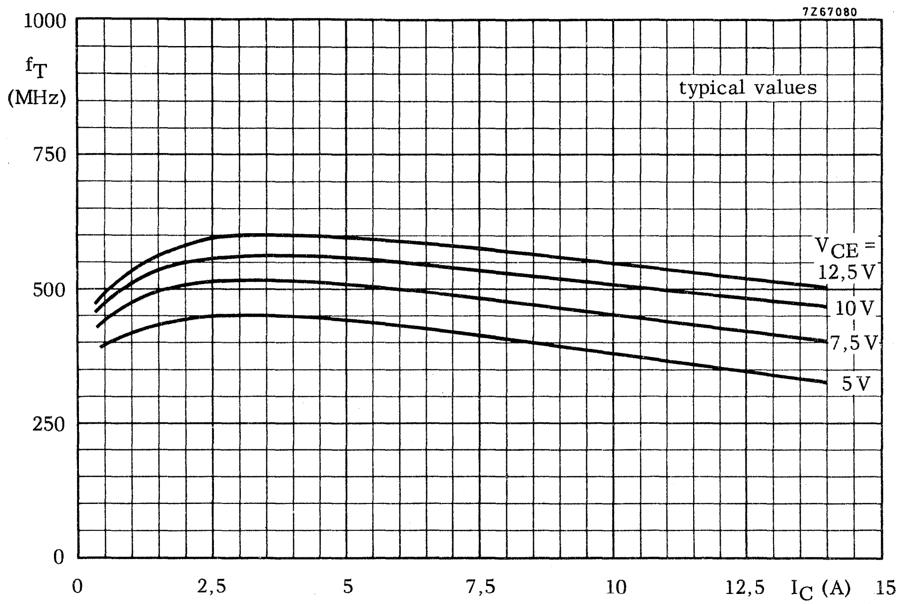


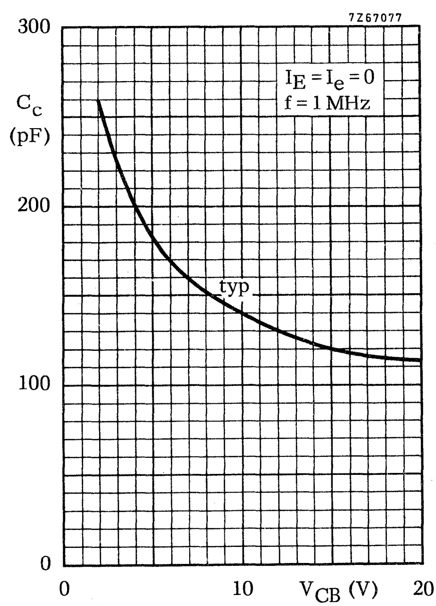
Storage temperature	T_{stg}	−65 to +200	°C

CHARACTERISTICS

$T_j = 25\ ^oC$ unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter; $I_C = 100$ mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector; $I_E = 25$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE} = 1,5$ V; $R_{BE} = 33\ \Omega$	E	>	8	ms
D.C. current gain				
$I_C = 1$ A; $V_{CE} = 5$ V	h_{FE}		20 to 100	
D.C. current gain ratio of matched devices				
$I_C = 1$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	<	1,2	
Transition frequency				
$I_C = 6$ A; $V_{CE} = 10$ V	f_T	typ.	550	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ. <	120 160	pF pF
Feedback capacitance				
$I_C = 200$ mA; $V_{CE} = 15$ V	C_{re}	typ.	80	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z67080
1000
f_T
(MHz)
750
500
250
0
typical values
V_{CE} =
12,5 V
10 V
7,5 V
5 V
0
2,5
5
7,5
10
12,5
I_C (A)
15


7Z67077
300
C_c
(pF)
200
100
0
$I_E = I_e = 0$
f = 1 MHz
typ
0
10
V_{CB} (V)
20

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f MHz	V_{CE} V	P_L W	P_S W	G_p dB	I_C A	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω
175	12,5	45	< 14,2	> 5,0	< 4,8	> 75	1,2 + j1,4	2,6 − j1,2

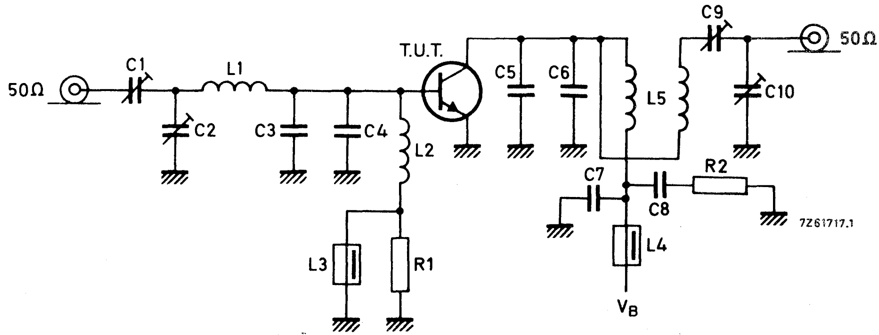


Fig. 6 Test circuit; c.w. class-B.

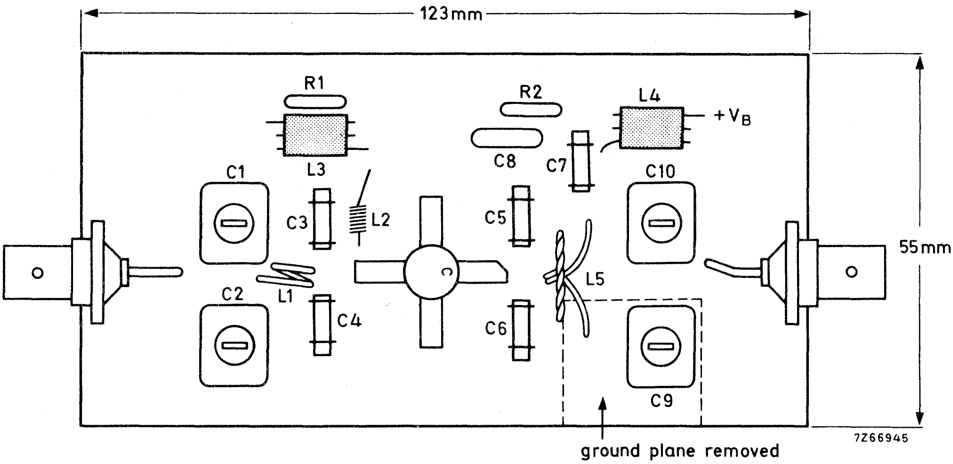
List of components:

C1 = 2 to 20 pF film dielectric trimmer
C2 = 4 to 40 pF film dielectric trimmer
C3 = C4 = C5 = C6 = 56 pF ceramic capacitor
C7 = 100 pF ceramic capacitor
C8 = 100 nF polyester capacitor
C9 = 4 to 80 pF film dielectric trimmer
C10 = 4 to 60 pF film dielectric trimmer

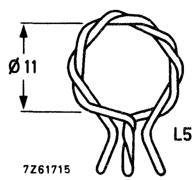
L1 =1½ turns enamelled Cu wire (1,6 mm); int. dia. 6,0 mm; length 4 mm; leads 2 x 5 mm
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3,0 mm; leads 2 x 5 mm
L3 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = bifilar wound enamelled Cu wire (1,0 mm); see figure on

R1 = 10 Ω carbon resistor
R2 = 4,7 Ω carbon resistor

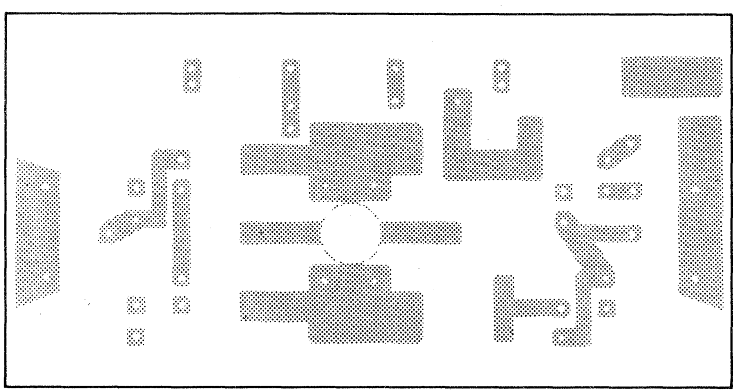
APPLICATION INFORMATION (continued)



7Z66945

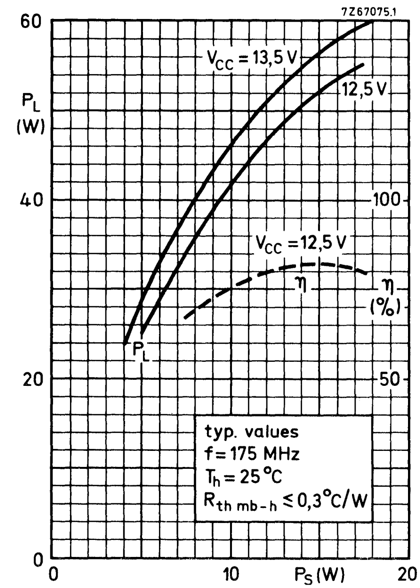


7Z61715

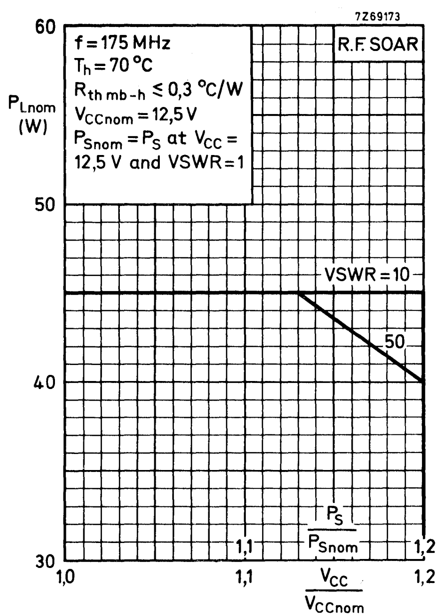


7Z66943

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



At P_L = 45 W and V_{CC} = 12,5 V, the output power at heatsink temperatures between 25 °C and 70 °C relative to that at 25 °C is diminished by 60 mW/K



The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power (P_{Lnom}) must be derated in accordance with the adjacent graph for safe operation at supply voltages other than nominal.
The graph shows the allowable output power under nominal conditions as a function of the supply overvoltage ratio with VSWR as parameter. The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio (V_{CC}/V_{CCnom}).

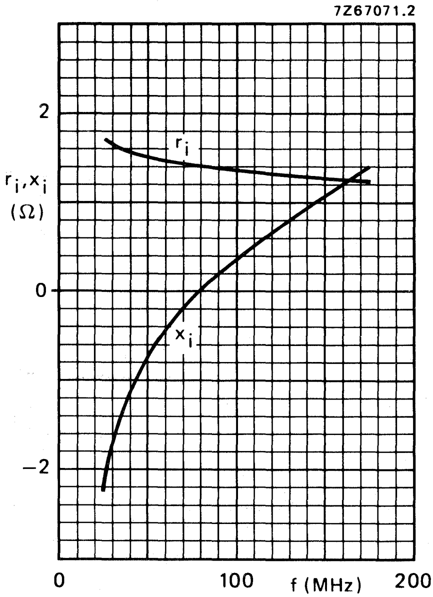


Fig. 10 Input impedance (series components).

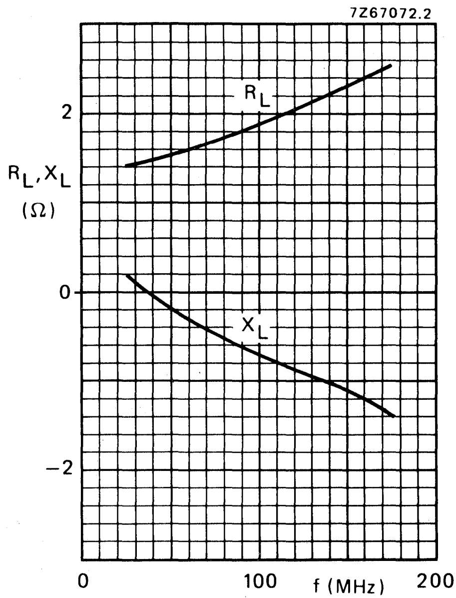


Fig. 11 Load impedance (series components).

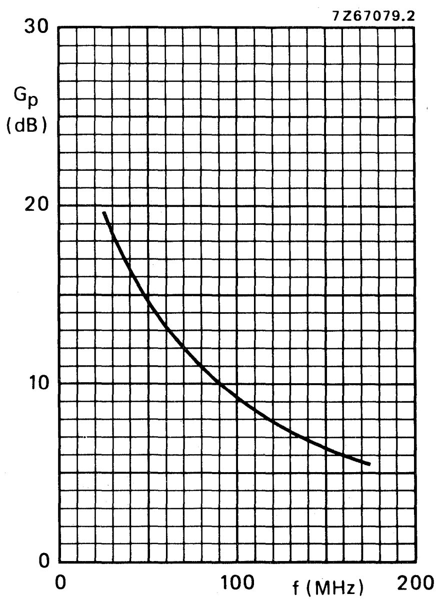


Fig. 12.

Conditions for Figs 10, 11 and 12:

Typical values; V_{CE} = 12,5 V; P_L = 45 W; T_h = 25 °C.

APPLICATION INFORMATION (continued)

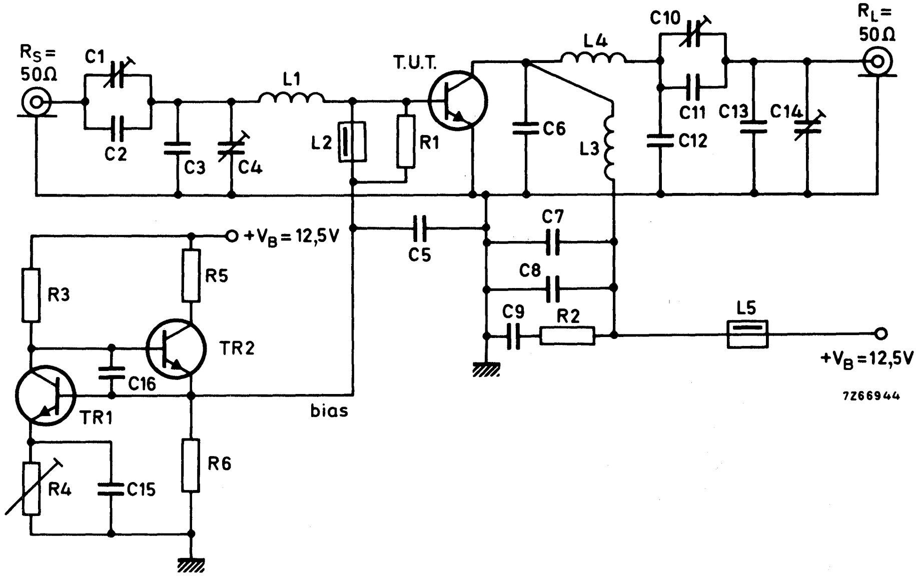
R.F. performance in s.s.b. class-AB operation

V_{CE} = 12,5 V; T_h up to 25 °C; $R_{th\ mb\text{-}h} \leq$ 0,3 K/W

f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} %	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ mA
3 to 30 (P.E.P.)	typ. 19,5	typ. 35	typ. −33	typ. −36	25

Test circuit; s.s.b. class-AB.



List of components on

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

List of components:

Tr1 = Tr2 = BD137

C1 =	100 pF	air dielectric capacitor (single insulated rotor)
C2 =	27 pF	ceramic capacitor
C3 =	180 pF	ceramic capacitor
C4 =	100 pF	air dielectric capacitor (single non-insulated rotor)
C5 = C7 =	3,9 nF	polyester capacitor (±10%)
C6 =	2 x 270 pF	polystyrene capacitors in parallel
C8 = C15 = C16 =	100 nF	polyester capacitor (±10%)
C9 =	2,2 μF	moulded metallized polyester capacitor
C10 =	2 x 385 pF	film dielectric trimmers in parallel
C11 =	68 pF	ceramic capacitor
C12 =	2 x 82 pF	ceramic capacitors in parallel
C13 =	47 pF	ceramic capacitor
C14 =	385 pF	film dielectric trimmer

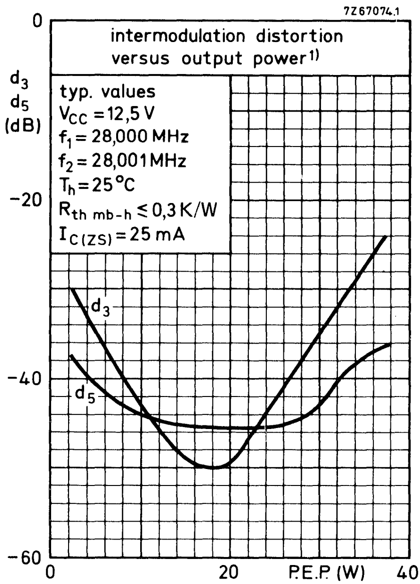
L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm; leads 2 x 5 mm

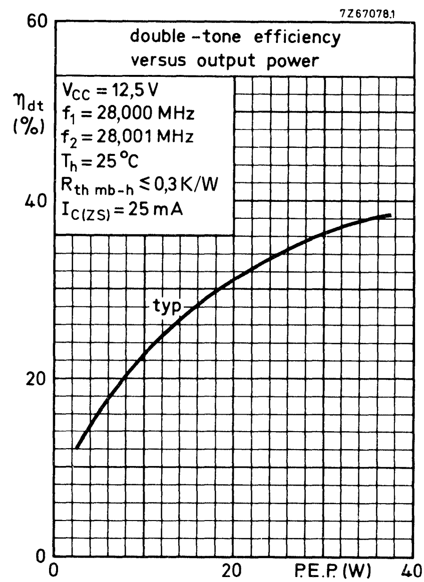
L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36640)

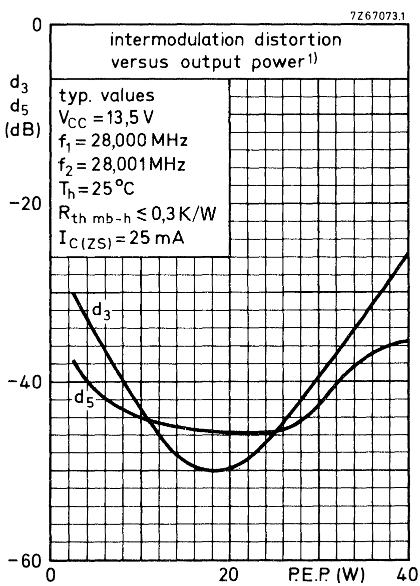
L3 = 68 nH; 3 turns enamelled Cu wire (1,6 mm); internal diameter 8 mm; coil length 8,3 mm; leads 2 x 5 mm

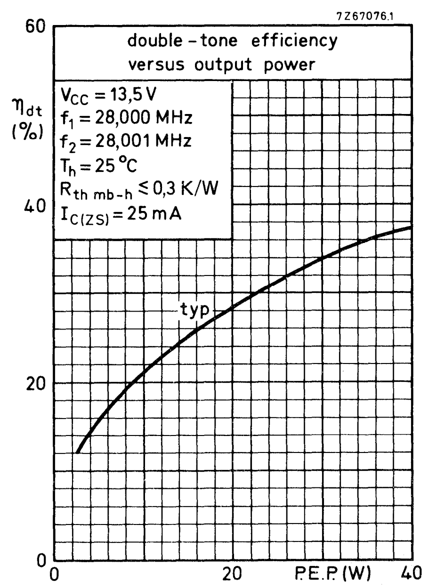
L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm; coil length 7,6 mm; leads 2 x 5 mm

R1 =	27 Ω	carbon resistor (±5%)
R2 =	4,7 Ω	carbon resistor (±5%)
R3 =	1,5 kΩ	carbon resistor (±5%)
R4 =	10 Ω	wire-wound potentiometer (3 W)
R5 =	47 Ω	wire-wound resistor (5,5 W)
R6 =	150 Ω	carbon resistor (±5%)

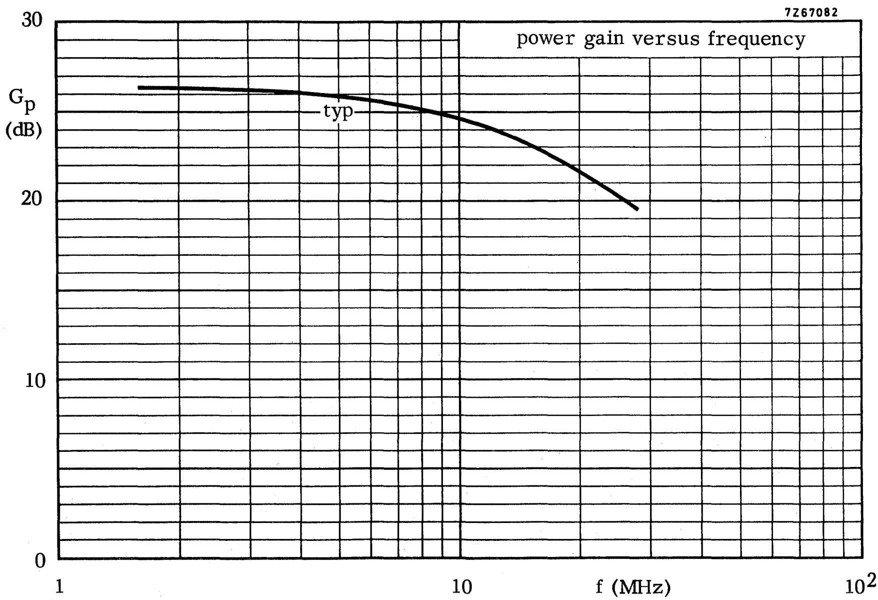








1) Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

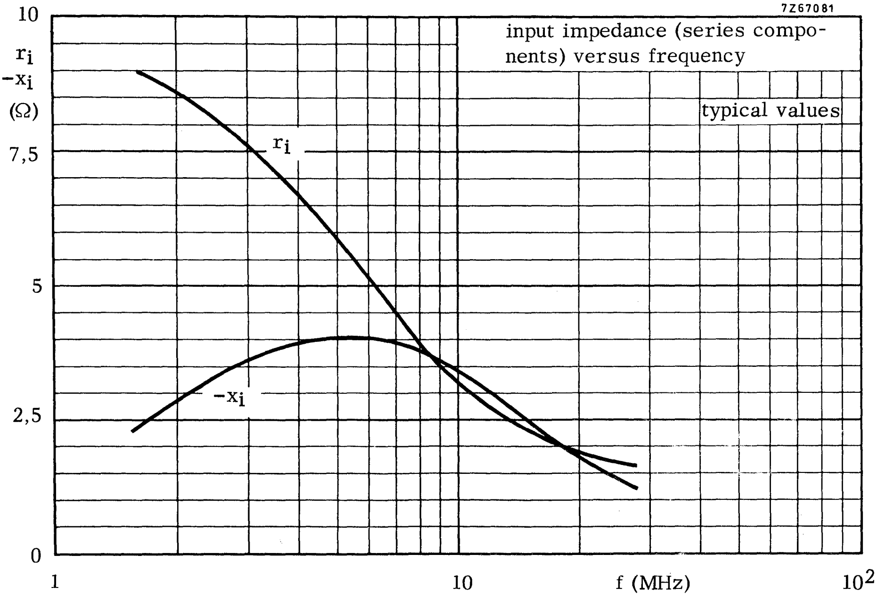


S.S.B. class AB operation

Conditions:

P_L = 30 W (PEP)		P_L = 35 W (PEP)	
V_{CC} = 12,5 V		V_{CC} = 13,5 V	
$I_{C(ZS)}$ = 25 mA		$I_{C(ZS)}$ = 25 mA	
T_h = 25 °C		T_h = 25 °C	
$R_{th\ mb-h}$ ≤ 0,3 K/W		$R_{th\ mb-h}$ ≤ 0,3 K/W	
Z_L = 1,9 Ω		Z_L = 1,9 Ω	

The curve (both conditions) holds for an unneutralized amplifier.



S.S.B. class AB operation

Conditions:

P_L	= 30 W (PEP)	P_L	= 35 W (PEP)
V_{CC}	= 12,5 V	V_{CC}	= 13,5 V
$I_{C(ZS)}$	= 25 mA	$I_{C(ZS)}$	= 25 mA
T_h	= 25 °C	T_h	= 25 °C
$R_{th\ mb-h}$	≤ 0,3 K/W	$R_{th\ mb-h}$	≤ 0,3 K/W
Z_L	= 1,9 Ω	Z_L	= 1,9 Ω

The curve (both conditions) holds for an unneutralized amplifier.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Matched h_{FE} groups are available on request.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

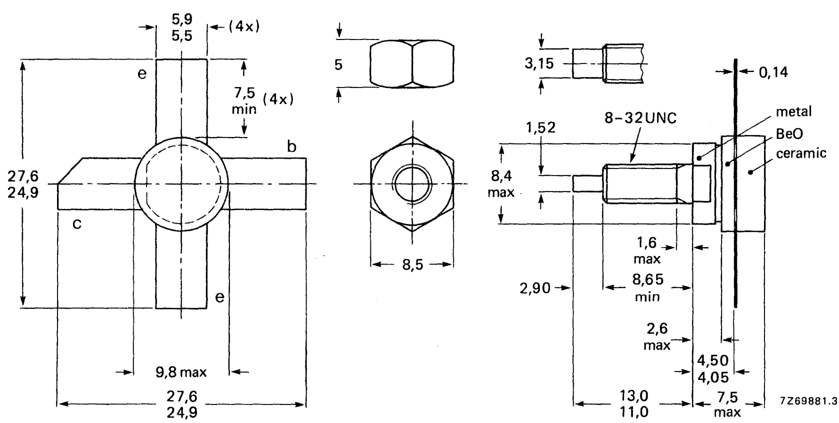
R.F. performance up to T_h = 25 °C

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω	d_3 dB
c.w. (class-B)	**12,5**	**175**	**45**	**> 5,0**	**> 75**	**1,2 + j1,4**	**2,6 − j1,2**	−
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ. 19,5	typ. 35	−	−	typ. −33

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	9	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	22	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	100	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

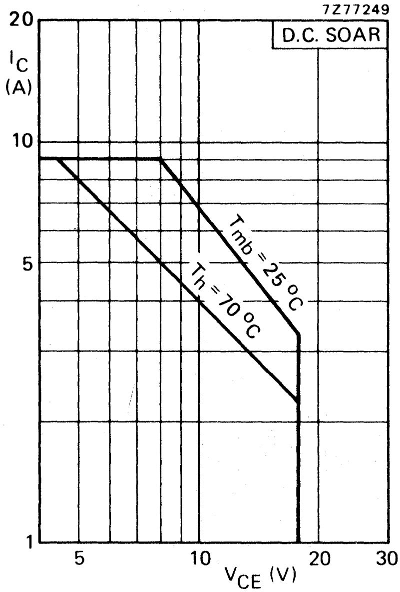


Fig. 2 D.C. SOAR.

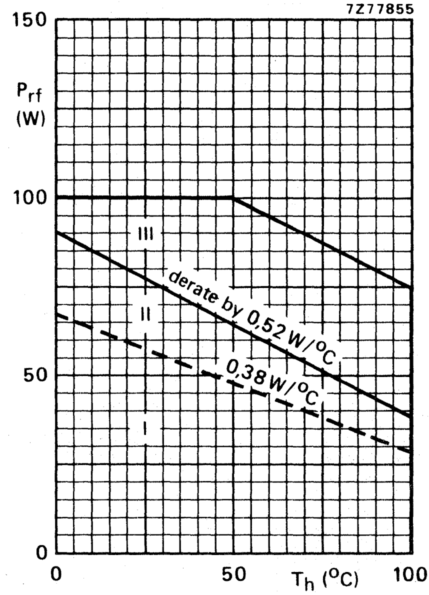


Fig. 3 R.F. power dissipation; V_{CE} ≤ 16,5 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 40 W; T_{mb} = 88 °C, i.e. T_h = 70 °C)

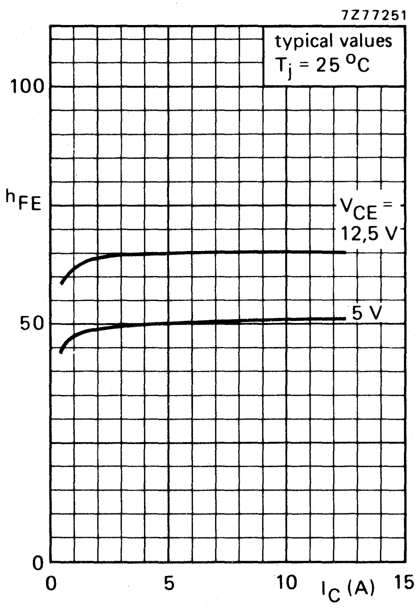
From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,8	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,05	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

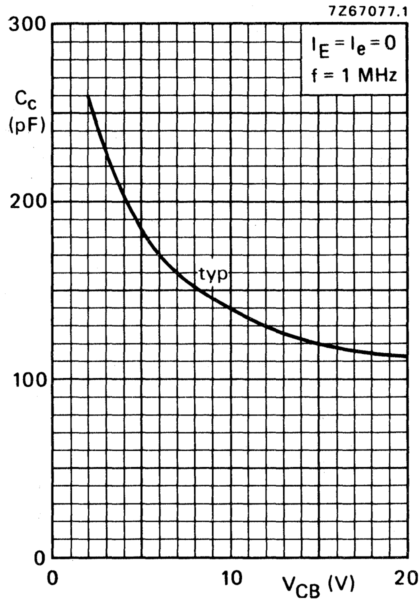
CHARACTERISTICS

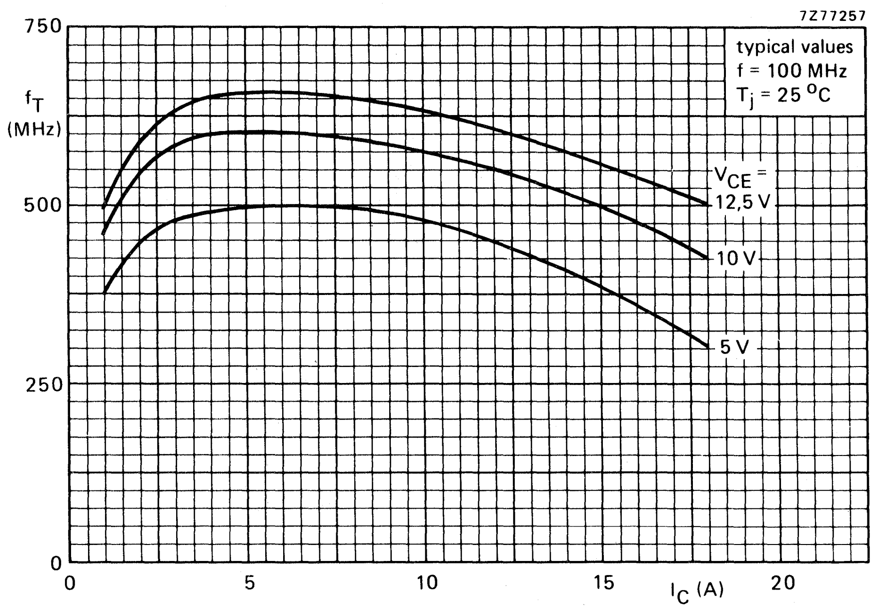
$T_j = 25\ ^oC$

Breakdown voltage			
Collector-emitter voltage $V_{BE} = 0$; $I_C = 50$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base voltage open collector; $I_E = 25$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 15$ V	I_{CES}	<	25 mA
Transient energy			
L = 25 mH; f = 50 Hz			
open base	E	>	8 ms
$-V_{BE} = 1,5$ V; $R_{BE} = 33\ \Omega$	E	>	8 ms
D.C. current gain *			
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE}	typ	50
			10 to 80
D.C. current gain ratio of matched devices *			
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage *			
$I_C = 12,5$ A; $I_B = 2,5$ A	V_{CEsat}	typ	1,5 V
Transition frequency at f = 100 MHz *			
$I_C = 4$ A; $V_{CE} = 12,5$ V	f_T	typ	650 MHz
$I_C = 12,5$ A; $V_{CE} = 12,5$ V	f_T	typ	600 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ	120 pF
		<	160 pF
Feedback capacitance at f = 1 MHz			
$I_C = 200$ mA; $V_{CE} = 15$ V	C_{re}	typ	80 pF
Collector-stud capacitance	C_{cs}	typ	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.


7Z77251
typical values
T_j = 25 °C
h_{FE}
100
50
0
V_{CE} =
12,5 V
5 V
0
5
10
15
I_C (A)


7Z67077.1
$I_E = I_e = 0$
f = 1 MHz
C_c
(pF)
300
200
100
0
typ
0
10
20
V_{CB} (V)


7Z77257
typical values
f = 100 MHz
T_j = 25 °C
f_T
(MHz)
750
500
250
0
V_{CE} =
12,5 V
10 V
5 V
0
5
10
15
20
I_C (A)

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CC} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (Ω)
175	**12,5**	**45**	**< 14,2**	**> 5,0**	**< 4,8**	**> 75**	**1,2 + j1,4**	**2,6 − j1,2**
175	13,5	45	–	typ. 6,0	–	typ. 75	–	–

Test circuit for 175 MHz

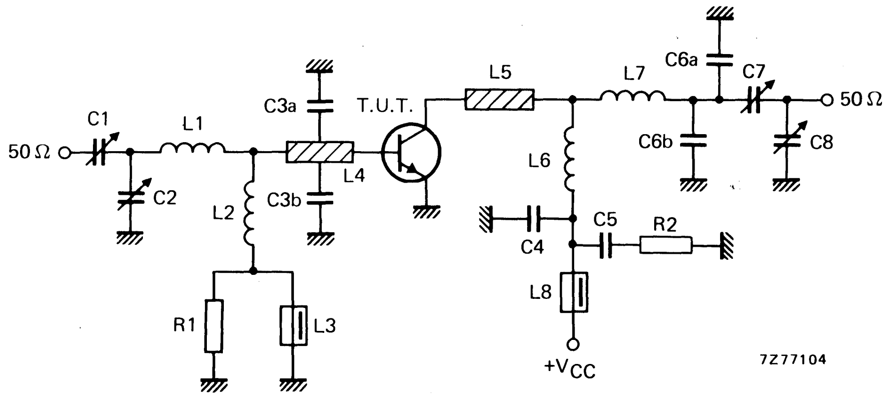


Fig. 7 Class-B test circuit at f = 175 MHz.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6a = C6b = 8,2 pF ceramic capacitor (500 V)
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

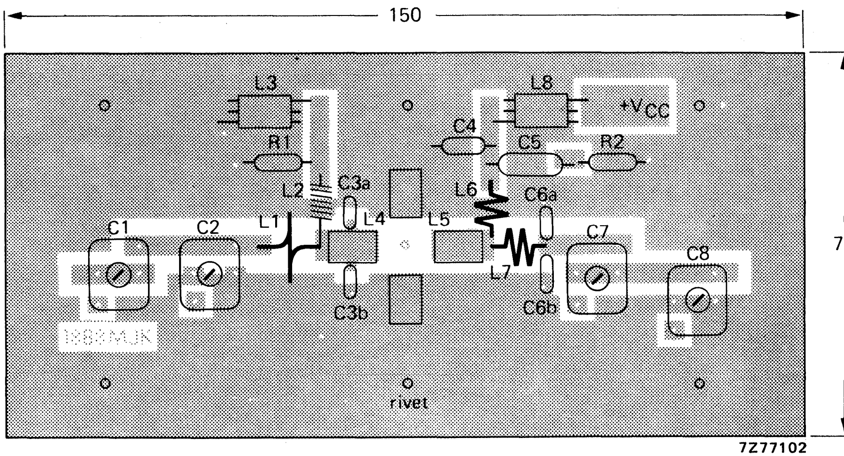
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

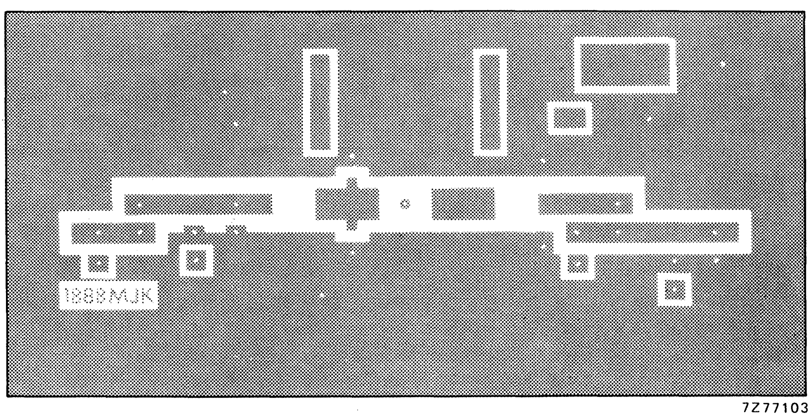
R1 = 10 Ω (±10%) carbon resistor
R2 = 4,7 Ω (±5%) carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit on

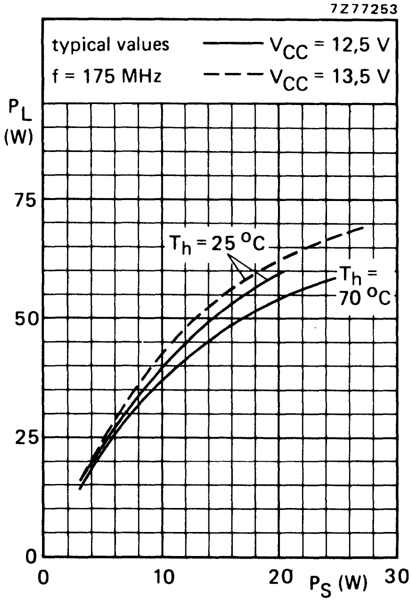
APPLICATION INFORMATION (continued)

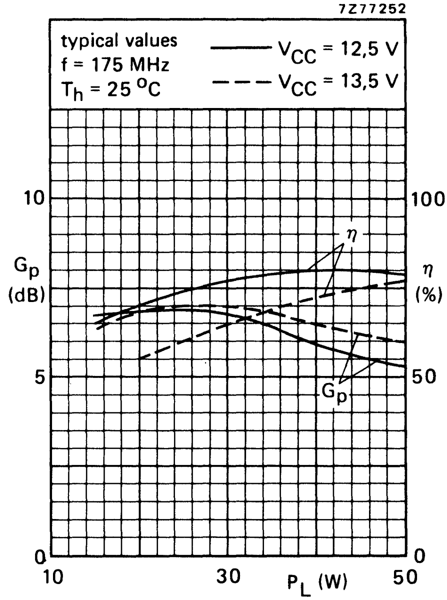
Component layout and printed-circuit board for 175 MHz test circuit.

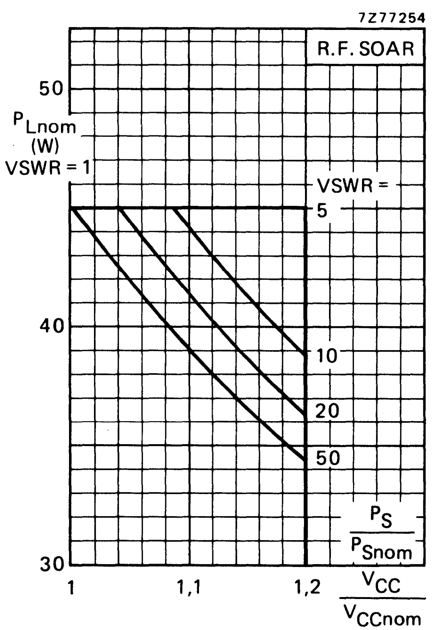




The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.







Conditions for R.F. SOAR

f = 175 MHz
T_h = 70 °C
$R_{th\ mb\text{-}h}$ = 0,45 K/W
V_{CCnom} = 12,5 V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
see

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

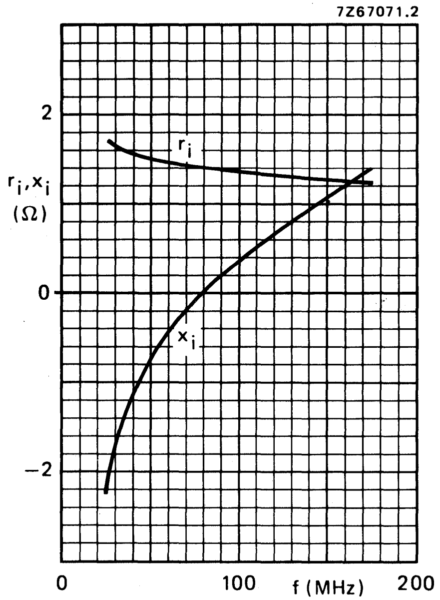


Fig. 12 Input impedance (series components).

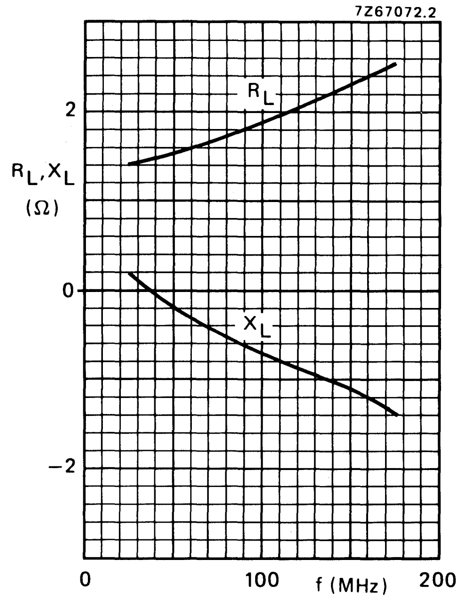


Fig. 13 Load impedance (series components).

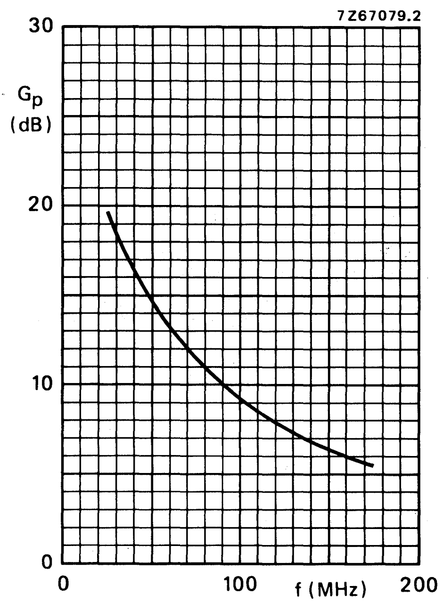


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 12,5 V; P_L = 45 W; class-B operation; T_h = 25 °C.

APPLICATION INFORMATION (continued)

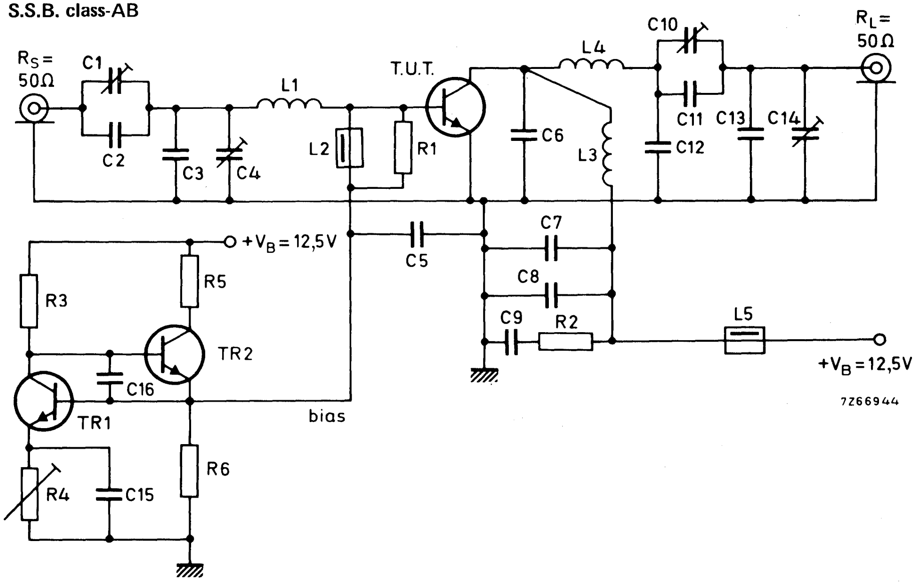
R.F. performance in s.s.b. class-AB operation

V_{CE} = 12,5 V; T_h up to 25 °C; $R_{th\ mb\text{-}h} \leqslant$ 0,45 K/W
f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} %	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ mA
3 to 30 (P.E.P.)	typ 19,5	typ 35	typ −33	typ −36	25

Test circuit

S.S.B. class-AB



List of components:

TR1 = TR2 = BD137

C1 = 100 pF air dielectric trimmer (single insulated rotor type)
C2 = 27 pF ceramic capacitor
C3 = 180 pF ceramic capacitor
C4 = 100 pF air dielectric trimmer (single non-insulated rotor type)
C5 = C7 = 3,9 nF polyester capacitor
C6 = 2 x 270 pF polystyrene capacitors in parallel
C8 = C15 = C16 = 100 nF polyester capacitor
C9 = 2,2 μF moulded metallized polyester capacitor
C10 = 2 x 385 pF film dielectric trimmer
C11 = 68 pF ceramic capacitor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

List of components (continued)

C12 = 2 x 82 pF ceramic capacitors in parallel
C13 = 47 pF ceramic capacitor
C14 = 385 pF film dielectric trimmer

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9 mm; length 6,1 mm; leads 2 x 5 mm
L2 = L5 = Ferroxcube choke coil (cat. no. 4312 020 36640)
L3 = 68 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 8,3 mm; leads 2 x 5 mm
L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 7,6 mm; leads 2 x 5 mm

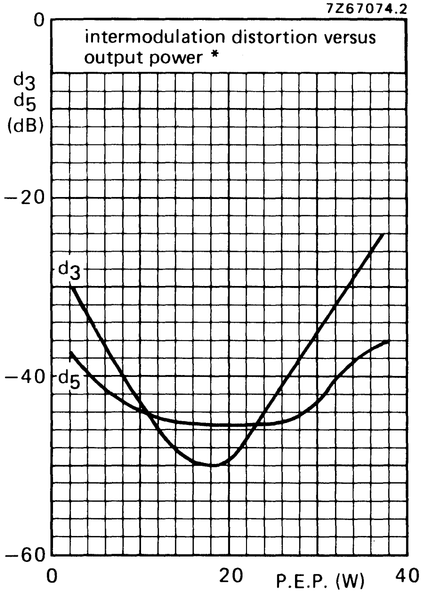
R1 = 27 Ω (±5%) carbon resistor
R2 = 4,7 Ω (±5%) carbon resistor
R3 = 1,5 kΩ (±5%) carbon resistor
R4 = 10 Ω wirewound potentiometer (3 W)
R5 = 47 Ω wirewound resistor (5,5 W)
R6 = 150 Ω (±5%) carbon resistor

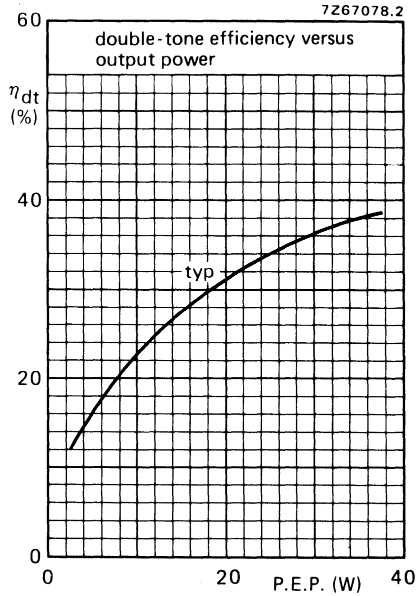
Measuring conditions for the upper graphs on page 11

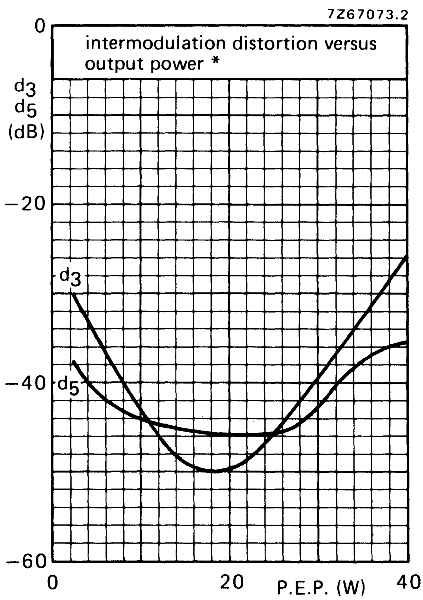
V_{CC} = 12,5 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
$R_{th\ mb-h} \leq$ 0,45 °K/W
$I_{C(ZS)}$ = 25 mA
typical values

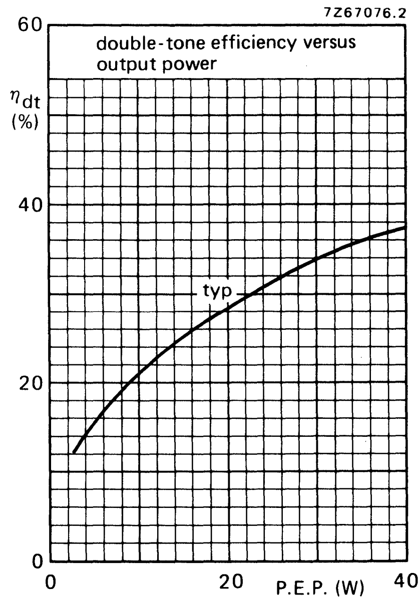
Measuring conditions for the lower graphs on page 11

V_{CC} = 13,5 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
$R_{th\ mb-h} \leq$ 0,45 °K/W
$I_{C(ZS)}$ = 25 mA
typical values

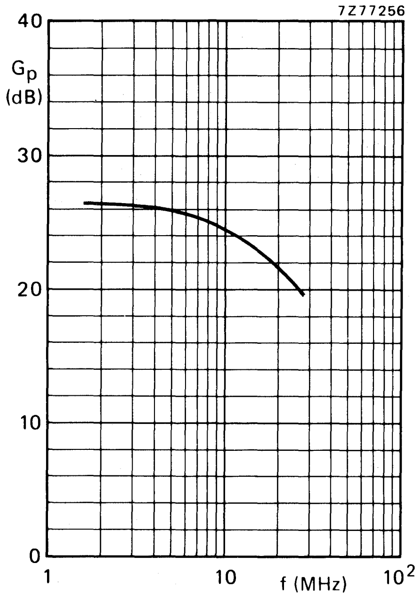


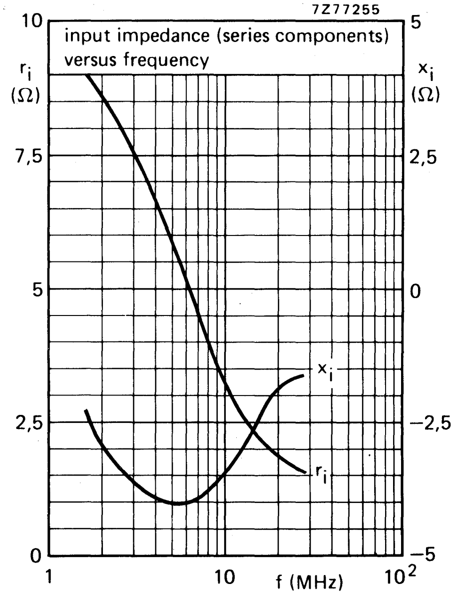






* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.





S.S.B. class-AB operation

Conditions for the graphs above:

V_{CC} = 12,5 V	V_{CC} = 13,5 V
P_L = 30 W (P.E.P.)	P_L = 35 W (P.E.P.)
T_h = 25 °C	T_h = 25 °C
$R_{th\ mb\text{-}h} \leqslant$ 0,45 K/W	$R_{th\ mb\text{-}h} \leqslant$ 0,45 K/W
$I_{C(ZS)}$ = 25 mA	$I_{C(ZS)}$ = 25 mA
Z_L = 1,9 Ω	Z_L = 1,9 Ω

The typical curves (both conditions) hold for an unneutralized amplifier.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB or class-B operated high power transmitters in the h.f. and v.h.f. bands. The transistor presents excellent performance as a linear amplifier in the h.f. band. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Transistors are delivered in matched h_{FE} groups.

The transistor has a ½" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η %	d_3 dB
s.s.b. (class-AB)	**28**	**0,05**	**1,6–28**	**8–80 (P.E.P.)**	**> 13**	**> 35***	**<–30**
c.w. (class-B)	28	–	108	80	typ. 7,9	typ. 70	–

* At 80 W P.E.P.

MECHANICAL DATA

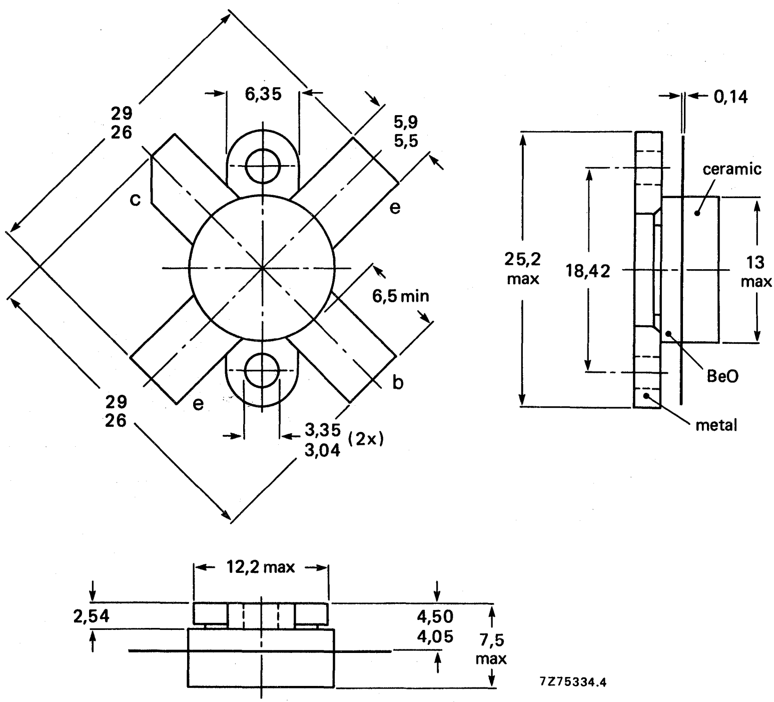
SOT-121 (see Fig.1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	70	V
Collector-emitter voltage (open base)	V_{CEO}	max.	35	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	8	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	20	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	140	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

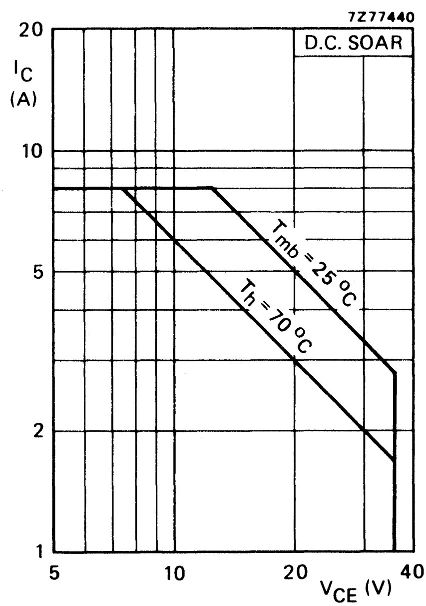


Fig. 2 D.C. SOAR.

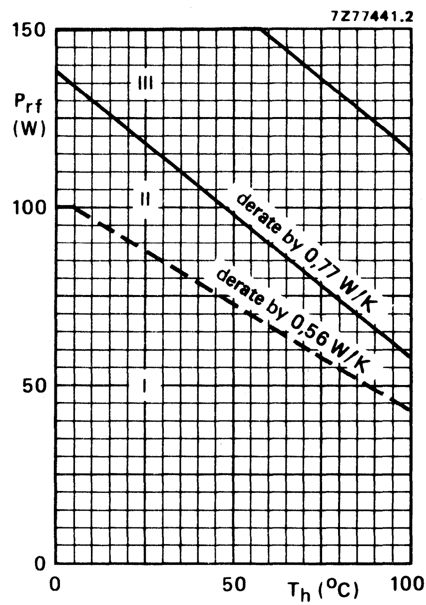


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.

I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 60 W; T_{mb} = 82 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,92	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,33	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	70 V
Collector-emitter breakdown voltage			
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	35 V
Emitter-base breakdown voltage			
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 35 V	I_{CES}	<	10 mA
D.C. current gain*			
I_C = 4 A; V_{CE} = 5 V	h_{FE}		15 to 80
D.C. current gain ratio of matched devices*			
I_C = 4 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage*			
I_C = 12,5 A; I_B = 2,5 A	V_{CEsat}	typ.	2,5 V
Transition frequency at f = 100 MHz**			
$-I_E$ = 4 A; V_{CB} = 28 V	f_T	typ.	315 MHz
$-I_E$ = 12,5 A; V_{CB} = 28 V	f_T	typ.	305 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	125 pF
Feedback capacitance at f = 1 MHz			
I_C = 50 mA; V_{CE} = 28 V	C_{re}	typ.	85 pF
Collector-flange capacitance	C_{cf}	typ.	3 pF

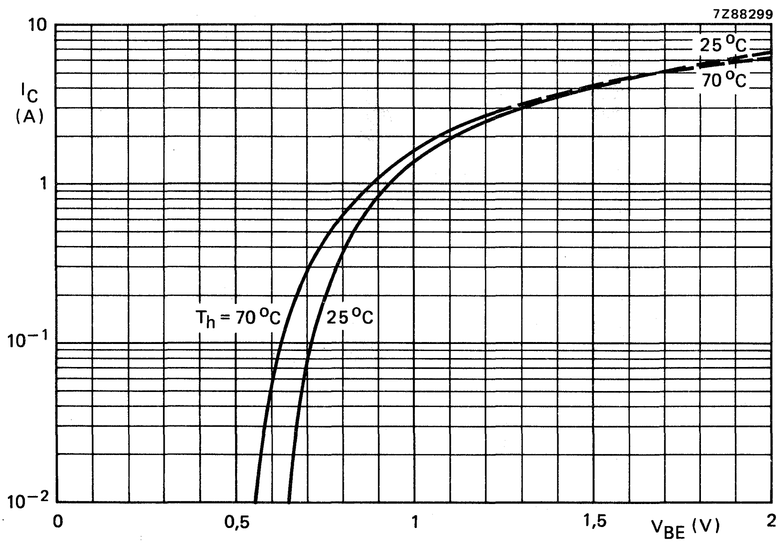


Fig. 4 Typical values; V_{CE} = 20 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

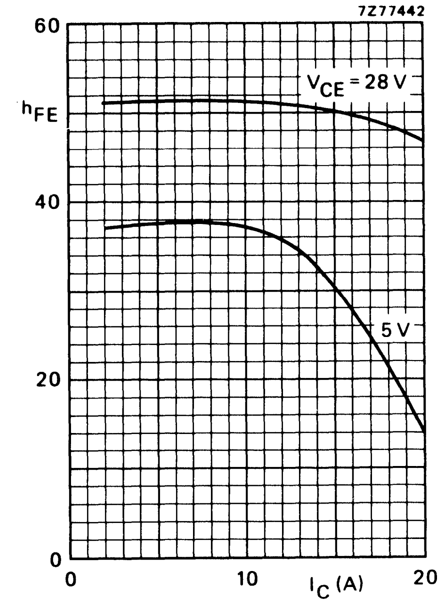


Fig. 5 Typical values; T_j = 25 °C.

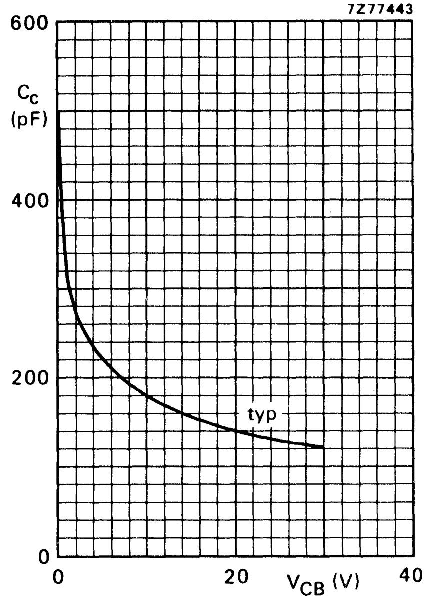


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

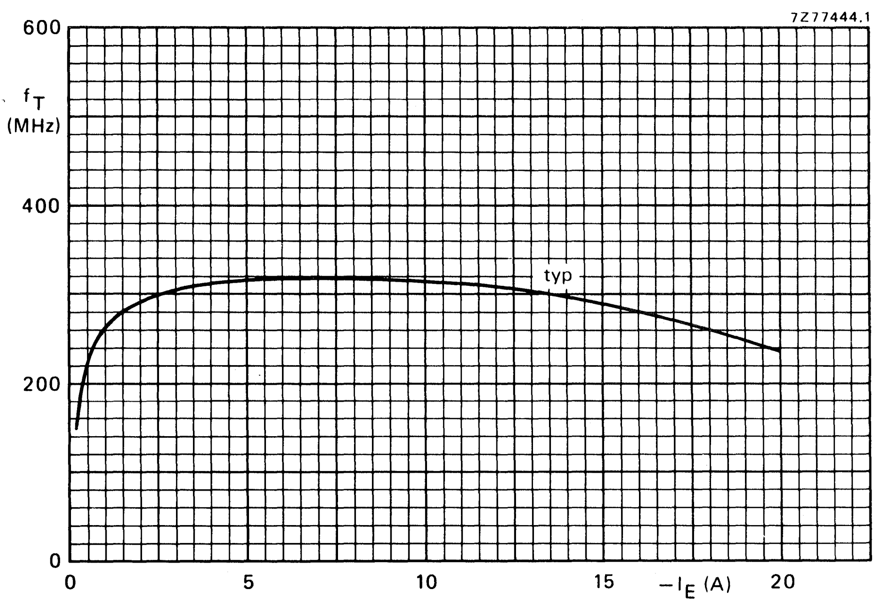


Fig. 7 V_{CB} = 28 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 80 W P.E.P.	I_C(A) at 80 W P.E.P.	d_3 dB	d_5 dB	$I_{C(ZS)}$ A
8 to 80 (P.E.P.)	> **13**	> **35**	< **4,1**	< **−30**	< **−30**	**0,05**

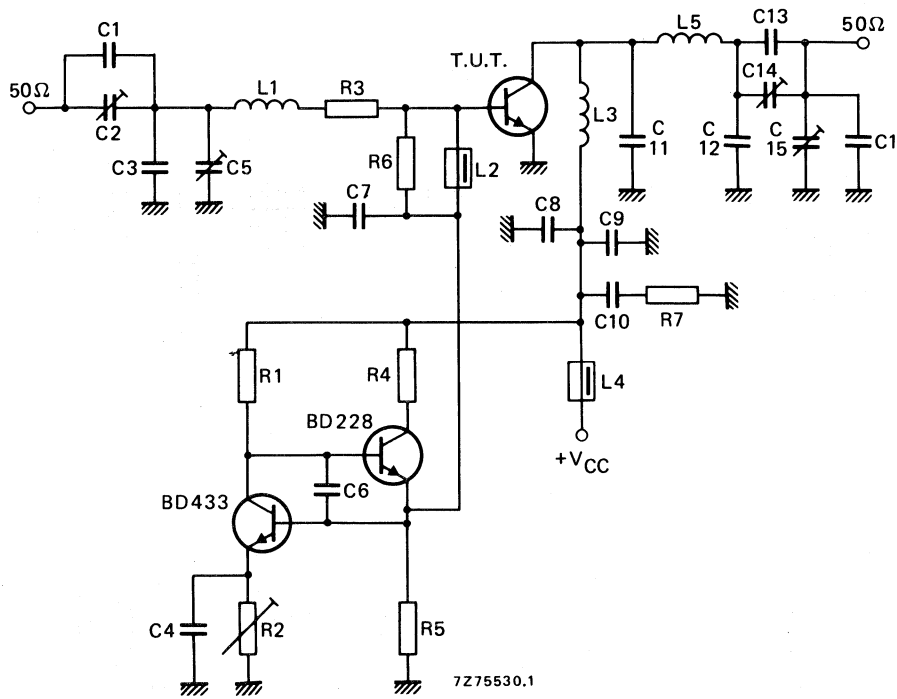


Fig. 8 Test circuit; s.s.b. class-AB.

List of components:

C1 = 27 pF ceramic capacitor (500 V)
C2 = 100 pF air dielectric trimmer (single insulated rotor type)
C3 = 100 pF polystyrene capacitor
C4 = C6 = C9 = 100 nF polyester capacitor
C5 = 280 pF air dielectric trimmer (single non-insulated rotor type)
C7 = C8 = 3,9 nF ceramic capacitor
C10 = 2,2 μF moulded metallized polyester capacitor
C11 = 180 pF polystyrene capacitor
C12 = 2 x 68 pF ceramic capacitors in parallel (500 V)
C13 = 120 pF polystyrene capacitor

C14 = C15 = 280 pF air dielectric trimmer (single insulated rotor type)
C16 = 56 pF ceramic capacitor (500 V)

L1 = 108 nH; 4 turns Cu wire (1,6 mm); int. dia. 8,7 mm; length 11,2 mm; leads 2 x 7 mm
L2 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 88 nH; 3 turns Cu wire (1,6 mm); int. dia. 8,0 mm; length 8,0 mm; leads 2 x 7 mm
L5 = 120 nH; 4 turns Cu wire (1,6 mm); int. dia. 9,3 mm; length 11,2 mm; leads 2 x 7 mm

R1 = 1,5 kΩ (± 5%) carbon resistor (0,5 W)
R2 = 10 Ω wirewound potentiometer (3 W)
R3 = 0,9 Ω; parallel connection of 2 x 1,8 Ω carbon resistors (± 5%; 0,5 W each)
R4 = 60 Ω; parallel connection of 2 x 120 Ω wirewound resistors (5,5 W each)
R5 = 56 Ω (± 5%) carbon resistor (0,5 W)
R6 = 33 Ω (± 5%) carbon resistor (0,5 W)
R7 = 4,7 Ω (± 5%) carbon resistor (0,5 W)

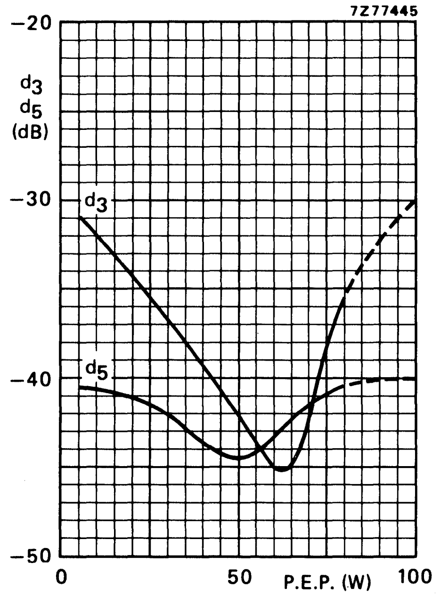


Fig. 9 Intermodulation distortion as a function of output power.*

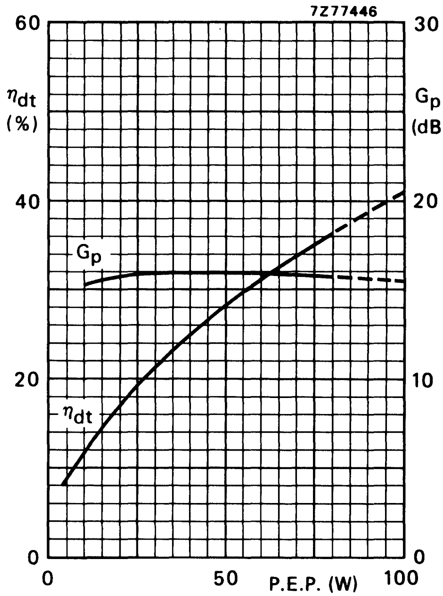


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

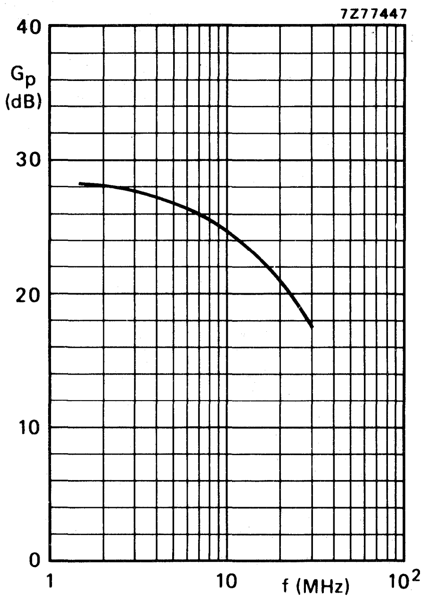


Fig. 11 Power gain as a function of frequency.

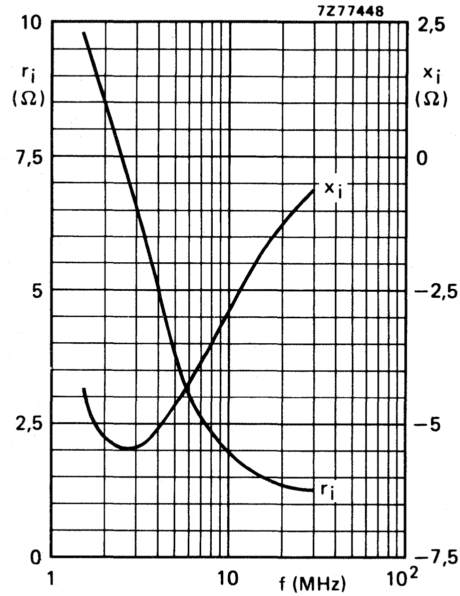


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 80 W; T_h = 25 °C; Z_L = 3,9 Ω.

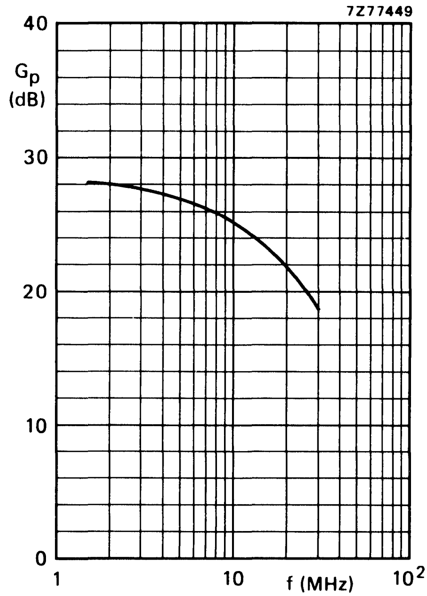


Fig. 13 Power gain as a function of frequency.

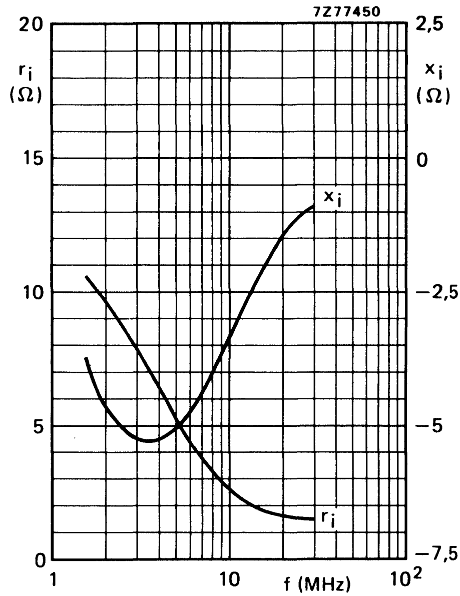


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for a push-pull amplifier with cross-neutralization in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 80 W; T_h = 25 °C; Z_L = 3,9 Ω; neutralizing capacitor: 68 pF.

APPLICATION INFORMATION (continued)

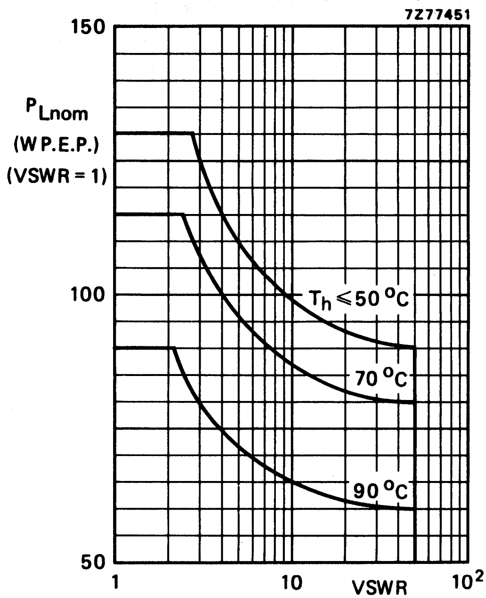


Fig. 15 R.F. SOAR; s.s.b. class-AB operation; f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W.
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)
T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
108	**28**	**80**	typ. **13**	typ. **7,9**	typ. **4,1**	typ. **70**	**0,85 + j1,0**	**174 − j40**

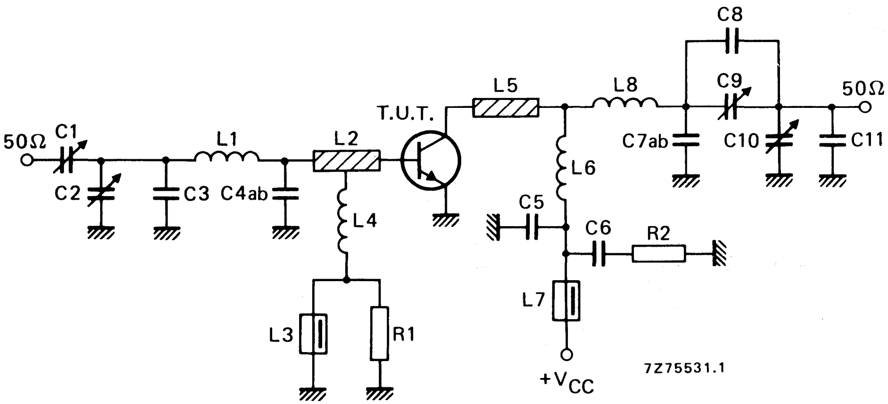


Fig. 16 Test circuit; c.w. class-B.

List of components:

C1 = C9 = C10 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3 = 22 pF ceramic capacitor (500 V)
C4ab = 2 x 82 pF ceramic capacitors in parallel (500 V)
C5 = 270 pF polystyrene capacitor
C6 = 100 nF polyester capacitor
C7a = 8,2 pF ceramic capacitor (500 V)
C7b = 10 pF ceramic capacitor (500 V)
C 8 = 5,6 pF ceramic capacitor (500 V)
C11 = 10 pF ceramic capacitor (500 V)

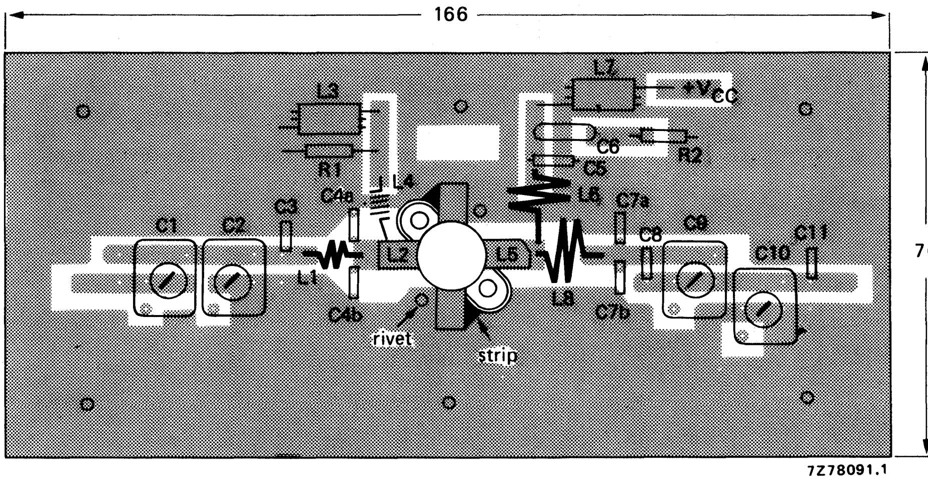
L1 = 21 nH; 2 turns Cu wire (1,0 mm); int. dia. 4,0 mm; length 3,5 mm; leads 2 x 5 mm
L2 = L5 = 2,4 nH; strip (12 mm x 6 mm); tap for L4 at 6 mm from transistor
L3 = L 7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L6 = 49 nH; 2 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 4,7 mm; leads 2 x 5 mm
L8 = 56 nH; 2 turns Cu wire (1,6 mm); int. dia. 10,0 mm; length 4,5 mm; leads 2 x 5 mm

L2 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric.

R1 = R2 = 10 Ω (± 10%) carbon resistor

Component layout and printed-circuit board for 108 MHz test circuit are shown in Fig. 17.

APPLICATION INFORMATION (continued)



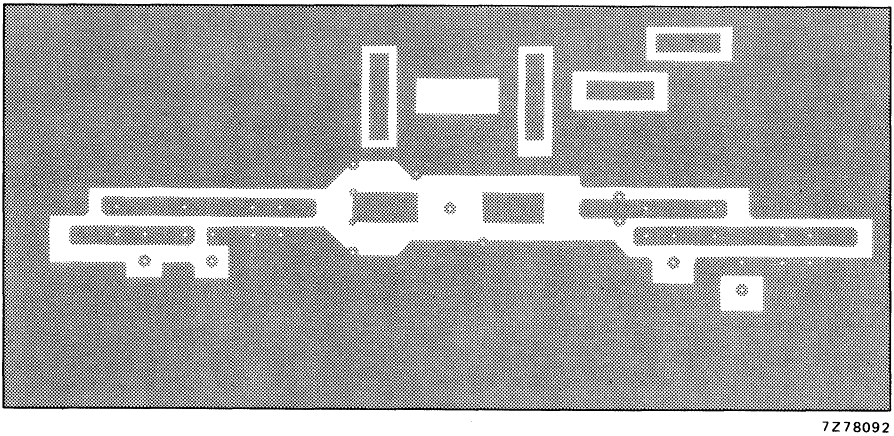


Fig. 17 Component layout and printed-circuit board for 108 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

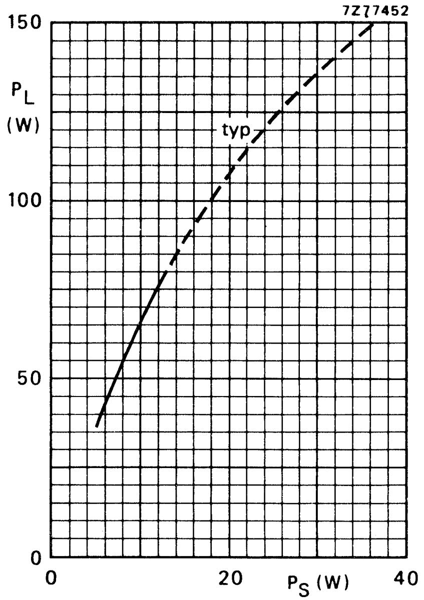


Fig. 18 V_{CE} = 28 V; f = 108 MHz; T_h = 25 °C.

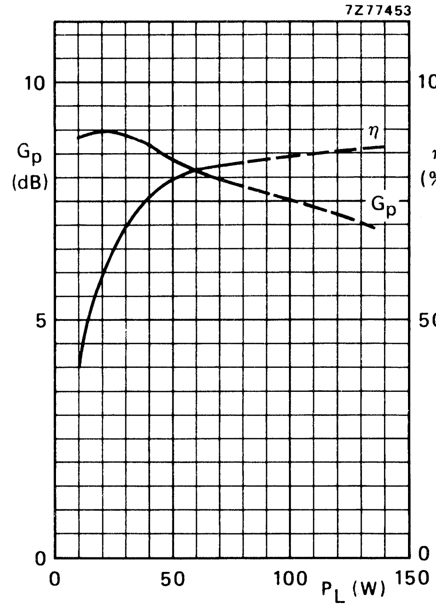


Fig. 19 V_{CE} = 28 V; f = 108 MHz; T_h = 25 °C; typical values.

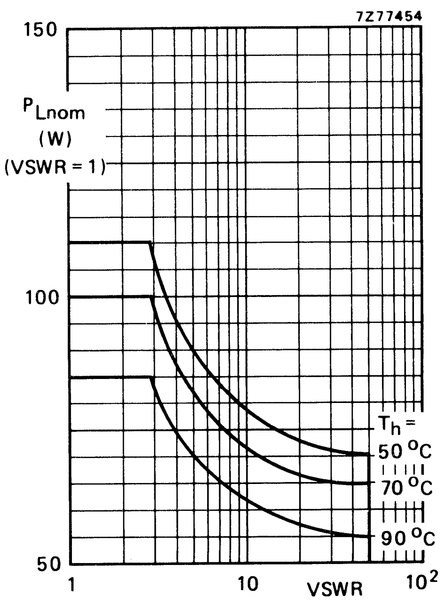


Fig. 20 R.F. SOAR; c.w. class-B operation; f = 108 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,2 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

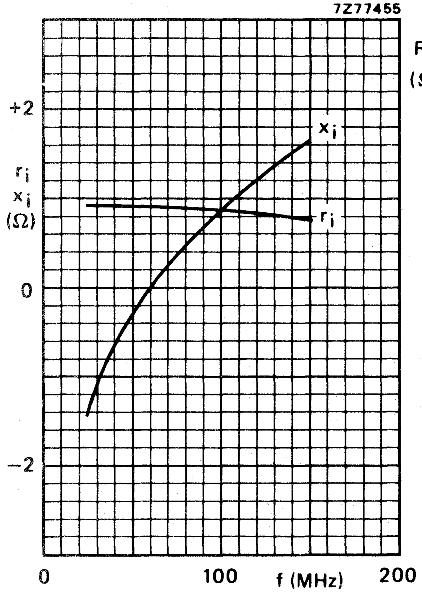


Fig. 21 V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C typical values.

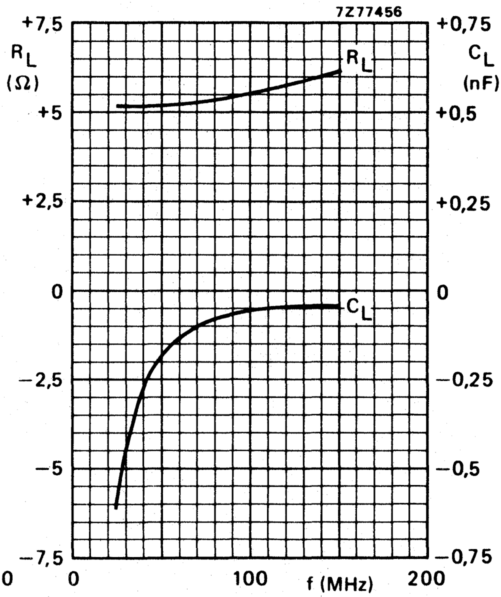


Fig. 22 V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C; typical values.

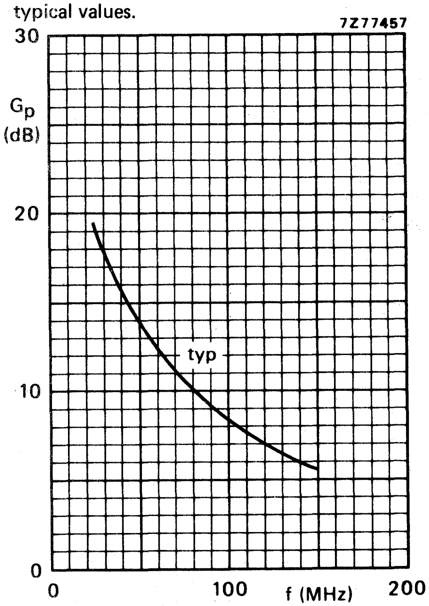


Fig. 23 V_{CE} = 28 V; P_L = 80 W; T_h = 25 °C.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB or class-B operated high power transmitters in the h.f. and v.h.f. bands. The transistor presents excellent performance as a linear amplifier in the h.f. band. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Transistors are delivered in matched h_{FE} groups.

The transistor has a ½" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η %	d_3 dB
s.s.b. (class-AB)	**28**	**0,1**	**1,6–28**	**15–130** (P.E.P.)	**> 12**	**> 37,5***	**< –30**
c.w. (class-B)	28	–	87,5	130	typ. 7,5	typ. 75	–

* At 130 W P.E.P.

MECHANICAL DATA

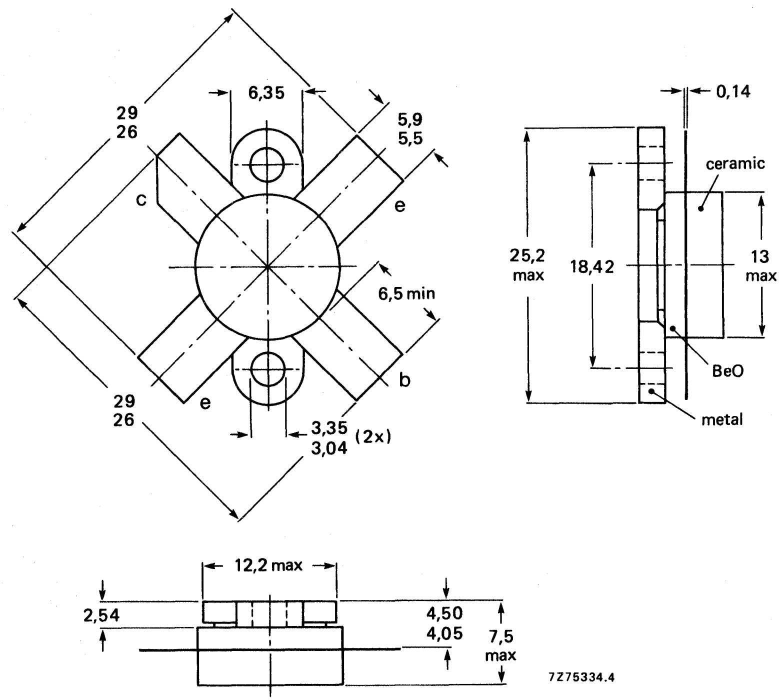
SOT-121 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	70 V
Collector-emitter voltage (open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	12 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	30 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	245 W
Storage temperature	T_{stg}	−65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

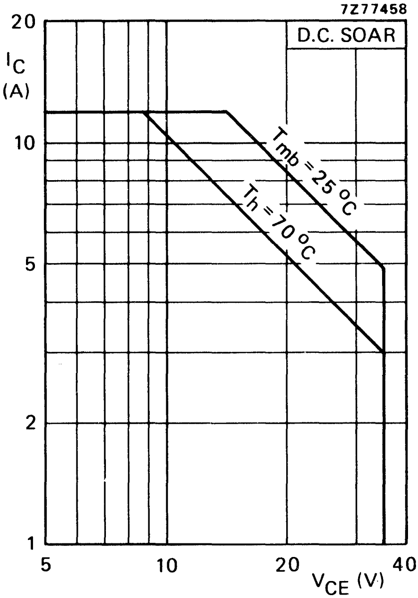


Fig. 2 D.C. SOAR.

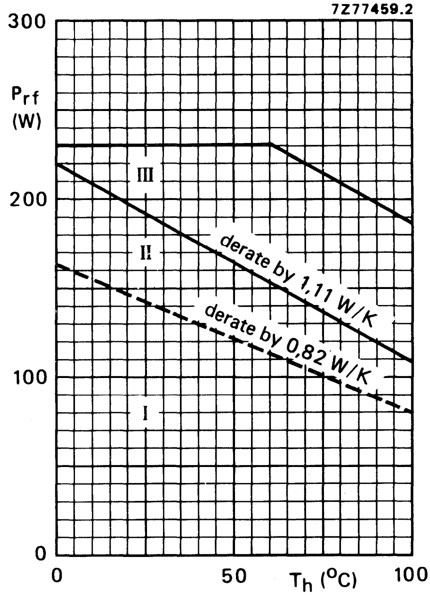


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f ≥ 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 100 W; T_{mb} = 90 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,03 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,71 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	70	V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	35	V
Emitter-base breakdown voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 35 V	I_{CES}	<	20	mA
D.C. current gain* I_C = 7 A; V_{CE} = 5 V	h_{FE}		15 to 80	
D.C. current gain ratio of matched devices* I_C = 7 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage* I_C = 20 A; I_B = 4 A	V_{CEsat}	typ.	2	V
Transition frequency at f = 100 MHz** $-I_E$ = 7 A; V_{CB} = 28 V	f_T	typ.	320	MHz
$-I_E$ = 20 A; V_{CB} = 28 V	f_T	typ.	300	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	255	pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	175	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

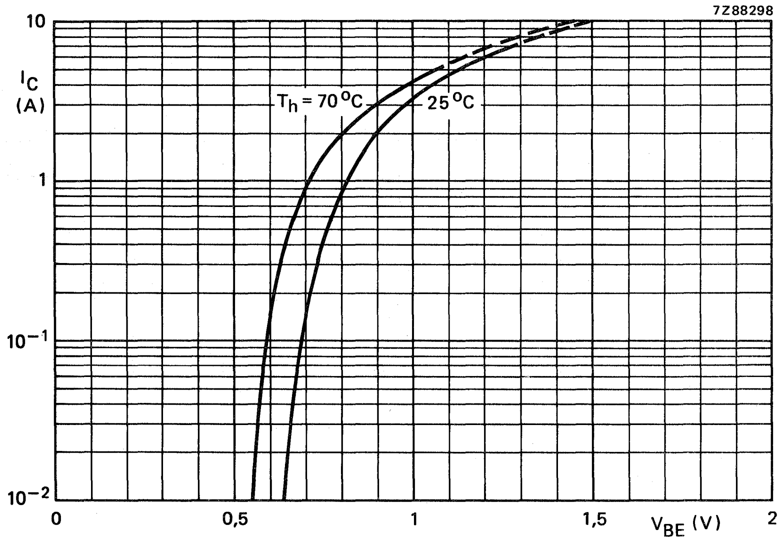


Fig. 4 Typical values; V_{CE} = 20 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

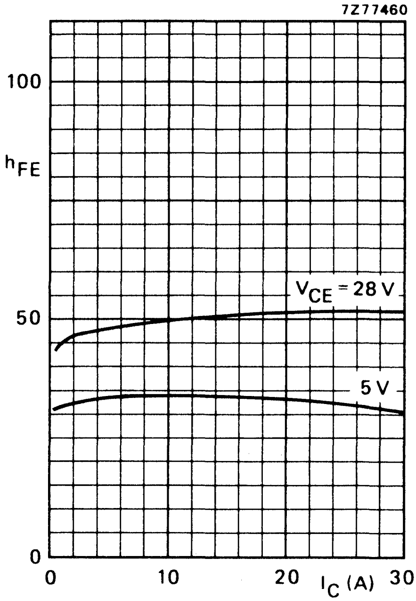


Fig. 5 Typical values; T_j = 25 °C.

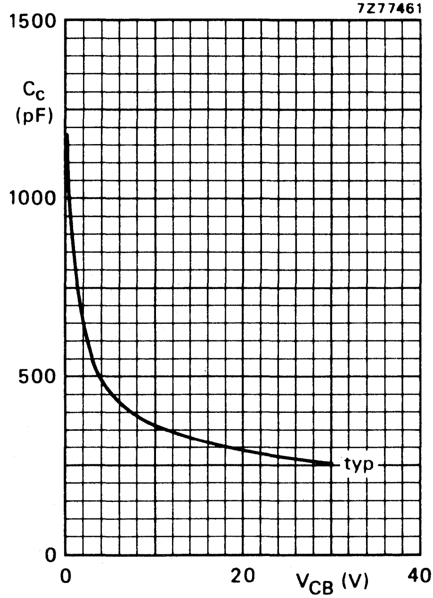


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

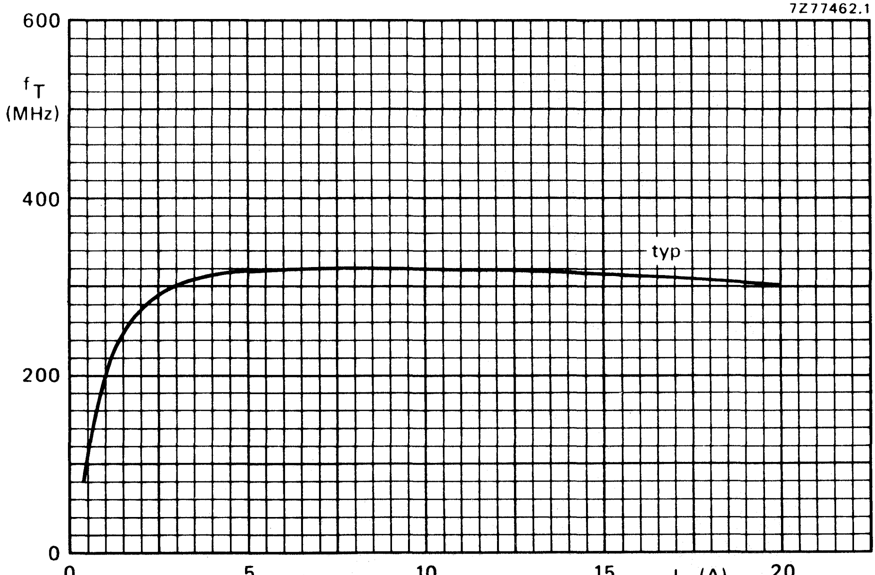


Fig. 7 V_{CB} = 28 V; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 130 W P.E.P.	I_C (A) at 130 W P.E.P.	d_3 dB	d_5 dB	$I_{C(ZS)}$ A
15 to 130 (P.E.P.)	**> 12**	**> 37,5**	**< 6,2**	**< −30**	**< −30**	**0,1**

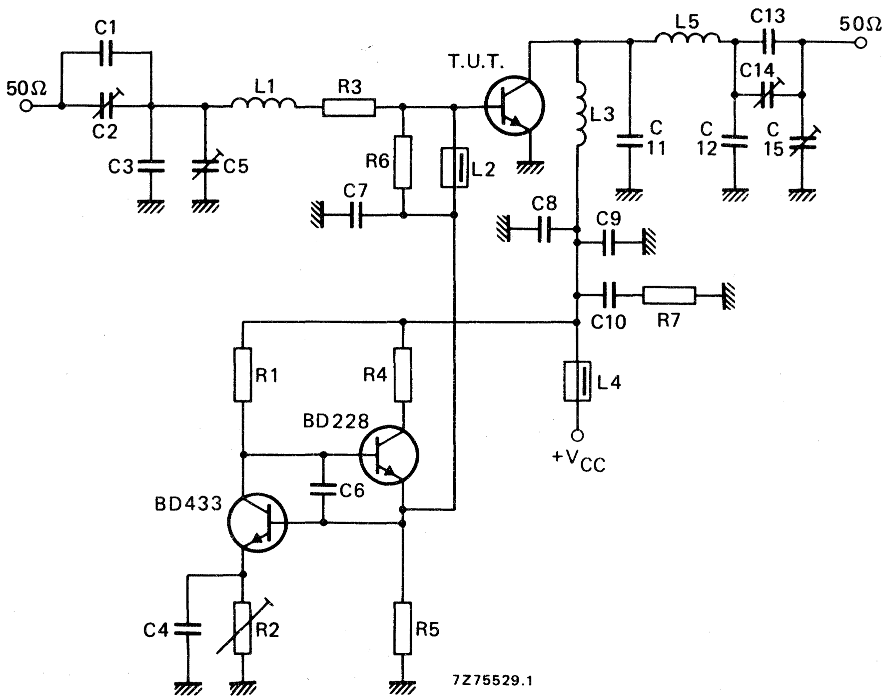


Fig. 8 Test circuit; s.s.b. class-AB.

List of components:

C1 = 27 pF ceramic capacitor (500 V)
C2 = 100 pF air dielectric trimmer (single insulated rotor type)
C3 = 180 pF polystyrene capacitor
C4 = C6 = C9 = 100 nF polyester capacitor
C5 = 100 pF air dielectric trimmer (single non-insulated rotor type)
C7 = C8 = 3,9 nF ceramic capacitor
C10 = 2,2 μF moulded metallized polyester capacitor
C11 = 2 x 180 pF polysterene capacitors in parallel
C12 = 3 x 56 pF and 33 pF ceramic capacitors in parallel (500 V)
C13 = 4 x 56 pF and 68 pF ceramic capacitors in parallel (500 V)

C14 = 360 pF air dielectric trimmer (single insulated rotor type)
C15 = 360 pF air dielectric trimmer (single non-insulated rotor type)

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9,0 mm; length 6,1 mm; leads 2 x 7 mm
L2 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L5 = 80 nH; 2,5 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 10,0 mm; leads 2 x 7 mm

R1 = 470 Ω wirewound resistor (5,5 W)
R2 = 4,7 Ω wirewound potentiometer (3 W)
R3 = 0,55 Ω; parallel connection of 4 x 2,2 Ω carbon resistors (± 5%; 0,5 W each)
R4 = 45 Ω; parallel connection of 4 x 180 Ω wirewound resistors (5,5 W each)
R5 = 56 Ω (± 5%) carbon resistor (0,5 W)
R6 = 27 Ω (± 5%) carbon resistor (0,5 W)
R7 = 4,7 Ω (± 5%) carbon resistor (0,5 W)

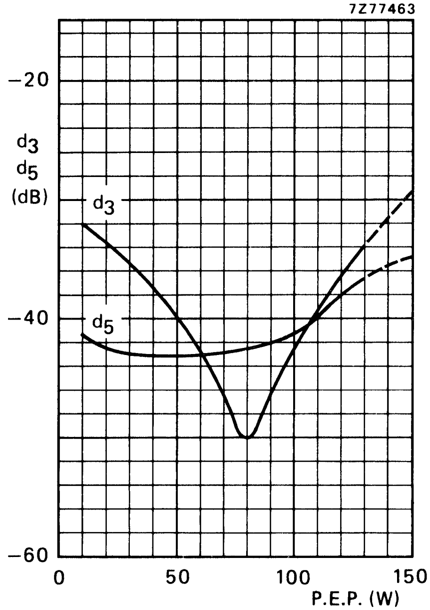


Fig. 9 Intermodulation distortion as a function of output power.*

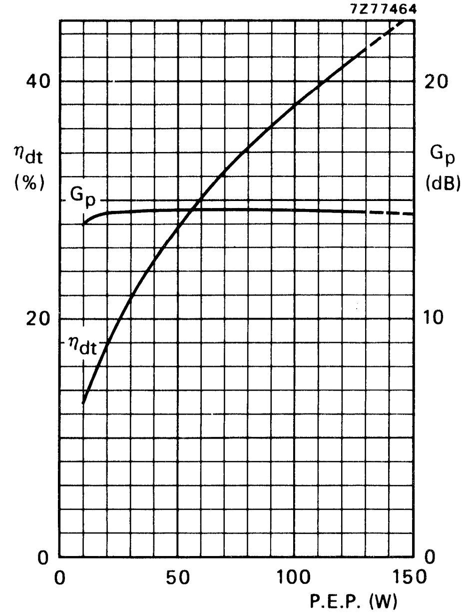


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 28 V; $I_{C(ZS)}$ = 100 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

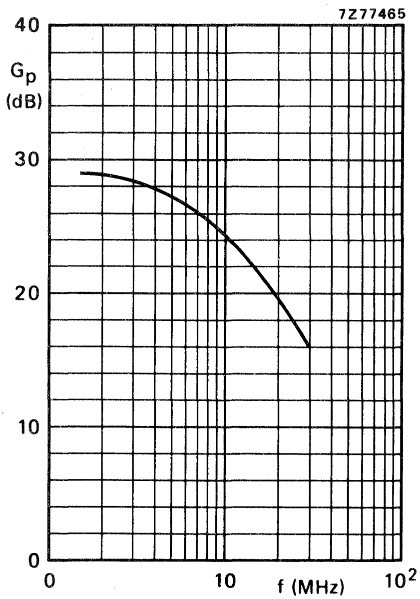


Fig. 11 Power gain as a function of frequency.

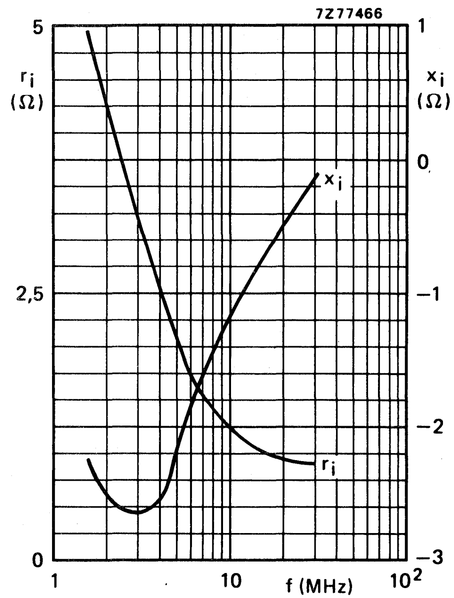


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 100 mA; P_L = 130 W; T_h = 25 °C; Z_L = 2,5 Ω.

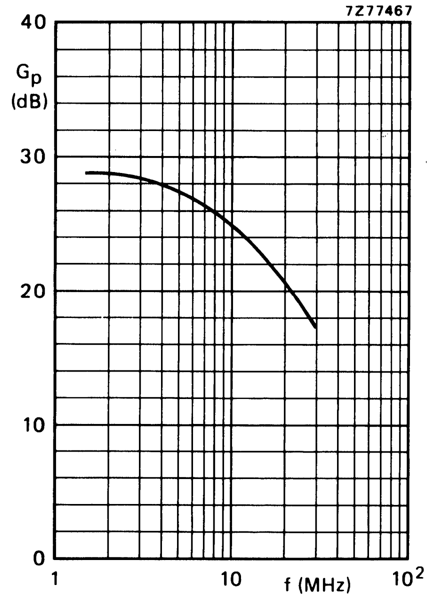


Fig. 13 Power gain as a function of frequency.

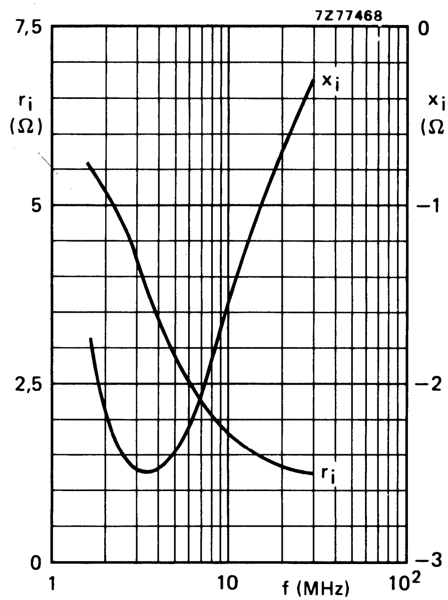


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for a push-pull amplifier with cross-neutralization in s.s.b class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 100 mA; P_L = 130 W; T_h = 25 °C; Z_L = 2,5 Ω; neutralizing capacitor: 150 pF.

APPLICATION INFORMATION (continued)

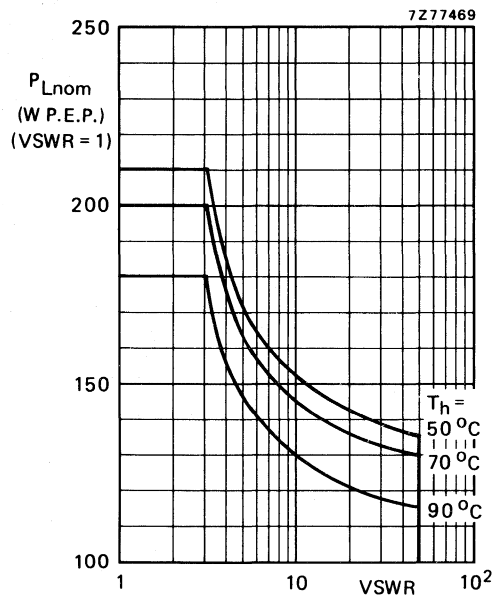


Fig. 15 R.F. SOAR; s.s.b. class-AB operation; f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W.
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)
T_h = 25 °C

f (MHz)	V_{CE}(V)	P_L (W)	P_S(W)	G_p (dB)	I_C (A)	η (%)	$\bar{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
87,5	28	130	typ. 23,2	typ. 7,5	typ. 6,2	typ. 75	0,62 + j0,73	273 − j42

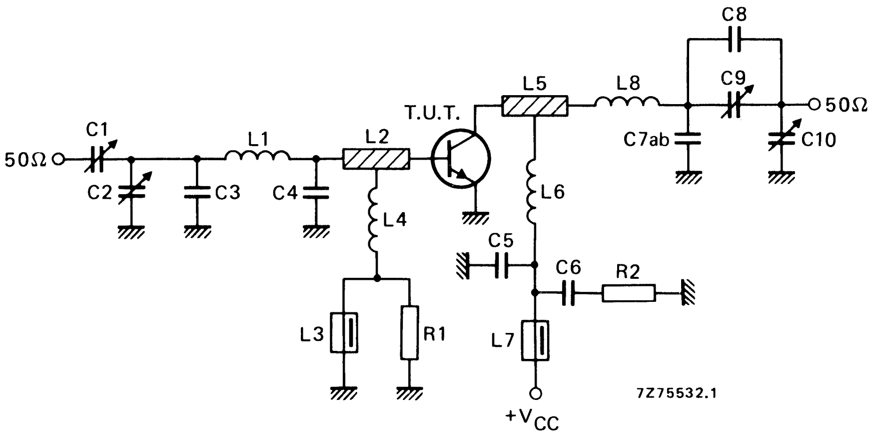


Fig. 16 Test circuit; c.w. class-B.

List of components:

C1 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C2 = C9 = C10 = 7 to 100 pF film dielectric trimmer (cat. no. 2222 809 07015)
C3 = C8 = 22 pF ceramic capacitor (500 V)
C4 = 4 x 82 pF ceramic capacitors in parallel (500 V)
C5 = 390 pF polystyrene capacitor
C6 = 220 nF polyester capacitor
C7a = 2 x 10 pF ceramic capacitors in parallel (500 V)
C7b = 2 x 8,2 pF ceramic capacitors in parallel (500 V)

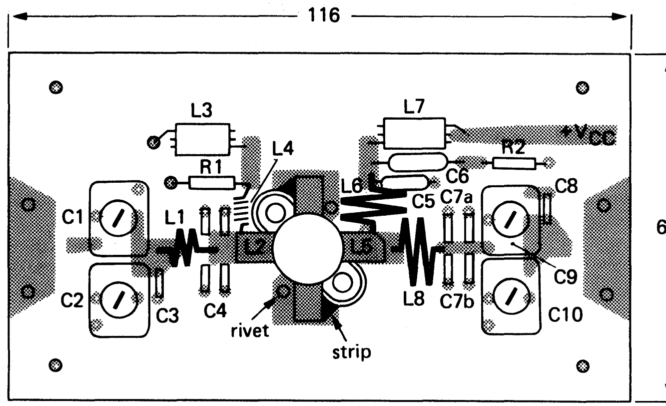
L1 = 25 nH; 2 turns Cu wire (1,6 mm); int. dia. 5,0 mm; length 4,6 mm; leads 2 x 5 mm
L2 = L5 = 2,4 nH; strip (12 mm x 6 mm); tap for L4 and L6 at 5 mm from transistor
L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L6 = 46 nH; 2 turns Cu wire (2,0 mm); int. dia. 9,0 mm; length 6,0 mm; leads 2 x 5 mm
L8 = 44 nH; 2 turns Cu wire (2,0 mm); int. dia. 9,0 mm; length 6,7 mm; leads 2 x 5 mm

L2 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric.

R1 = 10 Ω (± 10%) carbon resistor
R2 = 4,7 Ω (± 10%) carbon resistor

Component layout and printed-circuit board for 87,5 MHz test circuit are shown in Fig. 17.

APPLICATION INFORMATION (continued)



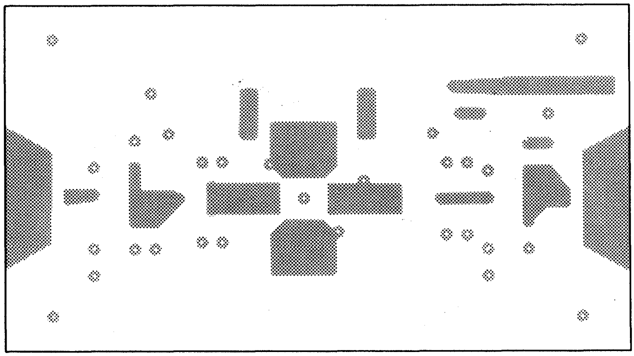


Fig. 17 Component layout and printed-circuit board for 87,5 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

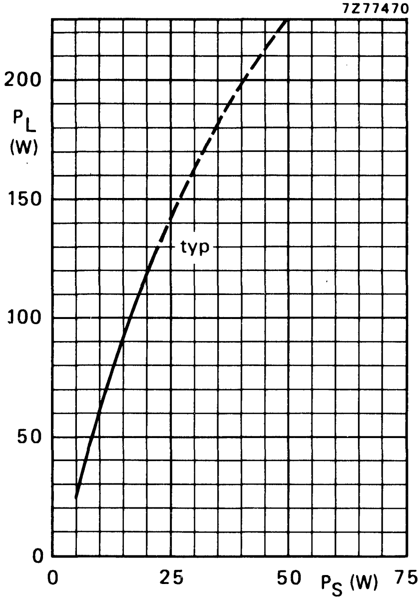


Fig. 18 V_{CE} = 28 V; f = 87,5 MHz; T_h = 25 °C.

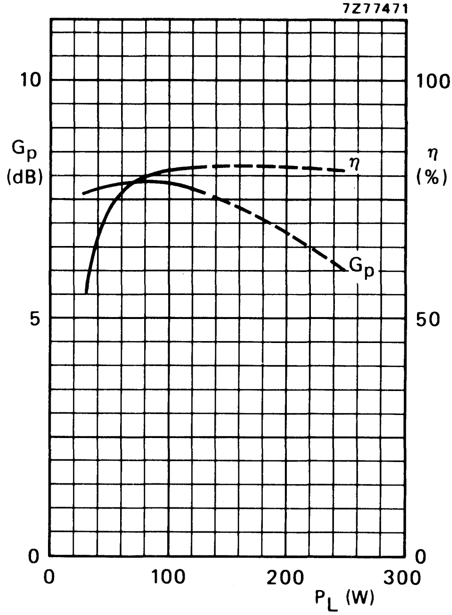


Fig. 19 V_{CE} = 28 V; f = 87,5 MHz; T_h = 25 °C; typical values.

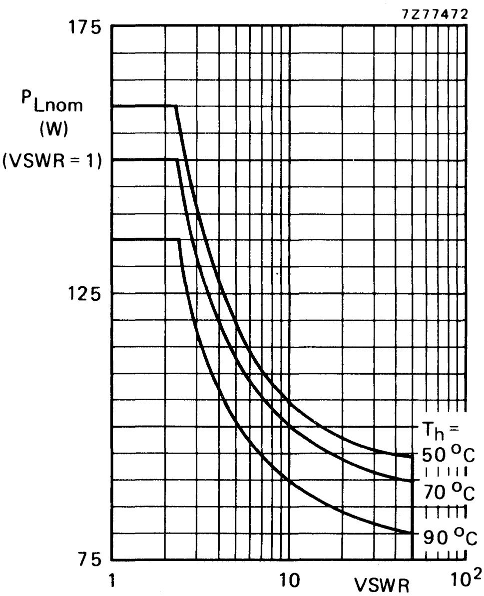


Fig. 20 R.F. SOAR; c.w. class-B operation; f = 87,5 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

APPLICATION INFORMATION (continued)

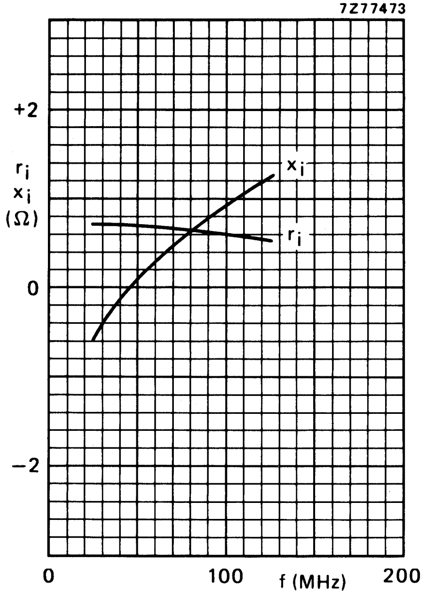


Fig. 21 V_{CE} = 28 V; P_L = 130 W; T_h = 25 °C; typical values.

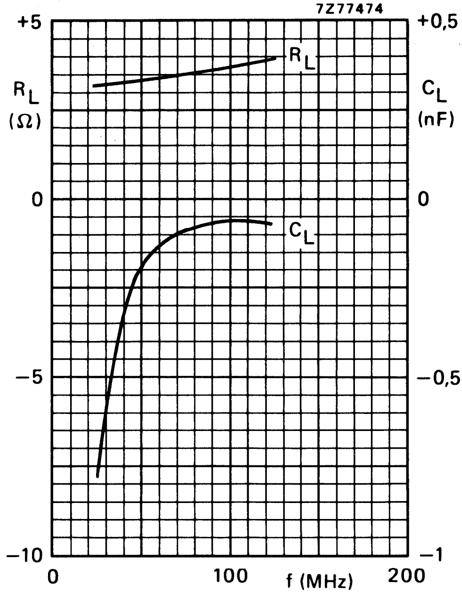


Fig. 22 V_{CE} = 28 V; P_L = 130 W; T_h = 25 °C; typical values.

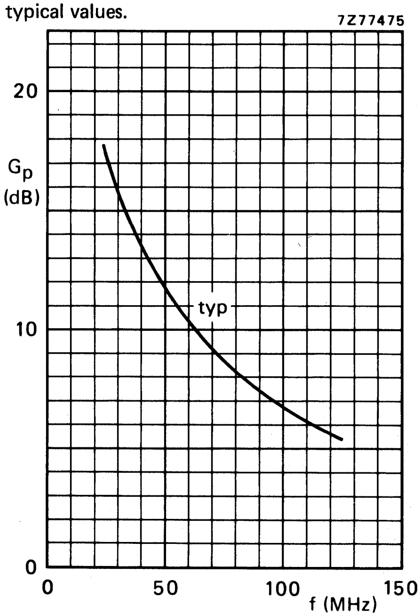


Fig. 23 V_{CE} = 28 V; P_L = 130 W; T_h = 25 °C.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB or B operated mobile, industrial and military transmitters in the h.f. and v.h.f. bands. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a ½" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	I_C $I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η %	d_3* dB
c.w. (class-B)	**28**	–	**150**	**100**	**> 6**	**> 70**	–
s.s.b. (class-A)	26	3	28	35 (P.E.P.)	typ. 19,5	–	typ. –40
s.s.b. (class-AB)	28	0,05	28	100 (P.E.P.)	typ. 19,0	typ. 42	typ. –30

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

MECHANICAL DATA

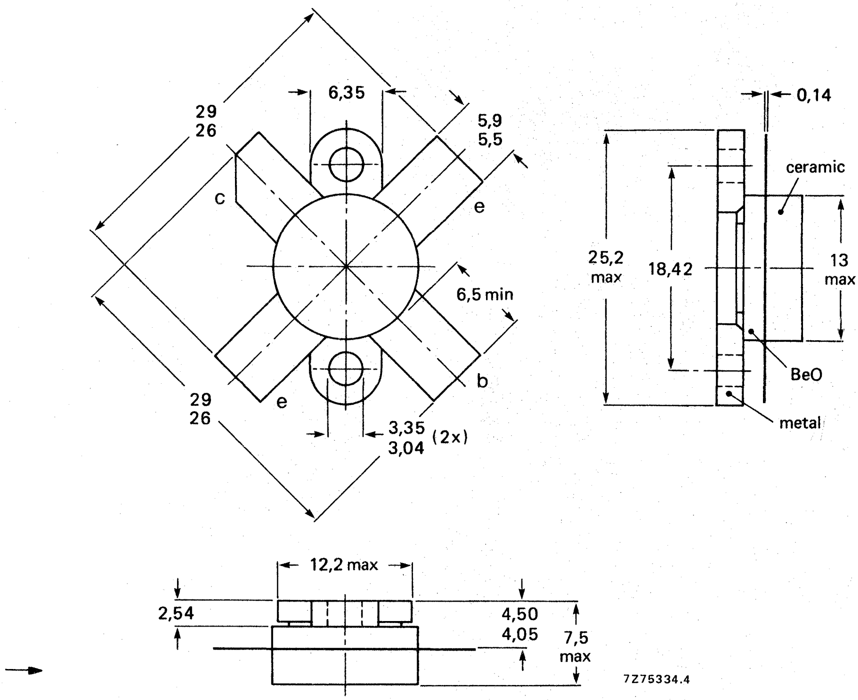
SOT-121 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	70 V
Collector-emitter voltage (open base)	V_{CEO}	max.	35 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	10 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	25 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	160 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

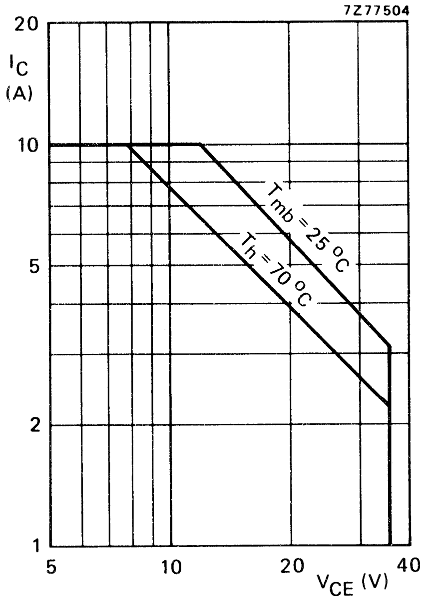


Fig. 2 D.C. SOAR.

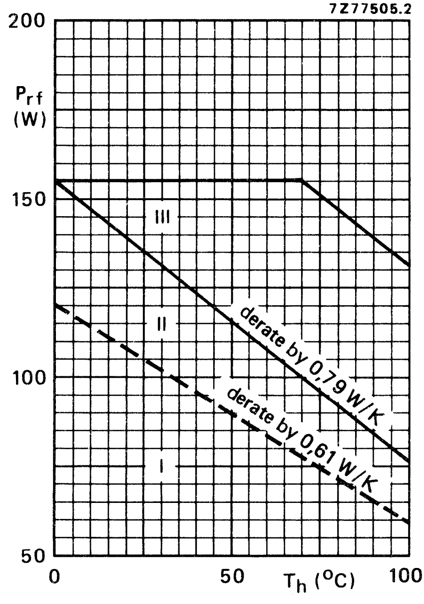


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 80 W; T_{mb} = 86 °C; i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,45 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,06 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	> 70 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	> 35 V
Emitter-base breakdown voltage open collector; I_E = 5 mA	$V_{(BR)EBO}$	> 4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 35 V	I_{CES}	< 5 mA
D.C. current gain* I_C = 5 A; V_{CE} = 5 V	h_{FE}	20 to 85
Collector-emitter saturation voltage I_C = 15 A; I_B = 3 A	V_{CEsat}	typ. 2 V
Transition frequency at f = 100 MHz** $-I_E$ = 5 A; V_{CB} = 28 V	f_T	typ. 370 MHz
$-I_E$ = 15 A; V_{CB} = 28 V	f_T	typ. 350 MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 28 V	C_c	typ. 155 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ. 102 pF
Collector-flange capacitance	C_{cf}	typ. 3 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0{,}02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0{,}01$.

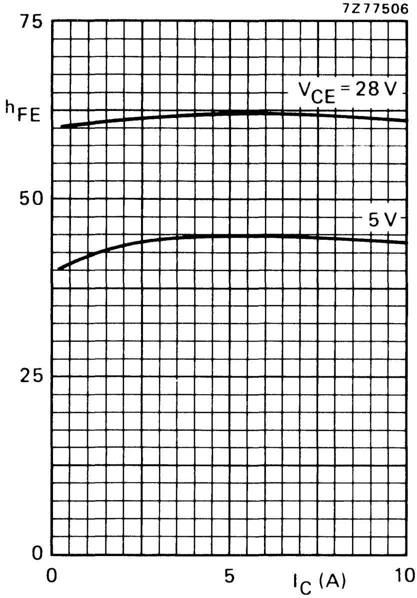


Fig. 4 Typical values; T_j = 25 °C.

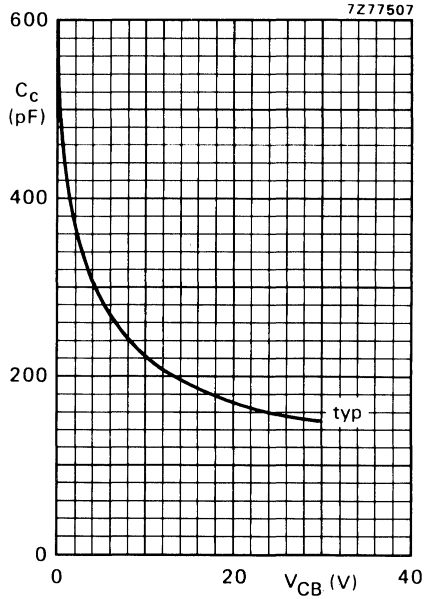


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

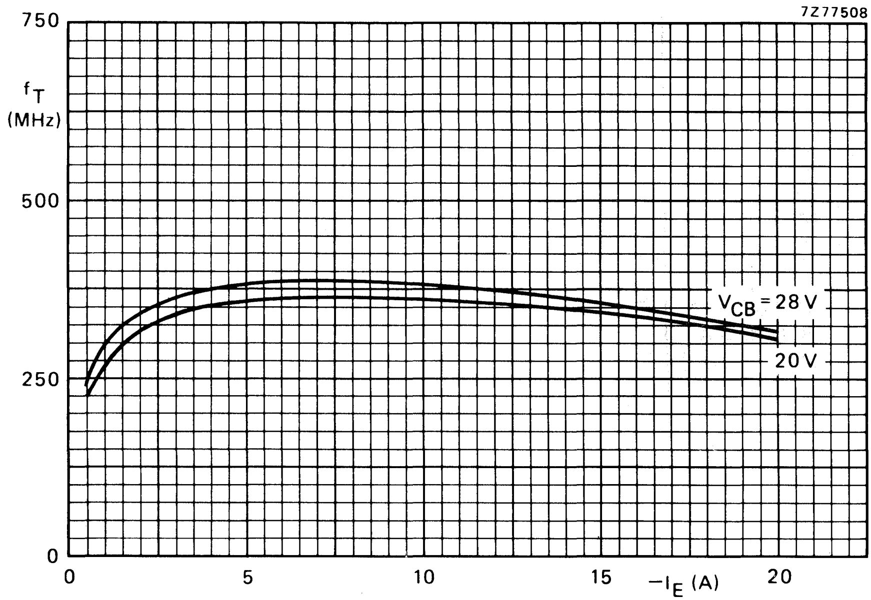


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit); T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_D (W)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (Ω)
150	28	100	$\leq$ 25	$\geq$ 70	0,74 + j1,35	4,30 + j0,60

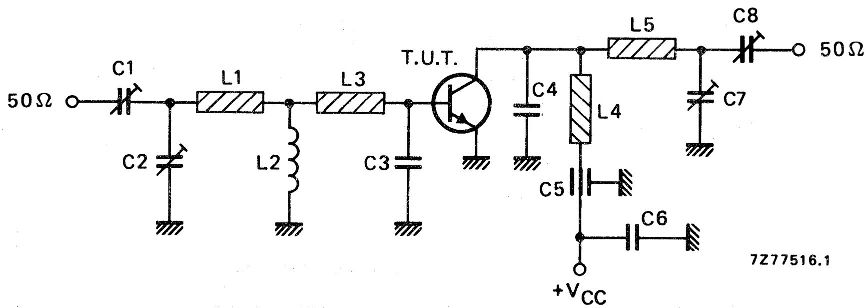


Fig. 7 Test circuit; c.w. class-B; f = 150 MHz.

List of components:

C1 = C2 = C7 = C8 = 5 to 100 pF film dielectric trimmer
C3 = 203 pF; 2 x 82 pF and 39 pF multilayer ceramic chip capacitors (500 V, ATC▲) in parallel
C4 = 39 pF multilayer ceramic chip capacitor (500 V, ATC▲)
C5 = 1 nF feed-through capacitor
C6 = 100 nF polyester capacitor

L1 = strip (30 mm x 8 mm); bent to form inverted 'U' shape with top 15 mm above heatsink, and bottom 5 mm above heatsink
L2 = 1 μH r.f. choke
L3 = strip; shape as shown in Fig. 8; 5 mm above heatsink
L4 = strip (40 mm x 8 mm); bent in form __┌‾‾‾, 25 mm at 15 mm above heatsink, 5 mm at 5 mm above heatsink
L5 = strip (75 mm long; width 8 mm); 5 mm above base

L1, L3, L4, and L5 are copper strips with a thickness of 0,6 mm.

Heatsink: aluminium; 0,9 K/W

At P_L = 100 W and V_{CE} = 28 V, the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 0,12 W/K.

Component layout on an aluminium heatsink for 150 MHz test circuit is shown in Fig. 8.

▲ ATC means American Technical Ceramics.

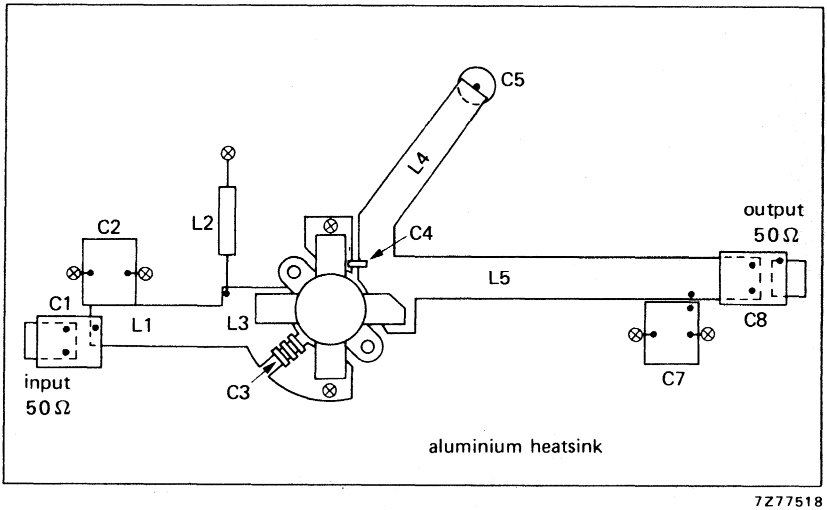


Fig. 8 Component layout on an aluminium heatsink for 150 MHz test circuit. ⊗ Earthing bolts.

APPLICATION INFORMATION (continued)

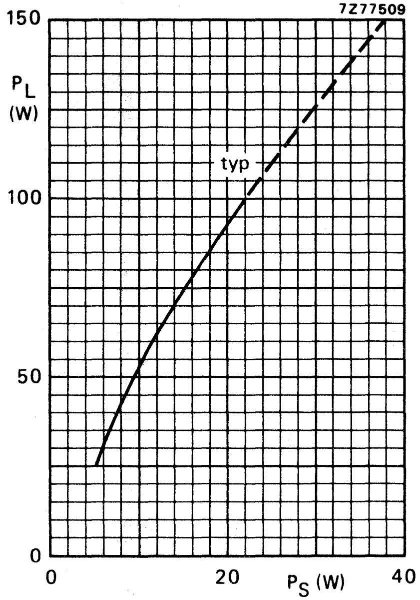


Fig. 9 V_{CE} = 28 V; f = 150 MHz; T_h = 25 °C.

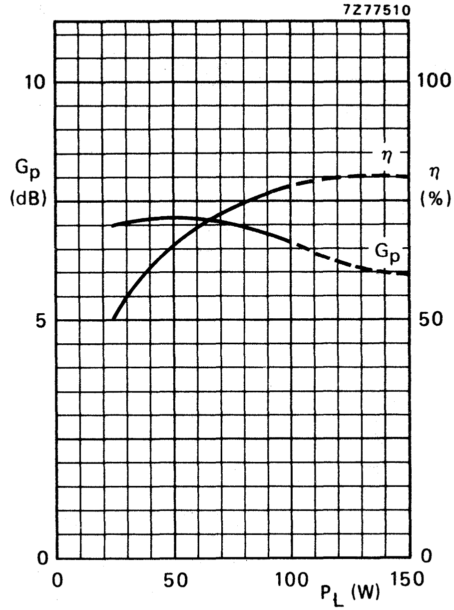


Fig. 10 V_{CE} = 28 V; f = 150 MHz; T_h = 25 °C; typical values.

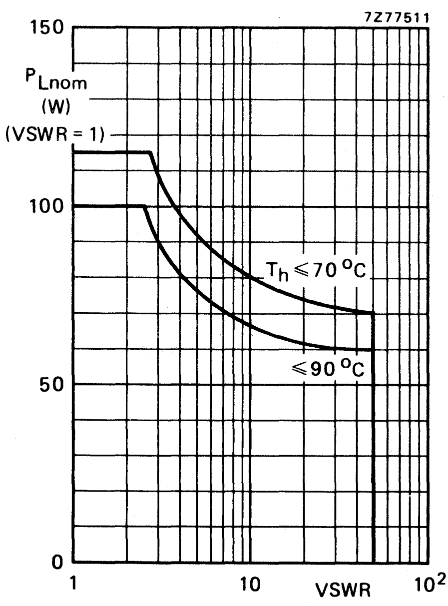


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 150 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,2 K/W. The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 4,7 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

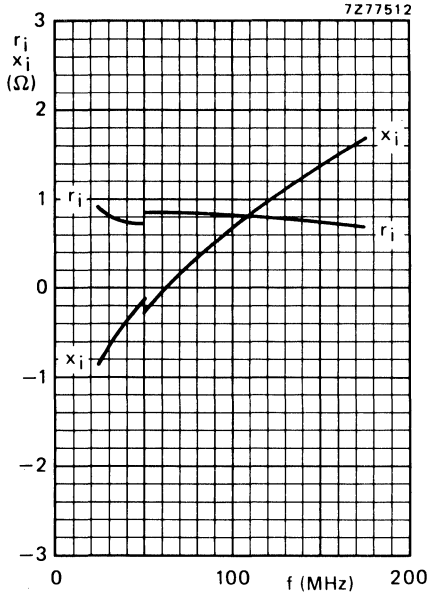


Fig. 12 Input impedance (series components).

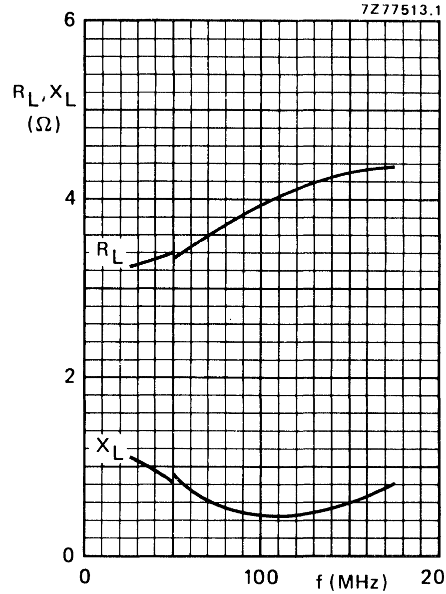


Fig. 13 Load impedance (series components).

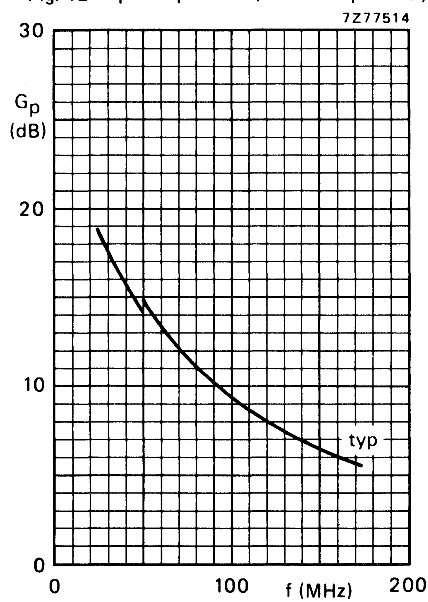


Fig. 14.

Conditions for Figs 12, 13 and 14:
V_{CE} = 28 V; P_L = 100 W; T_h = 25 °C;
typical values; class-B operation.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. class-A operation

V_{CE} = 26 V; T_h = 40 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB
35 (P.E.P.)	typ. 19,5	3	typ. −40

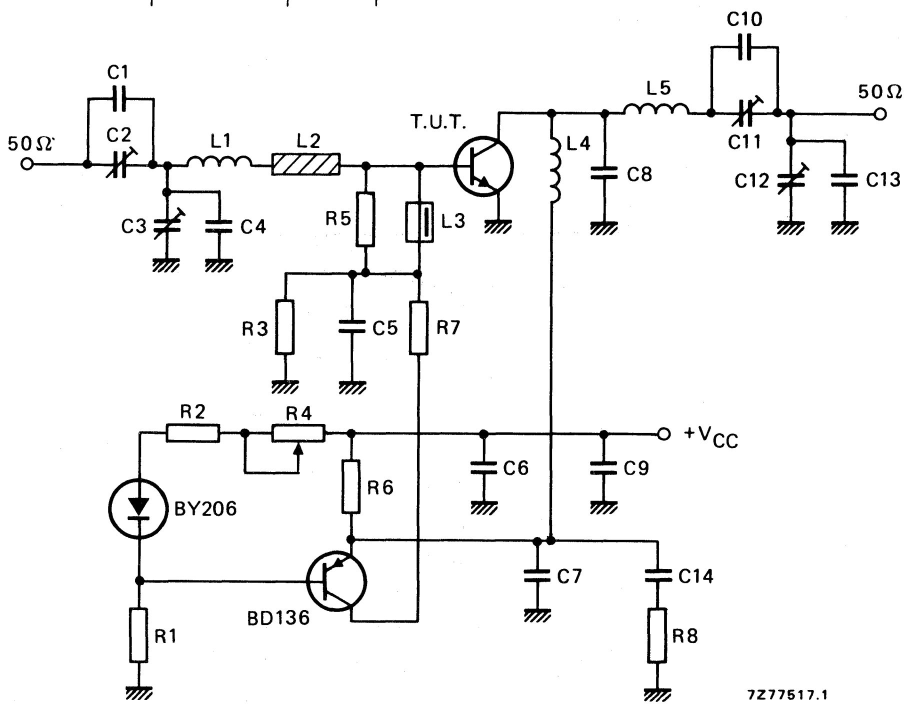


Fig. 15 Test circuit; s.s.b. class-A; f = 28 MHz.

List of components:

C1 = 33 pF ceramic capacitor (500 V)
C2 = 100 pF air dielectric trimmer (single insulated rotor type)
C3 = 280 pF air dielectric trimmer (single non-insulated rotor type)
C4 = 180 pF polystyrene capacitor
C5 = C6 = C7 = 3,9 nF ceramic capacitor
C8 = 2 x 33 pF ceramic capacitors in parallel (500 V)
C9 = 330 nF polyester capacitor
C10 = 82 pF ceramic capacitor (500 V)
C11 = 100 pF air dielectric trimmer (single insulated rotor type)
C12 = 180 pF air dielectric trimmer (single non-insulated rotor type)
C13 = 150 pF polystyrene capacitor
C14 = 390 nF polyester capacitor

List of components in Fig. 15 (continued):

L1 = 72 nH; 3 turns Cu wire (1,0 mm); int. dia. 7 mm; length 4,8 mm; leads 2 x 5 mm
L2 = Cu strip (28 mm x 5 mm x 0,2 mm); 18 mm at 3 mm above printed-circuit board
L3 = Ferroxcube choke coil (cat. no. 4312 020 36640)
L4 = 300 nH; 6 turns Cu wire (1,5 mm); int. dia. 12 mm; length 16 mm; leads 2 x 5 mm
L5 = 330 nH; 7 turns Cu wire (1,5 mm); int. dia. 12 mm; length 20,8 mm; leads 2 x 5 mm

R1 = 1,5 kΩ (± 5%) carbon resistor (0,5 W)
R2 = 100 Ω (± 5%) carbon resistor (0,5 W)
R3 = 68 Ω (± 5%) carbon resistor (0,5 W)
R4 = 100 Ω wirewound potentiometer
R5 = 33 Ω (± 5%) carbon resistor (0,5 W)
R6 = 0,68 Ω (± 10%) wirewound resistor (7 W)
R7 = 120 Ω wirewound resistor (8 W)
R8 = 10 Ω (± 10%) carbon resistor (0,5 W)

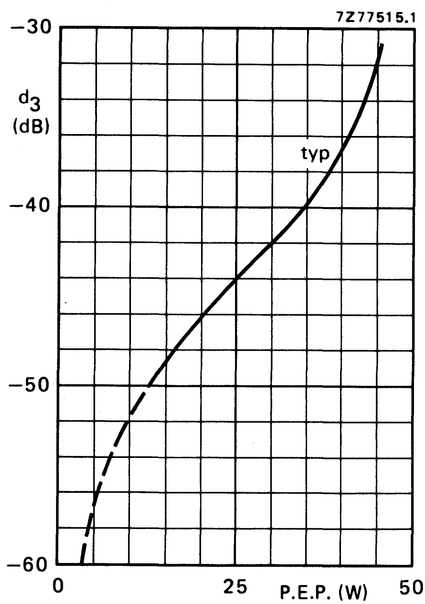


Fig. 16 Intermodulation distortion as a function of output power; V_{CE} = 26 V; I_C = 3 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 40 °C.

APPLICATION INFORMATION (continued)

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} %	I_C A	d_3* dB	d_5* dB	$I_{C(ZS)}$ mA
100 (P.E.P.)	typ. 19	typ. 42	typ. 4,3	typ. −30	typ. −37	50

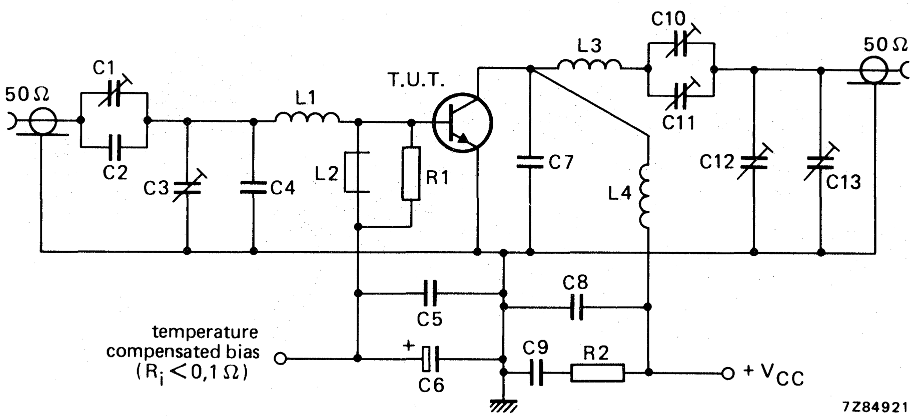


Fig. 17 Test circuit; s.s.b. class-AB; f = 28 MHz.

List of components:

C1 = C11 = 150 pF air dielectric trimmer (single insulated rotor type)
C2 = 27 pF ceramic capacitor (500 V)
C3 = C12 = 150 pF air dielectric trimmer (single non-insulated rotor type)
C4 = 180 pF ceramic capacitor (500 V)
C5 = C8 = 3,9 nF ceramic capacitor
C6 = 150 μF/6 V solid tantalum capacitor
C7 = 150 pF ceramic capacitor (500 V)
C9 = 100 nF polyester capacitor
C10 = 750 pF mica dielectric trimmer (single insultated rotor type)
C13 = 750 pF mica dielectric trimmer (single non-insulated rotor type)

L1 = 3 turns enamelled Cu wire (1,0 mm); int. dia. 12 mm; length 12 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 3 turns enamelled Cu wire (2,0 mm); int. dia. 12 mm; length 12 mm
L4 = 2 turns enamelled Cu wire (2,0 mm); int. dia. 12 mm; length 8 mm

R1 = 27 Ω (± 10%) carbon resistor (0,5 W)
R2 = 4,7 Ω (± 10%) carbon resistor (0,5 W)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

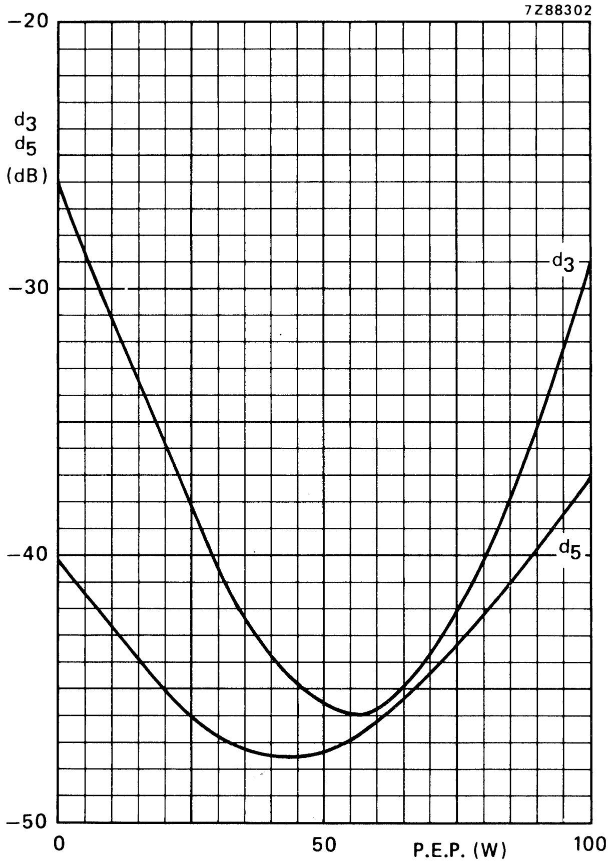


Fig. 18 Intermodulation distortion* as a function of output power.
Typical values; V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 ^oC.

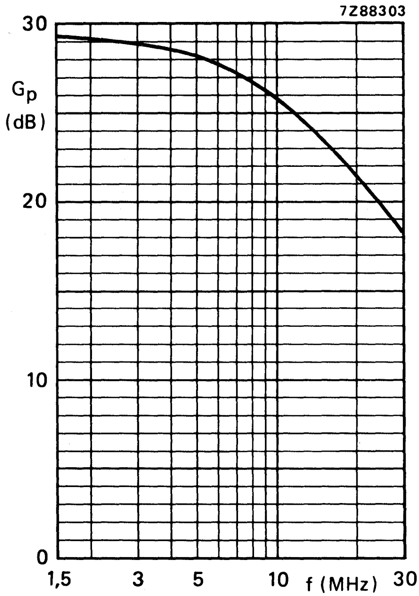


Fig. 19 Power gain as a function of frequency.

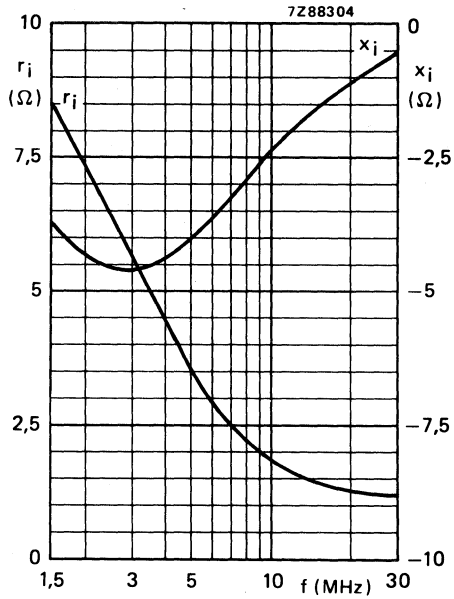


Fig. 20 Input impedance (series components).

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.
Conditions:
V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 100 W (P.E.P.); T_h = 25 °C; Z_L = 2,7 Ω.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for nominal supply voltages up to 13,5 V. The resistance stabilization of the transistor provides protection against device damage at severe load mismatch conditions.
The transistor is housed in a ¼" capstan envelope with a ceramic cap.

QUICK REFERENCE DATA

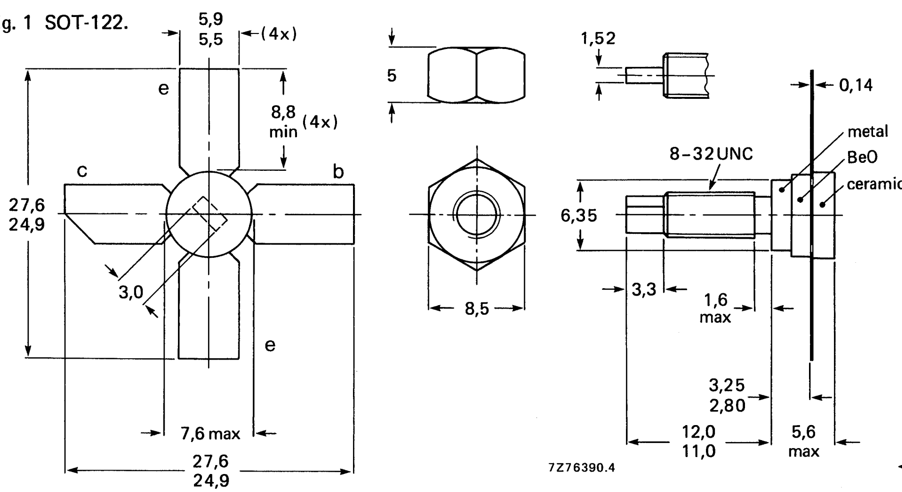
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**12,5**	**470**	**2**	**> 9,0**	**> 60**	**3,5 + j0,4**	**28 − j38**
c.w.	12,5	175	2	typ. 13,5	typ. 60	4,2 − j3,4	25 − j24

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

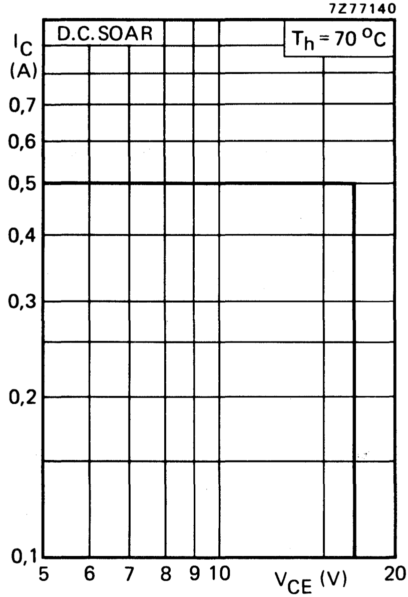
When locking is required an adhesive is preferred instead of a lock washer.

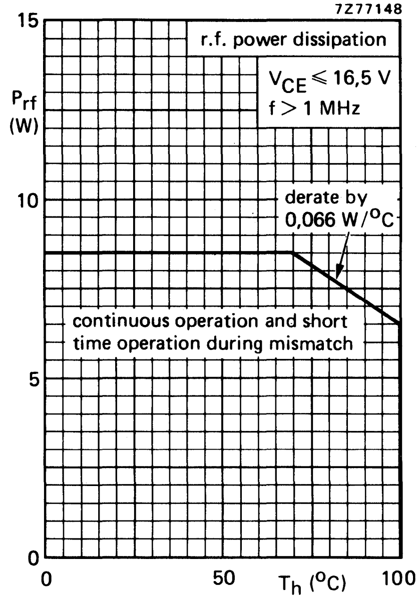
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max	36 V
Collector-emitter voltage (open base)	V_{CEO}	max	17 V
Emitter-base voltage (open collector)	V_{EBO}	max	4 V
Collector current (d.c.)	I_C	max	0,5 A
Collector current (peak value); f > 1 MHz	I_{CM}	max	1,5 A
Total power dissipation (d.c. and r.f.) up to T_h = 70 °C	P_{tot}	max	8,5 W





Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max	200 °C

THERMAL RESISTANCE

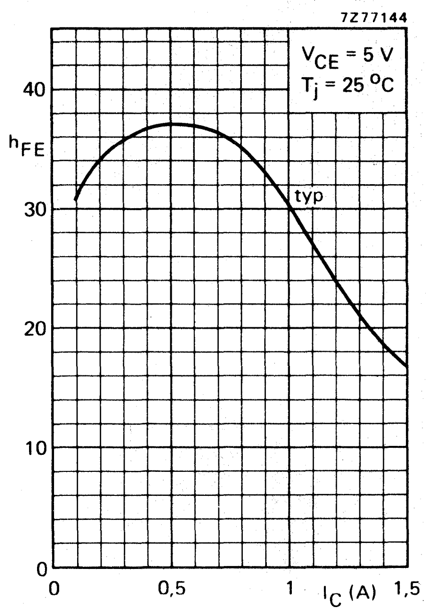
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	14,5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

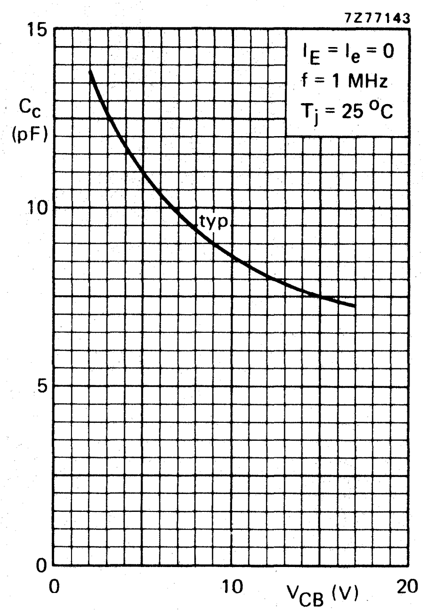
CHARACTERISTICS

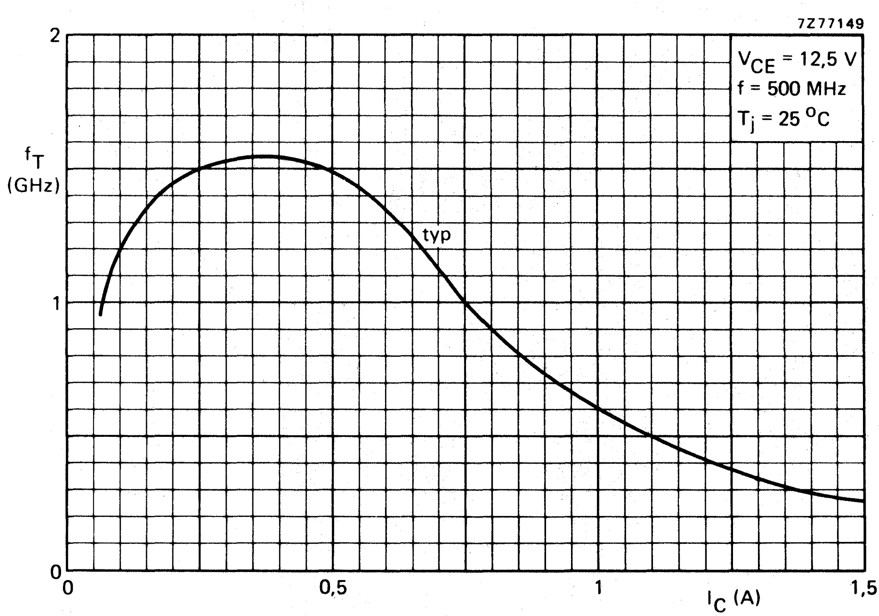
T_j = 25 °C

Breakdown voltages			
Collector-emitter voltage V_{BE} = 0; I_C = 5 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; I_C = 25 mA	$V_{(BR)CEO}$	>	17 V
Emitter-base voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 17 V	I_{CES}	<	2 mA
D.C. current gain * I_C = 250 mA; V_{CE} = 5 V	h_{FE}	> typ	10 35
Collector-emitter saturation voltage * I_C = 750 mA; I_B = 150 mA	V_{CEsat}	typ	0,6 V
Transition frequency at f = 500 MHz *			
I_C = 250 mA; V_{CE} = 12,5 V	f_T	typ	1,5 GHz
I_C = 750 mA; V_{CE} = 12,5 V	f_T	typ	1,0 GHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 12,5 V	C_c	typ	8 pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 12,5 V	C_{re}	typ	3,6 pF
Collector-stud capacitance	C_{cs}	typ	1,2 pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.


7Z77144
V_{CE} = 5 V
T_j = 25 °C
h_{FE}
typ
40
30
20
10
0
0
0,5
1
I_C (A)
1,5


7Z77143
$I_E = I_e = 0$
f = 1 MHz
T_j = 25 °C
C_c
(pF)
typ
15
10
5
0
0
10
V_{CB} (V)
20


7Z77149
V_{CE} = 12,5 V
f = 500 MHz
T_j = 25 °C
f_T
(GHz)
typ
2
1
0
0
0,5
1
I_C (A)
1,5

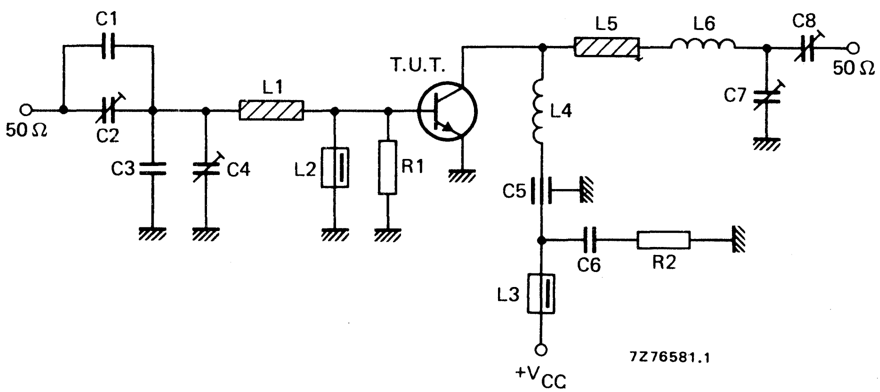
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
470	**12,5**	**2**	**< 0,25**	**> 9,0**	**< 0,27**	**> 60**	**3,5 + j0,4**	**28 – j38**
470	13,5	2	–	typ 10,5	–	typ 70	–	–
175	12,5	2	–	typ 13,5	–	typ 60	4,2 – j3,4	25 – j24

Test circuit for 470 MHz



List of components:

C1 = 2,2 pF (± 0,25 pF) ceramic capacitor
C2 = C4 = C7 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 3,3 pF (± 0,25 pF) ceramic capacitor
C5 = 100 pF ceramic feed-through capacitor
C6 = 100 nF polyester capacitor
C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

L1 = stripline (35,6 mm x 6,0 mm)
L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 178 nH; 4 turns Cu wire (1 mm); int. dia. 6 mm; length 7 mm; leads 2 x 5 mm
L5 = stripline (10,0 mm x 6,0 mm)
L6 = 28 nH; ½ turn Cu wire (1 mm); int. dia. 10 mm

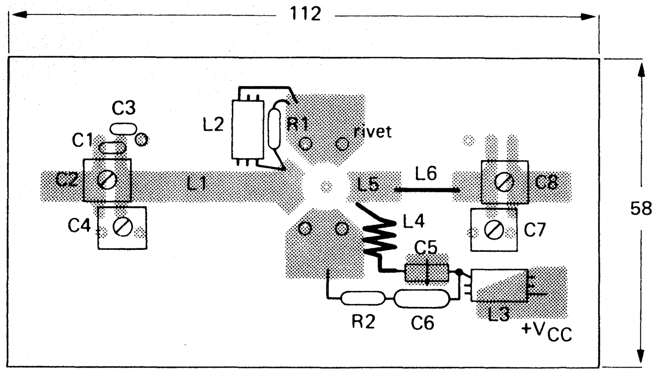
L1 and L5 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

R1 = 100 Ω (± 5%) carbon resistor
R2 = 10 Ω (± 5%) carbon resistor

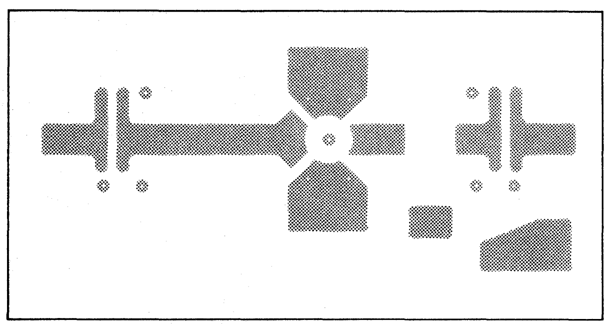
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.

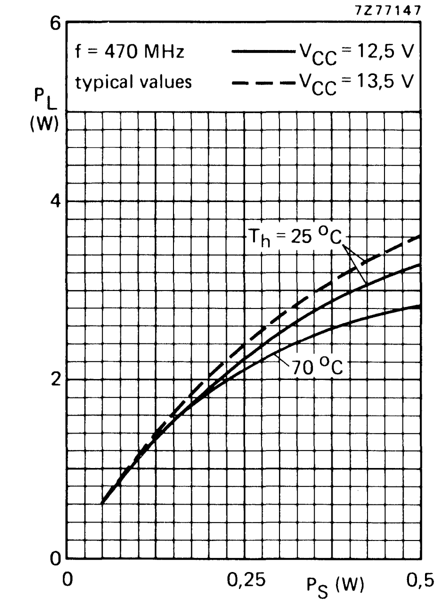


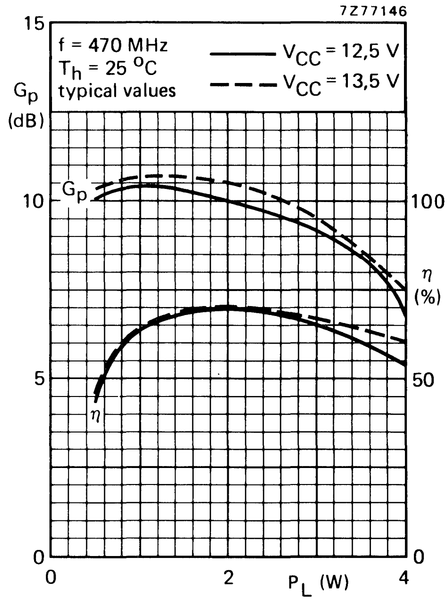
7Z76579

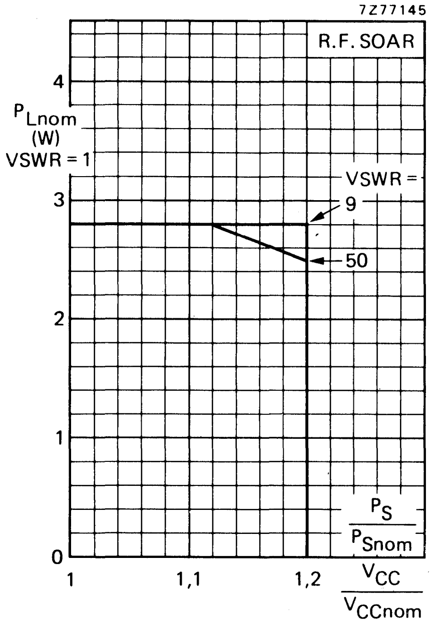


7Z76580

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.







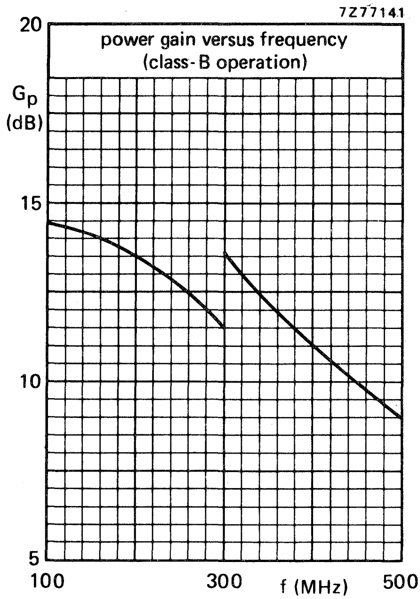
Conditions for R.F. SOAR

f = 470 MHz
T_h = 70 °C
$R_{th\ mb\text{-}h}$ = 0,6 K/W
V_{CCnom} = 12,5 V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio, with VSWR as parameter.

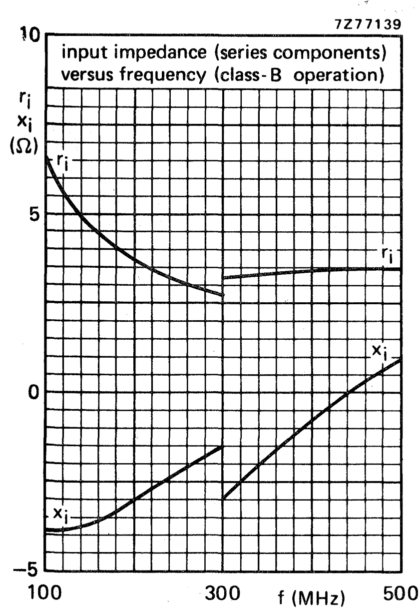
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

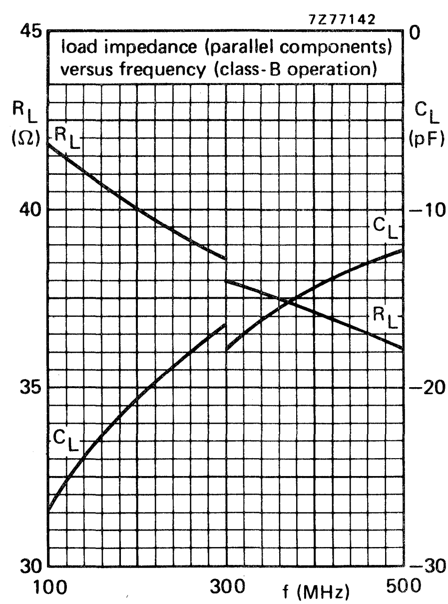
OPERATING NOTE Below 300 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.



Measuring conditions for the graphs on this page

V_{CC} = 12,5 V
P_L = 2 W
T_h = 25 °C
typical values





U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for nominal supply voltages up to 13,5 V.
The resistance stabilization of the transistor provides protection against device damage at severe load mismatch conditions.
The transistor is housed in a ¼″ capstan envelope with a ceramic cap.

QUICK REFERENCE DATA

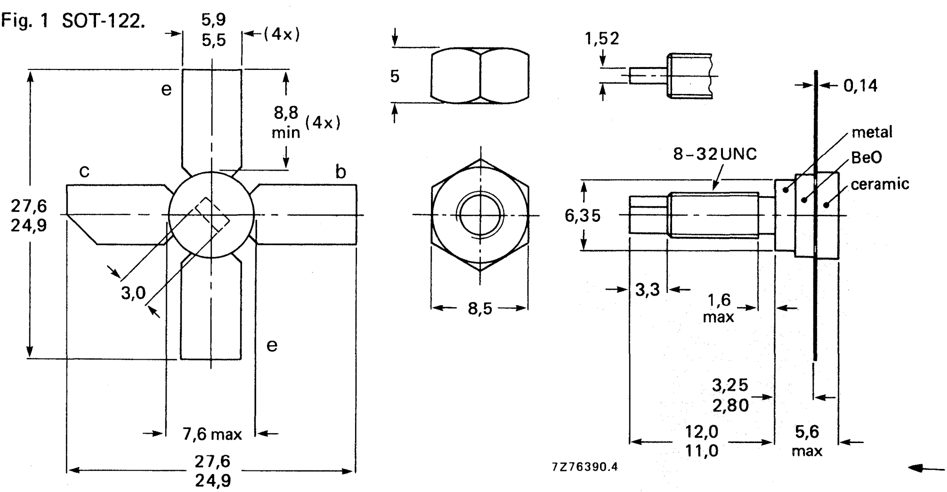
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**12,5**	**470**	**4**	**> 8,0**	**> 60**	**2,1 + j2,3**	**57 − j56**
c.w.	12,5	175	4	typ. 15,0	typ. 60	2,0 − j2,2	51 − j48

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

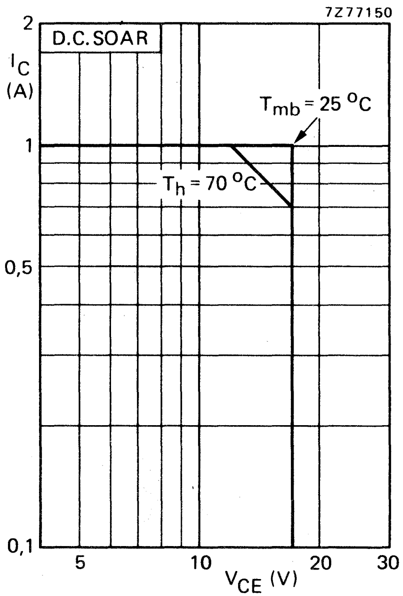
When locking is required an adhesive is preferred instead of a lock washer.

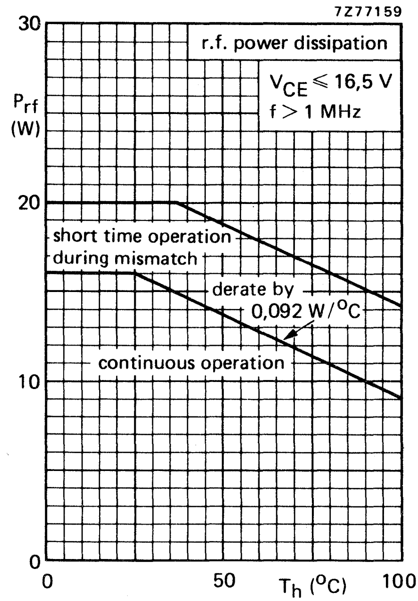
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max	36 V
Collector-emitter voltage (open base)	V_{CEO}	max	17 V
Emitter-base voltage (open collector)	V_{EBO}	max	4 V
Collector current (d.c.)	I_C	max	1 A
Collector current (peak value); f > 1 MHz	I_{CM}	max	3 A
Total power dissipation (d.c. and r.f.) up to T_{mb} = 25 °C	P_{tot}	max	17 W





Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max	200 °C

THERMAL RESISTANCE

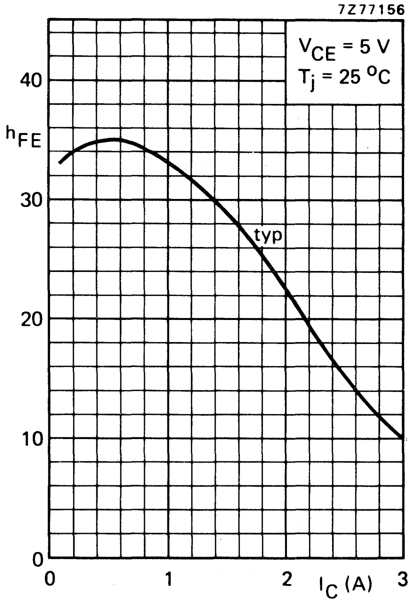
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	10,3 °C/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 °C/W

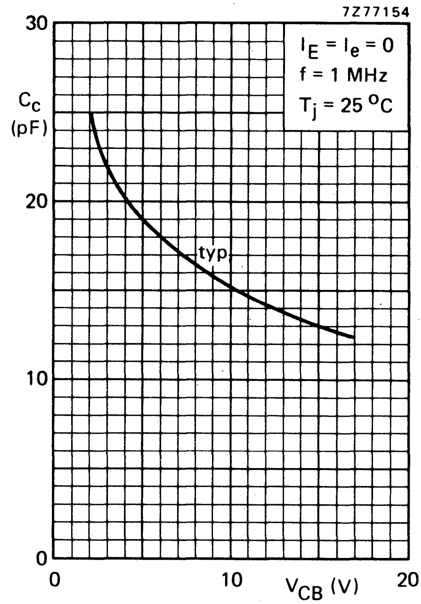
CHARACTERISTICS

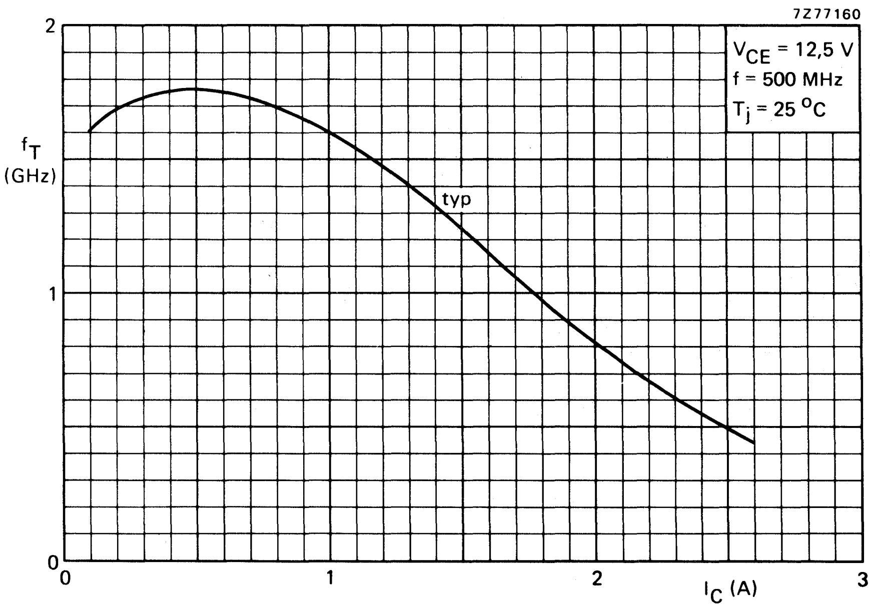
$T_j = 25\ ^oC$

Breakdown voltages			
Collector-emitter voltage $V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	17 V
Emitter-base voltage open collector; $I_E = 4$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 17$ V	I_{CES}	<	4 mA
D.C. current gain *			
$I_C = 0,5$ A; $V_{CE} = 5$ V	h_{FE}	>	10
		typ	35
Collector-emitter saturation voltage *			
$I_C = 1,5$ A; $I_B = 0,3$ A	V_{CEsat}	typ	0,75 V
Transition frequency at f = 500 MHz *			
$I_C = 0,5$ A; $V_{CE} = 12,5$ V	f_T	typ	1,75 GHz
$I_C = 1,5$ A; $V_{CE} = 12,5$ V	f_T	typ	1,25 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 12,5$ V	C_c	typ	14 pF
Feedback capacitance at f = 1 MHz			
$I_C = 40$ mA; $V_{CE} = 12,5$ V	C_{re}	typ	7,1 pF
Collector-stud capacitance	C_{cs}	typ	1,2 pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.


7Z77156
V_{CE} = 5 V
T_j = 25 °C
h_{FE}
typ
I_C (A)
0
1
2
3
0
10
20
30
40


7Z77154
$I_E = I_e = 0$
f = 1 MHz
T_j = 25 °C
C_c
(pF)
typ
V_{CB} (V)
0
10
20
0
10
20
30


7Z77160
V_{CE} = 12,5 V
f = 500 MHz
T_j = 25 °C
f_T
(GHz)
typ
I_C (A)
0
1
2
3
0
1
2

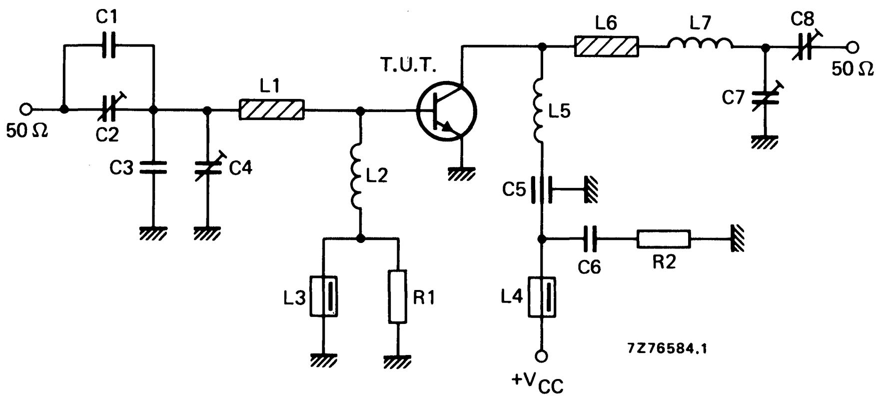
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
470	**12,5**	**4**	**< 0,63**	**> 8,0**	**< 0,53**	**> 60**	**2,1 + j2,3**	**57 − j56**
470	13,5	4	−	typ 9,5	−	typ 65	−	−
175	12,5	4	−	typ 15,0	−	typ 60	2,0 − j2,2	51 − j48

Test circuit for 470 MHz



List of components:

C1 = 2,2 pF (± 0,25 pF) ceramic capacitor
C2 = C7 = C8 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = 5,6 pF (± 0,25 pF) ceramic capacitor
C4 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C5 = 100 pF ceramic feed-through capacitor
C6 = 100 nF polyester capacitor

L1 = stripline (22,5 mm x 6,0 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 x 5 mm
L3 = L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = 51 nH; 3,5 turns Cu wire (1 mm); int. dia. 6 mm; coil length 7 mm; leads 2 x 5 mm
L6 = stripline (10,0 mm x 6,0 mm)
L7 = 15 nH; 1 turn Cu wire (1 mm); int. dia. 5 mm; leads 2 x 5 mm

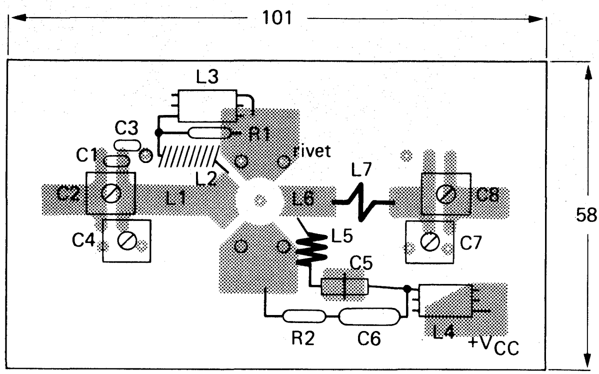
L1 and L6 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16″.

R1 = R2 = 10 Ω (± 5%) carbon resistor

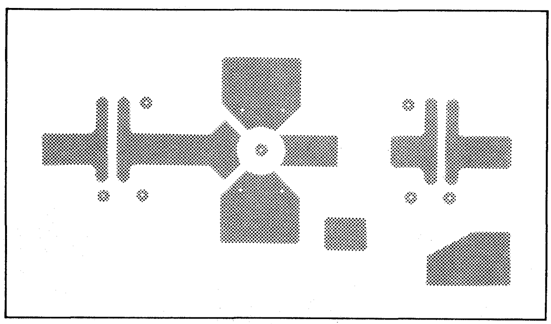
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.

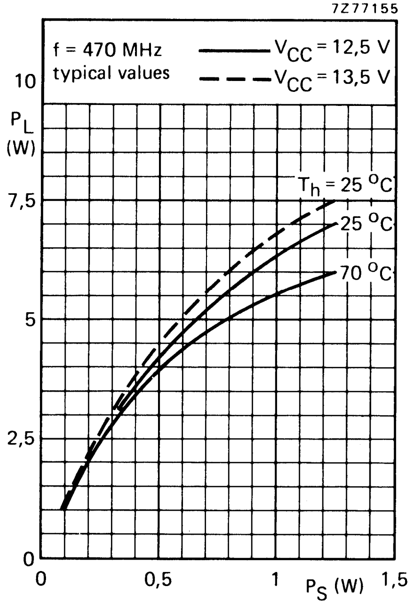


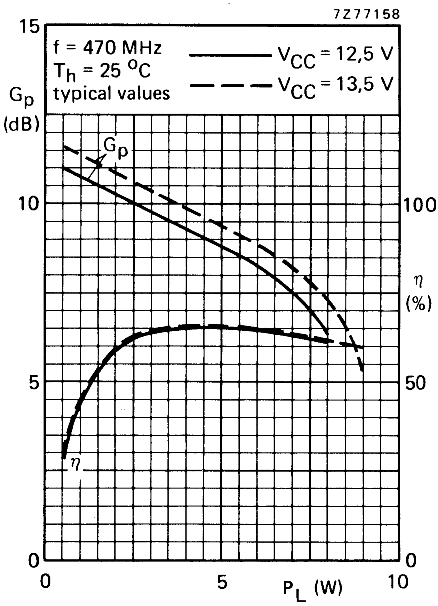
7Z76582

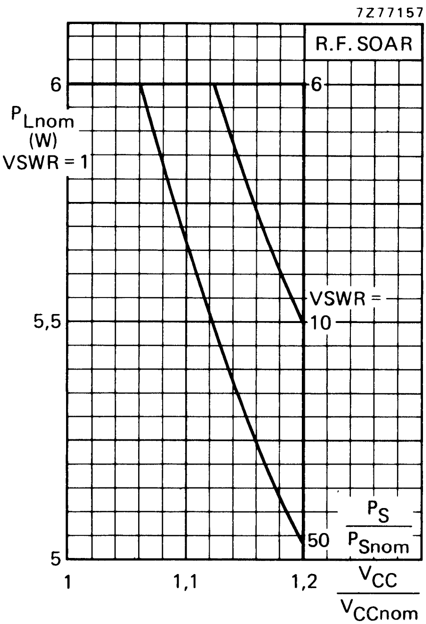


7Z76583

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.







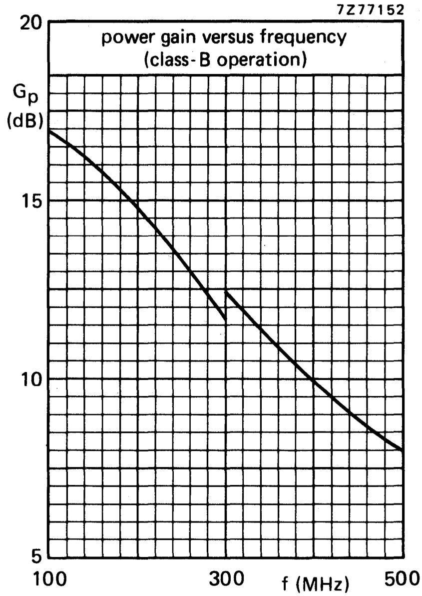
Conditions for R.F. SOAR

f = 470 MHz
T_h = 70 °C
$R_{th\ mb\text{-}h}$ = 0,6 K/W
V_{CCnom} = 12,5 V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other that the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio, with VSWR as parameter.

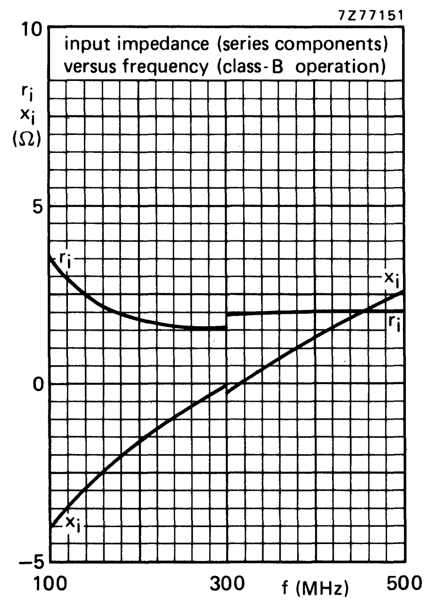
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

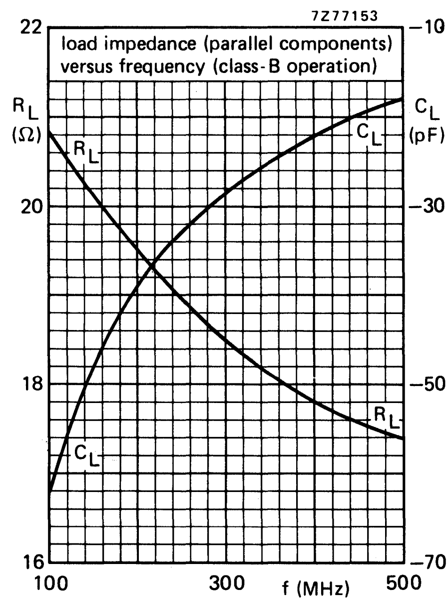
OPERATING NOTE Below 300 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.



Measuring conditions for the graphs on this page

V_{CC} = 12,5 V
P_L = 4 W
T_h = 25 °C
typical values





U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for nominal supply voltages up to 13,5 V.
The resistance stabilization of the transistor provides protection against device damage at severe load mismatch conditions.
The transistor is housed in a ¼″ capstan envelope with a ceramic cap.

QUICK REFERENCE DATA

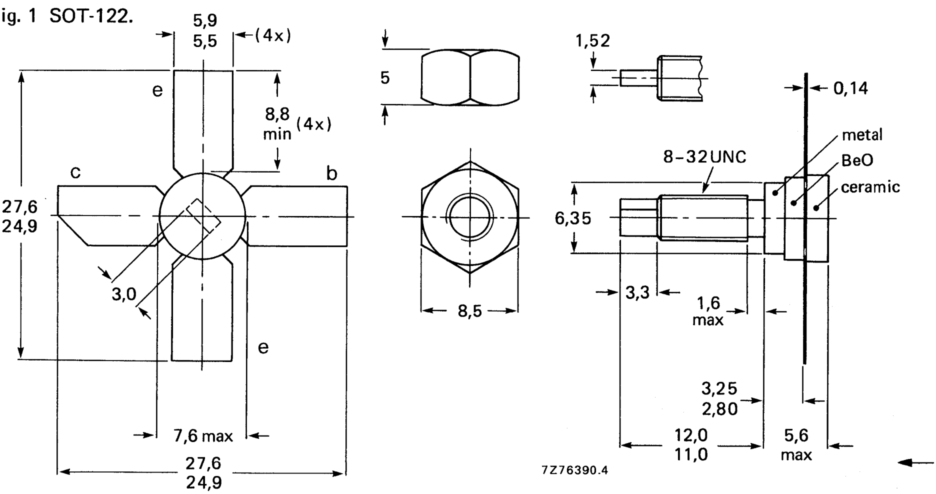
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**12,5**	**470**	**10**	**> 6,0**	**> 60**	**1,3 + j2,5**	**150 − j66**
c.w.	12,5	175	10	typ. 13,5	typ. 60	1,2 − j0,6	140 − j80

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

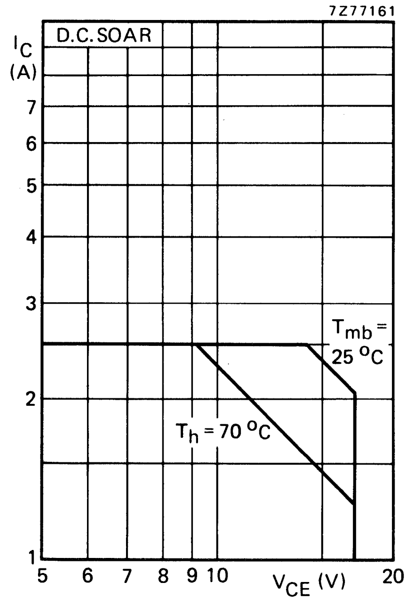
When locking is required an adhesive is preferred instead of a lock washer.

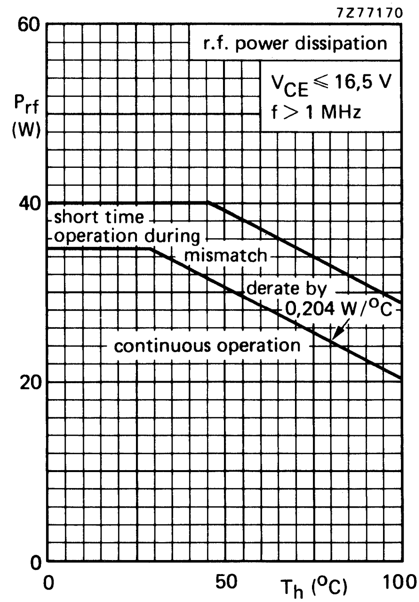
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max	36	V
Collector-emitter voltage (open base)	V_{CEO}	max	17	V
Emitter-base voltage (open collector)	V_{EBO}	max	4	V
Collector current (d.c. or average)	I_C	max	2,5	A
Collector current (peak value); f > 1 MHz	I_{CM}	max	7,5	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{tot}	max	40	W





Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max	200	°C

THERMAL RESISTANCE

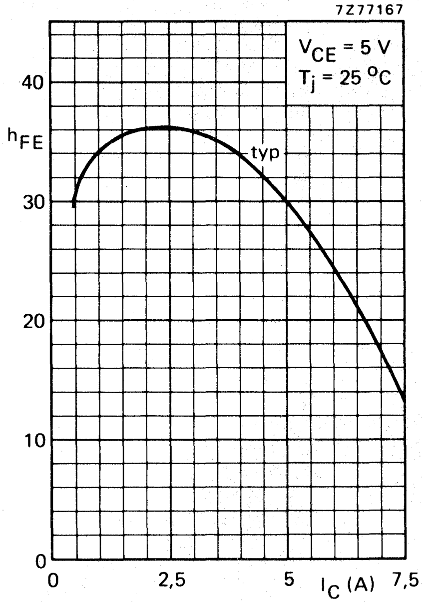
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4,3	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

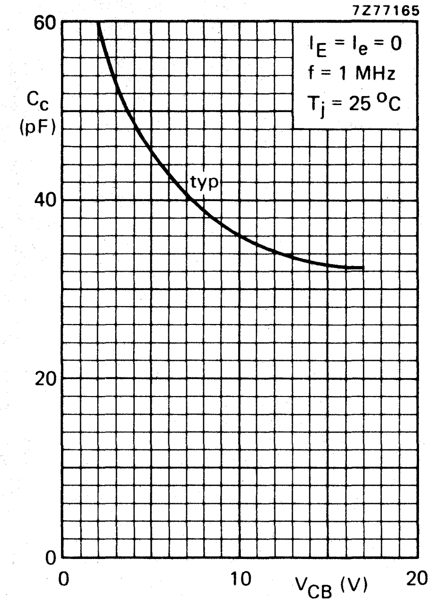
CHARACTERISTICS

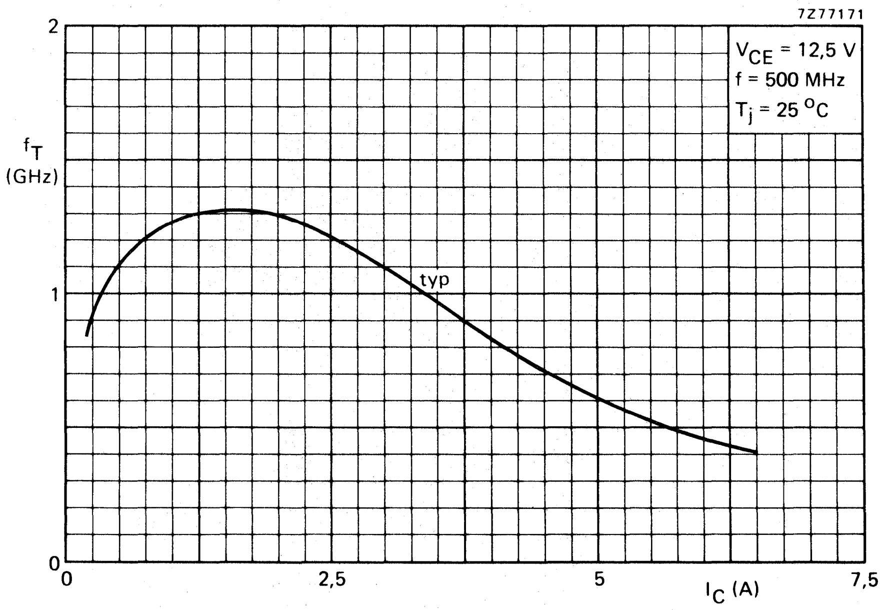
$T_j = 25\ ^oC$

Breakdown voltages			
Collector-emitter voltage			
$V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage			
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	17 V
Emitter-base voltage			
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 17$ V	I_{CES}	<	10 mA
D.C. current gain *			
$I_C = 1,25$ A; $V_{CE} = 5$ V	h_{FE}	>	10
		typ	35
Collector-emitter saturation voltage *			
$I_C = 3,75$ A; $I_B = 0,75$ A	V_{CEsat}	typ	0,75 V
Transition frequency at f = 500 MHz *			
$I_C = 1,25$ A; $V_{CE} = 12,5$ V	f_T	typ	1,3 GHz
$I_C = 3,75$ A; $V_{CE} = 12,5$ V	f_T	typ	0,9 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 12,5$ V	C_c	typ	34 pF
Feedback capacitance at f = 1 MHz			
$I_C = 100$ mA; $V_{CE} = 12,5$ V	C_{re}	typ	18 pF
Collector-stud capacitance	C_{cs}	typ	1,2 pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.


7Z77167
V_{CE} = 5 V
T_j = 25 °C
h_{FE}
typ
40
30
20
10
0
0
2,5
5
7,5
I_C (A)


7Z77165
I_E = I_e = 0
f = 1 MHz
T_j = 25 °C
C_c
(pF)
typ
60
40
20
0
0
10
20
V_{CB} (V)


7Z77171
V_{CE} = 12,5 V
f = 500 MHz
T_j = 25 °C
f_T
(GHz)
typ
2
1
0
0
2,5
5
7,5
I_C (A)

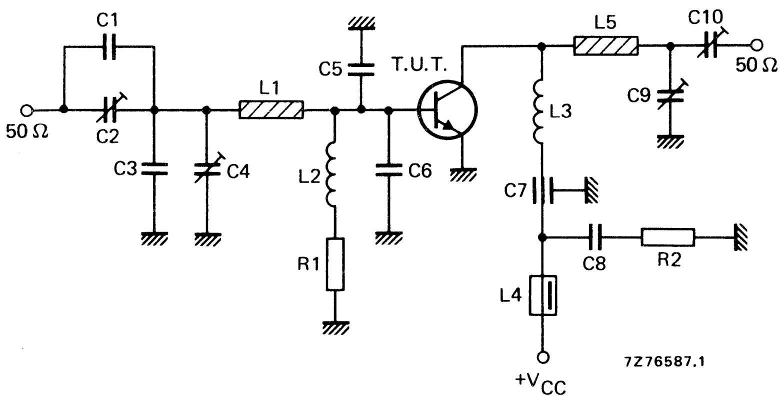
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
470	**12,5**	**10**	**< 2,5**	**> 6,0**	**< 1,33**	**> 60**	**1,3 + j2,5**	**150 – j66**
470	13,5	10	typ 1,9	typ 7,2	–	typ 75	–	–
175	12,5	10	typ 0,45	typ 13,5	–	typ 60	1,2 – j0,6	140 – j80

Test circuit for 470 MHz



List of components:

C1 = 2,2 pF (± 0,25 pF) ceramic capacitor
C2 = C9 = C10 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C3 = 3,9 pF (± 0,25 pF) ceramic capacitor
C4 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C5 = C6 = 15 pF ceramic chip capacitor (cat. no. 2222 851 13159)
C7 = 100 pF ceramic feed-through capacitor
C8 = 100 nF polyester capacitor

L1 = stripline (27,9 mm x 6,0 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. = 4 mm; leads 2 x 5 mm
L3 = 17 nH; 1½ turns enamelled Cu wire (1 mm); spacing 1 mm; int. dia. = 6 mm; leads 2 x 5 mm
L4 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L5 = stripline (45,8 mm x 6,0 mm)

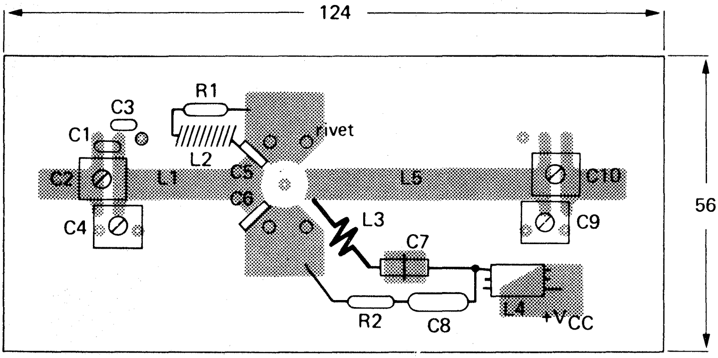
L1 and L5 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

R1 = 1 Ω (± 5%) carbon resistor
R2 = 10 Ω (± 5%) carbon resistor

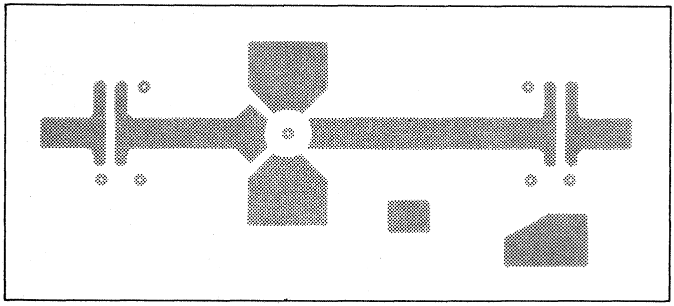
Component layout and printed-circuit board for 470 MHz test circuit see page 6.

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 470 MHz test circuit.

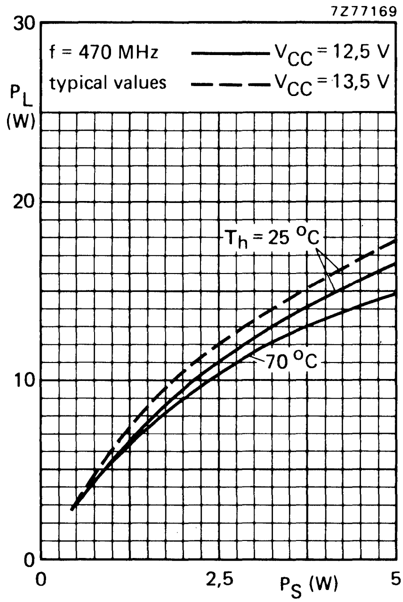


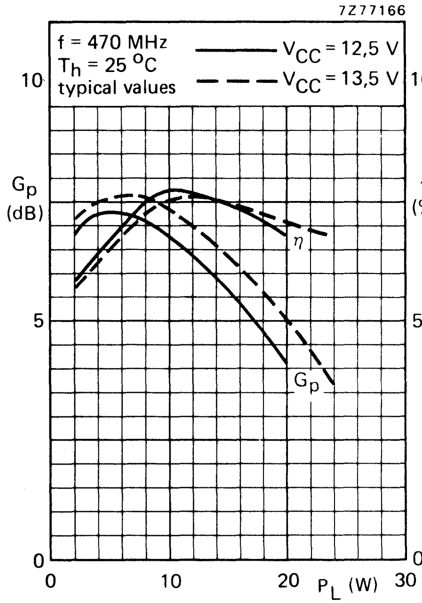
7Z76585

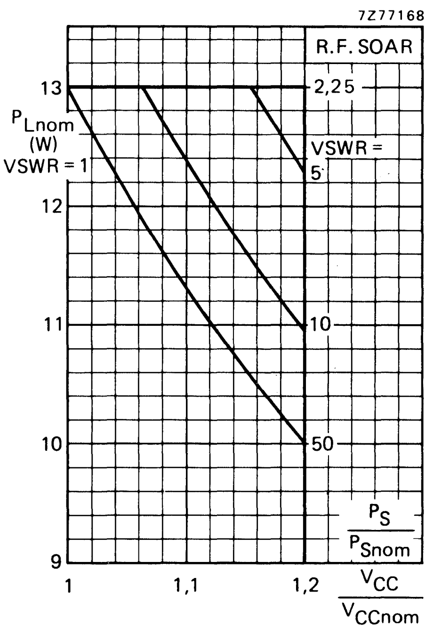


7Z76586

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.







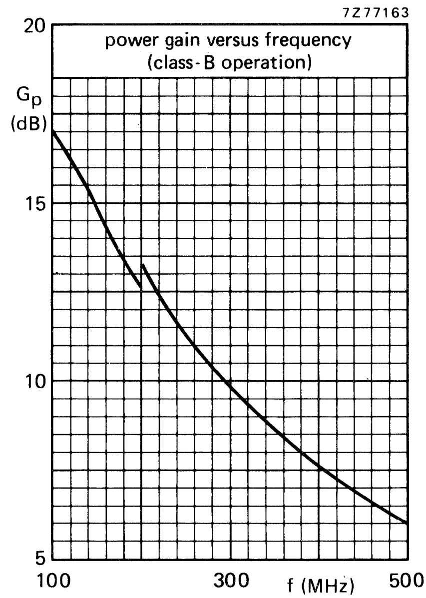
Measuring conditions for R.F. SOAR

f = 470 MHz
T_h = 70 °C
$R_{th\ mb\text{-}h}$ = 0,6 K/W
V_{CCnom} = 12,5 V or 13,5 V
$P_S = P_{Snom}$ at V_{CCnom} and VSWR = 1
see page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio, with VSWR as parameter.

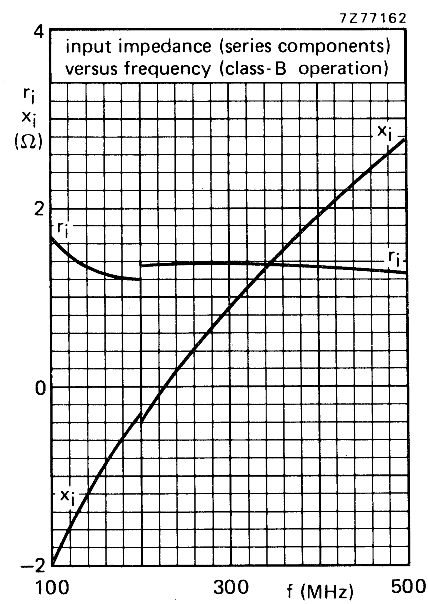
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

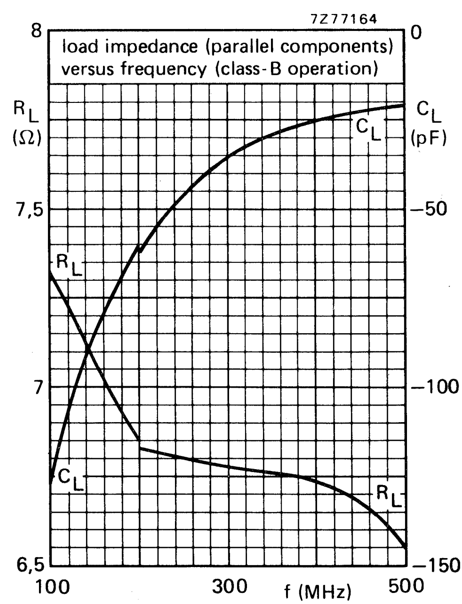
OPERATING NOTE Below 200 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.



Measuring conditions for the graphs on this page

V_{CC} = 12,5 V
P_L = 10 W
T_h = 25 °C
typical values





H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in transmitting amplifiers operating in the h.f. and v.h.f. bands, with a nominal supply voltage of 28 V. The transistor is specified for s.s.b. applications as linear amplifier in class-A and AB. The device is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

Matched h_{FE} groups are available on request.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

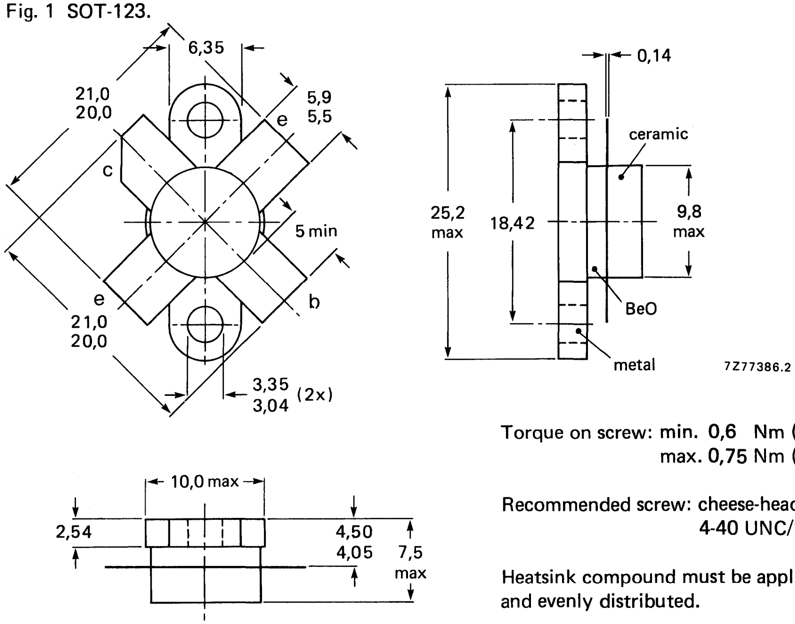
R.F. performance

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	d_3 dB	T_h °C
s.s.b. (class-A)	**26**	**1,6 – 28**	**0 – 10** (P.E.P.)	> **20**	–	**1,35**	< **−40**	**70**
s.s.b. (class-AB)	28	1,6 – 28	3 – 30 (P.E.P.)	typ. 21	typ. 40	typ. 1,34	typ. −30	25

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	3	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	9	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	76	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

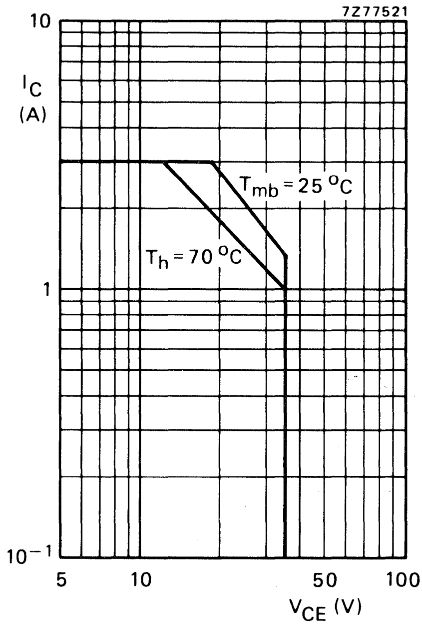


Fig. 2 D.C. SOAR.

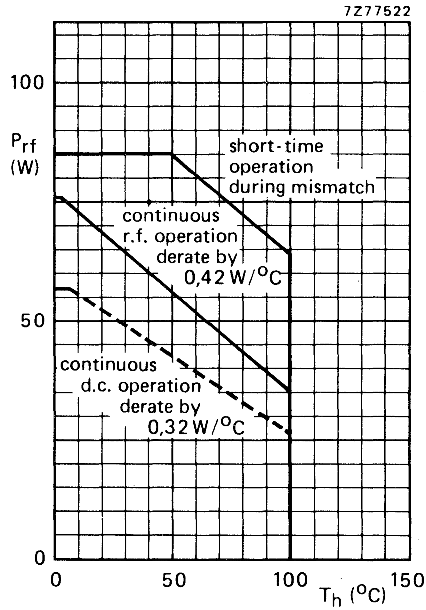


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 28 V; f $\geqslant$ 1 MHz.

THERMAL RESISTANCE (dissipation = 35 W; T_{mb} = 80 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,15	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,35	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain*				
I_C = 1,25 A; V_{CE} = 5 V	h_{FE}	typ.	50 10 to 100	
D.C. current gain ratio of matched devices*				
I_C = 1,25 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage*				
I_C = 3,75 A; I_B = 0,75 A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz*				
$-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	530	MHz
$-I_E$ = 3,75 A; V_{CB} = 28 V	f_T	typ.	530	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	50	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	31	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

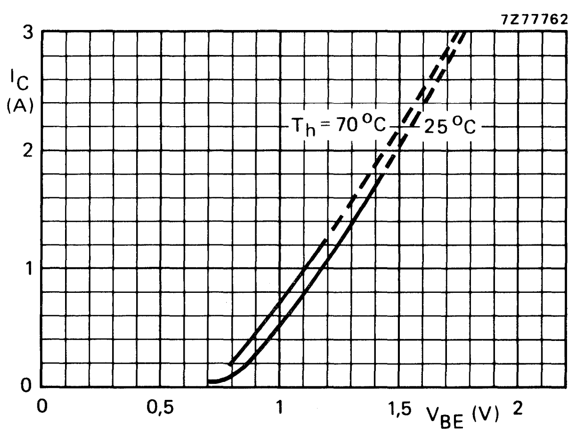


Fig. 4 Typical values; V_{CE} = 28 V.

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

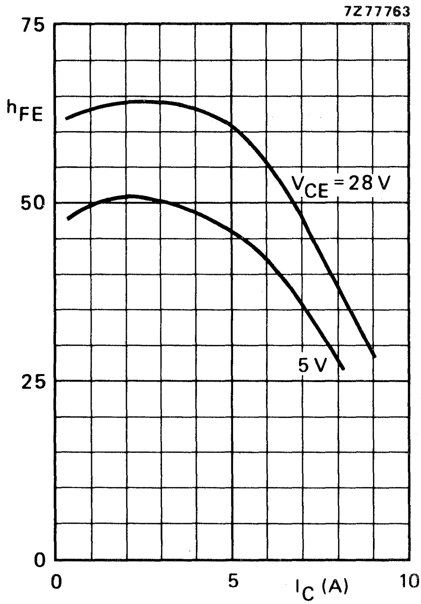


Fig. 5 Typical values; T_j = 25 °C.

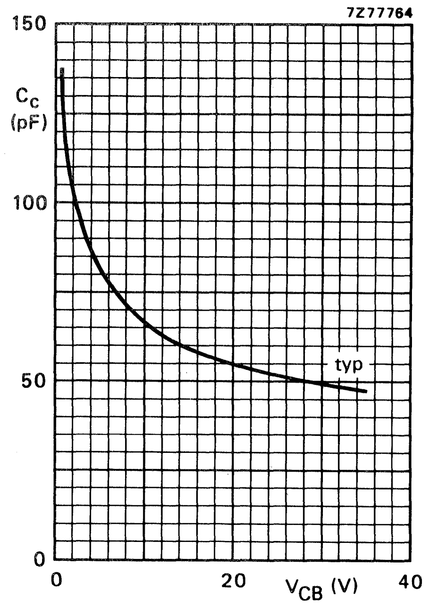


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

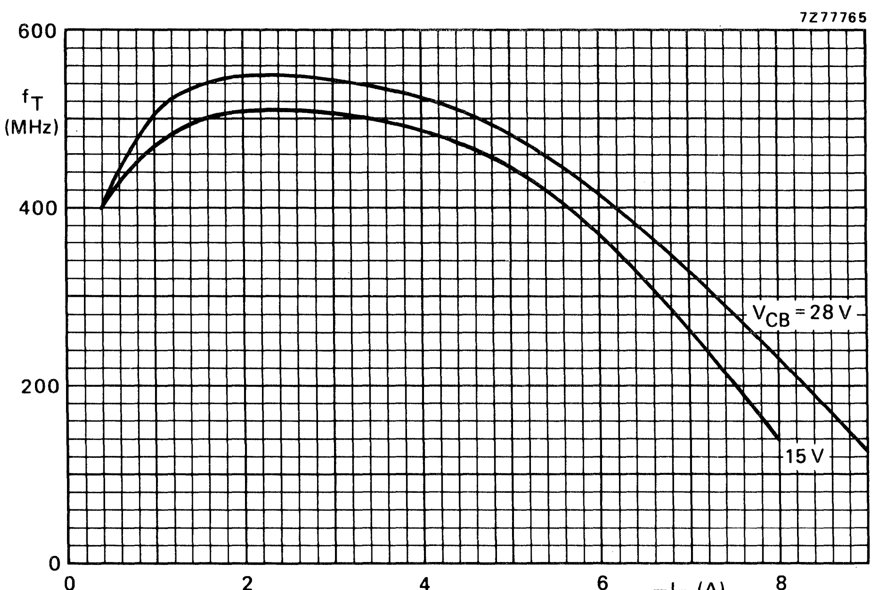


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB*	d_5 dB*	T_h °C
> 10 (P.E.P.) typ. 11 (P.E.P.)	> 20	1,35	−40	< −40	70
typ. 12 (P.E.P.)	typ. 24	1,35	−40	< −40	25

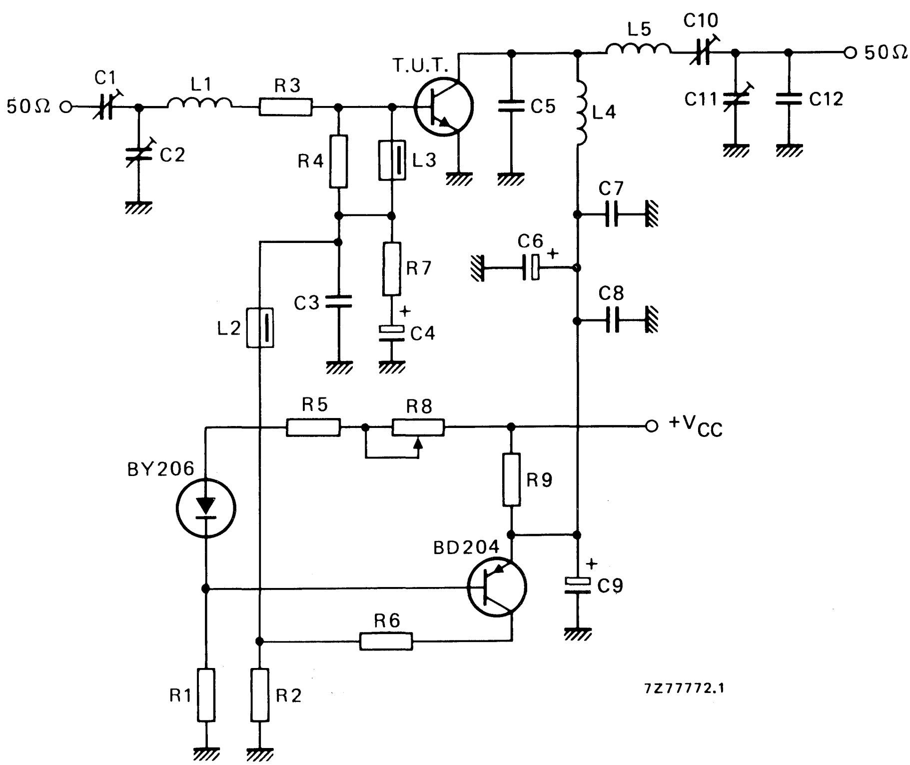


Fig. 8 Test circuit; s.s.b. class-A.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 8:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = 22 nF ceramic capacitor (63 V)
C4 = 47 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/35 V electrolytic capacitor
C10 = C11 = 7 to 100 pF film dielectric trimmer
C12 = 82 pF ceramic capacitor (500 V)

L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads to 2 x 5 mm
L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm
L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω; parallel connection of 2 x 1,2 kΩ carbon resistors (±5%; 0,5 W each)
R2 = 15 Ω carbon resistor (±5%; 0,25 W)
R3 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors (±5%; 0,125 W each)
R4 = 33 Ω carbon resistor (±5%; 0,25 W)
R5 = 18 Ω carbon resistor (±5%; 0,25 W)
R6 = 120 Ω wirewound resistor (±5%; 5,5 W)
R7 = 1 Ω carbon resistor (±5%; 0,125 W)
R8 = 47 Ω wirewound potentiometer (3 W)
R9 = 1,57 Ω; parallel connection of 3 x 4,7 Ω wirewound resistors (±5%; 5,5 W each)

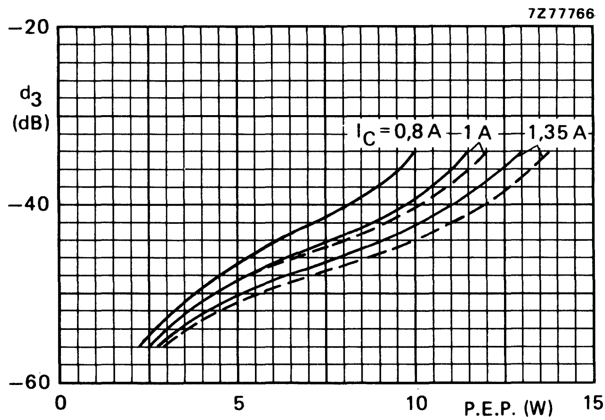


Fig. 9 Intermodulation distortion as a function of output power.
Typical values; V_{CE} = 26 V; —— T_h = 70 °C; ---- T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 30 W P.E.P.	I_C (A) at 30 W P.E.P.	d_3 dB*	d_5 dB*	$I_{C(ZS)}$ mA	T_h °C
3 to 30 (P.E.P.)	typ. 21	typ. 40	typ. 1,34	typ. −30	< −30	25	25
3 to 25 (P.E.P.)	typ. 21	–	–	typ. −30	< −30	25	70

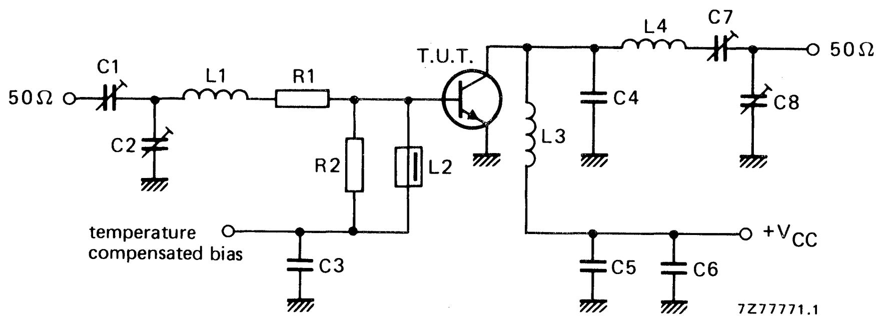


Fig. 10 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = C5 = C6 = 220 nF polyester capacitor
C4 = 56 pF ceramic capacitor (500 V)
C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm
L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors
R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

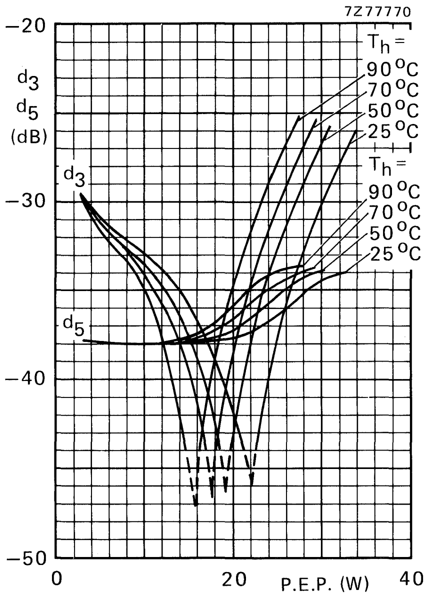


Fig. 11 Intermodulation distortion as a function of output power.*

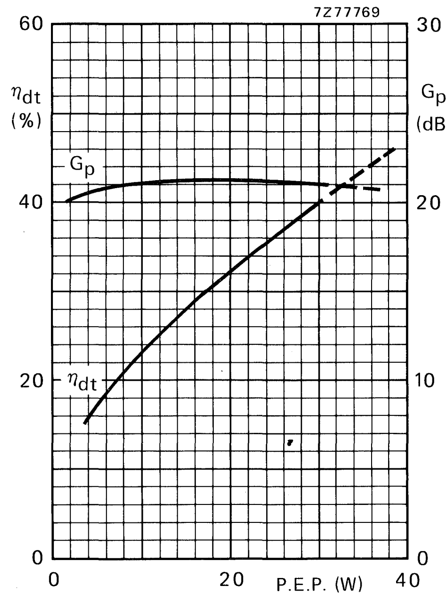


Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 11:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 12:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* See note on previous page.

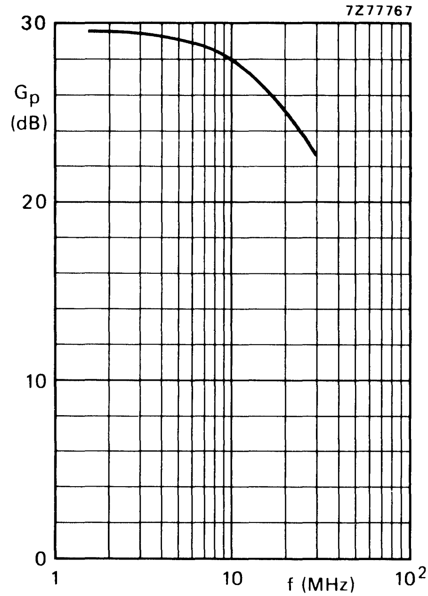


Fig. 13 Power gain as a function of frequency.

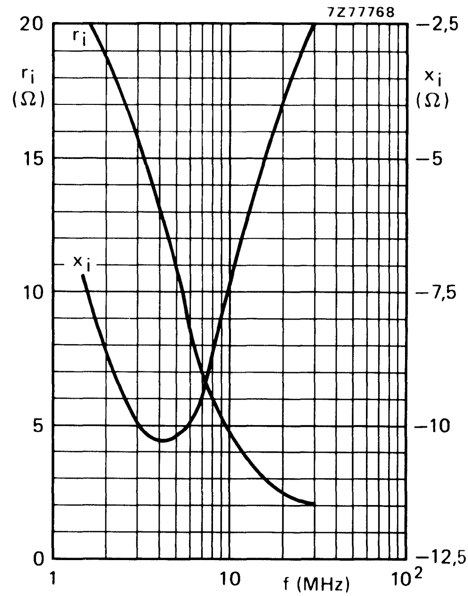


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; P_L = 30 W; T_h = 25 °C; Z_L = 9,5 Ω.

Ruggedness in s.s.b. operation

The BLW83 is capable of withstanding a load mismatch (VSWR = 50) under the following conditions: f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_{Lnom} = 35 W (P.E.P.).

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

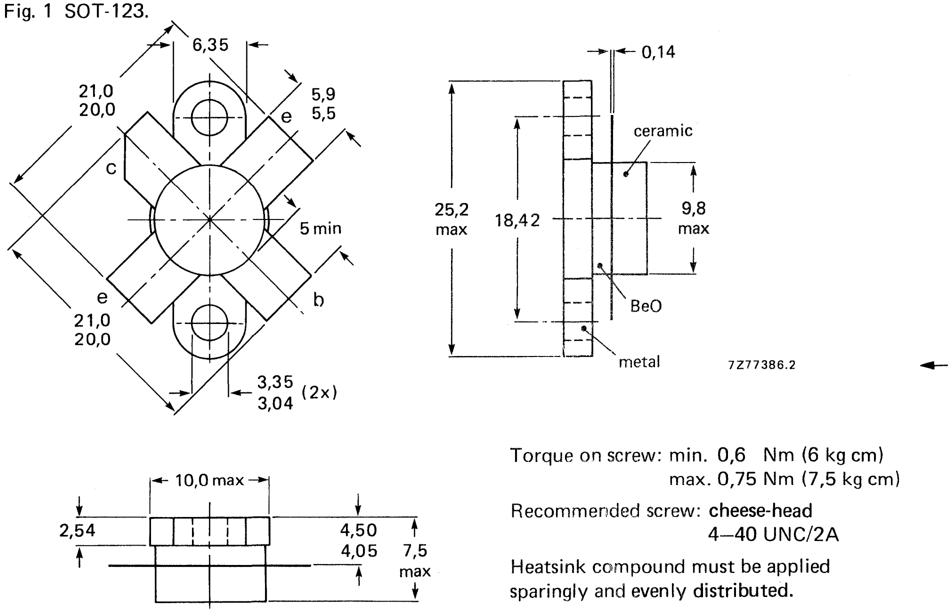
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**28**	**175**	**25**	**> 9**	**> 60**	**1,0 + j1,2**	**59 − j54**

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4—40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	3	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	9	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	76	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

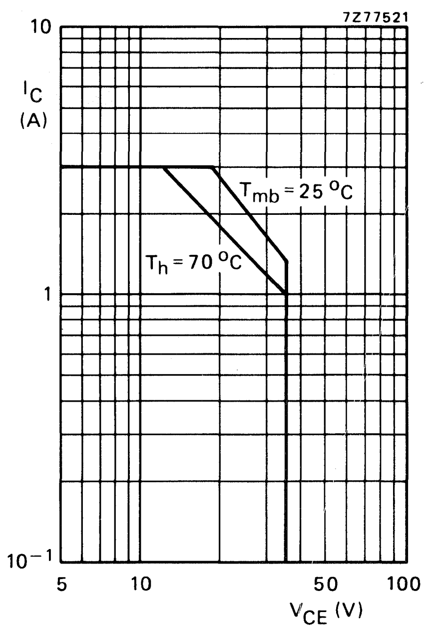


Fig. 2 D.C. SOAR.

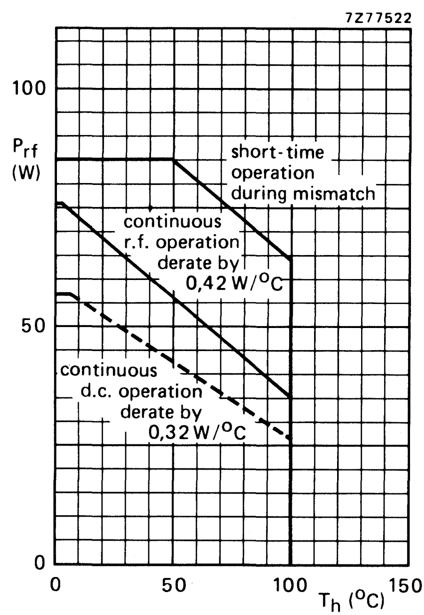


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f ≥ 1 MHz.

THERMAL RESISTANCE (dissipation = 20 W; T_{mb} = 76 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb\ (dc)}$	=	3,0	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb\ (rf)}$	=	2,25	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage			
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage			
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	8 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8 mJ
D.C. current gain *			
$I_C = 1,25$ A; $V_{CE} = 5$ V	h_{FE}	typ.	45
			10 to 100
Collector-emitter saturation voltage *			
$I_C = 3,75$ A; $I_B = 0,75$ A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz *			
$-I_E = 1,25$ A; $V_{CB} = 28$ V	f_T	typ.	650 MHz
$-I_E = 3,75$ A; $V_{CB} = 28$ V	f_T	typ.	650 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	45 pF
Feedback capacitance at f = 1 MHz			
$I_C = 100$ mA; $V_{CE} = 28$ V	C_{re}	typ.	28 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

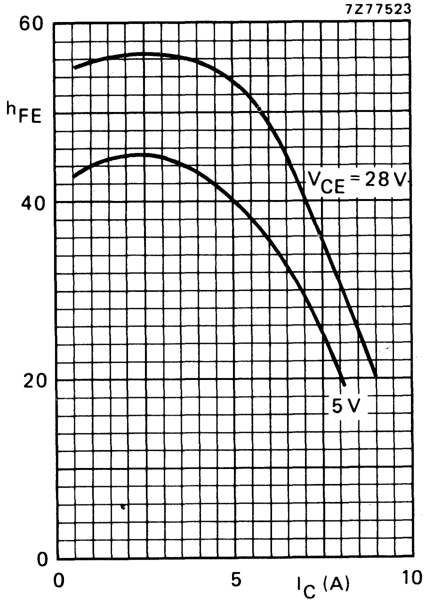


Fig. 4 Typical values; T_j = 25 °C.

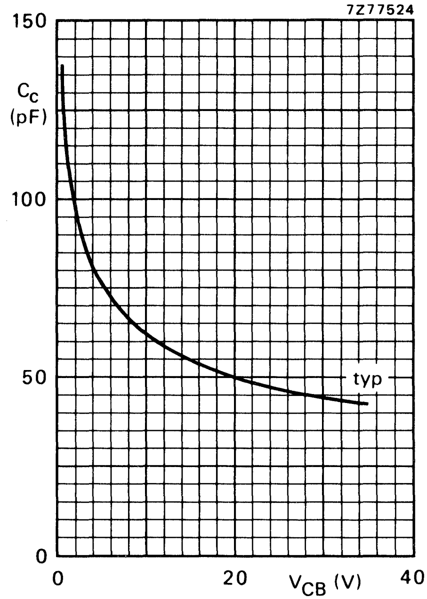


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

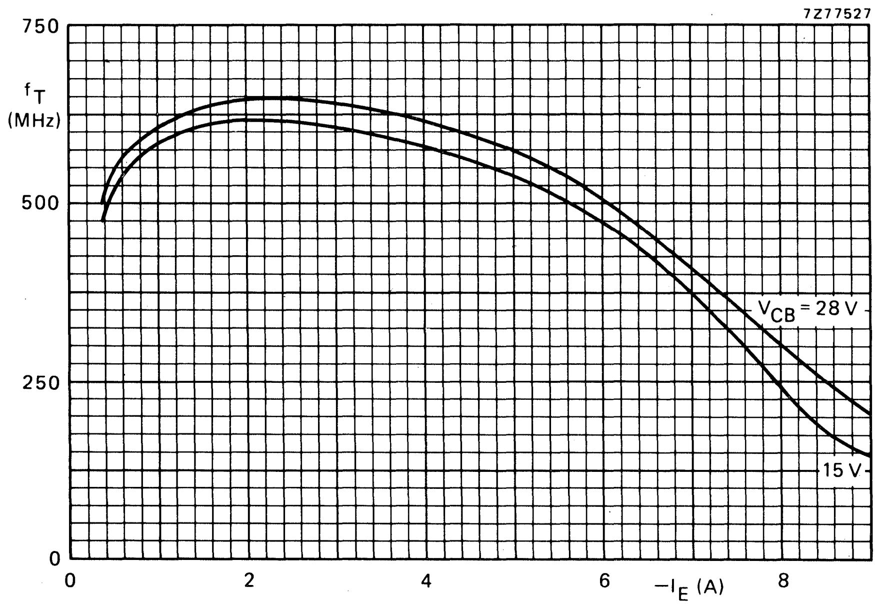


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**28**	**25**	**< 3,15**	**> 9**	**< 1,49**	**> 60**	**1,0 + j1,2**	**59 – j54**

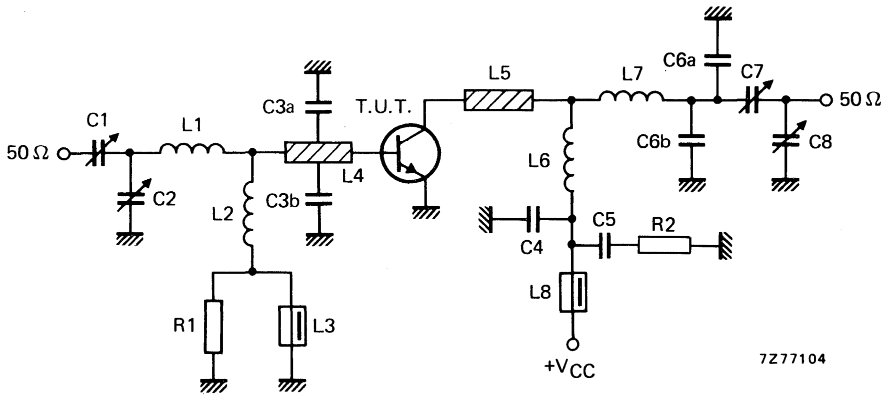


Fig. 7 Test circuit; c.w. class-B.

List of components
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF (± 10%) polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
C6b = 1,8 pF ceramic capacitor (500 V)
C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

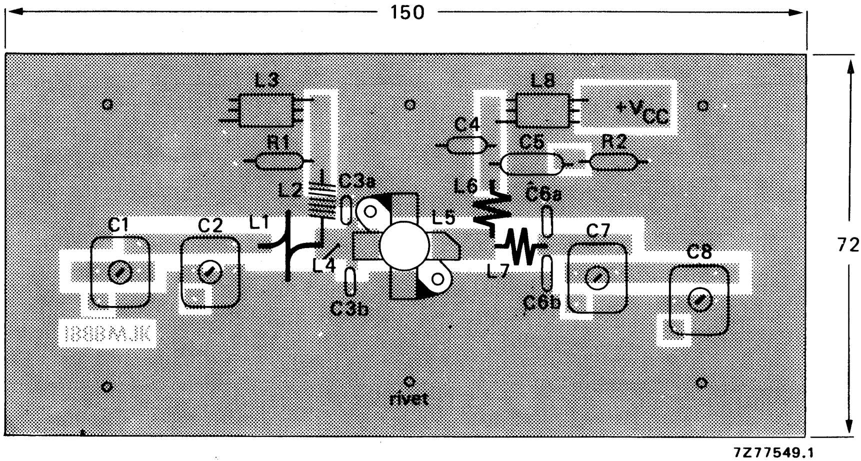
L1 = 14 nH; 1 turn enamelled Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 80 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm
L7 = 62 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω (± 10%) carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)



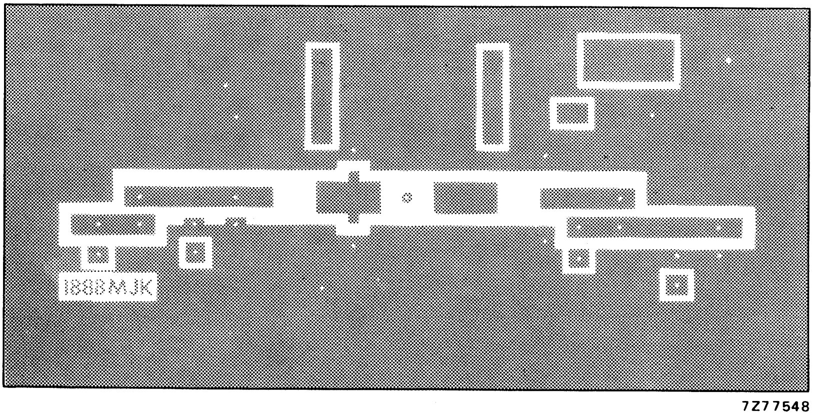


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

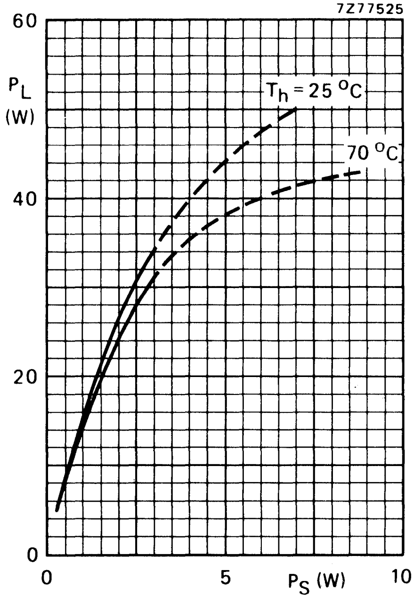


Fig. 9 V_{CE} = 28 V; f = 175 MHz; typical values.

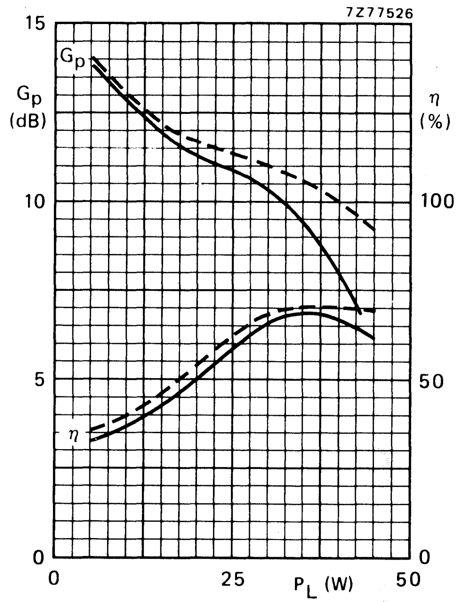


Fig. 10 V_{CE} = 28 V; f = 175 MHz; typical values;
— — — T_h = 25 °C; ——— T_h = 70 °C.

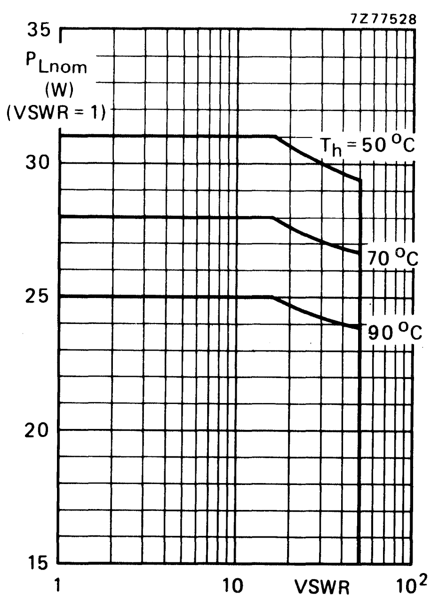


Fig. 11 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,3 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

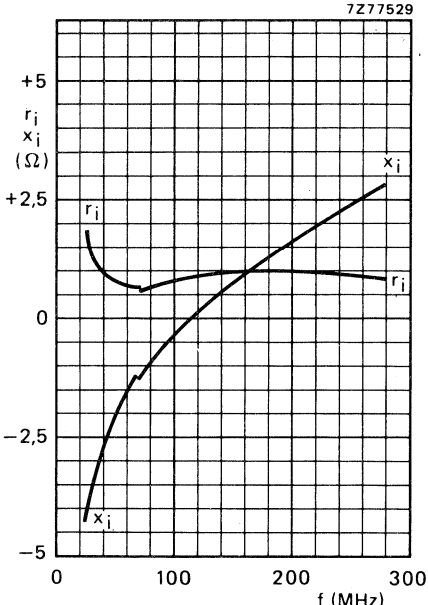


Fig. 12.

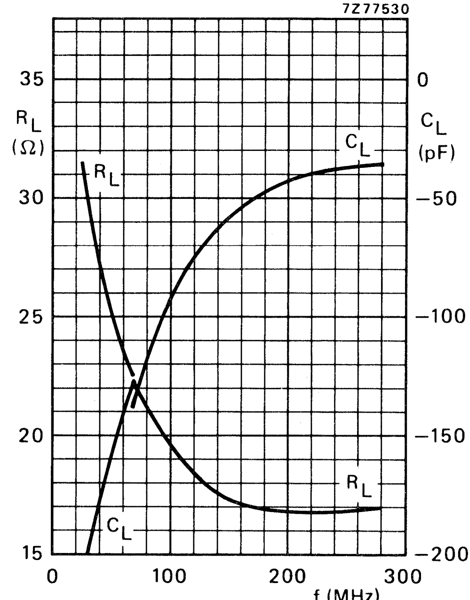
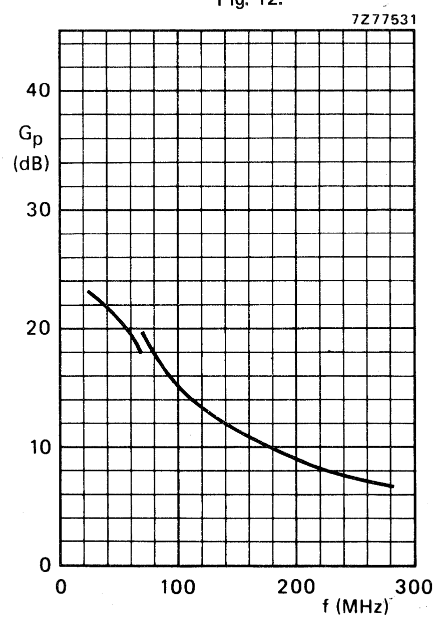


Fig. 13.



Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 25 W; T_h = 25 °C.

Fig. 14.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile h.f. and v.h.f. transmitters with a nominal supply voltage of 12,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Matched h_{FE} groups are available on request.

It has a 3/8″ flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

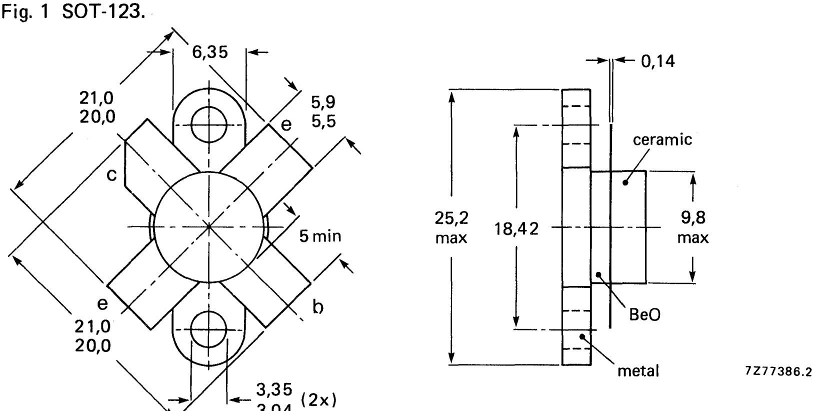
R.F. performance up to T_h = 25 °C

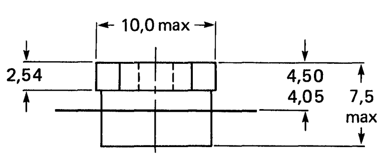
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Z_L}$ Ω	d_3 dB
c.w. (class-B)	**12,5**	**175**	**45**	**> 4,5**	**> 75**	**1,4 + j1,5**	**2,7 − j1,3**	–
s.s.b. (class-AB)	12,5	1,6–28	3–30 (P.E.P.)	typ. 19,5	typ. 35	–	–	typ. −33

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	9 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	22 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	105 W
Storage temperature	T_{stg}		− 65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

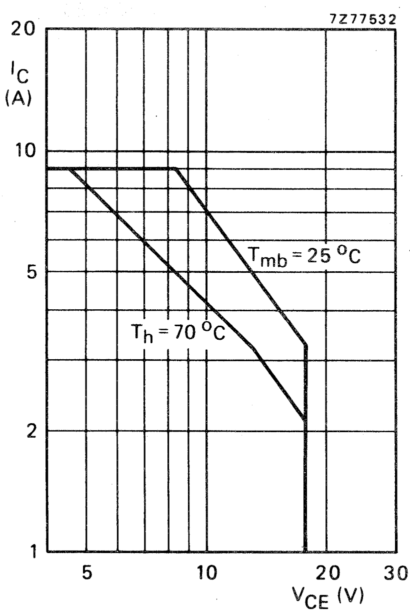


Fig. 2 D.C. SOAR.

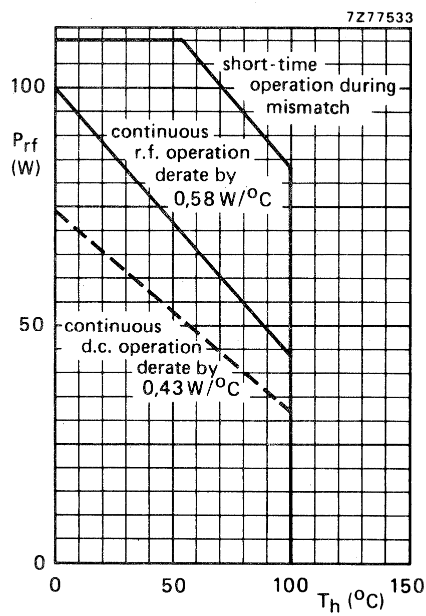


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16{,}5$ V; f ⩾ 1 MHz.

THERMAL RESISTANCE (dissipation = 30 W; T_{mb} = 79 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,5 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,8 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 50$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage				
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage				
open collector; $I_E = 25$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	25	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain*				
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50	
			10 to 80	
D.C. current gain ratio of matched devices*				
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage*				
$I_C = 12,5$ A; $I_B = 2,5$ A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz*				
$-I_E = 4$ A; $V_{CB} = 12,5$ V	f_T	typ.	650	MHz
$-I_E = 12,5$ A; $V_{CB} = 12,5$ V	f_T	typ.	600	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ.	120	pF
Feedback capacitance at f = 1 MHz				
$I_C = 200$ mA; $V_{CE} = 15$ V	C_{re}	typ.	82	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

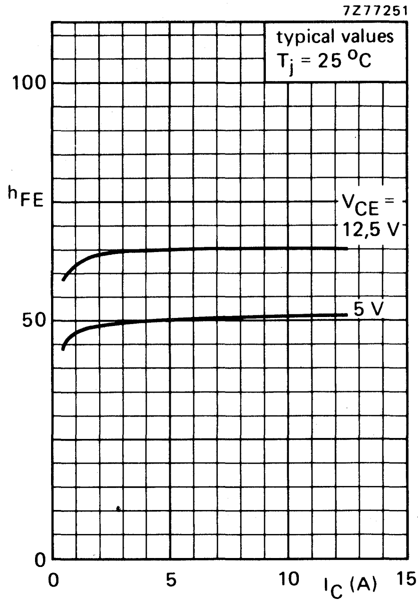


Fig. 4.

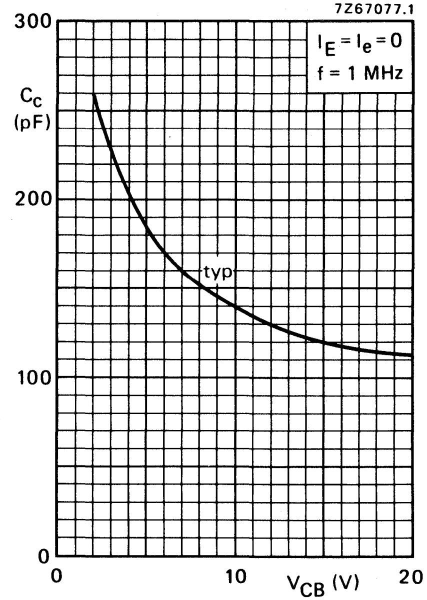


Fig. 5 T_j = 25 °C.

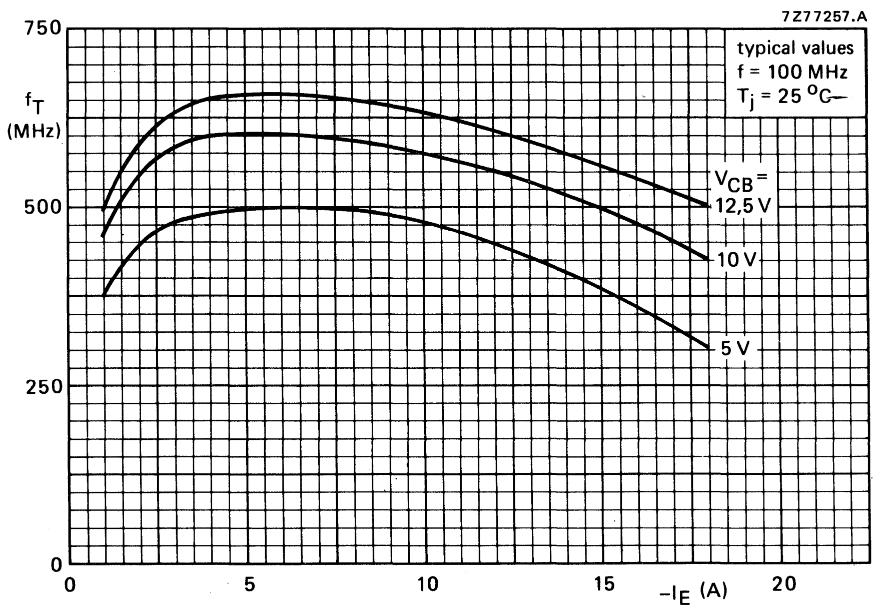


Fig. 6.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\bar{z_i}$ (Ω)	$\bar{Z_L}$ (Ω)
175	**12,5**	**45**	**< 16**	**> 4,5**	**< 4,8**	**> 75**	**1,4 + j1,5**	**2,7 − j1,3**
175	13,5	45	–	typ. 6,0	–	typ. 75	–	–

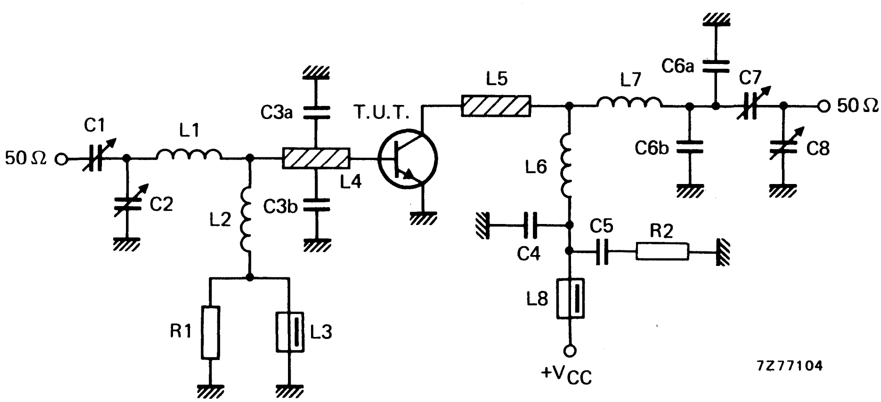


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C6a = C6b = 8,2 pF ceramic capacitor (500 V)
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

R1 = 10 Ω (±10%) carbon resistor (0,25 W)
R2 = 4,7 Ω (±5%) carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)

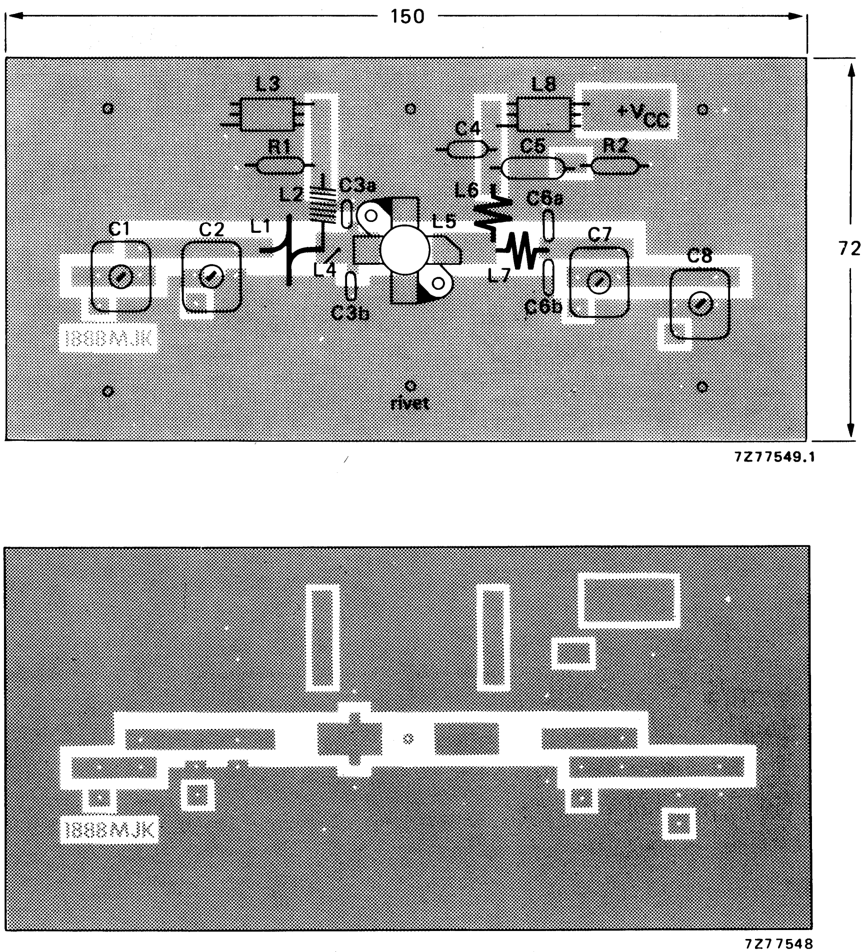


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

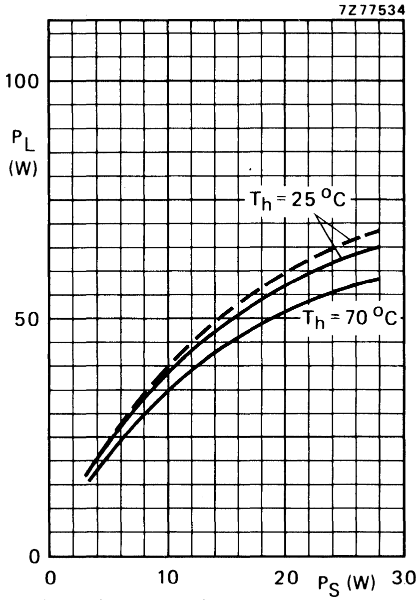


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 12,5 V; - - - V_{CE} = 13,5 V.

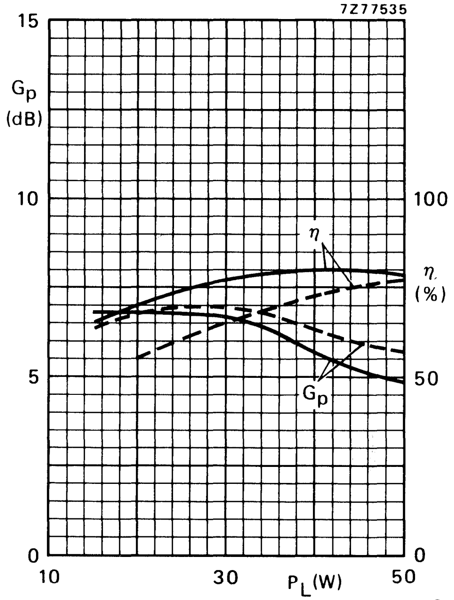


Fig. 10 Typical values; f = 175 MHz; T_h = 25 °C;
—— V_{CE} = 12,5 V; - - - V_{CE} = 13,5 V.

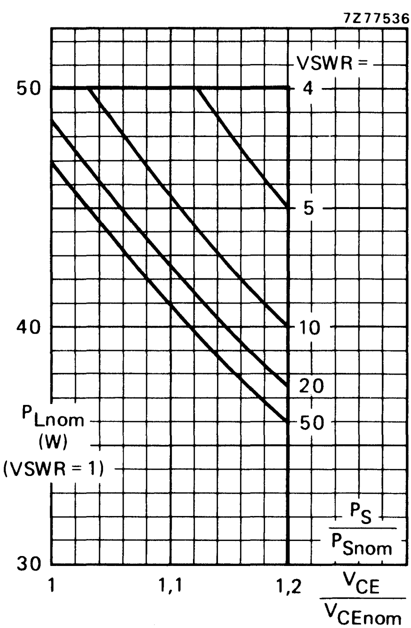


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb-h}$ = 0,3 K/W ; V_{CEnom} = 12,5 V or 13,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

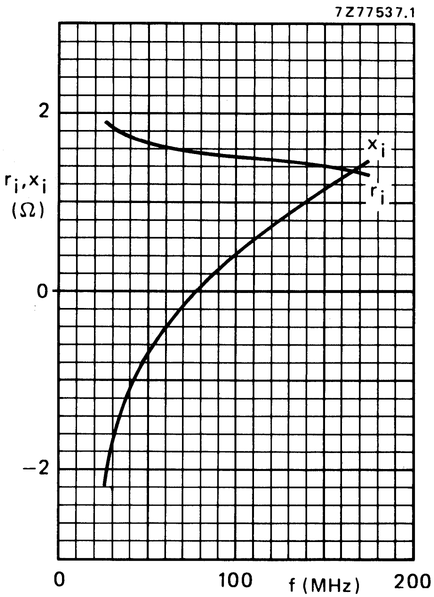


Fig. 12 Input impedance (series components).

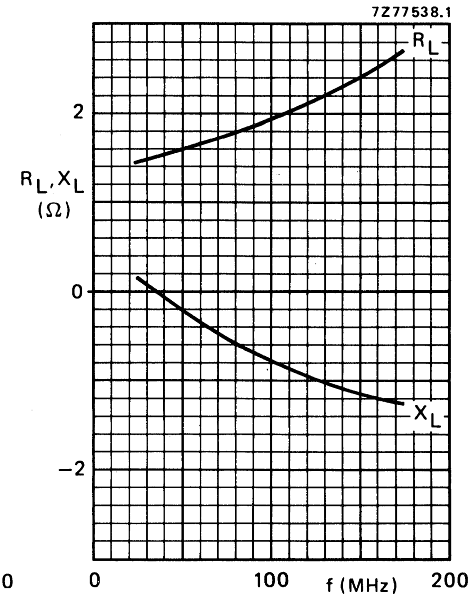


Fig. 13 Load impedance (series components).

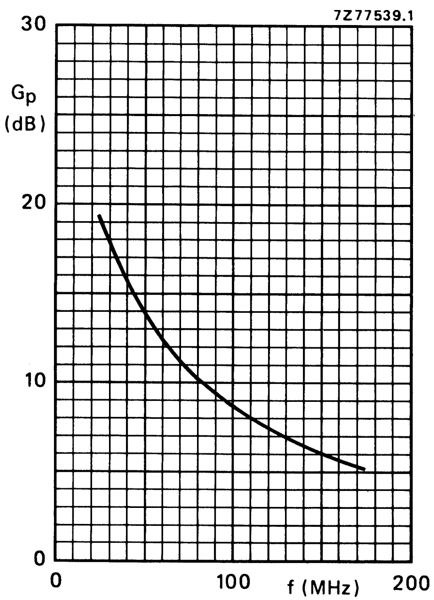


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 12,5 V; P_L = 45 W; class-B operation; T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation

V_{CE} = 12,5 V; T_h up to 25 °C; $R_{th\ mb-h} \leq$ 0,3 K/W
f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} %	d_3 dB*	d_5 dB*	$I_{C(ZS)}$ mA
3 to 30 (P.E.P.)	typ. 19,5	typ. 35	typ. −33	typ. −36	25

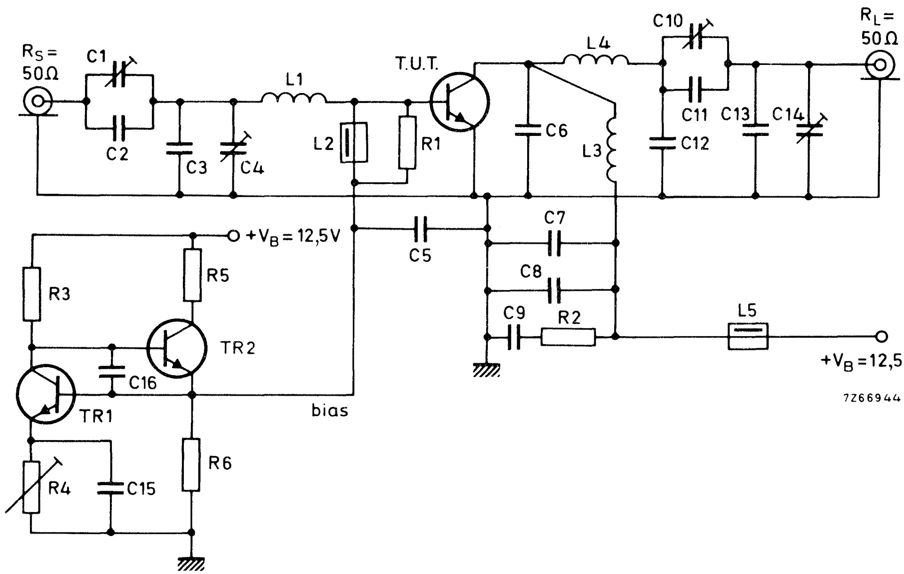


Fig. 15 Test circuit; s.s.b. class-AB.

List of components:

TR1 = TR2 = BD137

C1 = 100 pF air dielectric trimmer (single insulated rotor type)
C2 = 27 pF ceramic capacitor (500 V)
C3 = 180 pF polystyrene capacitor
C4 = 100 pF air dielectric trimmer (single non-insulated rotor type)
C5 = C7 = 3,9 nF polyester capacitor
C6 = 2 x 270 pF polystyrene capacitors in parallel
C8 = C15 = C16 = 100 nF polyester capacitor
C9 = 2,2 μF moulded metallized polyester capacitor
C10 = 2 x 385 pF (sections in parallel) film dielectric trimmer
C11 = 68 pF ceramic capacitor (500 V)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

List of components (continued)

C12 = 2 x 82 pF ceramic capacitors in parallel (500 V)
C13 = 47 pF ceramic capacitor (500 V)
C14 = 385 pF film dielectric trimmer

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9 mm; length 6,1 mm; leads 2 x 5 mm
L2 = L5 = Ferroxcube choke coil (cat. no. 4312 020 36640)
L3 = 68 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 8 mm; length 8,3 mm; leads 2 x 5 mm
L4 = 96 nH; 3 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 7,6 mm; leads 2 x 5 mm

R1 = 27 Ω (±5%) carbon resistor (0,5 W)
R2 = 4,7 Ω (±5%) carbon resistor (0,25 W)
R3 = 1,5 kΩ (±5%) carbon resistor (0,5 W)
R4 = 10 Ω wirewound potentiometer (3 W)
R5 = 47 Ω wirewound resistor (5,5 W)
R6 = 150 Ω (±5%) carbon resistor (0,25 W)

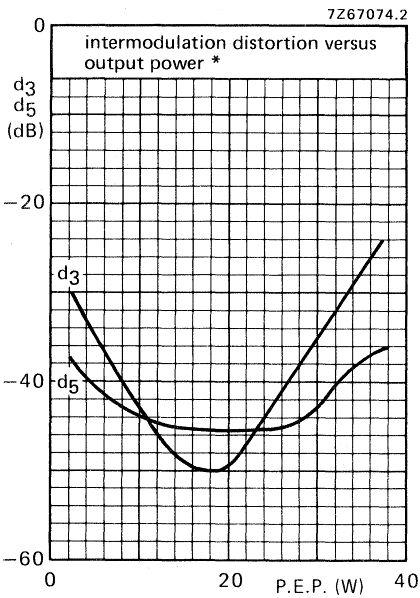


Fig. 16.

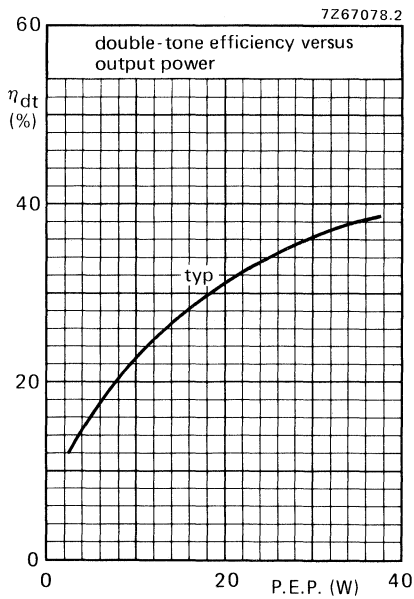


Fig. 17.

Conditions for Figs 16 and 17:

V_{CE} = 12,5 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; $R_{th\ mb-h} \leq$ 0,3 °K/W; $I_{C(ZS)}$ = 25 mA; typical values.

* See next page.

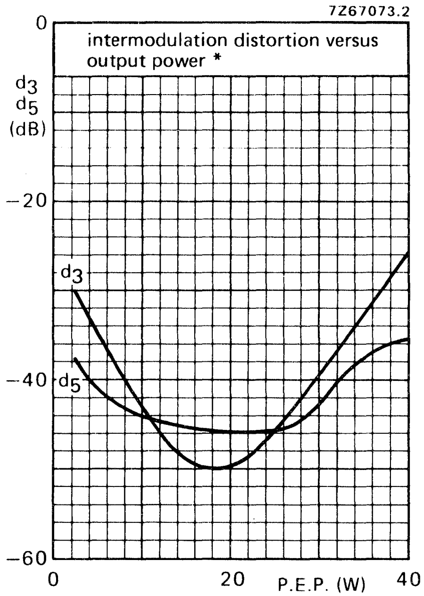


Fig. 18.

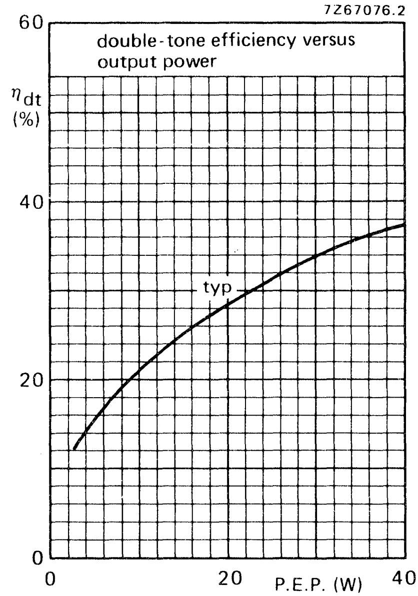


Fig. 19.

Conditions for Figs 18 and 19:

V_{CE} = 13,5 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; $R_{th\ mb\text{-}h}$ ≤ 0,3 K/W ; $I_{C(ZS)}$ = 25 mA; typical values.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

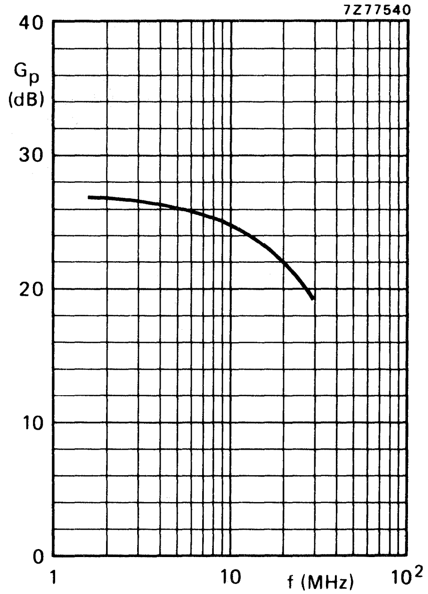


Fig. 20 Power gain as a function of frequency.

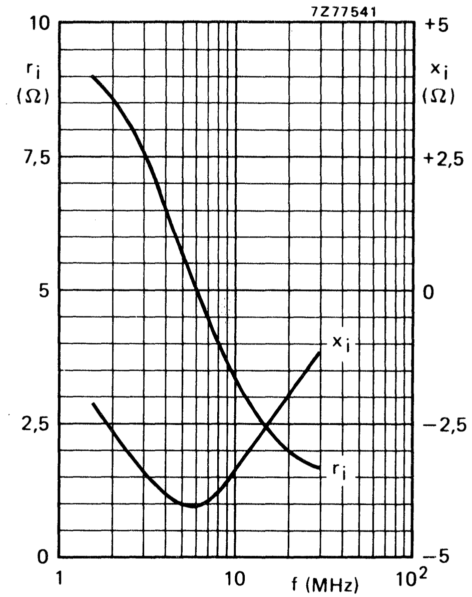


Fig. 21 Input impedance (series components) as a function of frequency.

Fig. 20 and 21 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 12,5 V	V_{CE} = 13,5 V
P_L = 30 W (P.E.P.)	P_L = 35 W (P.E.P.)
T_h = 25 °C	T_h = 25 °C
$R_{th\ mb\text{-}h} \leq$ 0,3 K/W	$R_{th\ mb\text{-}h} \leq$ 0,3 K/W
$I_{C(ZS)}$ = 25 mA	$I_{C(ZS)}$ = 25 mA
Z_L = 1,8 Ω	Z_L = 1,8 Ω

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB and B operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Matched h_{FE} groups are available on request.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

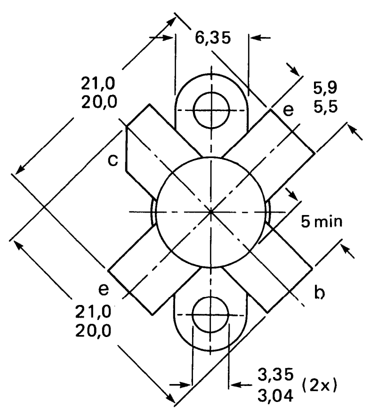
R.F. performance up to T_h = 25 °C

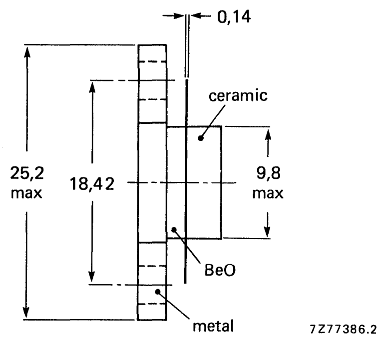
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\bar{z_i}$ Ω	$\overline{Y_L}$ mS	d_3 dB
c.w. (class-B)	**28**	**175**	**45**	**> 7,5**	**> 70**	**0,7 + j1,3**	**110 – j62**	–
s.s.b. (class-AB)	28	1,6 – 28	5–47,5(P.E.P.)	typ. 19	typ. 45	–	–	typ. –30
s.s.b. (class-A)	26	1,6 – 28	17(P.E.P.)	typ. 22	–	–	–	typ. –42

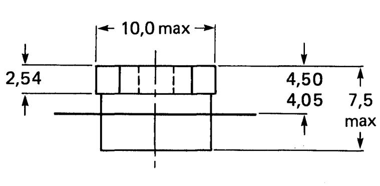
MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.







Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65 V
Collector-emitter voltage (open base)	V_{CEO}	max.	36 V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	4 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	12 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	105 W
Storage temperature	T_{stg}		−65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

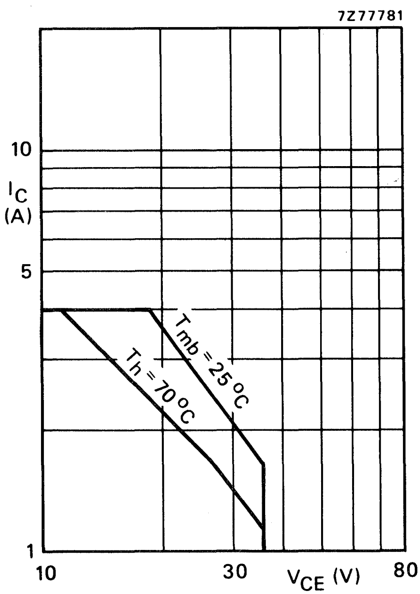


Fig. 2 D.C. SOAR.

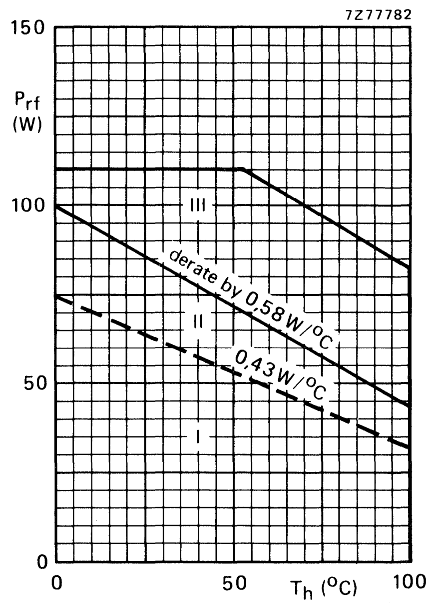


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 45 W; T_{mb} = 83,5 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,65 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	1,95 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage				
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain*				
I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ.	45	
			10 to 80	
D.C. current gain ratio of matched devices*				
I_C = 2,5 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage*				
I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz*				
$-I_E$ = 2,5 A; V_{CB} = 28 V	f_T	typ.	570	MHz
$-I_E$ = 7,5 A; V_{CB} = 28 V	f_T	typ.	570	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 28 V	C_c	typ.	82	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	54	pF
Collector-flange capacitance	C_{cf}	typ.	2	pF

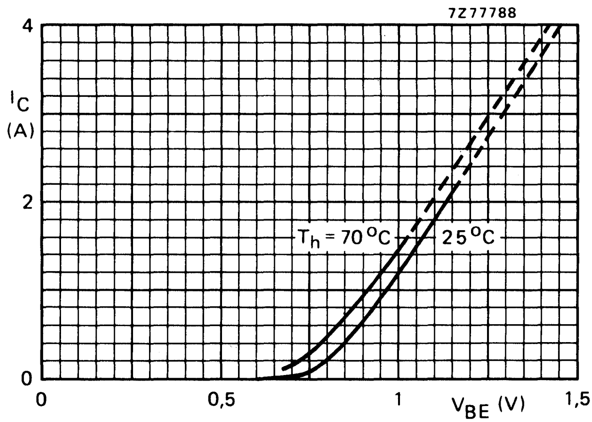


Fig. 4 Typical values; V_{CE} = 28 V.

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

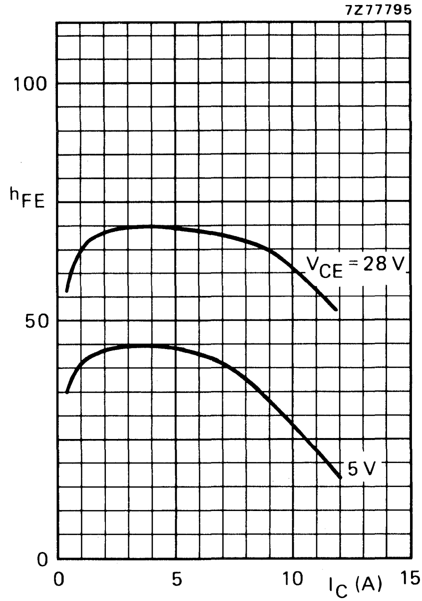


Fig. 5 Typical values; $T_j = 25\ ^oC$.

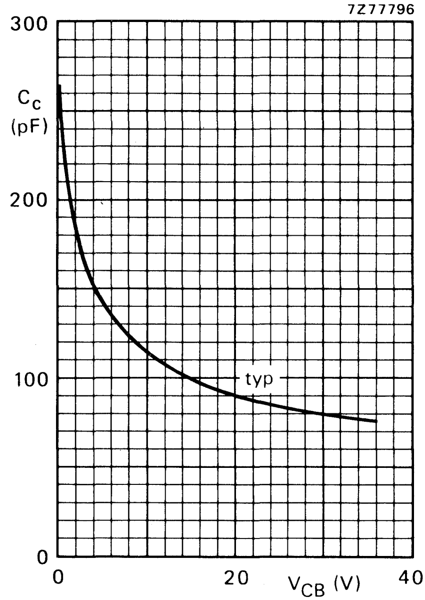


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; $T_j = 25\ ^oC$.

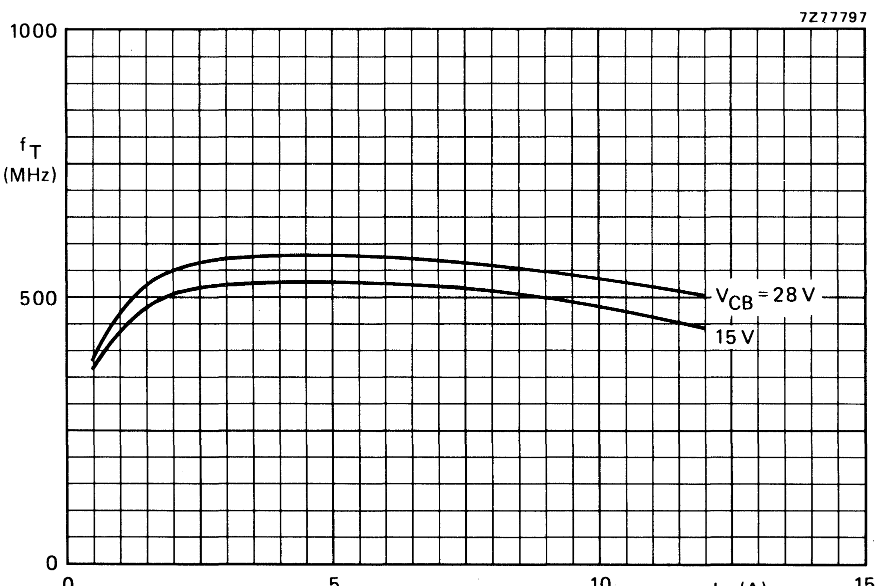


Fig. 7 Typical values; f = 100 MHz; $T_j = 25\ ^oC$.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	45	< 8	> 7,5	< 2,47	> 70	0,7 + j1,3	110 – j62

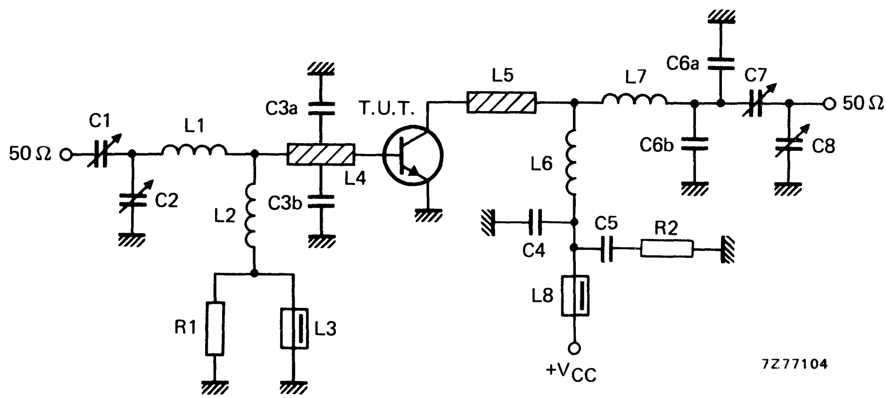


Fig. 8 Test circuit; c.w. class-B.

List of components:

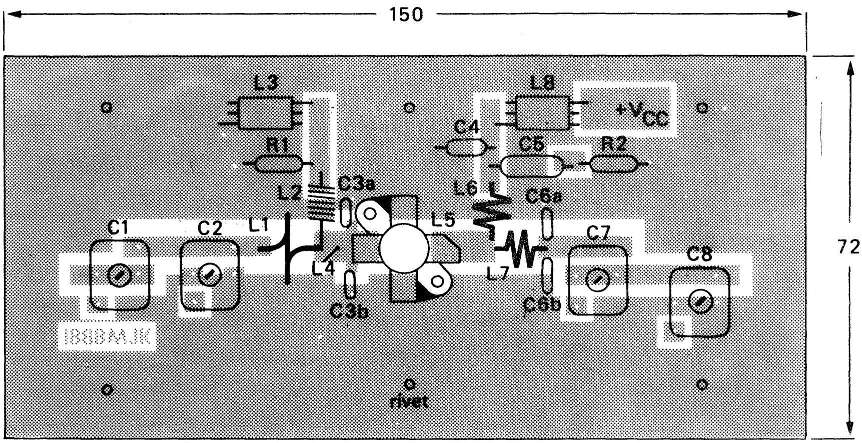
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
C6b = 1,8 pF ceramic capacitor (500 V)
C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 80 nH; 3 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm
L7 = 62 nH; 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 9.



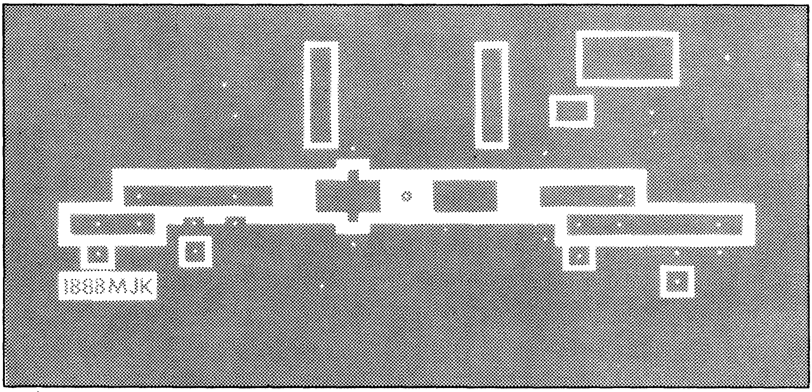
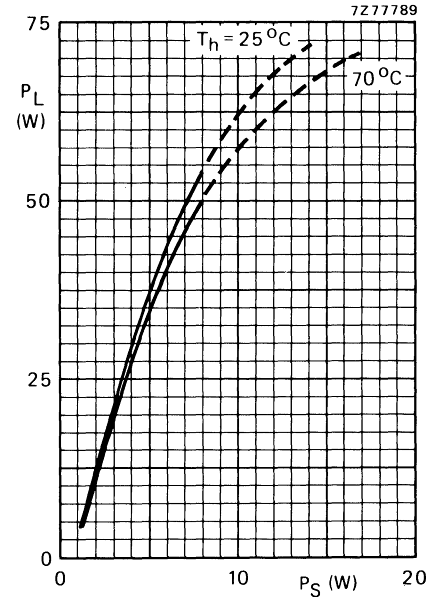


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.



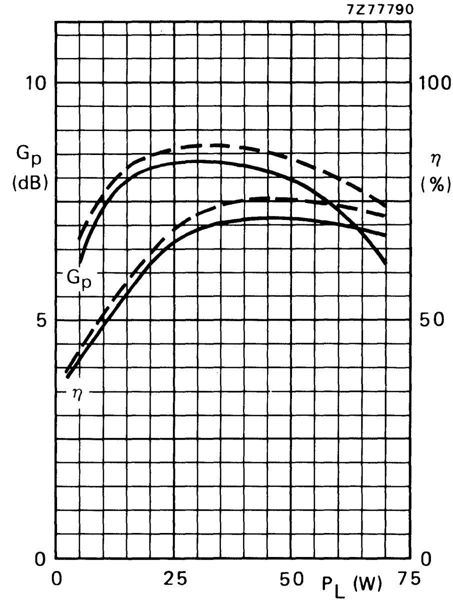


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

Fig. 11 Typical values; V_{CE} = 28 V; f = 175 MHz; --- T_h = 25 °C; —— T_h = 70 °C.

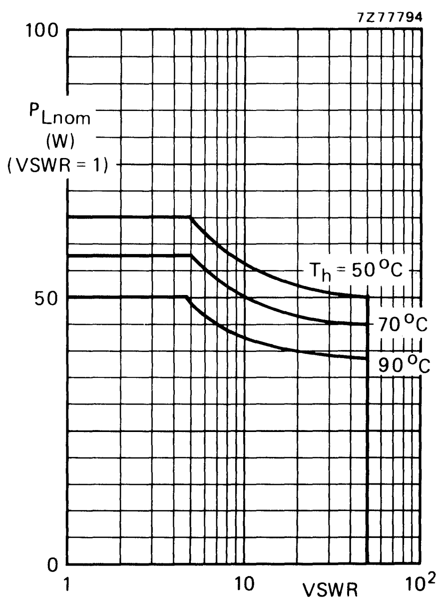


Fig. 12 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,3 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

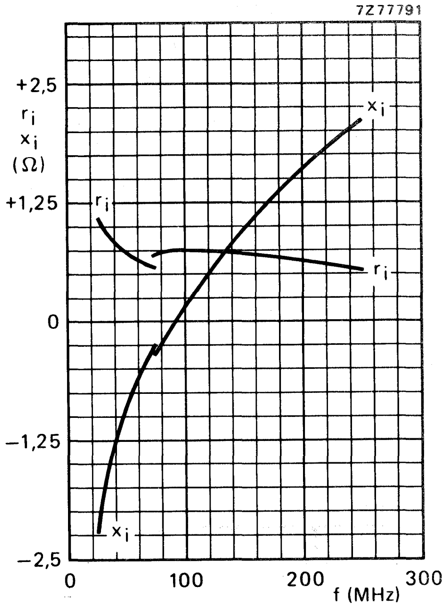


Fig. 13 Input impedance (series components).

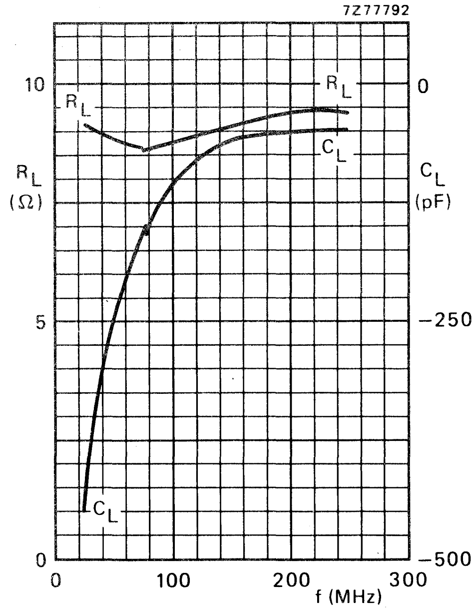


Fig. 14 Load impedance (parallel components).

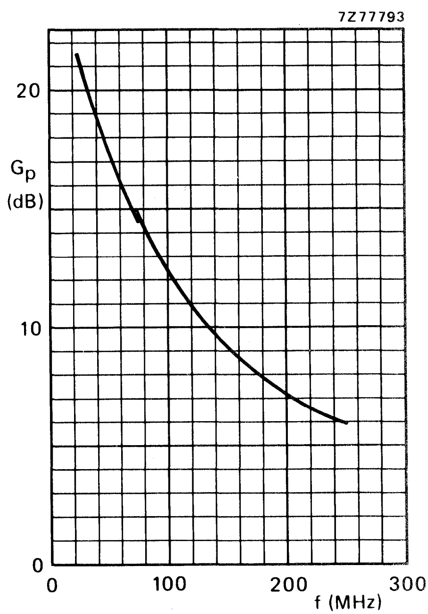


Fig. 15 Power gain versus frequency.

OPERATING NOTE

Below 75 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Conditions for Figs 13; 14 and 15.

Typical values; V_{CE} = 28 V; P_L = 45 W; T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 47,5 W (P.E.P.)	I_C (A) at 47,5 W (P.E.P.)	d_3 dB*	d_5 dB*	$I_{C(ZS)}$ mA	T_h °C
5 to 47,5 (P.E.P.)	typ. 19	typ. 45	typ. 1,9	typ. −30	< −30	50	25
5 to 42,5 (P.E.P.)	typ. 19	—	—	typ. −30	< −30	50	70

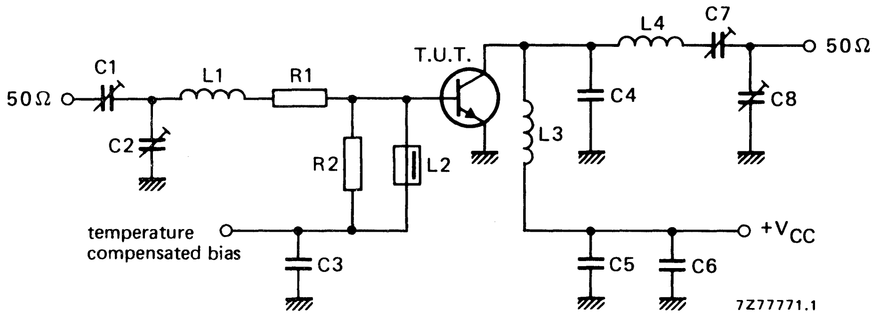


Fig. 16 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = C5 = C6 = 220 nF polyester capacitor
C4 = 56 pF ceramic capacitor (500 V)
C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm
L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors
R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

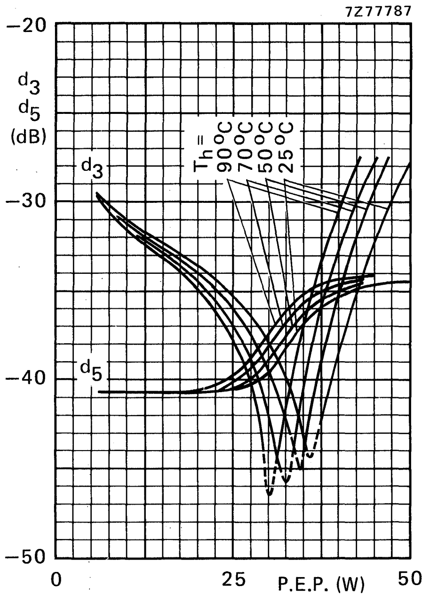


Fig. 17 Intermodulation distortion as a function of output power.*

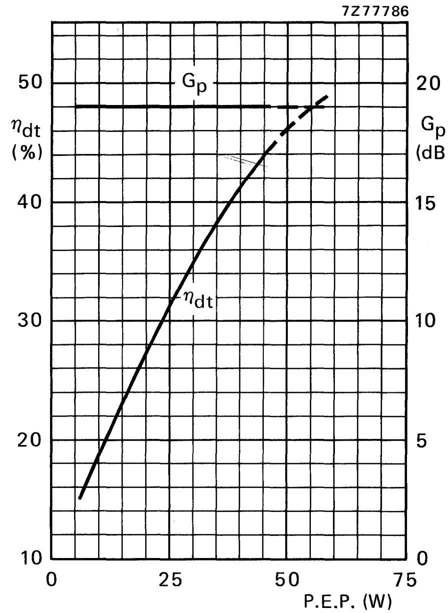


Fig. 18 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 17:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 18:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* See note on previous page.

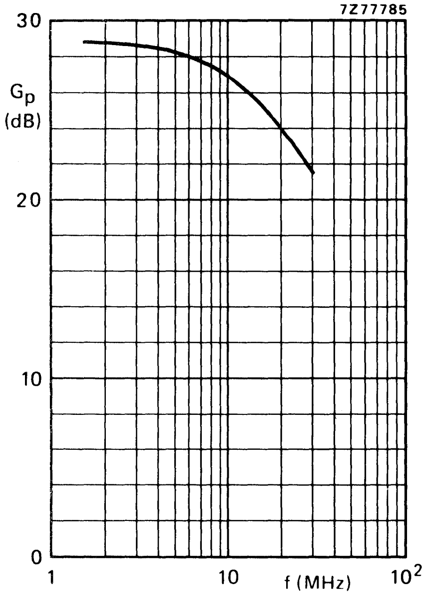


Fig. 19 Power gain as a function of frequency.

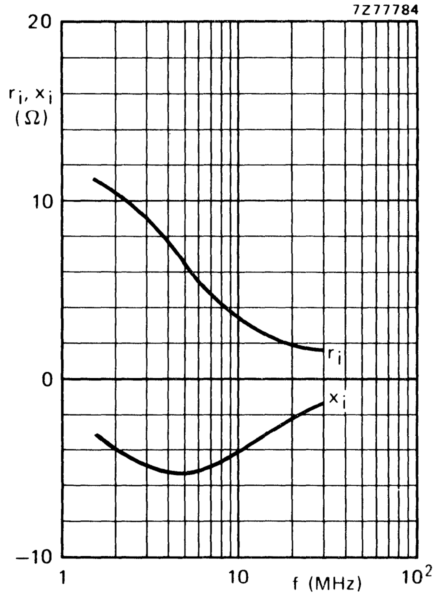


Fig. 20 Input impedance (series components) as a function of frequency.

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 47,5 W; T_h = 25 °C; Z_L = 6,4 Ω.

Ruggedness in s.s.b. operation

The BLW86 is capable of withstanding a load mismatch (VSWR = 50) under the following conditions: class-AB operation; f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_{Lnom} = 50 W P.E.P.

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB*	d_5 dB*	T_h °C
17 (P.E.P.)	typ. 22	1,7	typ. −40	< −40	70
17 (P.E.P.)	typ. 22	1,7	typ. −42	< −40	25

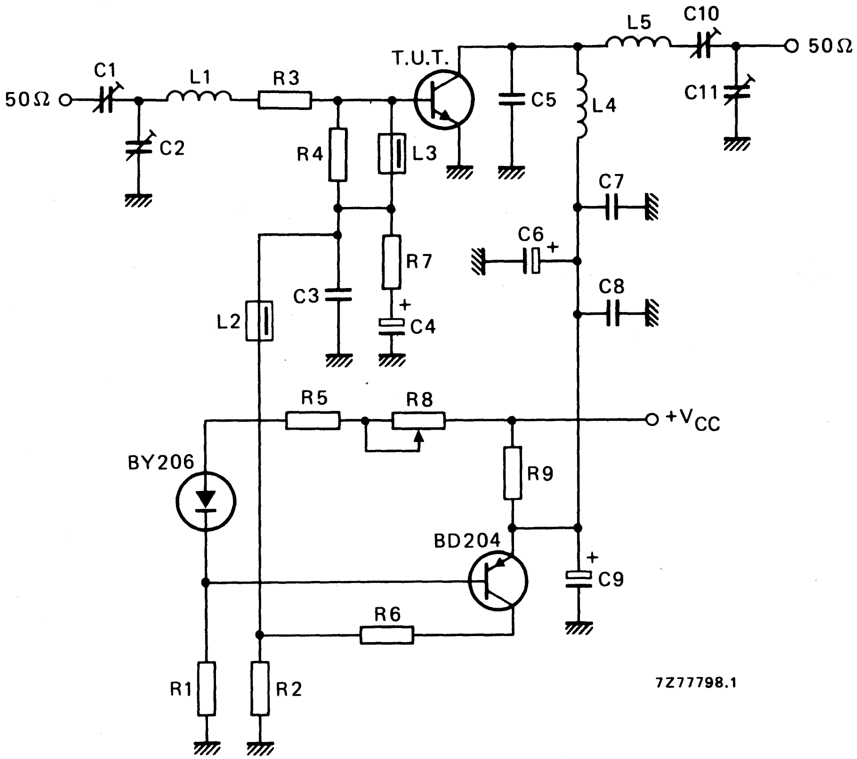


Fig. 21 Test circuit; s.s.b. class-A.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 21:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = 22 nF ceramic capacitor (63 V)
C4 = 47 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/35 V electrolytic capacitor
C10 = 10 to 210 pF film dielectric trimmer
C11 = 15 to 575 pF film dielectric trimmer

L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm
L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω; parallel connection of 2 x 1,2 kΩ carbon resistors (±5%; 0,5 W each)
R2 = 15 Ω carbon resistor (±5%; 0,25 W)
R3 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors (±5%; 0,125 W each)
R4 = 33 Ω carbon resistor (±5%; 0,25 W)
R5 = 18 Ω carbon resistor (±5%; 0,25 W)
R6 = 120 Ω wirewound resistor (±5%; 5,5 W)
R7 = 1 Ω carbon resistor (±5%; 0,125 W)
R8 = 47 Ω wirewound potentiometer (3 W)
R9 = 1,57 Ω; parallel connection of 3 x 4,7 Ω wirewound resistors (±5%; 5,5 W each)

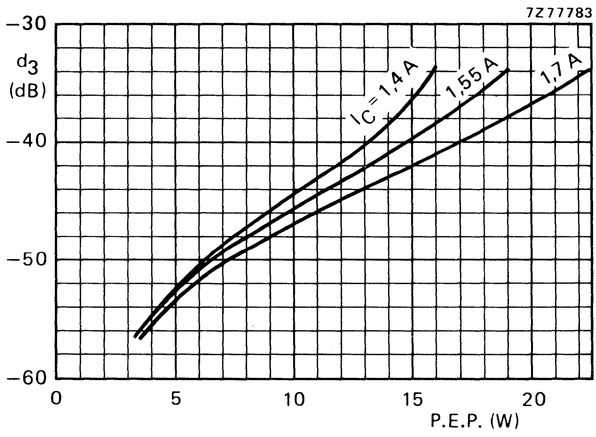


Fig. 22 Intermodulation distortion as a function of output power.
Typical values; V_{CE} = 26 V; T_h = 70 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

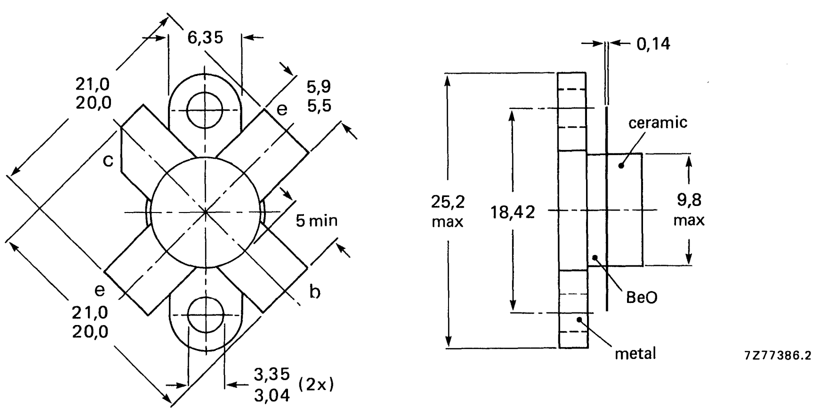
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

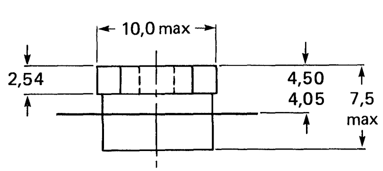
mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**25**	**> 6**	**> 70**	**1,6 + j1,4**	**210 + j5,5**

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-123.





Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head
4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	6	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	12	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	76	W
Storage temperature	T_{stg}		− 65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

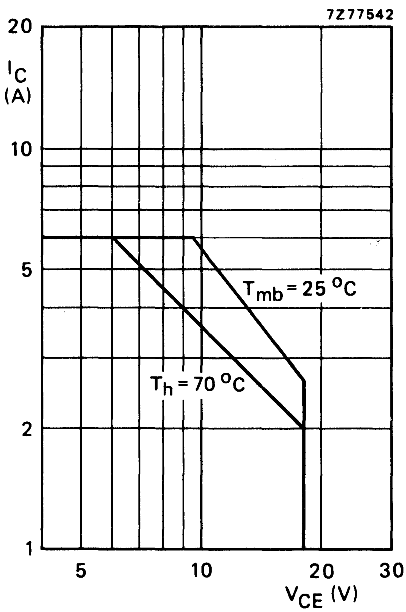


Fig. 2 D.C. SOAR.

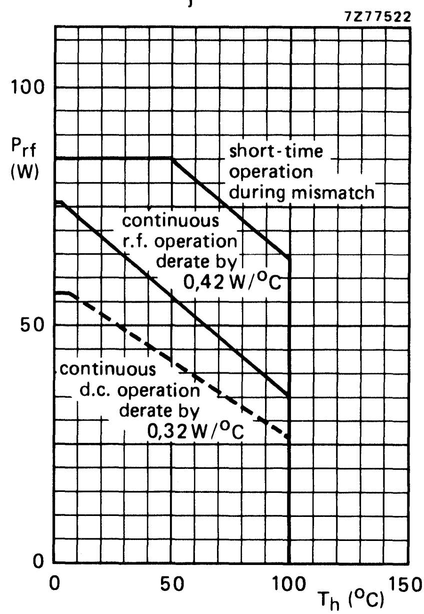


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f $\geqslant$ 1 MHz.

THERMAL RESISTANCE (dissipation = 20 W; T_{mb} = 76 °C; i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,0	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,25	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	8 mJ
R_{BE} = 10 Ω	E_{SBR}	>	8 mJ
D.C. current gain* I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ.	50
			10 to 80
Collector-emitter saturation voltage* I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ.	1,7 V
Transition frequency at f = 100 MHz*			
$-I_E$ = 2,5 A; V_{CB} = 13,5 V	f_T	typ.	800 MHz
$-I_E$ = 7,5 A; V_{CB} = 13,5 V	f_T	typ.	750 MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 15 V	C_c	typ.	65 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 15 V	C_{re}	typ.	41 pF
Collector-flange capacitance	C_{cf}	typ.	2 pF

* Measured under pulse conditions: $t_p \leq 200\ \mu s$; $\delta \leq 0{,}02$.

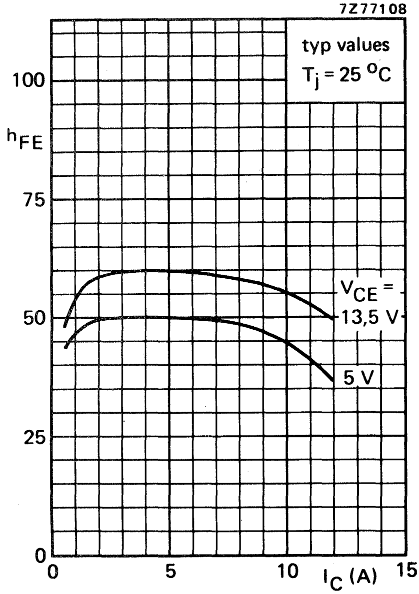


Fig. 4.

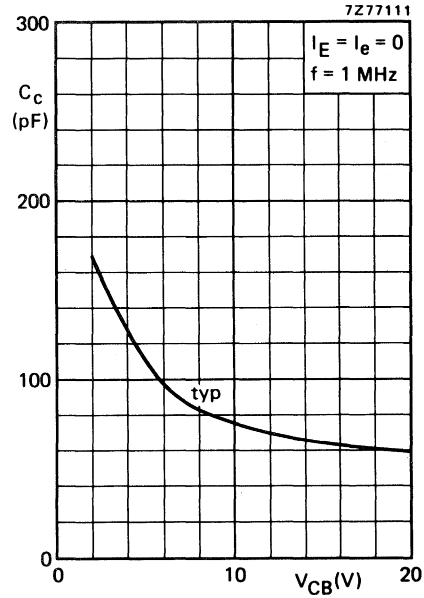


Fig. 5 T_j = 25 °C.

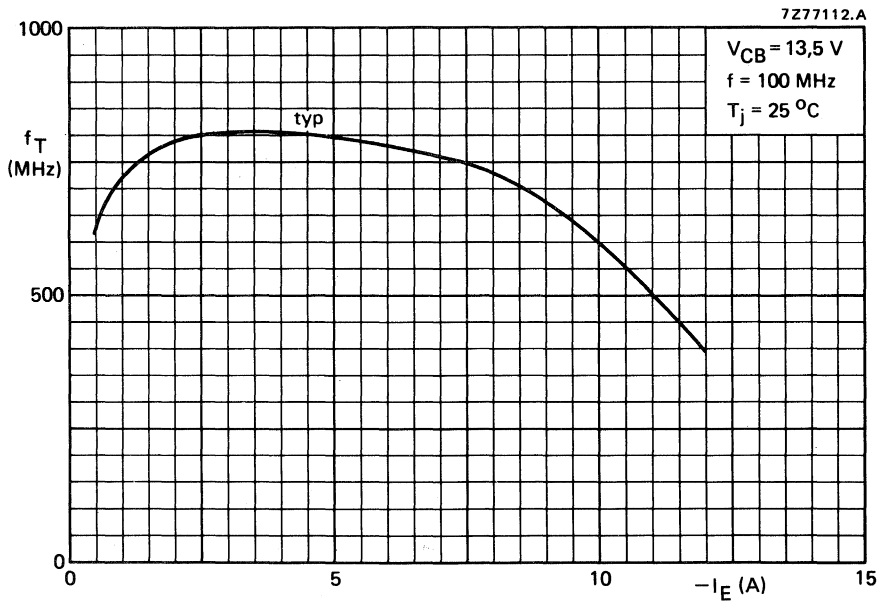


Fig. 6.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**25**	**< 6,25**	**> 6**	**< 2,64**	**> 70**	**1,6 + j1,4**	**210 + j5,5**
175	12,5	25	–	typ. 6,6	–	typ. 75	–	–

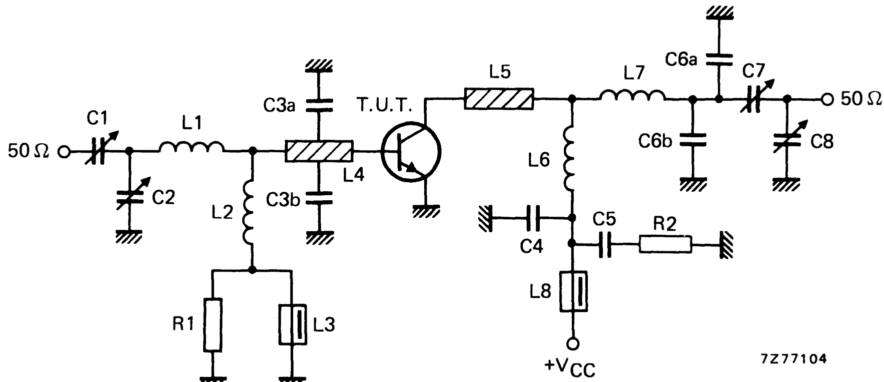


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C6a = C6b = 8,2 pF ceramic capacitor (500 V)
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 1 turn Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 2 turns Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm
L7 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω (± 10%) carbon resistor (0,25 W)
R2 = 4,7 Ω (± 5%) carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit are shown in Fig. 8.

APPLICATION INFORMATION (continued)

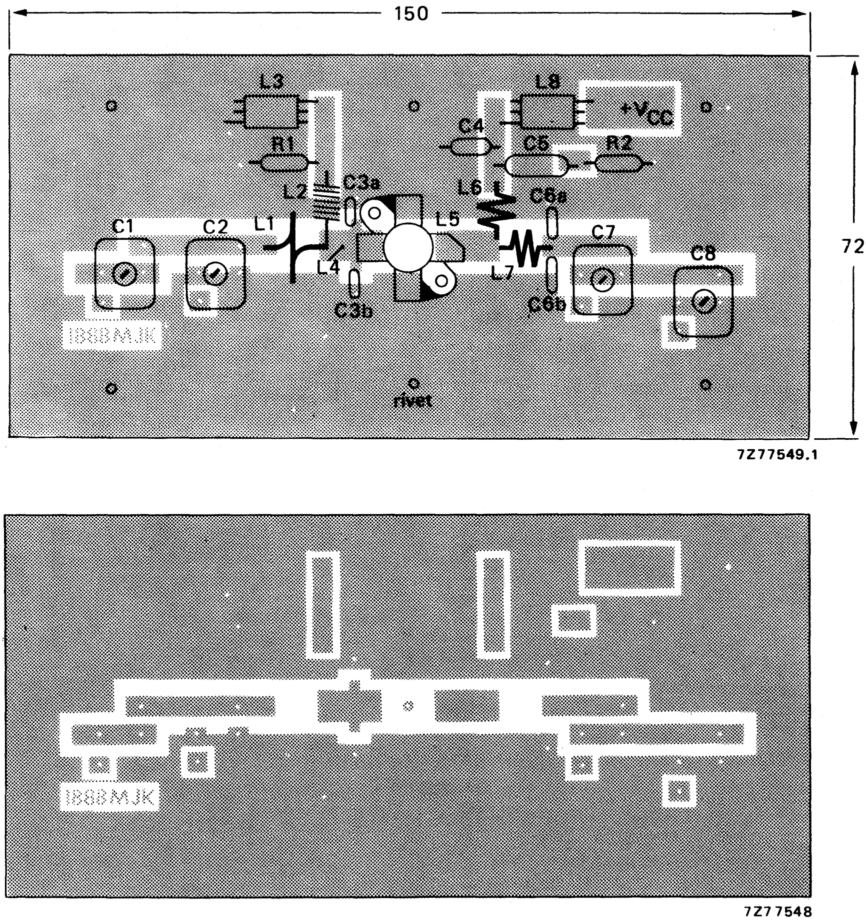


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

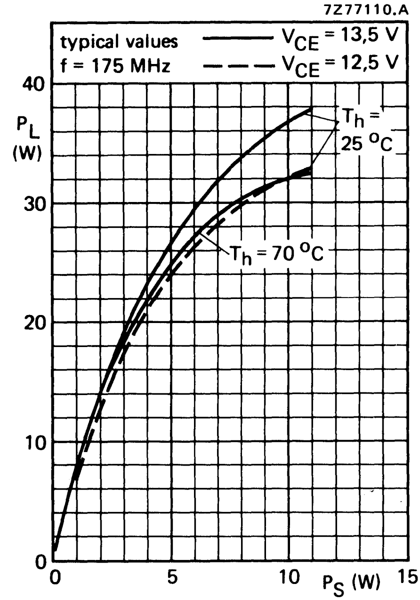


Fig. 9.

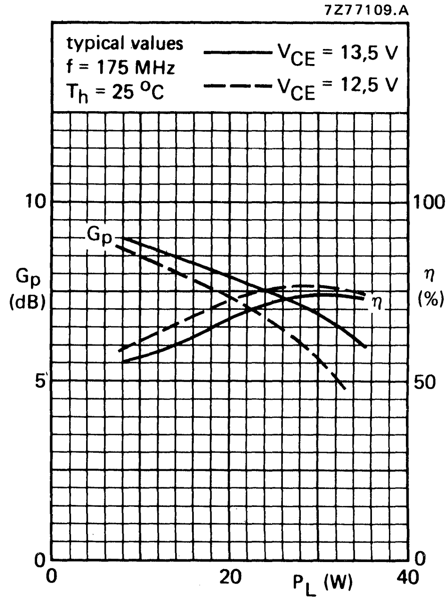


Fig. 10.

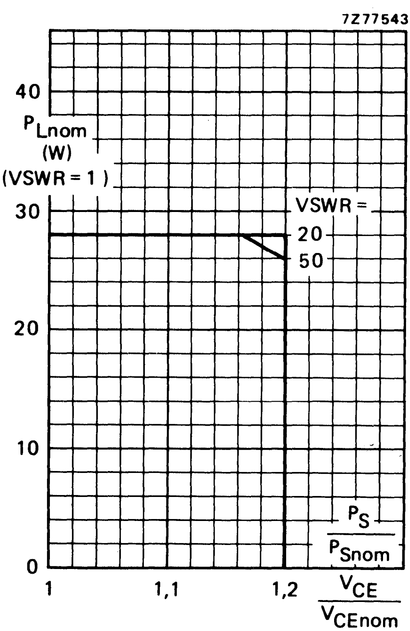


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,3 K/W ; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

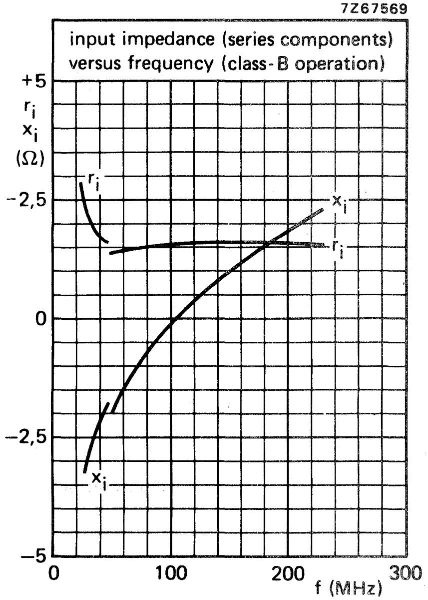


Fig. 12.

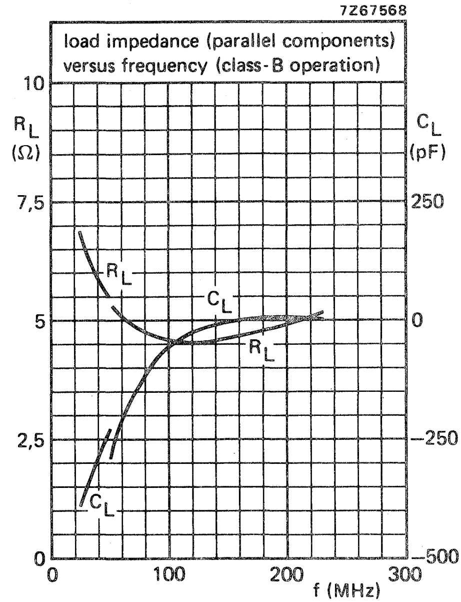
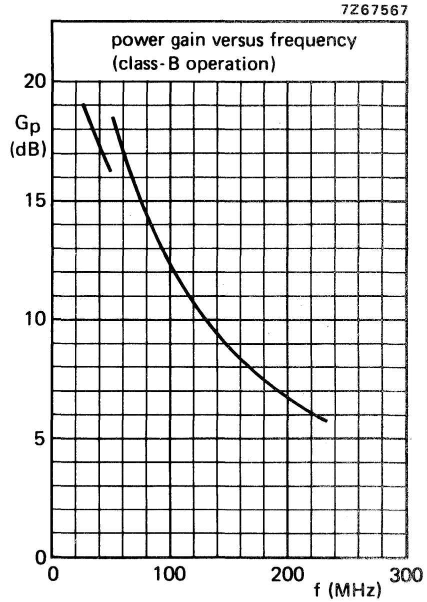


Fig. 13.



Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 25 W; T_h = 25 °C.

Fig. 14.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a **gold sandwich metallization.**

The transistor is housed in a ¼″ capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

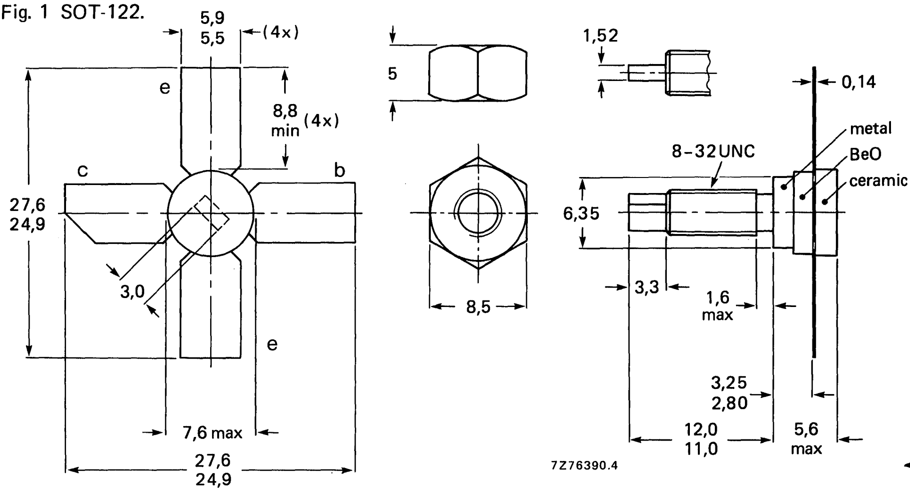
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	2	> 12	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	60	V
open base	V_{CEO}	max.	30	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	0,32	A
(peak value); f > 1 MHz	I_{CM}	max.	1,0	A
Total power dissipation (d.c. and r.f.) up to T_{mb} = 50 °C	P_{tot}	max.	9,6	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

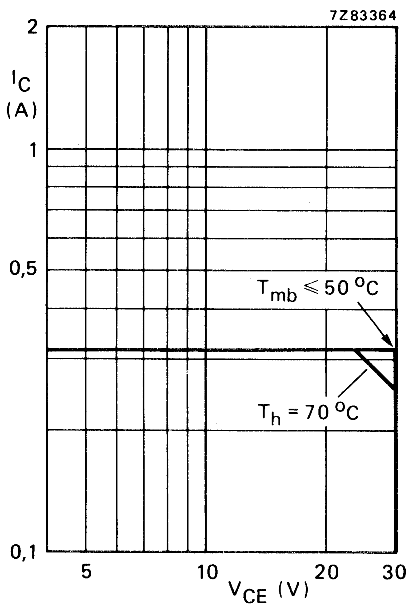


Fig. 2 D.C. SOAR.

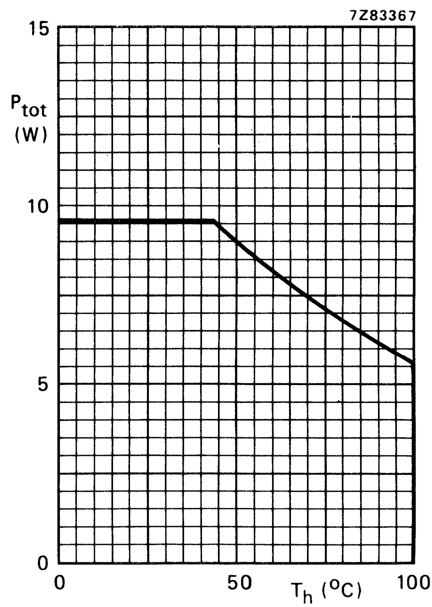


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 3,5 W; T_{mb} = 72 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. and r.f. dissipation)	$R_{th\ j\text{-}mb}$	=	13,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 2$ mA	$V_{(BR)CES}$	>	60	V
Collector-emitter breakdown voltage open base; $I_C = 10$ mA	$V_{(BR)CEO}$	>	30	V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 30$ V	I_{CES}	<	1	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5	mJ
D.C. current gain * $I_C = 0,15$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40	
			10 to 100	
Collector-emitter saturation voltage * $I_C = 0,5$ A; $I_B = 0,1$ A	V_{CEsat}	typ.	0,9	V
Transition frequency at f = 500 MHz * $-I_E = 0,15$ A; $V_{CB} = 28$ V	f_T	typ.	1,20	GHz
$-I_E = 0,50$ A; $V_{CB} = 28$ V	f_T	typ.	0,85	GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	5,5	pF
Feedback capacitance at f = 1 MHz $I_C = 10$ mA; $V_{CE} = 28$ V	C_{re}	typ.	2	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

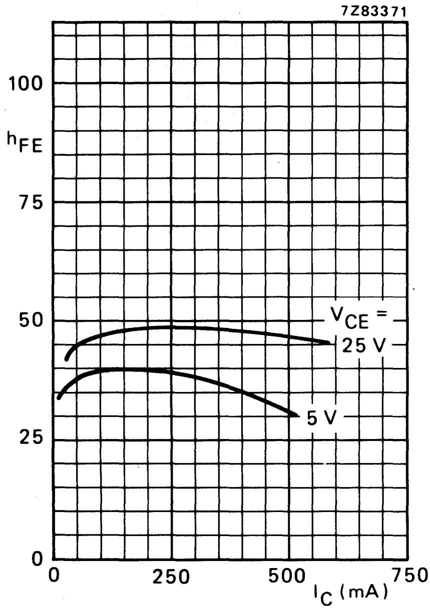


Fig. 4 Typical values; T_j = 25 °C.

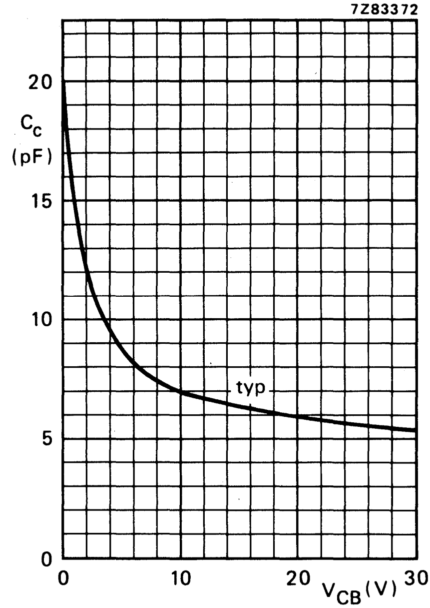


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

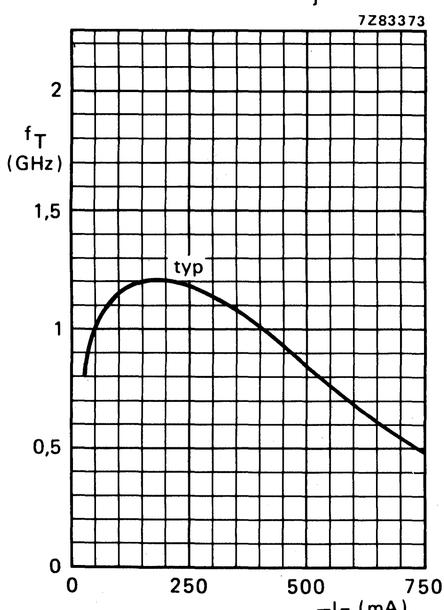


Fig. 6 V_{CB} = 28 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (Ω)
470	**28**	**2**	< **0,13**	> **12**	< **0,145**	> **50**	**3,0 – j0,4**	**12 + j45**
470	28	2	typ. 0,09	typ. 13,5	typ. 0,135	typ. 53	–	–

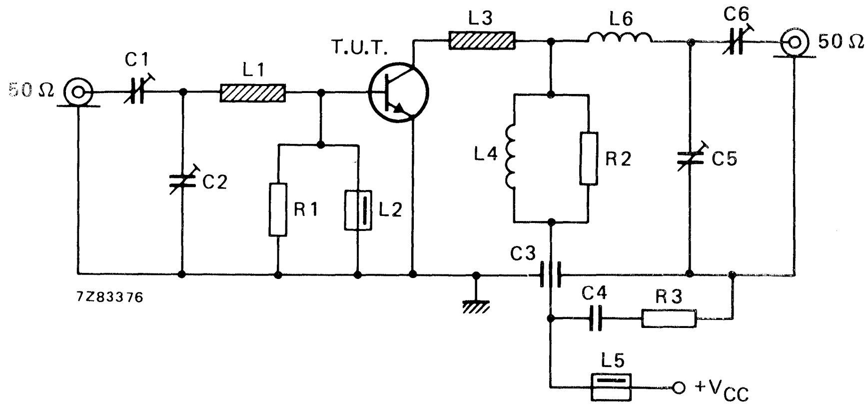


Fig. 7 Test circuit; c.w. class-B.

List of components:

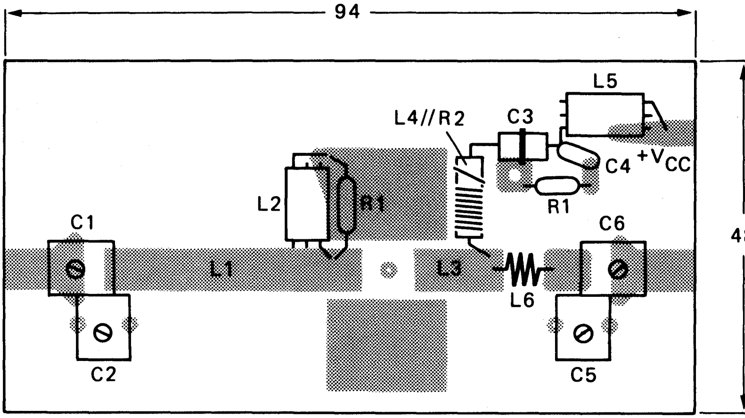
C1 = C5 = C6 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = 100 pF ceramic feed-through capacitor
C4 = 100 nF polyester capacitor

L1 = stripline (34,8 mm x 6,0 mm)
L2 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = stripline (12,0 mm x 6,0 mm)
L4 = 220 nH; 10 turns enamelled Cu wire (0,35 mm) closely wound around R2
L6 = 29 nH; 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 3,5 mm; leads 2 x 4 mm

L1 and L3 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

R1 = 100 Ω carbon resistor
R2 = 10 kΩ carbon resistor (style CR37)
R3 = 10 Ω carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig. 8.



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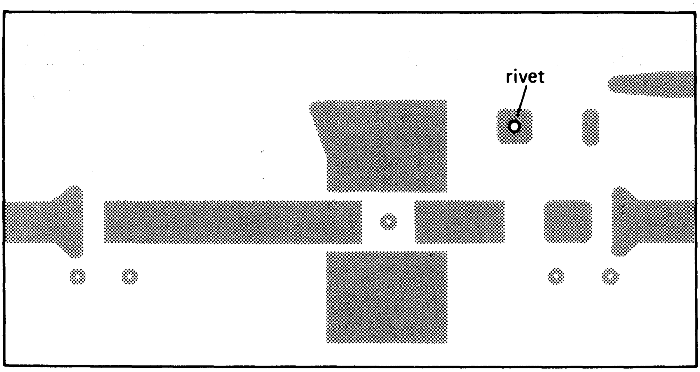

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Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

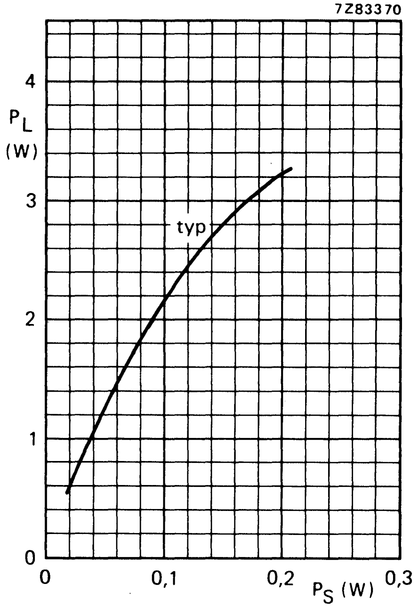


Fig. 9 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

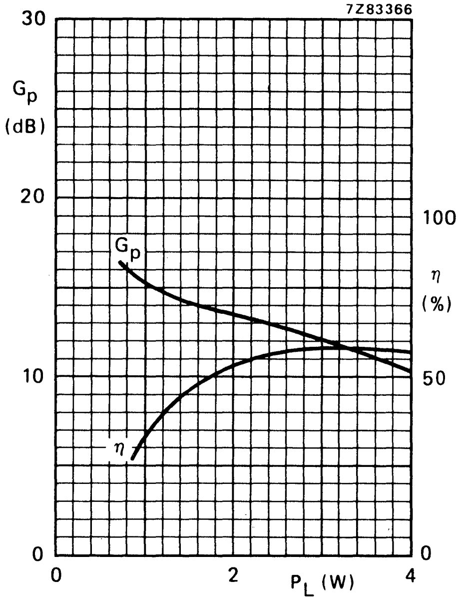


Fig. 10 Typical values; V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

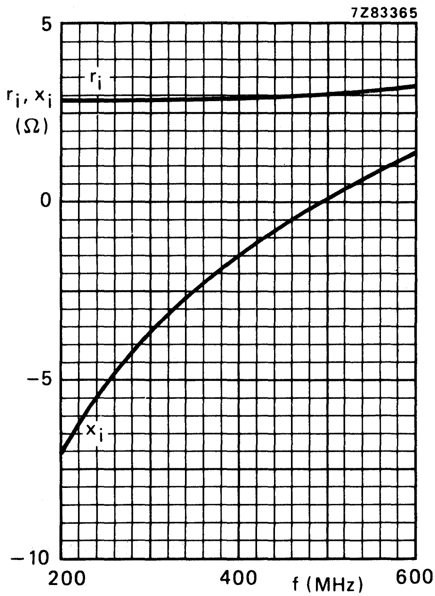


Fig. 11 Input impedance (series components).

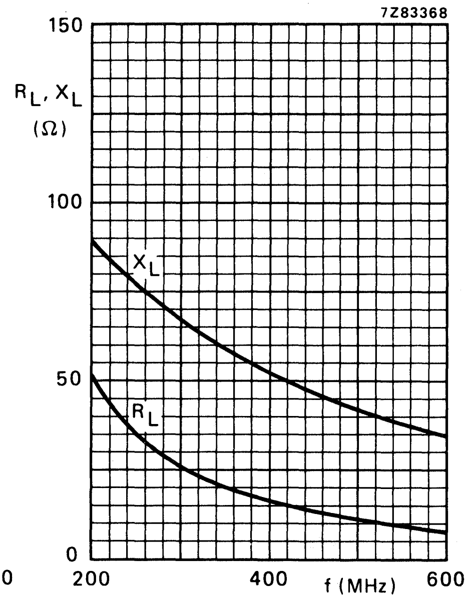


Fig. 12 Load impedance (series components).

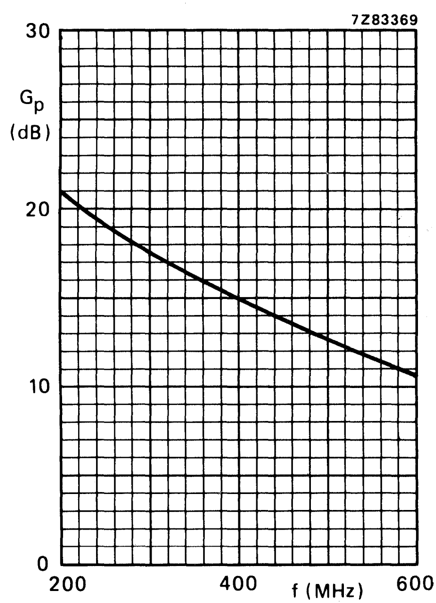


Fig. 13.

Conditions for Figs 11, 12 and 13:

Typical values; V_{CE} = 28 V; P_L = 2 W; T_h = 25 °C.

Ruggedness

The BLW89 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 2 W under the following conditions:

V_{CE} = 28 V; f = 470 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,6 K/W.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a **gold sandwich metallization.**

The transistor is housed in a ¼″ capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

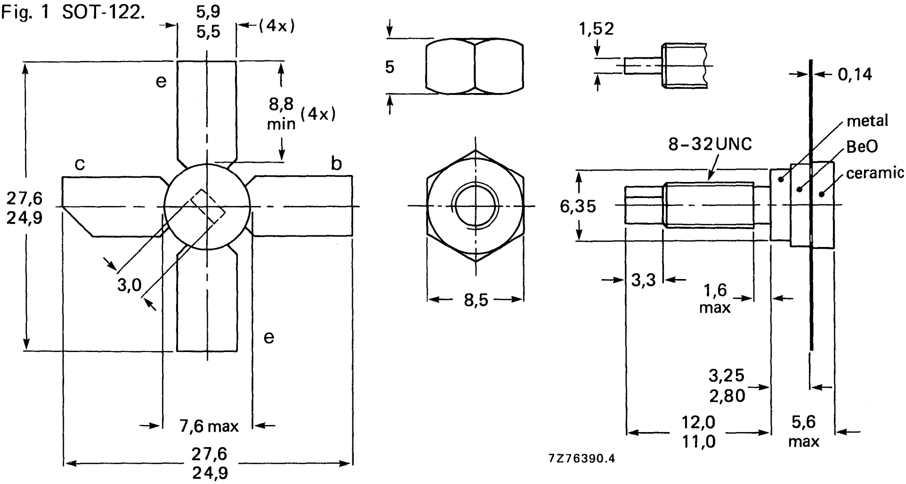
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	4	> 11	> 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	60	V
open base	V_{CEO}	max.	30	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
d.c. or average	I_C; $I_{C(AV)}$	max.	0,62	A
(peak value); f > 1 MHz	I_{CM}	max.	2,0	A
Total power dissipation (d.c. and r.f.) up to T_{mb} = 25 °C	P_{tot}	max.	18,6	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

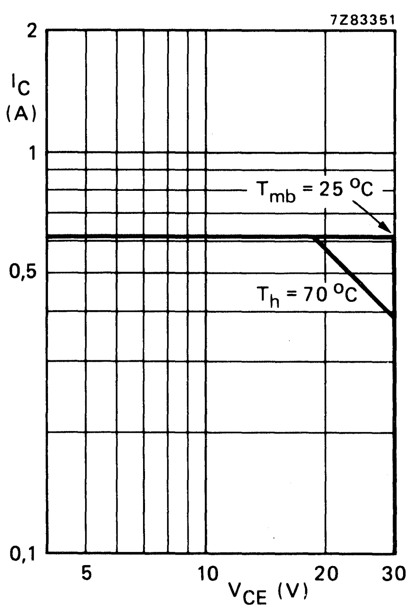


Fig. 2 D.C. SOAR.

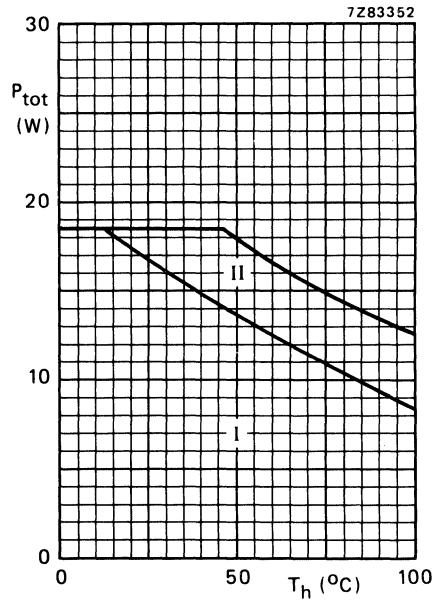


Fig. 3 Power derating curves vs. temperature.
I Continuous d.c. and r.f. operation
II Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 6 W; T_{mb} = 73,6 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. and r.f. dissipation)	$R_{th\ j\text{-}mb}$	=	9,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 4$ mA	$V_{(BR)CES}$	>	60	V
Collector-emitter breakdown voltage				
open base; $I_C = 20$ mA	$V_{(BR)CEO}$	>	30	V
Emitter-base breakdown voltage				
open collector; $I_E = 2$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 30$ V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	1	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	1	mJ
D.C. current gain *				
$I_C = 0,3$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40	
			10 to 100	
Collector-emitter saturation voltage *				
$I_C = 1,0$ A; $I_B = 0,2$ A	V_{CEsat}	typ.	0,9	V
Transition frequency at f = 500 MHz *				
$-I_E = 0,3$ A; $V_{CB} = 28$ V	f_T	typ.	1,2	GHz
$-I_E = 1,0$ A; $V_{CB} = 28$ V	f_T	typ.	0,9	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	8,4	pF
Feedback capacitance at f = 1 MHz				
$I_C = 20$ mA; $V_{CE} = 28$ V	C_{re}	typ.	3,6	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

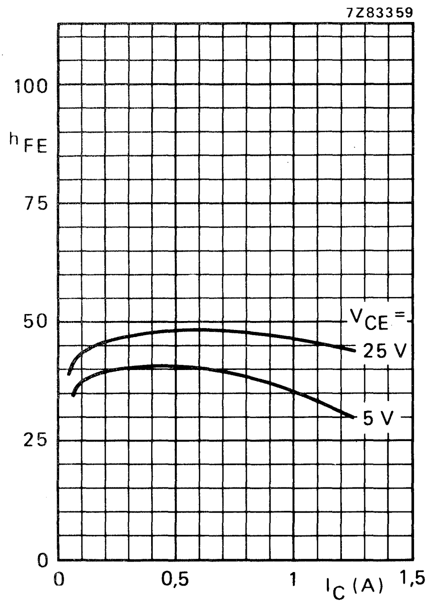


Fig. 4 Typical values; T_j = 25 °C.

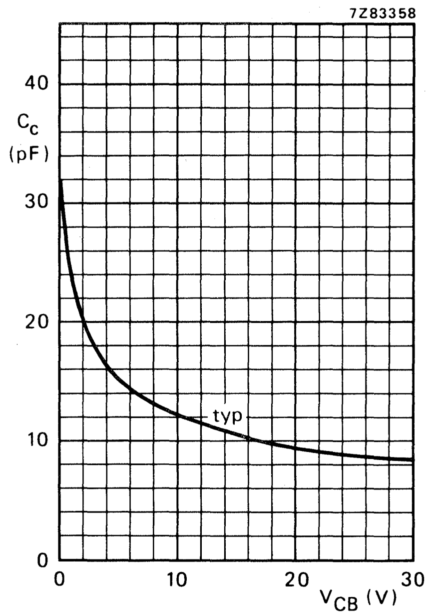


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

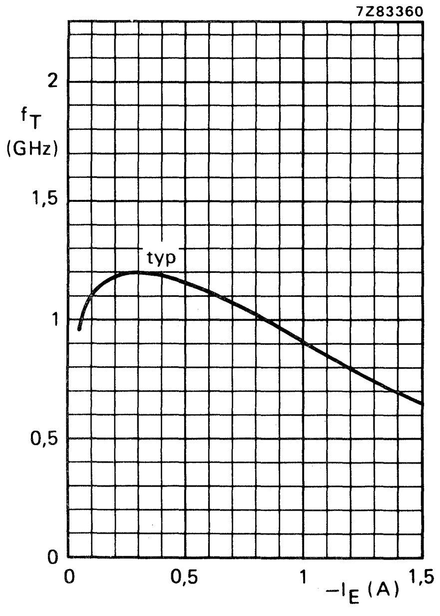


Fig. 6 V_{CB} = 28 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (Ω)
470	**28**	**4**	< **0,32**	> **11**	< **0,26**	> **55**	**1,7 + j1,8**	**8 + j26**
470	28	4	typ. 0,23	typ. 12,5	typ. 0,25	typ. 58	–	–

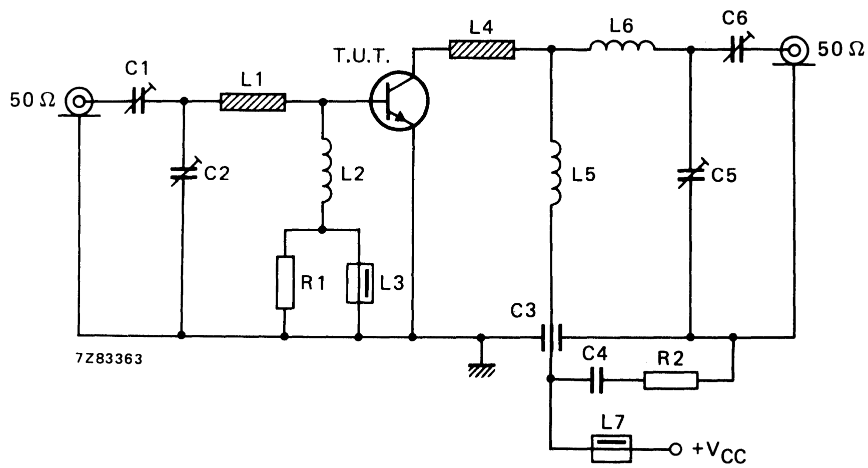


Fig. 7 Test circuit; c.w. class-B.

List of components:

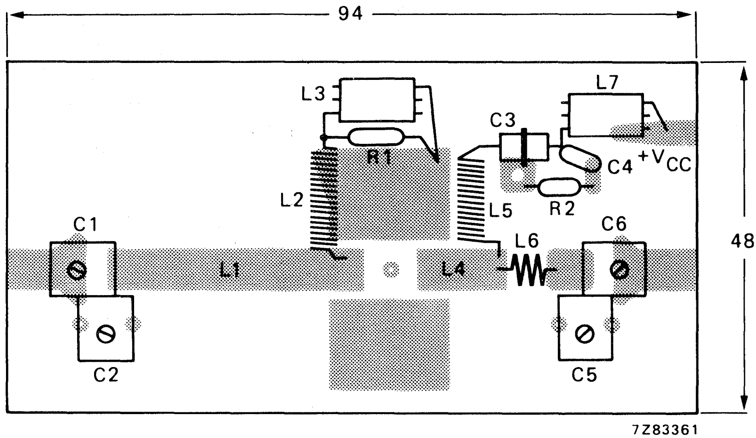
C1 = C5 = C6 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = 100 pF feed-through capacitor
C4 = 100 nF polyester capacitor

L1 = stripline (34,8 mm x 6,0 mm)
L2 = 320 nH; 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 x 4 mm
L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = stripline (12,0 mm x 6,0 mm)
L5 = 265 nH; 13 turns closely wound enamelled Cu wire (0,35 mm); int. dia. 3,5 mm; leads 2 x 4 mm
L6 = 29 nH; 3 turns closely wound enamelled Cu wire (1 mm); int. dia. 3,5 mm; leads 2 x 4 mm

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16".

R1 = 100 Ω carbon resistor
R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 470 MHz test circuit are shown in Fig. 8.



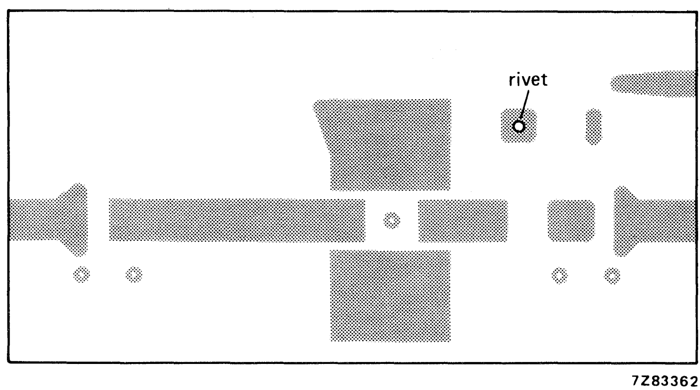


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

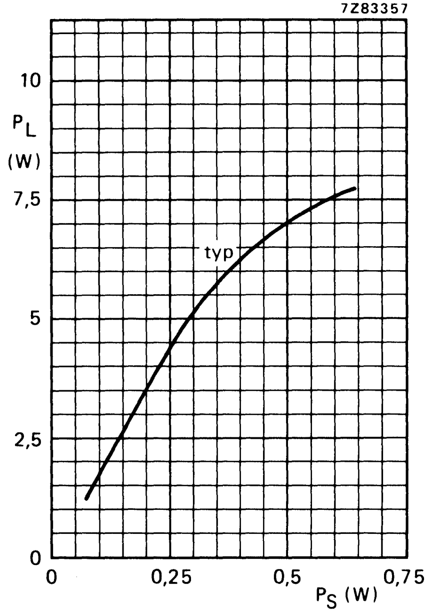


Fig. 9 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

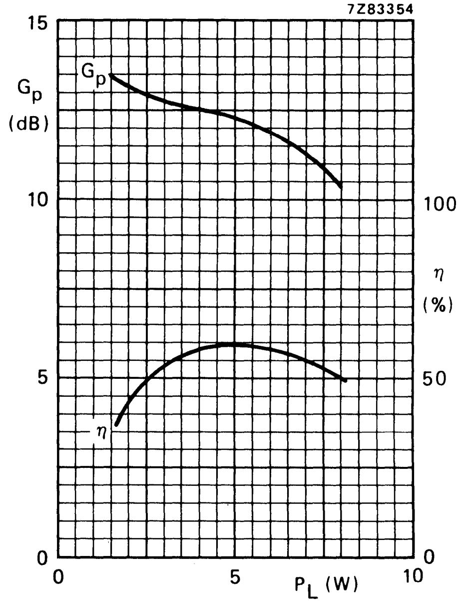


Fig. 10 Typical values; V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

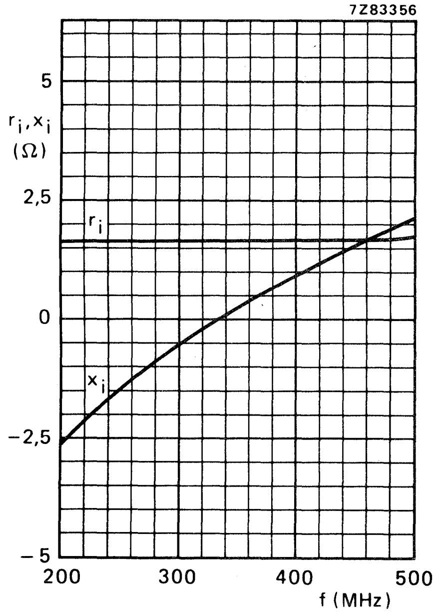


Fig. 11 Input impedance (series components).

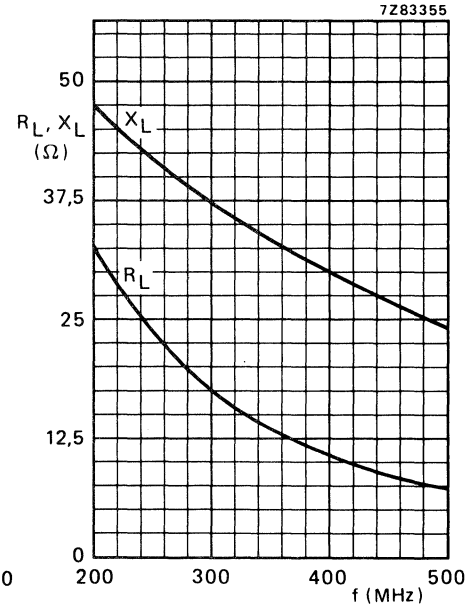


Fig. 12 Load impedance (series components).

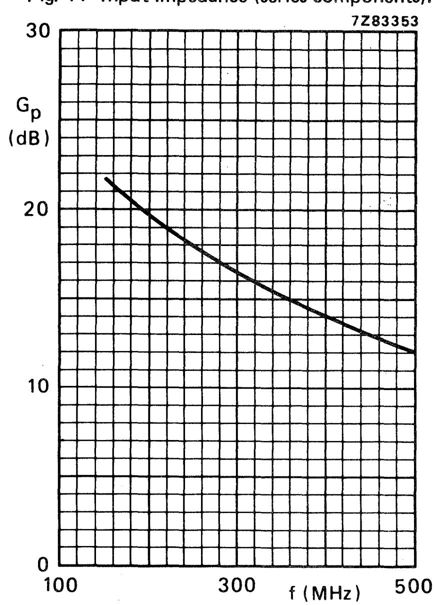


Fig. 13.

Conditions for Figs 11, 12 and 13:

Typical values; V_{CE} = 28 V; P_L = 4 W; T_h = 25 °C.

Ruggedness

The BLW90 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 4 W under the following conditions:

V_{CE} = 28 V; f = 470 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,6 K/W.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor suitable for transmitting applications in class-A, B or C in the u.h.f. and v.h.f. range for a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand infinite VSWR at rated output power. High reliability is ensured by a **gold sandwich metallization.**

The transistor is housed in a ¼" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

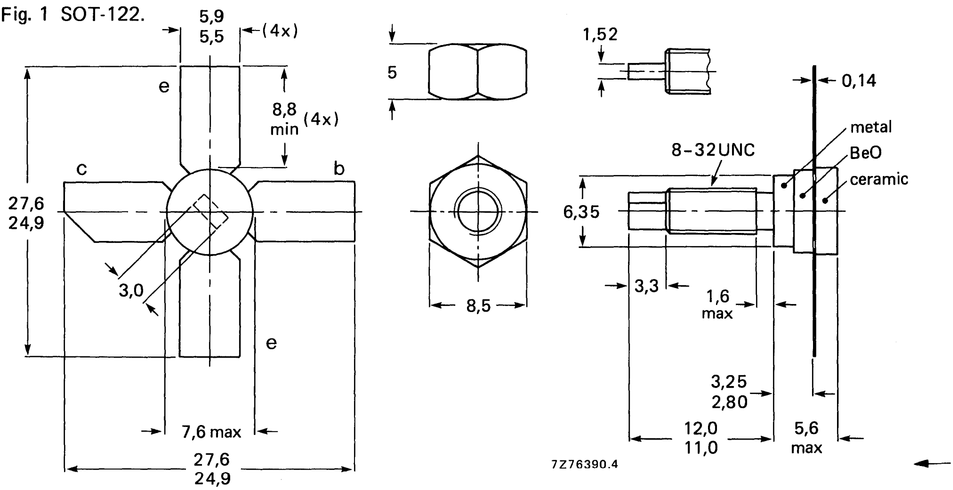
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
c.w.	28	470	10	> 9	> 60

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	60 V
open base	V_{CEO}	max.	30 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c. or average	I_C; $I_{C(AV)}$	max.	1,5 A
(peak value); $f > 1$ MHz	I_{CM}	max.	3,5 A
Total power dissipation up to $T_{mb} = 35$ °C	P_{tot}	max.	30 W
R.F. power dissipation ($f > 1$ MHz); $T_{mb} = 25$ °C	P_{rf}	max.	32,5 W
Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

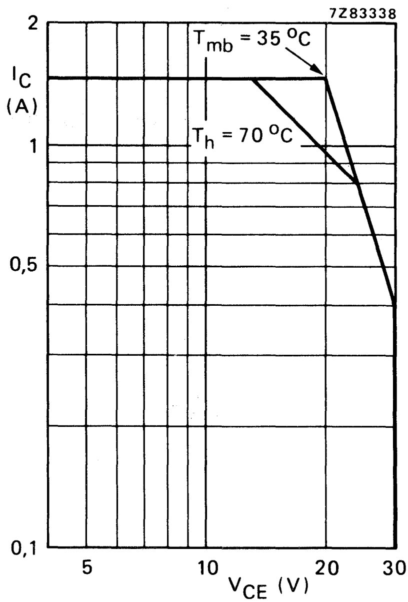


Fig. 2 D.C. SOAR.

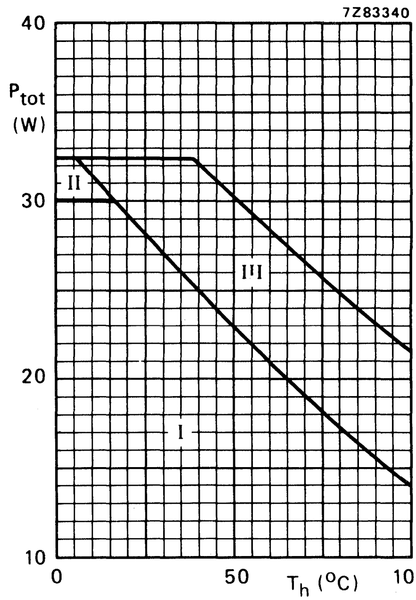


Fig. 3 Power derating curves vs. temperature.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 10 W; $T_{mb} = 76$ °C, i.e. $T_h = 70$ °C)

From junction to mounting base (d.c. and r.f. dissipation)	$R_{th\ j\text{-}mb}$	=	6,2 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	60	V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	30	V
Emitter-base breakdown voltage open collector; I_E = 4 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 30 V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	2	mJ
R_{BE} = 10 Ω	E_{SBR}	>	2	mJ
D.C. current gain * I_C = 0,6 A; V_{CE} = 5 V	h_{FE}	typ.	40 10 to 100	
Collector-emitter saturation voltage * I_C = 2,0 A; I_B = 0,4 A	V_{CEsat}	typ.	1,0	V
Transition frequency at f = 500 MHz * $-I_E$ = 0,6 A; V_{CB} = 28 V	f_T	typ.	1,2	GHz
$-I_E$ = 2,0 A; V_{CB} = 28 V	f_T	typ.	1,0	GHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	17	pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 28 V	C_{re}	typ.	8,5	pF
Collector-stud capacitance	C_{cs}	typ.	1,2	pF ←

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

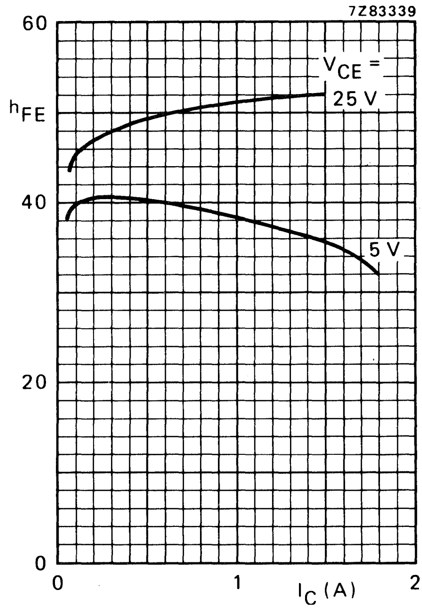


Fig. 4 Typical values; T_j = 25 °C.

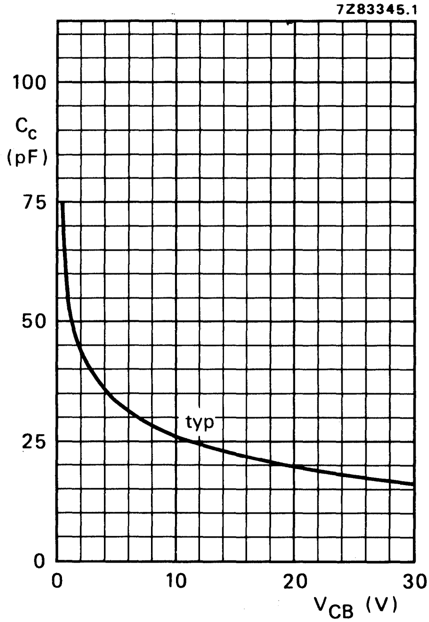


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

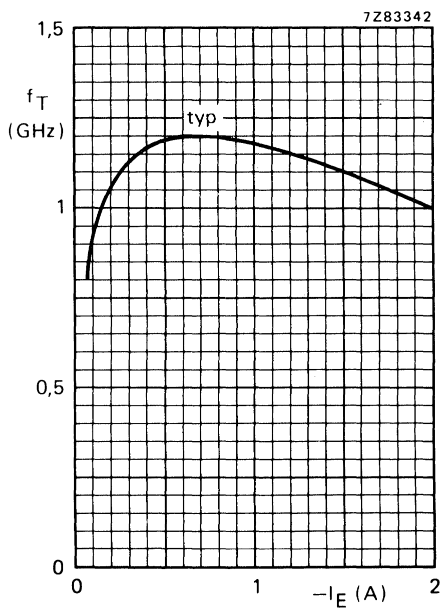


Fig. 6 V_{CB} = 28 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Z_L}$ (Ω)
470	**28**	**10**	< **1,26**	> **9**	< **0,6**	> **60**	**1,0 + j2,1**	**4,9 + j11**
470	28	10	typ. 0,9	typ. 10,5	typ. 0,56	typ. 63	–	–

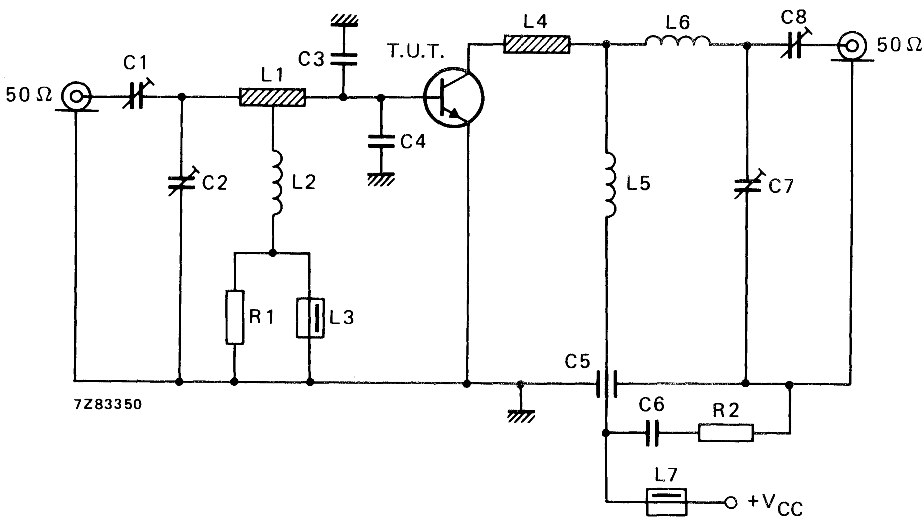


Fig. 7 Test circuit; c.w. class-B. For component layout and p.c.b. see Fig. 8.

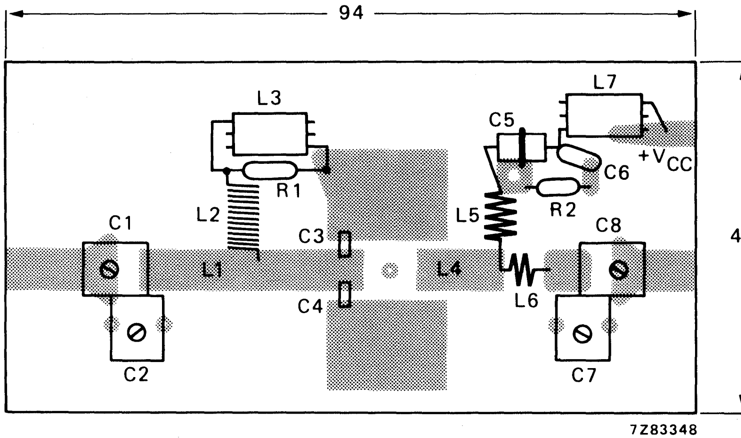
List of components:

C1 = C7 = C8 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C2 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C4 = 15 pF multilayer ceramic chip capacitor (cat. no. 2222 851 13159), middle of capacitor 3 mm from transistor edge
C5 = 100 pF feed-through capacitor
C6 = 100 nF polyester capacitor

L1 = stripline (30,4 mm x 6,0 mm); tap for L2 placed 11 mm from transistor edge
L2 = 320 nH; 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; leads 2 x 4 mm
L3 = L7 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = stripline (12,0 mm x 6,0 mm)
L5 = 78 nH; 5 turns enamelled Cu wire (1,0 mm); int. dia. 5 mm; length 9,3 mm; leads 2 x 5 mm
L6 = 22 nH; 2 turns enamelled Cu wire (1,0 mm); int. dia. 4 mm; length 3,2 mm; leads 2 x 5 mm

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1/16″.

R1 = R2 = 10 Ω carbon resistor



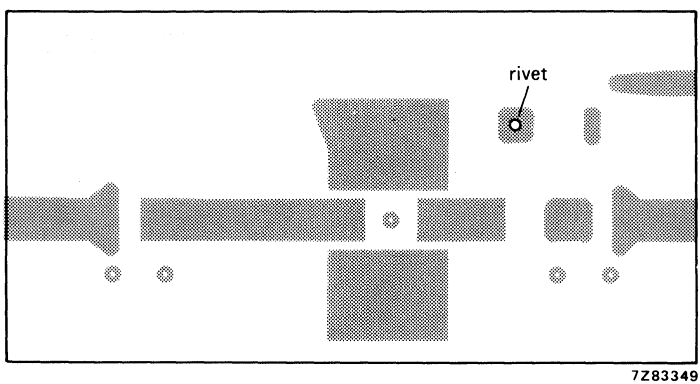


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

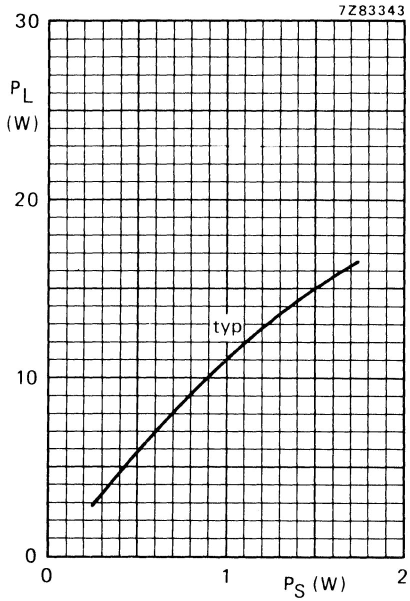


Fig. 9 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

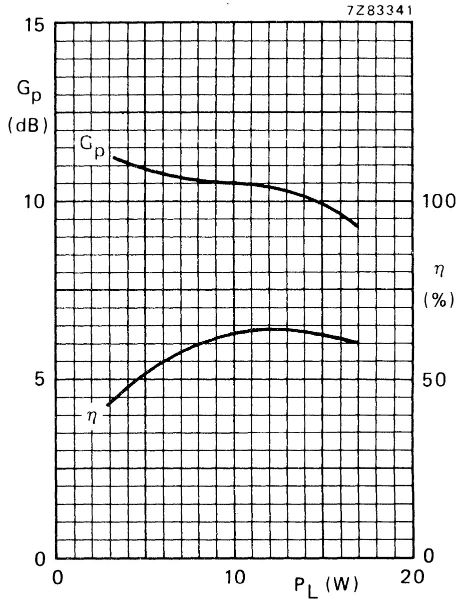


Fig. 10 Typical values; V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C.

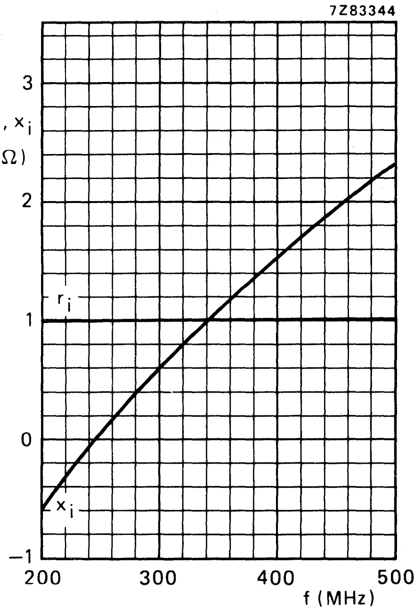


Fig. 11 Input impedance (series components).

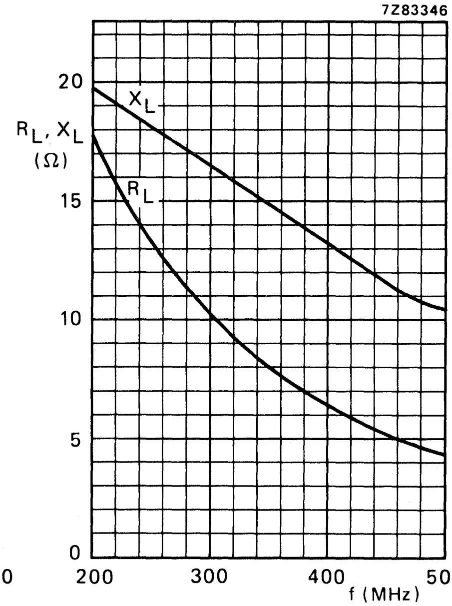
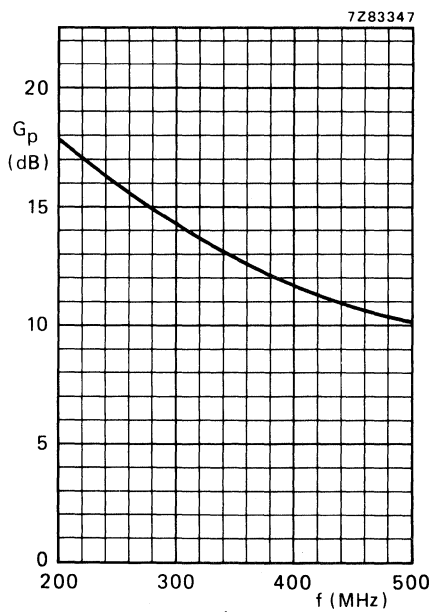


Fig. 12 Load impedance (series components).



Conditions for Figs 11, 12 and 13:

Typical values; V_{CE} = 28 V; P_L = 10 W; T_h = 25 °C.

Ruggedness

The BLW91 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 10 W under the following conditions:

V_{CE} = 28 V; f = 470 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,6 K/W.

H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB operated high power industrial and military transmitting equipment in the h.f. band. The transistor presents excellent performance as a linear amplifier in s.s.b. applications. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Matched h_{FE} groups are available on request.

The transistor has a ½″ flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_p dB	η_{dt} %	d_3 dB
s.s.b. (class-AB)	50	0,1	1,6 – 28	20 – 160 (P.E.P.)	> 14	> 40*	< –30

* At 160 W P.E.P.

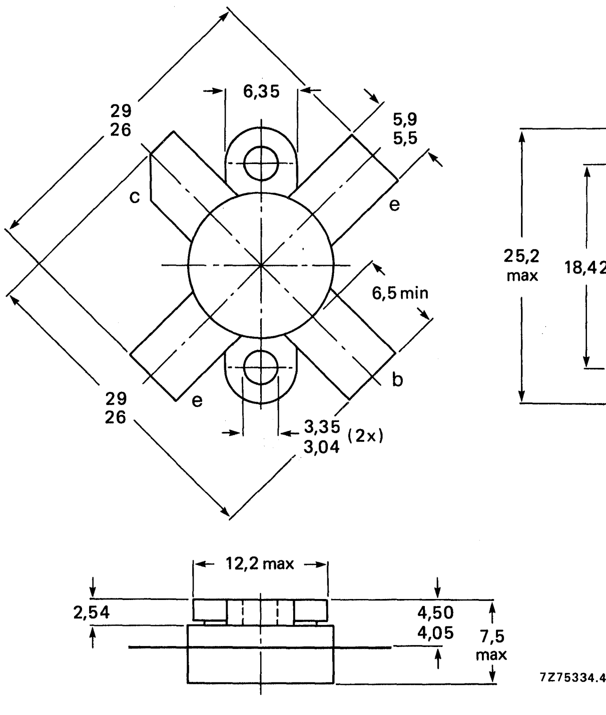
MECHANICAL DATA

SOT-121A (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	110	V
Collector-emitter voltage (open base)	V_{CEO}	max.	53	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	8	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	20	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	245	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

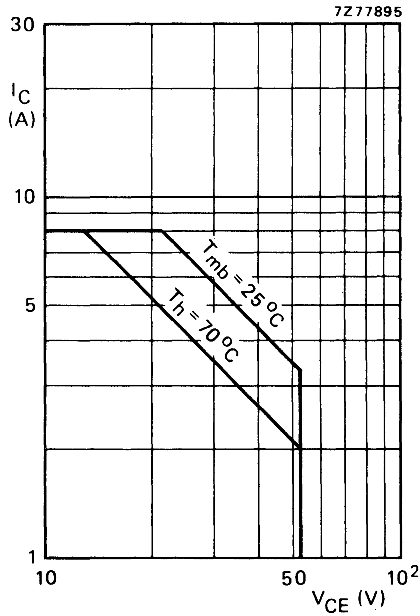


Fig. 2 D.C. SOAR.

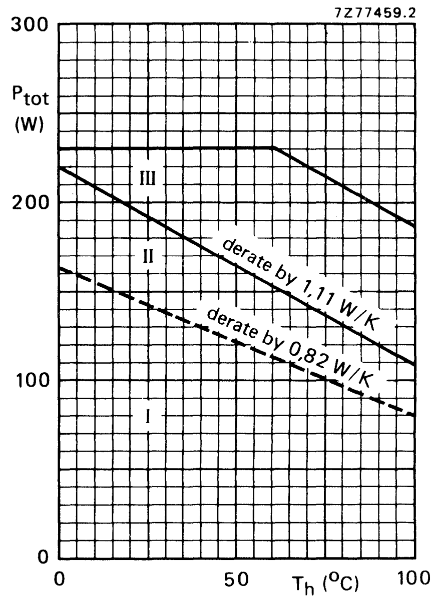


Fig. 3 R.F. power dissipation; $V_{CE} \leq 50$ V; f ≥ 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 100 W; T_{mb} = 90 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,0 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,7 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage				
$V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	110	V
Collector-emitter breakdown voltage				
open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	53	V
Emitter-base breakdown voltage				
open collector; $I_E = 20$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
$V_{BE} = 0$; $V_{CE} = 53$ V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	12,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	12,5	mJ
D.C. current gain *				
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE}	typ.	30 15 to 50	
D.C. current gain ratio of matched devices *				
$I_C = 4$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	⩽	1,2	
Collector-emitter saturation voltage *				
$I_C = 12,5$ A; $I_B = 2,5$ A	V_{CEsat}	typ.	2,2	V
Transition frequency at f = 100 MHz *				
$-I_E = 4$ A; $V_{CB} = 40$ V	f_T	typ.	270	MHz
$-I_E = 12,5$ A; $V_{CB} = 40$ V	f_T	typ.	285	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 50$ V	C_c	typ.	185	pF
Feedback capacitance at f = 1 MHz				
$I_C = 150$ mA; $V_{CE} = 50$ V	C_{re}	typ.	115	pF
Collector-flange capacitance	C_{cf}	typ.	3	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

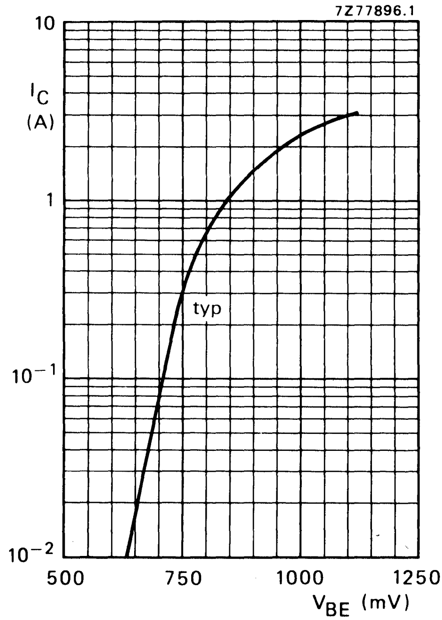


Fig. 4 V_{CE} = 40 V; T_h = 25 °C.

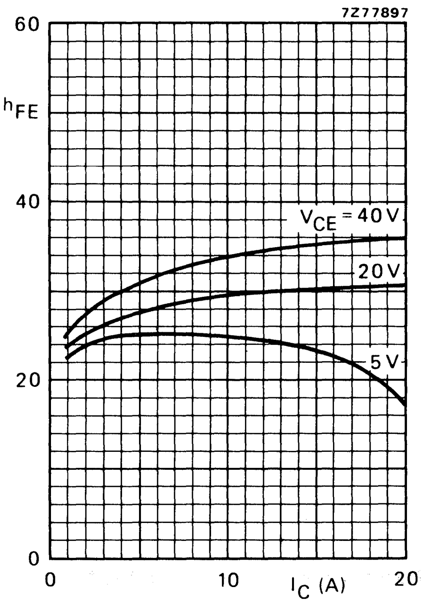


Fig. 5 Typical values; T_j = 25 °C.

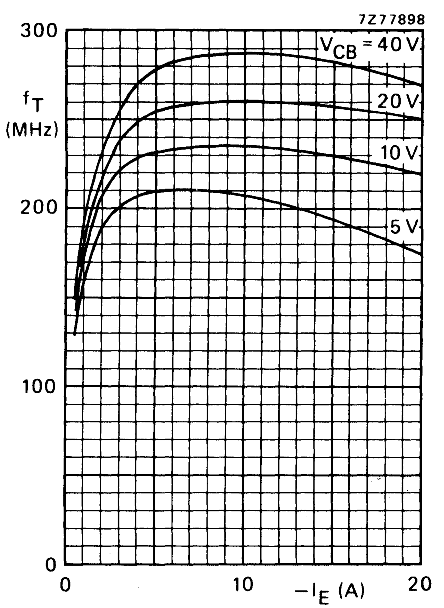


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

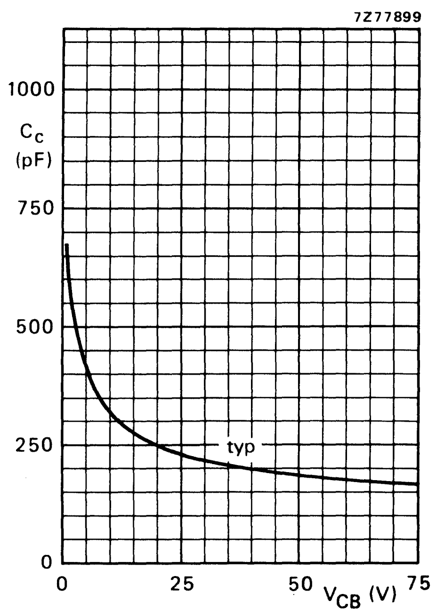


Fig. 7 I_E = I_e = 0; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 50 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 160 W (P.E.P.)	I_C (A) at 160 W (P.E.P.)	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ A
20 to 160 (P.E.P.)	> 14	> 40	< 4,0	< −30	< −30	0,1

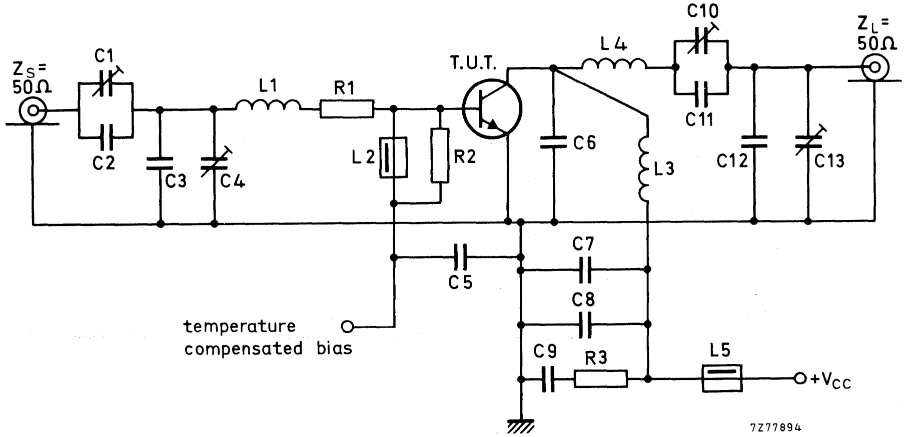


Fig. 8 Test circuit; s.s.b. class-AB.

List of components:

C1 = C10 = 100 pF film dielectric trimmer
C2 = C6 = 27 pF ceramic capacitor (500 V)
C3 = 220 pF polystyrene capacitor
C4 = C13 = 100 pF film dielectric trimmer
C5 = C7 = 3,9 nF ceramic capacitor
C8 = 100 nF polyester capacitor
C9 = 2,2 μF moulded metallized polyester capacitor
C11 = 68 pF ceramic capacitor (500 V)
C12 = 220 pF polystyrene capacitor

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9,0 mm; length 6,1 mm; leads 2 x 5 mm
L2 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 180 nH; 4 turns enamelled Cu wire (1,6 mm); int. dia. 12,0 mm; length 9,9 mm; leads 2 x 10 mm
L4 = 350 nH; 7 turns enamelled Cu wire (1,6 mm); int. dia. 12,0 mm; length 19,1 mm; leads 2 x 10 mm

R1 = 0,66 Ω; parallel connection of 5 x 3,3 Ω carbon resistors (± 5%; 0,5 W each)
R2 = 27 Ω carbon resistor (± 5%; 0,5 W)
R3 = 4,7 Ω carbon resistor (± 5%; 0,5 W)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

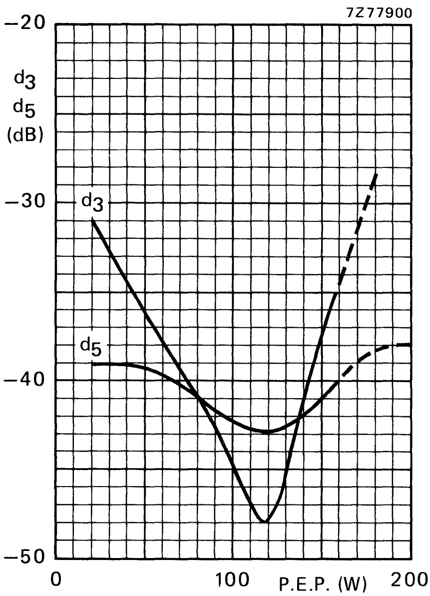


Fig. 9 Intermodulation distortion as a function of output power.*

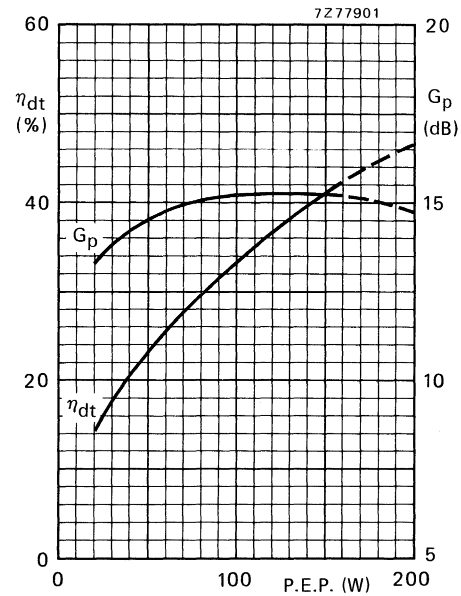


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

Ruggedness

The BLW95 is capable of withstanding full load mismatch (VSWR = 50) up to 150 W (P.E.P.) under the following conditions:

V_{CE} = 45V; f = 28 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

* See note on previous page.

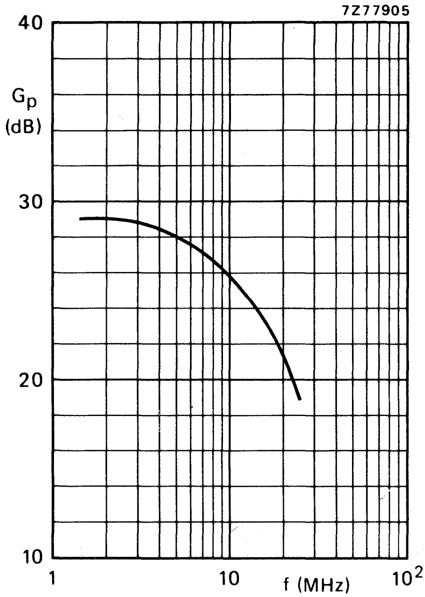


Fig. 11 Power gain as a function of frequency.

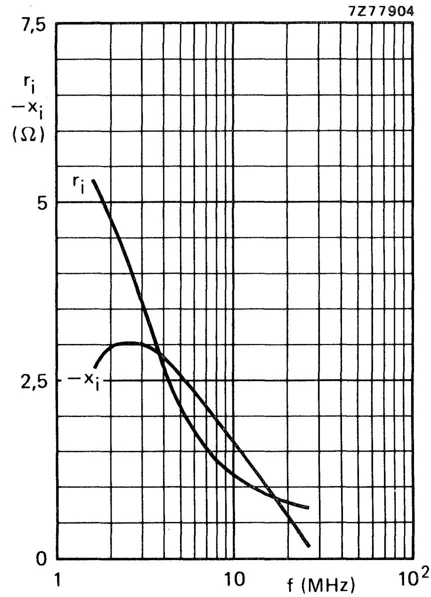


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; P_L = 160 W (P.E.P.); T_h = 25 °C; Z_L = 6,25 Ω in series with 7,3 nH (in parallel with −188 pF).

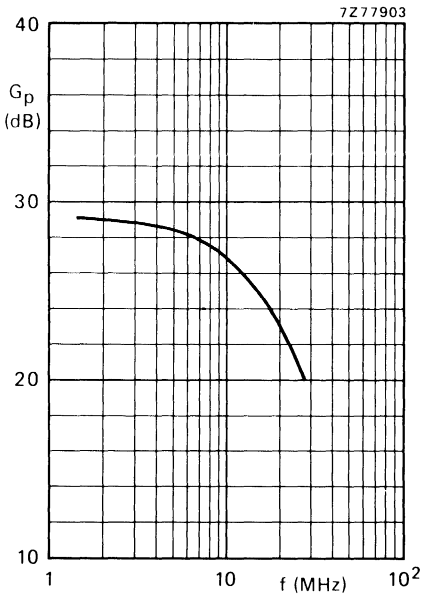


Fig. 13 Power gain as a function of frequency.

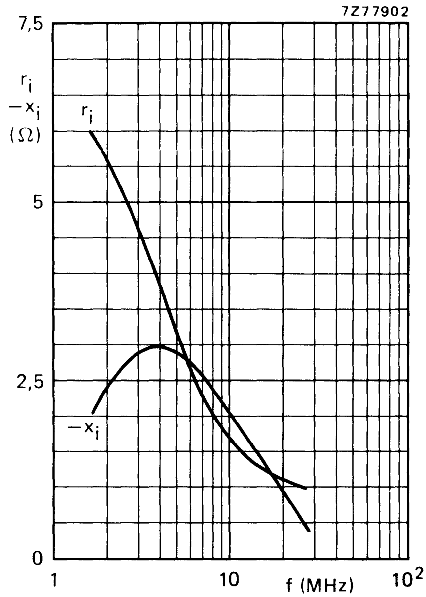


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for one transistor of a push-pull amplifier with cross-neutralization in s.s.b. class-AB operation.

Conditions:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; P_L = 160 W (P.E.P.); T_h = 25 °C; Z_L = 6,25 Ω in series with 10,4 nH (in parallel with −267 pF); neutralizing capacitor: 82 pF.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, AB and B operated high power industrial and military transmitting equipment in the h.f. and v.h.f. band. The transistor presents excellent performance as a linear amplifier in s.s.b. applications. It is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Transistors are supplied in matched h_{FE} groups.

The transistor has a ½" flange envelope with a ceramic cap. All leads are isolated from the flange.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	d_3 dB	d_5 dB	$I_{C(ZS)}$ (I_C) A
s.s.b. (class-AB)	**50**	**1,6 – 28**	**25 – 200 (P.E.P.)**	> **13,5**	> **40***	< **–30**	< **–30**	**0,1**
c.w. (class-B)	50	108	200	typ. 6,5	typ. 67	–	–	(6)
s.s.b. (class-A)	40	28	50 (P.E.P.)	typ. 19	–	typ. –40	< –40	(4)

* η_{dt} at 200 W P.E.P.

MECHANICAL DATA

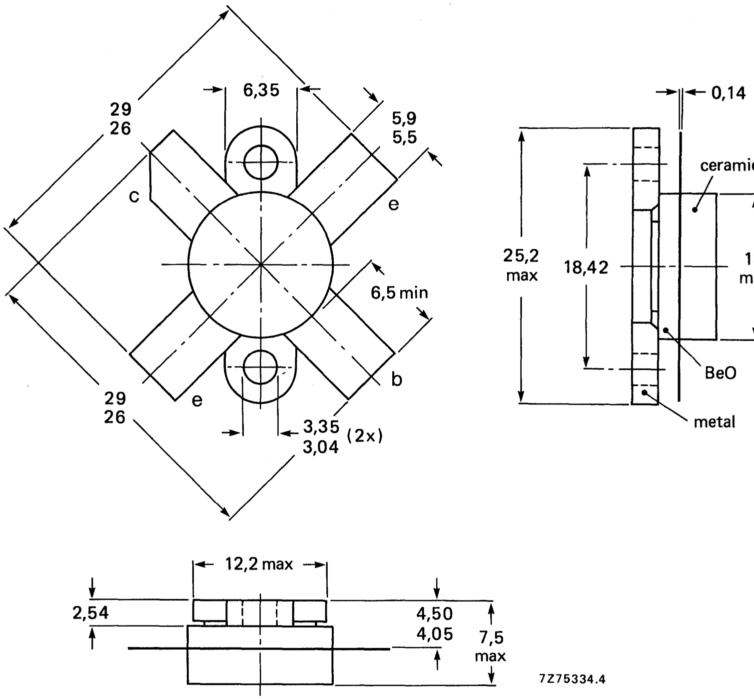
SOT-121 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,6 Nm (6 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	110	V
Collector-emitter voltage (open base)	V_{CEO}	max.	55	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	12	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	40	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 45 °C	P_{rf}	max.	340	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

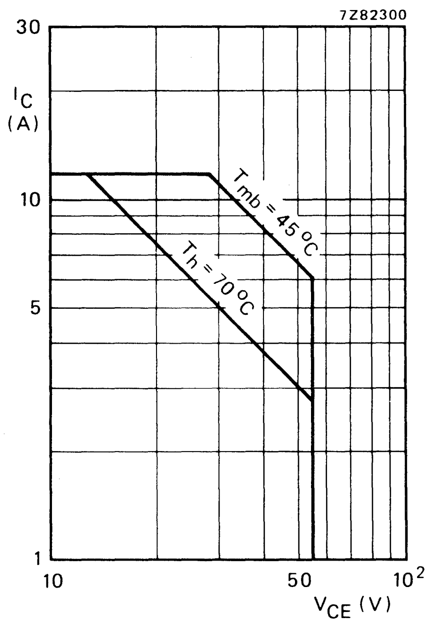


Fig. 2 D.C. SOAR.

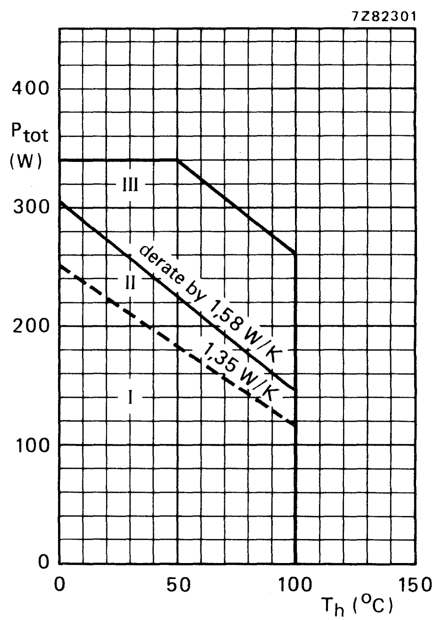


Fig. 3 Power/temperature derating curves.
I Continuous d.c. operation
II Continuous r.f. operation; f > 1 MHz
III Short-time operation during mismatch; f > 1 MHz

THERMAL RESISTANCE (dissipation = 150 W; T_{mb} = 100 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,63	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 50$ mA	$V_{(BR)CES}$	>	110 V
Collector-emitter breakdown voltage			
open base; $I_C = 200$ mA	$V_{(BR)CEO}$	>	55 V
Emitter-base breakdown voltage			
open collector; $I_E = 20$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 55$ V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	20 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	20 mJ
D.C. current gain*			
$I_C = 7$ A; $V_{CE} = 5$ V	h_{FE}	typ.	30
			15 to 50
D.C. current gain ratio of matched devices*			
$I_C = 7$ A; $V_{CE} = 5$ V	h_{FE1}/h_{FE2}	⩽	1,2
Collector-emitter saturation voltage*			
$I_C = 20$ A; $I_B = 4$ A	V_{CEsat}	typ.	1,9 V
Transition frequency at f = 100 MHz**			
$-I_E = 7$ A; $V_{CB} = 45$ V	f_T	typ.	235 MHz
$-I_E = 20$ A; $V_{CB} = 45$ V	f_T	typ.	245 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 50$ V	C_c	typ.	280 pF
Feedback capacitance at f = 1 MHz			
$I_C = 150$ mA; $V_{CE} = 50$ V	C_{re}	typ.	170 pF
Collector-flange capacitance	C_{cf}	typ.	4,4 pF

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

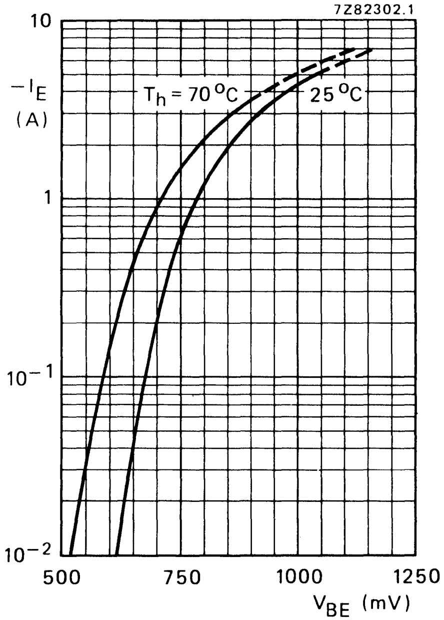


Fig. 4 Typical values; V_{CE} = 40 V.

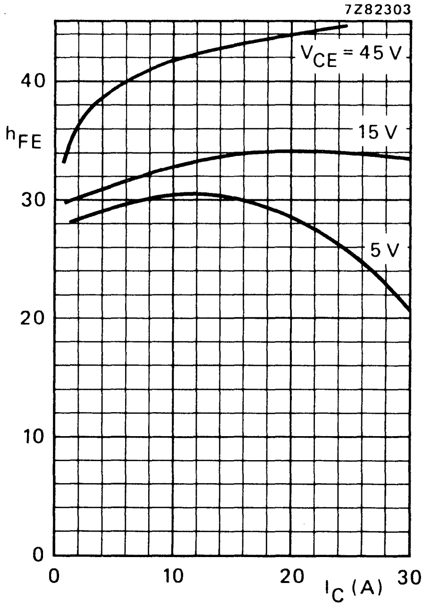


Fig. 5 Typical values; T_j = 25 °C.

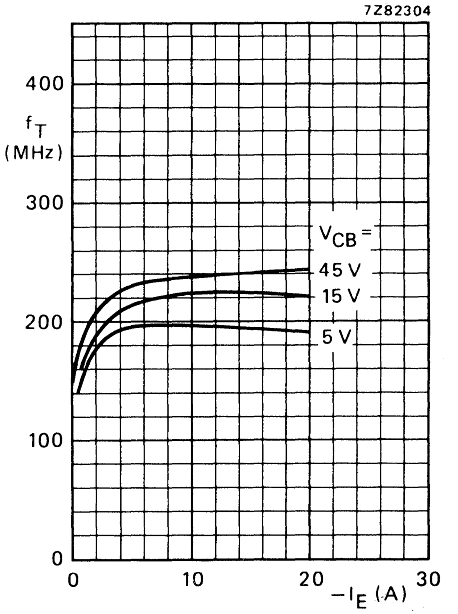


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

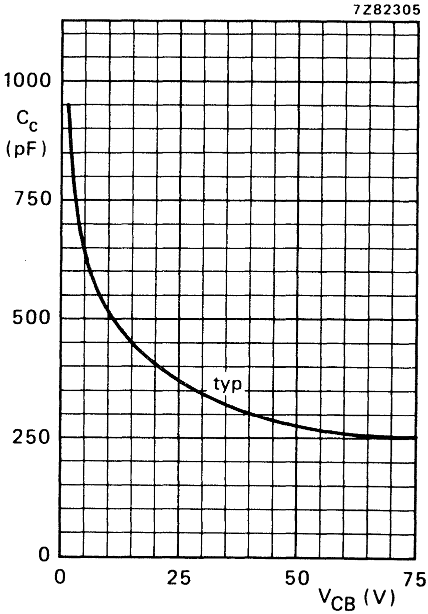


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 50 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt}(%) at 200 W (P.E.P.)	I_C (A) at 200 W (P.E.P.)	d_3 * dB	d_5* dB	$I_{C(ZS)}$ A
25 to 200 (P.E.P.)	> 13,5	> 40	< 5,0	< −30	< −30	0,1

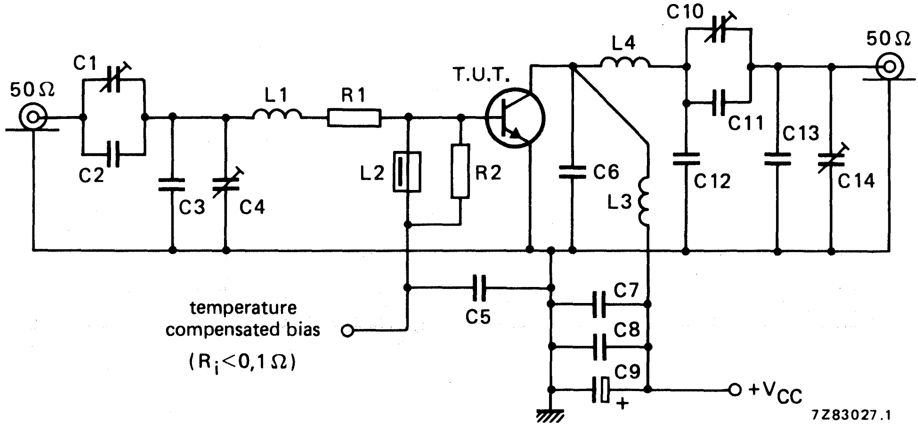


Fig. 8 Test circuit; s.s.b. class-AB.

List of components:

C1 = C4 = C10 = C14 = 100 pF film dielectric trimmer
C2 = 27 pF ceramic capacitor (500 V)
C3 = 270 pF polysterene capacitor (630 V)
C5 = C7 = C8 =220 nF multilayer ceramic chip capacitor
C6 = 27 pF multilayer ceramic chip capacitor (500 V; ATC▲)
C9 = 47 μF/63 V electrolytic capacitor
C11 = 2 x 36 pF multilayer ceramic chip capacitors (500 V; ATC▲) in parallel
C12 = 2 x 43 pF multilayer ceramic chip capacitors (500 V; ATC▲) in parallel
C13 = 43 pF multilayer ceramic chip capacitor (500 V; ATC▲)

L1 = 88 nH; 3 turns Cu wire (1,0 mm); int. dia. 9,0 mm; length 6,1 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 150 nH; 5 turns Cu wire (2,0 mm); int. dia. 10,0 mm; length 18,7 mm; leads 2 x 5 mm
L4 = 197 nH; 5 turns Cu wire (2,0 mm); int. dia. 12,0 mm; length 18,6 mm; leads 2 x 5 mm

R1 = 0,66 Ω; parallel connection of 5 x 3,3 Ω metal film resistors (PR37; ± 5%; 1,6 W each)
R2 = 27 Ω carbon resistor (± 5%; 0,5 W)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

▲ ATC means American Technical Ceramics.

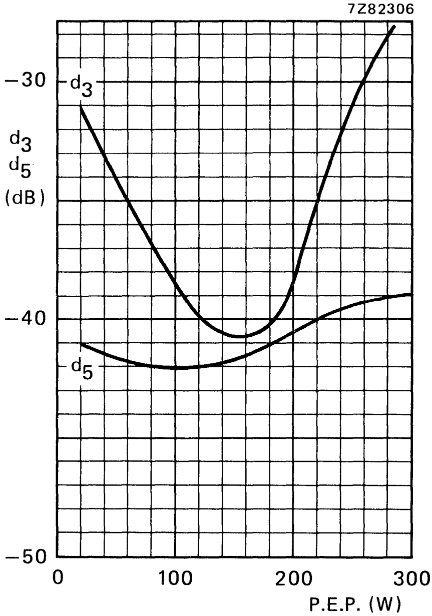


Fig. 9 Intermodulation distortion as a function of output power.*

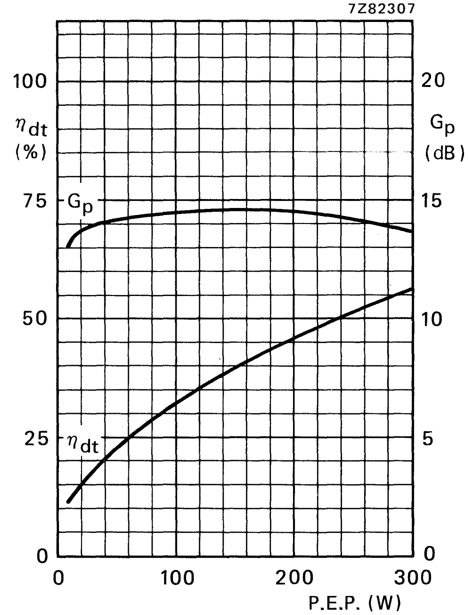


Fig. 10 Double-tone efficiency and power gain as a function of output power.

Conditions for Figs 9 and 10:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

Ruggedness

The BLW96 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 150 W (P.E.P.) or a load mismatch (VSWR = 5 through all phases) up to 200 W (P.E.P.) under the following conditions:

V_{CE} = 45 V; f = 28 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,2 K/W.

* See note on previous page.

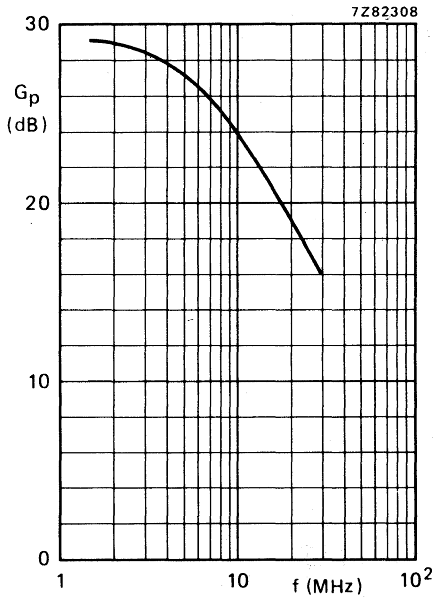


Fig. 11 Power gain as a function of frequency.

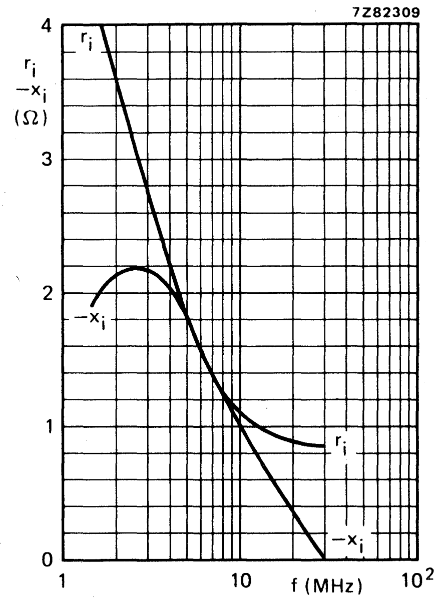


Fig. 12 Input impedance (series components) as a function of frequency.

Figs 11 and 12 are typical curves and hold for one transistor of a push-pull amplifier with cross-neutralization in s.s.b. class-AB operation.

Conditions:

V_{CE} = 50 V; $I_{C(ZS)}$ = 0,1 A; P_L = 200 W (P.E.P.); T_h = 25 °C; Z_L = 5 Ω; neutralizing capacitor: 47 pF.

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)
T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)
108	50	200	typ. 45	typ. 6,5	typ. 6	typ. 67

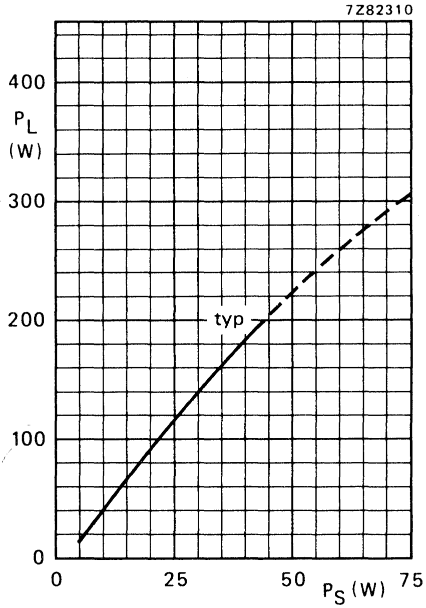


Fig. 13 V_{CE} = 50 V; f = 108 MHz; T_h = 25 °C.

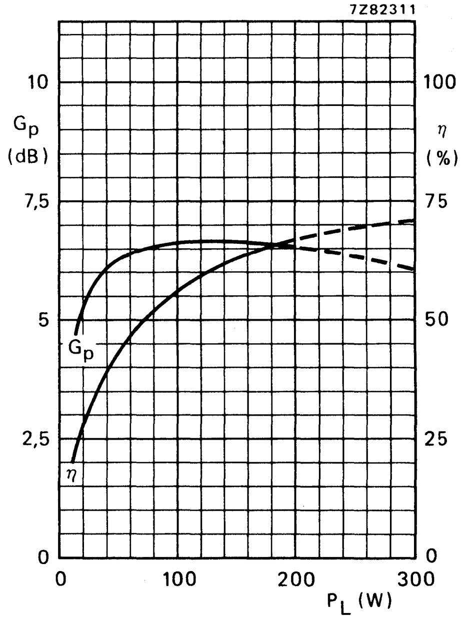


Fig. 14 V_{CE} = 50 V; f = 108 MHz; T_h = 25 °C; typical values.

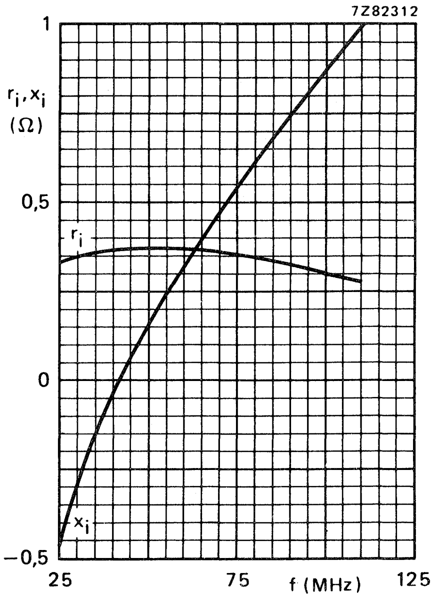


Fig. 15 Input impedance (series components).

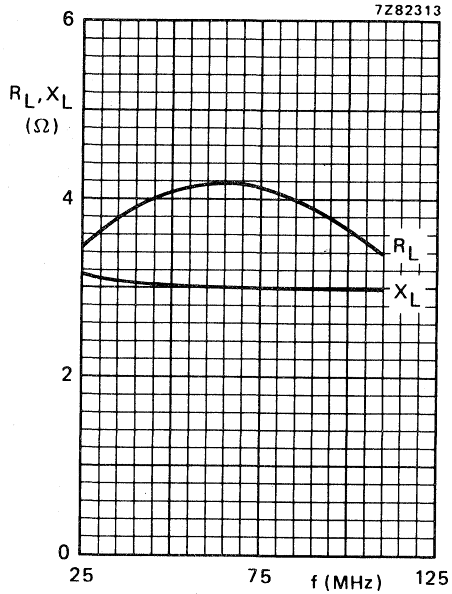


Fig. 16 Load impedance (series components).

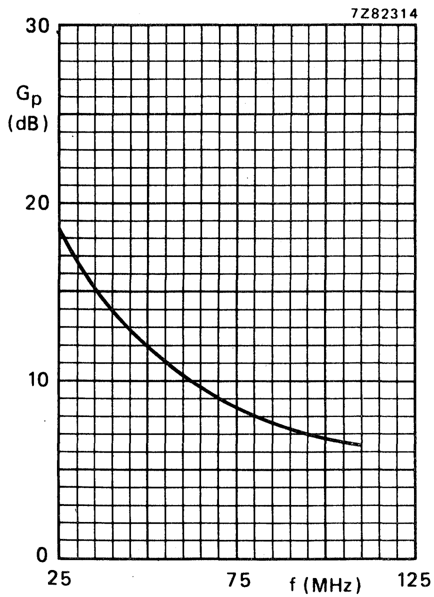


Fig. 17.

Conditions for Figs 15, 16 and 17:

Typical values; V_{CE} = 50 V; P_L = 200 W; T_h = 25 ^oC; class-B operation.

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 40 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3* dB	d_5* dB
typ. 50 (P.E.P.)	typ. 19	4	typ. −40	< −40

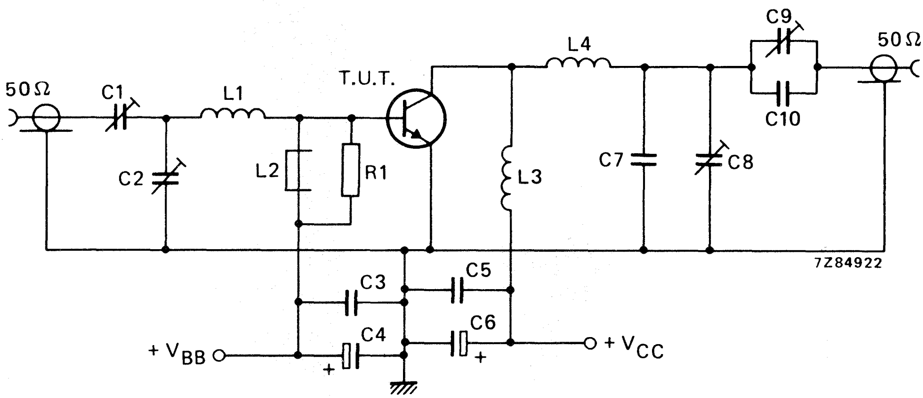


Fig. 18 Test circuit; s.s.b. class-A.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = 220 nF polyester capacitor (100 V)
C4 = 100 μF/4 V electrolytic capacitor
C5 = 2 x 330 nF polyester capacitors (100 V) in parallel
C6 = 47 μF/63 V electrolytic capacitor
C7 = C10 = 2 x 82 pF ceramic capacitors (500 V) in parallel
C8 = C9 = 10 to 150 pF air dielectric trimmer

L1 = 45 nH; 2 turns enamelled Cu wire (1,6 mm); int. dia. 8,0 mm; length 4,0 mm; leads 2 x 3 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 110 nH; 4 turns enamelled Cu wire (2,0 mm); int. dia. 10,0 mm; length 8,0 mm; leads 2 x 2 mm
L4 = 210 nH; 5 turns enamelled Cu wire (2,0 mm); int. dia. 12,0 mm; length 10,0 mm; leads 2 x 2 mm

R1 = 27 Ω carbon resistor (± 5%; 0,5 W)

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

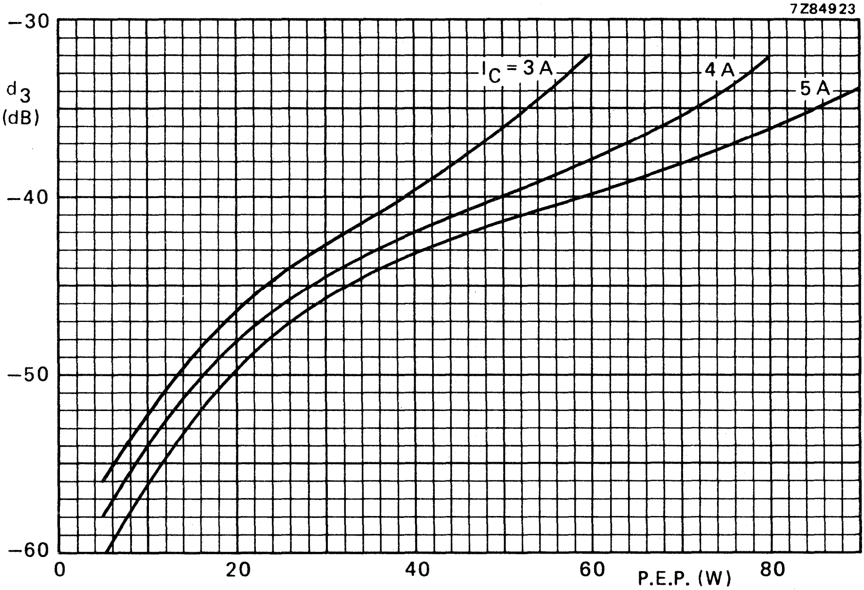


Fig. 19 Third order intermodulation distortion as a function of output power.*
Typical values; V_{CE} = 40 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor designed for use in class-A, AB and B operated high-power industrial and military transmitting equipment in the h.f. band.

The transistor offers excellent performance as a linear amplifier in s.s.b. applications. It is resistance stabilized and is made to withstand severe load-mismatch conditions. All leads are isolated from the flange.

The transistors are supplied in matched h_{FE} groups.

QUICK REFERENCE DATA

R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_P dB	η_{dt} %	d_3 dB	d_5 dB
s.s.b. (class-AB)	28	0,1	1,6 – 28	175 (PEP)	$>$11,5	$>$40	$<$–30	$<$–30

MECHANICAL DATA

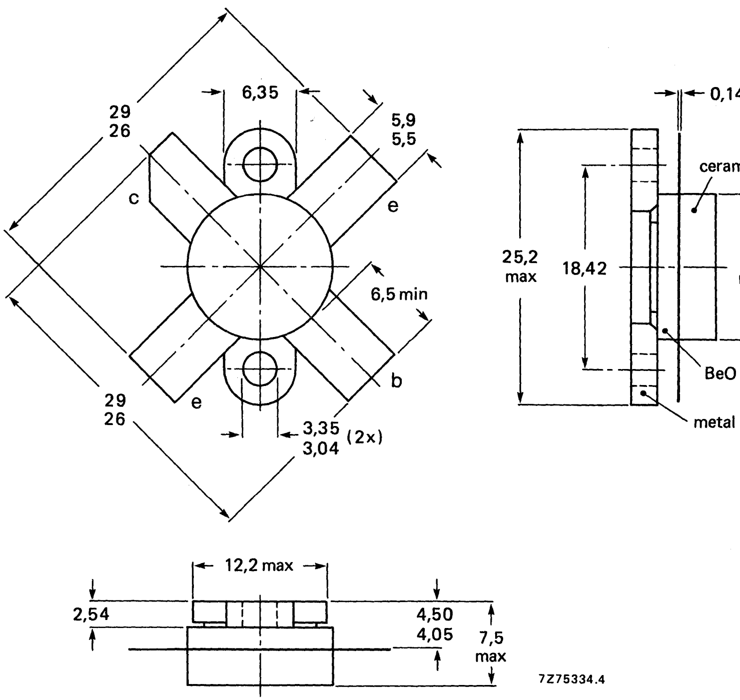
SOT-121 (see Fig. 1).

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-121.



Torque on screw: min. 0,60 Nm (6,0 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (peak value)				
$V_{BE} = 0$	V_{CESM}	max.	65	V
open base	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current				
average	$I_{C(AV)}$	max.	15	A
peak value; f > 1 MHz	I_{CM}	max.	50	A
Total d.c. power dissipation at T_h = 25°C	$P_{tot(d.c.)}$	max.	190	W
R.F. power dissipation				
f > 1 MHz; T_h = 25°C	$P_{tot(rf)}$	max.	230	W
Storage temperature	T_{stg}	−65 to +150		°C
Operating junction temperature	T_j	max.	200	°C

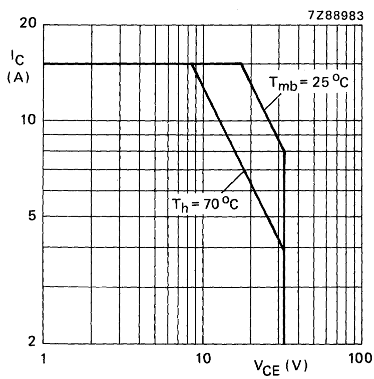


Fig. 2 D.C. SOAR.

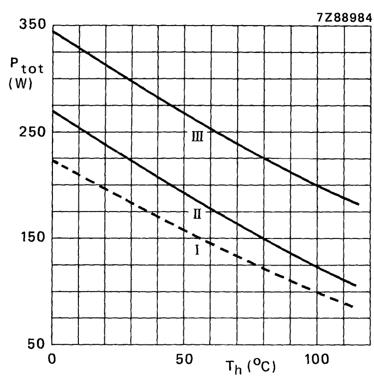


Fig. 3 Power/temperature derating curves.

I Continuous d.c. operation
II Continuous r.f. operation (f > 1 MHz).
III Short-time operation during mismatch; (f > 1 MHz).

THERMAL RESISTANCE (dissipation = 120 W; T_h = 25 °C i.e. T_{mb} = 49 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,63	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	0,48	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,20	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	65 V
I_C = 100 mA; open base	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
I_E = 20 mA; open collector	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{CE} = 33 V; V_{BE} = 0	I_{CES}	<	20 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	20 mJ
R_{BE} = 10 Ω	E_{SBR}	>	20 mJ
D.C. current gain*			
I_C = 10 A; V_{CE} = 5 V	h_{FE}	typ. 15 to	30 50
D.C. current gain ratio of matched devices*			
→ I_C = 10 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage*			
I_C = 25 A; I_B = 5 A	V_{CEsat}	typ.	2,4 V
Transition frequency at f = 100 MHz**			
$-I_E$ = 10 A; V_{CB} = 28 V	f_T	typ.	230 MHz
$-I_E$ = 20 A; V_{CB} = 28 V	f_T	typ.	235 MHz
Collector capacitance at f = 1 MHz			
$I_E = i_e$ = 0; V_{CB} = 28 V	C_c	typ.	380 pF
Feedback capacitance at f = 1 MHz			
I_C = 0; V_{CE} = 28 V	C_{re}	typ.	235 pF
Collector-flange capacitance	C_{cf}	typ.	4,5 pF

* Measured under pulse conditions: t_p = 500 μs.
** Measured under pulse conditions: t_p = 300 μs; δ = 0,02.

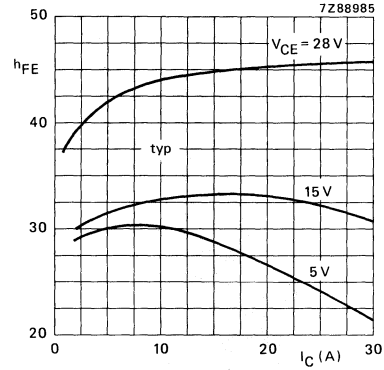


Fig. 4 T_j = 25 °C.

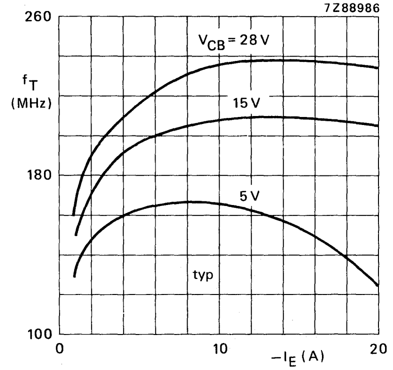


Fig. 5 T_j = 25 °C; f = 100 MHz; t_p = 300 μs.

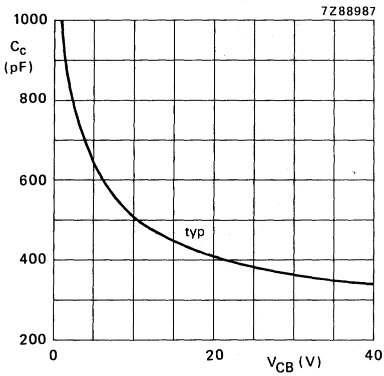


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; T_j = 25 °C.

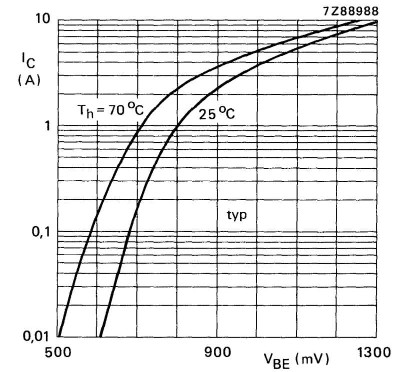


Fig. 7 V_{CE} = 28 V.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier).
V_{CE} = 28 V; T_h = 25 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

output power W	G_p dB	η_{dt} %	I_C A	d_3* dB	d_5* dB	$I_{C(ZS)}$ A
175 (PEP)	> 11,5 typ. 13,0	> 40 typ. 50	< 7,8 typ. 6,3	< −30 typ. −34	< −30 typ. −38	0,1

* The stated intermodulation distortion levels are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

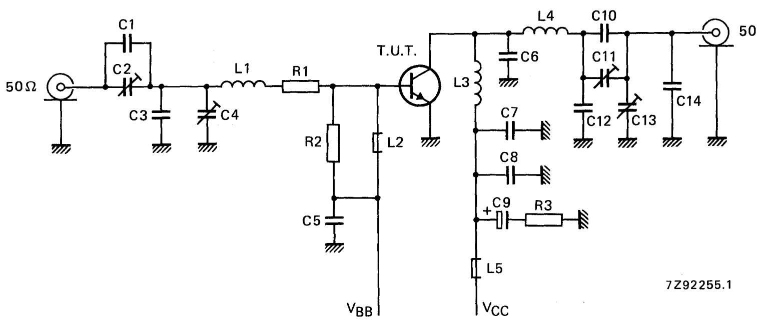


Fig. 8 Class-AB (s.s.b.) test circuit.

List of components:

C1 = 47 pF (500 V) multilayer ceramic chip capacitor*
C2 = 100 pF film dielectric trimmer
C3 = 2 x 130 pF (300 V) multilayer ceramic chip capacitors in parallel*
C4 = 280 pF film dielectric trimmer
C5 = 10 nF (50 V) multilayer ceramic chip capacitor 2222 856 13103
C6 = 2 x 180 pF (300 V) multilayer ceramic chip capacitors in parallel*
C7 = 100 nF (50 V) multilayer ceramic chip capacitor 2222 856 48104
C8 = 10 nF (50 V) multilayer ceramic chip capacitor 2222 856 13103
C9 = 2,2 μF - 63 V solid aluminium electrolytic capacitor
C10 = 5 x 82 pF (500 V) multilayer ceramic chip capacitors in parallel*
C11 = 250 pF air dielectric trimmer
C12 = 5 x 33 pF ceramic feed-through capacitors mounted in parallel on a brass plate
C13 = 100 pF air dielectric trimmer
C14 = 3 x 91 pF (500 V) multilayer ceramic chip capacitors in parallel*

R1 = 0,7 Ω - 7 W (7 x 4,7 Ω - 1 W carbon resistors in parallel)
R2 = 27 Ω - 0,25 W carbon resistor
R3 = 4,7 Ω - 0,25 W carbon resistor

* American Technical Ceramics capacitor or capacitor of same quality.

L1 = 73 nH; 4 turns Cu wire (1,5 mm); int. dia. 7 mm; length 9,4 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke grade 3B (cat. no. 4312 020 36640); 6 leads in parallel
L3 = 70,4 nH; 4 turns Cu wire (2 mm); int. dia. 7 mm; length 14,8 mm; leads 2 x 5 mm
L4 = 83,5 nH; 4 turns Cu wire (2 mm); int. dia. 8 mm; length 15 mm; leads 2 x 5 mm
L5 = Ferroxcube wide-band h.f. choke grade 3 B (cat. no. 4312 020 36640) with 6 leads in parallel

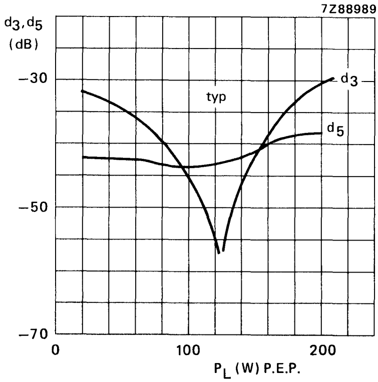


Fig. 9 Intermodulation distortion (see note on preceding page).

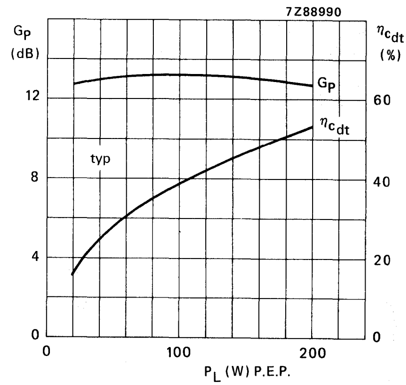


Fig. 10 Power gain and double-tone efficiency.

Conditions for Figs 9 and 10:
V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C.

RUGGEDNESS

The BLW97 is capable of withstanding full load mismatch (VSWR = 50 through all phases) up to 150 W (P.E.P.) or a load mismatch (VSWR = 5 through all phases) up to 175 W (P.E.P.) under the following conditions:
V_{CE} = 28 V; f = 28 MHz; T_h = 25 °C; $R_{th\ mb-h}$ = 0,2 K/W.

Figures 11 and 12 on the next page present typical curves which are valid for one transistor of a push-pull amplifier in s.s.b. class-AB operation.

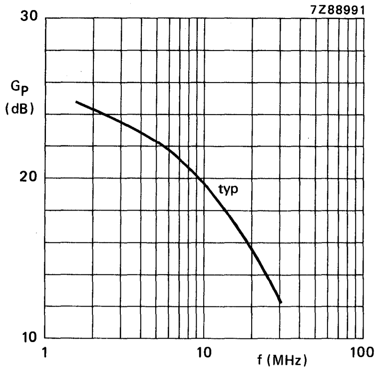


Fig. 11 Power gain.

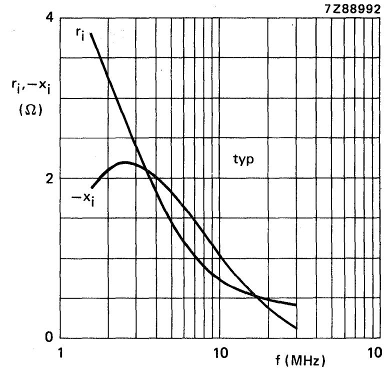


Fig. 12 Input impedance (series components).

Conditions for Figs 11 and 12:
V_{CE} = 28 V; $I_{C(ZS)}$ = 0,1 A;
P_L = 175 W(PEP); T_h = 25 °C;
Z_L = 1,55 Ω

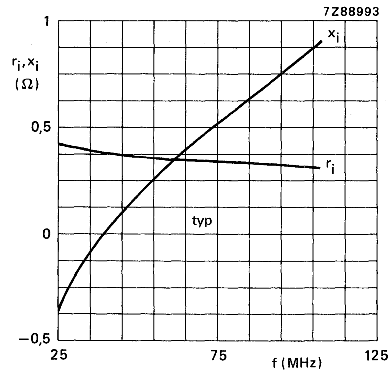


Fig. 13 Input impedance (series components).

Conditions for Figs 13, 14 and 15:
V_{CE} = 28 V; P_L = 175 W; T_h = 25 °C;
class-B operation.

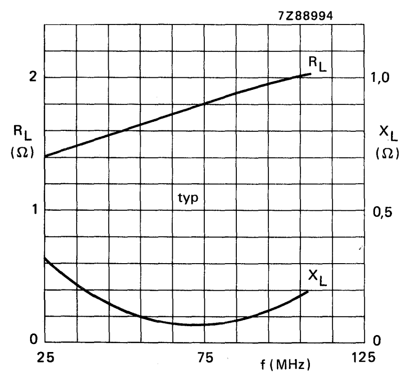


Fig. 14 Load impedance (series components).

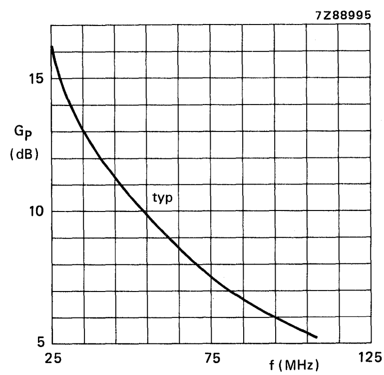


Fig. 15 Power gain.

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear u.h.f. amplifiers of TV transposers and transmitters in band IV-V, as well as for driver stages in tube systems.

Features:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold sandwich metallization ensures excellent reliability.

The transistor has a ¼" capstan envelope with ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

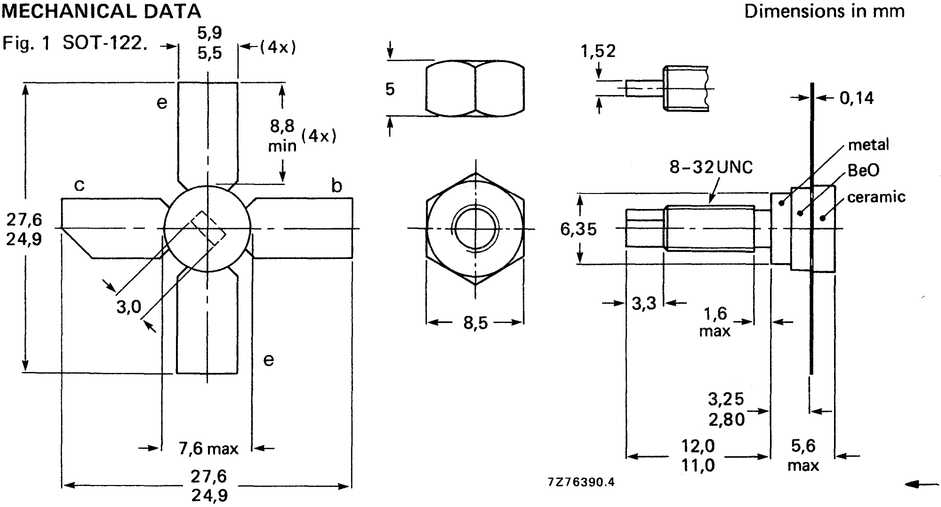
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A	860	25	850	70	−60	> 3,5	> 6,5
class-A	860	25	850	25	−60	typ. 4,4	typ. 7,0

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-122.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

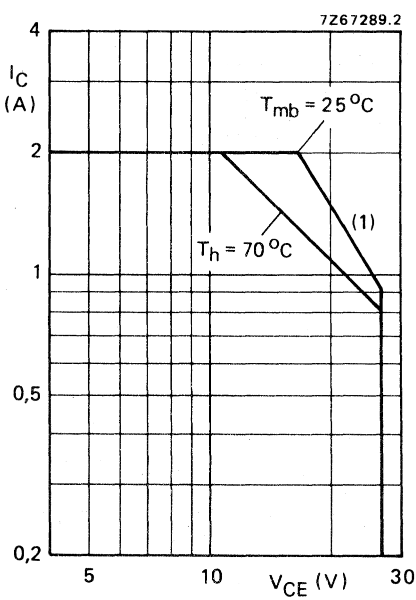
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50	V
open base	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current				
d.c.	I_C	max.	2	A
(peak value); f > 1 MHz	I_{CM}	max.	4	A
Total power dissipation at T_h = 70 °C	P_{tot}	max.	21,5	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

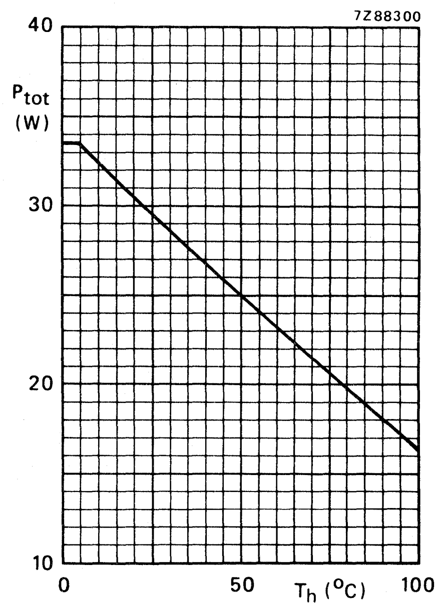


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 21,25 W; T_{mb} = 82,75 °C, T_h = 70 °C)

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	5,45	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

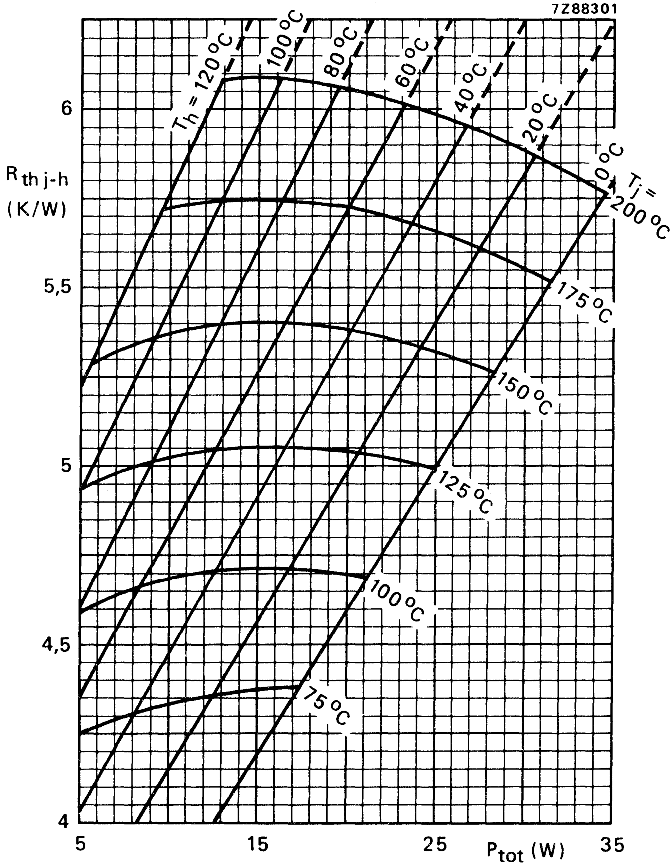


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb\text{-}h}$ = 0,6 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 850 mA; T_h = 70 °C.

Fig. 4 shows:	$R_{th\ j\text{-}h}$	max.	6,05 K/W
	T_j	max.	200 °C
Typical device:	$R_{th\ j\text{-}h}$	typ.	5,35 K/W
	T_j	typ.	183 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	50	V
open base, I_C = 25 mA	$V_{(BR)CEO}$	>	27	V
Emitter-base breakdown voltage				
open collector, I_E = 5 mA	$V_{(BR)EBO}$	>	3,5	V
D.C. current gain*				
I_C = 850 mA; V_{CE} = 25 V	h_{FE}	>	15	
		typ.	40	
Collector-emitter saturation voltage*				
I_C = 500 mA; I_B = 100 mA	V_{CEsat}	typ.	0,25	V
Transition frequency at f = 500 MHz**				
$-I_E$ = 850 mA; V_{CB} = 25 V	f_T	typ.	2,5	GHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 25 V	C_c	typ.	24	pF
		<	30	pF
Feedback capacitance at f = 1 MHz				
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	15	pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2	pF

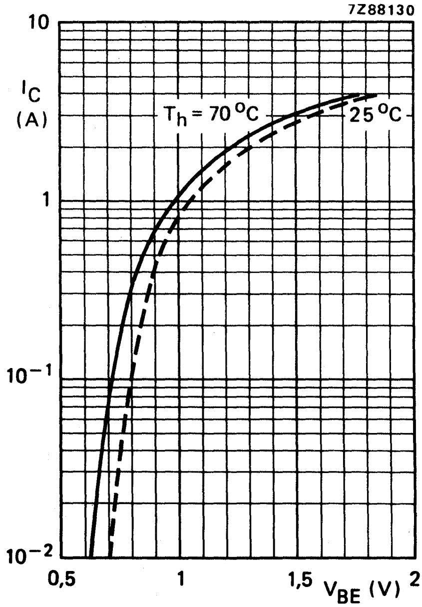


Fig. 5 Typical values; V_{CE} = 25 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.
** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

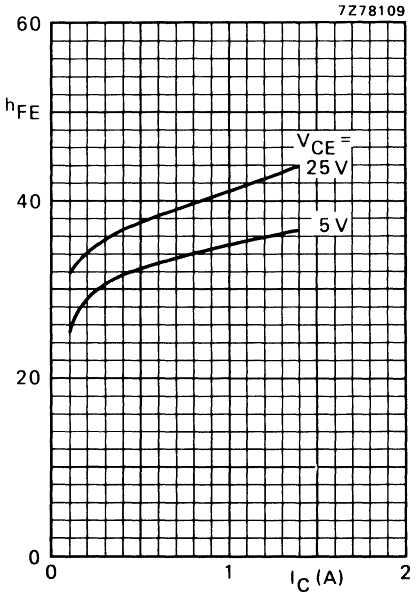


Fig. 6 Typical values; T_j = 25 °C.

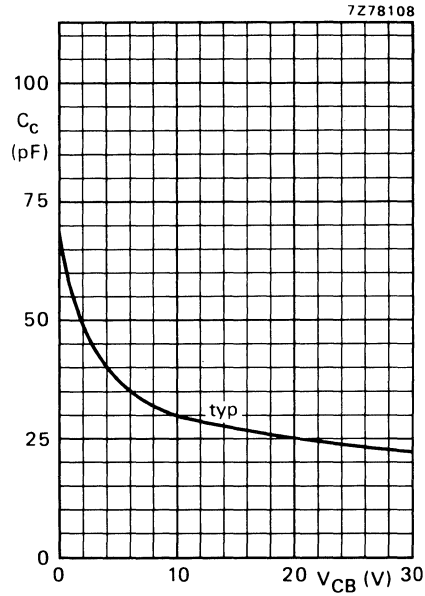


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

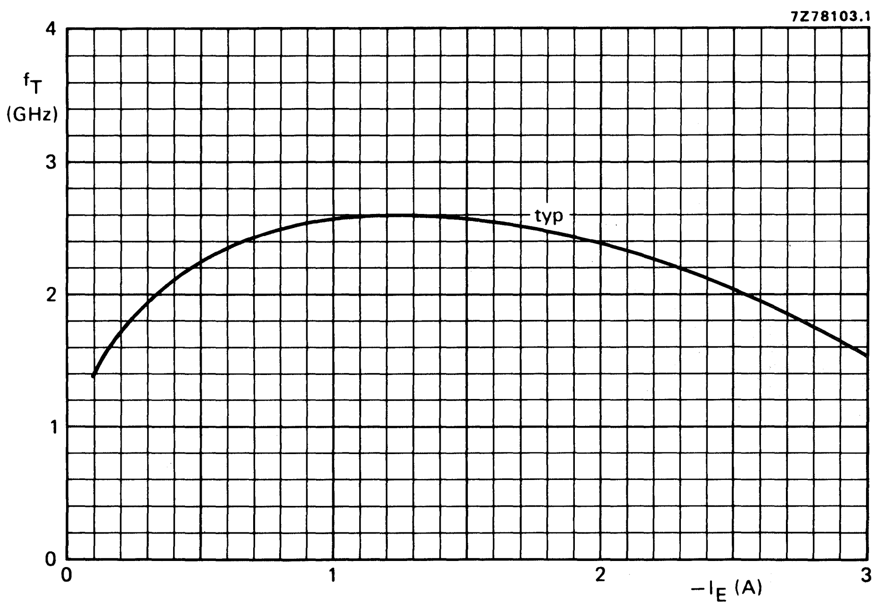


Fig. 8 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB)*	$P_{o\ sync}$ (W)*	G_p (dB)
860	25	850	70	–60	> 3,5	> 6,5
860	25	850	70	–60	typ. 3,8	typ. 7,0
860	25	850	25	–60	typ. 4,4	typ. 7,0

* Three-tone test method (vision carrier –8 dB, sound carrier –7 dB, sideband signal –16 dB), zero dB corresponds to peak sync level.

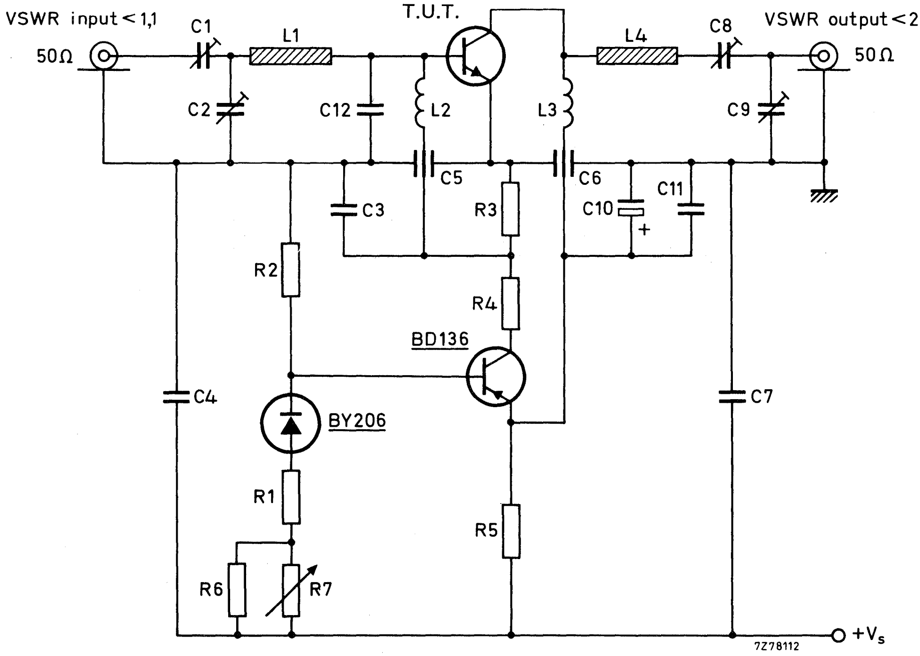


Fig. 9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

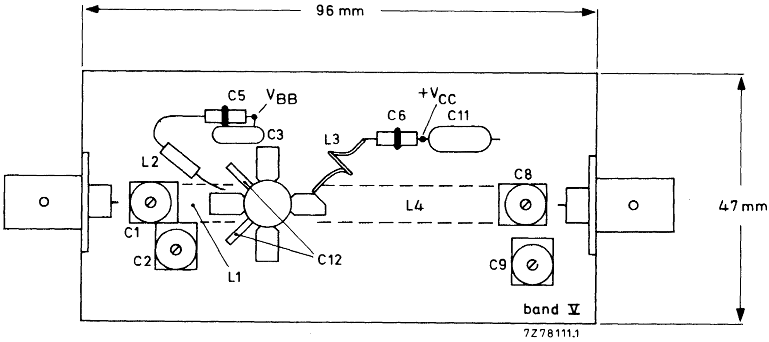
C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat. no. 2222 809 09001)
C3 = C4 = 100 nF polyester capacitor
C5 = C6 = 1 nF feed-through capacitor
C7 = 5,6 pF ceramic capacitor
C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C9 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C10 = 10 μF/40 V solid aluminium electrolytic capacitor
C11 = 470 nF polyester capacitor
C12 = 2 x 3,3 pF chip capacitors (in parallel)

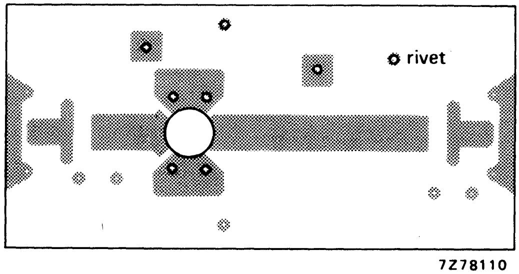
List of components: (continued)

R1 = 150 Ω carbon resistor (0,25 W)
R2 = 1,8 kΩ carbon resistor (0,5 W)
R3 = 33 Ω carbon resistor (0,5 W)
R4 = 220 Ω carbon resistor (1 W)
R5 = 4 x 12 Ω carbon resistors in parallel (1 W each)
R6 = 1 kΩ carbon resistor (0,25 W)
R7 = 220 Ω carbon potentiometer (0,25 W)

L1 = stripline (13,6 mm x 6,9 mm)
L2 = microchoke 0,47 μH (cat. no. 4322 057 04770)
L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm
L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1,5 mm.





Note
Hole in printed-circuit board: ϕ 9,7 mm.

Fig. 10 Component layout and printed circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

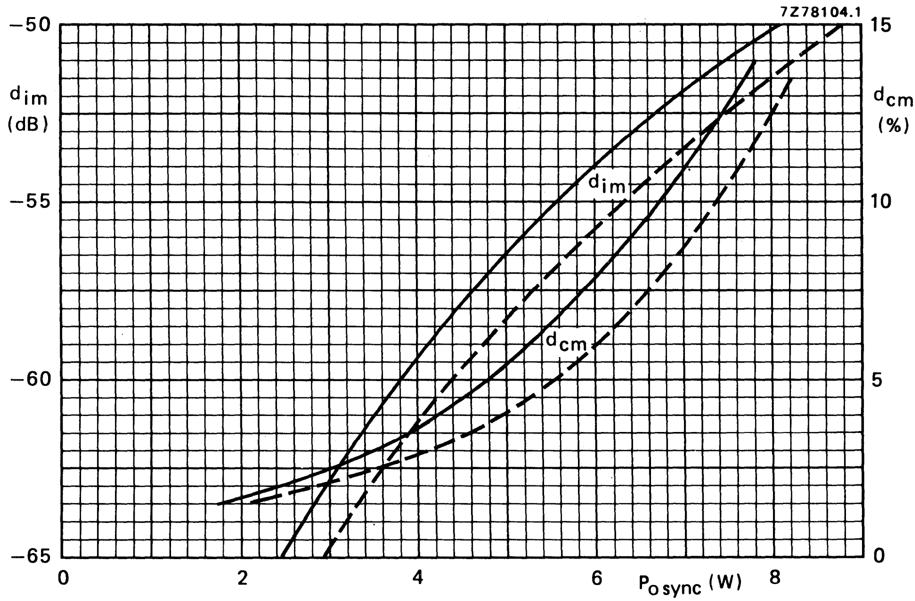


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of $P_{o\,sync}$. Typical values; V_{CE} = 25 V; I_C = 850 mA;– – –T_h = 25 °C;——T_h = 70 °C; f_{vision} = 860 MHz.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ⩽ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

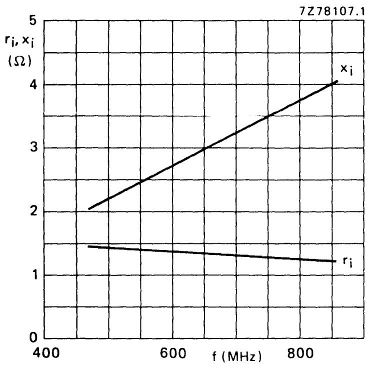


Fig. 12 Input impedance (series components).

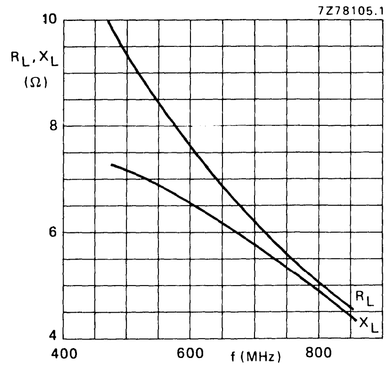


Fig. 13 Load impedance (series components).

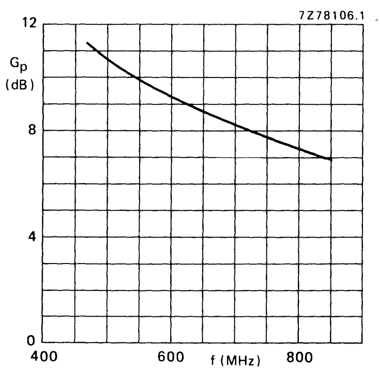


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 850 mA; class-A operation; T_h = 70 °C.

H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-AB and B operated high-power mobile transmitting equipment in the h.f. band.

The transistors are resistance-stabilized and are guaranteed to withstand severe load mismatch conditions. They are supplied in matched h_{FE} groups.

The transistor has a 1/2 in 4-lead flange envelope with a ceramic cap. All leads are isolated from the flange.

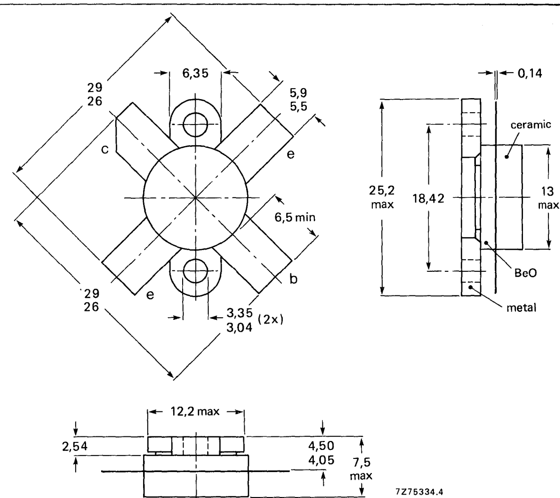
QUICK REFERENCE DATA

R.F. performance at T_h = 25 °C

mode of operation	V_{CE} V	$I_{C(ZS)}$ A	f MHz	P_L W	G_P dB	η_{dt} %	d_3 dB	d_5 dB
s.s.b. class-AB	12,5	0,15	1,6-28	80 (P.E.P.)	> 12,5	> 35	< −24	< −24

MECHANICAL DATA

Fig. 1 SOT-121.



Torque on screw: min. 0,60 Nm (6,0 kg cm)
max. 0,75 Nm (7,5 kg cm)

Recommended screw: cheese-head 4-40 UNC/2A

Heatsink compound must be applied sparingly and evenly distributed.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	36 V
open base	V_{CEO}	max.	17 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
average	$I_{C(AV)}$	max.	18 A
(peak value); f > 1 MHz	I_{CM}	max.	55 A
D.C. power dissipation at $T_{mb} = 25\ ^oC$	$P_{tot(d.c.)}$	max.	154 W
R.F. power dissipation			
→ f > 1 MHz; $T_{mb} = 25\ ^oC$	$P_{tot(rf)}$	max.	192 W
Storage temperature	T_{stg}	−65 to +150	^oC
Operating junction temperature	T_j	max.	200 ^oC

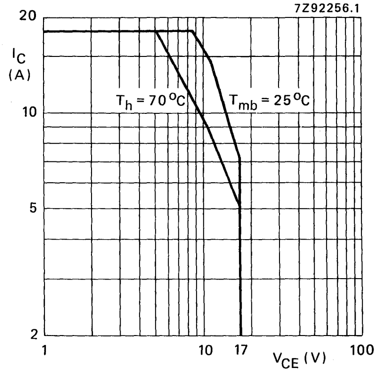


Fig. 2 D.C. SOAR.

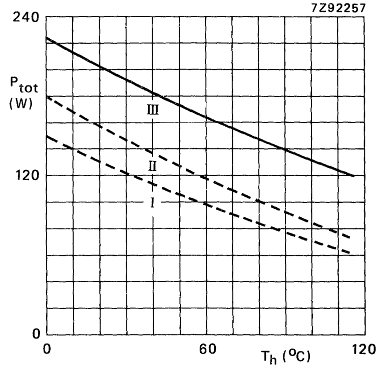


Fig. 3 Power/temperature derating curves.

I Continuous d.c. operation
II Continuous r.f. operation; (f > 1 MHz)
III Short-time r.f. operation during mismatch (f > 1 MHz)

THERMAL RESISTANCE

Dissipation = 100 W; $T_{mb} = 25\ ^oC$

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	1,00 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	0,75 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,2 K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage				
V_{BE} = 0; I_C = 50 mA	$V_{(BR)CES}$	>	36	V
open base; I_C = 100 mA	$V_{(BR)CEO}$	>	17	V
Emitter-base breakdown voltage				
open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current				
V_{BE} = 0; V_{CE} = 17 V	I_{CES}	<	20	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	12,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	12,5	mJ
D.C. current gain*				
I_C = 10 A; V_{CE} = 5 V	h_{FE}	typ.	35	
		15 to	80	
D.C. current gain ratio of matched devices*				
I_C = 10 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage*				
I_C = 25 A; I_B = 5 A	V_{CEsat}	typ.	1,7	V
Transition frequency at f = 100 MHz**				
$-I_E$ = 10 A; V_{CB} = 12,5 V	f_T	typ.	290	MHz
$-I_E$ = 20 A; V_{CB} = 12,5 V	f_T	typ.	275	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 12,5 V	C_c	typ.	400	pF
Feedback capacitance at f = 1 MHz				
I_C = 0; V_{CE} = 12,5 V	C_{re}	typ.	265	pF
Collector-flange capacitance	C_{cf}	typ.	4,5	pF

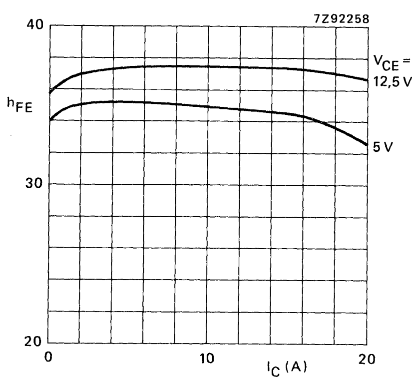


Fig. 4 T_j = 25 °C.

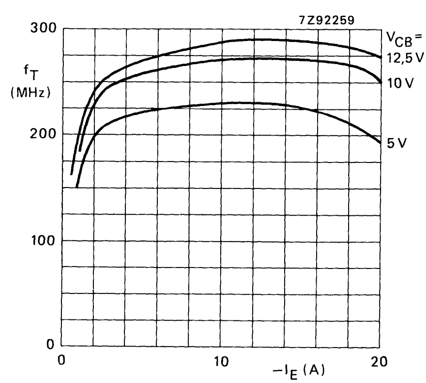


Fig. 5 f = 100 MHz; T_j = 25 °C.

* Measured under pulse conditions: t_p = 500 μs.
** Measured under pulse conditions: t_p = 300 μs; δ = 0,02.

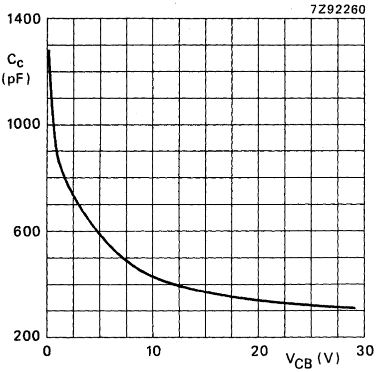


Fig. 6 $I_E = i_e = 0$; f = 1 MHz; $T_j = 25\ ^oC$.

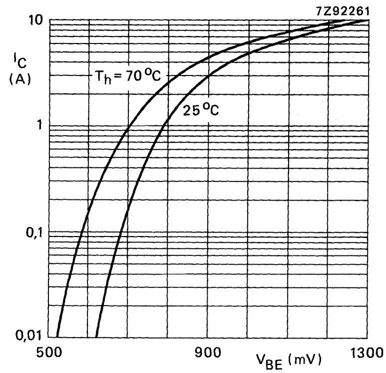


Fig. 7 $V_{CE} = 12{,}5$ V; typ. values.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier) $V_{CE} = 12{,}5$ V; $T_h = 25\ ^oC$; $f_1 = 28{,}000$ MHz; $f_2 = 28{,}001$ MHz

output power W	G_p dB	η_{dt} %	I_C A	d_3* dB	d_5* dB	$I_{C(ZS)}$ A
80 (P.E.P.)	> 12,5 typ. 14	> 35 typ. 40	< 9,1 typ. 7,6	< −24 typ. −27	< −24 typ. −36	0,15

* The stated intermodulation distortion levels are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

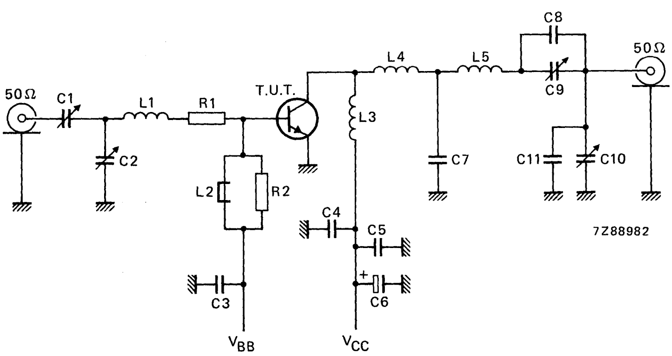


Fig. 8 Class-AB test circuit, s.s.b.

List of components:

C1 = C2 = 270 pF film dielectric trimmer capacitor
C3 = 220 nF chip capacitor
C4 = 1 nF chip capacitor
C5 = 100 nF chip capacitor
C6 = 47 μF – 63 V electrolytic capacitor
C7 = 3 x 180 pF multilayer ceramic chip capacitors in parallel*
C8 = 2 x 150 pF (500 V) multilayer ceramic chip capacitors*
C9 = C10 = 100 pF film dielectric trimmer capacitor
C11 = 150 pF multilayer ceramic chip capacitor*

R1 = 4 x 1,2 Ω carbon resistors in parallel (4 x 0,125 W)
R2 = 27 Ω carbon resistor (0,5 W)

L1 = 3 turns Cu wire (2 mm); int. dia. 8 mm; length 9 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke (cat. no. 4312 020 36640)
L3 = L4 = 2 turns Cu wire (2 mm); int. dia. 8 mm; length 5 mm; leads 2 x 5 mm
L5 = 3 turns Cu wire (2 mm); int. dia. 8,5 mm; length 8,5 mm; length 8,5 mm; leads 2 x 5 mm

* American Technical Ceramics capacitor type 100 B or capacitor of same quality.

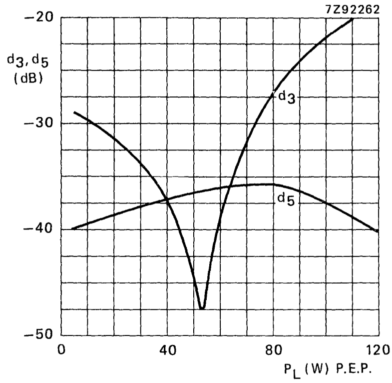


Fig. 9 Intermodulation distortion (see note on preceding page); typ. values.

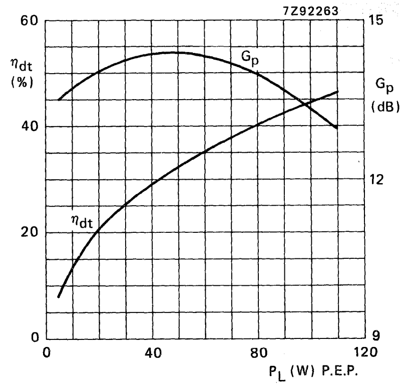


Fig. 10 Double-tone efficiency and power gain; typ. values.

Conditions for Figs 9 and 10:

V_{CE} = 12,5 V; $I_{C(ZS)}$ = 0,15 A; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C.

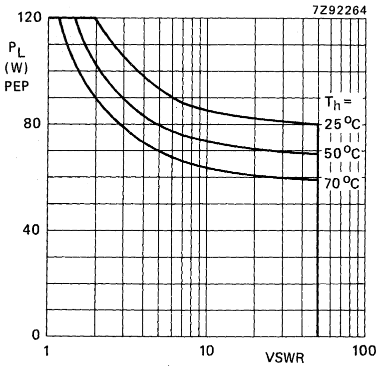


Fig. 11 R.F. SOAR: s.s.b. class-AB operation; V_{CE} = 15 V; $R_{th\ mb\text{-}h}$ = 0,2 K/W; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

This graph shows the permissible output power as a function of VSWR during mismatch conditions with the heatsink temperature as parameter.

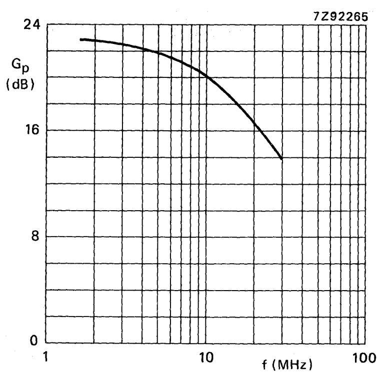


Fig. 12 Power gain.

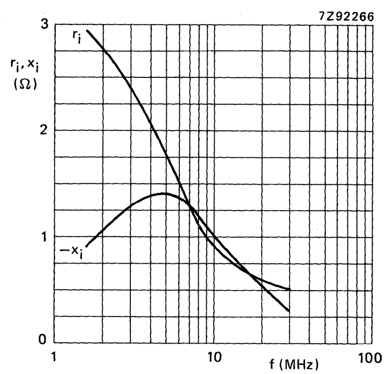


Fig. 13 Input impedance (series components).

Conditions for Figs 12 and 13:

V_{CE} = 12,5 V; $I_{C(ZS)}$ = 0,15 A; Z_L = 0,65 Ω; P_L = 80 W (PEP); T_h = 25 °C.

The curves in Figs 12 and 13 are typical and hold for one transistor of a push-pull amplifier in s.s.b. class-AB operation.

H.F./V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for s.s.b. in class-A and AB and in f.m. transmitting applications in class-C with a supply voltage up to 28 V. The transistor is resistance stabilized and tested under severe load mismatch conditions. It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

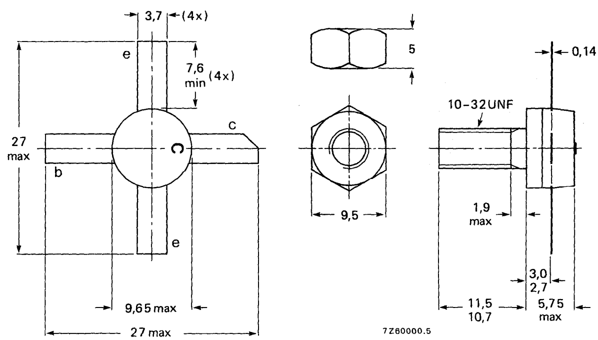
mode of operation	V_{CE} V	f_1 MHz	f_2 MHz	P_L W	G_p dB	d_3 dB	I_C A	η_{dt} %
s.s.b. (class-A)	26	28,000	28,001	0-8(P.E.P.)	> 18	< −40	< 1,2	–
s.s.b. (class-AB)	28	28,000	28,001	25(P.E.P.)	> 18	typ. −35	typ. 1,28	typ. 35

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	G_p dB	I_C A	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w. (class-B)	28	70	typ. 0,5	25	typ. 17	typ. 1,49	typ. 60	0,53 − j1,4	42,5 − j54

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



Torque on nut: min. 1,5 Nm (15 kg cm)
max. 1,7 Nm (17 kg cm)

Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

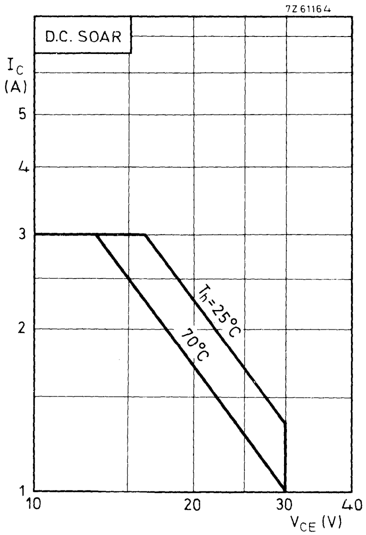
CHARACTERISTICS

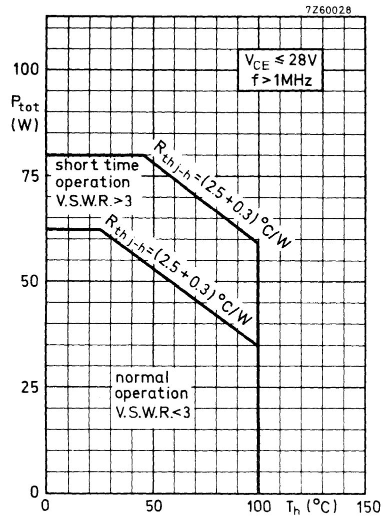
T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter; I_C = 50 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4.0	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain				
I_C = 1.0 A; V_{CE} = 5 V	h_{FE}	typ.	50	
		10	to 100	
Transition frequency				
I_C = 3.0 A; V_{CE} = 20 V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 30 V	C_c	typ.	50	pF
		<	65	pF
Feedback capacitance				
I_C = 100 mA; V_{CE} = 30 V	$-C_{re}$	typ.	31	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4.0	V
Collector current (average)	$I_{C(AV)}$	max.	3.0	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	6	A
Total power dissipation up to T_h = 25 °C f > 1 MHz	P_{tot}	max.	62.5	W

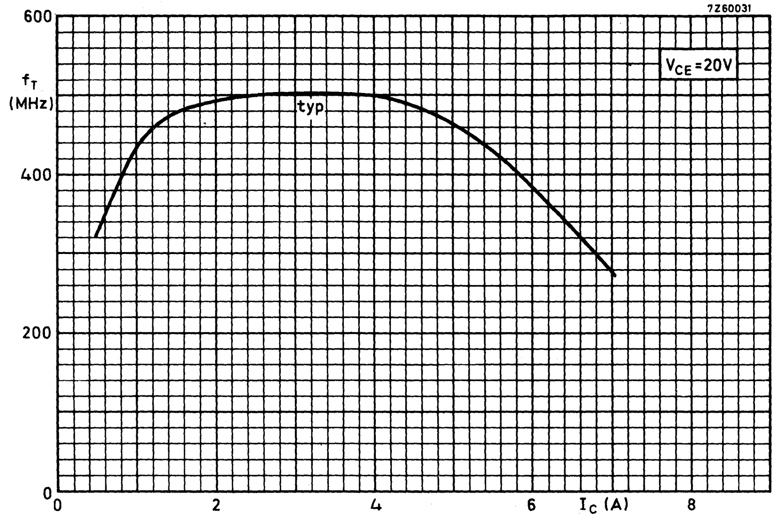


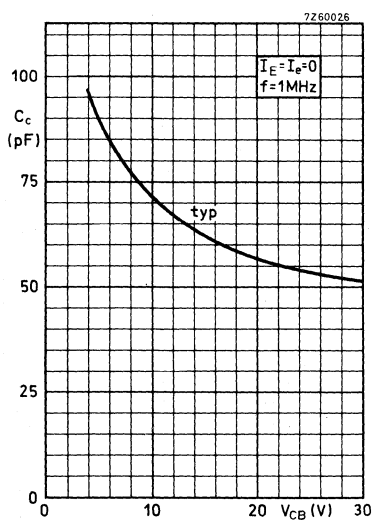


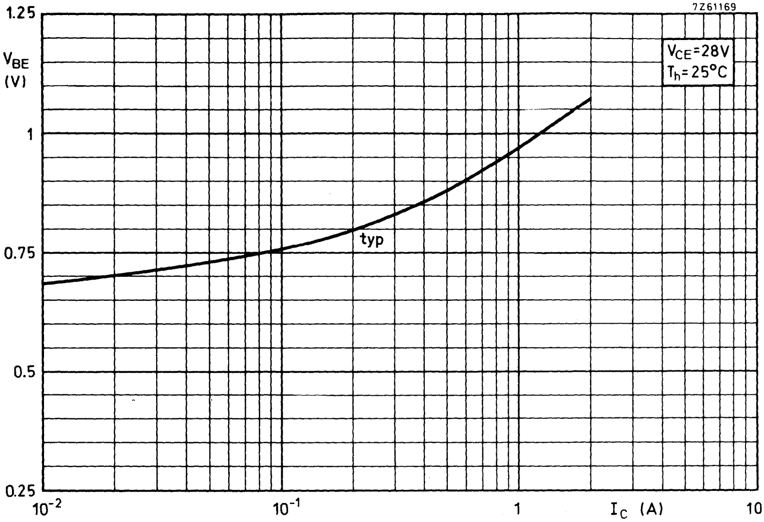
Storage temperature	T_{stg}	−30 to +200		°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j-mb}$	=	2.5	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.3	K/W


7Z60031
600
400
200
0
f_T
(MHz)
V_{CE} = 20V
typ
0
2
4
6
I_C (A)
8


7Z60026
100
75
50
25
0
C_c
(pF)
$I_E = I_e = 0$
f = 1MHz
typ
0
10
20
V_{CB} (V)
30


7Z61169
1.25
V_{BE}
(V)
1
0.75
0.5
0.25
V_{CE}=28V
T_h=25°C
typ
10^{-2}
10^{-1}
1
I_C (A)
10

APPLICATION INFORMATION

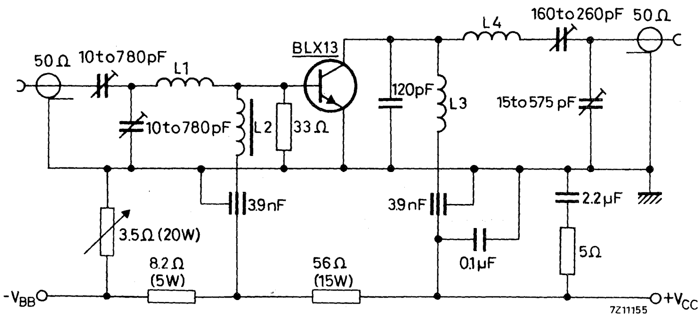
R.F. performance in S.S.B. operation (linear power amplifier)

V_{CE} = 26 V; T_h up to 25 °C
f_1 = 28.000 MHz; f_2 = 28.001 MHz

output power (W)	G_p (dB)	d_3 (dB) [1]	I_C (A)	Class
0-8 (PEP)	> 18	< −40	< 1.2	A

Test circuit:

S.S.B.
class A



L1 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 7 mm leads 50 mm totally
L2 = 7 turns enamelled Cu wire (0.7 mm) on 3H1 toroid; 60 μH (code number of 3H1: 4322 020 36620)
L3 = 4 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 10 mm
L4 = 7 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; int. diam. 12 mm

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Detailed information for a wide band application
1.6 to 28 MHz available on request

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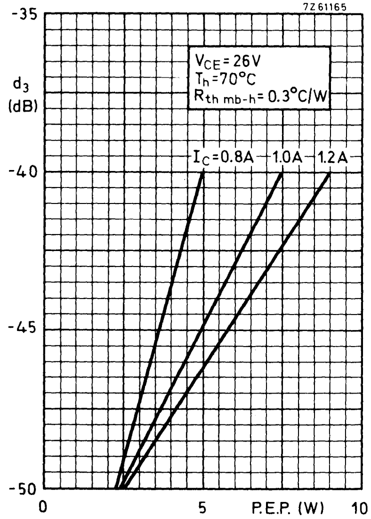
[1]) Stated figures are maxima encountered at any driving level between the specified values of PEP and are referred to the according level of either of the equal ampl. tones. Relative to the according peak envelope power these figures should be increased by 6 dB.


7Z61165
V_{CE} = 26 V
T_h = 70 °C
$R_{th\ mb-h}$ = 0.3 °C/W
I_C = 0.8 A
1.0 A
1.2 A
d_3 (dB)
-35
-40
-45
-50
0
5
10
P.E.P. (W)

APPLICATION INFORMATION

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	Gp dB	η_{dt} %	I_C A	d_3* dB	$I_{C(ZS)}$ mA	T_h °C
25 (P.E.P.)	> 18	typ. 35	typ. 1,28	typ. −35	25	25

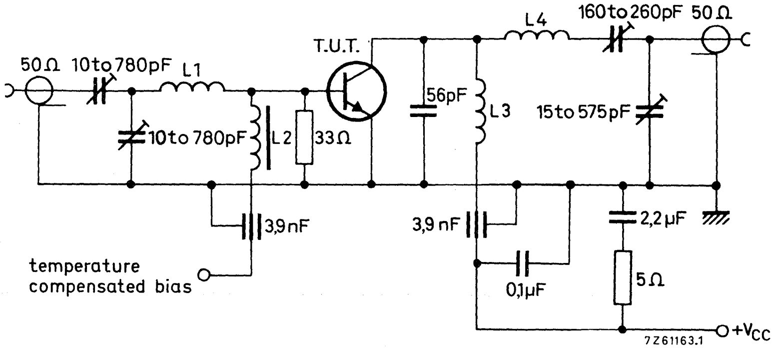
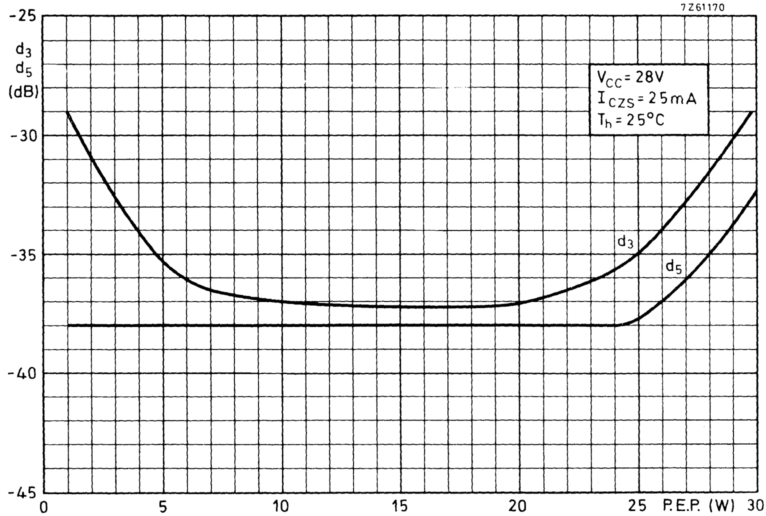


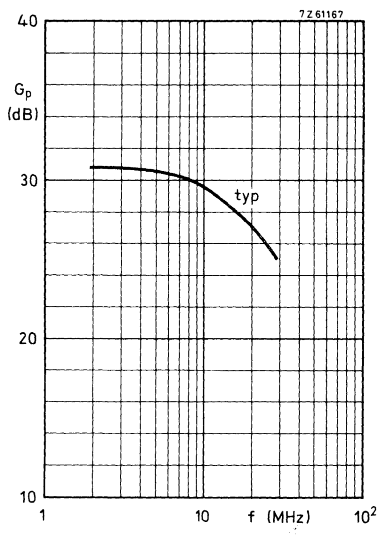
Fig. 9 Test circuit; s.s.b. class-AB.

List of components:

L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7,0 mm; leads 50 mm (total)
L2 = 7 turns enamelled Cu wire (0,7 mm) on 3H1 toroid; 60 μH (cat. no. of 3H1: 4322 020 36620)
L3 = 4 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 10 mm
L4 = 7 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 12 mm

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.





Conditions:

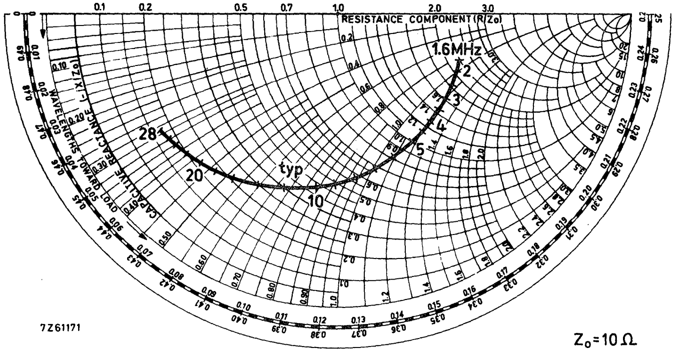
P_L = 25 W PEP

V_{CC} = 28 V

I_{CZS} = 25 mA

Z_L = 12.5 Ω

T_h = 25 °C



Conditions:

P_L = 25 W PEP

V_{CC} = 28 V

I_{CZS} = 25 mA

Z_L = 12.5 Ω

T_h = 25 °C

APPLICATION INFORMATION

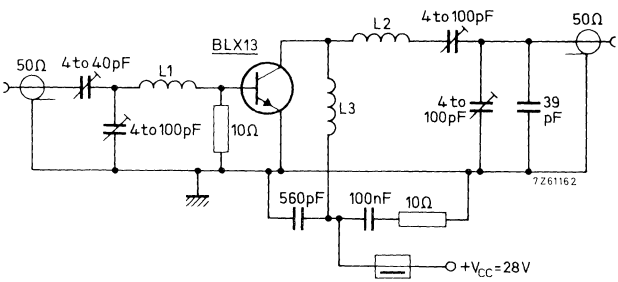
R.F. performance in c.w. operation (class B)

V_{CC} = 28 V; T_h up to 25 °C

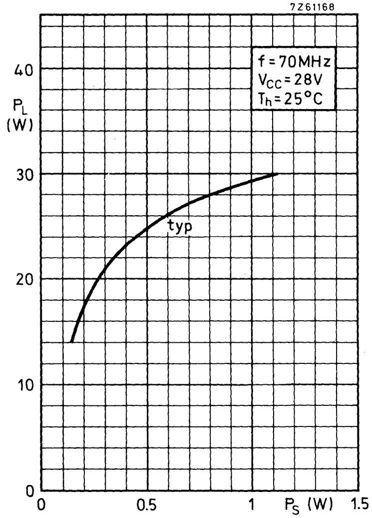
f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Y}_L$ (mS)
70	typ. 0.5	25	typ. 1.49	typ. 17	typ. 60	0.53-j1.4	42.5-j54

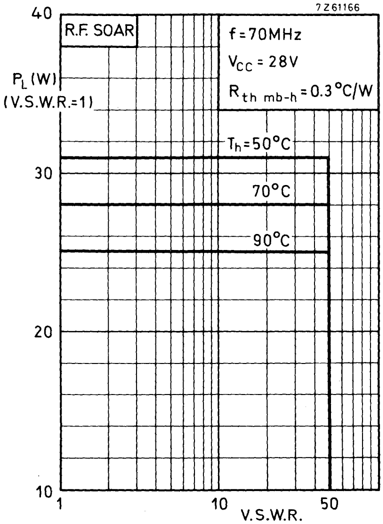
Test circuit:

C.W.
class B



L1 = 93 nH; 3 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; length 8 mm; leads 2 x 5 mm
L2 = 147 nH; 5 turns enamelled Cu wire (1.5 mm); int. diam. 9 mm; length 14 mm; leads 2 x 5 mm
L3 = 118 nH; 4 turns enamelled Cu wire (1.5 mm); int. diam. 9 mm; length 10.5 mm; leads 2 x 5 mm
L4 = FXC choke (code number 4312 020 36640)





For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in transmitting amplifiers operating in the h.f. and v.h.f. bands, with a nominal supply voltage of 28 V. The transistor is specified for s.s.b. applications as linear amplifier in class-A and AB. The device is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

Matched h_{FE} groups are available on request.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

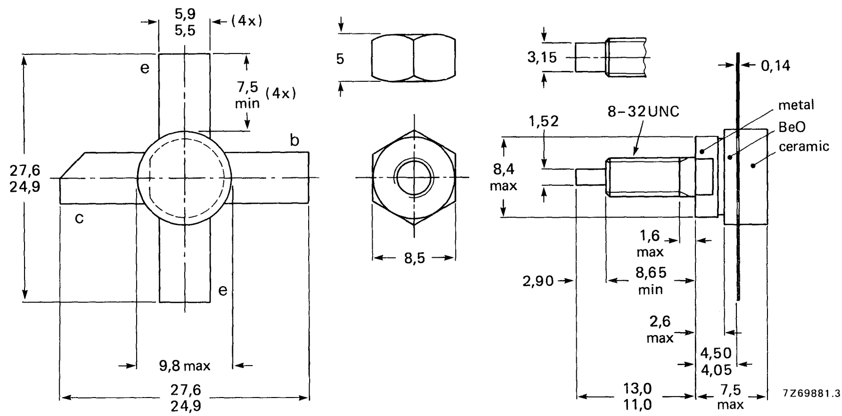
R.F. performance

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η_{dt} %	I_C A	d_3 dB	T_h °C
s.s.b. (class-A)	**26**	**1,6 – 28**	**0 – 8 (P.E.P.)**	**> 20**	**–**	**1,25**	**< –40**	**70**
s.s.b. (class-AB)	28	1,6 – 28	3 – 25 (P.E.P.)	typ. 21	typ. 45	typ. 1,0	typ. –30	25

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	3	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	9	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	73	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

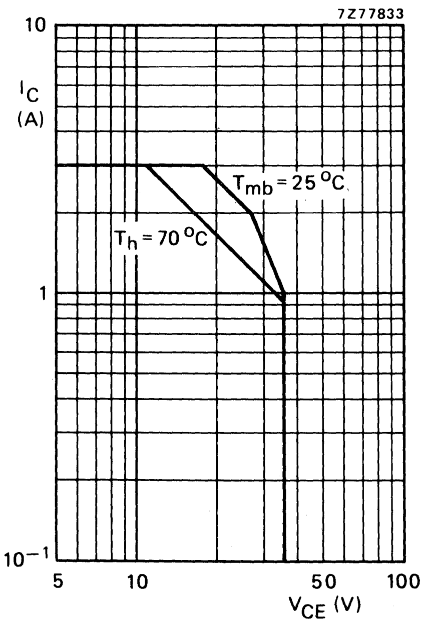


Fig. 2 D.C. SOAR.

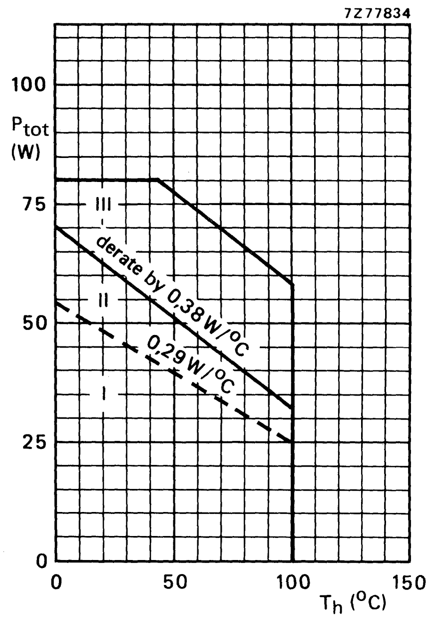


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f ⩾ 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operating during mismatch

THERMAL RESISTANCE (dissipation = 32,5 W; T_{mb} = 85 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,55	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,65	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	4	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8	mJ
R_{BE} = 10 Ω	E_{SBR}	>	8	mJ
D.C. current gain * I_C = 1,25 A; V_{CE} = 5 V	h_{FE}	typ.	50	
			10 to 100	
D.C. current gain ratio of matched devices * I_C = 1,25 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2	
Collector-emitter saturation voltage * I_C = 3,75 A; I_B = 0,75 A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 100 MHz * $-I_E$ = 1,25 A; V_{CB} = 28 V	f_T	typ.	530	MHz
$-I_E$ = 3,75 A; V_{CB} = 28 V	f_T	typ.	530	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 28 V	C_c	typ.	50	pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	31	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

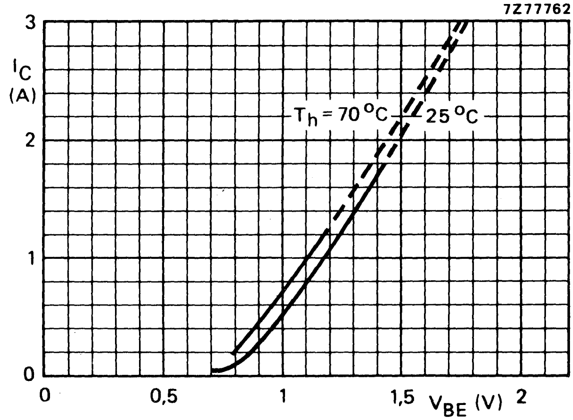


Fig. 4 Typical values; V_{CE} = 28 V.

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

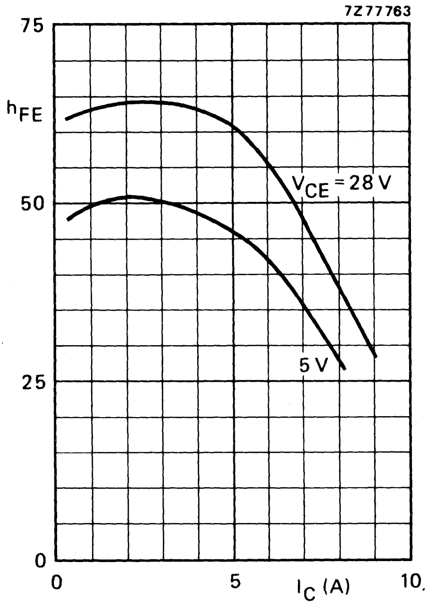


Fig. 5 Typical values; T_j = 25 °C.

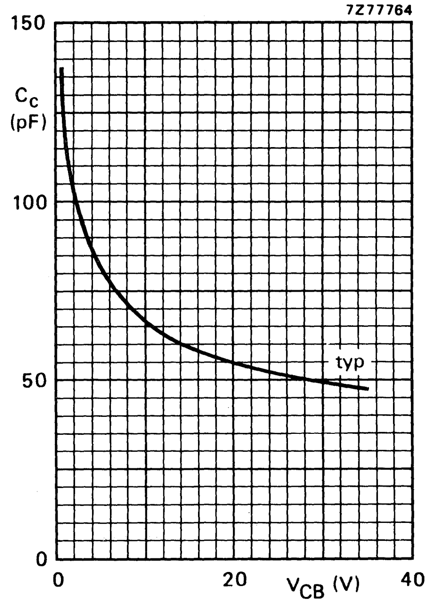


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

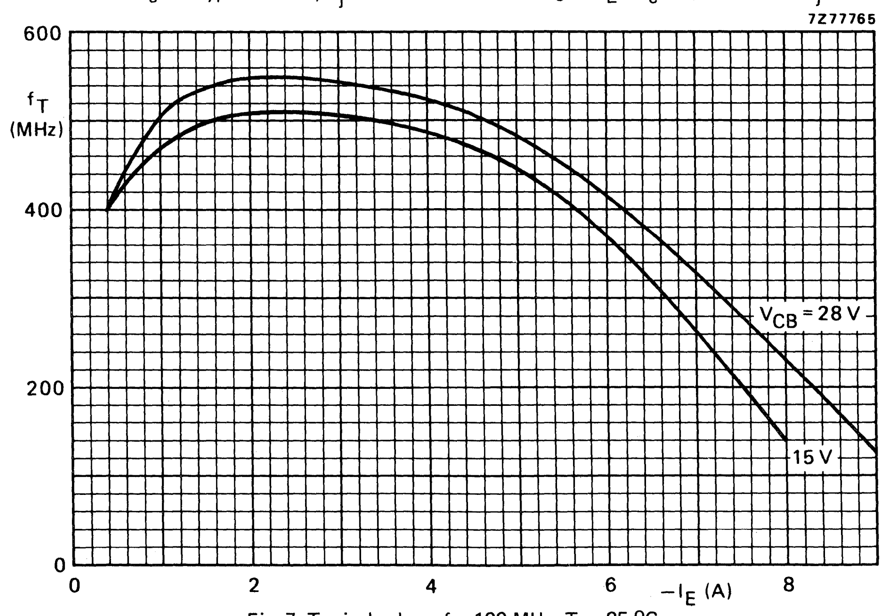


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB *	d_5 dB *	T_h °C
> 8 (P.E.P.)	> 20	1,25	−40	< −40	70
typ. 10 (P.E.P.)	typ. 24	1,25	−40	< −40	25

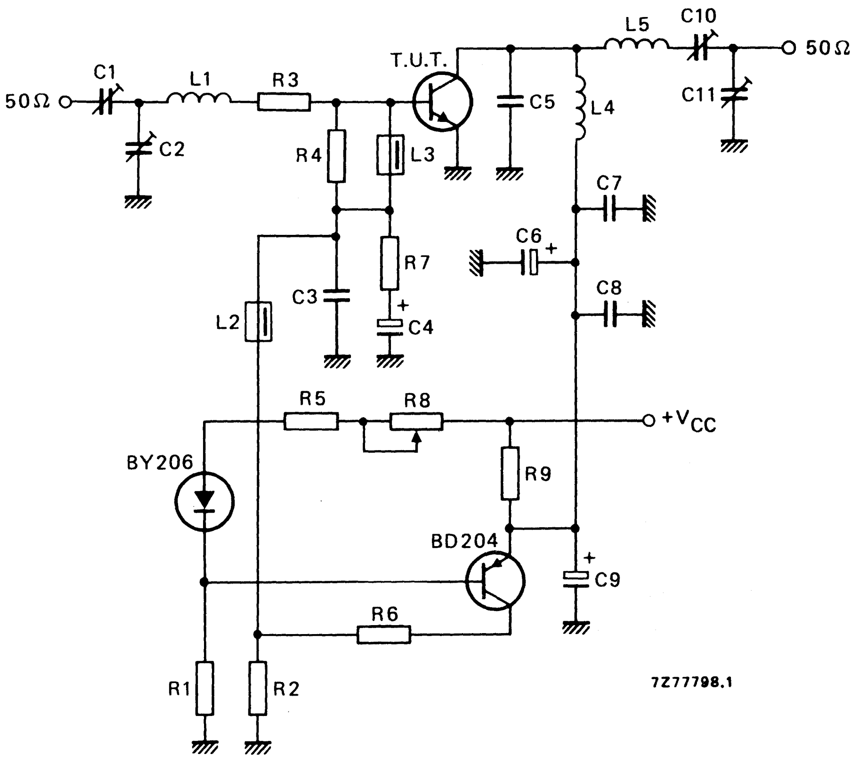


Fig. 8 Test circuit; s.s.b. class-A.

List of components on page 6.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 8:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = 22 nF ceramic capacitor (63 V)
C4 = 47 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/35 V electrolytic capacitor
C10 = 10 to 210 pF film dielectric trimmer
C11 = 15 to 575 film dielectric trimmer

L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm
L5 = 14 turns closely enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω; parallel connection of 2 x 1,2 kΩ carbon resistors (± 5%; 0,5 W each)
R2 = 15 Ω carbon resistor (± 5%; 0,25 W)
R3 = 1,2 Ω parallel connection of 4 x 4,7 Ω carbon resistors (± 5%; 0,125 W each)
R4 = 33 Ω carbon resistor (± 5%; 0,25 W)
R5 = 18 Ω carbon resistor (± 5%; 0,25 W)
R6 = 120 Ω wirewound resistor (± 5%; 5,5 W)
R7 = 1 Ω carbon resistor (± 5%; 0,125 W)
R8 = 47 Ω wirewound potentiometer (3 W)
R9 = 1,57 Ω; parallel connection of 3 x 4,7 Ω wirewound resistors (± 5%; 5,5 W each)

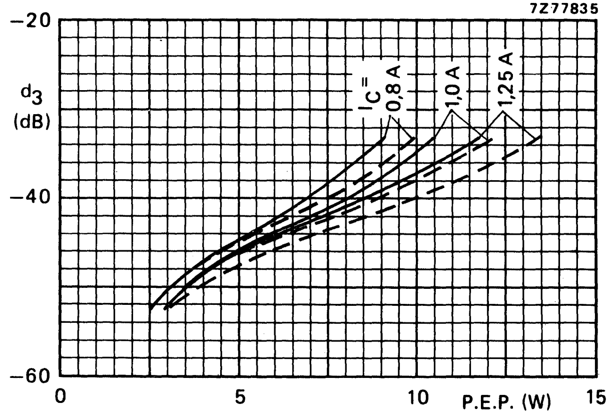


Fig. 9 Intermodulation distortion as a function of output power.
Typical values; V_{CE} = 26 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz;
—— T_h = 70 °C; – – – T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt} (%) at 25 W P.E.P.	I_C (A) at 25 W P.E.P.	d_3 dB *	d_5 dB *	$I_{C(ZS)}$ mA	T_h °C
3 to 25 (P.E.P.)	typ. 21	typ. 45	typ. 1,0	typ. −30	< −30	25	25
3 to 22 (P.E.P.)	typ. 21	–	–	typ. −30	< −30	25	70

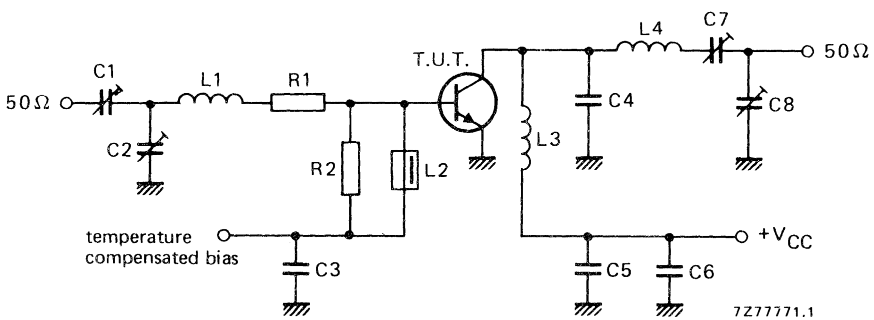


Fig. 10 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = C5 = C6 = 220 nF polyester capacitor
C4 = 56 pF ceramic capacitor (500 V)
C7 = C8 = 15 to 575 pF film dielectric trimmer

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm
L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors
R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

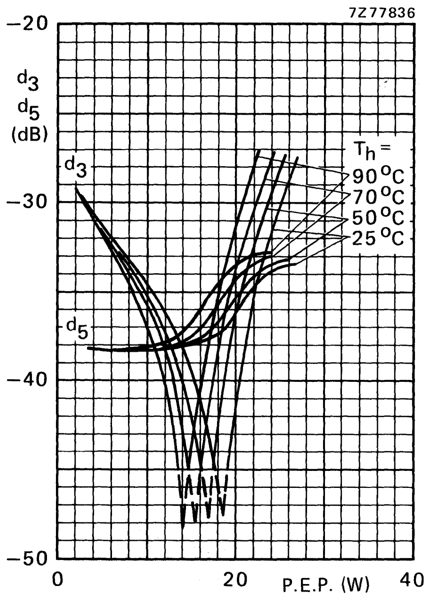


Fig. 11 Intermodulation distortion as a function of output power. *

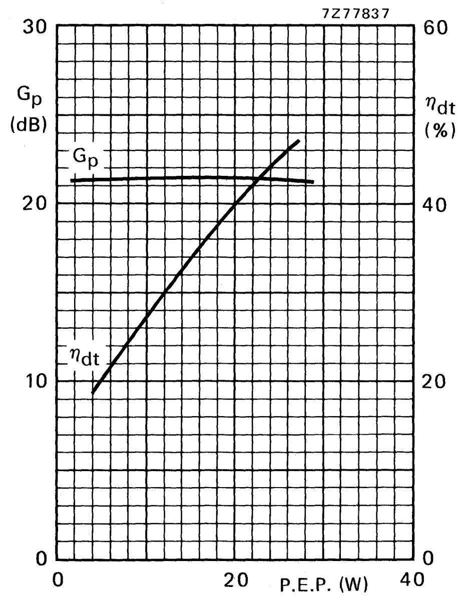


Fig. 12 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 11:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 12:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 25 °C; typical values.

* See note on previous page.

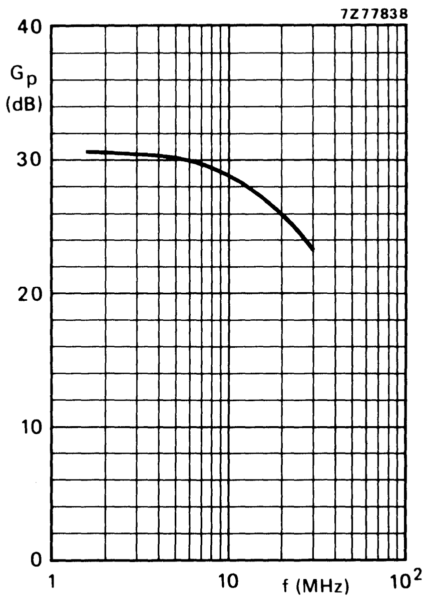


Fig. 13 Power gain as a function of frequency.

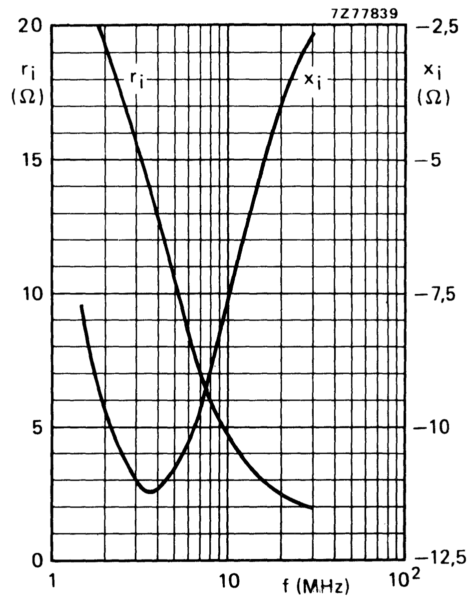


Fig. 14 Input impedance (series components) as a function of frequency.

Figs 13 and 14 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 25 mA; P_L = 25 W; T_h = 25 °C; Z_L = 12 Ω.

Ruggedness in s.s.b. operation

The BLX13C is capable of withstanding a load mismatch (VSWR = 50) under the following conditions: f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_L = 30 W (P.E.P.).

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, AB and B operated transmitting equipment in the h.f. and v.h.f. band.

- rated for 50 W P.E.P. at 1,6 MHz to 28 MHz (intermodulation distortion better than −30 dB); full load mismatch permissible at stud temperatures up to 70 °C
- rated at 50 W for frequencies up to 70 MHz in c.w. operation
- supply voltage 28 V
- plastic stripline package

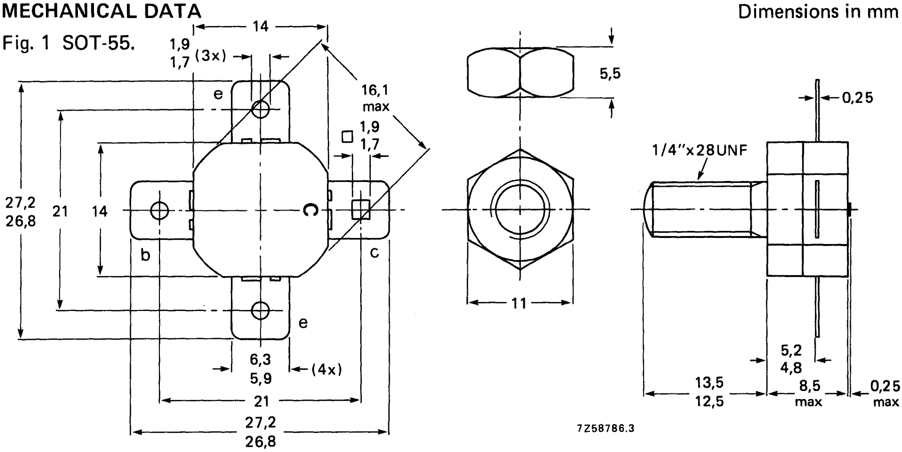
QUICK REFERENCE DATA

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	d_3 dB	$I_{C(ZS)}$ A
s.s.b. (class-A)	28	1,6 to 28	15 (P.E.P.)	> 13	typ. −40	2,0
s.s.b. (class-AB)	28	1,6 to 28	7,5-50 (P.E.P.)	> 13	< −30	0,1
c.w. (class-B)	28	70	50	> 7,5		
c.w. (class-B)	28	30	50	typ. 16		

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



Torque on nut: min. 2,3 Nm (23 kg cm)
max. 2,7 Nm (27 kg cm)

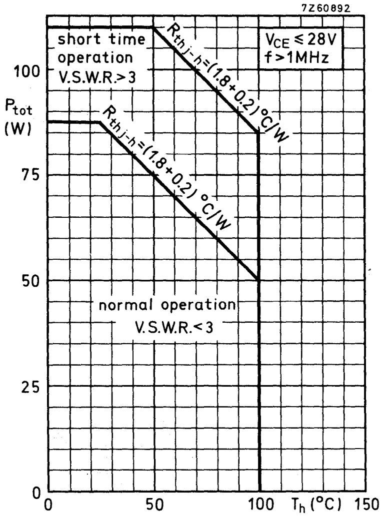
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

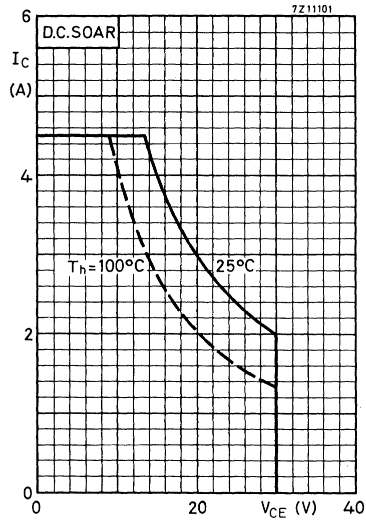
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	85	V
Collector-emitter voltage (R_{BE} = 10 Ω) peak value	V_{CERM}	max.	85	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4.0	V
Collector current (average)	I_{CAV}	max.	4.0	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	12	A
Total power dissipation up to T_h = 25 °C f > 1 MHz	P_{tot}	max.	88	W





Storage temperature	T_{stg}	−65 to +200	°C
Operating junction temperature	T_j	max. +200	°C

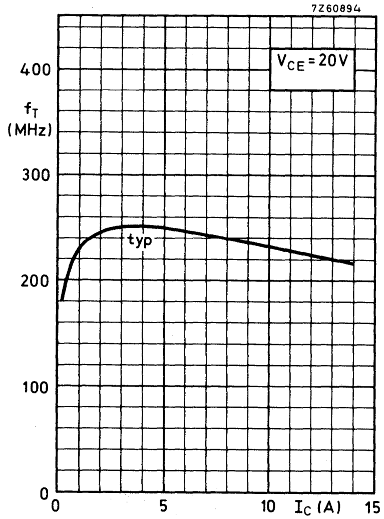
THERMAL RESISTANCE

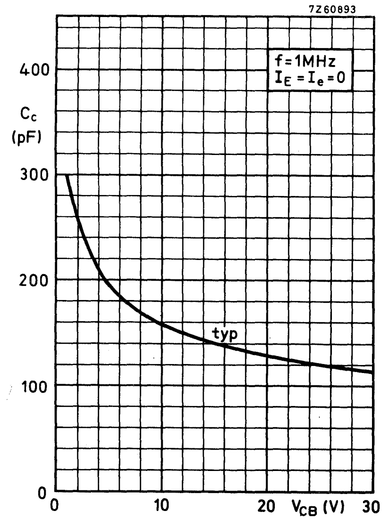
From junction to mounting base	$R_{th\,j\text{-}mb}$	=	1.8	K/W
From mounting base to heatsink	$R_{th\,mb\text{-}h}$	=	0.2	K/W

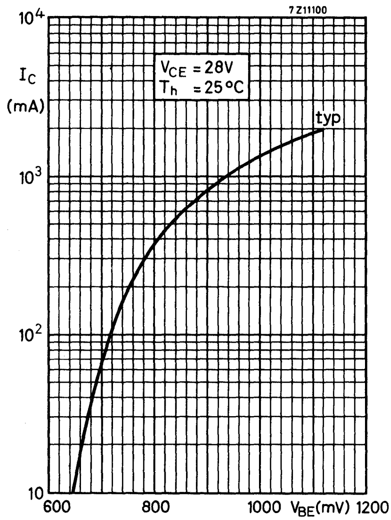
CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-base breakdown voltage				
open emitter; $I_C = 25$ mA	$V_{(BR)CBO}$	>	85	V
Collector-emitter breakdown voltage				
$R_{BE} = 10\ \Omega$; $I_C = 25$ mA	$V_{(BR)CER}$	>	85	V
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage				
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4,0	V
Collector-emitter saturation voltage				
$I_C = 0,7$ A; $I_B = 0,14$ A	V_{CEsat}	<	1,0	V
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	8	mJ
$R_{BE} = 33\ \Omega$	E_{SBR}	>	8	mJ
D.C. current gain				
$I_C = 1,4$ A; $V_{CE} = 6$ V	h_{FE}		15 to 100	
Transition frequency				
$I_C = 3,0$ A; $V_{CE} = 20$ V	f_T	typ.	250	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 30$ V	C_c	typ.	115	pF
		<	125	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 30$ V	C_{re}	typ.	90	pF
Collector-stud capacitance	C_{cs}	typ.	3,5	pF


7Z60894
V_{CE} = 20V
f_T (MHz)
typ
I_C (A)
0
5
10
15
100
200
300
400


7Z60893
f = 1MHz
$I_E = I_e = 0$
C_c (pF)
typ
V_{CB} (V)
0
10
20
30
100
200
300
400


7Z11100
V_{CE} = 28V
T_h = 25 °C
I_C (mA)
typ
V_{BE}(mV)
600
800
1000
1200
10
10^2
10^3
10^4

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	Gp dB	η_{dt} %	I_C A	d_3* dB	d_5* dB	$I_{C(ZS)}$ A	T_h °C
7,5 to 50 (P.E.P.)	> 13	> 35	< 2,55	< −30	< −30	0,1	25

At temperatures up to 90 °C the output power relative to that at 25 °C is diminished by −40 mW/K.

The transistor is designed to withstand a full load mismatch operating under 50 W P.E.P. at V_{CE} = 28 V and T_h = 70 °C.

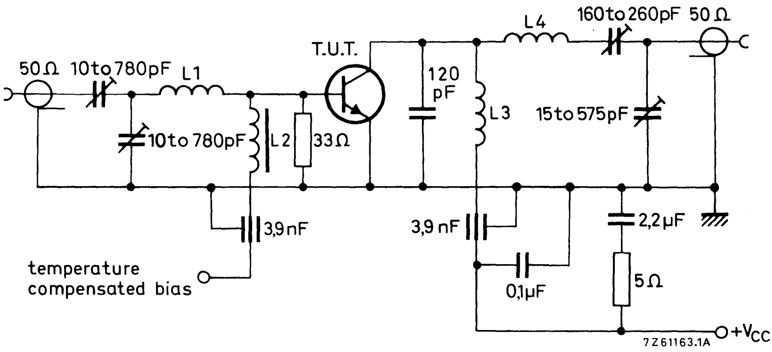
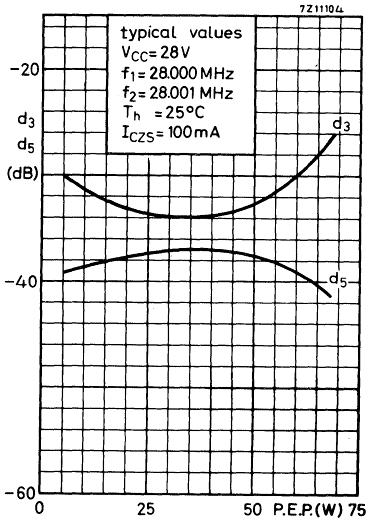


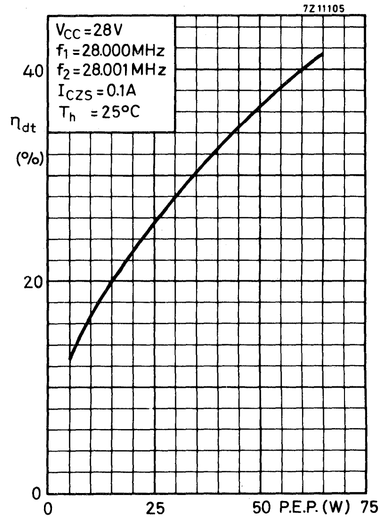
Fig. 7 Test circuit; s.s.b. class-AB.

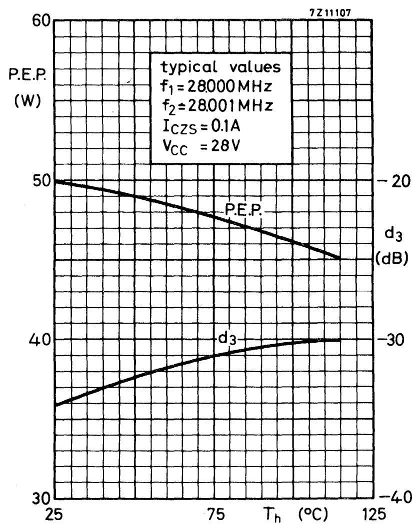
List of components:

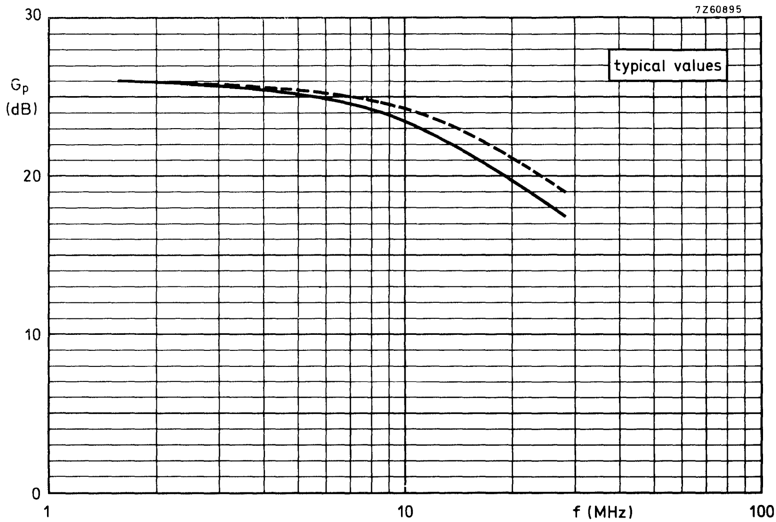
L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7,0 mm; leads 50 mm (total)
L2 = 7 turns enamelled Cu wire (0,7 mm) on 3H1 toroid; 60 μH (cat. no. of 3H1 4322 020 36620)
L3 = 4 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 10 mm
L4 = 7 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 12 mm

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.


7Z11104
typical values
V_{CC} = 28 V
f_1 = 28.000 MHz
f_2 = 28.001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
d_3
d_5
(dB)
−20
−40
−60
0
25
50
P.E.P. (W)
75


7Z11105
V_{CC} = 28 V
f_1 = 28.000 MHz
f_2 = 28.001 MHz
I_{CZS} = 0.1 A
T_h = 25 °C
η_{dt}
(%)
40
20
0
0
25
50
P.E.P. (W)
75


7Z11107
typical values
f_1 = 28.000 MHz
f_2 = 28.001 MHz
I_{CZS} = 0.1 A
V_{CC} = 28 V
P.E.P.
(W)
60
50
40
30
P.E.P.
d_3
d_3
(dB)
−20
−30
−40
25
75
T_h (°C)
125

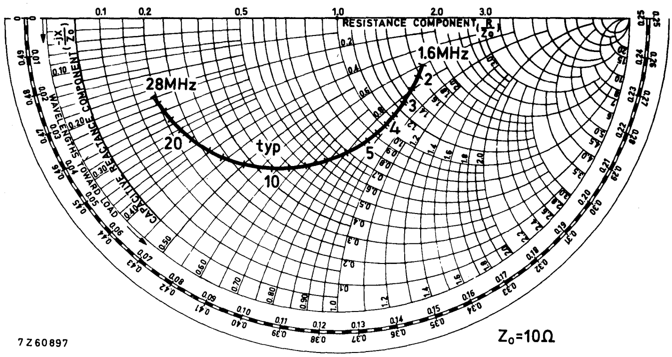


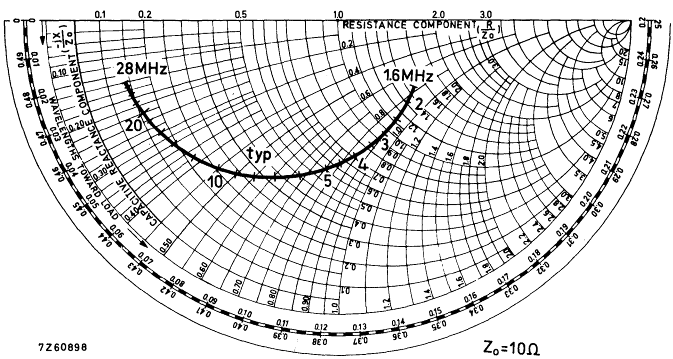
S.S.B. class AB operation

P_L = 50 W PEP
V_{CC} = 28 V
I_C = 100 mA
Z_L = 6.25 Ω
T_h = 25 °C

The drawn curve holds for an unneutralized amplifier.

The dashed curve holds for a push-pull amplifier with cross neutralization.
Collector-base neutralizing capacitor: 82 pF





S.S.B. class AB operation

P_L = 50 W PEP
V_{CC} = 28 V
I_C = 100 mA
Z_L = 6.25 Ω
T_h = 25 °C

The upper graph holds for a push-pull amplifier with cross neutralization.
Collector-base neutralizing capacitor: 82 pF

The lower graph holds for an unneutralized amplifier.

APPLICATION INFORMATION (continued)

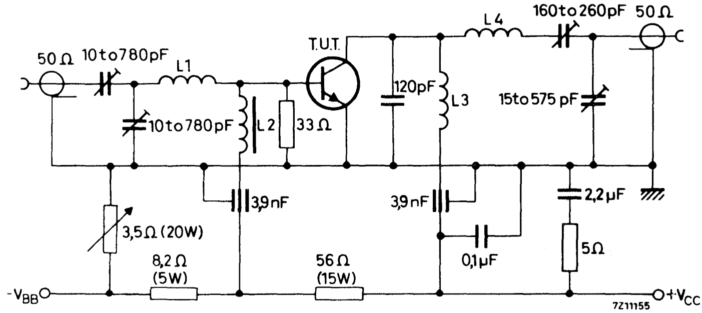
R.F. performance in s.s.b. operation (linear power amplifier)

V_{CC} = 28 V; T_h up to 25 °C
f_1 = 28,000 MHz; f_2 = 28,001 MHz

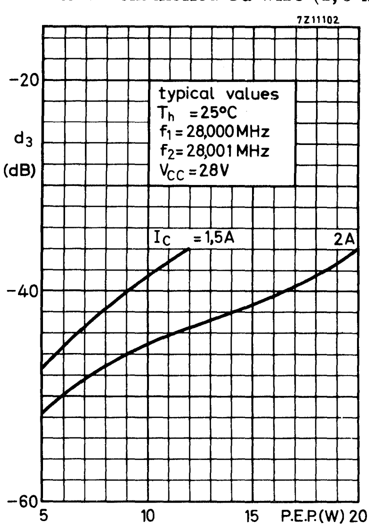
output power (W)	G_p (dB)	d_3 (dB) [1]	d_5 (dB) [1]	I_C (A)	Class
15 PEP	> 13	typ. −40	typ. −45	2,0	A

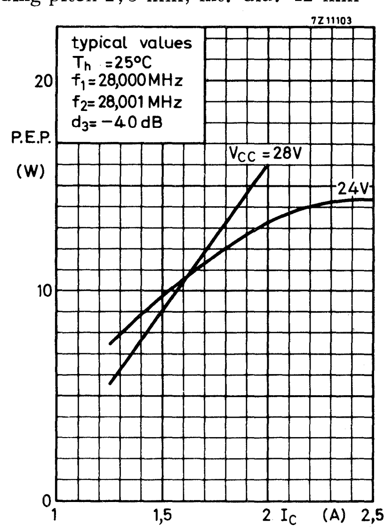
Test circuit:

S.S.B. class-A



L1 = 3 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 7 mm leads 50 mm totally
L2 = 7 turns enamelled Cu wire (0,7 mm) on 3H1 toroid; 60 µH (code number of 3H1: 4322 020 36620)
L3 = 4 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 10 mm
L4 = 7 turns enamelled Cu wire (1,5 mm); winding pitch 2,5 mm; int. dia. 12 mm





APPLICATION INFORMATION

R.F. performance in c.w. operation (class B)

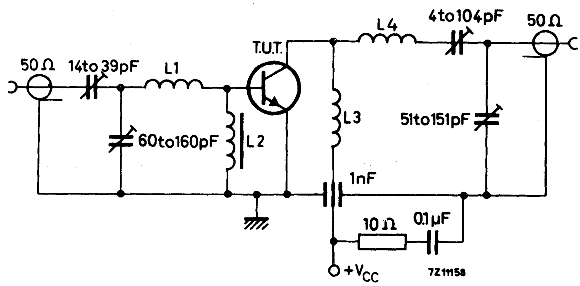
V_{CC} = 28 V; T_h up to 25 °C

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
70	< 8.9	50	< 3.25	> 7.5	> 55	1.0+j0.2	120 − j75
50	typ. 4	50	typ. 3.25	typ. 11	typ. 55	–	–
30	typ. 1.2	50	typ. 3.25	typ. 16	typ. 55	–	–

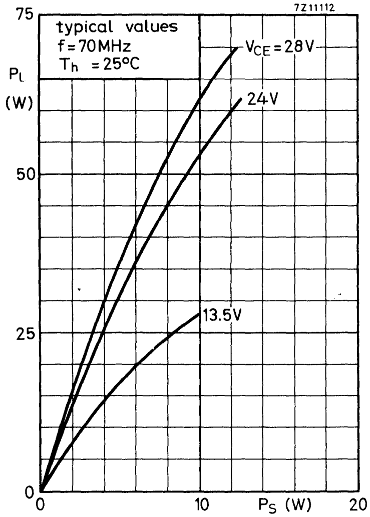
At temperatures up to 90 °C the output power relative to that at 25 °C is diminished by a factor −40 mW/K

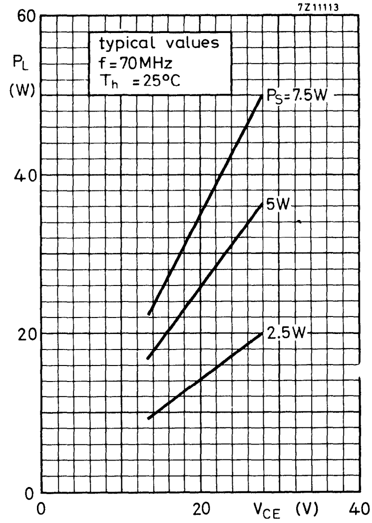
Test circuit :

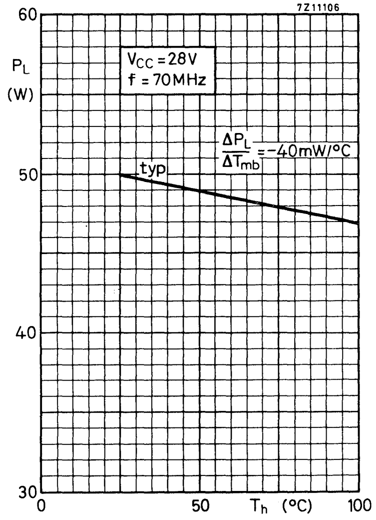
C.W.
70 MHz

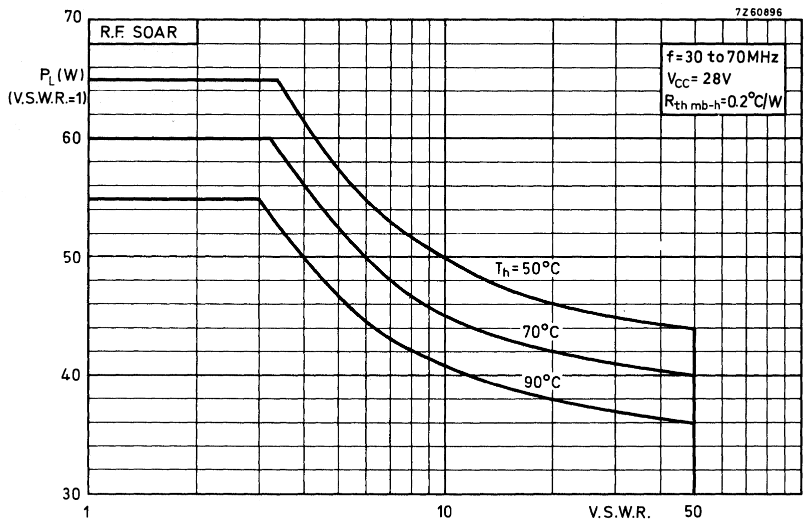


L1 = 60 mm straight enamelled Cu wire (1.5 mm); 9 mm above chassis
L2 = FXC choke coil (code number 4322 020 36640)
L3 = 2 turns enamelled Cu wire (1.5 mm); winding pitch 2 mm; internal diam. 10 mm; leads 55 mm totally
L4 = 3 turns enamelled Cu wire (1.5 mm); winding pitch 2.5 mm; internal diam. 10 mm; leads 50 mm totally


7Z11112
typical values
f = 70 MHz
T_h = 25 °C
P_L
(W)
V_{CE} = 28 V
24 V
13.5 V
P_S (W)
0
10
20
25
50
75

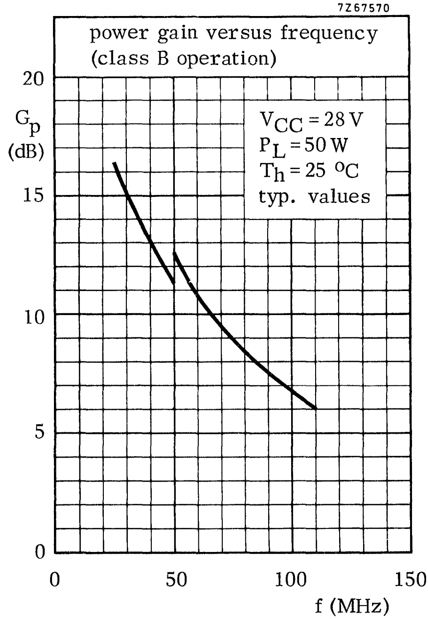

7Z11113
typical values
f = 70 MHz
T_h = 25 °C
P_L
(W)
P_S = 7.5 W
5 W
2.5 W
V_{CE} (V)
0
20
40
60

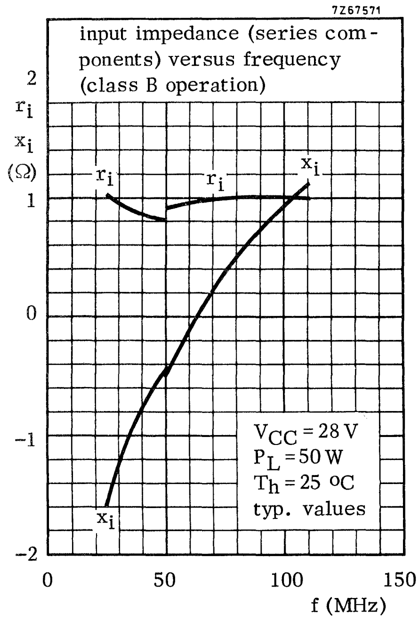

7Z11106
V_{CC} = 28 V
f = 70 MHz
P_L
(W)
$\frac{\Delta P_L}{\Delta T_{mb}}$ = −40 mW/°C
typ
T_h (°C)
0
50
100
30
40
50
60

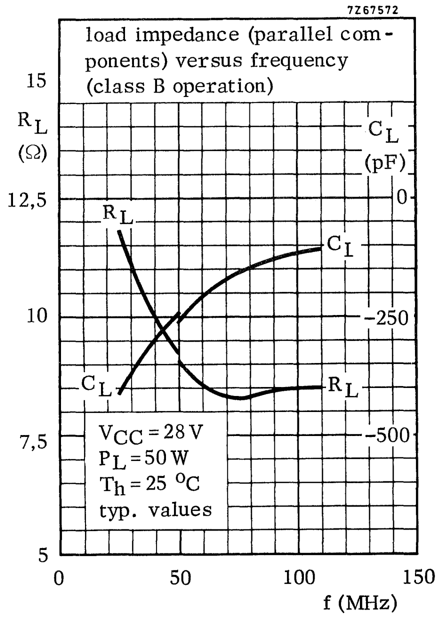


For high voltage operation, a stabilized power supply generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heatsink temperature as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 6,8 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







H.F./V.H.F. POWER TRANSISTOR

Silicon n-p-n power transistor for use in industrial and military s.s.b. and c.w. equipment operating in the h.f. and v.h.f. band:

- rated for 150 W P.E.P. at 1,6 MHz to 28 MHz (intermodulation distortion better than 30 dB down)
- rated at 150 W output power for frequencies up to 108 MHz in c.w. operation
- supply voltage up to 50 V
- plastic encapsulated stripline package
- delivered in matched h_{FE} groups

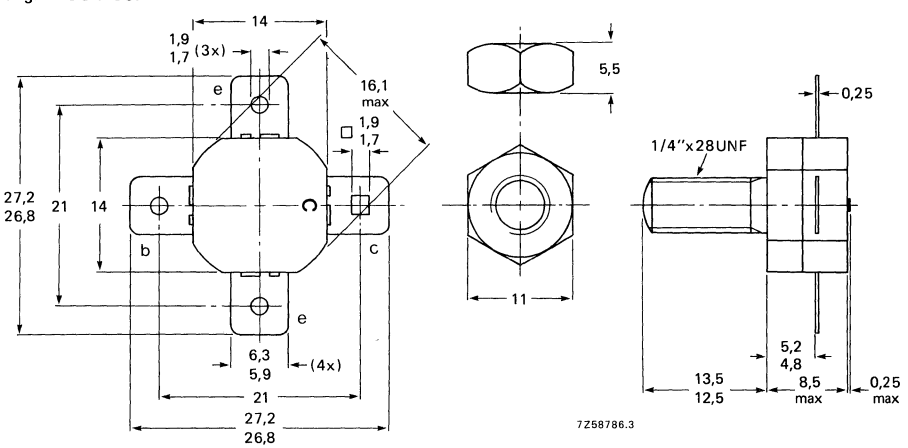
QUICK REFERENCE DATA

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	d_3 dB	$I_{C(ZS)}$ A
s.s.b. (class-AB)	50	1,6 to 28	20 to 150 (P.E.P.)	> 14	< −30	0,10
s.s.b. (class-A)	40	1,6 to 28	typ. 30 (P.E.P.)	> 14	< −40	2,5
c.w. (class-B)	50	70	150	> 10	−	−
c.w. (class-B)	50	108	150	typ. 7,4	−	−

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



When locking is required an adhesive is preferred instead of a lock washer.

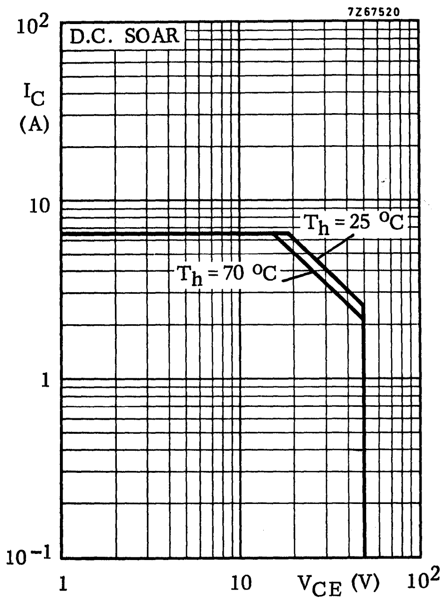
Torque on nut: min. 2,3 Nm (23 kg cm)
max. 2,7 Nm (27 kg cm)

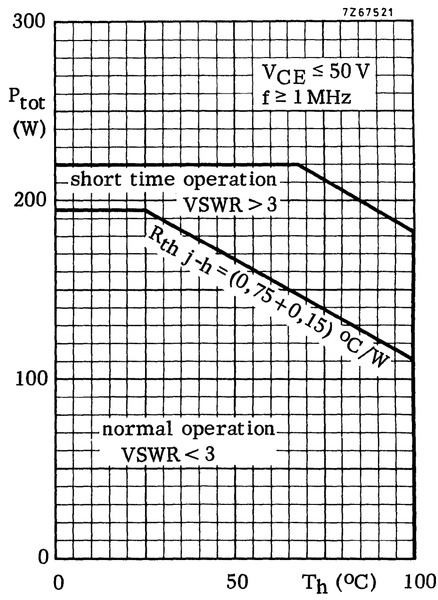
Diameter of clearance hole in heatsink: max.6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	110	V
Collector-emitter voltage ($R_{BE} = 10\Omega$) peak value	V_{CERM}	max.	110	V
Collector-emitter voltage (open base)	V_{CEO}	max.	53	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V
Collector current (average)	$I_{C(AV)}$	max.	6,5	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	20	A





Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

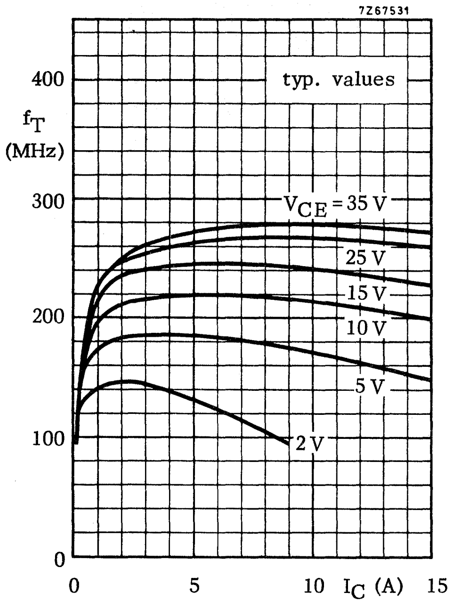
THERMAL RESISTANCE

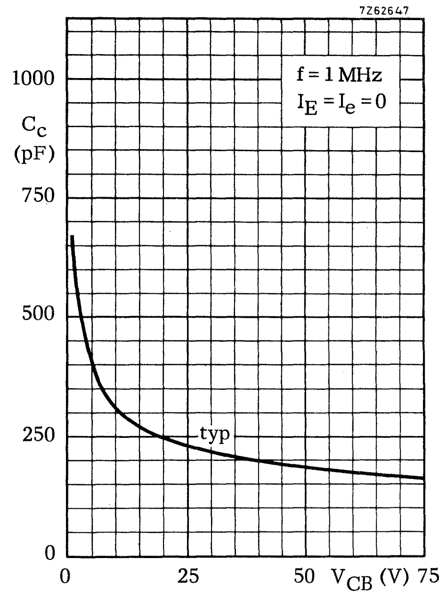
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	0,75	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,15	K/W

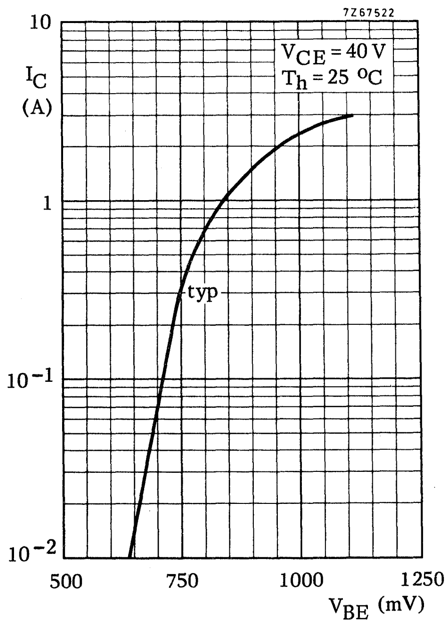
CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter ; I_C = 100 mA	$V_{(BR)CBO}$	>	110	V
Collector-emitter voltage R_{BE} = 5 Ω ; I_C = 100 mA	$V_{(BR)CER}$	>	110	V
Collector-emitter voltage open base ; I_C = 100 mA	$V_{(BR)CEO}$	>	53	V
Emitter-base voltage open collector; I_E = 20 mA	$V_{(BR)EBO}$	>	4,0	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	12,5	ms
$-V_{BE}$ = 1,5 V; R_{BE} = 33 Ω	E	>	12,5	ms
D.C. current gain				
I_C = 1,4 A ; V_{CE} = 6 V	h_{FE}		15 to 50	
D.C. current gain ratio of matched devices				
I_C = 1,4 A ; V_{CE} = 6 V	h_{FE1}/h_{FE2}	<	1,2	
Transition frequency				
I_C = 6,0 A ; V_{CE} = 35 V	f_T	typ.	275	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0 ; V_{CB} = 50 V	C_c	typ. <	185 220	pF pF
Feedback capacitance at f = 1 MHz				
I_C = 150 mA; V_{CE} = 50 V	C_{re}	typ.	115	pF
Collector-stud capacitance	C_{cs}	typ.	3,5	pF


7Z67531
typ. values
400
300
200
100
0
f_T
(MHz)
V_{CE} = 35 V
25 V
15 V
10 V
5 V
2 V
0
5
10
I_C (A)
15


7Z62647
f = 1 MHz
$I_E = I_e = 0$
1000
750
500
250
0
C_c
(pF)
typ
0
25
50
V_{CB} (V)
75


7Z67522
V_{CE} = 40 V
T_h = 25 °C
10
I_C
(A)
1
10^{-1}
10^{-2}
typ
500
750
1000
1250
V_{BE} (mV)

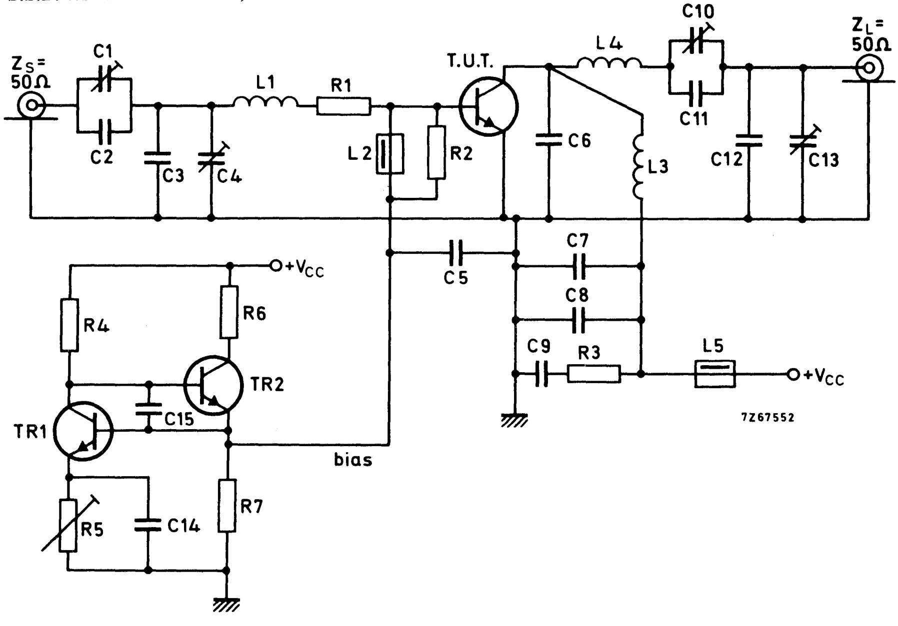
APPLICATION INFORMATION

R.F. performance in s.s.b. operation (linear power amplifier)

T_h up to 25 °C
f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power (W)	G_p (dB)	η_{dt} (%)	d_3 (dB) 1)	d_5 (dB) 1)	I_{CZS} (A)	I_C (A)	V_{CE} (V)	Class
20 to 150 (PEP)	> 14	> 37,5	< −30	< −30	0,10	< 4	50	AB
typ. 30 (PEP)	>·14	typ. 15	< −40	< −40	2,5	–	40	A

S.S.B. test circuit class AB; f = 28 MHz



1) Stated figures are maxima encountered at any driving level between the specified values of PEP and are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope power these figures should be increased by 6 dB.

APPLICATION INFORMATION (continued)

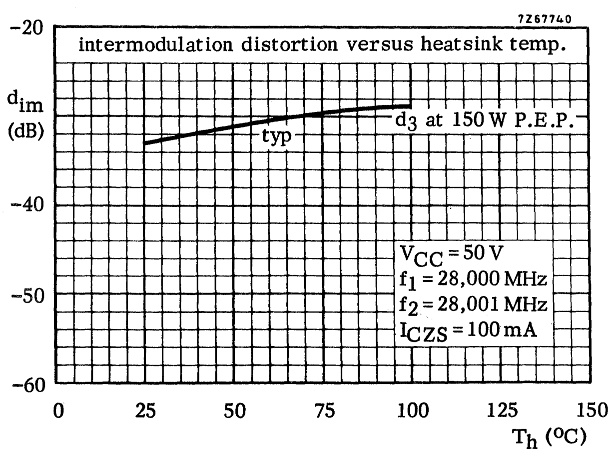
List of components:

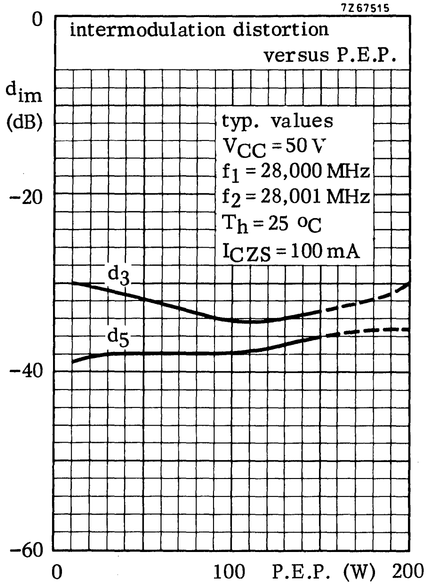
Tr1 = BD135
Tr2 = BD228

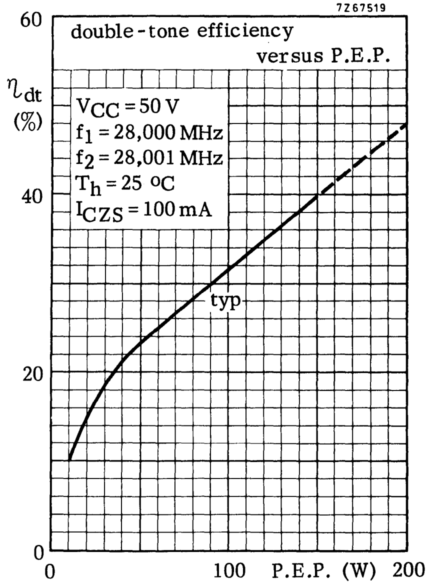
C1 = C10 =	100 pF	air dielectric capacitor (single insulated rotor type)
C2 = C6 =	27 pF	ceramic capacitor
C3 =	180 pF	ceramic capacitor
C4 = C13 =	100 pF	air dielectric capacitor (single non-insulated rotor)
C5 = C7 =	3,9 nF	polyester capacitor (±10%)
C8 = C14 = C15 =	100 nF	polyester capacitor (±10%)
C9 =	2,2 μF	moulded metallized polyester capacitor
C11 =	68 pF	ceramic capacitor
C12 =	220 pF	ceramic capacitor

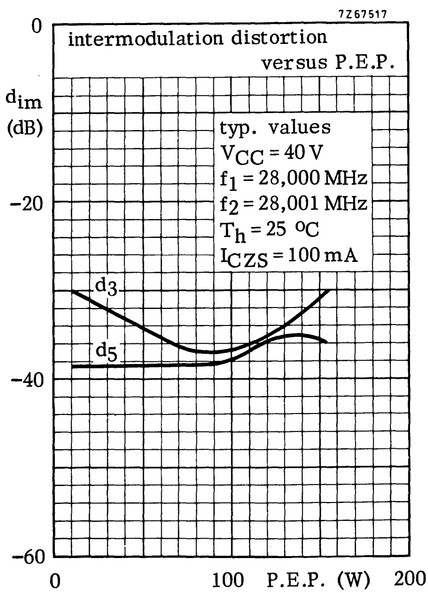
L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm; leads 2 x 5 mm
L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36640)
L3 = 180 nH; 4 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 9,9 mm; leads 2 x 10 mm
L4 = 350 nH; 7 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 19,1 mm; leads 2 x 10 mm

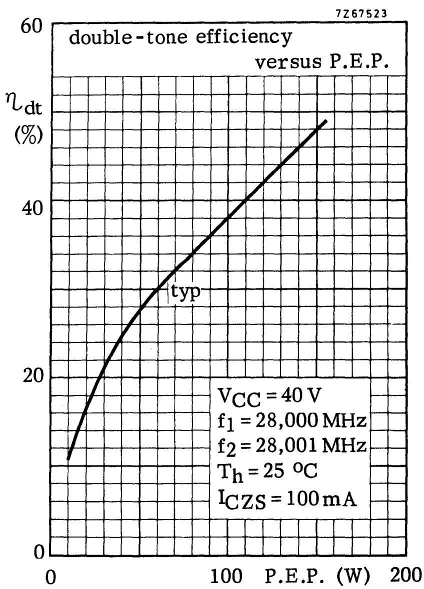
R1 = 0,66 Ω parallel connection of 5 x 3,3 Ω carbon resistors (±5%; 0,5 W each)
R2 = 27 Ω carbon resistor (±5%; 0,5 W)
R3 = 4,7 Ω carbon resistor (±5%; 0,5 W)
R4 = 5,6 kΩ carbon resistor (±5%; 1 W)
R5 = 15 Ω wire-wound potentiometer (3W)
R6 = 157 Ω parallel connection of 3 x 470 Ω wire-wound resistors (5,5W each)
R7 = 68 Ω carbon resistor (±5%; 0,5 W)

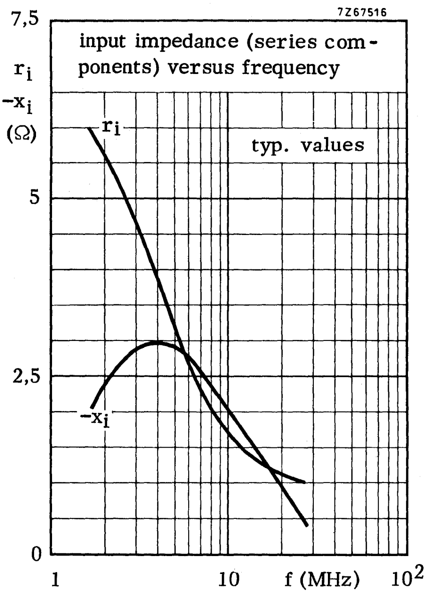


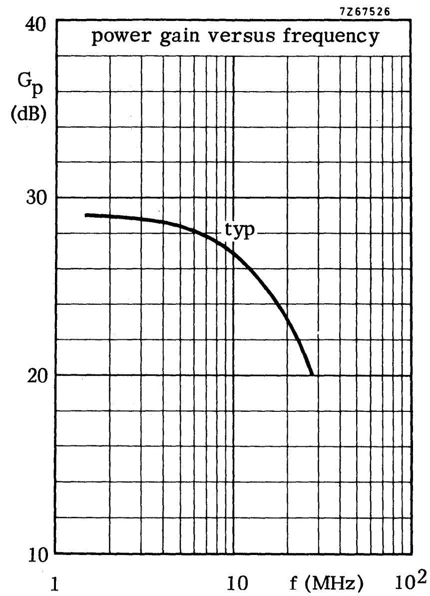

7Z67515
intermodulation distortion versus P.E.P.
d_{im} (dB)
0
-20
-40
-60
typ. values
V_{CC} = 50 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
d_3
d_5
0
100
P.E.P. (W)
200


7Z67519
double-tone efficiency versus P.E.P.
η_{dt} (%)
60
40
20
0
V_{CC} = 50 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
typ
0
100
P.E.P. (W)
200


7Z67517
intermodulation distortion versus P.E.P.
d_{im} (dB)
0
-20
-40
-60
typ. values
V_{CC} = 40 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
d_3
d_5
0
100
P.E.P. (W)
200


7Z67523
double-tone efficiency versus P.E.P.
η_{dt} (%)
60
40
20
0
typ
V_{CC} = 40 V
f_1 = 28,000 MHz
f_2 = 28,001 MHz
T_h = 25 °C
I_{CZS} = 100 mA
0
100
P.E.P. (W)
200

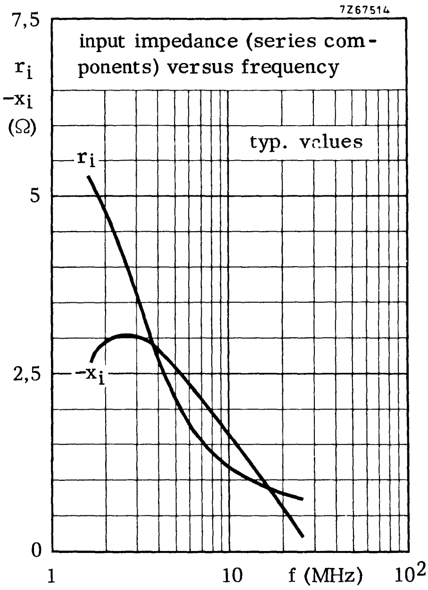


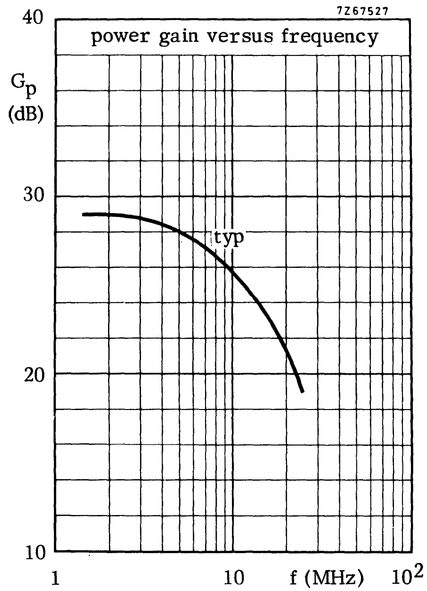


S.S.B. class AB operation

P_L = 150 W (PEP)
V_{CC} = 50 V
I_{CZS} = 100 mA
T_h = 25 °C
Z_L = 6,25 Ω in series with 10,4 nH (in parallel with −267 pF)

The graphs hold for one transistor of a push-pull amplifier with cross neutralization; collector (Tr1) - base (Tr2), neutralizing capacitor: 82 pF.





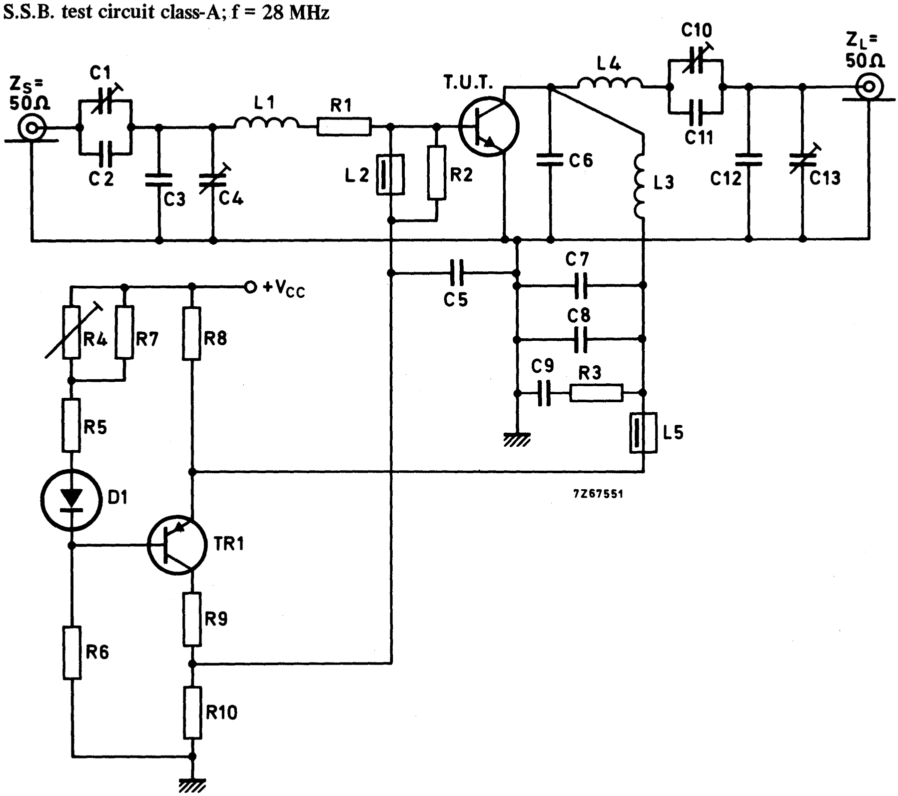
S.S.B. class AB operation

P_L = 150 W (PEP)
V_{CC} = 50 V
I_{CZS} = 100 mA
T_h = 25 °C
Z_L = 6,25 Ω in series with 7,3 nH (in parallel with −188 pF)

The graphs hold for an unneutralized amplifier.

APPLICATION INFORMATION (continued)

S.S.B. test circuit class-A; f = 28 MHz



List of components:

D1 = BY206
TR1 = BD204

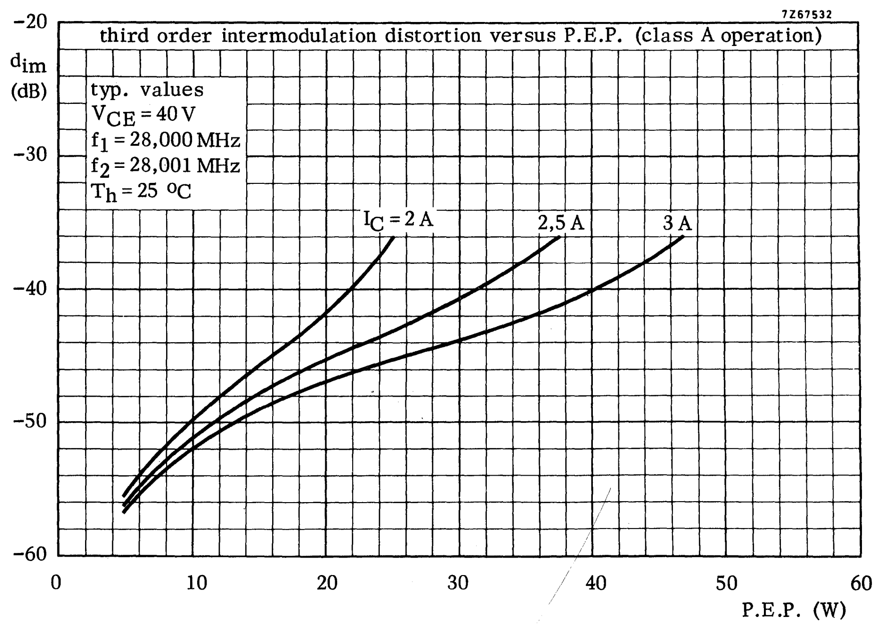
C1 = C10 = 100 pF air dielectric capacitor (single insulated rotor type)
C2 = C6 = 27 pF ceramic capacitor
C3 = 180 pF ceramic capacitor
C4 = C13 = 100 pF air dielectric capacitor (single non-insulated rotor)
C5 = C7 = 3,9 nF polyester capacitor (±10%)
C8 = 100 nF polyester capacitor (±10%)
C9 = 2,2 μF moulded metallized polyester capacitor
C11 = 68 pF ceramic capacitor
C12 = 220 pF ceramic capacitor

APPLICATION INFORMATION (continued)

List of components: (continued)

L1 = 88 nH; 3 turns Cu wire (1,0 mm); internal diameter 9 mm; coil length 6,1 mm; leads 2 x 5 mm
L2 = L5 = ferroxcube bead, grade 3B (code number 4312 020 36440)
L3 = 180 nH; 4 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 9,9 mm; leads 2 x 10 mm
L4 = 350 nH; 7 turns enamelled Cu wire (1,5 mm); internal diameter 12 mm; coil length 19,1 mm; leads 2 x 10 mm

R1 = 0,66 Ω parallel connection of 5 x 3,3 Ω carbon resistors (±5%; 0,5 W each)
R2 = 27 Ω carbon resistor (±5%; 0,5 W)
R3 = 4,7 Ω carbon resistor (±5%; 0,5 W)
R4 = 50 Ω wire-wound potentiometer (1 W)
R5 = 10 Ω carbon resistor (±5%; 1 W)
R6 = 560 Ω enamelled wire-wound resistor (5,5 W)
R7 = 270 Ω carbon resistor (±5%; 1 W)
R8 = 0,6 Ω parallel connection of 3 x 1,8 Ω wire-wound resistors (8 W each)
R9 = 90 Ω parallel connection of 3 x 270 Ω enamelled wire-wound resistor (5,5 W each)
R10 = 12 Ω carbon resistor (±5%; 1 W)



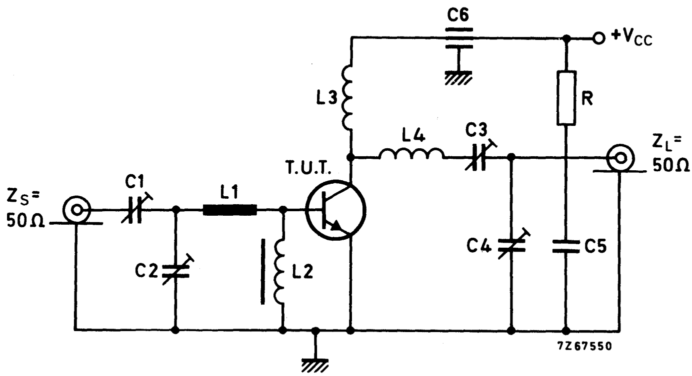
APPLICATION INFORMATION (continued)

R.F. performance in c.w. operation (class-B circuit)

V_{CE} = 50 V; T_h up to 25 °C

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)
70	< 15	150	< 4,6	> 10	> 65
108	typ. 27	150	typ. 4,0	typ. 7,4	typ. 75

Test circuit: 70 MHz; c.w. class-B.



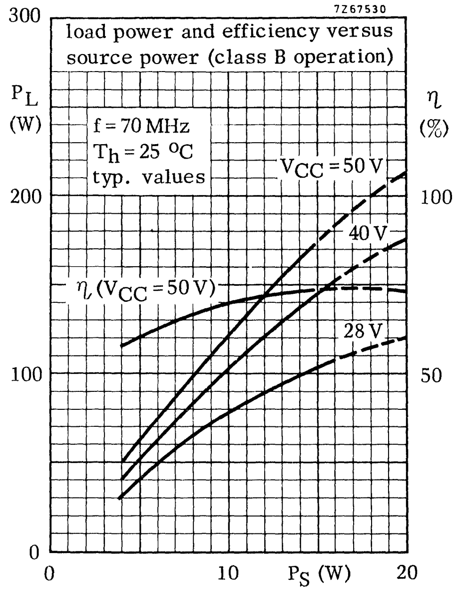
List of components:

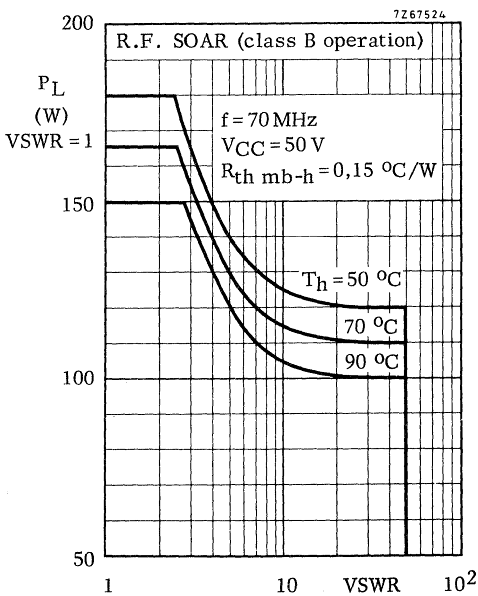
L1 = 60 mm straight enamelled Cu wire (1,6 mm); 9 mm above chassis
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 18 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm; pitch 2 mm; leads 55 mm totally
L4 = 3 turns enamelled Cu wire (1,6 mm); internal diameter 10 mm; pitch 2,5 mm; leads 50 mm totally

C1 = 4 to 29 pF concentric air trimmer in parallel with 10 pF ceramic capacitor
C2 = 4 to 104 pF film dielectric trimmer in parallel with 56 pF ceramic capacitor
C3 = 4 to 104 pF film dielectric trimmer
C4 = 4 to 104 pF film dielectric trimmer in parallel with 47 pF ceramic capacitor
C5 = 100 nF polyester capacitor (± 10%)
C6 = 1 nF ceramic feed-through capacitor

R = 10 Ω carbon resistor (0,5 W)

At P_L = 150 W and V_{CE} = 50 V, the output power at heatsink temperatures between 25 °C and 75 °C relative to that at 25 °C is diminished by 100 mW/K.



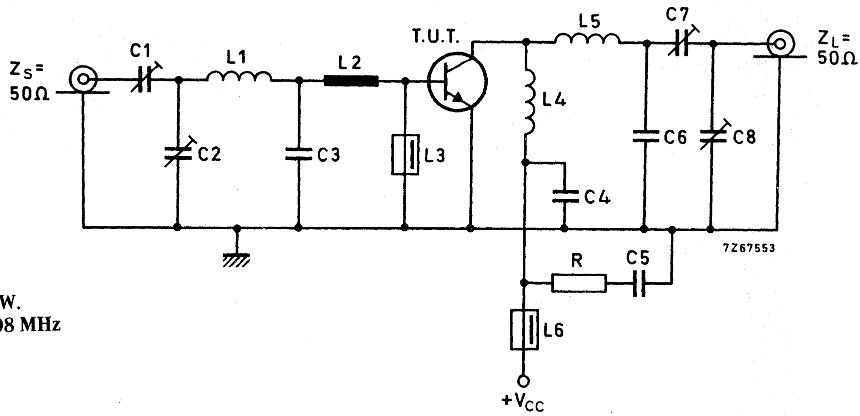


Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 180 W load power in the test amplifier and subsequently subjected to various mismatch conditions at 50 V with VSWR up to 50 and elevated heatsink temperatures.
This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

APPLICATION INFORMATION (continued)

Test circuit:



C.W.
108 MHz

List of components:

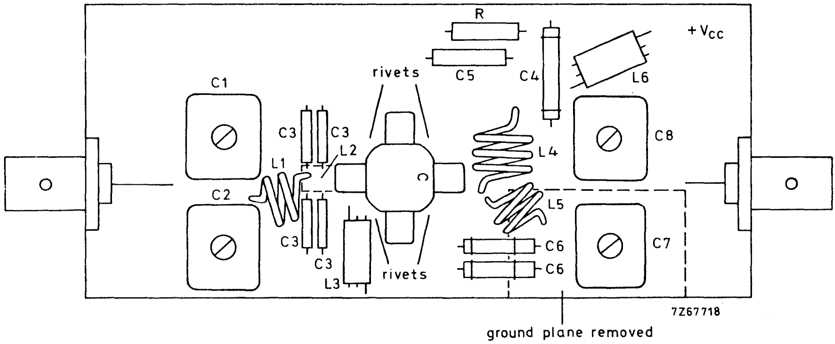
C1 = C2 = 40 pF film dielectric trimmer
C3 = 400 pF parallel connection of 4 x 100 pF ceramic capacitors
C4 = 270 pF ceramic capacitor
C5 = 100 nF polyester capacitor (±10%)
C6 = 20 pF parallel connection of 2 x 10 pF ceramic capacitors
C7 = C8 = 60 pF film dielectric trimmer

L1 = 49 nH; 2 turns enamelled Cu wire (1,5 mm); internal diameter 9 mm; coil length 4,8 mm; leads 2 x 5 mm
L2 = strip-line (7,7 mm x 6 mm); tap for C3 is 7,5 mm from transistor edge
L3 = L6 = ferroxcube bead, grade 3B (code number 4312 020 36640)
L4 = 67 nH; 3 turns enamelled Cu wire (1,5 mm); internal diameter 8 mm; coil length 8,3 mm; leads 2 x 5 mm
L5 = 57 nH; 2 turns enamelled Cu wire (1,5 mm); internal diameter 10 mm; coil length 4,5 mm; leads 2 x 5 mm

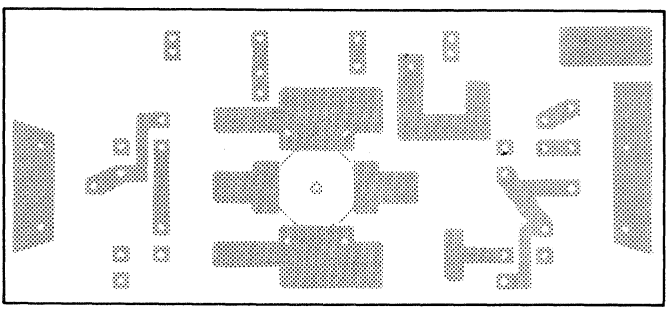
R = 10 Ω carbon resistor (0,5 W)

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 108 MHz test circuit.

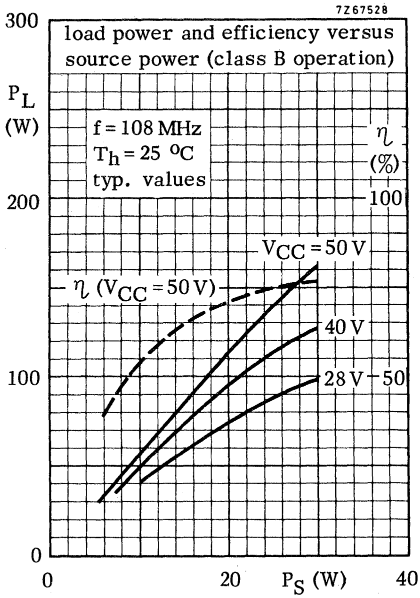


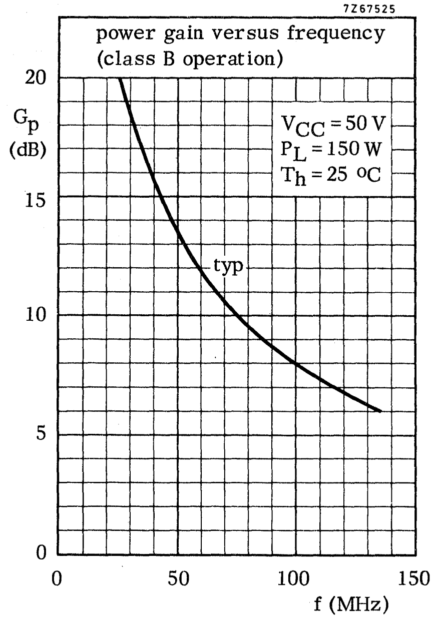
Dimensions of printed circuit board 123 mm x 55 mm.

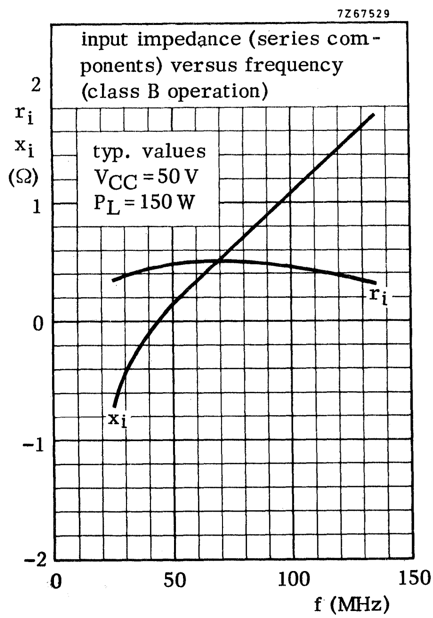


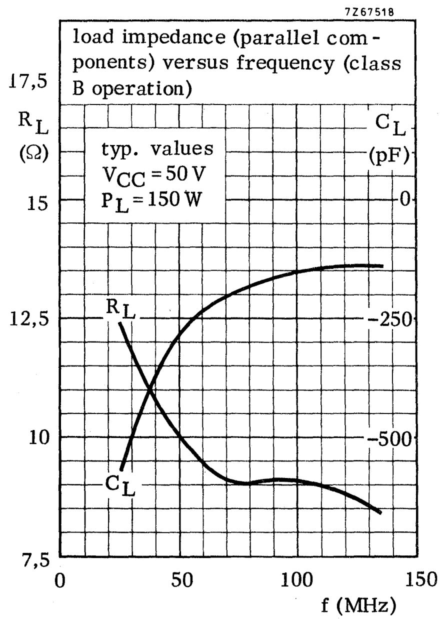
7Z67664

The circuit has been built on epoxy fibre-glass double copper clad printed circuit board (thickness 1/16"). To minimize the dielectric losses, the ground plane under the interconnection of L5, C6 and C7 has been removed.


7Z67528
load power and efficiency versus source power (class B operation)
300
200
100
0
P_L (W)
f = 108 MHz
T_h = 25 °C
typ. values
η (%)
100
50
V_{CC} = 50 V
η (V_{CC} = 50 V)
40 V
28 V
0
20
40
P_S (W)


7Z67525
power gain versus frequency (class B operation)
20
15
10
5
0
G_p (dB)
V_{CC} = 50 V
P_L = 150 W
T_h = 25 °C
typ
0
50
100
150
f (MHz)


7Z67529
input impedance (series components) versus frequency (class B operation)
2
1
0
−1
−2
r_i
x_i
(Ω)
typ. values
V_{CC} = 50 V
P_L = 150 W
r_i
x_i
0
50
100
150
f (MHz)


7Z67518
load impedance (parallel components) versus frequency (class B operation)
17,5
15
12,5
10
7,5
R_L (Ω)
C_L (pF)
typ. values
V_{CC} = 50 V
P_L = 150 W
0
−250
−500
R_L
C_L
0
50
100
150
f (MHz)

H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Matched h_{FE} groups are available on request.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

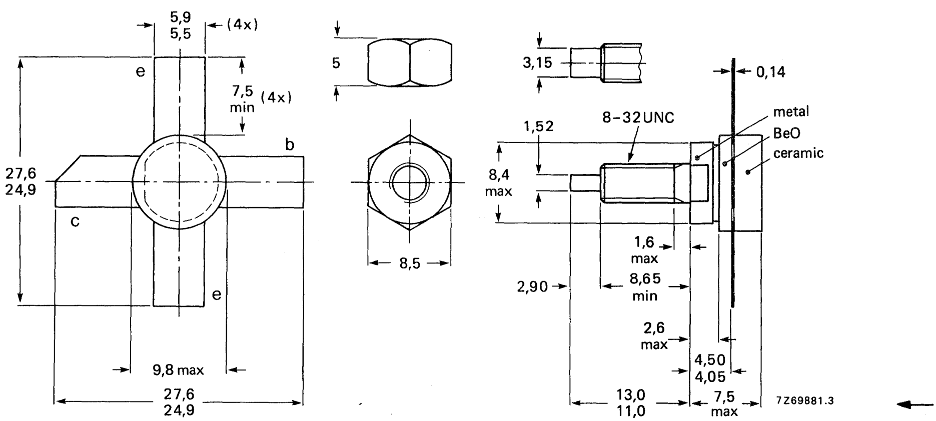
R.F. performance up to T_h = 25 °C

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS	d_3 dB
c.w. (class-B)	**28**	**175**	**45**	> **7,5**	> **70**	**0,7 + j1,3**	**110 – j62**	–
s.s.b. (class-AB)	28	1,6–28	5–42,5(P.E.P)	typ. 19	typ. 50	–	–	typ. –30
s.s.b. (class-A)	26	1,6–28	15 (P.E.P)	typ. 20	–	–	–	typ. –42

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open-collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	4	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	12	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	100	W
Storage temperature	T_{stg}	− 65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

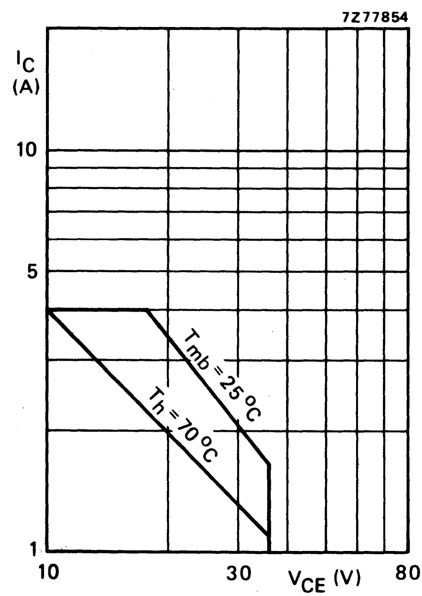


Fig. 2 D.C. SOAR.

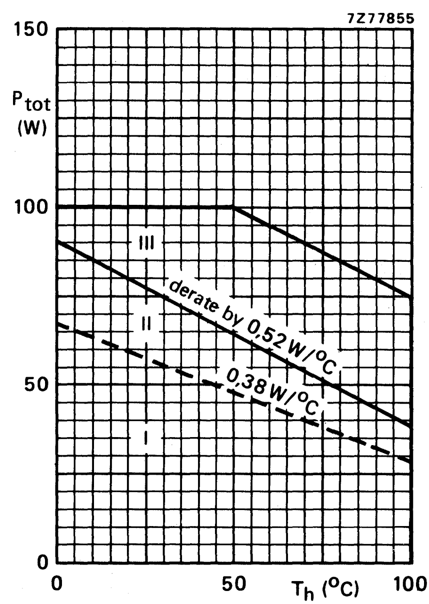


Fig. 3 R.F. power dissipation; V_{CE} ≤ 28 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 40 W; T_{mb} = 88 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	2,8	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,05	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage open base; I_C = 100 mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	10 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	8 mJ
R_{BE} = 10 Ω	E_{SBR}	>	8 mJ
D.C. current gain * I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ.	45 10 to 80
D.C. current gain ratio of matched devices * I_C = 2,5 A; V_{CE} = 5 V	h_{FE1}/h_{FE2}	<	1,2
Collector-emitter saturation voltage * I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz * $-I_E$ = 2,5 A; V_{CB} = 28 V	f_T	typ.	570 MHz
$-I_E$ = 7,5 A; V_{CB} = 28 V	f_T	typ.	570 MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 28 V	C_c	typ.	82 pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	54 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

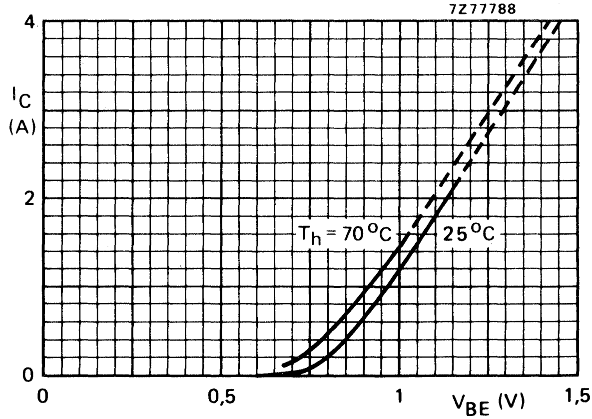


Fig. 4 Typical values; V_{CE} = 28 V.

* Measured under pulse conditions: $t_p \leq 200\ \mu s$; $\delta \leq 0,02$.

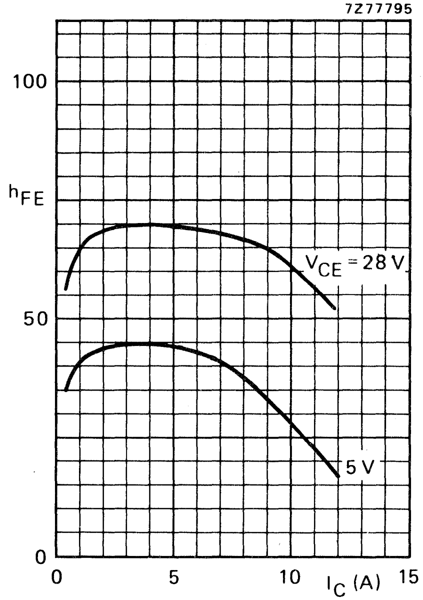


Fig. 5 Typical values; T_j = 25 °C.

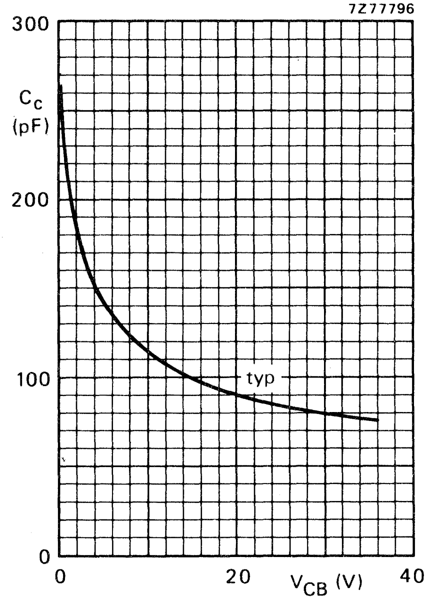


Fig. 6 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

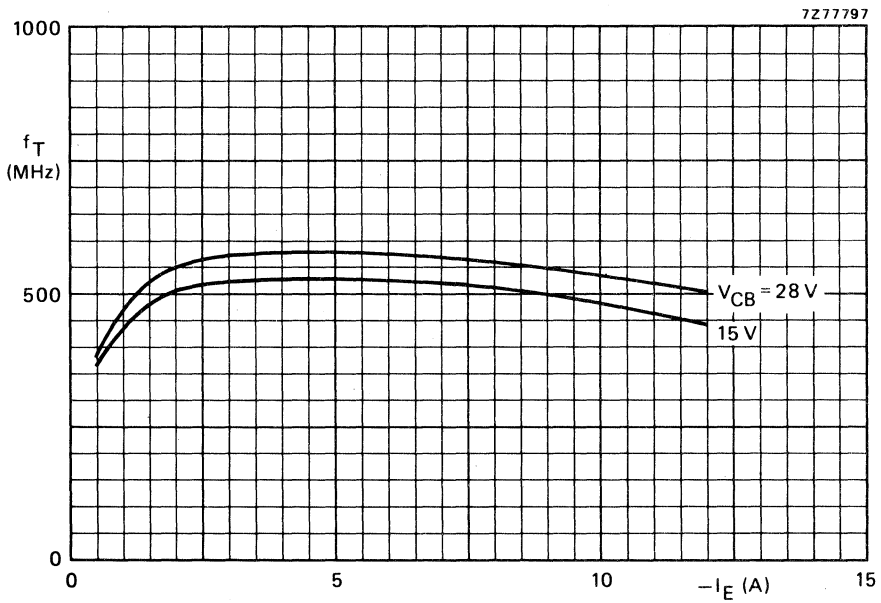


Fig. 7 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	45	< 8	> 7,5	< 2,47	> 70	0,7 + j1,3	110 − j62

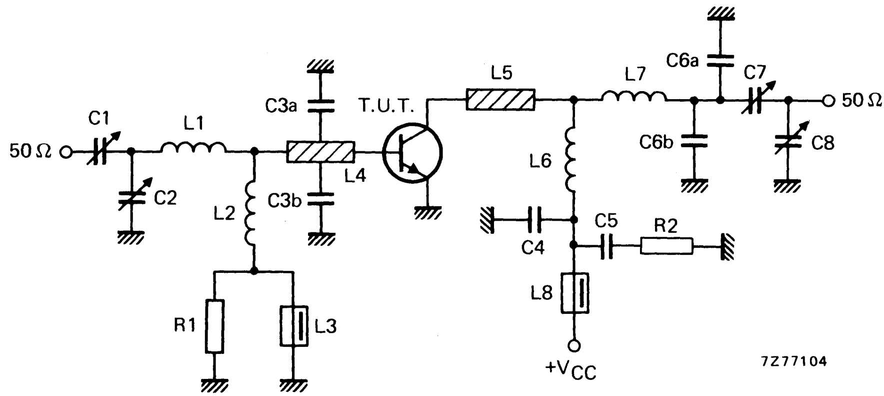


Fig. 8 Test circuit; c.w. class-B.

List of components:

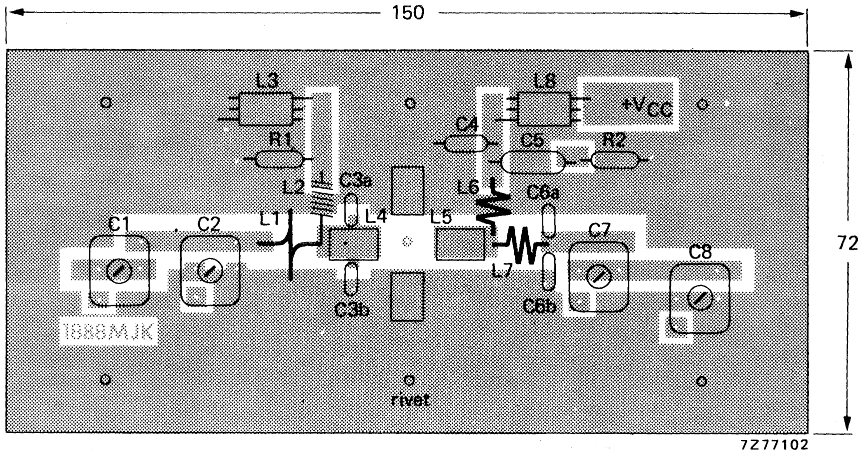
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
C6b = 1,8 pF ceramic capacitor (500 V)
C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 80 nH; 3 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm
L7 = 62 nH; 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor.

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 9.



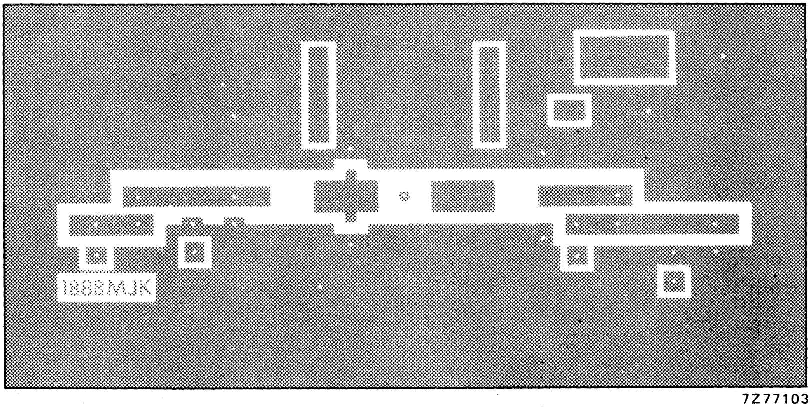


Fig. 9 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

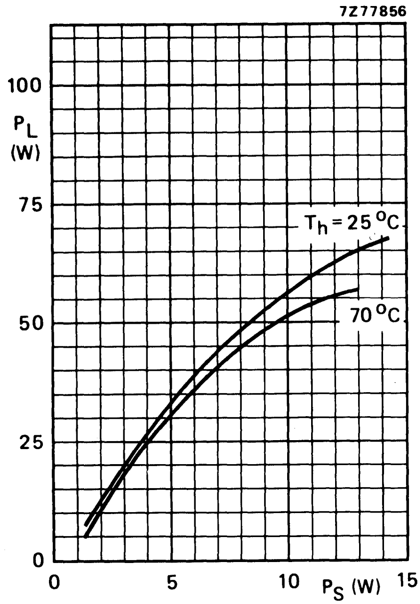


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

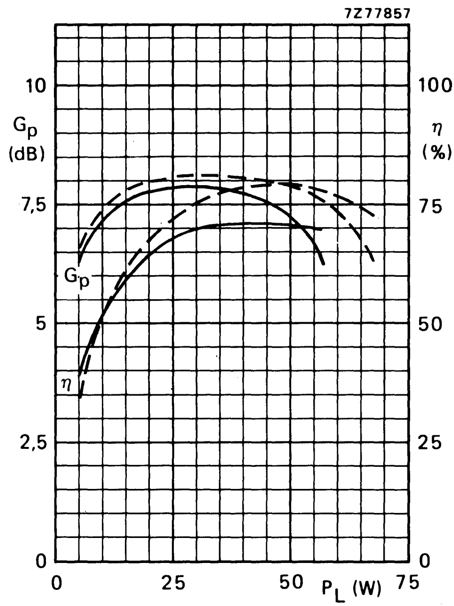


Fig. 11 Typical values; V_{CE} = 28 V; f = 175 MHz;
– – – T_h = 25 °C; —— T_h = 70 °C.

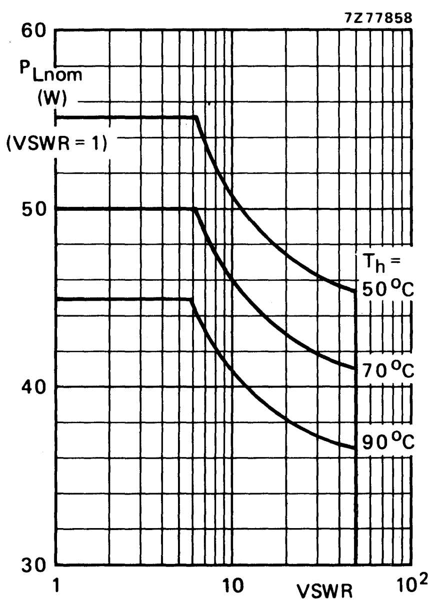


Fig. 12 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,45 K/W .
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

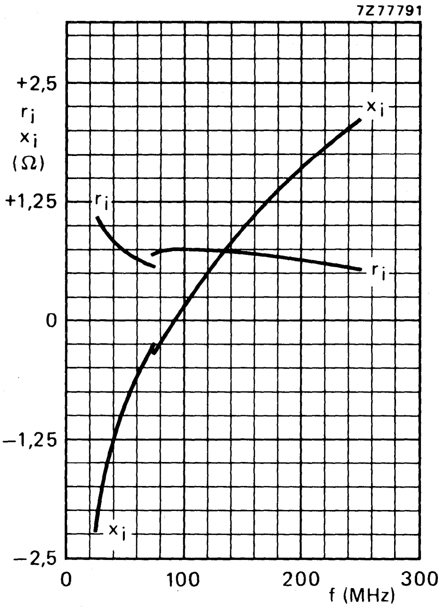


Fig. 13 Input impedance (series components).

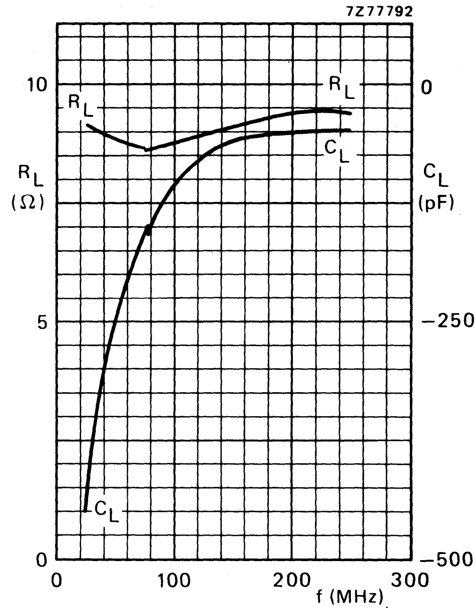


Fig. 14 Load impedance (parallel components).

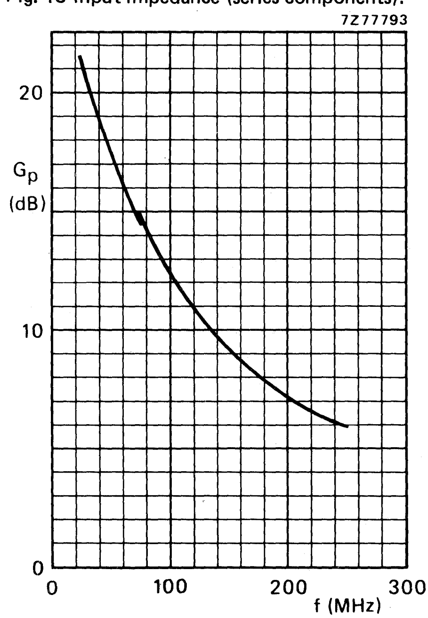


Fig. 15 Power gain versus frequency.

OPERATING NOTE

Below 75 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Conditions for Figs 13; 14 and 15.

Typical values; V_{CE} = 28 V; P_L = 45 W; T_h = 25 °C.

R.F. performance in s.s.b. class-AB operation (linear power amplifier)

V_{CE} = 28 V; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	η_{dt}(%) at 42,5 W (P.E.P)	I_C (A) at 42,5 W (P.E.P)	d_3 dB*	d_5 dB*	$I_{C(ZS)}$ mA	T_h °C
5 to 42,5(P.E.P)	typ. 19	typ. 50	typ. 1,52	typ. −30	< −30	50	25
5 to 37,5(P.E.P)	typ. 19	—	—	typ. −30	< −30	50	70

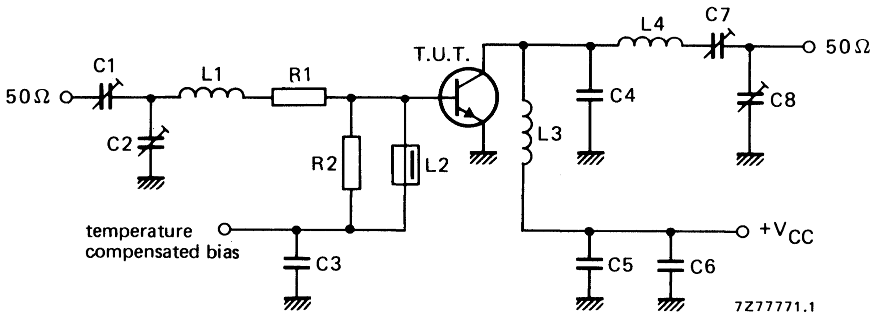


Fig. 16 Test circuit; s.s.b. class-AB.

List of components:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = C5 = C6 = 220 nF polyester capacitor
C4 = 56 pF ceramic capacitor (500 V)
C7 = C8 = 15 to 575 pF film dielectric capacitor

L1 = 4 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 7,0 mm; leads 2 x 5 mm
L2 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = 4 turns enamelled Cu wire (1,6 mm); int. dia. 10 mm; length 9,4 mm; leads 2 x 5 mm
L4 = 7 turns enamelled Cu wire (1,6 mm); int. dia. 12 mm; length 17,2 mm; leads 2 x 5 mm

R1 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors
R2 = 39 Ω carbon resistor

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

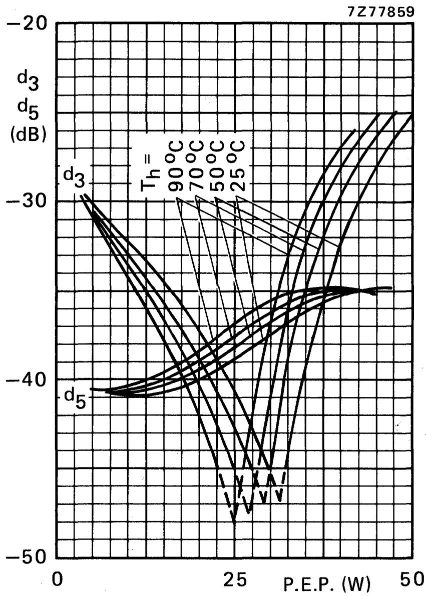


Fig. 17 Intermodulation distortion as a function of output power.*

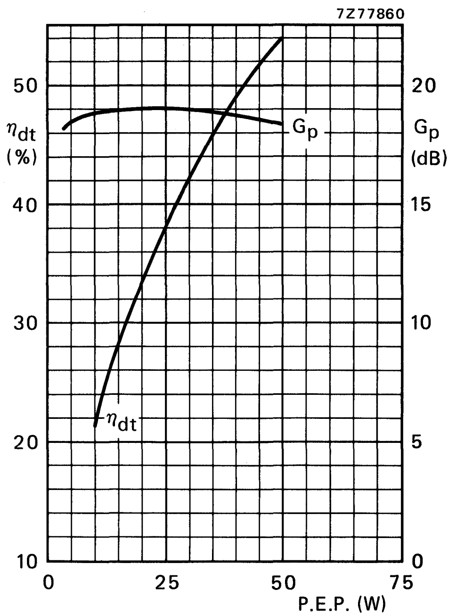


Fig. 18 Double-tone efficiency and power gain as a function of output power.

Conditions for Fig. 17:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; typical values.

Conditions for Fig. 18:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; f_1 = 28,000 MHz; f_2 = 28,001 MHz; T_h = 70 °C; typical values.

* See note on previous page.

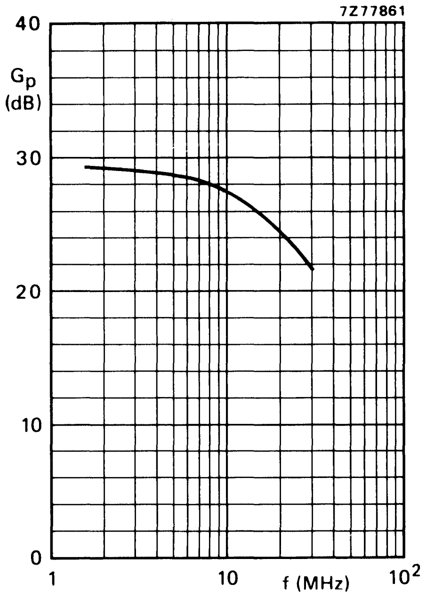


Fig. 19 Power gain as a function of frequency.

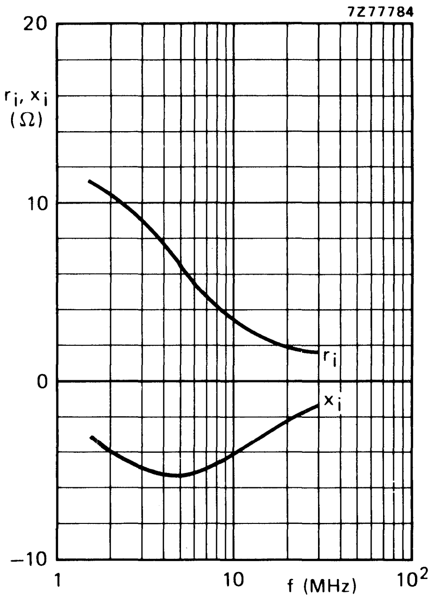


Fig. 20 Input impedance (series components) as a function of frequency.

Figs 19 and 20 are typical curves and hold for an unneutralized amplifier in s.s.b. class-AB operation.

Conditions:

V_{CE} = 28 V; $I_{C(ZS)}$ = 50 mA; P_L = 42,5 W; T_h = 25 °C; Z_L = 7,4 Ω.

Ruggedness in s.s.b. operation

The BLX39 is capable of withstanding a load mismatch (VSWR = 50) under the following conditions:
Class-AB operation; f_1 = 28,000 MHz; f_2 = 28,001 MHz; V_{CE} = 28 V; T_h = 70 °C and P_{Lnom} = 45 W P.E.P.

R.F. performance in s.s.b. class-A operation (linear power amplifier)

V_{CE} = 26 V; T_h = 70 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz

output power W	G_p dB	I_C A	d_3 dB *	d_5 dB *
15 (P.E.P)	typ. 20	1,55	typ. −42	< −40

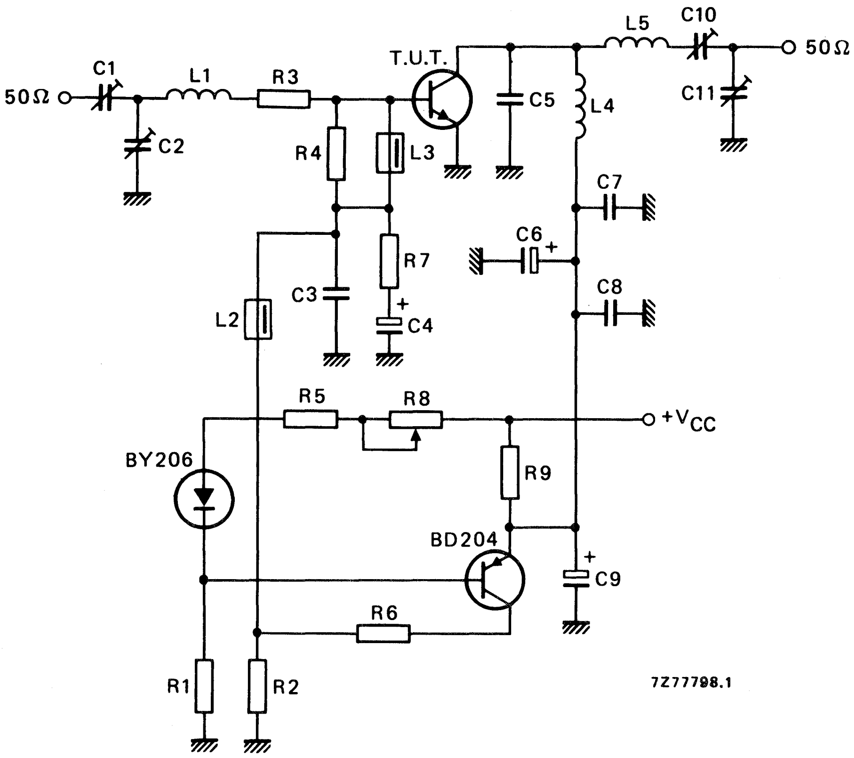


Fig. 21 Test circuit; s.s.b. class-A.

* Stated intermodulation distortion figures are referred to the according level of either of the equal amplified tones. Relative to the according peak envelope powers these figures should be increased by 6 dB.

List of components in Fig. 21:

C1 = C2 = 10 to 780 pF film dielectric trimmer
C3 = 22 nF ceramic capacitor (63 V)
C4 = 47 μF/10 V electrolytic capacitor
C5 = 56 pF ceramic capacitor (500 V)
C6 = 47 μF/35 V electrolytic capacitor
C7 = C8 = 220 nF polyester capacitor
C9 = 10 μF/35 V electrolytic capacitor
C10 = 10 to 210 pF film dielectric trimmer
C11 = 15 to 575 pF film dielectric trimmer

L1 = 3 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = L3 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 11 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm
L5 = 14 turns closely wound enamelled Cu wire (1,6 mm); int. dia. 11,0 mm

R1 = 600 Ω; parallel connection of 2 x 1,2 kΩ carbon resistors (± 5% ; 0,5 W each)
R2 = 15 Ω carbon resistor (± 5% ; 0,25 W)
R3 = 1,2 Ω; parallel connection of 4 x 4,7 Ω carbon resistors (± 5% ; 0,125 W each)
R4 = 33 Ω carbon resistor (± 5% ; 0,25 W)
R5 = 18 Ω carbon resistor (± 5% ; 0,25 W)
R6 = 120 Ω wirewound resistor (± 5% ; 5,5 W)
R7 = 1 Ω carbon resistor (± 5% ; 0,125 W)
R8 = 47 Ω wirewound potentiometer (3 W)
R9 = 1,57 Ω; parallel connection of 3 x 4,7 Ω wirewound resistors (± 5% ; 5,5 W each)

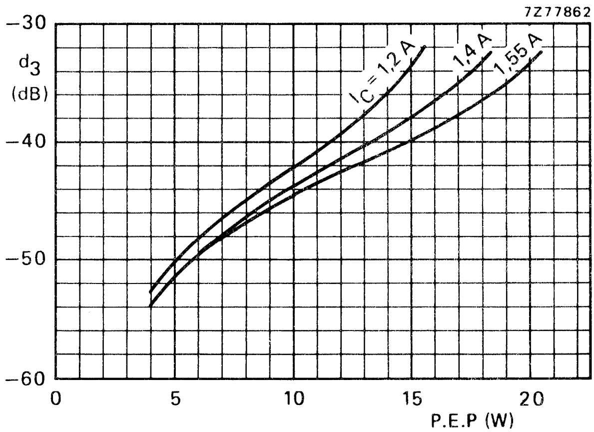


Fig. 22 Intermodulation distortion as a function of output power. Typical values; V_{CE} = 26 V; T_h = 70 °C; f_1 = 28,000 MHz; f_2 = 28,001 MHz.

U.H.F./V.H.F. TRANSMITTING TRANSISTOR

N-P-N transistor intended for use in class-B and C operated mobile, industrial and military transmitters with a supply voltage of 13,8 V. It has a TO-39 metal envelope with the collector connected to the case.

QUICK REFERENCE DATA

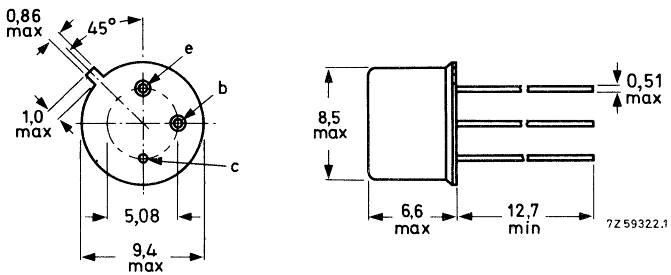
R.F. performance up to T_{case} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,8	470	typ. 0,4	2,0	typ. 0,22	typ. 7	typ. 66	5 + j11	17 − j19
c.w.	12,5	470	< 0,5	2,0	< 0,25	> 6	> 65	–	–
c.w.	12,5	175	typ. 0,12	2,0	typ. 0,21	typ. 12	typ. 75	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2.0	A
Total power dissipation up to T_{case} = 90 °C f > 10 MHz	P_{tot}	max.	3.0	W
Storage temperature	T_{stg}	-65 to +150		°C
Operating junction temperature	T_j	max	165	°C

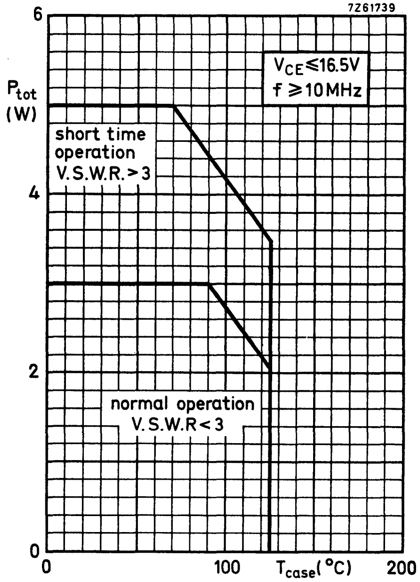
THERMAL RESISTANCE

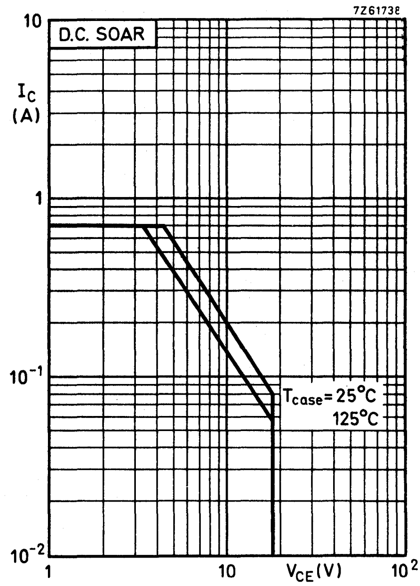
From junction to case	$R_{th\ j-c}$	=	25	K/W
From mounting base to heatsink with a boron nitride washer for electrical insulation	$R_{th\ mb-h}$	=	2.5	K/W

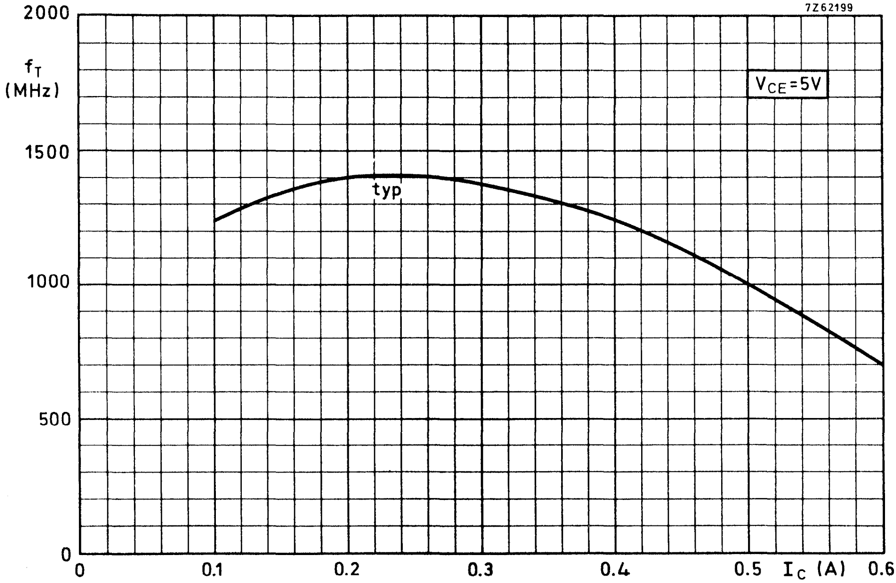
CHARACTERISTICS

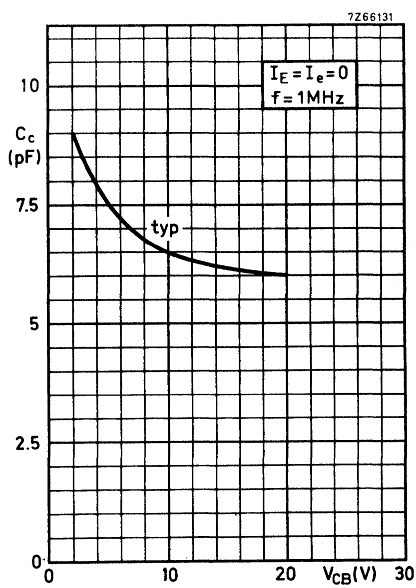
T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 10 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, I_E = 1.0 mA	$V_{(BR)EBO}$	>	4	V
Collector-emitter saturation voltage I_C = 100 mA; I_B = 20 mA	V_{CEsat}	typ.	0.1	V
D.C. current gain I_C = 100 mA; V_{CE} = 5 V	h_{FE}	> typ.	10 40	
Transition frequency I_C = 200 mA; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1400	MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 10 V	C_c	typ. <	6.5 9.0	pF pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 10 V	$-C_{re}$	typ.	4.8	pF


7Z61739
Ptot (W)
6
4
2
0
0
100
Tcase(°C)
200
VCE≤16.5V
f ≥10 MHz
short time operation V.S.W.R.>3
normal operation V.S.W.R<3


7Z61738
D.C. SOAR
IC (A)
10
1
10⁻¹
10⁻²
1
10
VCE(V)
10²
Tcase=25°C
125°C


7Z62199
2000
f_T
(MHz)
1500
1000
500
0
0
0.1
0.2
0.3
0.4
0.5
I_C (A)
0.6
V_{CE} = 5V
typ


7Z66131
10
C_c
(pF)
7.5
5
2.5
0
0
10
20
V_{CB}(V)
30
$I_E = I_e = 0$
f = 1MHz
typ

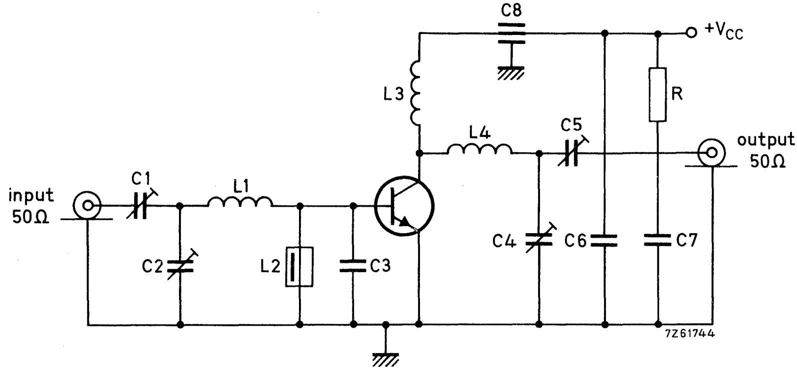
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class B circuit)

T_{case} up to 25 °C

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z}_i$ (Ω)	$\overline{Y}_L$ mS
470	13.8	typ. 0.4	2.0	typ. 0.22	typ. 7	typ. 66	5 + j11	17 − j19
→ 470	12.5	< 0.5	2.0	< 0.25	> 6	> 65	−	−
175	12.5	typ. 0.12	2.0	typ. 0.21	typ. 12	typ. 75	−	−

→ Test circuit I (470 Mhz)



To obtain optimum gain performance the emitter lead length should not exceed 1.6 mm

C1 = C2 = C4 = C5 = 1.8 to 18 pF film dielectric trimmer
C3 = 22 pF disc ceramic capacitor
C6 = 10 nF ceramic capacitor
C7 = 0.1 µF polyester capacitor
C8 = 4 nF feed-through capacitor

L1 = 1 turn Cu wire (1 mm); int. diam. 5 mm, max. lead length 1 mm
L2 = 0.22 µH choke
L3 = 1 turn Cu wire (1 mm); int. diam. 7 mm; lead length 2 mm
L4 = 1 turn Cu wire (1 mm); int. diam. 5 mm; lead length 2 mm

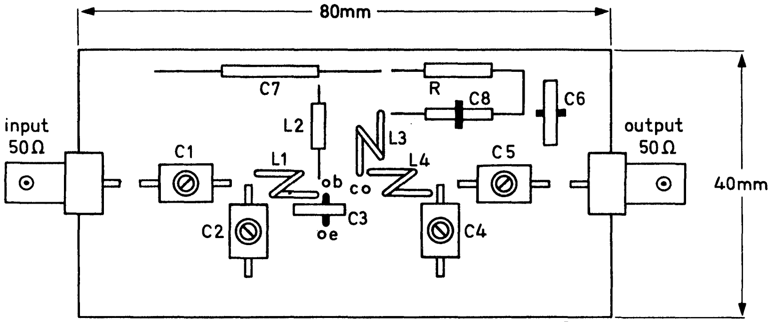
R = 10 Ω carbon

At P_L = 2.0 W and V_{CC} = 12.5 V the output power at case temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 5 mW/K

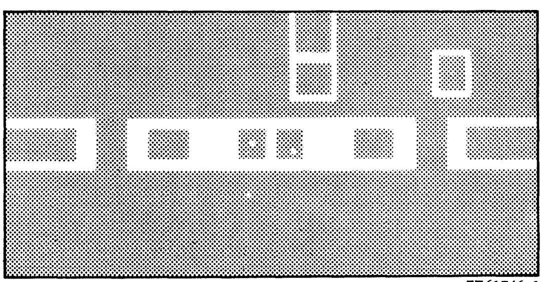
The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 16.5 V; f = 470 MHz; T_{case} = 70 °C
V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom}$ + 20 %
where $P_{Snom} = P_S$ for 1.4 W transistor output into 50 Ω load at V_{CC} = 13.8 V.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 470 MHz test circuit.



7Z61747

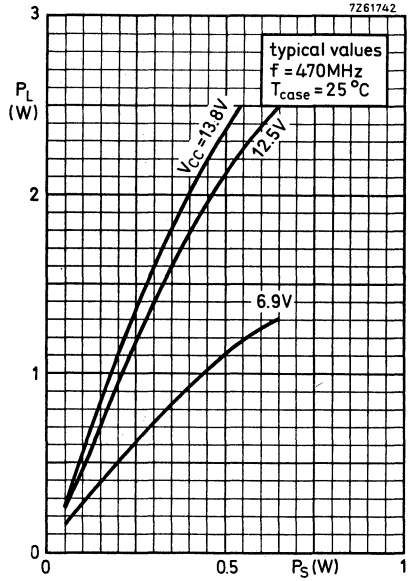


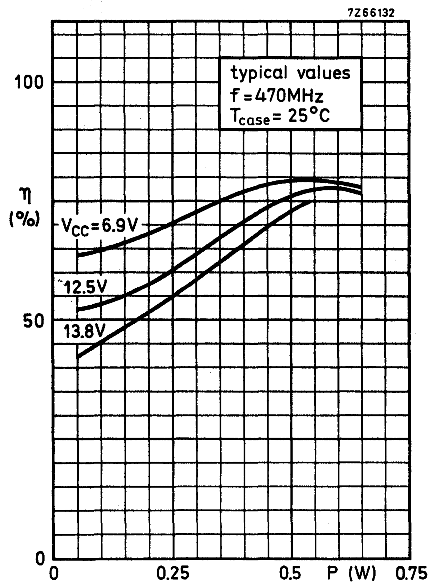
7Z61746.1

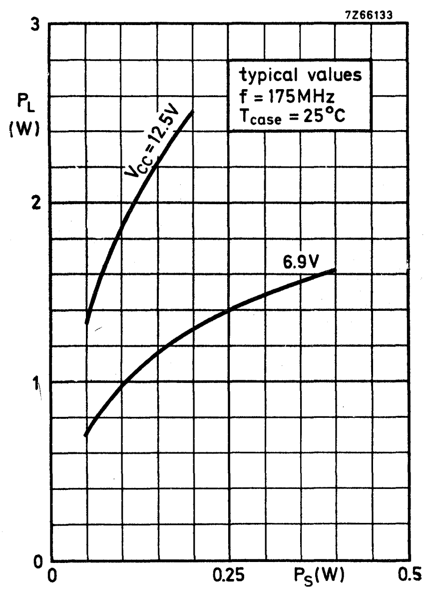
Shaded area copper

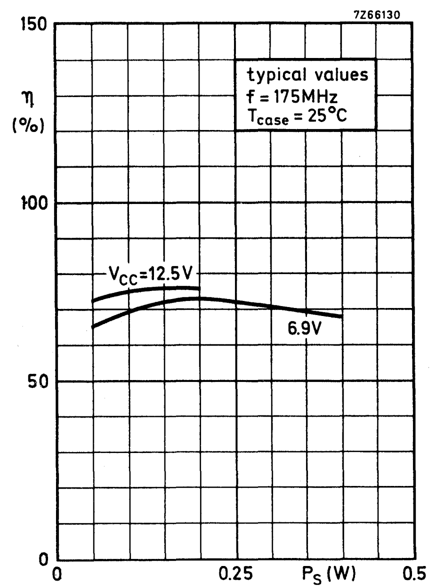
Back area not metalized

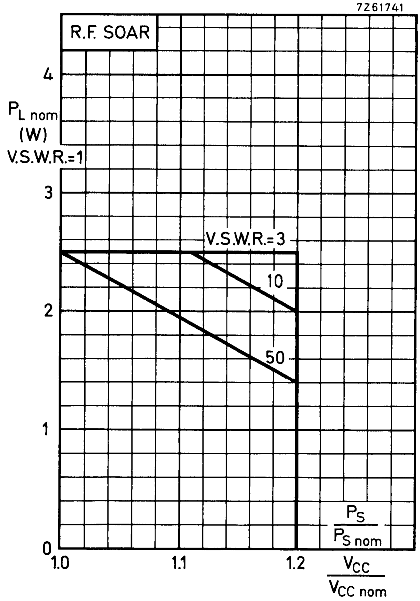
Material of printed circuit board: 1.5 mm epoxy fibre-glass


7Z61742
typical values
f = 470MHz
T_{case} = 25 °C
P_L
(W)
V_{CC}=13.8V
12.5V
6.9V
3
2
1
0
0
0.5
P_S (W)
1


7Z66132
typical values
f = 470MHz
T_{case} = 25°C
η
(%)
V_{CC}=6.9V
12.5V
13.8V
100
50
0
0
0.25
0.5
P (W)
0.75


7Z66133
typical values
f = 175MHz
T_{case} = 25°C
P_L
(W)
V_{CC}=12.5V
6.9V
3
2
1
0
0
0.25
P_S(W)
0.5


7Z66130
typical values
f = 175MHz
T_{case} = 25°C
η
(%)
V_{CC}=12.5V
6.9V
150
100
50
0
0
0.25
P_S (W)
0.5



Conditions for R.F. SOAR

f = 470 MHz

T_{case} = 70 °C

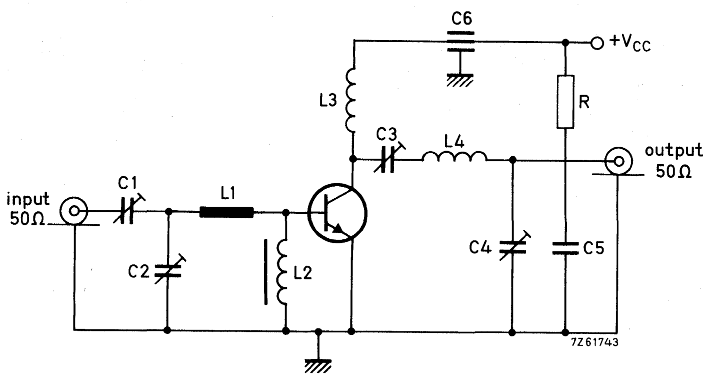
V_{CCnom} = 13.8 V

$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1

The transistor was developed for use with unstabilized supply voltage V_{CC}.
The above graph is based on its measured performance in test circuit I.
Supply voltage was varied from V_{CCnom} to 1.2 V_{CCnom}, and V.S.W.R. from 1 to 50.
It shows the maximum allowable output power under nominal conditions in order not to exceed the maximum allowable power dissipation under conditions of supply overvoltage ($V_{CC} > V_{CCnom}$) and load mismatch (V.S.W.R. > 1).
It is assumed that the drive power increases linearly with the supply voltage; i.e. $P_S/P_{Snom} = V_{CC}/V_{CCnom}$.

APPLICATION INFORMATION (continued)

Test circuit II (175 MHz)



To obtain optimum gain performance the emitter lead length should not exceed 1.6 mm

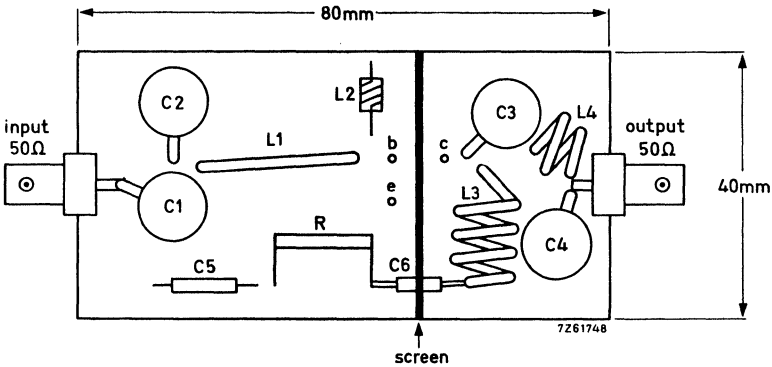
C1 = C4 = 60 pF concentric air trimmer
C2 = C3 = 30 pF concentric air trimmer
C5 = 0.25 μF polyester capacitor
C6 = 4 nF feed-through capacitor

L1 = 25 mm straight Cu wire (1.2 mm); height above print 3 mm
L2 = 3 turns Cu wire (0.5 mm) on ferrite FX1115, d = 2 mm, D = 4 mm, 1 = 5 mm, material 3B (code number 3113 991 16740)
L3 = 5 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm
L4 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

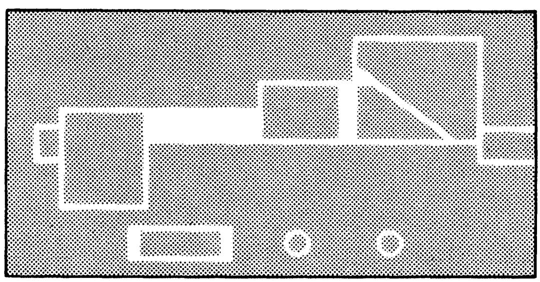
R = 10 Ω carbon

APPLICATION INFORMATION (continued)

Component lay-out and printed cicuit board for 175 MHz test circuit:



7Z61748



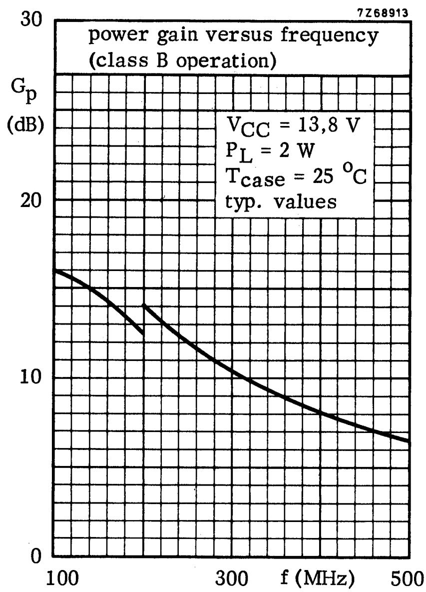
7Z61745.1

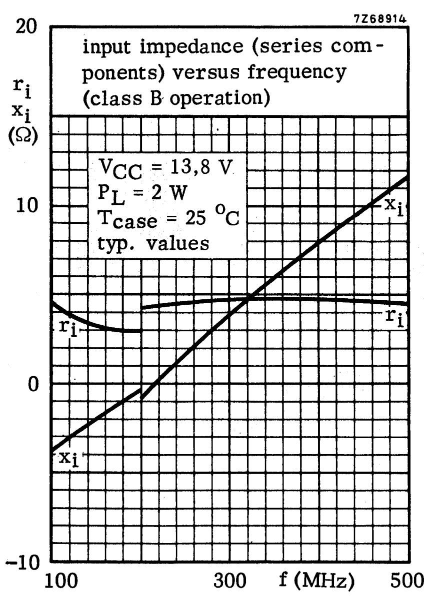
Shaded area copper

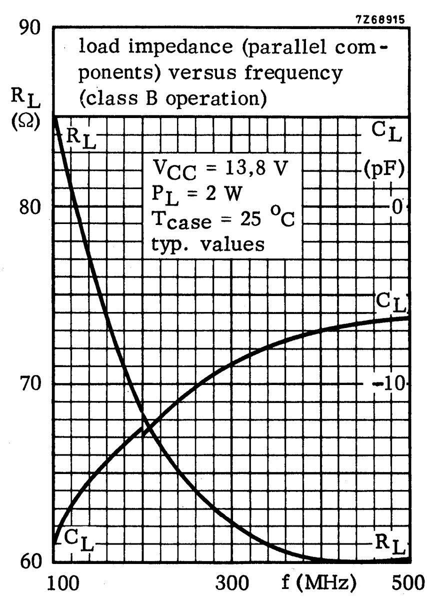
Back area not metallized

Material of printed circuit board: 1.5 mm epoxy fibre-glass

OPERATING NOTE Below 200 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







V.H.F./U.H.F. POWER TRANSISTORS

N-P-N silicon planar epitaxial transistors in TO-39 envelope designed for use in portable and mobile radio transmitters in the v.h.f. and u.h.f. bands.

QUICK REFERENCE DATA

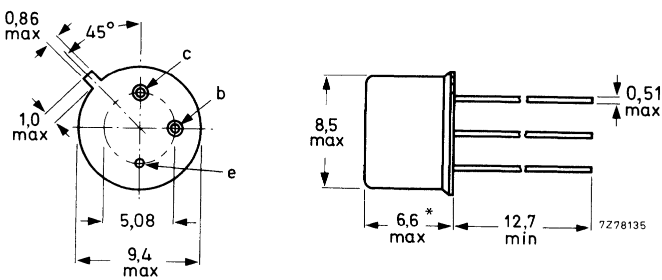
R.F. performance at T_C = 25 °C in a common-emitter class-B circuit.

mode of oepration	V_{CE} V	f MHz	P_L W	G_p dB	η_C %
C.W.; narrow band	12,5	175	2	typ. 16	typ. 68
	12,5	470	2	≥ 9	≥ 55

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39/3.
Emitter connected
to case.



* Max. 4,9 for BLX65ES.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134).

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36 V
Collector emitter voltage (open base)	V_{CEO}	max.	16 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current d.c. or average	I_C	max.	0,7 A
(peak value); f ⩾ 1 MHz	I_{CM}	max.	2,0 A
Total power dissipation at T_{mb} ⩽ 90 °C; f ⩾ 1 MHz	P_{tot}	max.	3,0 W
Storage temperature	T_{stg}		−65 to + 175 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-base breakdown voltage open emitter; I_C = 10 mA	$V_{(BR)CBO)}$	>	36 V
Collector-emitter breakdown voltage open base; I_C = 25 mA	$V_{(BR)CEO}$	>	16 V
Emitter-base breakdown voltage open collector; + I_E = 1,0 mA	$V_{(BR)EBO}$	>	4 V
Collector-emitter saturation voltage I_C = 100 mA; I_B = 20 mA	V_{CEsat}	typ.	0,1 V
D.C. current gain I_C = 100 mA; V_{CE} = 5 V	h_{FE}	>	10
		typ.	40
Transition frequency at f = 500 MHz $-I_E$ = 200 mA; V_{CB} = 5 V	f_T	typ.	1,4 GHz
Collector capacitance at f = 1 MHz $I_E = i_e = 0$; V_{CB} = 10 V	C_c	typ.	6,5 pF

APPLICATION INFORMATION

R.F. performance in c.w. operation (common-emitter circuit; class B); T_c = 25 °C

V_{CE} V	f MHz	P_L W	G_p dB	η_C %	z_i Ω	Z_L Ω
9,6	175	2,0	typ. 13	typ. 68	–	–
12,5	175	2,0	typ. 16	typ. 68	–	–
12,5	470	2,0	≥ 9	> 55	3 + j8	12 – j17
12,5	470	2,0	typ. 10,6	typ. 68	–	–

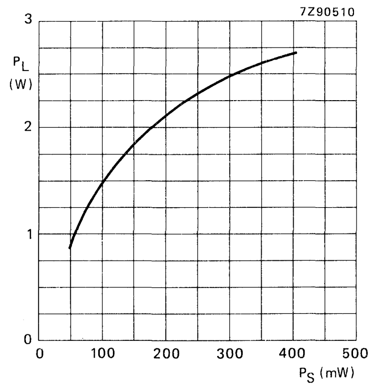


Fig. 2 Load power vs. source power; V_{CE} = 12,5 V; f = 470 MHz; T_{mb} = 25 °C; class-B operation; typical values.

RUGGEDNESS

The device is capable of withstanding a full load mismatch (VSWR = 50; all phases)at rated load power up to a supply voltage of 15,0 V, P_S + 20%, f = 470 MHz and T_{mb} = 25 °C.

U.H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon transistor for use in class-B and C operated mobile, industrial and military transmitters with a supply voltage of 13,8 V.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

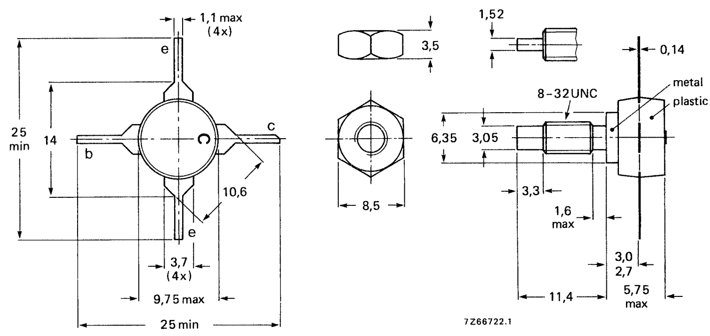
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,8	470	typ. 0,15	1,5	typ. 0,17	typ. 10	typ. 65	–	–
c.w.	13,8	470	typ. 0,35	3,0	typ. 0,28	typ. 9,3	typ. 79	2,9 + j5,1	27 – j21
c.w.	12,5	470	< 0,35	2,5	< 0,31	> 8,5	> 65	–	–
c.w.	12,5	175	typ. 0,03	3,0	typ. 0,29	typ. 20	typ. 84	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System(IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (R_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0.7	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2.0	A
Total power dissipation up to T_h = 90 °C f > 10 MHz	P_{tot}	max.	4.5	W
Storage temperature	T_{stg}	−65 to	+150	°C
Junction temperature	T_j	max.	150	°C

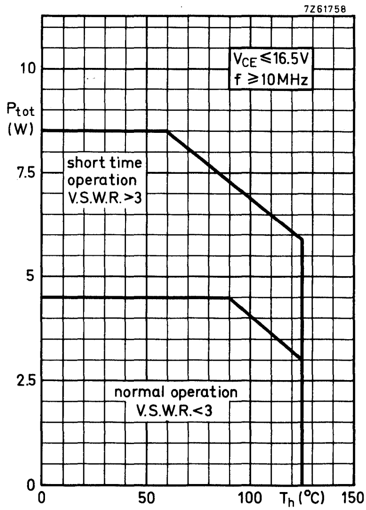
THERMAL RESISTANCE

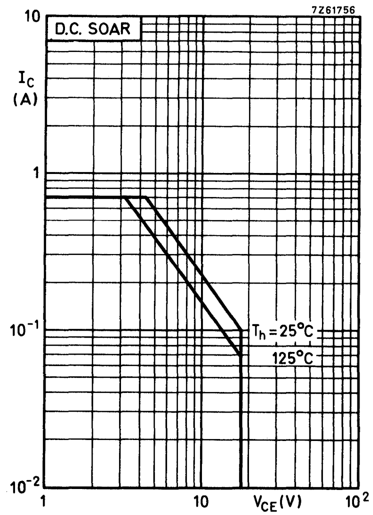
From junction to mounting base	$R_{th\ j-mb}$ =	12	K/W
From mounting base to heatsink	$R_{th\ mb-h}$ =	0.6	K/W

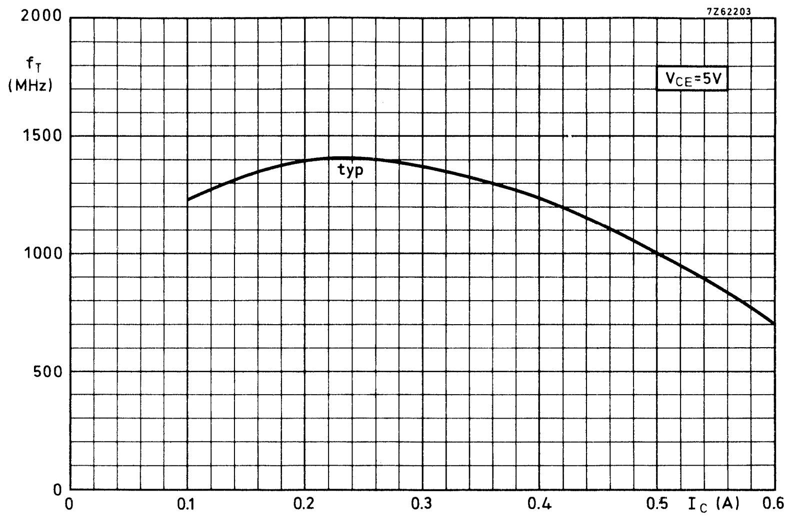
CHARACTERISTICS

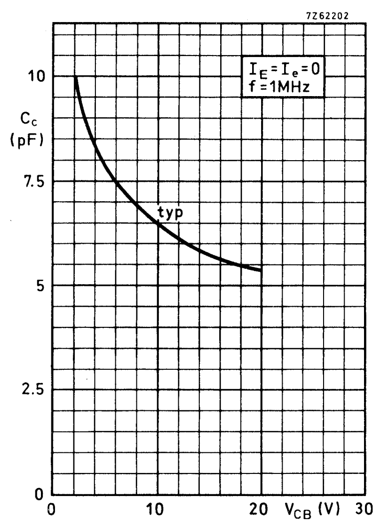
T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 10 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, I_E = 1,0 mA	$V_{(BR)EBO}$	>	4	V
Collector-emitter saturation voltage I_C = 100 mA; I_B = 20 mA	V_{CEsat}	typ.	0,1	V
D.C. current gain I_C = 100 mA; V_{CE} = 5 V	h_{FE}	> typ.	10 40	
Transition frequency I_C = 0,2 A; V_{CE} = 5 V; f = 500 MHz	f_T	typ.	1400	MHz
Collector capacitance at f = 1 MHz $I_E = I_e$ = 0; V_{CB} = 10 V	C_c	typ. <	6,5 9,0	pF pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 10 V	C_{re}	typ.	4,8	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z61758
VCE ≤ 16.5 V
f ≥ 10 MHz
Ptot (W)
short time operation V.S.W.R. > 3
normal operation V.S.W.R. < 3
0
2.5
5
7.5
10
0
50
100
Th (°C)
150


7Z61756
D.C. SOAR
IC (A)
10
1
10-1
10-2
Th = 25°C
125°C
1
10
VCE (V)
102


7Z62203
2000
f_T (MHz)
1500
1000
500
0
V_{CE}=5V
typ
0
0.1
0.2
0.3
0.4
0.5
I_C (A)
0.6


7Z62202
10
C_c (pF)
7.5
5
2.5
0
$I_E = I_e = 0$
f = 1MHz
typ
0
10
20
V_{CB} (V)
30

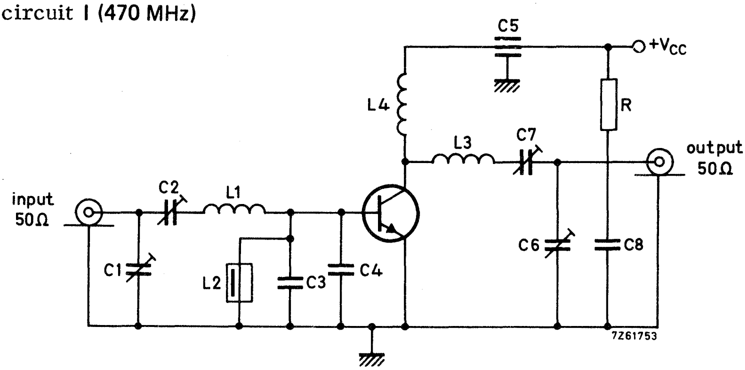
APPLICATION INFORMATION T_j = 25 °C unless otherwise specified

R.F. performance in c.w. operation (unneutralized common-emitter class B circuit)

T_h up to 25 °C

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z}_i$ (Ω)	$\overline{Y}_L$ (mS)
470	13.8	typ. 0.15	1.5	typ. 0.17	typ. 10	typ. 65	-	-
470	13.8	typ. 0.35	3.0	typ. 0.28	typ. 9.3	typ. 79	2.9 + j5.1	27 – j21
470	12.5	< 0.35	2.5	< 0.31	> 8.5	> 65	-	-
175	12.5	typ. 0.03	3.0	typ. 0.29	typ. 20	typ. 84	-	-

Test circuit I (470 MHz)



C1 = C2 = C6 = C7 = 1.8 to 18 pF film dielectric trimmer
C3 = C4 = 18 pF disc ceramic capacitor
C5 = 4 nF feed-through capacitor
C8 = 0.1 μF polyester capacitor

L1 = 1 turn Cu wire (1.2 mm); int. diam. 6 mm; max. lead length 1 mm
L2 = 1 μH choke
L3 = 30 mm straight Cu wire (2 mm); height above print 2 mm
L4 = 2 turns closely wound Cu wire (0.5 mm); int. diam. 3 mm; max. lead length 8 mm

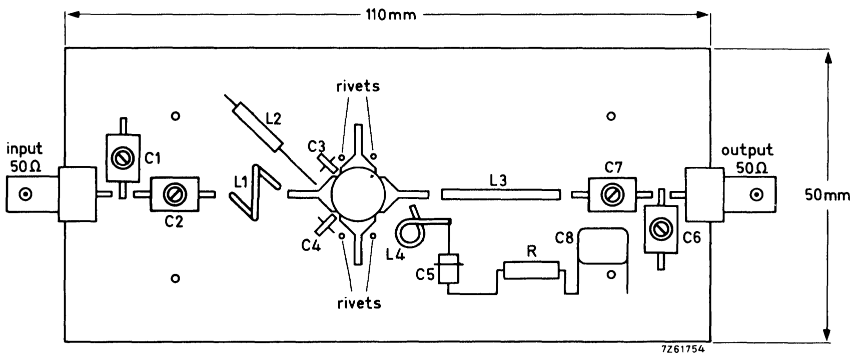
R = 10 Ω carbon

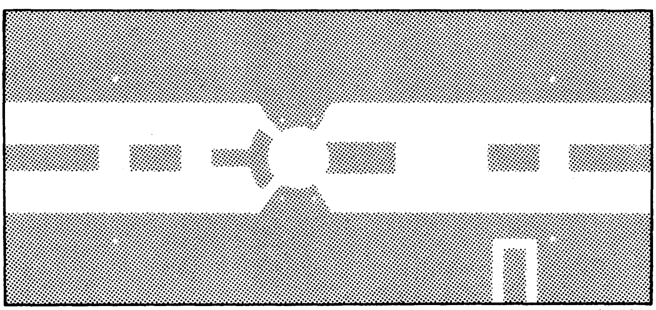
At P_L =2.5 W and V_{CC} = 12.5 V, the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 5 mW/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 16.5 V; f = 470 MHz; T_h = 70 °C;
V.S.W.R. = 50 : 1 through all phases; P_S = P_{Snom} + 20 %
where P_{Snom} = P_S for 2.5 W transistor output into 50 Ω load and V_{CC} = 13.8 V

APPLICATION INFORMATION (continued)

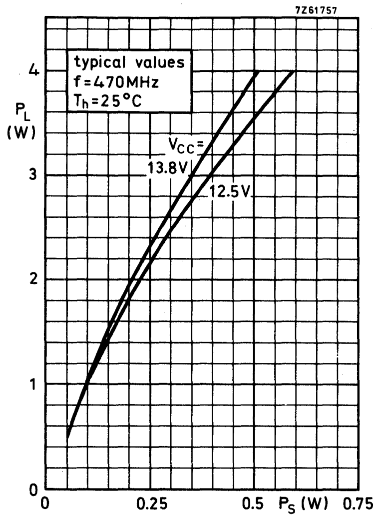
Component lay-out and printed circuit board for 470 MHz test circuit.

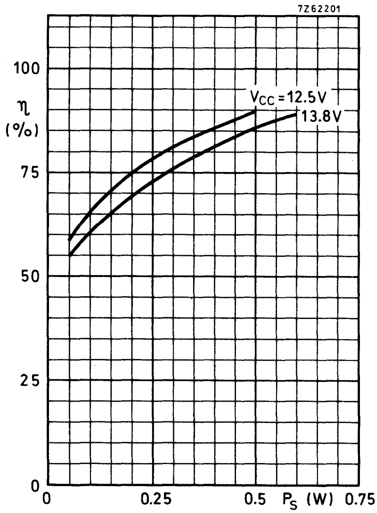


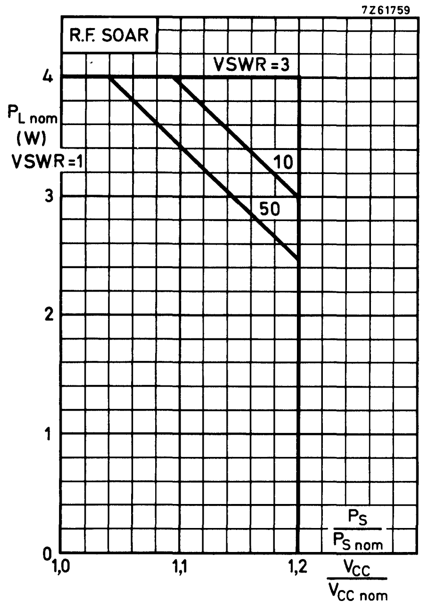


7Z61755.1

Shaded area copper
Back area completely copper clad.
Material of printed circuit board: 1,5 mm epoxy fibre glass.


7Z61757
typical values
f=470MHz
T_h=25°C
P_L
(W)
V_{CC}=
13.8V
12.5V
4
3
2
1
0
0
0.25
0.5
P_S (W)
0.75


7Z62201
η
(%)
V_{CC}=12.5V
13.8V
100
75
50
25
0
0
0.25
0.5
P_S (W)
0.75



Conditions for R.F. SOAR

f = 470 MHz

T_h = 70 °C

V_{CCnom} = 13, 8 V

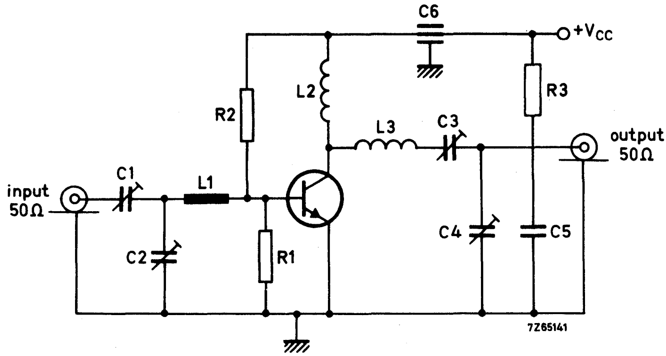
$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and VSWR = 1

$R_{th\ mb\text{-}h}$ = 0, 6 K/W

The transistor was developed for use with unstabilized supply voltage V_{CC}.
The above graph is based on its measured performance in test circuit I.
Supply voltage was varied from V_{CCnom} to 1,2 V_{CCnom}, and VSWR from 1 to 50.
It shows the max. permissible output power under nominal conditions in order not to exceed the max. permissible power dissipation under conditions of supply over-voltage ($V_{CC} > V_{CCnom}$) and load mismatch (VSWR > 1).
It is assumed that the drive power increases **linearly** with the supply voltage; i.e. $P_S/P_{Snom} = V_{CC}/V_{CCnom}$.

APPLICATION INFORMATION (continued)

Test circuit II (175 MHz)



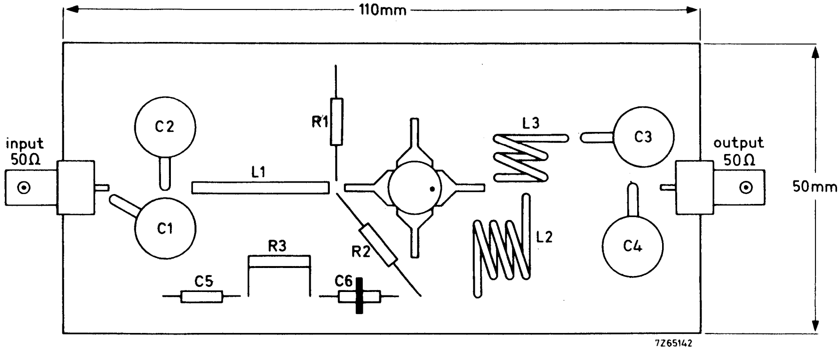
C1 = C3 = C4= 30 pF concentric air trimmer
C2 = 60 pF concentric air trimmer
C5 = 0.25 μF ceramic capacitor
C6 = 4 nF polyester capacitor

L1 = 25 mm straight Cu wire (1.2 mm); height above print max. 3 mm
L2 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm
L3 = 2 turns closely wound Cu wire (1.7 mm); int. diam. 12 mm; lead length 5 mm

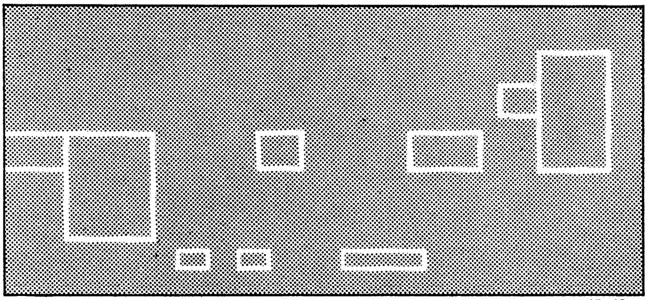
R1 = 50 Ω carbon
R2 = 1.2 kΩ carbon
R3 = 5 Ω carbon

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175MHz test circuit.

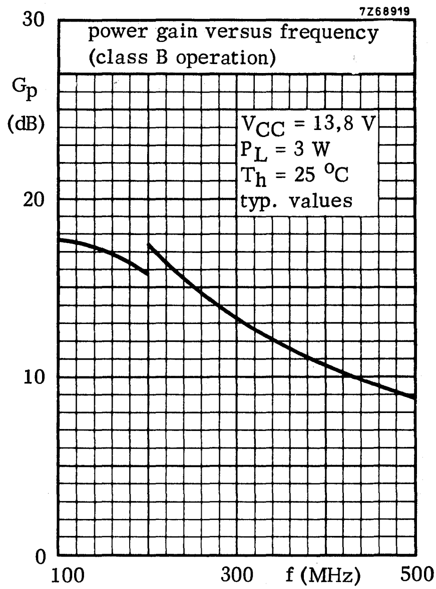


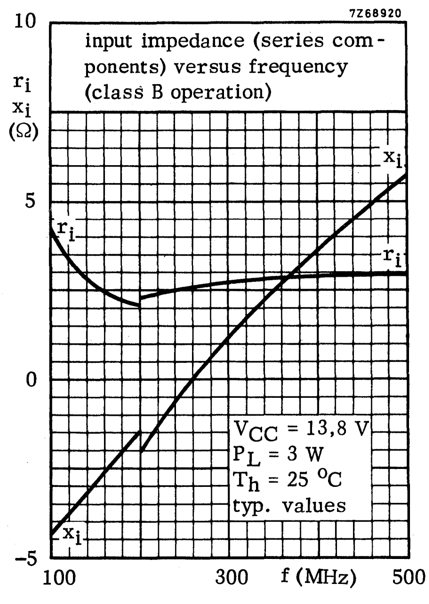
Shaded area copper
Back area not metalized
Material of pcb : 1.5 mm epoxy fibre glass

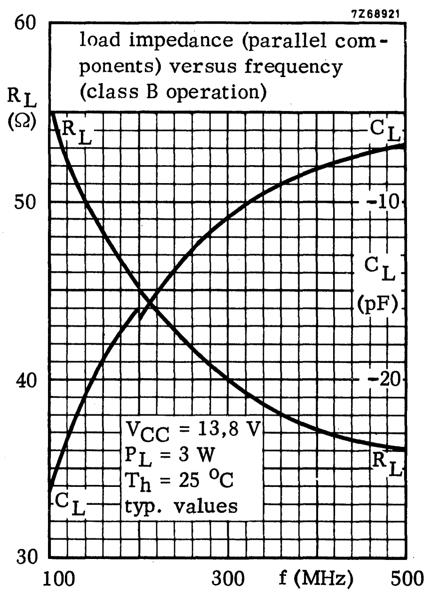


7Z65143.1

OPERATING NOTE Below 200 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







U.H.F./V.H.F. POWER TRANSISTOR

N-P-N silicon transistor for use in class-B and C operated mobile, industrial and military transmitters with a supply voltage of 13,8 V.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

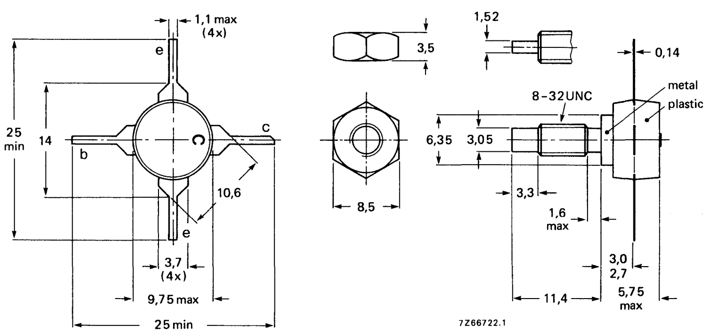
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,8	470	< 2,0	7,0	< 0,78	> 5,4	> 65	–	–
c.w.	13,8	470	typ. 2,0	7,8	typ. 0,81	typ. 5,9	typ. 70	2,4 + j6,7	60 – j20
c.w.	12,5	470	< 2,2	7,0	< 0,86	> 5,0	> 65	–	–
c.w.	12,5	175	typ. 0,4	7,2	typ. 0,87	typ.12,6	typ. 66	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (R_{BE} = 0) peak value	V_{CESM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	1.0	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	4.0	A
Total power dissipation up to T_h = 70 °C f > 10 MHz	P_{tot}	max.	10	W
Storage temperature	T_{stg}		−65 to +150	°C
Junction temperature	T_j	max.	150	°C

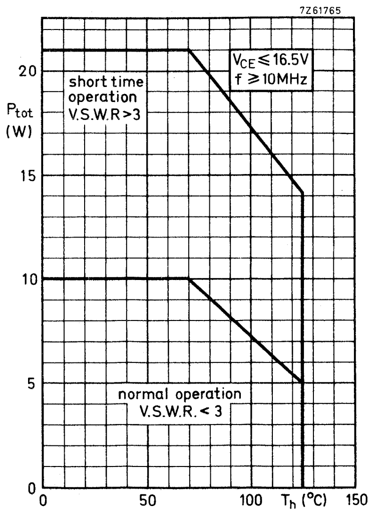
THERMAL RESISTANCE

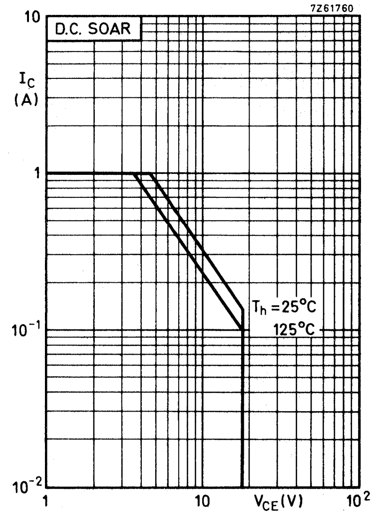
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	7.0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.6	K/W

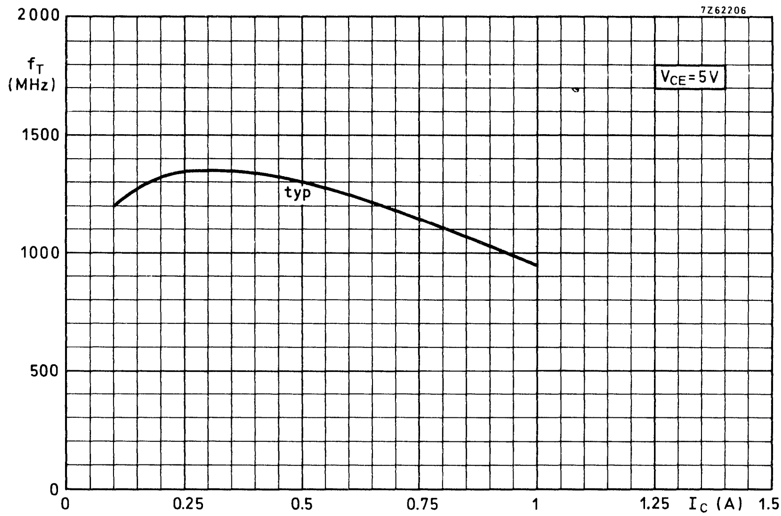
CHARACTERISTICS

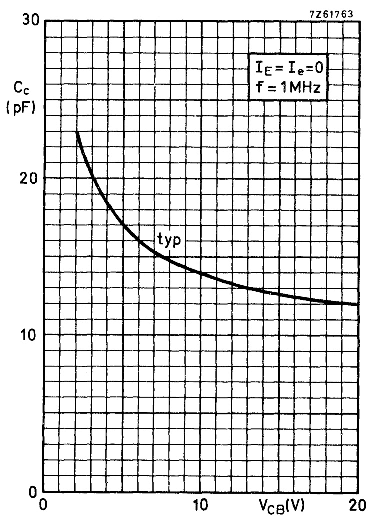
$T_j = 25\ ^oC$ unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, $I_C = 10$ mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage $V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter voltage open base, $I_C = 25$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, $I_E = 1.0$ mA	$V_{(BR)EBO}$	>	4	V
Collector-emitter saturation voltage $I_C = 500$ mA; $I_B = 100$ mA	V_{CEsat}	typ.	0.2	V
D.C. current gain $I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	> typ.	10 40	
Transition frequency $I_C = 500$ mA; $V_{CE} = 5$ V; f = 500 MHz	f_T	typ.	1300	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 10$ V	C_c	typ. <	14 20	pF pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; $V_{EB} = 0$	C_e	typ.	65	pF
Feedback capacitance at f = 1 MHz $I_C = 50$ mA; $V_{CE} = 10$ V	C_{re}	typ.	10.5	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z61765
P_{tot} (W)
20
15
10
5
0
0
50
100
150
T_h (°C)
short time operation V.S.W.R > 3
V_{CE} ≤ 16.5V
f ≥ 10MHz
normal operation V.S.W.R. < 3


7Z61760
D.C. SOAR
I_C (A)
10
1
10^{-1}
10^{-2}
1
10
10^2
V_{CE} (V)
T_h = 25°C
125°C


7Z62206
2000
f_T (MHz)
1500
1000
500
0
0
0.25
0.5
0.75
1
1.25
I_C (A)
1.5
$V_{CE} = 5$ V
typ


7Z61763
30
C_c (pF)
20
10
0
0
10
V_{CB}(V)
20
$I_E = I_e = 0$
f = 1MHz
typ

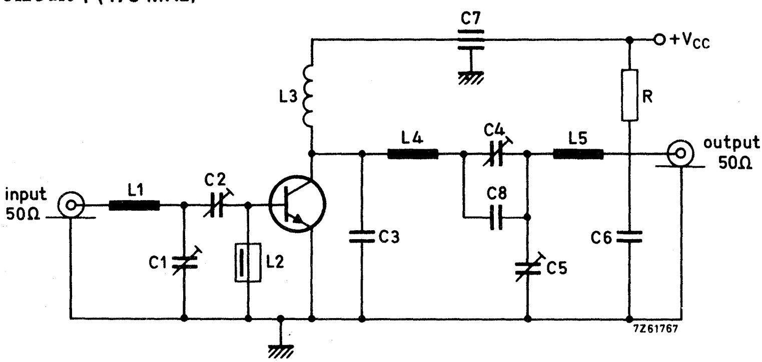
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class B circuit)

T_h up to 25 °C

f (MHz)	V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Y}_L$ (mS)
470	13.8	< 2.0	7.0	< 0.78	> 5.4	> 65	–	–
470	13.8	typ. 2.0	7.8	typ. 0.81	typ. 5.9	typ. 70	2.4+j6.7	60 – j20
470	12.5	< 2.2	7.0	< 0.86	> 5.0	> 65	–	–
175	12.5	typ. 0.4	7.2	typ. 0.87	typ. 12.6	typ. 66	–	–

Test circuit I (470 MHz)



C1 = C2 = C4 = C5 = 1.8 to 18 pF film dielectric trimmer
C3 = 6.8 pF ceramic capacitor
C6 = 0.1 µF polyester capacitor
C7 = 4 nF feed-through capacitor
C8 = 10 pF ceramic capacitor

L1 = L4 = L5 = 20 mm straight Cu wire (1.2 mm); height above print 12 mm
L2 = 0.47 µH choke
L3 = 1 turn Cu wire (1.7 mm); int. diam. 10 mm; max. lead length 5 mm

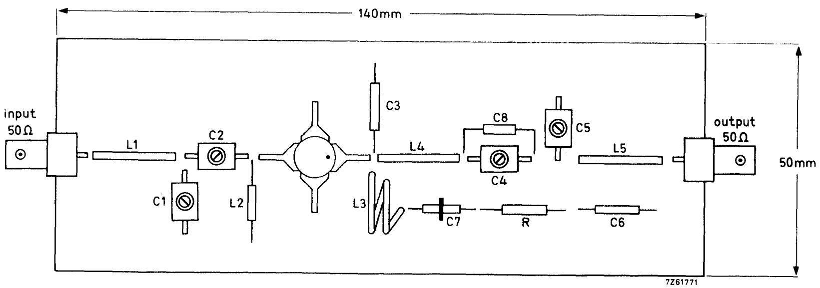
R = 10 Ω carbon

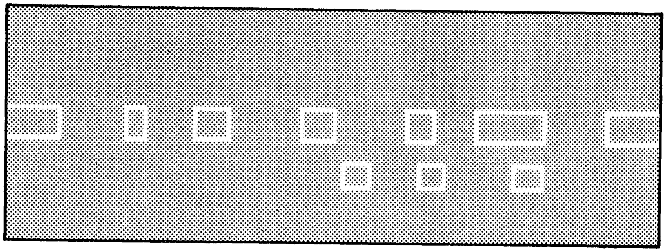
At P_L = 7.0 W and V_{CC} = 12.5 V the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 10 mW/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 16.5 V; f = 470 MHz; T_h = 70 °C;
V.S.W.R. = 50 : 1 through all phases; $P_S = P_{Snom}$ + 20 %
where $P_{Snom} = P_S$ for 7.0 W transistor output into 50 Ω load at V_{CC} = 13.8 V

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 470 MHz test circuit.



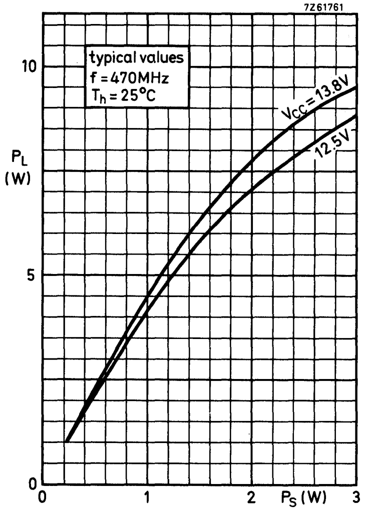


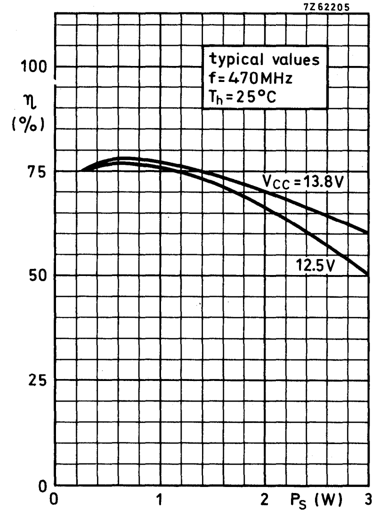
7Z61770.1

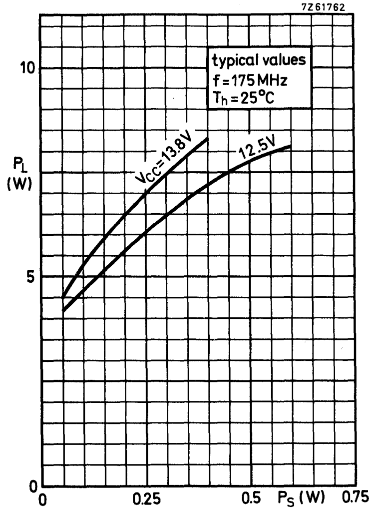
Shaded area copper

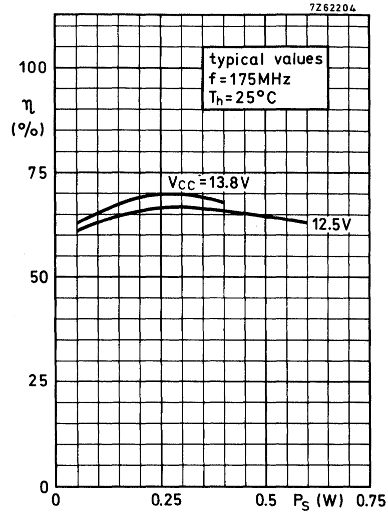
Back area completely copper clad

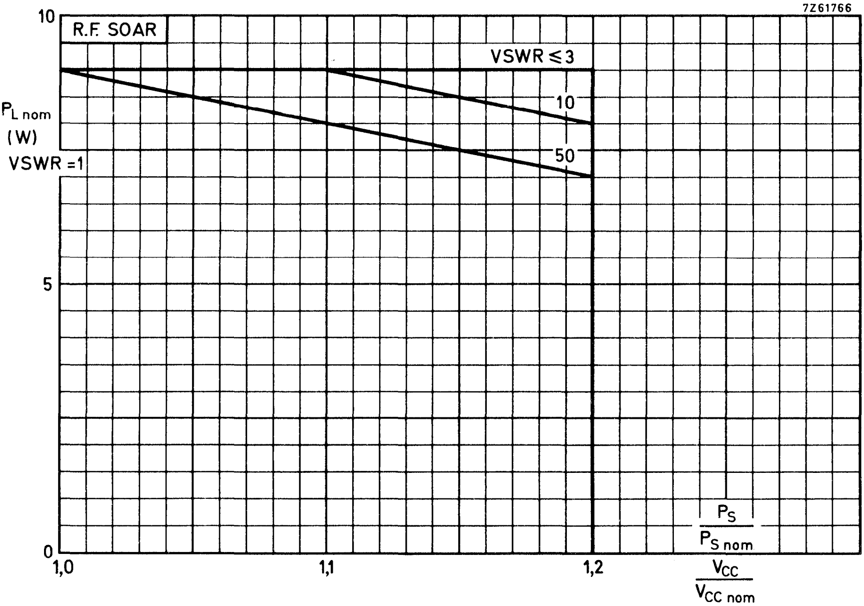
Material of printed circuit board: 1.5 mm epoxy fibre glass


7Z61761
typical values
f = 470MHz
T_h = 25°C
V_{CC} = 13.8V
12.5V
P_L (W)
P_S (W)
0
5
10
1
2
3


7Z62205
typical values
f = 470MHz
T_h = 25°C
V_{CC} = 13.8V
12.5V
η (%)
P_S (W)
0
25
50
75
100
1
2
3


7Z61762
typical values
f = 175MHz
T_h = 25°C
V_{CC} = 13.8V
12.5V
P_L (W)
P_S (W)
0
5
10
0.25
0.5
0.75


7Z62204
typical values
f = 175MHz
T_h = 25°C
V_{CC} = 13.8V
12.5V
η (%)
P_S (W)
0
25
50
75
100
0.25
0.5
0.75



Conditions for R.F. SOAR :

f = 470 MHz

T_h = 70 °C

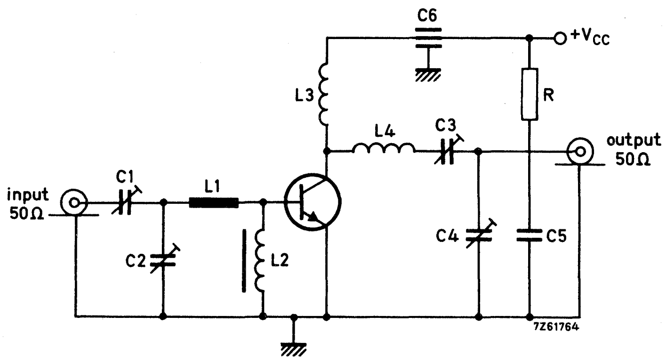
V_{CCnom} = 13,8 V

$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and VSWR = 1

The transistor was developed for use with unstabilized supply voltage V_{CC}.
The above graph is based on its measured performance in test circuit I.
Supply voltage was varied from V_{CCnom} to 1,2 V_{CCnom}, and VSWR from 1 to 50.
It shows the max. permissible output power under nominal conditions in order not to exceed the max. permissible power dissipation under conditions of supply over-voltage ($V_{CC} > V_{CCnom}$) and load mismatch (VSWR > 1).
It is assumed that the drive power increases **linearly** with the supply voltage; i.e. $P_S/P_{Snom} = V_{CC}/V_{CCnom}$.

APPLICATION INFORMATION (continued)

Test circuit II (175 MHz)



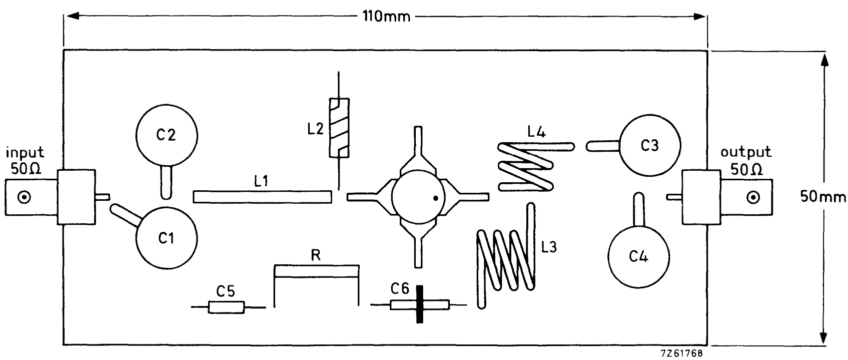
C1 = C3 = C4 =	30 pF	concentric air trimmer
C2 =	60 pF	concentric air trimmer
C5 =	0.25 μF	polyester capacitor
C6 =	4.0 nF	feed-through capacitor

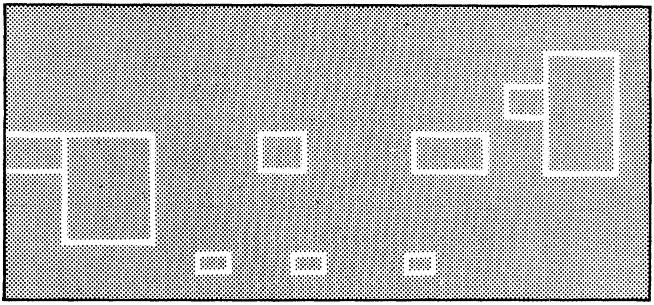
L1 = 25 mm straight Cu wire (1.2 mm); height above print 3 mm
L2 = 3 turns Cu wire (0.5 mm) on Ferrite FX1115, d = 2 mm, D = 4 mm, l = 5 mm material 3B (code number 3113 991 16740)
L3 = 5 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm
L4 = 3 turns closely wound Cu wire (1.2 mm); int. diam. 10 mm; lead length 5 mm

R = 10 Ω carbon

APPLICATION INFORMATION (continued)

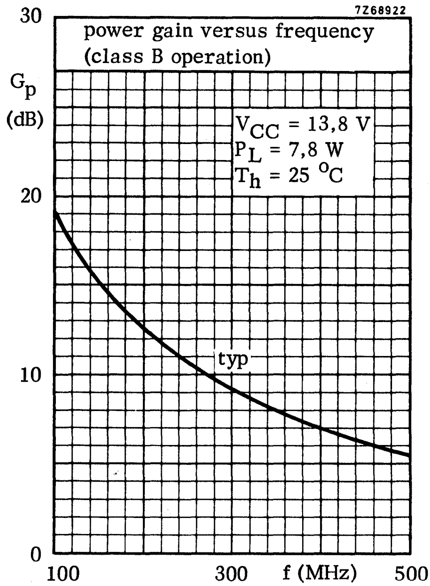
Component lay-out and printed circuit board for 175 MHz test circuit

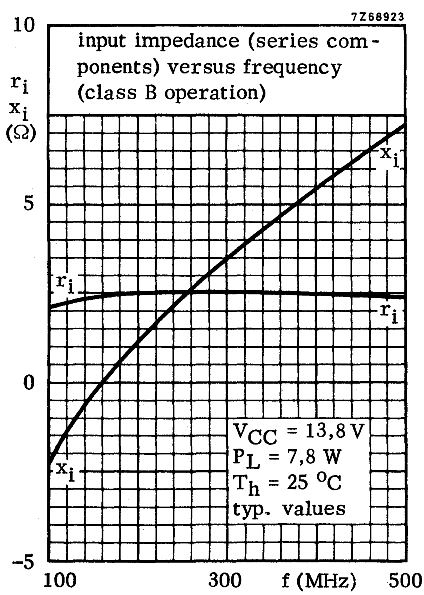


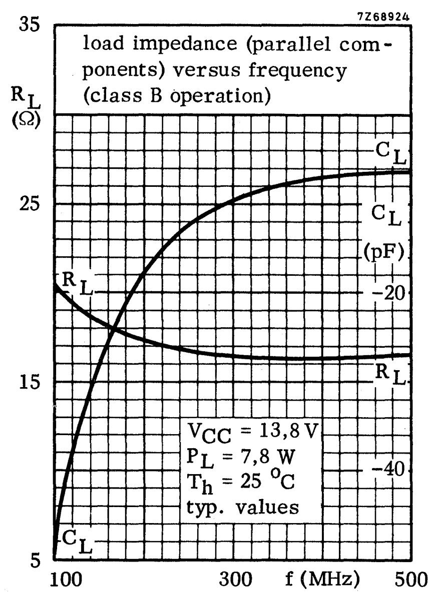


7Z61769.1

Shaded area copper
Back area not metalized
Material of printed circuit board: 1.5 mm epoxy fibre glass


7Z68922
power gain versus frequency
(class B operation)
G_p
(dB)
30
20
10
0
V_{CC} = 13,8 V
P_L = 7,8 W
T_h = 25 °C
typ
100
300
f (MHz)
500


7Z68923
input impedance (series components) versus frequency
(class B operation)
r_i
x_i
(Ω)
10
5
0
−5
x_i
r_i
r_i
x_i
V_{CC} = 13,8 V
P_L = 7,8 W
T_h = 25 °C
typ. values
100
300
f (MHz)
500


7Z68924
load impedance (parallel components) versus frequency
(class B operation)
R_L
(Ω)
35
25
15
5
C_L
C_L
(pF)
−20
−40
R_L
R_L
C_L
V_{CC} = 13,8 V
P_L = 7,8 W
T_h = 25 °C
typ. values
100
300
f (MHz)
500

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. Gold metallization ensures extremely high reliability.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

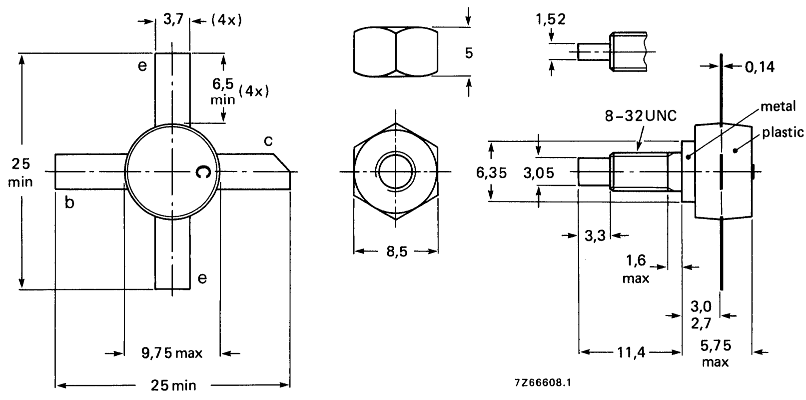
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_P dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,5	470	< 8,0	20	< 2,28	> 4	> 65	1,2 + j4,5	163 – j35
c.w.	12,5	470	< 6,8	17	< 2,09	> 4	> 65	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm. Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Voltages

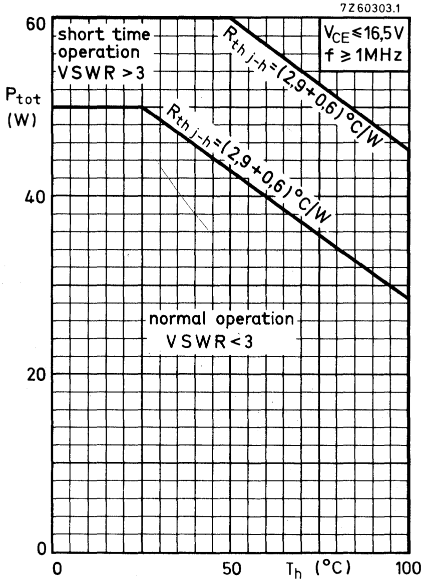
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V

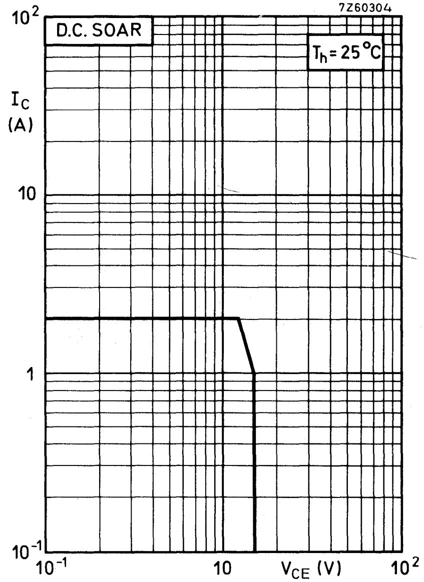
Currents

Collector current (average)	$I_{C(AV)}$	max.	3,5	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	10	A

Power dissipation

Total power dissipation up to T_h = 25 °C f ≥ 1 MHz	P_{tot}	max.	50	W





Temperatures

Storage temperature	T_{stg}	−65 to +200		°C
Junction temperature	T_j	max.	200	°C

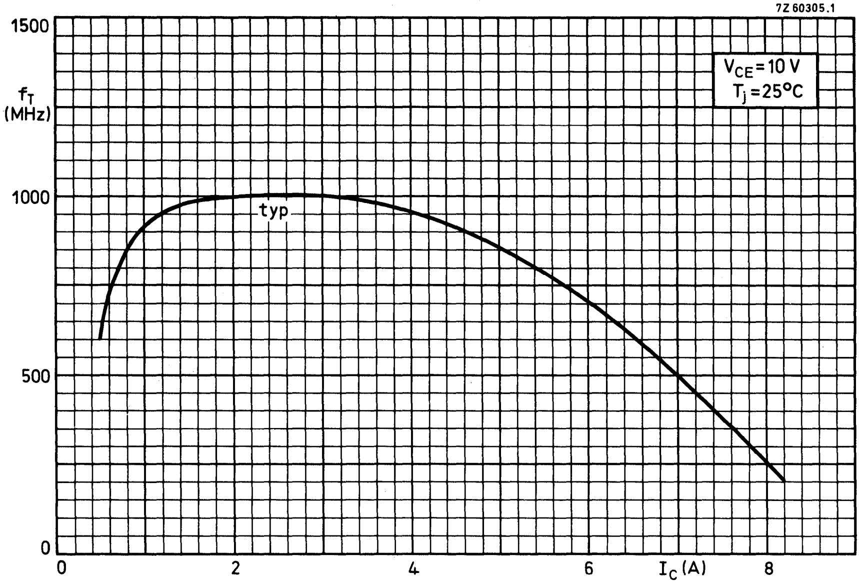
THERMAL RESISTANCE

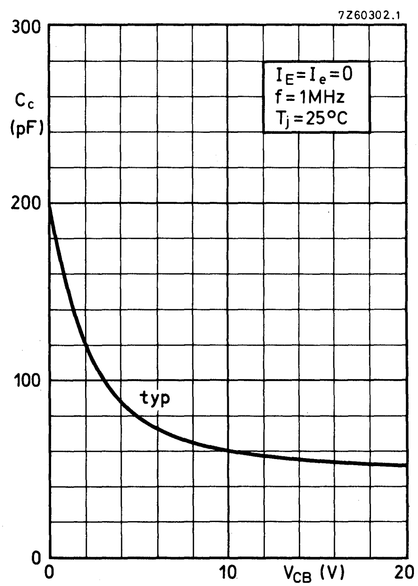
From junction to mounting base	$R_{th\ j-mb}$	=	2,9	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter ; I_C = 25 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base ; I_C = 25 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector ; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	3,1	mWs
$-V_{BE}$ = 1,5 V; R_{BE} = 33 Ω	E	>	3,1	mWs
D.C. current gain				
I_C = 1 A; V_{CE} = 5 V	h_{FE}	> typ.	10 30	
Transition frequency				
I_C = 2 A; V_{CE} = 10 V	f_T	typ.	1,0	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ. <	55 70	pF pF
Feedback capacitance				
I_C = 100 mA; V_{CE} = 15 V	C_{re}	typ.	32	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z 60305.1
1500
f_T
(MHz)
1000
500
0
0
2
4
6
8
I_C (A)
V_{CE} = 10 V
T_j = 25°C
typ


7Z60302.1
300
C_c
(pF)
200
100
0
0
10
20
V_{CB} (V)
$I_E = I_e = 0$
f = 1MHz
T_j = 25°C
typ

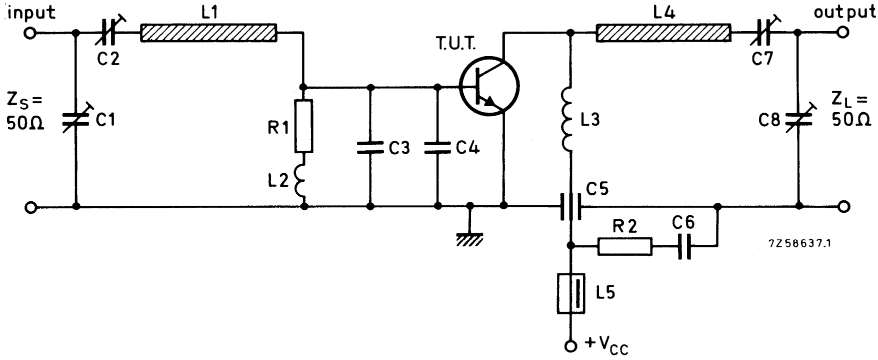
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_{mb} up to 25 °C

f (MHz)	V_{CE} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
470	13,5	< 8,00	20	< 2,28	> 4	> 65	1,2 + j4,5	163 − j35
470	12,5	< 6,80	17	< 2,09	> 4	> 65	–	–
175	12,5	typ. 1,35	17	typ. 2,30	typ. 11	typ. 60	–	–

Test circuit: 470 MHz; c.w. class-B.



List of components:

C1 = C2 = C7 = C8 = 2,0 to 9,0 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C4 = 15 pF chip capacitor
C5 = 100 pF feed-through capacitor
C6 = 33 nF polyester capacitor

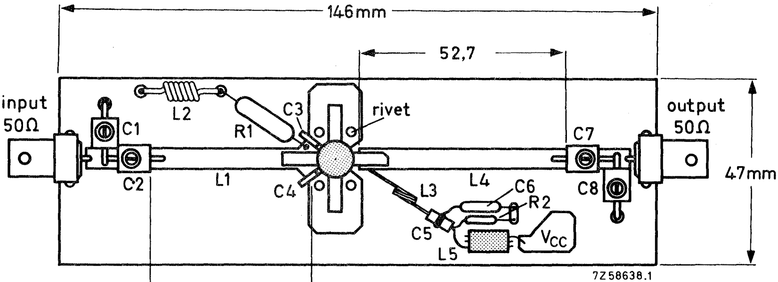
R1 = 1 Ω carbon resistor
R2 = 10 Ω carbon resistor

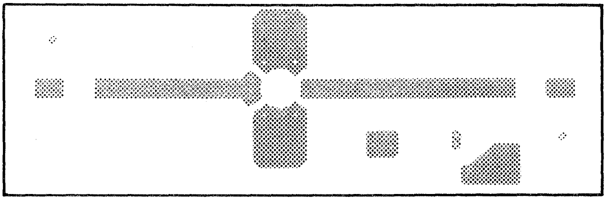
L1 = stripline (41,1 mm x 5,0 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm (0,32 μH)
L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4 mm; leads 2 x 5 mm
L4 = stripline (52,7 mm x 5,0 mm)
L5 = Ferroxcube choke coil. Z (at f = 50 MHz) = 750 Ω ± 20% (cat. no. 4312 020 36640)

L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric.
(ϵ_r = 2,74); thickness 1,45 mm.

APPLICATION INFORMATION (continued)

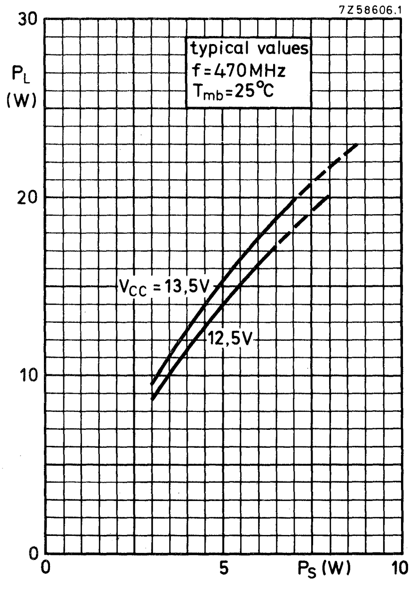
Component layout and printed-circuit board for 470 MHz test circuit.

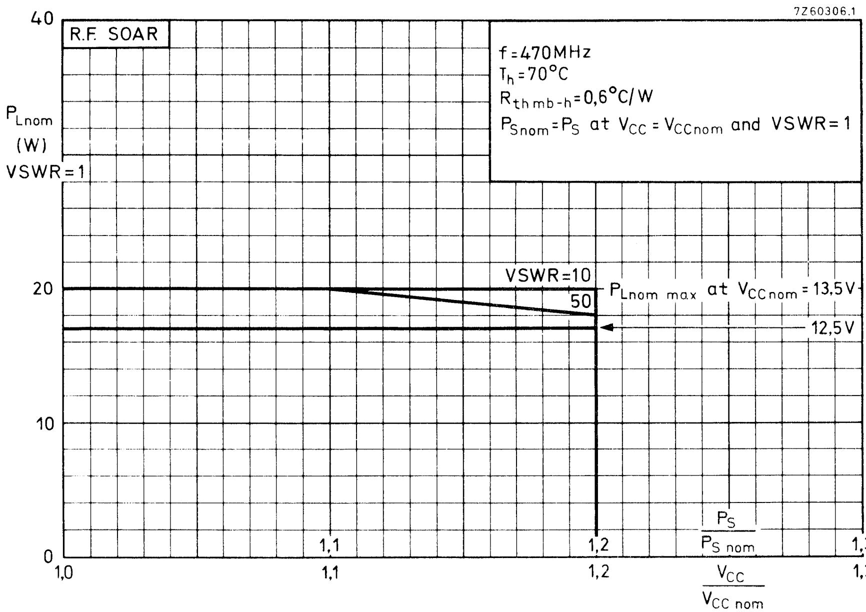




7Z66443.1

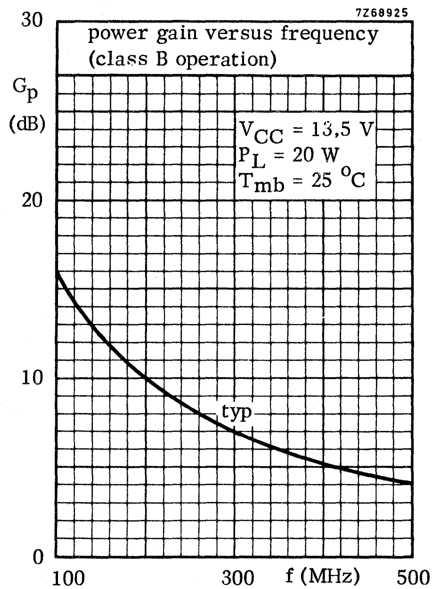
The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

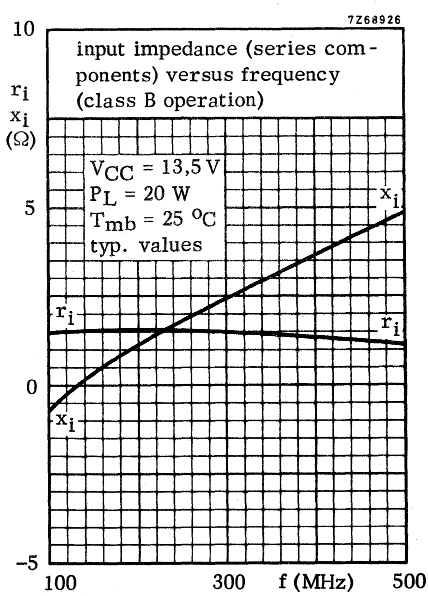


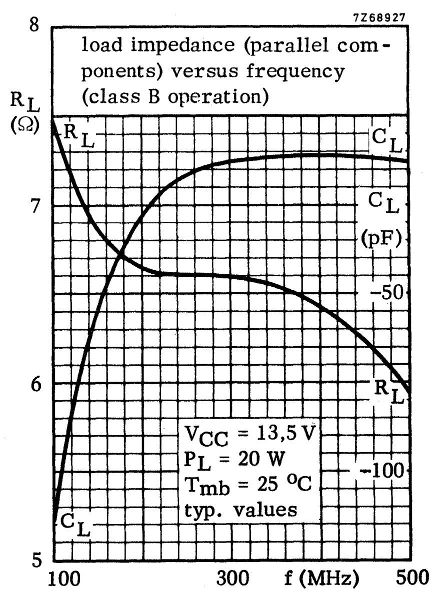


The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph above for safe operation at supply voltages other than the nominal. The graph shows the allowable output power, under nominal conditions, as a function of the supply overvoltage ratio, with VSWR as parameter.
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with the supply overvoltage ratio.

The horizontal line at 20 W applies at V_{CCnom} = 13,5 V.
For V_{CCnom} = 12,5 V, P_L should be derated to 17 W.


7Z68925
power gain versus frequency
(class B operation)
30
G_p
(dB)
20
10
0
V_{CC} = 13,5 V
P_L = 20 W
T_{mb} = 25 °C
typ
100
300
f (MHz)
500


7Z68926
input impedance (series components) versus frequency
(class B operation)
10
r_i
x_i
(Ω)
5
0
−5
V_{CC} = 13,5 V
P_L = 20 W
T_{mb} = 25 °C
typ. values
x_i
r_i
r_i
x_i
100
300
f (MHz)
500


7Z68927
load impedance (parallel components) versus frequency
(class B operation)
8
R_L
(Ω)
7
6
5
R_L
C_L
C_L
(pF)
−50
R_L
−100
C_L
V_{CC} = 13,5 V
P_L = 20 W
T_{mb} = 25 °C
typ. values
100
300
f (MHz)
500

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C with a supply voltage up to 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Gold metallization ensures extremely high reliability.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

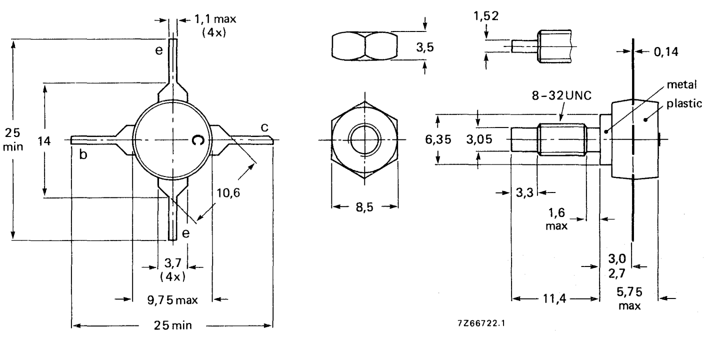
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S mW	P_L W	I_C mA	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	24	470	typ. 50	0,85	typ. 67	typ. 12,3	typ. 53	–	–
c.w.	28	470	< 80	1,0	< 71	> 11,0	> 50	–	–
c.w.	28	470	typ. 80	1,45	typ. 86	typ. 12,6	typ. 60	2,5 + j0,2	3,4 – j16
c.w.	28	1000	typ. 400	1,4	typ.100	typ. 5,4	typ. 50	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

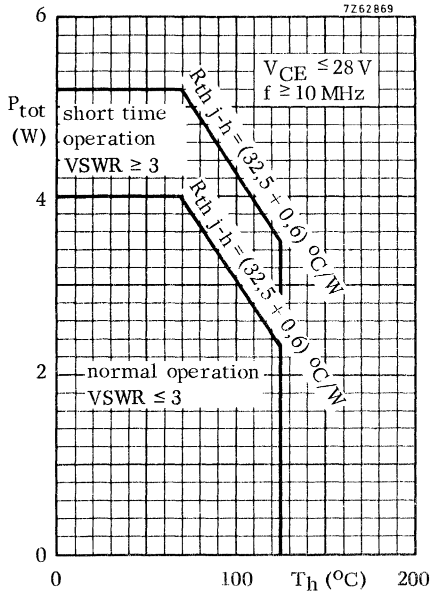
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

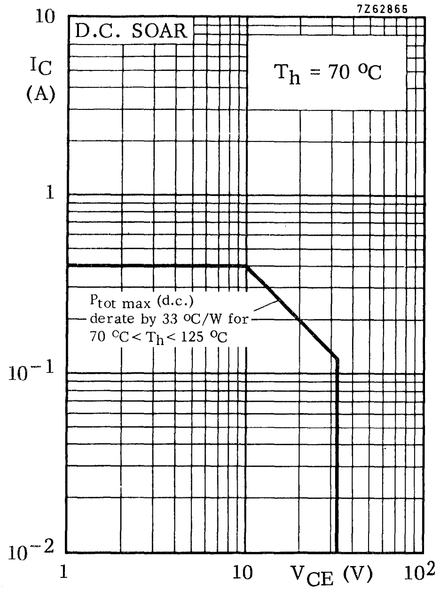
RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Voltages				
Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V
Currents				
Collector current (d.c.)	I_C	max.	400	mA
Collector current (peak value); f ≥ 10 MHz	I_{CM}	max.	800	mA
Power dissipation				
Total power dissipation up to T_h = 70 ^oC f ≥ 10 MHz	P_{tot}	max.	4,0	W
Temperatures				
Storage temperature	T_{stg}	−65 to +150		^oC
Operating junction temperature	T_j	max.	200	^oC

THERMAL RESISTANCE

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	32,5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

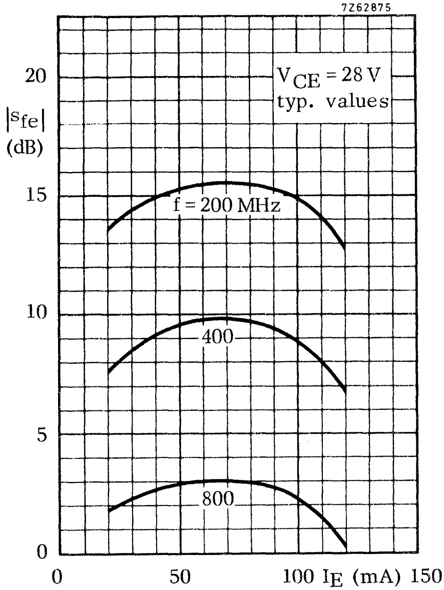

7Z62869
6
4
2
0
Ptot
(W)
short time
operation
VSWR ≥ 3
VCE ≤ 28 V
f ≥ 10 MHz
Rth j-h = (32,5 + 0,6) °C/W
Rth j-h = (32,5 + 0,6) °C/W
normal operation
VSWR ≤ 3
0
100
Th (°C)
200

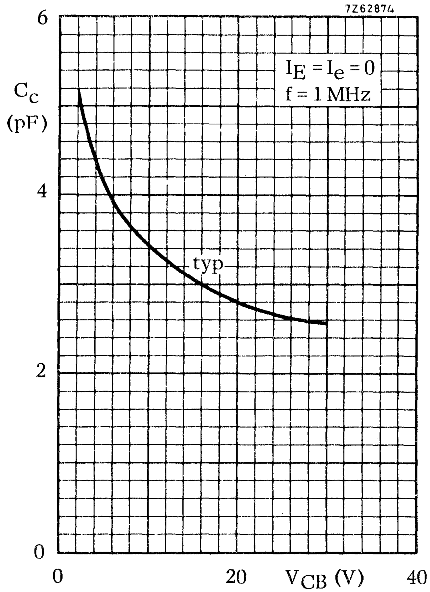

7Z62865
10
IC
(A)
1
10⁻¹
10⁻²
D.C. SOAR
Th = 70 °C
Ptot max (d.c.)
derate by 33 °C/W for
70 °C < Th < 125 °C
1
10
VCE (V)
10²

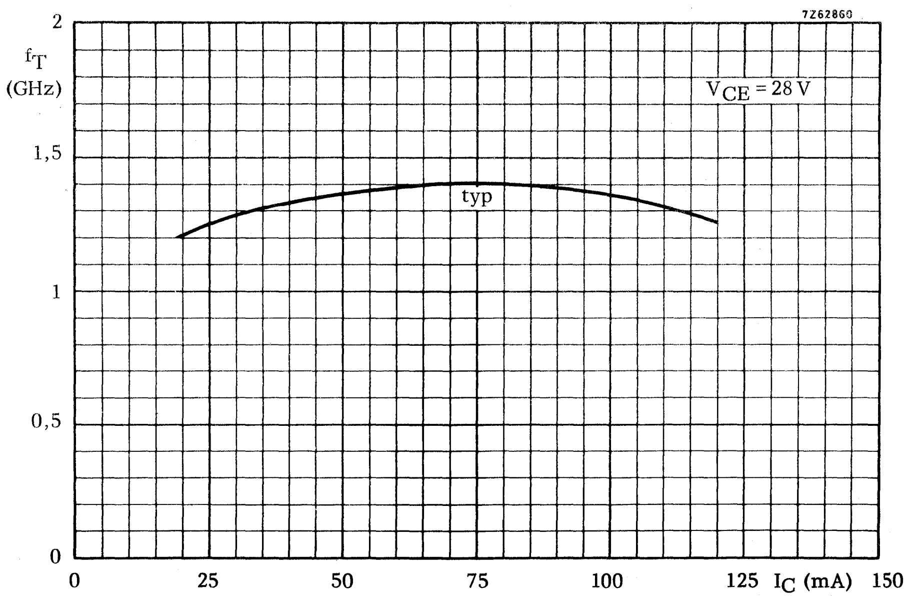
CHARACTERISTICS

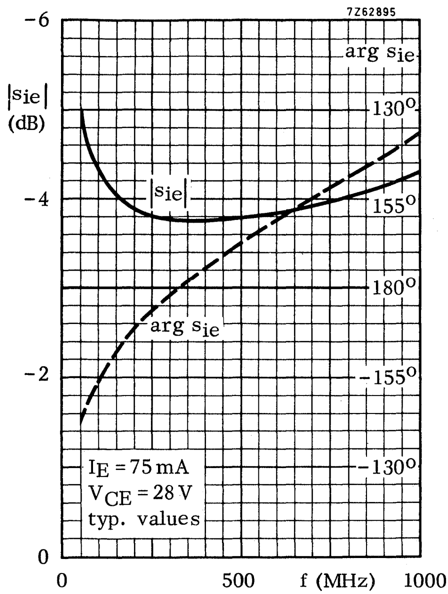
T_j = 25 °C unless otherwise specified

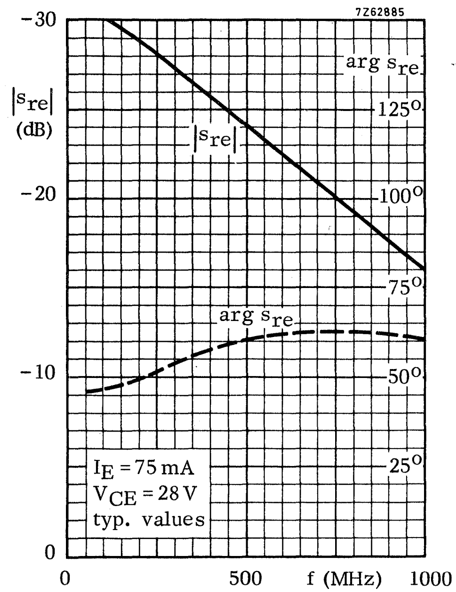
Breakdown voltages				
Collector-base voltage open emitter, I_C = 10 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage V_{BE} = 0, I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base voltage open collector, I_E = 1,0 mA	$V_{(BR)EBO}$	>	4,0	V
D.C. current gain I_C = 100 mA; V_{CE} = 5,0 V	h_{FE}	> typ.	10 35	
Transition frequency I_C = 50 mA; V_{CE} = 5,0 V	f_T	typ.	1,2	GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; V_{CB} = 10 V	C_c	typ.	3,5	pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; V_{EB} = 0	C_e	typ.	11	pF
Feedback capacitance at f = 1 MHz I_C = 5 mA; V_{CE} = 10 V	C_{re}	typ.	2,5	pF
Collector-stud capacitance	C_{cs}	typ.	2,0	pF

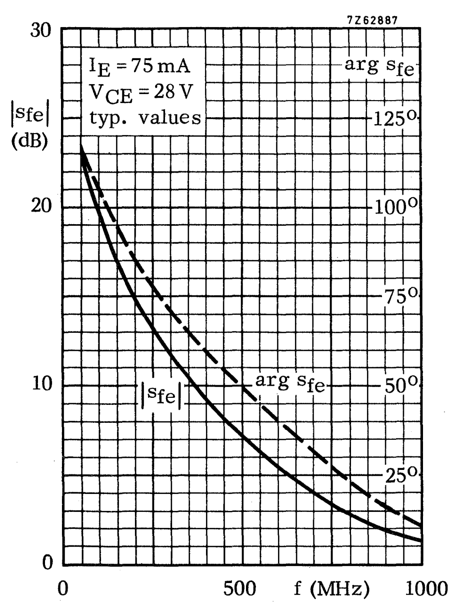

7Z62875
20
15
10
5
0
|sfe|
(dB)
VCE = 28 V
typ. values
f = 200 MHz
400
800
0
50
100
IE (mA)
150

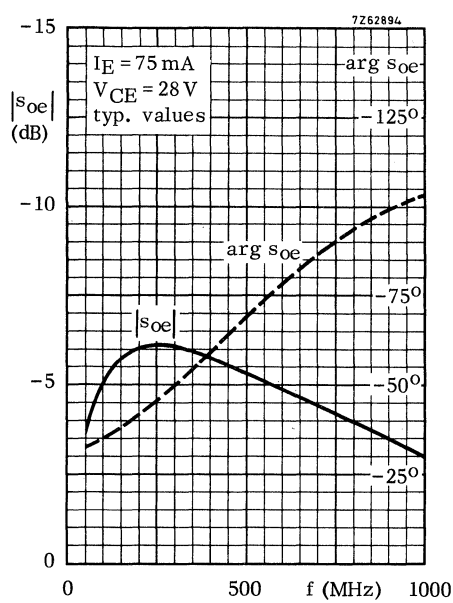

7Z62874
6
4
2
0
Cc
(pF)
IE = Ie = 0
f = 1 MHz
typ
0
20
VCB (V)
40


7Z62860
2
1,5
1
0,5
0
fT
(GHz)
VCE = 28 V
typ
0
25
50
75
100
125
IC (mA)
150


7Z62895
-6
-4
-2
0
|sie|
(dB)
arg sie
130°
155°
180°
-155°
-130°
|sie|
arg sie
IE = 75 mA
VCE = 28 V
typ. values
0
500
f (MHz)
1000


7Z62885
-30
-20
-10
0
|sre|
(dB)
arg sre
125°
100°
75°
50°
25°
|sre|
arg sre
IE = 75 mA
VCE = 28 V
typ. values
0
500
f (MHz)
1000


7Z62887
30
20
10
0
|sfe|
(dB)
IE = 75 mA
VCE = 28 V
typ. values
arg sfe
125°
100°
75°
50°
25°
|sfe|
arg sfe
0
500
f (MHz)
1000


7Z62894
-15
-10
-5
0
|soe|
(dB)
IE = 75 mA
VCE = 28 V
typ. values
arg soe
-125°
-75°
-50°
-25°
arg soe
|soe|
0
500
f (MHz)
1000

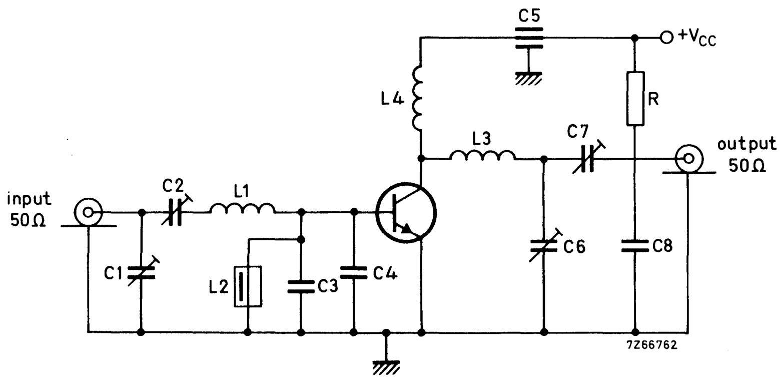
APPLICATION INFORMATION

R.F. performance in c.w. operation (Unneutralized common-emitter class-B circuit)

T_h = 25 °C

V_{CC} (V)	f (MHz)	P_S (mW)	P_L (W)	I_C (mA)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
24	470	typ. 50	0,85	typ. 67	typ. 12,3	typ. 53	–	–
28	470	< 80	1,0	< 71	> 11,0	> 50	–	–
28	470	typ. 80	1,45	typ. 86	typ. 12,6	typ. 60	2,5 + j0,2	3,4 – j16
28	1000	typ. 400	1,4	typ. 100	typ. 5,4	typ. 50	–	–

Test circuit for 470 MHz:



C1 = C2 = C7 = 1,8 to 18 pF film dielectric trimmer
C3 = C4 = 18 pF disc ceramic capacitor
C5 = 1 nF feed-through capacitor
C6 = 1,0 to 9,0 pF film dielectric trimmer
C8 = 0,1 μF polyester capacitor

L1 = 1 turn Cu wire (1,2 mm); int. dia. 5 mm; lead length = 2 mm
L2 = 0,47 μH choke
L3 = 4 turns closely wound enamelled Cu wire (1,2 mm); int. dia. 6,5 mm; lead length = 4 mm
L4 = 5 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4 mm; lead length = 5 mm

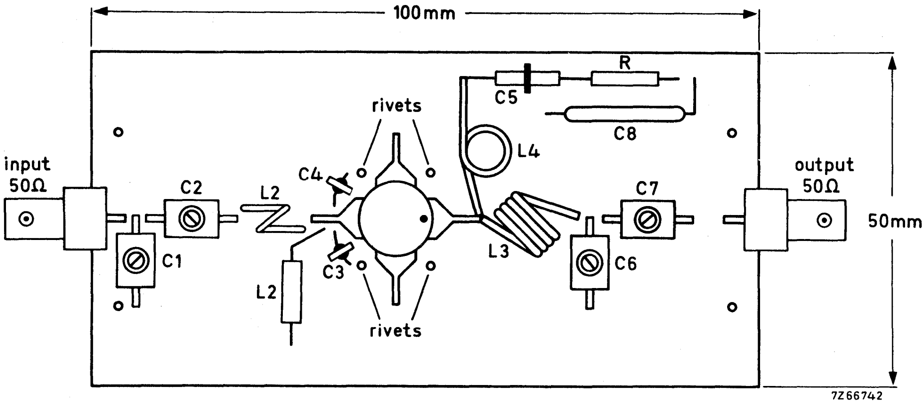
R = 10 Ω carbon

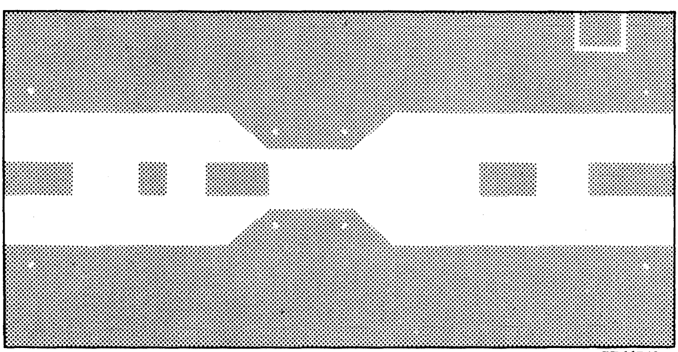
At P_L = 1,0 W and V_{CC} = 28 V, the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 2 mW/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 28 V; f = 470 MHz; T_h = 90 °C.
VSWR = 50 : 1 through all phases; P_L = 1,2 W.

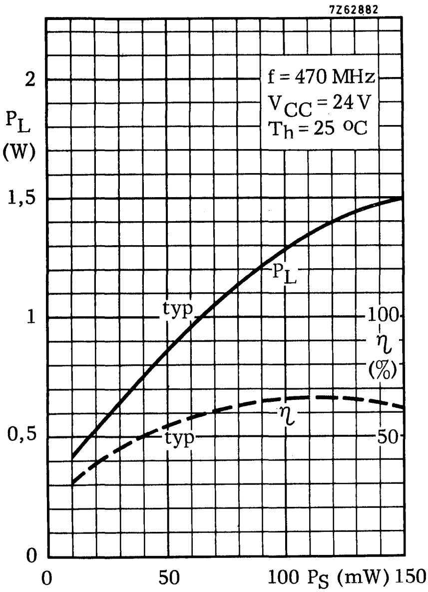
APPLICATION INFORMATION (continued)

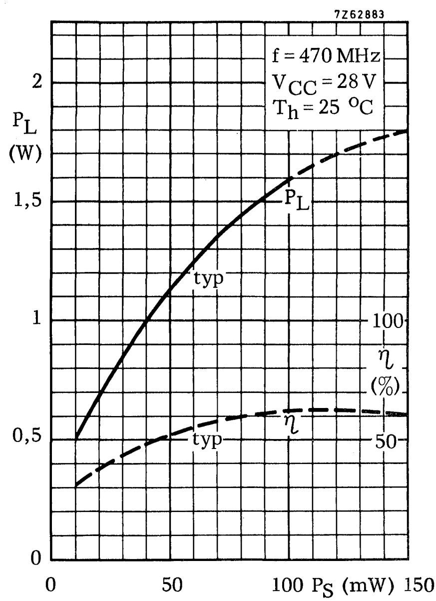
Component layout and printed-circuit board for 470 MHz test circuit.

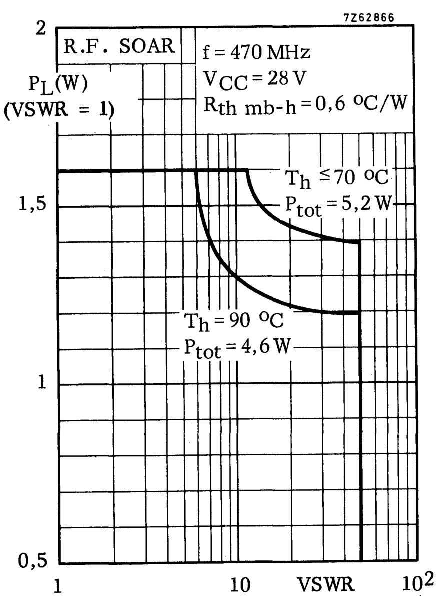



7Z66743.1

Shaded area copper
Back area completely copper clad
Material of printed-circuit board: 1,5 mm epoxy fibre-glass



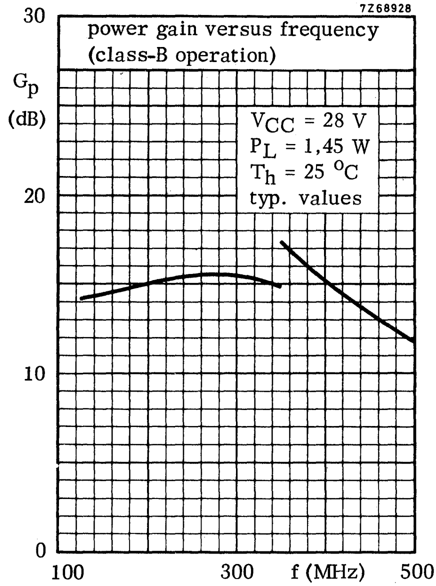


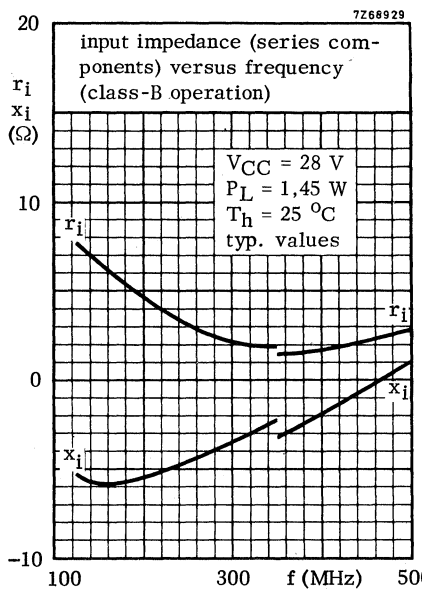


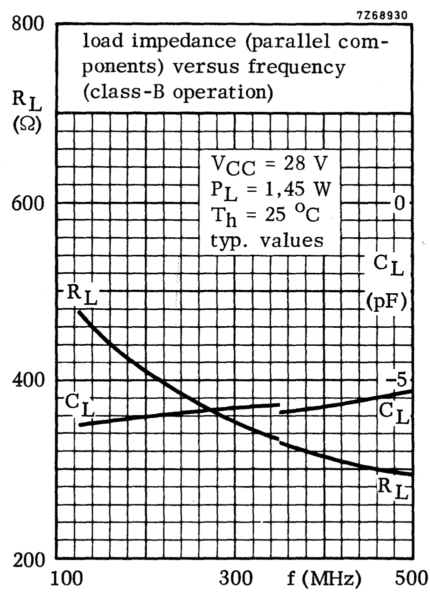
Indicated load power as a function of overload

The graph has been derived from an evaluation of the performance of transistors matched up to 1,6 W load power in the test amplifier and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures. This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

OPERATING NOTE Below 350 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







SILICON PLANAR EPITAXIAL TRANSISTOR

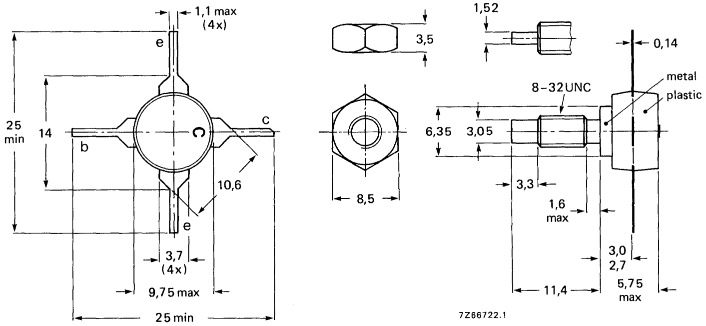
N-P-N silicon planar epitaxial transistor primarily designed for use in fast-switching wide-band video amplifiers for driving the cathode of a picture tube.

The transistor has a common-base pin configuration and is sealed in a capstan envelope with a moulded cap. All the leads are isolated from the stud.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm
Mounting holes to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	65 V
open base	V_{CEO}	max.	33 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current			
d.c.	I_C	max.	400 mA
(peak value); f > 1 MHz	I_{CM}	max.	800 mA
D.C. power dissipation up to T_h = 70 °C (see D.C. SOAR in Fig. 2)	$P_{d.c.}$	max.	4 W
Storage temperature	T_{stg}	–65 to + 150 °C	
Operating junction temperature	T_j	max.	200 °C

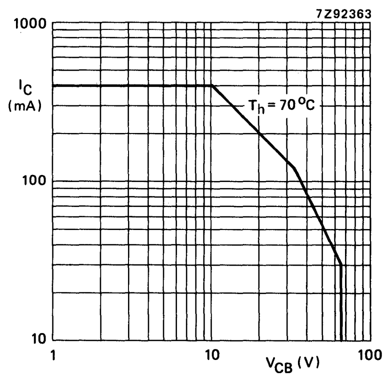


Fig. 2 D.C. SOAR.

THERMAL RESISTANCE

From junction to mounting base (d.c.)	$R_{th\ j\text{-}mb}$	=	32,5 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	65 V
I_C = 25 mA; I_B = 0	$V_{(BR)CEO}$	>	33 V
Emitter-base breakdown voltage			
I_E = 1 mA; I_C = 0	$V_{(BR)EBO}$	>	4 V
Collector-base leakage current			
V_{CB} = 20 V; I_E = 0	I_{CBO}	<	1 mA
D.C. current gain			
I_C = 100 mA; V_{CE} = 5 V	h_{FE}		10 to 160 typ. 50
Transition frequency			
I_C = 50 mA; V_{CE} = 5 V	f_T	typ.	1,0 GHz
Collector capacitance at f = 1 MHz			
I_E = i_e = 0; V_{CB} = 10 V	C_c	typ.	3,5 pF
Emitter capacitance at f = 1 MHz			
I_C = i_c = 0; V_{EB} = 0,5 V	C_e	typ.	11 pF
Feedback capacitance at f = 1 MHz			
I_C = 5 mA; V_{CE} = 10 V	C_{re}	typ.	2,5 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

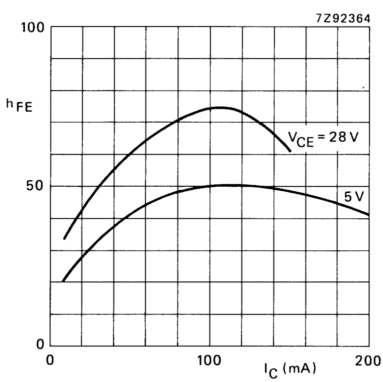


Fig. 3 Current gain (d.c.) versus collector current.

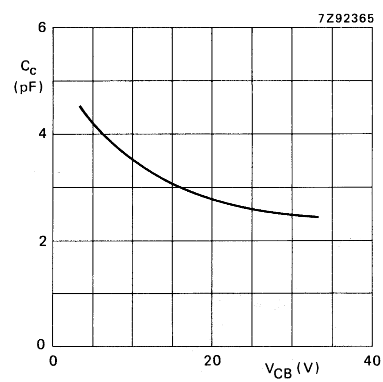


Fig. 4 Collector capacitance versus V_{CB}; I_E = i_e = 0; f = 1 MHz.

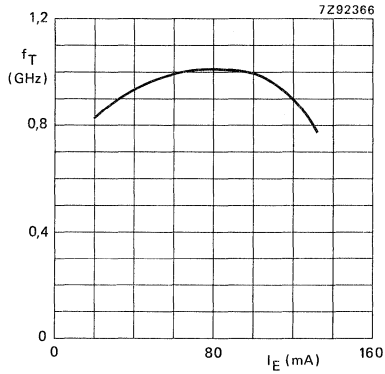


Fig. 5 Transition frequency versus emitter current; V_{CB} = 28 V.

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C with a supply voltage up to 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Gold metallization ensures extremely high reliability.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

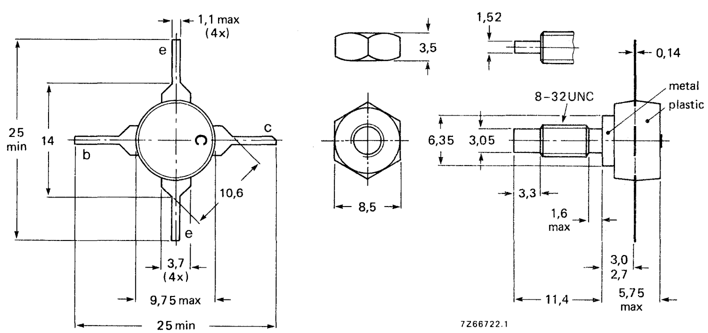
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C mA	G_P dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	24	470	typ. 0,2	2,4	typ. 143	typ. 10,8	typ. 70	–	–
c.w.	28	470	< 0,2	2,5	< 149	> 11,0	> 60	–	–
c.w.	28	470	typ. 0,2	3,0	typ. 162	typ. 11,7	typ. 66	1,8 + j2,8	7,2 – j24
c.w.	28	1000	typ. 0,7	2,5	typ. 179	typ. 5,5	typ. 50	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V
Collector current (d.c.)	I_C	max.	0,7	A
Collector current (peak value) f ≥ 10 MHz	I_{CM}	max.	2,0	A
Total power dissipation up to T_h = 70 °C f ≥ 10 MHz	P_{tot}	max.	6,0	W
Storage temperature	T_{stg}		−65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

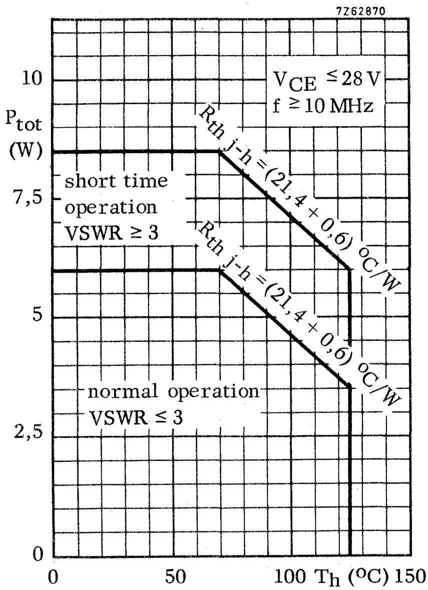
THERMAL RESISTANCE

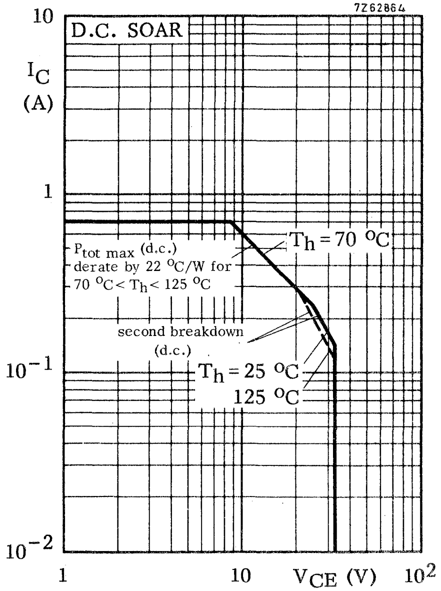
From junction to mounting base	$R_{th\ j-mb}$	=	21,4	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	K/W

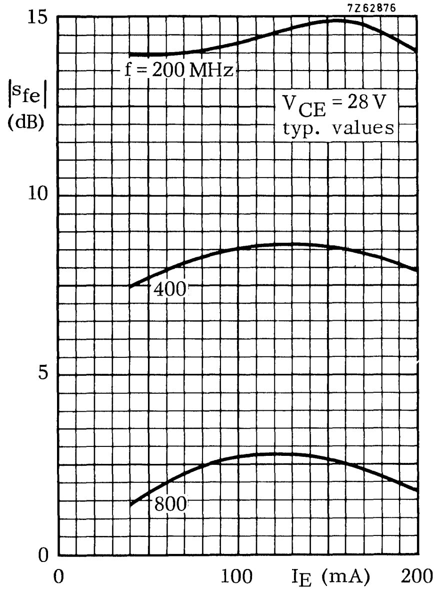
CHARACTERISTICS

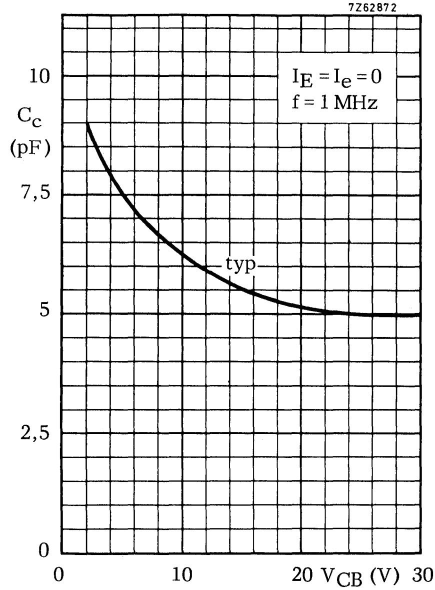
T_j = 25 °C unless otherwise specified

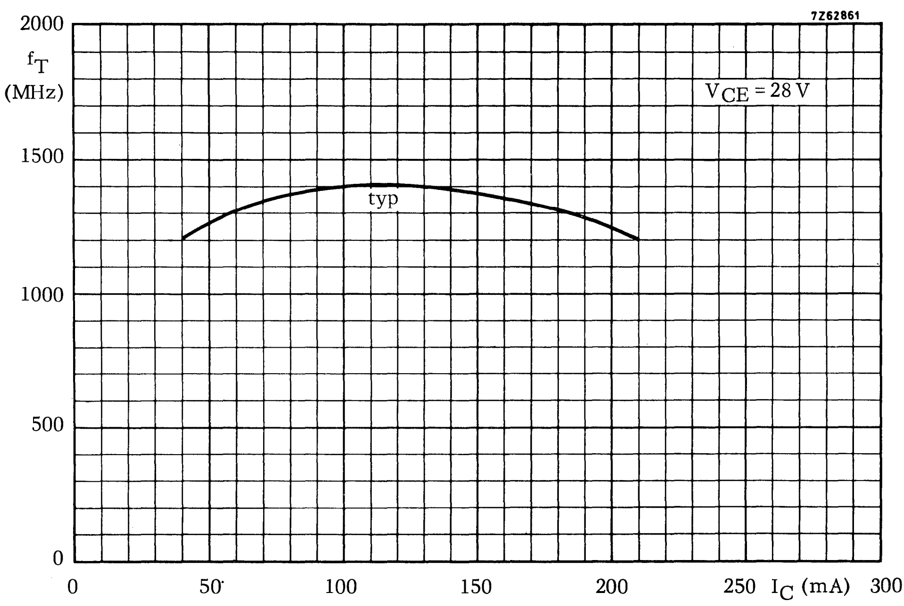
Breakdown voltages				
Collector-base voltage open emitter, I_C = 10 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage V_{BE} = 0, I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base voltage open collector, I_E = 1,0 mA	$V_{(BR)EBO}$	>	4,0	V
Collector-emitter saturation voltage I_C = 100 mA; I_B = 20 mA	V_{CEsat}	typ.	0,17	V
D.C. current gain I_C = 100 mA; V_{CE} = 5,0 V	h_{FE}	> typ.	10 40	
Transition frequency I_C = 100 mA; V_{CE} = 5,0 V	f_T	typ.	1,2	GHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 10 V	C_c	typ,	6,5	pF
Emitter capacitance at f = 1 MHz I_C = I_c = 0; V_{EB} = 0	C_e	typ.	25	pF
Feedback capacitance at f = 1 MHz I_C = 10 mA; V_{CE} = 10 V	C_{re}	typ.	4,8	pF
Collector-stud capacitance	C_{cs}	typ.	2,0	pF

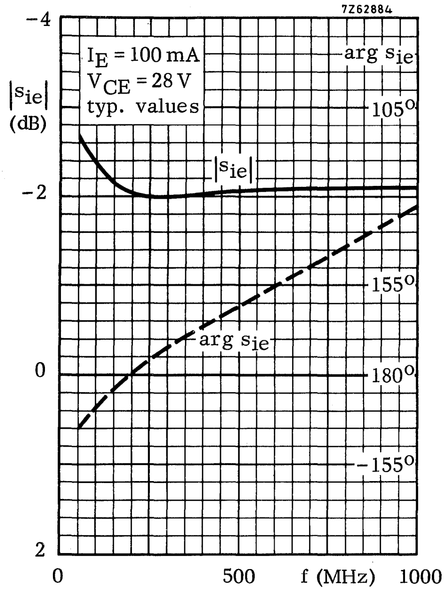

7Z62870
10
7,5
5
2,5
0
P_{tot}
(W)
$V_{CE} \leq 28$ V
$f \geq 10$ MHz
$R_{th\ j\text{-}h} = (21,4 + 0,6)$ °C/W
short time
operation
VSWR ≥ 3
$R_{th\ j\text{-}h} = (21,4 + 0,6)$ °C/W
normal operation
VSWR ≤ 3
0
50
100 T_h (°C) 150

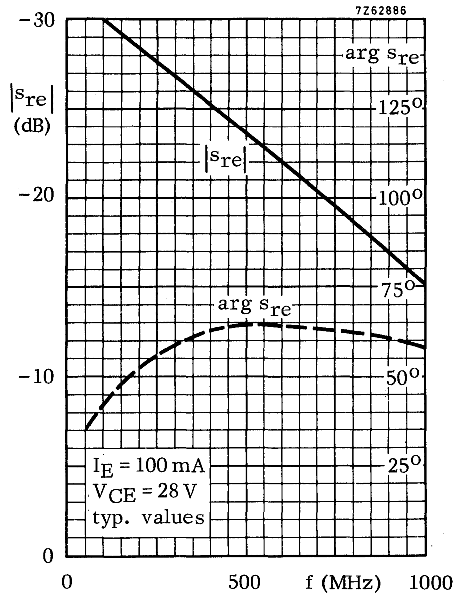

7Z62864
10
I_C
(A)
1
10^{-1}
10^{-2}
D.C. SOAR
$T_h = 70$ °C
$P_{tot\ max}$ (d.c.)
derate by 22 °C/W for
70 °C < T_h < 125 °C
second breakdown
(d.c.)
$T_h = 25$ °C
125 °C
1
10
V_{CE} (V)
10^2

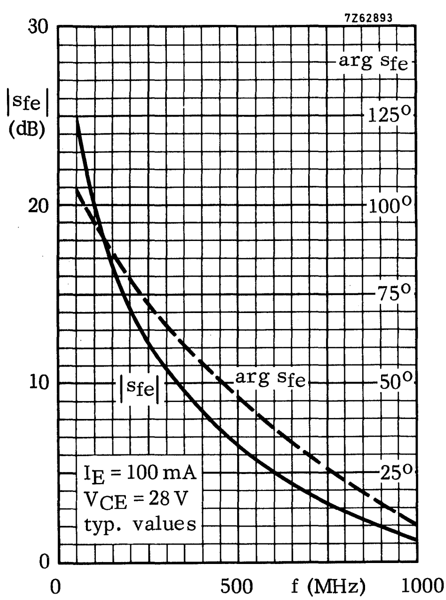

7Z62876
15
|sfe|
(dB)
10
5
0
f = 200 MHz
VCE = 28 V
typ. values
400
800
0
100
IE (mA)
200

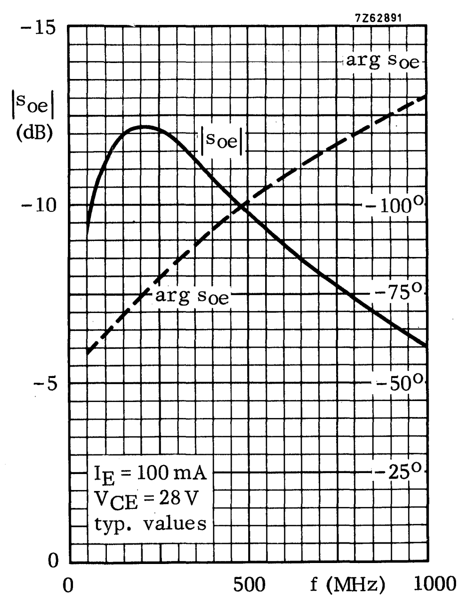

7Z62872
10
Cc
(pF)
7,5
5
2,5
0
IE = Ie = 0
f = 1 MHz
typ
0
10
20 VCB (V) 30


7Z62861
2000
fT
(MHz)
1500
1000
500
0
VCE = 28 V
typ
0
50
100
150
200
250 IC (mA) 300


7Z62884
I_E = 100 mA
V_{CE} = 28 V
typ. values
$|s_{ie}|$ (dB)
arg s_{ie}
105°
155°
180°
−155°
−4
−2
0
2
0
500
f (MHz)
1000


7Z62886
$|s_{re}|$ (dB)
arg s_{re}
125°
100°
75°
50°
25°
I_E = 100 mA
V_{CE} = 28 V
typ. values
−30
−20
−10
0
0
500
f (MHz)
1000


7Z62893
$|s_{fe}|$ (dB)
arg s_{fe}
125°
100°
75°
50°
25°
I_E = 100 mA
V_{CE} = 28 V
typ. values
30
20
10
0
0
500
f (MHz)
1000


7Z62891
$|s_{oe}|$ (dB)
arg s_{oe}
−100°
−75°
−50°
−25°
I_E = 100 mA
V_{CE} = 28 V
typ. values
−15
−10
−5
0
0
500
f (MHz)
1000

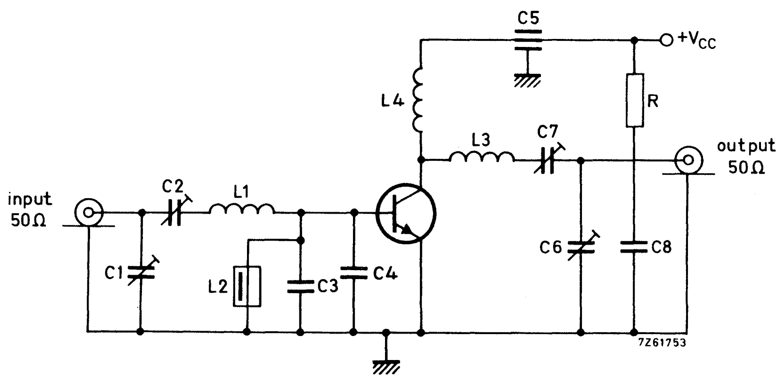
APPLICATION INFORMATION

R.F. performance in c.w. operation (Unneutralized common-emitter class-B circuit)

T_h = 25 °C

V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (mA)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
24	470	typ. 0,2	2,4	typ. 143	typ. 10,8	typ. 70	–	–
28	470	< 0,2	2,5	< 149	> 11,0	> 60	–	–
28	470	typ. 0,2	3,0	typ. 162	typ. 11,7	typ. 66	1,8 + j2,8	7,2 – j24
28	1000	typ. 0,7	2,5	typ. 179	typ. 5,5	typ. 50	–	–

Test circuit for 470 MHz:



C1 = C2 = 1,8 to 18 pF film dielectric trimmer
C3 = C4 = 18 pF disc ceramic capacitor
C5 = 1 nF feed-through capacitor
C6 = C7 = 1,0 to 9,0 pF film dielectric trimmer
C8 = 0,1 μF polyester capacitor

L1 = 1 turn Cu wire (1,2 mm); int. dia. 5 mm; lead length = 2 mm
L2 = 0,47 μH choke
L3 = 2 turns closely wound enamelled Cu wire (1,2 mm); int. dia. 6,5 mm; lead length = 4 mm
L4 = 3 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm; lead length = 5 mm

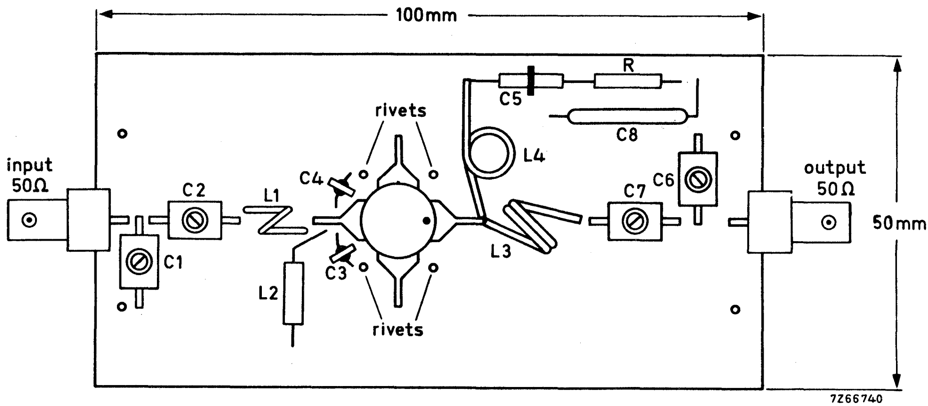
R = 10 Ω carbon

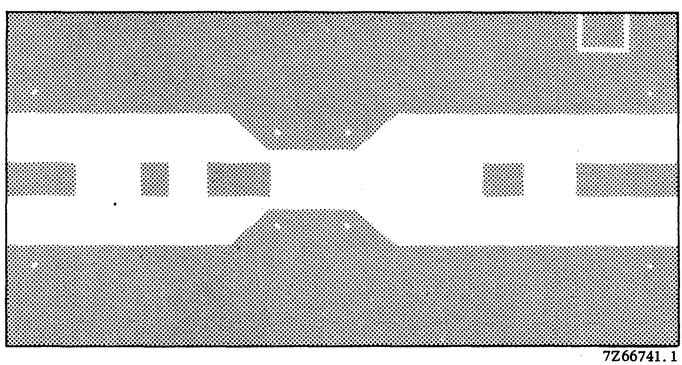
At P_L = 2,5 W and V_{CC} = 28 V, the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 5 mw/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 28 V; f = 470 MHz; T_h = 90 °C.
VSWR = 50 : 1 through all phases; P_L = 2,5 W.

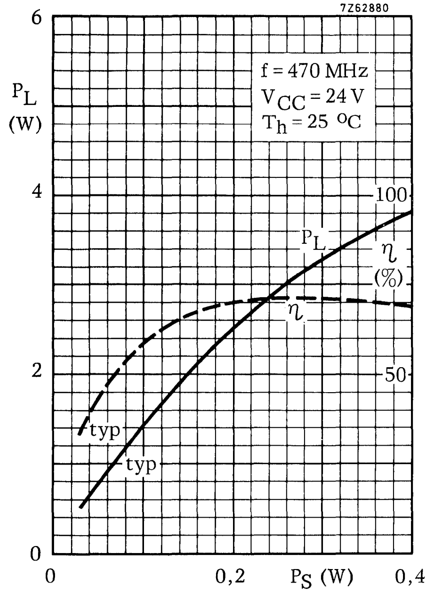
APPLICATION INFORMATION (continued)

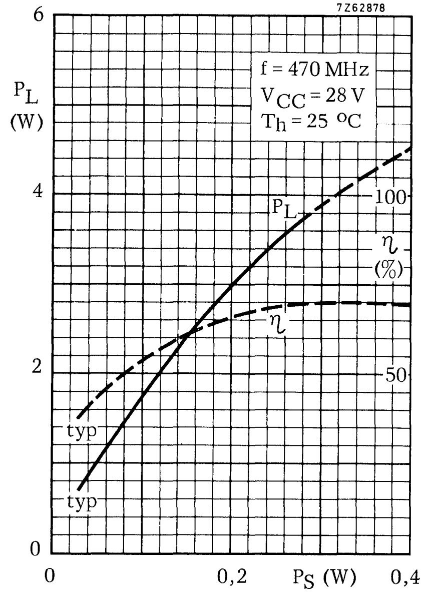
Component layout and printed-circuit board for 470 MHz test circuit.

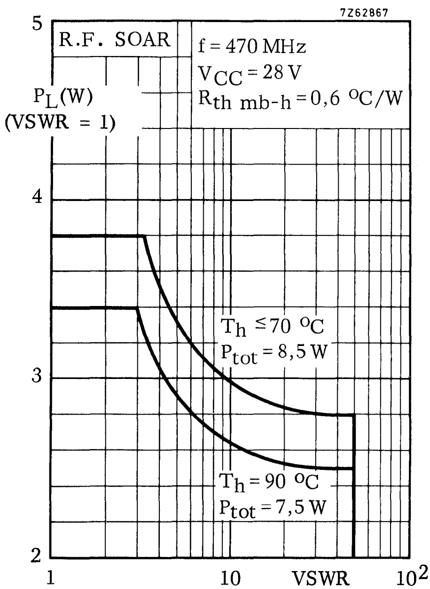




Shade area copper
Back area completely copper clad
Material of printed-circuit board: 1,5 mm epoxy fibre-glass



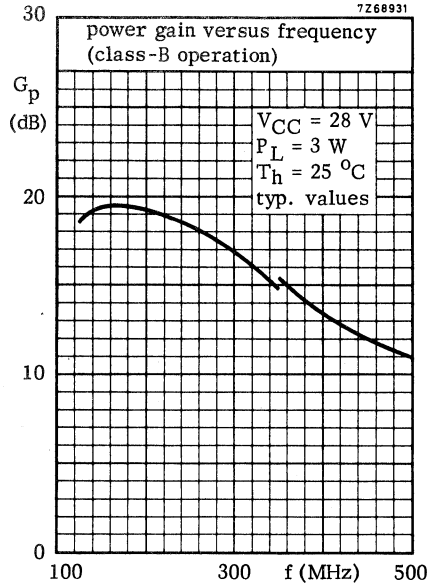


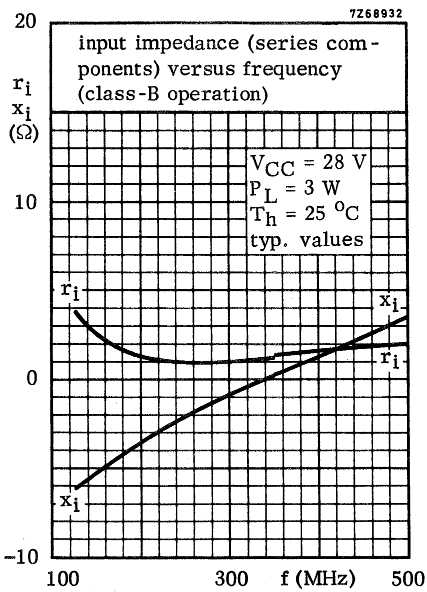


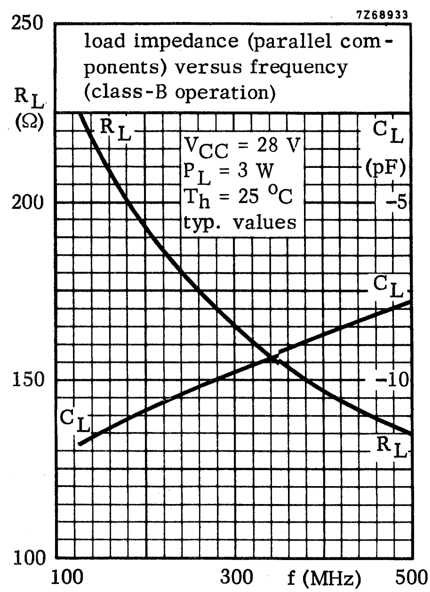
Indicated load power as a function of overload

The graph has been derived from an evaluation of the performance of transistors matched up to 3,8 W load power in the test amplifier and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures. This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

OPERATING NOTE Below 350 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C with a supply voltage up to 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions. Gold metallization ensures extremely high reliability.

It has a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

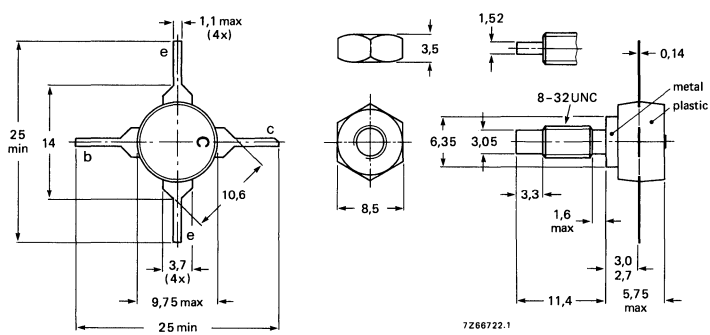
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	24	470	typ. 1,0	7,0	typ. 0,42	typ. 8,5	typ. 70	–	–
c.w.	28	470	< 1,0	7,0	< 0,42	> 8,5	> 60	–	–
c.w.	28	470	typ. 1,0	8,0	typ. 0,38	typ. 9,0	typ. 75	1,8 + j5,3	19 – j32
c.w.	28	1000	typ. 1,5	5,0	typ. 0,40	typ. 5,2	typ. 45	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	33	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4,0	V
Collector current (d.c.)	I_C	max.	1,0	A
Collector current (peak value) f ≥ 10 MHz	I_{CM}	max.	3,0	A
Total power dissipation up to T_h = 70 °C f ≥ 10 MHz	P_{tot}	max.	12,5	W
Storage temperature	T_{stg}		-65 to +150	°C
Operating junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

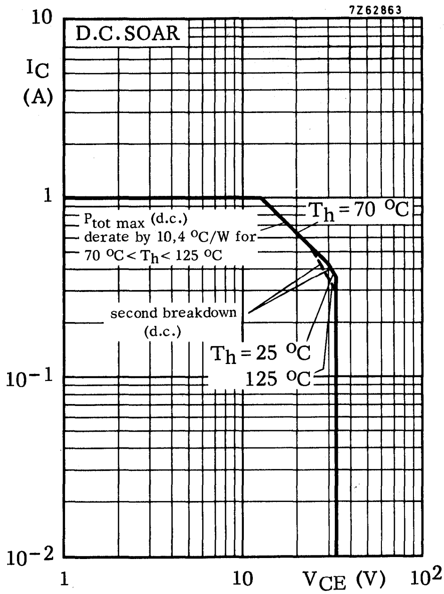
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	9,8	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

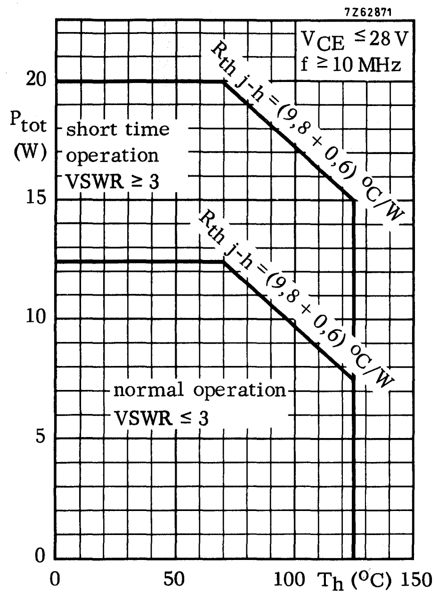
CHARACTERISTICS

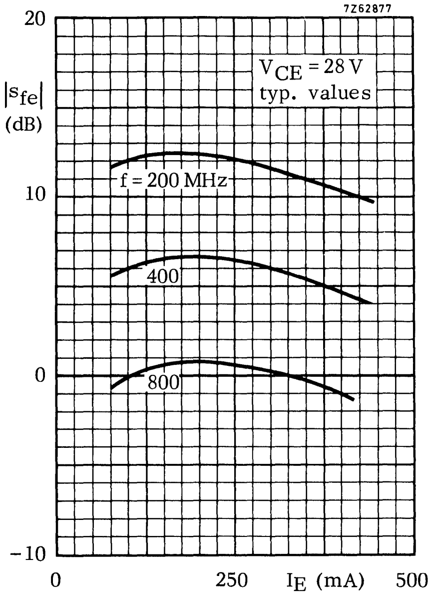
T_j = 25 °C unless otherwise specified

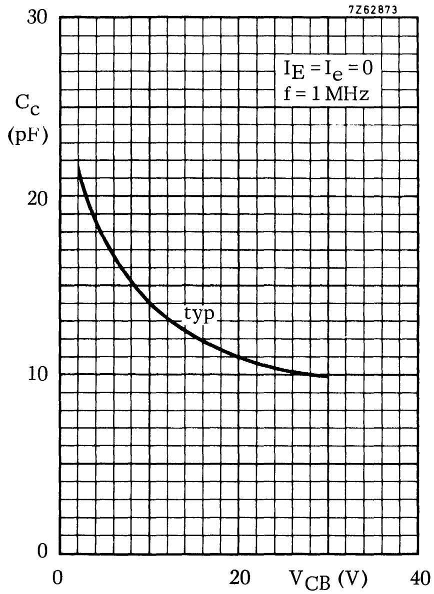
Breakdown voltages

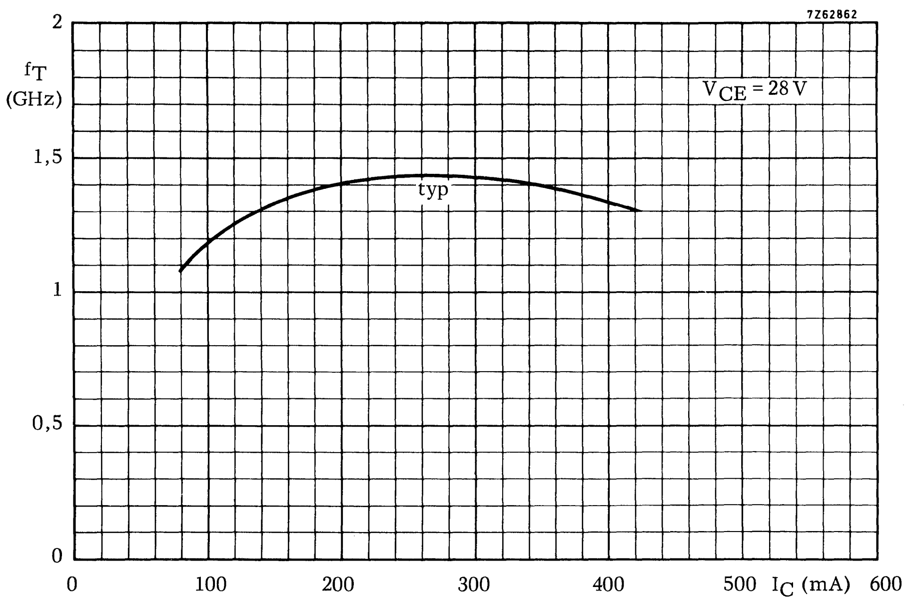
Collector-base voltage open emitter, I_C = 10 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, I_C = 10 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	33	V
Emitter-base voltage open collector, I_E = 1,0 mA	$V_{(BR)EBO}$	>	4,0	V
D.C. current gain I_C = 100 mA; V_{CE} = 5,0 V	h_{FE}	> typ.	10 35	
Transition frequency I_C = 200 mA; V_{CE} = 5,0 V	f_T	typ.	1,2	GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; V_{CB} = 10 V	C_c	typ.	14	pF
Emitter capacitance at f = 1 MHz $I_C = I_c = 0$; V_{EB} = 0	C_e	typ.	60	pF
Feedback capacitance at f = 1 MHz I_C = 20 mA; V_{CE} = 10 V	C_{re}	typ.	10	pF
Collector-stud capacitance	C_{cs}	typ.	2,0	pF

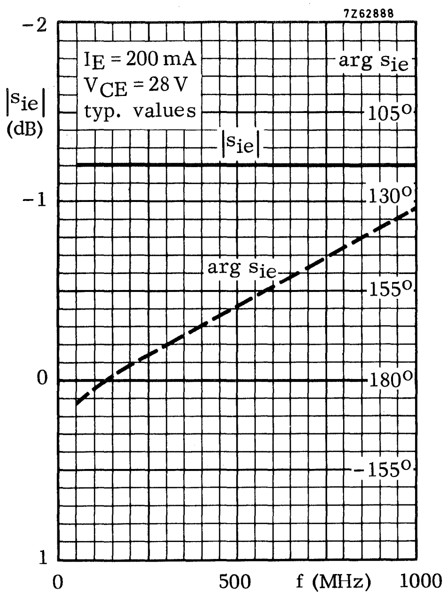

7Z62863
D.C.SOAR
10
I_C
(A)
1
$P_{tot\,max}$ (d.c.)
derate by 10,4 °C/W for
70 °C < T_h < 125 °C
T_h = 70 °C
second breakdown
(d.c.)
T_h = 25 °C
125 °C
10^{-1}
10^{-2}
1
10
V_{CE} (V)
10^2

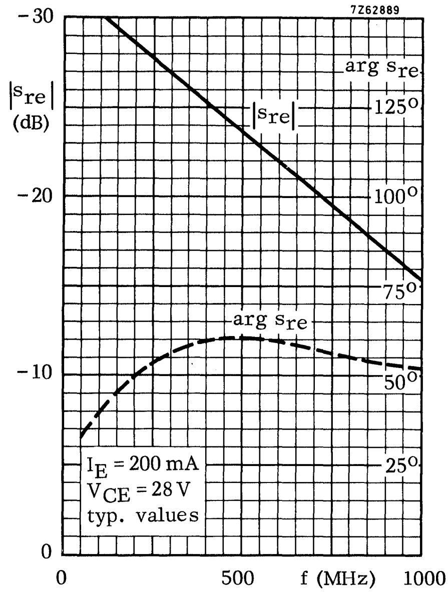

7Z62871
V_{CE} ≤ 28 V
f ≥ 10 MHz
$R_{th\ j\text{-}h}$ = (9,8 + 0,6) °C/W
short time
operation
VSWR ≥ 3
P_{tot}
(W)
20
15
10
5
0
$R_{th\ j\text{-}h}$ = (9,8 + 0,6) °C/W
normal operation
VSWR ≤ 3
0
50
100
T_h (°C)
150

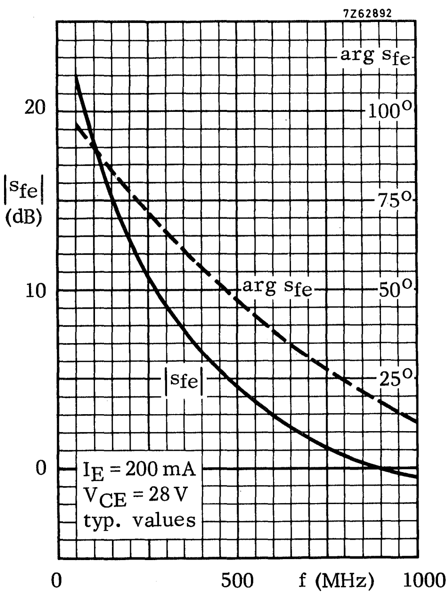

7Z62877
$|s_{fe}|$ (dB)
20
10
0
−10
V_{CE} = 28 V
typ. values
f = 200 MHz
400
800
0
250
I_E (mA)
500

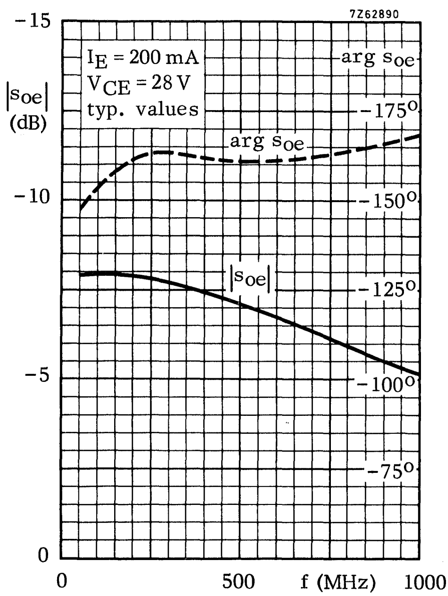

7Z62873
C_c (pF)
30
20
10
0
$I_E = I_e = 0$
f = 1 MHz
typ
0
20
V_{CB} (V)
40


7Z62862
f_T (GHz)
2
1,5
1
0,5
0
V_{CE} = 28 V
typ
0
100
200
300
400
500
I_C (mA)
600


7Z62888
I_E = 200 mA
V_{CE} = 28 V
typ. values
$|s_{ie}|$ (dB)
arg s_{ie}
$|s_{ie}|$
-2
-1
0
1
105°
130°
155°
180°
-155°
0
500
f (MHz)
1000


7Z62889
$|s_{re}|$ (dB)
arg s_{re}
$|s_{re}|$
I_E = 200 mA
V_{CE} = 28 V
typ. values
-30
-20
-10
0
125°
100°
75°
50°
25°
0
500
f (MHz)
1000


7Z62892
arg s_{fe}
$|s_{fe}|$ (dB)
$|s_{fe}|$
I_E = 200 mA
V_{CE} = 28 V
typ. values
20
10
0
100°
75°
50°
25°
0
500
f (MHz)
1000


7Z62890
I_E = 200 mA
V_{CE} = 28 V
typ. values
$|s_{oe}|$ (dB)
arg s_{oe}
$|s_{oe}|$
-15
-10
-5
0
-175°
-150°
-125°
-100°
-75°
0
500
f (MHz)
1000

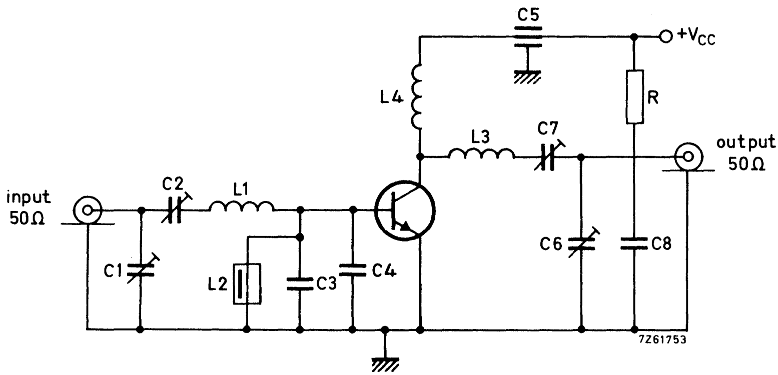
APPLICATION INFORMATION

R.F. performance in c.w. operation (Unneutralized common-emitter class-B circuit)

T_h = 25 °C

V_{CC} (V)	f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
24	470	typ. 1,0	7,0	typ. 0,42	typ. 8,5	typ. 70	–	–
28	470	< 1,0	7,0	< 0,42	> 8,5	> 60	–	–
28	470	typ. 1,0	8,0	typ. 0,38	typ. 9,0	typ. 75	1,8 + j5,3	19 – j32
28	1000	typ. 1,5	5,0	typ. 0,40	typ. 5,2	typ. 45	–	–

Test circuit for 470 MHz:



C1 = C2 = 1,8 to 18 pF film dielectric trimmer
C3 = C4 = 18 pF disc ceramic capacitor
C5 = 1 nF feed-through capacitor
C6 = C7 = 1,0 to 9,0 pF film dielectric trimmer
C8 = 0,1 µF polyester capacitor

L1 = 1 turn Cu wire (1,2 mm); int. dia. 5 mm; lead length = 2 mm
L2 = 0,47 µH choke
L3 = 2 turns closely wound enamelled Cu wire (1,2 mm); int. dia. 6,5 mm; lead length = 4 mm
L4 = 3 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm; lead length = 5 mm

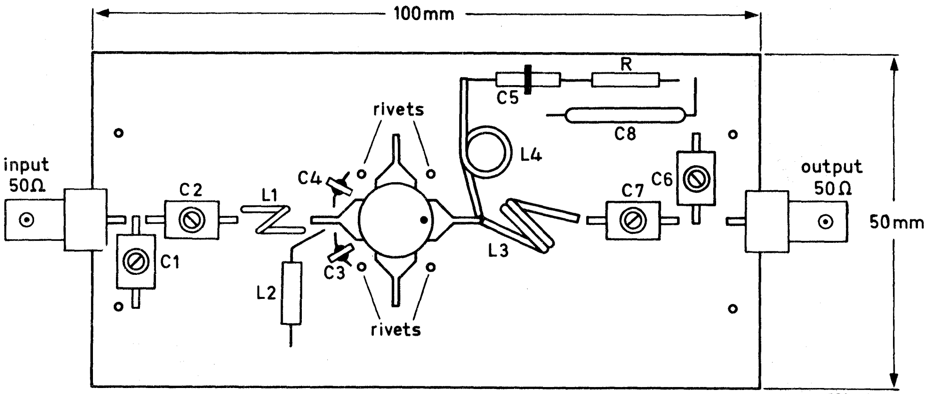
R = 10 Ω carbon

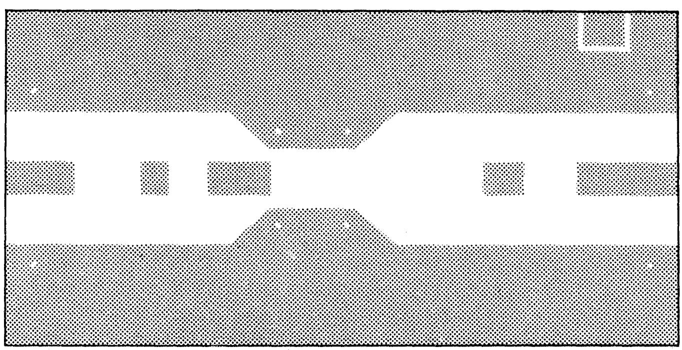
At P_L = 7,0 W and V_{CC} = 28 V, the output power at heatsink temperatures between 25 °C and 90 °C relative to that at 25 °C is diminished by typ. 10 mW/K

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CC} = 28 V; f = 470 MHz; T_h = 90 °C.
VSWR = 50 : 1 through all phases; P_L = 7,0 W.

APPLICATION INFORMATION (continued)

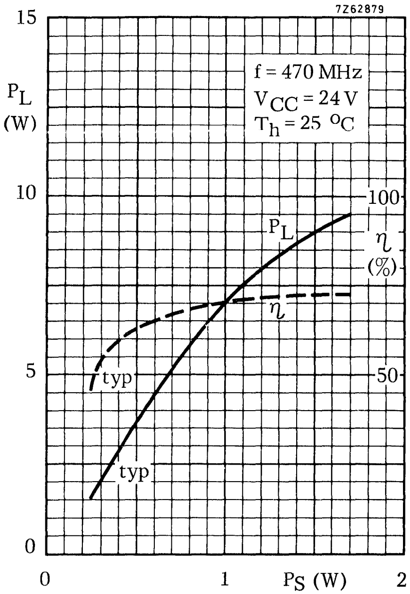
Component layout and printed-circuit board for 470 MHz test circuit.

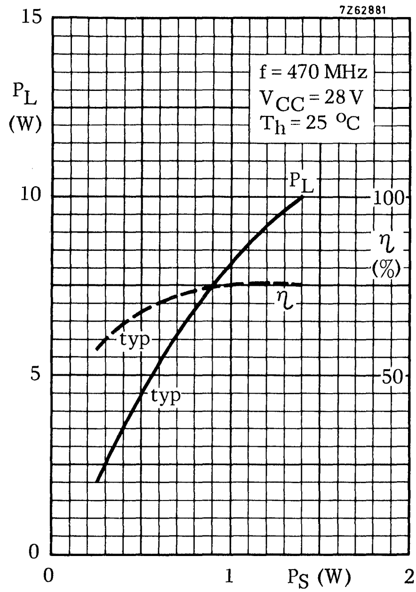


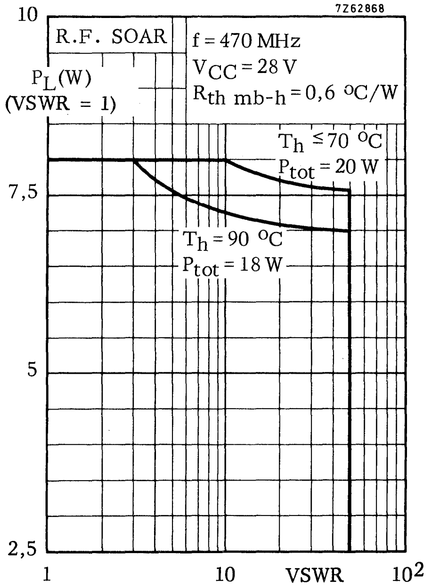


7Z66741.1

Shaded area copper
Back area completely copper clad
Material of printed-circuit board: 1,5 mm epoxy fibre-glass



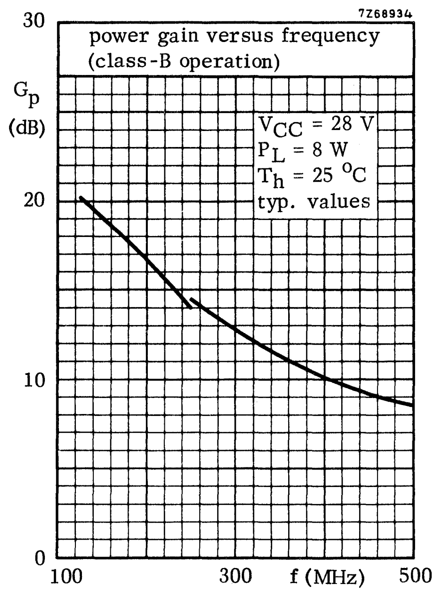


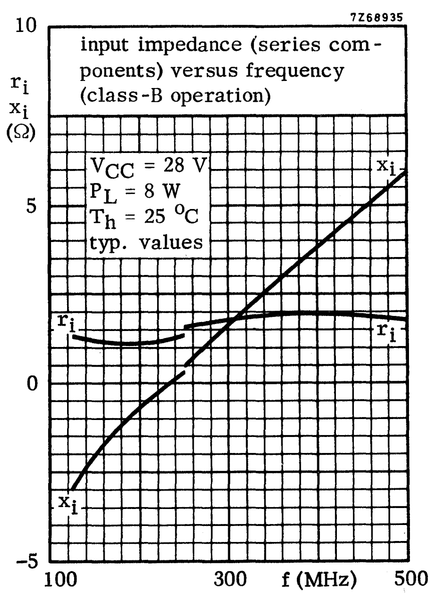


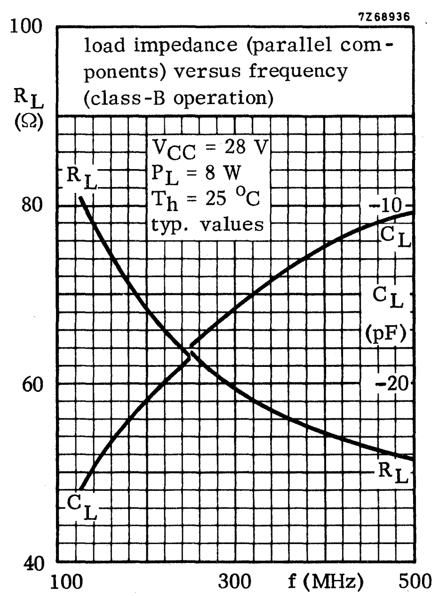
Indicated load power as a function of overload

The graph has been derived from an evaluation of the performance of transistors matched up to 8 W load power in the test amplifier and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures. This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

OPERATING NOTE Below 250 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







U.H.F. POWER TRANSISTORS

N-P-N silicon planar epitaxial transistors suitable for transmitting applications in class-A, B or C in the u.h.f. range for a nominal supply voltage up to 28 V. The transistors are resistance stabilized and tested under severe load mismatch conditions. Diffused emitter-ballasting resistors and gold sandwich metallization ensure excellent reliability properties.

These transistors are housed in capstan envelopes with ¼″ studs, the **BLX94A** has a transfer-moulded cap and the **BLX94C** a ceramic cap.

All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance at T_h = 25 °C in an unneutralized common-emitter class-B circuit

type number	mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %
BLX94A	c.w.	28	470	25	> 6	> 55
BLX94C	c.w.	28	470	25	> 6,5	> 55

MECHANICAL DATA

SOT-48/2 (see Fig. 1a) ←
SOT-122 (see Fig. 1b)

MECHANICAL DATA

Dimensions in mm

Fig. 1a SOT-48/2 (BLX94A)

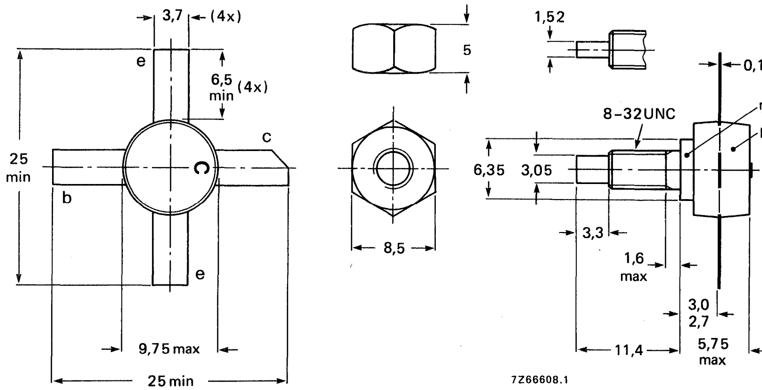
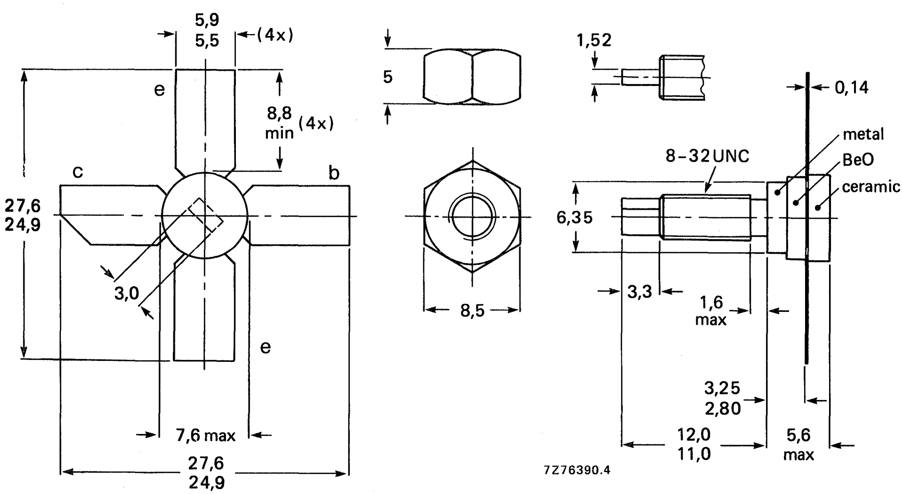


Fig. 1b SOT-122 (BLX94C)



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

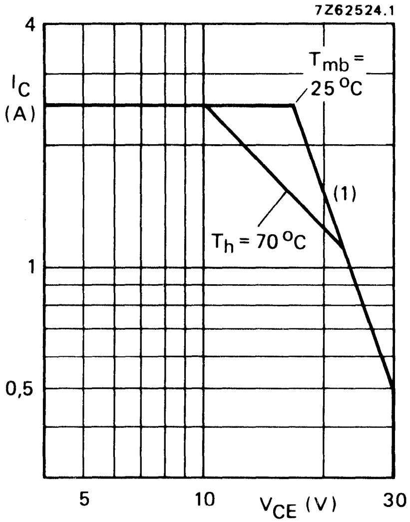
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage				
(peak value); $V_{BE} = 0$		V_{CESM}	max.	65 V
open base		V_{CEO}	max.	30 V
Emitter-base voltage (open collector)		V_{EBO}	max.	4 V
Collector current				
d.c. or average		I_C; $I_{C(AV)}$	max.	2,5 A
(peak value); f > 1 MHz		I_{CM}	max.	6,0 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C		P_{rf}	max.	60 W
Storage temperature	**BLX94A**	T_{stg}		−65 to +200 °C
	BLX94C	T_{stg}		−65 to +150 °C
Operating junction temperature		T_j	max.	200 °C



(1) Second breakdown limit (independent of temperature).

Fig. 2 D.C. SOAR.

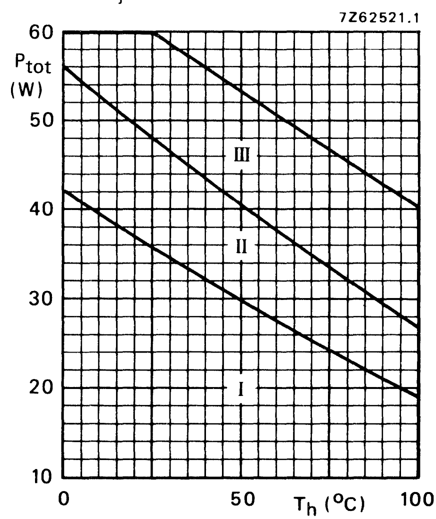


Fig. 3 Power derating curve vs. temperature.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 20 W; T_{mb} = 82 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	4,0 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,7 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 25$ mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage open base; $I_C = 100$ mA	$V_{(BR)CEO}$	>	30	V
Emitter-base breakdown voltage open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 30$ V	I_{CES}	<	10	mA
Second breakdown energy; L = 25 mH; f = 50 Hz				
open base	E_{SBO}	>	3	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	3	mJ
D.C. current gain * $I_C = 1{,}5$ A; $V_{CE} = 5$ V	h_{FE}	>	15	
		typ.	50	
Collector-emitter saturation voltage * $I_C = 4{,}0$ A; $I_B = 0{,}8$ A	V_{CEsat}	typ.	1,5	V
Transition frequency at f = 500 MHz *				
$-I_E = 1{,}5$ A; $V_{CB} = 28$ V	f_T	typ.	1,1	GHz
$-I_E = 4{,}0$ A; $V_{CB} = 28$ V	f_T	typ.	0,75	GHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	33	pF
Feedback capacitance at f = 1 MHz $I_C = 20$ mA; $V_{CE} = 28$ V	C_{re}	typ.	18	pF
→ Collector-stud capacitance	C_{cs}	typ.	1,2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.

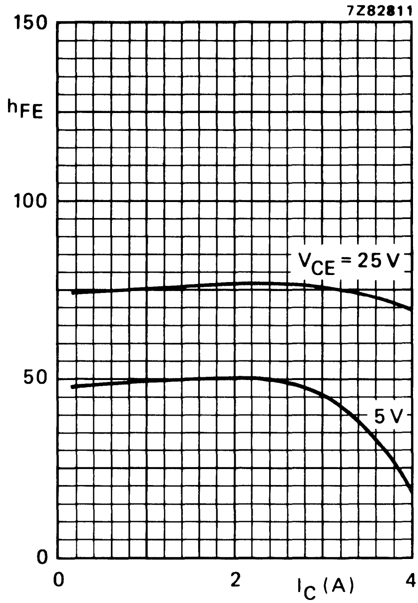


Fig. 4 Typical values; T_j = 25 °C.

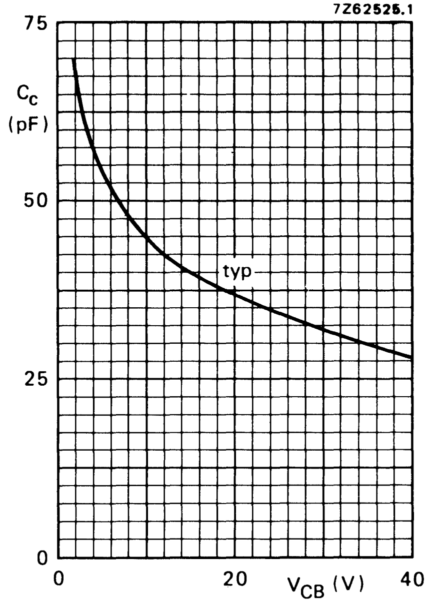


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

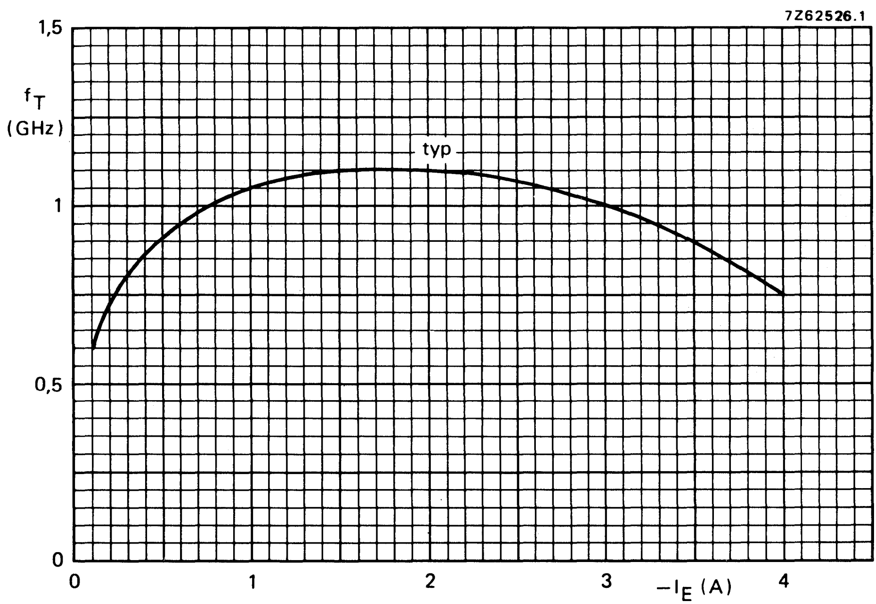


Fig. 6 V_{CB} = 28 V; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

f = 470 MHz; T_h = 25 °C

type number	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\bar{z}_i$ (Ω)	$\bar{Z}_L$ (Ω)
BLX94A	28	25	< 6,25	> 6	< 1,62	> 55	–	–
	28	25	typ. 5,6	typ. 6,5	typ. 1,49	typ. 60	0,9 + j4,1	6,6 + j6,4
BLX94C	28	25	< 5,6	> 6,5	< 1,62	> 55	–	–
	28	25	typ. 4,7	typ. 7,25	typ. 1,54	typ. 58	0,7 + j2,6	5,8 + j6,3

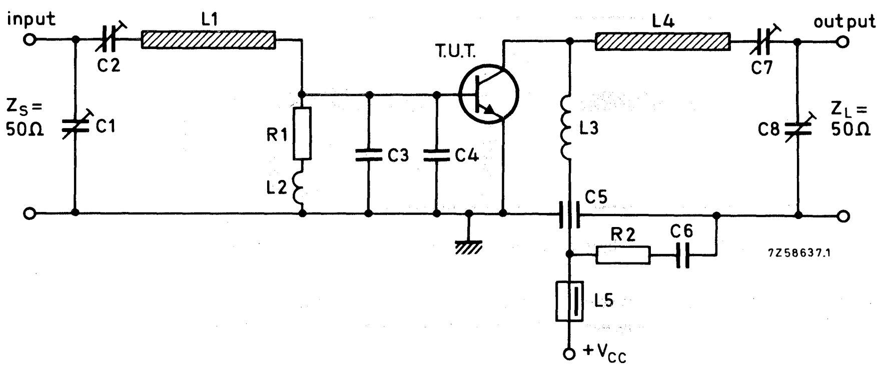


Fig. 7 470 MHz test circuit; c.w. class-B. For component layout and p.c.b. see Fig. 8.

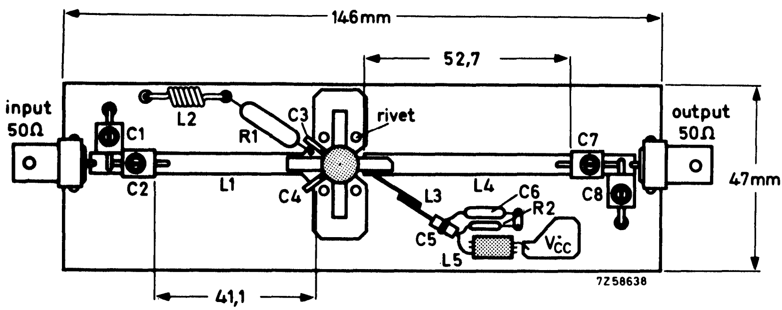
List of components:

C1 = C2 = C8 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C4 = 15 pF chip capacitor
C5 = 100 pF feed-through capacitor
C6 = 33 nF polyester capacitor
C7 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)

R1 = 1 Ω carbon resistor
R2 = 10 Ω carbon resistor

L1 = stripline (41,1 mm x 5,0 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 4,0 mm
L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4 mm; leads 2 x 5 mm
L4 = stripline (52,7 mm x 5,0 mm)
L5 = Ferroxcube choke coil. Z (at f = 50 MHz) = 750 Ω ± 20% (cat. no. 4312 020 36640)

L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric. (ϵ_r = 2,74); thickness 1,45 mm.



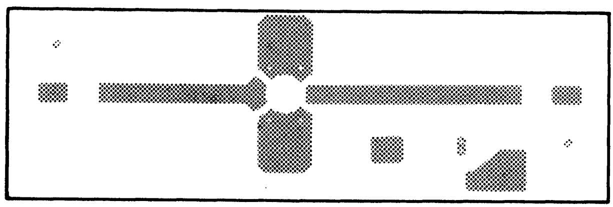


Fig. 8 Component layout and printed-circuit board for 470 MHz test circuit.

The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

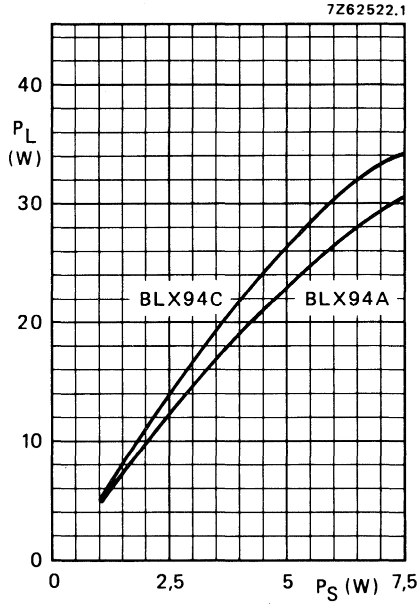


Fig. 9 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C; typical values.

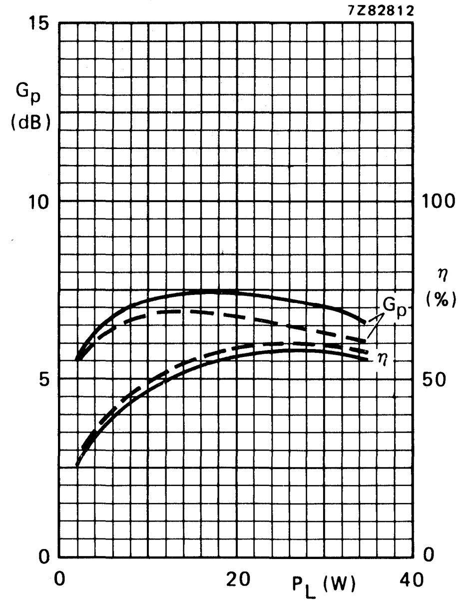


Fig. 10 V_{CE} = 28 V; f = 470 MHz; T_h = 25 °C; typ. values; ---- **BLX94A**; —— **BLX94C.**

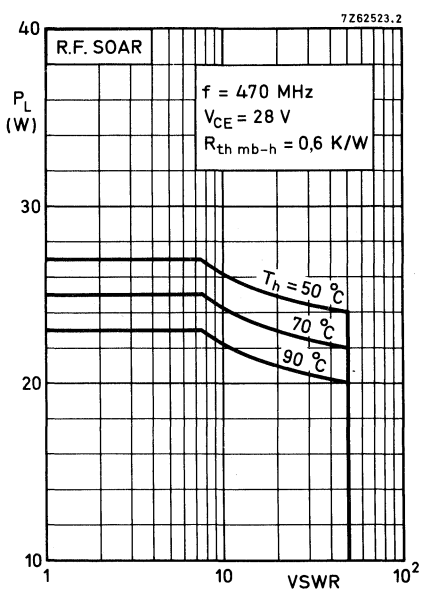


Fig. 11 For high voltage operation, a stabilized power supply is generally used. The graph shows the permissible output power under nominal conditions as a function of the VSWR, with heatsink temperature as parameter.

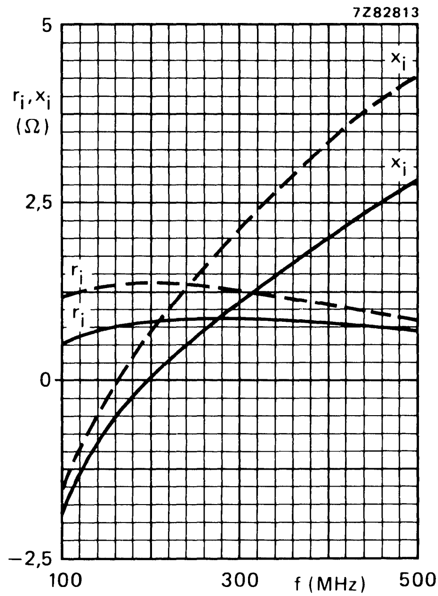


Fig. 12 Input impedance (series components).

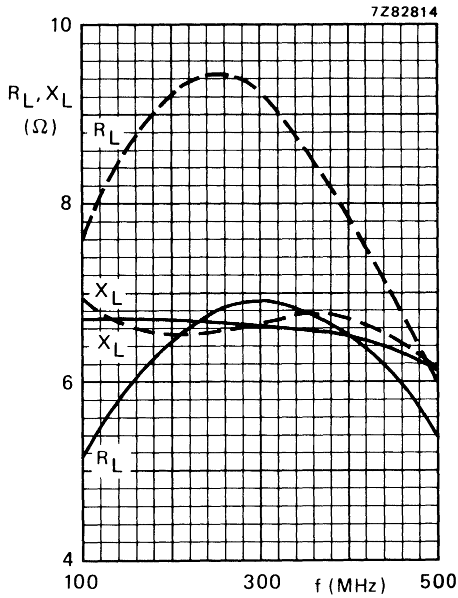


Fig. 13 Load impedance (series components).

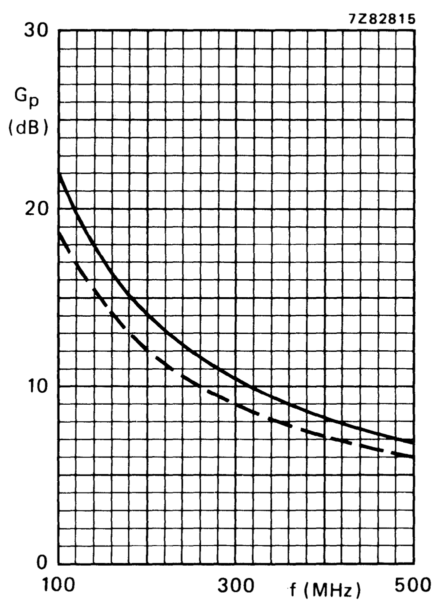


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 25 W;
T_h = 25 °C; class-B operation;
--- **BLX94A**; —— **BLX94C.**

U.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for transmitting applications in class-A, B or C in the u.h.f. frequency range for supply voltages up to 28 V. The transistor is resistance stabilized and is tested under severe load mismatch conditions. Due to a gold metallization excellent reliability properties have been obtained. The transistor is housed in a capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

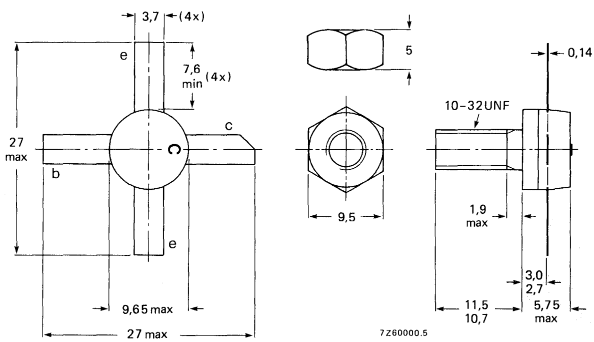
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %
c.w.	28	470	< 14,2	40	< 2,4	< 4,5	> 60
c.w.	28	175	typ. 3,2	40	typ. 1,9	typ. 11	typ. 75

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



Torque on nut: min. 1,5 Nm (15 kg cm)
max. 1,7 Nm (17 kg cm)

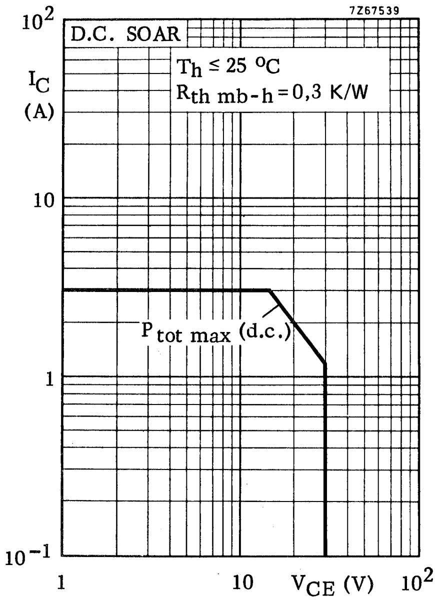
Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

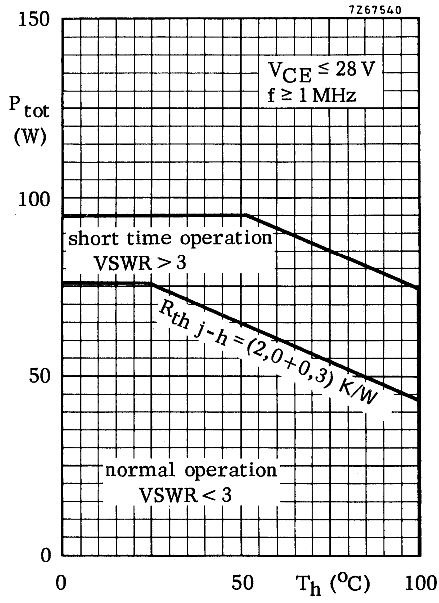
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage ($R_{BE} = 10\,\Omega$) peak value	V_{CERM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	30	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	3,0	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	10,0	A





Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

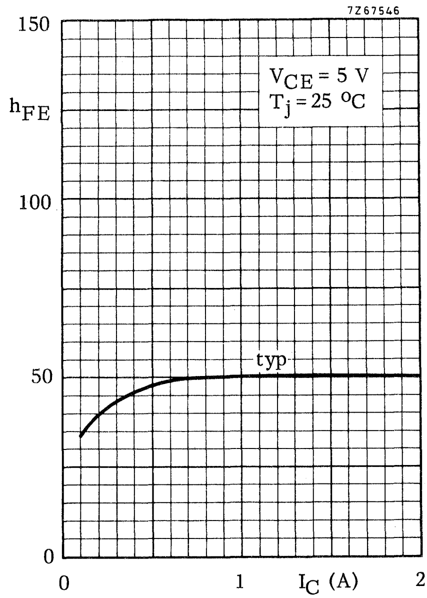
THERMAL RESISTANCE

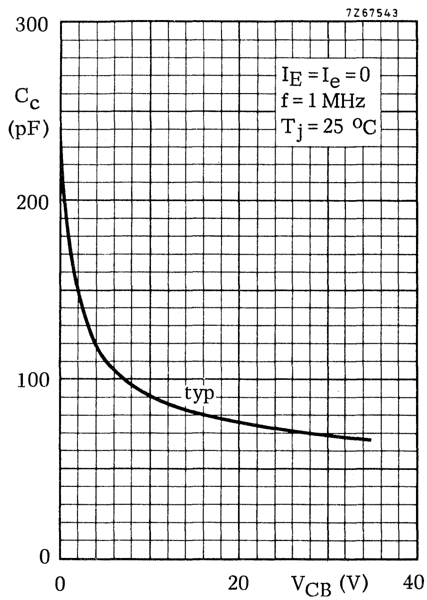
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	2,0	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,3	K/W

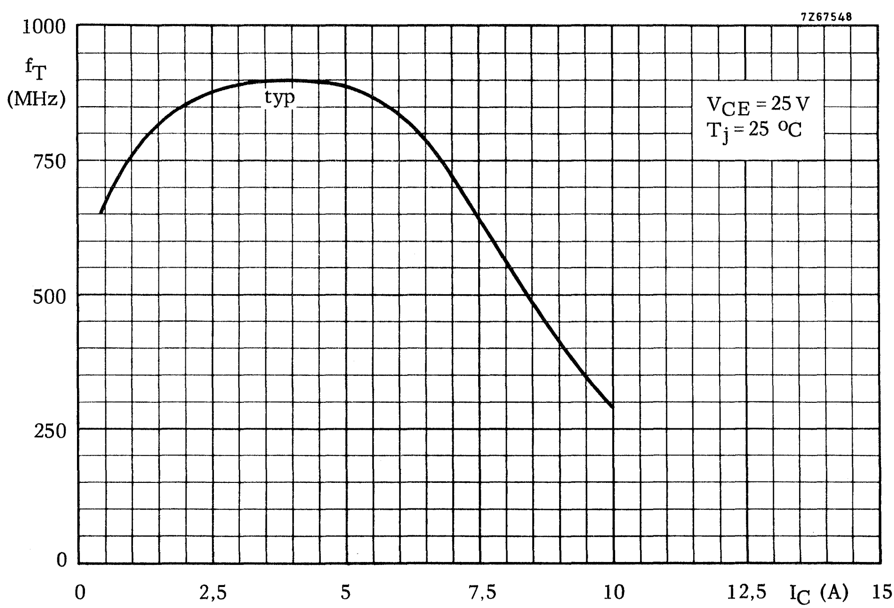
CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 50 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage R_{BE} = 10 Ω, I_C = 50 mA	$V_{(BR)CER}$	>	65	V
Collector-emitter voltage open base, I_C = 50 mA	$V_{(BR)CEO}$	>	30	V
Emitter-base voltage open collector, I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	4,5	mS
$-V_{BE}$ = 1,5 V; R_{BE} = 33 Ω	E	>	4,5	mS
D.C. current gain				
I_C = 1,0 A; V_{CE} = 5 V	h_{FE}	25 to 100		
Transition frequency				
I_C = 4 A; V_{CE} = 25 V	f_T	typ.	900	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 30 V	C_c	typ.	68	pF
		<	80	pF
Feedback capacitance at f = 1 MHz				
I_C = 200 mA; V_{CE} = 30 V	C_{re}	typ.	39	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z67546
150
100
50
0
hFE
VCE = 5 V
Tj = 25 °C
typ
0
1
IC (A)
2


7Z67543
300
200
100
0
Cc
(pF)
IE = Ie = 0
f = 1 MHz
Tj = 25 °C
typ
0
20
VCB (V)
40


7Z67548
1000
750
500
250
0
fT
(MHz)
typ
VCE = 25 V
Tj = 25 °C
0
2,5
5
7,5
10
12,5
IC (A)
15

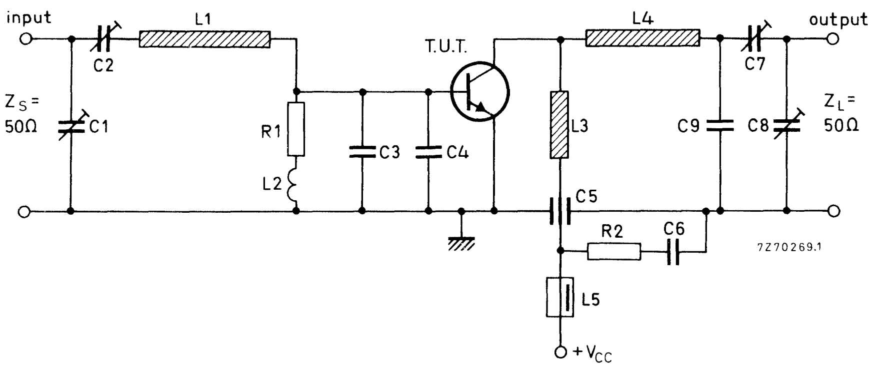
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

V_{CE} = 28 V; T_h up to 25 °C

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)
470	< 14,2	40	< 2,4	> 4,5	> 60
175	typ. 3,2	40	typ. 1,9	typ. 11	typ. 75

Test circuit: 470 MHz; c.w. class-B.



List of components:

C1 = C7 = C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C2 = 1,8 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C3 = C4 = 18 pF chip capacitor
C5 = 100 pF feed-through capacitor
C6 = 33 nF polyester capacitor
C9 = 2 x 3,3 pF miniature ceramic plate capacitors (in parallel)

R1 = 1 Ω carbon resistor (0,25 W)
R2 = 10 Ω carbon resistor (0,25 W)

L1 = stripline (21,4 mm x 5,3 mm)
L2 = 13 turns closely wound enamelled Cu wire (0,5 mm); internal diameter 4,0 mm
L3 = stripline (43,8 mm x 3,0 mm)
L4 = stripline (45,5 mm x 5,3 mm)
L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)

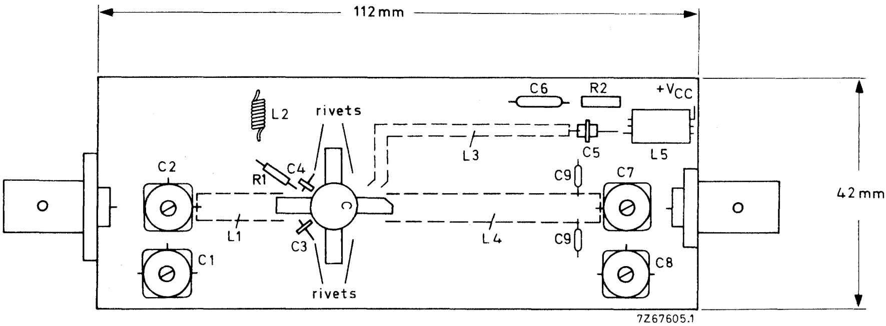
L1; L3; L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric. (ϵ_r = 2,74); thickness 1/32".

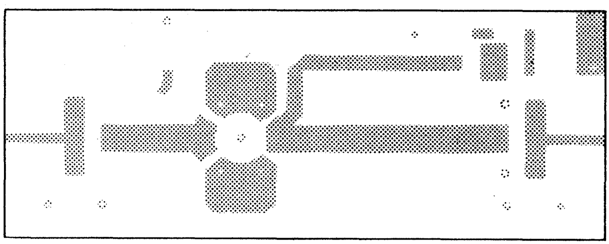
At P_L = 40 W and V_{CE} = 28 V, the output power at heatsink temperatures between 25 °C and 70 °C relative to that at 25 °C is diminished by typ. 50 mW/K.

The transistor is designed to withstand full load mismatch in the test circuit under the following conditions: V_{CE} = 28 V; f = 470 MHz; T_h = 70 °C.
VSWR = 50 through all phases; P_L = 36 W.

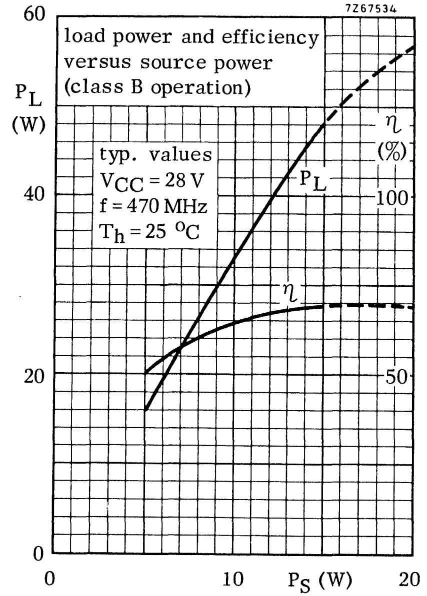
APPLICATION INFORMATION (continued)

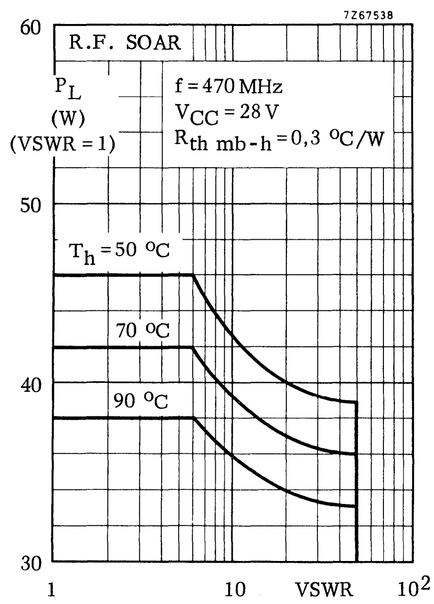
Component layout and printed-circuit board for 470 MHz test circuit.





The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.



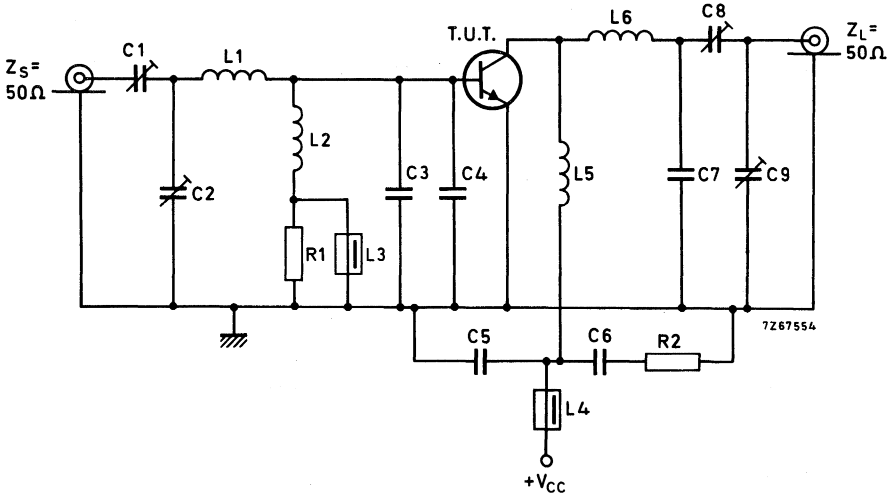


Indicated load power as a function of overload.

The graph has been derived from an evaluation of the performance of transistors matched up to 46 W load power in the test amplifier and subsequently subjected to various mismatch conditions at 28 V with VSWR up to 50 and elevated heatsink temperatures.
This indicates a restriction to the load power matched under nominal conditions in the recommended test configuration.

APPLICATION INFORMATION (continued)

Test circuit for 175 MHz:

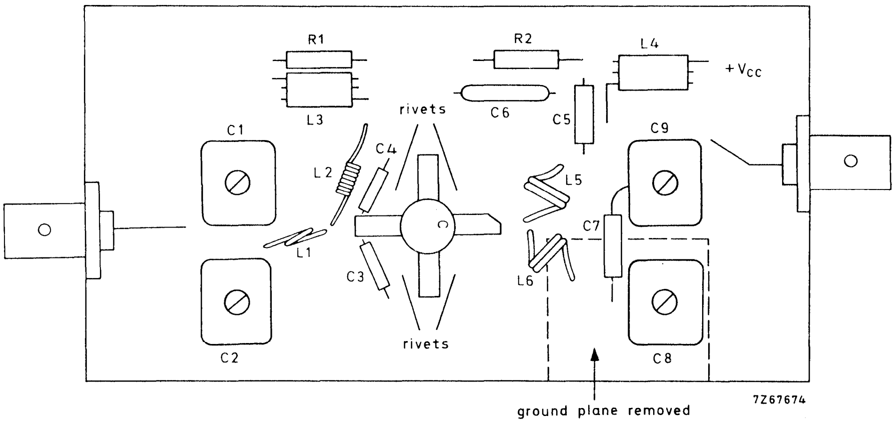


List of components:

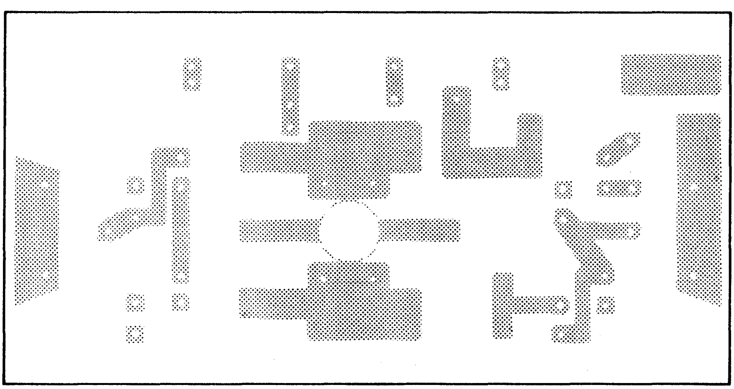
C1 =	2,5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
C2 =	4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
C3 = C4 =	47 pF ceramic capacitor
C5 =	100 pF ceramic capacitor
C6 =	100 nF polyester capacitor
C7 =	6,8 pF ceramic capacitor
C8 =	4 to 60 pF film dielectric trimmer (code number 2222 809 07011)
C9 =	4 to 100 pF film dielectric trimmer (code number 2222 809 07015)
L1 =	0,5 turn enamelled Cu wire (1,5 mm); int. diam. 6 mm; lead length 2 x 6 mm
L2 =	100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. diam. 3 mm; lead length 2 x 5 mm
L3 = L4 =	ferroxcube choke coil (code number 4312 020 36640)
L5 =	53 nH; 2 turns enamelled Cu wire (1,5 mm); int. diam. 10 mm; coil length 5,2 mm; lead length 2 x 5 mm
L6 =	46 nH; 2 turns enamelled Cu wire (1,5 mm); int. diam. 9 mm; coil length 5,4 mm; lead length 2 x 5 mm
R1 = R2 =	10 Ω carbon resistor (0,25W)

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

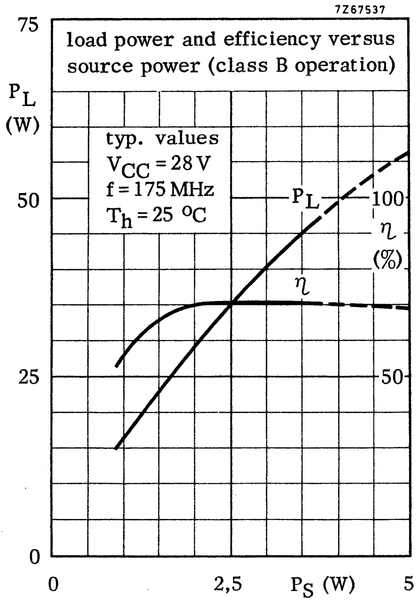


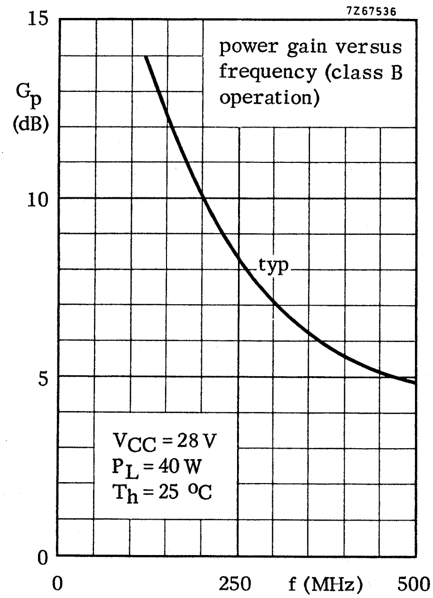
Dimensions of printed circuit board 123 mm x 55 mm.

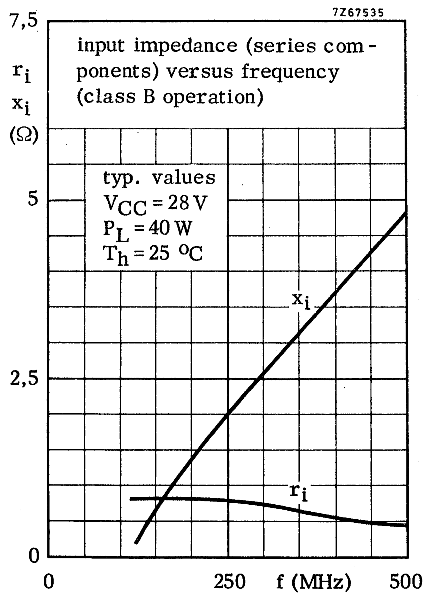


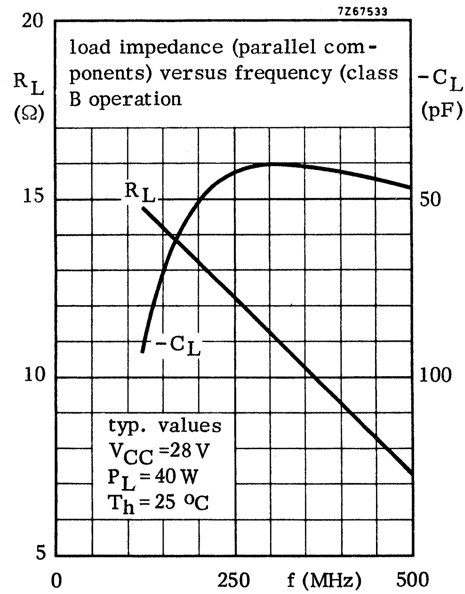
7Z66943

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.


7Z67537
load power and efficiency versus source power (class B operation)
typ. values
V_{CC} = 28 V
f = 175 MHz
T_h = 25 °C
P_L (W)
75
50
25
0
P_L
η
100
η (%)
50
0
2,5
P_S (W)
5


7Z67536
power gain versus frequency (class B operation)
G_p (dB)
15
10
5
0
typ
V_{CC} = 28 V
P_L = 40 W
T_h = 25 °C
0
250
f (MHz)
500


7Z67535
input impedance (series components) versus frequency (class B operation)
r_i
x_i
(Ω)
7,5
5
2,5
0
typ. values
V_{CC} = 28 V
P_L = 40 W
T_h = 25 °C
x_i
r_i
0
250
f (MHz)
500


7Z67533
load impedance (parallel components) versus frequency (class B operation
R_L (Ω)
20
15
10
5
$-C_L$ (pF)
50
100
R_L
$-C_L$
typ. values
V_{CC} = 28 V
P_L = 40 W
T_h = 25 °C
0
250
f (MHz)
500

U.H.F. LINEAR POWER TRANSISTOR

N-P-N multi-emitter silicon planar epitaxial transistor primarily for use in linear u.h.f. amplifiers for television transposers and transmitters.

Features:

- guaranteed low intermodulation figures;
- gold metallization ensures excellent reliability.

The transistor has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

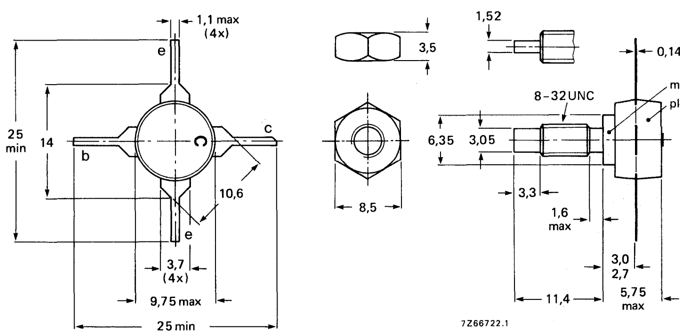
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A	860	25	250	25	−60	> 0,5	> 6
class-A	860	25	250	25	−60	typ. 0,6	typ. 7

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

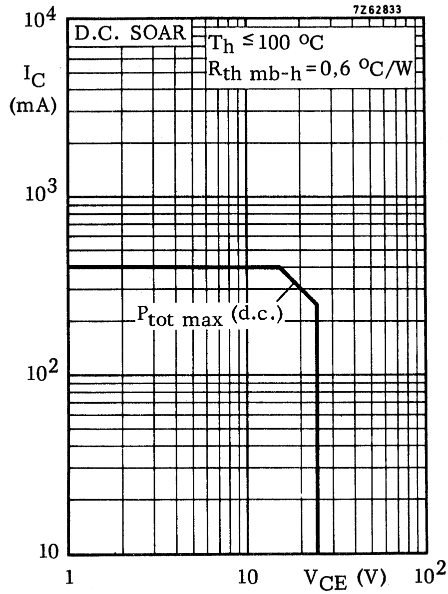
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage (R_{BE} = 10 Ω; peak value)	V_{CERM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	0,4	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	1	A
Total power dissipation up to T_h = 100 °C	P_{tot}	max.	6,25	W



Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

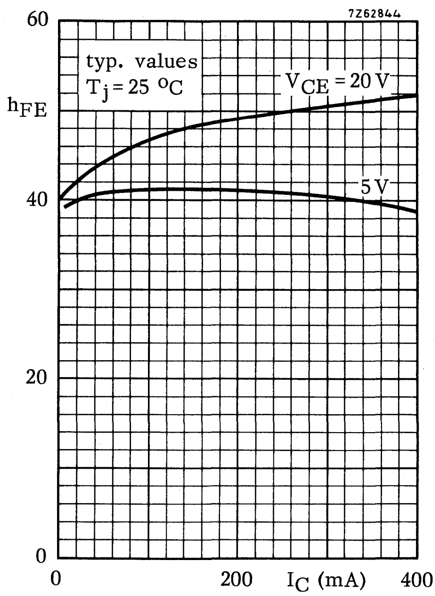
THERMAL RESISTANCE

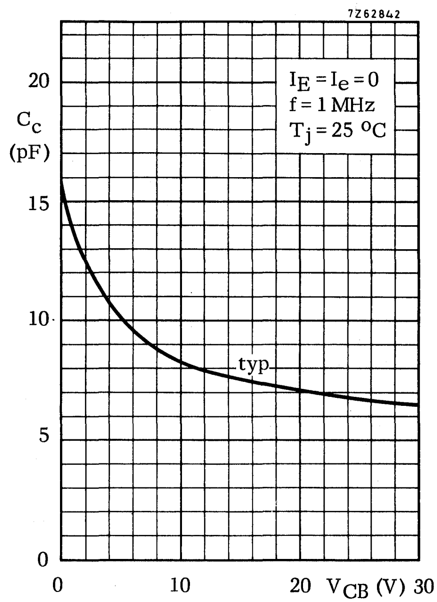
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	15	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6	K/W

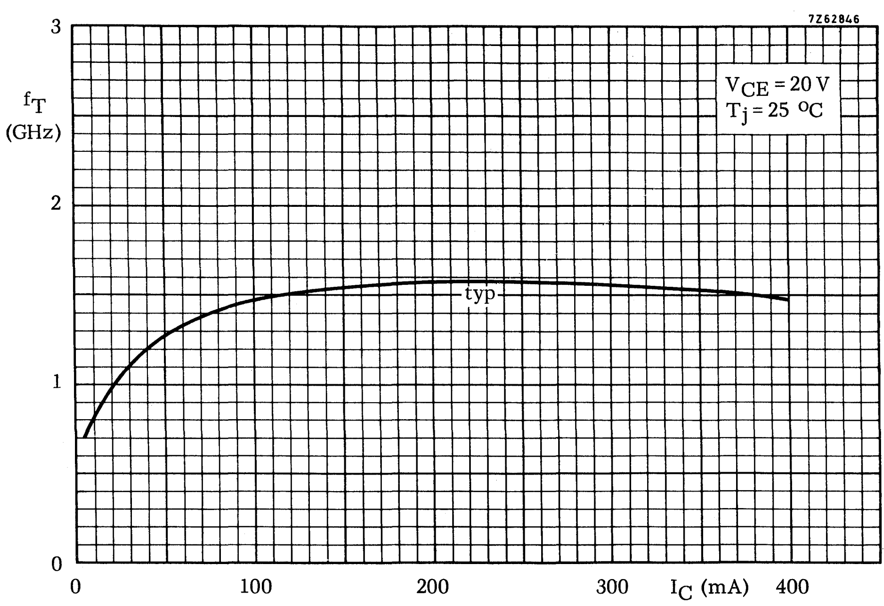
CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	100	μA
Breakdown voltages				
Collector-base voltage open emitter; $I_C = 1$ mA	$V_{(BR)CBO}$	>	40	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$; $I_C = 5$ mA	$V_{(BR)CER}$	>	40	V
open base; $I_C = 5$ mA	$V_{(BR)CEO}$	>	27	V
Emitter-base voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	3,5	V
Saturation voltage				
$I_C = 200$ mA; $I_B = 20$ mA	V_{CEsat}	<	0,75	V
D.C. current gain				
$I_C = 200$ mA; $V_{CE} = 20$ V	h_{FE}	>	30	
$I_C = 400$ mA; $V_{CE} = 20$ V	h_{FE}	>	20	
Transition frequency				
$I_C = 200$ mA; $V_{CE} = 20$ V	f_T	>	1,2	GHz
$I_C = 350$ mA; $V_{CE} = 20$ V	f_T	>	1,0	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 20$ V	C_c	<	10	pF
Feedback capacitance at f = 1 MHz				
$I_C = 10$ mA; $V_{CE} = 20$ V; $T_{mb} = 25$ °C	C_{re}	typ.	3,5	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z62844
60
40
20
0
typ. values
Tj = 25 oC
hFE
VCE = 20 V
5 V
0
200
IC (mA)
400


7Z62842
20
15
10
5
0
Cc
(pF)
IE = Ie = 0
f = 1 MHz
Tj = 25 oC
typ
0
10
20
VCB (V)
30

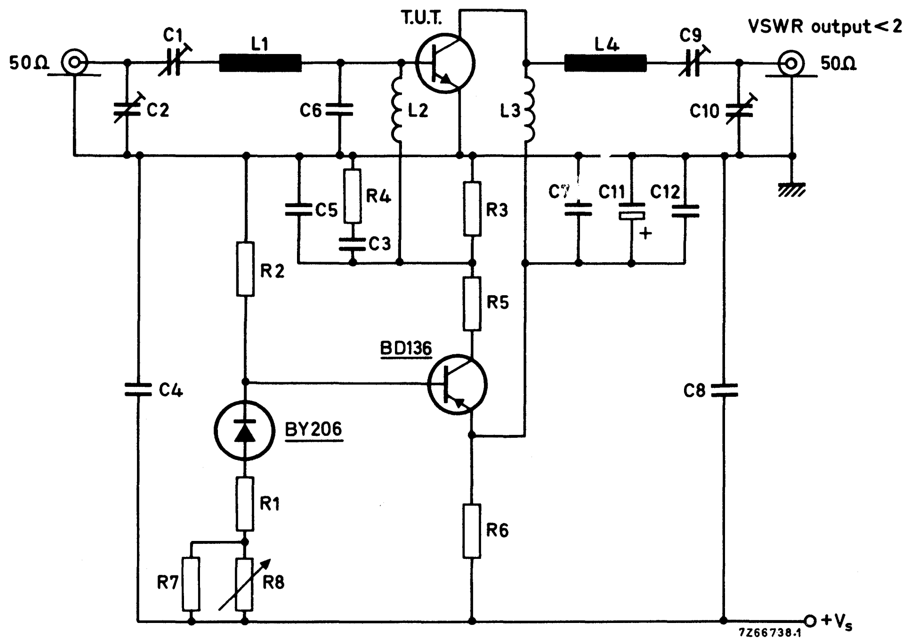

7Z62846
3
2
1
0
fT
(GHz)
VCE = 20 V
Tj = 25 oC
typ
0
100
200
300
IC (mA)
400

APPLICATION INFORMATION

d_{im}(dB) *)	f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	G_p (dB)	$P_{o\ sync}$ (W) *)	T_h (°C)
−60	860	25	250	> 6	> 0,5	25
−60	860	25	250	typ. 7	typ. 0,6	25

*) Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

Test circuit at f_{vision} = 860 MHz



List of components:

C1 = C2 = C10 = 2 to 9 pF film dielectric trimmers
C3 = C4 = C12 = 100 nF polyester capacitors
C5 = C7 = C8 = 100 pF feed-through capacitors
C6 = 2 x 2,7 pF in parallel, chip capacitors
C9 = 2 to 18 pF film dielectric trimmer
C11 = 10 μF/40 V solid aluminium electrolytic capacitor

R1 = 220 Ω
R2 = 4,7 kΩ
R3 = 100 Ω
R4 = 10 Ω

R5 = 470 Ω (1 W)
R6 = 3 x 22 Ω in parallel; (1 W)
R7 = 12 kΩ
R8 = 1 kΩ

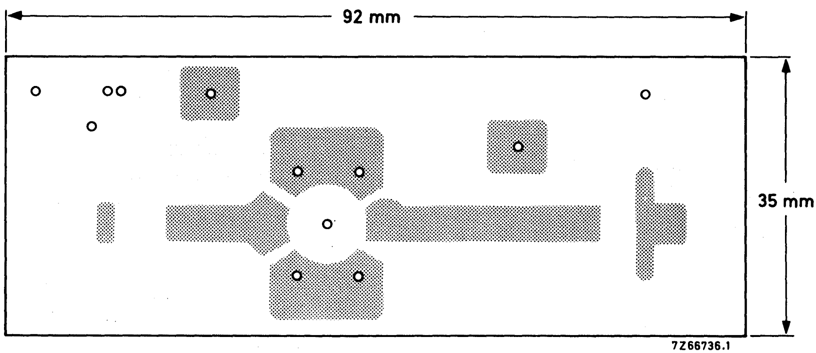
APPLICATION INFORMATION (continued)

List of components: (continued)

L1 = stripline (14,8 mm x 4,3 mm)
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm
L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4,5 mm; leads 2 x 5 mm
L4 = stripline (29,5 mm x 4,3 mm)

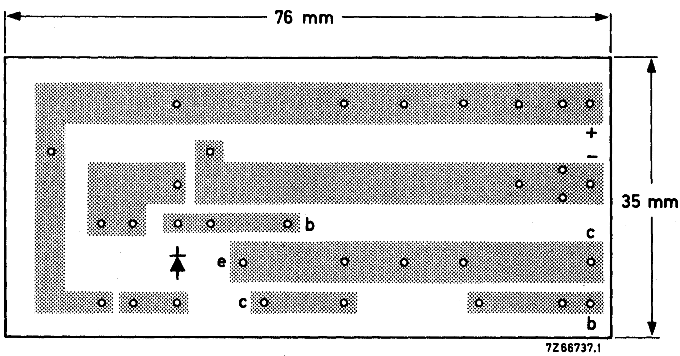
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1,45 mm.

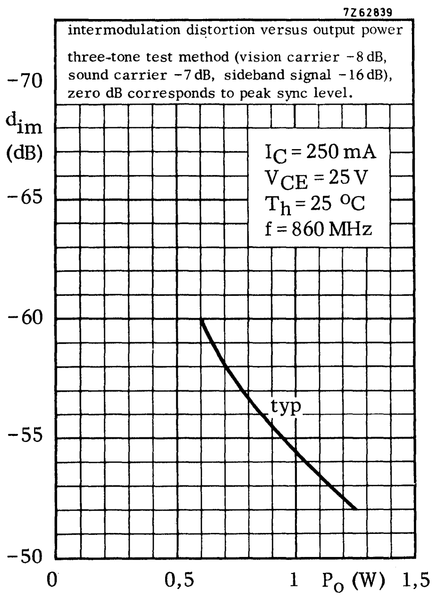
Layout of printed-circuit board for 860 MHz test circuit.

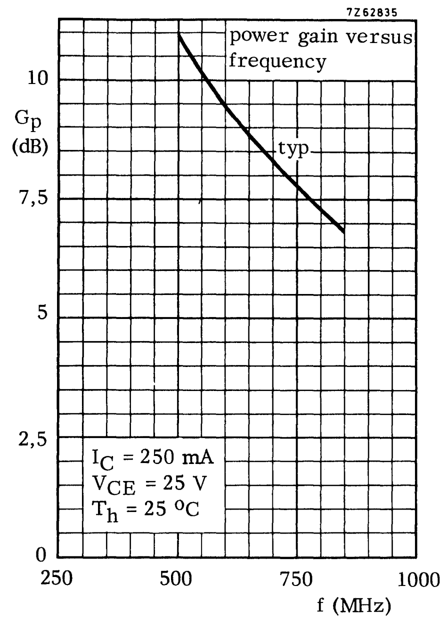


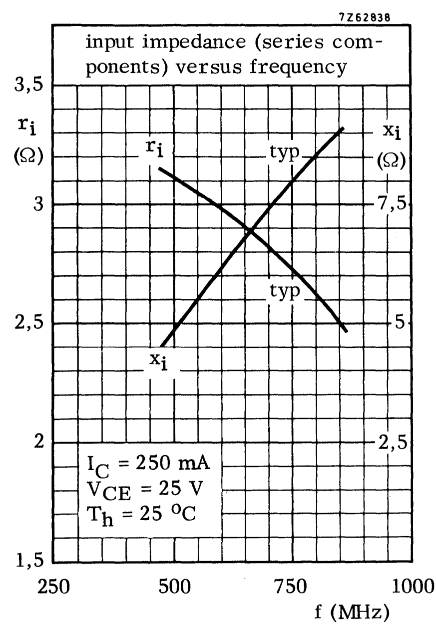
The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

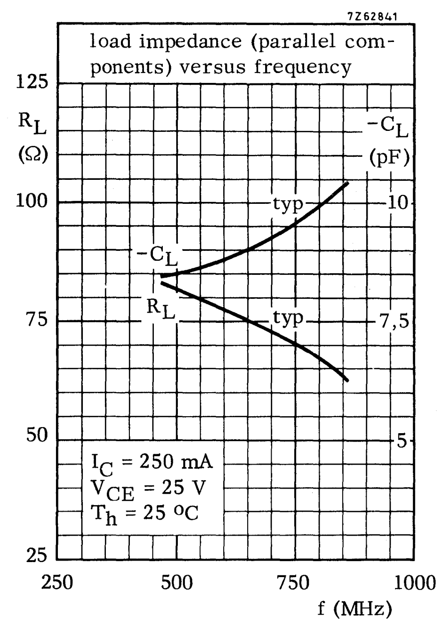
Layout of printed board bias circuit.




7Z62839
intermodulation distortion versus output power
three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
I_C = 250 mA
V_{CE} = 25 V
T_h = 25 °C
f = 860 MHz
typ
d_{im} (dB)
−70
−65
−60
−55
−50
0
0,5
1
P_o (W)
1,5


7Z62835
power gain versus frequency
typ
I_C = 250 mA
V_{CE} = 25 V
T_h = 25 °C
G_p (dB)
10
7,5
5
2,5
0
250
500
750
1000
f (MHz)


7Z62838
input impedance (series components) versus frequency
r_i (Ω)
x_i (Ω)
r_i
x_i
typ
typ
I_C = 250 mA
V_{CE} = 25 V
T_h = 25 °C
3,5
3
2,5
2
1,5
7,5
5
2,5
250
500
750
1000
f (MHz)


7Z62841
load impedance (parallel components) versus frequency
R_L (Ω)
$-C_L$ (pF)
$-C_L$
R_L
typ
typ
I_C = 250 mA
V_{CE} = 25 V
T_h = 25 °C
125
100
75
50
25
10
7,5
5
250
500
750
1000
f (MHz)

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- gold metallization ensures excellent reliability.

The transistor has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

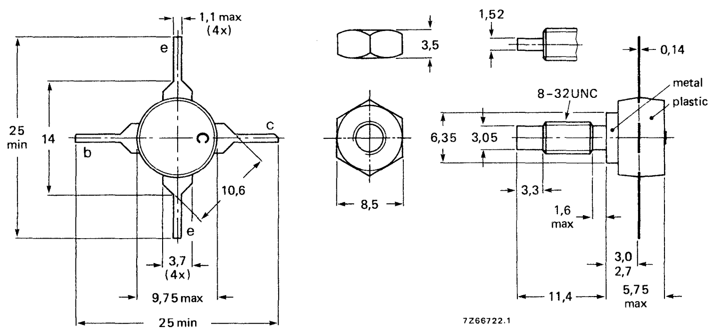
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A	860	25	500	25	−60	> 1,0	> 5,5
class-A	860	25	500	25	−60	typ. 1,1	typ. 6,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/3.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

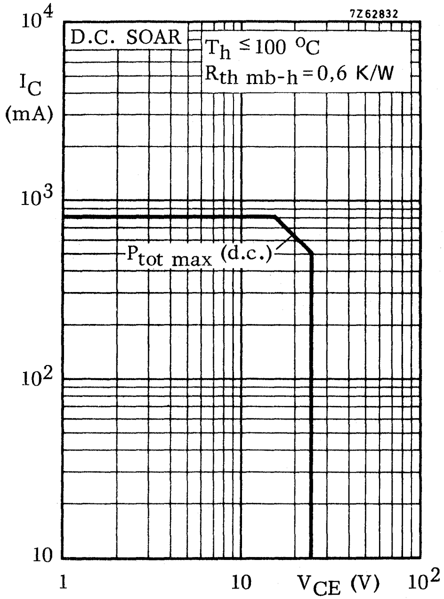
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter; peak value)	V_{CBOM}	max.	40	V
Collector-emitter voltage ($R_{BE} = 10\,\Omega$; peak value)	V_{CERM}	max.	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	27	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	V
Collector current (d.c.)	I_C	max.	0,8	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2	A
Total power dissipation up to T_h = 100 °C	P_{tot}	max.	12,5	W



Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

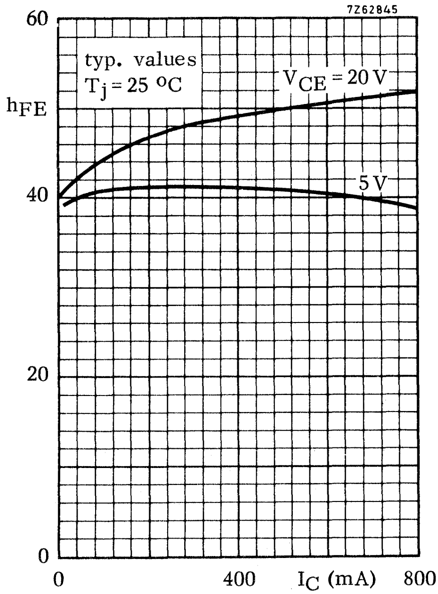
THERMAL RESISTANCE

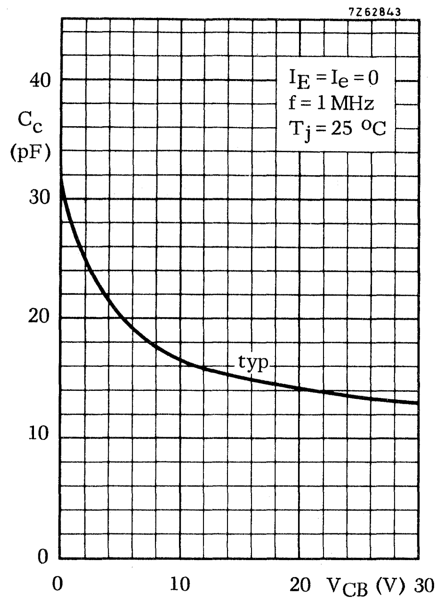
From junction to mounting base	$R_{th\ j-mb}$	=	7,5	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0,6	K/W

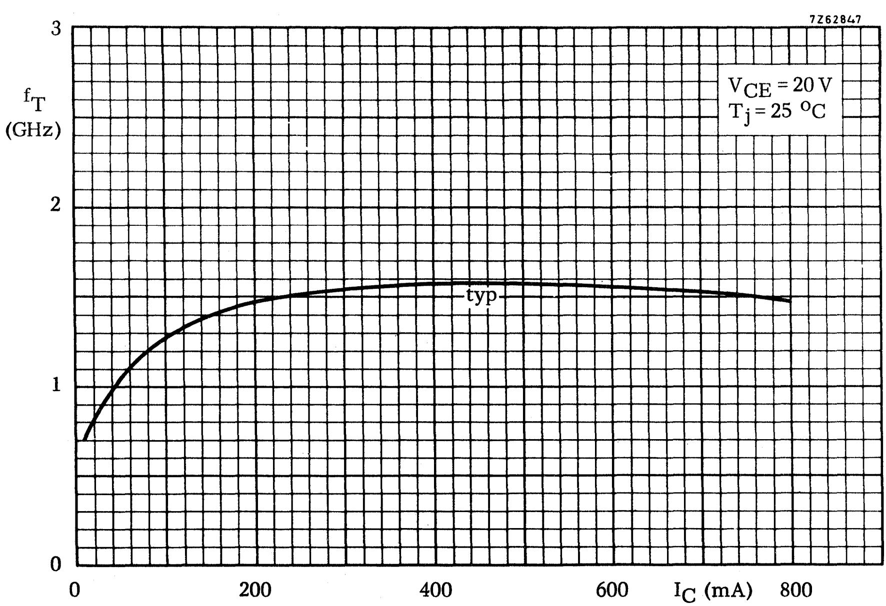
CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_E = 0$; $V_{CB} = 20$ V	I_{CBO}	<	200	μA
Breakdown voltages				
Collector-base voltage open emitter; $I_C = 2$ mA	$V_{(BR)CBO}$	>	40	V
Collector-emitter voltage $R_{BE} = 10\ \Omega$; $I_C = 10$ mA	$V_{(BR)CER}$	>	40	V
open base; $I_C = 10$ mA	$V_{(BR)CEO}$	>	27	V
Emitter-base voltage open collector; $I_E = 2$ mA	$V_{(BR)EBO}$	>	3,5	V
Saturation voltage				
$I_C = 400$ mA; $I_B = 40$ mA	V_{CEsat}	<	0,75	V
D.C. current gain				
$I_C = 400$ mA; $V_{CE} = 20$ V	h_{FE}	>	30	
$I_C = 800$ mA; $V_{CE} = 20$ V	h_{FE}	>	20	
Transition frequency				
$I_C = 400$ mA; $V_{CE} = 20$ V	f_T	>	1,2	GHz
$I_C = 700$ mA; $V_{CE} = 20$ V	f_T	>	1,0	GHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 20$ V	C_c	<	20	pF
Feedback capacitance at f = 1 MHz				
$I_C = 20$ mA; $V_{CE} = 20$ V; $T_{mb} = 25$ °C	C_{re}	typ.	7	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z62845
typ. values
$T_j = 25\ ^oC$
h_{FE}
$V_{CE} = 20\ V$
5 V
60
40
20
0
0
400
I_C (mA)
800


7Z62843
$I_E = I_e = 0$
f = 1 MHz
$T_j = 25\ ^oC$
C_c
(pF)
typ
40
30
20
10
0
0
10
20
V_{CB} (V)
30

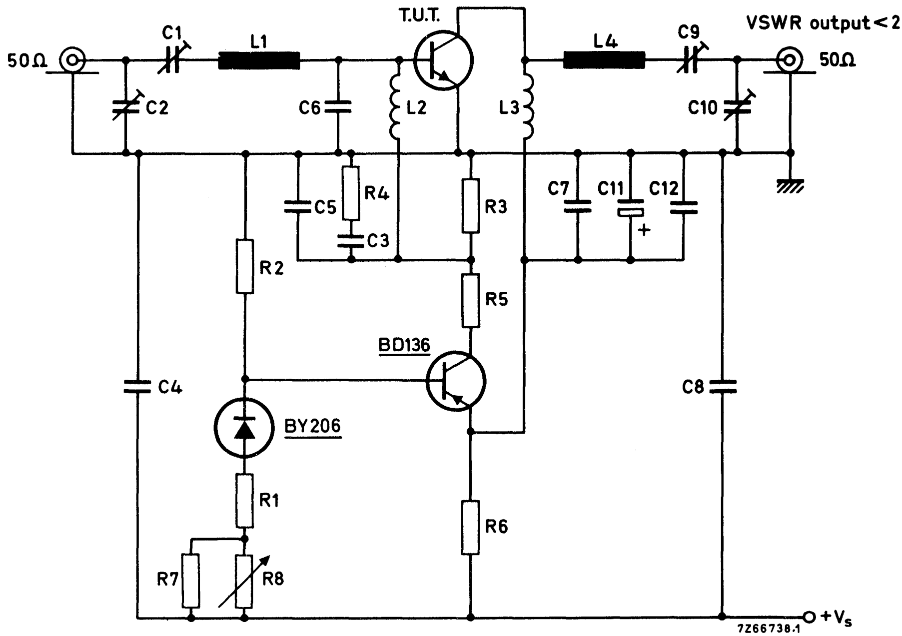

7Z62847
$V_{CE} = 20\ V$
$T_j = 25\ ^oC$
f_T
(GHz)
typ
3
2
1
0
0
200
400
600
I_C (mA)
800

APPLICATION INFORMATION

d_{im} (dB) *)	f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	G_p (dB)	$P_{o\ sync}$ (W) *)	T_h (°C)
−60	860	25	500	> 5,5	> 1,0	25
−60	860	25	500	typ. 6,5	typ. 1,1	25

*) Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

Test circuit at f_{vision} = 860 MHz



List of components: (see also page 6)

C1 = C2 = C10 = 2 to 9 pF film dielectric trimmers
C3 = C4 = C12 = 100 nF polyester capacitors
C5 = C7 = C8 = 100 pF feed-through capacitors
C6 = 2 x 2,7 pF in parallel, chip capacitors
C9 = 2 to 18 pF film dielectric trimmer
C11 = 10 μF/40 V solid aluminium electrolytic capacitor

R1 = 220 Ω
R2 = 4,7 kΩ
R3 = 100 Ω
R4 = 10 Ω
R5 = 470 Ω (1 W)
R6 = 3 x 22 Ω in parallel; (1 W)
R7 = 12 kΩ
R8 = 1 kΩ

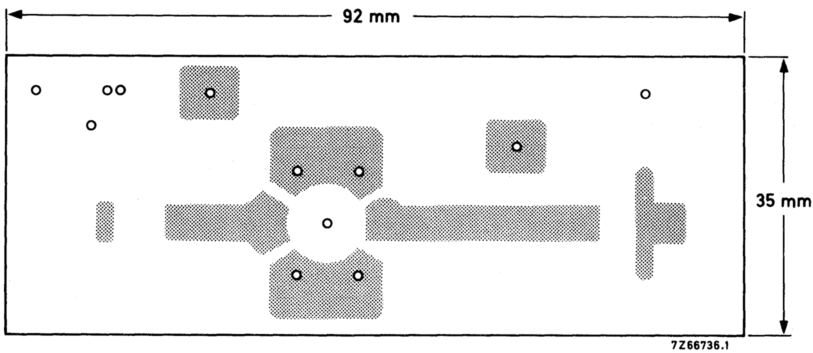
APPLICATION INFORMATION (continued)

List of components: (continued)

L1 = stripline (14,8 mm x 4,3 mm)
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm
L3 = 2 turns Cu wire (1 mm); winding pitch 1,5 mm; int. dia. 4,5 mm; leads 2 x 5 mm
L4 = stripline (29,5 mm x 4,3 mm)

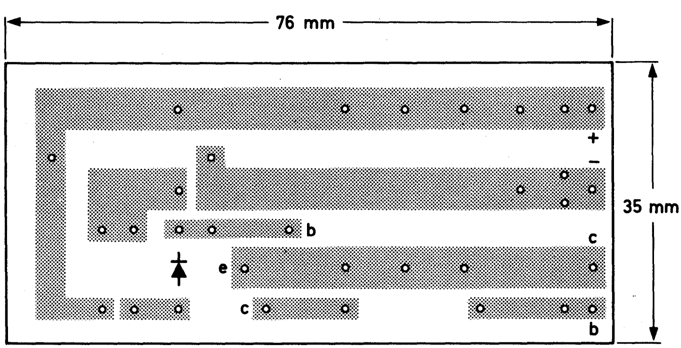
L1 and L4 are striplines on a double Cu-clad print plate with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1,45 mm.

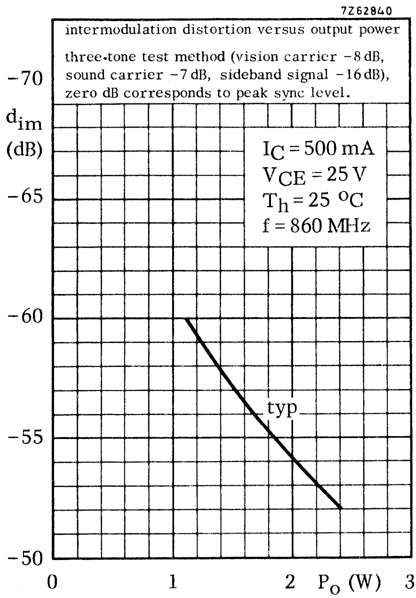
Layout of printed-circuit board for 860 MHz test circuit.

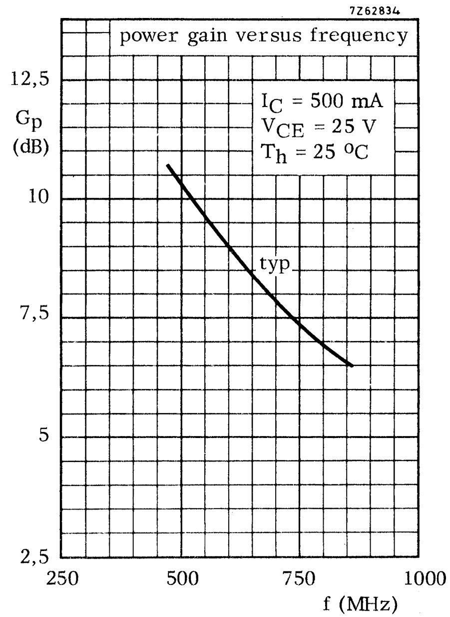


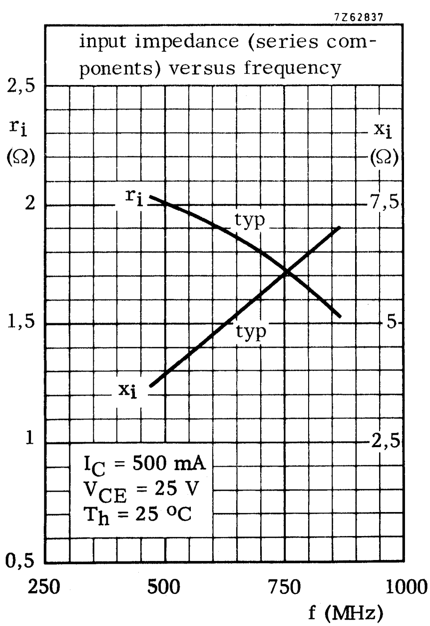
The circuit and the components are situated on one side of the PTFE fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets.

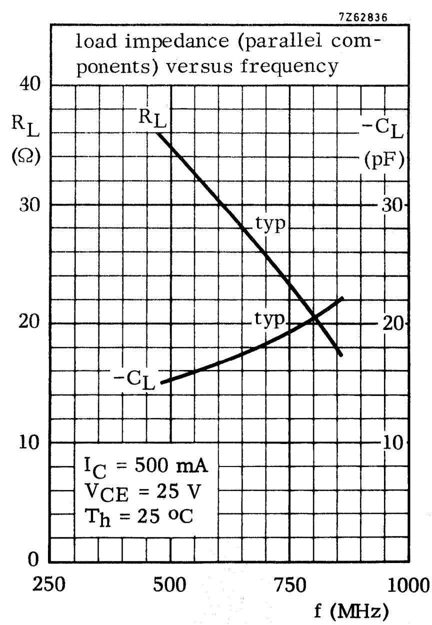
Layout of printed board bias circuit.




7Z62840
intermodulation distortion versus output power
three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
−70
d_{im} (dB)
−65
−60
−55
−50
0
1
2
3
P_o (W)
I_C = 500 mA
V_{CE} = 25 V
T_h = 25 °C
f = 860 MHz
typ


7Z62834
power gain versus frequency
12,5
G_p (dB)
10
7,5
5
2,5
250
500
750
1000
f (MHz)
I_C = 500 mA
V_{CE} = 25 V
T_h = 25 °C
typ


7Z62837
input impedance (series components) versus frequency
2,5
r_i (Ω)
2
1,5
1
0,5
x_i (Ω)
7,5
5
2,5
r_i
x_i
typ
typ
250
500
750
1000
f (MHz)
I_C = 500 mA
V_{CE} = 25 V
T_h = 25 °C


7Z62836
load impedance (parallel components) versus frequency
40
R_L (Ω)
30
20
10
0
$-C_L$ (pF)
30
20
10
R_L
$-C_L$
typ
typ
250
500
750
1000
f (MHz)
I_C = 500 mA
V_{CE} = 25 V
T_h = 25 °C

U.H.F. LINEAR POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor primarily intended for use in linear u.h.f. amplifiers of television transposers and transmitters in band IV-V.

Features:

- diffused emitter ballasting resistors for an optimum temperature profile;
- gold metallization ensures excellent reliability.

The transistor has a ¼″ capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

R.F. performance in linear amplifier

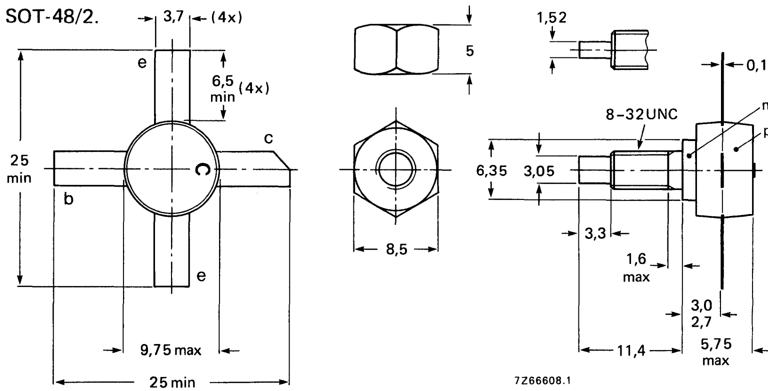
mode of operation	f_{vision} MHz	V_{CE} V	I_C mA	T_h °C	d_{im}* dB	$P_{o\ sync}$* W	G_p dB
class-A	860	25	850	70	−60	> 3,5	> 5,0
class-A	860	25	850	70	−60	typ. 4,0	typ. 5,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

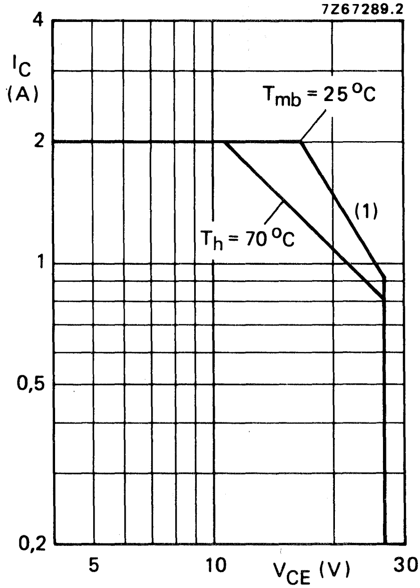
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage			
(peak value); $V_{BE} = 0$	V_{CESM}	max.	50 V
open base	V_{CEO}	max.	27 V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5 V
Collector current			
d.c.	I_C	max.	2 A
(peak value); f > 1 MHz	I_{CM}	max.	4 A
Total power dissipation at T_h = 70 °C	P_{tot}	max.	21,5 W
Storage temperature	T_{stg}	−65 to + 200 °C	
Junction temperature	T_j	max.	200 °C



(1) Second breakdown limit (independent of temperature.

Fig. 2 D.C. SOAR.

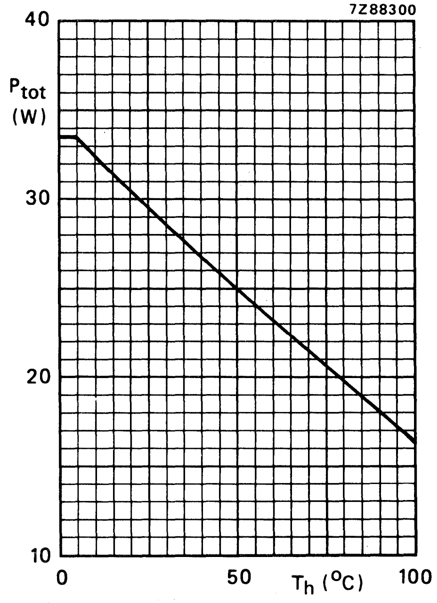


Fig. 3 Power derating curve vs. temperature.

THERMAL RESISTANCE (dissipation = 21,25 W; T_{mb} = 82,75 °C, i.e. T_h = 70 °C.

From junction to mounting base	$R_{th\ j\text{-}mb}$	=	5,45 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,6 K/W

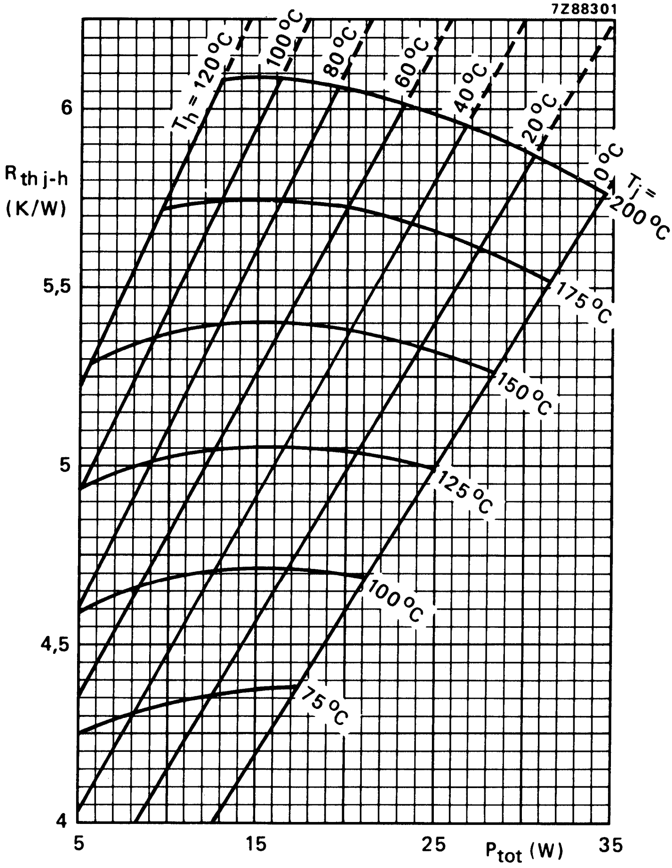


Fig. 4 Maximum thermal resistance from junction to heatsink as a function of power dissipation, with heatsink and junction temperature as parameters. ($R_{th\ mb-h}$ = 0,6 K/W.)

Example

Nominal class-A operation (without r.f. signal): V_{CE} = 25 V; I_C = 850 mA; T_h = 70 °C.

Fig. 4 shows: $R_{th\ j-h}$ max. 6,05 K/W
T_j max. 200 °C

Typical device: $R_{th\ j-h}$ typ. 5,35 K/W
T_j typ. 183 °C

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector-emitter breakdown voltage			
V_{BE} = 0; I_C = 10 mA	$V_{(BR)CES}$	>	50 V
open base; I_C = 25 mA	$V_{(BR)CEO}$	>	27 V
Emitter-base breakdown voltage			
open collector; I_E = 5 mA	$V_{(BR)EBO}$	>	3,5 V
D.C. current gain*			
I_C = 850 mA; V_{CE} = 25 V	h_{FE}	>	15
		typ.	40
Collector-emitter saturation voltage*			
I_C = 500 mA; I_B = 100 mA	V_{CEsat}	typ.	0,25 V
Transition frequency at f = 500 MHz**			
$-I_E$ = 850 mA; V_{CB} = 25 V	f_T	typ.	2,5 GHz
Collector capacitance at f = 1 MHz			
$I_E = I_e$ = 0; V_{CB} = 25 V	C_c	typ.	24 pF
		<	30 pF
Feedback capacitance at f = 1 MHz			
I_C = 50 mA; V_{CE} = 25 V	C_{re}	typ.	15 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

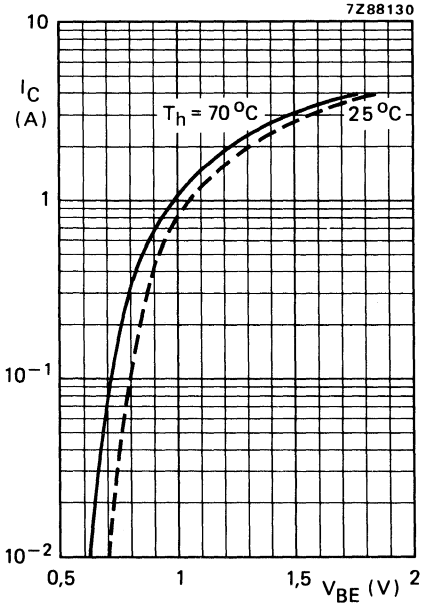


Fig. 5 Typical values; V_{CE} = 25 V.

* Measured under pulse conditions: $t_p \leqslant 300\ \mu s$; $\delta \leqslant 0,02$.

** Measured under pulse conditions: $t_p \leqslant 50\ \mu s$; $\delta \leqslant 0,01$.

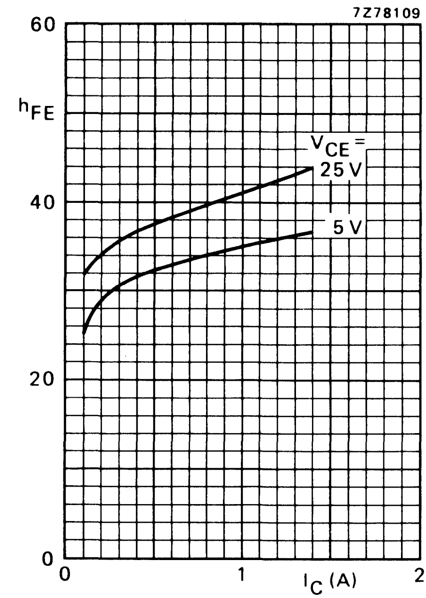


Fig. 6 Typical values; T_j = 25 °C.

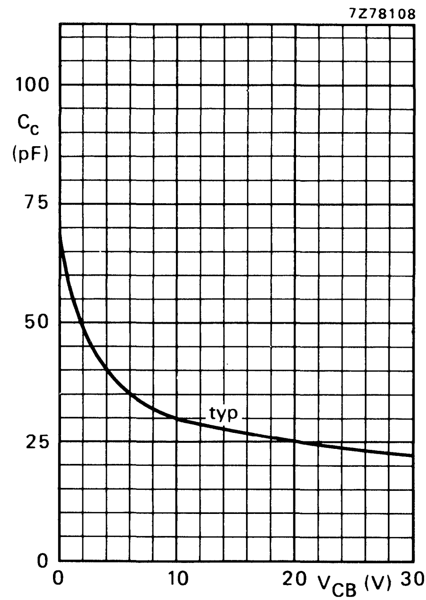


Fig. 7 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

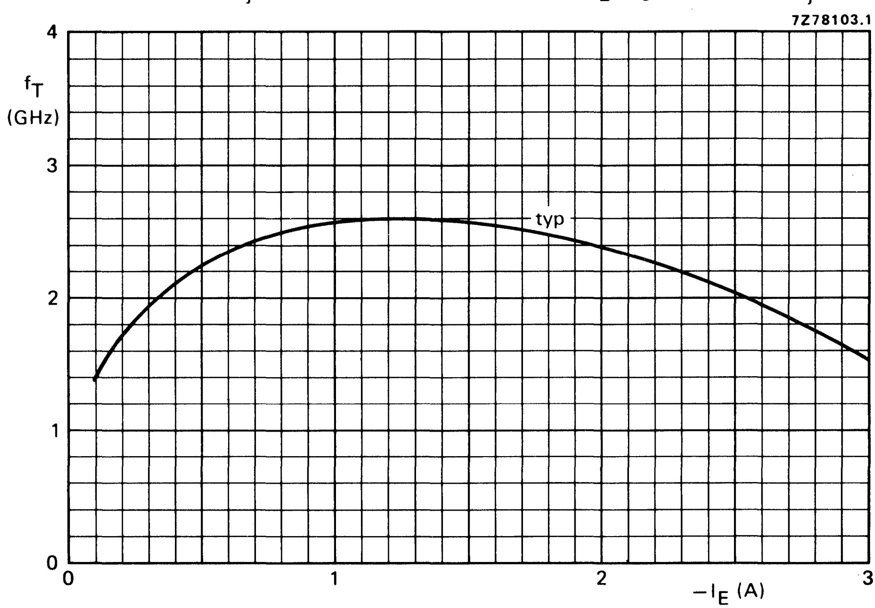


Fig. 8 V_{CB} = 25 V; f = 500 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in u.h.f. class-A operation (linear power amplifier)

f_{vision} (MHz)	V_{CE} (V)	I_C (mA)	T_h (°C)	d_{im} (dB)*	$P_{o\,sync}$ (W)*	G_p (dB)
860	25	850	70	−60	> 3,5	> 5,0
860	25	850	70	−60	typ. 4,0	typ. 5,5

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.

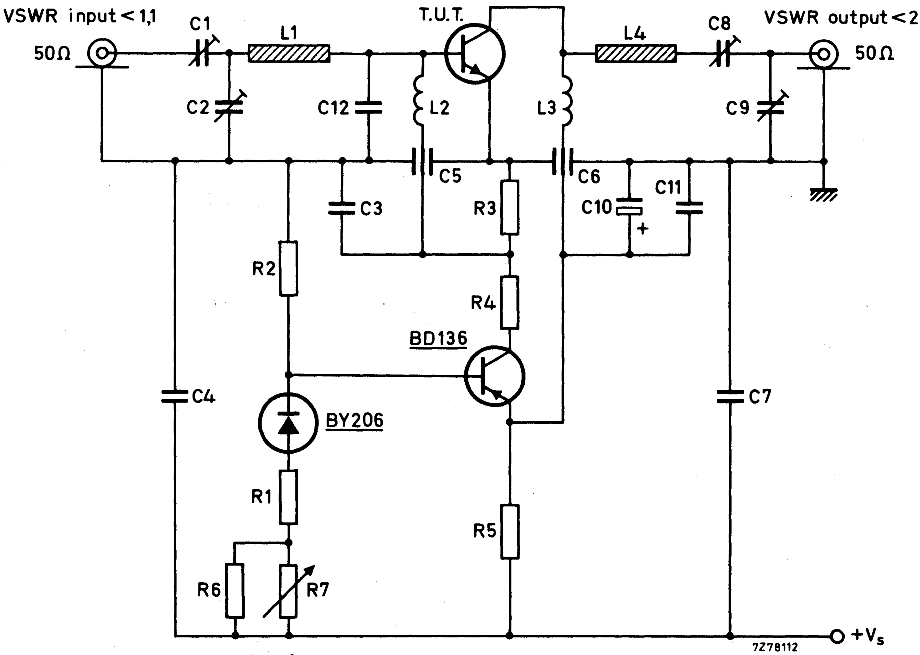


Fig. 9 Class-A test circuit at f_{vision} = 860 MHz.

List of components:

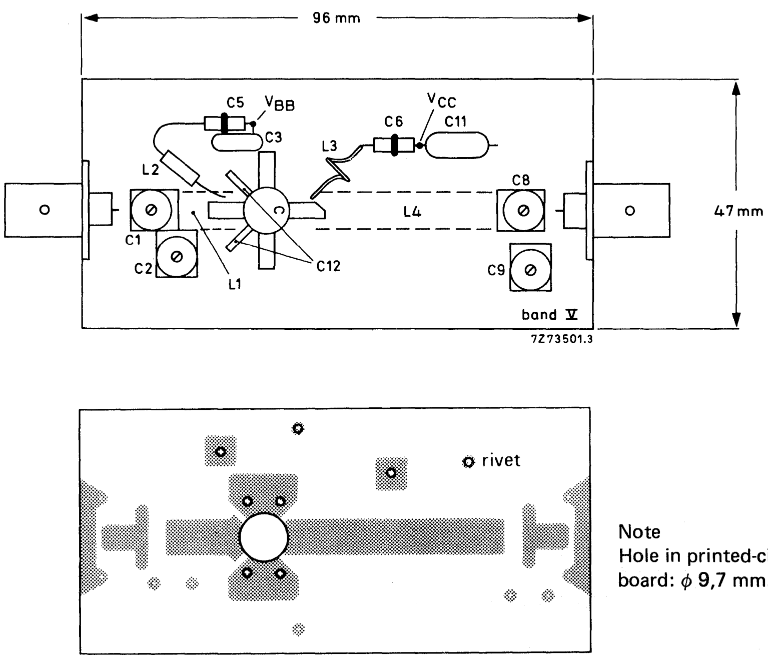
C1 = C2 = 1,4 to 5,5 pF film dielectric trimmer (cat.no. 2222 809 09001)
C3 = C4 = 100 nF polyester capacitor
C5 = C6 = 1 nF feed-through capacitor
C7 = 5,6 pF ceramic capacitor
C8 = 2 to 18 pF film dielectric trimmer (cat. no. 2222 809 09003)
C9 = 2 to 9 pF film dielectric trimmer (cat. no. 2222 809 09002)
C10 = 10 μF/40 V solid aluminium electrolytic capacitor
C11 = 470 nF polyester capacitor
C12 = 2 x 3,3 pF chip capacitors (in parallel)

List of components: (continued)

R1 = 150 Ω carbon resistor (0,25 W)
R2 = 1,8 kΩ carbon resistor (0,5 W)
R3 = 33 Ω carbon resistor (0,5 W)
R4 = 220 Ω carbon resistor (1 W)
R5 = 4 x 12 Ω carbon resistors in parallel (1 W each)
R6 = 1 kΩ carbon resistor (0,25 W)
R7 = 220 Ω carbon potentiometer (0,25 W)

L1 = stripline (13,6 mm x 6,9 mm)
L2 = microchoke 0,47 μH (cat. no. 4322 057 04770)
L3 = 1 turn Cu wire (1 mm); internal diameter 5,5 mm; leads 2 x 5 mm
L4 = stripline (40,8 mm x 6,9 mm)

L1 and L4 are striplines on a double Cu-clad printed-circuit board with PTFE fibre-glass dielectric (ϵ_r = 2,74); thickness 1,5 mm.



Note
Hole in printed-circuit board: ϕ 9,7 mm.

Fig. 10 Component layout and printed-circuit board for 860 MHz class-A test circuit.

The circuit and the components are on one side of the PTFE fibre-glass board, the other side is unetched copper to serve as a ground-plane. Earth connections are made by hollow rivets. Additionally copper straps are used under the emitters and at the input and output to provide direct contact between the copper on the component side and the ground-plane.

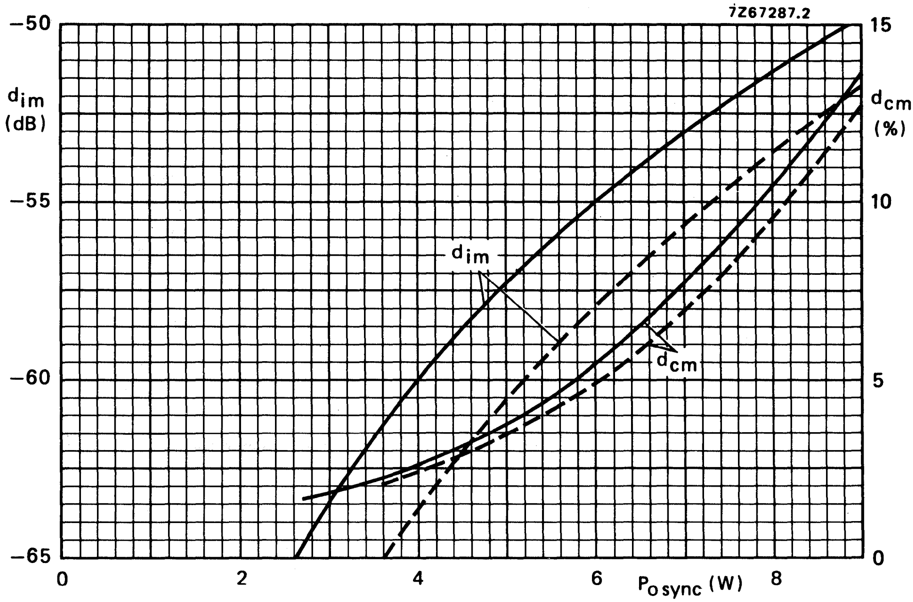


Fig. 11 Intermodulation distortion (d_{im})* and cross-modulation distortion (d_{cm})** as a function of $P_{o\,sync}$. Typical values; V_{CE} = 25 C; I_C = 850 mA; — — — T_h = 25 °C; —— T_h = 70 °C; f_{vision} = 860 MHz.

* Three-tone test method (vision carrier −8 dB, sound carrier −7 dB, sideband signal −16 dB), zero dB corresponds to peak sync level.
Intermodulation distortion of input signal ≤ −75 dB.

** Two-tone test method (vision carrier 0 dB, sound carrier −7 dB), zero dB corresponds to peak sync level.
Cross-modulation distortion (d_{cm}) is the voltage variation (%) of sound carrier when vision carrier is switched from 0 dB to −20 dB.

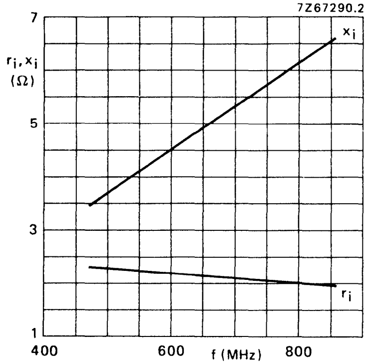


Fig. 12 Input impedance (series components).

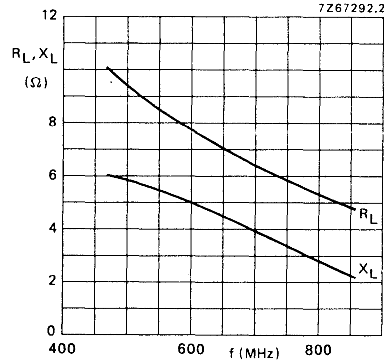


Fig. 13 Load impedance (series components).

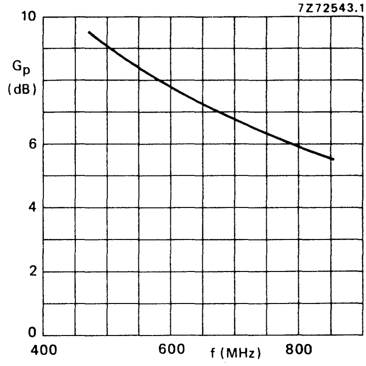


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 25 V; I_C = 850 mA; class-A operation; T_h = 70 °C.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

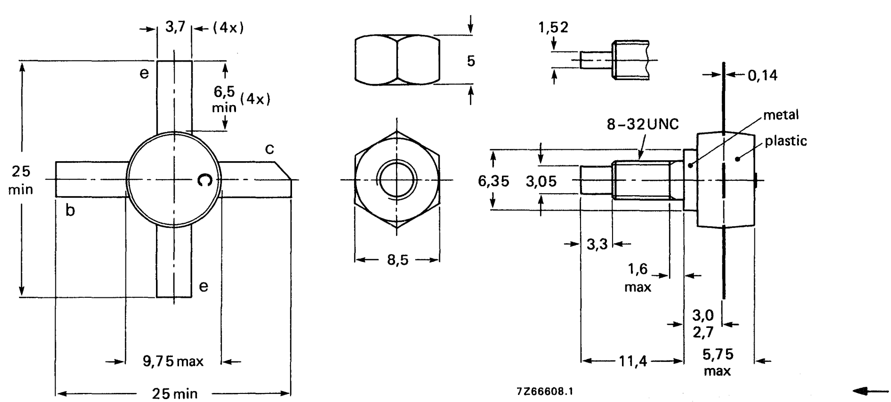
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**8**	**> 9**	**> 70**	**2,8 + j1,2**	**76 − j16**
c.w.	12,5	175	8	typ. 9	typ. 70	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

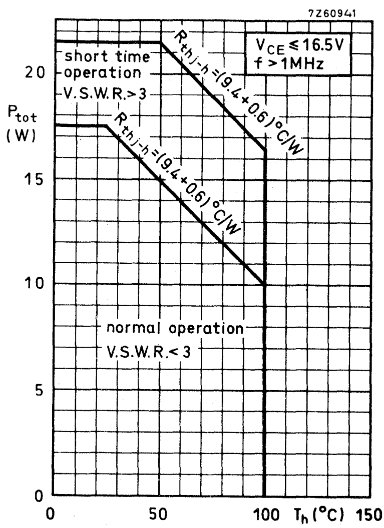
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

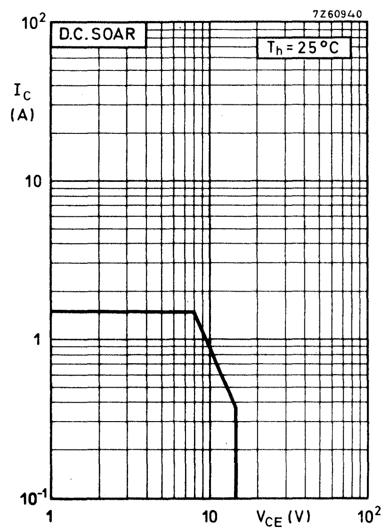
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	1.25	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	3.75	A
Total power dissipation up to T_h = 25 °C f > 1 MHz	P_{tot}	max.	17.5	W





Storage temperature	T_{stg}		−30 to +200	°C
Operating junction temperature	T_j	max.	200	°C

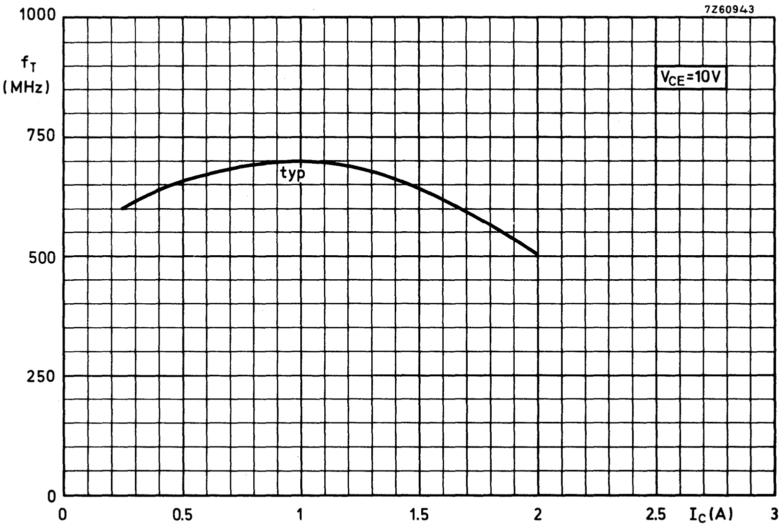
THERMAL RESISTANCE

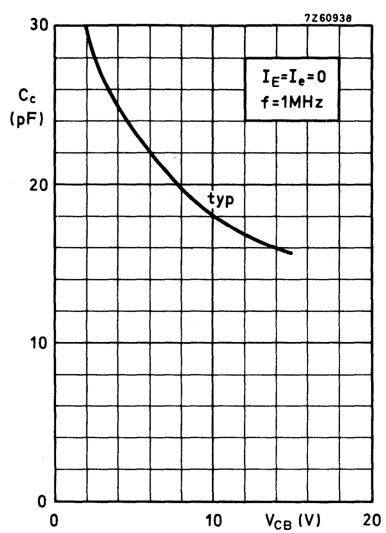
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	9.4	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25°C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 14$ V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter, $I_C = 1$ mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base, $I_C = 10$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector, $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	mS
$-V_{BE} = 1.5$ V; $R_{BE} = 33\ \Omega$	E	>	0.5	mS
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 500$ mA; $V_{CE} = 10$ V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 15$ V	C_c	typ.	15	pF
		<	20	pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 15$ V	$-C_{re}$	typ.	11	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60943
1000
f_T
(MHz)
750
500
250
0
0
0.5
1
1.5
2
2.5
I_C (A)
3
V_{CE}=10V
typ


7Z60938
30
C_c
(pF)
20
10
0
0
10
V_{CB} (V)
20
I_E=I_e=0
f=1MHz
typ

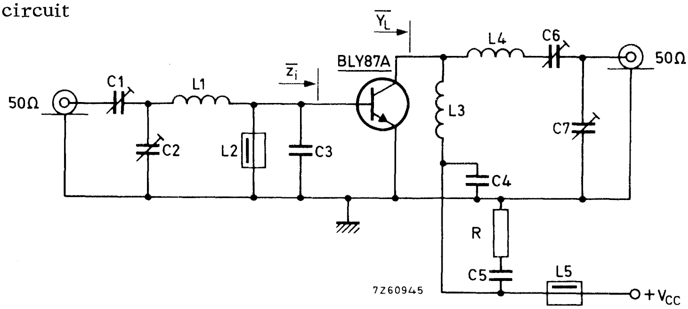
APPLICATION INFORMATION

R. F. performance in c. w. operation (unneutralised common-emitter class B circuit)

f = 175 MHz; T_{mb} up to 25 °C

V_{CC}(V)	P_S(W)	P_L(W)	I_C (A)	G_p(dB)	η(%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$(mS)
13.5	< 1.0	8	< 0.85	> 9	> 70	2.8 + j1.2	76 − j16
12.5	typ. 1.0	8	typ. 0.91	typ. 9	typ. 70	–	–

Test circuit



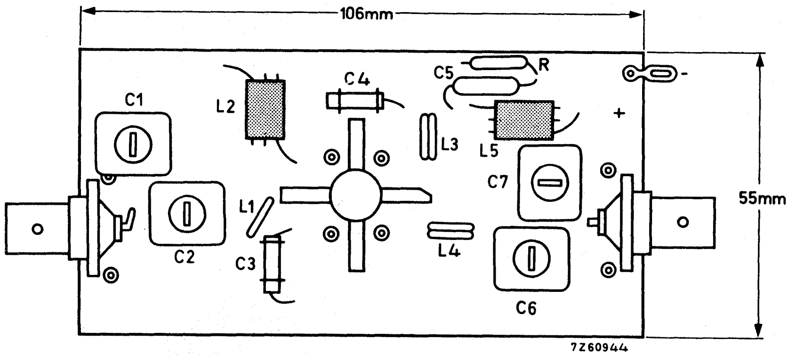
C1 = 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
C3 = 47 pF ceramic
C4 = 100 pF ceramic
C5 = 150 nF polyester

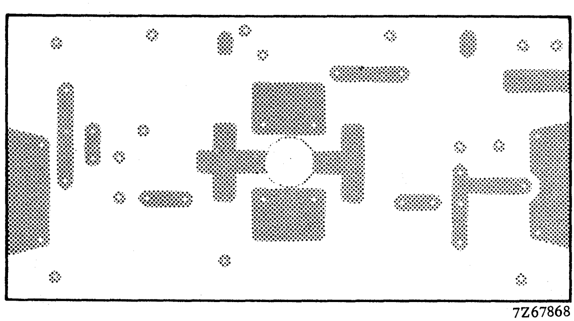
L1 = 0.5 turn enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
L2 = L5 = ferroxcube choke (code number 4312 020 36640)
L3 = 2.5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
L4 = 4.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

R = 10 Ω carbon

APPLICATION INFORMATION (continued)

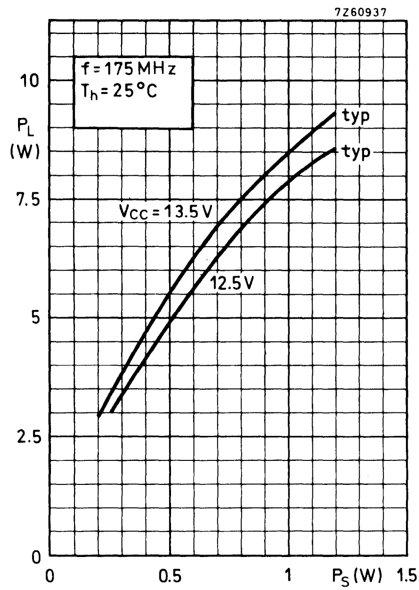
Component lay-out and printed circuit board for 175 MHz test circuit.

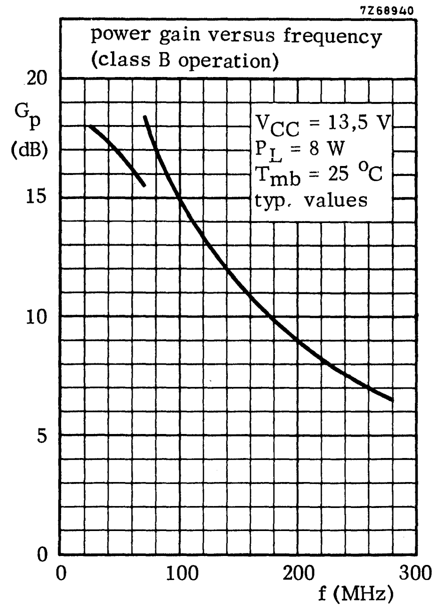


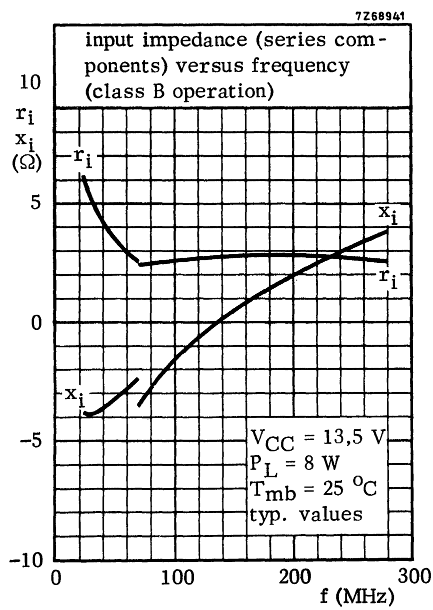


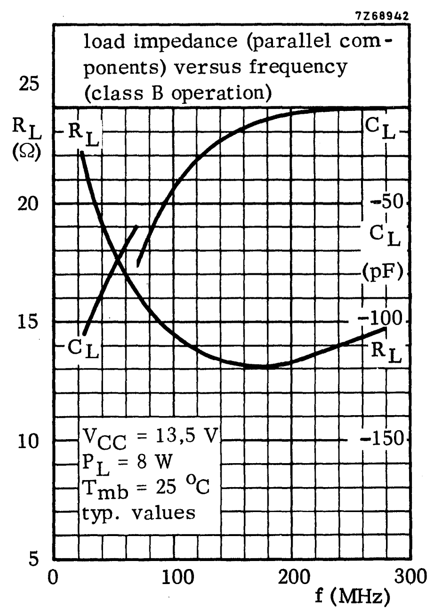
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

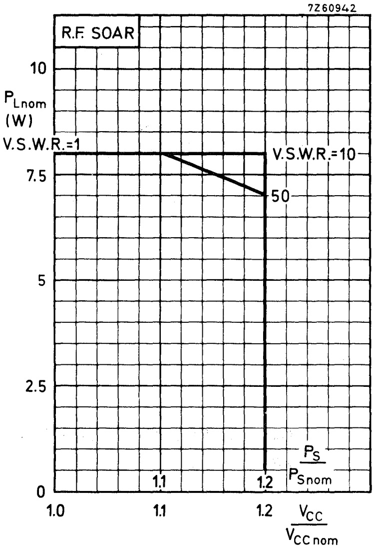
OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

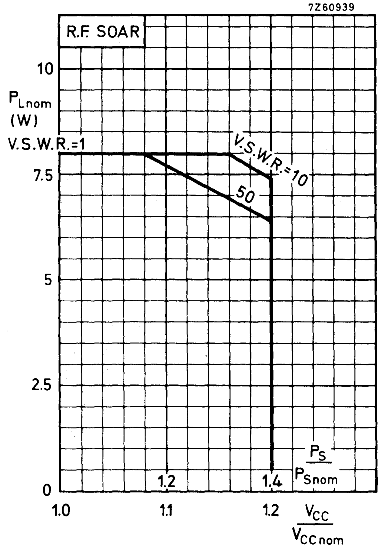












Conditions for R.F. SOAR:

f = 175 MHz
T_h = 70 °C
V_{CCnom} = 12.5 or 13.5 V
$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1
$R_{th\ mb-h} \leq 0.6$ K/W

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V.S.W.R. as parameter.
The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.
The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).
Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

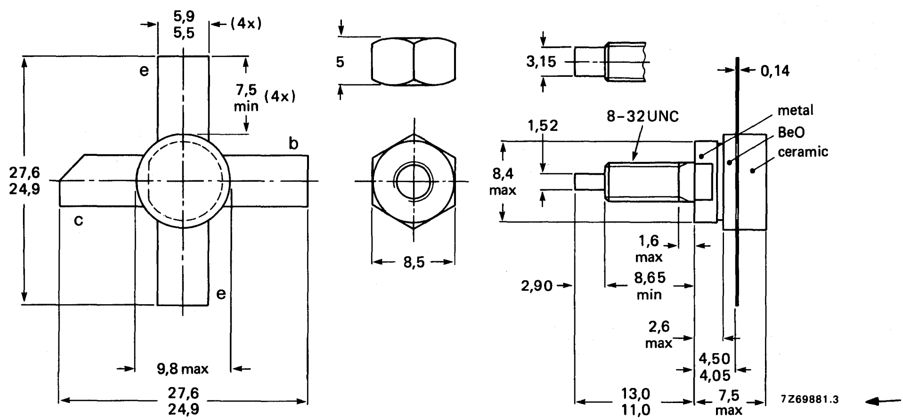
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**8**	**> 12,0**	**> 60**	**2,2 + j0,4**	**96 – j28**
c.w.	12,5	175	8	typ. 11,5	typ. 65	–	–

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm. Mounting hole to have no burrs at either end. De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	1,5 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	4,0 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	20 W

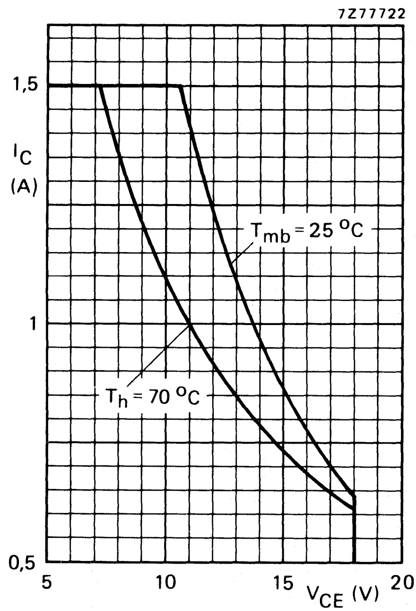


Fig. 2 D.C. SOAR.

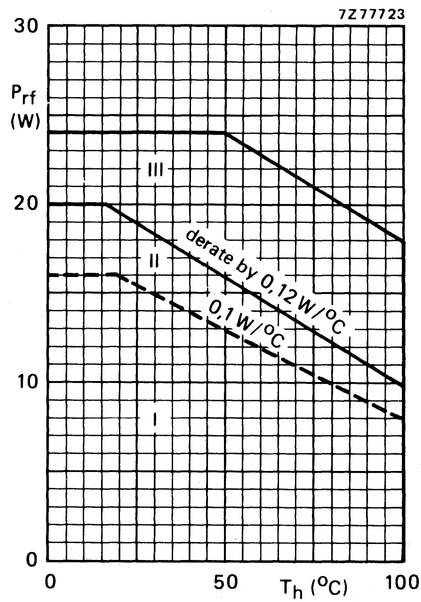


Fig. 3 R.F. power dissipation; $V_{CE} \leq$ 16,5 V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

Storage temperature	T_{stg}		−65 to + 150 °C
Operating junction temperature	T_j	max.	200 °C

THERMAL RESISTANCE (dissipation = 8 W; T_{mb} = 73,5 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	10,7 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45 K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 5$ mA	$V_{(BR)CES}$	>	36	V
Collector-emitter breakdown voltage open base; $I_C = 25$ mA	$V_{(BR)CEO}$	>	18	V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5	mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5	mJ
D.C. current gain * $I_C = 0,75$ A; $V_{CE} = 5$ V	h_{FE}	typ.	40	
			10 to 100	
Collector-emitter saturation voltage * $I_C = 2$ A; $I_B = 0,4$ A	V_{CEsat}	typ.	0,85	V
Transition frequency at f = 100 MHz * $-I_E = 0,75$ A; $V_{CB} = 13,5$ V	f_T	typ.	950	MHz
$-I_E = 2$ A; $V_{CB} = 13,5$ V	f_T	typ.	850	MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c	typ.	16,5	pF
Feedback capacitance at f = 1 MHz $I_C = 100$ mA; $V_{CE} = 13,5$ V	C_{re}	typ.	12	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

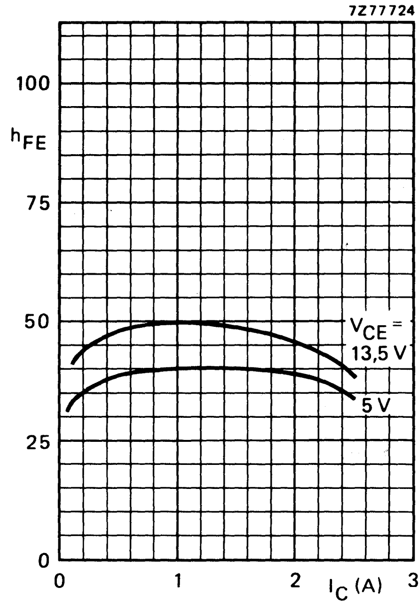


Fig. 4 Typical values; T_j = 25 °C.

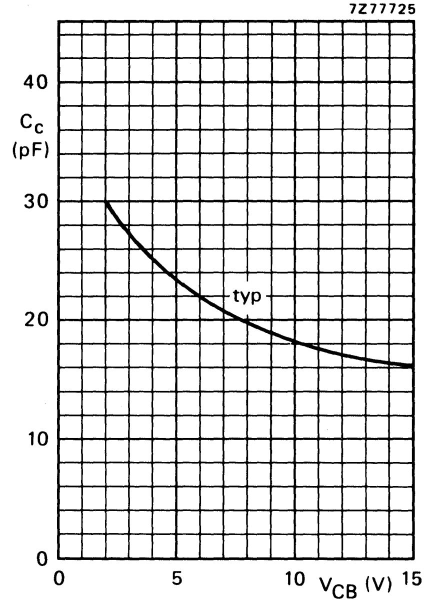


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

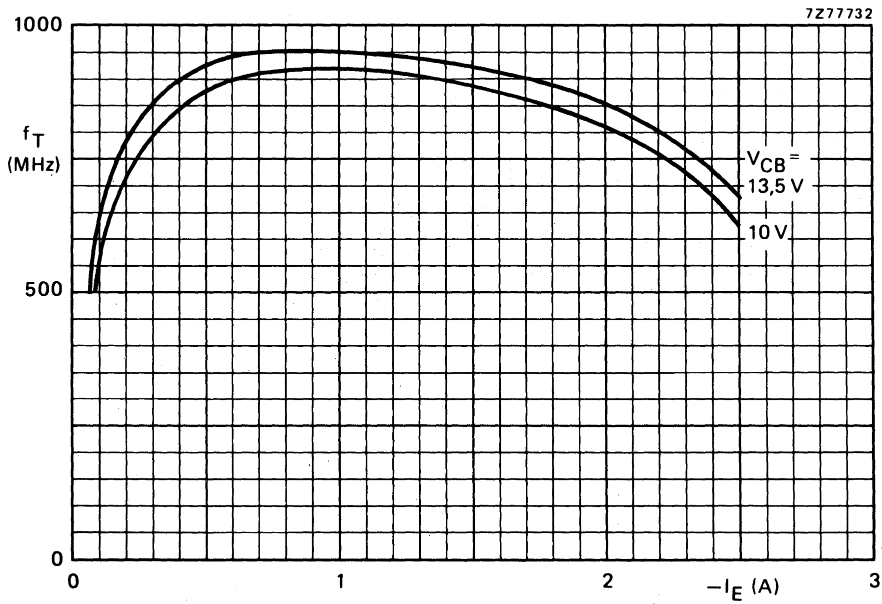


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	**13,5**	**8**	< **0,5**	> **12,0**	< **0,99**	> **60**	**2,2 + j0,4**	**96 − j28**
175	12,5	8	−	typ. 11,5	−	typ. 65	−	−

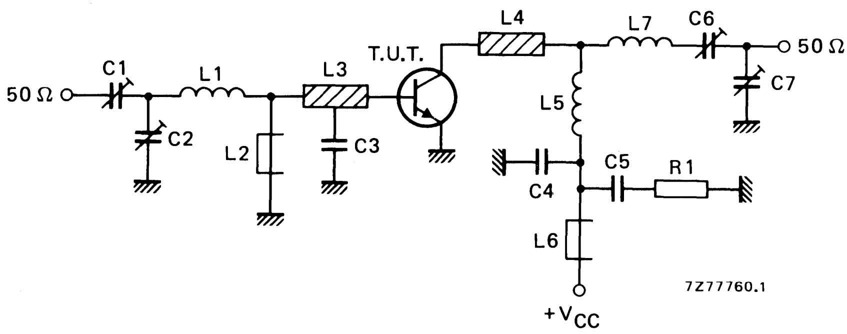


Fig. 7 Test circuit; c.w. class-B.

List of components:

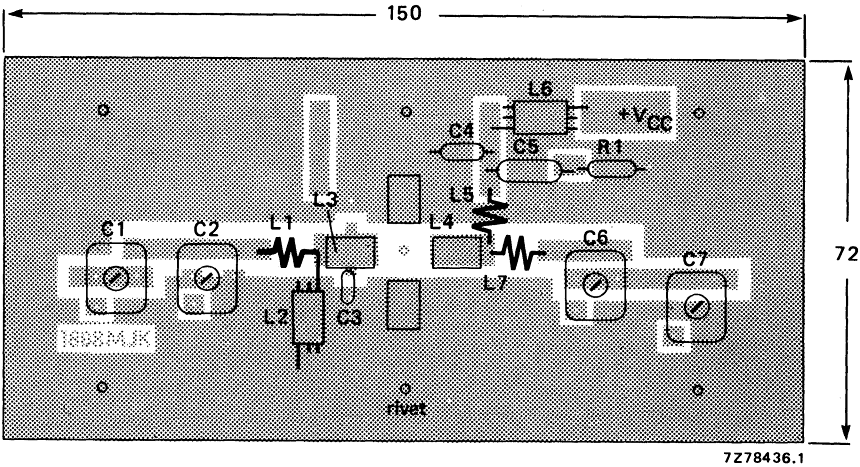
C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm
L2 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L5 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm
L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



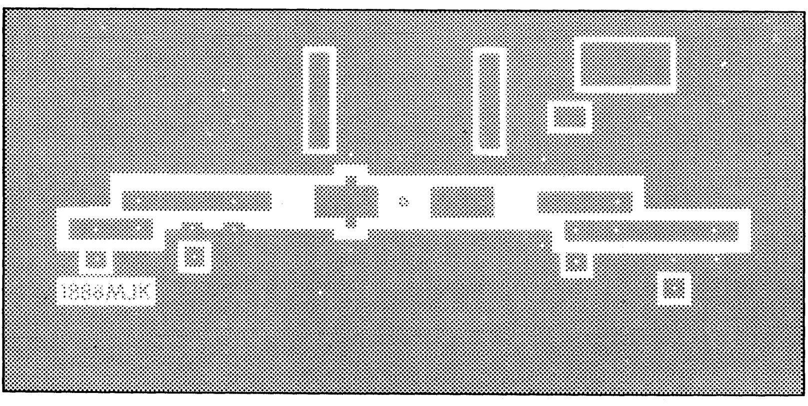


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

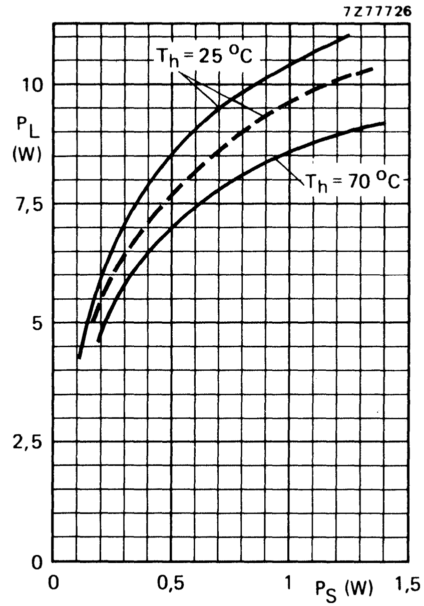


Fig. 9 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

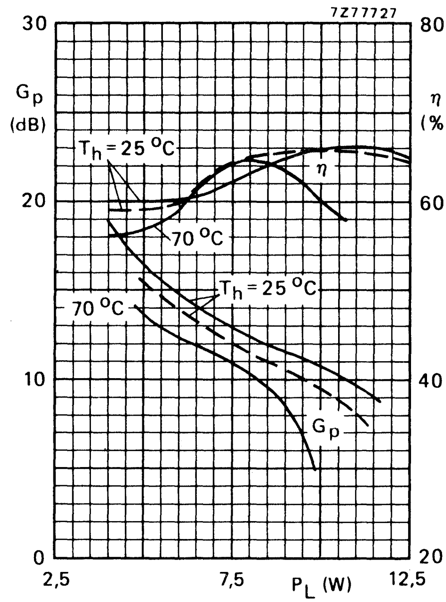


Fig. 10 Typical values; f = 175 MHz;
—— V_{CE} = 13,5 V; – – – V_{CE} = 12,5 V.

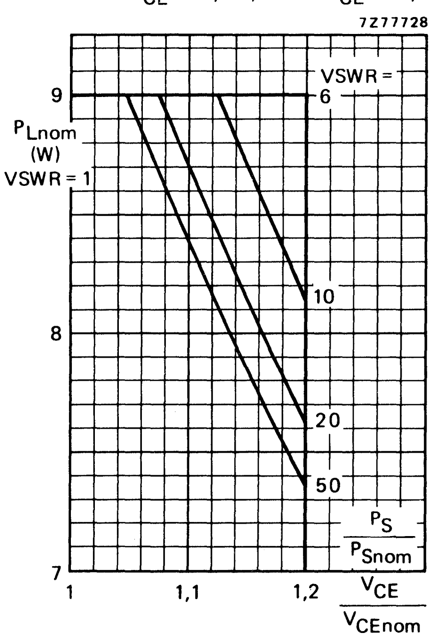


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W ; V_{CEnom} = 13,5 V or 12,5 V; P_S = P_{Snom} at V_{CEnom} and VSWR = 1.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

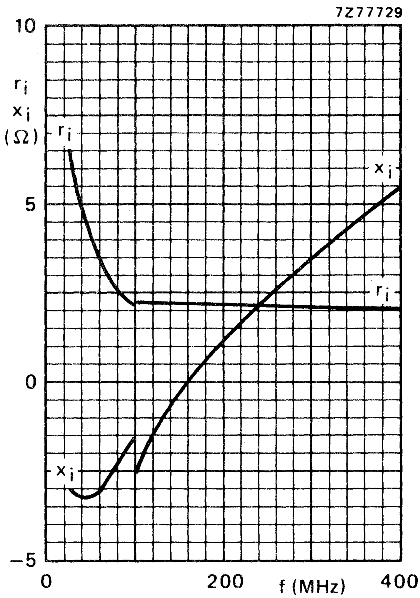


Fig. 12 Input impedance (series components).

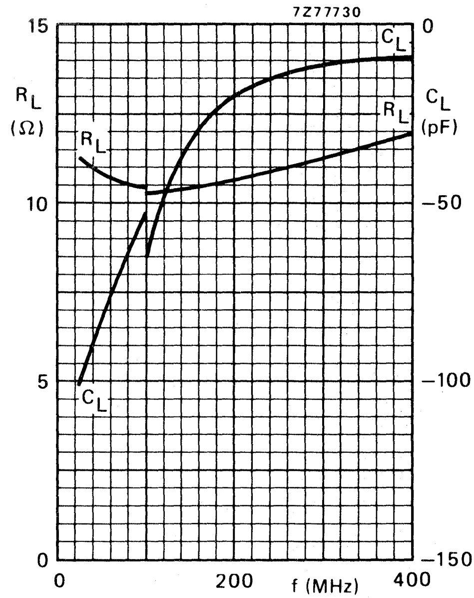


Fig. 13 Load impedance (parallel components).

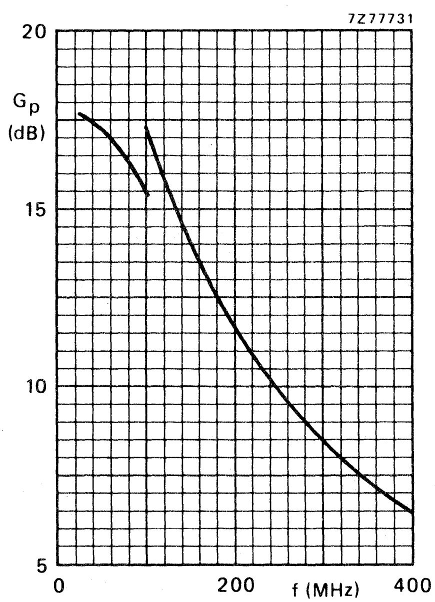


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 13,5 V; P_L = 8 W; T_h = 25 °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation.
This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

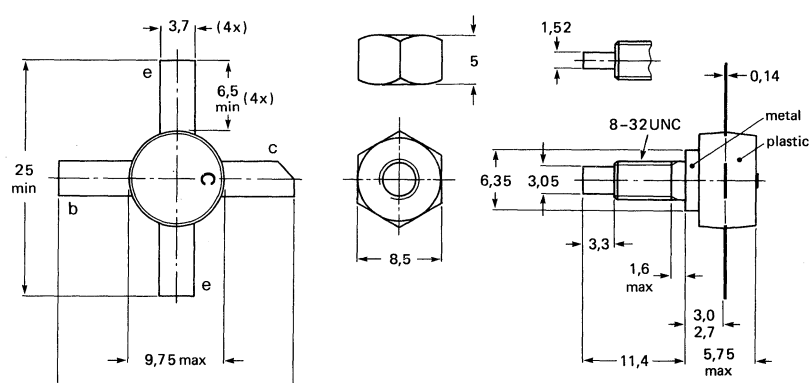
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**13,5**	**175**	**15**	**> 7,5**	**> 65**	**2,3 + j2,2**	**128 − j4,4**
c.w.	12,5	175	15	typ. 7,5	typ. 65	−	−

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

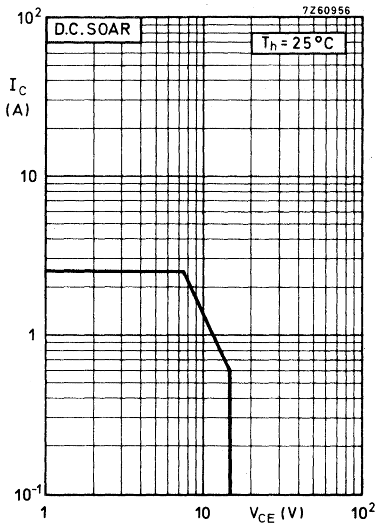
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

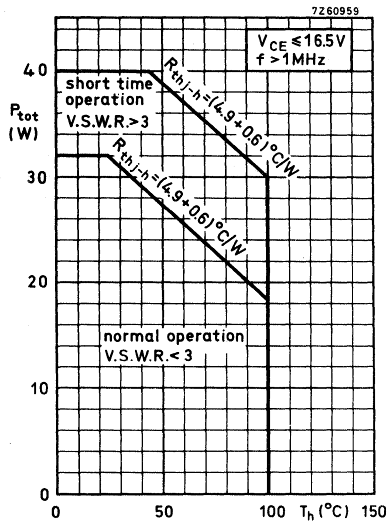
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	2.5	A
Collector (peak value) f > 1 MHz	I_{CM}	max.	7.5	A
Total power dissipation up to T_h = 25 °C f > 1 MHz	P_{tot}	max.	32	W





Storage temperature	T_{stg}		−30 to +200	°C
Operating junction temperature	T_j	max.	200	°C

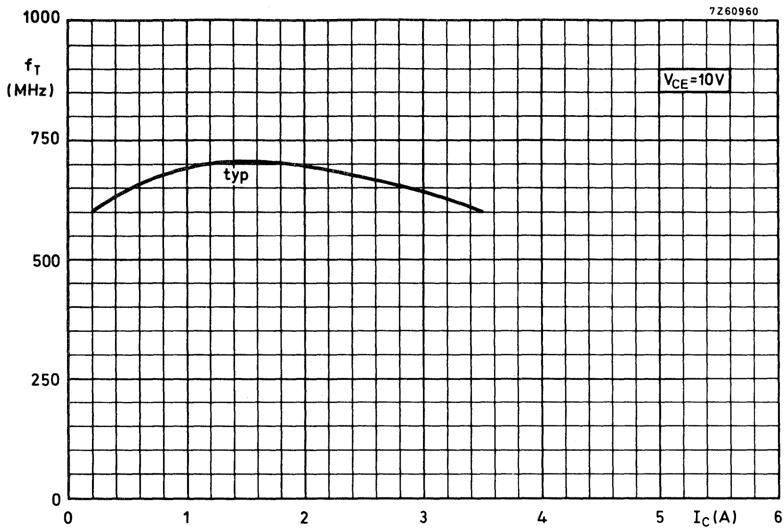
THERMAL RESISTANCE

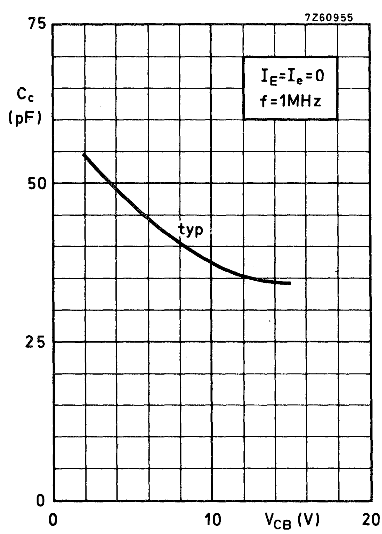
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4.9	K/W
From mounting base to heatsink	$R_{mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
I_B = 0; V_{CE} = 14 V	I_{CEO}	<	10	mA
Breakdown voltages				
Collector-base voltage open emitter, I_C = 3 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base, I_C = 25 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector; I_E = 3 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	2.0	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	4.5	ms
D.C. current gain				
I_C = 500 mA; V_{CE} = 5 V	h_{FE}	>	5	
Transition frequency				
I_C = 1 A; V_{CE} = 10 V	f_T	typ.	700	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 15 V	C_c	typ.	34	pF
		<	40	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 15 V	$-C_{re}$	typ.	25	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60960
1000
f_T
(MHz)
750
500
250
0
V_{CE}=10V
typ
0
1
2
3
4
5
I_C(A)
6


7Z60955
75
C_c
(pF)
50
25
0
I_E=I_e=0
f=1MHz
typ
0
10
V_{CB} (V)
20

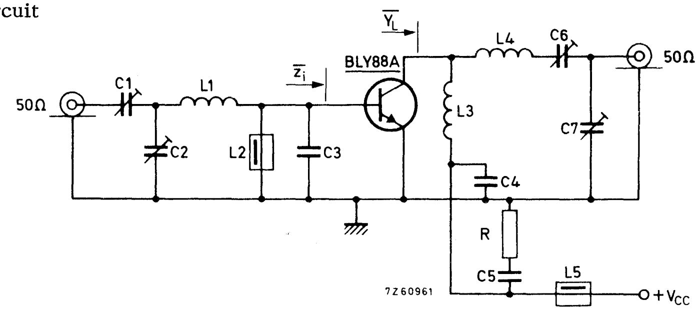
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralised common-emitter class B circuit)

f = 175 MHz; T_{mb} up to 25 °C

V_{CC}(V)	P_S(W)	P_L(W)	I_C(A)	G_p(dB)	η (%)	$\overline{z_i}$(Ω)	$\overline{Y_L}$(mS)
13.5	< 2.65	15	< 1.71	> 7.5	> 65	2.3+j2.2	128−j4.4
12.5	typ. 2.65	15	typ. 1.85	typ. 7.5	typ. 65	−	−

Test circuit



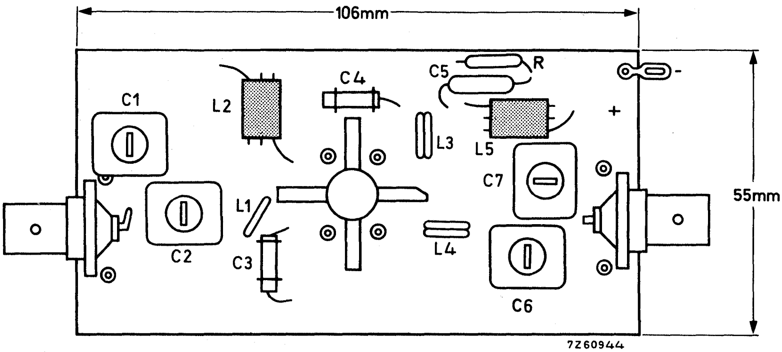
C1= 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
C2=C6=C7= 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
C3= 47 pF ceramic
C4= 100 pF ceramic
C5= 150 nF polyester

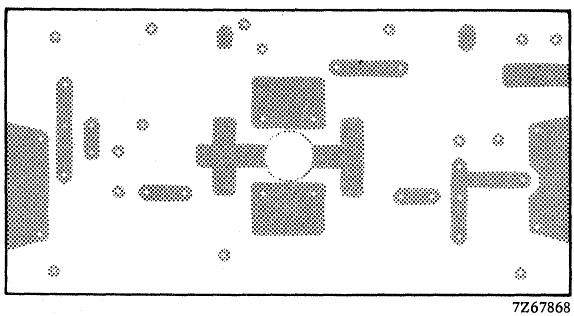
L1= 0.5 turn enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
L2=L5= ferroxcube choke (code number 4312 020 36640)
L3= 2.5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
L4= 2.5 turns enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm

R = 10 Ω carbon

APPLICATION INFORMATION (continued)

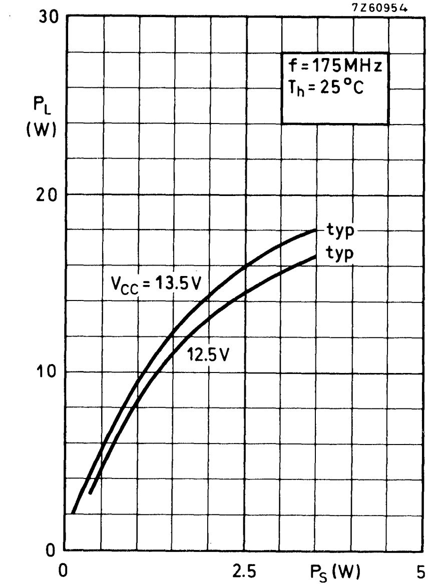
Component lay-out and printed circuit board for 175 MHz test circuit.

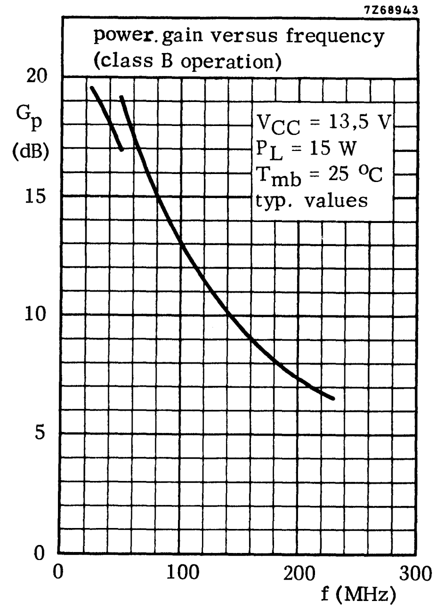


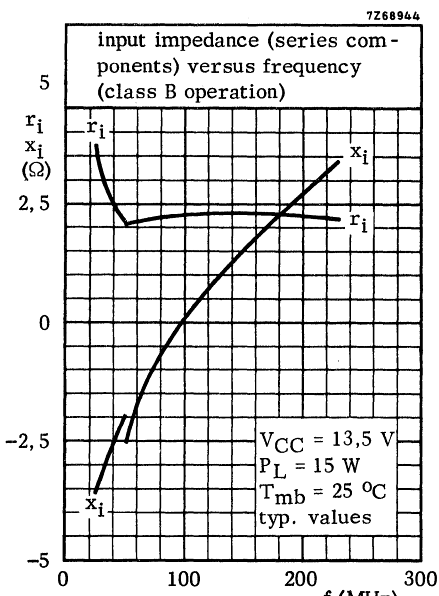


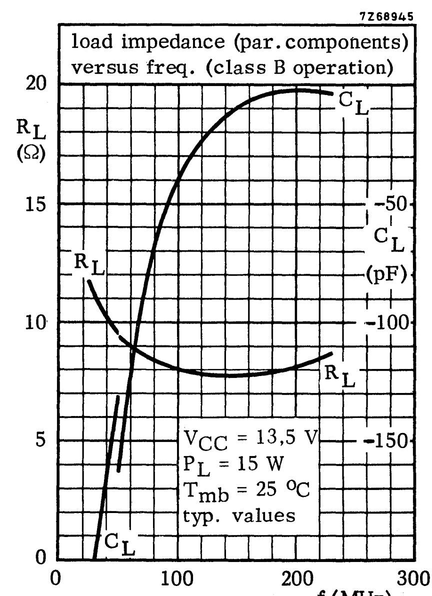
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

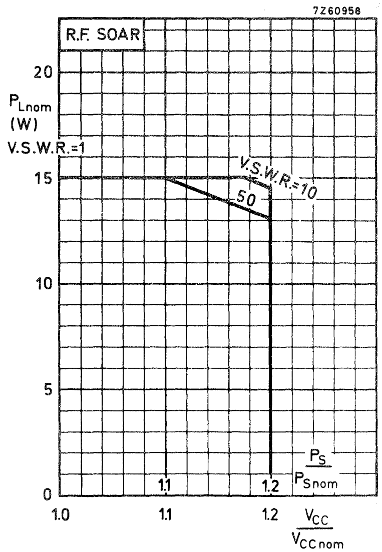
OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.

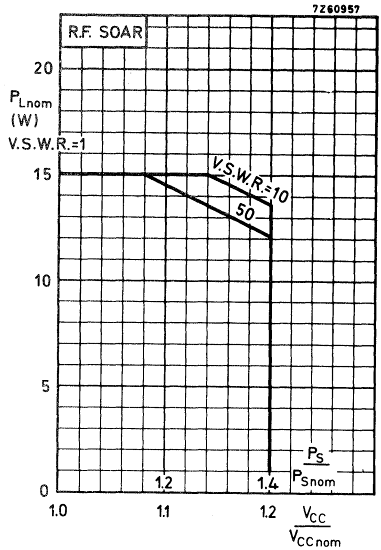












Conditions for R.F. SOAR:

f	= 175 MHz	$P_{Snom} = P_S$ at $V_{CC} = V_{CCnom}$ and V.S.W.R. = 1
T_h	= 70 °C	$R_{th\ mb\text{-}h} = 0.6$ K/W
V_{CCnom}	= 12.5 or 13.5 V	see also page 5

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs above for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V.S.W.R. as parameter.
The left hand graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.
The right hand graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).
Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, h.f. and v.h.f. transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

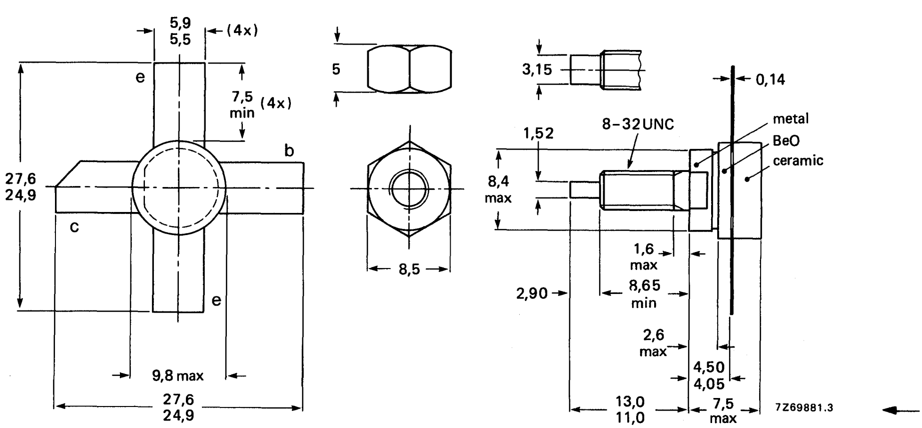
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,5	175	15	> 8,0	> 60	2,3 + j2,2	130 − j4,4
c.w.	12,5	175	15	typ. 7,5	typ. 67	−	−

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max.	36 V
Collector-emitter voltage (open base)	V_{CEO}	max.	18 V
Emitter-base voltage (open collector)	V_{EBO}	max.	4 V
Collector current (average)	$I_{C(AV)}$	max.	3 A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	8 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	36 W
Storage temperature	T_{stg}		–65 to +150 °C
Operating junction temperature	T_j	max.	200 °C

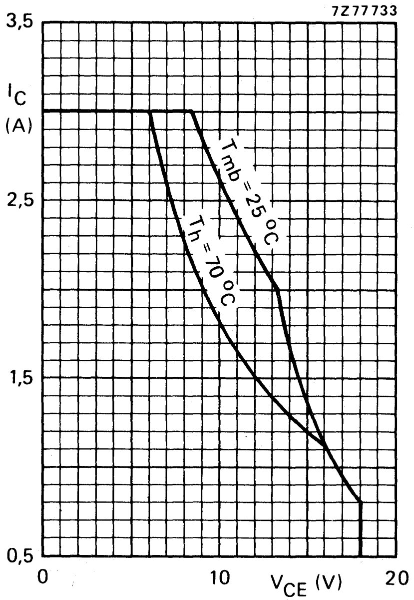


Fig. 2 D.C. SOAR.

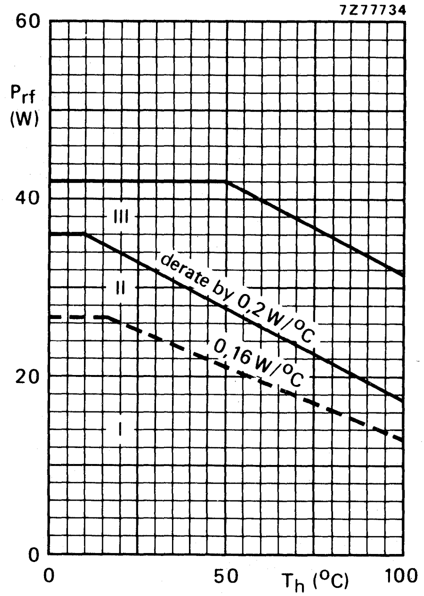


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 16{,}5$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; T_{mb} = 77 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	= 6,55	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	= 4,95	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	= 0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	36 V
Collector-emitter breakdown voltage open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	18 V
Emitter-base breakdown voltage open collector; $I_E = 4$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 18$ V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	2,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	2,5 mJ
D.C. current gain* $I_C = 1,5$ A; $V_{CE} = 5$ V	h_{FE}		typ. 40 10 to 100
Collector-emitter saturation voltage* $I_C = 4,5$ A; $I_B = 0,9$ A	V_{CEsat}		typ. 1,0 V
Transition frequency at f = 100 MHz* $-I_E = 1,5$ A; $V_{CB} = 13,5$ V	f_T		typ. 850 MHz
$-I_E = 4,5$ A; $V_{CB} = 13,5$ V	f_T		typ. 800 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 13,5$ V	C_c		typ. 32 pF
Feedback capacitance at f = 1 MHz $I_C = 200$ mA; $V_{CE} = 13,5$ V	C_{re}		typ. 23 pF
Collector-stud capacitance	C_{cs}		typ. 2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

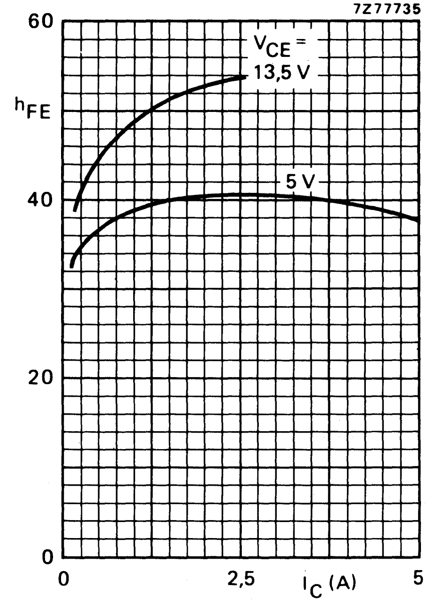


Fig. 4 Typical values; T_j = 25 °C.

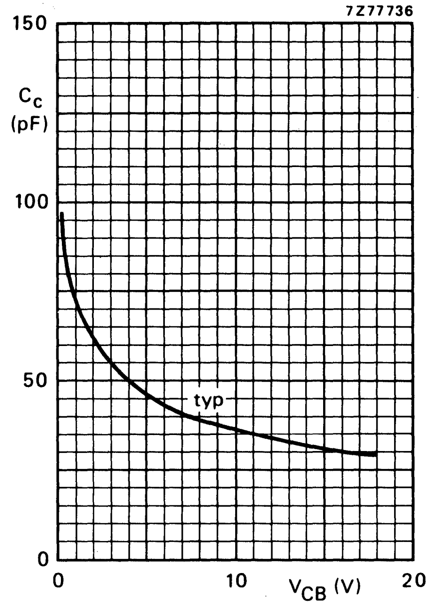


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

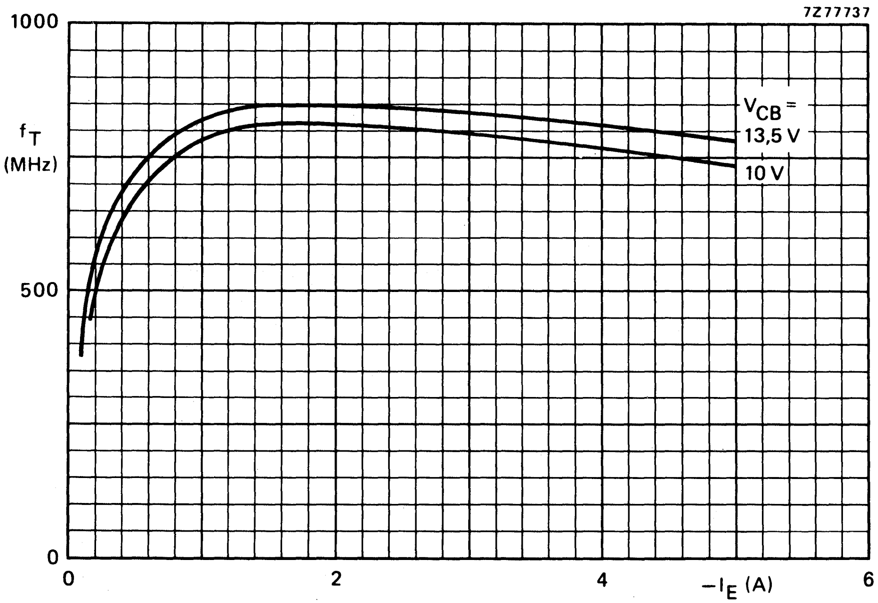


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

$T_h = 25\ ^oC$

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	13,5	15	< 2,4	> 8,0	< 1,85	> 60	2,3 + j2,2	130 – j4,4
175	12,5	15	–	typ. 7,5	–	typ. 67	–	–

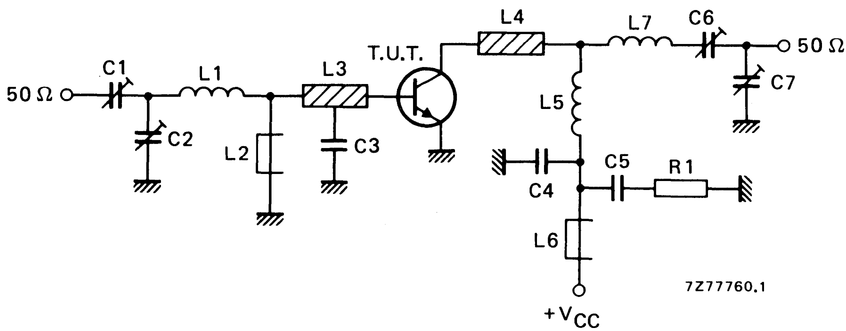


Fig. 7 Test circuit; c.w. class-B.

List of components:

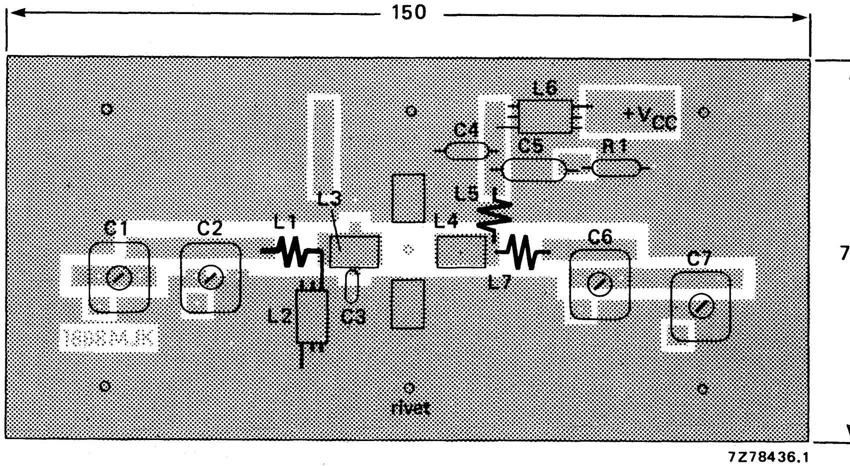
C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

L1 = 2 turns Cu wire (1,6 mm); int. dia. 4,5 mm; length 5,7 mm; leads 2 x 5 mm
L2 = L6 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L3 = L4 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L5 = 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 7,5 mm; leads 2 x 5 mm
L7 = 3 turns Cu wire (1,6 mm); int. dia. 6,5 mm; length 7,4 mm; leads 2 x 5 mm

L3 and L4 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

R1 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



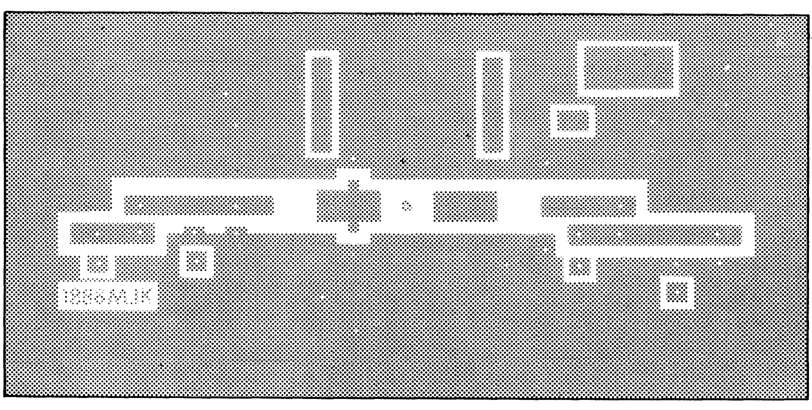


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

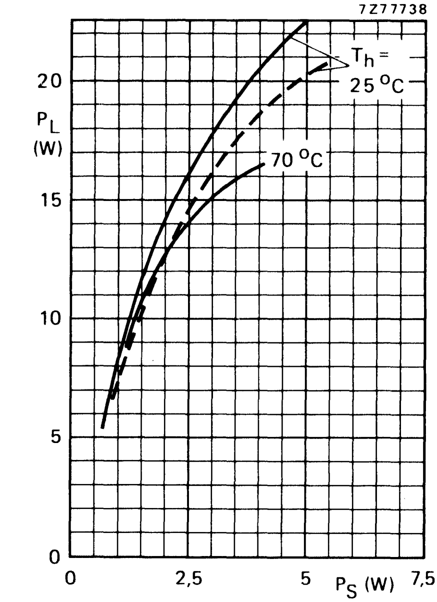


Fig. 9 Typical values; f = 175 MHz;
——— V_{CE} = 13,5 V; – – – – V_{CE} = 12,5 V.

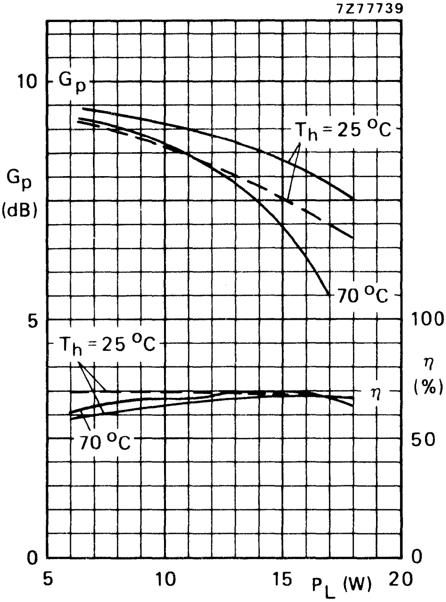


Fig. 10 Typical values; f = 175 MHz;
——— V_{CE} = 13,5 V; – – – – V_{CE} = 12,5 V.

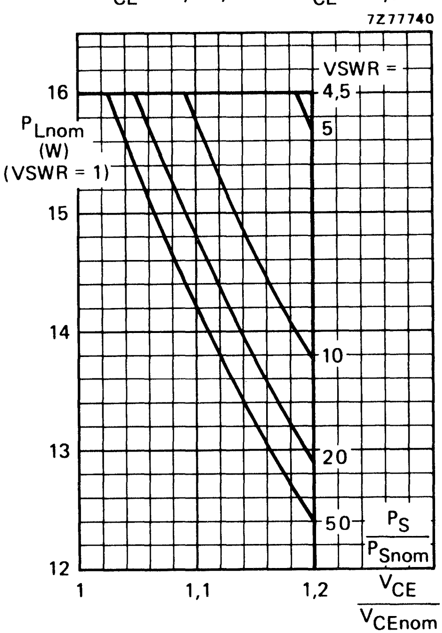


Fig. 11 R.F. SOAR (short-time operation during mismatch); f = 175 MHz; T_h = 70 °C; $R_{th\ mb\text{-}h}$ = 0,45 K/W; V_{CEnom} = 13,5 V or 12,5 V; $P_S = P_{Snom}$ at V_{CEnom} and VSWR = 1.

Note to Fig. 11:

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

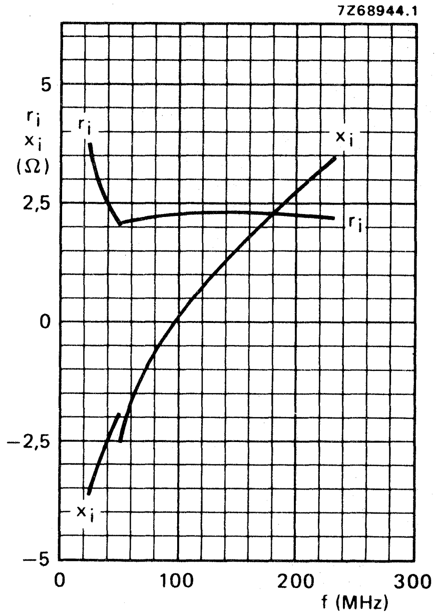


Fig. 12 Input impedance (series components).

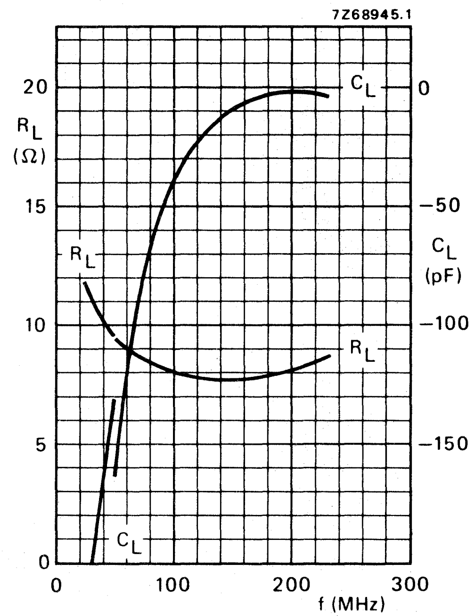


Fig. 13 Load impedance (parallel components).

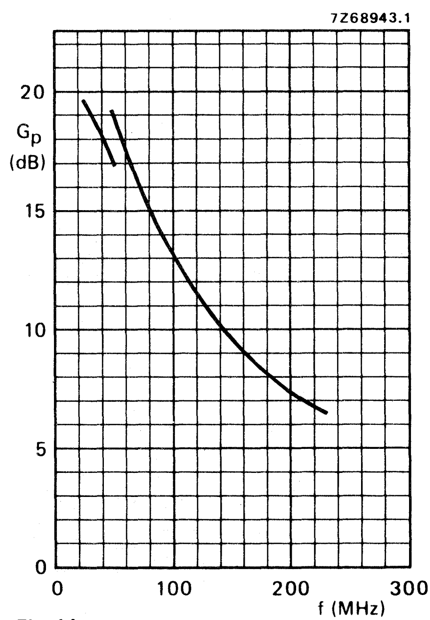


Fig. 14.

Conditions for Figs 12, 13 and 14:

Typical values: V_{CE} = 13,5 V; P_L = 15 W; T_h = 25 °C.

OPERATING NOTE

Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 13,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 16,5 V. It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

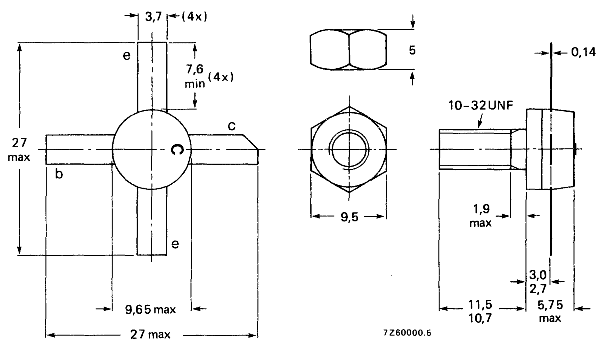
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,5	175	< 6,25	25	< 2,64	> 6	> 70	1,6 + j1,4	213 + j5,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



Torque on nut: min. 1,5 Nm (15 kg cm)
max. 1,7 Nm (17 kg cm)

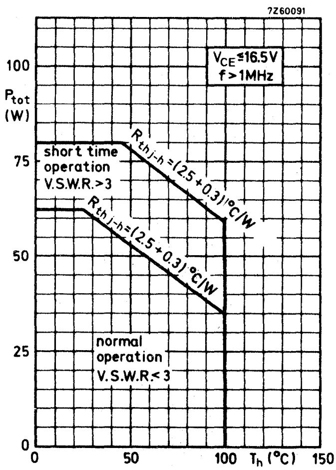
Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

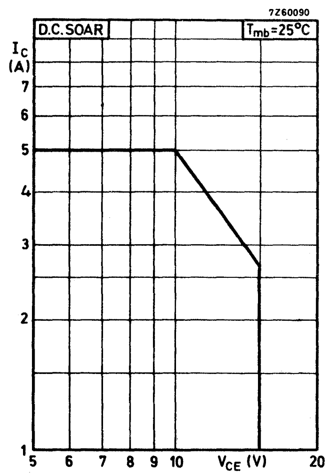
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	5	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	10	A
Total power dissipation up to T_{mb} = 25 °C f > 1 MHz	P_{tot}	max.	70	W





Storage temperature	T_{stg}		−30 to +200	°C
Operating junction temperature	T_j	max.	200	°C

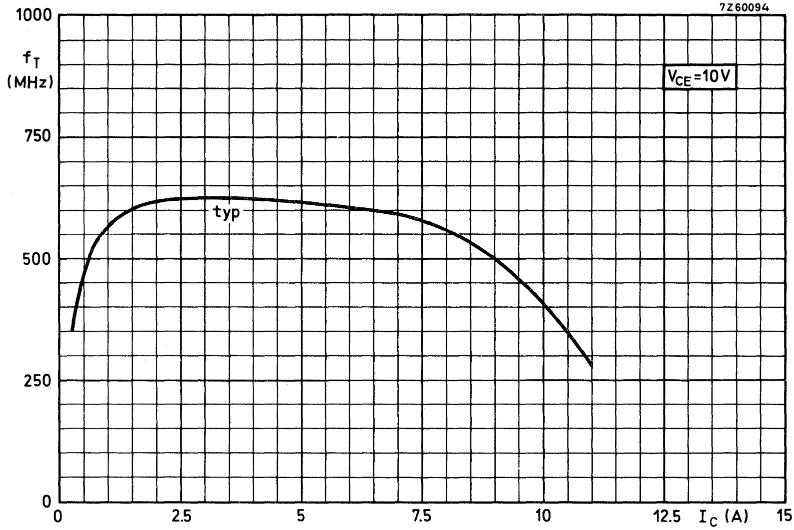
THERMAL RESISTANCE

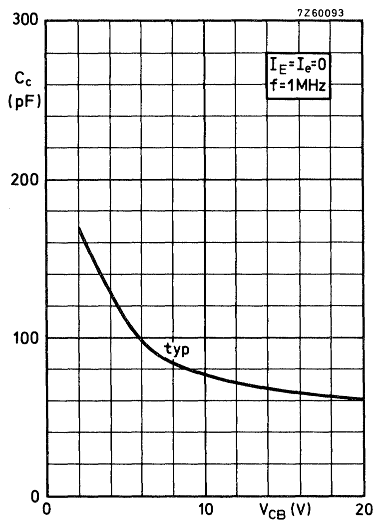
From junction to mounting base	$R_{th\ j-mb}$	=	2.5	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.3	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 50 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage open base, I_C = 50 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain				
I_C = 1 A; V_{CE} = 5 V	h_{FE}	typ. 10 to	50 120	
Transition frequency				
I_C = 4 A; V_{CE} = 10 V	f_T	typ.	650	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e$ = 0; V_{CB} = 15 V	C_c	typ. <	65 90	pF pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 15 V	C_{re}	typ.	41	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60094
1000
f_T
(MHz)
750
500
250
0
0
2.5
5
7.5
10
12.5
I_C (A)
15
V_{CE} = 10 V
typ


7Z60093
300
C_c
(pF)
200
100
0
0
10
V_{CB} (V)
20
$I_E = I_e = 0$
f = 1 MHz
typ

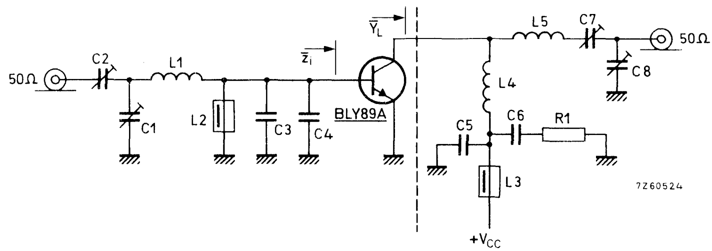
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralised common-emitter class B circuit)

V_{CC} = 13.5 V; T_{mb} up to 25 °C

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	< 6.25	25	< 2.64	> 6	> 70	1.6+j1.4	213 + j5.5

Test circuit



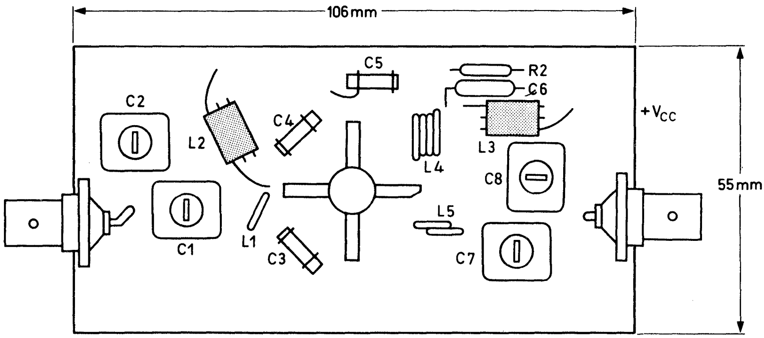
C1 = 4 to 44 pF film dielectric trimmer (code number 2222 809 07008)
C2 = 2 to 22 pF film dielectric trimmer (code number 2222 809 07004)
C3 = C4 = 47 pF ceramic
C5 = 100 pF ceramic
C6 = 150 nF polyester
C7 = 4 to 104 pF film dielectric trimmer (code number 2222 809 07015)
C8 = 4 to 64 pF film dielectric trimmer (code number 2222 809 07011)

L1 = 0.5 turn enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm
L2 = L3 = ferroxcube choke (code number 4312 020 36640)
L4 = 3.5 turns closely wound enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm
L5 = 1 turn enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

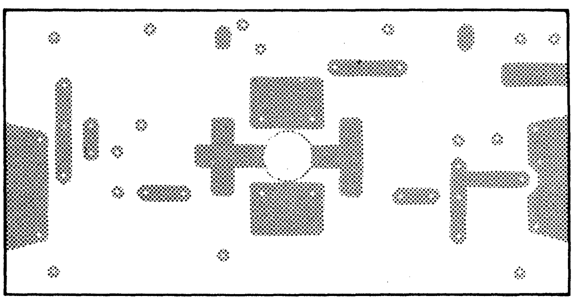
R1 = 10 Ω carbon

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

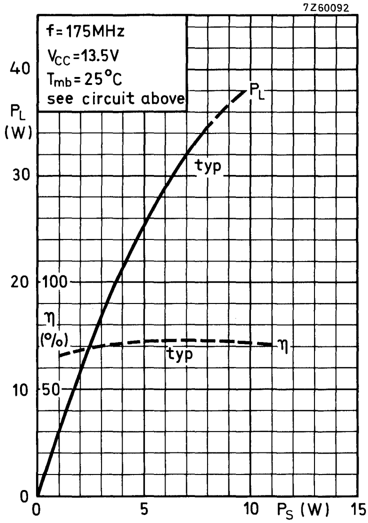


7Z60525



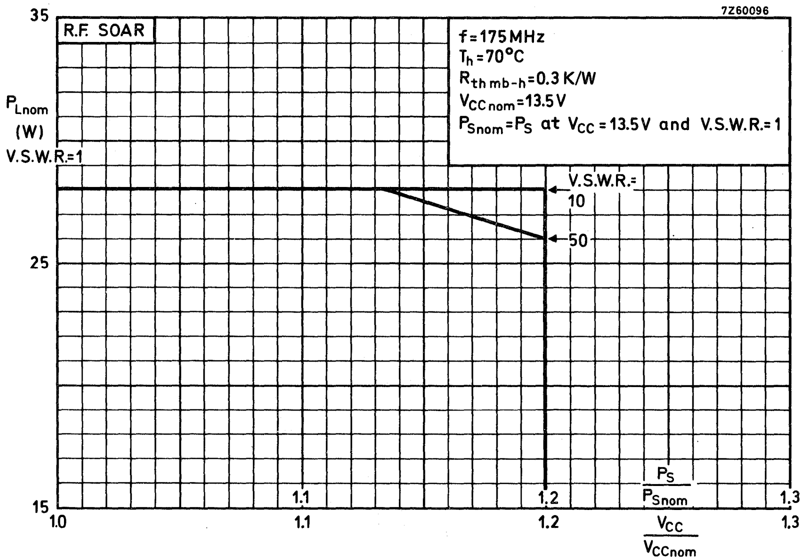
7Z67868

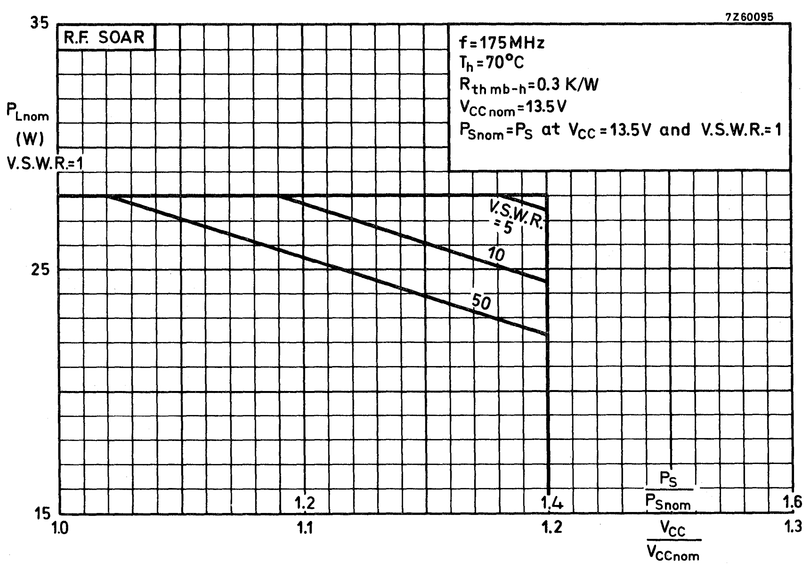
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.



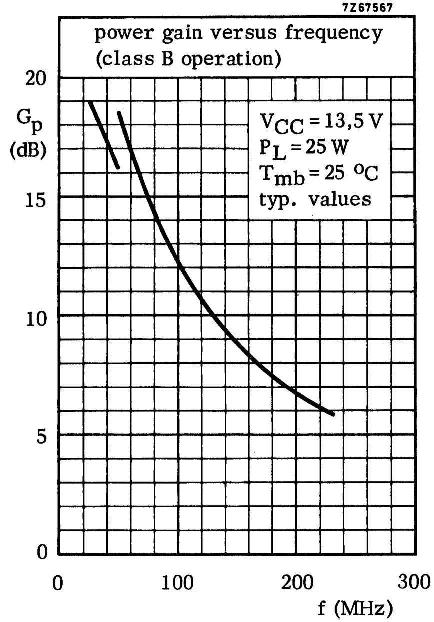
The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graphs next page for safe operation at supply voltages other than the nominal. The graphs show the allowable output power under nominal conditions, as a function of the supply overvoltage ratio, with V.S.W.R. as parameter.
The upper graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio.
The lower graph shows the derating factor to be applied when the drive (P_S/P_{Snom}) increases as the square of the supply overvoltage ratio (V_{CC}/V_{CCnom}).

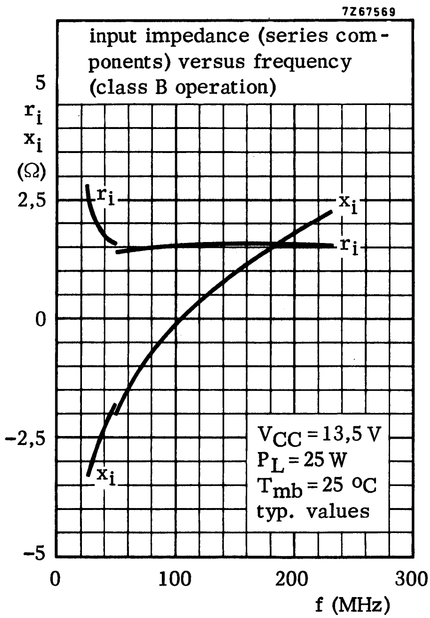
Depending on the operating conditions, the appropriate derating factor may lie in the region between the linear and the square-law functions.

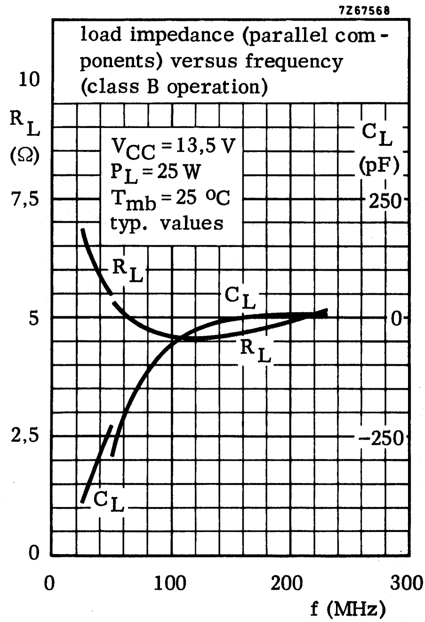

7Z60096
R.F. SOAR
f = 175 MHz
T_h = 70°C
$R_{th\ mb-h}$ = 0.3 K/W
$V_{CC\ nom}$ = 13.5 V
$P_{S\ nom}$ = P_S at V_{CC} = 13.5 V and V.S.W.R. = 1
$P_{L\ nom}$ (W) V.S.W.R. = 1
35
25
15
V.S.W.R. = 10
50
1.0
1.1
1.2
1.3
$\frac{P_S}{P_{S\ nom}}$
$\frac{V_{CC}}{V_{CC\ nom}}$


7Z60095
R.F. SOAR
f = 175 MHz
T_h = 70°C
$R_{th\ mb-h}$ = 0.3 K/W
$V_{CC\ nom}$ = 13.5 V
$P_{S\ nom}$ = P_S at V_{CC} = 13.5 V and V.S.W.R. = 1
$P_{L\ nom}$ (W) V.S.W.R. = 1
35
25
15
V.S.W.R. = 5
10
50
1.2
1.4
1.6
1.0
1.1
1.2
1.3
$\frac{P_S}{P_{S\ nom}}$
$\frac{V_{CC}}{V_{CC\ nom}}$

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 13,5 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions with a supply over-voltage to 16,5 V. It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

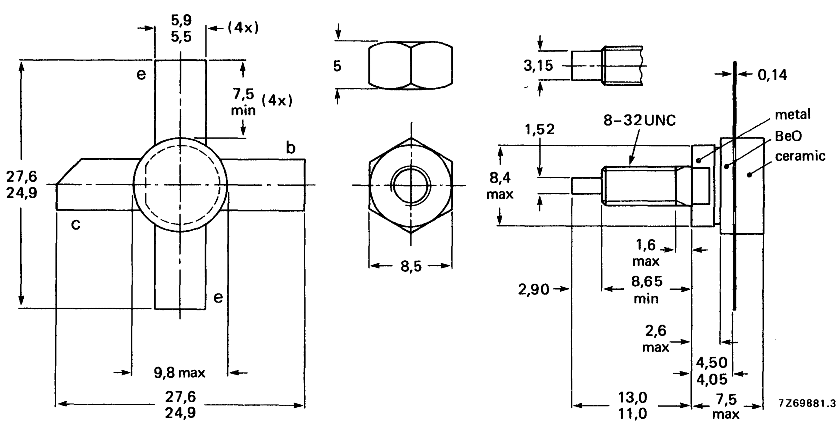
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CC} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	13,5	175	25	> 6	> 70	1,6 + j1,4	210 + j5,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min 0,75 Nm (7,5 kg cm)
max 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

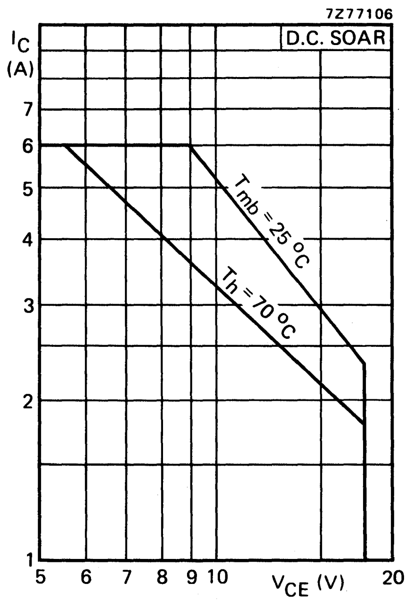
When locking is required an adhesive is preferred instead of a lock washer.

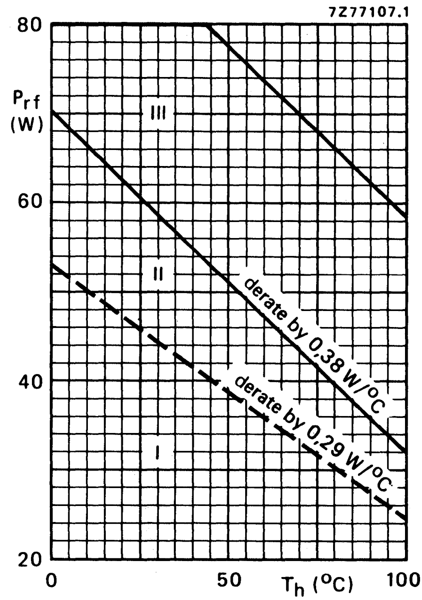
PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-emitter voltage ($V_{BE} = 0$) peak value	V_{CESM}	max	36 V
Collector-emitter voltage (open base)	V_{CEO}	max	18 V
Emitter-base voltage (open collector)	V_{EBO}	max	4 V
Collector current (average)	$I_{C(AV)}$	max	6 A
Collector current (peak value); f > 1 MHz	I_{CM}	max	12 A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max	73 W





R.F. power dissipation; $V_{CE} \leqslant$ 16,5 V; f > 1 MHz.

I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation 20 W; T_{mb} = 79 °C, i.e. T_h = 70 °C)

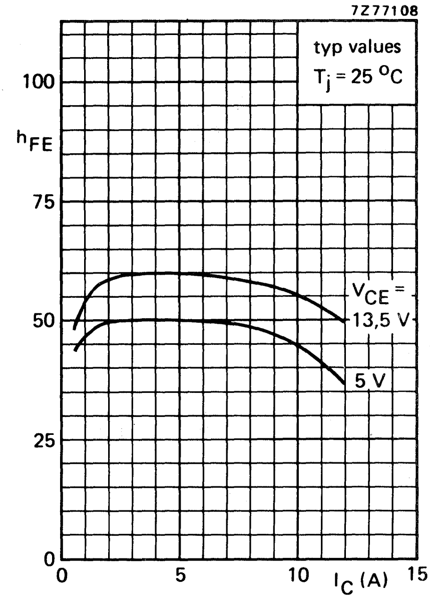
From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	3,1 K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	2,3 K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45 K/W

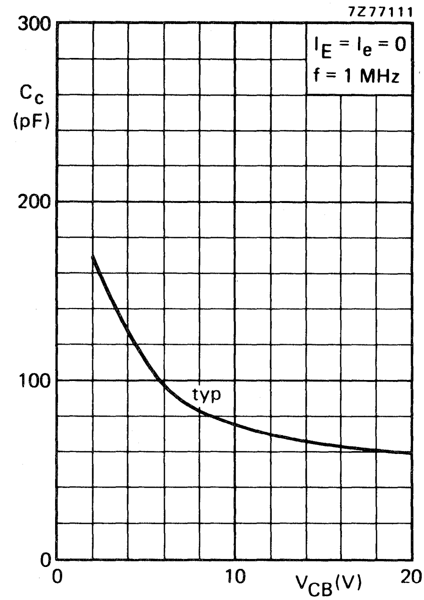
CHARACTERISTICS

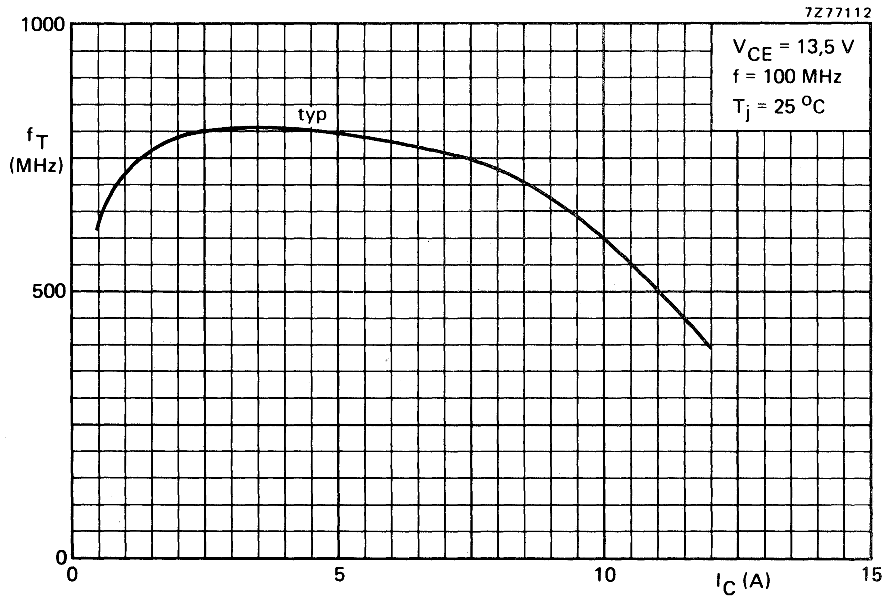
T_j = 25 °C

Breakdown voltage			
Collector-emitter voltage V_{BE} = 0; I_C = 25 mA	$V_{(BR)CES}$	>	36 V
Collector-emitter voltage open base; I_C = 50 mA	$V_{(BR)CEO}$	>	18 V
Emitter-base voltage open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
V_{BE} = 0; V_{CE} = 18 V	I_{CES}	<	10 mA
Transient energy			
L = 25 mH; f = 50 Hz			
open base	E	>	8 ms
$-V_{BE}$ = 1,5 V; R_{BE} = 33 Ω	E	>	8 ms
D.C. current gain*			
I_C = 2,5 A; V_{CE} = 5 V	h_{FE}	typ	50
			10 to 80
Collector-emitter saturation voltage*			
I_C = 7,5 A; I_B = 1,5 A	V_{CEsat}	typ	1,7 V
Transition frequency at f = 100 MHz*			
I_C = 2,5 A; V_{CE} = 13,5 V	f_T	typ	800 MHz
I_C = 7,5 A; V_{CE} = 13,5 V	f_T	typ	750 MHz
Collector capacitance at f = 1 MHz			
I_E = I_e = 0; V_{CB} = 15 V	C_c	typ	65 pF
		<	90 pF
Feedback capacitance at f = 1 MHz			
I_C = 100 mA; V_{CE} = 15 V	C_{re}	typ	41 pF
Collector-stud capacitance	C_{cs}	typ	2 pF

* Measured under pulse conditions: $t_p \leq 200\ \mu s$; $\delta \leq 0{,}02$.


7Z77108
typ values
T_j = 25 °C
h_{FE}
100
75
50
25
0
V_{CE} =
13,5 V
5 V
0
5
10
15
I_C (A)


7Z77111
$I_E = I_e = 0$
f = 1 MHz
C_c
(pF)
300
200
100
0
typ
0
10
20
V_{CB}(V)


7Z77112
V_{CE} = 13,5 V
f = 100 MHz
T_j = 25 °C
f_T
(MHz)
1000
500
0
typ
0
5
10
15
I_C (A)

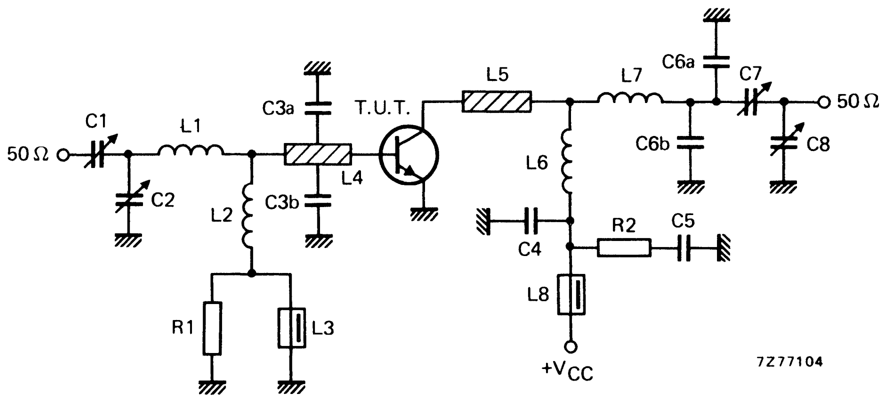
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CC}(V)	P_L(W)	P_S(W)	G_p(dB)	I_C(A)	η (%)	$\overline{z_i}$(Ω)	$\overline{Y_L}$ (mS)
175	13,5	25	<6,25	> 6	<2,64	> 70	1,6 + j1,4	210 + j5,5
175	12,5	25	–	typ 6,6	–	typ 75	–	–

Test circuit for 175 MHz



List of components:

C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6a = C6b = 8,2 pF ceramic capacitor (500 V)
C7 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)

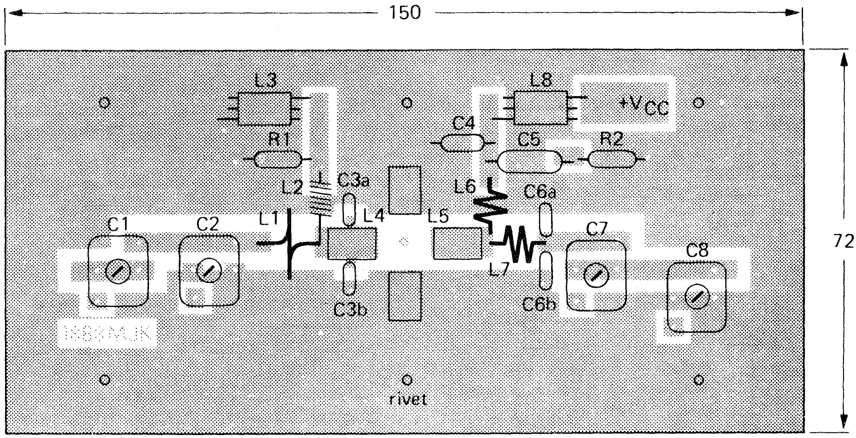
L1 = 1 turn enamelled Cu wire (1,6 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube choke coil (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 5,0 mm; length 6,0 mm; leads 2 x 5 mm
L7 = 2 turns enamelled Cu wire (1,6 mm); int. dia. 4,5 mm; length 6,0 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

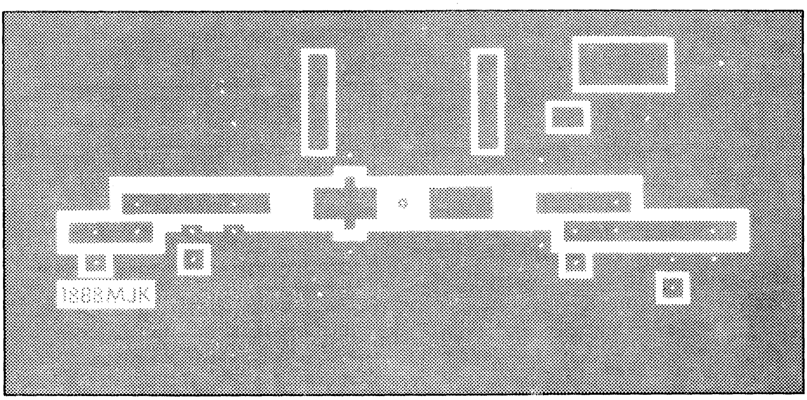
R1 = 10 Ω (±10%) carbon resistor
R2 = 4,7 Ω (±5%) carbon resistor

APPLICATION INFORMATION (continued)

Component layout and printed-circuit board for 175 MHz test circuit.

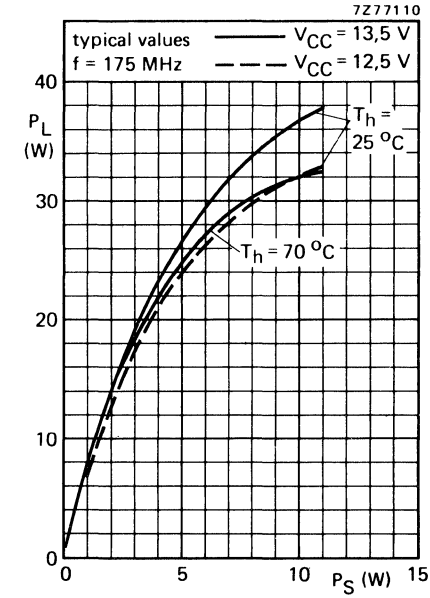


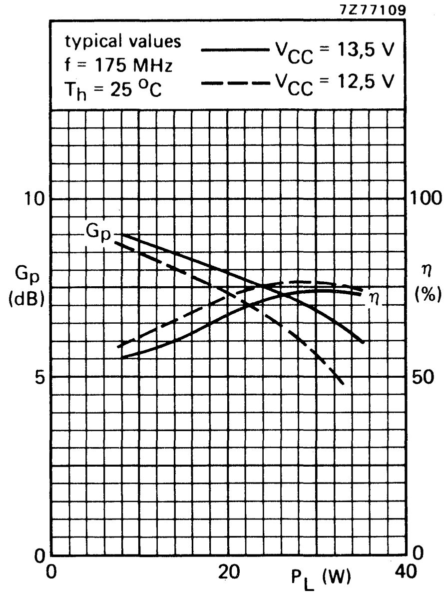
7Z77102

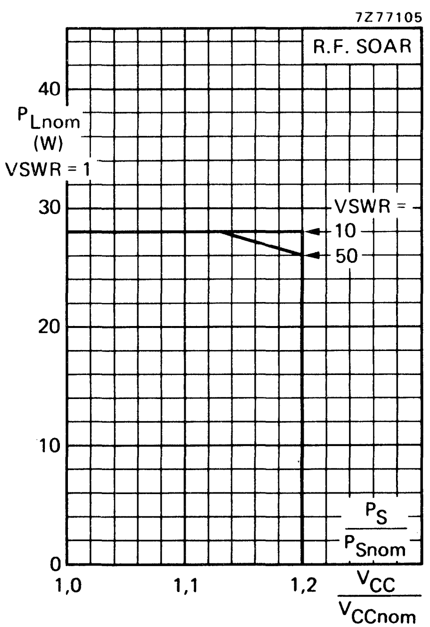


7Z77103

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.







Conditions for R.F. SOAR

f = 175 MHz

T_h = 70 °C

$R_{th\ mb\text{-}h}$ = 0,45 K/W

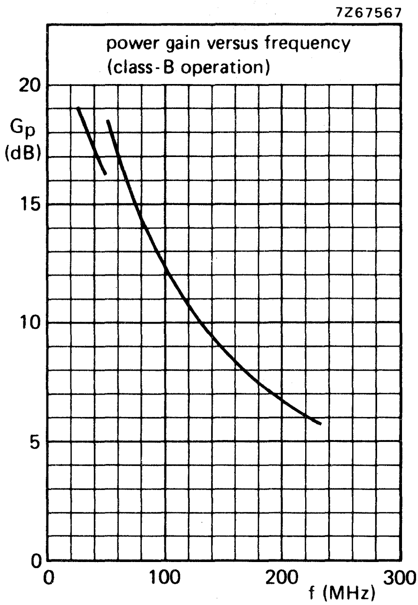
V_{CCnom} = 13,5 V

$P_S = P_{Snom}$ at V_{CCnom} = 13,5 V and VSWR = 1

The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power must be derated in accordance with the graph for safe operation at supply voltages other than the nominal. The graph shows the permissible output power under nominal conditions (VSWR = 1), as a function of the expected supply over-voltage ratio with VSWR as parameter.

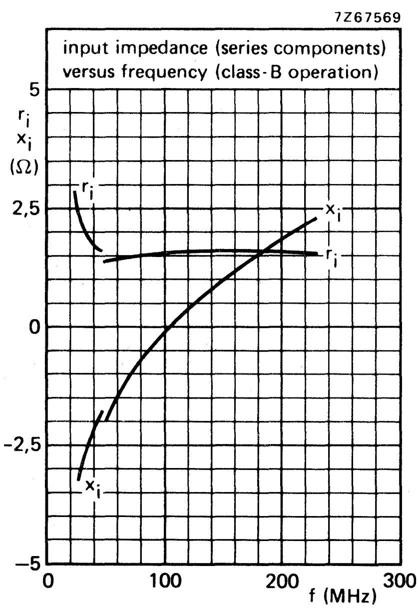
The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply over-voltage ratio.

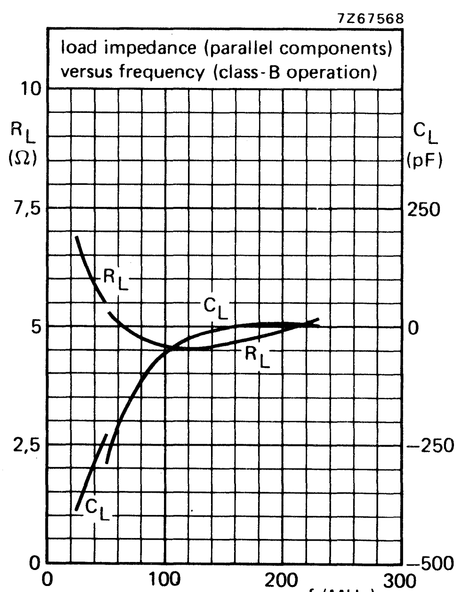
OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.



Measuring conditions for the graphs on this page

V_{CC} = 13,5 V
P_L = 25 W
T_h = 25 °C
typical values





V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 12,5 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions with a supply over-voltage to 15 V. It has a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

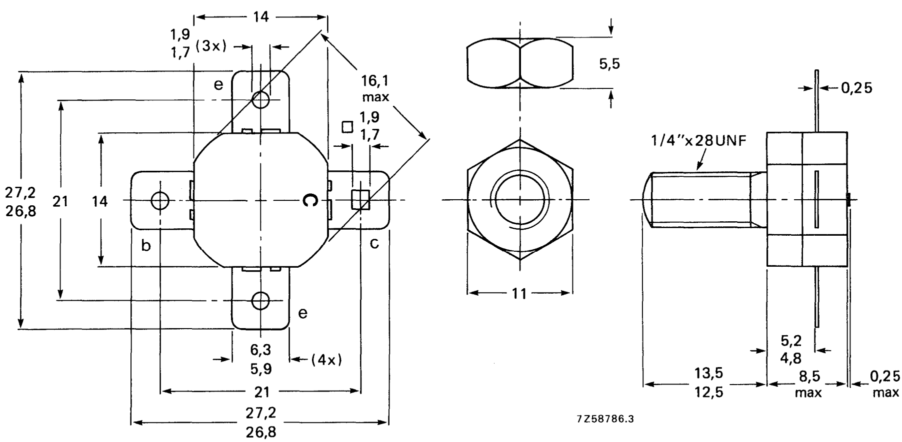
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	12,5	175	< 15,8	50	< 5,33	> 5,0	> 75	1,3 + j1,6	270 + j170

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



Torque on nut: min. 2,3 Nm (23 kg cm)
max. 2,7 Nm (27 kg cm)

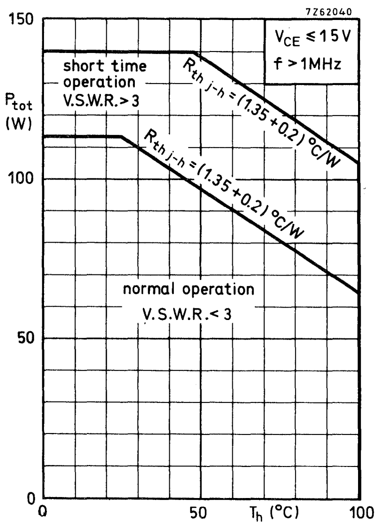
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

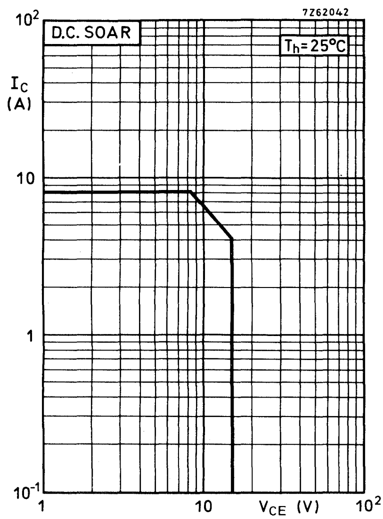
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	8	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	20	A
Total power dissipation up to T_{mb} = 25 °C f > 1 MHz	P_{tot}	max.	130	W





Storage temperature	T_{stg}		−65 to +200	°C
Operating junction temperature	T_j	max.	200	°C

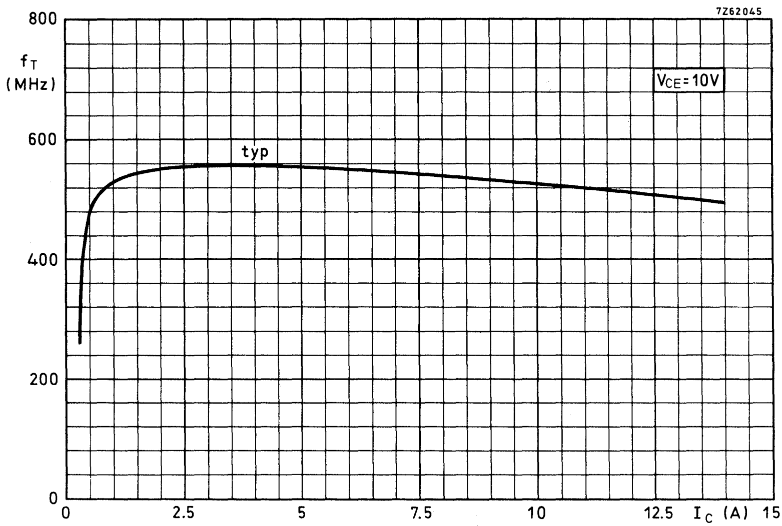
THERMAL RESISTANCE

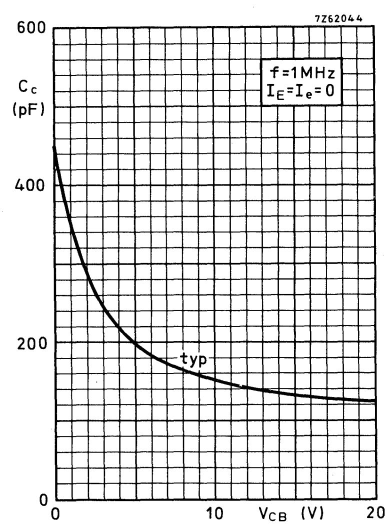
From junction to mounting base	$R_{th\ j-mb}$	=	1.35	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage				
open emitter, I_C = 100 mA	$V_{(BR)CBO}$	>	36	V
Collector-emitter voltage				
open base, I_C = 100 mA	$V_{(BR)CEO}$	>	18	V
Emitter-base voltage				
open collector, I_E = 25 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain				
I_C = 1 A; V_{CE} = 5 V	h_{FE}	>	10	
		typ.	50	
Transition frequency				
I_C = 6 A; V_{CE} = 10 V	f_T	typ.	550	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; V_{CB} = 15 V	C_c	typ.	130	pF
		<	160	pF
Feedback capacitance				
I_C = 200 mA; V_{CE} = 15 V	$-C_{re}$	typ.	82	pF
Collector-stud capacitance	C_{cs}	typ.	3.5	pF


7Z62045
800
f_T
(MHz)
600
400
200
0
V_{CE} = 10V
typ
0
2.5
5
7.5
10
12.5
I_C (A)
15


7Z62044
600
C_c
(pF)
400
200
0
f = 1 MHz
$I_E = I_e = 0$
typ
0
10
V_{CB} (V)
20

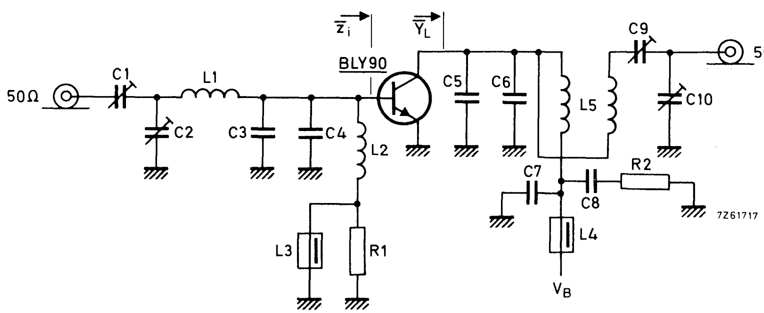
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

f = 175 MHz; T_h up to 25 °C

V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
12,5	< 15,8	50	< 5,33	> 5,0	> 75	1,3 + j 1,6	270+ j 170

Test circuit for 175 MHz:



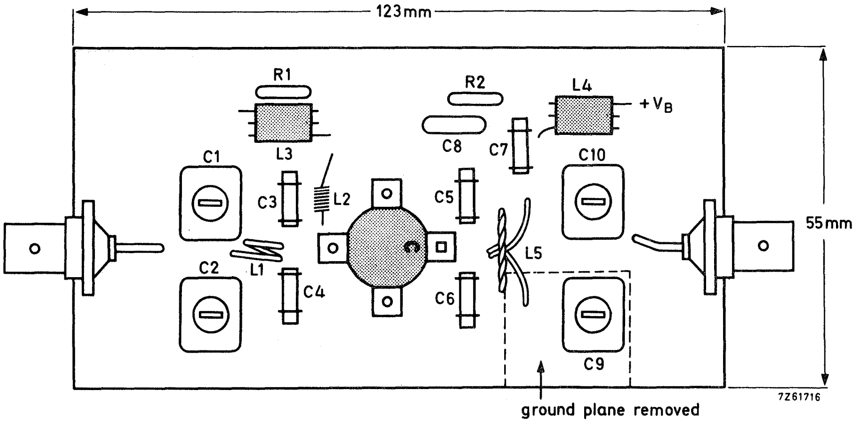
C1 = 2 to 20 pF film dielectric trimmer
C2 = 4 to 40 pF film dielectric trimmer
C3 = C4 = 27 pF ceramic capacitor
C5 = C6 = 56 pF ceramic capacitor
C7 = 100 pF ceramic capacitor
C8 = 100 nF polyester capacitor
C9 = 4 to 80 pF film dielectric trimmer
C10 = 4 to 60 pF film dielectric trimmer

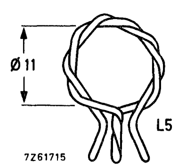
L1 = 1,5 turns enamelled Cu wire (1,5 mm); int. dia. 6 mm; length 4 mm; leads 2 x 5 mm
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L4 = Ferroxcube choke (code number 4312 020 36640)
L5 = bifilar wound enamelled Cu wire (1,0 mm); see figure on next page

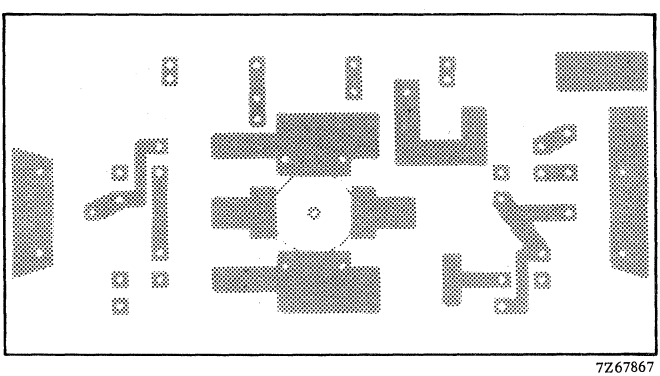
R1 = 10 Ω carbon resistor
R2 = 4,7 Ω carbon resistor

APPLICATION INFORMATION (continued)

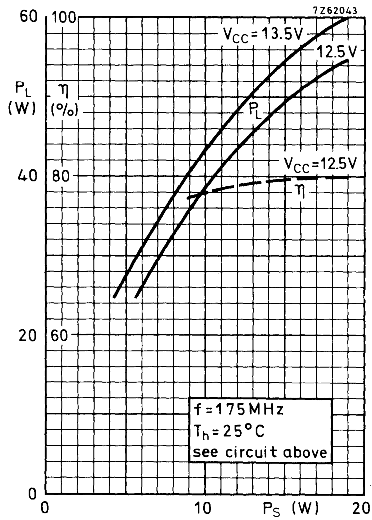
Component lay-out and printed circuit board for 175 MHz test circuit.

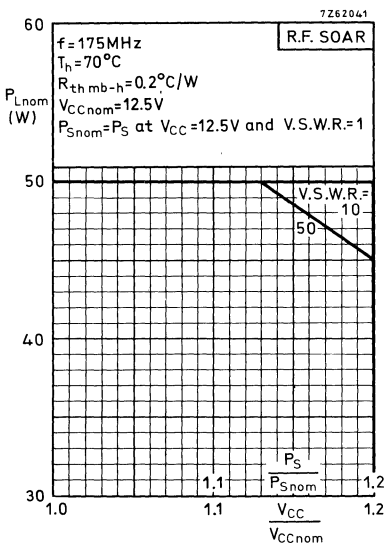




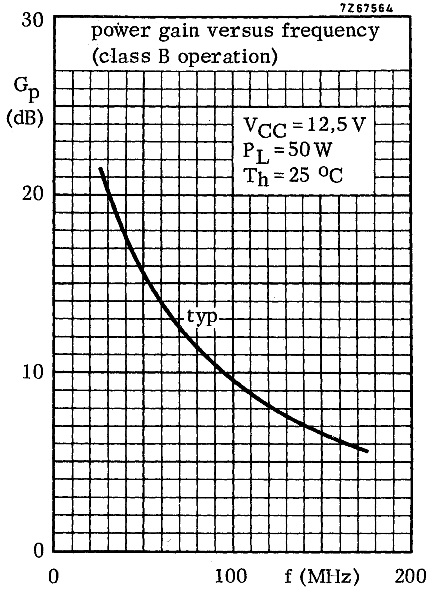


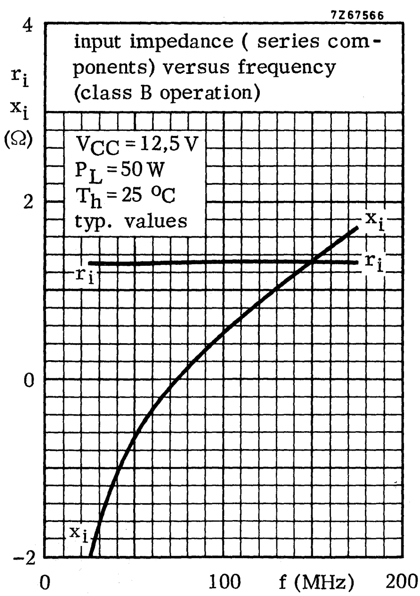
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully **metallized** to serve as earth. Earth connections are made by means of hollow rivets.

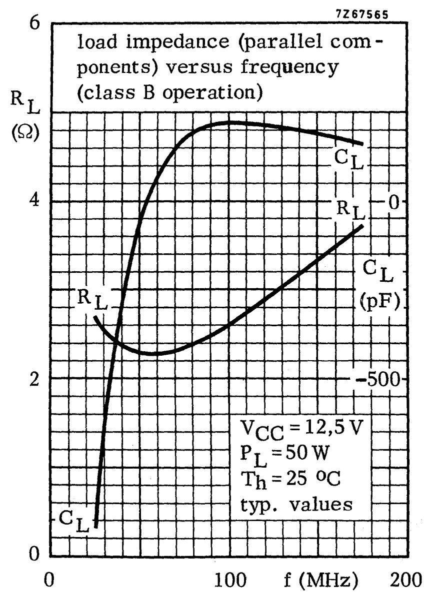




The transistor has been developed for use with unstabilized supply voltages. As the output power and drive power increase with the supply voltage, the nominal output power (P_{Lnom}) must be derated in accordance with the adjacent graph for safe operation at supply voltage other than the nominal. The graph shows the allowable output power under nominal conditions, as a function of the supply overvoltage ratio with V.S.W.R. as parameter. The graph applies to the situation in which the drive (P_S/P_{Snom}) increases linearly with supply overvoltage ratio (V_{CC}/V_{CCnom}).


7Z67564
power gain versus frequency
(class B operation)
G_p
(dB)
30
20
10
0
V_{CC} = 12,5 V
P_L = 50 W
T_h = 25 °C
typ
0
100
f (MHz)
200


7Z67566
input impedance (series components) versus frequency
(class B operation)
r_i
x_i
(Ω)
4
2
0
−2
V_{CC} = 12,5 V
P_L = 50 W
T_h = 25 °C
typ. values
x_i
r_i
r_i
x_i
0
100
f (MHz)
200


7Z67565
load impedance (parallel components) versus frequency
(class B operation)
R_L
(Ω)
6
4
2
0
C_L
R_L
0
C_L
(pF)
R_L
−500
V_{CC} = 12,5 V
P_L = 50 W
T_h = 25 °C
typ. values
C_L
0
100
f (MHz)
200

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

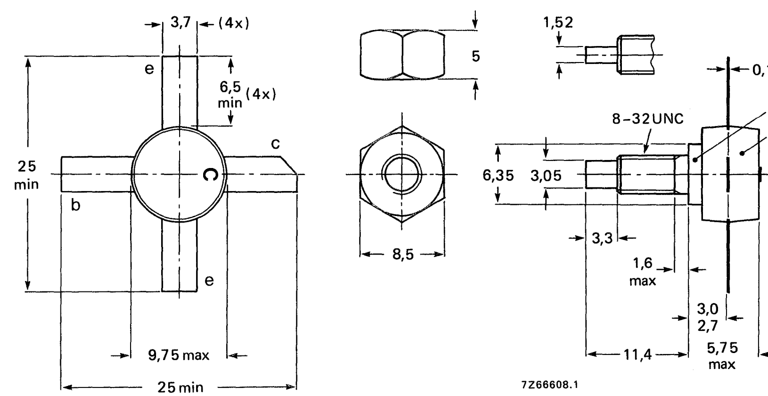
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	8	> 12	> 65	1,8 + j0,7	18 – j20

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2



Torque on nut: min. 0,75 Nm
(7,5 kg cm)
max. 0,85 Nm
(8,5 kg cm)

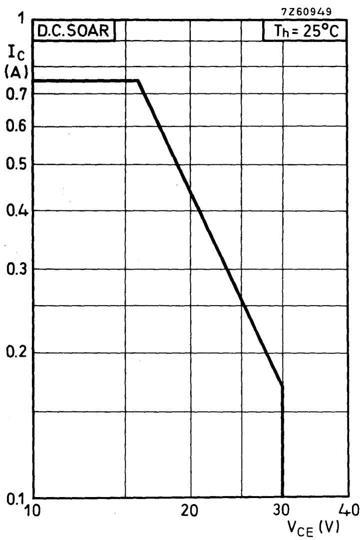
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

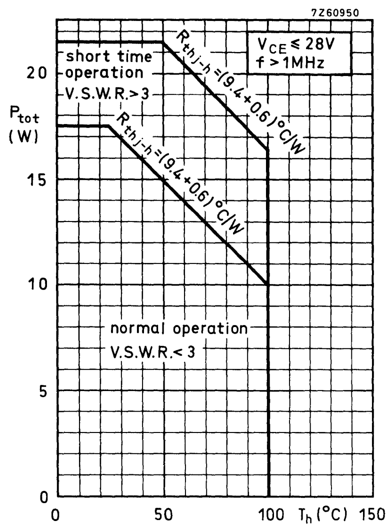
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0.75	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	2.25	A
Total power dissipation up to T_h = 25 °C f > 1 MHz	P_{tot}	max.	17.5	W





Storage temperature	T_{stg}	−30 to +200		°C
Operating junction temperature	T_j	max.	200	°C

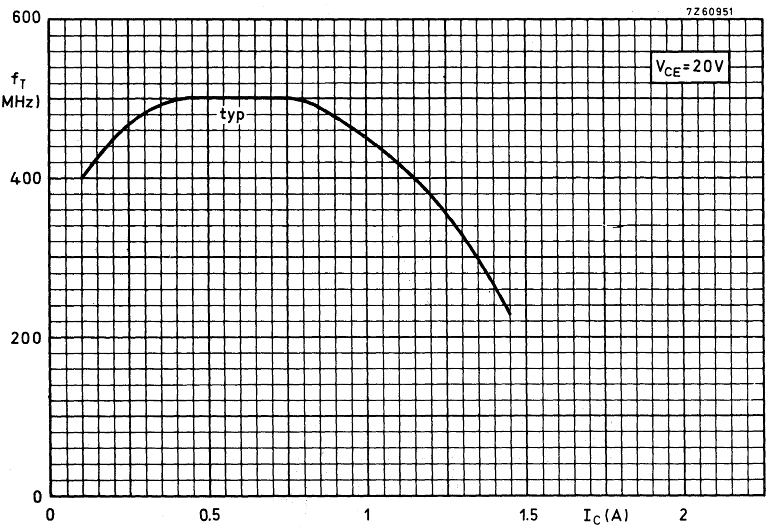
THERMAL RESISTANCE

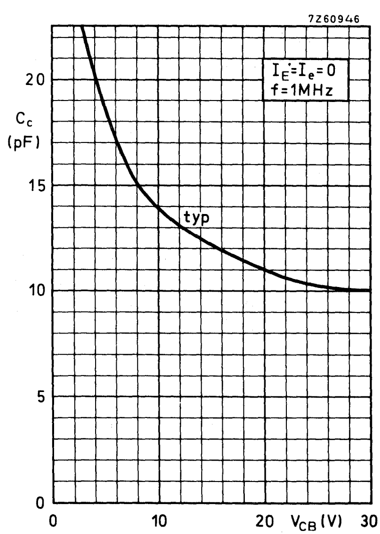
From junction to mounting base	$R_{th\ j-mb}$	=	9.4	K/W
From mounting base to heatsink	$R_{th\ mb-h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 28$ V	I_{CEO}	<	5	mA
Breakdown voltages				
Collector-base voltage open emitter; $I_C = 1$ mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, $I_C = 10$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	0.5	ms
$-V_{BE} = 1.5$ V; $R_{BE} = 33\,\Omega$	E	>	0.5	ms
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 400$ mA; $V_{CE} = 20$ V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 30$ V	C_c	typ.	10	pF
		<	15	pF
Feedback capacitance at f = 1 MHz				
$I_C = 50$ mA; $V_{CE} = 30$ V	C_{re}	typ.	7.5	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60951
600
f_T
(MHz)
400
200
0
0
0.5
1
1.5
I_C (A)
2
V_{CE} = 20V
typ


7Z60946
20
C_c
(pF)
15
10
5
0
0
10
20
V_{CB} (V)
30
$I_E = I_e = 0$
f = 1MHz
typ

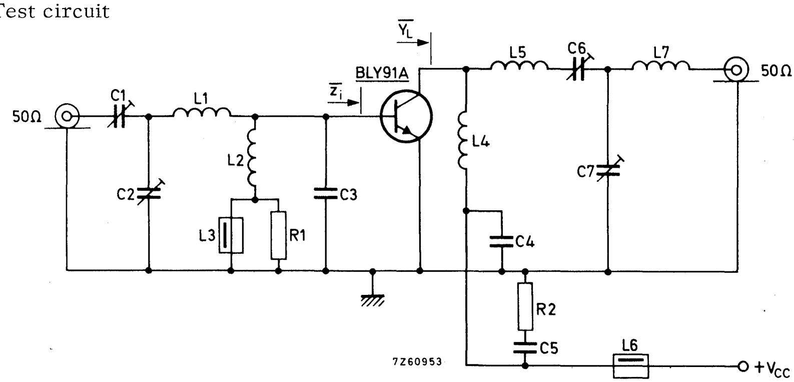
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralised common-emitter class B circuit)

V_{CC} = 28 V; T_{mb} up to 25 °C

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	< 0.50	8	< 0.44	> 12	> 65	1.8+j0.7	18−j20

Test circuit



C1 = 2.5 to 20 pF film dielectric trimmer (code number 2222 809 07004)
C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
C3 = 47 pF ceramic
C4 = 100 pF ceramic
C5 = 150 nF polyester

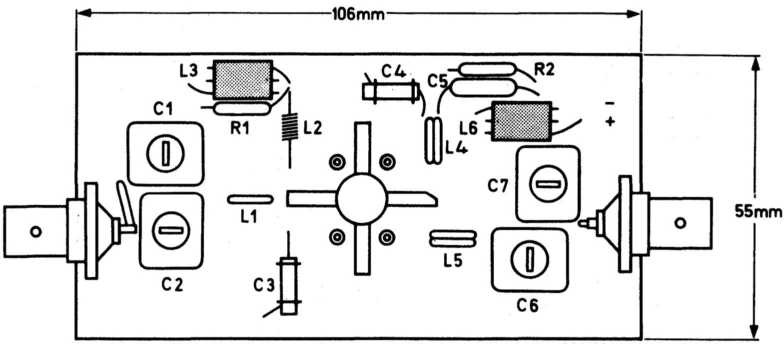
L1 = 0.5 turn enamelled Cu wire (1.5 mm); int. diam. 6 mm; leads 2 x 10 mm
L2 = 6.5 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 5 mm
L3 = L6 = ferroxcube choke (code number 4312 020 36640)
L4 = 7.5 turns enamelled Cu wire (0.7 mm); int. diam. 4 mm; leads 2 x 5 mm
L5 = 4.5 turns enamelled Cu wire (0.7 mm); int. diam. 6 mm; leads 2 x 7 mm
L7 = 3.5 turns enamelled Cu wire (0.7 mm); int. diam. 6 mm; leads 2 x 7 mm

R1 = R2 = 10 Ω carbon

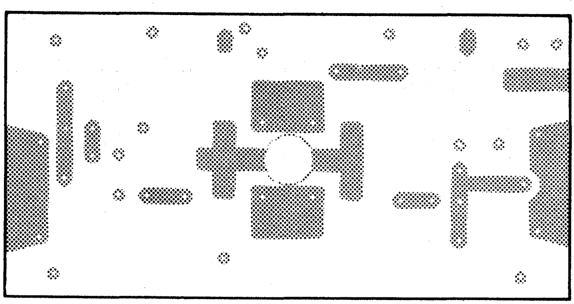
Component lay-out for 175 MHz test circuit see next page.

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

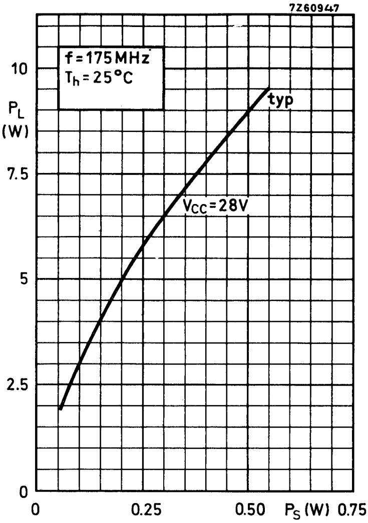


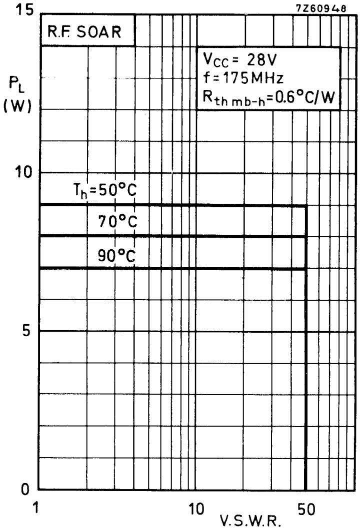
7Z60952



7Z67868

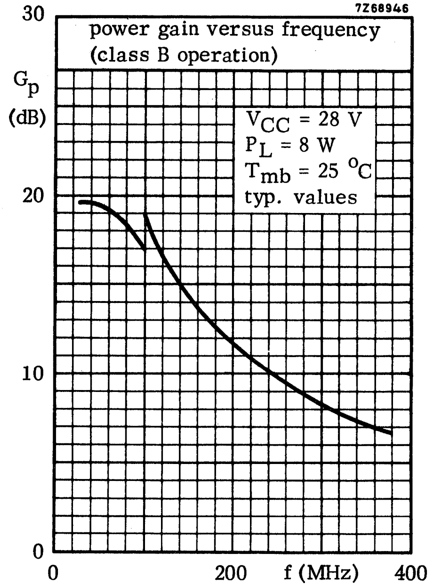
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

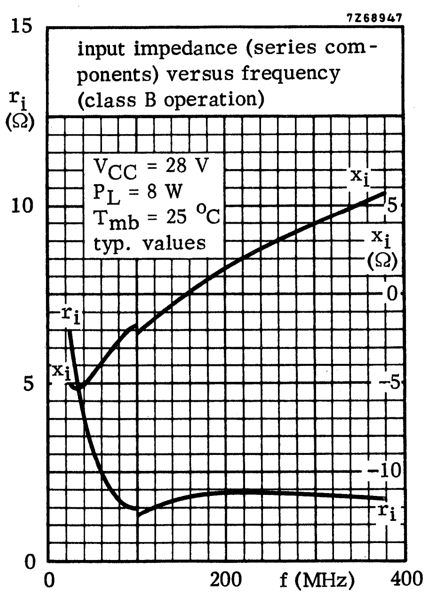


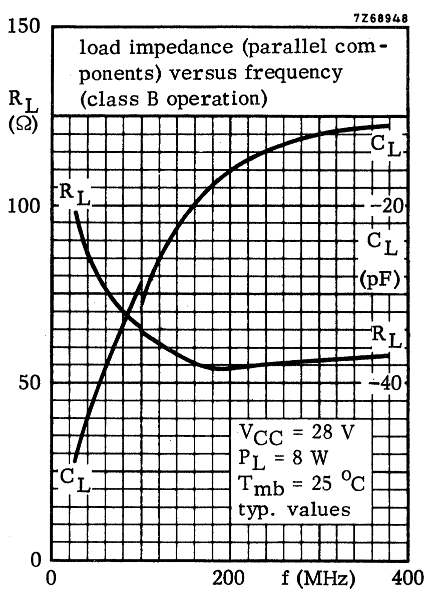


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

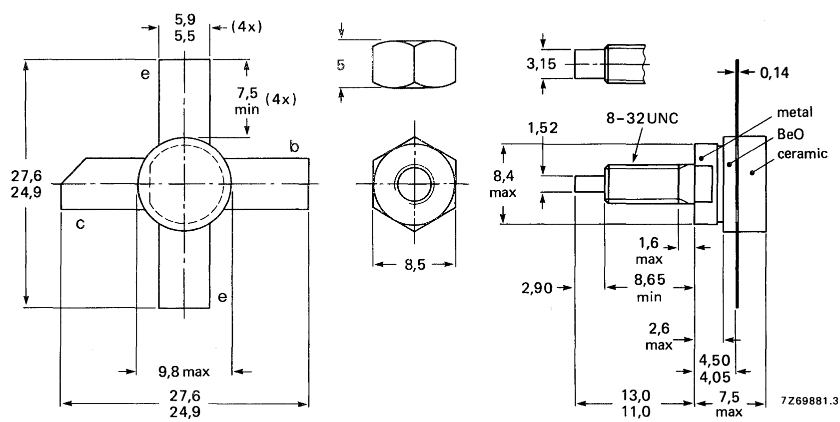
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit.

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	8	> 12	> 65	1,8 + j0,7	18 − j20

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	0,9	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	2,5	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	20	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

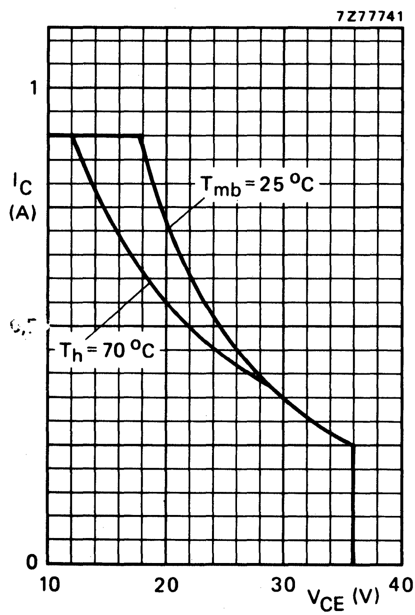


Fig. 2 D.C. SOAR.

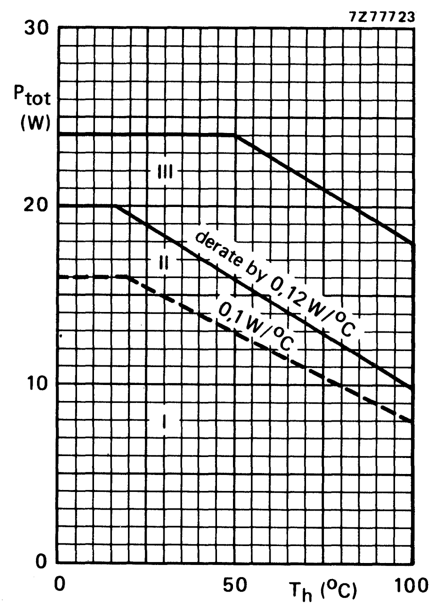


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f > 1 MHz.
I Continuous d.c operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 8 W; T_{mb} = 73,6 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	10,7	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	8,6	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage $V_{BE} = 0$; $I_C = 2$ mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage open base; $I_C = 10$ mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage open collector; $I_E = 1$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current $V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	1 mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	0,5 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	0,5 mJ
D.C. current gain* $I_C = 0,4$ A; $V_{CE} = 5$ V	h_{FE}	typ.	50
			10 to 100
Collector-emitter saturation voltage* $I_C = 1,25$ A; $I_B = 0,25$ A	V_{CEsat}	typ.	0,8 V
Transition frequency at f = 100 MHz* $-I_E = 0,4$ A; $V_{CB} = 28$ V	f_T	typ.	600 MHz
$-I_E = 1,25$ A; $V_{CB} = 28$ V	f_T	typ.	525 MHz
Collector capacitance at f = 1 MHz $I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	10 pF
Feedback capacitance at f = 1 MHz $I_C = 50$ mA; $V_{CE} = 28$ V	C_{re}	typ.	7,1 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0,02$.

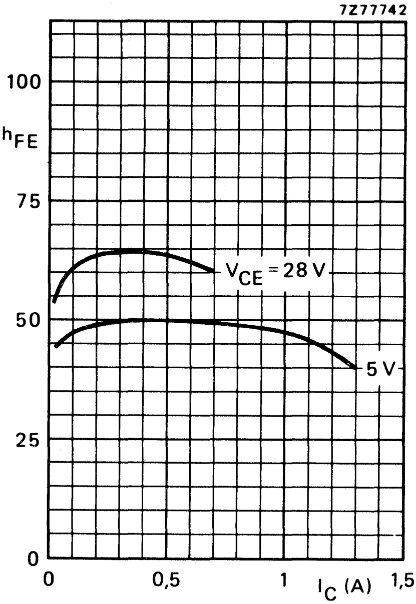


Fig.4 Typical values; T_j = 25 °C.

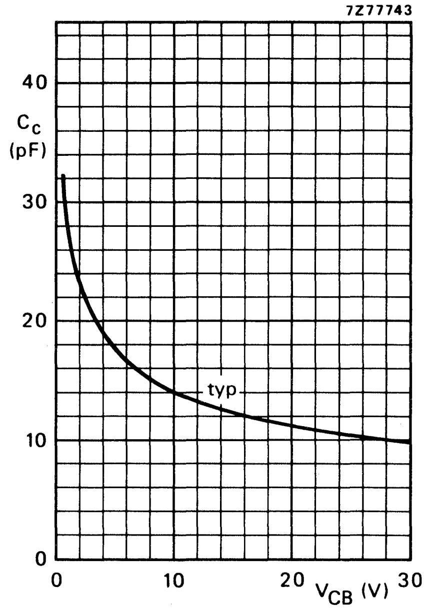


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

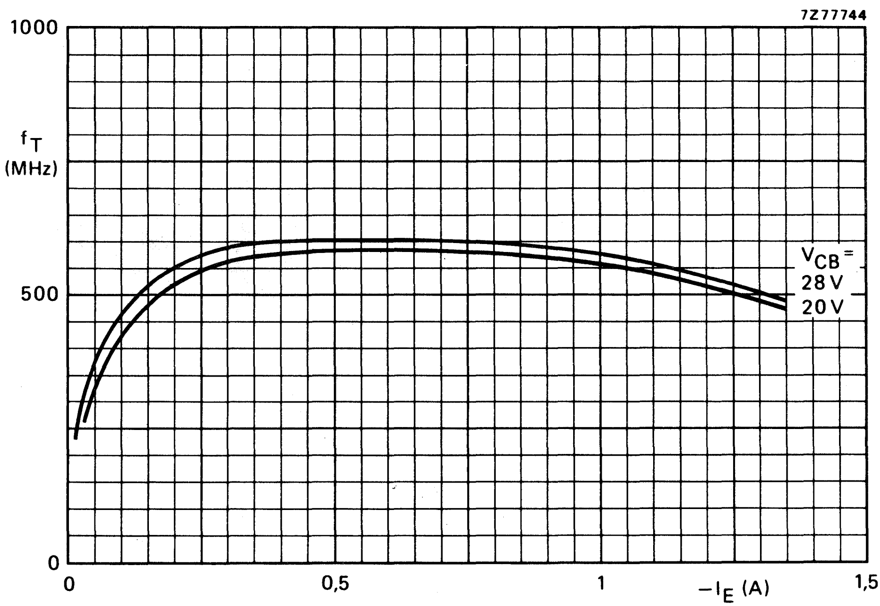


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	8	<0,5	>12	<0,44	>65	1,8 + j0,7	18 – j20

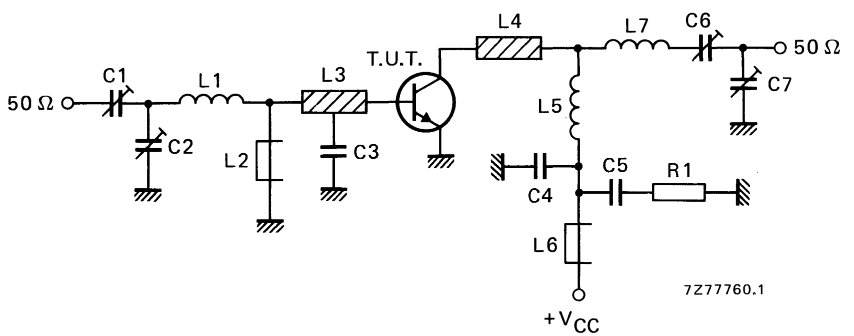


Fig. 7 Test circuit; c.w. class-B.

List of components:

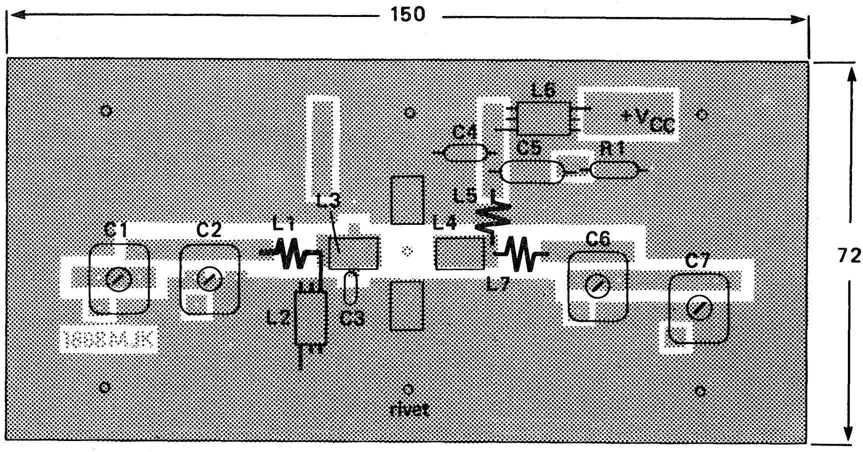
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3 = 27 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L6 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; leads 2 x 5 mm

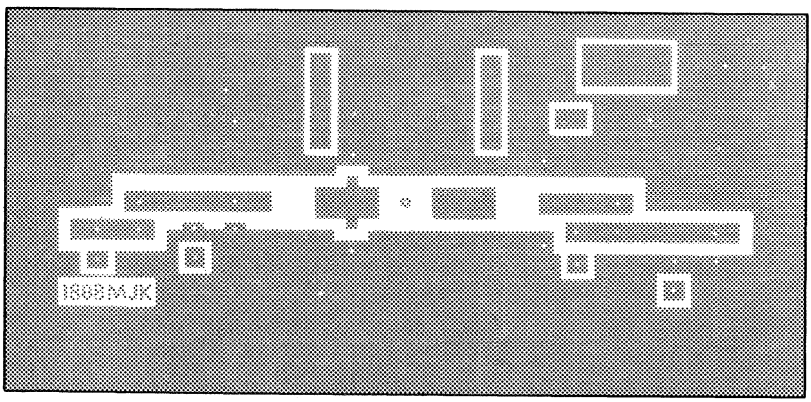
L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16″.

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



7Z78436.1



7Z78435

Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

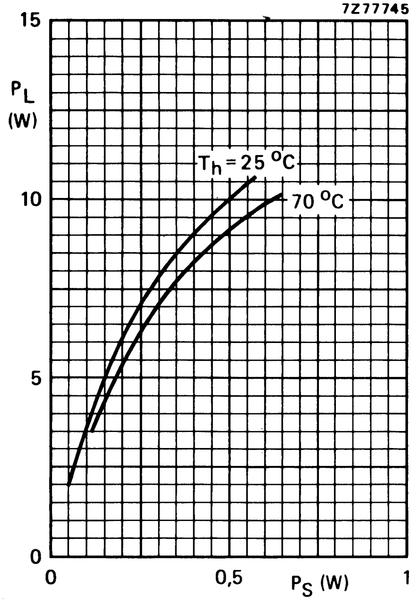


Fig. 9 Typical values; V_{CE} = 28 V; f = 175 MHz.

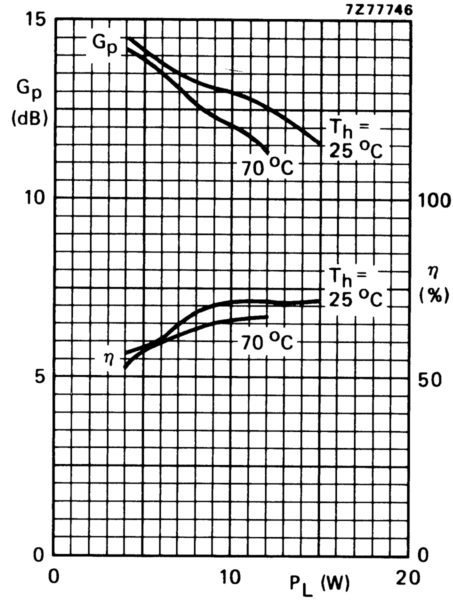


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

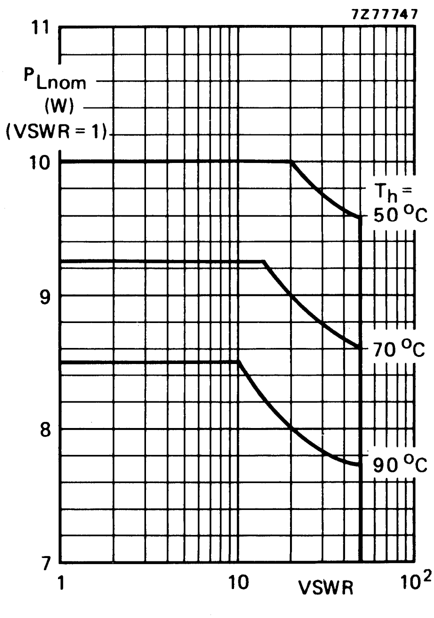


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb-h}$ = 0,45 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

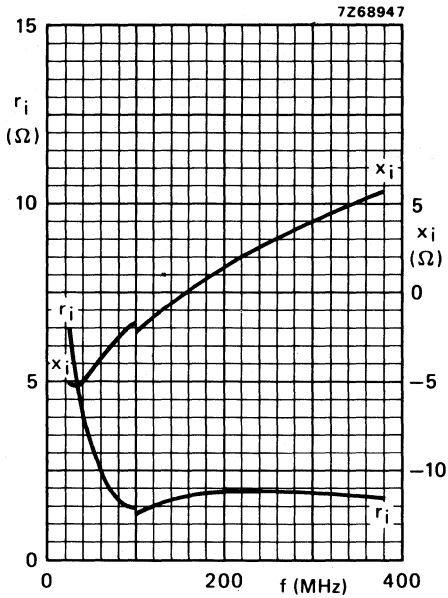


Fig. 12 Input impedance (series components).

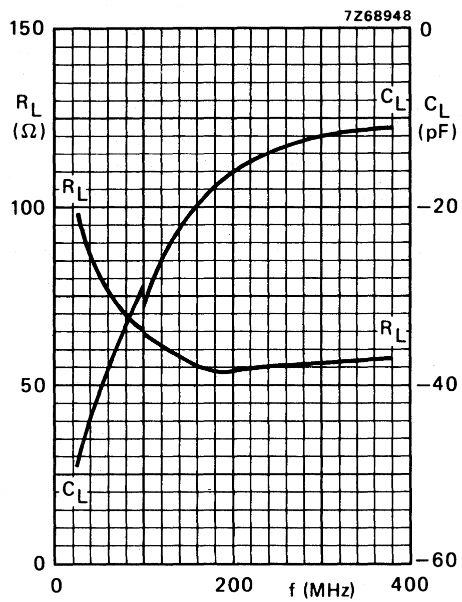


Fig. 13 Load impedance (parallel components).

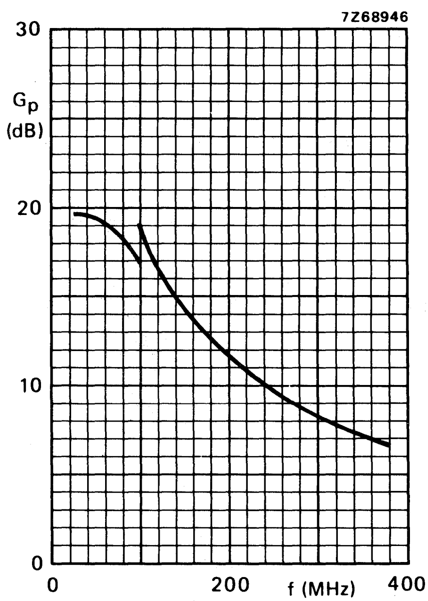


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; V_{CE} = 28 V; P_L = 8 W; T_h = 25 °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor for use in class-A, B and C operated mobile, industrial and military transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a ¼" capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

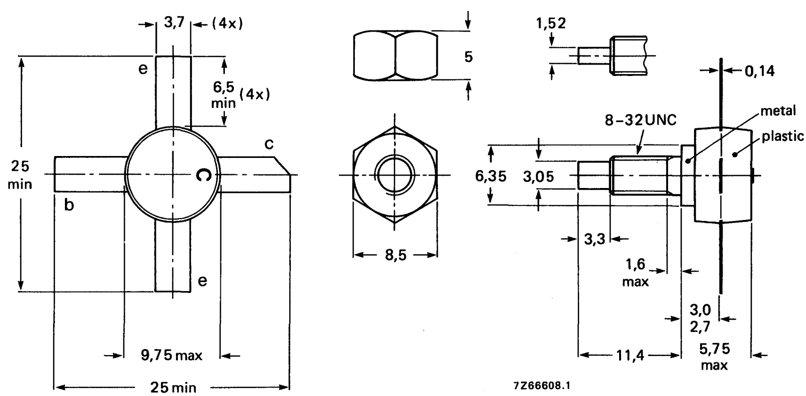
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

Mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	15	> 10	> 65	1,4 + j1,85	33 − j27,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-48/2.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

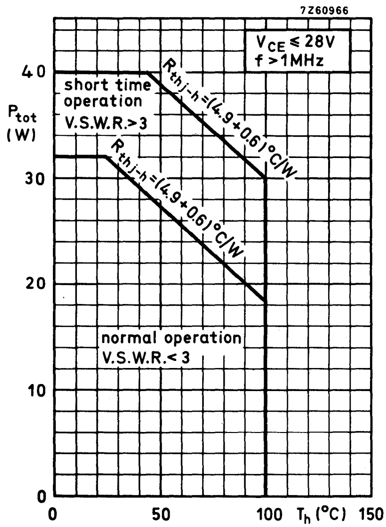
Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

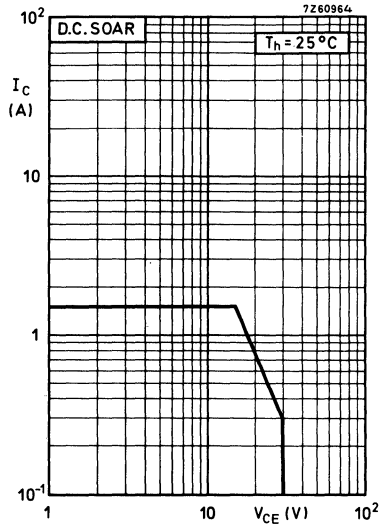
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	1.5	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	4.5	A
Total power dissipation up to T_h = 25 °C f > 1 MHz	P_{tot}	max.	32	W





Storage temperature	T_{stg}	−30 to	+200	°C
Operating junction temperature	T_j	max.	200	°C

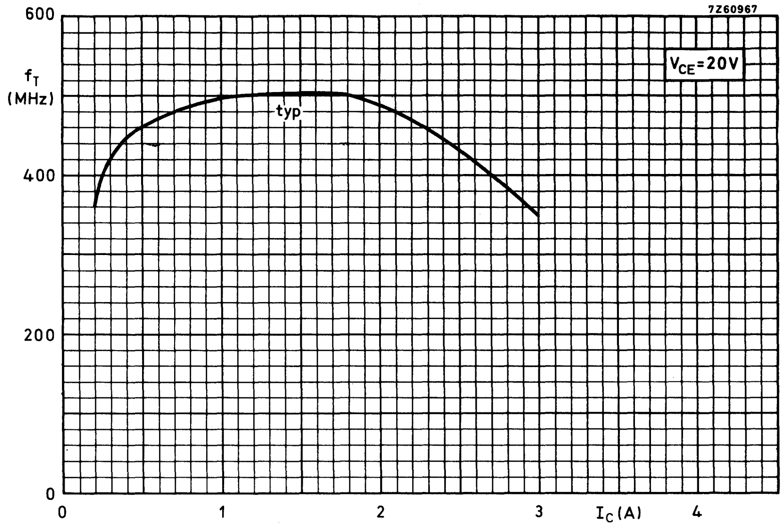
THERMAL RESISTANCE

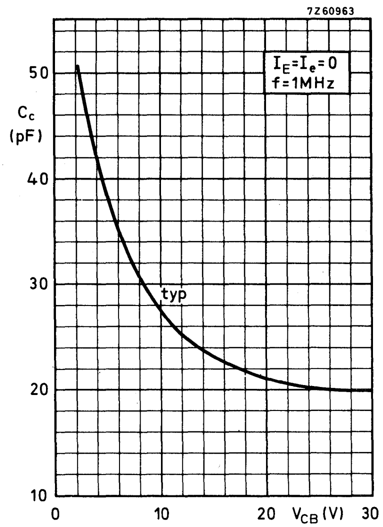
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	4.9	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Collector cut-off current				
$I_B = 0$; $V_{CE} = 28$ V	I_{CEO}	<	10	mA
Breakdown voltages				
Collector-base voltage open emitter, $I_C = 3$ mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, $I_C = 25$ mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; $I_E = 3$ mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	2.0	ms
$-V_{BE} = 1.5$ V; $R_{BE} = 33\,\Omega$	E	>	4.5	ms
D.C. current gain				
$I_C = 500$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	
Transition frequency				
$I_C = 600$ mA; $V_{CE} = 20$ V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
$I_E = I_e = 0$; $V_{CB} = 30$ V	C_c	typ. <	20 30	pF pF
Feedback capacitance at f = 1 MHz				
$I_C = 100$ mA; $V_{CE} = 30$ V	C_{re}	typ.	15	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60967
600
f_T
(MHz)
400
200
0
V_{CE}=20V
typ
0
1
2
3
I_C (A)
4


7Z60963
50
C_c
(pF)
40
30
20
10
I_E=I_e=0
f=1MHz
typ
0
10
20
V_{CB} (V)
30

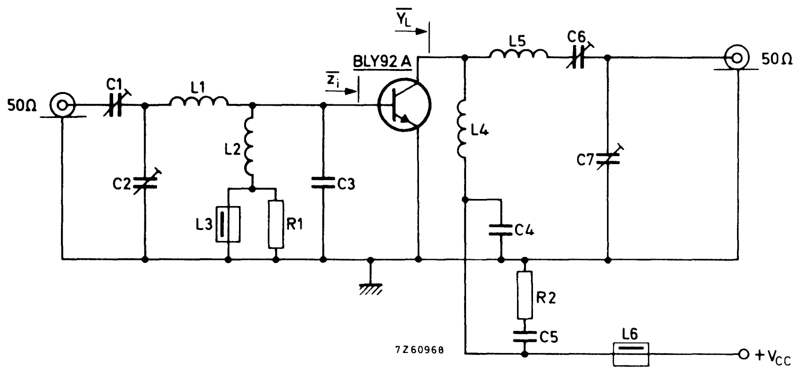
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

V_{CE} = 28 V; T_{mb} up to 25 °C

f (MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	< 1,5	15	< 0,83	> 10	> 65	1,4 + j1,85	33 – j27,5

Test circuit: 175 MHz; c.w. class-B.



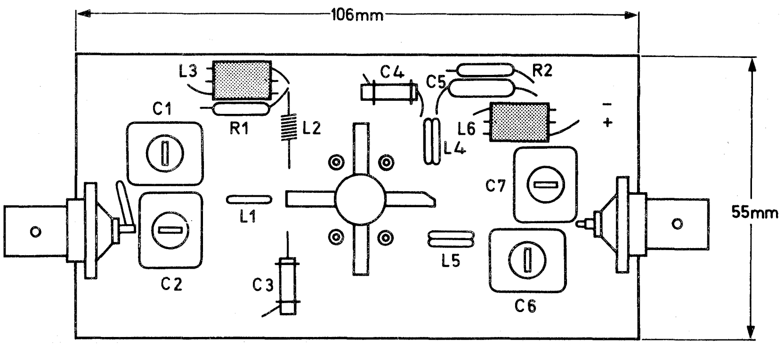
C1 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = C7 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)
C3 = 47 pF ceramic capacitor
C4 = 100 pF ceramic capacitor
C5 = 150 nF polyester capacitor

L1 = 0,5 turn enamelled Cu wire (1,6 mm); int. dia. 6 mm; leads 2 x 10 mm
L2 = 6,5 turns closely wound enamelled Cu wire (0,7 mm); int. dia. 4 mm; leads 2 x 5 mm
L3 = L5 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = 2,5 turns enamelled Cu wire (0,7 mm); int. dia. 6 mm; leads 2 x 7 mm
L6 = 4,5 turns enamelled Cu wire (0,7 mm); int. dia. 6 mm; leads 2 x 7 mm

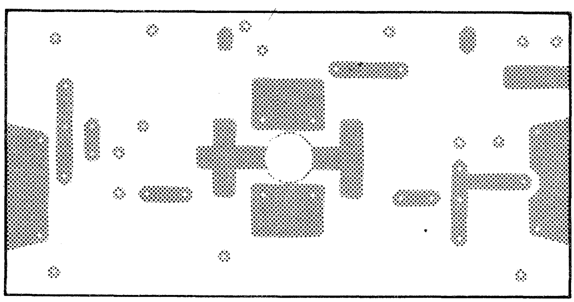
R1 = R2 = 10 Ω carbon resistor

APPLICATION INFORMATION (continued)

Component lay-out and printed circuit board for 175 MHz test circuit.

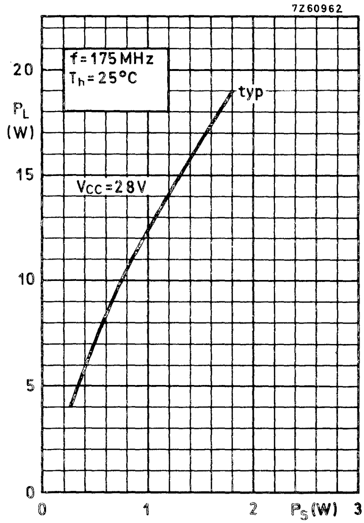


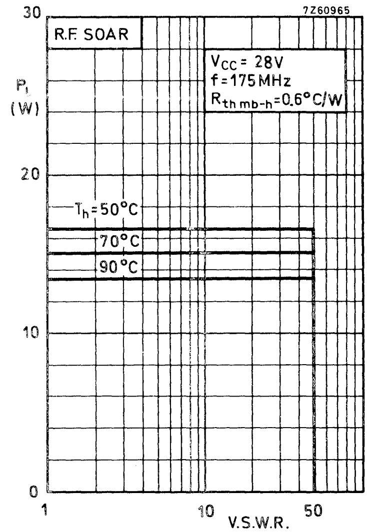
7Z60952



7Z67868

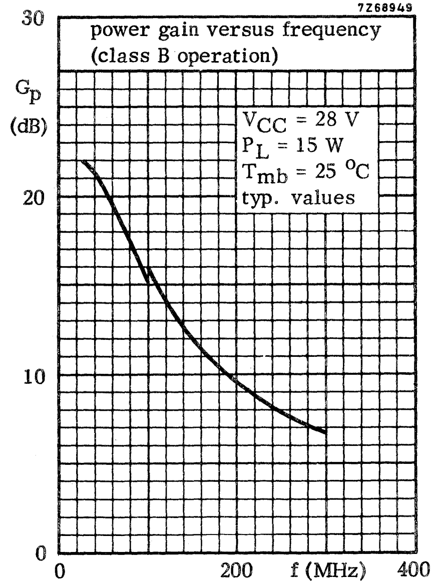
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

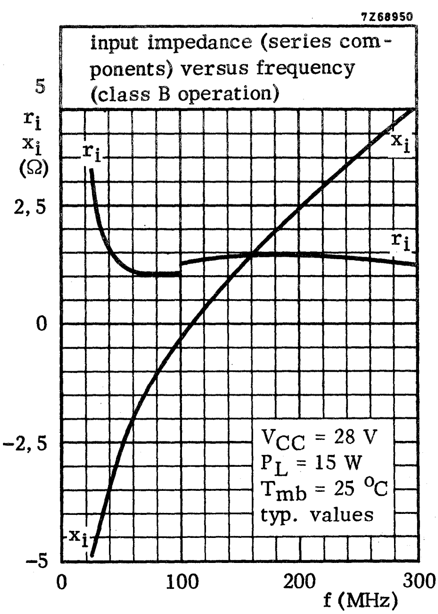


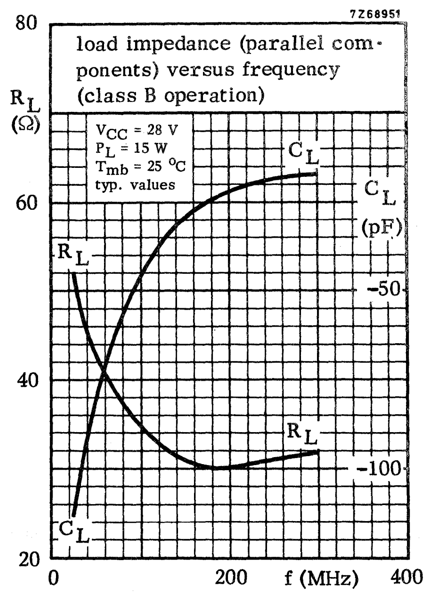


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

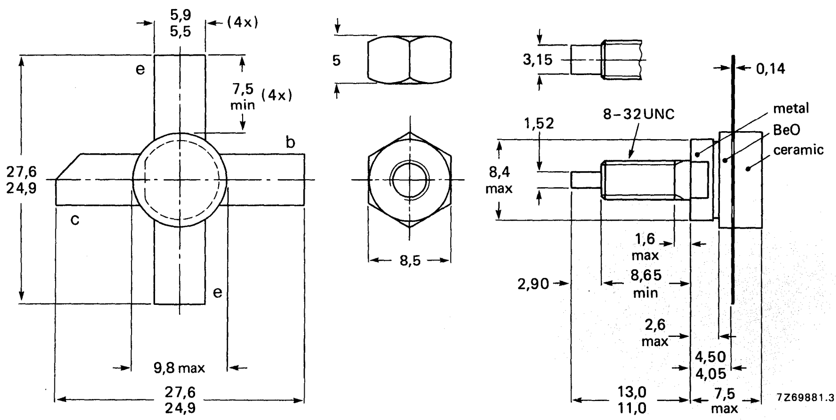
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	15	> 10	> 65	1,4 + j1,85	33 – j27,5

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	1,75	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	5,0	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	36	W
Storage temperature	T_{stg}	−65 to + 150		°C
Operating junction temperature	T_j	max.	200	°C

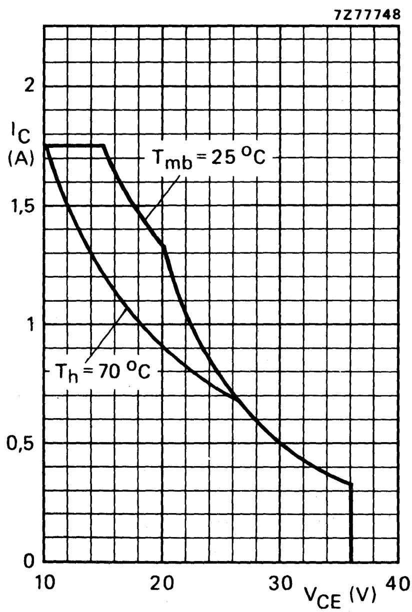


Fig. 2 D.C. SOAR.

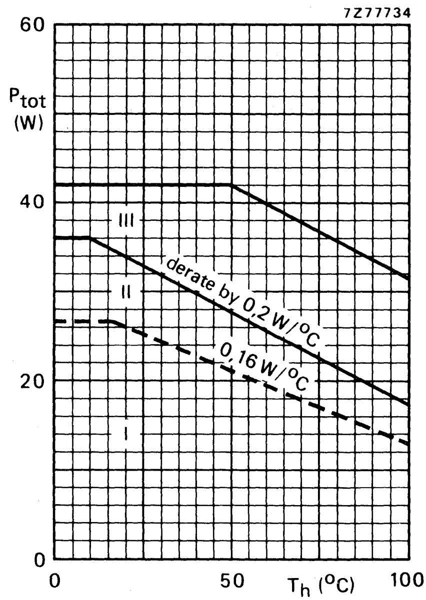


Fig. 3 R.F. power dissipation; $V_{CE} \leqslant 28$ V; f > 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 15 W; T_{mb} = 77 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb(dc)}$	=	6,55	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb(rf)}$	=	4,95	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

T_j = 25 °C

Collector-emitter breakdown voltage V_{BE} = 0; I_C = 5 mA	$V_{(BR)CES}$	>	65	V
Collector-emitter breakdown voltage open base; I_C = 25 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base breakdown voltage open collector; I_E = 2 mA	$V_{(BR)EBO}$	>	4	V
Collector cut-off current V_{BE} = 0; V_{CE} = 36 V	I_{CES}	<	2	mA
Second breakdown energy; L = 25 mH; f = 50 Hz open base	E_{SBO}	>	2,5	mJ
R_{BE} = 10 Ω	E_{SBR}	>	2,5	mJ
D.C. current gain* I_C = 0,7 A; V_{CE} = 5 V	h_{FE}	typ.	50	
			10 to 100	
Collector-emitter saturation voltage* I_C = 2 A; I_B = 0,4 A	V_{CEsat}	typ.	0,65	V
Transition frequency at f = 100 MHz* $-I_E$ = 0,7 A; V_{CB} = 28 V	f_T	typ.	650	MHz
$-I_E$ = 2 A; V_{CB} = 28 V	f_T	typ.	625	MHz
Collector capacitance at f = 1 MHz I_E = I_e = 0; V_{CB} = 28 V	C_c	typ.	18	pF
Feedback capacitance at f = 1 MHz I_C = 100 mA; V_{CE} = 28 V	C_{re}	typ.	12,8	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.

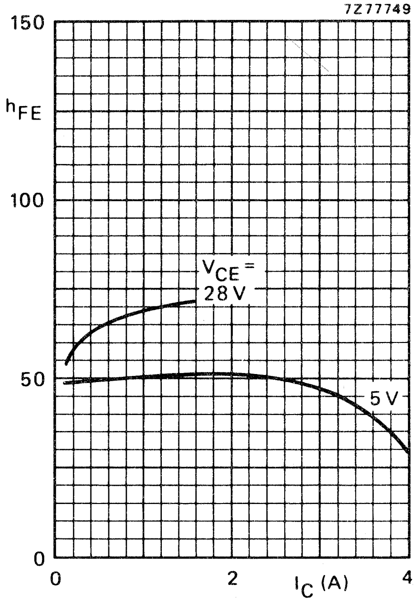


Fig. 4 Typical values; T_j = 25 °C.

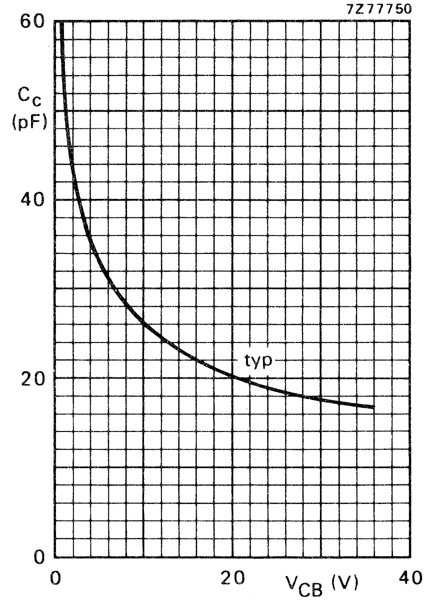


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

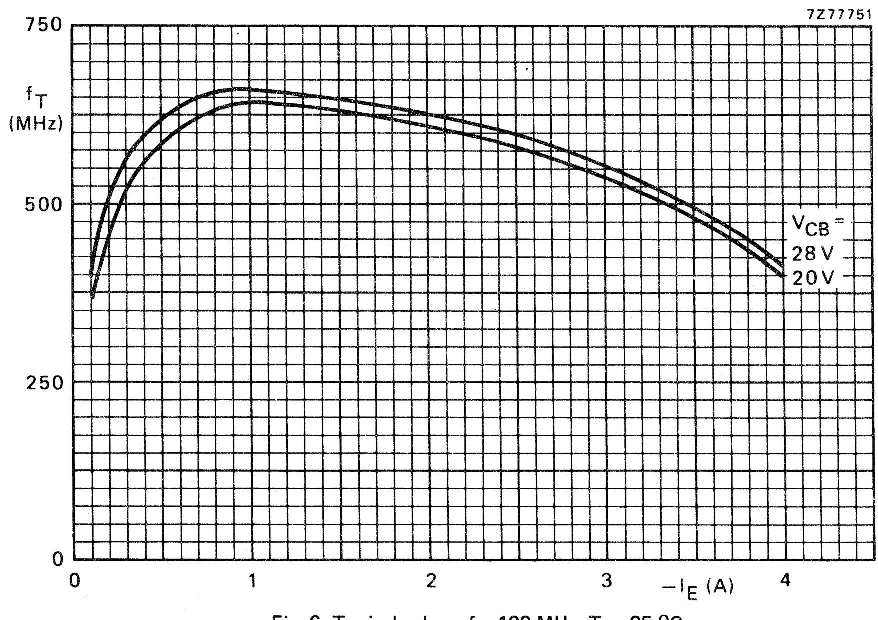


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	15	< 1,5	> 10	< 0,83	> 65	1,4 + j1,85	33 – j27,5

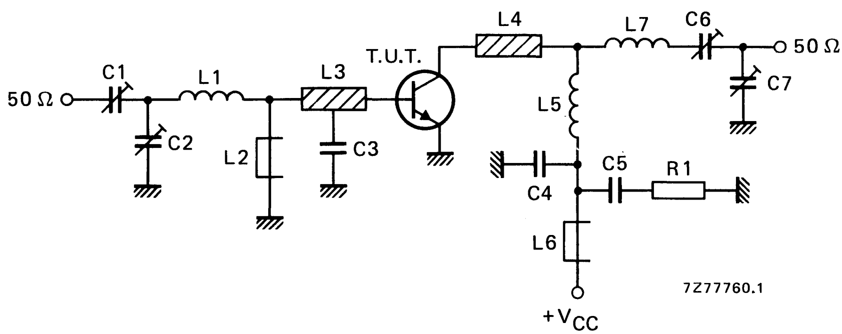


Fig. 7 Test circuit; c.w. class-B.

List of components:

C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = C6 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3 = 27 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor (500 V)
C5 = 100 nF polyester capacitor

L1 = 1 turn Cu wire (1,6 mm); int. dia. 8,4 mm; leads 2 x 5 mm
L2 = 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); tap for C3 at 5 mm from transistor
L6 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 9,0 mm; leads 2 x 5 mm
L7 = 3 turns closely wound enamelled Cu wire (1,0 mm); int. dia. 8,2 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.

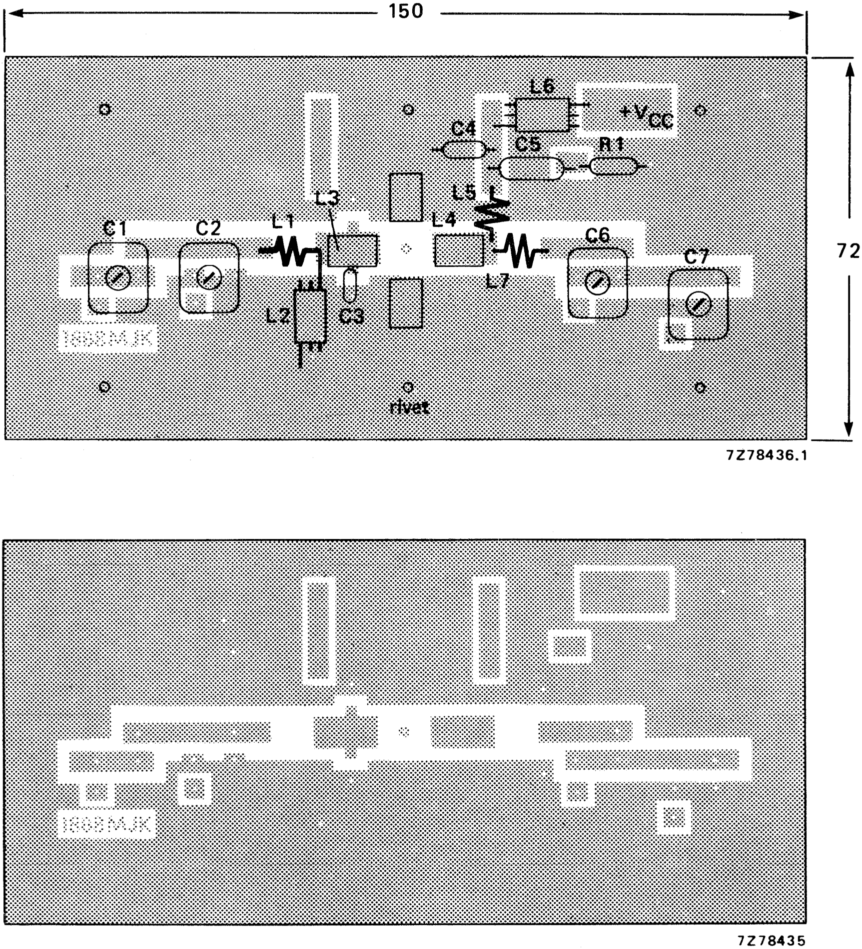


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

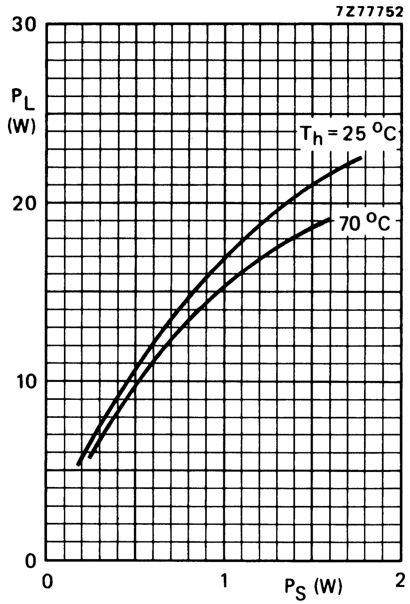


Fig. 9 Typical values; V_{CE} = 28 V; f = 175 MHz.

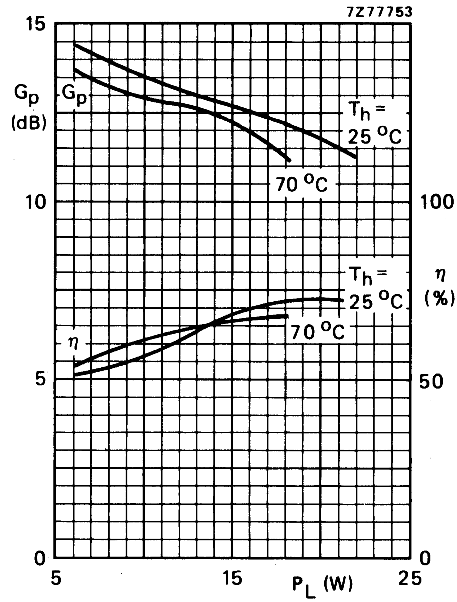


Fig. 10 Typical values; V_{CE} = 28 V; f = 175 MHz.

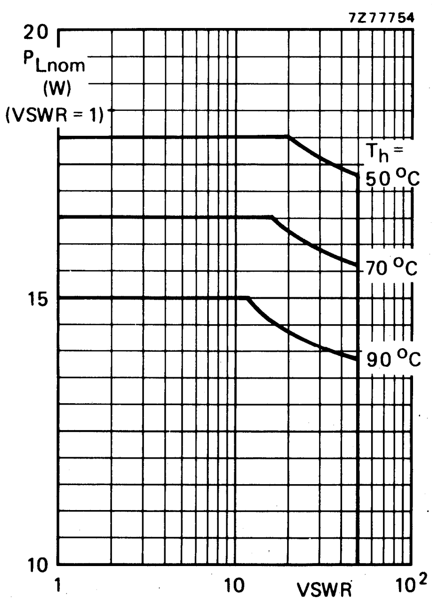


Fig. 11 R.F. SOAR; c.w. class-B operation; f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,45 K/W
The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

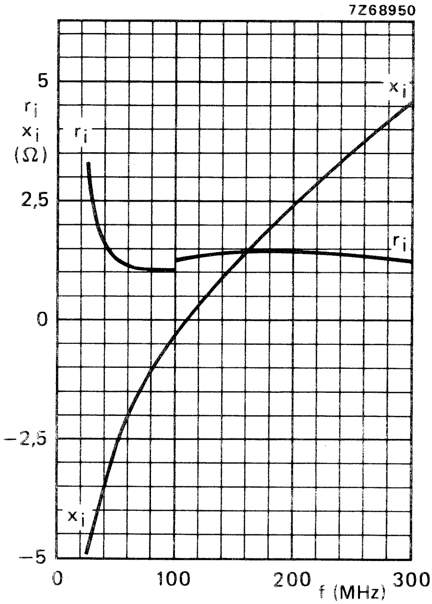


Fig. 12 Input impedance (series components).

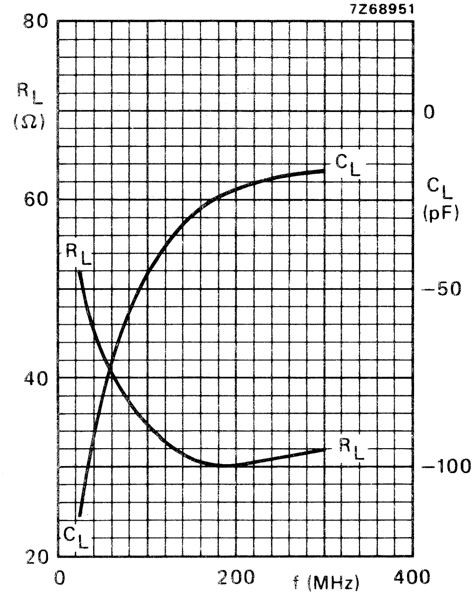


Fig. 13 Load impedance (parallel components).

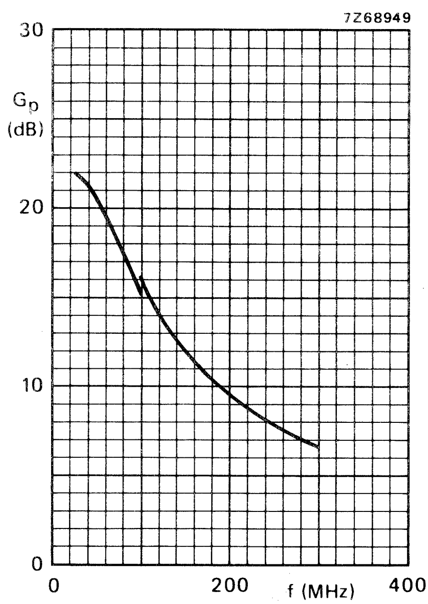


Fig. 14.

Conditions for Figs 12, 13 and 14.

Typical values; V_{CE} = 28 V; P_L = 15 W; T_h = 25 °C.

OPERATING NOTE

Below 100 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

V.H.F. POWER TRANSISTOR

N-P-N epitaxial planar transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions. It has a ¼″ capstan envelope with a moulded cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

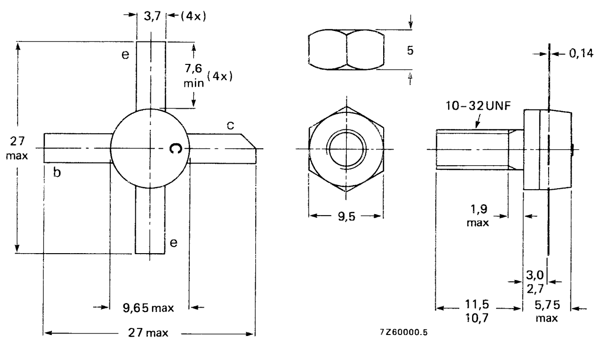
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	< 3,1	25	< 1,5	> 9	> 60	1,0 + j1,2	58,8 – j53,8

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-56.



Torque on nut: min. 1,5 Nm (15 kg cm)
max. 1,7 Nm (17 kg cm)

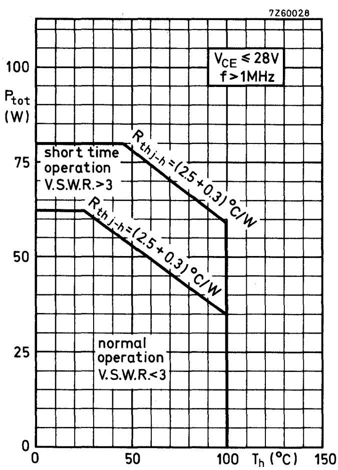
Diameter of clearance hole in heatsink: max. 4,9 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

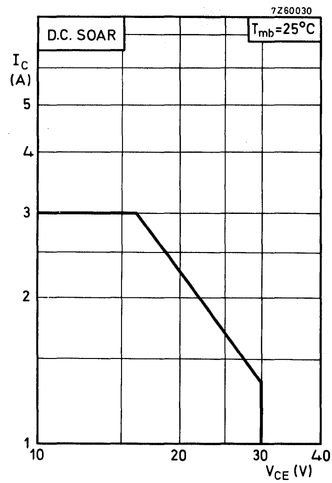
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	3	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	9	A
Total power dissipation up to T_{mb} = 25 °C f > 1 MHz	P_{tot}	max.	70	W





Storage temperature	T_{stg}		−30 to +200	°C
Operating junction temperature	T_j	max.	200	°C

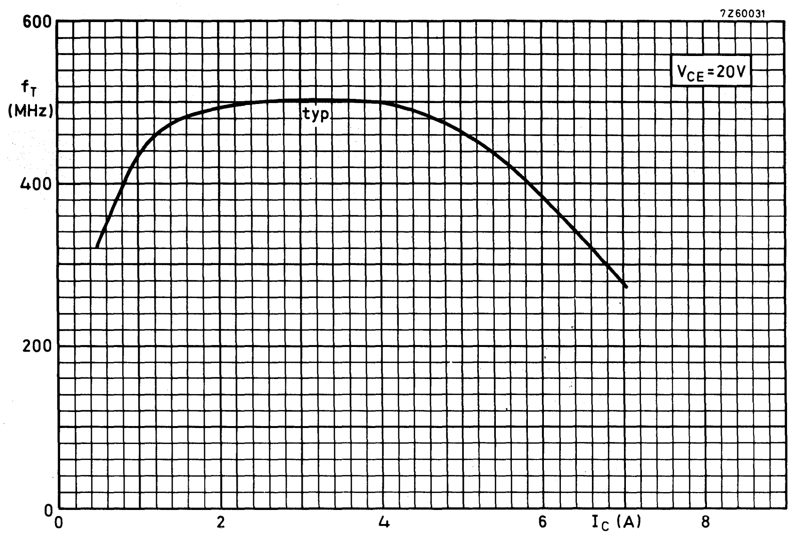
THERMAL RESISTANCE

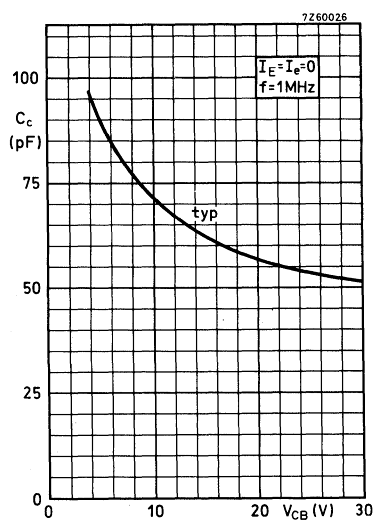
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	2.5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.3	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage, open emitter, I_C = 50 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage, open base, I_C = 50 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage, open collector; I_E = 10 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz, open base	E	>	8	ms
L = 25 mH; f = 50 Hz, $-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain				
I_C = 1 A; V_{CE} = 5 V	h_{FE}	typ.	50	
			10 to 120	
Transition frequency				
I_C = 3 A; V_{CE} = 20 V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 30 V	C_c	typ.	50	pF
		<	65	pF
Feedback capacitance at f = 1 MHz				
I_C = 100 mA; V_{CE} = 30 V	C_{re}	typ.	31	pF
Collector-stud capacitance	C_{cs}	typ.	2	pF


7Z60031
600
f_T
(MHz)
400
200
0
0
2
4
6
I_C (A)
8
V_CE = 20V
typ


7Z60026
100
C_c
(pF)
75
50
25
0
0
10
20
V_CB (V)
30
I_E = I_e = 0
f = 1MHz
typ

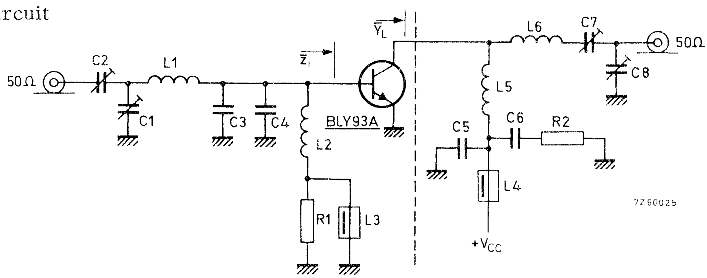
APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralised common-emitter class B circuit)

V_{CC} = 28 V; T_{mb} = 25 °C

f(MHz)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	< 3.1	25	< 1.5	> 9	> 60	1.0+j1.2	58.8−j53.8

Test circuit



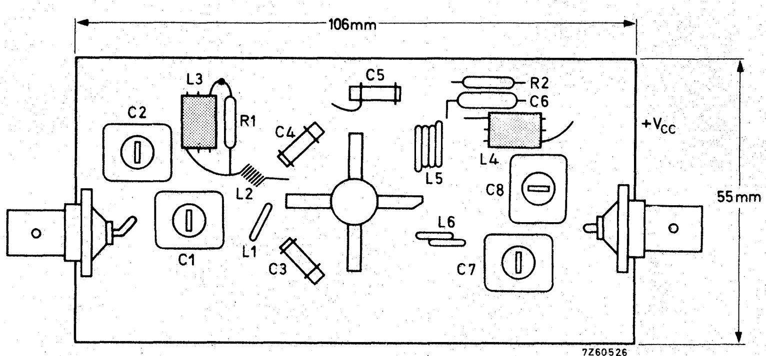
C1 = 4 to 44 pF film dielectric trimmer (code number 2222 809 07008)
C2 = 2 to 22 pF film dielectric trimmer (code number 2222 809 07004)
C3 = C4 = 47 pF ceramic
C5 = 100 pF ceramic
C6 = 150 nF polyester
C7 = 4 to 104 pF film dielectric trimmer (code number 2222 809 07015)
C8 = 4 to 64 pF film dielectric trimmer (code number 2222 809 07011)

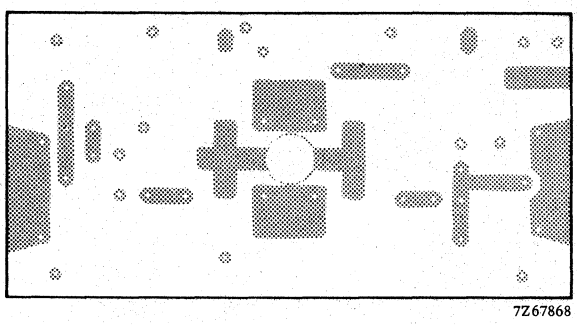
L1 = 0.5 turn enamelled Cu wire (1.5 mm); int.diam.6 mm; leads 2x6 mm
L2 = 6 turns closely wound enamelled Cu wire (0.7 mm); int.diam.4 mm; leads 2x4 mm
L3 = L4 = ferroxcube choke (code number 4312 020 36640)
L5 = 3.5 turns enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm
L6 = 1.5 turns enamelled Cu wire (1.5 mm); int.diam. 6 mm; leads 2x6 mm

R1 = R2 = 10 Ω carbon

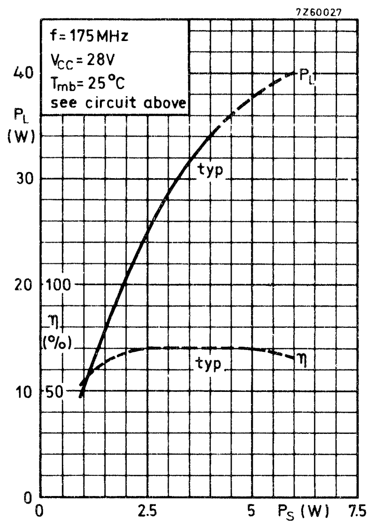
APPLICATION INFORMATION (continued)

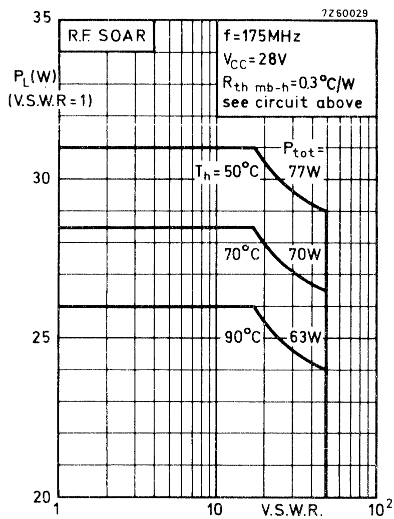
Component lay-out and printed circuit board for 175 MHz test circuit.





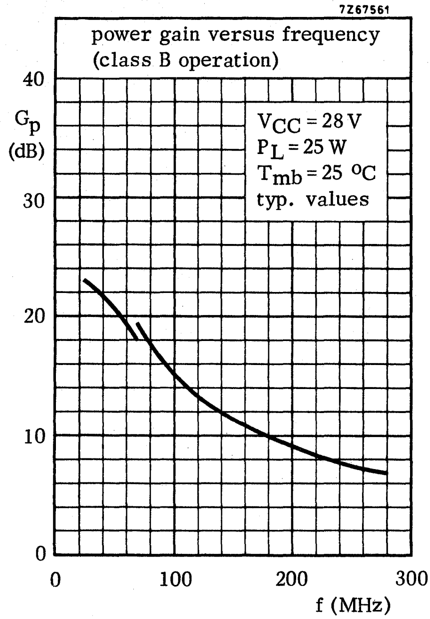
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

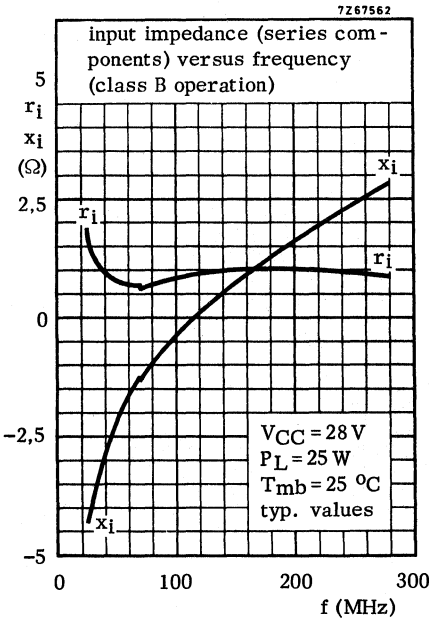


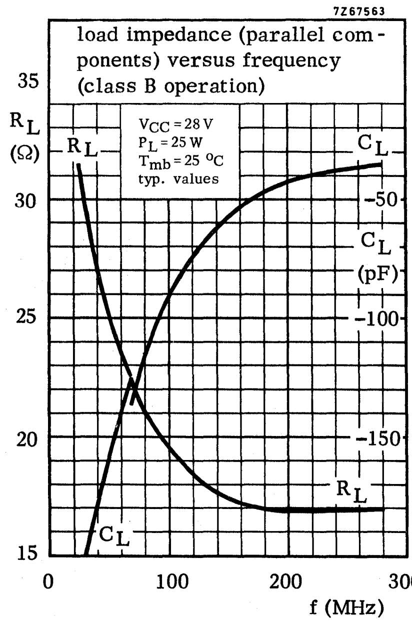


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







V.H.F. POWER TRANSISTOR

N-P-N silicon planar epitaxial transistor intended for use in class-A, B and C operated h.f. and v.h.f. transmitters with a nominal supply voltage of 28 V. The transistor is resistance stabilized and is guaranteed to withstand severe load mismatch conditions.

It has a 3/8" capstan envelope with a ceramic cap. All leads are isolated from the stud.

QUICK REFERENCE DATA

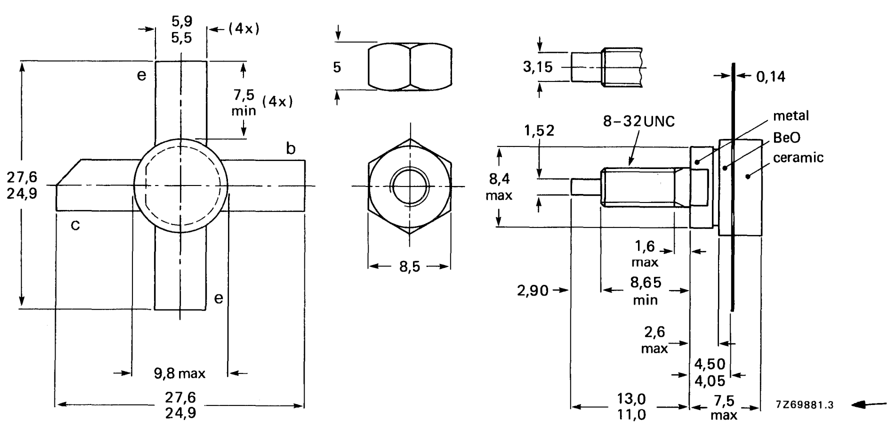
R.F. performance up to T_h = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_L W	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	**28**	**175**	**25**	**> 9**	**> 60**	**1,0 + j1,2**	**59–j54**

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-120.



Torque on nut: min. 0,75 Nm (7,5 kg cm)
max. 0,85 Nm (8,5 kg cm)

Diameter of clearance hole in heatsink: max. 4,2 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-emitter voltage (V_{BE} = 0) peak value	V_{CESM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	3	A
Collector current (peak value); f > 1 MHz	I_{CM}	max.	9	A
R.F. power dissipation (f > 1 MHz); T_{mb} = 25 °C	P_{rf}	max.	70	W
Storage temperature	T_{stg}		−65 to + 150	°C
Operating junction temperature	T_j	max.	200	°C

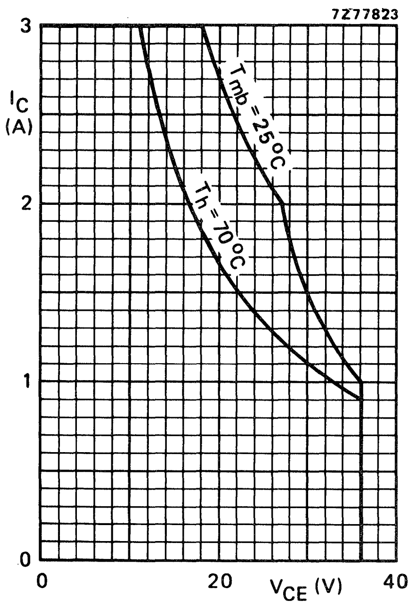


Fig. 2 D.C. SOAR.

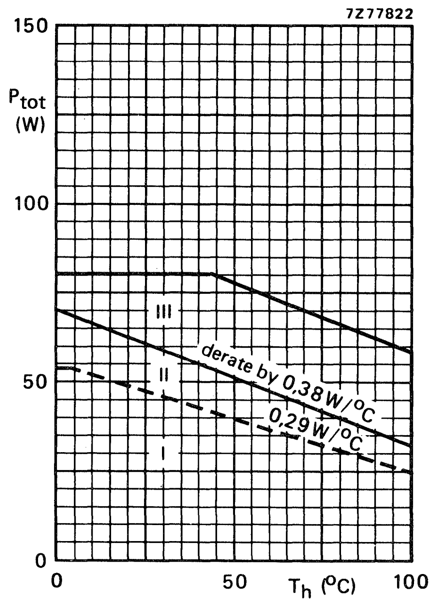


Fig. 3 R.F. power dissipation; $V_{CE} \leq 28$ V; f ≥ 1 MHz.
I Continuous d.c. operation
II Continuous r.f. operation
III Short-time operation during mismatch

THERMAL RESISTANCE (dissipation = 20 W; T_{mb} = 79 °C, i.e. T_h = 70 °C)

From junction to mounting base (d.c. dissipation)	$R_{th\ j\text{-}mb\ (dc)}$	=	3,1	K/W
From junction to mounting base (r.f. dissipation)	$R_{th\ j\text{-}mb\ (rf)}$	=	2,3	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0,45	K/W

CHARACTERISTICS

$T_j = 25\ ^oC$

Collector-emitter breakdown voltage			
$V_{BE} = 0$; $I_C = 10$ mA	$V_{(BR)CES}$	>	65 V
Collector-emitter breakdown voltage			
open base; $I_C = 50$ mA	$V_{(BR)CEO}$	>	36 V
Emitter-base breakdown voltage			
open collector; $I_E = 10$ mA	$V_{(BR)EBO}$	>	4 V
Collector cut-off current			
$V_{BE} = 0$; $V_{CE} = 36$ V	I_{CES}	<	4 mA
Second breakdown energy; L = 25 mH; f = 50 Hz			
open base	E_{SBO}	>	8 mJ
$R_{BE} = 10\ \Omega$	E_{SBR}	>	8 mJ
D.C. current gain *			
$I_C = 1{,}25$ A; $V_{CE} = 5$ V	h_{FE}	typ.	45
			10 to 100
Collector-emitter saturation voltage *			
$I_C = 3{,}75$ A; $I_B = 0{,}75$ A	V_{CEsat}	typ.	1,5 V
Transition frequency at f = 100 MHz *			
$-I_E = 1{,}25$ A; $V_{CB} = 28$ V	f_T	typ.	625 MHz
$-I_E = 3{,}75$ A; $V_{CB} = 28$ V	f_T	typ.	625 MHz
Collector capacitance at f = 1 MHz			
$I_E = I_e = 0$; $V_{CB} = 28$ V	C_c	typ.	45 pF
Feedback capacitance at f = 1 MHz			
$I_C = 100$ mA; $V_{CE} = 28$ V	C_{re}	typ.	28 pF
Collector-stud capacitance	C_{cs}	typ.	2 pF

* Measured under pulse conditions: $t_p \leqslant 200\ \mu s$; $\delta \leqslant 0{,}02$.

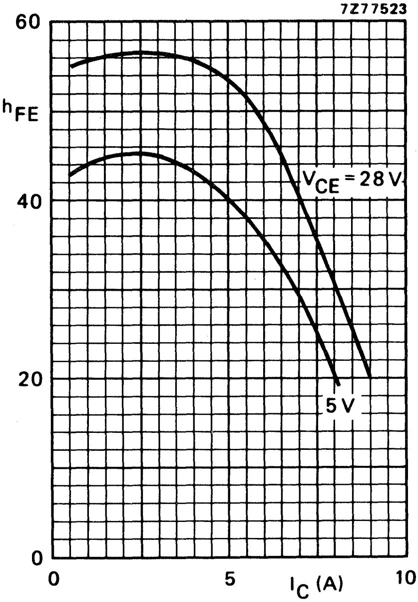


Fig. 4 Typical values; T_j = 25 °C.

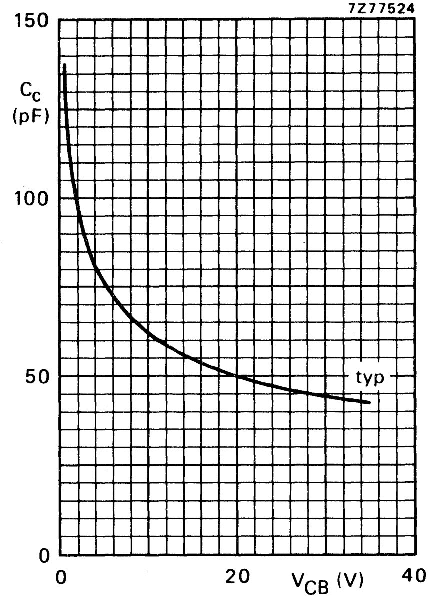


Fig. 5 $I_E = I_e = 0$; f = 1 MHz; T_j = 25 °C.

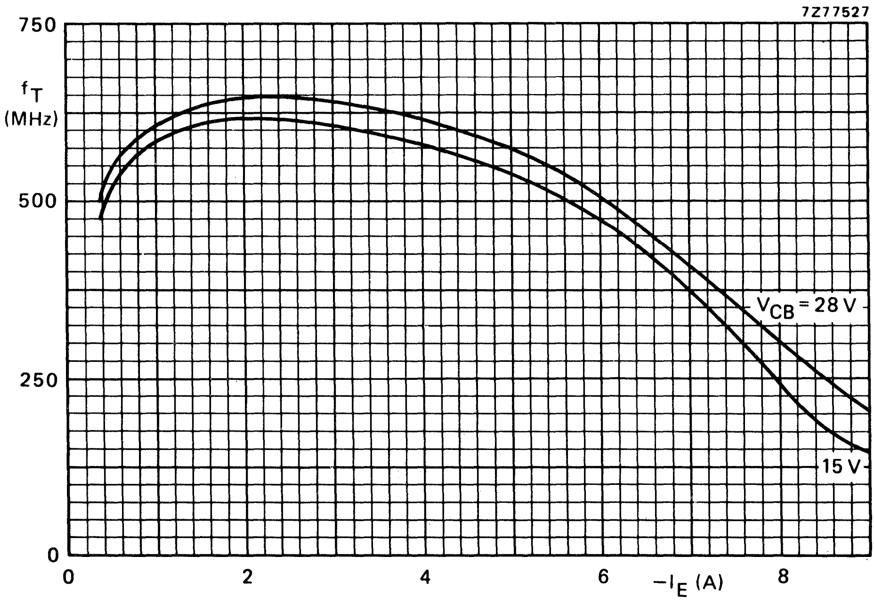


Fig. 6 Typical values; f = 100 MHz; T_j = 25 °C.

APPLICATION INFORMATION

R.F. performance in c.w. operation (unneutralized common-emitter class-B circuit)

T_h = 25 °C

f (MHz)	V_{CE} (V)	P_L (W)	P_S (W)	G_p (dB)	I_C (A)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
175	28	25	< 3,15	> 9	< 1,5	> 60	1,0 + j1,2	59–j54

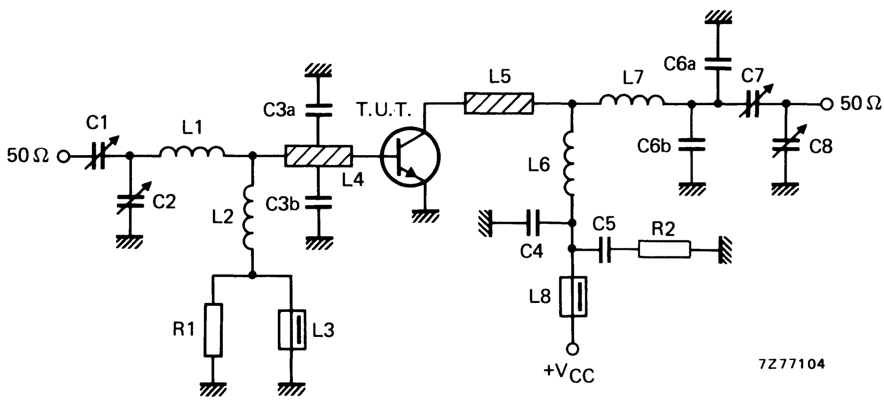


Fig. 7 Test circuit; c.w. class-B.

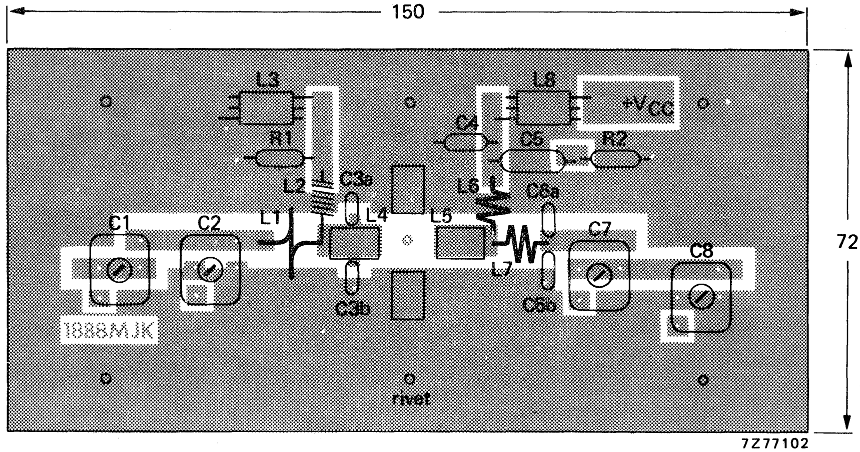
List of components
C1 = C7 = 2,5 to 20 pF film dielectric trimmer (cat. no. 2222 809 07004)
C2 = 5 to 60 pF film dielectric trimmer (cat. no. 2222 809 07011)
C3a = C3b = 47 pF ceramic capacitor (500 V)
C4 = 120 pF ceramic capacitor
C5 = 100 nF polyester capacitor
C6a = 2,2 pF ceramic capacitor (500 V)
C6b = 1,8 pF ceramic capacitor (500 V)
C8 = 4 to 40 pF film dielectric trimmer (cat. no. 2222 809 07008)

L1 = 14 nH; 1 turn Cu wire (1,6 mm); int. dia. 7,7 mm; leads 2 x 5 mm
L2 = 100 nH; 7 turns closely wound enamelled Cu wire (0,5 mm); int. dia. 3 mm; leads 2 x 5 mm
L3 = L8 = Ferroxcube wide-band h.f. choke, grade 3B (cat. no. 4312 020 36640)
L4 = L5 = strip (12 mm x 6 mm); taps for C3a and C3b at 5 mm from transistor
L6 = 80 nH; 3 turns Cu wire (1,6 mm); int. dia. 9,0 mm; length 8,0 mm; leads 2 x 5 mm
L7 = 62 nH; 3 turns Cu wire (1,6 mm); int. dia. 7,5 mm; length 8,1 mm; leads 2 x 5 mm

L4 and L5 are strips on a double Cu-clad printed-circuit board with epoxy fibre-glass dielectric, thickness 1/16".

R1 = R2 = 10 Ω carbon resistor (0,25 W)

Component layout and printed-circuit board for 175 MHz test circuit see Fig. 8.



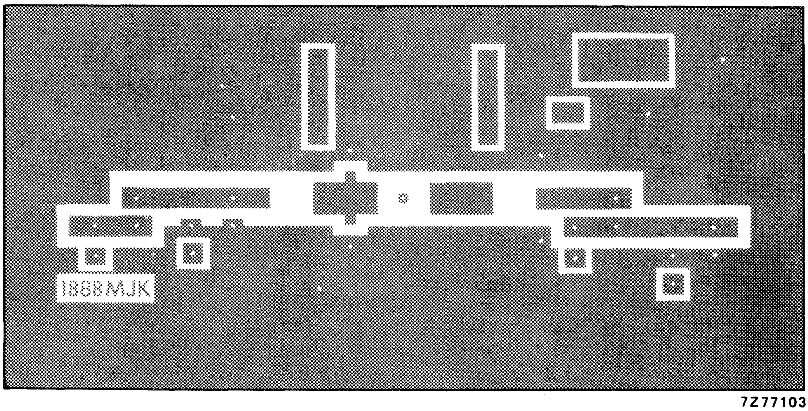


Fig. 8 Component layout and printed-circuit board for 175 MHz test circuit.

The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallized to serve as earth. Earth connections are made by means of hollow rivets, whilst under the emitter leads Cu straps are used for a direct contact between upper and lower sheets.

To minimize the dielectric losses, the ground plane under the interconnection of L7 and C7 has been removed.

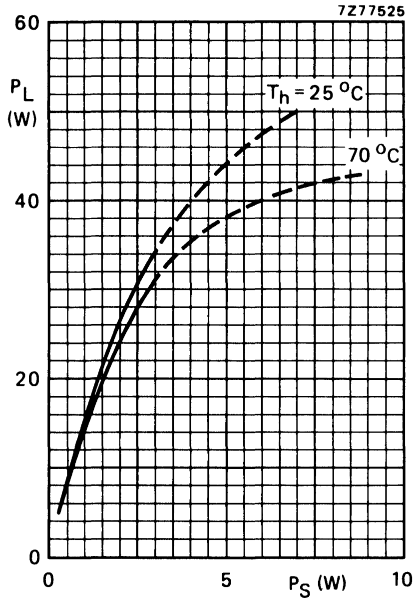


Fig. 9 V_{CE} = 28 V; f = 175 MHz; typical values.

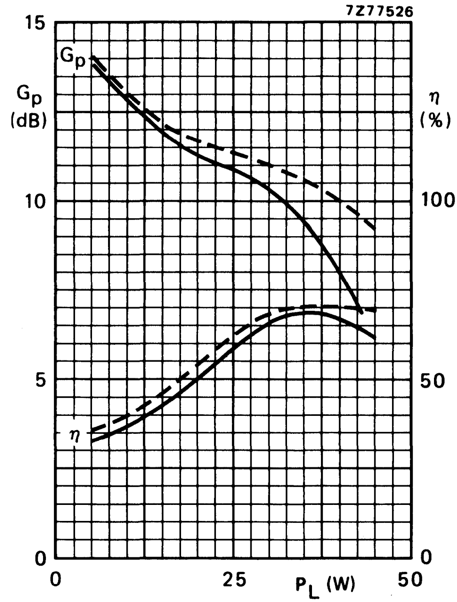


Fig. 10 V_{CE} = 28 V; f = 175 MHz; typical values;
– – – T_h = 25 °C; —— T_h = 70 °C.

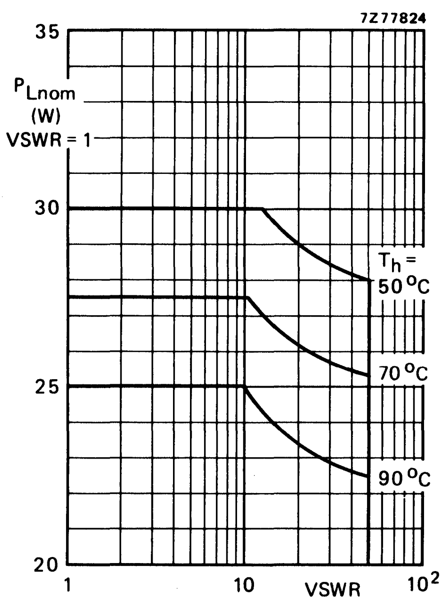


Fig. 11 R.F. SOAR; c.w. class-B operation;
f = 175 MHz; V_{CE} = 28 V; $R_{th\ mb\text{-}h}$ = 0,45 K/W

The graph shows the permissible output power under nominal conditions (VSWR = 1) as a function of the expected VSWR during short-time mismatch conditions with heatsink temperatures as parameter.

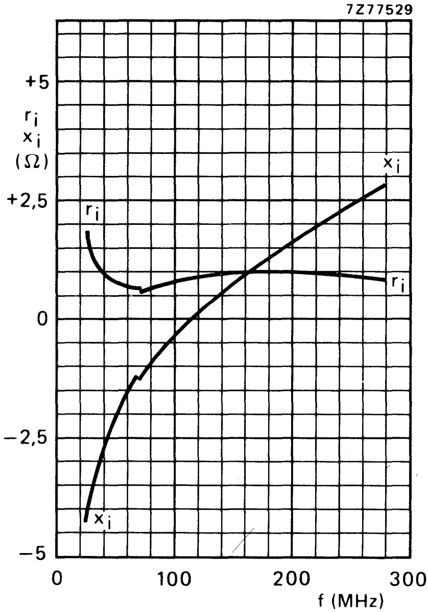


Fig. 12 Input impedance (series components).

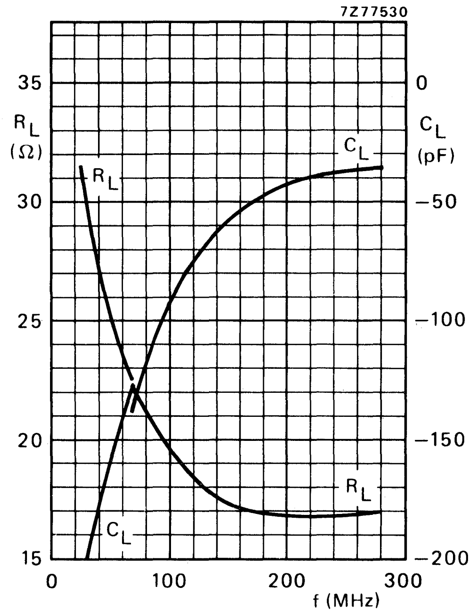


Fig. 13 Load impedance (parallel components).

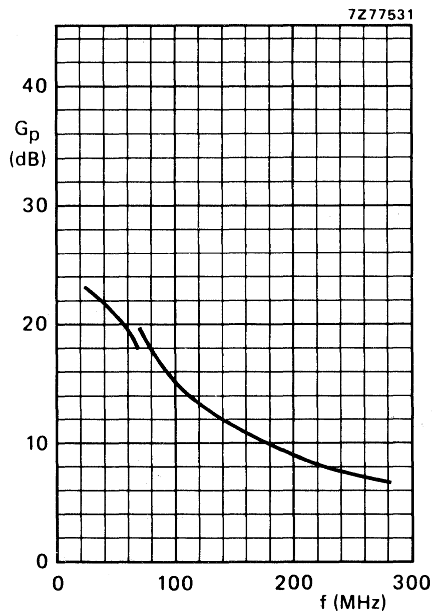


Fig. 14 Power gain versus frequency.

OPERATING NOTE

Below 70 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for r.f. only.

Conditions for Figs 12, 13 and 14:

Typical values; V_{CE} = 28 V; P_L = 25 W; T_h = 25 °C.

V.H.F. POWER TRANSISTOR

N-P-N planar epitaxial transistor intended for use in class-A, B and C operated mobile, industrial and military transmitters with a supply voltage of 28 V. The transistor is resistance stabilized. Every transistor is tested under severe load mismatch conditions. It has a plastic encapsulated stripline package. All leads are isolated from the stud.

QUICK REFERENCE DATA

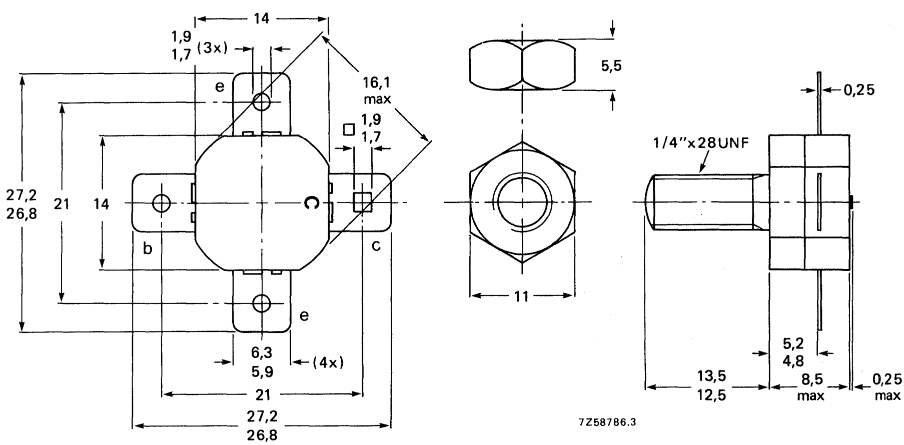
R.F. performance up to T_{mb} = 25 °C in an unneutralized common-emitter class-B circuit

mode of operation	V_{CE} V	f MHz	P_S W	P_L W	I_C A	G_p dB	η %	$\overline{z_i}$ Ω	$\overline{Y_L}$ mS
c.w.	28	175	< 10	50	< 2,75	> 7	> 65	0,8 + j1,45	125 − j66

MECHANICAL DATA

Dimensions in mm

Fig. 1 SOT-55.



Torque on nut: min. 2,3 Nm (23 kg cm)
max. 2,7 Nm (27 kg cm)

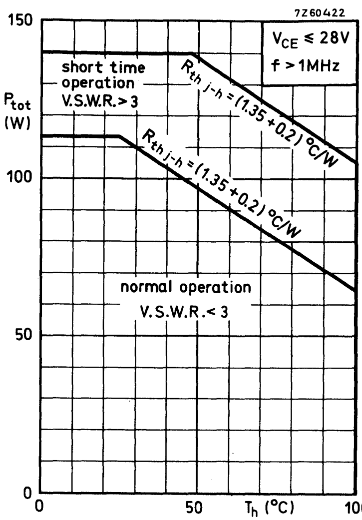
Diameter of clearance hole in heatsink: max. 6,4 mm.
Mounting hole to have no burrs at either end.
De-burring must leave surface flat; do not chamfer or countersink either end of hole.

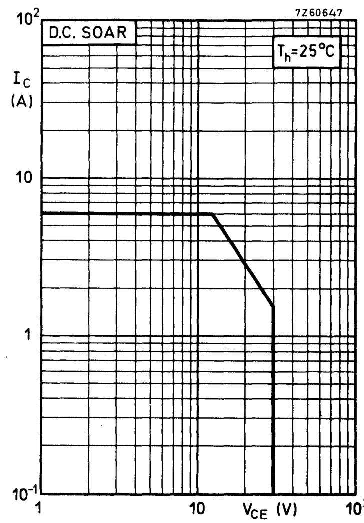
When locking is required an adhesive is preferred instead of a lock washer.

PRODUCT SAFETY This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter) peak value	V_{CBOM}	max.	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	36	V
Emitter-base voltage (open collector)	V_{EBO}	max.	4	V
Collector current (average)	$I_{C(AV)}$	max.	6	A
Collector current (peak value) f > 1 MHz	I_{CM}	max.	12	A
Total power dissipation up to T_{mb} = 25 °C f > 1 MHz	P_{tot}	max.	130	W





Storage temperature	T_{stg}		−65 to +200	°C
Operating junction temperature	T_j	max.	200	°C

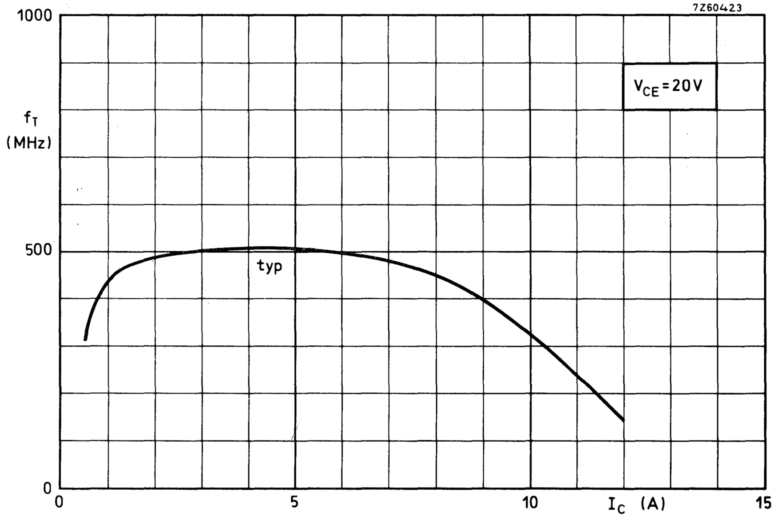
THERMAL RESISTANCE

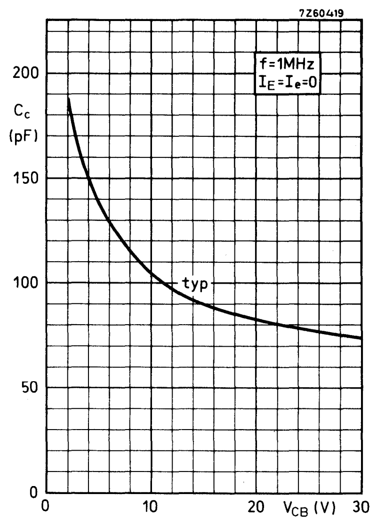
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	1.35	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=	0.2	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

Breakdown voltages				
Collector-base voltage open emitter, I_C = 100 mA	$V_{(BR)CBO}$	>	65	V
Collector-emitter voltage open base, I_C = 100 mA	$V_{(BR)CEO}$	>	36	V
Emitter-base voltage open collector; I_E = 25 mA	$V_{(BR)EBO}$	>	4	V
Transient energy				
L = 25 mH; f = 50 Hz				
open base	E	>	8	ms
$-V_{BE}$ = 1.5 V; R_{BE} = 33 Ω	E	>	8	ms
D.C. current gain				
I_C = 1 A; V_{CE} = 5 V	h_{FE}	10 to	120	
Transition frequency				
I_C = 6 A; V_{CE} = 20 V	f_T	typ.	500	MHz
Collector capacitance at f = 1 MHz				
I_E = I_e = 0; V_{CB} = 30 V	C_c	typ.	75	pF
		<	130	pF
Feedback capacitance				
I_C = 100 mA; V_{CE} = 30 V	$-C_{re}$	typ.	47	pF
Collector-stud capacitance	C_{cs}	typ.	3.5	pF


7Z60423
1000
f_T
(MHz)
500
0
V_{CE} = 20 V
typ
0
5
10
I_C (A)
15


7Z60419
200
C_c
(pF)
150
100
50
0
f = 1MHz
$I_E = I_e = 0$
typ
0
10
20
V_{CB} (V)
30

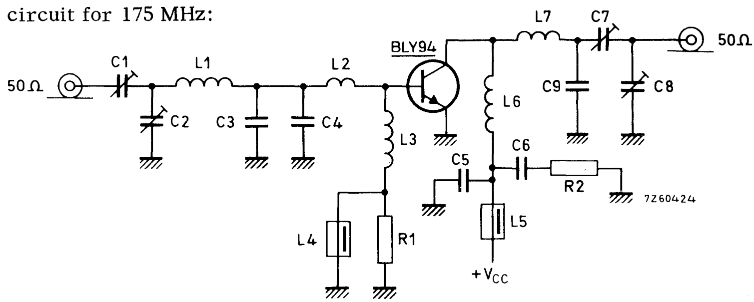
APPLICATION INFORMATION

R. F. performance in c.w. operation (unneutralised common-emitter class B circuit)

f = 175 MHz; T_{mb} up to 25 °C

V_{CC} (V)	P_S (W)	P_L (W)	I_C (A)	G_p (dB)	η (%)	$\overline{z_i}$ (Ω)	$\overline{Y_L}$ (mS)
28	< 10	50	< 2.75	> 7	> 65	0.8+j1.45	125 − j66

Test circuit for 175 MHz:



List of components:

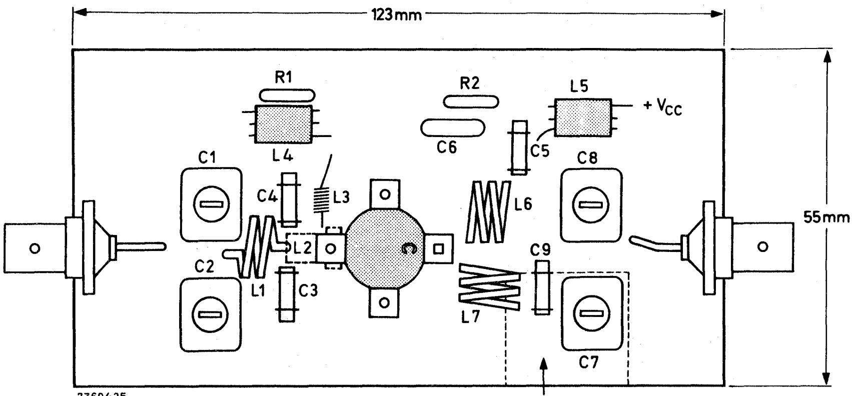
C1 = 2 to 20 pF film dielectric trimmer (code number 2222 809 07004)
C2 = 4 to 40 pF film dielectric trimmer (code number 2222 809 07008)
C3 = C4 = 56 pF ceramic
C5 = 100 pF ceramic
C6 = 100 nF polyester
C7 = 4 to 60 pF film dielectric trimmer (code number 2222 809 07011)
C8 = 4 to 100 pF film dielectric trimmer (code number 2222 809 07015)
C9 = 6.8 pF ceramic

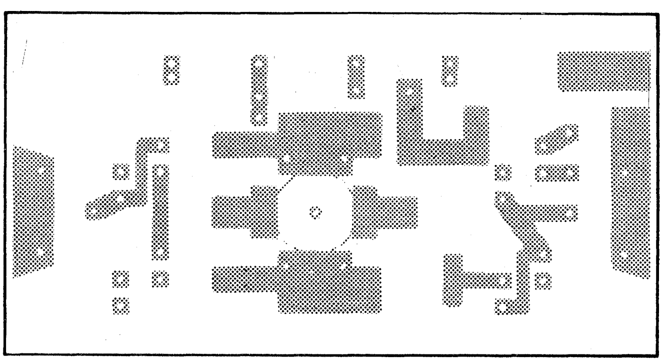
L1 = 36 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 7 mm; length 5 mm; lead length 2 x 5 mm
L2 = formed by the metallization on the p.c. board; see component lay-out
L3 = 100 nH; 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam 3 mm; lead length 2 x 5 mm
L4 = L5 = ferroxcube choke (code number 4312 020 36640)
L6 53 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 10 mm; length 5.2 mm; lead length 2 x 5 mm
L7 = 46 nH; 2 turns enamelled Cu wire (1.5 mm); int. diam. 9 mm; length 5.4 mm; lead length 2 x 5 mm

R1 = R2 = 10 Ω carbon

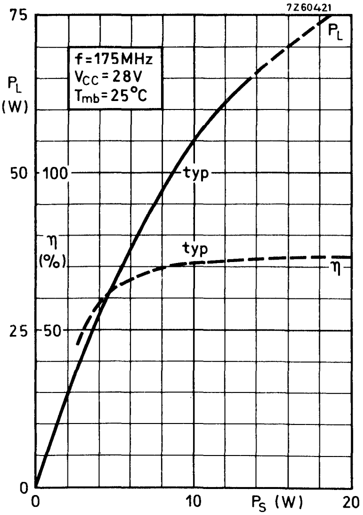
APPLICATION INFORMATION (continued)

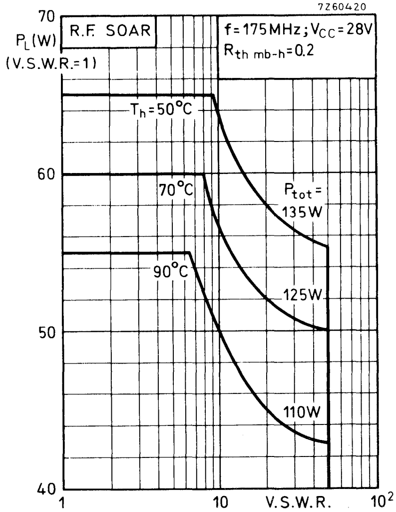
Component lay-out and printed circuit board for 175 MHz test circuit.





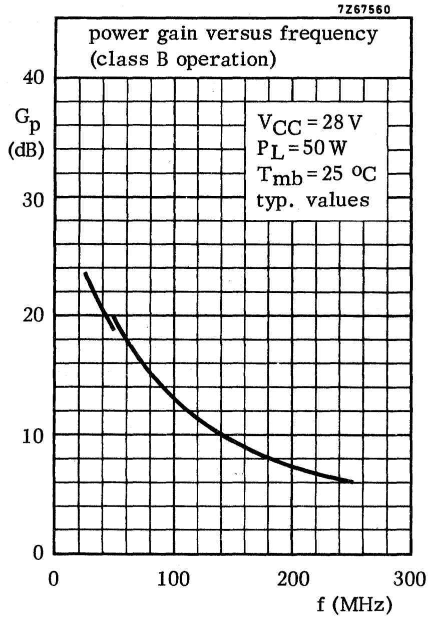
The circuit and the components are situated on one side of the epoxy fibre-glass board, the other side being fully metallised to serve as earth. Earth connections are made by means of hollow rivets.

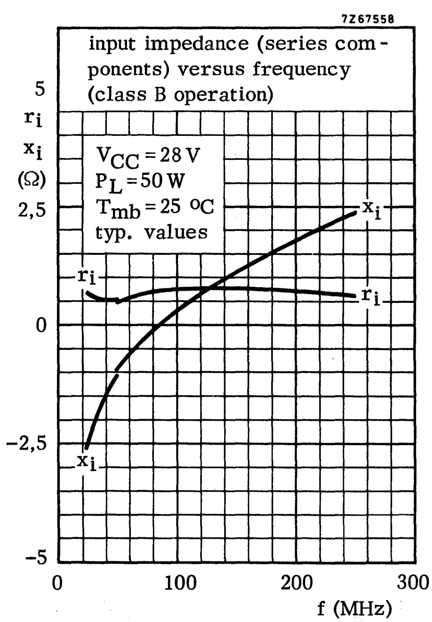


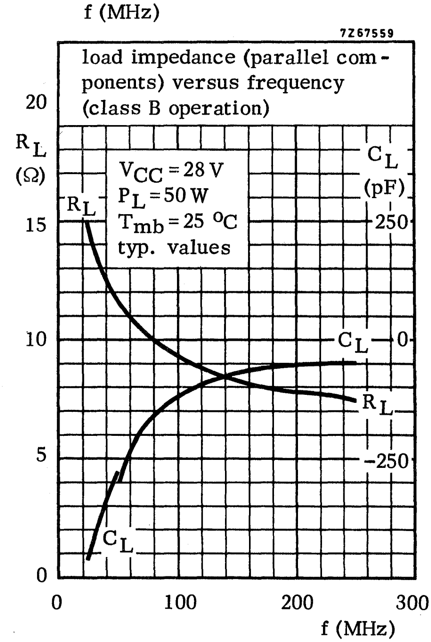


For high voltage operation, a stabilized power supply is generally used.
The graph shows the allowable output power under nominal conditions as a function of the V.S.W.R., with heat-sink temperature as parameter.

OPERATING NOTE Below 50 MHz a base-emitter resistor of 10 Ω is recommended to avoid oscillation. This resistor must be effective for both d.c. and r.f.







SILICON EPITAXIAL PLANAR OVERLAY TRANSISTORS

The **2N3553** is an n-p-n overlay transistor in a TO-39 metal envelope with the collector connected to the case. The **2N3375** and the **2N3632** are n-p-n overlay transistors in TO-60 metal envelopes with the electrodes insulated from the studs.
The **2N3553** and the **2N3375** are intended for v.h.f./u.h.f. and the **2N3632** for v.h.f. transmitting applications.

QUICK REFERENCE DATA

			2N3553	2N3375	2N3632	
Collector-emitter voltage $-V_{BE} = 1,5$ V	V_{CEX}	max.	65	65	65	V
Collector-emitter voltage (open base)	V_{CEO}	max.	40	40	40	V
Collector current (peak value)	I_{CM}	max.	1,0	1,5	3,0	A
Total power dissipation up to $T_{mb} = 25$ °C	P_{tot}	max.	7	11,6	23	W
Junction temperature	T_j	max.	200	200	200	°C
Transition frequency $I_C = 125$ mA; $V_{CE} = 28$ V	f_T	typ.	500	500	–	MHz
$I_C = 250$ mA; $V_{CE} = 28$ V	f_T	typ.	–	–	400	MHz

R.F. performance at $V_{CE} = 28$ V

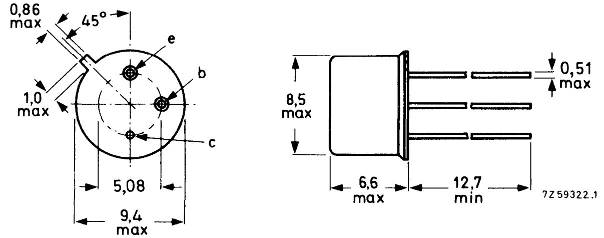
type number	f (MHz)	P_o (W)	P_i (W)	η (%)
2N3553	175	2,5	< 0,25	> 50
2N3375	100	7,5	< 1	> 65
2N3375	400	> 3	1	> 40
2N3632	175	> 13,5	3,5	> 70

MECHANICAL DATA

Dimensions in mm

Fig. 1a TO-39; collector connected to case.

2N3553



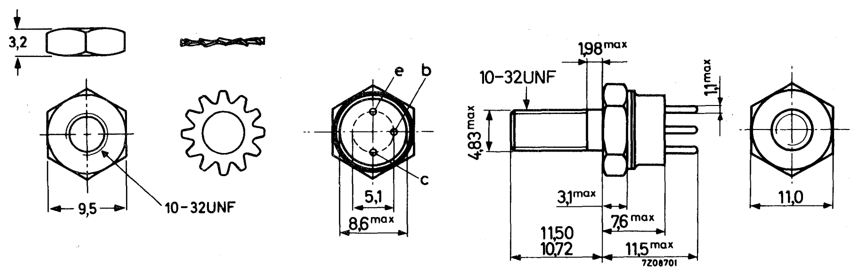
Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

MECHANICAL DATA (continued) Dimensions in mm

Fig. 1b TO-60 (**2N3375** and **2N3632**).

The top pins should not be bent.



Torque on nut: min. 0,8 Nm (8 kg cm)
max. 1,7 Nm (17 kg cm)

Diameter of clearance hole in heatsink: 4,8 mm to 5,2 mm.

P.S. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.		65		V
Collector-emitter voltage						
$I_C \leq 200$ mA; $-V_{BE} = 1{,}5$ V	V_{CEX}	max.		65		V
(open base); $I_C \leq 200$ mA	V_{CEO}	max.		40		V
Emitter-base voltage (open collector)	V_{EBO}	max.		4		V
			2N3553	**2N3375**	**2N3632**	
Collector current						
d.c.	I_C	max.	0,35	0,5	1	A
peak value	I_{CM}	max.	1,0	1,5	3	A
Total power dissipation						
up to T_{mb} = 25 °C	P_{tot}	max.	7	11,6	23	W
Storage temperature	T_{stg}			−65 to +200		°C
Junction temperature	T_j	max.		200		°C

THERMAL RESISTANCE

			2N3553	2N3375	2N3632	
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	25	15	7.5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=		0.6	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			2N3553	2N3375	2N3632	
Collector cut-off current						
$I_B = 0$; $V_{CE} = 30$ V	I_{CEO}	<	100	100	250	μA
Breakdown voltages						
$I_E = 0$; $I_C = 250\ \mu A$	$V_{(BR)CBO}$	>	65	65	65	V
I_C up to 200 mA						
$-V_{BE} = 1.5$ V; $R_B = 33\ \Omega$ [1]	$V_{(BR)CEX}$	>	65	65	65	V
$I_B = 0$ [1]	$V_{(BR)CEO}$	>	40	40	40	V
$I_C = 0$; $I_E = 250\ \mu A$	$V_{(BR)EBO}$	>	4	4	4	V
Base-emitter voltage						
$I_C = 250$ mA; $V_{CE} = 5$ V	V_{BE}	<	1.5			V
$I_C = 500$ mA; $V_{CE} = 5$ V	V_{BE}	<		1.5		V
$I_C = 1000$ mA; $V_{CE} = 5$ V	V_{BE}	<			1.5	V
Saturation voltage						
$I_C = 250$ mA; $I_B = 50$ mA	V_{CEsat}	<	1.0			V
$I_C = 500$ mA; $I_B = 100$ mA	V_{CEsat}	<		1.0		V
$I_C = 1000$ mA; $I_B = 200$ mA	V_{CEsat}	<			1.0	V

[1]) Pulsed through an inductor of 25 mH; $\delta = 0.5$; f = 50 Hz

CHARACTERISTICS (continued)

T_j = 25 °C unless otherwise specified

			2N3553	2N3375	2N3632	
D.C. current gain						
I_C = 125 mA; V_{CE} = 5 V	h_{FE}	>	15	15		
		<	200	200		
I_C = 250 mA; V_{CE} = 5 V	h_{FE}	>	10	10	10	
		<	100	100	150	
I_C = 1000 mA; V_{CE} = 5 V	h_{FE}	>			5	
		<			110	
Collector capacitance at f = 1 MHz						
$I_E = I_e = 0$; V_{CB} = 28 V	C_c	<	10	10	20	pF
Collector-case capacitance		<		6	6	pF
Transition frequency						
I_C = 125 mA; V_{CE} = 28 V	f_T	typ.	500	500		MHz
I_C = 250 mA; V_{CE} = 28 V	f_T	typ.			400	MHz
Real part of input impedance at f = 200 MHz						
I_C = 125 mA; V_{CE} = 28 V	$Re(h_{ie})$	<	20	20		Ω
I_C = 250 mA; V_{CE} = 28 V	$Re(h_{ie})$	<			20	Ω

R.F. performance at V_{CE} = 28 V

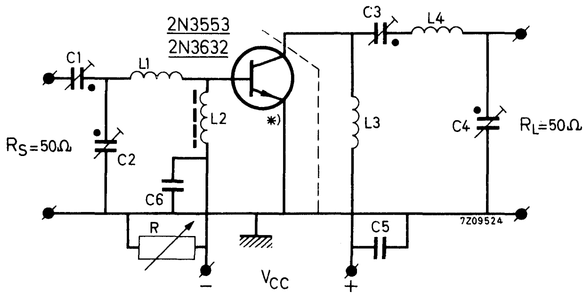
	f (MHz)	P_o (W)	P_i (W)	I_C (mA)	η %	Test circuit
2N3553	175	2.5	< 0.25	< 180	> 50	I
2N3375	100	7.5	< 1	< 410	> 65	II
2N3375	400	> 3	1	270	> 40	III
2N3632	175	> 13.5	3.5	690	> 70	I

NOTE

The transistors can withstand an output V.S.W.R. of 3 : 1 varied through all phases under conditions mentioned in the table above.

CHARACTERISTICS (continued)

Test circuit **I (with the 2N3553 or the 2N3632 at f = 175 MHz)**



*) The length of the external emitter wire of the 2N3553 is 1.6 mm.
The emitter of the 2N3632 should be connected to the case as short as possible.

Components

C1 = C2 = C3 = C4 =	4 to 29 pF	air trimmer
C5 =	10 nF	polyester
C6 =	100 pF	ceramic

L1 = 1 turn Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm

L2 = Ferroxcube choke coil. Z (at f = 175 MHz) = 550 Ω ± 20% (code number 4312 020 36640)

L3 = 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

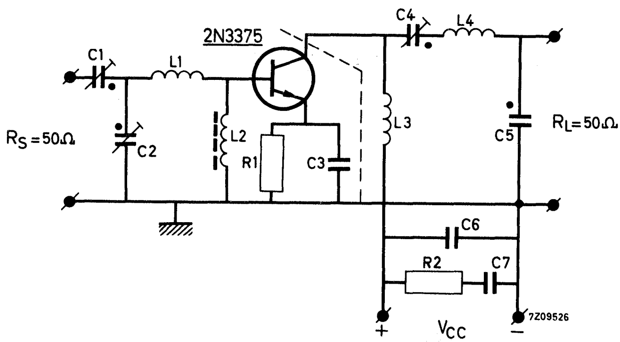
L4 = 3 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 2 x 20 mm

R = 0 for the 2N3553

R = 0 to 2 Ω for the 2N3632

CHARACTERISTICS (continued)

Test circuit II (with the 2N3375 at f = 100 MHz)



Components

C1 = C2 = 3.5 to 61.5 pF		air trimmer
C3 =	10 nF	polyester
C4 = C5 = 4 to	29 pF	air trimmer
C6 =	330 pF	ceramic
C7 =	10 nF	polyester

L1 = 2 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 10 mm; leads 2 x 10 mm

L2 = Ferroxcube choke coil. Z (at f = 100 MHz) = 700 Ω ± 20% (code number 4312 020 36640)

L3 = 23 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 6 mm

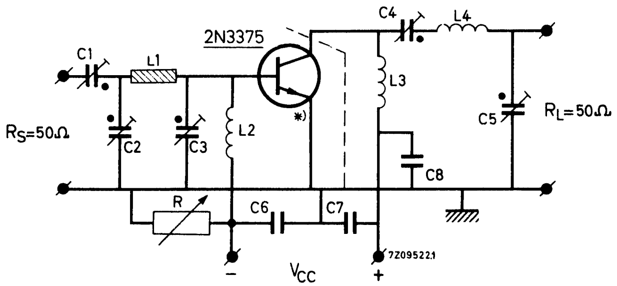
L4 = 5 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 2 x 10 mm

R1 = 1.35 Ω carbon

R2 = 10 Ω carbon

CHARACTERISTICS (continued)

Test circuit **III (with the 2N3375 at f = 400 MHz)**



*) The emitter should be connected to the case as short as possible.

Components

C1 = C2 =	0.7 to 6.7 pF	ceramic trimmer
C3 =	0.5 to 3.5 pF	ceramic trimmer
C4 = C5 =	3 to 19 pF	air trimmer
C6 = C7 =	15 pF	ceramic
C8 =	4700 pF	ceramic

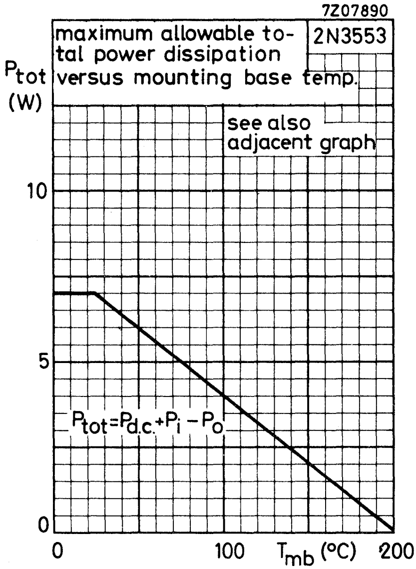
L1 = 20 mm straight Cu wire; diam. 1.5 mm; spaced 8 mm from chassis

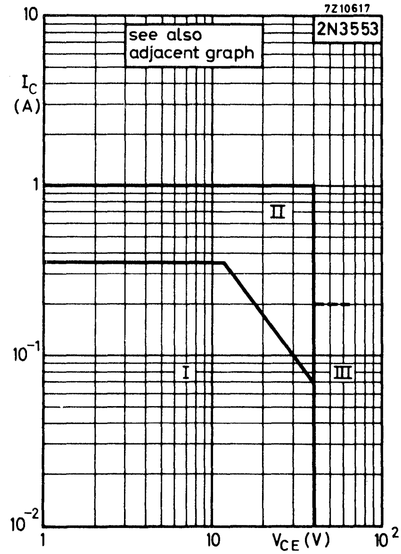
L2 = 17 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3 mm

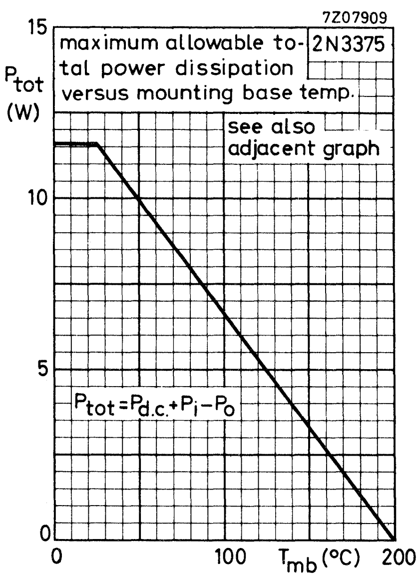
L3 = 7 turns closely wound enamelled Cu wire (0.5 mm); int. diam. 3 mm

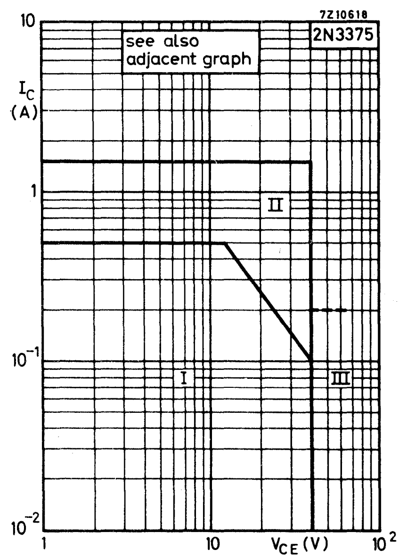
L4 = 1 turn Cu wire (1.5 mm); int. diam. 10 mm; leads 2 x 5 mm

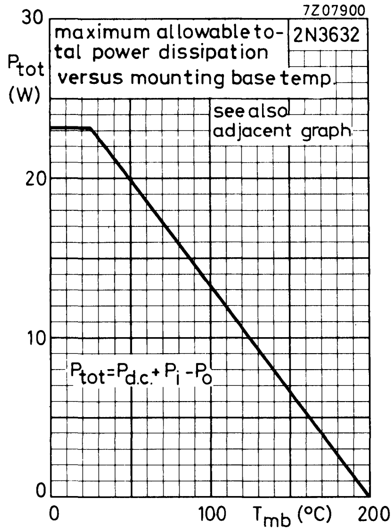
R = 0 to 5 Ω

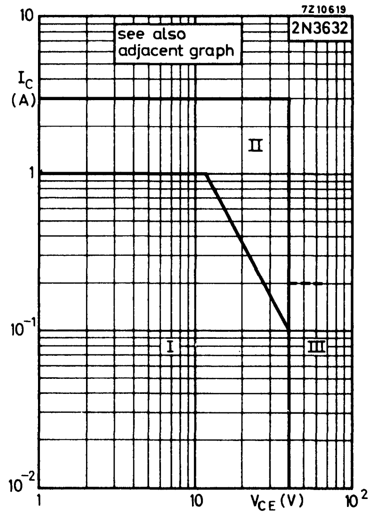

7Z07890
maximum allowable total power dissipation versus mounting base temp.
2N3553
see also adjacent graph
P_{tot} (W)
10
5
0
$P_{tot} = P_{d.c.} + P_i - P_o$
0
100
T_{mb} (°C)
200


7Z10617
2N3553
see also adjacent graph
I_C (A)
10
1
10^{-1}
10^{-2}
II
I
III
1
10
V_{CE} (V)
10^2


7Z07909
maximum allowable total power dissipation versus mounting base temp.
2N3375
see also adjacent graph
P_{tot} (W)
15
10
5
0
$P_{tot} = P_{d.c.} + P_i - P_o$
0
100
T_{mb} (°C)
200


7Z10618
2N3375
see also adjacent graph
I_C (A)
10
1
10^{-1}
10^{-2}
II
I
III
1
10
V_{CE} (V)
10^2

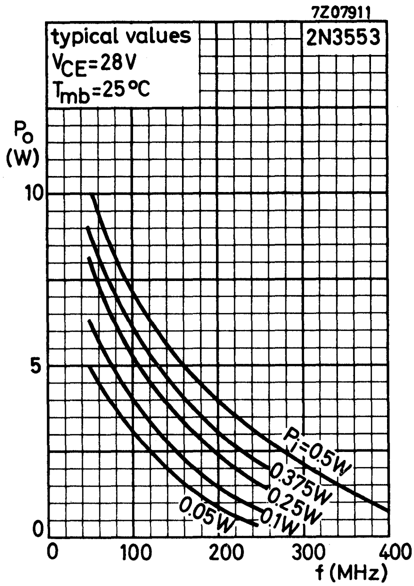


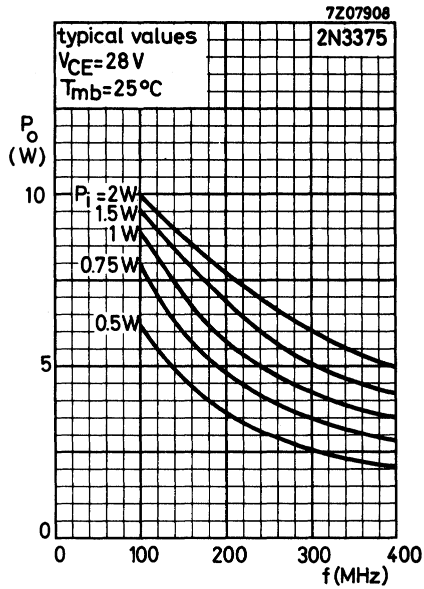


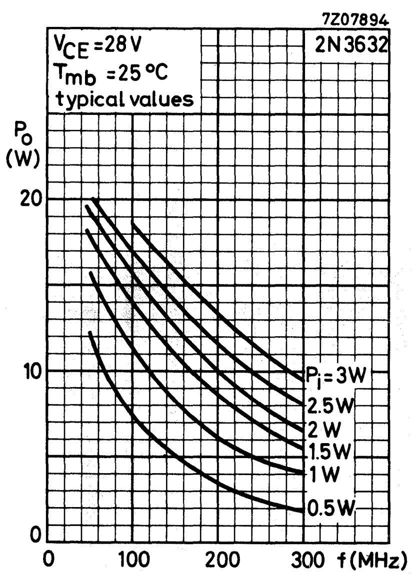
I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

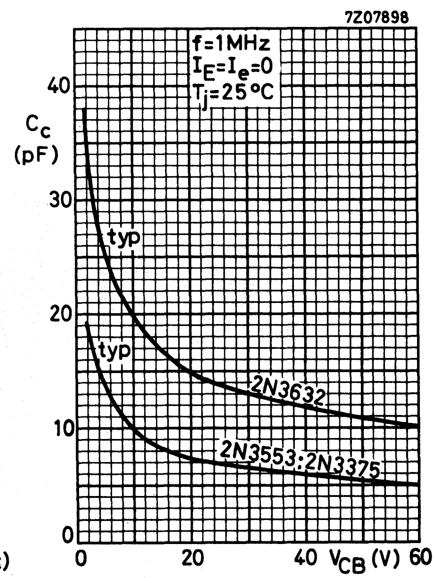
II Additional region of operation at f ≥ 1 MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.

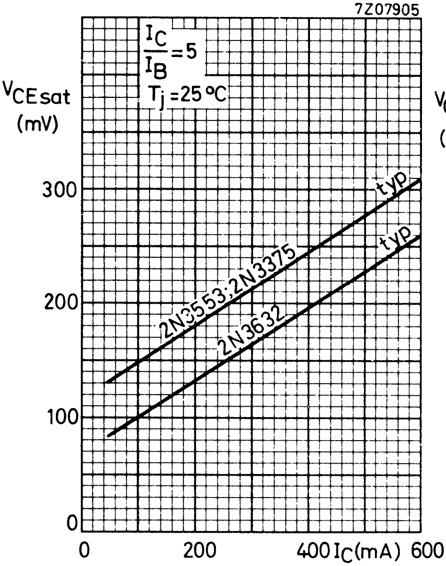
III Operating during switching off in this region is allowed, provided the transistor is cut-off with $-V_{BB} \leq 1.5$ V and $R_{BE} \geq 33\ \Omega$, $I_C \leq 200$ mA and the transient energy does not exceed 0.5 mWs.

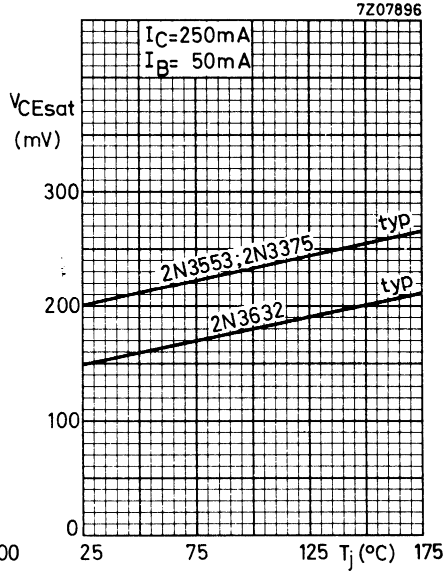

7Z07911
typical values
V_{CE}=28 V
T_{mb}=25 °C
2N3553
P_o (W)
10
5
0
P_i=0.5W
0.375W
0.25W
0.1W
0.05W
0
100
200
300
400
f (MHz)

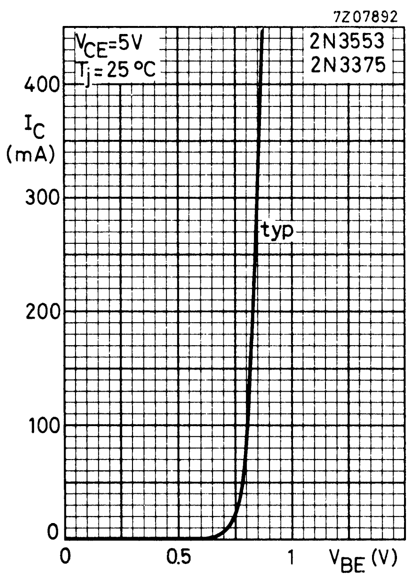

7Z07908
typical values
V_{CE}=28 V
T_{mb}=25 °C
2N3375
P_o (W)
10
5
0
P_i =2W
1.5 W
1 W
0.75 W
0.5W
0
100
200
300
400
f (MHz)

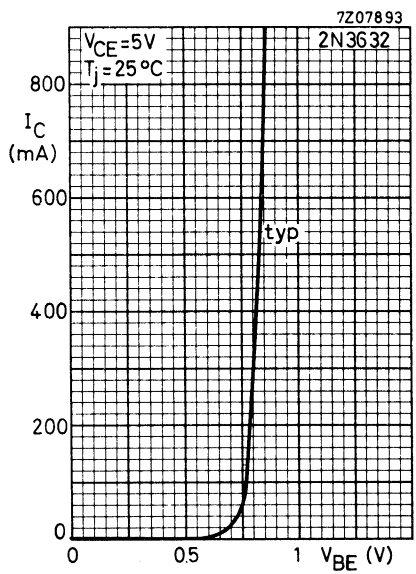

7Z07894
V_{CE} =28 V
T_{mb} =25 °C
typical values
2N3632
P_o (W)
20
10
0
P_i= 3W
2.5 W
2 W
1.5 W
1 W
0.5 W
0
100
200
300
f (MHz)

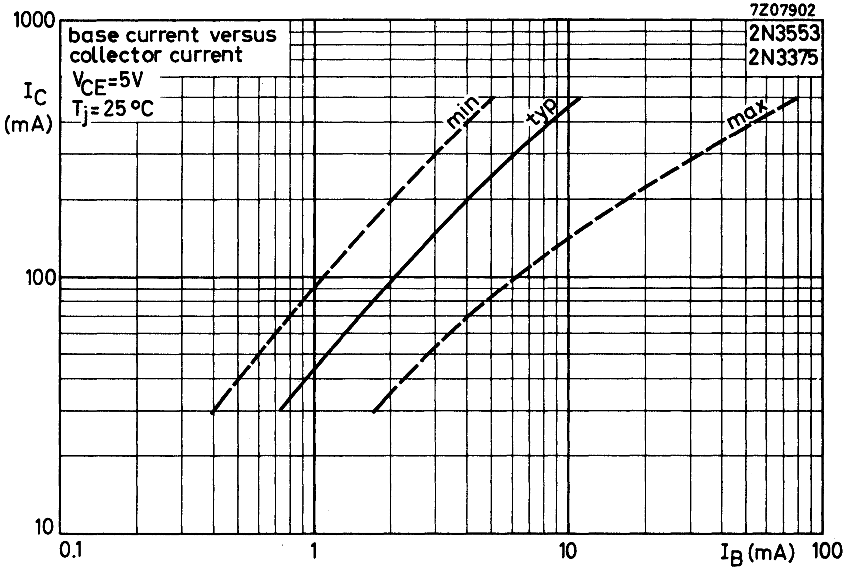

7Z07898
f=1 MHz
I_E=I_e=0
T_j=25 °C
C_c (pF)
40
30
20
10
0
typ
typ
2N3632
2N3553;2N3375
0
20
40
V_{CB} (V)
60

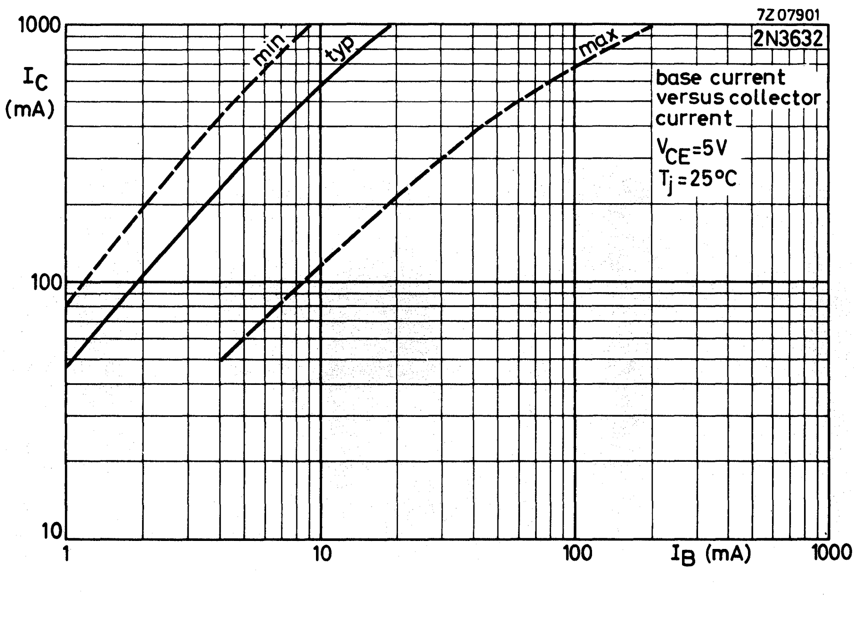

7Z07905
$\frac{I_C}{I_B}=5$
$T_j=25\ ^\circ C$
V_{CEsat} (mV)
300
200
100
0
typ
typ
2N3553;2N3375
2N3632
0
200
400
I_C (mA)
600

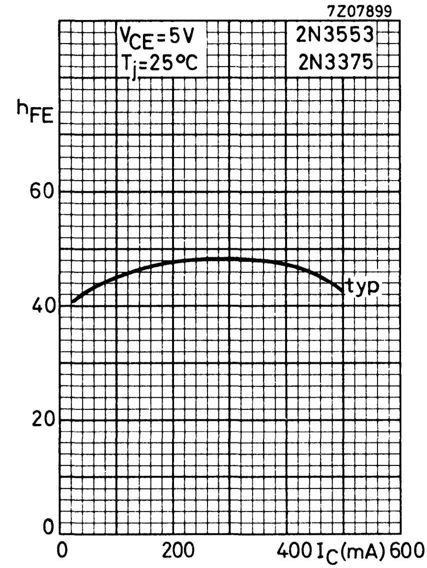

7Z07896
$I_C=250$ mA
$I_B=50$ mA
V_{CEsat} (mV)
300
200
100
0
typ
typ
2N3553;2N3375
2N3632
25
75
125
T_j (°C)
175

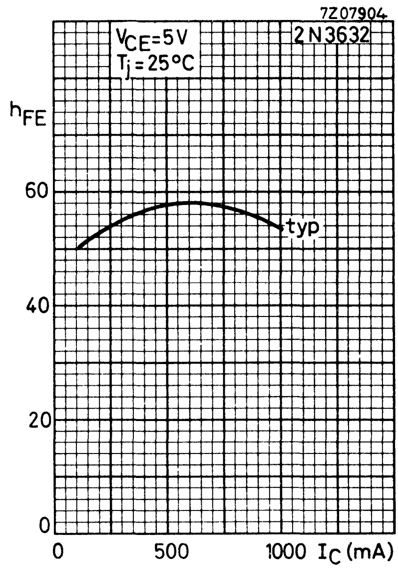

7Z07892
$V_{CE}=5$ V
$T_j=25\ ^\circ C$
2N3553
2N3375
400
I_C (mA)
300
200
100
0
typ
0
0.5
1
V_{BE} (V)

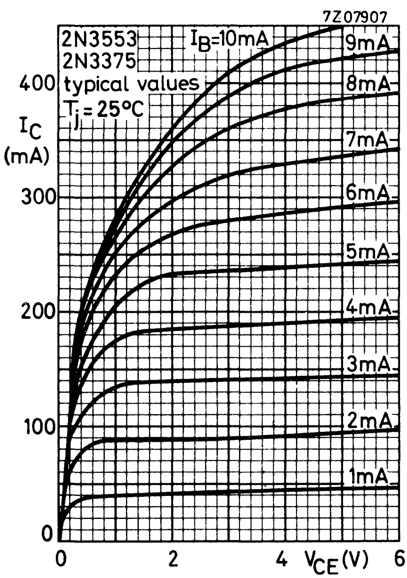

7Z07893
$V_{CE}=5$ V
$T_j=25\ ^\circ C$
2N3632
800
I_C (mA)
600
400
200
0
typ
0
0.5
1
V_{BE} (V)

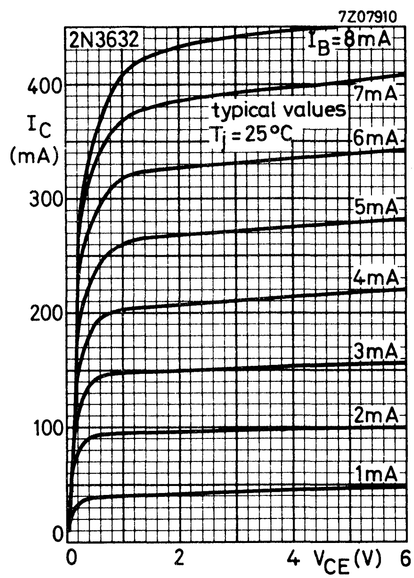

7Z07902
2N3553
2N3375
base current versus
collector current
V_{CE}=5V
T_j=25 °C
I_C
(mA)
1000
100
10
0.1
1
10
100
I_B (mA)
min
typ
max

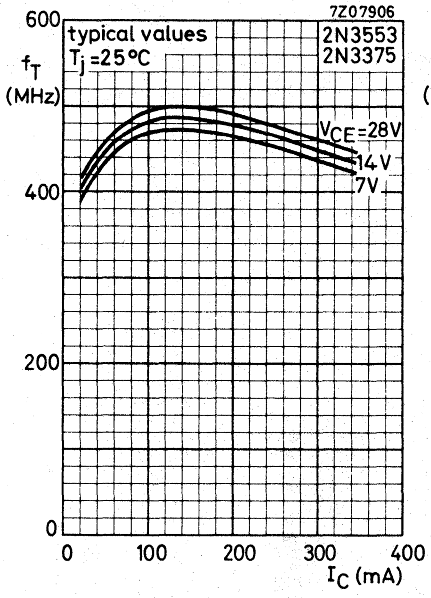

7Z07901
2N3632
base current
versus collector
current
V_{CE}=5V
T_j=25°C
I_C
(mA)
1000
100
10
1
10
100
1000
I_B (mA)
min
typ
max

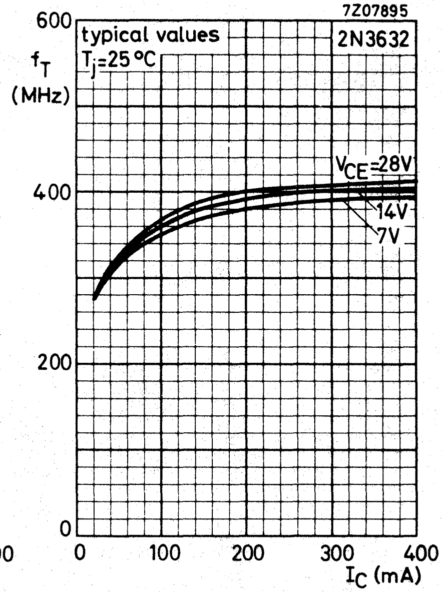

7Z07899
V_{CE}=5V
T_j=25°C
2N3553
2N3375
h_{FE}
60
40
20
0
typ
0
200
400 I_C(mA) 600

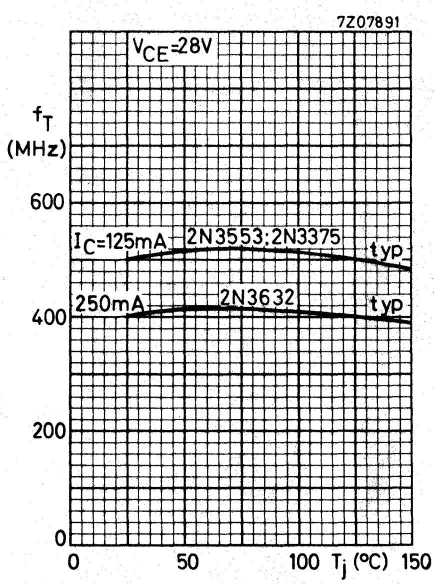

7Z07904
V_{CE}=5V
T_j=25°C
2N3632
h_{FE}
60
40
20
0
typ
0
500
1000 I_C (mA)

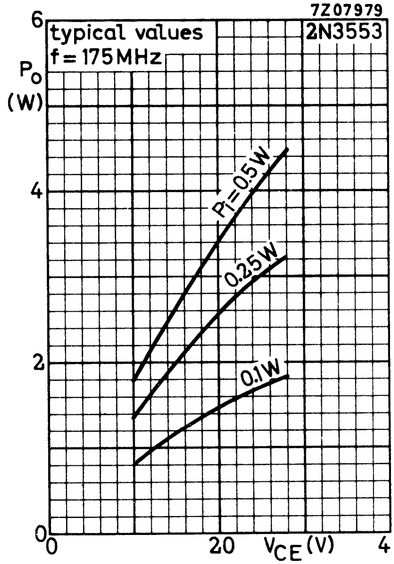

7Z07907
2N3553
2N3375
typical values
T_j=25°C
I_B=10mA
9mA
8mA
7mA
6mA
5mA
4mA
3mA
2mA
1mA
I_C
(mA)
400
300
200
100
0
0
2
4 V_{CE}(V) 6

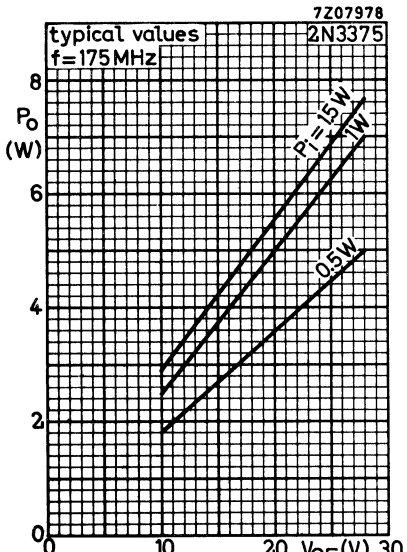

7Z07910
2N3632
I_B=8mA
7mA
6mA
5mA
4mA
3mA
2mA
1mA
typical values
T_j = 25°C
I_C
(mA)
400
300
200
100
0
0
2
4 V_{CE}(V) 6

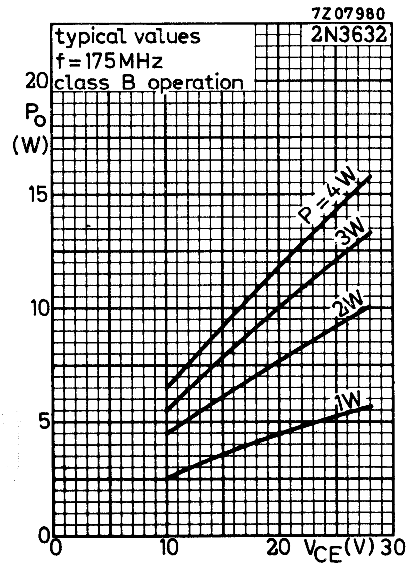

7Z07906
typical values
T_j = 25 °C
2N3553
2N3375
f_T (MHz)
V_{CE} = 28V
14 V
7V
I_C (mA)
0
100
200
300
400
600


7Z07895
typical values
T_j = 25 °C
2N3632
f_T (MHz)
V_{CE} = 28V
14V
7V
I_C (mA)
0
100
200
300
400
600


7Z07891
V_{CE} = 28V
f_T (MHz)
I_C = 125mA
2N3553;2N3375
typ
250mA
2N3632
typ
T_j (°C)
0
50
100
150
200
400
600


7Z07979
typical values
f = 175 MHz
2N3553
P_o (W)
P_i = 0.5 W
0.25 W
0.1 W
V_{CE} (V)
0
2
4
6
0
20
4


7Z07978
typical values
f = 175 MHz
2N3375
P_o (W)
P_i = 1.5 W
1 W
0.5 W
V_{CE} (V)
0
2
4
6
8
0
10
20
30


7Z07980
typical values
f = 175 MHz
class B operation
2N3632
P_o (W)
P_i = 4 W
3 W
2 W
1 W
V_{CE} (V)
0
5
10
15
20
0
10
20
30

SILICON PLANAR EPITAXIAL OVERLAY TRANSISTORS

N-P-N overlay transistors in TO-39 metal envelopes with the collector connected to the case. The devices are primarily intended for class-A, B or C amplifiers, frequency multiplier and oscillator circuits.

The transistors are suitable in output, driver or pre-driver stages in v.h.f. and u.h.f. equipment.

QUICK REFERENCE DATA

			2N3866	2N4427	
Collector-emitter voltage $R_{BE} = 10\,\Omega$	V_{CER}	max.	55	40	V
Collector-emitter voltage (open base)	V_{CEO}	max.	30	20	V
Emitter-base voltage (open collector)	V_{EBO}	max.	3,5	2,0	V
Collector current (d.c. or averaged over any 20 ms period)	I_C	max.	0,4	0,4	A
Total power dissipation up to $T_{mb} = 25\ ^oC$	P_{tot}	max.	5	3,5	W
Junction temperature	T_j	max.	200	200	^oC
Transition frequency $I_C = 50$ mA; $V_{CE} = 15$ V; f = 200 MHz	f_T	min.	500	500	MHz

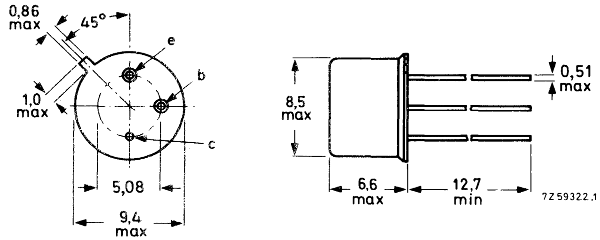
R.F. performance

type number	f (MHz)	V_{CE} (V)	P_o (W)	G_P (dB)	η (%)
2N3866	400	28	1	> 10	> 45
2N4427	175	12	1	> 10	> 50

MECHANICAL DATA

Dimensions in mm

Fig. 1 TO-39; collector connected to case.



Maximum lead diameter is guaranteed only for 12,7 mm.

Accessories: 56245 (distance disc).

RATINGS Limiting values in accordance with the Absolute Maximum System (IEC 134)

			2N3866	2N4427	
Collector-base voltage (open emitter) [1]	V_{CBO}	max.	55	40	V
Collector-emitter voltage [1] R_{BE} = 10 Ω	V_{CER}	max.	55	40	V
Collector-emitter voltage (open base) [1]	V_{CEO}	max.	30	20	V
Emitter-base voltage (open collector) [1]	V_{EBO}	max.	3.5	2.0	V
Collector current (d.c. or averaged over any 20 ms period) [1]	I_C	max.	0.4	0.4	A
Collector current (peak value) [1]	I_{CM}	max.	0.4	0.4	A
Total power dissipation up to T_{mb} = 25 °C [1]	P_{tot}	max.	5	3.5	W

Temperatures

Storage temperature	T_{stg}		−65 to +200	°C
Junction temperature	T_j	max.	200	°C

THERMAL RESISTANCE

From junction to ambient in free air	$R_{th\ j-a}$	=	200	K/W
From junction to mounting base	$R_{th\ j-mb}$	=	35	K/W
From mounting base to heatsink mounted with top clamping washer of 56218	$R_{th\ mb-h}$	=	1.0	K/W
top clamping washer of 56218 and a boron nitride washer for electrical insulation	$R_{th\ mb-h}$	=	2.5	K/W

1) See also graphs indicating areas of permissible operation.

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			2N3866	2N4427	
Collector cut-off current					
$I_B = 0$; $V_{CE} = 28$ V	I_{CEO}	<	20		μA
$I_B = 0$; $V_{CE} = 12$ V	I_{CEO}	<		20	μA
Breakdown voltages					
$I_E = 0$; $I_C = 100$ μA	$V_{(BR)CBO}$	>	55	40	V
$I_C = 5$ mA; $R_{BE} = 10\ \Omega$	$V_{(BR)CER}$	>	55	40	V
$I_B = 0$; $I_C = 5$ mA	$V_{(BR)CEO}$	>	30	20	V
$I_C = 0$; $I_E = 100$ μA	$V_{(BR)EBO}$	>	3,5	2	V
Collector-emitter saturation voltage					
$I_C = 100$ mA; $I_B = 20$ mA	V_{CEsat}	<	1,0	0,5	V
D.C. current gain					
$I_C = 50$ mA; $V_{CE} = 5$ V	h_{FE}		10 to 200		
$I_C = 100$ mA; $V_{CE} = 5$ V	h_{FE}			10 to 200	
$I_C = 360$ mA; $V_{CE} = 5$ V	h_{FE}	>	5	5	
Transition frequency					
$I_C = 50$ mA; $V_{CE} = 15$ V; f = 200 MHz	f_T	⩾	500	500	MHz ←
Collector capacitance					
$V_{CB} = 28$ V; $I_E = I_e = 0$; f = 1 MHz	C_c	<	3		pF
$V_{CB} = 12$ V; $I_E = I_e = 0$; f = 1 MHz	C_c	<		4	pF

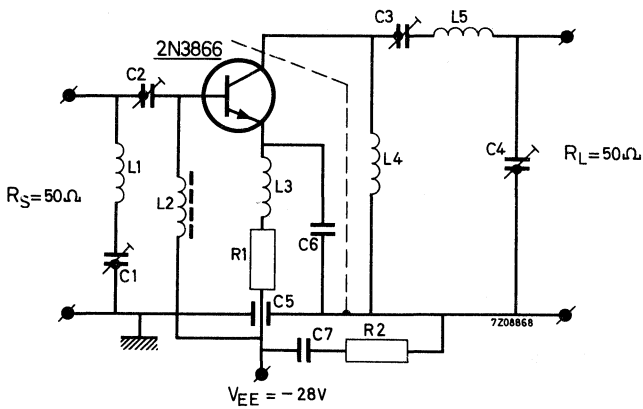
R.F. performance at T_{mb} = 25 °C

	f (MHz)	V_{CE} (V)	P_o (W)	G_p (dB)	I_C (mA)	η (%)	test circuit
2N3866	100	28	1,8	> 10	<107	> 60	
2N3866	250	28	1,5	> 10	<107	> 50	
2N3866	400	28	1,0	> 10	< 79	> 45	I*
2N4427	175	12	1,0	> 10	<167	> 50	II*
2N4427	470	12	0,4	> 10	67	50	

* The transistor can withstand an output V.S.W.R. of 3 : 1 varied through all phases for conditions, mentioned in the table above.

CHARACTERISTICS (continued)

Test circuit **I** (with the 2N3866 at f = 400 MHz)

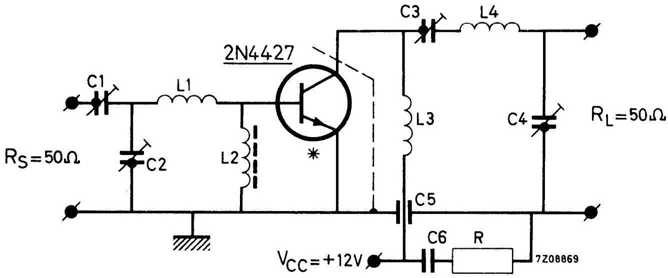


C1 = C2 = C3 =	4 to 29 pF	air trimmer
C4 =	4 to 14 pF	air trimmer
C5 =	1 nF	feed through
C6 =	12 pF	
C7 =	12 nF	
R1 =	5.6 Ω	
R2 =	10 Ω	

L1 = 2 turns Cu wire (1 mm); int. diam. 6 mm; winding pitch 3 mm
L2 = Ferroxcube choke coil; Z (at f = 250 MHz) = 450 Ω (code number 4312 020 36690)
L3 = L4 = 6 turns enamelled Cu wire (0.5 mm); int. diam. 3.5 mm (100 nH)
L5 = 2 turns Cu wire (1 mm); int. diam. 7 mm; winding pitch 2.5 mm; leads 2x15 mm.

APPLICATION INFORMATION (continued)

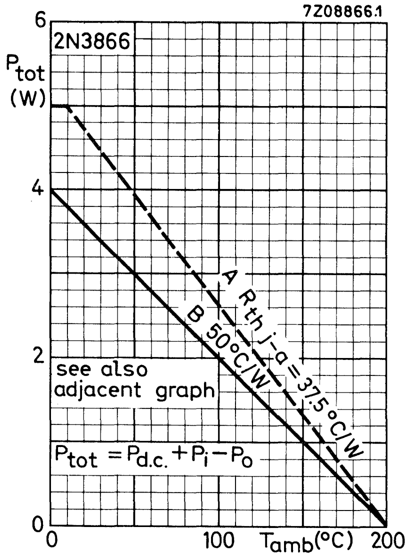
Test circuit **II** **(with the 2N4427 at f = 175 MHz)**

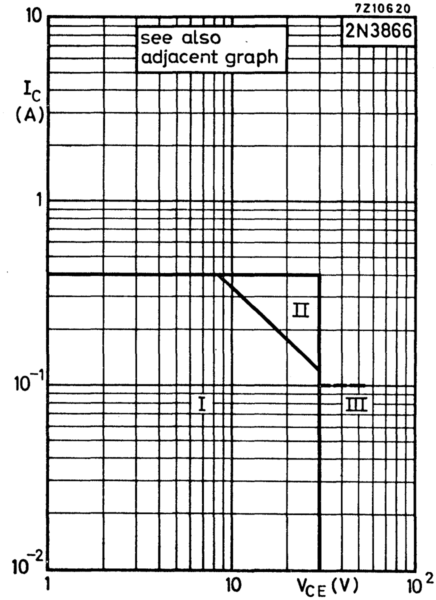


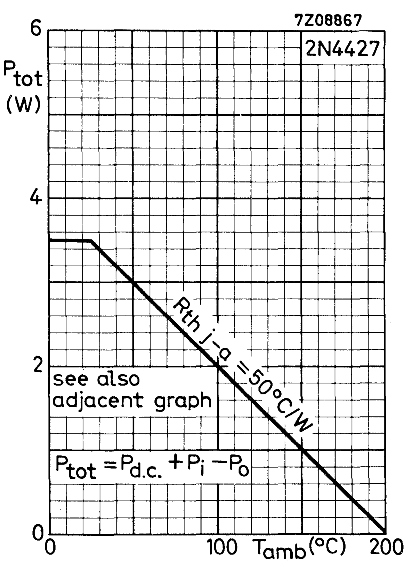
*) The length of the external emitter wire is 1.6 mm

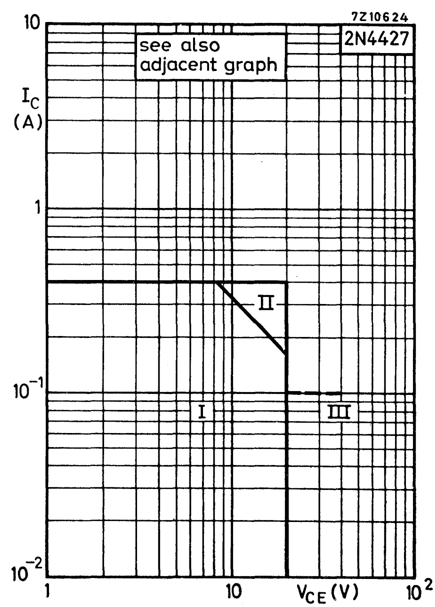
C1 = C2 = C3 = C4 =	4 to 29 pF	air trimmer
C5 =	1 nF	feed through
C6 =	12 nF	
R =	10 Ω	

L1 = 2 turns Cu wire (1 mm); int. diam. 6 mm; winding pitch 2 mm; leads 2x10 mm
L2 = Ferroxcube choke coil; Z (at f = 175 MHz) = 550 Ω (code number 4312 020 36640)
L3 = 2 turns Cu wire (1 mm); int. diam. 5 mm; winding pitch 2 mm; leads 2x10 mm
L4 = 3 turns Cu wire (1.5 mm); int. diam. 10 mm; winding pitch 2 mm; leads 2x15 mm


7Z08866.1
2N3866
Ptot (W)
A Rth j-a = 37.5 °C/W
B 50 °C/W
see also adjacent graph
Ptot = Pd.c. + Pi − Po
Tamb (°C)
0
100
200
6
4
2
0


7Z10620
2N3866
see also adjacent graph
IC (A)
10
1
10⁻¹
10⁻²
I
II
III
1
10
VCE (V)
10²


7Z08867
2N4427
Ptot (W)
Rth j-a = 50 °C/W
see also adjacent graph
Ptot = Pd.c. + Pi − Po
Tamb (°C)
0
100
200
6
4
2
0


7Z10624
2N4427
see also adjacent graph
IC (A)
10
1
10⁻¹
10⁻²
I
II
III
1
10
VCE (V)
10²

I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

II Additional region of operation at $f \geq 1$ MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.

III Operating during switching off in this region is allowed, provided the transistor is cut-off with $-V_{BB} \leq 1.5$ V and $R_{BE} \geq 33\ \Omega$, $I_C \leq 100$ mA and the transient energy does not exceed 0.125 mWs.

SILICON PLANAR EPITAXIAL OVERLAY TRANSISTORS

The **2N3924** is an n-p-n overlay transistor in a TO-39 metal envelope with the collector connected to the case. The **2N3926** and the **2N3927** are n-p-n overlay transistors in TO-60 metal envelopes with the emitter connected to the case.
The transistors are intended for v.h.f. transmitting applications.

QUICK REFERENCE DATA

			2N3924	2N3926	2N3927	
Collector-emitter voltage $-V_{BE}$ = 1,5 V	V_{CEX}	max.	36	36	36	V
Collector-emitter voltage (open base)	V_{CEO}	max.	18	18	18	V
Collector current (peak value)	I_{CM}	max.	1,5	3,0	4,5	A
Total power dissipation up to T_{mb} = 25 °C	P_{tot}	max.	7	11,6	23	W
Junction temperature	T_j	max.	200	200	200	°C
Transition frequency I_C = 100 mA; V_{CE} = 13,5 V	f_T	>	250	250	–	MHz
I_C = 200 mA; V_{CE} = 13,5 V	f_T	>	–	–	200	MHz

R.F. performance at V_{CE} = 13,5 V; f = 175 MHz

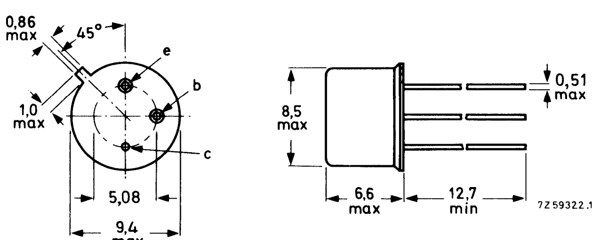
type number	P_o (W)	P_i (W)	η (%)
2N3924	4	< 1	> 70
2N3926	7	< 2	> 70
2N3927	12	< 4	> 80

MECHANICAL DATA

Dimensions in mm

Fig. 1a TO-39; collector connected to case.

2N3924

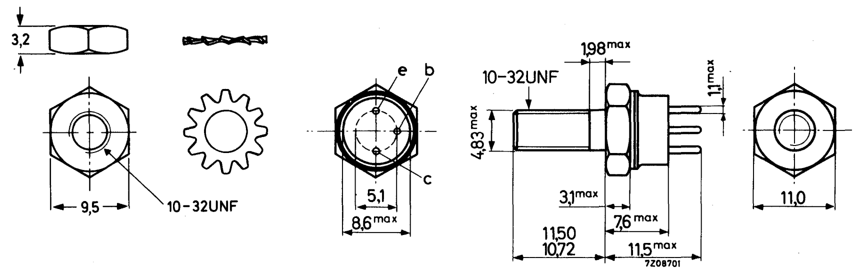


Maximum lead diameter is guaranteed only for 12,7 mm.
Accessories: 56245 (distance disc).

MECHANICAL DATA (continued) Dimensions in mm

Fig. 1b TO-60 (**2N3926** and **2N3927**).

Emitter connected to case.
The top pins should not be bent.



Torque on nut: min. 0,8 Nm (8 kg cm)
max. 1,7 Nm (17 kg cm)

Diameter of clearance hole in heatsink: 4,8 mm to 5,2 mm.

P.S. This device incorporates beryllium oxide, the dust of which is toxic. The device is entirely safe provided that the BeO disc is not damaged.

RATINGS

Limiting values in accordance with the Absolute Maximum System (IEC 134)

Collector-base voltage (open emitter)	V_{CBO}	max.		36		V
Collector-emitter voltage						
$I_C \leqslant 400$ mA; $-V_{BE} = 1,5$ V	V_{CEX}	max.		36		V
(open base); $I_C \leqslant 400$ mA	V_{CEO}	max.		18		V
Emitter-base voltage (open collector)	V_{EBO}	max.		4		V
			2N3924	**2N3926**	**2N3927**	
Collector current						
d.c.	I_C	max.	0,5	1,0	1,5	A
peak value	I_{CM}	max.	1,5	3,0	4,5	A
Total power dissipation						
up to $T_{mb} = 25$ °C	P_{tot}	max.	7	11,6	23	W
Storage temperature	T_{stg}			−65 to +200		°C
Junction temperature	T_j	max.		200		°C

THERMAL RESISTANCE

			2N3924	2N3926	2N3927	
From junction to mounting base	$R_{th\ j\text{-}mb}$	=	25	15	7.5	K/W
From mounting base to heatsink	$R_{th\ mb\text{-}h}$	=		0.6	0.6	K/W

CHARACTERISTICS

T_j = 25 °C unless otherwise specified

			2N3924	2N3926	2N3927	
Collector cut-off current						
$I_E = 0$; $V_{CB} = 15$ V	I_{CBO}	<	100	100	250	μA
$I_E = 0$; $V_{CB} = 15$ V; $T_j = 150$ °C	I_{CBO}	<	5	5	10	mA
Breakdown voltages						
$I_E = 0$; $I_C = 250$ μA	$V_{(BR)CBO}$	>	36	36	36	V
I_C up to 400 mA						
$-V_{BE} = 1.5$ V; $R_B = 33$ Ω [1]	$V_{(BR)CEX}$	>	36	36	36	V
$I_B = 0$ [1]	$V_{(BR)CEO}$	>	18	18	18	V
$I_C = 0$; $I_E = 250$ μA	$V_{(BR)EBO}$	>	4	4	4	V
Base-emitter voltage						
$I_C = 250$ mA; $V_{CE} = 5$ V	V_{BE}	<	1.5			V
$I_C = 500$ mA; $V_{CE} = 5$ V	V_{BE}	<		1.5		V
$I_C = 1000$ mA; $V_{CE} = 5$ V	V_{BE}	<			1.5	V
Saturation voltage						
$I_C = 250$ mA; $I_B = 50$ mA	V_{CEsat}	<	0.75			V
$I_C = 500$ mA; $I_B = 100$ mA	V_{CEsat}	<		0.75		V
$I_C = 1000$ mA; $I_B = 200$ mA	V_{CEsat}	<			1.0	V

[1]) Pulsed through an inductor of 25 mH; $\delta = 0.5$; f = 50 Hz

CHARACTERISTICS (continued)

$T_j = 25°C$ unless otherwise specified

			2N3924	2N3926	2N3927	
D.C. current gain						
I_C = 250 mA; V_{CE} = 5 V	h_{FE}	>	10			
		<	150			
I_C = 500 mA; V_{CE} = 5 V	h_{FE}	>		5		
		<		150		
I_C = 1000 mA; V_{CE} = 5 V	h_{FE}	>			5	
		<			150	
Collector capacitance at f = 1 MHz						
$I_E = I_e = 0$; V_{CB} = 13.5 V	C_c	<	20	20	45	pF
Transition frequency						
I_C = 100 mA; V_{CE} = 13.5 V	f_T	>	250	250		MHz
I_C = 200 mA; V_{CE} = 13.5 V	f_T	>			200	MHz
Real part of input impedance at f = 200 MHz						
I_C = 100 mA; V_{CE} = 13.5 V	$Re(h_{ie})$	<	20	20		Ω
I_C = 200 mA; V_{CE} = 13.5 V	$Re(h_{ie})$	<			20	Ω

R.F. performance at V_{CE} = 13.5 V; f = 175 MHz

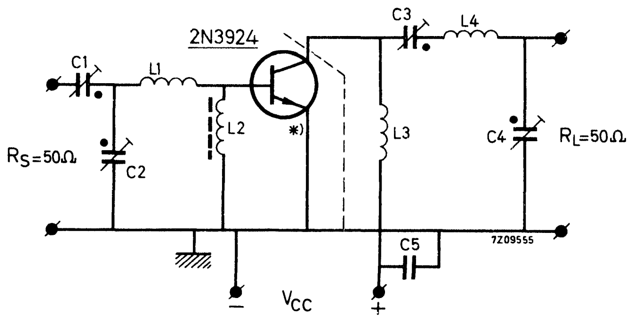
	P_o (W)	P_i (W)	I_C (mA)	η %	Test circuit
2N3924	4	< 1	< 420	> 70	I
2N3926	7	< 2	< 740	> 70	II
2N3927	12	< 4	< 1100	> 80	II

NOTE

The transistors can withstand an output V.S.W.R. of 3 : 1 varied through all phases under conditions mentioned in the table above.

CHARACTERISTICS (continued)

Test circuit I (with the 2N3924 at f = 175 MHz)



*) The length of the external emitter wire of the 2N3924 is 1.6 mm.

Components

C1 = C2 = C3 = C4 =	4 to 29 pF	air trimmer
C5 =	10 nF	polyester

L1 = 1 turn Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm

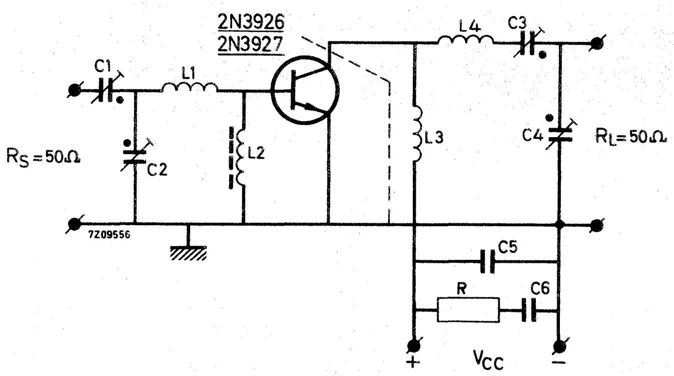
L2 = Ferroxcube choke coil. Z (at f = 175 MHz) = 550 Ω ± 20%
(code number 4312 020 **36640**)

L3 = 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

L4 = 3 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 12 mm; leads 2 x 20 mm

CHARACTERISTICS (continued)

Test circuit II (with the 2N3926 or 2N3927 at f = 175 MHz)



Components

C1 = C2 = C3 = C4 =	4 to 29 pF	air trimmer
C5 =	100 pF	ceramic
C6 =	10 nF	polyester

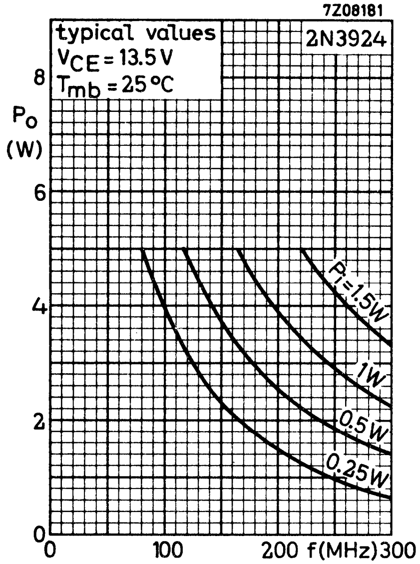
L1 = 1 turn Cu wire (1.0 mm); int. diam. 10 mm; leads 2 x 10 mm

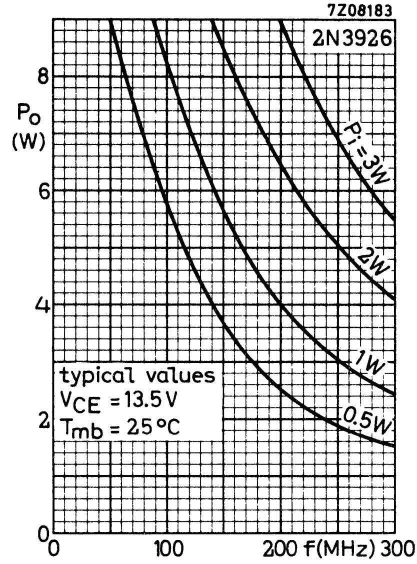
L2 = Ferroxcube choke coil. Z (at f = 175 MHz) = 550 Ω ± 20%
(code number 4312 020 **36640**)

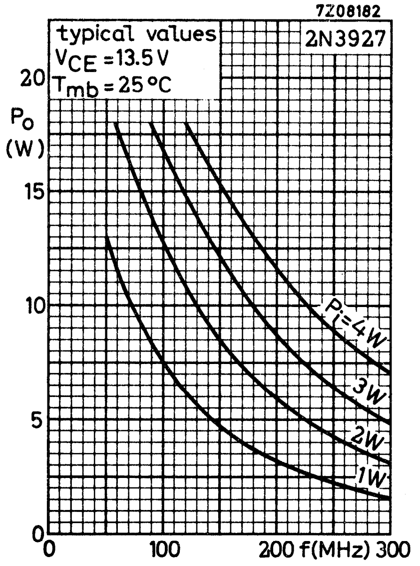
L3 = 15 turns closely wound enamelled Cu wire (0.7 mm); int. diam. 4 mm

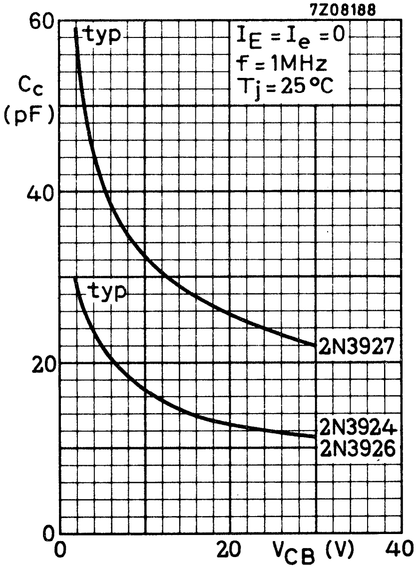
L4 = 2 turns closely wound enamelled Cu wire (1.5 mm); int. diam. 8.5 mm; leads 2 x 20 mm

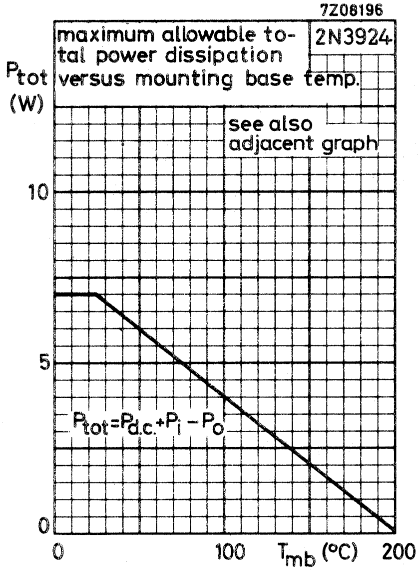
R = 10 Ω carbon

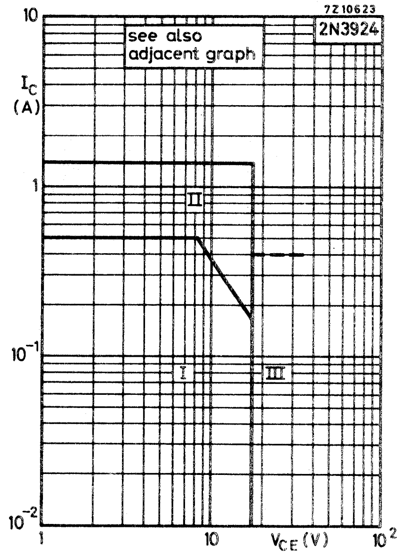

7Z08181
typical values
V_{CE} = 13.5 V
T_{mb} = 25 °C
2N3924
P_o
(W)
P_i = 1.5 W
1 W
0.5 W
0.25 W
0
2
4
6
8
0
100
200
f (MHz)
300

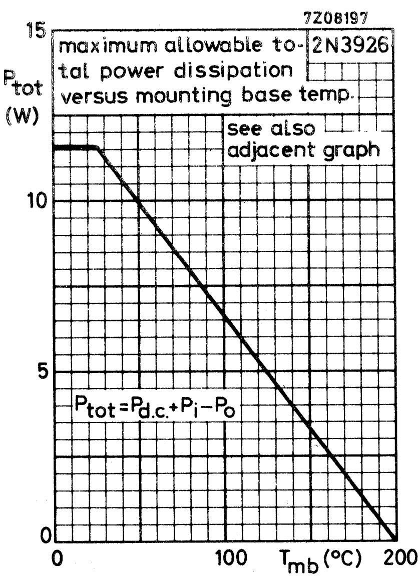

7Z08183
2N3926
P_o
(W)
P_i = 3 W
2 W
1 W
0.5 W
typical values
V_{CE} = 13.5 V
T_{mb} = 25 °C
0
2
4
6
8
0
100
200
f (MHz)
300

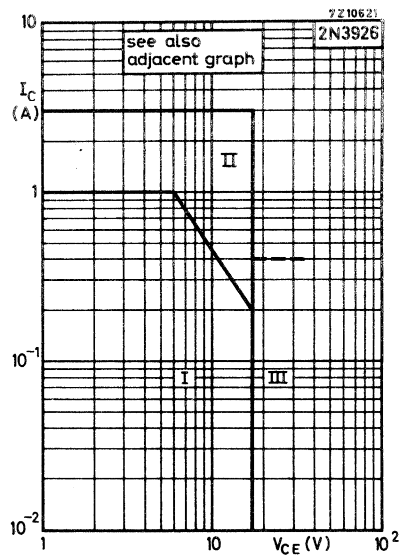

7Z08182
typical values
V_{CE} = 13.5 V
T_{mb} = 25 °C
2N3927
P_o
(W)
P_i = 4 W
3 W
2 W
1 W
0
5
10
15
20
0
100
200
f (MHz)
300

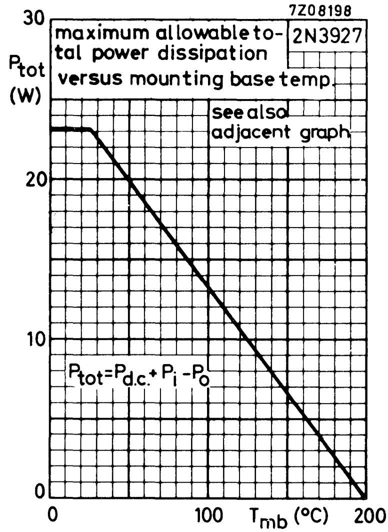

7Z08188
$I_E = I_e = 0$
f = 1 MHz
T_j = 25 °C
C_c
(pF)
typ
typ
2N3927
2N3924
2N3926
0
20
40
60
0
20
V_{CB} (V)
40

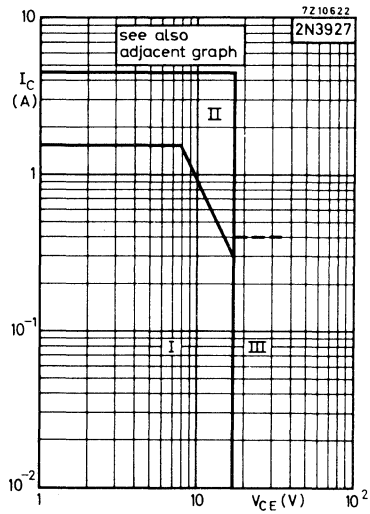

7Z08196
maximum allowable total power dissipation versus mounting base temp.
2N3924
Ptot (W)
see also adjacent graph
Ptot=Pd.c.+Pi−Po
0
5
10
0
100
Tmb (°C)
200


7Z10623
see also adjacent graph
2N3924
IC (A)
II
I
III
10
1
10−1
10−2
1
10
VCE (V)
10²


7Z08197
maximum allowable total power dissipation versus mounting base temp.
2N3926
Ptot (W)
see also adjacent graph
Ptot=Pd.c.+Pi−Po
15
10
5
0
0
100
Tmb (°C)
200


7Z10621
see also adjacent graph
2N3926
IC (A)
II
I
III
10
1
10−1
10−2
1
10
VCE (V)
10²

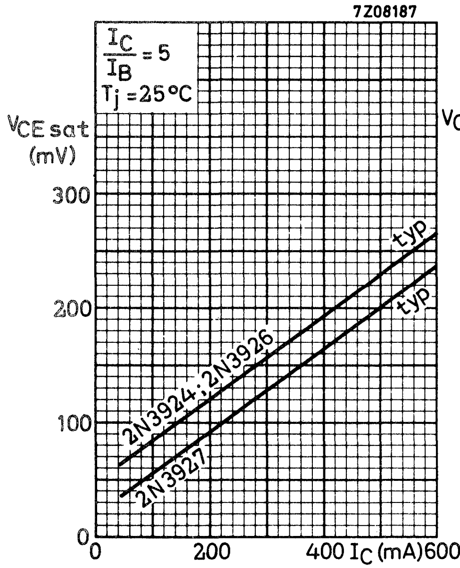


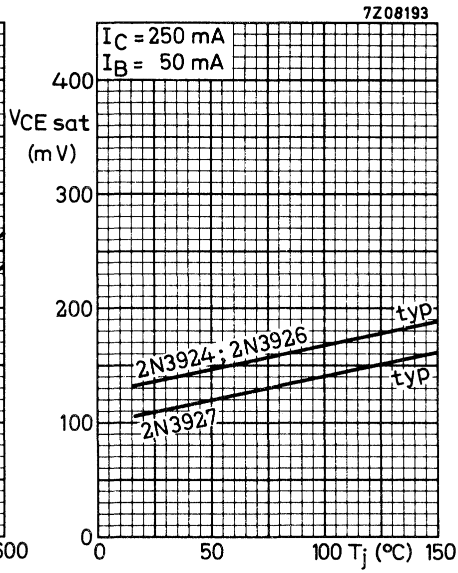


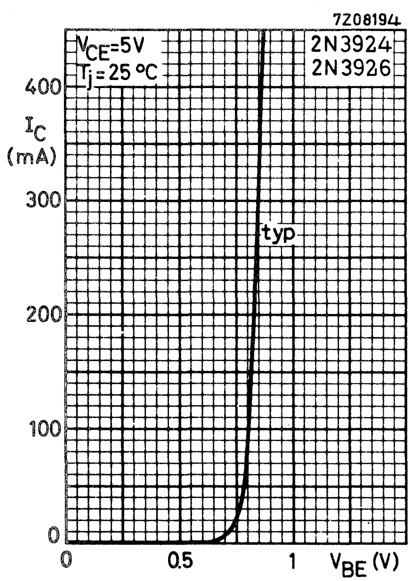
I Region of permissible operation under all base-emitter conditions and at all frequencies, including d.c.

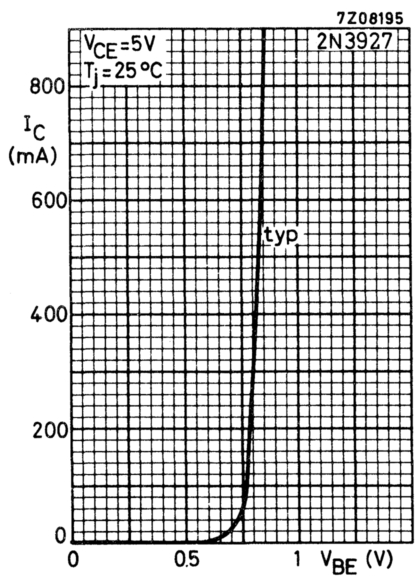
II Additional region of operation at f $\geq$ 1 MHz.
Care must be taken to reduce the d.c. adjustment to region I before removing the a.c. signal. This may be achieved by an appropriate bias in class A, B or C.

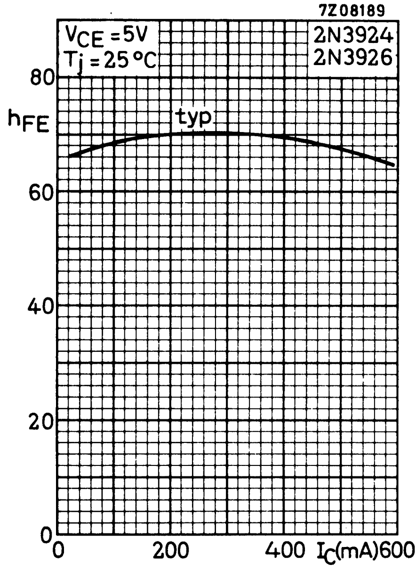
III Operating during switching off in this region is allowed, provided the transistor is cut-off with $-V_{BB} \leq 1.5$ V and $R_{BE} \geq 33\ \Omega$, $I_C \leq 400$ mA and the transient energy does not exceed 2 mWs.

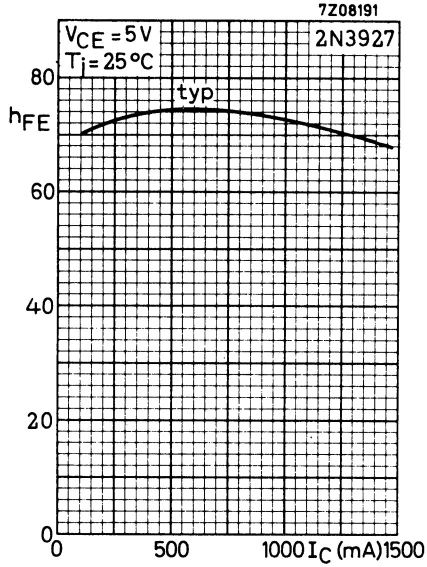

7Z08187
$\frac{I_C}{I_B} = 5$
$T_j = 25\ ^\circ C$
$V_{CE\,sat}$ (mV)
300
200
100
0
0
200
400
I_C (mA)
600
typ
typ
2N3924; 2N3926
2N3927

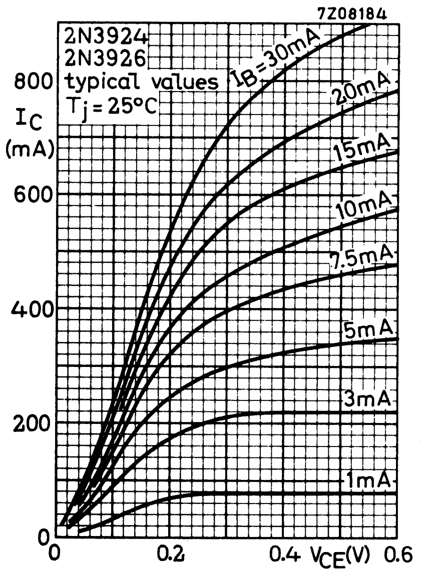

7Z08193
$I_C = 250$ mA
$I_B = 50$ mA
400
$V_{CE\,sat}$ (mV)
300
200
100
0
0
50
100
T_j (°C)
150
typ
typ
2N3924; 2N3926
2N3927

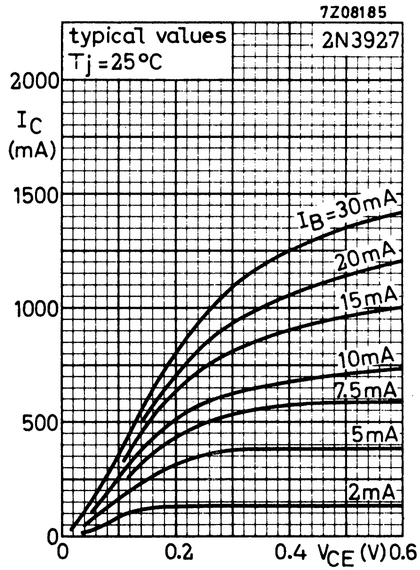

7Z08194
$V_{CE} = 5$ V
$T_j = 25\ ^\circ C$
2N3924
2N3926
400
I_C (mA)
300
200
100
0
0
0.5
1
V_{BE} (V)
typ

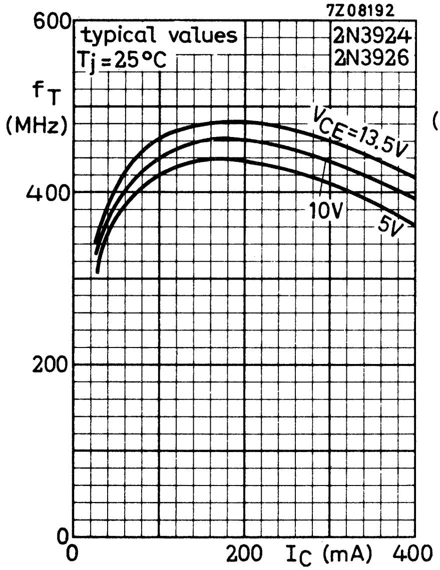

7Z08195
$V_{CE} = 5$ V
$T_j = 25\ ^\circ C$
2N3927
800
I_C (mA)
600
400
200
0
0
0.5
1
V_{BE} (V)
typ

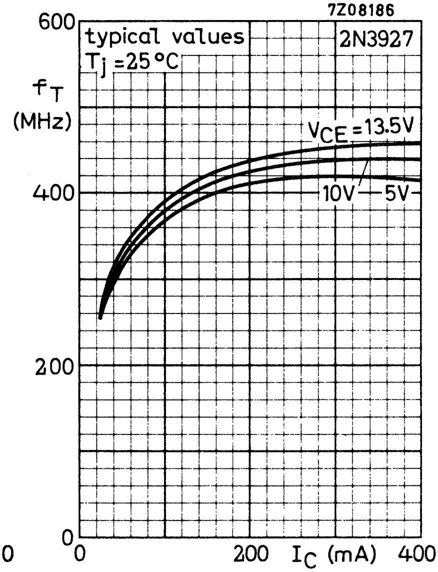

7Z08189
VCE = 5V
Tj = 25 °C
2N3924
2N3926
typ
hFE
80
60
40
20
0
0
200
400
IC(mA)600

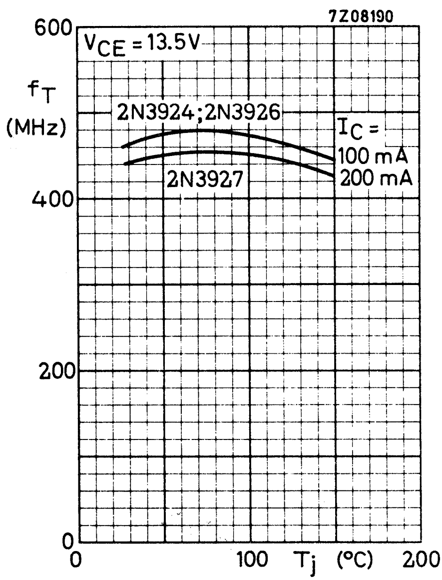

7Z08191
VCE = 5 V
Tj = 25 °C
2N3927
typ
hFE
80
60
40
20
0
0
500
1000 IC (mA)1500


7Z08184
2N3924
2N3926
typical values
Tj = 25°C
IB=30mA
20mA
15mA
10mA
7.5mA
5mA
3mA
1mA
IC
(mA)
800
600
400
200
0
0
0.2
0.4 VCE(V) 0.6


7Z08185
typical values
Tj = 25°C
2N3927
IB=30mA
20mA
15mA
10mA
7.5mA
5mA
2mA
IC
(mA)
2000
1500
1000
500
0
0
0.2
0.4 VCE (V) 0.6


7Z08192
typical values
Tj = 25 °C
2N3924
2N3926
fT
(MHz)
VCE = 13.5V
10V
5V
600
400
200
0
0
200
IC (mA)
400


7Z08186
typical values
Tj = 25 °C
2N3927
fT
(MHz)
VCE = 13.5V
10V
5V
600
400
200
0
0
200
IC (mA)
400


7Z08190
VCE = 13.5V
fT
(MHz)
2N3924;2N3926
IC =
100 mA
200 mA
2N3927
600
400
200
0
0
100
Tj (°C)
200

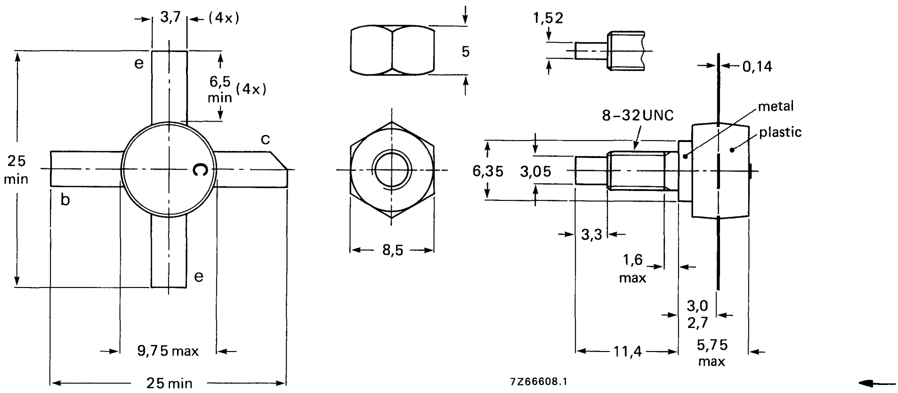
SILICON EPITAXIAL PLANAR OVERLAY TRANSISTOR

For data of this transistor please refer to type 2N3866

SOT-48/2

MECHANICAL DATA

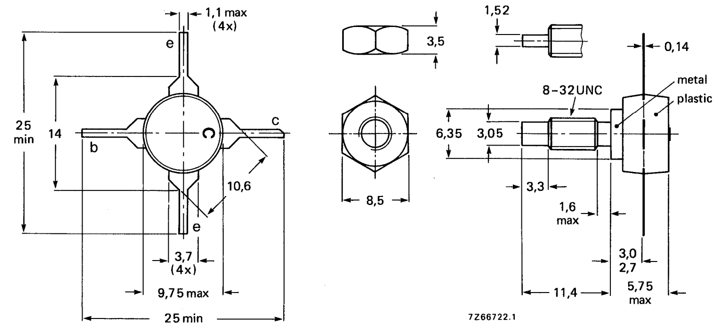
Dimensions in mm



SOT-48/3

MECHANICAL DATA

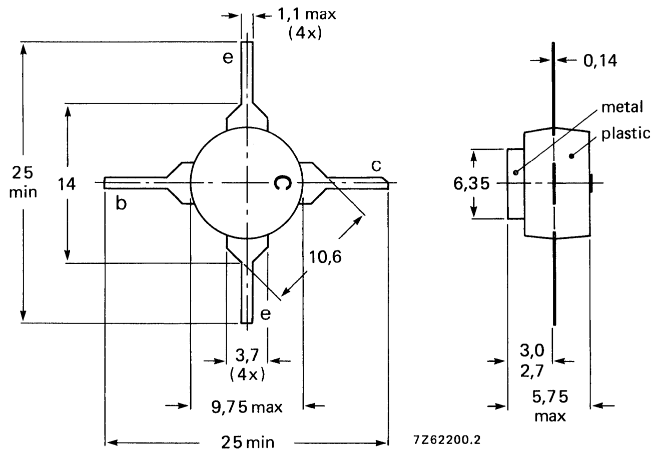
Dimensions in mm



SOT-48/4

MECHANICAL DATA

Dimensions in mm

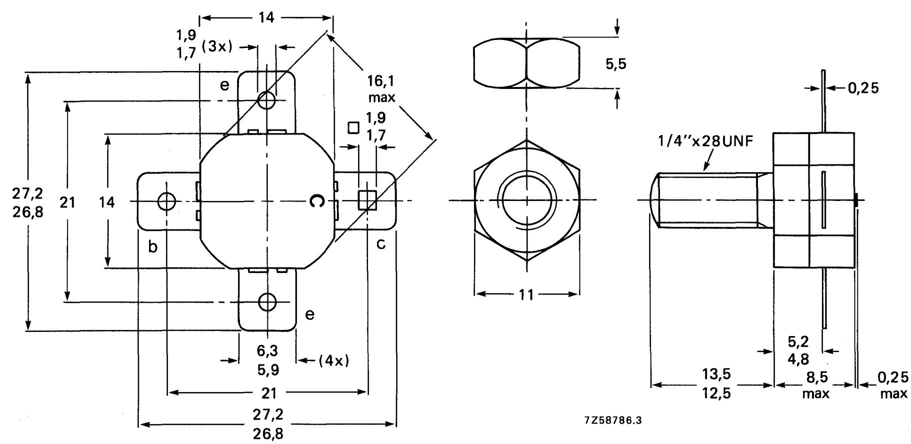


7Z62200.2

SOT-55

MECHANICAL DATA

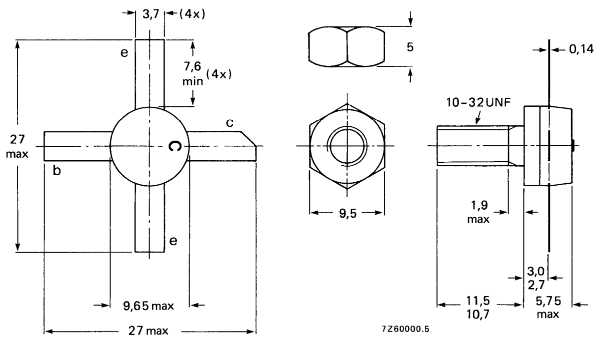
Dimensions in mm



SOT-56

MECHANICAL DATA

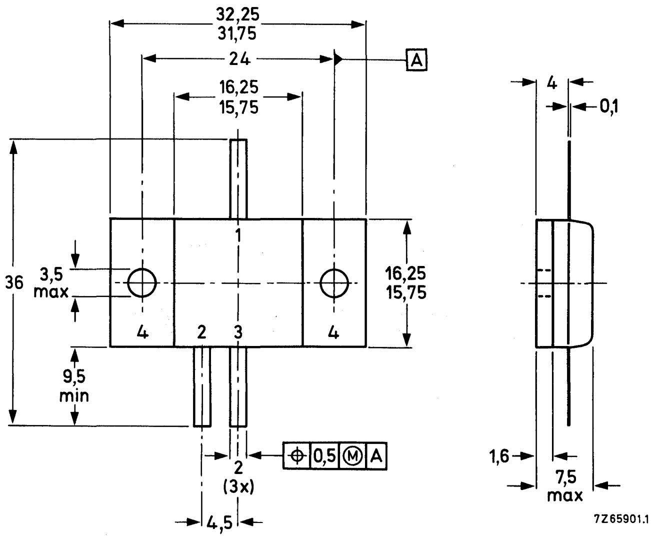
Dimensions in mm



SOT-75A

MECHANICAL DATA

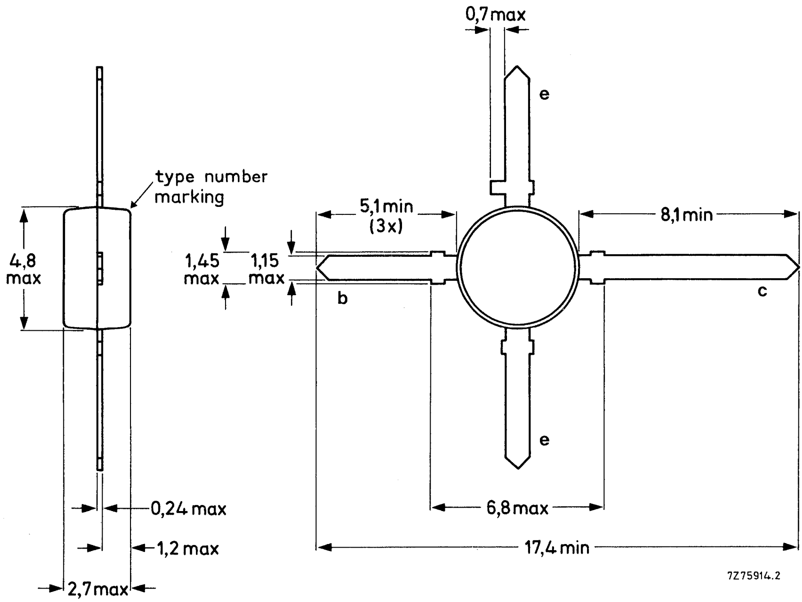
Dimensions in mm



SOT-103

MECHANICAL DATA

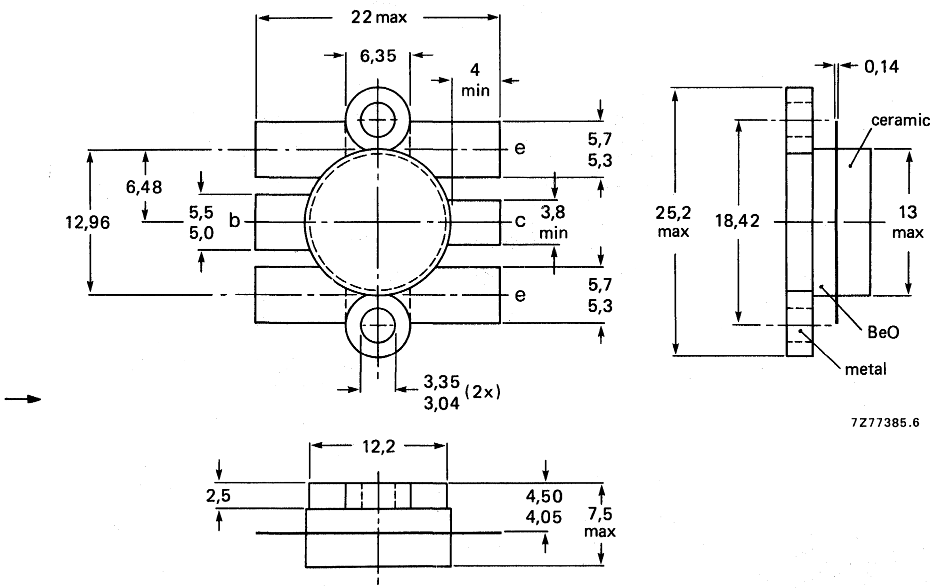
Dimensions in mm



SOT-119

MECHANICAL DATA

Dimensions in mm

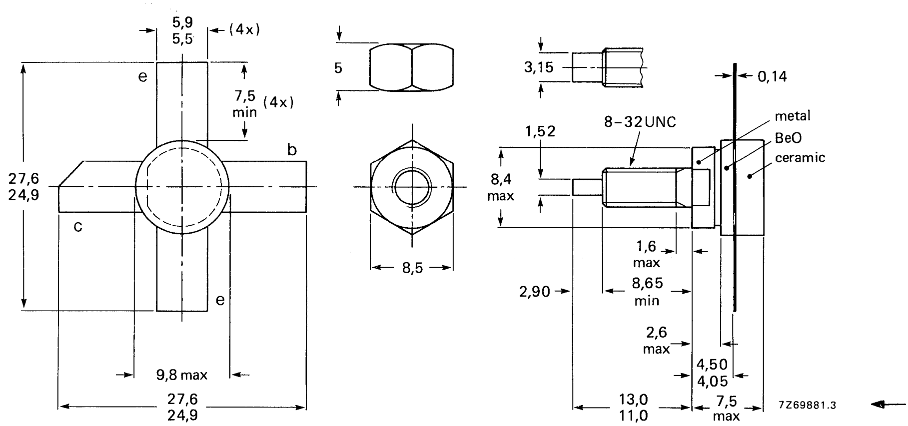


7Z77385.6

SOT-120

MECHANICAL DATA

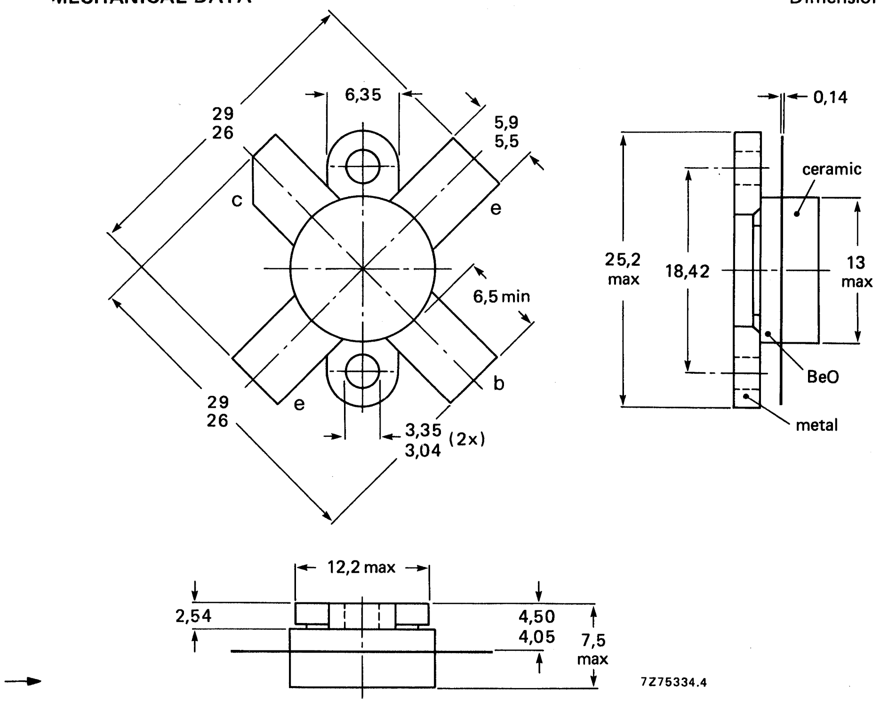
Dimensions in mm



SOT-121

MECHANICAL DATA

Dimensions in mm

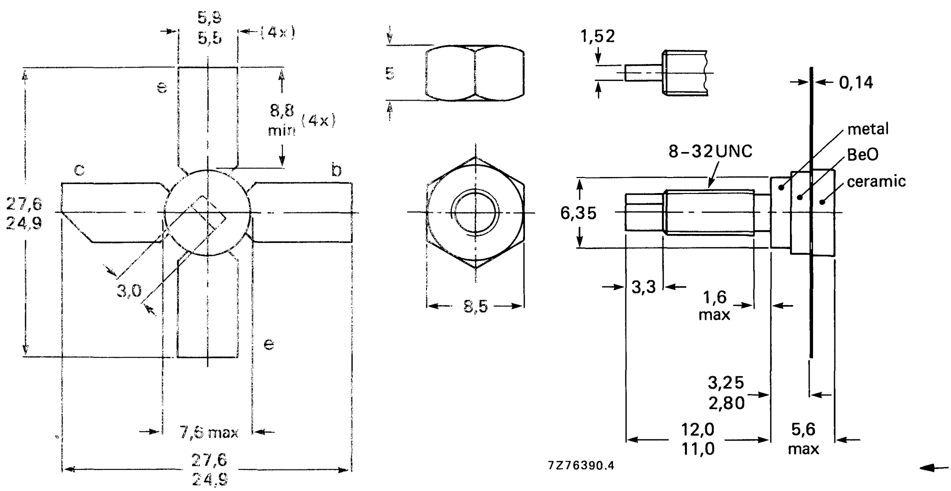


7Z75334.4

SOT-122

MECHANICAL DATA

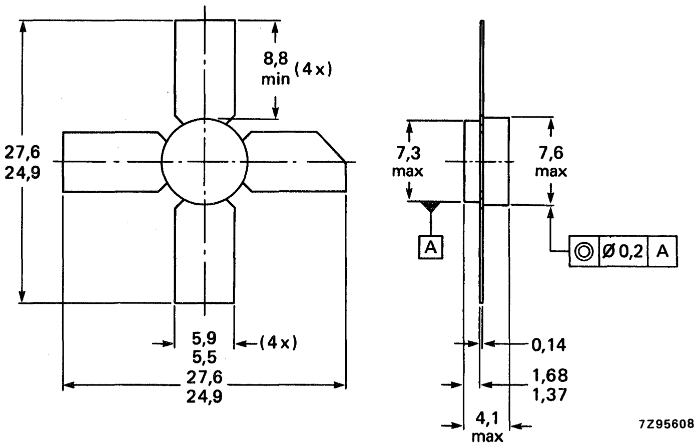
Dimensions in mm



SOT-122D

MECHANICAL DATA

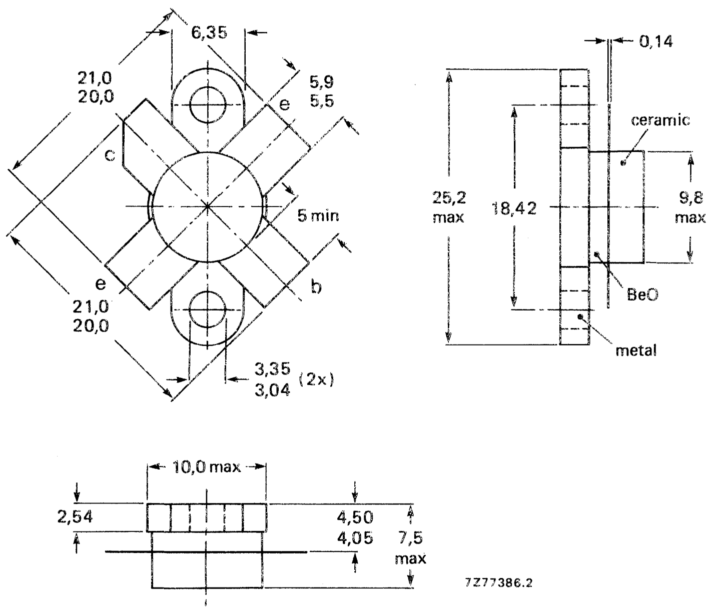
Dimensions in mm



SOT-123

MECHANICAL DATA

Dimensions in mm

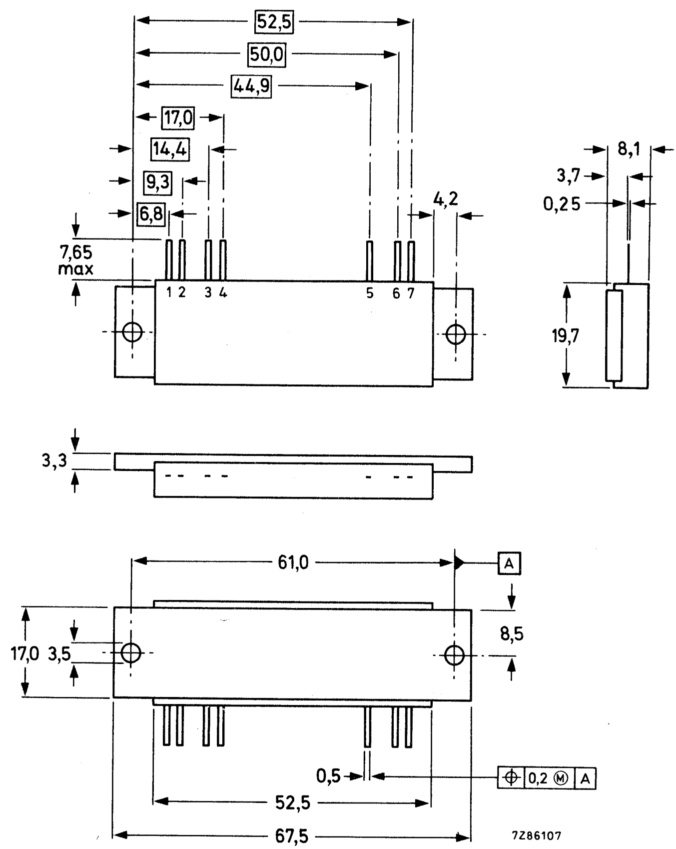


7Z77386.2

SOT-132B

MECHANICAL DATA

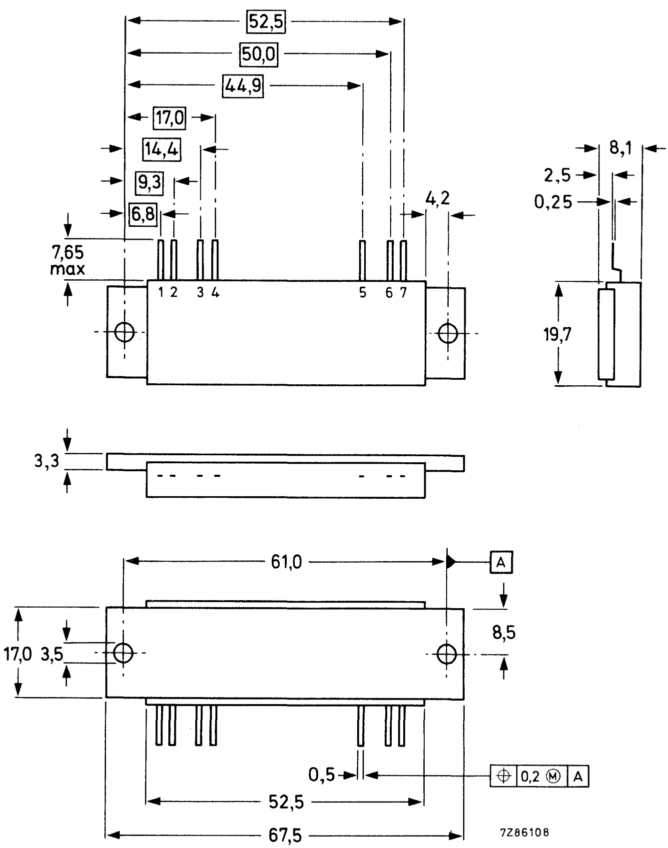
Dimensions in mm



SOT-132C

MECHANICAL DATA

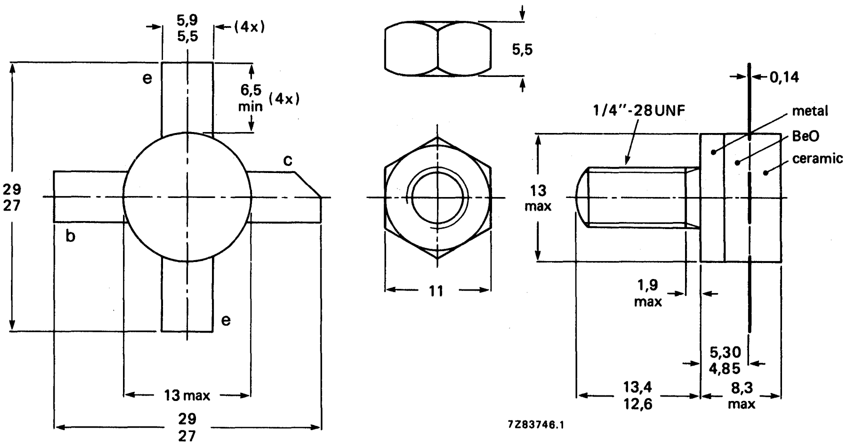
Dimensions in mm



SOT-147

MECHANICAL DATA

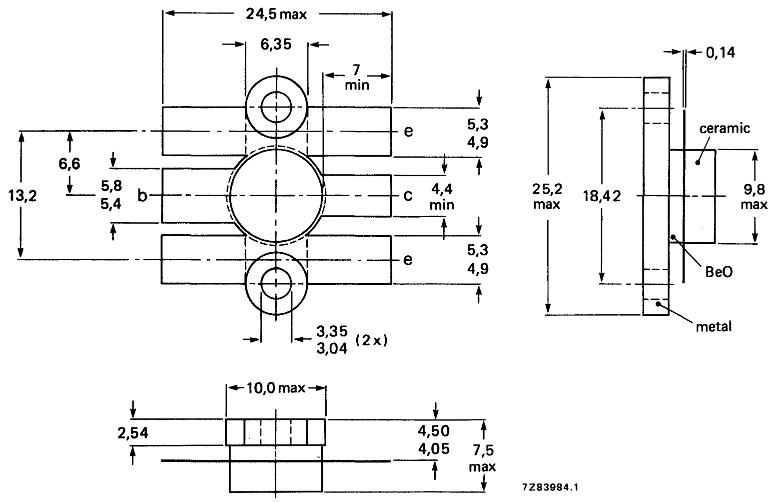
Dimensions in mm



SOT-160

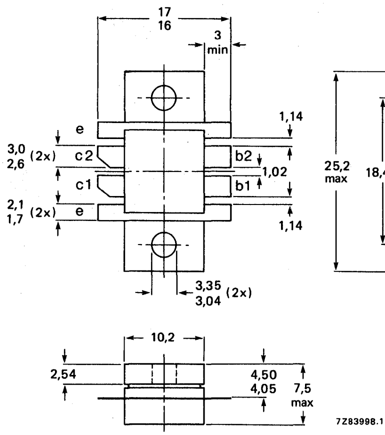
MECHANICAL DATA

Dimensions in mm



SOT-161

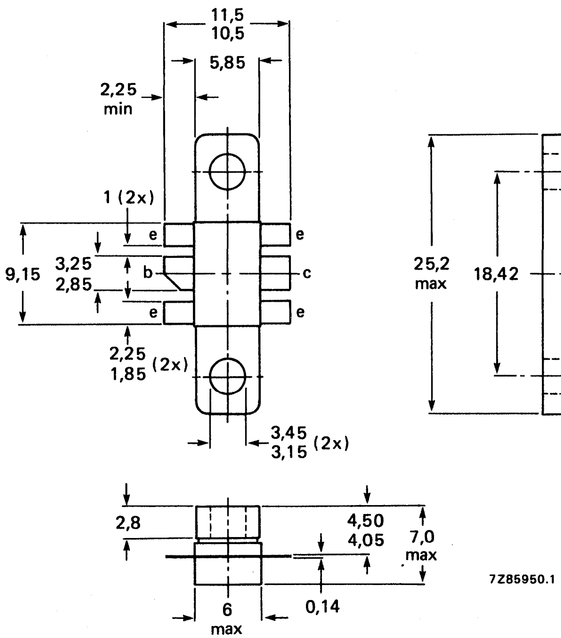
MECHANICAL DATA Dimensions in mm



SOT-171

MECHANICAL DATA

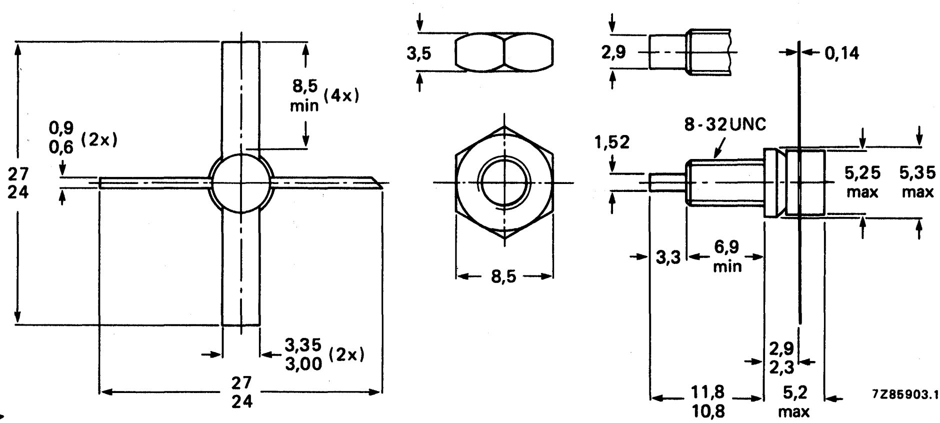
Dimensions in mm



SOT-172A1

MECHANICAL DATA

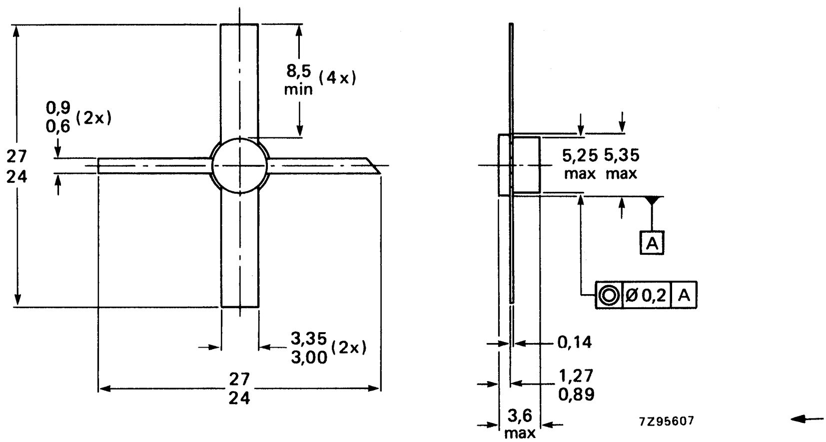
Dimensions in mm



SOT-172D

MECHANICAL DATA

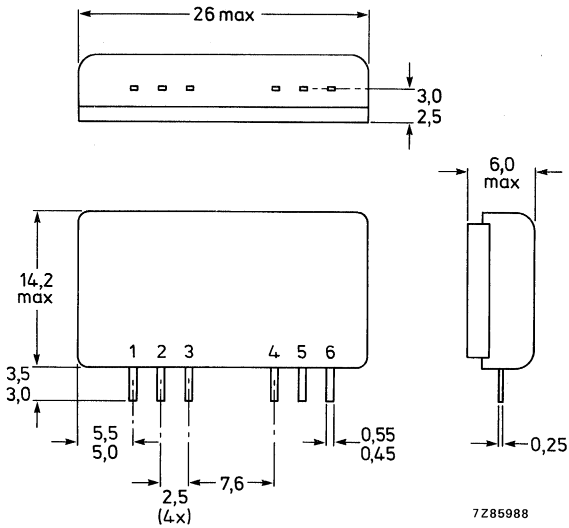
Dimensions in mm



SOT-181

MECHANICAL DATA

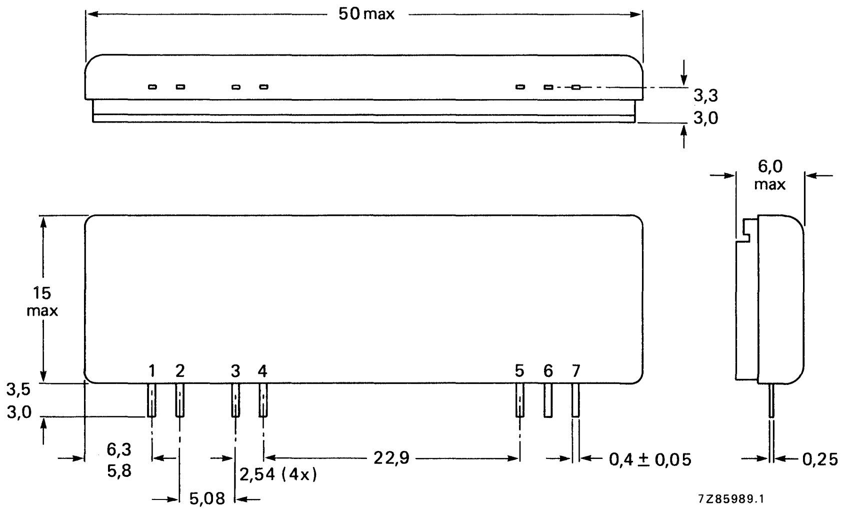
Dimensions in mm



SOT-182

MECHANICAL DATA

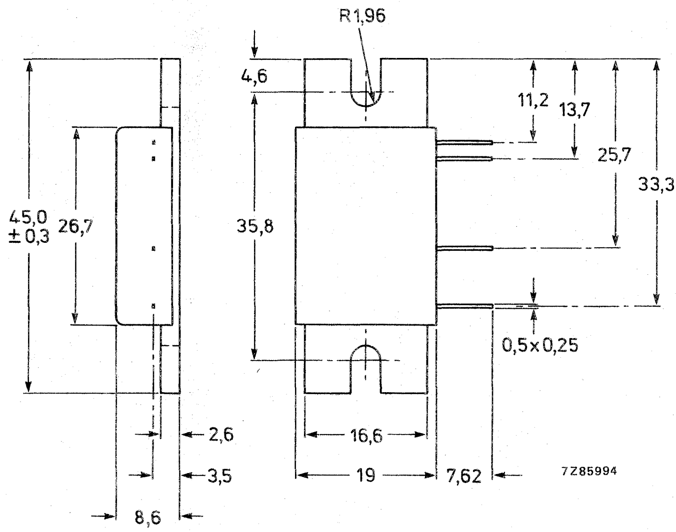
Dimensions in mm



SOT-183

MECHANICAL DATA

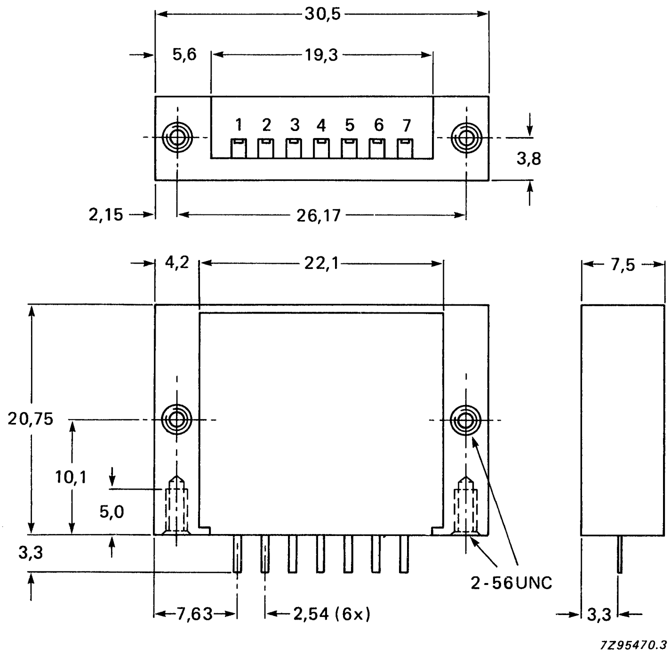
Dimensions in mm



SOT-200

MECHANICAL DATA

Dimensions in mm

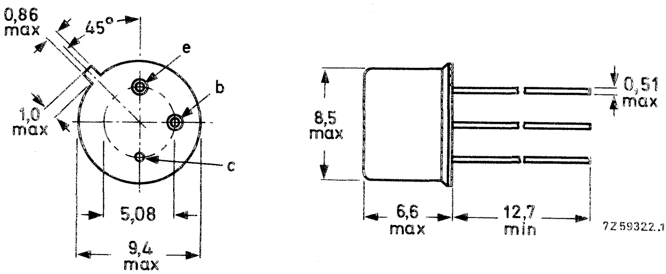


→

TO-39/1

MECHANICAL DATA

Dimensions in mm

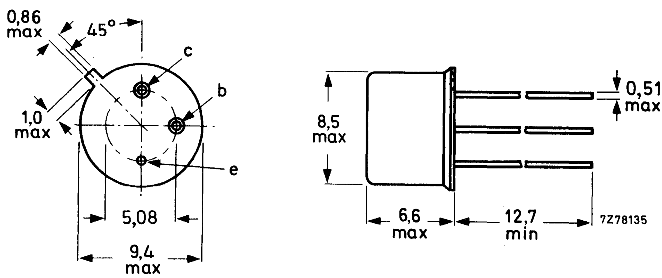


Collector connected to case.
(TO-39/1)

TO-39/3

MECHANICAL DATA

Dimensions in mm

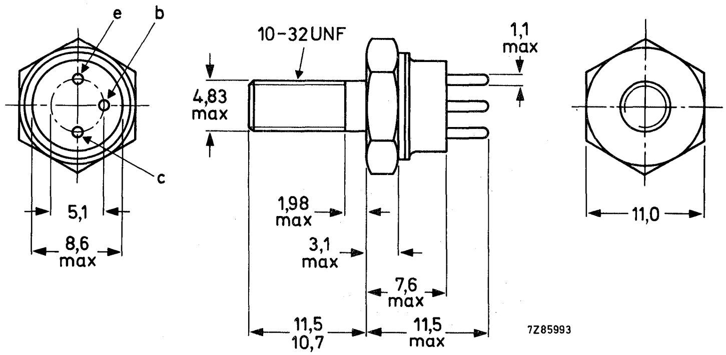


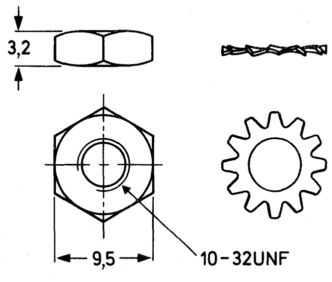
Emitter connected to case.
(TO-39/3)

TO-60

MECHANICAL DATA

Dimensions in mm

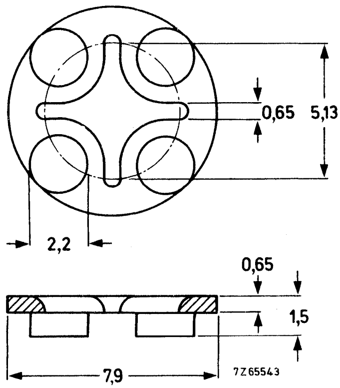




56245

MECHANICAL DATA

Dimensions in mm



(Distance disc) for TO-39.

Insulating material.

Maximum permissible temperature 100 °C.

INDEX OF TYPE NUMBERS

The inclusion of a type number in this publication does not necessarily imply its availability.

type no.	book	section	type no.	book	section	type no.	book	section
BA220	S1	SD	BAS29	S7/S1	Mm/SD	BAV99	S7/S1	Mm/SD
BA221	S1	SD	BAS31	S7/S1	Mm/SD	BAV100	S7/S1	Mm/SD
BA223	S1	T	BAS32	S7/S1	Mm/SD	BAV101	S7/S1	Mm/SD
BA281	S1	SD	BAS35	S7/S1	Mm/SD	BAV102	S7/S1	Mm/SD
BA314	S1	Vrg	BAS45	S1	SD	BAV103	S7/S1	Mm/SD
BA315	S1	Vrg	BAS56	S1/S7	SD/Mm	BAW56	S7/S1	Mm/SD
BA316	S1	SD	BAT17	S7/S1	Mm/T	BAW62	S1	SD
BA317	S1	SD	BAT18	S7/S1	Mm/T	BAX12	S1	SD
BA318	S1	SD	BAT54	S1/S7	SD/Mm	BAX14	S1	SD
BA423	S1	T	BAT74	S1/S7	SD/Mm	BAX18	S1	SD
BA480	S1	T	BAT81	S1	T	BAY80	S1	SD
BA481	S1	T	BAT82	S1	T	BB112	S1	T
BA482	S1	T	BAT83	S1	T	BB119	S1	T
BA483	S1	T	BAT85	S1	T	BB130	S1	T
BA484	S1	T	BAT86	S1	T	BB204B	S1	T
BA682	S1/S7	T/Mm	BAV10	S1	SD	BB204G	S1	T
BA683	S1/S7	T/Mm	BAV18	S1	SD	BB212	S1	T
BAS11	S1	SD	BAV19	S1	SD	BB215	S7/S1	Mm/SD
BAS15	S1	SD	BAV20	S1	SD	BB219	S7/S1	Mm/SD
BAS16	S7/S1	Mm/SD	BAV21	S1	SD	BB405B	S1	T
BAS17	S7/S1	Mm/Vrg	BAV23	S7/S1	Mm/SD	BB417	S1	T
BAS19	S7/S1	Mm/SD	BAV45	S1	Sp	BB809	S1	T
BAS20	S7/S1	Mm/SD	BAV45A	S1	Sp	BB909A	S1	T
BAS21	S7/S1	Mm/SD	BAV70	S7/S1	Mm/SD	BB909B	S1	T
BAS28	S7/S1	Mm/SD	BAV74	S1	SD	BBY31	S7/S1	Mm/T

Mm = Microminiature semiconductors for hybrid circuits
SD = Small-signal diodes
Sp = Special diodes
T = Tuner diodes
Vrg = Voltage regulator diodes

type no.	book	section	type no.	book	section	type no.	book	section
BBY39	S1	T	BC639	S3	Sm	BCW72;R	S7	Mm
BBY40	S7/S1	Mm/T	BC640	S3	Sm	BCW81;R	S7	Mm
BC107	S3	Sm	BC807	S7	Mm	BCW89;R	S7	Mm
BC108	S3	Sm	BC808	S7	Mm	BCX17;R	S7	Mm
BC109	S3	Sm	BC817	S7	Mm	BCX18;R	S7	Mm
BC140	S3	Sm	BC818	S7	Mm	BCX19;R	S7	Mm
BC141	S3	Sm	BC846	S7	Mm	BCX20;R	S7	Mm
BC146	S3	Sm	BC847	S7	Mm	BCX51	S7	Mm
BC160	S3	Sm	BC848	S7	Mm	BCX52	S7	Mm
BC161	S3	Sm	BC849	S7	Mm	BCX53	S7	Mm
BC177	S3	Sm	BC850	S7	Mm	BCX54	S7	Mm
BC178	S3	Sm	BC856	S7	Mm	BCX55	S7	Mm
BC179	S3	Sm	BC857	S7	Mm	BCX56	S7	Mm
BC200	S3	Sm	BC858	S7	Mm	BCX68	S7	Mm
BC264A	S5	FET	BC859	S7	Mm	BCX69	S7	mm
BC264B	S5	FET	BC860	S7	Mm	BCX70*	S7	Mm
BC264C	S5	FET	BC868	S7	Mm	BCX71*	S7	Mm
BC264D	S5	FET	BC869	S7	Mm	BCY56	S3	Sm
BC327;A	S3	Sm	BCF29;R	S7	Mm	BCY57	S3	Sm
BC328	S3	Sm	BCF30;R	S7	Mm	BCY58	S3	Sm
BC337;A	S3	Sm	BCF32;R	S7	Mm	BCY59	S3	Sm
BC338	S3	Sm	BCF33;R	S7	Mm	BCY70	S3	Sm
BC368	S3	Sm	BCF70;R	S7	Mm	BCY71	S3	Sm
BC369	S3	Sm	BCF81;R	S7	Mm	BCY72	S3	Sm
BC375	S3	Sm	BCV26	S7	Mm	BCY78	S3	Sm
BC376	S3	Sm	BCV27	S7	Mm	BCY79	S3	Sm
BC546	S3	Sm	BCV61	S7	Mm	BCY87	S3	Sm
BC547	S3	Sm	BCV62	S7	Mm	BCY88	S3	Sm
BC548	S3	Sm	BCV71;R	S7	Mm	BCY89	S3	Sm
BC549	S3	Sm	BCV72;R	S7	Mm	BD131	S4a	P
BC550	S3	Sm	BCW29;R	S7	Mm	BD132	S4a	P
BC556	S3	Sm	BCW30;R	S7	Mm	BD135	S4a	P
BC557	S3	Sm	BCW31;R	S7	Mm	BD136	S4a	P
BC558	S3	Sm	BCW32;R	S7	Mm	BD137	S4a	P
BC559	S3	Sm	BCW33;R	S7	Mm	BD138	S4a	P
BC560	S3	Sm	BCW60*	S7	Mm	BD139	S4a	P
BC635	S3	Sm	BCW61*	S7	Mm	BD140	S4a	P
BC636	S3	Sm	BCW69;R	S7	Mm	BD201	S4a	P
BC637	S3	Sm	BCW70;R	S7	Mm	BD202	S4a	P
BC638	S3	Sm	BCW71;R	S7	Mm	BD203	S4a	P

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors
T = Tuner diodes

type no.	book	section
BD204	S4a	P
BD226	S4a	P
BD227	S4a	P
BD228	S4a	P
BD229	S4a	P
BD230	S4a	P
BD231	S4a	P
BD233	S4a	P
BD234	S4a	P
BD235	S4a	P
BD236	S4a	P
BD237	S4a	P
BD238	S4a	P
BD239	S4a	P
BD239A	S4a	P
BD239B	S4a	P
BD239C	S4a	P
BD240	S4a	P
BD240A	S4a	P
BD240B	S4a	P
BD240C	S4a	P
BD241	S4a	P
BD241A	S4a	P
BD241B	S4a	P
BD241C	S4a	P
BD242	S4a	P
BD242A	S4a	P
BD242B	S4a	P
BD242C	S4a	P
BD243	S4a	P
BD243A	S4a	P
BD243B	S4a	P
BD243C	S4a	P
BD244	S4a	P
BD244A	S4a	P
BD244B	S4a	P
BD244C	S4a	P
BD329	S4a	P
BD330	S4a	P
BD331	S4a	P
BD332	S4a	P
BD333	S4a	P
BD334	S4a	P
BD335	S4a	P
BD336	S4a	P
BD337	S4a	P
BD338	S4a	P
BD433	S4a	P
BD434	S4a	P
BD435	S4a	P
BD436	S4a	P
BD437	S4a	P
BD438	S4a	P
BD645	S4a	P
BD646	S4a	P
BD647	S4a	P
BD648	S4a	P
BD649	S4a	P
BD650	S4a	P
BD651	S4a	P
BD652	S4a	P
BD675	S4a	P
BD676	S4a	P
BD677	S4a	P
BD678	S4a	P
BD679	S4a	P
BD680	S4a	P
BD681	S4a	P
BD682	S4a	P
BD683	S4a	P
BD684	S4a	P
BD813	S4a	P
BD814	S4a	P
BD815	S4a	P
BD816	S4a	P
BD817	S4a	P
BD818	S4a	P
BD825	S4a	P
BD826	S4a	P
BD827	S4a	P
BD828	S4a	P
BD829	S4a	P
BD830	S4a	P
BD839	S4a	P
BD840	S4a	P
BD841	S4a	P
BD842	S4a	P
BD843	S4a	P
BD844	S4a	P
BD845	S4a	P
BD846	S4a	P
BD847	S4a	P
BD848	S4a	P
BD849	S4a	P
BD850	S4a	P
BD933	S4a	P
BD934	S4a	P
BD935	S4a	P
BD936	S4a	P
BD937	S4a	P
BD938	S4a	P
BD939	S4a	P
BD940	S4a	P
BD941	S4a	P
BD942	S4a	P
BD943	S4a	P
BD944	S4a	P
BD945	S4a	P
BD946	S4a	P
BD947	S4a	P
BD948	S4a	P
BD949	S4a	P
BD950	S4a	P
BD951	S4a	P
BD952	S4a	P
BD953	S4a	P
BD954	S4a	P
BD955	S4a	P
BD956	S4a	P
BDT20	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDT21	S4a	P	BDT61C	S4a	P	BDV66B	S4a	P
BDT29	S4a	P	BDT62	S4a	P	BDV66C	S4a	P
BDT29A	S4a	P	BDT62A	S4a	P	BDV66D	S4a	P
BDT29B	S4a	P	BDT62B	S4a	P	BDV67A	S4a	P
BDT29C	S4a	P	BDT62C	S4a	P	BDV67B	S4a	P
BDT30	S4a	P	BDT63	S4a	P	BDV67C	S4a	P
BDT30A	S4a	P	BDT63A	S4a	P	BDV67D	S4a	P
BDT30B	S4a	P	BDT63B	S4a	P	BDV91	S4a	P
BDT30C	S4a	P	BDT63C	S4a	P	BDV92	S4a	P
BDT31	S4a	P	BDT64	S4a	P	BDV93	S4a	P
BDT31A	S4a	P	BDT64A	S4a	P	BDV94	S4a	P
BDT31B	S4a	P	BDT64B	S4a	P	BDV95	S4a	P
BDT31C	S4a	P	BDT64C	S4a	P	BDV96	S4a	P
BDT32	S4a	P	BDT65	S4a	P	BDW55	S4a	P
BDT32A	S4a	P	BDT65A	S4a	P	BDW56	S4a	P
BDT32B	S4a	P	BDT65B	S4a	P	BDW57	S4a	P
BDT32C	S4a	P	BDT65C	S4a	P	BDW58	S4a	P
BDT41	S4a	P	BDT81	S4a	P	BDW59	S4a	P
BDT41A	S4a	P	BDT82	S4a	P	BDW60	S4a	P
BDT41B	S4a	P	BDT83	S4a	P	BDX35	S4a	P
BDT41C	S4a	P	BDT84	S4a	P	BDX36	S4a	P
BDT42	S4a	P	BDT85	S4a	P	BDX37	S4a	P
BDT42A	S4a	P	BDT86	S4a	P	BDX42	S4a	P
BDT42B	S4a	P	BDT87	S4a	P	BDX43	S4a	P
BDT42C	S4a	P	BDT88	S4a	P	BDX44	S4a	P
BDT51	S4a	P	BDT91	S4a	P	BDX45	S4a	P
BDT52	S4a	P	BDT92	S4a	P	BDX46	S4a	P
BDT53	S4a	P	BDT93	S4a	P	BDX47	S4a	P
BDT54	S4a	P	BDT94	S4a	P	BDX62	S4a	P
BDT55	S4a	P	BDT95	S4a	P	BDX62A	S4a	P
BDT56	S4a	P	BDT96	S4a	P	BDX62B	S4a	P
BDT57	S4a	P	BDV64	S4a	P	BDX62C	S4a	P
BDT58	S4a	P	BDV64A	S4a	P	BDX63	S4a	P
BDT60	S4a	P	BDV64B	S4a	P	BDX63A	S4a	P
BDT60A	S4a	P	BDV64C	S4a	P	BDX63B	S4a	P
BDT60B	S4a	P	BDV65	S4a	P	BDX63C	S4a	P
BDT60C	S4a	P	BDV65A	S4a	P	BDX64	S4a	P
BDT61	S4a	P	BDV65B	S4a	P	BDX64A	S4a	P
BDT61A	S4a	P	BDV65C	S4a	P	BDX64B	S4a	P
BDT61B	S4a	P	BDV66A	S4a	P	BDX64C	S4a	P

P = Low-frequency power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BDX65	S4a	P	BF247B	S5	FET	BF585	S4b	HVP
BDX65A	S4a	P	BF247C	S5	FET	BF587	S4b	HVP
BDX65B	S4a	P	BF256A	S5	FET	BF591	S4b	HVP
BDX65C	S4a	P	BF256B	S5	FET	BF593	S4b	HVP
BDX66	S4a	P	BF256C	S5	FET	BF620	S7	Mm
BDX66A	S4a	P	BF324	S3	Sm	BF621	S7	Mm
BDX66B	S4a	P	BF370	S3	Sm	BF622	S7	Mm
BDX66C	S4a	P	BF410A	S5	FET	BF623	S7	Mm
BDX67	S4a	P	BF410B	S5	FET	BF660;R	S7	Mm
BDX67A	S4a	P	BF410C	S5	FET	BF689K	S10	WBT
BDX67B	S4a	P	BF410D	S5	FET	BF763	S10	WBT
BDX67C	S4a	P	BF419	S4b	HVP	BF767	S7	Mm
BDX68	S4a	P	BF420	S3	Sm	BF819	S4b	HVP
BDX68A	S4a	P	BF421	S3	Sm	BF820	S7	Mm
BDX68B	S4a	P	BF422	S3	Sm	BF821	S7	Mm
BDX68C	S4a	P	BF423	S3	Sm	BF822	S7	Mm
BDX69	S4a	P	BF450	S3	Sm	BF823	S7	Mm
BDX69A	S4a	P	BF451	S3	Sm	BF824	S7	Mm
BDX69B	S4a	P	BF457	S4b	HVP	BF840	S7	Mm
BDX69C	S4a	P	BF458	S4b	HVP	BF841	S7	Mm
BDX77	S4a	P	BF459	S4b	HVP	BF857	S4b	HVP
BDX78	S4a	P	BF469	S4b	HVP	BF858	S4b	HVP
BDX91	S4a	P	BF470	S4b	HVP	BF859	S4b	HVP
BDX92	S4a	P	BF471	S4b	HVP	BF869	S4b	HVP
BDX93	S4a	P	BF472	S4b	HVP	BF870	S4b	HVP
BDX94	S4a	P	BF483	S3	Sm	BF871	S4b	HVP
BDX95	S4a	P	BF485	S3	Sm	BF872	S4b	HVP
BDX96	S4a	P	BF487	S3	Sm	BF926	S3	Sm
BDY90	S4a	P	BF494	S3	Sm	BF936	S3	Sm
BDY90A	S4a	P	BF495	S3	Sm	BF939	S3	Sm
BDY91	S4a	P	BF496	S3	Sm	BF960	S5	FET
BDY92	S4a	P	BF510	S7/S5	Mm/FET	BF964	S5	FET
BF198	S3	Sm	BF511	S7/S5	Mm/FET	BF966	S5	FET
BF199	S3	Sm	BF512	S7/S5	Mm/FET	BF967	S3	Sm
BF240	S3	Sm	BF513	S7/S5	Mm/FET	BF970	S3	Sm
BF241	S3	Sm	BF536	S7	Mm	BF979	S3	Sm
BF245A	S5	FET	BF550;R	S7	Mm	BF980	S5	FET
BF245B	S5	FET	BF569	S7	Mm	BF981	S5	FET
BF245C	S5	FET	BF579	S7	Mm	BF982	S5	FET
BF247A	S5	FET	BF583	S4b	HVP	BF989	S7/S5	Mm/FET

FET = Field-effect transistors
HVP = High-voltage power transistors
Mm = Microniature semiconductors for hybrid circuits
P = Low-frequency power transistors
Sm = Small-signal transistors
WBT = Wideband transistors

type no.	book	section	type no.	book	section	type no.	book	section
BF990	S7/S5	Mm/FET	BFQ51	S10	WBT	BFT24	S10	WBT
BF991	S7/S5	Mm/FET	BFQ51C	S10	WBT	BFT25;R	S7	Mm
BF992	S7/S5	Mm/FET	BFQ52	S10	WBT	BFT44	S3	Sm
BF994	S7/S5	Mm/FET	BFQ53	S10	WBT	BFT45	S3	Sm
BF996	S7/S5	Mm/FET	BFQ63	S10	WBT	BFT46	S7/S5	Mm/FET
BFG23	S10	WBT	BFQ65	S10	WBT	BFT92;R	S7	Mm
BFG32	S10	WBT	BFQ66	S10	WBT	BFT93;R	S7	Mm
BFG34	S10	WBT	BFQ67	S7	Mm	BFW10	S5	FET
BFG51	S10	WBT	BFQ68	S10	WBT	BFW11	S5	FET
BFG65	S10	WBT	BFQ136	S10	WBT	BFW12	S5	FET
BFG67	S7	Mm	BFR29	S5	FET	BFW13	S5	FET
BFG90A	S10	WBT	BFR30	S7/S5	Mm/FET	BFW16A	S10	WBT
BFG91A	S10	WBT	BFR31	S7/S5	Mm/FET	BFW17A	S10	WBT
BFG96	S10	WBT	BFR49	S10	WBT	BFW30	S10	WBT
BFP90A	S10	WBT	BFR53;R	S7	Mm	BFW61	S5	FET
BFP91A	S10	WBT	BFR54	S3	Sm	BFW92	S10	WBT
BFP96	S10	WBT	BFR64	S10	WBT	BFW92A	S10	WBT
BFQ10	S5	FET	BFR65	S10	WBT	BFW93	S10	WBT
BFQ11	S5	FET	BFR84	S5	FET	BFX29	S3	Sm
BFQ12	S5	FET	BFR90	S10	WBT	BFX30	S3	Sm
BFQ13	S5	FET	BFR90A	S10	WBT	BFX34	S3	Sm
BFQ14	S5	FET	BFR91	S10	WBT	BFX84	S3	Sm
BFQ15	S5	FET	BFR91A	S10	WBT	BFX85	S3	Sm
BFQ16	S5	FET	BFR92;R	S7	Mm	BFX86	S3	Sm
BFQ17	S7	Mm	BFR92A;R	S7	Mm	BFX87	S3	Sm
BFQ18A	S7	Mm	BFR93;R	S7	Mm	BFX88	S3	Sm
BFQ19	S7	Mm	BFR93A;R	S7	Mm	BFX89	S10	WBT
BFQ22S	S10	WBT	BFR94	S10	WBT	BFY50	S3	Sm
BFQ23	S10	WBT	BFR95	S10	WBT	BFY51	S3	Sm
BFQ23C	S10	WBT	BFR96	S10	WBT	BFY52	S3	Sm
BFQ24	S10	WBT	BFR96S	S10	WBT	BFY55	S3	Sm
BFQ32	S10	WBT	BFR101A;B	S7/S5	Mm/FET	BFY90	S10	WBT
BFQ32C	S10	WBT	BFS17;R	S7	Mm	BG2000	S1	RT
BFQ32S	S10	WBT	BFS18;R	S7	Mm	BG2097	S1	RT
BFQ33	S10	WBT	BFS19;R	S7	Mm	BGD102	S10	WBM
BFQ34	S10	WBT	BFS20;R	S7	Mm	BGD102E	S10	WBM
BFQ34T	S10	WBT	BFS21	S5	FET	BGD104	S10	WBM
BFQ42	S6	RFP	BFS21A	S5	FET	BGD104E	S10	WBM
BFQ43	S6	RFP	BFS22A	S6	RFP	BGX11*	S2b	ThM
BFQ43S	S6	RFP	BFS23A	S6	RFP	BGX12*	S2b	ThM

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
RFP = R.F. power transistors and modules
RT = Tripler
Sm = Small-signal transistors
ThM = Thyristor modules
WBM = Wideband hybrid IC modules
WBT = Wideband transistors

type no.	book	section
BGX13*	S2b	ThM
BGX14*	S2b	ThM
BGX15*	S2b	ThM
BGX17*	S2b	ThM
BGX25	S2a	ThM
BGY22	S6	RFP
BGY22A	S6	RFP
BGY23	S6	RFP
BGY23A	S6	RFP
BGY32	S6	RFP
BGY33	S6	RFP
BGY35	S6	RFP
BGY36	S6	RFP
BGY40A	S6	RFP
BGY40B	S6	RFP
BGY41A	S6	RFP
BGY41B	S6	RFP
BGY43	S6	RFP
BGY45A	S6	RFP
BGY45B	S6	RFP
BGY46A	S6	RFP
BGY46B	S6	RFP
BGY47*	S6	RFP
BGY48*	S6	RFP
BGY50	S10	WBM
BGY51	S10	WBM
BGY52	S10	WBM
BGY53	S10	WBM
BGY54	S10	WBM
BGY55	S10	WBM
BGY56	S10	WBM
BGY57	S10	WBM
BGY58	S10	WBM
BGY58A	S10	WBM
BGY59	S10	WBM
BGY60	S10	WBM
BGY61	S10	WBM
BGY65	S10	WBM
BGY67	S10	WBM
BGY67A	S10	WBM
BGY70	S10	WBM
BGY71	S10	WBM
BGY74	S10	WBM
BGY75	S10	WBM
BGY84	S10	WBM
BGY84A	S10	WBM
BGY85	S10	WBM
BGY85A	S10	WBM
BGY90A	S6	RFP
BGY90B	S6	RFP
BGY93*	S6	RFP
BGY94*	S6	RFP
BGY95A	S6	RFP
BGY95B	S6	RFP
BGY96A	S6	RFP
BGY96B	S6	RFP
BLF146	S6	RFP/FET
BLF242	S6	RFP/FET
BLF244	S6	RFP/FET
BLF245	S6	RFP/FET
BLT90/SL	S6	RFP
BLT91/SL	S6	RFP
BLT92/SL	S6	RFP
BLU20/12	S6	RFP
BLU30/12	S6	RFP
BLU45/12	S6	RFP
BLU50	S6	RFP
BLU51	S6	RFP
BLU52	S6	RFP
BLU53	S6	RFP
BLU60/12	S6	RFP
BLU97	S6	RFP
BLU98	S6	RFP
BLU99	S6	RFP
BLV10	S6	RFP
BLV11	S6	RFP
BLV20	S6	RFP
BLV21	S6	RFP
BLV25	S6	RFP
BLV30	S6	RFP
BLV30/12	S6	RFP
BLV31	S6	RFP
BLV32F	S6	RFP
BLV33	S6	RFP
BLV33F	S6	RFP
BLV36	S6	RFP
BLV45/12	S6	RFP
BLV57	S6	RFP
BLV59	S6	RFP
BLV75/12	S6	RFP
BLV80/28	S6	RFP
BLV90	S6	RFP
BLV90/SL	S6	RFP
BLV91	S6	RFP
BLV91/SL	S6	RFP
BLV92	S6	RFP
BLV93	S6	RFP
BLV94	S6	RFP
BLV95	S6	RFP
BLV97	S6	RFP
BLV98	S6	RFP
BLV99	S6	RFP
BLW29	S6	RFP
BLW31	S6	RFP
BLW32	S6	RFP
BLW33	S6	RFP
BLW34	S6	RFP
BLW50F	S6	RFP
BLW60	S6	RFP
BLW60C	S6	RFP
BLW76	S6	RFP
BLW77	S6	RFP
BLW78	S6	RFP
BLW79	S6	RFP
BLW80	S6	RFP
BLW81	S6	RFP
BLW83	S6	RFP
BLW84	S6	RFP
BLW85	S6	RFP
BLW86	S6	RFP

* = series
FET = Field-effect transistors
RFP = R.F. power transistors and modules
ThM = Thyristor modules
WBM = Wideband hybrid IC modules

type no.	book	section	type no.	book	section	type no.	book	section
BLW87	S6	RFP	BLY92C	S6	RFP	BSR18;R	S7	Mm
BLW89	S6	RFP	BLY93A	S6	RFP	BSR18A;R	S7	Mm
BLW90	S6	RFP	BLY93C	S6	RFP	BSR19; A	S7	Mm
BLW91	S6	RFP	BLY94	S6	RFP	BSR20; A	S7	Mm
BLW95	S6	RFP	BPF24	S8b	PDT	BSR30	S7	Mm
BLW96	S6	RFP	BPW22A	S8a/b	PDT	BSR31	S7	Mm
BLW97	S6	RFP	BPW50	S8a/b	PDT	BSR32	S7	Mm
BLW98	S6	RFP	BPW71	S8b	PDT	BSR33	S7	Mm
BLW99	S6	RFP	BPX25	S8b	PDT	BSR40	S7	Mm
BLX13	S6	RFP	BPX29	S8b	PDT	BSR41	S7	Mm
BLX13C	S6	RFP	BPX40	S8b	PDT	BSR42	S7	Mm
BLX14	S6	RFP	BPX41	S8b	PDT	BSR43	S7	Mm
BLX15	S6	RFP	BPX42	S8b	PDT	BSR50	S3	Sm
BLX39	S6	RFP	BPX61	S8b	PDT	BSR51	S3	Sm
BLX65	S6	RFP	BPX61P	S8b	PDT	BSR52	S3	Sm
BLX65E	S6	RFP	BPX71	S8b	PDT	BSR56	S7/S5	Mm/FET
BLX65ES	S6	RFP	BPX72	S8b	PDT	BSR57	S7/S5	Mm/FET
BLX67	S6	RFP	BR100/03	S2b	Th	BSR58	S7/S5	Mm/FET
BLX68	S6	RFP	BR101	S3	Sm	BSR60	S3	Sm
BLX69A	S6	RFP	BRY39	S3	Sm	BSR61	S3	Sm
BLX91A	S6	RFP	BRY56	S3	Sm	BSR62	S3	Sm
BLX91CB	S6	RFP	BRY61	S7	Mm	BSS38	S3	Sm
BLX92A	S6	RFP	BRY62	S7	Mm	BSS50	S3	Sm
BLX93A	S6	RFP	BS107	S5	FET	BSS51	S3	Sm
BLX94A	S6	RFP	BS170	S5	FET	BSS52	S3	Sm
BLX94C	S6	RFP	BSD10	S5	FET	BSS60	S3	Sm
BLX95	S6	RFP	BSD12	S5	FET	BSS61	S3	Sm
BLX96	S6	RFP	BSD20	S5/7	FET	BSS62	S3	Sm
BLX97	S6	RFP	BSD22	S5/7	FET	BSS63;R	S7	Mm
BLX98	S6	RFP	BSD212	S5	FET	BSS64;R	S7	Mm
BLY87A	S6	RFP	BSD213	S5	FET	BSS68	S3	Sm
BLY87C	S6	RFP	BSD214	S5	FET	BSS83	S5/7	FET/Mm
BLY88A	S6	RFP	BSD215	S5	FET	BST15	S7	Mm
BLY88C	S6	RFP	BSR12;R	S7	Mm	BST16	S7	Mm
BLY89A	S6	RFP	BSR13;R	S7	Mm	BST39	S7	Mm
BLY89C	S6	RFP	BSR14;R	S7	Mm	BST40	S7	Mm
BLY90	S6	RFP	BSR15;R	S7	Mm	BST50	S7	Mm
BLY91A	S6	RFP	BSR16;R	S7	Mm	BST51	S7	Mm
BLY91C	S6	RFP	BSR17;R	S7	Mm	BST52	S7	Mm
BLY92A	S6	RFP	BSR17A;R	S7	Mm	BST60	S7	Mm

FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
PDT = Photodiodes or transistors
RFP = R.F. power transistors and modules
Sm = Small-signal transistors
Th = Thyristors

type no.	book	section	type no.	book	section	type no.	book	section
BST61	S7	Mm	BT138*	S2b	Tri	BU808	S4b	SP
BST62	S7	Mm	BT139*	S2b	Tri	BU824	S4b	SP
BST70A	S5	FET	BT149*	S2b	Th	BU826	S4b	SP
BST72A	S5	FET	BT151*	S2b	Th	BUP22*	S4b	SP
BST74A	S5	FET	BT152*	S2b	Th	BUP23*	S4b	SP
BST76A	S5	FET	BT153	S2b	Th	BUS11;A	S4b	SP
BST78	S5	FET	BT155*	S2b	Th	BUS12;A	S4b	SP
BST80	S5/S7	FET/Mm	BT157*	S2b	Th	BUS13;A	S4b	SP
BST82	S5/S7	FET/Mm	BTV24*	S2b	Th	BUS14;A	S4b	SP
BST84	S5/S7	FET/Mm	BTV34*	S2b	Tri	BUS21*	S4b	SP
BST86	S5/S7	FET/Mm	BTV58*	S2b	Th	BUS22*	S4b	SP
BST90	S5	FET	BTV59*	S2b	Th	BUS23*	S4b	SP
BST97	S5	FET	BTV60*	S2b	Th	BUT11;A	S4b	SP
BST100	S5	FET	BTW23*	S2b	Th	BUT11A	S4b	SP
BST110	S5	FET	BTW38*	S2b	Th	BUT11AF	S4b	SP
BST120	S5/S7	FET/Mm	BTW40*	S2b	Th	BUV82	S4b	SP
BST122	S5/S7	FET/Mm	BTW42*	S2b	Th	BUV83	S4b	SP
BSV15	S3	Sm	BTW43*	S2b	Tri	BUV89	S4b	SP
BSV16	S3	Sm	BTW45*	S2b	Th	BUV90;A	S4b	SP
BSV17	S3	Sm	BTW58*	S2b	Th	BUW11;A	S4b	SP
BSV52;R	S7	Mm	BTW59*	S2b	Th	BUW12;A	S4b	SP
BSV64	S3	Sm	BTW63*	S2b	Th	BUW13;A	S4b	SP
BSV78	S5	FET	BTW92*	S2b	Th	BUW84	S4b	SP
BSV79	S5	FET	BTX18*	S2b	Th	BUW85	S4b	SP
BSV80	S5	FET	BTX94*	S2b	Tri	BUX46;A	S4b	SP
BSV81	S5	FET	BTY79*	S2b	Th	BUX47;A	S4b	SP
BSW66A	S3	Sm	BTY91*	S2b	Th	BUX48;A	S4b	SP
BSW67A	S3	Sm	BU426	S4b	SP	BUX80	S4b	SP
BSW68A	S3	Sm	BU426A	S4b	SP	BUX81	S4b	SP
BSX19	S3	Sm	BU433	S4b	SP	BUX82	S4b	SP
BSX20	S3	Sm	BU505	S4b	SP	BUX83	S4b	SP
BSX45	S3	Sm	BU506	S4b	SP	BUX84	S4b	SP
BSX46	S3	Sm	BU506D	S4b	SP	BUX84F	S4b	SP
BSX47	S3	Sm	BU508A	S4b	SP	BUX85	S4b	SP
BSX59	S3	Sm	BU508D	S4b	SP	BUX85F	S4b	SP
BSX60	S3	Sm	BU705	S4b	SP	BUX86	S4b	SP
BSX61	S3	Sm	BU706	S4b	SP	BUX87	S4b	SP
BSY95A	S3	Sm	BU706D	S4b	SP	BUX88	S4b	SP
BT136*	S2b	Tri	BU806	S4b	SP	BUX90	S4b	SP
BT137*	S2b	Tri	BU807	S4b	SP	BUX98	S4b	SP

* = series
FET = Field-effect transistors
Mm = Microminiature semiconductors for hybrid circuits
Sm = Small-signal transistors
SP = Low-frequency switching power transistors
Th = Thyristors
Tri = Triacs

type no.	book	section	type no.	book	section	type no.	book	section
BUX98A	S4b	SP	BUZ64	S9	PM	BY710	S1	R
BUX99	S4b	SP	BUZ71	S9	PM	BY711	S1	R
BUY89	S4b	SP	BUZ71A	S9	PM	BY712	S1	R
BUZ10	S9	PM	BUZ72	S9	PM	BY713	S1	R
BUZ10A	S9	PM	BUZ72A	S9	PM	BY714	S1	R
BUZ11	S9	PM	BUZ73A	S9	PM	BYD13*	S1	R
BUZ11A	S9	PM	BUZ74	S9	PM	BYD14*	S1	R
BUZ14	S9	PM	BUZ74A	S9	PM	BYD17*	S1	R
BUZ15	S9	PM	BUZ76	S9	PM	BYD33*	S1	R
BUZ20	S9	PM	BUZ76A	S9	PM	BYD37*	S1	R
BUZ21	S9	PM	BUZ80	S9	PM	BYD73*	S1	R
BUZ23	S9	PM	BUZ80A	S9	PM	BYD74*	S1	R
BUZ24	S9	PM	BUZ83	S9	PM	BYD77*	S1	R
BUZ25	S9	PM	BUZ83A	S9	PM	BYM26*	S1	R
BUZ30	S9	PM	BUZ84	S9	PM	BYM36*	S1	R
BUZ31	S9	PM	BUZ84A	S9	PM	BYM56*	S1	R
BUZ32	S9	PM	BY228	S1	R	BYQ28*	S2a	R
BUZ33	S9	PM	BY229*	S2a	R	BYR29*	S2a	R
BUZ34	S9	PM	BY249*	S2a	R	BYT79*	S2a	R
BUZ35	S9	PM	BY260*	S2a	R	BYV10	S1	R
BUZ36	S9	PM	BY261*	S2a	R	BYV19*	S2a	R
BUZ40	S9	PM	BY329*	S2a	R	BYV20*	S2a	R
BUZ41A	S9	PM	BY359*	S2a	R	BYV21*	S2a	R
BUZ42	S9	PM	BY438	S1	R	BYV22*	S2a	R
BUZ43	S9	PM	BY448	S1	R	BYV23*	S2a	R
BUZ44A	S9	PM	BY458	S1	R	BYV24*	S2a	R
BUZ45	S9	PM	BY505	S1	R	BYV26*	S1	R
BUZ45A	S9	PM	BY509	S1	R	BYV27*	S1/S2a	R
BUZ45B	S9	PM	BY527	S1	R	BYV28*	S1/S2a	R
BUZ45C	S9	PM	BY584	S1	R	BYV29*	S2a	R
BUZ46	S9	PM	BY588	S1	R	BYV30*	S2a	R
BUZ50A	S9	PM	BY609	S1	R	BYV32*	S2a	R
BUZ50B	S9	PM	BY610	S1	R	BYV33*	S2a	R
BUZ53A	S9	PM	BY614	S1	R	BYV34*	S2a	R
BUZ54	S9	PM	BY619	S1	R	BYV36*	S1	R
BUZ54A	S9	PM	BY620	S1	R	BYV39*	S2a	R
BUZ60	S9	PM	BY627	S1	R	BYV42*	S2a	R
BUZ60B	S9	PM	BY707	S1	R	BYV43*	S2a	R
BUZ63	S9	PM	BY708	S1	R	BYV72*	S2a	R
BUZ63B	S9	PM	BY709	S1	R	BYV73*	S2a	R

* = series
PM = Power MOS transistors
R = Rectifier diodes
SP = Low-frequency switching power transistors

type no.	book	section	type no.	book	section	type no.	book	section
BYV79*	S2a	R	BZT03	S1	Vrg	CNX36U	S8b	PhC
BYV92*	S2a	R	BZV10	S1	Vrf	CNX38	S8b	PhC
BYV95A	S1	R	BZV11	S1	Vrf	CNX38U	S8b	PhC
BYV95B	S1	R	BZV12	S1	Vrf	CNX39	S8b	PhC
BYV95C	S1	R	BZV13	S1	Vrf	CNX39U	S8b	PhC
BYV96D	S1	R	BZV14	S1	Vrf	CNX44	S8b	PhC
BYV96E	S1	R	BZV37	S1	Vrf	CNX44A	S8b	PhC
BYW25*	S2a	R	BZV46	S1	Vrg	CNX46	S8b	PhC
BYW29*	S2a	R	BZV49*	S1/S7	Vrg/Mm	CNX48	S8b	PhC
BYW30*	S2a	R	BZV55*	S7	Mm	CNX48U	S8b	PhC
BYW31*	S2a	R	BZV80	S1	Vrf	CNX62	S8b	PhC
BYW54	S1	R	BZV81	S1	Vrf	CNX72	S8b	PhC
BYW55	S1	R	BZV85*	S1	Vrg	CNX82	S8b	PhC
BYW56	S1	R	BZW03*	S1	Vrg	CNX91	S8b	PhC
BYW92*	S2a	R	BZW14	S1	Vrg	CNX92	S8b	PhC
BYW93*	S2a	R	BZW70*	S2a	TS	CNY17-1	S8b	PhC
BYW94*	S2a	R	BZW86*	S2a	TS	CNY17-2	S8b	PhC
BYW95A	S1	R	BZW91*	S2a	TS	CNY17-3	S8b	PhC
BYW95B	S1	R	BZX55*	S1	Vrg	CNY50	S8b	PhC
BYW95C	S1	R	BZX70*	S2a	Vrg	CNY57	S8b	PhC
BYW96D	S1	R	BZX75*	S1	Vrg	CNY57A	S8b	PhC
BYW96E	S1	R	BZX79*	S1	Vrg	CNY57AU	S8b	PhC
BYX25*	S2a	R	BZX84*	S7/S1	Mm/Vrg	CNY57U	S8b	PhC
BYX30*	S2a	R	BZY91*	S2a	Vrg	CNY62	S8b	PhC
BYX32*	S2a	R	BZY93*	S2a	Vrg	CNY63	S8b	PhC
BYX38*	S2a	R	BZY95*	S2a	Vrg	CQF24	S8b	Ph
BYX39*	S2a	R	BZY96*	S2a	Vrg	CQL10A	S8b	Ph
BYX42*	S2a	R	CFX13	S11	M	CQL13A	S8b	Ph
BYX46*	S2a	R	CFX21	S11	M	CQL16	S8b	Ph
BYX50*	S2a	R	CFX30	S11	M	CQS51L	S8a	LED
BYX52*	S2a	R	CFX31	S11	M	CQS54	S8a	LED
BYX56*	S2a	R	CFX32	S11	M	CQS82L	S8a	LED
BYX10G	S1	R	CFX33	S11	M	CQS82AL	S8a	LED
BYX90G	S1	R	CNG35	S8b	PhC	CQS84L	S8a	LED
BYX96*	S2a	R	CNG36	S8b	PhC	CQS86L	S8a	LED
BYX97*	S2a	R	CNR36	S8b	PhC	CQS93	S8a	LED
BYX98*	S2a	R	CNX21	S8b	PhC	CQS93E	S8a	LED
BYX99*	S2a	R	CNX35	S8b	PhC	CQS93L	S8a	LED
BZD23	S1	Vrg	CNX35U	S8b	PhC	CQS95	S8a	LED
BZD27	S1	Vrg	CNX36	S8b	PhC	CQS95E	S8a	LED

* = series
LED = Light-emitting diodes
M = Microwave transistors
Mm = Microminiature semiconductors for hybrid circuits
Ph = Photoconductive devices
PhC = Photocouplers
R = Rectifier diodes
TS = Transient suppressor diodes
Vrf = Voltage reference diodes
Vrg = Voltage regulator diodes

type no.	book	section
CQS95L	S8a	LED
CQS97	S8a	LED
CQS97E	S8a	LED
CQS97L	S8a	LED
CQT10B	S8a	LED
CQT24	S8a	LED
CQT60	S8a	LED
CQT70	S8a	LED
CQT80L	S8a	LED
CQV70(L)	S8a	LED
CQV70A(L)	S8a	LED
CQV70U(L)	S8a	LED
CQV71A(L)	S8a	LED
CQV72(L)	S8a	LED
CQV80L	S8a	LED
CQV80AL	S8a	LED
CQV80UL	S8a	LED
CQV81L	S8a	LED
CQV82L	S8a	LED
CQW10A(L)	S8a	LED
CQW10B(L)	S8a	LED
CQW10U(L)	S8a	LED
CQW11B(L)	S8a	LED
CQW12B(L)	S8a	LED
CQW20A	S8a	LED
CQW21	S8a	LED
CQW22	S8a	LED
CQW24(L)	S8a	LED
CQW54	S8a	LED
CQW60(L)	S8a	LED
CQW60A(L)	S8a	LED
CQW60U(L)	S8a	LED
CQW61(L)	S8a	LED
CQW62(L)	S8a	LED
CQW89A	S8a/b	I
CQW93	S8a	LED
CQW95	S8a	LED
CQW97	S8a	LED
CQX24(L)	S8a	LED
CQX51(L)	S8a	LED
CQX54(L)	S8a	LED
CQX54D	S8a	LED
CQX64(L)	S8a	LED
CQX64D	S8a	LED
CQX74(L)	S8a	LED
CQX74D	S8a	LED
CQY11B	S8b	LED
CQY11C	S8b	LED
CQY24B(L)	S8a	LED
CQY49B	S8b	LED
CQY49C	S8b	LED
CQY50	S8b	LED
CQY52	S8b	LED
CQY53S	S8b	LED
CQY54A	S8a	LED
CQY58A	S8a/b	I
CQY89A	S8a/b	I
CQY94B(L)	S8a	LED
CQY95B	S8a	LED
CQY96(L)	S8a	LED
CQY97A	S8a	LED
Fresnel-lens	S8b	A
H11A1	S8b	PhC
H11A2	S8b	PhC
H11A3	S8b	PhC
H11A4	S8b	PhC
H11A5	S8b	PhC
H11B1	S8b	PhC
H11B2	S8b	PhC
H11B3	S8b	PhC
H11B255	S8b	PhC
KMZ10A	S13	SEN
KMZ10B	S13	SEN
KMZ10C	S13	SEN
KP100A	S13	SEN
KP101A	S13	SEN
KPZ20G	S13	SEN
KPZ21G	S13	SEN
KTY81*	S13	SEN
KTY83*	S13	SEN
KTY84*	S13	SEN
LAE2001R	S11	M
LAE4001Q	S11	M
LAE4001R	S11	M
LAE4002S	S11	M
LAE6000Q	S11	M
LBE1004R	S11	M
LBE1010R	S11	M
LBE2003S	S11	M
LBE2005Q	S11	M
LBE2008T	S11	M
LBE2009S	S11	M
LCE1010R	S11	M
LCE2003S	S11	M
LCE2005Q	S11	M
LCE2008T	S11	M
LCE2009S	S11	M
LJE42002T	S11	M
LKE1004R	S11	M
LKE2002T	S11	M
LKE2004T	S11	M
LKE2015T	S11	M
LKE21004R	S11	M
LKE21015T	S11	M
LKE21050T	S11	M
LKE27010R	S11	M
LKE27025R	S11	M
LKE32002T	S11	M
LKE32004T	S11	M
LTE42005S	S11	M
LTE42008R	S11	M
LTE42012R	S11	M
LV1721E50R	S11	M
LV2024E45R	S11	M
LV2327E40R	S11	M
LV3742E16R	S11	M
LV3742E24R	S11	M
LWE2015R	S11	M
LWE2025R	S11	M

* = series
A = Accessories
I = Infrared devices
LED = Light-emitting diodes
M = Microwave transistors
PhC = Photocouplers
SEN = Sensors

type no.	book	section
LZ1418E100R	S11	M
MCA230	S8b	PhC
MCA231	S8b	PhC
MCA255	S8b	PhC
MCT2	S8b	PhC
MCT26	S8b	PhC
MKB12040WS	S11	M
MKB12100WS	S11	M
MKB12140W	S11	M
MO6075B200Z	S11	M
MO6075B400Z	S11	M
MRB12175YR	S11	M
MRB12350YR	S11	M
MS1011B700Y	S11	M
MS6075B800Z	S11	M
MSB12900Y	S11	M
MZ0912B75Y	S11	M
MZ0912B150Y	S11	M
OM286; M	S13	SEN
OM287; M	S13	SEN
OM320	S10	WBM
OM321	S10	WBM
OM322	S10	WBM
OM323	S10	WBM
OM323A	S10	WBM
OM335	S10	WBM
OM336	S10	WBM
OM337	S10	WBM
OM337A	S10	WBM
OM339	S10	WBM
OM345	S10	WBM
OM350	S10	WBM
OM360	S10	WBM
OM361	S10	WBM
OM370	S10	WBM
OM386B	S13	SEN
OM386M	S13	SEN
OM387B	S13	SEN
OM387M	S13	SEN
OM388B	S13	SEN

type no.	book	section
OM389B	S13	SEN
OM931	S4a	P
OM961	S4a	P
OSB9110	S2a	St
OSB9115	S2a	St
OSB9210	S2a	St
OSB9215	S2a	St
OSB9410	S2a	St
OSB9415	S2a	St
OSM9110	S2a	St
OSM9115	S2a	St
OSM9210	S2a	St
OSM9215	S2a	St
OSM9410	S2a	St
OSM9415	S2a	St
OSM9510	S2a	St
OSM9511	S2a	St
OSM9512	S2a	St
OSS9110	S2a	St
OSS9115	S2a	St
OSS9210	S2a	St
OSS9215	S2a	St
OSS9410	S2a	St
OSS9415	S2a	St
P2105	S8b	I
PBMF4391	S5	FET
PBMF4392	S5	FET
PBMF4393	S5	FET
PDE1001U	S11	M
PDE1003U	S11	M
PDE1005U	S11	M
PDE1010U	S11	M
PEE1001U	S11	M
PEE1003U	S11	M
PEE1005U	S11	M
PEE1010U	S11	M
PH2222;R	S3	Sm
PH2222A;R	S3	Sm
PH2369	S3	Sm
PH2907;R	S3	Sm

type no.	book	section
PH2907A;R	S3	Sm
PH2955T	S4a	P
PH3055T	S4a	P
PH5415	S3	Sm
PH5416	S3	Sm
PH13002	S4b	SP
PH13003	S4b	SP
PHSD51	S2a	R
PKB3001U	S11	M
PKB3003U	S11	M
PKB3005U	S11	M
PKB12005U	S11	M
PKB20010U	S11	M
PKB23001U	S11	M
PKB23003U	S11	M
PKB23005U	S11	M
PKB25006T	S11	M
PKB32001U	S11	M
PKB32003U	S11	M
PKB32005U	S11	M
PMBF4391	S7	Mm
PMBF4392	S7	Mm
PMBF4392	S7	Mm
PMLL4148	S1	SD
PMLL4150	S1	SD
PMLL4151	S1	SD
PMLL4153	S1	SD
PMLL4446	S1	SD
PMLL4448	S1	SD
PMLL5225B to PMLL5267B	S1	SD
PO44	S8b	PhC
PO44A	S8b	PhC
PPC5001T	S11	M
PQC5001T	S11	M
PTB23001X	S11	M
PTB23003X	S11	M
PTB23005X	S11	M
PTB32001X	S11	M

FET = Field-effect transistors
I = Infrared devices
M = Microwave transistors
Mm = Microminiature semiconductors for hybrid circuits
P = Low-frequency power transistors
PhC = Photocouplers
R = Rectifier diodes
SD = Small-signal diodes
SEN = Sensors
Sm = Small-signal transistors
SP = Low-frequency switching power transistors
St = Rectifier stacks
WBM = Wideband hybrid IC modules

type no.	book	section	type no.	book	section	type no.	book	section
PTB32003X	S11	M	SL5501	S8b	PhC	TIP147	S4a	P
PTB32005X	S11	M	SL5502R	S8b	PhC	TIP2955	S4a	P
PTB42001X	S11	M	SL5504	S8b	PhC	TIP3055	S4a	P
PTB42002X	S11	M	SL5504S	S8b	PhC	1N821;A	S1	Vrf
PTB42003X	S11	M	SL5505S	S8b	PhC	1N823;A	S1	Vrf
PV3742B4X	S11	M	SL5511	S8b	PhC	1N825;A	S1	Vrf
PVB42004X	S11	M	TIP29*	S4a	P	1N827;A	S1	Vrf
PZ1418B15U	S11	M	TIP30*	S4a	P	1N829;A	S1	Vrf
PZ1418B30U	S11	M	TIP31*	S4a	P	1N914	S1	SD
PZ1721B12U	S11	M	TIP32*	S4a	P	1N916	S1	SD
PZ1721B25U	S11	M	TIP33*	S4a	P	1N3879	S2a	R
PZ2024B10U	S11	M	TIP34*	S4a	P	1N3880	S2a	R
PZ2024B20U	S11	M	TIP41*	S4a	P	1N3881	S2a	R
PZB16035U	S11	M	TIP42*	S4a	P	1N3882	S2a	R
PZB27020U	S11	M	TIP47	S4a	P	1N3883	S2a	R
RPY97	S8b	I	TIP48	S4a	P	1N3889	S2a	R
RPY100	S8b	I	TIP49	S4a	P	1N3890	S2a	R
RPY101	S8b	I	TIP50	S4a	P	1N3891	S2a	R
RPY102	S8b	I	TIP110	S4a	P	1N3892	S2a	R
RPY103	S8b	I	TIP111	S4a	P	1N3893	S2a	R
RPY107	S8b	I	TIP112	S4a	P	1N3909	S2a	R
RPY109	S8b	I	TIP115	S4a	P	1N3910	S2a	R
RV3135B5X	S11	M	TIP116	S4a	P	1N3911	S2a	R
RX1214B300Y	S11	M	TIP117	S4a	P	1N3912	S2a	R
RXB12350Y	S11	M	TIP120	S4a	P	1N3913	S2a	R
RZ1214B35Y	S11	M	TIP121	S4a	P	1N4001G	S1	R
RZ1214B60W	S11	M	TIP122	S4a	P	1N4002G	S1	R
RZ1214B65Y	S11	M	TIP125	S4a	P	1N4003G	S1	R
RZ1214B125W	S11	M	TIP126	S4a	P	1N4004G	S1	R
RZ1214B125Y	S11	M	TIP127	S4a	P	1N4005G	S1	R
RZ1214B150Y	S11	M	TIP130	S4a	P	1N4006G	S1	R
RZ2833B45W	S11	M	TIP131	S4a	P	1N4007G	S1	R
RZ3135B15U	S11	M	TIP132	S4a	P	1N4148	S1	SD
RZ3135B15W	S11	M	TIP135	S4a	P	1N4150	S1	SD
RZ3135B25U	S11	M	TIP136	S4a	P	1N4151	S1	SD
RZ3135B30W	S11	M	TIP137	S4a	P	1N4153	S1	SD
RZB12100Y	S11	M	TIP140	S4a	P	1N4446	S1	SD
RZB12350Y	S11	M	TIP141	S4a	P	1N4448	S1	SD
RZZ1214B300Y	S11	M	TIP145	S4a	P	1N4531	S1	SD
SL5500	S8b	PhC	TIP146	S4a	P	1N4532	S1	SD

* = series
I = Infrared devices
M = Microwave transistors
P = Low-frequency power transistors
PhC = Photocouplers
R = Rectifier diodes
SD = Small-signal diodes
Vrf = Voltage reference diodes

type no.	book	section	type no.	book	section	type no.	book	section
1N5059	S1	R	2N3553	S6	RFP	2N6659	S5	FET
1N5060	S1	R	2N3632	S6	RFP	2N6660	S5	FET
1N5061	S1	R	2N3822	S5	FET	2N6661	S5	FET
1N5062	S1	R	2N3823	S5	FET	4N25	S8b	PhC
			2N3866	S6	RFP	4N25A	S8b	PhC
1N5225B to 1N5267B	S1	SD	2N3903	S3	Sm	4N26	S8b	PhC
			2N3904	S3	Sm	4N27	S8b	PhC
1N5832	S2a	R	2N3905	S3	Sm	4N28	S8b	PhC
1N5833	S2a	R	2N3906	S3	Sm	4N35	S8b	PhC
1N5834	S2a	R	2N3924	S6	RFP	4N36	S8b	PhC
1N6097	S2a	R	2N3926	S6	RFP	4N37	S8b	PhC
1N6098	S2a	R	2N3927	S6	RFP	4N38	S8b	PhC
2N918	S10	WBT	2N3966	S5	FET	4N38A	S8b	PhC
2N929	S3	Sm	2N4030	S3	Sm	502CQF	S8b	Ph
2N930	S3	Sm	2N4031	S3	Sm	503CQF	S8b	Ph
2N1613	S3	Sm	2N4032	S3	Sm	504CQL	S8b	Ph
2N1711	S3	Sm	2N4033	S3	Sm	516CQF-B	S8b	Ph
2N1893	S3	Sm	2N4091	S5	FET	56201d	S4b	A
2N2219	S3	Sm	2N4092	S5	FET	56201j	S4b	A
2N2219A	S3	Sm	2N4093	S5	FET	56245	S3,10	A
2N2222	S3	Sm	2N4123	S3	Sm	56246	S3,10	A
2N2222A	S3	Sm	2N4124	S3	Sm	56261a	S4b	A
2N2297	S3	Sm	2N4125	S3	Sm	56264a,b	S2a/b	A
2N2368	S3	Sm	2N4126	S3	Sm	56295	S2a/b	A
2N2369	S3	Sm	2N4391	S5	FET	56326	S4b	A
2N2369A	S3	Sm	2N4392	S5	FET	56339	S4b	A
2N2483	S3	Sm	2N4393	S5	FET	56352	S4b	A
2N2484	S3	Sm	2N4427	S6	RFP	56353	S4b	A
2N2904	S3	Sm	2N4856	S5	FET	56354	S4b	A
2N2904A	S3	Sm	2N4857	S5	FET	56359b	S2,4b	A
2N2905	S3	Sm	2N4858	S5	FET	56359c	S2,4b	A
2N2905A	S3	Sm	2N4859	S5	FET	56359d	S2,4b	A
2N2906	S3	Sm	2N4860	S5	FET	56360a	S2,4b	A
2N2906A	S3	Sm	2N4861	S5	FET	56363	S2,4b	A
2N2907	S3	Sm	2N5400	S3	Sm	56364	S2,4b	A
2N2907A	S3	Sm	2N5401	S3	Sm	56367	S2a/b	A
2N3019	S3	Sm	2N5415	S3	Sm	56368a	S2,4b	A
2N3020	S3	Sm	2N5416	S3	Sm	56368b	S2,4b	A
2N3053	S3	Sm	2N5550	S3	Sm	56369	S2,4b	A
2N3375	S6	RFP	2N5551	S3	Sm	56378	S2,4b	A

A = Accessories
FET = Field-effect transistors
Ph = Photoconductive devices
PhC = Photocouplers
R = Rectifier diodes
RFP = R.F. power transistors and modules
SD = Small-signal diodes
Sm = Small-signal transistors
WBT = Wideband transistors

type no.	book	section
56379	S2,4b	A
56387a,b	S4b	A
56397	S8b	A

A = Accessories

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