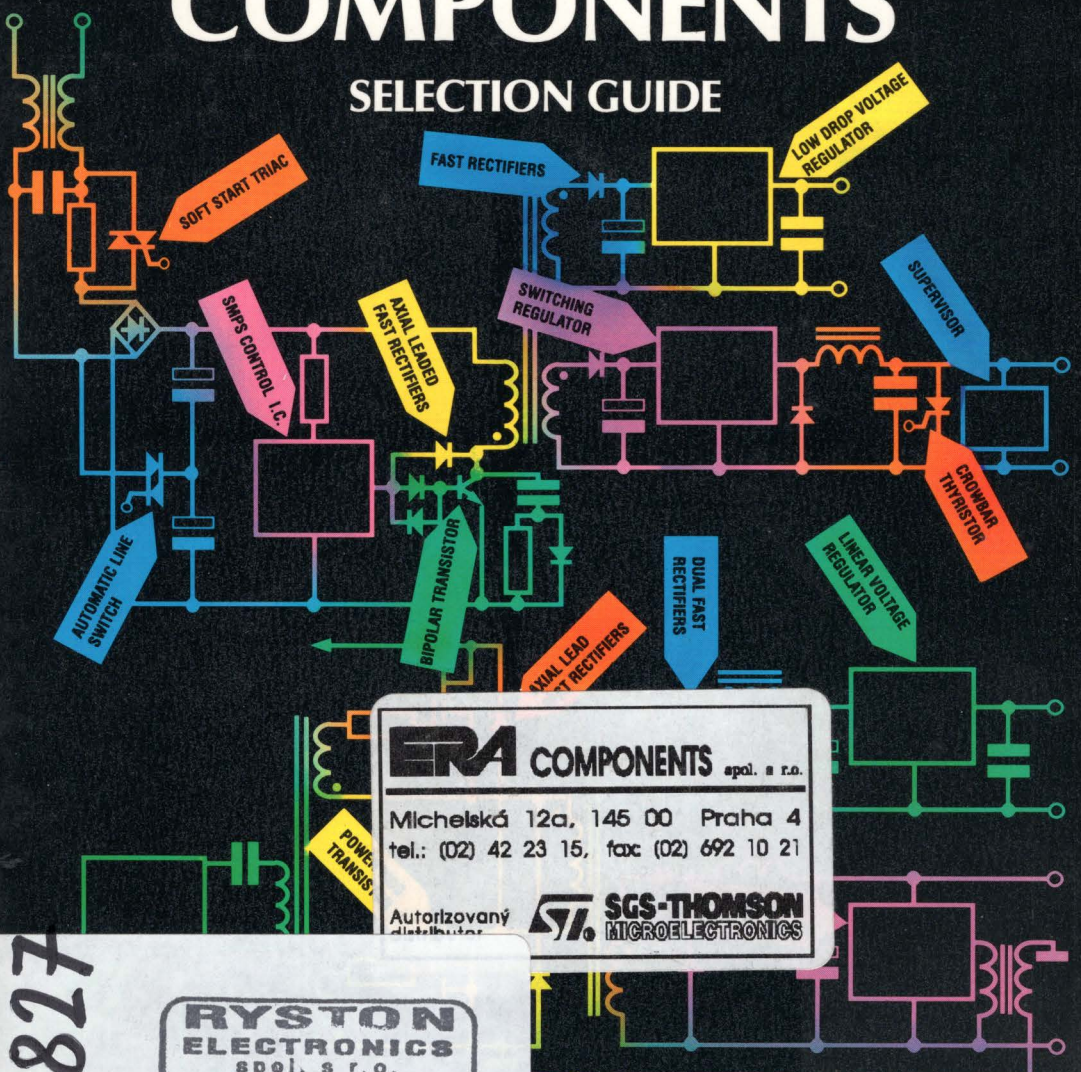


SWITCHED MODE POWER SUPPLY COMPONENTS

SELECTION GUIDE



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SGS-THOMSON
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16 827

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THOMSON
ELECTRONICS

SWITCHED MODE POWER SUPPLY COMPONENTS

SELECTION GUIDE

FEBRUARY 1990

USE IN LIFE SUPPORT DEVICES OR SYSTEMS MUST BE EXPRESSLY AUTHORIZED

SGS-THOMSON PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF SGS-THOMSON Microelectronics. As used herein:

1. Life support devices or systems are those which (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided with the product, can be reasonably expected to result in significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can reasonably be expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

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POWER SUPPLY COMPONENTS FROM SGS-THOMSON Microelectronics

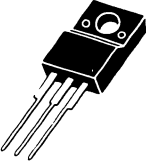
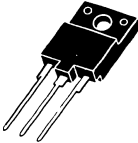
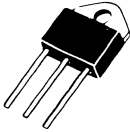
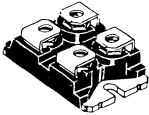
For the Power Supply designer, a working knowledge of a wide range of components and technologies is an essential requirement. This selection guide brings together, in a single publication, information required to make the right choice of component from a vast range of products. Many of the components listed are supported with application notes which are available, on request.

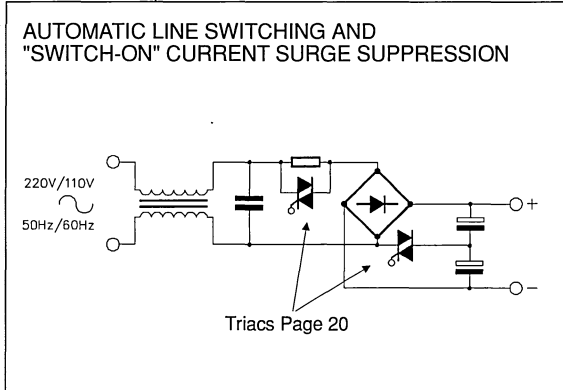
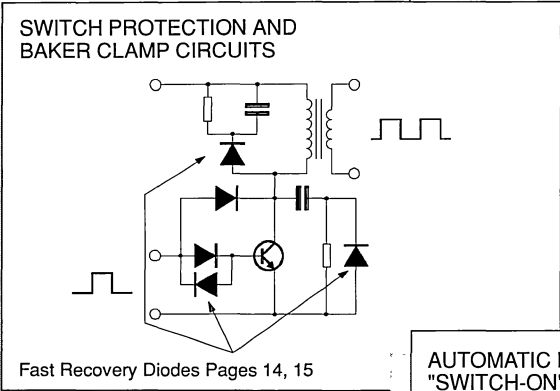
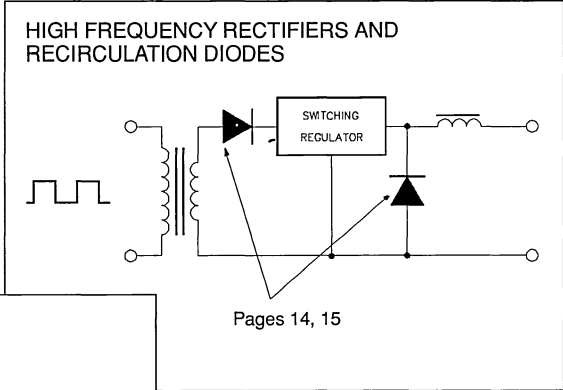
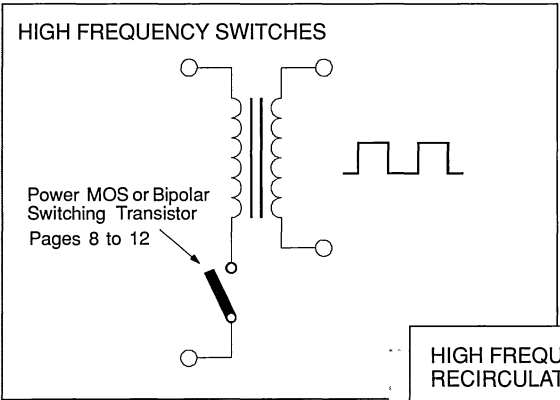
Our product range includes PowerMOS transistors with voltage rating, V_{DSS} , up to 1000V and "on-resistance", $R_{DS(on)}$, down to 23 milliohms. We have a growing family of devices in "ISOTOP" package to meet high power system requirements. Also included in the guide is a new family of high performance switching regulators, the L4970 family, capable of delivering a 10A output at a switching frequency of 500kHz with a conversion efficiency higher than 80%.

Across the product range, a common and important theme is the option to choose a component in a fully isolated package. Features like high voltage isolation, the use of high thermal conductivity materials and the minimisation of parasitic elements and thermal stress by careful design characterise the isolated packages detailed on the following pages. In each case, the package is mechanically compatible with an industry standard package outline.

All the components listed, and derivatives, are available at the date of publication of this selection guide. Just contact your local SGS-THOMSON sales office, or franchised distributor for further details.

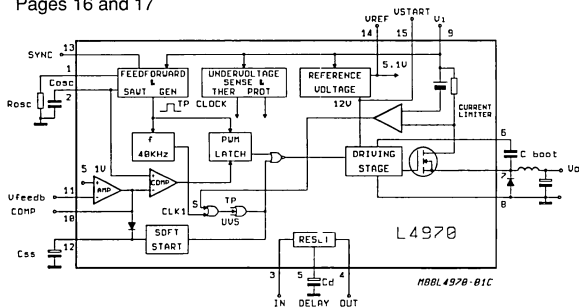
Table 1. Isolated Package Characteristics

	ISOWATT220	ISOWATT218	TOP3I	ISOTOP
				
Insulation Voltage.	2kV dc	4kV dc	2.5kVrms	2.5kVrms
Typical Thermal Resistance.	3.5°C/W	1.9° C/W	1.3°C/W	0.5°C/W
Insulation material.	Epoxy resin	Epoxy resin	.Al ₂ O ₃	Al ₂ O ₃ or Al ₃ N ₄ →ALN
Insulation thickness.	375μ	500μ		
Creepage distance to heatsink.	2.3 mm	6.5 mm	2.8 mm	7.0 mm
Lead inductance.				5 nH
Capacitance to heatsink.		17 pf		45 pf



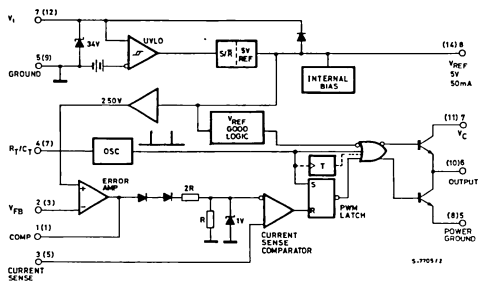
SWITCHING REGULATORS

Pages 16 and 17

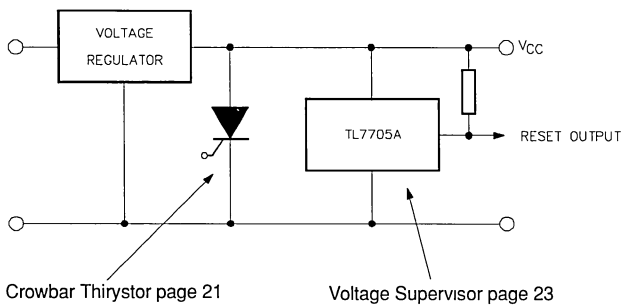


SWITCHED MODE POWER SUPPLY

CONTROL CIRCUITS Pages 24 to 27



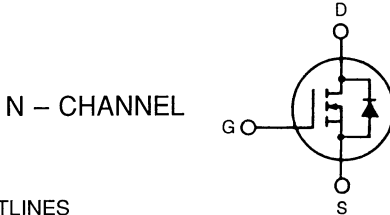
SUPERVISOR AND LOAD PROTECTION



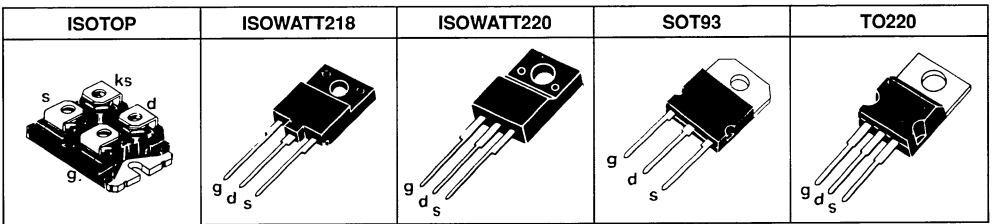
POWER MOS TRANSISTORS

A selection of PowerMOS transistors from a growing product family of over 250 types. Drain-source voltage ratings from 50V to 1000V.

Drain-source "on" resistance from 14 milliohms to 3.5 ohms. Rugged structure for switching un-clamped inductive loads. Industry standard and isolated plastic packages



PACKAGE OUTLINES



$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (Ω)	$I_{D(rms)}$ (A)	Type	Package				
				ISOTOP	ISOWATT218	ISOWATT220	SOT93	TO220
50	0.3	7	SGSP358					•
50	0.08	20	BUZ10					•
50	0.04	20	BUZ11FI			•		
50	0.04	30	BUZ11					•
50	0.023	52	STVHD90					•
60	0.055	26	IRFP151FI		•			
60	0.055	40	IRFP151				•	
60	0.04	20	BUZ11S2FI			•		
60	0.04	30	BUZ11S2					•
60	0.028	26	MTH40N06FI		•			
60	0.028	40	MTH40N06				•	
60	0.014	135	TSD4M151	•				
100	0.3	11	SGSP311					•
100	0.27	7	IRF520FI			•		
100	0.27	9.2	IRF520					•
100	0.16	9	IRF530FI			•		
100	0.16	14	IRF530					•
100	0.15	18	SGSP361					•
100	0.077	15	IRF540FI			•		
100	0.077	28.0	IRF540					•

Note: $R_{DS(on)}$ and $I_{D(rms)}$ at 25°C Tcase

POWER MOS TRANSISTORS

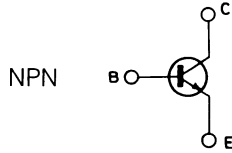
V _{(BR)DSS} (V)	R _{Ds(on)} (Ω)	I _{D(rms)} (A)	Type	Package				
				ISOTOP	ISOWATT218	ISOWATT220	SOT93	TO220
100	0.055	26.0	IRFP150FI		•			
100	0.055	40.0	IRFP150				•	
100	0.014	135.0	TSD4M150(V)	•				
200	0.8	4.0	IRF620FI			•		
200	0.8	5.0	IRF620					•
200	0.33	12.0	SGSP367					•
200	0.17	20.0	SGSP477				•	
200	0.021	110.0	TSD4M250(V)	•				
400	1.8	2.5	IRF720FI			•		
400	1.8	3.3	IRF720					•
400	1.0	3.5	IRF730FI			•		
400	1.0	5.5	IRF730					•
400	0.55	5.5	IRF740FI			•		
400	0.55	10.0	IRF740					•
400	0.3	10.0	IRFP350FI		•			
400	0.3	15.0	IRFP350				•	
400	0.075	50.0	TSD4M350(V)	•				
500	3.0	2.0	IRF820FI			•		
500	3.0	2.5	IRF820					•
500	1.5	3.0	IRF830FI			•		
500	1.5	4.5	IRF830					•
500	0.85	4.5	IRF840FI			•		
500	0.85	8.0	IRF840					•
500	0.7	9.0	SGSP479				•	
500	0.4	9.0	IRFP450FI		•			
500	0.4	14.0	IRFP450				•	
500	0.1	45.0	TSD4M450(V)	•				
600	2.5	2.5	MTP3N60FI			•		
600	2.5	3.0	MTP3N60					•
600	1.2	3.5	MTH6N60FI		•			
600	1.2	6.0	MTP6N60					•
800	4.0	2.4	BUZ80FI			•		
800	4.0	2.6	BUZ80					•
800	3.0	2.4	BUZ80AFI			•		
800	3.0	3.0	BUZ80A					•
800	2.0	4.0	STHV82FI		•			
800	2.0	5.5	STHV82				•	
1000	3.5	3.0	STHV102FI		•			
1000	3.5	4.2	STHV102				•	
1000	0.7	17.0	TSD5MG40(V)	•				

Note: R_{Ds(on)} and I_{D(rms)} measured at 25°C T_{case}

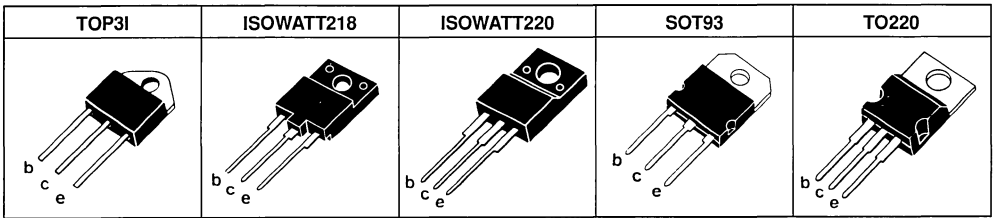
FASTSWITCH AND ETD BIPOLAR TRANSISTORS

A selection from an established family of fast switching bipolar power transistors and Darlingtontons with wide Reverse Bias Safe Operating Area (RBSOA).

Collector-emitter voltage rating (V_{ceV}) 600V to 1300V. Collector current ratings from 4A to 100A. Industry standard and isolated packages.



PACKAGE OUTLINES



V_{CEV} (V)	V_{CEO} (V)	I_C (A)	Type	V_{CEsat} (V)	I_{Csat} (A)	I_{Bsat} (A)	Package					
							TOP3I	ISOWATT218	ISOWATT220	SOT93	TO220	
850	400	5	SGS(I)F321	1.5	3.5	0.7			•			•
850	400	5	SGS(I)F421	1.5	3.5	0.7		•			•	
850	450	7.5	BUF405(FI)	0.5*	5	1			•			•
850	400	10	SGS(I)F341	1.5	6	1.2			•			•
850	400	10	SGS(I)F441	1.5	6	1.2		•			•	
850	450	15	BUF410(FI)	0.5*	10	2	•	•			•	
850	400	15	SGS(I)F461	1.5	10	2		•			•	
850	400	30	BUF420(FI)	0.5*	20	4	•	•			•	
1000	450	5	SGS(I)F323	1.5	2.5	0.5			•			•
1000	450	5	SGS(I)F423	1.5	2.5	0.5		•			•	
1000	450	8	SGS(I)F343	1.5	4.5	0.9			•			•
1000	450	8	SGS(I)F443	1.5	4.5	0.9		•			•	
1000	450	7.5	BUF405A	0.5*	5	1			•			•
1000	450	12	SGS(I)F463	1.5	7	1.4		•			•	
1000	450	15	BUF410A	0.5*	10	2	•	•			•	
1000	450	30	BUF420A	0.5*	20	4	•	•			•	
1200	600	4	SGS(I)F324	1.5	1.75	0.35			•			•
1200	600	4	SGS(I)F424	1.5	1.75	0.35		•			•	
1200	600	7	SGS(I)F344	1.5	3.5	0.7			•			•
1200	600	7	SGS(I)F444	1.5	3.5	0.7					•	
1200	600	10	SGS(I)F464	1.5	6	1.2		•			•	
1300	600	4	SGS(I)F425	1.5	1.25	0.25		•			•	
1300	600	7	SGS(I)F445	1.5	3	0.6		•			•	
1300	600	10	SGS(I)F465	1.5	5	1		•			•	

Notes: * Indicates typical V_{CEsat} value.

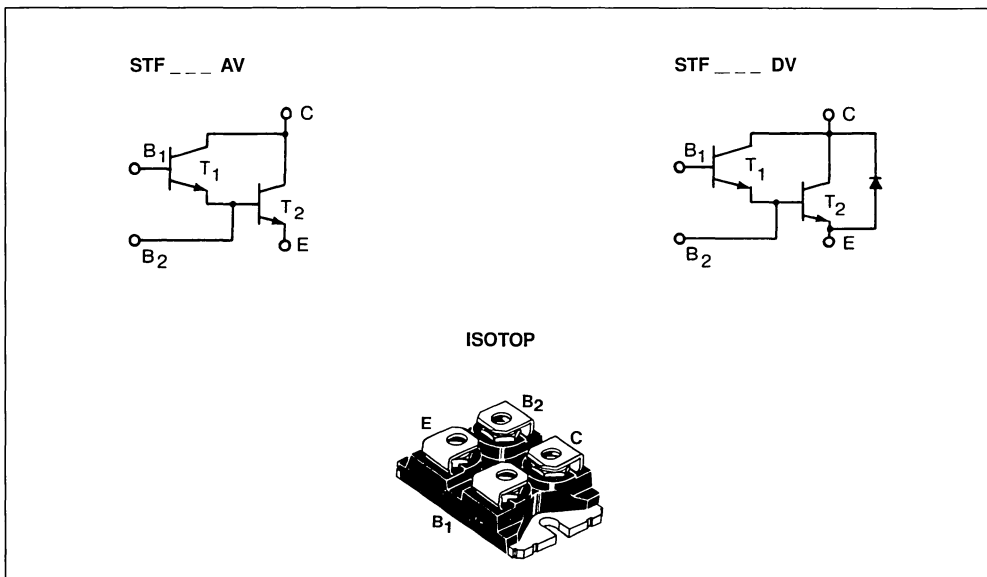
ETD BIPOLAR TRANSISTORS AND DARLINGTONS IN ISOTOP PACKAGE

Switching times at 100 °C T_{case} :

Bipolar Transistor, typical fall time, t_f 100 nsec
 Darlington typical fall time, t_f 400 nsec

Bipolar Transistor, typical crossover time, t_c 200 nsec
 Darlington typical crossover time, t_c 1000 nsec

DARLINGTON TRANSISTORS CONNECTIONS AND PACKAGE OUTLINE



V_{CEV} (V)	V_{CEO} (V)	I_C (A)	Type	V_{CEsat}^* (V)	I_{Csat} (A)	I_{Bsats} (A)
600	450	80	STF6045DV	2.0	50	1
600	450	100	STF8045DV	2.0	85	4.9
850	450	60	BUF298V	2.0	40	8
850	450	90	BUF460V	2.0	60	12
1000	450	50	BUF298AV	2.0	32	6.4
1000	450	80	STF6045AV	2.0	50	1
1000	450	90	BUF460AV	2.0	60	12
1000	450	100	STF8045AV	2.0	72	2.9

Notes: The ISOTOP package is available with "fast-on" or solder terminals. To order the "fast-on" variant omit the "V" from the type number. Darlington transistors with "D" suffix are supplied with integral fast recovery c-e diode.

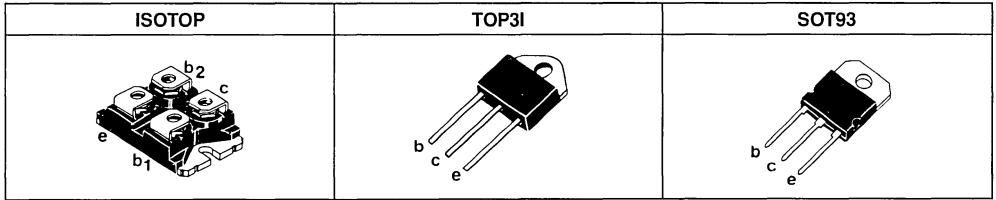
* V_{CEsat} for all devices measured at $T_j=125^\circ\text{C}$

SUPERSWITCH II BIPOLAR TRANSISTORS AND DARLINGTONS

A selection of high current bipolar power transistors and Darlingtons with collector-emitter voltage ratings of 150V to 1000V and collector current

ratings of 24A to 200A. The hybrid Darlington ("D" suffix types) have fast recovery hybrid diodes assembled in the same package.

PACKAGE OUTLINES



Switching times at 100°C T_{case}:

Typical fall time, t_f 200 nsec to 600 nsec.

Typical crossover time, t_c 350 nsec to 2 microsec.

Typical c-e diode reverse recovery time, t_{rr} 150 nsec.

V _{CEV} (V)	V _{CEO} (V)	I _C (A)	Type	V _{CEsat} (V)	I _{Csat} (A)	I _{Bsat} (A)	Package		
							ISOTOP	TOP3I	SOT93
150	125	120	ESM2012DV +	1.5	70	0.25	•		
200	125	40	BUT70(I)	0.9	35	1.75		•	•
200	125	100	BUT30V	0.9	100	10	•		
200	125	200	BUT230V	0.9	200	20	•		
400	300	40	BUT72(I)	0.9	30	3		•	•
400	300	80	BUT32V	0.9	40	4	•		
400	300	67	ESM2030DV +	2.0	56	1.6	•		
400	300	100	ESM3030DV +	1.7	60	0.6	•		
400	300	140	BUT232V	0.9	70	7	•		
600	450	24	ESM3045DV +	2.0*	15	0.3	•		
600	450	42	ESM4045DV +	2.0*	25	0.5	•		
600	450	60	ESM5045DV +	2.0*	35	0.7	•		
600	450	75	ESM7545DV +	2.5	75	1.5	•		
600	450	84	ESM6045DV +	2.0*	50	1	•		
1000	450	24	ESM3045AV	2.0	15	0.3	•		
1000	450	42	ESM4045AV	2.0*	30	1.2	•		
1000	700	50	ESMT5070DV ++	3.0	50	0.5	•		
1000	450	84	ESM6045AV	2.0*	60	2.4	•		

Notes: * V_{CEsat} measured at T_j 125 °C.

(I) Indicates a type variant in isolation package.

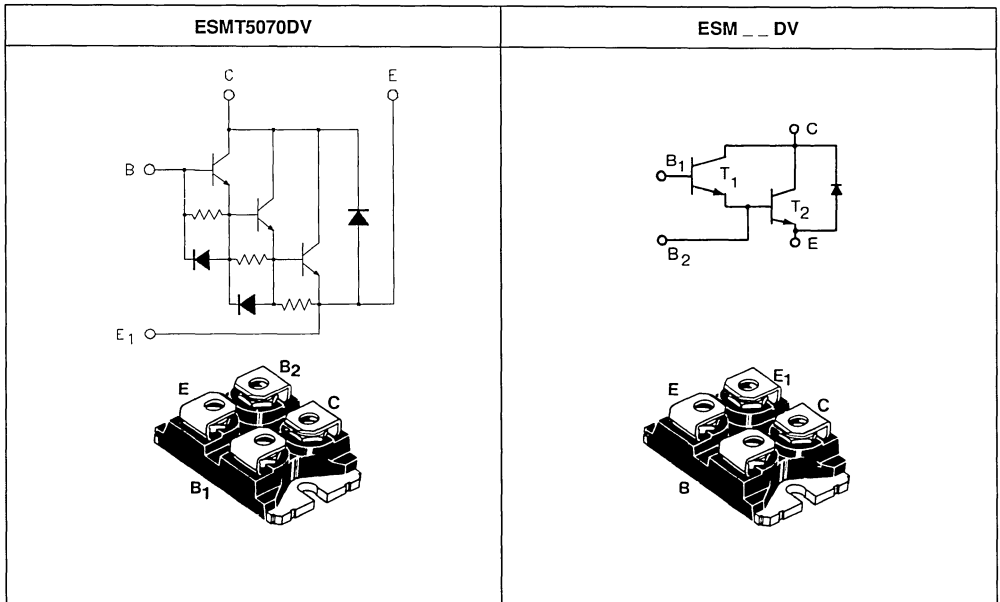
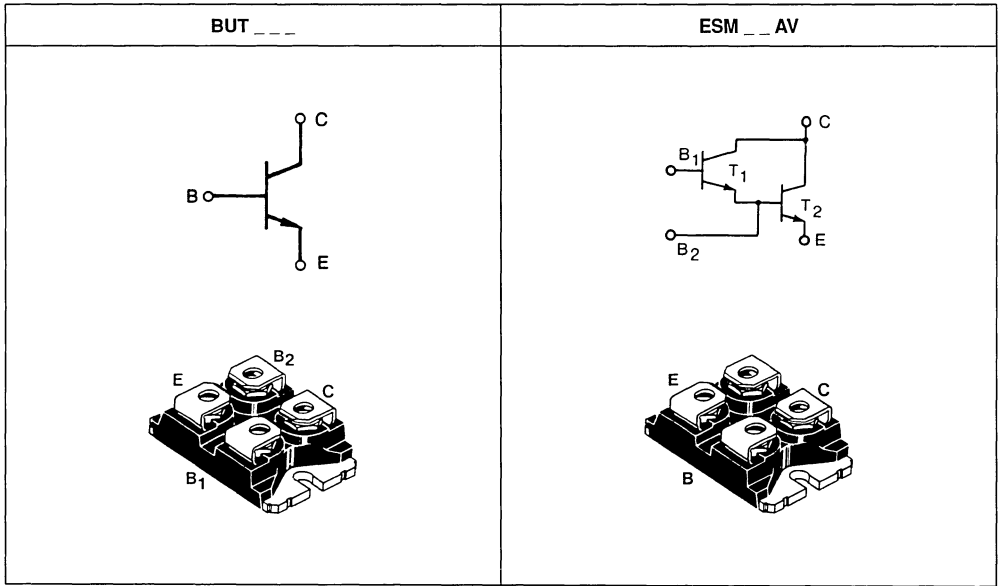
+ Monolithic Darlington with integral fast recovery c-e package

++ Monolithic Trilington with integral fast recovery c-e diode.

The ISOTOP package is available with "fast-on" or solder terminals. To order the "fast-on" variant, omit the "V" from the type number.

SUPERSWITCH II BIPOLAR TRANSISTORS AND DARLINGTONS

CIRCUIT CONFIGURATIONS AND PACKAGE OUTLINE



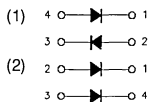
FAST RECOVERY EPITAXIAL RECTIFIER DIODES, V_{RRM} 20 TO 200V

Schottkies and fast recovery epitaxial rectifier diodes with soft reverse recovery characteristic.

Current ratings from 1A to 100A. Low forward voltage drop. Voltage ratings, V_{rrm}, 20V to 200V.

ISOLATED PACKAGE OUTLINES

ISOTOP	TOP3I	DOP3I	DO220I



NON ISOLATED PACKAGE OUTLINES

TOP3	DOP3	TO220	DO220	DO27A	DO41	F126

V _{RRM} (V)	IF (A)	Type	t _{rr} (nsec)	Package
20 to 60	1	BYV10*	—	DO41
80	1	BAT49*	—	DO41
50 to 200	1	BYW100	35	F126
50 to 200	3	PFR850/1/2	150	DO27A
50 to 200	3	BYW98	35	DO27A
50 to 200	8	BYW29-A	35	DO220
50 to 200	8	BYW80-A	35	DO220
50 to 200	12	BYW81P(I)	35	DO220(I)
50 to 200	2x10	BYW51-A	35	TO220
50 to 200	25	BYW77P(I)	50	DOP3(I)
50 to 200	2x15	BYW99P	35	TOP3
50 to 200	2x30	BYV52(PI)	50	TOP3(I)
50 to 200	2x50	BYV54V	60	ISOTOP (1)
50 to 200	2x100	BYV55V	80	ISOTOP (2)

Notes: Reverse recovery time, t_{rr}, is measured with IF 0.5A, I_R 1.0A at I_{rr} 0.25A

* Indicates Schottky diodes. t_{rr} is not applicable.

The PFR850 series are diffused, fast rectifiers.

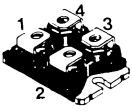
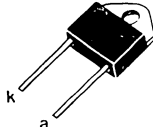
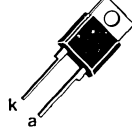
(I) and (PI) suffixes indicated isolated package variants.

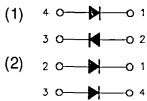
SUPERSWITCH II FAST RECOVERY RECTIFIERS, V_{RRM} 200V TO 1000V

Superswitch II high voltage fast recovery rectifiers with soft reverse recovery characteristic. Current

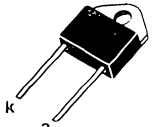
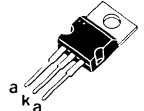
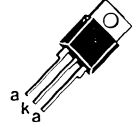

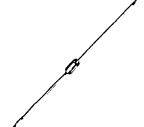
ratings from 1A to 60A. Voltage ratings, V_{rrm}, 200V to 1000V.

ISOLATED PACKAGE OUTLINES

ISOTOP	DOP3I	DO220I
		



NON ISOLATED PACKAGE OUTLINES

DOP3	TO220	DO220	DO27A	F126
				

V _{RRM} (V)	IF (A)	Type	t _{rr} (nsec)	Package
200 to 400	1	BYT01	25	F126
600 to 1000	1	BYT11	100	F126
200 to 400	3	BYT03	25	DO27A
200 to 600	3	PFR852/4/6	150-200	DO27A
600 to 1000	3	BYT13	150	DO27A
200 to 1000	8	BYT08P(I) A	35- 65	DO220(I)
600 to 1000	12	BYT12P(I)	50- 65	DO220(I)
200 to 400	2x8	BYT16P-A	35	TO220
200 to 1000	30	BYT30P(I)	50- 70	DOP3(I)
200 to 400	60	BYT60P	50	DOP3
200 to 1000	2x30	BYT230PI	50- 70	ISOTOP(1)
200 to 1000	2x60	BYT261PI	50- 70	ISOTOP(2)

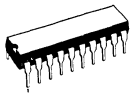
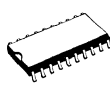
Notes: Reverse recovery time, t_{rr}, is measured with I_F 0.5A, I_R 1.0A at I_{rr} 0.25A
 (I) suffix indicates isolated package variant

MONOLITHIC SWITCHING REGULATORS L4970 FAMILY

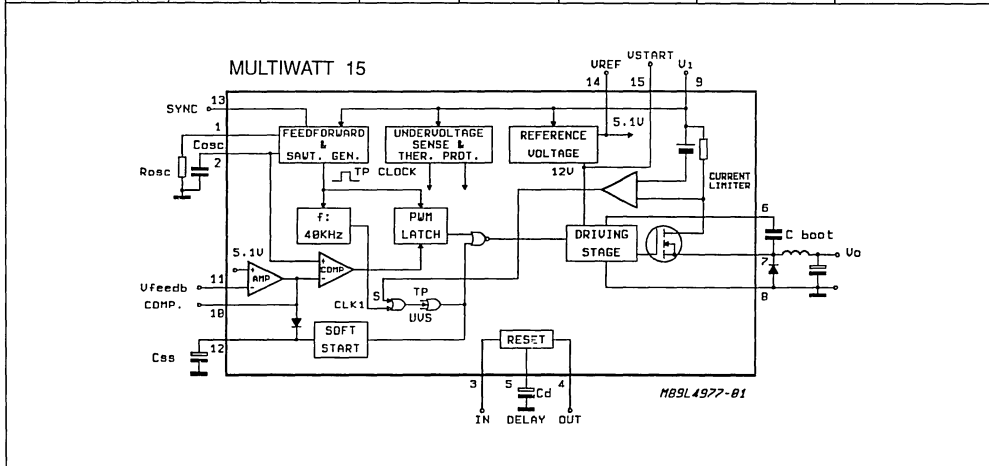
A new family of high performance switching regulators with DMOS switching transistor, delivering up to 10A output at a switching frequency of 500kHz with a conversion efficiency greater than 80%.

The wide input supply range can eliminate the requirement for separate secondary windings on the power transformer, simplifying it's design.

PACKAGE OUTLINES

MULTIWATT 15		POWERDIP 16+2+2	SO20L
Vertical	Horizontal		

	L4970	L4977	L4975	L4974	L4972	L4972D Surface Mounting
Max Input Operating Voltage	50V	50V	50V	50V	50V	50V
Output Voltage Range	5.1V to 40V ± 2% (Internal Ref)					
Max Output Current	10A	7A	5A	3.5A	2A	2A
Max Output Power	400W	280W	200W	140W	80W	80W
Power Switch	DMOS R _{DS(ON)} 0.18ohm					
Switching Mode Control System	Continuous Mode; Direct Duty Cycle Control with Feed Forward (Improved Transient Response)					
Chopping Frequency	500kHz	500kHz	500kHz	200kHz	200kHz	200kHz
V _{IN} = 35V	10A	7A	5A	3.5A	2A	2A
Efficiency V _{OUT} = 5.1V 100kHz	83%	84%	84%	84%	83%	83%
Current Limiting	True Current Generator					
Soft Start	Yes					
Reset and Power Fail	Yes					
Crowbar	No					
Package	Multiwatt15	Multiwatt15	Multiwatt15	Powerdip16+2+2	Powerdip16+2+2	SO20L
Max R _{thj} - case (PIN)	1°C/W	1°C/W	1°C/W	12°C/W	12°C/W	15°C/W

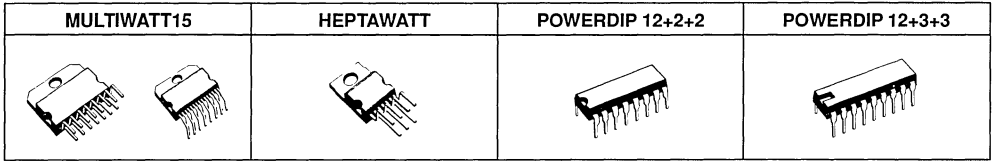


MONOLITHIC SWITCHING REGULATORS L296 FAMILY

Bipolar switching regulators with wide input supply voltage range and output current ratings of 4A to 1.5A. The L4963, which operates in variable fre-

quency discontinuous mode, has been designed to provide a cost efficient solution with output power in the range 5W to 40W.

PACKAGE OUTLINES

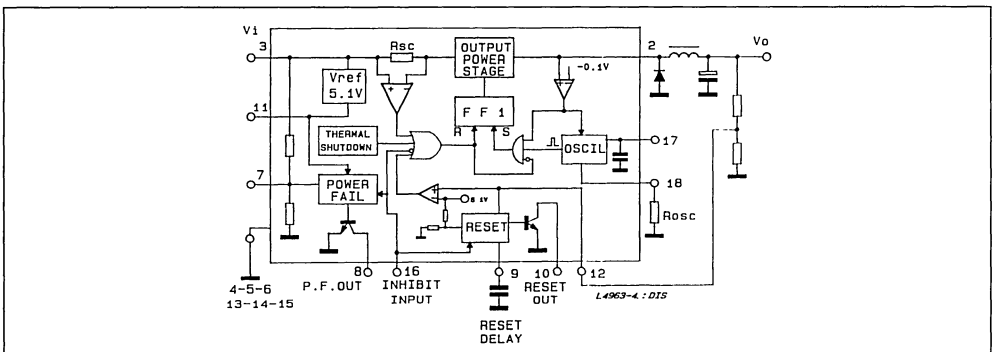


	L296(P)	L4960	L4962(E)	L4963	L4964
Max. Input Voltage	46V	46V	46V	46V	36V
Output Voltage Range		5.1V to 40V		to 36V	to 28V
Max. Output Current	4A	2.5A	1.5A	1.5A	4A
Max. Output Power	160W	100W	60W	44W	112W
Power Switch V_{CEsat}	3.2V 4A	3V 2A	2V 1.5A	2V 3A	3.2V 3A
Switching Mode Control System (1)	A	A	A	B	A
Chopping Frequency	100kHz	100kHz	100kHz	var.to	100kHz
Efficiency $V_{IN} = 35V$ $V_{OUT} = 5.1V, I_{out}$	3.5A 76%	2A 74%	1A 76%	1.5A 75%	3A 75%
Current Limiting (2)	A	A	A	B	A
Soft Start	Y	Y	Y	N	Y
Reset and Power Fail	Y	N	N	Y	Y
Crowbar	Y	N	N	N	Y
Package	Multiwatt15	Heptawatt	Heptawatt(E) or Powerdip 12+2+2	Powerdip 12+3+3	Multiwatt15
Max. $R_{thj-case}(pin)$	3°C/W	4°C/W	4°C/W and 14°C/W	12°C/W	3°C/W

Notes: (1) A - Continuous mode, direct duty cycle control.
B - Discontinuous mode, direct duty cycle control

(2) A - Soft start triggers.
B - Peak current limiting

BLOCK DIAGRAM L4963






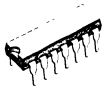

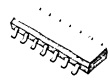


LINEAR AND “LOW DROP” REGULATORS

Industry standard linear voltage regulators with output current rating 150mA to 5A. Proprietary low drop regulators for battery operated applications and

dual regulators with integral power “on” reset for battery backed microprocessor applications.

PACKAGES OUTLINES

TO3	PENTAWATT(V)	TO220	SOT82
			
SOT194	DIP14	MINIDIP	SO14
			

POSITIVE VOLTAGE OUTPUT

I _o max (A)	Type	REGULATED OUTPUT VOLTAGE (V)												Precision (%)	Package	
		5.0	6.0	7.5	8.0	8.5	9.0	10	12	15	18	20	24			
5	LM238 K	1.2V ← adjustable → 32V												4	TO3	
5	LM338 K	1.2V ← adjustable → 32V												4	TO3	
3	LM223 K	•													6	TO3
3	LM323 K	•													4	TO3
2	L200 CV/CH	2.9V ← adjustable → 36V												4	Pentawatt	
2	L78S00 CV	•		•			•	•	•	•	•		•		4	TO220
2	L78S00CT	•		•			•	•	•	•	•		•		4	TO-3
2	L78S00T (**)	•		•			•	•	•	•	•		•		4	TO-3
1.5	LM117K (**)	1.2V ← adjustable → 37V												4	TO-3	
1.5	LM217K (*)	1.2V ← adjustable → 37V												4	TO-3	
1.5	LM317K	1.2V ← adjustable → 37V												4	TO-3	
1.5	LM317 T	1.2V ← adjustable → 37V													TO220	
1	L7800 CV	•	•		•	•			•	•	•	•	•	•	4	TO220
1	L7800ABV	•	•		•				•	•	•	•	•	•	2	TO220
1	L7800ACV	•	•		•				•	•	•	•	•	•	2	TO220
1	L7800HBV	•													1	TO220
0.5	L78M00ABV	•	•		•				•	•	•	•	•	•	2	TO22
0.5	L78M00 CV	•	•		•				•	•	•	•	•	•	4	TO220
0.5	L78M00 CX	•	•		•				•	•	•	•	•	•	4	SOT82
0.5	L78M00 CS	•	•		•				•	•	•	•	•	•	4	SOT194

LINEAR AND “LOW DROP” REGULATORS

POSITIVE VOLTAGE OUTPUT (Cont'd)

I _o max (A)	Type	REGULATED OUTPUT VOLTAGE (V)												Precision (%)	Package
		5.0	6.0	7.5	8.0	8.5	9.0	10	12	15	18	20	24		
0.15	LM723 CN	2.0V ← adjustable → 37V												5	DIP14
0.15	LM723 CD1													5	SO14
0.15	LM723CH													5	TO-100
0.15	LM723CJ													5	DIL-14C
0.15	LM723J (**)													5	DIL-14 C
0.15	LM723H (**)													5	TO-100

Notes: L78/L79 series: 1st suffix indicates voltage precision
 2nd suffix indicates operating temperature range: "B" -40°C to 125°C, "C" 0° C to 125°C
 3rd suffix indicates package type

(*) -40C to 125°C
 (**) -55°C to 150°C

NEGATIVE VOLTAGE OUTPUT

I _o max (A)	Type	REGULATED OUTPUT VOLTAGE (-V)												Precision (%)	Package
		5.0	5.2	6.0	8.0	9.0	10	12	15	18	20	22	24		
1	L7900CT	5	5.2	6			8	12	15	18	20	22	24	4	TO-3
1	L7900ACV	•	•	•	•			•	•	•	•	•	•	2	TO220
1	L7900CV	•	•	•	•			•	•	•	•	•	•	4	TO220
1	LM337 SP	1.2V ← adjustable → 32V												3	TO220

MONOLITHIC “LOW DROP” AND DUAL OUTPUT VOLTAGE REGULATORS

I _o max (A)	Type	REGULATED OUTPUT VOLTAGE (V)												Drop out Voltage (V)	Precision (%)	Package	
		5.0	8.5	10	12												
1.5	L4940	•	•	•	•									0.9	2	TO220	
1	L4941BV	•												0.7	4	TO220	
1	L4941BX	•												0.7	4	SOT82	
0.5	L4700CV	•	•	•										0.9		TO220	
0.5	L387A	•	} With Reset											0.8	4	Pentawatt	
0.5	L487	•												0.8		Pentawatt	
0.4	L4901A	•	Dual output with reset output.												1.4	2	Heptawatt
0.4																	
0.3	L4902A	•	Dual output with reset output.												1.4	2	Heptawatt
0.3																	
0.3	L4905	•	Dual output with reset output.												1.3	1	Heptawatt
0.2																	
0.1	L4903	•	Dual output with reset output and disable input.												0.9	2	Minidip
0.05															0.8		
0.1	L4904A	•	Dual output with reset output												0.9	2	Minidip
0.05															0.8		

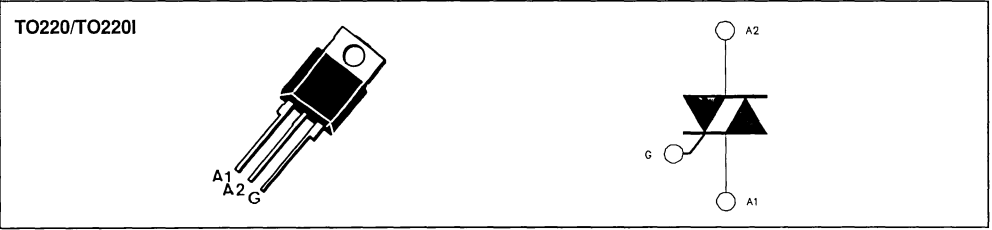
Note: Dual output voltage regulators are useful in battery back up applications.

TRIACS FOR INRUSH CURRENT LIMITING AND AUTOMATIC LINE SWITCHING APPLICATIONS

Use of a triac in the Automatic Line Switching (ALS) application makes possible universal input smps design without resorting to the use of a pc board link. The inrush current limiting triac short circuits the surge limiting resistor, improving circuit efficiency with out using an electro-mechanical relay.

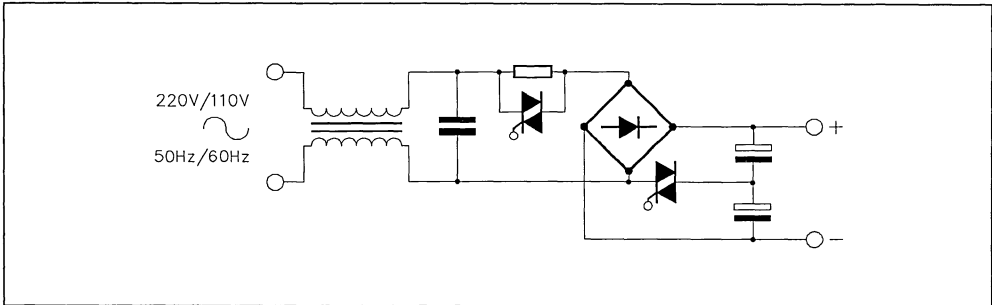
Triggering can be achieved using an additional winding on the switched mode transformer. The snubberless triacs ("W" suffix) will operate with the minimum of peripheral components.

CIRCUIT CONFIGURATION AND PACKAGE OUTLINE



V _{DRM} =V _{RRM} (V)	I _{Trms} (A)	Type	I _{TSM-A}		dv/dt (V/μsec)	I _{GT} Q1-Q3 (mA)	Package	
			50Hz	60Hz			TO220I	TO220
400 to 800	6	BTA06-SW	85	95	50	10	•	•
	6	BTB06-SW						•
	6	BTB06-BW	60	63	500	50	•	•
	6	BTA06-BW						•
400 to 800	8	BTA08-SW	85	95	50	10	•	•
	8	BTB08-SW						•
	8	BTA08-BW	80	85	500	50	•	•
	8	BTB08-BW						•
400 to 800	10	BTA10-BW	100	105	500	50	•	•
	10	BTB10-BW						•
400 to 800	12	BTA12-BW	120	126	500	50	•	•
	12	BTB12-BW						•
400 to 800	16	BTA16-BW	150	157	500	50	•	•
	16	BTB16-BW						•

APPLICATION CIRCUIT

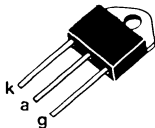
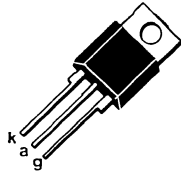


THYRISTORS FOR OVERVOLTAGE CROWBAR CIRCUITS

In the event of overcurrent (short circuit output), or over voltage, as a result of a supply borne transient, a crowbar thyristor can be triggered causing the

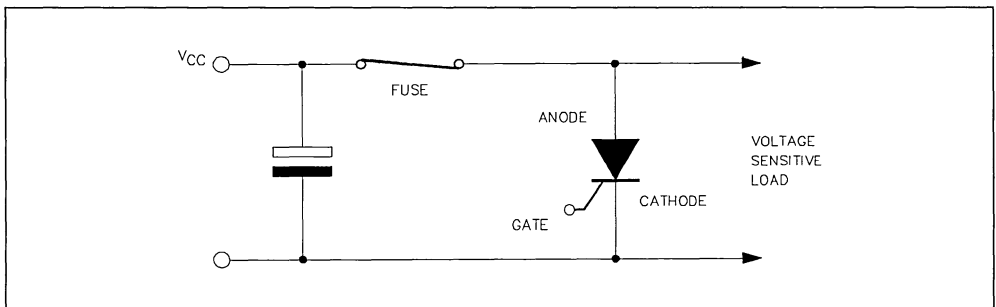
supply fuse to blow, protecting the power supply and the load circuit. The low voltage thyristors listed in the table are designed to meet this application requirement.

PACKAGE OUTLINES

TOP3/TOP3I	TO220/TO220I
	

V _{DRM} (V)	I ² t, 10 msec A ² sec	Type	I _{TSM} , (A)		Package			
			50Hz	60Hz	TOP3I	TOP3	TO220I	TO220
50 to 200	50	TYN0510, TYN110, TYN210	100	105				•
50 to 200	50	TXN0510, TXN110, TXN210	100	105			•	
50 to 200	72	TYN0512, TYN112, TYN212	120	125				•
50 to 200	72	TXN0512, TXN112, TXN212	120	125			•	
25 to 200	450	TYP212, TYP512, TYP1012, TYP2012	300	315				
200	1250	BTW69, BTW69N	500	525	•	•		

APPLICATION CIRCUIT



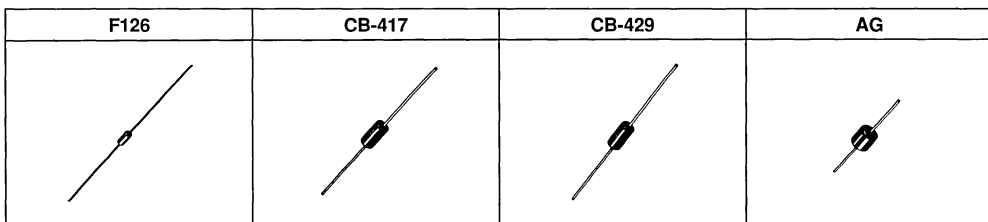
VOLTAGE TRANSIENT SUPPRESSORS-TRANSILS

Fast voltage transients on voltage supply lines and on communication links can be suppressed using the appropriate TRANSIL component.

We offer a complete range of 2 terminal voltage transient suppressors with energy absorption capability ranging from 400 watts to 5 Kwatts.

- * Breakdown voltages range from 6.8V to 440V.
- * Unidirectional (P) and Bidirectional (CP) types are available.
- * TRANSILS have:
 - better dynamic characteristics than zener diodes.
 - good stability with time, unlike VDR's, and will fail short circuit on overload, unlike VDR's.

PACKAGE OUTLINES



Type	BZW04	P6KE	1.5KE	BZW50
P_{peak} , 1 msec W	400	600	1.500	5.000
P_{avg} , T_{amb} . 50°C W	1.7	5.0	1.5	5.0
I_{FSM} , Unidirectional types only. A, 10 msec	50	100	250	500



Note: TRANSILS can be used to turn-on a power semiconductor - PowerMOS, bipolar transistor or Darlington, thyristor or triac to provide overvoltage protection. The power semiconductor absorbs the transient, the TRANSIL being used as a trigger component.

SUPERVISOR/RESET GENERATOR CIRCUITS

Microcomputers and microprocessor systems require a reset signal on "power up" in order to start up in an orderly manner. Random drops in supply voltage during operation of a digital system will cause processing errors unless the condition is detected and a warning given to the controller before the supply voltage falls below limits. A supply

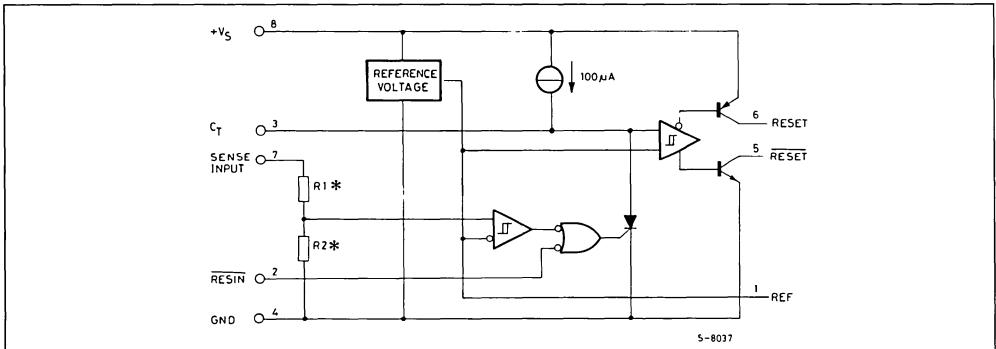
voltage supervisor circuit (see figure) consisting of a precision reference voltage source, a comparator and a timing circuit will monitor the supply voltage and send a signal to the processor as soon as the supply falls below a preset level. The reset signal is generated only when the supply is re-established, and a delay time, set by the timer, has transpired.

PACKAGE OUTLINES

PLASTIC MINIDIP	SO-8J
	

Type	Sense Input Threshold Voltage	Temp. Range
TL7702ACP	Externally programmable	0°C to 70°C
TL7702AIP	Externally programmable	-40°C to 85°C
TL7705ACP	4.55V	0°C to 70°C
TL7705AIP	4.55V	-40°C to 85°C
TL7709ACP	7.60V	0°C to 70°C
TL7709AIP	7.60V	-40°C to 85°C
TL7712ACP	10.8V	0°C to 70°C
TL7712AIP	10.8V	-40°C to 85°C
TL7715ACP	13.5V	0°C to 70°C
TL7715AIP	13.5V	-40°C to 85°C

BLOCK DIAGRAM OF THE TL77_ _ A VOLTAGE SUPERVISOR CIRCUIT



*: TL7702A R1= 0Ω, R2= open; TL7705A R1= 7.8 KΩ, R2= 10 KΩ; TL7709A R1= 19.7 KΩ, R2= 10 KΩ, TL7712A R1= 32.7 KΩ, R2= 10 KΩ; TL7715A R1= 43.4 KΩ, R2= 10 KΩ

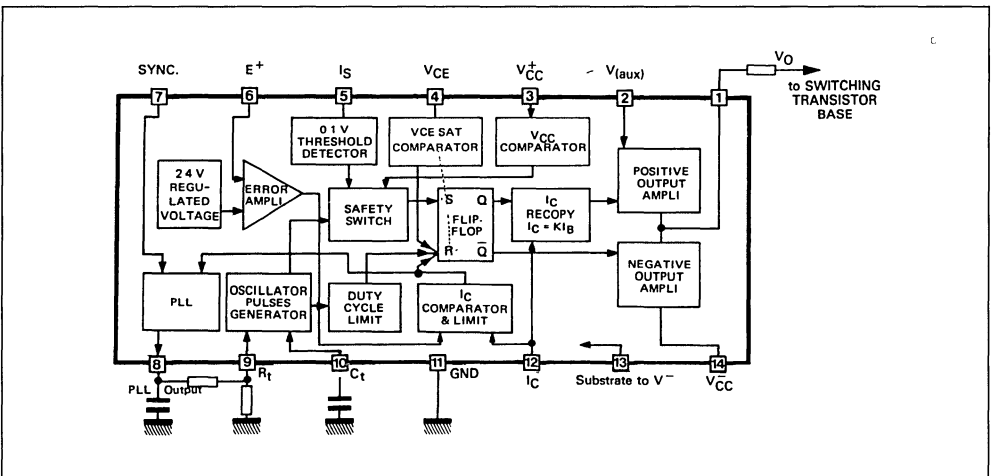
CURRENT MODE CONTROL

The current mode control circuits listed below are all suitable for use in single ended smps design, either direct off line, or from a low voltage power source. The output power achieved will depend on

the power semiconductor used together with the controller. Single ended current mode smps are normally used in the power range 35W to 250W.

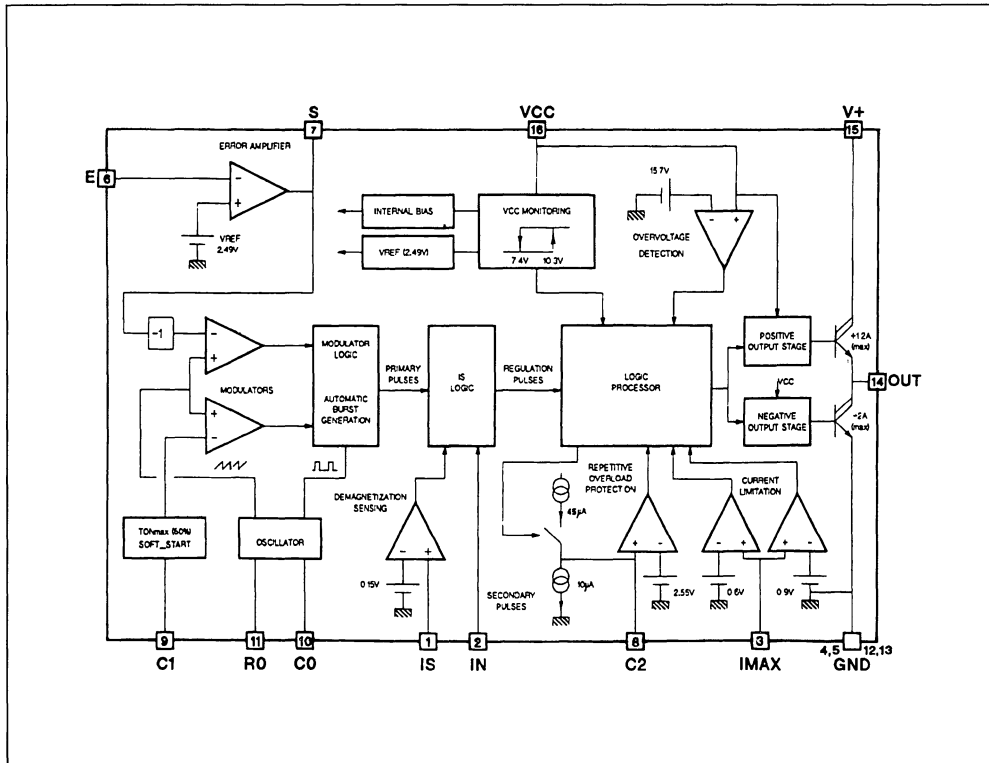
Parameter	UC3842	UC3843	UC3844	UC3845	TEA2018A	TEA2019
Reference voltage tolerance, +/- %	1	1	1	1	2.4	4
PWM latch.	Y	Y	Y	Y	Y	Y
Start-up voltage threshold, V	16	8.4	16	8.4	6.0	5.8
Shutdown voltage threshold, V	10	7.6	10	7.6	4.9	4.9
Remote shutdown terminal	Y	Y	Y	Y	Y	Y
Output current, +/- A (peak value), +/- A	0.2	0.2	0.2	0.2	0.5	0.5
	1.0	1.0	1.0	1.0	1.0	1.0
Direct drives:	PMOS	Y	Y	Y	N	N
	Bipolar	Y	Y	Y	Y	Y
Max. oscillator frequency KHz.	500	500	500	500	40	40
Oscillator synchronisation	-	-	-	-	-	PLL
Deadtime control	Y	Y	Y	Y	Y	Y
Peak current limit.	Y	Y	Y	Y	Y	Y
Start-up current, mA	0.5	0.5	0.5	0.5	1.0	1.0

BLOCK DIAGRAM UC 3842/3/4/5



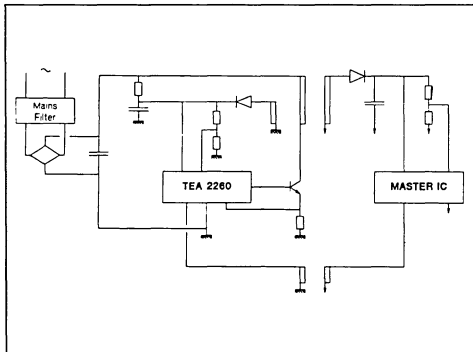
CURRENT MODE CONTROL

BLOCK DIAGRAM TEA 2260



MASTER-SLAVE CONTROL PRINCIPLE

Switched mode power supplies using the master-slave control principle offer a solution to some common problems: Good load regulation is achieved as the output voltage is sensed directly by the "master". The isolation interface is simple and is not a critical part of the design. Normally, either a feedback winding on the switched mode transformer or an opto-coupler is used to transfer the feedback signal across the isolation interface. The slave circuit directly drives, and protects, the primary switching device. The power supply can be easily synchronised to a secondary circuit. Systems requiring "stand-by" operation are more easily implemented.

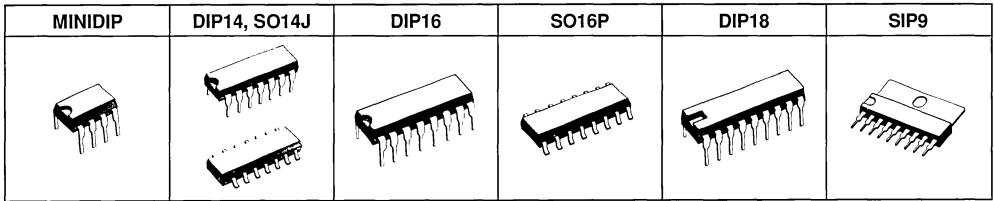


VOLTAGE MODE CONTROL

These control circuits contain the h.f. oscillator, voltage reference, error amplifier, PWM comparator, protection and interface circuitry required in smps applications. The SGS524/25A/27A circuits are designed for use in either half-bridge or push-pull circuit configurations, but can be easily adapted

to single ended circuits too. UC3840 and TDA4601 are intended for use in single ended circuit configuration (flyback or forward). The single ended controllers are used in power supplies delivering 30W to 150W. The SGS3524/25A/27A can be used to control smps with output power into the KW range.

PACKAGE OUTLINES:

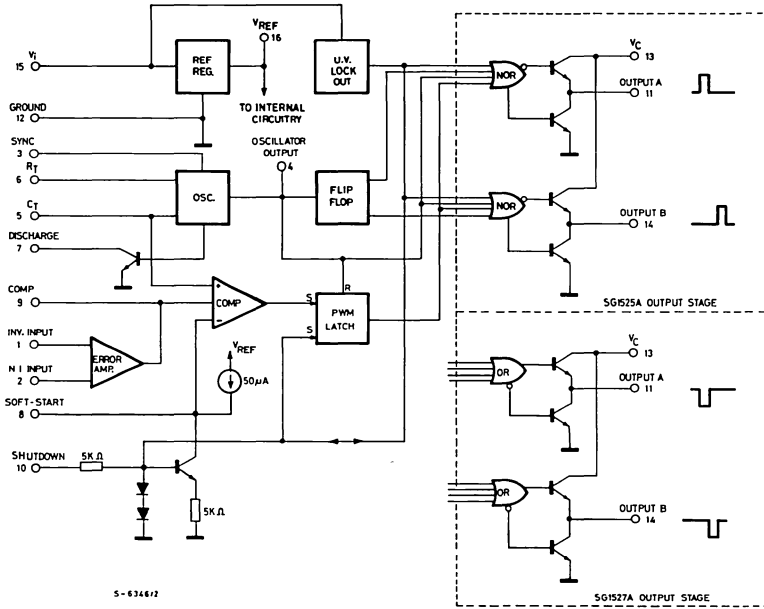


Parameter	SG3524	SGS3525A	SGS3527A	UC3840	TDA4601	TEA517D	TEA2164	TEA2260
Reference voltage tolerance, +/- %	8	2	2	2	5	2	-	2.5
Soft start terminal	-	Y	Y	Y	-	-	-	-
PWM latch.	-	Y	Y	Y	-	-	Y	Y
Start-up voltage threshold, V	-	-	-	-	-	4.0	9.0	10.3
Shutdown voltage threshold, V	-	-	-	-	-	3.9	6.2	7.4
Under voltage lock out	-	Y	Y	Y	Y	-	-	-
Pulse by pulse current limit	-	-	-	Y	Y	-	-	-
Remote shutdown terminal	Y	Y	Y	Y	Y	Y	-	Y
Output current, +/- A	0.05	0.1	0.1	0.2/0.4	1.5	0.1/0.06	1.2/1.7	1.2/2.0 1.5/2.5
Peak value, +/- A	0.1	0.5	0.5	-	1.5	-	N	N
Direct drives: MOS	Y	Y	(transformer coupled)	Y	N	-	Y	Y
Bipolar	Y	Y	-	Y	Y	250	50	100
Feedforward	-	-	-	Y	-	-	-	-
Max. oscillator frequency KHz.	300	500	500	500	75 (variable f mode)	250	50	100
Oscillator synchronisation	-	Y	Y	Y	N	Y	Y	Y
Deadtime control	-	Y	Y	Y	Y	-	-	Y
Start-up current, mA	8	8	8	4	2.4	-	0.8	0.7
Package	DIP16, SO16P			DIP18	DIP18, SIP9	Minidip	DIP16	

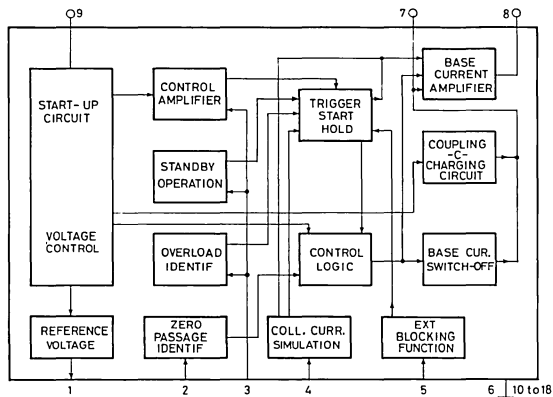
VOLTAGE MODE CONTROL

BLOCK DIAGRAMS:

SG3525A/SG3527A



TEA 4601



SEMICUSTOM CIRCUIT

The Semicustom solution offers the advantages of Design Security and reduced component count when compared to a solution using standard components. It offers both reduced development time and cost compared to the full custom I.C. solution. SGS-THOMSON Analog Cells and Arrays technologies allow cost effective integration of power supply control and peripheral circuit functions with short turn around times.

The Polyuse J (TSFJ series) uses a mixed analog/digital bipolar technology and is offered in five array sizes comprising between 468 and 2436 components.

A mixed Analog/Digital standard cell solution can be

implemented in CMOS technology (TSGSM series). Cells - functional blocks - currently in our cell library include:

PNP and NPN transistor./ Power-on reset function.

N and P channel MOS transistors./ Timer.

Operational amplifiers./ D/A and A/D converters.

Transconductance amplifier./ CMOS logic gates.

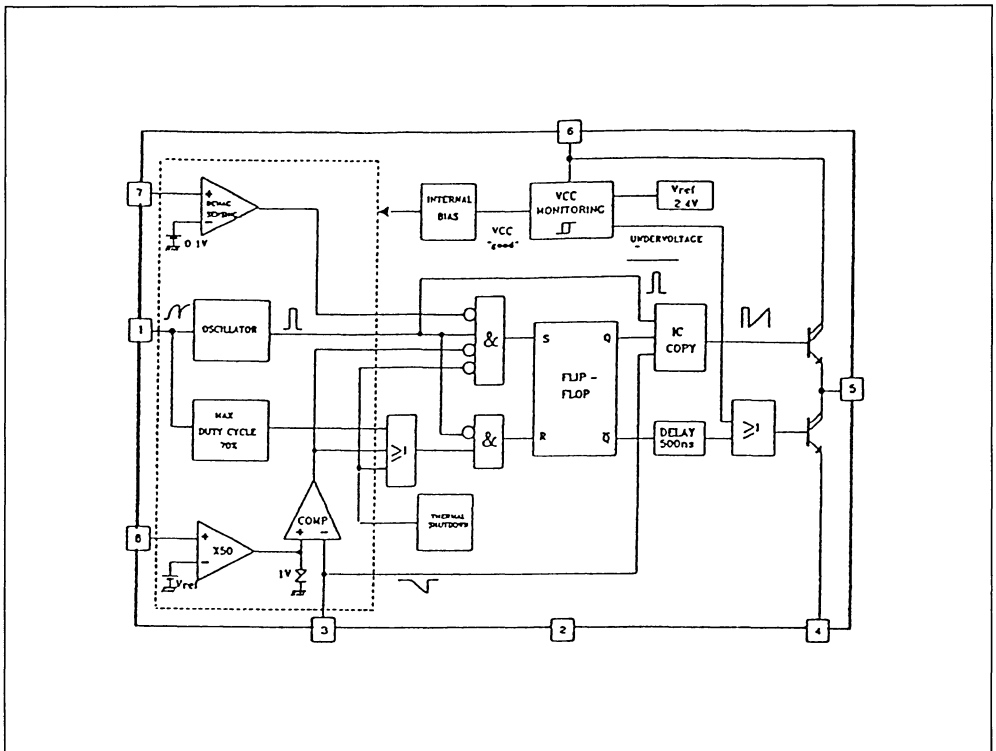
Comparators./ D type latches.

Oscillators./ Input/Output buffers.

Voltage reference./ Counters.

Semicustom circuit design support is provided from regional design centres across the world.

TYPICAL PRODUCT APPLICATION OF POLYUSE J



STANDARD CIRCUITS

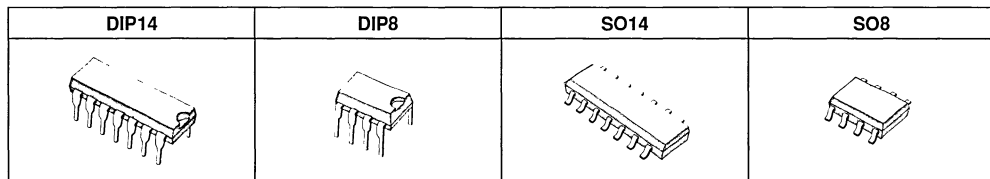
Dedicated Power Supply control and peripheral functions will not always meet the application requirement. Standard I.C.s are used to complement the dedicated functions when a Semicustom, or a full custom solution cannot be justified.

Today, the best speed/power consumption ratio is

achieved using CMOS linear and digital standard circuits.

SGS-THOMSON offers a range of CMOS Op Amps and Comparators in addition to one of the largest ranges of HCMOS logic circuits -176 types currently available with an additional 34 types scheduled for release.

PACKAGE OUTLINES:



CMOS OPERATIONAL AMPLIFIERS

Type	Description		I _{CC} each (μA.)	GBP (MHz)	
TS271	A,B	Single	Programmable bias current.	10 to 800	0.1 to 2.3
TS272	A,B	Dual	High speed.	1000	3.5
TS27M2	A,B	Dual	Medium speed.	150	1.0
TS27L2	A,B	Dual	Low power.	10	0.1
TS274	A,B	Quad	High speed.	1000	3.5
TS27M4	A,B	Quad	Medium speed.	150	1.0
TS27L4	A,B	Quad	Low power.	10	0.1

Note: Suffix "A" indicates a max. input offset voltage of 5 mV.

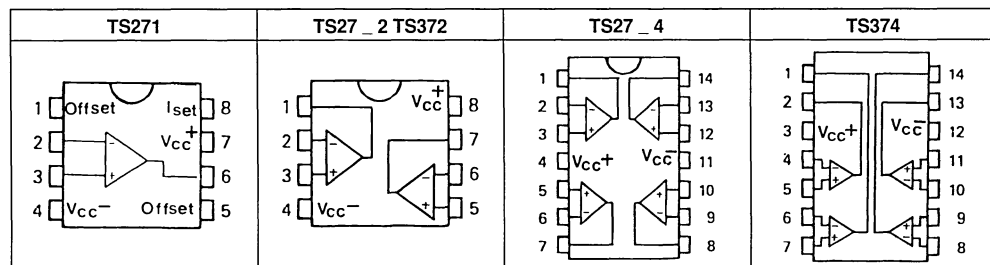
Suffix "B" indicates a max. input offset voltage of 2 mV.

No suffix is the standard part with 10 mV max. input offset voltage.

CMOS COMPARATORS

Type	Description	I _{CC} each. μA.	Response Time (ns)
TS372	Dual, Low power.	150	200
TS374	Quad, Low power.	150	200

PIN CONNECTION DIAGRAMS:



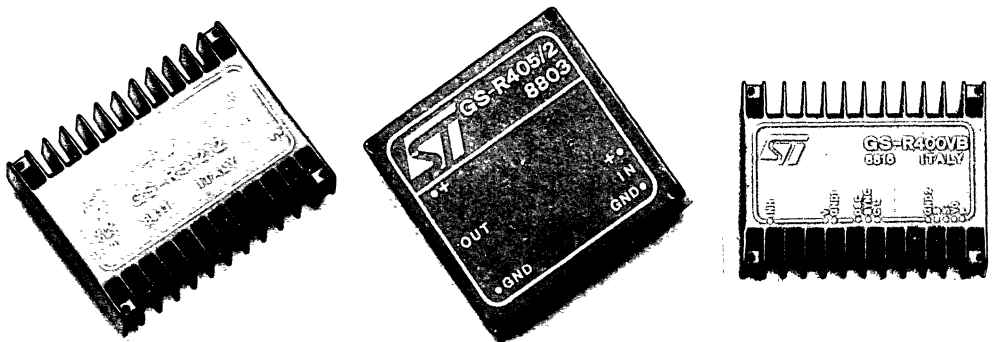
SWITCHING REGULATOR MODULES

Compact, lightweight, standard sized stepdown regulators offering a solution to a wide range of applications including battery powered equipment, peripheral equipment, modems and point of sale terminals. The GS-R400 family. Supplied in finned,

aluminium cases, have "soft start", "remote sense", logic level "inhibit", crowbar and short circuit protection, built-in. The GS-R400/2 family are supplied in a reduced size module (2.0 by 2.0 by 0.6 inches) giving a power density of 24 watts/in.
GS-M51212 is for Modem Application.

INPUT VOLTAGE RANGE (V _{DC})	TYPE	OUTPUT Volt/A	OUT 2 Volt/ma	OUT 3 Volt/ma	Dimensions. L • W • H (mm)
+12/0/-12 or 9-0-9 V _{AC}	GS-M51212	5/2	+12/125	-12/125	101,6 • 50,8 • 16,5
9 ÷ 40	GS-R400V/2	5,1 ÷ 24/2	-	-	50,8 • 50,8 • 14,7
9 ÷ 40	GS-R405/2	5,1/4	-	-	50,8 • 50,8 • 14,7
16 ÷ 40	GS-R412/2	12/3	-	-	50,8 • 50,8 • 14,7
28 ÷ 40	GS-R424/2	24/2	-	-	50,8 • 50,8 • 14,7
9 ÷ 46 ⁽¹⁾	GS-R400V	5,1 ÷ 40/4	-	-	85,5 • 67 • 21,3
9 ÷ 46 ⁽²⁾	GS-R400VB	5,1 ÷ 40/4	-	-	85,5 • 67 • 21,3
9 ÷ 46 ⁽³⁾	GS-R405S	5,1/4	-	-	85,5 • 67 • 21,3
9 ÷ 46	GS-R405	5,1/4	-	-	85,5 • 67 • 21,3
16 ÷ 46	GS-R412	12/4	-	-	85,5 • 67 • 21,3
19 ÷ 46	GS-R415	15/4	-	-	85,5 • 67 • 21,3
28 ÷ 46	GS-R424	24/4	-	-	85,5 • 67 • 21,3
9 ÷ 46 ⁽³⁾	GS-R51212	5,1/3,5	+12/100	-12/100	85,5 • 67 • 21,3

- Notes: 1) User programmable unit
 2) User programmable and synchronizable unit
 3) Power-on reset output



DC-DC CONVERTERS WITH ISOLATED OUTPUTS

Typical application areas include on-card regulation for industrial controls, telecomm networks, cellular and portable telecomm systems, Lan node supply. The range of modules described below have from

500V to 3000V isolation between input and output terminals and deliver between 2W and 30W to the load.

OUTPUT POWER	INPUT VOLTAGE RANGE (V _{DC})	SINGLE OUTPUT TYPE	OUTPUT Volt/mA	DUAL OUTPUT TYPE	OUT 1 Volt/mA	OUT 2 Volt/mA	DIMENSIONS L · W · H (mm)
2W	39 ÷ 59	GS-2148-28	28/60	—	—	—	33 · 33 · 16,5
2W	11,28 ÷ 15,75	GS-2112-9	9/250	—	—	—	33 · 33 · 10,9
2W	9,50 ÷ 15,75	GS-2112-9A	9/250	—	—	—	35,6 · 21,6 · 14
2W	4,50 ÷ 5,50	GS-215-9	9/250	—	—	—	35,6 · 21,6 · 14
2W	4,50 ÷ 15,75	GS-21X-9	9/250	—	—	—	35,6 · 21,6 · 14
2W	4,75 ÷ 5,25	—	—	GS-215-D5	+5/200	-5/200	50,8 · 25,4 · 11
2W	4,75 ÷ 5,25	—	—	GS-215-D12	+12/100	-12/100	50,8 · 25,4 · 11
3W	4,75 ÷ 5,25	GS-315-3.3	3,3/750	—	—	—	33 · 33 · 16,5
3W	4,75 ÷ 5,25	GS-315-5.2	5,2/600	—	—	—	33 · 33 · 16,5
25W	36,0 ÷ 72,0	GS-T25-0500	5/5000	—	—	—	116 · 65 · 21,1
27W	36,0 ÷ 72,0	GS-T27-0600	6/4500	—	—	—	116 · 65 · 21,1
30W	36,0 ÷ 72,0	GS-T30-1200	12/2500	—	—	—	116 · 65 · 21,1
30W	36,0 ÷ 72,0	GS-T30-1500	15/2000	—	—	—	116 · 65 · 21,1

OUTPUT POWER	INPUT VOLTAGE RANGE (V _{DC})	TRIPLE OUTPUT TYPE	OUT 1 Volt/mA	OUT 2 Volt/mA	OUT 3 Volt/mA	DIMENSIONS L · W · H (mm)
1W	4,7 ÷ 5,3	GS-115-5D15	+5/20	+15/15	-15/15	33 · 33 · 16,5
2W	4,7 ÷ 5,3	GS-215-5D15	+5/50	+15/70	-15/70	33 · 33 · 16,5
5W	21,6 ÷ 30,0	GS-5124-5D15	+5/250	+15/125	-15/125	50,8 · 38,1 · 19



SGS – THOMSON DATABOOKS AND APPLICATION MANUALS

DATABOOKS

Power MOS Devices Databook, 1st Edition, 1988.
(Order Code: DBPOWERMOSST/1)

Power Bipolar Transistors Databook, 1st Edition, 1989.
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Thyristors and Triacs Databook, 1st Edition, 1989.
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The L4970 Switching Regulator IC Family
Designer's Databooklet, 1989.
(Order Code: BKL4970FA/0489)

APPLICATIONS MANUALS

Smart Power Applications Manual, 1st Edition,
1989. (Order Code: AMSMARTPOWST/1)

Thyristors and Triacs Application Manual, 1st Edition,
1989. (Order Code: AMTHYST/1)

Power Transistors Application Manual, 1st Edition,
1989. (Order Code: AMPOWTRANST/1)

EVALUATION BOARDS.

We have developed a range of circuit boards to assist the designer in evaluation of several of the circuits described in this selection guide. The use of an L4970 evaluation board, for example, can greatly reduce development and printed circuit board rework time. Ask your SGS-THOMSON sales representative, or franchised distributor, for further details.

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Cover design by Keit & Koppel, Segrate, Italy
Typesetting and layout on Desk Top Publishing
by SERVOFFSET, Milano, Italy
Printed by Garzanti, Cernusco S.N., Italy

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