SHORTFORM

SEMICONDUCTOR PRODUCTS

SEMICONDUCTOR PRODUCTS

Phoenix, Arizona

COVER:
The SGS class one manufacturing plant in Phoenix, Arizona. This 330,000 square foot facility also houses SGS'American Headquarters and a development center.

SEMICONDUCTOR PRODUCTS

1987

This publication aims to provide condensed information on the vast range of devices currently produced by SGS. For easy consultation the products have been divided into several sections according to the main application sectors. Each device is presented along with its essential electrical characteristics. If further information is required SGS will provide individual data sheets for all the devices on request. All the data sheets for the individual devices are collected in "databooks". These can be acquired through SGS sales network.

NEC ELECTRONICS INC.

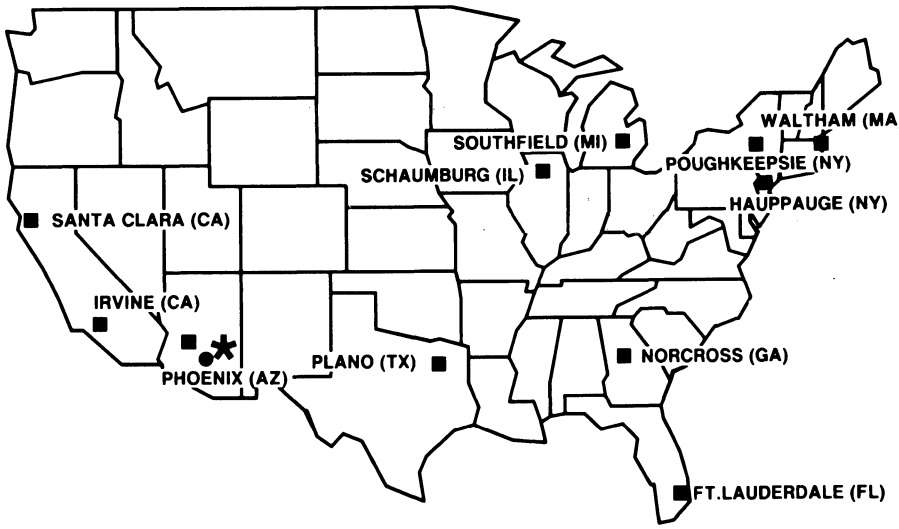
IDENTITY

Late in 1957, SGS was founded around a team of researchers who were already carrying out pioneer work in the field of semiconductors. From that small nucleus, the company has evolved into a Group of Companies, operating on a worldwide basis as a broad range semiconductor producer, with billings over 300 million dollars and employing over 9500 people.

The SGS Group of Companies has now reached a total of 11 subsidiaries, located in Brazil, France, Germany, Italy, Malta, Malaysia, Singapore, Sweden, Switzerland, United Kingdom and the USA.

To go with its logo, the company takes the motto "Technology and Service", underlining the accent given to the development of state-of-the-art technologies and the corporate commitment to offer customers the best quality and service in the industry.

SGS IN NORTH AMERICA

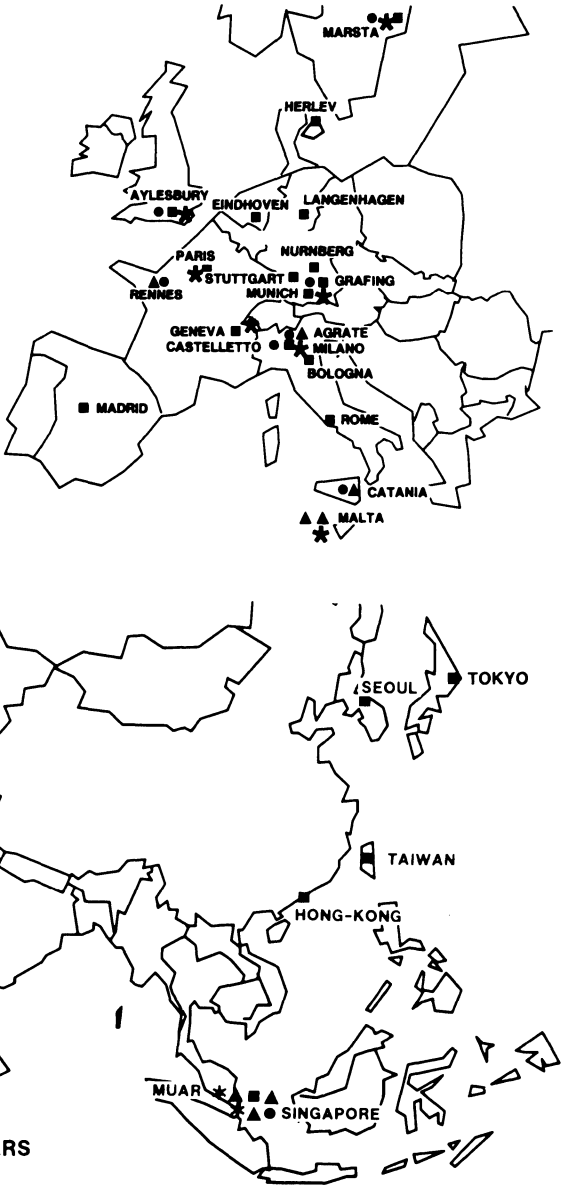


* **HEADQUARTERS**

■ **SALES OFFICES**

• **DESIGN CENTERS**

SGS IN EUROPE AND ASIA/PACIFIC



* HEADQUARTERS
▲ FACTORIES
■ SALES OFFICES
● DESIGN CENTERS

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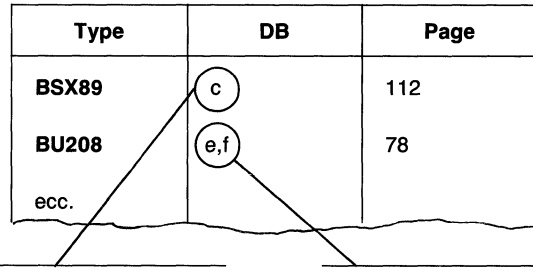
For more detailed information on each product, please refer to the relevant databooks, as indicated in the column "DB".



DB	DATABOOK	ORDER CODE
a	FASTSWITCH TRANSISTORS	DAFASTSWITCH/1
b	POWER MOS TRANSISTORS	DAPOWERMOS/1
c	SMALL SIGNAL TRANSISTORS	DASST/6
d	POWER SUPPLY APPLICATION MANUAL	DAPOSUAPMA/1
e	DISCRETE POWER DEVICES	DAPWR/6
f	TV AND MONITOR PRODUCTS	DAICSTVMO/1
g	INDUSTRY STANDARD LINEAR ICs	DAINDSTALI/1
h	GS-R MODULES APPLICATION MANUAL	DAGSRMAM/1
i	MOTION CONTROL APPLICATION MANUAL	DAPOLIACAPMA/1
l	TRANSPACK APPLICATION MANUAL	DATRAPMA/1
m	AUDIO AND RADIO PRODUCTS (Coming soon)	DAAUDIORADIO/1
n	MOS MEMORY PRODUCTS	DAMOSMEM/1
o	TELECOM PRODUCTS	DATELECOM/3
p	Z8500 UNIVERSAL PERIPHERALS	DAZ8500DB/1
r	Z8 MICROCOMPUTER FAMILY	DAZ8DB/3
s	Z80 MICROPROCESSOR FAMILY	DAZ80DB/5
t	Z8000 MICROPROCESSOR FAMILY	DAZ8000DB/2
u	M3870 MICROCOMPUTER FAMILY	DA3870BD/2
v	HIGH SPEED CMOS	DAHSCMOS/1
z	CMOS B SERIES	DACMOSB/3
x	LOW POWER SCHOTTKY	DALPSCHOTTKY/3
y	FAST RECOVERY POWER DIODES	DAFAREPOD1/1
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L4940	d,i	60	LB1012	o	29	LM293J	g	130
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TELECOMMUNICATIONS

TELEPHONE SET

SPEECH CIRCUITS

Type	Function	Technology	Package
LS285	Speech circuit	BIPOLAR	DIP-14
LS156	Speech circuit with MF interface (for piezoceramic transducers)	BIPOLAR	DIP-16
LS356	Speech circuit with MF interface (for dynamic transducers)	BIPOLAR	DIP-16
LS656	Low drop speech circuit with MF interface (for dynamic transducers)	BIPOLAR	DIP-16
LS288	Speech circuit with programmable gains	BIPOLAR	DIP-16
LS388	Low drop speech circuit with programmable gains	BIPOLAR	DIP-16
LS588	Speech circuit with programmable gains and power down	BIPOLAR	DIP-16
L3211	Very low drop speech circuit with MF interface	BIPOLAR	DIP-18
L3212	Very low drop speech circuit with MF interface (Japanese spec)	BIPOLAR	DIP-18
L3280	Very low drop speech circuit (Japanese spec)	BIPOLAR	DIP-14
PBL3726 Series	Mask programmable speech circuits	BIPOLAR	DIP-16/18

TONE RINGERS/RINGING DETECTORS

Type	Function	Technology	Package
LS1240 LS1240A LS1241	Two tone ringers	BIPOLAR	MINIDIP
L3240	Two tone ringers with push-pull output	BIPOLAR	MINIDIP
ML8204 ML8205	Two tone ringers	BIPOLAR	MINIDIP
M764	Programmable three tone ringer	C MOS	DIP-16/18
M774	Programmable three tone ringer	C MOS	DIP-14
LB1004 *	Full feature tone ringer and ringing detector	BIPOLAR	DIP-16
LB1005 *	General purpose tone ringer	BIPOLAR	MINIDIP
LB1006 *	Tone ringer detector	BIPOLAR	MINIDIP
M1094	Three tone ringer	C MOS	DIP-14

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TELEPHONE SET

MICROPHONE PREAMPLIFIERS

Type	Function	Technology	Package
LS188	Microphone preamplifier (dynamic and piezoceramic transducers)	BIPOLAR	MINIDIP
LB1027 *	Electret preamplifier	BIPOLAR	DIE (4 PADS)

INTEGRATED RECTIFIER BRIDGES

Type	Function	Technology	Package
LS346	Low drop polarity guard	BIPOLAR	MINIDIP
LH1028 *	Telephone interface circuit	BIPOLAR	MINIDIP

DUAL TONE MULTIFREQUENCY DIALLERS

Type	Function	Technology	Package
M761	Dual tone multifrequency generator	C MOS	DIP-16/18
M6569	Dual tone multifrequency generator with redial memory (21 digits)	C MOS	DIP-16
M6579	Dual tone multifrequency generator with redial memory (21 digits) and flash key	C MOS	DIP-16
PBD3535	Dual tone multifrequency generator	BIPOLAR	DIP-16

PULSE DIALLERS

Type	Function	Technology	Package
M2560	Pulse dialler	C MOS	DIP-16
M2561	Pulse dialler	C MOS	DIP-16
M3326	Pulse dialler	C MOS	DIP-18
M3327	Pulse dialler	C MOS	DIP-16

SPECIAL FUNCTIONS

Type	Function	Technology	Package
LB1020 *	Speakerphone kit	BIPOLAR	DIP-24
LB1021 *			DIP-18
LB1026 *	Voice frequency level expander	BIPOLAR	DIE (6 PADS)

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TELEPHONE SET

SINGLE CHIP TELEPHONE

Type	Function	Technology	Package
LB1007 *	Keypad controlled basic integrated single chip telephone with polarity guard	BIPOLAR	DIP-20
LB1008 *	Keypad controlled enhanced integrated single chip telephone	BIPOLAR	DIP-20
LB1009 *	Microprocessor controlled integrated single chip telephone	BIPOLAR	DIP-20

SUBSCRIBER CARD

SUBSCRIBER LINE INTERFACE CIRCUITS

Type	Function	Technology	Package
L3000	Line interface	BIPOLAR	SILWATT-15
L3010	Control unit with serial interface	BIPOLAR	CER DIP-28
L3025	Control unit with serial interface	BIPOLAR	CER DIP-28
L3030	Control unit with parallel/serial interface	BIPOLAR	CER DIP-28
L3121	Overvoltage Suppressor	BIPOLAR	SIP-4
LB1011 *	Telephone line battery feed	BIPOLAR	MINIDIP
LB1012 *	Telephone line battery feed with hook status output signal	BIPOLAR	POWERDIP-18 MULTIWATT-15
LB1013 *	85V dual op-amp	BIPOLAR	POWERDIP-18
LB1019 *	Telephone set power control	BIPOLAR	MINIDIP

CODEC

Type	Function	Technology	Package
M5116	μ-law PCM codec	C MOS	CER DIP-16
M5156	A-law PCM codec	C MOS	CER DIP-16

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SUBSCRIBER CARD

COMBO

Type	Function	Technology	Package
M5913	Synchronous PCM Combo	C MOS	CER DIP-20
M5914	Synchronous/Asinchronous/Signalling PCM Combo	C MOS	CER DIP-24
M5916	u-law PCM Combo	C MOS	CER DIP-16
M5917	A-law PCM Combo	C MOS	CER DIP-16

SPECIAL OPERATIONAL AMPLIFIERS

Type	Function	Technology	Package
LS204	High performance dual op-amp	BIPOLAR	MINIDIP
LS404	High performance quad op-amp	BIPOLAR	DIP-14

SWITCHING EQUIPMENTS

ANALOG CROSS POINTS

Type	Function	Technology	Package
M079	2x2x2 cross point	N MOS	DIP-14
M089	2x8 cross point matrix	N MOS	DIP/CER DIP-16
M093	12x8 cross point matrix	N MOS	DIP-40
LB1018 *	4x8 cross point array	BIPOLAR	DIP-16

DIGITAL CROSS POINT

Type	Function	Technology	Package
M088	256x256 Digital switching matrix	N MOS	CER DIP-40

SPECIAL FUNCTIONS

Type	Function	Technology	Package
M116	PCM conference circuit	N MOS	CER DIP-24

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DATA PROCESSING

LINE INTERFACE

Type	Function	Technology	Package
L545	Active trunk termination circuit	BIPOLAR	MINIDIP

LINE DRIVERS/LINE RECEIVERS/LINE TRANSCEIVERS

Type	Function	Technology	Package
LB1022 *	General purpose quad line receivers	BIPOLAR	DIP-16
LB1023 *	Dual line driver	BIPOLAR	DIP-16
LB1024 *	Digital signal transceiver	BIPOLAR	MINIDIP/DIP-16
LB1025 *	Dual bus transceiver	BIPOLAR	DIP-16

PROTECTION CIRCUITS

Type	Function	Technology	Package
L3100/3101	Monodirectional overvoltage/overcurrent protection circuits gate controlled	BIPOLAR	MINIDIP
L3121	Bidirectional overvoltage/overcurrent protection gate controlled	BIPOLAR	SIP-4
LS5120 **LS5060** **LS5018**	Bidirectional overvoltage protection circuits	BIPOLAR	MINIDIP
LB1010 *	Octal line protector	BIPOLAR	DIP-18

SOLID STATE RELAYS

Type	Function	Technology	Package
LH1061 *	Optically coupled ligh voltage solid state AC/DC relay	BIPOLAR	SPECIAL MINIDIP
LH1016 *	Optically coupled ligh voltage solid state AC/DC relay	BIPOLAR	SPECIAL MINIDIP
LH1056 *	Optically coupled ligh voltage solid state AC/DC relay	BIPOLAR	6-LEAD MINIDIP

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GENERAL PURPOSE

Type	Function	Technology	Package
LS025	Balanced modulator	BIPOLAR	TO-100/DIP-14
LS496	Quad relay driver	BIPOLAR	DIP-16
LBR Family *	Regulation control circuit family	BIPOLAR	MINIDIP/ DIP-16/ SO-8/SO-16
LS1014 *	Dual independent relay driver	BIPOLAR	MINIDIP
LB1017 *	Dual ligh speed analog switch	BIPOLAR	DIP-20

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SMALL SIGNAL TRANSISTORS

Polar.	Max ratings			Type	Characteristics				Package
	V_{CEO} (V)	I_C (mA)	P_{tot} (mW)		f_T (MHz)	NF (dB)	and P_G (dB)	@ f (MHz)	
NPN	15	25	200	**BFY90**	1400	4.5	8	800	TO-72
NPN	15	50	200	**2N3600**	1000	3	—	60	TO-72
NPN	15	50	200	**2N918**	900	3.5	22	200	TO-72
NPN	15	50	200	**BFX73**	900	6	—	60	TO-72
PNP	25	50	225	**BFR99A**	2300	3.5	8	800	TO-72
NPN	20	200	600	**2N3137**	750	—	7	250	TO-39
NPN	30	200	800	**BFR36**	1000	4	16	200	TO-39
NPN	20	400	1000	**2N5109**	1400	3	14	200	TO-39

AUTOMOTIVE

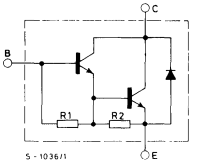
POWER TRANSISTORS FOR AUTOMOTIVE APPLICATIONS

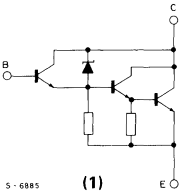
With a complete range of Power Transistor technologies and packages SGS can supply devices for every automotive application.
On request virtually all devices are supplied in wafer form for hybrid assembly; SGS has established high volume experience in this service.

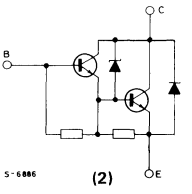
ELECTRONIC IGNITION DARLINGTONS

The SGS range of high voltage darlingtons for inductive discharge ignition systems covers applications from hand held power tools and small motors for a variety of applications through to the most sophisticated computer controlled systems. Their high gain makes them suitable for driving directly by SGS control circuits, see page 41.

INTERNAL SCHEMATIC DIAGRAMS







I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	NPN	h_{FE} min @ I_C (A)	@ V_{CE} (V)	V_{CEsat} (V) @ I_C (A)	@ I_B (mA)
6.00	450	400	60	SOT-82	**SGS911**	20.00	4.00	1.80	1.80	2.50	50
6.00	450	400	60	TO-220	**BU911**	20.00	4.00	1.80	1.80	2.50	50
6.00	500	450	60	SOT-82	**SGS912**	20.00	4.00	1.80	1.80	2.00	50
6.00	500	450	60	TO-220	**BU912**	20.00	4.00	1.80	1.80	2.00	50
8.00	650	400	70	TO-220	**SGSD00020**(1)**	7000.00	1.00	5.00	4.00	3.00	3
10.00	450	400	60	ISOWATT218	**SGSI921**	50.00	7.00	1.80	1.80	5.00	50
10.00	450	400	105	TO-220	**BU921T**	50.00	7.00	1.80	1.80	5.00	50
10.00	450	400	105	SOT-93	**BU921P**	50.00	7.00	1.80	1.80	5.00	50
10.00	450	400	125	TO-3	**BU921**	50.00	7.00	1.80	1.80	5.00	50
10.00	500	450	60	ISOWATT218	**SGSI922**	50.00	7.00	1.80	1.80	5.00	50
10.00	500	450	105	TO-220	**BU922T**	50.00	7.00	1.80	1.80	5.00	50
10.00	500	450	105	SOT-93	**BU922P**	50.00	7.00	1.80	1.80	5.00	50
10.00	500	450	125	TO-3	**BU922**	50.00	7.00	1.80	1.80	5.00	50
15.00	350*	350	60	ISOWATT218	**SGSI931Z** +(2)	100.00	7.00	1.60	1.80	8.00	100
15.00	350*	350	150	SOT-93	**BU931ZP** +(2)	100.00	7.00	1.60	1.80	8.00	100
15.00	350*	350	175	TO-3	**BU931Z** +(2)	100.00	7.00	1.60	1.80	8.00	100
15.00	450	400	60	ISOWATT218	**SGSI931R** +	40.00	10.00	1.80	1.80	8.00	100
15.00	450	400	105	SOT-93	**BU931RP** +	40.00	10.00	1.80	1.80	8.00	100
15.00	450	400	175	TO-3	**BU931R**	40.00	10.00	1.80	1.80	8.00	100
15.00	500	450	60	ISOWATT218	**SGSI932R** +	40.00	10.00	1.80	1.80	8.00	100
15.00	500	450	105	SOT-93	**BU932RP** +	53.00	8.00	1.80	1.80	8.00	150
15.00	500	450	175	TO-3	**BU932R** +	53.00	8.00	1.80	1.80	8.00	150

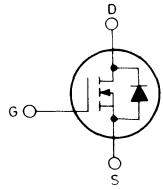
* $V_{CBO} = V_{CEO}$ due to the action of the integrated zener clamp
** TRILINTON device
\+ Specially designed for regulated current applications

POWER TRANSISTORS

LOW VOLTAGE POWER MOS DEVICES

In the automotive environment the rapid implementation of electronic control systems calls for a large variety of loads to be driven. SGS offers a wide variety of packages and both unipolar and bipolar technologies suitable for lamp, motor and solenoid driving as well as the classic alternator regulator function. The following are a selection of some of the most popular devices.

INTERNAL SCHEMATIC DIAGRAM



SEF ≡ IRF
SEFP ≡ MTP
SEFM ≡ MTM

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω) @	I_D (A)	Package	N-Channel	$I_{D}max$ (A)	P_{tot} (W)	$g_{fs(min)}$ (mho)	$C_{iss(max)}$ (pF)
50	0.60	2.50	SOT-82	**SGSP252**	5.00	40	1.50	250
50	0.60	2.50	TO-220	**SGSP352**	5.00	50	1.50	250
50	0.60	2.50	TO-39	**SGSP152**	5.00	15	1.50	250
50	0.30	3.50	SOT-82	**SGSP258**	7.00	40	1.50	270
50	0.30	3.50	TO-220	**SGSP358**	7.00	50	1.50	270
50	0.30	2.50	TO-39	**SGSP158**	5.00	15	1.50	270
50	0.13	5.00	SOT-82	**SGSP222**	10.00	50	3.00	550
50	0.13	5.00	SOT-93	**SGSP422**	10.00	75	3.00	550
50	0.13	5.00	TO-220	**SGSP322**	10.00	75	3.00	550
50	0.13	5.00	TO-3	**SGSP522**	10.00	75	3.00	550
50	0.13	3.50	TO-39	**SGSP122**	7.00	15	2.50	550
50	0.06	12.00	SOT-93	**SGSP482**	24.00	125	5.00	1400
50	0.06	12.00	TO-220	**SGSP382**	24.00	100	5.00	1400
50	0.06	12.00	TO-3	**SGSP582**	24.00	125	5.00	1400
50	0.04	15.00	SOT-93	**SGSP487**	40.00	125	6.00	1900
50	0.04	15.00	TO-220	**SGSP387**	40.00	125	6.00	1900
50	0.04	15.00	TO-3	**SGSP587**	40.00	125	6.00	1900
50	0.03	20.00	SOT-93	**SGSP492**	40.00	150	10.00	2500
50	0.03	20.00	TO-3	**SGSP592**	40.00	150	10.00	2500
60	0.60	2.50	SOT-82	**SGSP251**	5.00	40	1.50	250
60	0.60	2.50	TO-220	**SGSP351**	5.00	50	1.50	250
60	0.60	2.50	TO-39	**SGSP151**	5.00	15	1.50	250
60	0.30	3.50	SOT-82	**SGSP257**	7.00	40	1.50	270
60	0.30	3.50	TO-220	**SGSP357**	7.00	50	1.50	270
60	0.30	2.50	TO-39	**SGSP157**	5.00	15	1.50	270
60	0.13	5.00	SOT-82	**SGSP221**	10.00	50	3.00	550
60	0.13	5.00	SOT-93	**SGSP421**	10.00	75	3.00	550
60	0.13	5.00	TO-220	**SGSP321**	10.00	75	3.00	550
60	0.13	5.00	TO-3	**SGSP521**	10.00	75	3.00	550
60	0.13	3.50	TO-39	**SGSP121**	7.00	15	2.50	550
60	0.06	12.00	SOT-93	**SGSP481**	24.00	125	5.00	1400
60	0.06	12.00	TO-220	**SGSP381**	24.00	100	5.00	1400

POWER TRANSISTORS

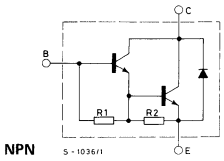
LOW VOLTAGE POWER MOS DEVICES (Continued)

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω) @	I_D (A)	Package	N-Channel	$I_D$max (A)	P_{tot} (W)	$g_{fs(min)}$ (mho)	$C_{iss(max)}$ (pF)
60	0.06	12.00	TO-3	**SGSP581**	24.00	125	5.00	1400
60	0.05	20.00	SOT-93	**SGSP491**	40.00	150	10.00	2500
60	0.05	20.00	TO-3	**SGSP591**	40.00	150	10.00	2500
60	0.04	15.00	SOT-93	**SGSP486**	40.00	125	6.00	1900
60	0.04	15.00	TO-220	**SGSP386**	40.00	125	6.00	1900
60	0.04	15.00	TO-3	**SGSP586**	40.00	125	6.00	1900

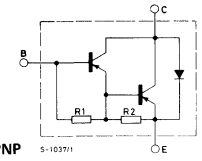
HIGH GAIN BIPOLAR DARLINGTONS

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	h_{FE} min @	I_C (A) @	V_{CE} (V) @	V_{CEsat} (V) @	I_C (A) @	I_B (mA) @
2.00	80	80	50	SOT-82	**SGS111**	**SGS116**	1000.00	1.00	4.00	2.50	2.00	8
2.00	100	100	50	SOT-82	**SGS112**	**SGS117**	1000.00	1.00	4.00	2.50	2.00	8
5.00	80	80	65	SOT-82	**SGS121**	**SGS126**	1000.00	3.00	3.00	2.00	3.00	12
5.00	100	100	65	SOT-82	**SGS122**	**SGS127**	1000.00	3.00	3.00	2.00	3.00	12
6.00	80	80	60	SOT-82	**BD333**	**BD334**	750.00	3.00	3.00	2.00	3.00	12
6.00	100	100	60	SOT-82	**BD335**	**BD336**	750.00	3.00	3.00	2.00	3.00	12
8.00	80	80	60	TO-220	**BDX53B**	**BDX54B**	750.00	3.00	3.00	2.00	3.00	12
8.00	80	80	65	SOT-82	**SGS131**	**SGS136**	1000.00	4.00	4.00	2.00	4.00	16
8.00	80	80	70	TO-220	**TIP131**	**TIP136**	1000.00	4.00	4.00	2.00	4.00	16
8.00	80	80	80	TO-220	**TIP101**	**TIP106**	1000.00	3.00	4.00	2.00	3.00	16
8.00	100	100	60	TO-220	**BDX53C**	**BDX54C**	750.00	3.00	3.00	2.00	3.00	12
8.00	100	100	65	SOT-82	**SGS132**	**SGS137**	1000.00	4.00	4.00	2.00	4.00	16
8.00	100	100	70	TO-220	**TIP132**	**TIP137**	1000.00	4.00	4.00	2.00	4.00	16
8.00	100	100	80	TO-220	**TIP102**	**TIP107**	1000.00	3.00	4.00	2.00	3.00	6
10.00	60	60	65	SOT-82	**SGS6387**		1000.00	5.00	3.00	2.00	5.00	10
10.00	60	60	65	TO-220	**2N6387**		1000.00	5.00	3.00	2.00	5.00	10
10.00	80	80	65	SOT-82	**SGS6388**		1000.00	5.00	3.00	2.00	5.00	10
10.00	80	80	65	TO-220	**2N6388**		1000.00	5.00	3.00	2.00	5.00	10
10.00	80	80	125	SOT-93	**TIP141**	**TIP146**	1000.00	5.00	4.00	3.00	10.00	40
10.00	100	100	125	SOT-93	**TIP142**	**TIP147**	1000.00	5.00	4.00	3.00	10.00	40
12.00	80	80	80	TO-220	**BDW93B**	**BDW94B**	750.00	5.00	3.00	2.00	5.00	20
12.00	100	100	80	TO-220	**BDW93C**	**BDW94C**	750.00	5.00	3.00	2.00	5.00	20
20.00	80	80	160	TO-3	**2N6283**	**2N6286**	750.00	10.00	3.00	3.00	20.00	200
25.00	80	80	130	SOT-93	**SGSD100**	**SGSD200**	300.00	20.00	3.00	1.75	10.00	400
30.00	60	60	200	TO-3	**MJ11012**	**MJ11011**	1000.00	20.00	5.00	4.00	30.00	300
30.00	90	90	200	TO-3	**MJ11014**	**MJ11013**	1000.00	20.00	5.00	4.00	30.00	300

INTERNAL SCHEMATIC DIAGRAMS



NPN



PNP

INTEGRATED CIRCUITS

IGNITION CONTROL

Type	Function	Package
L482	Controller (hall effect pickup)	DIP-16 and MICROWATT
L484	Controller (Magnetic pickup)	
L497	Controller (Hall effect pickup)	
L530	Interface (Hall/Magnetic)	

FUEL INJECTION CONTROL

Type	Function	Package
L583	Controller	DIP-16
L9335	Solenoid driver	PENTAWATT
L9336	Solenoid driver	PENTAWATT
L9342	Multipoint injector driver	DIP-24

ALTERNATOR REGULATORS

Type	Function	Package
L485	Voltage regulator	DIP-16 MICROWATT
L9480	One chip regulator	TO-3

POWER ACTUATORS

Type	Function	Package
L9305 **L9306**	Dual power comparators	DIP-16 MINIDIP
L9222	Quad transistor switch	DIP-16
L9350 **L9351**	Power drivers	PENTAWATT

SPECIAL FUNCTIONS

Type	Function	Package
M706	Analog car clock	MINIDIP
L586	Direction indicator driver	
L4620	Liquid level alarm	
L9700	Protection circuit	

POWER CONTROL

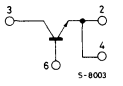
- MOTOR CONTROL
- DRIVERS
- SPECIAL FUNCTIONS

MOTOR CONTROL

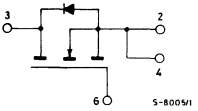
POWER TRANSISTORS FOR MOTOR CONTROL

The application of power transistors to motor control is growing rapidy. Factional HP motors are being used for robotics and automated handling. DC motors may be controlled by high frequency PWM techniques and AC motors by frequency synthesis; in both cases high power fast switching transistors are required together with fast recovery "free wheel" diodes with matching voltage and current capability. For low power applications SOT-93 (TO-218) and TO-3 devices may be adequate but as power levels rise paralleling these devices causes various problems. To overcome these difficulties SGS has developed the TRANSPACK (TO-240) power modules.
For small DC motors and stepper motors running from low voltage DC the General Purpose Transistors & Darlingtons (pages 113 to 118) or Power MOS (page 120) are suitable.

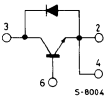
TRANSPACK CONFIGURATIONS



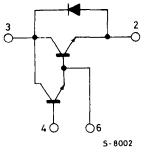
QUARTER BRIDGE TRANSISTOR
(1)



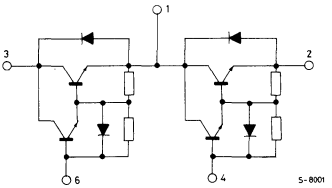
QUARTER BRIDGE POWER MOS
(2)



QUARTER BRIDGE TRANSISTOR
PLUS FREEWHEEL DIODE
(3)



QUARTER BRIDGE DARLINGTON
PLUS FREEWHEEL DIODE
(4)



HALF BRIDGE DARLINGTON
PLUS FREEWHEEL DIODE
(5)

POWER MODULES

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	Config.	h_{FE} min @ I_C (A)	@ V_{CE} (V)	V_{CEsat} (V) @ I_C (A)	@ I_B (mA)
23.00	1000	700	300	TO-240	**SGS15DB070D**	5	15.00	15.00	5.00	3.00	15.00	1.50
23.00	1200	800	300	TO-240	**SGS15DB080D**	5	15.00	15.00	5.00	3.00	15.0	1.50
37.00	1000	700	300	TO-240	**SGS25DB070D**	5	30.00	25.00	5.00	3.00	25.00	2.50
37.00	1200	800	300	TO-240	**SGS25DB080D**	5	30.00	25.00	5.00	3.00	25.00	2.50
45.00	500	400	300	TO-240	**SGS30DB040D**	5	40.00	30.00	5.00	3.00	30.00	2.00
45.00	600	450	300	TO-240	**SGS30DB045D**	5	40.00	30.00	5.00	3.00	30.00	2.00
45.00	1000	600	300	TO-240	**SGS30DA060D**	4	80.00	30.00	5.00	2.50	30.00	1.50
45.00	1200	700	300	TO-240	**SGS30DA070D**	4	80.00	30.00	5.00	2.50	30.00	1.50
60.00	850	450	300	TO-240	**SGS40TA045**	1	7.00	40.00	3.00	2.00	40.00	8.00
60.00	850	450	300	TO-240	**SGS40TA045D**	3	7.00	40.00	3.00	2.00	40.00	8.00
75.00	500	400	300	TO-240	**SGS50DB040D**	5	70.00	50.00	5.00	3.00	50.00	5.00
75.00	600	450	300	TO-240	**SGS50DB045D**	5	70.00	50.00	5.00	3.00	50.00	5.00
75.00	850	450	300	TO-240	**SGS50DA045D**	4	80.00	50.00	5.00	2.50	50.00	2.00
120.00	300	200	300	TO-240	**SGS80DA020D**	4	500.00	80.00	5.00	2.00	80.00	1.00
150.00*	300	250	300	TO-240	**SGS100DA025D**	4	500.00	100.00	5.00	2.00	100.00	1.00

MOTOR CONTROL

POWER MOS MODULES (Configuration 2)

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω) @	I_D (A)	Package	Type	$I_D$max (A)	P_{tot} (W)	$g_{fs(min)}$	$C_{iss(max)}$ (pF)
100	0.02	50.00	TO-240	**SGS100MA010D1**	100.00	375	50.00	7200
100*	0.01	75.00	TO-240	**SGS150MA010D1**	150.00	400	60.00	9000
500	0.25	15.00	TO-240	**SGS30MA050D1**	30.00	375	20.00	6500
500*	0.16	17.50	TO-240	**SGS35MA050D1**	35.00	400	20.00	8000

(*) indicates new products scheduled for introduction Q3 1986

The proven chips used in the TO-240 modules are available as individual devices.

INDIVIDUAL BIPOLAR DEVICES AS USED IN MODULES

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	h_{FE} min @	I_C (A)	V_{CE} (V)	V_{CEsat} (V) @	I_C (A)	I_B (mA)
12.00	650	400	150	SOT-93	**SGSD00030** Darlington	30.00	10.00	5.00	2.50	12.00	0.10
12.00	650	400	150	TO-3	**SGSD00031** Darlington	30.00	10.00	5.00	2.50	12.00	0.10
15.00	8.50	400	50	ISOWATT218	**SGSIV48**	5.00	15.00	5.00	1.50	10.00	2.00
15.00	850	400	150	SOT-93	**BUV48**	5.00	15.00	5.00	1.50	10.00	2.00
15.00	850	400	175	TO-3	**BUX48**	5.00	15.00	5.00	1.50	10.00	2.00
15.00	1000	450	50	ISOWATT218	**SGSIV48A**	5.00	12.00	5.00	1.50	8.00	1.60
15.00	1000	450	150	SOT-93	**BUV48A**	5.00	12.00	5.00	1.50	8.00	1.60
15.00	1000	450	175	TO-3	**BUX48A**	5.00	12.00	5.00	1.50	8.00	1.60
15.00	1200	700	50	ISOWATT218	**SGSIV48C**	2.50	10.00	3.00	1.50	6.00	1.50
15.00	1200	700	150	SOT-93	**BUV48C**	2.50	10.00	3.00	1.50	6.00	1.50
15.00	1200	700	175	TO-3	**BUX48C**	2.50	10.00	3.00	1.50	6.00	1.50
30.00	850	400	250	TO-3	**BUX98**	5.00	20.00	1.50	1.50	20.00	4.00
30.00	1000	450	250	TO-3	**BUX98A**	4.80	24.00	5.00	1.50	16.00	3.20
30.00	1200	700	250	TO-3	**BUX98C**	2.50	20.00	3.00	1.50	12.00	3.00
60.00	300	200	350	TO-3	**BUR51**	15.00	50.00	4.00	1.00	30.00	2.00

The darlington devices feature a turn-off speed up diode and are completly free of parasitic C-E diode.

INDIVIDUAL FAST DIODES AS USED IN POWER MODULES

I_{av} (A)	V_{rrm} (V)	I_{frm} (A)	P_{tot} (W)	Package	Type	V_f (max) (V) @	I_f (A)	t_{rr} (max) (ns)	I_f (max) (A) @	-di/dt (A/us)	V_r (V)
35.00	1200	500	90	DIOWATT2	**SGS35R120**	1.70	35.00	150	1.00	25.00	30
45.00	800	600	90	DIOWATT2	**SGS45R80**	1.50	45.00	125	1.00	50.00	30
60.00	400	700	90	DIOWATT2	**SGS60R40**	150	60.00	125	1.00	25.00	30

MOTOR CONTROL

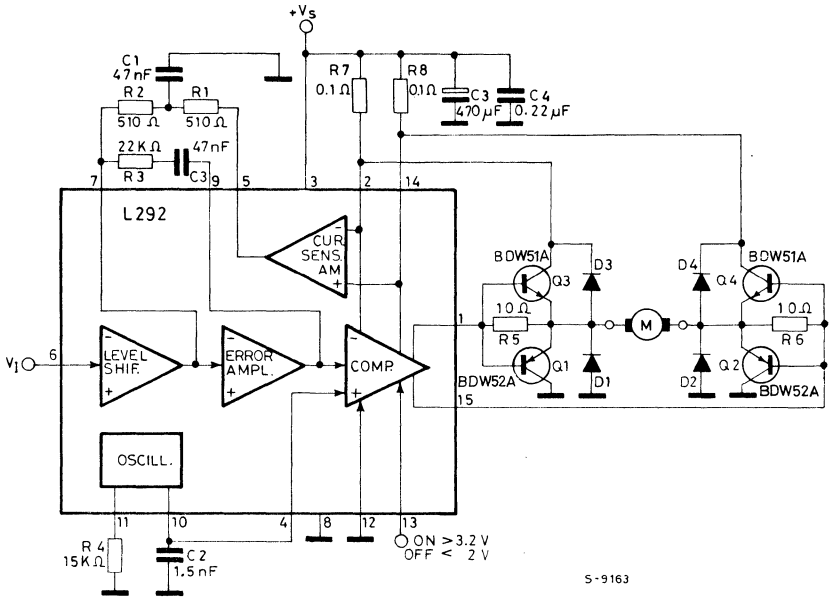
INDIVIDUAL POWER MOS DEVICES AS USED IN MODULES

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω)	@ I_D (A)	Package	Type	$I_D$max (A)	P_{tot} (W)	$g_{fs(min)}$	$C_{iss(max)}$ (pF)
100	0.08	15.00	ISOWATT218	**SGSIP471**	30.00 +	50	9.00	2200
100	0.08	15.00	SOT-93	**SGSP471**	30.00	150	9.00	2200
100	0.08	15.00	TO-3	**SGSP571**	30.00	150	9.00	2200
500	0.70	5.00	ISOWATT218	**SGSIP479**	10.00 +	150	5.00	1900
500	0.70	5.00	SOT-93	**SGSP479**	10.00	150	5.00	1900
500	0.70	5.00	TO-3	**SGSP579**	10.00	150	5.00	1900

The ISOWATT218™ isolated power package gives a simple solution to device mounting problems. It offers one hole mounting, may be easily paralleled and with 2500V AC isolation and long creepage distances makes it easy to achieve the standards required by VDE, UL, IEC etc. The power dissipation is equivalent to a non isolated SOT-93 (TO-218) device mounted with external electrical isolation.

+ Note: the I_D(max) may be subject to the same thermal limitations as a non isolated package mounted with external isolation on a heatsink.

8A SWITCH-MODE DRIVER FOR DC MOTORS



DRIVERS

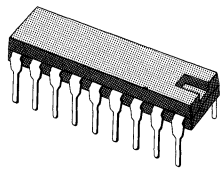
BRIDGE DRIVERS

Type	Function	Supply Voltage Max (V)	Package
L293 **L293C** **L293E**	Quad Push-Pull Driver	36 44 36	DIP-16 DIP-20 DIP-20
L293D	Quad Push-Pull Driver with clamp diodes	36	DIP-16
L298 **L298D**	Dual bridge driver Dual birdge driver with clamp diodes	50 50	MULTIWATT15
L6202*	1.5A bridge driver	60	DIP-18
L6203*	3.0 A bridge driver	60	MULTIWATT11
L6208	Dual bridge driver	24	MULTIWATT15
L6210*	Dual 1A schottky diode bridge	46	DIP-16
MC3479C	Stepper motor driver	18	DIP-16
PBL 3717A	Stepper motor driver	46	DIP-16

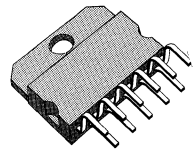
* In development

SWITCH-MODE DRIVERS

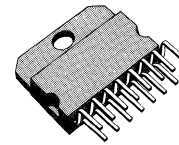
Type	Function	Supply Voltage Max (V)	Package
L292	Switch-mode DC Motor driver	36	MULTIWATT15
L294	Switch-mode solenoid driver	50	MULTIWATT11
L295	Dual Switch-mode driver	50	MULTIWATT15
L6212	Switch-mode 6A solenoid driver	50	MULTIWATT15



DIP-18



MULTIWATT11



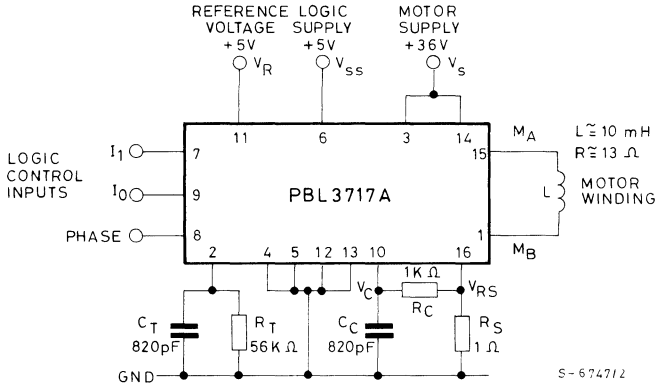
MULTIWATT15

SPECIAL FUNCTIONS

Type	Function	Supply Voltage Max (V)	Package
L290	Tachometer converter	±15	DIP-16
L291	5 bit D/A converter	±15	DIP-16
L297	Stepper motor controller	10	DIP-20
L297A	Stepper motor controller	10	DIP-20
L3654	Printer driver (8.5V)	9.5	DIP-16
L3654S	Printer driver (5V)	9.5	DIP-16
L5832	Solenoid controller	46	DIP-16
L6209*	3A bridge driver	46	MULTIWATT15
L6221A	Darlington array	50	DIP-16/MULT.15
L6222	Transistor array	50	DIP-16
L6230	Three phase brushless DC motor driver	18	MULTIWATT15
L6503	Hammer solenoid controller	7	DIP-20
L6504	Solenoid controller	10	DIP-14
L6506	Stepper motor controller	10	DIP-18

* In development

PBL3717A - APPLICATION CIRCUIT



POWER SUPPLY

DC-DC CONVERTERS

POWER TRANSISTORS FOR DC-DC CONVERTERS

SGS devices for use in DC-DC converters are very fast switching Planar devices and for operation at above 100kHz Power MOS devices are available. For operation from very high DC voltages see page 51, for extremely high power applications the TRANSPACK Power Modules (page 41) are suitable. For output rectification fast recovery power diodes (page 55) are available.
Suitable control circuits can be found on page 56.

FAST SWITCHING EPITAXIAL PLANAR POWER TRANSISTORS

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	NPN	h_{FE} min @	I_C (A) @	V_{CE} (V) @	V_{CEsat} (V) @	I_C (A) @	I_B (mA) @
4.00	200	125	31	TO-220	**D44Q1**	30.00	0.20	10.00	1.00	2.00	200.00
4.00	250	175	31	TO-220	**D44Q3**	30.00	0.20	10.00	1.00	2.00	200.00
4.00	300	225	31	TO-220	**D44Q5**	30.00	0.20	10.00	1.00	2.00	200.00
10.00	160	125	106	SOT-93	**BUX10P**	10.00	20.00	4.00	0.60	10.00	1000.00
20.00	220	160	150	TO-3	**BUX11N**	10.00	15.00	4.00	0.60	8.00	800.00
20.00	250	200	150	TO-3	**BUX11**	10.00	12.00	4.00	0.60	6.00	600.00
20.00	300	250	150	TO-3	**BUX12**	10.00	10.00	4.00	1.00	5.00	500.00
25.00	160	125	150	TO-3	**BUX10**	10.00	20.00	4.00	0.60	10.00	1000.00
40.00	250	200	250	TO-3	**BUV21**	10.00	25.00	4.00	0.60	12.00	1200.00
40.00	300	250	250	TO-3	**BUV22**	10.00	20.00	4.00	1.00	10.00	1000.00
50.00	160	125	250	TO-3	**BUV20**	10.00	50.00	4.00	0.60	25.00	2500.00
60.00	300	200	350	TO-3	**BUR51**	15.00	50.00	4.00	1.00	30.00	2000.00
60.00	350	250	350	TO-3	**BUR52**	15.00	40.00	4.00	1.80	25.00	2000.00
70.00	200	125	350	TO-3	**BUR50S**	15.00	50.00	4.00	1.00	35.00	2000.00

MEDIUM VOLTAGE N-CHANNEL POWER MOS TRANSISTORS

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω) @	I_D (A) @	Package	Type	$I_D$max (A)	P_{tot} (W)	$g_{fs(min)}$	$C_{iss(max)}$ (pF)
100	1.40	0.75	SOT-82	**SGSP201**	1.50	18	0.50	125
100	1.40	0.75	TO-220	**SGSP301**	1.50	18	0.50	125
100	1.40	0.75	TO-39	**SGSP101**	1.50	15	0.50	125
100	0.30	3.50	SOT-82	**SGSP211**	7.00	50	2.00	480
100	0.30	3.50	TO-220	**SGSP311**	7.00	75	2.00	480
100	0.30	3.50	TO-3	**SGSP511**	7.00	75	2.00	480
100	0.30	2.50	TO-39	**SGSP111**	5.00	15	2.00	480
100	0.15	8.00	ISOWATT218	**SGSIP461**	16.00*	50	4.50	1200
100	0.15	8.00	SOT-93	**SGSP461**	16.00	125	4.50	1200
100	0.15	8.00	TO-220	**SGSP361**	16.00	100	4.50	1200

* Note: I_D(max) may be subject to the same thermal limitations as a non isolated device mounted with external isolation on a heatsink.

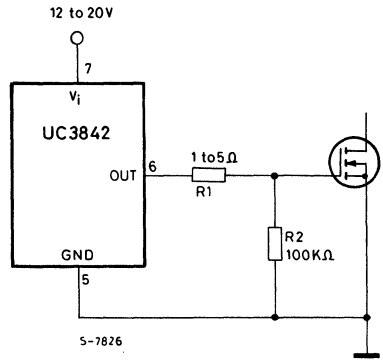
DC-DC CONVERTERS

MEDIUM VOLTAGE N-CHANNEL POWER MOS TRANSISTORS (Continued)

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω) @	I_D (A)	Package	Type	I_Dmax (A)	P_{tot} (W)	$g_{fs(min)}$	$C_{iss(max)}$ (pF)
100	0.15	8.00	TO-3	**SGSP561**	16.00	125	4.50	1200
100	0.08	15.00	ISOWATT218	**SGSIP471**	30.00*	50	9.00	2200
100	0.08	15.00	SOT-93	**SGSP471**	30.00	150	9.00	2200
100	0.08	15.00	TO-3	**SGSP571**	30.00	150	9.00	2200
200	0.75	3.00	SOT-82	**SGSP217**	6.00	50	1.50	500
200	0.75	3.00	TO-220	**SGSP317**	6.00	75	1.50	500
200	0.75	3.00	TO-3	**SGSP517**	6.00	75	1.50	500
200	0.75	2.00	TO-39	**SGSP117**	4.00	15	1.50	500
200	0.33	5.00	ISOWATT218	**SGSIP467**	10.00*	50	3.00	1200
200	0.33	5.00	SOT-93	**SGSP467**	10.00	125	3.00	1200
200	0.33	5.00	TO-220	**SGSP367**	10.00	100	3.00	1200
200	0.33	5.00	TO-3	**SGSP567**	10.00	125	3.00	1200
200	0.17	10.00	ISOWATT218	**SGSIP477**	20.00*	50	8.00	2200
200	0.17	10.00	SOT-93	**SGSP477**	20.00	150	8.00	2200
200	0.17	10.00	TO-3	**SGSP577**	20.00	150	8.00	2200
250	1.20	3.00	SOT-82	**SGSP216**	6.00	50	1.50	500
250	1.20	3.00	TO-220	**SGSP316**	6.00	75	1.50	500
250	1.20	3.00	TO-3	**SGSP516**	6.00	75	1.50	500
250	1.20	2.00	TO-39	**SGSP116**	4.00	15	1.50	500
250	0.45	5.00	ISOWATT218	**SGSIP463**	10.00*	50	3.00	1200
250	0.45	5.00	SOT-93	**SGSP463**	10.00	125	3.00	1200
250	0.45	5.00	TO-220	**SGSP363**	10.00	100	3.00	1200
250	0.45	5.00	TO-3	**SGSP563**	10.00	125	3.00	1200
250	0.22	10.00	ISOWATT218	**SGSIP473**	20.00*	50	8.00	2200
250	0.22	10.00	SOT-93	**SGSP473**	20.00	150	8.00	2200
250	0.22	10.00	TO-3	**SGSP573**	20.00	150	8.00	2200

* Note: I_D(max) may be subject to the same thermal limitations as a non isolated device mounted with external isolation on a heatsink.

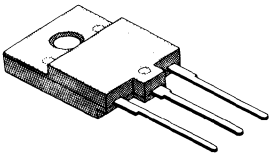
DIRECT POWER MOS DRIVE



OFF-LINE SWITCHING

POWER DISCRETES FOR OFF-LINE SWITCHING POWER SUPPLIES

SGS Power Discretes cover applications from low power low cost applications through multi kW units for large computer installations. The availability of bipolar power transistors, fast recovery power diodes and Power MOS with a choice of package styles enable an optimum solution to be found.
Matching PWM control circuits may be found on pages 56 to 58.
The new ISOWATT218 isolated power package gives a simple solution to device mounting problems. It offers one hole mounting, may be easily paralled and with 2500V AC isolation and long creepage distances makes it easy to achieve the standards required by VDE, UL, IEC etc. The power dissipation is equivalent to a non isolated SOT-93 (TO-218) device mounted with external electrical isolation. Both FASTSWITCH and Power MOS devices are available in this user friendly package.



ISOWATT218

The FASTSWITCH™ transistors are 3rd generation bipolar devices and are particularly cost effective for applications operating up to 70kHz. In addition the availability of 1200V devices offers extra margin for flyback topologies used at up to 50kHz.

MULTIEPITAXIAL MESA FASTSWITCH - I_{CM} 5 to 12A; V_{CEO} 400 to 450V

Suitable for 50KHz to 100KHz switching power supplied

NPN types

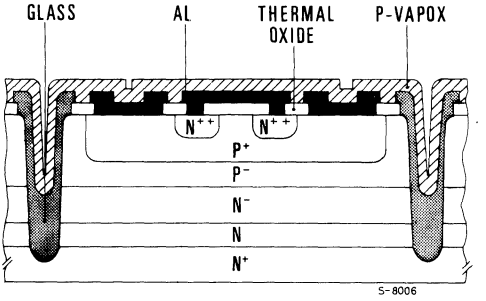
High voltage (V_{CBO} up to 1000V)

High power

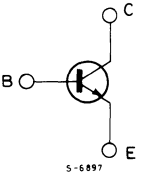
Very good $I_{s/b}$ and $E_{s/b}$ performance

Very high switching speed

Good stability



INTERNAL SCHEMATIC DIAGRAM

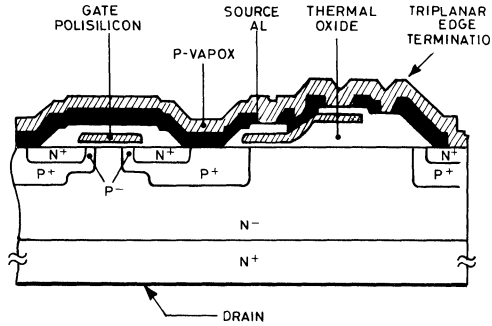


OFF-LINE SWITCHING

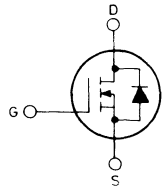
SGS Power MOS devices offer easy driving and very fast switching for applications operating at 100kHz or more.

Very fast switching and/or easy driving:

— SMPS
— DC-DC CONVERTERS
— SYNCHRONOUS RECTIFIERS
— DRIVERS



INTERNAL SCHEMATIC DIAGRAM



FASTSWITCH NPN POWER TRANSISTORS

I_C (A)	V_{CES} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	V_{CEsat} (V)	@ $h_{FE=5}$ I_C(A)	@ $h_{FE=7}$ I_C(A)
4.00	1200	600	85	TO-220	**SGSF324**	1.50	1.75	1.25
4.00	1200	600	41.5	ISOWATT218	**SGSIF424**	1.50	1.75	1.25
4.00	1200	600	95	TO-3	**SGSF524**	1.50	1.75	1.25
4.00	1200	600	100	SOT-93	**SGSF424**	1.50	1.75	1.25
4.00	1300	600	41.5	ISOWATT218	**SGSIF425**	1.50	1.25	1.00
4.00	1300	600	100	SOT-93	**SGSF425**	1.50	1.25	1.00
5.00	700	400	41.5	ISOWATT218	**SGSIF421**	1.50	3.50	2.50
5.00	700	400	85	TO-220	**SGSF321**	1.50	3.50	2.50
5.00	700	400	95	TO-3	**SGSF521**	1.50	3.50	2.50
5.00	700	400	100	SOT-93	**SGSF421**	1.50	3.50	2.50

OFF-LINE SWITCHING

FASTSWITCH NPN POWER TRANSISTORS

I_C (A)	V_{CES} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	V_{CEsat} (V)	@ $h_{FE=5}$ I_C(A)	@ $h_{FE=7}$ I_C(A)
5.00	850	450	41.5	ISOWATT218	**SGSIF422**	1.50	3.00	2.00
5.00	850	450	85	TO-220	**SGSF322**	1.50	3.00	2.00
5.00	850	450	95	TO-3	**SGSF522**	1.50	3.00	2.00
5.00	850	450	100	SOT-93	**SGSF422**	1.50	3.00	2.00
5.00	1000	450	41.5	ISOWATT218	**SGSIF423**	1.50	2.50	1.75
5.00	1000	450	85	TO-220	**SGSF323**	1.50	2.50	1.75
5.00	1000	450	95	TO-3	**SGSF523**	1.50	2.50	1.75
5.00	1000	450	100	SOT-93	**SGSF423**	1.50	2.50	1.75
7.00	1200	600	44	ISOWATT218	**SGSIF444**	1.50	3.50	2.50
7.00	1200	600	95	TO-220	**SGSF344**	1.50	3.50	2.50
7.00	1200	600	105	TO-3	**SGSF544**	1.50	3.50	2.50
7.00	1200	600	115	SOT-93	**SGSF444**	1.50	3.50	2.50
7.00	1300	600	44	ISOWATT218	**SGSIF445**	1.50	3.00	2.00
7.00	1300	600	115	SOT-93	**SGSF445**	1.50	3.00	2.00
8.00	850	450	44	ISOWATT218	**SGSIF442**	1.50	5.00	3.50
8.00	850	450	95	TO-220	**SGSF342**	1.50	5.00	3.50
8.00	850	450	105	TO-3	**SGSF542**	1.50	5.00	3.50
8.00	850	450	115	SOT-93	**SGSF442**	1.50	5.00	3.50
8.00	1000	450	44	ISOWATT218	**SGSIF443**	1.50	4.50	3.00
8.00	1000	450	95	TO-220	**SGSF343**	1.50	4.50	3.00
8.00	1000	450	105	TO-3	**SGSF543**	1.50	4.50	3.00
8.00	1000	450	115	SOT-93	**SGSF443**	1.50	4.50	3.00
10.00	700	400	44	ISOWATT218	**SGSIF441**	1.50	6.00	4.00
10.00	700	400	95	TO-220	**SGSF341**	1.50	6.00	4.00
10.00	700	400	105	TO-3	**SGSF541**	1.50	6.00	4.00
10.00	700	400	115	SOT-93	**SGSF441**	1.50	6.00	4.00
10.00	1200	600	50	ISOWATT218	**SGSIF464**	1.50	6.00	3.50
10.00	1200	600	140	TO-3	**SGSF564**	1.50	6.00	3.50
10.00	1200	600	165	SOT-93	**SGSF464**	1.50	6.00	3.50
10.00	1300	600	50	ISOWATT218	**SGSIF465**	1.50	5.00	3.00
10.00	1300	600	140	TO-3	**SGSF565**	1.50	5.00	3.00
10.00	1300	600	165	SOT-93	**SGSF465**	1.50	5.00	3.00
12.00	850	450	50	ISOWATT218	**SGSIF462**	1.50	8.50	5.00
12.00	850	450	140	TO-3	**SGSF562**	1.50	8.50	5.00
12.00	850	450	165	SOT-93	**SGSF462**	1.50	8.50	5.00
12.00	1000	450	50	ISOWATT218	**SGSIF463**	1.50	7.00	4.00
12.00	1000	450	140	TO-3	**SGSF563**	1.50	7.00	4.00
12.00	1000	450	165	SOT-93	**SGSF463**	1.50	7.00	4.00
15.00	700	350	50	ISOWATT218	**SGSIF461**	1.50	10.00	5.50
15.00	700	350	140	TO-3	**SGSF561**	1.50	10.00	5.50
15.00	700	350	165	SOT-93	**SGSF461**	1.50	10.00	5.50
20.00	1200	600	210	TO-3	**SGSF664**	1.50	12.00	7.00
20.00	1300	600	210	TO-3	**SGSF665**	1.50	10.00	6.00
24.00	850	450	210	TO-3	**SGSF662**	1.50	17.00	10.00
24.00	1000	450	210	TO-3	**SGSF663**	1.50	14.00	8.00
30.00	700	400	210	TO-3	**SGSF661**	1.50	20.00	11.00

OFF-LINE SWITCHING

HIGH VOLTAGE N-CHANNEL POWER MOS TRANSISTORS

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ (max) (Ω) @	I_D (A)	Package	Type	I_{Dmax} (A)	P_{tot} (W)	$g_{fs(min)}$	$C_{iss(max)}$ (pF)
400	5.00	0.75	SOT-82	**SGSP255**	1.50	40	0.85	250
400	5.00	0.74	TO-220	**SGSP355**	1.50	50	0.85	250
400	5.00	0.75	TO-39	**SGSP155**	1.50	15	0.85	250
400	2.50	1.50	SOT-82	**SGSP231**	3.00	50	1.50	450
400	2.50	1.50	TO-220	**SGSP331**	3.00	75	1.50	450
400	2.50	1.50	TO-3	**SGSP531**	3.00	75	1.50	450
400	2.50	1.50	TO-39	**SGSP131**	3.00	15	1.50	450
400	1.00	3.00	ISOWATT218	**SGSIP465**	6.00*	50	3.00	1000
400	1.00	3.00	SOT-93	**SGSP465**	6.00	125	3.00	1000
400	1.00	3.00	TO-220	**SGSP365**	6.00	100	3.00	1000
400	1.00	3.00	TO-3	**SGSP565**	6.00	125	3.00	1000
400	0.55	6.00	ISOWATT218	**SGSIP475**	12.00*	50	6.00	2100
400	0.55	6.00	SOT-93	**SGSP475**	12.00	150	6.00	2100
400	0.55	6.00	TO-3	**SGSP575**	12.00	150	6.00	2100
450	3.00	1.50	SOT-82	**SGSP230**	3.00	50	1.50	450
450	3.00	1.50	SOT-93	**SGSP430**	3.00	75	1.50	450
450	3.00	1.50	TO-220	**SGSP330**	3.00	75	1.50	450
450	3.00	1.50	TO-3	**SGSP530**	3.00	75	1.50	450
450	3.00	1.50	TO-39	**SGSP130**	3.00	15	1.50	450
450	1.50	3.00	SOT-93	**SGSP464**	6.00	125	3.00	1000
450	1.50	3.00	TO-220	**SGSP364**	6.00	100	3.00	1000
450	1.50	3.00	TO-3	**SGSP564**	6.00	125	3.00	1000
450	1.00	3.00	ISOWATT218	**SGSIP464**	6.00*	50	3.00	1000
450	0.70	6.00	ISOWATT218	**SGSIP474**	12.00*	50	6.00	2100
450	0.70	6.00	SOT-93	**SGSP474**	12.00	150	6.00	2100
450	0.70	6.00	TO-3	**SGSP574**	12.00	150	6.00	2100
500	3.80	1.00	SOT-82	**SGSP219**	2.00	50	1.20	380
500	3.80	1.00	TO-220	**SGSP319**	2.00	75	1.20	380
500	3.80	1.00	TO-3	**SGSP519**	2.00	75	1.20	380
500	3.80	1.00	TO-39	**SGSP119**	2.00	15	1.20	380
500	1.50	2.50	SOT-93	**SGSP469**	5.00	125	3.00	1000
500	1.50	2.50	TO-220	**SGSP369**	5.00	100	3.00	1000
500	1.50	2.50	TO-3	**SGSP569**	5.00	125	3.00	1000
500	0.70	5.00	ISOWATT218	**SGSIP479**	10.00*	50	5.00	1900
500	0.70	5.00	SOT-93	**SGSP479**	10.00	150	5.00	1900
500	0.70	5.00	TO-3	**SGSP579**	10.00	150	5.00	1900
550	4.50	1.00	SOT-82	**SGSP218**	2.00	50	1.20	380
550	4.50	1.00	TO-220	**SGSP318**	2.00	75	1.20	380
550	4.50	1.00	TO-3	**SGSP518**	2.00	75	1.20	380
550	4.50	1.00	TO-39	**SGSP118**	2.00	15	1.20	380
550	2.50	2.50	ISOWATT218	**SGSIP468**	5.00*	50	3.00	1000
550	2.50	2.50	SOT-93	**SGSP468**	5.00	125	3.00	1000
550	2.50	2.50	TO-220	**SGSP368**	5.00	100	3.00	1000
550	2.50	2.50	TO-3	**SGSP568**	5.00	125	3.00	1000
550	1.00	5.00	ISOWATT218	**SGSIP478**	10.00*	50	5.00	1900
550	1.00	5.00	SOT-93	**SGSP478**	10.00	150	5.00	1900
550	1.00	5.00	TO-3	**SGSP578**	10.00	150	5.00	1900

* The ISOWATT218 isolated power package gives a simple solution to device mounting problems. 2500V AC isolation and long creepage distances makes it easy to achieve the standards required by VDE, UL, IEC etc. The power dissipation is equivalent to a non isolated SOT-93 (TO-218) device mounted with external electrical isolation. The I_D (max) may be subject to the same thermal limitations as a non isolated package mounted with external isolation on a heatsink.

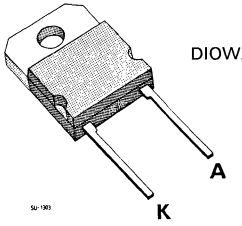
OFF-LINE SWITCHING

FAST RECOVERY POWER DIODES

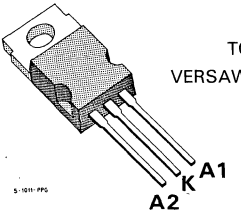
I_{av} (A)	V_{rrm} (V)	V_{frm} (A)	P_{tot} (W)	Package	Type	V_f(max) (V)	@ I_f (A)	t_{rr}(max) (ns)
8.00	50	100	50	DIOWATT1	**SGS8R05**	1.00	8.00	35
8.00	100	100	50	DIOWATT1	**SGS8R10**	1.00	8.00	35
8.00	150	100	50	DIOWATT1	**SGS8R15**	1.00	8.00	35
8.00	200	100	50	DIOWATT1	**SGS8R20**	1.00	8.00	35
16.00	50	120	70	TO-220	**SGS16DR05***	1.00	8.00	35
16.00	100	120	70	TO-220	**SGS16DR10***	1.00	8.00	35
16.00	150	120	70	TO-220	**SGS16DR15***	1.00	8.00	35
16.00	200	120	70	TO-220	**SGS16DR20***	1.00	8.00	35
20.00	50	250	60	DIOWATT1	**SGS20R05**	1.00	20.00	35
20.00	100	250	60	DIOWATT1	**SGS20R10**	1.00	20.00	35
20.00	150	250	60	DIOWATT1	**SGS20R15**	1.00	20.00	35
20.00	200	250	60	DIOWATT1	**SGS20R20**	1.00	20.00	35
45.00	800	600	90	DIOWATT2	**SGS45R80**	1.50	45.00	125
60.00	400	700	90	DIOWATT2	**SGS60R40**	1.50	60.00	125

* Common cathode dual diodes

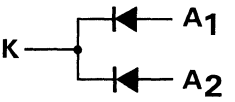
To complete the range of Power Discretes SGS offers a growing range of ultrafast recovery epitaxial diodes for secondary rectification.

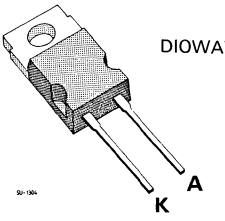


DIOWATT2



TO-220
VERSAWATT





DIOWATT1

OFF-LINE SWITCHING

PWM CONTROLLERS

Parameters	Operating temperature: 0 to 70°C							
	SG3524	UC3524A	SG3525A	SG3527A	UC3840	UC3842	UC3846	UC3847
Voltage Reference (%)	±8	±2	±2	±2	±2	±2	±2	±2
Soft Start			●	●	●		●	●
PWM Latch		●	●	●	●	●	●	●
Under Voltage Lockout		●	●	●	●	●	●	●
Pulse by Pulse Current Limiting		●			●	●	●	●
Shutdown Terminal	●	●	●	●	●	●	●	●
Output Current (A)	0.01	0.2	0.1 (0.4)	0.1 (0.4)	0.2	0.2 (1)	0.2	0.2
Feedforward					●	●	●	●
Max. Oscillator Frequency (KHz)	300	500	500	500	500	500	500	500
Dual Uncommitted Outputs	●	●						
Single Ended Output					●	●		
Totem Pole Outputs			●	●			●	●
Separate Oscillator Synch. Terminal			●	●			●	●
Adjustable Deadtime Control			●	●	●	●	●	●
Latch Off or Continuous Retry Mode					●		●	●
Double Pulse Suppression		●					●	●
Low Current Start-Up					●	●		
Package	DIP-16				DIP-18	Minidip	DIP-16	

OFF-LINE SWITCHING

PWM CONTROLLERS (Continued)

Parameters	Operating temperature: −25 to 85°C							
	SG2524	UC2524A	SG2525A	SG2527A	UC2840	UC2842	UC2846	UC2847
Voltage Reference (%)	±4	±1	±1	±1	±1	±1	±1	±1
Soft Start			●	●	●		●	●
PWM Latch		●	●	●	●	●	●	●
Under Voltage Lockout		●	●	●	●	●	●	●
Pulse by Pulse Current Limiting		●			●	●	●	●
Shutdown Terminal	●	●	●	●	●		●	●
Output Current (A)	0.1	0.2	0.1 (0.4)	0.1 (0.4)	0.2	0.2 (1)	0.2	0.2
Feedforward					●	●	●	●
Max. Oscillator Frequency (KHz)	300	500	500	500	500	500	500	500
Dual Uncommitted Outputs	●	●						
Single Ended Output					●	●		
Totem Pole Outputs			●	●			●	●
Separate Oscillator Synch. Terminal			●	●			●	●
Adjustable Deadtime Control			●	●	●	●	●	●
Latch Off or Continuous Retry Mode					●		●	●
Double Pulse Suppression		●					●	●
Low Current Start-Up					●	●		
Package	DIP-16				DIP-18	Minidip	DIP-16	

OFF-LINE SWITCHING

PWM CONTROLLERS (Continued)

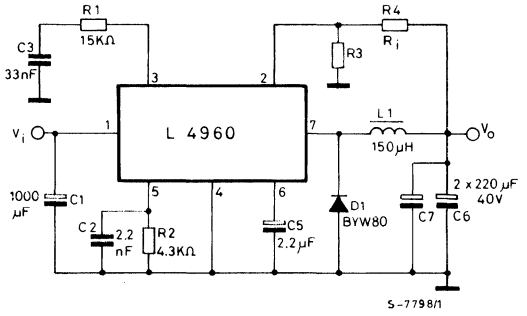
Parameters	Operating temperature: −55 to 125°C							
	SG1524	UC1524A	SG1525A	SG1527A	UC1840	UC1842	UC1846	UC1847
Voltage Reference (%)	±4	±1	±1	±1	±1	±1	±1	±1
Soft Start			●	●	●		●	●
PWM Latch		●	●	●	●	●	●	●
Under Voltage Lockout		●	●	●	●	●	●	●
Pulse by Pulse Current Limiting		●			●	●	●	●
Shutdown Terminal	●	●	●	●	●		●	
Output Current (A)	0.1	0.2	0.1 (0.4)	0.1 (0.4)	0.2	0.2 (1)	0.2	0.2
Feedforward					●	●	●	●
Max. Oscillator Frequency (KHz)	300	500	500	500	500	500	500	500
Dual Uncommitted Outputs	●	●						
Single Ended Output					●	●		
Totem Pole Outputs			●	●			●	●
Separate Oscillator Synch. Terminal			●	●			●	●
Adjustable Deadtime Control			●	●	●	●	●	●
Latch Off or Continuous Retry Mode					●		●	●
Double Pulse Suppression		●					●	●
Low Current Start-Up					●	●		
Package	DIP-16				DIP-18	Minidip	DIP-16	

VOLTAGE REGULATORS

HIGH CURRENT SWITCHING

Parameters	Devices			
	L296	L4960	L4962	L4964
Voltage Reference (%)	±2	±4	±4	±3
Output Voltage Range	V_{REF} to 40V	V_{REF} to 40V	V_{REF} to 40V	V_{REF} to 28V
Output Current (A)	4.0	2.5	1.5	4.0
Internal Current Limiting	●	●	●	●
Soft Start	●	●	●	●
Inhibit Input	●			●
Reset Output	●			●
Crowbar Control	●			
Max. Oscillator Frequency (KHz)	200	120	120	120
Separate Oscillator Synch.	●			●
Thermal Protection	●	●	●	●
Package	Multiwatt 15	Heptawatt	12+2+2	Multiwatt 15

L4960 - APPLICATION CIRCUIT



VOLTAGE REGULATORS

LOW DROP

Type	Low drop	Very low drop	Transient protection				Reset	Short circuit protection	Reverse voltage protection	Output voltage			
			±100	±80	±60	±40				5V	8.5V	10V	12V
L387		●					●	●	●	●			
L487		●		●			●	●	●	●			
L2605	●		●					●	●	●			
L2685	●		●					●	●		●		
L2610	●		●					●	●			●	
L4705		●		●				●	●	●			
L4785		●		●				●	●		●		
L4710		●		●				●	●			●	
L4805		●			●			●	●	●			
L4885		●			●			●	●		●		
L4810		●			●			●	●			●	
L4812		●			●			●	●				●
L4920		●			●			●	●	adjustable			
L4921		●			●			●	●				
L4940		●				●		●	●	●			
LM2930A		●				●		●	●	●			
LM2931A		●			●			●	●	●			
LM2935 *		●			●		●	●	●	●			

PROPRIETARY

I_o max (A)	Type	Regulated output voltage (V)						Package
			5	8.5	10	12		
4	**L296 ****	5.1V ←adjustable→ 40V						Multiwatt 15
	L4964 **	5.1V ←adjustable→ 28V						
2.5	**L4960 ****	1V ←adjustable→ 40V						Heptawatt
2	**L200CH/CV** **L200CT/T**	2.9V ←adjustable→ 36V						Pentawatt TO-3 (4 lead)
1.5	**L4962****	5V ←adjustable→ 40V						Powerdip 12+2+2
	L4940		●					TO-220
0.5	**L387**		●					Pentawatt
	L487		●					Pentawatt
	L2600V		●	●	●			TO-220
	L4700CV		●	●	●			TO-220
	L4800CV		●	●	●	●		TO-220
	L4800CX		●	●	●	●		SOT-82
	L4901 *		●					Heptawatt
	L4902 *		●					Heptawatt
	L4916			●				Minidip
	L4920	1.25V ←adjustable→ 20V						Pentawatt
	L4921							Minidip

* Dual regulator ** Switch-mode

VOLTAGE REGULATORS

STANDARD POSITIVE

I_o max (A)	Type	Regulated output voltage (V)												Package
			5	6	7.5	8	9	10	12	15	18	20	24	
2 *	**L78S00CV**		●		●		●	●	●	●	●		●	TO-220
	L78S00CT/T		●		●		●	●	●	●	●		●	TO-3
1.5	**LM117K**	1.2V ←adjustable→ 37V												TO-3
	LM217K													TO-3
	LM317K													TO-3
	LM317T													TO-220
1	**L7800CV**		●	●		●			●	●	●	●	●	TO-220
	L7800ACV **		●	●		●			●	●	●	●	●	TO-220
	L7800CT/T		●	●		●			●	●	●	●	●	TO-3
0.5	**L78M00CV**		●	●		●			●	●	●	●	●	TO-220
	L78M00CX		●	●		●			●	●	●	●	●	SOT-82
0.15	**LM723CD**	2V ←adjustable→ 36V												SO-14
	LM723CH													TO-100
	LM723CJ													DIP-14C
	LM723CN													DIP-14P
	LM723J													DIP-14C
	LM723H													TO-100

STANDARD NEGATIVE

I_o max (A)	Type	Regulated output voltage (V)									Package
			−5	−5.2	−8	−12	−15	−18	−20	−24	
1	**L7900ACV** **		●	●	●	●	●	●	●	●	TO-220
	L7900CV		●	●	●	●	●	●	●	●	TO-220
	L7900CT/T		●	●	●	●	●	●	●	●	TO-3

* Proprietary SGS selection ** Output voltage = ±2%

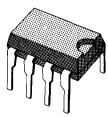
VOLTAGE REGULATORS

SWITCHING REGULATOR CONTROLLERS FOR TV AND MONITORS

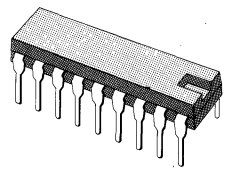
Type	Description	Package
TDA4601	Designed to regulate and control the high voltage transistor of a switching power supply. — $V_{S\ MAX} = 20V$ - $I_{S\ MAX} = 160mA$ — Operating frequency: 10 to 80KHz.	DIP-18 (9 + 9) SIP-9
TDA8130	Provides the necessary features to implement off-line, fixed frequency current mode control schemes. Protection circuitry includes built-in voltage lockout, pulse by pulse limiting and an antimagnetization circuit.	Minidip
TDA8132	Provides the same features and functions of the TDA 8130, but with added: — Enable input — Over and under voltage detectors — Overload identification — Synch. facility.	DIP-14

SPECIAL FUNCTIONS

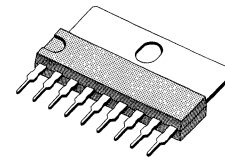
Type	Description	Package
TL7700 series	Supply voltage supervisors designed for use as reset controllers in μP systems. During power-up the device tests the supply voltage and keeps the reset outputs active as long as the supply voltage has non reached its nominal voltage value. — $V_S = 3V$ to 18V — Temperature compensated voltage reference — Externally adjustable pulse width	Minidip



MINIDIP



DIP-18



SIP-9

SWITCHING REGULATOR MODULES

GS-R FAMILY MODULES

The SGS Subsystems product line is rapidly growing and it includes a wide range of single and multiple output modules covering a wide spectrum of applications in the Industrial and Computer market.
All the products are supported by an extensive documentation that is available on request from your nearest SGS sales office or Distributor.
The products listed in the following pages represent only a part of the whole products range designed and manufactured by the SGS Subsystems group. They include custom boards and modules performing various logic and analog functions based on the leading SGS silicon technology.

GS-R400 FAMILY

The GS-R400 series is a complete family of High Current High Voltage regulators available in output voltages from 5 to 40 Volt.
These DC/DC Converter modules, shielded for EMI, can provide local on-card regulation, or be used in central power supply systems, in both professional and industrial applications.
All the family incorporates many extra features like thermal protection, remote voltage sensing, soft start, load crowbar protection, logic inhibit/enable, foldback current limiting, system reset output (405S only) and adjustable output voltage (400VB), that allow the implementation of higly sophisticated power supply systems.
The GS-R400 VB is particularly suited for multiple output power supplies, because up to four units can be synchronized.

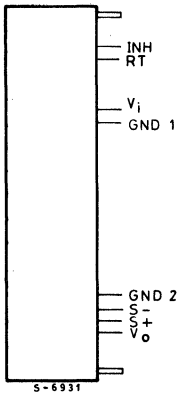
Type	Input Voltage V	Output Voltage V	Output Current A	Current Limit A	Line Regulation dB	Load Regulation mV/A	Temp. Stability mV/°C	Crowbar Intervention V	Output Ripple mV	Efficiency
GS-R405	8-46	5.1	4	5	60	20	0.2	6	25	75
GS-R405S	8-46	5.1	4	5	60	20	0.2	6	25	75
GS-R412	15-46	12	4	5	60	40	0.5	15	30	85
GS-R415	18-46	15	4	5	60	60	0.6	18	40	90
GS-R424	27-46	24	4	5	60	90	1	29	50	90
GS-R400V	V_o + 3-46	5.1-40 ADJUST	4	5	60	20/90	0.2/1.6	1.2 V_o	25/50	75/90
GS-R400VB	V_o + 3-46	5.1-40 ADJUST	4	5	60	20/90	0.2/1.6	1.2 V_o	25/50	75/90

SWITCHING REGULATOR MODULES

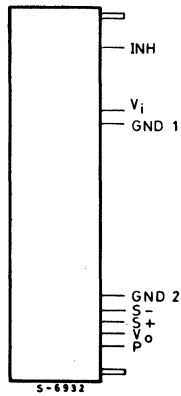
GS-R400 FAMILY (Continued)

CONNECTION DIAGRAM (side view)

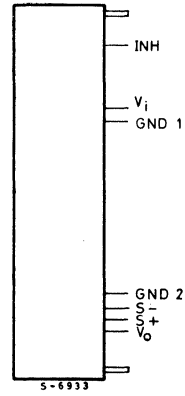
GS-R405S



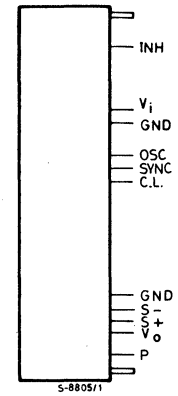
GS-R400V



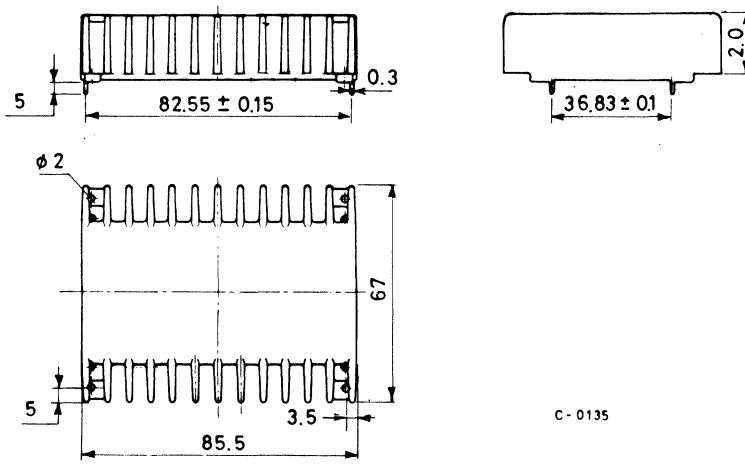
GS-R405/412/415/424



GS-R400VB



MECHANICAL DATA (dimensions in mm)



SWITCHING REGULATOR MODULES

GS-R400 FAMILY (Continued)

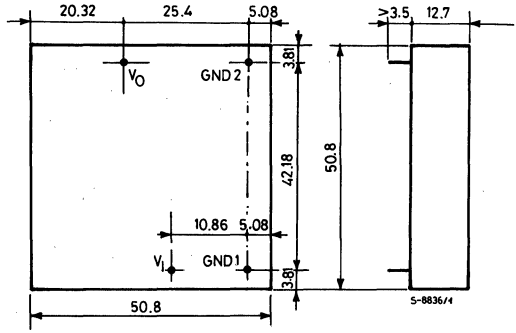
Pin	Function
INH - Inhibit	TTL compatible input. A logic high level signal applied to this pin disables the module. To be connected to GND_2 when not used.
RT - Reset Output	Available on GS-R405S only. Reset voltage is high (5.1 V) when output voltage reaches nominal value (5.1 V) and it is generated with a fixed 100 ms delay.
V_i - Input Voltage	Unregulated DC voltage input. Maximum voltage must not exceed 48 V. Recommended maximum operating voltage is 46 V.
GND_1 - Ground	Common ground for input voltage.
GND_2 - Ground	Common ground of high current path.
S^- - Sensing Negative	For connection to remote load, this pin senses the actual ground of the load itself. To be connected to GND_2 when not used. This pin is connected to case.
S^+ - Sensing Positive	For connection to remote loads this pin allows voltage sensing on the load itself. To be connected to V_o when not used.
OSC - Oscillator Output Pin	An internal RC network determines the 100 KHz PWM switching frequency. This pin must be connected SYNC if the unit is a Master.
SYNC - Syncronization Input Pin	This pin must be connected to SYNC pin of the Master unit.
C.L. - Current Limit	An external resistor connected between this pin and S— fixes the maximum output current (2,2 KΩ min).
V_o - Output Voltage	Regulated and stabilized DC voltage is available on this pin. Max output current is 4 A. The device is protected against short circuit of this pin to ground or to supply.
P - Output Voltage Programming	A variable resistor (18 KΩ max) connected between this pin and S+ set the output voltage.

SWITCHING REGULATOR MODULES

GS-R400/2 FAMILY

The GS-R400/2 is a complete family of Small Size High Current High Voltage Switching Voltage Regulators available in two output voltages.
These step down regulators shielded for EMI, can provide local on-card regulation, or be used in central power supply systems, in both professional and industrial applications.
All the family incorporates many extra features like thermal protection, soft start, load crow bar protection, high efficiency and high power/volume ratio.

Type	Input Voltage V	Output Voltage V	Output Current A	Current Limit A	Line Regulation dB	Load Regulation mV/A	Temp. Stability mV/°C	Crowbar Intervention V	Output Noise mV	Efficiency
GS-R405/2	8-40	5.1	4	5	60	20	0.2	6	25	80
GS-R412/2	15-40	12	4	5	60	40	0.5	15	50	85



PIN FUNCTIONS

Pin	Function
V_i - Input Voltage	Unregulated DC voltage input. Maximum voltage must not exceed 40 V.
GND_1 - Ground	Common ground for input voltage.
GND_2 - Ground	Common ground of high current path.
V_O - Output Voltage	Regulated and stabilized DC voltage is available on this pin. Max output current is 4 A. The device is protected against short circuit of this pin to ground or to supply.

The case is electrically connected to GND.

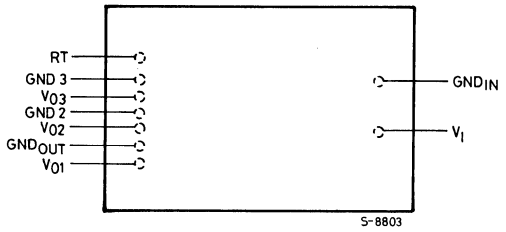
SWITCHING REGULATOR MODULES

GS-R51212

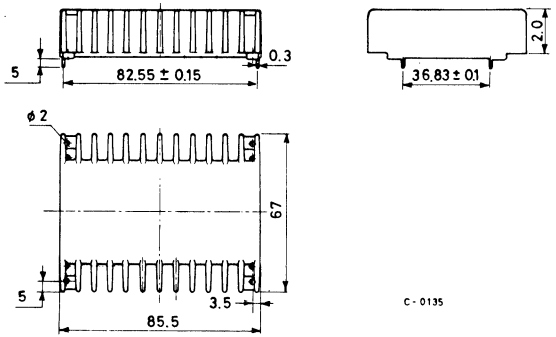
Triple output switching voltage regulator module.
The GS-R51212 is a triple ouput High Current High Voltage Switching Voltage Regulator that provides +5V and 12V outputs.
This step down regulator shielded for EMI, provides local on-card regulation. The very large input voltage range allows flexibility in both professional and industrial applications.
The GS-R51212 incorporates many extra features like thermal protection, soft start, load crow bar protection, reset output, non-latching short circuit protection.

Input Voltage V	Output Voltage V	Output Current A	Current Limit A	Line Regulation dB	Load Regulation mV/A	Temp. Stability mV/°C	Crowbar Intervention V	Output Noise mV	Efficiency
9-40	5.1	3.5	5	60	20	0.2	6	30	75
	12	0.1	0.2						
	12	0.1	0.2						

CONNECTION DIAGRAM (top view)



MECHANICAL DATA (dimensions in mm)



SWITCHING REGULATOR MODULES

GS-R51212 (Continued)

PIN FUNCTIONS

Pin	Function
RT - Reset Output	Reset output is high when output voltage reaches nominal value (5.1V) and it is generated with a fixed 100 ms delay. A proper resistor (270Ω min) must be connected between this pin and V_{01}
V_i - Input Voltage	Unregulated DC voltage input. Maximum voltage must not exceed 40 V.
GND_{IN} - Ground	Common ground for input voltage.
GND_{OUT} - Ground	Common ground of high current path. The case of the module is connected to this pin.
V_{01} - 5 V Output Voltage	Regulated and stabilized DC voltage is available on this pin. Max output current is 3.5 A. The device is protected against short circuit of this pin to ground or to supply.
V_{02} - 12 V Output Voltage	Regulated and stabilized 12 V DC output at 150 mA max. current referred to GND_2. This output can float ± 50 V in respect to GND_{OUT} and GND_3.
GND_2 - Ground	Reference ground for V_{02} output.
V_{03} - 12 V Output Voltage	Regulated and stabilized 12 V DC output at 150 mA max. current referred to GND_3. This output can float ± 50 V in respect to GND_{OUT} and GND_2.
GND_3 - Ground	Reference ground for V_{03} output.

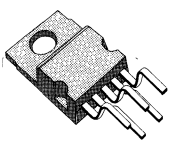
INTEGRATED CIRCUITS

AUDIO AMPLIFIERS FOR TV AND RADIO

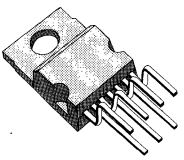
Type	Function	Supply Voltage (V)	Package
TBA820M	1W amplifier (8Ω)	9	MINIDIP
TDA1904	4W amplifier (4Ω)	12	POWERDIP8
TDA1905	6W amplifier (4Ω) with muting	14	POWERDIP8
TDA1908	8W amplifier (8Ω)	22	FINDIP
TDA1910	10W amplifier (8Ω)	24	MULTIWATT11
TDA2006	12W amplifier (4Ω)	24	PENTAWATT
TDA2008	10W amplifier (4Ω)	24	PENTAWATT
TDA2009	10 + 10W amplifier (4Ω)	23	MULTIWATT11
TDA2822	3.5W bridge amplifier (1.8 + 1.8W stereo)	3 to 15	DIP-16
TDA2822M	1 + 1W amplifier	1.8 to 15	MINIDIP
TDA2824	3.5W bridge	2 to 15	DIP-16
TDA2824S	or 1.8 + 1.8W stereo amplifier (low SVR)		SIP-9
TDA7231	1.6W amplifier (4Ω)	1.8 to 15	MINIDIP (4 + 4)

AUDIO AMPLIFIERS FOR CAR RADIO

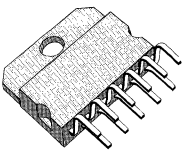
Type	Function	Supply Voltage (V)	Package
TDA2002	8W amplifier	14.4	PENTAWATT
TDA2003	10W amplifier	14.4	PENTAWATT
TDA2004	10 + 10W amplifier	14.4	MULTIWATT11
TDA2005	20W bridge amplifier	14.4	MULTIWATT11
TDA7240	20W bridge amplifier	14.4	HEPTAWATT
TDA7260	PWM audio driver (25W)	14.4	DIP-20



PENTAWATT



HEPTAWATT



MULTIWATT

INTEGRATED CIRCUITS

HI-FI POWER AMPLIFIERS

Type	Function	Supply Voltage (V)	Package
TDA2030	14W amplifier (4Ω)	36 (max)	PENTAWATT
TDA2030A	18W amplifier (4Ω) 12W amplifier (8Ω) 32W with two devices in bridge configuration	44 (max)	PENTAWATT
TDA2040 **TDA2040A**	22W amplifier (4Ω)	40	PENTAWATT
TDA7250	15 to 80W stereo drivers	70	DIP-20

AUDIO - PREAMPLIFIERS

Type	Function	Supply Voltage (V)	Package
TDA3410 **LM1837**	Dual Low-noise preamplifier with autoreverse	8 to 30	DIP-16
TDA3420	Dual Low - noise preamplifier	8 to 30	DIP-16
TDA2320A	Stereo preamplifier	3 to 36	MINDIP
TDA7232	Preamplifier/compressor	11 to 30	DIP-20
TDA7282	Stereo preamplifier	1.8 to 6	MINIDIP and SO-8

MOTOR REGULATORS

Type	Function	Supply Voltage (V)	Package
TDA1151	0.4A Speed regulator	2.5 to 20	SOT-32 (TO-126)
TDA1151M	0,8A Speed regulator	2.5 to 20	MINIDIP 4+4
TDA7270S	Multifunction system for tape players	6 to 18	POWERDIP8+8
TDA7272	1A Autoreverse speed regulator	5 to 18	DIP-20
TDA7274	Low voltage speed regulator	1.8 to 6	MINIDIP

SGS INTEGRATED CIRCUITS

MUSIC

Type	Function	Supply Voltage (V)	Package
M082/A **M083/A** **M086/A**	Tone generator Tone generator Tone generator	12	DIP-16
M112	Polyphonic sound generator	12	DIP-40
M114	Digital sound generator	5	DIP-40
M747	7-Stage divider	12	DIP-14

RADIO CIRCUITS

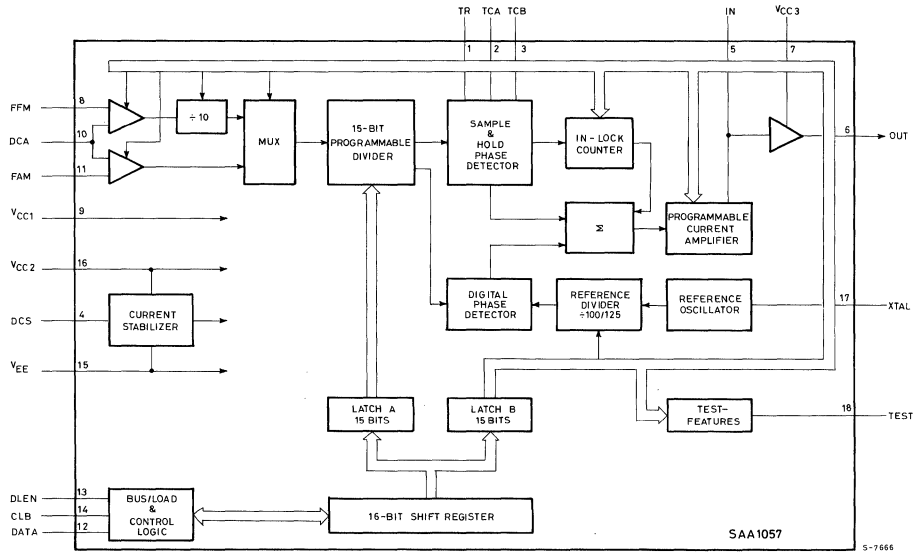
Type	Function	Features	Package
TCA3089	FM-IF Radio system	— High limiting sensitivity. — High AMR. — High recovered audio. — Low distortion.	DIP-16
TCA3189	FM-IF high quality radio system	— Very low distortion. — Improved S/N. — Programmable audio level.	DIP-16
TDA1220B **TDA1220L** **TDA7220**		— Design for use in 3V-4.5V-6V portable radio. — High sensitivity. — Very low "tweet". — High signal handing. — Low battery drain.	DIP-16
TDA1225 **TDA7225**			SO-16
TDA7211	FM tuner	— 1.3V Min. supply voltage. — Balanced mixer with 30MHz to 150MHz operating frequency.	Minidip
TDA7212	FM tuner for cordless		
TEA1330	Stereo decoder	— Requires no inductors. — Wide supply range: 3V to 14V. — Excellent channel separation. — Low distortion.	DIP-16
TDA7230	Stereo decoder and headphone amplifier	— Operating voltage from 1.8V to 6V. — Stereo/mono switch. — Led driving for stereo indication.	DIP-16
TDA7359 **TDA7359D** **TDA7361** **TDA7361D**	Narrow band FM-IF demodulator for cordless	— Oscillator, mixer, limiting amplifier, quadrature discrim. — Squelch and mute. Designed for dual conversion cordless receivers.	DIP-18 SO-16 DIP-16 SO-16

INTEGRATED CIRCUITS

RADIO CIRCUITS (Continued)

Type	Function	Features	Package
L4916	Voltage Regulator plus filter	— Fixed 8.5V/200mA — High ripple rejection. — Short-circuit cent thermal protection.	Minidip 4 + 4
SAA1057	PLL radio tuning synthesizer	— On chip prescaler. — 1KHz/1.2KHz step (AM). — 10KHz/12.5KHz stef (FM). — Serial bus interface. — Supply voltage = 3.6V to 12V.	
M8438A	LCD driver	— 32 segment static	DIP-40/PLLC44
M145026 **M145027** **M145028**	RC Encoder RC Decoder RC Decoder	— 4.5V to 18V	DIP-16

SAA1057 - BLOCK DIAGRAM

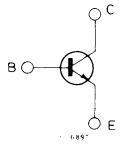


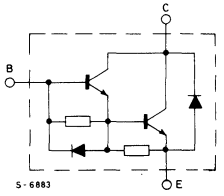
TV & MONITORS

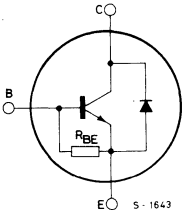
POWER TRANSISTORS

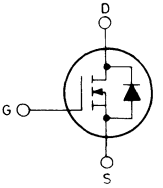
SGS offers a variety of technology and package solutions for the horizontal deflection of CRTs. In addition to industry standard products, for both colour and monochrone tubes, innovative products such as FASTSWITCH bipolar transistors and Power MOS provide the higher switching speeds required for high definition monitors.
For vertical deflection, requiring higher powers than SGS integrated solutions (see page 79) can provide, a wide range of standard transistors and darlingtons are manufactured by SGS see pages 113 to 118.

INTERNAL SCHEMATIC DIAGRAMS









HIGH DEFINITION COLOUR MONITORS HORIZONTAL DEFLECTION

These NPN transistors feature very fast switching times typically 3 to 5 times faster than 1500V products designed several years ago.

I_C (A)	V_{CES} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	V_{CEsat} (V) @	$h_{FE}=5$ I_C(A) @	$h_{FE}=7$ I_C(A) @
4.00	1200	600	85	TO-220	**SGSF324**	1.50	1.75	1.25
4.00	1200	600	41.5	ISOWATT218	**SGSIF424**	1.50	1.75	1.25
4.00	1200	600	95	TO-3	**SGSF524**	1.50	1.75	1.25
4.00	1200	600	100	SOT-93	**SGSF424**	1.50	1.75	1.25
4.00	1300	600	41.5	ISOWATT218	**SGSIF425**	1.50	1.25	1.00
4.00	1300	600	100	SOT-93	**SGSF425**	1.50	1.25	1.00
7.00	1200	600	95	TO-220	**SGSF344**	1.50	3.50	2.50
7.00	1200	600	105	TO-3	**SGSF544**	1.50	3.50	2.50
7.00	1200	600	115	SOT-93	**SGSF444**	1.50	3.50	2.50
7.00	1300	600	44	ISOWATT218	**SGSIF445**	1.50	3.00	2.00
7.00	1300	600	115	SOT-93	**SGSF445**	1.50	3.00	2.00
10.00	1200	600	50	ISOWATT218	**SGSIF464**	1.50	6.00	3.50
10.00	1200	600	140	TO-3	**SGSF564**	1.50	6.00	3.50
10.00	1200	600	165	SOT-93	**SGSF464**	1.50	6.00	3.50
10.00	1300	600	50	ISOWATT218	**SGSIF465**	1.50	5.00	3.00
10.00	1300	600	140	TO-3	**SGSF565**	1.50	5.00	3.00
10.00	1300	600	165	SOT-93	**SGSF465**	1.50	5.00	3.00
20.00	1200	600	210	TO-3	**SGSF664**	1.50	12.00	7.00
20.00	1300	600	210	TO-3	**SGSF665**	1.50	10.00	6.00

The ISOWATT218 isolated power package gives a simple solution to device mounting problems. It offers one hole mounting, may be easily paralleled and with 2500V AC isolation and long creepage distances makes it easy to achieve the standards required by VDE, UL, IEC etc. The power dissipation is equivalent to a non isolated SOT-93(TO-218) device mounted with external electrical isolation.

POWER TRANSISTORS

COLOUR TV HORIZONTAL DEFLECTION

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	V_{CEsat} (V)	I_C @ (A)	I_B @ (mA)
8.00	1500	700	50	ISOWATT218	**SGSI508**	5.00	4.50	2000.00
8.00	1500	700	50	ISOWATT218	**SGSI508A**	1.00	4.50	2000.00
8.00	1500	700	50	ISOWATT218	**SGSI508D***	1.00	4.50	2000.00
8.00	1500	700	125	SOT-93	**BU508**	5.00	4.50	2000.00
8.00	1500	700	125	SOT-93	**BU508A**	1.00	4.50	2000.00
8.00	1500	700	125	SOT-93	**BU508D***	1.00	4.50	2000.00
8.00	1500	700	150	TO-3	**BU208**	5.00	4.50	2000.00
8.00	1500	700	150	TO-3	**BU208A**	1.00	4.50	2000.00
8.00	1500	700	150	TO-3	**BU208D***	1.00	4.50	2000.00

* Transistors with integral damper diode

POWER BIPOLAR DEVICES FOR MONOCHROME DEFLECTION

The following devices originated by SGS have become industry standards for monochrone horizontal deflection. The Fast Switching Darlingtons may be driven directly by horizontal processor ICs (see page 59).

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	NPN	h_{FE} min @	I_C (A)	V_{CE} (V)	V_{CEsat} (V) @	I_C (A)	I_B (mA)
7.00	330	150	60	TO-220	**BU407**	10.00	5.00	1.00	1.00	5.00	500.00
7.00	330	150	60	TO-220	**BU407D***	8.00	5.00	1.00	1.00	5.00	650.00
7.00	400	200	60	TO-200	**BU406**	10.00	5.00	1.00	1.00	5.00	500.00
7.00	400	200	60	TO-220	**BU406D***	8.00	5.00	1.00	1.00	5.00	500.00
7.00	400	200	60	TO-220	**BU408**	10.00	5.00	1.00	1.00	6.00	1200.00
7.00	400	200	60	TO-220	**BU408D***	8.00	5.00	1.00	1.00	6.00	1200.00
7.00	600	400	75	TO-220	**BU810 +**	100.00	2.00	2.00	2.50	4.00	200.00
8.00	330	150	60	TO-220	**BU807 +**	100.00	5.00	2.00	1.50	5.00	50.00
8.00	400	200	60	TO-220	**BU806 +**	100.00	5.00	2.00	1.50	5.00	50.00

+ Fast Switching Monolithic Darlingtons with Integral Speed up and damper diodes.
* Transistors with integral damper diode.

POWER MOS DEVICES FOR MONOCHROME DEFLECTION

For very high rate monitors SGS High Voltage Power MOS N-Channel technology offers complete absence of storage time and is easily driven. The following represent a small selection from a very wide range.

$V_{(BR)DSS}$ (V)	$R_{DS(on)}$ @ (max) (Ω)	I_D (A)	Package	Type	$I_D$max (A)	P_{tot} (W)	$g_{fs(min)}$ (mho)	$C_{iss(max)}$ (pF)
500	0.70	5.00	ISOWATT218	**SGSIP479**	10.00*	50	5.00	1900
500	0.70	5.00	SOT-93	**SGSP479**	10.00	150	5.00	1900
500	0.70	5.00	TO-3	**SGSP579**	10.00	150	5.00	1900
550	1.00	5.00	ISOWATT218	**SGSIP478**	10.00*	50	5.00	1900
550	1.00	5.00	SOT-93	**SGSP478**	10.00	150	5.00	1900
550	1.00	5.00	TO-3	**SGSP578**	10.00	150	5.00	1900

* The I_D(max) may be subject to the same thermal limitations as a non isolated package mounted with external isolation on a heatsink.

INTEGRATED CIRCUITS

ICs FOR TV-VCR-MONITORS

Type	Function	Supply voltage Max (V)	Package
M28SB74	4K ROM Microcomputer with S-BUS	5	DIP-28
M38SB74	4K ROM Microcomputer with S-BUS	5	DIP-40
M38SB78	8K ROM Microcomputer with S-BUS	5	DIP-40
M104	Remote Control Receiver	5	DIP-28
M105	Remote Control Receiver	5	DIP-24
M192	4-Bit Binary 7-Segment Decoder Driver	15	DIP-16
M206	PLL TV Microcomputer Interface	5	DIP-28
M293	Electronic Program Memory for 32 Stations	5	DIP-28
M490B	Single Chip Voltage Synthesis tuning system with 1 analog control	5	DIP-40
M491B	Single Chip Voltage Synthesis tuning system with 1 analog control	5	DIP-40
M494	Single chip voltage tuning system with 4 analog controls and μP interface	5	DIP-40
M708	Remote Control Transmitter	10.5	DIP-20
M708A	Remote Control Transmitter	10.5/12	DIP-20
M708L	Remote Control Transmitter (low voltage)	5	DIP-20
M709	Remote Control Transmitter	10.5	DIP-24
M709A	Remote Control Transmitter	10.5	DIP-24
M710	Remote Control Transmitter	10.5	DIP-28
M710A	Remote Control Transmitter	10.5	DIP-28
M3004	Remote Control Transmitter	10.5	DIP-20-SO-20
M3005	Remote Control Transmitter	10.5	DIP-20-SO-20
M5450	LED display driver	13.2	DIP-40
M5451	LED display driver	13.2	DIP-40
M5480	LED display driver	13.2	DIP-28
M5481	LED display driver	13.2	DIP-20
M5482	LED display driver	13.2	DIP-20
M8571	1024 Bit serial S-BUS EEPROM	5.5	Minidip/ Ceramic Minidip
M8716A	Clock/Calendar with serial I²C bus	5.5	Minidip
M8793	TV Stereo decoder/Audio processor	5.5	DIP-28
M8910	Single chip frequency synthesis Microcomputer for TV	5.5	DIP-28
TDA440S	TV Video if system	15	DIP-16
TDA1170D	Low-noise TV vertical deflection system	35	DIP-16
TDA1170N	Low-noise TV vertical deflection system	35	FINDIP-
TDA1170S	TV Vertical deflection system	35	FINDIP-
TDA1180P	TV Horizontal processor	15	DIP-16
TDA1190Z	Complete TV sound channel	28	FINDIP-
TDA1670A	Vertical deflection circuit	35	MULTIWATT15
TDA1672	Vertical deflection circuit	35	MULTIWATT15
TDA1770A	Vertical deflection circuit	35	DIP-20
TDA1904	4W Audio amplifier	20	DIP-16
TDA1905	5W Audio amplifier with muting	30	DIP-16
TDA1910	10W Audio amplifier with muting	30	MULTIWATT11
TDA2006	10W Audio amplifier	±15	PENTAWATT
TDA2008	12W Audio amplifier	28	PENTAWATT
TDA2009	10 + 10W high quality stereo amplifier	28	MULTIWATT11
TDA2030	14W Hi-Fi Audio amplifier	±18	PENTAWATT

INTEGRATED CIRCUITS

ICs FOR TV-VCR-MONITORS (Continued)

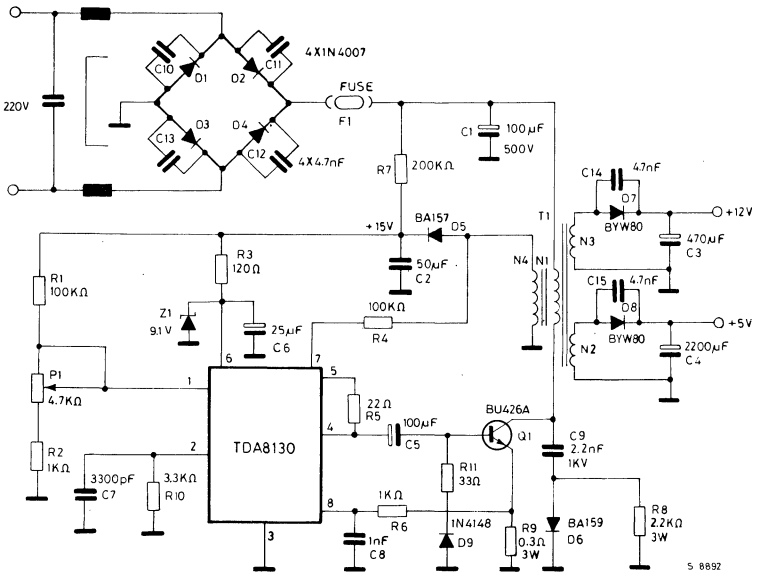
Type	Function	Supply voltage Max (V)	Package
TDA2030A	18W Hi-Fi Amplifier	±12	PENTAWATT
TDA2040	20W Hi-Fi Audio Power amplifier	±20	PENTAWATT
TDA2170	TV Vertical deflection output circuit	35	MULTIWATT11
TDA2270	TV Vertical deflection output circuit	35	DIP-16
TDA2320	Preamplifier for infrared remote control system	20	MINIDIP
TDA3190	Complete TV sound channel	28	DIP-16
TDA3562A	PAL/NTSC One-chip decoder	13.2	DIP-28
TDA4092	5 Bit binary to 7-segment decoder driver	10	DIP-24
TDA4190	TV Sound channel with DC controls	28	DIP-20
TDA4420	Vision if system with AFC	15	DIP-18
TDA4431	TV Signal identification circuit and AFC interface	16	DIP-14
TDA4433	TV Signal identification circuit and AFC interface	16	DIP-14
TDA4601	Switch-mode power supply controller	20	SIP-9/DIP-18
TDA4950	TV East/West correction circuit	35	MINIDIP
TDA8100	Horizontal-vertical deflection for video monitors	18	DIP-20
TDA8114	VCR processor interface circuit	10	DIP-20
TDA8115	Dual Motor driver	28	HEPTWATT
TDA8116	Video head servo controller	18	DIP-16
TDA8120	Multistandard video if system	15	DIP-24
TDA8130	Current mode PWW controller	10	MINIDIP
TDA8132	Current mode PWW controller	10	DIP-14
TDA8134	Dual 5V+12V regulator with disable	24	HEPTAWATT
TDA8135	Dual voltage regulator with disable	24	HEPTAWATT
TDA8136	Dual 12V regulator with disable	24	HEPTAWATT
TDA8140	Horizontal deflection power driver	18	DIP-16
TDA8143	Horizontal deflection power driver	18	SIP-9
TDA8145	TV East/West correction circuit for square tubes	35	MINIDIP
TDA8153	RGB Video output amplifier	250	MULTIWATT15
TDA8160	Infrared remote control receiver	16	MINIDIP
TDA8170	TV vertical deflection output circuit	35	HEPTAWATT
TDA8172	TV vertical deflection output circuit	35	HEPTAWATT
TDA8173	TV vertical deflection output circuit	35	DIP-16
TDA8175	TV vertical deflection output circuit	35	HEPTAWATT
TDA8176	TV vertical deflection system for TV and monitors	35	MULTIWATT15
TDA8180	Deflection processor	5.25	DIP-24
TDA8185	Horizontal and vertical processor	5.25	DIP-24
TDA8190	TV sound channel with DC controls	28	DIP-20
TDA8192	Multistandard AM and FM sound if circuit for TV	16	DIP-20
TDA8194	FM-IF with bus controlled scart switch and audio preamplifier	15	DIP-20
TDA8196	Audio switch and DC volume control for TV	16	MINIDIP

INTEGRATED CIRCUITS

SWITCHING REGULATOR CONTROLLERS FOR TV AND MONITORS

Type	Description	Package
TDA4601	Designed to regulate and control the high voltage transistor of a switching power supply. — $V_{S\ MAX}$ = 20V - $I_{S\ MAX}$ = 16mA — Operating frequency: 10 to 80KHz.	DIP-18 (9 + 9) SIP-9
TDA8130	Provides the necessary features to implement offline, fixed frequency current mode control schemes. Protection circuitry includes built-in voltage lockout, pulse by pulse limiting and an antimagnetization circuit.	Minidip
TDA8132	Provides the same features and functions of the TDA 8130, but with added: — Enable input — Over and under voltage detectors — Overload identification — Synch. facility.	DIP-14

TDA8130 - APPLICATION CIRCUIT



CUSTOM/SEMICUSTOM

FULL CUSTOM

SGS designs and produces custom bipolar ICs for a large number of leading manufacturers. Specialising in advanced technologies and packages for demanding applications, SGS is particularly strong in the industrial, automotive and telecommunications sectors.

A wide range of technologies is available for custom circuits, including low voltage, low noise, high voltage, high current and mixed analog/digital processes. SGS also offers packages of almost every type, ranging from the 8-pin small outline micropackage to the 15-lead Multiwatt plastic power package.

If you are interested in discussing custom chip designs contact your nearest sales office for more information.

ZODIAC CELL LIBRARY

Zodiac is a library cell system which allows customers with no specific knowledge of IC technology to design their own mixed analog/digital signal processing circuits. The library consists of 17 analog blocks, 16 I^2L logic blocks and an ECL prescaler. Individual transistors, diodes, capacitors and resistors can also be integrated.

The customer designs and evaluates the proposed design with the help of a series of development parts, each containing one or more of the library cells. When the breadboard functions correctly SGS takes the final drawings and lays out the appropriate cells in the smallest possible silicon area.

Zodiac is almost as fast as pre-diffused arrays but uses the silicon area more effectively. Zodiac chips are therefore cheap to develop and cheap to produce.

CMOS SEMICUSTOM

SGS is now present in the Semicustom Market, offering different solutions. The wide range of complexity of the gate arrays families covers the most important applications. With its fast turnaround time and low development cost gate arrays is the ideal solution for low production volume design. On the other hand, with standard cells it's possible to optimize die area, and reduce cost for high production volume design. The full design compatibility allows an easy migration from gate arrays to standard cells.

GATE ARRAYS

Systems Board In Silicon is probably the most succint description of gate arrays. They are in fact a large number of standard circuit elements, up to 10.000 sets of basic logic elements (i.e. 2 N-channel and 2 P-channel MOS transistors), on a single chip. These are interconnected using custom generated metalization masks to produce all the logic functions the customer desires.

HSG 3000 SERIES

FEATURES

- Silicon-gate 3.5-micron (drawn) HCMOS technology.
- Single-layer metal interconnection.
- HTTL and LSTTL speeds – 5 ns through a 2-input NAND gate and interconnection, $T_A = 25$ °C, fanout = 2, $V_{DD} = 5V$.
- Optimal block structure of 2N and 2P transistors.
- Complexities ranging from 272 to 2550 blocks.
- Pin counts ranging up to 104.
- Fully supported by LDS™.
- Extensive macrocell and macrofunction libraries.
- All non-power pads configurable as inputs, outputs or bidirectional.
- TTL/CMOS I/O compatibility.
- Configurable output drive up to 4.8mA.
- All inputs and outputs protected from overvoltage and latch-up.
- Full Military capability.
- Ceramic and plastic packages.
- Alternately-sourced.
- HSG3110Q evalutation device available.

PRODUCT OUTLINE

Type	Block Complexity	Max[3] I/O	V_{DD} Pads	V_{SS} Pads	Max Pads	Gate Speed (ns)[1]	
						Typ.	Max[2]
HSG3020	272	32	1	3	36	5.0	9.0
HSG3030	342	36	1	3	40	5.0	9.0
HSG3040	420	40	1	3	44	5.0	9.0
HSG3060	600	48	1	3	52	5.0	9.0
HSG3080	812	56	1	3	60	5.0	9.0
HSG3110	1056	64	1	3	68	5.0	9.0
HSG3130	1332	72	1	3	76	5.0	9.0
HSG3170	1722	82	1	3	86	5.0	9.0
HSG3210	2162	92	1	3	96	5.0	9.0
HSG3250	2550	100	1	3	104	5.0	9.0

Note: 1. 2-input NAND gate, fanout = 2, statistically necessary metal interconnection
2. $T_A = 0$ to 70 degress C, $V_{DD} = 5V \pm 5\%$
3. It may be necessary to configure additional I/O pads for V_{DD} and V_{SS}, depending on the number and drive of the outputs buffers. See section on 'V_{DD} and V_{SS} Requirements'.

CMOS SEMICUSTOM

ABSOLUTE MAXIMUM RATINGS (Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	−3.0 to +7	V
V_I	Input Voltage	−0.3 to V_{DD} +0.3	V
I_I	DC Input Current	±10	mA
T_{STG}	Storage Temperature Range (Ceramic)	−65 to +150	°C
T_{STG}	Storage Temperature Range (Plastic)	−40 to +125	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	+3 to +6	V
T_A	Operating Ambient Temperature Range Military	−55 to +125	°C
T_A	Industrial Range	−40 to +85	°C
T_A	Commercial Range	0 to +70	°C

PACKAGE SELECTOR GUIDE FOR THE HSG3000 SERIES

Type	Max Pins	Dual-in-line Packages		Chip Carriers		Pin Grid Arrays
		Plastic	Ceramic	Plastic	Ceramic	
HSG3020	36	16+	16+	20+	28	—
HSG3030	40	16+	16+	20+	28+	—
HSG3040	44	16+	16+	20+	28+	64
HSG3060	52	18+	16+	20+	28+	64
HSG3080	60	24+	24+	20+	28+	64
HSG3110	68	24+	24+	20+	28+	64
HSG3130	76	24+	24+	20+	44+	64
HSG3170	86	24+	24+	44+	44+	64+
HSG3210	96	40+	24+	44+	44+	68+
HSG3250	104	40+	40+	44+	44+	68+

Package families include:
Ceramic DIPs — 16,18,20,24,28,40 and 48 leads.
Plastic DIPs — 16,18,20,24,28,40 and 48 leads.
Ceramic chip carriers — 28,44,52,68,84 and 100 leads.
Plastic chip carriers — 20,44,68,84 leads.
Ceramic Pin-grid arrays — 64,68,84, 100 and 120 leads.

CMOS SEMICUSTOM

HSG 5000 SERIES

FEATURES

- Silicon-gate 3-micron (drawn) HCMOS technology.
- Double-layer metal interconnection
- Shottky TTL speeds —2.5 ns through 2-input NAND gate and interconnection, $T_A = 25$ °C, fanout = 2, $V_{DD} = 5V$.
- Optimal block structure of 2N and 2P transistors.
- Complexities ranging from 500 to 6000 blocks.
- Pin counts ranging up to 180.
- Fully supported by LDS™.
- Extensive macrocell and macrofunction libraries.
- All non-power pads configurable as inputs, outputs or bidirectional.
- TTL/CMOS I/O compatibility.
- Configurable output drive up to 12 mA.
- All inputs and outputs protected from overvoltage and latch-up.
- Full Military compatibility.
- Ceramic and plastic packages.
- Alternately-sourced.
- HSG5220Q evalutation device available.

PRODUCT OUTLINE

Type	Block Complexity	Max[3] I/O	V_{DD} Pads	V_{SS} Pads	Max Pads	Gate Speed (ns)[1]	
						Typ.	Max[2]
HSG5050	504	46	2	6	52	2.5	4.5
HSG5080	880	66	2	6	74	2.5	4.5
HSG5140	1417	84	2	6	92	2.5	4.5
HSG5170	1708	90	2	6	96	2.5	4.5
HSG5220	2224	106	2	6	114	2.5	4.5
HSG5320	3192	132	2	6	138	2.5	4.5
HSG5420	4202	148	4	8	156	2.5	4.5
HSG5600	5902	172	4	8	180	2.5	4.5

Note: 1. 2-input NAND gate, fanout = 2, statistically necessary metal interconnection
2. $T_A = 0$ to 70 °C, $V_{DD} = 5V \pm 5\%$
3. It may be necessary to configure additional I/O pads for V_{DD} and V_{SS}, depending on the number and drive of the outputs buffers. See section on 'V_{DD} and V_{SS} Requirements'.

CMOS SEMICUSTOM

ABSOLUTE MAXIMUM RATINGS (Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	−0.3 to +7	V
V_I	Input Voltage	−0.3 to V_{DD} +0.3	V
I_I	DC Input Current	±10	mA
T_{STG}	Storage Temperature Range (Ceramic)	−65 to +150	°C
T_{STG}	Storage Temperature Range (Plastic)	−40 to +125	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	+3 to +6	V
T_A	Operating Ambient Temperature Range Military	−55 to +125	°C
T_A	Industrial Range	−40 to +85	°C
T_A	Commercial Range	0 to +70	°C

PACKAGE SELECTOR GUIDE FOR THE HSG5000 SERIES

Type	Max Pins	Dual-in-line Packages		Chip Carriers		Pin Grid Arrays
		Plastic	Ceramic	Plastic	Ceramic	
HSG5050	52	16+	24+	20+	28	64+
HSG5080	74	24+	24+	44+	28+	64+
HSG5140	92	24+	24+	44+	44+	64+
HSG5170	96	24+	24+	44+	44+	64+
HSG5220	114	40+	24+	44+	44+	68+
HSG5320	138	—	—	44+	68+	68+
HSG5420	156	—	—	68+	68+	68+
HSG5600	180	—	—	68+	84+	100+

Package families include:
Ceramic DIPs — 24,28,40,48 leads.
Plastic DIPs — 24,28,40,48 leads.
Ceramic chip carriers — 28,44,52,68,84 and 100 leads.
Plastic chip carriers — 20,44,68 and 84 leads.
Ceramic Pin-grid arrays — 64,68,84,100,120,144 and 180 leads.

CMOS SEMICUSTOM

HSG 7000 SERIES

FEATURES

- Silicon-gate 2.0-micron (drawn) HCMOS technology.
- Speeds higher than 74S TTL —1.4 ns through 2-input NAND gate and interconnection, $T_A = 25$ °C, fanout = 2, $V_{DD} = 5V$.
- Optimal block structure of 2N and 2P transistors.
- Complexities ranging from 880 to 10.013 blocks.
- Pin counts ranging up to 174.
- Fully supported by LDS™.
- Extensive macrocell and macrofunction libraries.
- All non-power pads configurable as inputs, outputs or bidirectional I/O.
- TTL/CMOS I/O compatibility.
- Configurable output drive up to 12mA under worst-case commercial conditions.
- All inputs and outputs protected from overvoltage and latch-up.
- HSG7220Q evaluation device available
- Full Military capability.
- Ceramic and plastic packages.

PRODUCT OUTLINE

Type	Gate Complexity	Max I/O Pads[3]	Max Pads[3]	Gate Speed (ns)[1]	
				Typ.	Max[2]
HSG7080	880	44	52	1.4	2.4
HSG7140	1443	58	66	1.4	1.4
HSG7220	2224	70	78	1.4	2.4
HSG7320	3192	80	96	1.4	2.4
HSG7420	4242	98	114	1.4	2.4
HSG7600	6072	122	138	1.4	2.4
HSG7840	8370	150	166	1.4	2.4
HSG71000	10.013	158	174	1.4	2.4

Note: 1. 2-input NAND gate, fanout = 2, statistically necessary metal interconnection
2. $T_A = 0$ to 70 °C $V_{DD} = 5V \pm 5\%$
3. The difference between the maximum number of pads, and I/O s is the number of dedicated V_{DD} or V_{SS}, pads. It may be necessary to configure additional I/O pads for V_{DD}/V_{SS} depending on the number and drive of the output buffers.

CMOS SEMICUSTOM

ABSOLUTE MAXIMUM RATINGS (Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	−0.3 to +7	V
V_I	Input Voltage	−0.3 to V_{DD} +0.3	V
I_I	DC Input Current	±10	mA
T_{STG}	Storage Temperature Range (Ceramic)	−65 to +150	°C
T_{STG}	Storage Temperature Range (Plastic)	−65 40 to +125	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	+3 to +6	V
T_A	Operating Ambient Temperature Range Military	−55 to +125	°C
T_A	Industrial Range	−40 to +85	°C
T_A	Commercial Range	0 to +70	°C

PACKAGE SELECTOR GUIDE FOR THE HSG7000 SERIES

Type	Dual-in-line		Chip Carriers		Pin Grid Arrays
	Plastic	Ceramic	Plastic	Ceramic	
HSG7080	24+	24+	20	28	64
HSG7140	24+	24+	20+	28+	64
HSG7220	24+	24+	20+	44+	64+
HSG7320	24+	24+	44+	44+	64+
HSG7420	40	40	44+	52+	68+
HSG7600	—	—	44+	68+	68+
HSG7840	—	—	68+	84+	100+
HSG71000	—	—	68+	84+	100+

Package families include:
Ceramic DIPs — 24,28,40,48 leads.
Plastic DIPs — 24,28,40,48 leads.
Ceramic chip carriers — 28,44,52,68,84 and 100 leads.
Plastic chip carriers — 20,44,68 and 84 leads.
Ceramic Pin-grid arrays — 64,68,84,100,120,144 and 180 leads.
Fiberglass Pin-grid arrays — 64,68,84,100,120,140 and 180 leads.

CMOS SEMICUSTOM

STANDARD CELLS

FEATURES

- Silicon gate 3 micron (drawn) HC MOS technology.
- Double layer metal interconnection.
- TTL speeds 2.5 ns through a 2 input NAND gate and interconnection TA = 25 °C at FAN OUT = 2.
- 170 logic cells available.
- Fully supported by DAISY workstation.
- Easy design migration form gate arrays.
- All non power pads configurable as inputs outputs or bidirectional.
- TTL / CMOS2 / I/O compatibility.
- Output drive current up to 12 mA.
- All inputs and outputs protected from overvoltage and latch up.
- Ceramic or plastic package.

ABSOLUTE MAXIMUM RATINGS (Referenced to V_{SS})

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	−0.3 to +7	V
V_I	Input Voltage	−0.3 to V_{DD} +0.3	V
I_I	DC Input Current	±10	mA
T_{STG}	Storage Temperature Range (Ceramic)	−65 to +150	°C
T_{STG}	Storage Temperature Range (Plastic)	−40 to +125	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	DC Supply Voltage	+3 to +6	V
T_A	Operating Ambient Temperature Range Military	−55 to +125	°C
T_A	Industrial Range	−40 to +85	°C
T_A	Commercial Range	0 to +70	°C

EPROM

Type	Organization	Technology	Supply Voltage (V)	Temp. Range	Current cons. max (mA)	t_{ACC} (ms)	Package
M2716F1	2048x8 bit	NMOS E0	5±5%	0/+70°C	100	450	DIP-24CL
M2716-1F1			5±10%	0/+70°C	100	350	
M2716F6			5±5%	−40/+85°C	100	450	
M2716-1F6			5±10%	−40/+85°C	100	350	
M2732AF1	4096x8 bit	NMOS E1	5±5%	0/+70°C	125	250	DIP-24CL
M2732A-2F1			5±5%	0/+70°C	125	200	
M2732A-3F1			5±5%	0/+70°C	125	300	
M2732A-4F1			5±5%	0/+70°C	125	450	
M2764AF1	8192x8 bit	NMOS E3	5±5%	0/+70°C	75	250	DIP-28CL
M2764A-2F1			5±5%	0/+70°C	60	200	
M2764A-3F1			5±5%	0/+70°C	75	300	
M2764A-4F1			5±5%	0/+70°C	75	450	
M2764A-20F1			5±10%	0/+70°C	60	200	
M2764A-25F1			5±10%	0/+70°C	75	250	
M2764A-30F1			5±10%	0/+70°C	75	300	
M2764A-45F1			5±10%	0/+70°C	75	450	
M2764AF6			5±5%	−40/+85°C	75	250	
M2764A-4F6			5±5%	−40/+85°C	75	450	
M27128AF1*	16384x8 bit	NMOS E3	5±5%	0/+70°C	85	250	DIP-28CL
M27128A-2F1*			5±5%	0/+70°C	85	200	
M27128A-3F1*			5±5%	0/+70°C	85	300	
M27128A-4F1*			5±5%	0/+70°C	85	450	
M27128A-25F1*			5±10%	0/+70°C	85	250	
M27128A-30F1*			5±10%	0/+70°C	85	300	
M27128A-45F1*			5±10%	0/+70°C	85	450	
M27128AF6*			5±5%	−40/+85°C	85	250	
M27128A-4F6*			5±5%	−40/+85°C	85	450	
M27256F1	32768x8 bit	NMOS E3	5±5%	0/+70°C	100	250	DIP-28CL
M27256-2F1			5±5%	0/+70°C	100	200	
M27256-3F1			5±5%	0/+70°C	100	300	
M27256-4F1			5±5%	0/+70°C	100	450	
M27256-25F1			5±10%	0/+70°C	100	250	
M27256-30F1			5±10%	0/+70°C	100	300	
M27256-45F1			5±10%	0/+70°C	100	450	
M27256F6			5±5%	−40/+85°C	100	250	
M27256-4F6			5±5%	−40/+85°C	100	450	
M27512F1*	65536x8 bit	NMOS E3	5±5%	0/+70°C	125	250	DIP-28CL
M27512-3F1*			5±5%	0/+70°C	125	300	
M27512-25F1*			5±10%	0/+70°C	125	250	
M27512-30F1*			5±10%	0/+70°C	125	300	

* These products are in introduction phase.

MEMORIES

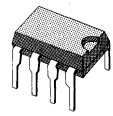
ROM

Type	Organization	Technology	Supply Voltage (V)	Temp. Range	Current cons. max (mA)	t_{ACC} (ms)	Package
M2316H	2048x8 bit	NMOS H1	5±10%	0/+70°C	100	300	DIP-24
M2332	4096x8 bit	NMOS H1	5±10%	0/+70°C	100	250	DIP-24
M2333	4096x8 bit	NMOS H1	5±10%	0/+70°C	100	250	DIP-24
M2365	8192x8 bit	NMOS H2	5±10%	0/+70°C	80	250	DIP-28

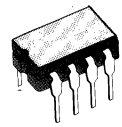
EEPROM

Type	Organization	Technology	Supply Voltage (V)	Temp. Range	Current cons. max (mA)	Clock Freq. (KHz)	Package
M8571*	128x8 bit	NMOS F1	5±5%	0/+70°C	20	125	DIP-8/DIP-8F
M9306B1	16x16 bit	NMOS F1	5±10%	0/+70°C	5	250	DIP-8/SO-8
M9306B6	16x16 bit	NMOS F1	5±10%	−40/+85°C	5	250	DIP-8/SO-8
M9346B1*	64x16 bit	NMOS F1	5±10%	0/+70°C	12	250	DIP-8/SO-8
M9346B6*	64x16 bit	NMOS F1	5±10%	−40/+85°C	12	250	DIP-8/SO-8

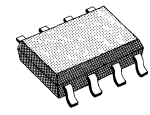
* These products are in introduction phase.



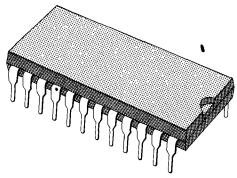
DIP-8 (Plastic)



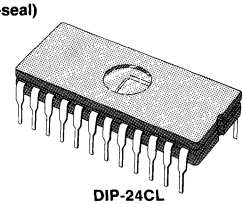
DIP-8F (Ceramic frit-seal)



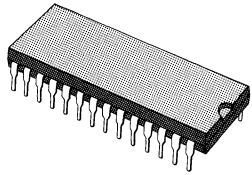
SO-8



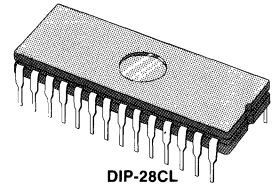
DIP-24 (Plastic)



DIP-24CL
(Ceramic frit-seal cap glass lens)



DIP-28 (Plastic)



DIP-28CL
(Ceramic frit-seal cap glass lens)

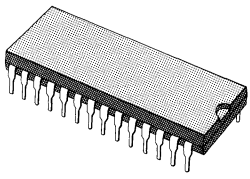
MICROCOMPUTERS

M3870 MICROCOMPUTER UNIT (MCU) STD FAMILY

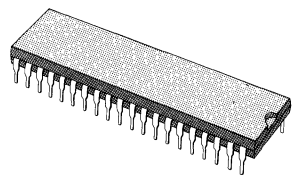
The M3870 std family are NMOS 8 bit single chip microcomputers with ROM capacity of 2K, 4K, 6K and 8K bytes, 64 bytes of scratchpad RAM and 0 or 64 bytes of general purpose RAM. The M3875 features a battery back-up "power-down" mode that preserves the RAM memory content when the supply fails. The M3873 has a serial I/O port.
The M2870 family provides the same powerful architecture as the M3870 family but with reduced I/O lines to enable the die to be packaged in a 28 pin package. The ROM capacity is limited to 4K.
The M38P7X are the piggyback versions of the M3870 std MCU for prototype low-volume applications.
All types cover 0/+70°C and −40/+85°C temperature ranges.

Type	Description	Power supply (V)	Clock Freq. (MHz)	ROM Bytes	RAM Bytes	I/O lines	Package
M3870	Std MCU	+5	4	2K	64	32	DIP-40 PLCC44
M3872				4K	64 + 64		
M3876				6K	64 + 64		
M3878				8K	64 + 64		
M3875	MCU with battery backup RAM	+5*	4	4K	64 + 64(1)	32	
M3873*	MCU with serial I/O	+5	4	2K	64	29 + S(2)	
M2870	Std MCU	+5	4	2K	64	20	DIP-28
M2872				4K	64 + 64		
M38P74OD*	Piggyback Std MCU (emulation of M3870-M3872)	+5	4	up to 4K (ext.)	64 + 64	32 (P4,P5 Open Drain)	DIP-40/28PB
M38P74ST*	Piggyback Std MCU (emulation of M3870-M3872)	+5	4	up to 4K (ext.)	64 + 64	32 (P4,P5 Std Pull-up)	DIP-40/28PB
M38P78OD*	Piggyback Std MCU (emulation of M3876-M3878)	+5	4	up to 8K (ext.)	64 + 64	32 (P4,P5 Open Drain)	DIP-40/28PB
M38P78ST*	Piggyback Std MCU (emulation of M3876-M3878)	+5	4	up to 8K (ext.)	64 + 64	32 (P4,P5 Std Pull-up)	DIP-40/28PB

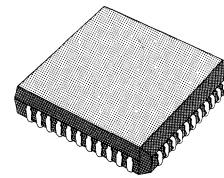
(1) Battery back up 3.2V min. for 64 byte RAM (2) S indicates serial I/O *These products are in introduction phase.



DIP-28 (Plastic)



DIP-40 (Plastic)



PLCC44 (Plastic Chip-Carrier)

MICROCOMPUTERS

M38XX70 DEDICATED MICROCOMPUTER FAMILY

New dedicated products have been introduced to cover specific application areas are:
- MCU with Non Volatile Shadow RAM which automatically saves the 64-byte content of the Executable RAM whenever power is turned off
- MCU with 8-bit A/D converter
- MCU with 8-bit A/D converter and 64-byte N.V. SHRAM
- MCU with serial S-BUS interface, a 3-wire bidirectional SGS Data-Bus, compatible with Philips I²C BUS.
- MCU with PLL for TV and 32-byte N.V. SHRAM
- Piggyback version of MCU with A/D converter

All the devices are produced with an NMOS technology.

Type	Description	Power supply (V)	Clock Freq. (MHz)	ROM Bytes	RAM Bytes	I/O Lines	Additional Features	Package
M38SH74 (p. M38SH72)	MCU with N.V. SHRAM	+5	4	4K	64 + 64 SH	31		DIP-40 PLCC44
M38AD72 (p. M38ADP70) M38AD74	MCU with A/D Converter	+5	4	2K 4K	64	25	•4 A/D inputs •Not Maskable Interrupt •8 lines 20 mA sink	
M38AS74	MCU with A/D Converter and N.V. SHRAM	+5	4	4K	64 + 64 SH	24	•4 A/D inputs •Not Maskable Interrupt •8 lines 20 mA sink •1 line 50 mA sink	DIP-40 PLCC44
M48AS74						32	•4 A/D inputs •Not Maskable Interrupt •8 lines 20 mA sink •2 lines 50 mA sink	DIP-48 PLCC68
M38SB74 (p. M38SB72) M38SB78	MCU with Serial S-BUS (I²C BUS compatible)	+5	4	4K 8K	64 + 64	29	•Serial S-BUS •8 lines 30 mA sink	DIP-40 PLCC44
M28SB74 (p. M28SB72)	MCU with Serial S-BUS (I²C BUS compatible)	+5	4	4K	64 + 64	17	•Serial S-BUS •8 lines 30 mA sink	DIP-28
M28FS72/ M8910	MCU with PLL for TV and N.V. SHRAM	+5	4	2K	64 + 32 SH	17	•PLL for TV (16 MHz input) •8 lines 30 mA sink •A/D for AFC •6 bit D/A Converter	
M38PAD74	Piggyback MCU with A/D (emulation of M38AD72 and M38AD74)	+5	4	Up to 4K (Ext.)	64	25	Piggyback for M38AD7X	DIP-40/24PB

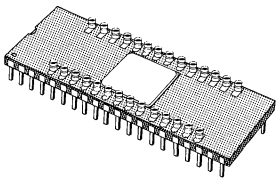
MICROCOMPUTERS

S6 HCMOS MICROCOMPUTER FAMILY

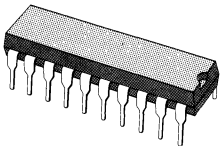
The S6 is a new family of single chip Microcomputers, oriented to low cost applications in Automotive, Consumer and Industrial Markets.
The HCMOS technology allows 3 to 6V supply voltage range, low power consumption and fully static operation, while the serial architecture gives significant contribution to reduce the die size.
Here below are listed the S6 family products in design at the time of publication; new circuits will be added in the near future.
The products are supported by Customer Programmable Devices (Piggyback or ROMless Versions).

Type	Description	Clock Freq. (MHz)	Progr. ROM (Bytes)	Data ROM (Bytes)	RAM (Bytes)	I/O Lines	Ext.int. Input	Timer	Watchdog Timer	Other Features	Packages
S6010*	MCU with A/D	0-4	2K	32	32	7	—	1	1	• 8 bit A/D (7 inputs)	DIP-20
S6011*	MCU with A/D	0-4	2K	32	32	7	1	1	1	• 8 bit A/D (3 inputs) • Analog V_{SS} • Analog V_{DD}	DIP-20
S6012*	MCU with A/D	0-4	2K	32	32	8	1	1	1	• 8 bit A/D (6 inputs) • Analog V_{SS} • Analog V_{DD}	DIP-24
S6040*	MCU with A/D and LCD drivers	4	4K	64	64	16	1	2	—	• 8 bit A/D (3 inputs) • LCD drivers (18 x 2)	PLCC44
S60P12*	Piggyback MCU (emulation of S6010-S6011-S6012)	0-4	2K	32	32	8	1	1	1	• 8 bit A/D (7 inputs) • Analog V_{SS} • Analog V_{DD}	DIP-40/ 28PB
S60R40*	ROMless MCU (emulation of S6040)	4	4K ext.	64	64	16	1	2	—	• 8 bit A/D (3 inputs) • LCD drivers (18 x 2)	LCCC68

* These products are in introduction phase.



DIP-40/28PB
(Ceramic Piggyback)



DIP-20 (Plastc)

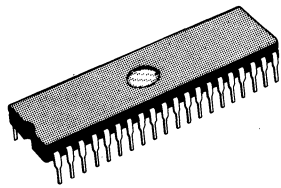
MICROCOMPUTERS

Z8* MICROCOMPUTER UNIT (MCU) FAMILY

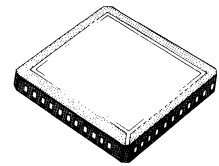
The Z8 family are flexible 8 bit single chip microcomputers with ROM capacity of 2K, 4K and 8K bytes and 144/256 bytes of RAM register file out of which 4 I/O ports registers, 16 control registers and 124/236 general purpose registers. I/O facilities are software programmable. The Z8 includes six levels of vectored interrupt, an on-chip UART, and two 8 bit counter/timers with 6 bit prescaler. Development type is - a 64 pin version with address/data lines brough out to package pins. New products will be introduced in the year: 4K and 8K EPROM versions to speed design and prototyping phases; and Low Power version on all the family.
The Z8 family is available in 0/+70°C and −40/+85°C temperature ranges.

Type	Description	Power supply (V)	Clock Freq. (MHz)	ROM Bytes	RAM Bytes	I/O Lines†	Package
Z8601 **Z8601A**	Microcomputer Unit	+5	8 12	2K	144	32	DIP-40 DIP-40CM PLCC44
Z8611 **Z8611A**	Microcomputer Unit	+5	8 12	4K	144	32	
Z8621* **Z8621A***	Microcomputer Unit	+5	8 12	8K	256	32	
Z8671	MCU BASIC/Debug Interpreter	+5	8	2K	144	32	
Z8681 **Z8681A**	MCU ROMless (1)	+5	8 12	EXT.64K	144+ EXT.64K	32	
Z8682 **Z8682A**	MCU ROMless (2)	+5	8 12	EXT.62K	144+ EXT.62K	32	
Z8684 **Z8684A**	MCU ROMless (3)	+5	8 12	EXT.60K	144+ EXT.60K	32	
Z86E11*	MCU 4K EPROM	+5	8	4K	144	32	DIP40CL
Z86E21*	MCU 8K EPROM	+5	8	8K	256	32	

† Function of I/O lines is programmable and includes address/data lines, external interrupts, I/O handshake and serial I/O (1) EXT. RAM starting at 0 — (2) EXT. RAM starting at 2K — (3) EXT. RAM starting at 4K
* These products are in introduction phase.



DIP-40CL
(Ceramic frit-seal Cap glass lens)



LCCC44
(Ceramic Chip-Carrier)

MICROPROCESSORS

Z80* MICROPROCESSOR UNIT (MPU) FAMILY

The Z80 microprocessor family is the world's leading 8 bit chip set. The high speed Z80H features 8 MHz clock operation.
The family is composed of the Central Processing Unit and five highly integrated peripheral devices, which include all of the circuitry necessary to built high-performance microcomputer systems with virtually no other logic and a minimum of low cost memory elements.
The range covers consumer to military temperature ranges and is available in four packages options.

Type	Description	Power supply (V)	Clock Freq. (MHz)	Package
Z8400 **Z8400A** **Z8400B** **Z8400H**	Central Processing Unit	5±5%	2.5 4 6 8	DIP-40 DIP-40CM PLCC44 LCCC44
Z8410 **Z8410A**	Direct Memory Access	5±5%	2.5 4	
Z8420 **Z8420A** **Z8420B**	Peripheral Input Output	5±5%	2.5 4 6	
Z8430 **Z8430A** **Z8430B**	Counter Timer Circuit	5±5%	2.5 4 6	DIP-28 DIP-28CM PLCC44 LCCC44
Z8440/1/2 **Z8440A/1A/2A** **Z8440B/1B/2B** **Z8444/A/B**	Serial Input Output (Dual) *(Chip Carrier only)*	5±5%	2.5 4 6 2.5/4/6	DIP-40 DIP-40CM PLCC44 LCCC44
Z8470 **Z8470A** **Z8470B** **Z8444/A/B**	Dual Async. Receiver/Transmitter *(Chip carrier only)*	5±5%	2.5 4 6 2.5/4/6	
M8719	Clock Generator for Microprocessor	5±10%	16	DIP-16/DIP-16F

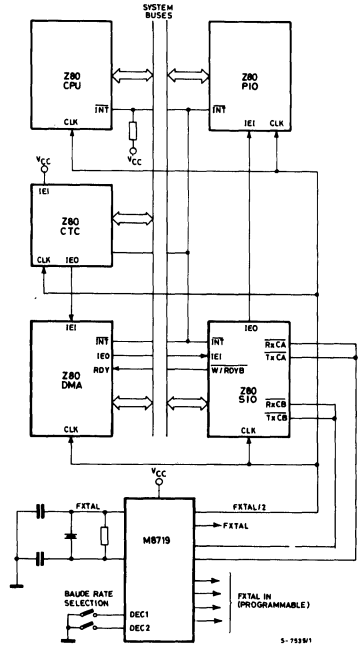
MICROPROCESSORS

Z80 CMOS FAMILY

An important technology evolution to extend the possible applications for the Z80 Family.

Type	Description	Power supply (V)	Clock Freq. (MHz)	Package
Z84C00	Central Processing Unit	5 ± 10%	4	DIP-40 DIP-40CM PLCC44
Z84C20	Parallel Input/Output	5 ± 10%	4	
Z84C30	Counter Timer Circuit	5 ± 10%	4	DIP-28 DIP-28CM PLCC44
Z84C40/1/2 **Z84C44**	Serial Input/Output (Chip Carrier Only)	5 ± 10%	4	DIP-40 DIP-40CM PLCC44
M8719	Clock Generator for Microprocessor	5 ± 10%	16	DIP-16/DIP-16F

Z80 FAMILY TYPICAL APPLICATION



Z8000* MICROPROCESSOR UNIT (MPU) FAMILY

The Z8000 microprocessor family is a powerful 16 bit chip set. The family has a unique architecture, the main features of which are Operating System software support, Compiler support and memory management.
The chip set is highly integrated, each LSI peripheral device performing an intelligent function; in addition a Universal Peripheral Controller microcomputer and multimicro facilities on the Z8000 CPU chip, enable multi microprocessor system to be realised. All devices interface via a common, well defined, Z-BUS™ bus structure.
Two versions of the CPU are available to match the family to a wide range of target applications from fast process control to large microcomputers.

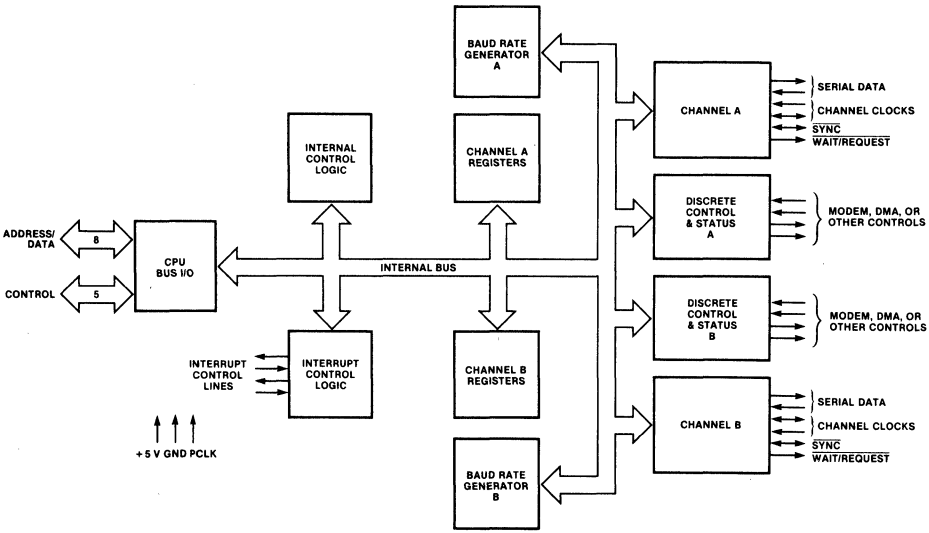
Type	Description	Power Supply (V)	Clock Freq. (MHz)	Package
Z8001 **Z8001A** **Z8001B**	Z8000 16 bit Segmented CPU, 48 pin, 8M byte address range	+5	4 6 10	DIP-48 DIP-48CM
Z8002 **Z8002A** **Z8002B**	Z8000 16 bit Non Segmented CPU,40 pin,64K byte address range	+5	4 6 10	DIP-40 DIP-40CM PLCC44
Z8003 **Z8003A** **Z8003B**	Z8000 VMPU Segmented, virtual memory CPU, 48 pin	+5	4 6 10	DIP-48 DIP-48CM
Z8004 **Z8004A**	Z8000 VMPU Non Segmented, virtual memory CPU, 40 pin	+5	4 6	DIP-40 DIP40-CM
Z8010 **Z8010A** **Z8010B**	Z8000 MMU Memory Management Unit for Z8001 SEGCPU	+5	4 6 10	DIP-48 DIP-48CM
Z8015 **Z8015A**	Z8000 PMMU Paged Memory Management Unit	+5	4 6	DIP-64CM
Z8030 **Z8030A** **Z8030L/LA**	Z8000 SCC Serial Communication Controller (Dual) *(Chip-Carrier only)*	+5	4 6 4/6	DIP-40 DIP-40CM PLCC44
Z8031 **Z8031A**	Z8000 ASCC Asynchronous Serial Communication Controller	+5	4 6	DIP-40 DIP-40CM
Z8036 **Z8036A** **Z8036L/LA**	Z8000 CIO Counter/Timer and Parallel Input/Output *(Chip-Carrier only)*	+5	4 6 4/6	DIP-40 DIP-40CM PLCC44
Z8038 **Z8038A**	Z8000 FIFO Input/Output Interface	+5	4 6	DIP-40 DIP-40CM PLCC44
Z8060	Z8000 FIFO Buffer Unit and Z8038 Expander	+5	4	DIP-28

Z8500 UNIVERSAL PERIPHERALS

Selected Z8000 LSI peripheral components feature alternative versions with modified bus interfacing suitable for use with other CPU's such as the Z80.

Type	Description	Power Supply (V)	Clock Freq. (MHz)	Package
Z8530 **Z8530A** **Z8030L/LA**	SCC - Serial Communications Controller (Dual) *(Chip-Carrier only)*	+5	4 6 4/6	DIP-40 DIP-40CM PLCC44
Z8531 **Z8531A**	ASCC - Asynchronous Serial Communication Controller	+5	4 6	DIP-40 DIP-40CM
Z8536 **Z8536A** **Z8036L/LA**	CIO Counter/Timer and Parallel Input/Output *(Chip-Carrier only)*	+5	4 6 4/6	DIP-40 DIP-40CM PLCC44
Z8038 **Z8038A**	Z8000 FIFO Input/Output Interface	+5	4 6	DIP-40 DIP-40CM PLCC44
Z8060	Z8000 FIFO Buffer Unit and Z8038 Expander	+5	4	DIP-28

SCC ARCHITECTURAL BLOCK DIAGRAM



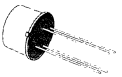
GENERAL PURPOSE TRANSISTORS

SMALL SIGNAL

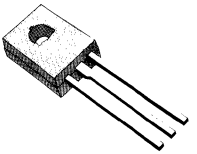
SGS has a range of small signal silicon transistors to cover a wide variety of applications demanded by the industrial, instrumentation, telecommunication as well as military and space markets.

TO-18

TO-39



TO-72

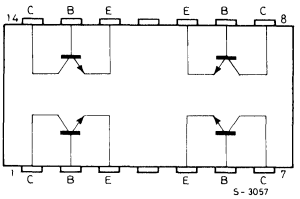


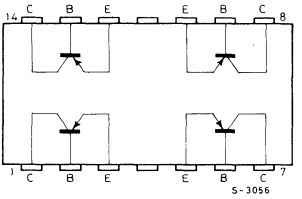
TO-126/SOT-32

QUAD SMALL SIGNAL TRANSISTORS

These devices offer all the performance of discrete small signal transistors in a package which is compatible with automatic insertion equipment. They may be used as effective input buffers, level shifters and current boosters to drive high fan out loads, LEDs, relays and other peripheral loads from boards of logic circuitry.

(a)





(b)

QUAD SILICON TRANSISTORS IN DUAL IN LINE PLASTIC PACKAGE

Type	Polarity	P_D (W)	V_{CBO} (V)	V_{CEO} (V)	I_C (mA)	and @ h_{FE} min	V_{CEsat} max (V)	I_C (mA)	f_T min (MHz)	Package	Connections
MPQ2222	NPN	1.9	60	40	500	100	0.4	150	200	DIP-14	(a)
MPQ2907	PNP	1.9	60	40	600	100	0.4	150	200	DIP-14	(b)

SMALL SIGNAL

TRANSISTORS FOR RADIO FREQUENCY APPLICATIONS

Polar.	Max ratings			Type	Main function	Trans. freq.		Noise figure			Gain		Package
						@		@ and			@		
	V_{CEO} (V)	I_C (mA)	P_{tot} (mW)			f_T (MHz)	I_C (mA)	NF (dB)	I_C (mA)	f (MHz)	P_G (dB)	f (MHz)	
PNP	35	20		**BFR38**	VHF/UHF amplifier	1000	3	3.5	3	800	14	800	TO-72
PNP	35	20	200	**BF272A**	UHF amp.	850	3	3.5	3	800	15	800	TO-72
NPN	25	25	175	**BF173**	Video IF amp.	1000 typ	5	—	—	—	25 typ	35	TO-72
NPN	15	40	200	**2N2857**	VHF/UHF amplifier-osc.	1200	5	3.8	1.5	450	16	450	TO-72
NPN	15	40	200	**2N3839**	VHF/UHF amplifier-osc.	1400	5	3	1.5	450	17	450	TO-72
NPN	12	50	200	**2N5179**	VHF amplifier-osc.	1400	5	3	1.5	200	21	200	TO-72
NPN	15	50	200	**BFX89**	UHF amplifier	1200	25	5	2	500	12	500	TO-72
PNP	25	50	225	**BFR99A**	UHF amplifier	1400	10	5	3	800	10	800	TO-72
PNP	25	50	225	**BFR99**	UHF amplifier	2000	10	3.5	3	800	12	800	TO-72
NPN	25	150	700	**BFW16A**	CATV-MATV amplifier	1200	150	6	30	200	6.5	800	TO-39
NPN	25	150	700	**BFX17A**	CATV-MATV amplifier	1100	150	—	—	—	16	200	TO-39
NPN	20	500	3500	**2N4427**	VHF power amp.	500	50	—	—	—	10	175	TO-39
NPN	30	500	3500	**2N3866**	UHF/VHF power amp.	500	50	—	—	—	10	400	TO-39

NPN GENERAL PURPOSE TRANSISTORS - TO-18

V_{CEO} V_{CER}* (V)	@ h_{FE} min/max	@ I_C (mA)	Type	@ $V_{CE(sat)}$ (V) max	@ I_C (mA)	f_T (MHz) min	t_s t_{off}* (ns)	P_{tot} (mW)	Also available
55	50/—	50	**BSX33**	0.3	150	60	800*	500	
25	75/260	100	**BC377**	0.7	500	300 typ.	—	375	
40	75/260	100	**BC378**	0.7	500	300 typ.	—	375	
30	100/300	150	**2N2222**	1.6	500	250	225	500	2N2221
40	100/300	150	**2N2222A**	1	500	250	225	500	2N2221A
50*	100/300	150	**2N956**	1.5	150	70	—	500	2N718A
55	60/180	150	**BFR18**	0.25	150	60	—	500	
80	40/—	150	**2N720A**	5	150	50	—	500	
80	100/300	150	**2N3700**	0.5	500	100 typ.	—	500	2N3302

SGS

SMALL SIGNAL

NPN GENERAL PURPOSE TRANSISTORS - TO-39

V_{CEO} V_{CER}* (V)	h_{FE} min/max @	I_C (mA) @	Type	$V_{CE(sat)}$ (V) max @	I_C (mA) @	f_T (MHz) min	t_s t_{off}* (ns)	P_{tot} (mW)	Also available
40	40/250	100	**BC140**	0.35 typ.	500	50	850*	800	h_{FE} groups
60	40/250	100	**BC141**	0.35 typ.	500	50	850*	800	-6, -10, -16
30	40/—	150	**BFY51**	0.35	150	50	160 typ.	800	BFY52
30	100/300	150	**2N2219**	1.6	500	250	225	800	2N2218
35	30/—	150	**BFY50**	0.2	150	60	140 typ.	800	
40	50/250	150	**2N3053**	1.4	150	100 typ.	—	800	
40	100/300	150	**2N2219A**	1	500	250	225	800	2N2218A
50*	40/120	150	**2N1613**	1.5	150	60	—	800	
50*	100/300	150	**2N1711**	1.5	150	70	—	800	
55	40/120	150	**BFY56A**	0.25	150	60	800*	800	BFY56
60	40/120	150	**2N3108**	1.4	150	100 typ.	—	800	2N3110
60	100/300	150	**2N3107**	1.4	150	100 typ.	—	800	2N3109
65	40/120	150	**2N2102**	0.5	150	60	30*	1000	
80	40/120	150	**2N1893**	5	150	50	—	800	
80	40/120	150	**2N3020**	0.5	500	80 typ.	—	800	
80	100/300	150	**2N3019**	0.5	500	100 typ.	—	800	
40	40/240	500	**BC440**	1	1000	50	—	1000	
50	40/250	500	**2N5321**	0.8	500	50	800*	1000	
60	40/240	500	**BC441**	1	1000	50	—	1000	
75	30/130	500	**2N5320**	0.50	500	50	800*	1000	

PNP GENERAL PURPOSE TRANSISTORS - TO-18

V_{CEO} (V)	h_{FE} min/max @	I_C (mA)	Type	$V_{CE(sat)}$ (V) max @	I_C/I_B (mA)	f_T (MHz) min	t_s t_{off}* (ns)	P_{tot} (mW)	Also available
30	90/—	10	**BFX48**	0.3	50/5	400	160*	360	
40	50/—	10	**BCY70**	0.5	50/5	250	350	350	
40	100/300	10	**2N3251**	0.5	50/5	300	200	360	2N3250
40	150/300	10	**2N4035**	0.3	50/5	450	150*	360	
45	100/600	10	**BCY71**	0.5	50/5	200	—	350	BCY72
40	100/300	150	**2N2907**	0.4	150/15	200	80	400	
45	100/300	150	**2N3504**	0.4	150/15	200	40	400	2N3505
60	40/120	150	**2N2906A**	0.4	150/15	200	80	400	2N2906
60	100/300	150	**2N2907A**	0.4	150/15	200	80	400	

SMALL SIGNAL

PNP GENERAL PURPOSE TRANSISTORS - TO-39

V_{CEO} (V)	h_{FE} @ I_C min/max	I_C (mA)	Type	$V_{CE(sat)}$ (V) @ I_C/I_B max	I_C/I_B (mA)	f_T (MHz) min	t_s t_{off}* (ns)	P_{tot} (mW)	Also available
55	85/—	100	**BFX38**	0.5	500/50	100	350	800	BFX39
75	40/—	100	**BFX41**	0.5	500/50	100	350	800	
75	85/—	100	**BFX40**	0.5	500/50	100	350	800	
80	100/300	100	**2N4033**	0.5	500/50	150	350	800	2N4031/2
40	50/250	150	**2N4037**	0.3	150/15	100	110	700	
40	100/230	150	**2N2905**	0.4	150/15	200	80	600	
60	40/120	150	**2N2904A**	0.4	150/15	200	80	600	2N2904
60	100/300	150	**2N2905A**	0.4	150/15	200	80	600	
65	40/140	150	**2N4036**	0.65	150/15	60	700*	1000	
40	40/250	500	**BC460**	1	1000/100	50	—	1000	
60	40/250	500	**BC461**	1	1000/100	50	—	1000	
75	30/130	500	**2N5322**	0.7	500/50	50	1000*	1000	2N5323
60	40/120	100	**2N4030**	0.5	500/50	100	350	800	
40	40/250	100	**BC160**	0.35 typ.	500/50	50	600*	650	
60	40/250	100	**BC161**	0.35 typ.	500/50	50	600*	650	

NPN TRANSISTORS FOR LOW LEVEL, LOW NOISE APPLICATIONS - TO-18

V_{CEO} (V)	h_{FE} @ I_C min/max	I_C (mA)	Type	$V_{CE(sat)}$ (V) @ I_C/I_B max	I_C/I_B (mA)	f_T (MHz) min	NF (dB)	P_{tot} (mW)	Also available
45	100/500	0.01	**2N930**	1	10/0.5	30	3	300	
60	100/500	0.01	**2N2484**	0.35	1/0.1	60	3	360	2N2483
60	130/—	0.01	**BFR17**	0.35	1/0.1	70	3	360	
60	150/300	1	**BFY76**	0.35	1/0.1	100	4	360	
20	110/800*	2	**BC108**	0.6	100/5	100	10	300	
20	200/800*	2	**BC109**	0.6	100/5	100	4	300	
45	110/450*	2	**BC107**	0.6	100/5	100	10	300	
45	120/630	2	**BCY59**	0.7	100/2.5	100	6	360	BCY58

* h_{fe} @ KHz

SGS

SMALL SIGNAL

PNP TRANSISTORS FOR LOW LEVEL, LOW NOISE APPLICATIONS - TO-18

V_{CEO} (V)	h_{FE} min/max @	I_C (mA) @	Type	$V_{CE(sat)}$ (V) max @	I_C/I_B (mA) @	f_T (MHz) min	NF (dB)	P_{tot} (mW)	Also available
45	250/500	0.01	**2N3964**	0.25	10/0.5	50	2	360	2N3965
80	70/230	0.01	**BFX37**	0.4	50/5	40	3.5	360	
80	100/300	0.01	**2N3963**	0.25	10/0.5	40	3	360	2N3962
25	125/500*	2	**BC178**	0.25	50/5	200 typ.	10	300	BC179
45	120/460	2	**BCY79**	0.8	100/2.5	180 typ.	6	390	BCY78
45	125/500*	2	**BC177**	0.25	50/5	200 typ.	10	300	
50	110/450	2	**BC478**	0.25	50/5	150 typ.	6	360	BC479
80	110/250	2	**BC477**	0.25	50/5	150 typ.	10	360	

* h_{fe} @ 1KHz

HIGH VOLTAGE TRANSISTORS

Polarity	V_{CEO} (V)	h_{FE} min/max @	I_C (mA)	Type	$V_{CE(sat)}$ (V) max @	I_C/I_B (mA)	f_T (MHz) min	P_{tot} (mW)	Package
PNP	150	40/—	10	**BFW43**	0.5	10/1	60	400	
NPN	180	30/—	10	**BC394**	0.3	10/1	50	400	TO-18
PNP	180	50/—	10	**BC393**	0.3	10/1	50	400	
NPN	200	40/—	30	**BSS72S**	0.5	50/5	200	500	
PNP	200	40/250	30	**BSS75S**	0.4	30/3	200	500	
PNP	150	40/—	10	**BFW44**	0.5	10/1	60	700	
PNP	180	80/300	10	**BFX91**	0.25	10/1	40	700	
PNP	180	80/300	10	**2N3931**	0.25	10/1	60	700	TO-39
PNP	200	30/150	10	**2N5415S**	2.5	50/5	15	1000	
NPN	250	25/—	30	**BF258**	1	30/6	90 typ.	1000	
NPN	150	30/—	30	**2N3114**	1	50/5	40	800	
NPN	250	30/—	30	**BF458**	1	50/10	90 typ.	1250	TO-126
NPN	300	30/—	30	**BF459**	1	50/10	90 typ.	1250	

SMALL SIGNAL

NPN TRANSISTORS FOR FAST AND ULTRA FAST SWITCHING

V_{CEO} (V)	h_{FE} @ min/max	I_C @ (mA)	Type	$V_{CE(sat)}$ @ (V) max	I_C/I_B @ (mA)	f_T (MHz) min	t_s t_{off}* (ns)	P_{tot} (mW)	Package
12	30/120	10	**BSX28**	0.25	30/3	400	13	360	TO-18
15	30/120	10	**2N708**	0.4	10/1	300	75*	360	
15	30/120	10	**2N914**	0.7	200/20	300	20	360	
15	40/120	10	**BSX20**	0.6	100/10	450	13	360	
15	40/120	10	**2N2369**	0.25	10/1	500	13	360	
15	40/120	10	**2N2369A**	0.2	10/1	500	13	360	
15	30/120	30	**BSX26**	0.5	300/30	350	18	360	
20	30/120	30	**2N3014**	0.18	100/10	350	18	360	
20	40/120	30	**BSX39**	0.28	100/10	350	18	360	
15	25/—	100	**2N3013**	0.5	300/30	350	18	360	
30	60/150	100	**2N4013**	0.20	100/10	300	60*	500	
30	30/120	150	**2N2845**	0.4	150/15	350	40*	360	
40	60/150	100	**BSX32**	0.5	500/50	300	60*	800	TO-39
50	60/150	100	**2N3725**	0.52	500/50	300	60*	800	

PNP TRANSISTORS FOR FAST AND ULTRA FAST SWITCHING

V_{CEO} (V)	h_{FE} @ min/max	I_C @ (mA)	Type	$V_{CE(sat)}$ @ (V) max	I_C/I_B @ (mA)	f_T (MHz) min	t_{off}* (ns)	P_{tot} (mW)	Package
12	30/120	30	**BSX29**	0.2	30/3	400	90	360	TO-18
12	40/120	30	**2N2894**	0.2	100/10	400	90	360	
20	30/120	30	**2N3209**	0.2	30/3	400	90	360	

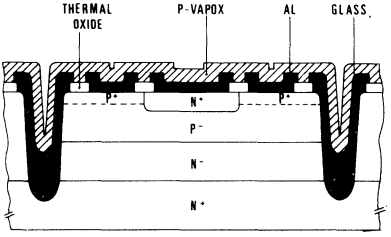
POWER BIPOLAR

Power transistors are used for a myriad of power regulation, amplification and switching purposes. The epitaxial base process provides cost effective complementary pairs of transistors, and for higher gain darlingtons. The SGS range of current capability and choice of packages are second to non.

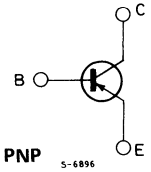
POWER TRANSISTORS

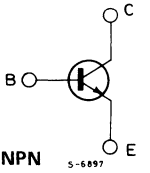
EPITAXIAL BASE - I_{CM} 1 to 3A; V_{CEO} 22 to 100V

NPN and PNP types
(perfect complementary pairs)
Medium V_{CEO} range (22 to 100V)
Medium switching speed
Medium f_T (2 to 20 MHz)
High ruggedness



INTERNAL SCHEMATIC DIAGRAMS





EPITAXIAL BASE

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	@ V_{CEsat} (V)	@ I_C (A)	@ I_B (mA)
1	40	40	30	SOT-32	**2N4921**	**2N4918**	30	0.5	1	0.6	1	100
1	40	40	30	TO-220	**TIP29**	**TIP30**	15	1	4	0.7	1	125
1	60	60	30	SOT-32	**2N4922**	**2N4919**	30	0.5	1	0.6	1	100
1	60	60	30	TO-220	**TIP29A**	**TIP30A**	15	1	4	0.7	1	125
1	80	80	30	SOT-32	**2N4923**	**2N4920**	30	0.5	1	0.6	1	100
1	80	80	30	TO-220	**TIP29B**	**TIP30B**	15	1	4	0.7	1	125
1	100	100	30	TO-220	**TIP29C**	**TIP30C**	15	1	4	0.7	1	125
2	45	45	25	SOT-32	**BD233**	**BD234**	25	1	2	0.6	1	100
2	55	45	30	TO-220	**BD239**	**BD240**	15	1	4	0.7	1	200
2	60	60	25	SOT-32	**BD235**	**BD236**	25	1	2	0.6	1	100
2	70	60	30	TO-220	**BD239A**	**BD240A**	15	1	4	0.7	1	200
2	90	80	30	TO-220	**BD239B**	**BD240B**	15	1	4	0.7	1	200
2	100	80	25	SOT-32	**BD237**	**BD238**	25	1	2	0.6	1	100
2	115	100	30	TO-220	**BD239C**	**BD240C**	15	1	4	0.7	1	200

POWER BIPOLAR

EPITAXIAL BASE (continued)

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	@ V_{CEsat} (V)	@ I_C (A)	@ I_B (mA)
3	30	30	25	SOT-32	**MJE520**	**MJE370**	25	1	1	—	—	—
3	30	30	25	SOT-82	**SGS520**		25	1	1	—	—	—
3	40	40	40	TO-220	**TIP31**	**TIP32**	25	1	4	1.2	3	375
3	45	45	30	SOT-32	**BD175**	**BD176**	40	0.15	2	0.8	1	100
3	45	45	30	SOT-32	**BD175-10**	**BD176-10**	63	0.15	2	0.8	1	100
3	45	45	30	SOT-32	**BD175-16**	**BD176-16**	100	0.15	2	0.8	1	100
3	45	45	30	SOT-32	**BD175-6**	**BD176-6**	40	0.15	2	0.8	1	100
3	55	45	40	TO-220	**BD241**	**BD242**	25	1	4	1.2	3	600
3	60	60	30	SOT-32	**BD177**	**BD178**	40	0.15	2	0.8	1	100
3	60	60	30	SOT-32	**BD177-10**	**BD178-10**	63	0.15	2	0.8	1	100
3	60	60	30	SOT-32	**BD177-6**	**BD178-6**	40	0.15	2	0.8	1	100
3	60	60	40	TO-220	**TIP31A**	**TIP32A**	25	1	4	1.2	3	375
3	70	60	40	TO-220	**BD241A**	**BD242A**	25	1	4	1.2	3	600
3	80	80	30	SOT-32	**BD179**	**BD180**	40	0.15	2	0.8	1	100
3	80	80	30	SOT-32	**BD179-10**	**BD180-10**	63	0.15	2	0.8	1	100
3	80	80	30	SOT-32	**BD179-6**	**BD180-6**	40	0.15	2	0.8	1	100
3	80	80	40	TO-220	**TIP31B**	**TIP32B**	25	1	4	1.2	3	375
3	90	80	40	TO-220	**BD241B**	**BD242B**	25	1	4	1.2	3	600
3	100	100	40	TO-220	**TIP31C**	**TIP32C**	25	1	4	1.2	3	375
3	115	100	40	TO-220	**BD241C**	**BD242C**	25	1	4	1.2	3	600
4	22	22	36	SOT-32	**BD433**	**BD434**	50	2	1	0.5	2	200
4	32	32	36	SOT-32	**BD435**	**BD436**	50	2	1	0.5	2	200
4	40	40	40	SOT-32	**MJE521**	**MJE371**	40	1	1	—	—	—
4	40	40	40	SOT-32	**2N5190**	**2N5193**	25	1.5	2	0.6	1.5	150
4	45	45	36	SOT-32	**BD437**	**BD438**	40	2	1	0.6	2	200
4	45	45	40	TO-220	**2N6121**	**2N6124**	25	1	2	0.6	1.5	150
4	60	60	36	SOT-32	**BD439**	**BD440**	25	2	1	0.8	2	200
4	60	60	40	SOT-32	**2N5191**	**2N5194**	25	1.5	2	0.6	1.5	150
4	60	60	40	TO-220	**2N6122**	**2N6125**	25	1.5	2	0.6	1.5	150
4	80	80	36	SOT-32	**BD441**	**BD442**	15	2	1	0.8	2	200
4	80	80	40	SOT-32	**2N5192**	**2N5195**	20	1.5	2	0.6	1.5	150
4	80	80	40	TO-220	**2N6123**	**2N6126**	20	1.5	2	0.6	1.5	150
5	40	25	15	SOT-32	**MJE200**	**MJE210**	70	0.5	1	0.3	0.5	50
6	40	40	65	TO-220	**TIP41**	**TIP42**	15	3	4	1.5	6	600
6	45	45	65	TO-220	**BD243**	**BD244**	15	3	4	1.5	6	1000
6	60	60	65	TO-220	**BD243A**	**BD244A**	15	3	4	1.5	6	1000
6	60	60	65	TO-220	**TIP41A**	**TIP42A**	15	3	4	1.5	6	600
6	80	80	65	TO-220	**BD243B**	**BD244B**	15	3	4	1.5	6	1000
6	80	80	65	TO-220	**TIP41B**	**TIP42B**	15	3	4	1.5	6	600
6	100	100	65	TO-220	**BD243C**	**BD244C**	15	3	4	1.5	6	1000
6	100	100	65	TO-220	**TIP41C**	**TIP42C**	15	3	4	1.5	6	600
7	40	30	40	TO-220	**2N6288**	**2N6111**	30	4	3	1	3	300
7	60	50	40	TO-220	**2N6290**	**2N6109**	30	4	2.5	1	2.5	250
7	80	70	40	TO-220	**2N6292**	**2N6107**	30	4	2	1	2	200

SGS

POWER BIPOLAR

EPITAXIAL BASE (continued)

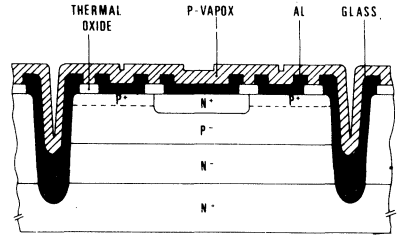
I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	V_{CEsat} (V)	I_C (A)	I_B (mA)
8	45	45	50	TO-220	**BD533**	**BD534**	25	2	2	0.8	2	200
8	60	60	50	TO-220	**BD535**	**BD536**	25	2	2	0.8	2	200
8	80	80	50	TO-220	**BD537**	**BD538**	15	2	2	0.8	2	200
10	60	60	150	TO-3	**2N5877**	**2N5875**	20	4	4	1	5	500
10	70	60	75	TO-220	**MJE3055T**	**MJE2955T**	20	4	4	1.1	4	400
10	80	60	150	TO-3	**2N3715**	**2N3791**	30	3	2	0.8	5	500
10	80	80	150	TO-3	**2N5878**	**2N5876**	20	4	4	1	5	500
10	100	80	150	TO-3	**2N3716**	**2N3792**	30	3	2	0.8	5	500
12	45	45	75	TO-220	**BD705**	**BD706**	20	4	4	1	4	400
12	60	60	75	TO-220	**BD707**	**BD708**	15	4	4	1	4	400
12	80	80	75	TO-220	**BD709**	**BD710**	15	4	4	1	4	400
12	100	100	75	TO-220	**BD711**	**BD712**	15	4	4	1	4	400
15	50	40	150	TO-3	**2N3771**		15	15	4	1.4	10	1000
15	45	45	90	TO-220	**BD905**	**BD906**	15	5	4	1	5	500
15	45	45	125	TO-3	**BDW51**	**BDW52**	20	5	4	1	5	500
15	50	50	75	TO-220	**2N6486**	**2N6489**	20	5	4	1.3	5	500
15	60	60	100	TO-220	**BD907**	**BD908**	15	5	4	1	5	500
15	60	60	125	TO-3	**BDW51A**	**BDW52A**	20	5	4	1	5	500
15	70	60	90	SOT-93	**TIP3055**	**TIP2955**	20	4	4	1.1	4	400
15	100	60	115	TO-3	**2N3055**	**MJ2955**	20	4	4	1.1	4	400
15	100	60	150	TO-3	**2N3772**		15	10	4	2	15	1500
15	100	60	150	TO-3	**SGS3055**		20	4	4	1	5	500
15	70	70	75	TO-220	**2N6487**	**2N6490**	20	5	4	1.3	5	500
15	80	80	90	TO-220	**BD909**	**BD910**	15	5	4	1	5	500
15	80	80	125	TO-3	**BDW51B**	**BDW52B**	20	5	4	1	5	500
15	90	90	75	TO-220	**2N6488**	**2N6491**	20	5	4	1.3	5	500
15	100	100	90	TO-220	**BD911**	**BD912**	15	5	4	1	5	500
15	100	100	125	TO-3	**BDW51C**	**BDW52C**	20	5	4	1	5	500
16	100	100	200	TO-3	**2N5629**	**2N6029**	25	8	2	1	10	1000
20	80	80	200	TO-3	**2N5303**	**2N5745**	40	1	2	1	10	1000
25	60	60	125	SOT-93	**TIP35A**	**TIP36A**	25	1.5	4	1.8	15	1500
25	60	60	200	TO-3	**2N5885**	**2N5883**	35	3	4	1	15	1500
25	80	80	125	SOT-93	**TIP35B**	**TIP36B**	25	1.5	4	1.8	15	1500
25	80	80	130	SOT-93	**SGSD110**	**SGSD210**	15	5	4	1.5	16	2000
25	80	80	200	TO-3	**2N5886**	**2N5884**	35	3	4	1	15	1500
25	100	100	125	SOT-93	**TIP35C**	**TIP36C**	25	1.5	4	1.8	15	1500
30	40	40	200	TO-3	**2N5301**	**2N4398**	40	1	2	0.75	10	1000
30	60	60	200	TO-3	**2N5302**	**2N4399**	40	1	2	0.75	10	1000
30	100	90	200	TO-3	**MJ802**	**MJ4502**	25	7.5	2	0.8	7.5	750

POWER BIPOLAR

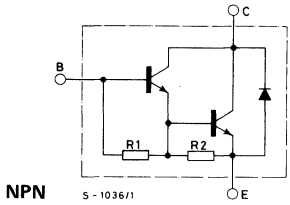
HIGH GAIN DARLINGTONS

EPITAXIAL BASE - I_{CM} 2 to 30A; V_{CE} 45 to 180V

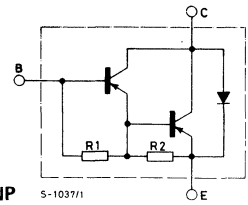
NPN and PNP types
Medium V_{CEO} range (45 to 180V)
Medium Switching speed
Medium f_T (2 to 20 MHz)
High ruggedness
Monolithic Darlingtons



INTERNAL SCHEMATIC DIAGRAMS



NPN S-1036/1



PNP S-1037/1

EPITAXIAL BASE

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	V_{CEsat} (V)	@ I_C (A)	@ I_B (mA)
2	45	45	40	SOT-32	**BD675**	**BD676**	750	1.5	3	2.5	1.5	30
2	60	60	50	SOT-82	**SGS110**	**SGS115**	1000	1	4	2.5	2	8
2	60	60	50	TO-220	**TIP110**	**TIP115**	1000	1	4	2.5	2	8
2	80	80	50	SOT-82	**SGS111**	**SGS116**	1000	1	4	2.5	2	8
2	80	80	50	TO-220	**TIP111**	**TIP116**	1000	1	4	2.5	2	8
2	100	100	50	SOT-82	**SGS112**	**SGS117**	1000	1	4	2.5	2	8
2	100	100	50	TO-220	**TIP112**	**TIP117**	1000	1	4	2.5	2	8
4	40	40	40	SOT-32	**2N6037**	**2N6034**	500	0.5	3	2	2	8
4	45	45	40	SOT-32	**BD675A**	**BD676A**	750	2	3	2.8	2	40
4	60	60	40	SOT-32	**2N6038**	**2N6035**	500	0.5	3	2	2	8
4	60	60	40	SOT-32	**BD677**	**BD678**	750	1.5	3	2.5	1.5	30
4	60	60	40	SOT-32	**BD677A**	**BD678A**	750	2	3	2.8	2	40
4	60	60	40	SOT-32	**MJE800**	**MJE700**	100	4	3	3	4	40
4	60	60	40	SOT-32	**MJE801**	**MJE701**	100	4	3	3	4	40
4	80	80	40	SOT-32	**2N6039**	**2N6036**	500	0.5	3	2	2	8
4	80	80	40	SOT-32	**BD679**	**BD680**	750	1.5	3	2.5	1.5	30
4	80	80	40	SOT-32	**BD679A**	**BD680A**	750	2	3	2.8	2	40
4	80	80	40	SOT-32	**MJE802**	**MJE702**	100	4	3	3	4	40
4	80	80	40	SOT-32	**MJE803**	**MJE703**	100	4	3	3	4	40
4	100	100	40	SOT-32	**BD681**	**BD682**	750	1.5	3	2.5	1.5	30
4	180	180	10	TO-39	**BDW91**	**BDW92**	1000	2	5	2	2	4

POWER BIPOLAR

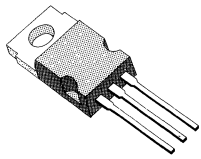
EPITAXIAL BASE (continued)

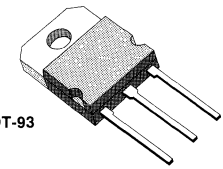
I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	V_{CEsat} (V)	@ I_C (A)	@ I_B (mA)
5	60	60	65	SOT-82	**SGS120**	**SGS125**	1000	3	3	2	3	12
5	60	60	65	TO-220	**TIP120**	**TIP125**	1000	3	3	2	3	12
5	80	80	65	SOT-82	**SGS121**	**SGS126**	1000	3	3	2	3	12
5	80	80	65	TO-220	**TIP121**	**TIP126**	1000	3	3	2	3	12
5	100	100	65	SOT-82	**SGS122**	**SGS127**	1000	3	3	2	3	12
5	100	100	65	TO-220	**TIP122**	**TIP127**	1000	3	3	2	3	12
6	45	45	50	TO-220	**BDW23**	**BDW24**	750	2	3	2	2	8
6	60	60	50	TO-220	**BDW23A**	**BDW24A**	750	2	3	2	2	8
6	60	60	60	SOT-82	**BD331**	**BD332**	750	3	3	2	3	12
6	80	80	50	TO-220	**BDW23B**	**BDW24B**	750	2	3	2	2	8
6	80	80	60	SOT-82	**BD333**	**BD334**	750	3	3	2	3	12
6	100	100	50	TO-220	**BDW23C**	**BDW24C**	750	2	3	2	2	8
6	100	100	60	SOT-82	**BD335**	**BD336**	750	3	3	2	3	12
6	140	140	60	TO-220	**BDX53E**	**BDX54E**	500	2	5	2	2	10
6	150	150	15	TO-39	**BDX53S**	**BDX54S**	500	2	5	2	2	8
6	160	160	60	TO-220	**BDX53F**	**BDX54F**	500	2	5	2	2	10
8	40	40	65	TO-220	**2N6386**		1000	3	3	2	3	6
8	40	40	65	SOT-82	**SGS6386**		1000	3	3	2	3	6
8	45	45	60	TO-220	**BDX53**	**BDX54**	750	3	3	2	3	12
8	60	60	60	TO-220	**BDX53A**	**BDX54A**	750	3	3	2	3	12
8	60	60	65	SOT-82	**SGS130**	**SGS135**	1000	4	4	2	4	16
8	60	60	70	TO-220	**TIP130**	**TIP135**	1000	4	4	2	4	16
8	60	60	75	TO-220	**2N6043**	**2N6040**	1000	4	4	2	4	16
8	60	60	80	TO-220	**TIP100**	**TIP105**	1000	3	4	2	3	6
8	60	60	90	TO-3	**MJ1000**	**MJ900**	1000	3	3	2	3	12
8	80	80	60	TO-220	**BDX53B**	**BDX54B**	750	3	3	2	3	12
8	80	80	65	SOT-82	**SGS131**	**SGS136**	1000	4	4	2	4	16
8	80	80	70	TO-220	**TIP131**	**TIP136**	1000	4	4	2	4	16
8	80	80	75	TO-220	**2N6044**	**2N6041**	1000	4	4	2	4	16
8	80	80	80	TO-220	**TIP101**	**TIP106**	1000	3	4	2	3	6
8	80	80	90	TO-3	**MJ1001**	**MJ901**	1000	3	3	2	3	12
8	100	100	60	TO-220	**BDX53C**	**BDX54C**	750	3	3	2	3	12
8	100	100	65	SOT-82	**SGS132**	**SGS137**	1000	4	4	2	4	16
8	100	100	70	TO-220	**TIP132**	**TIP137**	1000	4	4	2	4	16
8	100	100	75	TO-220	**2N6045**	**2N6042**	1000	3	4	2	3	12
8	100	100	80	TO-220	**TIP102**	**TIP107**	1000	3	4	2	3	6
10	45	45	70	TO-220	**BDX33**	**BDX34**	750	4	3	2.5	4	8
10	45	45	100	TO-3	**BDX85**	**BDX86**	1000	3	3	2	4	16
10	60	60	65	TO-220	**2N6387**		1000	5	3	2	5	10
10	60	60	65	SOT-82	**SGS6387**		1000	5	3	2	5	10
10	60	60	70	TO-220	**BDX33A**	**BDX34A**	750	4	3	2.5	4	8
10	60	60	100	TO-3	**BDX85A**	**BDX86A**	1000	3	3	2	4	16
10	60	60	125	SOT-93	**TIP140**	**TIP145**	1000	5	4	3	10	40
10	60	60	150	TO-3	**MJ3000**	**MJ2500**	1000	5	3	2	5	20
10	80	80	100	TO-3	**BDX85B**	**BDX86B**	1000	3	3	2	4	16
10	80	80	65	TO-220	**2N6388**		1000	5	3	2	5	10
10	80	80	65	SOT-82	**SGS6388**		1000	5	3	2	5	10

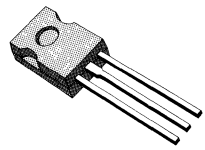
POWER BIPOLAR

EPITAXIAL BASE (continued)

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type NPN	Type PNP	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	V_{CEsat} (V)	@ I_C (A)	@ I_B (mA)
10	80	80	70	TO-220	**BDX33B**	**BDX34B**	750	3	3	2.5	3	6
10	80	80	125	SOT-93	**TIP141**	**TIP146**	1000	5	4	3	10	40
10	80	80	150	TO-3	**MJ3001**	**MJ2501**	1000	5	3	2	5	20
10	100	100	70	TO-220	**BDX33C**	**BDX34C**	750	3	3	2.5	3	6
10	100	100	100	TO-3	**BDX85C**	**BDX86C**	1000	3	3	2	4	16
10	100	100	125	SOT-93	**TIP142**	**TIP147**	1000	5	4	3	10	40
12	45	45	80	TO-220	**BDW93**	**BDW94**	750	5	3	2	5	20
12	45	45	120	TO-3	**BDX87**	**BDX88**	1000	5	3	2	6	24
12	60	60	80	TO-220	**BDW93A**	**BDW94A**	750	5	3	2	5	20
12	60	60	120	TO-3	**BDX87A**	**BDX88A**	1000	5	3	2	6	24
12	60	60	125	SOT-93	**BDV65**	**BDV64**	1000	5	4	2	5	20
12	80	80	80	TO-220	**BDW93B**	**BDW94B**	750	5	3	2	5	20
12	80	80	120	TO-3	**BDX87B**	**BDX88B**	1000	5	3	2	6	24
12	80	80	125	SOT-93	**BDV65A**	**BDV64A**	1000	5	4	2	5	20
12	100	100	80	TO-220	**BDW93C**	**BDW94C**	750	5	3	2	5	20
12	100	100	120	TO-3	**BDX87C**	**BDX88C**	1000	5	3	2	6	24
12	100	100	125	SOT-93	**BDV65B**	**BDV64B**	1000	5	4	2	5	20
16	60	60	150	TO-3	**MJ4033**	**MJ4030**	1000	10	3	4	16	80
16	80	80	150	TO-3	**MJ4034**	**MJ4031**	1000	10	3	4	16	80
16	100	100	150	TO-3	**MJ4035**	**MJ4032**	1000	10	3	4	16	80
20	60	60	160	TO-3	**2N6282**	**2N6285**	750	10	3	3	20	200
20	80	80	160	TO-3	**2N6283**	**2N6286**	750	10	3	3	20	200
20	100	100	160	TO-3	**2N6284**	**2N6287**	750	10	3	3	20	200
25	80	80	130	SOT-93	**SGSD100**	**SGSD200**	300	20	3	1.75	10	40
30	60	60	200	TO-3	**MJ11012**	**MJ11011**	1000	20	5	4	30	300
30	90	90	200	TO-3	**MJ11014**	**MJ11013**	1000	20	5	4	30	300
30	120	120	200	TO-3	**MJ11016**	**MJ11015**	1000	20	5	4	30	300


TO-220


SOT-93


SOT-82

POWER BIPOLAR

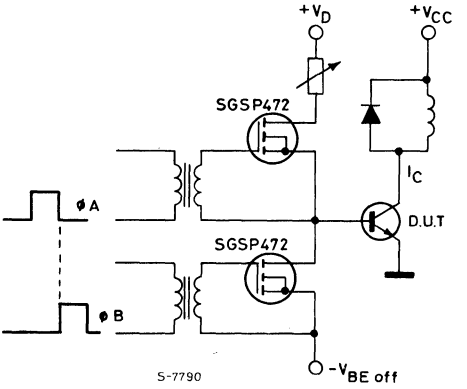
POWER TRANSISTORS FOR LAMP BALLAST APPLICATIONS

SGS Multiepitaxial Mesa devices offer cost effective devices for fluorescent electronic lamp ballasts. The FASTSWITCH technology offers easier driving and faster switching. For use in applications such as transportation or emergency lighting running from low voltage DC the power transistors for DC-DC converters (page 49) will be suitable.

I_C (A)	V_{CBO} (V)	V_{CEO} (V)	P_{tot} (W)	Package	Type	@ h_{FE} min	@ I_C (A)	@ V_{CE} (V)	@ V_{CEsat} (V)	@ I_C (A)	@ I_B (mA)
2.00	700	400	50	SOT-82	**SGSD00046***	5.00	1.50	1.00	1.00	1.50	300.00
2.00	700	400	50	TO-220	**SGSD00048***	5.00	1.50	1.00	1.00	1.50	300.00
4.00	700	400	75	TO-200	**MJE13005**	10.00	1.00	5.00	1.00	4.00	1000.00
4.00	700	400	75	TO-220	**SGSL13005**	10.00	1.00	5.00	1.00	3.00	600.00
5.00	700	400	85	TO-220	**SGSF321***	5.00	3.50	1.50	1.50	2.50	360.00
8.00	700	400	80	TO-220	**MJE13007**	8.00	2.00	5.00	1.50	5.00	1000.00
8.00	700	400	80	TO-220	**SGSL13007**	8.00	2.00	5.00	1.00	4.00	800.00

* FASTSWITCH technology

SWITCHING TIMES TEST CIRCUIT FOR HIGH VOLTAGE POWER TRANSISTORS



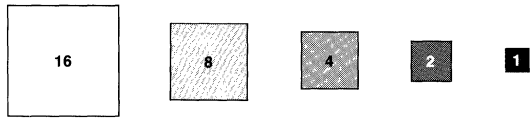
POWER MOS

LOW VOLTAGE POWER MOS PRODUCT RANGE

I_D max (A)	$R_{DS(on)}$ (Ω)	V_{DS} (V) 50	60	80	100	200	250	C_{iss} (pF)	gfs (mho)
40	0.03	SGSP492 SGSP592	SGSP491 SGSP591					2400	10
30	0.05			SGSP472 SGSP572				2200	9
	0.075				SGSP471 SGSP571				
24	0.06	SGSP382 SGSP482 SGSP582	SGSP381 SGSP481 SGSP581					1400	5
20	0.17					SGSP477 SGSP577		2500	8
	0.22						SGSP473 SGSP573		
15	0.1			SGSP362 SGSP462 SGSP562				1200	4.5
	0.15				SGSP361 SGSP461 SGSP561				
12	0.15	SGSP3055						460	3
10	0.13	SGSP122(*) SGSP222 SGSP322 SGSP422 SGSP522	SGSP121(*) SGSP221 SGSP321 SGSP421 SGSP521					500	2.5
	0.33					SGSP367 SGSP467 SGSP567		1200	3
	0.45						SGSP363 SGSP463 SGSP563		
7.0	0.3	SGSP158(*) SGSP258 SGSP358	SGSP157(*) SGSP257 SGSP357	SGSP112(*) SGSP212 SGSP312 SGSP412 SGSP512	SGSP111(*) SGSP211 SGSP311 SGSP411 SGSP511			480 270	2 1.5
6.0	0.75					SGSP117(*) SGSP217 SGSP317 SGSP517		465	1.5
	1.2						SGSP116(*) SGSP216 SGSP316 SGSP516		
5.0	0.45			SGSP152 SGSP252 SGSP352	SGSP151 SGSP251 SGSP351			250	1.5
1.5	1.4			SGSP102 SGSP202 SGSP302	SGSP101 SGSP201 SGSP301			125	0.5

Note: For TO-39 DEVICES MARKED (*); $I_D$max IS DERATED BY ABOUT 30% REFER TO THE DATASHEET

Die size (relative areas)

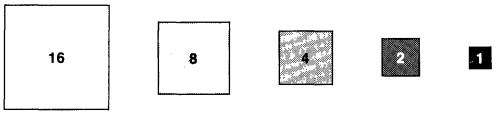


POWER MOS

HIGH VOLTAGE POWER MOS PRODUCT RANGE

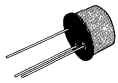
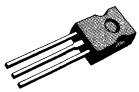
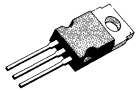
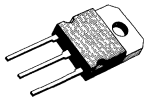
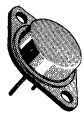
I_D max (A)	$R_{DS(on)}$ (Ω)	V_{DS} (V) 350	400	450	500	550	C_{iss} (pF)	gfs (mho)
12.0	0.55	SGSP476 SGSP576	SGSP475 SGSP575				2100	6
	0.7			SGSP474 SGSP574				
10.0	0.7				SGSP479 SGSP579		1900	5
	1					SGSP478 SGSP578		
6.0	1.0	SGSP366 SGSP466 SGSP566	SGSP365 SGSP465 SGSP565				1000	3
	1.5			SGSP364 SGSP464 SGSP564				
	1.5				SGSP369 SGSP469 SGSP569		1000	3
	2.5					SGSP368 SGSP468 SGSP568		
3.0	2.5	SGSP132 SGSP232 SGSP332 SGSP532	SGSP131 SGSP231 SGSP331 SGSP531				450	1.5
	3.0			SGSP130 SGSP230 SGSP330 SGSP530				
2.0	3.8				SGSP119 SGSP219 SGSP319 SGSP519		380	1.2
	4.5					SGSP118 SGSP218 SGSP318 SGSP518		
1.5	5.0	SGSP156 SGSP256 SGSP356	SGSP155 SGSP255 SGSP355				220	0.65
	6.5			SGSP154 SGSP254 SGSP354				
1.2	8.5				SGSP139 SGSP239 SGSP339			
	11.0					SGSP138 SGSP238 SGSP338		
0.6	20.0	SGSP142 SGSP242 SGSP342	SGSP141 SGSP241 SGSP341				105	0.2
	25.0			SGSP140 SGSP240 SGSP340				
0.5	30.0				SGSP149 SGSP249 SGSP349		95	0.18
	40.0					SGSP148 SGSP248 SGSP348		

Die size (relative areas)



POWER MOS

POWER MOS POWER DISSIPATION PACKAGE VS DIE SIZE AT T_{case} 25°C

PACKAGE	DIE SIZE (relative areas) 1	2	4	8	16
 TO-39 SGSP1——	15W	15W	15W	—	—
 SOT-82 SGSP2——	18W	40W	50W	—	—
 TO-220 SGSP3——	18W	50W	75W	100W	—
 SOT-93 SGSP4——	—	—	75W	125W	150W
 TO-3 SGSP5——	—	—	75W	125W	150W

OPERATIONAL AMPLIFIERS

STANDARD DUAL OPERATIONAL AMPLIFIERS

Type	Temperature Range (°C)	Input Bias Current (nA)	Input Offset Voltage (mV)	Slew Rate (V/μs)	Supply Current (mA)	Max Supply (V)	Package
LM258 D	−25 to 85	45	2	—	1	±16	SO-8
LM358 D	0 to 70	45	2	—	1	±16	
LM2904 D	−40 to 85	45	2	—	1	±13	
LS204 CM	0 to 70	100	0.5	1	0.8	±18	
LS204 M	−25 to 85	50	0.5	1.5	0.7	±18	
MC1458 CD	0 to 70	80	2	0.5	2.3	±18	
MC1458 D	0 to 70	80	2	0.5	2.3	±18	
NE532 D	0 to 70	45	2	—	1	±16	
LM258 N	−25 to 85	45	2	—	1	±16	Plastic Minidip
LM358 AN	0 to 70	45	2	—	1	±16	
LM358 N	0 to 70	45	2	—	1	±16	
LM2904 N	−40 to 85	45	2	—	1	±13	
LS204 CB	0 to 70	100	0.5	1	0.8	±18	
MC1458 CP1	0 to 70	80	2	0.5	2.3	±18	
MC1458 P1	0 to 70	80	2	0.5	2.3	±18	
NE532 N	0 to 70	45	2	—	—	±16	
TDA2320	0 to 70	100	2	1.5	0.8	±10	
TDA2320A	0 to 70	150	1	1.6	0.8	±18	
LM158 AJ	−55 to 125	20	1	—	1	±16	Ceramic Minidip
LM158 J	−55 to 125	45	2	—	1	±16	
LM258 AJ	−25 to 85	40	2	—	1	±16	
LM258 J	−25 to 85	45	2	—	1	±16	
LM358 AJ	0 to 70	45	2	—	1	±16	
LM358 J	0 to 70	45	2	—	1	±16	
LM2904 J	−40 to 85	45	2	—	1	±16	
MC1458 CU	0 to 70	80	2	0.5	2.3	±18	
MC1458 U	0 to 70	80	2	0.5	2.3	±18	
MC1558 U	−55 to 125	80	1	0.5	2.3	±22	

OPERATIONAL AMPLIFIERS

STANDARD DUAL OPERATIONAL AMPLIFIERS (Continued)

Type	Temperature Range (°C)	Input Bias Current (nA)	Input Offset Voltage (mV)	Slew Rate (V/μs)	Supply Current (mA)	Max Supply (V)	Package
NE532 FE	0 to 70	45	2	—	1	±16	Ceramic Minidip
LS204 ATB	−55 to 125	50	0.5	1.5	0.7	±18	TO-99
LS204 CTB	0 to 70	100	0.5	1	0.8	±18	
LS204 TB	−25 to 85	50	0.5	1.5	0.7	±18	

JFET-INPUT DUAL OPERATIONAL AMPLIFIERS

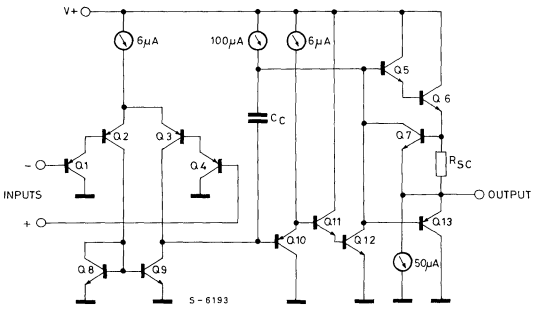
Type	Temperature Range (°C)	Slew Rate (V/μs)	Input Offset Voltage (mV)	Input Noise Voltage (nV/ Hz)	Supply Current (mA)	Max Supply (V)	Package
TL082 CD	0 to 70	13	5	25	2.8	±18	SO-8
TL082 ID	−25 to 85	13	5	25	2.8	±18	
MC34002 AP	0 to 70	13	1	25	2.8	±18	Plastic Minidip
MC34002 BP	0 to 70	13	3	25	2.8	±18	
MC34002 P	0 to 70	13	5	25	2.8	±18	
TL072 ACP	0 to 70	13	3	18	2.8	±18	
TL072 BCP	0 to 70	13	2	18	2.8	±18	
TL072 CP	0 to 70	13	5	18	2.8	±18	
TL072 IP	−25 to 85	13	5	18	2.8	±18	
TL082 ACP	0 to 70	13	3	25	2.8	±18	
TL082 BCP	0 to 70	13	2	25	2.8	±18	
TL082 CP	0 to 70	13	5	25	2.8	±18	
TL082 IP	−25 to 85	13	5	25	2.8	±18	
MC34002 AU	0 to 70	13	1	25	2.8	±18	Ceramic Minidip
MC34002 BU	0 to 70	13	3	25	2.8	±18	
MC34002 U	0 to 70	13	5	25	2.8	±18	
TL072 ACJG	0 to 70	13	3	18	2.8	±18	
TL072 BCJG	0 to 70	13	2	18	2.8	±18	
TL072 CJG	0 to 70	13	5	18	2.8	±18	
TL072 IJG	−25 to 85	13	5	18	2.8	±18	
TL082 ACJG	0 to 70	13	3	25	2.8	±18	
TL082 BCJG	0 to 70	13	2	25	2.8	±18	
TL082 CJG	0 to 70	13	5	25	2.8	±18	
TL082 IJG	−25 to 85	13	5	25	2.8	±18	
TL082 MJG	−55 to 125	13	3	25	2.8	±18	

OPERATIONAL AMPLIFIERS

STANDARD QUAD OPERATIONAL AMPLIFIERS

Type	Temperature Range (°C)	Input Bias Current (nA)	Input Offset Voltage (mV)	Slew Rate (V/μs)	Supply Current (mA)	Max Supply (V)	Package
LM224 D	0 to 70	45	2	—	1.5	±16	SO-14
LM324 D	0 to 70	45	2	—	1.5	±16	
LM2902 D	−40 to 85	45	2	—	1.5	±13	
LS404 CM	0 to 70	100	1	1	1.5	±18	
LS404 M	−25 to 85	50	1	1.5	1.3	±18	
MC3403 D	0 to 70	200	2	0.6	2.8	±18	
LM224 N	−25 to 85	45	2	—	1.5	±16	Plastic DIP-14
LM324 AN	0 to 70	45	2	—	1.5	±16	
LM324 N	0 to 70	45	2	—	1.5	±16	
LM2902 N	−40 to 85	45	2	—	1.5	±13	
LS404 CB	0 to 70	100	1	1	1.5	±18	
MC3303 P	−40 to 85	200	2	0.6	2.8	±18	
MC3403 P	0 to 70	200	2	0.6	2.8	±18	
LM124 AJ	−55 to 125	20	1	—	1.5	±16	Ceramic DIP-14
LM124 J	−55 to 125	45	2	—	1.5	±16	
LM224 AJ	−25 to 85	40	1	—	1.5	±16	
LM224 J	−25 to 85	45	2	—	1.5	±16	
LM324 AJ	0 to 70	45	2	—	1.5	±16	
LM324 J	0 to 70	45	2	—	1.5	±16	
LM2902J	−40 to 85	45	2	—	1.5	±13	
MC3303 L	−40 to 85	200	2	0.6	2.8	±18	
MC3403 L	0 to 70	200	2	0.6	2.8	±18	
MC3503 L	−55 to 125	200	2	0.6	2.8	±18	

LM 324 - SCHEMATIC DIAGRAM (ONE SECTION)



OPERATIONAL AMPLIFIERS

JFET-INPUT QUAD OPERATIONAL AMPLIFIERS

Type	Temperature Range (°C)	Slew Rate (V/μs)	Input Offset Voltage (mV)	Input Noise Voltage (nV/√Hz)	Supply Current (mA)	Max Supply (V)	Package
TL084 CD	0 to 70	12	5	25	5.6	±18	SO-14
TL084 ID	−25 to 85	13	5	25	5.6	±18	
MC34004 BP	0 to 70	13	3	25	5.6	±18	Plastic DIP-14
MC34004 P	0 to 70	13	5	25	5.6	±18	
TL074 ACN	0 to 70	13	3	18	5.6	±18	
TL074 BCN	0 to 70	13	2	18	5.6	±18	
TL074 CN	0 to 70	13	5	18	5.6	±18	
TL074 IN	−25 to 85	13	5	18	5.6	±18	
TL084 ACN	0 to 70	13	3	25	5.6	±18	
TL084 BCN	0 to 70	13	2	25	5.6	±18	
TL084 CN	0 to 70	13	5	25	5.6	±18	
TL084 IN	−25 to 85	13	5	25	5.6	±18	
MC34004 BL	0 to 70	13	3	25	5.6	±18	Ceramic DIP-14
MC34004 L	0 to 70	13	5	25	5.6	±18	
TL074 ACJ	0 to 70	13	3	18	5.6	±18	
TL074 BCJ	0 to 70	13	2	18	5.6	±18	
TL074 CJ	0 to 70	13	5	18	5.6	±18	
TL074 IJ	−25 to 85	13	5	18	5.6	±18	
TL084 ACJ	0 to 70	13	3	25	5.6	±18	
TL084 BCJ	0 to 70	13	2	25	5.6	±18	
TL084 CJ	0 to 70	13	5	25	5.6	±18	
TL084 IJ	−25 to 85	13	5	25	5.6	±18	
TL084 MJ	−55 to125	13	3	25	5.6	±18	

SINGLE OPERATIONAL AMPLIFIERS

Type	Temperature Range (°C)	Frequency Compensat.	CMR (dB)	Input Bias Current (nA)	Slew Rate /V/μs)	Max Supply (V)	Package
LM201 AD	−25 to 85		96	30	—	±22	SO-8
LM301 AD	0 to 70		90	70	—	±18	
LM741 CD	0 to 70	●	90	80	0.5	±18	
LM741 ID	−25 to 85	●	90	80	0.5	±18	
LM748 CD	0 to 70		90	80	—	±22	
LM748 ID	−25 to 85		90	80	—	±22	

OPERATIONAL AMPLIFIERS

SINGLE OPERATIONAL AMPLIFIERS (Continued)

Type	Temperature Range (°C)	Frequency Compensat.	CMR (dB)	Input Bias Current (nA)	Slew Rate /V/μs)	Max Supply (V)	Package
MC1776 CD	0 to 70	●	90	15	0.8	±18	
MC1776 ID	−25 to 85	●	90	15	0.8	±18	
LM201 AN	0 to 70		96	30	—	±22	
LM301 AN	0 to 70		90	70	—	±18	
LM741 CN	0 to 70	●	90	80	0.5	±18	Plastifc Minidip
LM741 EN	0 to 70	●	90	80	0.5	±18	
LM748 CN	0 to 70		90	80	—	±22	
MC1776 CP1	0 to 70	●	90	15	0.8	±18	
LS709 CB	0 to 70		90	300	0.25	±18	Plastic DIP 14
LM101 AJ	−55 to 125		96	30	—	±22	
LM201 AJ	−25 to 85		96	30	—	±22	
LM301 AJ	0 to 70		90	70	—	±18	
LM741 CJ	0 to 70	●	90	80	0.5	±18	
LM741 EJ	0 to 70	●	90	80	0.5	±18	Ceramic Minidip
LM741 J	−55 to 125	●	90	80	0.5	±18	
LM748 CJ	0 to 70		90	80	—	±22	
LM748 J	−55 to 125		90	80	—	±22	
MC1776 CU	0 to 70	●	90	15	0.8	±18	
MC1776 U	−55 to 125	●	90	15	0.8	±18	
LM101 AH	−55 to 125		96	30	—	±22	
LM201 AH	−25 to 85		96	30	—	±22	
LM301 AH	0 to 70		90	70	—	±18	
LM741 AH	−55 to 125	●	95	30	0.7	±22	
LM741 CH	0 to 70	●	90	80	0.5	±18	
LM741 H	0 to 70	●	90	80	0.5	±18	
LM748 CH	0 to 70		90	80	—	±22	TO-99
LM748 H	−55 to 125		90	80	—	±22	
MC1776 CG	0 to 70	●	90	15	0.8	±18	
MC1776 G	0 to 70	●	90	15	0.8	±18	
LS709 ATB	−55 to 125		110	100	0.25	±18	
LS709 CTB	0 to 70		90	300	0.25	±18	
LS709 TB	−55 to 125		90	200	0.25	±18	

COMPARATORS

Type		Temperature Range (°C)	Input Bias Current (mA)	Input Offset Voltage (mV)	Supply Current (mA)	Max Supply (V)	Package
LM239 D	Quad	−25 to 85	25	2	0.8	36	SO-14
LM339 D	Quad	0 to 70	25	2	0.8	36	
LM2901 D	Quad	−40 to 85	25	2	0.8	36	
MC3302 D	Quad	−40 to 85	30	3	0.8	28	
LM293 D	Dual	−25 to 85	25	2	0.4	36	SO-8
LM311 D	Single	0 to 70	100	2	5.1	36	
LM393 D	Dual	0 to 70	25	2	0.4	36	
LM2903 D	Dual	−40 to 85	25	2	0.4	36	
LM239 N	Quad	−25 to 85	25	2	0.8	36	Plastic DIP-14
LM339 AN	Quad	0 to 70	25	2	0.8	36	
LM339 N	Quad	0 to 70	25	2	0.8	36	
LM2901 N	Quad	−40 to 85	25	2	0.8	36	
MC3302 P	Quad	−40 to 85	30	3	0.8	28	
LM293 N	Duad	−25 to 85	25	2	0.4	36	Plastic Minidip
LM311 N	Single	0 to 70	100	2	5.1	36	
LM393 AN	Dual	0 to 70	25	2	0.4	36	
LM393 N	Dual	0 to 70	25	2	0.4	36	
LM2903 N	Dual	−40 to 84	25	2	0.4	36	
LM193 AJ	Dual	−55 to 125	25	1	0.4	36	Ceramic Minidip
LM193 J	Dual	−55 to 125	25	2	0.4	36	
LM293 AJ	Dual	−25 to 85	25	2	0.4	36	
LM293 J	Dual	−25 to 85	25	2	0.4	36	
LM311 J	Single	0 to 70	100	2	5.1	36	
LM393 AJ	Dual	0 to 70	25	2	0.4	36	
LM393 J	Dual	0 to 70	25	2	0.4	36	
LM2903 J	Dual	−40 to 85	25	2	0.4	36	
LM139 AJ	Quad	−55 to 125	25	1	0.8	36	Ceramic DIP-14
LM139 J	Quad	−55 to 125	25	2	0.8	36	
LM239 AJ	Quad	−25 to 85	25	2	0.8	36	
LM239 J	Quad	−25 to 85	25	2	0.8	36	
LM339 AJ	Quad	0 to 70	25	2	0.8	36	
LM339 J	Quad	0 to 70	25	2	0.8	36	
LM2901 J	Quad	−40 to 85	25	2	0.8	36	
MC3302 L	Quad	−40 to 85	30	3	0.8	28	

DARLINGTON ARRAYS

Type	N°	V_{CEX}	I_o	Input	Configuration	Package
L601	8	90V	0.5A	General purpose	● →|–	Plastic DIP-16
L602	8	90V	0.4A	14-25V PMOS	● →|–	
L603	8	90V	0.4A	5V TTL/CMOS	● →|–	
L604	8	90V	0.4A	6-15V CMOS/PMOS	● →|–	
L702B	4	90V	2A	5V TTL	●	
L702N	4	90V	2A	5V TTL	●	Multiwatt 11
L7150	4	50V	1.5A	5V TTL/CMOS	● →|–	Multiwatt 15
L7152	4	50V	1.5A	6-15V CMOS/PMOS	● →|–	
L7180	4	80V	1.5A	5V TTL/CMOS	● →|–	
L7182	4	80V	1.5A	6-15V CMOS/PMOS	● →|–	
ULN2001A/D	7	50V	0.5A	General Purpose	● →|–	Plastic DIP-16 and SO-16
ULN2002A/D	7	50V	0.5A	14-25V PMOS	● →|–	
ULN2003A/D	7	50V	0.5A	5V TTL/CMOS	● →|–	
ULN2004A/D	7	50V	0.5A	6-15V CMOS/PMOS	● →|–	
ULQ2001R	7	50V	0.5A	General purpose	● →|–	Ceramic DIP-16
ULQ2002R	7	50V	0.5A	14-25V PMOS	● →|–	
ULQ2003R	7	50V	0.5A	5V TTL/CMOS	● →|–	
ULQ2004R	7	50V	0.5A	6-15V CMOS/PMOS	● →|–	

● = common emitters. ■ = isolated darlingtons.
→|– = integral suppression diodes. ▷ = predriver stage.

DARLINGTON ARRAYS

Type	N°	V_{CEX}	I_o	Input	Configuration	Package
ULN2064B	4	50V	1.5A	5V TTL/CMOS	● →|←	Plastic DIP-16
ULN2065B	4	80V	1.5A	5V TTL/CMOS	● →|←	
ULN2066B	4	50V	1.5A	6-15V CMOS/PMOS	● →|←	
ULN2067B	4	80V	1.5A	6-15V CMOS/PMOS	● →|←	
ULN2068B	4	50V	1.5A	5V CMOS/TTL	▷ ● →|←	
ULN2069B	4	80V	1.5A	5V CMOS/TTL	▷ ● →|←	
ULN2070B	4	50V	1.5A	6-15V CMOS/PMOS	▷ ● →|←	
ULN2071B	4	80V	1.5A	6-15V CMOS/PMOS	▷ ● →|←	
ULN2074B	4	50V	1.5A	General purpose	■	
ULN2075B	4	80V	1.5A	General purpose	■	
ULN2076B	4	50V	1.5A	6-15V CMOS/PMOS	■	
ULN2077B	4	80V	1.5A	6-15V CMOS/PMOS	■	
ULN2801A	8	50V	0.5A	General purpose	● →|←	Plastic DIP-18
ULN2802A	8	50V	0.5A	14-25V PMOS	● →|←	
ULN2803A	8	50V	0.5A	5V TTL/CMOS	● →|←	
ULN2804A	8	50V	0.5A	6-15V CMOS/PMOS	● →|←	
ULN2805A	8	50V	0.5A	High Output TTL	● →|←	

● = common emitters.
→|← = integral suppression diodes.
■ = isolated darlingtons.
▷ = predriver stage.

TIMERS

Type		Temperature Range (°C)	Max. Operat. Freq. (KHz)	Supply Current (mA)	Max Supply (V)	Package
NE555 D	Single	0 to 70	500	3	16	SO-8
NE556 D	Dual	0 to 70	500	6	16	SO-14
NE555 N **SE555 N**	Single	0 to 70	500	3	16	Minidip
		– 40 to 85	500	3	16	
NE556 N **SE556 N**	Dual	0 to 70	500	6	16	DIP-14
		– 40 to 85	500	6	16	
NE555 FE **SE555 FE**	Single	0 to 70	500	3	16	Ceramic Minidip
		– 55 to 125	500	6	18	
NE556 F **SE556 F**	Dual	0 to 70	500	6	16	Ceramic DIP-14
		– 55 to 125	500	6	18	

TRANSISTORS ARRAYS

Type	Temperature Range (°C)	V_{CBO} (V)	I_{cmax} (mA)	Input offset voltage (mV)	f_t (Mhz)	Package
LM3046 D	– 40 to 85	20	50	0.45	550	SO-14
LM3046 N	– 40 to 85	20	50	0.45	550	DIP-14
TBA331	0 to 85	20	50	0.45	550	
LM3045 J	– 55 to 125	20	50	0.45	550	DIP-14
LM3046 J	– 40 to 85	20	50	0.45	550	

LINEAR DRIVERS

Type	Function	Package
L149	4A Linear Driver	Pentawatt
L165	Power Op. Amp.	Pentawatt
L465A	Power Op. Amp.	Pentawatt
L272	Dual Power Op. Amp.	DIP-16
L272M	Dual Power Op. Amp.	Minidip

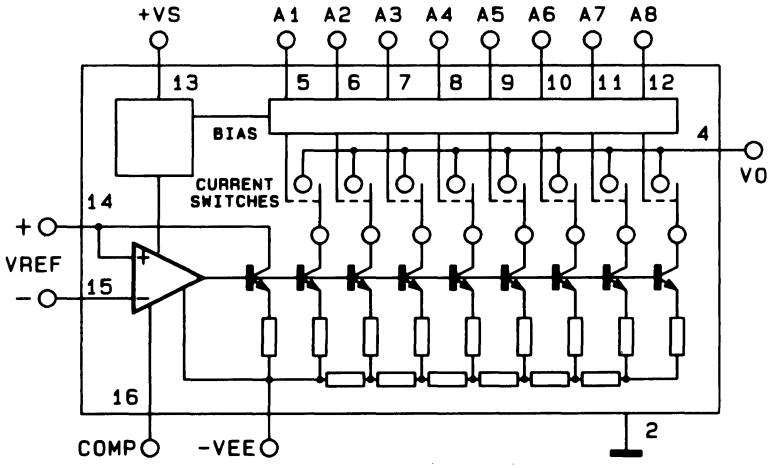
QUAD LINE DRIVERS/RECEIVERS

Type	Function	Temperature Range (°C)	Rise Time (ns)	Delay Time (ns)	Supply Current (mA)	Max Supply (V)	Package
MC1488 D	Driver	0 to 75	55	110/275	18	30	SO-14
MC1489 D **MC1489 AD**	Receivers	0 to 75	120 120	25 25	16 16	10	
MC1488 P	Driver	0 to 75	55	110/275	18	30	DIP-14
MC1489 AP **MC1489 P**	Receivers	0 to 75	120 120	25 25	16 16	10	
MC1488 L	Driver	0 to 75	55	110/275	18	30	Ceramic DIP-14
MC1489 AL **MC1489 L**	Receivers	0 to 75	120 120	25 25	16 16	10	

DATA CONVERSION

Type	Accuracy	Temperature range (°C)	Package
DAC0808 LCN **DAC0808 LCJ** **DAC0808 D1**	8 bit	0 to 75	DIP-16 CERAMIC DIP-16 SO-16
DAC0808 LJ		−55 to 125	CERAMIC DIP-16
DAC0807 LCN **DAC0807 LCJ** **DAC0807 D1**	7 bit	0 to 75	DIP-16 CERAMIC DIP-16 SO-16
DAC0806 LCN **DAC0806 LCJ** **DAC0806 D1**	6 bit	0 to 75	DIP-16 CERAMIC DIP-16 SO-16
AM6012 DC **AM6012 ADC**	12 bit	0 to 70	DIP-20
AM6012 D **AM6012 AD**	12 bit	0 to 70	SO-20L

DAC0808 - BLOCK DIAGRAM



GENERAL PURPOSE DIGITAL

- CMOS-B SERIES
- HS-CMOS LOGIC
- LOW POWER SCHOTTKY

CMOS B SERIES

FEATURES

- Very low power dissipations: typically 10mW/package (MSI)
- Wide supply voltage range: 3 to 18V for HCC/HCF4000B/4500B/40100B series
- High noise immunity: 45% of supply voltage/typ (1V min. guaranteed)
- High speed operation: 10 MHz for gates and flip-flops; 5 MHz for MSI
- Direct interface with HLL (H 100 family): $V_{DD} = 10.8$ to 18V for HCC/HCF4000B/4500B/40100B series No external components or special rules are needed
- DTL and TTL compatibility
- Output drive current standardized for HCC and HCF 4000B/4500B/40100B series
- Excellent temperature stability: $\pm 1.5\%$ shift in transfer characteristics over $-55°C$ to $+125°C$
- Inputs fully protected
- High input impedance: 10^{12} typ.
- Low output impedance
- Single phase clock
- HCC/HCF 4000B/4500B/40100B types meet all requirements of Jedec "Standard specifications for description of B-series CMOS devices".
- Complete range of packages: HCF4XXXBEY - plastic DIP
  HCC/HCF4XXXBF - ceramic DIP (frit seal)
  HCC4XXXBD - ceramic DIP (metal seal)
  HCC4XXXBK - ceramic flat package
  HCC4XXXBZ - ceramic chip carrier
  HCF4XXXBM1/BM - surface mounting DIP

A wide range of different screenings is also available to meet all requirements:

CMOS 4000B

- SGS PLUS (SP) Screening Program for plastic and ceramic packages.
- MIL STD 883C screening for ceramic packages.
- Products qualified to CECC 90104 specifications.
- Qualified Hi-Rel Radiation Hardened products according to ESA/SCC 9000 specs.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage (for HCC/HCF4000B/4500B/40100B series)	3 to 18	V
P_{tot}	Total power dissipation (per package):	200	mW
V_I	Input voltage:	0.5 to $V_{DD}+0.5$	V
T_{op}	Operating temperature: HCC types: HCF types:	-55 to 125 -40 to 85	°C °C
T_{stg}	Storage temperature	$-65°C$ to $+150$	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage (for HCC/HCF4000B/4500B/40100B series)	3 to 18	V
V_I	Input voltage	0 to V_{DD}	V

CMOS B SERIES

HCC/HCF 4000B/4500B 40100B STANDARD SERIES

C = CECC Approved H = ESA/SCC approved

Type		Function	Package DIP
4000B	H	Dual 3-Input NOR Gate Plus Inverter	14
4001B	CH	Quad 2-Input NOR Gate	14
4002B	CH	Dual 4-Input NOR Gate	14
4006B	CH	18-Stage Static Shift Register	14
4007UB	CH	Dual Complementary Pair Plus Inverter	14
4008B	CH	4 Bit Full Adder	16
4009B		Hex Buffer/Converters Inverting	16
4010B		Hex Buffer/Converters non Inverting	16
4011B	CH	Quad 2-Input NAND Gate	14
4012B	CH	Dual 4-Input NAND Gate	14
4013B	CH	Dual D Flip-Flop	14
4014B	CH	8-Stage Static Sync. Shift Register	16
4015B	CH	Dual 4-Stage Static Shift Register	16
4016B	CH	Quad Bilateral Switch	14
4017B	CH	Decade Counter/Divider	16
4018B	H	Presettable Divide-by-N Counter	16
4019B	CH	Quad AND/OR Select Gate	16
4020B	CH	14-Stage Binary/Ripple Counter	16
4021B	CH	8-Stage Static Shift Register	16
4022B	CH	Divide-by-8 Counter/Divider	16
4023B	CH	Triple 3-Input NAND Gate	14
4024B	CH	7-Stage Binary/Ripple Counter	14
4025B	CH	Triple 3-Input NOR Gate	14
4026B	H	Decade Counter/Divider 7-Segment Display Driver	16
4027B	CH	Dual J-K Master-Slave Flip-Flop	16
4028B	CH	BCD-To-Decimal Decoder	16
4029B	CH	Presettable Up/Down Counter	16
4030B	CH	Quad ex-or Gate	14
4031B	H	64-Stage Static Shift Register	16
4032B	CH	Triple Serial Adder	16
4033B	H	Decade Counter/Divider 7-Segent Display Driver	16
4034B	CH	8-Stage Static Bidirectional bus Register	24
4035B	CH	4-Stage Parallel I/O Shift Register	16
4038B	CH	Triple Serial Adder	16
4040B	CH	12-Stage Binary/Ripple Counter	16
4041UB	H	Quad True/Complement Buffer	14
4042B	CH	Quad Clocked D Latch	16
4043B	CH	Quad 3-State NOR R/S Latch	16
4044B	CH	Quad 3-State NAND R/S Latch	16
4045B	H	21-Stage Counter	16
4046B	H	Micropower Phase Locked Loop	16
4047B	H	Monostable/Astable Multivibrator	14
4048B	H	Multifunction Expandable 8-Input Gate	16
4049UB	CH	Hex Inverting Buffer/Converter	16
4050B	CH	Hex non-Inverting Buffer/Converter	16
4051B	CH	Single 8-Channel Analog Multiplexer/Demultiplexer	16
4052B	CH	Differential 4-Channel Analog Multiplexer/Demultiplexer	16
4053B	CH	Triple 2-Channel Analog Multiplexer/Demultiplexer	16
4054B	H	4-Segment Display Driver	16
4055B	H	BCD to 7-Segment Decoder/Driver	16

CMOS B SERIES

HCC/HCF 4000B/4500B 40100B STANDARD SERIES (Continued)

C = CECC Approved H = ESA/SCC approved

Type		Function	Package DIP
4056B	H	BCD to 7-Segment Decoder/Driver	16
4060B	H	14-Stage Counter/Divider and Oscillator	16
4063B	H	4-Bit Magnitude Comparator	16
4066B	CH	Quad Bilateral Switch	14
4067B	H	Single 16-Channel Analog Multiplexer/Demultiplexer	24
4068B	CH	8-Input NAND/AND Gate	14
4069UB	CH	Hex Inverter	14
4070B	CH	Quad EX-OR Gate	14
4071B	CH	Quad 2-Input OR Gate	14
4072B	CH	Dual 4-Input OR Gate	14
4073B	CH	Triple 3-Input AND Gate	14
4075B	CH	Triple 3-Input OR Gate	14
4076B	CH	4-Bit D-Type Register	16
4077B	CH	Quad EX-NOR Gate	14
4078B	CH	8-Input NOR/OR Gate	14
4081B	CH	Quad 2-Input AND Gate	14
4082B	CH	Dual 4-Input AND Gate	14
4085B	H	Dual 2-Wide 2-Input AND-OR-Inverter Gate	14
4086B	H	Expandable 4-Wide 2-Input AND-OR-Inverter Gate	14
4089B	H	Binary Rate Multiplier	16
4093B	H	Quad 2-Input NAND Schmitt Trigger	14
4094B	CH	8-Stage Shift-AND-Store Bus Register	16
4095B	H	Gated J-K Master-Slave Flip-Flop	14
4096B	H	Gated J-K Master-Slave Flip-Flop	14
4097B	H	Differential 8-Channel Analog Multiplexer/Demultiplexer	24
4098B	H	Dual Monostable Multivibrator	16
4099B	CH	8-BIT Addressable Latch	16
4502B	CH	Strobe Hex Inverter/Buffer	16
4503B	CH	Hex 3-State Buffer	16
4508B	CH	Dual 4-Bit Latch	24
4510B	CH	Presettable Up/Down Counter	16
4511B	CH	BCD to 7-Segent Latch/Decoder/Driver	16
4512B	CH	B-Channel Data Selector	16
4514B	CH	4-Bit Latch/4-to-16 Line Decoder	24
4515B	CH	4-Bit Latch/4-yo-16 Line Decoder	24
4516B	CH	Presettable Up/Down Counter	16
4517B	C	Dual 64-Stage Static Shift Register	16
4518B	CH	Dual BCD Up-Counter	16
4520B	CH	Dual Binary Up-Counter	16
4527B	CH	BCD Rate Multiplier	16
4532B	CH	8-Bit Priority Encoder	16
4536B		Programmable Timer	16
4555B	CH	Dual Binary to 1 of 4 Decoder/Demultiplexer	16
4556B	CH	Dual Binary to 1 of 4 Decoder/Demultiplexer	16
4585B	CH	4-Bit Magnitude Comparator	16
40100B	H	32-Stage Static Left/Right Shift Register	16
40101B	H	9-Bit Parity Generator Checker	16
40102B	H	8-Stage Down Counter	16
40103B	H	8-Stage Down Counter	16
40104B	H	4-Bit Shift Register	16

CMOS B SERIES

HCC/HCF 4000B/4500B 40100B STANDARD SERIES (Continued)

C = CECC Approved H = ESA/SCC approved

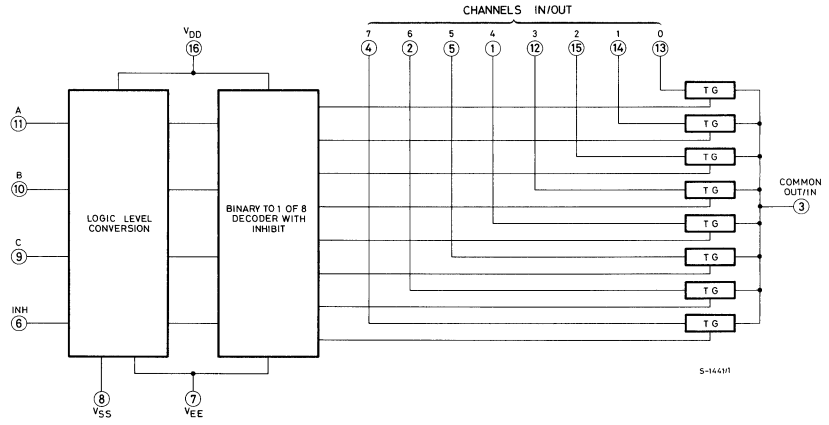
Type		Function	Package DIP
40105B	H	Fifo Register	16
40106B	H	Hex Schmitt Trigger	14
40107B	H	Dual 2-Input NAND Buffer/Driver	8
40108B	H	4 x 4 Multiport Register	24
40109B	H	Quad Low-to-High Voltage Level Shifter	16
40110B	H	Decade Up-Down Counter/Decoder/Latch/Driver	16
40160B	H	Programmable Decade Counter	16
40161B	H	Programmable Binary Counter	16
40162B	H	Programmable Decade Counter	16
40163B	H	Programmable Binary Counter	16
40174B	H	Hex D Type Flip-Flop	16
40181B	H	4-Bit Alu	24
40182B	H	Look Ahead Carry Generator	16
40192B	H	Presettable Up/Down BCD Counter	16
40193B	H	Presettable Up/Down Binary Counter	16
40194B	H	4-Bit Shift Register	16
40208B	H	4 x 4 Multiport Register	24
40257B	H	Quad 2-Line-To-1 Data Selector/Multiplexer	16

Function		Standard code
GATE BUFFER	NAND	4011B 4012B 4023B 4068B 40107B
	NOR	4000B 4001B 4002B 4025B 4078B
	AND	4068B 4073B 4081B 4082B
	OR	4071B 4072B 4075B 4078B
	INVERTER	4069UB 4502B
	BUFFER	4007UB 4009UB 4010B 4041UB 4049UB 4050B 4502B 4503B 40107B
	MULTIFUNCTION	4019B 4030B 4048B 4070B 4077B 4085B 4086B 4519B 4572UB
	SCHMITT TRIGGER	4093B 40106B
FLIP-FLOP	J-K FLIP-FLOP	4027B 4095B 4096B
	D FLIP-FLOP	4013B 4076B 40174B
INTERFACE CIRCUIT		4009UB 4010B 4504B 40109B
LATCH		4042B 4043B 4044B 4099B 4508B
MULTIVIBRATOR		4047B 4098B 4538B
DECODER		4028B 4514B 4515B 4555B 4556B

HCC/HCF 4000B/4500B 40100B STANDARD SERIES (continued)

Function		Standard code
ENCODER		4532B 40147B
DISPLAY DRIVER		454B 4055B 4056B 4511B 4543B
	WITH COUNTER	4026B 4033B 40110B
REGISTER	SHIFT STATIC	4006B 4014B 4015B 4021B 4031B 4034B 4035B 4094B 4517B 40100B 40104B 40194B
	STORAGE	4076B 4099B 40108B 40208B
	FIFO	40105B
COUNTER	SYNCHRONOUS	4017B 4018B 4022B 4029B 4510B 4516B 4518B 4520B 4521B 4522B 40102B 40103B 40160B 40161B 40162B 40163B 40192B 40193B
	BINARY RIPPLE	4020B 4024B 4040B 4060B
	CLOCK TIMER	4045B 4536B 4541B 4566B
MULTIPLEXER/ DEMULTIPLEXER	ANALOG DIGITAL	4016B 4019B 4051B 4052B 4053B 4066B 4067B 4097B 4555B 4556B
	DATA SELECTOR	4512B 4529B 40257
ARITHMETIC CIRCUIT	ADDER	4008B 4032B 4038B 4560B
	COMPARATOR	4030B 4063B 4070B 4077B 4585B 40101B
	ALU/MULTIPLEXER	4089B 4527B 40181B 40182B
PHASE LOCKED LOOP		4046B

4051B - ANALOG MULTIPLEXER (BLOCK DIAGRAM)



HS-C²MOS LOGIC

M54HC/74HC SERIES - LSTTL SPEED WITH CMOS LOW POWER

Use of the latest microlithography techniques employed in VLSI memory and microprocessor has resulted in the silicon-gate CMOS M54/74HC series with an operating speed ten times higher than the existing CMOS B logic family.
The combination of LSTTL speed and the advantages of CMOS which are extremely low power dissipation and wider operating supply voltage range will remarkably realize not only low total power dissipation of high speed digital systems, but also develop new application fields such as high speed portable instruments which could not be achieved with current LSTTL or CMOS devices.

FEATURES

- High speed operation LSTTL speed $f_{MAX} = 60$ MHz (typ.)
- Low power dissipation Micro Watt dissipation of standard CMOS B
- High output current Fan-out of 10 LSTTL loads (15 for bus buffer)
- Symmetrical output buffer Equal I_{OH} and I_{OL}
- High noise immunity 28% V_{CC} at high and low level
- Wide operating voltage range $V_{CC} = 2$ to 6V
- Pin and Function compatible with equivalent LSTTL and some popular types of HCF4000 series
- Wide range of products. Over 180 types planned.
- Second source available.
- Complete range of packages: M74HC/HCTXXXXB1 - plastic DIP
  M74HCUXXXXB1 - plastic DIP
  M74HC/HCTXXXXM1 - surface mounting DIP
  M54HC/HCTXXXXF1 - ceramic DIP

A wide range of different screenings is also available to meet all requirements:

HS-C²MOS*

- SGS PLUS (SP) Screening Program for plastic and ceramic packages.*
- MIL STD 883C screening for ceramic packages.*
- All screening levels included in CECC 90109 specs.*

* Introduction during Q3/Q4 1986.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	−0.5 to +7	V
V_I	Input voltage	−0.5 to V_{CC} + 0.5	V
V_O	Output voltage	−0.5 to V_{CC} + 0.5	V
I_{OK}	Output current	+20	mA
I_O	Output current (buffer)	+35	mA
P_D	Total power dissipation	500	mW
T_{stg}	Storage temperature	−65 to 150	°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	2 to 6	V
V_I	Input voltage	0 to V_{CC}	V
T_A	Operating temperature (74 series)	−40 to 85	°C
T_A	Operating temperature (54 series)	−55 to 125	°C

M54/74HC SERIES

Type	Function	Package DIP
HC00	Quad 2-Input NAND Gate	14
HC02	Quad 2-Input NOR Gate	14
HC03	Quad 2-NAND (open drain)	14
HC04	Hex Inverter	14
HCT04	Hex Inverter	14
HCU04	Hex Inverter (single stage)	14
HC08	Quad 2-Input AND Gate	14
HC10	Triple 3-Input NAND Gate	14
HC11	Triple 3-Input AND Gate	14
HC14	Hex Schmitt Inverter	14
HC20	Dual 4-Input NAND Gate	14
HC21	Dual 4-Input AND Gate	14
HC27	Triple 3-Input NOR Gate	14
HC30	8-Input NAND Gate	14
HC32	Quad 2-Input OR Gate	14
HC42	BCD to Decimal Decoder	16
HC51	Dual 2W-21 AND/OR Inverter Gate	14
HC73	Dual J-K Flip-Flop with clear	14
HC74	Dual D-Type Flip-Flop with preset and clear	14
HC75	4-Bit D-type latch	16
HC76	Dual J-K Flip-Flop with preset and clear	16
HC77	Quad D-type latch	14
HC85	8-Bit magnitude comparator	16
HC86	Quad exclusive OR Gate	14
HC107	Dual J-K Flip-Flop	14
HC109	Dual J-K Flip-Flop with preset and clear	16
HC112	Dual J-K Flip-Flop with preset and clear	16
HC113	Dual J-K Flip-Flop	14
HC123	Dual monostable multivibrator with clear	16
HC125	Quad bus buffer (3-state)	14
HC126	Quad bus buffer (3-state)	14
HC131	3 to 8 line decoder latch	16
HC132	Quad 2-Input schmitt NAND	14
HC133	13 Input NAND Gate	16
HC137	3 to 8 line decoder latch (Inv.)	16

HS-C²MOS LOGIC

M54/74HC SERIES (Continued)

Type	Function	Package DIP
HCT137	3 to 8 line decoder latch (Inv.)	16
HC138	3 to 8 line decoder (Inv.)	16
HCT138	3 to 8 line decoder (Inv.)	16
HC139	Qual 2 to 4 line decoder/demultiplexer	16
HC147	10 to 4 line priority encoder	16
HC148	8 to 3 line priority encoder	16
HC151	8-Channel multiplexer 16	16
HC153	Dual 4-Channel multiplexer	16
HC154	4 to 16 decoder/demultiplexer	24
HC155	Dual 2 to 4 line decoder	16
HC157	Quad 2-Channel multiplexer	16
HC158	Quad 2-Channel multiplexer (Inv.)	16
HC160	Sync. decade counter with async. clear	16
HC161	Sync. binary counter with async. clear	16
HC162	Sync. decade counter with sync. clear	16
HC163	Sync. binary counter with sync. clear	16
HC164	8 bit SIPO shift register	14
HC165	8 bit PISO shift register	16
HC166	8 bit PISO shift register	16
HC173	Quad D-type register (3-state)	16
HC174	Hex D-type Flip-Flop with clear	16
HC175	Quad D-type Flip-Flop with clear	16
HC181	Arithmetic logic unit	24
HC182	Look ahead carry generator	16
HC190	BCD sync. up/down counter	16
HC191	4 bit sync. binary up/down counter	16
HC192	Sync. up/down decade counter	16
HC193	Sync. up/down binary counter	16
HC194	4 bit PIPO shift register	16
HC195	4 bit PIPO shift register	16
HC221	Dual monostable multivibrator	16
HC237	3 to 8 line decoder latch	16
HC238	3 to 8 line decoder	16
HC240	Octal bus buffer (3-state/Inv.)	20
HCT240	Octal buffer (3-state/Inv.)	20
HC241	Octal bus buffer (3-state)	20
HCT241	Octal bus buffer (3-state)	20
HC242	Quad bus transceiver (3-state/Inv.)	14
HC243	Quad bus transceiver (3-state)	14
HC244	Octal bus buffer (3-state)	20
HCT244	Octal buffer (3-state)	20
HC245	Octal bus transceiver (3-state)	20
HCT245	Octal bus transceiver (3-state)	20
HC251	8-Channel multiplexer (3-state)	16
HC253	Dual 4-Channel multiplexer (3-state)	16
HC257	Quad 2-Channel multiplexer	16
HC258	Quad 2-Channel multiplexer	16
HC259	8 bit addressable latch	16
HC273	Octal D-type Flip-Flop with clear	20
HC279	Quad S-R latch	16

M54/74HC SERIES (Continued)

Type	Function	Package DIP
HC280	9 bit parity generator	14
HC283	4 bit binary full generator	16
HC292	Programmable divider/timer	16
HC294	Programmable divider/timer	16
HC298	Quad 2-Channel multiplexer register	16
HC299	8 bit PIPO shift register (3-state)	20
HC323	8 bit PIPO shift register (3-state)	20
HC354	8 Channel multiplexer/register (3-state)	20
HC356	8 Channel multiplexer/register (3-state)	20
HC365	Hex bus buffer	16
HC366	HEX bus buffer (Inv.)	16
HC367	HEX bus buffer (3-state)	16
HC368	HEX bus buffer (3-state/Inv.)	16
HC373	Octal D-type latch (3-state)	20
HCT373	Octal D-type latch (3-state)	20
HC374	Octal D-type Flip-Flop (3-state)	20
HCT374	Octal D-type Flip-Flop (3-state)	20
HC375	Quad D-type latch	16
HC377	Octal D-type Flip-Flop	20
HC386	Quad exclusive OR Gate	14
HC390	Dual decade counter	16
HC393	Dual binary counter	14
HC423	Dual monostable multivibrator with clear	16
HC533	Octal D-type latch (3-state/Inv.)	20
HC534	Octal D-type Flip-Flop (3-state/Inv.)	20
HC540	Octal bus buffer (3-state/Inv.)	20
HCT540	Octal bus buffer (3-state/Inv.)	20
HC541	Octal bus buffer (3-state)	20
HCT541	Octal bus buffer (3-state)	20
HC563	Octal D-type latch (3-state/Inv.)	20
HCT563	Octal D-type latch (3-state/Inv.)	20
HC564	Octal D-type Flip-Flop (3-state/Inv.)	20
HCT564	Octal D-type Flip-Flop (3-state/Inv.)	20
HC573	Octal D-type latch (3-state)	20
HCT573	Octal D-type latch (3-state)	20
HC574	Octal D-type Flip-Flop (3-state)	20
HCT574	Octal D-type Flip-Flop (3-state)	20
HC590	8 bit binary counter register (3-state)	16
HC592	8 bit register binary counter	16
HC593	8 bit register binary counter (3-state)	20
HC595	8 bit shift register latch (3-state)	16
HC597	8 bit latch shift register	16
HC620	Octal bus transceiver (3-state/Inv.)	20
HC623	Octal bus transceiver (3-state)	20
HC640	Octal bus transceiver (3-state/Inv.)	20
HCT640	Octal bus transceiver (3-state/Inv.)	20
HC643	Octal bus transceiver (3-state)	20
HCT643	Octal bus transceiver (3-state)	20
HC646	Octal bus transceiver (3-state)	24
HCT646	Octal bus transceiver (3-state)	24
HC648	Octal bus transceiver (3-state/Inv.)	24

HS-C²MOS LOGIC

M54/74HC SERIES (Continued)

Type	Function	Package DIP
HCT648	Octal bus transceiver (3-state/Inv.)	24
HC651	Octal bus transceiver (3-state/Inv.)	24
HCT651	Octal bus transceiver (3-state/Inv.)	24
HC652	Octal bus transceiver (3-state)	24
HCT652	Octal bus transceiver (3-state)	24
HC670	4 word x 4 bit file (3-state)	16
HC688	8 bit equality comparator	20
HC690	Decade counter (3-state)	20
HC691	4 bit binary counter (3-state)	20
HC692	Decade counter (3-state)	20
HC693	4 bit binary counter (3-state)	20
HC696	U/D decade counter (3-state)	20
HC697	U/D 4-bit binary counter (3-state)	20
HC698	U/D decade counter (3-state)	20
HC699	U/D 4-bit binary counter (3-state)	20
HC4002	Dual 4-input NOR Gate	14
HC4017	Decade counter/divider	16
HC4020	14-stage binary counter	16
HC4022	Octal counter/divider	16
HC4024	7-stage binary counter	14
HC4028B	BCD to decimal decoder	16
HC4040	12-stage binary counter	16
HC4049B	Hex buffer/converter (Inv.)	16
HC4050B	Hex buffer/converter	16
HC4051	8 Channel analog multiplexer	16
HC4052	Dual 4-channel analog multiplexer	16
HC4053	Triple 2-channel analog multiplexer	16
HC4060	14-stage binary counter/osc.	16
HC4066	Quad bilateral switch	14
HC4072	Dual 4 Input OR Gate	14
HC4075	Triple 3-input OR Gate	14
HC4078	8-Input NOR/Or Gate	14
HC4094	8 bit SIPO shift register latch (3-state)	16
HC4511	BCD to 7-segment L/D/D (LED)	16
HC4514	4 to 16 line decoder latch	24
HC4515	4 to 16 line decoder latch (Inv.)	24
HC4518	Dual decade counter	16
HC4520	Dual 4 bit binary counter	16
HC4538	Dual monostable multivibrator	16
HC4543	BCD to 7-segment L/D/D (LCD)	16
HC7266	Quad exclusive NOR Gate	14
HC7292	Programmable divider/timer	16
HC7294	Programmable divider/timer	16
HCT7007	Hex buffer	14
HC40102	Dual BCD programmable down counter	16
HC40103	8 bit binary prog. down counter	16

M54/74HC SERIES (continued)

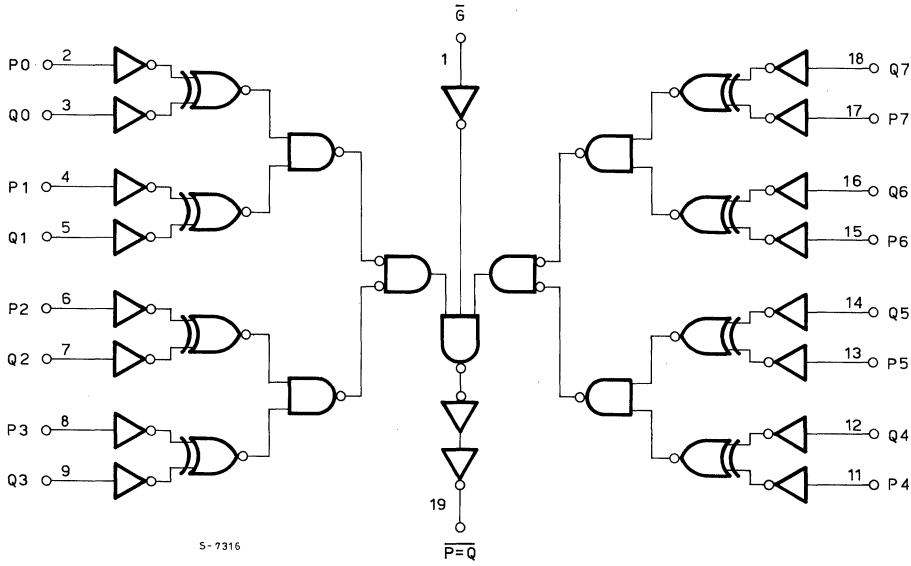
Function			Standard code
GATE BUFFER	NAND		HC00 HC03 HC10 HC20 HC30 HC133
	NOR		HC02 HC27 HC4002 HC4078
	AND		HC08 HC11 HC21
	OR		HC32 HC4075 HC4072 HC4078
	INVERTER		HCU04 HC04 HCT04
	BUFFER		HCT7007 HC4049B HC4050B
	3-STATE		HC125 HC126 HC240 HCT240 HC241 HCT241 HC244 HCT244 HC365 HC366 HC367 HC368 HC540 HCT540 HC541 HCT541
	BIDIRECTIONAL		HC242 HC243 HC245 HCT245 HC620 HC623 HC640 HCT640 HC643 HCT643
	MULTIFUNCTION		HC51 HC86 HC386 HC7266
	SCHMITT TRIGGER		HC14 HC132
FLIP-FLOP	J-K FLIP-FLOP		HC73 HC76 HC107 HC109 HC112 HC113
	D FLIP-FLOP		HC74 HC174 HC175 HC273 HC377
		3-STATE	HC374 HCT374 HC534 HC564 HCT564 HC574 HCT574 HC646 HCT646 HC648 HCT648 HC651 HCT651 HC652 HCT652
LATCH			HC75 HC77 HC259 HC279 HC375
		3-STATE	HC373 HCT373 HC533 HC563 HCT563 HC573 HCT573
MULTIVIBRATOR			HC123 HC221 HC423 HC4538
DECODER			HC42 HC131 HC137 HCT137 HC138 HCT138 HC139 HC154 HC155 HC237 HC238 HC4028 HC4514 HC4515
		7-SEGMENT	HC4511 HC4543
ENCODER			HC147 HC148
REGISTER			HC164 HC165 HC166 HC173 HC194 HC195 HC299 HC323 HC595 HC597 HC670 HC4094
COUNTER	BINARY		HC161 HC163 HC191 HC193 HC393 HC590 HC592 HC593 HC691 HC693 HC697 HC697 HC699 HC4520
	DECADE		HC160 HC162 HC190 HC192 HC390 HC690 HC692 HC696 HC698 HC4518
	DIVIDER		HC292 HC294 HC4017 HC4020 HC4022 HC4024 HC4040 HC4060 HC40102 HC40103 HC7292 HC7294

HS-C²MOS LOGIC

M54/74HC SERIES (continued)

Function		Standard code
MULPTIPLEXER	ANALOG	HC4051 HC4052 HC4053 HC4066
	DIGITAL	HC151 HC153 HC157 HC158 HC251 HC253 HC257 HC258 HC298 HC354 HC356
OTHERS	ADDER	HC283
	COMPARATORS	HC85 HC688
	ALU	HC181 HC182
	PARITY TREE	HC280

HC688 - BLOCK DIAGRAM



LOW POWER SCHOTTKY

FEATURES

- All the popular functions available.
- Low power consumption: typically 2 mW/gate.
- Very high speed operation: 30 MHz typically.
- Direct input interface with CMOS devices operating up to 15 V due to the high voltage schottky diode.
- High fan-out capacity: 5 TTL unit load at low logic level output: 10 TTL unit load at high logic level output.
- Fully protected inputs for breakdown up to 15 V.
- Open collector output on some devices.
- 5 ns typical propagation delay (15 pF load).
- Fully implanted process reducing spread of electrical parameters.
- Complete range of packages:
  - T74LSXXXB1 - PLASTIC DIP
  - T74LSXXXD1 - CERAMIC DIP
  - T74LSXXXM1 - MICROPACKAGE DIP
  - T74LSXXXC1 - QUAD PLASTIC PACKAGE
  - T54LSXXXD2 - CERAMIC DIP (EXTENDED TEMPERATURE RANGE)

A wide range of different screenings is also available to meet all requirements:

- SGS PLUS (SP) Screening Program for plastic and ceramic packages.
- MIL STD 883C for ceramic packages.
- Products qualified to CECC 90103 specifications.

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply voltage	−0.5 to 7	V
V_I	Input Voltage applied to Input	−0.5 to 15	V
V_O	Output Voltage applied to Output	−0.5 to 5.5	V
I_I	Input Current into Inputs	−30 to 5	mA
I_O	Output Current into Outputs	50	mA
T_{stg}	Storage Temperature	−65 to +150	°C

GUARANTEED OPERATING RANGES

Type	Supply Voltage			Value	Unit
	Min.	Typ.	Max.		
T54LSXXXD2	4.5	5.0	5.5	−55 to +125	°C
T74LSXXXYY	4.75	5.0	5.25	0 to 70	°C

YY = package type

LOW POWER SCHOTTKY

TTL-T54/T74LS SERIES

C = CECC Approved

Type		Function	Package DIP
LS00	C	Quad 2-Input NAND Gate	14
LS01		Quad 2-Input NAND Gate (Open Collector)	14
LS02	C	Quad 2-Input NOR Gate	14
LS03		Quad 2-Input NAND Gate (Open Collector)	14
LS04	C	Hex Inverter	14
LS05	C	Hex Inverter (Open Collector)	14
LS08	C	Quad 2-Input AND Gate	14
LS09	C	Quad 2-Input AND Gate (Open Collector)	14
LS10	C	Triple 3-Input NAND Gate	14
LS11	C	Triple 3-Input AND Gate	14
LS12		Triple 3-Input NAND Gate (Open Collector)	14
LS13	C	Dual 4-Input NAND Schmitt Trigger	14
LS14	C	Hex Schmitt Trigger Inverter	14
LS15	C	Triple 3-Input AND Gate (Open Collector)	14
LS18		Dual 4-Input NAND Schmitt Trigger	14
LS19		Hex Schmitt Trigger Inverter	14
LS20	C	Dual 4-Input NAND Gate	14
LS21	C	Dual 4-Input AND Gate	14
LS22	C	Dual 4-Input NAND Gate (Open Collector)	14
LS24		Quad 2-Input NAND Schmitt Trigger	14
LS26	C	Quad 2-Input NAND Buffer (Open Collector)	14
LS27	C	Triple 3-Input NOR Gate	14
LS28	C	Quad 2-Input NOR Buffer	14
LS30	C	8-Input NAND Gate	14
LS32	C	Quad 2-Input OR Gate	14
LS33	C	Quad 2-Input NOR Buffer (Open Collector)	14
LS37	C	Quad 2-Input NAND Buffer	14
LS38	C	Quad 2-Input NAND Buffer (Open Collector)	14
LS40	C	Dual 4-Input NAND Buffer	14
LS42	C	1-of-10 Decoder	16
LS51	C	Dual 2-Wide 2-Input/3-Input AND-OR-INVERT Gate	14
LS54	C	2-3-3-2-Input AND-OR-INVERT Gate	14
LS55	C	2-Wide 4-Input AND-OR-INVERT Gate	14
LS73A		Dual JK Negative Edge-Triggered Flip-Flop	14
LS74A	C	Dual D-Type Positive Edge-Triggered Flip-Flop	14
LS75		4-Bit D Latch	16
LS76A		Dual JK Flip-Flop with Set and Clear	16
LS78A		Dual JK Flip-Flop with Preset	14
LS83A	C	4-Bit Full Adder with Fast Carry	16
LS85	C	4-Bit Magnitude Comparators	16
LS86	C	Quad 2-Input Exclusive OR Gate	14
LS90	C	Decade Counter	14
LS91	C	8-Bit Shift Register Serial-In Serial-Out	14
LS92	C	Divide-by-12 Counter	14
LS93	C	4-Bit Binary Counter	14
LS95B	C	4-Bit Shift Register	14
LS96	C	5-Bit Shift Register	16
LS107A		Dual JK Flip-Flop with Clear	14
LS109	C	Dual JK Positive Edge-Triggered Flip-Flop	16

SGS

LOW POWER SCHOTTKY

TTL-T54/T74LS SERIES (Continued)
C = CECC Approved

Type		Function	Package DIP
LS109A		Dual JK Positive Edge-Triggered Flip-Flop	16
LS112A		Dual JK Negative Edge-Triggered Flip-Flop	16
LS113	C	Dual JK Negative Edge-Triggered Flip-Flop	14
LS113A		Dual JK Negative Edge-Triggered Flip-Flop	14
LS114	C	Dual JK Negative Edger-Triggered Flip-Flop	14
LS114A		Dual JK Negative Edge-Triggered Flip-Flop	14
LS122		Retriggerable Monostable Multivibrators	14
LS123		Dual Retriggerable Monostable Multivibrators	16
LS125	C	Quad 3-State Buffer (LOW Enable)	14
LS125A		Quad 3-State Buffer (LOW Enable)	14
LS126	C	Quad 3-State Buffer (High Enable)	14
LS126A		Quad 3-State Buffer (HIGH Enable)	14
LS132	C	Quad 2-Input Schmitt Trigger NAND Gate	14
LS133		13-Input NAND Gate	16
LS136	C	Quad 2-Input Exclusive OR Gate (Open Collector)	14
LS138	C	1-of-8 Decoder/Demultiplexer	16
LS139	C	Dual 1-of-4 Decoder/Demultiplexer	16
LS145		1-of-10 Decoder/Driver (Open-Collector)	16
LS147		10-Line to 4-Line Priority Encoder	16
LS148		8-Input to 3-Line Priority Encoder	16
LS151	C	8-Input Multiplexer	16
LS152		8-Input Multiplexer	14
LS153		Dual 4-Input Multiplexer	16
LS154		4-Line-To-16-Line Decoders/Demultiplexers	24
LS155	C	Dual 1-of-4 Decoder/Demultiplexer	16
LS156	C	Dual 1-of-4 Decoder/demultiplexer (Open Collector)	16
LS157	C	Quad 2-Input Multiplexer (Non inverting)	16
LS158	C	Quad 2-Input Multiplexer (Inverting)	16
LS160		BCD Decade Counter, Asynchronous Reset	16
LS160A	C	BCD Decade Counter, Asynchronous Reset	16
LS161		4-Bit Binary Counter, Asynchronous Reset	16
LS161A	C	4-Bit Binary Counter, Asynchronous Reset	16
LS162		BCD Decade Counter, Synchronous Reset	16
LS162A	C	BCD Decade Counter, Synchronous Reset	16
LS163		4-Bit Binary Counter, Synchronous Reset	16
LS163A	C	4-Bit Binary Counter, Synchronous Reset	16
LS164	C	8-Bit Shift Register (Serial-In Parallel-Out)	14
LS166		8-Bit Shift Register (Parallel-In Serial-Out)	16
LS168		Up/Down Decade Counter	16
LS169		Up/Down Binary Counter	16
LS170	C	4 x 4 Register File (Open Collector)	16
LS173A		4-Bit D-Type Register (3-State)	16
LS174	C	Hex D-Type Flip-Flop with Clear	16
LS175	C	Quad D-Type Flip-Flop with Clear	16
LS181	C	4-Bit ALU	24
LS183		Dual Carry-Save Full Adder	14
LS190	C	Presettable BCD/Decade Up/Down Counter	16
LS191	C	Presettable 4-Bit Binary Up/Down Counter	16
LS192	C	Presettable BCD/Decade Up/Down Counter	16

LOW POWER SCHOTTKY

TTL-T54/T74LS SERIES (Continued)
C = CECC Approved

Type		Function	Package DIP
LS193	C	Presettable 4-Bit Binary Up/Down Counter	16
LS194A	C	4-Bit Right/Left Shift Register	16
LS195A	C	4-Bit Shift Register	16
LS196	C	Decade Counter	14
LS197	C	4-Bit Binary Counter	14
LS221		Dual Monostable Multivibrator	16
LS240	C	Octal Inverting Bus/Line Driver (3-State)	20
LS241		Octal Bus Line Driver (3-State)	20
LS242		Quad Inverting Bus Transceiver (3-State)	14
LS243		Quad Non Inverting Bus Transceiver (3-State)	14
LS244		Octal Non Inverting Driver (3-State)	20
LS245		Octal Non Inverting Bus Transceiver (3-State)	20
LS247		BCD to 7-Segment Decoder/Driver (Open Collector)	16
LS248		BCD to 7-Segment Decoder/Driver with Pull-Ups	16
LS251	C	8-Input Multiplexer (3-State)	16
LS253	C	Dual 4-Input Multiplexer (3-State)	16
LS256		Dual 4-Bit Addressable Latch	16
LS257		Quad 2-Input Multiplexer (3-State)	16
LS257A		Quad 2-Input Multiplexer (3-State)	16
LS258		Quad 2-Input Multiplexer (3-State)	16
LS258A		Quad 2-Input Multiplexer (3-State)	16
LS259	C	8-Bit Addressable Latch	16
LS260		Dual 5-Input NOR Gate	14
LS266	C	Quad 2-Input Exclusive NOR Gate (Open Collector)	14
LS273	C	Octal D-Type Flip-Flop with Master Reset	20
LS279	C	Quad Set-Reset Latch	16
LS280	C	9-Bit Odd/Even Parity Generator/Checker	14
LS283	C	4-Bit Binary Full Adder (Rotated LS83A)	16
LS290	C	Decade Counter	14
LS293	C	4-Bit Binary Counter	14
LS295A		4-Bit Shift Register (3-State)	14
LS298	C	Quad 2-Input Multiplexer with Output Latches	16
LS299		8-Bit Shift/Storage Register (3-State)	20
LS322A		8-Bit Shift/Register with Sign Extend (3-State)	20
LS323		8-Bit Shift/Storage Register (3-State)	20
LS348		8-Input to 3 Line Priority Encoder (3-State)	16
LS352	C	Dual 4-Input Multiplexer (Inverting LS153)	16
LS353	C	Dual 4-Input Multiplexer (3-State LS352)	16
LS365A	C	Hex Buffer with Common Enable (3-State)	16
LS366A	C	Hex Inverter Buffer with Common Enable (3-State)	16
LS367A	C	Hex Buffer, 4-Bit and 2-Bit (3-State)	16
LS368A	C	Hex Inverter Buffer, 4-Bit and 2-Bit (3-State)	16
LS373	C	Octal Transparent Latch (3-State)	20
LS374	C	Octal D-Type Flip-Flop (3-State)	20
LS377	C	Octal D-Type Flip-Flop with Common Enable	20
LS378	C	Hex D-Type Flip-Flop with Enable	16
LS379	C	4-Bit D-Type Flip-Flop with Enable	16
LS386		Quad 2-Input Exclusive OR Gate	14
LS390	C	Dual Decade Counter	16

LOW POWER SCHOTTKY

TTL-T54/T74LS SERIES (Continued)
C = CECC Approved

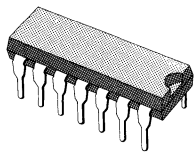
Type		Function	Package DIP
LS393	C	Dual 4-Bit Binary Counter	14
LS395		4-Bit Shift Register (3-State)	16
LS395A		4-Bit Shift Register (3-State)	16
LS398		Quad 2-Input Multiplexer with Output Register	20
LS399		Quad 2-Input Multiplexer with Output Register	16
LS465		Octal Buffer Gated Enable-Inverted (3-State)	20
LS490		Dual Decade Counter	16
LS533		Octal Transparent Latch (3-State)	20
LS534		Octal D-Type Flip-Flop (3-State)	20
LS540		Octal Inverting Buffer/Line Driver (3-State)	20
LS541		Octal Buffer/Line Driver (3-State)	20
LS568		Decade Up/Down Counter (3-State)	20
LS569		Binary Up/Down Counter (3-State)	20
LS573		Octal D-Type Latch (3-State)	20
LS574		Octal D-Type Flip-Flops (3-State)	20
LS640		Octal Bus Transceiver (3-State)	20
LS641		Octal Non Inverting Bus Transceiver (3-State)	20
LS645		Octal Non Inverting Bus Transceiver (3-State)	20
LS670	C	4 x 4 Register File (3-State)	16
LS682		8-Bit Magnitude Comparator (3-State)	20

Function			Standard code
GATE BUFFER	NAND		LS00 LS01 LS03 LS10 LS12 LS20 LS22 LS26 LS30 LS37 LS38 LS40 LS133
	NOR		LS02 LS27 LS28 LS33 LS260
	AND		LS08 LS09 LS11 LS15 LS21
	OR		LS32
	INVERTER		LS04 LS05
	3-STATE		LS125 LS126 LS240 LS241 LS244 LS245 LS365 LS366 LS367 LS368 LS540 LS541
	BIDIRECTIONAL		LS242 LS243 LS245 LS640 LS641 LS645
	MULTIFUNCTION		LS51 LS54 LS55
	SCHMITT TRIGGER		LS13 LS14 LS18 LS19 LS24 LS132
FLIP-FLOP	J-K FLIP-FLOP		LS73 LS76 LS78 LS107 LS109 LS112 LS113 LS114
	D FLIP-FLOP		LS74A LS174 LS175 LS273 LS377
		3-STATE	LS374 LS534 LS573 LS574

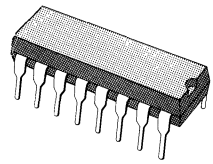
LOW POWER SCHOTTKY

TTL-T54/T74LS SERIES (continued)

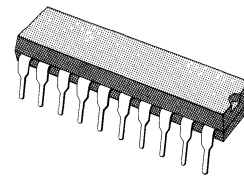
Function		Standard code
LATCH		LS75 LS259 LS279
	3-STATE	LS373 LS533 LS573
MULTIVIBRATOR		LS122 LS123 LS221
DECODER		LS42 LS138 LS139 LS145 LS154 LS155 LS156 LS256 LS259
	7-SEGMENT	LS247 LS248
ENCODER		LS147 LS148 LS348
REGISTER		LS91 LS95 LS96 LS164 LS166 LS170 LS173 LS174 LS175 LS194 LS195 LS273 LS295 LS298 LS299 LS322 LS323 LS374 LS377 LS378 LS379 LS395 LS398 LS399 LS534 LS670
COUNTER	BINARY	LS93 LS161 LS163 LS169 LS191 LS193 LS197 LS293 LS393 LS569
	DECADE	LS90 LS160 LS162 LS168 LS190 LS192 LS196 LS290 LS390 LS490 LS568
MULPTIPLEXER	DIGITAL	LS151 LS152 LS153 LS157 LS158 LS251 LS253 LS257 LS258 LS298 LS352 LS353 LS398 LS399
OTHERS	ADDER	LS83 LS283
	COMPARATORS	LS85 LS682
	ALU	LS181
	PARITY TREE	LS280



DIP-14



DIP-16



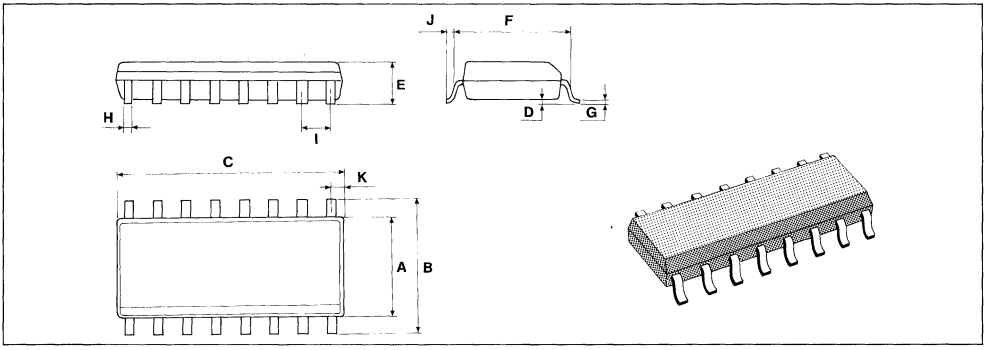
DIP-20

SURFACE MOUNTING

PACKAGES

The range of surface mounting package types available from SGS meets most of the industries'needs today and an ongoing development program will ensure that SGS will be there in the future with the products you need.

SMALL OUTLINE PACKAGES — The SGS range of SO packages includes both standard JEDEC types plus a range of packages with slightly larger body dimensions. These special SO packages are of course foot-print compatible with standard JEDEC types thus allowing SGS to offer an increased product range without reducing your automation options or creating extra costs for PCB manufacturers. In addition SGS has developed a special improved dissipation package — called the MICROWATT® and given a P suffix — which will allow the SGS product range to include devices with higher power dissipation. And of course the new package is completely foot-print compatible with standard JEDEC SO packages.

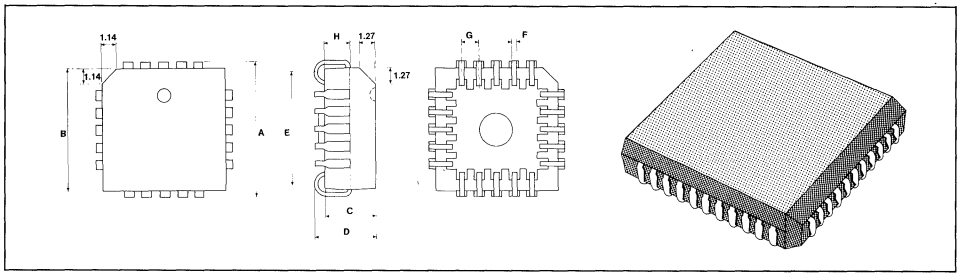


Package	A	B	C	D	E	F	G	H	I	J	K
SO-14	4.0	6.2	8.75	0.1	1.75	5.3	0.2	0.4	1.27	0.5	0.55
SO-16	4.0	6.2	10.0	0.1	1.75	5.3	0.2	0.4	1.27	0.5	0.6
SO-16L	7.5	10.3	10.3	0.15	2.5	9.0	0.25	0.43	1.27	0.5	0.7
SO-20	7.5	10.3	12.7	0.15	2.5	9.0	0.25	0.43	1.27	0.5	0.63
SO-8G	4.5	6.3	5.08	0.1	2.0	5.3	0.2	0.4	1.27	0.25	0.63
SO-14G	4.5	6.3	10.16	0.1	2.0	5.3	0.2	0.4	1.27	0.25	1.27
SO-16G	4.5	6.3	10.16	0.1	2.0	5.3	0.2	0.4	1.27	0.25	0.63
SO-16P	4.5	6.3	10.16	0.1	2.0	5.3	0.25	0.4	1.27	0.25	0.63

All dimensions in mm

PACKAGES

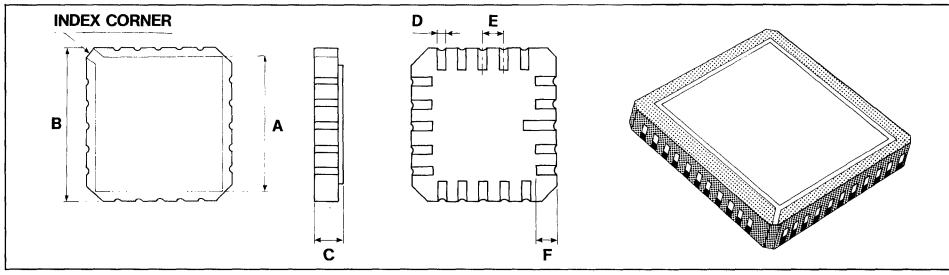
PLASTIC LEADED CHIP CARRIERS — Designed to take circuits with high pin-outs, like microprocessors, SGS PLCCs are available in 20, 44, 68 and 84 pin versions. In this type of package the leads are folded under the package ready for surface mounting.
This configuration also has the advantage of reducing the risk of lead bending during shipping — a real problem with standard DIP packages.



Package	A	B	C	D	E	F	G	H
PLCC20	9.69	8.96	3.81	4.42	8.35	0.38	1.27	2.54
PLCC44	17.65	16.66	3.81	4.42	16.00	0.38	1.27	2.54
PLCC68	24.93	24.2	3.81	4.42	23.5	0.38	1.27	2.54
PLCC84	30.2	29.2	3.81	4.42	28.4	0.38	1.27	2.54

All dimensions in mm

LEADLESS CERAMIC CHIP CARRIERS — Designed originally for the demanding military markets, LCCCs are now used in many applications with special environmental conditions and wherever high reliability is of prime importance. SGS LCCCs come in 20, 44, 52, 68, 84 and 100 pin packages.

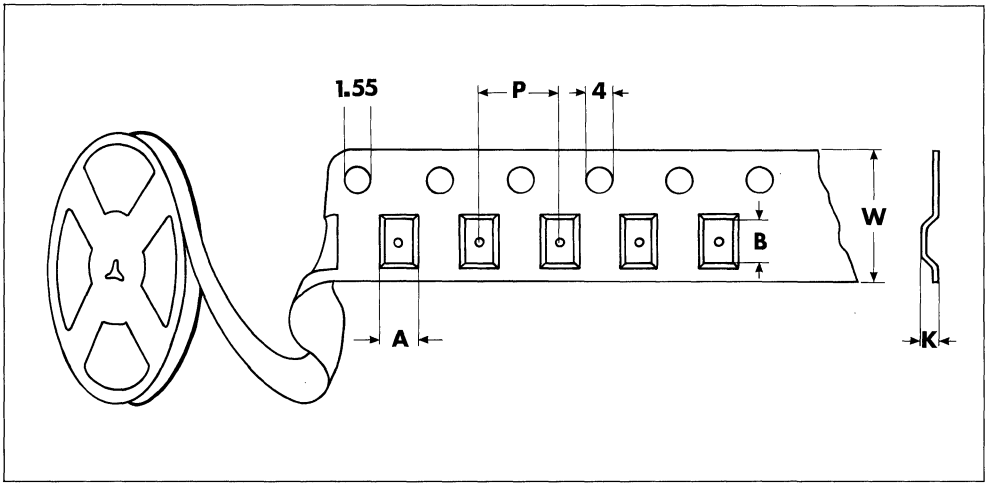


Package	A	B	C	D	E	F
LCCC20	8.00	8.89	1.85	0.63	1.27	1.27
LCCC44	13.4	16.31	1.85	0.63	1.27	1.27
LCCC52	13.4	19.05	1.85	0.63	1.27	1.27
LCCC68	15.8	24.13	1.85	0.63	1.27	1.27
LCCC84	18.6	29.21	2.03	0.63	1.27	1.27
LCCC100	19.5	36.5	2.03	0.63	1.27	1.27

All dimensions in mm

SHIPPING METHODS

Two main shipping methods are available for SGS SMICs. Firstly there is the traditional antistatic stick commonly used for standard DIP packages. This is the optimum solution when small numbers of SMICs are being used in mixed surface and through-hole mounting assemblies. Where a higher volume of surface mounted components is used with fully automated placement equipment, the optimum solution is tape and reel.



TAPE AND REEL

Package	A (mm)	B (mm)	W (mm)	P (mm)	K (mm)	Quantity*
SO-14	6.5	9.5	16	8	2.2	2500
SO-16	6.5	10.3	16	8	2.2	2500
SO-16L	10.9	10.76	24	12	3.0	2000
SO-20	10.9	19.3	24	12	3.0	1000
SO-8	6.4	5.2	12	8	2.2	2500
SO-14G	6.5	9.5	16	8	2.2	2500
SO-16G	6.5	10.3	16	8	2.2	2500
SO-16P	6.5	10.3	16	8	2.2	2500
PLCC20	10.3	10.3	16	12	5.0	1000
PLCC44	18.0	18.0	32	24	5.0	500
PLCC68	25.6	25.6	44	32	5.0	300

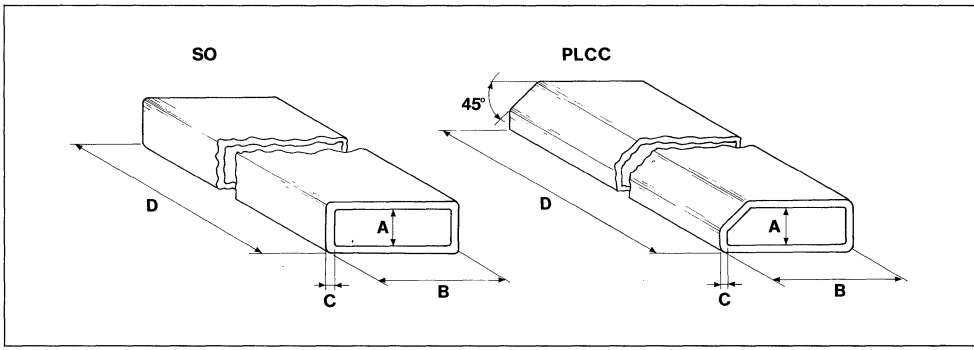
* SGS may supply smaller quantities in order to accomplish lot code.

SHIPPING METHODS

ANTISTATIC STICKS

Package	A		B		C		D		Qty
	Min	Max	Min	Max	Min	Max	Min	Max	
SO-14	2.2	2.5	6.4	6.7	0.5	0.7	520	521	56
SO-16	2.2	2.5	6.4	6.7	0.5	0.7	520	521	50
SO-16L	3.0	3.3	10.7	11.0	0.5	0.7	540	541	50
SO-20	3.0	3.3	10.7	11.0	0.5	0.7	540	541	40
SO-8G	2.2	2.5	6.4	6.7	0.5	0.7	520	521	100
SO-14G	2.2	2.5	6.4	6.7	0.5	0.7	520	521	50
SO-16G	2.2	2.5	6.4	6.7	0.5	0.7	520	521	50
SO-16P	2.2	2.5	6.4	6.7	0.5	0.7	520	521	50
PLCC20	4.8	5.2	10.5	10.9	1.05	1.15	573	574	50
PLCC44	4.8	5.2	18.15	18.55	1.05	1.15	573	574	30
PLCC68	4.8	5.2	25.75	26.15	1.05	1.15	573	574	20
PLCC84	4.8	5.2	31.05	31.56	1.05	1.15	573	574	16

All dimensions in mm



BIPOLAR LINEAR DEVICES

STANDARD LINEARS

Type	Function	Package
AM26LS31D1	Quad Line Driver for RS422/3	SO-14
AM26LS32D1	Quad Line Receiver for RS422/3	SO-14
AM6012D1	12 Bit D/A Converter	SO-20
DAC0808D1	8 Bit D/A Converter	SO-14
LM211D	Comparator	SO-8G
LM224D1	Quad Operational Amplifiers	SO-14
LM224D	Quad Operational Amplifiers	SO-14G
LM239D1	Quad Comparator	SO-14
LM239D	Quad Comparator	SO-14G
LM258D	Dual Operational Amplifiers	SO-8G
LM293D	Dual Comparator	SO-8G
LM301AD	General Purpose Operational Amplifiers	SO-8G
LM311D	Comparator	SO-8G
LM324D1	Quad Operational Amplifiers	SO-14
LM324D	Quad Operational Amplifiers	SO-14G
LM324AD1	Quad Operational Amplifiers	SO-14
LM324AD	Quad Operational Amplifiers	SO-14G
LM339D1	Quad Comparator	SO-14
LM339D	Quad Comparator	SO-14G
LM358D	Dual Operational Amplifiers	SO-8G
LM358AD	Dual Operational Amplifiers	SO-8G
LM393D	Dual Comparator	SO-8G
LM723CD1	Precision Voltage Regulator	SO-14
LM723CD	Precision Voltage Regulator	SO-14G
LM741ID	General Purposes Operational Amplifiers	SO-8G
LM741CD	General Purposes Operational Amplifiers	SO-8G
LM748ID	General Purposes Operational Amplifiers	SO-8G
LM748CD	General Purposes Operational Amplifiers	SO-8G
LM2901D1	Quad Comparator	SO-14
LM2901D	Quad Comparator	SO-14G
LM2902D1	Quad Operational Amplifiers	SO-14
LM2902D	Quad Operational Amplifiers	SO-14G
LM2903D	Dual Comparator	SO-8G
LM2904D	Operational Amplifiers	SO-8G
LM3046D1	Five Transistors Array	SO-14
LM3046D	Five Transistors Array	SO-14G
MC1458D	Dual Operational Amplifiers	SO-8G
MC1458ID	Dual Operational Amplifiers	SO-8G
MC1458CD	Dual Operational Amplifiers	SO-8G
MC1488D1	Quad Line Driver	SO-14
MC1488D	Quad Line Driver	SO-14G
MC1489D1	Quad Line Receiver	SO-14
MC1489D	Quad Line Receiver	SO-14G

BIPOLAR LINEAR DEVICES

STANDARD LINEARS (Continued)

Type	Function	Package
MC1489AD1	Quad Line Receiver	SO-14
MC1489AD	Quad Line Receiver	SO-14G
MC1776ID	Program Operational Amplifiers	SO-8G
MC1776CD	Program Operational Amplifiers	SO-8G
MC3302D1	Quad Comparator	SO-14
MC3302D	Quad Comparator	SO-14G
MC3303D1	Quad Operational Amplifiers	SO-14
MC3303D	Quad Operational Amplifiers	SO-14G
MC3403D1	Quad Operational Amplifiers	SO-14
MC3403D	Quad Operational Amplifiers	SO-14G
NE532D	Dual Operational Amplifiers	SO-8G
NE555D	Timer	SO-8G
NE556D	Dual Timer	SO-14G
TL072CD	Dual Low Noise JFET Operational Amplifiers	SO-8G
TL072ID	Dual Low Noise JFET Operational Amplifiers	SO-8G
TL072AD	Dual Low Noise JFET Operational Amplifiers	SO-8G
TL072BD	Dual Low Noise JFET Operational Amplifiers	SO-8G
TL082CD	Dual JFET Operational Amplifiers	SO-8G
TL082ID	Dual JFET Operational Amplifiers	SO-8G
TL082AD	Dual JFET Operational Amplifiers	SO-8G
TL082BD	Dual JFET Operational Amplifiers	SO-8G
TL7702ACD	Supply Voltage Supervisor	SO-8G
TL7705ACD	Supply Voltage Supervisor	SO-8G
TL7709ACD	Supply Voltage Supervisor	SO-8G
TL7712ACD	Supply Voltage Supervisor	SO-8G
TL7715ACD	Supply Voltage Supervisor	SO-8G
ULN2001D1	7-Channel Darlington Drivers	SO-16
ULN2001D	7-Channel Darlington Drivers	SO-16G
ULN2002D1	7-Channel Darlington Drivers	SO-16
ULN2002D	7-Channel Darlington Drivers	SO-16G
ULN2003D1	7-Channel Darlington Drivers	SO-16
ULN2003D	7-Channel Darlington Drivers	SO-16G
ULN2004D1	7-Channel Darlington Drivers	SO-16
ULN2004D	7-Channel Darlington Drivers	SO-16G

BIPOLAR LINEAR DEVICES

AUTOMOTIVE

Type	Function	Package
L482P	Electronic ignition (hall effect sensor)	SO-16P
L484P	Electronic ignition (magnetic pickup)	SO-16P
L485	Alternator regulator	SO-16P
L497A	Electronic ignition (hall effect sensor)	SO-16P
L530	Electronic ignition interface for microprocessor	SO-16P

TELECOM

Type	Function	Package
LS025M	Balanced modulator	SO-14G
LS204CM	High performance dual operational/amplifier	SO-8G
LS204M	High performance dual operational/amplifier	SO-8G
LS404CM	High performance dual operational/amplifier	SO-14G
LS404M	High performance dual operational/amplifier	SO-14G
LS4558NM	High performance dual operational/amplifier	SO-8G

RADIO

Type	Function	Package
TDA1225	AM/FM Radio	SO-16G
TDA7215	FM Tuner	SO-8G
TDA7225	Low Voltage AM/FM Radio	SO-16G

HS-C²MOS LOGIC

Type	Function	Package
M74HC00M1	Quad 2-Input NAND Gate	SO-16
M74HC02M1	Quad 2-Input NOR Gate	SO-16
M74HC03M1	Quad 2-Input NAND (Open Drain)	SO-16
M74HC04M1	Hex Inverter	SO-16
M74HCT04M1	Hex Inverter	SO-16
M74HCU04M1	Hex Inverter (Single Stage)	SO-16
M74HCT07M1	Hex Buffer	SO-16
M74HC08M1	Quad 2-Input AND Gate	SO-16
M74HC10M1	Triple 3-Input NAND Gate	SO-16
M74HC11M1	Triple 3-Input AND Gate	SO-16
M74HC14M1	Hex Schmitt Inverter	SO-16
M74HC20M1	Dual 4-Input NAND Gate	SO-16
M74HC21M1	Dual 4-Input AND Gate	SO-16
M74HC27M1	Triple 3-Input NOR Gate	SO-16
M74HC30M1	8-Input NAND Gate	SO-16
M74HC32M1	Quad 2-Input OR Gate	SO-16
M74HC42M1	BCD to Decimal Decoder	SO-16
M74HC51M1	Dual 2W-2I AND/OR Inverter Gate	SO-16
M74HC73M1	Dual J-K Flip-Flop with Clear	SO-16
M74HC74M1	Dual D-Type Flip-Flop with Preset and Clear	SO-16
M74HC75M1	4-Bit D-Type Latch	SO-16
M74HC76M1	Dual J-K Flip-Flop with Preset and Clear	SO-16
M74HC77M1	Quad D-Type Latch	SO-14
M74HC86M1	Quad Exclusive OR Gate	SO-16
M74HC107M1	Quad J-K Flip Flop	SO-16
M74HC109M1	Dual J-K Flip-Flop with Preset and Clear	SO-14
M74HC112M1	Dual J-K Flip-Flop	SO-16
M74HC113M1	Dual J-K Flip-Flop with Preset	SO-16
M74HC123M1	Dual Monostable Multivibrator with Clear	SO-16
M74HC125M1	Quad Bus Buffer (3-state)	SO-14
M74HC126M1	Quad Bus Buffer (3-state)	SO-14
M74HC131M1	3 to 8-Line Decoder Latch	SO-16
M74HC132M1	Quad 2-Input Schmitt NAND	SO-16
M74HC133M1	13-Input NAND Gate	SO-14
M74HC137M1	3 to 8-Line Decoder Latch (Inv)	SO-16
M74HCT137M1	3 to 8-Line Decoder Latch (Inv)	SO-14
M74HC138M1	3 to 8-Line Decoder (Inv)	SO-16
M74HCT138M1	3 to 8-Line Decoder (Inv)	SO-16

SGS

HS-C²MOS LOGIC

Type	Function	Package
M74HC139M1	Dual 2 to 4-Line Decoder/Demultiplexer	SO-14
M74HC147M1	10 to 4-Line Priority Encoder	SO-14
M74HC148M1	8 to 3-Line Priority Encoder	SO-16
M74HC151M1	8-Channel Multiplexer	SO-16
M74HC153M1	Dual 4-Channel Multiplexer	SO-16
M74HC155M1	Dual 2 to 4-Line Decoder	SO-16
M74HC157M1	Quad 2-Channel Multiplexer	SO-16
M74HC158M1	Quad 2-Channel Multiplexer (Inv.)	SO-16
M74HC160M1	Sync. Decade Counter with Async. Clear	SO-16
M74HC161M1	Sync. Binary Counter with Async. Clear	SO-16
M74HC162M1	Sync. Decade Counter with Sync. Clear	SO-16
M74HC163M1	Sync. Binary Counter with Sync. Clear	SO-16
M74HC164M1	8-Bit SIPO Shift Register	SO-14
M74HC165M1	8-Bit PISO Shift Register	SO-16
M74HC166M1	8-Bit PISO Shift Register	SO-14
M74HC173M1	Quad D-Type Register (3-States)	SO-16
M74HC175M1	Quad D-Type Flip-Flop with Clear	SO-16
M74HC192M1	Sync. Up/Down Decade Counter	SO-16
M74HC193M1	Sync. Up/Down Binary Counter	SO-16
M74HC195M1	4-Bit PIPO Shift Register	SO-16
M74HC221M1	Dual Monostable Multivibrator	SO-16
M74HC237M1	3 to 8-Line Decoder	SO-16
M74HC238M1	3 to 8-Line Decoder	SO-16
M74HC251M1	8-Channel Multiplexer (3-State)	SO-16
M74HC253M1	Dual 4-Channel Multiplexer (3-State)	SO-16
M74HC257M1	Quad 2-Channel Multiplexer (3-State)	SO-16
M74HC258M1	Quad 2-Channel Multiplexer (3-State/Inv.)	SO-16
M74HC259M1	8-Bit Addressable Latch	SO-16
M74HC279M1	Quad S-R Latch	SO-14
M74HC280M1	9-Bit Parity Generator	SO-16
M74HC283M1	4-Bit Binary Full Adder	SO-16
M74HC298M1	Quad 2-Channel Multiplexer Register	SO-14
M74HC365M1	Hex Bus Buffer	SO-16
M74HC366M1	Hex Bus Buffer (Inv.)	SO-16
M74HC367M1	Hex Bus Buffer (3-State)	SO-16
M74HC368M1	Hex Bus Buffer (3-State/Inv.)	SO-16
M74HC375M1	Quad D-Type Latch	SO-14
M74HC386M1	Quad Exclusive OR Gate	SO-16

HS-C²MOS LOGIC

Type	Function	Package
M74HC423M1	Dual Monostable Multivibrator with Clear	SO-16
M74HC597M1	8-Bit Latch Shift Register	SO-16
M74HC4002M1	Dual 4-Input NOR Gate	SO-16
M74HC4022M1	Octal Counter/Divider	SO-16
M74HC4024M1	7-Stage Binary Counter	SO-16
M74HC4028M1	BCD to Decimal Decoder	SO-16
M74HC4049M1	Hex Buffer/Converter (Inv.)	SO-14
M74HC4050M1	Hex Buffer/Converter	SO-14
M74HC4066M1	Quad Bilateral Switch	SO-16
M74HC4072M1	Dual 4-Input OR Gate	SO-16
M74HC4076M1	4-Bit D-Type Register	SO-16
M74HC4078M1	8-Input NOR/OR Gate	SO-16
M74HC4538M1	Dual Monostable Multivibrator	SO-16
M74HC4543M1	BCD Monostable Multivibrator	SO-16
M74HC7266M1	Quad Exclusive NOR Gate	SO-16

LOW POWER SCHOTTKY

Type	Function	Package
T74LS00M1	Quad 2-Input NAND Gate	SO-14
T74LS01M1	Quad 2-Input NAND Gate (Open Collector)	SO-14
T74LS02M1	Quad 2-Input NOR Gate	SO-14
T74LS03M1	Quad 2-Input NAND Gate (Open Collector)	SO-14
T74LS04M1	Hex Inverter	SO-14
T74LS05M1	Hex Inverter (Open Collector)	SO-14
T74LS08M1	Quad 2-Input AND Gate	SO-14
T74LS09M1	Quad 2-Input AND Gate (Open Collector)	SO-14
T74LS10M1	Triple 3-Input NAND Gate	SO-14
T74LS11M1	Triple 3-Input AND Gate	SO-14
T74LS12M1	Triple 3-Input NAND Gate (Open Collector)	SO-14
T74LS13M1	Dual 4-Input NAND Schmitt Trigger	SO-14
T74LS14M1	Hex Schmitt Trigger Inverter	SO-14
T74LS15M1	Triple 3-Input AND Gate (Open Collector)	SO-14
T74LS18M1	Dual 4-Input NAND Schmitt Trigger	SO-14 □

LOW POWER SCHOTTKY

Type	Function	Package
T74LS19M1	Hex Schmitt Trigger Inverter	SO-14 □
T74LS20M1	Dual 4-Input NAND Gate	SO-14
T74LS21M1	Dual 4-Input AND Gate	SO-14
T74LS22M1	Dual 4-Input NAND Gate (Open Collector)	SO-14
T74LS24M1	Quad 2-Input NAND Schmitt Trigger	SO-14 □
T74LS26M1	Quad 2-Input NAND Buffer (Open Collector)	SO-14
T74LS27M1	Triple 3-Input NOR Gate	SO-14
T74LS28M1	Quad 2-Input NOR Buffer	SO-14
T74LS30M1	8-Input NAND Gate	SO-14
T74LS32M1	Quad 2-Input OR Gate	SO-14
T74LS33M1	Quad 2-Input NOR Buffer (Open Collector)	SO-14
T74LS37M1	Quad 2-Input NAND Buffer	SO-14
T74LS38M1	Quad 2-Input NAND Buffer (Open Collector)	SO-14
T74LS40M1	Dual 4-Input NAND Buffer	SO-14
T74LS42M1	1-of-10 Decoder	SO-16
T74LS51M1	Dual 2-Wide 2-Input/3-Input AND-OR-INVERT Gate	SO-14
T74LS54M1	2-3-3-2-Input AND-OR-INVERT Gate	SO-14
T74LS55M1	2-Wide 4-Input AND-OR-INVERT Gate	SO-14
T74LS73AM1	Dual JK Negative Edge-Triggered Flip-Flop	SO-14 □
T74LS74AM1	Dual D-Type Positive Edge-Triggered Flip-Flop	SO-14
T74LS75M1	4-Bit D Latch	SO-16 □
T74LS76AM1	Dual JK Flip-Flop with Set and Clear	SO-16 □
T74LS78AM1	Dual JK Flip-Flop with Preset	SO-14 □
T74LS83AM1	4-Bit Full Adder with Fast Carry	SO-16
T74LS85M1	4-Bit Magnitude Comparators	SO-16
T74LS86M1	Quad 2-Input Exclusive OR Gate	SO-14
T74LS90M1	Decade Counter	SO-14
T74LS91M1	8-Bit Shift Register Serial-In Serial-Out	SO-14 □
T74LS92M1	Divide-by-12 Counter	SO-14
T74LS93M1	4-Bit Binary Counter	SO-14
T74LS95BM1	4-Bit Shift Register	SO-14
T74LS96M1	5-Bit Shift Register	SO-16 □
T74LS107AM1	Dual JK Flip-Flop with Clear	SO-14 □
T74LS109M1	Dual JK Positive Edge-Triggered Flip-Flop	SO-16
T74LS109AM1	Dual JK Positive Edge-Triggered Flip-Flop	SO-16 □
T74LS112AM1	Dual JK Negative Edge-Triggered Flip-Flop	SO-16 □
T74LS113M1	Dual JK Negative Edge-Triggered Flip-Flop	SO-14
T74LS113AM1	Dual JK Negative Edge-Triggered Flip-Flop	SO-14 □

LOW POWER SCHOTTKY

Type	Function	Package
T74LS114M1	Dual JK Negative Edge-Triggered Flip-Flop	SO-14
T74LS114AM1	Dual JK Negative Edge-Triggered Flip-Flop	SO-14 □
T74LS122M1	Retriggerable Monostable Multivibrators	SO-14 □
T74LS123M1	Dual Retriggerable Monostable Multivibrators	SO-16 □
T74LS125M1	Quad 3-State Buffer (LOW Enable)	SO-14
T74LS125AM1	Quad 3-State Buffer (LOW Enable)	SO-14 □
T74LS126M1	Quad 3-State Buffer (HIGH Enable)	SO-14
T74LS126AM1	Quad 3-State Buffer (HIGH Enable)	SO-14 □
T74LS132M1	Quad 2-Input Schmitt Trigger NAND Gate	SO-14
T74LS133M1	13-Input NAND Gate	SO-16
T74LS136M1	Quad 2-Input Exclusive OR Gate (Open Collector)	SO-14
T74LS138M1	1-of-8 Decoder/Demultiplexer	SO-16
T74LS139M1	Dual 1-of-4 Decoder/Demultiplexer	SO-16
T74LS145M1	1-of-10 Decoder/Driver (Open Collector)	SO-16
T74LS147M1	10-Line to 4-Line Priority Encoder	SO-16 □
T74LS148M1	8-Input to 3-Line Priority Encoder	SO-16 □
T74LS151M1	8-Input Multiplexer	SO-16 □
T74LS152M1	8-Input Multiplexer	SO-14 □
T74LS153M1	Dual 4-Input Multiplexer	SO-16 □
T74LS154M1	4-Line to 16-Line Decoders/Demultiplexer	SO-24 □
T74LS155M1	Dual 1-of-4 Decoder/Demultiplexer	SO-16 □
T74LS156M1	Dual 1-of-4 Decoder/Demultiplexer (Open Collector)	SO-16 □
T74LS157M1	Quad 2-Input Multiplexer (Non inverting)	SO-16
T74LS158M1	Quad 2-Input Multiplexer (Inverting)	SO-16
T74LS160M1	BCD Decade Counter, Asynchronous Reset	SO-16L
T74LS160AM1	BCD Decade Counter, Asynchronous Reset	SO-16 □
T74LS161M1	4-Bit Binary Counter, Asynchronous Reset	SO-16L
T74LS161AM1	4-Bit Binary Counter, Asynchronous Reset	SO-16 □
T74LS162M1	BCD Decade Counter, Synchronous Reset	SO-16L
T74LS162AM1	BCD Decade Counter, Synchronous Reset	SO-16 □
T74LS163M1	4-Bit Binary Counter, Synchronous Reset	SO-16L
T74LS163AM1	4-Bit Binary Counter, Synchronous Reset	SO-16 □
T74LS164M1	8-Bit Shift Register (Serial-In Parallel-Out)	SO-14
T74LS168M1	Up/Down Decade Counter	SO-16L
T74LS169M1	Up/Down Binary Counter	SO-16L
T74LS170M1	4x4 Register File (Open Collector)	SO-16L □
T74LS173AM1	4-Bit D-Type Register (3-State)	SO-16 □
T74LS174M1	Hex D-Type Flip-Flop with Clear	SO-16

LOW POWER SCHOTTKY

Type	Function	Package
T74LS175M1	Quad D-Type Flip-Flop with Clear	SO-16
T74LS183M1	Dual Carry-Save Full Adder	SO-14 □
T74LS190M1	Presettable BCD/Decade Up/Down Counter	SO-16L
T74LS191M1	Presettable 4-Bit Binary Up/Down Counter	SO-16L
T74LS192M1	Presettable BCD/Decade Up/Down Counter	SO-16
T74LS193M1	Presettable 4-Bit Binary Up/Down Counter	SO-16
T74LS194AM1	4-Bit Right/Left Shift Register	SO-16L
T74LS195AM1	4-Bit Shift Register	SO-16
T74LS196M1	Decade Counter	SO-14
T74LS197M1	4-Bit Binary Counter	SO-14
T74LS221M1	Dual Monostable Multivibrator	SO-16 □
T74LS240M1	Octal Inverting Bus/Line Driver (3-State)	SO-20
T74LS241M1	Octal Bus Line Driver (3-State)	SO-20
T74LS242M1	Quad Inverting Bus Transceiver (3-State)	SO-14 □
T74LS243M1	Quad Non Inverting Bus Transceiver (3-State)	SO-14 □
T74LS244M1	Octal Non Inverting Driver (3-State)	SO-20
T74LS245M1	Octal Non Inverting Bus Transceiver (3-State)	SO-20 □
T74LS247M1	BCD to 7-Segment Decoder/Driver (Open Collector)	SO-16 □
T74LS248M1	BCD to 7-Segment Decoder/Driver with Pull-Ups	SO-16 □
T74LS251M1	8-Input Multiplexer (3-State)	SO-16
T74LS253M1	Dual 4-Input Multiplexer (3-State)	SO-16
T74LS256M1	Dual 4-Bit Addressable Latch	SO-16
T74LS257M1	Quad 2-Input Multiplexer (3-State)	SO-16
T74LS257AM1	Quad 2-Input Multiplexer (3-State)	SO-16 □
T74LS258M1	Quad 2-Input Multiplexer (3-State)	SO-16
T74LS258AM1	Quad 2-Input Multiplexer (3-State)	SO-16 □
T74LS259M1	8-Bit Addressable Latch	SO-16
T74LS260M1	Dual 5-Input NOR Gate	SO-14
T74LS266M1	Quad 2-Input Exclusive NOR Gate (Open Collector)	SO-14
T74LS273M1	Octal D-Type Flip-Flop with Master Reset	SO-20
T74LS279M1	Quad Set-Reset Latch	SO-16
T74LS280M1	9-Bit Odd/Even Parity Generator/Checker	SO-14
T74LS283M1	4-Bit Binary Full Adder (Rotated LS83A)	SO-16L
T74LS290M1	Decade Counter	SO-14
T74LS293M1	4-Bit Binary Counter	SO-14
T74LS298M1	Quad 2-Input Multiplexer with Output Latches	SO-16
T74LS299M1	8-Bit Shift/Storage Register (3-State)	SO-20 □
T74LS323M1	8-Bit Shift/Storage Register (3-State)	SO-20 □

LOW POWER SCHOTTKY

Type	Function	Package
T74LS348M1	8-Input to 3 Line Priority Encoder (3-State)	SO-16 □
T74LS352M1	Dual 4-Input Multiplexer (Inverting LS153)	SO-16
T74LS353M1	Dual 4-Input Multiplexer (3-State LS352)	SO-16
T74LS365AM1	Hex Buffer with Common Enable (3-State)	SO-16
T74LS366AM1	Hex Inverter Buffer with Common Enable (3-State)	SO-16
T74LS367AM1	Hex Buffer, 4-Bit and 2-Bit (3-State)	SO-16
T74LS368AM1	Hex Inverter Buffer 4-Bit/2-Bit (3-State)	SO-16
T74LS373M1	Octal Transparent Latch (3-State)	SO-20
T74LS374M1	Octal D-Type Flip-Flop (3-State)	SO-20
T74LS377M1	Octal D-Type Flip-Flop with Common Enable	SO-20
T74LS378M1	Hex D-Type Flip-Flop with Enable	SO-16
T74LS379M1	4-Bit D-Type Flip-Flop with Enable	SO-16
T74LS386M1	Quad 2-Input Exclusive OR Gate	SO-14 □
T74LS390M1	Dual Decade Counter	SO-16
T74LS393M1	Dual 4-Bit Binary Counter	SO-14
T74LS395M1	4-Bit Shift Register (3-State)	SO-16
T74LS395AM1	4-Bit Shift Register (3-State)	SO-16 □
T74LS398M1	Quad 2-Input Multiplexer with Output Register	SO-20 □
T74LS399M1	Quad 2-Input Multiplexer with Output Register	SO-16
T74LS465M1	Octal Buffer Gated Enable-Inverted (3-State)	SO-20 □
T74LS490M1	Dual Decade Counter	SO-16
T74LS533M1	Octal Transparent Latch (3-State)	SO-20 □
T74LS534M1	Octal D-Type Flip-Flop (3-State)	SO-20 □
T74LS540M1	Octal Inverting Buffer/Line Driver (3-State)	SO-20 □
T74LS541M1	Octal Buffer/Line Driver (3-State)	SO-20 □
T74LS568M1	Decade Up/Down Counter (3-State)	SO-20 □
T74LS569M1	Binary Up/Down Counter (3-State)	SO-20 □
T74LS573M1	Octal D-Type Latch (3-State)	SO-20 □
T74LS574M1	Octal D-Type Flip-Flops (3-State)	SO-20 □
T74LS640M1	Octal Bus Transceiver (3-State)	SO-20 □
T74LS641M1	Octal Non Inverting Bus Transceiver (3-State)	SO-20 □
T74LS645M1	Octal Non Inverting Bus Transceiver (3-State)	SO-20 □
T74LS670M1	4x4 Register File (3-State)	SO-16
T74LS682M1	8-Bit Magnitude Comparator (3-State)	SO-20 □

□ New Type in Development

CMOS B SERIES

Type	Function	Package
HCF4000BM1	Dual 3-Input NOR Gate Plus Inverter	SO-14
HCF4001BM1	Quad 2-Input NOR Gate	SO-14
HCF4002BM1	Dual 4-Input NOR Gate	SO-14
HCF4006BM1	18-Stage Static Shift Register	SO-14
HCF4007UBM1	Dual Complementary Pair Plus Inverter	SO-14
HCF4008BM	4-Bit Full Adder	SO-16G
HCF4009BM1	Hex Buffer/Converter Inverting	SO-16
HCF4010BM1	Hex Buffer/Converter Non-Inverting	SO-16
HCF4011BM1	Quad 2-Input NAND Gate	SO-14
HCF4012BM1	Dual 4-Input NAND Gate	SO-14
HCF4013BM1	Dual D Flip-Flop	SO-14
HCF4014BM	8-Stage Static Sync. Shift Register	SO-16G
HCF4015BM	Dual 4-Stage Static Shift Register	SO-16G
HCF4016BM1	Quad Bilateral Switch	SO-14
HCF4017BM	Decade Counter/Divider	SO-16G
HCF4018BM	Presettable Divide-By-N- Counter	SO-16G
HCF4019BM1	Quad AND/OR Select Gate	SO-16
HCF4020BM	14-Stage Binary/Ripple Counter	SO-16G
HCF4021BM	8-Stage Static Shift Register	SO-16G
HCF4022BM	Devide By-8 Counter/Divider	SO-16G
HCF4023BM1	Triple 3-Input NAND Gate	SO-14
HCF4024BM1	7-Stage Binary/Ripple Counter	SO-14
HCF4025BM1	Triple 3-Input NOR Gate	SO-14
HCF4026BM	Decade Counter/Divider 7 Segment Disp Drv	SO-16G
HCF4027BM1	Dual J-K Mater-Slave Flip-Flop	SO-16
HCF4028BM1	BCD-to-Decimal Decoder	SO-16
HCF4029BM	Presettable Up-Down Counter	SO-16G
HCF4030BM1	Quad Ex-OR Gate	SO-14
HCF4032BM	Triple Serial Adder	SO-16G
HCF4033BM	Decade Counter/Divider 7 Segment Disp Drv	SO-16G
HCF4035BM	4-stage Parallel I/O Shift Register	SO-16G
HCF4038BM	Triple Serial Adder	SO-16G
HCF4040BM	12-Stage Binary/Ripple Counter	SO-16G
HCF4041UBM	Quad True/Complement Buffer	SO-14G
HCF4042BM1	Quad Clocked D Latch	SO-16
HCF4043BM	Quad 3-State NOR R/S Latch	SO-16G
HCF4044BM	Quad 3-State NAND R/S Latch	SO-16G
HCF4045BM	21-Stage Counter	SO-16G

CMOS B SERIES

Type	Function	Package
HCF4047BM	Monostable/Astable Multivibrator	SO-14G
HCF4048BM1	Multifunction Expandable 8-Input Gate	SO-16L
HCF4049UBM1	Hex Inverting Buffer/Converter	SO-16
HCF4050BM1	Hex Non-Inverting Buffer/ Converter	SO-16
HCF4051BM1	Single-8 Channel Analog Multiplexer/Demultiplexer	SO-16
HCF4052BM1	Differential 4-Channel Analog Multiplexer/Demultiplexer	SO-16
HCF4053BM1	Triple 2-Channel Analog Multiplexer/Demultiplexer	SO-16
HCF4054BM1	4-Segment Display Driver	SO-16
HCF4055BM	BCD to 7-Segment Decoder/Driver	SO-16G
HCF4056BM	BCD to 7-Segment Decoder/Driver	SO-16G
HCF4060BM	14-Stage Counter/Divider and Oscillator	SO-16G
HCF4063BM1	4-Bit Magnitude Comparator	SO-16
HCF4066BM1	Quad Bilateral Switch	SO-14
HCF4068BM1	8-Input NAND/AND Gate	SO-14
HCF4069BM1	Hex Inverter	SO-14
HCF4070BM1	Quad Ex-OR Gate	SO-14
HCF4071BM1	Quad 2-Input OR Gate	SO-14
HCF4072BM1	Dual 4-Input OR Gate	SO-14
HCF4073BM1	Triple 3-Input AND Gate	SO-14
HCF4075BM1	Triple 3-Input OR Gate	SO-14
HCF4076BM	4-Bit D-Type Register	SO-16G
HCF4077BM1	Quad Ex-NOR Gate	SO-14
HCF4078BM1	8-Input NOR/OR Gate	SO-14
HCF4081BM1	Quad 2-Input AND Gate	SO-14
HCF4082BM1	Dual 4-Input AND Gate	SO-14
HCF4085BM1	Dual 2-Wide 2-Input AND-OR-Inverter Gate	SO-14
HCF4086BM1	Expandable 4-Wide 2-Input AND-OR-Inverter Gate	SO-14
HCF4093BM1	Quad 2-Input NAND Schmitt Trigger	SO-14
HCF4094BM	8-Stage Shift-and-Store Bus Register	SO-16G
HCF4095BM1	Gated J-K Master-Slave Flip-Flop	SO-14
HCF4096BM1	Gated J-K Master-Slave Flip-Flop	SO-14
HCF4098BM1	Dual Monostable Multivibrator	SO-16
HCF4099BM	8-Bit Addressable Latch	SO-16G
HCF4502BM	Strobe Hex Inverter/Buffer	SO-16G
HCF4503BM	Hex 3-Stage Buffer	SO-16G
HCF4511BM	BCD to 7-Segment Latch/Decoder/Driver	SO-16G
HCF4512BM1	8- Channel Data Selector	SO-16
HCF4518BM	Dual BCD Up-Counter	SO-16G

CMOS B SERIES

Type	Function	Package
HCF4520BM	Dual Binary Up-Counter	SO-16G
HCF4532BM	8-Bit Priority Encoder	SO-16G
HCF4555BM	Dual Binary to 1 of 4 Decoder/Demultiplexer	SO-16G
HCF4556BM	Dual Binary to 1 of 4 Decoder/Demultiplexer	SO-16G
HCF4585BM	4-Bit Magnitude Comparator	SO-16G
HCF40100BM	32-Stage Static Left/Right Shift Register	SO-16G
HCF40101BM	9-Bit Parity Generator Checker	SO-16G
HCF40106BM1	Hex Schmitt Trigger	SO-14
HCF40107BM	Dual 2 Input NAND Buffer/Driver	SO-8G
HCF40109BM	Quad Low-To-High Voltage Level Shifter	SO-16G
HCF40109BM1	Quad Low-to-High Voltage Level Shifter	SO-16L
HCF40160BM	Programmable Decade Counter	SO-16G
HCF40160BM1	Programmable Decade Counter	SO-16L
HCF40161BM	Programmable Binary Counter	SO-16G
HCF40161BM1	Programmable Binary Counter	SO-16L
HCF40162BM	Programmable Decade Counter	SO-16G
HCF40162BM1	Programmable Decade Counter	SO-16L
HCF40163BM	Programmable Binary Counter	SO-16G
HCF40163BM1	Programmable Binary Counter	SO-16L
HCF40174BM	Hex D Type Flip-Flop	SO-16G
HCF40174BM1	Hex D-Type Flip-Flop	SO-16L
HCF40182BM1	Look Ahead Carry Generator	SO-16
HCF40257BM1	Quad 2-Line-to-1 Data Selector/Multiplexer	SO-16

GATE ARRAY PACKAGES

ARRAY	20PLCC	44PLCC	68PLCC	84PLCC	28LCCC	44LCCC	52LCCC	68LCCC	84LCCC	100LCCC
HSG3020	●	●			●					
HSG3030	●	●			●					
HSG3040	●	●			●					
HSG3060		●			●	●	●			
HSG3080		●			●	●	●			
HSG3110		●	●		●	●	●			
HSG3130		●	●	●	●	●	●	●	●	
HSG3170			●	●		●	●	●	●	
HSG3210			●	●		●	●	●	●	
HSG3250			●	●		●	●	●	●	
HSG5080		●	●	●	●	●	●			
HSG5140			●	●		●	●	●	●	
HSG5220			●	●		●	●	●	●	
HSG5320			●	●				●	●	●
HSG5420			●	●				●	●	●
HSG5600			●	●					●	●

MICROPROCESSORS

Z80 FAMILY

Type	Function	Clock	Package
Z8400C	Z80CPU Central Processing Unit	2.5MHz	PLCC44
Z8400AC	Z80ACPU Central Processing Unit	4MHz	PLCC44
Z8400BC	Z80BCPU Central Processing Unit	6MHz	PLCC44
Z8400K	Z80CPU Central Processing Unit	2.5MHz	LCCC44
Z8400AK	Z80ACPU Central Processing Unit	4MHz	LCCC44
Z8400BK	Z80BCPU Central Processing Unit	6MHz	LCCC44
Z8410C	Z80DMA Direct Memory Access	2.5MHz	PLCC44
Z8410AC	Z80ADMA Direct Memory Access	4MHz	PLCC44
Z8410K	Z80DMA Direct Memory Access	2.5MHz	LCCC44
Z8410AK	Z80ADMA Direct Memory Access	4MHz	LCCC44
Z8420C	Z80PIO Parallel Input Output	2.5MHz	PLCC44
Z8420AC	Z80APIO Parallel Input Output	4MHz	PLCC44
Z8420BC	Z80BPIO Parallel Input Output	6MHz	PLCC44
Z8420K	Z80PIO Parallel Input Output	2.5MHz	LCCC44
Z8420AK	Z80APIO Parallel Input Output	4MHz	LCCC44
Z8420BK	Z80BPIO Parallel Input Output	6MHz	LCCC44
Z8430C	Z80CTC Counter Timer Circuit	2.5MHz	PLCC44
Z8430AC	Z80ACTC Counter Timer Circuit	4MHz	PLCC44
Z8430BC	Z80BCTC Counter Timer Circuit	6MHz	PLCC44
Z8430K	Z80CTC Counter Timer Circuit	2.5MHz	LCCC44
Z8430AK	Z80ACTC Counter Timer Circuit	4MHz	LCCC44
Z8430BK	Z80BCTC Counter Timer Circuit	6MHz	LCCC44
Z8444C	Z80SIO Dual Serial Input Output	2.5MHz	PLCC44
Z8444AC	Z80ASIO Dual Serial Input Output	4MHz	PLCC44
Z8444BC	Z80BSIO Dual Serial Input Output	6MHz	PLCC44
Z8444K	Z80SIO Dual Serial Input Output	2.5MHz	LCCC44
Z8444AK	Z80ASIO Dual Serial Input Output	4MHz	LCCC44
Z8444BK	Z80BSIO Dual Serial Input Output	6MHz	LCCC44

Z80 CMOS FAMILY

Type	Function	Clock	Package
Z84C00C	Z80CPU CMOS Central Processing Unit	4MHz	PLCC44
Z84C20C	Z80PIO CMOS Parallel Input/Output	4MHz	PLCC44
Z84C30C	Z80CTC CMOS Counter Timer Circuit	4MHz	PLCC44
Z84C44C	Z80SIO CMOS Serial Input/Output	4MHz	PLCC44

MICROPROCESSORS

Z8000 FAMILY

Type	Function	Clock	Package
Z8002C	Z8000 16 bit Non-Segmented CPU,40 pin,60K byte address range	4MHz	PLCC44
Z8002AC	Z8000 16 bit Non-Segmented CPU,40 pin,60K byte address range	6MHz	PLCC44
Z8030LC	Z8000 SCC Serial Communications Controller (Dual)	4MHz	PLCC44
Z8030LAC	Z8000 SCC Serial Communications Controller (Dual)	6MHz	PLCC44
Z8036LC	Z8000 CIO Counter/Timer and Parallel Input/Output	4MHz	PLCC44
Z8036LAC	Z8000 CIO Counter/Timer and Parallel Input/Output	6MHz	PLCC44
Z8038C	Z8000 FIFO Input/Output Interface	4MHz	PLCC44
Z8038AC	Z8000 FIFO Input/Output Interface	6MHz	PLCC44

MICROCOMPUTERS

Z8 FAMILY

Type	Function	Clock	Rom	Package
Z8601C	Z8 Microcomputer	8MHz	2K	PLCC44
Z8601AC	Z8 Microcomputer	12MHz	2K	PLCC44
Z8611C	Z8 Microcomputer	8MHz	4K	PLCC44
Z8611AC	Z8 Microcomputer	12MHz	4K	PLCC44
Z8621C*	Z8 Microcomputer	8MHz	8K	PLCC44
Z8621AC*	Z8 Microcomputer	12MHz	8K	PLCC44
Z8671C	Z8 MCU Tiny Basic	8MHz	2K	PLCC44
Z8681C	Z8 MCU ROMless External memory starts at 0	8MHz	Ext64K	PLCC44
Z8681AC	Z8 MCU ROMless External memory starts at 0	12MHz	Ext64K	PLCC44

* These products are in introduction phase.

M3870 FAMILY

Type	Function	Clock	Rom	Package
M3870C	Microcomputer Unit	4MHz	2K	PLCC44
M3872C	Microcomputer Unit	4MHz	4K	PLCC44
M3875C	Microcomputer Unit (Battery back-up)	4MHz	4K	PLCC44
M3876C	Microcomputer Unit	4MHz	6K	PLCC44
M3878C	Microcomputer Unit	4MHz	8K	PLCC44
M3873C*	Serial I/O MCU	4MHz	2K	PLCC44
M38SH74C	NV Shadow RAM MCU (Dedicated micro)	4MHz	4K	PLCC44
M38AD72C	8-Bit A/D Converter Input MCU (Dedicated micro)	4MHz	2K	PLCC44
M38AD74C	8-Bit A/D Converter Input MCU (Dedicated micro)	4MHz	4K	PLCC44
M38AS74C*	MCU with AID Converter and N.V. SHRAM	4MHz	4K	PLCC44
M38SB74C	S-Bus/I² CBus MCU (Dedicated micro)	4MHz	4K	PLCC44
M38SB78C	S-Bus/I² CBus MCU (Dedicated micro)	4MHz	8K	PLCC44

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