# SGS-THOMSON MICROELECTRONICS

HCC/HCF4532B

8–BIT PRIORITY ENCODER

- CONVERTS FROM 1 OF 8 TO BINARY
- PROVIDES CASCADING FEATURE TO HANDLE ANY NUMBER OF INPUTS
- GROUP SELECT INDICATES ONE OR MORE PRIORITY INPUTS
- QUIESCENT CURRENT SPECIFIED TO 20V FOR HCC DEVICE
- STANDARDIZED SYMMETRICAL OUTPUT CHARACTERISTICS
- 5V, 10V, AND 15V PARAMETRIC RATINGS
- INPUT CURRENT OF 100 nA AT 18V AND 25°C FOR HCC DEVICE
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC TENTATIVE STANDARD N° 13A, "STANDARD SPECIFICATIONS FOR DESCRIPTION OF "B" SERIES CMOS DEVICES"

EY
(Plastic Package)

F
(Ceramic Frit Seal Package)

M1
(Micro Package)

C1
(Plastic Chip Carrier)

ORDER CODES :

|	
HCC4532BF	HCF4532BM1
HCF4532BEY	HCF4532BC1
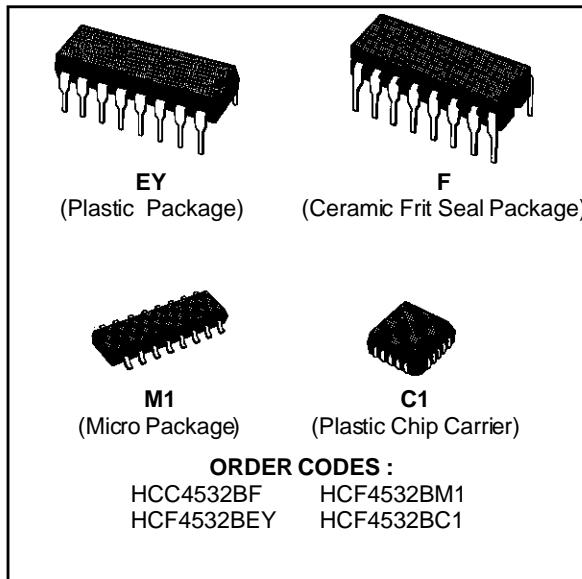
DESCRIPTION

The **HCC4532B** (extended temperature range) and **HCF4532B** (intermediate temperature range) are monolithic integrated circuit, available in 16-lead dual in-line plastic or ceramic package and plastic micro package.

The **HCC/HCF4532** consists of combinational logic that encodes the highest priority input (D7-D0) to a 3-bit binary code. The eight inputs, D7 through D0, each have an assigned priority. D7 is the highest priority and D0 is the lowest. The priority encoder is inhibited when the chip-enable input E_I is low. When E_I is high, the binary representation of the highest-priority input appears on output lines Q2-Q0, and the group select line GS is high to indicate that priority inputs are present. The enable-out (E_O) is high when no priority inputs are present. If any one input is high, E_O is low and all cascaded lower-order stages are disabled.

PIN CONNECTIONS

D4	1	16	V_{DD}
D5	2	15	E_O
D6	3	14	GS
D7	4	13	D3
E_I	5	12	D2
Q2	6	11	D1
Q1	7	10	D0
V_{SS}	8	9	Q0

S– 2248
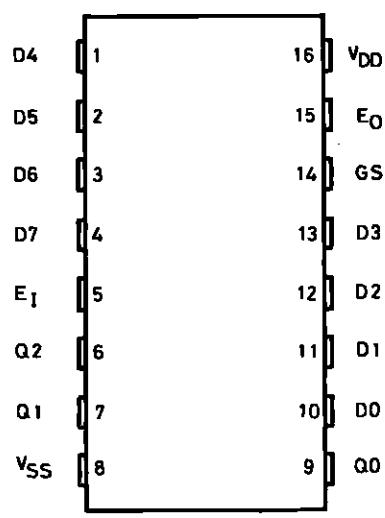
FUNCTIONAL DIAGRAM
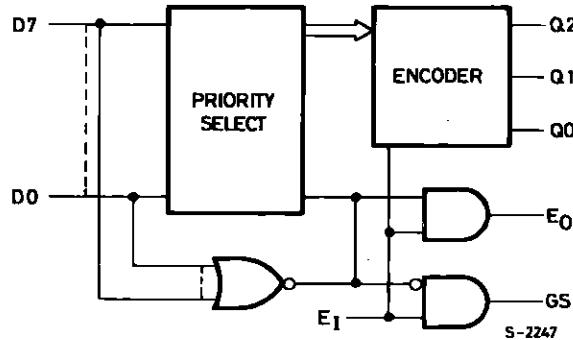
ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{DD}*	Supply Voltage : **HCC** Types **HCF** Types	-0.5 to $+20$ -0.5 to $+18$	V V
V_i	Input Voltage	-0.5 to $V_{DD} + 0.5$	V
I_I	DC Input Current (any one input)	± 10	mA
P_{tot}	Total Power Dissipation (per package) Dissipation per Output Transistor for T_{op} = Full Package-temperature Range	200 100	mW mW
T_{op}	Operating Temperature : **HCC** Types **HCF** Types	-55 to $+125$ -40 to $+85$	°C °C
T_{stg}	Storage Temperature	-65 to $+150$	°C

Stresses above those listed under "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for external periods may affect device reliability.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{DD}	Supply Voltage : **HCC** Types **HCF** Types	3 to 18 3 to 15	V V
V_I	Input Voltage	0 to V_{DD}	V
T_{op}	Operating Temperature : **HCC** Types **HCF** Types	-55 to $+125$ -40 to $+85$	°C °C

LOGIC DIAGRAM

PIN 8 = V_SS
PIN 16 = V_DD

ALL INPUTS PROTECTED BY COS/MOS
PROTECTION NETWORK

S-2249
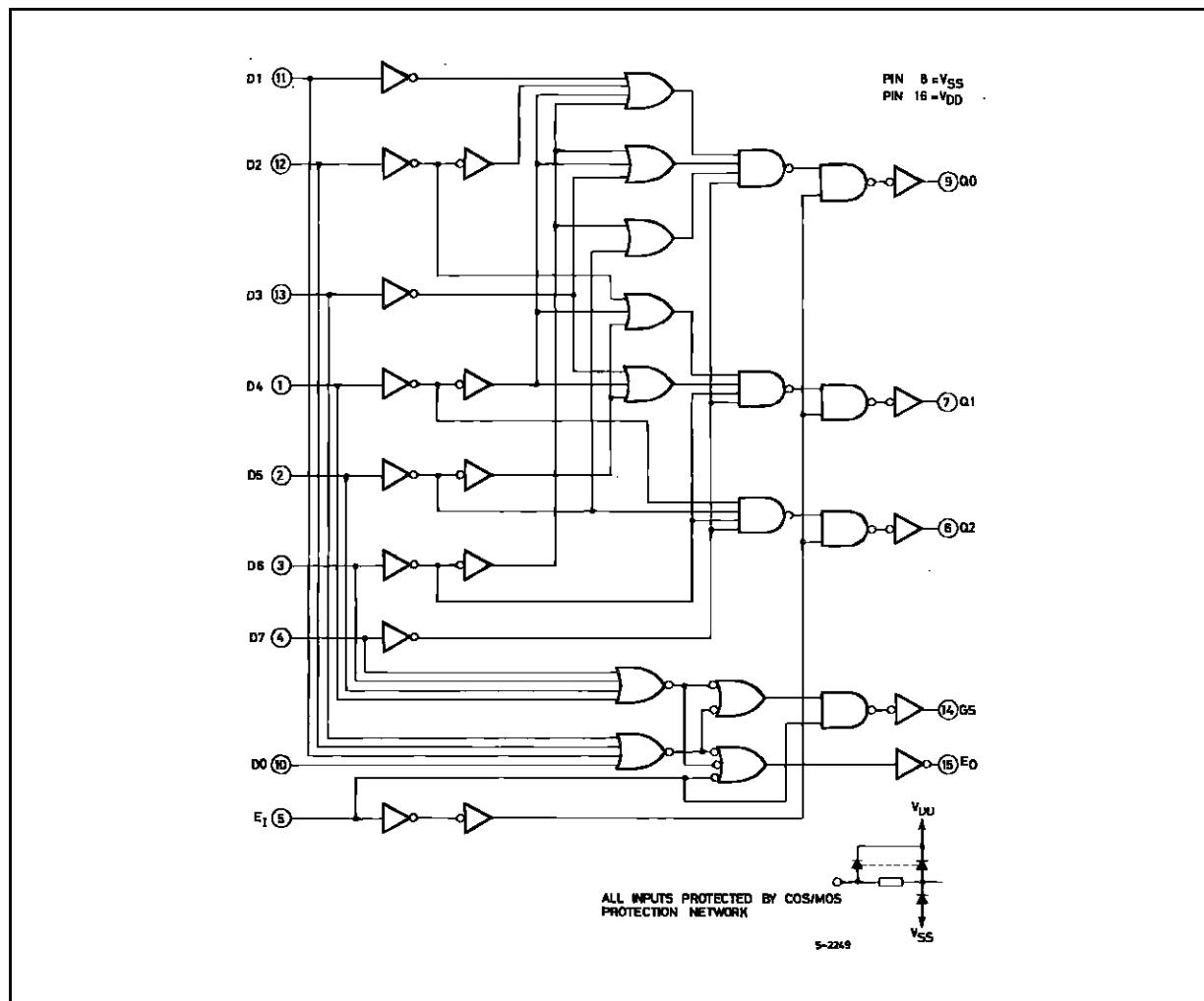
TRUTH TABLE

Input									Output				
E_I	D 7	D 6	D 5	D 4	D 3	D 2	D 1	D 0	GS	Q 2	Q 1	Q 0	E_O
0	X	X	X	X	X	X	X	X	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	0	1
1	1	X	X	X	X	X	X	X	1	1	1	0	0
1	0	1	X	X	X	X	X	X	1	1	1	1	0
1	0	0	1	X	X	X	X	X	1	1	0	0	0
1	0	0	0	1	X	X	X	X	1	1	0	1	0
1	0	0	0	0	1	X	X	X	1	0	1	1	0
1	0	0	0	0	0	1	X	X	1	0	1	0	0
1	0	0	0	0	0	0	1	X	1	0	0	1	0
1	0	0	0	0	0	0	0	1	1	0	0	0	0

X ≡ Don't Care   Logic 1 ≡ High   Logic 0 ≡ Low

SGS-THOMSON
MICROELECTRONICS

STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		V_I (V)	V_O (V)	$\|I_O\|$ (µA)	V_{DD} (V)	T_{Low}* Min.	T_{Low}* Max.	25°C Min.	25°C Typ.	25°C Max.	T_{High}* Min.	T_{High}* Max.	Unit
I_L	Quiescent Current		0/ 5			5		5		0.04	5		150	µA
		HCC Types	0/10			10		10		0.04	10		300	
			0/15			15		20		0.04	20		600	
			0/20			20		100		0.08	100		3000	
		HCF Types	0/ 5			5		20		0.04	20		150	
			0/10			10		40		0.04	40		300	
			0/15			15		80		0.04	80		600	
V_{OH}	Output High Voltage		0/ 5		< 1	5	4.95		4.95			4.95		V
			0/10		< 1	10	9.95		9.95			9.95		
			0/15		< 1	15	14.95		14.95			14.95		
V_{OL}	Output Low Voltage		5/0		< 1	5		0.05			0.05		0.05	V
			10/0		< 1	10		0.05			0.05		0.05	
			15/0		< 1	15		0.05			0.05		0.05	
V_{IH}	Input High Voltage			0.5/4.5	< 1	5	3.5		3.5			3.5		V
				1/9	< 1	10	7		7			7		
				1.5/13.5	< 1	15	11		11			11		
V_{IL}	Input Low Voltage			4.5/0.5	< 1	5		1.5			1.5		1.5	V
				9/1	< 1	10		3			3		3	
				13.5/1.5	< 1	15		4			4		4	
I_{OH}	Output Drive Current		0/ 5	2.5		5	$-$ 2		$-$ 1.6	$-$ 3.2		$-$ 1.15		mA
		HCC Types	0/ 5	4.6		5	$-$ 0.64		$-$ 0.51	$-$ 1		$-$ 0.36		
			0/10	9.5		10	$-$ 1.6		$-$ 1.3	$-$ 2.6		$-$ 0.9		
			0/15	13.5		15	$-$ 4.2		$-$ 3.4	$-$ 6.8		$-$ 2.4		
		HCF Types	0/ 5	2.5		5	$-$ 1.53		$-$ 1.36	$-$ 3.2		$-$ 1.1		
			0/ 5	4.6		5	$-$ 0.52		$-$ 0.44	$-$ 1		$-$ 0.36		
			0/10	9.5		10	$-$ 1.3		$-$ 1.1	$-$ 2.6		$-$ 0.9		
			0/15	13.5		15	$-$ 3.6		$-$ 3.0	$-$ 6.8		$-$ 2.4		
I_{OL}	Output Sink Current		0/ 5	0.4		5	0.64		0.51	1		0.36		mA
		HCC Types	0/10	0.5		10	1.6		1.3	2.6		0.9		
			0/15	1.5		15	4.2		3.4	6.8		2.4		
		HCF Types	0/ 5	0.4		5	0.52		0.44	1		0.36		
			0/10	0.5		10	1.3		1.1	2.6		0.9		
			0/15	1.5		15	3.6		3.0	6.8		2.4		
I_{IH}, I_{IL}	Input Leakage Current	HCC Types	0/18	Any Input		18		$\pm$ 0.1		$\pm 10^{-5}$	$\pm$ 0.1		$\pm$ 1	µA
		HCF Types	0/15			15		$\pm$ 0.3		$\pm 10^{-5}$	$\pm$ 0.3		$\pm$ 1	
C_I	Input Capacitance			Any Input						5	7.5			pF

* T_{Low} = $-$ 55°C for **HCC** device : $-$ 40°C for **HCF** device.
* T_{High} = + 125°C for **HCC** device : + 85°C for **HCF** device.
  The Noise Margin for both "1" and "0" level is : 1V min. with V_{DD} = 5V, 2V min. with V_{DD} = 10V, 2.5 V min. with V_{DD} = 15V.

SGS-THOMSON MICROELECTRONICS

DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25°C, C_L = 50pF, R_L = 200kΩ, typical temperature coefficient for all V_{DD} values is 0.3%/°C, all input rise and fall times = 20ns)

Symbol	Parameter	Test Conditions		Value			Unit
			V_{DD} (V)	Min.	Typ.	Max.	
t_{PLH}, t_{PHL}	Propagation Delay Time (E_I to E_O, E_I to GS)		5		110	220	ns
			10		55	110	
			15		45	85	
t_{PLH}, t_{PHL}	Propagation Delay Time (E_I to Qm, Dn to GS)		5		170	340	ns
			10		85	170	
			15		65	125	
t_{PLH}, t_{PHL}	Propagation Delay Time (Dn to Q_M)		5		220	440	ns
			10		110	220	
			15		85	160	
t_{TLH}, t_{THL}	Transition Time		5		100	200	ns
			10		50	100	
			15		40	80	

Minimum Output Low (sink) Current Characteristics.
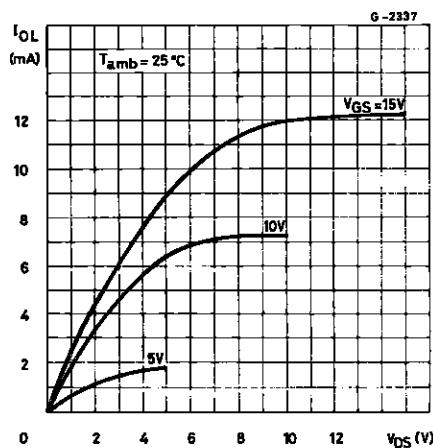
Typical Output High (source) Current Characteristics.

SGS-THOMSON
MICROELECTRONICS
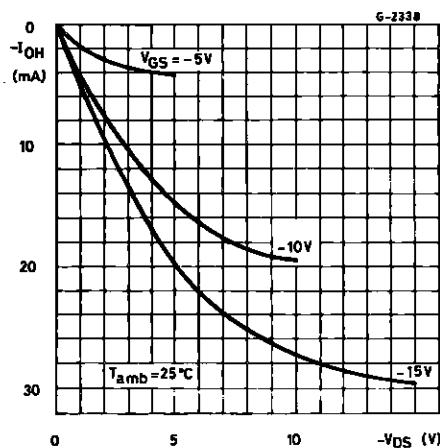
Minimum Output High (source) Current Characteristics.

Typical Output Low (sink) Current Characteristics.


Typical Propagation Delay (Dn to Qm) vs. Supply Voltage.
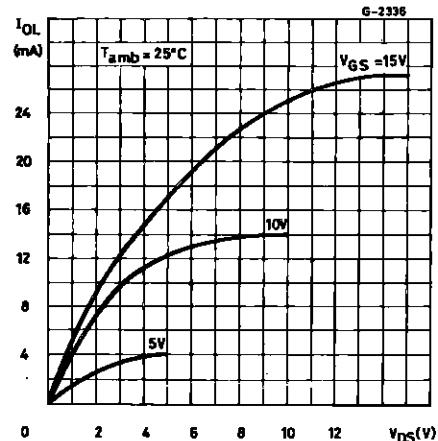
Typical Propagation Delay (E$_I$ to GS, E$_I$ to E$_O$) vs. Load Capacitance.

Typical Propagation Delay (Dn to Qm) vs. Load Capacitance.
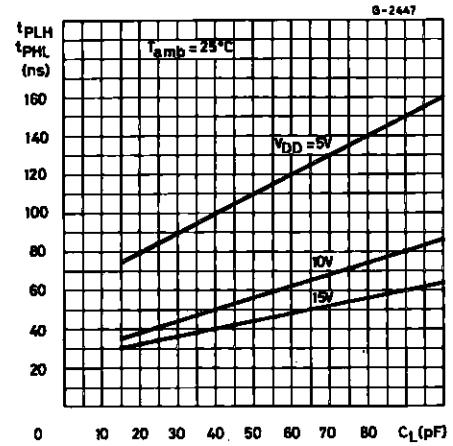
Typical Transition Time vs. Load Capacitance.

SGS-THOMSON
MICROELECTRONICS
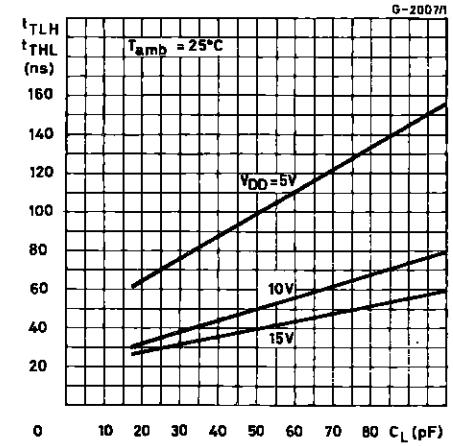
Typical Dynamic Power Dissipation vs. Frequency.
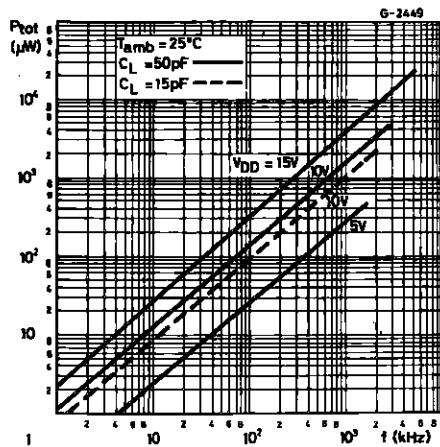
APPLICATIONS

16-LEVEL PRIORITY ENCODER
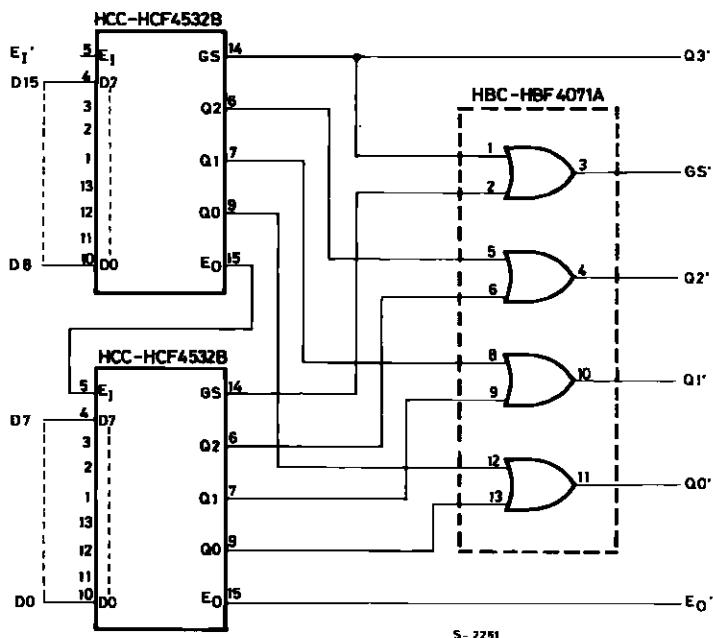
APPLICATIONS (continued)

0-TO-9 KEYBOARD ENCODER
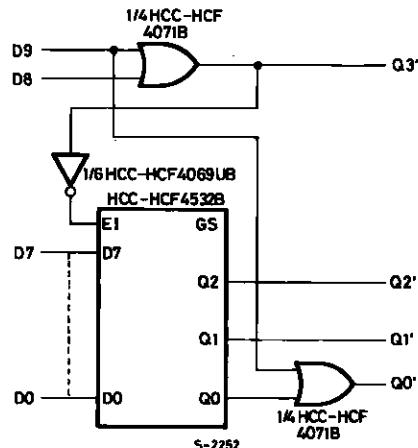
TRUTH TABLE

| Input										Output				
D9	D8	D7	D6	D5	D4	D3	D2	D1	D0	GS	Q3'	Q2'	Q1'	Q0
1	X	X	X	X	X	X	X	X	X	0	1	0	0	1
0	1	X	X	X	X	X	X	X	X	0	1	0	0	0
0	0	1	X	X	X	X	X	X	X	1	0	1	1	1
0	0	0	1	X	X	X	X	X	X	1	0	1	1	0
0	0	0	0	1	X	X	X	X	X	1	0	1	0	1
0	0	0	0	0	1	X	X	X	X	1	0	1	0	0
0	0	0	0	0	0	1	X	X	X	1	0	0	1	1
0	0	0	0	0	0	0	1	X	X	1	0	0	1	0
0	0	0	0	0	0	0	0	1	X	1	0	0	0	1
0	0	0	0	0	0	0	0	0	1	1	0	0	0	0

X = Don't Care   Logic 1 ≡ High   Logic 0 ≡ Low

## APPLICATIONS (continued)

DIGITAL TO ANALOG CONVERSION


S-2253
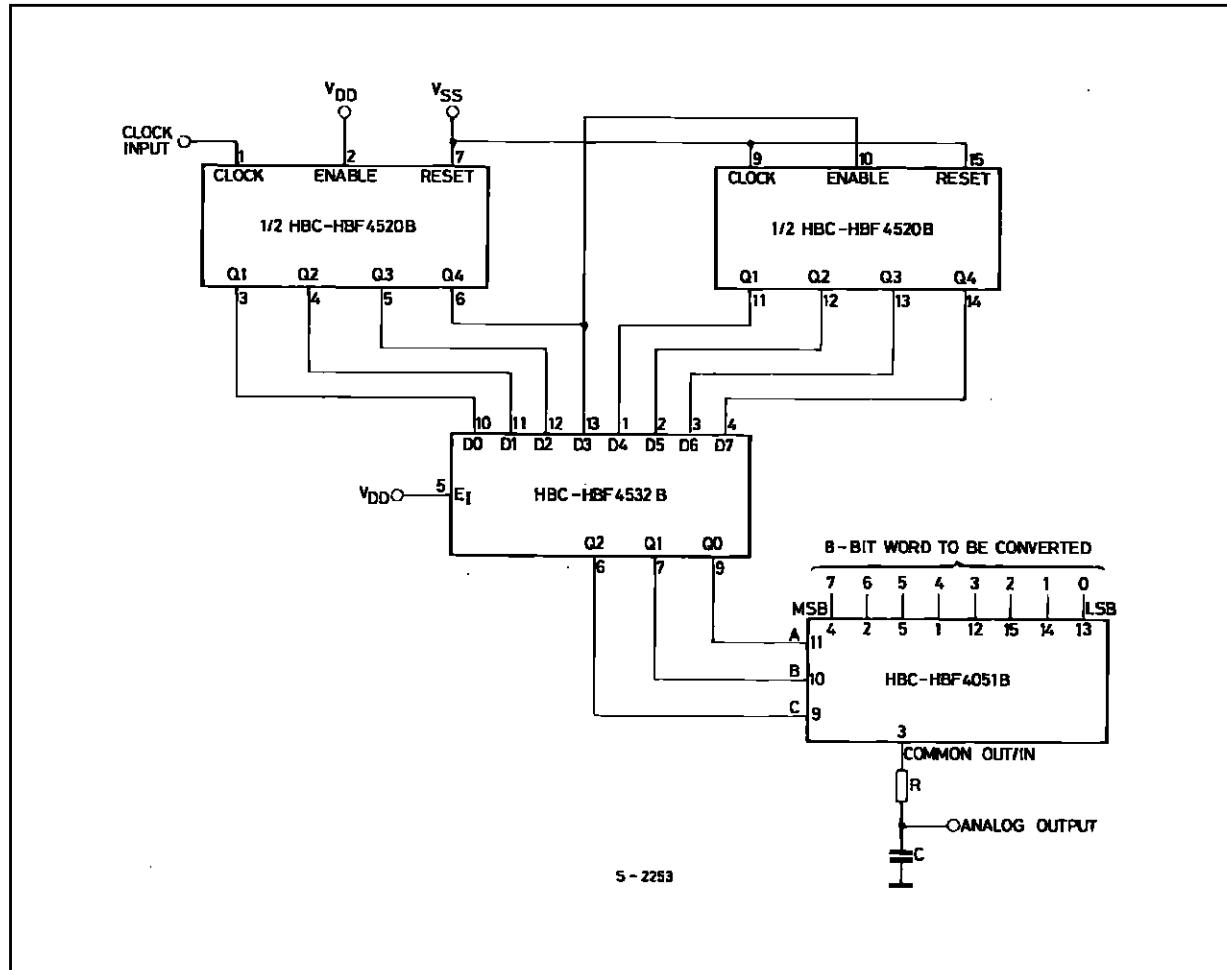
TEST CIRCUITS

Input Leakage Current.

S-1992/1

Noise Immunity.

NOTE:
TEST ANY ONE INPUT
WITH OTHER INPUTS
AT V_DD OR V_SS

S-1993/4

SGS-THOMSON
MICROELECTRONICS
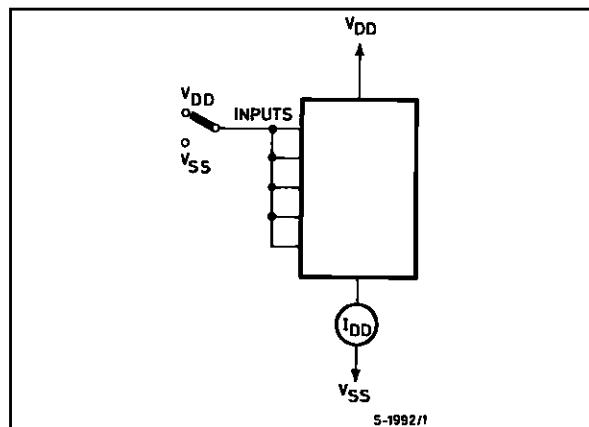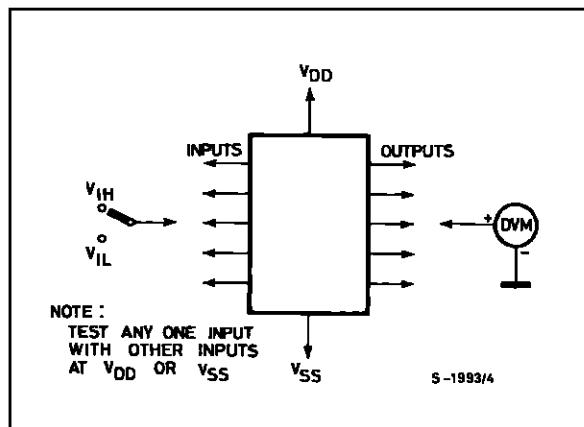
TEST CIRCUITS (continued)

Quiescent Device Current.

Dynamic Power Dissipation.

SGS-THOMSON
MICROELECTRONICS
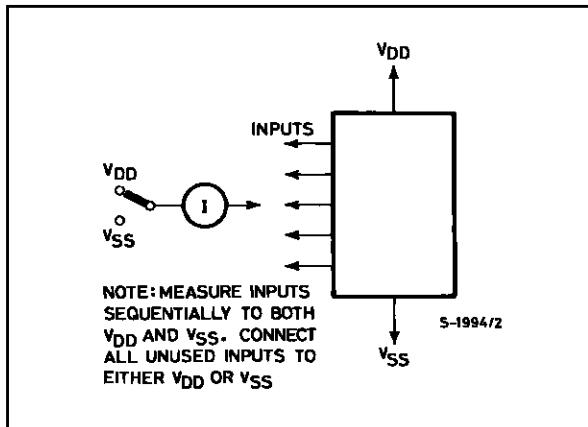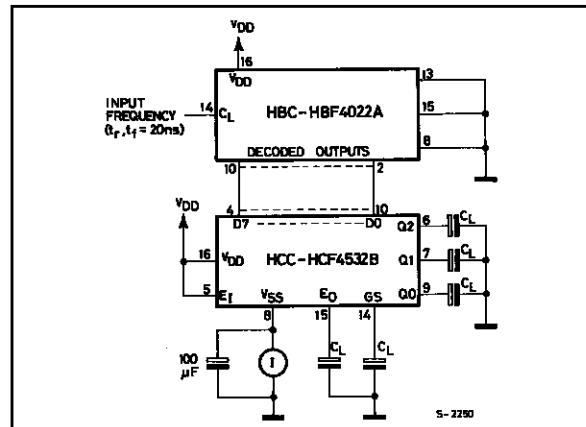
Plastic DIP16 (0.25) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050

P001C

SGS-THOMSON MICROELECTRONICS
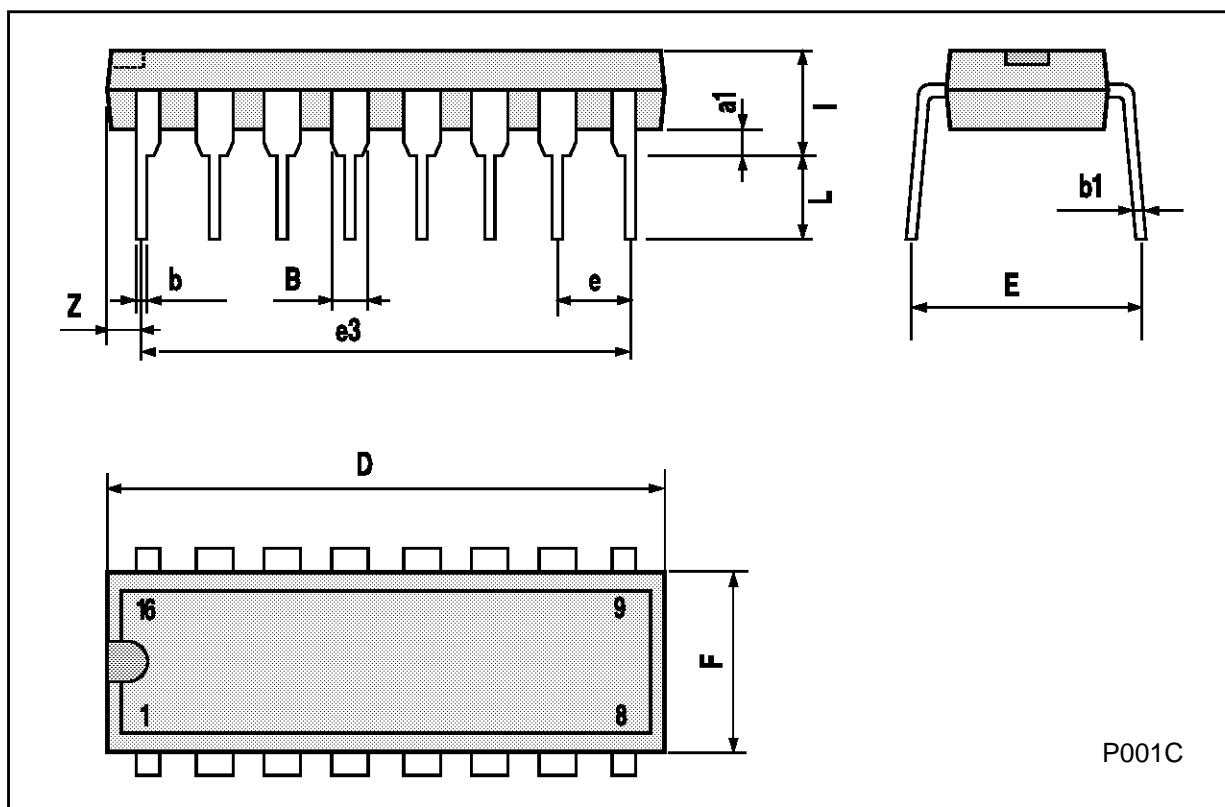
Ceramic DIP16/1 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		17.78			0.700	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200

P053D
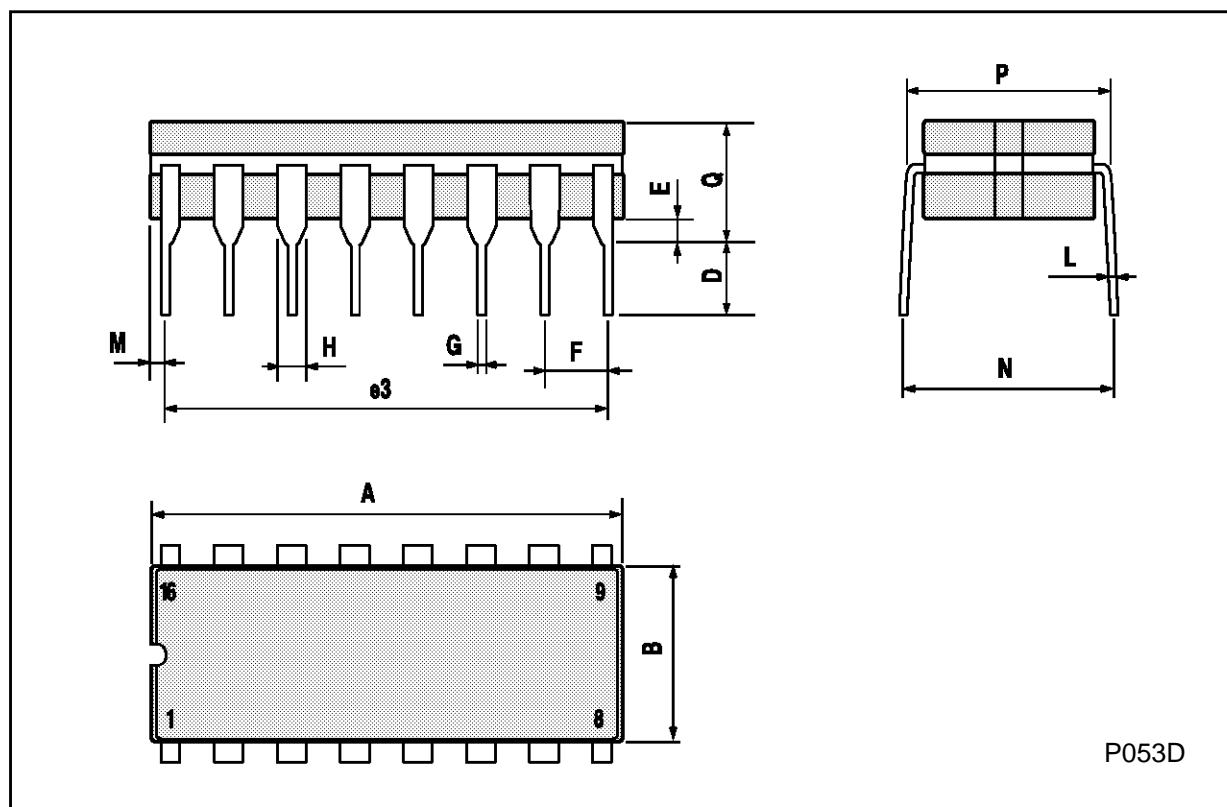
SO16 (Narrow) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.62			0.024
S	8° (max.)					

P013H

SGS-THOMSON MICROELECTRONICS
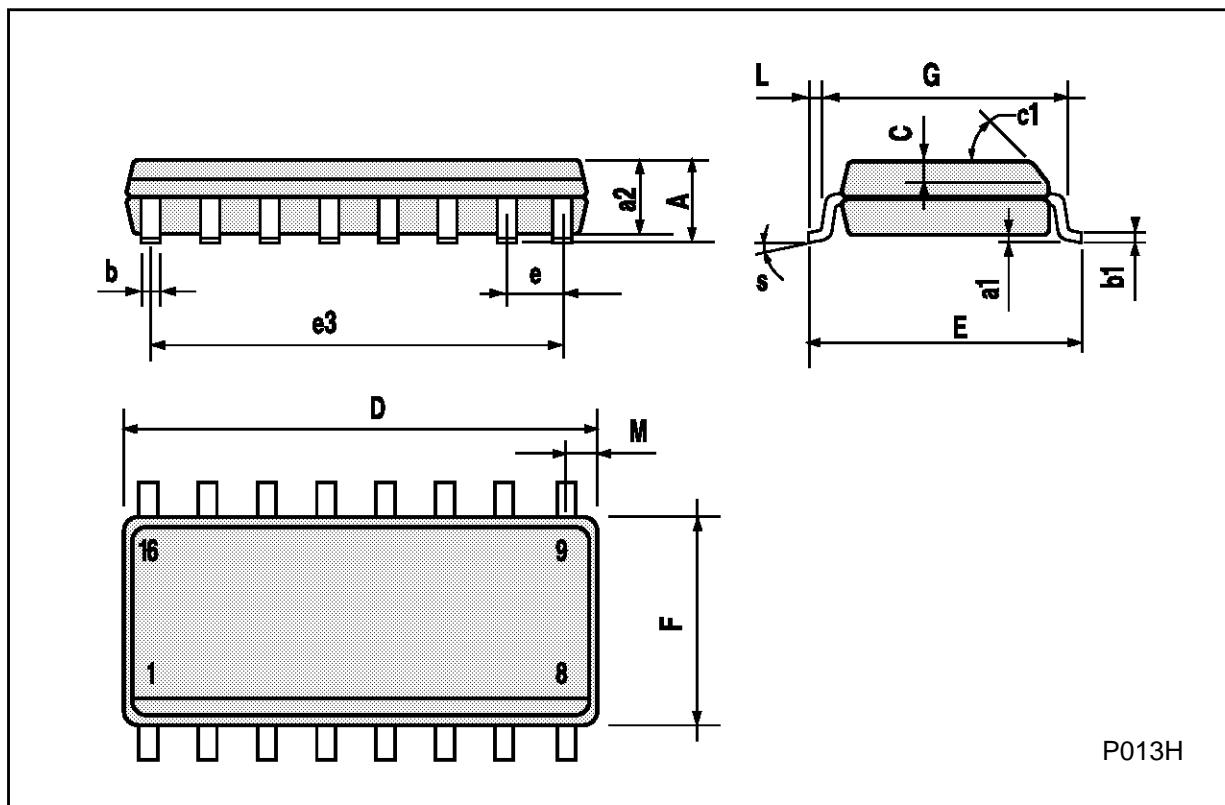
PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	

G (Seating Plane Coplanarity)

P027A

SGS-THOMSON
MICROELECTRONICS

SGS-THOMSON Microelectronics GROUP OF COMPANIES
Australia - Brazil - France - Germany - Hong Kong - Italy - Japan - Korea - Malaysia - Malta - Morocco - The Netherlands - Singapore - Spain - Sweden - Switzerland - Taiwan - Thailand - United Kingdom - U.S.A

SGS-THOMSON
MICROELECTRONICS