10 TO 4 LINE BCD PRIORITY ENCODER

- ENCODES 10 LINE TO 4 LINE BCD
- ACTIVE LOW INPUTS AND OUTPUTS
- STANDARDIZED, SYMMETRICAL OUTPUT CHARACTERIZATION
- 100 % TESTED FOR QUIESCENT CURRENT AT 20 V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- MAXIMUM INPUT CURREENT OF 1 μA AT 18V OVER FULL PACKAGE TEMPERATURE RANGE; 100 nA AT 18 V AND 25 $^{\circ}$C
- NOISE MARGIN (FULL PACKAGE TEMPERA-TURE RANGE): 1V AT V_{DD} = 5V, 2V AT V_{DD} = 10V, 2.5V AT V_{DD} = 15V

APPLICATIONS:
- KEYBOARD ENCODING
- 10 LINE TO BCD ENCODING
- RANGE SELECTION

EY
(Plastic Package)

F
(Ceramic Package)

M1
(Micro Package)

C1
(Chip Carrier)

ORDER CODES :

HCC40147BF	HCF40147BM1
HCF40147BEY	HCF40147BC1
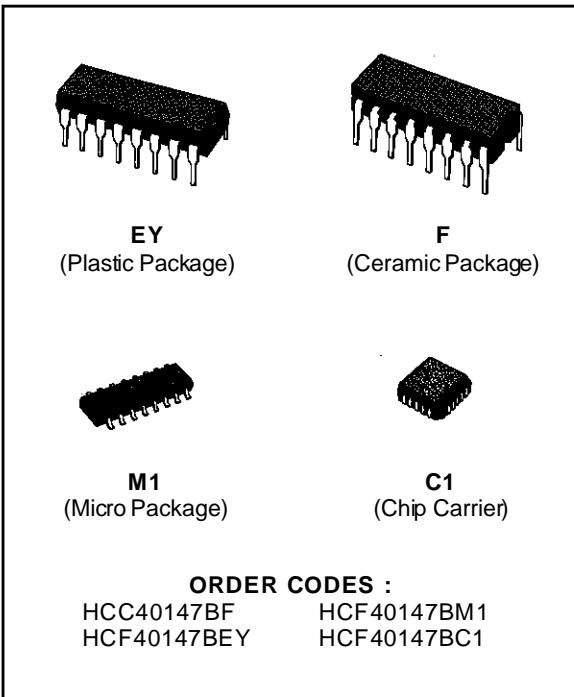
DESCRIPTION

The **HCC/HCF40147B** CMOS encoder features priority encoding of the inputs to ensure that only the highest order data line is encoded. Ten data input lines (0-9) are encoded to four line (8, 4, 2, 1) BCD. The highest priority line is line 9. All four output lines are logic 1 (VSS) when all input lines are logic 0. All inputs and outputs are buffered, and each output can drive one TTL Low Power Schottky load. The **HCC/HCFF40147** is functionally similar to the T54/T74LS147 if pin 15 is tied low.

The **HCC/HCF40147B** types are supplied in 16 lead plastic or ceramic and plastic micropackage.

PIN CONNECTIONS

4	1	16 V_{DD}
5	2	15 0
6	3	14 D
7	4	13 3
8	5	12 2
C	6	11 1
B	7	10 9
V_{SS}	8	9 A

PC10870
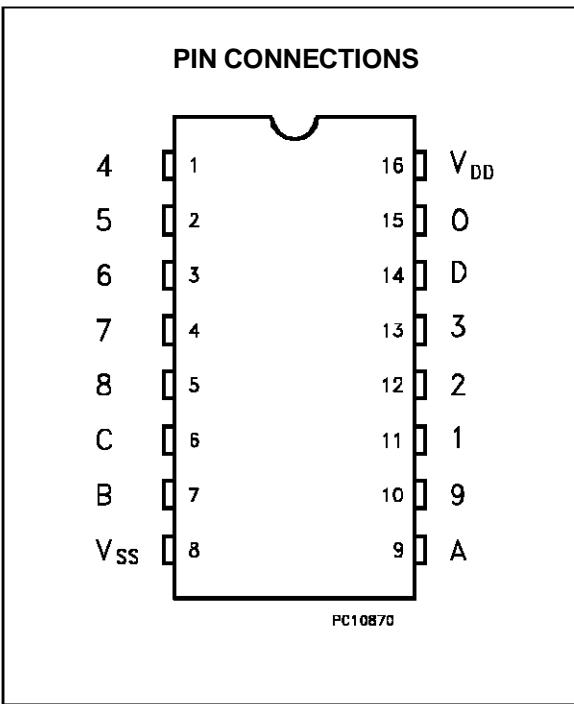
ABSOLUTE MAXIMUM RATING

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 Top = Full Package Temperature Range	200 100	mW mW
T_{op}	Operating Temperature: **HCC** Types **HCF** Types	-55 to +125 -40 to +85	^{o}C ^{o}C
T_{stg}	Storage Temperature	-65 to +150	^{o}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.

* All voltage values are referred to V_{SS} pin voltage.

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	^{o}C ^{o}C

TRUTH TABLE

INPUT										OUTPUTS			
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**D**	**C**	**B**	**A**
0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0
X	1	0	0	0	0	0	0	0	0	0	0	0	1
X	X	1	0	0	0	0	0	0	0	0	0	1	0
X	X	X	1	0	0	0	0	0	0	0	0	1	1
X	X	X	X	1	0	0	0	0	0	0	1	0	0
X	X	X	X	X	1	0	0	0	0	0	1	0	1
X	X	X	X	X	X	1	0	0	0	0	1	1	0
X	X	X	X	X	X	X	1	0	0	0	1	1	1
X	X	X	X	X	X	X	X	1	0	1	0	0	0
X	X	X	X	X	X	X	X	X	1	1	0	0	1

0 = High Level, 1 = Low Level, X = Don't Care

LOGIC DIAGRAM

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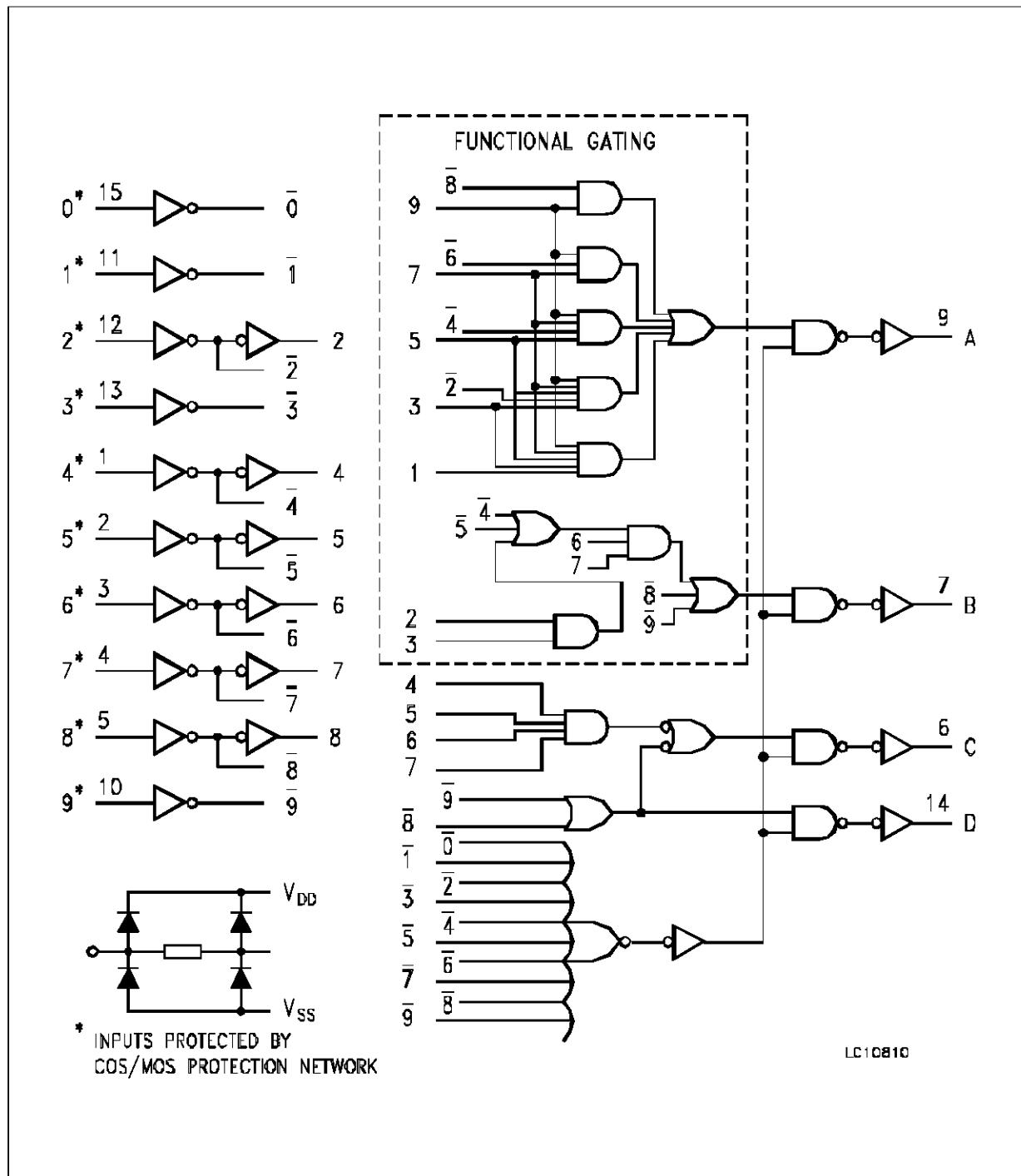
STATIC ELECTRICAL CHARACTERISTICS (over recommended operating conditions)

Symbol	Parameter		V_I (V)	V_O (V)	$|I_O|$ (µA)	V_{DD} (V)	T_{LOW} * Min.	Max.	25 °C Min.	Typ.	Max.	T_{HIGH} * Min.	Max.	Unit
I_L	Quiescent Current	HCC Types	0/5			5		1		0.02	1		30	µA
			0/10			10		2		0.02	2		60	
			0/15			15		4		0.02	4		120	
			0/20			20		20		0.04	20		600	
		HCF Types	0/5			5		4		0.02	4		30	
			0/10			10		8		0.02	8		60	
			0/15			15		16		0.02	16		120	
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	HCC Types	0/5	2.5		5	-2		-1.6	-3.2		-1.15		mA
			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	HCC Types	0/5	0.4		5	0.64		0.51	1		0.36		mA
			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		0/18	Any Input		18		±0.1		±10^{-5}	±0.1		±1	µA
			0/15			15		±0.3		±10^{-5}	±0.3		±1	µA
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} = 5 V, 2 V min. with V_{DD} = 10 V, 2.5 V min. with V_{DD} = 15 V

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DYNAMIC ELECTRICAL CHARACTERISTICS (T_{amb} = 25 $^\circ$C, C_L = 50 pF, R_L = 200 KΩ, typical temperature coefficent for all V_{DD} values is 03 %/$^\circ$C, all input rise and fall times= 20 ns)

Symbol	Parameter	Test Conditions	Value			Unit
		V_{DD} (V)	Min.	Typ.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time In Phase Output	5		450	900	ns
		10		200	400	
		15		150	300	
t_{PLH} t_{PHL}	Propagation Delay Time Out of Phase Output	5		425	850	ns
		10		175	350	
		15		125	250	
t_{TLH} t_{THL}	Transition Time	5		100	200	ns
		10		50	100	
		15		40	80	
C_I	Input Capacitance			5	7.5	pF

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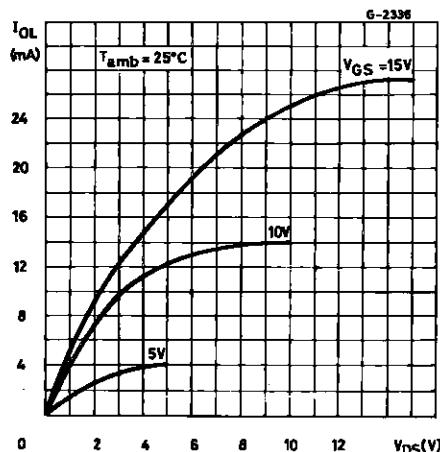
Minimum Output Low (source) Current Characteristics
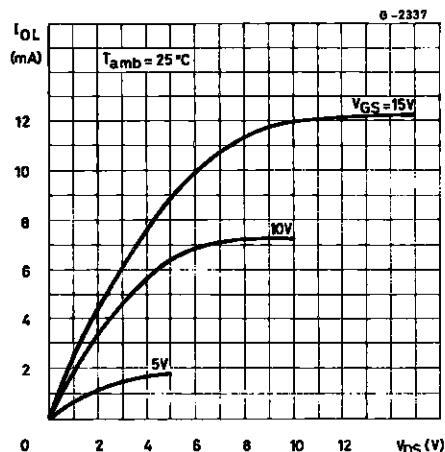
Typical Output High (source) Current Characteristics
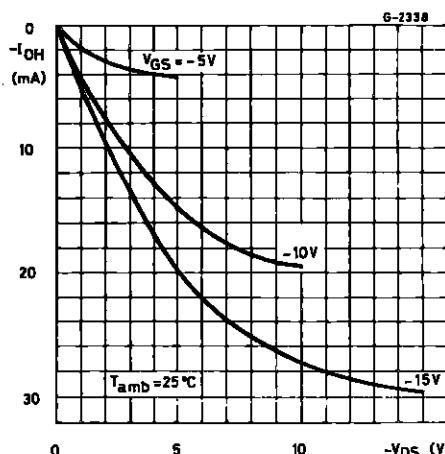
Minimum Output High (source) Current Characteristics

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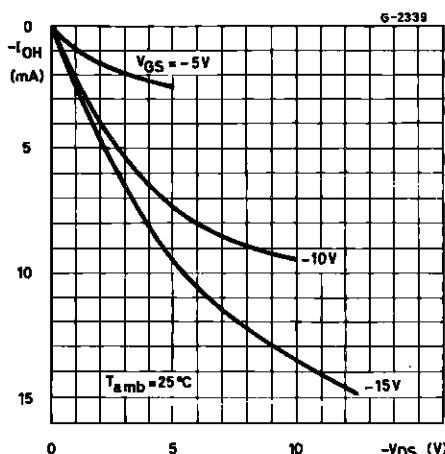
Propagation Delay Time vs Load Capacitance
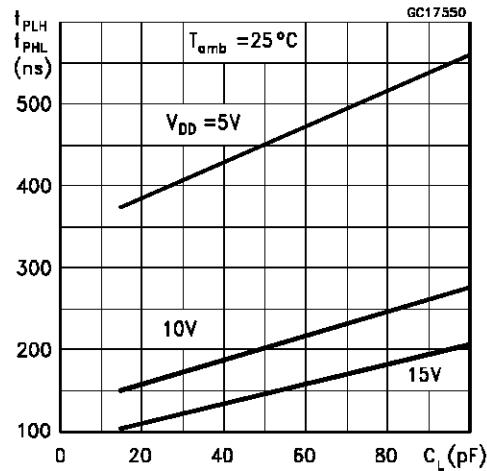
Tipical Transition Time vs Load Capacitance
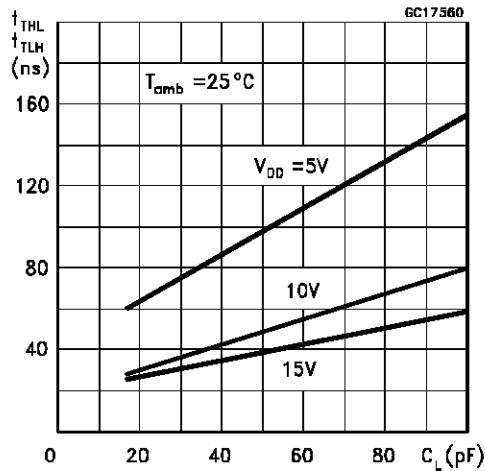
Typical Dynamic Power Dissipation vs Input Frequency

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**MICROELECTRONICS**
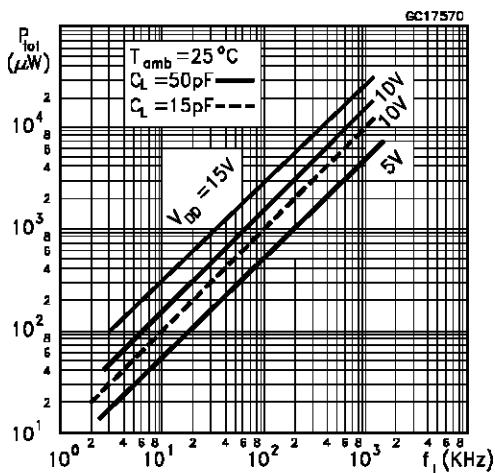
TEST CIRCUITS

Quiescent Device Current.
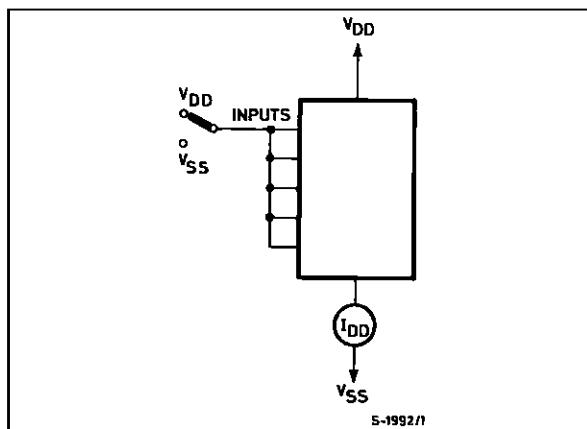
Noise Immunity.
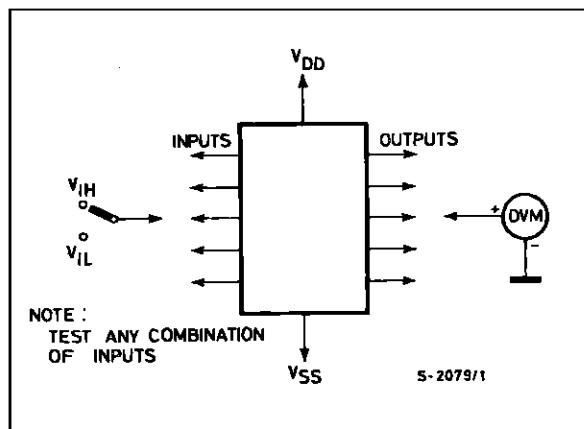
Input Leakage Current.
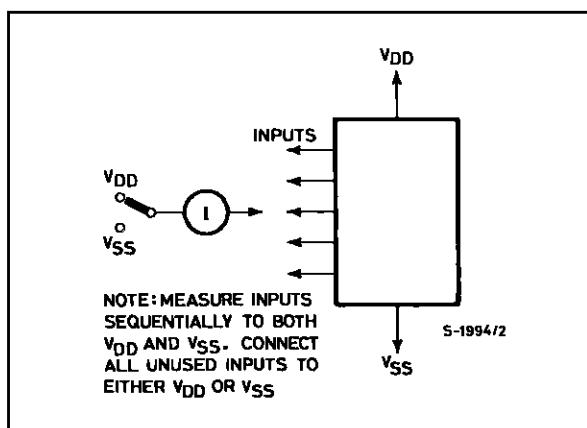

Dynamic Power DIssipation Test Circuit

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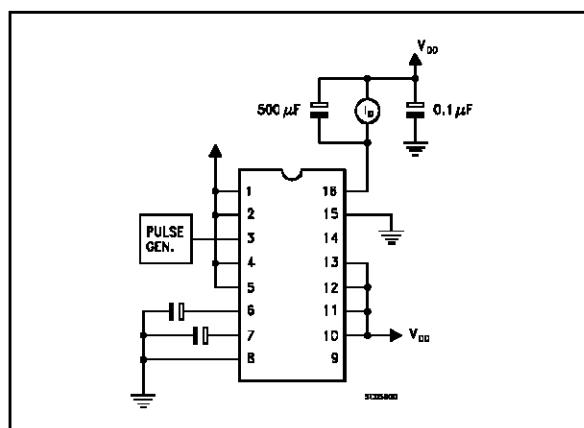
Plastic DIP16 (0.25) MECHANICAL DATA

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

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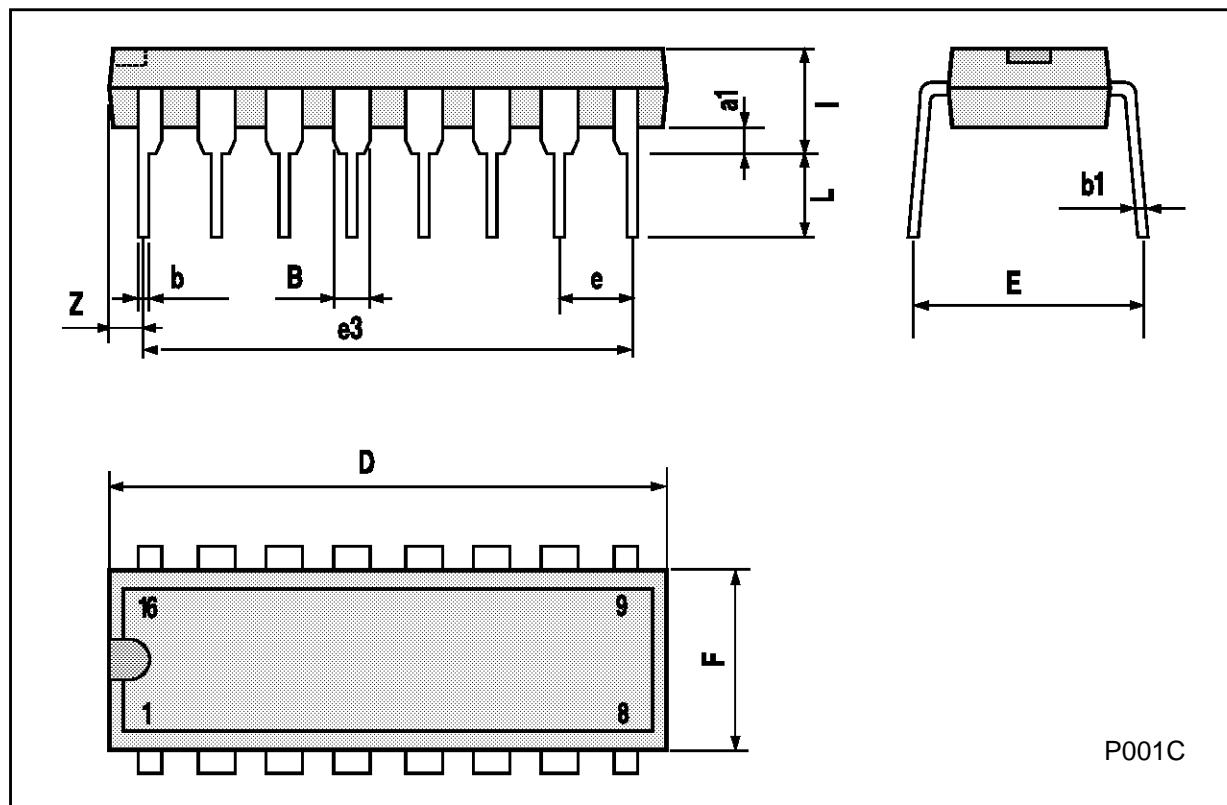
Ceramic DIP16/1 MECHANICAL DATA

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

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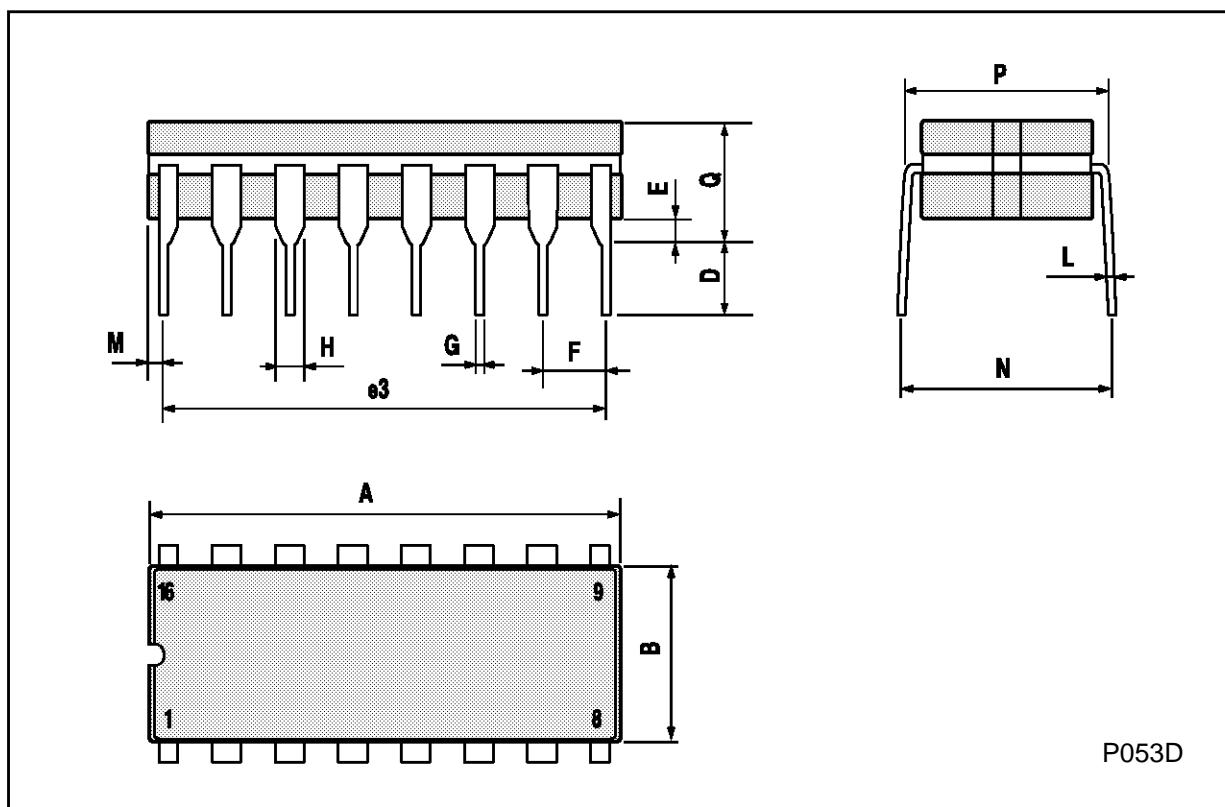
SO16 (Narrow) MECHANICAL DATA

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

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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	

P027A

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