SGS-THOMSON MICROELECTRONICS

M54HC155
M74HC155

# DUAL 2 TO 4 LINE DECODER 3 TO 8 LINE DECODER

- HIGH SPEED
  t_{PD} = 12 ns (TYP.) AT V_{CC} = 5 V
- LOW POWER DISSIPATION
  I_{CC} = 4 µA (MAX.) AT T_A = 25 °C
- HIGH NOISE IMMUNITY
  V_{NIH} = V_{NIL} = 28 % V_{CC} (MIN.)
- OUTPUT DRIVE CAPABILITY
  10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
  $|I_{OH}|$ = I_{OL} = 4 mA (MIN.)
- BALANCED PROPAGATION DELAYS
  t_{PLH} = t_{PHL}
- WIDE OPERATING VOLTAGE RANGE
  V_{CC} (OPR) = 2 V TO 6 V
- PIN AND FUNCTION COMPATIBLE
  WITH 54/74LS155

B1R
(Plastic Package)

F1R
(Ceramic Package)

M1R
(Micro Package)

C1R
(Chip Carrier)

ORDER CODES :
M54HC155F1R   M74HC155M1R
M74HC155B1R   M74HC155C1R
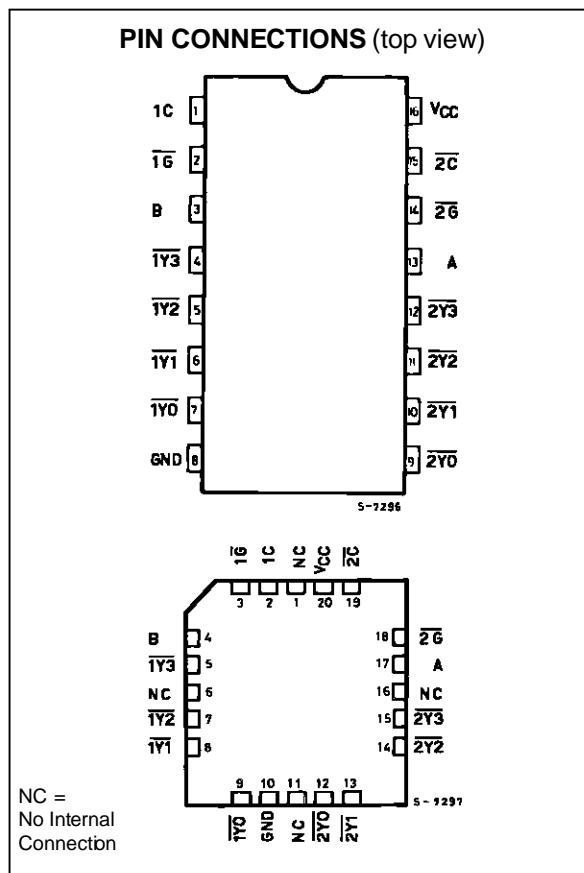
DESCRIPTION

The M54/74HC155 is a high speed CMOS DUAL 2-TO-4 LINE DECODER fabricated in silicon gate C^{2}MOS technology.

It has the same high speed performance of LSTTL combined with true CMOS low power consumption. It features dual 1-TO-4 line demultiplexers with individual strobe inputs (1G and 2G), individual data inputs (1C and $\overline{2C}$) and common binary address inputs (A and B).
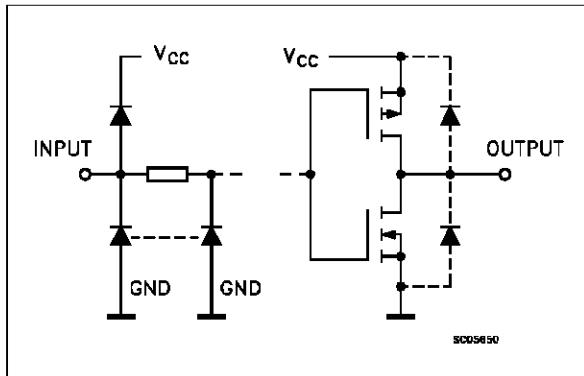
When both decoders are enabled by the strobes, the inverted output of 1C data and non-inverted output of $\overline{2C}$ data will be brought to the select output pins of each sections. A 1-TO-8 line demultiplexer can also be easily built up by providing a data signal to both 1C and $\overline{2C}$ inputs ; the output order from the msb is 1Y3, 1Y2, 1Y1, 1Y0, 2Y3, 2Y2, 2Y1, 2Y0. This device can be used as a 2-to-4 line decoder or a 3-to-8 line decoder when 1C is held high and $\overline{2C}$ is held low.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTIONS (top view)

Pin	Signal		Pin	Signal
1	1C		16	V_{CC}
2	$\overline{1G}$		15	$\overline{2C}$
3	B		14	$\overline{2G}$
4	$\overline{1Y3}$		13	A
5	$\overline{1Y2}$		12	$\overline{2Y3}$
6	$\overline{1Y1}$		11	$\overline{2Y2}$
7	$\overline{1Y0}$		10	$\overline{2Y1}$
8	GND		9	$\overline{2Y0}$

S-7296

NC =
No Internal
Connection

S-7297
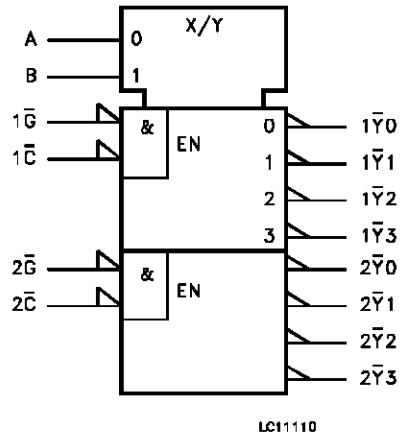
INPUT AND OUTPUT EQUIVALENT CIRCUIT

PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 15	1C, $\overline{2C}$	Data Inputs
2, 14	$\overline{1G}$, $\overline{2G}$	Strobe Inputs
3, 13	B, A	Common Data Inputs
7, 6, 5, 4	$\overline{1Y0}$ to $\overline{1Y3}$	Outputs
9, 10, 11, 12	$\overline{2Y0}$ to $\overline{2Y3}$	Outputs
8	GND	Ground (0V)
16	V_{CC}	Positive Supply Voltage

IEC LOGIC SYMBOL
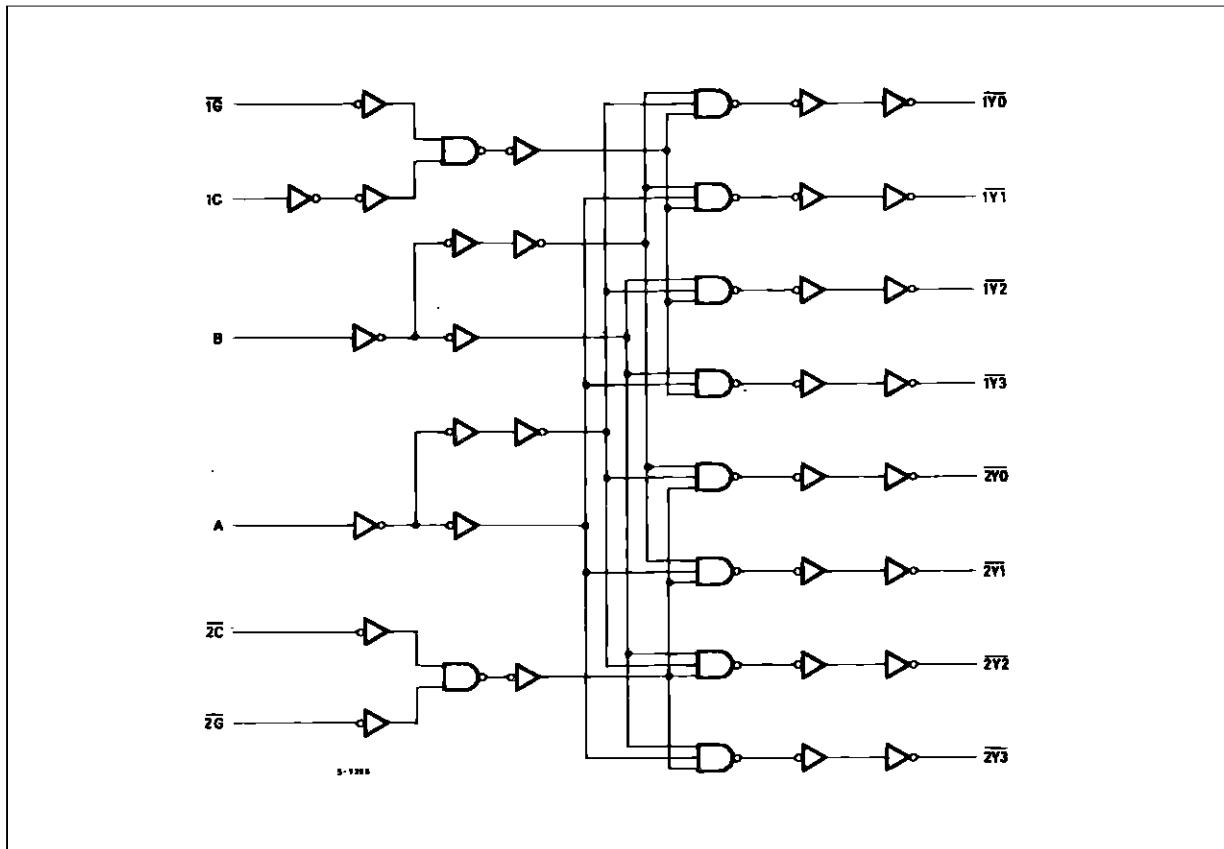
TRUTH TABLE

INPUTS				OUTPUTS			
B	A	$\overline{1G}$	1C	$\overline{1Y0}$	$\overline{1Y1}$	$\overline{1Y2}$	$\overline{1Y3}$
X	X	H	X	H	H	H	H
L	L	L	H	L	H	H	H
L	H	L	H	H	L	H	H
H	L	L	H	H	H	L	H
H	H	L	H	H	H	H	L
X	X	X	L	H	H	H	H

TRUTH TABLE

INPUTS				OUTPUTS			
B	A	$\overline{2G}$	$\overline{2C}$	$\overline{2Y0}$	$\overline{2Y1}$	$\overline{2Y2}$	$\overline{2Y3}$
X	X	H	X	H	H	H	H
L	L	L	L	L	H	H	H
L	H	L	L	H	L	H	H
H	L	L	L	H	H	L	H
H	H	L	L	H	H	H	L
X	X	X	H	H	H	H	H

LOGIC CIRCUIT

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7	V
V_I	DC Input Voltage	-0.5 to V_{CC} + 0.5	V
V_O	DC Output Voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	$\pm$ 20	mA
I_{OK}	DC Output Diode Current	$\pm$ 20	mA
I_O	DC Output Source Sink Current Per Output Pin	$\pm$ 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	$\pm$ 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	-65 to +150	^{o}C
T_L	Lead Temperature (10 sec)	300	^{o}C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.
(*) 500 mW: $\cong$ 65 ^{o}C derate to 300 mW by 10mW/^{o}C: 65 ^{o}C to 85 ^{o}C

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RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage		2 to 6	V
V_I	Input Voltage		0 to V_{CC}	V
V_O	Output Voltage		0 to V_{CC}	V
T_{op}	Operating Temperature: **M54HC** Series **M74HC** Series		-55 to +125 -40 to +85	^oC ^oC
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2 V	0 to 1000	ns
		V_{CC} = 4.5 V	0 to 500	
		V_{CC} = 6 V	0 to 400	

DC SPECIFICATIONS
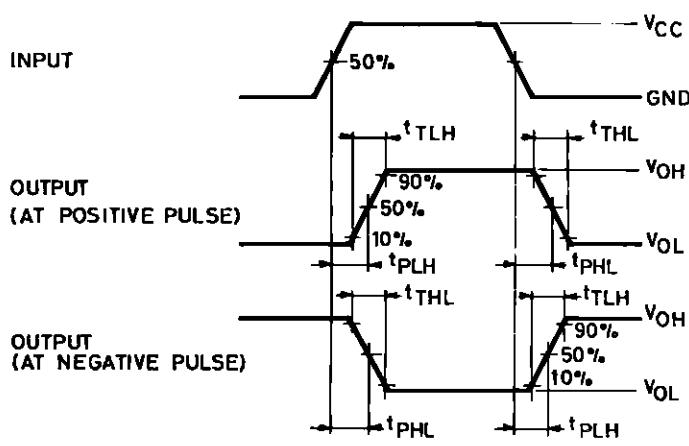
Symbol	Parameter	Test Conditions			Value							Unit
		V_{CC} (V)			T_A = 25 ^oC 54HC and 74HC			-40 to 85 ^oC 74HC		-55 to 125 ^oC 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	2.0			1.5			1.5		1.5		V
		4.5			3.15			3.15		3.15		
		6.0			4.2			4.2		4.2		
V_{IL}	Low Level Input Voltage	2.0					0.5		0.5		0.5	V
		4.5					1.35		1.35		1.35	
		6.0					1.8		1.8		1.8	
V_{OH}	High Level Output Voltage	2.0	V_I = V_{IH} or V_{IL}	I_O=-20 μA	1.9	2.0		1.9		1.9		V
		4.5			4.4	4.5		4.4		4.4		
		6.0			5.9	6.0		5.9		5.9		
		4.5		I_O=-4.0 mA	4.18	4.31		4.13		4.10		
		6.0		I_O=-5.2 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage	2.0	V_I = V_{IH} or V_{IL}	I_O= 20 μA		0.0	0.1		0.1		0.1	V
		4.5				0.0	0.1		0.1		0.1	
		6.0				0.0	0.1		0.1		0.1	
		4.5		I_O= 4.0 mA		0.17	0.26		0.33		0.40	
		6.0		I_O= 5.2 mA		0.18	0.26		0.33		0.40	
I_I	Input Leakage Current	6.0	V_I = V_{CC} or GND				±0.1		±1		±1	μA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND				4		40		80	μA

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AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input t_r = t_f = 6 ns)

Symbol	Parameter	Test Conditions		Value							Unit
		V_{CC} (V)		$T_A = 25\ ^oC$ 54HC and 74HC			-40 to 85 ^oC 74HC		-55 to 125 ^oC 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t_{PLH} t_{PHL}	Propagation Delay Time	2.0			45	130		165		195	ns
		4.5			15	26		33		39	
		6.0			13	22		28		33	
C_{IN}	Input Capacitance				5	10		10		10	pF
C_{PD} (*)	Power Dissipation Capacitance				53						pF
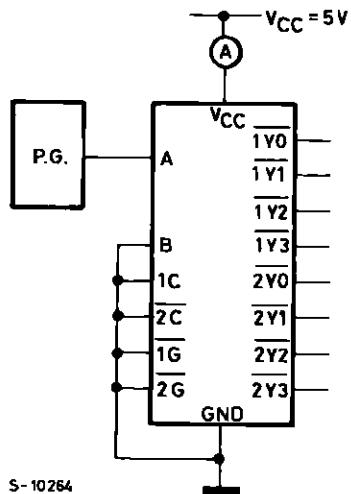
(*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operting current can be obtained by the following equation. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}$

## SWITCHING CHARACTERISTICS TEST WAVEFORM

S-10263

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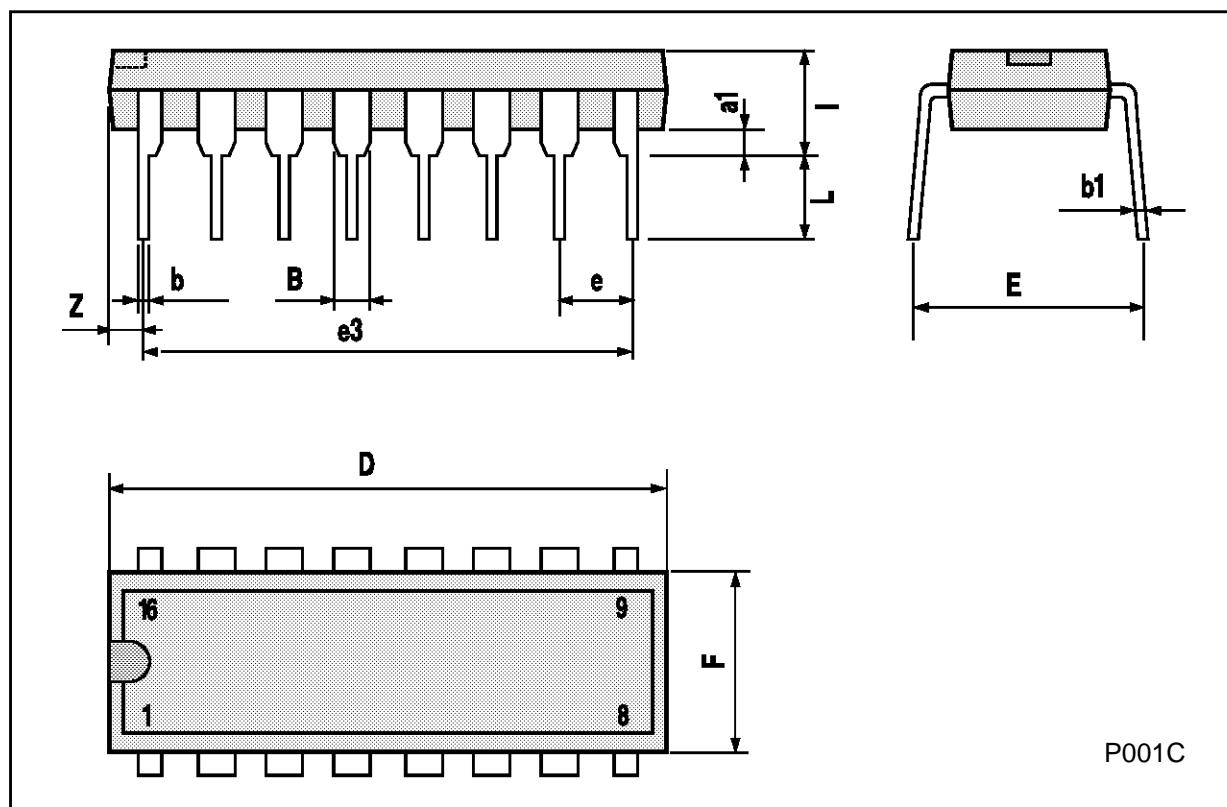
TEST WAVEFORM I$_{CC}$ (Opr.)

S-10264

INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST.

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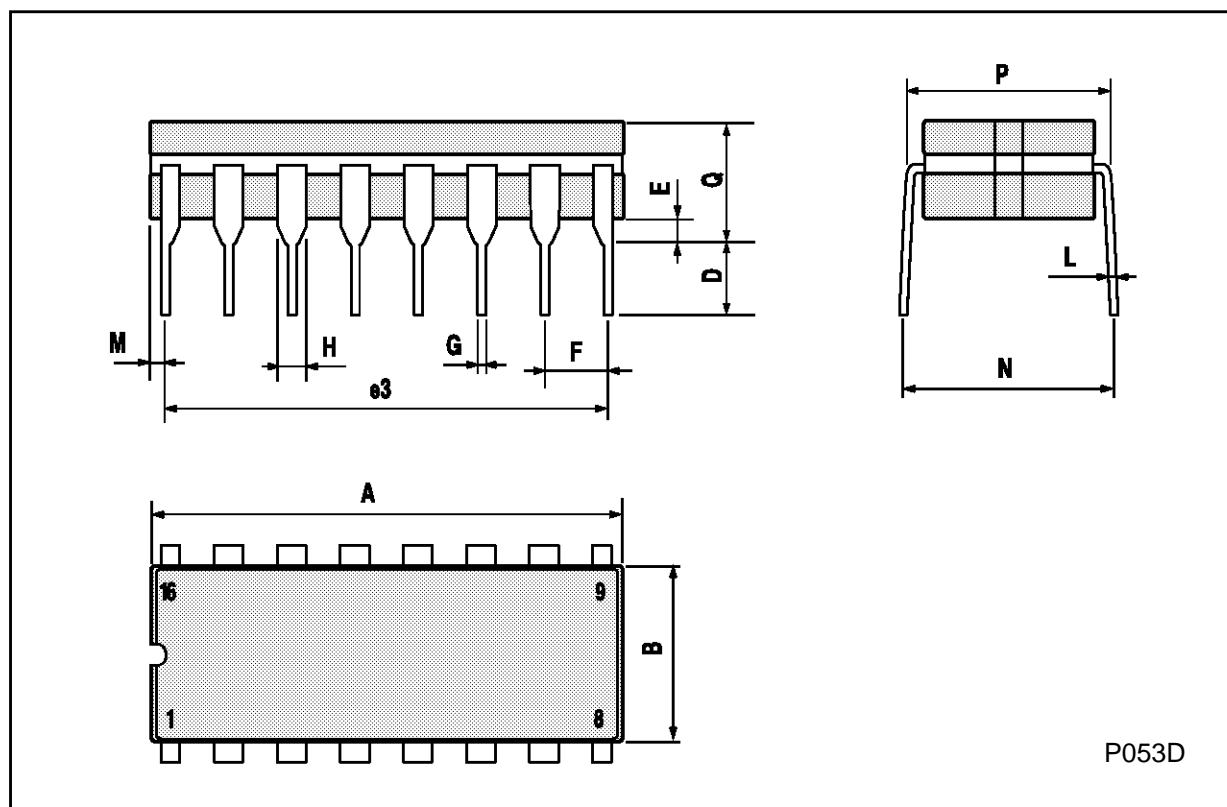
Plastic DIP16 (0.25) MECHANICAL DATA

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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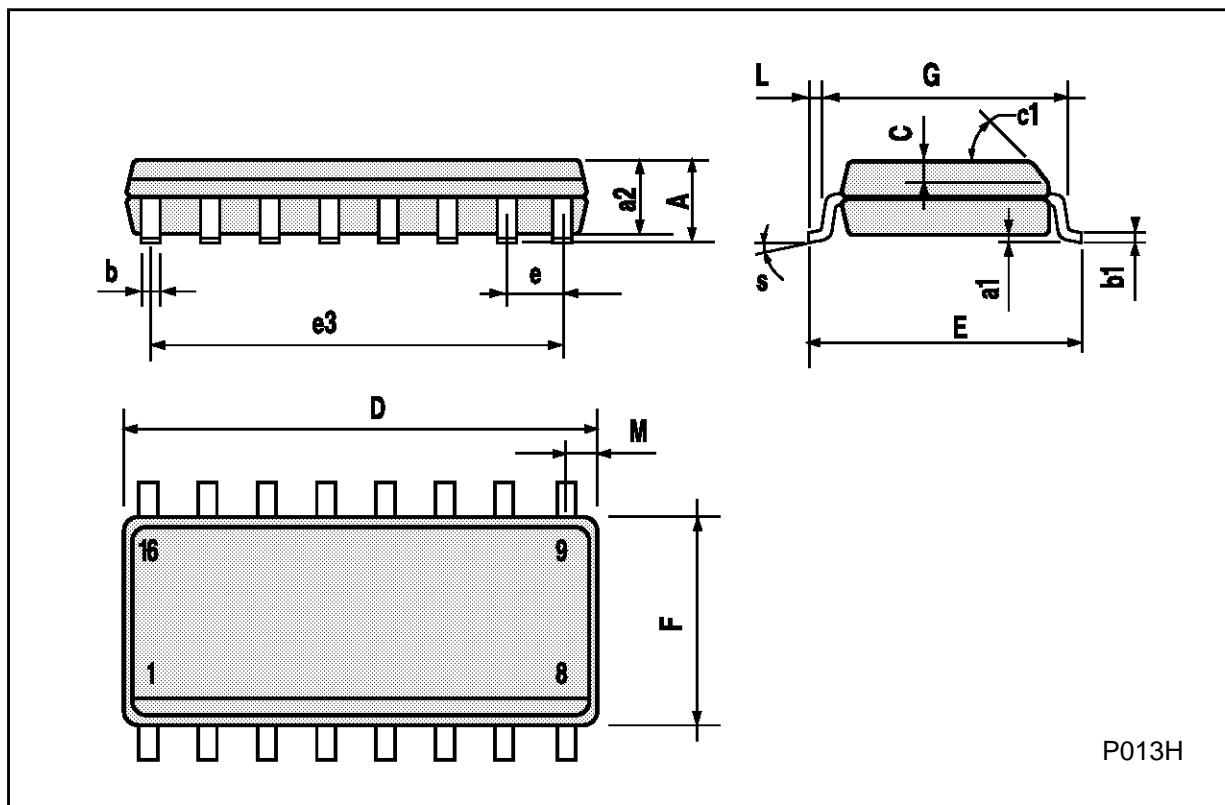
Ceramic DIP16/1 MECHANICAL DATA

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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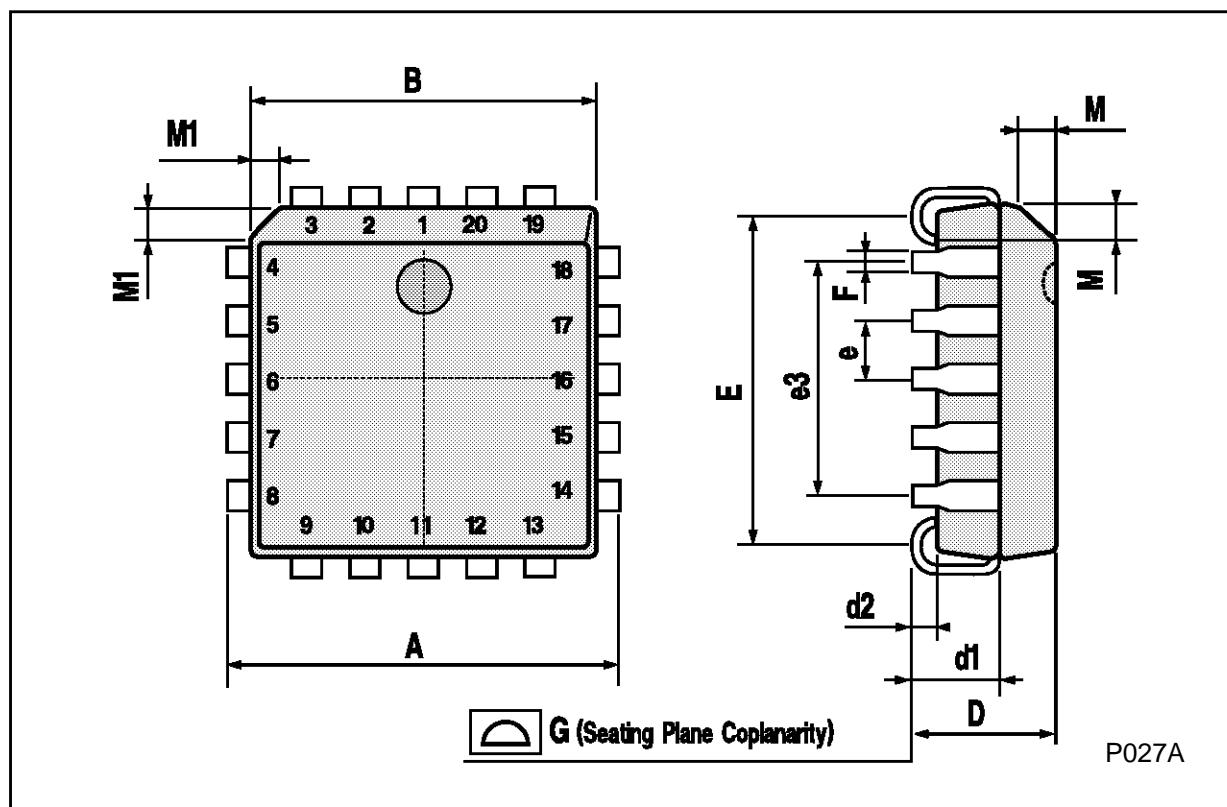
SO16 (Narrow) MECHANICAL DATA

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	

G (Seating Plane Coplanarity)

P027A

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