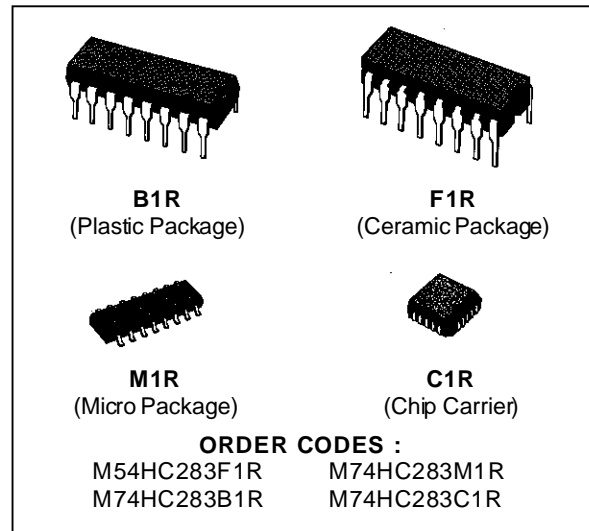


4 BIT BINARY FULL ADDER

- HIGH SPEED
 $t_{PD} = 17 \text{ ns (TYP.) AT } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION
 $I_{CC} = 4 \mu\text{A (MAX.) AT } 25^\circ\text{C}$
- HIGH NOISE IMMUNITY
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- OUTPUT DRIVE CAPABILITY
 10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
 $|I_{OH}| = I_{OL} = 4 \text{ mA (MIN.)}$
- BALANCED PROPAGATION DELAYS
 $t_{PLH} = t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- FULL-CARRY LOOK-AHEAD ACROSS THE FOUR BITS
- PARTIAL LOOK-AHEAD WITH THE ECONOMY OF RIPPLY CARRY
- PIN AND FUNCTION COMPATIBLE WITH 54/74LS283

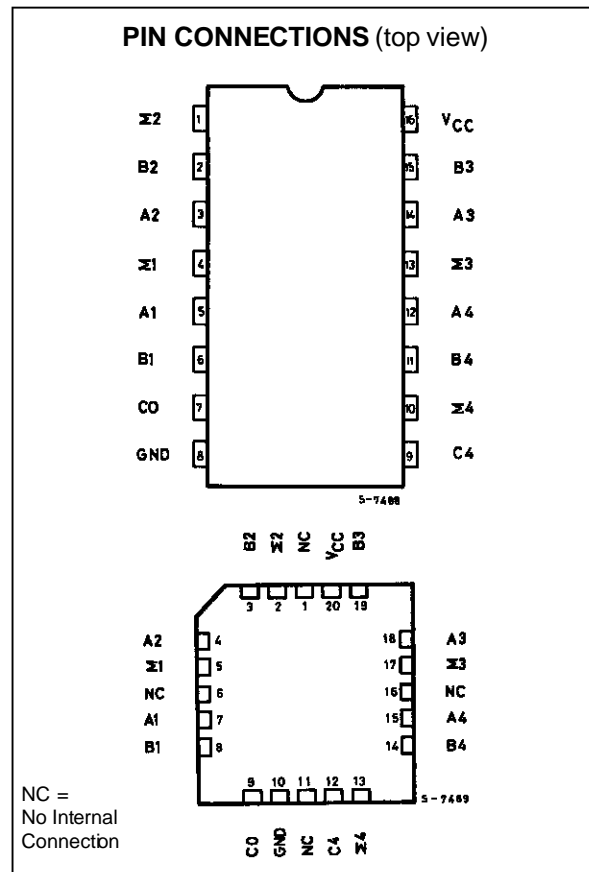


DESCRIPTION

The M54/74HC283 is a high speed CMOS 4-BIT BINARY FULL ADDER fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

Sum (Σ) outputs are provided for each bit and a resultant carry (C4) is obtained from the fourth bit. This adder features full internal look ahead across all four bits. A 4 x n binary adder is easily built up by cascading without any additional logic.

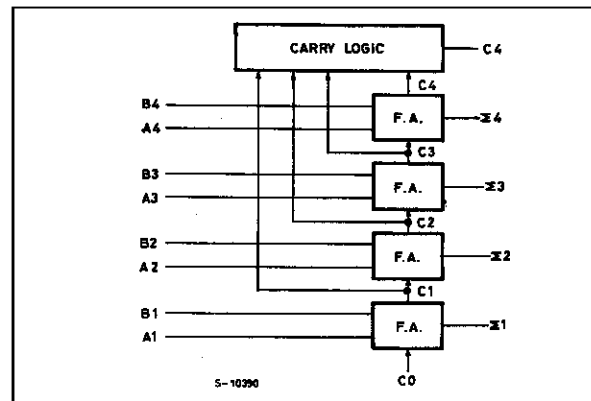
All inputs are equipped with protection circuits against static discharge and transient excess voltage.



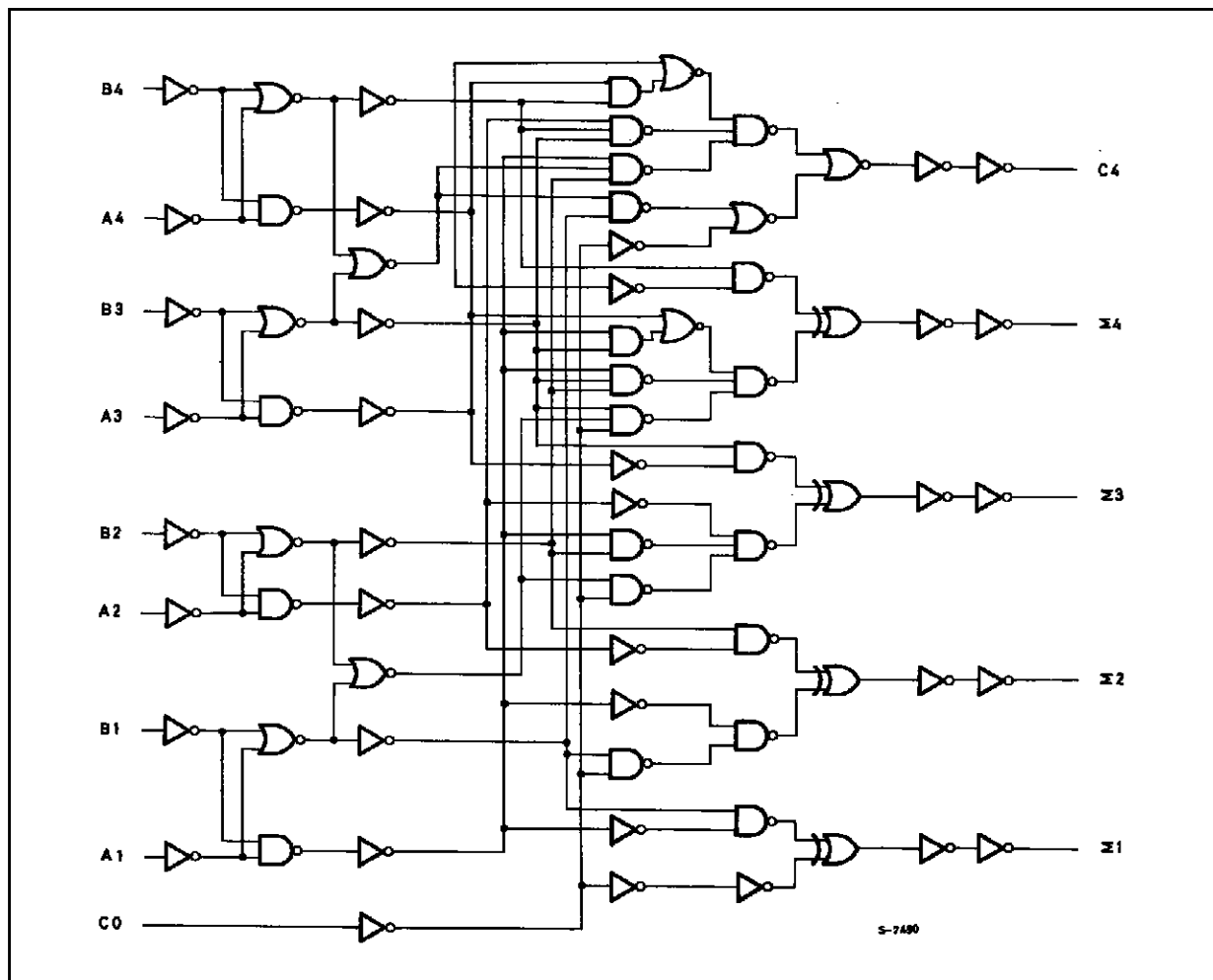
TRUTH TABLE (1 bit)

INPUTS			OUTPUTS	
B _n	A _n	C _{n-1}	Σ _n	C _n
L	L	L	L	L
L	L	H	H	L
L	H	L	H	L
L	H	H	L	H
H	L	L	H	L
H	L	H	L	H
H	H	L	L	H
H	H	H	H	H

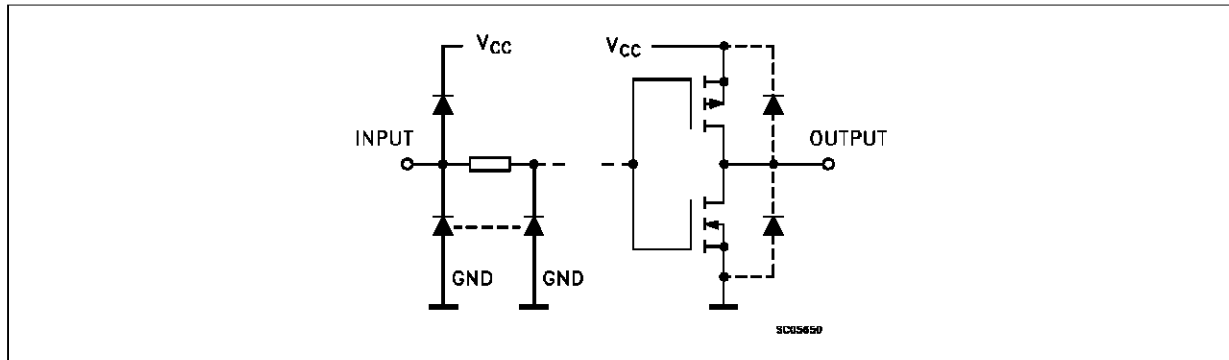
BLOCK DIAGRAM



LOGIC DIAGRAM



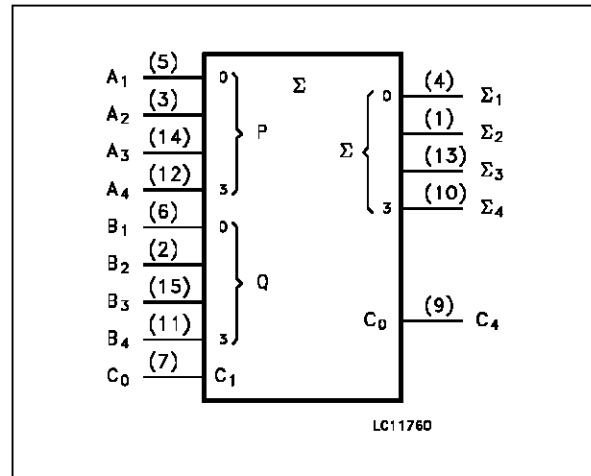
INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
4, 1, 13, 10	$\Sigma 1$ to $\Sigma 4$	Sum Outputs
5, 3, 14, 12	A1 to A4	A Operand Inputs
6, 2, 15, 11	B1 to B4	B Operand Inputs
7	C0	Carry Input
9	C4	Carry Output
8	GND	Ground (0V)
16	Vcc	Positive Supply Voltage

IEC LOGIC SYMBOL



ABSOLUTE MAXIMUM RATING

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	± 20	mA
I _{OK}	DC Output Diode Current	± 20	mA
I _O	DC Output Source Sink Current Per Output Pin	± 25	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current	± 50	mA
P _D	Power Dissipation	500 (*)	mW
T _{stg}	Storage Temperature	-65 to +150	°C
T _L	Lead Temperature (10 sec)	300	°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: ≅ 65 °C derate to 300 mW by 10mW/°C: 65 °C to 85 °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
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature: M54HC Series M74HC Series	-55 to +125 -40 to +85	°C °C
t_r, t_f	Input Rise and Fall Time	$V_{CC} = 2\text{ V}$	0 to 1000
		$V_{CC} = 4.5\text{ V}$	0 to 500
		$V_{CC} = 6\text{ V}$	0 to 400

DC SPECIFICATIONS

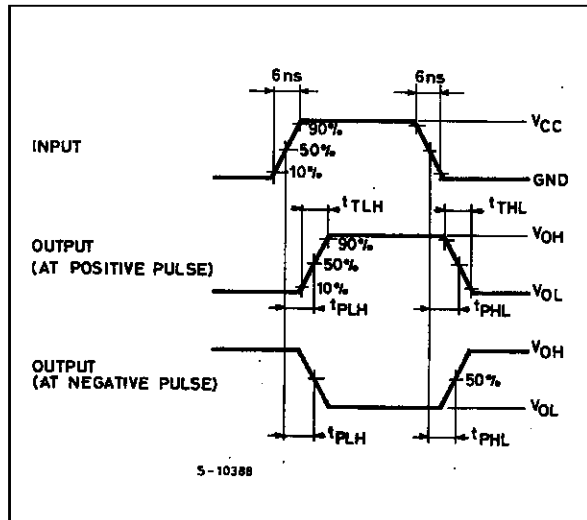
Symbol	Parameter	Test Conditions		Value						Unit			
				$T_A = 25\text{ °C}$ 54HC and 74HC			$-40\text{ to }85\text{ °C}$ 74HC		$-55\text{ to }125\text{ °C}$ 54HC				
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.		
V_{IH}	High Level Input Voltage	V_{CC} (V)		1.5			1.5		1.5		V		
				4.5			3.15		3.15				
	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

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

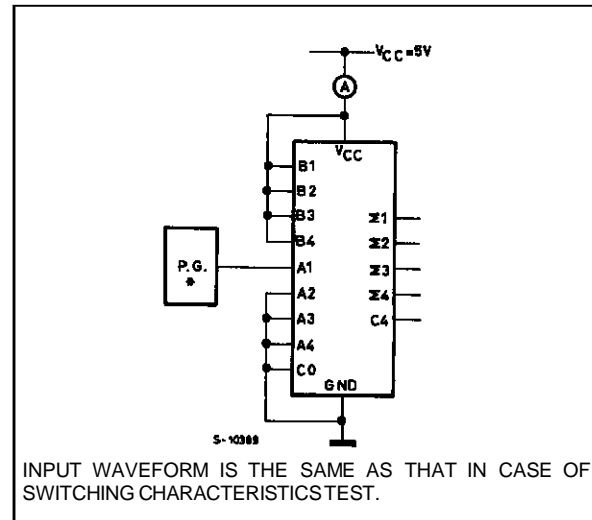
Symbol	Parameter	Test Conditions		Value						Unit	
		V_{CC} (V)		$T_A = 25 \text{ }^\circ\text{C}$ 54HC and 74HC			$-40 \text{ to } 85 \text{ }^\circ\text{C}$ 74HC		$-55 \text{ to } 125 \text{ }^\circ\text{C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t_{TLH} t_{THL}	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t_{PLH} t_{PHL}	Propagation Delay Time ($A_n, B_n - \Sigma_n$)	2.0			95	210		265		315	ns
		4.5			27	42		53		63	
		6.0			22	36		45		54	
t_{PLH} t_{PHL}	Propagation Delay Time ($A_n, B_n - C_4$)	2.0			80	195		245		295	ns
		4.5			25	39		49		59	
		6.0			20	33		42		50	
t_{PLH} t_{PHL}	Propagation Delay Time ($C_0 - \Sigma_n$)	2.0			60	150		190		225	ns
		4.5			20	30		38		45	
		6.0			17	26		32		38	
t_{PLH} t_{PHL}	Propagation Delay Time ($C_0 - C_4$)	2.0			60	150		190		225	ns
		4.5			20	30		38		45	
		6.0			17	26		32		38	
C_{IN}	Input Capacitance				5	10		10		10	pF
$C_{PD} (*)$	Power Dissipation Capacitance				126						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 operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}$

SWITCHING CHARACTERISTICS TEST WAVEFORM

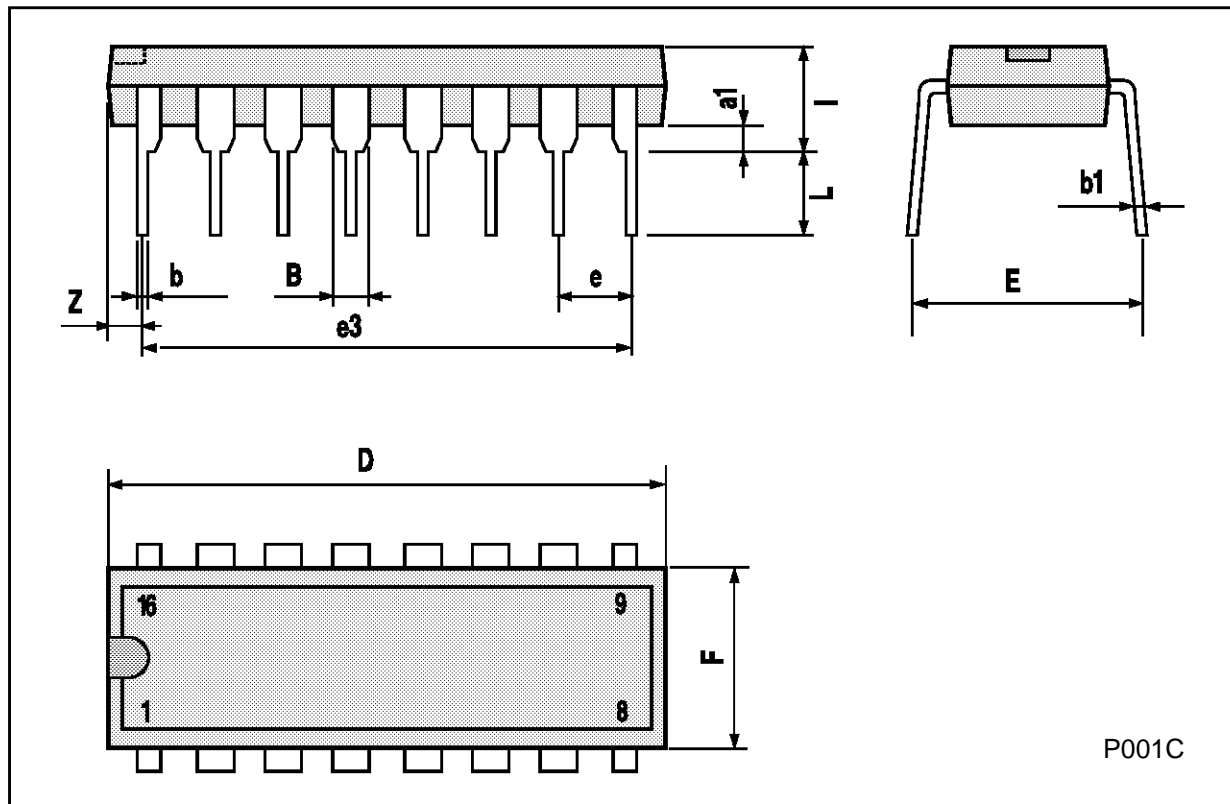


TEST CIRCUIT I_{CC} (Opr.)



Plastic DIP16 (0.25) MECHANICAL DATA

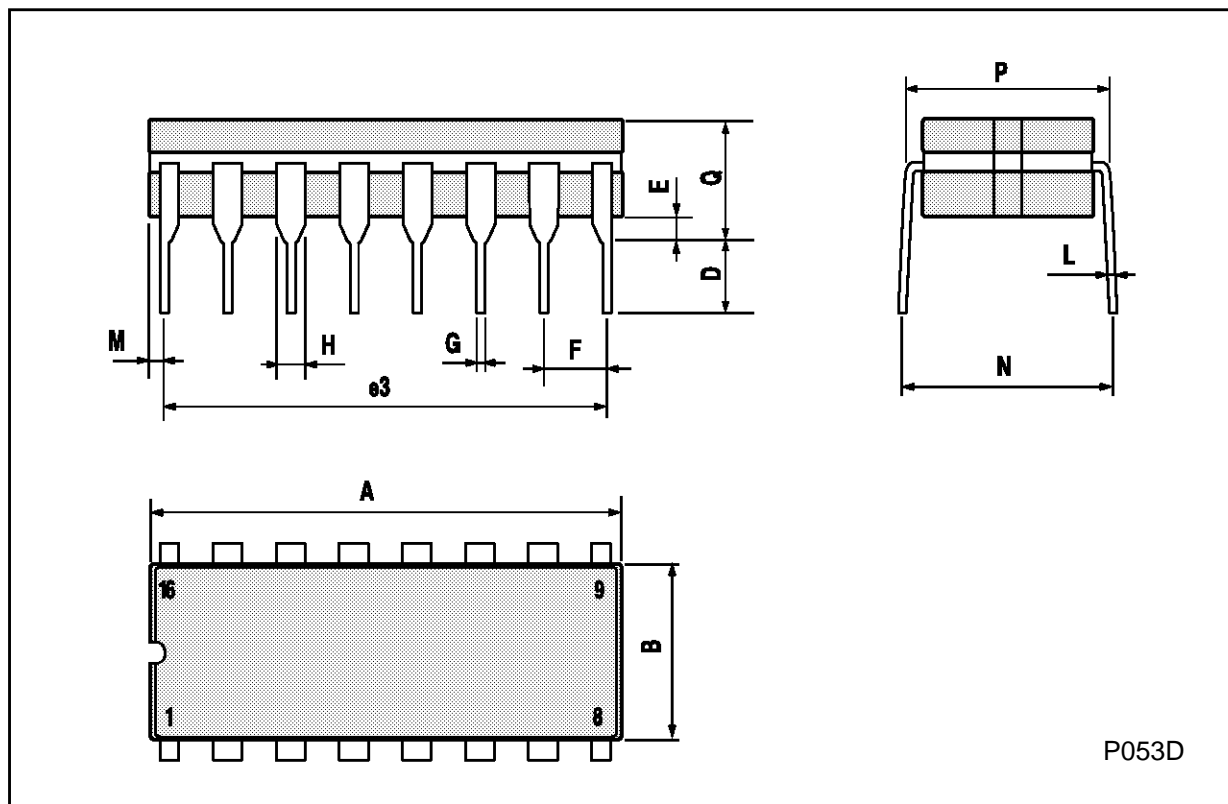
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

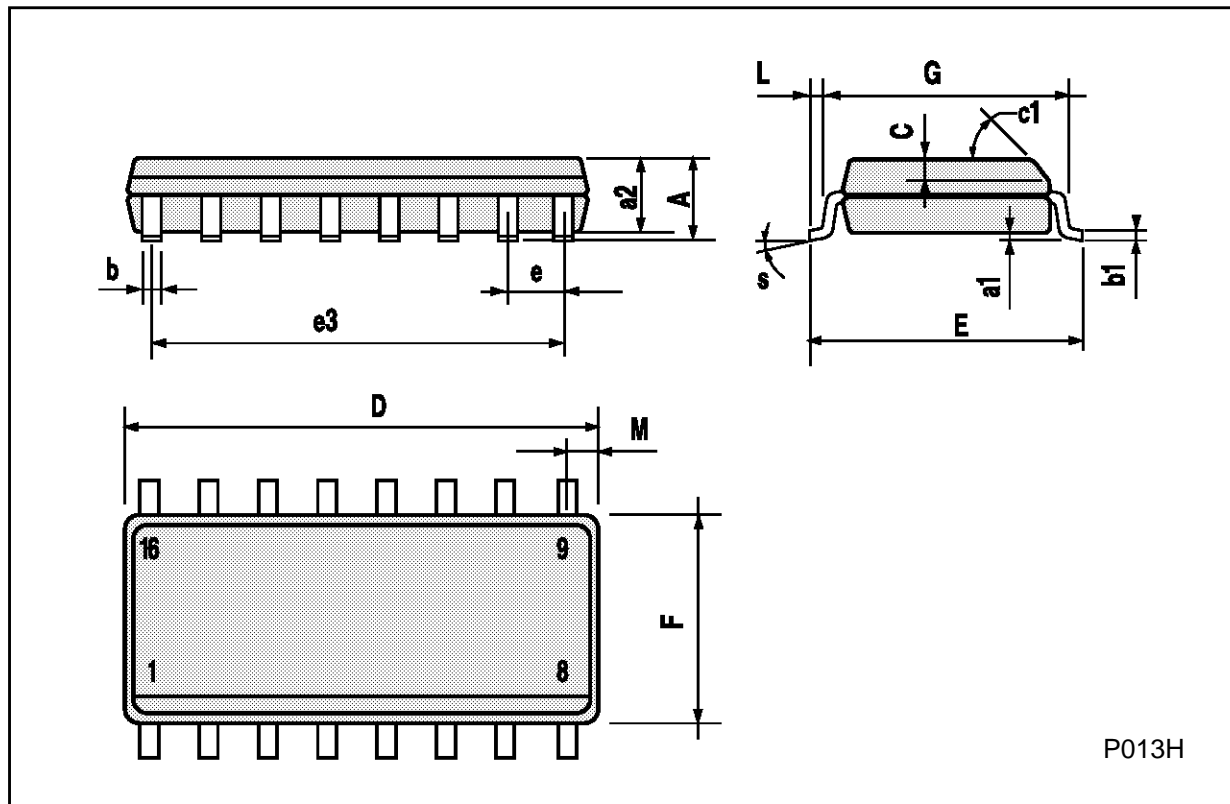
Ceramic DIP16/1 MECHANICAL DATA

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



SO16 (Narrow) MECHANICAL DATA

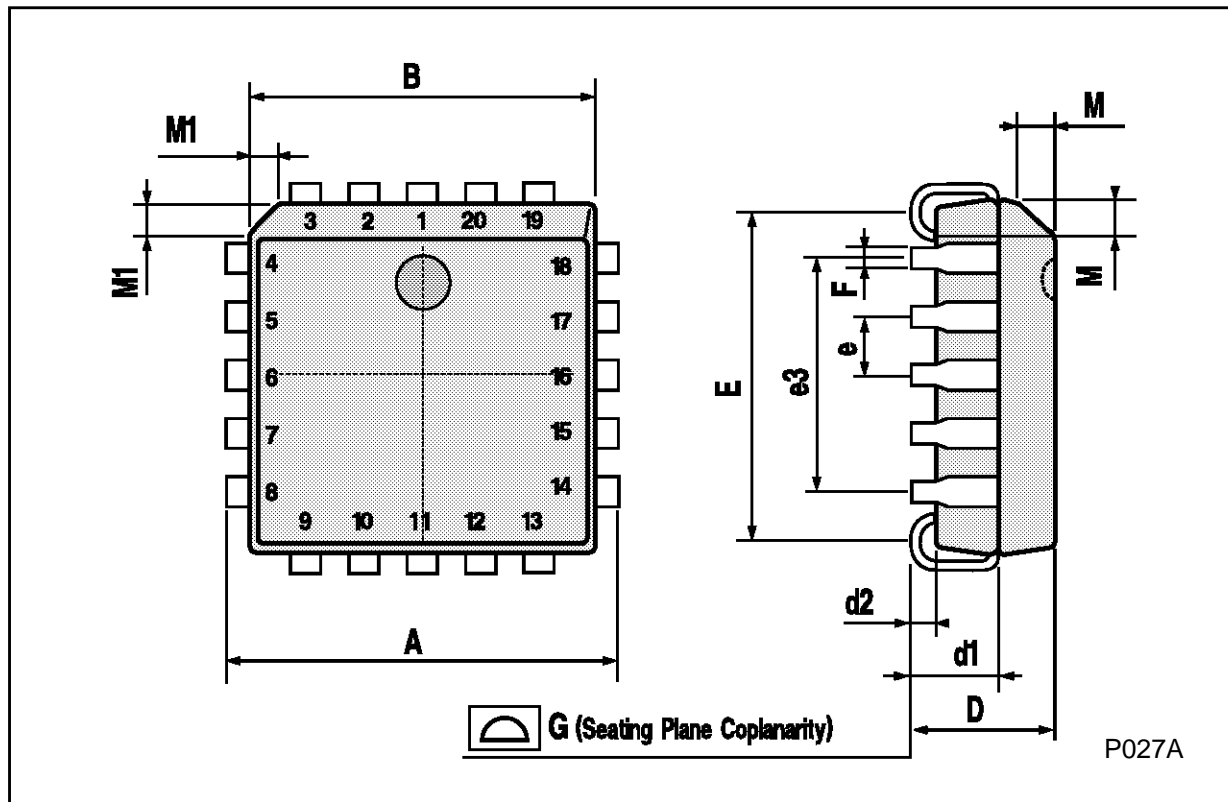
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.004		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157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

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	



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