

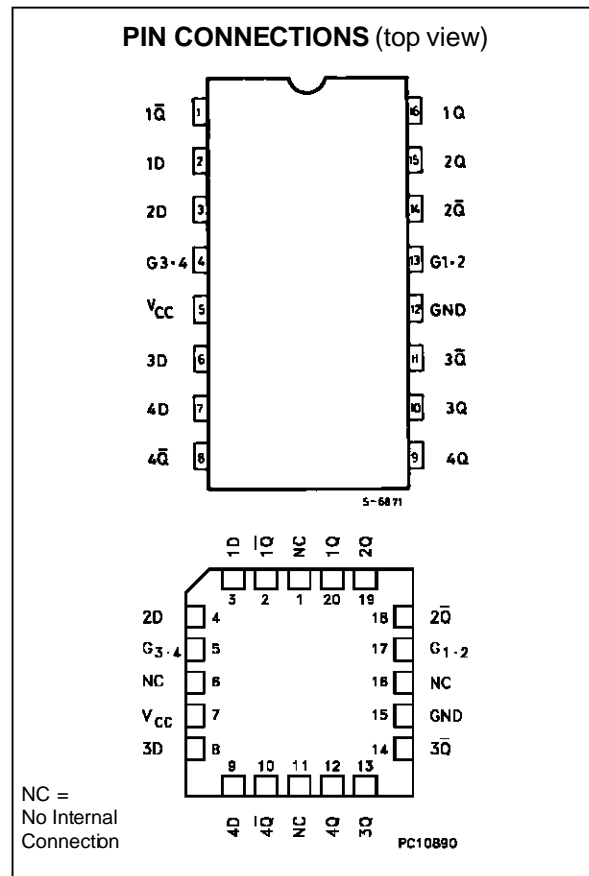
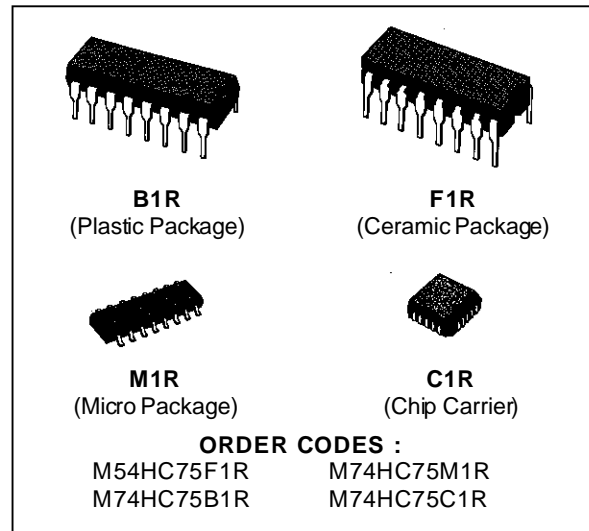
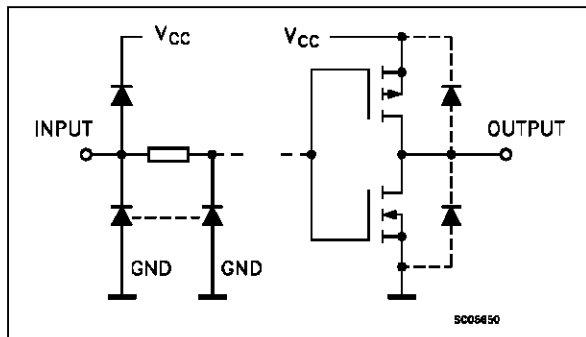
4 BIT D TYPE LATCH

- HIGH SPEED
 $t_{PD} = 10 \text{ ns (TYP.) AT } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION
 $I_{CC} = 2 \mu\text{A (MAX.) AT } T_A = 25 \text{ }^\circ\text{C}$
- 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
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- PIN AND FUNCTION COMPATIBLE WITH
54/74LS75

DESCRIPTION

The M54/74HC75 is a high speed CMOS 4-BIT D-TYPE LATCH fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. It contains two groups of 2-bit latches controlled by an enable input (G1•2 or G3•4). These two latch groups can be used in different circuits. Each latch has Q and \bar{Q} outputs (1Q - 4 \bar{Q} and 1 \bar{Q} - 4Q). The data applied to the data input is transferred to the Q and \bar{Q} outputs when the enable input is taken high and the outputs will follow the data input as long as the enable input is kept high. When the enable input is taken low, the information data applied to the data input is retained at the outputs. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



M54/M74HC75

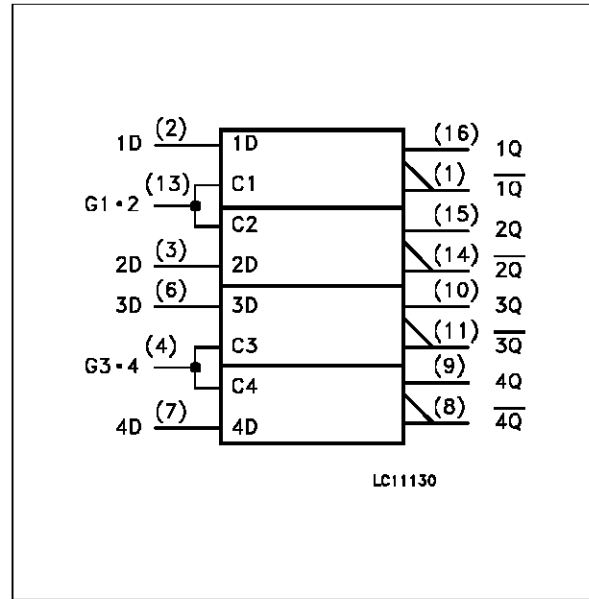
TRUTH TABLE

INPUTS		OUTPUTS		FUNCTION
D	G	Q	\bar{Q}	
L	H	L	H	
H	H	H	L	
X	L	Qn	$\bar{Q}n$	LATCH

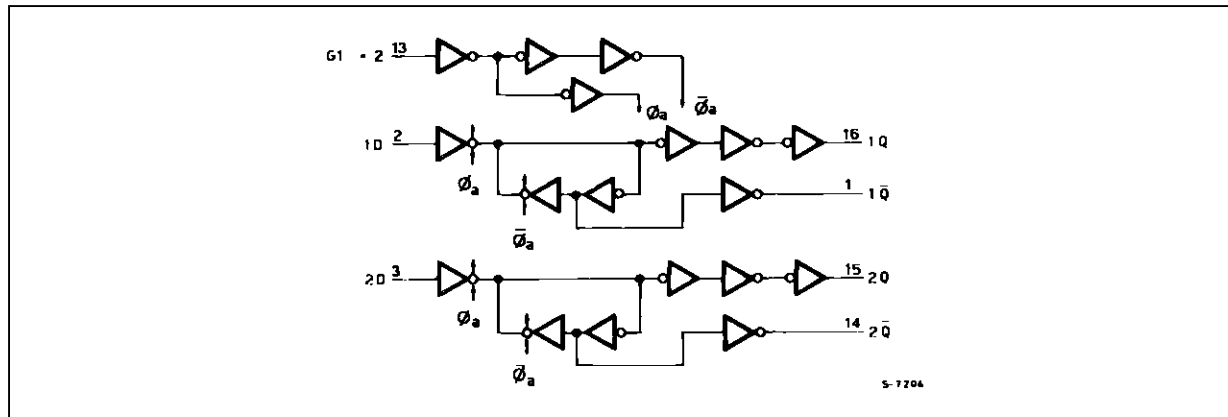
PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 14, 11, 8	1 \bar{Q} to 4 \bar{Q}	Complementary Latch Outputs
2, 3, 6, 7	1D to 4D	Data Inputs
4	G3 • 4	Latch Enable Input, latches 3 and 4
13	G1 • 2	Latch Enable Input, latches 1 and 2
16, 15, 10, 9	1Q to 4Q	Latch Outputs
12	GND	Ground (0V)
5	V _{CC}	Positive Supply Voltage

IEC LOGIC SYMBOL



SCHEMATIC 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	± 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	$V_{CC} = 2\text{ V}$ $V_{CC} = 4.5\text{ V}$ $V_{CC} = 6\text{ V}$	0 to 1000 0 to 500 0 to 400	ns

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	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}	$I_O = -20\text{ }\mu\text{A}$	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		$I_O = -4.0\text{ mA}$	4.18	4.31		4.13		4.10		
		6.0		$I_O = -5.2\text{ mA}$	5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage	2.0	$V_I = V_{IH}$ or V_{IL}	$I_O = 20\text{ }\mu\text{A}$		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			$I_O = 4.0\text{ mA}$	0.17	0.26		0.33		0.40	
		6.0			$I_O = 5.2\text{ mA}$	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			2		20		40	μA	

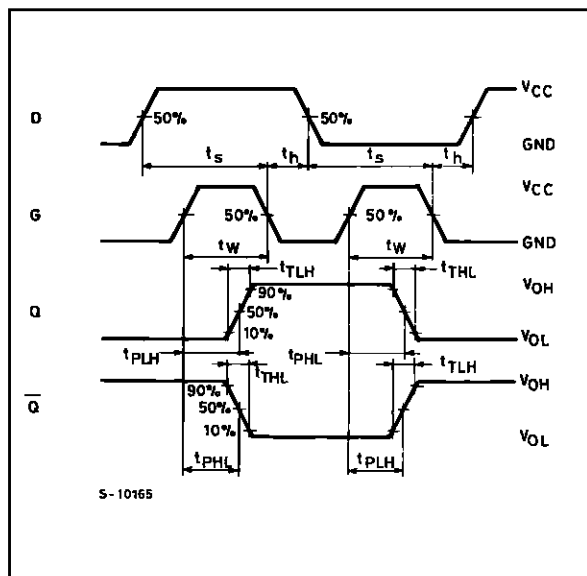
M54/M74HC75

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

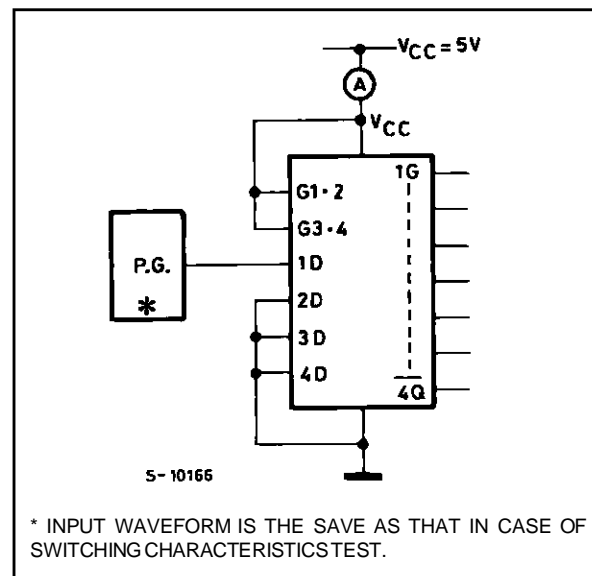
Symbol	Parameter	Test Conditions		Value						Unit	
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t _{TLH} t _{THL}	Output Transition Time	2.0			25	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
t _{PLH} t _{PHL}	Propagation Delay Time (DATA-Q)	2.0			36	110		140		165	ns
		4.5			12	22		28		33	
		6.0			10	19		24		28	
t _{PLH} t _{PHL}	Propagation Delay Time (G-Q)	2.0			40	125		155		190	ns
		4.5			13	25		31		38	
		6.0			11	21		26		32	
t _{W(H)}	Minimum Pulse Width (G)	2.0			18	75		95		110	ns
		4.5			6	15		19		22	
		6.0			6	13		16		19	
t _s	Minimum Set-up Time	2.0				50		65		75	ns
		4.5				10		13		15	
		6.0				9		11		13	
t _h	Minimum Hold Time	2.0				25		30		40	ns
		4.5				5		6		8	
		6.0				4		5		7	
C _{IN}	Input Capacitance				5	10		10		10	pF
C _{PD} (*)	Power Dissipation Capacitance				30						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} • V_{CC} • f_{IN} + I_{CC}

SWITCHING CHARACTERISTICS TEST WAVEFORM

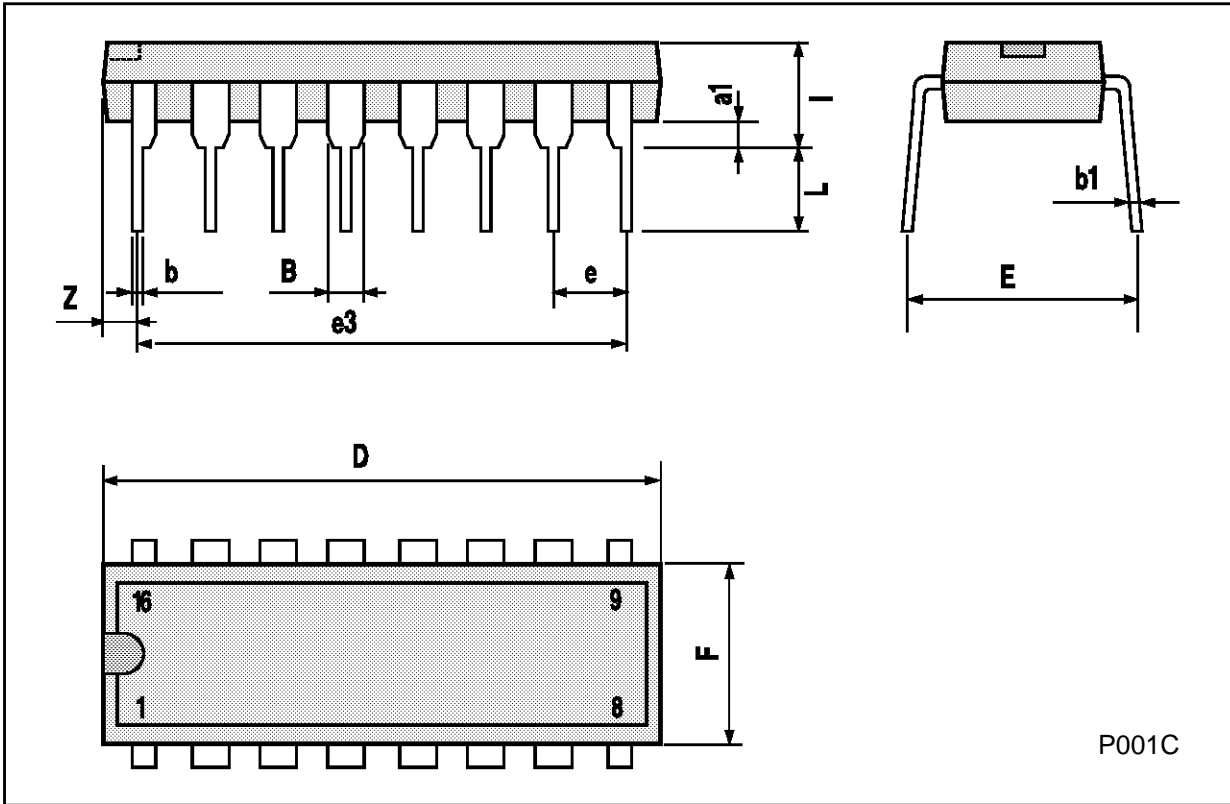


TEST CIRCUIT I_{CC} (Opr)



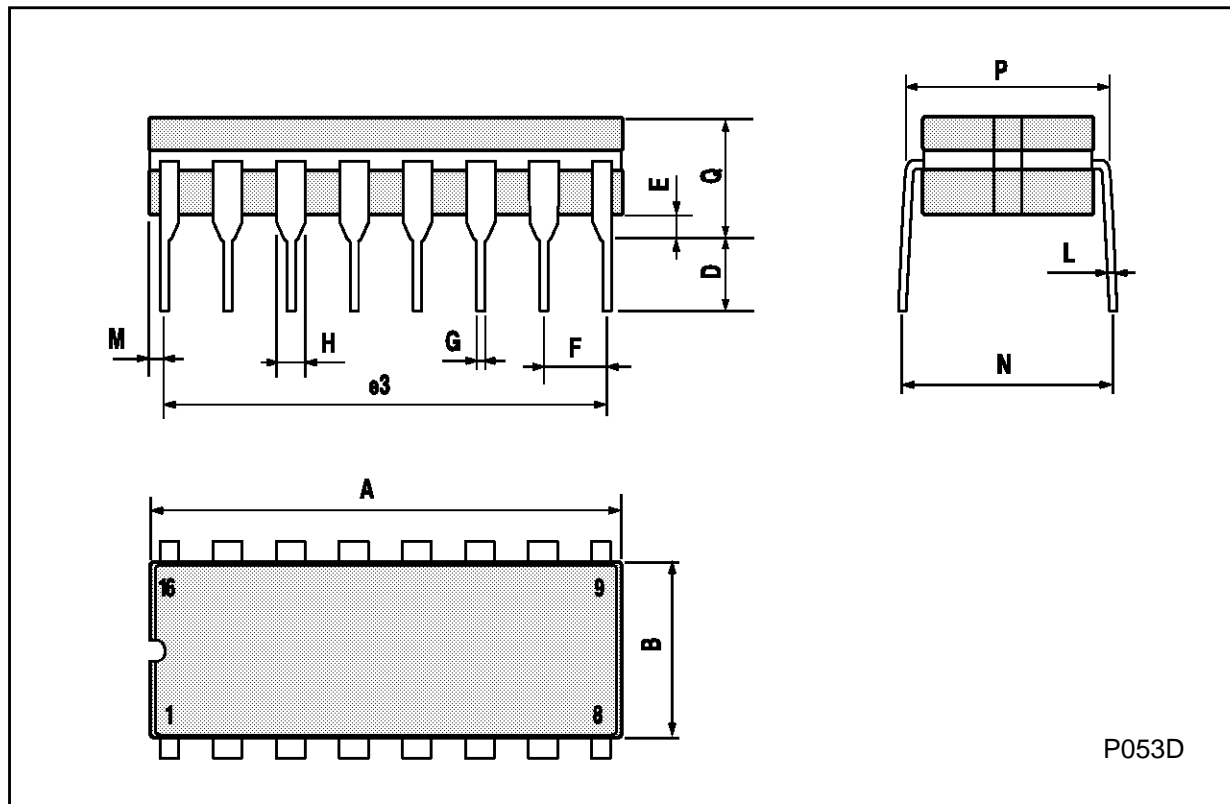
Plastic DIP16 (0.25) MECHANICAL DATA

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



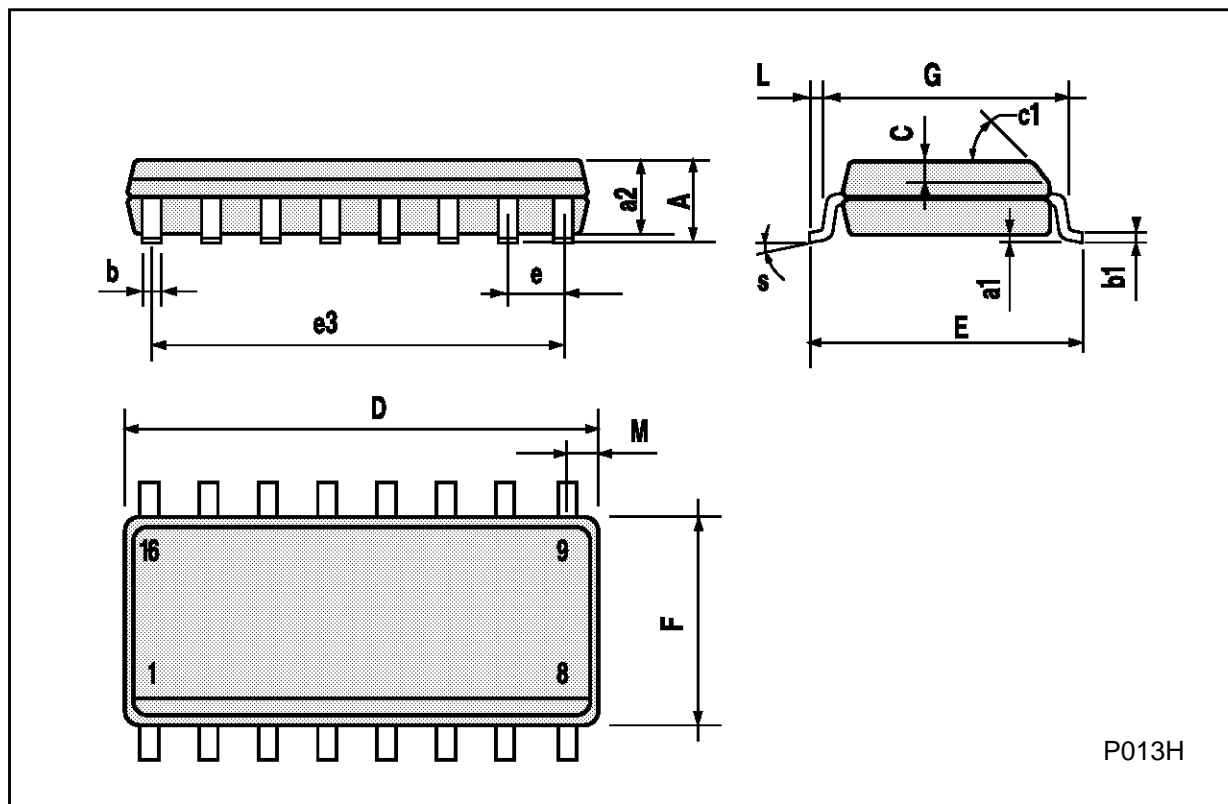
Ceramic DIP16/1 MECHANICAL DATA

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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