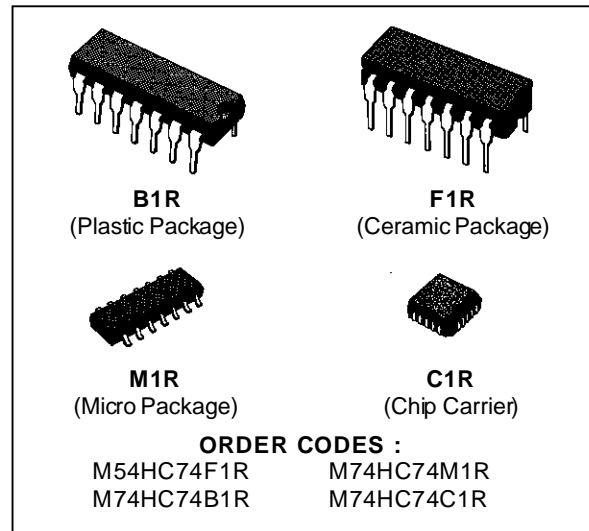


DUAL D TYPE FLIP FLOP WITH PRESET AND CLEAR

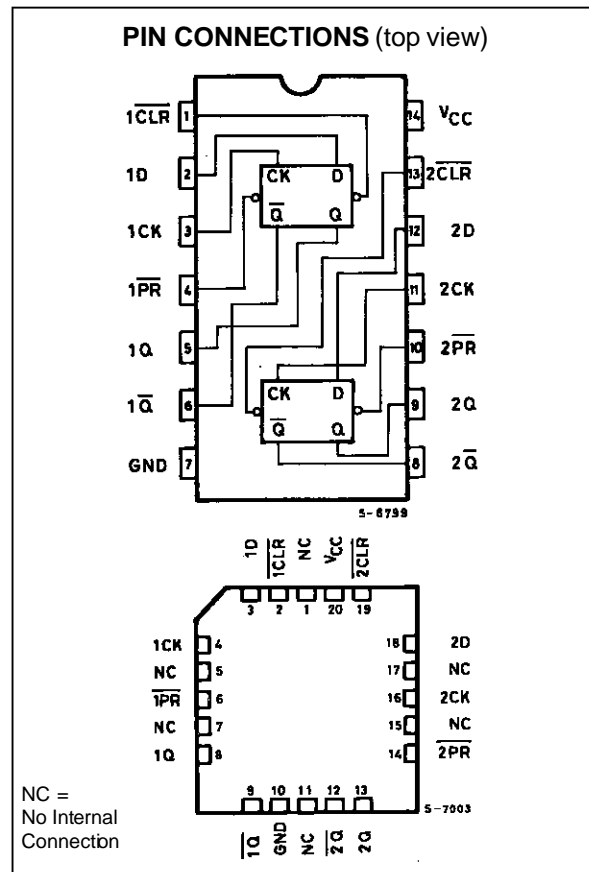
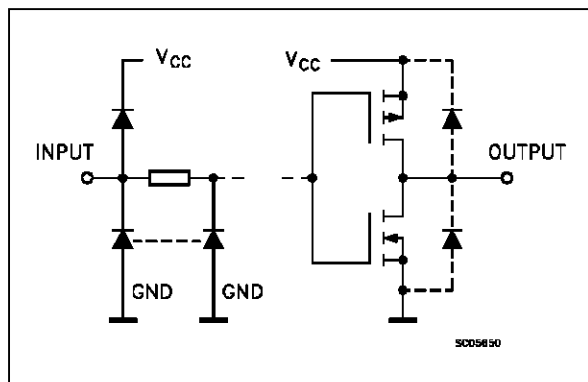
- HIGH SPEED
f_{MAX} = 71 MHz (TYP.) AT V_{CC} = 5 V
- LOW POWER DISSIPATION
I_{CC} = 2 μA (MAX.) AT T_A = 25 °C
- HIGH NOISE IMMUNITY
V_{NIH} = V_{NIL} = 28 % V_{CC} (MIN.)
- OUTPUT DRIVE CAPABILITY
10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
|I_{OH}| = I_{OL} = 4 mA (MIN.)
- BALANCED PROPAGATION DELAYS
t_{PLH} = t_{PHL}
- WIDE OPERATING VOLTAGE RANGE
V_{CC} (OPR) = 2 V TO 6 V
- PIN AND FUNCTION COMPATIBLE
WITH 54/74LS74



DESCRIPTION

The M54/74HC74 is a high speed CMOS DUAL D TYPE FLOP WITH PRESET AND CLEAR fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. A signal on the D INPUT is transferred to the Q OUTPUT during the positive going transition of the clock pulse. CLEAR and PRESET are independent of the clock and accomplished by a low on the appropriate input. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



M54/M74HC74

TRUTH TABLE

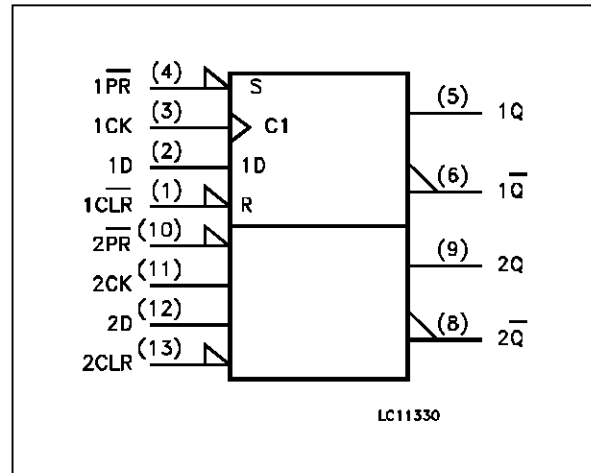
INPUTS				OUTPUTS		FUNCTION
CLR	PR	D	CK	Q	\bar{Q}	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	
H	H	L	\downarrow	L	H	
H	H	H	\downarrow	H	L	
H	H	X	\downarrow	Q_n	\bar{Q}_n	NO CHANGE

X: Don't Care

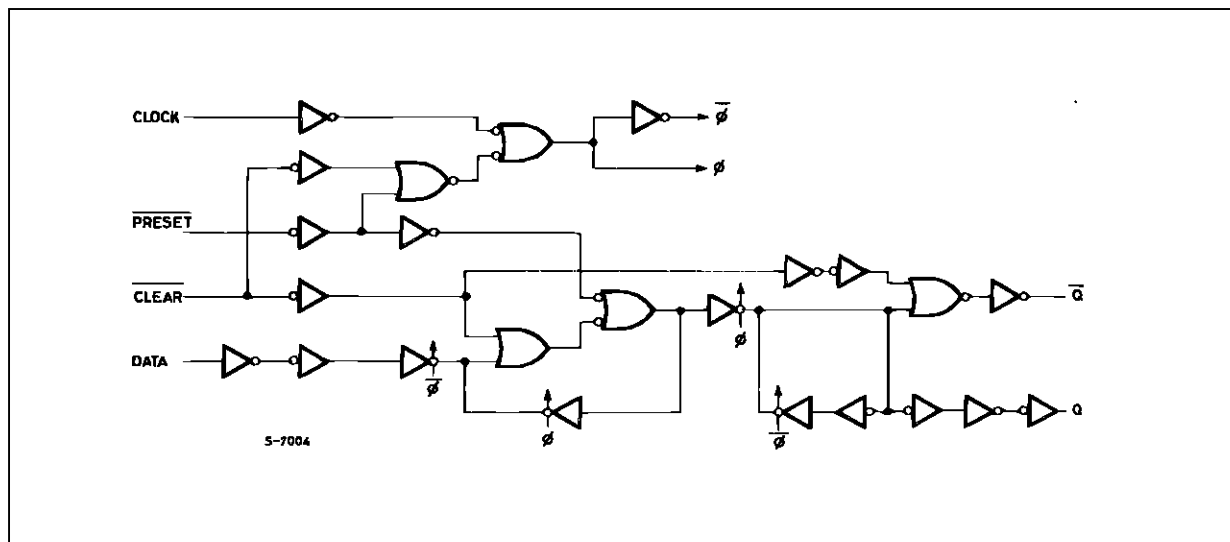
PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 13	1CLR, 2CLR	Asynchronous Reset - Direct Input
2, 12	1D, 2D	Data Inputs
3, 11	1CK, 2CK	Clock Input (LOW-to-HIGH, Edge-Triggered)
4, 10	1PR, 2PR	Asynchronous Set - Direct Input
5, 9	1Q, 2Q	True Flip-Flop Output
6, 8	1 \bar{Q} , 2 \bar{Q}	Complement Flip-Flop Outputs
7	GND	Ground (0V)
14	V _{CC}	Positive Supply Voltage

IEC LOGIC SYMBOL



LOGIC DIAGRAM



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 V V _{CC} = 4.5 V V _{CC} = 6 V	0 to 1000 0 to 500 0 to 400	ns

M54/M74HC74

DC SPECIFICATIONS

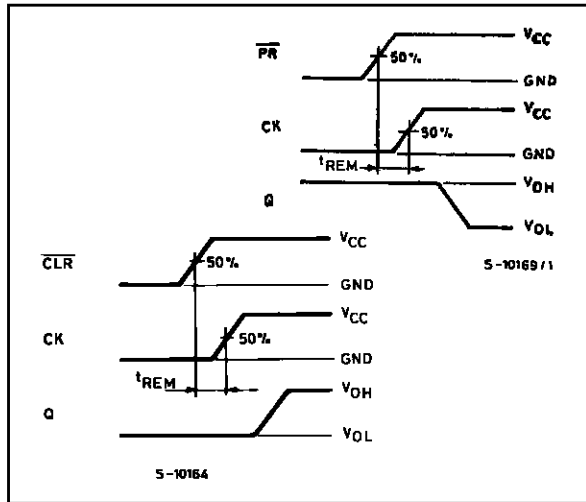
Symbol	Parameter	Test Conditions		Value						Unit		
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
V _{IH}	High Level Input Voltage	2.0		1.5			1.5		1.5		V	
		4.5		3.15			3.15		3.15			
		6.0		4.2			4.2		4.2			
V _{IL}	Low Level 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			2		20		40	μA	

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

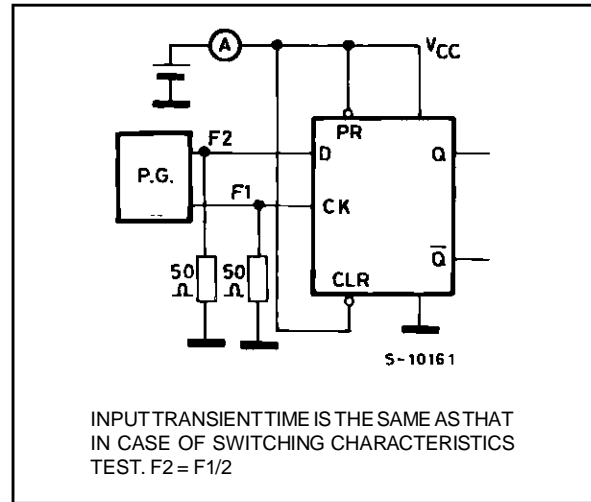
Symbol	Parameter	Test Conditions		Value						Unit	
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t _{TLH} t _{THL}	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t _{PLH} t _{PHL}	Propagation Delay Time (CLOCK - Q)	2.0			48	150		190		225	ns
		4.5			16	30		38		45	
		6.0			13	26		32		38	
t _{PLH} t _{PHL}	Propagation Delay Time (CL, PR - Q)	2.0			51	150		190		225	ns
		4.5			17	30		38		45	
		6.0			15	26		32		38	
f _{MAX}	Maximum Clock Frequency	2.0		6.2	21		5		4.2		MHz
		4.5		31	63		25		21		
		6.0		37	67		30		25		
t _{W(H)} t _{W(L)}	Minimum Pulse Width (CLOCK)	2.0			18	75		95		110	ns
		4.5			6	15		19		22	
		6.0			6	13		16		19	
t _{W(L)}	Minimum Pulse Width (CL, PR)	2.0			21	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
t _s	Minimum Set-up Time	2.0			15	75		95		110	ns
		4.5			4	15		19		22	
		6.0			3	13		16		19	
t _h	Minimum Hold Time	2.0				0		0		0	ns
		4.5				0		0		0	
		6.0				0		0		0	
t _{REM}	Minimum Removal Time (CL, PR)	2.0			0	25		30		35	ns
		4.5			0	5		6		7	
		6.0			0	4		5		6	
C _{IN}	Input Capacitance				5	10		10		10	pF
C _{PD} (*)	Power Dissipation Capacitance				34						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. $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/2$ (per FLIP/FLOP)

SWITCHING CHARACTERISTICS TEST WAVEFORM

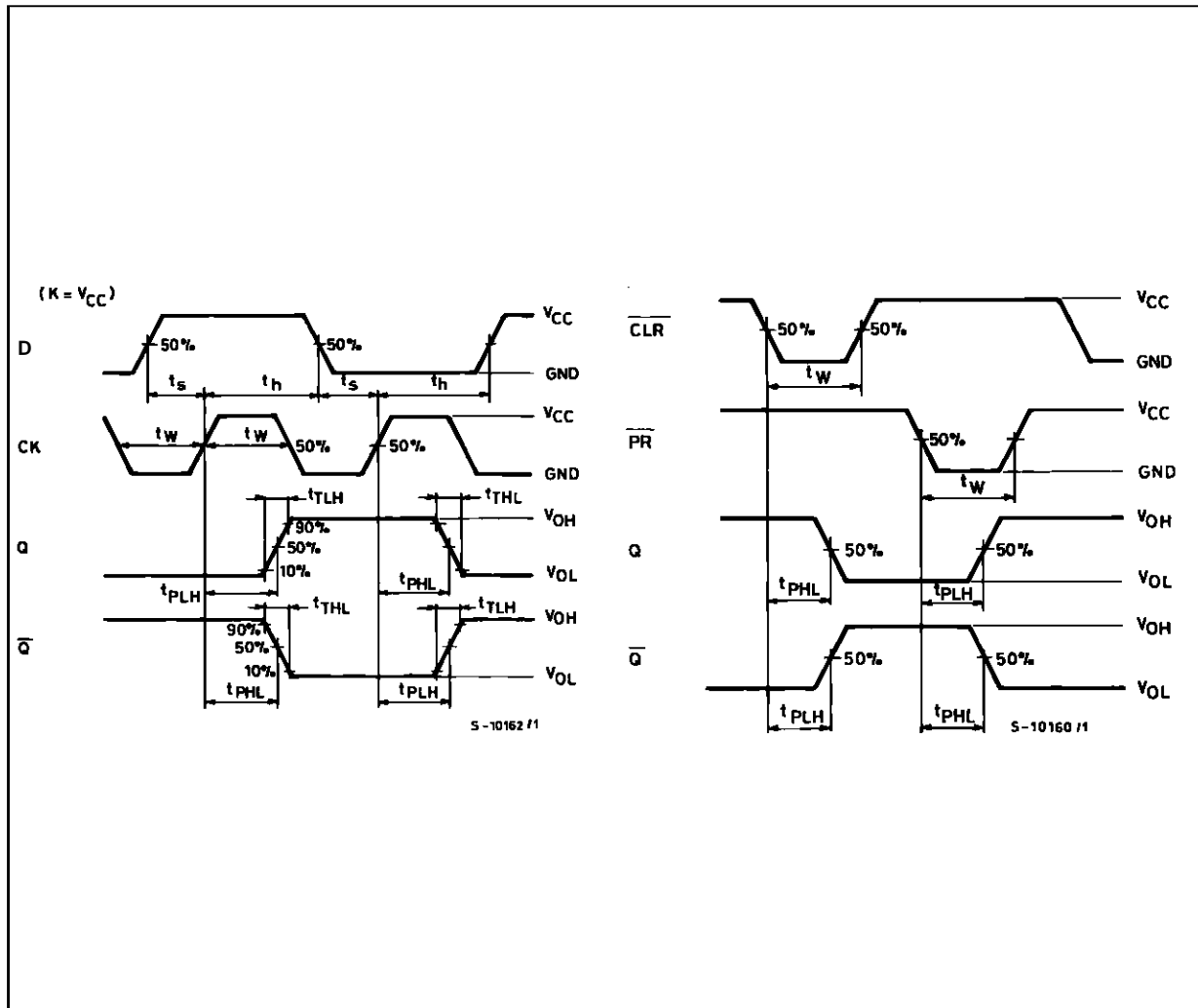


TEST CIRCUIT I_{CC} (Opr.)



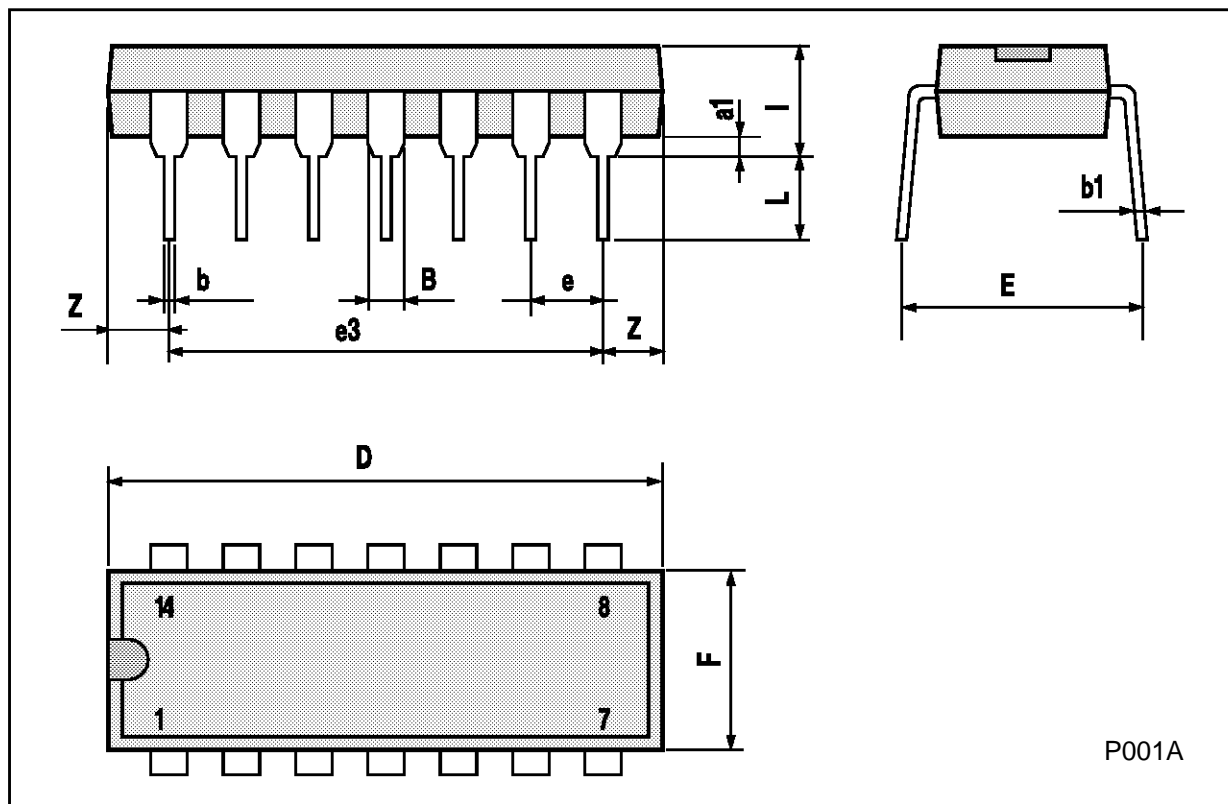
INPUT TRANSIENT TIME IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TEST. F2 = F1/2

SWITCHING CHARACTERISTICS TEST WAVEFORM (K = V_{CC})



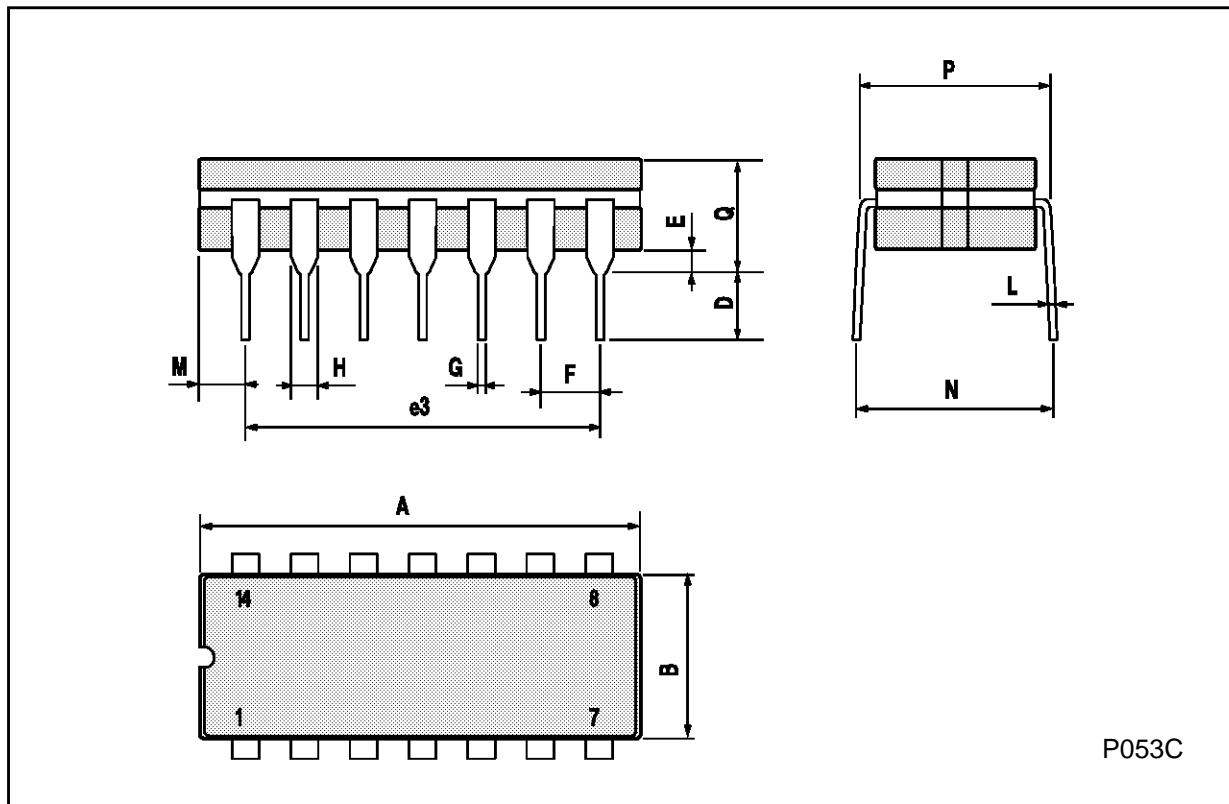
Plastic DIP14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		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		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



Ceramic DIP14/1 MECHANICAL DATA

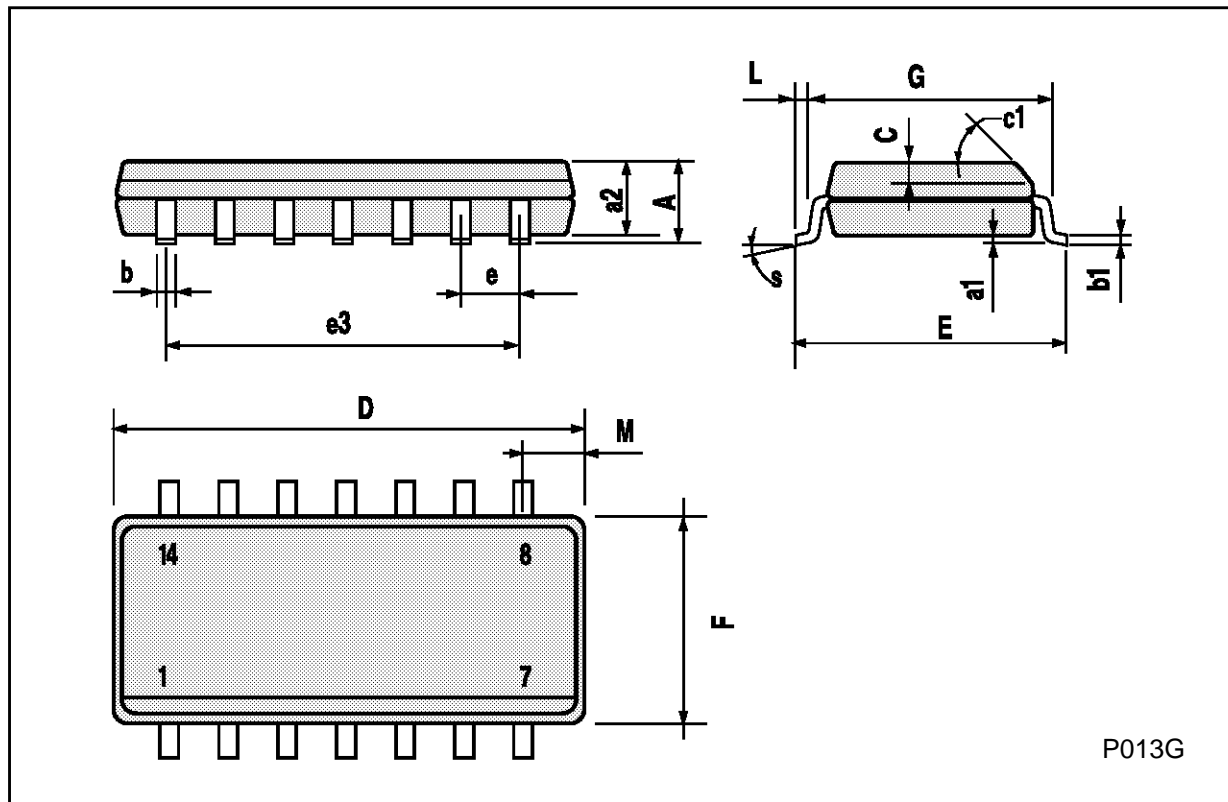
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



P053C

SO14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		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	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
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			0.68			0.026
S	8° (max.)					



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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