

OCTAL D TYPE FLIP FLOP WITH CLEAR

- HIGH SPEED
 $f_{MAX} = 67 \text{ MHz (TYP.) AT } V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION
 $I_{CC} = 4 \mu\text{A (MAX.) AT } T_A = 25^\circ\text{C}$
- 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
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- PIN AND FUNCTION COMPATIBLE WITH
54/74LS273

DESCRIPTION

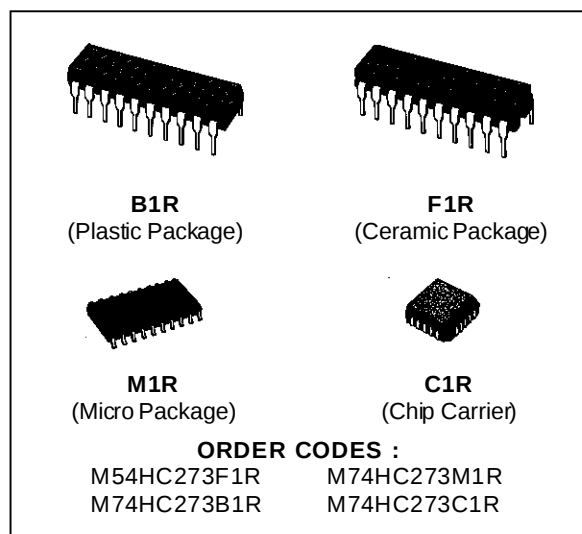
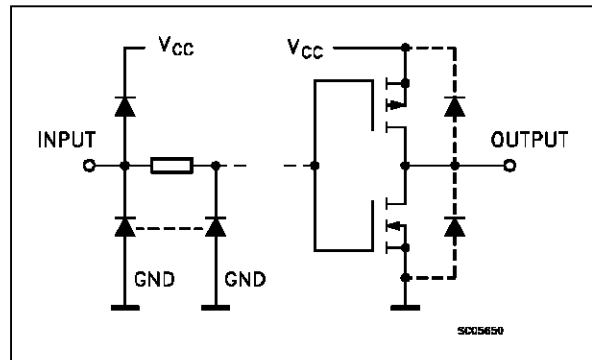
The M54/74HC273 is a high speed CMOS OCTAL D-TYPE FLIP FLOP WITH CLEAR fabricated in silicon gate C^2 MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

Information signals applied to D inputs are transferred to the Q outputs on the positive-going edge of the clock pulse.

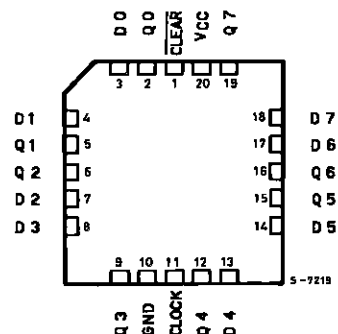
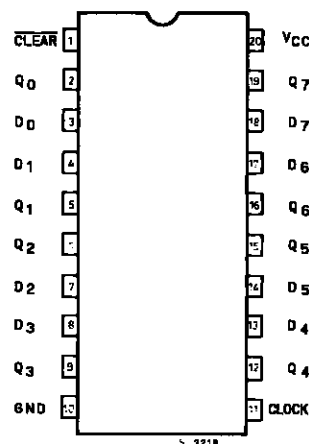
When the $\overline{\text{CLEAR}}$ input is held low, the Q output are in the low logic level independent of the other inputs.

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

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN CONNECTIONS (top view)

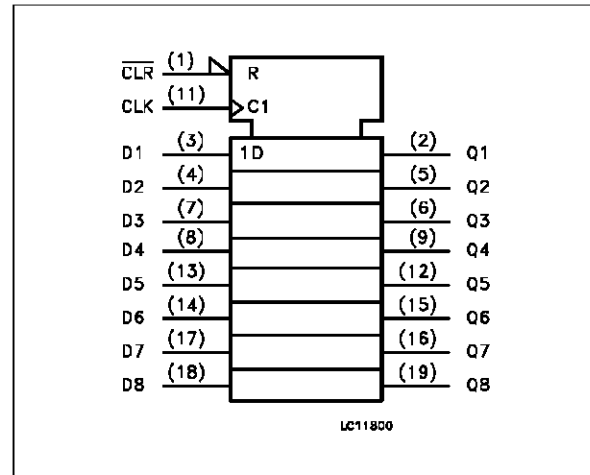


NC =
No Internal
Connection

PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1	CLEAR	Master Reset Input (Active LOW)
2, 5, 6, 9, 12, 15, 16, 19	Q0 to Q7	Flip Flop Outputs
3, 4, 7, 8, 13, 14, 17, 18	D0 to D7	Data Inputs
11	CLOCK	Clock Input (LOW to HIGH, Edge Triggered)
10	GND	Ground (0V)
20	Vcc	Positive Supply Voltage

IEC LOGIC SYMBOL

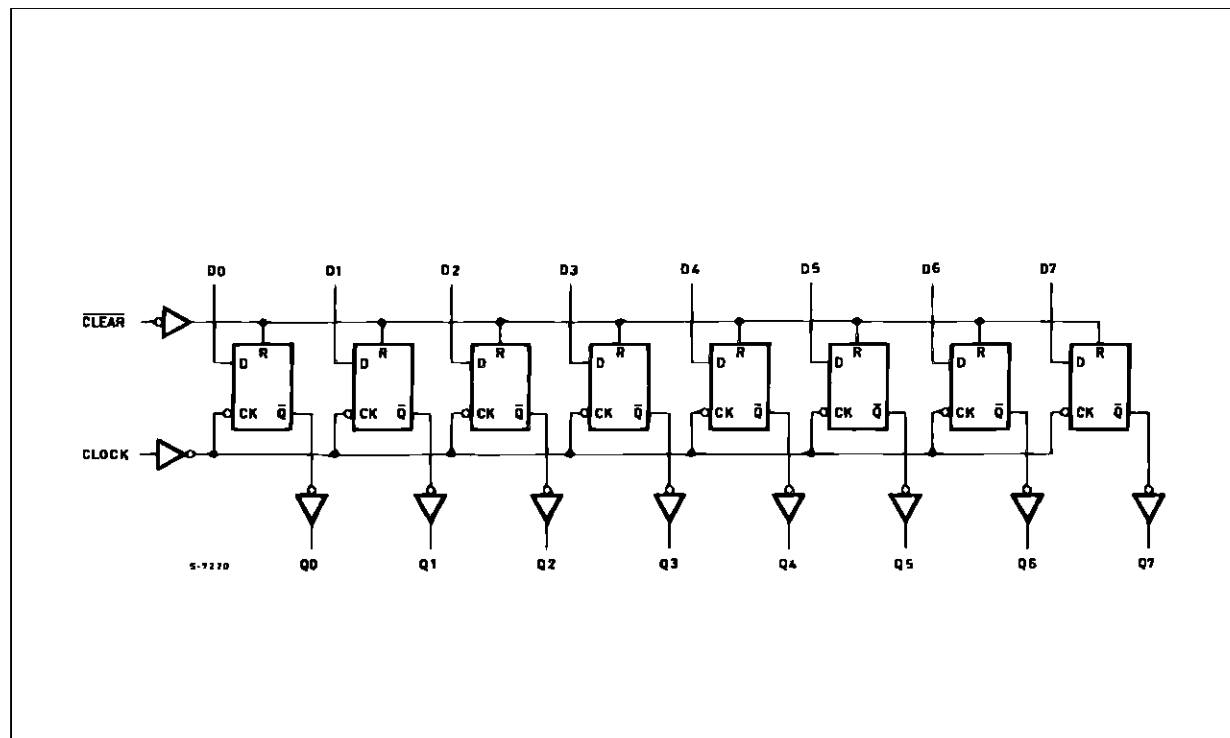


TRUTH TABLE

INPUTS			OUTPUTS	FUNCTION
CLEAR	CLOCK	D	Q	
L	X	X	L	CLEAR
H	⌋	L	L	
H	⌋	H	H	
H	⌋	X	Qn	NO CHANGE

X: Don't Care

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: $\equiv 65^\circ\text{C}$ 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	ns

DC SPECIFICATIONS

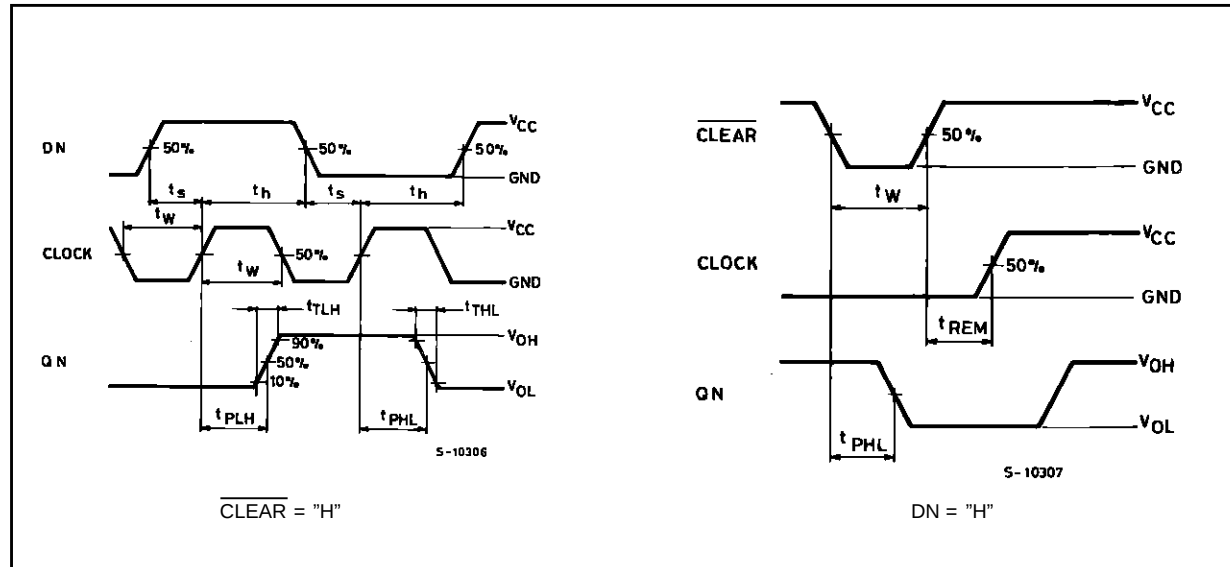
Symbol	Parameter	Test Conditions		Value								Unit
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V _{IH}	High Level Input Voltage	2.0		1.5			1.5		1.5		V	
		4.5		3.15			3.15		3.15			
		6.0		4.2			4.2		4.2			
V _{IL}	Low Level 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		V	
		4.5				0.0	0.1		0.1			
		6.0				0.0	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	

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

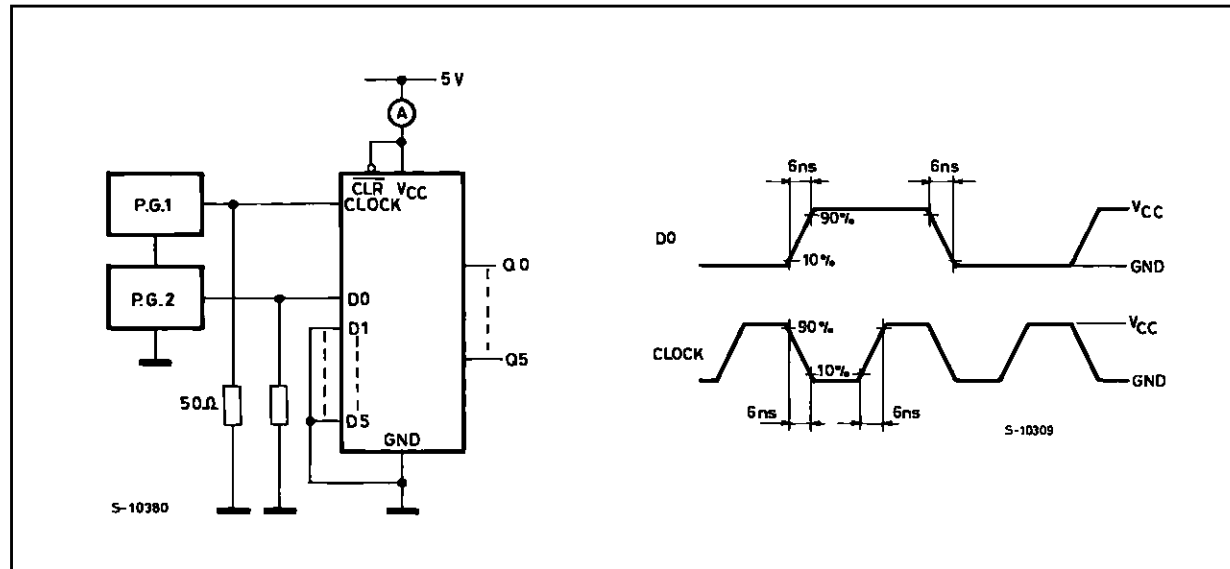
Symbol	Parameter	Test Conditions		Value						Unit	
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t _{TLH} t _{THL}	Output Transition Time	2.0			25	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
t _{PLH} t _{PHL}	Propagation Delay Time (CLOCK - Q)	2.0			54	145		180		220	ns
		4.5			18	29		36		44	
		6.0			15	25		31		37	
t _{PLH} t _{PHL}	Propagation Delay Time (CLEAR - Q)	2.0			60	160		200		240	ns
		4.5			20	32		40		48	
		6.0			17	27		34		41	
f _{MAX}	Maximum Clock Frequency	2.0		6	18		4.8		4		MHz
		4.5		30	56		24		20		
		6.0		35	66		28		24		
t _{W(H)} t _{W(L)}	Minimum Pulse Width (CLOCK)	2.0			28	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
t _{W(L)}	Minimum Pulse Width (CLEAR)	2.0			28	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
t _s	Minimum Set-up Time	2.0			20	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 (CLEAR)	2.0			16	50		65		75	ns
		4.5			4	10		13		15	
		6.0			3	9		11		13	
C _{IN}	Input Capacitance				5	10		10		10	pF
C _{PD} (*)	Power Dissipation Capacitance				43						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. $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/8$ (per Flip Flop), and the total CPD when n pcs of Flip Flop operate can be gained by the following equations: $CPD_{(total)} = 32 + 11 \times n$

SWITCHING CHARACTERISTICS TEST WAVEFORM

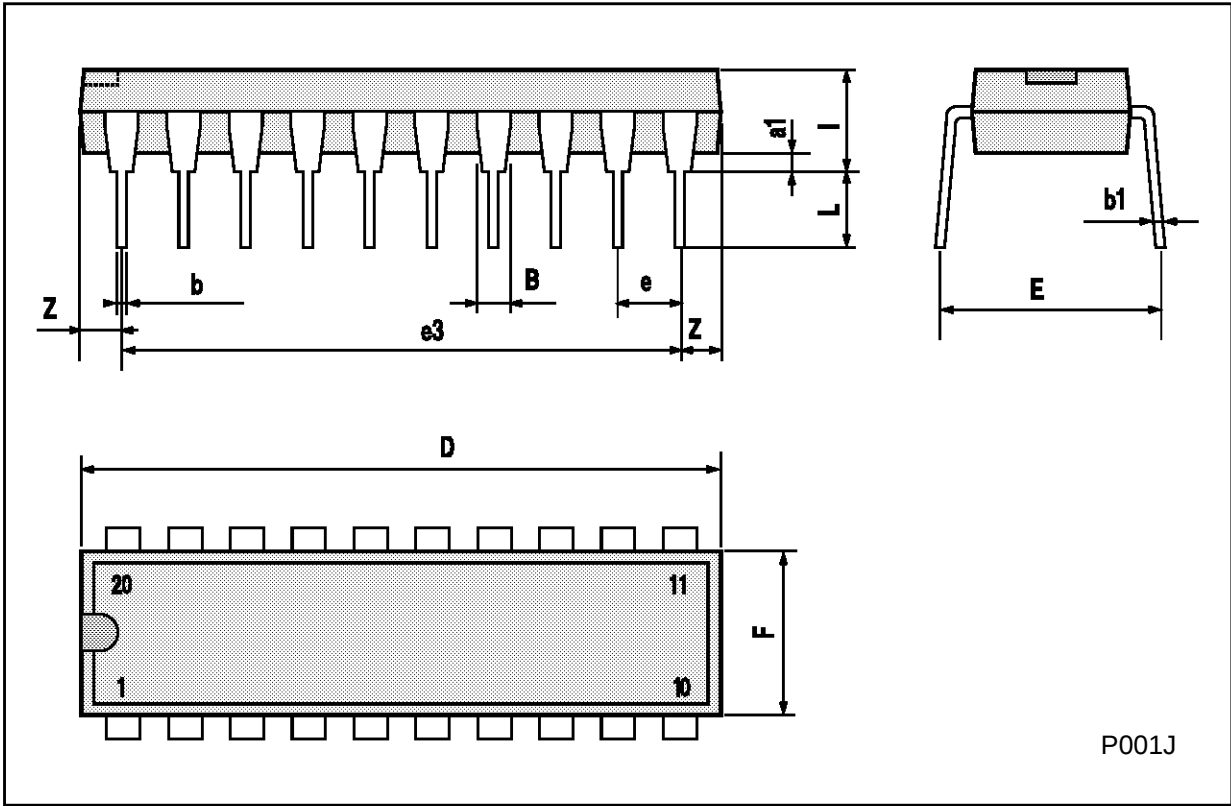


TEST CIRCUIT I_{CC} (Opr.)



Plastic DIP20 (0.25) MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.254			0.010		
B	1.39		1.65	0.055		0.065
b		0.45			0.018	
b1		0.25			0.010	
D			25.4			1.000
E		8.5			0.335	
e		2.54			0.100	
e3		22.86			0.900	
F			7.1			0.280
I			3.93			0.155
L		3.3			0.130	
Z			1.34			0.053



Ceramic DIP20 MECHANICAL DATA

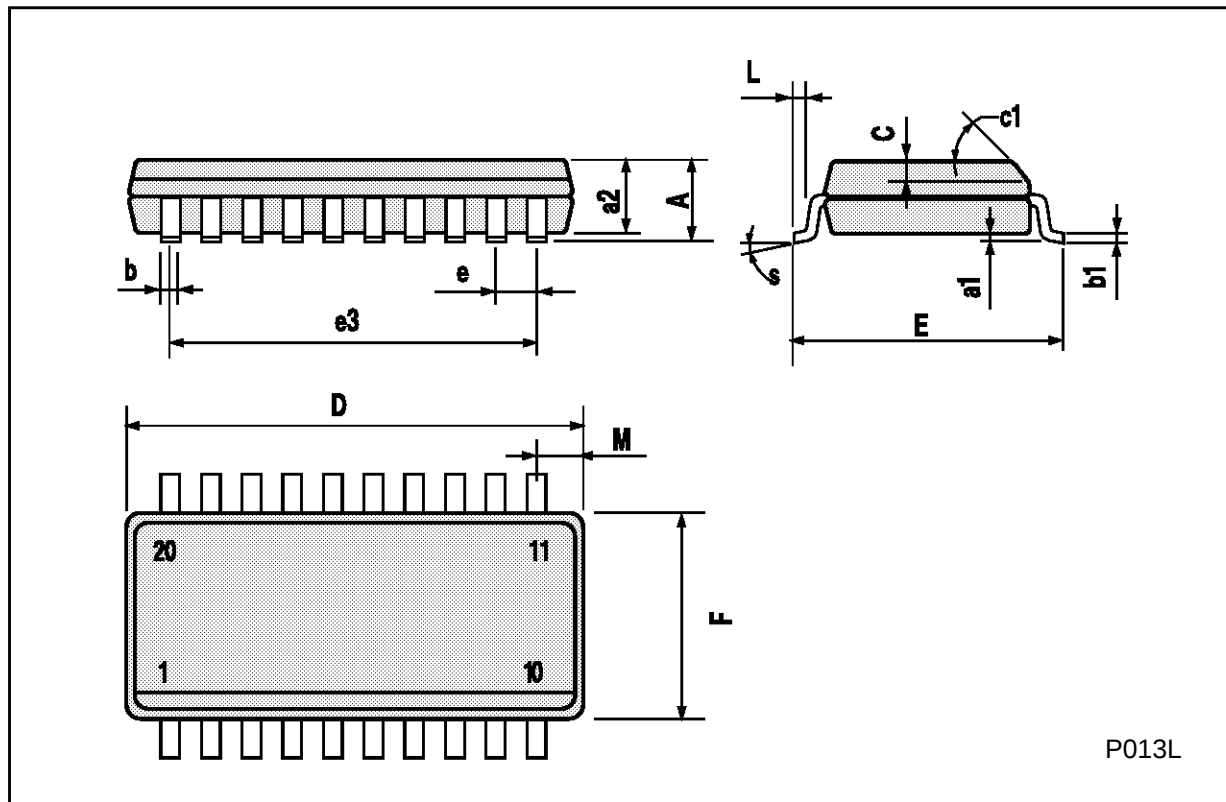
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			25			0.984
B			7.8			0.307
D		3.3			0.130	
E	0.5		1.78	0.020		0.070
e3		22.86			0.900	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
I	1.27		1.52	0.050		0.060
L	0.22		0.31	0.009		0.012
M	0.51		1.27	0.020		0.050
N1	4° (min.), 15° (max.)					
P	7.9		8.13	0.311		0.320
Q			5.71			0.225



P057H

SO20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45° (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
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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