

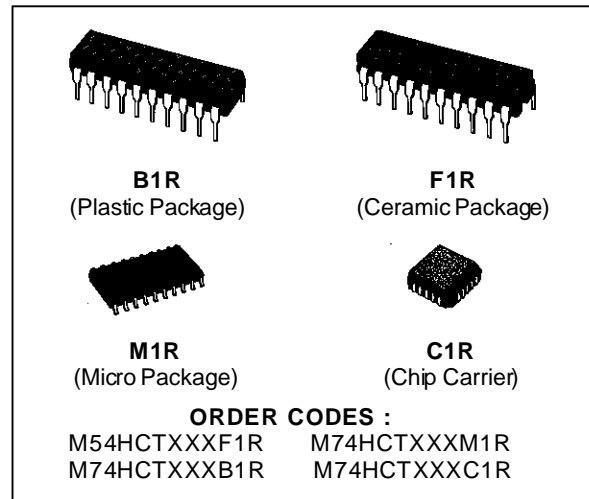
**OCTAL D-TYPE FLIP FLOP WITH 3 STATE OUTPUT**  
**HCT564 INVERTING - HCT574 NON INVERTING**

- HIGH SPEED  
f<sub>MAX</sub> = 62 MHz (TYP.) AT V<sub>CC</sub> = 5 V
- LOW POWER DISSIPATION  
I<sub>CC</sub> = 4 μA (MAX.) AT T<sub>A</sub> = 25 °C
- COMPATIBLE WITH TTL OUTPUTS  
V<sub>IH</sub> = 2V (MIN.) V<sub>IL</sub> = 0.8V (MAX)
- OUTPUT DRIVE CAPABILITY  
15 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE  
I<sub>OL</sub> = |I<sub>OH</sub>| = 6 mA (MIN.)
- BALANCED PROPAGATION DELAYS  
t<sub>PLH</sub> = t<sub>PHL</sub>
- PIN AND FUNCTION COMPATIBLE  
WITH 54/74LS564/574

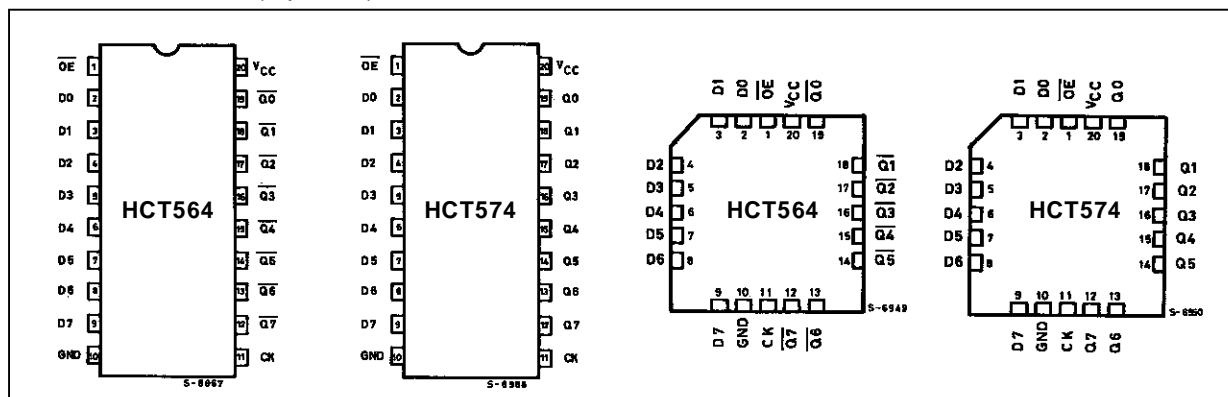
**DESCRIPTION**

The M54/74HCT564 and M54HCT574 are high speed CMOS OCTAL D-TYPE FLIP FLOP WITH 3-STATE OUTPUTS fabricated in silicon gate C<sup>2</sup>MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption. These 8-bit D-type flip-flops are controlled by a clock input (CK) and an output enable input ( $\overline{OE}$ ). On the positive transition of the clock, the Q outputs will be set to the logic state that were setup at the D inputs (HCT574) or their complements (HCT564).

While the  $\overline{OE}$  input is low, the eight outputs will be in a normal logic state (high or low logic level), and while high level, the outputs will be in a high impedance state. The output control does not affect the internal operation of flip-flops. That is, the old data can be retained or the new data can be entered even while the outputs are off. The application engineer has a choice of combination of inverting and non-inverting outputs. The 3-state output configuration and the wide choice of outline make bus-organized systems simple. All inputs are equipped with protection circuits against static discharge and transient excess voltage. This integrated circuit has input and output characteristics that are fully compatible with 54/74 LSTTL logic families. M54/74HCT devices are designed to directly interface HSC<sup>2</sup>MOS systems with TTL and NMOS components. They are also plug in replacements for LSTTL devices giving a reduction of power consumption.



**PIN CONNECTION (top view)**



INPUT AND OUTPUT EQUIVALENT CIRCUIT



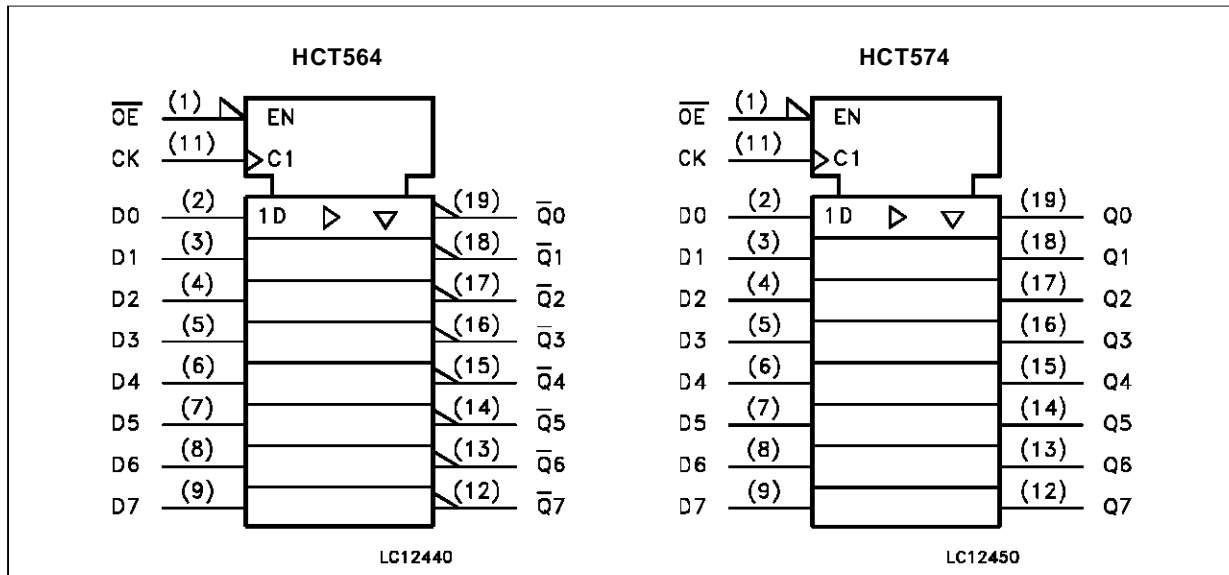
PIN DESCRIPTION (HCT564)

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{OE}$	3 State output Enable Input (Active LOW)
2, 3, 4, 5, 6, 7, 8, 9	D0 to D7	Data Inputs
12, 13, 14, 15, 16, 17, 18, 19	$\overline{Q0}$ to $\overline{Q7}$	3 State outputs
11	CLOCK	Clock Input (LOW to HIGH, edge triggered)
10	GND	Ground (0V)
20	Vcc	Positive Supply Voltage

PIN DESCRIPTION (HCT574)

PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{OE}$	3 State output Enable Input (Active LOW)
2, 3, 4, 5, 6, 7, 8, 9	D0 to D7	Data Inputs
12, 13, 14, 15, 16, 17, 18, 19	Q0 to Q7	3 State outputs
11	CLOCK	Clock Input (LOW to HIGH, edge triggered)
10	GND	Ground (0V)
20	Vcc	Positive Supply Voltage

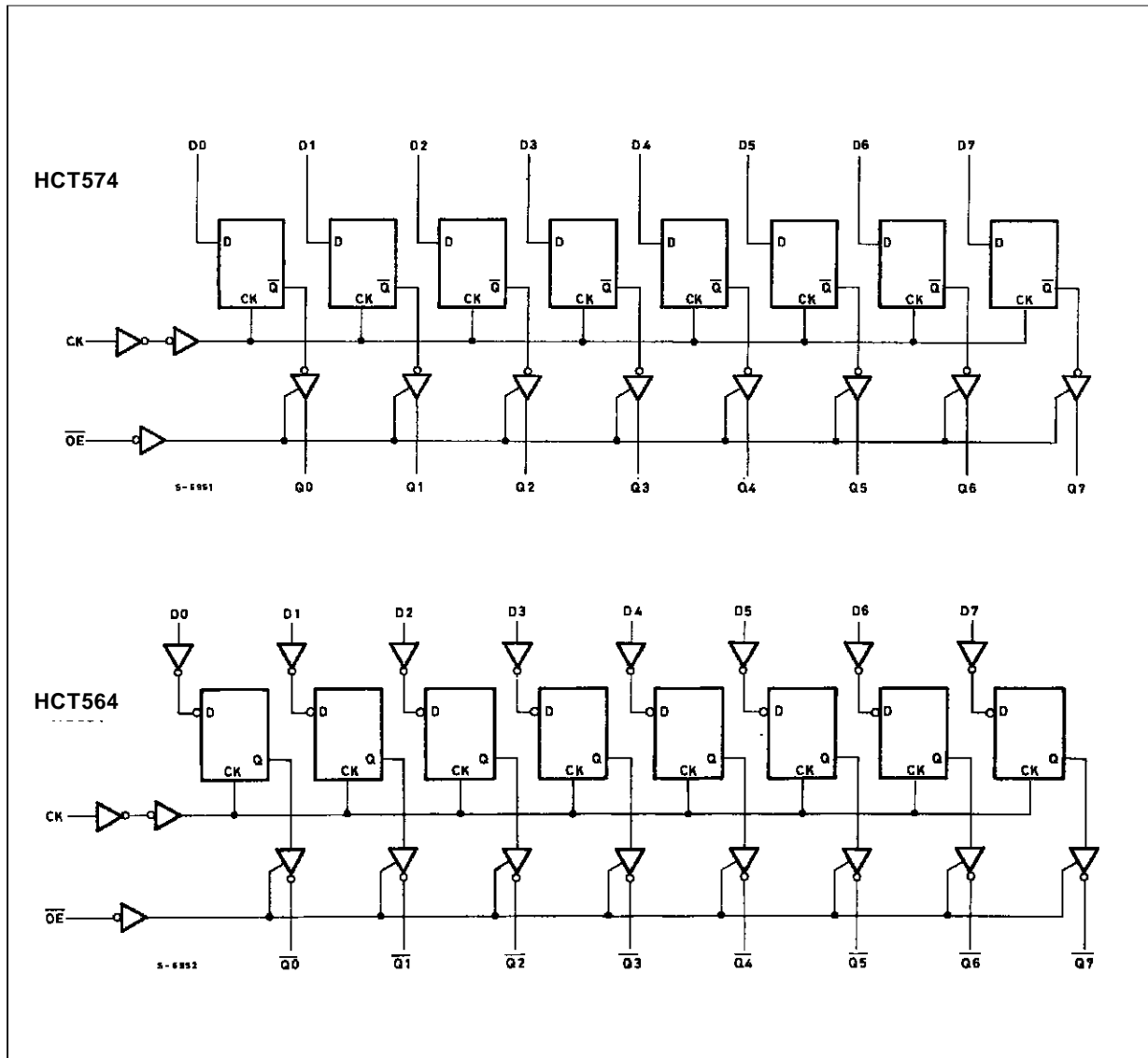
IEC LOGIC SYMBOLS



TRUTH TABLE

INPUTS			OUTPUTS	
OE	CK	D	Q (HCT574)	Q̄ (HCT564)
H	X	X	Z	Z
L	⌋	X	NO CHANGE	NO CHANGE
L	⌋	L	L	H
L	⌋	H	H	L

LOGIC DIAGRAMS



**ABSOLUTE MAXIMUM RATINGS**

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Source Sink Current Per Output Pin	± 35	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 70	mA
P <sub>D</sub>	Power Dissipation	500 (*)	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	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 <sub>CC</sub>	Supply Voltage	4.5 to 5.5	V
V <sub>I</sub>	Input Voltage	0 to V <sub>CC</sub>	V
V <sub>O</sub>	Output Voltage	0 to V <sub>CC</sub>	V
T <sub>op</sub>	Operating Temperature: <b>M54HC Series</b> <b>M74HC Series</b>	-55 to +125 -40 to +85	°C °C
t <sub>r</sub> , t <sub>f</sub>	Input Rise and Fall Time (V <sub>CC</sub> = 4.5 to 5.5V)	0 to 500	ns

## DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>IH</sub>	High Level Input Voltage	4.5 to 5.5		2.0			2.0		2.0		V
V <sub>IL</sub>	Low Level Input Voltage	4.5 to 5.5				0.8		0.8		0.8	V
V <sub>OH</sub>	High Level Output Voltage	4.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -20 μA	4.4	4.5		4.4		4.4	V
				I <sub>O</sub> = -6.0 mA	4.18	4.31		4.13		4.10	
V <sub>OL</sub>	Low Level Output Voltage	4.5	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = 20 μA		0.0	0.1		0.1	0.1	V
				I <sub>O</sub> = 6.0 mA		0.17	0.26		0.33	0.4	
I <sub>I</sub>	Input Leakage Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	μA
I <sub>CC</sub>	Quiescent Supply Current	5.5	V <sub>I</sub> = V <sub>CC</sub> or GND			4		40		80	μA
ΔI <sub>CC</sub>	Additional worst case supply current	5.5	Per Input pin V <sub>I</sub> = 0.5V or V <sub>I</sub> = 2.4V Other Inputs at V <sub>CC</sub> or GND I <sub>O</sub> = 0			2.0		2.9		3.0	mA

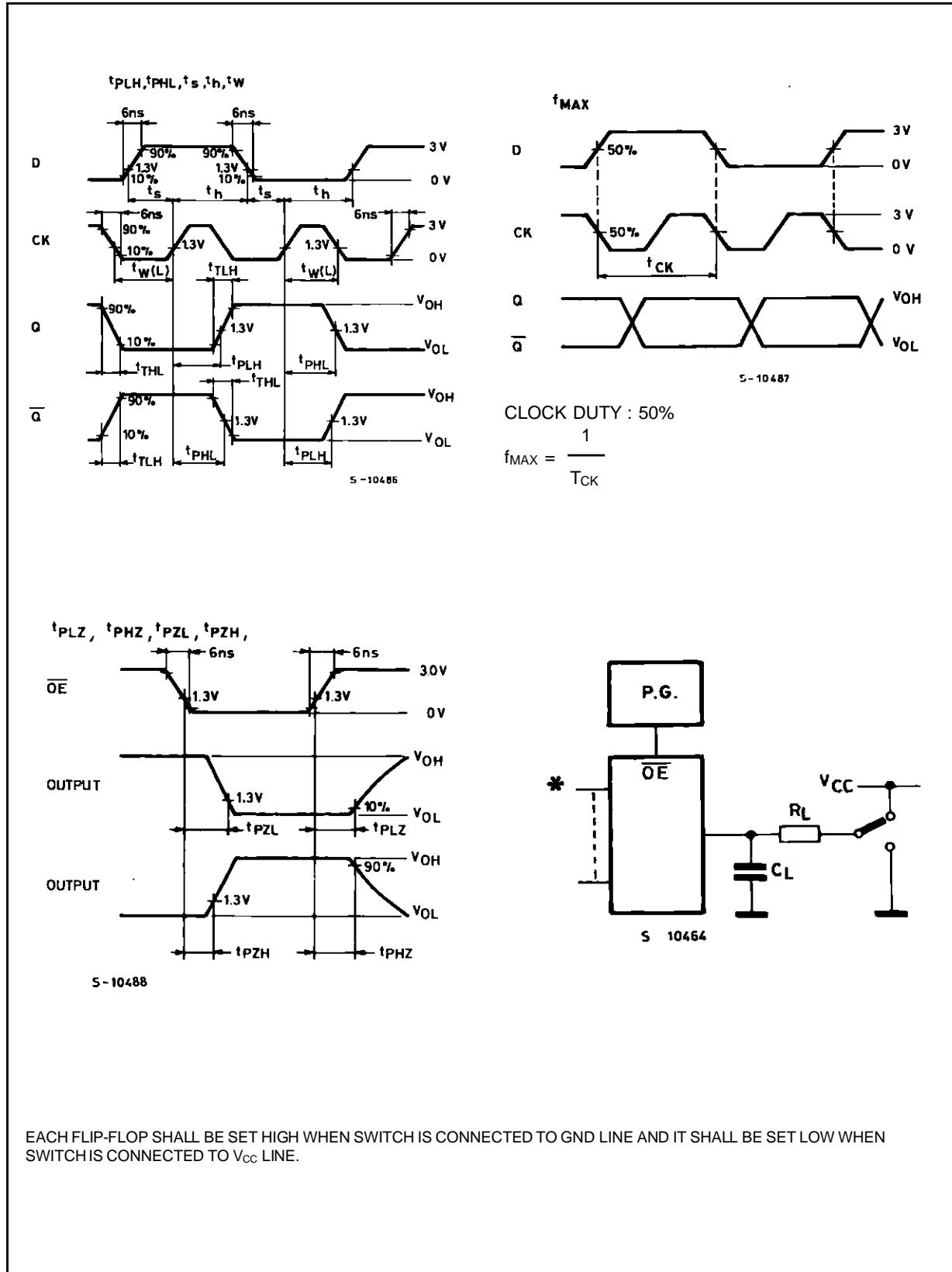
## M54/M74HCT564/574

### AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50 pF, Input t<sub>r</sub> = t<sub>f</sub> = 6 ns)

Symbol	Parameter	Test Conditions			Value						Unit	
		V <sub>CC</sub> (V)	C <sub>L</sub> (pF)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	4.5	50			7	12		15		18	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time	4.5	50			20	30		38		45	ns
		4.5	150			24	36		45		54	
t <sub>PZL</sub> t <sub>PZH</sub>	3 State Output Enable Time	4.5	50	R <sub>L</sub> = 1 KΩ		19	30		38		45	ns
		4.5	150	R <sub>L</sub> = 1 KΩ		23	36		45		54	
t <sub>PLZ</sub> t <sub>PHZ</sub>	3 State Output Disable Time	4.5	50	R <sub>L</sub> = 1 KΩ		19	30		38		45	ns
f <sub>MAX</sub>	Maximum CLock Frequency	4.5	50		31	50		25		21		ns
t <sub>W(L)</sub> t <sub>W(H)</sub>	Minimum Pulse Width (CLOCK)	4.5	50			8	15		19		22	ns
t <sub>s</sub>	Minimum Set-up Time	4.5	50			7	15		19		22	ns
t <sub>h</sub>	Minimum Hold Time	4.5	50				0		0		0	ns
C <sub>IN</sub>	Input Capacitance					5	10		10		10	pF
C <sub>OUT</sub>	Out put Capacitance					10						pF
C <sub>PD</sub> (*)	Power Dissipation Capacitance			HCT564		67						pF
				HCT574		63						

(\*) C<sub>PD</sub> 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<sub>CC(OPR)</sub> = C<sub>PD</sub> • V<sub>CC</sub> • f<sub>IN</sub> + I<sub>CC</sub> (per Flip-Flop)

SWITCHING CHARACTERISTICS TEST WAVEFORM



EACH FLIP-FLOP SHALL BE SET HIGH WHEN SWITCH IS CONNECTED TO GND LINE AND IT SHALL BE SET LOW WHEN SWITCH IS CONNECTED TO  $V_{CC}$  LINE.

## M54/M74HCT564/574

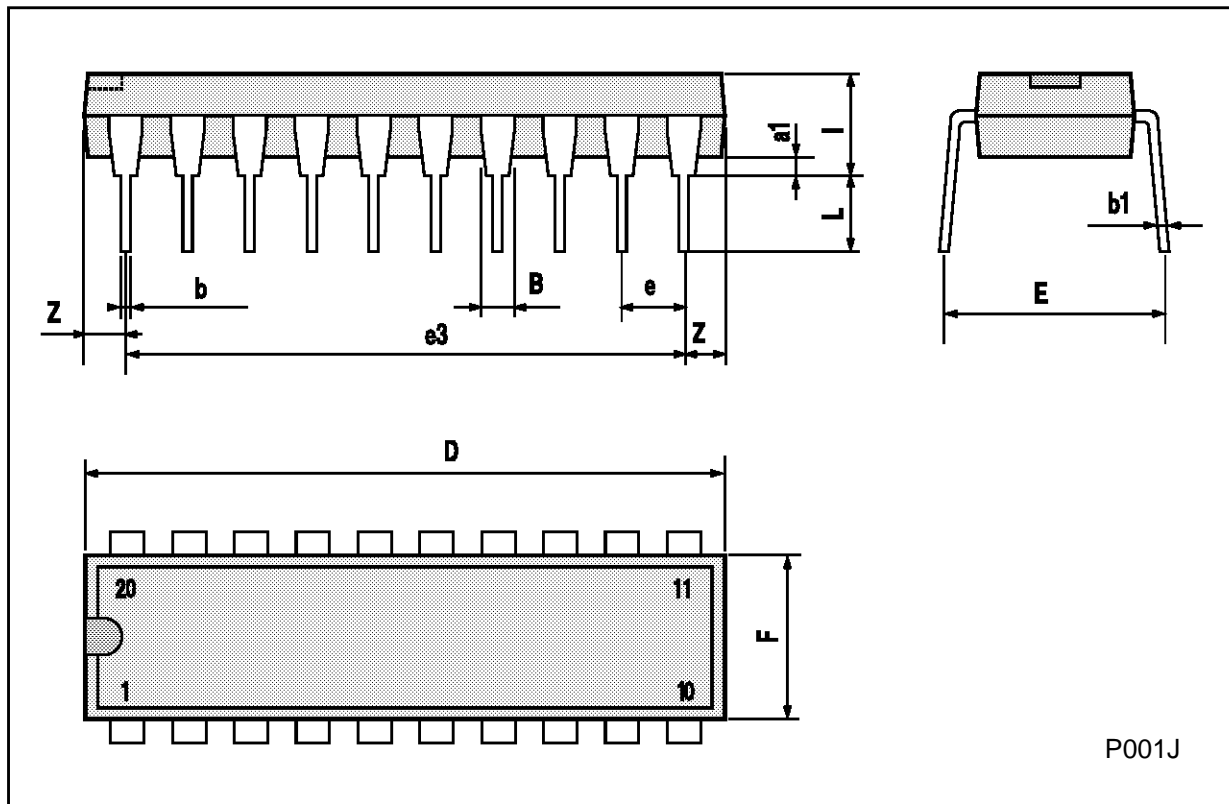
### TEST CIRCUIT $I_{CC}$ (Opr.)





**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



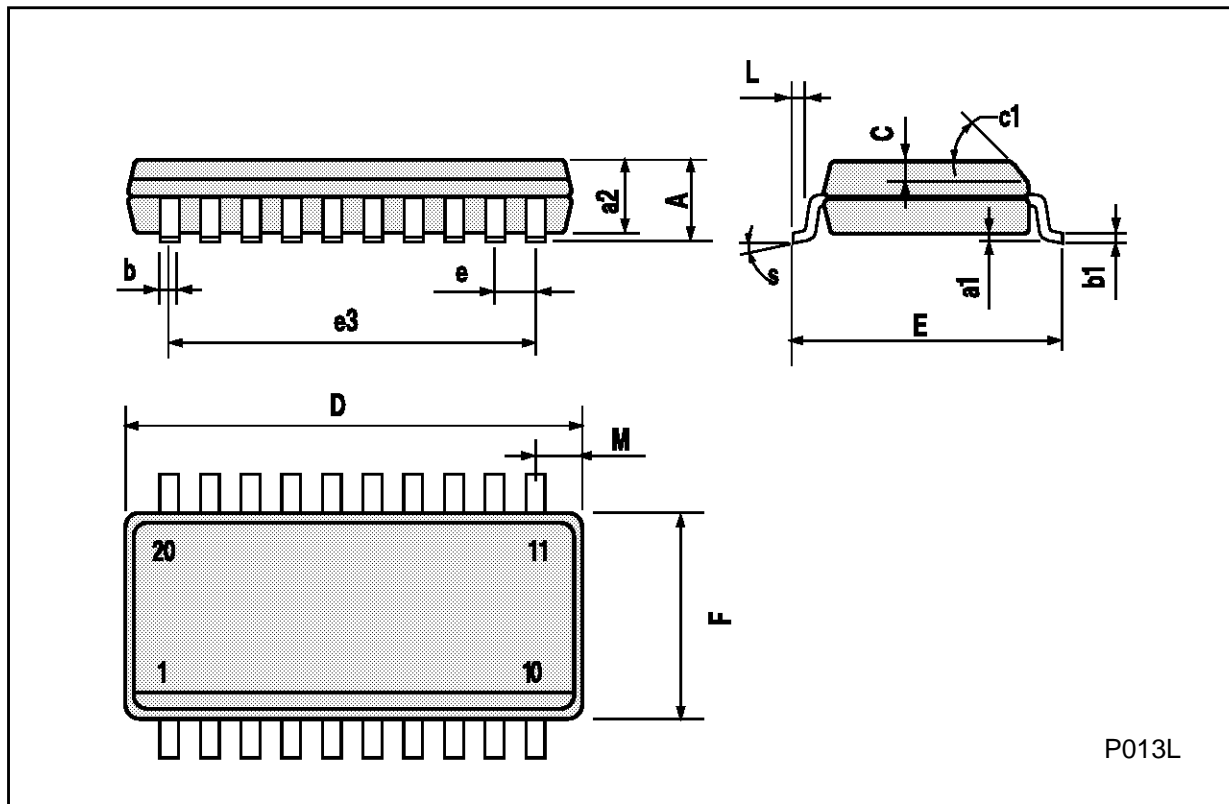
Ceramic DIP20 MECHANICAL DATA

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



**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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