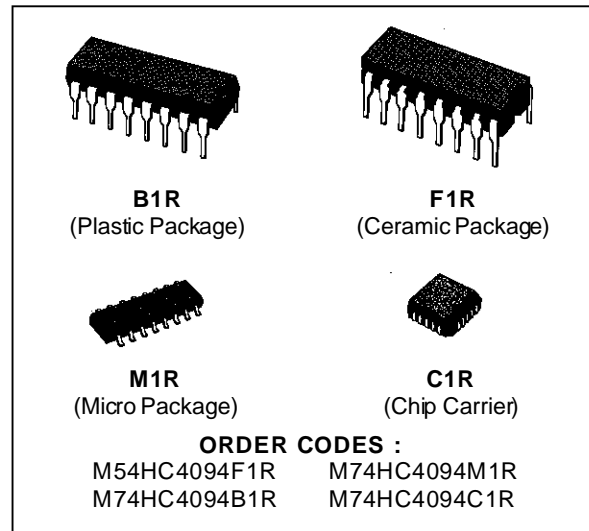


**8 BIT SIPO SHIFT LATCH REGISTER (3-STATE)**

- HIGH SPEED  
f<sub>MAX</sub> = 73 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
- HIGH NOISE IMMUNITY  
V<sub>NIH</sub> = V<sub>NIL</sub> = 28 % V<sub>CC</sub> (MIN.)
- OUTPUT DRIVE CAPABILITY  
10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE  
|I<sub>OH</sub>| = I<sub>OL</sub> = 4 mA (MIN.)
- BALANCED PROPAGATION DELAYS  
t<sub>PLH</sub> = t<sub>PHL</sub>
- WIDE OPERATING VOLTAGE RANGE  
V<sub>CC</sub> (OPR) = 2 V TO 6 V
- PIN AND FUNCTION COMPATIBLE  
WITH 4094B



**DESCRIPTION**

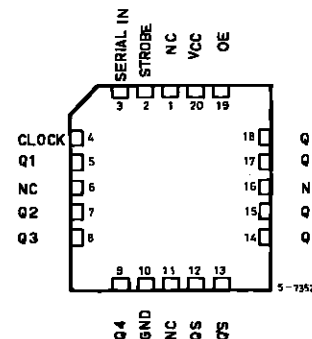
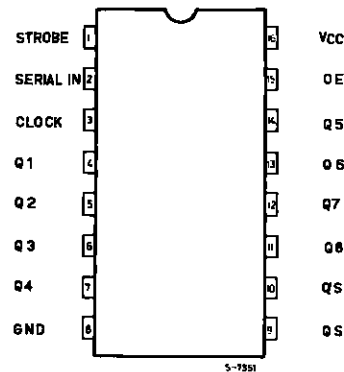
The M54/74HC4094 is a high speed CMOS 8 BIT SIPO SHIFT LATCH REGISTER fabricated with silicon gate C<sup>2</sup>MOS technology.

It has the same high speed performance of LSTTL combined with true CMOS low power consumption. This device consists of an 8-bit shift register and an 8-bit latch with 3-state output buffer. Data is shifted serially through the shift register on the positive going transition of the clock input signal. The output of the last stage (Q<sub>s</sub>) can be used to cascade several devices.

Data on the Q<sub>s</sub> output is transferred to a second output (Q<sub>s'</sub>) on the following negative transition of the clock input signal. The data of each stage of the shift register is provided with a latch, which latches data on the negative going transition of the STROBE input signal. When the STROBE input is held high, data propagates through the latch to a 3-state output buffer.

This buffer is enabled when OUTPUT ENABLE input is taken high. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

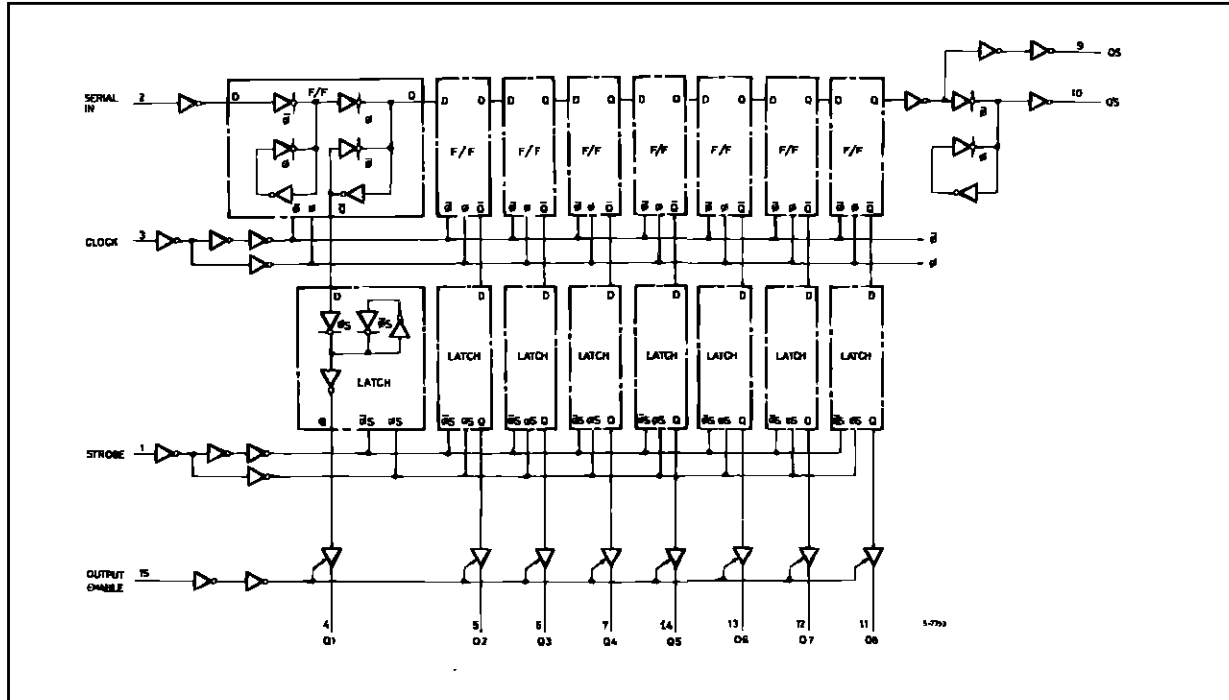
**PIN CONNECTIONS (top view)**



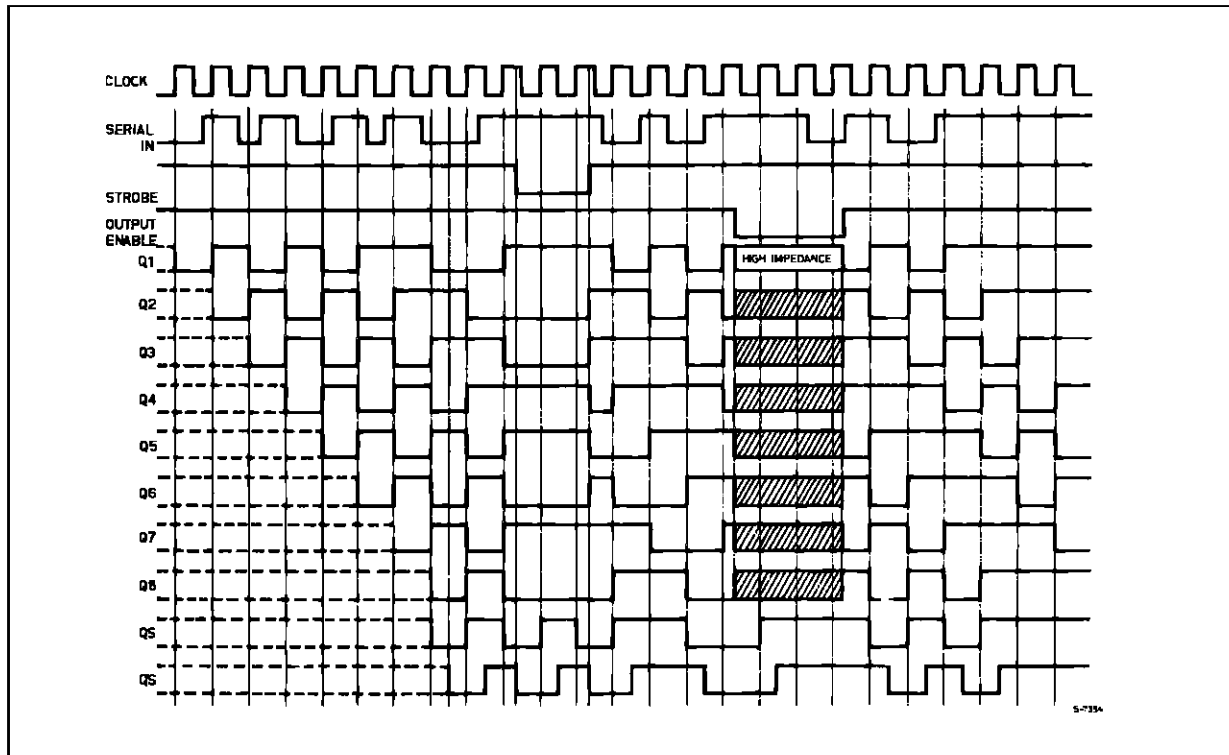
NC =  
No Internal  
Connection

# M54/M74HC4094

## LOGIC DIAGRAM



## LOGIC DIAGRAM

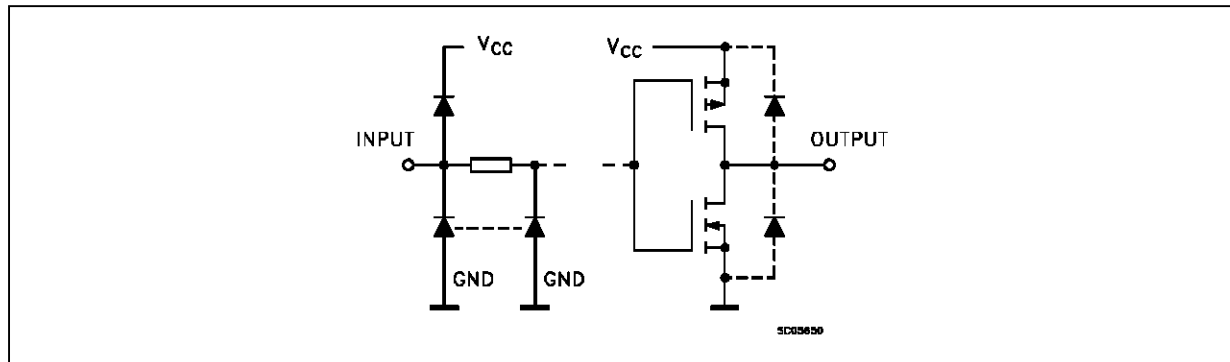


**TRUTH TABLE**

CK	OE	ST	SI	PARALLEL OUTPUT		SERIAL OUTPUT	
				Q1	Qn	Qs	Qs'
	H	H	L	L	Qn-1	Q7	NC
	H	H	H	H	Qn-1	Q7	NC
	H	L	X	NC	NC	Q7	NC
	L	X	X	Z	Z	Q7	NC
	H	X	X	NC	NC	NC	Qs
	L	X	X	Z	Z	NC	Qs

X: Don't Care Z: High Impedance NC: No Change

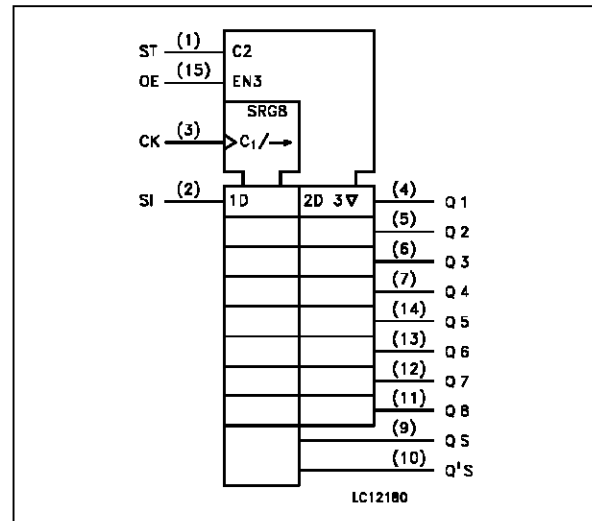
**INPUT AND OUTPUT EQUIVALENT CIRCUIT**



**PIN DESCRIPTION**

PIN No	SYMBOL	NAME AND FUNCTION
1	STROBE	Strobe Input
2	SERIAL IN	Serial Input
3	CLOCK	Clock Input
4, 5, 6, 7, 14, 13, 12, 11	Q1 to Q7	Parallel Outputs
9, 10	QS Q'S	Serial Outputs
15	OE	Output Enable Input
8	GND	Ground (0V)
16	V <sub>CC</sub>	Positive Supply Voltage

**IEC LOGIC SYMBOL**



## M54/M74HC4094

### 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	± 25	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 50	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	2 to 6	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> = 2 V V <sub>CC</sub> = 4.5 V V <sub>CC</sub> = 6 V	0 to 1000 0 to 500 0 to 400	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	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 <sub>IL</sub>	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 <sub>OH</sub>	High Level Output Voltage	2.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	I <sub>O</sub> = -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 <sub>O</sub> = -4.0 mA	4.18	4.31		4.13		4.10			
		6.0		I <sub>O</sub> = -5.2 mA	5.68	5.8		5.63		5.60		
V <sub>OL</sub>	Low Level Output Voltage	2.0	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
		4.5				0.0	0.1		0.1		0.1	
		6.0				0.0	0.1		0.1		0.1	
		4.5	I <sub>O</sub> = 4.0 mA		0.17	0.26		0.37		0.40		
		6.0		I <sub>O</sub> = 5.2 mA		0.18	0.26		0.37		0.40	
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND				±0.1		±1		±1	μA
I <sub>OZ</sub>	3 State Output Off State Current	6.0	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> V <sub>O</sub> = V <sub>CC</sub> or GND				±0.5		±5.0		±10	μA
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND				4		40		80	μA

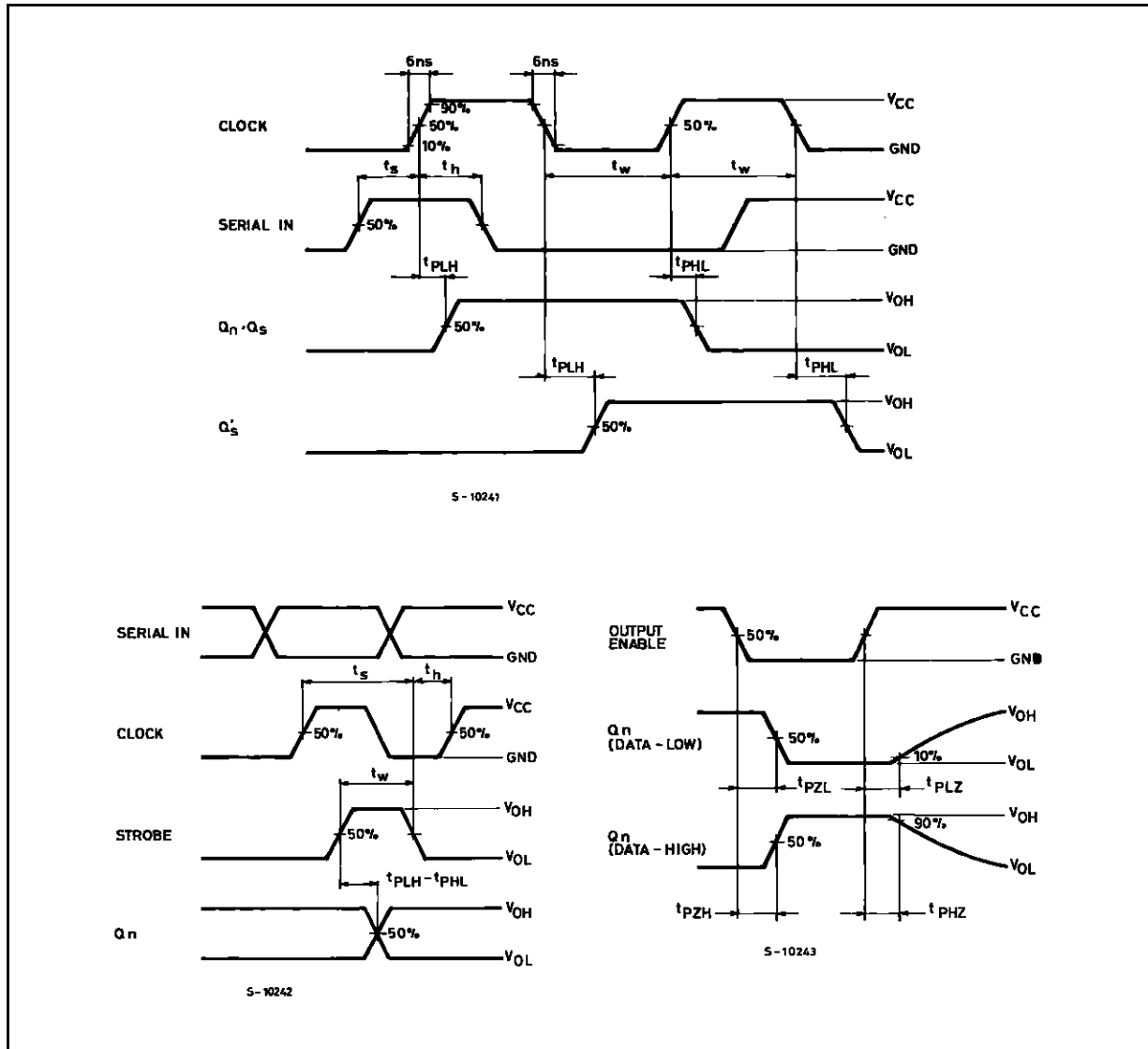
## M54/M74HC4094

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

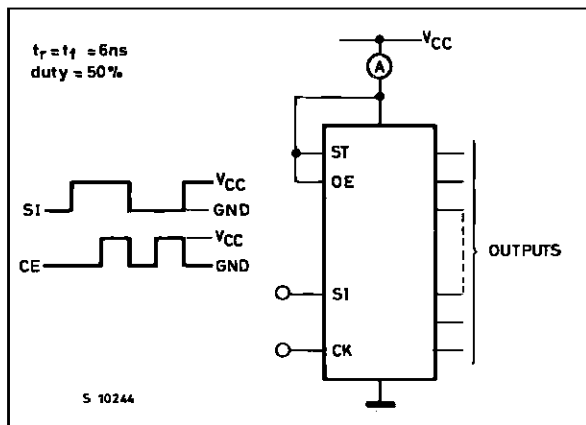
Symbol	Parameter	Test Conditions		Value						Unit	
		$V_{CC}$ (V)		$T_A = 25\text{ }^\circ\text{C}$ 54HC and 74HC			$-40$ to $85\text{ }^\circ\text{C}$ 74HC		$-55$ to $125\text{ }^\circ\text{C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}$ $t_{THL}$	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (CLOCK - $Q_n$ )	2.0			92	200		250		300	ns
		4.5			26	40		50		60	
		6.0			20	34		43		51	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (CLOCK - $Q_S, Q\bar{S}$ )	2.0			65	150		190		225	ns
		4.5			19	30		38		45	
		6.0			15	26		32		38	
$t_{PLH}$ $t_{PHL}$	Propagation Delay Time (STROBE - $Q_n$ )	2.0			75	160		200		240	ns
		4.5			20	32		40		48	
		6.0			16	27		34		41	
$t_{PZL}$ $t_{PZH}$	3 State Output Enable Time	2.0			58	150		190		225	ns
		4.5			16	30		38		45	
		6.0			13	26		32		38	
$t_{PHZ}$ $t_{PLZ}$	3 State Output Disable Time	2.0			35	150		190		225	ns
		4.5			16	30		38		45	
		6.0			13	26		32		38	
$f_{MAX}$	Maximum Clock Frequency	2.0			6	16		4.8		4	MHz
		4.5			30	66		24		20	
		6.0			35	80		28		24	
$t_{W(H)}$ $t_{W(L)}$	Minimum Pulse Width	2.0			17	75		95		110	ns
		4.5			7	15		19		22	
		6.0			6	13		16		19	
$t_{W(L)}$	Minimum Pulse Width	2.0			28	75		95		110	ns
		4.5			6	15		19		22	
		6.0			6	13		16		19	
$t_s$	Minimum Set-up Time (SI)	2.0			30	75		95		110	ns
		4.5			7	15		19		22	
		6.0			5	13		16		19	
$t_s$	Minimum Set-up Time (ST)	2.0			45	100		125		145	ns
		4.5			10	20		25		29	
		6.0			8	17		21		25	
$t_h$	Minimum Hold Time (SI, ST)	2.0				0		0		0	ns
		4.5				0		0		0	
		6.0				0		0		0	
$C_{IN}$	Input Capacitance				5	10		10		10	pF
$C_{PD} (*)$	Power Dissipation Capacitance				140						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.  $I_{CC(opr)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC0}/2$  (per FLIP/FLOP)

SWITCHING CHARACTERISTICS TEST WAVEFORM



TEST WAVEFORM  $I_{CC}$  (Op.)



$C_{PD}$  CALCULATION

$C_{PD}$  is to be calculated with the following formula by using the measured value of  $I_{CC}$  (Op.) in the test circuit opposite.

$$C_{PD} = \frac{I_{CC} (Op)}{f_{IN} \times V_{CC}}$$

In determining the typical value of  $C_{PD}$ , a relatively high frequency of 1 MHz was applied to  $f_{IN}$ , in order to eliminate any error caused by the quiescent supply current.

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	



 G (Seating Plane Coplanarity)

P027A

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