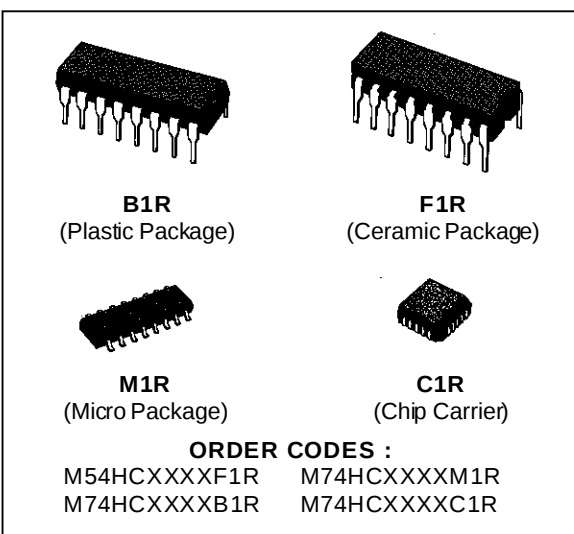


HC4518 DUAL DECADE COUNTER HC4520 DUAL 4 BIT BINARY COUNTER

- **HIGH SPEED**
 $f_{MAX} = 55 \text{ MHz (TYP.) at } V_{CC} = 5 \text{ V}$
- **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**
 4520B/4518B



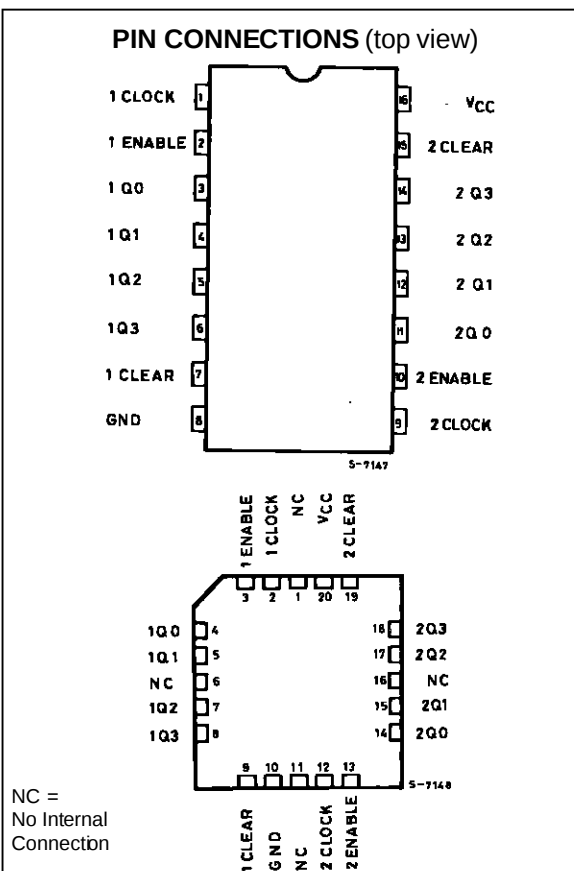
DESCRIPTION

The M54/74HC4518/4520 are high speed CMOS DUAL 4 BIT BINARY COUNTERS fabricated in silicon gate C²MOS technology. They have the same high speed performance of LSTTL combined with true CMOS low power consumption.

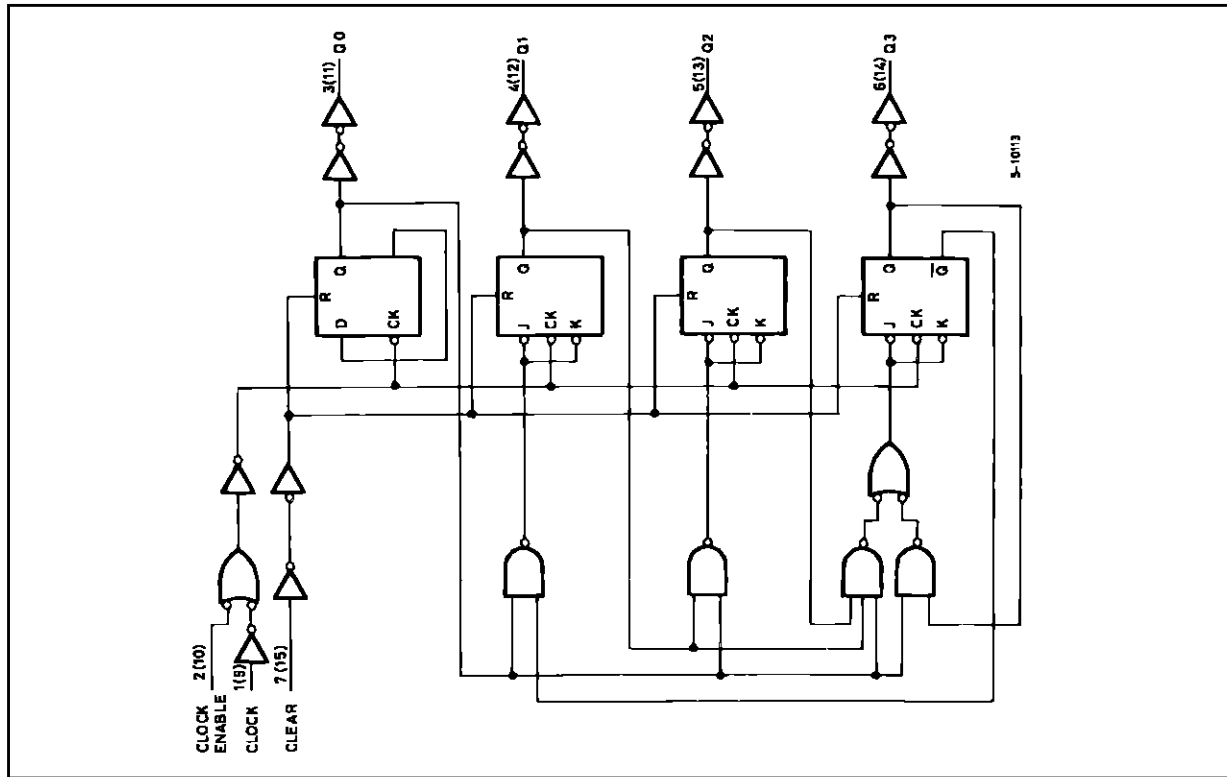
They consists of two identical internally synchronous 4-stage counters. The counter stages are D-type flip-flops having interchangeable Clock and ENABLE inputs for incrementing on either the positive-going or negative-going transition.

For single-unit operation the ENABLE input is maintained "high" and the counter advances on each positive-going transition of the CLOCK. The counters are cleared by high levels on their clear lines. The counter can be cascaded in the ripple mode by connecting Q4 to the enable input of the subsequent counter while the clock input of the latter is held permanently low.

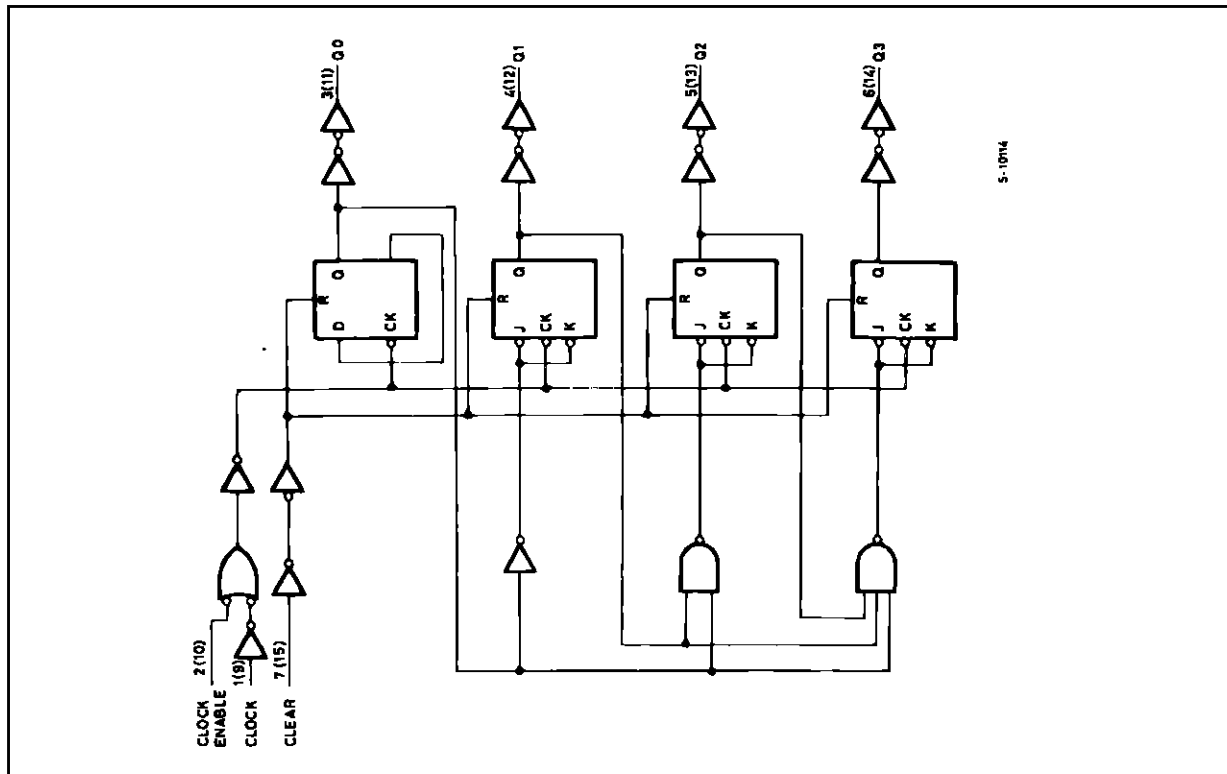
All inputs are equipped with protection circuits against static discharge and transient excess voltage.



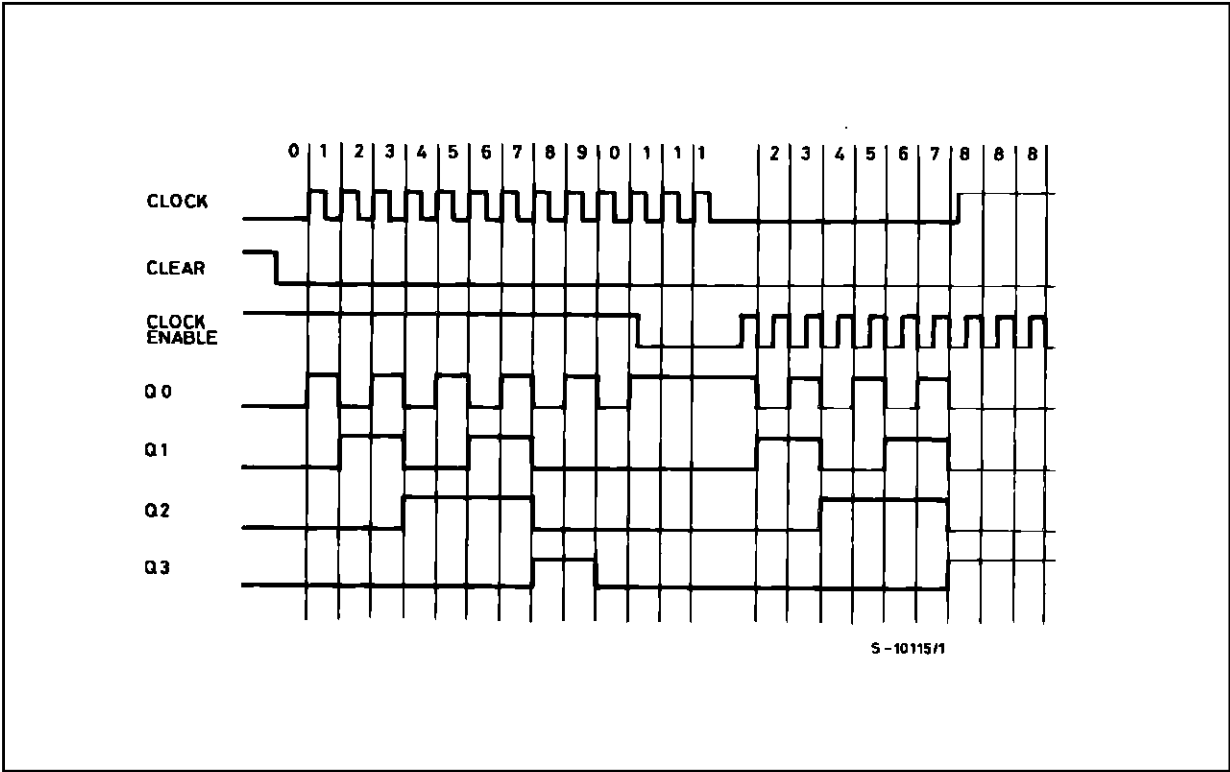
LOGIC DIAGRAM (1/2 HC4518)



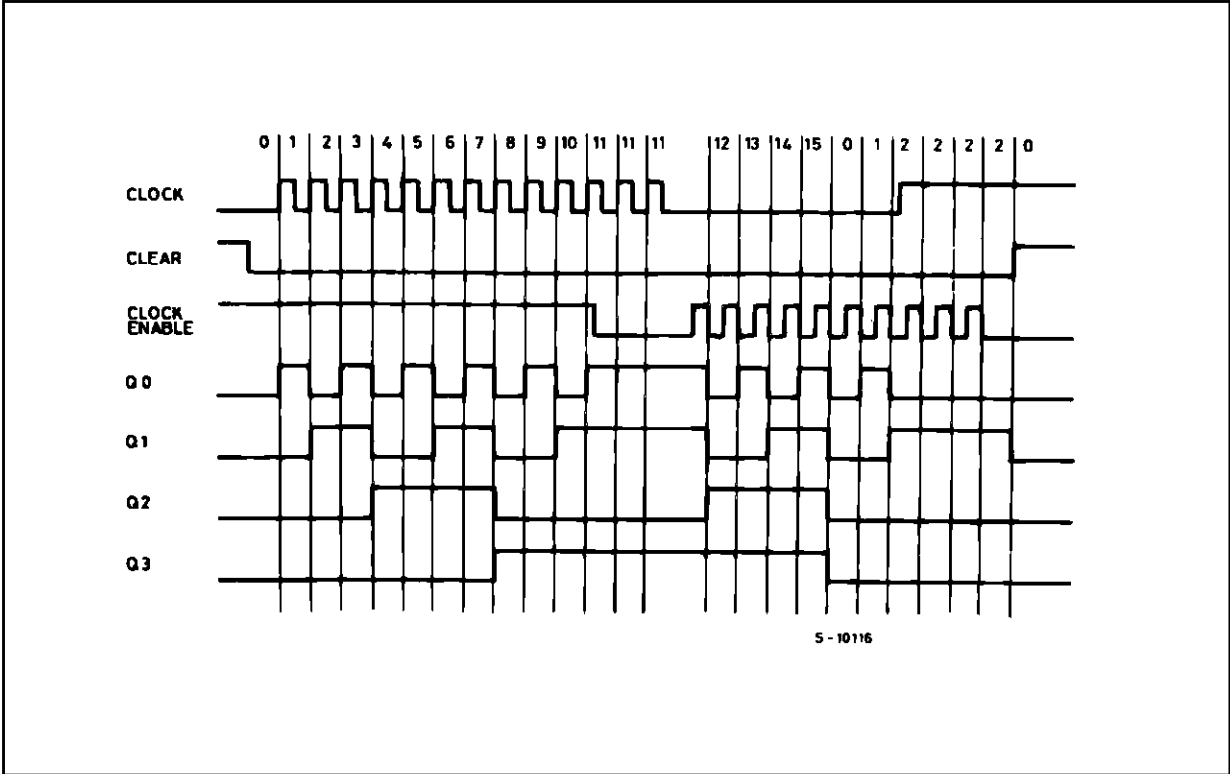
LOGIC DIAGRAM (1/2 HC4520)



TIMING CHART (HC4518)



TIMING CHART (HC4520)



TRUTH TABLE

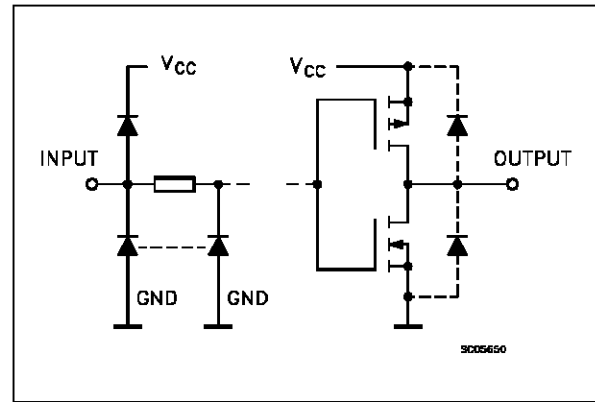
INPUTS			FUNCTION
CLOCK	ENABLE	CLEAR	
	H	L	INCREMENT COUNTER
L		L	INCREMENT COUNTER
	X	L	NO CHANGE
X		L	NO CHANGE
	L	L	NO CHANGE
H		L	NO CHANGE
X	X	H	Q0 THRU Q3 = L

X: Don't Care Z: High Impedance

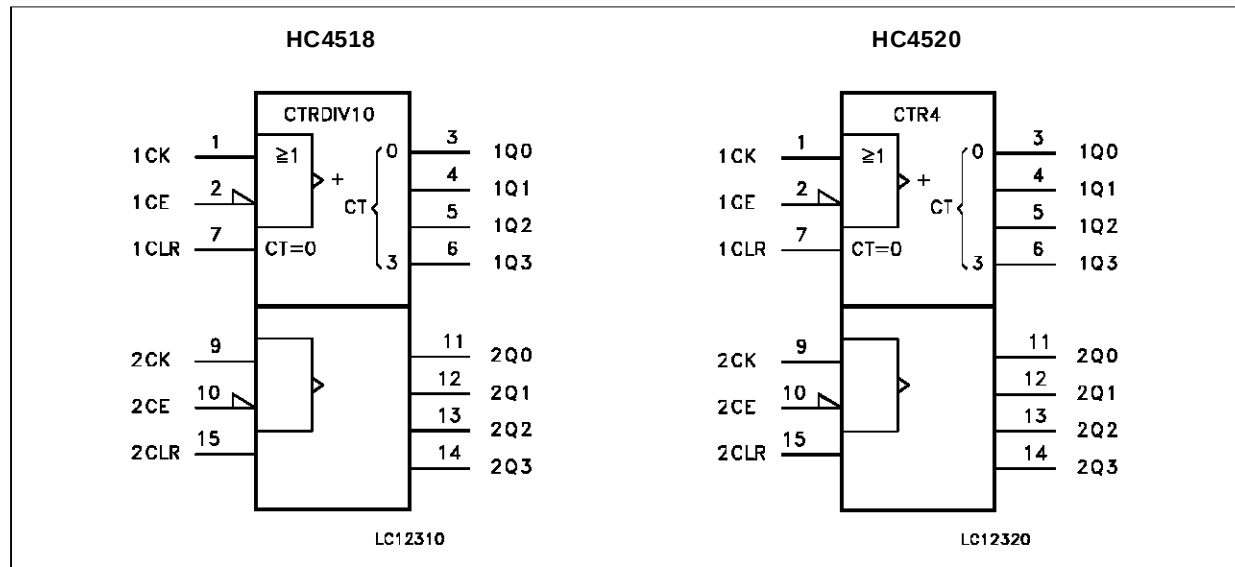
PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 9	1CLOCK, 2CLOCK	Clock Inputs (LOW to HIGH, Edge-triggered)
2, 10	1ENABLE, 2ENABLE	Clock Enable Inputs
3, 4, 5, 6	1Q0 to 1Q3	Data Outputs
7, 15	1CLEAR, 2CLEAR	Asynchronous Reset Inputs (Active LOW)
11, 12, 13, 14	2Q0 to 2Q3	Data Outputs
8	GND	Ground (0V)
16	Vcc	Positive Supply Voltage

INPUT AND OUTPUT EQUIVALENT CIRCUIT



IEC LOGIC SYMBOLS



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

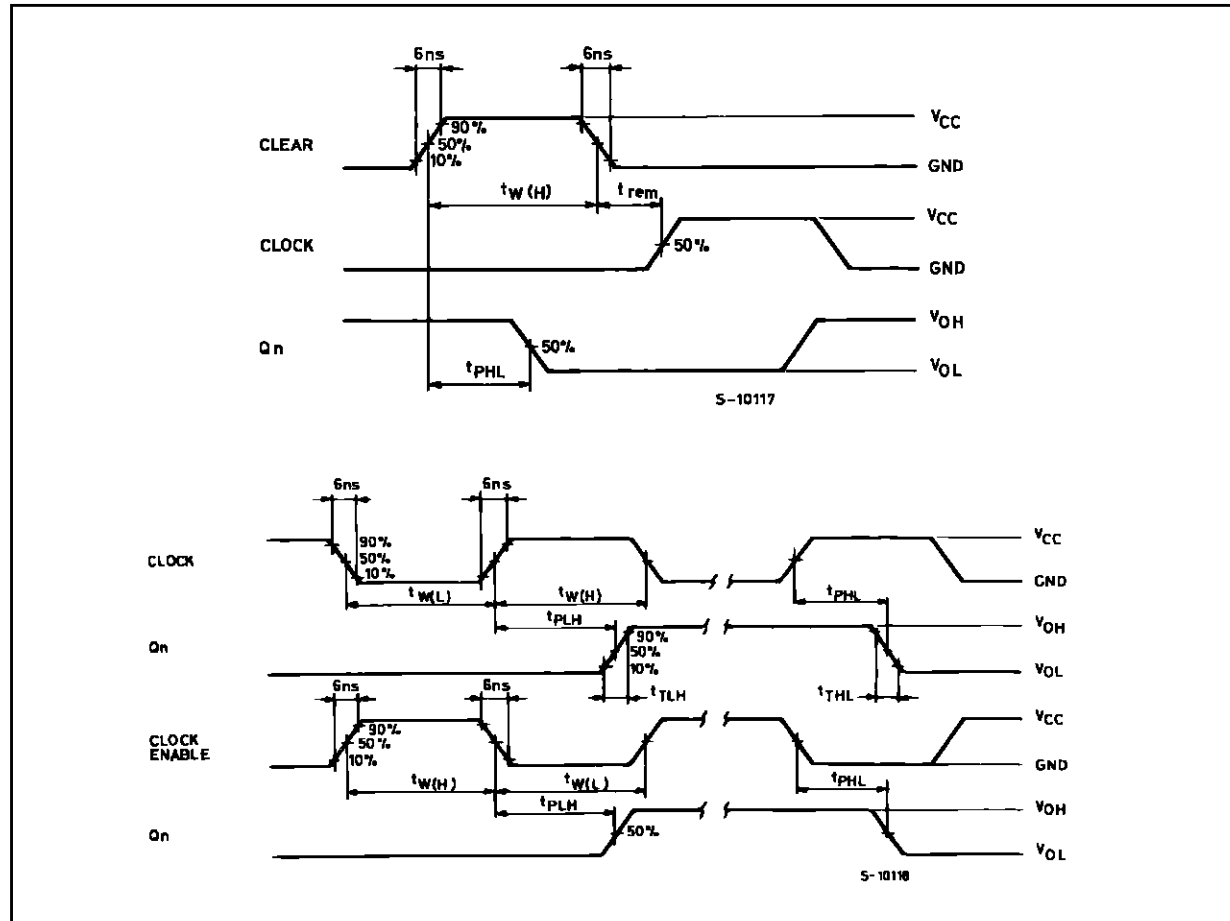
Symbol	Parameter	Test Conditions			Value						Unit	
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC			
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V _{IH}	High Level Input Voltage	2.0		1.5			1.5		1.5		V	
		4.5		3.15			3.15		3.15			
		6.0		4.2			4.2		4.2			
V _{IL}	Low Level 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		0.37			0.40
		6.0			I _O = 5.2 mA		0.18	0.26		0.37		
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 ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

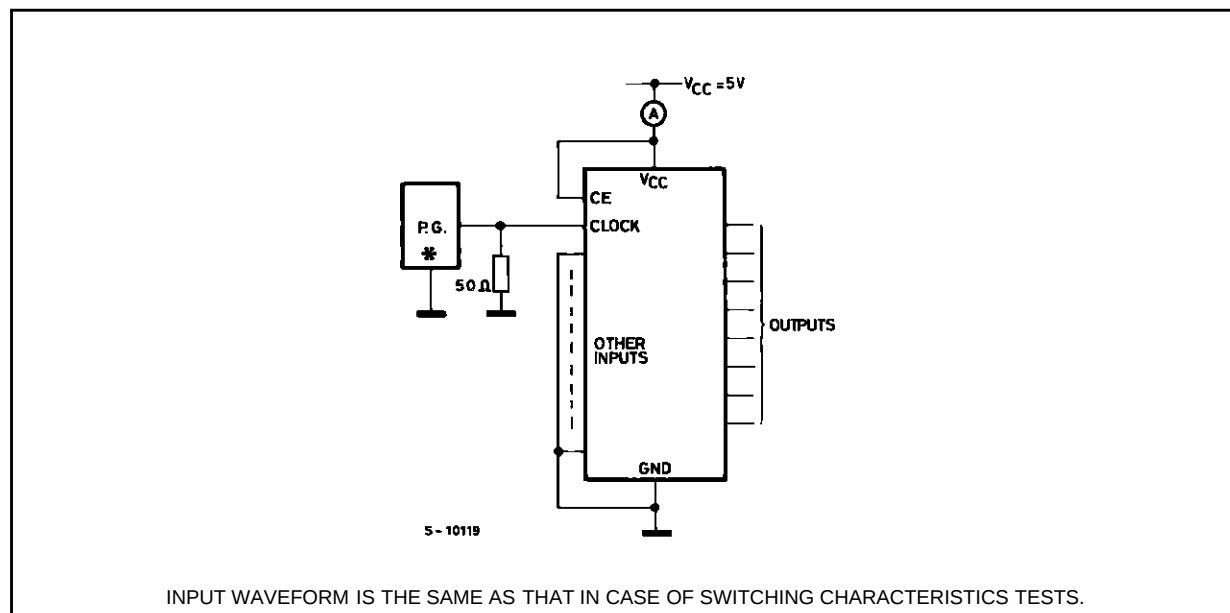
Symbol	Parameter	Test Conditions		Value						Unit	
		V _{CC} (V)		T _A = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t _{TLH} t _{THL}	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t _{PLH} t _{PHL}	Propagation Delay Time (CK, CE - Q _n)	2.0			72	160		200		240	ns
		4.5			22	32		40		48	
		6.0			18	27		34		41	
t _{PHL}	Propagation Delay Time (CLR - Q _n)	2.0			65	150		190		225	ns
		4.5			20	30		38		45	
		6.0			16	26		33		38	
f _{MAX}	Maximum Clock Frequency	2.0			6	23		4.8		4	MHz
		4.5			30	51		24		20	
		6.0			35	60		28		24	
t _{W(H)} t _{W(L)}	Minimum Pulse Width (CK, CE)	2.0			25	75		95			ns
		4.5			6	15		19			
		6.0			5	13		16			
t _{W(L)}	Minimum Pulse Width (CLR)	2.0			20	75		95		110	ns
		4.5			5	15		19		22	
		6.0			4	13		16		19	
t _{REM}	Minimum Removal Time (CLR)	2.0			21	50		60		75	ns
		4.5			3	10		12		15	
		6.0			3	9		11		13	
C _{IN}	Input Capacitance				5	10		10		10	pF
C _{PD} (*)	Power Dissipation Capacitance		for HC4518 for HC4520		38 32						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 COUNTER)

SWITCHING CHARACTERISTICS TEST WAVEFORMS



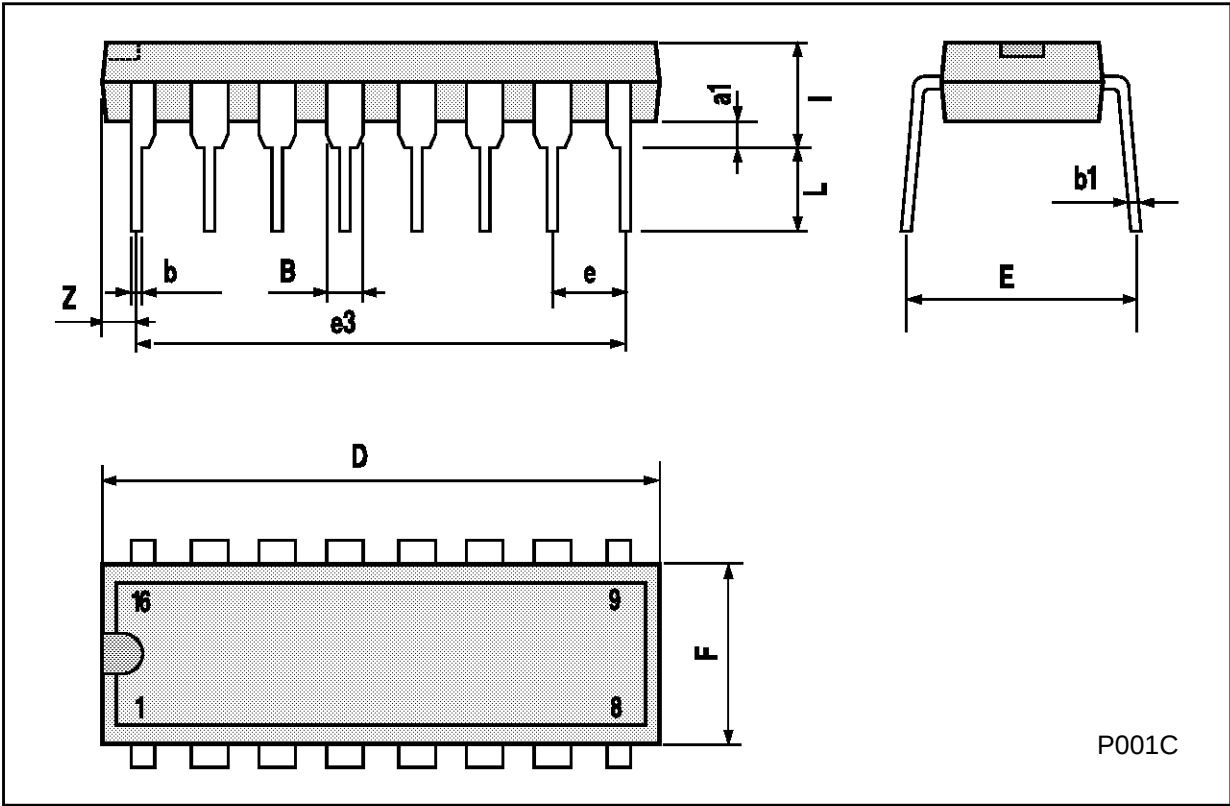
TEST CIRCUIT I_{CC} (Opr.)



INPUT WAVEFORM IS THE SAME AS THAT IN CASE OF SWITCHING CHARACTERISTICS TESTS.

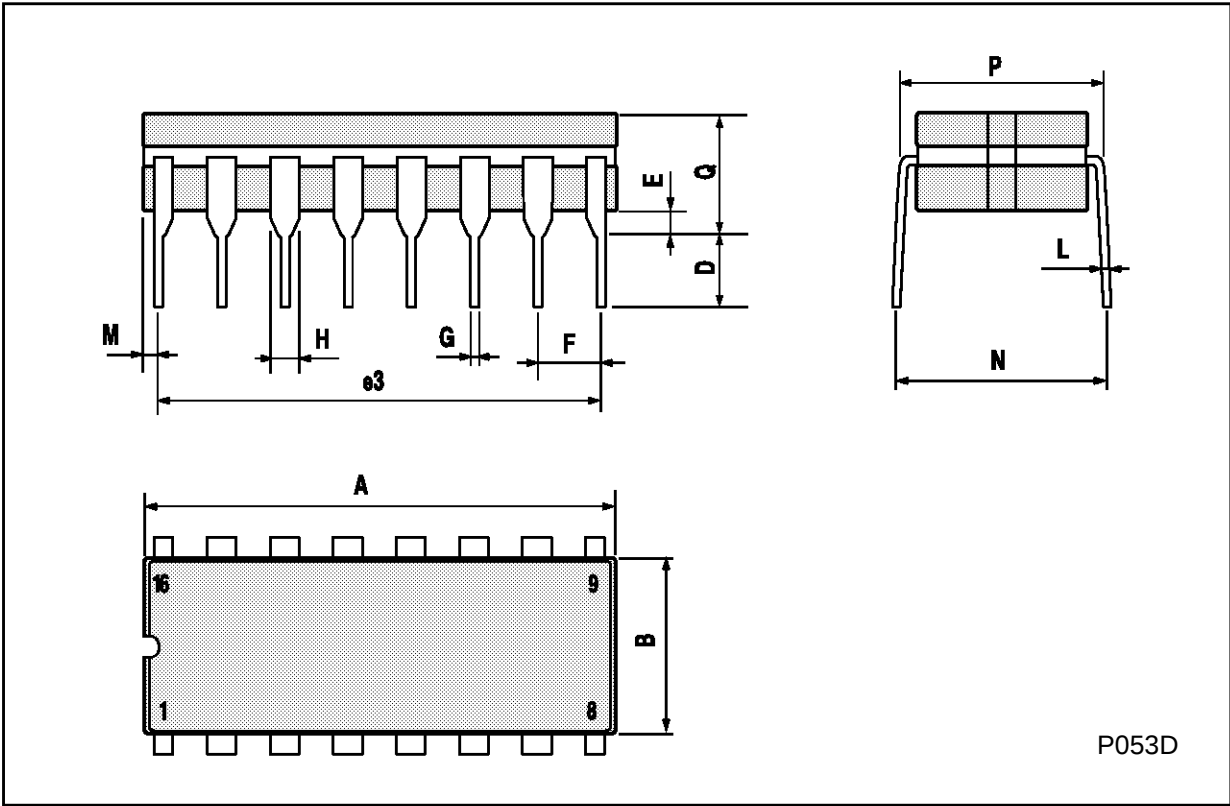
Plastic DIP16 (0.25) MECHANICAL DATA

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



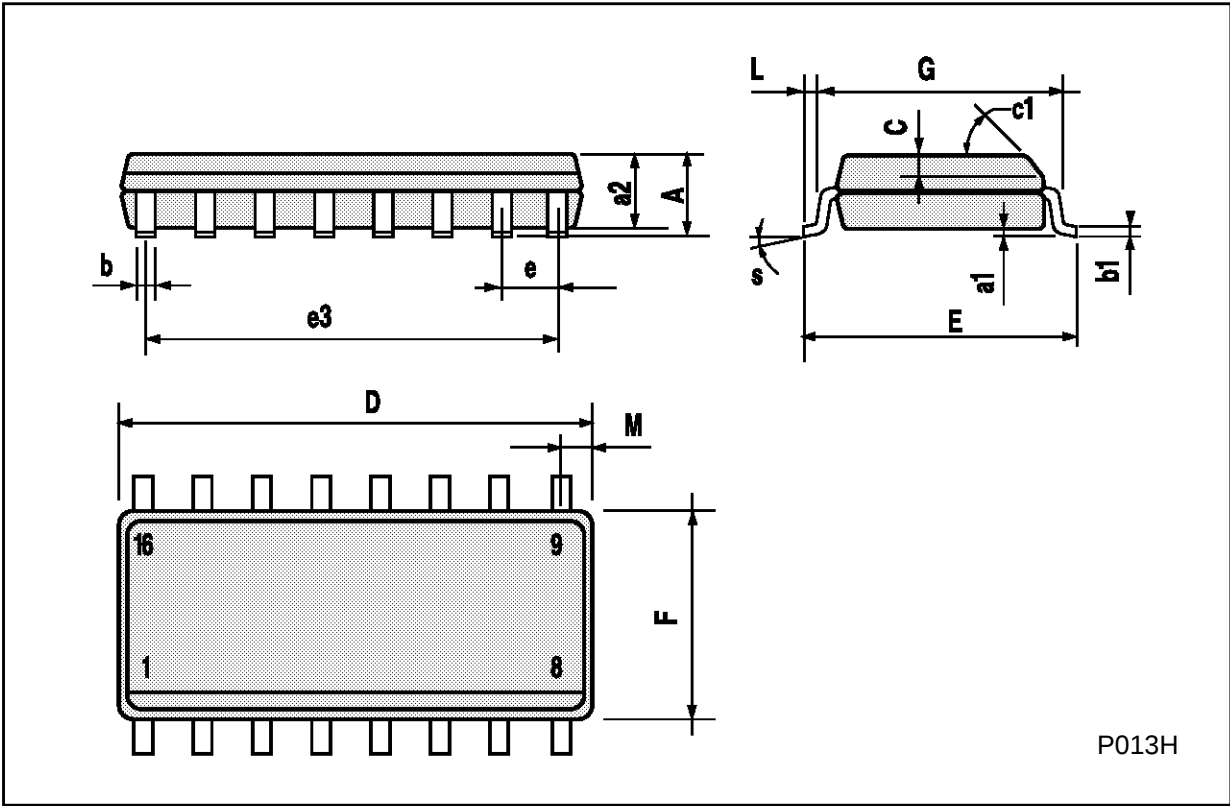
Ceramic DIP16/1 MECHANICAL DATA

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.)					



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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