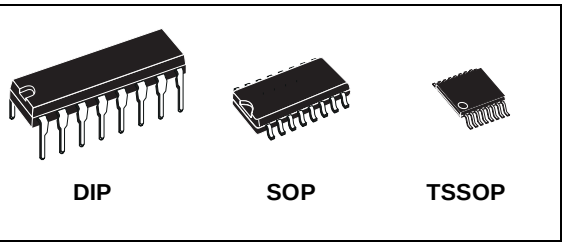
M74HC7292

PROGRAMMABLE DIVIDER/TIMER

- HIGH SPEED :
  f_{MAX} = 75 MHz (TYP.) at V_{CC} = 6V
- LOW POWER DISSIPATION:
  I_{CC} =4μA(MAX.) at T_A=25°C
- HIGH NOISE IMMUNITY:
  $V_{NIH} = V_{NIL}$ = 28 % V_{CC} (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL}$ = 4mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
  V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 7292



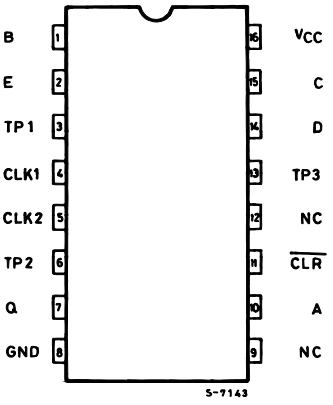
ORDER CODES

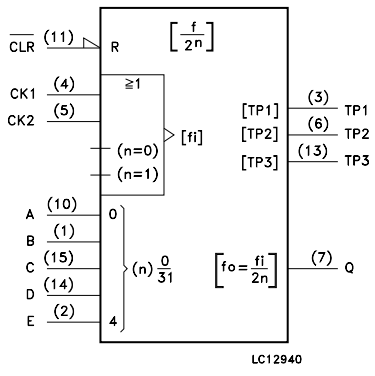
PACKAGE	TUBE	T & R
DIP	M74HC7292B1R	
SOP	M74HC7292M1R	M74HC7292RM13TR
TSSOP		M74HC7292TTR

DESCRIPTION

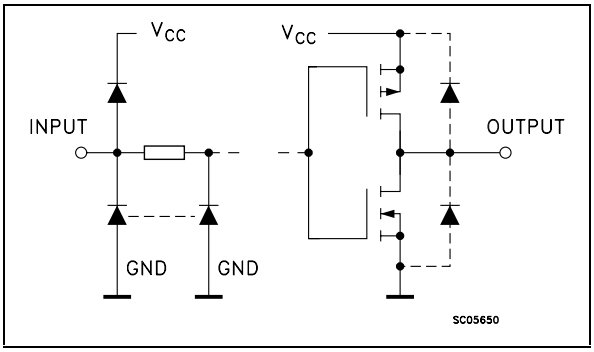
The M74HC7292 is an high speed CMOS PROGRAMMABLE DIVIDER/TIMER fabricated with silicon gate C^2MOS technology.
This device is a programmable frequency divider and have two clock inputs, either one may be used for clock gating. (see the function table).The M74HC7292 can divide from 2^2 to 2^{31}. This device feature an active-low clear input to initialize the state of all flip-flops. To facilitate incoming inspection, test points (TP1, TP2, TP3) are provided. All inputs are equipped with protection circuits against static discharge and transient excess voltage.
This device have all outputs "Totem Pole"

PIN CONNECTION AND IEC LOGIC SYMBOLS





INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
4, 5	CLK1, CLK2	Input Clock
1, 2, 10, 14, 15	A to E	Program Inputs
3, 6, 13	TP1, TP2, TP3	Test Point Outputs
11	$\overline{CLR}$	Clear (Active LOW)
7	Q	Output
8	GND	Ground (0V)
16	Vcc	Positive Supply Voltage

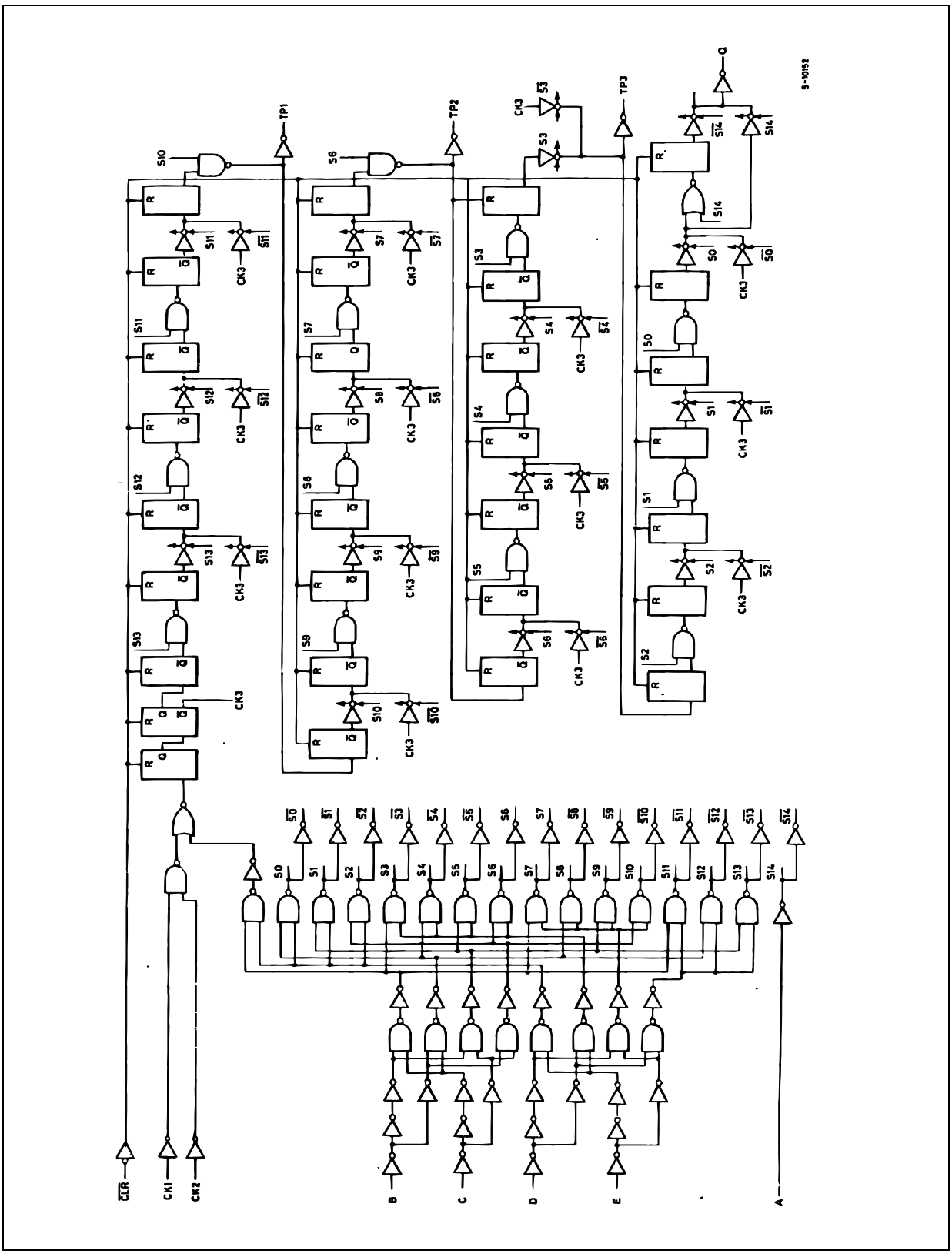
TRUTH TABLE

$\overline{CLR}$	CLK1	CLK2	Q OUTPUT MODE
L	X	X	CLEARED TO L
H	⎍	L	UP COUNT
H	L	⎍	
H	H	X	NO CHANGE
H	X	H	

FUNCTIONAL TABLE

PROGRAMMING INPUTS					FREQUENCY DIVISION							
					Q		TP1		TP2		TP3	
E	D	C	B	A	BINARY	DECIMAL	BINARY	DECIMAL	BINARY	DECIMAL	BINARY	DECIMAL
L	L	L	L	L	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	L	H	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit	Inhibit
L	L	L	H	L	2^2	4	2^9	512	2^{17}	131.072	2^{24}	16.777.216
L	L	L	H	H	2^3	8	2^9	512	2^{17}	131.072	2^{24}	16.777.216
L	L	H	L	L	2^4	16	2^9	512	2^{17}	131.072	2^{24}	16.777.216
L	L	H	L	H	2^5	32	2^9	512	2^{17}	131.072	2^{24}	16.777.216
L	L	H	H	L	2^6	64	2^9	512	2^{17}	131.072	2^{24}	16.777.216
L	L	H	H	H	2^7	128	2^9	512	2^{17}	131.072	2^{24}	16.777.216
L	H	L	L	L	2^8	256	2^9	512	2^{17}	131.072	2^2	4
L	H	L	L	H	2^9	512	2^9	512	2^{17}	131.072	2^2	4
L	H	L	H	L	2^{10}	1.024	2^9	512	2^{17}	131.072	2^4	16
L	H	L	H	H	2^{11}	2.048	2^9	512	2^{17}	131.072	2^4	16
L	H	H	L	L	2^{12}	4.096	2^9	512	2^{17}	131.072	2^6	64
L	H	H	L	H	2^{13}	8.192	2^9	512	2^{17}	131.072	2^6	64
L	H	H	H	L	2^{14}	16.384	2^9	512	Disabled Low		2^8	256
H	H	H	H	H	2^{15}	32.768	2^9	512	Disabled Low		2^8	256
H	L	L	L	L	2^{16}	65.536	2^9	512	2^3	8	2^{10}	1.024
H	L	L	L	H	2^{17}	131.072	2^9	512	2^3	8	2^{10}	1.024
H	L	L	H	L	2^{18}	262.144	2^9	512	2^5	32	2^{12}	4.096
H	L	L	H	H	2^{19}	524.288	2^9	512	2^5	32	2^{12}	4.096
H	L	H	L	L	2^{20}	1.048.576	2^9	512	2^7	128	2^{14}	16.384
H	L	H	L	H	2^{21}	2.097.152	2^9	512	2^7	128	2^{14}	16.384
H	L	H	H	L	2^{22}	4.194.304	Disabled Low		2^9	512	2^{16}	65.536
H	L	H	H	H	2^{23}	8.388.608	Disabled Low		2^9	512	2^{16}	65.536
H	H	L	L	L	2^{24}	16.777.216	2^3	8	2^{11}	2.048	2^{18}	262.144
H	H	L	L	H	2^{25}	33.544.432	2^3	8	2^{11}	2.048	2^{18}	262.144
H	H	L	H	L	2^{26}	67.108.864	2^5	32	2^{13}	8.192	2^{20}	1.048.576
H	H	L	H	H	2^{27}	134.217.728	2^5	32	2^{13}	8.192	2^{20}	1.048.576
H	H	H	L	L	2^{28}	268.435.456	2^7	128	2^{15}	32.768	2^{22}	4.194.304
H	H	H	L	H	2^{29}	536.870.912	2^7	128	2^{15}	32.768	2^{22}	4.194.304
H	H	H	H	L	2^{30}	1.073.741.824	2^9	512	2^{17}	131.072	2^{24}	16.777.216
H	H	H	H	H	2^{31}	2.147.483.648	2^9	512	2^{17}	131.072	2^{24}	16.777.216

LOGIC DIAGRAM



This logic diagram has not be used to estimate propagation delays

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 Current	± 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 conditions is not implied
(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 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		-55 to 125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2.0V	0 to 1000	ns
		V_{CC} = 4.5V	0 to 500	ns
		V_{CC} = 6.0V	0 to 400	ns

DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				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 (Q)	2.0	I_O=-20 µA	1.9	2.0		1.9		1.9		V
		4.5	I_O=-20 µA	4.4	4.5		4.4		4.4		
		6.0	I_O=-20 µA	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_{OH}	High Level Output Voltage (TP)	2.0	I_O=-20 µA	1.9	2.0		1.9		1.9		V
		4.5	I_O=-20 µA	4.4	4.5		4.4		4.4		
		6.0	I_O=-20 µA	5.9	6.0		5.9		5.9		
		4.5	I_O=-1.0 mA	4.18	4.31		4.13		4.10		
		6.0	I_O=-1.3 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage (Q)	2.0	I_O=20 µA		0.0	0.1		0.1		0.1	V
		4.5	I_O=20 µA		0.0	0.1		0.1		0.1	
		6.0	I_O=20 µA		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	
V_{OL}	Low Level Output Voltage (TP)	2.0	I_O=20 µA		0.0	0.1		0.1		0.1	V
		4.5	I_O=20 µA		0.0	0.1		0.1		0.1	
		6.0	I_O=20 µA		0.0	0.1		0.1		0.1	
		4.5	I_O=1.0 mA		0.17	0.26		0.33		0.40	
		6.0	I_O=1.3 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 pF, Input $t_r = t_f$ = 6ns)

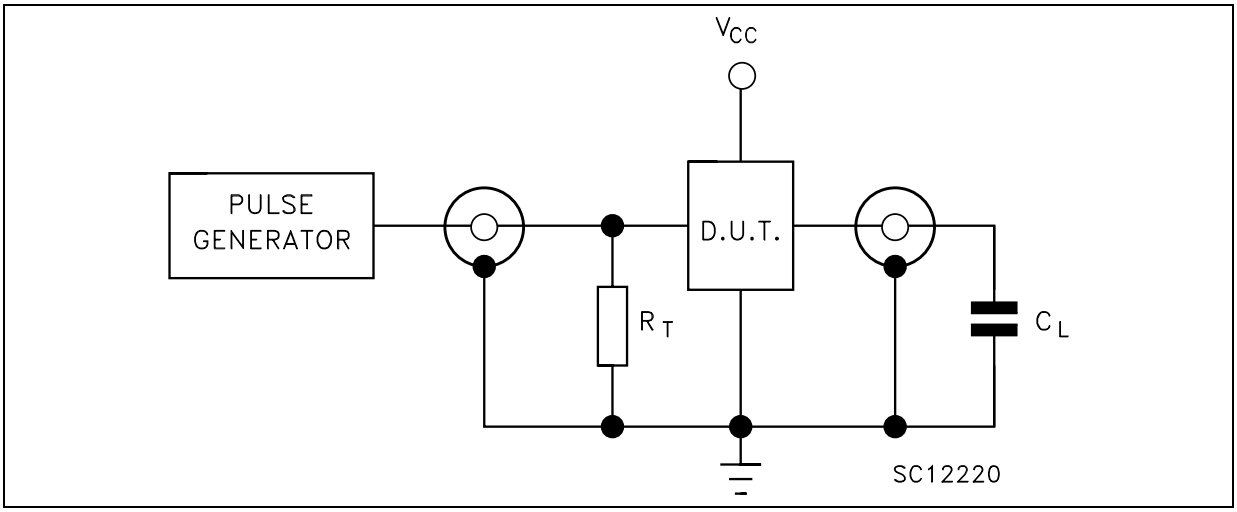
Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time (Q)	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t_{TLH} t_{THL}	Output Transition Time (TP)	2.0			116	225		280		340	ns
		4.5			29	45		56		68	
		6.0			25	38		48		57	
t_{PLH} t_{PHL}	Propagation Delay Time (CLK - Q)	2.0			160	350		440			ns
		4.5			46	70		88		105	
		6.0			39	60		75		90	
t_{PHL}	Propagation Delay Time ($\overline{CLR}$ - Q)	2.0			130	320		400		210	ns
		4.5			42	64		80		100	
		6.0			36	54		68		81	
f_{MAX}	Maximum Clock Frequency	2.0		5.0	21		4		3.4		MHz
		4.5		27	64		22		18		
		6.0		32	75		26		21		
$t_{W(L)}$ $t_{W(H)}$	Minimum Pulse Width (CLK)	2.0			40	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		20	
$t_{W(L)}$	Minimum Pulse Width ($\overline{CLR}$)	2.0			48	125		155		190	ns
		4.5			12	25		31		38	
		6.0			10	21		26		32	
t_{REM}	Minimum Removal Time	2.0				5		5		5	ns
		4.5				5		5		5	
		6.0				5		5		5	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
C_{IN}	Input Capacitance	5.0			5	10		10		10	pF
C_{PD}	Power Dissipation Capacitance (note 1)	5.0			21						pF

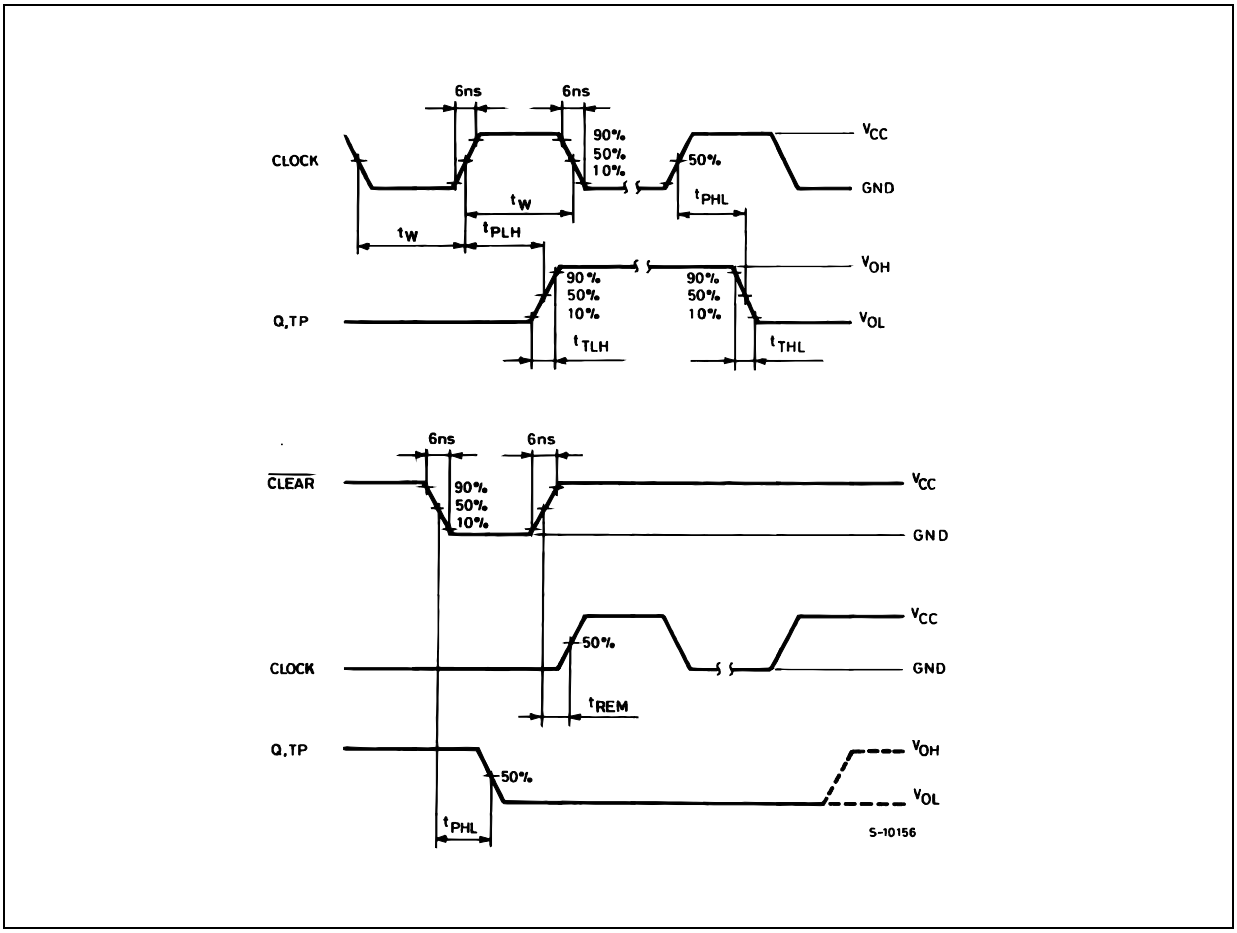
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

TEST CIRCUIT



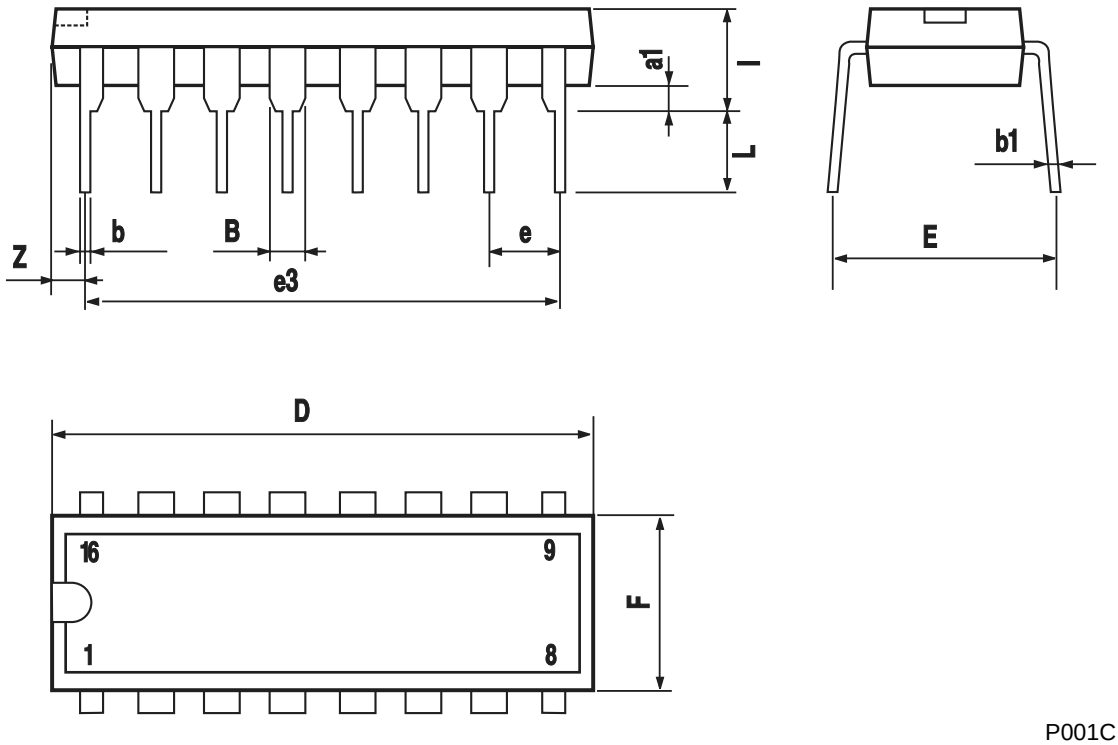
C_L = 50pF or equivalent (includes jig and probe capacitance)
$R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

SWITCHING CHARACTERISTICS TEST WAVEFORM (f=1MHz; 50% duty cycle)



Plastic DIP-16 (0.25) MECHANICAL DATA

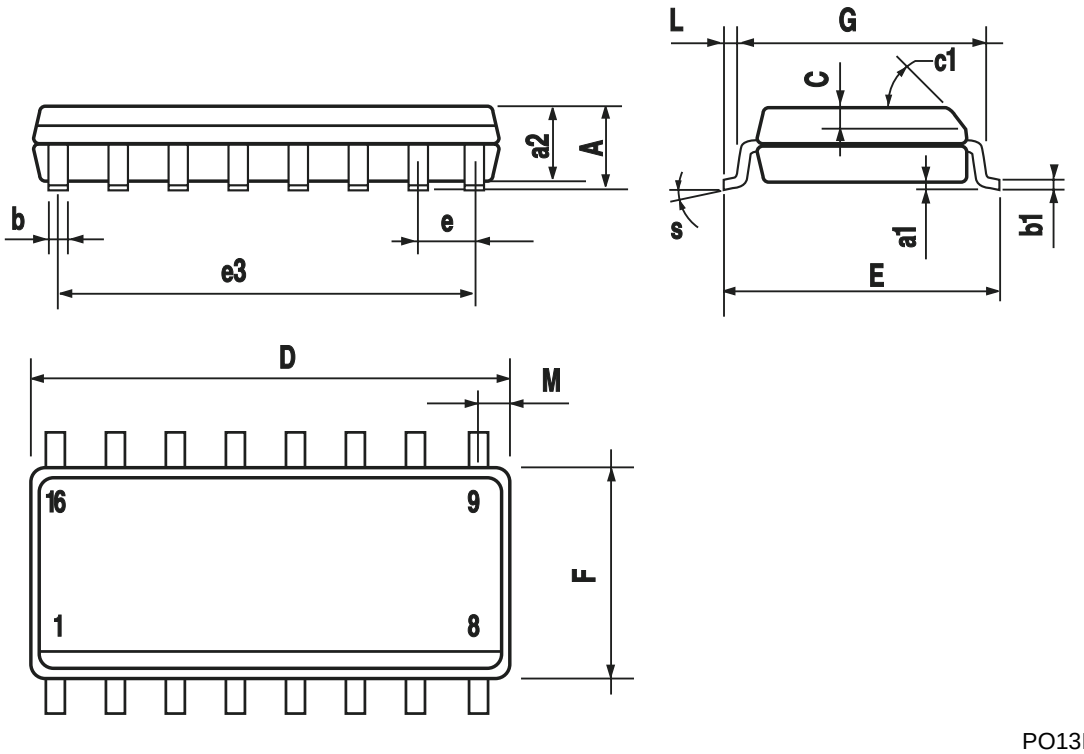
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C

SO-16 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	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.)					



PO13H

TSSOP16 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°		8°	0°		8°
L	0.45	0.60	0.75	0.018	0.024	0.030