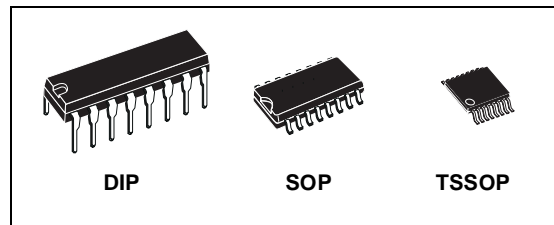




M74HC592

8 BIT REGISTER BINARY COUNTER

- HIGH SPEED:
 $f_{MAX} = 53 \text{ MHz (TYP.) at } V_{CC} = 6V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu\text{A (MAX.) at } T_A=25^\circ\text{C}$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 4\text{mA (MIN)}$
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- PIN AND FUNCTION COMPATIBLE WITH
 74 SERIES 592



ORDER CODES

PACKAGE	TUBE	T & R
DIP	M74HC592B1R	
SOP	M74HC592M1R	M74HC592RM13TR
TSSOP		M74HC592TTR

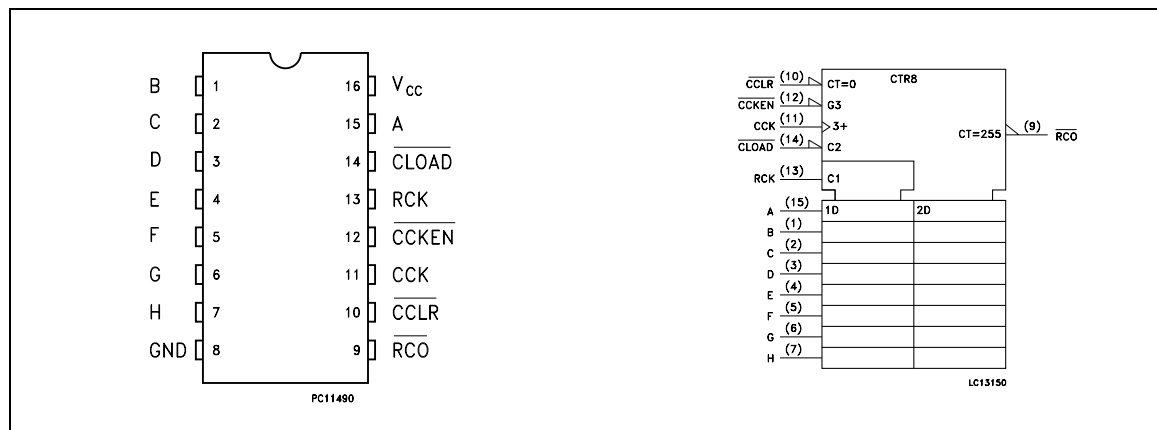
DESCRIPTION

The M74HC592 is an high speed CMOS 8-BIT REGISTER COUNTER fabricated with silicon gate C²MOS technology.

The M74HC592 is a parallel input, 8 bit storage register feeding an 8 bit binary counter. Both the register and the counter have individual positive edge triggered clock. In addition, the counter has

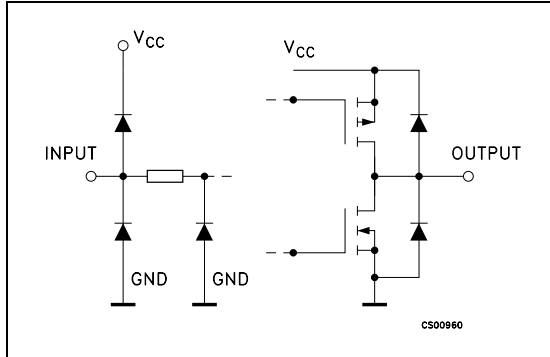
direct load and clear functions. Expansion is easily accomplished by connecting RCO at the first stage to the count enable of the second stage. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



M74HC592

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1 to 7, 15	A to H	Data Inputs
9	RCO	Ripple Carry Output
10	CCLR	Counter Clear Input
11	CCK	Counter Clock Input
12	CCKEN	Counter Clock Enable Input
13	RCK	Register Clock Input
14	CLOAD	Counter Load Input
8	GND	Ground (0V)
16	V _{CC}	Positive Supply Voltage

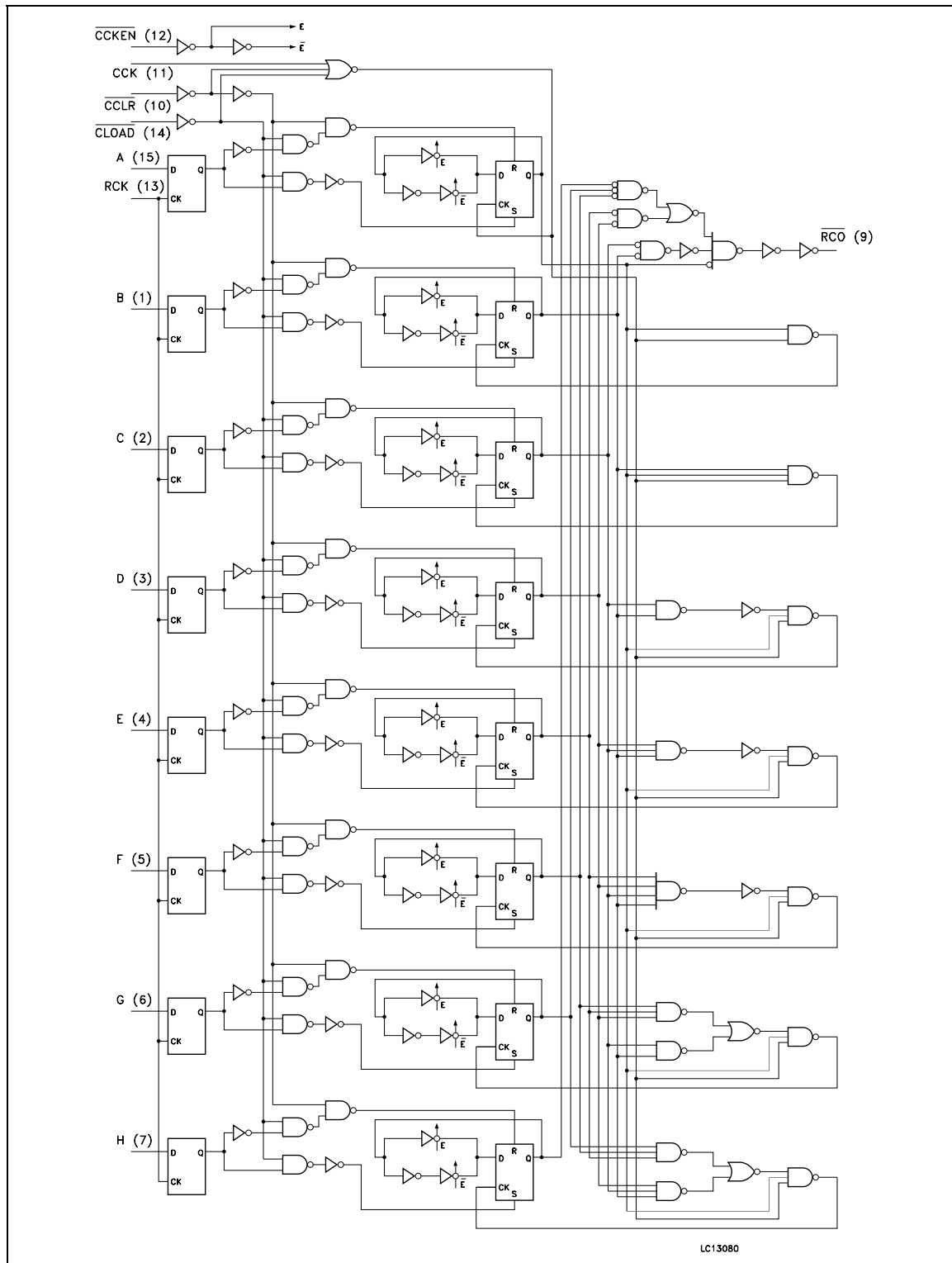
TRUTH TABLE

INPUTS					OUTPUT
RCK	$\overline{\text{CLOAD}}$	$\overline{\text{CCLR}}$	$\overline{\text{CCKEN}}$	CCK	
x	L	H	X	X	REGISTER DATA IS LOADED INTO COUNTER
x	H	L	X	X	COUNTER CLEAR
	H	H	X	X	THE DATA OF A THRU H INPUTS IS STORED INTO REGISTER
	H	H	X	X	REGISTER STATE IS NOT CHANGED
X	H	H	L		COUNTER ADVANCES THE COUNT
X	H	H	L		NO COUNT
X	H	H	H	X	NO COUNT

X: Don't Care

$\overline{\text{RCO}} = \overline{\text{QA}' \cdot \text{QB}' \cdot \text{QC}' \cdot \text{QD}' \cdot \text{QE}' \cdot \text{QF}' \cdot \text{QG}' \cdot \text{QH}'}$ (QA' to QH' : INTERNAL OUTPUTS OF THE COUNTER)

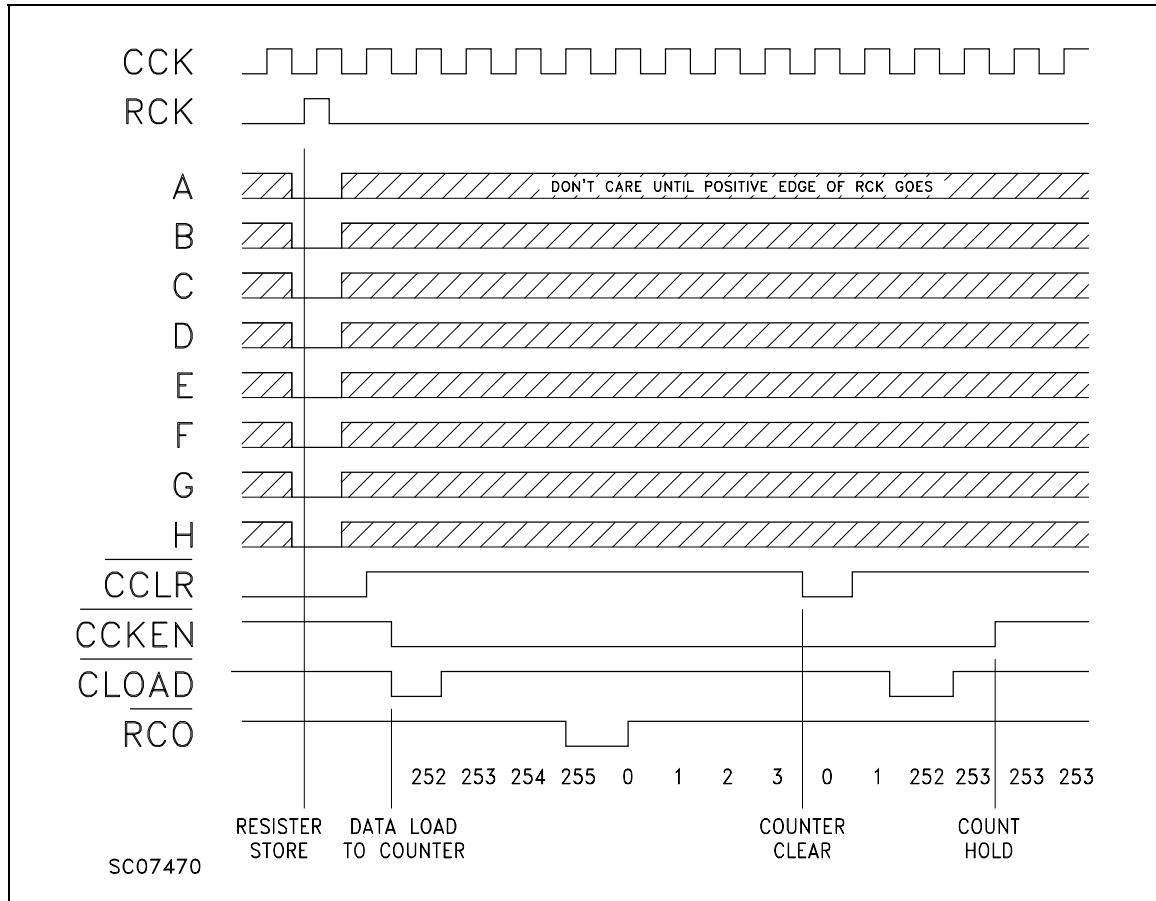
LOGIC DIAGRAM



This logic diagram has not be used to estimate propagation delays



TIMING CHART



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	
				$T_A = 25^\circ C$			$-40 \text{ to } 85^\circ C$		$-55 \text{ to } 125^\circ C$		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V_{IH}	High Level Input Voltage	V_{CC} (V)		1.5			1.5		1.5	V	
				3.15			3.15		3.15		
				4.2			4.2		4.2		
V_{IL}	Low Level Input Voltage	V_{CC} (V)				0.5		0.5		0.5	V
						1.35		1.35		1.35	
						1.8		1.8		1.8	
V_{OH}	High Level Output Voltage	V_{CC} (V)	$I_O = -20 \mu A$	1.9	2.0		1.9		1.9	V	
				4.4	4.5		4.4		4.4		
				5.9	6.0		5.9		5.9		
				4.18	4.31		4.13		4.10		
				5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage	V_{CC} (V)	$I_O = 20 \mu A$		0.0	0.1		0.1		0.1	V
					0.0	0.1		0.1		0.1	
					0.0	0.1		0.1		0.1	
					0.17	0.26		0.33		0.40	
					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

M74HC592

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

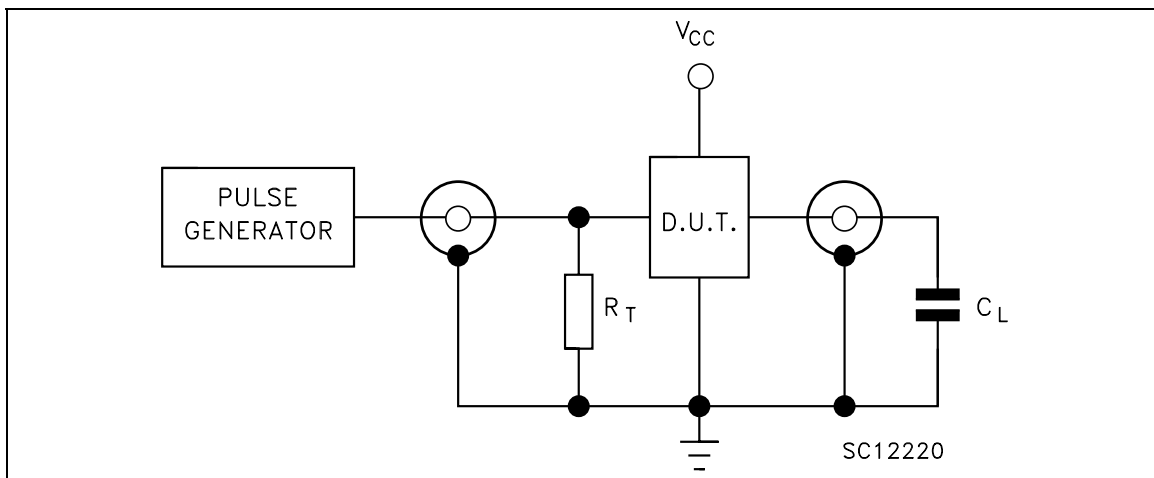
Symbol	Parameter	Test Condition V_{CC} (V)	Value						Unit	
			$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
			Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t_{TLH} t_{THL}	Output Transition Time	2.0		30	75		95		110	ns
		4.5		8	15		19		22	
		6.0		7	13		16		19	
t_{PLH} t_{PHL}	Propagation Delay Time (CCK - $\overline{\text{RCO}}$)	2.0		63	165		205		250	ns
		4.5		21	33		41		50	
		6.0		18	28		35		43	
t_{PLH} t_{PHL}	Propagation Delay Time (CLOAD - $\overline{\text{RCO}}$)	2.0		110	235		295		355	ns
		4.5		30	47		59		71	
		6.0		26	40		50		60	
t_{PHL}	Propagation Delay Time (CCLR - $\overline{\text{RCO}}$)	2.0		70	160		200		240	ns
		4.5		20	32		40		48	
		6.0		17	27		34		41	
t_{PLH} t_{PHL}	Propagation Delay Time (RCK - $\overline{\text{RCO}}$)	2.0		120	260		325		390	ns
		4.5		34	52		65		78	
		6.0		29	44		55		66	
f_{MAX}	Maximum Clock Frequency	2.0		5.4	11		4.4		3.6	MHz
		4.5		27	45		22		18	
		6.0		32	53		26		21	
$t_{W(H)}$ $t_{W(L)}$	Minimum Pulse Width	2.0		40	75		95		110	ns
		4.5		8	15		19		22	
		6.0		7	13		16		19	
$t_{W(L)}$	Minimum Pulse Width (CCLR, CLOAD)	2.0		40	75		95		110	ns
		4.5		8	15		19		22	
		6.0		7	13		16		19	
t_s	Minimum Set-up Time (CCKEN - CCK)	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 (RCK-CLOAD) (A...H - RCK)	2.0		40	100		125		145	ns
		4.5		10	20		25		29	
		6.0		9	17		21		25	
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	2.0		28	75		95		110	ns
		4.5		7	15		19		22	
		6.0		6	13		16		19	

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition			Value						Unit	
		V_{CC} (V)			$T_A = 25^\circ\text{C}$			$-40 \text{ to } 85^\circ\text{C}$		$-55 \text{ to } 125^\circ\text{C}$		
					Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C_{IN}	Input Capacitance					5	10		10		10	pF
C_{PD}	Power Dissipation Capacitance (note 1)					30						pF

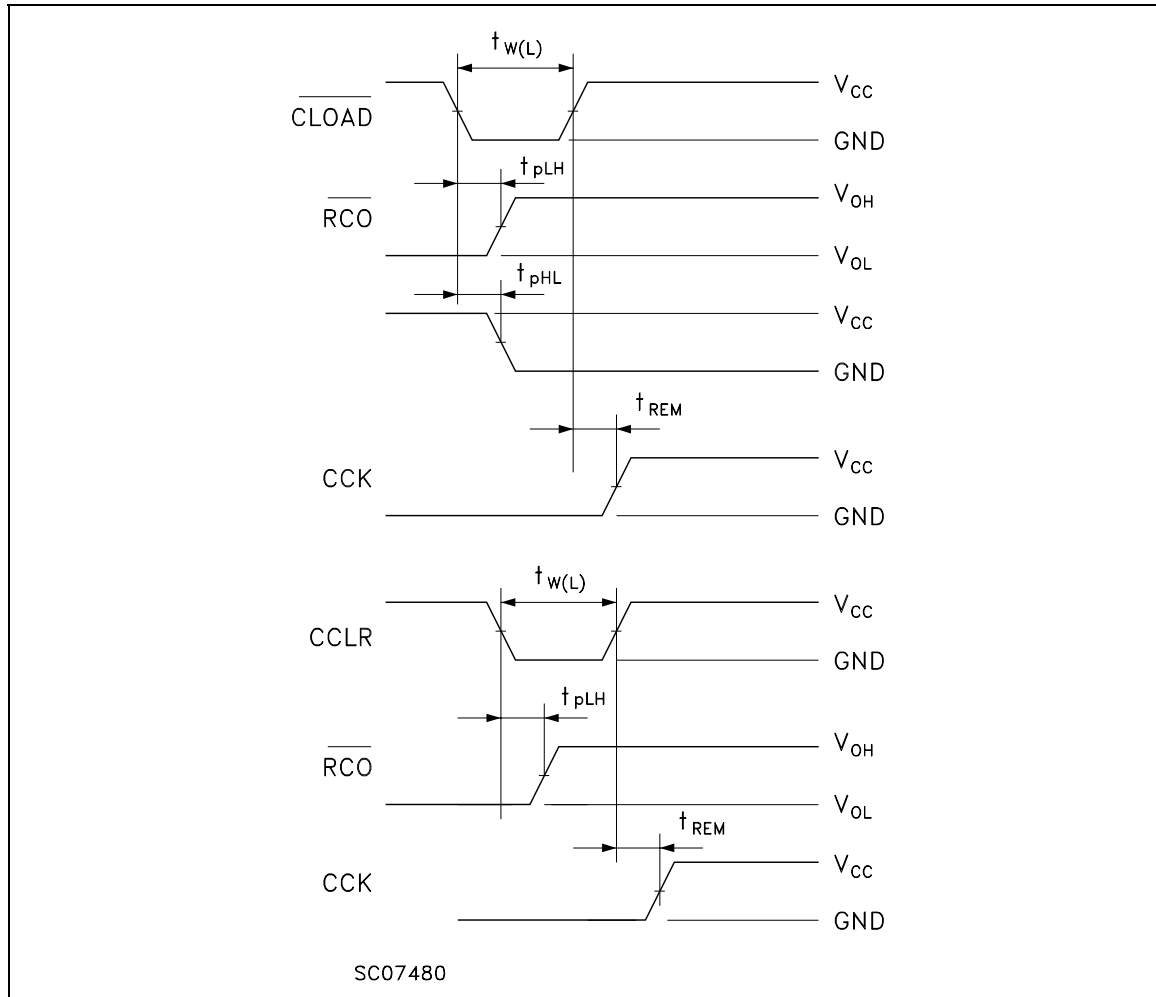
1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$

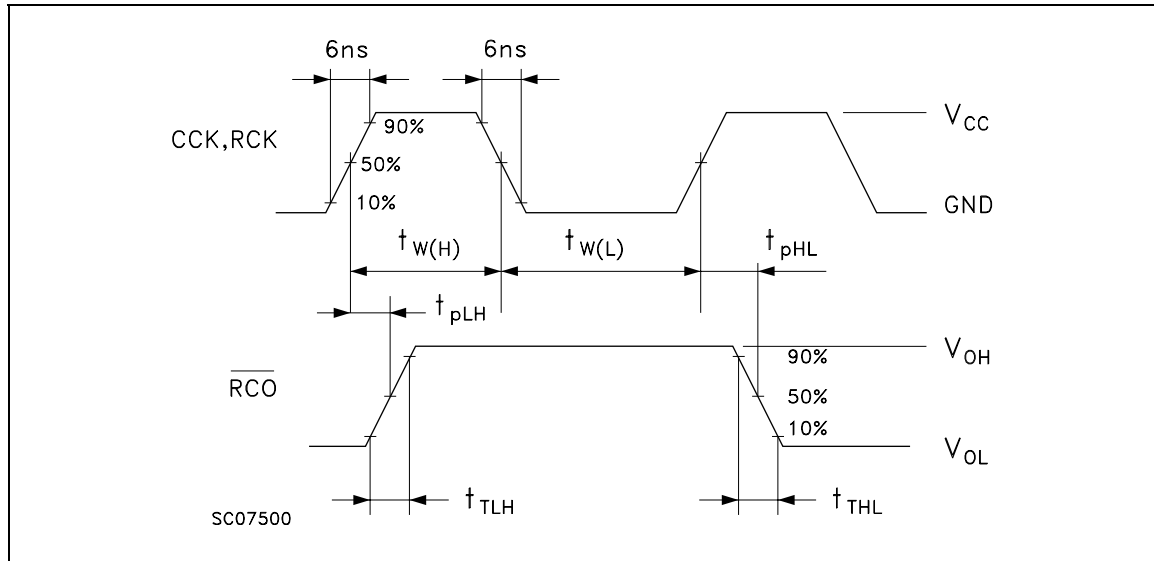
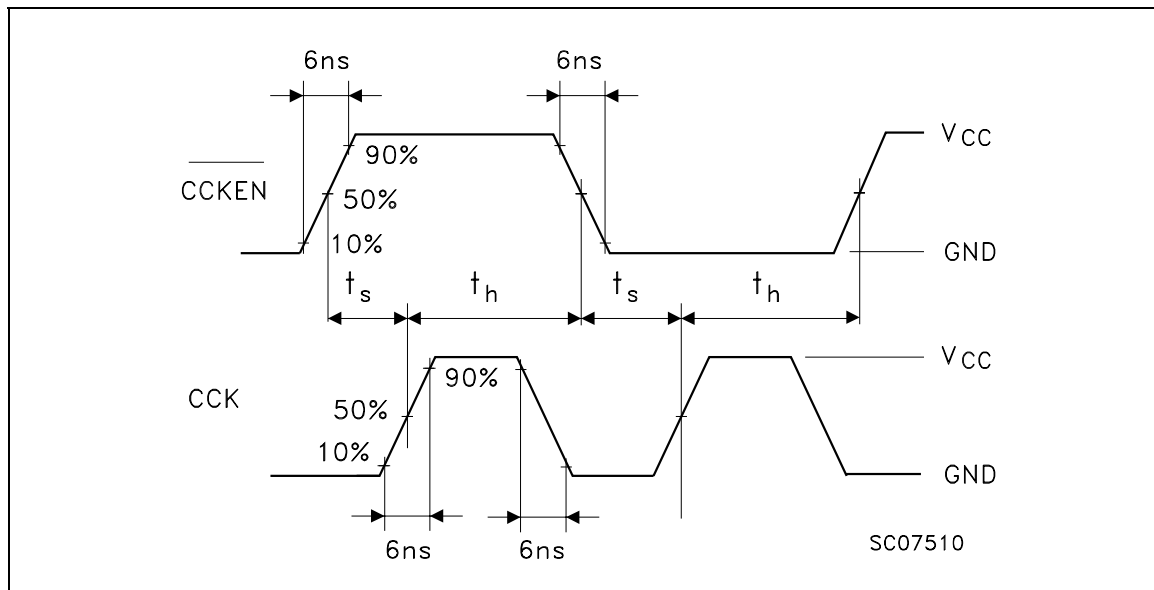
TEST CIRCUIT



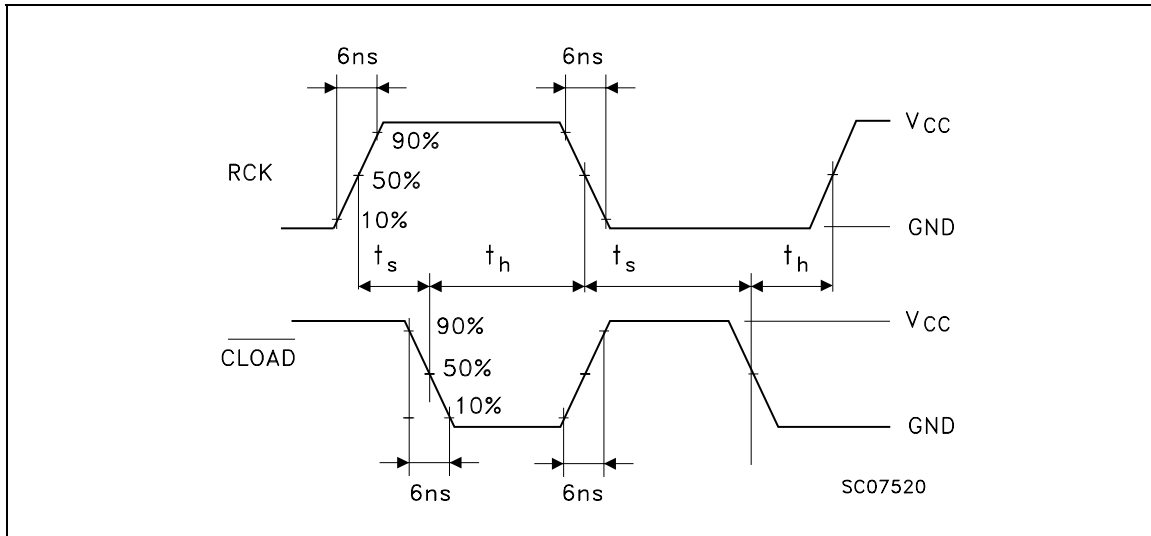
$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

WAVEFORM 1 : MINIMUM PULSE WIDTH, REMOVAL TIME (f=1MHz; 50% duty cycle)

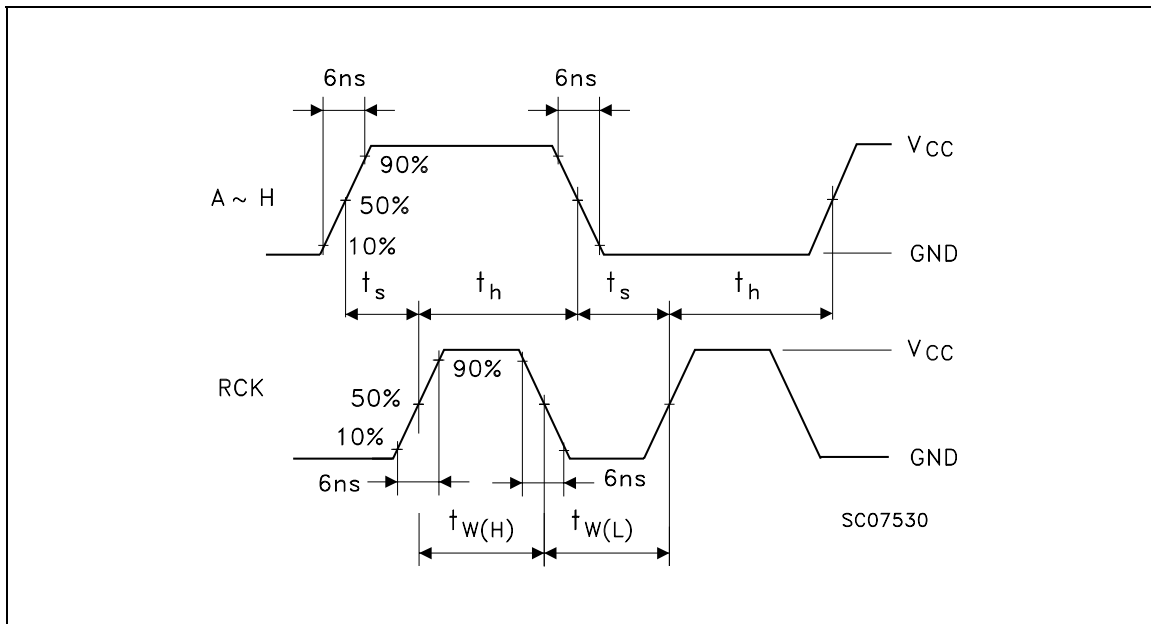


WAVEFORM 2 : PROPAGATION DELAY TIME, MINIMUM PULSE WIDTH (f=1MHz; 50% duty cycle)**WAVEFORM 3 : MINIMUM SETUP AND HOLD TIME** (f=1MHz; 50% duty cycle)

WAVEFORM 4 : MINIMUM SETUP AND HOLD TIME (f=1MHz; 50% duty cycle)

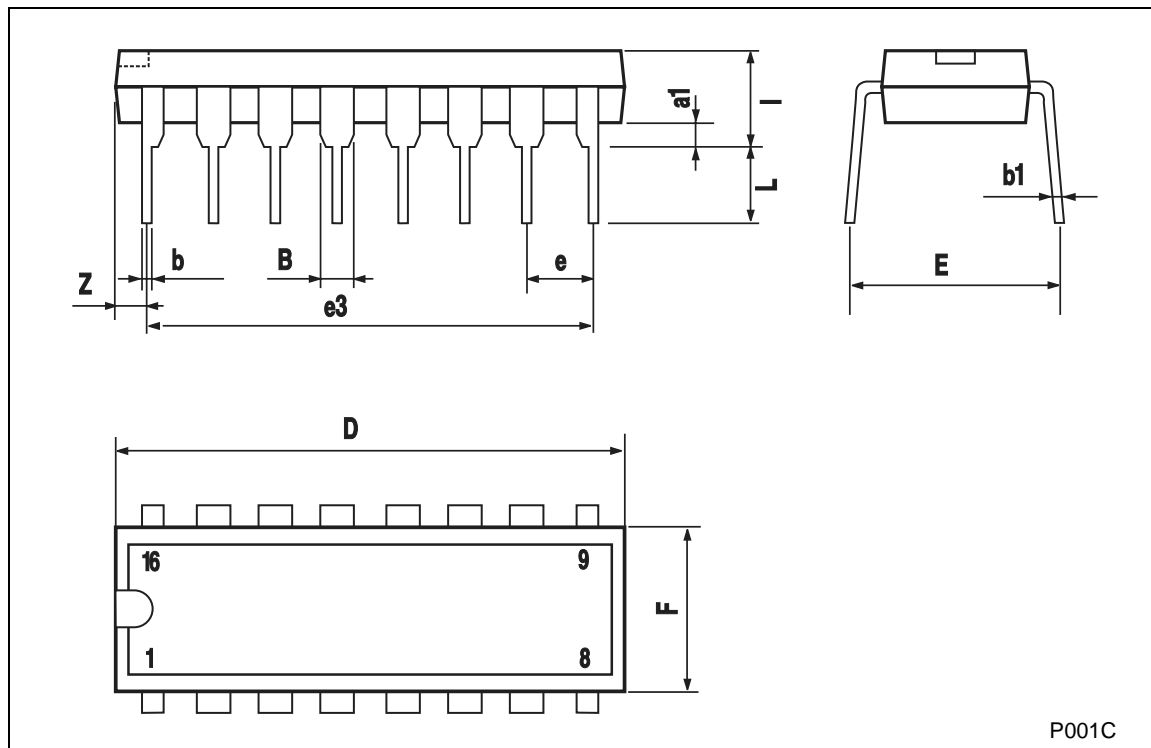


WAVEFORM 5 : MINIMUM PULSE WIDTH, SETUP AND HOLD TIME (f=1MHz; 50% duty cycle)



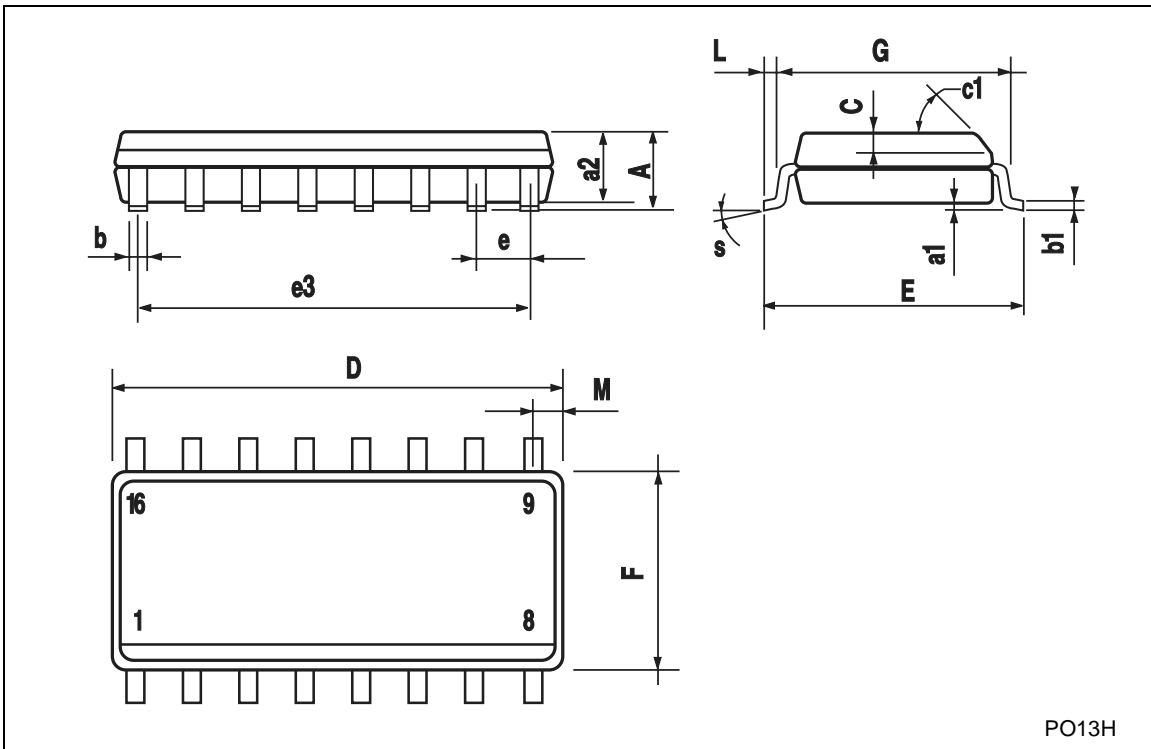
Plastic DIP-16 (0.25) MECHANICAL DATA

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



SO-16 MECHANICAL DATA

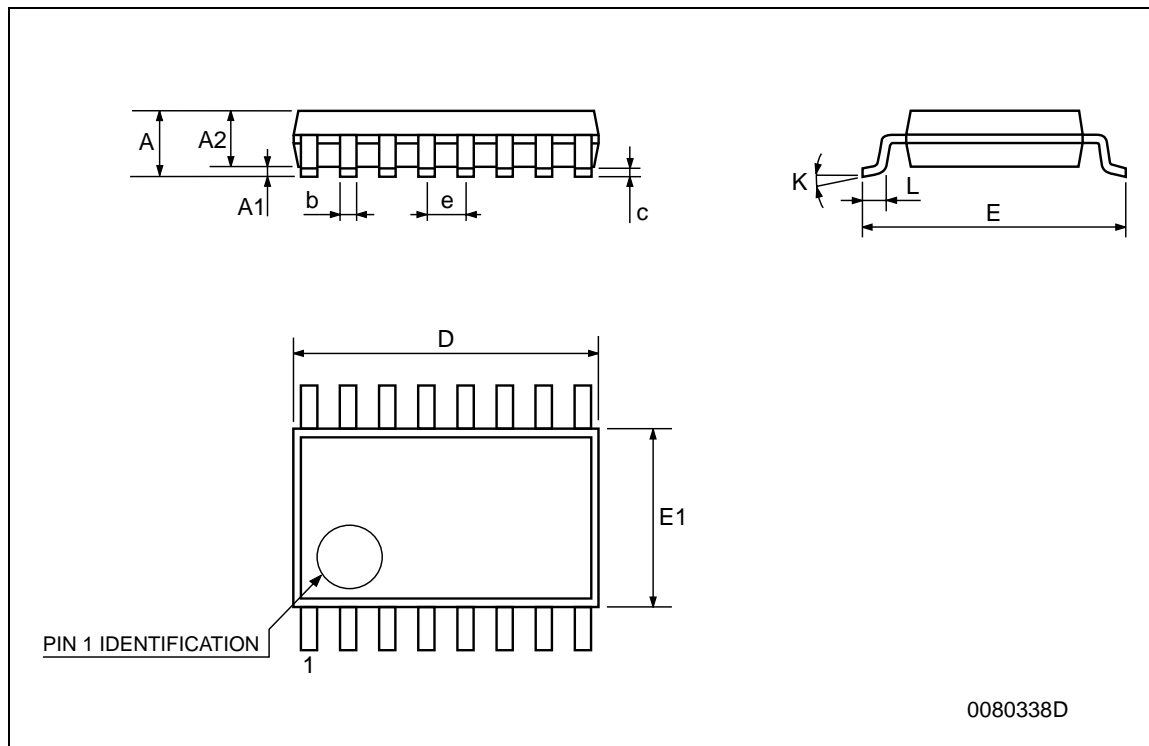
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157
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



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