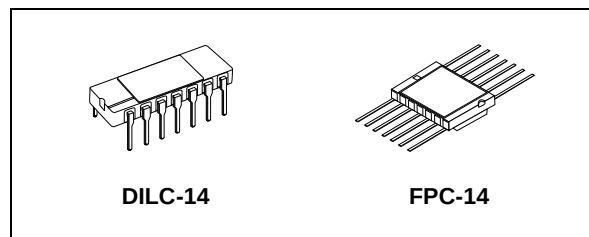


RAD HARD DUAL D TYPE FLIP FLOP WITH PRESET AND CLEAR

- HIGH SPEED:
 $f_{MAX} = 67\text{MHz (TYP.)}$ at $V_{CC} = 6\text{V}$
- LOW POWER DISSIPATION:
 $I_{CC} = 2\mu\text{A (MAX.)}$ 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:
 $V_{CC} \text{ (OPR)} = 2\text{V to } 6\text{V}$
- PIN AND FUNCTION COMPATIBLE WITH
54 SERIES 74
- SPACE GRADE-1: ESA SCC QUALIFIED
- 50 krad QUALIFIED, 100 krad AVAILABLE ON
REQUEST
- NO SEL UNDER HIGH LET HEAVY IONS
IRRADIATION
- DEVICE FULLY COMPLIANT WITH
SCC-9203-050

DESCRIPTION

The M54HC74 is an high speed CMOS DUAL D TYPE FLIP FLOP WITH CLEAR fabricated with silicon gate C²MOS technology.



ORDER CODES

PACKAGE	FM	EM
DILC	M54HC74D	M54HC74D1
FPC	M54HC74K	M54HC74K1

A signal on the D INPUT is transferred on the Q OUTPUT during the positive going transition of the clock pulse. CLEAR and PRESET are independent of the clock and accomplished by a low on the appropriate input.
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION

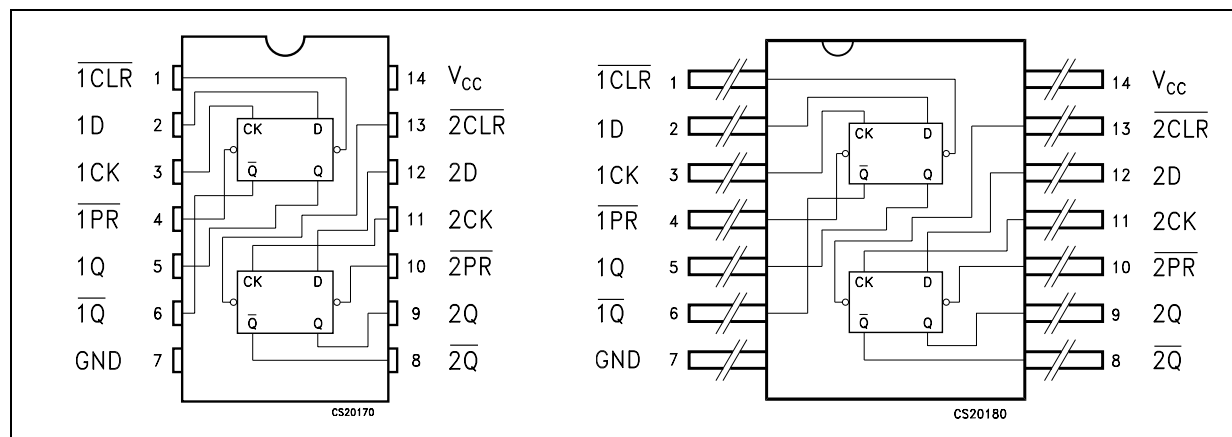


Figure 1: IEC Logic Symbols

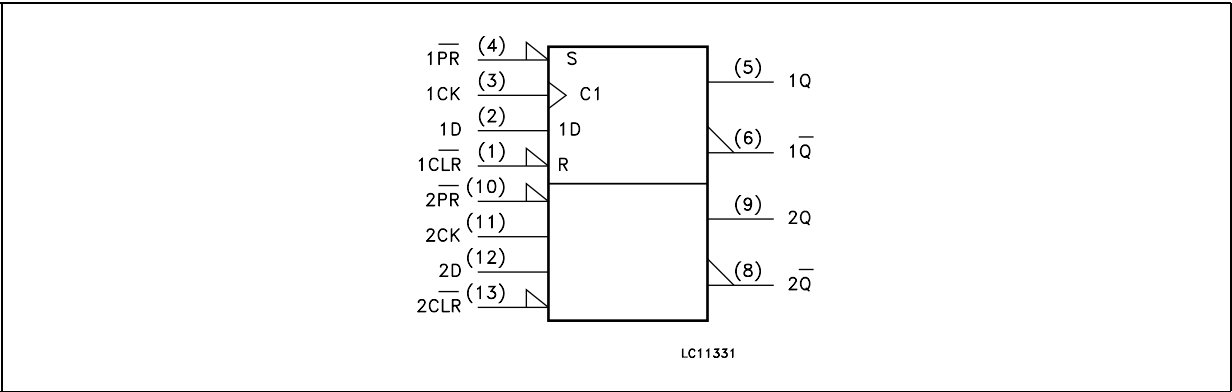


Figure 2: Input And Output Equivalent Circuit

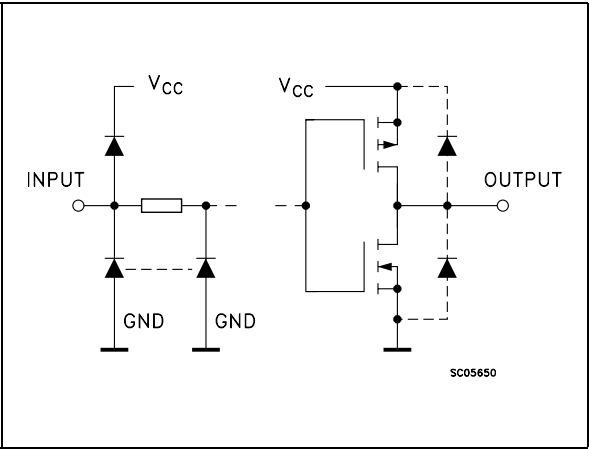


Table 1: Pin Description

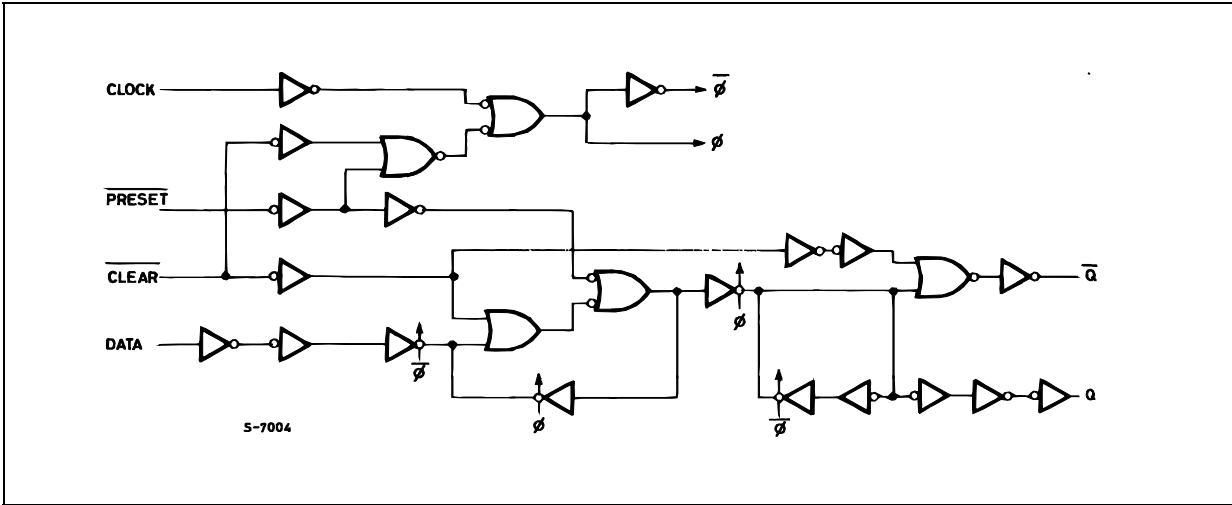
PIN N°	SYMBOL	NAME AND FUNCTION
1,13	1 $\overline{\text{CLR}}$, 2 $\overline{\text{CLR}}$	Asynchronous Reset - Direct Input
2, 12	1D, 2D	Data Inputs
3, 11	1CK, 2CK	Clock Input (LOW-to-HIGH, Edge-Triggered)
4, 10	1 $\overline{\text{PR}}$, 2 $\overline{\text{PR}}$	Asynchronous Set - Direct Input
5, 9	1Q, 2Q	True Flip-Flop Outputs
6, 8	1 $\overline{\text{Q}}$, 2 $\overline{\text{Q}}$	Complement Flip-Flop Outputs
7	GND	Ground (0V)
14	V _{CC}	Positive Supply Voltage

Table 2: Truth Table

INPUTS				OUTPUTS		FUNCTION
$\overline{\text{CLR}}$	$\overline{\text{PR}}$	D	CK	Q	$\overline{\text{Q}}$	
L	H	X	X	L	H	CLEAR
H	L	X	X	H	L	PRESET
L	L	X	X	H	H	----
H	H	L		L	H	----
H	H	H		H	L	----
H	H	X		Q _n	$\overline{\text{Q}}_n$	NO CHANGE

X : Don't Care

Figure 3: Logic Diagram



This logic diagram has not be used to estimate propagation delays

Table 3: 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	300	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	265	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

Table 4: 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
		$V_{CC} = 4.5V$	0 to 500
		$V_{CC} = 6.0V$	0 to 400

Table 5: 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	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 _{OL}	Low Level Output Voltage	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		
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			2		20		40	μA	

Table 6: AC Electrical Characteristics ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

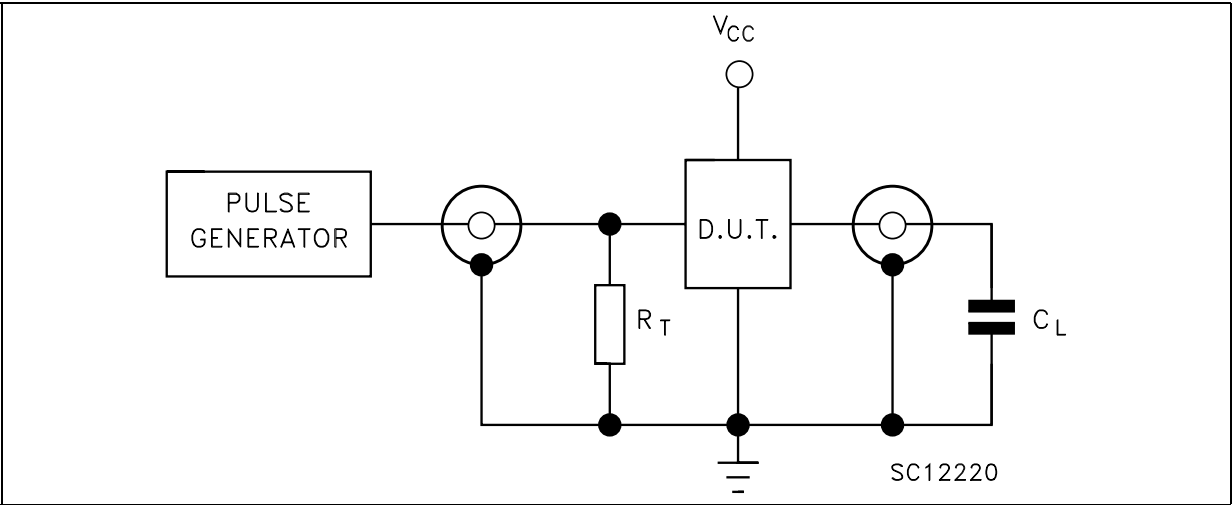
Symbol	Parameter	Test Condition		Value						Unit		
		V _{CC} (V)		T _A = 25°C			-40 to 85°C		-55 to 125°C			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
t _{TLH} t _{THL}	Output Transition Time	2.0			30	75		95		110	ns	
		4.5			8	15		19		22		
		6.0			7	13		16		19		
t _{PLH} t _{PHL}	Propagation Delay Time (CK - Q, Q)	2.0			48	150		190		225	ns	
		4.5			16	30		38		45		
		6.0			13	26		32		38		
t _{PLH} t _{PHL}	Propagation Delay Time (CLR, PR - Q, Q)	2.0			51	150		190		225	ns	
		4.5			17	30		38		45		
		6.0			15	26		32		38		
f _{MAX}	Maximum Clock Frequency	2.0		6.2	21		5		4.2		MHz	
		4.5		31	63		25		21			
		6.0		37	67		30		25			
t _{W(H)} t _{W(L)}	Minimum Pulse Width (CK)	2.0			18	75		95		110	ns	
		4.5			6	15		19		22		
		6.0			6	13		16		19		
t _{W(L)}	Minimum Pulse Width (CLR, PR)	2.0			21	75		95		110	ns	
		4.5			7	15		19		22		
		6.0			6	13		16		19		
t _s	Minimum Set-up Time	2.0			15	75		95		110	ns	
		4.5			4	15		19		22		
		6.0			3	13		16		19		
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 (CLR, PR to CK)	2.0			0	25		30		35	ns	
		4.5			0	5		6		7		
		6.0			0	4		5		6		

Table 7: 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			34						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. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/2$ (per FLIP/FLOP)

Figure 4: Test Circuit



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

Figure 5: Waveform - nCK To nQ, $\overline{nQ}$ Propagation Delay Times, and To nCK Setup And Hold Times, nCK Minimum Pulse Width, Maximum nCK Frequency ($f=1\text{MHz}$; 50% duty cycle)

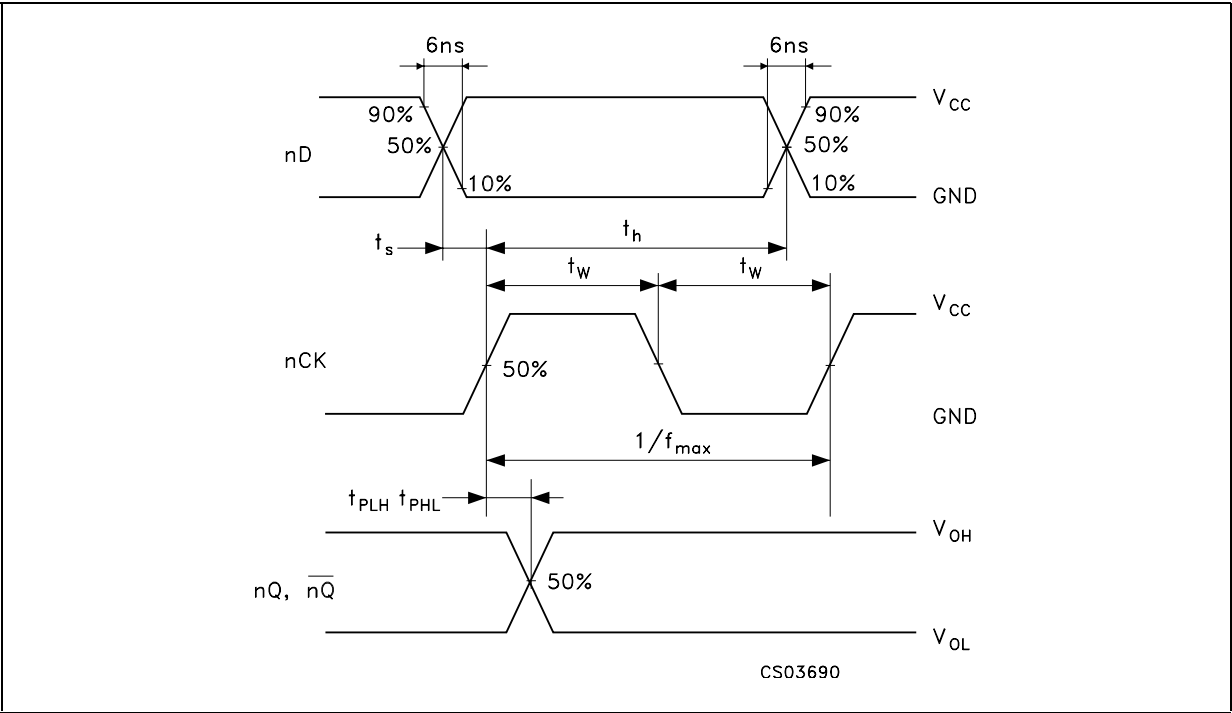


Figure 6: Waveform - $n\overline{Q}$, $n\overline{Q}$ TO $\overline{CLR}$, $\overline{PR}$ Propagation Delay Times, Minimum Pulse Width ($n\overline{CLR}$ and $n\overline{PR}$) ($f=1\text{MHz}$; 50% duty cycle)

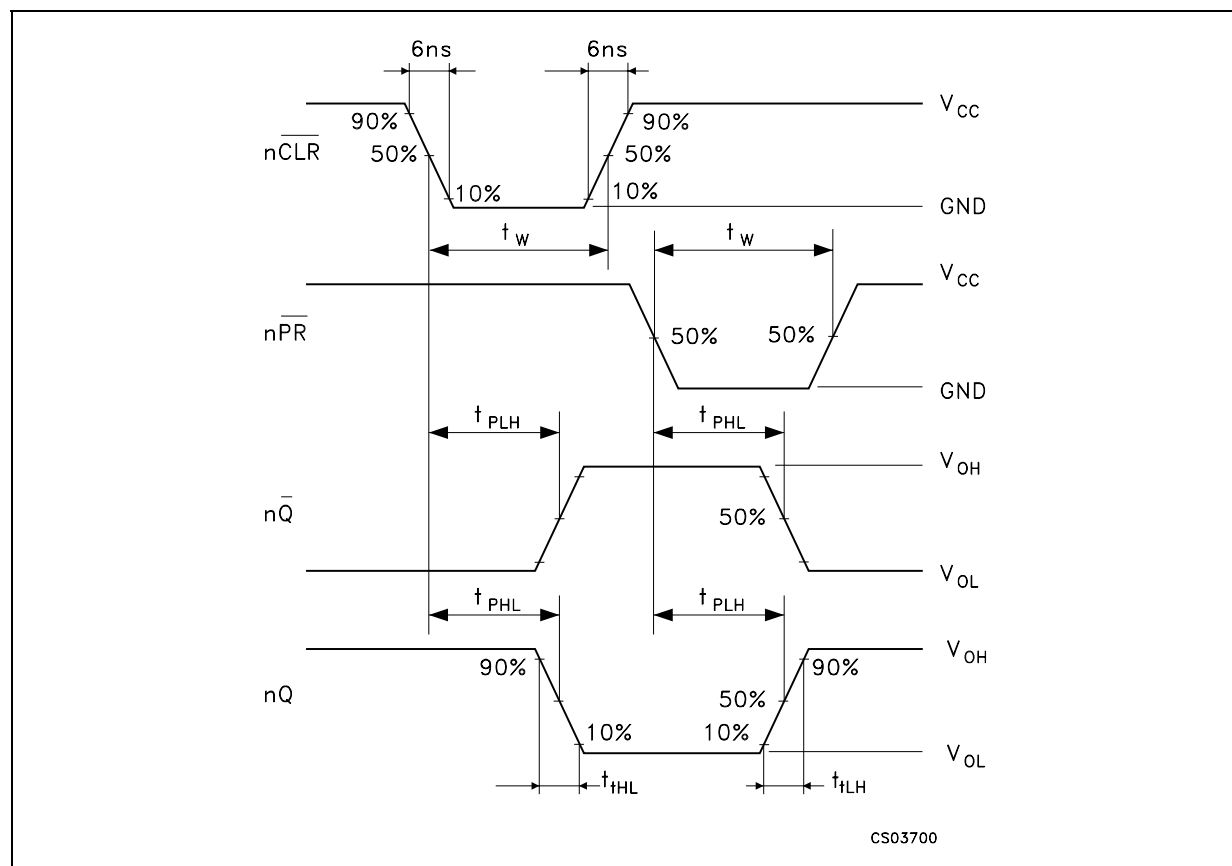


Figure 7: Waveform - Minimum Pulse Width ($n\overline{CLR}$ and $n\overline{PR}$), Minimum Removal Time ($n\overline{CLR}$ and $n\overline{PR}$ TO nCK) ($f=1\text{MHz}$; 50% duty cycle)

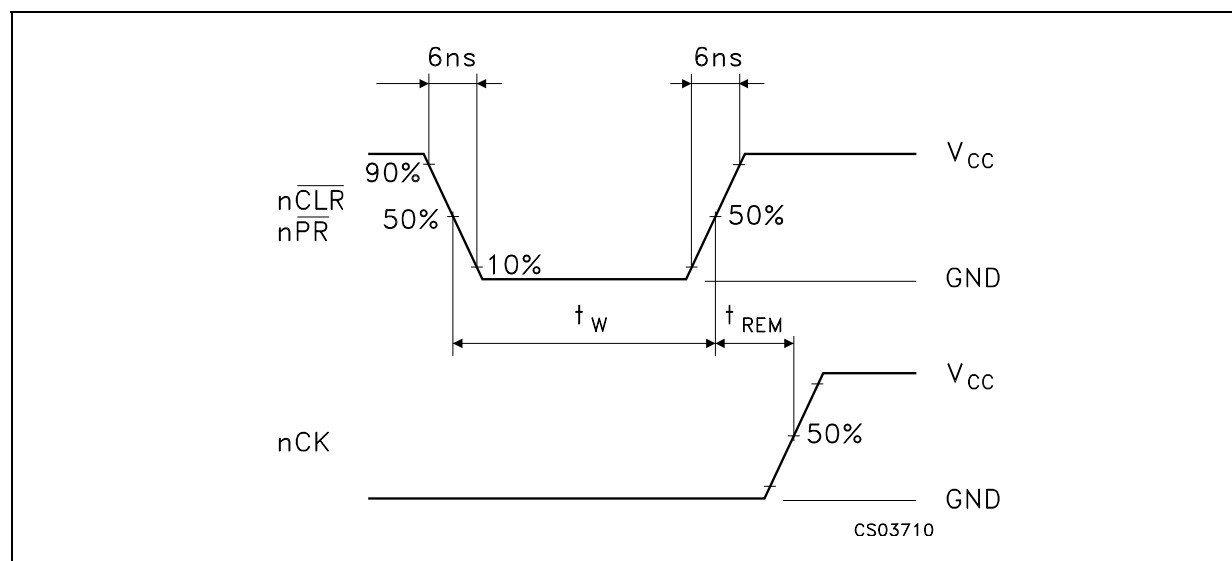
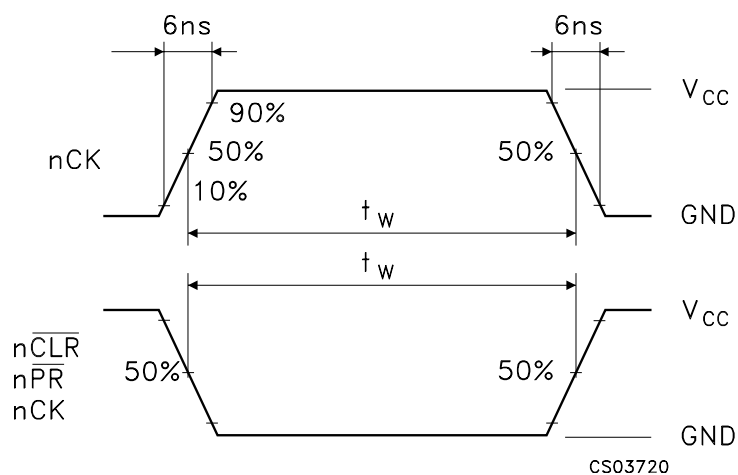
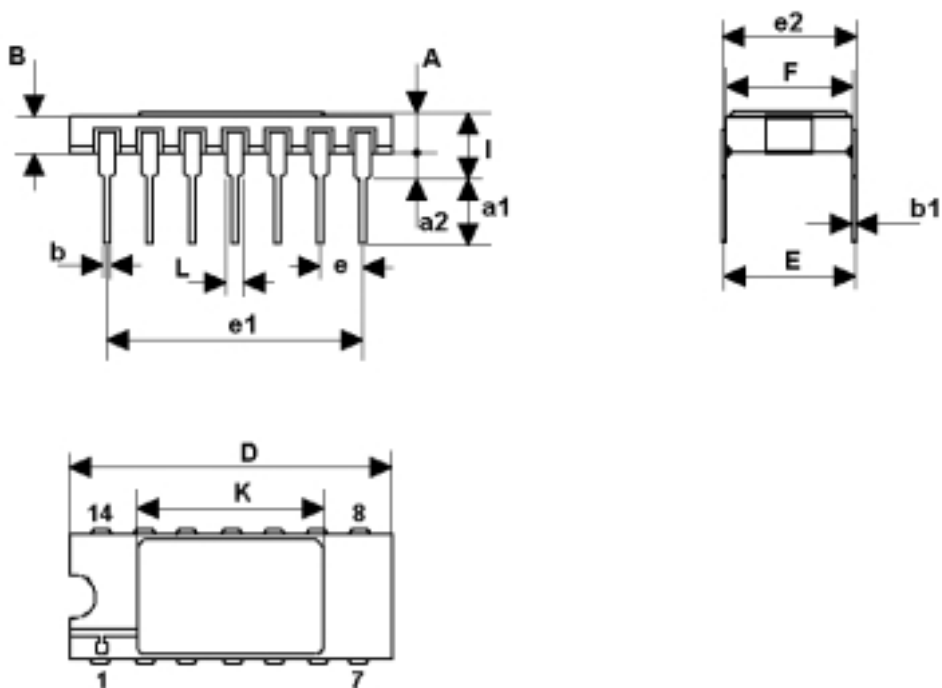


Figure 8: Waveform - Minimum Pulse Width ($\overline{nCLR}$, $\overline{nPR}$, nCK) ($f=1\text{MHz}$; 50% duty cycle)

DILC-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	2.1		2.54	0.083		0.100
a1	3.00		3.70	0.118		0.146
a2	0.63	0.88	1.14	0.025	0.035	0.045
B	1.82	2.03	2.39	0.072	0.080	0.094
b	0.40	0.45	0.50	0.016	0.018	0.020
b1	0.20	0.254	0.30	0.008	0.010	0.012
D	18.79	19.00	19.20	0.740	0.748	0.756
E	7.36	7.62	7.87	0.290	0.300	0.310
e		2.54			0.100	
e1	15.11	15.24	15.37	0.595	0.600	0.605
e2	7.62	7.87	8.12	0.300	0.310	0.320
F	7.11		7.75	0.280		0.305
I			3.70			0.146
K	10.90		12.1	0.429		0.476
L	1.14	1.27	1.5	0.045	0.050	0.059



0016173H

FPC-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	6.75	6.91	7.06	0.266	0.272	0.278
B	9.76	9.95	10.14	0.384	0.392	0.399
C	1.49		1.95	0.059		0.077
D	0.10	0.127	0.15	0.004	0.005	0.006
E	7.50	7.62	7.75	0.295	0.300	0.305
F		1.27			0.050	
G	0.38	0.43	0.48	0.015	0.017	0.019
H		6.0			0.236	
L	18.75		22.0	0.738		0.866
M		0.38			0.015	
N		4.31			0.170	

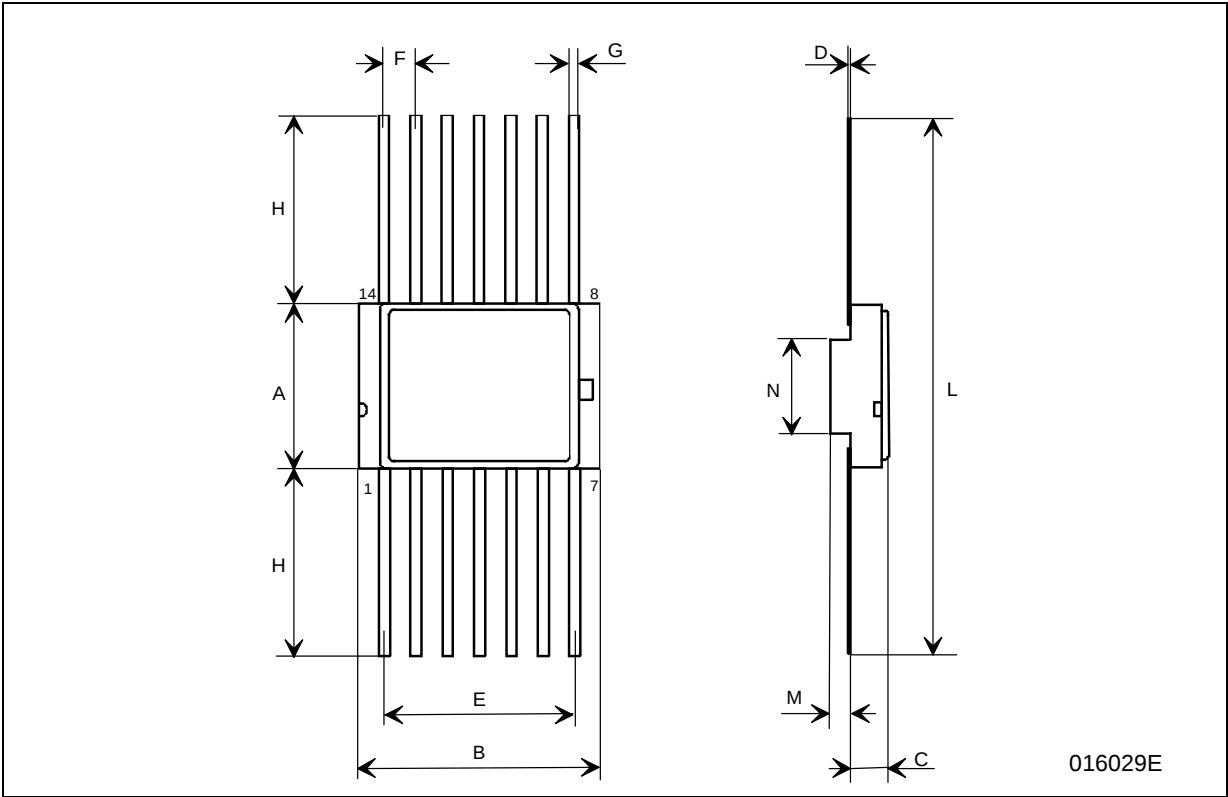


Table 8: Revision History

Date	Revision	Description of Changes
01-Jun-2004	1	First Release

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