

Figure 2: Input Equivalent Circuit

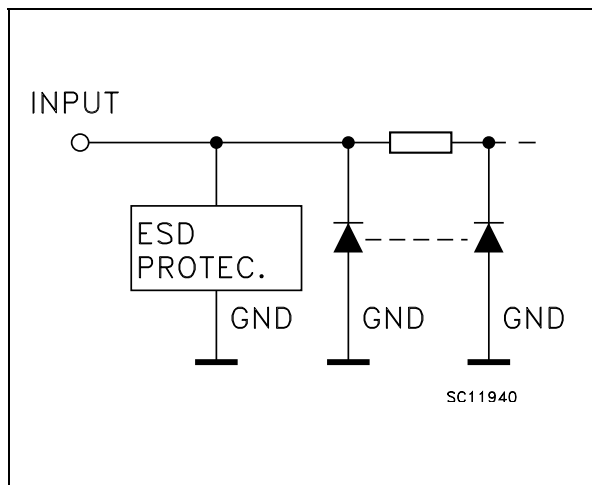


Table 2: Pin Description

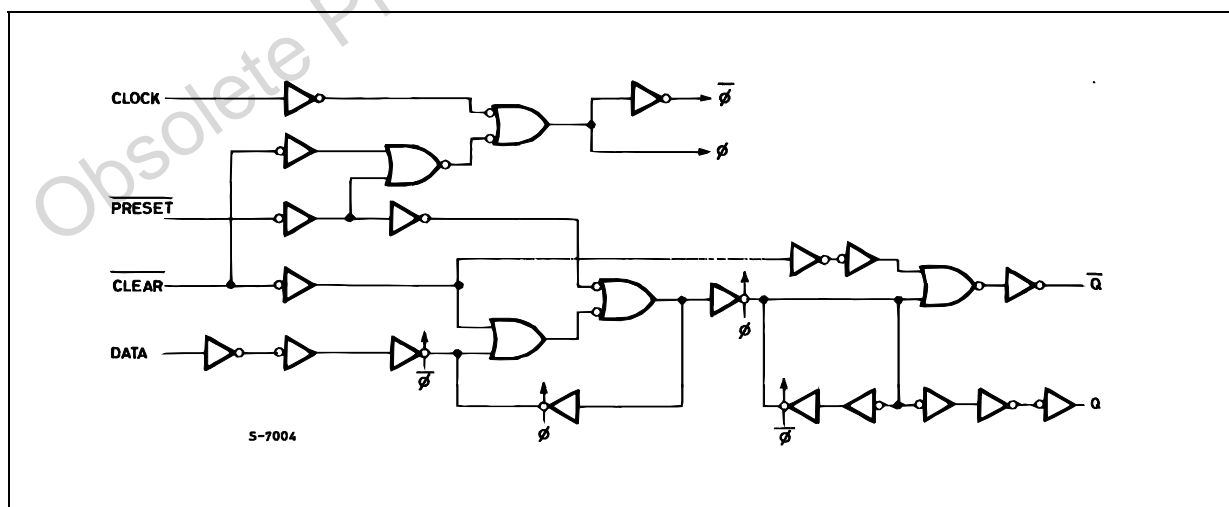
PIN N°	SYMBOL	NAME AND FUNCTION
1, 13	$\overline{1CLR}$, $\overline{2CLR}$	Asynchronous Reset - Direct Input
2, 12	1D, 2D	Data Inputs
3, 11	1CK, 2CK	Clock Input (LOW to HIGH, Edge Triggered)
4, 10	1PR, 2PR	Asynchronous Set - Direct Input
5, 9	1Q, 2Q	True Flip-Flop Outputs
6, 8	$\overline{1Q}$, $\overline{2Q}$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

Table 3: Truth Table

INPUTS				OUTPUTS		FUNCTION
\overline{CLR}	\overline{PR}	D	CK	Q	\overline{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{Q}_n	NO CHANGE

X : Don't Care

Figure 3: Logic Diagram



This logic diagram has not been used to estimate propagation delays

Table 4: Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7.0	V
V_I	DC Input Voltage	-0.5 to +7.0	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
T_{stg}	Storage Temperature	-65 to +150	$^{\circ}C$
T_L	Lead Temperature (10 sec)	300	$^{\circ}C$

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

Table 5: Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	2 to 3.6	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature	-55 to 125	$^{\circ}C$
dt/dv	Input Rise and Fall Time (note 2) ($V_{CC} = 3.3V$)	0 to 100	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V

2) V_{IN} from 0.8V to 2.0V

Table 6: DC Specifications

Symbol	Parameter	Test Condition		Value						Unit		
				$T_A = 25^{\circ}C$			-40 to 85 $^{\circ}C$		-55 to 125 $^{\circ}C$			
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.	
V_{IH}	High Level Input Voltage	V_{CC}	2.0								V	
			3.0									
			3.6									
V_{IL}	Low Level Input Voltage	V_{CC}	2.0		0.5		0.5		0.5		V	
			3.0		0.8		0.8		0.8			
			3.6		0.8		0.8		0.8			
V_{OH}	High Level Output Voltage	V_{CC}	2.0	$I_O = -50 \mu A$	1.9	2.0		1.9		1.9		V
			3.0	$I_O = -50 \mu A$	2.9	3.0		2.9		2.9		
			3.0	$I_O = -4 mA$	2.58			2.48		2.4		
V_{OL}	Low Level Output Voltage	V_{CC}	2.0	$I_O = 50 \mu A$		0.0	0.1		0.1		0.1	V
			3.0	$I_O = 50 \mu A$		0.0	0.1		0.1		0.1	
			3.0	$I_O = 4 mA$			0.36		0.44		0.55	
I_I	Input Leakage Current	$V_I = 5V$ or GND	3.6				± 0.1		± 1		± 1	μA
I_{CC}	Quiescent Supply Current	$V_I = V_{CC}$ or GND	3.6				2		20		20	μA

Table 7: Dynamic Switching Characteristics

Symbol	Parameter	Test Condition		Value						Unit	
		V _{CC} (V)	C _L (pF)	T _A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V _{OLP}	Dynamic Low Voltage Quiet Output (note 1, 2)	3.3	C _L = 50 pF		0.3	0.5					V
V _{OLV}				-0.5	-0.3						
V _{IHD}	Dynamic High Voltage Input (note 1, 3)	3.3		2							
V _{ILD}	Dynamic Low Voltage Input (note 1, 3)	3.3				0.8					

1) Worst case package.

2) Max number of outputs defined as (n). Data inputs are driven 0V to 3.3V, (n-1) outputs switching and one output at GND.

3) Max number of data inputs (n) switching. (n-1) switching 0V to 3.3V. Inputs under test switching: 3.3V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f=1MHz.

Table 8: AC Electrical Characteristics (Input t_r = t_f = 3ns)

Symbol	Parameter	Test Condition		Value						Unit	
		V _{CC} (V)	C _L (pF)	T _A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
t _{PLH} t _{PHL}	Propagation Delay Time CK to Q or Q	2.7	15		7.3	15.0	1.0	18.5	1.0	18.5	ns
		2.7	50		9.8	18.5	1.0	22.0	1.0	22.0	
		3.3(*)	15		5.7	9.7	1.0	11.5	1.0	11.5	
		3.3(*)	50		8.2	13.2	1.0	15.0	1.0	15.0	
t _{PLH} t _{PHL}	Propagation Delay Time PR or CLR to Q or Q	2.7	15		8.4	15.6	1.0	18.5	1.0	18.5	ns
		2.7	50		10.9	19.1	1.0	22.0	1.0	22.0	
		3.3(*)	15		6.6	10.1	1.0	12.0	1.0	12.0	
		3.3(*)	50		9.1	13.6	1.0	15.5	1.0	15.5	
t _w	Minimum Pulse Width HIGH or LOW, CK	2.7	50			8.5		10.0		10.0	ns
		3.3(*)	50			6.0		7.0		7.0	
t _{w(L)}	Minimum Pulse Width LOW PR or CLR	2.7	50			8.5		10.0		10.0	ns
		3.3(*)	50			6.0		7.0		7.0	
t _s	Minimum Setup Time D to CK HIGH or LOW	2.7	50			8.0		9.5		9.5	ns
		3.3(*)	50			5.5		6.5		6.5	
t _h	Minimum Hold Time D to CK HIGH or LOW	2.7	50			0.5		0.5		0.5	ns
		3.3(*)	50			0.5		0.5		0.5	
t _{REM}	Minimum Removal Time PR or CLR to CK	2.7	50			6.5		7.5		7.5	ns
		3.3(*)	50			5.0		5.0		5.0	
f _{MAX}	Maximum Clock Frequency	2.7	15		55	135		50		50	MHz
		2.7	50		45	60		40		40	
		3.3(*)	15		95	145		80		80	
		3.3(*)	50		60	85		50		50	
t _{OSLH} t _{OSHL}	Output To Output Skew Time (note 1, 2)	2.7	50		0.5	1.0		1.5		1.5	ns
		3.3(*)	50		0.5	1.0		1.5		1.5	

1) Skew is defined as the absolute value of the difference between the actual propagation delay for any two outputs of the same device switching in the same direction, either HIGH or LOW

2) Parameter guaranteed by design

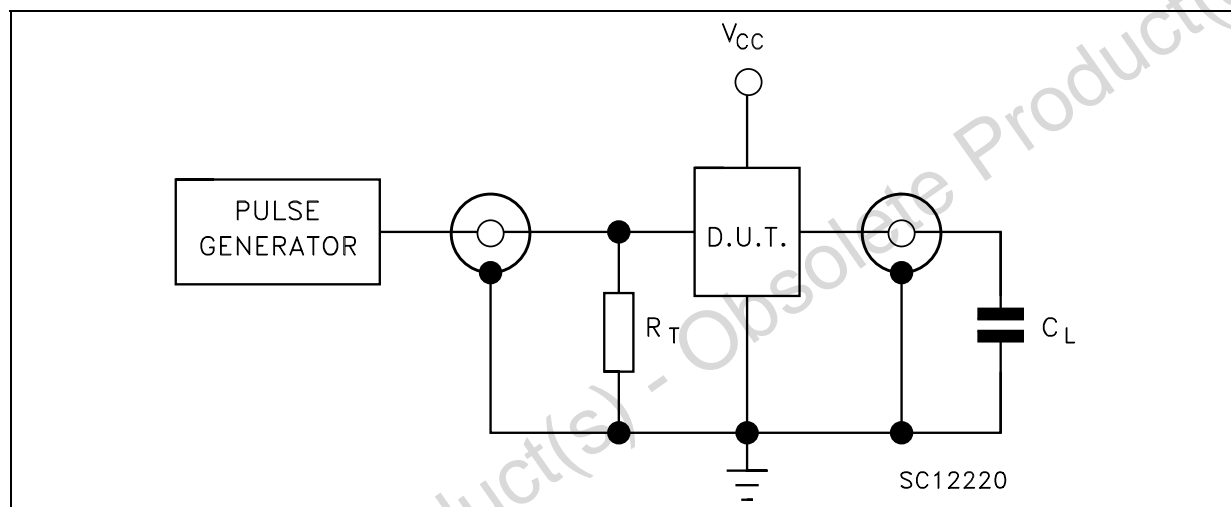
(*) Voltage range is 3.3V ± 0.3V

Table 9: 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	3.3			4	10		10		10	pF
C _{PD}	Power Dissipation Capacitance (note 1)	3.3	f _{IN} = 10 MHz		25						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} × V_{CC} × f_{IN} + I_{CC}/2 (per circuit)

Figure 4: Test Circuit



C_L = 15/50pF or equivalent (includes jig and probe capacitance)
R_T = Z_{OUT} of pulse generator (typically 50Ω)

Figure 5: Waveform - Propagation Delays, Setup And Hold Times (f=1MHz; 50% duty cycle)

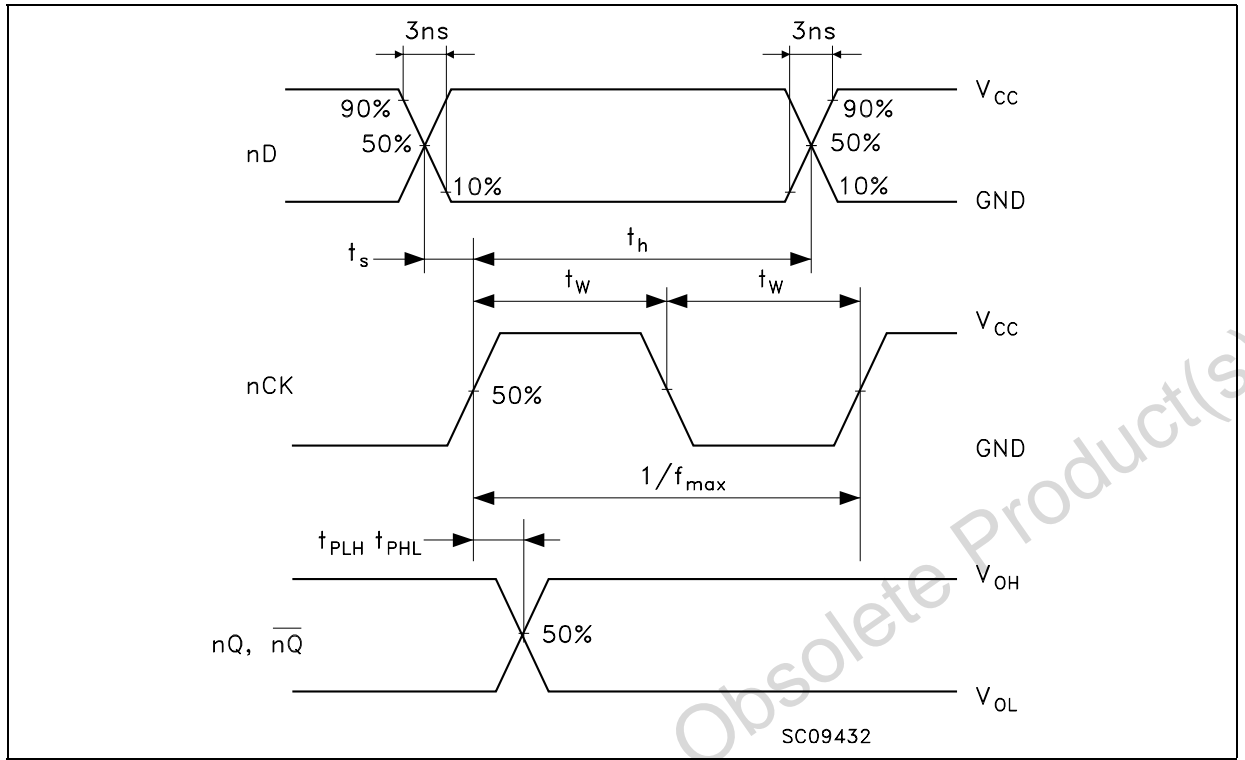


Figure 6: Waveform - Recovery Time (f=1MHz; 50% duty cycle)

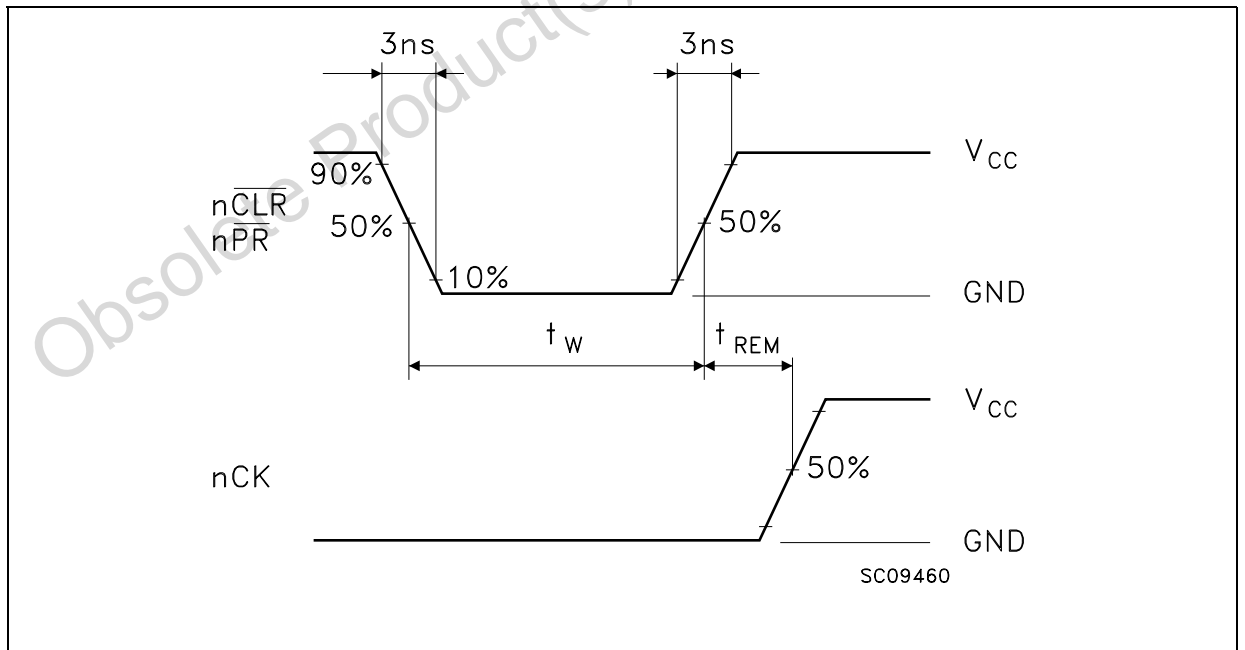


Figure 7: Waveform - Propagation Delays, Minimum Pulse Width ($f=1\text{MHz}$; 50% duty cycle)

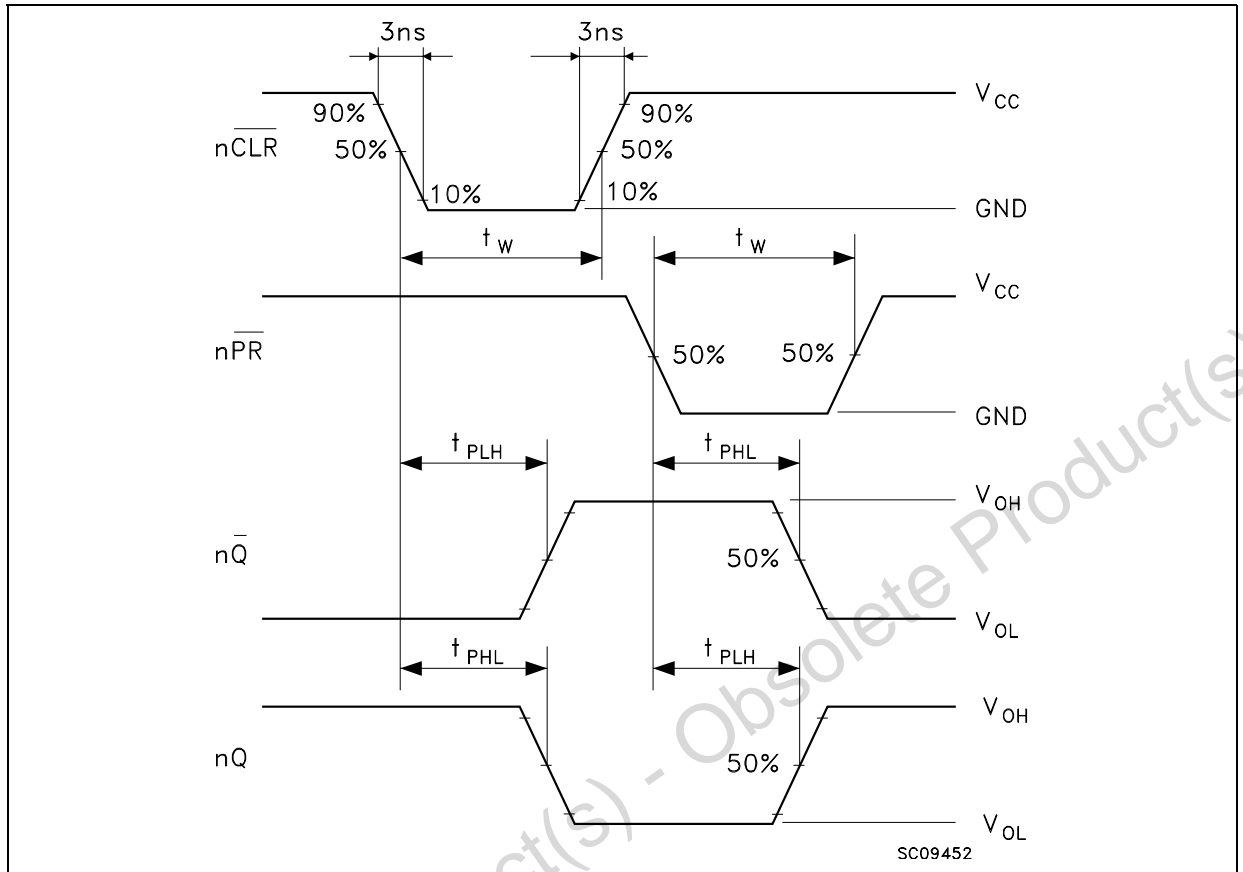
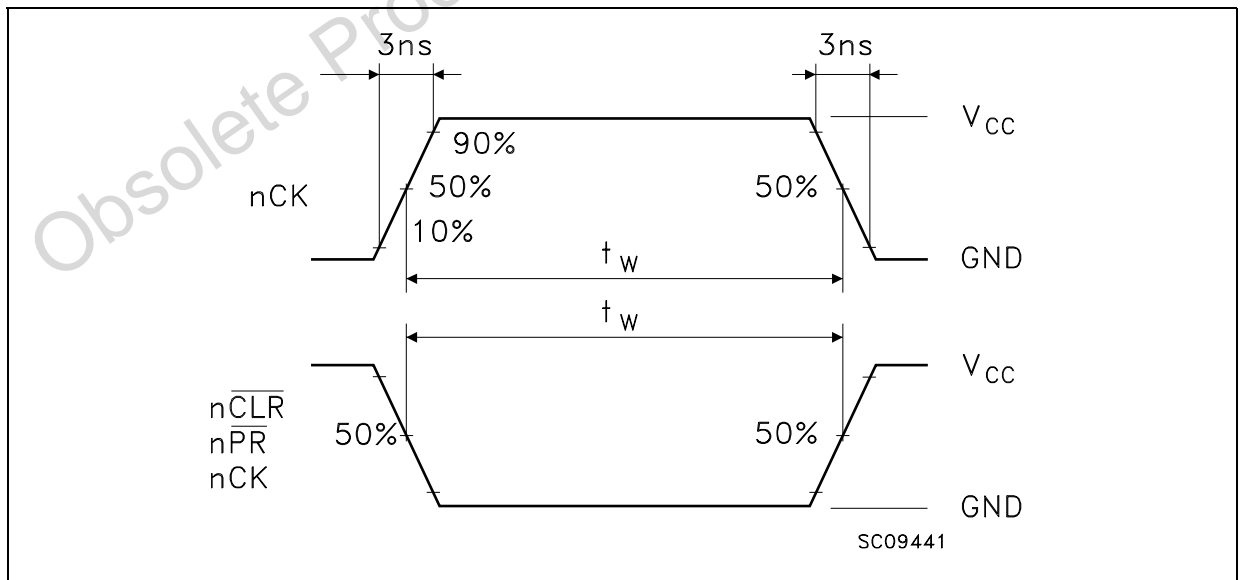
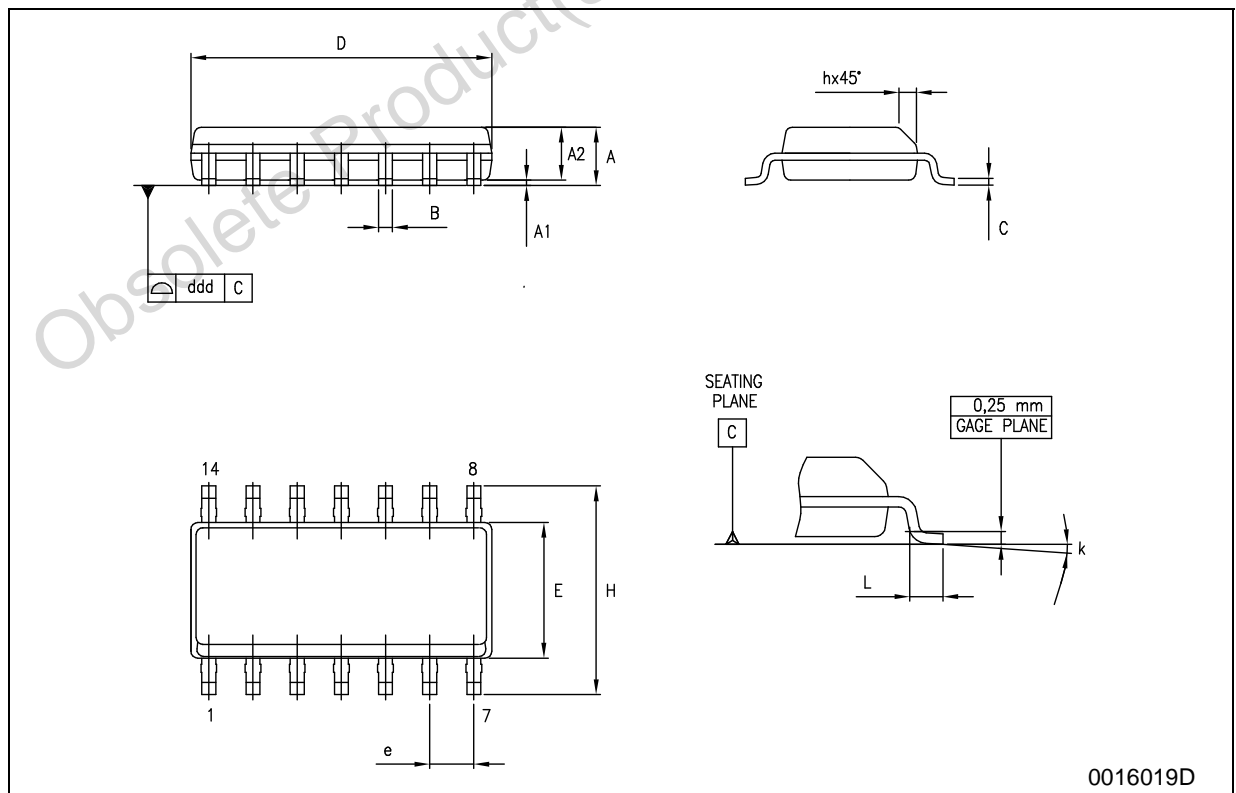


Figure 8: Waveform - Minimum Pulse Width



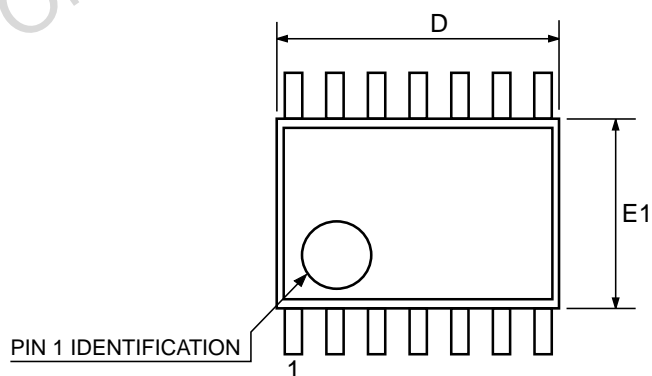
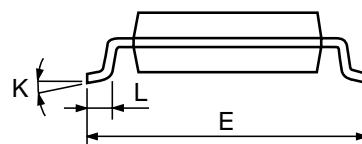
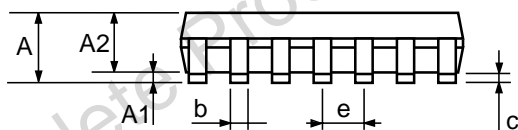
SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.35		1.75	0.053		0.069
A1	0.1		0.25	0.004		0.010
A2	1.10		1.65	0.043		0.065
B	0.33		0.51	0.013		0.020
C	0.19		0.25	0.007		0.010
D	8.55		8.75	0.337		0.344
E	3.8		4.0	0.150		0.157
e		1.27			0.050	
H	5.8		6.2	0.228		0.244
h	0.25		0.50	0.010		0.020
L	0.4		1.27	0.016		0.050
k	0°		8°	0°		8°
ddd			0.100			0.004



TSSOP14 MECHANICAL DATA

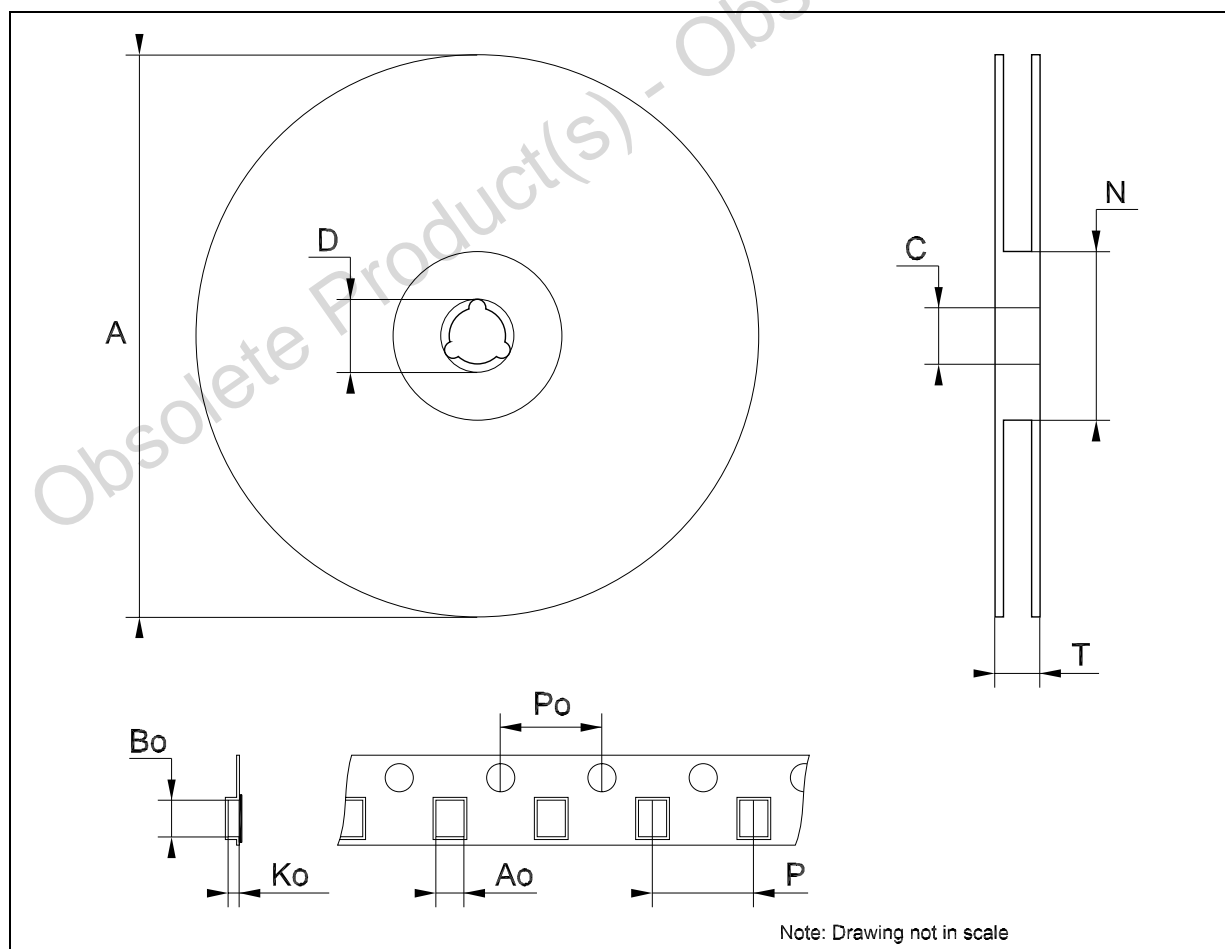
DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC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



0080337D

Tape & Reel SO-14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.4		6.6	0.252		0.260
Bo	9		9.2	0.354		0.362
Ko	2.1		2.3	0.082		0.090
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319



Tape & Reel TSSOP14 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A			330			12.992
C	12.8		13.2	0.504		0.519
D	20.2			0.795		
N	60			2.362		
T			22.4			0.882
Ao	6.7		6.9	0.264		0.272
Bo	5.3		5.5	0.209		0.217
Ko	1.6		1.8	0.063		0.071
Po	3.9		4.1	0.153		0.161
P	7.9		8.1	0.311		0.319

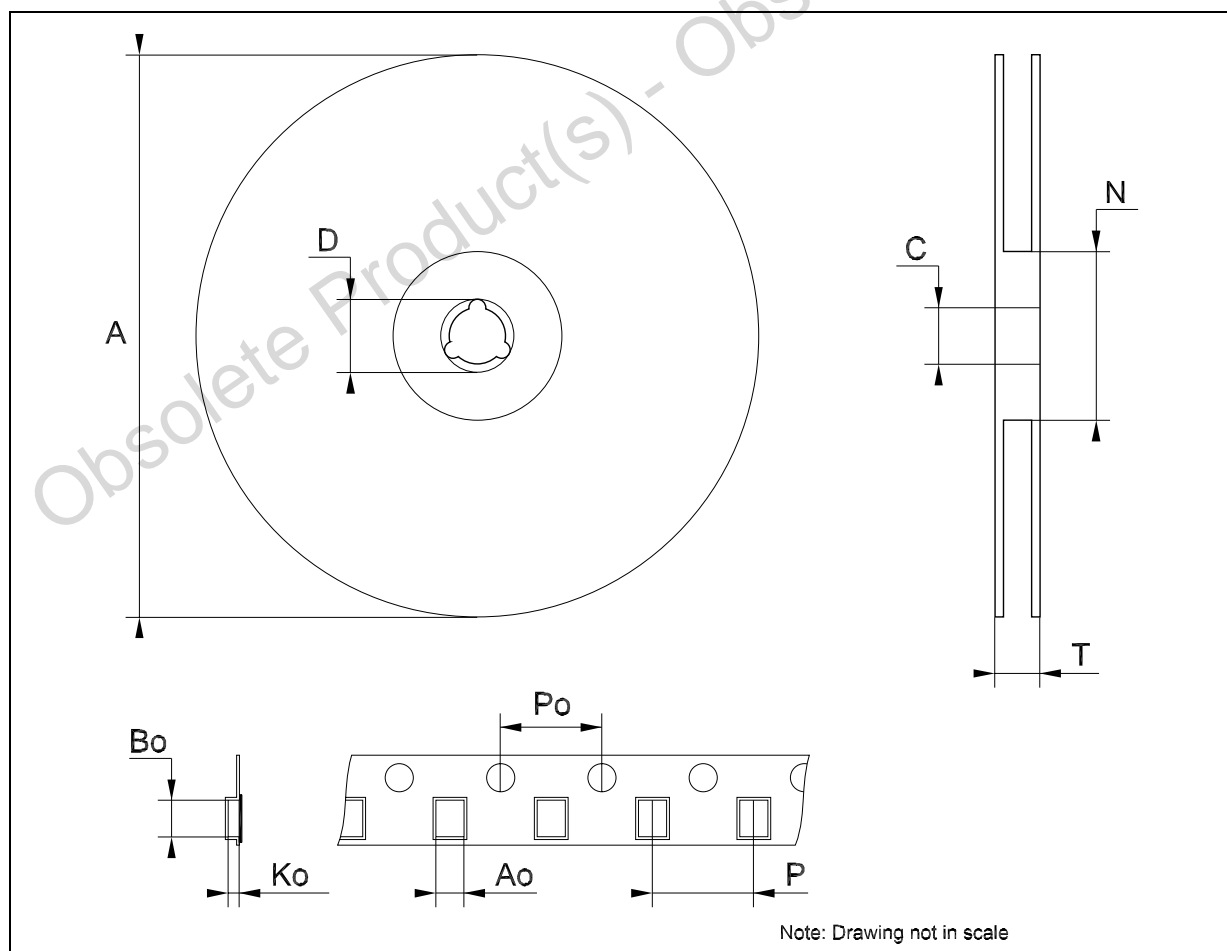


Table 10: Revision History

Date	Revision	Description of Changes
27-Aug-2004	3	Ordering Codes Revision - pag. 1.

Obsolete Product(s) - Obsolete Product(s)

Obsolete Product(s) - Obsolete Product(s)

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