

Figure 2: Input And Output Equivalent Circuit

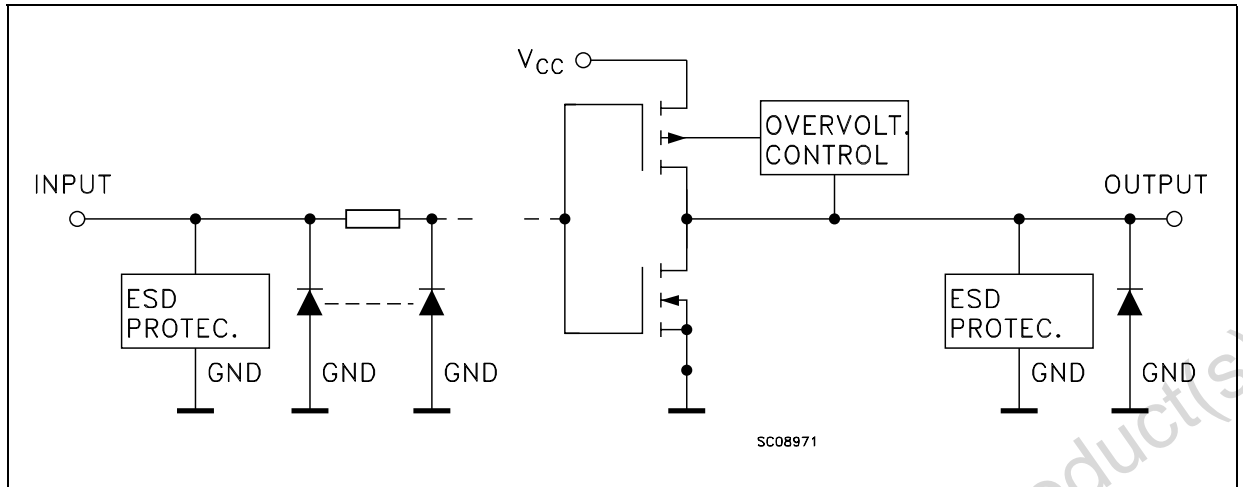


Table 2: Pin Description

PIN N°	SYMBOL	NAME AND FUNCTION
1	\overline{OE}	3 State Output Enable Input (Active LOW)
2, 3, 4, 5, 6, 7, 8, 9	D0 to D7	Data Inputs
12, 13, 14, 15, 16, 17, 18, 19	Q0 to Q7	3-State Latch Outputs
11	LE	Latch Enable Input
10	GND	Ground (0V)
20	V _{CC}	Positive Supply Voltage

Table 3: Truth Table

INPUTS			OUTPUT
\overline{OE}	LE	D	Q
H	X	X	Z
L	L	X	NO CHANGE
L	H	L	L
L	H	H	H

X : Don't Care

Z : High Impedance

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 (V _{CC} = 0V)	-0.5 to +7.0	V
V _O	DC Output Voltage (High or Low State) (note 1)	-0.5 to V _{CC} + 0.5	V
I _{IK}	DC Input Diode Current	- 50	mA
I _{OK}	DC Output Diode Current (note 2)	- 50	mA
I _O	DC Output Current	± 50	mA
I _{CC} or I _{GND}	DC V _{CC} or Ground Current per Supply Pin	± 100	mA
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

1) I_O absolute maximum rating must be observed

2) V_O < GND

Table 5: Recommended Operating Conditions

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage (note 1)	1.65 to 3.6	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage ($V_{CC} = 0V$)	0 to 5.5	V
V_O	Output Voltage (High or Low State)	0 to V_{CC}	V
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 3.0$ to $3.6V$)	± 24	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 2.7$ to $3.0V$)	± 12	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 2.3$ to $2.7V$)	± 8	mA
I_{OH}, I_{OL}	High or Low Level Output Current ($V_{CC} = 1.65$ to $2.3V$)	± 4	mA
T_{op}	Operating Temperature	-55 to 125	$^{\circ}C$
dt/dv	Input Rise and Fall Time (note 2)	0 to 10	ns/V

1) Truth Table guaranteed: 1.2V to 3.6V

2) V_{IN} from 0.8V to 2V at $V_{CC} = 3.0V$

Table 6: DC Specifications

Symbol	Parameter	Test Condition		Value				Unit
		V_{CC} (V)		-40 to 85 $^{\circ}C$		-55 to 125 $^{\circ}C$		
				Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	1.65 to 1.95		$0.65V_{CC}$		$0.65V_{CC}$		V
		2.3 to 2.7		1.7		1.7		
		2.7 to 3.6		2		2		
V_{IL}	Low Level Input Voltage	1.65 to 1.95			$0.35V_{CC}$		$0.35V_{CC}$	V
		2.3 to 2.7			0.7		0.7	
		2.7 to 3.6			0.8		0.8	
V_{OH}	High Level Output Voltage	1.65 to 3.6	$I_O = -100 \mu A$	$V_{CC} - 0.2$		$V_{CC} - 0.2$		V
		1.65	$I_O = -4 \text{ mA}$	1.2		1.2		
		2.3	$I_O = -8 \text{ mA}$	1.7		1.7		
		2.7	$I_O = -12 \text{ mA}$	2.2		2.2		
		3.0	$I_O = -18 \text{ mA}$	2.4		2.4		
		3.0	$I_O = -24 \text{ mA}$	2.2		2.2		
V_{OL}	Low Level Output Voltage	1.65 to 3.6	$I_O = 100 \mu A$		0.2		0.2	V
		1.65	$I_O = 4 \text{ mA}$		0.45		0.45	
		2.3	$I_O = 8 \text{ mA}$		0.7		0.7	
		2.7	$I_O = 12 \text{ mA}$		0.4		0.4	
		3.0	$I_O = 24 \text{ mA}$		0.55		0.55	
I_I	Input Leakage Current	3.6	$V_I = 0$ to $5.5V$		± 5		± 5	μA
I_{off}	Power Off Leakage Current	0	V_I or $V_O = 5.5V$		10		10	μA
I_{OZ}	High Impedance Output Leakage Current	3.6	$V_I = V_{IH}$ or V_{IL} $V_O = 0$ to $5.5V$		± 5		± 5	μA
I_{CC}	Quiescent Supply Current	3.6	$V_I = V_{CC}$ or GND		10		10	μA
			V_I or $V_O = 3.6$ to $5.5V$		± 10		± 10	
ΔI_{CC}	I_{CC} incr. per Input	2.7 to 3.6	$V_{IH} = V_{CC} - 0.6V$		500		500	μA

Table 7: Dynamic Switching Characteristics

Symbol	Parameter	Test Condition		Value			Unit
		V _{CC} (V)		T _A = 25 °C			
				Min.	Typ.	Max.	
V _{OLP}	Dynamic Low Level Quiet Output (note 1)	3.3	C _L = 50pF V _{IL} = 0V, V _{IH} = 3.3V		0.8		V
V _{OLV}					-0.8		

1) Number of output defined as "n". Measured with "n-1" outputs switching from HIGH to LOW or LOW to HIGH. The remaining output is measured in the LOW state.

Table 8: AC Electrical Characteristics

Symbol	Parameter	Test Condition				Value				Unit
		V _{CC} (V)	C _L (pF)	R _L (Ω)	t _s = t _r (ns)	-40 to 85 °C		-55 to 125 °C		
						Min.	Max.	Min.	Max.	
t _{PLH} t _{PHL}	Propagation Delay Time D to Q	1.65 to 1.95	30	1000	2.0		TBD		TBD	ns
		2.3 to 2.7	30	500	2.0		TBD		TBD	
		2.7	50	500	2.5	1.5	7.8	1.5	9.4	
		3.0 to 3.6	50	500	2.5	1	6.8	1	8.2	
t _{PLH} t _{PHL}	Propagation Delay Time LE to Q	1.65 to 1.95	30	1000	2.0		TBD		TBD	ns
		2.3 to 2.7	30	500	2.0		TBD		TBD	
		2.7	50	500	2.5	1.5	7.8	1.5	9.4	
		3.0 to 3.6	50	500	2.5	1	6.8	1	8.2	
t _{PZL} t _{PZH}	Output Enable Time	1.65 to 1.95	30	1000	2.0		TBD		TBD	ns
		2.3 to 2.7	30	500	2.0		TBD		TBD	
		2.7	50	500	2.5	1	8.7	1	10.4	
		3.0 to 3.6	50	500	2.5	1	7.7	1	9.2	
t _{PLZ} t _{PHZ}	Output Disable Time	1.65 to 1.95	30	1000	2.0		TBD		TBD	ns
		2.3 to 2.7	30	500	2.0		TBD		TBD	
		2.7	50	500	2.5	2	7.6	2	9.1	
		3.0 to 3.6	50	500	2.5	2	7.0	2	8.4	
t _w	LE Pulse Width HIGH	1.65 to 1.95	30	1000	2.0	TBD		TBD		ns
		2.3 to 2.7	30	500	2.0	TBD		TBD		
		2.7	50	500	2.5	3.3		3.3		
		3.0 to 3.6	50	500	2.5	3.3		3.3		
t _s	Setup Time D to LE, (HIGH to LOW)	1.65 to 1.95	30	1000	2.0	TBD		TBD		ns
		2.3 to 2.7	30	500	2.0	TBD		TBD		
		2.7	50	500	2.5	2		2		
		3.0 to 3.6	50	500	2.5	2		2		
t _h	Hold Time LE (HIGH to LOW) to D	1.65 to 1.95	30	1000	2.0	TBD		TBD		ns
		2.3 to 2.7	30	500	2.0	TBD		TBD		
		2.7	50	500	2.5	1.5		1.5		
		3.0 to 3.6	50	500	2.5	1.5		1.5		
t _{OSLH} t _{OSSL}	Output To Output Skew Time (note1, 2)	2.7 to 3.6					1		1	ns

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 (t_{OSLH} = |t_{PLHm} - t_{PLHn}|, t_{OSSL} = |t_{PHLm} - t_{PHLn}|)

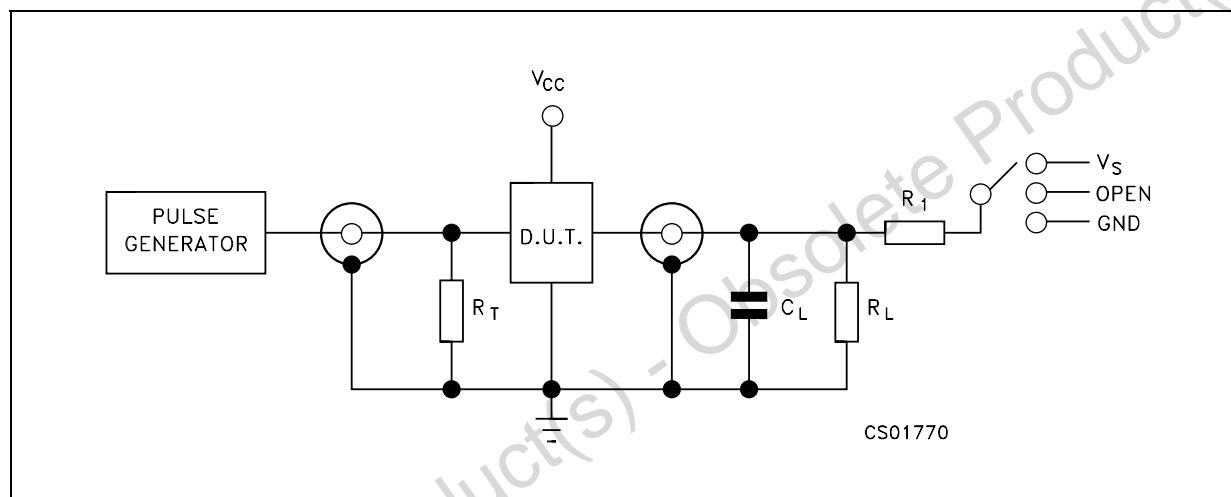
2) Parameter guaranteed by design

Table 9: Capacitive Characteristics

Symbol	Parameter	Test Condition		Value			Unit
		V _{CC} (V)	f _{IN} = 10MHz	T _A = 25 °C			
				Min.	Typ.	Max.	
C _{IN}	Input Capacitance				4		pF
C _{PD}	Power Dissipation Capacitance (note 1)	1.8	f _{IN} = 10MHz		28		pF
		2.5			30		
		3.3			34		

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/n} (per circuit)

Figure 3: Test Circuit



R_T = Z_{OUT} of pulse generator (typically 50Ω)

Table 10: Test Circuit And Waveform Symbol Value

Symbol	V _{CC}			
	1.65 to 1.95V	2.3 to 2.7V	2.7V	3.0 to 3.6V
C _L	30pF	30pF	50pF	50pF
R _L = R ₁	1000Ω	500Ω	500Ω	500Ω
V _S	2 × V _{CC}	2 × V _{CC}	6V	7V
V _{IH}	V _{CC}	V _{CC}	2.7V	3.0V
V _M	V _{CC} /2	V _{CC} /2	1.5V	1.5V
V _{OH}	V _{CC}	V _{CC}	3.0V	3.5V
V _X	V _{OL} + 0.15V	V _{OL} + 0.15V	V _{OL} + 0.3V	V _{OL} + 0.3V
V _Y	V _{OH} - 0.15V	V _{OH} - 0.15V	V _{OH} - 0.3V	V _{OH} - 0.3V
t _r = t _f	<2.0ns	<2.0ns	<2.5ns	<2.5ns

Figure 4: Waveform - Propagation Delay, Setup And Hold Times (f=1MHz; 50% duty cycle)

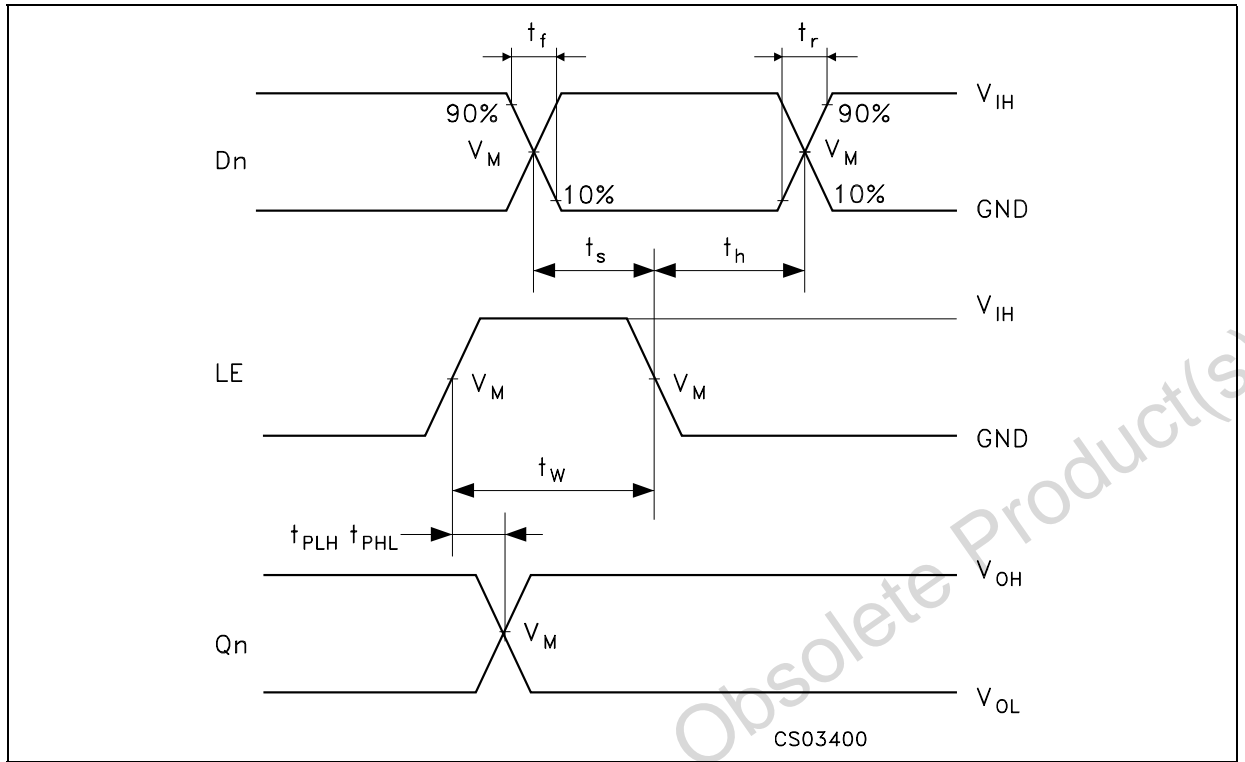


Figure 5: Waveform - Output Enable And Disable Times (f=1MHz; 50% duty cycle)

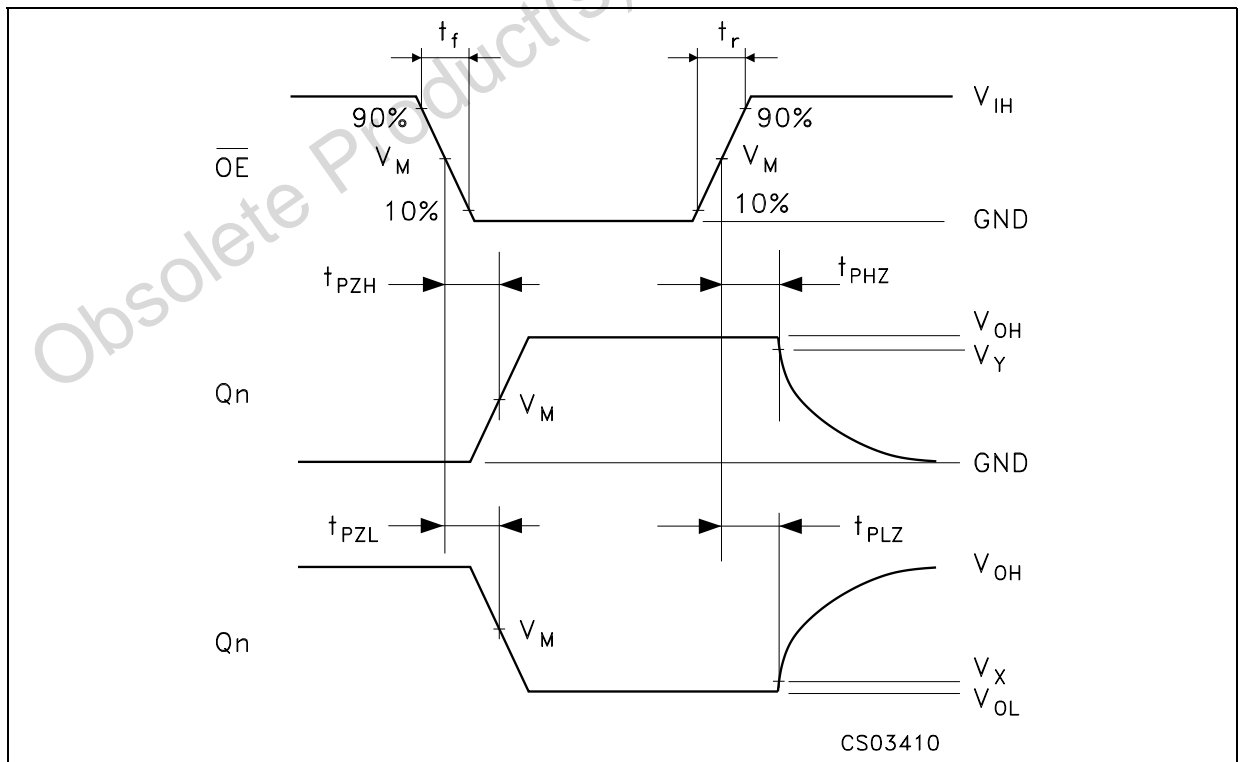
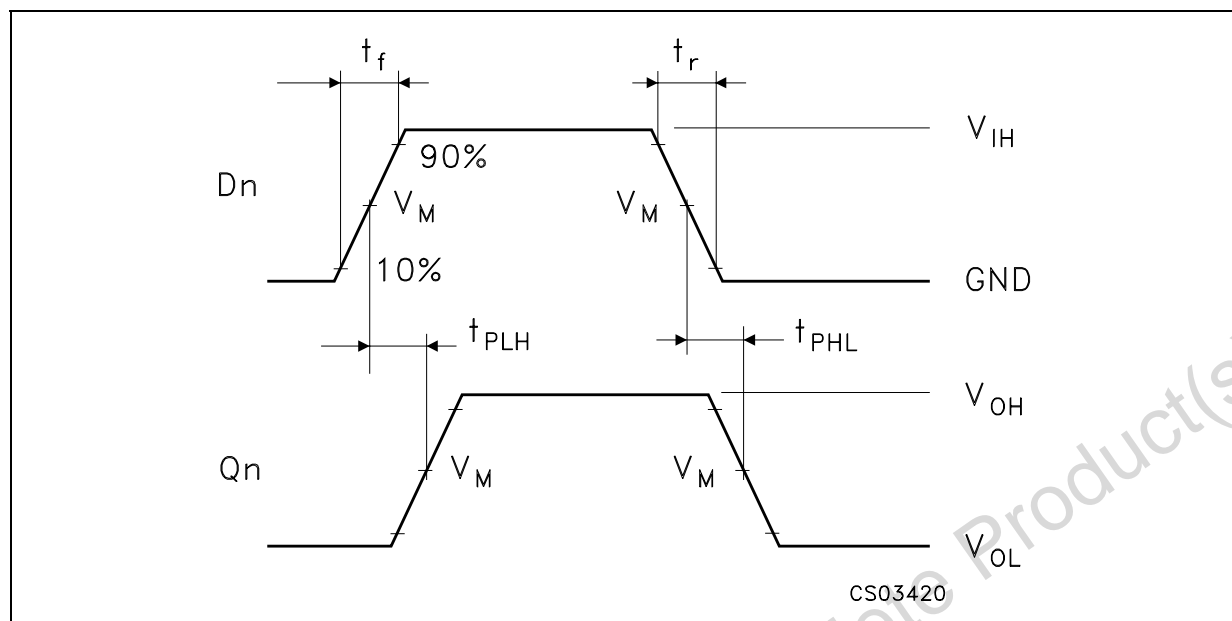
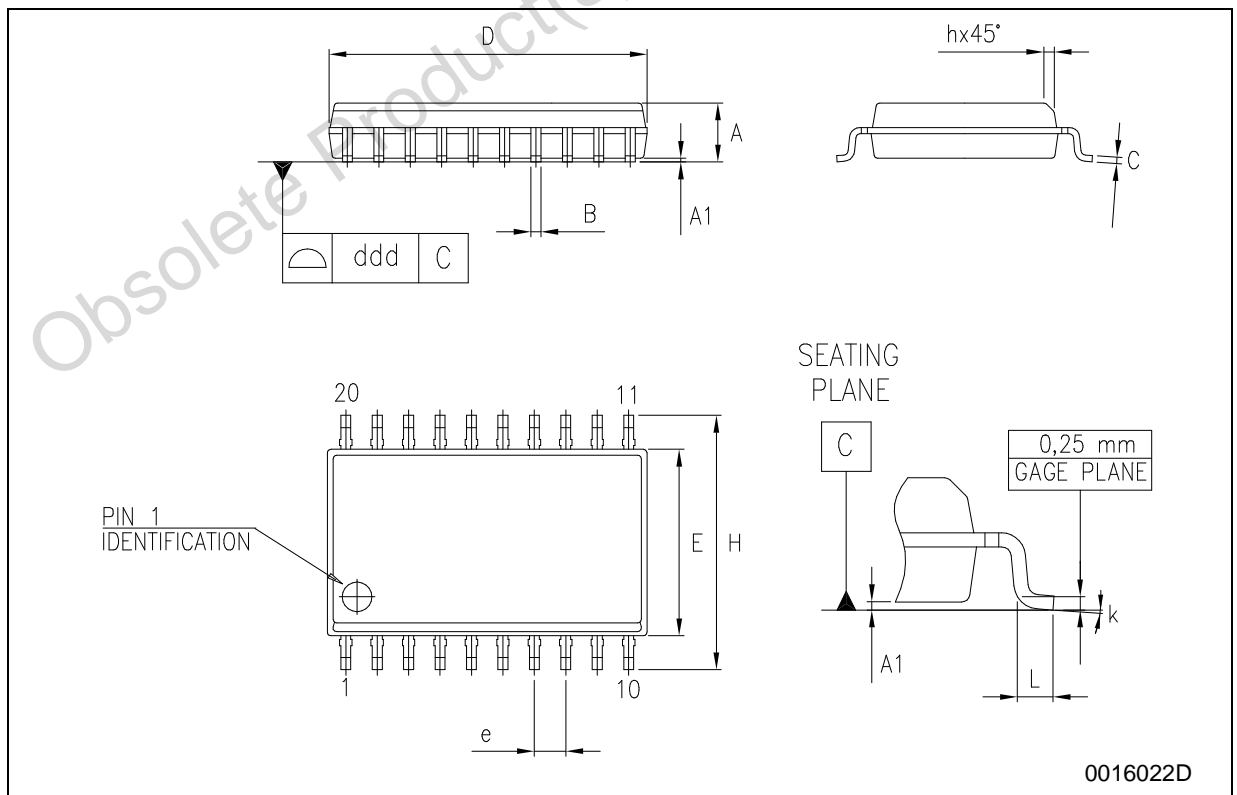


Figure 6: Waveform - Propagation Delay Time (f=1MHz; 50% duty cycle)



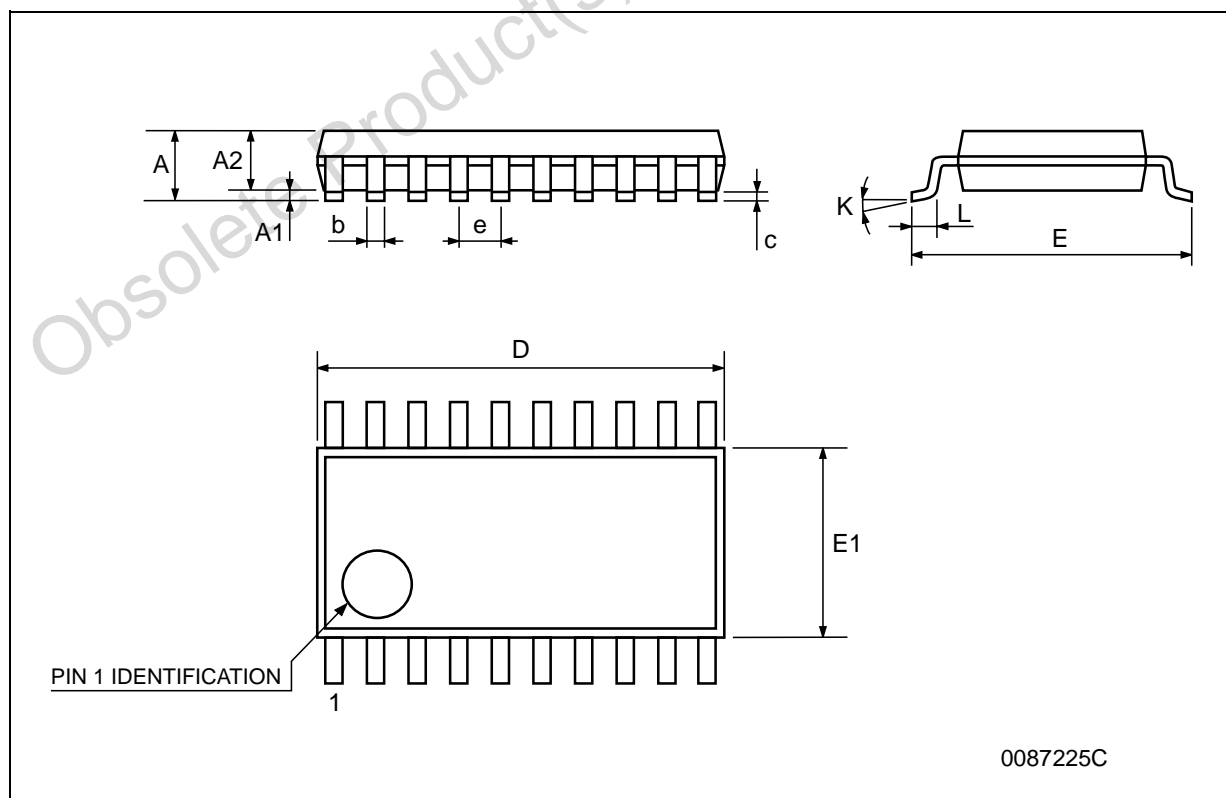
SO-20 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	2.35		2.65	0.093		0.104
A1	0.1		0.30	0.004		0.012
B	0.33		0.51	0.013		0.020
C	0.23		0.32	0.009		0.013
D	12.60		13.00	0.496		0.512
E	7.4		7.6	0.291		0.299
e		1.27			0.050	
H	10.00		10.65	0.394		0.419
h	0.25		0.75	0.010		0.030
L	0.4		1.27	0.016		0.050
k	0°		8°	0°		8°
ddd			0.100			0.004



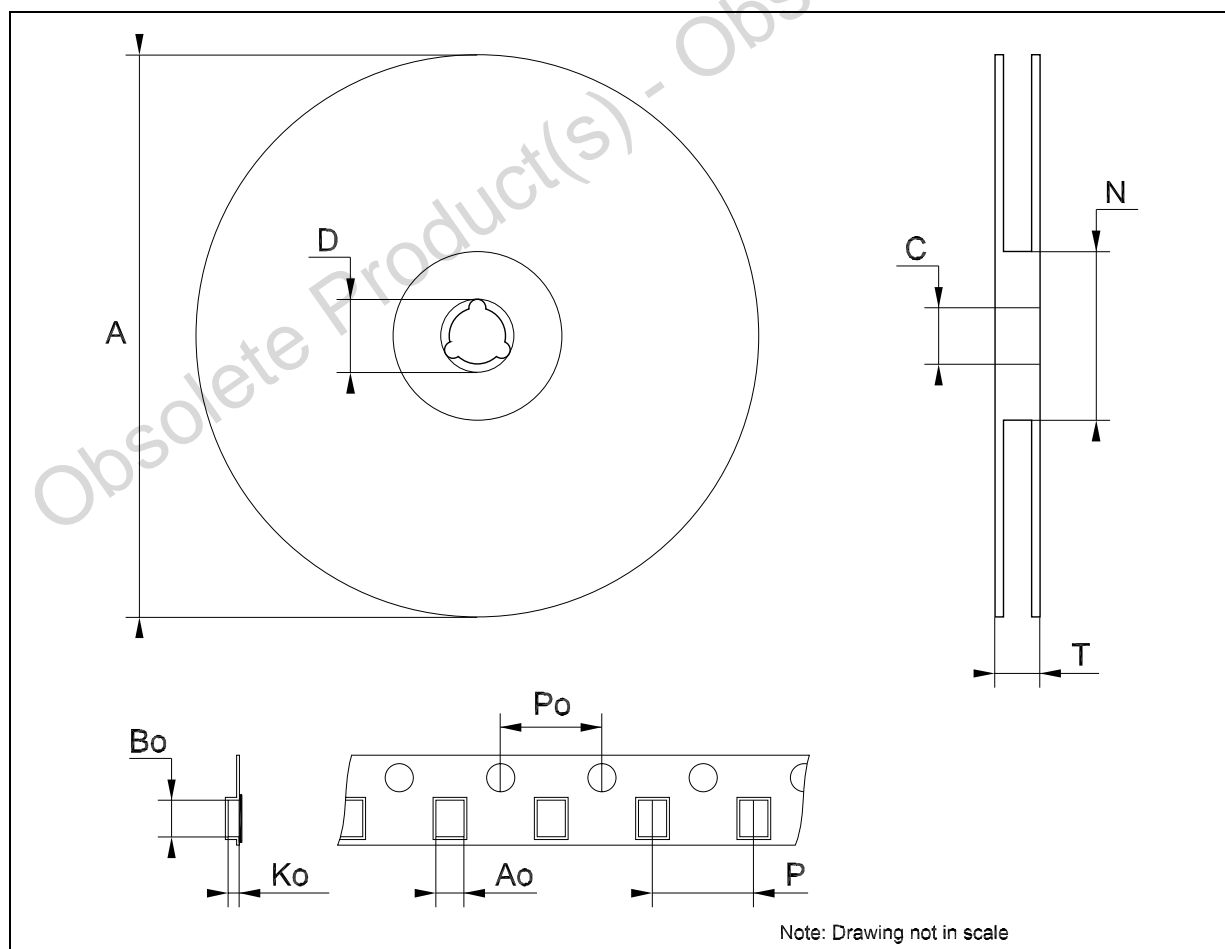
TSSOP20 MECHANICAL DATA

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		0.0079
D	6.4	6.5	6.6	0.252	0.256	0.260
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



Tape & Reel SO-20 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			30.4			1.197
Ao	10.8		11	0.425		0.433
Bo	13.2		13.4	0.520		0.528
Ko	3.1		3.3	0.122		0.130
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476



Tape & Reel TSSOP20 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	6.8		7	0.268		0.276
Bo	6.9		7.1	0.272		0.280
Ko	1.7		1.9	0.067		0.075
Po	3.9		4.1	0.153		0.161
P	11.9		12.1	0.468		0.476

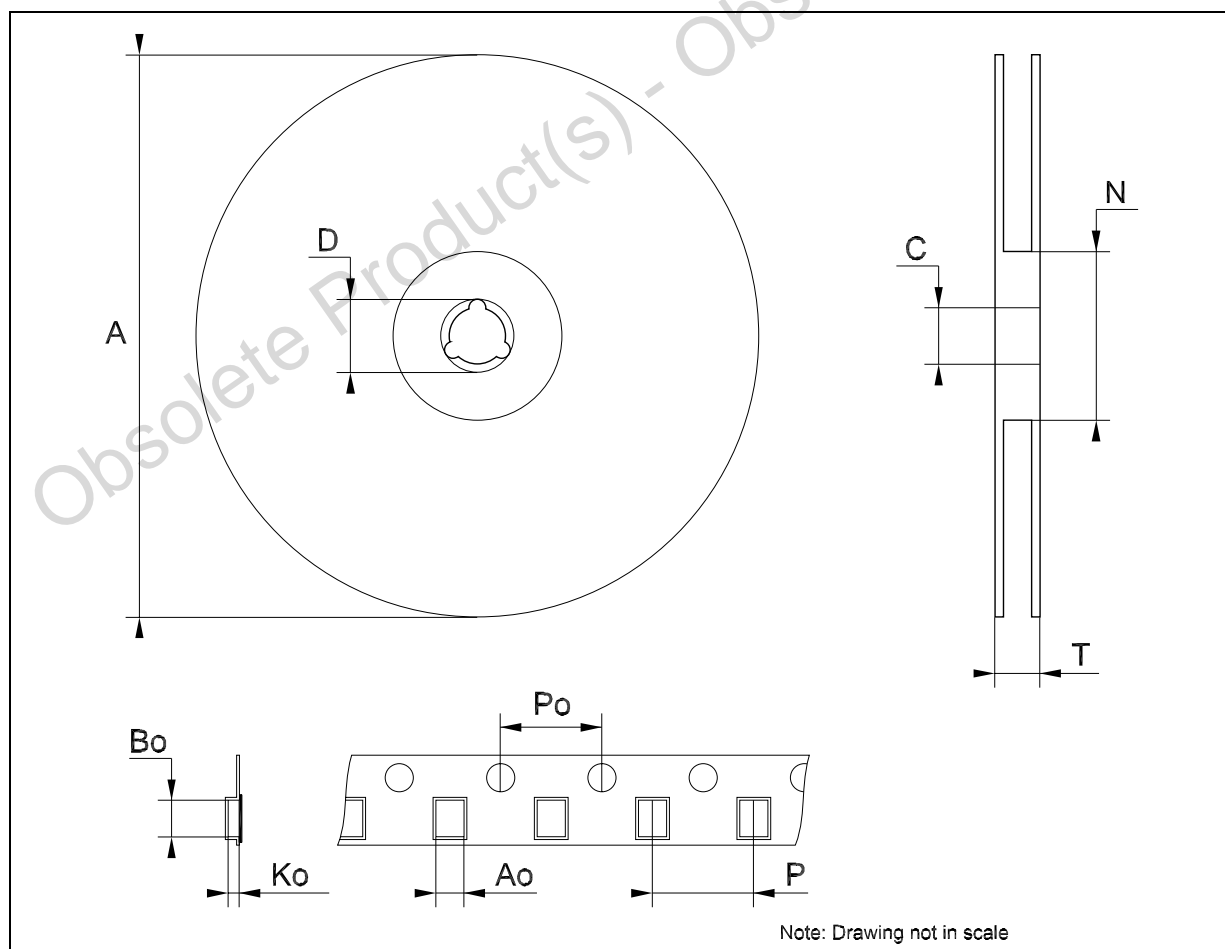


Table 11: Revision History

Date	Revision	Description of Changes
26-Jul-2004	3	Ordering Codes Revision - pag. 1.

Obsolete Product(s) - Obsolete Product(s)

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