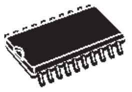
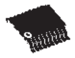
74VHC573

OCTAL D-TYPE LATCH
WITH 3 STATE OUTPUT NON INVERTING

- HIGH SPEED: t_{PD} = 4.5 ns (TYP.) at V_{CC} = 5V
- LOW POWER DISSIPATION:
  I_{CC} = 4 µA (MAX.) at T_A = 25 ^oC
- HIGH NOISE IMMUNITY:
  $V_{NIH} = V_{NIL}$ = 28% V_{CC} (MIN.)
- POWER DOWN PROTECTION ON INPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL}$ = 8 mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
  V_{CC} (OPR) = 2V to 5.5V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 573
- IMPROVED LATCH-UP IMMUNITY
- LOW NOISE: V_{OLP} = 0.9V (Max.)



M
(Micro Package)



T
(TSSOP Package)

ORDER CODES :

74VHC573M	74VHC573T

DESCRIPTION

The 74VHC573 is an advanced high-speed CMOS OCTAL D-TYPE LATCH with 3 STATE OUTPUT NON INVERTING fabricated with sub-micron silicon gate and double-layer metal wiring C^2MOS technology.

It has similar high speed performance of equivalent Bipolar Schottky TTL combined with true CMOS low power dissipation.

This 8 bit D-Type latch is controlled by a latch enable input (LE) and an output enable input ($\overline{OE}$).

While the LE input is held at a high level, the Q outputs will follow the data inputs precisely.

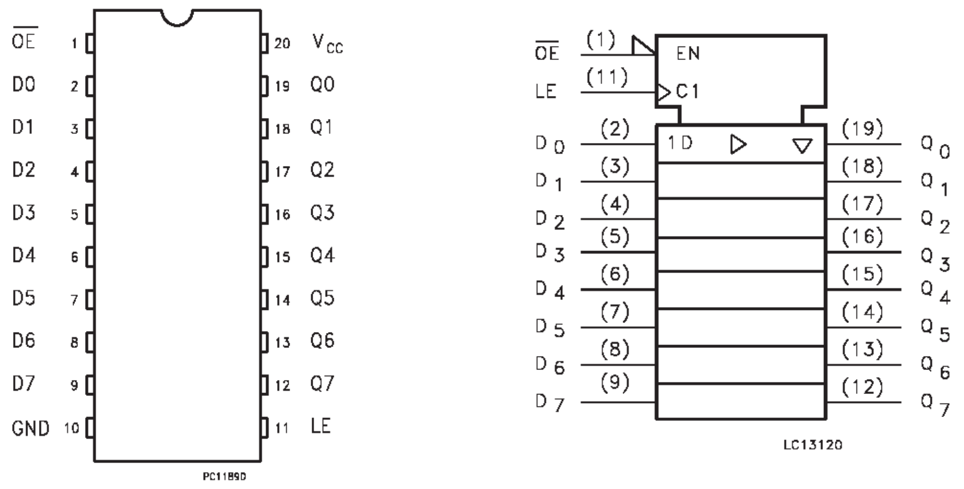
When the LE is taken low, the Q outputs will be latched precisely at the logic level of D input data.

While the ($\overline{OE}$) input is low, the 8 outputs will be in a normal logic state (high or low logic level) and while high level the outputs will be in a high impedance state.

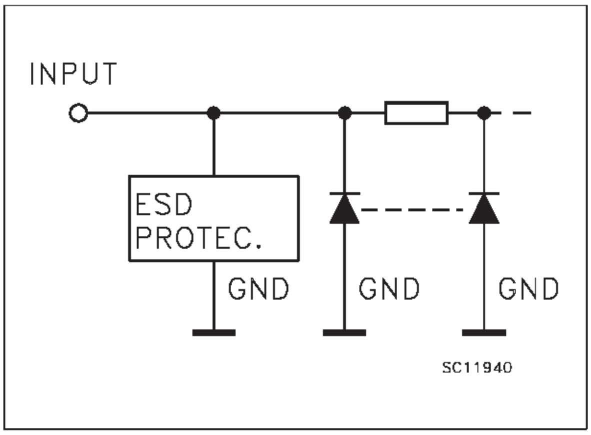
Power down protection is provided on all inputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V.

All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

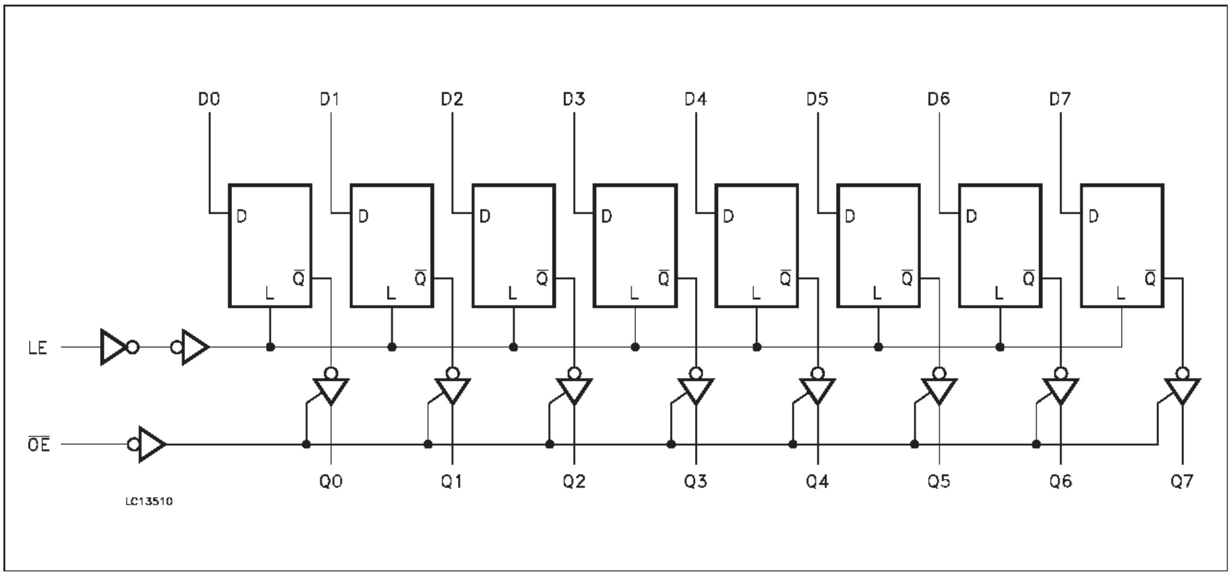
PIN No	SYMBOL	NAME AND FUNCTION
1	$\overline{OE}$	3 State Output Enable Input (Active LOW)
2, 3, 4, 5, 6, 7, 8, 9	D0 to D7	Data Inputs
12, 13, 14, 15, 16, 17, 18, 19	Q0 to Q7	3 State Latch Outputs
11	LE	Latch Enable Input
10	GND	Ground (0V)
20	V_{CC}	Positive Supply Voltage

TRUTH TABLE

INPUTS			OUTPUTS
$\overline{OE}$	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
* Q outputs are latched at the time when the LE input is taken low logic level.

LOGIC DIAGRAM



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	± 75	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 condition is not implied.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	2.0 to 5.5	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage	0 to V_{CC}	V
T_{op}	Operating Temperature	-40 to +85	°C
dt/dv	Input Rise and Fall Time (see note 1) (V_{CC} = 3.3 ± 0.3V) (V_{CC} = 5.0 ± 0.5V)	0 to 100 0 to 20	ns/V ns/V

1) V_{IN} from 30% to 70% of V_{CC}

DC SPECIFICATIONS

Symbol	Parameter	Test Conditions			Value					Unit
		V_{CC} (V)			T_A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	2.0			1.5			1.5		V
		3.0 to 5.5			0.7V_{CC}			0.7V_{CC}		
V_{IL}	Low Level Input Voltage	2.0					0.5		0.5	V
		3.0 to 5.5					0.3V_{CC}		0.3V_{CC}	
V_{OH}	High Level Output Voltage	2.0	$V_I^{(*)}$ = V_{IH} or V_{IL}	I_O=-50 µA	1.9	2.0		1.9		V
		3.0		I_O=-50 µA	2.9	3.0		2.9		
		4.5		I_O=-50 µA	4.4	4.5		4.4		
		3.0		I_O=-4 mA	2.58			2.48		
		4.5		I_O=-8 mA	3.94			3.8		
V_{OL}	Low Level Output Voltage	2.0	$V_I^{(*)}$ = V_{IH}or V_{IL}	I_O=50 µA		0.0	0.1		0.1	V
		3.0		I_O=50 µA		0.0	0.1		0.1	
		4.5		I_O=50 µA		0.0	0.1		0.1	
		3.0		I_O=4 mA			0.36		0.44	
		4.5		I_O=8 mA			0.36		0.44	
I_{OZ}	3 State Output Leakage Current	5.5	V_I = V_{IH} or V_{IL} V_O = V_{CC} or GND				±0.25		±2.5	µA
I_I	Input Leakage Current	0 to 5.5	V_I = 5.5V or GND				±0.1		±1.0	µA
I_{CC}	Quiescent Supply Current	5.5	V_I = V_{CC} or GND				4		40	µA

(*) All outputs loaded.

AC ELECTRICAL CHARACTERISTICS (Input t_r = t_f =3 ns)

Symbol	Parameter	Test Condition			Value					Unit
		V_{CC} (V)	C_L (pF)		T_A = 25 °C			-40 to 85 °C		
					Min.	Typ.	Max.	Min.	Max.	
t_{PLH} t_{PHL}	Propagation Delay Time (LE to Q)	3.3(*)	15			7.6	11.9	1.0	14.0	ns
		3.3(*)	50			10.1	15.4	1.0	17.5	
		5.0(**)	15			5.0	7.7	1.0	9.0	
		5.0(**)	50			6.5	9.7	1.0	11.0	
t_{PLH} t_{PHL}	Propagation Delay Time (D to Q)	3.3(*)	15			7.0	11.0	1.0	13.0	ns
		3.3(*)	50			9.5	14.5	1.0	16.5	
		5.0(**)	15			4.5	6.8	1.0	8.0	
		5.0(**)	50			6.0	8.8	1.0	10.0	
t_{PZL} t_{PZH}	Output EnableTime	3.3(*)	15	R_L = 1KΩ		7.3	11.5	1.0	13.5	ns
		3.3(*)	50	R_L = 1KΩ		9.8	15.0	1.0	17.0	
		5.0(**)	15	R_L = 1KΩ		5.2	7.7	1.0	9.0	
		5.0(**)	50	R_L = 1KΩ		6.7	9.7	1.0	11.0	
t_{PLZ} t_{PHZ}	Output Disable Time	3.3(*)	50	R_L = 1KΩ		10.7	14.5	1.0	16.5	ns
		5.0(**)	50	R_L = 1KΩ		6.7	9.7	1.0	11	
t_w	Pulse Width (LE) HIGH	3.3(*)					5.0		5.0	ns
		5.0(**)					5.0		5.0	
t_s	Setup Time D to LE HIGH or LOW	3.3(*)					3.5		3.5	ns
		5.0(**)					3.5		3.5	
t_h	Hold Time D to LE HIGH or LOW	3.3(*)					1.5		1.5	ns
		5.0(**)					1.5		1.5	
t_{OSLH} t_{OSHL}	Output to Output Skew Time (note 1)	3.3(*)	50				1.5		1.5	ns
		5.0(**)	50				1.0		1.0	

(*) Voltage range is 3.3V ± 0.3V

(**) Voltage range is 5V ± 0.5V

Note 1: Parameter guaranteed by design. $t_{soLH} = |t_{pLHm} - t_{pLHn}|$, $t_{soHL} = |t_{pHLm} - t_{pHLn}|$

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Conditions	Value					Unit
			T_A = 25 °C			-40 to 85 °C		
			Min.	Typ.	Max.	Min.	Max.	
C_{IN}	Input Capacitance			4	10		10	pF
C_{OUT}	Output Capacitance			6				pF
C_{PD}	Power Dissipation Capacitance (note 1)			29				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. $I_{CC}(opr) = C_{PD} \bullet V_{CC} \bullet f_{IN} + I_{CC}/8$ (per Latch)

DYNAMIC SWITCHING CHARACTERISTICS

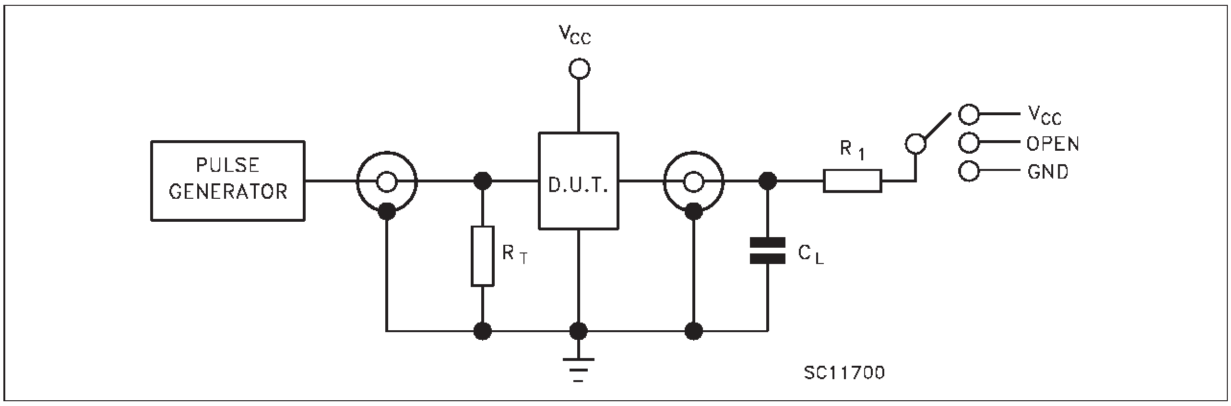
Symbol	Parameter	Test Conditions		Value					Unit
		V_{CC} (V)		T_A = 25 °C			-40 to 85 °C		
				Min.	Typ.	Max.	Min.	Max.	
V_{OLP}	Dynamic Low Voltage Quiet Output (note 1, 2)	5.0	C_L = 50 pF		0.6	0.9			V
V_{OLV}				-0.9	-0.6				
V_{IHD}	Dynamic High Voltage Input (note 1, 3)	5.0		3.5					
V_{ILD}	Dynamic Low Voltage Input (note 1, 3)	5.0				1.5			

1) Worst case package.

2) Max number of outputs defined as (n). Data inputs are driven 0V to 5.0V, (n -1) outputs switching and one output at GND.

3) Max number of data inputs (n) switching. (n-1) switching 0V to 5.0V. Inputs under test switching: 5.0V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f=1MHz.

TEST CIRCUIT



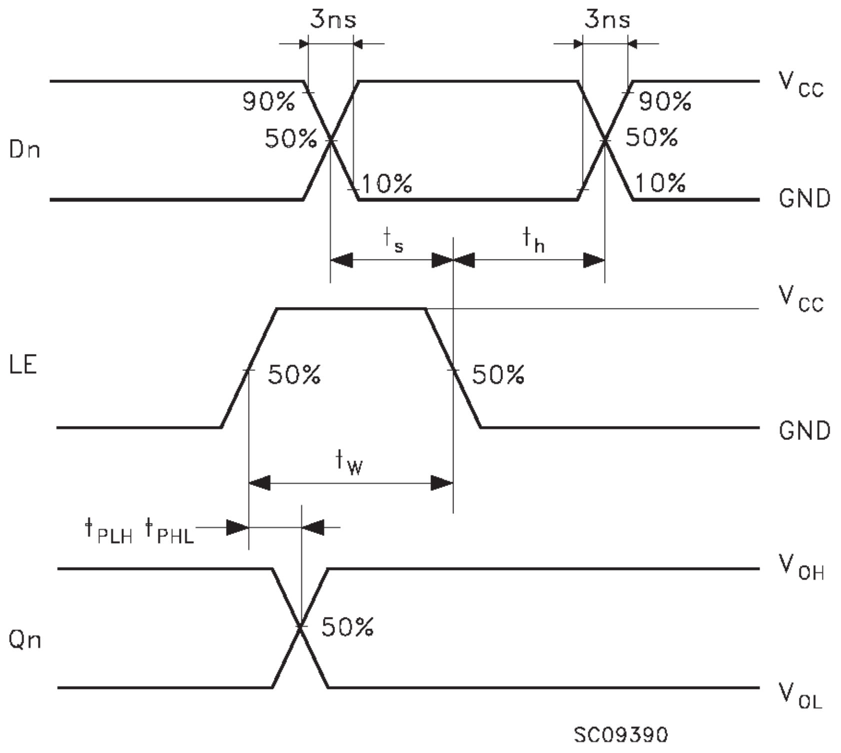
TEST	SWITCH
t_{PLH}, t_{PHL}	Open
t_{PZL}, t_{PLZ}	V_{CC}
t_{PZH}, t_{PHZ}	GND

C_L = 15/50 pF or equivalent (includes jig and probe capacitance)

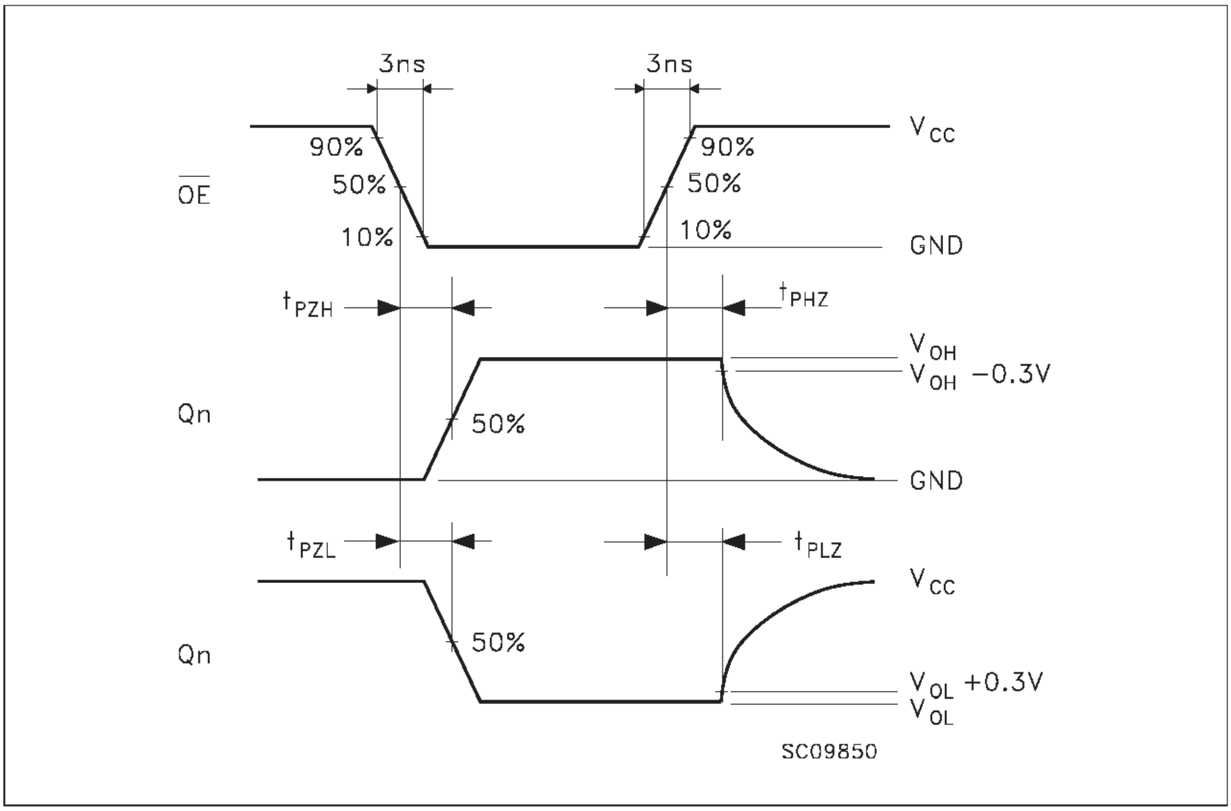
$R_L = R_1$ = 1KΩ or equivalent

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

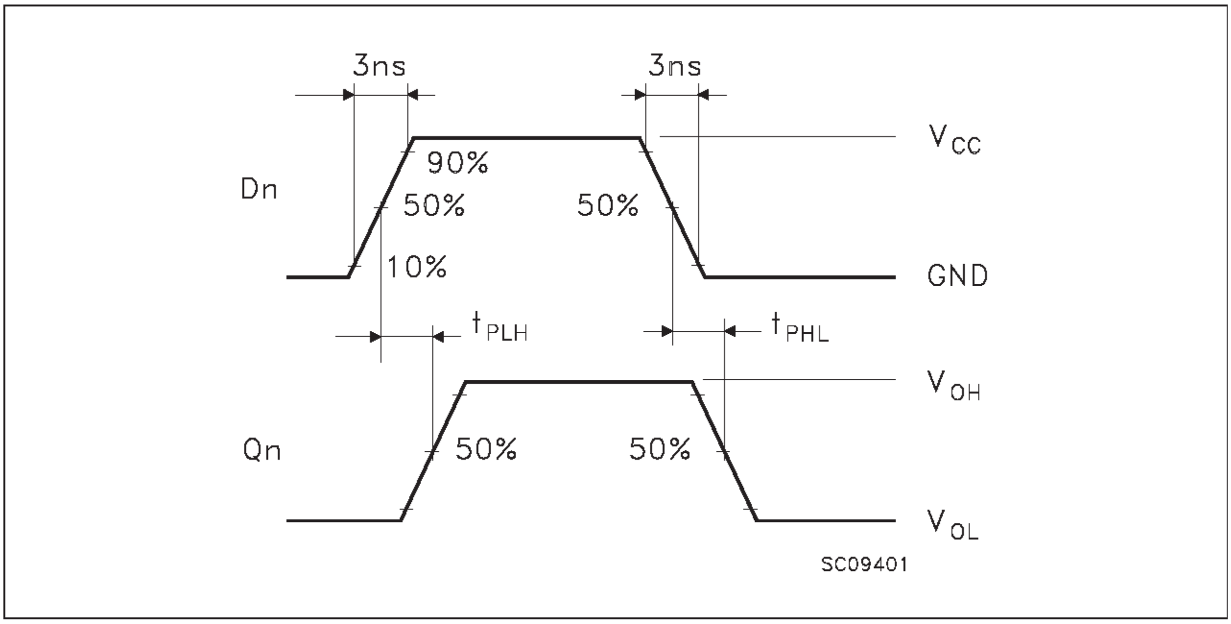
WAVEFORM 1: LE TO Qn PROPAGATION DELAYS, LE MINIMUM PULSE WIDTH, Dn TO LE SETUP AND HOLD TIMES (f=1MHz; 50% duty cycle)



WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIMES (f=1MHz; 50% duty cycle)

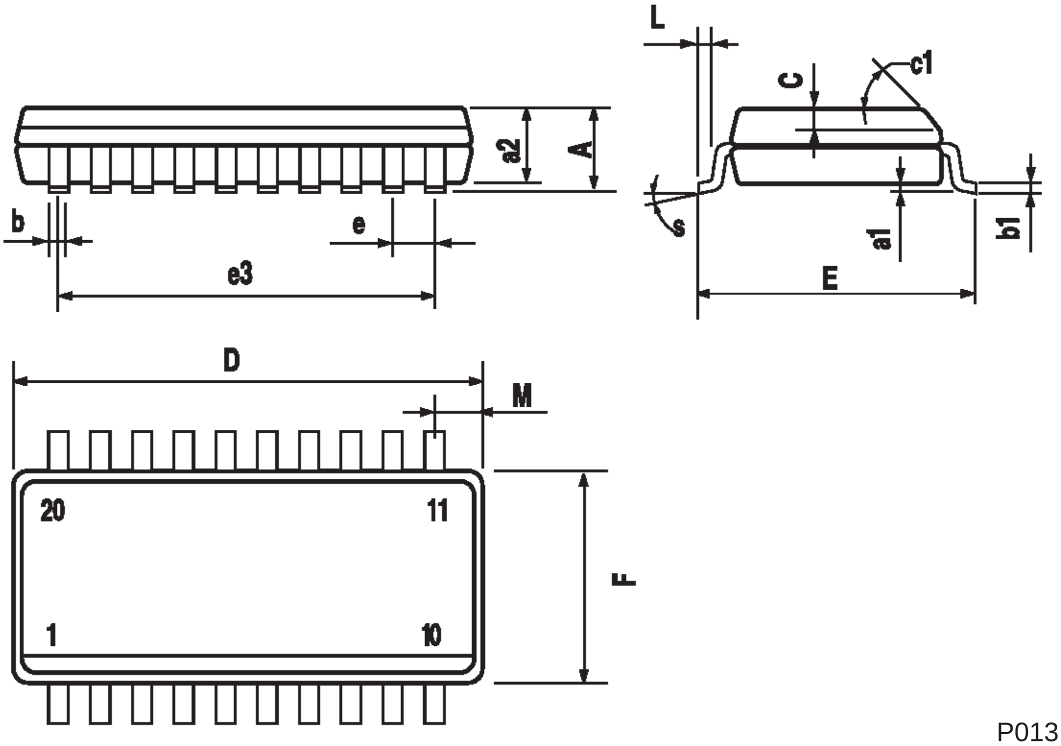


WAVEFORM 3: PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)



SO-20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			2.65			0.104
a1	0.10		0.20	0.004		0.007
a2			2.45			0.096
b	0.35		0.49	0.013		0.019
b1	0.23		0.32	0.009		0.012
C		0.50			0.020	
c1	45 (typ.)					
D	12.60		13.00	0.496		0.512
E	10.00		10.65	0.393		0.419
e		1.27			0.050	
e3		11.43			0.450	
F	7.40		7.60	0.291		0.299
L	0.50		1.27	0.19		0.050
M			0.75			0.029
S	8 (max.)					



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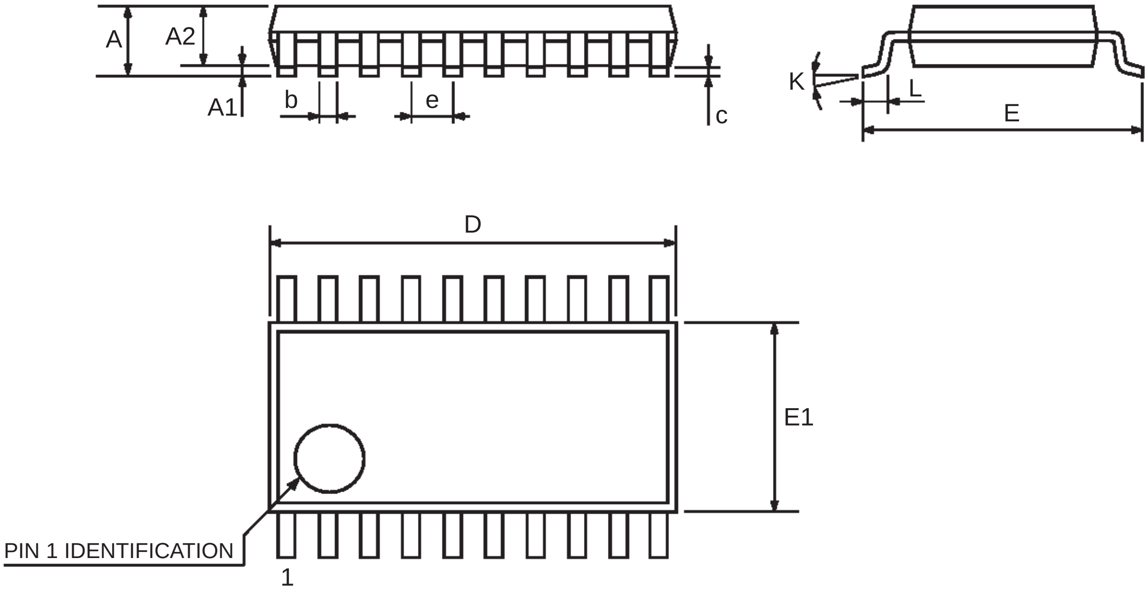
TSSOP20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.1			0.433
A1	0.05	0.10	0.15	0.002	0.004	0.006
A2	0.85	0.9	0.95	0.335	0.354	0.374
b	0.19		0.30	0.0075		0.0118
c	0.09		0.2	0.0035		0.0079
D	6.4	6.5	6.6	0.252	0.256	0.260
E	6.25	6.4	6.5	0.246	0.252	0.256
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65 BSC			0.0256 BSC	
K	0°	4°	8°	0°	4°	8°
L	0.50	0.60	0.70	0.020	0.024	0.028



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