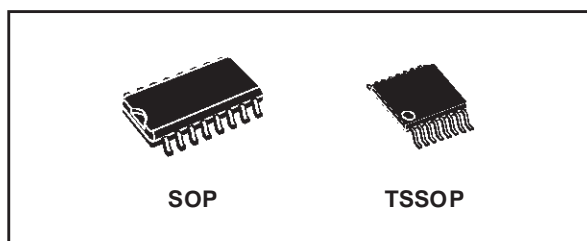




74VHCT257A

QUAD 2 CHANNEL MULTIPLEXER (3-STATE)

- HIGH SPEED: $t_{PD} = 4.8 \text{ ns}$ (TYP.) at $V_{CC} = 5V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4 \mu\text{A}$ (MAX.) at $T_A = 25^\circ\text{C}$
- COMPATIBLE WITH TTL OUTPUTS:
 $V_{IH} = 2V$ (MIN.), $V_{IL} = 0.8V$ (MAX)
- POWER DOWN PROTECTION ON INPUTS & OUTPUTS
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 8 \text{ mA}$ (MIN)
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \approx t_{PHL}$
- OPERATING VOLTAGE RANGE:
 $V_{CC}(\text{OPR}) = 4.5V \text{ to } 5.5V$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 257
- IMPROVED LATCH-UP IMMUNITY
- LOW NOISE: $V_{OLP} = 0.8V$ (MAX.)



ORDER CODES

PACKAGE	TUBE	T & R
SOP	74VHCT257AM	74VHCT257AMTR
TSSOP		74VHCT257ATTR

DESCRIPTION

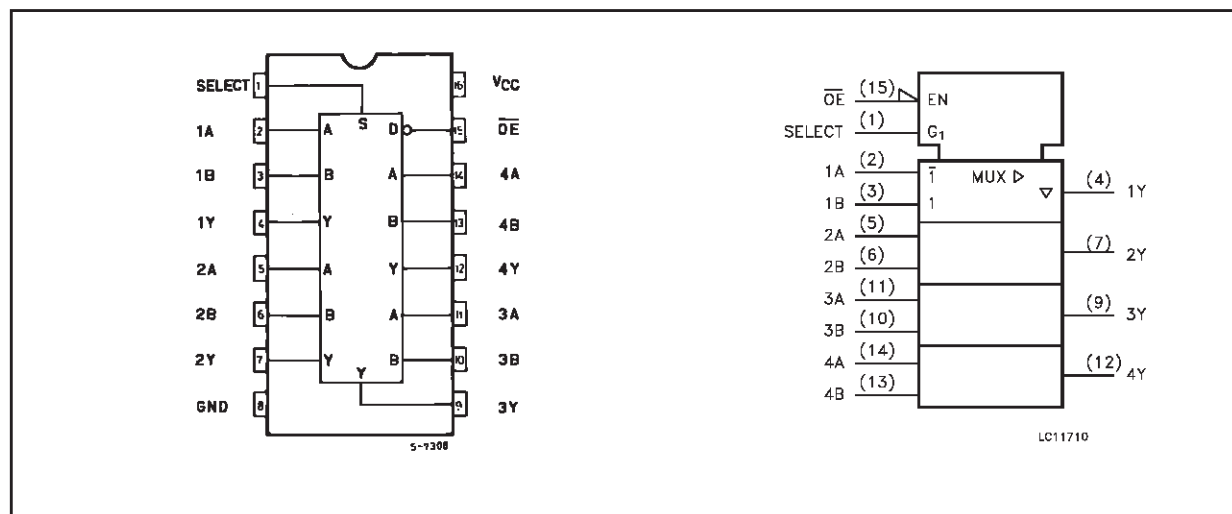
The 74VHCT257A is an advanced high-speed CMOS QUAD 2-CHANNEL MULTIPLEXER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C²MOS technology. It is composed of four independent 2-channel multiplexers with common SELECT and ENABLE INPUT(\overline{OE}). The VHCT257A is a non-inverting multiplexer. When the ENABLE INPUT is held "High", all outputs become high impedance state.

If SELECT INPUT is held "Low", "A" data is selected, when SELECT INPUT is "High", "B" data is chosen.

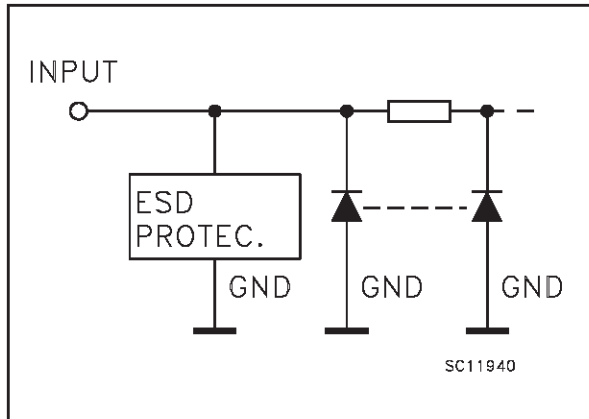
Power down protection is provided on all inputs and outputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 5V to 3V since all inputs are equipped with TTL threshold.

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

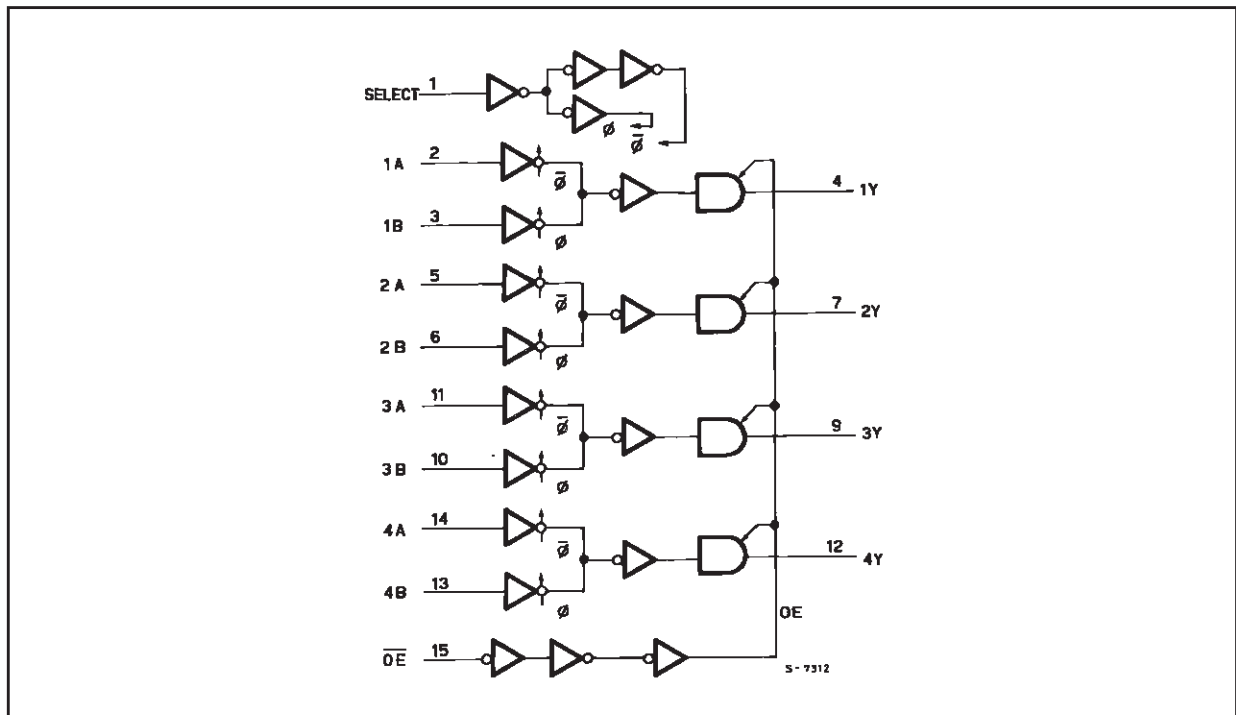
PIN No	SYMBOL	NAME AND FUNCTION
1	SELECT	Common Data Select Inputs
2, 5, 11, 14	1A to 4A	Data Inputs From Source A
3, 6, 10, 13	1B to 4B	Data Inputs From Source B
4, 7, 9, 12	1Y to 4Y	3 State Multiplexer Outputs
15	OE	3 State Output Enable Inputs (Active LOW)
8	GND	Ground (0V)
16	V _{CC}	Positive Supply Voltage

TRUTH TABLE

INPUTS				OUTPUT
OE	SELECT	A	B	Y
H	X	X	X	Z
L	L	L	X	L
L	L	H	X	H
L	H	X	L	L
L	H	X	H	H

X : Don't Care
Z : High Impedance

LOGIC DIAGRAM



This logic diagram has not been used to estimate propagation delays

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 (see note 1)	-0.5 to +7.0	V
V_O	DC Output Voltage (see note 2)	-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	°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) Output in OFF State
2) High or Low State

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	4.5 to 5.5	V
V_I	Input Voltage	0 to 5.5	V
V_O	Output Voltage (see note 1)	0 to 5.5	V
V_O	Output Voltage (see note 2)	0 to V_{CC}	V
T_{op}	Operating Temperature	-55 to 125	°C
dt/dv	Input Rise and Fall Time (see note 3) ($V_{CC} = 5.0 \pm 0.5V$)	0 to 20	ns/V

- 1) Output in OFF State
2) High or Low State
3) V_{IN} from 0.8V to 2V

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	4.5 to 5.5		2			2		2		V
V _{IL}	Low Level Input Voltage	4.5 to 5.5				0.8		0.8		0.8	V
V _{OH}	High Level Output Voltage	4.5	I _O =-50 μA	4.4	4.5		4.4		4.4		V
		4.5	I _O =-8 mA	3.94			3.8		3.7		
V _{OL}	Low Level Output Voltage	4.5	I _O =50 μA		0.0	0.1		0.1		0.1	V
		4.5	I _O =8 mA			0.36		0.44		0.55	
I _{oz}	High Impedance Output Leakage Current	5.5	V _I = V _{IH} or V _{IL} V _O = 0V to 5.5V			±0.25		± 2.5		± 2.5	μA
I _I	Input Leakage Current	0 to 5.5	V _I = 5.5V or GND			± 0.1		± 1.0		± 1.0	μA
I _{CC}	Quiescent Supply Current	5.5	V _I = V _{CC} or GND			4		40		40	μA
I _{CC}	Additional Worst Case Supply Current	5.5	One Input at 3.4V, other input at V _{CC} or GND			1.35		1.5		1.5	mA
I _{OPD}	Output Leakage Current	0	V _{OUT} = 5.5V			0.5		5.0		5.0	μA

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 A, B, to Y	5.0	15		4.8	7.0	1.0	8.0	1.0	8.0	ns
		5.0	50		5.5	8.0	1.0	9.0	1.0	9.0	
t _{PLH} t _{PHL}	Propagation Delay Time SELECT to Y	5.0	15		6.0	6.8	1.0	8.0	1.0	8.0	ns
		5.0	50		7.0	8.8	1.0	10.0	1.0	10.0	
t _{PZL} t _{PZH}	Output Enable Time	5.0	15		5.8	6.8	1.0	8.0	1.0	8.0	ns
		5.0	50		6.5	8.8	1.0	10.0	1.0	10.0	
t _{PLZ} t _{PHZ}	Output Disable Time	5.0	50		5.7	7.9	1.0	9.0	1.0	9.0	ns

(*) Voltage range is 5.0V ± 0.5V

CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value						Unit	
				T _A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
C _{IN}	Input Capacitance			4	10			10		10	pF
C _{OUT}	Output Capacitance			6							pF
C _{PD}	Power Dissipation Capacitance (note 1)			23							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. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$ (per Channel)

DYNAMIC SWITCHING CHARACTERISTICS

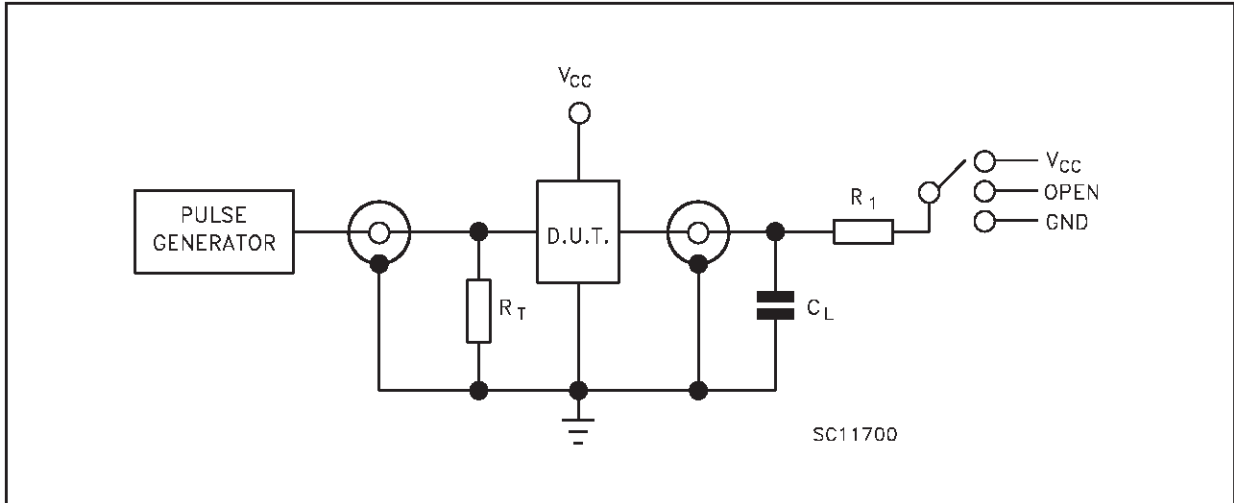
Symbol	Parameter	Test Condition		Value						Unit		
				V _{CC} (V)	T _A = 25°C			-40 to 85°C			-55 to 125°C	
					Min.	Typ.	Max.	Min.	Max.		Min.	Max.
V _{OLP}	Dynamic Low Voltage Quiet Output (note 1, 2)	5.0	C _L = 50 pF		0.3	0.8					V	
V _{OLV}				-0.8	-0.3							
V _{IHD}	5.0	2.0										
V _{ILD}	5.0				0.8							

1) Worst case package.

2) Max number of outputs defined as (n). Data inputs are driven 0V to 3.0V, (n-1) outputs switching and one output at GND.

3) Max number of data inputs (n) switching. (n-1) switching 0V to 3.0V. Inputs under test switching: 3.0V to threshold (V_{ILD}), 0V to threshold (V_{IHD}), f=1MHz.

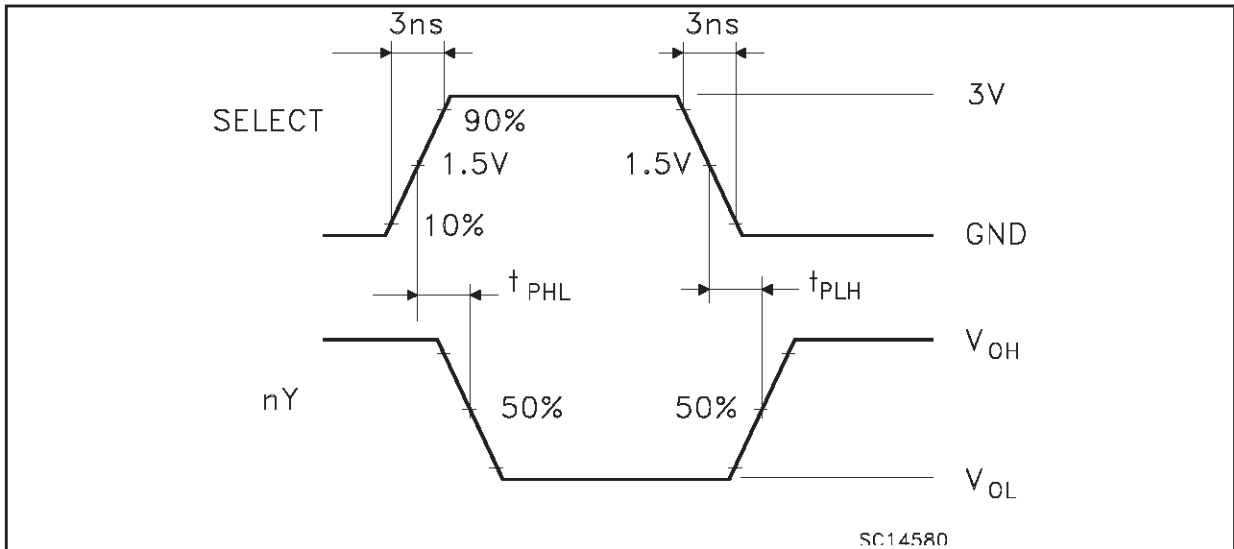
TEST CIRCUIT



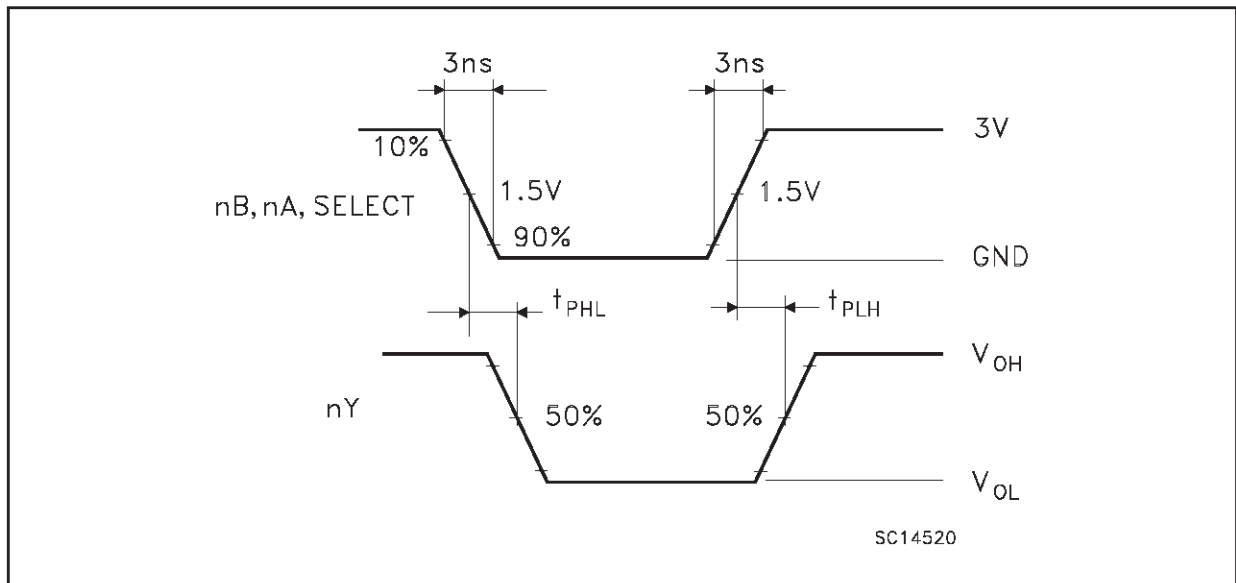
TEST	SWITCH
t_{PLH} , t_{PHL}	Open
t_{PZL} , t_{PLZ}	V_{CC}
t_{PZH} , t_{PHZ}	GND

$C_L = 15/50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_L = R_1 = 1\text{K}\Omega$ or equivalent
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

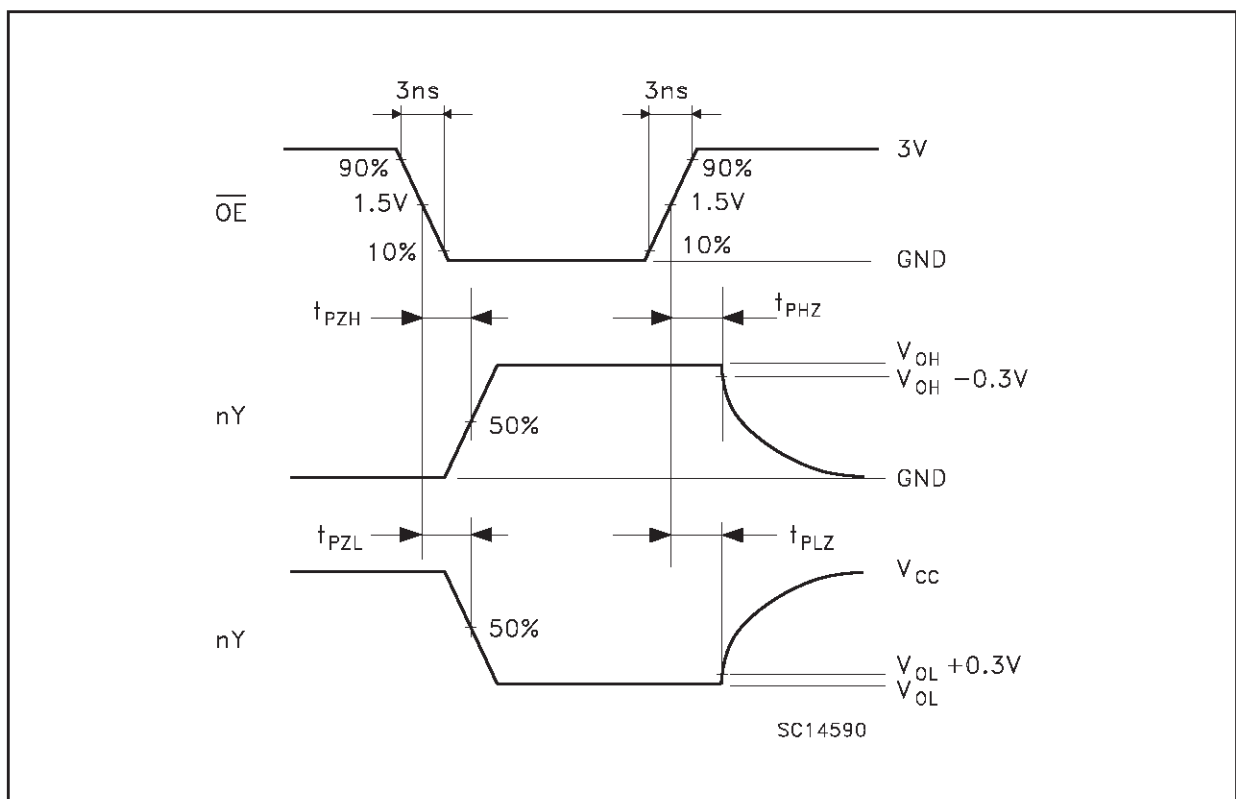
WAVEFORM 1: PROPAGATION DELAYS FOR INVERTING CONDITIONS ($f=1\text{MHz}$; 50% duty cycle)



WAVEFORM 2: PROPAGATION DELAYS FOR NON-INVERTING CONDITIONS ($f=1\text{MHz}$; 50% duty cycle)

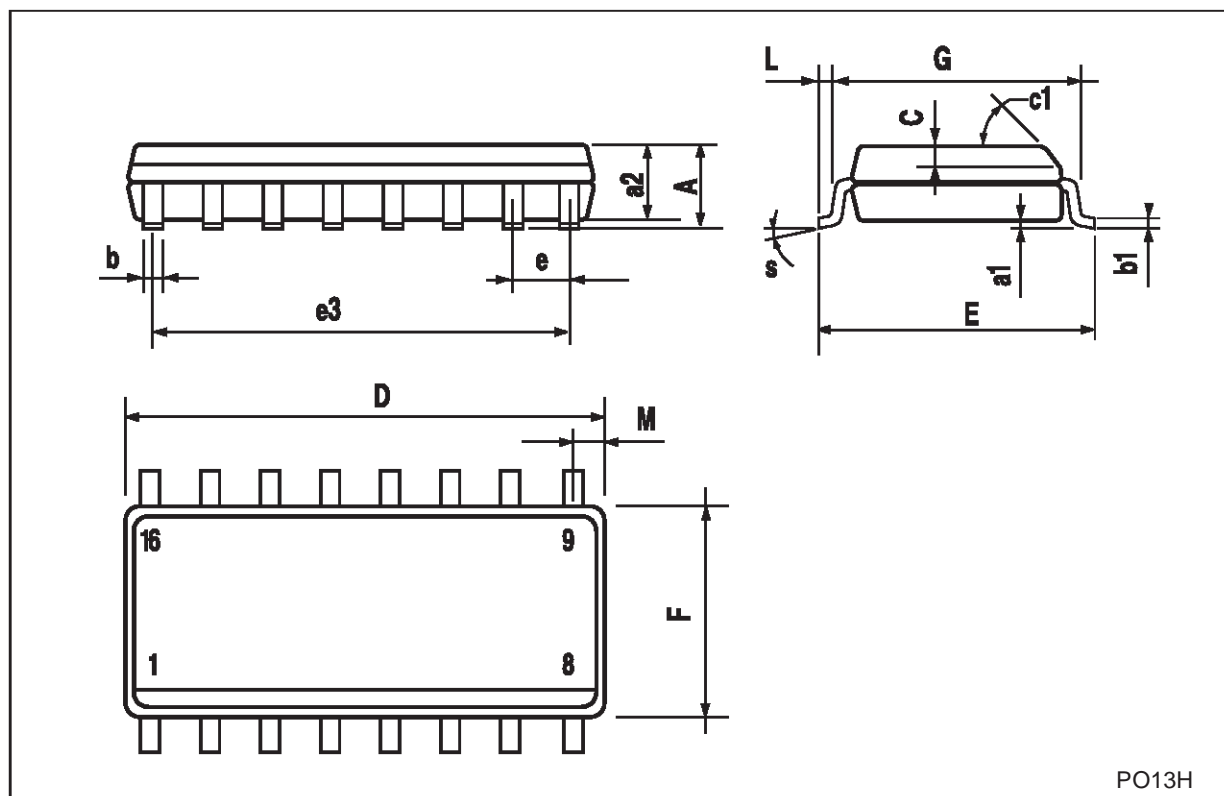


WAVEFORM 3: OUTPUT ENABLE AND DISABLE TIME ($f=1\text{MHz}$; 50% duty cycle)



SO-16 MECHANICAL DATA

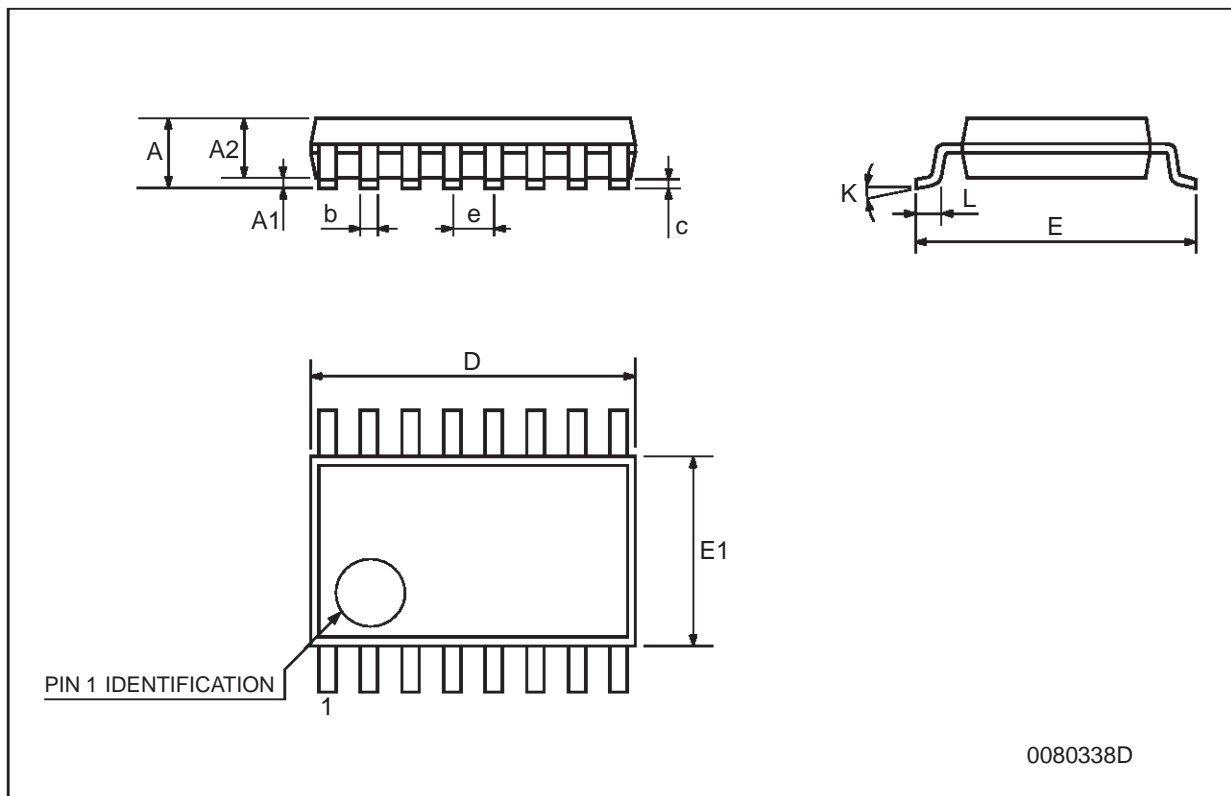
DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
F	3.8		4.0	0.149		0.157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