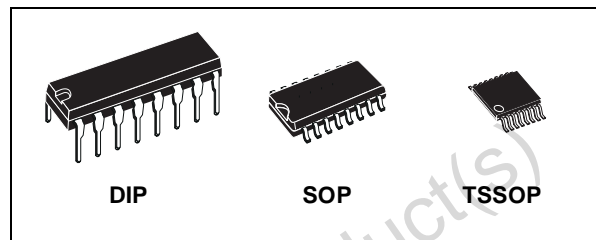




M74HC257

QUAD 2 CHANNEL MULTIPLEXER (3-STATE)

- HIGH SPEED :
 $t_{PD} = 11 \text{ ns (TYP.) at } V_{CC} = 6V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu\text{A (MAX.) at } T_A = 25^\circ\text{C}$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (MIN.)}$
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 6\text{mA (MIN)}$
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \approx t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
 $V_{CC} \text{ (OPR)} = 2V \text{ to } 6V$
- PIN AND FUNCTION COMPATIBLE WITH
 74 SERIES 257



ORDER CODES

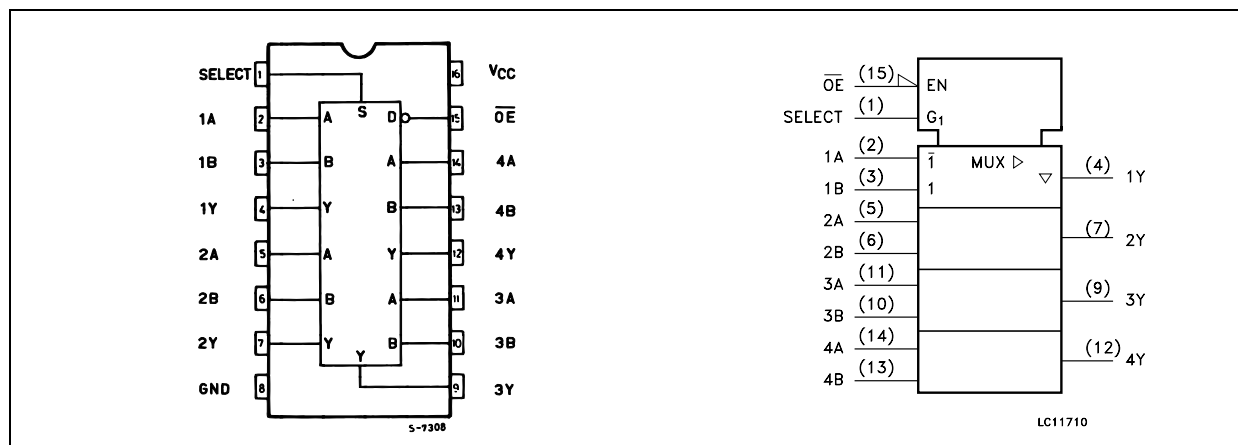
| PACKAGE | TUBE | T & R |
|---------|-------------|----------------|
| DIP | M74HC257B1R | |
| SOP | M74HC257M1R | M74HC257RM13TR |
| TSSOP | | M74HC257TTR |

DESCRIPTION

The M74HC257 is an high speed CMOS QUAD 2 CHANNEL MULTIPLEXER (3-STATE) fabricated with silicon gate C²MOS technology. This IC is composed of an independent 2-channel multiplexer with common SELECT and ENABLE (OE) input. The M74HC257 is a non-inverting multiplexer.

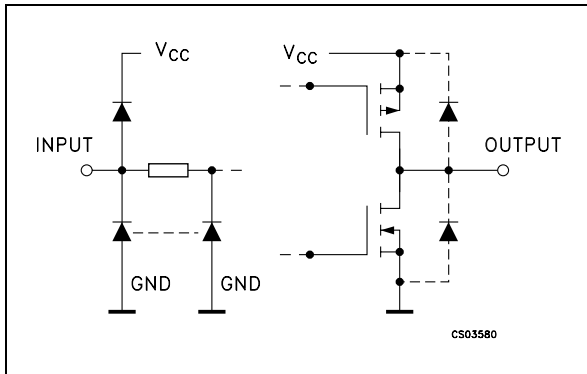
When the ENABLE input is held "High", outputs of the IC become in a High-Impedance state. If SELECT input is held low, "A" data is selected, when SELECT is high, "B" data is chosen. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



M74HC257

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

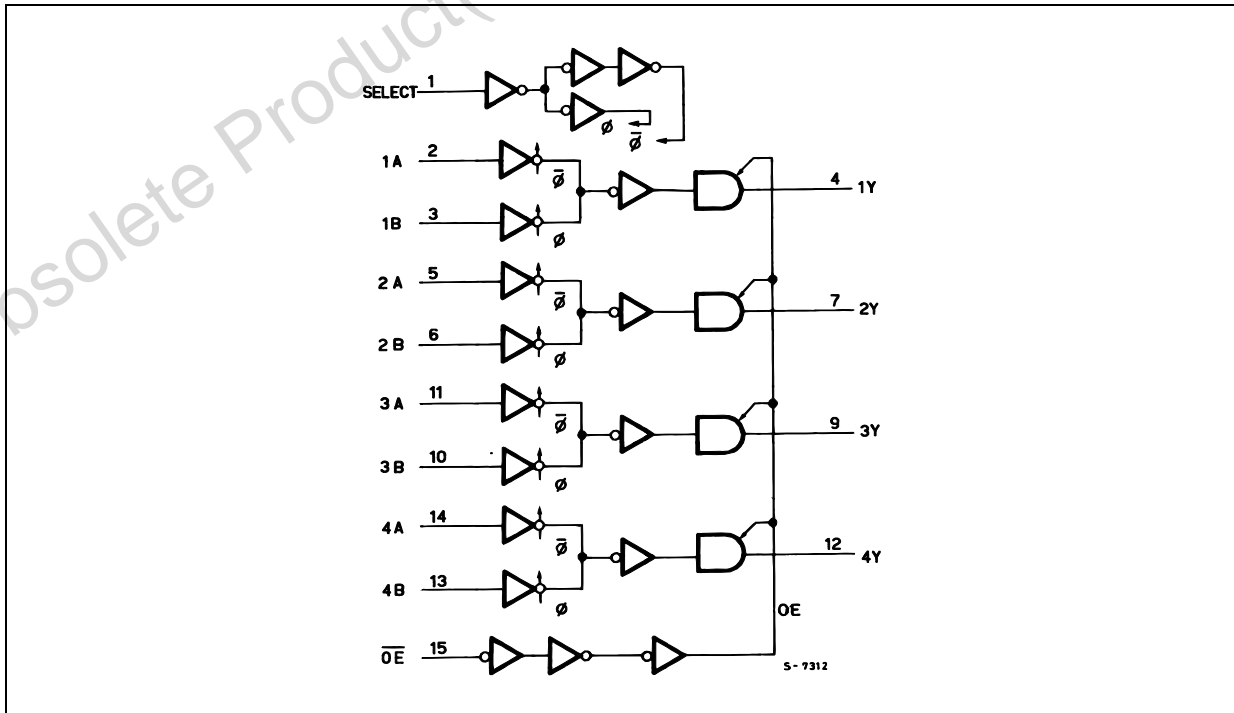
| PIN No | SYMBOL | NAME AND FUNCTION |
|--------------|-----------------|---|
| 1 | SELECT | Common Data Select Input |
| 2, 5, 14, 11 | 1A to 4A | Data Input From Source A |
| 3, 6, 13, 10 | 1B to 4B | Data Input From Source B |
| 4, 7, 12, 9 | 1Y to 4Y | 3 State Multiplexer Outputs |
| 15 | \overline{OE}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

TRUTH TABLE

| INPUTS | | | | OUTPUT |
|-----------------|--------|---|---|--------|
| \overline{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 be used to estimate propagation delays

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 | ± 35 | mA |
| I_{CC} or I_{GND} | DC V_{CC} or Ground Current | ± 70 | mA |
| P_D | Power Dissipation | 500(*) | mW |
| 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

(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

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 | ns |
| | | $V_{CC} = 4.5V$ | 0 to 500 | ns |
| | | $V_{CC} = 6.0V$ | 0 to 400 | ns |

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 =-6.0 mA | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| | | 6.0 | I _O =-7.8 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 =6.0 mA | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| | | 6.0 | I _O =7.8 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 _{OZ} | High Impedance Output Leakage Current | 6.0 | V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND | | | ± 0.5 | | ± 5 | | ± 10 | μA |
| I _{CC} | Quiescent Supply Current | 6.0 | V _I = V _{CC} or GND | | | 4 | | 40 | | 80 | μA |

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, Input $t_r = t_f = 6 \text{ ns}$)

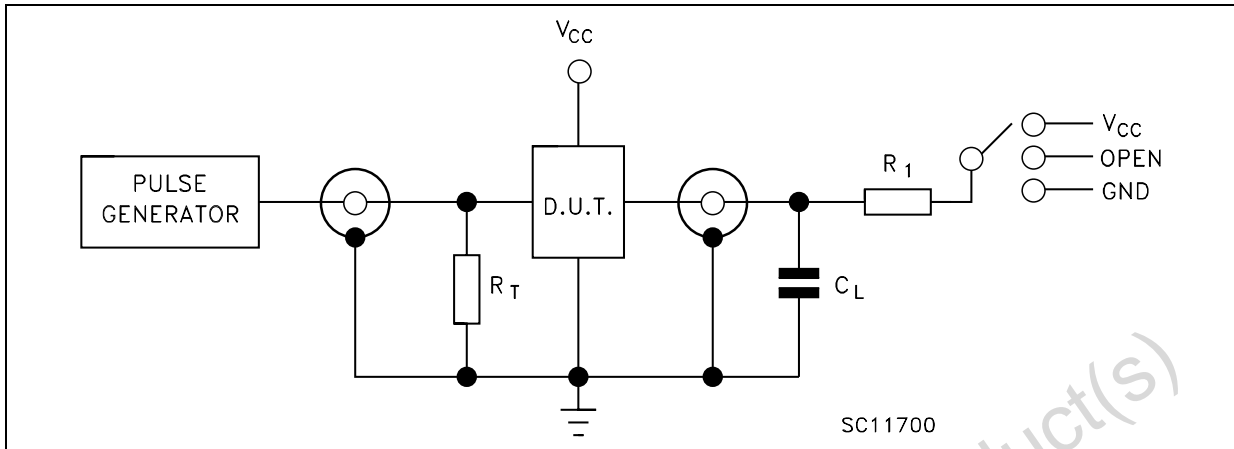
| Symbol | Parameter | Test Condition | | | Value | | | | | | Unit | |
|---------------------|--|-----------------|-----|---------------------------|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
| | | V_{CC} (V) | | | $T_A = 25^\circ\text{C}$ | | | $-40 \text{ to } 85^\circ\text{C}$ | | $-55 \text{ to } 125^\circ\text{C}$ | | |
| | | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| t_{TLH} t_{THL} | Output Transition Time | 2.0 | 50 | | | 25 | 60 | | 75 | | 90 | ns |
| | | 4.5 | | | | 7 | 12 | | 15 | | 19 | |
| | | 6.0 | | | | 6 | 10 | | 13 | | 15 | |
| t_{PLH} t_{PHL} | Propagation Delay Time (A, B - Y) | 2.0 | 50 | | | 45 | 100 | | 125 | | 150 | ns |
| | | 4.5 | | | | 13 | 20 | | 25 | | 30 | |
| | | 6.0 | | | | 11 | 17 | | 21 | | 26 | |
| | | 2.0 | 150 | | | 62 | 140 | | 175 | | 210 | ns |
| | | 4.5 | | | | 18 | 28 | | 35 | | 42 | |
| | | 6.0 | | | | 15 | 24 | | 30 | | 36 | |
| t_{PLH} t_{PHL} | Propagation Delay Time (SELECT - Y) | 2.0 | 50 | | | 45 | 100 | | 125 | | 150 | ns |
| | | 4.5 | | | | 13 | 20 | | 25 | | 30 | |
| | | 6.0 | | | | 11 | 17 | | 21 | | 26 | |
| | | 2.0 | 150 | | | 62 | 140 | | 175 | | 210 | ns |
| | | 4.5 | | | | 18 | 28 | | 35 | | 42 | |
| | | 6.0 | | | | 15 | 24 | | 30 | | 36 | |
| t_{PZL} t_{PZH} | High Impedance Output Enable Time | 2.0 | 50 | $R_L = 1 \text{ K}\Omega$ | | 40 | 110 | | 140 | | 165 | ns |
| | | 4.5 | | | | 12 | 22 | | 28 | | 33 | |
| | | 6.0 | | | | 10 | 19 | | 24 | | 28 | |
| | | 2.0 | 150 | $R_L = 1 \text{ K}\Omega$ | | 57 | 150 | | 190 | | 225 | ns |
| | | 4.5 | | | | 17 | 30 | | 38 | | 45 | |
| | | 6.0 | | | | 14 | 26 | | 32 | | 38 | |
| t_{PLZ} t_{PHZ} | High Impedance Output Disable Time | 2.0 | 50 | $R_L = 1 \text{ K}\Omega$ | | 28 | 140 | | 175 | | 210 | ns |
| | | 4.5 | | | | 14 | 28 | | 35 | | 42 | |
| | | 6.0 | | | | 13 | 24 | | 30 | | 36 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | | Value | | | | | | Unit | |
|-----------|--|-----------------|--|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
| | | V_{CC} (V) | | | $T_A = 25^\circ\text{C}$ | | | $-40 \text{ to } 85^\circ\text{C}$ | | $-55 \text{ to } 125^\circ\text{C}$ | | |
| | | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| C_{IN} | Input Capacitance | | | | | 5 | 10 | | 10 | | 10 | pF |
| C_{OUT} | Output Capacitance | | | | | 10 | | | | | | pF |
| C_{PD} | Power Dissipation Capacitance (note 1) | | | | | 47 | | | | | | 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. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$ (per Channel)

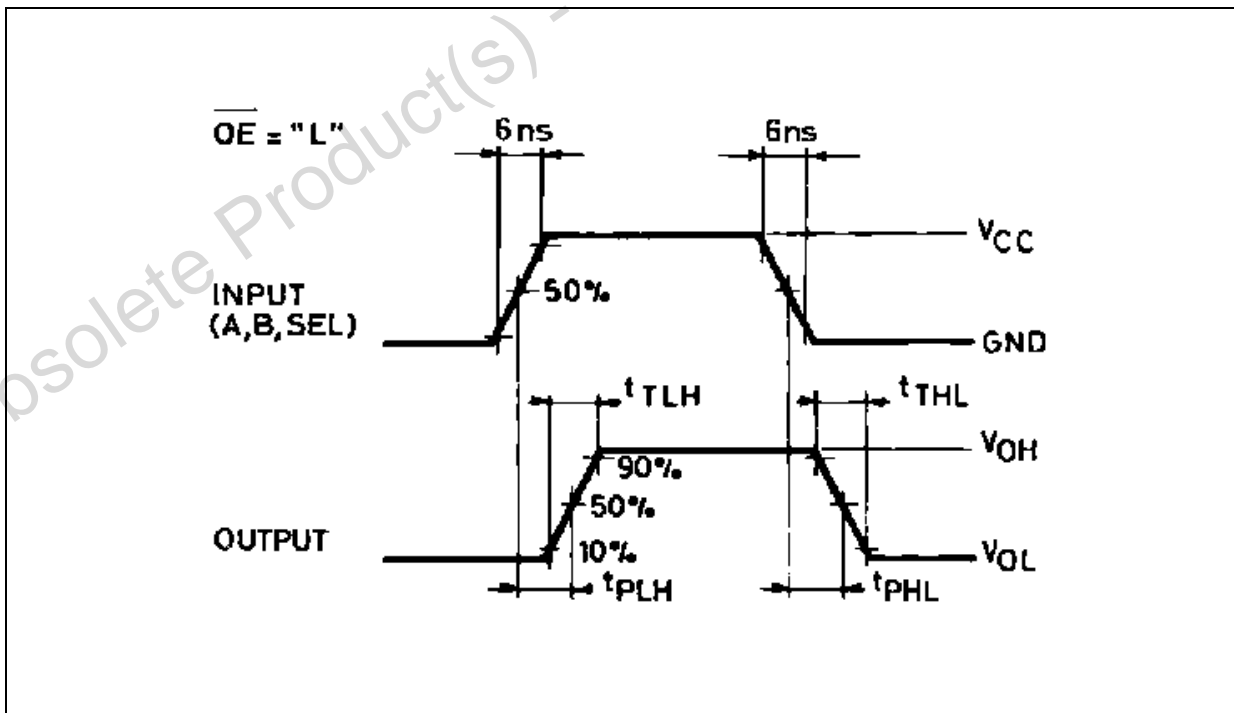
TEST CIRCUIT



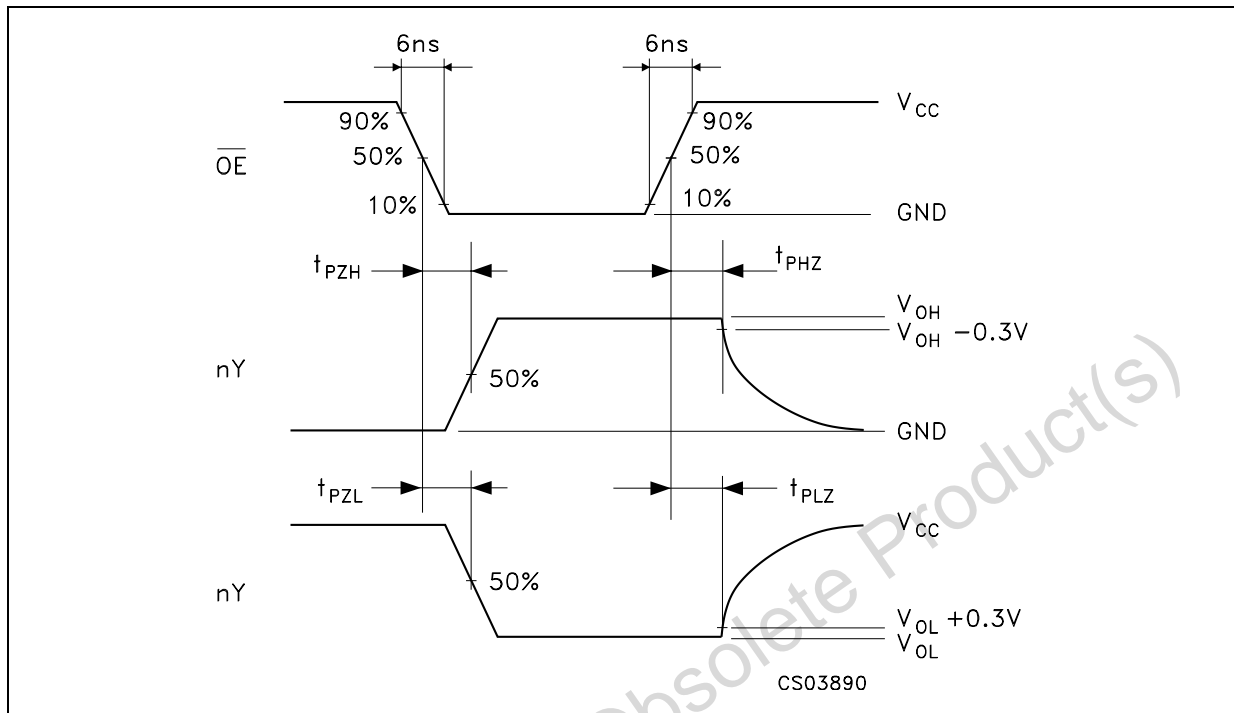
| TEST | SWITCH |
|-----------------------|----------|
| t_{PLH} , t_{PHL} | Open |
| t_{PZL} , t_{PLZ} | V_{CC} |
| t_{PZH} , t_{PHZ} | GND |

C_L = 50pF/150pF or equivalent (includes jig and probe capacitance)
 R_1 = 1K Ω or equivalent
 R_T = Z_{OUT} of pulse generator (typically 50 Ω)

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

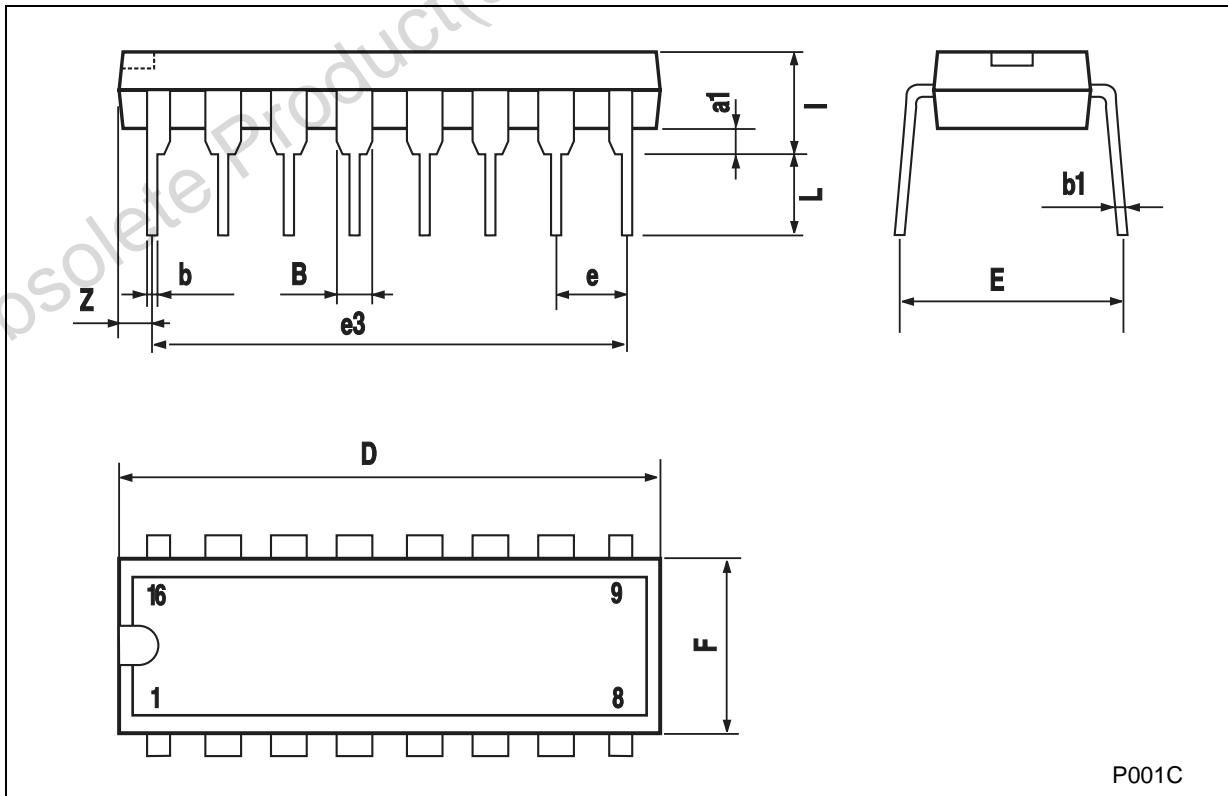


WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



Plastic DIP-16 (0.25) MECHANICAL DATA

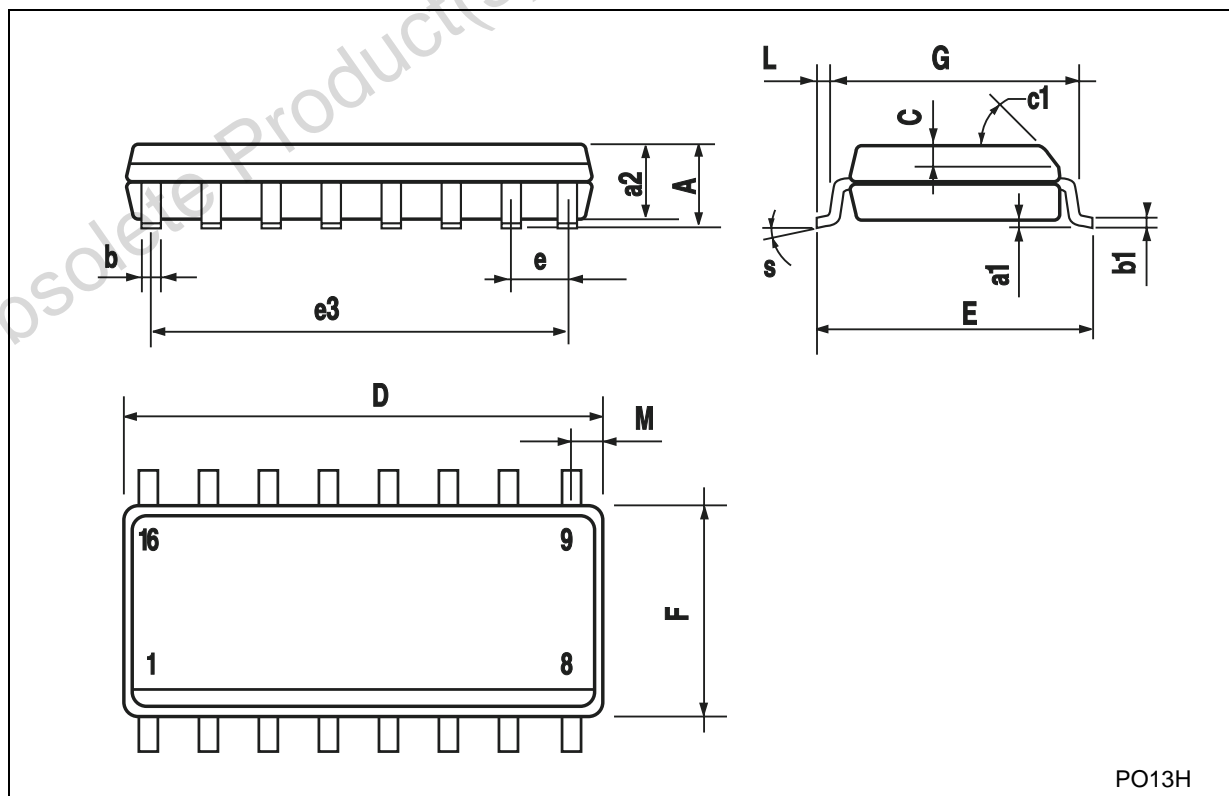
| DIM. | mm. | | | inch | | |
|------|------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.51 | | | 0.020 | | |
| B | 0.77 | | 1.65 | 0.030 | | 0.065 |
| b | | 0.5 | | | 0.020 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 20 | | | 0.787 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 17.78 | | | 0.700 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 5.1 | | | 0.201 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.27 | | | 0.050 |



P001C

SO-16 MECHANICAL DATA

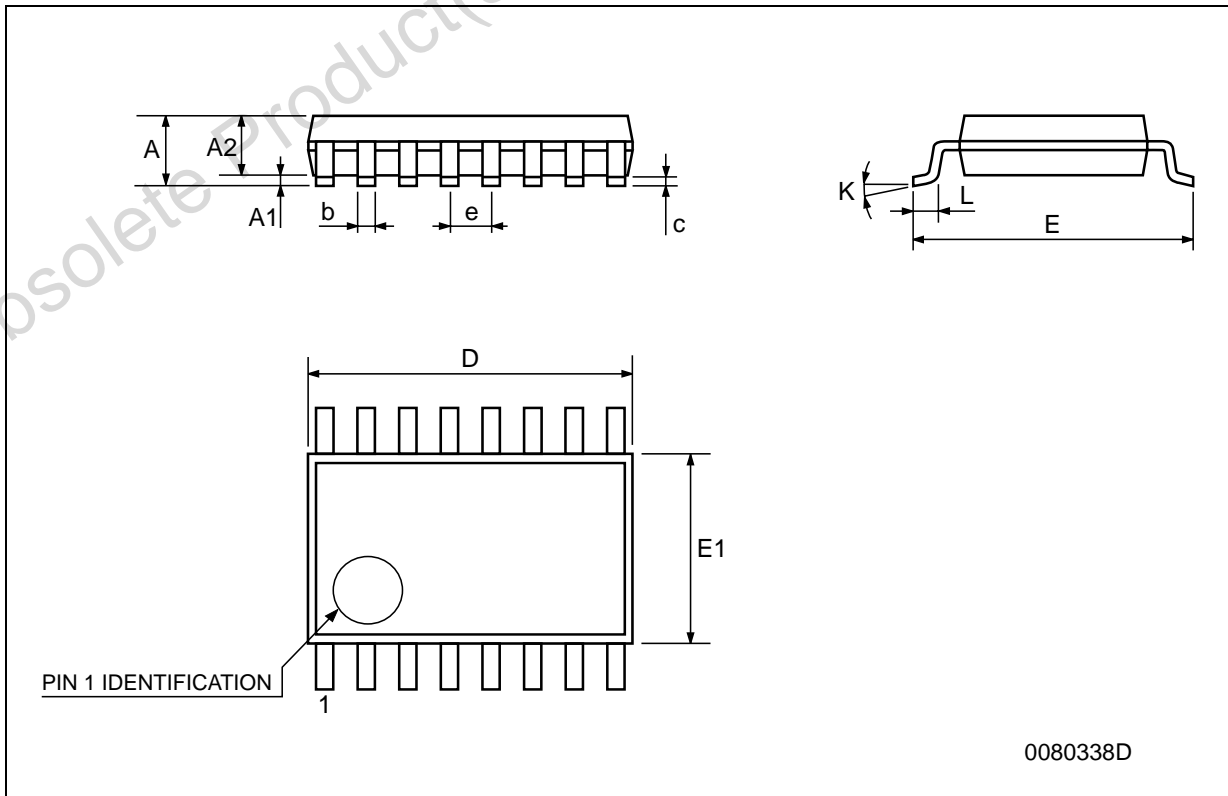
| DIM. | mm. | | | inch | | |
|------|------------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.003 | | 0.007 |
| a2 | | | 1.65 | | | 0.064 |
| b | 0.35 | | 0.46 | 0.013 | | 0.018 |
| b1 | 0.19 | | 0.25 | 0.007 | | 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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