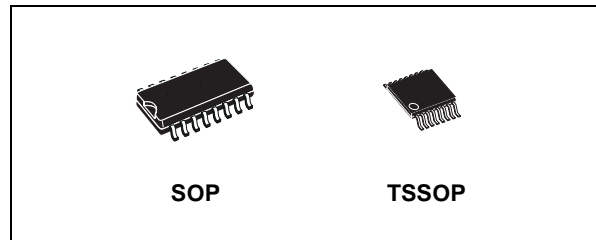




74VHCT157A

QUAD 2 CHANNEL MULTIPLEXER

- HIGH SPEED: $t_{PD} = 4.1 \text{ ns}$ (TYP.) at $V_{CC} = 5V$
- LOW POWER DISSIPATION:
 $I_{CC} = 2 \mu\text{A}$ (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 157
- IMPROVED LATCH-UP IMMUNITY
- LOW NOISE: $V_{OLP} = 0.8V$ (MAX.)



ORDER CODES

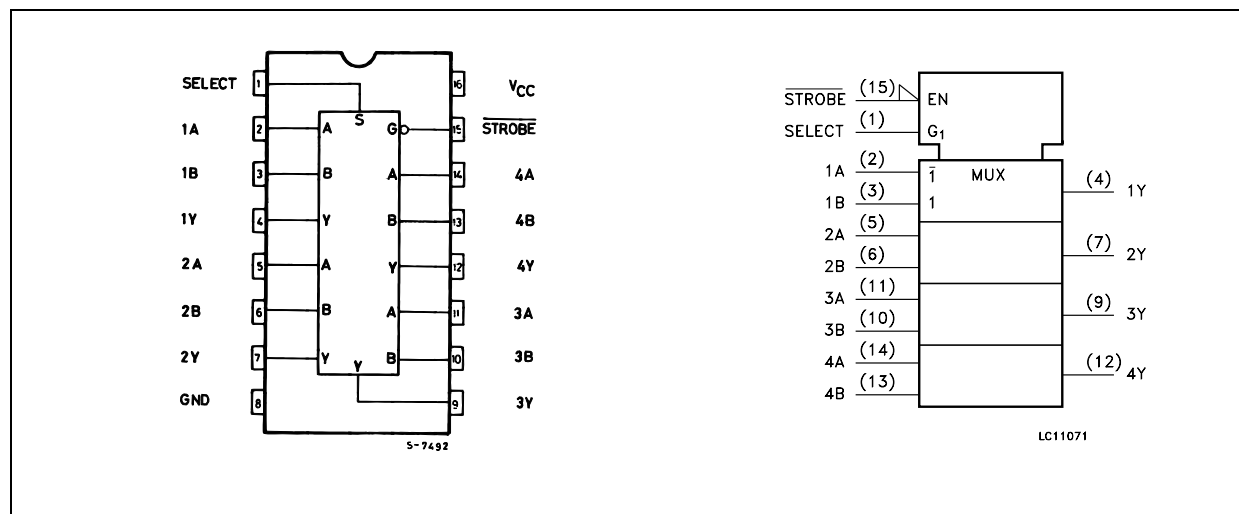
| PACKAGE | TUBE | T & R |
|---------|-------------|---------------|
| SOP | 74VHCT157AM | 74VHCT157AMTR |
| TSSOP | | 74VHCT157ATTR |

DESCRIPTION

The 74VHCT157A is an advanced high-speed CMOS QUAD 2-CHANNEL MULTIPLEXER fabricated with sub-micron silicon gate and double-layer metal wiring C²MOS technology. It consists of four 2-input digital multiplexer with common select and strobe inputs. It is a non-inverting multiplexer. When the STROBE input is held high, selection of data is inhibited and

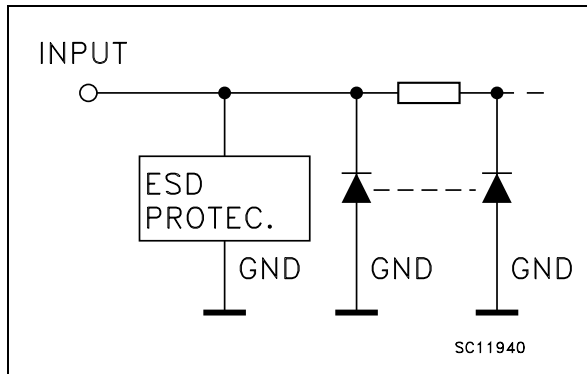
all the outputs become low. The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs. Power down protection is provided on all inputs and outputs and 0 to 7V can be accepted on inputs with no regard to the supply voltage. This device can be used to interface 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



74VHCT157A

INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

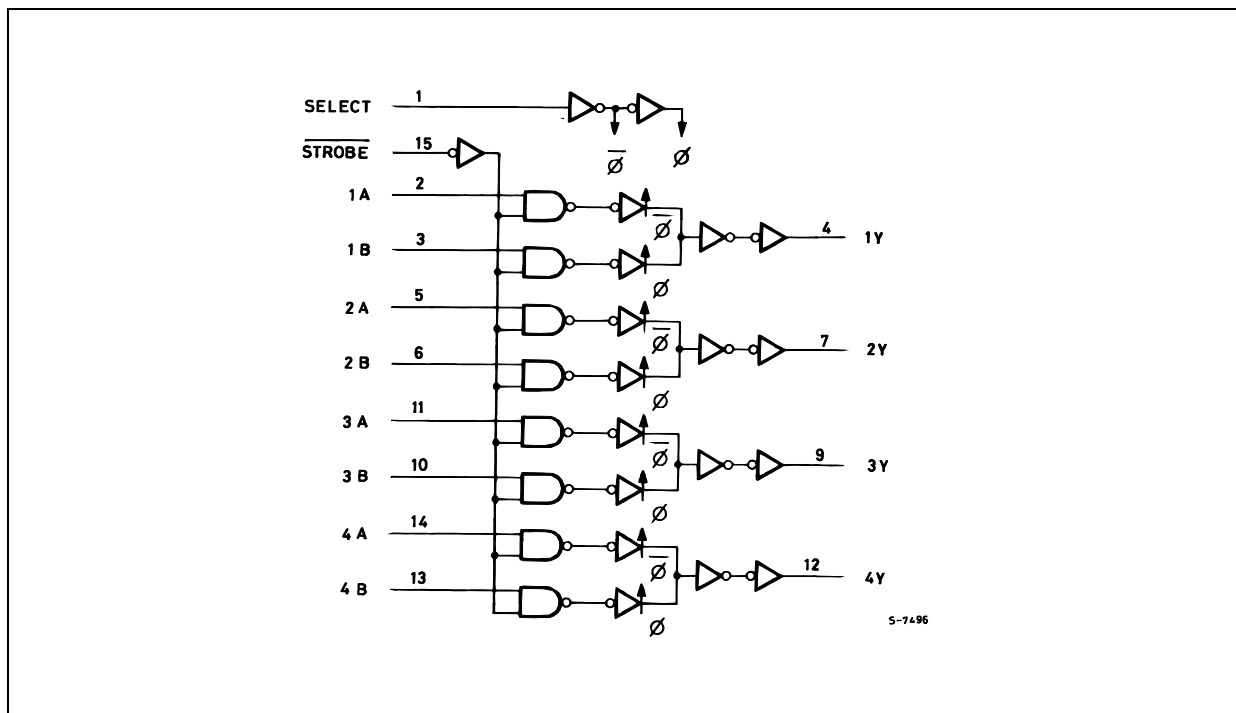
| PIN No | SYMBOL | NAME AND FUNCTION |
|--------------|-----------------|---------------------------|
| 1 | SELECT | Common Data Select Inputs |
| 2, 5, 11, 14 | 1A to 4A | Data Inputs From Source A |
| 3, 6, 10, 13 | 1B to 4B | Data Inputs From Source B |
| 4, 7, 9, 12 | 1Y to 4Y | Multiplexer Outputs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

TRUTH TABLE

| INPUTS | | | | OUTPUT |
|----------------------------|--------|---|---|--------|
| $\overline{\text{STROBE}}$ | SELECT | A | B | Y |
| H | X | X | X | L |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | H | H |

X : Don't Care

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 (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) $V_{CC} = 0V$

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) $V_{CC} = 0V$

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 _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 | | | 2 | | 20 | | 20 | μA |
| Δ 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 | | 4.1 | 6.4 | 1.0 | 7.5 | 1.0 | 7.5 | ns |
| | | 5.0 | 50 | | 5.6 | 8.4 | 1.0 | 9.5 | 1.0 | 9.5 | |
| t _{PLH} t _{PHL} | Propagation Delay Time SELECT to Y | 5.0 | 15 | | 5.3 | 8.1 | 1.0 | 9.5 | 1.0 | 9.5 | ns |
| | | 5.0 | 50 | | 6.8 | 10.1 | 1.0 | 11.5 | 1.0 | 11.5 | |
| t _{PLH} t _{PHL} | Propagation Delay Time STROBE to Y | 5.0 | 15 | | 5.6 | 8.6 | 1.0 | 10.0 | 1.0 | 10.0 | ns |
| | | 5.0 | 50 | | 7.1 | 10.6 | 1.0 | 12.0 | 1.0 | 12.0 | |

(*) 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 | | | | 6 | 10 | | 10 | | 10 | pF |
| C _{PD} | Power Dissipation Capacitance (note 1) | | | | 18 | | | | | | 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}/4 (per channel)

DYNAMIC SWITCHING CHARACTERISTICS

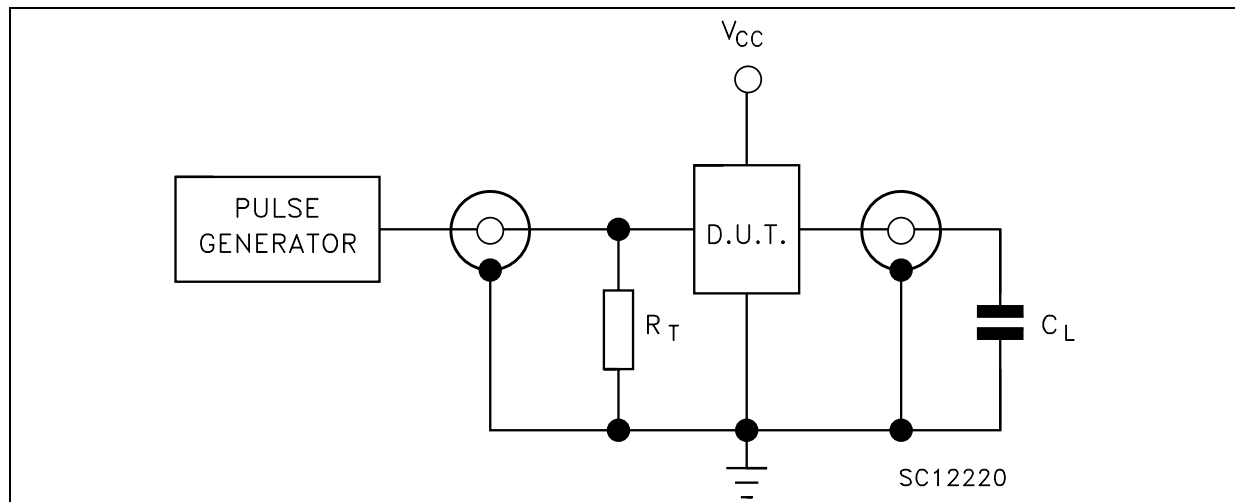
| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|------------------|--|------------------------|------------------------|-----------------------|------|------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | C _L = 50 pF | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| V _{OLP} | Dynamic Low Voltage Quiet Output (note 1, 2) | 5.0 | C _L = 50 pF | | 0.3 | 0.8 | | | | | V |
| V _{OLV} | | | | -0.8 | -0.3 | | | | | | |
| V _{IHD} | Dynamic High Voltage Input (note 1, 3) | 5.0 | | 2.0 | | | | | | | |
| V _{ILD} | Dynamic Low Voltage Input (note 1, 3) | 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.

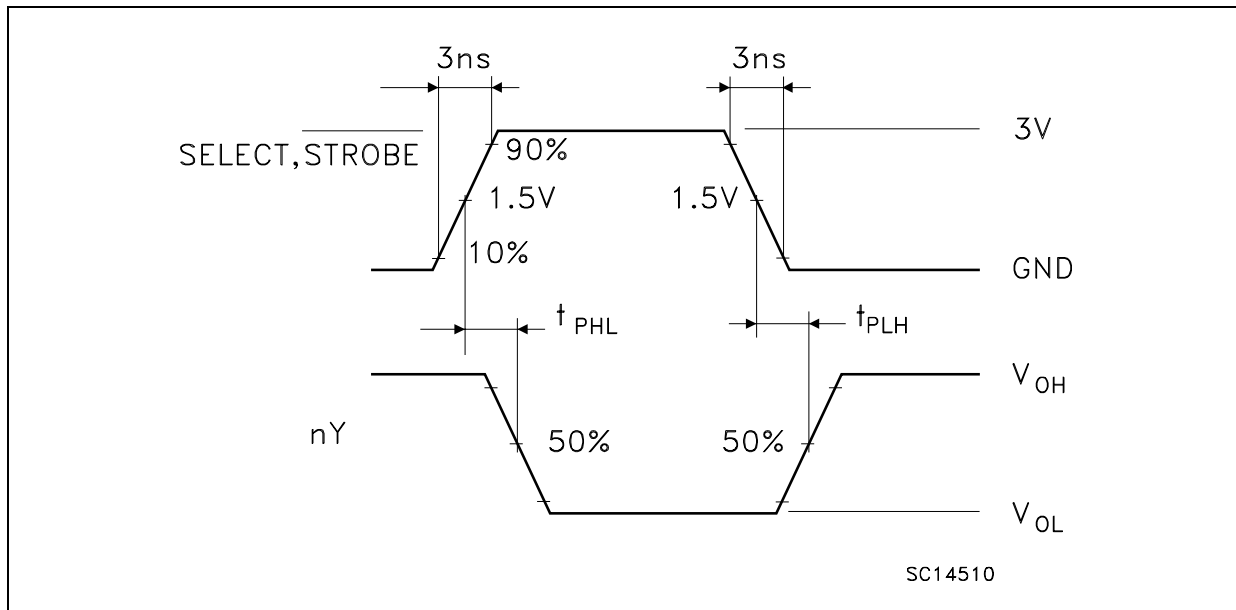
TEST CIRCUIT



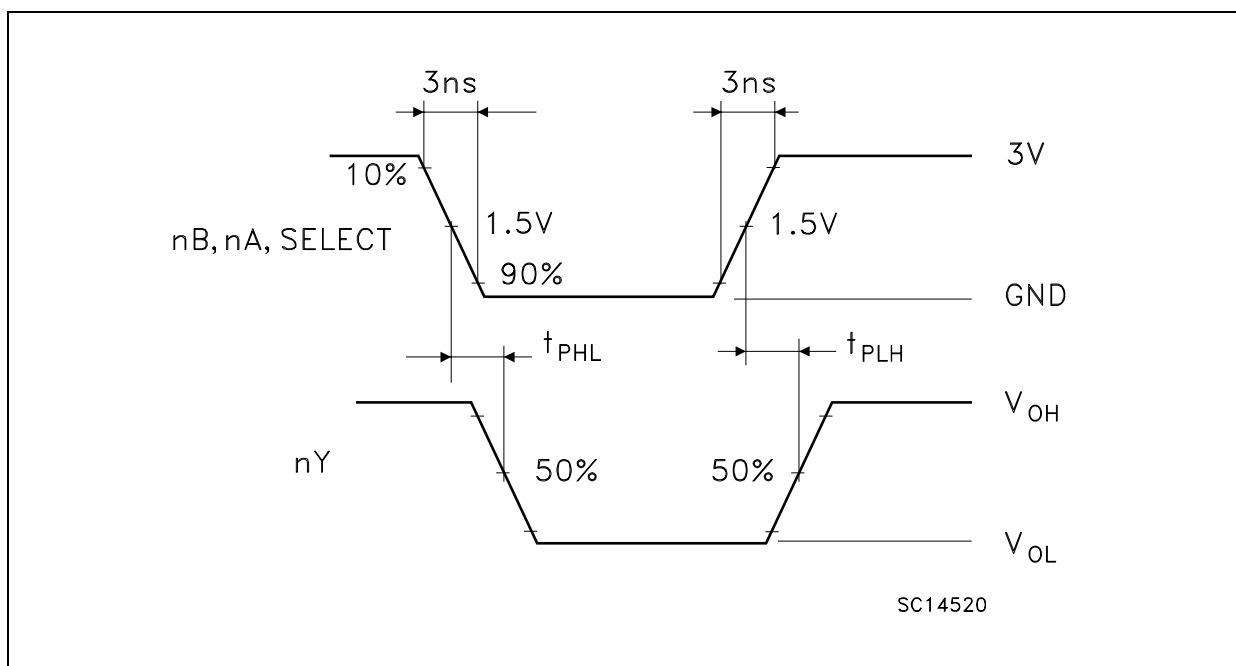
C_L = 15/50pF or equivalent (includes jig and probe capacitance)

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

WAVEFORM 1: PROPAGATION DELAYS FOR INVERTING CONDITIONS

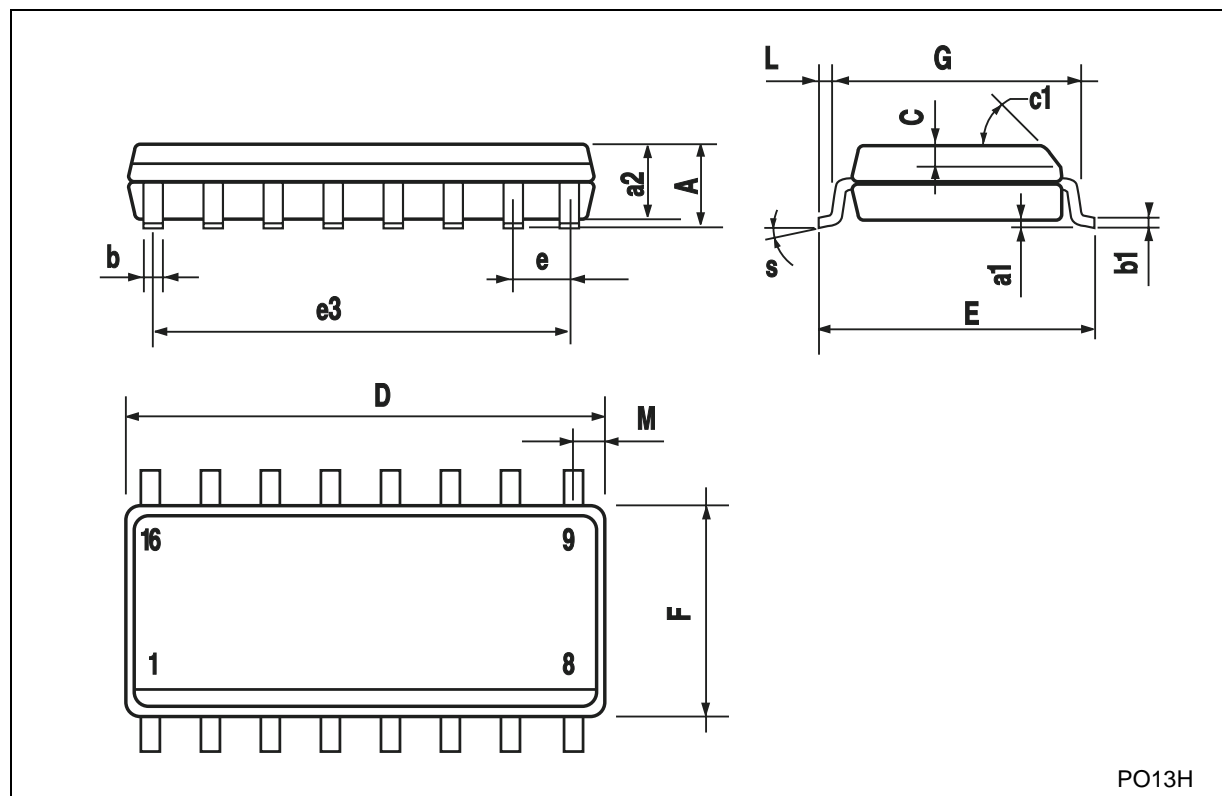


WAVEFORM 2: PROPAGATION DELAYS FOR NON-INVERTING CONDITIONS



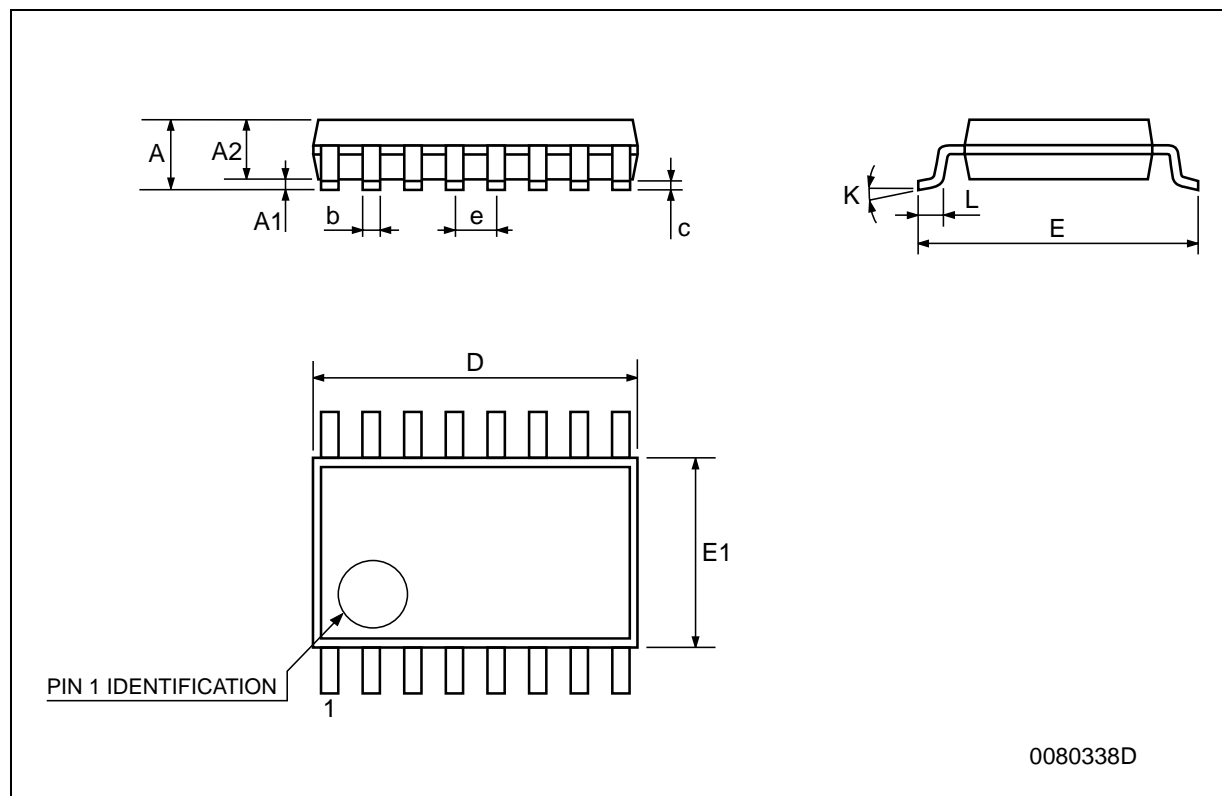
SO-16 MECHANICAL DATA

| 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.) | | | | | |



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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