



74AC257

QUAD 2 CHANNEL MULTIPLEXER (3-STATE)

- HIGH SPEED: $t_{PD} = 4.5ns$ (TYP.) at $V_{CC} = 5V$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu A$ (MAX.) at $T_A=25^\circ C$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- 50Ω TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 24mA$ (MIN)
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:
 V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 257
- IMPROVED LATCH-UP IMMUNITY



ORDER CODES

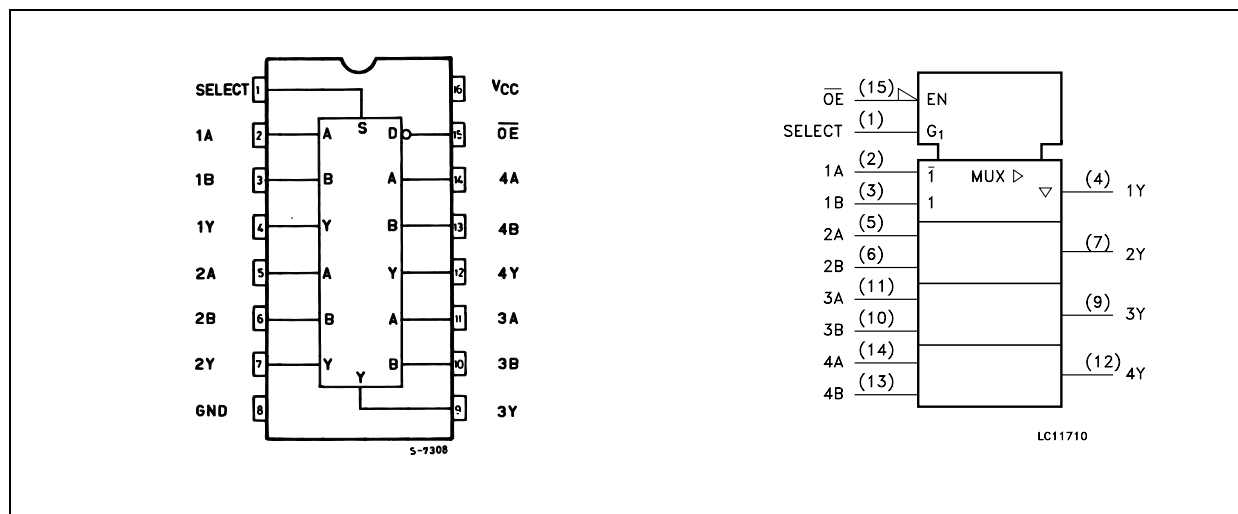
| PACKAGE | TUBE | T & R |
|---------|----------|------------|
| DIP | 74AC257B | |
| SOP | 74AC257M | 74AC257MTR |
| TSSOP | | 74AC257TTR |

DESCRIPTION

The 74AC257 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 multiplexer with common SELECT and ENABLE (OE) inputs. It is a non-inverting multiplexer. When the OE input is held HIGH, all the output become in

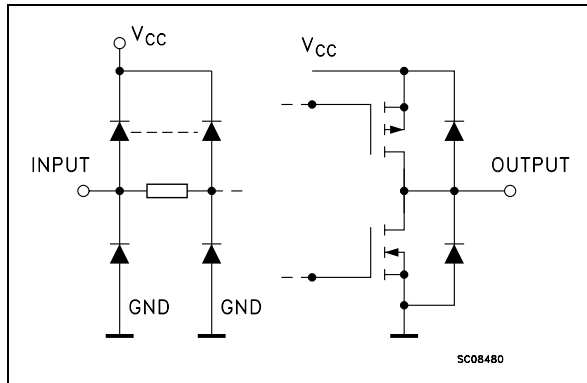
high impedance state. If SELECT input is held LOW, "A" data is selected, when SELECT input is held HIGH, "B" data is chosen. All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS



74AC257

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

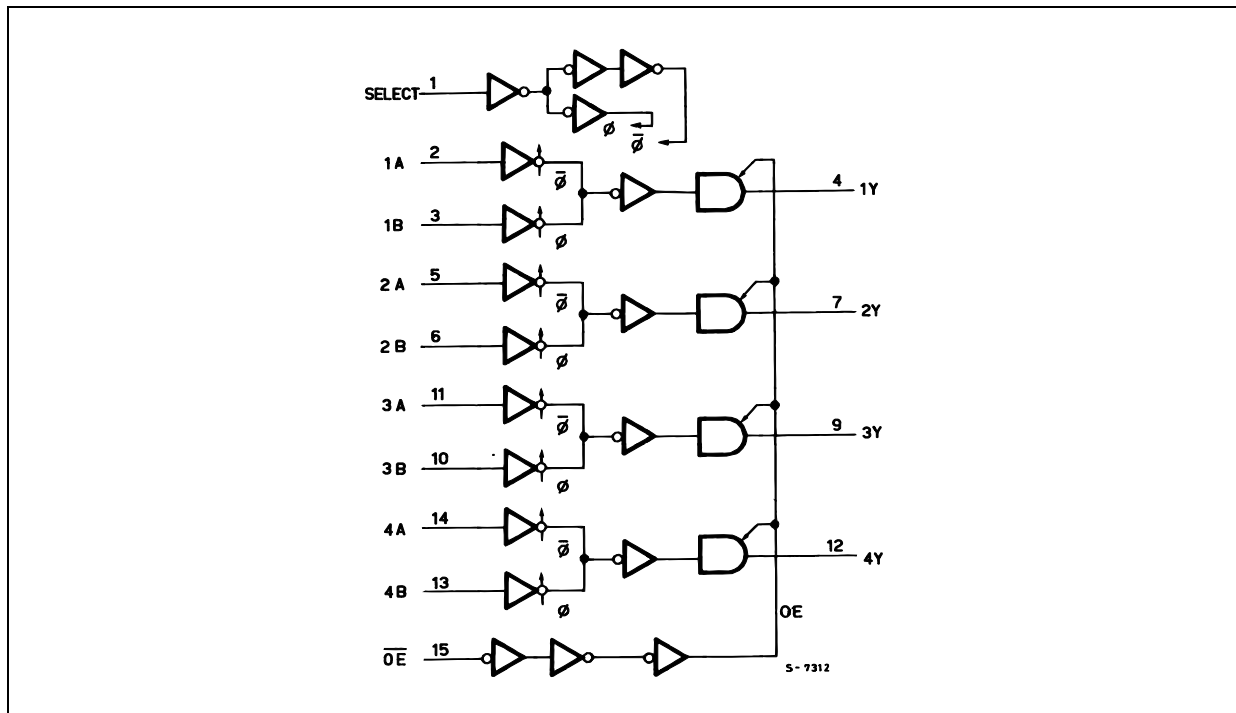
| PIN No | SYMBOL | NAME AND FUNCTION |
|--------------|-----------------|---|
| 1 | SELECT | Common Data Select Inputs |
| 2, 5, 11, 14 | 1A to 4A | Data Inputs From Source A |
| 3, 6, 10, 13 | 1B to 4B | Data Inputs From Source B |
| 4, 7, 9, 12 | 1Y to 4Y | Multiplexer Outputs |
| 15 | OE | 3 State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

TRUTH TABLE

| INPUTS | | | | OUTPUT |
|-----------------|--------|---|---|--------|
| \overline{OE} | 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
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 | ± 50 | mA |
| I_{CC} or I_{GND} | DC V_{CC} or Ground Current | ± 200 | 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.

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 |
| dt/dv | Input Rise and Fall Time $V_{CC} = 3.0, 4.5$ or $5.5V$ (note 1) | 8 | ns/V |

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

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 | 3.0 | V _O = 0.1 V or V _{CC} -0.1V | 2.1 | 1.5 | | 2.1 | | 2.1 | | V |
| | | 4.5 | | 3.15 | 2.25 | | 3.15 | | 3.15 | | |
| | | 5.5 | | 3.85 | 2.75 | | 3.85 | | 3.85 | | |
| V _{IL} | Low Level Input Voltage | 3.0 | V _O = 0.1 V or V _{CC} -0.1V | | 1.5 | 0.9 | | 0.9 | | 0.9 | V |
| | | 4.5 | | | 2.25 | 1.35 | | 1.35 | | 1.35 | |
| | | 5.5 | | | 2.75 | 1.65 | | 1.65 | | 1.65 | |
| V _{OH} | High Level Output Voltage | 3.0 | I _O =-50 μA | 2.9 | 2.99 | | 2.9 | | 2.9 | | V |
| | | 4.5 | I _O =-50 μA | 4.4 | 4.49 | | 4.4 | | 4.4 | | |
| | | 5.5 | I _O =-50 μA | 5.4 | 5.49 | | 5.4 | | 5.4 | | |
| | | 3.0 | I _O =-12 mA | 2.56 | | | 2.46 | | 2.4 | | |
| | | 4.5 | I _O =-24 mA | 3.86 | | | 3.76 | | 3.7 | | |
| | | 5.5 | I _O =-24 mA | 4.86 | | | 4.76 | | 4.7 | | |
| V _{OL} | Low Level Output Voltage | 3.0 | I _O =50 μA | | 0.002 | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 | I _O =50 μA | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | 5.5 | I _O =50 μA | | 0.001 | 0.1 | | 0.1 | | 0.1 | |
| | | 3.0 | I _O =12 mA | | | 0.36 | | 0.44 | | 0.5 | |
| | | 4.5 | I _O =24 mA | | | 0.36 | | 0.44 | | 0.5 | |
| | | 5.5 | I _O =24 mA | | | 0.36 | | 0.44 | | 0.5 | |
| I _I | Input Leakage Current | 5.5 | V _I = V _{CC} or GND | | | ± 0.1 | | ± 1 | | ± 1 | μA |
| I _{oz} | High Impedance Output Leakage Current | 5.5 | V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND | | | ± 0.5 | | ± 5 | | ± 10 | μA |
| I _{CC} | Quiescent Supply Current | 5.5 | V _I = V _{CC} or GND | | | 4 | | 40 | | 80 | μA |
| I _{OLD} | Dynamic Output Current (note 1, 2) | 5.5 | V _{OLD} = 1.65 V max | | | | | 75 | | 50 | mA |
| I _{OHD} | | | V _{OHD} = 3.85 V min | | | | | -75 | | -50 | mA |

1) Maximum test duration 2ms, one output loaded at time

2) Incident wave switching is guaranteed on transmission lines with impedances as low as 50Ω

AC ELECTRICAL CHARACTERISTICS ($C_L = 50 \text{ pF}$, $R_L = 500 \Omega$, Input $t_r = t_f = 3\text{ns}$)

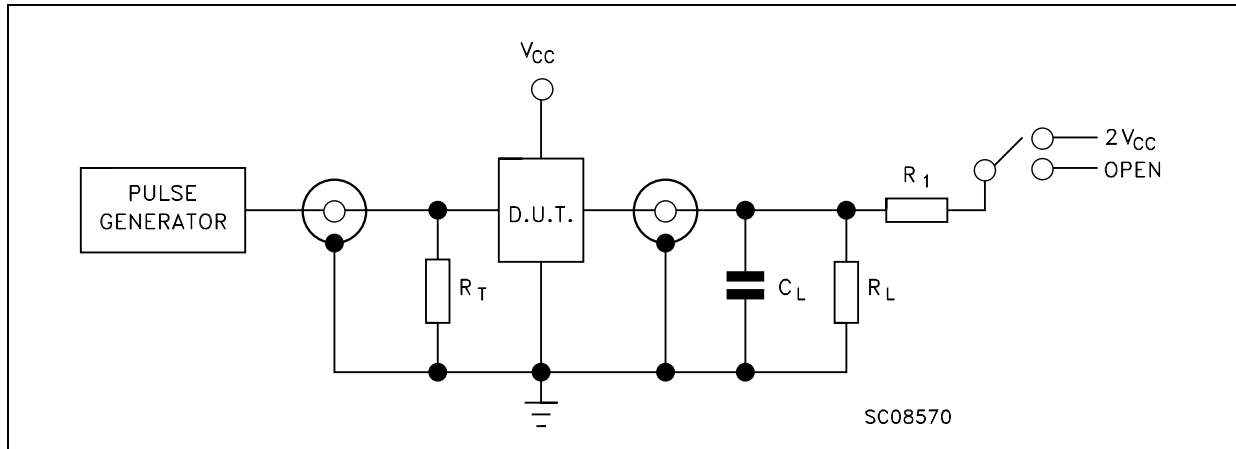
| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|---------------------|---------------------------------------|-----------------|--|--------------------------|------|------|------------------------------------|------|-------------------------------------|------|------|
| | | V_{CC} (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_{PLH} t_{PHL} | Propagation Delay Time A, B to Y | 3.3(*) | | 1.5 | 5.5 | 8.5 | 1.5 | 9.0 | 1.5 | 9.0 | ns |
| | | 5.0(**) | | 1.5 | 4.5 | 6.0 | 1.5 | 7.0 | 1.5 | 7.0 | |
| t_{PLH} t_{PHL} | Propagation Delay Time SELECT to Y | 3.3(*) | | 1.5 | 7.0 | 10.5 | 1.5 | 11.5 | 1.5 | 11.5 | ns |
| | | 5.0(**) | | 1.5 | 5.5 | 7.5 | 1.5 | 8.5 | 1.5 | 8.5 | |
| t_{PZL} t_{PZH} | Output Enable Time | 3.3(*) | | 1.5 | 5.5 | 9.0 | 1.5 | 100 | 1.5 | 100 | ns |
| | | 5.0(**) | | 1.5 | 4.5 | 7.5 | 1.5 | 8.5 | 1.5 | 8.5 | |
| t_{PLZ} t_{PHZ} | Output Disable Time | 3.3(*) | | 1.5 | 7.0 | 10.0 | 1.5 | 11.0 | 1.5 | 13.0 | ns |
| | | 5.0(**) | | 1.5 | 5.5 | 9.0 | 1.5 | 10.0 | 1.5 | 11.0 | |

(*) Voltage range is $3.3\text{V} \pm 0.3\text{V}$ (**) Voltage range is $5.0\text{V} \pm 0.5\text{V}$ **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 | 5.0 | | | 5 | | | | | | pF |
| C_{OUT} | Output Capacitance | 5.0 | | | 8 | | | | | | pF |
| C_{PD} | Power Dissipation Capacitance (note 1) | 5.0 | $f_{IN} = 10\text{MHz}$ | | 20 | | | | | | 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 circuit)

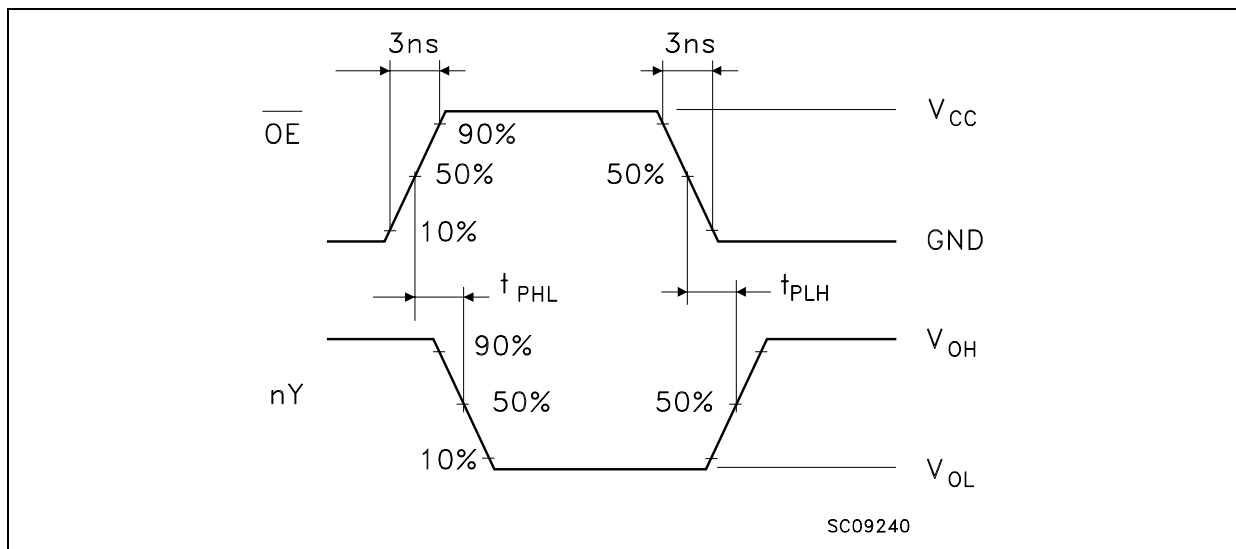
TEST CIRCUIT



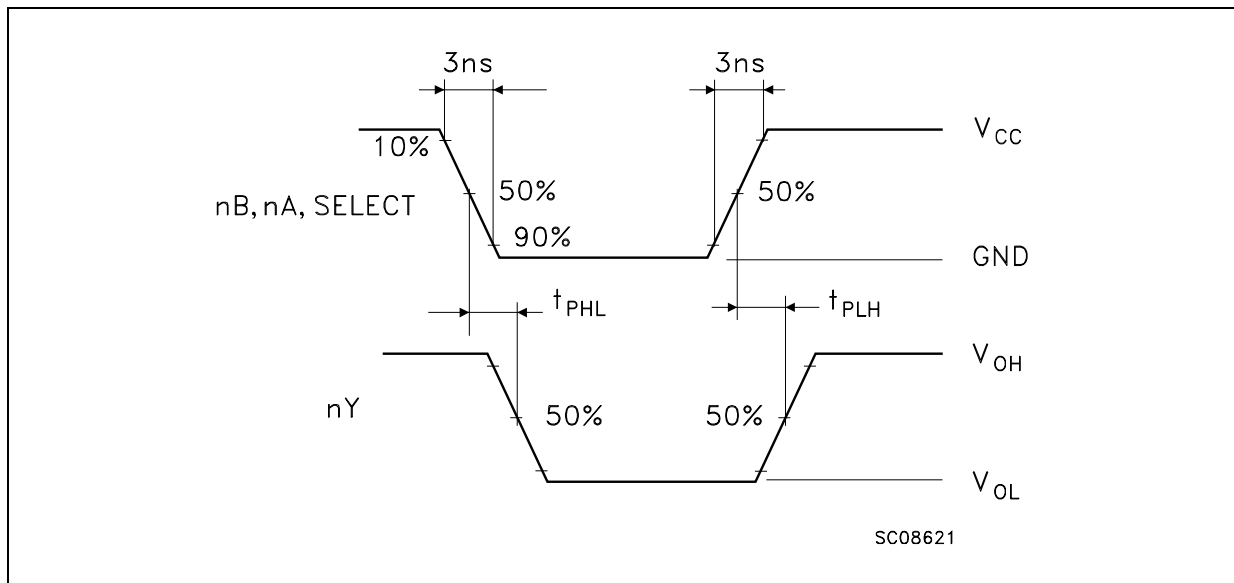
| TEST | SWITCH |
|-----------------------|-----------|
| t_{PLH} , t_{PHL} | Open |
| t_{PZL} , t_{PLZ} | $2V_{CC}$ |
| t_{PZH} , t_{PHZ} | Open |

$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_L = R_1 = 500\Omega$ or equivalent
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

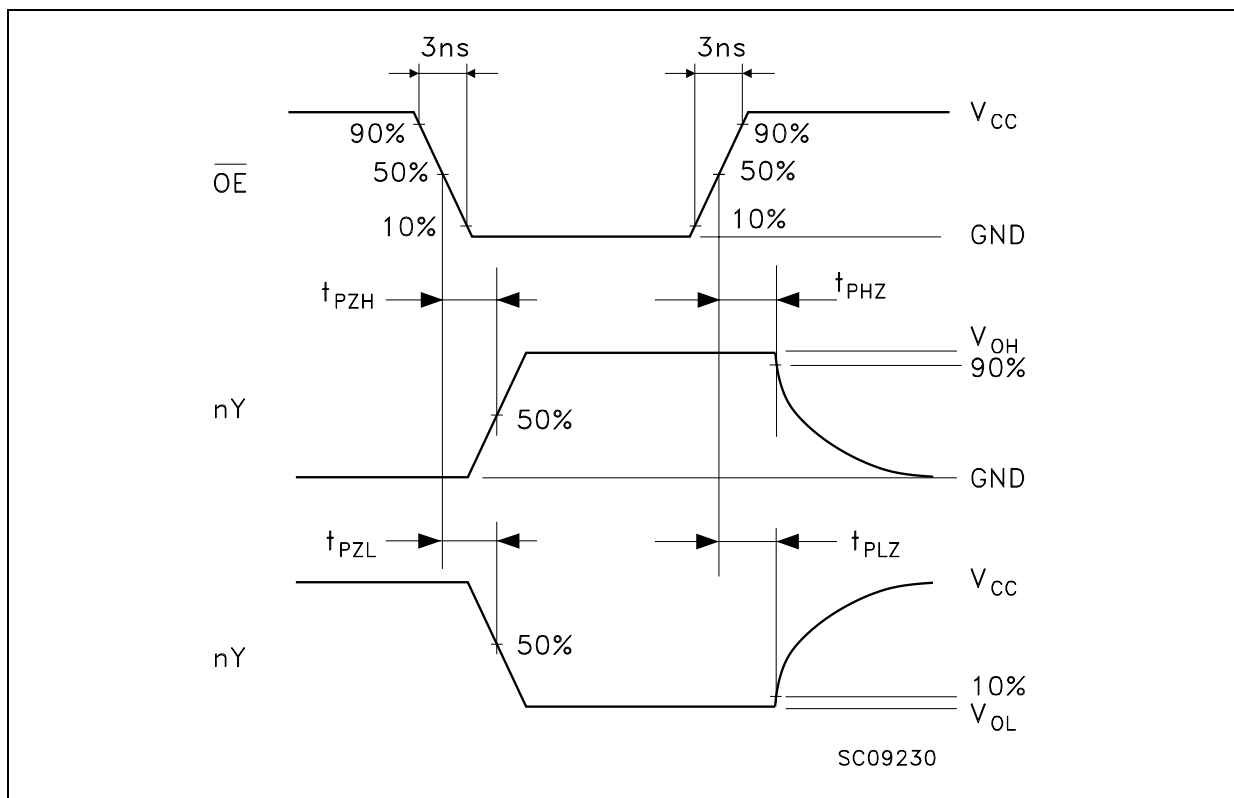
WAVEFORM 1: PROPAGATION DELAYS FOR INVERTING CONDITIONS ($f=1\text{MHz}$; 50% duty cycle)



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

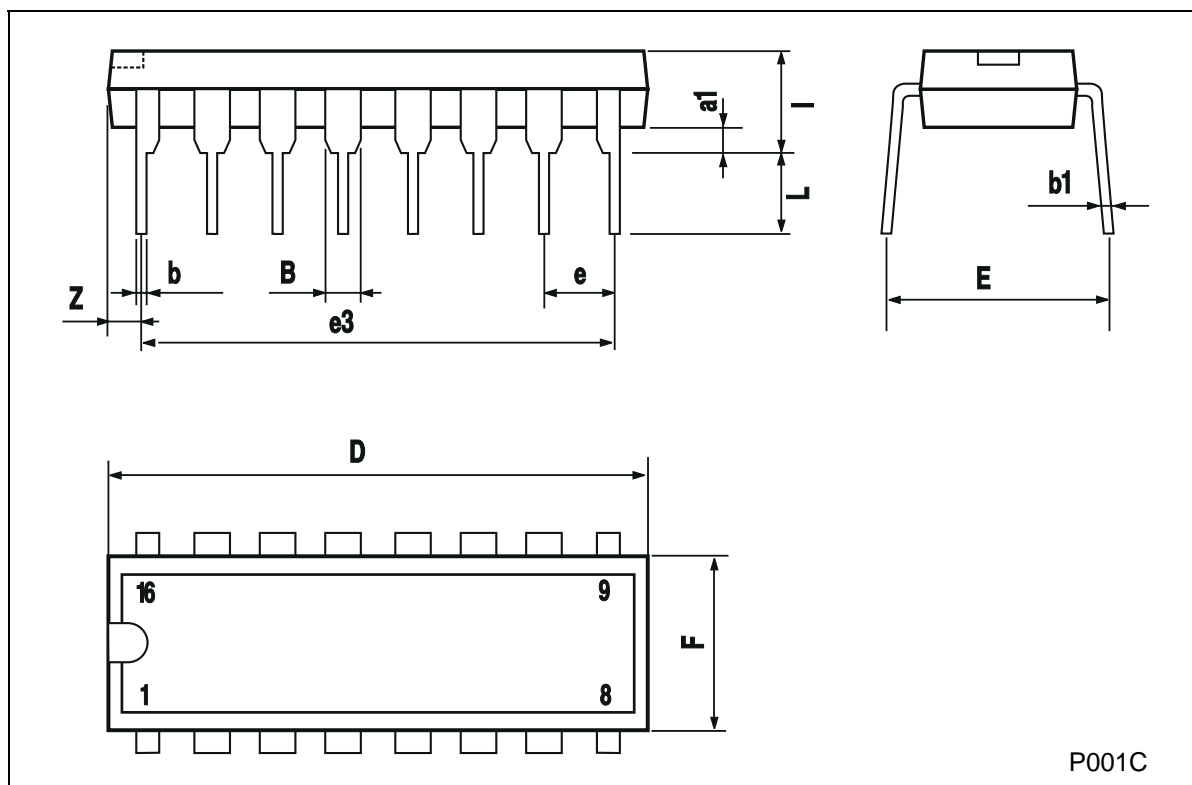


WAVEFORM 3: OUTPUT ENABLE AND DISABLE TIME ($f=1\text{MHz}$; 50% duty cycle)



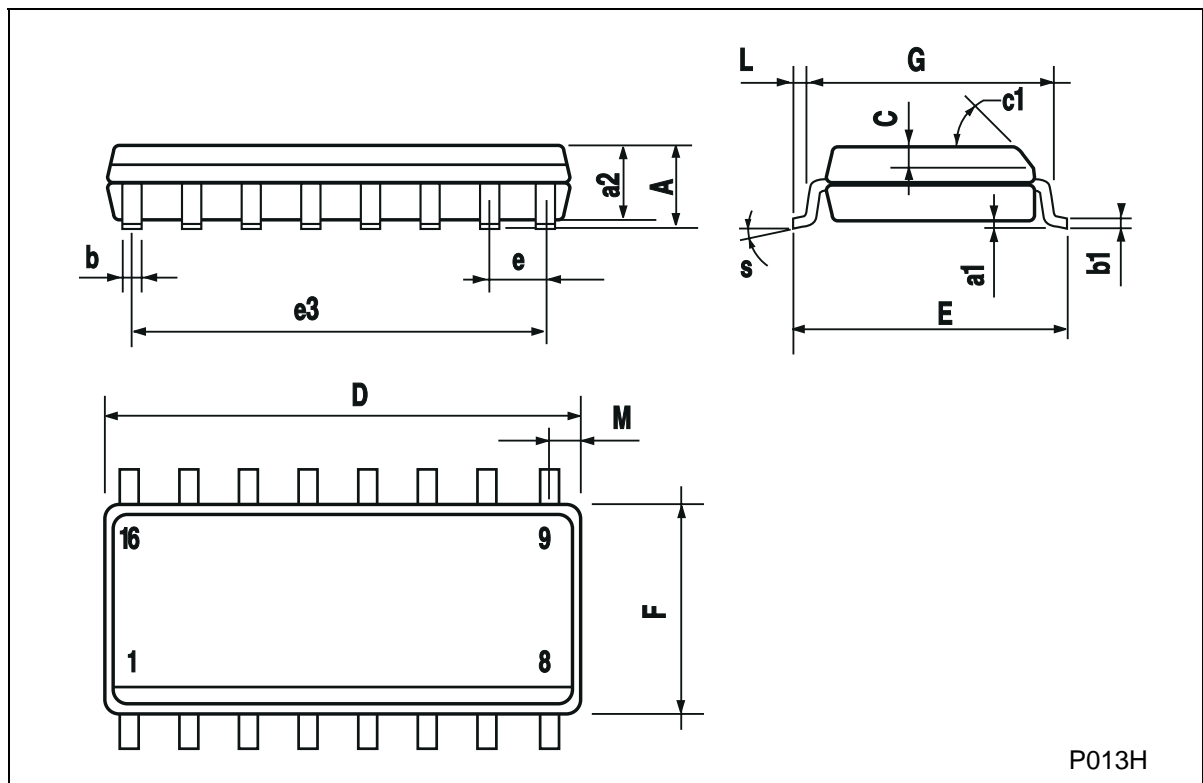
Plastic DIP-16 (0.25) MECHANICAL DATA

| 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 |



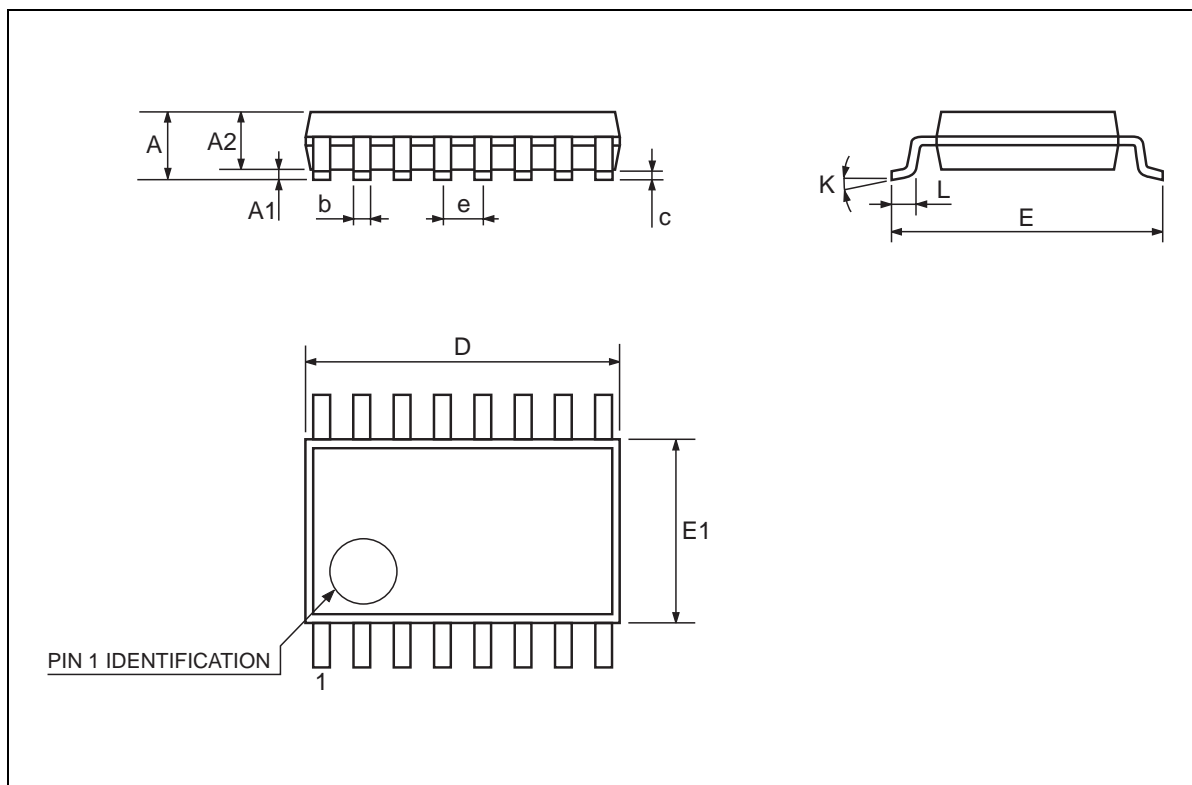
SO-16 MECHANICAL DATA

| DIM. | mm | | | inch | | |
|------|-----------|------|------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.75 | | | 0.068 |
| a1 | 0.1 | | 0.2 | 0.004 | | 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 | | | 1.1 | | | 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 | | 0.20 | 0.0035 | | 0.0079 |
| D | 4.9 | 5 | 5.1 | 0.193 | 0.197 | 0.201 |
| 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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