

**QUAD 2 CHANNEL MULTIPLEXER (INV.)**

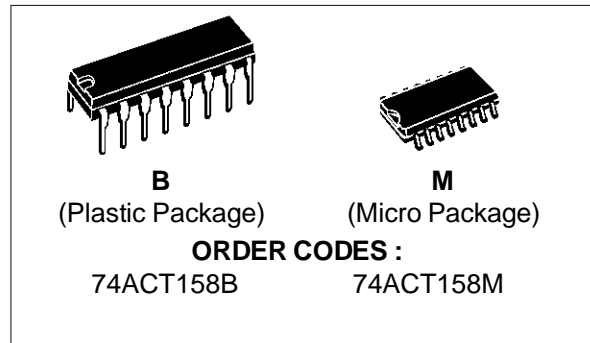
- HIGH SPEED:  $t_{PD} = 4 \text{ ns (TYP.)}$  at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 8 \mu A \text{ (MAX.)}$  at  $T_A = 25^\circ C$
- COMPATIBLE WITH TTL OUTPUTS  
 $V_{IH} = 2V \text{ (MIN)}$ ,  $V_{IL} = 0.8V \text{ (MAX)}$
- $50\Omega$  TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24 \text{ mA (MIN)}$
- BALANCED PROPAGATION DELAYS:  
 $t_{PLH} \cong t_{PHL}$
- OPERATING VOLTAGE RANGE:  
 $V_{CC} \text{ (OPR)} = 4.5V \text{ to } 5.5V$
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 158
- IMPROVED LATCH-UP IMMUNITY

**DESCRIPTION**

The ACT158 is an high-speed CMOS QUAD 2-CHANNEL MULTIPLEXER fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology. It is ideal for low power applications maintaining high speed operation similar to equivalent Bipolar Schottky TTL.

It consists of four 2-input digital multiplexers with

**PRELIMINARY DATA**

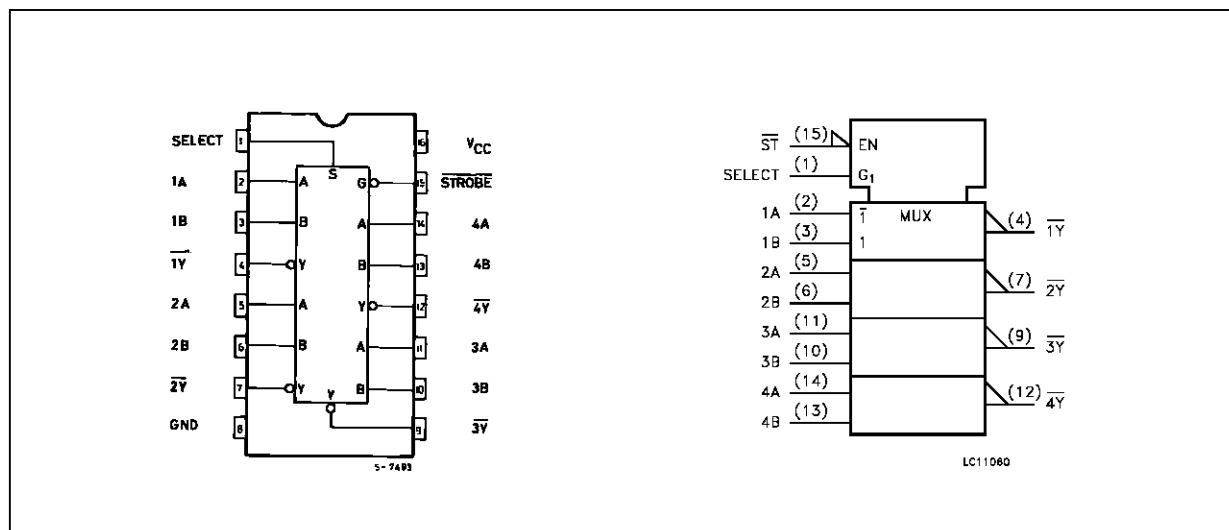


common select and strobe inputs. It is an inverting multiplexer. When the STROBE input is held High selection of data is inhibit and all the outputs become high. The SELECT decoding determines whether the A or B inputs get routed to their corresponding Y outputs.

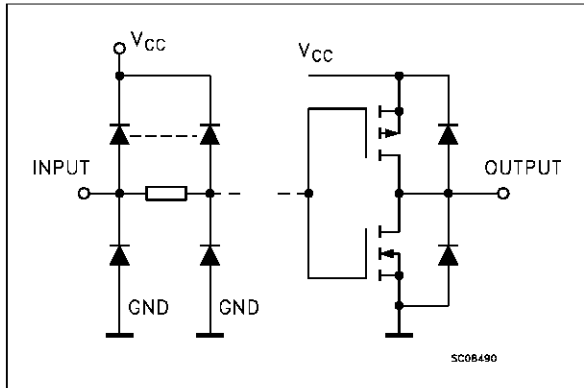
The device is designed to interface directly High Speed CMOS systems with TTL, NMOS and CMOS output voltage levels.

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 AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No       | SYMBOL                             | NAME AND FUNCTION         |
|--------------|------------------------------------|---------------------------|
| 1            | SELECT                             | Common Data Select Input  |
| 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  | $\overline{1Y}$ to $\overline{4Y}$ | Multiplexer Outputs       |
| 15           | $\overline{\text{STROBE}}$         | Strobe Input              |
| 8            | GND                                | Ground (0V)               |
| 16           | V <sub>CC</sub>                    | Positive Supply Voltage   |

TRUTH TABLE

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

X: "H" or "L"

ABSOLUTE MAXIMUM RATING

| Symbol                              | Parameter                            | Value                         | Unit |
|-------------------------------------|--------------------------------------|-------------------------------|------|
| V <sub>CC</sub>                     | Supply Voltage                       | -0.5 to +7                    | V    |
| V <sub>I</sub>                      | DC Input Voltage                     | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| V <sub>O</sub>                      | DC Output Voltage                    | -0.5 to V <sub>CC</sub> + 0.5 | V    |
| I <sub>IK</sub>                     | DC Input Diode Current               | ± 20                          | mA   |
| I <sub>OK</sub>                     | DC Output Diode Current              | ± 20                          | mA   |
| I <sub>O</sub>                      | DC Output Current                    | ± 50                          | mA   |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or Ground Current | ± 200                         | mA   |
| T <sub>stg</sub>                    | Storage Temperature                  | -65 to +150                   | °C   |
| T <sub>L</sub>                      | 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 <sub>CC</sub>                | Supply Voltage  | 4.5 to 5.5           | V    |
| V <sub>I</sub>                 | Input Voltage   | 0 to V <sub>CC</sub> | V    |
| V <sub>O</sub>                 | Output Voltage  | 0 to V <sub>CC</sub> | V    |
| T <sub>op</sub>                | Operating Temperature:  | -40 to +85           | °C   |
| d <sub>t</sub> /d <sub>v</sub> | Input Rise and Fall Time V <sub>CC</sub> = 4.5 to 5.5V (note 1) | 8                    | ns/V |

1) V<sub>IN</sub> from 0.8 V to 2.0 V

## DC SPECIFICATIONS

| Symbol           | Parameter                             | Test Conditions |  | Value                   |                        |       |      |              | Unit |      |
|------------------|---------------------------------------|-----------------|--|-------------------------|------------------------|-------|------|--------------|------|------|
|                  |                                       |                 |  | V <sub>CC</sub><br>(V)  | T <sub>A</sub> = 25 °C |       |      | -40 to 85 °C |      |      |
|                  |                                       |                 |  |                         | Min.                   | Typ.  | Max. | Min.         |      | Max. |
| V <sub>IH</sub>  | High Level Input Voltage              | 4.5             | V <sub>O</sub> = 0.1 V or<br>V <sub>CC</sub> - 0.1 V                     | 2.0                     | 1.5                    |       | 2.0  |              | V    |      |
|                  |                                       | 5.5             |  | 2.0                     | 1.5                    |       | 2.0  |              |      |      |
| V <sub>IL</sub>  | Low Level Input Voltage               | 4.5             | V <sub>O</sub> = 0.1 V or<br>V <sub>CC</sub> - 0.1 V                     |                         | 1.5                    | 0.8   |      | 0.8          | V    |      |
|                  |                                       | 5.5             |  |                         | 1.5                    | 0.8   |      | 0.8          |      |      |
| V <sub>OH</sub>  | High Level Output<br>Voltage          | 4.5             | V <sub>I</sub> <sup>(*)</sup> =<br>V <sub>IH</sub> or<br>V <sub>IL</sub> | I <sub>O</sub> = -50 μA | 4.4                    | 4.49  |      | 4.4          | V    |      |
|                  |                                       | 5.5             |  | I <sub>O</sub> = -50 μA | 5.4                    | 5.49  |      | 5.4          |      |      |
|                  |                                       | 4.5             |  | I <sub>O</sub> = -24 mA | 3.86                   |       |      | 3.76         |      |      |
|                  |                                       | 5.5             |  | I <sub>O</sub> = -24 mA | 4.86                   |       |      | 4.76         |      |      |
| V <sub>OL</sub>  | Low Level Output<br>Voltage           | 4.5             | V <sub>I</sub> <sup>(*)</sup> =<br>V <sub>IH</sub> or<br>V <sub>IL</sub> | I <sub>O</sub> = 50 μA  |                        | 0.001 | 0.1  | 0.1          | V    |      |
|                  |                                       | 5.5             |  | I <sub>O</sub> = 50 mA  |                        | 0.001 | 0.1  | 0.1          |      |      |
|                  |                                       | 4.5             |  | I <sub>O</sub> = 24 mA  |                        |       | 0.36 | 0.44         |      |      |
|                  |                                       | 5.5             |  | I <sub>O</sub> = 24 mA  |                        |       | 0.36 | 0.44         |      |      |
| I <sub>I</sub>   | Input Leakage Current                 | 5.5             | V <sub>I</sub> = V <sub>CC</sub> or GND                                  |                         |                        | ±0.1  |      | ±1           | μA   |      |
| I <sub>CC1</sub> | Max I <sub>CC</sub> /Input            | 5.5             | V <sub>I</sub> = V <sub>CC</sub> - 2.1 V                                 |                         | 0.6                    |       |      | 1.5          | mA   |      |
| I <sub>CC</sub>  | Quiescent Supply<br>Current           | 5.5             | V <sub>I</sub> = V <sub>CC</sub> or GND                                  |                         |                        | 8     |      | 80           | μA   |      |
| I <sub>OLD</sub> | Dynamic Output Current<br>(note 1, 2) | 5.5             | V <sub>OLD</sub> = 1.65 V max<br>V <sub>OHD</sub> = 3.85 V min.          |                         |                        |       |      | 75           | mA   |      |
| I <sub>OHD</sub> |                                       |                 |  |                         |                        |       |      | -75          | 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 50 Ω.

(\*) All outputs loaded.

**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 <sub>CC</sub> (V) |  | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                                      |                                       |                     |  | Min.                   | Typ. | Max. | Min.         | Max. |      |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time<br>SELECT to Y | 5.0 <sup>(*)</sup>  |  | 1.5                    | 5.5  | 9.0  | 1.0          | 10.0 | ns   |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time<br>STROBE to Y | 5.0 <sup>(*)</sup>  |  | 1.5                    | 5.5  | 9.5  | 1.0          | 10.5 | ns   |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay Time<br>A, B to Y   | 5.0 <sup>(*)</sup>  |  | 1.5                    | 4.0  | 7.5  | 1.0          | 8.5  | ns   |

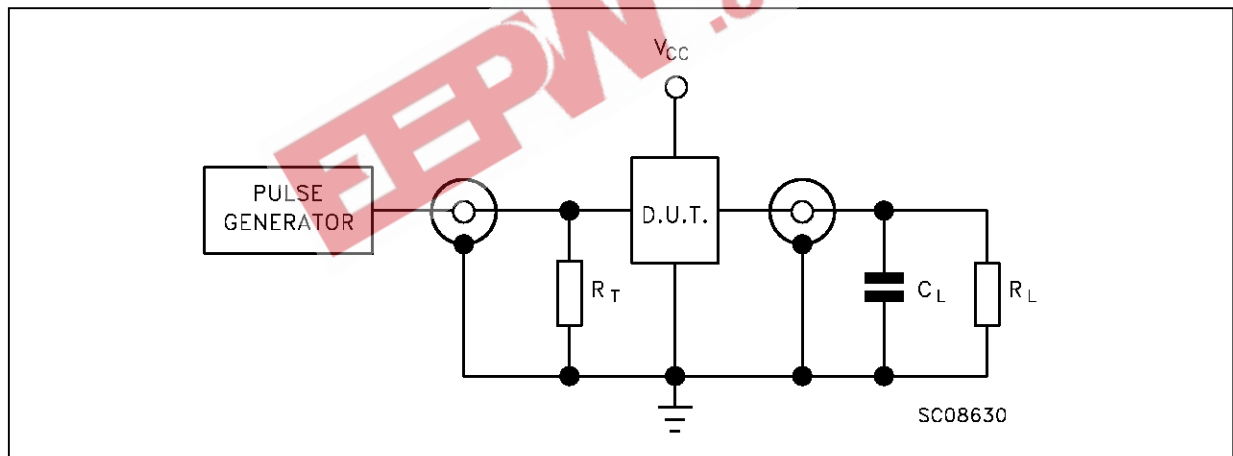
(\*) Voltage range is 5V ± 0.5V

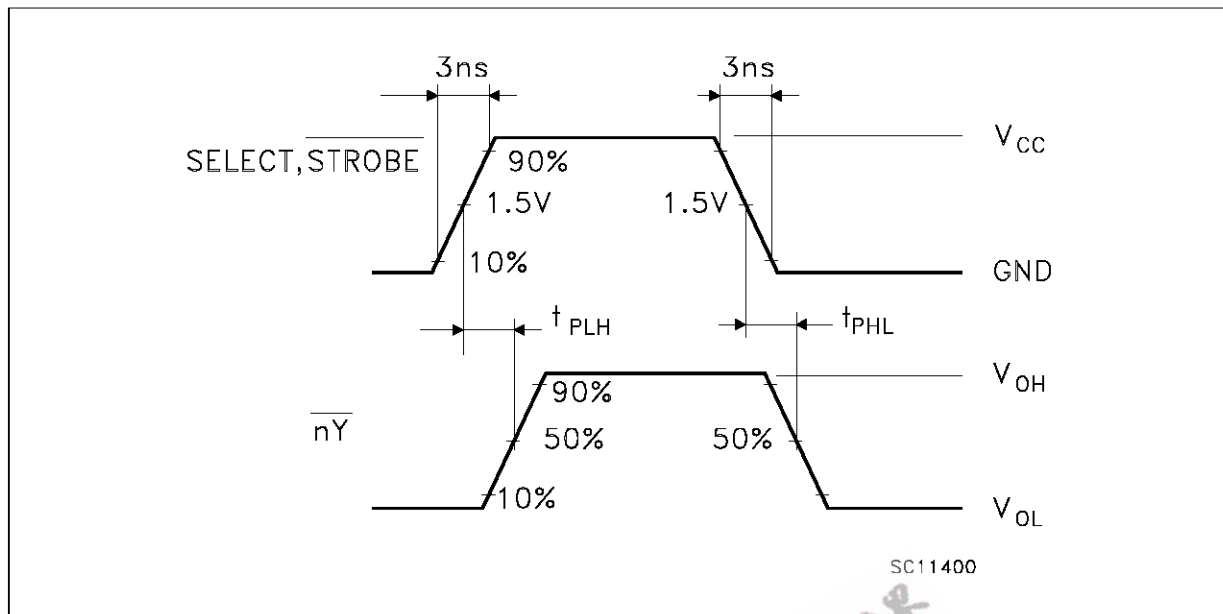
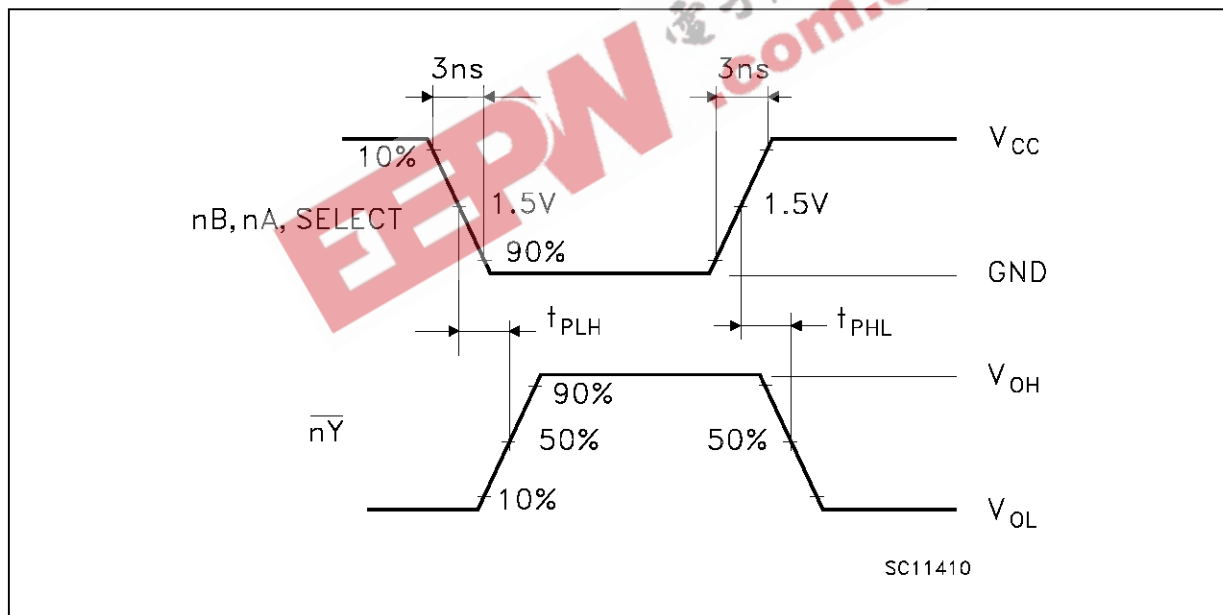
**CAPACITIVE CHARACTERISTICS**

| Symbol          | Parameter                                 | Test Conditions     |  | Value                  |      |      |              |      | Unit |
|-----------------|---|---------------------|--|------------------------|------|------|--------------|------|------|
|                 |   | V <sub>CC</sub> (V) |  | T <sub>A</sub> = 25 °C |      |      | -40 to 85 °C |      |      |
|                 |   |                     |  | Min.                   | Typ. | Max. | Min.         | Max. |      |
| C <sub>IN</sub> | Input Capacitance                         | 5.0                 |  |                        | 4    |      |              |      | pF   |
| C <sub>PD</sub> | Power Dissipation<br>Capacitance (note 1) | 5.0                 |  |                        | TBD  |      |              |      | pF   |

1) C<sub>PD</sub> 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.  $I_{CC(oper)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC0}$  (per circuit)

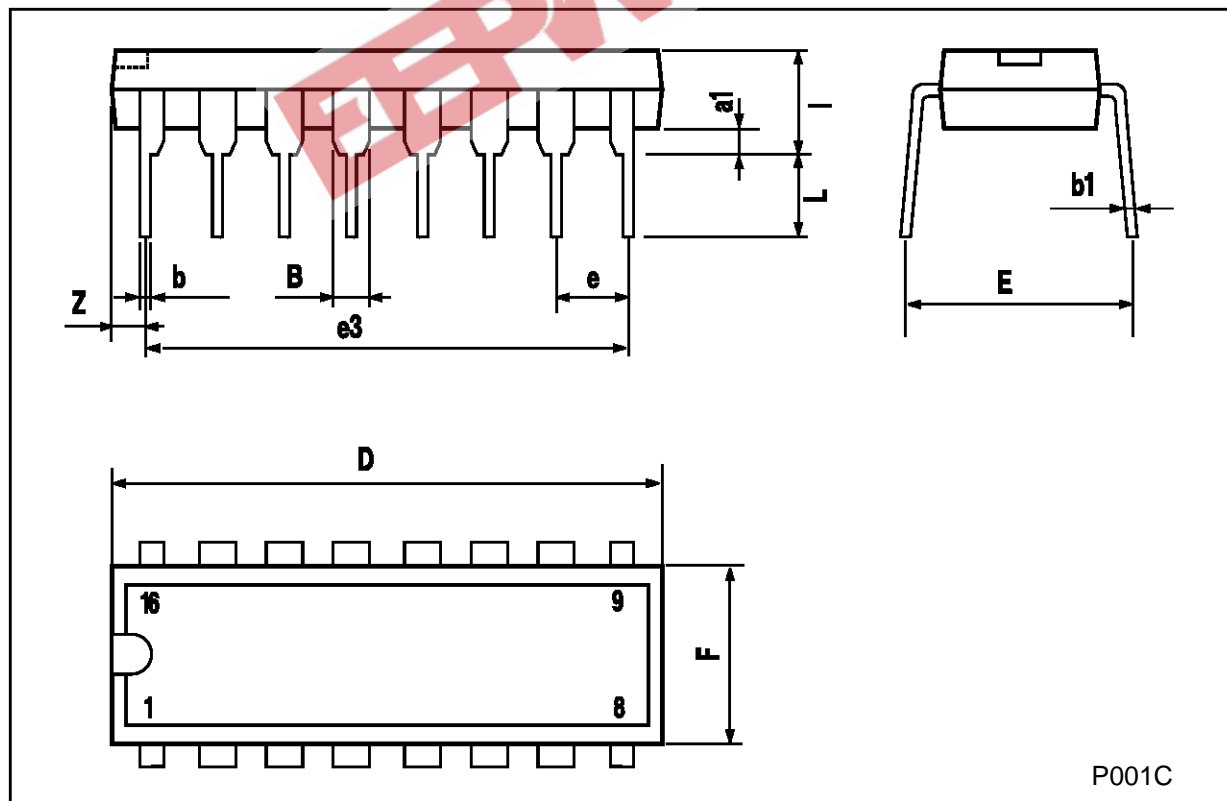
**TEST CIRCUIT**



**WAVEFORM 1: PROPAGATION DELAYS FOR NON-INVERTING CONDITIONS**

**WAVEFORM 2: PROPAGATION DELAYS FOR INVERTING CONDITIONS**


## Plastic DIP-16 (0.25) MECHANICAL DATA

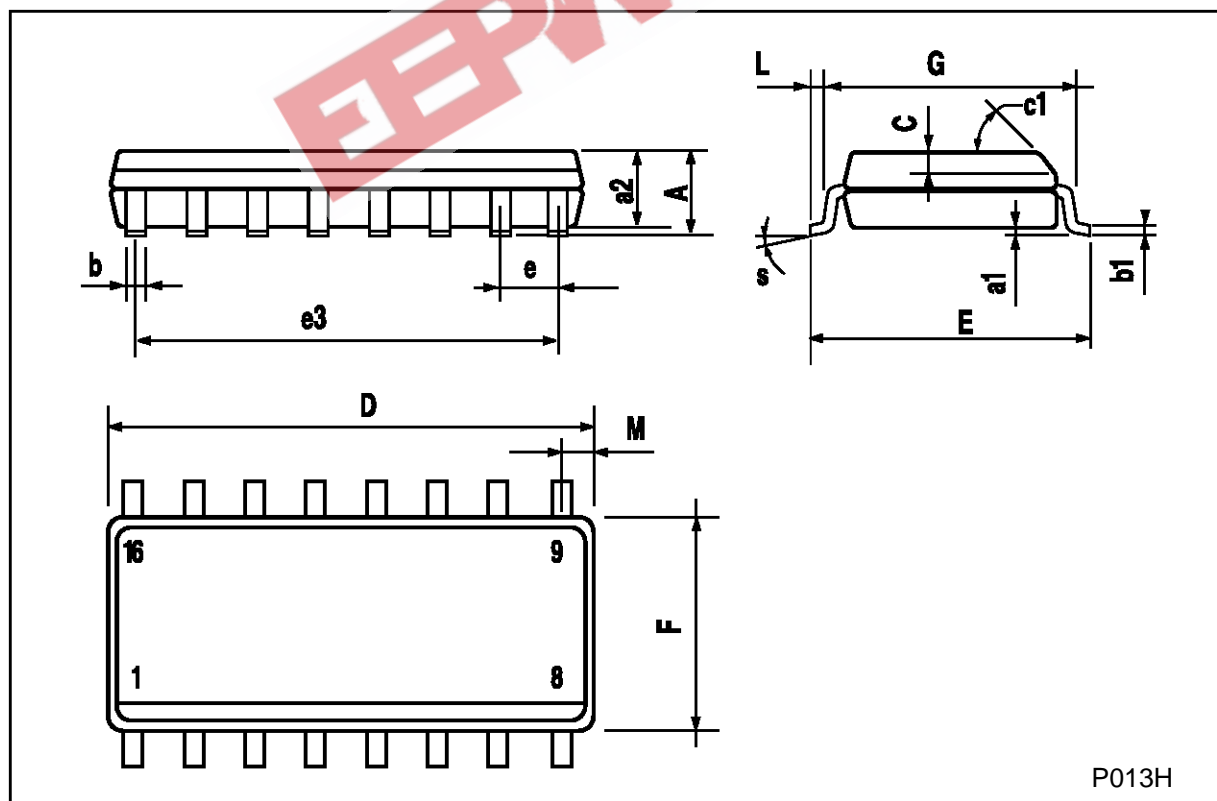
| DIM. | mm   |       |      | inch  |       |       |
|------|------|-------|------|-------|-------|-------|
|      | MIN. | TYP.  | MAX. | MIN.  | TYP.  | MAX.  |
| a1   | 0.51 |       |      | 0.020 |       |       |
| B    | 0.77 |       | 1.65 | 0.030 |       | 0.065 |
| b    |      | 0.5   |      |       | 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 |
| l    |      |       | 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  | 0.004 |       | 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.)  |      |      |       |       |       |



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