



# 74ACT16244

## 16-BIT BUS BUFFER WITH 3-STATE OUTPUTS (NON INVERTED)

- HIGH SPEED:  $t_{PD} = 4.8ns$  (TYP.) at  $V_{CC} = 5V$
- LOW POWER DISSIPATION:  
 $I_{CC} = 8\mu A$  (MAX.) at  $T_A = 25^\circ C$
- COMPATIBLE WITH TTL OUTPUTS  
 $V_{IH} = 2V$  (MIN.),  $V_{IL} = 0.8V$  (MAX.)
- $50\Omega$  TRANSMISSION LINE DRIVING CAPABILITY
- SYMMETRICAL OUTPUT IMPEDANCE:  
 $|I_{OH}| = I_{OL} = 24mA$  (MIN)
- OPERATING VOLTAGE RANGE:  
 $V_{CC}$  (OPR) = 4.5V to 5.5V
- IMPROVED LATCH-UP IMMUNITY

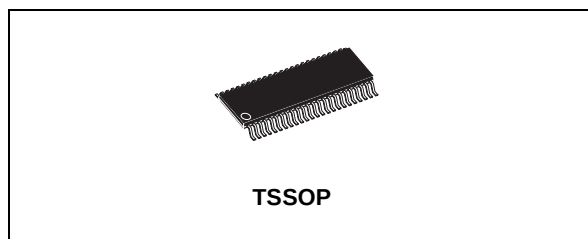
### DESCRIPTION

The 74ACT16244 is an advanced high-speed CMOS 16-BIT BUS BUFFER (3-STATE) fabricated with sub-micron silicon gate and double-layer metal wiring C<sup>2</sup>MOS technology.

G output control governs four BUS BUFFERS.

The device is designed to be used with 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. The device is designed to interface directly High Speed CMOS systems with TTL, NMOS and CMOS output voltage levels.

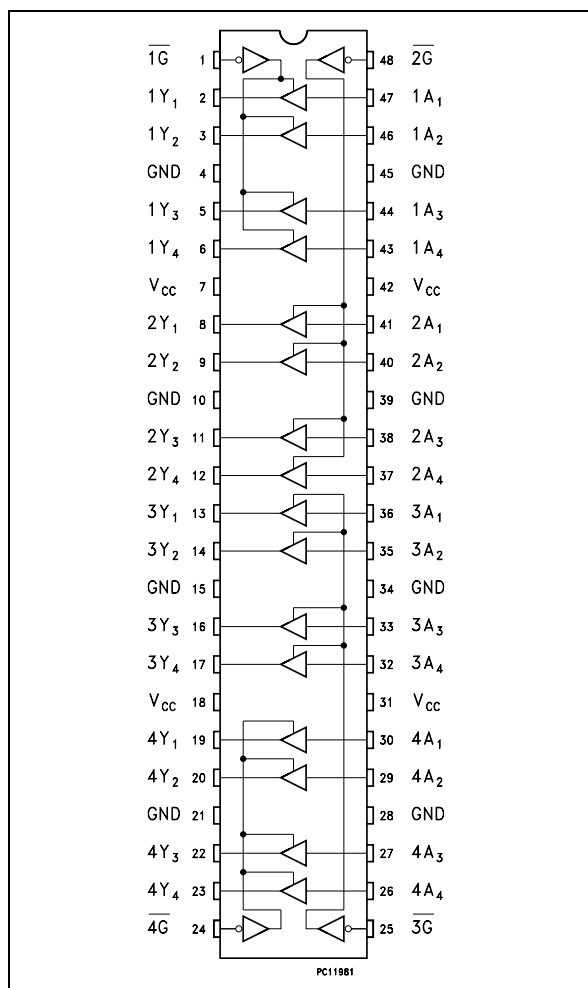
All inputs and outputs are equipped with protection circuits against static discharge, giving them 2KV ESD immunity and transient excess voltage.



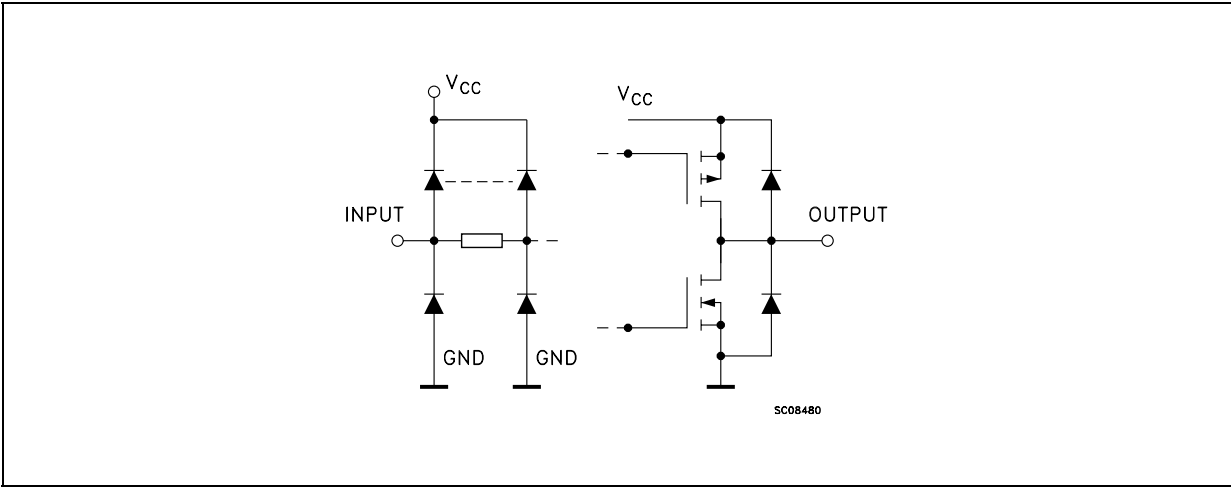
### ORDER CODES

| PACKAGE | TUBE | T & R         |
|---------|------|---------------|
| TSSOP   |      | 74ACT16244TTR |

### PIN CONNECTION



INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

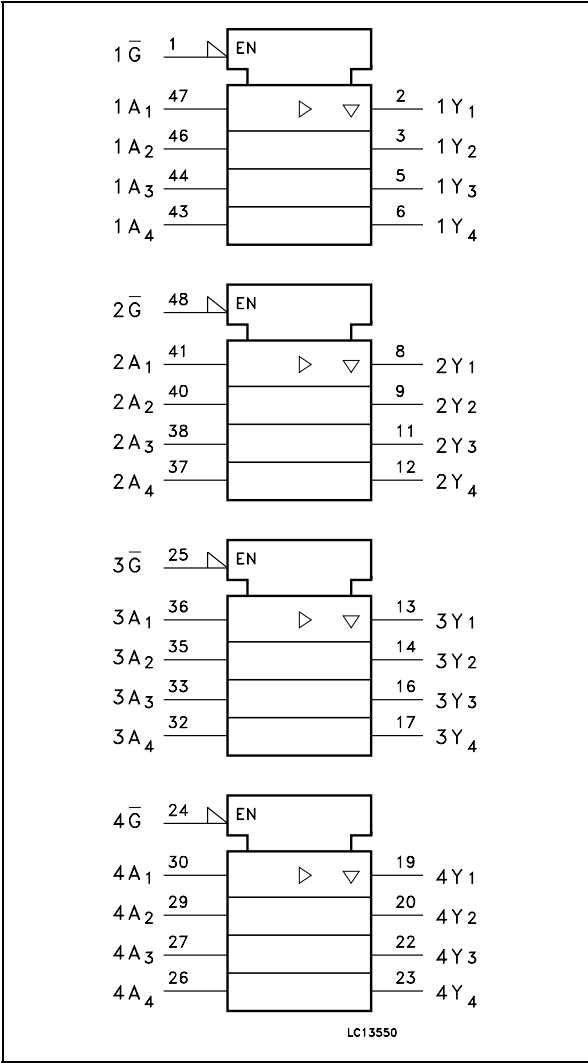
| PIN No                        | SYMBOL     | NAME AND FUNCTION       |
|-------------------------------|------------|-------------------------|
| 1                             | 1G         | Output Enable Input     |
| 2, 3, 5, 6                    | 1Y1 to 1Y4 | Data Outputs            |
| 8, 9, 11, 12                  | 2Y1 to 2Y4 | Data Outputs            |
| 13, 14, 16, 17                | 3Y1 to 3Y4 | Data Outputs            |
| 19, 20, 22, 23                | 4Y1 to 4Y4 | Data Outputs            |
| 24                            | 4G         | Output Enable Input     |
| 25                            | 3G         | Output Enable Input     |
| 30, 29, 27, 26                | 4A1 to 4A4 | Data Outputs            |
| 36, 35, 33, 32                | 3A1 to 3A4 | Data Outputs            |
| 41, 40, 38, 37                | 2A1 to 2A4 | Data Outputs            |
| 47, 46, 44, 43                | 1A1 to 1A4 | Data Outputs            |
| 48                            | 2G         | Output Enable Input     |
| 4, 10, 15, 21, 28, 34, 39, 45 | GND        | Ground (0V)             |
| 7, 18, 31, 42                 | VCC        | Positive Supply Voltage |

TRUTH TABLE

| INPUTS         |                | OUTPUT         |
|----------------|----------------|----------------|
| $\overline{G}$ | A <sub>n</sub> | Y <sub>n</sub> |
| L              | L              | L              |
| L              | H              | H              |
| H              | X              | Z              |

X : Don't Care  
Z : High Impedance

IEC LOGIC SYMBOLS



**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        | $\pm 20$               | mA   |
| $I_{OK}$              | DC Output Diode Current       | $\pm 20$               | mA   |
| $I_O$                 | DC Output Current             | $\pm 50$               | mA   |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or Ground Current | $\pm 400$              | 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                                             | 4.5 to 5.5    | 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 $V_{CC} = 4.5$ to $5.5V$ (note 1) | 8             | ns/V |

1)  $V_{IN}$  from 0.8V to 2.0V

## DC SPECIFICATIONS

| Symbol           | Parameter                             | Test Condition         |                                                                                                 | Value                 |       |       |             |      |              |      | Unit |
|------------------|---------------------------------------|------------------------|-------------------------------------------------------------------------------------------------|-----------------------|-------|-------|-------------|------|--------------|------|------|
|                  |                                       | V <sub>CC</sub><br>(V) |                                                                                                 | T <sub>A</sub> = 25°C |       |       | -40 to 85°C |      | -55 to 125°C |      |      |
|                  |                                       |                        |                                                                                                 | Min.                  | Typ.  | Max.  | Min.        | 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> -0.1V                                              | 2.0                   | 1.5   |       | 2.0         |      | 2.0          |      | V    |
|                  |                                       | 5.5                    |                                                                                                 | 2.0                   | 1.5   |       | 2.0         |      | 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> -0.1V                                              |                       | 1.5   | 0.8   |             | 0.8  |              | 0.8  | V    |
|                  |                                       | 5.5                    |                                                                                                 |                       | 1.5   | 0.8   |             | 0.8  |              | 0.8  |      |
| V <sub>OH</sub>  | High Level Output Voltage             | 4.5                    | I <sub>O</sub> =-50 μA                                                                          | 4.4                   | 4.49  |       | 4.4         |      | 4.4          |      | V    |
|                  |                                       | 5.5                    | I <sub>O</sub> =-50 μA                                                                          | 5.4                   | 5.49  |       | 5.4         |      | 5.4          |      |      |
|                  |                                       | 4.5                    | I <sub>O</sub> =-24 mA                                                                          | 3.86                  |       |       | 3.76        |      | 3.7          |      | V    |
|                  |                                       | 5.5                    | I <sub>O</sub> =-24 mA                                                                          | 4.86                  |       |       | 4.76        |      | 4.7          |      |      |
| V <sub>OL</sub>  | Low Level Output Voltage              | 4.5                    | I <sub>O</sub> =50 μA                                                                           |                       | 0.001 | 0.1   |             | 0.1  |              | 0.1  | V    |
|                  |                                       | 5.5                    | I <sub>O</sub> =50 μA                                                                           |                       | 0.001 | 0.1   |             | 0.1  |              | 0.1  |      |
|                  |                                       | 4.5                    | I <sub>O</sub> =24 mA                                                                           |                       |       | 0.36  |             | 0.44 |              | 0.5  |      |
|                  |                                       | 5.5                    | I <sub>O</sub> =24 mA                                                                           |                       |       | 0.36  |             | 0.44 |              | 0.5  |      |
| I <sub>I</sub>   | Input Leakage Current                 | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> or GND                                                         |                       |       | ± 0.1 |             | ± 1  |              | ± 1  | μA   |
| I <sub>OZ</sub>  | High Impedance Output Leakage Current | 5.5                    | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IIL</sub><br>V <sub>O</sub> = V <sub>CC</sub> or GND |                       |       | ± 0.5 |             | ± 5  |              | ± 10 | μA   |
| I <sub>CCT</sub> | Max I <sub>CC</sub> /Input            | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> - 2.1V                                                         |                       | 0.6   |       |             | 1.5  |              | 1.6  | mA   |
| I <sub>CC</sub>  | Quiescent Supply Current              | 5.5                    | V <sub>I</sub> = V <sub>CC</sub> or GND                                                         |                       |       | 8     |             | 80   |              | 160  | μA   |
| I <sub>OLD</sub> | Dynamic Output Current (note 1, 2)    | 5.5                    | V <sub>OLD</sub> = 1.65 V max                                                                   |                       |       |       |             | 75   |              | 50   | mA   |
| I <sub>OHD</sub> |                                       |                        | V <sub>OHD</sub> = 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<sub>L</sub> = 50 pF, R<sub>L</sub> = 500 Ω, Input t<sub>r</sub> = t<sub>f</sub> = 3ns)

| Symbol           | Parameter              | Test Condition         |  | Value                 |      |      |             |      |              | Unit |      |
|------------------|------------------------|------------------------|--|-----------------------|------|------|-------------|------|--------------|------|------|
|                  |                        | V <sub>CC</sub><br>(V) |  | T <sub>A</sub> = 25°C |      |      | -40 to 85°C |      | -55 to 125°C |      |      |
|                  |                        |                        |  | Min.                  | Typ. | Max. | Min.        | Max. | Min.         |      | Max. |
| t <sub>PLH</sub> | Propagation Delay Time | 5.0(*)                 |  |                       | 3.3  | 4.8  |             | 9.4  |              | 10.3 | ns   |
| t <sub>PHL</sub> |                        |                        |  |                       | 5.0  | 7.3  |             | 9.5  |              | 10.1 |      |
| t <sub>PZL</sub> | Output Enable Time     | 5.0(*)                 |  |                       | 5.5  | 8.4  |             | 10.3 |              | 11.0 | ns   |
| t <sub>PZH</sub> |                        |                        |  |                       | 4.7  | 7.0  |             | 8.9  |              | 10.5 |      |
| t <sub>PLZ</sub> | Output Disable-Time    | 5.0(*)                 |  |                       | 6.6  | 9.4  |             | 10.3 |              | 10.9 | ns   |
| t <sub>PHZ</sub> |                        |                        |  |                       | 6.1  | 8.7  |             | 11.3 |              | 13.0 |      |

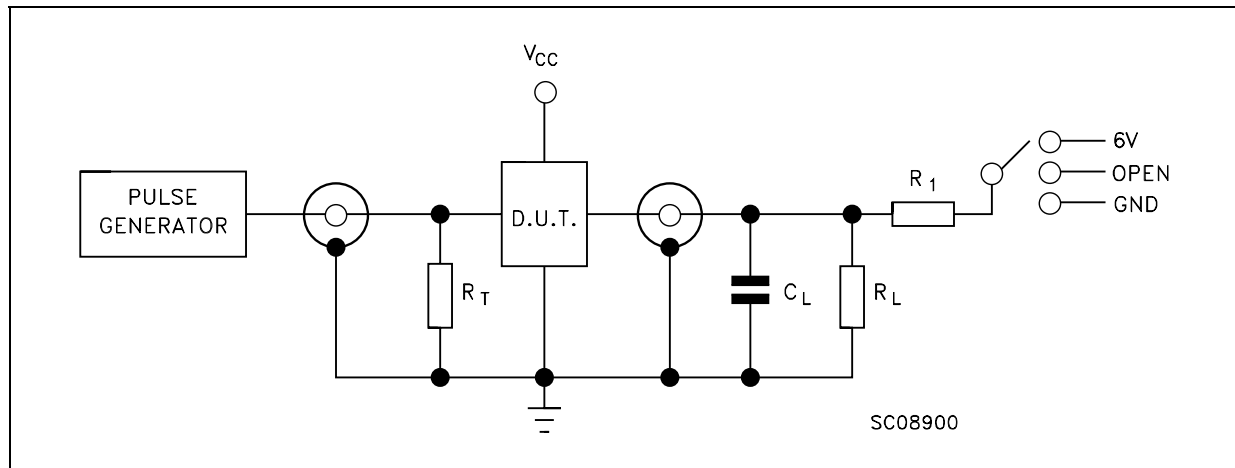
(\*) Voltage range is 5.0V ± 0.5V

## CAPACITIVE CHARACTERISTICS

| Symbol           | Parameter                              | Test Condition         |                         | Value                 |      |      |             |      |              | Unit |      |
|------------------|----------------------------------------|------------------------|-------------------------|-----------------------|------|------|-------------|------|--------------|------|------|
|                  |                                        | V <sub>CC</sub><br>(V) |                         | T <sub>A</sub> = 25°C |      |      | -40 to 85°C |      | -55 to 125°C |      |      |
|                  |                                        |                        |                         | Min.                  | Typ. | Max. | Min.        | Max. | Min.         |      | Max. |
| C <sub>IN</sub>  | Input Capacitance                      | 5.0                    |                         |                       | 3.6  |      |             |      |              |      | pF   |
| C <sub>OUT</sub> | Output Capacitance                     | 5.0                    |                         |                       | 8    |      |             |      |              |      | pF   |
| C <sub>PD</sub>  | Power Dissipation Capacitance (note 1) | 5.0                    | f <sub>IN</sub> = 10MHz |                       | 45   |      |             |      |              |      | 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.  $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/n$  (per circuit)

## TEST CIRCUIT

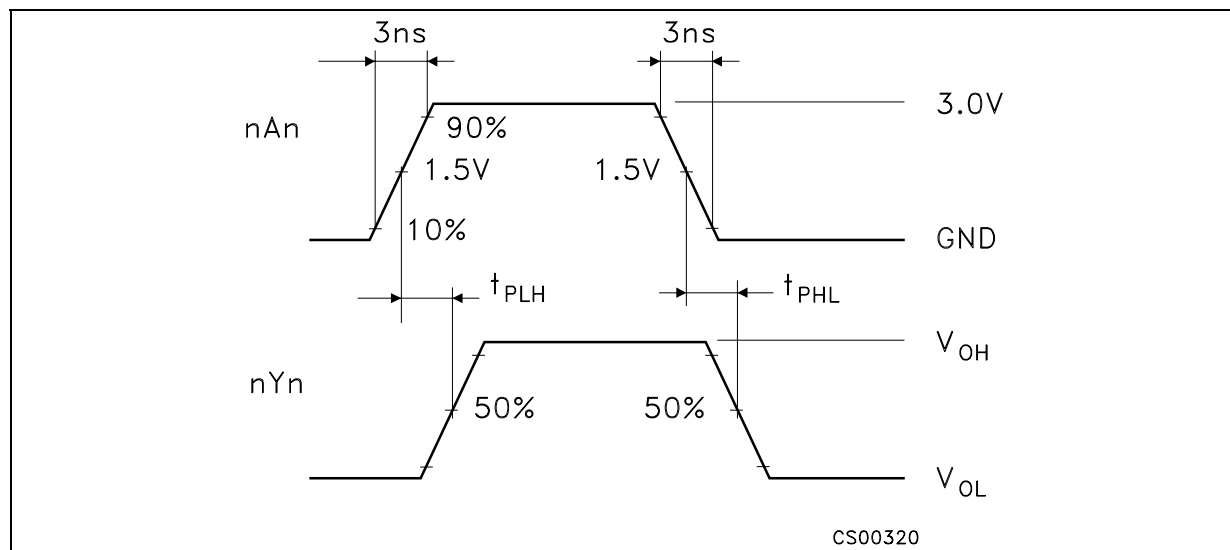
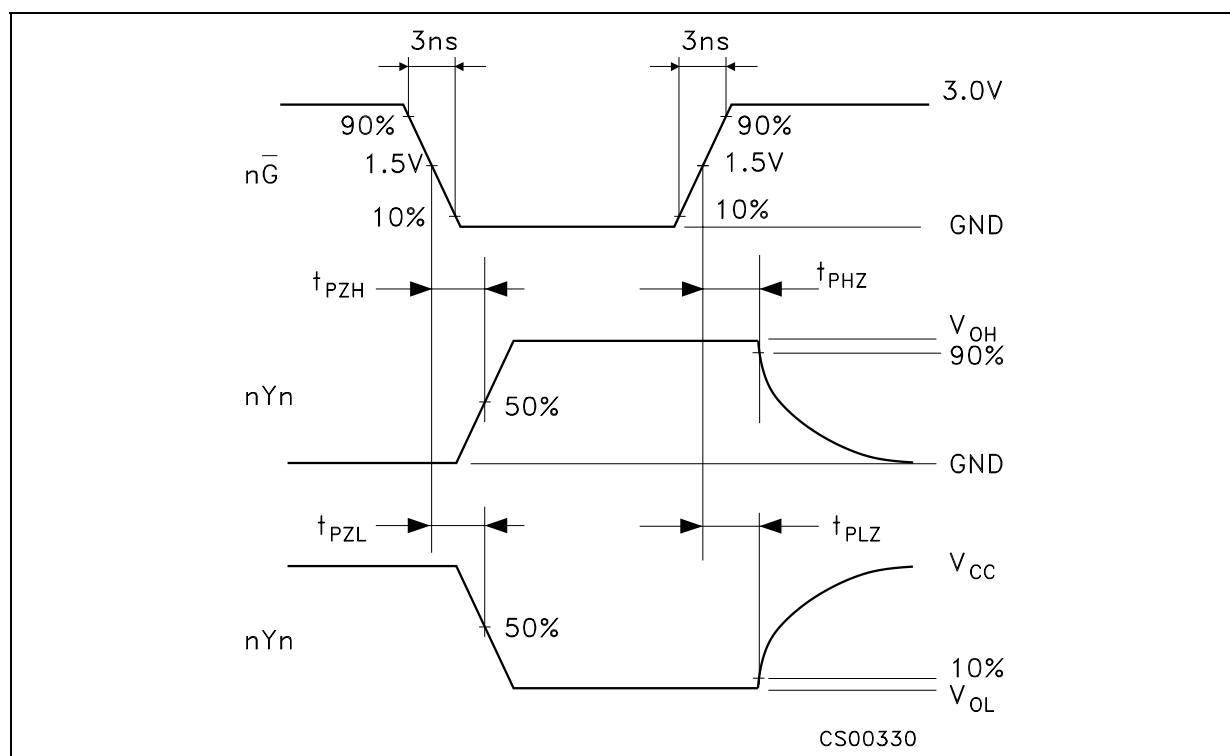


| Test               | Switch    |
|--------------------|-----------|
| $t_{PLH}, t_{PHL}$ | Open      |
| $t_{PZL}, t_{PLZ}$ | $2V_{CC}$ |
| $t_{PZH}, t_{PHZ}$ | GND       |

$C_L = 50\text{pF}$  or equivalent (includes jig and probe capacitance)

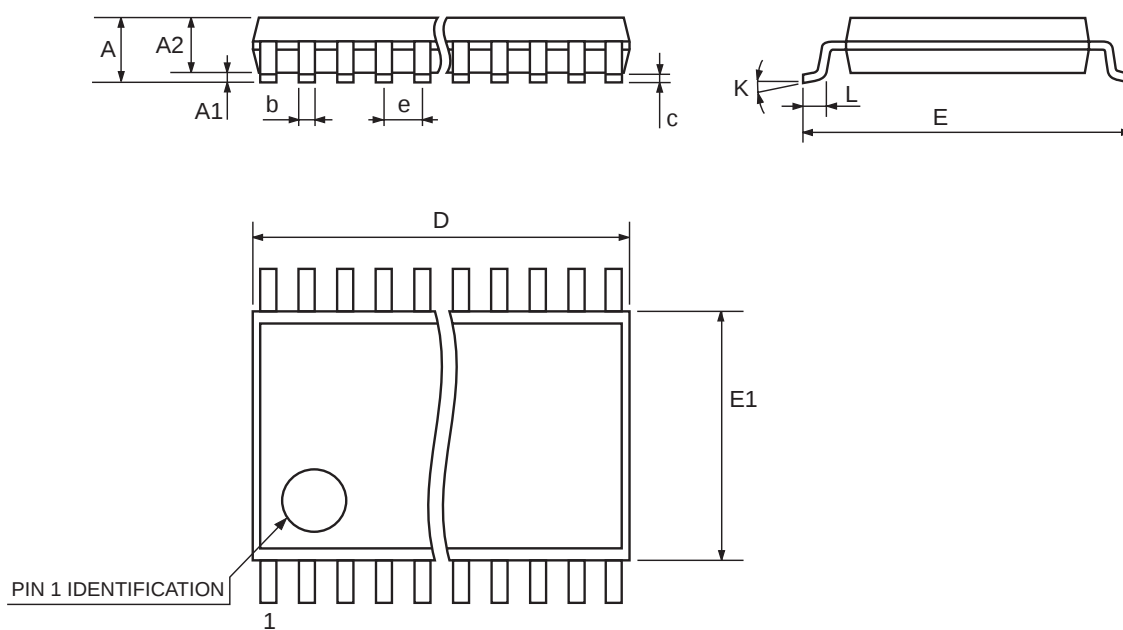
$R_L = R_1 = 500\Omega$  or equivalent

$R_T = Z_{OUT}$  of pulse generator (typically  $50\Omega$ )

**WAVEFORM 1: PROPAGATION DELAYS** ( $f=1\text{MHz}$ ; 50% duty cycle)**WAVEFORM 2: OUTPUT ENABLE AND DISABLE TIME** ( $f=1\text{MHz}$ ; 50% duty cycle)

## TSSOP48 MECHANICAL DATA

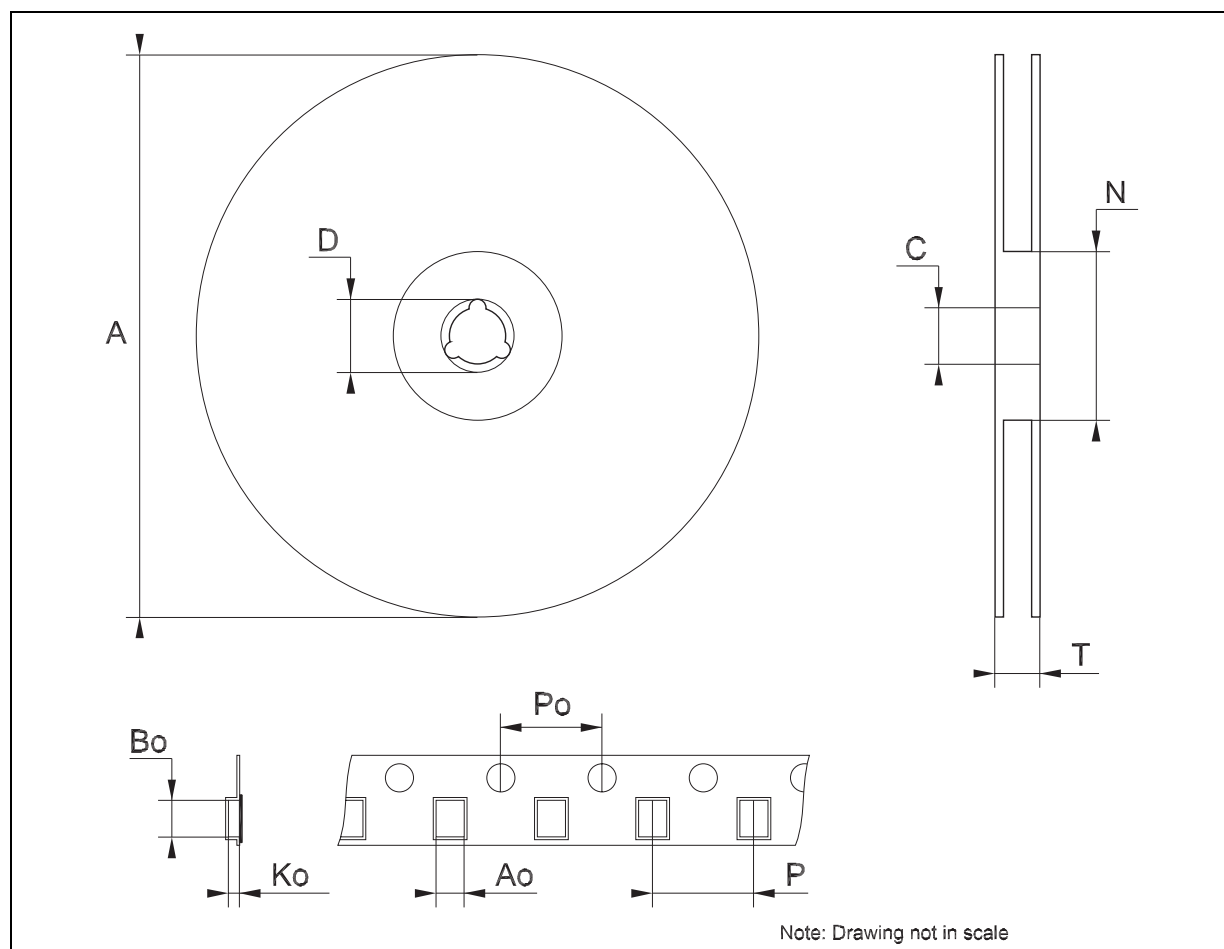
| DIM. | mm.  |         |      | inch   |            |        |
|------|------|---------|------|--------|------------|--------|
|      | MIN. | TYP     | MAX. | MIN.   | TYP.       | MAX.   |
| A    |      |         | 1.2  |        |            | 0.047  |
| A1   | 0.05 |         | 0.15 | 0.002  |            | 0.006  |
| A2   |      | 0.9     |      |        | 0.035      |        |
| b    | 0.17 |         | 0.27 | 0.0067 |            | 0.011  |
| c    | 0.09 |         | 0.20 | 0.0035 |            | 0.0079 |
| D    | 12.4 |         | 12.6 | 0.488  |            | 0.496  |
| E    |      | 8.1 BSC |      |        | 0.318 BSC  |        |
| E1   | 6.0  |         | 6.2  | 0.236  |            | 0.244  |
| e    |      | 0.5 BSC |      |        | 0.0197 BSC |        |
| K    | 0°   |         | 8°   | 0°     |            | 8°     |
| L    | 0.50 |         | 0.75 | 0.020  |            | 0.030  |



7065588C

### Tape & Reel TSSOP48 MECHANICAL DATA

| DIM. | mm.  |     |      | inch  |      |        |
|------|------|-----|------|-------|------|--------|
|      | MIN. | TYP | MAX. | MIN.  | TYP. | MAX.   |
| A    |      |     | 330  |       |      | 12.992 |
| C    | 12.8 |     | 13.2 | 0.504 |      | 0.519  |
| D    | 20.2 |     |      | 0.795 |      |        |
| N    | 60   |     |      | 2.362 |      |        |
| T    |      |     | 30.4 |       |      | 1.197  |
| Ao   | 8.7  |     | 8.9  | 0.343 |      | 0.350  |
| Bo   | 13.1 |     | 13.3 | 0.516 |      | 0.524  |
| Ko   | 1.5  |     | 1.7  | 0.059 |      | 0.067  |
| Po   | 3.9  |     | 4.1  | 0.153 |      | 0.161  |
| P    | 11.9 |     | 12.1 | 0.468 |      | 0.476  |



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