

## Fast CMOS 3.3V 16-Bit Bidirectional Transceiver

### Product Features

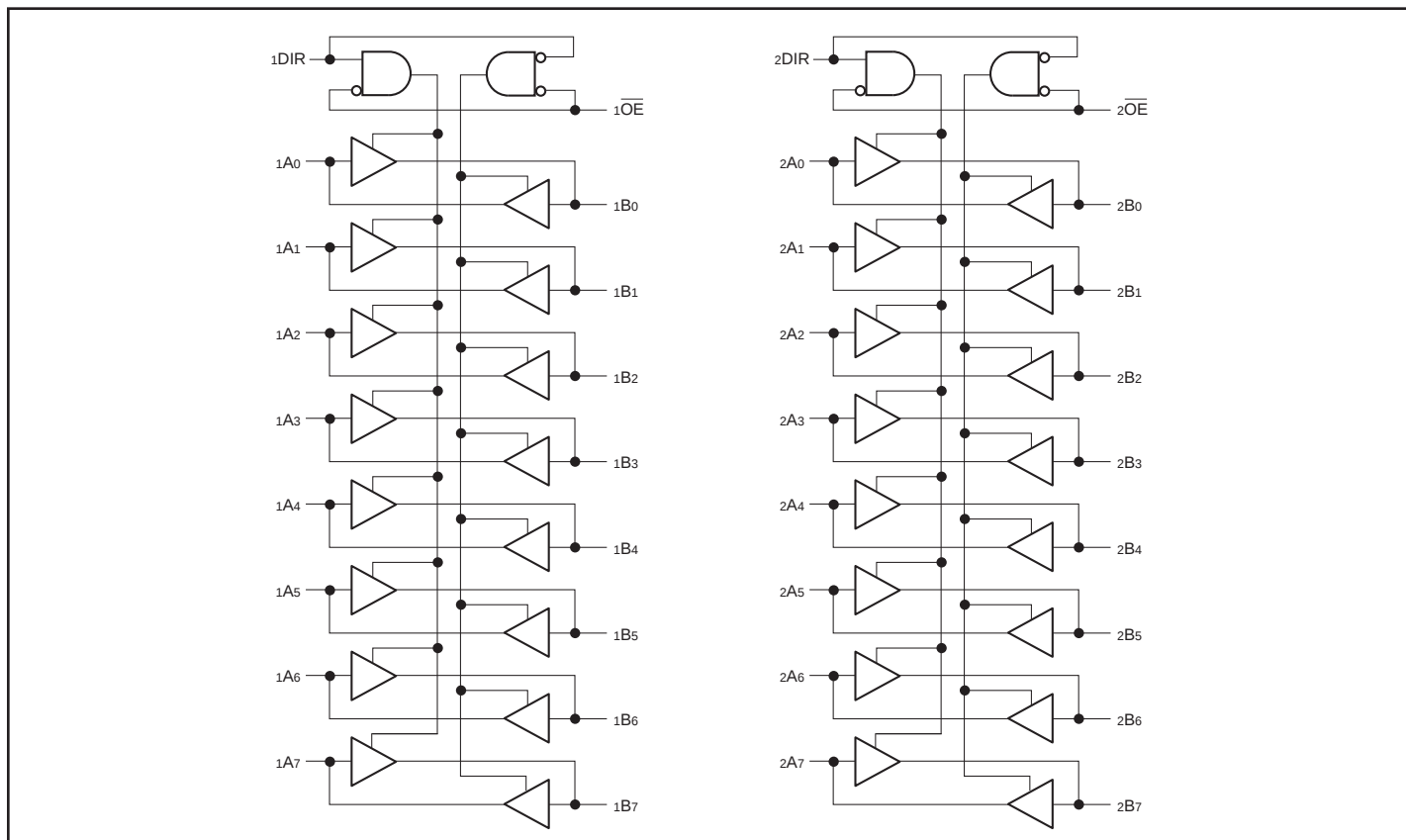
- Compatible with LCX™ and LVT™ families of products
- Supports 5V Tolerant Mixed Signal Mode Operation
  - Input can be 3V or 5V
  - Output can be 3V or connected to 5V bus
- Advanced Low Power CMOS Operation
- Excellent output drive capability:  
Balanced drives (24 mA sink and source)
- Pin compatible with industry standard double-density pinouts
- Low ground bounce outputs
- Hysteresis on all inputs
- Industrial operating temperature range:  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Multiple center pins and distributed Vcc/GND pins minimize switching noise
- Packaging (Pb-free & Green available):
  - 48-pin 240 mil wide thin plastic TSSOP (A)
  - 48-pin 300 mil wide plastic SSOP (V)

### Product Description

The PI74LPT16245 is a 16-bit bidirectional transceiver designed for asynchronous two-way communication between data buses. The direction control input pin (xDIR) determines the direction of data flow through the bidirectional transceiver. The Direction and Output Enable controls are designed to operate this device as either two independent 8-bit transceivers or one 16-bit transceiver. The output enable (OE) input, when HIGH, disables both A and B ports by placing them in HIGH Z condition.

The PI74LPT16245 can be driven from either 3.3V or 5.0V devices allowing this device to be used as a translator in a mixed 3.3/5.0V system.

### Logic Block Diagram



## Maximum Ratings

(Above which the useful life may be impaired. For user guidelines, not tested.)

|                                                              |                 |
|--------------------------------------------------------------|-----------------|
| Storage Temperature .....                                    | –55°C to +125°C |
| Ambient Temperature with Power Applied .....                 | –40°C to +85°C  |
| Supply Voltage to Ground Potential (Inputs & Vcc Only) ..... | –0.5V to +7.0V  |
| Supply Voltage to Ground Potential (Outputs & D/O Only) ...  | –0.5V to +7.0V  |
| DC Input Voltage .....                                       | –0.5V to +7.0V  |
| DC Output Current.....                                       | 120 mA          |
| Power Dissipation .....                                      | 1.0W            |

### Note:

Stresses greater than those listed under MAXIMUM RATINGS may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied. Exposure to absolute maximum rating conditions for extended periods may affect reliability.

## Product Pin Configuration

|      |    |    |     |
|------|----|----|-----|
| 1DIR | 1  | 48 | 1OE |
| 1B0  | 2  | 47 | 1A0 |
| 1B1  | 3  | 46 | 1A1 |
| GND  | 4  | 45 | GND |
| 1B2  | 5  | 44 | 1A2 |
| 1B3  | 6  | 43 | 1A3 |
| Vcc  | 7  | 42 | Vcc |
| 1B4  | 8  | 41 | 1A4 |
| 1B5  | 9  | 40 | 1A5 |
| GND  | 10 | 39 | GND |
| 1B6  | 11 | 38 | 1A6 |
| 1B7  | 12 | 37 | 1A7 |
| 2B0  | 13 | 36 | 2A0 |
| 2B1  | 14 | 35 | 2A1 |
| GND  | 15 | 34 | GND |
| 2B2  | 16 | 33 | 2A2 |
| 2B3  | 17 | 32 | 2A3 |
| Vcc  | 18 | 31 | Vcc |
| 2B4  | 19 | 30 | 2A4 |
| 2B5  | 20 | 29 | 2A5 |
| GND  | 21 | 28 | GND |
| 2B6  | 22 | 27 | 2A6 |
| 2B7  | 23 | 26 | 2A7 |
| 2DIR | 24 | 25 | 2OE |

## Truth Table<sup>(1)</sup>

| Inputs |      | Outputs             |
|--------|------|---------------------|
| xOE    | xDIR |                     |
| L      | L    | Bus B Data to Bus A |
| L      | H    | Bus A Data to Bus B |
| H      | X    | Z                   |

### Notes:

1. H = High Voltage Level, X = Don't Care,  
L = Low Voltage Level, Z = High Impedance

## Product Pin Description

| Pin Name | Description                               |
|----------|-------------------------------------------|
| xOE      | 3-State Output Enable Inputs (Active LOW) |
| xDIR     | Direction Control Input                   |
| xAx      | Side A Inputs or 3-State Inputs           |
| XYx      | Side B Outputs or 3-State Outputs         |
| GND      | Ground                                    |
| VCC      | Power                                     |

**Capacitance** ( $T_A = 25^\circ\text{C}$ ,  $f = 1\text{ MHz}$ )

| Parameters <sup>(1)</sup> | Description        | Test Conditions       | Typ | Max. | Units |
|---------------------------|--------------------|-----------------------|-----|------|-------|
| $C_{IN}$                  | Input Capacitance  | $V_{IN} = 0\text{V}$  | 4.5 | 6    | pF    |
| $C_{OUT}$                 | Output Capacitance | $V_{OUT} = 0\text{V}$ | 5.5 | 8    |       |

**Notes:**

1. This parameter is determined by device characterization but is not production tested.

**DC Electrical Characteristics** (Over the Operating Range,  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $V_{CC} = 2.7\text{V}$  to  $3.6\text{V}$ )

| Parameters | Description                            | Test Conditions <sup>(1)</sup>                                                     |                           | Min.               | Typ <sup>(2)</sup> | Max.      | Units         |
|------------|----------------------------------------|------------------------------------------------------------------------------------|---------------------------|--------------------|--------------------|-----------|---------------|
| $V_{IH}$   | Input HIGH Voltage (Input pins)        | Guaranteed Logic HIGH Level                                                        |                           | 2.2                |                    | 5.5       | V             |
|            | Input HIGH Voltage (I/O pins)          |                                                                                    |                           | 2.0                |                    | 5.5       |               |
| $V_{IL}$   | Input LOW Voltage (Input and I/O pins) | Guaranteed Logic LOW Level                                                         |                           | -0.5               |                    | 0.8       |               |
| $I_{IH}$   | Input HIGH Current (Input pins)        | $V_{CC} = \text{Max.}$                                                             | $V_{IN} = 5.5\text{V}$    |                    |                    | $\pm 1$   | $\mu\text{A}$ |
|            | Input HIGH Current (I/O pins)          | $V_{CC} = \text{Max.}$                                                             | $V_{IN} = V_{CC}$         |                    |                    | $\pm 1$   |               |
| $I_{IL}$   | Input LOW Current (Input pins)         | $V_{CC} = \text{Max.}$                                                             | $V_{IN} = \text{GND}$     |                    |                    | $\pm 1$   |               |
|            | Input LOW Current (I/O pins)           | $V_{CC} = \text{Max.}$                                                             | $V_{IN} = \text{GND}$     |                    |                    | $\pm 1$   |               |
| $I_{OZH}$  | High Impedance Output Current          | $V_{CC} = \text{Max.}$                                                             | $V_{OUT} = 5.5\text{V}$   |                    |                    | $\pm 1$   |               |
| $I_{OZL}$  | (3-State Output pins)                  | $V_{CC} = \text{Max.}$                                                             | $V_{OUT} = \text{GND}$    |                    |                    | $\pm 1$   |               |
| $V_{IK}$   | Clamp Diode Voltage                    | $V_{CC} = \text{Min.}$ , $I_{IN} = -18\text{ mA}$                                  |                           |                    | -0.7               | -1.2      | V             |
| $I_{OHD}$  | Output HIGH Current                    | $V_{CC} = 3.3\text{V}$ , $V_{IN} = V_{IL}$ or $V_{IL}$ , $V_O = 1.5\text{V}^{(3)}$ |                           | -36                | -60                | -110      | mA            |
| $I_{ODL}$  | Output LOW Current                     | $V_{CC} = 3.3\text{V}$ , $V_{IN} = V_{IH}$ or $V_{IL}$ , $V_O = 1.5\text{V}^{(3)}$ |                           | 50                 | 90                 | 200       |               |
| $V_{OH}$   | Output HIGH Voltage                    | $V_{CC} = \text{Min.}$                                                             | $I_{OH} = -0.1\text{ mA}$ | $V_{CC} - 0.2$     |                    |           | V             |
|            |                                        | $V_{IN} = V_{IH}$ or $V_{IL}$                                                      | $I_{OH} = -3\text{ mA}$   | 2.4                | 3.0                |           |               |
|            |                                        | $V_{CC} = 3.0\text{V}$ ,                                                           | $I_{OH} = -8\text{ mA}$   | 2.4 <sup>(5)</sup> | 3.0                |           |               |
|            |                                        | $V_{IN} = V_{IH}$ or $V_{IL}$                                                      | $I_{OH} = -24\text{ mA}$  | 2.0                |                    |           |               |
| $V_{OL}$   | Output LOW Voltage                     | $V_{CC} = \text{Min.}$ , $V_{IN} = V_{IH}$ or $V_{IL}$                             | $I_{OL} = 0.1\text{ mA}$  |                    |                    | 0.2       |               |
|            |                                        |                                                                                    | $I_{OL} = 16\text{ mA}$   |                    | 0.2                | 0.4       |               |
|            |                                        |                                                                                    | $I_{OL} = 24\text{ mA}$   |                    | 0.3                | 0.5       |               |
| $I_{OS}$   | Short Circuit Current <sup>(4)</sup>   | $V_{CC} = \text{Max.}^{(3)}$ , $V_{OUT} = \text{GND} - 60$                         |                           | -60                | -85                | -240      | mA            |
| $I_{OFF}$  | Power Down Disable                     | $V_{CC} = 0\text{V}$ , $V_{IN}$ or $V_{OUT} \leq 4.5\text{V}$                      |                           |                    |                    | $\pm 100$ | $\mu\text{A}$ |
| $V_H$      | Input Hysteresis                       |                                                                                    |                           |                    | 150                |           | mV            |

**Notes:**

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at  $V_{CC} = 3.3\text{V}$ ,  $+25^\circ\text{C}$  ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5.  $V_{OH} = V_{CC} - 0.6\text{V}$  at rated current.

## Power Supply Characteristics

| Parameters       | Description                                       | Test Conditions <sup>(1)</sup>                                                                                                      |                                                                   | Min. | Typ <sup>(2)</sup> | Max.               | Units      |
|------------------|---------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|------|--------------------|--------------------|------------|
| I <sub>CC</sub>  | Quiescent Power Supply Current                    | V <sub>CC</sub> = Max.                                                                                                              | V <sub>IN</sub> = GND or V <sub>CC</sub>                          |      | 0.1                | 10                 | μA         |
| ΔI <sub>CC</sub> | Quiescent Power Supply Current<br>TTL Inputs HIGH | V <sub>CC</sub> = Max.                                                                                                              | V <sub>IN</sub> = V <sub>CC</sub> – 0.6V <sup>(3)</sup>           |      |                    | 500                |            |
| I <sub>CCD</sub> | Dynamic Power Supply <sup>(4)</sup>               | V <sub>CC</sub> = Max.,<br>Outputs Open<br>$\overline{xOE}$ = GND<br>One Bit Toggling<br>50% Duty Cycle                             | V <sub>IN</sub> = V <sub>CC</sub><br>V <sub>IN</sub> = GND        |      | 50                 | 75                 | μA/<br>MHz |
| I <sub>C</sub>   | Total Power Supply<br>Current <sup>(6)</sup>      | V <sub>CC</sub> = Max.,<br>Outputs Open<br>f <sub>i</sub> = 10 MHz<br>50% Duty Cycle<br>$\overline{xOE}$ = GND<br>One Bit Toggling  | V <sub>IN</sub> = V <sub>CC</sub> – 0.6V<br>V <sub>IN</sub> = GND |      | 0.5                | 0.8                | mA         |
|                  |                                                   | V <sub>CC</sub> = Max.,<br>Outputs Open<br>f <sub>i</sub> = 2.5 MHz<br>50% Duty Cycle<br>$\overline{xOE}$ = GND<br>16 Bits Toggling | V <sub>IN</sub> = V <sub>CC</sub> – 0.6V<br>V <sub>IN</sub> = GND |      | 2.0                | 3.3 <sup>(5)</sup> |            |

### Notes:

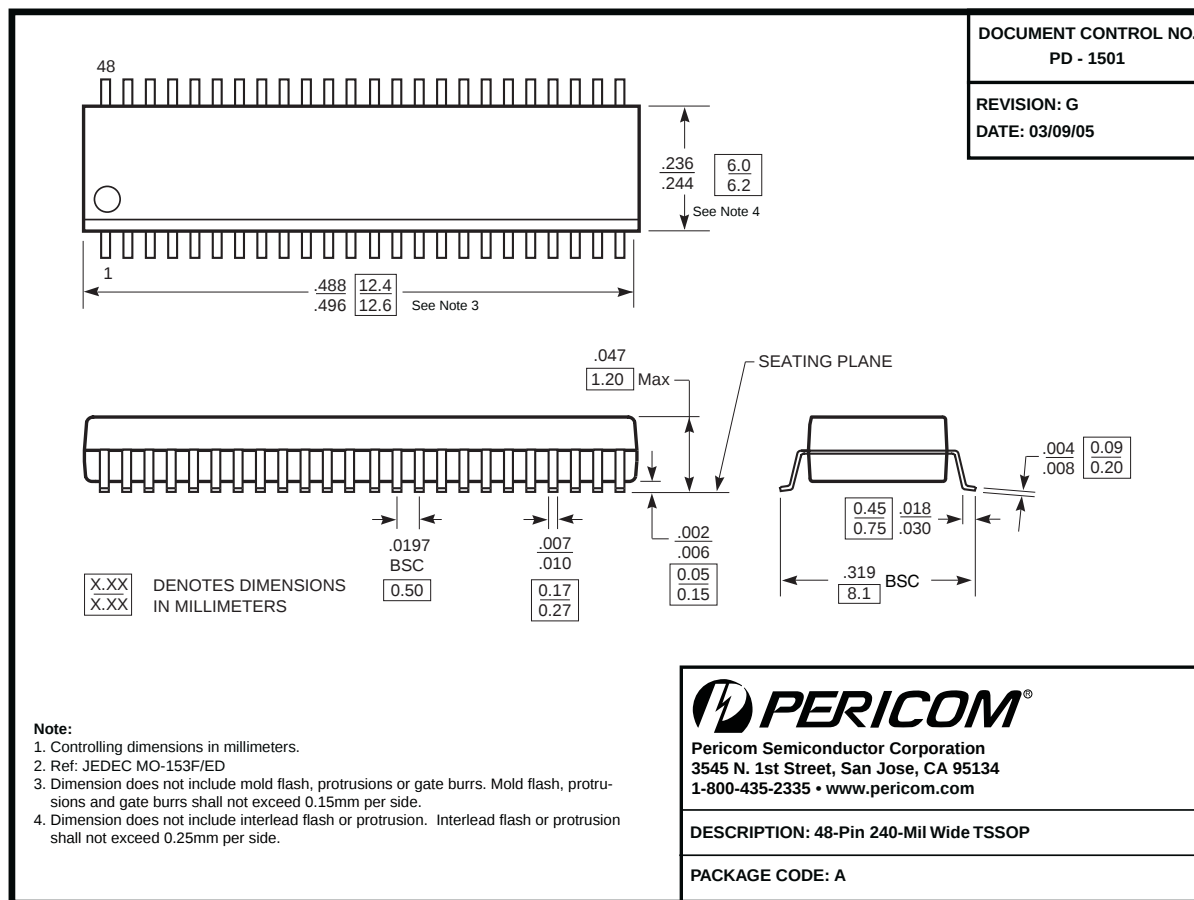
- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at V<sub>CC</sub> = 3.3V, +25°C ambient.
- Per TTL driven input; all other inputs at V<sub>CC</sub> or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the I<sub>CC</sub> formula. These limits are guaranteed but not tested.
- I<sub>C</sub> = I<sub>QUIESCENT</sub> + I<sub>INPUTS</sub> + I<sub>DYNAMIC</sub>  
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_i)$   
I<sub>CC</sub> = Quiescent Current (I<sub>CC1</sub>, I<sub>CC2</sub> and I<sub>CC3</sub>)  
ΔI<sub>CC</sub> = Power Supply Current for a TTL High Input  
D<sub>H</sub> = Duty Cycle for TTL Inputs High  
N<sub>T</sub> = Number of TTL Inputs at D<sub>H</sub>  
I<sub>CCD</sub> = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)  
f<sub>CP</sub> = Clock Frequency for Register Devices (Zero for Non-Register Devices)  
N<sub>CP</sub> = Number of Clock Inputs at f<sub>CP</sub>  
f<sub>i</sub> = Input Frequency  
N<sub>i</sub> = Number of Inputs at f<sub>i</sub>  
All currents are in milliamps and all frequencies are in megahertz.

**Switching Characteristics over Operating Range<sup>(1)</sup>**

| Parameters                           | Description                                         | Conditions <sup>(2)</sup>                      | LPT16245           |      | LPT16245A          |      | LPT16245C          |      | Units |
|--------------------------------------|-----------------------------------------------------|------------------------------------------------|--------------------|------|--------------------|------|--------------------|------|-------|
|                                      |                                                     |                                                | Com.               |      | Com.               |      | Com.               |      |       |
|                                      |                                                     |                                                | Min <sup>(3)</sup> | Max. | Min <sup>(3)</sup> | Max. | Min <sup>(3)</sup> | Max. |       |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>xAX to xBx                     | C <sub>L</sub> = 50pF<br>R <sub>L</sub> = 500Ω | 1.5                | 5.2  | 1.5                | 4.6  | 1.5                | 4.1  | ns    |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time<br>xOE to xBx                    |                                                | 1.5                | 7.2  | 1.5                | 6.2  | 1.5                | 5.8  |       |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time <sup>(4)</sup><br>xOE to xBx    |                                                | 1.5                | 7.2  | 1.5                | 5.0  | 1.5                | 4.8  |       |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time xDIR<br>to A or B                |                                                | 1.5                | 7.2  | 1.5                | 6.2  | 1.5                | 5.8  |       |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output DisableTime xDIR<br>to A or B <sup>(4)</sup> |                                                | 1.5                | 7.2  | 1.5                | 5.0  | 1.5                | 4.8  |       |
| t <sub>SK(o)</sub>                   | Output Skew <sup>(5)</sup>                          |                                                |                    | 0.5  |                    | 0.5  |                    | 0.5  |       |

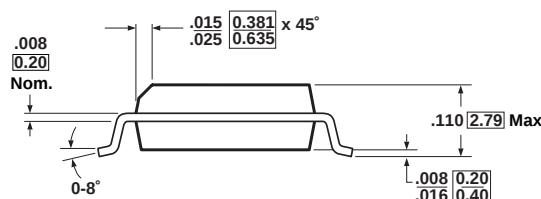
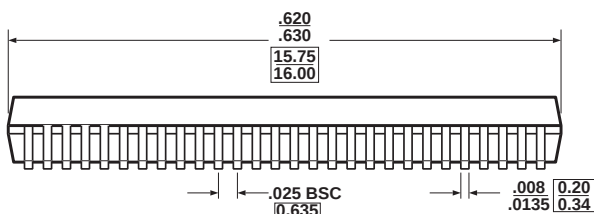
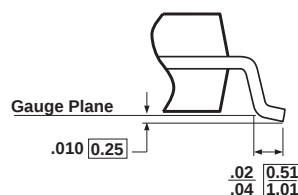
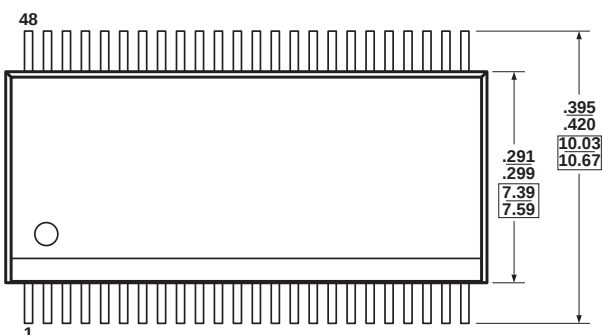
**Notes:**

- Propagation Delays and Enable/Disable times are with V<sub>CC</sub> = 3.3V ±0.3V, normal range. For V<sub>CC</sub> = 2.7V, extended range, all Propagation Delays and Enable/Disable times should be degraded by 20%.
- See test circuit and wave forms.
- Minimum limits are guaranteed but not tested on Propagation Delays.
- This parameter is guaranteed but not production tested.
- Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.



DOCUMENT CONTROL NO.  
PD - 1401

REVISION: E  
DATE: 03/09/05



X.XX DENOTES DIMENSIONS  
X.XX IN MILLIMETERS

**Notes:**

- 1) Controlling dimensions in inches.
- 2) Ref: JEDEC MO-118B/AA



Pericom Semiconductor Corporation  
3545 N. 1st Street, San Jose, CA 95134  
1-800-435-2335 • www.pericom.com

DESCRIPTION: 48-Pin, 300-Mil Wide, SSOP

PACKAGE CODE: V

## Ordering Information

| Ordering Code   | Package Code | Description                                        |
|-----------------|--------------|----------------------------------------------------|
| PI74LPT16245AE  | A            | Pb-free & Green, 48-pin 173 mil wide plastic TSSOP |
| PI74LPT16245AAE | A            | Pb-free & Green, 48-pin 173 mil wide plastic TSSOP |
| PI74LPT16245VE  | V            | Pb-free & Green, 48-pin 300 mil wide plastic SSOP  |
| PI74LPT16245CAE | A            | Pb-free & Green, 48-pin 173 mil wide plastic TSSOP |

**Notes:**

- Thermal characteristics can be found on the company web site at [www.pericom.com/packaging/](http://www.pericom.com/packaging/)
- E = Pb-free & Green
- Adding an X suffix = Tape/Reel