

## Fast CMOS 16-Bit Bidirectional Transceivers

### Features

#### Common Features

- PI74FCT16245T and PI74FCT162245T are high-speed, low-power devices with high-current drive
- $V_{CC} = 5V \pm 10\%$
- Hysteresis on all inputs

#### PI74FCT16245T Features

- High output drive:  $I_{OH} = -32mA$ ;  $I_{OL} = 64mA$
- Power off disable outputs permit “live insertion”
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 1.0V$  at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$
- Packaging (Pb-free & Green available):
  - 48-pin 240-mil wide plastic TSSOP (A)
  - 48-pin 300-mil wide plastic SSOP (V)
  - 48-pin 300-mil wide plastic TVSOP (K)

#### PI74FCT162245T Features

- Balanced output drivers:  $\pm 24mA$
- Reduced system switching noise
- Typical  $V_{OLP}$  (Output Ground Bounce)  $< 0.6V$  at  $V_{CC} = 5V$ ,  $T_A = 25^\circ C$
- Packaging (Pb-free & Green available):
  - 48-pin 240-mil wide plastic TSSOP (A)
  - 48-pin 300-mil wide plastic SSOP (V)
  - 48-pin 300-mil wide plastic TVSOP (K)

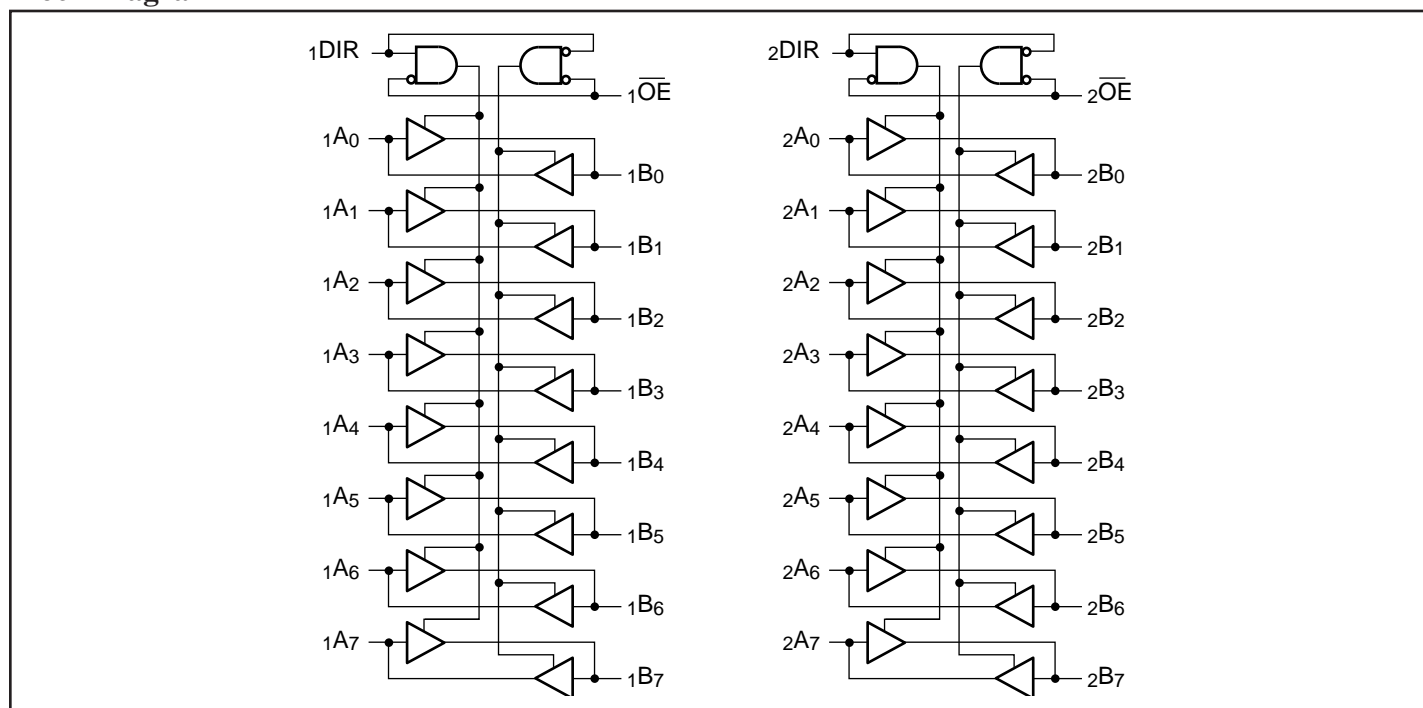
### Description

Pericom Semiconductor’s PI74FCT16245T and PI74FCT162245T are 16-bit bidirectional transceivers 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 these devices as either two independent 8-bit transceivers or one 16-bit transceiver. The output enable ( $\overline{OE}$ ) input, when HIGH, disables both A and B ports by placing them in Hi-Z condition.

The PI74FCT16245T output buffers are designed with a power off disable allowing “live insertion” of boards when used as backplane drivers.

The PI74FCT162245T has  $\pm 24mA$  balanced output drivers. It is designed with current limiting resistors at its outputs to control the output edge rate resulting in lower ground bounce and undershoot. This eliminates the need for external terminating resistors for most interface applications.

### Block Diagram



### Maximum Ratings

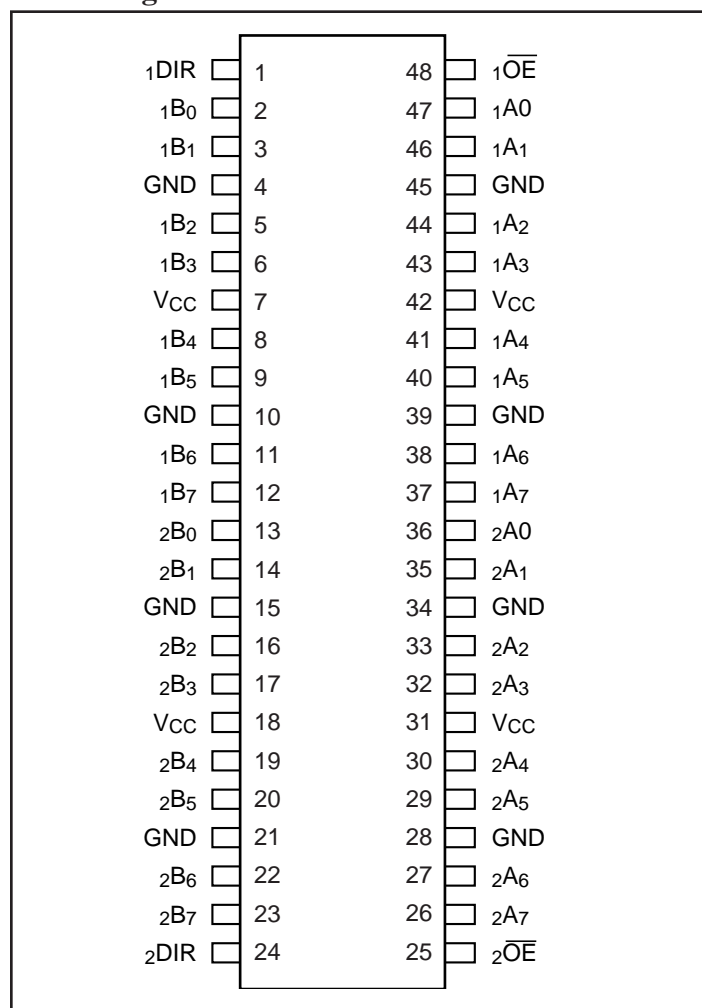
(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature .....	-65°C to +150°C
Ambient Temperature with Power Applied .....	-40°C to +85°C
Supply Voltage to Ground Potential (Inputs & V <sub>CC</sub> 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.....	120mA
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.

### Pin Configuration



### Truth Table

Inputs <sup>(1)</sup>		Outputs <sup>(1)</sup>
xOE	xDIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

**Note:**

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

### Pin Description

Pin Name	Description
xOE	3-State Enable Inputs (Active LOW)
xDIR	Direction Control Input
xAx	Side A Inputs or 3-State Outputs
xBx	Side B Inputs or 3-State Outputs
GND	Ground
V <sub>CC</sub>	Power

**DC Electrical Characteristics** (Over the Operating Range,  $T_A = -40^\circ\text{C}$  to  $+85^\circ\text{C}$ ,  $V_{CC} = 5.0\text{V} \pm 10\%$ )

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
$V_{IH}$	Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0			V
$V_{IL}$	Input LOW Voltage	Guaranteed Logic LOW Level				0.8	
$I_{IH}$	Input HIGH Current	Standard Input, $V_{CC} = \text{Max.}$	$V_{IN} = V_{CC}$			1	$\mu\text{A}$
		Standard I/O, $V_{CC} = \text{Max.}$	$V_{IN} = V_{CC}$			1	
$I_{IL}$	Input LOW Current	Standard Input, $V_{CC} = \text{Min.}$	$V_{IN} = \text{GND}$			-1	
		Standard I/O, $V_{CC} = \text{Min.}$	$V_{IN} = \text{GND}$			-1	
$I_{OZH}$	High Impedance	$V_{CC} = \text{Max.}$	$V_{OUT} = 2.7\text{V}$			1	
$I_{OZL}$	Output Current	$V_{CC} = \text{Max.}$	$V_{OUT} = 0.5\text{V}$			-1	
$V_{IK}$	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$			-0.7	-1.2	V
$I_{OS}$	Short Circuit Current	$V_{CC} = \text{Max.}^{(3)}, V_{OUT} = \text{GND}$		-80	-140	-300	mA
$I_O$	Output Drive Current	$V_{CC} = \text{Max.}^{(3)}, V_{OUT} = 2.5\text{V}$		-50		-180	
$V_H$	Input Hysteresis				100		mV

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0\text{V}$ ,  $+25^\circ\text{C}$  ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

**PI74FCT16245T Output Drive Characteristics** (Over the Operating Range)

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -3.0\text{mA}$	2.5	3.5		V
			$I_{OH} = -15.0\text{mA}$	2.4	3.5		
			$I_{OH} = -32.0\text{mA}$				
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 64\text{mA}$		0.2	0.55	
$I_{OFF}$	Power Down Disable	$V_{CC} = 0\text{V}, V_{IN} \text{ or } V_{OUT} \leq 4.5\text{V}$				$\pm 100$	$\mu\text{A}$

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0\text{V}$ ,  $+25^\circ\text{C}$  ambient and maximum loading.

**PI74FCT162245T Output Drive Characteristics** (Over the Operating Range)

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
$V_{OH}$	Output HIGH Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OH} = -24.0\text{mA}$	2.4	3.3		V
$V_{OL}$	Output LOW Voltage	$V_{CC} = \text{Min.}, V_{IN} = V_{IH} \text{ or } V_{IL}$	$I_{OL} = 24\text{mA}$		0.3	0.55	
$I_{ODL}$	Output LOW Current	$V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_{OUT} = 1.5\text{V}^{(3)}$		60	115	160	mA
$I_{ODH}$	Output HIGH Current	$V_{CC} = 5\text{V}, V_{IN} = V_{IH} \text{ or } V_{IL}, V_{OUT} = 1.5\text{V}^{(3)}$		-60	-115	-150	

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
- Typical values are at  $V_{CC} = 5.0\text{V}$ ,  $+25^\circ\text{C}$  ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.

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

Parameters	Description	Test Conditions <sup>(1)</sup>	Typ. <sup>(2)</sup>	Max.	Units
$C_{IN}$	Input Capacitance	$V_{IN} = 0V$	4.5	6	pF
$C_{OUT}$	Output Capacitance	$V_{OUT} = 0V$	5.5	8	

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ\text{C}$  ambient.

**Power Supply Characteristics**

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
$I_{CC}$	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	$V_{IN} = \text{GND}$ or $V_{CC}$		0.1	500	$\mu\text{A}$
$\Delta I_{CC}$	Supply Current per Input @ TTL HIGH	$V_{CC} = \text{Max.}$	$V_{IN} = 3.4V^{(3)}$		0.5	1.5	mA
$I_{CCD}$	Supply Current per Input per MHz <sup>(4)</sup>	$V_{CC} = \text{Max.}$ , Outputs Open $\overline{xOE} = xDIR = \text{GND}$ One Bit Toggling 50% Duty Cycle	$V_{IN} = V_{CC}$ , $V_{IN} = \text{GND}$		60	100	$\mu\text{A}/\text{MHz}$
$I_C$	Total Power Supply Current <sup>(6)</sup>	$V_{CC} = \text{Max.}$ , Outputs Open $f_i = 10\text{ MHz}$ 50% Duty Cycle $\overline{xOE} = xDIR = \text{GND}$ One Bit Toggling	$V_{IN} = V_{CC}$ , $V_{IN} = \text{GND}$		0.7	2.5 <sup>(5)</sup>	mA
			$V_{IN} = 3.4V$		0.9	3.3 <sup>(5)</sup>	
		$V_{CC} = \text{Max.}$ , Outputs Open $f_i = 2.5\text{ MHz}$ 50% Duty Cycle $\overline{xOE} = xDIR = \text{GND}$ 16 Bits Toggling	$V_{IN} = V_{CC}$ , $V_{IN} = \text{GND}$		2.5	5.5 <sup>(5)</sup>	
			$V_{IN} = 3.4V$		6.5	17.5 <sup>(5)</sup>	

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at  $V_{CC} = 5.0V$ ,  $+25^\circ\text{C}$  ambient.
- Per TTL driven input ( $V_{IN} = 3.4V$ ); all other inputs at  $V_{CC}$  or GND.
- Guaranteed by design, not production tested.
- Values for these conditions are examples of the  $I_{CC}$  formula. These limits are guaranteed but not tested.
- $I_C = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$   
 $I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_I)$   
 $I_{CC}$  = Quiescent Current  
 $\Delta I_{CC}$  = Power Supply Current for a TTL High Input ( $V_{IN} = 3.4V$ )  
 $D_H$  = Duty Cycle for TTL Inputs High  
 $N_T$  = Number of TTL Inputs at  $D_H$   
 $I_{CCD}$  = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)  
 $f_{CP}$  = Clock Frequency for Register Devices (Zero for Non-Register Devices)  
 $f_i$  = Input Frequency  
 $N_I$  = Number of Inputs at  $f_i$   
 All currents are in milliamps and all frequencies are in megahertz.

### PI74FCT16245T Switching Characteristics over Operating Range

Parameters	Description	Conditions <sup>(1)</sup>	16245T		16245AT		16245CT		Units
			Com.		Com.		Com.		
			Min.	Max.	Min.	Max.	Min.	Max.	
t <sub>PHL</sub> t <sub>PHL</sub>	Propagation Delay <sup>(2)</sup> A to B, B to A	C <sub>L</sub> = 50pF R <sub>L</sub> = 500Ω	1.5	7.0	1.5	4.6	1.5	4.1	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time xOE to A or B		1.5	9.5	1.5	6.2	1.5	5.8	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time <sup>(3)</sup> xOE to A or B		1.5	7.5	1.5	5.0	1.5	4.8	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time xDIR to A or B <sup>(3)</sup>		1.5	9.5	1.5	6.2	1.5	5.8	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time xDIR to A or B <sup>(3)</sup>		1.5	7.5	1.5	5.0	1.5	4.8	ns
t <sub>SK(o)</sub>	Output Skew <sup>(4)</sup>			0.5		0.5		0.5	ns

**Notes:**

- For Max or Min conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- 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.

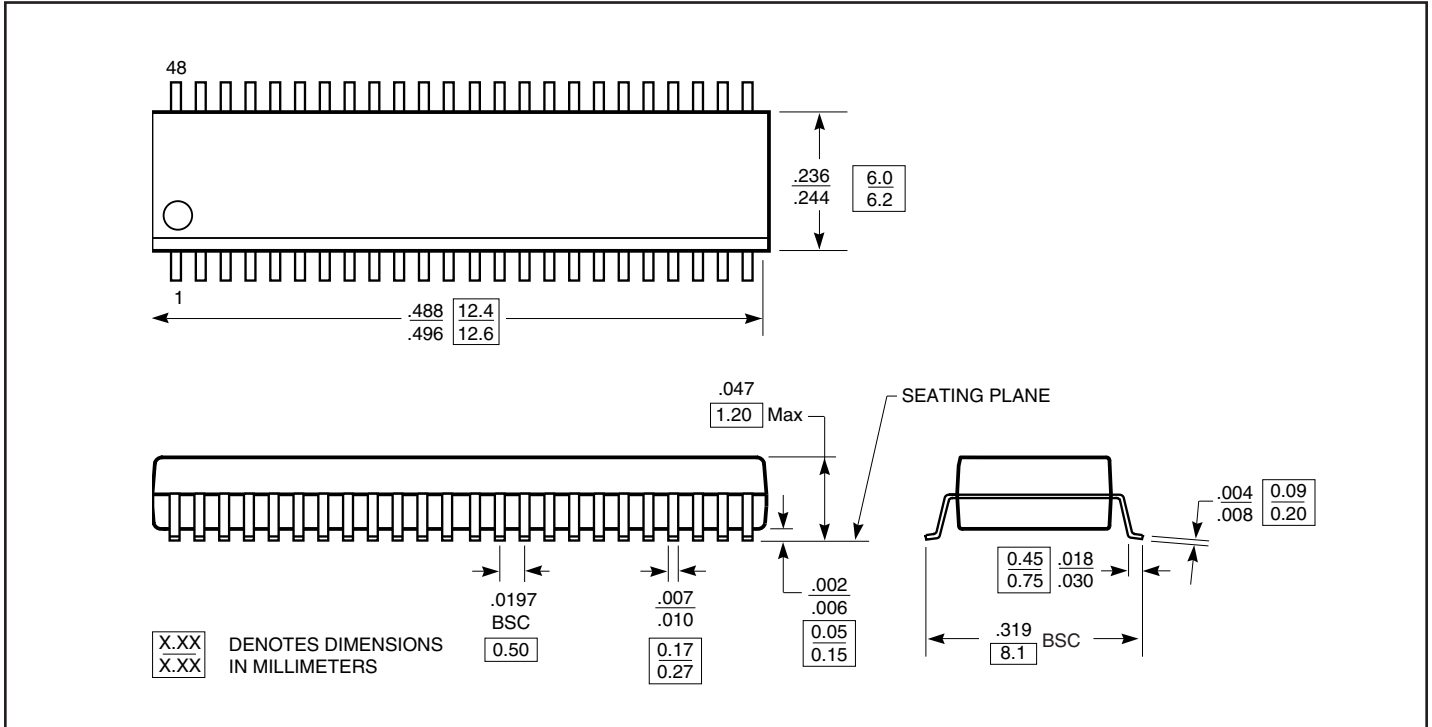
### PI74FCT162245T Switching Characteristics over Operating Range

Parameters	Description	Conditions <sup>(1)</sup>	162245T		162245AT		162245CT		Units
			Com.		Com.		Com.		
			Min.	Max.	Min.	Max.	Min.	Max.	
t <sub>PHL</sub> t <sub>PHL</sub>	Propagation Delay <sup>(2)</sup> A to B, B to A	C <sub>L</sub> = 50pF R <sub>L</sub> = 500Ω	1.5	7.0	1.5	4.6	1.5	4.1	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time xOE to A or B		1.5	9.5	1.5	6.2	1.5	5.8	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time <sup>(3)</sup> xOE to A or B		1.5	7.5	1.5	5.0	1.5	4.8	ns
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time xDIR to A or B <sup>(3)</sup>		1.5	9.5	1.5	6.2	1.5	5.8	ns
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time xDIR to A or B <sup>(3)</sup>		1.5	7.5	1.5	5.0	1.5	4.8	ns
t <sub>SK(o)</sub>	Output Skew <sup>(4)</sup>			0.5		0.5		0.5	ns

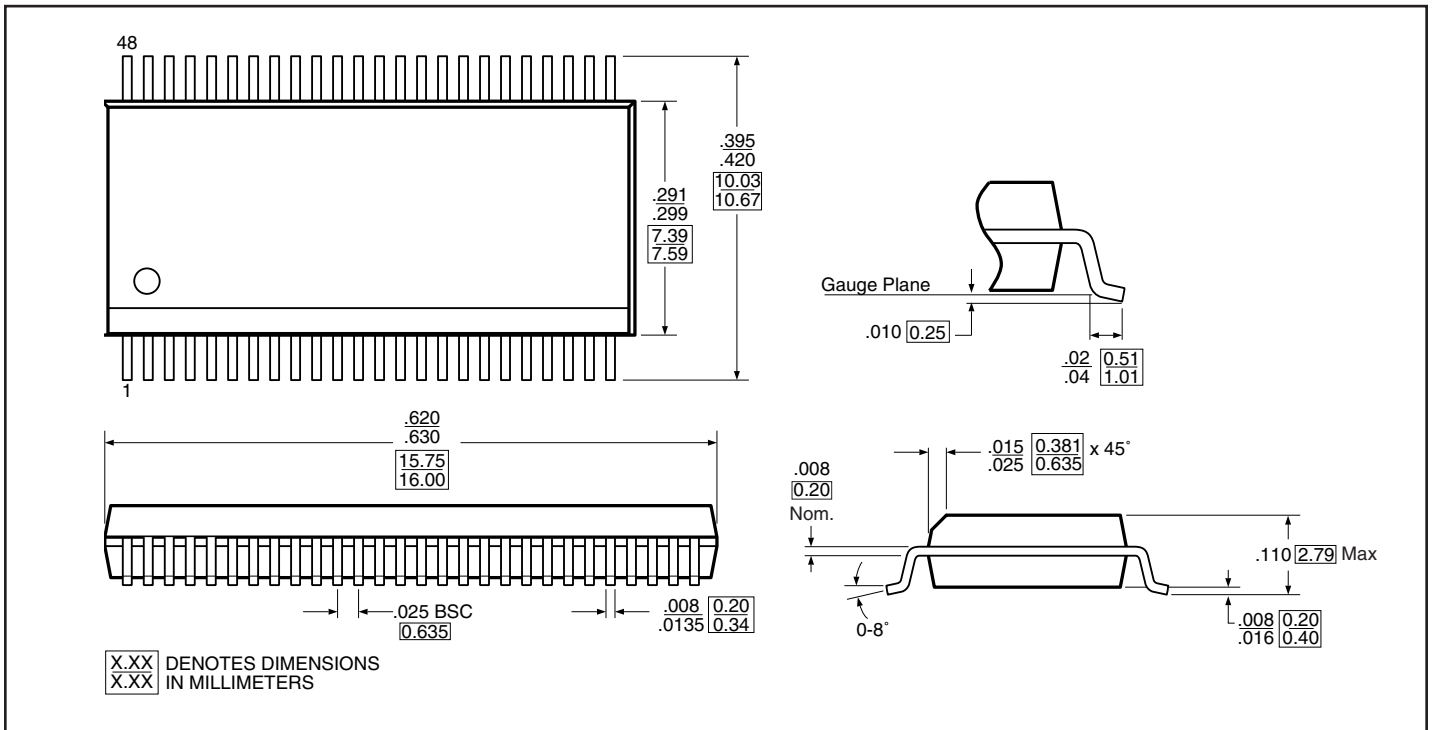
**Notes:**

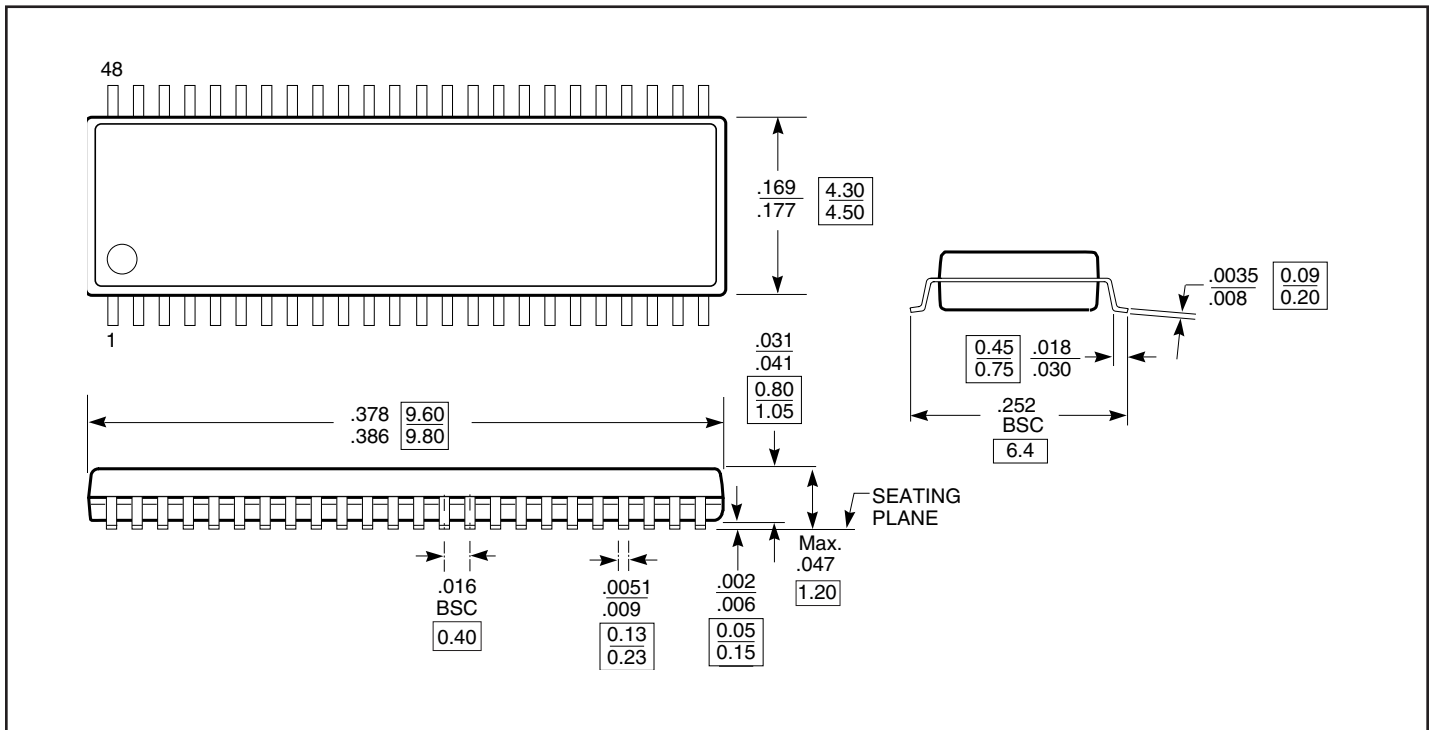
- For Max or Min conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Minimum limits are guaranteed but not tested on Propagation Delays.
- This parameter is guaranteed but not production tested.
- Skew between any two outputs, of the same package, switching in the same direction.  
This parameter is guaranteed by design.

**Packaging Mechanical: 48-Pin, 240-mil wide Plastic TSSOP (A)**



**Packaging Mechanical: 48-pin 300-mil wide plastic SSOP (V)**



**Packaging Mechanical: 48-pin wide plastic TVSOP (K)**


**PI74FCT16245T Ordering Information**

Ordering Code	Package Code	Speed Grade	Package Description
PI74FCT16245TAE	A	Blank	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT16245TVE	V	Blank	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT16245ATAE	A	A	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT16245ATVE	V	A	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT16245CTAE	A	C	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT16245CTVE	V	C	Pb-free & Green, 48-pin 300-mil wide plastic SSOP

**PI74FCT162245T Ordering Information**

Ordering Code	Package Code	Speed Grade	Package Description
PI74FCT162245TAE	A	Blank	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT162245TVE	V	Blank	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT162245ATAE	A	A	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT162245ATVE	V	A	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT162245CTAE	A	C	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT162245CTVE	V	C	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT162245CATK	K	A	48-pin 173-mil wide plastic TVSOP
PI74FCT162245CTK	K	C	48-pin 173-mil wide plastic TVSOP
PI74FCT162245TKE	K	Blank	Pb-free & Green, 48-pin 173-mil wide plastic TVSOP
PI74FCT162245ATKE	K	A	Pb-free & Green, 48-pin 173-mil wide plastic TVSOP
PI74FCT162245CTKE	K	C	Pb-free & Green, 48-pin 173-mil wide plastic TVSOP

**Notes:**

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

