

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
- Packaging (Pb-free & Green available):
 - 48-pin 240-mil wide plastic TSSOP (A)
 - 48-pin 300-mil wide plastic SSOP (V)

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 $V_{CC} = 5V$, $T_A = 25^\circ C$

PI74FCT162245T Features

- Balanced output drivers: $\pm 24mA$
- Reduced system switching noise
- Typical V_{OLP} (Output Ground Bounce) $< 0.6V$ at $V_{CC} = 5V$, $T_A = 25^\circ C$

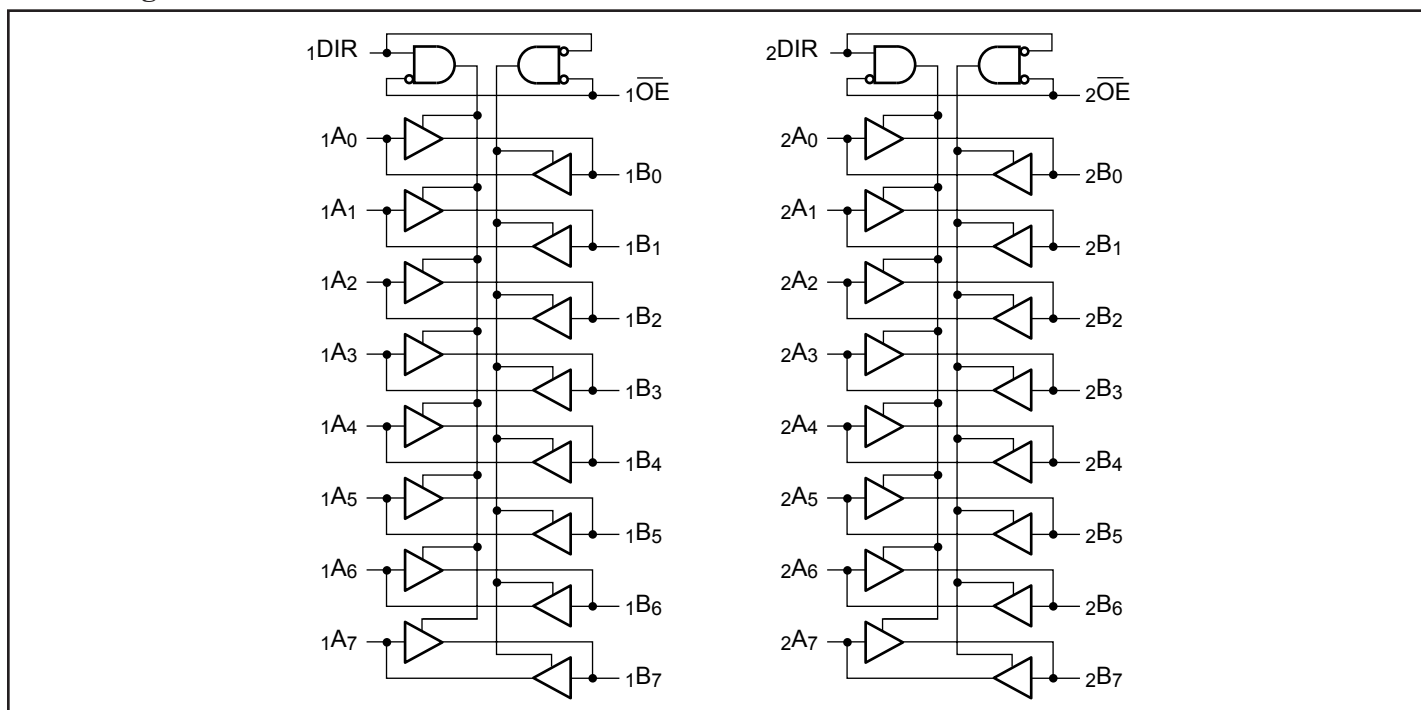
Description

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

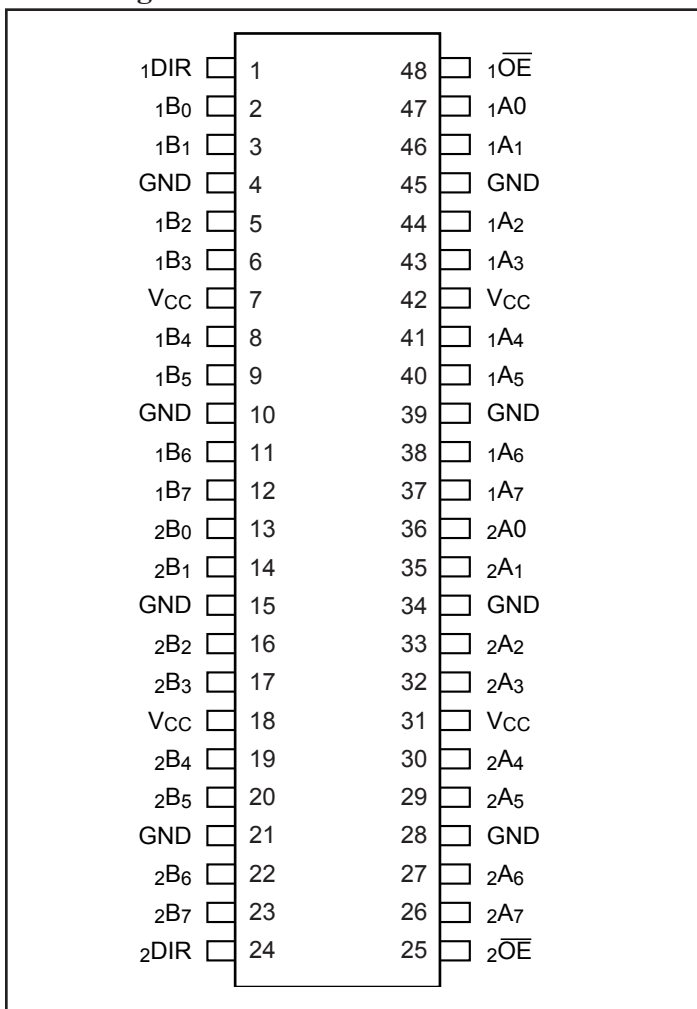
(Above which the useful life may be impaired. For user guidelines, not tested.)

Storage Temperature	-65°C to +150°C
Ambient Temperature with Power Applied.....	-40°C to +85°C
Supply Voltage to Ground Potential (Inputs & V _{CC} 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 ⁽¹⁾		Outputs ⁽¹⁾
x $\overline{\text{OE}}$	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
x $\overline{\text{OE}}$	3-State Enable Inputs (Active LOW)
xDIR	Direction Control Input
xA _X	Side A Inputs or 3-State Outputs
xB _X	Side B Inputs or 3-State Outputs
GND	Ground
V _{CC}	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 ⁽¹⁾		Min.	Typ. ⁽²⁾	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	μA
		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 ⁽¹⁾		Min.	Typ. ⁽²⁾	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	$V_{CC} = 0\text{V}, V_{IN} \text{ or } V_{OUT} \leq 4.5\text{V}$		—	—	± 100	μA

PI74FCT162245T Output Drive Characteristics (Over the Operating Range)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	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	

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

Parameters ⁽⁴⁾	Description	Test Conditions	Typ.	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 type.
- Typical values are at $V_{CC} = 5.0V$, $+25^\circ\text{C}$ ambient and maximum loading.
- Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
- This parameter is determined by device characterization but is not production tested.

Power Supply Characteristics

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ. ⁽²⁾	Max.	Units
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	$V_{IN} = \text{GND}$ or V_{CC}		0.1	500	μA
ΔI_{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 ⁽⁴⁾	$V_{CC} = \text{Max.}$, 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 ⁽⁶⁾	$V_{CC} = \text{Max.}$, 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 ⁽⁵⁾	mA
			$V_{IN} = 3.4V$		0.9	3.3 ⁽⁵⁾	
		$V_{CC} = \text{Max.}$, 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 ⁽⁵⁾	
			$V_{IN} = 3.4V$		6.5	17.5 ⁽⁵⁾	

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.
- 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_{CC} formula. These limits are guaranteed but not tested.

$$I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$$

$$I_C = I_{CC} + \Delta I_{CC} D_H N_T + I_{CCD} (f_{CP}/2 + f_i N_I)$$

I_{CC} = Quiescent Current
 ΔI_{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 ⁽¹⁾	16245T		16245AT		16245CT		Units
			Com.		Com.		Com.		
			Min.	Max.	Min.	Max.	Min.	Max.	
t _{PHL} t _{PHL}	Propagation Delay ⁽²⁾ A to B, B to A	C _L = 50pF R _L = 500Ω	1.5	7.0	1.5	4.6	1.5	4.1	ns
t _{PZH} t _{PZL}	Output Enable Time xOE to A OR B		1.5	9.5	1.5	6.2	1.5	5.8	ns
t _{PHZ} t _{PLZ}	Output Disable Time ⁽³⁾ xOE to A OR B		1.5	7.5	1.5	5.0	1.5	4.8	ns
t _{PZH} t _{PZL}	Output Enable Time xDIR to A OR B ⁽³⁾		1.5	9.5	1.5	6.2	1.5	5.8	ns
t _{PHZ} t _{PLZ}	Output Disable Time xDIR to A OR B ⁽³⁾		1.5	7.5	1.5	5.0	1.5	4.8	ns
T _{SK(O)}	Output Skew ⁽⁴⁾		—	0.5	—	0.5	—	0.5	ns

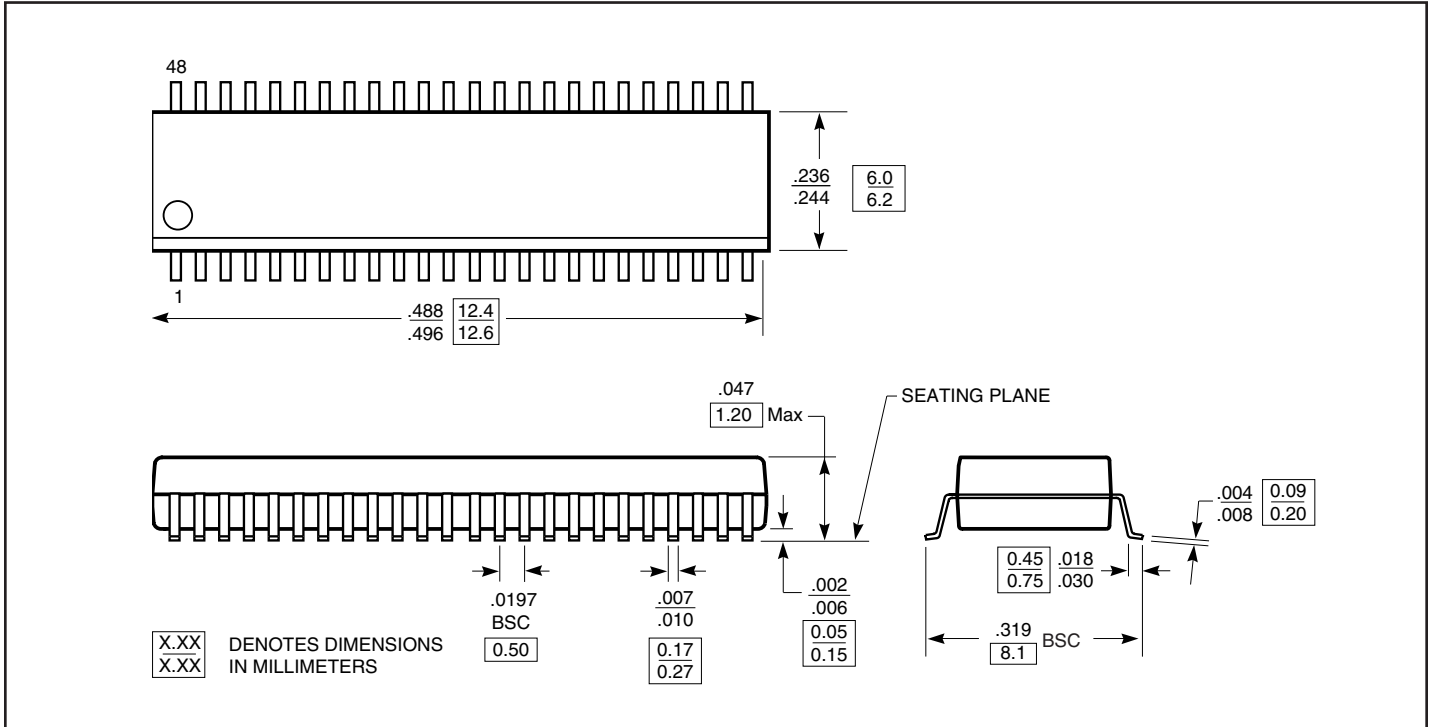
PI74FCT162245T Switching Characteristics over Operating Range

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

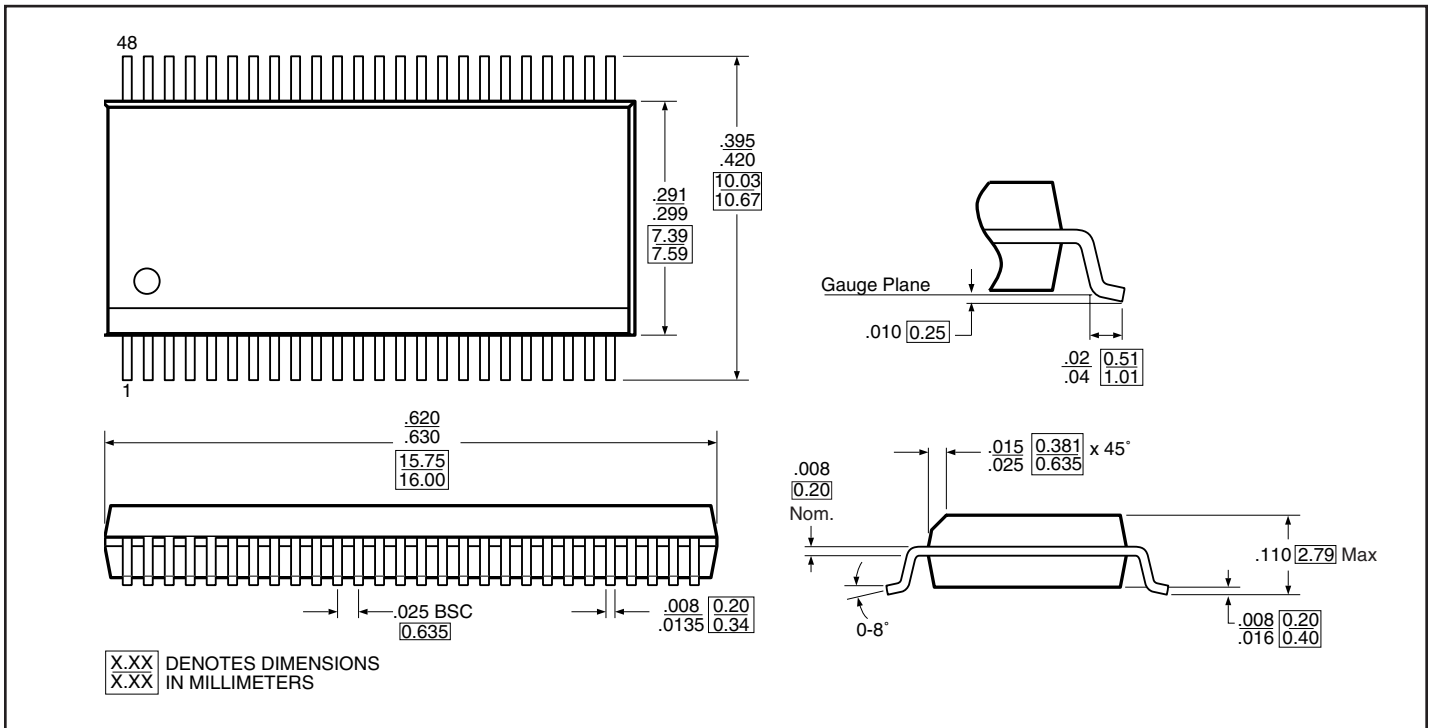
Notes:

1. See test circuit and waveforms.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. 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)



PI74FCT16245T Ordering Information

Ordering Code	Package Code	Speed Grade	Package Description
PI74FCT16245TA	A	Blank	48-pin 240-mil wide plastic TSSOP
PI74FCT16245TAE	A	Blank	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT16245TV	V	Blank	48-pin 300-mil wide plastic SSOP
PI74FCT16245TVE	V	Blank	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT16245ATA	A	A	48-pin 240-mil wide plastic TSSOP
PI74FCT16245ATAE	A	A	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT16245ATV	V	A	48-pin 300-mil wide plastic SSOP
PI74FCT16245ATVE	V	A	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT16245CTA	A	C	48-pin 240-mil wide plastic TSSOP
PI74FCT16245CTAE	A	C	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT16245CTV	V	C	48-pin 300-mil wide plastic SSOP
PI74FCT16245CTVE	V	C	Pb-free & Green, 48-pin 300-mil wide plastic SSOP

PI74FCT162245T Ordering Information

Ordering Code	Package Code	Speed Grade	Package Description
PI74FCT162245TA	A	Blank	48-pin 240-mil wide plastic TSSOP
PI74FCT162245TAE	A	Blank	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT162245TV	V	Blank	48-pin 300-mil wide plastic SSOP
PI74FCT162245TVE	V	Blank	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT162245ATA	A	A	48-pin 240-mil wide plastic TSSOP
PI74FCT162245ATAE	A	A	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT162245ATV	V	A	48-pin 300-mil wide plastic SSOP
PI74FCT162245ATVE	V	A	Pb-free & Green, 48-pin 300-mil wide plastic SSOP
PI74FCT162245CTA	A	C	48-pin 240-mil wide plastic TSSOP
PI74FCT162245CTAE	A	C	Pb-free & Green, 48-pin 240-mil wide plastic TSSOP
PI74FCT162245CTV	V	C	48-pin 300-mil wide plastic SSOP
PI74FCT162245CTVE	V	C	Pb-free & Green, 48-pin 300-mil wide plastic SSOP

Notes:

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/