

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)

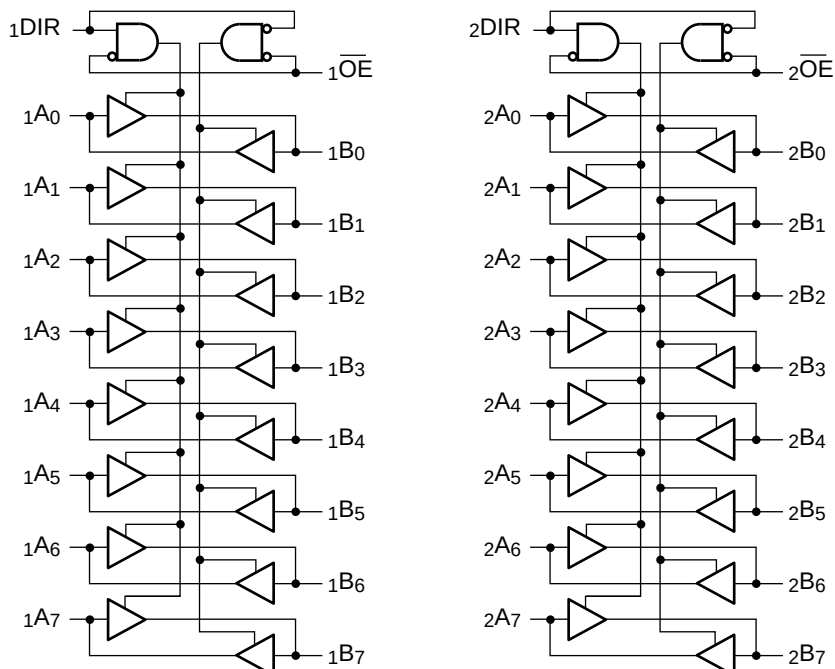
Description

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 _{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

1DIR	1	48	1OE
1B ₀	2	47	1A ₀
1B ₁	3	46	1A ₁
GND	4	45	GND
1B ₂	5	44	1A ₂
1B ₃	6	43	1A ₃
V _{CC}	7	42	V _{CC}
1B ₄	8	41	1A ₄
1B ₅	9	40	1A ₅
GND	10	39	GND
1B ₆	11	38	1A ₆
1B ₇	12	37	1A ₇
2B ₀	13	36	2A ₀
2B ₁	14	35	2A ₁
GND	15	34	GND
2B ₂	16	33	2A ₂
2B ₃	17	32	2A ₃
V _{CC}	18	31	V _{CC}
2B ₄	19	30	2A ₄
2B ₅	20	29	2A ₅
GND	21	28	GND
2B ₆	22	27	2A ₆
2B ₇	23	26	2A ₇
2DIR	24	25	2OE

Truth Table

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

Note:

- 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
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	$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ 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	$V_{CC} = \text{Min.}$, $V_{IN} = V_{IH}$ or V_{IL}	$I_{OL} = 64\text{mA}$		0.2	0.55	
I_{OFF}	Power Down Disable	$V_{CC} = 0\text{V}$, V_{IN} or $V_{OUT} \leq 4.5\text{V}$				± 100	μA

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

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

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	$V_{CC} = \text{Max.}$	$V_{IN} = 3.4\text{V}^{(3)}$		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
			$V_{IN} = 3.4\text{V}$		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⁾	
			$V_{IN} = 3.4\text{V}$		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 $V_{CC} = 5.0\text{V}$, $+25^\circ\text{C}$ ambient.
- Per TTL driven input ($V_{IN} = 3.4\text{V}$); 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.
- $I_C = I_{\text{QUIESCENT}} + I_{\text{INPUTS}} + I_{\text{DYNAMIC}}$
 $I_C = I_{CC} + \Delta I_{CC} D_{HT} + I_{CCD} (f_{CP}/2 + f_i N_i)$
 I_{CC} = Quiescent Current
 ΔI_{CC} = Power Supply Current for a TTL High Input ($V_{IN} = 3.4\text{V}$)
 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(0)}	Output Skew ⁽⁴⁾			0.5		0.5		0.5	ns

Notes:

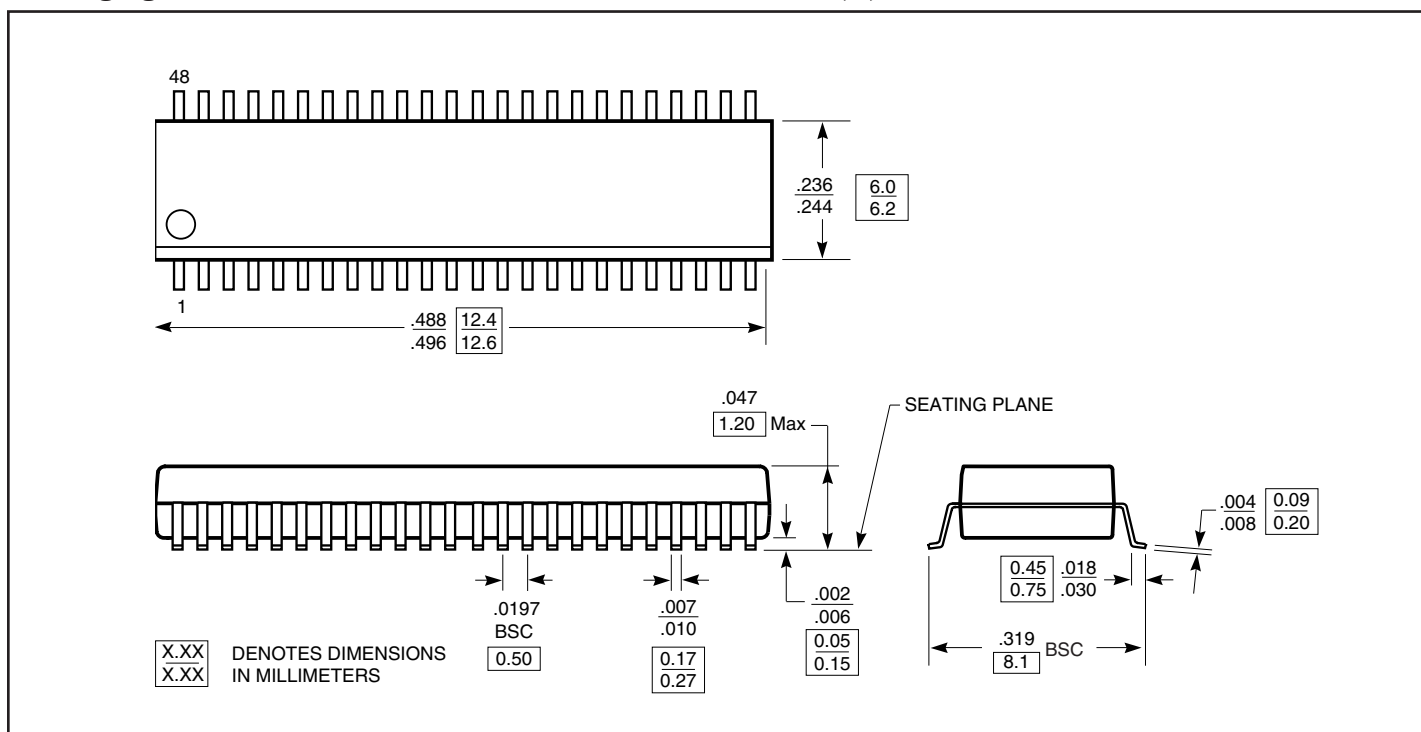
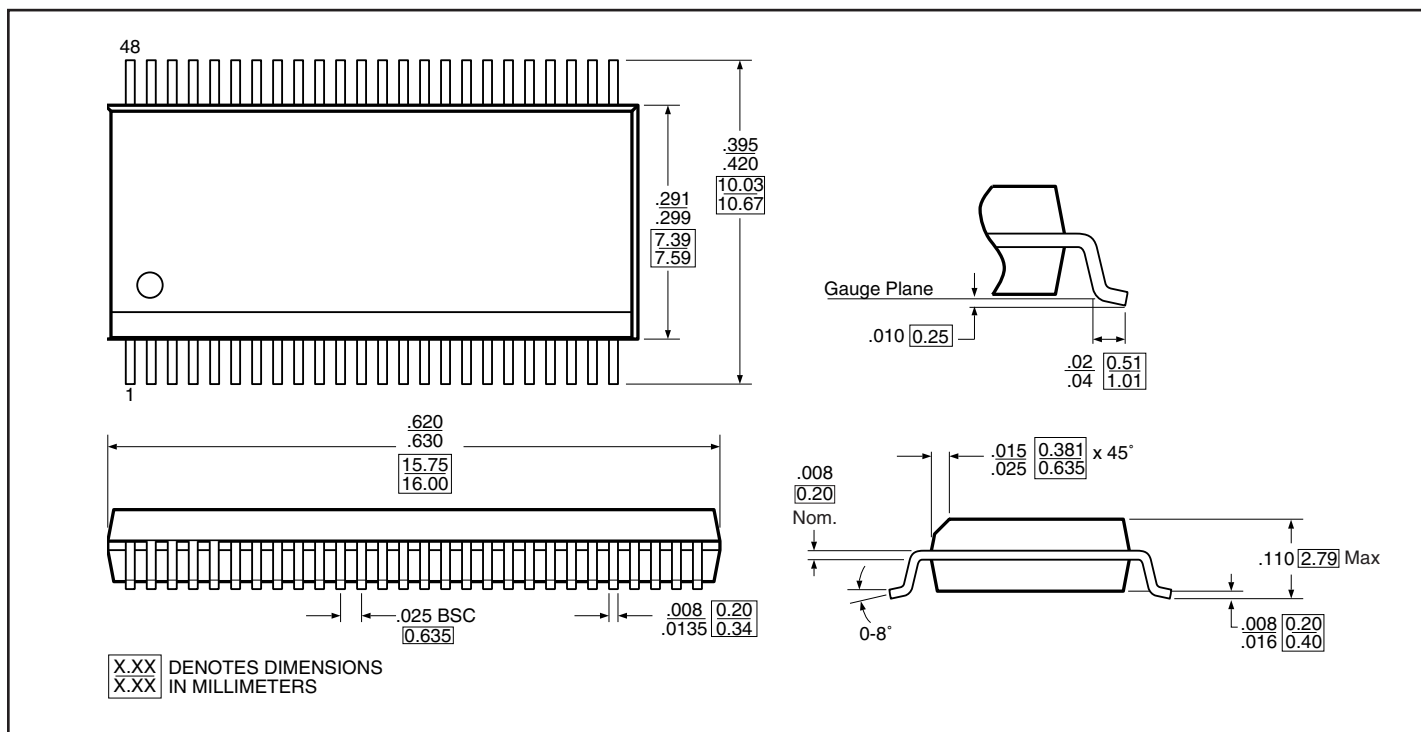
1. For Max or Min conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Minimum limits are guaranteed but not tested on Propagation Delays.
3. This parameter is guaranteed but not production tested.
4. Skew between any two outputs, of the same package,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

PI74FCT162245T Switching Characteristics over Operating Range

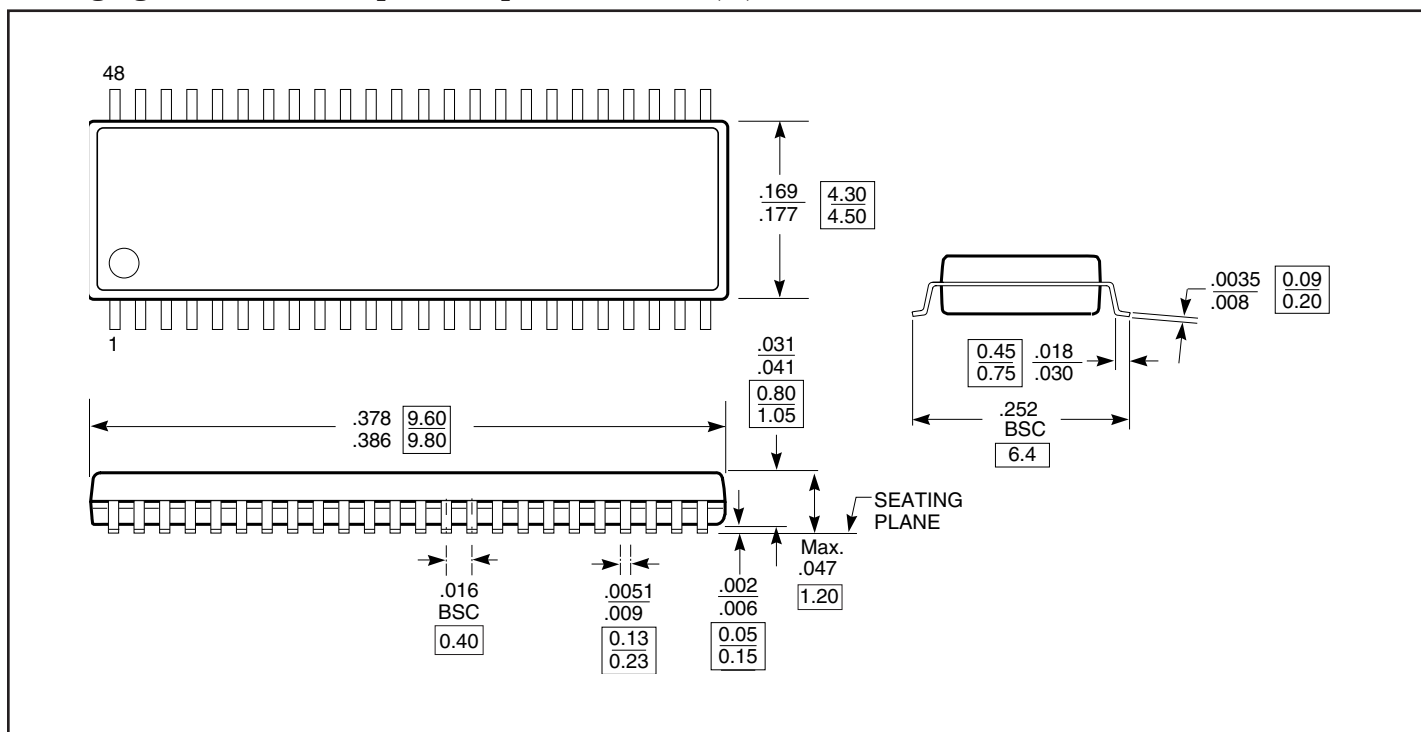
Parameters	Description	Conditions ⁽¹⁾	162245T		162245AT		162245CT		Units
			Com.		Com.		Com.		
			Min.	Max.	Min.	Max.	Min.	Max.	
t _{PHL} t _{PHL}	Propagation Delay ⁽²⁾ A to B, B to A	C _L = 50pF R _L = 500Ω	1.5	7.0	1.5	4.6	1.5	4.1	ns
t _{PZH} t _{PZL}	Output Enable Time xOE to A or B		1.5	9.5	1.5	6.2	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. For Max or Min conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
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)


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/
- E = Pb-free and Green
- Adding an X suffix = Tape/Reel

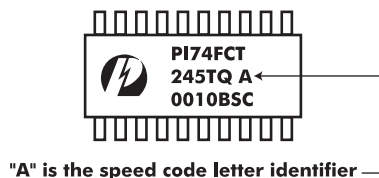
Part Marking Information

Pericom's standard product mark follows our standard part number ordering information, except for those products with a speed letter code. For marking purposes, the speed letter code mark is placed after the package code letter, rather than after the device number as it is ordered.

Although all products are marked immediately after assembly to assure material traceability, Pericom does not usually mark the speed code at that time. After electrical test screening and speed binning have been completed, we then perform an "add mark" operation which places the speed code letter at the end of the complete part number.

Please refer to the example shown below:

- Part Number as ordered: PI74FCT245ATQ
- Example of Part Number as marked:

**Notes:**

- 1) 8-pin DIP, 8-pin SOIC, 8-pin TSSOP, 14-pin SOIC, 16-pin QSOP, SC70, MSOP, and SOT23 packages are not marked with the Pericom logo due to space limitations on the package.