

16-Bit BiDirectional Transceiver with 3-State Outputs

Features

- PI74ALVTC family is designed for low voltage operation, $V_{DD} = 1.8V$ to $3.6V$
- Supports Live Insertion
- 3.6V I/O Tolerant Inputs and Outputs
- Bus Hold
- High Drive, $-32/64mA$ @ $3.3V$
- Uses patented noise reduction circuitry
- Power-off high impedance inputs and outputs
- Industrial operation at $-40^{\circ}C$ to $+85^{\circ}C$
- Packaging (Pb-free & Green):
 - 48-pin 240-mil wide plastic TSSOP (A)
 - 48-pin 300-mil wide plastic SSOP (V)

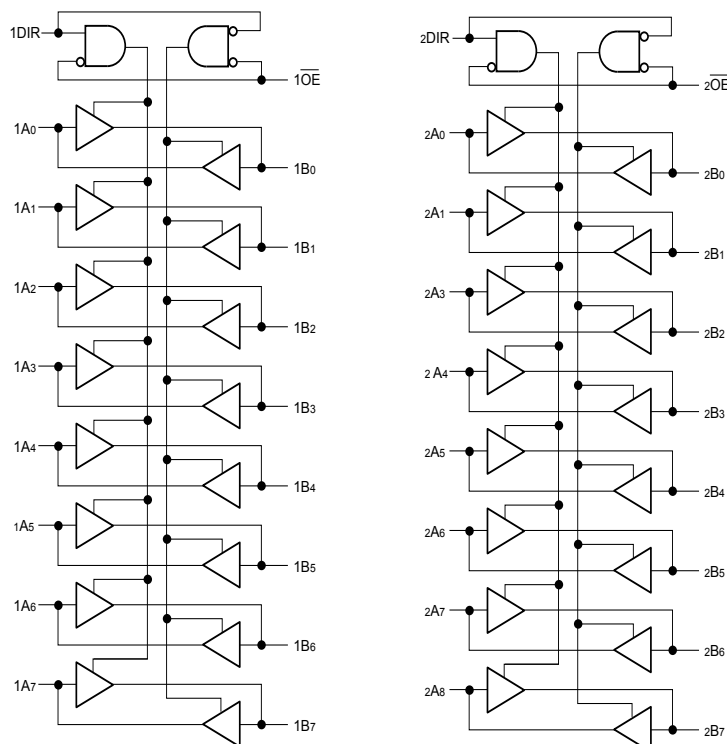
Description

Pericom Semiconductor's PI74ALVTC16245 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 ($\overline{OE}$) input, when HIGH, disables both A and B ports by placing them in Hi-Z condition.

To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to V_{DD} through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The family offers both I/O Tolerant, which allows it to operate in mixed 1.8/3.6V systems, and "Bus Hold," which retains the data input's last state whenever the data input goes to high-impedance, preventing "floating" inputs and eliminating the need for pullup/down resistors.

Block Diagram



Pinout Table

Pin Name	Description
$\overline{\text{xOE}}$	3-State Output Enable Inputs (Active LOW)
xDIR	Direction Control Input
xAx	Side A Inputs or 3-State Inputs
xBx	Side B Inputs or 3-State Outputs
GND	Ground
V _{CC}	Power

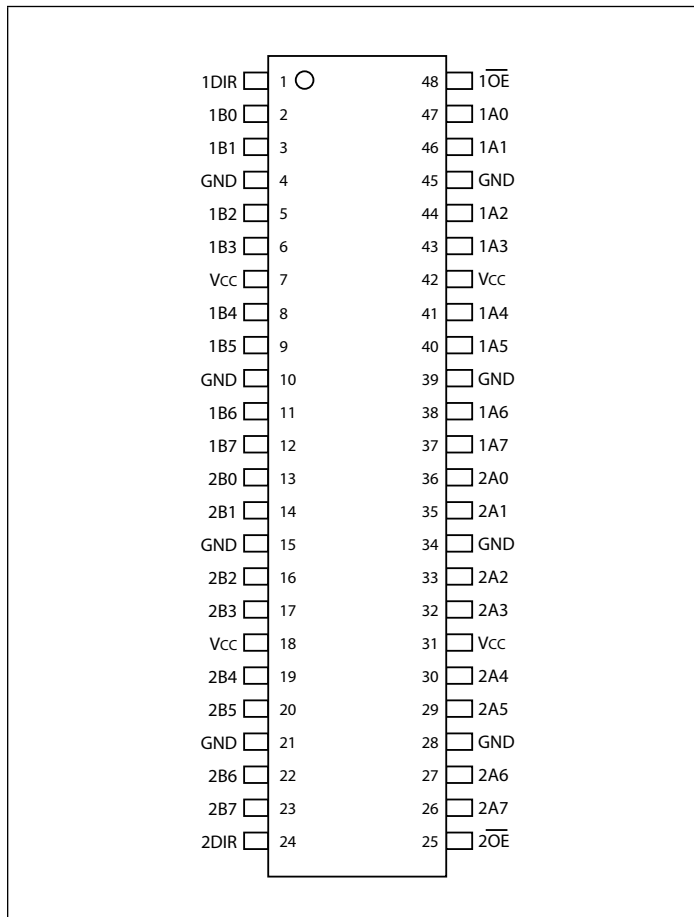
Truth Table

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

Notes:

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

Pin Configuration



Absolute Maximum Ratings (Over operating free-air temperature range)

Parameter		Min.	Max.	Units
Supply Voltage Range, V_{DD}		-0.5	4.6	V
Input Voltage Range, V_I		-0.5	4.6	
Output Voltage Range, V_O (3-States)		-0.5	4.6	
Output Voltage Range, $V_O^{(1)}$ (Active)		-0.5	$V_{DD}+0.5$	
DC Input Diode Current (I_{IK}) $V_I < 0V$		-	-50	mA
DC Output Diode Current (I_{OK})	$V_O < 0V$	-	-50	
	$V_O > V_{DD}$	-	50	
DC Output Source/Sink Current (I_{OH}/I_{OL})		-	-64/128	
DC V_{DD} or GND Current per Supply Pin (I_{CC} or GND)		-	± 100	
Storage Temperature Range, T_{stg}		-65	150	$^{\circ}C$

Stress beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device.

Recommended Operating Conditions⁽¹⁾

Parameters	Description	Test Conditions	Min	Max	Units
V_D	Supply voltage	Operating	1.8	3.6	V
		Data Retention Only	1.2	3.6	
V_{IH}	High-level input voltage	$V_{DD} = 2.7V$ to $3.6V$	2.0		
V_{IL}	Low-level input voltage	$V_{DD} = 2.7V$ to $3.6V$		0.8	
V_I	Input voltage		-0.3	3.6	
V_O	Output voltage	Active State	0	V_{DD}	mA
		Off State	0	3.6	
I_O	Output current in I_{OH}/I_{OL}	$V_{DD} = 3.0V$ to $3.6V$ $V_{DD} = 2.7V$ to $3.0V$ $V_{DD} = 2.3V$ to $2.7V$ $V_{DD} = 1.8V$		-32/64 ± 24 ± 18 ± 6	
$\Delta t/\Delta v$	Input transistion rise or fall rate ⁽²⁾		0	10	ns/V
T_A	Operating free-air temperture		-40	85	C

Notes:

- Unused control inputs must be held HIGH or LOW to prevent them from floating.
- As measured between 0.8V and 2.0V, $V_{DD} = 3.0V$.

Electrical Characteristics over Recommended Operating Free-Air Temperature Range

(unless otherwise noted)

DC Electrical Characteristics (2.7V < V_{DD} ≤ 3.6V)

Parameters	Description	Test Conditions	V _{DD}	Min	Typ	Max	Units
V _{IH}	Input HIGH Voltage		2.7 - 3.6	2.0			V
V _{IL}	Input LOW Voltage					0.8	
V _{OH}	HIGH Level Output Voltage	I _{OH} = -100μA		V _{DD} -0.2			
		I _{OH} = -12mA	2.7	2.2			
		I _{OH} = -18mA	3.0	2.4			
		I _{OH} = -24mA		2.2			
		I _{OH} = -32mA		2.0			
V _{OL}	LOW Level Output Voltage	I _{OH} = 100μA	2.7 - 3.6			0.2	
		I _{OH} = 12mA	2.7			0.4	
		I _{OH} = 18mA	3.0			0.4	
		I _{OH} = 24mA				0.45	
		I _{OH} = 32mA				0.5	
		I _{OH} = 64mA				0.55	
I _I	Input Leakage Current	V _I = V _{DD} , or GND	3.6			±5.0	μA
I _{OZ}	3-STATE Output Leakage	V _O = 3.6V	2.7			±10	
I _{OFF}	Power-OFF Leakage Current	V _I or V _O ≤ 3.6V	0			10	
I _{ODL}	Output Current Low	V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽¹⁾	3.6	150		334	mA
I _{ODH}	Output Current High	V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽¹⁾		-58		-114	
I _{HOLD}	Bus Hold Current A or B Outputs	V _I = 0.8V	3.0	75			μA
		V _I = 2.0V		-75			
		V _I = 0 to 3.6V	3.6			±500	
I _{DD}	Quiescent Supply Current	V _I = V _{DD} or GND	2.7 - 3.6			50	
		V _{DD} ≤ (V _I , V _O) ≤ 3.6V				±50	
ΔI _{DD}	Increase in I _{DD} per input	V _{IH} = V _{DD} -0.6V, Other inputs at V _{DD} or GND				400	

Notes:

1. Duration of test must not exceed 1 second with only 1 output tested at a time.

Electrical Characteristics over Recommended Operating Free-Air Temperature Range

(unless otherwise noted)

DC Electrical Characteristics (2.3V < V_{DD} ≤ 2.7V)

Parameters	Description	Test Conditions	V _{DD}	Min	Typ	Max	Units
V _{IH}	Input HIGH Voltage		2.3 - 2.7	1.6			V
V _{IL}	Input LOW Voltage					0.7	
V _{OH}	HIGH Level Output Voltage	I _{OH} = -100μA		V _{DD} -0.2			
		I _{OH} = -12mA	2.3	1.8			
		I _{OH} = -18mA		1.7			
V _{OL}	LOW Level Output Voltage	I _{OH} = 100μA	2.3 - 2.7			0.2	
		I _{OH} = 12mA	2.3			0.4	
		I _{OH} = 18mA				0.5	
		I _{OH} = 24mA				0.55	
I _I	Input Leakage Current	V _I = V _{DD} , or GND	2.7			±5.0	μA
I _{OZ}	3-STATE Output Leakage	V _O = 3.6V	2.3			±10	
I _{OFF}	Power-OFF Leakage Current	V _I or V _O ≤ 3.6V	0			10	
I _{ODL}	Output Current Low	V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽²⁾	2.7	110		264	mA
I _{ODH}	Output Current High	V _{IN} = V _{IH} or V _{IL} , V _O = 1.5V ⁽²⁾		-30		-60	
I _{HOLD} ⁽¹⁾	Bus Hold Current A or B Outputs	V _I = 0.7V	2.5		90		μA
		V _I = 1.7V			-90		
I _{DD}	Quiescent Supply Current	V _I = V _{DD} or GND	2.3 - 2.7			40	
		V _{DD} ≤ (V _I , V _O) ≤ 3.6V				±40	
ΔI _{DD}	Increase in I _{DD} per input	V _{IH} = V _{DD} -0.6V, Other inputs at V _{DD} or GND				400	

Notes:

1. Not guaranteed.
2. Duration of test must not exceed 1 second with only 1 output tested at a time.

Electrical Characteristics over Recommended Operating Free-Air Temperature Range

(unless otherwise noted)

DC Electrical Characteristics (1.8V < V_{DD} ≤ 2.3V)

Parameters	Description	Test Conditions	V _{DD}	Min	Typ	Max	Units
V _{IH}	Input HIGH Voltage		1.8 - 2.3	0.7 x V _{DD}			V
V _{IL}	Input LOW Voltage					0.2 x V _{DD}	
V _{OH}	HIGH Level Output Voltage	I _{OH} = -100μA	1.8	V _{DD} -0.2			
		I _{OH} = -6mA		1.4			
V _{OL}	LOW Level Output Voltage	I _{OH} = 100μA				0.2	
		I _{OH} = 6mA				0.3	
I _I	Input Leakage Current	V _I = V _{DD} , or GND	2.3			±5.0	μA
I _{OZ}	3-STATE Output Leakage	V _O = 3.6V	1.8			±10	
I _{OFF}	Power-OFF Leakage Current	V _I or V _O ≤ 3.6V	0			10	
I _{ODL}	Output Current Low	V _{IN} = V _{IH} or V _{IL} , V _O = 0.9V ⁽²⁾	1.8	50		137	mA
I _{ODH}	Output Current High	V _{IN} = V _{IH} or V _{IL} , V _O = 0.9V ⁽²⁾		-14		-34	
I _{HOLD} ⁽¹⁾	Bus Hold Current A or B Outputs	V _I = 0.4V	1.8		50		μA
		V _I = 1.3V			-50		
I _{DD}	Quiescent Supply Current	V _I = V _{DD} or GND				20	
		V _{DD} ≤ (V _I , V _O) ≤ 3.6V				±20	
ΔI _{DD}	Increase in I _{DD} per input	V _{IH} = V _{DD} -0.6V, Other inputs at V _{DD} or GND				400	

Notes:

1. Not guaranteed.
2. Duration of test must not exceed 1 second with only 1 output tested at a time.

AC Electrical Characteristics

Parameters	Description	T _A = -40°C to +85°C, C _L = 50pF, R _L = 500Ω						Units
		V _{DD} = 3.3V ±0.3V		V _{DD} = 2.5V ±0.2V		V _{DD} = 1.8V		
		Min	Max	Min	Max	Min	Max	
t _{PHL} , t _{PLH}	Prop Delay	0.5	2.4	0.5	2.8	1.0	3.6	ns
t _{PZL} , t _{PZH}	Output Enable Time	1.0	2.9	1.0	3.5	1.5	4.5	
t _{PLZ} , t _{PHZ}	Output Disable Time	1.5	3.7	1.0	4.0	1.5	4.8	
t _{OSHL} , t _{OSLH}	Output to Output Skew ⁽¹⁾		0.5		0.5		0.5	

Notes:

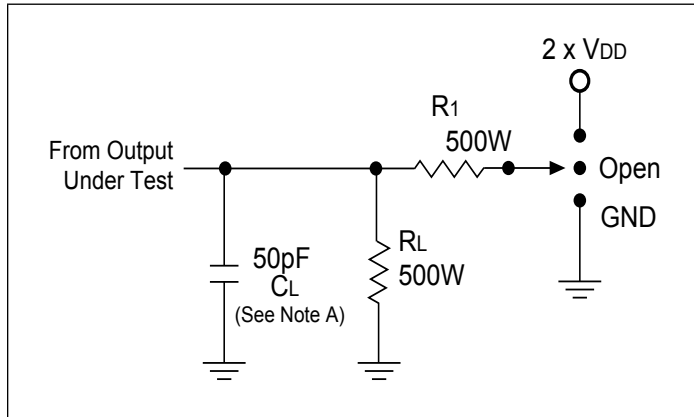
1. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH or LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}).

Capacitance

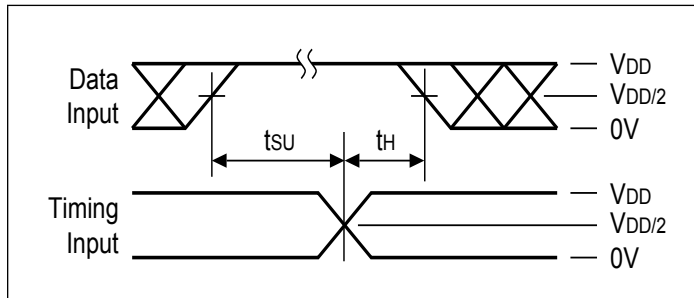
Parameters	Description	Test Conditions	T _A = +25°C Typical	Units
C _{IN}	Input Capacitance	V _{DD} = 1.8, 2.5V or 3.3V, V _I = 0V or V _{DD}	6	pF
C _{OUT}	Output Capacitance	V _I = 0V or V _{DD} , V _{DD} = 1.8V, 2.5V or 3.3V	7	
C _{PD}	Power Dissipation Capacitance	V _I = 0V or V _{DD} , F = 10 MHz V _{DD} = 1.8V, 2.5V or 3.3V	20	

Test Circuits and Switching Waveforms

Parameter Measurement Information ($V_{DD} = 1.8V - 3.6V$)



Setup, Hold, and Release Timing



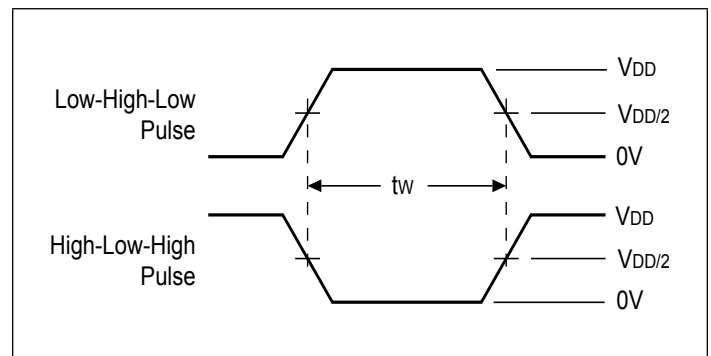
Notes:

1. C_L includes probe and jig capacitance.
2. Waveform 1 is for an output with internal conditions such that the output is LOW except when disabled by the output control.
3. Waveform 2 is for an output with internal conditions such that the output is HIGH except when disabled by the output control.
4. All input pulses are supplied by generators having the following characteristics: $PRR \leq 10 \text{ MHz}$, $Z_O = 50\Omega$, $t_r \leq 2\text{ns}$, $t_f \leq 2\text{ns}$, measured from 10% to 90%, unless otherwise specified.
5. The outputs are measured one at a time with one transition per measurement.

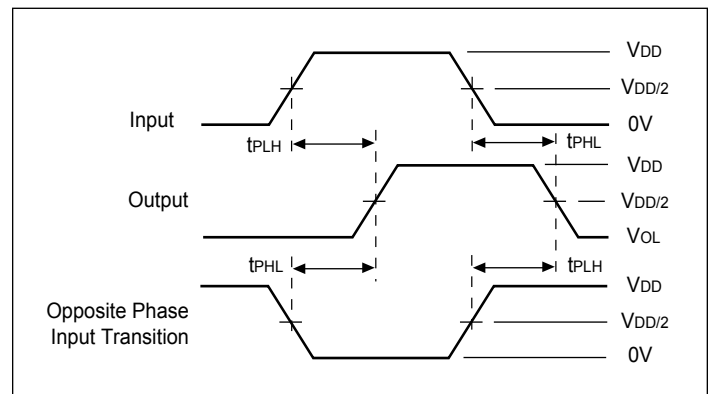
Switch Position

Test	S1
tpd	Open
tPLZ/tPZL	$2 \times V_{DD}$
tPHZ/tPZH	GND

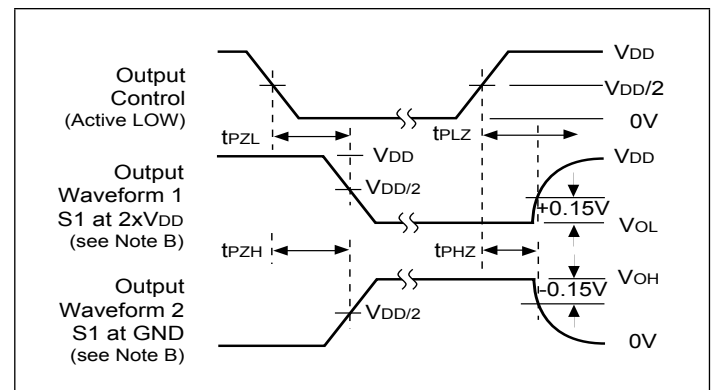
Pulse Width



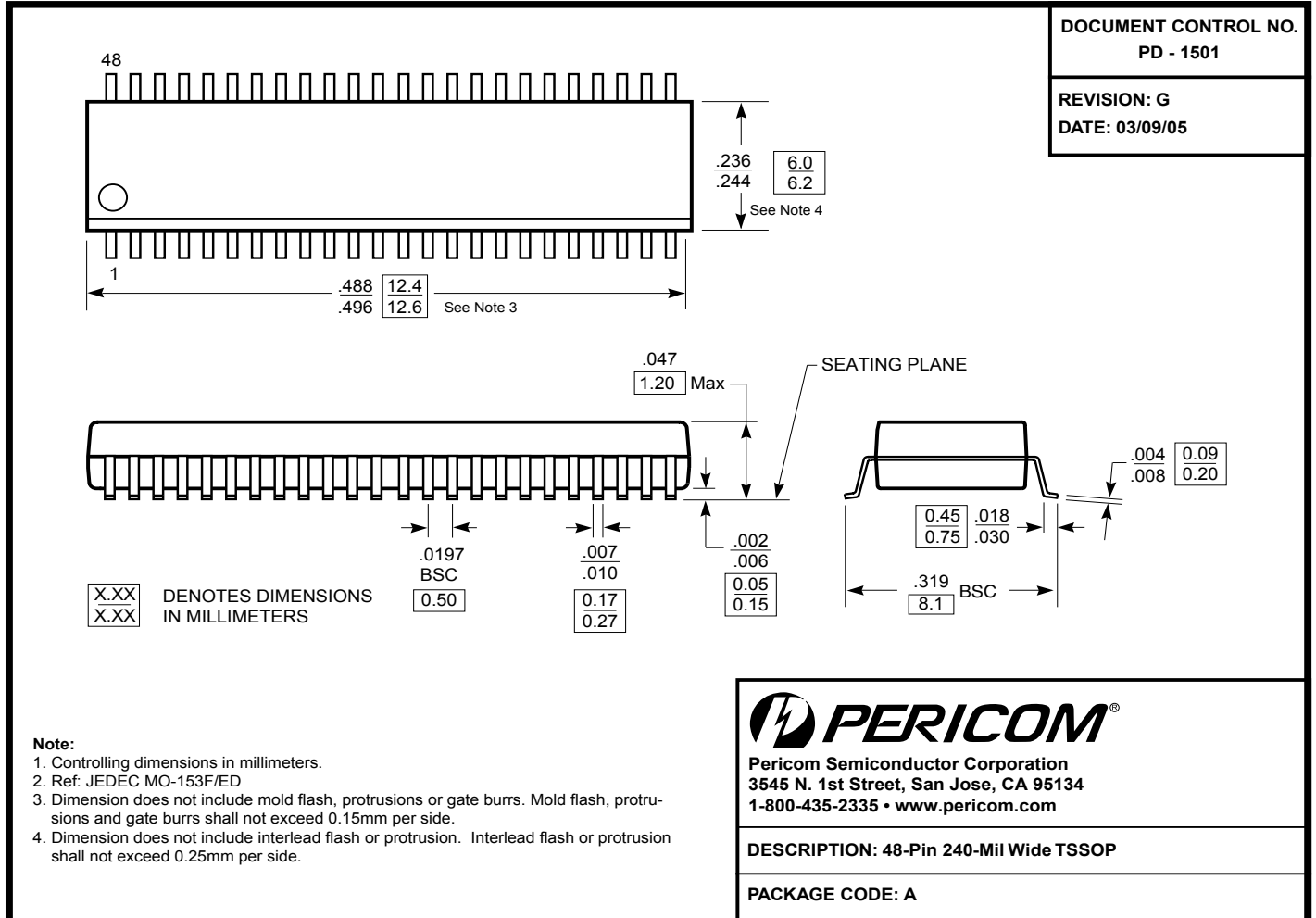
Propagation Delay



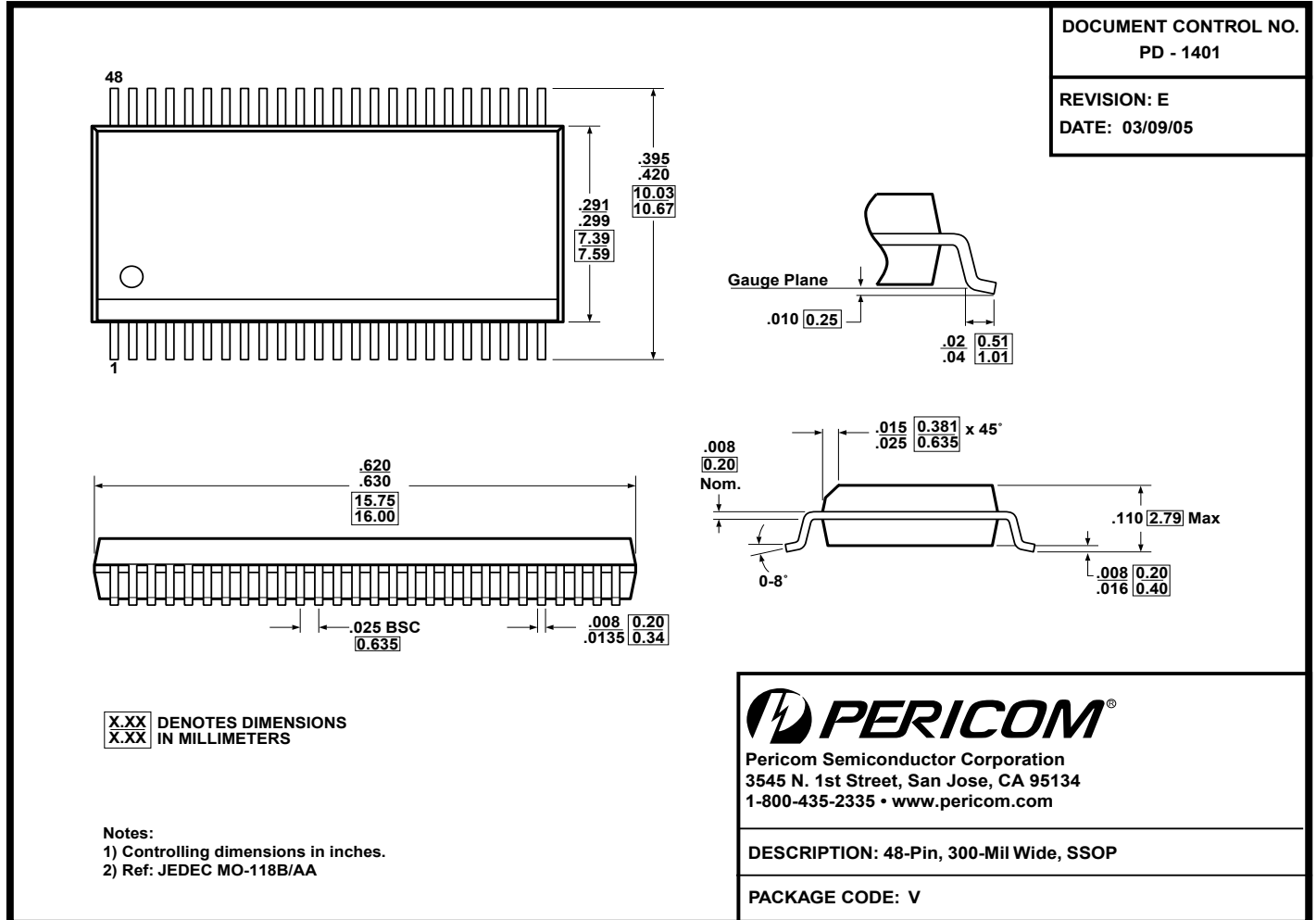
Enable Disable Timing



Packaging Mechanical: 48-Pin TSSOP (A)



Packaging Mechanical: 48-Pin SSOP (V)



Ordering Information

Ordering Code	Package Code	Package Type
PI74ALVTC16245AE	A	Pb-free & Green, 48-pin 240-mil wide TSSOP
PI74ALVTC16245VE	V	Pb-free & Green, 48-pin 300-mil wide SSOP

1. Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
2. "E" denotes Pb-free and Green
3. Adding an "X" at the end of the ordering code denotes tape and reel packaging