PI74ALVTC16245

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°C to +85°C
- Packaging (Pb-free & Green):
  - 48-pin 240- mil wide plastic TSSOP (A)
  - 48-pin 300-mil wide plastic SSOP (V)

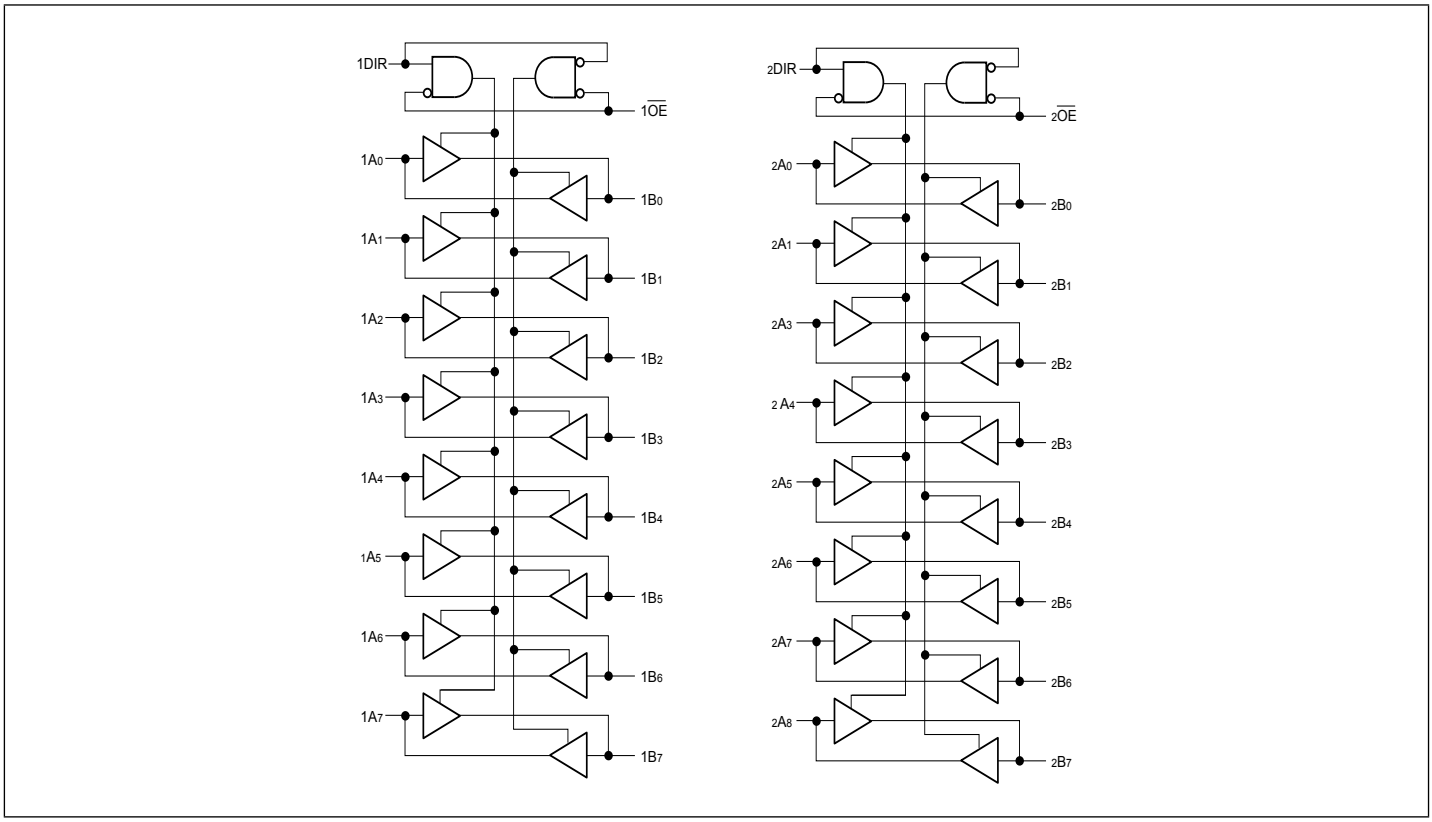
Description

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 Vdd 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
$x\overline{OE}$	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

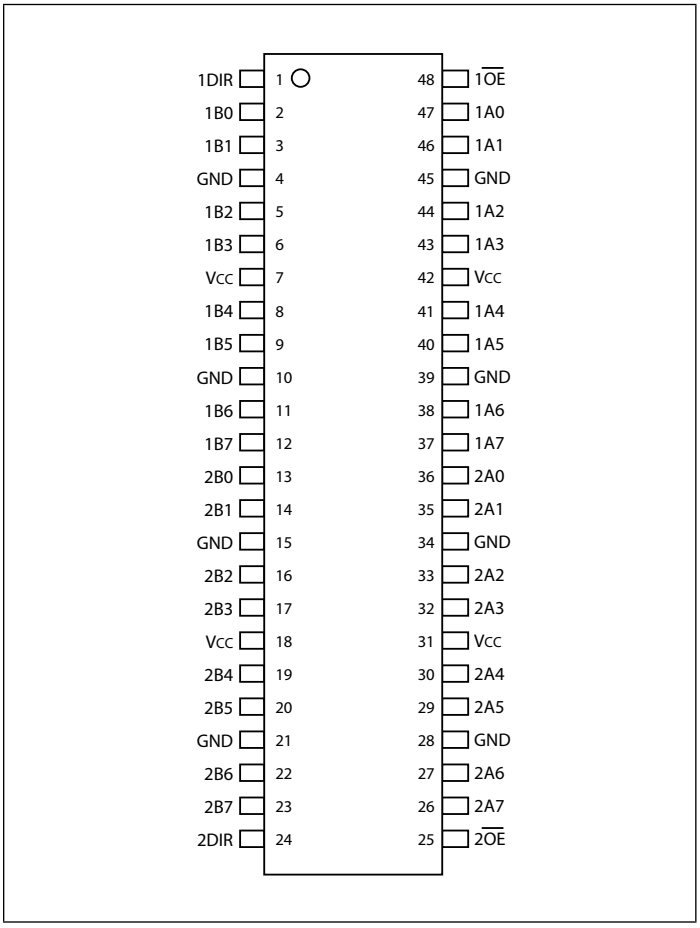
Truth Table

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, VO (3-Stated)		-0.5	4.6	
Output Voltage Range, VO[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	˚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}	
		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	mA
Δt/Δv	Input transistion rise or fall rate[2]		0	10	ns/V
T_A	Operating free-air temperture		-40	85	C

Notes:

1. Unused control inputs must be held HIGH or LOW to prevent them from floating.
2. 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 ($2.7V<V_{DD} \leq 3.6V$)

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 $V_O \leq 3.6V$	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	
		$V_{DD} \leq (V_I, V_O) \leq 3.6V$				±50	
ΔI_{DD}	Increase in IDD 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 ($2.3V<V_{DD} \leq 2.7V$)

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 $V_O \leq$ 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	
		$V_{DD} \leq (V_I, V_O) \leq$ 3.6V				±40	
ΔI_{DD}	Increase in IDD 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 IDD 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, RL = 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:

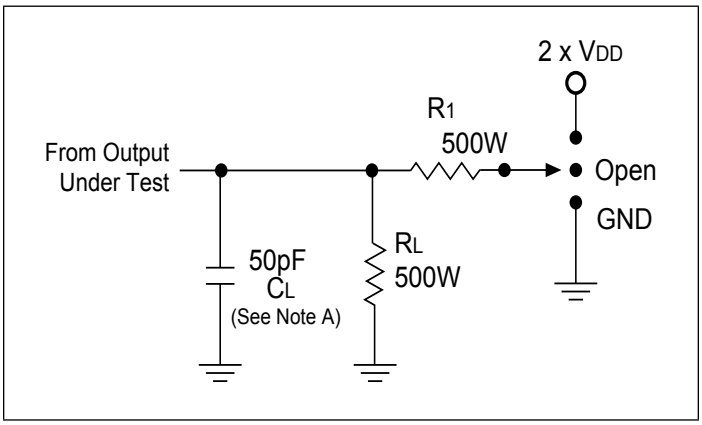
1. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the same direction, either HIGH or LOW (t_{OSHL}) or LOW to HIGH (t_{OSLH}).

Capacitance

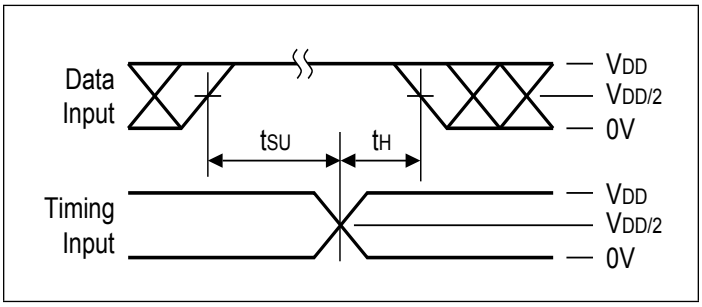
Parameters	Description	Test Conditions	T_A = +25°C Typical	Units
C_{IN}	Input Capacitance	V_{DD} = 1.8, 2.5V or 3.3V, V_I = 0V or V_{DD}	6	pF
C_{OUT}	Output Capacitance	V_I = 0V or V_{DD}, V_{DD} = 1.8V, 2.5V or 3.3V	7	
C_{PD}	Power Dissipation Capacitance	V_I = 0V or V_{DD}, F = 10 MHz V_{DD} = 1.8V, 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



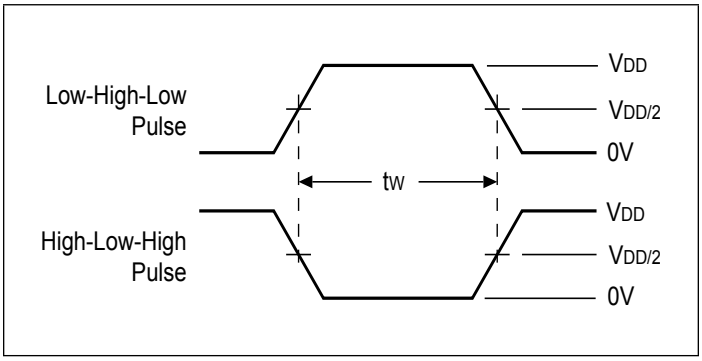
Notes:

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 ≤ 10 MHz, Z_O = 50Ω, t_r ≤ 2ns, t_f ≤ 2ns, measured from 10% to 90%, unless otherwise specified.
5. The outputs are measured one at a time with one transition per measurement.

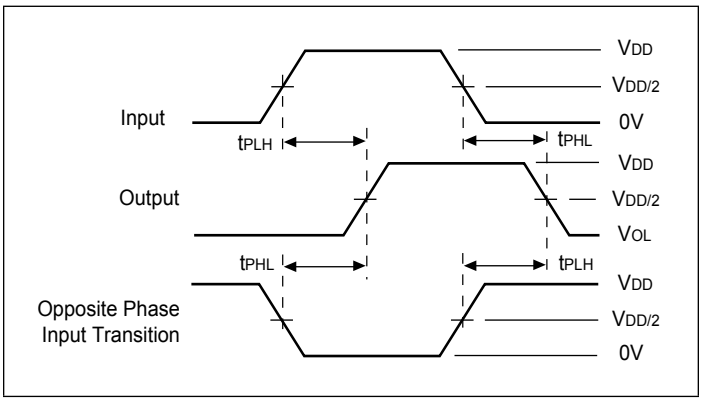
Switch Position

Test	S1
tpd	Open
t_{PLZ}/t_{PZL}	2 x V_{DD}
t_{PHZ}/t_{PZH}	GND

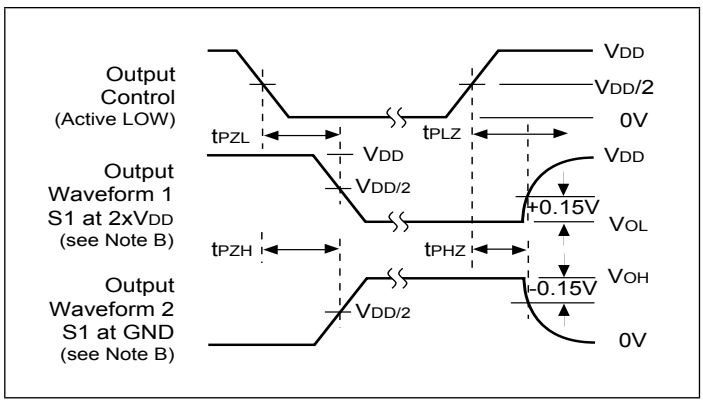
Pulse Width



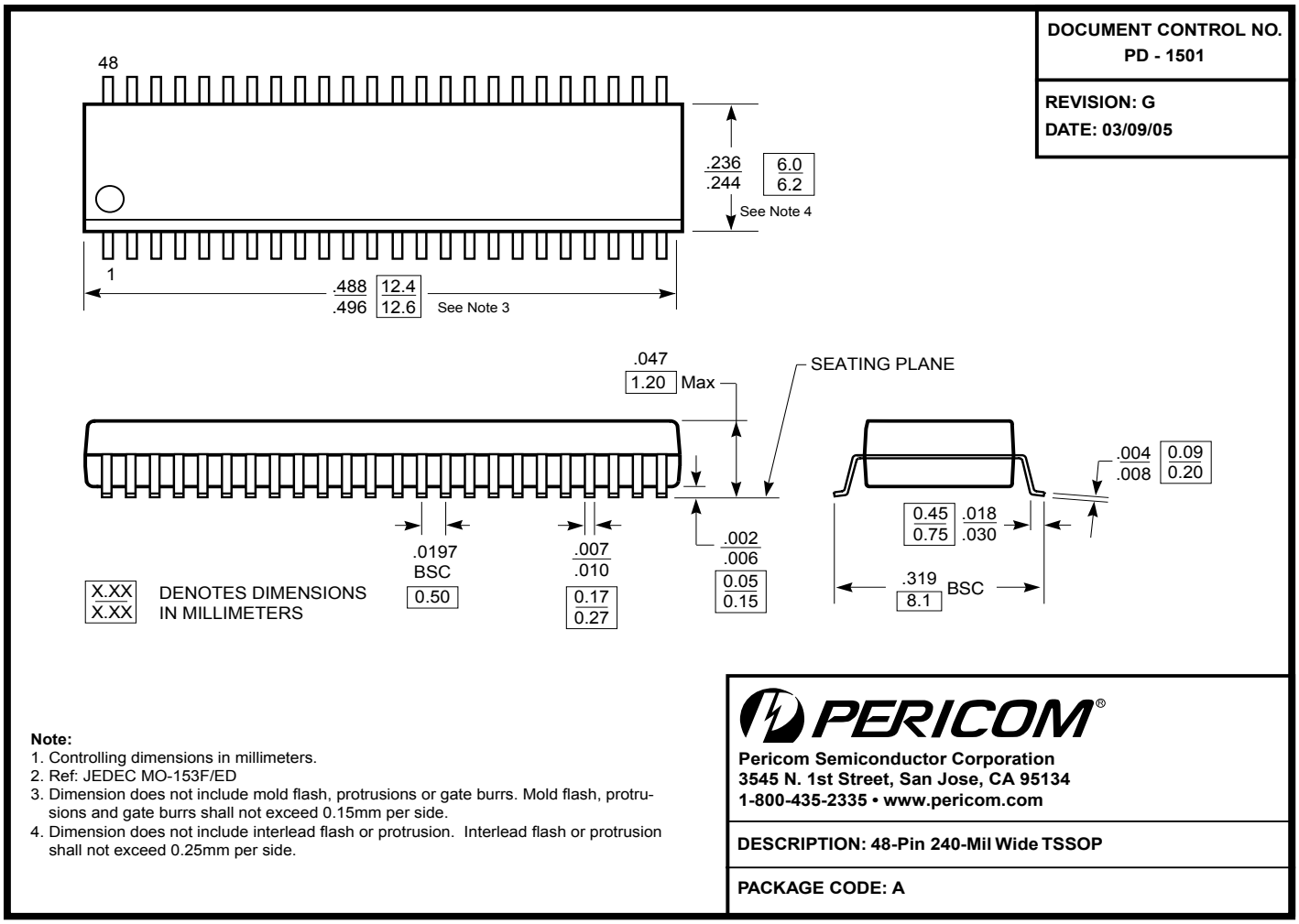
Propagation Delay



Enable Disable Timing



Packaging Mechanical: 48-Pin TSSOP (A)



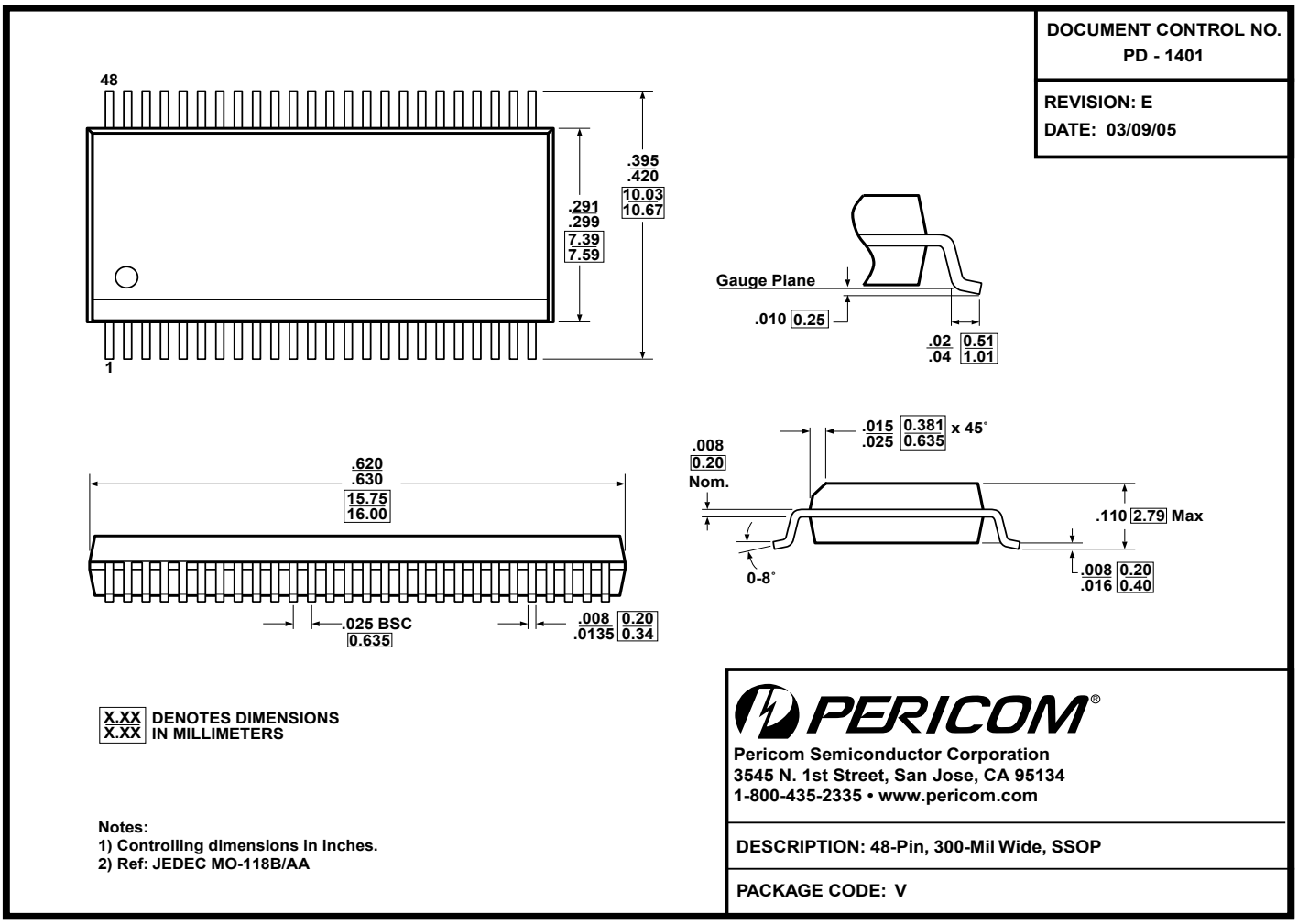
Note:
1. Controlling dimensions in millimeters.
2. Ref: JEDEC MO-153F/ED
3. Dimension does not include mold flash, protrusions or gate burrs. Mold flash, protrusions and gate burrs shall not exceed 0.15mm per side.
4. Dimension does not include interlead flash or protrusion. Interlead flash or protrusion shall not exceed 0.25mm per side.

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

DESCRIPTION: 48-Pin 240-Mil Wide TSSOP

PACKAGE CODE: 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