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8-Bit Dual Supply Bus Transceiver with 3-State Outputs

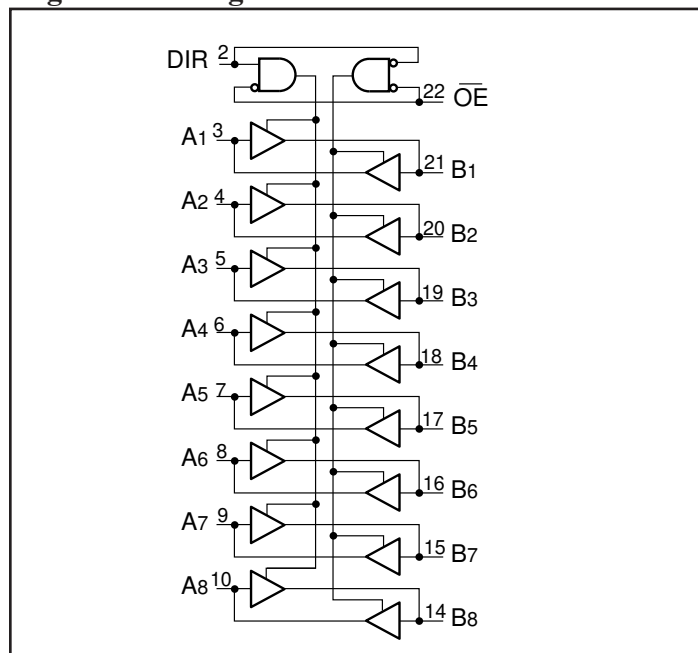
Product Features

- 2.7V to 3.6V on A-port and 4.5V to 5.5V on B-port
- TTL Compatible Inputs
- Latch-up performance exceeds 200mA Per JESD78
- ESD protection exceeds JESD22
 - 2000V Human-Body Model (A114-B)
 - 200V Machine Model (A115-A)
- Industrial Temperature: –40°C to +85°C
- Packaging (Pb-free & Green available):
 - 24-pin 173-mil wide plastic TSSOP (L)
 - 24-pin 150-mil wide plastic QSOP (Q)

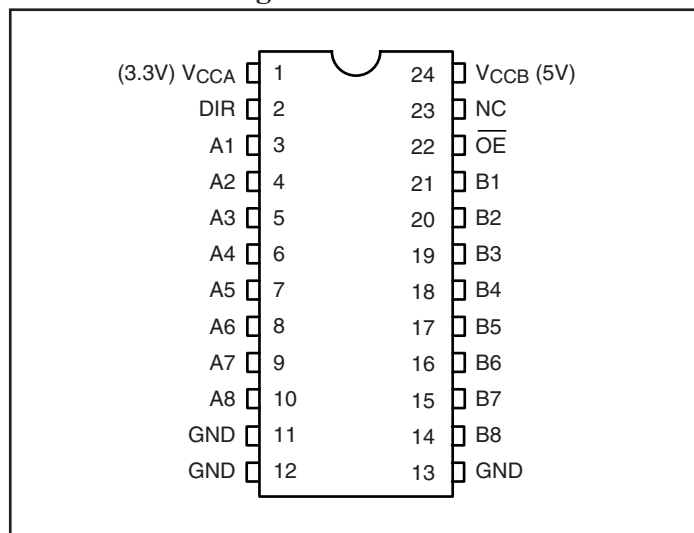
Product Description

The PI74LVC3245A is a non-inverting 8-bit Bidirectional Transceiver that uses two separate power supply rails. A-port (V_{CCA}) is set to operate at 3.3V and B-port (V_{CCB}) is set to operate at 5V. This allows for translation from a 3.3V to a 5V environment and vice-versa. This transceiver is designed for asynchronous two-way communication between data buses. The direction control input pin (DIR) determines the dataflow from the A bus to the B bus or from the B bus to the A bus. The output enable (\overline{OE}) input, when HIGH, disables both A and B ports by placing them in HIGH Z condition.

Logic Block Diagram



Product Pin Configuration



Truth Table⁽¹⁾

Inputs		Outputs
\overline{OE}	DIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	Z (Isolation)

Note:

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

Product Pin Description

Pin Name	Description
\overline{OE}	3-State Output Enable Inputs (Active LOW)
DIR	Direction Control Input
Ax	Side A Inputs or 3-State Outputs
Bx	Side B Inputs or 3-State Outputs
NC	NO Internal Connect
GND	Ground
V_{CCA}, V_{CCB}	Power

Recommended Operating Conditions⁽¹⁾

Parameters	Description		V _{CCA}	V _{CCB}	Min.	Typ.	Max.	Units
V _{CCA}	Supply Voltage				2.7	3.3	3.6	V
V _{CCB}	Supply Voltage				4.5	5	5.5	
V _{IHA}	High-Level Input Voltage	V _{OB} ≤ 0.1V or V _{OB} ≥ V _{CCB} -0.1V	2.7V	5.0V	2			
			3.6V	5.0V	2			
V _{IHB}	High-Level Input Voltage	V _{OA} ≤ 0.1V or V _{OA} ≥ V _{CCA} -0.1V	3.3V	4.5V	2			
			3.3V	5.5V	2			
V _{ILA}	Low-Level Input Voltage	V _{OB} ≤ 0.1V or V _{OB} ≥ V _{CCB} -0.1V	2.7V	5.0V			0.8	
			3.6V	5.0V			0.8	
V _{ILB}	Low-Level Input Voltage	V _{OA} ≤ 0.1V or V _{OA} ≥ V _{CCA} -0.1V	3.3V	4.5V			0.8	
			3.3V	5.5V			0.8	
V _{IH}	High-Level Input Voltage (Control Pins)	V _{OA} ≤ 0.1V or V _{OA} ≥ V _{CCA} -0.1V, V _{OB} ≤ 0.1V or V _{OB} ≥ V _{CCB} -0.1V	2.7V	4.5V	2			
			3.6V	5.5V	2			
V _{IL}	Low-Level Input Voltage (Control Pins)	V _{OA} ≤ 0.1V or V _{OA} ≥ V _{CCA} -0.1V, V _{OB} ≤ 0.1V or V _{OB} ≥ V _{CCB} -0.1V	2.7V	4.5V			0.8	
			3.6V	5.5V			0.8	
V _{IA}	Input Voltage				0		V _{CCA}	
V _{IB}	Input Voltage				0		V _{CCB}	
V _{OA}	Output Voltage				0		V _{CCA}	
V _{OB}	Output Voltage				0		V _{CCB}	
I _{OHA}	High-Level Output Current		2.7V	4.5V			-12	mA
			3V	4.5V			-24	
I _{OHB}	High-Level Output Current		3V	4.5V			-24	
I _{IOLA}	Low-Level Output Current		2.7V	4.5V			12	
			3V	4.5V			24	
I _{IOLB}	Low-Level Output Current		3V	4.5V			24	
Δt/Δv	Input transition Rise or Fall Rate						10	ns/v
T _A	Operating Free-Air Temp.				-40		85	°C

Notes:

1. All unused inputs of the device must be held at the associated V_{CC} or GND to ensure proper device operation.

DC Electrical Characteristics (Over the Operating Range, $T_A = -40^\circ\text{C} + 85^\circ\text{C}$)

Parameters	Description	Test Conditions	V _{CCA}	V _{CCB}	Min.	Typ.	Max.	Units
V _{OHA}	Minimum High Level Output Voltage (Port A)	I _{OH} = -100μA	3V	4.5V	2.9	3		V
		I _{OH} = -12mA	2.7V	4.5V	2.2	2.55		
			3V	4.5V	2.4	2.8		
		I _{OH} = -24mA	2.7V	4.5V	2	2.4		
3V	4.5V		2.25	2.7				
V _{OHB}	Minimum High Level Output Voltage (Port B)	I _{OH} = -100μA	3V	4.5V	4.4	4.5		
		I _{OH} = -24mA	3V	4.5V	3.76	4.21		
V _{OLA}	Maximum Low Level Output Voltage (Port A)	I _{OL} = 100μA	3V	4.5V		0.01	0.1	
		I _{OL} = 12mA	2.7V	4.5V		0.09	0.44	
			2.7V	4.5V		0.18	0.5	
		I _{OL} = 24mA	3V	4.5V		0.18	0.44	
V _{OLB}	Maximum Low Level Output Voltage (Port B)	I _{OL} = 100μA	3V	4.5V		0.01	0.1	
		I _{OL} = 24mA	3V	4.5V		0.18	0.44	
I _I	Maximum Input Leakage Current (Control Inputs)	V _I = V _{CCA} or GND	3.6V	5.5V			±1	μA
I _{OZ} ⁽¹⁾	Maximum 3-State Output Leakage Current (A or B ports)	V _I = V _{IL} or V _{IH} , $\overline{\text{OE}} = \text{V}_{\text{CCA}}$ V _O = V _{CCA/B} or GND	3.6V	5.5V			±5	
I _{CCA}	Quiescent V _{CCA} Supply Current	B to A, B-Port = V _{CCB} or GND, I _O (A port) = 0	3.6V	5.5V			10	
I _{CCB}	Quiescent V _{CCB} Supply Current	A to B, A port = V _{CCA} or GND, I _O (B port) = 0	3.6V	5.5V			10	
ΔI _{CC} ⁽²⁾	I _{CC} per input (A port)	One input V _I = V _{CCA} - 0.6V, other inputs = V _{CCA} or GND, $\overline{\text{OE}} = \text{GND}$ and DIR = V _{CCA}	3.6V	5.5V			50	uA
	I _{CC} per input ($\overline{\text{OE}}$)	One input V _I = V _{CCA} - 0.6V, other inputs = V _{CCA} or GND, DIR = V _{CCA}	3.6V	5.5V			50	
	I _{CC} per input (DIR)	V _I = V _{CCA} - 0.6V, other inputs = V _{CCA} or GND, $\overline{\text{OE}} = \text{GND}$	3.6V	5.5V			50	
	I _{CC} per input (B Port)	One Input V _I = V _{CCB} - 2.1V, other inputs = V _{CCB} or GND, $\overline{\text{OE}} = \text{GND}$ and DIR = GND	3.6V	5.5V		0.7	1.5	mA

Notes:

- For I/O ports, the parameter I_{OZ} includes the input leakage current.
- This is the increase in supply current for each input that is at one of the specified voltage levels, rather than 0V or the associated V_{CC}.

Capacitance ($T_A = 25^\circ\text{C}$)

Parameters	Description	Test Conditions	Typ.	Units
C_{IN}	Control Input Capacitance	$V_I = V_{CCA}$ or GND, $V_{CCA} = \text{Open}$, $V_{CCB} = \text{Open}$	2.8	pF
$C_{I/O}$	Input/Output Capacitance (A or B port)	$V_{I/O} = V_{CCA/B}$ or GND, $V_{CCA} = 3.3\text{V}$, $V_{CCB} = 5\text{V}$	9	
C_{PD}	Power Dissipation Capacitance ⁽¹⁾	Outputs Enabled	$V_{CCA} = 3.3\text{V}$, $V_{CCB} = 5\text{V}$ $C_L = 0\text{pF}$, $f = 10\text{MHz}$	
		Outputs Disabled		2.2

Notes:

- C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current consumption (I_{CCD}) at no output loading and operating at 50% duty cycle, C_{PD} is related to I_{CCD} dynamic operating current by the expression: $I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CC} \text{ static})$

AC Electrical Characteristics (Over Operating Range, $T_A = -40^\circ\text{C}$ to $+85^\circ\text{C}$)

Parameters	From (Input)	To (Output)	$V_{CCA} = 2.7\text{V to }3.6\text{V}$, $V_{CCB} = 5\text{V} \pm 0.5\text{V}$		Units
			$C_L = 50\text{pF}$, $R_L = 500\Omega$		
			Min.	Max.	
t_{PHL}	A	B	1.0	6.3	ns
t_{PLH}			1.0	6.0	
t_{PHL}	B	A	1.0	5.7	
t_{PLH}			1.0	6.0	
t_{PZL}	\overline{OE}	A	1.0	7.8	
t_{PZH}			1.0	7.5	
t_{PZL}	\overline{OE}	B	1.0	7.8	
t_{PZH}			1.0	7.6	
t_{PLZ}	\overline{OE}	A	1.0	7.0	
t_{PHZ}			1.0	7.5	
t_{PLZ}	\overline{OE}	B	1.0	7.0	
t_{PHZ}			1.0	7.3	
$t_{SK(O)}$	Output-to-Output Skew ⁽¹⁾			1.5	

Notes:

- Skew between any two outputs of the same device, switching in the same direction. Parameter guaranteed by design.

Power- Up Considerations

To avoid excessive supply current, bus contention or oscillation during power-up, the following guidelines should be followed:

1. Connect ground first before any supply voltage is applied.
2. Power up V_{CCA} , which is the control side of the device.
3. Ramp \overline{OE} ahead of or with V_{CCA} to help prevent bus contention
4. Ramp DIR with V_{CCA} if DIR high is needed (A bus to B bus). Otherwise keep DIR Low.

PARAMETER MEASUREMENT INFORMATION FOR A TO B PORT

$V_{CCA} = 2.7V$ TO $3.6V$ and $V_{CCB} = 5V \pm 0.5V$

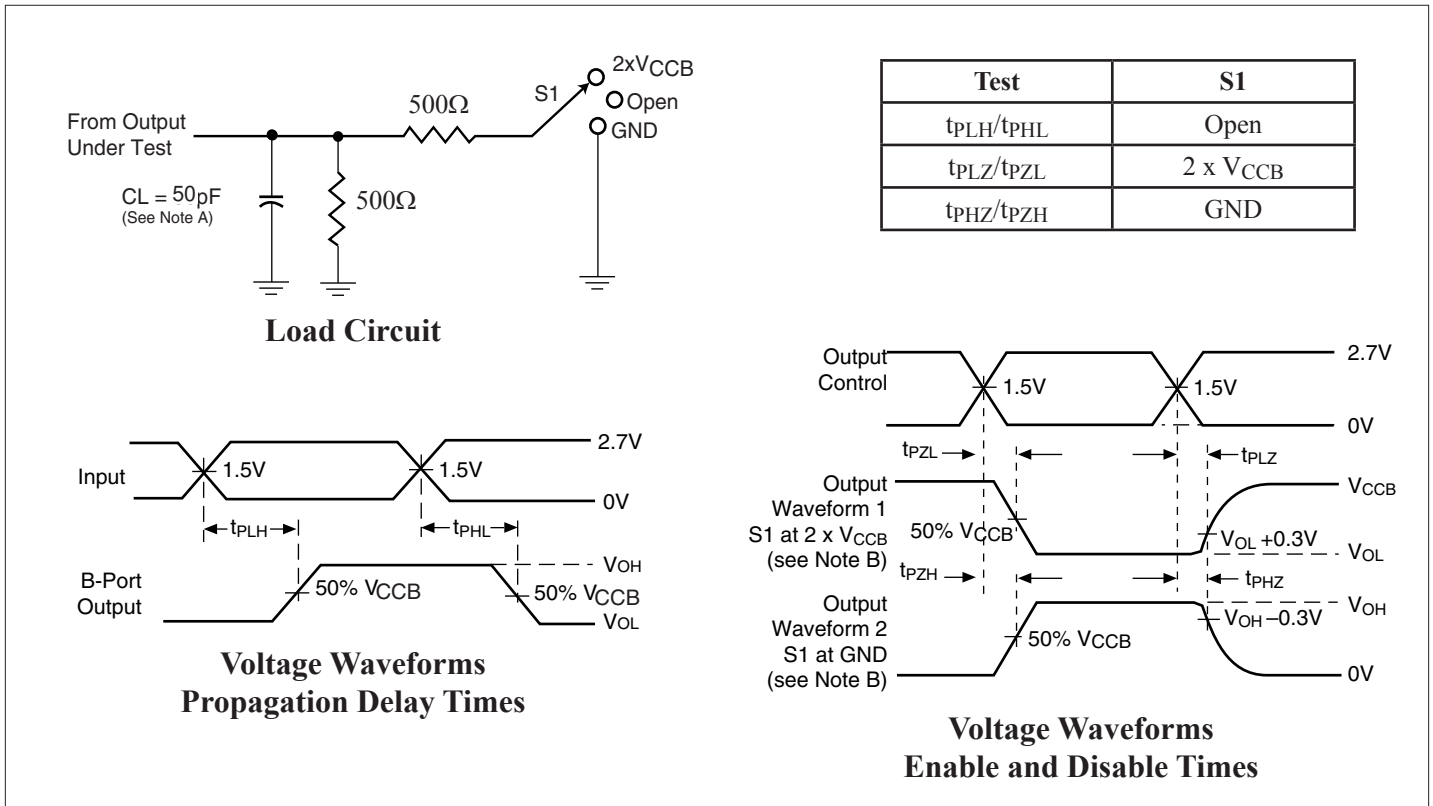


Figure 1. Load Circuit and Voltage Waveforms

Notes:

- A. C_L includes probe and jig capacitance.
 - B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
 Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- All input impulses are supplied by generators having the following characteristics: $PRR \leq 10$ MHz, $Z_O = 50\Omega$, $t_R \leq 2.5ns$, $t_F \leq 2.5ns$.
 - The outputs are measured one at a time with one transition per measurement.

PARAMETER MEASUREMENT INFORMATION FOR B TO A PORT

$V_{CCA} = 2.7V$ TO $3.6V$ and $V_{CCB} = 5V \pm 0.5V$

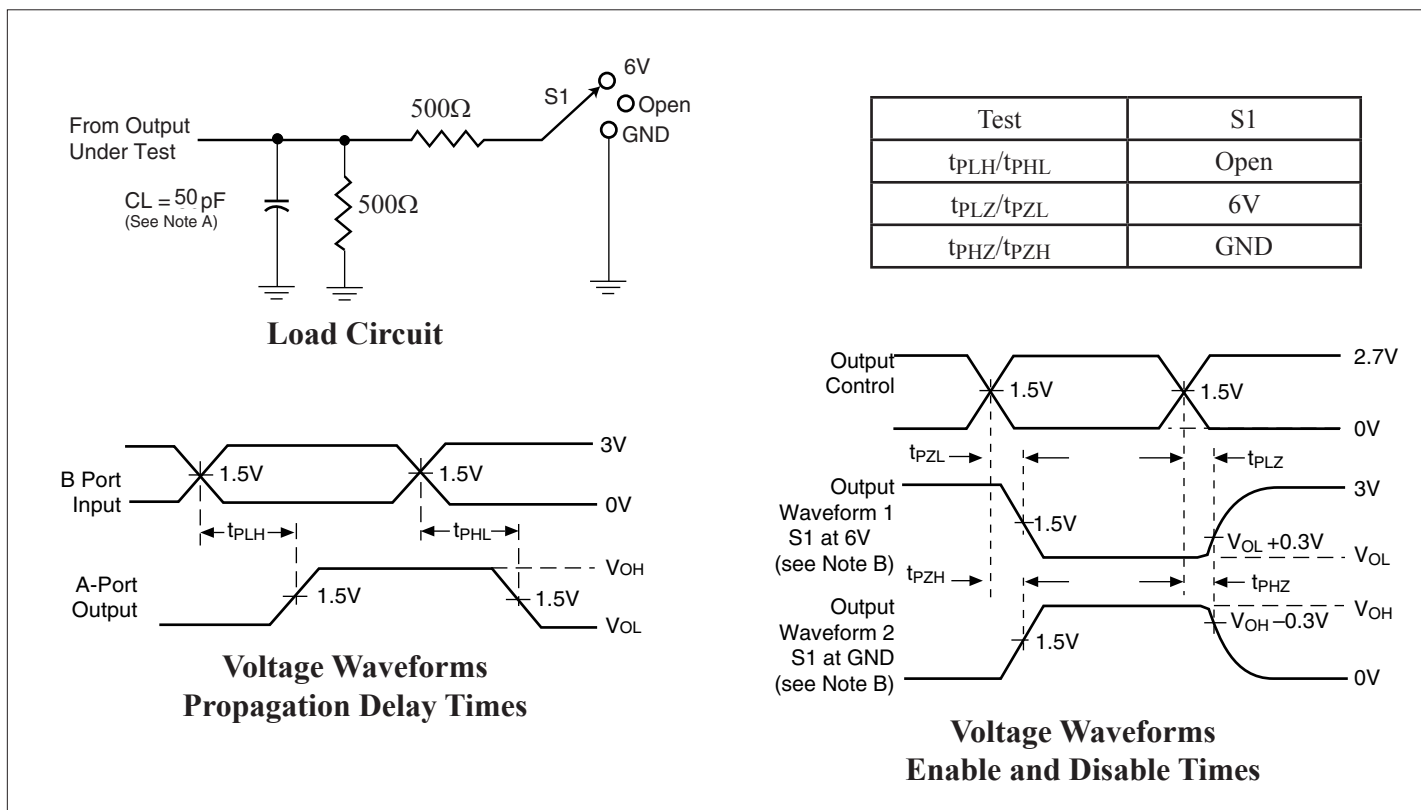


Figure 2. Load Circuit and Voltage Waveforms

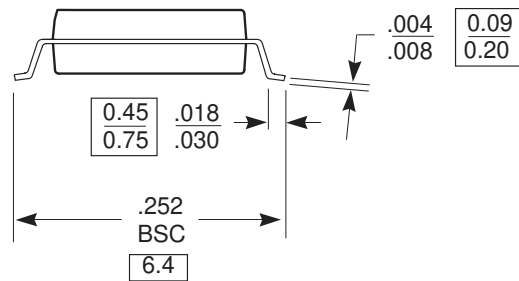
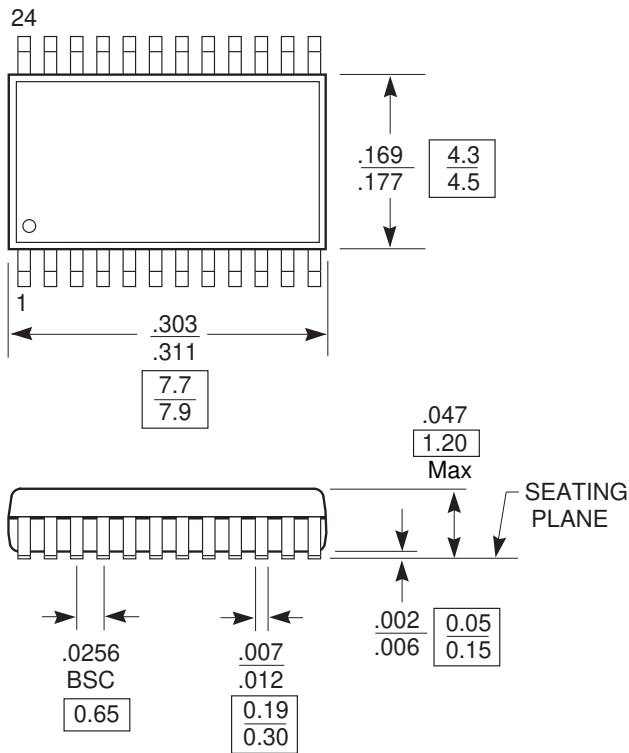
Notes:

- A. C_L includes probe and jig capacitance.
- B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
 Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
- All input impulses are supplied by generators having the following characteristics: $PRR \leq 10\text{ MHz}$, $Z_O = 50\Omega$, $t_R \leq 2.5\text{ ns}$, $t_F \leq 2.5\text{ ns}$.
- The outputs are measured one at a time with one transition per measurement.

Packaging Mechanical: 24-pin TSSOP (L)

DOCUMENT CONTROL NO.
PD - 1312

REVISION: E
DATE: 03/09/05



Note:

1. Package Outline Exclusive of Mold Flash and Metal Burr
2. Controlling dimensions in millimeters
3. Ref: JEDEC MO-153F/AD

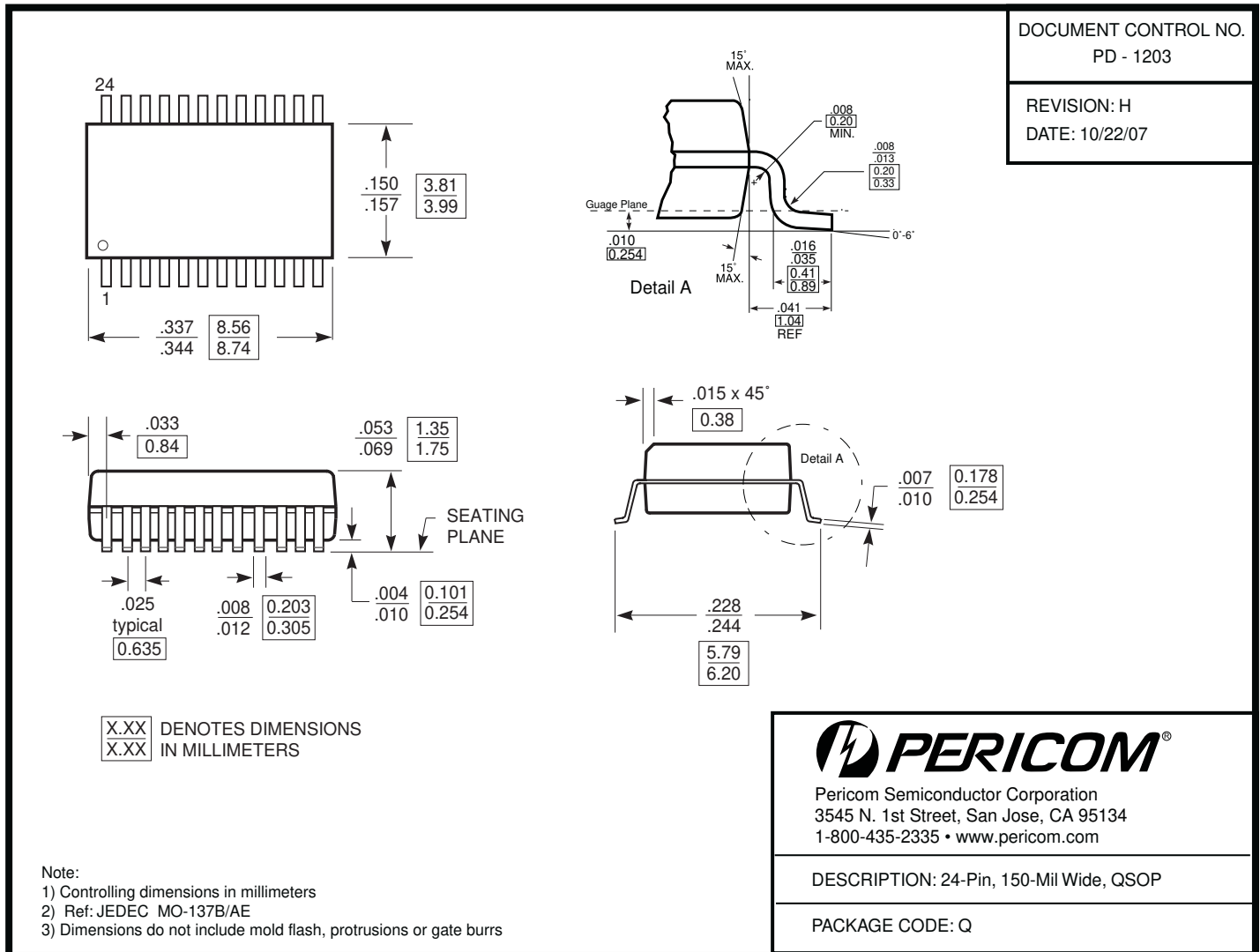


Pericom Semiconductor Corporation
3545 N. 1st Street, San Jose, CA 95134
1-800-435-2335 • www.pericom.com

DESCRIPTION: 24-Pin, 173-Mil Wide, TSSOP

PACKAGE CODE: L

Packaging Mechanical: 24-pin QSOP (Q)



07-0475

Ordering Information

Ordering Code	Package Code	Package Type
PI74LVC3245ALE	L	Pb-free & Green, 24-pin, 173-mil wide plastic TSSOP
PI74LVC3245AQE	Q	Pb-free & Green, 24-pin, 150-mil wide plastic QSOP

Notes:

- Thermal characteristics can be found on the company web site at www.pericom.com/packaging/
- E = Pb-free & Green
- Adding an X suffix = Tape/Reel