

3.3V 16-Bit Buffer/Line Driver with 3-State Outputs

Product Features

- Advanced low power CMOS design for 2.7V to 3.6V V_{CC} operation
- Supports 5V input/output tolerance in mixed signal mode operation
- Function compatible with LVT family of products
- Balanced $\pm 24\text{mA}$ output drive
- Typical V_{OLP} (Output Ground Bounce) $< 0.8\text{V}$ at $V_{CC}=3.3\text{V}$, $T_A=25^\circ\text{C}$
- I_{off} and Power Up/Down 3-State support live insertion
- Latch-up performance exceeds 200mA Per JESD78
- ESD protection exceeds JESD 22
 - 2000V Human-Body Model (A114-B)
 - 200V Machine Model (A115-A)
- Available Packages (Pb-free available):
 - 48-pin 240-mil wide plastic TSSOP (A48)
 - 48-pin 300-mil wide plastic SSOP (V48)
- Industrial Temperature: -40°C to $+85^\circ\text{C}$

Product Description

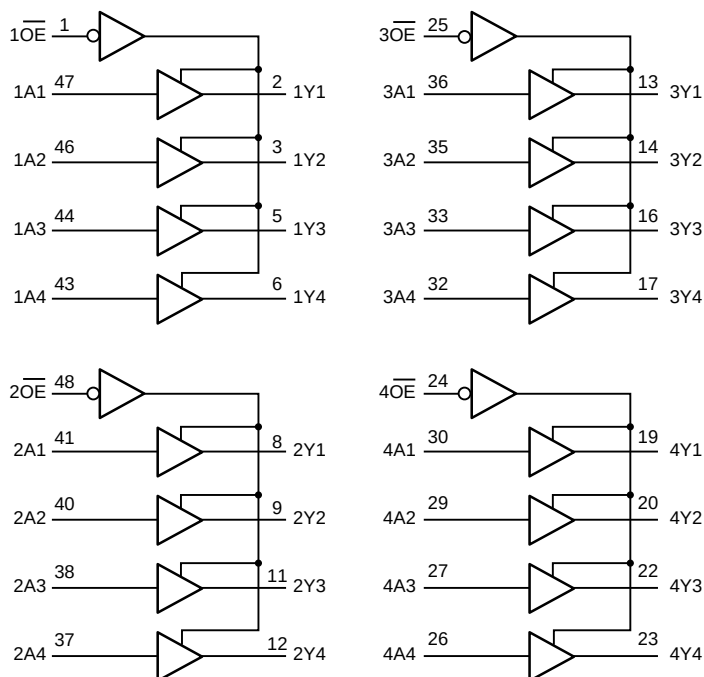
Pericom Semiconductor's PI74LVTC series of logic circuits are produced using the Company's advanced CMOS technology, achieving industry leading speed.

The PI74LVTC16244 is a non-inverting 16-bit buffer and line driver designed for low-voltage 2.7V to 3.6V V_{CC} operation, with the capability of interfacing to the 5V system environment. This buffer/driver is designed specifically to improve both the performance and density of 3-State memory address drivers, clock drivers, and bus-oriented receivers and transmitters. The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer.

When V_{CC} is between 0 to 1.5V during power up or power down, the device is in the high-impedance state. To ensure the high-impedance state above 1.5V, $\overline{OE}$ should be tied to V_{CC} through a pullup resistor; the minimum value of the resistor is determined by the current sinking capability of the driver.

The device fully supports live-insertion with its I_{off} and power-up/down 3-state. The I_{off} circuitry disables the outputs when the power is off, preventing the backflow of damaging current through the device. Power-up/down 3-state places the outputs in the high-impedance state during power up or power down, preventing driver conflict.

Logic Block Diagram



Maximum Ratings

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

Supply voltage range, V_{CC}	-0.5V to +6.5V
Input voltage range, $V_I^{(1)}$	-0.5V to +6.5V
Voltage range applied to any output in the high-impedance or power-off state, $V_O^{(1)}$	-0.5V to +6.5V
Voltage range applied to any output in the active state, $V_O^{(1), (2)}$	-0.5V to $V_{CC} + 0.5V$
Input clamp current, $I_{IK} (V_I < 0)$	-50mA
Output clamp current, $I_{OK} (V_O < 0)$	-50mA
Continuous Output Current I_O	$\pm 50mA$
Continuous Current through each VCC or GND pin	$\pm 100mA$
Package thermal impedance, $\theta_{JA}^{(3)}$: package A	104°C/W
package V	94°C/W
Storage Temperature range, T_{stg}	-65°C to 150°C

Notes:

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.

1. Input negative-voltage and output voltage ratings may be exceeded if the input and output clamp current ratings are observed.
2. This value is limited to 6.5V maximum.
3. The package thermal impedance is calculated in accordance with JESD 51.

Truth Table⁽⁴⁾

Inputs		Outputs
$\overline{xOE}$	xAx	xYx
L	H	H
L	L	L
H	X	Z

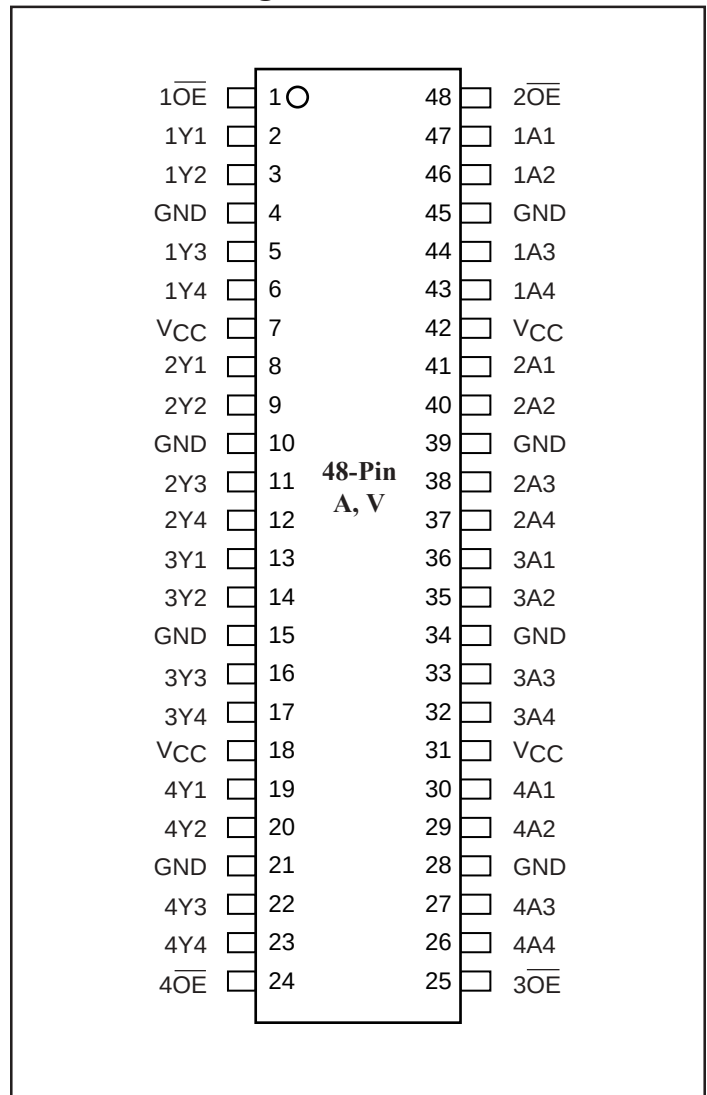
Notes:

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

Product Pin Description

Pin Name	Description
$\overline{xOE}$	3-State Output Enable Inputs (Active LOW)
xAx	Inputs
xYx	3-State Outputs
GND	Ground
V_{CC}	Power

Product Pin Configuration



Recommended Operating Conditions⁽⁵⁾

			Min.	Max.	Units
V _{CC}	Supply Voltage	Operating	2.7	3.6	V
V _{IH}	High-level Input Voltage	V _{CC} = 2.7V to 3.6V	2.0		
V _{IL}	Low-level Input Voltage	V _{CC} = 2.7V to 3.6V		0.8	
V _I	Input Voltage		0	5.5	
V _O	Output Voltage	High or Low State	0	V _{CC}	
		3-State	0	5.5	
I _{OH}	High-level output current	V _{CC} = 2.7V		−12	mA
		V _{CC} = 3.0V to 3.6V		− 24	
I _{OL}	Low-level output current	V _{CC} = 2.7V		12	
		V _{CC} = 3.0V to 3.6V		24	
Δt/Δv	Input transition rise or fall rate			10	ns/V
Δt/ΔV _{CC}	Power-up ramp rate		150		μs/V
T _A	Operating free-air temperature		− 40	+85	°C

Notes:

5. All unused inputs must be held at V_{CC} or GND to ensure proper device operation.

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

Parameters	Description	Test Conditions		Min.	Max.	Units
V _{IK}	Clamp Diode Voltage	V _{CC} = 2.7V	I _I = −18mA		−1.2V	V
V _{OH}	Output High Voltage	V _{CC} = 2.7V to 3.6V	I _{OH} = −100μA	V _{CC} −0.2V		
		V _{CC} = 2.7V	I _{OH} = −12mA	2.2		
		V _{CC} = 3V	I _{OH} = −12mA	2.4		
			I _{OH} = −24mA	2.2		
V _{OL}	Output Low Voltage	V _{CC} = 2.7V to 3.6V	I _{OL} = 100μA		0.2	
		V _{CC} = 2.7V	I _{OL} = 12mA		0.4	
		V _{CC} = 3V	I _{OL} = 12mA		0.4	
			I _{OL} = 24mA		0.55	
I _I	Input Leakage Current	V _{CC} = 0V to 3.6V	V _T = 0V to 5.5V		±5	μA
I _{OFF}	Power Off Output Leakage Current	V _{CC} = 0V	V _T or V _O = 0V to 5.5V		±5	
I _{OZ}	3-State Output Leakage Current	V _{CC} = 2.7V to 3.6V	V _O = 0V to 5.5V,		±5	
I _{OZPU}	Power-Up 3-State Current	V _{CC} = 0V to 1.5V	V _O = 0.5V to 5.5V, OE = don't care		±5	
I _{OZPD}	Power-Down 3-State Current	V _{CC} = 1.5V to 0V	V _O = 0.5V to 5.5V, OE = don't care		±5	
I _{CC}	Quiescent Power Supply Current	V _{CC} = 2.7V to 3.6V	V _I = V _{CC} or GND	I _O = 0	100	
			3.6V ≤ V _I ≤ 5.5V			
ΔI _{CC}	Increase in I _{CC}	V _{CC} = 2.7V to 3.6V	One input at V _{CC} - 0.6V ⁽⁶⁾ Other inputs at V _{CC} or GND		100	

Notes:

6. This is the increase in supply current for each input that is at the specified TTL voltage level rather than V_{CC} or GND.

Capacitance

Parameters	Description	Test Conditions	Typ. ⁽⁷⁾	Units
C _I	Input Capacitance	V _{CC} = 3.3V, V _I = V _{CC} or GND	3.7	pF
C _O	Output Capacitance	V _{CC} = 3.3V, V _O = V _{CC} or GND	7	
C _{PD}	Power Dissipation Capacitance ⁽⁸⁾	V _{CC} = 3.3V, V _I = 0V or V _{CC} , f=10 MHz	15	

Notes:

7. All typical values are measured at V_{CC} = 3.3V, T_A = 25°C.
8. C_{PD} is defined as the value of the internal equivalent capacitance which is derived from dynamic operating current sumption (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: $I_{CCD} = (C_{PD})(V_{CC})(f_{IN}) + (I_{CCstatic})$

Switching Characteristics Over Operating Range

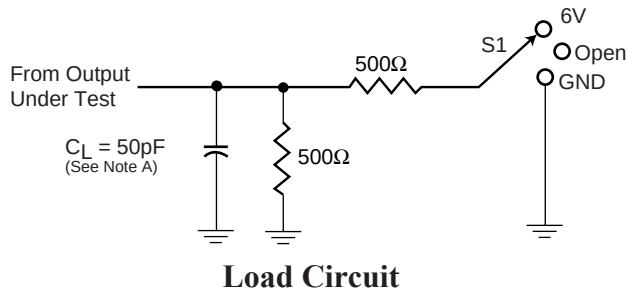
Parameters	Description	From (Input)	To (Output)	V _{CC} = 3.3V ±0.3V			V _{CC} = 2.7V		Units
				C _L = 50pF, R _L = 500Ohm			C _L = 50pF, R _L = 500Ohm		
				Min.	Typ. ⁽⁹⁾	Max.	Min.	Max.	
t _{PLH}	Propagation Delay	$\overline{A}$	Y	1.0	2.5	3.4		3.8	ns
t _{PHL}				1.0	2.5	3.4		3.8	
t _{pZH}	Output Enable Time	$\overline{OE}$	Y	1.0	2.9	4.2		5.0	
t _{pZL}				1.0	3.0	4.2		5.0	
t _{PHZ}	Output Disable Time	OE	Y	1.0	2.5	4.0		4.7	
t _{PLZ}				1.0	2.4	3.9		4.3	
t _{SK(O)}	Output to Output Skew ⁽¹⁰⁾					0.5			

Notes:

9. All typical values are measured at V_{CC} = 3.3V, T_A = 25°C.
10. Skew between any two outputs, switching in the same direction.

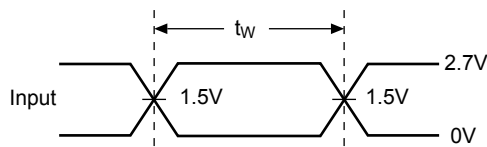
PARAMETER MEASUREMENT INFORMATION

$V_{CC} = 2.7V \text{ and } 3.3V \pm 0.3V$

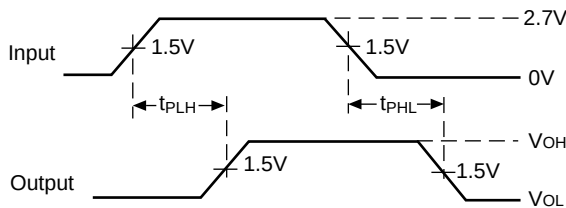


Load Circuit

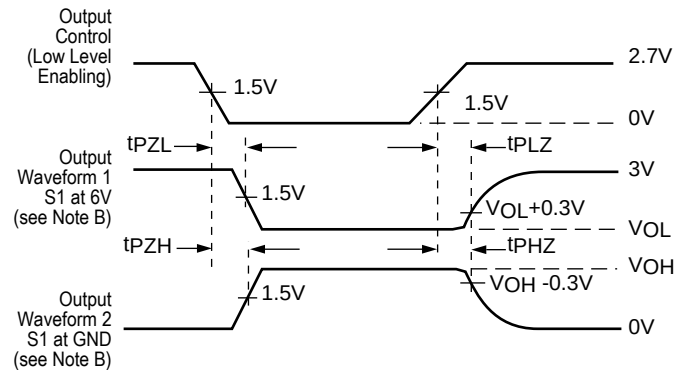
Test	S1
t_{PLH}/t_{PHL}	Open
t_{PLZ}/t_{PZL}	6V
t_{PHZ}/t_{PZH}	GND



**Voltage Waveforms
Pulse Duration**



**Voltage Waveforms
Propagation Delay Times**

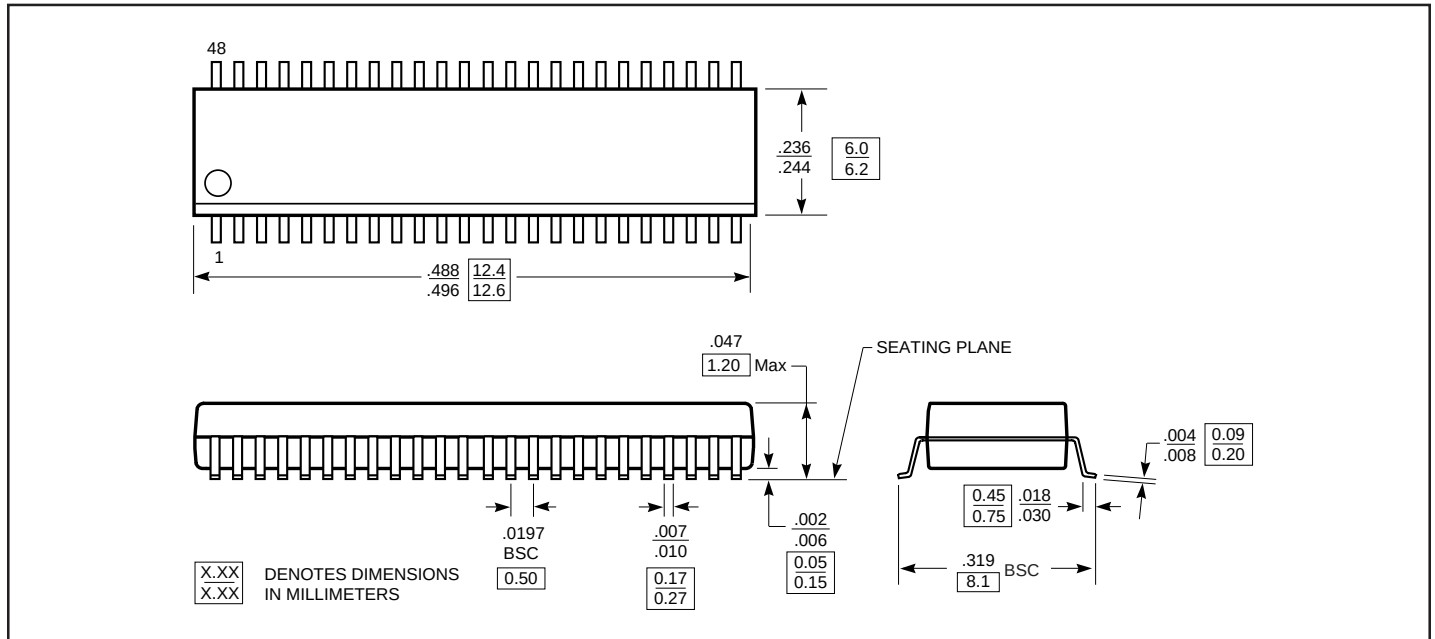
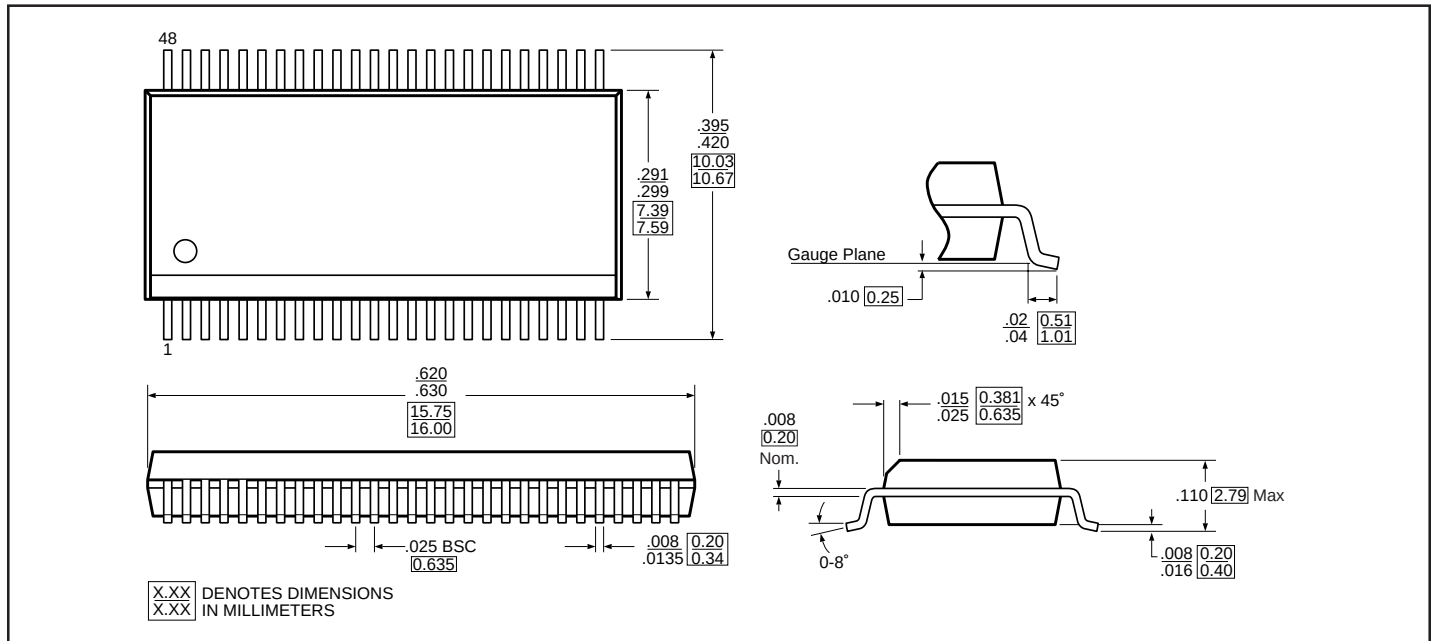


**Voltage Waveforms
Enable and Disable Times**

Figure 1. Load Circuit and Voltage Waveforms

Notes:

- C_L includes probe and jig capacitance.
- 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 ≤ 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.

Packaging Mechanical: 48-pin TSSOP (A)

Packaging Mechanical: 48-pin SSOP (V)




Ordering Information

Ordering Code	Package Code	Package Type
PI74LVTC16244A	A	48-pin, 240-mil wide plastic TSSOP (A)
PI74LVTC16244AE	A	Pb-free, 48-pin, 240-mil wide plastic TSSOP (A)
PI74LVTC16244V	V	48-pin, 300-mil wide plastic SSOP (V)
PI74LVTC16244VE	V	Pb-free, 48-pin, 300-mil wide plastic SSOP (V)

Notes:

1. Thermal characteristics can be found on the company web site at <http://www.pericom.com/packaging/mechanicals.php>
2. X = Tape/Reel