PI74ALPT16244

1.8/2.5/3.3V 16-Bit Buffer/Driver with 3-State Outputs

Product Features:

- PI74ALPT family is designed for low voltage operation, V_{DD} = 1.8V to 3.6V
- Supports Live Insertion
- 3.6V Tolerant Inputs and Outputs
- Bus Hold
- High Drive, -32/64mA @ 3.3V
- Typical V_{OLP} (Output Ground Bounce) < 0.6V at V_{DD} = 2.5V, T_A = 25°C
- Typical V_{OHV} (Output V_{OH} Undershoot) <- 0.6V at V_{DD} = 2.5V, T_A = 25°C
- Industrial operation at –40°C to +85°C
- Packages available:
  - –48-pin 240 mil wide plastic TSSOP (A48)
  - –48-pin 173 mil wide plastic TVSOP (K48)
  - –48-pin 300 mil wide plastic SSOP (V48)

Product Description:

Pericom Semiconductor's PI74ALPT series of logic circuits are produced using the Company's advanced 0.35 micron CMOS technology, achieving industry leading speed.

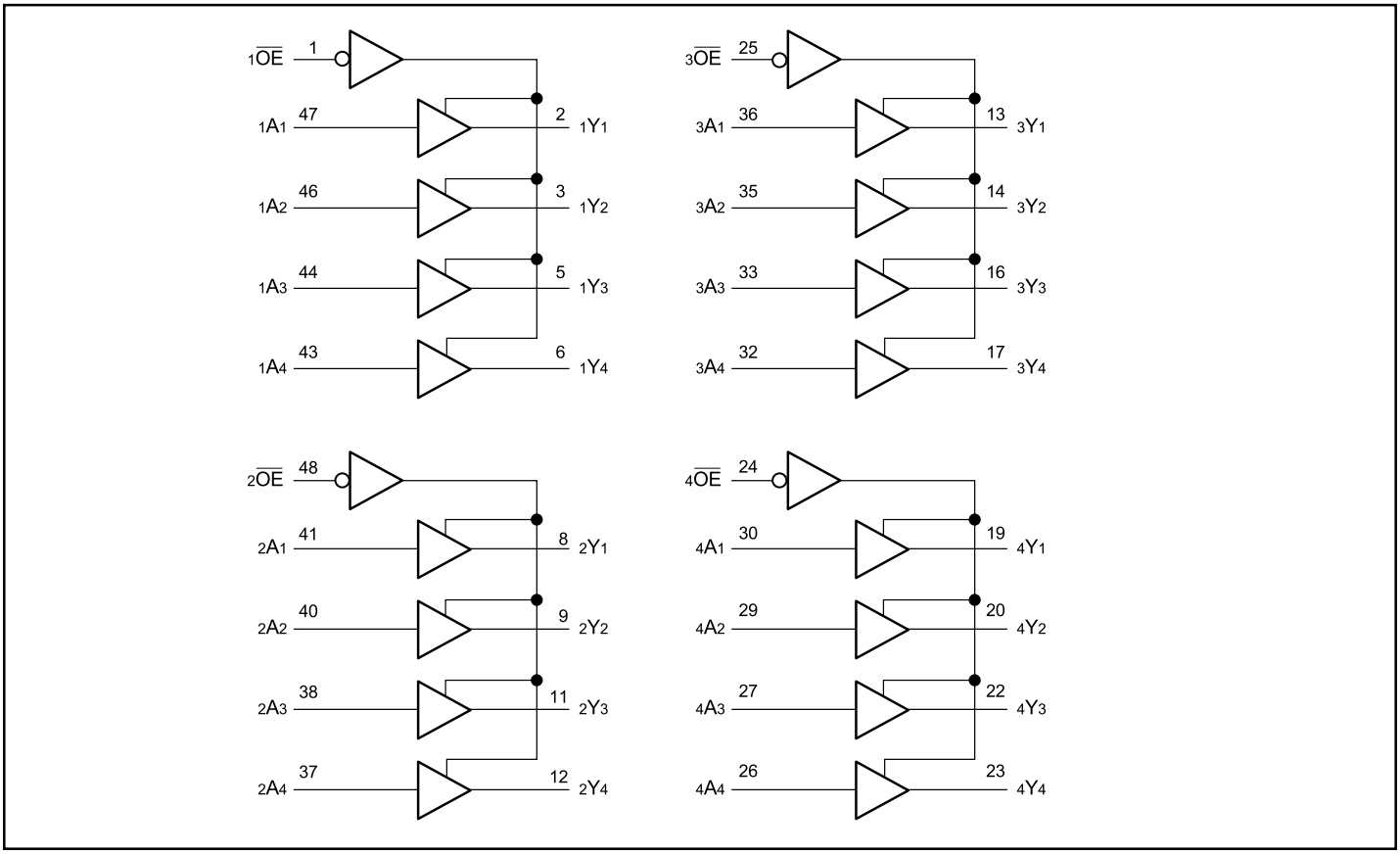
The PI74ALPT16244 buffer/driver is designed specifically to improve both the performance and density of 3-state memory address drivers, clock drivers, and bus-oriented receivers and transmitters.

The device can be used as four 4-bit buffers, two 8-bit buffers, or one 16-bit buffer. It provides true outputs and symmetrical active-low output-enable ($\overline{OE}$) inputs.

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

The family is I/O Tolerant, allowing it to operate in mixed 1.8/3.6V systems. The family has "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.

Logic Block Diagram



Product Pin Description

Pin Name	Description
n$\overline{OE}$	3-State Output Enable Inputs (Active LOW)
nAx	Inputs
nYx	3-State Outputs
GND	Ground
VCC	Power

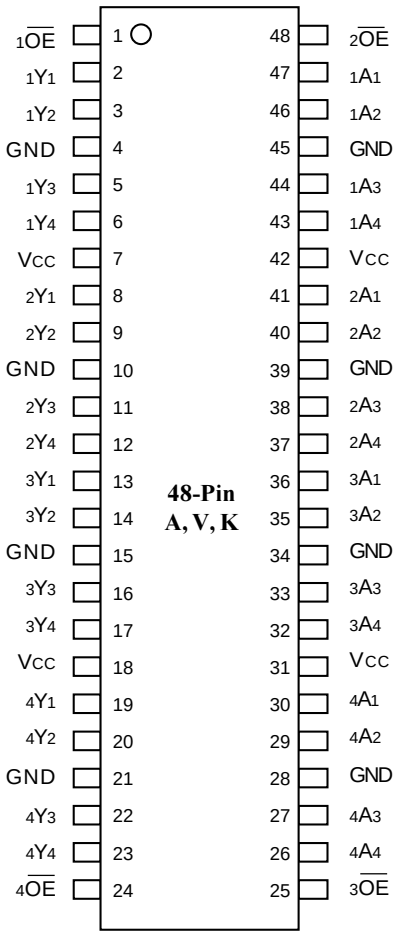
Truth Table[1]

Inputs		Outputs
n$\overline{OE}$	nAx	nYx
L	H	H
L	L	L
H	X	Z

Note:

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

Product Pin Configuration



Maximum Ratings

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

Supply Voltage Range, V_{DD} ..... –0.5V to 4.6V
Input Voltage Range, V_I ..... –0.5V to 4.6V
Output Voltage Range, V_O (3-Stated) ..... –0.5V to 4.6V
Output Voltage Range, V_O[(1)] (Active) ..... –0.5V to V_{DD}+0.5V
DC Input Diode Current (I_{IK}) V_I<0V ..... –50mA
DC Output Diode Current (I_{OK})
V_O<0V ..... –50mA
V_O>V_{DD} ..... +50mA
DC Output Source/Sink Current (I_{OH}/I_{OL}) ..... –64/128mA
DC V_{DD} or GND Current per Supply Pin (I_{CC} or GND) ..... ±100mA
Storage Temperature Range, T_{stg} ..... –65°C to 150°C

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.

Recommended Operating Conditions[2]

			Min.	Max.	Unit
V_{DD}	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
$\Delta t/\Delta v$	Input transistion rise or fall rate[(3)]		0	10	ns/V
T_A	Operating free-air temperture		-40	85	C

Notes

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

	Parameter	Conditions	V_{DD}	Min.	Typ.	Max.	Units
V_{IH}	HIGH Level Input Voltage		2.7 - 3.6	2.0			V
V_{IL}	LOW Level Input 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_{OL} = 100µA	2.7 - 3.6			0.2	
		I_{OL} = 12mA	2.7			0.4	
		I_{OL} = 18mA	3.0			0.4	
		I_{OL} = 24mA				0.45	
		I_{OL} = 32mA				0.5	
		I_{OL} = 6 mA				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}, Vo = 1.5V(1)	3.6	150		334	mA
I_{ODH}	Output Current High	$V_{IN} = V_{IH}$ or V_{IL}, Vo = 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			20	
		$V_{DD} \leq (V_I, V_O) \leq 3.6V$				±20	
ΔI_{DD}	Increase in I_{DD} per input	$V_{IH} = V_{DD}$ -0.6V, Other inputs at V_{DD} or Gnd				750	

Notes

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

DC Characteristics ($2.3V \leq V_{DD} \leq 2.7V$)

Dessription	Parameters	Conditions	V_{DD}	Min.	Typ.	Max.	Units
V_{IH}	HIGH Level Input Voltage		2.3 - 2.7	1.6			V
V_{IL}	LOW Level Input Voltage					0.7	
V_{OH}	HIGH Level Output Voltage	$I_{OH} = -100\mu A$		$V_{DD} - 0.2$			
		$I_{OH} = -12mA$	2.3	1.8			
		$I_{OH} = -18mA$		1.7			
V_{OL}	LOW Level Output Voltage	$I_{OL} = 100\mu A$	2.3 - 2.7			0.2	
		$I_{OL} = 12mA$	2.3			0.4	
		$I_{OL} = 18mA$				0.5	
		$I_{OL} = 24mA$				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			20	
		$V_{DD} \leq (V_I, V_O) \leq 3.6V$				±20	
ΔI_{DD}	Increase in I_{DD} per input	$V_{IH} = V_{DD}$ -0.6V, Inputs at V_{DD} or Gnd				TBD	

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

DC Characteristics ($1.8V \leq V_{DD} \leq 2.3V$)

Description	Parameters	Conditions	V_{DD}	Min.	Typ.	Max.	Units
V_{IH}	HIGH Level Input Voltage		1.8 - 2.3	0.7 x V_{DD}			V
V_{IL}	LOW Level Input 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_{OL} = 100µA				0.2	
		I_{OL} = 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	$V_I = V_O \leq 3.6V$	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 = 0.4	1.8		50		µA
		V_I = 1.3			–50		
I_{DD}	Quiescent Supply Current	$V_I = V_{DD}$ or GND				20	
		$V_{DD} \leq (V_I, V_O) \leq 3.6V$				±20	
ΔI_{DD}	Increase in I_{DD} per input	$V_I = V_{DD}$ -06V, Other inputs at V_{DD} or Gnd				TBD	

Note:

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

AC Electrical Characteristics

Symbol	Parameter	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	0.8	2.5	1.0	3.0	1.5	5.0	ns
t_{PZL}, t_{PZH}	Output Enable Time	1.0	3.5	2.0	4.1	1.5	6.5	
t_{PLZ}, t_{PHZ}	Output Disable Time	1.5	3.5	1.5	3.8	1.5	5.0	
t_{OSHL}, t_{OSLH}	Output to Output Skew(1)		0.5		0.5		0.5	

Note

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}).

Dynamic Switching Characteristics (Target Spec, Eng. Ref Only)

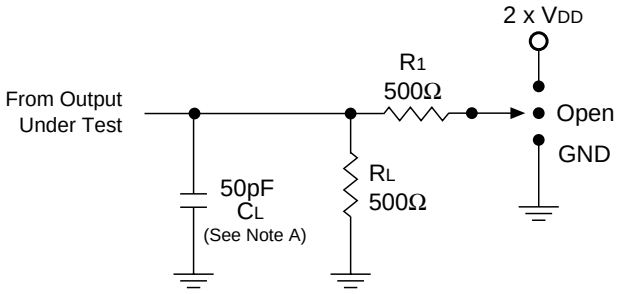
Symbol	Parameter	Conditions	V_{DD}	T_A= +25°C Typical	Units
V_{OLP}	Quiet Output Dynamic Peak V_{OL}	C_L = 50pF, V_{IH}= V_{DD}, V_{IL}= 0V	1.8 2.5 3.3	0.25 0.6 0.8	V
V_{OLV}	Quiet Output Dynamic Valley V_{OL}	C_L = 50pF, V_{IH}= V_{DD}, V_{IL}= 0V	1.8 2.5 3.3	–0.25 –0.6 –0.8	
V_{OHV}	Quiet Output Dynamic Valley V_{OH}	C_L = 50pF, V_{IH}= V_{DD}, V_{IL}= 0V	1.8 2.5 3.3	1.5 1.9 2.2	

Capacitance

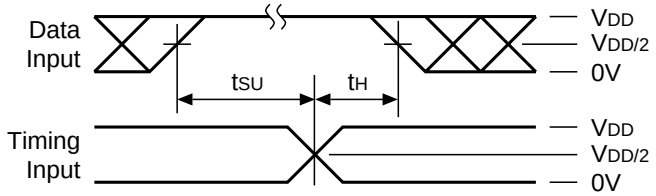
Symbol	Parameter	Conditions	T_A = +25°C, Typical	Units
C_{IN}	Input Capacitance	V_{DD} = 1.8, 2.5V or 3.3V, V_I = 0V or V_{DD}	6	pF
C_{OUT}	Output Capacitance	V_I = 0V or V_{DD}, V_{DD} = 1.8V, 2.5V or 3.3V	7	
C_{PD}	Power Dissipation Capacitance	V_I = 0V or V_{DD}, F = 10 MHz V_{DD} = 1.8V, 2.5V or 3.3V	20	

Test Circuits and Switching Waveforms

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



Setup, Hold, and Release Timing



Notes:

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.

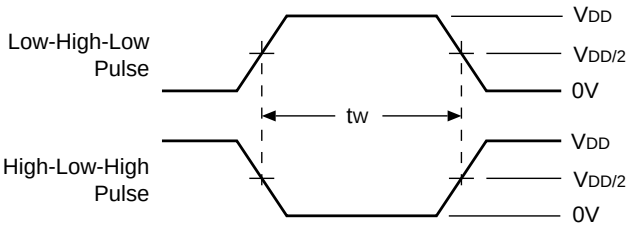
C. All input pulses are supplied by generators having the following characteristics: PRR ≤ 10 MHz, Z_O = 50Ω, t_r ≤ 2ns, t_f ≤ 2ns, ***measured from 10% to 90%, unless otherwise specified.***

D. The outputs are measured one at a time with one transition per measurement.

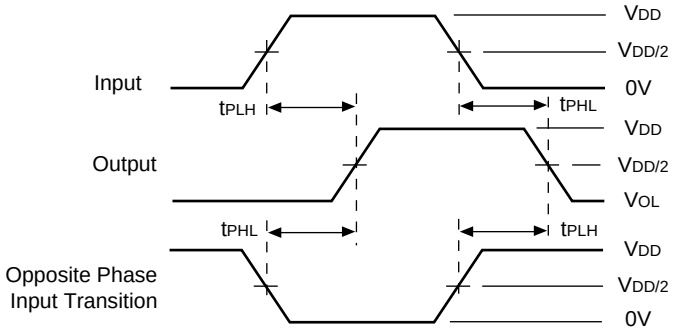
Switch Position

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

Pulse Width



Propagaton Delay



Enable Disable Timing