PI74ALVCH32245

3.3V, 32-Bit Bidirectional Transceiver with 3-State Outputs

Product Features

- PI74ALVCH32245 is designed for low voltage operation
- V_{CC} = 2.3V to 3.6V
- Typical V_{OLP} (Output Ground Bounce) < 0.8V at V_{CC} = 3.3V, T_A = 25°C
- Typical V_{OHV} (Output V_{OH} Undershoot) > 2.0V at V_{CC} = 3.3V, T_A = 25°C
- Bus Hold retains last active bus state during 3-State, eliminating the need for external pullup resistors
- Industrial operation at –40°C to +85°C
- Packages available:
  – 96-ball, 13.5mm x 5.5mm x 1.4mm low profile fine pitch ball grid array, LFBGA (NB)

Product Description

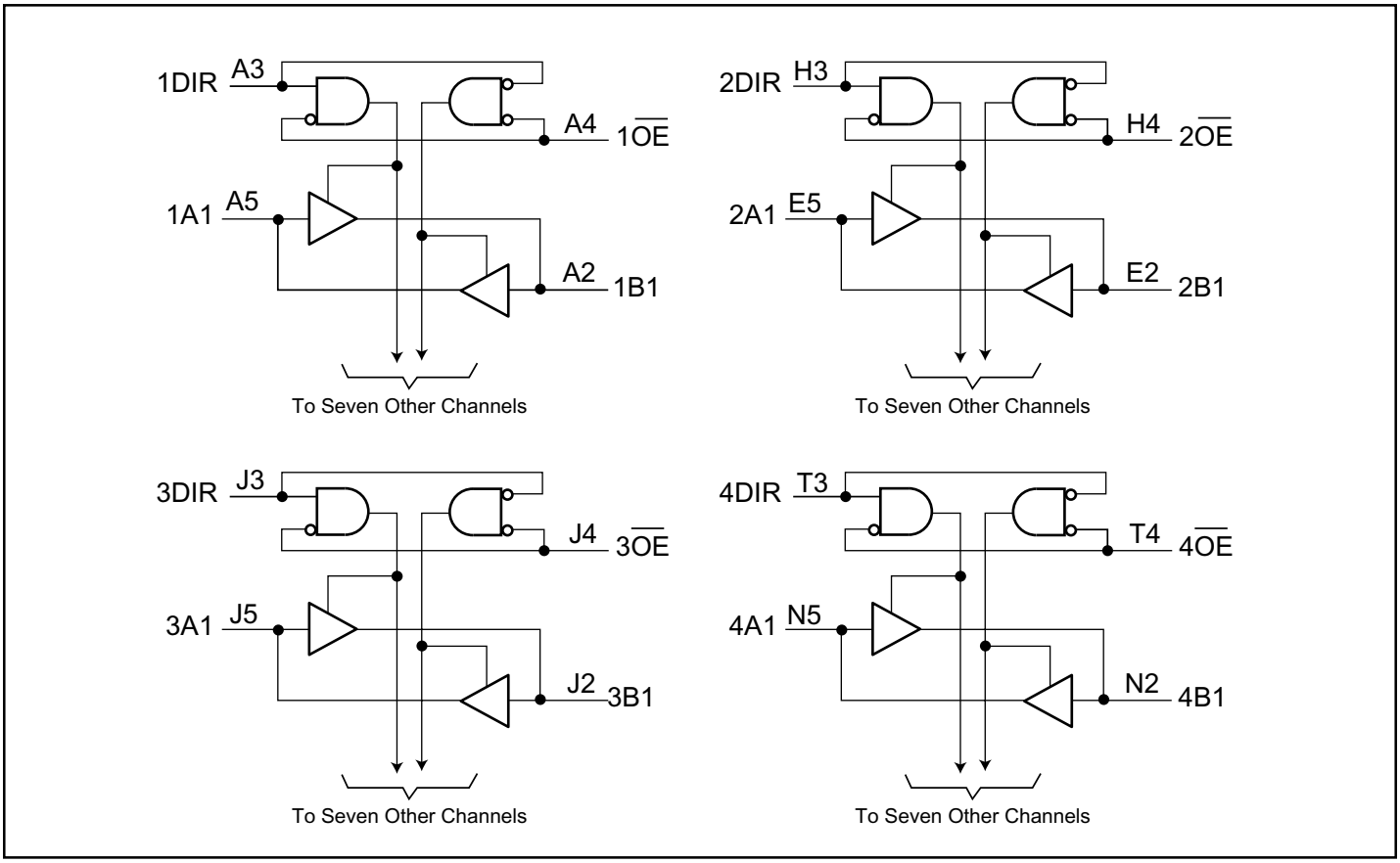
Pericom Semiconductor's PI74ALVCH series of logic circuits are produced using the Company's advanced 0.5 micron CMOS technology, achieving industry leading speed grades.

The PI74ALVCH32245 is a 32-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 four independent 8-bit transceivers, two 16-Bit transceivers, or one 32-Bit transceiver. The output enable ($\overline{OE}$) input, when HIGH, disables both A and B ports by placing them in HIGH Z condition.

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

Active bus-hold circuitry is provided to hold unused or floating data inputs at a valid logic level.

Logic Block Diagram (Positive Logic)



Product Pin Description

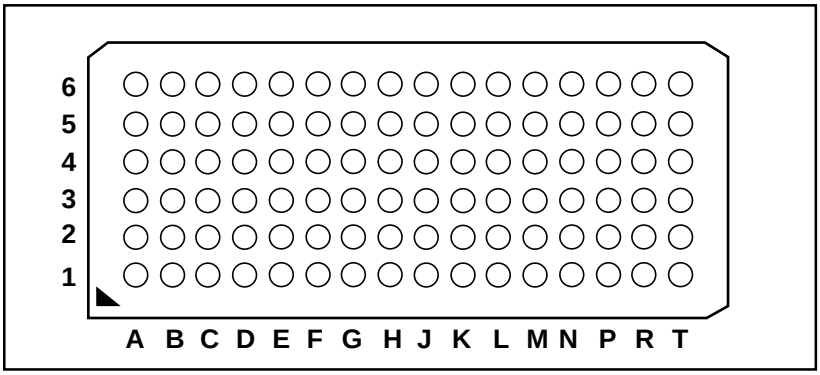
Pin Name	Description
x$\overline{OE}$	3-State Output Enable Inputs (Active LOW)
xDIR	Direction Control Input
xAx	Side A Inputs or 3-State Inputs
xBx	Side B Outputs or 3-State Outputs
GND	Ground
V_{CC}	Power

Truth Table[1]

Inputs[1]		Outputs[1]
x$\overline{OE}$	xDIR	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	Z

Notes:
1. H = High Voltage Level
   L = Low Voltage Level
   X = Don't Care
   Z = High Impedance

NB Package (Top View)



Terminal Assignments

6	1A2	1A4	1A6	1A8	2A2	2A4	2A6	2A7	3A2	3A4	3A6	3A8	4A2	4A4	4A6	4A7
5	1A1	1A3	1A5	1A7	2A1	2A3	2A5	2A8	3A1	3A3	3A5	3A7	4A1	4A3	4A5	4A8
4	1$\overline{OE}$	GND	V_{CC}	GND	GND	V_{CC}	GND	2$\overline{OE}$	3$\overline{OE}$	GND	V_{CC}	GND	GND	V_{CC}	GND	4$\overline{OE}$
3	1DIR	GND	V_{CC}	GND	GND	V_{CC}	GND	2DIR	3DIR	GND	V_{CC}	GND	GND	V_{CC}	GND	4DIR
2	1B1	1B3	1B5	1B7	2B1	2B3	2B5	2B8	3B1	3B3	3B5	3B7	4B1	4B3	4B5	4B8
1	1B2	1B4	1B6	1B8	2B2	2B4	2B6	2B7	3B2	3B4	3B6	3B8	4B2	4B4	4B6	4B7
	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	T

Maximum Ratings

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

Supply Voltage Range, V_{CC}	–0.5V to 4.6V
Input Voltage Range, V_I: Except I/O ports (1)	–0.5V to 4.6V
I/O ports (1,2)	–0.5V to V_{CC} + 0.5V
Output Voltage Range, 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	±50mA
Continuous Current through each V_{CC} or GND	±100mA
Package Thermal Impedance, θ_{JA} (3)	40ºC/W
Storage Temperature Range, T_{STG}	–65ºC to 150ºC

Note:
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.

Note:
1. The input negative voltage and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. This value is limited to 4.6V maximum.
3. The package thermal impedance is calculated in accordance with JESD 51.

Recommended Operating Conditions(1)

Parameters	Description	Test Conditions	Min.	Typ.	Max.	Units
V_{CC}	Supply Voltage		2.3		3.6	V
V_{IH}	Input HIGH Voltage	V_{CC} = 2.3V to 2.7V	1.7			
		V_{CC} = 2.7V to 3.6V	2.0			
V_{IL}	Input LOW Voltage	V_{CC} = 2.3V to 2.7V			0.7	
		V_{CC} = 2.7V to 3.6V			0.8	
V_{IN}	Input Voltage		0		V_{CC}	
V_{OUT}	Output Voltage		0		V_{CC}	
I_{OH}	Output HIGH Current	V_{CC} = 2.3V			–12	mA
		V_{CC} = 2.7V			–12	
		V_{CC} = 3.0V			–24	
I_{OL}	Output LOW Current	V_{CC} = 2.3V			12	
		V_{CC} = 2.7V			12	
		V_{CC} = 3.0V			24	
$\Delta t/\Delta V$	Input Transition Rise or Fall Rate		0		10	ns/V
T_A	Operating Free-Air Temperature		–40		85	°C

Note 1: All unused inputs must be held at V_{CC} or GND to ensure proper device operation

DC Electrical Characteristics (Over the Operating Range, $T_A = –40°C$ to $+85°C$, $V_{CC} = 3.3V \pm 10\%$)

Parameters	Description	Test Conditions[1]	Min.	Typ.[2]	Max.	Units
V_{OH}	Output HIGH Voltage	I_{OH} = -100µA, V_{CC} = Min. to Max.	V_{CC}- 0.2			V
		V_{IH} = 1.7V, I_{OH} = -6mA, V_{CC} = 2.3V	2.0			
		V_{IH} = 1.7V, I_{OH} = -12mA, V_{CC} = 2.3V	1.7			
		V_{IH} = 2.0V, I_{OH} = -12mA, V_{CC} = 2.7V	2.2			
		V_{IH} = 2.0V, I_{OH} = -12mA, V_{CC} =3.0V	2.4			
		V_{IH} = 2.0V, I_{OH} = -24mA, V_{CC} =3.0V	2.0			
V_{OL}	Output LOW Voltage	I_{OL} = -100µA, V_{IL} = Min. to Max.			0.2	
		V_{IL} = 0.7V, I_{OL} = 6mA, V_{CC} = 2.3V			0.4	
		V_{IL} = 0.7V, I_{OL} = 12mA, V_{CC} = 2.3V			0.7	
		V_{IL} = 0.8V, I_{OL} = 12mA, V_{CC} = 2.7V			0.4	
		V_{IL} = 0.8V, I_{OL} = 24mA, V_{CC} =3.0V			0.55	
I_{IN}	Input Current	V_{IN} = V_{CC} or GND, V_{CC} = 3.6V			±5	µA
I_{IN} (HOLD)	Input Hold Current	V_{IN} = 0.7V, V_{CC} = 2.3V	45			
		V_{IN} = 1.7V, V_{CC} = 2.3V	–45			
		V_{IN} = 0.8V, V_{CC} = 3.0V	75			
		V_{IN} = 2.0V, V_{CC} = 3.0V	–75			
		V_{IN} = 0 to 3.6V, V_{CC} = 3.6V[3]			±500	
I_{OZ}	Output Current (3-State Outputs)	V_{OUT} = V_{CC} or GND, V_{CC} = 3.6V			±10	
I_{CC}	Supply Current	V_{CC} = 3.6V, I_{OUT} = 0µA, V_{IN} = GND or V_{CC}			40	
ΔI_{CC}	Supply Current per Input @ TTL HIGH	V_{CC} = 3.0V to 3.6V One Input at V_{CC} - 0.6V Other Inputs at V_{CC} or GND			750	
C_I	Control Inputs	V_{IN} = V_{CC} or GND, V_{CC} = 3.3V		4		pF
C_{IO}	A or B Ports	V_O = V_{CC} or GND, V_{CC} = 3.3V		8		

Notes:

1. For Min. or Max conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3V$, +25°C ambient and maximum loading.
3. This is the bushold maximum dynamic current. It is the mimum overdrive current necessary to switch the input from one state to another.

Switching Characteristics over Operating Range[1]

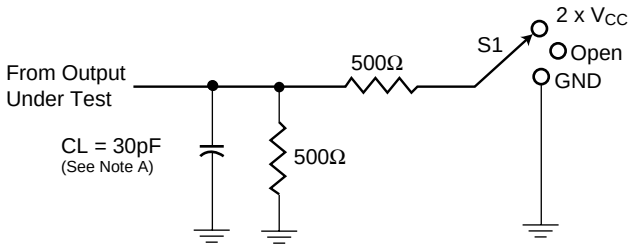
Parameters	From (INPUT)	To (OUTPUT)	V_{CC} = 2.5V ± 0.2V		V_{CC} = 2.7V		V_{CC} = 3.3V ± 0.3V		Units
			Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.	
t_{PD}	A or B	B or A	1.0	3.7		3.6	1.0	3.0	ns
t_{EN}	$\overline{OE}$	B or A	1.0	5.7		5.4	1.0	4.4	
t_{DIS}	$\overline{OE}$	B or A	1.5	5.2		4.6	1.0	4.1	

Notes:
1. See test circuit and waveforms, Figures 1 and 2.
2. Minimum limits are guaranteed but not tested on Propagation Delays.

Operating Characteristics, $T_A = 25°C$

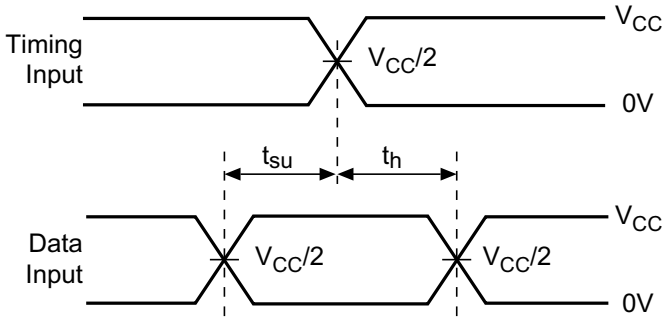
Parameter		Test Conditions	V_{CC} = 2.5V ± 0.2V	V_{CC} = 3.3V ± 0.3V	Units
			Typical		
C_{PD} Power Dissipation Capacitance	Outputs Enabled	C_L = 50pF, f = 10 MHz	44	58	pF
	Outputs Disabled		8	10	

PARAMETER MEASUREMENT INFORMATION
V_{CC} = 2.5V ±0.2V

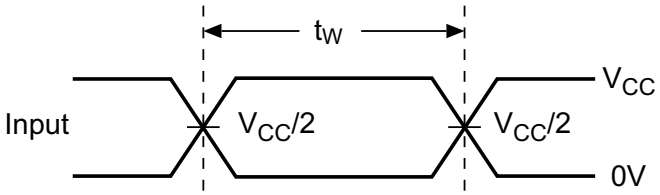


Test	S1
t_{pd}	Open
t_{PLZ}/t_{PZH}	2 x V_{CC}
t_{PHZ}/t_{PZH}	GND

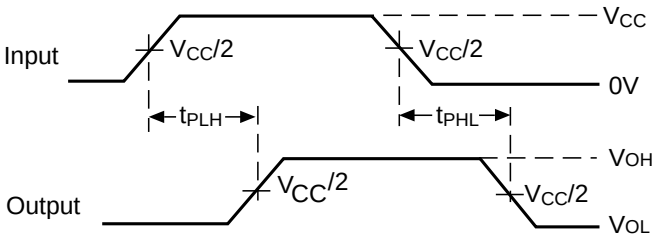
Load Circuit



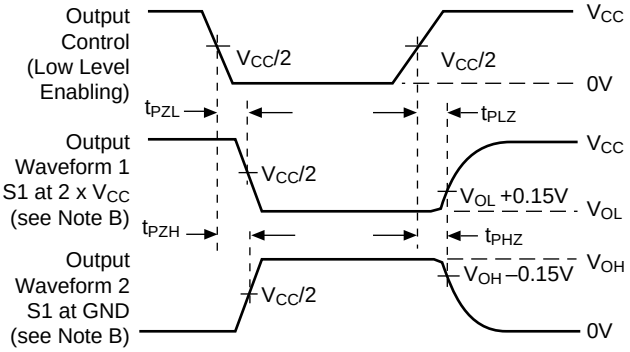
Voltage Waveforms
Setup and Hold Times



Voltage Waveforms
Pulse Duration



Voltage Waveforms
Propagation Delay Times



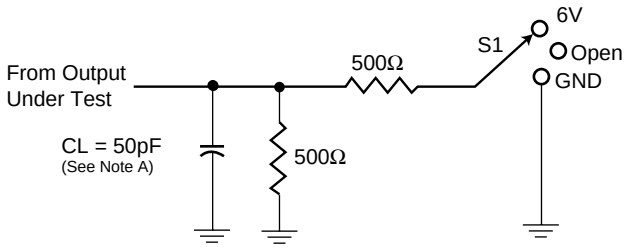
Voltage Waveforms
Enable and Disable Times

Figure 1. Load Circuit and Voltage Waveforms

Notes:

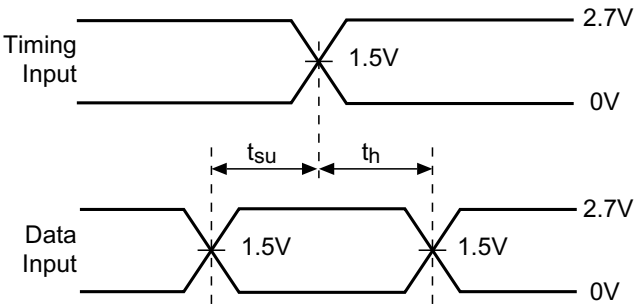
A. C_L includes probe and jig capacitance.
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
C. All input impulses are supplied by generators having the following characteristics: PRR ≤ MHz, Z_O = 50Ω, t_R ≤ 2.0ns, t_F ≤ 2.0ns.
D. The outputs are measured one at a time with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}
F. t_{PZL} and t_{PZH} are the same as t_{en}
G. t_{PLH} and t_{PHL} are the same as t_{pd}

PARAMETER MEASUREMENT INFORMATION
V_{CC} = 2.7V and 3.3V ±0.3V

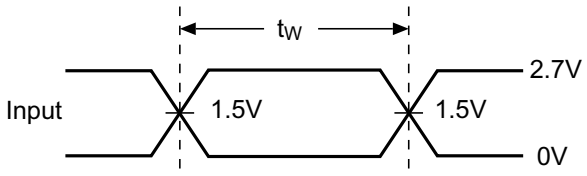


Test	S1
t_{pd}	Open
t_{PLZ}/t_{PZH}	6V
t_{PHZ}/t_{PZH}	GND

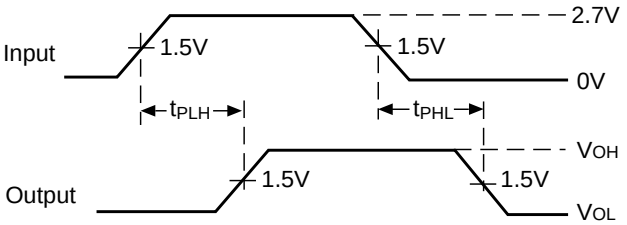
Load Circuit



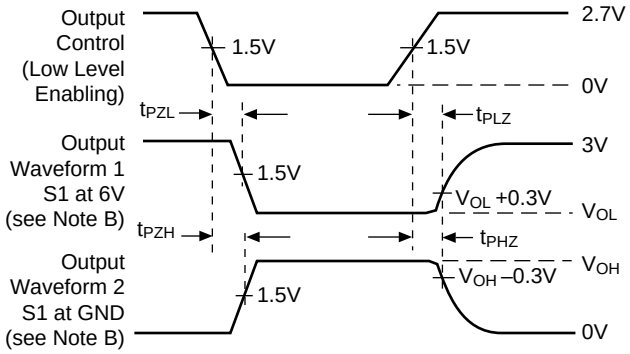
Voltage Waveforms
Setup and Hold Times



Voltage Waveforms
Pulse Duration



Voltage Waveforms
Propagation Delay Times



Voltage Waveforms
Enable and Disable Times

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.
C. All input impulses are supplied by generators having the following characteristics: PRR ≤ MHz, Z_O = 50Ω, t_R ≤ 2.5ns, t_F ≤ 2.5ns.
D. The outputs are measured one at a time with one transition per measurement.
E. t_{PLZ} and t_{PHZ} are the same as t_{dis}
F. t_{PZL} and t_{PZH} are the same as t_{en}
G. t_{PLH} and t_{PHL} are the same as t_{pd}