

16-Bit Registered Transceiver With 3-STATE Outputs

Product Features

- PI74ALVCH16952 is designed for low voltage operation
- $V_{CC} = 2.3V$ to $3.6V$
- Hysteresis on all inputs
- Typical V_{OLP} (Output Ground Bounce)
 $< 0.8V$ at $V_{CC} = 3.3V$, $T_A = 25^\circ C$
- Typical V_{OHV} (Output V_{OH} Undershoot)
 $< 2.0V$ at $V_{CC} = 3.3V$, $T_A = 25^\circ C$
- Bus Hold retains last active bus state during 3-STATE eliminating the need for external pullup resistors
- Industrial operation at $-40^\circ C$ to $+85^\circ C$
- Packages available:
 - 48-pin 240 mil wide plastic TSSOP (A)
 - 48-pin 300 mil wide plastic SSOP (V)

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.

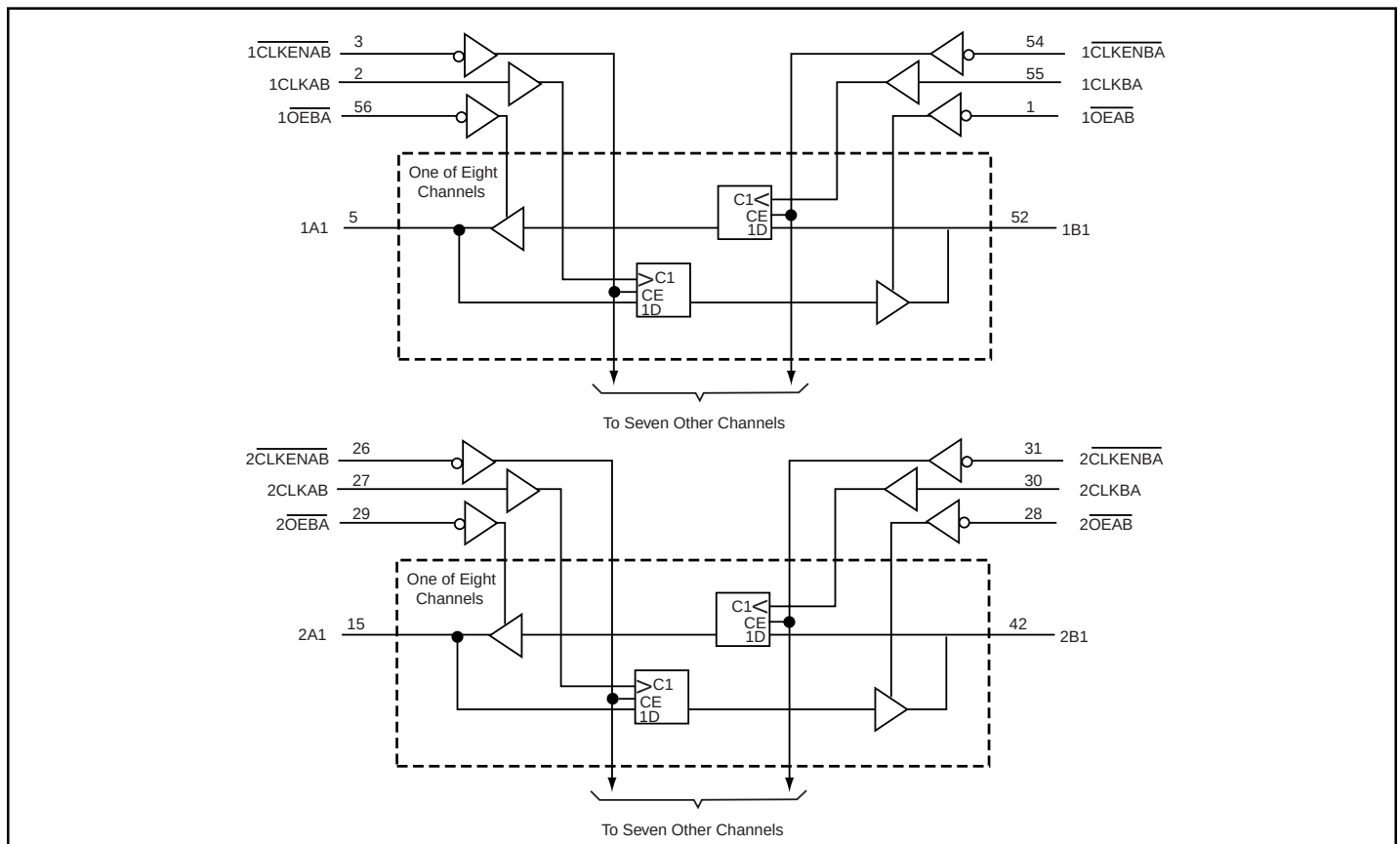
The PI74ALVCH16952 16-bit registered transceiver is designed for 2.3V to 3.6V V_{CC} operation.

The product contains two sets of D-type flip-flops for temporary storage of data flowing in either direction. The device can be used as two 8-bit transceivers or one 16-bit transceiver. Data on the A or B bus is stored in the registers on the low-to-high transition of the clock ($\overline{CLKAB}$ or $\overline{CLKBA}$) input provided that the clock-enable ($\overline{CLKENAB}$ or $\overline{CLKENBA}$) input is low. Taking the output-enable ($\overline{OEAB}$ or $\overline{OEBA}$) input low accesses the data on either port.

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 capability of the driver.

The PI74ALVCH16952 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
$\overline{\text{CLKEN}}$	Clock Enable Input (Active LOW)
$\overline{\text{OE}}$	Output Enable Input (Active LOW)
CLK	Clock Input (Active HIGH)
Ax	Data I/O
Bx	Data I/O
GND	Ground
VCC	Power

Truth Table^{(1)†}

Inputs				Output B
CLKENAB	CLKAB	OEAB	A	
H	X	L	X	B ₀ ‡
X	L	L	X	B ₀ ‡
L	↑	L	L	L
L	↑	L	H	H
X	X	H	X	Z

Product Pin Configuration

$\overline{1\text{OEAB}}$	1	56	$\overline{1\text{OEBA}}$
$\overline{1\text{CLKAB}}$	2	55	$\overline{1\text{CLKBA}}$
$\overline{1\text{CLKENAB}}$	3	54	$\overline{1\text{CLKENBA}}$
GND	4	53	GND
1A1	5	52	1B1
1A2	6	51	1B2
VCC	7	50	VCC
1A3	8	49	1B3
1A4	9	48	1B4
1A5	10	47	1B5
GND	11	46	GND
1A5	12	45	1B6
1A7	13	44	1B7
1A8	14	43	1B8
2A1	15	42	2B1
2A2	16	41	2B2
2A3	17	40	2B3
GND	18	39	GND
2A4	19	38	2B4
2A5	20	37	2B5
2A6	21	36	2B6
VCC	22	35	VCC
2A7	23	34	2B7
2A8	24	33	2B8
GND	25	32	GND
$\overline{2\text{CLKENAB}}$	26	31	$\overline{2\text{CLKENBA}}$
$\overline{2\text{CLKAB}}$	27	30	$\overline{2\text{CLKBA}}$
$\overline{2\text{OEAB}}$	28	29	$\overline{2\text{OEBA}}$

Note:

- H = High Signal Level
L = Low Signal Level
Z = High Impedance
↑ = LOW-to-HIGH Transition

† A-to-B data flow is shown: B-to-A flow is similar but uses $\overline{\text{OEBA}}$, $\overline{\text{CLKBA}}$, and $\overline{\text{CLKENBA}}$.

‡ Output level of B before the indicated steady-state input conditions were established.

Maximum Ratings

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

Storage Temperature	-65°C to +150°C
Ambient Temperature with Power Applied	-40°C to +85°C
Input Voltage Range, V_{IN}	-0.5V to $V_{CC} + 0.5V$
Output Voltage Range, V_{OUT}	-0.5V to $V_{CC} + 0.5V$
DC Input Voltage	-0.5V to +5.0V
DC Output Current	100mA
Power Dissipation	1.0W

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.

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}	High-level Output Current	$V_{CC} = 2.3V$			-12	mA
		$V_{CC} = 2.7V$			-12	
		$V_{CC} = 3.0V$			-24	
I_{OL}	Low-level Output Current	$V_{CC} = 2.3V$			12	
		$V_{CC} = 2.7V$			12	
		$V_{CC} = 3.0V$			24	
T_A	Operating Free-Air Temperature		-40		85	°C

Note:

- Unused control inputs must be held HIGH or LOW to prevent them from floating.

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

Parameters	Test Conditions		V _{CC} ⁽¹⁾	Min.	Typ. ⁽²⁾	Max.	Units
V _{OH}	I _{OH} = -100 μA		Min. to Max.	V _{CC} -0.2			V
	I _{OH} = -6 mA	V _{IH} = 1.7V	2.3V	2.0			
	I _{OH} = -12 mA	V _{IH} = 1.7V	2.3V	1.7			
		V _{IH} = 2.0V	2.7V	2.2			
		V _{IH} = 2.0V	3.0V	2.4			
	I _{OH} = -24 mA	V _{IH} = 2.0V	3.0V	2.0			
V _{OL}	I _{OL} = 100 μA		Min. to Max.			0.2	V
	I _{OL} = 6 mA	V _{IL} = 0.7V	2.3V			0.4	
	I _{OL} = 12 mA	V _{IL} = 0.7V	2.3V			0.7	
		V _{IL} = 0.8V	2.7V			0.4	
	I _{OL} = 24 mA	V _{IL} = 0.8V	3.0V			0.55	
I _I	V _I = V _{CC} or GND		3.6V			±5	μA
I _I (Hold) ⁽³⁾	V _I = 0.7V		2.3V	45			
	V _I = 1.7V			-45			
	V _I = 0.8V		3.0V	75			
	V _I = 2.0V			-75			
	V _I = 0 to 3.6V		3.6V			±500	
I _{OZ} ⁽⁴⁾	V _O = V _{CC} or GND		3.6V			±10	
I _{CC}	V _I = V _{CC} or GND	I _O = 0	3.6V			40	
ΔI _{CC}	One input at V _{CC} - 0.6V, Other inputs at V _{CC} or GND		3V to 3.6V			750	pF
C _I Control Inputs	V _I = V _{CC} or GND		3.3V		3.5		
C _{IO} A or B ports	V _O = V _{CC} or GND		3.3V		8.5		

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3\text{V}$, $+25^\circ\text{C}$ ambient and maximum loading.
3. Bus Hold maximum dynamic current required to switch the input from one state to another.
4. For I/O ports, the I_{OZ} includes the input leakage current.

Timing Requirements over Operating Range

Parameters	Description	$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 2.7V$		$V_{CC} = 3.3V \pm 0.3V$		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
f_{CLOCK}	Clock frequency	0	150	0	150	0	150	MHz
t_W Pulse Duration	$\overline{CLKEN}$ high	3.3		3.3		3.3		ns
	CLK high or low	3.3		3.3		3.3		
t_{SU} Setup time	Data before CLK	1.7		1.9		1.5		
	$\overline{CLKEN}$ before CLK	1.2		1.0		1.0		
t_H Hold time	Data after CLK	0.6		0.6		0.8		
	$\overline{CLKEN}$ after CLK	1.1		0.9		1.1		
$\Delta t/\Delta v^{(1)}$	Input Transition Rise or Fall	0	10	0	10	0	10	ns/V

Notes:

1. See test circuit and waveforms.

Switching Characteristics Over Operating Range⁽¹⁾

Parameters	From (Input)	To (Output)	$V_{CC} = 2.5V \pm 0.2V$		$V_{CC} = 2.7V$		$V_{CC} = 3.3V \pm 0.3V$		Units
			Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	Min. ⁽²⁾	Max.	
f_{MAX}			150		150		150		MHz
t_{PD}	CLK	A or B	1.0	4.1		4.6	1.0	3.9	ns
t_{EN}	$\overline{OEBA}$ or $\overline{OEAB}$			5.4		5.3	1.0	4.4	
t_{DIS}	$\overline{OEBA}$ or $\overline{OEAB}$			5.3		4.4	1.1	4.0	

Notes:

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

Operating Characteristics, $T_A = 25^\circ C$

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	53	71	pF
	Outputs Disabled		34	40	