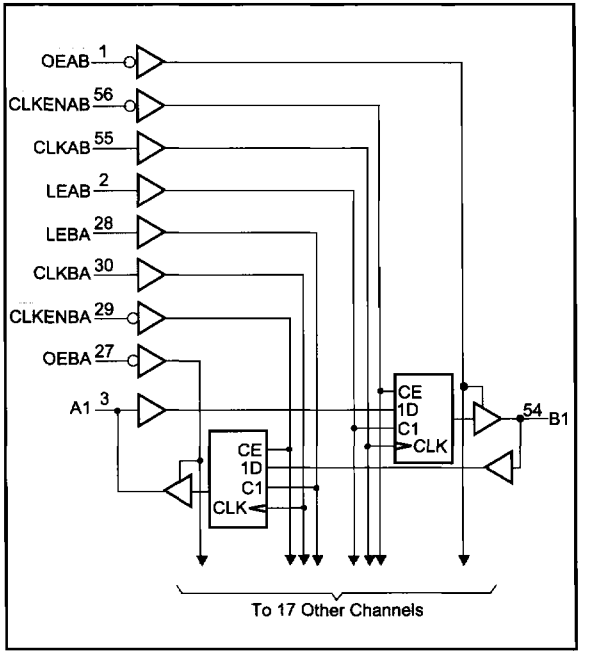
18-Bit Universal Bus Transceiver With 3-State Outputs

Product Features

- PI74ALVCH162601 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°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:
  – 56-pin 240 mil wide plastic TSSOP (A56)
  – 56-pin 300 mil wide plastic SSOP (V56)

Logic Block Diagram



Product Description

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

The PI74ALVCH162601 uses D-type latches and D-type flip-flops with 3-state outputs to allow data flow in transparent, latched, and clocked modes.

Data flow in each direction is controlled by Output Enable ($\overline{OEAB}$ and $\overline{OEBA}$), Latched Enable (LEAB and LEBA), and Clock (CLKAB and $\overline{CLKBA}$) inputs. The clock can be controlled by the Clock Enable (CLKENAB and $\overline{CLKENBA}$) inputs. For A-to-B data flow, the device operates in the transparent mode when LEAB is HIGH. When LEAB is LOW, the A data is latched if CLKAB is held at a high or low logic level. If LEAB is low, the A-bus is stored in the latch/flip-flop on the low-to-high transition of CLKAB. When $\overline{OEAB}$ is low, the outputs are active. When $\overline{OEAB}$ is HIGH, the outputs are in the high-impedance state.

Data flow for B to A is similar to that of A to B but uses $\overline{OEBA}$, LEBA, $\overline{CLKBA}$, and $\overline{CLKENBA}$.

To reduce overshoot and undershoot, the B-port outputs include 26Ω series resistors.

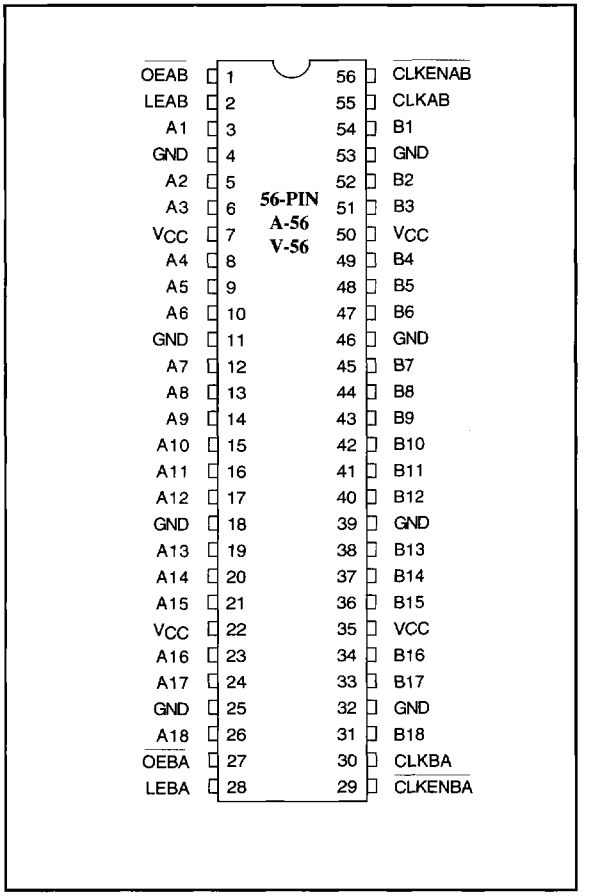
To ensure the high-impedance state during power up or power down, $\overline{OE}$ should be tied to Vcc through a pull-up resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

The PI74ALVCH162601 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.

Product Pin Description

Pin Name	Description
$\overline{CLKEN}$	Clock Enable Input (Active LOW)
$\overline{OE}$	Output Enable Input (Active LOW)
LE	Latch Enable (Active HIGH)
CLK	Clock Input (Active HIGH)
Ax	Data I/O
Bx	Data I/O
GND	Ground
VCC	Power

Product Pin Configuration



Truth Table[1]†

Inputs					Output B
CLKENAB	OEAB	LEAB	CLKAB	A	
X	H	X	X	X	Z
X	L	H	X	L	L
X	L	H	X	H	H
H	L	L	X	X	B_0‡
H	L	L	X	X	B_0‡
L	L	L	↑	L	L
L	L	L	↑	H	H
L	L	L	L	X	B_0‡
L	L	L	H	X	B_0§

Notes:

1. 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 OEBA, LEBA, CLKBA, and $\overline{CLKENBA}$.
‡ Output level before the indicated steady-state input conditions were established.
§ Output level before the indicated steady-state input conditions were established, provided that CLKAB is LOW before LEAB goes LOW.

Maximum Ratings

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

Storage Temperature	–65°C to +150°C
Supply Voltage Range, V_{CC}	–0.5V to 4.6V
Input Voltage Range, V_I:	
Except I/O ports (See Note 1):	–0.5V to 4.6V
I/O ports (See Notes 1 and 2)	–0.5V to V_{CC}+0.5V
Output Voltage Range, V_O (See Notes 1 and 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 or V_O>V_{CC})	±50mA
Continous Output Current, I_O (V_O=0 to V_{CC})	±50mA
Continous Current through each V_{CC} or GND	±100mA
Maximum Power Dissipation:	
A package	1W
V package	1.4W

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.

Notes:

1. The input and output negative-voltage ratings maybe exceeded if the input and outputclamp-current ratings are observed.
2. This value is limited to 4.6V maximum.
3. The maximumpackage power dissipation is calculated using a junction temperature of 150°C and a board trace lengthof 750mils.

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 (A Port)	V_{CC} = 2.3V			-12	mA
		V_{CC} = 2.7V			-12	
		V_{CC} = 3.0V			-24	
I_{OL}	Low-level Output Current (A Port)	V_{CC} = 2.3V			12	
		V_{CC} = 2.7V			12	
		V_{CC} = 3.0V			24	
I_{OH}	High-level Output Current (B Port)	V_{CC} = 2.3V			-6	
		V_{CC} = 2.7V			-8	
		V_{CC} = 3.0V			-12	
I_{OL}	Low-level Output Current (B Port)	V_{CC} = 2.3V			6	
		V_{CC} = 2.7V			8	
		V_{CC} = 3.0V			12	
T_A	Operating Free-Air Temperature		-40		85	°C

Note:

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

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

Parameters	Test Conditions		V_{CC}[1]	Min.	Typ.[2]	Max.	Units
V_{OH} (B Port)	I_{OH} = -100 µA		Min. to Max.	V_{CC} -0.2			V
	I_{OH} = -4 mA	V_{IH} = 1.7V	2.3V	1.9			
	I_{OH} = -6 mA	V_{IH} = 1.7V	2.3V	1.7			
		V_{IH} = 2.0V	3.0V	2.4			
	I_{OH} = -8 mA	V_{IH} = 2.0V	2.7V	2.0			
	I_{OH} = -12 mA	V_{IH} = 2.0V	3.0V	2.0			
V_{OH} (A Port)	I_{OH} = -100 µA		Min. to Max.	V_{CC} -0.2			
	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} (B Port)	I_{OL} = 100 µA		Min. to Max.			0.2	
	I_{OL} = 4 mA	V_{IL} = 0.7V	2.3V			0.4	
	I_{OL} = 6 mA	V_{IL} = 0.7V	2.3V			0.55	
		V_{IL} = 0.8V	3.0V			0.55	
	I_{OL} = 8 mA	V_{IL} = 0.8V	2.7V			0.6	
	I_{OL}= 12 mA	V_{IL} = 0.8V	3.0V			0.8	
V_{OL} (A Port)	I_{OL} = 100 µA		Min. to Max.			0.2	
	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	
C_I Control Inputs	$V_I = V_{CC}$ or GND		3.3V		4		pF
C_{IO} A or B ports	$V_O = V_{CC}$ or GND		3.3V		8		

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at $V_{CC} = 3.3V$, $+25°C$ 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 ± 0.2V		V_{CC} = 2.7V		V_{CC} = 3.3V ± 0.3V		Units
		Min.	Max.	Min.	Max.	Min.	Max.	
f_{CLOCK}	Clock frequency	0	140	0	150	0	150	MHz
t_W Pulse Duration	LE 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 high	2.3		2.4		2.1		
	Data before LE low, CLK high	2.0		1.6		1.6		
	Data before LE low, CLK low	1.3		1.2		1.1		
	CLKEN before CLK high	2.0		2.0		1.7		
t_H Hold time	Data after CLK high	0.7		0.7		0.8		
	Data after LE low, CLK high	1.3		1.6		1.4		
	Data after LE low, CLK low	1.7		2.0		1.7		
	CLKEN after CLK high	0.3		0.5		0.6		
$\Delta t/\Delta v$(1)	Input Transition Rise or Fall	0	10	0	10	0	10	ns/V

Note:
1. Unused control inputs must be held HIGH or LOW to prevent them from floating.

Switching Characteristics over Operating Range[1]

Parameters	From(INPUT)	To(OUTPUT)	V_{CC} = 2.5V ±0.2V		V_{CC} = 2.7V		V_{CC} = 3.3 V ± 0.3V		Units
			Min.[2]	Max.	Min.[2]	Max.	Min.[2]	Max.	
f_{MAX}			140		150		150		MHz
t_{PD}	A	B	1.8	5.4		5.2	1.6	4.5	ns
t_{PD}	B	A	1.3	4.9		4.6	1	4.1	
t_{PD}	LEAB	B	1.5	6.1		5.9	1.5	5.1	
t_{PD}	LEBA	A	1.4	5.6		5.3	1	4.7	
t_{PD}	CLKAB	B	2	6.7		6.3	1.6	5.5	
t_{PD}	CLKBA	A	1.8	6.2		5.8	1.4	5	
t_{EN}	$\overline{OEAB}$	B	1.7	6.6		6.7	1.6	5.7	
t_{DIS}	$\overline{OEAB}$	B	2.5	5.9		5.3	1.8	4.8	
t_{EN}	$\overline{OEBA}$	A	1.2	6		6.1	1.1	5.2	
t_{DIS}	$\overline{OEBA}$	A	2.1	5.4		4.8	1.6	4.4	

Notes:
1. See test circuit and wave forms.
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	41	50	pF
	Outputs Disabled		6	6	