



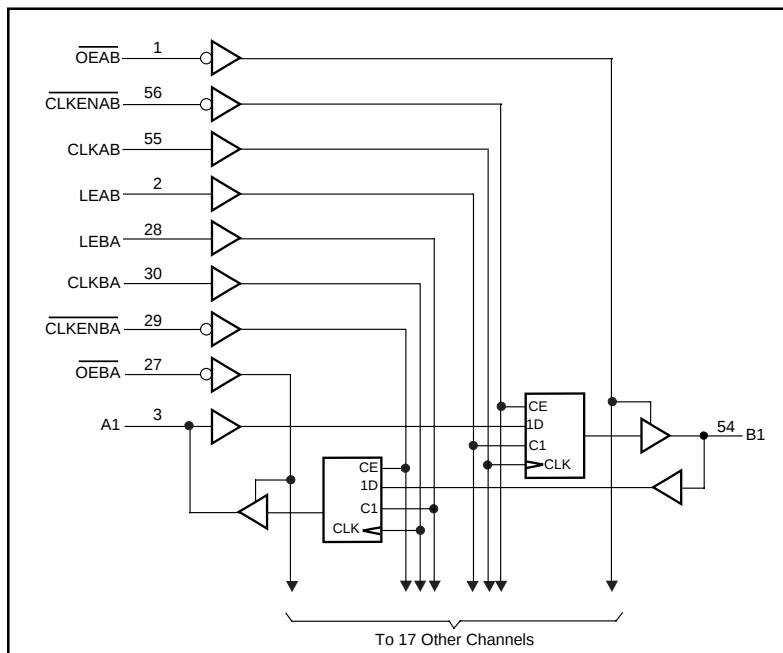
PI74FCT16322601

18-Bit Universal Bus Transceiver With 3-State Outputs

Product Features

- PI74FCT16322601 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 $V_{CC}=3.3V$, $T_A=25^{\circ}C$
- Inputs/Outputs have equivalent 26 ohm series resistors,
no external resistors are required.
- Bus Hold retains last active bus state during 3-state
eliminates the need for external pullup resistors
- Industrial operation at $-40^{\circ}C$ to $+85^{\circ}C$
- 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 PI74FCT3 series of logic circuits are produced in the Company's advanced 0.5 micron CMOS technology, achieving industry leading speed.

The PI74FCT16322601 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 ($\overline{LEAB}$ and $\overline{LEBA}$), and Clock ($\overline{CLKAB}$ and $\overline{CLKBA}$) inputs. The clock can be controlled by the Clock Enable ($\overline{CLKENAB}$ and $\overline{CLKENBA}$) inputs. For A-to-B data flow, the device operates in the transparent mode when $\overline{LEAB}$ is HIGH. When $\overline{LEAB}$ is LOW, the A data is latched if $\overline{CLKAB}$ is held at a high or low logic level. If $\overline{LEAB}$ is low, the A-bus is stored in the latch/flip-flop on the high-to-low transition of $\overline{CLKAB}$. 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 $\overline{OEBA}$, $\overline{LEBA}$, $\overline{CLKBA}$, and $\overline{CLKENBA}$.

To reduce overshoot and undershoot, the inputs/outputs include 26Ω series resistors.

To ensure the high-impedance state during power up or power down, 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 PI74FCT16322601 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
$\overline{\text{CLKEN}}$	Clock Enable Input (Active LOW)
$\overline{\text{OE}}$	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

Truth Table^{(1)†}

Inputs					Output B
$\overline{\text{CLKENAB}}$	$\overline{\text{OEAB}}$	LEAB	CLKAB	A	
X	H	X	X	X	Z
X	L	H	X	L	L
X	L	H	$\bar{X}$	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 §

Note:

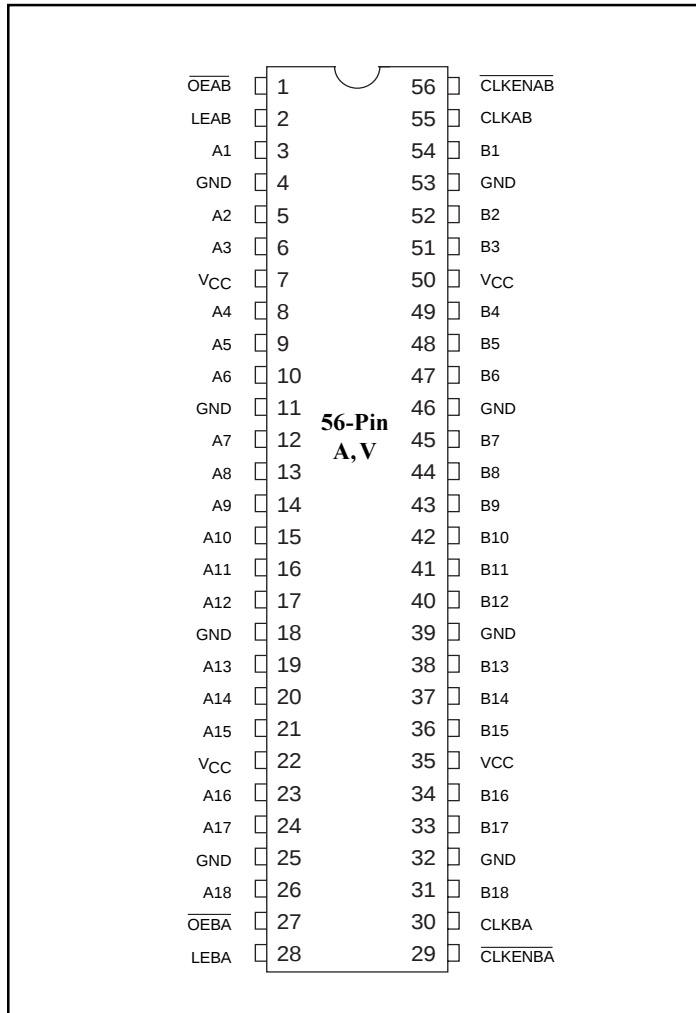
- H = High Signal Level
L = Low Signal Level
Z = High Impedance
↑ = LOW-to-HIGH Transition

† A-to-B data flow is shown: B-to-A flow is similar but uses OEBA, LEBA, CLKBA, and 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.

Product Pin Configuration



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	100 mA
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_{IH}	Input HIGH Voltage	$V_{CC} = 2.3V$ to $2.7V$				V
		$V_{CC} = 2.7V$ to $3.6V$	2.0			
V_{IL}	Input LOW Voltage	$V_{CC} = 2.3V$ to $2.7V$			0.7	V
		$V_{CC} = 2.7V$ to $3.6V$			0.8	
V_{in}	Input Voltage		0		V_{CC}	V
V_{out}	Output Voltage		0		V_{CC}	V
I_{OH}	High-level Output Current	$V_{CC} = 2.3V$			-6	mA
		$V_{CC} = 2.7V$			-8	
		$V_{CC} = 3.0V$			-12	
I_{OL}	Low-level Output Current	$V_{CC} = 2.3V$			6	mA
		$V_{CC} = 2.7V$			8	
		$V_{CC} = 3.0V$			12	
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} = −4mA	V _{IH} = 1.7V	2.3V	1.9			
	I _{OH} = −6mA	V _{IH} = 1.7V	2.3V	1.7			
		V _{IH} = 2.0V	3.0V	2.4			
	I _{OH} = −8mA	V _{IH} = 2.0V	2.7V	2.0			
	I _{OH} = −12mA	V _{IH} = 2.0V	3.0V	2.0			
V _{OL}	I _{OL} = 100μA		Min. to Max.	V _{CC} - 0.2		0.2	V
	I _{OL} = 4mA	V _{IL} = 0.7V	2.3V			0.4	
	I _{OL} = 6mA	V _{IL} = 0.7V	2.3V			0.55	
		V _{IL} = 0.8V	3.0V			0.55	
	I _{OL} = 8mA V _{IL} = 0.8V		2.7V			0.6	
	I _{OL} = 12mA	V _{IL} = 0.8V	3.0V			0.8	
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		pF

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	FCT16322601						Units
		Vcc = 2.5 V ±0.2 V		Vcc = 2.7 V		Vcc = 3.3 V ±0.3 V		
		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		
	$\overline{\text{CLKEN}}$ 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		
	$\overline{\text{CLKEN}}$ after CLK high	0.3		0.5		0.6		
Δt/Δv ⁽¹⁾	Input Transition Rise or Fall	0	10	0	10	0	10	ns/V

Note:

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

Switching Characteristics over Operating Range⁽¹⁾

Parameter	From (Input)	To (Output)	V _{CC} = 2.5 V ±0.2 V		V _{CC} = 2.7 V		V _{CC} = 3.3 V ±0.3 V		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	1.8	5.4		5.2	1.6	4.5	ns
t _{pd}	LEAB	B	1.5	6.1		5.9	1.5	5.1	ns
t _{pd}	LEBA	A	1.5	6.1		5.9	1.5	5.1	ns
t _{pd}	CLKAB	B	2	6.7		6.3	1.6	5.5	ns
t _{pd}	$\overline{\text{CLKBA}}$	A	1.2	6.7		6.3	1.6	5.5	ns
t _{en}	$\overline{\text{OEAB}}$	B	1.7	6.6		6.7	1.6	5.7	ns
t _{dis}	$\overline{\text{OEAB}}$	B	2.5	5.9		5.3	1.8	4.8	ns
t _{en}	$\overline{\text{OEBA}}$	A	1.7	6.6		6.7	1.6	5.7	ns
t _{dis}	OEBA	A	2.5	5.9		5.3	1.8	4.8	ns

Notes:

1. See test circuit and waveforms.
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	Typical	
C _{pd} Power Dissipation Capacitance	Outputs Enabled	C _L = 50pF, F = 10 MHz	41	50	pF
	Outputs Disabled		6	6	