

Fast CMOS 3.3V 16-Bit Registered Transceivers

Product Features

- Functionally compatible with FCT3, LVT, and 74 series 16646 families of products
- Tri-State outputs
- 5V Tolerant inputs and outputs
- 2.0V-3.6V V_{CC} supply operation
- Balanced sink and source output drives (24 mA)
- Low ground bounce outputs
- Supports live insertion
- ESD Protection exceeds 2000V, Human Body Model
200V, Machine Model
- Packages available:
 - 56-pin 240-mil wide plastic TSSOP (A)
 - 56-pin 300-mil wide plastic SSOP (V)

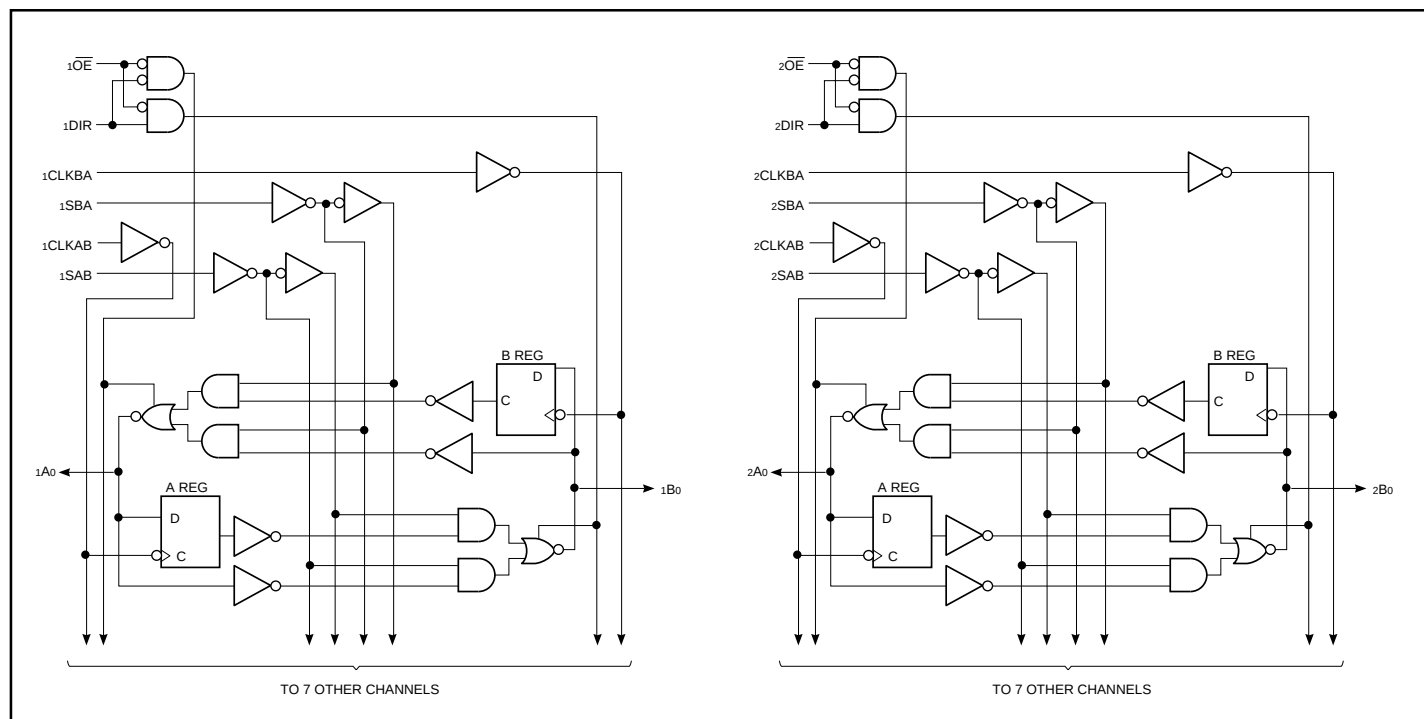
Product Description

Pericom Semiconductor's PI74LCX series of logic circuits are produced in the Company's advanced 0.6 micron CMOS technology, achieving industry leading speed grades.

The PI74LCX16646 is a 16-bit non-inverting, bidirectional registered bus transceiver organized as two independent 8-bit bus transceivers designed with 3-state D-type flip-flops and control circuitry arranged for multiplexed transmission of data directly from the data bus or from the internal storage registers. Each 8-bit transceiver utilizes the enable control ($\overline{xOE}$) and direction pins ($\overline{xDIR}$) to control the transceiver functions. The Select ($\overline{xSAB}$ and $\overline{xSBA}$) control pins are used to select either real-time or stored data transfer. The circuitry used for select control will eliminate the typical decoding glitch that occurs in a multiplexer during the transition between real-time and stored data. A low input level selects real-time data and a high selects stored data.

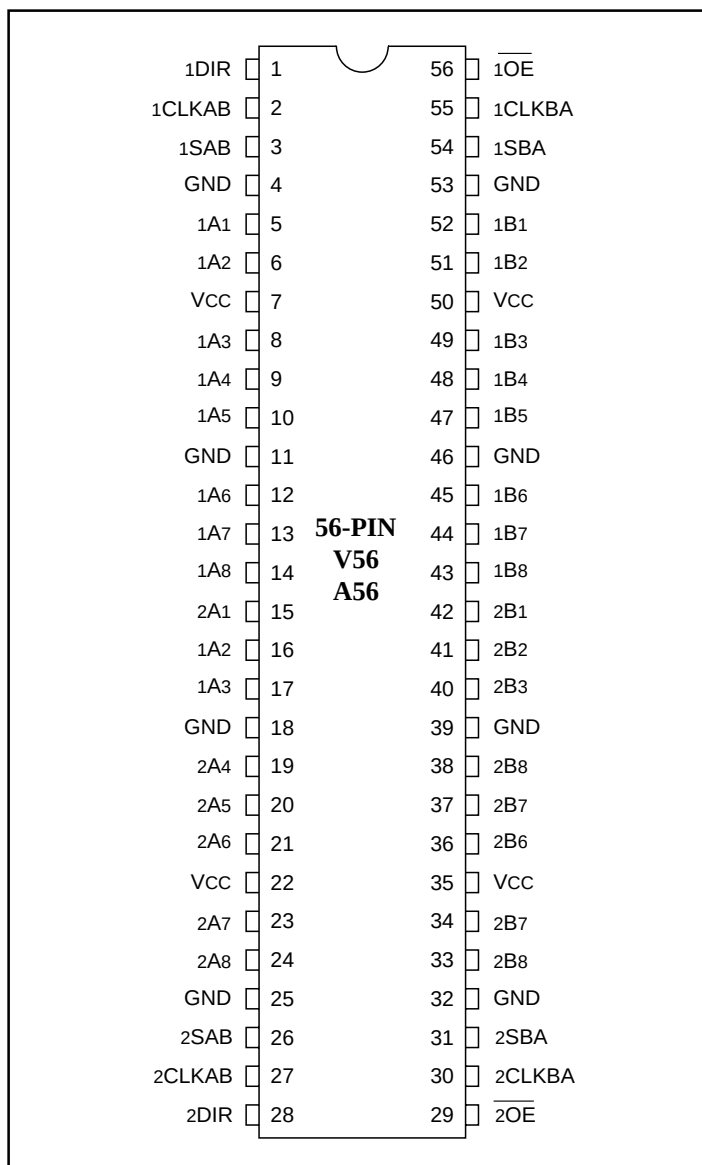
The PI74LCX16646 can be driven from either 3.3V or 5.0V devices allowing this device to be used as a translator in a mixed 3.3/5.0V system.

Logic Block Diagram



Product Pin Description

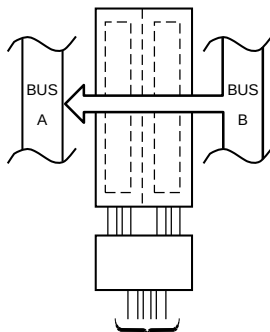
Pin Name	Description
$\overline{xOE}$, $xDIR$	Output Enable Inputs (Active LOW)
$xCLKAB$, $xCLKBA$	Clock Pulse Inputs
$xSAB$, $xSBA$	Output Data Source Select Inputs
xAx	Data Register A Inputs Data Register B Outputs
xBx	Data Register B Inputs Data Register A Outputs
GND	Ground
VCC	Power

Product Pin Configuration

Truth Table⁽²⁾

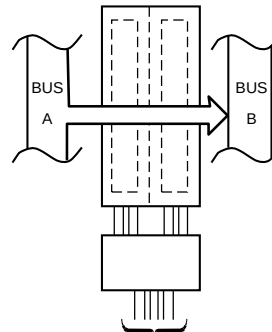
Function	Inputs						Data I/O ⁽¹⁾	
	$\overline{xOE}$	$xDIR$	$xCLKAB$	$xCLKBA$	$xSAB$	$xSBA$	xAx	xBx
Isolation	H	X	H or L	H or L	X	X	Input	Input
Store A and B Data	H	X	↑	↑	X	X		
Real Time B Data to A Bus	L	L	X	X	X	L	Output	Input
Stored B Data to A Bus	L	L	X	H or L	X	H		
Real Time A Data to B Bus	L	H	X	X	L	X	Input	Output
Stored A Data to B Bus	L	H	H or L	X	H	X		

Notes:

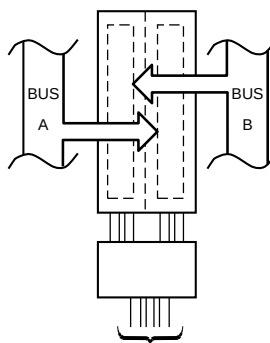
- The data output functions may be enabled or disabled by various signals at the $\overline{xOE}$ or $xDIR$ inputs. Data input functions are always enabled, i.e., data at the bus pins will be stored on every LOW-to-HIGH transition on the clock inputs.
- H = High Voltage Level, X = Don't Care,
L = Low Voltage Level, ↑ = LOW-to-HIGH Transition

**REAL-TIME TRANSFER
BUS B TO A**


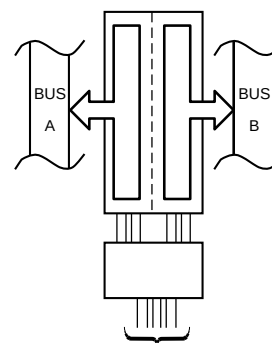
xDIR	xOE	CLKAB	CLKBA	xSAB	xSBA
L	L	X	X	X	L

**REAL-TIME TRANSFER
BUS A TO B**


xDIR	xOE	CLKAB	CLKBA	xSAB	xSBA
H	L	X	X	L	X

**STORAGE FROM
A AND/OR B**


xDIR	xOE	CLKAB	CLKBA	xSAB	xSBA
H	L	↑	X	X	X
L	L	X	↑	X	X
X	H	↑	↑	X	X

**TRANSFER STORES
DATA TO A AND/OR B**


xDIR⁽¹⁾	xOE	CLKAB	CLKBA	xSAB	xSBA
L	L	X	H or L	X	H
H	L	H or L	X	H	X

Note:

1. Cannot transfer data to A bus and B bus simultaneously.

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
Supply Voltage to Ground Potential (Inputs & V _{CC} Only)	–0.5V to +7.0V
Supply Voltage to Ground Potential (Outputs & D/O Only) ...	–0.5V to +7.0V
DC Input Voltage	–0.5V to +7.0V
DC Output Current	120 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

Symbol	Parameter		Min.	Max.	Units
V _{CC}	Supply Voltage	Operating	2.0	3.6	V
		Data Retention	1.5	3.6	
V _I	Input Voltage		0	5.5	
V _O	Output Voltage	HIGH or LOW State	0	V _{CC}	
		TRI-State	0	5.5	
I _{OH} /I _{OL}	Output Current	V _{CC} = 3.0V-3.6V	—	±24	mA
		V _{CC} = 2.7V	—	±12	
T _A	Free-Air Operating Temperature		–40	+85	°C
Δt/ΔV	Input Edge Rate	V = 0.8V-2.0V, V _{CC} = 3.0V	0	10	ns/V

DC Electrical Characteristics (Over the Operating Range, $T_A = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, $V_{CC} = 2.7\text{V}$ to 3.6V)

Parameters	Description	Test Conditions ⁽¹⁾		Min.	Typ ⁽²⁾	Max.	Units
V_{IH}	Input HIGH Voltage	Guaranteed Logic HIGH Level		2.0	—	—	V
V_{IL}	Input LOW Voltage	Guaranteed Logic LOW Level		—	—	0.8	
V_{OH}	Output HIGH Voltage	$V_{CC} = 2.7\text{-}3.6$	$I_{OH} = -0.1\text{mA}$	$V_{CC}-0.2$	—	—	
		$V_{CC} = 2.7$	$I_{OH} = -12\text{mA}$	2.2	—	—	
		$V_{CC} = 3.0$	$I_{OH} = -18\text{mA}$	2.4	—	—	
			$I_{OH} = -24\text{mA}$	2.2	—	—	
V_{OL}	Output LOW Voltage	$V_{CC} = 2.7\text{-}3.6$	$I_{OL} = 0.1\text{mA}$	—	—	0.2	
		$V_{CC} = 2.7$	$I_{OL} = 12\text{mA}$	—	—	0.4	
		$V_{CC} = 3.0$	$I_{OL} = 16\text{mA}$	—	—	0.4	
			$I_{OL} = 24\text{mA}$	—	—	0.55	
V_{IK}	Clamp Diode Voltage	$V_{CC} = \text{Min.}, I_{IN} = -18\text{mA}$		—	-0.7	-1.2	
I_I	Input Leakage Current	$0 \leq V_I \leq 5.5\text{V}$	$V_{CC} = 2.7\text{-}3.6$	—	—	± 5	μA
I_{OZ}	Tri-State Output Leakage	$0 \leq V_O \leq 5.5\text{V}$ $V_I = V_{IH}$ or V_{IL}	$V_{CC} = 2.7\text{-}3.6$	—	—	± 5	
I_{OFF}	Power Down Disable	$V_{CC} = 0\text{V}, V_{IN}$ or $V_{OUT} \leq 5.5\text{V}$		—	—	10	
I_{CC}	Quiescent Power Supply Current	$V_{CC} = \text{Max.}$	$V_{IN} = \text{GND}$ or V_{CC}	—	0.1	10	
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	$V_{CC} = \text{Max.}$	$V_{IN} = V_{CC} - 0.6\text{V}^{(3)}$	—	$\frac{3}{4}$	500	

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.
3. Per TTL driven input; all other inputs at V_{CC} or GND.

Capacitance

Parameters	Description	Test Conditions	Typ.	Units
C_{IN}	Input Capacitance	$V_{CC} = \text{Open}, V_I = 0\text{V}$ or V_{CC}	7	pF
C_{OUT}	Output Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V}$ or V_{CC}	8	
C_{PD}	Power Dissipation Capacitance	$V_{CC} = 3.3\text{V}, V_I = 0\text{V}$ or $V_{CC}, F = 10\text{ MHz}$	20	

Switching Characteristics over Operating Range

Parameters	Description	Conditions	$V_{CC} = 3.3V \pm 0.3V$		$V_{CC} = 2.7V$		Units
			Min.	Max.	Min.	Max.	
f _{max}	Maximum Clock Frequency	C _L = 50pF R _L = 500Ω	170	—	—	—	ns
t _{PHL} t _{PLH}	Propagation Delay Bus to Bus		1.5	5.0	1.5	6.0	
t _{PHL} t _{PLH}	Propagation Delay Clock to Bus		1.5	6.0	1.5	7.0	
t _{PHL} t _{PLH}	Propagation Delay Select to Bus		1.5	6.0	1.5	7.0	
t _{PZL} t _{PZH}	Output Enable Time		1.5	7.5	1.5	8.5	
t _{PLZ} t _{PHZ}	Output Disable Time		1.5	6.0	1.5	7.0	
t _S	Setup Time		2.5	—	2.5	—	
t _H	Hold Time		1.5	—	1.5	—	
t _W	Pulse Width		3.0	—	3.0	—	
t _{SK(O)}	Output to Output Skew ⁽¹⁾		—	1.0	—	—	

Note:

- Skew between any two outputs, of the same package, switching in the same direction.
This parameter is guaranteed by design.

Dynamic Switching Characteristics (T_A = +25°C)

Parameters	Description	Test Conditions ⁽¹⁾	Typ.	Units
V _{OLP}	Dynamic LOW Peak Voltage	V _{CC} = 3.3V, C _L = 50 pF V _{IH} = 3.3V, V _{IL} = 0V	0.8	V
V _{OLV}	Dynamic LOW Valley Voltage	V _{CC} = 3.3V, C _L = 50 pF V _{IH} = 3.3V, V _{IL} = 0V		

Note:

- Measured with n–1 outputs switching from HIGH-to-LOW or LOW-to-HIGH. The remaining output is measured in the LOW state.