PI74LCX646
PI74LCX652

Fast CMOS 3.3V 8-Bit Registered Transceiver

Product Features

- Functionally compatible with FCT3, LVT, and 74 series 646 and 652 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:
  – 24-pin 209-mil wide plastic SSOP (H)
  – 24-pin 173-mil wide plastic TSSOP (L)
  – 24-pin 150-mil wide plastic QSOP (Q)
  – 24-pin 300-mil wide plastic SOIC (S)

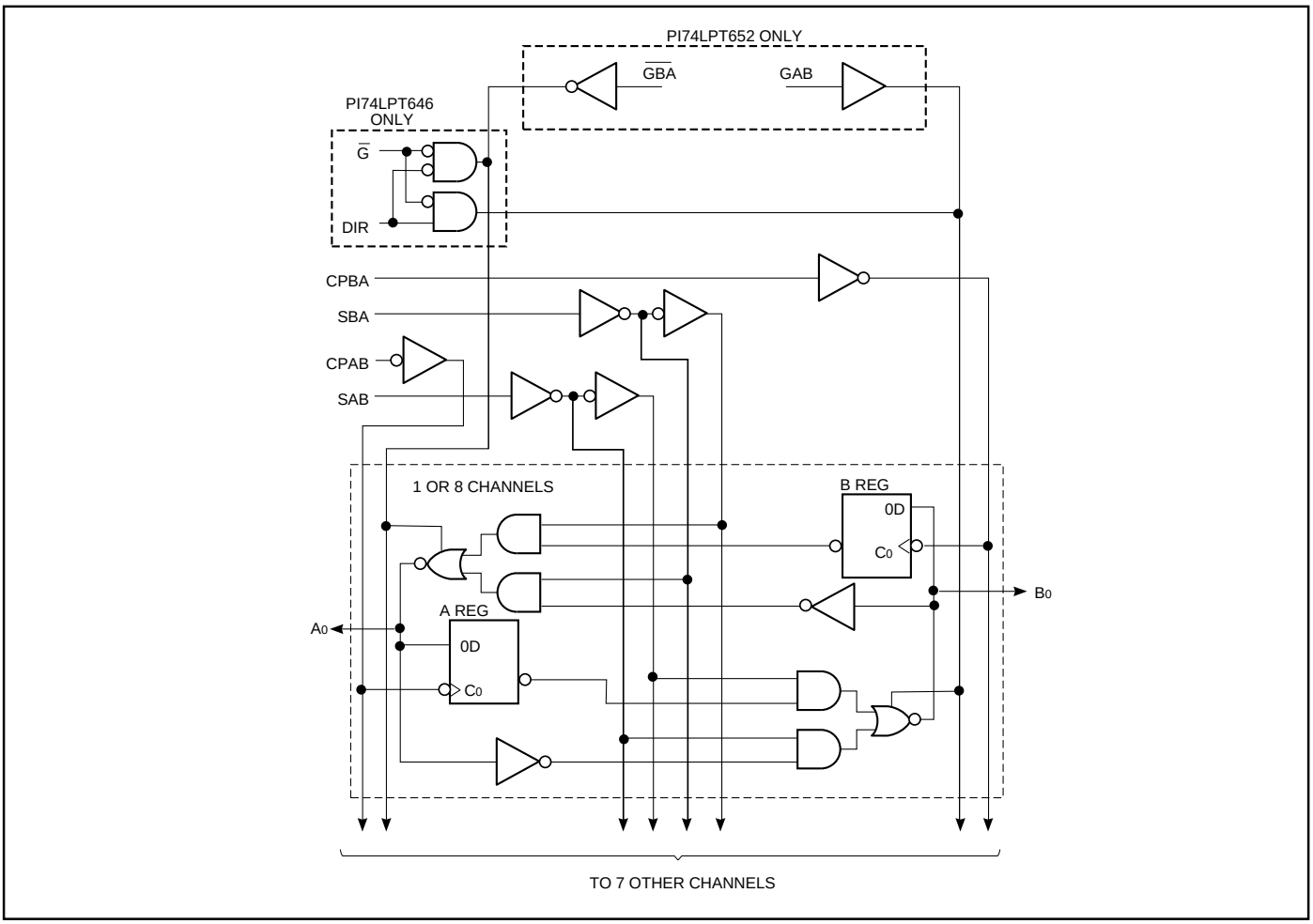
Product Description

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 PI74LCX646 and PI74LCX652 are designed with a bus transceiver 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. The PI74LCX652 utilizes $\overline{GAB}$ and GBA signals to control the transceiver functions. The PI74LCX646 uses the enable control ($\overline{G}$) and direction pins (DIR) to control the transceiver functions. SAB and SBA 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 PI74LCX646 and PI74LCX652 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



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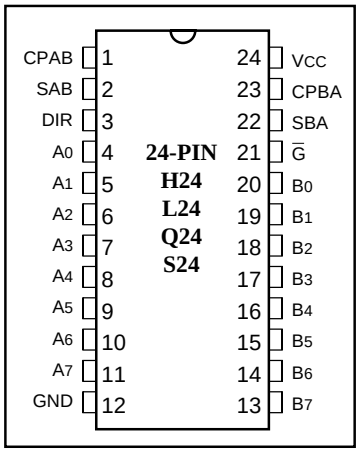
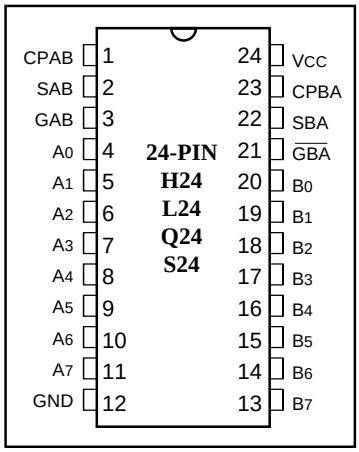
PI74LCX646 Product Pin Configuration



PI74LCX652 Product Pin Configuration



Product Pin Description

Pin Name	Description
A0-A7	Data Register A Inputs Data Register B Outputs
B0-B7	Data Register B Inputs Data Register A Outputs
CPAB, CPBA	Clock Pulse Inputs
SAB, SBA	Output Data Source SelectInputs
DIR, $\overline{G}$	Output Enable Inputs (LCX646)
GAB, $\overline{GBA}$	Output Enable Inputs (LCX652)
GND	Ground
VCC	Power

PI74LCX646 Truth Table

	Inputs						DATA I/O[2]	
Function/Operation	**$\overline{G}$**	**DIR**	**CPAB**	**CPBA**	**SAB**	**SBA**	**A0-A7**	**B0-B7**
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		

PI74LCX652 Truth Table

	Inputs						DATA I/O[2]	
Function/Operation	**GAB**	**$\overline{GBA}$**	**CPAB**	**CPBA**	**SAB**	**SBA**	**A0-A7**	**B0-B7**
Isolation	L	H	H or L	H or L	X	X	Input	Input
Store A and B Data	L	H	↑	↑	X	X		
Store A, Hold B	X	H	↑	H or L	X	X	Input	Unspecified[1]
Store A in Both Registers	H	H	↑	↑	X[2]	X	Input	Output
Hold A, Store B	L	X	H or L	↑	X	X	Unspecified[1]	Input
Store B in Both Registers	L	L	↑	↑	X	X[2]	Output	Input
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	H	H	X	X	L	X	Input	Output
Stored A Data to B Bus	H	H	H or L	X	H	X		
Stored A Data to B Bus and Stored B Data to A Bus	H	L	H or L	H or L	H	H	Output	Output

Notes:

1. The data output functions may be enabled or disabled by various signals at the GAB or $\overline{GBA}$ 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.
2. Select control = L: clocks can occur simultaneously.
   Select control = H: clocks must be staggered to load both registers.
   H = High Voltage Level; L = Low Voltage Level; X = Don't Care; ↑ = LOW-to-HIGH transition

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 & Vcc 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
$\Delta t/\Delta V$	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°C to +85°C, V_{CC} = 2.7V 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} = 2.7-3.6	I_{OH} = –0.1mA	V_{CC}-0.2	—	—	
		V_{CC} = 2.7	I_{OH} = –12mA	2.2	—	—	
		V_{CC} = 3.0	I_{OH} = –18mA	2.4	—	—	
			I_{OH} = –24mA	2.2	—	—	
V_{OL}	Output LOW Voltage	V_{CC} = 2.7-3.6	I_{OL} = 0.1mA	—	—	0.2	
		V_{CC} = 2.7	I_{OL} = 12mA	—	—	0.4	
		V_{CC} = 3.0	I_{OL} = 16mA	—	—	0.4	
			I_{OL} = 24mA	—	—	0.55	
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = –18mA		—	–0.7	–1.2	
I_I	Input Leakage Current	0 ≤ V_I ≤ 5.5V	Vcc = 2.7-3.6	—	—	±5	µA
I_{OZ}	Tri-State Output Leakage	0 ≤ V_O ≤ 5.5V V_I = V_{IH} or V_{IL}	V_{CC} = 2.7-3.6	—	—	±5	
I_{OFF}	Power Down Disable	V_{CC} = 0V, V_{IN} or V_{OUT} ≤ 5.5V		—	—	10	
I_{CC}	Quiescent Power Supply Current	V_{CC} = Max.	V_{IN} = GND or V_{CC}	—	0.1	10	
ΔI_{CC}	Quiescent Power Supply Current TTL Inputs HIGH	V_{CC} = Max.	V_{IN} = V_{CC} – 0.6V[3]	—	—	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} = 3.3V, +25°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} = Open, V_I = 0V or V_{CC}	7	pF
C_{OUT}	Output Capacitance	V_{CC} = 3.3V, V_I = 0V or V_{CC}	8	
C_{PD}	Power Dissipation Capacitance	V_{CC} = 3.3V, V_I = 0V or V_{CC}, F = 10 MHz	25	

Switching Characteristics over Operating Range

Parameters	Description	Conditions	V_{CC} = 3.3V ± 0.3V		V_{CC} = 2.7V		Units
			Min.	Max.	Min.	Max.	
f_{MAX}	Maximum Clock Frequency	C_L = 50pF R_L = 500Ω	150	—	—	—	MHz
t_{PHL} t_{PLH}	Propagation Delay Bus to Bus		1.5	7.0	1.5	8.0	ns
t_{PHL} t_{PLH}	Propagation Delay Clock to Bus		1.5	8.5	1.5	9.5	
t_{PHL} t_{PLH}	Propagation Delay Select to Bus		1.5	8.5	1.5	9.5	
t_{PZL} t_{PZH}	Output Enable Time		1.5	8.5	1.5	9.5	
t_{PLZ} t_{PHZ}	Output Disable Time		1.5	8.5	1.5	9.5	
t_S	Setup Time		2.5	—	2.5	—	
t_H	Hold Time		1.5	—	1.5	—	
t_W	Pulse Width		3.3	—	3.3	—	
$t_{SK}(0)$	Output to Output Skew[1]		—	1.0	—	—	

Note:
1. Skew between any two outputs, of the same package, switching in the same direction.

Dynamic Switching Characteristics (T_A = +25°C)

Parameters	Description	Test Conditions[1]	Typical	Units
V_{OLP}	Dynamic LOW Peak Voltage	V_{CC} = 3.3V, C_L = 50pF V_{IH} = 3.3V, V_{IL} = 0V	0.8	V
V_{OLV}	Dynamic LOW Valley Voltage	V_{CC} = 3.3V, C_L = 50pF V_{IH} = 3.3V, V_{IL} = 0V	0.8	V

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