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PI74LPT16952

Fast CMOS 3.3V 16-Bit Registered Transceivers
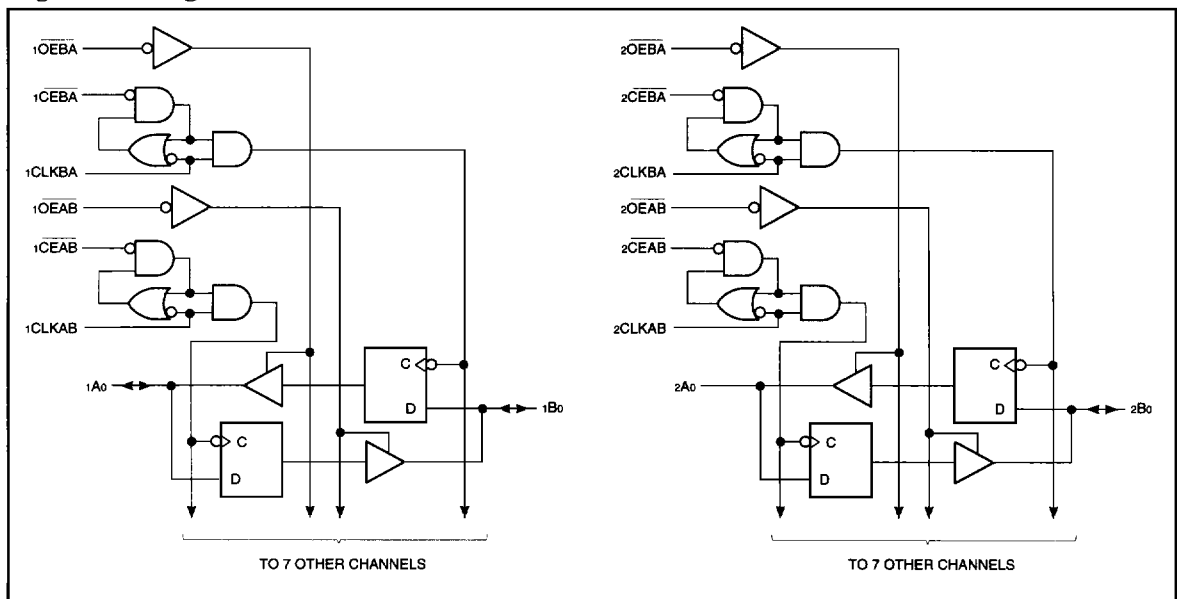
Product Features

- Compatible with LCX™ and LVT™ families of products
- Supports 5V Tolerant Mixed Signal Mode Operation
  - Input can be 3V or 5V
  - Output can be 3V or connected to 5V bus
- Advanced Low Power CMOS Operation
- Excellent output drive capability:
  Balanced drives (24mA sink and source)
- Pin compatible with industry standard double-density pinouts
- Low ground bounce outputs
- Hysteresis on all inputs
- Industrial operating temperature range: –40°C to +85°C
- Multiple center pins and distributed Vcc/GND pins minimize switching noise
- Packages available:
  - 56-pin 240 mil wide plastic TSSOP (A56)
  - 56-pin 300 mil wide plastic SSOP (V56)

Product Description

Pericom Semiconductor's PI74LPT series of logic circuits are produced using the Company's advanced 0.6 micron CMOS technology, achieving industry leading speed grades.

The PI74LPT16952 is a 16-bit registered transceivers organized with two sets of eight D-type latches with separate input and output controls for each set. For data flow from A to B, for example, the A-to-B Enable (xCEAB) input must be LOW to enter data from xAx. The data present on the A port will be clocked on the B register when xCLKAB toggles from LOW-to-HIGH. The xOEAB control performs the output enable function on the B port. Control of data from B to A is similar, but uses the xCEAB, xCLKAB, and xOEAB inputs. By connecting the control pins of the two independent transceivers together, a full 16-bit operation can be achieved. The output buffers are designed with a Power-Off disable allowing "live insertion" of boards when used as backplane drivers.

The PI74LPT16952 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

TO 7 OTHER CHANNELS   TO 7 OTHER CHANNELS

Product Pin Description

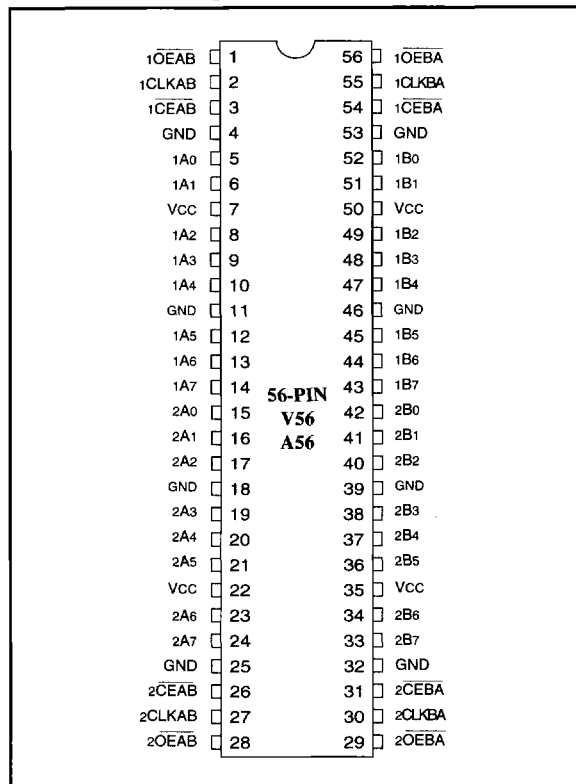| Pin Name	Description
x$\overline{\text{OEAB}}$	A-to-B Output Enable Input (Active LOW)
x$\overline{\text{OEBA}}$	B-to-A Output Enable Input (Active LOW)
x$\overline{\text{CEAB}}$	A-to-B Clock Enable Input (Active LOW)
x$\overline{\text{CEBA}}$	B-to-A Clock Enable Input (Active LOW)
xCLKAB	A-to-B Clock Input
xCLKBA	B-to-A Clock Input
xAx	A-to-B Data Inputs or B-to-A 3-State Outputs
xBx	B-to-A Data Inputs or B-to-A 3-State Outputs
GND	Ground
V$_{CC}$	Power

Truth Table[1,2]

Inputs				Outputs
x$\overline{\text{CEAB}}$	xCLKAB	x$\overline{\text{OEAB}}$	xAx	xBx
H	X	L	X	B[3]
X	L	L	X	B[3]
L	↑	L	L	L
L	↑	L	H	H
X	X	H	X	High Z

Notes:
1. H = High Voltage Level
   L = Low Voltage Level
   X = Don't Care or Irrelevant
   ↑ = LOW-to-HIGH Transition
   Z = High Impedance
2. A-to-B data flow shown. B-to-A flow control is the same, except using x$\overline{\text{CEBA}}$, xCLKBA, and x$\overline{\text{OEBA}}$.
3. Level of B before the indicated steady-state input conditions were established.

Product Pin Configuration

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            1OEAB  ⊏ 1      56 ⊐  1OEBA
           1CLKAB  ⊏ 2      55 ⊐  1CLKBA
            1CEAB  ⊏ 3      54 ⊐  1CEBA
              GND  ⊏ 4      53 ⊐  GND
              1A0  ⊏ 5      52 ⊐  1B0
              1A1  ⊏ 6      51 ⊐  1B1
              VCC  ⊏ 7      50 ⊐  VCC
              1A2  ⊏ 8      49 ⊐  1B2
              1A3  ⊏ 9      48 ⊐  1B3
              1A4  ⊏ 10     47 ⊐  1B4
              GND  ⊏ 11     46 ⊐  GND
              1A5  ⊏ 12     45 ⊐  1B5
              1A6  ⊏ 13     44 ⊐  1B6
              1A7  ⊏ 14     43 ⊐  1B7
                     56-PIN
              2A0  ⊏ 15  V56 42 ⊐  2B0
              2A1  ⊏ 16  A56 41 ⊐  2B1
              2A2  ⊏ 17     40 ⊐  2B2
              GND  ⊏ 18     39 ⊐  GND
              2A3  ⊏ 19     38 ⊐  2B3
              2A4  ⊏ 20     37 ⊐  2B4
              2A5  ⊏ 21     36 ⊐  2B5
              VCC  ⊏ 22     35 ⊐  VCC
              2A6  ⊏ 23     34 ⊐  2B6
              2A7  ⊏ 24     33 ⊐  2B7
              GND  ⊏ 25     32 ⊐  GND
            2CEAB  ⊏ 26     31 ⊐  2CEBA
           2CLKAB  ⊏ 27     30 ⊐  2CLKBA
            2OEAB  ⊏ 28     29 ⊐  2OEBA
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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.

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 (Input pins)	Guaranteed Logic HIGH Level		2.2	—	5.5	V
	Input HIGH Voltage (I/O pins)			2.0	—	5.5	V
V_{IL}	Input LOW Voltage (Input and I/O pins)	Guaranteed Logic LOW Level		−0.5	—	0.8	V
I_{IH}	Input HIGH Current (Input pins)	V_{CC} = Max.	V_{IN} = 5.5V	—	—	±1	μA
	Input HIGH Current (I/O pins)	V_{CC} = Max.	V_{IN} = V_{CC}	—	—	±1	μA
I_{IL}	Input LOW Current (Input pins)	V_{CC} = Max.	V_{IN} = GND	—	—	±1	μA
	Input LOW Current (I/O pins)	V_{CC} = Max.	V_{IN} = GND	—	—	±1	μA
I_{OZH}	High Impedance Output Current	V_{CC} = Max.	V_{OUT} = 5.5V	—	—	±1	μA
I_{OZL}	(3-State Output pins)	V_{CC} = Max.	V_{OUT} = GND	—	—	±1	μA
V_{IK}	Clamp Diode Voltage	V_{CC} = Min., I_{IN} = −18 mA		—	−70	−1.2	V
I_{ODH}	Output HIGH Current	V_{CC} = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_O = 1.5V[3]		−36	−60	−110	mA
I_{ODL}	Output LOW Current	V_{CC} = 3.3V, V_{IN} = V_{IH} or V_{IL}, V_O = 1.5V[3]		50	90	200	mA
V_{OH}	Output HIGH Voltage	V_{CC} = Min.	I_{OH} = −0.1 mA	Vcc−0.2	—	—	V
		V_{IN} = V_{IH} or V_{IL}	I_{OH} = −3 mA	2.4	3.0	—	V
		V_{CC} = 3.0V	I_{OH} = −8 mA	2.4[5]	3.0	—	V
		V_{IN} = V_{IH} or V_{IL}	I_{OH} = −24 mA	2.0	—	—	V
V_{OL}	Output LOW Voltage	V_{CC} = Min.	I_{OL} =0.1 mA	—	—	0.2	V
		V_{IN} = V_{IH} or V_{IL}	I_{OL} = 16 mA	—	0.2	0.4	V
			I_{OL} = 24 mA	—	0.3	0.5	V
I_{OS}	Short Circuit Current[4]	V_{CC} = Max.[3], V_{OUT} = GND		−60	−85	−240	mA
I_{OFF}	Power Down Disable	V_{CC} = 0V, V_{IN} or V_{OUT} ≤ 4.5V		—	—	±100	μA
V_H	Input Hysteresis			—	150	—	mV

Notes:
1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device type.
2. Typical values are at Vcc = 3.3V, +25°C ambient and maximum loading.
3. Not more than one output should be shorted at one time. Duration of the test should not exceed one second.
4. This parameter is guaranteed but not tested.
5. V_{OH} = V_{CC} − 0.6V at rated current.

Power Supply Characteristics

Parameters	Description	Test Conditions[1]		Min.	Typ[2]	Max.	Units
Icc	Quiescent Power Supply Current	Vcc = Max.	VIN = GND or Vcc		0.1	10	μA
ΔIcc	Quiescent Power Supply Current TTL Inputs HIGH	Vcc = Max.	VIN = Vcc – 0.6V[3]		2.0	30	μA
Iccd	Dynamic Power Supply[4]	Vcc = Max., Outputs Open xOE = GND One Bit Toggling 50% Duty Cycle	VIN = Vcc VIN = GND		50	75	μA/ MHz
Ic	Total Power Supply Current[6]	Vcc = Max., Outputs Open fI = 10 MHz 50% Duty Cycle xOE = GND One Bit Toggling	VIN = Vcc – 0.6V VIN = GND		0.6	2.3	mA
		Vcc = Max., Outputs Open fI = 2.5 MHz 50% Duty Cycle xOE = GND 16 Bits Toggling	VIN = Vcc – 0.6V VIN = GND		2.1	4.7[5]	

Notes:

1. For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
2. Typical values are at Vcc = 3.3V, +25°C ambient.
3. Per TTL driven input; all other inputs at Vcc or GND.
4. This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
5. Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.
6. Ic = IQUIESCENT + IINPUTS + IDYNAMIC
   Ic = Icc + ΔIcc DHNT + Iccd (fCP/2 + fINI)
   Icc = Quiescent Current (IccL, IccH and Iccz)
   ΔIcc = Power Supply Current for a TTL High Input
   DH = Duty Cycle for TTL Inputs High
   NT = Number of TTL Inputs at DH
   Iccd = Dynamic Current Caused by an Input Transition Pair (HLH or LHL)
   fCP = Clock Frequency for Register Devices (Zero for Non-Register Devices)
   NCP = Number of Clock Inputs at fCP
   fI = Input Frequency
   NI = Number of Inputs at fI
   All currents are in milliamps and all frequencies are in megahertz.

Switching Characteristics over Operating Range[1]

Parameters	Description	Conditions[2]	LPT16952A Com. Min.[3]	LPT16952A Com. Max.	LPT16952B Com. Min.[3]	LPT16952B Com. Max.	LPT16952C Com. Min.[3]	LPT16952C Com. Max.	Units
tPLH tPHL	Propagation Delay xCLKAB, xCLKBA to xBx, xAx	C$_L$ = 50 pF R$_L$ = 500Ω	2.0	10.0	2.0	7.5	2.0	6.3	ns
tPZH tPZL	Output Enable Time xOEBA, xOEAB to xAx, xBx		1.5	10.5	1.5	8.0	1.5	7.0	ns
tPHZ tPLZ	Output Disable Time[4] xOEBA, xOEAB to xAx, xBx		1.5	10.0	1.5	7.5	1.5	6.5	ns
tSU	Set-up Time HIGH or LOW xAx, xBx to xCLKAB, xCLKBA		2.5	—	2.5	—	2.5	—	ns
tH	Hold Time HIGH or LOW xAx, xBx to xCLKAB, xCLKBA		2.0	—	2.0	—	2.0	—	ns
tSU	Setup Time HIGH or LOW xCEAB, xCEBA to xCLKAB, xCLKBA		3.0	—	3.0	—	3.0	—	ns
tH	Hold Time HIGH or LOW xCEAB, xCEBA to xCLKAB, xCLKBA		2.0	—	2.0	—	2.0	—	ns
tW	Pulse Width HIGH[4] or LOW, xCLKAB or xCLKBA		3.0	—	3.0	—	3.0	—	ns
tSK(o)	Output Skew[5]		—	0.5	—	0.5	—	0.5	ns

Notes:
1. Propagation Delays and Enable/Disable times are with Vcc = 3.3V ±0.3V, normal range. For Vcc = 2.7V, extended range, all Propagation Delays and Enable/Disable times should be degraded by 20%.
2. See test circuit and wave forms.
3. Minimum limits are guaranteed but not tested on Propagation Delays.
4. This parameter is guaranteed but not production tested.
5. Skew between any two outputs, of the same package, switching in the same direction. This parameter is guaranteed by design.

Capacitance (T$_A$ = 25°C, f = 1 MHz)

Parameters[1]	Description	Test Conditions	Typ.	Max.	Units
C$_{IN}$	Input Capacitance	V$_{IN}$ = 0V	4.5	6	pF
C$_{OUT}$	Output Capacitance	V$_{OUT}$ = 0V	5.5	8	pF

Note:
1. This parameter is determined by device characterization but is not production tested.

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