

## Fast CMOS 3.3V 16-Bit Bidirectional Transceiver

### Product Features

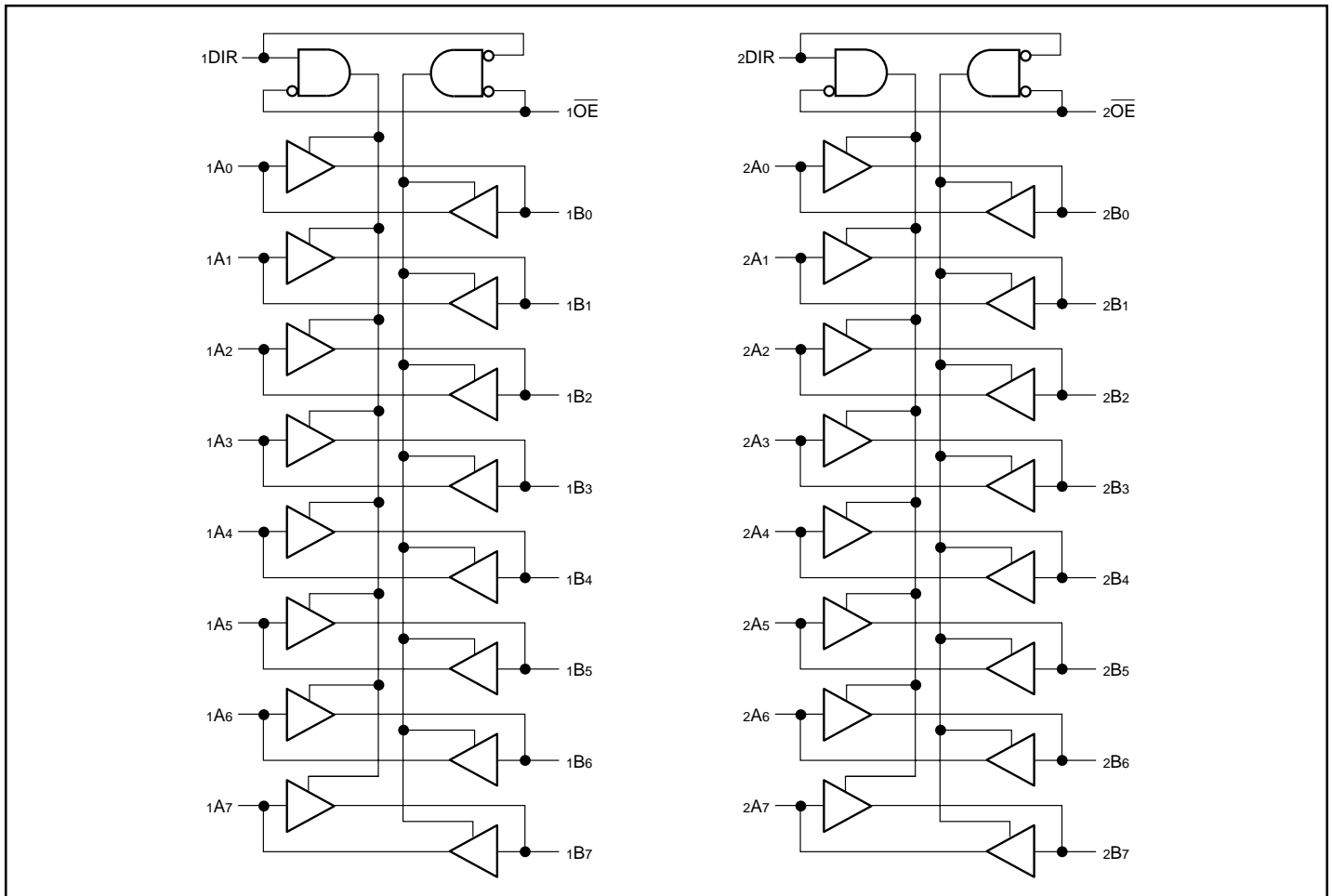
- Advanced Low Power CMOS Operation
- Excellent output drive capability:  
Balanced drives (24mA sink and source)  
Compatible with LVC™ class of products.
- Pin compatible with industry standard double-density pinouts
- Low ground bounce outputs
- Hysteresis on all inputs
- Industrial operating temperature range: -40°C to +85°C
- Control inputs can be driven by 3.3V or 5V devices
- Multiple center pin and distributed Vcc/GND pins minimizing switching noise
- Packages available:  
-48-pin 240 mil wide plastic TSSOP (A)  
-48-pin 300 mil wide plastic SSOP (V)  
-48-pin 173 mil wide plastic TVSOP (K)
- Device models available on request

### Product Description

Pericom Semiconductor's PI74FCT series of logic circuits are produced in the Company's advanced 0.6 micron CMOS technology, achieving industry leading speed grades.

The PI74FCT163245 is a 16-bit bidirectional transceiver designed for asynchronous two-way communication between data buses. The direction control input pin (xDIR) determines the direction of data flow through the bidirectional transceiver. The Direction and Output Enable controls are designed to operate this device as either two independent 8-bit transceivers or one 16-bit transceiver. The output enable (xOE) input, when HIGH, disables both A and B ports by placing them in HIGH Z condition.

### Logic Block Diagram



### Product Pin Description

Pin Name	Description
$\overline{xOE}$	3-State Output Enable Inputs (Active LOW)
$xDIR$	Direction Control Input
$xAx$	Side A Inputs or 3-State Inputs
$xBx$	Side B Outputs or 3-State Outputs
GND	Ground
Vcc	Power

### Truth Table

Inputs <sup>(1)</sup>		Outputs <sup>(1)</sup>
$\overline{xOE}$	$xDIR$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	Z

**Note:**

1. H = High Voltage Level, X = Don't Care, L = Low Voltage Level, Z = High Impedance

### Product Pin Configuration

1DIR	1	48	$\overline{1OE}$
1B0	2	47	1A0
1B1	3	46	1A1
GND	4	45	GND
1B2	5	44	1A2
1B3	6	43	1A3
Vcc	7	42	Vcc
1B4	8	41	1A4
1B5	9	40	1A5
GND	10	39	GND
1B6	11	38	1A6
1B7	12	37	1A7
2B0	13	36	2A0
2B1	14	35	2A1
GND	15	34	GND
2B2	16	33	2A2
2B3	17	32	2A3
Vcc	18	31	Vcc
2B4	19	30	2A4
2B5	20	29	2A5
GND	21	28	GND
2B6	22	27	2A6
2B7	23	26	2A7
2DIR	24	25	$\overline{2OE}$

**48-PIN**  
**V48**  
**A48**  
**K48**

### Capacitance ( $T_A = 25^\circ\text{C}$ , $f = 1\text{ MHz}$ )

Parameters <sup>(1)</sup>	Description	Test Conditions	Typ.	Max.	Units
CIN	Input Capacitance	VIN = 0V	4.5	6	pF
COU	Output Capacitance	VOUT = 0V	5.5	8	pF

**Note:**

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

### 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, TA = -40°C to +85°C, VCC = 2.7V to 3.6V)

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	Max.	Units
VIH	Input HIGH Voltage (Input pins)	Guaranteed Logic HIGH Level		2.2	—	5.5	V
	Input HIGH Voltage (I/O pins)			2.0	—	Vcc+0.5	V
VIL	Input LOW Voltage (Input and I/O pins)	Guaranteed Logic LOW Level		-0.5	—	0.8	V
IIH	Input HIGH Current (Input pins)	VCC = Max.	VIN = 5.5V	—	—	±1	µA
	Input HIGH Current (I/O pins)	VCC = Max.	VIN = VCC	—	—	±1	µA
IIL	Input LOW Current (Input pins)	VCC = Max.	VIN = GND	—	—	±1	µA
	Input LOW Current (I/O pins)	VCC = Max.	VIN = GND	—	—	±1	µA
IOZH	High Impedance Output Current (3-State Output pins)	VCC = Max.	VOUT = VCC	—	—	±1	µA
IOZL		VCC = Max.	VOUT = GND	—	—	±1	µA
VIK	Clamp Diode Voltage	VCC = Min., IIN = -18 mA		—	-0.7	-1.2	V
IODH	Output HIGH Current	VCC = 3.3V, VIN = VIH or VIL, VO = 1.5V <sup>(3)</sup>		-36	-60	-110	mA
IODL	Output LOW Current	VCC = 3.3V, VIN = VIH or VIL, VO = 1.5V <sup>(3)</sup>		50	90	200	mA
VOH	Output HIGH Voltage	VCC = Min.	IOH = -0.1mA	Vcc-0.2	—	—	V
		VIN = VIH or VIL	IOH = -3mA	2.4	3.0	—	V
		VCC = 3.0V,	IOH = -8mA	2.4 <sup>(5)</sup>	3.0	—	V
		VIN = VIH OR VIL	IOH = -24mA	2.0	—	—	V
VOL	Output LOW Voltage	VCC = Min.	IOL = 0.1mA	—	—	0.2	V
		VIN = VIH or VIL	IOL = 16mA	—	0.2	0.4	V
			IOL = 24mA	—	0.3	0.5	V
IOS	Short Circuit Current <sup>(4)</sup>	VCC = Max. <sup>(3)</sup> , VOUT = GND		-60	-85	-240	mA
VH	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. VOH = VCC - 0.6V at rated current.

### Power Supply Characteristics

Parameters	Description	Test Conditions <sup>(1)</sup>		Min.	Typ. <sup>(2)</sup>	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 <sup>(3)</sup>		2.0	30	μA
ICCD	Dynamic Power Supply <sup>(4)</sup>	VCC = Max., Outputs Open xOE = xDIR = GND One Bit Toggling 50% Duty Cycle	VIN = VCC VIN = GND		50	75	μA/ MHz
IC	Total Power Supply Current <sup>(6)</sup>	VCC = Max., Outputs Open fi = 10 MHz 50% Duty Cycle xOE = xDIR = GND One Bit Toggling	VIN = VCC - 0.6V VIN = GND		0.5	0.8	mA
		VCC = Max., Outputs Open fi = 2.5 MHz 50% Duty Cycle xOE = xDIR = GND 16 Bits Toggling	VIN = VCC - 0.6V VIN = GND		2.0	3.3 <sup>(5)</sup>	

**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.  $IC = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$   
 $IC = ICC + \Delta ICC_{DHNT} + ICCD (f_{CP}/2 + f_i N_i)$   
 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<sup>(1)</sup>**

Parameters	Description	Conditions <sup>(2)</sup>	FCT163245		FCT163245A		FCT163245C		Units
			Com.		Com.		Com.		
			Min. <sup>(3)</sup>	Max.	Min. <sup>(3)</sup>	Max.	Min. <sup>(3)</sup>	Max.	
tPLH tPHL	Propagation Delay A to B, B to A	CL = 50pF RL = 500Ω	1.5	7.0	1.5	4.6	1.5	4.1	ns
tPZH tPZL	Output Enable Time xOE to A or B		1.5	9.5	1.5	6.2	1.5	5.8	ns
tPHZ tPLZ	Output Disable Time <sup>(4)</sup> xOE to A or B		1.5	7.5	1.5	5.0	1.5	4.8	ns
tPZH tPZL	Output Enable Time xDIR to A or B		1.5	9.5	1.5	6.2	1.5	5.8	ns
tPHZ tPLZ	Output Disable Time <sup>(4)</sup> xDIR to A or B		1.5	7.5	1.5	5.0	1.5	4.8	ns
tSK(o)	Output Skew <sup>(5)</sup>			0.5		0.5		0.5	ns

**Notes:**

1. Propagation Delays and Enable/Disable times are with  $V_{cc} = 3.3V \pm 0.3V$ , normal range. For  $V_{cc} = 2.7V$ , extended range, all Propagation Delays and Enable/Disable times should be degraded by 20%.
2. See test circuit and waveforms.
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.