



# PI74FCT163245

## Fast CMOS 3.3V 16-Bit Bidirectional Transceiver

### Product Features

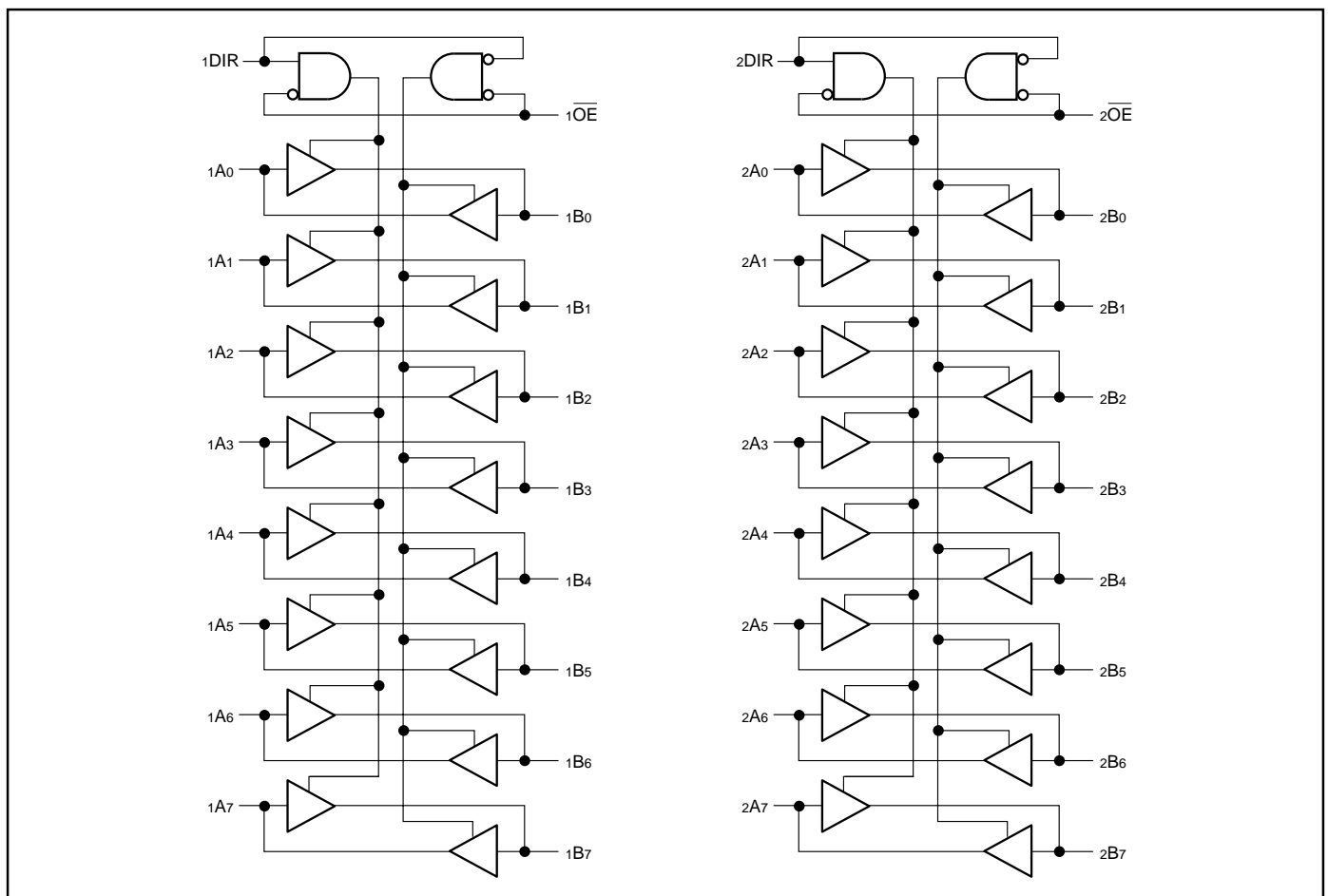
- Advanced Low Power CMOS Operation
- Excellent output drive capability:  
Balanced drives (24mA sink and source)  
Compatible with LVC™ class of products.
- Pin compatible with industry standard double-density pinouts
- Low ground bounce outputs
- Hysteresis on all inputs
- Industrial operating temperature 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<sub>A</sub> = 25°C, f = 1 MHz)

| Parameters <sup>(1)</sup> | Description        | Test Conditions | Typ. | Max. | Units |
|---------------------------|--------------------|-----------------|------|------|-------|
| CIN                       | Input Capacitance  | VIN = 0V        | 4.5  | 6    | pF    |
| COUT                      | Output Capacitance | VOU = 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<br>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.,<br>Outputs Open<br>XOE = xDIR = GND<br>One Bit Toggling<br>50% Duty Cycle                 | VIN = VCC<br>VIN = GND          |      | 50                  | 75                 | μA/<br>MHz |
| IC         | Total Power Supply<br>Current <sup>(6)</sup>      | VCC = Max.,<br>Outputs Open<br>fi = 10 MHz<br>50% Duty Cycle<br>XOE = xDIR = GND<br>One Bit Toggling  | VIN = VCC – 0.6V<br>VIN = GND   |      | 0.5                 | 0.8                | mA         |
|            |   | VCC = Max.,<br>Outputs Open<br>fi = 2.5 MHz<br>50% Duty Cycle<br>XOE = xDIR = GND<br>16 Bits Toggling | VIN = VCC – 0.6V<br>VIN = GND   |      | 2.0                 | 3.3 <sup>(5)</sup> |            |

**Notes:**

- For Max. or Min. conditions, use appropriate value specified under Electrical Characteristics for the applicable device.
- Typical values are at Vcc = 3.3V, +25°C ambient.
- Per TTL driven input; all other inputs at Vcc or GND.
- This parameter is not directly testable, but is derived for use in Total Power Supply Calculations.
- Values for these conditions are examples of the Icc formula. These limits are guaranteed but not tested.
- $IC = I_{QUIESCENT} + I_{INPUTS} + I_{DYNAMIC}$   
 $IC = ICC + \Delta ICC \cdot DHNT + ICCD (f_{CP}/2 + f_i NI)$   
 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<br>tPHL | Propagation Delay<br>A to B, B to A                  | CL = 50pF<br>RL = 500Ω    | 1.5                 | 7.0  | 1.5                 | 4.6  | 1.5                 | 4.1  | ns    |
| tPZH<br>tPZL | Output Enable Time<br>xOE to A or B                  |                           | 1.5                 | 9.5  | 1.5                 | 6.2  | 1.5                 | 5.8  | ns    |
| tPHZ<br>tPLZ | Output Disable Time <sup>(4)</sup><br>xOE to A or B  |                           | 1.5                 | 7.5  | 1.5                 | 5.0  | 1.5                 | 4.8  | ns    |
| tPZH<br>tPZL | Output Enable Time<br>xDIR to A or B                 |                           | 1.5                 | 9.5  | 1.5                 | 6.2  | 1.5                 | 5.8  | ns    |
| tPHZ<br>tPLZ | Output Disable Time <sup>(4)</sup><br>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.