



# 74BCT245

## Octal Bidirectional Transceiver with TRI-STATE® Outputs

### General Description

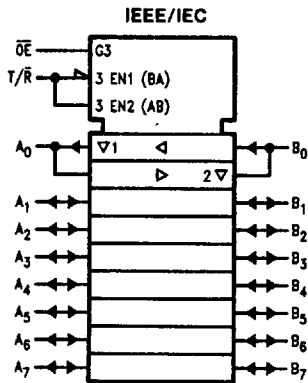
The 74BCT245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 64 mA (48 mA Mil) at the B port. The Transmit/Receive (T/R) input determines the direction of data flow through the bidirectional transceiver. Transmit (active HIGH) enables data from A ports to B ports; Receive (active LOW) enables data from B ports to A ports. The Output Enable (OE) input, when HIGH, disables both A and B ports by placing them in a high impedance state.

### Features

- Non-inverting buffers
- Bidirectional data path
- Low I<sub>CCZ</sub> through BiCMOS techniques
- TRI-STATE outputs drive bus lines
- Output sink capability of 64 mA
- Source capability of 15 mA
- Guaranteed output skew
- Guaranteed multiple output switching specifications
- Guaranteed 4000V minimum ESD protection
- Guaranteed latchup protection
- Nondestructive hot insertion capability
- High impedance in power down (I<sub>ZZ</sub> and V<sub>ID</sub>)

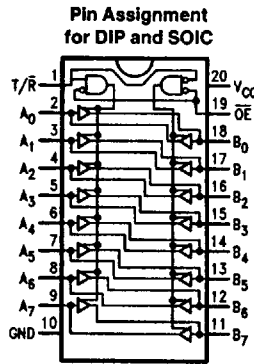
**Ordering Code:** See Section 11

### Logic Symbol



TL/F/10700-3

### Connection Diagram



TL/F/10700-2

### Truth Table

Inputs		Output
OE	T/R	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

Pin Names	Description
OE	Output Enable Input (Active Low)
T/R	Transmit/Receive Input
A <sub>0</sub> -A <sub>7</sub>	Inputs or TRI-STATE Outputs
B <sub>0</sub> -B <sub>7</sub>	Inputs or TRI-STATE Outputs

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial



### Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

Storage Temperature	-65°C to +150°C
Ambient Temperature under Bias	-55°C to +125°C
Junction Temperature under Bias Plastic	-55°C to +150°C
V <sub>CC</sub> Pin Potential to Ground Pin	-0.5V to +7.0V
Input Voltage (Note 2)	-0.5V to +7.0V
Input Current (Note 2)	-30 mA to +5.0 mA

**Note 1:** Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

**Note 2:** Either voltage limit or current limit is sufficient to protect inputs.

Voltage Applied to Any Output in the Disable or Power-Off State in the High State	-0.5V to +5.5V -0.5V to V <sub>CC</sub>
Current Applied to Output in LOW State (Max)	Twice the Rated I <sub>OL</sub> (mA)
ESD Last Passing Voltage (Min)	4000V
DC Latchup Source Current	500 mA
Over Voltage Latchup	V <sub>CC</sub> + 4.5V

### Recommended Operating Conditions

Free Air Ambient Temperature Commercial	0°C to +70°C
Supply Voltage Commercial	+4.5V to +5.5V

### DC Electrical Characteristics

Symbol	Parameter	74BCT			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	2.5 2.4 2.0			V	Min	I <sub>OH</sub> = -1 mA (An) I <sub>OH</sub> = -3 mA (An, Bn) I <sub>OH</sub> = -15 mA (Bn)
V <sub>OL</sub>	Output LOW Voltage			0.5 0.55	V	Min	I <sub>OL</sub> = 24 mA (An) I <sub>OL</sub> = 64 mA (Bn)
I <sub>IH</sub>	Input HIGH Current			5	μA	Max	V <sub>IN</sub> = 2.7V (OE, T/ $\bar{R}$ )
I <sub>BVI</sub>	Input HIGH Current Breakdown Test			7	μA	Max	V <sub>IN</sub> = 7.0V (OE, T/ $\bar{R}$ )
I <sub>BVIT</sub>	Input HIGH Current Breakdown Test (I/O)			100	μA	Max	V <sub>IN</sub> = 5.5V (An, Bn)
I <sub>IL</sub>	Input LOW Current			-250	μA	Max	V <sub>IN</sub> = 0.5V (OE, T/ $\bar{R}$ )
I <sub>OS</sub>	Output Short-Circuit Current	-100 -60		-225 -150	mA	Max	V <sub>OUT</sub> = 0V (Bn) V <sub>OUT</sub> = 0V (An)
I <sub>IH</sub> + I <sub>OZH</sub>	Output Leakage Current			25	μA	Max	V <sub>OUT</sub> = 2.7V (An, Bn)
I <sub>IL</sub> + I <sub>OZL</sub>	Output Leakage Current			-150	μA	Max	V <sub>OUT</sub> = 0.5V (An, Bn)
I <sub>CEx</sub>	Output High Leakage Current			50	μA	Max	V <sub>OUT</sub> = V <sub>CC</sub> (An, Bn)
V <sub>ID</sub>	Input Leakage Test	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>ZZ</sub>	Bus Drainage Test			100	μA	0.0	V <sub>OUT</sub> = 5.25V (An, Bn)
I <sub>CCH</sub>	Power Supply Current		19.4	40	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current		42.5	70	mA	Max	V <sub>O</sub> = LOW
I <sub>CCZ</sub>	Power Supply Current		10	15	mA	Max	V <sub>O</sub> = HIGH Z

**AC Electrical Characteristics:** See Section 8 for Waveforms and Load Configurations

Symbol	Parameter	74BCT			74BCT		Units	Fig. No.
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> = Com V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF			
		Min	Typ	Max	Min	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Data to Output	1.0 1.5	2.7 2.9	6.0 6.6	1.0 1.5	7.0 7.0	ns	8-3
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time	1.5 1.5	6.6 5.8	9.4 10.2	1.5 1.5	10.9 11.6	ns	8-5
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time	1.5 1.5	3.9 3.4	8.3 7.8	1.5 1.5	9.3 9.1	ns	8-5
t <sub>OSHL</sub> (Note 1)	Pin to Pin Skew HL Data to Output	1.2			1.3		ns	
t <sub>OSLH</sub> (Note 1)	Pin to Pin Skew LH Data to Output	0.9			1.0		ns	
t <sub>OST</sub> (Note 1)	Pin to Pin Skew LH/HL Data to Output	1.8			2.2		ns	
t <sub>pv</sub> (Note 2)	Device to Device Skew LH/HL Data to Output	4.6			5.0		ns	

**Note 1:** Skew is defined as the absolute value of the difference between the actual propagation delays for any two separate outputs of the same device. The specification applies to any outputs switching HIGH to LOW (t<sub>OSHL</sub>), LOW to HIGH (t<sub>OSLH</sub>), or any combination switching LOW to HIGH and/or HIGH to LOW (t<sub>OST</sub>). This specification is guaranteed but not tested.

**Note 2:** Propagation delay variation for a given set of conditions (i.e., temperature and V<sub>CC</sub>) from device to device. This specification is guaranteed but not tested.

**Extended AC Electrical Characteristics:** See Section 8 for Waveforms and Load Configurations

Symbol	Parameter	74BCT		74BCT		Units	Fig. No.
		T <sub>A</sub> = Com V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF 8 Outputs Switching (Note 1)		T <sub>A</sub> = Com V <sub>CC</sub> = Com C <sub>L</sub> = 250 pF (Note 2)			
		Min	Max	Min	Max		
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Data to Output	2.0 2.0	8.0 8.0	3.0 3.0	9.0 9.0	ns	8-3

**Note 1:** This specification is guaranteed but not tested. The limits apply to propagation delays for all paths described switching in phase (i.e., all low-to-high, high-to-low, etc.).

**Note 2:** This specification is guaranteed but not tested. The limits represent propagation delays with 250 pF load capacitors in place of the 50 pF load capacitors in the standard AC load. This specification pertains to single output switching only.

**Capacitance**

Symbol	Parameter	Typ	Units	Conditions
C <sub>IN</sub>	Input Pin Capacitance	11.2	pF	V <sub>CC</sub> = 5.0V (OE, T/R)
C <sub>I/O</sub>	Input/Output Pin Capacitance	10.2	pF	V <sub>CC</sub> = 5.0V (An, Bn)