



# 74BCT2244

## Octal Buffer/Line Driver

### with 25Ω Series Resistors in the Outputs

#### General Description

The 74BCT2244 is an octal buffer and line driver designed to drive the capacitive inputs of MOS memory drivers, address drivers, clock drivers, and bus-oriented transmitters/receivers.

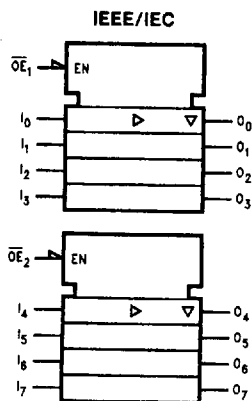
The 25Ω series resistors in the outputs reduce ringing and eliminate the need for external resistors.

#### Features

- 25Ω series resistors in outputs eliminate the need for external resistors
- TRI-STATE® outputs drive bus lines or buffer memory address registers
- Low I<sub>CCZ</sub> through BiCMOS techniques
- 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>IP</sub>)

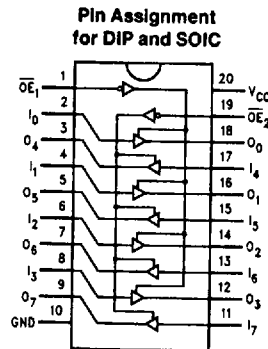
**Ordering Code:** See Section 11

#### Logic Symbol



TL/F/10896-1

#### Connection Diagram



TL/F/10896-2

| Pin Names                          | Description                      |
|------------------------------------|----------------------------------|
| $\overline{OE}_1, \overline{OE}_2$ | Output Enable Input (Active Low) |
| I <sub>0</sub> -I <sub>7</sub>     | Inputs                           |
| O <sub>0</sub> -O <sub>7</sub>     | Outputs                          |

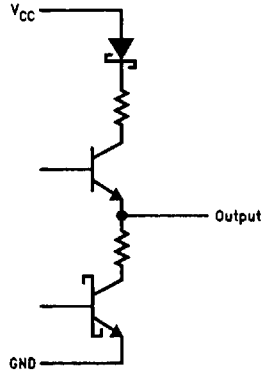


**Truth Table**

| $\overline{OE}_1$ | I <sub>0-3</sub> | O <sub>0-3</sub> | $\overline{OE}_2$ | I <sub>4-7</sub> | O <sub>4-7</sub> |
|-------------------|------------------|------------------|-------------------|------------------|------------------|
| H                 | X                | Z                | H                 | X                | Z                |
| L                 | H                | H                | L                 | H                | H                |
| L                 | L                | L                | L                 | L                | L                |

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = High Impedance

**Schematic of Each Output**



TL/F/10896-4

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### 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<br>-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               | 2.4<br>2.0 |             |      | V     | Min             | I <sub>OH</sub> = -3 mA<br>I <sub>OH</sub> = -15 mA |
| V <sub>OL</sub>  | Output LOW Voltage                |            | 0.55<br>0.8 |      | V     | Min             | I <sub>OL</sub> = 3 mA<br>I <sub>OL</sub> = 15 mA   |
| I <sub>IH</sub>  | Input HIGH Current                |            |             | 5    | μA    | Max             | V <sub>IN</sub> = 2.7V                              |
| I <sub>BVI</sub> | Input HIGH Current Breakdown Test |            |             | 7    | μA    | Max             | V <sub>IN</sub> = 7.0V                              |
| I <sub>IL</sub>  | Input LOW Current                 |            |             | -250 | μA    | Max             | V <sub>IN</sub> = 0.5V                              |
| I <sub>OS</sub>  | Output Short-Circuit Current      | -100       |             | -225 | mA    | Max             | V <sub>OUT</sub> = 0V                               |
| I <sub>OZH</sub> | Output Leakage Current            |            |             | 20   | μA    | Max             | V <sub>OUT</sub> = 2.7V                             |
| I <sub>OZL</sub> | Output Leakage Current            |            |             | -20  | μA    | Max             | V <sub>OUT</sub> = 0.5V                             |
| I <sub>CEX</sub> | Output HIGH Leakage Current       |            |             | 50   | μA    | Max             | V <sub>OUT</sub> = V <sub>CC</sub>                  |
| V <sub>ID</sub>  | Input Leakage Test                | 4.75       |             |      | V     | 0.0             | I <sub>ID</sub> = 1.9 μA<br>All Other Pins Grounded |
| I <sub>ZZ</sub>  | Bus Drainage Test                 |            |             | 100  | μA    | 0.0             | V <sub>OUT</sub> = 5.25V                            |
| I <sub>CCH</sub> | Power Supply Current              |            | 23          | 34   | mA    | Max             | V <sub>O</sub> = HIGH                               |
| I <sub>CCL</sub> | Power Supply Current              |            | 40          | 60   | mA    | Max             | V <sub>O</sub> = LOW                                |
| I <sub>CCZ</sub> | Power Supply Current              |            | 5.6         | 10   | mA    | Max             | V <sub>O</sub> = HIGH Z                             |

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

| Symbol                               | Parameter                                     | 74BCT   |            |            | 74BCT   |             | Units | Fig. No. |
|--------------------------------------|---|---|------------|------------|---|-------------|-------|----------|
|                                      |   | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |            |            | T <sub>A</sub> = Com<br>V <sub>CC</sub> = Com<br>C <sub>L</sub> = 50 pF |             |       |          |
|                                      |   | Min   | Typ        | Max        | Min   | Max         |       |          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>Data to Output           | 0.5<br>1.6  | 3<br>3.7   | 4.4<br>6.3 | 0.5<br>1.6  | 4.9<br>6.7  | ns    | 8-3      |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time                            | 2.4<br>3.9  | 6.1<br>7.1 | 7.7<br>9.4 | 2.4<br>3.9  | 8.7<br>10.4 | ns    | 8-5      |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time                           | 1.7<br>2.8  | 4<br>6     | 6.9<br>8.3 | 1.7<br>2.8  | 7.8<br>9.8  | ns    | 8-5      |
| t <sub>OSHL</sub><br>(Note 1)        | Pin to Pin Skew<br>HL Data to Output          |   |            | 1.8        |   | 2.8         | ns    |          |
| t <sub>OSLH</sub><br>(Note 1)        | Pin to Pin Skew<br>HL Data to Output          |   |            | 1.0        |   | 1.2         | ns    |          |
| t <sub>OST</sub><br>(Note 1)         | Pin to Pin Skew<br>LH/HL Data to Output       |   |            | 2.9        |   | 3.3         | ns    |          |
| t <sub>PV</sub><br>(Note 2)          | Device to Device Skew<br>LH/HL Data to Output |   |            | 3.5        |   | 3.9         | 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<br>V <sub>CC</sub> = Com<br>C <sub>L</sub> = 50 pF<br>8 Outputs<br>Switching<br>(Note 1) |            | T <sub>A</sub> = Com<br>V <sub>CC</sub> = Com<br>C <sub>L</sub> = 250 pF<br>(Note 2) |            |       |          |
|                                      |                                     | Min   | Max        | Min  | Max        |       |          |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>Data to Output | 2.0<br>3.0  | 5.4<br>7.2 | 3.0<br>3.0   | 7.0<br>9.5 | 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 Capacitance      | 6   | pF    | V <sub>CC</sub> = 5.0V |
| C <sub>OUT</sub> | Output Pin Capacitance | 11  | pF    | V <sub>CC</sub> = 5.0V |