

## 74FR16245

### 16-Bit Transceiver with 3-STATE Outputs

#### General Description

The 74FR16245 contains sixteen non-inverting bidirectional buffers with 3-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 64 mA on both the A and B Ports. The device is byte controlled. Each byte has separate control inputs which can be shorted together for full 16-bit operation. The transmit/receive ( $T/R_n$ ) inputs determine the direction of data flow through the transceiver. The output enable ( $\overline{OE}_n$ ) inputs disable both A and B Ports by placing them in an high impedance state.

#### Features

- Non-inverting buffers
- Bidirectional data paths
- A and B output sink capability of 64 mA, source capability of 15 mA
- Separate control pins for each byte
- Guaranteed pin-to-pin skew
- Low 3-STATE  $I_{IL}$
- 16-Bit version of the 74F245 or 74F645

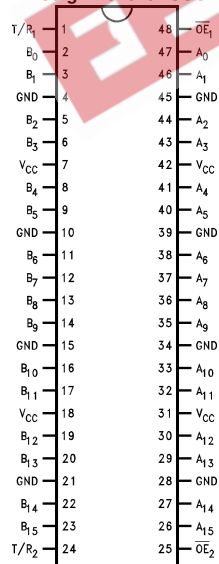
#### Ordering Code:

| Order Number | Package Number | Package Description                                                   |
|--------------|----------------|-----------------------------------------------------------------------|
| 74FR16245QC  | V44A           | 44-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.650 Square  |
| 74FR16245SSC | MS48A          | 48-Lead Small Shrink Outline Package (SSOP), JEDEC MO-118, 0.300 Wide |

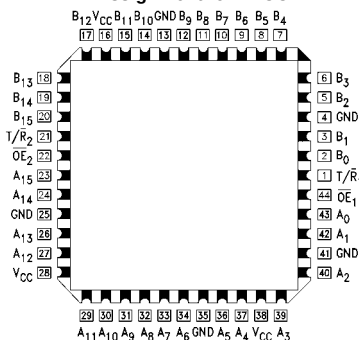
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

#### Connection Diagrams

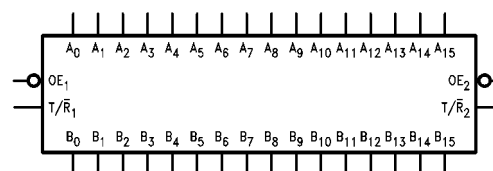
Pin Assignment for SSOP



Pin Assignment for PLCC



#### Logic Symbol



Pin Descriptions

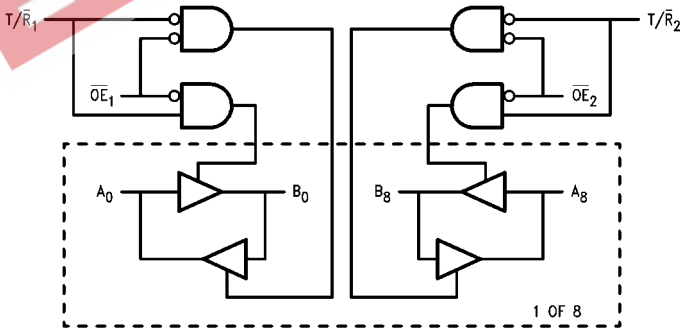
| Pin Names          | Description                  |
|--------------------|------------------------------|
| $\overline{OE}_n$  | Output Enable Input          |
| $T/\overline{R}_n$ | Transmit/Receive Input       |
| $A_0-A_{15}$       | A Bus Inputs/3-STATE Outputs |
| $B_0-B_{15}$       | B Bus Inputs/3-STATE Outputs |

Truth Table

| Inputs            |                    |                   |                    | Output Operating Mode |                 |
|-------------------|--------------------|-------------------|--------------------|-----------------------|-----------------|
| Byte1 (0:7)       |                    | Byte2 (8:15)      |                    | Byte1 (0:7)           | Byte2 (8:15)    |
| $\overline{OE}_1$ | $T/\overline{R}_1$ | $\overline{OE}_2$ | $T/\overline{R}_2$ | Byte1 (0:7)           | Byte2 (8:15)    |
| L                 | L                  | H                 | X                  | Bus B Data to A       | High Z State    |
| L                 | H                  | H                 | X                  | Bus A Data to B       | High Z State    |
| H                 | X                  | L                 | L                  | High Z State          | Bus B Data to A |
| H                 | X                  | L                 | H                  | High Z State          | Bus A Data to B |
| L                 | L                  | L                 | L                  | Bus B Data to A       | Bus B Data to A |
| L                 | H                  | L                 | H                  | Bus A Data to B       | Bus A Data to B |
| H                 | X                  | H                 | X                  | High Z State          | High Z State    |

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

Logic Diagram



**Absolute Maximum Ratings**(Note 1)

|                                                                        |                                      |
|------------------------------------------------------------------------|--------------------------------------|
| Storage Temperature                                                    | −65°C to +150°C                      |
| Ambient Temperature under Bias                                         | −55°C to +125°C                      |
| Junction Temperature under Bias                                        | −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                    |
| Voltage Applied to Output<br>in HIGH State (with V <sub>CC</sub> = 0V) |                                      |
| Standard Output                                                        | −0.5V to V <sub>CC</sub>             |
| 3-STATE Output                                                         | −0.5V to +5.5V                       |
| Current Applied to Output<br>in LOW State (Max)                        | Twice the Rated I <sub>OL</sub> (mA) |
| ESD Last Passing Voltage (Min)                                         | 4000V                                |

**Recommended Operating Conditions**

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

**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.

**DC Electrical Characteristics**

| Symbol                                | Parameter                               | Min        | Typ         | Max          | Units    | V <sub>CC</sub> | Conditions                                                                                                                     |
|---------------------------------------|-----------------------------------------|------------|-------------|--------------|----------|-----------------|--------------------------------------------------------------------------------------------------------------------------------|
| 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 | 2.8<br>2.44 |              | V        | Min             | I <sub>OH</sub> = − 3 mA<br>I <sub>OH</sub> = − 15 mA<br>(A <sub>n</sub> , B <sub>n</sub> )                                    |
| V <sub>OL</sub>                       | Output LOW Voltage                      |            | 0.45        | 0.55         | V        | Min             | I <sub>OL</sub> = 64 mA<br>(A <sub>n</sub> , B <sub>n</sub> )                                                                  |
| I <sub>IH</sub>                       | Input HIGH Current                      |            |             | 5.0          | μA       | Max             | V <sub>IN</sub> = 2.7V                                                                                                         |
| I <sub>BVI</sub>                      | Input HIGH Current Break-Down Test      |            |             | 7.0          | μA       | Max             | V <sub>IN</sub> = 7.0V<br>( $\overline{OE}_n$ , $\overline{TR}_n$ )                                                            |
| I <sub>BVIT</sub>                     | Input HIGH Current Breakdown Test (I/O) |            |             | 0.1          | mA       | Max             | V <sub>IN</sub> = 5.5V<br>(A <sub>n</sub> , B <sub>n</sub> )                                                                   |
| I <sub>IL</sub>                       | Input LOW Current                       |            |             | −150<br>−100 | μA<br>μA | Max<br>Max      | V <sub>IN</sub> = 0.5V ( $\overline{TR}_n$ , A <sub>n</sub> , B <sub>n</sub> )<br>V <sub>IN</sub> = 0.5V ( $\overline{OE}_n$ ) |
| I <sub>OS</sub>                       | Output Short-Circuit Current            | −100       |             | −225         | mA       | Max             | V <sub>OUT</sub> = 0V<br>(A <sub>n</sub> , B <sub>n</sub> )                                                                    |
| I <sub>IH</sub> +<br>I <sub>OZH</sub> | Output Leakage Current                  |            | 0           | 25           | μA       | Max             | V <sub>OUT</sub> = 2.7V<br>(A <sub>n</sub> , B <sub>n</sub> )                                                                  |
| I <sub>IL</sub> +<br>I <sub>OZL</sub> | Output Leakage Current                  |            | −20         | −150         | μA       | Max             | V <sub>OUT</sub> = 0.5V<br>(A <sub>n</sub> , B <sub>n</sub> )                                                                  |
| I <sub>CEX</sub>                      | Output HIGH Leakage Current             |            |             | 50           | μA       | Max             | V <sub>OUT</sub> = V <sub>CC</sub><br>(A <sub>n</sub> , B <sub>n</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>OD</sub>                       | Output Circuit Leakage Current          |            |             | 3.75         | μA       | 0.0             | V <sub>IOD</sub> = 150 mV<br>All Other Pins Grounded                                                                           |
| I <sub>ZZ</sub>                       | Bus Drainage Test                       |            |             | 100          | μA       | 0.0             | V <sub>OUT</sub> = 5.25V<br>(A <sub>n</sub> , B <sub>n</sub> )                                                                 |
| I <sub>CCH</sub>                      | Power Supply Current                    |            | 70          | 105          | mA       | Max             | V <sub>O</sub> = HIGH                                                                                                          |
| I <sub>CCL</sub>                      | Power Supply Current                    |            | 127         | 165          | mA       | Max             | V <sub>O</sub> = LOW                                                                                                           |
| I <sub>CCZ</sub>                      | Power Supply Current                    |            | 71          | 105          | mA       | Max             | V <sub>O</sub> = HIGH Z                                                                                                        |
| C <sub>IN</sub>                       | Input Capacitance                       |            | 8.0         |              | pF       | 5.0             | $\overline{OE}_n$ , $\overline{TR}_n$                                                                                          |
|                                       |                                         |            | 17.0        |              | pF       | 5.0             | A <sub>n</sub> , B <sub>n</sub>                                                                                                |

## AC Electrical Characteristics

| Symbol           | Parameter                                                            | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |     |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |      | Unit |
|------------------|----------------------------------------------------------------------|-----------------------------------------------------------------------------|-----|------|------------------------------------------------------------------------------------|------|------|
|                  |                                                                      | Min                                                                         | Typ | Max  | Min                                                                                | Max  |      |
| t <sub>PLH</sub> | Propagation Delay                                                    | 1.3                                                                         | 2.7 | 4.3  | 1.3                                                                                | 4.3  | ns   |
| t <sub>PHL</sub> | A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub> | 1.3                                                                         | 2.2 | 4.3  | 1.3                                                                                | 4.3  |      |
| t <sub>PZH</sub> | Output Enable Time                                                   | 3.9                                                                         | 6.9 | 13.9 | 3.9                                                                                | 13.9 | ns   |
| t <sub>PZL</sub> |                                                                      | 3.9                                                                         | 9.7 | 13.9 | 3.9                                                                                | 13.9 |      |
| t <sub>PHZ</sub> | Output Disable Time                                                  | 1.8                                                                         | 3.9 | 6.3  | 1.8                                                                                | 6.3  | ns   |
| t <sub>PLZ</sub> |                                                                      | 1.8                                                                         | 4.4 | 6.3  | 1.8                                                                                | 6.3  |      |

## Extended AC Characteristics

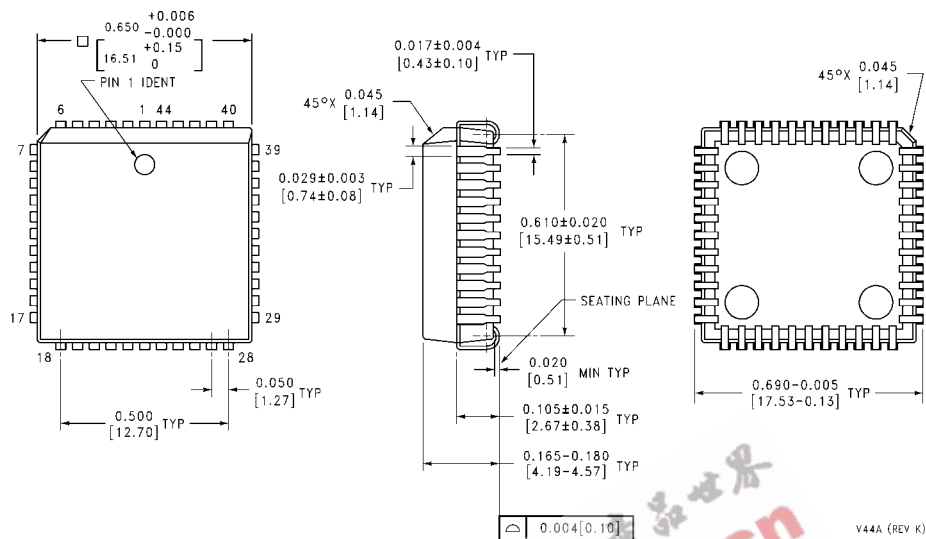
| Symbol                        | Parameter                                                            | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF<br>16 Outputs Switching<br>(Note 4) |      | T <sub>A</sub> = 0°C to +70°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 250 pF<br>(Note 5) |     | Unit |
|-------------------------------|----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------|-------------------------------------------------------------------------------------------------|-----|------|
|                               |                                                                      | Min                                                                                                                    | Max  | Min                                                                                             | Max |      |
| t <sub>PLH</sub>              | Propagation Delay                                                    | 1.3                                                                                                                    | 5.8  | 3.2                                                                                             | 8.2 | ns   |
| t <sub>PHL</sub>              | A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub> | 1.3                                                                                                                    | 5.8  | 3.2                                                                                             | 8.2 |      |
| t <sub>PZH</sub>              | Output Enable Time                                                   | 3.9                                                                                                                    | 14.6 |                                                                                                 |     | ns   |
| t <sub>PZL</sub>              |                                                                      | 3.9                                                                                                                    | 14.6 |                                                                                                 |     |      |
| t <sub>PHZ</sub>              | Output Disable Time                                                  | 1.8                                                                                                                    | 6.3  |                                                                                                 |     | ns   |
| t <sub>PLZ</sub>              |                                                                      | 1.8                                                                                                                    | 6.3  |                                                                                                 |     |      |
| t <sub>OSHL</sub><br>(Note 3) | Pin-to-Pin Skew<br>for HL Transitions                                |                                                                                                                        | 1.2  |                                                                                                 |     | ns   |
| t <sub>OSLH</sub><br>(Note 3) | Pin-to-Pin Skew<br>for LH Transitions                                |                                                                                                                        | 2.2  |                                                                                                 |     | ns   |
| t <sub>OST</sub><br>(Note 3)  | Pin-to-Pin Skew<br>for HL/LH Transitions                             |                                                                                                                        | 2.5  |                                                                                                 |     | ns   |

**Note 3:** Skew is defined as the absolute value of the difference between the actual propagation delays for any two 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 HIGH-to-LOW and/or LOW-to-HIGH (t<sub>OST</sub>). Specifications guaranteed with all outputs switching in phase.

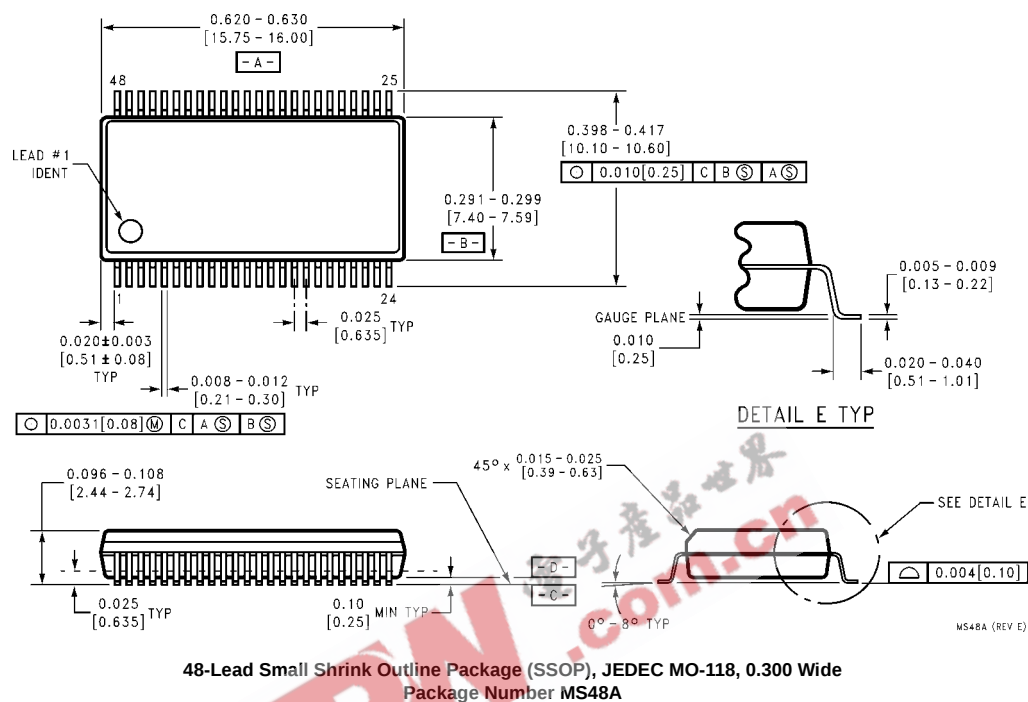
**Note 4:** This specification is guaranteed but not tested. The limits apply to propagation delays for all paths described switching in phase, i.e., all LOW-to-HIGH, HIGH-to-LOW, 3-STATE-to-HIGH, etc.

**Note 5:** These specifications 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.

# Physical Dimensions inches (millimeters) unless otherwise noted



44-Lead Plastic Lead Chip Carrier (PLCC), JEDEC MO-047, 0.650 Square  
 Package Number V44A

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

**LIFE SUPPORT POLICY**

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

[www.fairchildsemi.com](http://www.fairchildsemi.com)