

# 54F/74F243 Quad Bus Transceiver with TRI-STATE® Outputs

## General Description

The 'F243 is a quad bus transmitter/receiver designed for 4-line asynchronous 2-way data communications between data busses.

## Features

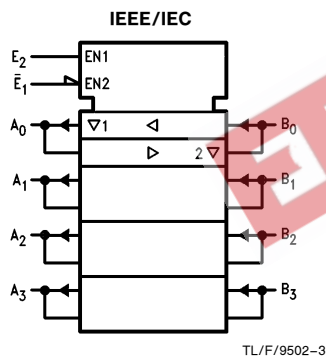
- 2-Way asynchronous data bus communication
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

| Commercial        | Military          | Package Number | Package Description                               |
|-------------------|-------------------|----------------|---|
|                   | 54F243DM (Note 2) | J14A           | 14-Lead Ceramic Dual-In-Line                      |
| 74F243SC (Note 1) |                   | M14A           | 14-Lead (0.150" Wide) Molded Small Outline, JEDEC |
|                   | 54F243FM (Note 2) | W14B           | 14-Lead Cerpack                                   |
|                   | 54F243LM (Note 2) | E20A           | 20-Lead Ceramic Leadless Chip Carrier, Type C     |

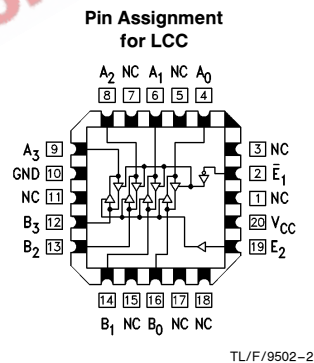
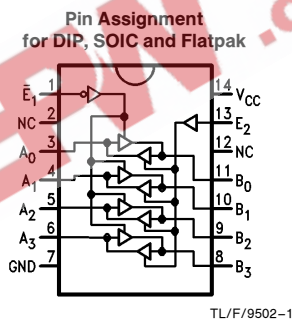
**Note 1:** Devices also available in 13" reel. Use Suffix = SCX.

**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMOB, FMOB and LMOB.

## Logic Symbol



## Connection Diagrams



TRI-STATE® is a registered trademark of National Semiconductor Corporation.

## Unit Loading/Fan Out

| Pin Names   | Description                | 54F/74F          |   |
|-------------|----------------------------|------------------|---|
|             |                            | U.L.<br>HIGH/LOW | Input $I_{IH}/I_{IL}$<br>Output $I_{OH}/I_{OL}$ |
| $\bar{E}_1$ | Enable Input (Active LOW)  | 1.0/1.67         | 20 $\mu$ A/ -1 mA                               |
| $E_2$       | Enable Input (Active HIGH) | 1.0/1.67         | 20 $\mu$ A/ -1 mA                               |
| $A_n, B_n$  | Inputs                     | 3.5/2.67         | 70 $\mu$ A/ -1.6 mA                             |
|             | Outputs                    | 600/106.6(80)    | -12 mA/64 mA(48 mA)                             |

## Truth Table

| Inputs      |       | Inputs/Outputs |       |
|-------------|-------|----------------|-------|
| $\bar{E}_1$ | $E_2$ | $A_n$          | $B_n$ |
| L           | L     | Input          | B = A |
| L           | H     | N/A            | N/A   |
| H           | L     | Z              | Z     |
| H           | H     | A = B          | Input |

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 Z = High Impedance  
 N/A = Not Allowed

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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                                     | -55°C to +175°C                      |
| 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                    |
| Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V) |                                      |
| Standard Output   | -0.5V to V <sub>CC</sub>             |
| TRI-STATE Output  | -0.5V to +5.5V                       |
| Current Applied to Output in LOW State (Max)                        | twice the rated I <sub>OL</sub> (mA) |
| ESD Last Passing Voltage (Min)                                      | 4000V                                |

**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.

## Recommended Operating Conditions

|                              |                 |
|------------------------------|-----------------|
| Free Air Ambient Temperature |                 |
| Military                     | -55°C to +125°C |
| Commercial                   | 0°C to +70°C    |
| Supply Voltage               |                 |
| Military                     | +4.5V to +5.5V  |
| Commercial                   | +4.5V to +5.5V  |

## DC Electrical Characteristics

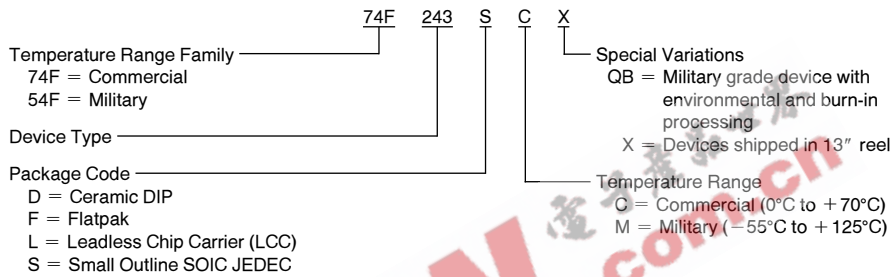
| Symbol                             | Parameter                          | 54F/74F  |                                 |              | Units | V <sub>CC</sub> | Conditions   |
|------------------------------------|------------------------------------|--|---------------------------------|--------------|-------|-----------------|--|
|                                    |                                    | 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                | 54F 10% V <sub>CC</sub><br>54F 10% V <sub>CC</sub><br>74F 10% V <sub>CC</sub><br>74F 10% V <sub>CC</sub><br>74F 5% V <sub>CC</sub> | 2.4<br>2.0<br>2.4<br>2.0<br>2.7 |              | V     | Min             | I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> )<br>I <sub>OH</sub> = -12 mA (A <sub>n</sub> , B <sub>n</sub> )<br>I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> )<br>I <sub>OH</sub> = -15 mA (A <sub>n</sub> , B <sub>n</sub> )<br>I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> ) |
| V <sub>OL</sub>                    | Output LOW Voltage                 | 54F 10% V <sub>CC</sub><br>74F 10% V <sub>CC</sub>   |                                 | 0.55<br>0.55 | V     | Min             | I <sub>OL</sub> = 48 mA (A <sub>n</sub> , B <sub>n</sub> )<br>I <sub>OL</sub> = 64 mA (A <sub>n</sub> , B <sub>n</sub> )   |
| I <sub>IH</sub>                    | Input HIGH Current                 | 54F<br>74F   |                                 | 20.0<br>5.0  | μA    | Max             | V <sub>IN</sub> = 2.7V   |
| I <sub>BVI</sub>                   | Input HIGH Current Breakdown Test  | 54F<br>74F   |                                 | 100<br>7.0   | μA    | Max             | V <sub>IN</sub> = 7.0V (E <sub>1</sub> , E <sub>2</sub> )  |
| I <sub>BVIT</sub>                  | Input HIGH Current Breakdown (I/O) | 54F<br>74F   |                                 | 1.0<br>0.5   | mA    | Max             | V <sub>IN</sub> = 5.5V (A <sub>n</sub> , B <sub>n</sub> )  |
| I <sub>CEX</sub>                   | Output HIGH Leakage Current        | 54F<br>74F   |                                 | 250<br>50    | μA    | Max             | V <sub>OUT</sub> = V <sub>CC</sub>   |
| V <sub>ID</sub>                    | Input Leakage Test                 | 74F  | 4.75                            |              | V     | 0.0             | I <sub>ID</sub> = 1.9 μA<br>All Other Pins Grounded  |
| I <sub>OD</sub>                    | Output Leakage Circuit Current     | 74F  |                                 | 3.75         | μA    | 0.0             | V <sub>IOD</sub> = 150 mV<br>All Other Pins Grounded   |
| I <sub>IL</sub>                    | Input LOW Current                  |  |                                 | -1.0         | mA    | Max             | V <sub>IN</sub> = 0.5V (E <sub>1</sub> , E <sub>2</sub> )  |
| I <sub>IH</sub> + I <sub>OZH</sub> | Output Leakage Current             |  |                                 | 70           | μA    | Max             | V <sub>OUT</sub> = 2.7V (A <sub>n</sub> , B <sub>n</sub> )   |
| I <sub>IL</sub> + I <sub>OZL</sub> | Output Leakage Current             |  |                                 | -1.6         | mA    | Max             | V <sub>OUT</sub> = 0.5V (A <sub>n</sub> , B <sub>n</sub> )   |
| I <sub>OS</sub>                    | Output Short-Circuit Current       |  |                                 | -100         | mA    | Max             | V <sub>OUT</sub> = 0V (A <sub>n</sub> , B <sub>n</sub> )   |
| I <sub>CCH</sub>                   | Power Supply Current               |  | 64                              | 80           | mA    | Max             | V <sub>O</sub> = HIGH  |
| I <sub>CCL</sub>                   | Power Supply Current               |  | 64                              | 90           | mA    | Max             | V <sub>O</sub> = LOW   |
| I <sub>CCZ</sub>                   | Power Supply Current               |  | 71                              | 90           | mA    | Max             | V <sub>O</sub> = HIGH Z  |

## AC Electrical Characteristics

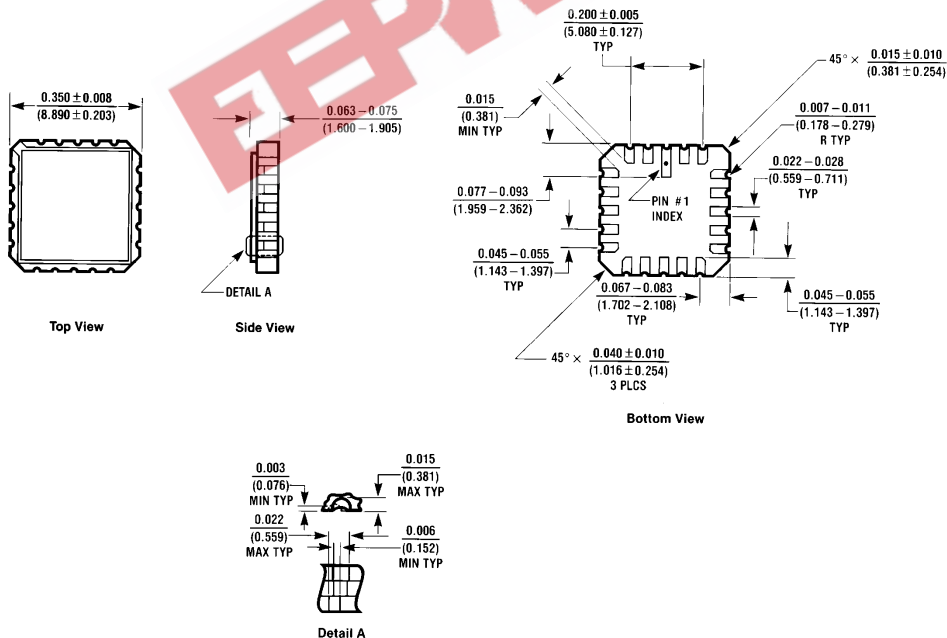
| Symbol           | Parameter   | 74F   |     |     | 54F  |      | 74F  |     | Units |
|------------------|---|---|-----|-----|--|------|--|-----|-------|
|                  |   | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V<br>C <sub>L</sub> = 50 pF |     |     | T <sub>A</sub> , V <sub>CC</sub> = Mil<br>C <sub>L</sub> = 50 pF |      | T <sub>A</sub> , V <sub>CC</sub> = Com<br>C <sub>L</sub> = 50 pF |     |       |
|                  |   | Min   | Typ | Max | Min  | Max  | Min  | Max |       |
| t <sub>PLH</sub> | Propagation Delay   | 2.5   | 4.0 | 5.2 | 2.0  | 6.5  | 2.0  | 6.2 | ns    |
| t <sub>PHL</sub> | A <sub>n</sub> to B <sub>n</sub> , B <sub>n</sub> to A <sub>n</sub> | 2.5   | 4.0 | 5.2 | 2.0  | 8.5  | 2.0  | 6.5 |       |
| t <sub>pZH</sub> | Output Enable Time  | 2.0   | 4.3 | 5.7 | 2.0  | 8.0  | 2.0  | 6.7 | ns    |
| t <sub>pZL</sub> | $\bar{E}_1$ to B <sub>n</sub> , E <sub>2</sub> to A <sub>n</sub>    | 2.0   | 5.8 | 7.5 | 2.0  | 10.5 | 2.0  | 8.5 |       |
| t <sub>pHZ</sub> | Output Disable Time   | 2.0   | 4.5 | 6.0 | 1.5  | 7.5  | 1.5  | 7.0 |       |
| t <sub>PLZ</sub> | $\bar{E}_1$ to B <sub>n</sub> , E <sub>2</sub> to A <sub>n</sub>    | 2.0   | 4.5 | 6.0 | 2.0  | 8.5  | 2.0  | 7.0 |       |

## Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



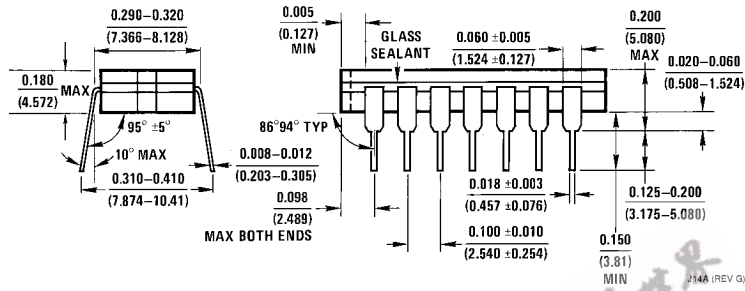
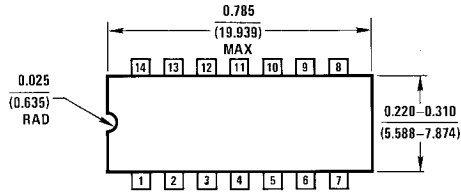
## Physical Dimensions inches (millimeters)



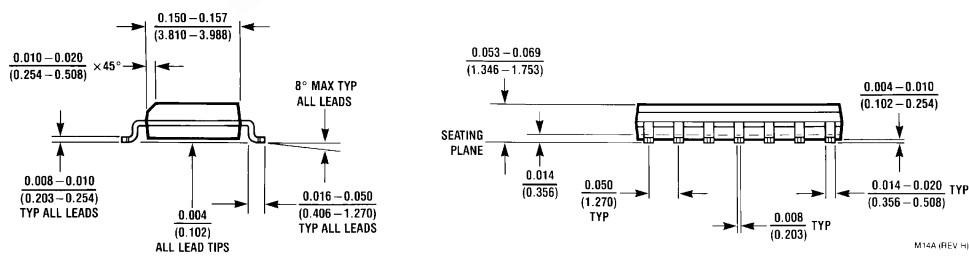
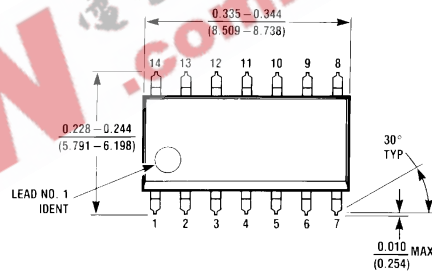
20-Lead Ceramic Leadless Chip Carrier (L)  
 NS Package Number E20A

E20A (REV D)

**Physical Dimensions** inches (millimeters) (Continued)

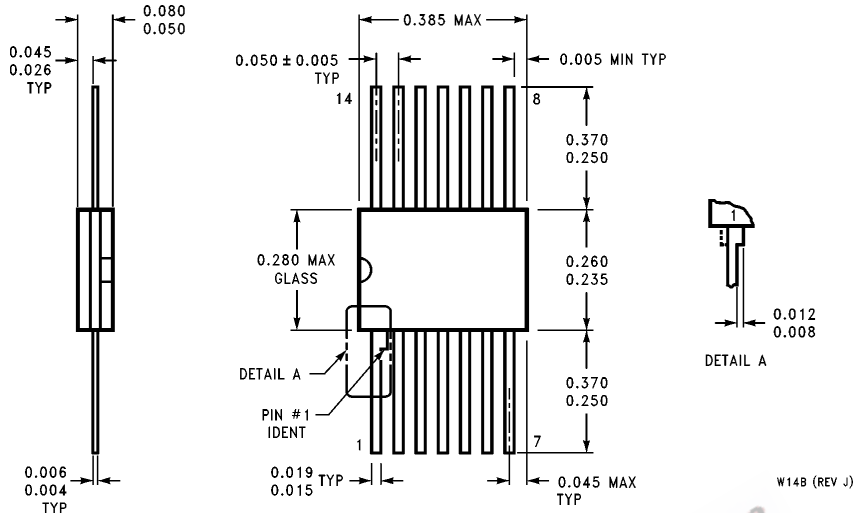


**14-Lead Ceramic Dual-In-Line Package (D)**  
NS Package Number J14A



**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)**  
NS Package Number M14A

**Physical Dimensions** inches (millimeters) (Continued)



**14-Lead Ceramic Flatpak (F)  
NS Package Number W14B**



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