

## 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

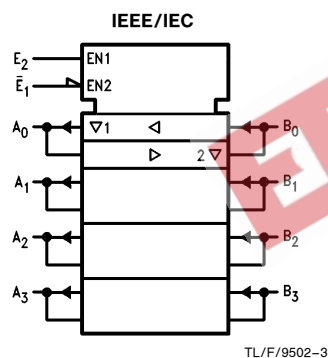
- 2-Way asynchronous data bus communication
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

| 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     |

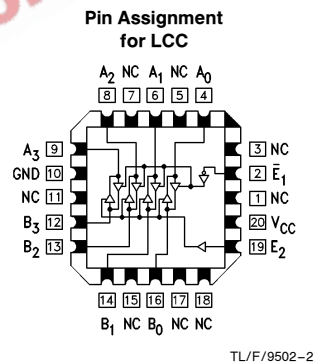
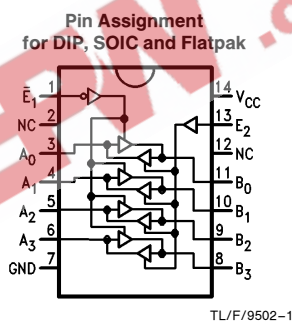
**Note 1:** Devices also available in 13" reel. Use Suffix = SCX.

**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

## 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

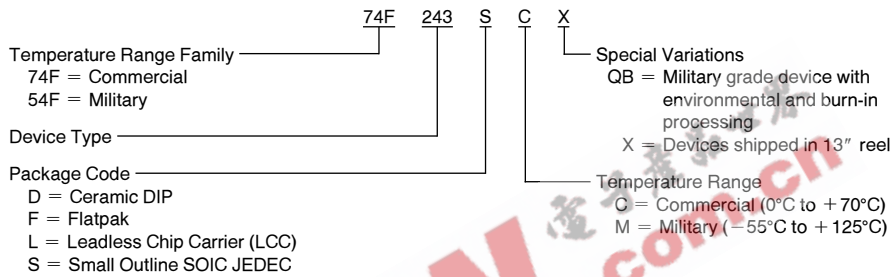
| Symbol                             | Parameter                          | 54F/74F                                                                                                                            |                                 |              | Units | V <sub>CC</sub> | Conditions                                                                                                                                                                                                                                                                                                           |
|------------------------------------|------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|--------------|-------|-----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                    |                                    | 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                            | −225         | 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

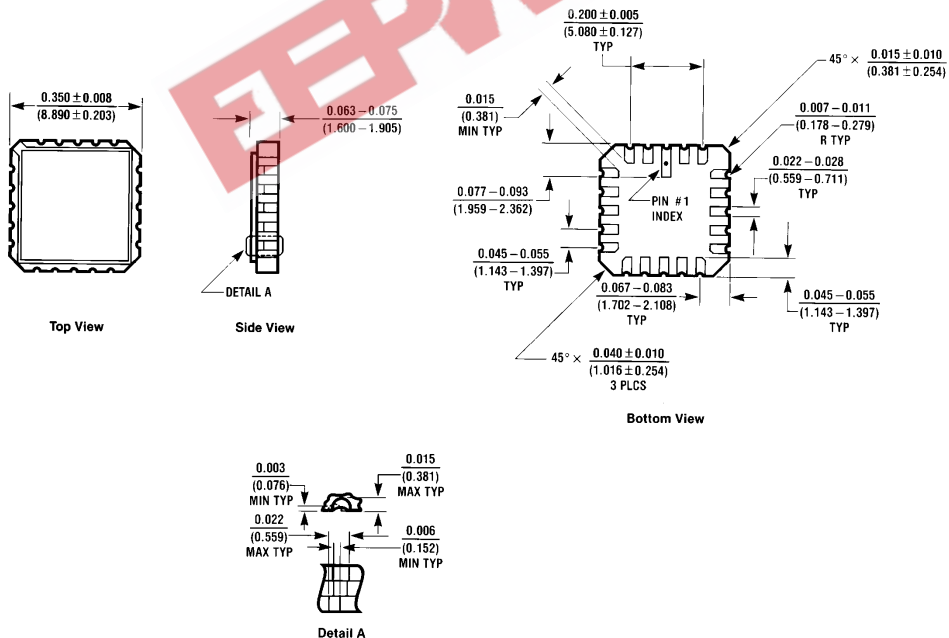
| Symbol           | Parameter                                                           | 74F                                                                            |     |     | 54F                                                |      | 74F                                                |     | Units |
|------------------|---------------------------------------------------------------------|--------------------------------------------------------------------------------|-----|-----|----------------------------------------------------|------|----------------------------------------------------|-----|-------|
|                  |                                                                     | $T_A = +25^{\circ}\text{C}$<br>$V_{CC} = +5.0\text{V}$<br>$C_L = 50\text{ pF}$ |     |     | $T_A, V_{CC} = \text{Mil}$<br>$C_L = 50\text{ pF}$ |      | $T_A, V_{CC} = \text{Com}$<br>$C_L = 50\text{ pF}$ |     |       |
|                  |                                                                     | 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)

0.785  
(19.939)  
MAX  
14 13 12 11 10 9 8  
0.025  
(0.635)  
RAD  
0.220-0.310  
(5.588-7.874)  
1 2 3 4 5 6 7

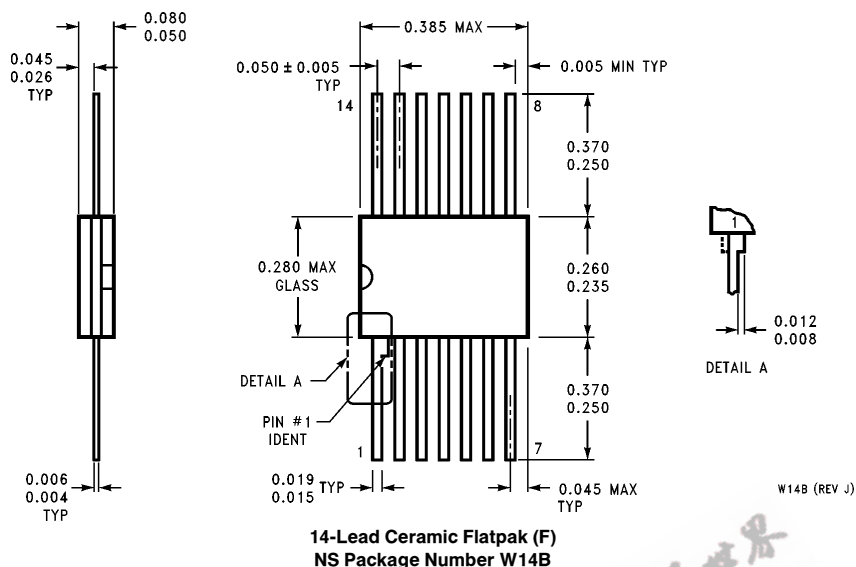
0.290-0.320  
(7.366-8.128)  
0.180  
(4.572)  
MAX  
95° ±5°  
10° MAX  
0.310-0.410  
(7.874-10.41)  
0.008-0.012  
(0.203-0.305)  
86°-94° TYP  
0.098  
(2.489)  
MAX BOTH ENDS  
0.060 ±0.005  
(1.524 ±0.127)  
GLASS SEALANT  
0.200  
(5.080)  
MAX  
0.020-0.060  
(0.508-1.524)  
0.018 ±0.003  
(0.457 ±0.076)  
0.100 ±0.010  
(2.540 ±0.254)  
0.125-0.200  
(3.175-5.080)  
0.150  
(3.81)  
MIN  
J14A (REV G)

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

0.335-0.344  
(8.509-8.738)  
14 13 12 11 10 9 8  
0.228-0.244  
(5.791-6.198)  
LEAD NO. 1  
IDENT  
30° TYP  
0.010 MAX  
(0.254)  
1 2 3 4 5 6 7

0.150-0.157  
(3.810-3.988)  
0.010-0.020  
(0.254-0.508)  
×45°  
8° MAX TYP  
ALL LEADS  
0.008-0.010  
(0.203-0.254)  
TYP ALL LEADS  
0.004  
(0.102)  
ALL LEAD TIPS  
0.016-0.050  
(0.406-1.270)  
TYP ALL LEADS  
0.053-0.069  
(1.346-1.753)  
SEATING PLANE  
0.014  
(0.356)  
0.050  
(1.270)  
TYP  
0.008 TYP  
(0.203)  
0.004-0.010  
(0.102-0.254)  
0.014-0.020 TYP  
(0.356-0.508)  
M14A (REV H)

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

**Physical Dimensions** inches (millimeters) (Continued)**LIFE SUPPORT POLICY**

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2. A critical component is 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.



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