National Semiconductor

November 1994

# 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

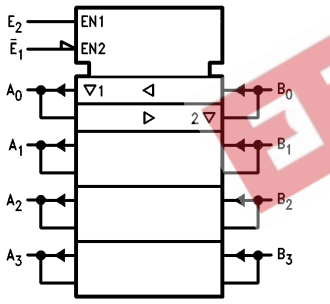
- 2-Way asynchronous data bus communication
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

| 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.

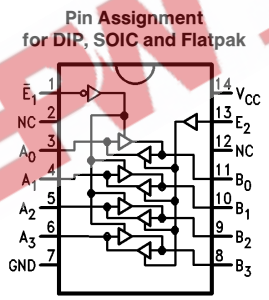
**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

## Logic Symbol




TL/F/9502–3

## Connection Diagrams

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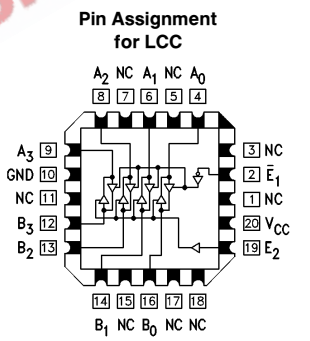


TL/F/9502–2

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RRD-B30M105/Printed in U. S. A.

## Unit Loading/Fan Out

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

## Truth Table

| Inputs | | Inputs/Outputs | |
|---|---|---|---|
| $\overline{E}_1$ | $E_2$ | $A_n$ | $B_n$ |
| 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 |
| $V_{CC}$ 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 $V_{CC}$ = 0V) | |
| Standard Output | −0.5V to $V_{CC}$ |
| TRI-STATE Output | −0.5V to +5.5V |
| Current Applied to Output in LOW State (Max) | twice the rated $I_{OL}$ (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 Min | 54F/74F Typ | 54F/74F Max | Units | $V_{CC}$ | Conditions |
|---|---|---|---|---|---|---|---|---|
| $V_{IH}$ | Input HIGH Voltage | | 2.0 | | | V | | Recognized as a HIGH Signal |
| $V_{IL}$ | Input LOW Voltage | | | | 0.8 | V | | Recognized as a LOW Signal |
| $V_{CD}$ | Input Clamp Diode Voltage | | | | −1.2 | V | Min | $I_{IN}$ = −18 mA |
| $V_{OH}$ | Output HIGH Voltage | 54F 10% $V_{CC}$ | 2.4 | | | V | Min | $I_{OH}$ = −3 mA ($A_n$, $B_n$) |
| | | 54F 10% $V_{CC}$ | 2.0 | | | | | $I_{OH}$ = −12 mA ($A_n$, $B_n$) |
| | | 74F 10% $V_{CC}$ | 2.4 | | | | | $I_{OH}$ = −3 mA ($A_n$, $B_n$) |
| | | 74F 10% $V_{CC}$ | 2.0 | | | | | $I_{OH}$ = −15 mA ($A_n$, $B_n$) |
| | | 74F 5% $V_{CC}$ | 2.7 | | | | | $I_{OH}$ = −3 mA ($A_n$, $B_n$) |
| $V_{OL}$ | Output LOW Voltage | 54F 10% $V_{CC}$ | | | 0.55 | V | Min | $I_{OL}$ = 48 mA ($A_n$, $B_n$) |
| | | 74F 10% $V_{CC}$ | | | 0.55 | | | $I_{OL}$ = 64 mA ($A_n$, $B_n$) |
| $I_{IH}$ | Input HIGH Current | 54F | | | 20.0 | μA | Max | $V_{IN}$ = 2.7V |
| | | 74F | | | 5.0 | | | |
| $I_{BVI}$ | Input HIGH Current Breakdown Test | 54F | | | 100 | μA | Max | $V_{IN}$ = 7.0V ($\overline{E}_1$, $E_2$) |
| | | 74F | | | 7.0 | | | |
| $I_{BVIT}$ | Input HIGH Current Breakdown (I/O) | 54F | | | 1.0 | mA | Max | $V_{IN}$ = 5.5V ($A_n$, $B_n$) |
| | | 74F | | | 0.5 | | | |
| $I_{CEX}$ | Output HIGH Leakage Current | 54F | | | 250 | μA | Max | $V_{OUT}$ = $V_{CC}$ |
| | | 74F | | | 50 | | | |
| $V_{ID}$ | Input Leakage Test | 74F | 4.75 | | | V | 0.0 | $I_{ID}$ = 1.9 μA All Other Pins Grounded |
| $I_{OD}$ | Output Leakage Circuit Current | 74F | | | 3.75 | μA | 0.0 | $V_{IOD}$ = 150 mV All Other Pins Grounded |
| $I_{IL}$ | Input LOW Current | | | | −1.0 | mA | Max | $V_{IN}$ = 0.5V ($\overline{E}_1$, $E_2$) |
| $I_{IH}$ + $I_{OZH}$ | Output Leakage Current | | | | 70 | μA | Max | $V_{OUT}$ = 2.7V ($A_n$, $B_n$) |
| $I_{IL}$ + $I_{OZL}$ | Output Leakage Current | | | | −1.6 | mA | Max | $V_{OUT}$ = 0.5V ($A_n$, $B_n$) |
| $I_{OS}$ | Output Short-Circuit Current | | −100 | | −225 | mA | Max | $V_{OUT}$ = 0V ($A_n$, $B_n$) |
| $I_{CCH}$ | Power Supply Current | | | 64 | 80 | mA | Max | $V_O$ = HIGH |
| $I_{CCL}$ | Power Supply Current | | | 64 | 90 | mA | Max | $V_O$ = LOW |
| $I_{CCZ}$ | Power Supply Current | | | 71 | 90 | mA | Max | $V_O$ = HIGH Z |

## AC Electrical Characteristics

| Symbol | Parameter | 74F $T_A = +25°C$ $V_{CC} = +5.0V$ $C_L = 50$ pF | | | 54F $T_A, V_{CC}$ = Mil $C_L = 50$ pF | | 74F $T_A, V_{CC}$ = Com $C_L = 50$ pF | | Units |
|---|---|---|---|---|---|---|---|---|---|
| | | Min | Typ | Max | Min | Max | Min | Max | |
| $t_{PLH}$ | Propagation Delay | 2.5 | 4.0 | 5.2 | 2.0 | 6.5 | 2.0 | 6.2 | ns |
| $t_{PHL}$ | $A_n$ to $B_n$, $B_n$ to $A_n$ | 2.5 | 4.0 | 5.2 | 2.0 | 8.5 | 2.0 | 6.5 | |
| $t_{PZH}$ | Output Enable Time | 2.0 | 4.3 | 5.7 | 2.0 | 8.0 | 2.0 | 6.7 | ns |
| $t_{PZL}$ | $\overline{E}_1$ to $B_n$, $E_2$ to $A_n$ | 2.0 | 5.8 | 7.5 | 2.0 | 10.5 | 2.0 | 8.5 | |
| $t_{PHZ}$ | Output Disable Time | 2.0 | 4.5 | 6.0 | 1.5 | 7.5 | 1.5 | 7.0 | |
| $t_{PLZ}$ | $\overline{E}_1$ to $B_n$, $E_2$ to $A_n$ | 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:

74F 243 S C X

Temperature Range Family
- 74F = Commercial
- 54F = Military

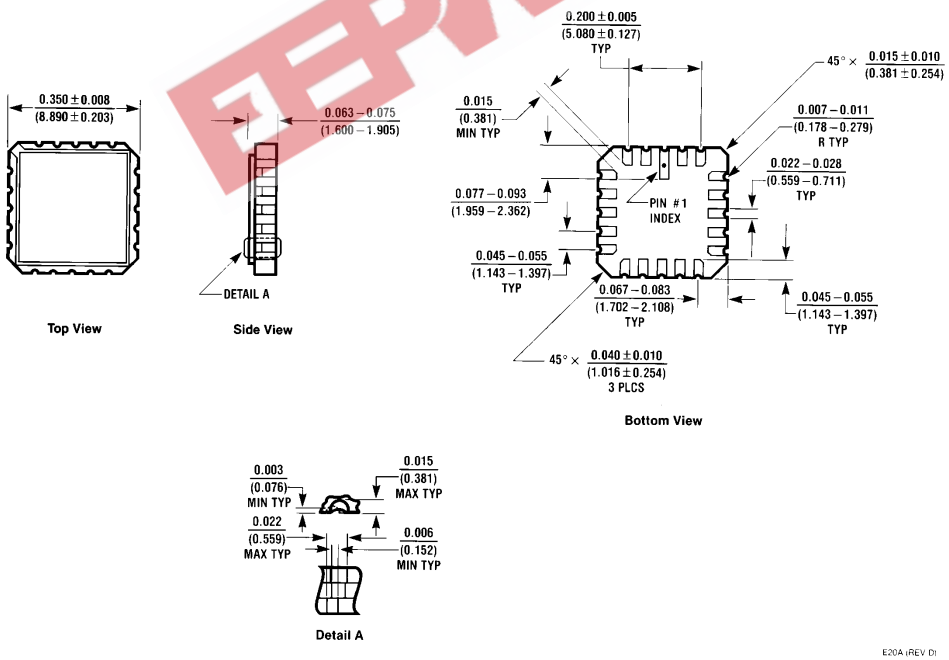
Device Type

Package Code
- D = Ceramic DIP
- F = Flatpak
- L = Leadless Chip Carrier (LCC)
- S = Small Outline SOIC JEDEC

Special Variations
- QB = Military grade device with environmental and burn-in processing
- X = Devices shipped in 13″ reel

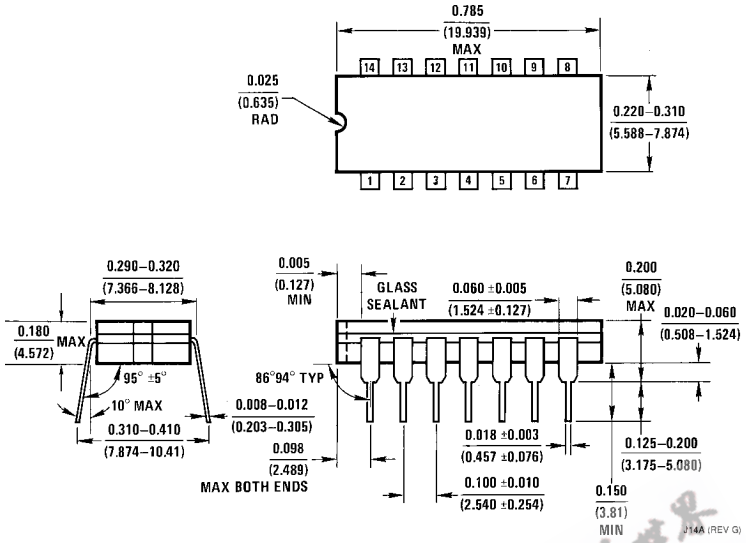
Temperature Range
- C = Commercial (0°C to +70°C)
- M = Military (−55°C to +125°C)

## Physical Dimensions inches (millimeters)

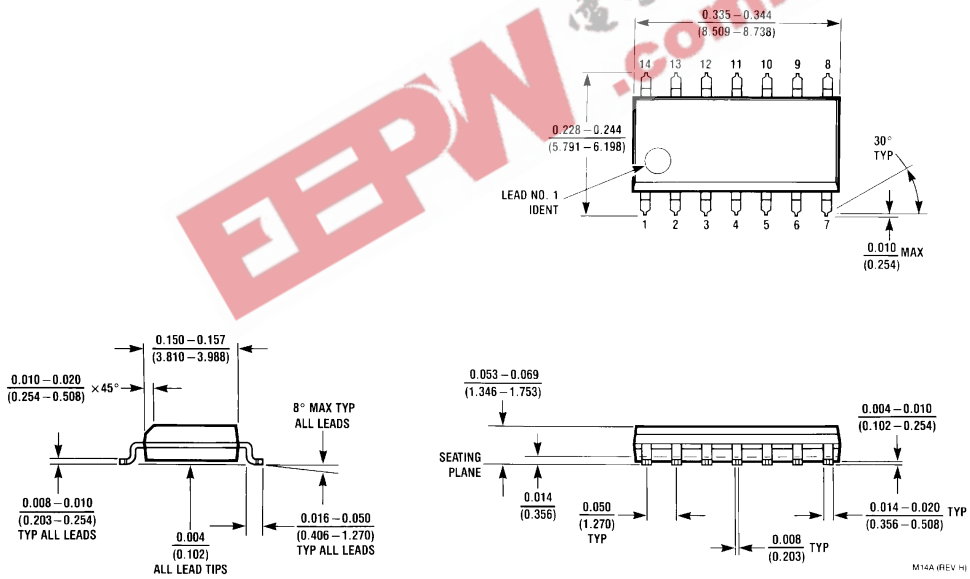



**20-Lead Ceramic Leadless Chip Carrier (L)**
**NS Package Number E20A**

## Physical Dimensions inches (millimeters) (Continued)

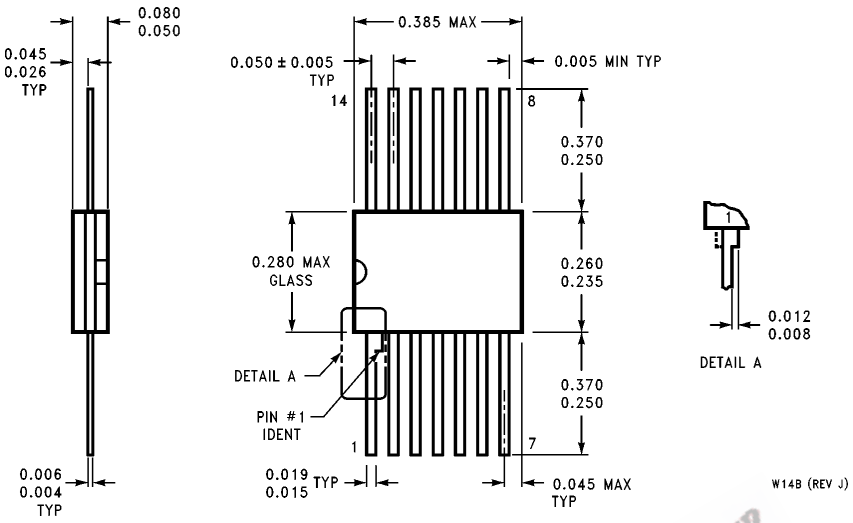



**14-Lead Ceramic Dual-In-Line Package (D)**
**NS Package Number J14A**




**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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