# 54F243,74F243

***54F243 74F243 Quad Bus Transceiver with TRI-STATE Outputs***


Literature Number: SNOS176A

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

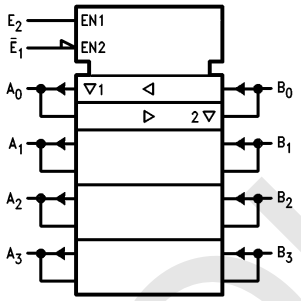
- 2-Way asynchronous data bus communication
- Input clamp diodes limit high-speed termination effects
- Guaranteed 4000V minimum ESD protection

| 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.

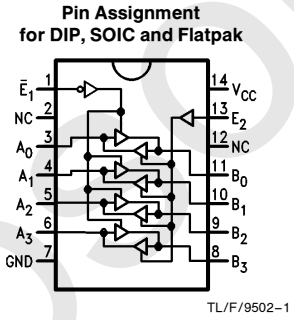
**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

## Logic Symbol

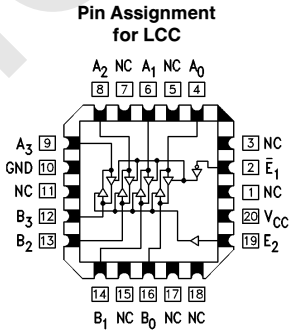



TL/F/9502–3

## Connection Diagrams




TL/F/9502–1




TL/F/9502–2

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

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 $\mu$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 | |
|---|---|---|---|
| $\overline{E}_1$ | $E_2$ | $A_n$ | $B_n$ |
| 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 | ns |
| $t_{PLZ}$ | $\overline{E}_1$ 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

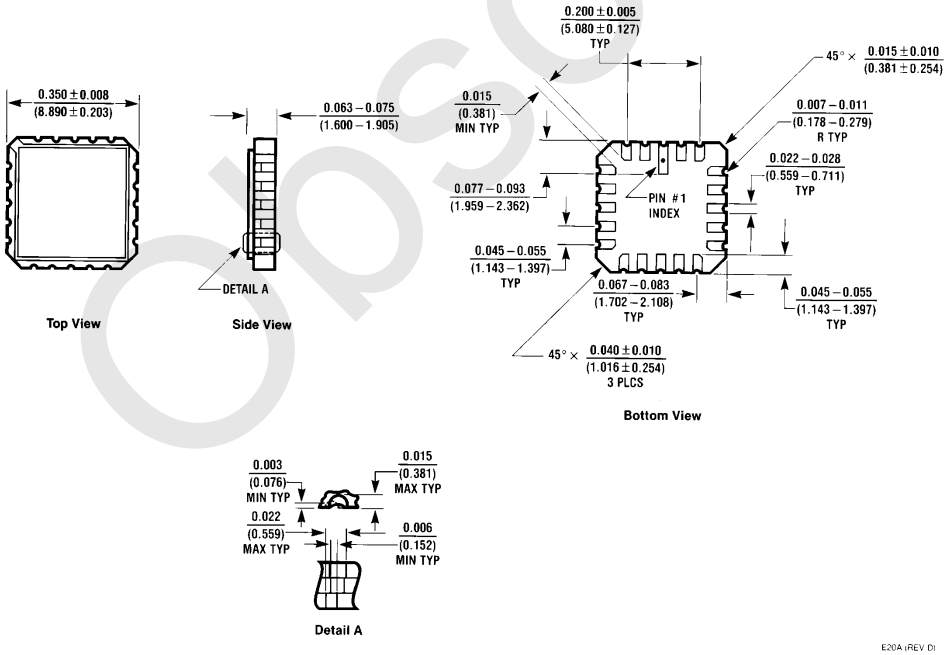
Device Type

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

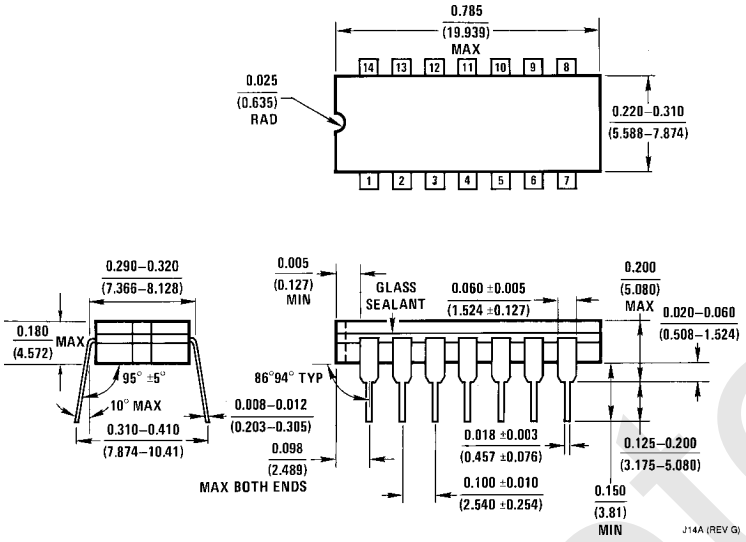
Temperature Range
- C = Commercial (0°C to +70°C)
- M = Military (−55°C to +125°C)

## Physical Dimensions inches (millimeters)

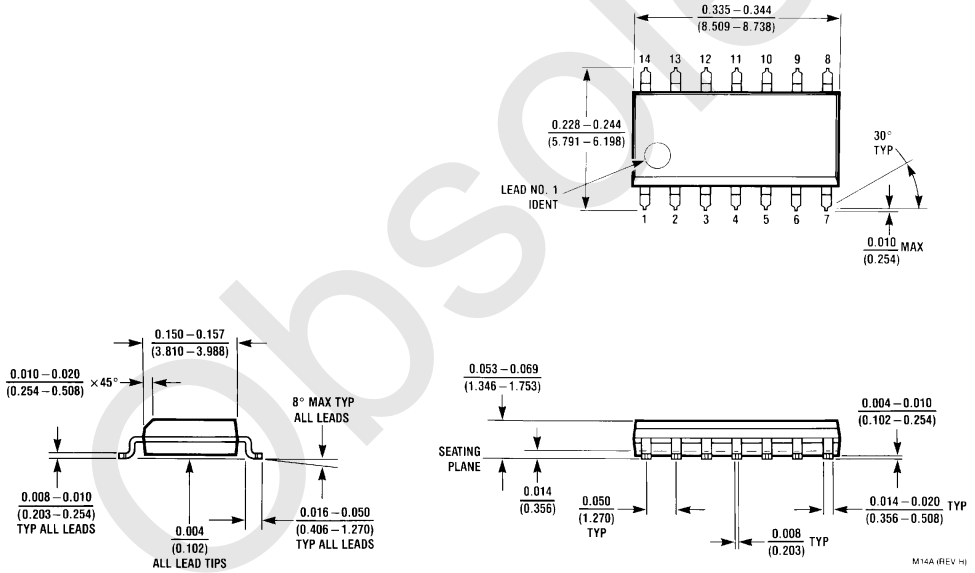



**20-Lead Ceramic Leadless Chip Carrier (L)**
**NS Package Number E20A**

## Physical Dimensions inches (millimeters) (Continued)

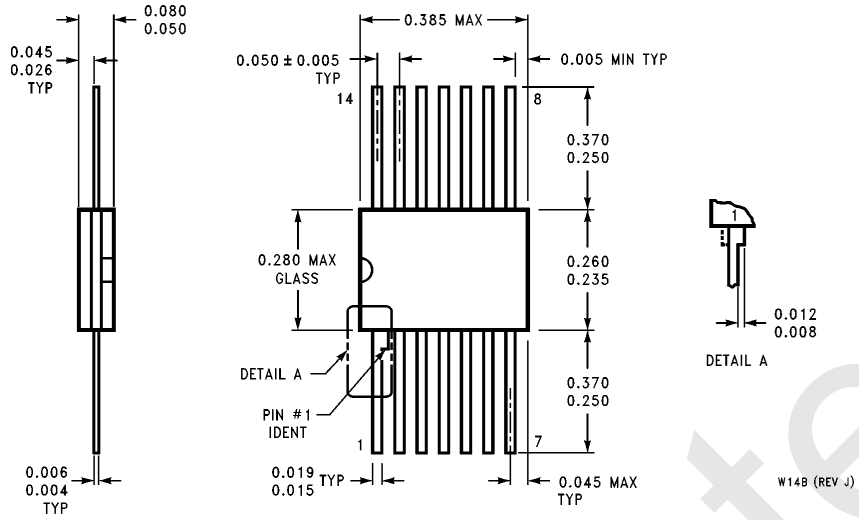



**14-Lead Ceramic Dual-In-Line Package (D)**
**NS Package Number J14A**




**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**



**LIFE SUPPORT POLICY**

NATIONAL'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 NATIONAL 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 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 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.

**National Semiconductor Corporation**
1111 West Bardin Road
Arlington, TX 76017
Tel: 1(800) 272-9959
Fax: 1(800) 737-7018

**National Semiconductor Europe**
Fax: (+49) 0-180-530 85 86
Email: cnjwge@tevm2.nsc.com
Deutsch Tel: (+49) 0-180-530 85 85
English Tel: (+49) 0-180-532 78 32
Français Tel: (+49) 0-180-532 93 58
Italiano Tel: (+49) 0-180-534 16 80

**National Semiconductor Hong Kong Ltd.**
13th Floor, Straight Block,
Ocean Centre, 5 Canton Rd.
Tsimshatsui, Kowloon
Hong Kong
Tel: (852) 2737-1600
Fax: (852) 2736-9960

**National Semiconductor Japan Ltd.**
Tel: 81-043-299-2309
Fax: 81-043-299-2408

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

| **Products** | | **Applications** | |
|---|---|---|---|
| Audio | www.ti.com/audio | Communications and Telecom | www.ti.com/communications |
| Amplifiers | amplifier.ti.com | Computers and Peripherals | www.ti.com/computers |
| Data Converters | dataconverter.ti.com | Consumer Electronics | www.ti.com/consumer-apps |
| DLP® Products | www.dlp.com | Energy and Lighting | www.ti.com/energy |
| DSP | dsp.ti.com | Industrial | www.ti.com/industrial |
| Clocks and Timers | www.ti.com/clocks | Medical | www.ti.com/medical |
| Interface | interface.ti.com | Security | www.ti.com/security |
| Logic | logic.ti.com | Space, Avionics and Defense | www.ti.com/space-avionics-defense |
| Power Mgmt | power.ti.com | Transportation and Automotive | www.ti.com/automotive |
| Microcontrollers | microcontroller.ti.com | Video and Imaging | www.ti.com/video |
| RFID | www.ti-rfid.com | | |
| OMAP Mobile Processors | www.ti.com/omap | | |
| Wireless Connectivity | www.ti.com/wirelessconnectivity | | |
| | **TI E2E Community Home Page** | | e2e.ti.com |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265