

# 54F/74F544

## Octal Registered Transceiver

### General Description

The 'F544 octal transceiver contains two sets of D-type latches for temporary storage of data flowing in either direction. Separate Latch Enable and Output Enable inputs are provided for each register to permit independent control of inputting and outputting in either direction of data flow. The A outputs are guaranteed to sink 24 mA (20 mA Mil) while the B outputs are rated for 64 mA (48 mA Mil). The 'F544 inverts data in both directions.

### Features

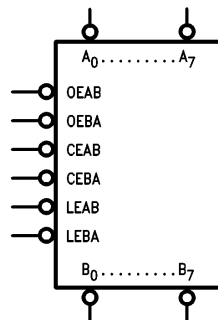
- 8-bit octal transceiver
- Back-to-back registers for storage
- Separate controls for data flow in each direction
- A outputs sink 24 mA (20 mA Mil), B outputs sink 64 mA (48 mA Mil)
- 300 mil slim PDIP

| Commercial         | Military           | Package Number | Package Description                                |
|--------------------|--------------------|----------------|--|
| 74F544SPC          |                    | N24C           | 24-Lead (0.300" Wide) Molded Dual-In-Line          |
|                    | 54F544DM (Note 2)  | J24A           | 24-Lead Ceramic Dual-In-Line                       |
|                    | 54F544SDM (Note 2) | J24F           | 24-Lead (0.300" Wide) Ceramic Dual-In-Line         |
| 74F544SC (Note 1)  |                    | M24B           | 24-Lead (0.300" Wide) Molded Small Outline, JEDEC  |
| 74F544MSA (Note 1) |                    | MSA24          | 24-Lead Molded Shrink Small Outline, EIAJ, Type II |
|                    | 54F544FM (Note 2)  | W24C           | 24-Lead Cerpack                                    |
|                    | 54F544LM (Note 2)  | E28A           | 24-Lead Ceramic Leadless Chip Carrier, Type C      |

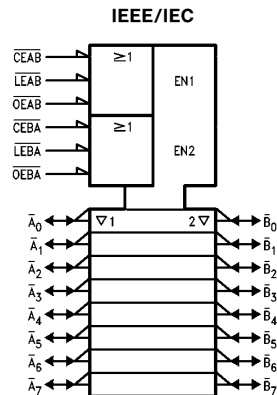
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and MSAX.

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

### Logic Symbols



TL/F/9555-2

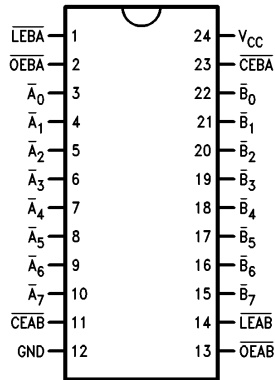


TL/F/9555-1

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

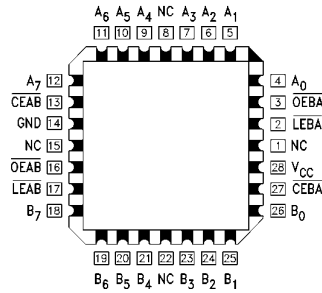
## Connection Diagrams

Pin Assignment for  
DIP, SOIC and Flatpak

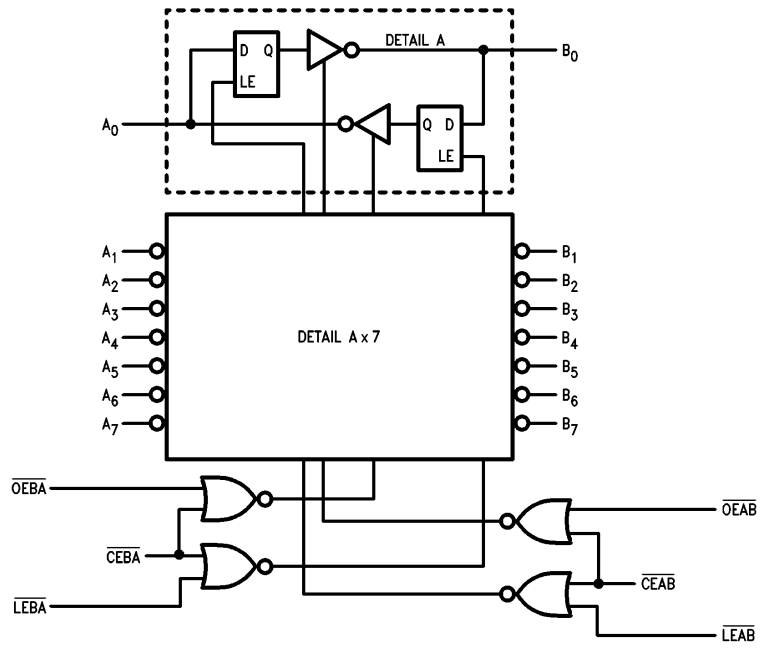


TL/F/9555-3

Pin Assignment  
for LCC



## Logic Diagram



TL/F/9555-5

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## 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 |

**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.

|   |                          |
|---|--------------------------|
| Voltage Applied to Output in HIGH State (with V <sub>CC</sub> = 0V) | -0.5V to V <sub>CC</sub> |
| Standard Output   | -0.5V to +5.5V           |
| TRI-STATE Output  | -0.5V to +5.5V           |

Current Applied to Output in LOW State (Max) twice the rated I<sub>OL</sub> (mA)

## Recommended Operating Conditions

|                              |                 |
|------------------------------|-----------------|
| Free Air Ambient Temperature | -55°C to +125°C |
| Military                     | 0°C to +70°C    |
| Commercial                   |                 |
| Supply Voltage               | +4.5V to +5.5V  |
| 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, (except $\bar{A}_n, \bar{B}_n$ )  |
| V <sub>OH</sub>                    | Output HIGH Voltage                | 54F 10% V <sub>CC</sub><br>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 10% V <sub>CC</sub><br>74F 5% V <sub>CC</sub><br>74F 5% V <sub>CC</sub> | 2.5<br>2.4<br>2.0<br>2.5<br>2.4<br>2.0<br>2.7<br>2.7 |                            | V     | Min             | I <sub>OH</sub> = -1 mA ( $\bar{A}_n$ )<br>I <sub>OH</sub> = -3 mA ( $\bar{A}_n, \bar{B}_n$ )<br>I <sub>OH</sub> = -12 mA ( $\bar{B}_n$ )<br>I <sub>OH</sub> = -1 mA ( $\bar{A}_n$ )<br>I <sub>OH</sub> = -3 mA ( $\bar{A}_n, \bar{B}_n$ )<br>I <sub>OH</sub> = -15 mA ( $\bar{B}_n$ )<br>I <sub>OH</sub> = -1 mA ( $\bar{A}_n$ )<br>I <sub>OH</sub> = -3 mA ( $\bar{A}_n, \bar{B}_n$ ) |
| V <sub>OL</sub>                    | Output LOW 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>   |  | 0.5<br>0.55<br>0.5<br>0.55 | V     | Min             | I <sub>OL</sub> = 20 mA ( $\bar{A}_n$ )<br>I <sub>OL</sub> = 48 mA ( $\bar{B}_n$ )<br>I <sub>OL</sub> = 24 mA ( $\bar{A}_n$ )<br>I <sub>OL</sub> = 64 mA ( $\bar{B}_n$ )  |
| I <sub>IH</sub>                    | Input HIGH Current                 | 54F<br>74F   |  | 20.0<br>5.0                | μA    | Max             | V <sub>IN</sub> = 2.7V (except $\bar{A}_n, \bar{B}_n$ )   |
| I <sub>BVI</sub>                   | Input HIGH Current Breakdown Test  | 54F<br>74F   |  | 100<br>7.0                 | μA    | Max             | V <sub>IN</sub> = 7.0V (except $\bar{A}_n, \bar{B}_n$ )   |
| 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 ( $\bar{A}_n, \bar{B}_n$ )   |
| I <sub>CEX</sub>                   | Output HIGH Leakage Current        | 54F<br>74F   |  | 250<br>250                 | μA    | Max             | V <sub>OUT</sub> = V <sub>CC</sub> ( $\bar{A}_n, \bar{B}_n$ )   |
| 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                  |  |  | -0.6<br>-1.2               | mA    | Max             | V <sub>IN</sub> = 0.5V ( $\overline{OEAB}, \overline{OEBA}$ )<br>V <sub>IN</sub> = 0.5V ( $\overline{CEAB}, \overline{CEBA}$ )  |
| I <sub>IH</sub> + I <sub>OZH</sub> | Output Leakage Current             |  |  | 70                         | μA    | Max             | V <sub>OUT</sub> = 2.7V ( $\bar{A}_n, \bar{B}_n$ )  |
| I <sub>IL</sub> + I <sub>OZL</sub> | Output Leakage Current             |  |  | -650                       | μA    | Max             | V <sub>OUT</sub> = 0.5V ( $\bar{A}_n, \bar{B}_n$ )  |

### DC Electrical Characteristics (Continued)

| Symbol           | Parameter                    | 54F/74F     |     |              | Units | V <sub>CC</sub> | Conditions   |
|------------------|------------------------------|-------------|-----|--------------|-------|-----------------|--|
|                  |                              | Min         | Typ | Max          |       |                 |  |
| I <sub>OS</sub>  | Output Short-Circuit Current | -60<br>-100 |     | -150<br>-225 | mA    | Max             | V <sub>OUT</sub> = 0V ( $\bar{A}_n$ )<br>V <sub>OUT</sub> = 0V ( $\bar{B}_n$ ) |
| I <sub>ZZ</sub>  | Bus Drainage Test            |             |     | 500          | μA    | 0.0V            | V <sub>OUT</sub> = 5.25V ( $\bar{A}_n, \bar{B}_n$ )                            |
| I <sub>CCH</sub> | Power Supply Current         |             | 70  | 105          | mA    | Max             | V <sub>O</sub> = HIGH  |
| I <sub>CCL</sub> | Power Supply Current         |             | 85  | 130          | mA    | Max             | V <sub>O</sub> = LOW   |
| I <sub>CCZ</sub> | Power Supply Current         |             | 83  | 125          | mA    | Max             | V <sub>O</sub> = HIGH Z  |

### AC Electrical Characteristics

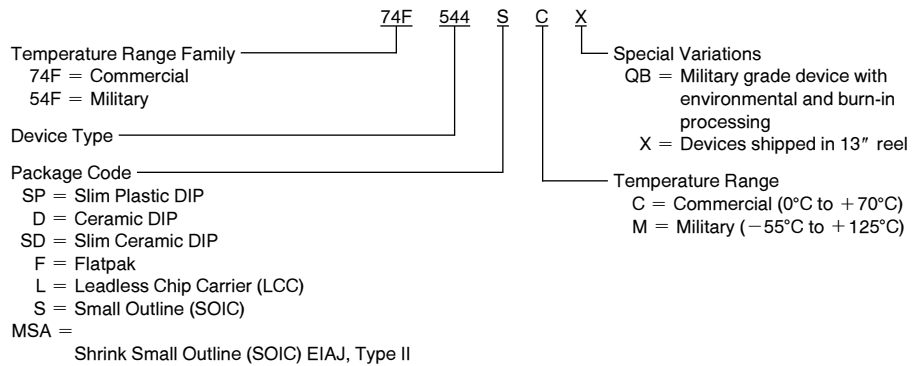
| Symbol                               | Parameter   | 74F   |             |             | 54F  |              | 74F  |              | Units |
|--------------------------------------|---|---|-------------|-------------|--|--------------|--|--------------|-------|
|                                      |   | 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><br>t <sub>PHL</sub> | Propagation Delay<br>Transparent Mode<br>$\bar{A}_n$ to $\bar{B}_n$ or $\bar{B}_n$ to $\bar{A}_n$   | 3.0<br>3.0  | 7.0<br>5.0  | 9.5<br>6.5  | 3.0<br>2.5   | 12.0<br>8.5  | 3.0<br>3.0   | 10.5<br>7.5  | ns    |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>LEBA to $\bar{A}_n$  | 6.0<br>4.0  | 10.0<br>7.0 | 13.0<br>9.5 | 6.0<br>4.0   | 18.0<br>11.5 | 6.0<br>4.0   | 14.5<br>10.5 | ns    |
| t <sub>PLH</sub><br>t <sub>PHL</sub> | Propagation Delay<br>$\overline{LEAB}$ to $\bar{B}_n$   | 6.0<br>4.0  | 10.0<br>7.0 | 13.0<br>9.5 | 6.0<br>4.0   | 18.0<br>11.5 | 6.0<br>4.0   | 14.5<br>10.5 | ns    |
| t <sub>PZH</sub><br>t <sub>PZL</sub> | Output Enable Time<br>$\overline{OEBA}$ or $\overline{OEAB}$ to $\bar{A}_n$ or $\bar{B}_n$<br>CEBA or CEAB to $\bar{A}_n$ or $\bar{B}_n$  | 3.0<br>4.0  | 7.0<br>7.5  | 9.0<br>10.5 | 3.0<br>4.0   | 11.0<br>13.0 | 3.0<br>4.0   | 10.0<br>12.0 | ns    |
| t <sub>PHZ</sub><br>t <sub>PLZ</sub> | Output Disable Time<br>$\overline{OEBA}$ or $\overline{OEAB}$ to $\bar{A}_n$ or $\bar{B}_n$<br>CEBA or CEAB to $\bar{A}_n$ or $\bar{B}_n$ | 1.0<br>2.5  | 6.0<br>5.5  | 8.0<br>10.5 | 2.0<br>2.0   | 10.0<br>9.5  | 1.0<br>2.5   | 9.0<br>11.5  | ns    |

### AC Operating Requirements

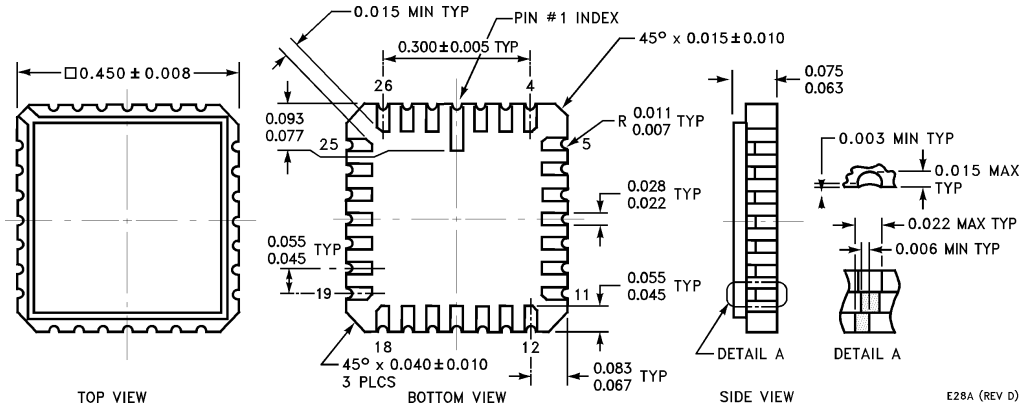
| Symbol                                   | Parameter   | 74F   |     | 54F                                    |     | 74F                                    |     | Units |
|--|---|---|-----|--|-----|--|-----|-------|
|  |   | T <sub>A</sub> = +25°C<br>V <sub>CC</sub> = +5.0V |     | T <sub>A</sub> , V <sub>CC</sub> = Mil |     | T <sub>A</sub> , V <sub>CC</sub> = Com |     |       |
|  |   | Min   | Max | Min                                    | Max | Min                                    | Max |       |
| t <sub>s</sub> (H)<br>t <sub>s</sub> (L) | Setup Time, HIGH or LOW<br>$\bar{A}_n$ or $\bar{B}_n$ to LEBA or LEAB | 3.0<br>3.0  |     | 3.0<br>3.0                             |     | 3.0<br>3.0                             |     | ns    |
| t <sub>h</sub> (H)<br>t <sub>h</sub> (L) | Hold Time, HIGH or LOW<br>$\bar{A}_n$ or $\bar{B}_n$ to LEBA or LEAB  | 3.0<br>3.0  |     | 3.0<br>3.0                             |     | 3.0<br>3.0                             |     | ns    |
| t <sub>w</sub> (L)                       | Latch Enable, B to A<br>Pulse Width, LOW                              | 6.0   |     | 9.0                                    |     | 7.5                                    |     | ns    |

## Ordering Information

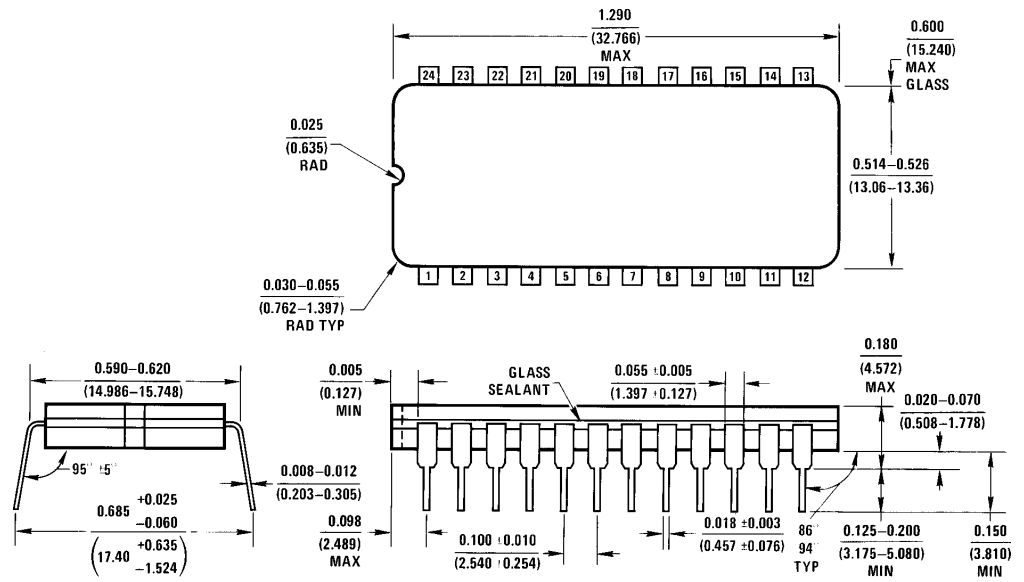
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



**Physical Dimensions** inches (millimeters)

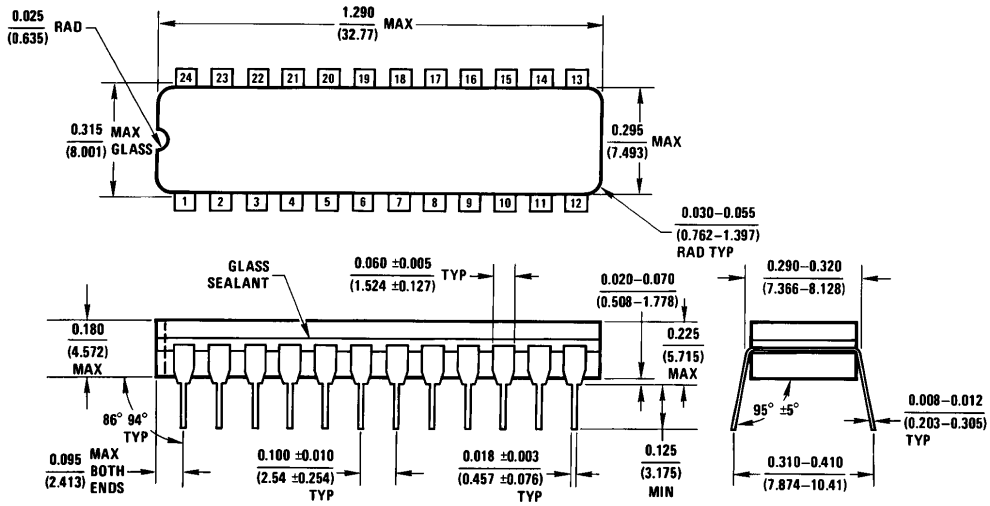


**28-Lead Ceramic Leadless Chip Carrier (L)**  
NS Package Number E28A



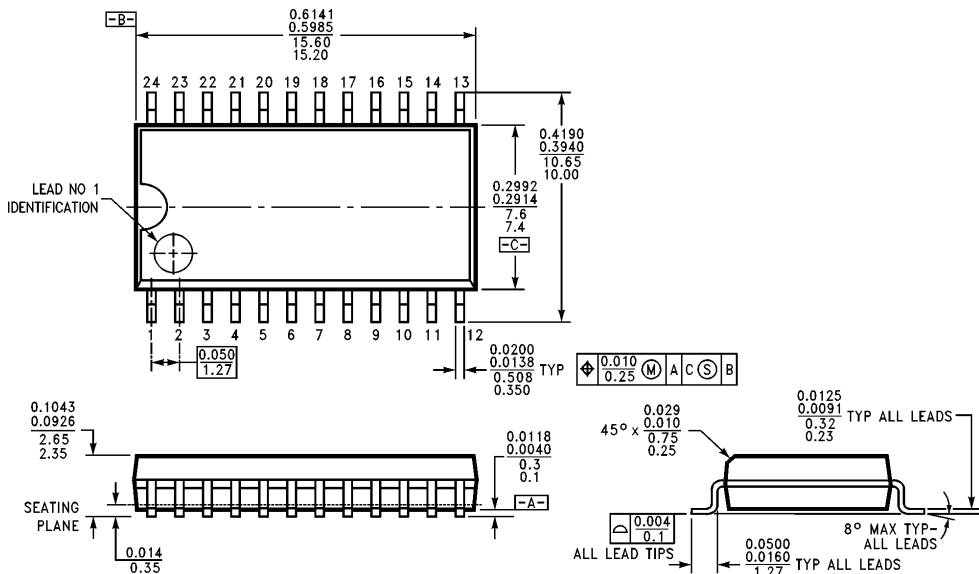
**24-Lead Ceramic Dual-In-Line Package (D)**  
NS Package Number J24A

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



J24F (REV G)

**24-Lead (0.300" Wide) Ceramic Dual-In-Line Package (SD)**  
**NS Package Number J24F**

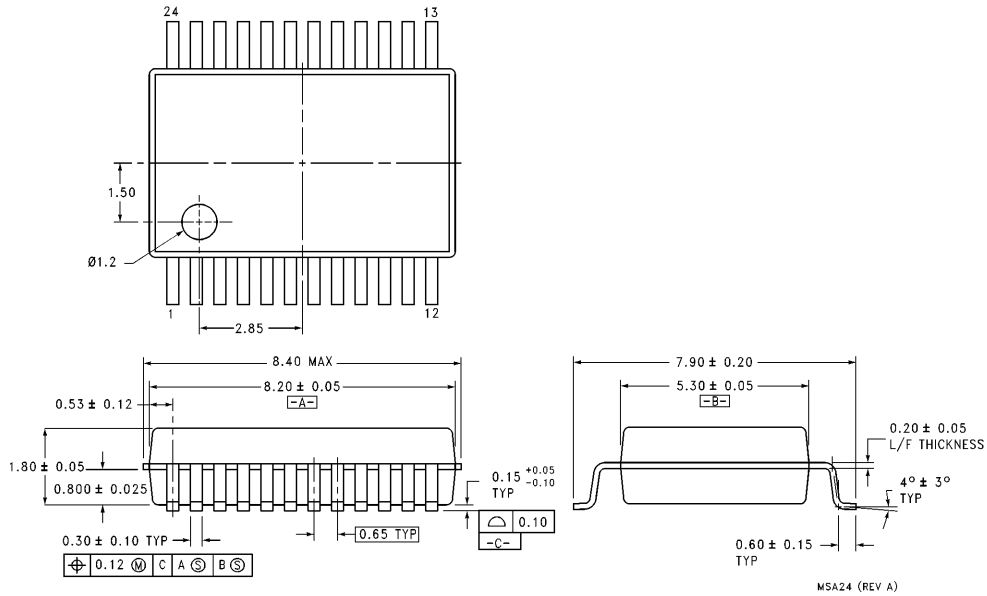


M24B (REV F)

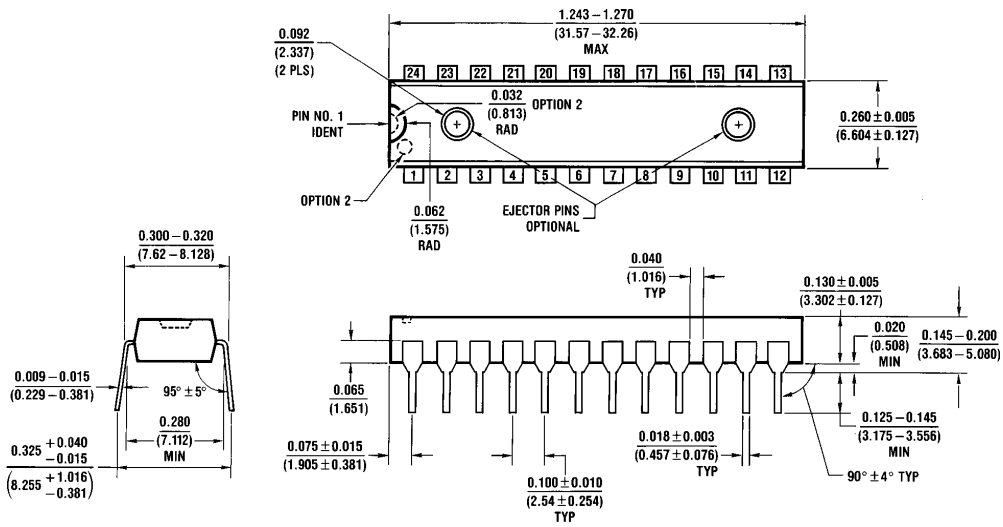
**24-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)**  
**NS Package Number M24B**



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

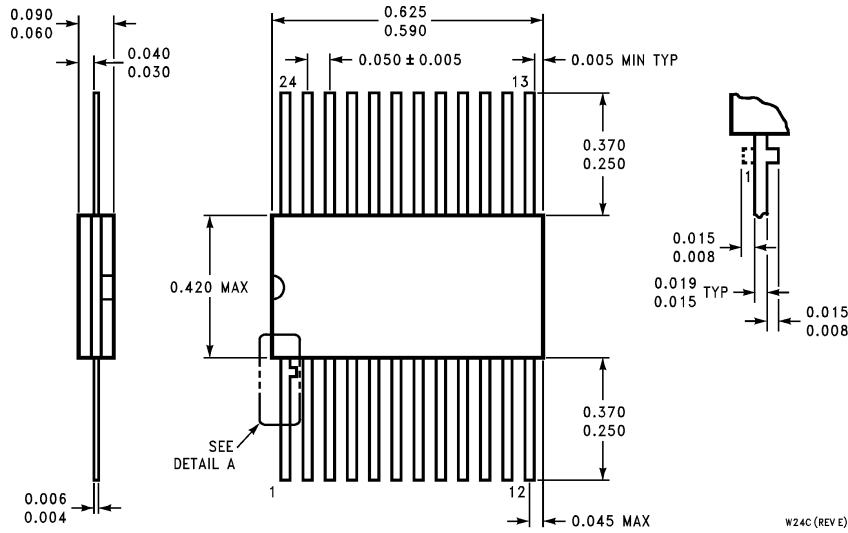


**24-Lead Molded Shrink Small Outline, EIAJ, Type II (MSA)**  
NS Package Number MSA24



**24-Lead (0.300" Wide) Molded Dual-In-Line Package (SP)**  
NS Package Number N24C

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



**24-Lead Ceramic Flatpak (F)  
NS Package Number W24C**

W24C (REV E)

**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**  
2900 Semiconductor Drive  
P.O. Box 58090  
Santa Clara, CA 95052-8090  
Tel: 1(800) 272-9959  
TWX: (910) 339-9240

**National Semiconductor GmbH**  
Livny-Gargan-Str. 10  
D-82256 Fürstenfeldbruck  
Germany  
Tel: (81-41) 35-0  
Telex: 527849  
Fax: (81-41) 35-1

**National Semiconductor Japan Ltd.**  
Sumitomo Chemical Engineering Center  
Bldg. 7F  
1-7-1, Nakase, Mihama-Ku  
Chiba-City,  
Ciba Prefecture 261  
Tel: (043) 299-2300  
Fax: (043) 299-2500

**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 Semicondutores Do Brazil Ltda.**  
Rue Deputado Lacorda Franco  
120-3A  
Sao Paulo-SP  
Brazil 05418-000  
Tel: (55-11) 212-5066  
Telex: 391-1131931 NSBR BR  
Fax: (55-11) 212-1181

**National Semiconductor (Australia) Pty. Ltd.**  
Building 16  
Business Park Drive  
Monash Business Park  
Nottingham, Melbourne  
Victoria 3168 Australia  
Tel: (3) 558-9999  
Fax: (3) 558-9998

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