

## 54F/74F86

### 2-Input Exclusive-OR Gate

#### General Description

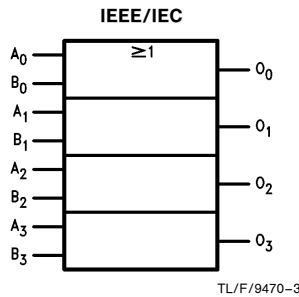
This device contains four independent gates, each of which performs the logic exclusive-OR function.

| Commercial       | Military         | Package Number | Package Description                               |
|------------------|------------------|----------------|---------------------------------------------------|
| 74F86PC          |                  | N14A           | 14-Lead (0.300" Wide) Molded Dual-in-Line         |
|                  | 54F86DM (Note 2) | J14A           | 14-Lead Ceramic Dual-in-Line                      |
| 74F86SC (Note 1) |                  | M14A           | 14-Lead (0.150" Wide) Molded Small Outline, JEDEC |
| 74F86SJ (Note 1) |                  | M14D           | 14-Lead (0.300" Wide) Molded Small Outline, EIAJ  |
|                  | 54F86FM (Note 2) | W14B           | 14-Lead Cerpack                                   |
|                  | 54F86LM (Note 2) | E20A           | 20-Lead Ceramic Leadless Chip Carrier, Type C     |

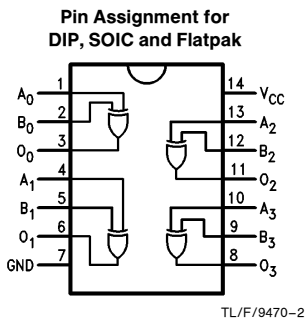
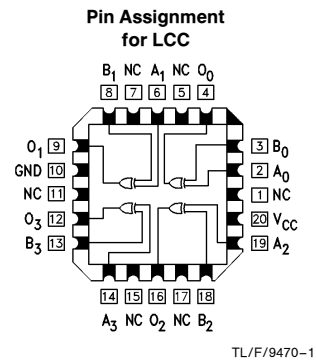
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

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

#### Logic Symbol



#### Connection Diagrams



#### Unit Loading/Fan Out

| Pin Names           | Description       | 54F/74F            |                                                 |
|---------------------|-------------------|--------------------|-------------------------------------------------|
|                     |                   | U.L.<br>HIGH/LOW   | Input $I_{IH}/I_{IL}$<br>Output $I_{OH}/I_{OL}$ |
| $A_n, B_n$<br>$O_n$ | Inputs<br>Outputs | 1.0/1.0<br>50/33.3 | 20 $\mu$ A/ - 0.6 mA<br>- 1 mA/20 mA            |

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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)

**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

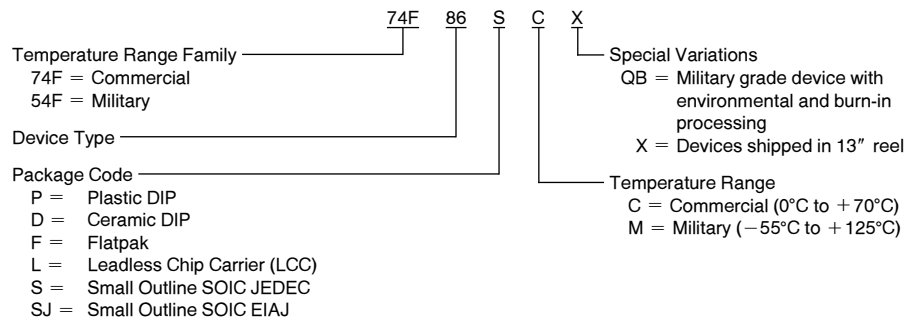
| Symbol           | Parameter                         |                                                                              | 54F/74F           |     |             | Units | V <sub>CC</sub> | Conditions                                                                    |
|------------------|-----------------------------------|------------------------------------------------------------------------------|-------------------|-----|-------------|-------|-----------------|-------------------------------------------------------------------------------|
|                  |                                   |                                                                              | 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>74F 10% V <sub>CC</sub><br>74F 5% V <sub>CC</sub> | 2.5<br>2.5<br>2.7 |     |             | V     | Min             | I <sub>OH</sub> = −1 mA<br>I <sub>OH</sub> = −1 mA<br>I <sub>OH</sub> = −1 mA |
| V <sub>OL</sub>  | Output LOW Voltage                | 54F 10% V <sub>CC</sub><br>74F 10% V <sub>CC</sub>                           |                   |     | 0.5<br>0.5  | V     | Min             | I <sub>OL</sub> = 20 mA<br>I <sub>OL</sub> = 20 mA                            |
| 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                                                        |
| 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                 |                                                                              |                   |     | −0.6        | mA    | Max             | V <sub>IN</sub> = 0.5V                                                        |
| I <sub>OS</sub>  | Output Short-Circuit Current      |                                                                              | −60               |     | −150        | mA    | Max             | V <sub>OUT</sub> = 0V                                                         |
| I <sub>CCH</sub> | Power Supply Current              |                                                                              |                   | 12  | 18          | mA    | Max             | V <sub>O</sub> = HIGH                                                         |
| I <sub>CCL</sub> | Power Supply Current              |                                                                              |                   | 18  | 28          | mA    | Max             | V <sub>O</sub> = LOW                                                          |

## AC Electrical Characteristics

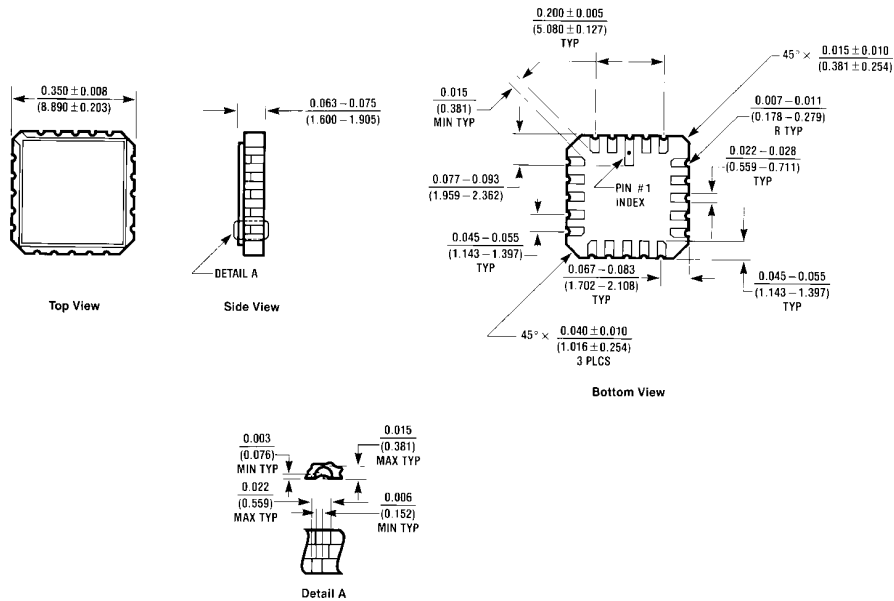
| Symbol                 | Parameter                                                      | 74F                                                                            |            |            | 54F                                                |            | 74F                                                |            | 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        |       |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>$A_n, B_n$ to $O_n$<br>(Other Input LOW)  | 3.0<br>3.0                                                                     | 4.0<br>4.2 | 5.5<br>5.5 | 2.5<br>3.0                                         | 7.0<br>7.0 | 3.0<br>3.0                                         | 6.5<br>6.5 | ns    |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation Delay<br>$A_n, B_n$ to $O_n$<br>(Other Input HIGH) | 3.5<br>3.0                                                                     | 5.3<br>4.7 | 7.0<br>6.5 | 3.5<br>3.0                                         | 8.5<br>8.0 | 3.5<br>3.0                                         | 8.0<br>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:



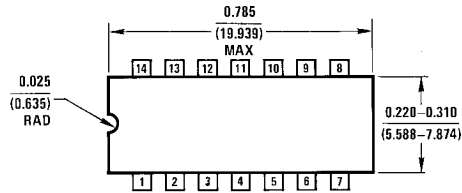
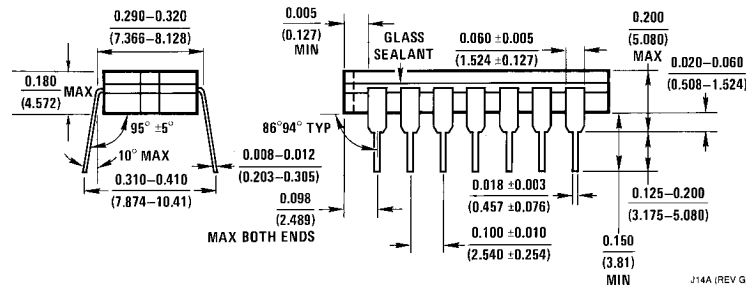
## Physical Dimensions inches (millimeters)



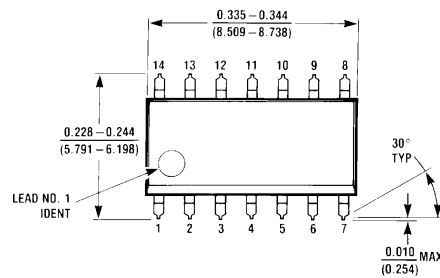
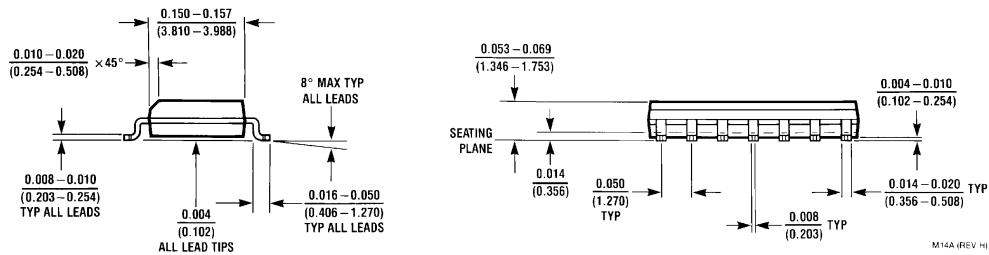
20-Terminal Ceramic Leadless Chip Carrier (L)  
NS Package Number E20A

1.20A (REV. 01)

# Physical Dimensions inches (millimeters) (Continued)

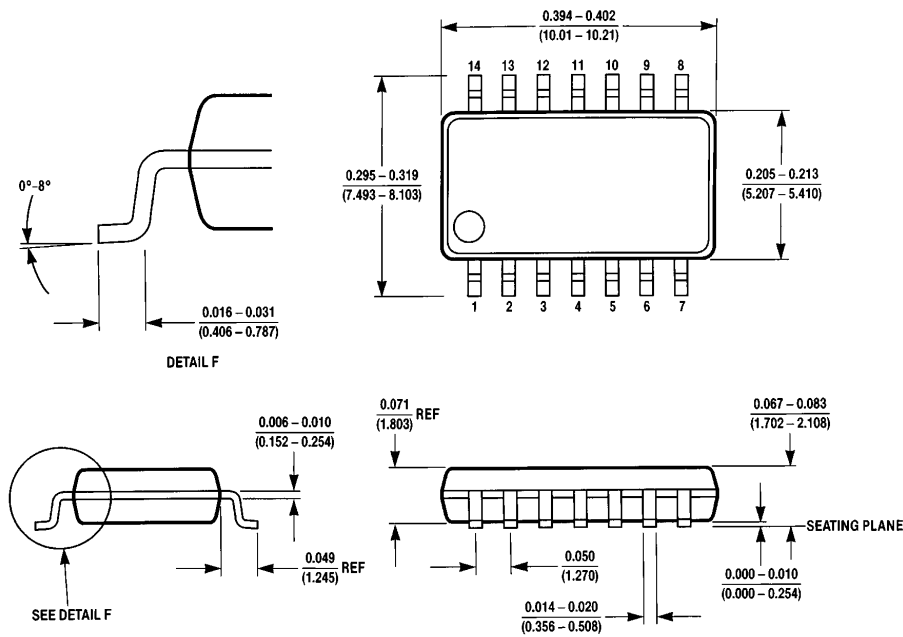


**14-Lead Ceramic Dual-In-Line Package (D)**  
**NS Package Number J14A**



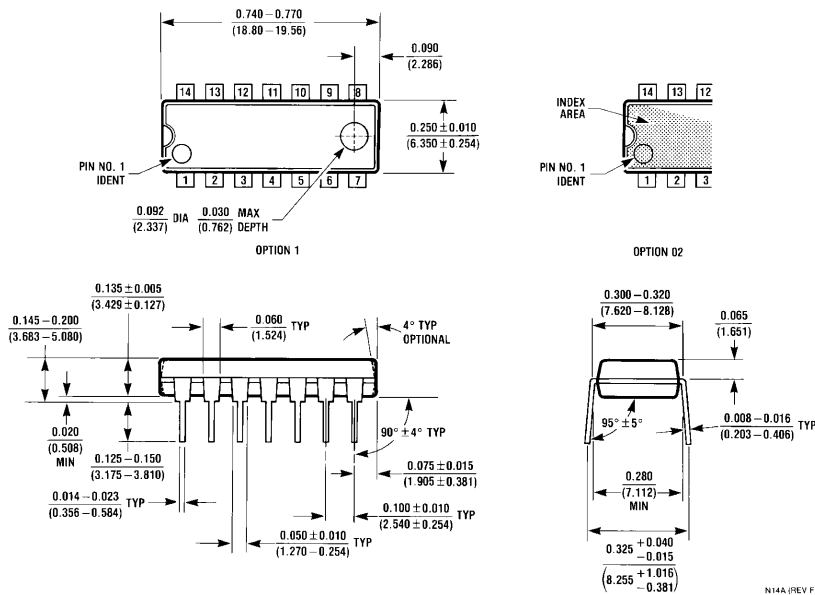
**14-Lead (0.150\"/>**

# Physical Dimensions inches (millimeters) (Continued)



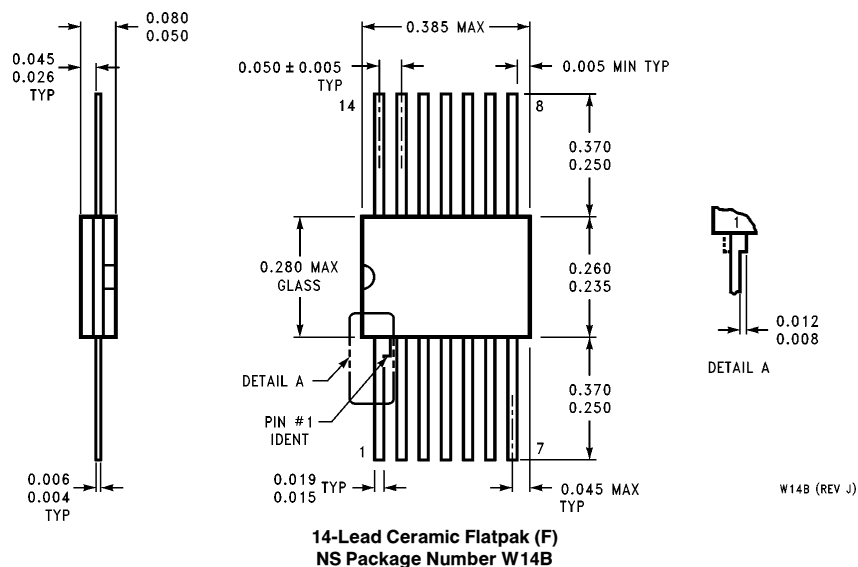
M14D (REV A)

**14-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)  
NS Package Number M14D**



N14A (REV F)

**14-Lead (0.300" Wide) Molded Dual-In-Line Package (P)  
NS Package Number N14A**



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|                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                      |                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                |
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