

## 54F/74F02

### Quad 2-Input NOR Gate

#### General Description

This device contains four independent gates, each of which performs the logic NOR function.

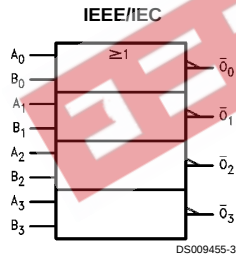
**Ordering Code:** See Section 0

| Commercial       | Military         | Package Number | Package Description                               |
|------------------|------------------|----------------|---------------------------------------------------|
| 74F02PC          |                  | N14A           | 14-Lead (0.300" Wide) Molded Dual-In-Line         |
|                  | 54F02DM (Note 2) | J14A           | 14-Lead Ceramic Dual-In-Line                      |
| 74F02SC (Note 1) |                  | M14A           | 14-Lead (0.150" Wide) Molded Small Outline, JEDEC |
| 74F02SJ (Note 1) |                  | M14D           | 14-Lead (0.300" Wide) Molded Small Outline, EIAJ  |
|                  | 54F02FM (Note 2) | W14B           | 14-Lead Cerpack                                   |
|                  | 54F02LM (Note 2) | E20A           | 20-Lead Ceramic Leadless Chip Carrier, Type C     |

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

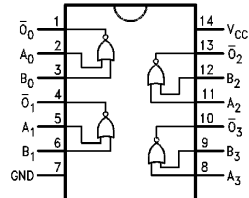
**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMOB, FMOB and LMOB.

#### Logic Symbol



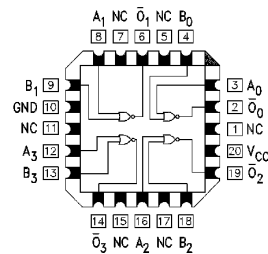
#### Connection Diagrams

##### Pin Assignment for DIP, SOIC and Flatpak



DS009455-2

##### Pin Assignment for LCC



DS009455-1

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Unit Loading/Fan Out

See Section 0 for U.L. definitions

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

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### Absolute Maximum Ratings (Note 3)

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 4)                                              | -0.5V to +7.0V           |
| Input Current (Note 4)                                              | -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)

### 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  |

**Note 3:** 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 4:** Either voltage limit or current limit is sufficient to protect inputs.

### 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> | 2.5  |      | V     | Min             | I <sub>OH</sub> = -1 mA                              |
|                  |                                   | 74F 10% V <sub>CC</sub> | 2.5  |      |       |                 | I <sub>OH</sub> = -1 mA                              |
|                  |                                   | 74F 5% V <sub>CC</sub>  | 2.7  |      |       |                 | I <sub>OH</sub> = -1 mA                              |
| V <sub>OL</sub>  | Output LOW Voltage                | 54F 10% V <sub>CC</sub> |      | 0.5  | V     | Min             | I <sub>OL</sub> = 20 mA                              |
|                  |                                   | 74F 10% V <sub>CC</sub> |      | 0.5  |       |                 | I <sub>OL</sub> = 20 mA                              |
| I <sub>IH</sub>  | Input HIGH Current                | 54F                     |      | 20.0 | μA    | Max             | V <sub>IN</sub> = 2.7V                               |
|                  |                                   | 74F                     |      | 5.0  |       |                 |                                                      |
| I <sub>BVI</sub> | Input HIGH Current Breakdown Test | 54F                     |      | 100  | μA    | Max             | V <sub>IN</sub> = 7.0V                               |
|                  |                                   | 74F                     |      | 7.0  |       |                 |                                                      |
| I <sub>CEX</sub> | Output HIGH Leakage Current       | 54F                     |      | 250  | μA    | Max             | V <sub>OUT</sub> = V <sub>CC</sub>                   |
|                  |                                   | 74F                     |      | 50   |       |                 |                                                      |
| 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              |                         | 3.7  | 5.6  | mA    | Max             | V <sub>O</sub> = HIGH                                |
| I <sub>CCL</sub> | Power Supply Current              |                         | 8.7  | 13.0 | mA    | Max             | V <sub>O</sub> = LOW                                 |

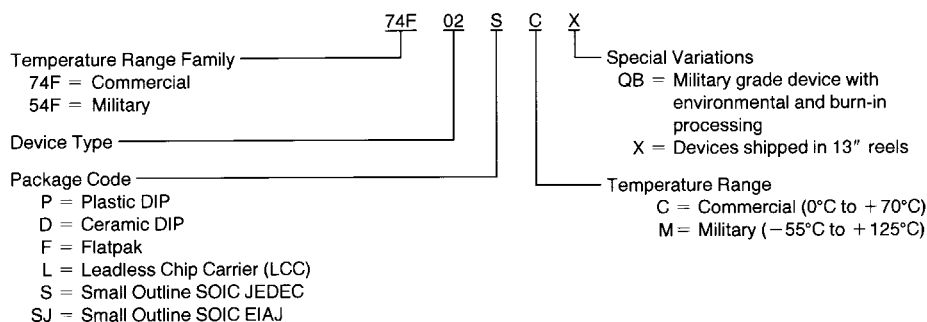
AC Electrical Characteristics

See Section 0 for Waveforms and Load Configurations

| Symbol           | Parameter                                           | 74F                                                                         |     |     | 54F                                                              |     | 74F                                                              |     | Units | Fig. No. |
|------------------|-----------------------------------------------------|-----------------------------------------------------------------------------|-----|-----|------------------------------------------------------------------|-----|------------------------------------------------------------------|-----|-------|----------|
|                  |                                                     | 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> | Propagation Delay                                   | 2.5                                                                         | 4.4 | 5.5 | 2.5                                                              | 7.5 | 2.5                                                              | 6.5 | ns    | ◆◆◆◆     |
| t <sub>PHL</sub> | A <sub>n</sub> , B <sub>n</sub> to $\overline{O}_n$ | 1.5                                                                         | 3.2 | 4.3 | 1.5                                                              | 6.5 | 1.5                                                              | 5.3 |       |          |

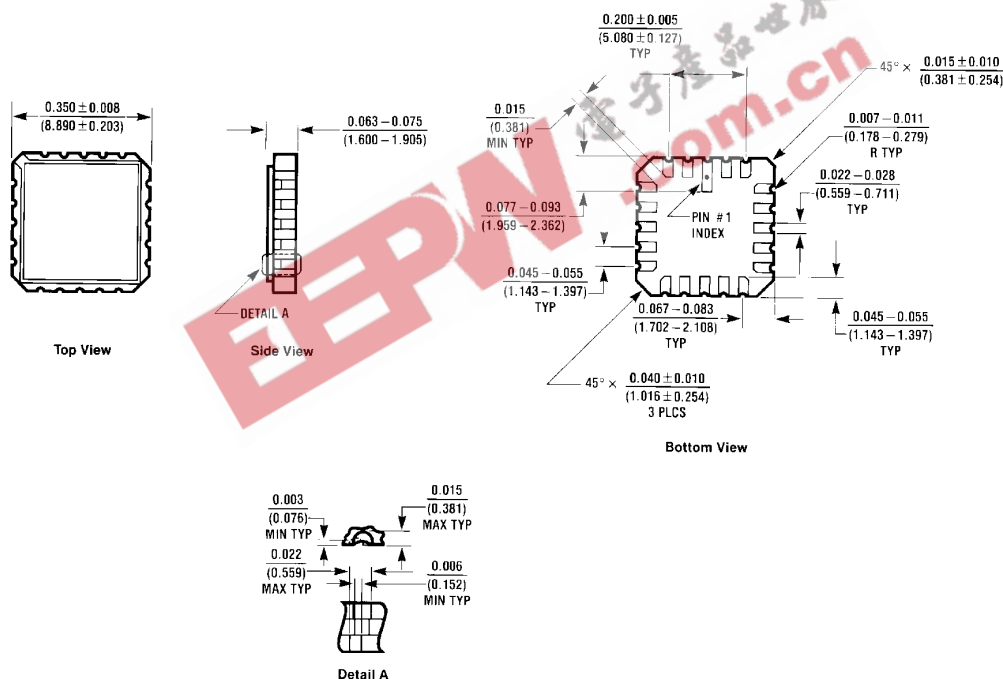
## Ordering Information

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



DS009455-4

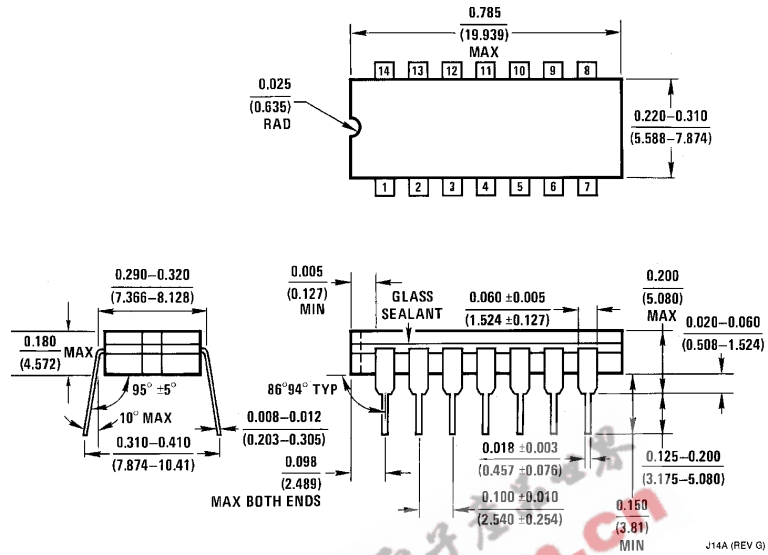
## Physical Dimensions inches (millimeters) unless otherwise noted



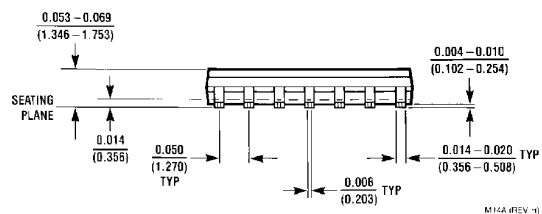
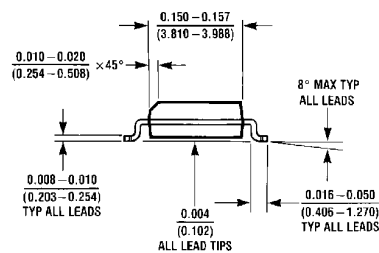
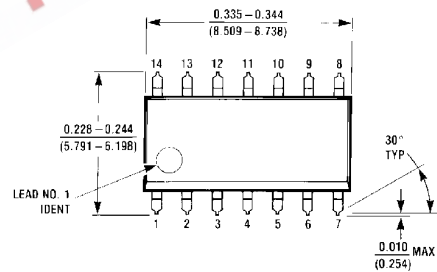
E20A (REV 01)

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

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)

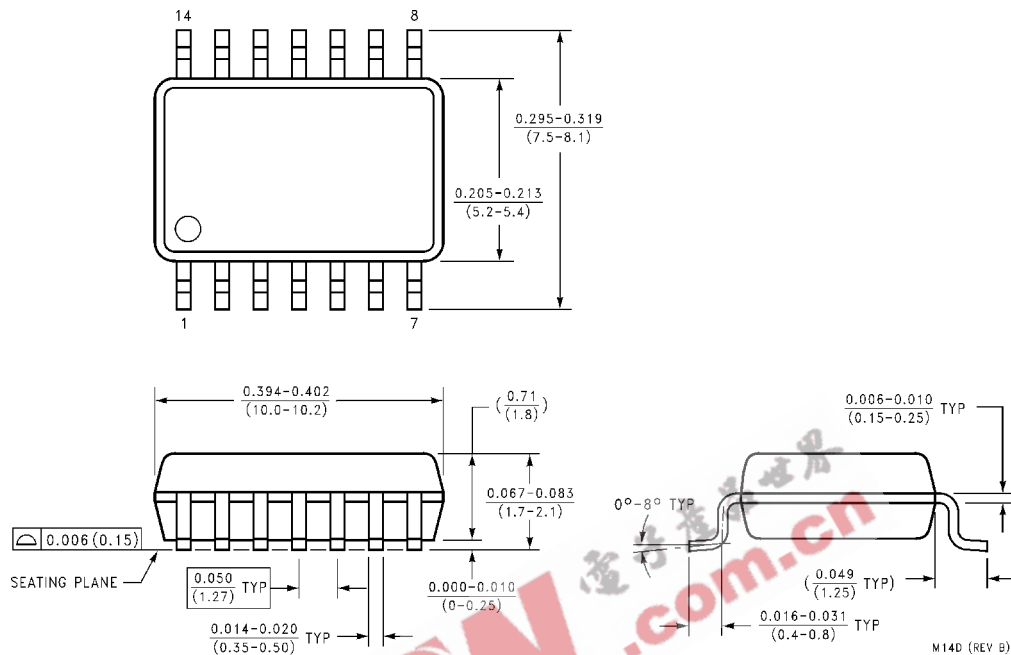


**14-Lead Ceramic Dual In-Line Package (D)**  
NS Package Number J14A

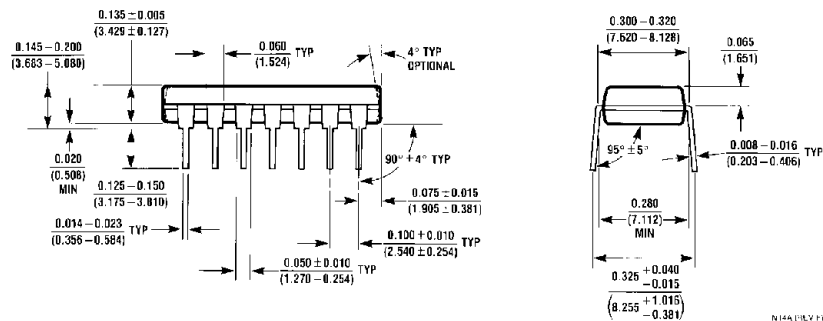
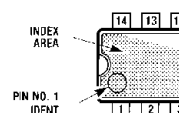
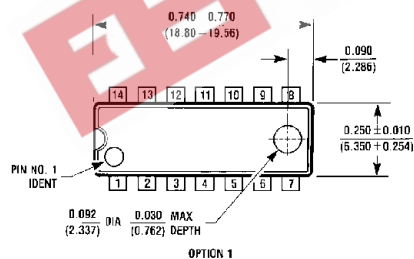


**14-Lead (0.150" Wide) Molded Small Outline Package, JEDEC (S)**  
NS Package Number M14A

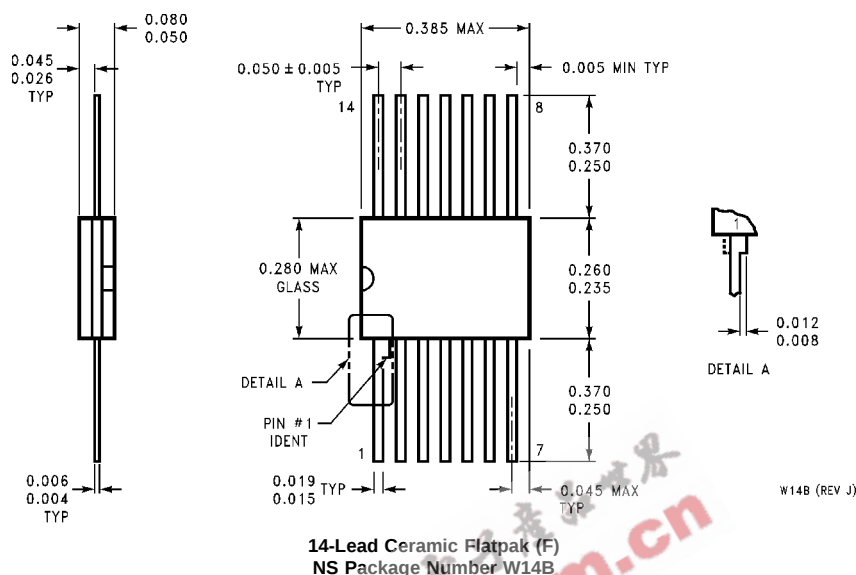
# **Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



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



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

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)**LIFE SUPPORT POLICY**

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