

## 54F/74F08 Quad 2-Input AND Gate

### General Description

This device contains four independent gates, each of which performs the logic AND function.

### Features

- Guaranteed 4000V minimum ESD protection

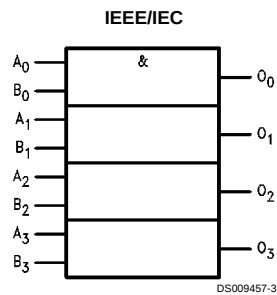
**Ordering Code:** See Section 0

| Commercial       | Military         | Package Number | Package Description                               |
|------------------|------------------|----------------|---------------------------------------------------|
| 74F08PC          |                  | N14A           | 14-Lead (0.300" Wide) Molded Dual-In-Line         |
|                  | 54F08DM (Note 2) | J14A           | 14-Lead Ceramic Dual-In-Line                      |
| 74F08SC (Note 1) |                  | M14A           | 14-Lead (0.150" Wide) Molded Small Outline, JEDEC |
| 74F08SJ (Note 1) |                  | M14D           | 14-Lead (0.300" Wide) Molded Small Outline, EIAJ  |
|                  | 54F08FM (Note 2) | W14B           | 14-Lead Cerpack                                   |
|                  | 54F08LM (Note 2) | E20A           | 20-Lead Ceramic Leadless Chip Carrier, Type C     |

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

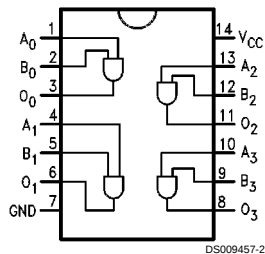
**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

### Logic Symbol

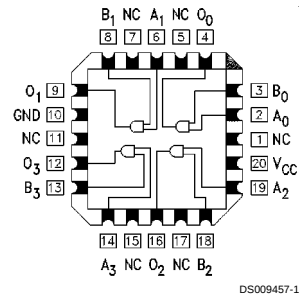


### Connection Diagrams

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



**Pin Assignment  
for LCC**



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## Unit Loading/Fan Out

See Section 0 for U.L. definitions

DSXXX

| Pin Names  | Description | 54F74F           |                                                 |
|------------|-------------|------------------|-------------------------------------------------|
|            |             | 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                              |
| $O_n$      | Outputs     | 50/33.3          | -1 mA/20 mA                                     |

## 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)

ESD Last Passing Voltage (Min) 4000V

## 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 |       |                 | V <sub>OUT</sub> = 0V                                |  |
| I <sub>CCH</sub> | Power Supply Current              |                         |         | 5.5 | 8.3  | mA    | Max             | V <sub>O</sub> = HIGH                                |  |
| I <sub>CCL</sub> | Power Supply Current              |                         |         | 8.6 | 12.9 |       |                 | V <sub>O</sub> = LOW                                 |  |

## AC Electrical Characteristics

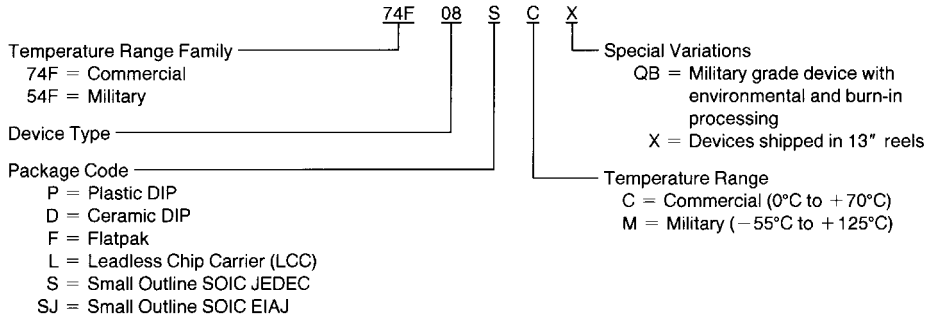
See Section 0 for Waveforms and Load Configurations

| 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                                 | 3.0                                                                         | 4.2 | 5.6 | 2.5                                                              | 7.5 | 3.0                                                              | 6.6 | ns    | ◆◆◆◆     |
| t <sub>PHL</sub> | A <sub>n</sub> , B <sub>n</sub> to O <sub>n</sub> | 2.5                                                                         | 4.0 | 5.3 | 2.0                                                              | 7.5 | 2.5                                                              | 6.3 |       |          |



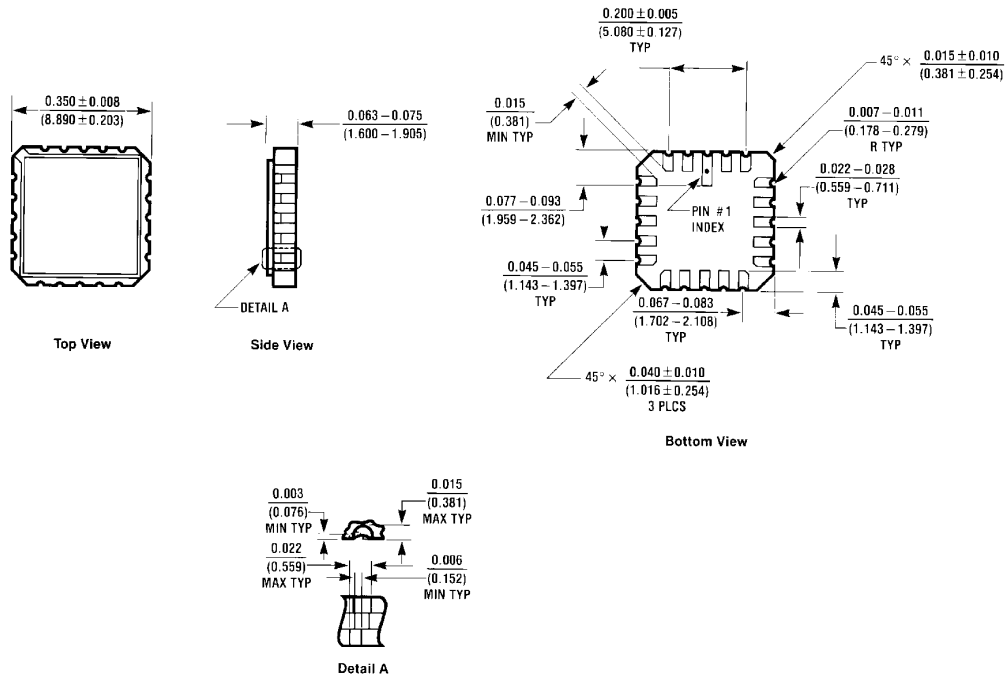
## Ordering Information

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



DS009457-4

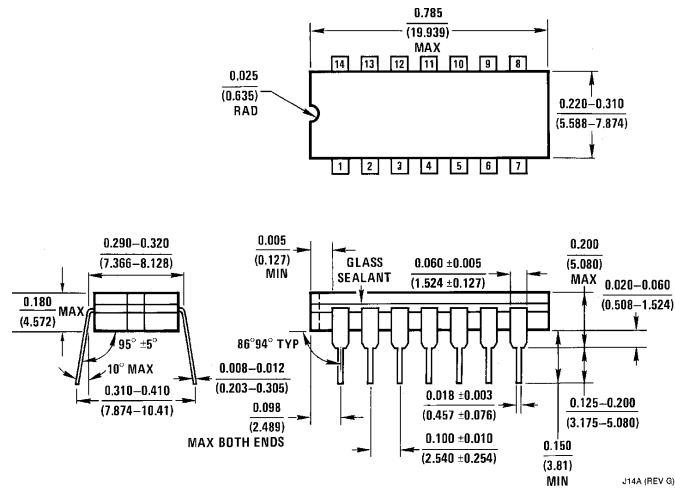
## Physical Dimensions inches (millimeters) unless otherwise noted



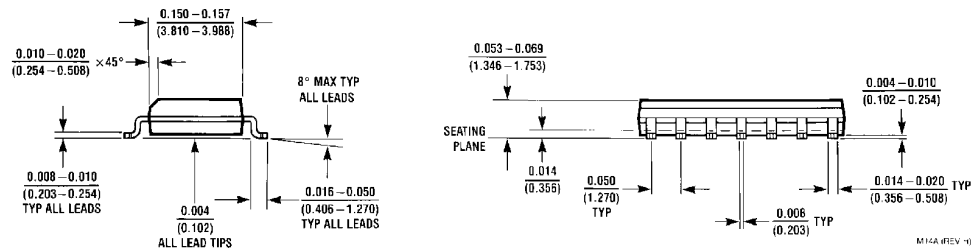
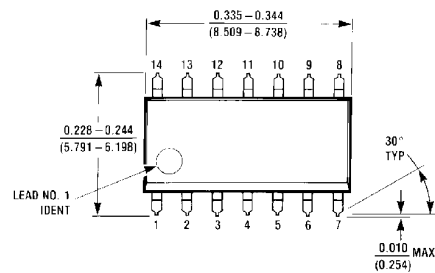
E20A (REV 01)

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

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

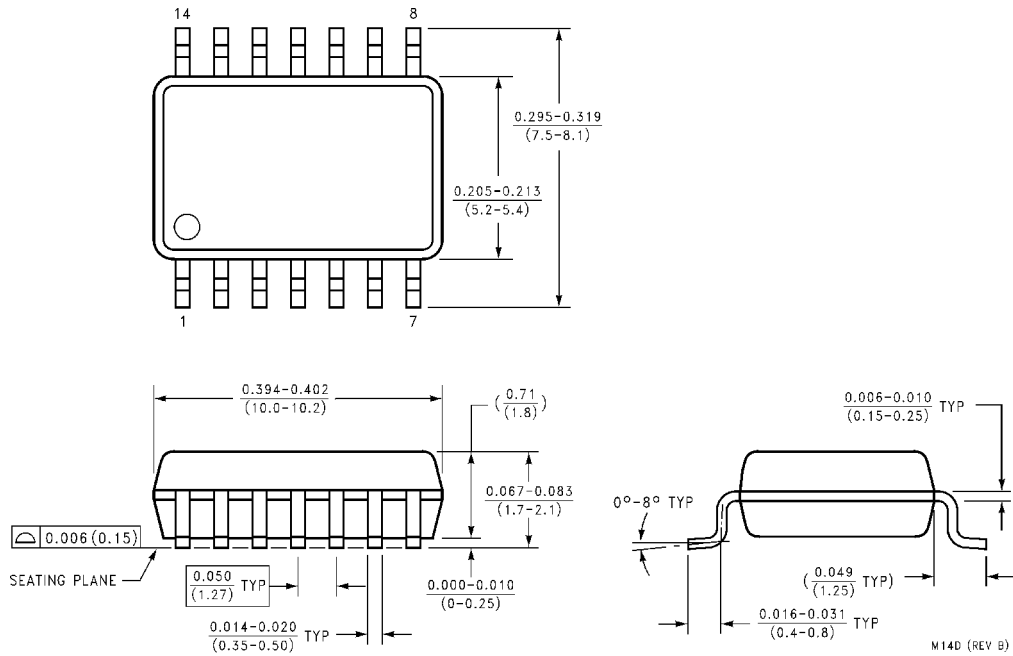


**14-Lead Ceramic Dual-In-Line Package (D)**  
**NS Package Number J14A**

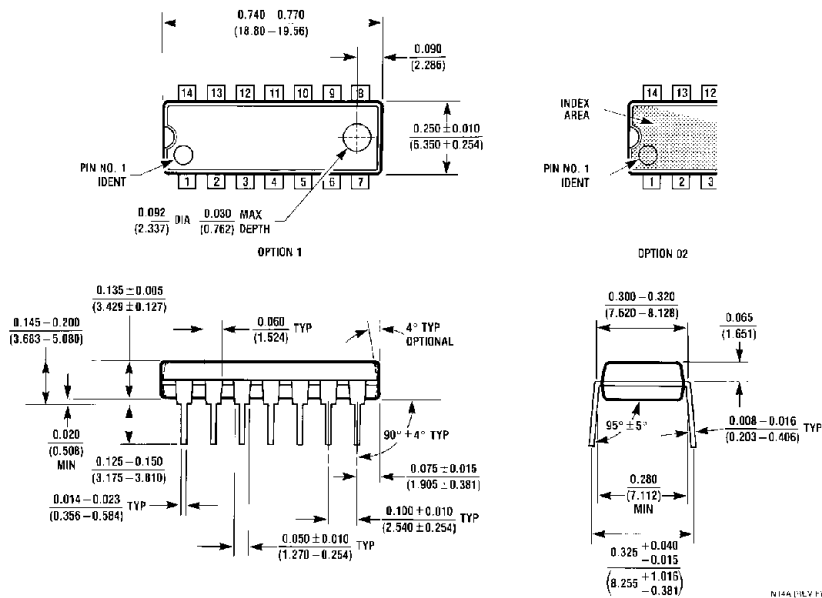


**14-Lead (0.150" Wide) Molded Small Outline, JEDEC (S)**  
**NS Package Number M14A**

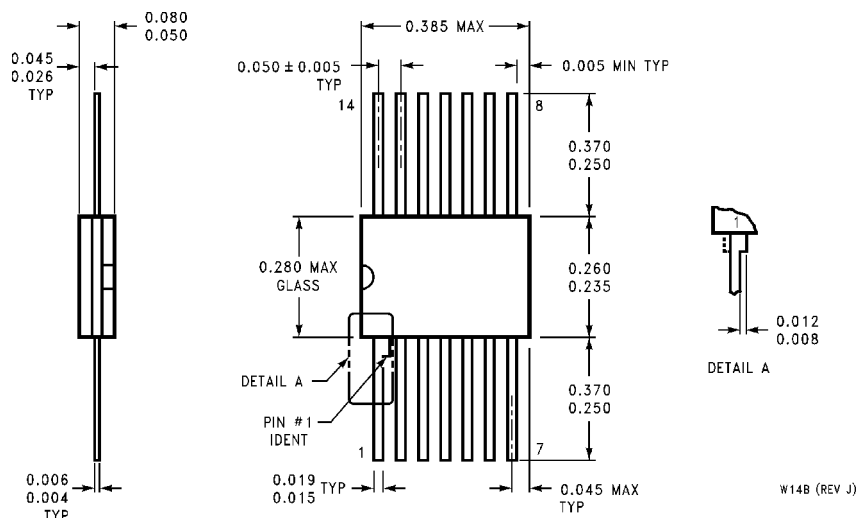
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**14-Lead (0.300" Wide) Molded Small Outline, 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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