

## 54LS20/DM54LS20/DM74LS20 Dual 4-Input NAND Gates

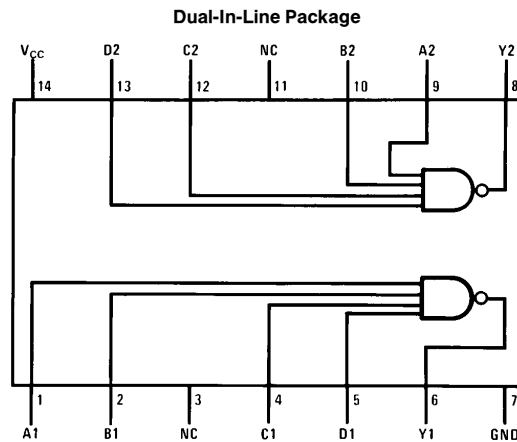
### General Description

This device contains two independent gates each of which performs the logic NAND function.

### Features

- Alternate Military/Aerospace device (54LS20) is available. Contact a National Semiconductor Sales Office/Distributor for specifications

### Connection Diagram



TL/F/6355-1

Order Number 54LS20DMQB, 54LS20FMQB, 54LS20LMQB,  
DM54LS20J, DM54LS20W, DM74LS20M or DM74LS20N  
See NS Package Number E20A, J14A, M14A, N14A or W14B

### Function Table

$$Y = \overline{ABCD}$$

| Inputs |   |   |   | Output |
|--------|---|---|---|--------|
| A      | B | C | D | Y      |
| X      | X | X | L | H      |
| X      | X | L | X | H      |
| X      | L | X | X | H      |
| L      | X | X | X | H      |
| H      | H | H | H | L      |

H = High Logic Level

L = Low Logic Level

X = Either Low or High Logic Level

## Absolute Maximum Ratings (Note)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/Distributors for availability and specifications.

|                                      |                 |
|--------------------------------------|-----------------|
| Supply Voltage                       | 7V              |
| Input Voltage                        | 7V              |
| Operating Free Air Temperature Range |                 |
| DM54LS and 54LS                      | −55°C to +125°C |
| DM74LS                               | 0°C to +70°C    |
| Storage Temperature Range            | −65°C to +150°C |

Note: The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.

## Recommended Operating Conditions

| Symbol          | Parameter                      | DM54LS20 |     |      | DM74LS20 |     |      | Units |
|-----------------|--------------------------------|----------|-----|------|----------|-----|------|-------|
|                 |                                | Min      | Nom | Max  | Min      | Nom | Max  |       |
| V <sub>CC</sub> | Supply Voltage                 | 4.5      | 5   | 5.5  | 4.75     | 5   | 5.25 | V     |
| V <sub>IH</sub> | High Level Input Voltage       | 2        |     |      | 2        |     |      | V     |
| V <sub>IL</sub> | Low Level Input Voltage        |          |     | 0.7  |          |     | 0.8  | V     |
| I <sub>OH</sub> | High Level Output Current      |          |     | −0.4 |          |     | −0.4 | mA    |
| I <sub>OL</sub> | Low Level Output Current       |          |     | 4    |          |     | 8    | mA    |
| T <sub>A</sub>  | Free Air Operating Temperature | −55      |     | 125  | 0        |     | 70   | °C    |

## Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

| Symbol           | Parameter                         | Conditions  | Min         | Typ (Note 1) | Max   | Units |
|------------------|-----------------------------------|---|-------------|--------------|-------|-------|
| V <sub>I</sub>   | Input Clamp Voltage               | V <sub>CC</sub> = Min, I <sub>I</sub> = −18 mA                      |             |              | −1.5  | V     |
| V <sub>OH</sub>  | High Level Output Voltage         | V <sub>CC</sub> = Min, I <sub>OH</sub> = Max, V <sub>IL</sub> = Max | DM54<br>2.5 | 3.4          |       | V     |
|                  |                                   |   | DM74<br>2.7 | 3.4          |       |       |
| V <sub>OL</sub>  | Low Level Output Voltage          | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max, V <sub>IH</sub> = Min | DM54        | 0.25         | 0.4   | V     |
|                  |                                   |   | DM74        | 0.35         | 0.5   |       |
|                  |                                   | I <sub>OL</sub> = 4 mA, V <sub>CC</sub> = Min                       | DM74        | 0.25         | 0.4   |       |
| I <sub>I</sub>   | Input Current @ Max Input Voltage | V <sub>CC</sub> = Max, V <sub>I</sub> = 7V                          |             |              | 0.1   | mA    |
| I <sub>IH</sub>  | High Level Input Current          | V <sub>CC</sub> = Max, V <sub>I</sub> = 2.7V                        |             |              | 20    | μA    |
| I <sub>IL</sub>  | Low Level Input Current           | V <sub>CC</sub> = Max, V <sub>I</sub> = 0.4V                        |             |              | −0.36 | mA    |
| I <sub>OS</sub>  | Short Circuit Output Current      | V <sub>CC</sub> = Max (Note 2)                                      | DM54<br>−20 |              | −100  | mA    |
|                  |                                   |   | DM74<br>−20 |              | −100  |       |
| I <sub>CCH</sub> | Supply Current with Outputs High  | V <sub>CC</sub> = Max   |             | 0.4          | 0.8   | mA    |
| I <sub>CCL</sub> | Supply Current with Outputs Low   | V <sub>CC</sub> = Max   |             | 1.2          | 2.2   | mA    |

## Switching Characteristics at V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C (See Section 1 for Test Waveforms and Output Load)

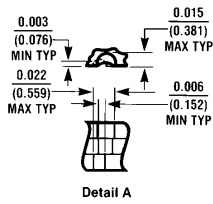
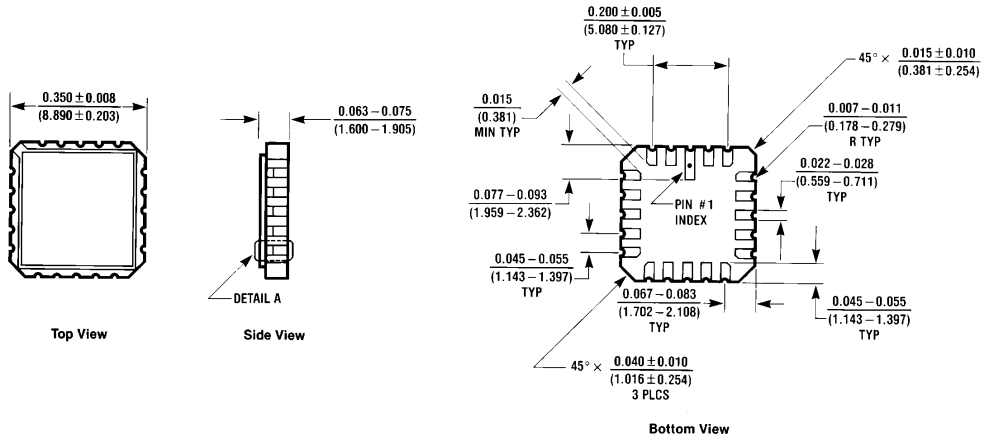
| Symbol           | Parameter                                       | R <sub>L</sub> = 2 kΩ  |     |                        |     | Units |
|------------------|---|------------------------|-----|------------------------|-----|-------|
|                  |   | C <sub>L</sub> = 15 pF |     | C <sub>L</sub> = 50 pF |     |       |
|                  |   | Min                    | Max | Min                    | Max |       |
| t <sub>PLH</sub> | Propagation Delay Time Low to High Level Output | 3                      | 10  | 4                      | 15  | ns    |
| t <sub>PHL</sub> | Propagation Delay Time High to Low Level Output | 3                      | 10  | 4                      | 15  | ns    |

Note 1: All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

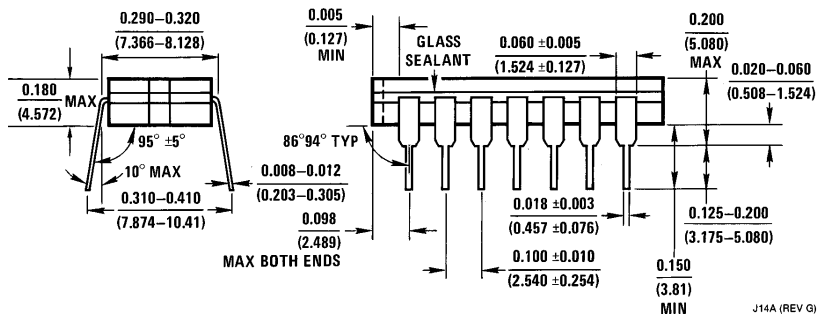
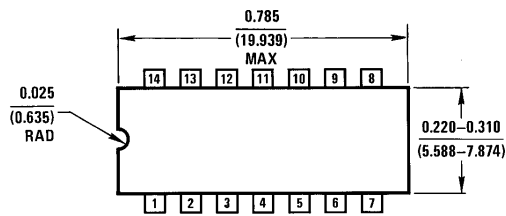


**Physical Dimensions** inches (millimeters)



**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS20LMQB**  
**NS Package Number E20A**

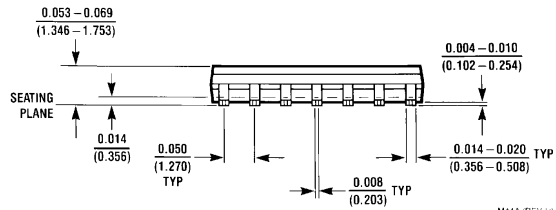
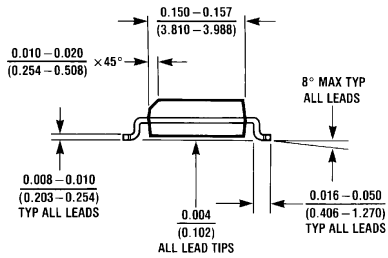
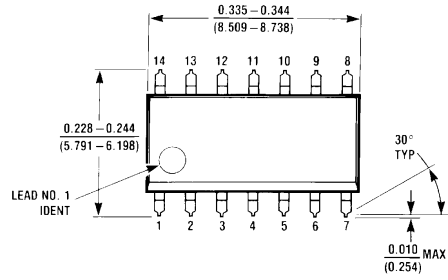
E20A (REV D)



**14-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number 54LS20DMQB or DM54LS20J**  
**NS Package Number J14A**

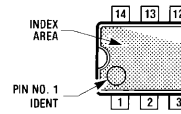
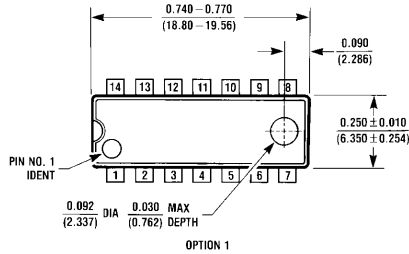
J14A (REV G)

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

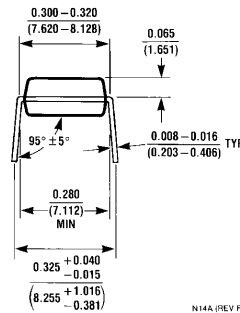
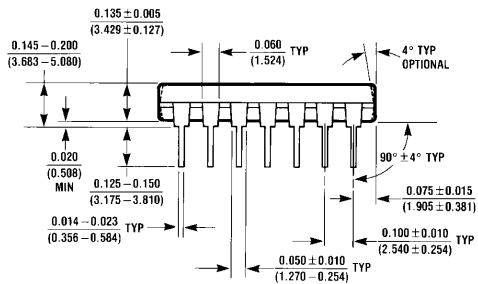


M14A (REV H)

**14-Lead Small Outline Molded Package (M)**  
**Order Number DM74LS20M**  
**NS Package Number M14A**



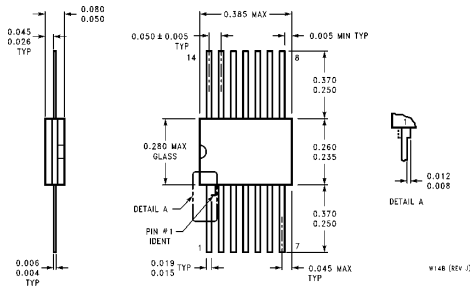
OPTION 02



N14A (REV F)

**14-Lead Molded Dual-In-Line Package (N)**  
**Order Number DM74LS20N**  
**NS Package Number N14A**

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



**14-Lead Ceramic Flat Package (W)**  
**Order Number 54LS20FMQB or DM54LS20W**  
**NS Package Number W14B**

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