

## DM74LS03

### Quad 2-Input NAND Gates with Open-Collector Outputs

#### General Description

This device contains four independent gates each of which performs the logic NAND function. The open-collector outputs require external pull-up resistors for proper logical operation.

#### Features

- Alternate Military/Aerospace device (54LS03) is available. Contact a Fairchild Semiconductor Sales Office/Distributor for specifications.

#### Pull-Up Resistor Equations

$$R_{MAX} = \frac{V_{CC} (Min) - V_{OH}}{N_1 (I_{OH}) + N_2 (I_{IH})}$$

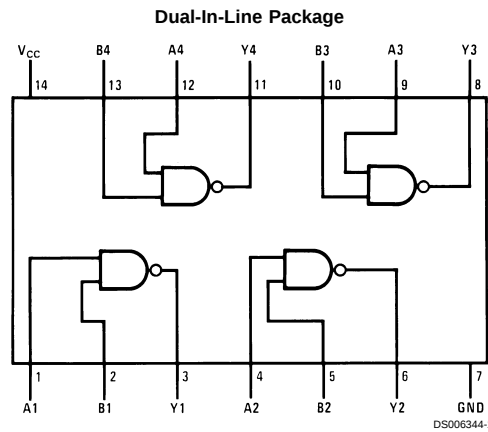
$$R_{MIN} = \frac{V_{CC} (Max) - V_{OL}}{I_{OL} - N_3 (I_{IL})}$$

Where:  $N_1 (I_{OH})$  = total maximum output high current for all outputs tied to pull-up resistor

$N_2 (I_{IH})$  = total maximum input high current for all inputs tied to pull-up resistor

$N_3 (I_{IL})$  = total maximum input low current for all inputs tied to pull-up resistor

#### Connection Diagram



Order Number 54LS03DMQB, 54LS03FMQB, 54LS03LMQB,  
DM54LS03J, DM54LS03W, DM74LS03M or DM74LS03N  
See Package Number E20A, J14A, M14A, N14A or W14B

#### Function Table

$$Y = \overline{AB}$$

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | H      |
| L      | H | H      |
| H      | L | H      |
| H      | H | L      |

H = High Logic Level  
L = Low Logic Level

**Absolute Maximum Ratings** (Note 1)

Supply Voltage  
Input Voltage  
Output Voltage

7V  
7V  
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

**Recommended Operating Conditions**

| Symbol          | Parameter                      | DM54LS03 |     |     | DM74LS03 |     |      | 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     |
| V <sub>OH</sub> | High Level Output Voltage      |          |     | 5.5 |          |     | 5.5  | V     |
| I <sub>OL</sub> | Low Level Output Current       |          |     | 4   |          |     | 8    | mA    |
| T <sub>A</sub>  | Free Air Operating Temperature | -55      |     | 125 | 0        |     | 70   | °C    |

**Note 1:** 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.

**Electrical Characteristics**

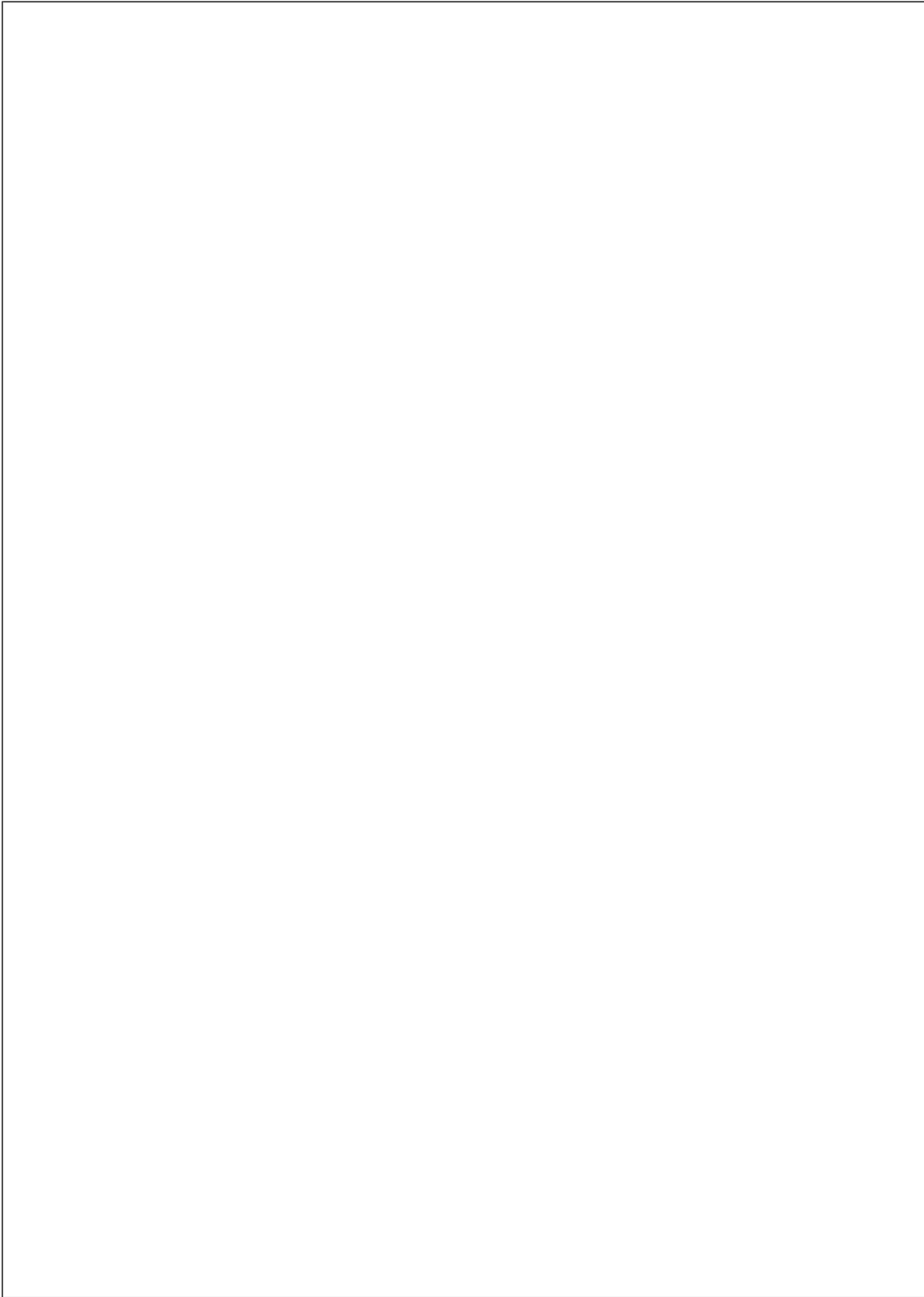
over recommended operating free air temperature range (unless otherwise noted)

| Symbol           | Parameter                         | Conditions                                                             | Min  | Typ<br>(Note 2) | Max   | Units |
|------------------|-----------------------------------|------------------------------------------------------------------------|------|-----------------|-------|-------|
| V <sub>I</sub>   | Input Clamp Voltage               | V <sub>CC</sub> = Min, I <sub>I</sub> = -18 mA                         |      |                 | -1.5  | V     |
| I <sub>CEX</sub> | High Level Output Current         | V <sub>CC</sub> = Min, V <sub>O</sub> = 5.5V,<br>V <sub>IL</sub> = Max |      |                 | 100   | μA    |
| V <sub>OL</sub>  | Low Level Output Voltage          | V <sub>CC</sub> = Min, I <sub>OL</sub> = Max,                          | DM54 | 0.25            | 0.4   | V     |
|                  |                                   | V <sub>IH</sub> = Min                                                  | 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>CCH</sub> | Supply Current with Outputs High  | V <sub>CC</sub> = Max                                                  |      | 0.8             | 1.6   | mA    |
| I <sub>CCL</sub> | Supply Current with Outputs Low   | V <sub>CC</sub> = Max                                                  |      | 2.4             | 4.4   | mA    |

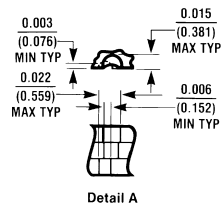
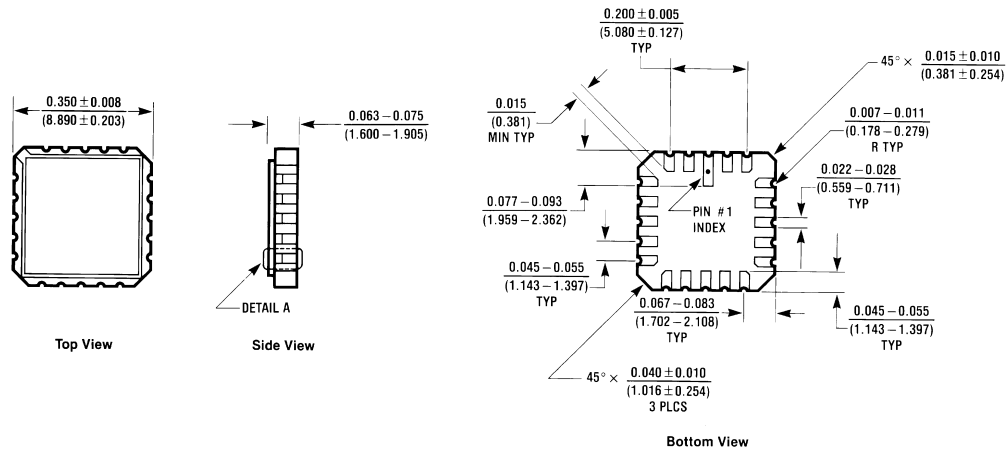
**Switching Characteristics**at V<sub>CC</sub> = 5V and T<sub>A</sub> = 25°C

| 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<br>Low to High Level Output | 6                      | 20  | 20                     | 45  | ns    |
| t <sub>PHL</sub> | Propagation Delay Time<br>High to Low Level Output | 3                      | 15  | 4                      | 20  | ns    |

**Note 2:** All typicals are at V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C.

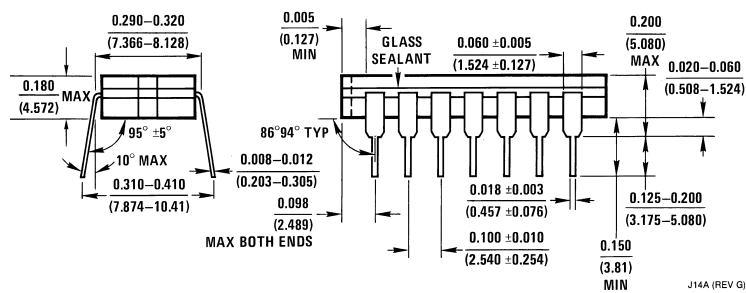
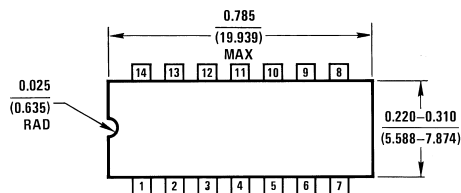


## Physical Dimensions inches (millimeters) unless otherwise noted



E20A (REV D)

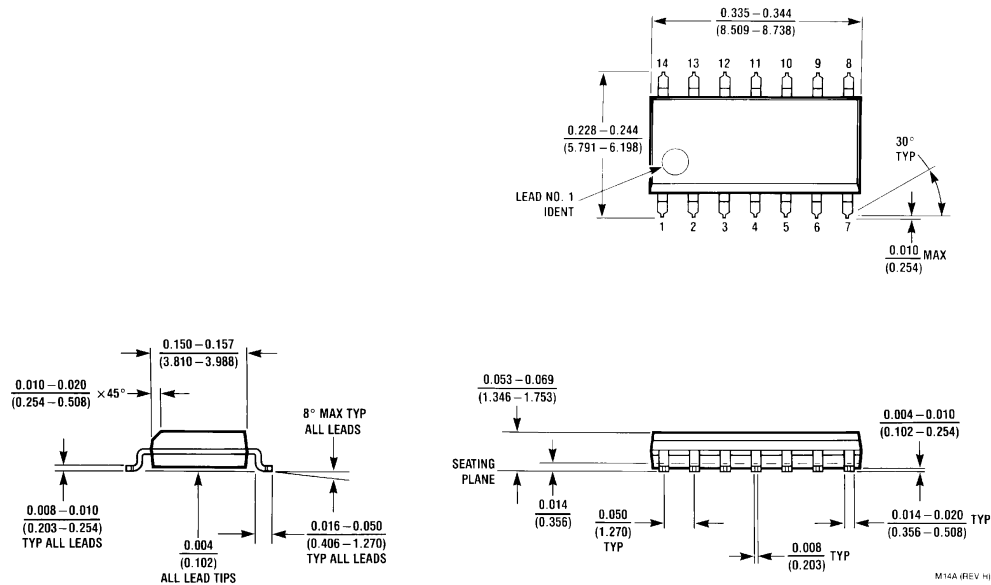
**Ceramic Leadless Chip Carrier Package (E)**  
**Order Number 54LS03LMQB**  
**Package Number E20A**



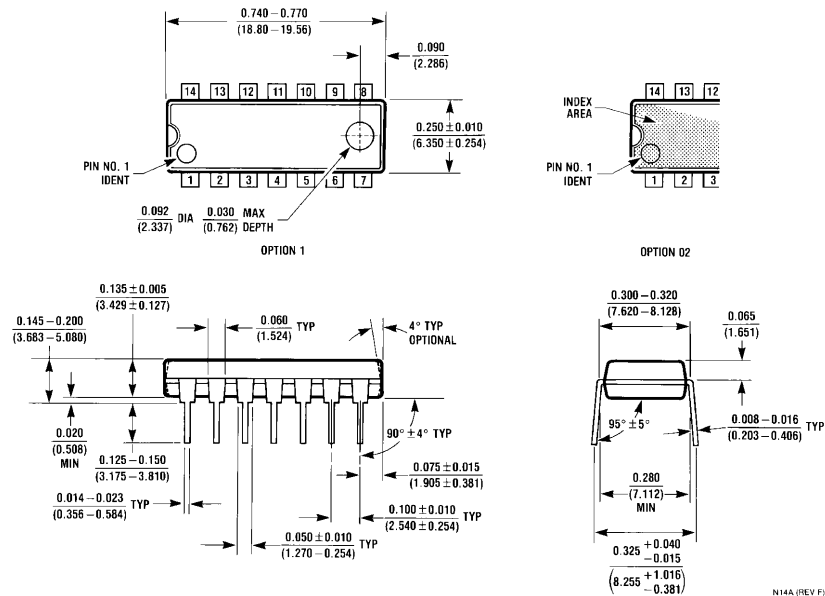
J14A (REV G)

**14-Lead Ceramic Dual-In-Line Package (J)**  
**Order Number 54LS03DMQB or DM54LS03J**  
**Package Number J14A**

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

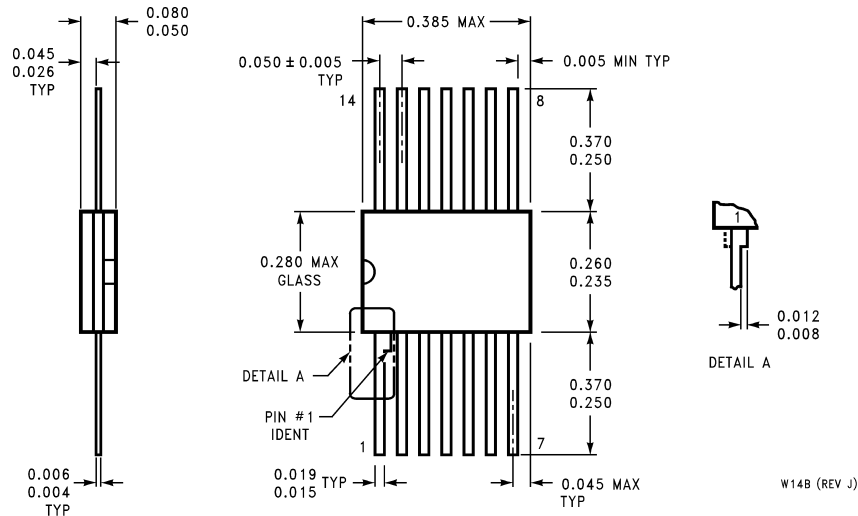


**14-Lead Small Outline Molded Package (M)**  
Order Number DM74LS03M  
Package Number M14A



**14-Lead Molded Dual-In-Line Package (N)**  
Order Number DM74LS03N  
Package Number N14A

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



**14-Lead Ceramic Flat Package (W)**  
**Order Number 54LS03FMQB or DM54LS03W**  
**Package Number W14B**

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