

## CD4023BC Buffered Triple 3-Input NAND Gate

### General Description

These triple gates are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement mode transistors. They have equal source and sink current capabilities and conform to standard B series output drive. The devices also have buffered outputs which improve transfer characteristics by providing very high gain. All inputs are protected against static discharge with diodes to  $V_{DD}$  and  $V_{SS}$ .

### Features

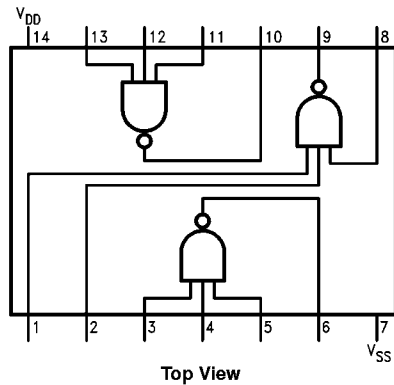
- Wide supply voltage range: 3.0V to 15V
- High noise immunity:  $0.45 V_{DD}$  (typ)
- Low power TTL compatibility:  
fan out of 2 driving 74L or 1 driving 74LS
- 5V–10V–15V parametric ratings
- Symmetrical output characteristics
- Maximum input leakage  $1 \mu\text{A}$  at 15V over full temperature range

### Ordering Code:

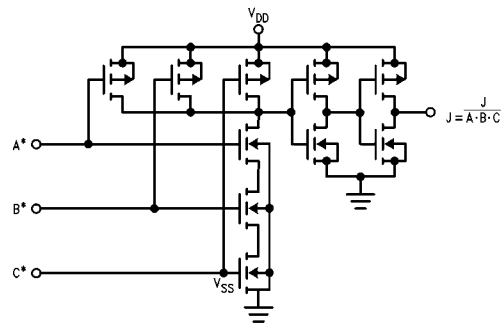
| Order Number | Package Number | Package Description   |
|--------------|----------------|---|
| CD4023BCM    | M14B           | 14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide |
| CD4023BCS    | M14D           | 14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide             |
| CD4023BCN    | N14A           | 14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide     |

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Connection Diagram



### Block Diagram



$1/3$  Device Shown

\*All Inputs Protected by Standard CMOS Input Protection Circuit.

**Absolute Maximum Ratings** (Note 1)

(Note 2)

|                                |                                      |
|--------------------------------|--------------------------------------|
| DC Supply Voltage ( $V_{DD}$ ) | -0.5 $V_{DC}$ to +18 $V_{DC}$        |
| Input Voltage ( $V_{IN}$ )     | -0.5 $V_{DC}$ to $V_{DD}+0.5 V_{DC}$ |
| Storage Temp. Range ( $T_S$ )  | -65°C to +150°C                      |
| Power Dissipation ( $P_D$ )    |                                      |
| Dual-In-Line                   | 700 mW                               |
| Small Outline                  | 500 mW                               |
| Lead Temperature ( $T_L$ )     |                                      |
| (Soldering, 10 seconds)        | 260°C                                |

**Recommended Operating Conditions**

|                                       |                               |
|---------------------------------------|-------------------------------|
| DC Supply Voltage ( $V_{DD}$ )        | 5 $V_{DC}$ to 15 $V_{DC}$     |
| Input Voltage ( $V_{IN}$ )            | 0 $V_{DC}$ to $V_{DD} V_{DC}$ |
| Operating Temperature Range ( $T_A$ ) | -40°C to +85°C                |

**Note 1:** "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The table of "Recommended Operating Conditions" and "Electrical Characteristics" provides conditions for actual device operation.

**Note 2:**  $V_{SS} = 0V$  unless otherwise specified.

**DC Electrical Characteristics** (Note 3)

| Symbol   | Parameter                             | Conditions               | -40°C |      | +25°C |            |      | +85°C |      | Units   |
|----------|---------------------------------------|--------------------------|-------|------|-------|------------|------|-------|------|---------|
|          |                                       |                          | Min   | Typ  | Min   | Typ        | Max  | Min   | Max  |         |
| $I_{DD}$ | Quiescent Device Current              | $V_{DD} = 5V$            |       | 1.0  |       | 0.004      | 1.0  |       | 7.5  | $\mu A$ |
|          |                                       | $V_{DD} = 10V$           |       | 2.0  |       | 0.005      | 2.0  |       | 15   |         |
|          |                                       | $V_{DD} = 15V$           |       | 4.0  |       | 0.006      | 4.0  |       | 30   |         |
| $V_{OL}$ | LOW Level Output Voltage              | $V_{DD} = 5V$            |       | 0.05 |       | 0          | 0.05 |       | 0.05 | V       |
|          |                                       | $V_{DD} = 10V$           |       | 0.05 |       | 0          | 0.05 |       | 0.05 |         |
|          |                                       | $V_{DD} = 15V$           |       | 0.05 |       | 0          | 0.05 |       | 0.05 |         |
| $V_{OH}$ | HIGH Level Output Voltage             | $V_{DD} = 5V$            | 4.95  |      | 4.95  | 5          |      | 4.95  |      | V       |
|          |                                       | $V_{DD} = 10V$           | 9.95  |      | 9.95  | 10         |      | 9.95  |      |         |
|          |                                       | $V_{DD} = 15V$           | 14.95 |      | 14.95 | 15         |      | 14.95 |      |         |
| $V_{IL}$ | LOW Level Input Voltage               | $V_{DD}=5V, V_O=4.5V$    |       | 1.5  |       | 2          | 1.5  |       | 1.5  | V       |
|          |                                       | $V_{DD}=10V, V_O=9.0V$   |       | 3.0  |       | 4          | 3.0  |       | 3.0  |         |
|          |                                       | $V_{DD}=15V, V_O=13.5V$  |       | 4.0  |       | 6          | 4.0  |       | 4.0  |         |
| $V_{IH}$ | HIGH Level Input Voltage              | $V_{DD}=5V, V_O=0.5V$    | 3.5   |      | 3.5   | 3          |      | 3.5   |      | V       |
|          |                                       | $V_{DD}=10V, V_O=1.0V$   | 7.0   |      | 7.0   | 6          |      | 7.0   |      |         |
|          |                                       | $V_{DD}=15V, V_O=1.5V$   | 11.0  |      | 11.0  | 9          |      | 11.0  |      |         |
| $I_{OL}$ | LOW Level Output Current<br>(Note 4)  | $V_{DD}=5V, V_O=0.4V$    | 0.52  |      | 0.44  | 0.88       |      | 0.36  |      | mA      |
|          |                                       | $V_{DD}=10V, V_O=0.5V$   | 1.3   |      | 1.1   | 2.2        |      | 0.90  |      |         |
|          |                                       | $V_{DD}=15V, V_O=1.5V$   | 3.6   |      | 3.0   | 8          |      | 2.4   |      |         |
| $I_{OH}$ | HIGH Level Output Current<br>(Note 4) | $V_{DD}=5V, V_O=4.6V$    | -0.52 |      | -0.44 | -0.88      |      | -0.36 |      | mA      |
|          |                                       | $V_{DD}=10V, V_O=9.5V$   | -1.3  |      | -1.1  | -2.2       |      | -0.90 |      |         |
|          |                                       | $V_{DD}=15V, V_O=13.5V$  | -3.6  |      | -3.0  | -8         |      | -2.4  |      |         |
| $I_{IN}$ | Input Current                         | $V_{DD}=15V, V_{IN}=0V$  |       | -0.3 |       | $-10^{-5}$ | -0.3 |       | -1.0 | $\mu A$ |
|          |                                       | $V_{DD}=15V, V_{IN}=15V$ |       | 0.3  |       | $10^{-5}$  | 0.3  |       | 1.0  |         |

**Note 3:**  $V_{SS} = 0V$  unless otherwise specified.

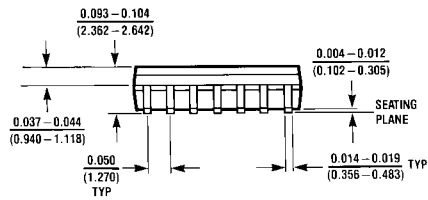
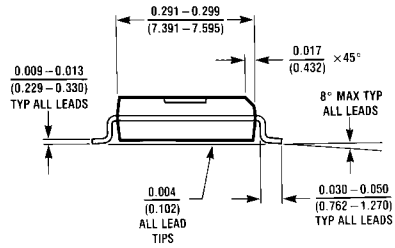
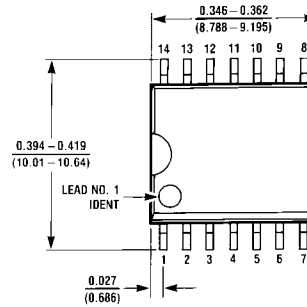
**Note 4:**  $I_{OH}$  and  $I_{OL}$  are tested one output at a time.

**AC Electrical Characteristics** (Note 5) $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ k}$ , unless otherwise specified

| Symbol                 | Parameter                            | Conditions   | Min | Typ             | Max              | Units |
|------------------------|--------------------------------------|--|-----|-----------------|------------------|-------|
| $t_{PHL}$              | Propagation Delay, HIGH-to-LOW Level | $V_{DD} = 5\text{V}$<br>$V_{DD} = 10\text{V}$<br>$V_{DD} = 15\text{V}$ |     | 130<br>60<br>40 | 250<br>100<br>70 | ns    |
| $t_{PLH}$              | Propagation Delay, LOW-to-HIGH Level | $V_{DD} = 5\text{V}$<br>$V_{DD} = 10\text{V}$<br>$V_{DD} = 15\text{V}$ |     | 110<br>50<br>35 | 250<br>100<br>70 | ns    |
| $t_{THL}$<br>$t_{TLH}$ | Transition Time                      | $V_{DD} = 5\text{V}$<br>$V_{DD} = 10\text{V}$<br>$V_{DD} = 15\text{V}$ |     | 90<br>50<br>40  | 200<br>100<br>80 | ns    |
| $C_{IN}$               | Average Input Capacitance            | Any Input  |     | 5               | 7.5              | pF    |
| $C_{PD}$               | Power Dissipation Capacity (Note 6)  | Any Gate   |     | 17              |                  | pF    |

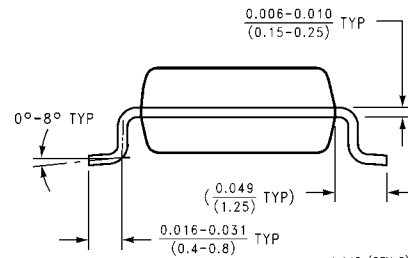
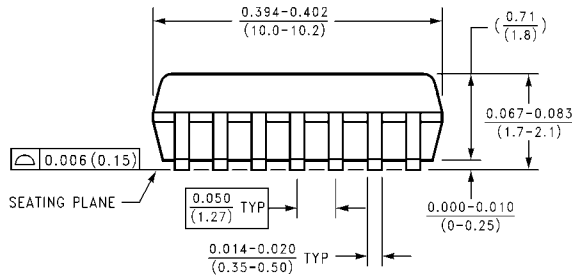
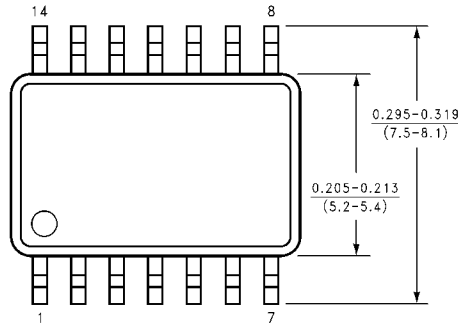
**Note 5:** AC Parameters are guaranteed by DC correlated testing.**Note 6:**  $C_{PD}$  determines the no load AC power consumption of any CMOS device.  
For complete explanation, see Family Characteristics Application Note AN-90.

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



M14B (REV D)

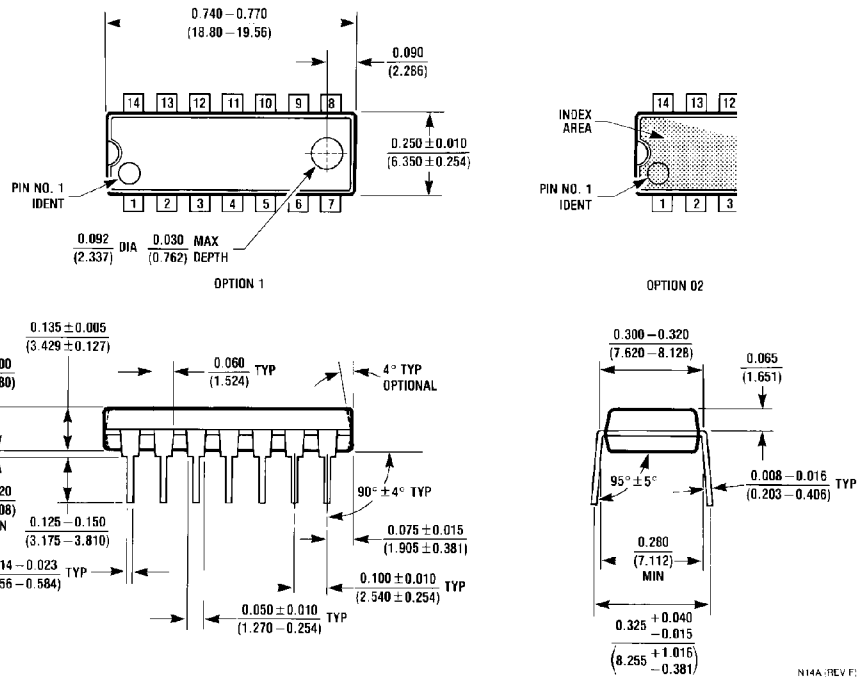
**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide  
Package Number M14B**



M14D (REV B)

**14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide  
Package Number M14D**

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



**14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide Package Number N14A**

N14A (REV F)

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