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October 1987  
Revised August 2000

CD4023BC Buffered Triple 3-Input NAND Gate

## 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

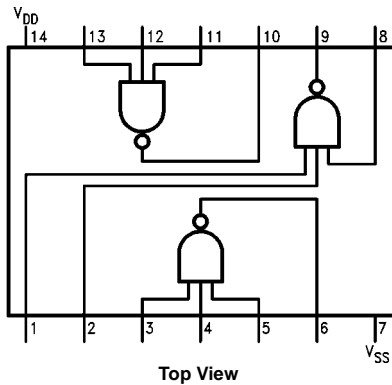
- Wide supply voltage range: 3.0V to 15V
- High noise immunity:  $0.45 V_{DD}$  (typ)
- Low power TTL compatibility:  
fan out of 2 driving 74L or 1 driving 74LS
- 5V–10V–15V parametric ratings
- Symmetrical output characteristics
- Maximum input leakage  $1 \mu A$  at 15V over full temperature range

### Ordering Code:

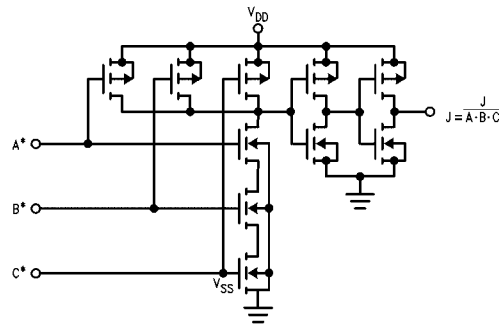
Order Number	Package Number	Package Description
CD4023BCM	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow
CD4023BCS	M14D	14-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
CD4023BCN	N14A	14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

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 (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 (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.

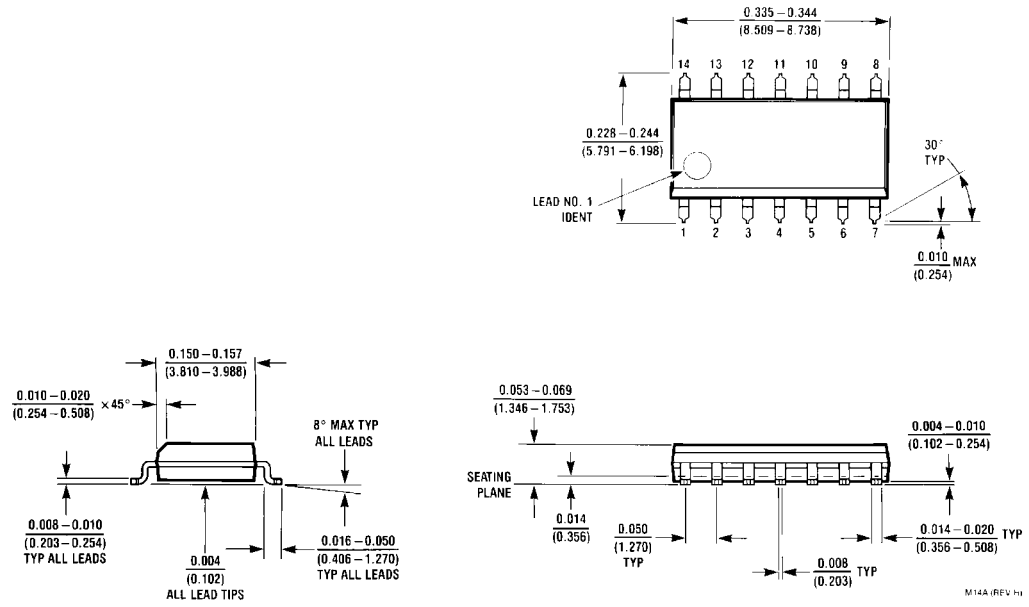
**AC Electrical Characteristics** (Note 5) $T_A = 25^\circ\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{k}$ , unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Units
$t_{PHL}$	Propagation Delay, HIGH-to-LOW Level	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		130 60 40	250 100 70	ns
$t_{PLH}$	Propagation Delay, LOW-to-HIGH Level	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		110 50 35	250 100 70	ns
$t_{THL}$ $t_{TLH}$	Transition Time	$V_{DD} = 5\text{V}$ $V_{DD} = 10\text{V}$ $V_{DD} = 15\text{V}$		90 50 40	200 100 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.

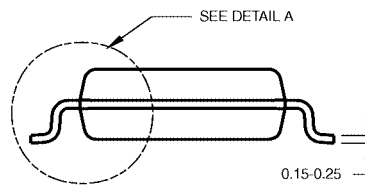
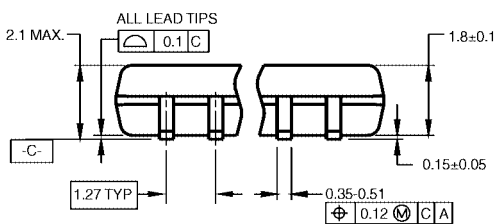
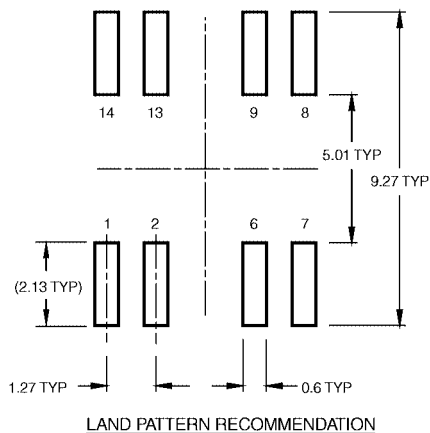
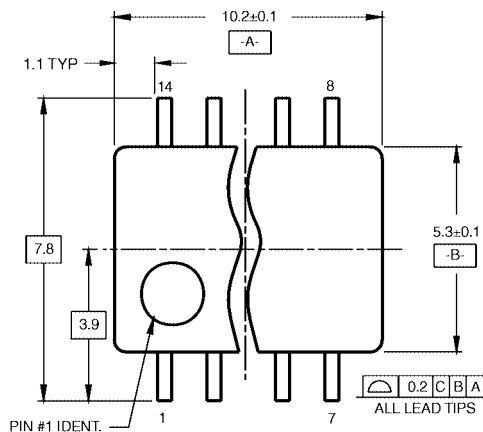
For complete explanation, see Family Characteristics Application Note AN-90.

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



**14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-120, 0.150 Narrow Package Number M14A**

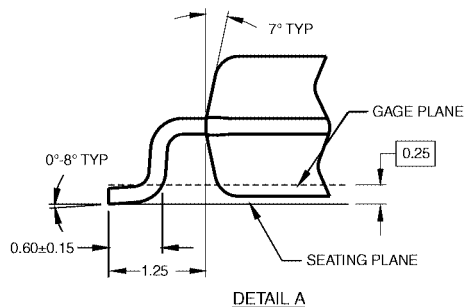
**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



DIMENSIONS ARE IN MILLIMETERS

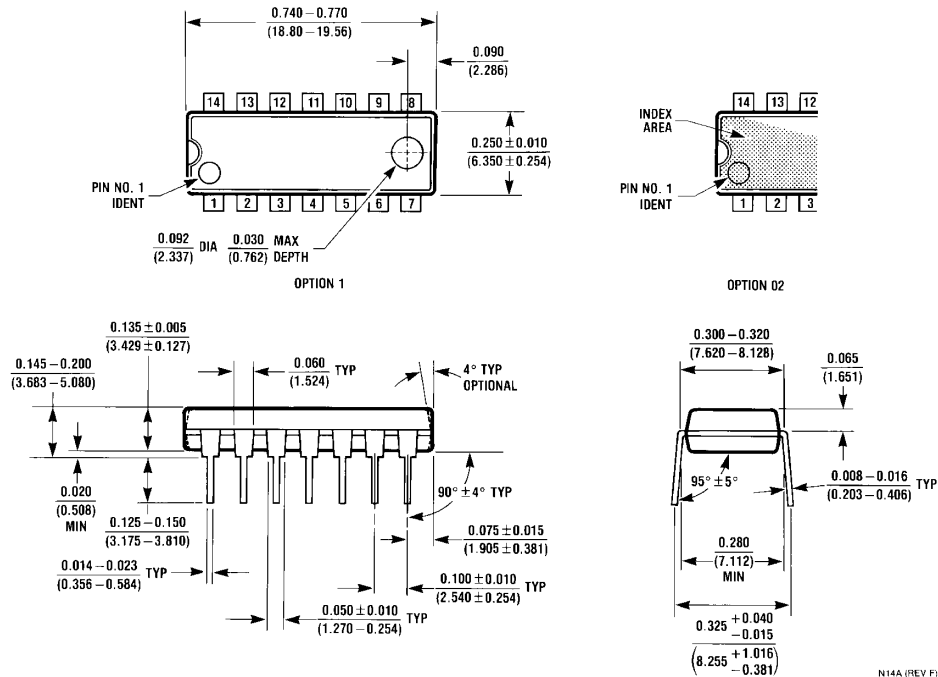
- NOTES:  
 A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.  
 B. DIMENSIONS ARE IN MILLIMETERS.  
 C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M14DRevB1



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

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



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