

CD4023BM/CD4023BC
Buffered Triple 3-Input NAND Gate
CD4025BM/CD4025BC
Buffered Triple 3-Input NOR Gate

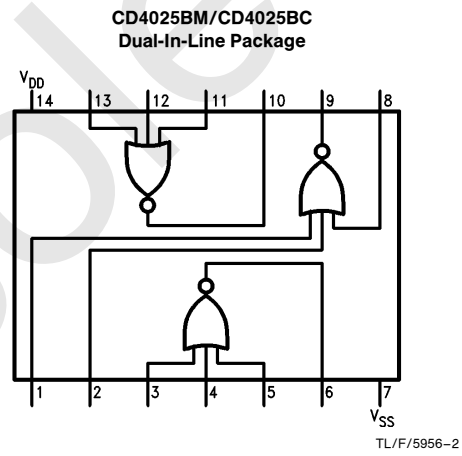
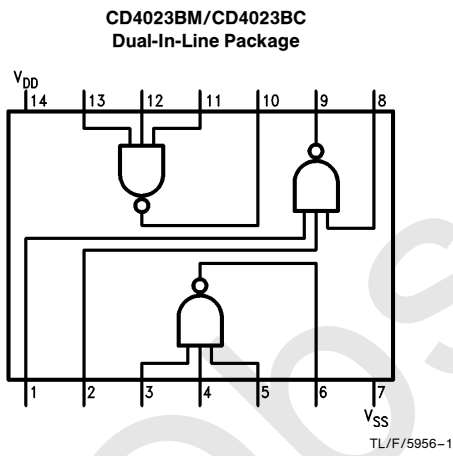
General Description

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 μ A at 15V over full temperature range

Connection Diagrams



Order Number CD4023B or CD4025B

CD4023BM/CD4023BC Buffered Triple 3-Input NAND Gate
CD4025BM/CD4025BC Buffered Triple 3-Input NOR Gate

Absolute Maximum Ratings (Notes 1 & 2)

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

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

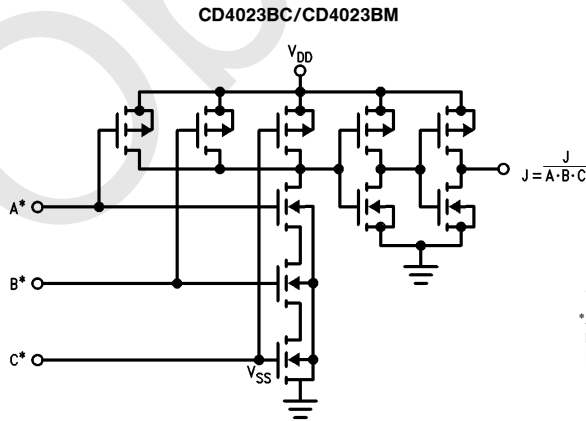
Recommended Operating Conditions

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)	
CD4023BM, CD4025BM	-55°C to +125°C
CD4023BC, CD4025BC	-40°C to +85°C

DC Electrical Characteristics CD4023BM, CD4025BM (Note 2)

Symbol	Parameter	Conditions	-55°C		+25°C			+125°C		Units
			Min	Typ	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	$V_{DD} = 5V$		0.25		0.004	0.25		7.5	μA
		$V_{DD} = 10V$		0.5		0.005	0.5		15	μA
		$V_{DD} = 15V$		1.0		0.006	1.0		30	μA
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
		$V_{DD} = 15V$		0.05		0	0.05		0.05	V
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
		$V_{DD} = 15V$	14.95		14.95	15		14.95		V
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
		$V_{DD} = 15V, V_O = 13.5V$		4.0		6	4.0		4.0	V
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
		$V_{DD} = 15V, V_O = 1.5V$	11.0		11.0	9		11.0		V
I_{OL}	Low Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 0.4V$	0.64		0.51	0.88		0.36		mA
		$V_{DD} = 10V, V_O = 0.5V$	1.6		1.3	2.2		0.90		mA
		$V_{DD} = 15V, V_O = 1.5V$	4.2		3.4	8		2.4		mA
I_{OH}	High Level Output Current (Note 3)	$V_{DD} = 5V, V_O = 4.6V$	-0.64		-0.51	-0.88		-0.36		mA
		$V_{DD} = 10V, V_O = 9.5V$	-1.6		-1.3	-2.2		-0.90		mA
		$V_{DD} = 15V, V_O = 13.5V$	-4.2		-3.4	-8		-2.4		mA
I_{IN}	Input Current	$V_{DD} = 15V, V_{IN} = 0V$		-0.10		-10^{-5}	-0.10		-1.0	μA
		$V_{DD} = 15V, V_{IN} = 15V$		0.10		10^{-5}	0.10		1.0	μA

Schematic Diagram



1/3 Device Shown
 *All Inputs Protected
 by Standard CMOS Input
 Protection Circuit.

TL/F/5956-3

DC Electrical Characteristics CD4023BC, CD4025BC (Note 2)

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	μA				
		V _{DD} = 10V		2.0		0.005	2.0		15	μA				
		V _{DD} = 15V		4.0		0.006	4.0		30	μA				
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				
		V _{DD} = 15V		0.05		0	0.05		0.05	V				
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				
		V _{DD} = 15V	14.95		14.95	15		14.95		V				
V _{IL}	Low Level Input Voltage	V _{DD} = 5V, V _O = 4.5V	} I _O < 1 μA	1.5	2	1.5	1.5	1.5	V					
		V _{DD} = 10V, V _O = 9.0V								3.0	4	3.0	3.0	V
		V _{DD} = 15V, V _O = 13.5V								4.0	6	4.0	4.0	V
V _{IH}	High Level Input Voltage	V _{DD} = 5V, V _O = 0.5V	} I _O < 1 μA	3.5	3.5	3	3.5	V						
		V _{DD} = 10V, V _O = 1.0V							7.0	6	7.0	V		
		V _{DD} = 15V, V _O = 1.5V							11.0	9	11.0	V		
I _{OL}	Low Level Output Current (Note 3)	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	mA							
		V _{DD} = 15V, V _O = 1.5V	3.6	3.0	8	2.4	mA							
I _{OH}	High Level Output Current (Note 3)	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	mA							
		V _{DD} = 15V, V _O = 13.5V	-3.6	-3.0	-8	-2.4	mA							
I _{IN}	Input Current	V _{DD} = 15V, V _{IN} = 0V		-0.3	-10 ⁻⁵	-0.3		-1.0	μA					
		V _{DD} = 15V, V _{IN} = 15V		0.3	10 ⁻⁵	0.3		1.0	μA					

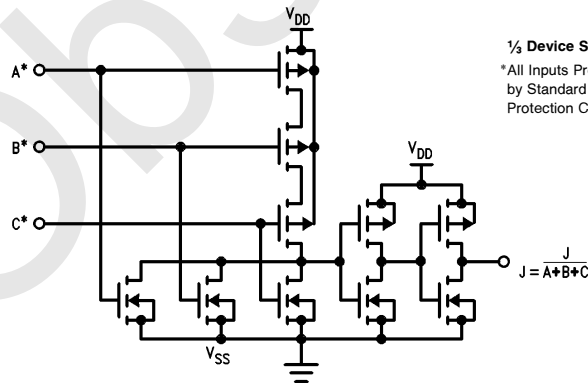
Note 1: "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed; they are not meant to imply that the devices should be operated at these limits. The table of "Recommended Operating Conditions" and "Electrical Characteristics" provides conditions for actual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

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

Note 3: I_{OH} and I_{OL} are tested one output at a time.

Schematic Diagram

CD4025BM/CD4025BC



TL/F/5956-4

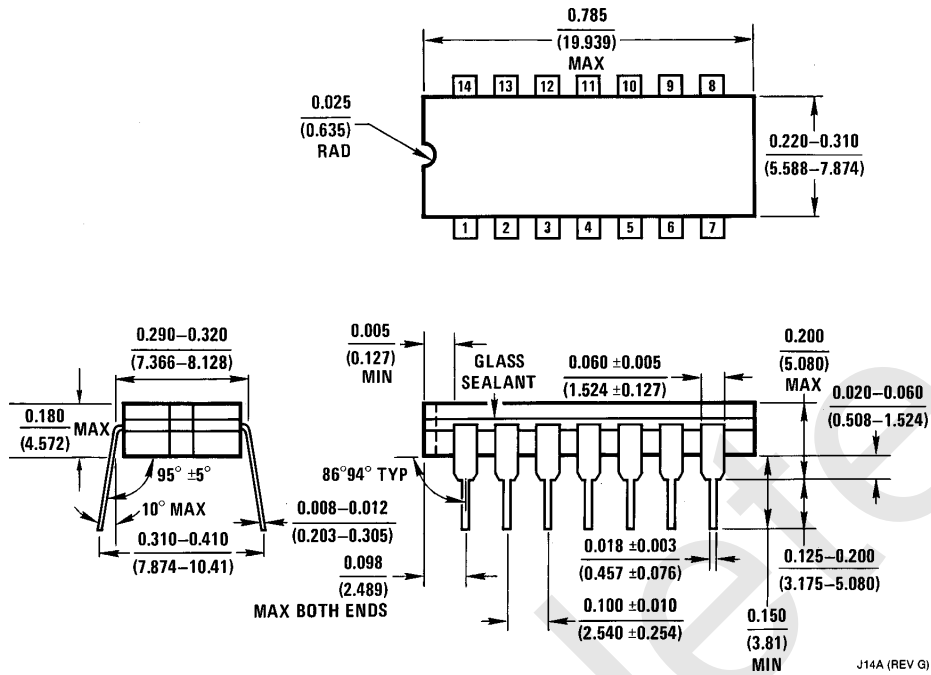
AC Electrical Characteristics* $T_A = 25^\circ\text{C}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}$, unless otherwise specified

Symbol	Parameter	Conditions	CD4023BC CD4023BM			CD4025BC CD4025BM			Units
			Min	Typ	Max	Min	Typ	Max	
t _{PHL}	Propagation Delay, High-to-Low Level	V _{DD} = 5V		130	250		130	250	ns
		V _{DD} = 10V		60	100		60	100	ns
		V _{DD} = 15V		40	70		40	70	ns
t _{PLH}	Propagation Delay, Low-to-High Level	V _{DD} = 5V		110	250		120	250	ns
		V _{DD} = 10V		50	100		60	100	ns
		V _{DD} = 15V		35	70		40	70	ns
t _{THL} t _{TLH}	Transition Time	V _{DD} = 5V		90	200		90	200	ns
		V _{DD} = 10V		50	100		50	100	ns
		V _{DD} = 15V		40	80		40	80	ns
C _{IN}	Average Input Capacitance	Any Input		5	7.5		5	7.5	pF
C _{PD}	Power Dissipation Capacity (Note 4)	Any Gate		17			17		pF

*AC Parameters are guaranteed by DC correlated testing.

Note 4: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation, see 54C/74C Family Characteristics Application Note AN-90.

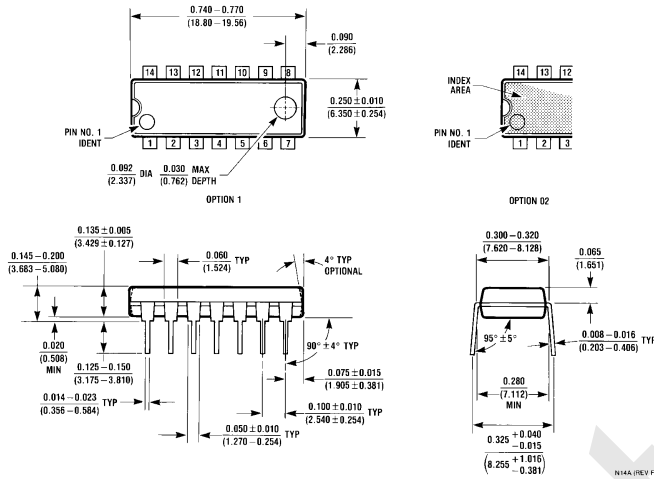
Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number CD4023BMJ, CD4023BCJ, CD4025BMJ or CD4025BCJ
NS Package Number J14A

**CD4023BM/CD4023BC Buffered Triple 3-Input NAND Gate
 CD4025BM/CD4025BC Buffered Triple 3-Input NOR Gate**

Physical Dimensions inches (millimeters) (Continued)



Molded Dual-In-Line Package (N)
 Order Number CD4023BMN, CD4023BCN, CD4025BMN or CD4025BCN
 NS Package Number N14A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform, when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.



National Semiconductor Corporation
 1111 West Bardin Road
 Arlington, TX 76017
 Tel: 1(800) 272-9959
 Fax: 1(800) 737-7018

National Semiconductor Europe
 Fax: (+49) 0-180-530 85 86
 Email: cnjwge@tevm2.nsc.com
 Deutsch Tel: (+49) 0-180-530 85 85
 English Tel: (+49) 0-180-532 78 32
 Français Tel: (+49) 0-180-532 93 58
 Italiano Tel: (+49) 0-180-534 16 80

National Semiconductor Hong Kong Ltd.
 19th Floor, Straight Block,
 Ocean Centre, 5 Canton Rd.
 Tsimshatsui, Kowloon
 Hong Kong
 Tel: (852) 2737-1600
 Fax: (852) 2736-9960

National Semiconductor Japan Ltd.
 Tel: 81-043-299-2309
 Fax: 81-043-299-2408

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.