National Semiconductor

CD4023M/CD4023C Triple 3-Input NAND Gate
CD4025M/CD4025C Triple 3-Input NOR Gate

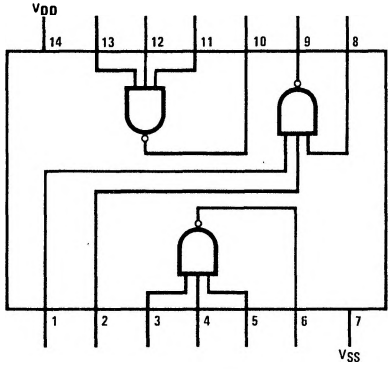
General Description

These triple gates are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement mode transistors. All inputs are protected against static discharge with diodes to V_{DD} and V_{SS}.

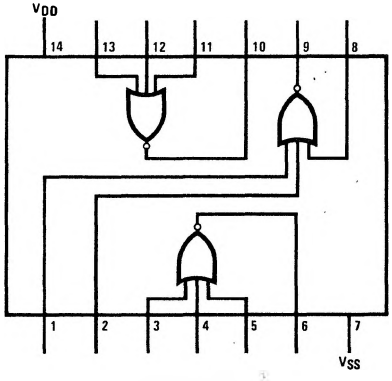
Features

■ Wide supply voltage range	3.0 V to 15 V
■ High noise immunity	0.45 V_{DD} (typ.)
■ 5-10 V parametric ratings	
■ Low Power	

Connection Diagrams



CD4023M/CD4023C
TOP VIEW



CD4025M/CD4025C
TOP VIEW

Absolute Maximum Ratings (Note 1)

Voltage at Any Pin	V_{SS} − to V_{DD} + 0.3 V	Storage Temperature Range	−65°C to +150°C
Operating Temperature Range	−55°C to +125°C	Package Dissipation	500 mW
CD4023M, CD4025M	−55°C to +125°C	Operating V_{DD} Range	V_{SS} + 3.0 V to V_{SS} + 15 V
CD4023C, CD4025C	−40°C to +85°C	Lead Temperature (Soldering, 10 seconds)	300°C

DC Electrical Characteristics — CD4023M, CD4025M

Parameter	Conditions	Limits							Units
		−55°C		25°C			125°C		
		Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_L Quiescent Device Current	V_{DD} = 5.0 V		0.05		0.001	0.05		3.0	μA
	V_{DD} = 10 V		0.1		0.001	0.1		6.0	μA
P_D Quiescent Device Dissipation/Package	V_{DD} = 5.0 V		0.25		0.005	0.25		15	μW
	V_{DD} = 10 V		1.0		0.01	1.0		60	μW
V_{OL} Output Voltage Low Level	V_{DD} = 5.0 V, V_I = V_{DD}, I_O = 0 A		0.05		0	0.05		0.05	V
	V_{DD} = 10 V, V_I = V_{DD}, I_O = 0 A		0.05		0	0.05		0.05	V
V_{OH} Output Voltage High Level	V_{DD} = 5.0 V, V_I = V_{SS}, I_O = 0 A	4.95		4.95	5.0		4.95		V
	V_{DD} = 10 V, V_I = V_{SS}, I_O = 0 A	9.95		9.95	10		9.95		V
V_{NL} Noise Immunity (All Inputs)	V_{DD} = 5.0 V, V_O = 3.6V, I_O = 0 A	1.5		1.5	2.25		1.4		V
	V_{DD} = 10 V, V_O = 7.2V, I_O = 0 A	3.0		3.0	4.5		2.9		V
V_{NH} Noise Immunity (All Inputs)	V_{DD} = 5.0 V, V_0 = 0.95 V, I_O = 0 A	1.4		1.5	2.25		1.5		V
	V_{DD} = 10 V, V_O = 2.9 V, I_O = 0 A	2.9		3.0	4.5		3.0		V
I_DN Output Drive Current N-Channel (4025)	V_{DD} = 5.0 V, V_O = 0.4 V, V_I = V_{DD}	0.5		0.40	1.0		0.28		mA
	V_{DD} = 10 V, V_O = 0.5 V, V_I = V_{DD}	1.1		0.9	2.5		0.65		mA
I_DP Output Drive Current P-Channel (4025)	V_{DD} = 5.0 V, V_O = 2.5V, V_I = V_{SS}	−0.62		−0.5	−2.0		−0.35		mA
	V_{DD} = 10 V, V_O = 9.5 V, V_I = V_{SS}	−0.62		−0.5	−1.0		−0.35		mA
I_DN Output Drive Current N-Channel (4023)	V_{DD} = 5.0 V, V_O = 0.4 V, V_I = V_{DD}	0.31		0.25	0.5		0.175		mA
	V_{DD} = 10 V, V_O = 0.5 V, V_I = V_{DD}	0.63		0.5	0.6		0.35		mA
I_DP Output Drive Current P-Channel (4023)	V_{DD} = 5.0 V, V_O = 2.5 V, V_I = V_{SS}	−0.31		−0.25	−0.5		−0.175		mA
	V_{DD} = 10 V, V_O = 9.5 V, V_I = V_{SS}	−0.75		−0.6	−1.2		−0.4		mA
I_I Input Current					10				pA

DC Electrical Characteristics — CD4023C, CD4025C

Parameter		Conditions	Limits						Units
			−40°C		25°C			85°C	
			Min.	Max.	Min.	Typ.	Max.	Min.	Max.	
I_L	Quiescent Device Current	$V_{DD} = 5.0\,V$		0.5		0.005	0.5		15	μA
		$V_{DD} = 10\,V$		5.0		0.005	5.0		30	μA
P_D	Quiescent Device Dissipation/Package	$V_{DD} = 5.0\,V$		2.5		0.025	2.5		75	μW
		$V_{DD} = 10\,V$		50		0.05	50		300	μW
V_{OL}	Output Voltage Low Level	$V_{DD} = 5.0\,V$, $V_I = V_{DD}$, $I_O = 0\,A$		0.01		0	0.01		0.05	V
		$V_{DD} = 10\,V$, $V_I = V_{DD}$, $I_O = 0\,A$		0.01		0	0.01		0.05	V
V_{OH}	Output Voltage High Level	$V_{DD} = 5.0\,V$, $V_I = V_{SS}$, $I_O = 0\,A$	4.99		4.99	5.0		4.95		V
		$V_{DD} = 10\,V$, $V_I = V_{SS}$, $I_O = 0\,A$	9.99		9.99	10		9.95		V
I_I	Input Current					10				pA
V_{NL}	Noise Immunity (All Inputs)	$V_{DD} = 5.0\,V$, $V_O = 3.6\,V$, $I_O = 0\,A$	1.5		1.5	2.25		1.4		V
		$V_{DD} = 10\,V$, $V_O = 7.2\,V$, $I_O = 0\,A$	3.0		3.0	4.5		2.9		V
V_{NH}	Noise Immunity (All Inputs)	$V_{DD} = 5.0\,V$, $V_O = 0.95\,V$, $I_O = 0\,A$	1.4		1.5	2.25		1.5		V
		$V_{DD} = 10\,V$, $V_O = 2.9\,V$, $I_O = 0\,A$	2.9		3.0	4.5		3.0		V
I_DN	Output Drive Current N-Channel (4025)	$V_{DD} = 5.0\,V$, $V_O = 0.4\,V$, $V_I = V_{DD}$	0.35		0.3	1.0		0.24		mA
		$V_{DD} = 10\,V$, $V_O = 0.5\,V$, $V_I = V_{DD}$	0.72		0.6	2.5		0.48		mA
I_DP	Output Drive Current P-Channel (4025)	$V_{DD} = 5.0\,V$, $V_O = 2.5\,V$, $V_I = V_{SS}$	−0.35		−0.3	−2.0		−0.24		mA
		$V_{DD} = 10\,V$, $V_O = 9.5\,V$, $V_I = V_{SS}$	−0.3		−0.25	−1.0		−0.2		mA
I_DN	Output Drive Current N-Channel (4023)	$V_{DD} = 5.0\,V$, $V_O = 0.4\,V$, $V_I = V_{DD}$	0.145		0.12	0.5		0.095		mA
		$V_{DD} = 10\,V$, $V_O = 0.5\,V$, $V_I = V_{DD}$	0.3		0.25	0.6		0.2		mA
I_D P	Output Drive Current P-Channel (4023)	$V_{DD} = 5.0\,V$, $V_O = 2.5\,V$, $V_I = V_{SS}$	−0.145		−0.12	−0.5		−0.095		mA
		$V_{DD} = 10\,V$, $V_O = 9.5\,V$, $V_I = V_{SS}$	−0.35		−0.3	−1.2		−0.24		mA
I_I	Input Current					10				pA

AC Electrical Characteristics

$T_A = 25°C$, $C_L = 15\,pF$, and input rise and fall times = 20 ns.
Typical temperature coefficient for all values of $V_{DD} = 0.3\%/°C$

	Parameter	Conditions	Min.	Typ.	Max.	Units
	CD4025M					
t_{PHL}	Propagation Delay Time High to Low Level	$V_{DD} = 5.0V$		35	50	ns
		$V_{DD} = 10V$		25	40	ns
t_{PLH}	Propagation Delay Time Low to High Level	$V_{DD} = 5.0V$		35	40	ns
		$V_{DD} = 10V$		25	70	ns
t_{THL}	Transition Time High to Low Level	$V_{DD} = 5.0V$		65	125	ns
		$V_{DD} = 10V$		35	70	ns
t_{TLH}	Transition Time Low to High Level	$V_{DD} = 5.0V$		65	175	ns
		$V_{DD} = 10V$		35	75	ns
C_I	Input Capacitance	Any Input		5.0		pF
	CD4025C					
t_{PHL}	Propagation Delay Time High to Low Level	$V_{DD} = 5.0V$		35	80	ns
		$V_{DD} = 10V$		25	55	ns
t_{PLH}	Propagation Delay Time Low to High Level	$V_{DD} = 5.0V$		35	120	ns
		$V_{DD} = 10V$		25	65	ns
t_{THL}	Transition Time High to Low Level	$V_{DD} = 5.0V$		65	200	ns
		$V_{DD} = 10V$		35	115	ns
t_{TLH}	Transition Time Low to High Level	$V_{DD} = 5.0V$		65	300	ns
		$V_{DD} = 10V$		35	125	ns
C_I	Input Capacitance	Any Input		5.0		pF

AC Electrical Characteristics

$T_A = 25°C$, $C_L = 15\,pF$, and input rise and fall times = 20 ns.
Typical temperature coefficient for all values of $V_{DD} = 0.3\%/°C$

	Parameter	Conditions	Min.	Typ.	Max.	Units
	CD4023M					
t_{PHL}	Propagation Delay Time High to Low Level	$V_{DD} = 5.0V$		50	75	ns
		$V_{DD} = 10V$		25	40	ns
t_{PLH}	Propagation Delay Time Low to High Level	$V_{DD} = 5.0V$		50	75	ns
		$V_{DD} = 10V$		25	40	ns
t_{THL}	Transition Time High to Low Level	$V_{DD} = 5.0V$		75	125	ns
		$V_{DD} = 10V$		50	75	ns
t_{TLH}	Transition Time Low to High Level	$V_{DD} = 5.0V$		75	100	ns
		$V_{DD} = 10V$		40	60	ns
C_I	Input Capacitance	Any Input		5.0		pF
	CD4023C					
t_{PHL}	Propagation Delay Time High to Low Level	$V_{DD} = 5.0V$		50	100	ns
		$V_{DD} = 10V$		25	50	ns
t_{PLH}	Propagation Delay Time Low to High Level	$V_{DD} = 5.0V$		50	100	ns
		$V_{DD} = 10V$		25	50	ns
t_{THL}	Transition Time High to Low Level	$V_{DD} = 5.0V$		75	150	ns
		$V_{DD} = 10V$		50	100	ns
t_{TLH}	Transition Time Low to High Level	$V_{DD} = 5.0V$		75	125	ns
		$V_{DD} = 10V$		40	75	ns
C_I	Input Capacitance	Any Input		5.0		pF