National Semiconductor

CD4030M/CD4030C Quad EXCLUSIVE-OR Gate

General Description

The EXCLUSIVE-OR 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}.

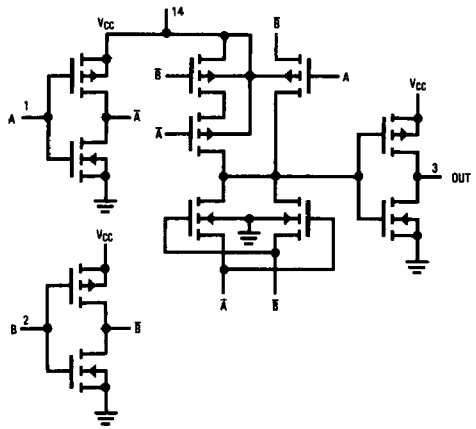
Features

■ Wide supply voltage range	3.0V to 15V
■ Low power	100 nW (typ.)
■ Medium speed operation	$t_{PHL} = t_{PLH} = 40$ ns (typ.) at $C_L = 15$ pF, 10V supply
■ High noise immunity	0.45 V_{CC} (typ.)

Applications

- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Industrial controls
- Remote metering
- Computers

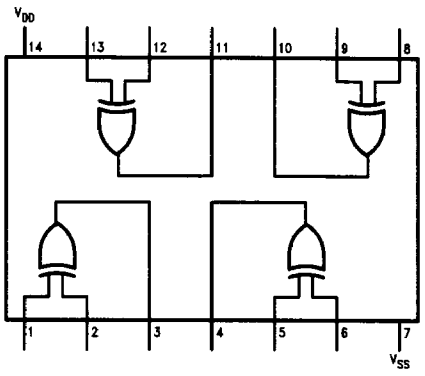
Schematic Diagram



TL/F/5961–1

Connection Diagram

Dual-In-Line Package



TL/F/5961–2

Order Number CD4030*

*Please look into Section 8, Appendix D for availability of various package types.

Absolute Maximum Ratings

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

Voltage at Any Pin (Note 1) V_{SS} −0.3V to V_{SS} +15.5V

Operating Temperature Range

CD4030M −55°C to +125°C

CD4030C −40°C to +85°C

Storage Temperature Range −65°C to +150°C

Power Dissipation (P_D)

Dual-In-Line 700 mW

Small Outline 500 mW

Operating V_{DD} Range V_{SS} +3.0V to V_{SS} +15V

Lead Temperature (Soldering, 10 seconds) 260°C

DC Electrical Characteristics CD4030M

Symbol	Parameter	Conditions	Limits									Units
			−55°C			+25°C			+125°C			
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_L	Quiescent Device Current	V_{DD} = 5.0V			0.5		0.005	0.5			30	μA
		V_{DD} = 10V			1.0		0.01	1.0			60	μA
P_D	Quiescent Device Dissipation Package	V_{DD} = 5.0V			2.5		0.025	2.5			150	μW
		V_{DD} = 10V			10		0.1	10			600	μW
V_{OL}	Output Voltage Low Level	V_{DD} = 5.0V			0.05		0	0.05			0.05	V
		V_{DD} = 10V			0.05		0	0.05			0.05	V
V_{OH}	Output Voltage High Level	V_{DD} = 5.0V	4.95			4.95	5.0		4.95			V
		V_{DD} = 10V	9.95			9.95	10		9.95			V
V_{NL}	Noise Immunity (All Inputs)	V_{DD} = 5.0V	1.5			1.5	2.25		1.4			V
		V_{DD} = 10V	3.0			3.0	4.5		2.9			V
V_{NH}	Noise Immunity (All Inputs)	V_{DD} = 5.0V	1.4			1.5	2.25		1.5			V
		V_{DD} = 10V	2.9			3.0	4.5		3.0			V
I_DN	Output Drive Current N-Channel (Note 2)	V_{DD} = 5.0V	0.75			0.6	1.2		0.45			mA
		V_{DD} = 10V	1.5			1.2	2.4		0.9			mA
I_DP	Output Drive Current P-Channel (Note 2)	V_{DD} = 5.0V	−0.45			−0.3	−0.6		−0.21			mA
		V_{DD} = 10V	−0.95			−0.65	−1.3		−0.45			mA
I_I	Input Current	V_I = 0V or V_I = V_{DD}					10					pA

DC Electrical Characteristics CD4030C

Symbol	Parameter	Conditions	Limits									Units
			−40°C			+25°C			+85°C			
			Min	Typ	Max	Min	Typ	Max	Min	Typ	Max	
I_L	Quiescent Device Current	V_{DD} = 5.0V			5.0		0.05	5.0			70	μA
		V_{DD} = 10V			10		0.1	10			140	μA
P_D	Quiescent Device Dissipation Package	V_{DD} = 5.0V			25		0.25	25			350	μW
		V_{DD} = 10V			100		1.0	100			1,400	μW
V_{OL}	Output Voltage Low Level	V_{DD} = 5.0V			0.05		0	0.05			0.05	V
		V_{DD} = 10V			0.05		0	0.05			0.05	V
V_{OH}	Output Voltage High Level	V_{DD} = 5.0V	4.95			4.95	5.0		4.95			V
		V_{DD} = 10V	9.95			9.95	10		9.95			V
V_{NL}	Noise Immunity (All Inputs)	V_{DD} = 5.0V	1.5			1.5	2.25		1.4			V
		V_{DD} = 10V	3.0			3.0	4.5		2.9			V
V_{NH}	Noise Immunity (All Inputs)	V_{DD} = 5.0V	1.4			1.5	2.25		1.5			V
		V_{DD} = 10V	2.9			3.0	4.5		3.0			V
I_DN	Output Drive Current N-Channel (Note 2)	V_{DD} = 5.0V	0.35			0.3	1.2		0.25			mA
		V_{DD} = 10V	0.7			0.6	2.4		0.5			mA
I_DP	Output Drive Current P-Channel (Note 2)	V_{DD} = 5.0V	−0.21			−0.15	−0.6		−0.12			mA
		V_{DD} = 10 V	−0.45			−0.32	−1.3		−0.25			mA
I_I	Input Current	V_I = 0V or V_I = V_{DD}					10					pA

5

AC Electrical Characteristics* CD4030M

Symbol	Parameter	Conditions	Limits			Units
			Min	Typ	Max	
t_{PHL}	Propagation Delay Time	V_{DD} = 5.0V V_{DD} = 10V		100 40	200 100	ns ns
t_{PLH}	Propagation Delay Time	V_{DD} = 5.0V V_{DD} = 10V		100 40	200 100	ns ns
t_{THL}	Transition Time High to Low Level	V_{DD} = 5.0V V_{DD} = 10V		70 25	150 75	ns ns
t_{TLH}	Transition Time Low to High Level	V_{DD} = 5.0V V_{DD} = 10V		80 30	150 75	ns ns
C_I	Input Capacitance	V_I = 0V or V_I = V_{DD}		5.0		pF

*AC Parameters are guaranteed by DC correlated testing.

AC Electrical Characteristics* CD4030C

Symbol	Parameter	Conditions	Limits			Units
			Min	Typ	Max	
t_{PHL}	Propagation Delay Time	V_{DD} = 5.0V V_{DD} = 10V		100 40	300 150	ns ns
t_{PLH}	Propagation Delay Time	V_{DD} = 5.0V V_{DD} = 10V		100 40	300 150	ns ns
t_{THL}	Transition Time High to Low Level	V_{DD} = 5.0V V_{DD} = 10V		70 25	300 150	ns ns
t_{TLH}	Transition Time Low to High Level	V_{DD} = 5.0V V_{DD} = 10V		80 30	300 150	ns ns
C_I	Input Capacitance	V_I = 0V or V_I = V_{DD}		5.0		pF

*AC Parameters are guaranteed by DC correlated testing.

Note 1: This device should not be connected to circuits with power on because high transient voltages may cause permanent damage.

Note 2: I_DN and I_DP are tested one output at a time.

Truth Table (For One of Four Identical Gates)

A	B	J
0	0	0
1	0	1
0	1	1
1	1	0

Where: "1" = High Level
"0" = Low Level