

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} .

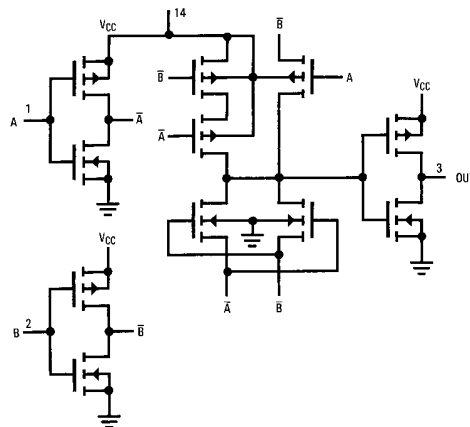
Features

- 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

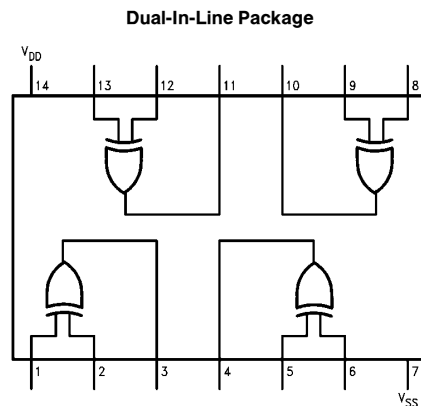
- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Industrial controls
- Remote metering
- Computers

Schematic Diagram



TL/F/5961-1

Connection Diagram



TL/F/5961-2

Order Number CD4030

Absolute Maximum Ratings

If Military/Aerospace specified devices are required, please 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

CD4030C

−55°C to +125°C

−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 V _{DD} = 10V			0.5 1.0		0.005 0.01	0.5 1.0			30 60	μA μA
P _D	Quiescent Device Dissipation Package	V _{DD} = 5.0V V _{DD} = 10V			2.5 10		0.025 0.1	2.5 10			150 600	μW μW
V _{OL}	Output Voltage Low Level	V _{DD} = 5.0V V _{DD} = 10V			0.05 0.05		0 0	0.05 0.05			0.05 0.05	V V
V _{OH}	Output Voltage High Level	V _{DD} = 5.0V V _{DD} = 10V	4.95 9.95			4.95 9.95	5.0 10		4.95 9.95			V V
V _{NL}	Noise Immunity (All Inputs)	V _{DD} = 5.0V V _{DD} = 10V	1.5 3.0			1.5 3.0	2.25 4.5		1.4 2.9			V V
V _{NH}	Noise Immunity (All Inputs)	V _{DD} = 5.0V V _{DD} = 10V	1.4 2.9			1.5 3.0	2.25 4.5		1.5 3.0			V V
I _{DN}	Output Drive Current N-Channel (Note 2)	V _{DD} = 5.0V V _{DD} = 10V	0.75 1.5			0.6 1.2	1.2 2.4		0.45 0.9			mA mA
I _{DP}	Output Drive Current P-Channel (Note 2)	V _{DD} = 5.0V V _{DD} = 10V	−0.45 −0.95			−0.3 −0.65	−0.6 −1.3		−0.21 −0.45			mA 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 V _{DD} = 10V			5.0 10		0.05 0.1	5.0 10			70 140	μA μA
P _D	Quiescent Device Dissipation Package	V _{DD} = 5.0V V _{DD} = 10V			25 100		0.25 1.0	25 100			350 1,400	μW μW
V _{OL}	Output Voltage Low Level	V _{DD} = 5.0V V _{DD} = 10V			0.05 0.05		0 0	0.05 0.05			0.05 0.05	V V
V _{OH}	Output Voltage High Level	V _{DD} = 5.0V V _{DD} = 10V	4.95 9.95			4.95 9.95	5.0 10		4.95 9.95			V V
V _{NL}	Noise Immunity (All Inputs)	V _{DD} = 5.0V V _{DD} = 10V	1.5 3.0			1.5 3.0	2.25 4.5		1.4 2.9			V V
V _{NH}	Noise Immunity (All Inputs)	V _{DD} = 5.0V V _{DD} = 10V	1.4 2.9			1.5 3.0	2.25 4.5		1.5 3.0			V V
I _{DN}	Output Drive Current N-Channel (Note 2)	V _{DD} = 5.0V V _{DD} = 10V	0.35 0.7			0.3 0.6	1.2 2.4		0.25 0.5			mA mA
I _{DP}	Output Drive Current P-Channel (Note 2)	V _{DD} = 5.0V V _{DD} = 10 V	−0.21 −0.45			−0.15 −0.32	−0.6 −1.3		−0.12 −0.25			mA mA
I _I	Input Current	V _I = 0V or V _I = V _{DD}					10					pA

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	200	ns
				40	100	ns
t_{PLH}	Propagation Delay Time	$V_{DD} = 5.0V$ $V_{DD} = 10V$		100	200	ns
				40	100	ns
t_{THL}	Transition Time High to Low Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$		70	150	ns
				25	75	ns
t_{TLH}	Transition Time Low to High Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$		80	150	ns
				30	75	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	300	ns
				40	150	ns
t_{PLH}	Propagation Delay Time	$V_{DD} = 5.0V$ $V_{DD} = 10V$		100	300	ns
				40	150	ns
t_{THL}	Transition Time High to Low Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$		70	300	ns
				25	150	ns
t_{TLH}	Transition Time Low to High Level	$V_{DD} = 5.0V$ $V_{DD} = 10V$		80	300	ns
				30	150	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.

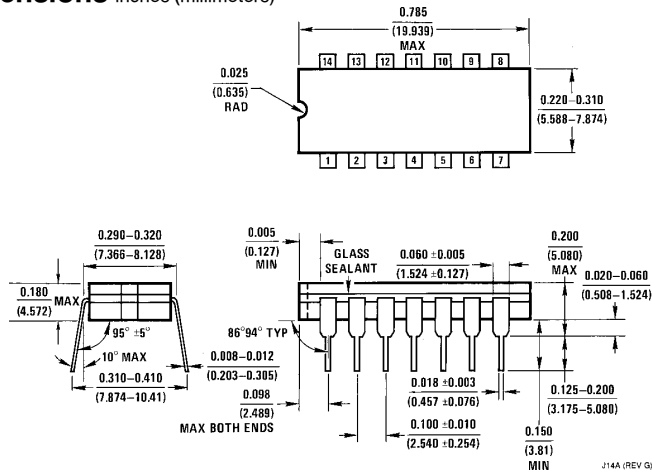
Note 2: I_{DN} and I_{DP} are tested one output at a time.

Truth Table (For One of Four Identical Gates)

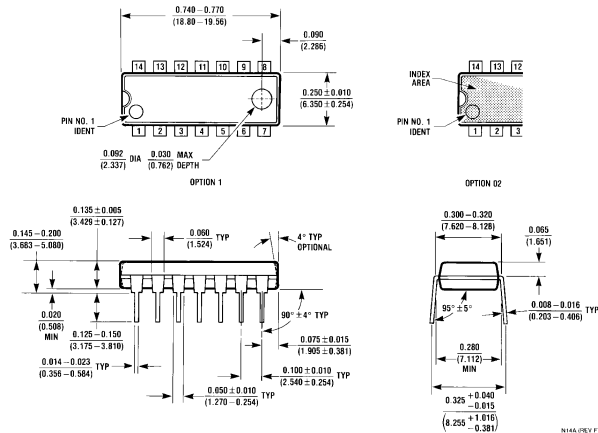
A	B	J
0	0	0
1	0	1
0	1	1
1	1	0

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

Physical Dimensions inches (millimeters)



Ceramic Dual-In-Line Package (J)
Order Number CD4030MJ or CD4030CJ
NS Package Number J14A



Molded Dual-In-Line Package (N)
Order Number CD4030MN or CD4030CN
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