FAIRCHILD SEMICONDUCTOR™

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CD4070BC
Quad 2-Input EXCLUSIVE-OR Gate

General Description

The CD4070BC employs complementary MOS (CMOS) transistors to achieve wide power supply operating range, low power consumption, and high noise margin, the CD4070BC provide basic functions used in the implementation of digital integrated circuit systems. The N- and P-channel enhancement mode transistors provide a symmetrical circuit with output swing essentially equal to the supply voltage. No DC power other than that caused by leakage current is consumed during static condition. All inputs are protected from damage due to static discharge by diode clamps 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
- Pin compatible to CD4030A

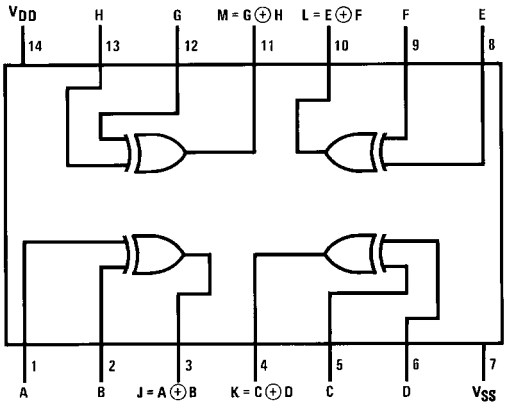
  Equivalent to MM74C86 and MC14070B

Ordering Code:

Order Number	Package Number	Package Description
CD4070BCM	M14A	14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
CD4070BCN	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



Top View

Truth Table

Inputs		Outputs
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

Absolute Maximum Ratings (Note 1)

(Note 2)

DC Supply Voltage (V_{DD})	−0.5 to +18 V_{DC}
Input Voltage (V_{IN})	−0.5 to V_{DD} +0.5 V_{DC}
Storage Temperature 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 (Note 2)

DC Supply Voltage (V_{DD})	3V to 15 V_{DC}
Input Voltage (V_{IN})	0 to V_{DD} V_{DC}
Operating Temperature Range (T_A)	−55°C to +125°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	−55°C		+25°C			+125°C		Units
			Min	Max	Min	Typ	Max	Min	Max	
I_{DD}	Quiescent Device Current	V_{DD} = 5V, V_{IN} = V_{DD} or V_{SS}		0.25			0.25		7.5	µA
		V_{DD} = 10V, V_{IN} = V_{DD} or V_{SS}		0.5			0.5		15	
		V_{DD} = 15V, V_{IN} = V_{DD} or V_{SS}		1.0			1.0		30	
V_{OL}	LOW Level Output Voltage	$\|I_O\|$ < 1 µA								
		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	$\|I_O\|$ < 1 µA								
		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	$\|I_O\|$ < 1 µA								
		V_{DD} = 5V, V_O = 4.5V or 0.5V		1.5			1.5		1.5	V
		V_{DD} = 10V, V_O = 9V or 1.0V		3.0			3.0		3.0	
		V_{DD} = 15V, V_O = 13.5V or 1.5V		4.0			4.0		4.0	
V_{IH}	HIGH Level Input Voltage	$\|I_O\|$ < 1 µA								
		V_{DD} = 5V, V_O = 0.5V or 4.5V	3.5		3.5			3.5		V
		V_{DD} = 10V, V_O = 1V or 9.0V	7.0		7.0			7.0		
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0			11.0		
I_{OL}	LOW Level Output Current	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	2.25		0.9		
		V_{DD} = 15V, V_O = 1.5V	4.2		3.4	8.8		2.4		
I_{OH}	HIGH Level Output Current	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	−2.25		−0.9		
		V_{DD} = 15V, V_O = 13.5V	−4.2		−3.4	−8.8		−2.4		
I_{IN}	Input Current	V_{DD} = 15V, V_{IN} = 0V		−0.1		-10^{-5}	−0.1		−1.0	µA
		V_{DD} = 15V, V_{IN} = 15V		0.1		10^{-5}	0.1		1.0	

Note 3: "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.

AC Electrical Characteristics (Note 4)

$T_A = 25°C$, $C_L = 50$ pF, $R_L = 200$k, t_r and $t_f \leq 20$ ns, unless otherwise specified

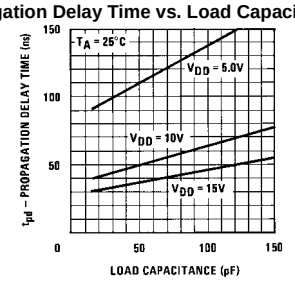
Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL} or	Propagation Delay Time	$V_{DD} = 5V$		110	185	
t_{PLH}	from Input to Output	$V_{DD} = 10V$		50	90	ns
		$V_{DD} = 15V$		40	75	
t_{THL} or	Transition Time	$V_{DD} = 5V$		100	200	
t_{TLH}		$V_{DD} = 10V$		50	100	ns
		$V_{DD} = 15V$		40	80	
C_{IN}	Average Input Capacitance	Any Input		5	7.5	pF
C_{PD}	Power Dissipation Capacitance	Any Input (Note 5)		20		pF

Note 4: AC Parameters are guaranteed by DC correlated testing.

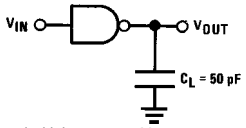
Note 5: C_{PD} determines the no load AC power consumption of any CMOS device. For complete explanation, see 74C Family Characteristics Application Note—AN-90.

Typical Performance Characteristics

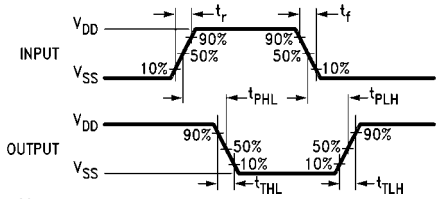
Propagation Delay Time vs. Load Capacitance



AC Test Circuit and Switching Time Waveforms

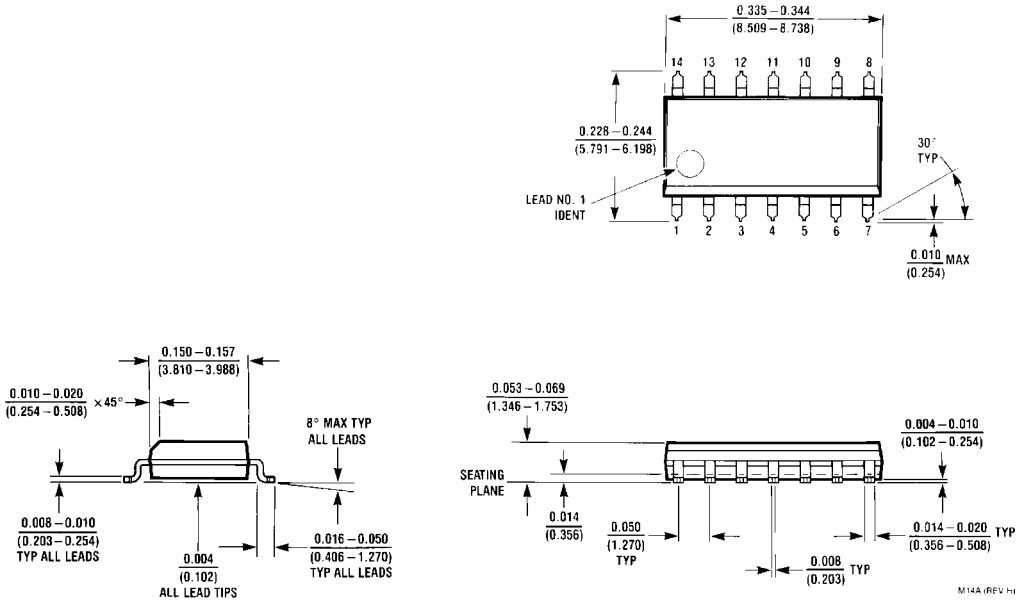


Note: Delays measured with input t_r, $t_f = 20$ ns.



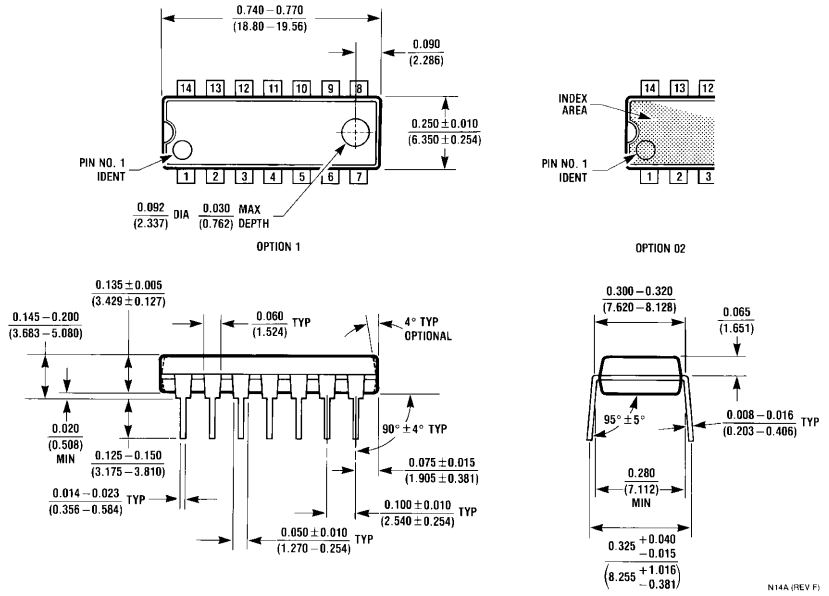
$t_r = t_f = 20$ ns

Physical Dimensions inches (millimeters) unless otherwise noted



14-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
Package Number M14A

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



14-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide
Package Number N14A