



CD4070BM/CD4070BC Quad 2-Input EXCLUSIVE-OR Gate

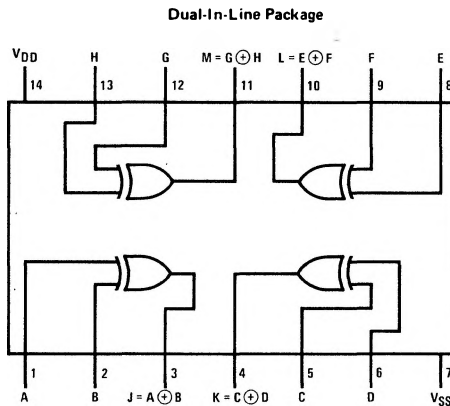
General Description

Employing complementary MOS (CMOS) transistors to achieve wide power supply operating range, low power consumption, and high noise margin, this gate provides 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} .

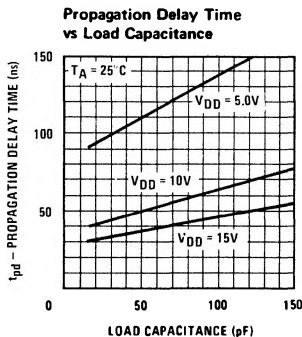
Features

- 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 MM54C86/MM74C86 and MC14507B

Connection Diagram



Typical Performance Characteristics



Truth Table

INPUTS		OUTPUTS
A	B	Y
L	L	L
L	H	H
H	L	H
H	H	L

Absolute Maximum Ratings

(Notes 1 and 2)

V _{DD} DC Supply Voltage	-0.5 to +18 V _{DC}
V _{IN} Input Voltage	-0.5 to V _{DD} + 0.5 V _{DC}
T _S Storage Temperature Range	-65°C to +150°C
P _D Package Dissipation	500 mW
T _L Lead Temperature (Soldering, 10 seconds)	300°C

Recommended Operating Conditions

(Note 2)

V _{DD} DC Supply Voltage	3 to 15 V _{DC}
V _{IN} Input Voltage	0 to V _{DD} V _{DC}
T _A Operating Temperature Range	-40°C to +85°C
CD4070BC	-55°C to +125°C
CD4070BM	

DC Electrical Characteristics CD4070BM (Note 2)

PARAMETER	CONDITIONS	-55°C		25°C			125°C		UNITS
		MIN	MAX	MIN	TYP	MAX	MIN	MAX	
I _{DD} Quiescent Device Current	V _{DD} = 5V		0.25			0.25		7.5	μA
	V _{DD} = 10V		0.5			0.5		15	μA
	V _{DD} = 15V		1.0			1.0		30	μA
V _{OL} Low Level Output Voltage	I _O < 1μA								
	V _{DD} = 5V		0.05		0	0.05		0.05	V
	V _{DD} = 10V		0.05		0	0.05		0.05	V
V _{OH} High Level Output Voltage	I _O < 1μA								
	V _{DD} = 5V	4.95		4.95	5		4.95		V
	V _{DD} = 10V	9.95		9.95	10		9.95		V
V _{IL} Low Level Input Voltage	V _{DD} = 5V, V _O = 4.5V		1.5			1.5		1.5	V
	V _{DD} = 10V, V _O = 9V		3.0			3.0		3.0	V
	V _{DD} = 15V, V _O = 13.5V		4.0			4.0		4.0	V
V _{IH} High Level Input Voltage	I _O < 1μA								
	V _{DD} = 5V, V _O = 0.5V	3.5		3.5			3.5		V
	V _{DD} = 10V, V _O = 1V	7.0		7.0			7.0		V
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		mA
	V _{DD} = 15V, V _O = 1.5V	4.2		3.4	8.8		2.4		mA
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		mA
	V _{DD} = 15V, V _O = 13.5V	-4.2		-3.4	-8.8		-2.4		mA
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	μA

DC Electrical Characteristics CD4070BC (Note 2)

PARAMETER	CONDITIONS	-40°C		25°C			85°C		UNITS
		MIN	MAX	MIN	TYP	MAX	MIN	MAX	
I _{DD} Quiescent Device Current	V _{DD} = 5V		1.0			1.0		7.5	μA
	V _{DD} = 10V		2.0			2.0		15	μA
	V _{DD} = 15V		4.0			4.0		30	μA
V _{OL} Low Level Output Voltage	I _O < 1μA								
	V _{DD} = 5V		0.05		0	0.05		0.05	V
	V _{DD} = 10V		0.05		0	0.05		0.05	V
V _{OH} High Level Output Voltage	I _O < 1μA								
	V _{DD} = 5V	4.95		4.95	5		4.95		V
	V _{DD} = 10V	9.95		9.95	10		9.95		V
V _{IL} Low Level Input Voltage	I _O < 1μA								
	V _{DD} = 5V, V _O = 0.5V		1.5			1.5		1.5	V
	V _{DD} = 10V, V _O = 1V		3.0			3.0		3.0	V
V _{IH} High Level Input Voltage	I _O < 1μA								
	V _{DD} = 5V, V _O = 4.5V	3.5		3.5			3.5		V
	V _{DD} = 10V, V _O = 9V	7.0		7.0			7.0		V
I _{OL} Low Level Output Current	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	2.25		0.9		mA
	V _{DD} = 15V, V _O = 1.5V	3.6		3.0	8.8		2.4		mA
I _{OH} High Level Output Current	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	-2.25		-0.9		mA
	V _{DD} = 15V, V _O = 13.5V	-3.6		-3.0	-8.8		-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

AC Electrical Characteristics T_A = 25°C, C_L = 50 pF, R_L = 200k, t_r and t_f ≤ 20ns, unless otherwise specified.

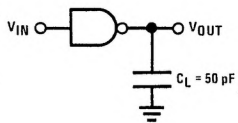
PARAMETER	CONDITIONS	MIN	TYP	MAX	UNITS
t _{PHL} or t _{PLH} Propagation Delay Time From Input To Output	V _{DD} = 5V		110	185	ns
	V _{DD} = 10V		50	90	ns
	V _{DD} = 15V		40	75	ns
t _{THL} or t _{TLH} Transition Time	V _{DD} = 5V		100	200	ns
	V _{DD} = 10V		50	100	ns
	V _{DD} = 15V		40	80	ns
C _{IN} Average Input Capacitance	Any Input		5	7.5	pF
C _{PD} Power Dissipation Capacitance	Any Input (Note 3)		20		pF

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: 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.

AC Test Circuit and Switching Time Waveforms



Note: Delays measured with input $t_r, t_f = 20 \text{ ns}$.

