National Semiconductor

February 1988

CD4019BM/CD4019BC Quad AND-OR Select Gate

General Description

The CD4019BM/CD4019BC is a complementary MOS quad AND-OR select gate. Low power and high noise margin over a wide voltage range is possible through implementation of N- and P-channel enhancement mode transistors. These complementary MOS (CMOS) transistors provide the building blocks for the 4 ''AND-OR select'' gate configurations, each consisting of two 2-input AND gates driving a single 2-input OR gate. Selection is accomplished by control bits K_A and K_B. All inputs are protected against static discharge damage.

Features

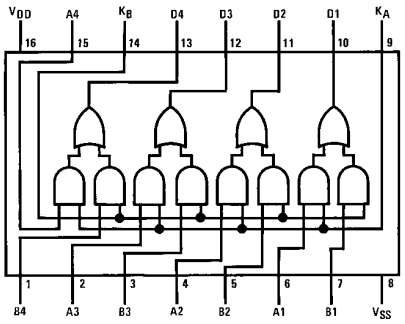
■ Wide supply voltage range	3.0V to 15V
■ High noise immunity	0.45 V_{DD} (typ.)
■ Low power TTL compatibility	Fan out of 2 driving 74L or 1 driving 74LS

Applications

- AND-OR select gating
- Shift-right/shift-left registers
- True/complement selection
- AND/OR/EXCLUSIVE-OR selection

Connection and Schematic Diagrams

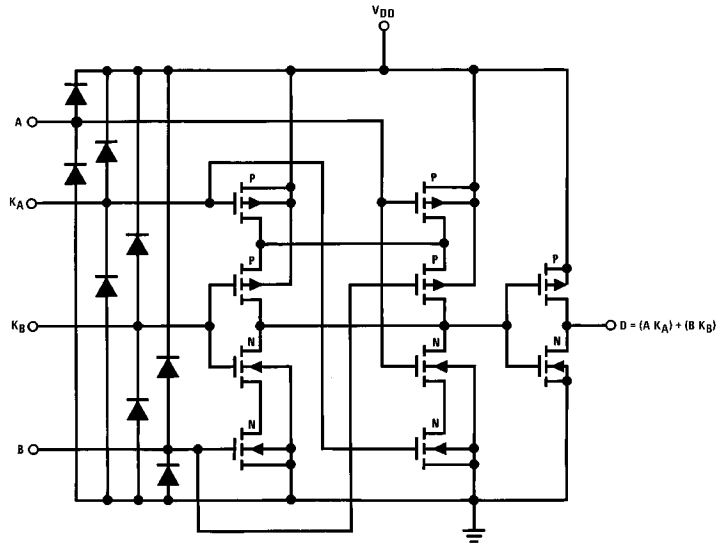
Dual-In-Line Package



TL/F/5952–1

Top View

Order Number CD4019B



Schematic diagram for 1 of 4 identical stages

TL/F/5952–2

RRD-B30M105/Printed in U. S. A.

Absolute Maximum Ratings (Notes 1 & 2)

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

Supply Voltage (V_{DD})	−0.5V to +18V
Input Voltage (V_{IN})	−0.5V to V_{DD} +0.5V
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 Operation Conditions (Note 2)

DC Supply Voltage (V_{DD})	+3V to +15V
Input Voltage (V_{IN})	0V to V_{DD} V
Operating Temperature Range (T_A)	
CD4019BM	−55°C to +125°C
CD4019BC	−40°C to +85°C

DC Electrical Characteristics CD4019BM (Note 2)

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		0.25		0.03	0.25		7.5	μA
		V_{DD} = 10V		0.5		0.05	0.5		15	μA
		V_{DD} = 15V		1.0		0.07	1.0		30	μA
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
		V_{DD} = 15V		0.05		0	0.05		0.05	V
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
		V_{DD} = 15V	14.95		14.95	15		14.95		V
V_{IL}	Low Level Input Voltage	V_{DD} = 5V, V_O = 0.5V or 4.5V		1.5		2	1.5		1.5	V
		V_{DD} = 10V, V_O = 1.0V or 9.0V		3.0		4	3.0		3.0	V
		V_{DD} = 15V, V_O = 1.5V or 13.5V		4.0		6	4.0		4.0	V
V_{IH}	High Level Input Voltage	V_{DD} = 5V, V_O = 0.5V or 4.5V	3.5		3.5	3		3.5		V
		V_{DD} = 10V, V_O = 1.0V or 9.0V	7.0		7.0	6		7.0		V
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0	9		11.0		V
I_{OL}	Low Level Output Current (Note 3)	V_{DD} = 5V, V_O = 0.4V	0.64		0.51	1		0.36		mA
		V_{DD} = 10V, V_O = 0.5V	1.6		1.3	2.5		0.9		mA
		V_{DD} = 15V, V_O = 1.5V	4.2		3.4	10		2.4		mA
I_{OH}	High Level Output Current (Note 3)	V_{DD} = 5V, V_O = 4.6V	−0.25		−0.2	−0.4		−0.14		mA
		V_{DD} = 10V, V_O = 9.5V	−0.62		−0.5	−1.0		−0.35		mA
		V_{DD} = 15V, V_O = 13.5V	−1.8		−1.5	−3.0		−1.1		mA
I_{IN}	Input Current	V_{DD} = 15V, V_{IN} = 0V		−0.10		-10^{-5}	−0.10		−1.0	μA
		V_{DD} = 15V, V_{IN} = 15V		0.10		10^{-5}	0.10		1.0	μA

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 tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

Note 2: V_{SS} = 0V unless otherwise specified.

Note 3: I_{OH} and I_{OL} are tested one output at a time.

DC Electrical Characteristics CD4019BC (Note 2)

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		1		0.03	1		7.5	μA
		V_{DD} = 10V		2		0.05	2		15	μA
		V_{DD} = 15V		4		0.07	4		30	μA
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
		V_{DD} = 15V		0.05		0	0.05		0.05	V
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
		V_{DD} = 15V	14.95		14.95	15		14.95		V
V_{IL}	Low Level Input Voltage	V_{DD} = 5V, V_O = 0.5V or 4.5V		1.5		2	1.5		1.5	V
		V_{DD} = 10V, V_O = 1.0V or 9.0V		3.0		4	3.0		3.0	V
		V_{DD} = 15V, V_O = 1.5V or 13.5V		4.0		6	4.0		4.0	V
V_{IH}	High Level Input Voltage	V_{DD} = 5V, V_O = 0.5V or 4.5V	3.5		3.5	3		3.5		V
		V_{DD} = 10V, V_O = 1.0V or 9.0V	7.0		7.0	6		7.0		V
		V_{DD} = 15V, V_O = 1.5V or 13.5V	11.0		11.0	9		11.0		V
I_{OL}	Low Level Output Current (Note 3)	V_{DD} = 5V, V_O = 0.4V	0.52		0.44	1		0.36		mA
		V_{DD} = 10V, V_O = 0.5V	1.3		1.1	2.5		0.9		mA
		V_{DD} = 15V, V_O = 1.5V	3.6		3.0	10		2.4		mA
I_{OH}	High Level Output Current (Note 3)	V_{DD} = 5V, V_O = 4.6V	−0.2		−0.16	−0.4		−0.12		mA
		V_{DD} = 10V, V_O = 9.5V	−0.5		−0.4	−1.0		−0.3		mA
		V_{DD} = 15V, V_O = 13.5V	−1.4		−1.2	−3.0		−1.0		mA
I_{IN}	Input Current	V_{DD} = 15V, V_{IN} = 0V		−0.30		-10^{-5}	−0.30		−1.0	μA
		V_{DD} = 15V, V_{IN} = 15V		0.30		10^{-5}	0.30		1.0	μA

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 tables of "Recommended Operating Conditions" and "Electrical Characteristics" provide conditions for actual device operation.

Note 2: V_{SS} = 0V unless otherwise specified.

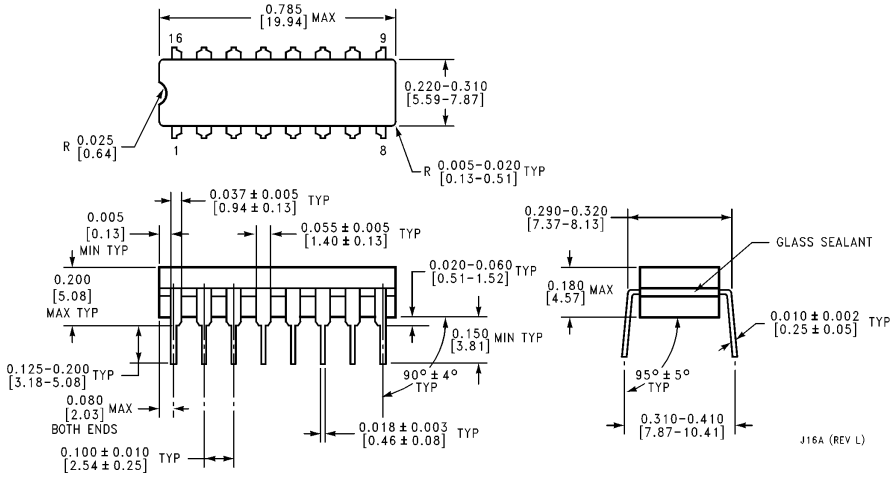
Note 3: I_{OH} and I_{OL} are tested one output at a time.

AC Electrical Characteristics* T_A = 25°C, C_L = 50 pF, R_L = 200k, unless otherwise specified

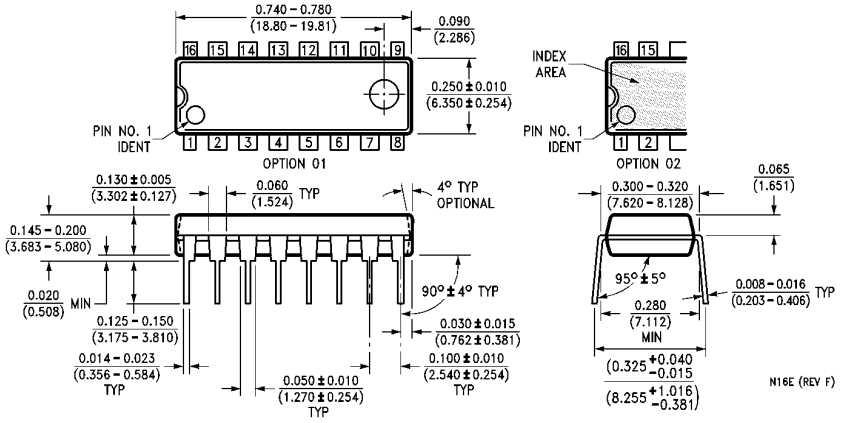
Symbol	Parameter	Conditions	Min	Typ	Max	Units
t_{PHL}, t_{PLH}	Propagation Delay, Input to Output	V_{DD} = 5V		100	300	ns
		V_{DD} = 10V		50	120	ns
		V_{DD} = 15V		45	100	ns
t_{THL}	High-to-Low Level Transition Time	V_{DD} = 5V		100	200	ns
		V_{DD} = 10V		50	100	ns
		V_{DD} = 15V		40	80	ns
t_{TLH}	Low-to-High Level Transition Time	V_{DD} = 5V		150	300	ns
		V_{DD} = 10V		70	140	ns
		V_{DD} = 15V		50	100	ns
C_{IN}	Input Capacitance	All A and B Inputs		5	7.5	pF
		K_A and K_B Inputs		10	15	pF

*AC Parameters are guaranteed by DC correlated testing.

Physical Dimensions inches (millimeters) (Continued)



Ceramic Dual-In-Line Package (J)
Order Number CD4019BMJ or CD4019BCJ
NS Package Number J16A



Molded Dual-In-Line Package (N)
Order Number CD4019BMN or CD4019BCN
NS Package Number N16E

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