

## 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.

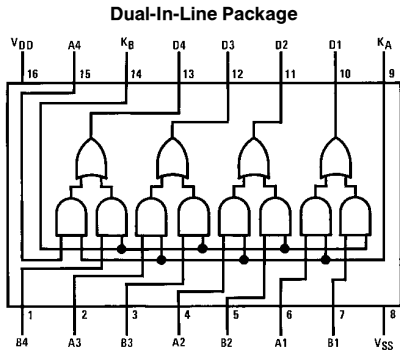
### Features

- 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

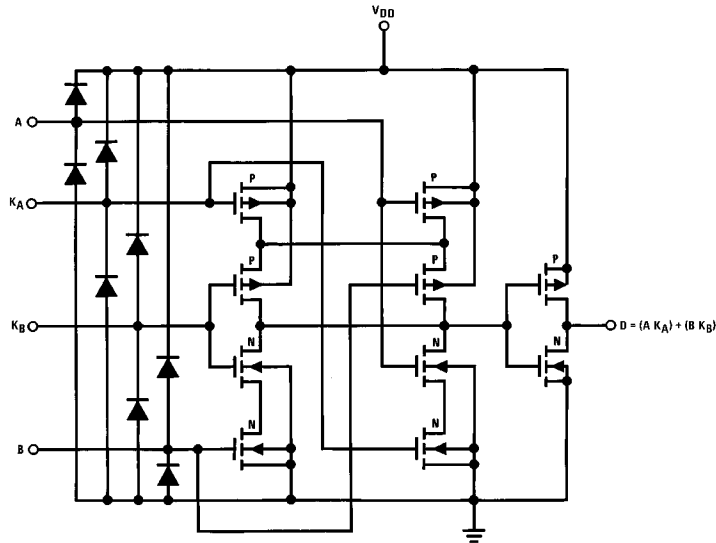
### Connection and Schematic Diagrams



Order Number CD4019B

Top View

TL/F/5952-1



Schematic diagram for 1 of 4 identical stages

TL/F/5952-2

## 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	$\mu A$
		$V_{DD} = 10V$		0.5		0.05	0.5		15	$\mu A$
		$V_{DD} = 15V$		1.0		0.07	1.0		30	$\mu A$
$V_{OL}$	Low Level Output Voltage	$ I_O  < 1 \mu A$								
		$V_{DD} = 5V$		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 \mu A$								
		$V_{DD} = 5V$	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	$\mu A$
		$V_{DD} = 15V, V_{IN} = 15V$		0.10		$10^{-5}$	0.10		1.0	$\mu A$

**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 <sub>DD</sub>	Quiescent Device Current	V <sub>DD</sub> = 5V		1		0.03	1		7.5	μA
		V <sub>DD</sub> = 10V		2		0.05	2		15	μA
		V <sub>DD</sub> = 15V		4		0.07	4		30	μA
V <sub>OL</sub>	Low Level Output Voltage	I <sub>O</sub>   < 1 μA								
		V <sub>DD</sub> = 5V		0.05		0	0.05		0.05	V
		V <sub>DD</sub> = 10V		0.05		0	0.05		0.05	V
		V <sub>DD</sub> = 15V		0.05		0	0.05		0.05	V
V <sub>OH</sub>	High Level Output Voltage	I <sub>O</sub>   < 1 μA								
		V <sub>DD</sub> = 5V	4.95		4.95	5		4.95		V
		V <sub>DD</sub> = 10V	9.95		9.95	10		9.95		V
		V <sub>DD</sub> = 15V	14.95		14.95	15		14.95		V
V <sub>IL</sub>	Low Level Input Voltage	V <sub>DD</sub> = 5V, V <sub>O</sub> = 0.5V or 4.5V		1.5		2	1.5		1.5	V
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 1.0V or 9.0V		3.0		4	3.0		3.0	V
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V		4.0		6	4.0		4.0	V
V <sub>IH</sub>	High Level Input Voltage	V <sub>DD</sub> = 5V, V <sub>O</sub> = 0.5V or 4.5V	3.5		3.5	3		3.5		V
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 1.0V or 9.0V	7.0		7.0	6		7.0		V
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V or 13.5V	11.0		11.0	9		11.0		V
I <sub>OL</sub>	Low Level Output Current (Note 3)	V <sub>DD</sub> = 5V, V <sub>O</sub> = 0.4V	0.52		0.44	1		0.36		mA
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 0.5V	1.3		1.1	2.5		0.9		mA
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 1.5V	3.6		3.0	10		2.4		mA
I <sub>OH</sub>	High Level Output Current (Note 3)	V <sub>DD</sub> = 5V, V <sub>O</sub> = 4.6V	-0.2		-0.16	-0.4		-0.12		mA
		V <sub>DD</sub> = 10V, V <sub>O</sub> = 9.5V	-0.5		-0.4	-1.0		-0.3		mA
		V <sub>DD</sub> = 15V, V <sub>O</sub> = 13.5V	-1.4		-1.2	-3.0		-1.0		mA
I <sub>IN</sub>	Input Current	V <sub>DD</sub> = 15V, V <sub>IN</sub> = 0V		-0.30		-10 <sup>-5</sup>	-0.30		-1.0	μA
		V <sub>DD</sub> = 15V, V <sub>IN</sub> = 15V		0.30		10 <sup>-5</sup>	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<sub>SS</sub> = 0V unless otherwise specified.

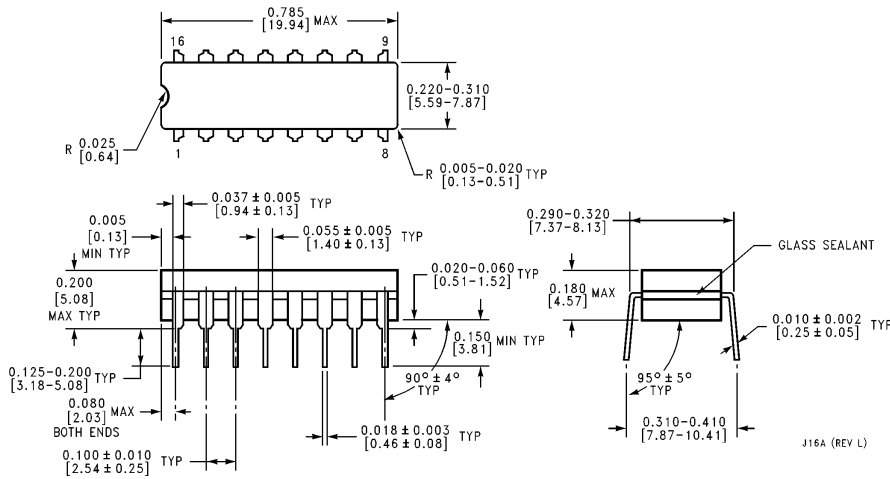
**Note 3:** I<sub>OH</sub> and I<sub>OL</sub> are tested one output at a time.

## AC Electrical Characteristics\* T<sub>A</sub> = 25°C, C<sub>L</sub> = 50 pF, R<sub>L</sub> = 200k, unless otherwise specified

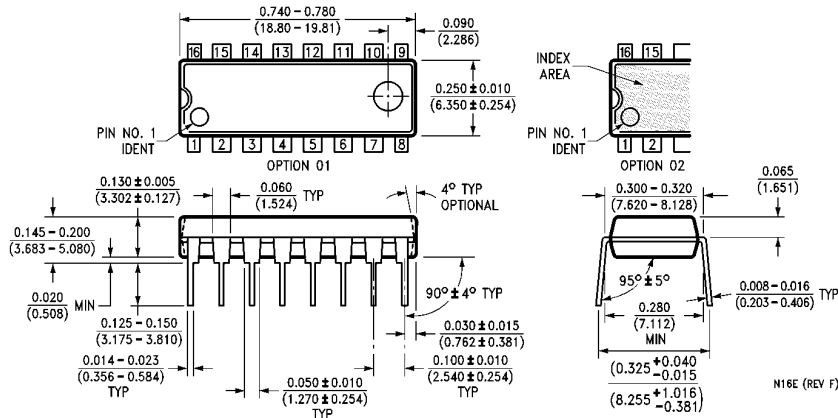
Symbol	Parameter	Conditions	Min	Typ	Max	Units
t <sub>PHL</sub> , t <sub>PLH</sub>	Propagation Delay, Input to Output	V <sub>DD</sub> = 5V		100	300	ns
		V <sub>DD</sub> = 10V		50	120	ns
		V <sub>DD</sub> = 15V		45	100	ns
t <sub>THL</sub>	High-to-Low Level Transition Time	V <sub>DD</sub> = 5V		100	200	ns
		V <sub>DD</sub> = 10V		50	100	ns
		V <sub>DD</sub> = 15V		40	80	ns
t <sub>TLH</sub>	Low-to-High Level Transition Time	V <sub>DD</sub> = 5V		150	300	ns
		V <sub>DD</sub> = 10V		70	140	ns
		V <sub>DD</sub> = 15V		50	100	ns
C <sub>IN</sub>	Input Capacitance	All A and B Inputs		5	7.5	pF
		K <sub>A</sub> and K <sub>B</sub> 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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