



CD4001BM/CD4001BC Quad 2-Input NOR Buffered B Series Gate

CD4011BM/CD4011BC Quad 2-Input NAND Buffered B Series Gate

General Description

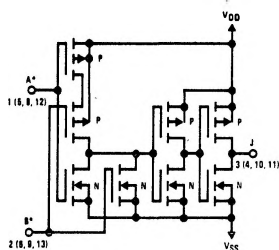
These quad gates are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement mode transistors. They have equal source and sink current capabilities and conform to standard B series output drive. The devices also have buffered outputs which improve transfer characteristics by providing very high gain.

All inputs are protected against static discharge with diodes to V_{DD} and V_{SS} .

Features

- Low power TTL compatibility fan out of 2 driving 74L or 1 driving 74LS
- 5V—10V—15V parametric ratings
- Symmetrical output characteristics
- Maximum input leakage $1\mu A$ at 15V over full temperature range

Schematic and Connection Diagrams



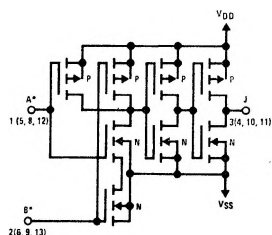
1/4 of device shown

$$J = A + B$$

Logical "1" = High

Logical "0" = Low

*All inputs protected by standard CMOS protection circuit.



1/4 of device shown

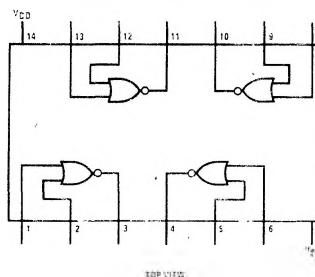
$$J = \overline{A} \cdot \overline{B}$$

Logical "1" = High

Logical "0" = Low

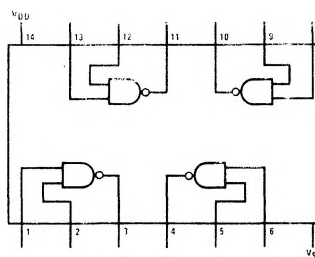
*All inputs protected by standard CMOS protection circuit.

CD4001BC/CD4001BM
Dual-In-Line and Flat Package



TOP VIEW

CD4011BC/CD4011BM
Dual-In-Line and Flat Package



TOP VIEW

Absolute Maximum Ratings (Notes 1 and 2)**Operating Conditions**

Voltage at Any Pin -0.5V to $V_{DD} + 0.5V$
 Package Dissipation 500 mW
 V_{DD} Range -0.5 V_{DC} to +18 V_{DC}
 Storage Temperature -65°C to +150°C
 Lead Temperature (Soldering, 10 seconds) 300°C

Operating V_{DD} Range 3 V_{DC} to 15 V_{DC}
 Operating Temperature Range
 CD4001BM, CD4011BM -55°C to +125°C
 CD4001BC, CD4011BC -40°C to +85°C

DC Electrical Characteristics CD4001BM, CD4011BM (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		0.004	0.25		7.5	μA
	$V_{DD} = 10V$		0.50		0.005	0.50		15	μA
	$V_{DD} = 15V$		1.0		0.006	1.0		30	μA
V_{OL} Low Level Output Voltage	$V_{DD} = 5V$		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	$V_{DD} = 5V$	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	$V_{DD} = 5V, V_O = 4.5V$		1.5		2	1.5		1.5	V
	$V_{DD} = 10V, V_O = 9.0V$		3.0		4	3.0		3.0	V
	$V_{DD} = 15V, V_O = 13.5V$		4.0		6	4.0		4.0	V
V_{IH} High Level Input Voltage	$V_{DD} = 5V, V_O = 0.5V$	3.5		3.5	3		3.5		V
	$V_{DD} = 10V, V_O = 1.0V$	7.0		7.0	6		7.0		V
	$V_{DD} = 15V, V_O = 1.5V$	11.0		11.0	9		11.0		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	$V_{DD} = 15V, V_{IN} = 0V$		-0.10		-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. Except for "Operating Temperature Range" they are not meant to imply that the devices should be operated at these limits. The table of "Electrical Characteristics" provides conditions for actual device operation.

Note 2: All voltages measured with respect to V_{SS} unless otherwise specified.

DC Electrical Characteristics CD4001BC, CD4011BC (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		0.004	1		7.5	μA
	V _{DD} = 10V		2		0.005	2		15	μA
	V _{DD} = 15V		4		0.006	4		30	μA
V _{OL} Low Level Output Voltage	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	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 = 4.5V		1.5		2	1.5		1.5	V
	V _{DD} = 10V, V _O = 9.0V		3.0		4	3.0		3.0	V
	V _{DD} = 15V, V _O = 13.5V		4.0		6	4.0		4.0	V
V _{IH} High Level Input Voltage	V _{DD} = 5V, V _O = 0.5V	3.5		3.5	3		3.5		V
	V _{DD} = 10V, V _O = 1.0V	7.0		7.0	6		7.0		V
	V _{DD} = 15V, V _O = 1.5V	11.0		11.0	9		11.0		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		-0.30		-10 ⁻⁵	-0.30		-1.0	μA
	V _{DD} = 15V, V _{IN} = 15V		0.30		10 ⁻⁵	0.30		1.0	μA

AC Electrical Characteristics CD4001BC, CD4001BM

T_A = 25°C, Input t_r; t_f = 20 ns, C_L = 50 pF, R_L = 200k. Typical temperature coefficient is 0.3%/°C.

PARAMETER	CONDITIONS	TYP	MAX	UNITS
t _{PHL} Propagation Delay Time, High-to-Low Level	V _{DD} = 5V	120	250	ns
	V _{DD} = 10V	50	100	ns
	V _{DD} = 15V	35	70	ns
t _{PLH} Propagation Delay Time, Low-to-High Level	V _{DD} = 5V	110	250	ns
	V _{DD} = 10V	50	100	ns
	V _{DD} = 15V	35	70	ns
t _{THL} , t _{TLH} Transition Time	V _{DD} = 5V	90	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 Capacity	Any Gate	14		pF

AC Electrical Characteristics CD4011BC, CD4011BM

$T_A = 25^\circ\text{C}$, Input t_r ; $t_f = 20\text{ ns}$, $C_L = 50\text{ pF}$, $R_L = 200\text{ k}$. Typical Temperature Coefficient is $0.3\%/^\circ\text{C}$.

PARAMETER	CONDITIONS	TYP	MAX	UNITS
t_{PHL} Propagation Delay, High-to-Low Level	$V_{DD} = 5\text{V}$	120	250	ns
	$V_{DD} = 10\text{V}$	50	100	ns
	$V_{DD} = 15\text{V}$	35	70	ns
t_{PLH} Propagation Delay, Low-to-High Level	$V_{DD} = 5\text{V}$	85	250	ns
	$V_{DD} = 10\text{V}$	40	100	ns
	$V_{DD} = 15\text{V}$	30	70	ns
t_{THL}, t_{TLH} Transition Time	$V_{DD} = 5\text{V}$	90	200	ns
	$V_{DD} = 10\text{V}$	50	100	ns
	$V_{DD} = 15\text{V}$	40	80	ns
C_{IN} Average Input Capacitance	Any Input	5	7.5	pF
C_{PD} Power Dissipation Capacity	Any Gate	14		pF

Typical Performance Characteristics

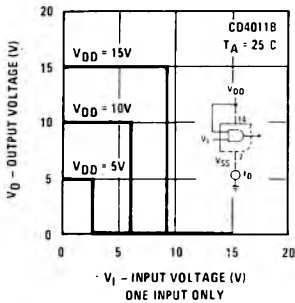


FIGURE 1. Typical Transfer Characteristics

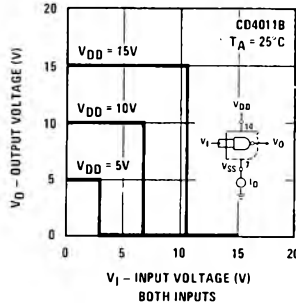


FIGURE 2. Typical Transfer Characteristics

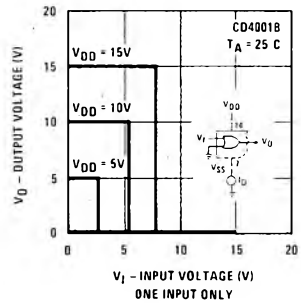


FIGURE 3. Typical Transfer Characteristics

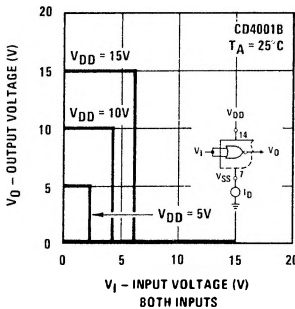


FIGURE 4. Typical Transfer Characteristics

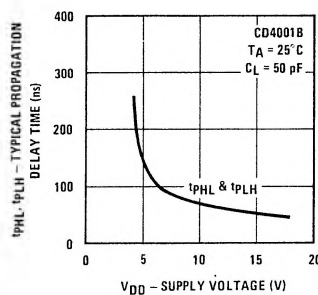


FIGURE 5

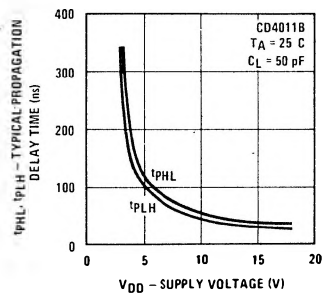


FIGURE 6

Typical Performance Characteristics (Cont'd.)

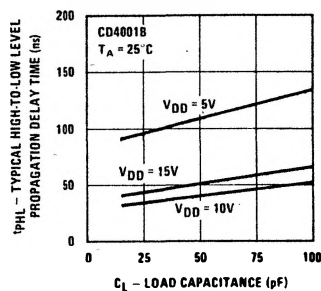


FIGURE 7

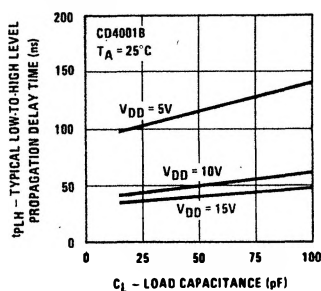


FIGURE 8

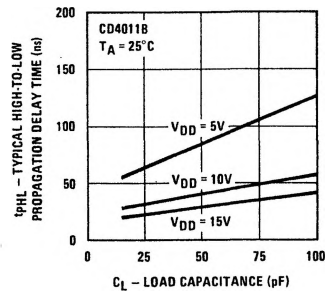


FIGURE 9

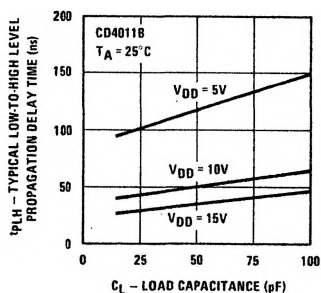


FIGURE 10

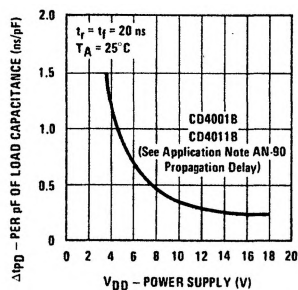


FIGURE 11

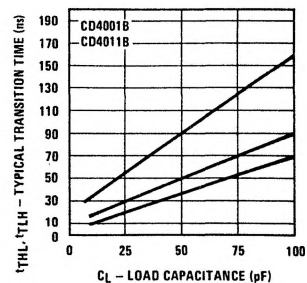


FIGURE 12

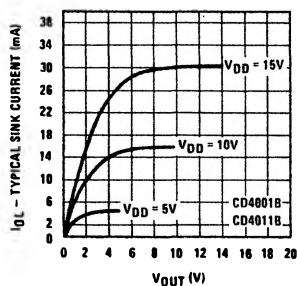


FIGURE 13

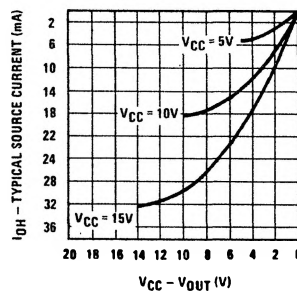


FIGURE 14