

CD4009M/CD4009C Hex Buffers (Inverting) CD4010M/CD4010C Hex Buffers (Non-Inverting)

General Description

These hex buffers are monolithic complementary MOS (CMOS) integrated circuits. The N- and P-channel enhancement mode transistors provide a symmetrical circuit with output swings essentially equal to the supply voltage. This results in high noise immunity over a wide supply voltage range. No DC power other than that caused by leakage current is consumed during static conditions. All inputs are protected against static discharge. These gates may be used as hex buffers, CMOS to DTL or TTL interface or as CMOS current drivers. Conversion ranges are from 3 to 15 volts providing $V_{CC} \leq V_{DD}$.

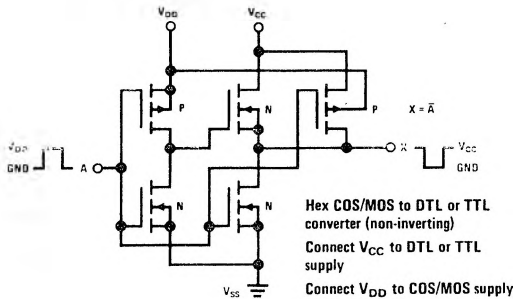
Features

- Wide supply voltage range 3.0V to 15V
- Low power 100nW (typ.)
- High noise immunity 0.45 V_{DD} (typ.)
- High current sinking capability 8 mA (min.) at $V_O = 0.5V$ and $V_{DD} = 10V$

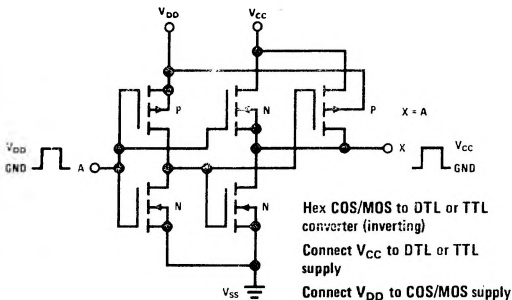
Applications

- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Alarm system
- Industrial controls
- Remote metering
- Computers

Schematic Diagrams

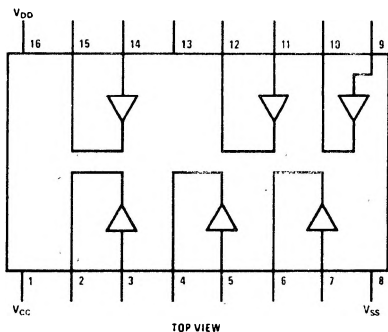
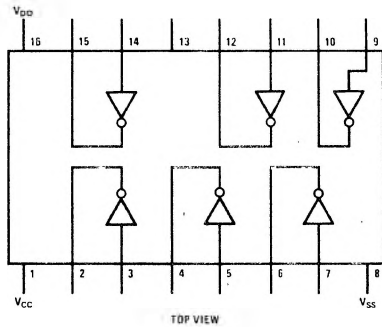


CD4009M/CD4009C



CD4010M/CD4010C

Connection Diagrams



Absolute Maximum Ratings

Voltage at Any Pin (Note 1)	$V_{SS} - 0.3V$ to $V_{SS} + 15.5V$
Operating Temperature Range	CD40XXM: $-55^{\circ}C$ to $+125^{\circ}C$ CD40XXC: $-40^{\circ}C$ to $+85^{\circ}C$
Storage Temperature Range	$-65^{\circ}C$ to $+150^{\circ}C$
Package Dissipation	500mW
Lead Temperature (Soldering, 10 seconds)	$300^{\circ}C$
Operating V_{DD} Range	$V_{SS} + 3V$ to $V_{SS} + 15V$

DC Electrical Characteristics

CHARACTERISTICS	TEST CONDITIONS VOLTS		LIMITS												UNITS	
			CD40XXM						CD40XXC							
			$-55^{\circ}C$		$+25^{\circ}C$		$+125^{\circ}C$		$-40^{\circ}C$		$+25^{\circ}C$		$+125^{\circ}C$			
V_O	V_{DD}	MIN	MAX	MIN	TYP	MAX	MIN	MAX	MIN	MAX	MIN	TYP	MAX	MIN	MAX	
Quiescent Device Current (I_L)	5	5	0.3		0.01	0.3		20		3		0.03	3		42	μA
	10	10	0.5		0.01	0.5		30		5		0.05	5		70	μA
Quiescent Device Dissipation/Package (P_D)	5	5	1.5		0.05	1.5		100		15		0.15	15		210	μW
	10	10	5		0.1	5		300		50		0.5	50		700	μW
Output Voltage Low Level (V_{OL})	5	5	0.01		0	0.01		0.05		0.01		0	0.01		0.05	V
	10	10	0.01		0	0.01		0.05		0.01		0	0.01		0.05	V
Output Voltage High Level (V_{OH})	5	5	4.99		4.99	5		4.95		4.99		4.99	5		4.95	V
	10	10	9.99		9.99	10		9.95		9.99		9.99	10		9.95	V
Noise Immunity (All Inputs)	(V_{NL}) CD4009M	$V_O \geq 4.0$	5	1		1	2.25		0.9		1	2.25		0.9		V
		$V_O \geq 8.0$	10	2		2	4.5		1.9		2	4.5		1.9		V
(V_{NL}) CD4010M	$V_O \geq 1.5$	5	1.6		1.5	2.25		1.4		1.6	1.5	2.25		1.4		V
	$V_O \geq 3.0$	10	3.2		3	4.5		2.9		3.2	3	4.5		2.9		V
(V_{NH})	$V_O \geq 3.5$	5	1.4		1.5	2.25		1.5		1.4	1.5	2.25		1.5		V
	$V_O \geq 7.0$	10	2.9		3	4.5		3		2.9	3	4.5		3		V
Output Drive Current N-Channel (I_{DN})	0.4	5	3.75		3	4		2.1		3.6	3			2.4		mA
	0.5	10	10		8	10		5.6		9.6	8			6.4		mA
P-Channel (I_{DP})	2.5	5	-1.85		-1.25	-1.75		-0.9		-1.5	-1.25			-1		mA
	9.5	10	-0.9		-0.6	-0.8		-0.4		-0.72	-0.6			-0.48		mA
Input Current (I_I)						10						10				pA

Note 1: This device should not be connected to circuits with the power on because high transient voltage may cause permanent damage.

AC Electrical Characteristics $T_A = 25^{\circ}C$, $C_L = 15 pF$, unless otherwise noted

Typical Temperature Coefficient for all values of $V_{DD} = 0.3\%/^{\circ}C$

CHARACTERISTIC	TEST CONDITIONS	LIMITS						UNITS	
		CD40XXM			CD40XXC				
		V_{DD} (VOLTS)	MIN	TYP	MAX	MIN	TYP		MAX
Propagation Delay Time High-to-Low Level (t_{PHL})	$V_{CC} = V_{DD}$	5	—	15	55	—	15	70	ns
	$V_{DD} = 10V$	10	—	10	30	—	10	40	
	$V_{CC} = 5V$		—	10	25	—	10	35	
Low-to-High Level (t_{PLH})	$V_{CC} = V_{DD}$	5	—	50	80	—	50	100	ns
	$V_{DD} = 10V$	10	—	25	55	—	25	70	
	$V_{CC} = 5V$		—	15	30	—	15	40	
Transition Time: High-to-Low Level (t_{THL})	$V_{CC} = V_{DD}$	5	—	20	45	—	20	60	ns
		10	—	16	40	—	16	50	
		5	—	80	125	—	80	160	
Low-to-High Level (t_{TLH})	$V_{CC} = V_{DD}$	5	—	50	100	—	50	120	ns
		10	—	50	100	—	50	120	
Input Capacitance (C_i)	Any Input		—	5		—	5		pF

Typical Applications

