

## CD4010C Hex Buffers (Non-Inverting)

### General Description

The CD4010C 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 3V to 15V providing  $V_{CC} \leq V_{DD}$ .

### Features

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

### Applications

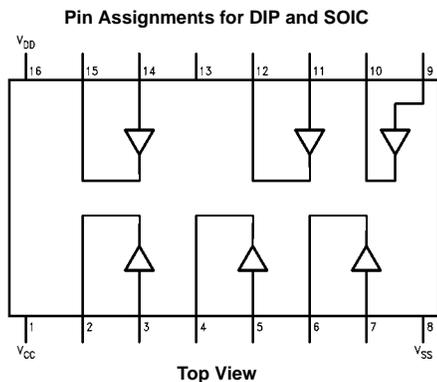
- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Alarm system
- Industrial controls
- Remote metering
- Computers

### Ordering Code:

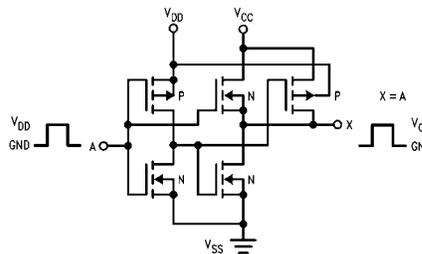
Order Number	Package Number	Package Description
CD4010CM	M16A	16-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow
CD4010CN	N16E	16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide

Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

### Connection Diagram



### Schematic Diagram



Hex COS/MOS to DTL or TTL converter (inverting).  
Connect  $V_{CC}$  to DTL or TTL supply.  
Connect  $V_{DD}$  to COS/MOS supply.

**Absolute Maximum Ratings**(Note 1)

Voltage at Any Pin (Note 2)	$V_{SS} - 0.3V$ to $V_{SS} + 15.5V$
Operating Temperature Range	$-45^{\circ}C$ to $+85^{\circ}C$
Storage Temperature Range ( $T_S$ )	$-65^{\circ}C$ to $+150^{\circ}C$
Power Dissipation ( $P_D$ )	
Dual-In-Line	700 mW
Small Outline	500 mW
Lead Temperature ( $T_L$ )	
(Soldering, 10 seconds)	260 $^{\circ}C$
Operating Range ( $V_{DD}$ )	$V_{SS} + 3V$ to $V_{SS} + 15V$

**Note 1:** "Absolute Maximum Ratings indicate limits beyond which damage to the device may occur. Operating Ratings indicate conditions for which the device is functional, but do not guarantee specific performance limits."

**Note 2:** This device should not be connected to circuits with the power on because high transient voltage may cause permanent damage.

**DC Electrical Characteristics**

Symbol	Characteristics	Test Conditions (Volts)		Limits						Units	
				$-40^{\circ}C$		$+25^{\circ}C$			$+85^{\circ}C$		
		$V_O$	$V_{DD}$	Min	Max	Min	Typ	Max	Min		Max
$I_{CC}$	Quiescent Device		5		3		0.03	3		42	$\mu A$
	Current		10		5		0.05	5		70	$\mu A$
$P_D$	Quiescent Device		5		15		0.15	15		210	$\mu W$
	Dissipation/Package		10		50		0.5	50		700	$\mu W$
$V_{OL}$	Output Voltage		5		0.01		0	0.01		0.05	V
	LOW Level		10		0.01		0	0.01		0.05	V
$V_{OH}$	HIGH Level		5	4.99		4.99	5		4.95		V
			10	9.99		9.99	10		9.95		V
$V_{NL}$	Noise Immunity (All Inputs)	$V_O \geq 1.5$	5	1.6		1.5	2.25		1.4		V
		$V_O \geq 3.0$	10	3.2		3	4.5		2.9		V
		$V_O \geq 3.5$	5	1.4		1.5	2.25		1.5		V
		$V_O \geq 7.0$	10	2.9		3	4.5		3		V
$I_{DN}$	Output Drive Current N-Channel (Note 3)	0.4	5	3.6		3			2.4		mA
		0.5	10	9.6		8			6.4		mA
		2.5	5	-1.5		-1.25			-1		mA
		9.5	10	-0.72		-0.6			-0.48		mA
$I_{IN}$	Input Current						10				pA

**Note 3:**  $I_{DN}$  and  $I_{DP}$  are tested one output at a time.

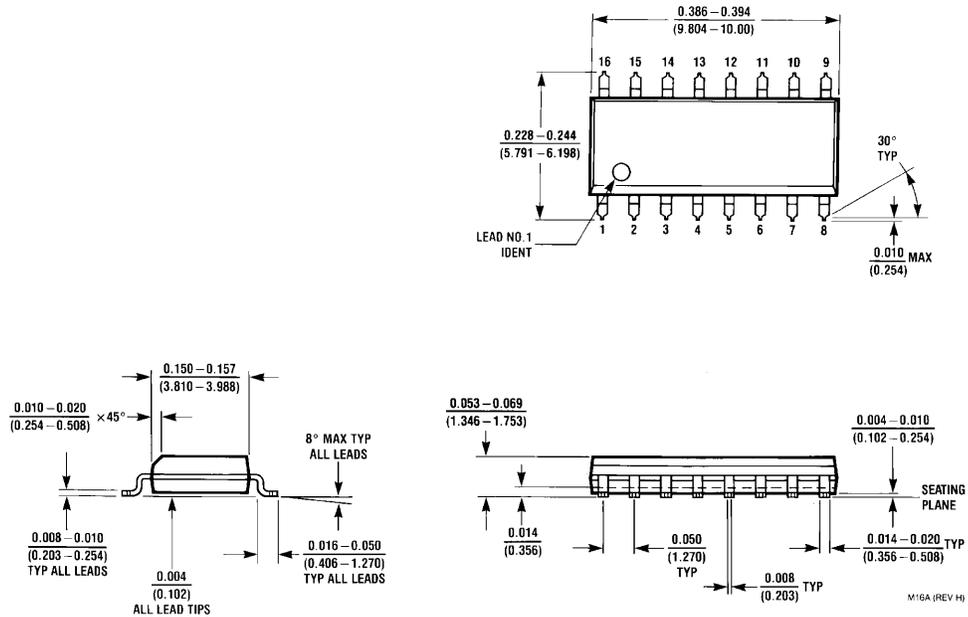
AC Electrical Characteristics (Note 4)							
T <sub>A</sub> = 25°C, C <sub>L</sub> = 15 pF, unless otherwise noted. Typical Temperature coefficient for all values of V <sub>DD</sub> = 0.3%/°C							
Symbol	Characteristics	Test Conditions	Limits			Units	
			V <sub>DD</sub> (Volts)	Min	Typ		Max
t <sub>PHL</sub>	Propagation Delay Time: HIGH-to-LOW Level (t <sub>PHL</sub> )	V <sub>CC</sub> = V <sub>DD</sub>	5	—	15	70	ns
t <sub>PLH</sub>		V <sub>DD</sub> = 10V V <sub>CC</sub> = 5V	10	—	10	40	
	LOW-to-HIGH Level (t <sub>PLH</sub> )	V <sub>CC</sub> = V <sub>DD</sub>	5	—	50	100	ns
		V <sub>DD</sub> = 10V V <sub>CC</sub> = 5V	10	—	25	70	
t <sub>THL</sub>	Transition Time: HIGH-to-LOW Level (t <sub>THL</sub> )	V <sub>CC</sub> = V <sub>DD</sub>	5	—	20	60	ns
t <sub>TLH</sub>		V <sub>CC</sub> = V <sub>DD</sub>	10	—	16	50	
	LOW-to-HIGH Level (t <sub>TLH</sub> )	V <sub>CC</sub> = V <sub>DD</sub>	5	—	80	160	ns
		V <sub>CC</sub> = V <sub>DD</sub>	10	—	50	120	
	Input Capacitance (C <sub>i</sub> )	Any Input	—	—	5	—	pF

**Note 4:** AC Parameters are guaranteed by DC correlated testing.

### Typical Application

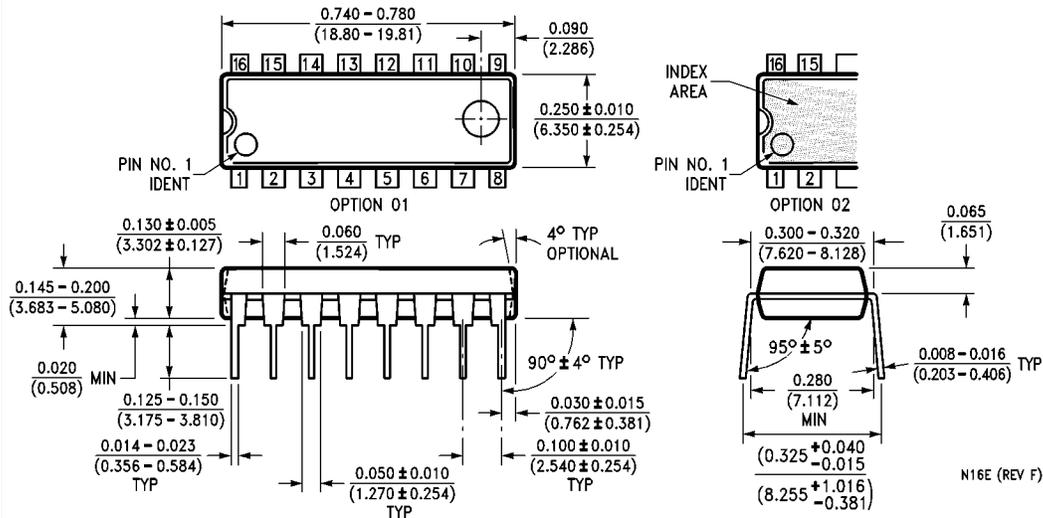
The diagram illustrates a typical application circuit. It features a CMOS inverter and a TTL buffer. The inverter's input and output are connected to a supply labeled V<sub>DD</sub>. The inverter's supply is connected to a supply labeled V<sub>CC</sub>. The TTL buffer's supply is connected to a supply labeled V<sub>CC</sub>, and its output is connected to a supply labeled +5V. The inverter and buffer are connected in series, with the inverter's output driving the buffer's input.

**Physical Dimensions** inches (millimeters) unless otherwise noted



**16-Line Small Outline Integrated Circuit (SOIC), JEDEC MS-012, 0.150" Narrow  
Package Number M16A**

**Physical Dimensions** inches (millimeters) unless otherwise noted (Continued)



**16-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300" Wide  
Package Number N16E**

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