

## 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  $V_{CC} \leq V_{DD}$ . The devices also have buffered outputs which improve transfer characteristics by providing very high gain.

### 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

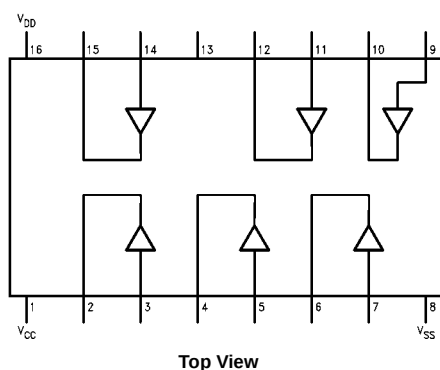
- Automotive
- Data terminals
- Instrumentation
- Medical electronics
- Alarm system
- Industrial controls
- Remote metering
- Computers

### Ordering Code:

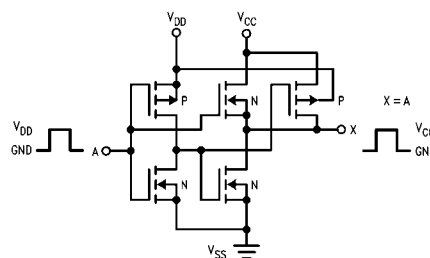
| Order Number | Package Number | Package Description                                                          |
|--------------|----------------|------------------------------------------------------------------------------|
| CD4010CM     | M16A           | 16-Lead Small Outline Integrated Circuit (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         | $-55^{\circ}C$ to $+125^{\circ}C$   |
| 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      | Conditions                                   | Limits |      |       |       |      |        |      | Units |
|-----------------|----------------------|----------------------------------------------|--------|------|-------|-------|------|--------|------|-------|
|                 |                      |                                              | −55°C  |      | +25°C |       |      | +125°C |      |       |
|                 |                      |                                              | Min    | Max  | Min   | Typ   | Max  | Min    | Max  |       |
| I <sub>CC</sub> | Quiescent Device     | V <sub>DD</sub> = 5.0V                       |        | 0.3  |       | 0.01  | 0.3  |        | 20   | μA    |
|                 | Current              | V <sub>DD</sub> = 10V                        |        | 0.5  |       | 0.01  | 0.5  |        | 30   |       |
| P <sub>D</sub>  | Quiescent Device     | V <sub>DD</sub> = 5.0V                       |        | 1.5  |       | 0.05  | 1.5  |        | 100  | μW    |
|                 | Dissipation/Package  | V <sub>DD</sub> = 10V                        |        | 5.0  |       | 0.1   | 5.0  |        | 300  |       |
| V <sub>OL</sub> | Output Voltage       | V <sub>DD</sub> = 5.0V                       |        | 0.01 |       | 0     | 0.01 |        | 0.05 | V     |
|                 | LOW Level            | V <sub>DD</sub> = 10V                        |        | 0.01 |       | 0     | 0.01 |        | 0.05 |       |
| V <sub>OH</sub> | Output Voltage       | V <sub>DD</sub> = 5.0V                       | 4.99   |      | 4.99  | 5     |      | 4.95   |      | V     |
|                 | HIGH Level           | V <sub>DD</sub> = 10V                        | 9.99   |      | 9.99  | 10    |      | 9.95   |      |       |
| V <sub>NL</sub> | Noise Immunity       | V <sub>DD</sub> = 5.0V, V <sub>O</sub> ≥ 1.5 | 1.6    |      | 1.5   | 2.25  |      | 1.4    |      | V     |
|                 | (All Inputs)         | V <sub>DD</sub> = 10V, V <sub>O</sub> ≥ 3.0  | 3.2    |      | 3     | 4.5   |      | 2.9    |      |       |
| V <sub>NH</sub> | Noise Immunity       | V <sub>DD</sub> = 5.0V, V <sub>O</sub> ≥ 3.5 | 1.4    |      | 1.5   | 2.25  |      | 1.5    |      | V     |
|                 | (All Inputs)         | V <sub>DD</sub> = 10V, V <sub>O</sub> ≥ 7.0  | 2.9    |      | 3     | 4.5   |      | 3      |      |       |
| I <sub>DN</sub> | Output Drive Current | V <sub>DD</sub> = 5.0V, 0.4 = V <sub>O</sub> | 3.75   |      | 3     | 4     |      | 2.1    |      | mA    |
|                 | N-Channel (Note 3)   | V <sub>DD</sub> = 10V, 0.5 = V <sub>O</sub>  | 10     |      | 8     | 10    |      | 5.6    |      |       |
| I <sub>DP</sub> | Output Drive Current | V <sub>DD</sub> = 5.0V, 2.5 = V <sub>O</sub> | −1.85  |      | −1.25 | −1.75 |      | −0.9   |      | mA    |
|                 | P-Channel (Note 3)   | V <sub>DD</sub> = 10V, 9.5 = V <sub>O</sub>  | −0.9   |      | −0.6  | −0.8  |      | −0.4   |      |       |
| I <sub>I</sub>  | Input Current        |                                              |        |      |       | 10    |      |        |      | pA    |

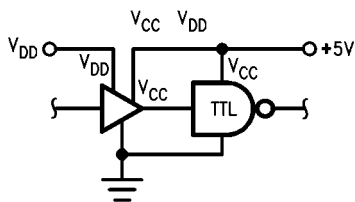
**Note 3:**  $I_{DN}$  and  $I_{DP}$  are tested one output at a time.

**AC Electrical Characteristics** (Note 4)

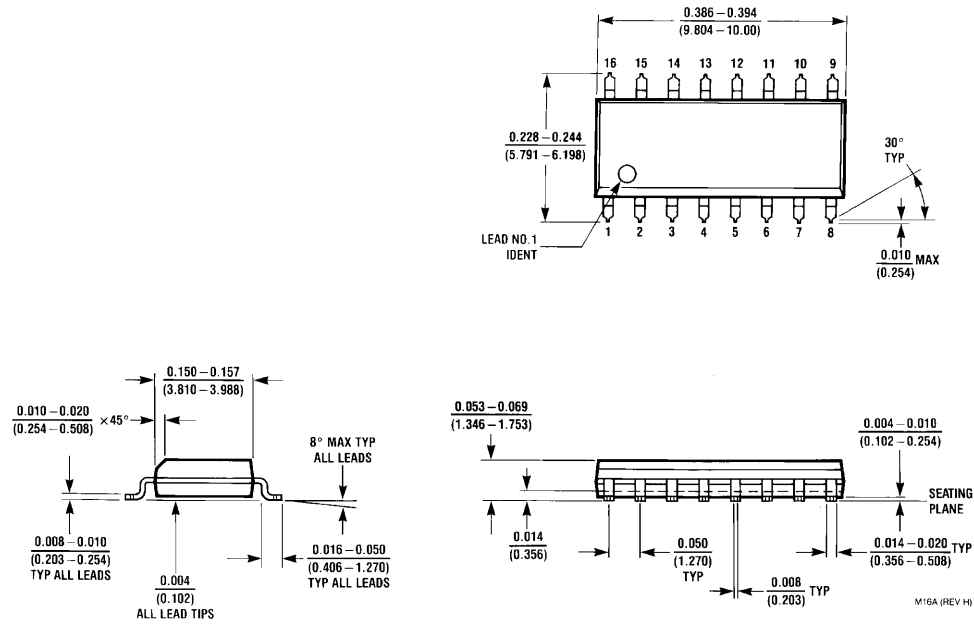
$T_A = 25^\circ\text{C}$ ,  $C_L = 15\text{ pF}$ , unless otherwise noted. Typical Temperature coefficient for all values of  $V_{DD} = 0.3\%/^\circ\text{C}$

| Symbol    | Characteristics                 | Test Conditions       |                     | Limits |     |     | Units |
|-----------|---------------------------------|-----------------------|---------------------|--------|-----|-----|-------|
|           |                                 |                       | $V_{DD}$<br>(Volts) | Min    | Typ | Max |       |
| $t_{PHL}$ | Propagation Delay Time:         | $V_{CC} = V_{DD}$     | 5                   | —      | 15  | 70  | ns    |
| $t_{PLH}$ | HIGH-to-LOW Level ( $t_{PHL}$ ) | $V_{DD} = 10\text{V}$ | 10                  | —      | 10  | 40  |       |
|           |                                 | $V_{CC} = 5\text{V}$  |                     | —      | 10  | 35  |       |
|           | LOW-to-HIGH Level ( $t_{PLH}$ ) | $V_{CC} = V_{DD}$     | 5                   | —      | 50  | 100 | ns    |
|           |                                 | $V_{DD} = 10\text{V}$ | 10                  | —      | 25  | 70  |       |
|           |                                 | $V_{CC} = 5\text{V}$  |                     | —      | 15  | 40  |       |
| $t_{THL}$ | Transition Time:                | $V_{CC} = V_{DD}$     | 5                   | —      | 20  | 60  | ns    |
| $t_{TLH}$ | HIGH-to-LOW Level ( $t_{THL}$ ) |                       | 10                  | —      | 16  | 50  | ns    |
|           | LOW-to-HIGH Level ( $t_{TLH}$ ) | $V_{CC} = V_{DD}$     | 5                   | —      | 80  | 160 |       |
|           |                                 |                       | 10                  | —      | 50  | 120 | pF    |
|           | Input Capacitance ( $C_I$ )     | Any Input             |                     | —      | 5   | —   |       |

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

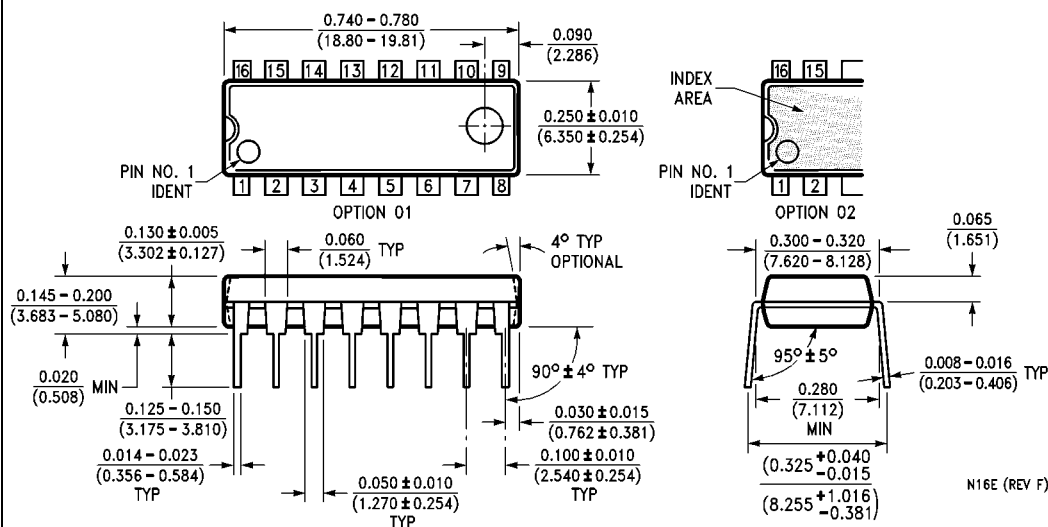
**Typical Application**

# Physical Dimensions inches (millimeters) unless otherwise noted



**16-Lead 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

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

[www.fairchildsemi.com](http://www.fairchildsemi.com)