

**MNCD4049UBM-X REV 1A0**

 Original Creation Date: 10/11/95  
 Last Update Date: 07/17/98  
 Last Major Revision Date: 03/05/98

**HEX INVERTING BUFFER**
**General Description**

These hex buffers are monolithic complementary MOS (CMOS) integrated circuits constructed with N- and P-channel enhancement mode transistors. These devices feature logic level conversion using only one supply voltage (Vdd). The input signal high level (Vih) can exceed the Vdd supply voltage when these devices are used for logic level conversions. These devices are intended for use as hex buffers, CMOS to DTL/TTL converters, or as CMOS current drivers, and at Vdd = 5.0V, they can drive directly two DTL/TTL loads over the full operating temperature range.

**Industry Part Number**

CD4049UBM

**NS Part Numbers**

 CD4049UBMJ/883  
 CD4049UBMW/883

**Prime Die**

CD4049UBM

**Processing**

MIL-STD-883, Method 5004

**Quality Conformance Inspection**

MIL-STD-883, Method 5005

| Subgrp | Description         | Temp ( °C) |
|--------|---------------------|------------|
| 1      | Static tests at     | +25        |
| 2      | Static tests at     | +125       |
| 3      | Static tests at     | -55        |
| 4      | Dynamic tests at    | +25        |
| 5      | Dynamic tests at    | +125       |
| 6      | Dynamic tests at    | -55        |
| 7      | Functional tests at | +25        |
| 8A     | Functional tests at | +125       |
| 8B     | Functional tests at | -55        |
| 9      | Switching tests at  | +25        |
| 10     | Switching tests at  | +125       |
| 11     | Switching tests at  | -55        |

### Features

- Wide supply voltage range 3.0V to 15V
- Direct drive to 2 TTL loads at 5.0V over full temperature range
- High source and sink current capability
- Special input protection permits input voltages greater than Vdd

### Applications

- CMOS hex inverter/buffer
- CMOS to DTL/TTL hex converter
- CMOS current "sink" or "source" driver
- CMOS high-to-low logic level converter

**(Absolute Maximum Ratings)**

(Note 1, 2)

|                                  |                    |
|----------------------------------|--------------------|
| Supply Voltage (Vdd)             | -0.5V to +18V      |
| Input Voltage (Vin)              | -0.5V to +18V      |
| Voltage at Any Output Pin (Vout) | -0.5V to Vdd +0.5V |
| Storage Temperature Range (Ts)   | -65 C to +150 C    |
| Power Dissipation (Pd)           |                    |
| Dual-In-Line                     | 700mW              |
| Small Outline                    | 500mW              |
| Lead Temperature (Tl)            |                    |
| (Soldering, 10 seconds)          | 260 C              |

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 table of "Recommended Operating Conditions" and "Electrical Characteristics" provides conditions for actual device operation.

Note 2: Vss = 0V unless otherwise specified.

**Recommended Operating Conditions**

(Note 1)

|                                  |                 |
|----------------------------------|-----------------|
| Supply Voltage (Vdd)             | 3V to 15V       |
| Input Voltage (Vin)              | 0V to 15V       |
| Voltage at Any Output Pin (Vout) | 0 to Vdd        |
| Operating Temperature Range (TA) |                 |
| CD4049UBM                        | -55 C to +125 C |

Note 1: Vss = 0V unless otherwise specified.

## Electrical Characteristics

### DC PARAMETERS

| SYMBOL | PARAMETER                  | CONDITIONS                                   | NOTES | PIN-NAME | MIN   | MAX   | UNIT | SUB-GROUPS |
|--------|----------------------------|--|-------|----------|-------|-------|------|------------|
| Vol    | Logical "0" Output Voltage | Vdd = 5V, Iout = 0uA, Vih = 5V, Vil = 0V     |       |          |       | 0.05  | V    | 1, 2, 3    |
|        |                            | Vdd = 10V, Iout = 0uA, Vih = 10V, Vil = 0V   |       |          |       | 0.05  | V    | 1, 2, 3    |
|        |                            | Vdd = 15V, Iout = 0uA, Vih = 15V, Vil = 0V   |       |          |       | 0.05  | V    | 1, 2, 3    |
| Voh    | Logical "1" Output Voltage | Vdd = 5V, Iout = 0uA, Vih = 5V, Vil = 0V     |       |          | 4.95  |       | V    | 1, 2, 3    |
|        |                            | Vdd = 10V, Iout = 0uA, Vih = 10V, Vil = 0V   |       |          | 9.95  |       | V    | 1, 2, 3    |
|        |                            | Vdd = 15V, Iout = 0uA, Vih = 15V, Vil = 0V   |       |          | 14.95 |       | V    | 1, 2, 3    |
| Iih    | Logical "1" Input Current  | Vdd = 15V, Vin = 15V                         |       |          |       | 100   | nA   | 1, 3       |
|        |                            |  |       |          |       | 1000  | nA   | 2          |
| Iil    | Logical "0" Input Current  | Vdd = 15V, Vin = 0V                          |       |          |       | -100  | nA   | 1, 3       |
|        |                            |  |       |          |       | -1000 | nA   | 2          |
| Ioh    | Logical "1" Output Current | Vdd = 5V, Vout = 4.6V, Vih = 5V, Vil = 0V    |       |          | -1.1  |       | mA   | 1          |
|        |                            |  |       |          | -0.72 |       | mA   | 2          |
|        |                            |  |       |          | -1.3  |       | mA   | 3          |
|        |                            | Vdd = 10V, Vout = 9.5V, Vih = 10V, Vil = 0V  |       |          | -2.2  |       | mA   | 1          |
|        |                            |  |       |          | -1.5  |       | mA   | 2          |
|        |                            |  |       |          | -2.6  |       | mA   | 3          |
|        |                            | Vdd = 15V, Vout = 13.5V, Vih = 15V, Vil = 0V |       |          | -7.2  |       | mA   | 1          |
|        |                            |  |       |          | -5    |       | mA   | 2          |
|        |                            |  |       |          | -8    |       | mA   | 3          |
| Iol    | Logical "1" Output Current | Vdd = 5V, Vout = 0.4V, Vih = 5V, Vil = 0V    |       |          | 4.6   |       | mA   | 1          |
|        |                            |  |       |          | 3.2   |       | mA   | 2          |
|        |                            |  |       |          | 5.6   |       | mA   | 3          |
|        |                            | Vdd = 10V, Vout = 0.5V, Vih = 10V, Vil = 0V  |       |          | 9.8   |       | mA   | 1          |
|        |                            |  |       |          | 6.8   |       | mA   | 2          |
|        |                            |  |       |          | 12    |       | mA   | 3          |
|        |                            | Vdd = 15V, Vout = 1.5V, Vih = 15V, Vil = 0V  |       |          | 29    |       | mA   | 1          |
|        |                            |  |       |          | 20    |       | mA   | 2          |
|        |                            |  |       |          | 35    |       | mA   | 3          |

## Electrical Characteristics

### DC PARAMETERS (Continued)

| SYMBOL          | PARAMETER                 | CONDITIONS   | NOTES | PIN-NAME | MIN | MAX | UNIT | SUB-GROUPS |
|-----------------|---------------------------|--|-------|----------|-----|-----|------|------------|
| I <sub>dd</sub> | Power Supply Current      | V <sub>dd</sub> = 5V, V <sub>ih</sub> = 5V, V <sub>il</sub> = 0V   |       |          | 1   |     | uA   | 1, 3       |
|                 |                           |  |       |          | 30  |     | uA   | 2          |
|                 |                           | V <sub>dd</sub> = 10V, V <sub>ih</sub> = 10V, V <sub>il</sub> = 0V |       |          | 2   |     | uA   | 1, 3       |
|                 |                           |  |       |          | 60  |     | uA   | 2          |
|                 |                           | V <sub>dd</sub> = 15V, V <sub>ih</sub> = 15V, V <sub>il</sub> = 0V |       |          | 4   |     | uA   | 1, 3       |
|                 |                           |  |       |          | 120 |     | uA   | 2          |
| V <sub>ih</sub> | Logical "1" Input Voltage | V <sub>dd</sub> = 5V, V <sub>out</sub> = 0.5V                      | 1     |          | 4   |     | V    | 1, 2, 3    |
|                 |                           | V <sub>dd</sub> = 10V, V <sub>out</sub> = 1V                       | 1     |          | 8   |     | V    | 1, 2, 3    |
|                 |                           | V <sub>dd</sub> = 15V, V <sub>out</sub> = 1.5V                     | 1     |          | 12  |     | V    | 1, 2, 3    |
| V <sub>il</sub> | Logical "0" Input Voltage | V <sub>dd</sub> = 5V, V <sub>out</sub> = 4.5V                      | 1     |          |     | 1   | V    | 1, 2, 3    |
|                 |                           | V <sub>dd</sub> = 10V, V <sub>out</sub> = 9V                       | 1     |          |     | 2   | V    | 1, 2, 3    |
|                 |                           | V <sub>dd</sub> = 15V, V <sub>out</sub> = 13.5V                    | 1     |          |     | 3   | V    | 1, 2, 3    |

## Electrical Characteristics

### AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC:  $C_l = 50\text{pF}$ ,  $R_l = 200\text{K}$  or equivalent impedance provided by diode load,  $t_r = t_f = 20\text{nS}$

| SYMBOL | PARAMETER               | CONDITIONS | NOTES | PIN-NAME | MIN | MAX  | UNIT | SUB-GROUPS |
|--------|-------------------------|------------|-------|----------|-----|------|------|------------|
| tPHL   | Propagation Delay Time: | Vdd = 5V   | 3, 4  |          |     | 65   | nS   | 9          |
|        |                         |            | 3, 4  |          |     | 90   | nS   | 10         |
|        |                         |            | 3, 4  |          |     | 50   | nS   | 11         |
|        |                         | Vdd = 10V  | 2, 4  |          |     | 40   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 55   | nS   | 10         |
|        |                         |            | 2, 4  |          |     | 30   | nS   | 11         |
|        |                         | Vdd = 15V  | 2, 4  |          |     | 30   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 40   | nS   | 10         |
|        |                         |            | 2, 4  |          |     | 25   | nS   | 11         |
| tPLH   | Propagation Delay Time: | Vdd = 5V   | 3, 4  |          |     | 85   | nS   | 9          |
|        |                         |            | 3, 4  |          |     | 120  | nS   | 10         |
|        |                         |            | 3, 4  |          |     | 70   | nS   | 11         |
|        |                         | Vdd = 10V  | 2, 4  |          |     | 45   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 60   | nS   | 10         |
|        |                         |            | 2, 4  |          |     | 35   | nS   | 11         |
|        |                         | Vdd = 15V  | 2, 4  |          |     | 35   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 50   | nS   | 10         |
|        |                         |            | 2, 4  |          |     | 30   | nS   | 11         |
| tTHL   | Transition Time         | Vdd = 5V   | 3, 4  |          |     | 60   | nS   | 9          |
|        |                         |            | 3, 4  |          |     | 90   | nS   | 10, 11     |
|        |                         | Vdd = 10V  | 2, 4  |          |     | 40   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 60   | nS   | 10, 11     |
|        |                         | Vdd = 15V  | 2, 4  |          |     | 30   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 45   | nS   | 10, 11     |
| tTLH   | Transition Time         | Vdd = 5V   | 3, 4  |          |     | 120  | nS   | 9          |
|        |                         |            | 3, 4  |          |     | 180  | nS   | 10, 11     |
|        |                         | Vdd = 10V  | 2, 4  |          |     | 55   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 83   | nS   | 10, 11     |
|        |                         | Vdd = 15V  | 2, 4  |          |     | 45   | nS   | 9          |
|        |                         |            | 2, 4  |          |     | 68   | nS   | 10, 11     |
| Cin    | Input Capacitance       | Any Input  | 2, 4  |          |     | 22.5 | pF   | 9          |

- Note 1: Parameter tested go-no-go only.
- Note 2: Guaranteed parameter not tested.
- Note 3: Tested at 25 C; guaranteed but not tested at +125 C and -55 C.
- Note 4: MM4649UB is an "A" Series device that meets "B" series electricals.

**Revision History**

| Rev | ECN #    | Rel Date | Originator    | Changes  |
|-----|----------|----------|---------------|--|
| 1A0 | M0000535 | 07/17/98 | Linda Collins | Converted from RETS4049UBX rev. 6A to MDS<br>MNCD4049UBM-X rev. 1A0. Deleted the Drift values. |