

# **CD4073BM/CD4073BC** **Double Buffered Triple 3-Input AND Gate** **CD4075BM/CD4075BC** **Double Buffered Triple 3-Input OR Gate**

## General Description

These triple 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  $V_{SS}$ .

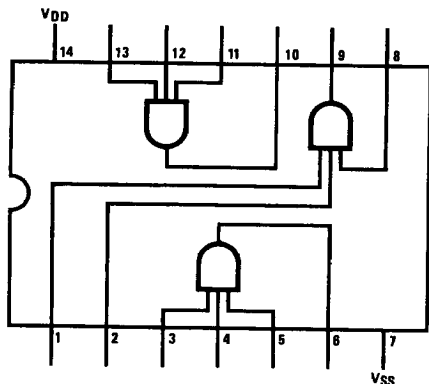
## Features

- Wide supply voltage range 3.0V to 15V
- High noise immunity 0.45  $V_{DD}$  (typ.)
- 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

## Connection Diagrams

### Dual-In-Line Packages

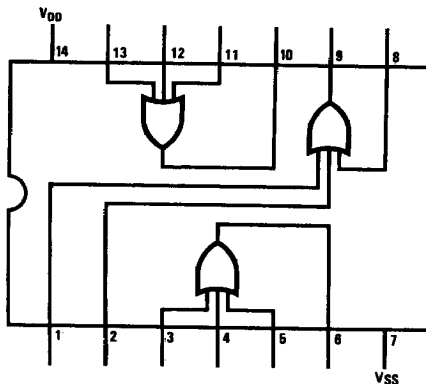
**CD4073 Triple 3-Input AND Gate**



**Top View**

TL/F/5979-1

**CD4075B Triple 3-Input OR Gate**



**Top View**

TL/F/5979-2

**Order Number CD4073B\* or CD4075B\***

\*Please look into Section 8, Appendix D for availability of various package types.

**Absolute Maximum Ratings** (Notes 1 & 2)

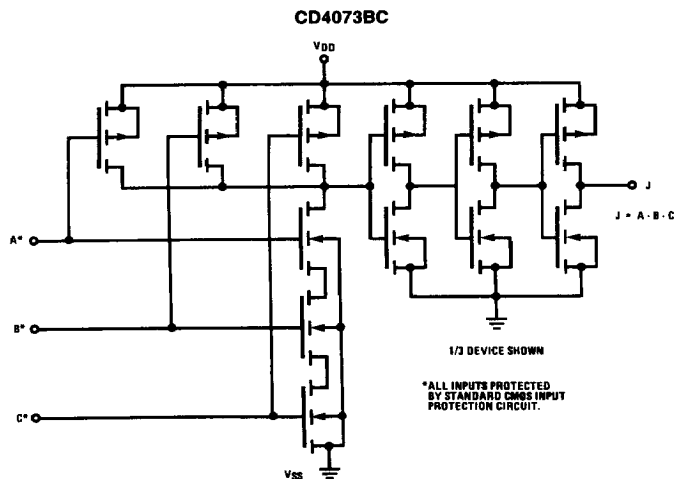
|                                     |                                                 |
|-------------------------------------|-------------------------------------------------|
| DC Supply Voltage ( $V_{DD}$ )      | $-0.5 V_{DC}$ to $+18 V_{DC}$                   |
| Input Voltage ( $V_{IN}$ )          | $-0.5 V_{DC}$ to $V_{DD} + 0.5 V_{DC}$          |
| Storage Temperature Range ( $T_S$ ) | $-65^{\circ}\text{C}$ to $+150^{\circ}\text{C}$ |
| Power Dissipation ( $P_D$ )         |                                                 |
| Dual-In-Line                        | 700 mW                                          |
| Small Outline                       | 500 mW                                          |
| Lead Temperature ( $T_L$ )          |                                                 |
| (Soldering, 10 seconds)             | $260^{\circ}\text{C}$                           |

**Operation Conditions** (Note 2)

|                                       |                                                 |
|---------------------------------------|-------------------------------------------------|
| DC Supply Voltage ( $V_{DD}$ )        | $+5 V_{DC}$ to $+15 V_{DC}$                     |
| Input Voltage ( $V_{IN}$ )            | $0 V_{DC}$ to $V_{DD} V_{DC}$                   |
| Operating Temperature Range ( $T_A$ ) |                                                 |
| CD4073BM/CD4075BM                     | $-55^{\circ}\text{C}$ to $+125^{\circ}\text{C}$ |
| CD4073BC/CD4075BC                     | $-40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$  |

**DC Electrical Characteristics** CD4073BM/CD4075BM (Note 2)

| Symbol   | Parameter                          | Conditions                                  | $-55^{\circ}\text{C}$ |       | $+25^{\circ}\text{C}$ |            |       | $+125^{\circ}\text{C}$ |      | Units         |
|----------|------------------------------------|---------------------------------------------|-----------------------|-------|-----------------------|------------|-------|------------------------|------|---------------|
|          |                                    |                                             | Min                   | Max   | Min                   | Typ        | Max   | Min                    | Max  |               |
| $I_{DD}$ | Quiescent Device Current           | $V_{DD} = 5V, V_{IN} = V_{DD}$ or $V_{SS}$  |                       | 0.25  |                       | 0.004      | 0.25  |                        | 7.5  | $\mu\text{A}$ |
|          |                                    | $V_{DD} = 10V, V_{IN} = V_{DD}$ or $V_{SS}$ |                       | 0.5   |                       | 0.005      | 0.5   |                        | 15   | $\mu\text{A}$ |
|          |                                    | $V_{DD} = 15V, V_{IN} = V_{DD}$ or $V_{SS}$ |                       | 1.0   |                       | 0.006      | 1.0   |                        | 30   | $\mu\text{A}$ |
| $V_{OL}$ | 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            | $V_{DD} = 5V, V_O = 0.5V$                   |                       | 1.5   |                       | 2          | 1.5   |                        | 1.5  | V             |
|          |                                    | $V_{DD} = 10V, V_O = 1.0V$                  |                       | 3.0   |                       | 4          | 3.0   |                        | 3.0  | V             |
|          |                                    | $V_{DD} = 15V, V_O = 1.5V$                  |                       | 4.0   |                       | 6          | 4.0   |                        | 4.0  | V             |
| $V_{IH}$ | High Level Input Voltage           | $V_{DD} = 5V, V_O = 4.5V$                   | 3.5                   |       | 3.5                   | 3          |       | 3.5                    |      | V             |
|          |                                    | $V_{DD} = 10V, V_O = 9.0V$                  | 7.0                   |       | 7.0                   | 6          |       | 7.0                    |      | V             |
|          |                                    | $V_{DD} = 15V, V_O = 13.5V$                 | 11.0                  |       | 11.0                  | 9          |       | 11.0                   |      | V             |
| $I_{OL}$ | Low Level Output Current (Note 3)  | $V_{DD} = 5V, V_O = 0.4V$                   | 0.64                  |       | 0.51                  | 0.88       |       | 0.36                   |      | mA            |
|          |                                    | $V_{DD} = 10V, V_O = 0.5V$                  | 1.6                   |       | 1.3                   | 2.2        |       | 0.9                    |      | mA            |
|          |                                    | $V_{DD} = 15V, V_O = 1.5V$                  | 4.2                   |       | 3.4                   | 8          |       | 2.4                    |      | mA            |
| $I_{OH}$ | High Level Output Current (Note 3) | $V_{DD} = 5V, V_O = 4.6V$                   | -0.64                 |       | -0.51                 | -0.88      |       | -0.36                  |      | mA            |
|          |                                    | $V_{DD} = 10V, V_O = 9.5V$                  | -1.6                  |       | -1.3                  | -2.2       |       | -0.9                   |      | mA            |
|          |                                    | $V_{DD} = 15V, V_O = 13.5V$                 | -4.2                  |       | -3.4                  | -8         |       | -2.4                   |      | mA            |
| $I_{IN}$ | Input Current                      | $V_{DD} = 15V, V_{IN} = 0V$                 |                       | -0.10 |                       | $-10^{-5}$ | -0.10 |                        | -1.0 | $\mu\text{A}$ |
|          |                                    | $V_{DD} = 15V, V_{IN} = 15V$                |                       | 0.10  |                       | $10^{-5}$  | 0.10  |                        | 1.0  | $\mu\text{A}$ |

**Schematic Diagram**

TL/F/5979-3

# DC Electrical Characteristics CD4073BC/CD4075BC (Note 2)

CD4073BM/CD4073BC/CD4075BM/CD4075BC

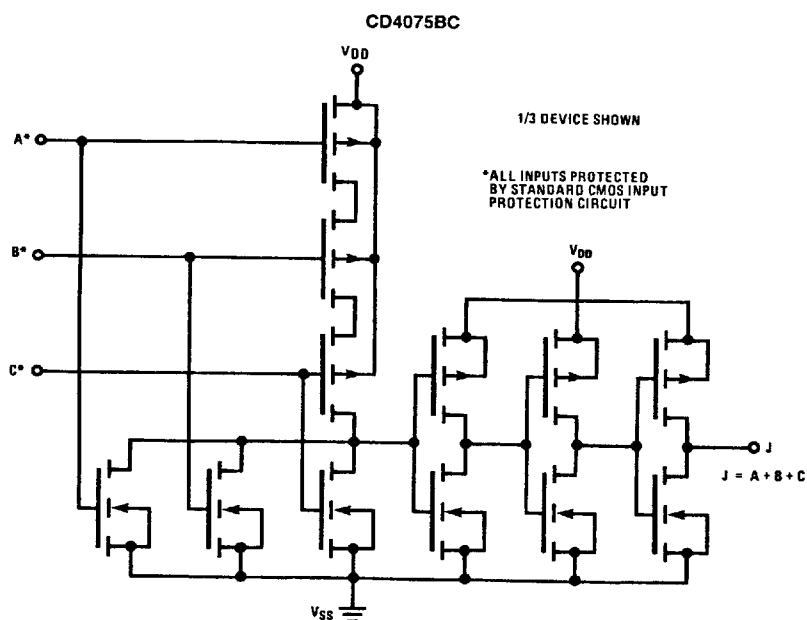
| Symbol   | Parameter                          | Conditions                                                                                                                                                    | -40°C                 |                      | +25°C                 |                         |                      | +85°C                 |                      | Units                         |
|----------|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|----------------------|-----------------------|-------------------------|----------------------|-----------------------|----------------------|-------------------------------|
|          |                                    |                                                                                                                                                               | Min                   | Max                  | Min                   | Typ                     | Max                  | Min                   | Max                  |                               |
| $I_{DD}$ | Quiescent Device Current           | $V_{DD} = 5V, V_{IN} = V_{DD} \text{ or } V_{SS}$<br>$V_{DD} = 10V, V_{IN} = V_{DD} \text{ or } V_{SS}$<br>$V_{DD} = 15V, V_{IN} = V_{DD} \text{ or } V_{SS}$ |                       | 1<br>2<br>4          |                       | 0.004<br>0.005<br>0.006 | 1<br>2<br>4          |                       | 7.5<br>15<br>30      | $\mu A$<br>$\mu A$<br>$\mu A$ |
| $V_{OL}$ | Low Level Output Voltage           | $V_{DD} = 5V$<br>$V_{DD} = 10V$<br>$V_{DD} = 15V$ } $ I_O  < 1 \mu A$                                                                                         |                       | 0.05<br>0.05<br>0.05 |                       | 0<br>0<br>0             | 0.05<br>0.05<br>0.05 |                       | 0.05<br>0.05<br>0.05 | V<br>V<br>V                   |
| $V_{OH}$ | High Level Output Voltage          | $V_{DD} = 5V$<br>$V_{DD} = 10V$<br>$V_{DD} = 15V$ } $ I_O  < 1 \mu A$                                                                                         | 4.95<br>9.95<br>14.95 |                      | 4.95<br>9.95<br>14.95 | 5<br>10<br>15           |                      | 4.95<br>9.95<br>14.95 |                      | V<br>V<br>V                   |
| $V_{IL}$ | Low Level Input Voltage            | $V_{DD} = 5V, V_O = 0.5V$<br>$V_{DD} = 10V, V_O = 1.0V$<br>$V_{DD} = 15V, V_O = 1.5V$ } $ I_O  < 1 \mu A$                                                     |                       | 1.5<br>3.0<br>4.0    |                       | 2<br>4<br>6             | 1.5<br>3.0<br>4.0    |                       | 1.5<br>3.0<br>4.0    | V<br>V<br>V                   |
| $V_{IH}$ | High Level Input Voltage           | $V_{DD} = 5V, V_O = 4.5V$<br>$V_{DD} = 10V, V_O = 9.0V$<br>$V_{DD} = 15V, V_O = 13.5V$ } $ I_O  < 1 \mu A$                                                    | 3.5<br>7.0<br>11.0    |                      | 3.5<br>7.0<br>11.0    | 3<br>6<br>9             |                      | 3.5<br>7.0<br>11.0    |                      | V<br>V<br>V                   |
| $I_{OL}$ | Low Level Output Current (Note 3)  | $V_{DD} = 5V, V_O = 0.4V$<br>$V_{DD} = 10V, V_O = 0.5V$<br>$V_{DD} = 15V, V_O = 1.5V$                                                                         | 0.52<br>1.3<br>3.6    |                      | 0.44<br>1.1<br>3.0    | 0.88<br>2.2<br>8        |                      | 0.36<br>0.9<br>2.4    |                      | mA<br>mA<br>mA                |
| $I_{OH}$ | High Level Output Current (Note 3) | $V_{DD} = 5V, V_O = 4.6V$<br>$V_{DD} = 10V, V_O = 9.5V$<br>$V_{DD} = 15V, V_O = 13.5V$                                                                        | -0.52<br>-1.3<br>-3.6 |                      | -0.44<br>-1.1<br>-3.0 | -0.88<br>-2.2<br>-8     |                      | -0.36<br>-0.9<br>-2.4 |                      | mA<br>mA<br>mA                |
| $I_{IN}$ | Input Current                      | $V_{DD} = 15V, V_{IN} = 0V$<br>$V_{DD} = 15V, V_{IN} = 15V$                                                                                                   |                       | -0.30<br>0.30        |                       | $-10^{-5}$<br>$10^{-5}$ | -0.30<br>0.30        |                       | -1.0<br>1.0          | $\mu A$<br>$\mu A$            |

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:  $V_{SS} = 0V$  unless otherwise specified

Note 3:  $I_{OH}$  and  $I_{OL}$  are tested one output at a time

## Schematic Diagram



TL/F/5979-4

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**AC Electrical Characteristics\*** CD4073BM/CD4073BC/CD4075BM/CD4075BCT<sub>A</sub> = 25°C, C<sub>L</sub> = 50 pF, R<sub>L</sub> = 200k unless otherwise specified

| Symbol                               | Parameter                               | Conditions            | CD4073BC<br>CD4073BM |     |     | CD4075BC<br>CD4075BM |     |     | Units |
|--------------------------------------|-----------------------------------------|-----------------------|----------------------|-----|-----|----------------------|-----|-----|-------|
|                                      |                                         |                       | Min                  | Typ | Max | Min                  | Typ | Max |       |
| t <sub>PHL</sub>                     | Propagation Delay,<br>High to Low Level | V <sub>DD</sub> = 5V  |                      | 130 | 250 |                      | 140 | 250 | ns    |
|                                      |                                         | V <sub>DD</sub> = 10V |                      | 60  | 100 |                      | 70  | 100 | ns    |
|                                      |                                         | V <sub>DD</sub> = 15V |                      | 40  | 70  |                      | 50  | 70  | ns    |
| t <sub>PLH</sub>                     | Propagation Delay,<br>Low to High Level | V <sub>DD</sub> = 5V  |                      | 140 | 250 |                      | 130 | 250 | ns    |
|                                      |                                         | V <sub>DD</sub> = 10V |                      | 70  | 100 |                      | 50  | 100 | ns    |
|                                      |                                         | V <sub>DD</sub> = 15V |                      | 50  | 70  |                      | 40  | 70  | ns    |
| t <sub>THL</sub><br>t <sub>TLH</sub> | Transition Time                         | V <sub>DD</sub> = 5V  |                      | 90  | 200 |                      | 90  | 200 | ns    |
|                                      |                                         | V <sub>DD</sub> = 10V |                      | 50  | 100 |                      | 50  | 100 | ns    |
|                                      |                                         | V <sub>DD</sub> = 15V |                      | 40  | 80  |                      | 40  | 80  | ns    |
| C <sub>IN</sub>                      | Average Input<br>Capacitance (Note 4)   | Any Input             |                      | 5   | 7.5 |                      | 5   | 7.5 | pF    |
| C <sub>PD</sub>                      | Power Dissipation<br>Capacity (Note 5)  | Any Gate              |                      | 17  |     |                      | 17  |     | pF    |

\*AC Parameters are guaranteed by DC correlated testing.

**Note 4:** Capacitance is guaranteed by periodic testing.**Note 5:** C<sub>PD</sub> determines the no load AC power consumption of any CMOS device. For complete explanation see 54C/74C Family characteristics Application Note AN-90.