

# MN4030B/S, MN4070B/S

## Quad Exclusive-OR Gates

### Description

The MN4030B/S and MN4070B/S are EXCLUSIVE-OR gates and have 4 circuits in a package.

The outputs are fully buffered to improve the propagation characteristics between the input and output which are affected by increasing load capacitance and minimizes propagation delay time. Their primary use is where low power dissipation and/or high noise immunity is desired.

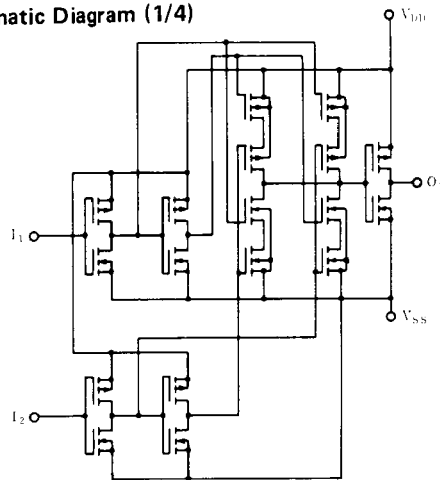
Typical applications include digital comparators and parity checkers.

These are equivalent to MOTOROLA MC14070B and RCA CD4070B.

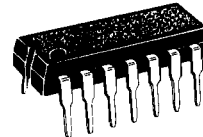
### Truth Table

| $I_1$ | $I_2$ | $O_1$ |
|-------|-------|-------|
| L     | L     | L     |
| H     | L     | H     |
| L     | H     | H     |
| H     | H     | L     |

### Schematic Diagram (1/4)



P-1



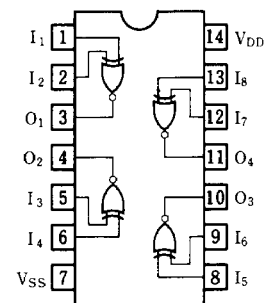
14-Pin • Plastic DIL Package

P-2



14-Pin • Pinflat Package (SO-14D)

### Pin Configuration



### Maximum Ratings ( $T_a = 25^\circ\text{C}$ )

| Item                                                                     | Symbol    | Ratings                                                    | Unit             |
|--------------------------------------------------------------------------|-----------|------------------------------------------------------------|------------------|
| Supply Voltage                                                           | $V_{DD}$  | $-0.5 \sim +18$                                            | V                |
| Input Voltage                                                            | $V_I$     | $-0.5 \sim V_{DD} + 0.5^*$                                 | V                |
| Output Voltage                                                           | $V_O$     | $-0.5 \sim V_{DD} + 0.5^*$                                 | V                |
| Peak Input • Output Current                                              | $\pm I_I$ | max. 10                                                    | mA               |
| Power Dissipation (per package)                                          | $P_D$     | max. 400                                                   | mW               |
| $T_a = -40 \sim +60^\circ\text{C}$<br>$T_a = +60 \sim +85^\circ\text{C}$ |           | Decrease up to 200mW rating at $8\text{mW}/^\circ\text{C}$ |                  |
| Power Dissipation (per output terminal)                                  | $P_D$     | max. 100                                                   | mW               |
| Operating Ambient Temperature                                            | $T_{opr}$ | $-40 \sim +85$                                             | $^\circ\text{C}$ |
| Storage Temperature                                                      | $T_{stg}$ | $-65 \sim +150$                                            | $^\circ\text{C}$ |

\*  $V_{DD} + 0.5\text{V}$  should be under 18V

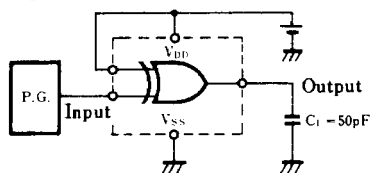
■ DC Characteristics ( $V_{SS}=0V$ )

| Item                              | $V_{DD}$<br>(V) | Sym-<br>bol | Conditions                                        | $T_a = -40^\circ C$ |      | $T_a = 25^\circ C$ |      | $T_a = 85^\circ C$ |      | Unit    |
|-----------------------------------|-----------------|-------------|---------------------------------------------------|---------------------|------|--------------------|------|--------------------|------|---------|
|                                   |                 |             |                                                   | min.                | max. | min.               | max. | min.               | max. |         |
| Quiescent Power<br>Supply Current | 5               | $I_{DD}$    | $V_i = V_{SS}$ or $V_{DD}$                        | —                   | 1    | —                  | 1    | —                  | 7.5  | $\mu A$ |
|                                   | 10              |             |                                                   | —                   | 2    | —                  | 2    | —                  | 15   |         |
|                                   | 15              |             |                                                   | —                   | 4    | —                  | 4    | —                  | 30   |         |
| Output Voltage<br>Low Level       | 5               | $V_{OL}$    | $V_i = V_{SS}$ or $V_{DD}$<br>$ I_{OI}  < 1\mu A$ | —                   | 0.05 | —                  | 0.05 | —                  | 0.05 | V       |
|                                   | 10              |             |                                                   | —                   | 0.05 | —                  | 0.05 | —                  | 0.05 |         |
|                                   | 15              |             |                                                   | —                   | 0.05 | —                  | 0.05 | —                  | 0.05 |         |
| Output Voltage<br>High Level      | 5               | $V_{OH}$    | $V_i = V_{SS}$ or $V_{DD}$<br>$ I_{OI}  < 1\mu A$ | 4.95                | —    | 4.95               | —    | 4.95               | —    | V       |
|                                   | 10              |             |                                                   | 9.95                | —    | 9.95               | —    | 9.95               | —    |         |
|                                   | 15              |             |                                                   | 14.95               | —    | 14.95              | —    | 14.95              | —    |         |
| Input Voltage<br>Low Level        | 5               | $V_{IL}$    | $ I_{OI}  < 1\mu A$<br>$V_O = 0.5V$ or $4.5V$     | —                   | 1.5  | —                  | 1.5  | —                  | 1.5  | V       |
|                                   | 10              |             |                                                   | —                   | 3    | —                  | 3    | —                  | 3    |         |
|                                   | 15              |             |                                                   | —                   | 4    | —                  | 4    | —                  | 4    |         |
| Input Voltage<br>High Level       | 5               | $V_{IH}$    | $ I_{OI}  < 1\mu A$<br>$V_O = 0.5V$ or $4.5V$     | 3.5                 | —    | 3.5                | —    | 3.5                | —    | V       |
|                                   | 10              |             |                                                   | 7                   | —    | 7                  | —    | 7                  | —    |         |
|                                   | 15              |             |                                                   | 11                  | —    | 11                 | —    | 11                 | —    |         |
| Output Current<br>Low Level       | 5               | $I_{OL}$    | $V_O = 0.4V, V_i = 0$ or $5V$                     | 0.52                | —    | 0.44               | —    | 0.36               | —    | mA      |
|                                   | 10              |             | $V_O = 0.5V, V_i = 0$ or $10V$                    | 1.3                 | —    | 1.1                | —    | 0.9                | —    |         |
|                                   | 15              |             | $V_O = 1.5V, V_i = 0$ or $15V$                    | 3.6                 | —    | 3                  | —    | 2.4                | —    |         |
| Output Current<br>High Level      | 5               | $-I_{OH}$   | $V_O = 4.6V, V_i = 0$ or $5V$                     | 0.52                | —    | 0.44               | —    | 0.36               | —    | mA      |
|                                   | 10              |             | $V_O = 9.5V, V_i = 0$ or $10V$                    | 1.3                 | —    | 1.1                | —    | 0.9                | —    |         |
|                                   | 15              |             | $V_O = 13.5V, V_i = 0$ or $15V$                   | 3.6                 | —    | 3                  | —    | 2.4                | —    |         |
| Output Current High Level         | 5               | $-I_{OH}$   | $V_O = 2.5V, V_i = 0$ or $5V$                     | 1.7                 | —    | 1.4                | —    | 1.1                | —    | mA      |
| Input Leakage Current             | 15              | $\pm I_I$   | $V_i = 0$ or $15V$                                | —                   | 0.3  | —                  | 0.3  | —                  | 1    | $\mu A$ |

■ Switching Characteristics ( $T_a = 25^\circ C, V_{SS} = 0V, C_L = 50pF$ )

| Item                   | $V_{DD}$ (V) | Symbol    | min. | typ. | max. | Unit |
|------------------------|--------------|-----------|------|------|------|------|
| Output Rise Time       | 5            | $t_{TLH}$ | —    | 60   | 180  | ns   |
|                        | 10           |           | —    | 30   | 90   |      |
|                        | 15           |           | —    | 20   | 60   |      |
| Output Fall Time       | 5            | $t_{THL}$ | —    | 60   | 180  | ns   |
|                        | 10           |           | —    | 30   | 90   |      |
|                        | 15           |           | —    | 20   | 60   |      |
| Propagation Delay Time | 5            | $t_{PLH}$ | —    | 75   | 225  | ns   |
|                        | 10           |           | —    | 30   | 90   |      |
|                        | 15           |           | —    | 25   | 75   |      |
| Propagation Delay Time | 5            | $t_{PHL}$ | —    | 85   | 255  | ns   |
|                        | 10           |           | —    | 35   | 105  |      |
|                        | 15           |           | —    | 30   | 90   |      |
| Input Capacitance      |              | $C_i$     | —    | —    | 7.5  | pF   |

1. Switching Time Test Circuit



2. Waveforms

