

# MN74HC386/MN74HC386S

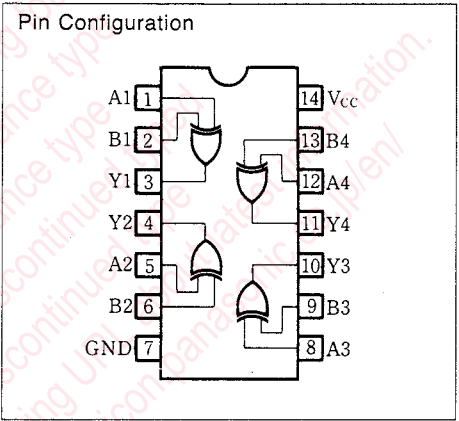
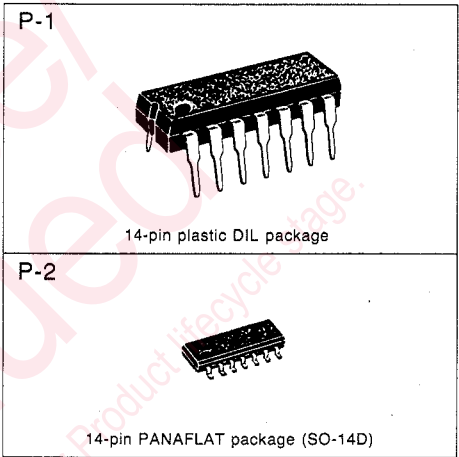
## Quad 2-Input Exclusive OR Gates

### Outline

The MN74HC386/MN74HC386S is constituted by 2-input exclusive OR gates having four built-in circuits in one chip. Owing to the silicon gate CMOS process, these OR gates have realized low power consumption and high noise immunity equivalent to those of a standard CMOS and the operation speed as high as of an LS TTL. The respective output can directly drive ten LS TTL inputs.

To protect the input and output against electrostatic breakdown, a resistor and a diode are used for the  $V_{CC}$  and the GND. The pin configuration and the function are the same as those of the standard 54LS/74LS logic family.

### Logic Diagram (1 Gate)



### Absolute Maximum Ratings

| Item                           |            |                           | Symbol            | Rating  | Unit        |
|--------------------------------|------------|---------------------------|-------------------|---|-------------|
| Supply voltage                 |            |                           | $V_{CC}$          | $-0.5\sim+7.0$                                      | V           |
| Input output voltage           |            |                           | $V_I, V_O$        | $-0.5\sim V_{CC}+0.5$                               | V           |
| Input protective diode current |            |                           | $I_{IK}$          | $\pm 20$  | mA          |
| Output parasitic diode current |            |                           | $I_{OK}$          | $\pm 20$  | mA          |
| Output current                 |            |                           | $I_O$             | $\pm 25$  | mA          |
| Supply current                 |            |                           | $I_{CC}, I_{GND}$ | $\pm 50$  | mA          |
| Storage temperature            |            |                           | $T_{stg}$         | $-65\sim+150$                                       | $^{\circ}C$ |
| Power<br>dissipation           | MN74HC386  | $T_a=-40\sim+60^{\circ}C$ | $P_D$             | 400   | mW          |
|                                |            | $T_a=+60\sim+85^{\circ}C$ |                   | Decrease to 200mW at the rate of 8mW/ $^{\circ}C$   |             |
|                                | MN74HC386S | $T_a=-40\sim+60^{\circ}C$ | $P_D$             | 275   | mW          |
|                                |            | $T_a=+60\sim+85^{\circ}C$ |                   | Decrease to 200mW at the rate of 3.8mW/ $^{\circ}C$ |             |

## ■ Recommended Operating Conditions

| Item                           | Symbol                          | V <sub>cc</sub> (V) | Rating            | Unit |
|--------------------------------|---------------------------------|---------------------|-------------------|------|
| Operating power supply voltage | V <sub>cc</sub>                 |                     | 1.4~6.0           | V    |
| Input output voltage           | V <sub>i</sub> , V <sub>o</sub> |                     | 0~V <sub>cc</sub> | V    |
| Operating temperature          | T <sub>A</sub>                  |                     | -40~+85           | °C   |
| Input rise, fall time          | t <sub>r</sub> , t <sub>f</sub> | 2.0                 | 0~1000            | ns   |
|                                |                                 | 4.5                 | 0~500             | ns   |
|                                |                                 | 6.0                 | 0~400             | ns   |

## ■ DC Characteristics (GND=0V)

| Item                      | Symbol          | V <sub>CC</sub><br>(V) | Test Condition  |                |      | Temperature |      |      |              |      | Unit |
|---------------------------|-----------------|------------------------|---|----------------|------|-------------|------|------|--------------|------|------|
|                           |                 |                        | V <sub>I</sub>  | I <sub>O</sub> | Unit | Ta=25°C     |      |      | Ta=-40~+85°C |      |      |
|                           |                 |                        |   |                |      | min.        | typ. | max. | min.         | max. |      |
| Input voltage high level  | V <sub>IH</sub> | 2.0                    |   |                |      | 1.5         |      |      | 1.5          |      | V    |
|                           |                 | 4.5                    |   |                |      | 3.15        |      |      | 3.15         |      |      |
|                           |                 | 6.0                    |   |                |      | 4.2         |      |      | 4.2          |      |      |
| Input voltage low level   | V <sub>IL</sub> | 2.0                    |   |                |      |             |      | 0.3  |              | 0.3  | V    |
|                           |                 | 4.5                    |   |                |      |             |      | 0.9  |              | 0.9  |      |
|                           |                 | 6.0                    |   |                |      |             |      | 1.2  |              | 1.2  |      |
| Output voltage high level | V <sub>OH</sub> | 2.0                    | V <sub>IH</sub><br>or<br>V <sub>IL</sub>                  | -20.0          | μA   | 1.9         | 2.0  |      | 1.9          |      | V    |
|                           |                 | 4.5                    |   | -20.0          | μA   | 4.4         | 4.5  |      | 4.4          |      |      |
|                           |                 | 6.0                    |   | -20.0          | μA   | 5.9         | 6.0  |      | 5.9          |      |      |
|                           |                 | 4.5                    |   | -4.0           | mA   | 3.92        |      |      | 3.84         |      |      |
|                           |                 | 6.0                    |   | -5.2           | mA   | 5.48        |      |      | 5.34         |      |      |
| Output voltage low level  | V <sub>OL</sub> | 2.0                    | V <sub>IH</sub>   | 20.0           | μA   |             | 0.0  | 0.1  |              | 0.1  | V    |
|                           |                 | 4.5                    |   | 20.0           | μA   |             | 0.0  | 0.1  |              | 0.1  |      |
|                           |                 | 6.0                    |   | 20.0           | μA   |             | 0.0  | 0.1  |              | 0.1  |      |
|                           |                 | 4.5                    |   | 4.0            | mA   |             |      | 0.26 |              | 0.33 |      |
|                           |                 | 6.0                    |   | 5.2            | mA   |             |      | 0.26 |              | 0.33 |      |
| Input leakage current     | I <sub>I</sub>  | 6.0                    | V <sub>I</sub> =V <sub>CC</sub> or GND                    |                |      |             |      | ±0.1 |              | ±1.0 | μA   |
| Static supply current     | I <sub>CC</sub> | 6.0                    | V <sub>I</sub> =V <sub>CC</sub> or GND, I <sub>O</sub> =0 |                |      |             |      | 2.0  |              | 20.0 | μA   |

■ AC Characteristics (GND=0V, Input transition time ≤ 6ns, C<sub>L</sub>=50pF)

| Item                   | Symbol           | V <sub>CC</sub><br>(V) | Test Condition | Temperature |      |      |              |      | Unit |
|------------------------|------------------|------------------------|----------------|-------------|------|------|--------------|------|------|
|                        |                  |                        |                | Ta=25°C     |      |      | Ta=-40~+85°C |      |      |
|                        |                  |                        |                | min.        | typ. | max. | min.         | max. |      |
| Output rise time       | t <sub>TLH</sub> | 2.0                    |                |             | 25   | 75   |              | 95   | ns   |
|                        |                  | 4.5                    |                |             | 8    | 15   |              | 19   |      |
|                        |                  | 6.0                    |                |             | 7    | 13   |              | 16   |      |
| Output fall time       | t <sub>THL</sub> | 2.0                    |                |             | 20   | 75   |              | 95   | ns   |
|                        |                  | 4.5                    |                |             | 7    | 15   |              | 19   |      |
|                        |                  | 6.0                    |                |             | 6    | 13   |              | 16   |      |
| Propagation time (L→H) | t <sub>PLH</sub> | 2.0                    |                |             | 25   | 75   |              | 95   | ns   |
|                        |                  | 4.5                    |                |             | 8    | 15   |              | 19   |      |
|                        |                  | 6.0                    |                |             | 7    | 13   |              | 16   |      |
| Propagation time (H→L) | t <sub>PHL</sub> | 2.0                    |                |             | 25   | 75   |              | 95   | ns   |
|                        |                  | 4.5                    |                |             | 8    | 15   |              | 19   |      |
|                        |                  | 6.0                    |                |             | 7    | 13   |              | 16   |      |

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