

# Quad 2-input NOR gate

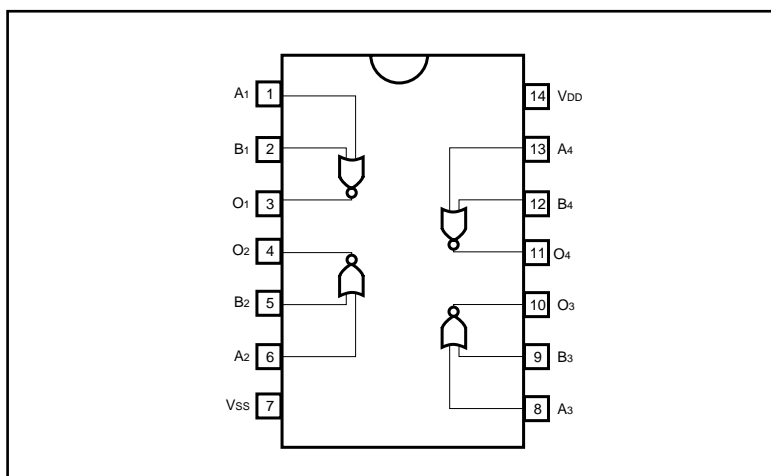
## BU4001B / BU4001BF

The BU4001B and BU4001BF are 2-input positive logic NOR gates, each with four built-in circuits. A buffer achieved by an inverter added at the gate output improves the input / output propagation characteristic and minimizes variation in the propagation time caused by increase of the load capacitance.

●Features

- 1) Low power dissipation.
- 2) Wide range of operating power supply voltage.
- 3) High input impedance.
- 4) High fan-out.
- 5) Direct drive of 2 L-TTL inputs and 1 LS-TTL input.

●Block diagram



●Absolute maximum ratings ( $V_{SS} = 0V$ ,  $T_a = 25^{\circ}C$ )

| Parameter             | Symbol    | Limits                 | Unit        |
|-----------------------|-----------|------------------------|-------------|
| Power supply voltage  | $V_{DD}$  | - 0.3 ~ + 18           | V           |
| Power dissipation     | $P_d$     | 1000 (DIP), 450 (SOP)  | mW          |
| Operating temperature | $T_{opr}$ | - 40 ~ + 85            | $^{\circ}C$ |
| Storage temperature   | $T_{stg}$ | - 55 ~ + 150           | $^{\circ}C$ |
| Input voltage         | $V_{IN}$  | - 0.3 ~ $V_{DD} + 0.3$ | V           |

## ●Electrical characteristics

DC characteristics (unless otherwise noted,  $V_{SS} = 0V$ ,  $T_a = 25^\circ C$ )

| Parameter                  | Symbol          | Min.  | Typ. | Max. | Unit | V <sub>DD</sub> (V) | Conditions                              | Measurement circuit |
|----------------------------|-----------------|-------|------|------|------|---------------------|---|---------------------|
|                            |                 |       |      |      |      |                     |   |                     |
| Input high level voltage   | V <sub>IH</sub> | 3.5   | —    | —    | V    | 5                   | —                                       | Fig.1               |
|                            |                 | 7.0   | —    | —    |      | 10                  |   |                     |
|                            |                 | 11.0  | —    | —    |      | 15                  |   |                     |
| Input low level voltage    | V <sub>IL</sub> | —     | —    | 1.5  | V    | 5                   | —                                       | Fig.1               |
|                            |                 | —     | —    | 3.0  |      | 10                  |   |                     |
|                            |                 | —     | —    | 4.0  |      | 15                  |   |                     |
| Input high level current   | I <sub>IH</sub> | —     | —    | 0.3  | μA   | 15                  | V <sub>IH</sub> = 15V                   | Fig.1               |
| Input low level current    | I <sub>IL</sub> | —     | —    | -0.3 | μA   | 15                  | V <sub>IL</sub> = 0V                    | Fig.1               |
| Output high level voltage  | V <sub>OH</sub> | 4.95  | —    | —    | V    | 5                   | I <sub>O</sub> = 0mA                    | Fig.1               |
|                            |                 | 9.95  | —    | —    |      | 10                  |   |                     |
|                            |                 | 14.95 | —    | —    |      | 15                  |   |                     |
| Output low level voltage   | V <sub>OL</sub> | —     | —    | 0.05 | V    | 5                   | I <sub>O</sub> = 0mA                    | Fig.1               |
|                            |                 | —     | —    | 0.05 |      | 10                  |   |                     |
|                            |                 | —     | —    | 0.05 |      | 15                  |   |                     |
| Output high level current  | I <sub>OH</sub> | -0.16 | —    | —    | mA   | 5                   | V <sub>OH</sub> = 4.6V                  | Fig.1               |
|                            |                 | -0.4  | —    | —    |      | 10                  | V <sub>OH</sub> = 9.5V                  |                     |
|                            |                 | -1.2  | —    | —    |      | 15                  | V <sub>OH</sub> = 13.5V                 |                     |
| Output low level current   | I <sub>OL</sub> | 0.44  | —    | —    | mA   | 5                   | V <sub>OL</sub> = 0.4V                  | Fig.1               |
|                            |                 | 1.1   | —    | —    |      | 10                  | V <sub>OL</sub> = 0.5V                  |                     |
|                            |                 | 3.0   | —    | —    |      | 15                  | V <sub>OL</sub> = 1.5V                  |                     |
| Static current dissipation | I <sub>DD</sub> | —     | —    | 1    | μA   | 5                   | V <sub>I</sub> = V <sub>DD</sub> or GND | —                   |
|                            |                 | —     | —    | 2    |      | 10                  |   |                     |
|                            |                 | —     | —    | 4    |      | 15                  |   |                     |

Switching characteristics (unless otherwise noted,  $V_{SS} = 0V$ ,  $T_a = 25^\circ C$ ,  $C_L = 50pF$ )

| Parameter                          | Symbol           | Min. | Typ. | Max. | Unit | V <sub>DD</sub> (V) | Conditions | Measurement circuit |
|------------------------------------|------------------|------|------|------|------|---------------------|------------|---------------------|
|                                    |                  |      |      |      |      | 5                   |            |                     |
| Output rise time                   | t <sub>TLH</sub> | —    | 180  | —    | ns   | 5                   | —          | Fig.2               |
|                                    |                  | —    | 90   | —    |      | 10                  |            |                     |
|                                    |                  | —    | 65   | —    |      | 15                  |            |                     |
| Output fall time                   | t <sub>THL</sub> | —    | 100  | —    | ns   | 5                   | —          | Fig.2               |
|                                    |                  | —    | 50   | —    |      | 10                  |            |                     |
|                                    |                  | —    | 40   | —    |      | 15                  |            |                     |
| Propagation delay time, "L" to "H" | t <sub>PLH</sub> | —    | 90   | —    | ns   | 5                   | —          | Fig.2               |
|                                    |                  | —    | 50   | —    |      | 10                  |            |                     |
|                                    |                  | —    | 40   | —    |      | 15                  |            |                     |
| Propagation delay time, "H" to "L" | t <sub>PHL</sub> | —    | 90   | —    | ns   | 5                   | —          | Fig.2               |
|                                    |                  | —    | 50   | —    |      | 10                  |            |                     |
|                                    |                  | —    | 40   | —    |      | 15                  |            |                     |
| Input capacitance                  | C <sub>IN</sub>  | —    | 5    | —    | pF   | —                   | —          | —                   |

● Measurement circuits

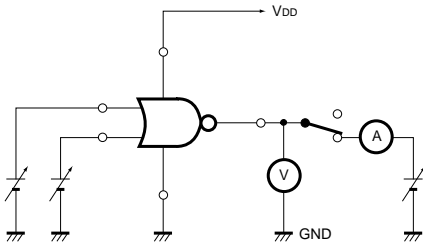


Fig.1 DC characteristics

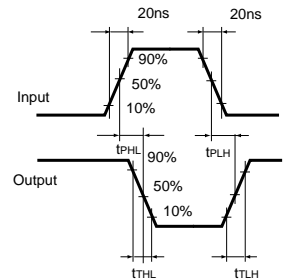
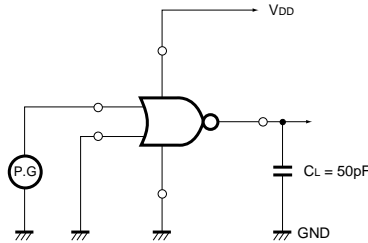


Fig.2 Switching characteristics

● Electrical characteristic curve

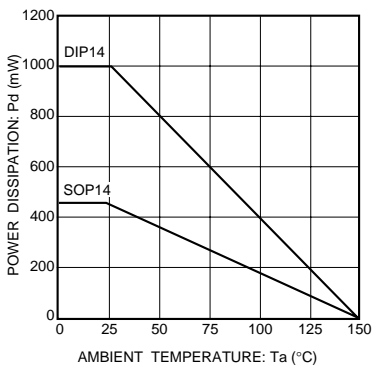
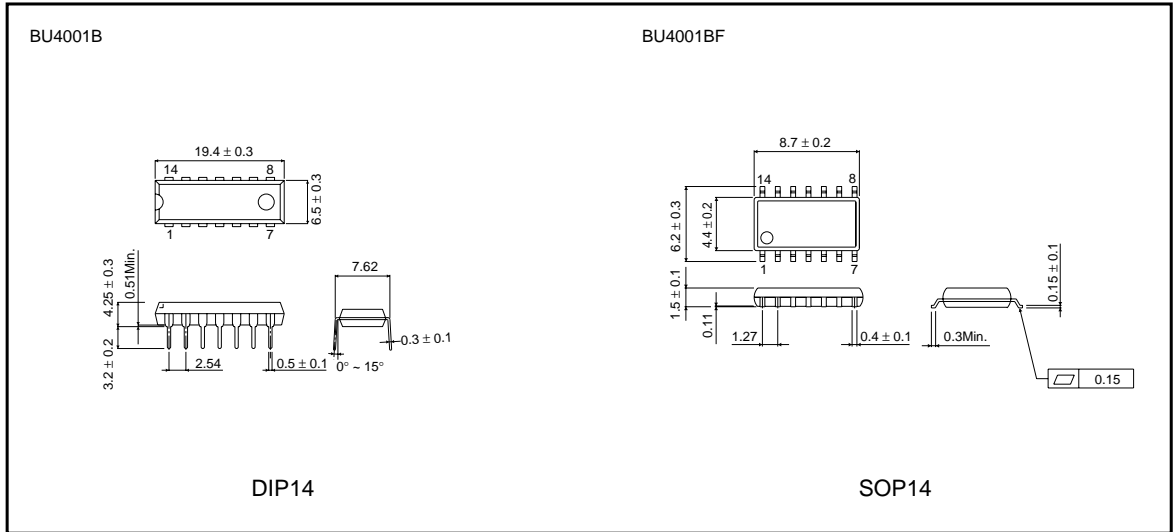


Fig.3 Power dissipation vs. Ta characteristic

●External dimensions (Units: mm)



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