

# Quad 2-input NAND gate

## BU4011B / BU4011BF / BU4011BFV

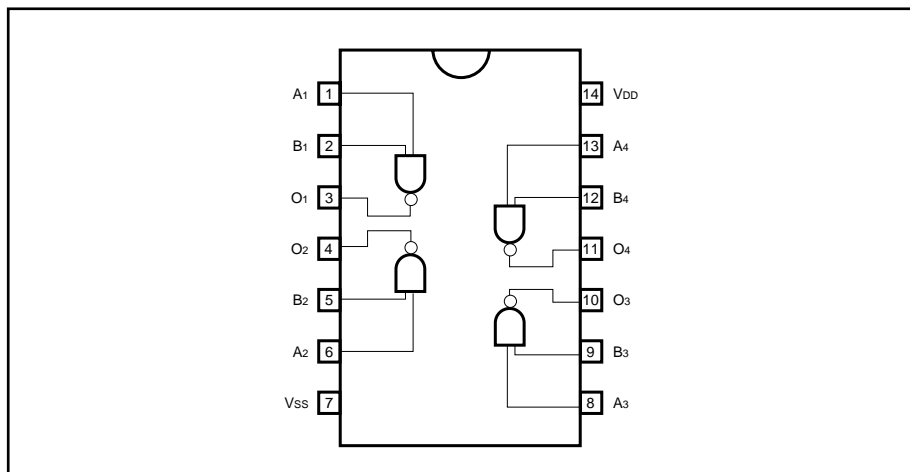
The BU4011B, BU4011BF, and BU4011BFV are dual-input positive logic NAND gates.

Four circuits are contained on a single chip. An inverter-based buffer has been added to the gate output, enabling improved input / output propagation characteristics, and an increased load capacitance minimizes fluctuation in propagation time.

●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)<br>350 (SSOP-B14) | 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, Ta = 25°C, Vss = 0V, CL = 50pF)

| Parameter                         | Symbol           | Min. | Typ. | Max. | Unit. | VDD (V) | Conditions | Measurement circuit |
|-----------------------------------|------------------|------|------|------|-------|---------|------------|---------------------|
|                                   |                  |      |      |      |       | 5       |            |                     |
| Output rise time                  | t <sub>TLH</sub> | —    | 180  | 360  | ns    | 5       | —          | Fig. 2              |
|                                   |                  | —    | 90   | 180  |       | 10      |            |                     |
|                                   |                  | —    | 65   | 130  |       | 15      |            |                     |
| Output fall time                  | t <sub>THL</sub> | —    | 100  | 200  | ns    | 5       | —          | Fig. 2              |
|                                   |                  | —    | 50   | 100  |       | 10      |            |                     |
|                                   |                  | —    | 40   | 80   |       | 15      |            |                     |
| “L” to “H” Propagation delay time | t <sub>PLH</sub> | —    | 90   | 180  | ns    | 5       | —          | Fig. 2              |
|                                   |                  | —    | 50   | 100  |       | 10      |            |                     |
|                                   |                  | —    | 40   | 80   |       | 15      |            |                     |
| “H” to “L” Propagation delay time | t <sub>PHL</sub> | —    | 90   | 180  | ns    | 5       | —          | Fig. 2              |
|                                   |                  | —    | 50   | 100  |       | 10      |            |                     |
|                                   |                  | —    | 40   | 80   |       | 15      |            |                     |
| Input capacitance                 | C <sub>IN</sub>  | —    | 5    | —    | pF    | —       | —          | —                   |

● Measurement circuits

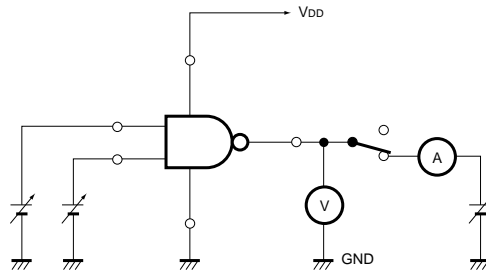


Fig. 1 DC characteristics

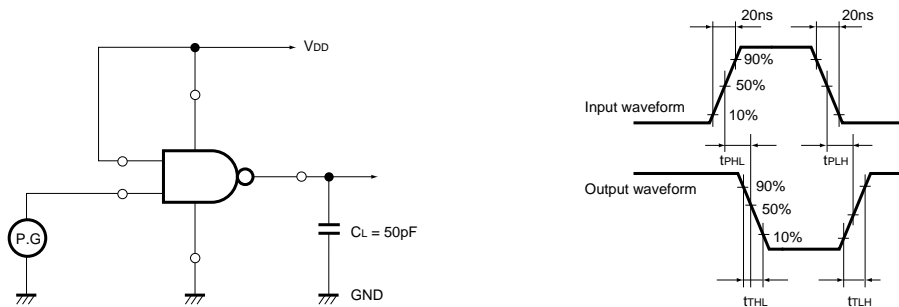


Fig. 2 Switching characteristics

●Electrical characteristic curve

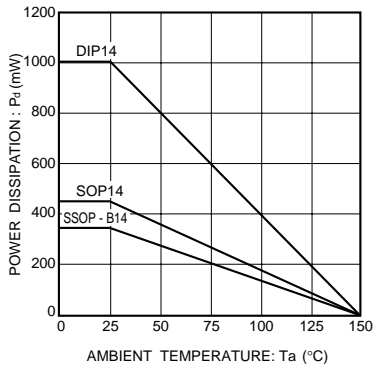


Fig. 3 Power dissipation vs. Ta

●External dimensions (Units: mm)

