

# HD74ALVC1G00

## 2-input NAND Gate

REJ03D0105-0600

Rev.6.00

Jun.20.2005

### Description

The HD74ALVC1G00 has two-input NAND gate in a 5 pin package. Low voltage and high-speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

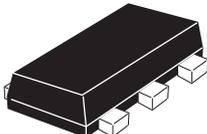
### Features

- The basic gate function is lined up as Renesas uni logic series.
- Supplied on emboss taping for high-speed automatic mounting.
- Supply voltage range : 1.2 to 3.6 V  
Operating temperature range : -40 to +85°C
- All inputs  $V_{IH}$  (Max.) = 3.6 V (@ $V_{CC}$  = 0 V to 3.6 V)  
All outputs  $V_O$  (Max.) = 3.6 V (@ $V_{CC}$  = 0 V)
- Output current    $\pm 2$  mA (@ $V_{CC}$  = 1.2 V)  
                           $\pm 4$  mA (@ $V_{CC}$  = 1.4 V to 1.6 V)  
                           $\pm 6$  mA (@ $V_{CC}$  = 1.65 V to 1.95 V)  
                           $\pm 18$  mA (@ $V_{CC}$  = 2.3 V to 2.7 V)  
                           $\pm 24$  mA (@ $V_{CC}$  = 3.0 V to 3.6 V)
- Ordering Information

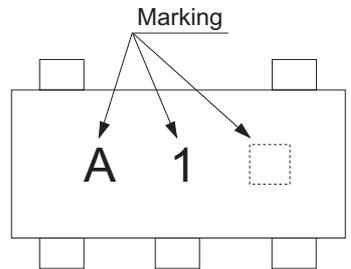
| Part Name       | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|-----------------|--------------|------------------------------|----------------------|--------------------------------|
| HD74ALVC1G00VSE | VSON-5 pin   | PUSN0005KA-A (TNP-5DV)       | VS                   | E (3,000 pcs/reel)             |

### Outline and Article Indication

• HD74ALVC1G00



VSON-5



Marking

□ = Control code

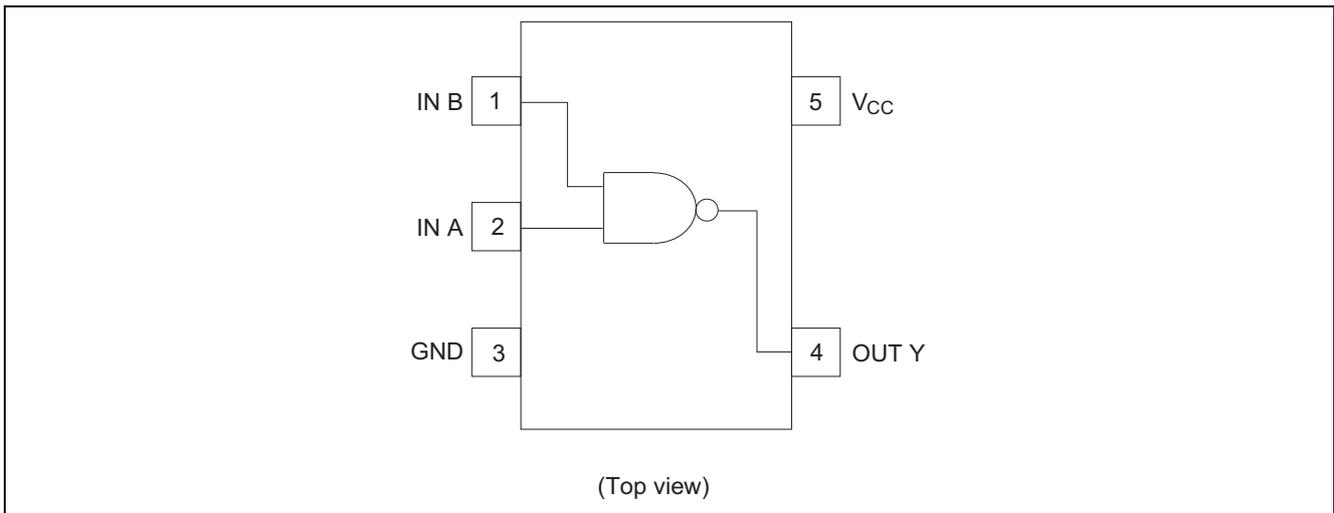
**Function Table**

| Inputs |   | Output |
|--------|---|--------|
| A      | B | Y      |
| L      | L | H      |
| L      | H | H      |
| H      | L | H      |
| H      | H | L      |

H : High level

L : Low level

**Pin Arrangement**



**Absolute Maximum Ratings**

| Item  | Symbol                | Ratings                | Unit             | Test Conditions             |
|---|-----------------------|------------------------|------------------|-----------------------------|
| Supply voltage range  | $V_{CC}$              | -0.5 to 4.6            | V                |                             |
| Input voltage range *1  | $V_I$                 | -0.5 to 4.6            | V                |                             |
| Output voltage range *1, 2  | $V_O$                 | -0.5 to $V_{CC} + 0.5$ | V                | Output : H or L             |
|   |                       | -0.5 to 4.6            |                  | $V_{CC}$ : OFF              |
| Input clamp current   | $I_{IK}$              | -50                    | mA               | $V_I < 0$                   |
| Output clamp current  | $I_{OK}$              | $\pm 50$               | mA               | $V_O < 0$ or $V_O > V_{CC}$ |
| Continuous output current   | $I_O$                 | $\pm 50$               | mA               | $V_O = 0$ to $V_{CC}$       |
| Continuous current through $V_{CC}$ or GND                              | $I_{CC}$ or $I_{GND}$ | $\pm 100$              | mA               |                             |
| Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) *3 | $P_T$                 | 200                    | mW               |                             |
| Storage temperature   | $T_{stg}$             | -65 to 150             | $^\circ\text{C}$ |                             |

Notes: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore no two of which may be realized at the same time.

1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 4.6 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150 $^\circ\text{C}$ .

### Recommended Operating Conditions

| Item                               | Symbol          | Min | Max             | Unit   | Conditions                     |
|------------------------------------|-----------------|-----|-----------------|--------|--------------------------------|
| Supply voltage range               | V <sub>CC</sub> | 1.2 | 3.6             | V      |                                |
| Input voltage range                | V <sub>I</sub>  | 0   | 3.6             | V      |                                |
| Output voltage range               | V <sub>O</sub>  | 0   | V <sub>CC</sub> | V      |                                |
| Output current                     | I <sub>OH</sub> | —   | -2              | mA     | V <sub>CC</sub> = 1.2 V        |
|                                    |                 | —   | -4              |        | V <sub>CC</sub> = 1.4 V        |
|                                    |                 | —   | -6              |        | V <sub>CC</sub> = 1.65 V       |
|                                    |                 | —   | -18             |        | V <sub>CC</sub> = 2.3 V        |
|                                    |                 | —   | -24             |        | V <sub>CC</sub> = 3.0 V        |
|                                    | I <sub>OL</sub> | —   | 2               |        | V <sub>CC</sub> = 1.2 V        |
|                                    |                 | —   | 4               |        | V <sub>CC</sub> = 1.4 V        |
|                                    |                 | —   | 6               |        | V <sub>CC</sub> = 1.65 V       |
|                                    |                 | —   | 18              |        | V <sub>CC</sub> = 2.3 V        |
|                                    |                 | —   | 24              |        | V <sub>CC</sub> = 3.0 V        |
| Input transition rise or fall rate | Δt / Δv         | 0   | 20              | ns / V | V <sub>CC</sub> = 1.2 to 2.7 V |
|                                    |                 | 0   | 10              |        | V <sub>CC</sub> = 3.3±0.3 V    |
| Operating free-air temperature     | T <sub>a</sub>  | -40 | 85              | °C     |                                |

Note: Unused or floating inputs must be held high or low.

### Electrical Characteristics

T<sub>a</sub> = -40 to 85°C

| Item                     | Symbol           | V <sub>CC</sub> (V) * | Min                   | Typ | Max                   | Unit | Test condition   |
|--------------------------|------------------|-----------------------|-----------------------|-----|-----------------------|------|--|
| Input voltage            | V <sub>IH</sub>  | 1.2                   | V <sub>CC</sub> ×0.75 | —   | —                     | V    |  |
|                          |                  | 1.4 to 1.6            | V <sub>CC</sub> ×0.7  | —   | —                     |      |  |
|                          |                  | 1.65 to 1.95          | V <sub>CC</sub> ×0.7  | —   | —                     |      |  |
|                          |                  | 2.3 to 2.7            | 1.7                   | —   | —                     |      |  |
|                          |                  | 3.0 to 3.6            | 2.0                   | —   | —                     |      |  |
|                          | V <sub>IL</sub>  | 1.2                   | —                     | —   | V <sub>CC</sub> ×0.25 |      |  |
|                          |                  | 1.4 to 1.6            | —                     | —   | V <sub>CC</sub> ×0.3  |      |  |
|                          |                  | 1.65 to 1.95          | —                     | —   | V <sub>CC</sub> ×0.3  |      |  |
|                          |                  | 2.3 to 2.7            | —                     | —   | 0.7                   |      |  |
|                          |                  | 3.0 to 3.6            | —                     | —   | 0.8                   |      |  |
| Output voltage           | V <sub>OH</sub>  | Min to Max            | V <sub>CC</sub> -0.2  | —   | —                     | V    | I <sub>OH</sub> = -100 μA                                    |
|                          |                  | 1.2                   | 0.9                   | —   | —                     |      | I <sub>OH</sub> = -2 mA                                      |
|                          |                  | 1.4                   | 1.1                   | —   | —                     |      | I <sub>OH</sub> = -4 mA                                      |
|                          |                  | 1.65                  | 1.2                   | —   | —                     |      | I <sub>OH</sub> = -6 mA                                      |
|                          |                  | 2.3                   | 1.7                   | —   | —                     |      | I <sub>OH</sub> = -18 mA                                     |
|                          |                  | 3.0                   | 2.2                   | —   | —                     |      | I <sub>OH</sub> = -24 mA                                     |
|                          | V <sub>OL</sub>  | Min to Max            | —                     | —   | 0.2                   |      | I <sub>OL</sub> = 100 μA                                     |
|                          |                  | 1.2                   | —                     | —   | 0.3                   |      | I <sub>OL</sub> = 2 mA                                       |
|                          |                  | 1.4                   | —                     | —   | 0.3                   |      | I <sub>OL</sub> = 4 mA                                       |
|                          |                  | 1.65                  | —                     | —   | 0.3                   |      | I <sub>OL</sub> = 6 mA                                       |
|                          |                  | 2.3                   | —                     | —   | 0.55                  |      | I <sub>OL</sub> = 18 mA                                      |
|                          |                  | 3.0                   | —                     | —   | 0.55                  |      | I <sub>OL</sub> = 24 mA                                      |
| Input current            | I <sub>IN</sub>  | 3.6                   | —                     | —   | ±5                    | μA   | V <sub>IN</sub> = 3.6 V or GND                               |
| Quiescent supply current | I <sub>CC</sub>  | 3.6                   | —                     | —   | 10                    | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0 |
| Output leakage current   | I <sub>OFF</sub> | 0                     | —                     | —   | 5                     | μA   | V <sub>I</sub> or V <sub>O</sub> = 0 to 3.6 V                |
| Input capacitance        | C <sub>IN</sub>  | 3.3                   | —                     | 4.5 | —                     | pF   | V <sub>IN</sub> = V <sub>CC</sub> or GND                     |

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

## Switching Characteristics

$V_{CC} = 1.2\text{ V}$

| Item                   | Symbol           | Ta = -40 to 85°C |     |     | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|------------------|-----|-----|------|------------------------|--------------|-------------|
|                        |                  | Min              | Typ | Max |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | —                | 7.5 | —   | ns   | C <sub>L</sub> = 15 pF | A or B       | Y           |
|                        | t <sub>PHL</sub> |                  |     |     |      |                        |              |             |

$V_{CC} = 1.5 \pm 0.1\text{ V}$

| Item                   | Symbol           | Ta = -40 to 85°C |     |     | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|------------------|-----|-----|------|------------------------|--------------|-------------|
|                        |                  | Min              | Typ | Max |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | 2.0              | —   | 7.0 | ns   | C <sub>L</sub> = 15 pF | A or B       | Y           |
|                        | t <sub>PHL</sub> |                  |     |     |      |                        |              |             |

$V_{CC} = 1.8 \pm 0.15\text{ V}$

| Item                   | Symbol           | Ta = -40 to 85°C |     |     | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|------------------|-----|-----|------|------------------------|--------------|-------------|
|                        |                  | Min              | Typ | Max |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | 1.5              | —   | 5.0 | ns   | C <sub>L</sub> = 30 pF | A or B       | Y           |
|                        | t <sub>PHL</sub> |                  |     |     |      |                        |              |             |

$V_{CC} = 2.5 \pm 0.2\text{ V}$

| Item                   | Symbol           | Ta = -40 to 85°C |     |     | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|------------------|-----|-----|------|------------------------|--------------|-------------|
|                        |                  | Min              | Typ | Max |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | 1.0              | —   | 3.7 | ns   | C <sub>L</sub> = 30 pF | A or B       | Y           |
|                        | t <sub>PHL</sub> |                  |     |     |      |                        |              |             |

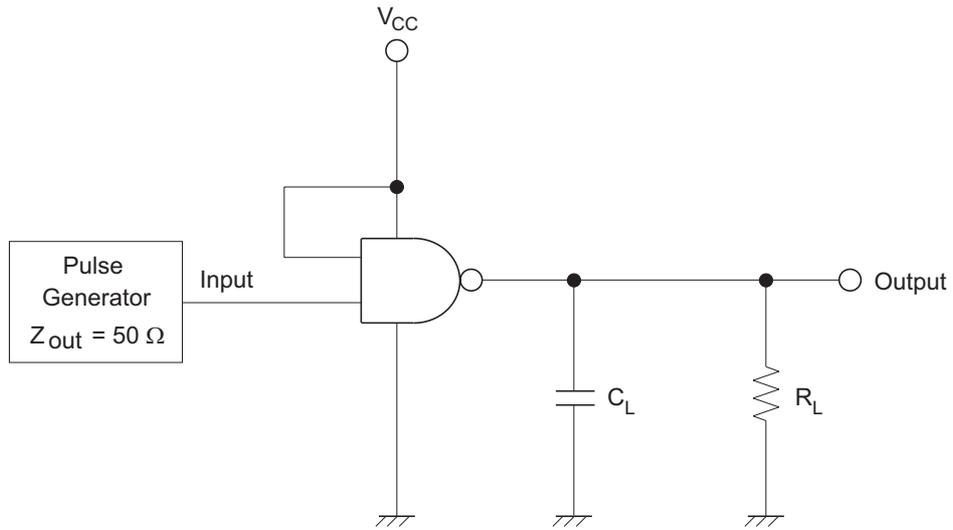
$V_{CC} = 3.3 \pm 0.3\text{ V}$

| Item                   | Symbol           | Ta = -40 to 85°C |     |     | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|------------------|-----|-----|------|------------------------|--------------|-------------|
|                        |                  | Min              | Typ | Max |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | 1.0              | —   | 2.8 | ns   | C <sub>L</sub> = 30 pF | A or B       | Y           |
|                        | t <sub>PHL</sub> |                  |     |     |      |                        |              |             |

## Operating Characteristics

| Item                          | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |      |     | Unit | Test Conditions |
|-------------------------------|-----------------|---------------------|-----------|------|-----|------|-----------------|
|                               |                 |                     | Min       | Typ  | Max |      |                 |
| Power dissipation capacitance | C <sub>PD</sub> | 1.5                 | —         | 10.5 | —   | pF   | f = 10 MHz      |
|                               |                 | 1.8                 | —         | 10.5 | —   |      |                 |
|                               |                 | 2.5                 | —         | 10.5 | —   |      |                 |
|                               |                 | 3.3                 | —         | 11.5 | —   |      |                 |

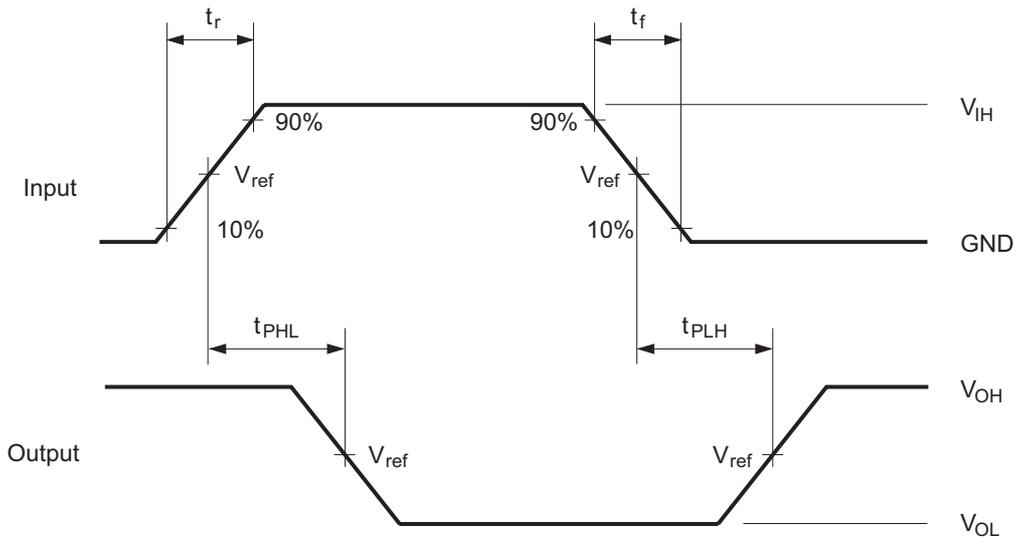
Test Circuit



| Symbol         | V <sub>CC</sub> = 1.2 V,<br>1.5±0.1 V | V <sub>CC</sub> = 1.8±0.15 V | V <sub>CC</sub> = 2.5±0.2 V,<br>3.3±0.3 V |
|----------------|---------------------------------------|------------------------------|---|
| R <sub>L</sub> | 2.0 kΩ                                | 1.0 kΩ                       | 500 Ω                                     |
| C <sub>L</sub> | 15 pF                                 | 30 pF                        | 30 pF                                     |

Note: C<sub>L</sub> includes probe and jig capacitance.

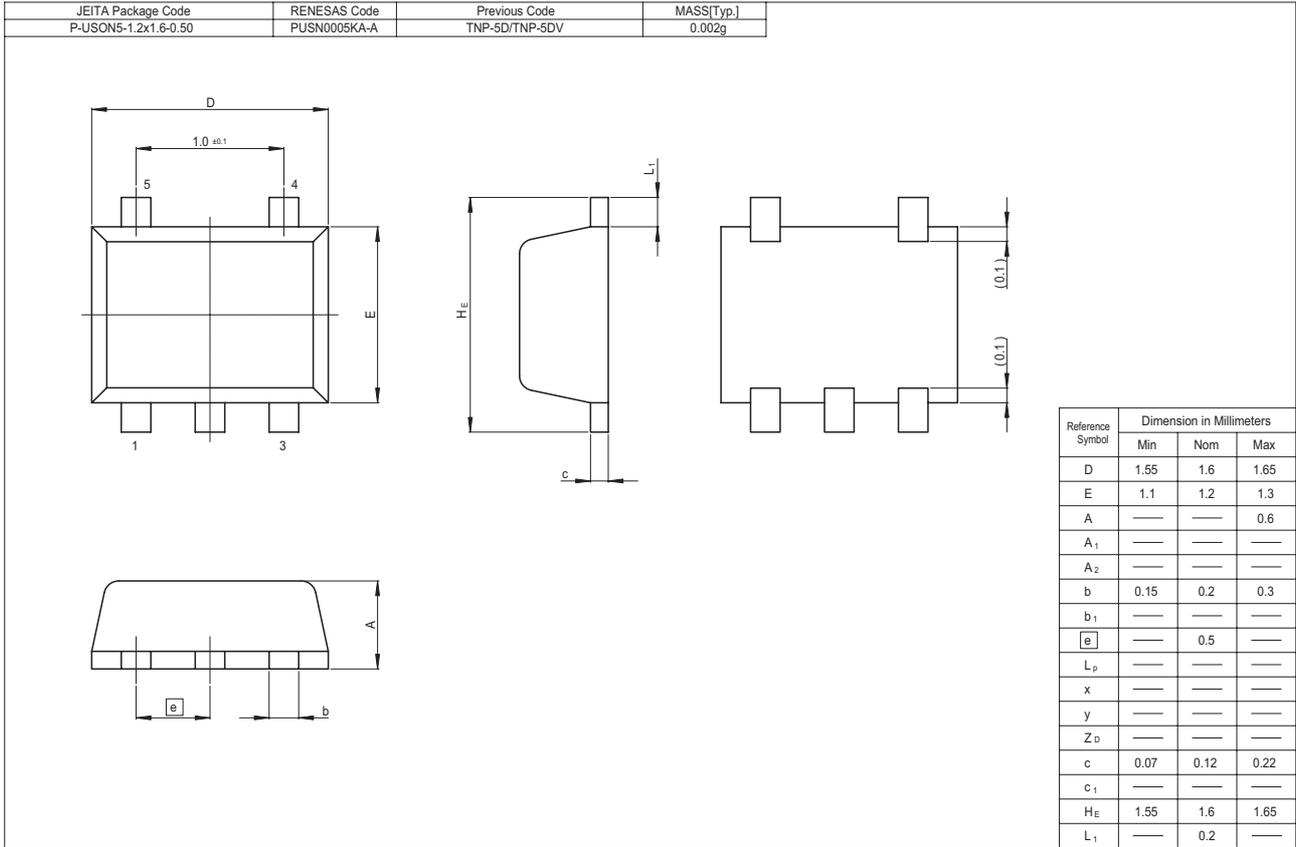
Waveforms



| Symbol      | $V_{CC} = 1.2\text{ V},$<br>$1.5 \pm 0.1\text{ V},$<br>$1.8 \pm 0.15\text{ V}$ | $V_{CC} = 2.5 \pm 0.2\text{ V}$ | $V_{CC} = 3.3 \pm 0.3\text{ V}$ |
|-------------|--|---------------------------------|---------------------------------|
| $t_r / t_f$ | 2.0 ns   | 2.5 ns                          | 2.5 ns                          |
| $V_{IH}$    | $V_{CC}$   | $V_{CC}$                        | 2.7 V                           |
| $V_{ref}$   | 50%  | 50%                             | 1.5 V                           |

Note: Input waveform : PRR = 10 MHz, duty cycle 50%

Package Dimensions



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