

## HD74LVC2G00

### Dual 2–Input NAND Gate

REJ03D0214–0100

Rev.1.00

Mar. 16, 2005

### Description

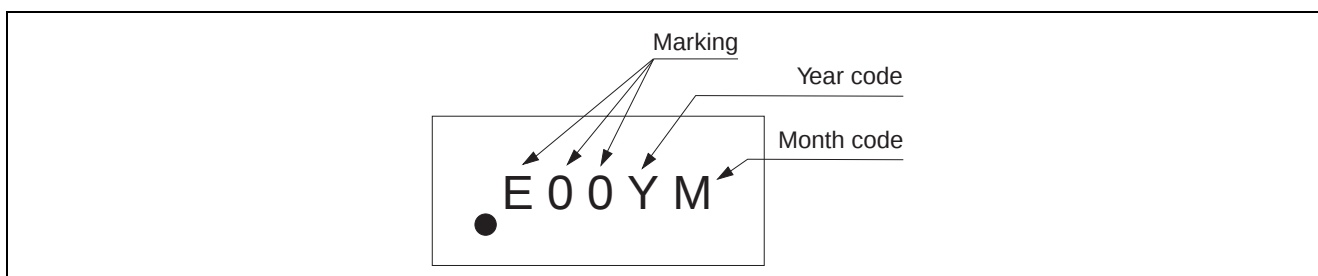
The HD74LVC2G00 has dual 2–input NAND gate in an 8-pin package. Low voltage and high-speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

### Features

- The basic gate function is lined up as renesas uni logic series.
- Supply voltage range: 1.65 to 5.5 V  
Operating temperature range: –40 to +85°C
- All inputs:  $V_{IH}$  (Max.) = 5.5 V (@ $V_{CC}$  = 0 V to 5.5 V)  
All outputs:  $V_O$  (Max.) = 5.5 V (@ $V_{CC}$  = 0 V)
- Output current:  $\pm 4$  mA (@ $V_{CC}$  = 1.65 V)  
 $\pm 8$  mA (@ $V_{CC}$  = 2.3 V)  
 $\pm 24$  mA (@ $V_{CC}$  = 3.0 V)  
 $\pm 32$  mA (@ $V_{CC}$  = 4.5 V)
- Ordering Information

| Part Name      | Package Type | Package Code<br>(Previous Code) | Package<br>Abbreviation | Taping Abbreviation<br>(Quantity) |
|----------------|--------------|---------------------------------|-------------------------|-----------------------------------|
| HD74LVC2G00CLE | WCSP–8 pin   | SXBG0008KB–A<br>(TBS–8AV)       | CL                      | E (3,000 pcs/reel)                |

### Article Indication



Function Table

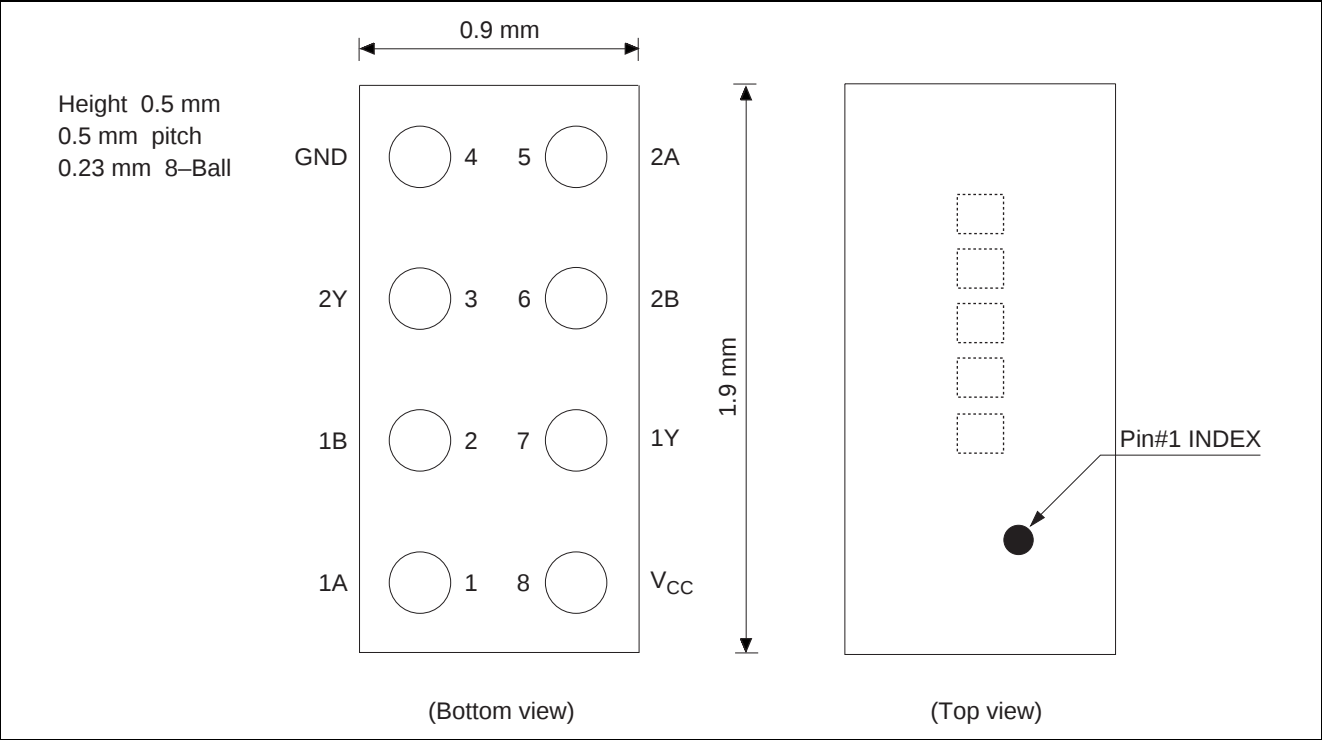
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| Inputs |   | Output Y |
|--------|---|----------|
| A      | B |          |
| L      | L | H        |
| L      | H | H        |
| H      | L | H        |
| H      | H | L        |

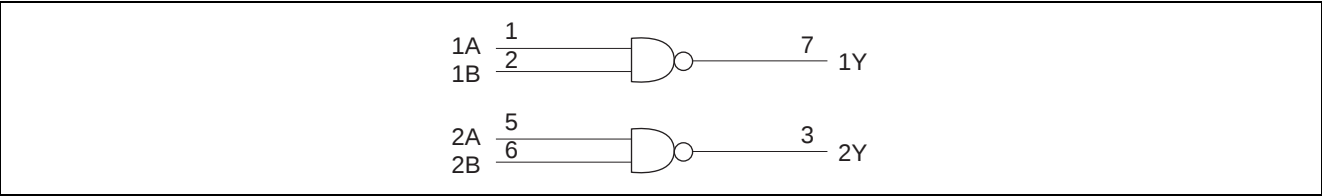
H: High level

L: Low level

Pin Arrangement



Logic Diagram



## Absolute Maximum Ratings

| Item                                       | Symbol                | Ratings                | Unit | Test Conditions       |
|--------------------------------------------|-----------------------|------------------------|------|-----------------------|
| Supply voltage range                       | $V_{CC}$              | −0.5 to 6.5            | V    |                       |
| Input voltage range <sup>*1</sup>          | $V_I$                 | −0.5 to 6.5            | V    |                       |
| Output voltage range <sup>*1, 2</sup>      | $V_O$                 | −0.5 to $V_{CC} + 0.5$ | V    | Output : H or L       |
|                                            |                       | −0.5 to 6.5            |      | $V_{CC}$ : OFF        |
| Input clamp current                        | $I_{IK}$              | −50                    | mA   | $V_I < 0$             |
| Output clamp current                       | $I_{OK}$              | −50                    | mA   | $V_O < 0$             |
| Continuous output current                  | $I_O$                 | ±50                    | mA   | $V_O = 0$ to $V_{CC}$ |
| Continuous current through $V_{CC}$ or GND | $I_{CC}$ or $I_{GND}$ | ±100                   | mA   |                       |
| Package Thermal impedance                  | $\theta_{ja}$         | 102                    | °C/W |                       |
| Storage temperature                        | $T_{stg}$             | −65 to 150             | °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 5.5 V maximum.

## Recommended Operating Conditions

| Item                               | Symbol                | Min  | Max      | Unit   | Conditions                                   |
|------------------------------------|-----------------------|------|----------|--------|----------------------------------------------|
| Supply voltage range               | $V_{CC}$              | 1.65 | 5.5      | V      |                                              |
| Input voltage range                | $V_I$                 | 0    | 5.5      | V      |                                              |
| Output voltage range               | $V_O$                 | 0    | $V_{CC}$ | V      |                                              |
| Output current                     | $I_{OL}$              | —    | 4        | mA     | $V_{CC} = 1.65$ V                            |
|                                    |                       | —    | 8        |        | $V_{CC} = 2.3$ V                             |
|                                    |                       | —    | 16       |        | $V_{CC} = 3.0$ V                             |
|                                    |                       | —    | 24       |        |                                              |
|                                    |                       | —    | 32       |        | $V_{CC} = 4.5$ V                             |
|                                    | $I_{OH}$              | —    | −4       |        | $V_{CC} = 1.65$ V                            |
|                                    |                       | —    | −8       |        | $V_{CC} = 2.3$ V                             |
|                                    |                       | —    | −16      |        | $V_{CC} = 3.0$ V                             |
|                                    |                       | —    | −24      |        |                                              |
|                                    |                       | —    | −32      |        | $V_{CC} = 4.5$ V                             |
| Input transition rise or fall rate | $\Delta t / \Delta v$ | 0    | 20       | ns / V | $V_{CC} = 1.65$ to $1.95$ V,<br>2.3 to 2.7 V |
|                                    |                       | 0    | 10       |        | $V_{CC} = 3.0$ to 3.6 V                      |
|                                    |                       | 0    | 5        |        | $V_{CC} = 4.5$ to 5.5 V                      |
| Operating free-air temperature     | $T_a$                 | −40  | 85       | °C     |                                              |

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

Ta = -40 to 85°C

| Item                     | Symbol           | V <sub>CC</sub> (V) | Min                   | Typ | Max                   | Unit | Test condition                                                                |
|--------------------------|------------------|---------------------|-----------------------|-----|-----------------------|------|-------------------------------------------------------------------------------|
| Input voltage            | V <sub>IH</sub>  | 1.65 to 1.95        | V <sub>CC</sub> ×0.65 | —   | —                     | V    |                                                                               |
|                          |                  | 2.3 to 2.7          | 1.7                   | —   | —                     |      |                                                                               |
|                          |                  | 3.0 to 3.6          | 2.0                   | —   | —                     |      |                                                                               |
|                          |                  | 4.5 to 5.5          | V <sub>CC</sub> ×0.7  | —   | —                     |      |                                                                               |
|                          | V <sub>IL</sub>  | 1.65 to 1.95        | —                     | —   | V <sub>CC</sub> ×0.35 |      |                                                                               |
|                          |                  | 2.3 to 2.7          | —                     | —   | 0.7                   |      |                                                                               |
|                          |                  | 3.0 to 3.6          | —                     | —   | 0.8                   |      |                                                                               |
|                          |                  | 4.5 to 5.5          | —                     | —   | V <sub>CC</sub> ×0.3  |      |                                                                               |
| Output voltage           | V <sub>OH</sub>  | Min to Max          | V <sub>CC</sub> -0.1  | —   | —                     | V    | I <sub>OH</sub> = -100 μA                                                     |
|                          |                  | 1.65                | 1.2                   | —   | —                     |      | I <sub>OH</sub> = -4 mA                                                       |
|                          |                  | 2.3                 | 1.9                   | —   | —                     |      | I <sub>OH</sub> = -8 mA                                                       |
|                          |                  | 3.0                 | 2.4                   | —   | —                     |      | I <sub>OH</sub> = -16 mA                                                      |
|                          |                  |                     | 2.3                   | —   | —                     |      | I <sub>OH</sub> = -24 mA                                                      |
|                          |                  | 4.5                 | 3.8                   | —   | —                     |      | I <sub>OH</sub> = -32 mA                                                      |
|                          | V <sub>OL</sub>  | Min to Max          | —                     | —   | 0.1                   |      | I <sub>OL</sub> = 100 μA                                                      |
|                          |                  | 1.65                | —                     | —   | 0.45                  |      | I <sub>OL</sub> = 4 mA                                                        |
|                          |                  | 2.3                 | —                     | —   | 0.3                   |      | I <sub>OL</sub> = 8 mA                                                        |
|                          |                  | 3.0                 | —                     | —   | 0.4                   |      | I <sub>OL</sub> = 16 mA                                                       |
|                          |                  |                     | —                     | —   | 0.55                  |      | I <sub>OL</sub> = 24 mA                                                       |
|                          |                  | 4.5                 | —                     | —   | 0.55                  |      | I <sub>OL</sub> = 32 mA                                                       |
| Input current            | I <sub>IN</sub>  | 0 to 5.5            | —                     | —   | ±5                    | μA   | V <sub>IN</sub> = 5.5 V or GND                                                |
| Quiescent supply current | I <sub>CC</sub>  | 1.65 to 5.5         | —                     | —   | 10                    | μA   | V <sub>IN</sub> = V <sub>CC</sub> or GND,<br>I <sub>O</sub> = 0               |
|                          | ΔI <sub>CC</sub> | 3 to 5.5            | —                     | —   | 500                   |      | One input at V <sub>CC</sub> -0.6 V,<br>Other input at V <sub>CC</sub> or GND |
| Output leakage current   | I <sub>OFF</sub> | 0                   | —                     | —   | ±10                   | μA   | V <sub>IN</sub> or V <sub>O</sub> = 0 to 5.5 V                                |
| Input capacitance        | C <sub>IN</sub>  | 3.3                 | —                     | 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.

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# Switching Characteristics

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

| Item                   | Symbol                               | Ta = -40 to 85°C |     | Unit | Test Conditions                                    | FROM (Input) | TO (Output) |
|------------------------|--------------------------------------|------------------|-----|------|----------------------------------------------------|--------------|-------------|
|                        |                                      | Min              | Max |      |                                                    |              |             |
| Propagation delay time | t <sub>PLH</sub><br>t <sub>PHL</sub> | 3.7              | 8.6 | ns   | C <sub>L</sub> = 30 pF,<br>R <sub>L</sub> = 1.0 kΩ | A, B         | Y           |

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

| Item                   | Symbol                               | Ta = -40 to 85°C |     | Unit | Test Conditions                                   | FROM (Input) | TO (Output) |
|------------------------|--------------------------------------|------------------|-----|------|---------------------------------------------------|--------------|-------------|
|                        |                                      | Min              | Max |      |                                                   |              |             |
| Propagation delay time | t <sub>PLH</sub><br>t <sub>PHL</sub> | 1.6              | 4.8 | ns   | C <sub>L</sub> = 30 pF,<br>R <sub>L</sub> = 500 Ω | A, B         | Y           |

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

| Item                   | Symbol                               | Ta = -40 to 85°C |     | Unit | Test Conditions                                   | FROM (Input) | TO (Output) |
|------------------------|--------------------------------------|------------------|-----|------|---------------------------------------------------|--------------|-------------|
|                        |                                      | Min              | Max |      |                                                   |              |             |
| Propagation delay time | t <sub>PLH</sub><br>t <sub>PHL</sub> | 1.1              | 4.3 | ns   | C <sub>L</sub> = 50 pF,<br>R <sub>L</sub> = 500 Ω | A, B         | Y           |

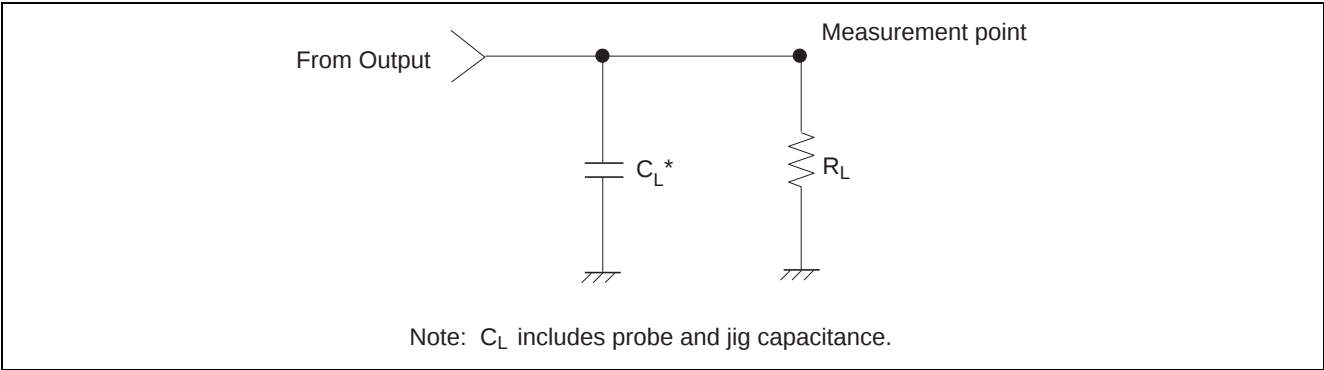
$V_{CC} = 5.0 \pm 0.5 \text{ V}$

| Item                   | Symbol                               | Ta = -40 to 85°C |     | Unit | Test Conditions                                | FROM (Input) | TO (Output) |
|------------------------|--------------------------------------|------------------|-----|------|------------------------------------------------|--------------|-------------|
|                        |                                      | Min              | Max |      |                                                |              |             |
| Propagation delay time | t <sub>PLH</sub><br>t <sub>PHL</sub> | 1.0              | 3.3 | ns   | C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω | A, B         | Y           |

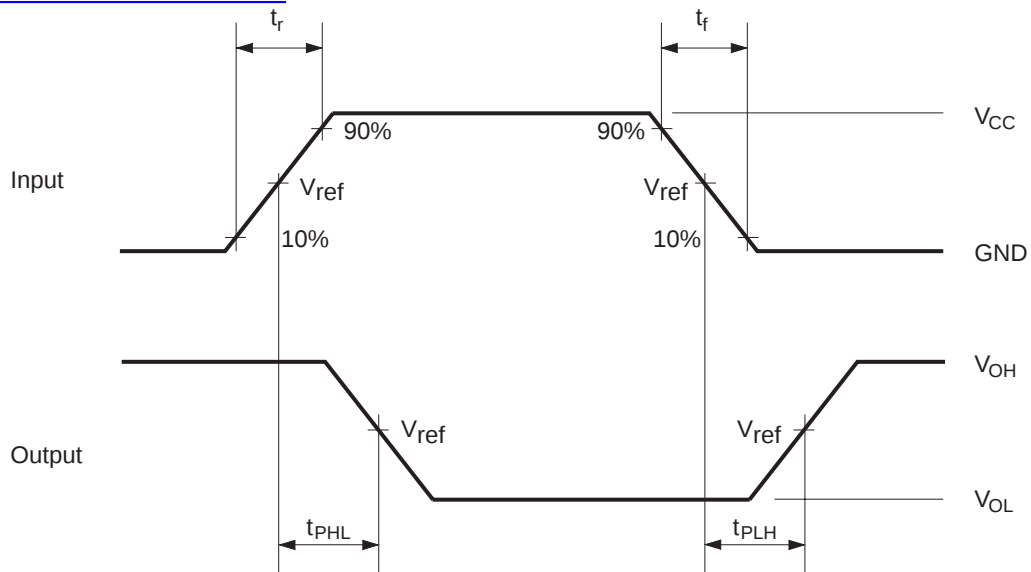
## Operating Characteristics

| Item                          | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |     |     | Unit | Test Conditions |
|-------------------------------|-----------------|---------------------|-----------|-----|-----|------|-----------------|
|                               |                 |                     | Min       | Typ | Max |      |                 |
| Power dissipation capacitance | C <sub>PD</sub> | 1.8                 | —         | 19  | —   | pF   | f = 10 MHz      |
|                               |                 | 2.5                 | —         | 19  | —   |      |                 |
|                               |                 | 3.3                 | —         | 20  | —   |      |                 |
|                               |                 | 5.0                 | —         | 22  | —   |      |                 |

## Test Circuit



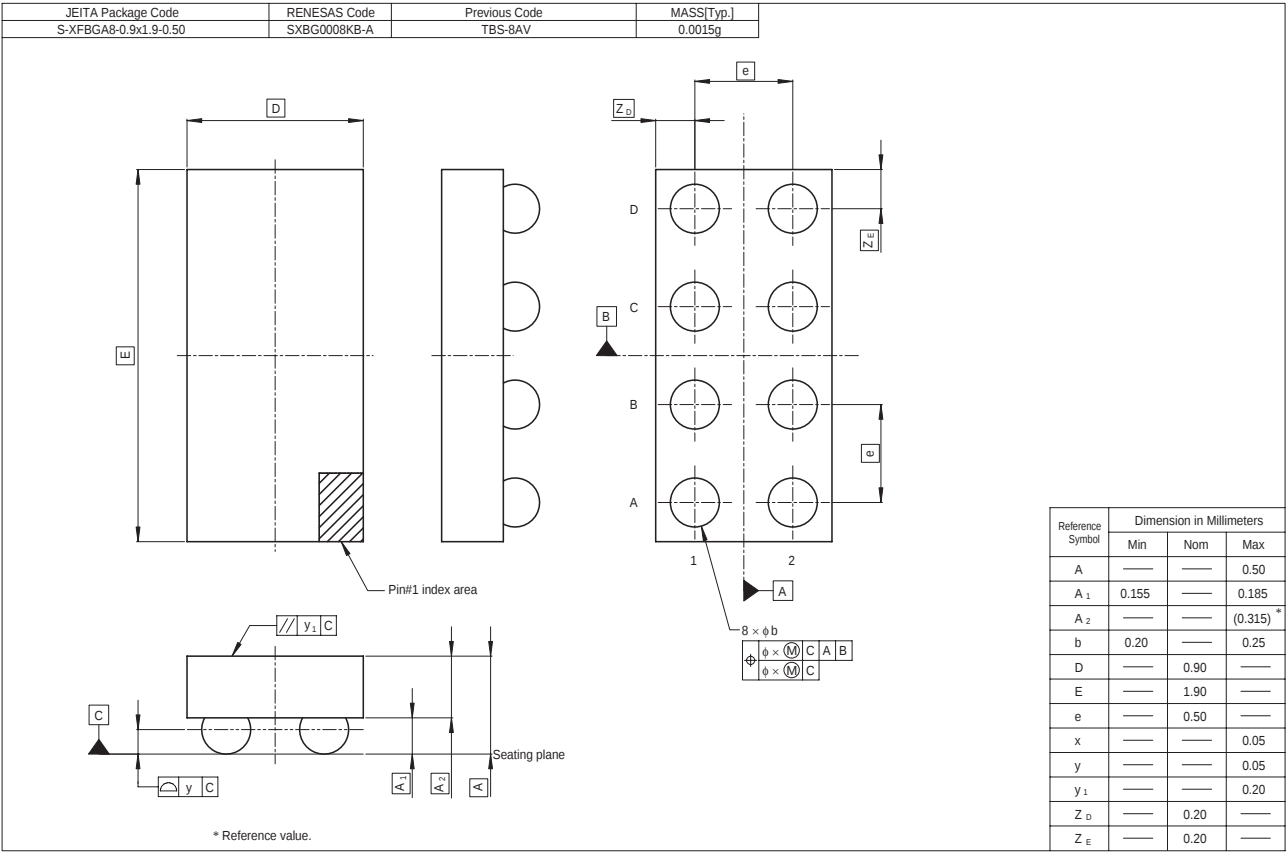
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| $V_{CC}$ (V) | INPUTS   |               | $V_{ref}$    | $C_L$ | $R_L$          |
|--------------|----------|---------------|--------------|-------|----------------|
|              | $V_I$    | $t_r / t_f$   |              |       |                |
| 1.8±0.15     | $V_{CC}$ | $\leq 2$ ns   | $V_{CC} / 2$ | 30 pF | 1.0 k $\Omega$ |
| 2.5±0.2      | $V_{CC}$ | $\leq 2$ ns   | $V_{CC} / 2$ | 30 pF | 500 $\Omega$   |
| 3.3±0.3      | 3 V      | $\leq 2.5$ ns | 1.5 V        | 50 pF | 500 $\Omega$   |
| 5.0±0.5      | $V_{CC}$ | $\leq 2.5$ ns | $V_{CC} / 2$ | 50 pF | 500 $\Omega$   |

Notes: 1. Input waveform: PRR  $\leq 10$  MHz,  $Z_o = 50 \Omega$ .  
2. The output are measured one at a time with one transition per measurement.

Package Dimensions



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