

RD74LVC1G125

Bus Buffer with 3–state Output

REJ03D0731–0100

Rev.1.00

Apr 13, 2006

Description

The RD74LVC1G125 has bus buffer with 3–state output 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.

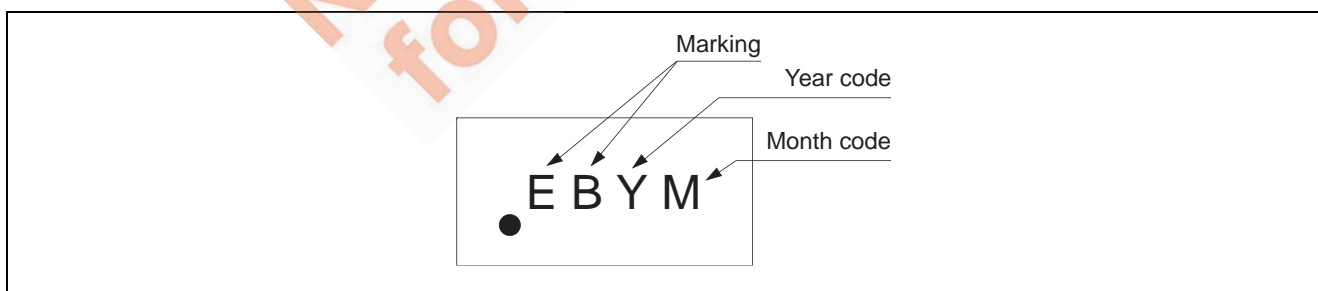
Features

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

- Ordering Information

| Part Name | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|-----------------|--------------|---------------------------------|-------------------------|-----------------------------------|
| RD74LVC1G125WPE | WCSP–5 pin | SXBG0005LB–A (TBS–5CV) | WP | E (3,000 pcs/reel) |

Article Indication

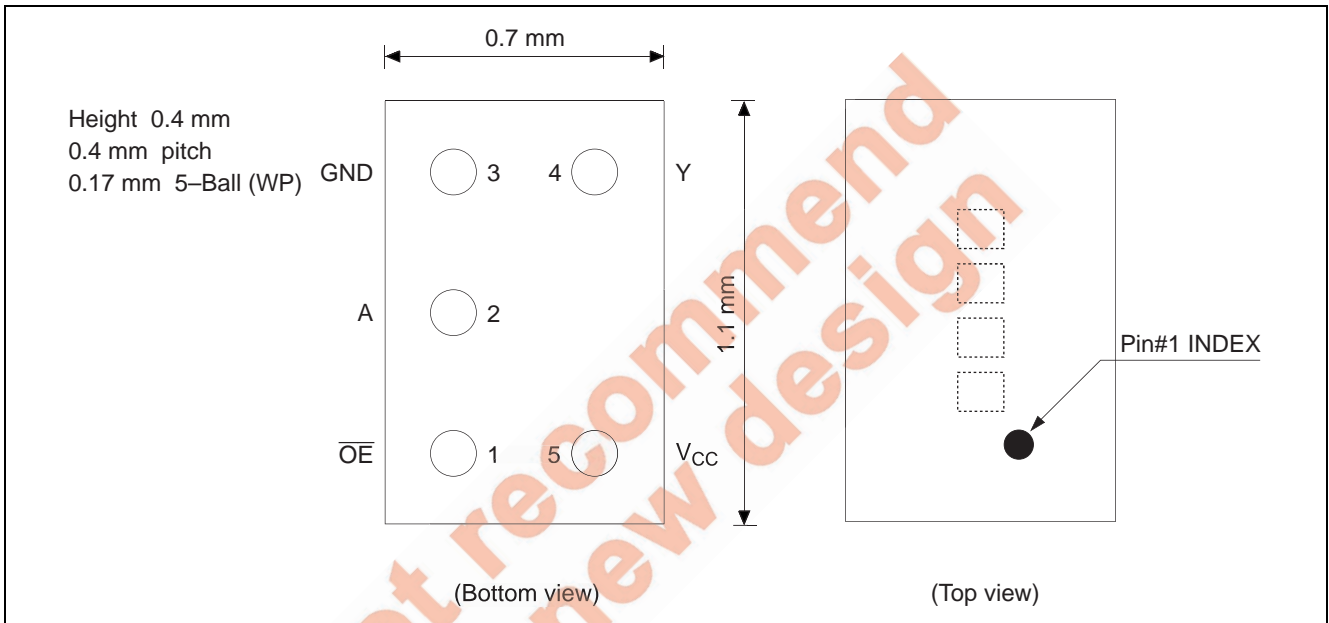


Function Table

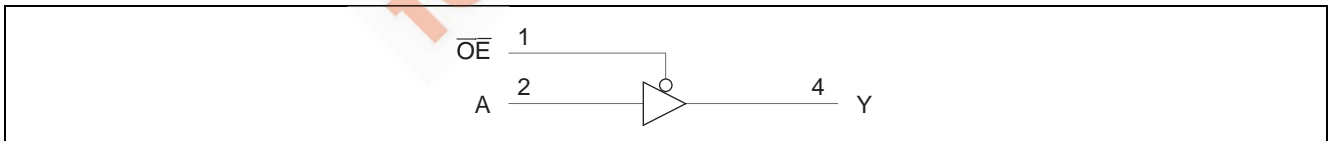
| Inputs | | Output Y |
|-----------------|---|----------|
| \overline{OE} | A | |
| L | H | H |
| L | L | L |
| H | X | Z |

H: High level
 L: Low level
 X: Immaterial
 Z: High impedance

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 ^{*1} | V_I | -0.5 to 6.5 | V | |
| Output voltage range ^{*1, 2} | V_O | -0.5 to $V_{CC} + 0.5$ | V | Output : H or L |
| | | -0.5 to 6.5 | | V_{CC} : OFF or Output "Z" |
| 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 | θ_{ja} | 200 | $^{\circ}\text{C}/\text{W}$ | WP |
| 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.

- The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- 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 | |
| | | 0 | 5.5 | | Output : Z |
| Output current | I_{OL} | — | 4 | mA | $V_{CC} = 1.65\text{ V}$ |
| | | — | 8 | | $V_{CC} = 2.3\text{ V}$ |
| | | — | 16 | | $V_{CC} = 3.0\text{ V}$ |
| | | — | 24 | | |
| | | — | 32 | | $V_{CC} = 4.5\text{ V}$ |
| | I_{OH} | — | -4 | | $V_{CC} = 1.65\text{ V}$ |
| | | — | -8 | | $V_{CC} = 2.3\text{ V}$ |
| | | — | -16 | | $V_{CC} = 3.0\text{ V}$ |
| | | — | -24 | | |
| | | — | -32 | | $V_{CC} = 4.5\text{ V}$ |
| Input transition rise or fall rate | $\Delta t / \Delta v$ | 0 | 20 | ns / V | $V_{CC} = 1.65$ to 1.95 V , 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 | $^{\circ}\text{C}$ | |

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

Electrical Characteristics

Ta = -40 to 85°C

| Item | Symbol | V _{CC} (V) | Min | Typ | Max | Unit | Test condition | | | |
|--------------------------|------------------|--------------------------|-----------------------|----------|-----------------------|------|---|----|----|--------------------------------|
| Input voltage | V _{IH} | 1.65 to 1.95 | V _{CC} ×0.65 | — | — | V | | | | |
| | | 2.3 to 2.7 | 1.7 | — | — | | | | | |
| | | 3.0 to 3.6 | 2.0 | — | — | | | | | |
| | | 4.5 to 5.5 | V _{CC} ×0.7 | — | — | | | | | |
| | V _{IL} | 1.65 to 1.95 | — | — | V _{CC} ×0.35 | | | | | |
| | | 2.3 to 2.7 | — | — | 0.7 | | | | | |
| | | 3.0 to 3.6 | — | — | 0.8 | | | | | |
| | | 4.5 to 5.5 | — | — | V _{CC} ×0.3 | | | | | |
| Output voltage | V _{OH} | Min to Max | V _{CC} -0.1 | — | — | V | I _{OH} = -100 μA | | | |
| | | 1.65 | 1.2 | — | — | | I _{OH} = -4 mA | | | |
| | | 2.3 | 1.9 | — | — | | I _{OH} = -8 mA | | | |
| | | 3.0 | 2.4 | — | — | | I _{OH} = -16 mA | | | |
| | | | 2.3 | — | — | | I _{OH} = -24 mA | | | |
| | | 4.5 | 3.8 | — | — | | I _{OH} = -32 mA | | | |
| | V _{OL} | Min to Max | — | — | 0.1 | | I _{OL} = 100 μA | | | |
| | | 1.65 | — | — | 0.45 | | I _{OL} = 4 mA | | | |
| | | 2.3 | — | — | 0.3 | | I _{OL} = 8 mA | | | |
| | | 3.0 | — | — | 0.4 | | I _{OL} = 16 mA | | | |
| | | | — | — | 0.55 | | I _{OL} = 24 mA | | | |
| | | 4.5 | — | — | 0.55 | | I _{OL} = 32 mA | | | |
| | | Input current | I _{IN} | 0 to 5.5 | — | | — | ±5 | μA | V _{IN} = 5.5 V or GND |
| | | Off state Output current | I _{OZ} | 3.6 | — | | — | 10 | μA | V _O = 5.5 V or GND |
| Quiescent supply current | I _{CC} | 1.65 to 5.5 | — | — | 10 | μA | V _{IN} = V _{CC} or GND, I _O = 0 | | | |
| | ΔI _{CC} | 3 to 5.5 | — | — | 500 | | One input at V _{CC} -0.6 V, Other input at V _{CC} or GND | | | |
| Output leakage current | I _{OFF} | 0 | — | — | ±10 | μA | V _{IN} or V _O = 0 to 5.5 V | | | |
| Input capacitance | C _{IN} | 3.3 | — | 3.5 | — | pF | V _{IN} = V _{CC} or GND | | | |

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

Switching Characteristics

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

| Item | Symbol | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|------------------------|-----------|--|-----|------|--|-----------------|----------------|
| | | Min | Max | | | | |
| Propagation delay time | t_{PLH} | 2.8 | 8.0 | ns | $C_L = 30 \text{ pF}, R_L = 1.0 \text{ k}\Omega$ | A | Y |
| | t_{PHL} | | | | | | |
| Output enable time | t_{ZH} | 3.3 | 9.4 | ns | | \overline{OE} | Y |
| | t_{ZL} | | | | | | |
| Output disable time | t_{HZ} | 1.3 | 9.2 | ns | | \overline{OE} | Y |
| | t_{LZ} | | | | | | |

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

| Item | Symbol | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|------------------------|-----------|--|-----|------|---|-----------------|----------------|
| | | Min | Max | | | | |
| Propagation delay time | t_{PLH} | 1.2 | 5.5 | ns | $C_L = 30 \text{ pF}, R_L = 500 \Omega$ | A | Y |
| | t_{PHL} | | | | | | |
| Output enable time | t_{ZH} | 1.5 | 6.6 | ns | | \overline{OE} | Y |
| | t_{ZL} | | | | | | |
| Output disable time | t_{HZ} | 1.0 | 5.0 | ns | | \overline{OE} | Y |
| | t_{LZ} | | | | | | |

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

| Item | Symbol | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|------------------------|-----------|--|-----|------|---|-----------------|----------------|
| | | Min | Max | | | | |
| Propagation delay time | t_{PLH} | 1.0 | 4.5 | ns | $C_L = 50 \text{ pF}, R_L = 500 \Omega$ | A | Y |
| | t_{PHL} | | | | | | |
| Output enable time | t_{ZH} | 1.0 | 5.3 | ns | | \overline{OE} | Y |
| | t_{ZL} | | | | | | |
| Output disable time | t_{HZ} | 1.0 | 5.0 | ns | | \overline{OE} | Y |
| | t_{LZ} | | | | | | |

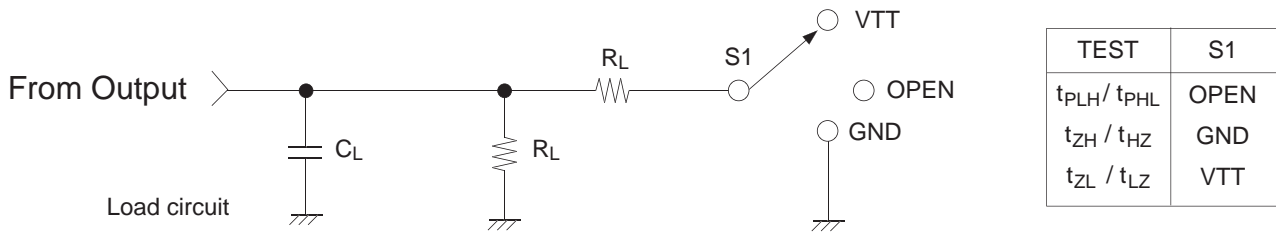
 $V_{CC} = 5.0 \pm 0.5 \text{ V}$

| Item | Symbol | $T_a = -40 \text{ to } 85^\circ\text{C}$ | | Unit | Test Conditions | FROM (Input) | TO (Output) |
|------------------------|-----------|--|-----|------|---|-----------------|----------------|
| | | Min | Max | | | | |
| Propagation delay time | t_{PLH} | 1.0 | 4.0 | ns | $C_L = 50 \text{ pF}, R_L = 500 \Omega$ | A | Y |
| | t_{PHL} | | | | | | |
| Output enable time | t_{ZH} | 1.0 | 5.0 | ns | | \overline{OE} | Y |
| | t_{ZL} | | | | | | |
| Output disable time | t_{HZ} | 1.0 | 4.2 | ns | | \overline{OE} | Y |
| | t_{LZ} | | | | | | |

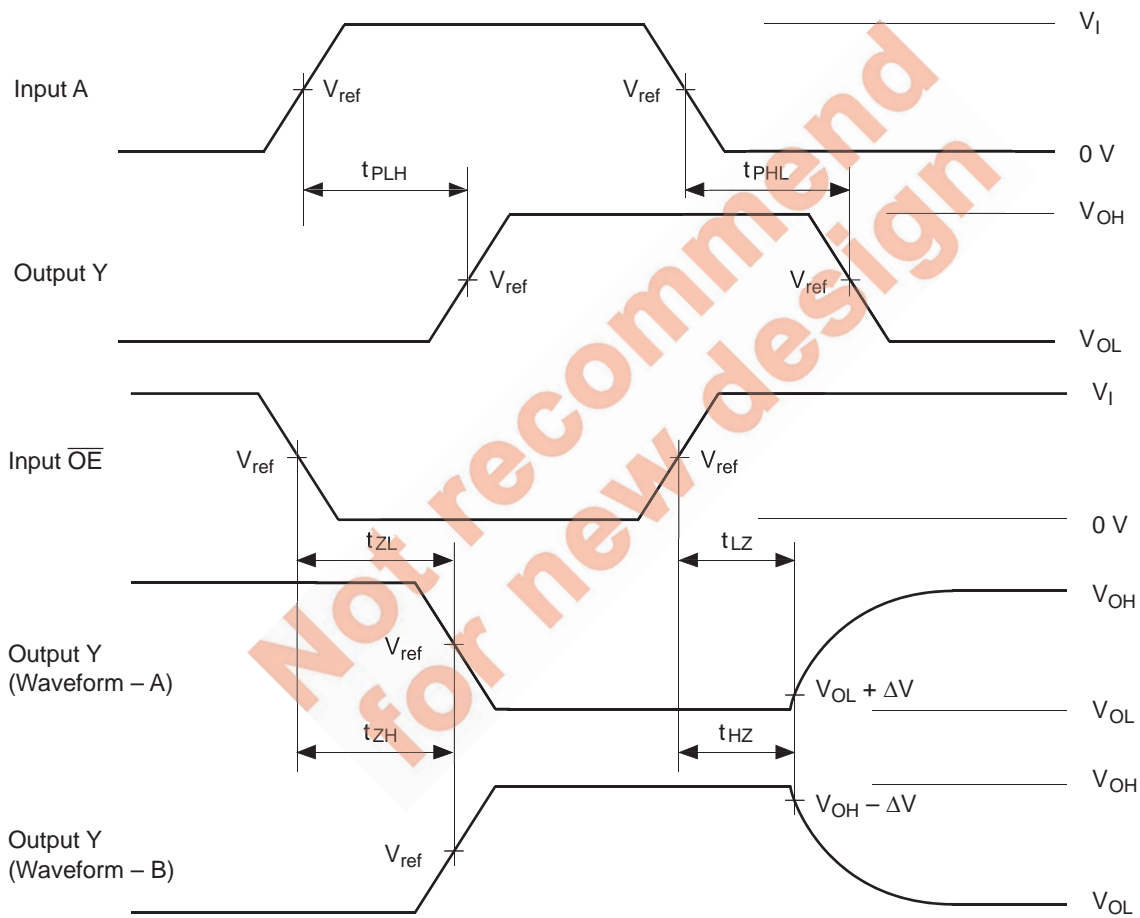
Operating Characteristics

| Item | Symbol | $V_{CC} \text{ (V)}$ | $T_a = 25^\circ\text{C}$ | | | Unit | Test Conditions |
|-------------------------------|----------|----------------------|--------------------------|-----|-----|------|----------------------|
| | | | Min | Typ | Max | | |
| Power dissipation capacitance | C_{PD} | 1.8 | — | 19 | — | pF | $f = 10 \text{ MHz}$ |
| | | 2.5 | — | 19 | — | | |
| | | 3.3 | — | 20 | — | | |
| | | 5.0 | — | 22 | — | | |

Test Circuit

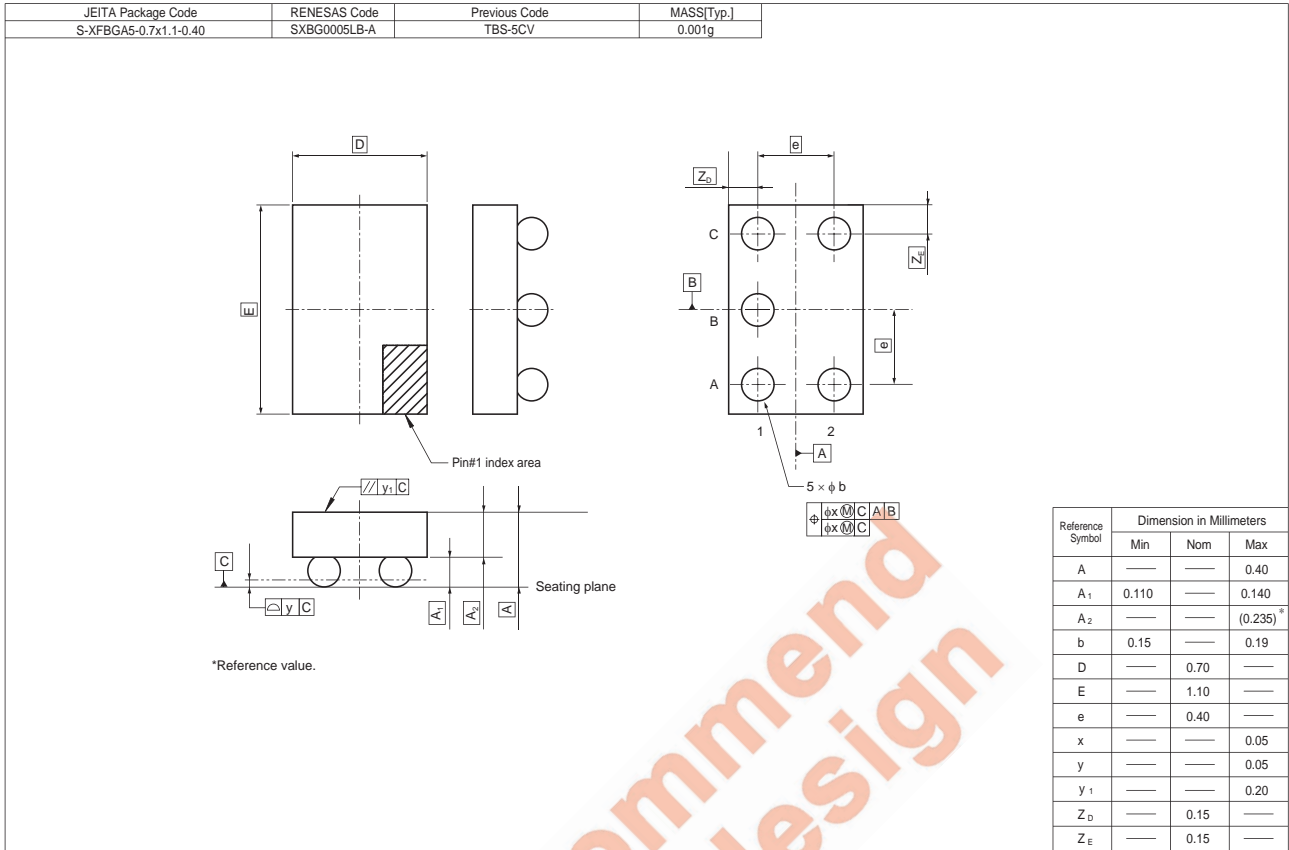


| V_{CC} (V) | INPUTS | | V_{ref} | VTT | C_L | R_L | ΔV |
|----------------|----------|---------------|--------------|-------------------|-------|----------------|------------|
| | V_I | t_r / t_f | | | | | |
| 1.8 ± 0.15 | V_{CC} | ≤ 2 ns | $V_{CC} / 2$ | $2 \times V_{CC}$ | 30 pF | 1.0 k Ω | 0.15 V |
| 2.5 ± 0.2 | V_{CC} | ≤ 2 ns | $V_{CC} / 2$ | $2 \times V_{CC}$ | 30 pF | 500 Ω | 0.15 V |
| 3.3 ± 0.3 | V_{CC} | ≤ 2.5 ns | 1.5 V | 6 V | 50 pF | 500 Ω | 0.3 V |
| 5.0 ± 0.5 | V_{CC} | ≤ 2.5 ns | $V_{CC} / 2$ | $2 \times V_{CC}$ | 50 pF | 500 Ω | 0.3 V |



- Notes:
- C_L includes probe and jig capacitance.
 - Waveform-A is for an output with internal conditions such that the output is low except when disabled by the output control.
 - Waveform-B is for an output with internal conditions such that the output is high except when disabled by the output control.
 - All input pulses are supplied by generators having the following characteristics:
 $PRR \leq 10$ MHz, $Z_o = 50 \Omega$.
 - The output are measured one at a time with one transition per measurement.

Package Dimensions



Not recommended for new design

Keep safety first in your circuit designs!

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