

# RD74VT1G125

## Bus Buffer Gate with 3–state output / Dual Supply Voltage Translator

REJ03D0496–0100

Rev.1.00

Feb. 01, 2005

### Description

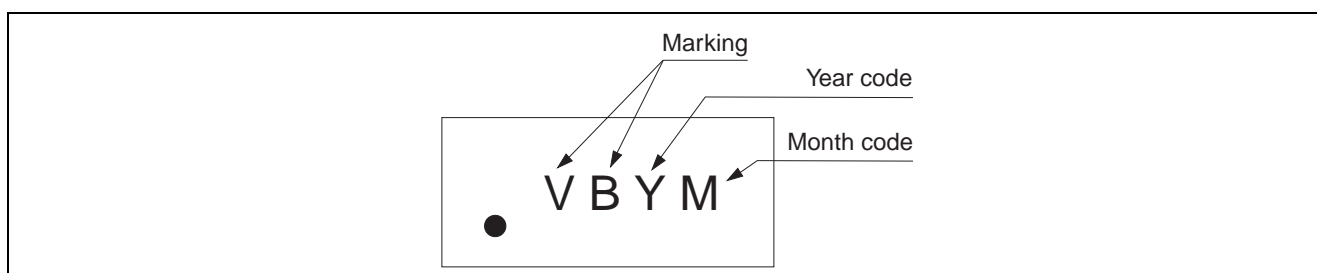
The RD74VT1G125 has a bus buffer gate with 3–state output in a 6 pin package. Output is disabled when the associated output enable ( $\overline{OE}$ ) input is high. To ensure the high impedance state during power up or power down,  $\overline{OE}$  should be connected to  $V_{CCIN}$  through a pull-up resistor, the minimum value of the resistor is determined by the current sinking capability of the driver. The input is designed to track  $V_{CCIN}$ , which accepts voltages from 1.2 V to 3.6 V, and the output is designed to track  $V_{CCOUT}$ , which operates at 1.2 V to 3.6 V. 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

- This product function as level shift that change  $V_{CCIN}$  input level to  $V_{CCOUT}$  output level by providing different supply voltage to  $V_{CCIN}$  and  $V_{CCOUT}$ .
- Supplied on emboss taping for high-speed automatic mounting.
- Supply voltage range:
  - $V_{CCIN} = 1.2 \text{ V to } 3.6 \text{ V}$
  - $V_{CCOUT} = 1.2 \text{ V to } 3.6 \text{ V}$
- Operating temperature range:  $-40^{\circ}\text{C to } +85^{\circ}\text{C}$
- All inputs  $V_{IH}(\text{Max.}) = 3.6 \text{ V}$  (@ $V_{CCIN} = 0 \text{ V to } 3.6 \text{ V}$ )  
All outputs  $V_{O}(\text{Max.}) = 3.6 \text{ V}$  (@ $V_{CCOUT} = 0 \text{ V}$ )
- Output current
  - $\pm 2 \text{ mA}$  (@ $V_{CCOUT} = 1.2 \text{ V}$ )
  - $\pm 4 \text{ mA}$  (@ $V_{CCOUT} = 1.4 \text{ V to } 1.6 \text{ V}$ )
  - $\pm 6 \text{ mA}$  (@ $V_{CCOUT} = 1.65 \text{ V to } 1.95 \text{ V}$ )
  - $\pm 18 \text{ mA}$  (@ $V_{CCOUT} = 2.3 \text{ V to } 2.7 \text{ V}$ )
  - $\pm 24 \text{ mA}$  (@ $V_{CCOUT} = 3.0 \text{ V to } 3.6 \text{ V}$ )
- Ordering Information

| Part Name      | Package Type | Package Code<br>(Previous Code) | Package<br>Abbreviation | Taping Abbreviation<br>(Quantity) |
|----------------|--------------|---------------------------------|-------------------------|-----------------------------------|
| RD74VT1G125CLE | WCSP–6 pin   | SXBG0006KB–A<br>(TBS–6AV)       | CL                      | E (3,000 pcs / reel)              |

### Article Indication



## Function Table

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

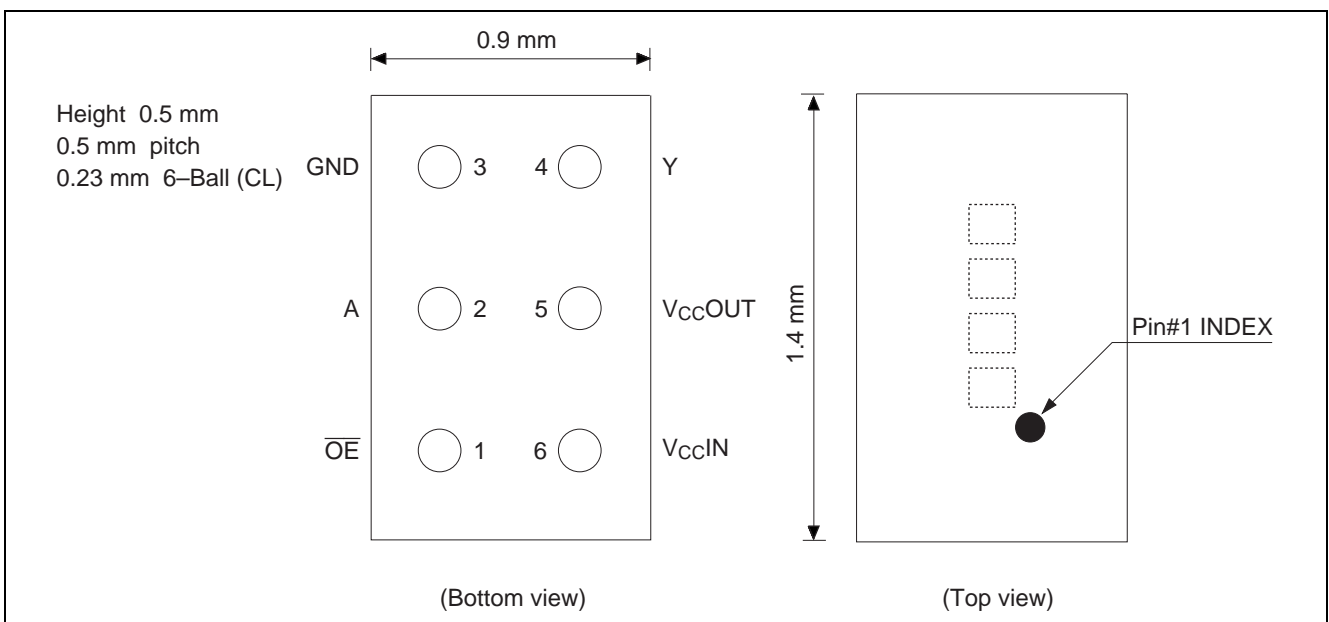
H: High level

L: Low level

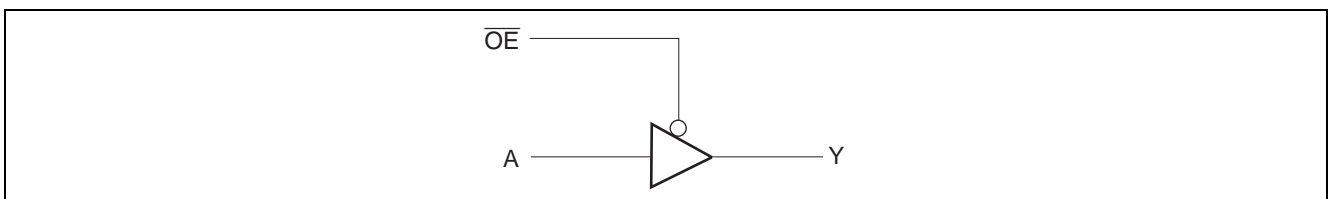
X: Immaterial

Z: High impedance

## Pin Arrangement



## Logic Diagram



## Absolute Maximum Ratings

| Item   | Symbol                         | Ratings                 | Unit          | Conditions                |
|--|--------------------------------|-------------------------|---------------|---------------------------|
| Supply voltage range                         | $V_{CCIN}, V_{CCOUT}$          | -0.5 to 4.6             | V             |                           |
| Input voltage range <sup>*1</sup>            | $V_I$                          | -0.5 to 4.6             | V             | A port or $\overline{OE}$ |
| Output voltage range <sup>*1, 2</sup>        | $V_O$                          | -0.5 to $V_{CCOUT}+0.5$ | V             | Output: "H" or "L"        |
|  |                                | -0.5 to 4.6             |               | $V_{CCOUT}$ : OFF         |
| Input clamp current                          | $I_{IK}$                       | -50                     | mA            | $V_I < 0$                 |
| Output clamp current                         | $I_{OK}$                       | -50                     | mA            | $V_O < 0$                 |
|  |                                | 50                      |               | $V_O > V_{CC}+0.5$        |
| Continuous output current                    | $I_O$                          | $\pm 50$                | mA            |                           |
| Continuous output current<br>$V_{CC}$ or GND | $I_{CCIN}, I_{CCOUT}, I_{GND}$ | $\pm 100$               | mA            |                           |
| Package Thermal impedance                    | $\theta_{ja}$                  | 123                     | $^{\circ}C/W$ |                           |
| Storage temperature                          | Tstg                           | -65 to 150              | $^{\circ}C$   |                           |

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 4.6 V maximum.

## Recommended Operating Conditions

| Item                               | Symbol                | Ratings           | Unit        | Conditions                   |
|------------------------------------|-----------------------|-------------------|-------------|------------------------------|
| Supply voltage range               | $V_{CCIN}$            | 1.2 to 3.6        | V           |                              |
|                                    | $V_{CCOUT}$           | 1.2 to 3.6        |             |                              |
| Input/Output voltage               | $V_I$                 | 0 to 3.6          | V           | A port or $\overline{OE}$    |
|                                    | $V_O$                 | 0 to 3.6          | V           | Output: "H" or "L" or "Z"    |
| 0 to $V_{CCOUT}$                   |                       | $V_{CCOUT}$ : OFF |             |                              |
| Output current                     | $I_{OH}$              | -2                | mA          | $V_{CCOUT} = 1.2$ V          |
|                                    |                       | -4                |             | $V_{CCOUT} = 1.5 \pm 0.1$ V  |
|                                    |                       | -6                |             | $V_{CCOUT} = 1.8 \pm 0.15$ V |
|                                    |                       | -18               |             | $V_{CCOUT} = 2.5 \pm 0.2$ V  |
|                                    |                       | -24               |             | $V_{CCOUT} = 3.3 \pm 0.3$ V  |
|                                    | $I_{OL}$              | 2                 | mA          | $V_{CCOUT} = 1.2$ V          |
|                                    |                       | 4                 |             | $V_{CCOUT} = 1.5 \pm 0.1$ V  |
|                                    |                       | 6                 |             | $V_{CCOUT} = 1.8 \pm 0.15$ V |
|                                    |                       | 18                |             | $V_{CCOUT} = 2.5 \pm 0.2$ V  |
|                                    |                       | 24                |             | $V_{CCOUT} = 3.3 \pm 0.3$ V  |
| Input transition rise or fall time | $\Delta t / \Delta v$ | 10                | ns / V      |                              |
| Operation free-air temperature     | Ta                    | -40 to 85         | $^{\circ}C$ |                              |

## Electrical Characteristics

(Ta = -40 to 85°C)

| Item                                  | Symbol             | V <sub>CCIN</sub> (V)* | V <sub>CCOUT</sub> (V)* | Min                     | Typ | Max                     | Unit | Test conditions  |
|---------------------------------------|--------------------|------------------------|-------------------------|-------------------------|-----|-------------------------|------|--|
| Input voltage                         | V <sub>IH</sub>    | 1.2                    | 1.2 to 3.6              | V <sub>CCIN</sub> ×0.75 | —   | —                       | V    | A port<br>Control input  |
|                                       |                    | 1.5±0.1                |                         | V <sub>CCIN</sub> ×0.70 | —   | —                       |      |  |
|                                       |                    | 1.8±0.15               |                         | V <sub>CCIN</sub> ×0.65 | —   | —                       |      |  |
|                                       |                    | 2.5±0.2                |                         | 1.6                     | —   | —                       |      |  |
|                                       |                    | 3.3±0.3                |                         | 2.0                     | —   | —                       |      |  |
|                                       | V <sub>IL</sub>    | 1.2                    | 1.2 to 3.6              | —                       | —   | V <sub>CCIN</sub> ×0.25 | V    | A port<br>Control input  |
|                                       |                    | 1.5±0.1                |                         | —                       | —   | V <sub>CCIN</sub> ×0.30 |      |  |
|                                       |                    | 1.8±0.15               |                         | —                       | —   | V <sub>CCIN</sub> ×0.35 |      |  |
|                                       |                    | 2.5±0.2                |                         | —                       | —   | 0.7                     |      |  |
|                                       |                    | 3.3±0.3                |                         | —                       | —   | 0.8                     |      |  |
| Output voltage                        | V <sub>OH</sub>    | 1.2 to 3.6             | 1.2 to 3.6              | V <sub>CCOUT</sub> -0.2 | —   | —                       | V    | I <sub>OH</sub> = -100 μA  |
|                                       |                    |                        | 1.2                     | 0.9                     | —   | —                       |      | I <sub>OH</sub> = -2 mA  |
|                                       |                    |                        | 1.5±0.1                 | 1.1                     | —   | —                       |      | I <sub>OH</sub> = -4 mA  |
|                                       |                    |                        | 1.8±0.15                | 1.25                    | —   | —                       |      | I <sub>OH</sub> = -6 mA  |
|                                       |                    |                        | 2.5±0.2                 | 1.7                     | —   | —                       |      | I <sub>OH</sub> = -18 mA   |
|                                       |                    |                        | 3.3±0.3                 | 2.2                     | —   | —                       |      | I <sub>OH</sub> = -24 mA   |
|                                       | V <sub>OL</sub>    | 1.2 to 3.6             | 1.2 to 3.6              | —                       | —   | 0.2                     | V    | I <sub>OL</sub> = 100 μA   |
|                                       |                    |                        | 1.2                     | —                       | —   | 0.3                     |      | I <sub>OL</sub> = 2 mA   |
|                                       |                    |                        | 1.5±0.1                 | —                       | —   | 0.3                     |      | I <sub>OL</sub> = 4 mA   |
|                                       |                    |                        | 1.8±0.15                | —                       | —   | 0.3                     |      | I <sub>OL</sub> = 6 mA   |
|                                       |                    |                        | 2.5±0.2                 | —                       | —   | 0.6                     |      | I <sub>OL</sub> = 18 mA  |
|                                       |                    |                        | 3.3±0.3                 | —                       | —   | 0.55                    |      | I <sub>OL</sub> = 24 mA  |
|                                       |                    |                        | —                       | —                       | —   | —                       |      | —  |
| Input current                         | I <sub>IN</sub>    | 3.6                    | 3.6                     | -1.0                    | —   | 1.0                     | μA   | V <sub>IN</sub> = GND or V <sub>CCIN</sub><br>control input              |
| Off state output current              | I <sub>OZ</sub>    | 3.6                    | 3.6                     | -1.5                    | —   | 1.5                     | μA   | V <sub>IN</sub> = V <sub>IH</sub> or V <sub>IL</sub>                     |
| Output leakage current                | I <sub>OFF</sub>   | 0                      | 0                       | —                       | —   | 1.5                     | μA   | V <sub>IN</sub> , V <sub>OUT</sub> =<br>0 to 3.6 V                       |
| Quiescent supply current              | I <sub>CCIN</sub>  | 1.2 to 3.6             | 1.2 to 3.6              | -3.0                    | —   | 3.0                     | μA   | I <sub>O(Y port)</sub> = 0<br>V <sub>IN</sub> = V <sub>CCIN</sub> or GND |
|                                       | I <sub>CCOUT</sub> | 1.2 to 3.6             | 1.2 to 3.6              | -3.0                    | —   | 3.0                     |      | I <sub>O(Y port)</sub> = 0<br>V <sub>IN</sub> = V <sub>CCIN</sub> or GND |
| Increase in I <sub>CC</sub> per input | ΔI <sub>CC</sub>   | 3.6                    | 3.6                     | —                       | —   | 250                     | μA   | A port or control<br>V <sub>CCIN</sub> -0.6 (1 input)                    |
| Input capacitance                     | C <sub>IN</sub>    | 3.3                    | 3.3                     | —                       | 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.

## Switching Characteristics

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

| Item                   | Symbol           | From<br>(input)        | To<br>(output) | Ta = -40 to 85°C           |     |                                |     |                                 |     |                                |     | Unit | Test<br>conditions |   |     |
|------------------------|------------------|------------------------|----------------|----------------------------|-----|--------------------------------|-----|---------------------------------|-----|--------------------------------|-----|------|--------------------|---|-----|
|                        |                  |                        |                | V <sub>CC</sub> OUT= 1.2 V |     | V <sub>CC</sub> OUT= 1.5±0.1 V |     | V <sub>CC</sub> OUT= 1.8±0.15 V |     | V <sub>CC</sub> OUT= 2.5±0.2 V |     |      |                    | V <sub>CC</sub> OUT= 3.3±0.3 V                  |     |
|                        |                  |                        |                | Typ                        | Min | Max                            | Min | Max                             | Min | Max                            | Min |      |                    | Max   | Min |
| Propagation delay time | t <sub>PLH</sub> | A                      | Y              | 9.2                        | 2.0 | 8.8                            | 1.5 | 5.8                             | 1.0 | 4.2                            | 1.0 | 3.5  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>PHL</sub> |                        |                | 9.2                        | 2.0 | 8.8                            | 1.5 | 5.8                             | 1.0 | 4.2                            | 1.0 | 3.5  |                    |   |     |
| Output enable time     | t <sub>ZH</sub>  | $\overline{\text{OE}}$ | Y              | 10.2                       | 2.0 | 9.6                            | 1.5 | 6.4                             | 1.0 | 4.2                            | 1.0 | 3.7  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>ZL</sub>  |                        |                | 10.2                       | 2.0 | 9.6                            | 1.5 | 6.4                             | 1.0 | 4.2                            | 1.0 | 3.7  |                    |   |     |
| Output disable time    | t <sub>HZ</sub>  | $\overline{\text{OE}}$ | Y              | 5.2                        | 2.0 | 5.6                            | 1.5 | 5.2                             | 1.0 | 4.6                            | 1.0 | 4.5  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>LZ</sub>  |                        |                | 5.2                        | 2.0 | 5.6                            | 1.5 | 5.2                             | 1.0 | 4.6                            | 1.0 | 4.5  |                    |   |     |

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

| Item                   | Symbol           | From<br>(input)        | To<br>(output) | Ta = -40 to 85°C           |     |                                |     |                                 |     |                                |     | Unit | Test<br>conditions |   |     |
|------------------------|------------------|------------------------|----------------|----------------------------|-----|--------------------------------|-----|---------------------------------|-----|--------------------------------|-----|------|--------------------|---|-----|
|                        |                  |                        |                | V <sub>CC</sub> OUT= 1.2 V |     | V <sub>CC</sub> OUT= 1.5±0.1 V |     | V <sub>CC</sub> OUT= 1.8±0.15 V |     | V <sub>CC</sub> OUT= 2.5±0.2 V |     |      |                    | V <sub>CC</sub> OUT= 3.3±0.3 V                  |     |
|                        |                  |                        |                | Typ                        | Min | Max                            | Min | Max                             | Min | Max                            | Min |      |                    | Max   | Min |
| Propagation delay time | t <sub>PLH</sub> | A                      | Y              | 9.5                        | 2.0 | 9.0                            | 1.5 | 6.0                             | 1.0 | 4.4                            | 1.0 | 3.7  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>PHL</sub> |                        |                | 9.5                        | 2.0 | 9.0                            | 1.5 | 6.0                             | 1.0 | 4.4                            | 1.0 | 3.7  |                    |   |     |
| Output enable time     | t <sub>ZH</sub>  | $\overline{\text{OE}}$ | Y              | 10.6                       | 2.0 | 10.2                           | 1.5 | 6.6                             | 1.0 | 4.5                            | 1.0 | 3.8  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>ZL</sub>  |                        |                | 10.6                       | 2.0 | 10.2                           | 1.5 | 6.6                             | 1.0 | 4.5                            | 1.0 | 3.8  |                    |   |     |
| Output disable time    | t <sub>HZ</sub>  | $\overline{\text{OE}}$ | Y              | 5.4                        | 2.0 | 5.7                            | 1.5 | 5.3                             | 1.0 | 4.5                            | 1.0 | 4.4  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>LZ</sub>  |                        |                | 5.4                        | 2.0 | 5.7                            | 1.5 | 5.3                             | 1.0 | 4.5                            | 1.0 | 4.4  |                    |   |     |

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

| Item                   | Symbol           | From<br>(input)        | To<br>(output) | Ta = -40 to 85°C           |     |                                |     |                                 |     |                                |     | Unit | Test<br>conditions |   |     |
|------------------------|------------------|------------------------|----------------|----------------------------|-----|--------------------------------|-----|---------------------------------|-----|--------------------------------|-----|------|--------------------|---|-----|
|                        |                  |                        |                | V <sub>CC</sub> OUT= 1.2 V |     | V <sub>CC</sub> OUT= 1.5±0.1 V |     | V <sub>CC</sub> OUT= 1.8±0.15 V |     | V <sub>CC</sub> OUT= 2.5±0.2 V |     |      |                    | V <sub>CC</sub> OUT= 3.3±0.3 V                  |     |
|                        |                  |                        |                | Typ                        | Min | Max                            | Min | Max                             | Min | Max                            | Min |      |                    | Max   | Min |
| Propagation delay time | t <sub>PLH</sub> | A                      | Y              | 9.6                        | 2.0 | 9.2                            | 1.5 | 6.5                             | 1.0 | 4.7                            | 1.0 | 4.0  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>PHL</sub> |                        |                | 9.6                        | 2.0 | 9.2                            | 1.5 | 6.5                             | 1.0 | 4.7                            | 1.0 | 4.0  |                    |   |     |
| Output enable time     | t <sub>ZH</sub>  | $\overline{\text{OE}}$ | Y              | 10.8                       | 2.0 | 10.8                           | 1.5 | 7.0                             | 1.0 | 5.2                            | 1.0 | 4.5  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>ZL</sub>  |                        |                | 10.8                       | 2.0 | 10.8                           | 1.5 | 7.0                             | 1.0 | 5.2                            | 1.0 | 4.5  |                    |   |     |
| Output disable time    | t <sub>HZ</sub>  | $\overline{\text{OE}}$ | Y              | 5.8                        | 2.0 | 6.0                            | 1.5 | 5.8                             | 1.0 | 5.4                            | 1.0 | 5.2  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>LZ</sub>  |                        |                | 5.8                        | 2.0 | 6.0                            | 1.5 | 5.8                             | 1.0 | 5.4                            | 1.0 | 5.2  |                    |   |     |

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

| Item                   | Symbol           | From<br>(input)        | To<br>(output) | Ta = -40 to 85°C           |     |                                |     |                                 |     |                                |     | Unit | Test<br>conditions |   |     |
|------------------------|------------------|------------------------|----------------|----------------------------|-----|--------------------------------|-----|---------------------------------|-----|--------------------------------|-----|------|--------------------|---|-----|
|                        |                  |                        |                | V <sub>CC</sub> OUT= 1.2 V |     | V <sub>CC</sub> OUT= 1.5±0.1 V |     | V <sub>CC</sub> OUT= 1.8±0.15 V |     | V <sub>CC</sub> OUT= 2.5±0.2 V |     |      |                    | V <sub>CC</sub> OUT= 3.3±0.3 V                  |     |
|                        |                  |                        |                | Typ                        | Min | Max                            | Min | Max                             | Min | Max                            | Min |      |                    | Max   | Min |
| Propagation delay time | t <sub>PLH</sub> | A                      | Y              | 9.8                        | 2.0 | 10.0                           | 1.5 | 6.9                             | 1.0 | 5.1                            | 1.0 | 4.5  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>PHL</sub> |                        |                | 9.8                        | 2.0 | 10.0                           | 1.5 | 6.9                             | 1.0 | 5.1                            | 1.0 | 4.5  |                    |   |     |
| Output enable time     | t <sub>ZH</sub>  | $\overline{\text{OE}}$ | Y              | 11.2                       | 2.0 | 11.2                           | 1.5 | 7.8                             | 1.0 | 5.4                            | 1.0 | 4.8  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>ZL</sub>  |                        |                | 11.2                       | 2.0 | 11.2                           | 1.5 | 7.8                             | 1.0 | 5.4                            | 1.0 | 4.8  |                    |   |     |
| Output disable time    | t <sub>HZ</sub>  | $\overline{\text{OE}}$ | Y              | 6.4                        | 2.0 | 7.2                            | 1.5 | 6.4                             | 1.0 | 5.8                            | 1.0 | 5.6  | ns                 | C <sub>L</sub> = 15pF<br>R <sub>L</sub> = 2.0kΩ |     |
|                        | t <sub>LZ</sub>  |                        |                | 6.4                        | 2.0 | 7.2                            | 1.5 | 6.4                             | 1.0 | 5.8                            | 1.0 | 5.6  |                    |   |     |

## Switching Characteristics (Cont.)

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

| Item                      | Symbol    | From<br>(input) | To<br>(output) | $T_a = -40\text{ to }85^\circ\text{C}$ |                                    |                                     |                                    |                                    | Unit | Test<br>conditions                               |
|---------------------------|-----------|-----------------|----------------|--|------------------------------------|-------------------------------------|------------------------------------|------------------------------------|------|--|
|                           |           |                 |                | $V_{CCOUT} = 1.2\text{ V}$             | $V_{CCOUT} = 1.5 \pm 0.1\text{ V}$ | $V_{CCOUT} = 1.8 \pm 0.15\text{ V}$ | $V_{CCOUT} = 2.5 \pm 0.2\text{ V}$ | $V_{CCOUT} = 3.3 \pm 0.3\text{ V}$ |      |  |
|                           |           |                 |                | Typ                                    | Typ                                | Typ                                 | Typ                                | Typ                                |      |  |
| Propagation<br>delay time | $t_{PLH}$ | A               | Y              | 10.5                                   | 7.5                                | 6.0                                 | 4.5                                | 4.0                                | ns   | $C_L = 15\text{pF}$<br>$R_L = 2.0\text{k}\Omega$ |
|                           | $t_{PHL}$ |                 |                | 10.5                                   | 7.5                                | 6.0                                 | 4.5                                | 4.0                                |      |  |
| Output<br>enable time     | $t_{ZH}$  | $\overline{OE}$ | Y              | 11.6                                   | 8.5                                | 6.5                                 | 5.0                                | 4.2                                | ns   | $C_L = 15\text{pF}$<br>$R_L = 2.0\text{k}\Omega$ |
|                           | $t_{ZL}$  |                 |                | 11.6                                   | 8.5                                | 6.5                                 | 5.0                                | 4.2                                |      |  |
| Output<br>disable time    | $t_{HZ}$  | $\overline{OE}$ | Y              | 7.0                                    | 6.2                                | 6.0                                 | 5.7                                | 5.5                                | ns   | $C_L = 15\text{pF}$<br>$R_L = 2.0\text{k}\Omega$ |
|                           | $t_{LZ}$  |                 |                | 7.0                                    | 6.2                                | 6.0                                 | 5.7                                | 5.5                                |      |  |

## Operating Characteristics

 $T_a = 25^\circ\text{C}$ 

| Item                             | Symbol   | $V_{CCIN}$ (V) | $V_{CCOUT}$ (V) | Min | Typ | Max | Unit | Test conditions                  |
|----------------------------------|----------|----------------|-----------------|-----|-----|-----|------|----------------------------------|
| Power dissipation<br>capacitance | $C_{PD}$ | 3.3            | 3.3             | —   | 12  | —   | pF   | $f = 10\text{ MHz}$<br>$C_L = 0$ |

## Power-up considerations

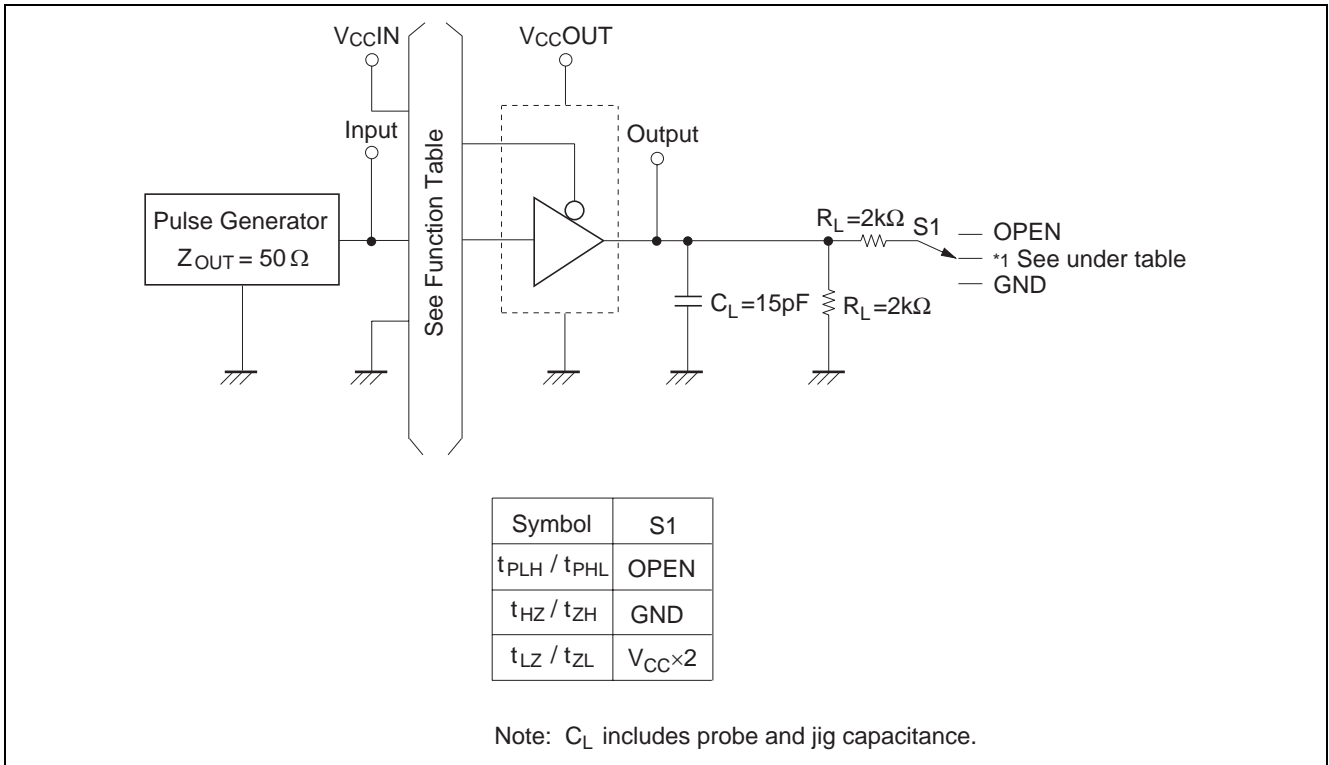
Level-translation devices offer an opportunity for successful mixed-voltage signal design.

A proper power-up sequence always should be followed to avoid excessive supply current, bus contention, oscillations, or other anomalies caused by improperly biased device pins.

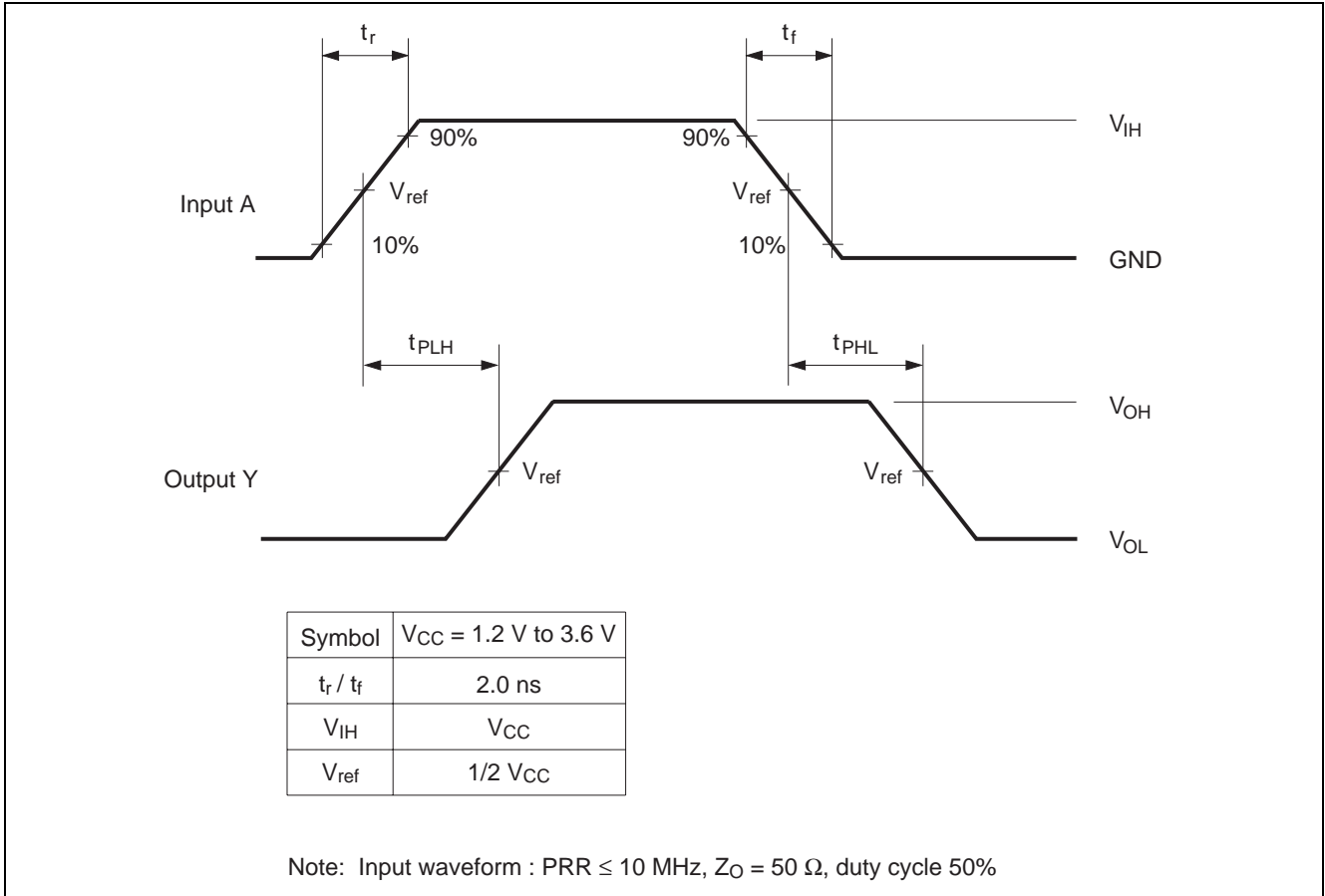
Take these precautions to guard against such power-up problems.

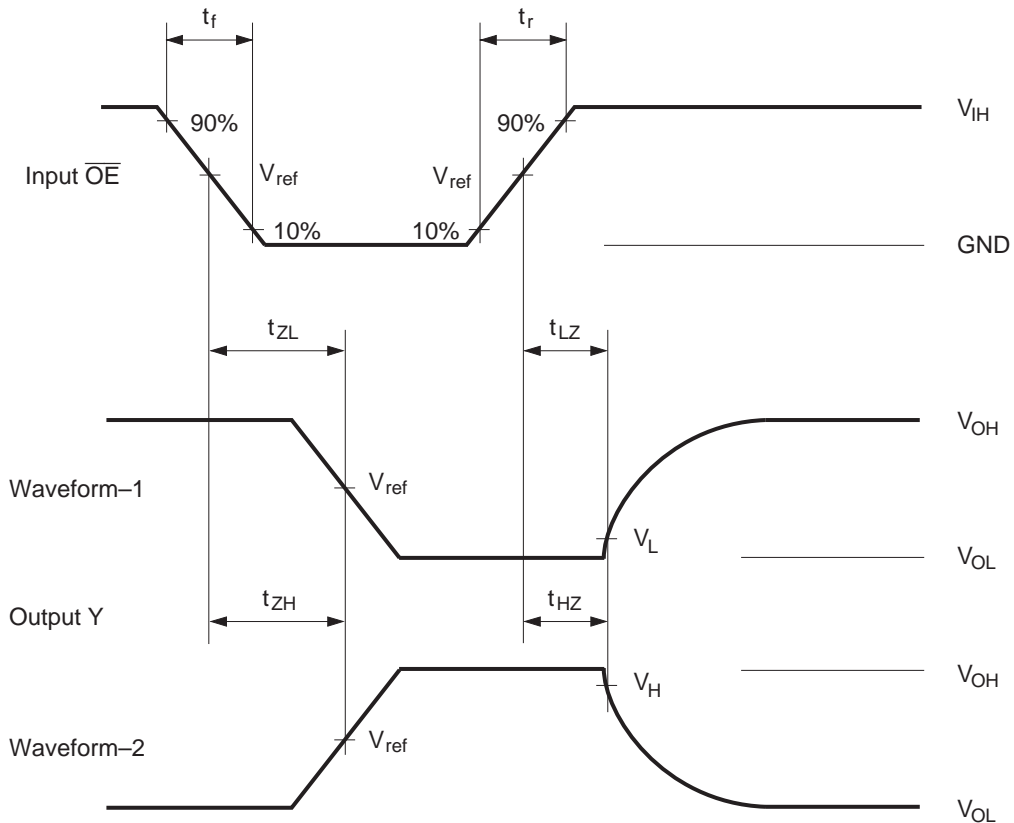
1. Connect ground before any supply voltage is applied.
2. Next, power up the control side of the device.  
(Power up of  $V_{CCIN}$  is first. Next power up is  $V_{CCOUT}$ )
3. Tie  $\overline{OE}$  to  $V_{CCIN}$  with a pull-up resistor so that it ramps with  $V_{CCIN}$ .

Test Circuit



Waveforms



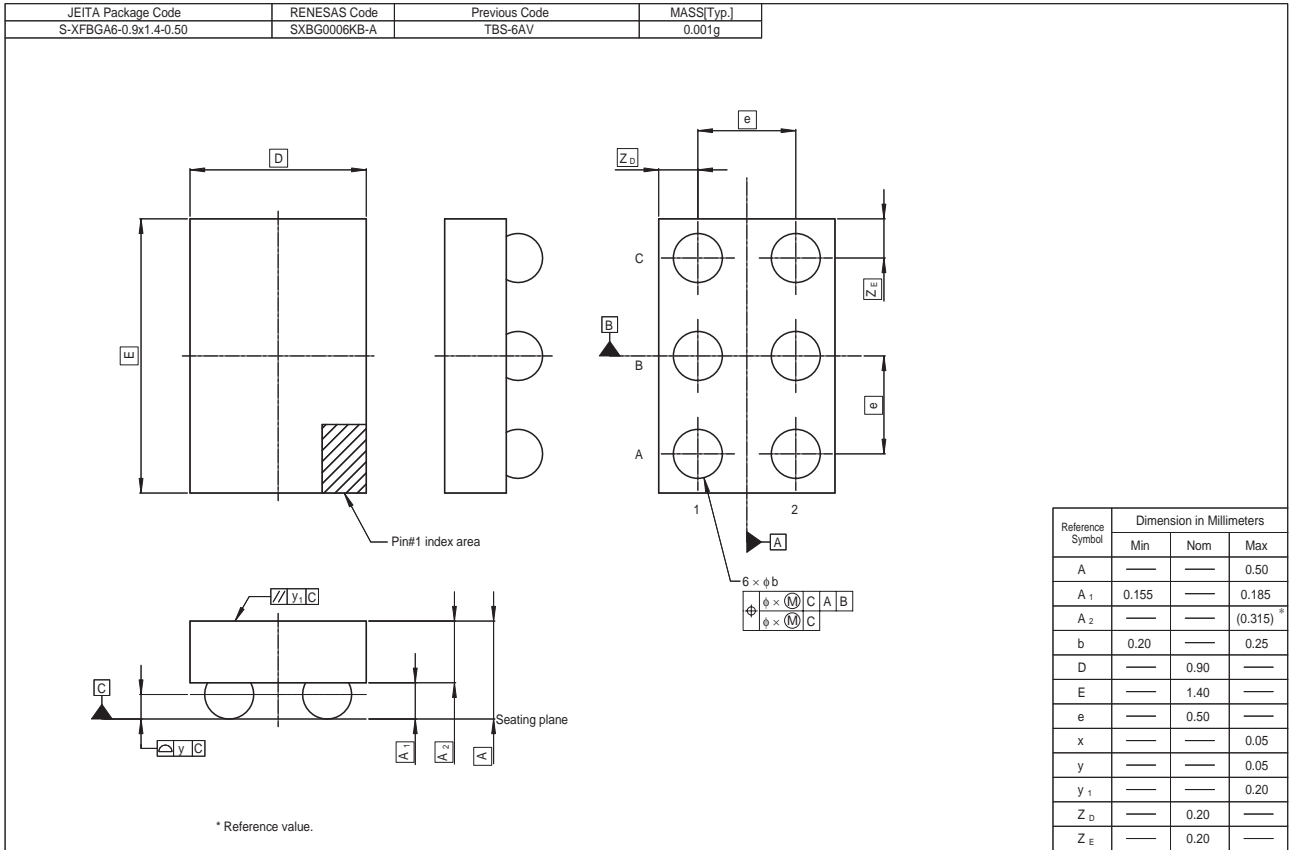


| Symbol                          | V <sub>CC</sub> = 1.2 V,<br>1.5±0.1 V  | V <sub>CC</sub> = 1.8±0.15 V   | V <sub>CC</sub> = 2.5±0.2 V  | V <sub>CC</sub> = 3.3±0.3 V  |
|---------------------------------|--|--|--|--|
| t <sub>r</sub> / t <sub>f</sub> | 2.0 ns   | 2.0 ns   | 2.0 ns   | 2.0 ns   |
| V <sub>IH</sub>                 | V <sub>CC</sub>  | V <sub>CC</sub>  | V <sub>CC</sub>  | V <sub>CC</sub>  |
| V <sub>ref</sub>                | 1/2 V <sub>CC</sub>  | 1/2 V <sub>CC</sub>  | 1/2 V <sub>CC</sub>  | 1/2 V <sub>CC</sub>  |
| V <sub>H</sub> / V <sub>L</sub> | V <sub>H</sub> = V <sub>OH</sub> -0.1 V<br>V <sub>L</sub> = V <sub>OL</sub> +0.1 V | V <sub>H</sub> = V <sub>OH</sub> -0.15 V<br>V <sub>L</sub> = V <sub>OL</sub> +0.15 V | V <sub>H</sub> = V <sub>OH</sub> -0.15 V<br>V <sub>L</sub> = V <sub>OL</sub> +0.15 V | V <sub>H</sub> = V <sub>OH</sub> -0.3 V<br>V <sub>L</sub> = V <sub>OL</sub> +0.3 V |

- Notes:
1. Input waveform : PRR ≤ 10 MHz, Z<sub>o</sub> = 50 Ω, duty cycle 50%.
  2. Waveform – 1 is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform – 2 is for an output with internal conditions such that the output is high except when disabled by the output control.
  4. The output are measured one at a time with one transition per measurement.



Package Dimensions



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