

# HD74LV1GW57A

## Configurable Multiple-Function Gate

REJ03D0081-0200  
Rev.2.00  
May 19, 2006

### Description

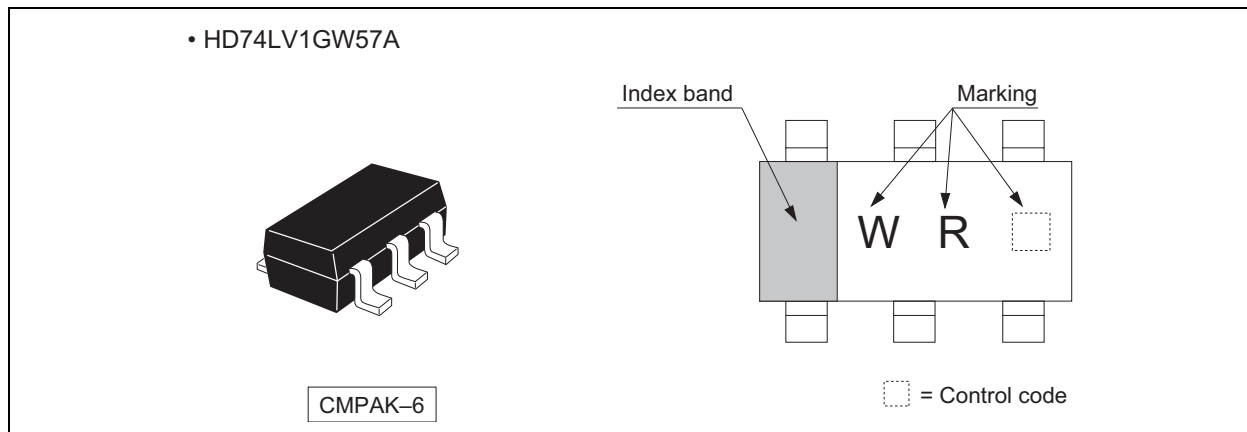
The HD74LV1GW57A has configurable multiple-function gate in a 6 pin package. The Output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, NAND, NOR, EX-NOR. Low voltage and high-speed operation is suitable for the battery powered products (e.g., notebook 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 : 1.65 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  $\pm 6$  mA (@  $V_{CC}$  = 3.0 V to 3.6 V),  $\pm 12$  mA (@  $V_{CC}$  = 4.5 V to 5.5 V)
- All the logical input has hysteresis voltage for the slow transition.
- Ordering Information

| Part Name       | Package Type | Package Code (Previous Code) | Package Abbreviation | Taping Abbreviation (Quantity) |
|-----------------|--------------|------------------------------|----------------------|--------------------------------|
| HD74LV1GW57ACME | CMPAK-6 pin  | PTSP0006JA-A (CMPAK-6V)      | CM                   | E (3,000 pcs / Reel)           |

### Outline and Article Indication

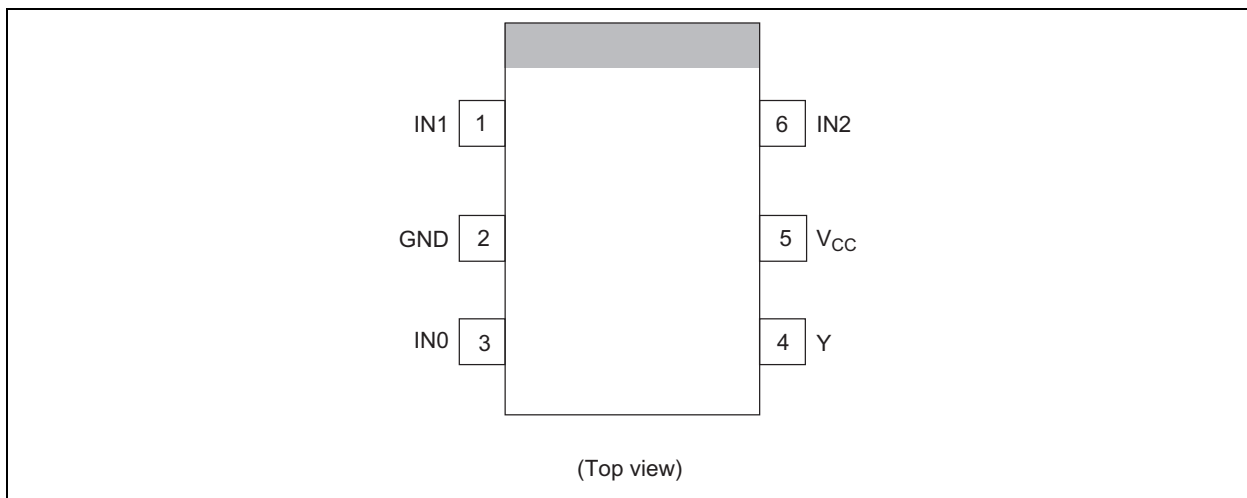


**Function Table**

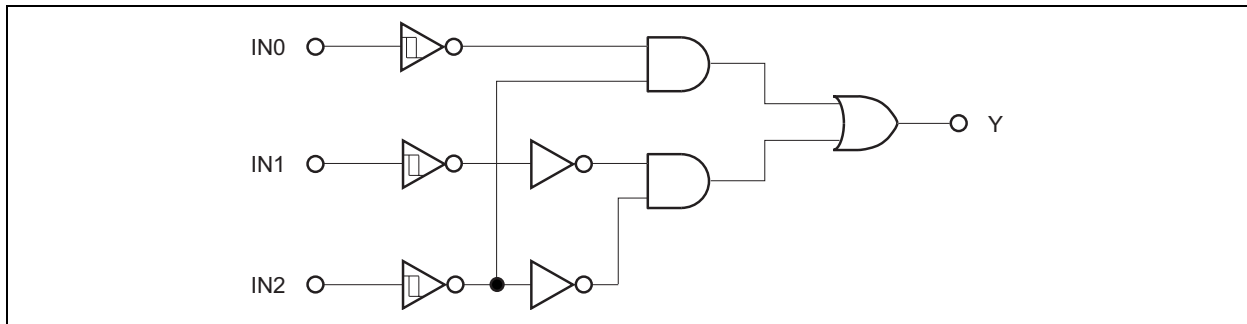
| Inputs |     |     | Output |
|--------|-----|-----|--------|
| IN2    | IN1 | IN0 | Y      |
| L      | L   | L   | H      |
| L      | L   | H   | L      |
| L      | H   | L   | H      |
| L      | H   | H   | L      |
| H      | L   | L   | L      |
| H      | L   | H   | L      |
| H      | H   | L   | H      |
| H      | H   | H   | H      |

H : High level  
L : Low level

**Pin Arrangement**



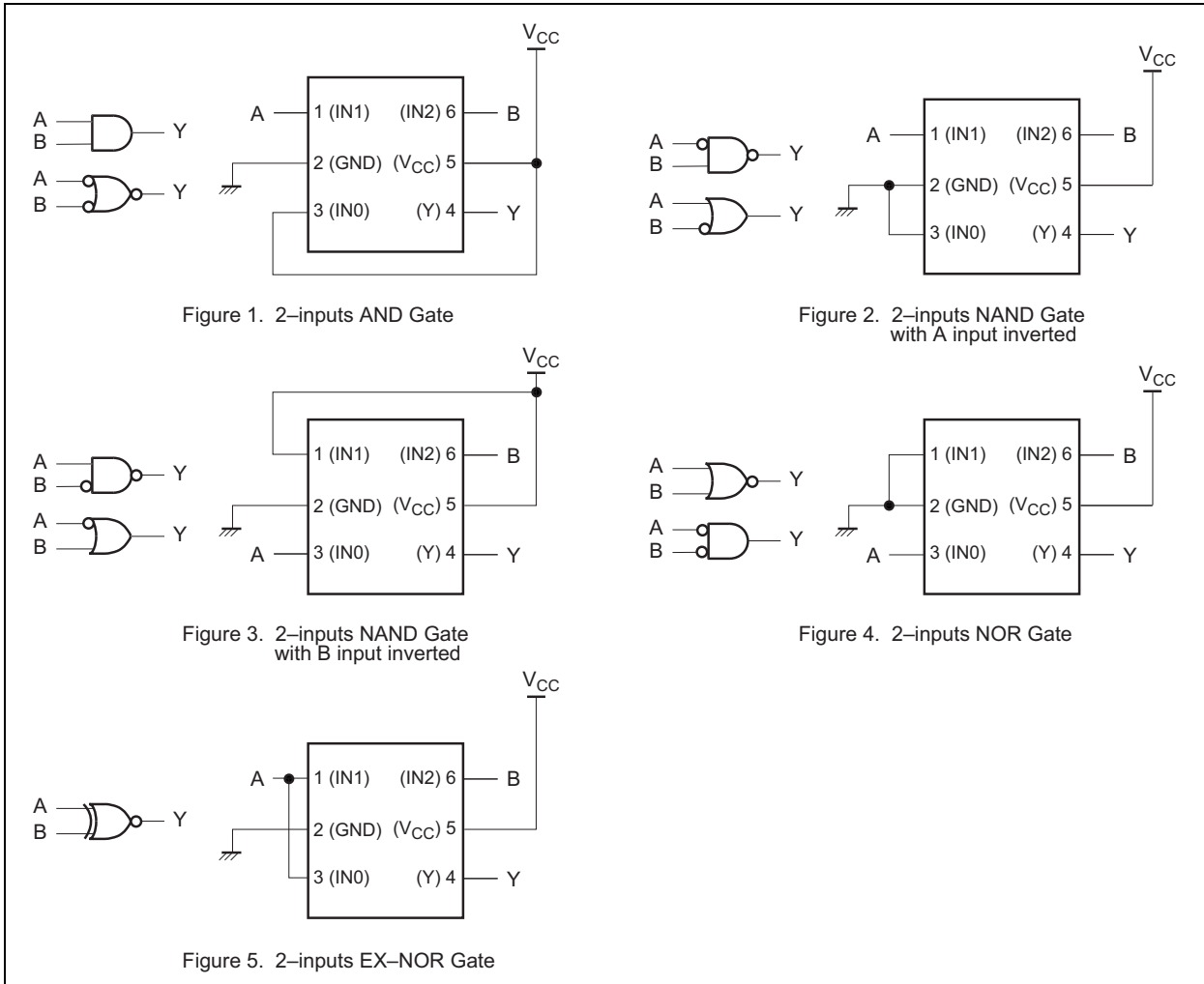
**Logic Diagram**



**Function Selection Table**

| Logic Function                        | Figure No. |
|---------------------------------------|------------|
| 2-input AND                           | 1          |
| 2-input AND with both inputs inverted | 4          |
| 2-input NAND with one input inverted  | 2, 3       |
| 2-input OR with one input inverted    | 2, 3       |
| 2-input NOR                           | 4          |
| 2-input NOR with both inputs inverted | 1          |
| 2-input EX-NOR                        | 5          |

**Logic Configurations**



### Absolute Maximum Ratings

| Item   | Symbol                | Ratings                | Unit             | Test Conditions                   |
|--|-----------------------|------------------------|------------------|-----------------------------------|
| Supply voltage range   | $V_{CC}$              | -0.5 to 7.0            | V                |                                   |
| Input voltage range <sup>*1</sup>  | $V_I$                 | -0.5 to 7.0            | V                |                                   |
| Output voltage range <sup>*1,2</sup>   | $V_O$                 | -0.5 to $V_{CC} + 0.5$ | V                | Output : H or L<br>$V_{CC}$ : OFF |
|  |                       | -0.5 to 7.0            |                  |                                   |
| Input clamp current  | $I_{IK}$              | -20                    | mA               | $V_I < 0$                         |
| Output clamp current   | $I_{OK}$              | $\pm 50$               | mA               | $V_O < 0$ or $V_O > V_{CC}$       |
| Continuous output current  | $I_O$                 | $\pm 25$               | mA               | $V_O = 0$ to $V_{CC}$             |
| Continuous current through $V_{CC}$ or GND   | $I_{CC}$ or $I_{GND}$ | $\pm 50$               | mA               |                                   |
| Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) <sup>*3</sup> | $P_T$                 | 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 5.5 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               | $V_{CC}$              | 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                     | $I_{OL}$              | —    | 1        | mA               | $V_{CC} = 1.65$ to $1.95$ V |
|                                    |                       | —    | 2        |                  | $V_{CC} = 2.3$ to $2.7$ V   |
|                                    |                       | —    | 6        |                  | $V_{CC} = 3.0$ to $3.6$ V   |
|                                    |                       | —    | 12       |                  | $V_{CC} = 4.5$ to $5.5$ V   |
|                                    | $I_{OH}$              | —    | -1       |                  | $V_{CC} = 1.65$ to $1.95$ V |
|                                    |                       | —    | -2       |                  | $V_{CC} = 2.3$ to $2.7$ V   |
|                                    |                       | —    | -6       |                  | $V_{CC} = 3.0$ to $3.6$ V   |
|                                    |                       | —    | -12      |                  | $V_{CC} = 4.5$ to $5.5$ V   |
| Input transition rise or fall rate | $\Delta t / \Delta v$ | 0    | 300      | ns / V           | $V_{CC} = 1.65$ to $1.95$ V |
|                                    |                       | 0    | 200      |                  | $V_{CC} = 2.3$ to $2.7$ V   |
|                                    |                       | 0    | 100      |                  | $V_{CC} = 3.0$ to $3.6$ V   |
|                                    |                       | 0    | 20       |                  | $V_{CC} = 4.5$ 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 Characteristic

Ta = -40 to 85°C

| Item                     | Symbol                      | V <sub>CC</sub> (V) * | Min                   | Typ | Max                   | Unit | Test condition   |                         |
|--------------------------|-----------------------------|-----------------------|-----------------------|-----|-----------------------|------|--|-------------------------|
| Threshold voltage        | V <sub>T</sub> <sup>+</sup> | 1.65 to 1.95          | —                     | —   | V <sub>CC</sub> ×0.75 | V    |  |                         |
|                          |                             | 2.5                   | —                     | —   | 1.75                  |      |  |                         |
|                          |                             | 3.3                   | —                     | —   | 2.31                  |      |  |                         |
|                          |                             | 5.0                   | —                     | —   | 3.50                  |      |  |                         |
|                          | V <sub>T</sub> <sup>-</sup> | 1.65 to 1.95          | V <sub>CC</sub> ×0.25 | —   | —                     |      |  |                         |
|                          |                             | 2.5                   | 0.75                  | —   | —                     |      |  |                         |
|                          |                             | 3.3                   | 0.99                  | —   | —                     |      |  |                         |
|                          |                             | 5.0                   | 1.5                   | —   | —                     |      |  |                         |
|                          | ΔV <sub>T</sub>             | 1.65 to 1.95          | 0.1                   | —   | —                     |      |  | V <sub>CC</sub> ×0.4    |
|                          |                             | 2.5                   | 0.25                  | —   | —                     |      |  | 1.0                     |
|                          |                             | 3.3                   | 0.33                  | —   | —                     |      |  | 1.32                    |
|                          |                             | 5.0                   | 0.5                   | —   | —                     |      |  | 2.0                     |
| Output voltage           | V <sub>OH</sub>             | Min to Max            | V <sub>CC</sub> -0.1  | —   | —                     | V    | I <sub>OH</sub> = -50 μA                                     |                         |
|                          |                             | 1.65                  | 1.4                   | —   | —                     |      | I <sub>OH</sub> = -1 mA                                      |                         |
|                          |                             | 2.3                   | 2.0                   | —   | —                     |      | I <sub>OH</sub> = -2 mA                                      |                         |
|                          |                             | 3.0                   | 2.48                  | —   | —                     |      | I <sub>OH</sub> = -6 mA                                      |                         |
|                          |                             | 4.5                   | 3.8                   | —   | —                     |      | I <sub>OH</sub> = -12 mA                                     |                         |
|                          | V <sub>OL</sub>             | Min to Max            | —                     | —   | —                     |      | 0.1  | I <sub>OL</sub> = 50 μA |
|                          |                             | 1.65                  | —                     | —   | —                     |      | 0.3  | I <sub>OL</sub> = 1 mA  |
|                          |                             | 2.3                   | —                     | —   | —                     |      | 0.4  | I <sub>OL</sub> = 2 mA  |
|                          |                             | 3.0                   | —                     | —   | —                     |      | 0.44   | I <sub>OL</sub> = 6 mA  |
|                          |                             | 4.5                   | —                     | —   | —                     |      | 0.55   | I <sub>OL</sub> = 12 mA |
| Input current            | I <sub>IN</sub>             | 0 to 5.5              | —                     | —   | ±1                    | μA   | V <sub>IN</sub> = 5.5 V or GND                               |                         |
| Quiescent supply current | I <sub>CC</sub>             | 5.5                   | —                     | —   | 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>IN</sub> or V <sub>O</sub> = 0 to 5.5 V               |                         |
| Input capacitance        | C <sub>IN</sub>             | 3.3                   | —                     | 3.0 | —                     | 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

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

| Item                   | Symbol           | Ta = 25°C |      |      | Ta = -40 to 85°C |      | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|-----------|------|------|------------------|------|------|------------------------|--------------|-------------|
|                        |                  | Min       | Typ  | Max  | Min              | Max  |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | —         | 15.8 | 29.4 | 1.0              | 33.0 | ns   | C <sub>L</sub> = 15 pF | IN           | Y           |
|                        | t <sub>PHL</sub> | —         | 22.6 | 40.9 | 1.0              | 45.0 |      | C <sub>L</sub> = 50 pF |              |             |

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

| Item                   | Symbol           | Ta = 25°C |      |      | Ta = -40 to 85°C |      | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|-----------|------|------|------------------|------|------|------------------------|--------------|-------------|
|                        |                  | Min       | Typ  | Max  | Min              | Max  |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | —         | 9.4  | 17.6 | 1.0              | 21.0 | ns   | C <sub>L</sub> = 15 pF | IN           | Y           |
|                        | t <sub>PHL</sub> | —         | 12.6 | 22.6 | 1.0              | 26.5 |      | C <sub>L</sub> = 50 pF |              |             |

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

| Item                   | Symbol           | Ta = 25°C |     |      | Ta = -40 to 85°C |      | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|-----------|-----|------|------------------|------|------|------------------------|--------------|-------------|
|                        |                  | Min       | Typ | Max  | Min              | Max  |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | —         | 7.0 | 11.0 | 1.0              | 13.0 | ns   | C <sub>L</sub> = 15 pF | IN           | Y           |
|                        | t <sub>PHL</sub> | —         | 9.5 | 14.5 | 1.0              | 16.5 |      | C <sub>L</sub> = 50 pF |              |             |

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

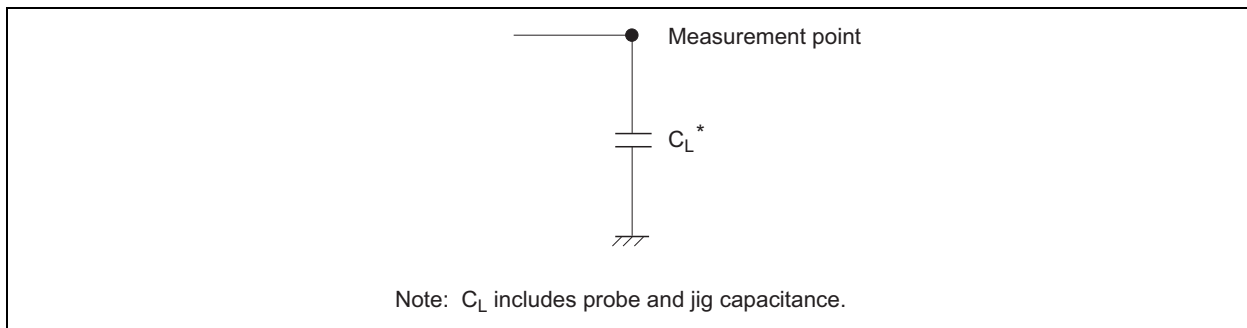
| Item                   | Symbol           | Ta = 25°C |     |     | Ta = -40 to 85°C |      | Unit | Test Conditions        | FROM (Input) | TO (Output) |
|------------------------|------------------|-----------|-----|-----|------------------|------|------|------------------------|--------------|-------------|
|                        |                  | Min       | Typ | Max | Min              | Max  |      |                        |              |             |
| Propagation delay time | t <sub>PLH</sub> | —         | 4.8 | 6.8 | 1.0              | 8.0  | ns   | C <sub>L</sub> = 15 pF | IN           | Y           |
|                        | t <sub>PHL</sub> | —         | 6.3 | 8.8 | 1.0              | 10.0 |      | C <sub>L</sub> = 50 pF |              |             |

### Operating Characteristics

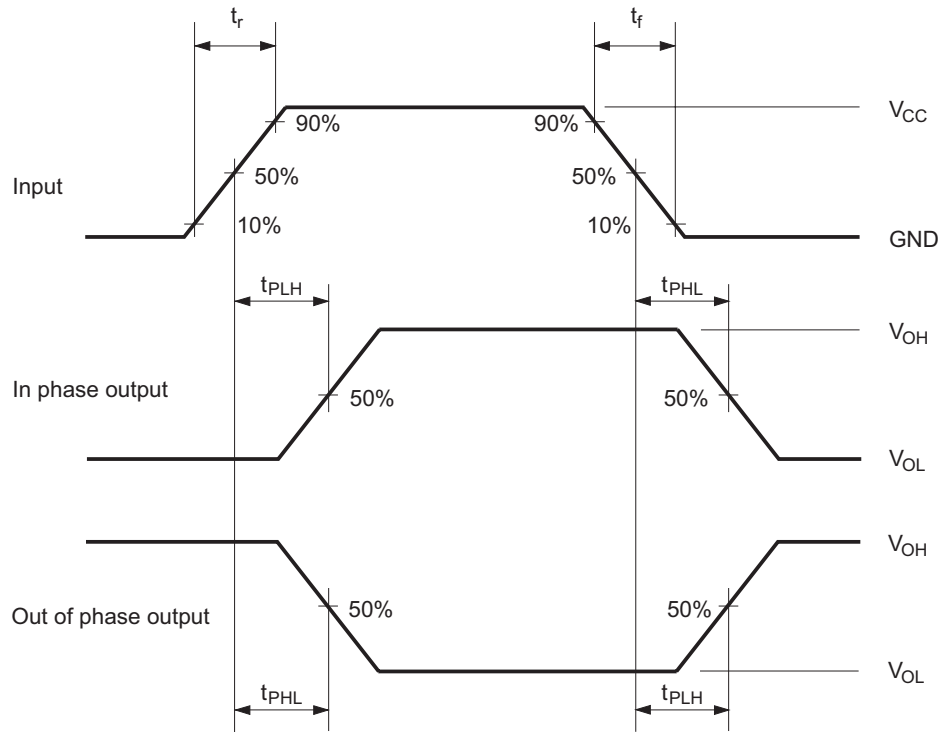
$C_L = 50 \text{ pF}$

| Item                          | Symbol          | V <sub>CC</sub> (V) | Ta = 25°C |      |     | Unit | Test Conditions |
|-------------------------------|-----------------|---------------------|-----------|------|-----|------|-----------------|
|                               |                 |                     | Min       | Typ  | Max |      |                 |
| Power dissipation capacitance | C <sub>PD</sub> | 3.3                 | —         | 8.5  | —   | pF   | f = 10 MHz      |
|                               |                 | 5.0                 | —         | 10.0 | —   |      |                 |

### Test Circuit

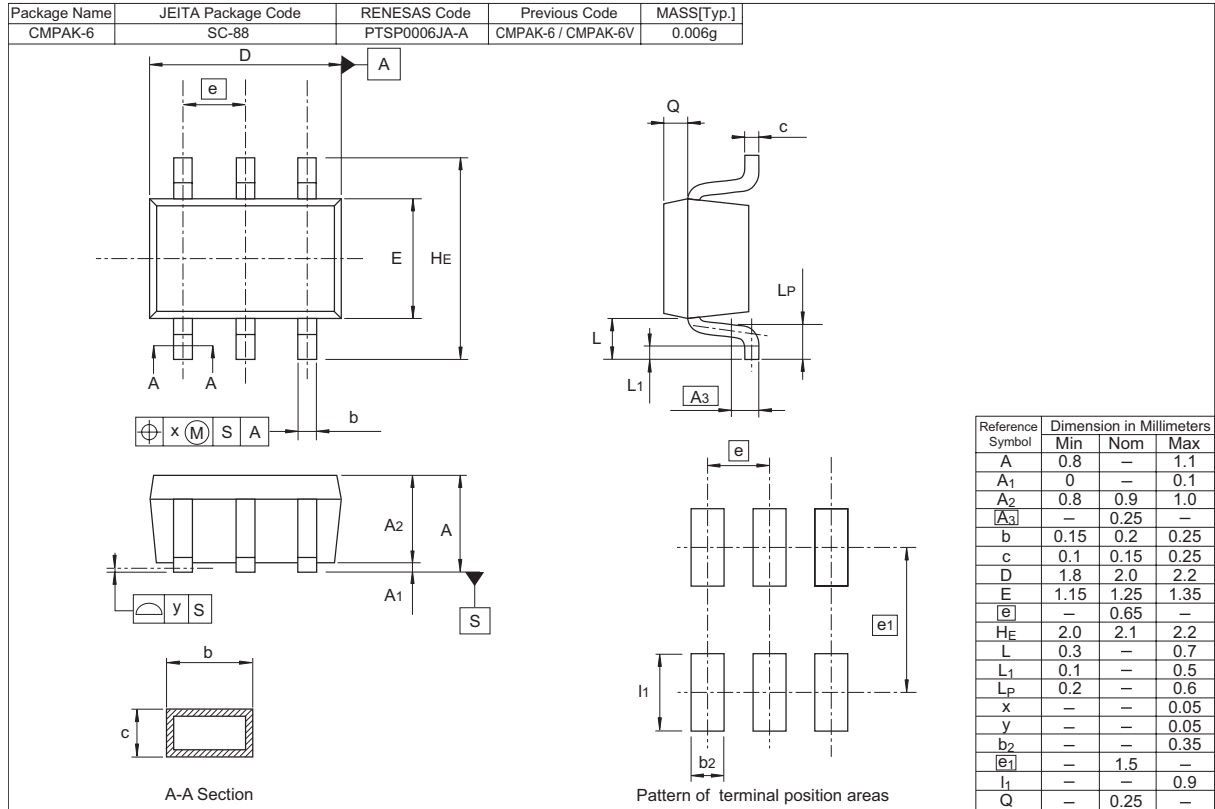


• Waveforms



- Notes: 1. Input waveform : PRR  $\leq$  1 MHz,  $Z_o = 50 \Omega$ ,  $t_r \leq 3$  ns,  $t_f \leq 3$  ns.  
 2. The output are measured one at a time with one transition per measurement.

Package Dimensions





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