

# HD74LV1GT125A

## Bus Buffer Gate with 3-state Output / CMOS Logic Level Shifter

REJ03D0123-0900

Rev.9.00

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### Description

The HD74LV1GT125A has a bus buffer gate with 3-state output in a 5 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  $V_{CC}$  through a pull-down resistor; the minimum value of the resistor is determined by the current sourcing capability of the driver. The input protection circuitry on this device allows over voltage tolerance on the input, allowing the device to be used as a logic-level translator from 3.0 V CMOS Logic to 5.0 V CMOS Logic or from 1.8 V CMOS logic to 3.0 V CMOS Logic while operating at the high-voltage power supply. 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

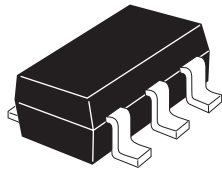
- The basic gate function is lined up as Renesas uni logic series.
- Supplied on emboss taping for high-speed automatic mounting.
- TTL compatible input level.  
Supply voltage range : 3.0 to 5.5 V  
Operating temperature range : -40 to +85°C
- Logic-level translate function  
3.0 V CMOS logic → 5.0 V CMOS logic (@ $V_{CC}$  = 5.0 V)  
1.8 V or 2.5 V CMOS logic → 3.3 V CMOS logic (@ $V_{CC}$  = 3.3 V)
- 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 : Z)
- 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)
HD74LV1GT125ACME	CMPAK-5 pin	PTSP0005ZC-A (CMPAK-5V)	CM	E (3000 pcs/reel)
HD74LV1GT125AVSE	VSON-5 pin	PUSN0005KA-A (TNP-5DV)	VS	E (3000 pcs/reel)

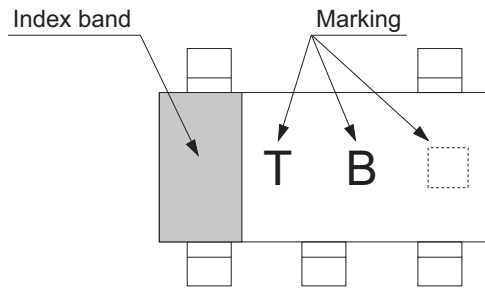
Note: Please consult the sales office for the above package availability.

## Outline and Article Indication

• HD74LV1GT125A

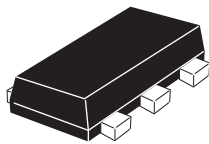


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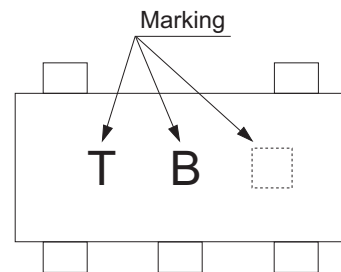


□ = Control code

• HD74LV1GT125A



VSON-5



□ = Control code

## Function Table

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

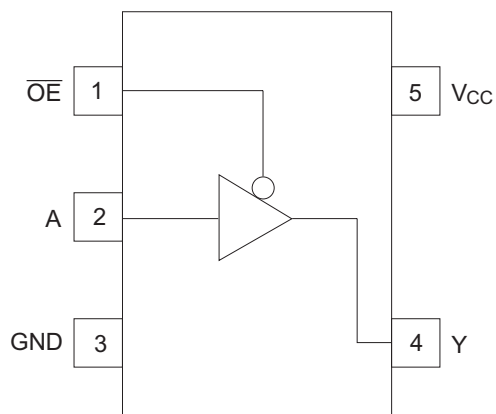
H : High level

L : Low level

X : Immaterial

Z : High impedance

## Pin Arrangement



(Top view)

## 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
		-0.5 to 7.0		$V_{CC}$ : OFF or Output : Z
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	$V_{CC}$	3.0	5.5	V	
Input voltage range	$V_I$	0	5.5	V	
Output voltage range	$V_O$	0	$V_{CC}$	V	Output : Z
		0	5.5		
Output current	$I_{OH}$	—	6	mA	$V_{CC} = 3.0$ to $3.6$ V
		—	12		$V_{CC} = 4.5$ to $5.5$ V
	$I_{OL}$	—	-6	mA	$V_{CC} = 3.0$ to $3.6$ V
		—	-12		$V_{CC} = 4.5$ to $5.5$ V
Input transition rise or fall rate	$\Delta t / \Delta v$	0	100	ns / V	$V_{CC} = 3.0$ 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

- $T_a = -40$  to  $85^\circ\text{C}$

Item	Symbol	$V_{CC}$ (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	$V_{IH}$	3.0 to 3.6	1.5	—	—	V	
		4.5 to 5.5	2.0	—	—		
	$V_{IL}$	3.0 to 3.6	—	—	0.6		
		4.5 to 5.5	—	—	0.8		
Hysteresis voltage	$V_H$	3.3	—	0.10	—	V	$V_{T^+} - V_{T^-}$
		5.0	—	0.15	—		
Output voltage	$V_{OH}$	Min to Max	$V_{CC}-0.1$	—	—	V	$I_{OH} = -50\ \mu\text{A}$
		3.0	2.48	—	—		$I_{OH} = -6\ \text{mA}$
		4.5	3.8	—	—		$I_{OH} = -12\ \text{mA}$
	$V_{OL}$	Min to Max	—	—	0.1		$I_{OL} = 50\ \mu\text{A}$
		3.0	—	—	0.44		$I_{OL} = 6\ \text{mA}$
		4.5	—	—	0.55		$I_{OL} = 12\ \text{mA}$
Input current	$I_{IN}$	0 to 5.5	—	—	$\pm 1$	$\mu\text{A}$	$V_{IN} = 5.5\ \text{V}$ or GND
Off state output current	$I_{OZ}$	Min to Max	—	—	$\pm 5$	$\mu\text{A}$	$V_O = 5.5\ \text{V}$ or GND
Quiescent supply current	$I_{CC}$	5.5	—	—	10	$\mu\text{A}$	$V_{IN} = V_{CC}$ or GND, $I_O = 0$
	$\Delta I_{CC}$	5.5	—	—	1.5	mA	One input $V_{IN} = 3.4\ \text{V}$ , other input $V_{CC}$ or GND
Output leakage current	$I_{OFF}$	0	—	—	5	$\mu\text{A}$	$V_{IN}$ or $V_O = 0$ to $5.5\ \text{V}$
Input capacitance	$C_{IN}$	5.0	—	3.0	—	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

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

Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	4.5	9.0	1.0	10.5	ns	$C_L = 15\ \text{pF}$	A	Y
	$t_{PHL}$	—	6.0	11.5	1.0	13.0		$C_L = 50\ \text{pF}$		
Enable time	$t_{ZH}$	—	4.5	9.0	1.0	10.5	ns	$C_L = 15\ \text{pF}$	$\overline{OE}$	Y
	$t_{ZL}$	—	6.0	11.5	1.0	13.0		$C_L = 50\ \text{pF}$		
Disable time	$t_{HZ}$	—	4.0	10.0	1.0	11.5	ns	$C_L = 15\ \text{pF}$	$\overline{OE}$	Y
	$t_{LZ}$	—	5.5	13.5	1.0	15.0		$C_L = 50\ \text{pF}$		

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

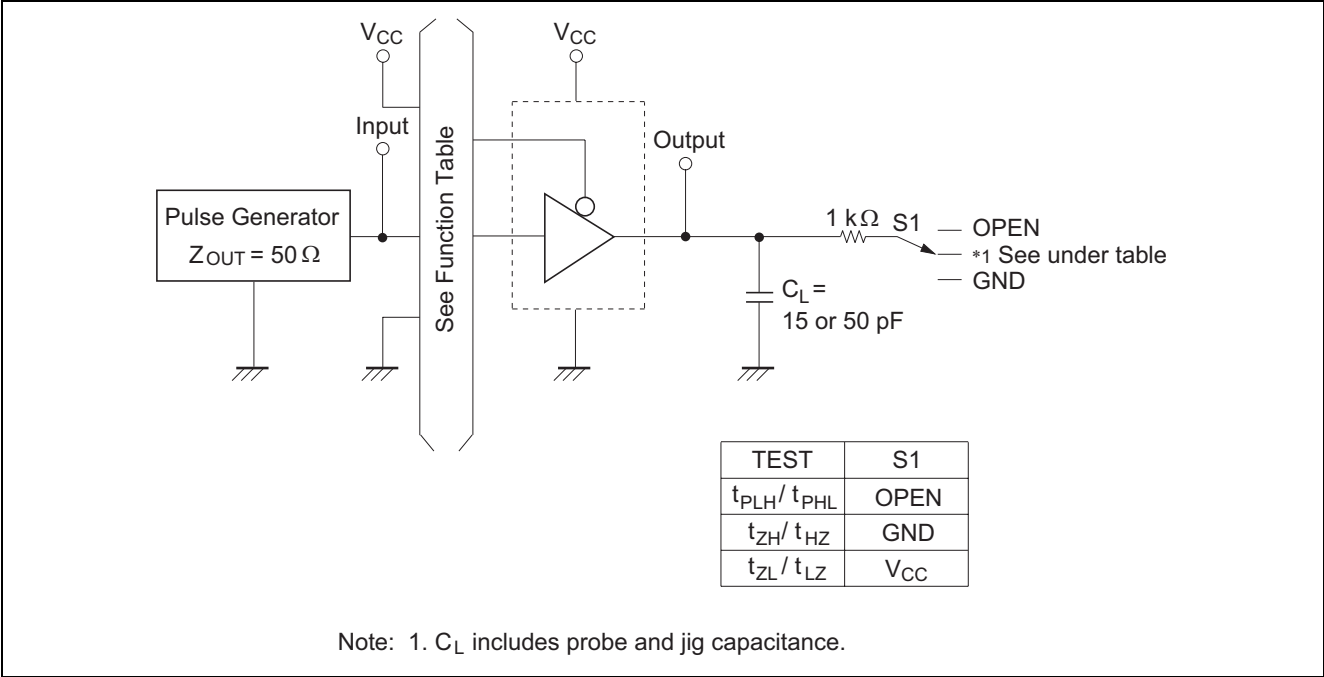
Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	3.4	5.5	1.0	6.5	ns	$C_L = 15\ \text{pF}$	A	Y
	$t_{PHL}$	—	4.3	7.5	1.0	8.5		$C_L = 50\ \text{pF}$		
Enable time	$t_{ZH}$	—	3.4	5.1	1.0	6.0	ns	$C_L = 15\ \text{pF}$	$\overline{OE}$	Y
	$t_{ZL}$	—	4.4	7.1	1.0	8.0		$C_L = 50\ \text{pF}$		
Disable time	$t_{HZ}$	—	3.2	6.8	1.0	8.0	ns	$C_L = 15\ \text{pF}$	$\overline{OE}$	Y
	$t_{LZ}$	—	4.0	8.8	1.0	10.0		$C_L = 50\ \text{pF}$		

Operating Characteristics

- $C_L = 50 \text{ pF}$

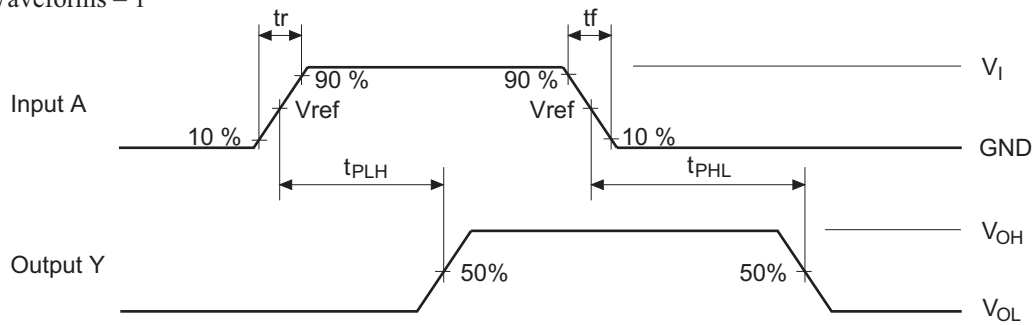
Item	Symbol	$V_{CC} \text{ (V)}$	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	$C_{PD}$	5.0	—	11.5	—	pF	$f = 10 \text{ MHz}$

Test Circuit

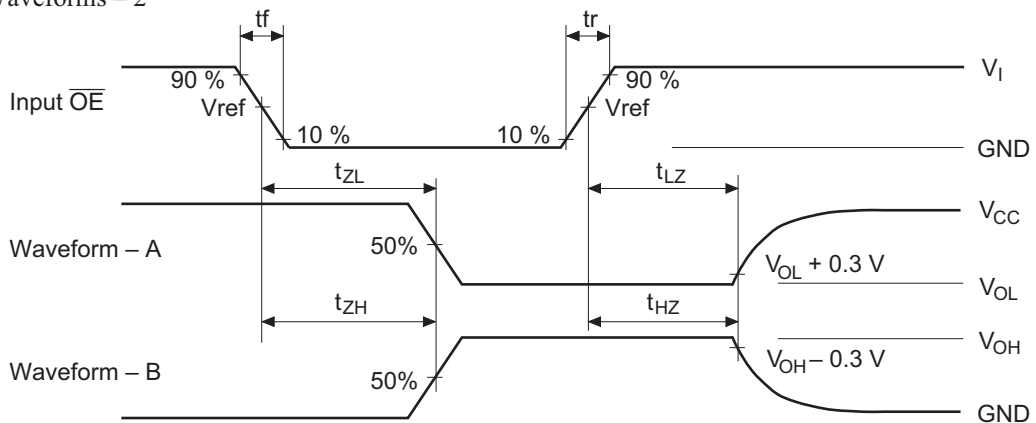


## Waveforms

• Waveforms – 1



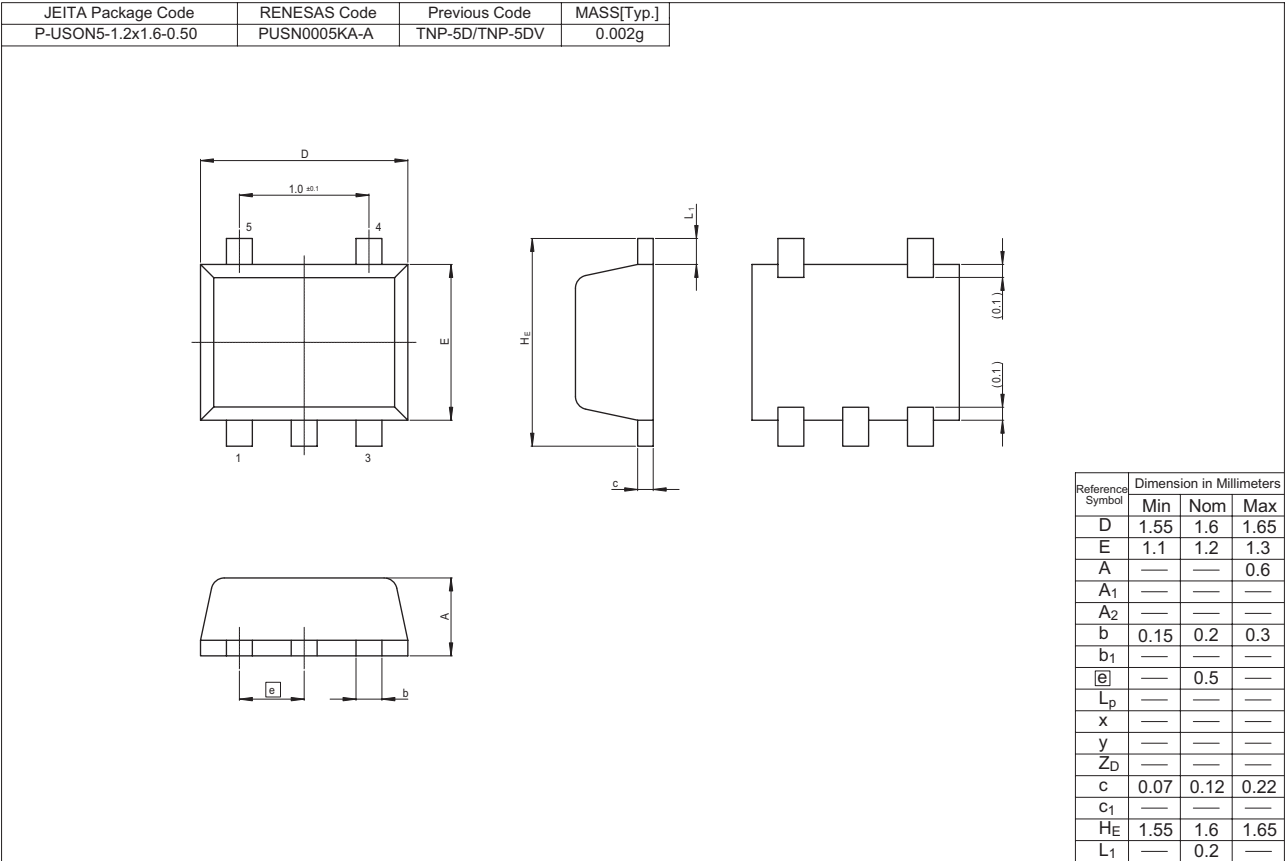
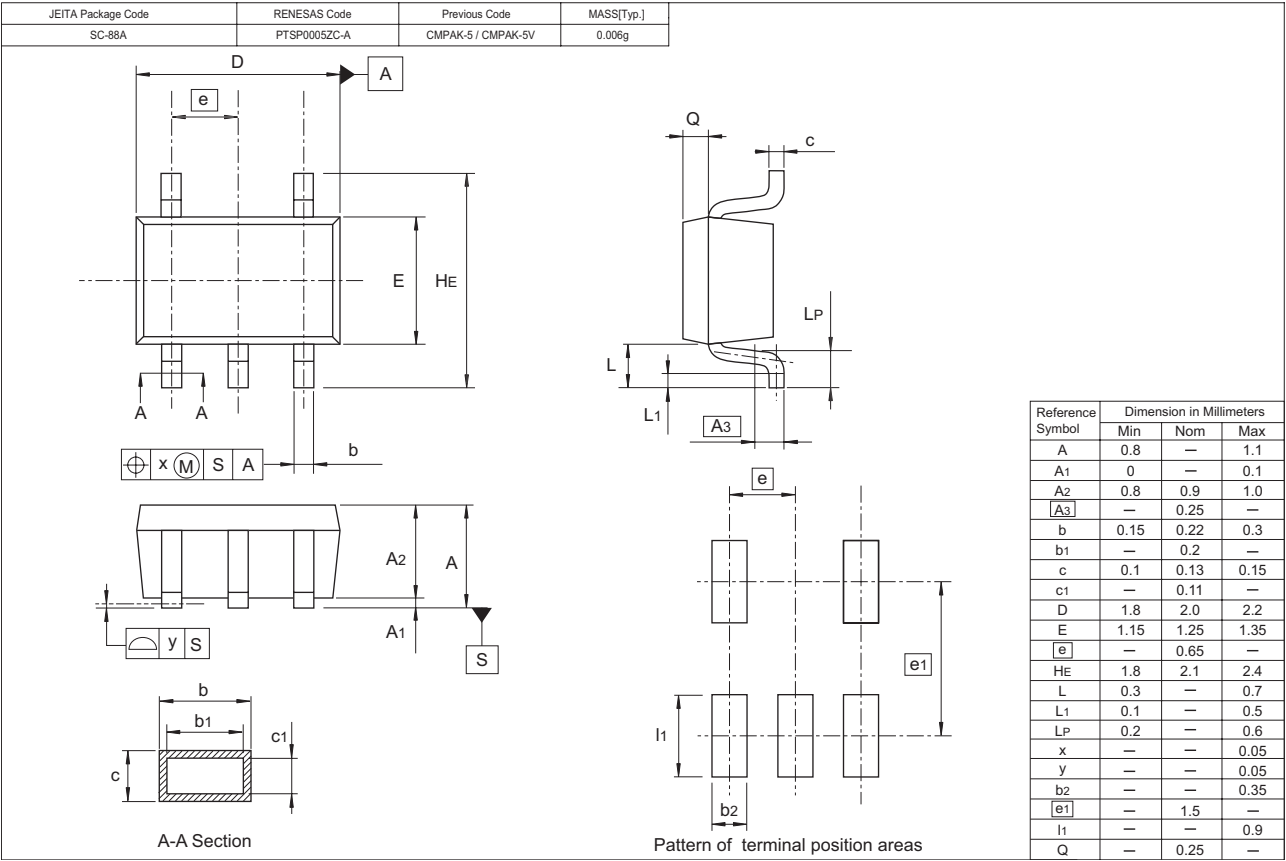
• Waveforms – 2



$V_{CC}$ (V)	INPUTS		$V_{ref}$
	$V_I$	$t_r / t_f$	
$3.3 \pm 0.3$	2.5 V	$\leq 3.0\text{ ns}$	50%
$5.0 \pm 0.5$	3 V	$\leq 3.0\text{ ns}$	1.5 V

- Notes:
1. Input waveform :  $PRR \leq 1\text{ MHz}$ ,  $Z_o = 50\ \Omega$ .
  2. Waveform – A is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform – B 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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Tel: <1> (408) 382-7500, Fax: <1> (408) 382-7501

**Renesas Technology Europe Limited**  
Dukes Meadow, Millboard Road, Bourne End, Buckinghamshire, SL8 5FH, U.K.  
Tel: <44> (1628) 585-100, Fax: <44> (1628) 585-900

**Renesas Technology (Shanghai) Co., Ltd.**  
Unit 204, 205, AZIA Center, No.1233 Lujiazui Ring Rd, Pudong District, Shanghai, China 200120  
Tel: <86> (21) 5877-1818, Fax: <86> (21) 6887-7858/7898

**Renesas Technology Hong Kong Ltd.**  
7th Floor, North Tower, World Finance Centre, Harbour City, Canton Road, Tsimshatsui, Kowloon, Hong Kong  
Tel: <852> 2265-6688, Fax: <852> 2377-3473

**Renesas Technology Taiwan Co., Ltd.**  
10th Floor, No.99, Fushing North Road, Taipei, Taiwan  
Tel: <886> (2) 2715-2888, Fax: <886> (2) 3518-3399

**Renesas Technology Singapore Pte. Ltd.**  
1 Harbour Front Avenue, #06-10, Keppel Bay Tower, Singapore 098632  
Tel: <65> 6213-0200, Fax: <65> 6278-8001

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Kukje Center Bldg. 18th Fl., 191, 2-ka, Hangang-ro, Yongsan-ku, Seoul 140-702, Korea  
Tel: <82> (2) 796-3115, Fax: <82> (2) 796-2145

**Renesas Technology Malaysia Sdn. Bhd**  
Unit 906, Block B, Menara Amcorp, Amcorp Trade Centre, No.18, Jln Persiaran Barat, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia  
Tel: <603> 7955-9390, Fax: <603> 7955-9510