

HD74LV1GT86A

2-input Exclusive-OR Gate / CMOS Logic Level Shifter

REJ03D0122-1000

Rev.10.00

Mar 21, 2008

Description

The HD74LV1GT86A performs the Boolean functions $Y = A \oplus B$ or $Y = \overline{A}B + A\overline{B}$ in positive logic. A common application is as a true / complement element. If one of the inputs is low, the other input will be reproduced in true form at the output. If one of the inputs is high, the signal on the other input will be reproduced inverted form at the output. 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.

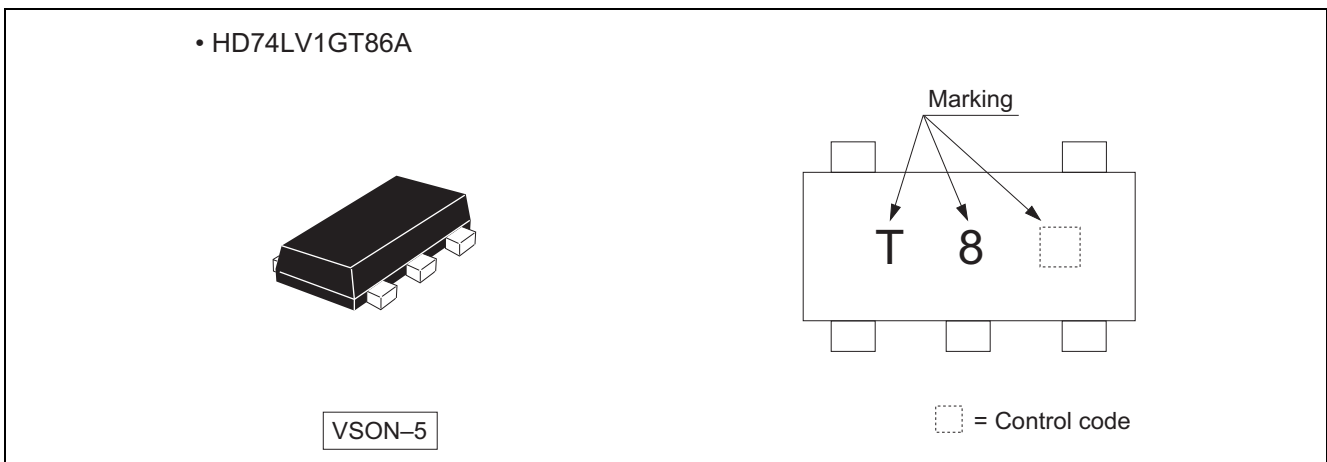
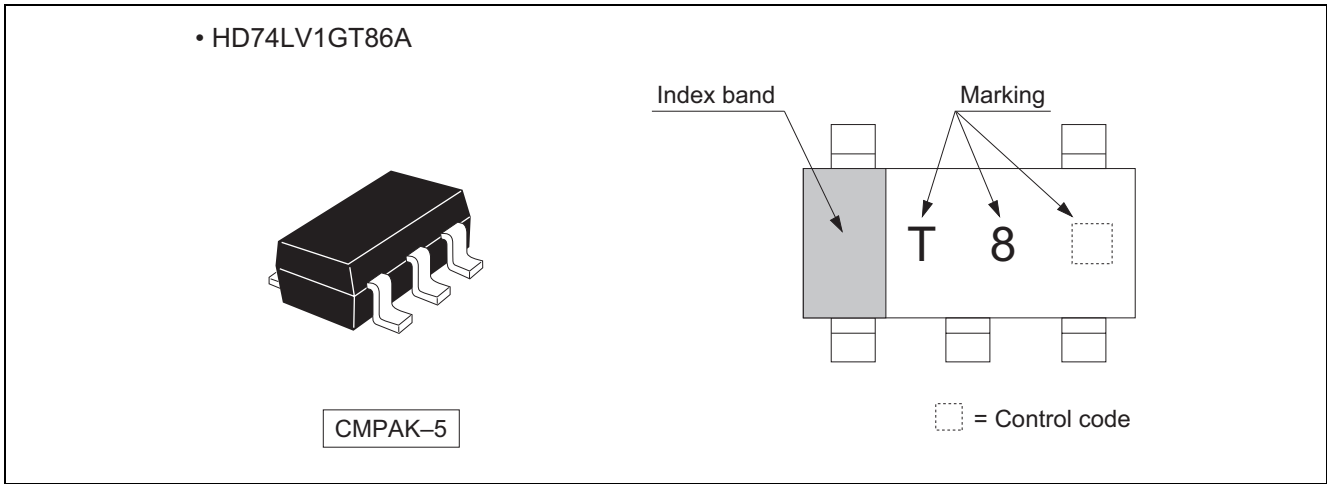
Features

- 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 current ±6 mA (@V_{CC} = 3.0 V to 3.6 V), ±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)
HD74LV1GT86ACME	CMPAK-5 pin	PTSP0005ZC-A (CMPAK-5V)	CM	E (3000 pcs/reel)
HD74LV1GT86AVSE	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



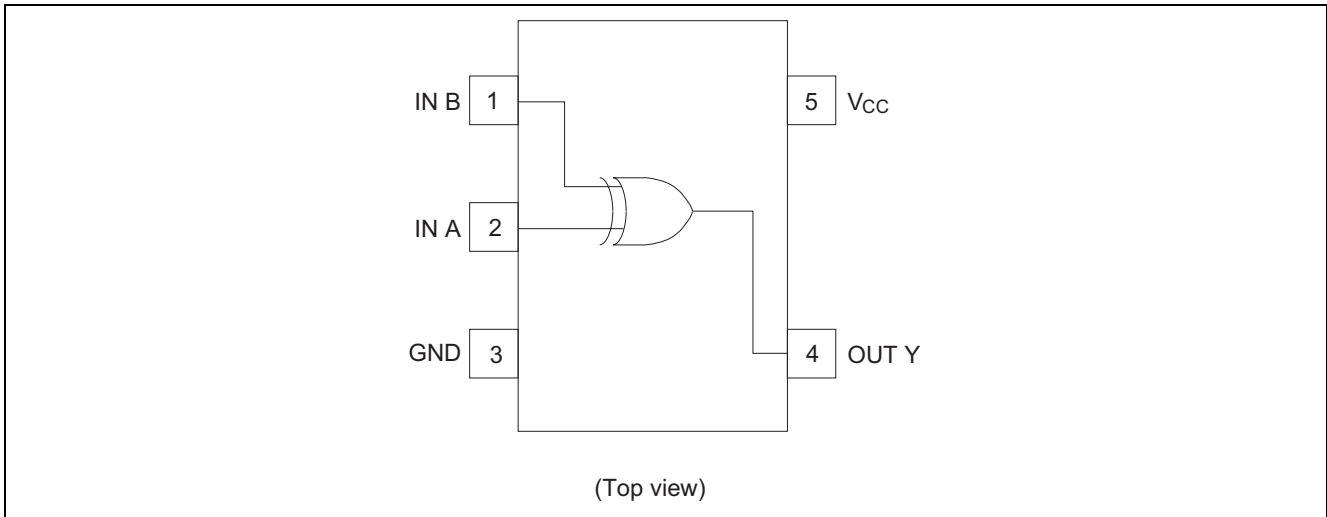
Function Table

Inputs		Output Y
A	B	
L	L	L
L	H	H
H	L	H
H	H	L

H : High level

L : Low level

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	V_{CC}	-0.5 to 7.0	V	
Input voltage range ^{*1}	V_I	-0.5 to 7.0	V	
Output voltage range ^{*1, 2}	V_O	-0.5 to $V_{CC} + 0.5$	V	Output : H or L
		-0.5 to 7.0		V_{CC} : OFF
Input clamp current	I_{IK}	-20	mA	$V_I < 0$
Output clamp current	I_{OK}	± 50	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	I_O	± 25	mA	$V_O = 0$ to V_{CC}
Continuous current through V_{CC} or GND	I_{CC} or I_{GND}	± 50	mA	
Maximum power dissipation at $T_a = 25^\circ\text{C}$ (in still air) ^{*3}	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 current	I_{OL}	—	6	mA	$V_{CC} = 3.0$ to 3.6 V
		—	12		$V_{CC} = 4.5$ to 5.5 V
	I_{OH}	—	-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	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°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	—	—	± 1	μA	$V_{IN} = 5.5 \text{ V}$ or GND
Quiescent supply current	I_{CC}	5.5	—	—	10	μA	$V_{IN} = V_{CC}$ or GND, $I_O = 0$
	ΔI_{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	μA	V_{IN} or $V_O = 0$ to 5.5 V
Input capacitance	C_{IN}	5.0	—	2.5	—	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

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

Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40$ to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t_{PLH}	—	8.0	12.5	1.0	14.0	ns	$C_L = 15 \text{ pF}$ $C_L = 50 \text{ pF}$	A or B	Y
	t_{PHL}	—	9.5	17.0	1.0	19.0				

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

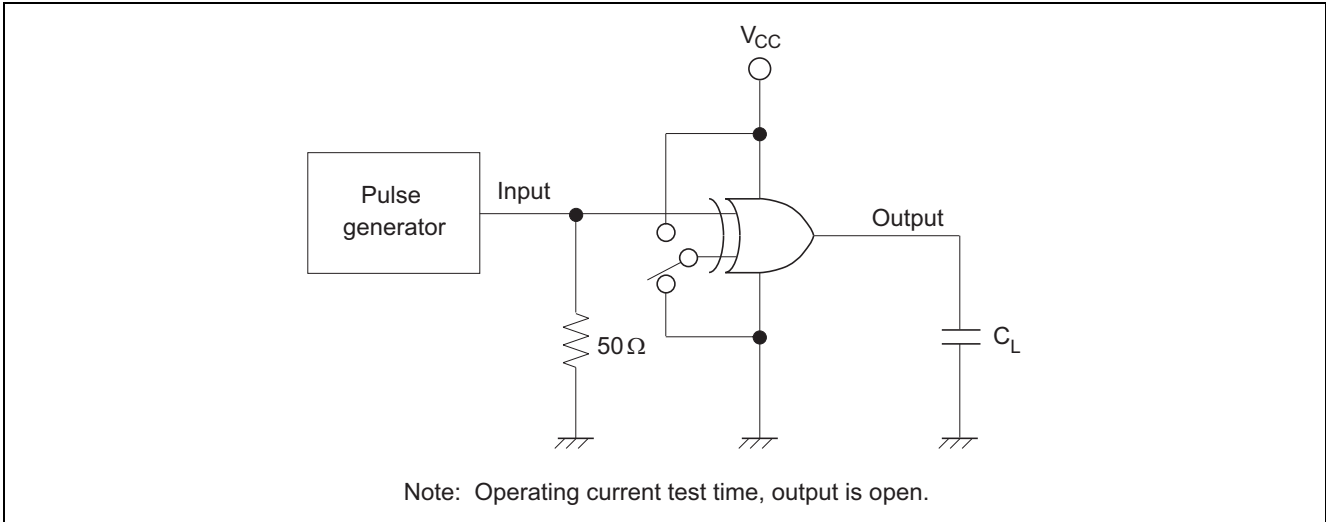
Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40$ to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	t_{PLH}	—	5.5	7.5	1.0	8.5	ns	$C_L = 15 \text{ pF}$ $C_L = 50 \text{ pF}$	A or B	Y
	t_{PHL}	—	6.5	10.3	1.0	11.5				

Operating Characteristics

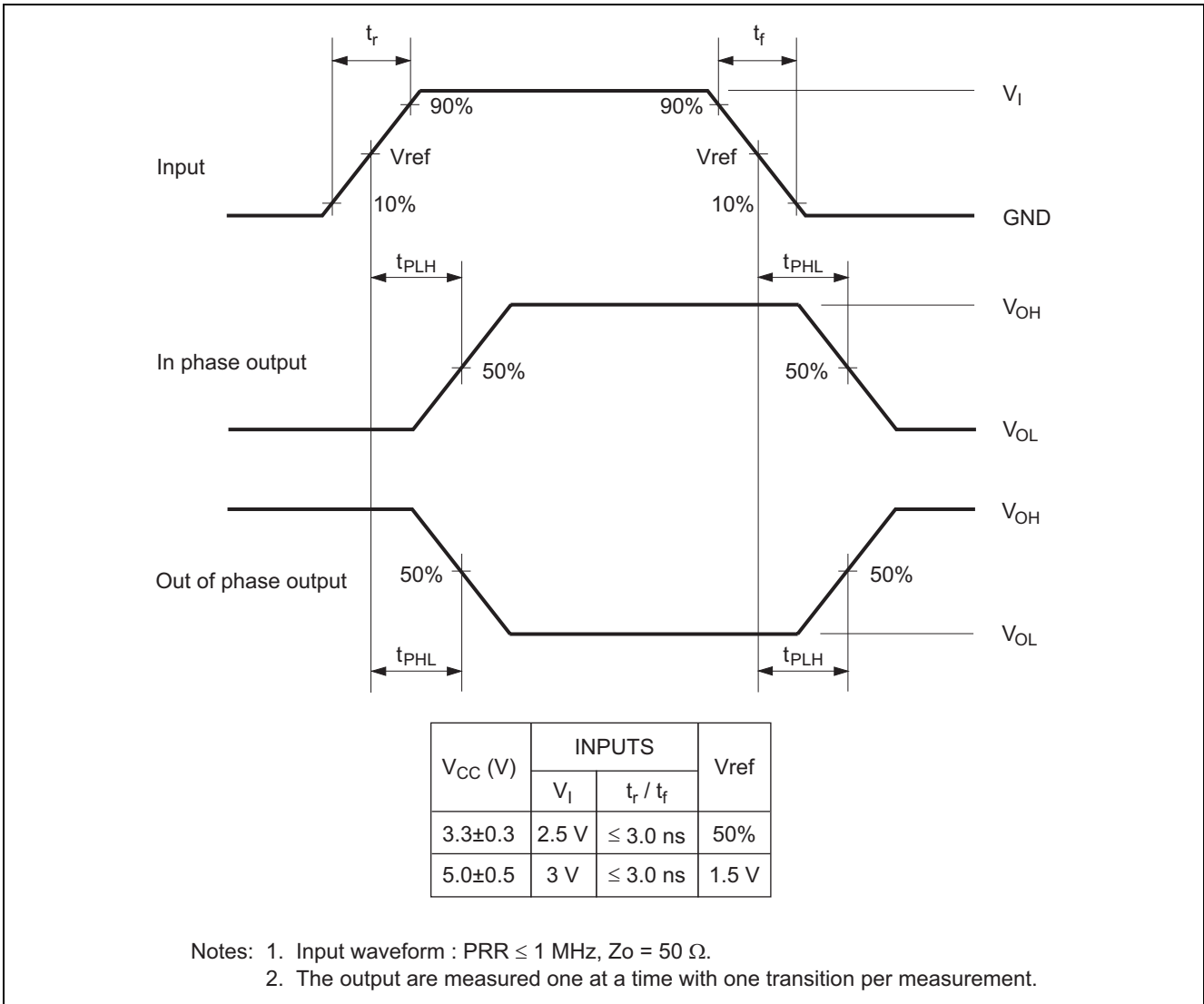
- $C_L = 50 \text{ pF}$

Item	Symbol	V_{CC} (V)	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C_{PD}	5.0	—	11.0	—	pF	$f = 10 \text{ MHz}$

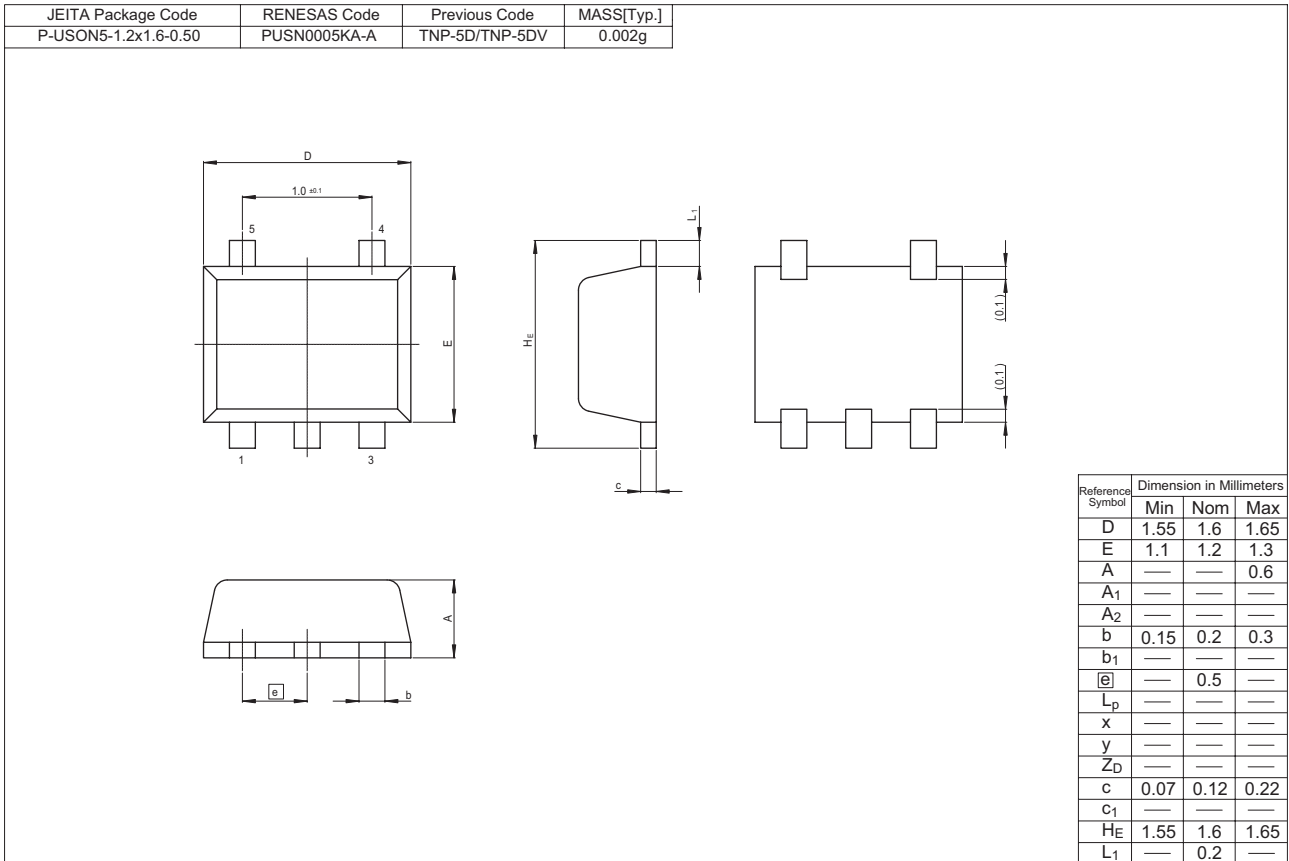
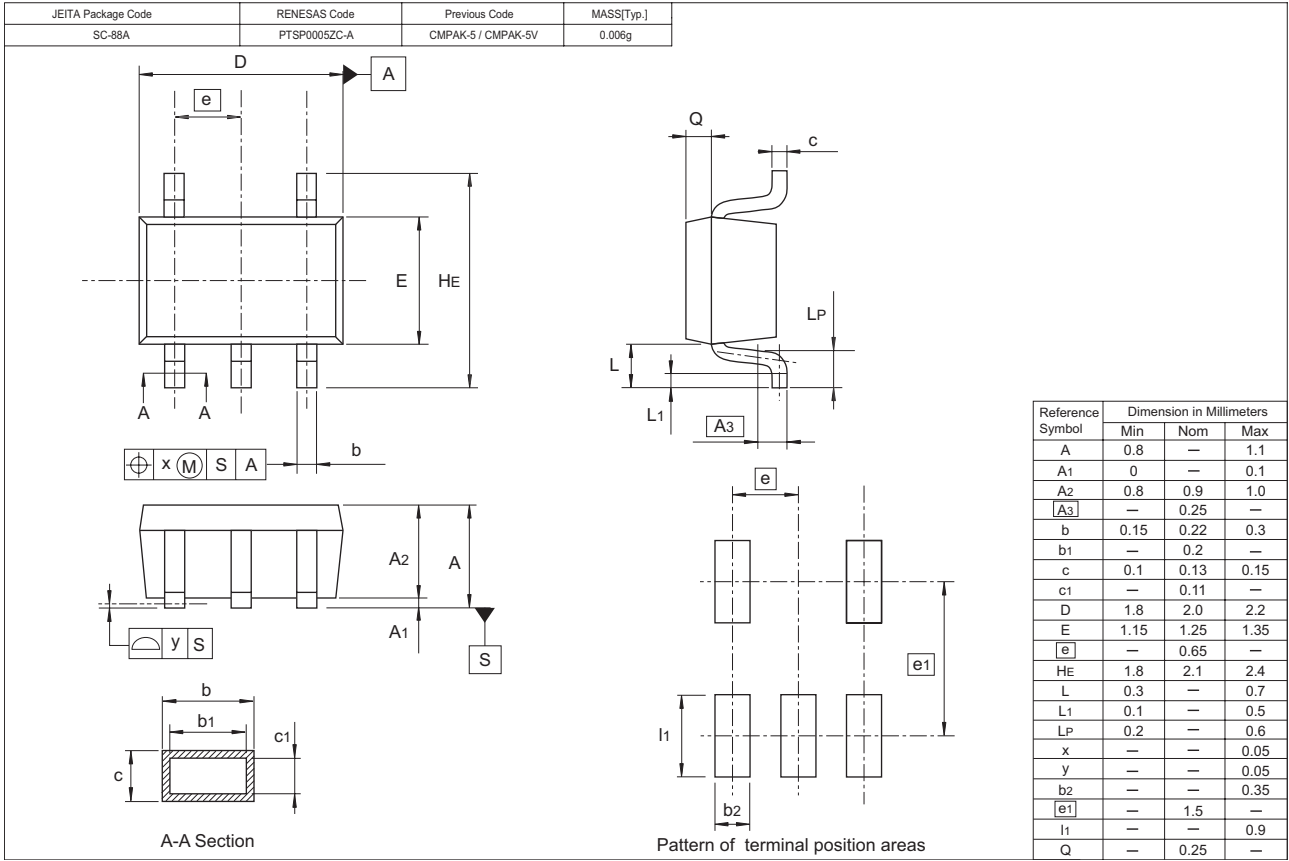
Test Circuit



Waveforms



Package Dimensions



Notes:

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450 Holger Way, San Jose, CA 95134-1368, U.S.A
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.
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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

Renesas Technology Korea Co., Ltd.
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