

To our customers,

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## Old Company Name in Catalogs and Other Documents

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April 1<sup>st</sup>, 2010  
Renesas Electronics Corporation

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# RD74LVC1G98

## Configurable Multiple-Function Gate

REJ03D0730-0100

Rev.1.00

Jul 26, 2006

### Description

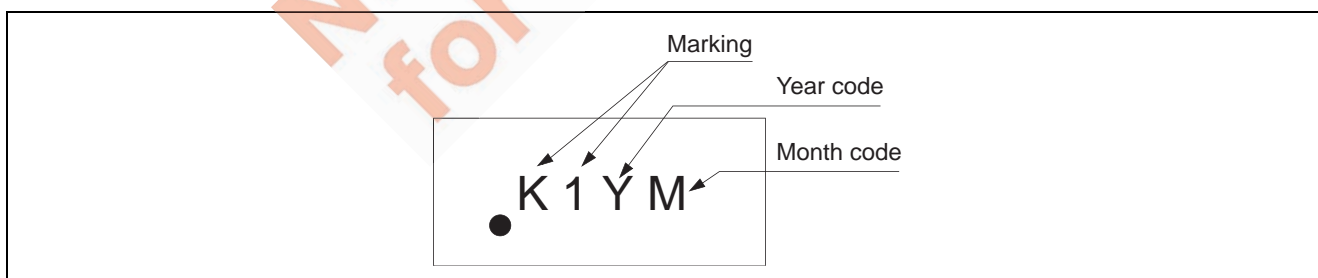
The RD74LVC1G98 has configurable multiple-function gate in a 6-pin package. The Output state is determined by eight patterns of 3-bit input. The user can choose the logic functions AND, NAND, OR, NOR, INVERTER, Non-Inverted Buffer, Data Selector. Low voltage and high-speed operation is suitable for the 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  $V_{IH}$  (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:
  - ±4 mA (@  $V_{CC}$  = 1.65 V)
  - ±8 mA (@  $V_{CC}$  = 2.3 V)
  - ±24 mA (@  $V_{CC}$  = 3.0 V)
  - ±32 mA (@  $V_{CC}$  = 4.5 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)
RD74LVC1G98WPE	WCSP-6 pin	SXBG0006LA-A (TBS-6BV)	WP	E (3,000 pcs/reel)

### Article Indication

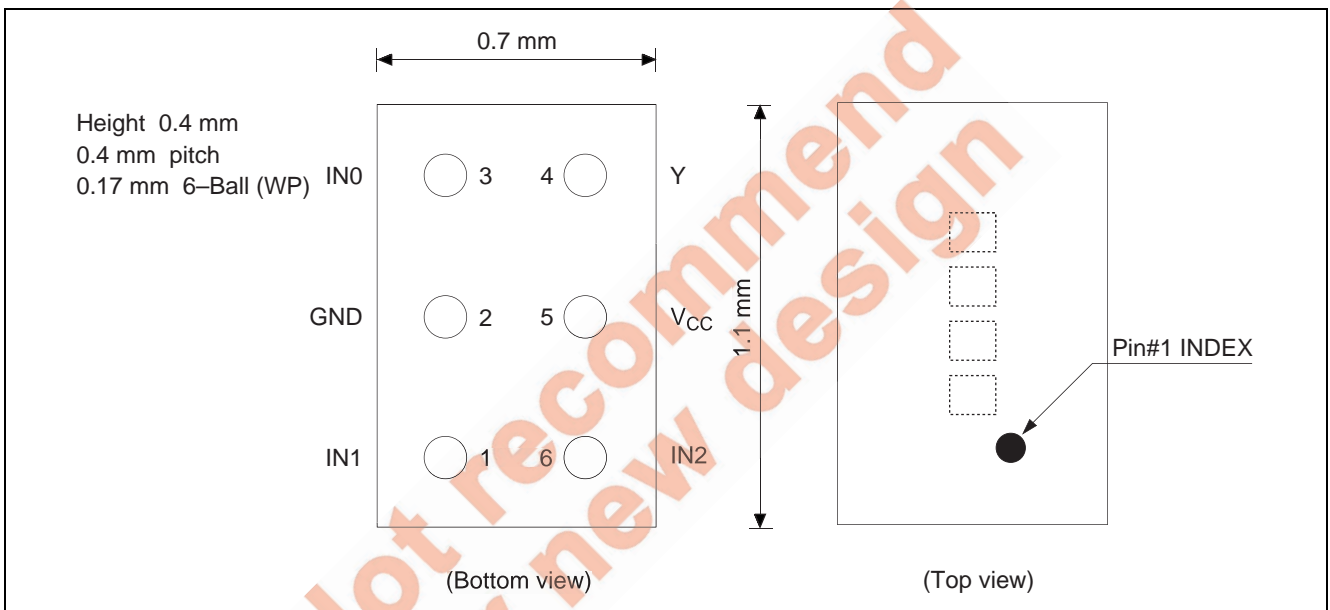


**Function Table**

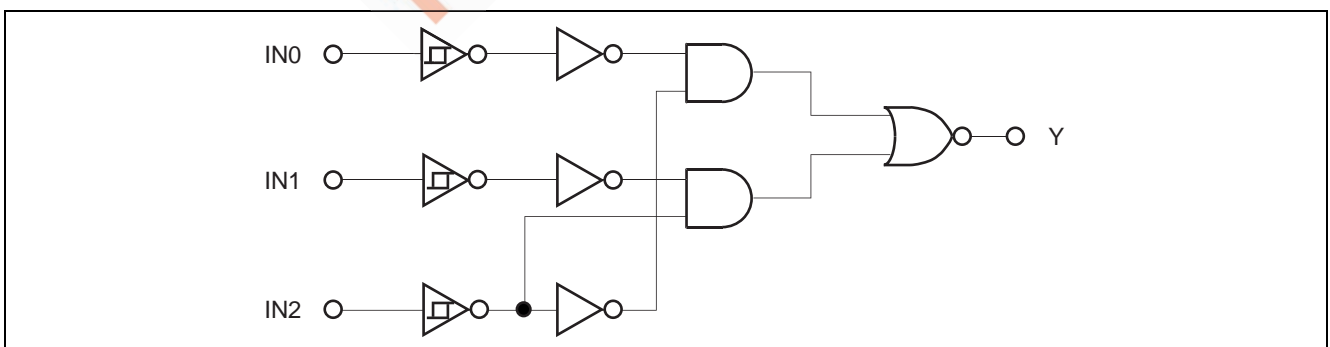
Inputs			Output
IN2	IN1	IN0	Y
L	L	L	H
L	L	H	H
L	H	L	L
L	H	H	L
H	L	L	H
H	L	H	L
H	H	L	H
H	H	H	L

H: High level  
L: Low level

**Pin Arrangement**



**Logic Diagram**



**Function Selection Table**

Logic Function	Figure No.
2 to 1 data Selector	1
2-inputs NAND	2
2-inputs NOR with one input inverted	3
2-inputs AND with one input inverted	3
2-inputs NAND with one input inverted	4
2-inputs OR with one input inverted	4
2-inputs NOR	5
Non-Invert Buffer	6
Inverter	7

Not recommend  
for new design

Logic Configurations

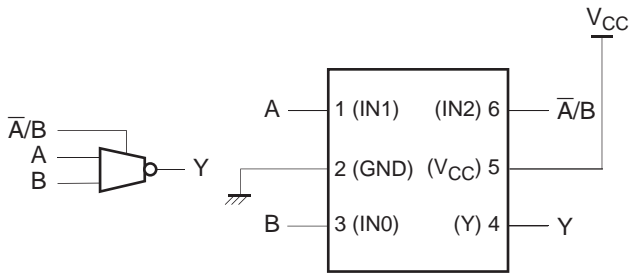


Figure 1 2 to 1 Data Selector

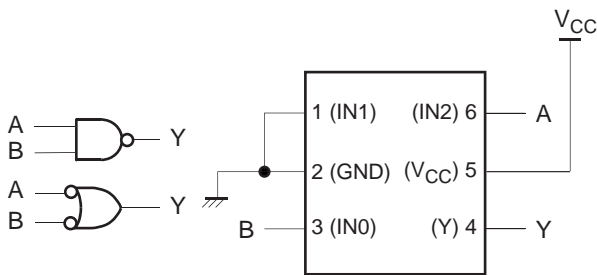


Figure 2 2-inputs NAND Gate

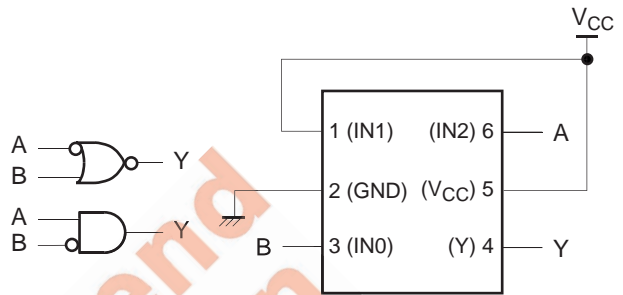


Figure 3 2-inputs NOR Gate with A input inverted

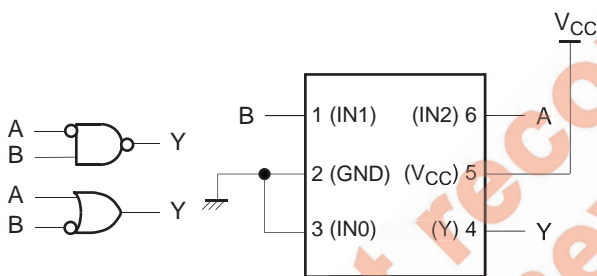


Figure 4 2-inputs NAND Gate with A input inverted

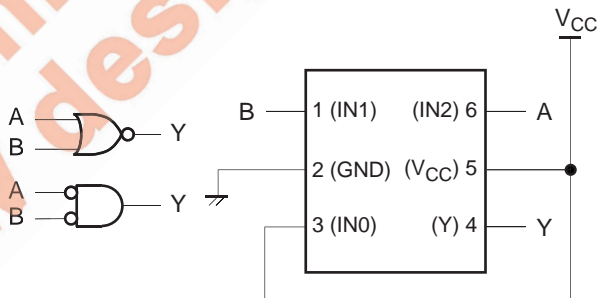


Figure 5 2-inputs NOR Gate

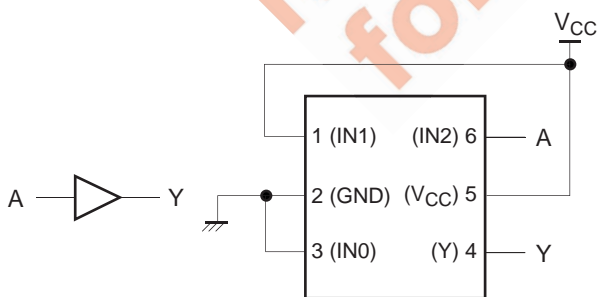


Figure 6 Non-Invert Buffer

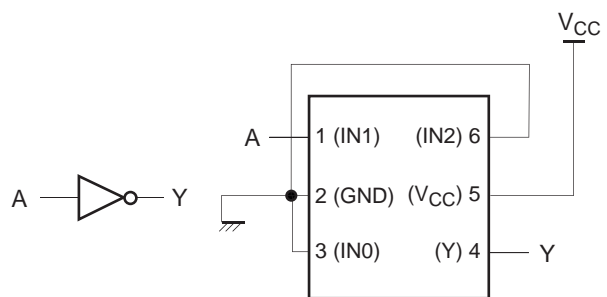


Figure 7 Inverter

## Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	Test Conditions
Supply voltage range	$V_{CC}$	-0.5 to 6.5	V	
Input voltage range <sup>*1</sup>	$V_I$	-0.5 to 6.5	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 6.5		$V_{CC} : \text{OFF}$
Input clamp current	$I_{IK}$	-50	mA	$V_I < 0$
Output clamp current	$I_{OK}$	-50	mA	$V_O < 0$
Continuous output current	$I_O$	$\pm 50$	mA	$V_O = 0$ to $V_{CC}$
Continuous current through $V_{CC}$ or GND	$I_{CC}$ or $I_{GND}$	$\pm 100$	mA	
Package Thermal impedance	$\theta_{ja}$	123	$^{\circ}\text{C}/\text{W}$	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.

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.

## 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	$I_{OL}$	—	4	mA	$V_{CC} = 1.65 \text{ V}$
		—	8		$V_{CC} = 2.3 \text{ V}$
		—	16		$V_{CC} = 3.0 \text{ V}$
		—	24		$V_{CC} = 4.5 \text{ V}$
		—	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		$V_{CC} = 4.5 \text{ V}$
		—	-32		$V_{CC} = 4.5 \text{ V}$
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 <sub>CC</sub> (V)	Min	Typ	Max	Unit	Test condition			
Threshold voltage	V <sub>T</sub> <sup>+</sup>	1.8	0.8	—	1.4	V				
		2.5	1.2	—	1.7					
		3.3	1.6	—	2.3					
		5.0	2.3	—	3.0					
	V <sub>T</sub> <sup>-</sup>	1.8	0.4	—	0.7					
		2.5	0.6	—	1.0					
		3.3	0.9	—	1.4					
		5.0	1.5	—	2.0					
	ΔV <sub>T</sub>	1.8	0.4	—	0.7					
		2.5	0.4	—	0.8					
		3.3	0.4	—	0.9					
		5.0	0.4	—	1.0					
Output voltage	V <sub>OH</sub>	1.65 to 5.5	V <sub>CC</sub> -0.1	—	—	V	I <sub>OH</sub> = -100 μA			
		1.65	1.2	—	—		I <sub>OH</sub> = -4 mA			
		2.3	1.9	—	—		I <sub>OH</sub> = -8 mA			
		3.0	2.4	—	—		I <sub>OH</sub> = -16 mA			
			2.3	—	—		I <sub>OH</sub> = -24 mA			
		4.5	3.8	—	—		I <sub>OH</sub> = -32 mA			
	V <sub>OL</sub>	1.65 to 5.5	—	—	0.1		I <sub>OL</sub> = 100 μA			
		1.65	—	—	0.45		I <sub>OL</sub> = 4 mA			
		2.3	—	—	0.3		I <sub>OL</sub> = 8 mA			
		3.0	—	—	0.4		I <sub>OL</sub> = 16 mA			
			—	—	0.55		I <sub>OL</sub> = 24 mA			
		4.5	—	—	0.55		I <sub>OL</sub> = 32 mA			
		Input current	I <sub>IN</sub>	0 to 5.5	—		—	±5	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
ΔI <sub>CC</sub>	3 to 5.5		—	—	500	One input at V <sub>CC</sub> -0.6 V, Other input at V <sub>CC</sub> or GND				
Output leakage current	I <sub>OFF</sub>	0	—	—	±10	μA	V <sub>IN</sub> or V <sub>O</sub> = 0 to 5.5 V			
Input capacitance	C <sub>IN</sub>	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

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

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	3.2	14.4	ns	$C_L = 30 \text{ pF}$ , $R_L = 1.0 \text{ k}\Omega$	IN	Y

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

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	2.0	8.3	ns	$C_L = 30 \text{ pF}$ , $R_L = 500 \Omega$	IN	Y

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

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.5	6.3	ns	$C_L = 50 \text{ pF}$ , $R_L = 500 \Omega$	IN	Y

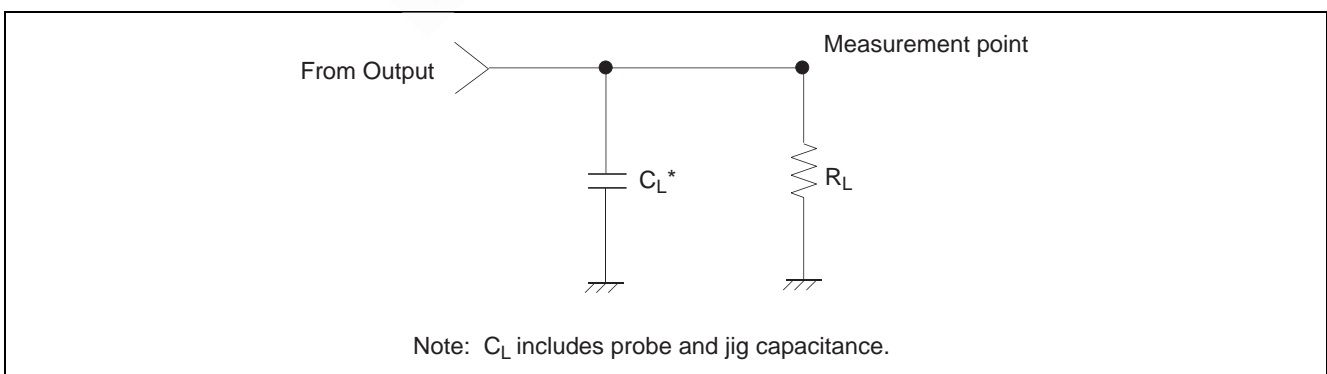
$V_{CC} = 5.0 \pm 0.5 \text{ V}$

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$ $t_{PHL}$	1.1	5.1	ns	$C_L = 50 \text{ pF}$ , $R_L = 500 \Omega$	IN	Y

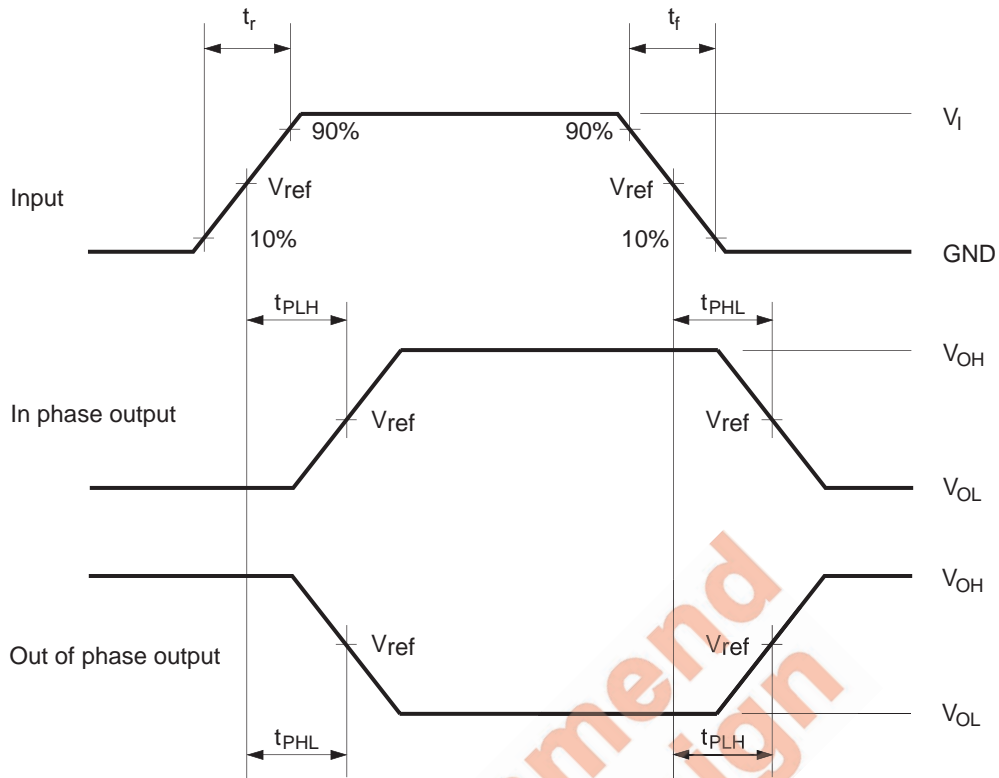
## Operating Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C <sub>PD</sub>	1.8	—	23	—	pF	f = 10 MHz
		2.5	—	23	—		
		3.3	—	23	—		
		5.0	—	26	—		

## Test Circuit



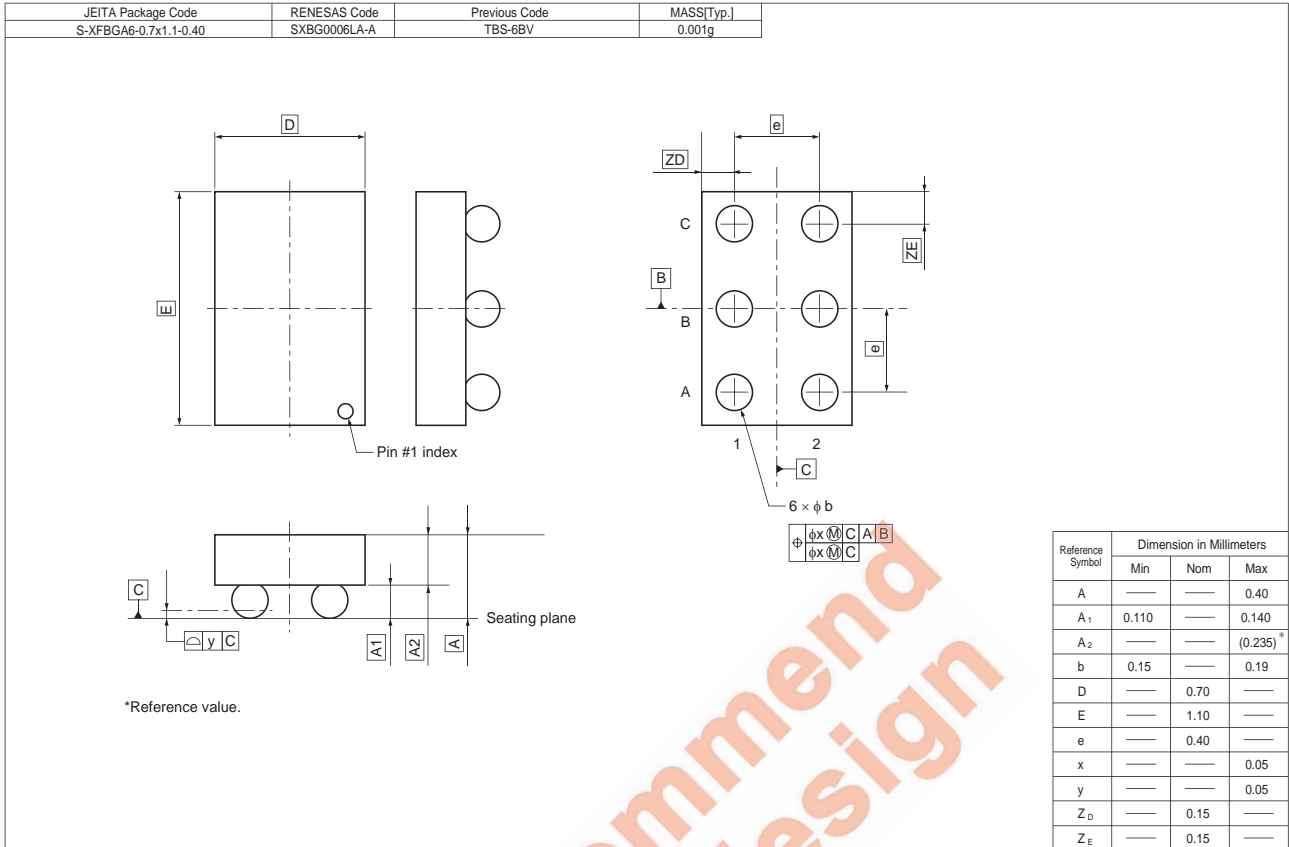
• Waveforms



$V_{CC}$ (V)	Inputs		$V_{ref}$	$C_L$	$R_L$
	$V_I$	$t_r / t_f$			
$1.8 \pm 0.15$	$V_{CC}$	$\leq 2$ ns	$V_{CC} / 2$	30 pF	1.0 k $\Omega$
$2.5 \pm 0.2$	$V_{CC}$	$\leq 2$ ns	$V_{CC} / 2$	30 pF	500 $\Omega$
$3.3 \pm 0.3$	3 V	$\leq 2.5$ ns	1.5 V	50 pF	500 $\Omega$
$5.0 \pm 0.5$	$V_{CC}$	$\leq 2.5$ ns	$V_{CC} / 2$	50 pF	500 $\Omega$

- Notes: 1. Input waveform : PRR  $\leq$  10 MHz,  $Z_o = 50 \Omega$ .  
 2. The output are measured one at a time with one transition per measurement.

Package Dimensions



Not recommended for new design

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