

# RD74LVC1G14

## Schmitt-trigger Inverter Buffer

REJ03D0705-0100

Rev.1.00

Jul 26, 2006

### Description

The RD74LVC1G14 has an Schmitt-trigger Inverter Buffer in a 5-pin package. 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.

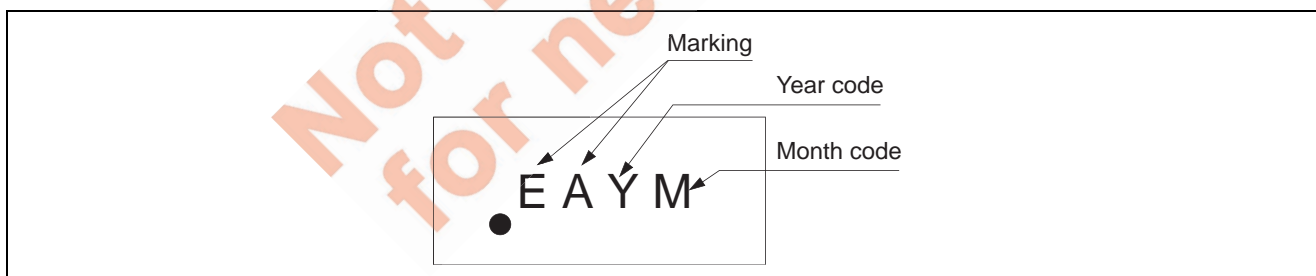
### Features

- 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:  $V_{IH} (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V to } 5.5 \text{ V})$
- All outputs:  $V_O (\text{Max.}) = 5.5 \text{ V} (@V_{CC} = 0 \text{ V})$
- Output current:
  - $\pm 4 \text{ mA} (@V_{CC} = 1.65 \text{ V})$
  - $\pm 8 \text{ mA} (@V_{CC} = 2.3 \text{ V})$
  - $\pm 24 \text{ mA} (@V_{CC} = 3.0 \text{ V})$
  - $\pm 32 \text{ mA} (@V_{CC} = 4.5 \text{ V})$

- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
RD74LVC1G14WPE	WCSP-5 pin	SXBG0005LB-A (TBS-5CV)	WP	E (3,000 pcs/reel)

### Article Indication



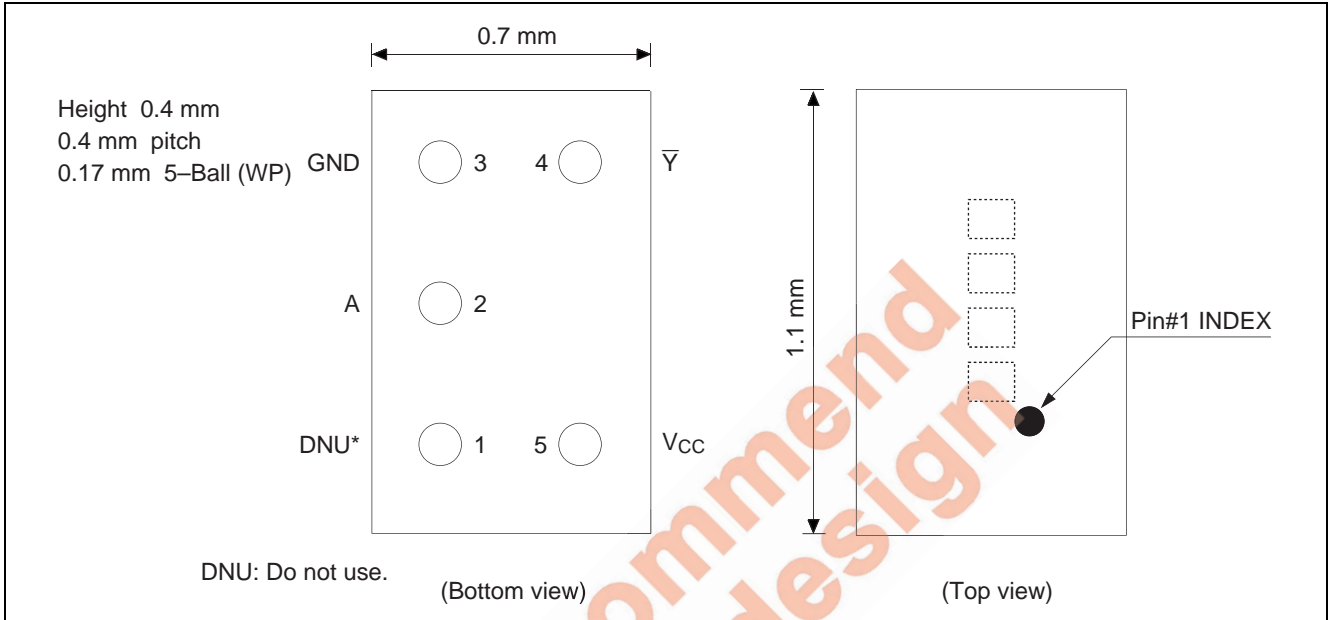
**Function Table**

Input A	Output $\bar{Y}$
H	L
L	H

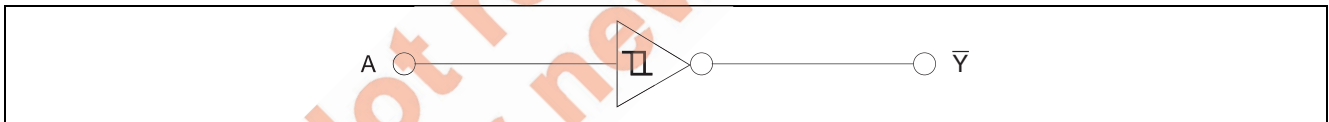
H: High level

L: Low level

**Pin Arrangement**



**Logic Diagram**



## 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		$V_{CC}$ : 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	$\theta_{ja}$	200	$^{\circ}\text{C}/\text{W}$	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.

- The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
- 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		$V_{CC} = 3.0\text{ V}$
		—	-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>	Min to Max	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>	Min to Max	—	—	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	$t_{PLH}$	2.8	9.9	ns	$C_L = 15 \text{ pF}, R_L = 1 \text{ M}\Omega$	A	$\bar{Y}$
	$t_{PHL}$	3.8	11.0		$C_L = 30 \text{ pF}, R_L = 1.0 \text{ k}\Omega$		

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

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$	1.6	5.5	ns	$C_L = 15 \text{ pF}, R_L = 1 \text{ M}\Omega$	A	$\bar{Y}$
	$t_{PHL}$	2.0	6.5		$C_L = 30 \text{ pF}, R_L = 500 \Omega$		

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

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$	1.5	4.6	ns	$C_L = 15 \text{ pF}, R_L = 1 \text{ M}\Omega$	A	$\bar{Y}$
	$t_{PHL}$	1.8	5.5		$C_L = 50 \text{ pF}, R_L = 500 \Omega$		

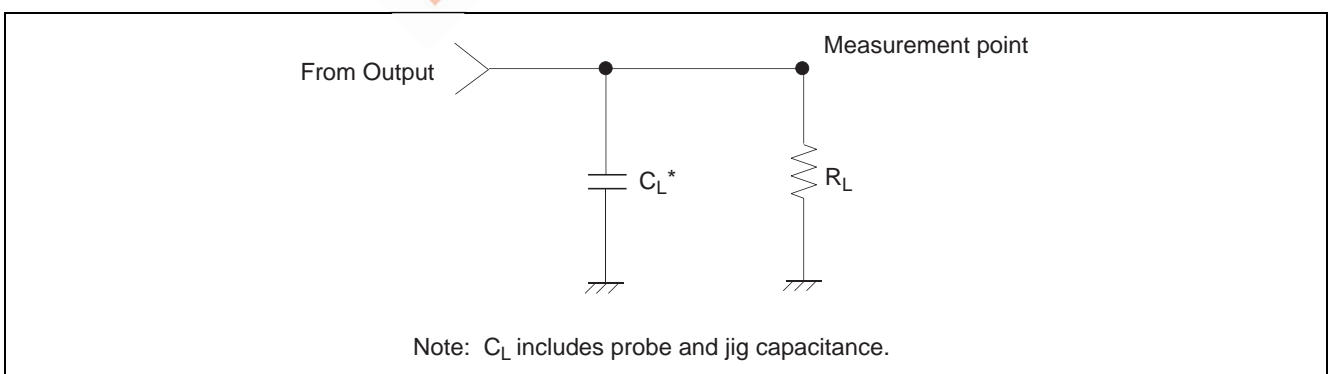
$V_{CC} = 5.0 \pm 0.5 \text{ V}$

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time	$t_{PLH}$	0.9	4.4	ns	$C_L = 15 \text{ pF}, R_L = 1 \text{ M}\Omega$	A	$\bar{Y}$
	$t_{PHL}$	1.2	5.0		$C_L = 50 \text{ pF}, R_L = 500 \Omega$		

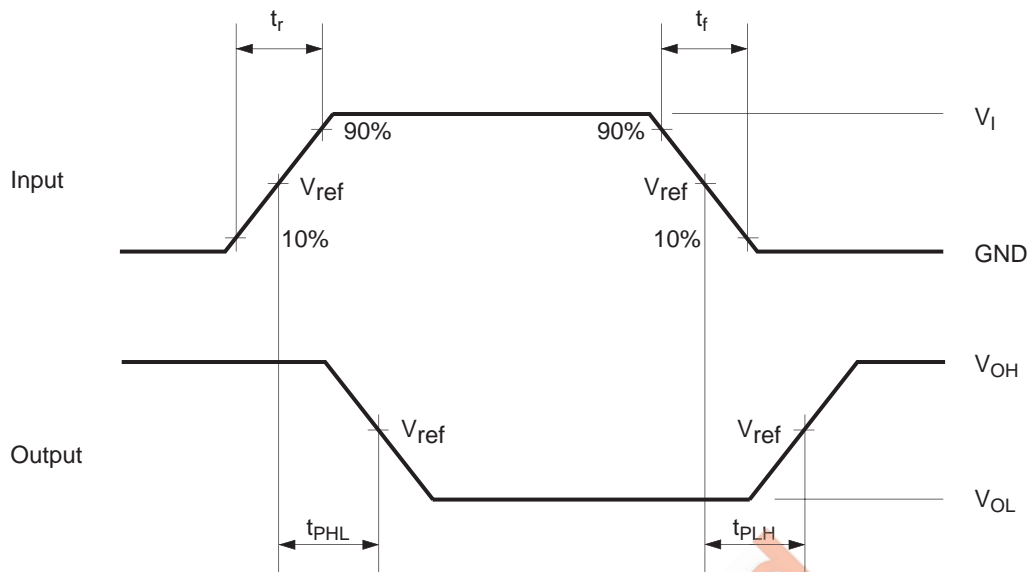
## Operating Characteristics

Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	$C_{PD}$	1.8	—	16	—	pF	f = 10 MHz
		2.5	—	18	—		
		3.3	—	18	—		
		5.0	—	20	—		

## Test Circuit



## • Waveforms

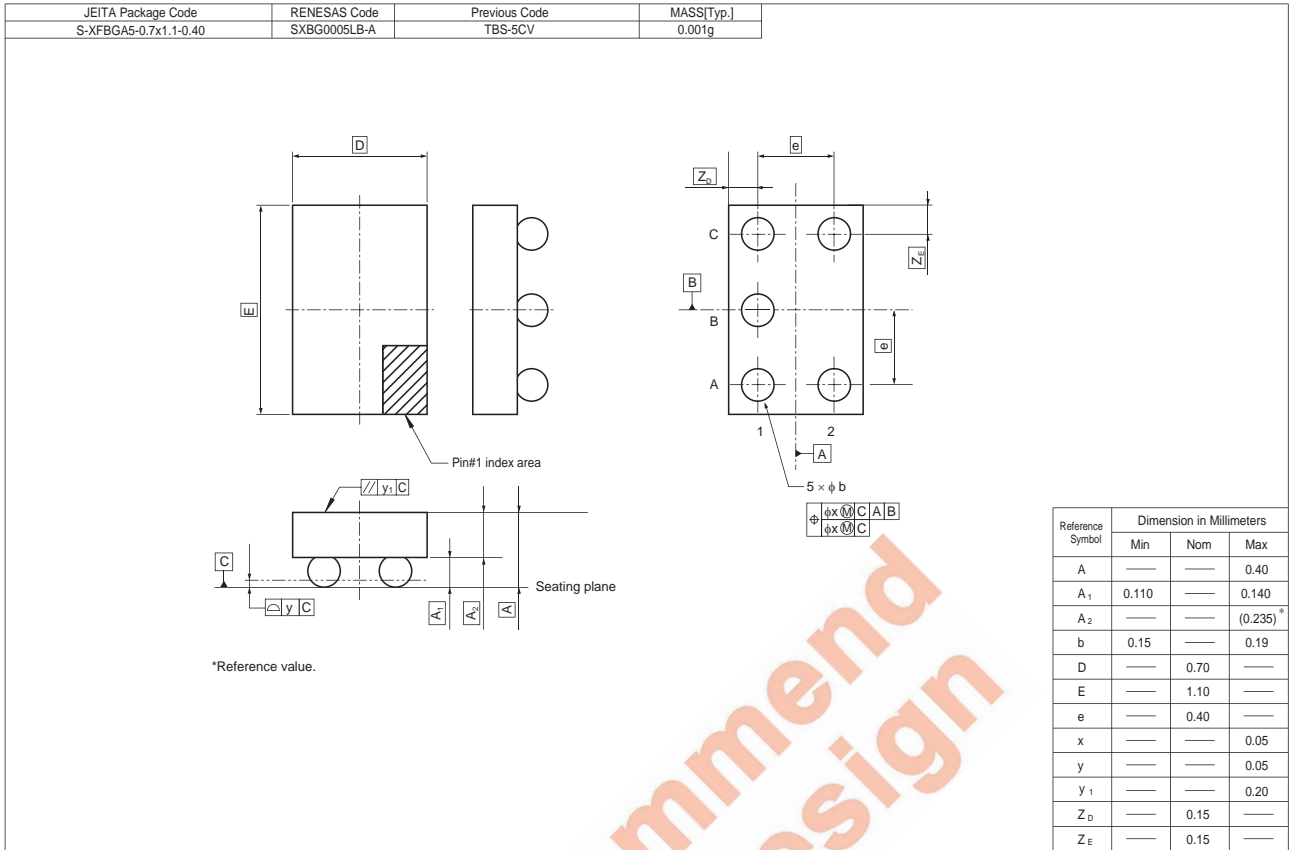


$V_{CC}$ (V)	Inputs		$V_{ref}$	$C_L$	$R_L$
	$V_I$	$t_r / t_f$			
$1.8 \pm 0.15$	$V_{CC}$	$\leq 2$ ns	$V_{CC} / 2$	15 pF	1 M $\Omega$
$2.5 \pm 0.2$	$V_{CC}$	$\leq 2$ ns	$V_{CC} / 2$	15 pF	1 M $\Omega$
$3.3 \pm 0.3$	3 V	$\leq 2.5$ ns	1.5 V	15 pF	1 M $\Omega$
$5.0 \pm 0.5$	$V_{CC}$	$\leq 2.5$ ns	$V_{CC} / 2$	15 pF	1 M $\Omega$

$V_{CC}$ (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 recommend  
for new design

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