

# HD74LVC1G66

## Single Analog Switch

REJ03D0026-0300Z

Rev.3.00

Jul. 01, 2004

### Description

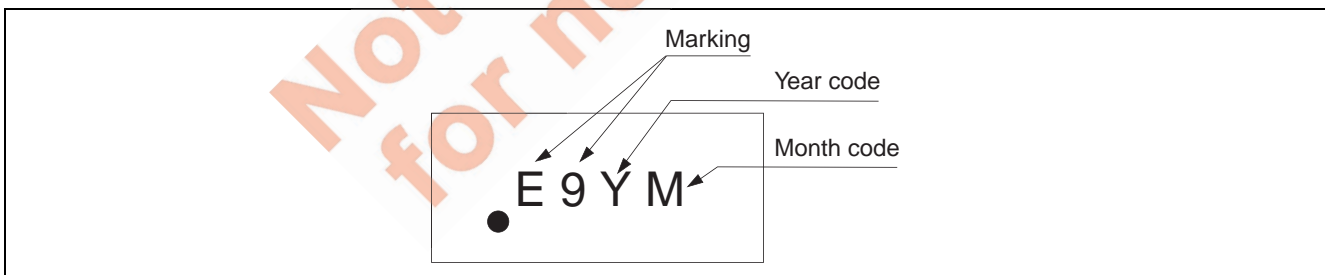
The HD74LVC1G66 has an analog switch in a 5-pin package. Switch section has its enable input control (CONT). High-level voltage applied to CONT turns on the switch section. Applications include signal gating chopping, modulation or demodulation (modem), and signal multiplexing for analog to digital to analog conversion systems. 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
- Control input:  $V_{IH}$  (Max.) = 5.5 V (@ $V_{CC}$  = 0 V to 5.5 V)
- Ordering Information

Part Name	Package Type	Package Code	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LVC1G66CPE	WCSP-5 pin	TBS-5V	CP	E (3,000 pcs/reel)
HD74LVC1G66CLE		TBS-5AV	CL	

### Article Indication



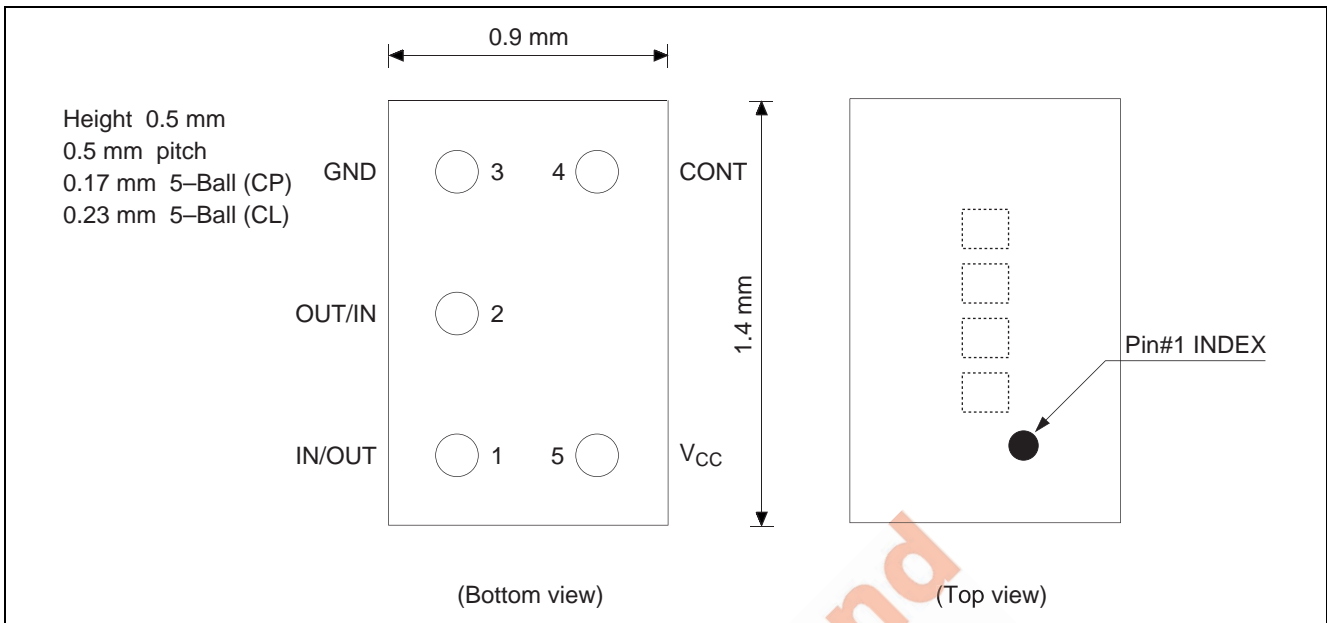
### Function Table

Control	Switch
L	OFF
H	ON

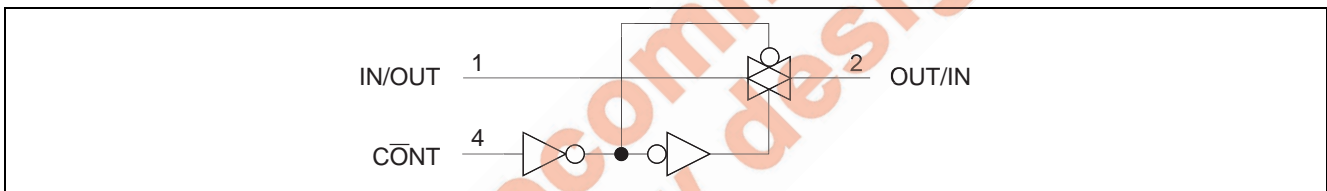
H: High level

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
Control Input clamp current	$I_{IK}$	-50	mA	$V_I < 0$
Output clamp current	$I_{OK}$	$\pm 50$	mA	$V_O < 0$ or $V_O > V_{CC}$
Continuous output current	$I_O$	$\pm 50$	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	$\theta_{ja}$	154	$^{\circ}C/W$	CP
		132		CL
Storage temperature	$T_{stg}$	-65 to 150	$^{\circ}C$	

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 <sub>CC</sub>	1.65	5.5	V	
Control Input voltage range	V <sub>I</sub>	0	5.5	V	
Input/Output voltage range	V <sub>I/O</sub>	0	V <sub>CC</sub>	V	
Input transition rise or fall rate	Δt / Δv	0	20	ns / V	V <sub>CC</sub> = 1.65 to 1.95 V, 2.3 to 2.7 V
		0	10		V <sub>CC</sub> = 3.0 to 3.6 V
		0	10		V <sub>CC</sub> = 4.5 to 5.5 V
Operating free-air temperature	T <sub>a</sub>	-40	85	°C	

Note: Unused or floating inputs must be held high or low.

### Electrical Characteristics

T<sub>a</sub> = -40 to 85°C

Item	Symbol	V <sub>CC</sub> (V)	Min	Typ	Max	Unit	Test condition
Input voltage	V <sub>IH</sub>	1.65 to 1.95	V <sub>CC</sub> ×0.65	—	—	V	
		2.3 to 2.7	V <sub>CC</sub> ×0.7	—	—		
		3.0 to 3.6	V <sub>CC</sub> ×0.7	—	—		
		4.5 to 5.5	V <sub>CC</sub> ×0.7	—	—		
	V <sub>IL</sub>	1.65 to 1.95	—	—	V <sub>CC</sub> ×0.35		
		2.3 to 2.7	—	—	V <sub>CC</sub> ×0.3		
		3.0 to 3.6	—	—	V <sub>CC</sub> ×0.3		
		4.5 to 5.5	—	—	V <sub>CC</sub> ×0.3		
On-state switch resistance	R <sub>ON</sub>	1.65	—	13	30	Ω	I <sub>S</sub> = 4 mA I <sub>S</sub> = 8 mA I <sub>S</sub> = 24 mA I <sub>S</sub> = 32 mA V <sub>I</sub> =V <sub>CC</sub> or GND
		2.3	—	9	20		
		3.0	—	7.5	15		
		4.5	—	5.5	10		
Peak on resistance	R <sub>ON(P)</sub>	1.65	—	74.5	120		I <sub>S</sub> = 4 mA I <sub>S</sub> = 8 mA I <sub>S</sub> = 24 mA I <sub>S</sub> = 32 mA V <sub>I</sub> =V <sub>CC</sub> to GND
		2.3	—	20	30		
		3.0	—	11.5	20		
		4.5	—	7.5	15		
Off-state switch leakage current	I <sub>S(OFF)</sub>	5.5	—	—	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> and V <sub>O</sub> = GND or V <sub>I</sub> = GND and V <sub>O</sub> = V <sub>CC</sub> , V <sub>C</sub> = V <sub>IL</sub>
			—	—	±0.1*1		
On-state switch leakage current	I <sub>S(ON)</sub>	5.5	—	—	±1.0	μA	V <sub>I</sub> = V <sub>CC</sub> or GND, V <sub>C</sub> = V <sub>IH</sub> V <sub>O</sub> = Open
			—	—	±0.1*1		
Control input current	I <sub>IN</sub>	5.5	—	—	±1.0	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
			—	—	±0.1*1		
Quiescent supply current	I <sub>CC</sub>	5.5	—	—	10	μA	V <sub>IN</sub> = V <sub>CC</sub> or GND
			—	—	1.0*1		
	ΔI <sub>CC</sub>	5.5	—	—	500	μA	V <sub>C</sub> = V <sub>CC</sub> -0.6 V
Control input capacitance	C <sub>IC</sub>	5.0	—	3.0	—	pF	
Switch terminal capacitance	C <sub>I/O(OFF)</sub>	5.0	—	6.0	—	pF	
	C <sub>I/O(ON)</sub>	5.0	—	13	—		

Note: 1. T<sub>a</sub> = 25°C

Switching Characteristics

V<sub>CC</sub> = 1.8 ± 0.15 V

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*1	t <sub>PLH</sub> t <sub>PHL</sub>	—	2.0	ns	C <sub>L</sub> = 30 pF, R <sub>L</sub> = 1.0 kΩ	INOUT or OUTIN	OUTIN or INOUT
Enable time	t <sub>ZH</sub> t <sub>ZL</sub>	2.5	12.0				
Disable time	t <sub>HZ</sub> t <sub>LZ</sub>	2.2	10.0				

V<sub>CC</sub> = 2.5 ± 0.2 V

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*1	t <sub>PLH</sub> t <sub>PHL</sub>	—	1.2	ns	C <sub>L</sub> = 30 pF, R <sub>L</sub> = 500 Ω	INOUT or OUTIN	OUTIN or INOUT
Enable time	t <sub>ZH</sub> t <sub>ZL</sub>	1.9	6.5				
Disable time	t <sub>HZ</sub> t <sub>LZ</sub>	1.4	6.9				

V<sub>CC</sub> = 3.3 ± 0.3 V

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*1	t <sub>PLH</sub> t <sub>PHL</sub>	—	0.8	ns	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	INOUT or OUTIN	OUTIN or INOUT
Enable time	t <sub>ZH</sub> t <sub>ZL</sub>	1.8	5.0				
Disable time	t <sub>HZ</sub> t <sub>LZ</sub>	2.0	6.5				

V<sub>CC</sub> = 5.0 ± 0.5 V

Item	Symbol	Ta = -40 to 85°C		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Max				
Propagation delay time*1	t <sub>PLH</sub> t <sub>PHL</sub>	—	0.6	ns	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 500 Ω	INOUT or OUTIN	OUTIN or INOUT
Enable time	t <sub>ZH</sub> t <sub>ZL</sub>	1.5	4.2				
Disable time	t <sub>HZ</sub> t <sub>LZ</sub>	1.4	5.0				

Note: 1. The propagation delay is calculated RC time constant of typical on-state resistance of the switch and the specified load capacitance, when driven by an ideal voltage source (zero output impedance).

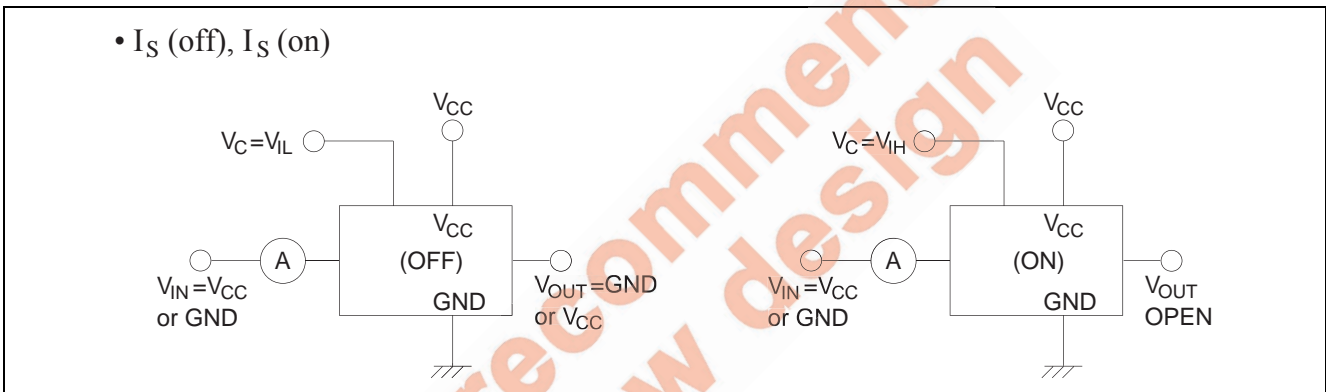
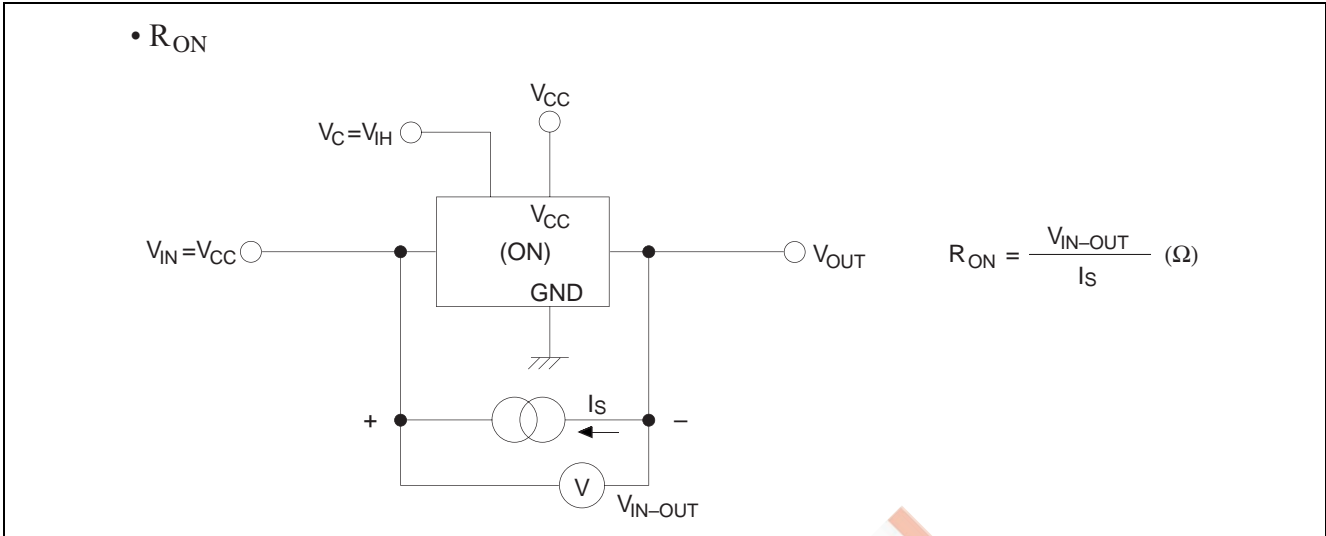
**Analog Switch Characteristics**

Item	V <sub>CC</sub> (V)	Ta = 25°C			Unit	Test conditions	FROM (Input)	TO (Output)
		Min	Typ	Max				
Frequency response (Switch ON)	1.65	—	35	—	MHz	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 600 Ω Adjust fin voltage to obtain 0dBm at output when fin is 1MHz (sine wave). Increase fin frequency until the dB-meter reads -3 dBm. 20 log(V <sub>O</sub> /V <sub>I</sub> ) = -3 dBm	INOUT or OUTIN	OUTIN or INOUT
	2.3	—	120	—				
	3.0	—	175	—				
	4.5	—	195	—				
	1.65	—	>300	—	MHz	C <sub>L</sub> = 5 pF, R <sub>L</sub> = 50 Ω	INOUT or OUTIN	OUTIN or INOUT
	2.3	—	>300	—				
	3.0	—	>300	—				
	4.5	—	>300	—				
Crosstalk (Control input to signal output)	1.65	—	35	—	mV	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 600 Ω Adjust RL value to obtain 0A at I <sub>IN/OUT</sub> when fin is 1MHz (square wave)	CONT	OUTIN or INOUT
	2.3	—	50	—				
	3.0	—	70	—				
	4.5	—	100	—				
Feed through attenuation (Switch OFF)	1.65	—	-58	—	dB	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 600 Ω Adjust fin voltage to obtain 0dBm at input when fin is 1MHz (sine-wave)	INOUT or OUTIN	OUTIN or INOUT
	2.3	—	-58	—				
	3.0	—	-58	—				
	4.5	—	-58	—				
	1.65	—	-42	—	dB	C <sub>L</sub> = 5 pF, R <sub>L</sub> = 50 Ω	INOUT or OUTIN	OUTIN or INOUT
	2.3	—	-42	—				
	3.0	—	-42	—				
	4.5	—	-42	—				
Sine-wave distortion	1.65	—	0.1	—	%	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 10 kΩ fin = 1 kHz (sine-wave) V <sub>I</sub> =1.4V <sub>P-P</sub> , V <sub>CC</sub> =1.65V V <sub>I</sub> =2.0V <sub>P-P</sub> , V <sub>CC</sub> =2.3V V <sub>I</sub> =2.5V <sub>P-P</sub> , V <sub>CC</sub> =3.0V V <sub>I</sub> =4.0V <sub>P-P</sub> , V <sub>CC</sub> =4.5V	INOUT or OUTIN	OUTIN or INOUT
	2.3	—	0.025	—				
	3.0	—	0.015	—				
	4.5	—	0.01	—				
	1.65	—	0.15	—	%	C <sub>L</sub> = 50 pF, R <sub>L</sub> = 10 kΩ fin = 10 kHz (sine-wave)	INOUT or OUTIN	OUTIN or INOUT
	2.3	—	0.025	—				
	3.0	—	0.015	—				
	4.5	—	0.01	—				

**Operating Characteristics**

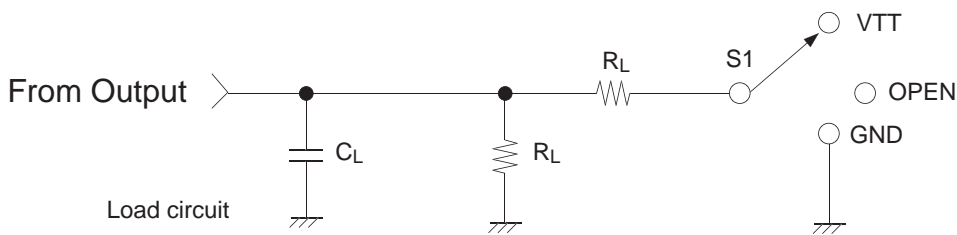
Item	Symbol	V <sub>CC</sub> (V)	Ta = 25°C			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	C <sub>PD</sub>	1.8	—	8	—	pF	f = 10 MHz
		2.5	—	9	—		
		3.3	—	9	—		
		5.0	—	11	—		

Test Circuit

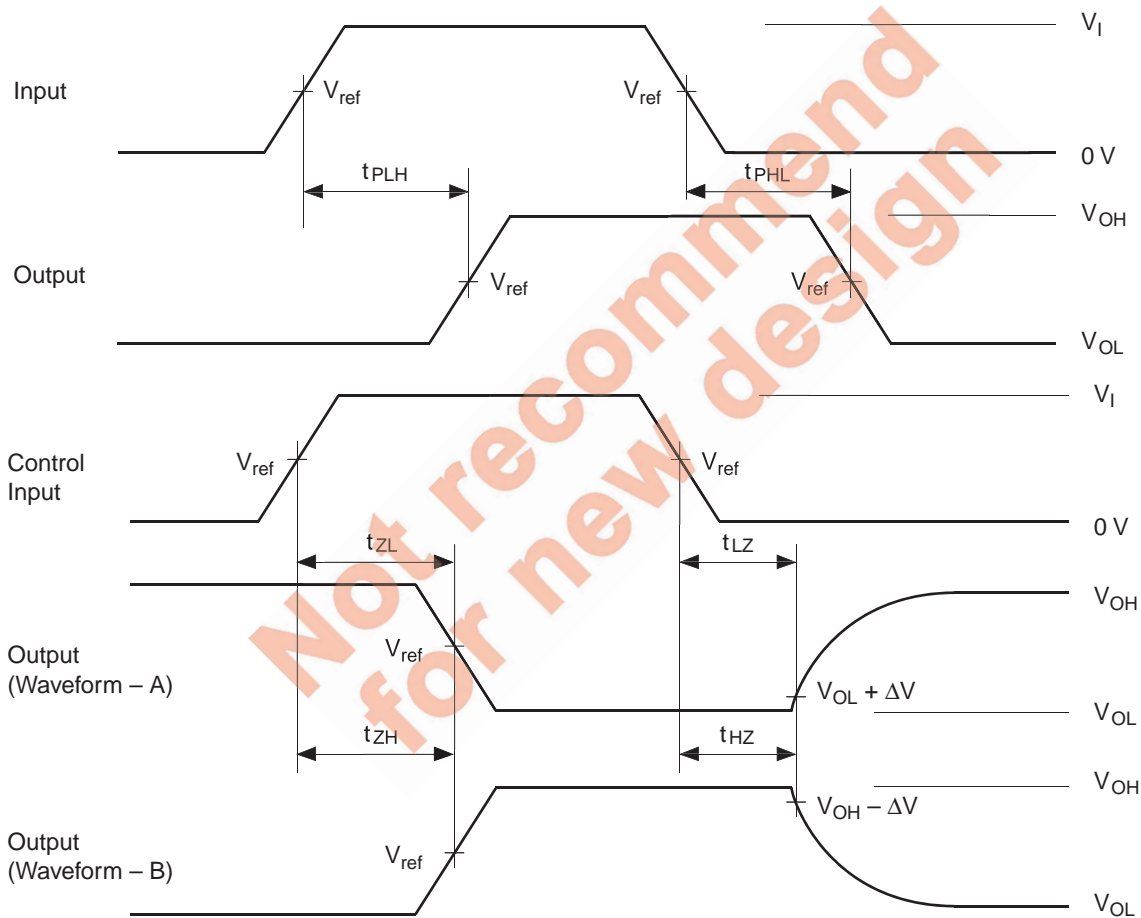


Not recommended for new design

Test Circuit (cont.)

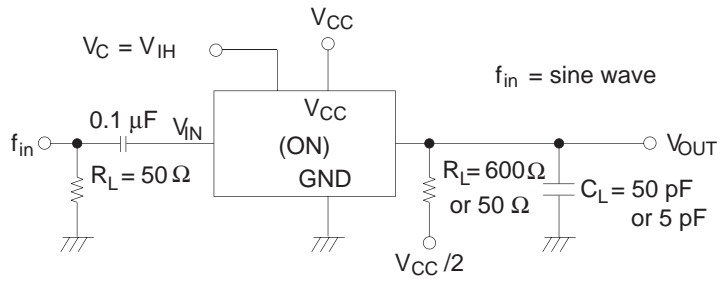


$V_{CC}$ (V)	INPUTS		$V_{ref}$	VTT	$C_L$	$R_L$	$\Delta V$
	$V_I$	$t_r / t_f$					
$1.8 \pm 0.15$	$V_{CC}$	$\leq 2$ ns	$V_{CC} / 2$	$2 \times V_{CC}$	30 pF	1.0 k $\Omega$	0.15 V
$2.5 \pm 0.2$	$V_{CC}$	$\leq 2$ ns	$V_{CC} / 2$	$2 \times V_{CC}$	30 pF	500 $\Omega$	0.15 V
$3.3 \pm 0.3$	$V_{CC}$	$\leq 2.5$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

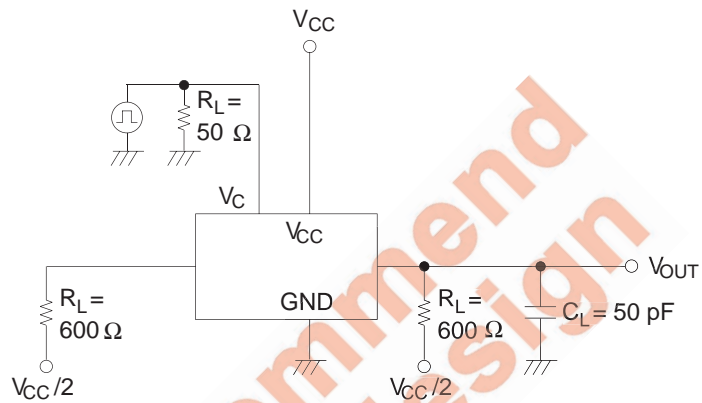


- Notes:
1.  $C_L$  includes probe and jig capacitance.
  2. Waveform-A is for an output with internal conditions such that the output is low except when disabled by the output control.
  3. Waveform-B is for an output with internal conditions such that the output is high except when disabled by the output control.
  4. All input pulses are supplied by generators having the following characteristics:  
 $PRR \leq 10$  MHz,  $Z_o = 50 \Omega$ .
  5. The output are measured one at a time with one transition per measurement.

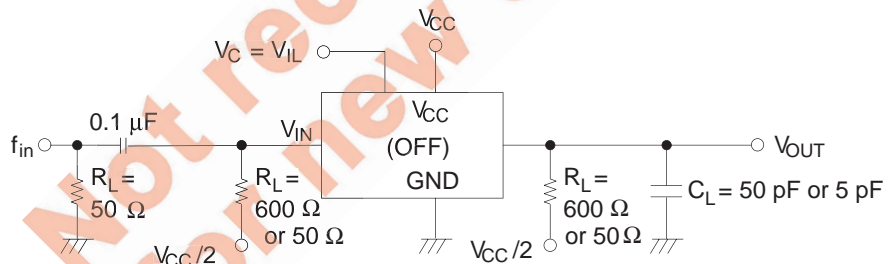
Frequency response (Switch ON)



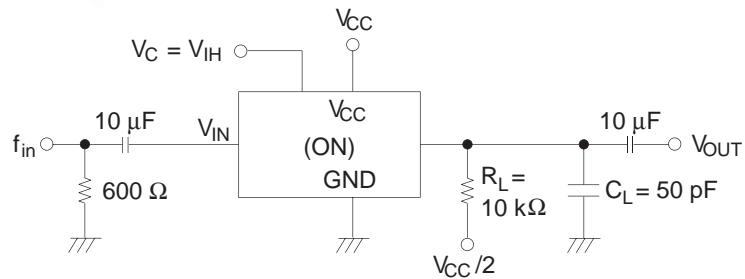
Crosstalk (Control input to signal output)



Feedthrough attenuation (Switch OFF)



Sine-wave distortion

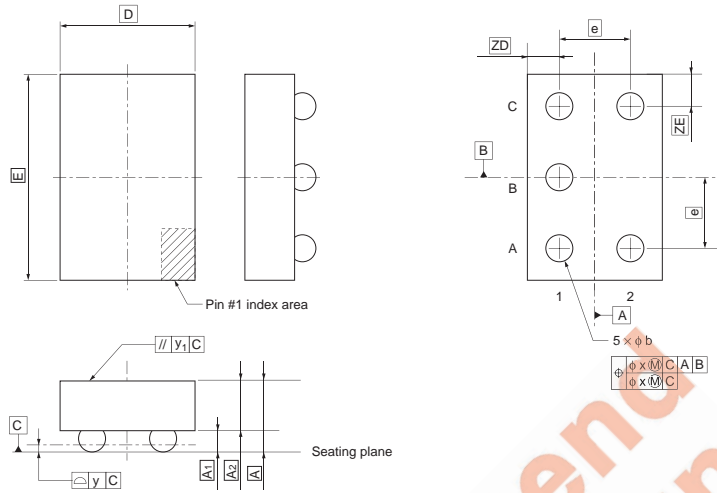




### Package Dimensions

**TBS-5V**

EIAJ Package Code	JEDEC Code	Mass (g)	Lead Material
—	—	0.001	—

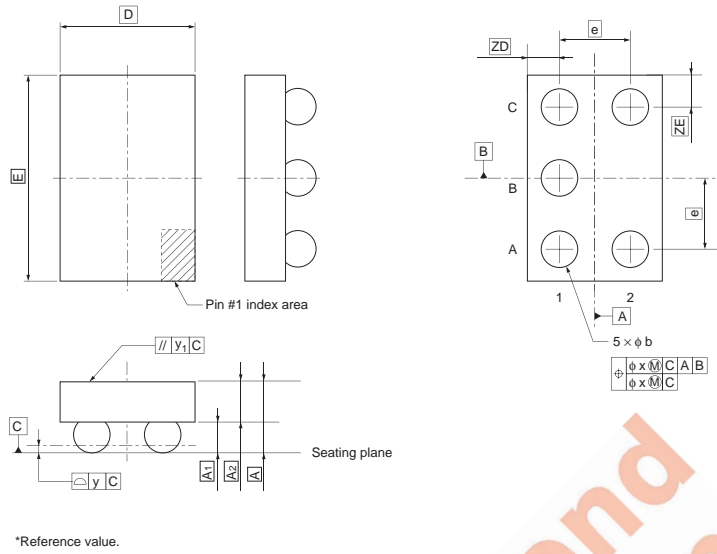


Symbol	Dimension in Millimeters		
	Min	Typ	Max
A	—	—	0.50
A <sub>1</sub>	0.10	—	0.15
A <sub>2</sub>	—	—	0.35
b	0.15	0.17	0.19
D	—	0.90	—
E	—	1.40	—
e	—	0.50	—
x	—	—	0.05
y	—	—	0.05
y <sub>1</sub>	—	—	0.20
ZD	—	0.20	—
ZE	—	0.20	—

Not recommended for new design

TBS-5AV

EIAJ Package Code	JEDEC Code	Mass (g)	Lead Material
—	—	0.001	



\*Reference value.

Symbol	Dimension in Millimeters		
	Min	Nom	Max
A	—	—	0.50
A <sub>1</sub>	0.155	—	0.185
A <sub>2</sub>	—	—	(0.315)*
b	0.20	—	0.25
D	—	0.90	—
E	—	1.40	—
e	—	0.50	—
x	—	—	0.05
y	—	—	0.05
y <sub>1</sub>	—	—	0.20
ZD	—	0.20	—
ZE	—	0.20	—

Not recommend for new design

**Keep safety first in your circuit designs!**

1. Renesas Technology Corp. puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of nonflammable material or (iii) prevention against any malfunction or mishap.

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