

# HD74LV2G123A

## Retriggerable Monostable Multivibrator

REJ03D0098–0300Z  
(Previous ADE-205-352B (Z))  
Rev.3.00  
Sep.30.2003

### Description

The HD74LV2G123A features output pulse duration control by three methods. In the first method, the  $\overline{A}$  input is low and the B input goes high. In the second method, the B input is high and the  $\overline{A}$  input goes low. In the third method, the  $\overline{A}$  input is low, the B input is high, and the clear ( $\overline{CLR}$ ) input goes high. The basic pulse duration is programmed by selecting external resistance and capacitance values. The external timing capacitor must be connected between Cext and Rext/Cext (positive) and an external resistor connected between Rext/Cext and  $V_{CC}$ . To obtain variable pulse durations, connect an external variable resistance between Rext/Cext and  $V_{CC}$ . Once triggered, the basic pulse duration can be extended by retriggering the gated low-level active ( $\overline{A}$ ) or high-level active (B) input. Pulse duration can be reduced by taking  $\overline{CLR}$  low. The output pulse equation is simply :  $t_{WQ} = C_{ext} \bullet R_{ext}$ .

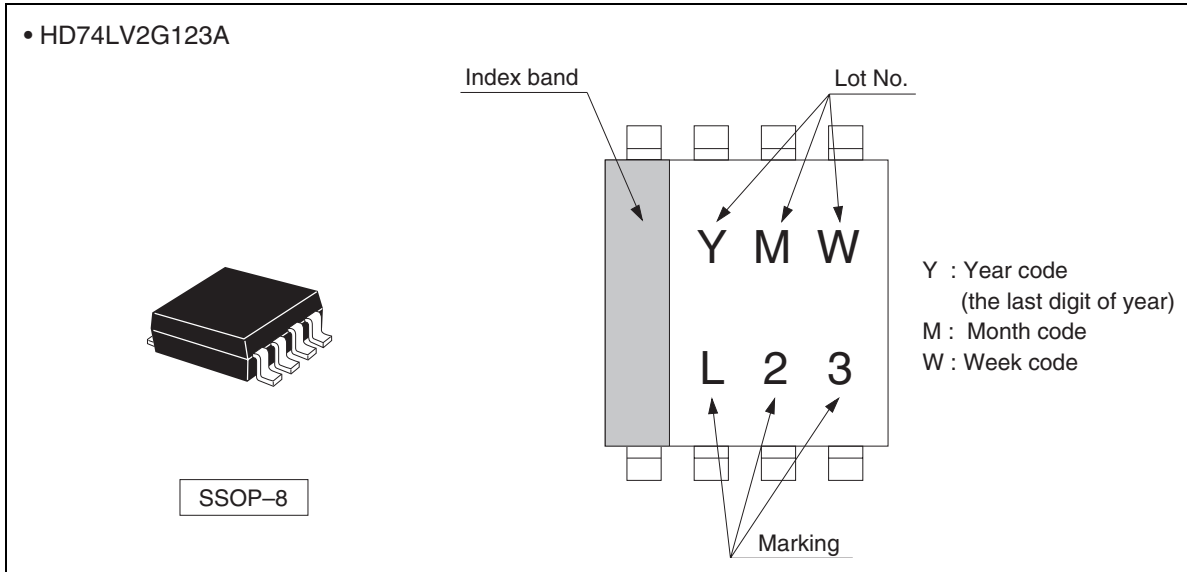
Low voltage and high-speed operation is suitable for the battery powered products (e.g., notebook computers), and the low power consumption extends the battery life.

### Features

- The basic gate function is lined up as Renesas uni logic series.
- Supplied on emboss taping for high-speed automatic mounting.
- Electrical characteristics equivalent to the HD74LV123A  
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  $\pm 6$  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	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LV2G123AUSE	SSOP-8 pin	TTP-8DBV	US	E (3,000 pcs/reel)

Outline and Article Indication

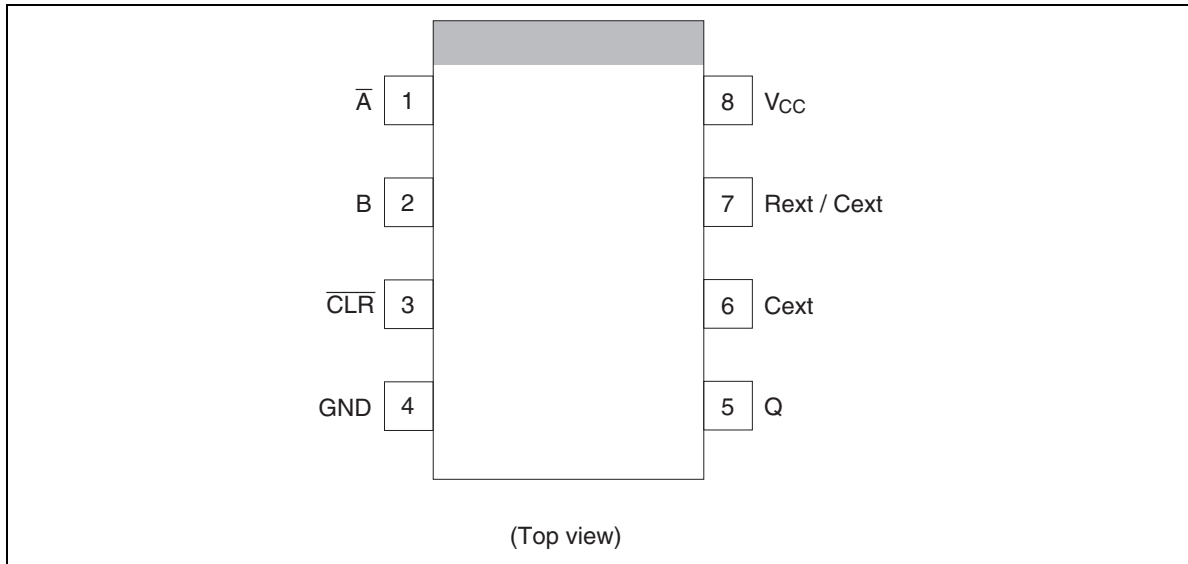


Function Table

Inputs			Output Q
CLR	$\bar{A}$	B	
L	X	X	L
H	H	X	L
H	X	L	L
H	L	↑	⎓
H	↓	H	⎓
↑	L	H	⎓

H : High level  
 L : Low level  
 X : Immaterial  
 ↑ : Low to high transition  
 ↓ : High to low transition  
 ⎓ : High level pulse

**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 <sup>*1</sup>	$V_I$	-0.5 to 7.0	V	
Output voltage range <sup>*1, 2</sup>	$V_O$	-0.5 to $V_{CC} + 0.5$ -0.5 to 7.0	V	Output : H or L $V_{CC}$ : OFF
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	$^\circ\text{C}$	

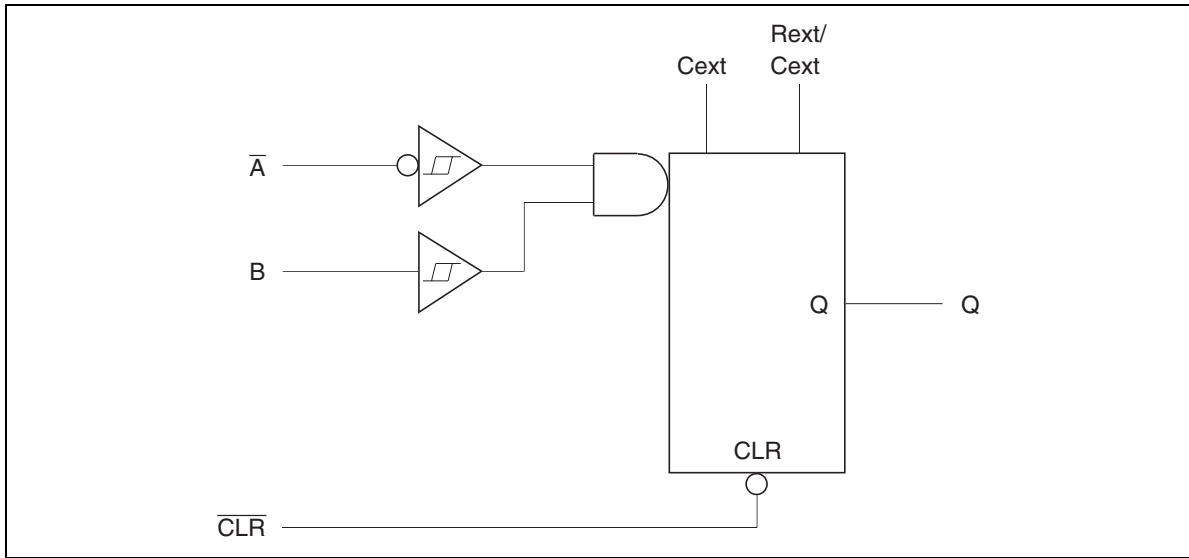
- Notes: The absolute maximum ratings are values, which must not individually be exceeded, and furthermore no two of which may be realized at the same time.
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
  2. This value is limited to 5.5 V maximum.
  3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

**Recommended Operating Conditions**

Item	Symbol	Min	Typ	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	$I_{OH}$	—	—	-1	mA	$V_{CC} = 1.65$ to $1.95$ V
		—	—	-2		$V_{CC} = 2.3$ to $2.7$ V
		—	—	-6		$V_{CC} = 3.0$ to $3.6$ V
		—	—	-12		$V_{CC} = 4.5$ to $5.5$ V
	$I_{OL}$	—	—	1		$V_{CC} = 1.65$ to $1.95$ V
		—	—	2		$V_{CC} = 2.3$ to $2.7$ V
		—	—	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	—	300	ns / V	$V_{CC} = 1.65$ to $1.95$ V
		0	—	200		$V_{CC} = 2.3$ to $2.7$ V
		0	—	100		$V_{CC} = 3.0$ to $3.6$ V
		0	—	20		$V_{CC} = 4.5$ to $5.5$ V
External timing resistance	$R_{ext}$	5	—	—	k $\Omega$	$V_{CC} = 1.65$ to $1.95$ V
		1	—	—		$V_{CC} \geq 2.3$ V
External capacitance	$C_{ext}$	—	Unlimited	—	F	
Supply transition rise rate	$\Delta t / \Delta V_{CC}$	1	—	—	ms / V	
Operating free-air temperature	$T_a$	-40	—	85	$^{\circ}$ C	

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

Logic Diagram



**Electrical Characteristic**

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

Item	Symbol	$V_{CC}$ (V) *	Min	Typ	Max	Unit	Test condition
Input voltage	$V_{IH}$	1.65 to 1.95	$V_{CC} \times 0.75$	—	—	V	
		2.3 to 2.7	$V_{CC} \times 0.7$	—	—		
		3.0 to 3.6	$V_{CC} \times 0.7$	—	—		
		4.5 to 5.5	$V_{CC} \times 0.7$	—	—		
	$V_{IL}$	1.65 to 1.95	—	—	$V_{CC} \times 0.25$		
		2.3 to 2.7	—	—	$V_{CC} \times 0.3$		
		3.0 to 3.6	—	—	$V_{CC} \times 0.3$		
		4.5 to 5.5	—	—	$V_{CC} \times 0.3$		
Hysteresis voltage	$V_H$	1.8	—	0.25	—	V	$V_T^+ - V_T^-$
		2.5	—	0.30	—		
		3.3	—	0.35	—		
		5.0	—	0.45	—		
Output voltage	$V_{OH}$	Min to Max	$V_{CC} - 0.1$	—	—	V	$I_{OH} = -50 \mu\text{A}$
		1.65	1.4	—	—		$I_{OH} = -1 \text{ mA}$
		2.3	2.0	—	—		$I_{OH} = -2 \text{ mA}$
		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	$I_{OL} = 50 \mu\text{A}$	
		1.65	—	—	0.3	$I_{OL} = 1 \text{ mA}$	
		2.3	—	—	0.4	$I_{OL} = 2 \text{ mA}$	
		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	—	—	$\pm 1$	$\mu\text{A}$	$V_{IN} = 5.5 \text{ V or GND}$
Input current Rext / Cext	$I_{IN}$	5.5	—	—	$\pm 2.5$	$\mu\text{A}$	$V_{IN} = V_{CC} \text{ or GND}$
Quiescent supply current	$I_{CC}$	5.5	—	—	10	$\mu\text{A}$	$V_{IN} = V_{CC} \text{ or GND},$ $I_O = 0$
Active state supply current	$\Delta I_{CC}$	2.3	—	—	220	$\mu\text{A}$	$V_{IN} = V_{CC} \text{ or GND}$ Rext / Cext = $0.5V_{CC}$
		3.0	—	—	280		
		4.5	—	—	650		
		5.5	—	—	975		
Output leakage current	$I_{OFF}$	0	—	—	5	$\mu\text{A}$	$V_{IN} \text{ or } V_O = 0 \text{ to } 5.5 \text{ V}$
Input capacitance	$C_{IN}$	3.3	—	2.5	—	pF	$V_{IN} = V_{CC} \text{ or GND}$

Note: For conditions shown as Min or Max, use the appropriate values under recommended operating conditions.

**Switching Characteristics**

- $V_{CC} = 1.8 \pm 0.15$  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	$t_{PLH}$	—	22.5	67.0	1.0	72.0	ns	$C_L = 15$ pF	$\bar{A}$ or B	Q
	$t_{PHL}$	—	28.0	78.0	1.0	82.0		$C_L = 50$ pF		
Enable time	$t_{ZH}$	—	16.0	48.5	1.0	54.0	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{ZL}$	—	20.0	60.0	1.0	66.0		$C_L = 50$ pF		
Disable time	$t_{HZ}$	—	21.5	64.0	1.0	69.5	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{LZ}$	—	29.0	80.0	1.0	84.5		$C_L = 50$ pF	(Trigger)	
Output pulse width	$t_{wQ}$	—	315	650	—	800	ns	$C_L = 50$ pF, $C_{ext} = 28$ pF, $R_{ext} = 5$ k $\Omega$		
		90	100	110	90	110	$\mu\text{s}$	$C_L = 50$ pF, $C_{ext} = 0.01$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
		0.9	1.0	1.1	0.9	1.1	ms	$C_L = 50$ pF, $C_{ext} = 0.1$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
Pulse width	$t_w$	7.0	—	—	8.0	—	ns	$\bar{A}$ , B or $\overline{\text{CLR}}$		
Retrigger time	$t_{rr}$	—	150	—	—	—	ns	$\bar{A}$ or B ( $R_{ext} = 5$ k $\Omega$ , $C_{ext} = 100$ pF)		
		—	2.5	—	—	—	$\mu\text{s}$	$\bar{A}$ or B ( $R_{ext} = 5$ k $\Omega$ , $C_{ext} = 0.01$ $\mu\text{F}$ )		

## HD74LV2G123A

### Switching Characteristics (cont)

- $V_{CC} = 2.5 \pm 0.2$  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	$t_{PLH}$	—	13.5	31.4	1.0	37.0	ns	$C_L = 15$ pF	$\bar{A}$ or B	Q
	$t_{PHL}$	—	16.0	36.0	1.0	42.0		$C_L = 50$ pF		
Enable time	$t_{ZH}$	—	11.0	25.0	1.0	29.5	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{ZL}$	—	13.0	32.8	1.0	34.5		$C_L = 50$ pF		
Disable time	$t_{HZ}$	—	14.0	33.4	1.0	39.0	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{LZ}$	—	16.0	38.0	1.0	44.0		$C_L = 50$ pF	(Trigger)	
Output pulse width	$t_{wQ}$	—	170	260	—	320	ns	$C_L = 50$ pF, $C_{ext} = 28$ pF, $R_{ext} = 2$ k $\Omega$		
		90	100	110	90	110	$\mu\text{s}$	$C_L = 50$ pF, $C_{ext} = 0.01$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
		0.9	1.0	1.1	0.9	1.1	ms	$C_L = 50$ pF, $C_{ext} = 0.1$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
Pulse width	$t_w$	6.0	—	—	6.5	—	ns	$\bar{A}$ , B or $\overline{\text{CLR}}$		
Retrigger time	$t_{rr}$	—	40	—	—	—	ns	$\bar{A}$ or B ( $R_{ext} = 1$ k $\Omega$ , $C_{ext} = 100$ pF)		
		—	1.5	—	—	—	$\mu\text{s}$	$\bar{A}$ or B ( $R_{ext} = 1$ k $\Omega$ , $C_{ext} = 0.01$ $\mu\text{F}$ )		



## HD74LV2G123A

### Switching Characteristics (cont)

- $V_{CC} = 3.3 \pm 0.3$  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	$t_{PLH}$	—	9.7	20.6	1.0	24.0	ns	$C_L = 15$ pF	$\bar{A}$ or B	Q
	$t_{PHL}$	—	11.5	24.1	1.0	27.5		$C_L = 50$ pF		
Enable time	$t_{ZH}$	—	8.0	15.8	1.0	18.5	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{ZL}$	—	9.5	19.3	1.0	22.0		$C_L = 50$ pF		
Disable time	$t_{HZ}$	—	9.9	22.4	1.0	26.0	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{LZ}$	—	11.5	25.9	1.0	29.5		$C_L = 50$ pF	(Trigger)	
Output pulse width	$t_{wQ}$	—	150	240	—	300	ns	$C_L = 50$ pF, $C_{ext} = 28$ pF, $R_{ext} = 2$ k $\Omega$		
		90	100	110	90	110	$\mu\text{s}$	$C_L = 50$ pF, $C_{ext} = 0.01$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
		0.9	1.0	1.1	0.9	1.1	ms	$C_L = 50$ pF, $C_{ext} = 0.1$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
Pulse width	$t_w$	5.0	—	—	5.0	—	ns	$\bar{A}$ , B or $\overline{\text{CLR}}$		
Retrigger time	$t_{rr}$	—	30	—	—	—	ns	$\bar{A}$ or B ( $R_{ext} = 1$ k $\Omega$ , $C_{ext} = 100$ pF)		
		—	1.2	—	—	—	$\mu\text{s}$	$\bar{A}$ or B ( $R_{ext} = 1$ k $\Omega$ , $C_{ext} = 0.01$ $\mu\text{F}$ )		

## HD74LV2G123A

### Switching Characteristics (cont)

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

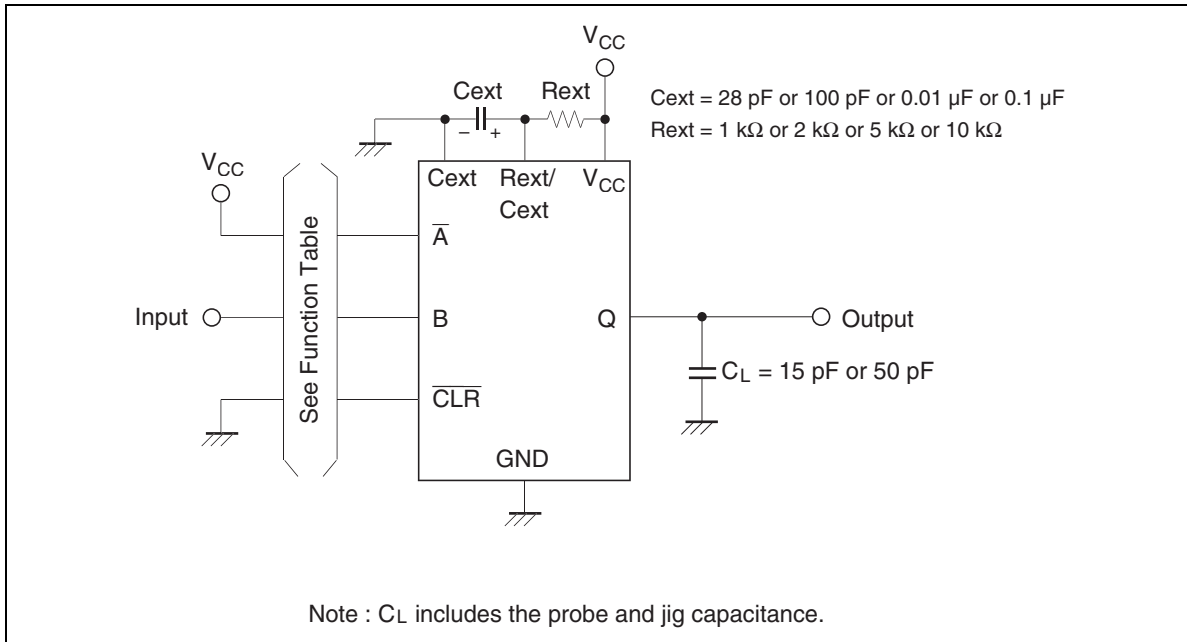
Item	Symbol	$T_a = 25^\circ\text{C}$			$T_a = -40$ to $85^\circ\text{C}$		Unit	Test Conditions	FROM (Input)	TO (Output)
		Min	Typ	Max	Min	Max				
Propagation delay time	$t_{PLH}$	—	7.3	12.0	1.0	14.0	ns	$C_L = 15$ pF	$\bar{A}$ or B	Q
	$t_{PHL}$	—	8.5	14.0	1.0	16.0		$C_L = 50$ pF		
Enable time	$t_{ZH}$	—	5.9	9.4	1.0	11.0	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{ZL}$	—	7.5	11.4	1.0	13.0		$C_L = 50$ pF		
Disable time	$t_{HZ}$	—	7.3	12.9	1.0	15.0	ns	$C_L = 15$ pF	$\overline{\text{CLR}}$	Q
	$t_{LZ}$	—	8.7	14.9	1.0	17.0		$C_L = 50$ pF	(Trigger)	
Output pulse width	$t_{wQ}$	—	140	200	—	240	ns	$C_L = 50$ pF, $C_{ext} = 28$ pF, $R_{ext} = 2$ k $\Omega$		
		90	100	110	90	110	$\mu\text{s}$	$C_L = 50$ pF, $C_{ext} = 0.01$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
		0.9	1.0	1.1	0.9	1.1	ms	$C_L = 50$ pF, $C_{ext} = 0.1$ $\mu\text{F}$ , $R_{ext} = 10$ k $\Omega$		
Pulse width	$t_w$	5.0	—	—	5.0	—	ns	$\bar{A}$ , B or $\overline{\text{CLR}}$		
Retrigger time	$t_{rr}$	—	20	—	—	—	ns	$\bar{A}$ or B ( $R_{ext} = 1$ k $\Omega$ , $C_{ext} = 100$ pF)		
		—	0.95	—	—	—	$\mu\text{s}$	$\bar{A}$ or B ( $R_{ext} = 1$ k $\Omega$ , $C_{ext} = 0.01$ $\mu\text{F}$ )		

### Operating Characteristics

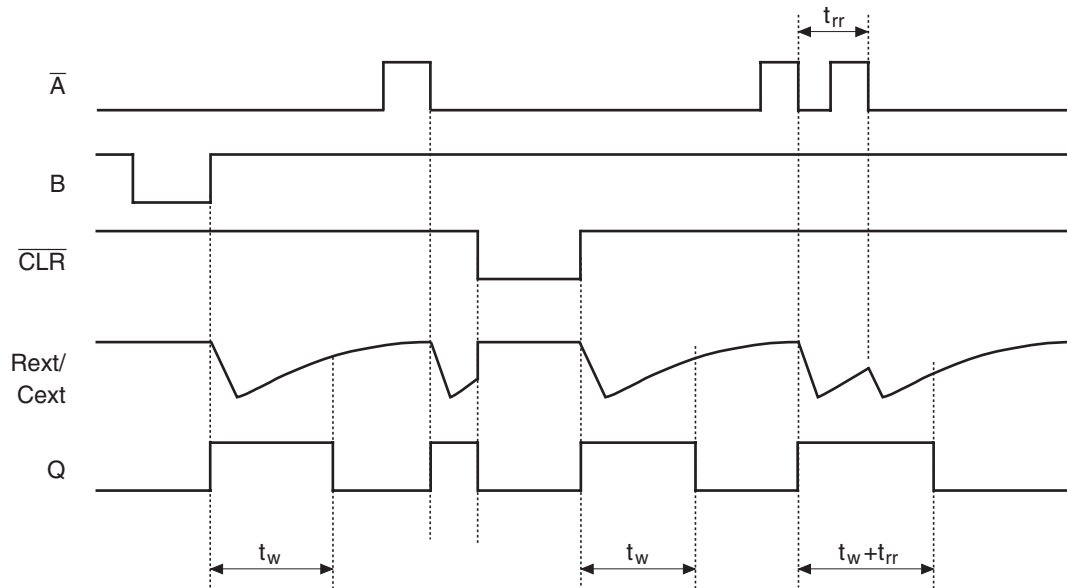
- $C_L = 50$  pF

Item	Symbol	$V_{CC}$ (V)	$T_a = 25^\circ\text{C}$			Unit	Test Conditions
			Min	Typ	Max		
Power dissipation capacitance	$C_{PD}$	3.3	—	28.0	—	pF	$f = 10$ MHz
		5.0	—	31.0	—		

Test Circuit



## Timing Diagram



### Caution in use

In order to prevent any malfunctions due to noise, connect a high frequency performance capacitor between Vcc and GND, and keep the wiring between the External components and Cext, Rext/Cext pins as short as possible.

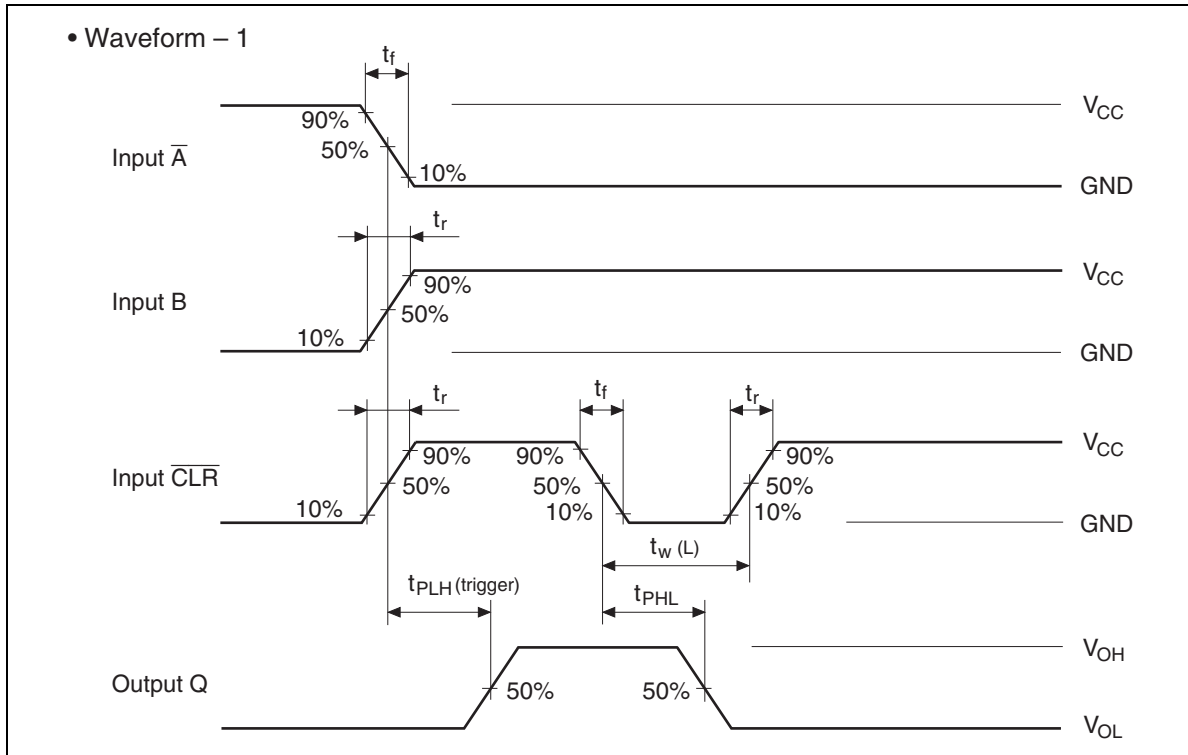
Large values of Cext may cause problems when powering down the HD74LV2G123A because of the amount of energy stored in the capacitor. When a system containing this device is powered down, the capacitor may discharge from Vcc through the protection diodes at pin 7 pin.

Current through the input protection diodes must be limited to 20 mA; therefore, the turn-off time of the Vcc power supply must not be faster than  $t = V_{cc} \cdot C_{ext} / (20 \text{ mA})$ . For example, if  $V_{cc} = 5 \text{ V}$  and  $C_{ext} = 22 \mu\text{F}$ , the Vcc supply must turn off no faster than  $t = (5 \text{ V}) \cdot (22 \mu\text{F}) / 20 \text{ mA} = 5.5 \text{ ms}$ . This is usually not a problem because power supplies are heavily filtered and cannot discharge at this rate.

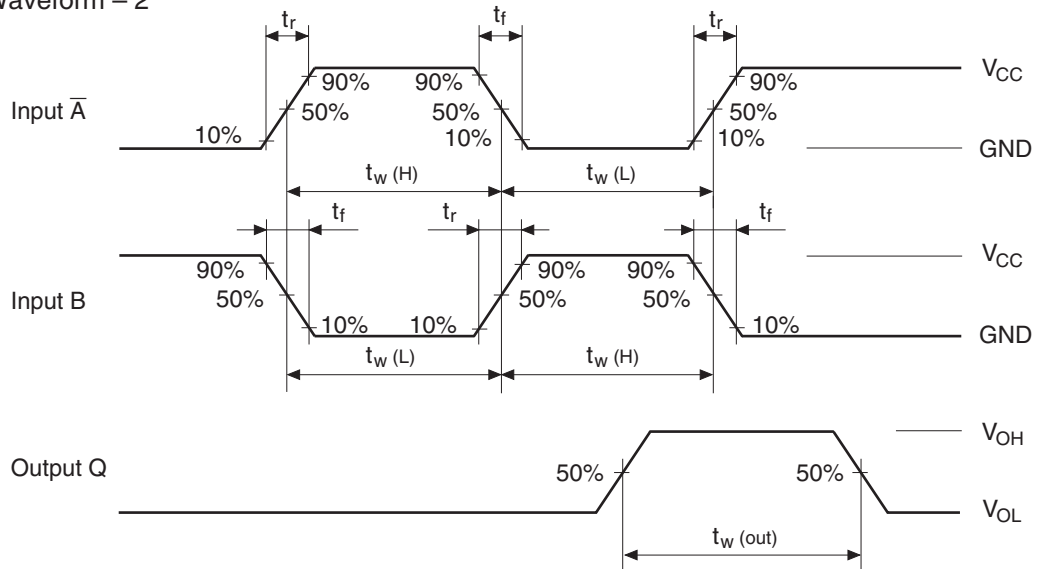
When a more rapid decrease of Vcc to zero volts occurs, the HD74LV2G123A may sustain damage.

To avoid this possibility, use an external clamping diode.

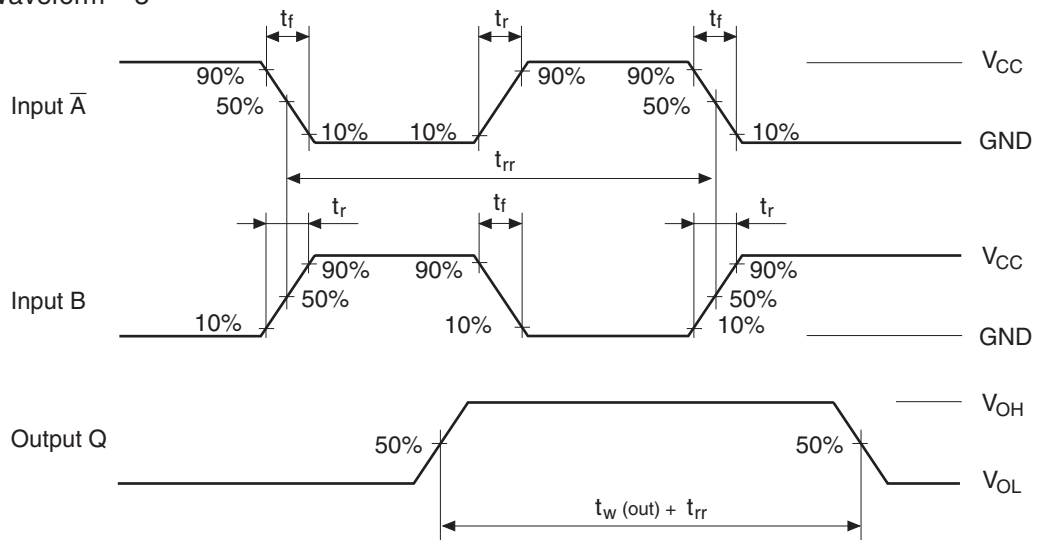
The input pins for unused circuit should be used under conditions to fix the outputs to avoid malfunction caused by noises. Also, it's recommended that Rext / Cext terminals are open and external parts are not connected to.



• Waveform – 2

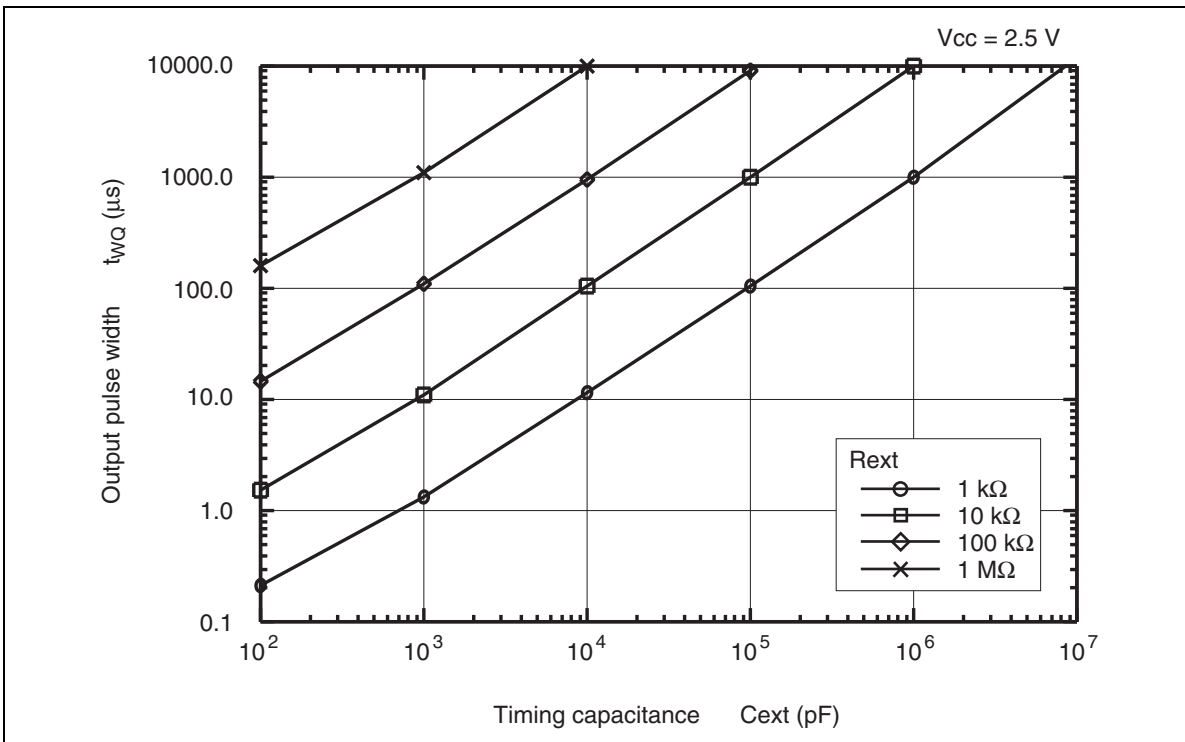
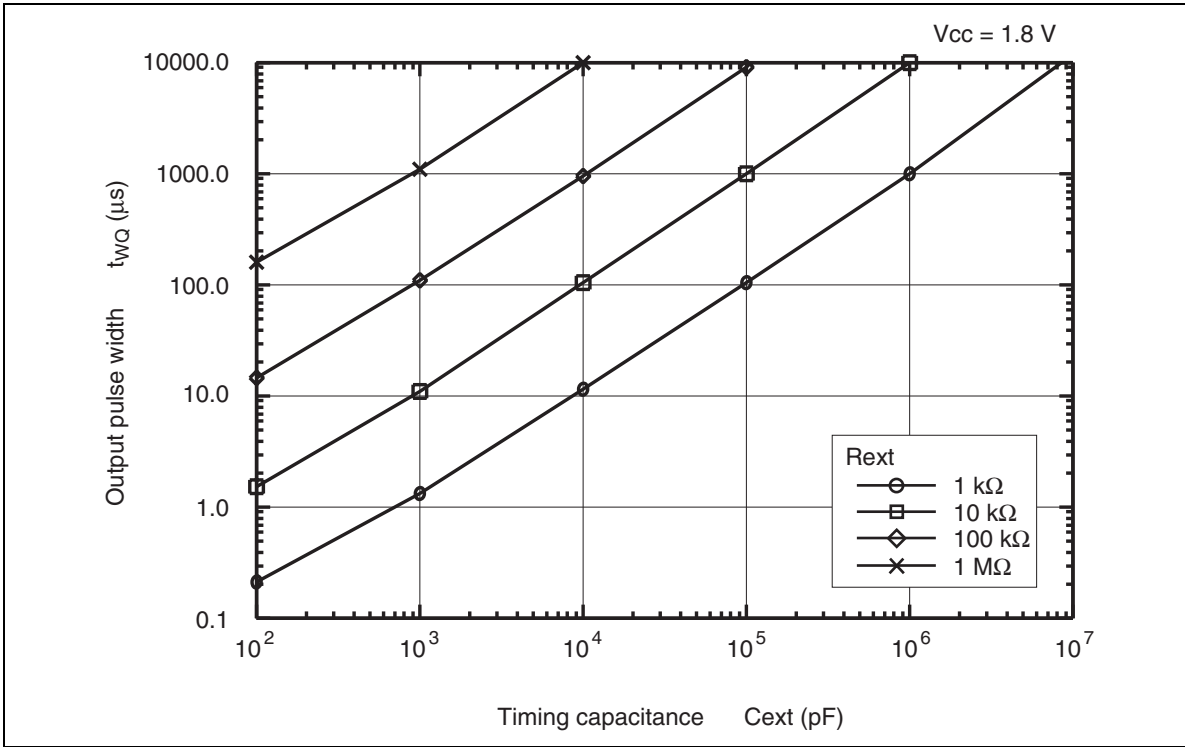


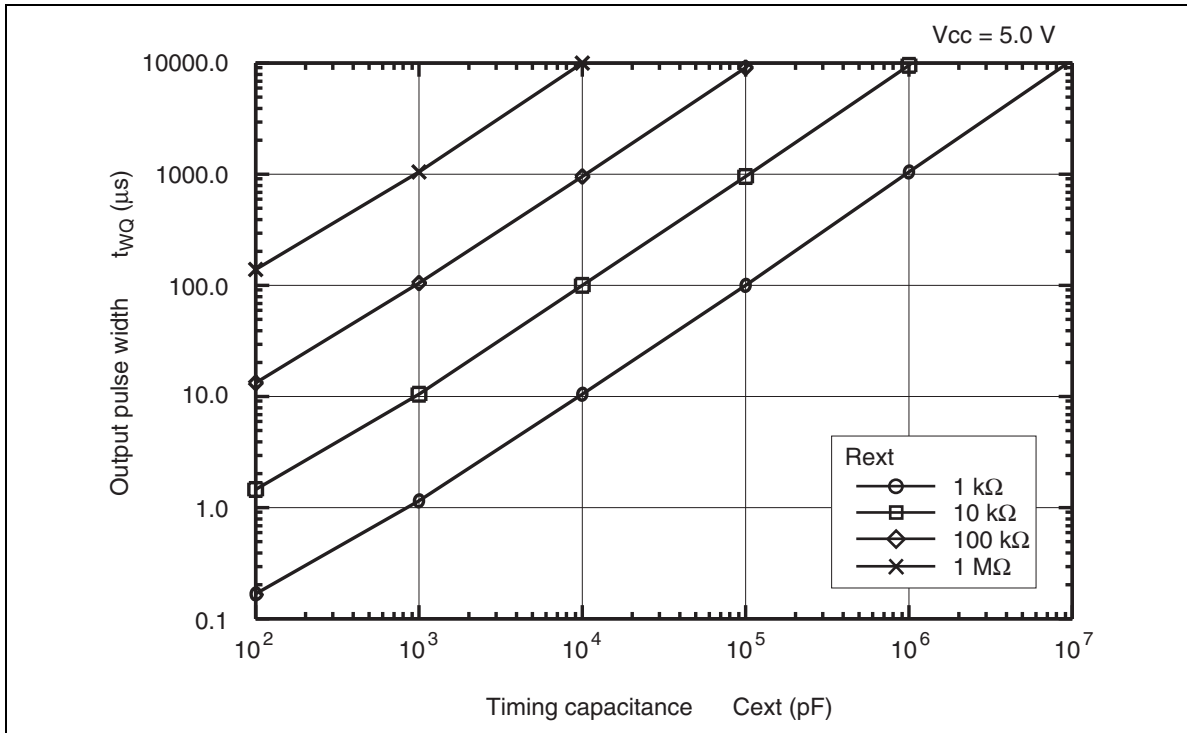
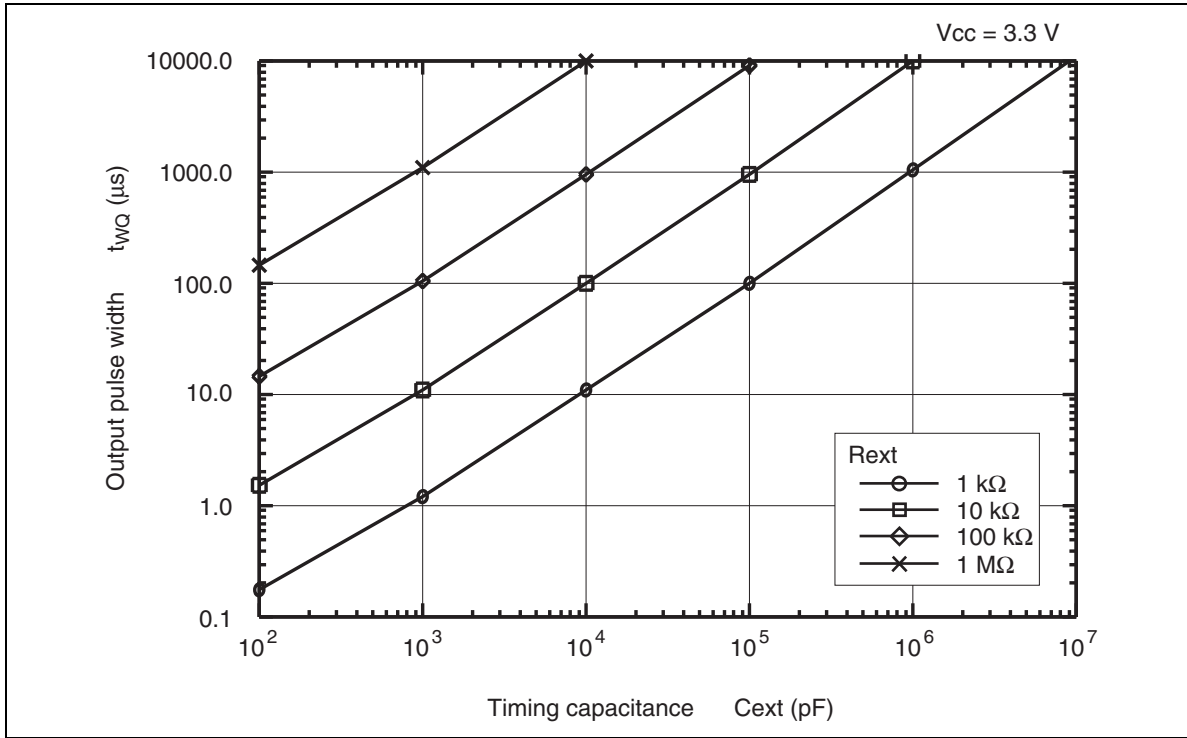
• Waveform – 3



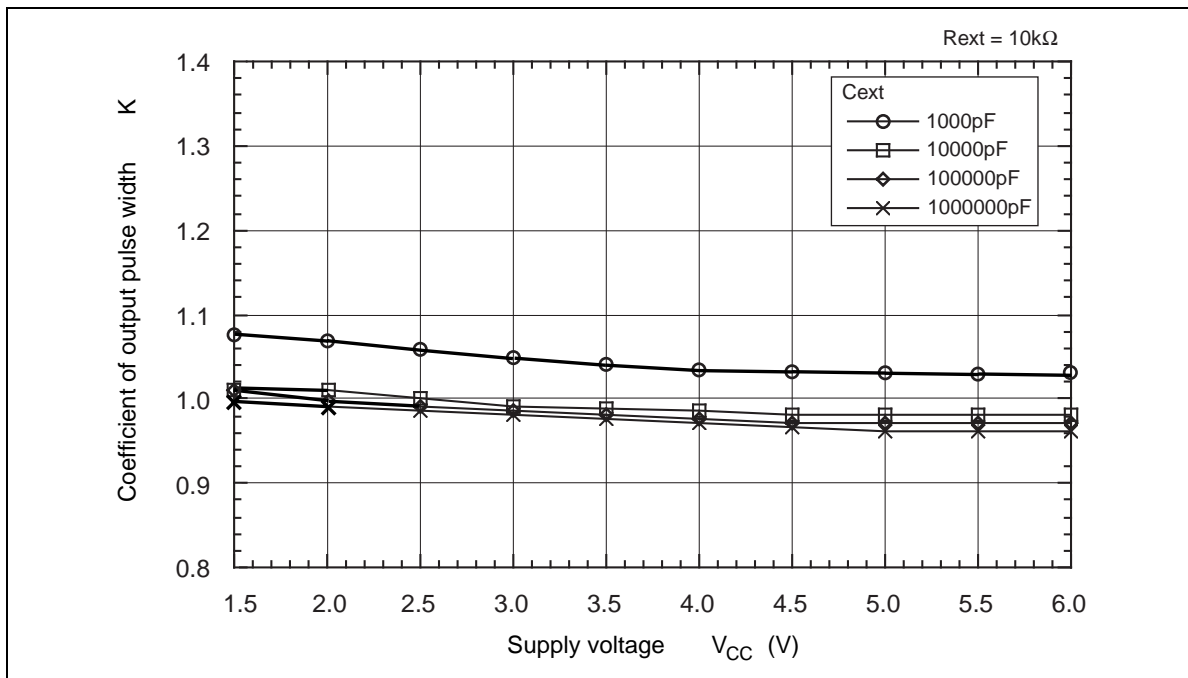
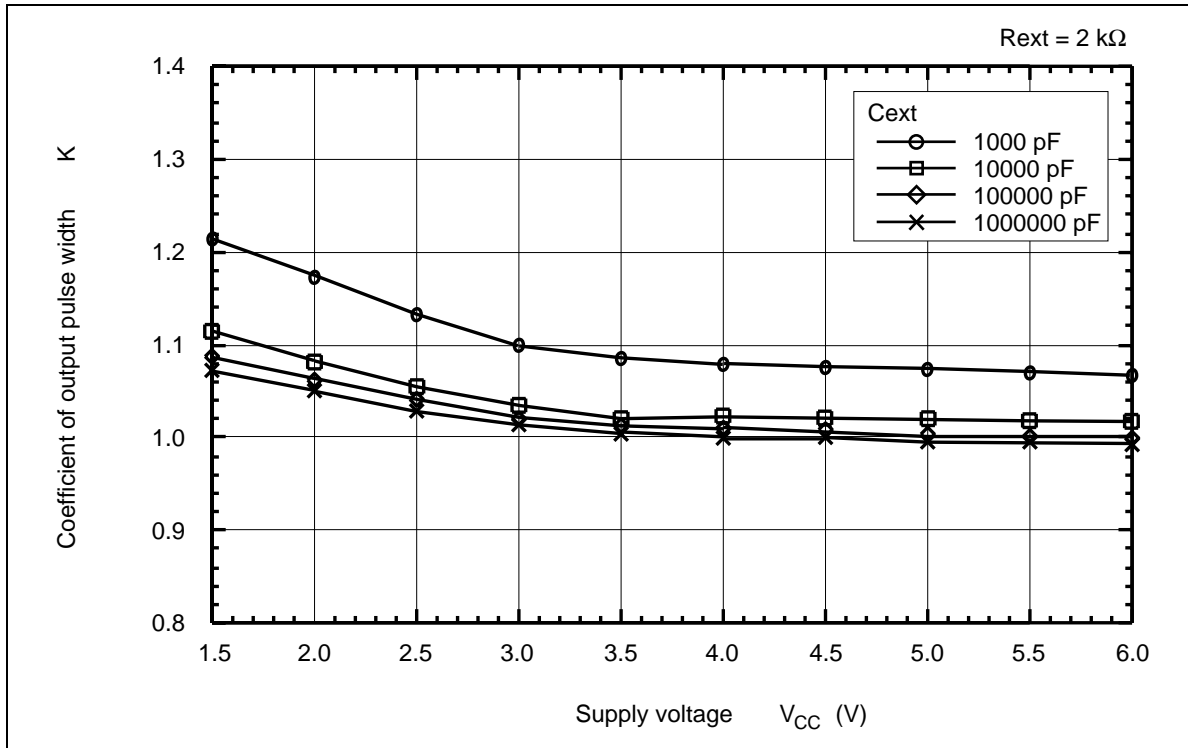
- Notes: 1. Input waveform:  $PRR \leq 1 \text{ MHz}$ ,  $Z_o = 50 \Omega$ ,  $t_r \leq 3 \text{ ns}$ ,  $t_f \leq 3 \text{ ns}$   
 2. The output are measured one at a time with one transition per measurement.

Application Data

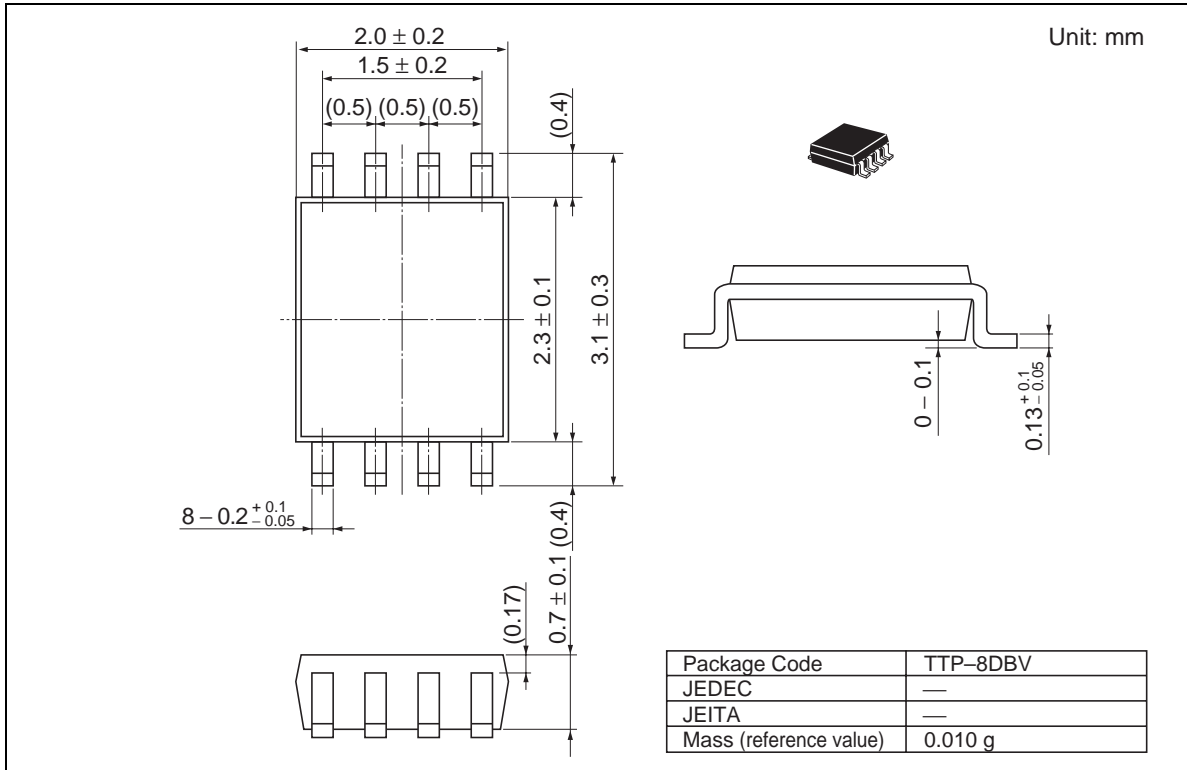








Package Dimensions



## RENESAS Technology Corp. Sales Strategic Planning Div. Nippon Bldg., 2-6-2, Ohte-machi, Chiyoda-ku, Tokyo 100-0004, Japan

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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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