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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

RENESAS
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HD74LV123A

Dual Retriggerable Monostable Multivibrators

ADE-205-258D (Z)

5th. Edition
Jul. 2001

Description

The HD74LV123A features output pulse-duration control by three methods. In the first method, the A input is low and the B input goes high. In the second method, the B input is high and the $\overline{\text{A}}$ input goes low. In the third method, the $\overline{\text{A}}$ input is low, the B input is high, and the clear ($\overline{\text{CLR}}$) 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 Vcc

To obtain variable pulse durations, connect an external variable resistance between Rext/Cext and Vcc.

Once triggered, the basic pulse duration can be extended by retriggering the gated low-level-active ($\overline{\text{A}}$) or high-level-active (B) input. Pulse duration can be reduced by taking $\overline{\text{CLR}}$ low.

Features

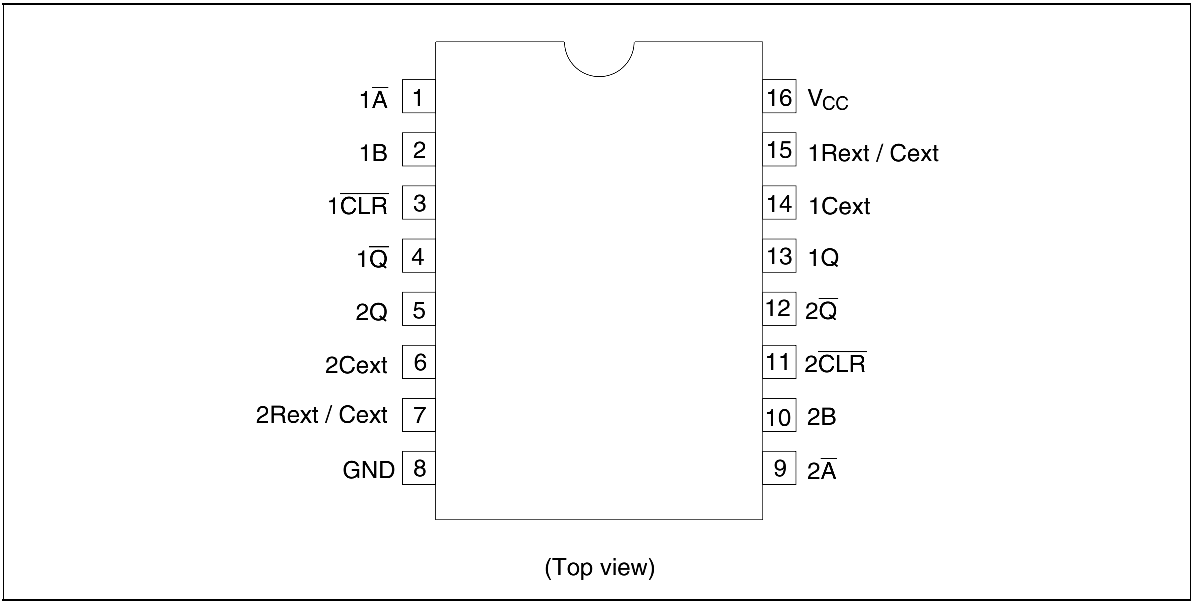
- V_{CC} = 2.0 V to 5.5 V operation
- All inputs V_{IH} (Max.) = 5.5 V (@V_{CC} = 0 V to 5.5 V)
- All outputs V_O (Max.) = 5.5 V (@V_{CC} = 0 V)
- Output current ±6 mA (@V_{CC} = 3.0 V to 3.6 V), ±12 mA (@V_{CC} = 4.5 V to 5.5 V)

Function Table

Inputs			Outputs	
$\overline{CLR}$	$\overline{A}$	B	Q	$\overline{Q}$
L	X	X	L	H
H	H	X	L	H
H	X	L	L	H
H	L	↑	⊓	⊔
H	↓	H	⊓	⊔
↑	L	H	⊓	⊔

Note: H: High level
L: Low level
X: Immaterial
↑: Low to high transition
↓: High to low transition
⊓: High level pulse
⊔: Low level pulse

Pin Arrangement



Absolute Maximum Ratings

Item	Symbol	Ratings	Unit	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 Ta = 25°C (in still air)*[3]	P_T	785	mW	SOP
		500		TSSOP
Storage temperature	Tstg	–65 to 150	°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.

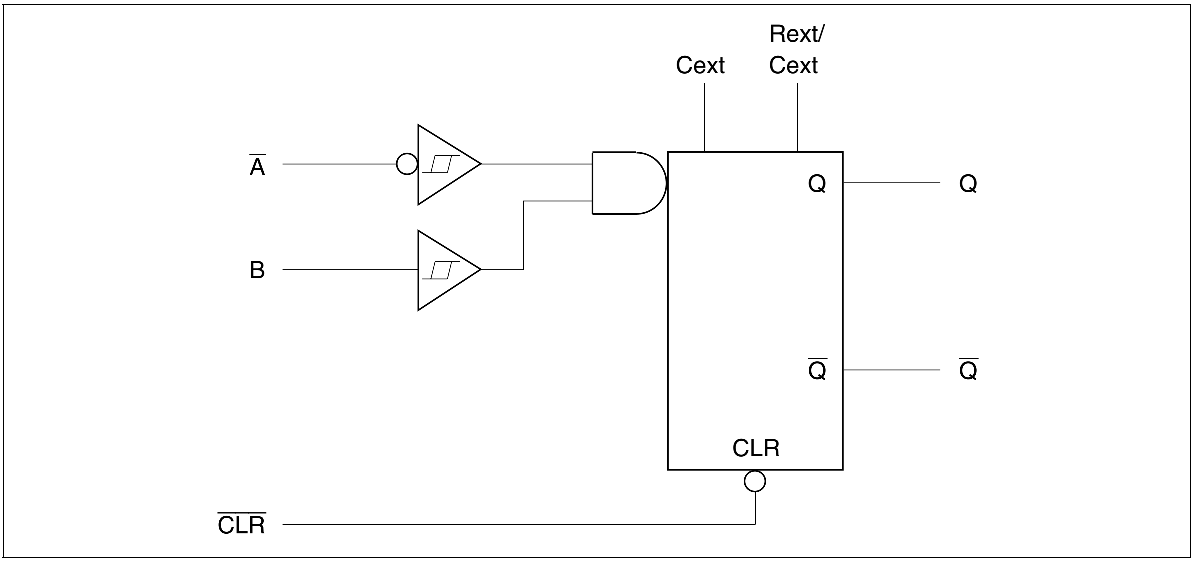
1. The input and output voltage ratings may be exceeded if the input and output clamp-current ratings are observed.
2. This value is limited to 5.5 V maximum.
3. The maximum package power dissipation was calculated using a junction temperature of 150°C.

Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit	Conditions
Supply voltage range	V_{CC}	2.0	—	5.5	V	
Input voltage range	V_I	0	—	5.5	V	
Output voltage range	V_O	0	—	V_{CC}	V	
Output current	I_{OH}	—	—	–50	µA	V_{CC} = 2.0 V
		—	—	–2	mA	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}	—	—	50	µA	V_{CC} = 2.0 V
		—	—	2	mA	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	—	200	ns/V	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 registance	Rext	5	—	—	kΩ	V_{CC} = 2.0 V
		1	—	—		$V_{CC} \geq 2.3$ V
External timing capacitance	Cext	—	Unlimited	—	F	
Power-up ramp rate	$\Delta t / \Delta V_{CC}$	1	—	—	ms/V	
Operating free-air temperature	Ta	–40	—	85	°C	

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

Logic Diagram



DC Electrical Characteristics

Ta = –40 to 85°C

Item	Symbol	V_{CC} (V)*	Min	Typ	Max	Unit	Test Conditions
Input voltage	V_{IH}	2.0	1.5	—	—	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}	2.0	—	—	0.5		
		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	—	—	$V_{CC} \times 0.3$		
Output voltage	V_{OH}	Min to Max	$V_{CC} - 0.1$	—	—	V	$I_{OH} = -50$ µA
		2.3	2.0	—	—		$I_{OH} = -2$ mA
		3.0	2.48	—	—		$I_{OH} = -6$ mA
		4.5	3.8	—	—		$I_{OH} = -12$ mA
	V_{OL}	Min to Max	—	—	0.1		$I_{OL} = 50$ µA
		2.3	—	—	0.4		$I_{OL} = 2$ mA
		3.0	—	—	0.44		$I_{OL} = 6$ mA
		4.5	—	—	0.55		$I_{OL} = 12$ mA
Input current	I_{IN}	0 to 5.5	—	—	±1	µA	$V_{IN} = 5.5$ V or GND
Input current Rext / Cext	I_{IN}	5.5	—	—	±2.5	µA	$V_{IN} = V_{CC}$ or GND
Quiescent supply current	I_{CC}	5.5	—	—	20	µA	$V_{IN} = V_{CC}$ or GND, $I_O = 0$
Active state supply current (per circuit)	ΔI_{CC}	2.3	—	—	220	µA	$V_{IN} = V_{CC}$ or GND Rext/Cext = 0.5 V_{CC}
		3.0	—	—	280		
		4.5	—	—	650		
		5.5	—	—	975		
Output leakage current	I_{OFF}	0	—	—	5	µA	V_I or $V_O = 0$ V to 5.5 V
Input capacitance	C_{IN}	3.3	—	4.0	—	pF	$V_I = V_{CC}$ or GND

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

Switching Characteristics

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

		Ta = 25°C			Ta = –40 to 85°C					
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**	**Test Conditions**	**FROM (Input)**	**TO (Output)**
Propagation delay time	t_{PLH} t_{PHL}	—	13.5	31.4	1.0	37.0	ns	C_L = 15 pF	A or B	Q or $\overline{Q}$
		—	16.0	36.0	1.0	42.0		C_L = 50 pF		
		—	11.0	25.0	1.0	29.5		C_L = 15 pF	$\overline{\text{CLR}}$	Q or $\overline{Q}$
		—	13.0	32.8	1.0	34.5		C_L = 50 pF		
		—	14.0	33.4	1.0	39.0		C_L = 15 pF	$\overline{\text{CLR}}$ (Trigger)	Q or $\overline{Q}$
		—	16.0	38.0	1.0	44.0		C_L = 50 pF		
Output pulse width	t_{wQ}	—	170	260	—	320	ns	C_L = 50 pF, Cext = 28 pF, Rext = 2 kΩ		
		90	100	110	90	110	µs	C_L = 50 pF, Cext = 0.01 µF, Rext = 10 kΩ		
		0.9	1.0	1.1	0.9	1.1	ms	C_L = 50 pF, Cext = 0.1 µF, Rext = 10 kΩ		
	Δt_{wQ}	—	±1	—	—	—	%	C_L = 50 pF		
Pulse width	t_w	6.0	—	—	6.5	—	ns	$\overline{A}$, B or $\overline{\text{CLR}}$		
Retrigger time	t_{rr}	—	40	—	—	—	ns	$\overline{A}$, or B (Rext = 1 kΩ, Cext = 100 pF)		
		—	1.5	—	—	—	µs	$\overline{A}$, or B (Rext = 1 kΩ, Cext = 0.01 µF)		

Switching Characteristics (cont)

V_{CC} = 3.3 ± 0.3 V

		Ta = 25°C			Ta = –40 to 85°C					
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**	**Test Conditions**	**FROM (Input)**	**TO (Output)**
Propagation delay time	t_{PLH} t_{PHL}	—	9.7	20.6	1.0	24.0	ns	C_L = 15 pF	A or B	Q or $\overline{Q}$
		—	11.5	24.1	1.0	27.5		C_L = 50 pF		
		—	8.0	15.8	1.0	18.5		C_L = 15 pF	$\overline{CLR}$	Q or $\overline{Q}$
		—	9.5	19.3	1.0	22.0		C_L = 50 pF		
		—	9.9	22.4	1.0	26.0		C_L = 15 pF	$\overline{CLR}$	Q or $\overline{Q}$
		—	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, Cext = 28 pF, Rext = 2 kΩ		
		90	100	110	90	110	µs	C_L = 50 pF, Cext = 0.01 µF, Rext = 10 kΩ		
		0.9	1.0	1.1	0.9	1.1	ms	C_L = 50 pF, Cext = 0.1 µF, Rext = 10 kΩ		
	Δt_{wQ}	—	±1	—	—	—	%	C_L = 50 pF		
Pulse width	t_w	5.0	—	—	5.0	—	ns	$\overline{A}$, B or $\overline{CLR}$		
Retrigger time	t_{rr}	—	30	—	—	—	ns	$\overline{A}$, or B (Rext = 1 kΩ, Cext = 100 pF)		
		—	1.2	—	—	—	µs	$\overline{A}$, or B (Rext = 1 kΩ, Cext = 0.01 µF)		

Switching Characteristics (cont)

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

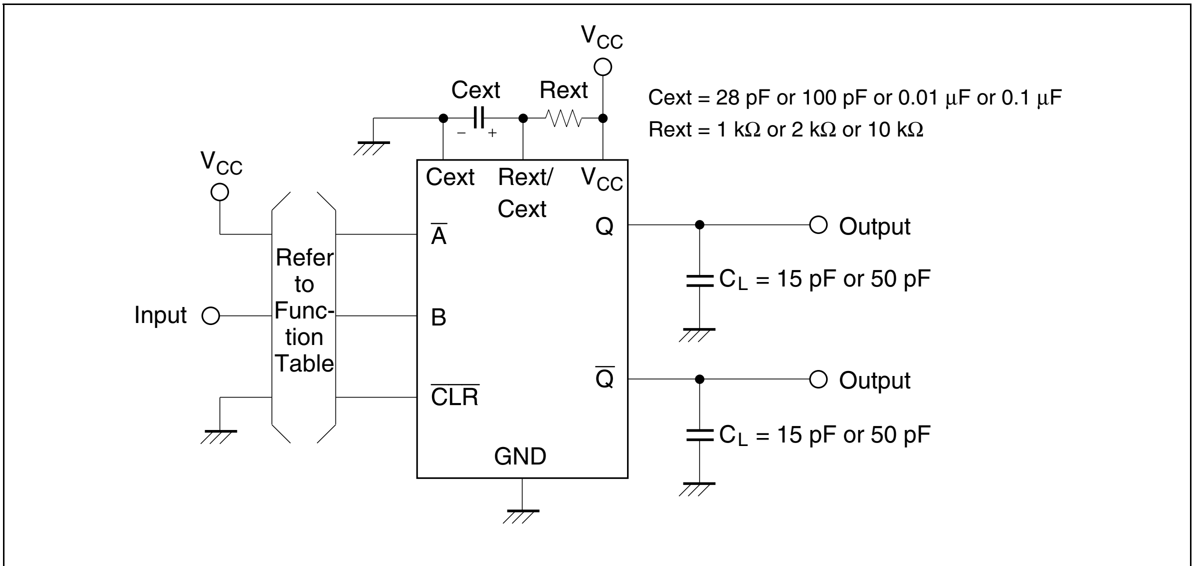
		Ta = 25°C			Ta = –40 to 85°C					
Item	**Symbol**	**Min**	**Typ**	**Max**	**Min**	**Max**	**Unit**	**Test Conditions**	**FROM (Input)**	**TO (Output)**
Propagation delay time	t_{PLH} t_{PHL}	—	7.3	12.0	1.0	14.0	ns	C_L = 15 pF	A or B	Q or $\overline{Q}$
		—	8.5	14.0	1.0	16.0		C_L = 50 pF		
		—	5.9	9.4	1.0	11.0		C_L = 15 pF	$\overline{\text{CLR}}$	Q or $\overline{Q}$
		—	7.5	11.4	1.0	13.0		C_L = 50 pF		
		—	7.3	12.9	1.0	15.0		C_L = 15 pF	$\overline{\text{CLR}}$ (Trigger)	Q or $\overline{Q}$
		—	8.7	14.9	1.0	17.0		C_L = 50 pF		
Output pulse width	t_{wQ}	—	140	200	—	240	ns	C_L = 50 pF, Cext = 28 pF, Rext = 2 kΩ		
		90	100	110	90	110	µs	C_L = 50 pF, Cext = 0.01 µF, Rext = 10 kΩ		
		0.9	1.0	1.1	0.9	1.1	ms	C_L = 50 pF, Cext = 0.1 µF, Rext = 10 kΩ		
	Δt_{wQ}	—	±1	—	—	—	%	C_L = 50 pF		
Pulse width	t_w	5.0	—	—	5.0	—	ns	$\overline{A}$, B or $\overline{\text{CLR}}$		
Retrigger time	t_{rr}	—	20	—	—	—	ns	$\overline{A}$, or B (Rext = 1 kΩ, Cext = 100 pF)		
		—	0.95	—	—	—	µs	$\overline{A}$, or B (Rext = 1 kΩ, Cext = 0.01 µF)		

Operating Characteristics

$C_L = 50$ pF

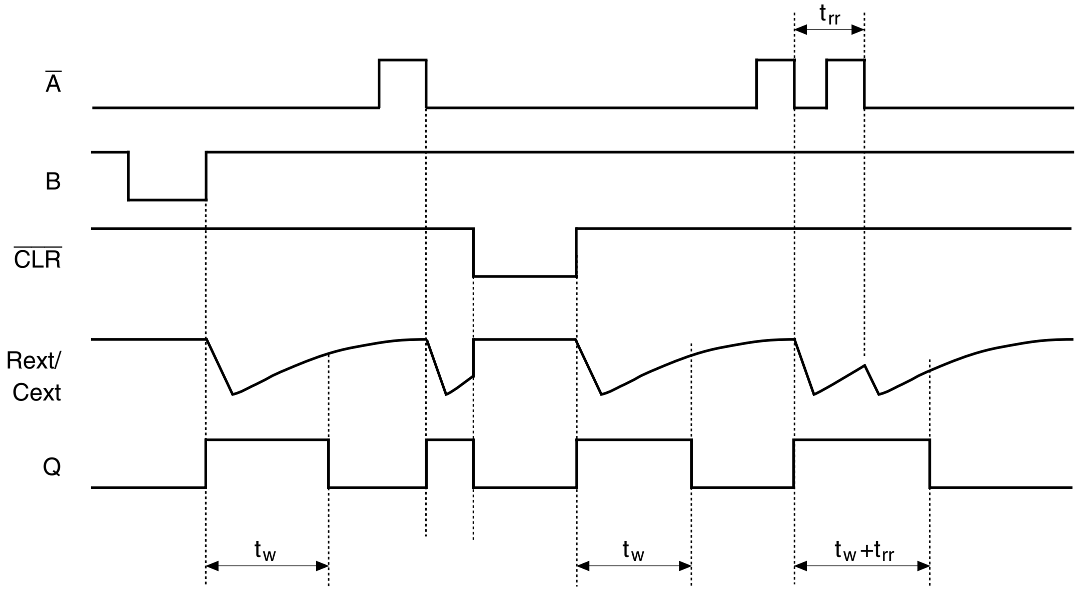
Item	Symbol	V_{cc} (V)	Ta = 25°C Min	Typ	Max	Unit	Test Conditions
Power dissipation capacitance	C_{PD}	3.3	—	74.0	—	pF	f = 10 MHz
		5.0	—	86.0	—		

Test Circuit



Note : C_L includes the probe and jig capacitance.

Timing diagram



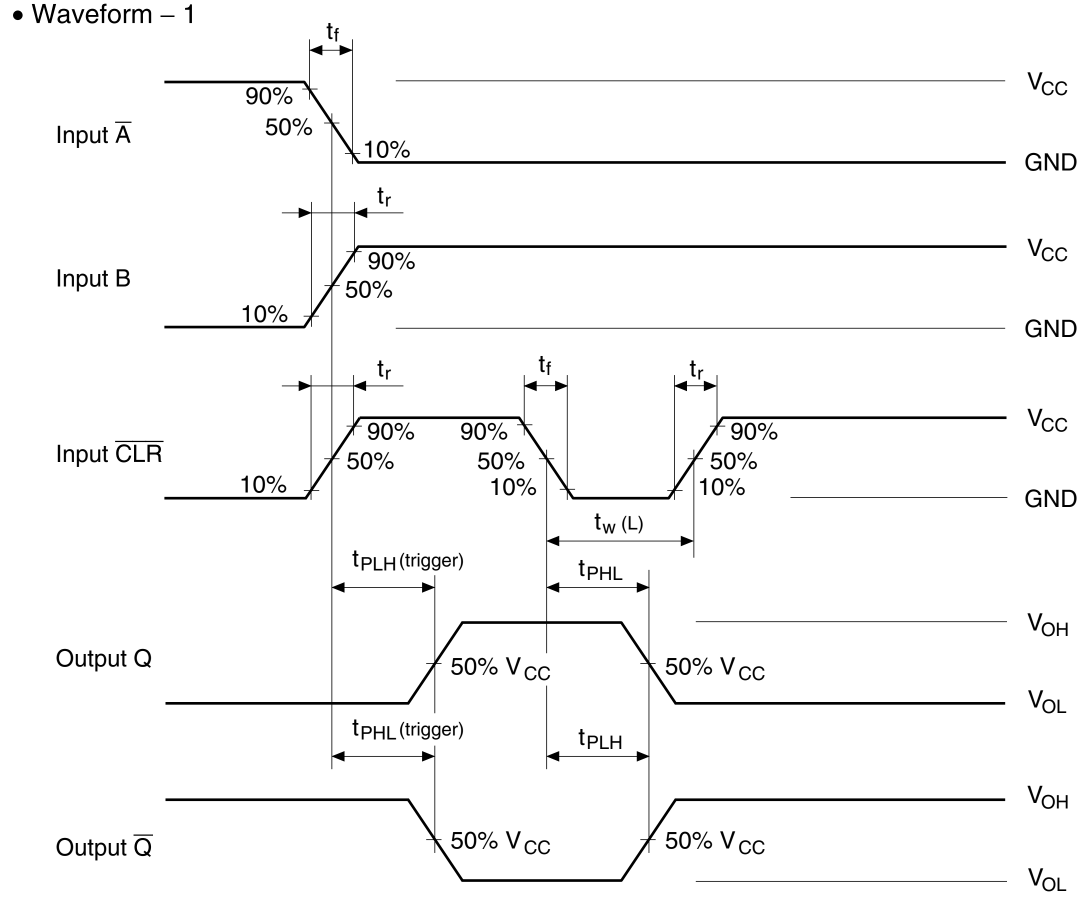
Caution in use

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.

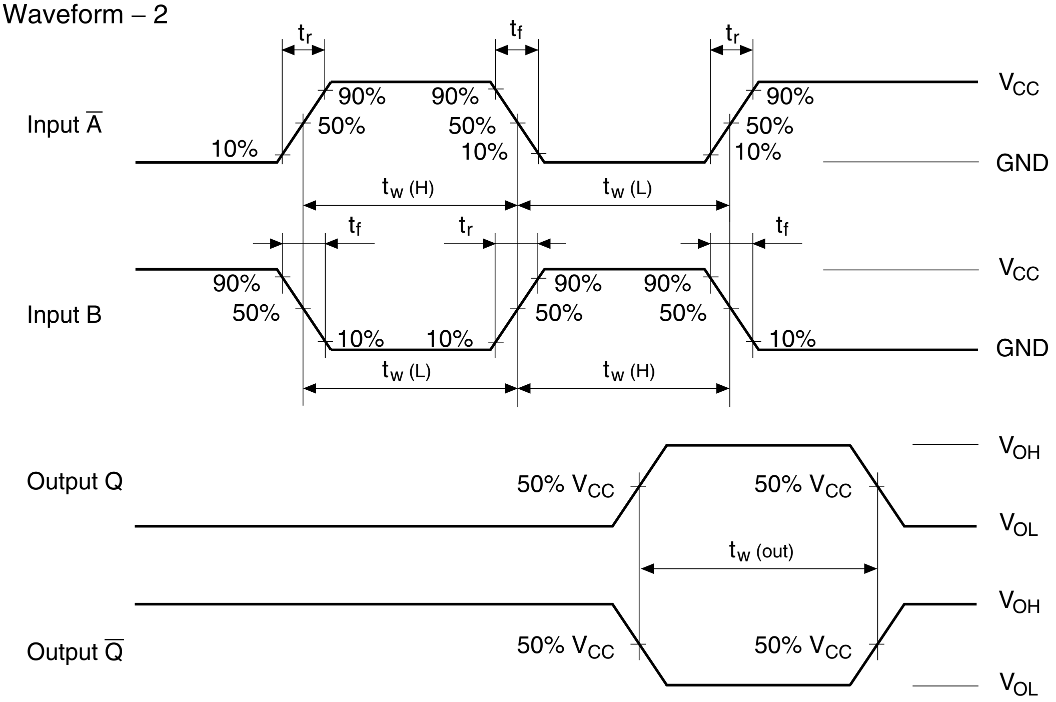
Large values of Cext may cause problems when powering down the HD74LV123A because of the amount of energy stored in the capacitor. When a system containing this device is powered down, the capacitor may discharge from Vcc through the protection diodes at pin 7 or pin 15.
Current through the input protection diodes must be limited to 20 mA; therefore, the turn-off time of the Vcc power supply must not be faster than t = Vcc • Cext/(20 mA). For example, if Vcc = 5 V and Cext = 22 µF, the Vcc supply must turn off no faster than t = (5 V) • (22 µF)/ 20 mA = 5.5 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 HD74LV123A may sustain damage. To avoid this possibility, use an external calmping diode.

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

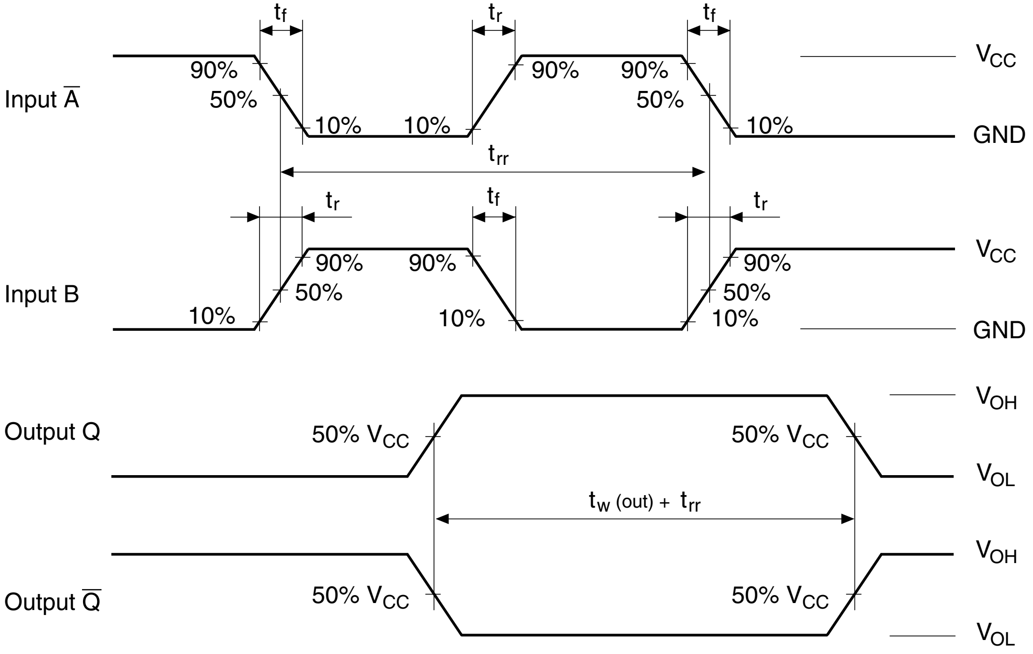
- Waveform – 1


t_f
Input A̅
90%
50%
10%
V_CC
GND
t_r
Input B
90%
50%
10%
V_CC
GND
t_r
t_f
t_r
Input CLR̅
90%
50%
10%
V_CC
GND
t_w (L)
t_PLH (trigger)
t_PHL
Output Q
50% V_CC
V_OH
V_OL
t_PHL (trigger)
t_PLH
Output Q̅
50% V_CC
V_OH
V_OL

- Waveform – 2

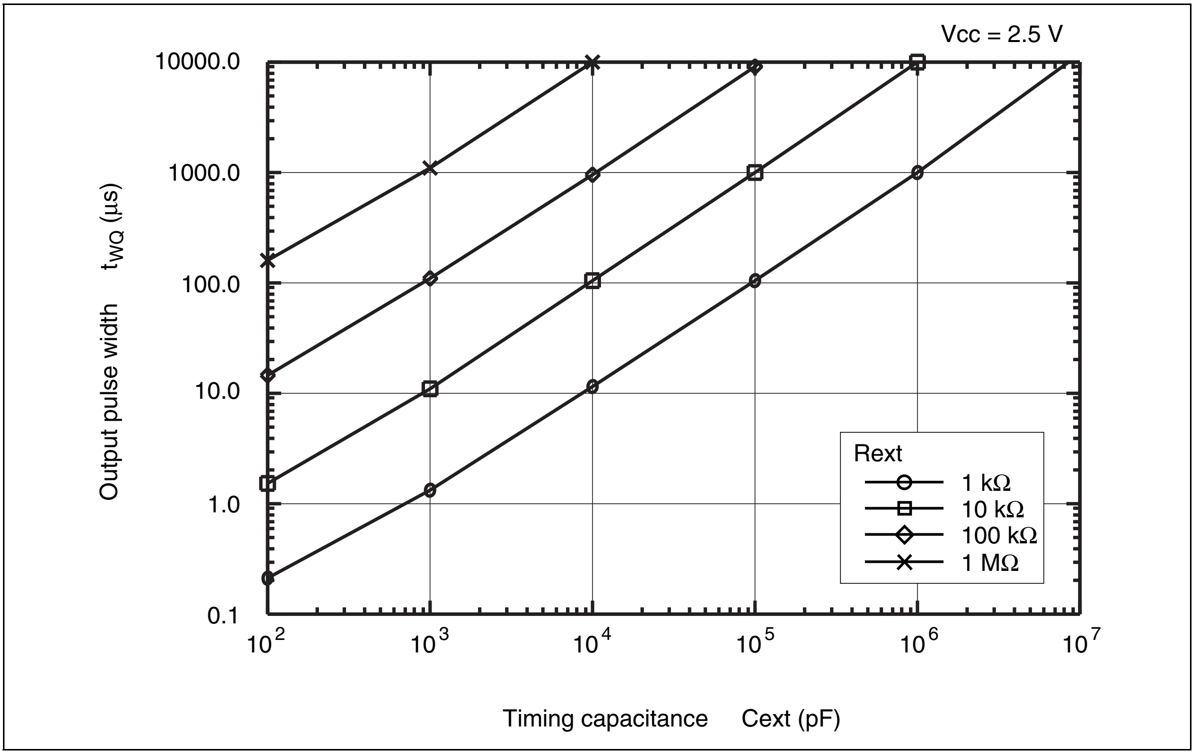


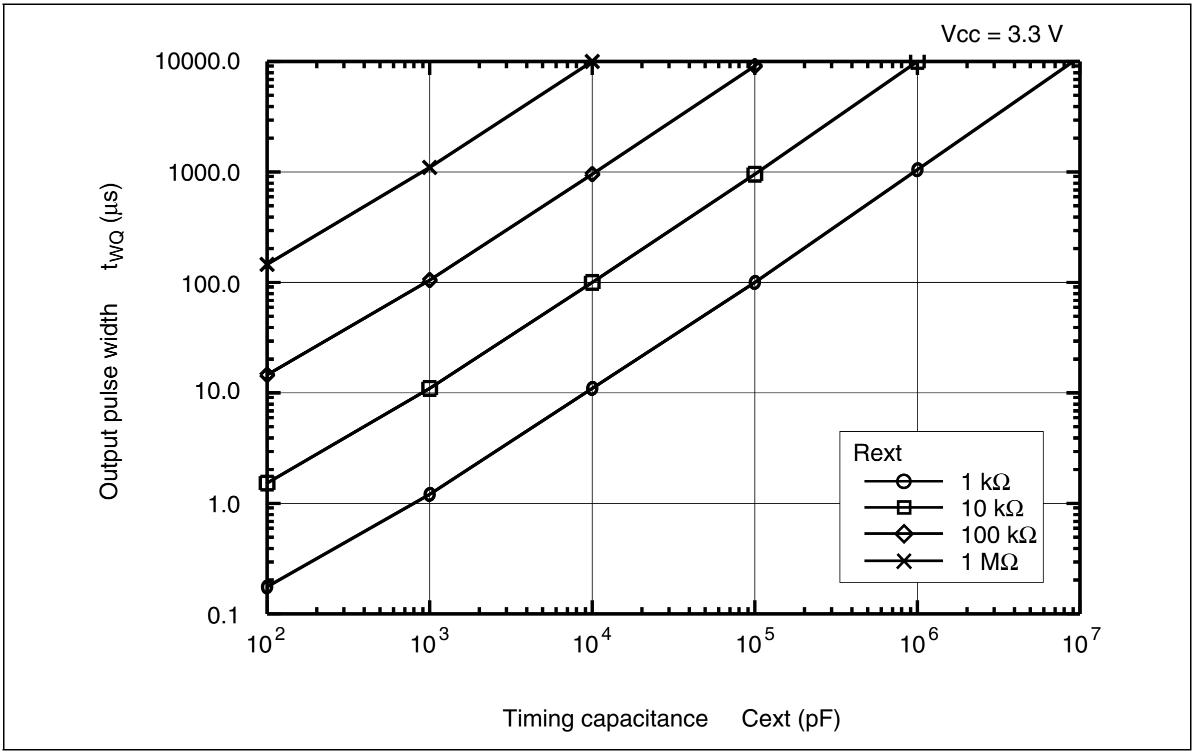
- Waveform – 3

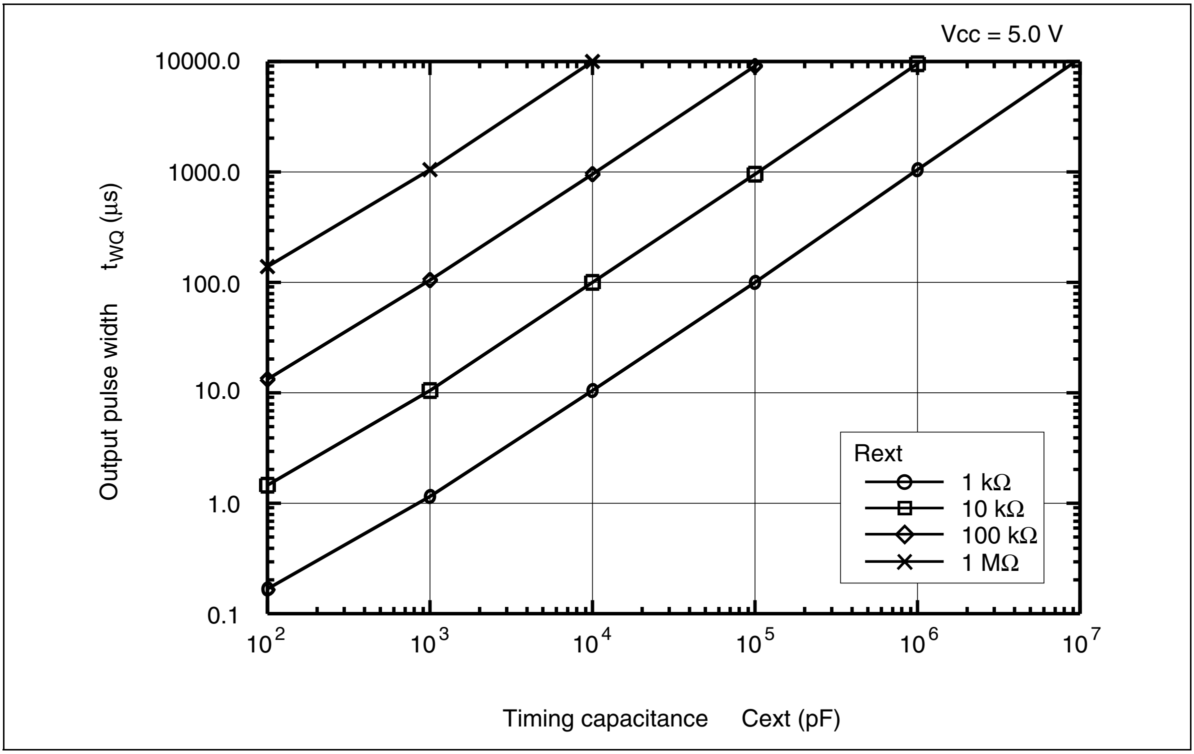


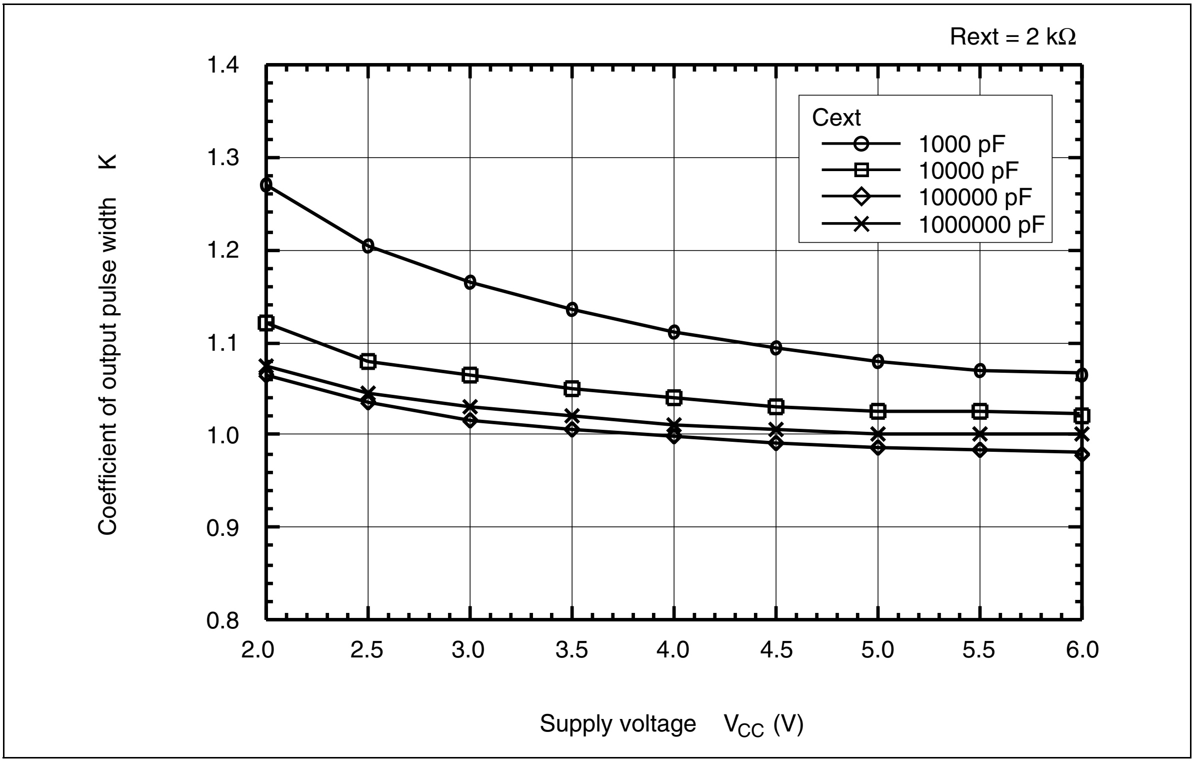
Notes: 1. Input waveform: PRR ≤ 1 MHz, Zo = 50 Ω, $t_r \leq 3$ ns, $t_f \leq 3$ ns
2. The output are measured one at a time with one transition per measurement.

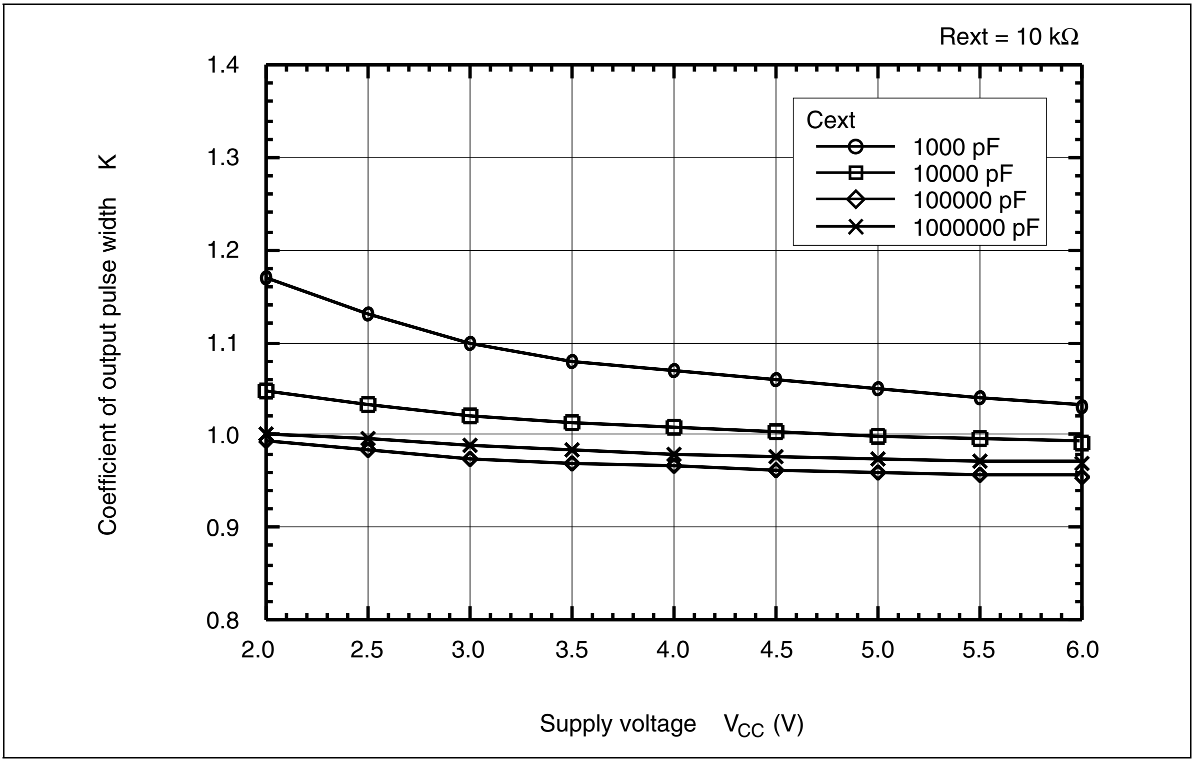
Application Data




Vcc = 3.3 V
10000.0
1000.0
100.0
10.0
1.0
0.1
Output pulse width t_{WQ} (µs)
10^2
10^3
10^4
10^5
10^6
10^7
Timing capacitance Cext (pF)
Rext
1 kΩ
10 kΩ
100 kΩ
1 MΩ


Vcc = 5.0 V
10000.0
1000.0
100.0
10.0
1.0
0.1
Output pulse width t_{WQ} (µs)
10^2
10^3
10^4
10^5
10^6
10^7
Timing capacitance Cext (pF)
Rext
1 kΩ
10 kΩ
100 kΩ
1 MΩ

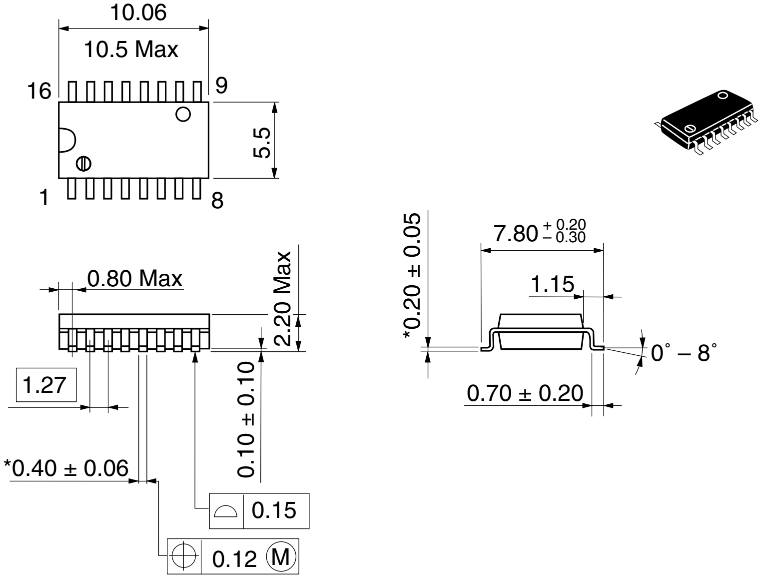

Rext = 2 kΩ
Cext
1000 pF
10000 pF
100000 pF
1000000 pF
Coefficient of output pulse width K
1.4
1.3
1.2
1.1
1.0
0.9
0.8
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
Supply voltage V_{CC} (V)


Rext = 10 kΩ
Cext
1000 pF
10000 pF
100000 pF
1000000 pF
Coefficient of output pulse width K
1.4
1.3
1.2
1.1
1.0
0.9
0.8
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
Supply voltage V_{CC} (V)

Package Dimensions

As of July, 2001

Unit: mm

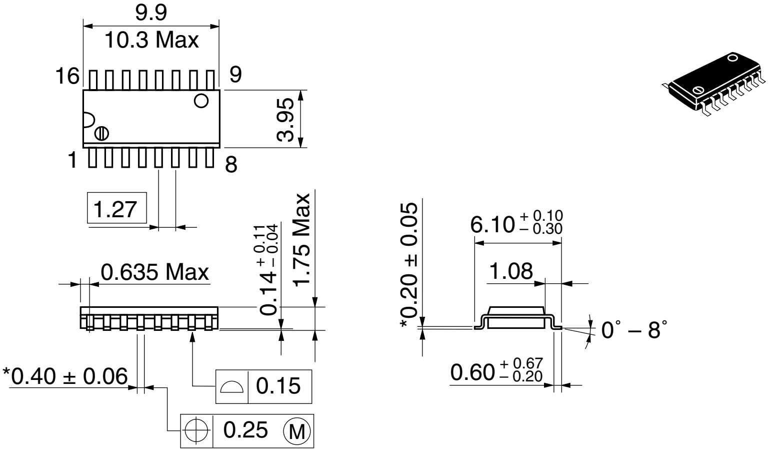


Hitachi Code	FP-16DAV
JEDEC	—
JEITA	Conforms
Mass (reference value)	0.24 g

*Pd plating

As of July, 2001

Unit: mm

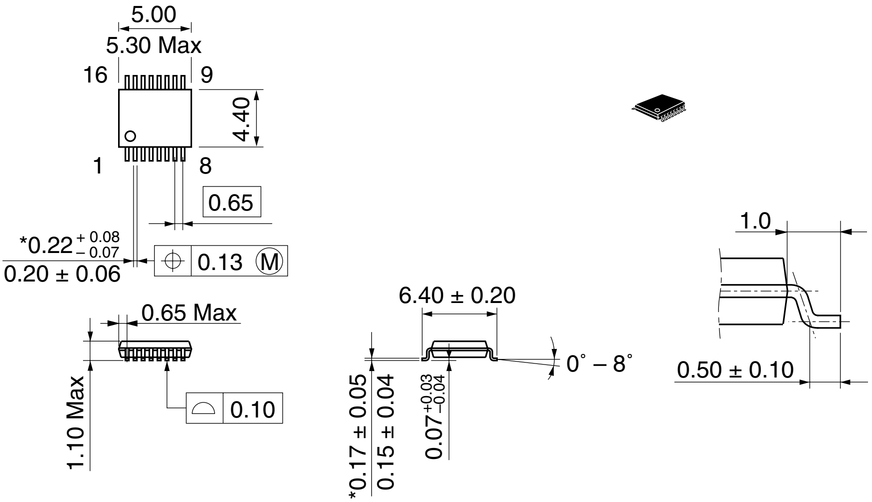


Hitachi Code	FP-16DNV
JEDEC	Conforms
JEITA	Conforms
Mass (reference value)	0.15 g

*Pd plating

As of July, 2001

Unit: mm



Hitachi Code	TTP-16DA
JEDEC	—
JEITA	—
Mass (reference value)	0.05 g

*Dimension including the plating thickness

Base material dimension

RENESAS

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