

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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# HD74LS123

## Dual Retriggerable Monostable Multivibrators (with Clear)

REJ03D0429-0200

Rev.2.00

Feb.18.2005

This d-c triggered multivibrator features output pulse width control by three method. The basic pulse time is programmed by selection of external resistance and capacitance values. Once triggered, the basic pulse width may be extended by retriggering the gated low-level -active (A) or high-level active (B) inputs, or be reduced by use of the overriding clear. Figure 1 illustrates pulse control by retriggering and early clear. This device is provided enough Schmitt hysteresis to ensure jitter-free triggering from the B input with transition rates as slow as 0.1 mV/ns.

### Features

- Ordering Information

Part Name	Package Type	Package Code (Previous Code)	Package Abbreviation	Taping Abbreviation (Quantity)
HD74LS123P	DILP-16 pin	PRDP0016AE-B (DP-16FV)	P	—
HD74LS123FPEL	SOP-16 pin (JEITA)	PRSP0016DH-B (FP-16DAV)	FP	EL (2,000 pcs/reel)
HD74LS123RPEL	SOP-16 pin (JEDEC)	PRSP0016DG-A (FP-16DNV)	RP	EL (2,500 pcs/reel)

Note: Please consult the sales office for the above package availability.

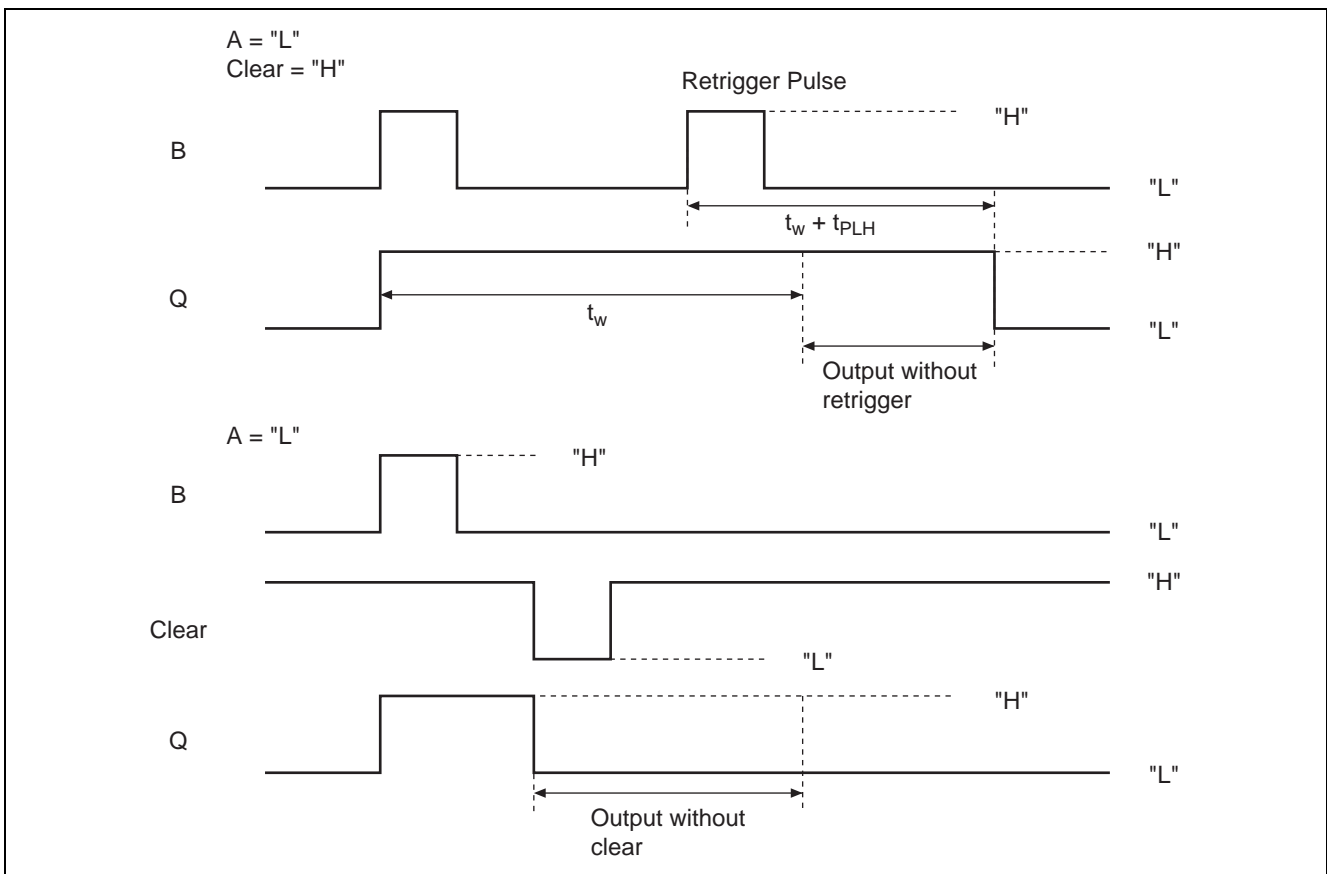
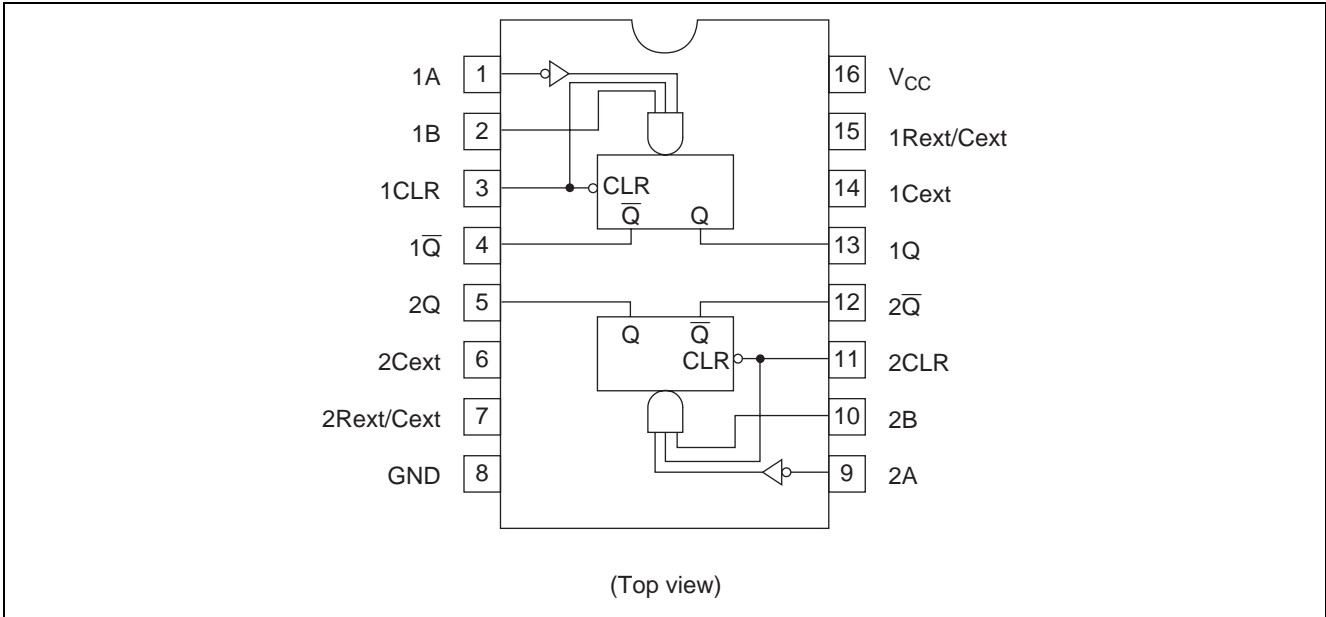


Figure 1 Typical Input / Output Pulse

### Pin Arrangement

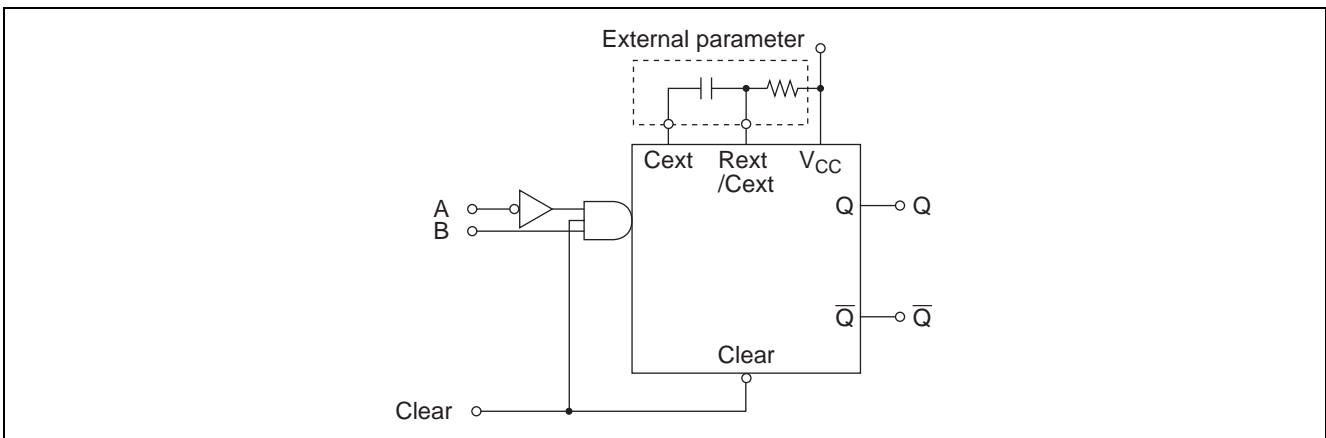


### Function Table

Clear	Inputs		Outputs	
	A <sub>1</sub>	B <sub>2</sub>	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⌋	⌌
H	↓	H	⌋	⌌
↑	L	H	⌋	⌌

Notes: H; high level, L; low level, X; irrelevant  
 ↑; transition from low to high level  
 ↓; transition from high to low level  
 ⌋; one high-level pulse  
 ⌌; one low-level pulse

### Block Diagram (1/2)



### Absolute Maximum Ratings

Item	Symbol	Ratings	Unit
Supply voltage	$V_{CC}$	7	V
Input voltage	$V_{IN}$	7	V
Power dissipation	$P_T$	400	mW
Storage temperature	$T_{stg}$	-65 to +150	°C

Note: Voltage value, unless otherwise noted, are with respect to network ground terminal.

### Recommended Operating Conditions

Item	Symbol	Min	Typ	Max	Unit
Supply voltage	$V_{CC}$	4.75	5.00	5.25	V
Output current	$I_{OH}$	—	—	-400	μA
	$I_{OL}$	—	—	8	mA
Operating temperature	$T_{opr}$	-20	25	75	°C
Input pulse width	A, B	"H"	$t_w (in)$	40	ns
		"L"		40	ns
	CLR	"L"		40	ns
External timing resistance	$R_{ext}$	5	—	260	kΩ
External capacitance	$C_{ext}$	Non restriction			
Wiring capacitance at $R_{ext}/C_{ext}$ terminal		—	—	50	pF

### Electrical Characteristics

( $T_a = -20$  to  $+75$  °C)

Item	Symbol	min.	typ.*	max.	Unit	Condition
Input voltage	$V_{IH}$	2.0	—	—	V	
	$V_{IL}$	—	—	0.8	V	
Output voltage	$V_{OH}$	2.7	—	—	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V, $I_{OH} = -400$ μA
	$V_{OL}$	—	—	0.4	V	$V_{CC} = 4.75$ V, $V_{IH} = 2$ V, $V_{IL} = 0.8$ V
—		—	0.5			
Input current	$I_{IH}$	—	—	20	μA	$V_{CC} = 5.25$ V, $V_I = 2.7$ V
	$I_{IL}$	—	—	-0.4	mA	$V_{CC} = 5.25$ V, $V_I = 0.4$ V
	$I_I$	—	—	0.1	mA	$V_{CC} = 5.25$ V, $V_I = 7$ V
Short-circuit output current	$I_{OS}$	-20	—	-100	mA	$V_{CC} = 5.25$ V
Supply current**	$I_{CC}$	—	12	20	mA	$V_{CC} = 5.25$ V
Input clamp voltage	$V_{IK}$	—	—	-1.5	V	$V_{CC} = 4.75$ V, $I_{IN} = -18$ mA

\*  $V_{CC} = 5$  V,  $T_a = 25$  °C

\*\* With all outputs open and 4.5 V applied to all data and clear inputs,  $I_{CC}$  is measured after a momentary ground, then 4.5 V, is applied to clock.

Note: To measure  $V_{OH}$  at Q,  $V_{OL}$  at  $\bar{Q}$ , or  $I_{OS}$  at Q, ground  $R_{ext} / C_{ext}$ , apply 2 V to B and clear, and pulse A from 2 V to 0 V.

Switching Characteristics

( $V_{CC} = 5\text{ V}$ ,  $T_a = 25^\circ\text{C}$ )

Item	Symbol	Inputs	Outputs	min.	typ.	max.	Unit	Condition
Propagation delay time	$t_{PLH}$	A	Q	—	23	33	ns	$C_{ext} = 0$ , $R_{ext} = 5\text{ k}\Omega$ , $C_L = 15\text{ pF}$ , $R_L = 2\text{ k}\Omega$
	$t_{PHL}$		$\overline{Q}$	—	32	45		
	$t_{PLH}$	B	Q	—	23	44		
	$t_{PHL}$		$\overline{Q}$	—	34	56		
	$t_{PLH}$	CLR	Q	—	20	27		
	$t_{PHL}$		$\overline{Q}$	—	28	45		
Output pulse width	$t_{(out)min}$	A, B	Q	—	116	200	$\mu\text{s}$	$C_{ext} = 1000\text{ pF}$ , $R_{ext} = 10\text{ k}\Omega$ , $C_L = 15\text{ pF}$ , $R_L = 2\text{ k}\Omega$
	$t_{(out)}$		Q	4	4.5	5		

Typical Application Data for HD74LS123

For pulse widths when  $C_{ext} \leq 1000\text{ pF}$ , See Figure 3.

The output pulse is primarily a function of the external capacitor and resistor. For  $C_{ext} > 1000\text{ pF}$ , the output pulse width ( $t_w$ ) is defined as:  $t_{w(out)} = K \cdot R_{ext} \cdot C_{ext}$ ; See Figure 4.

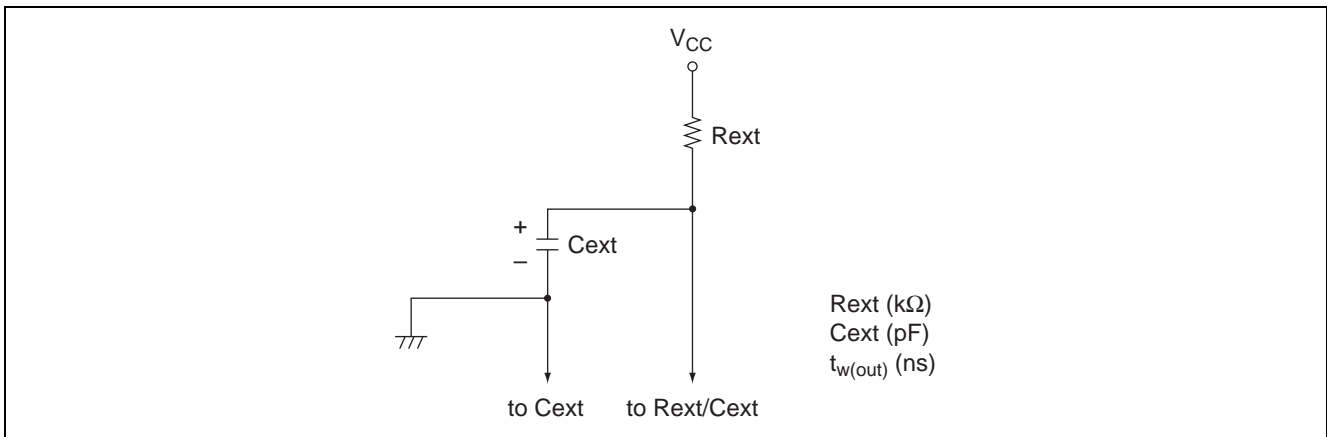


Figure 2 Timing Component Connections

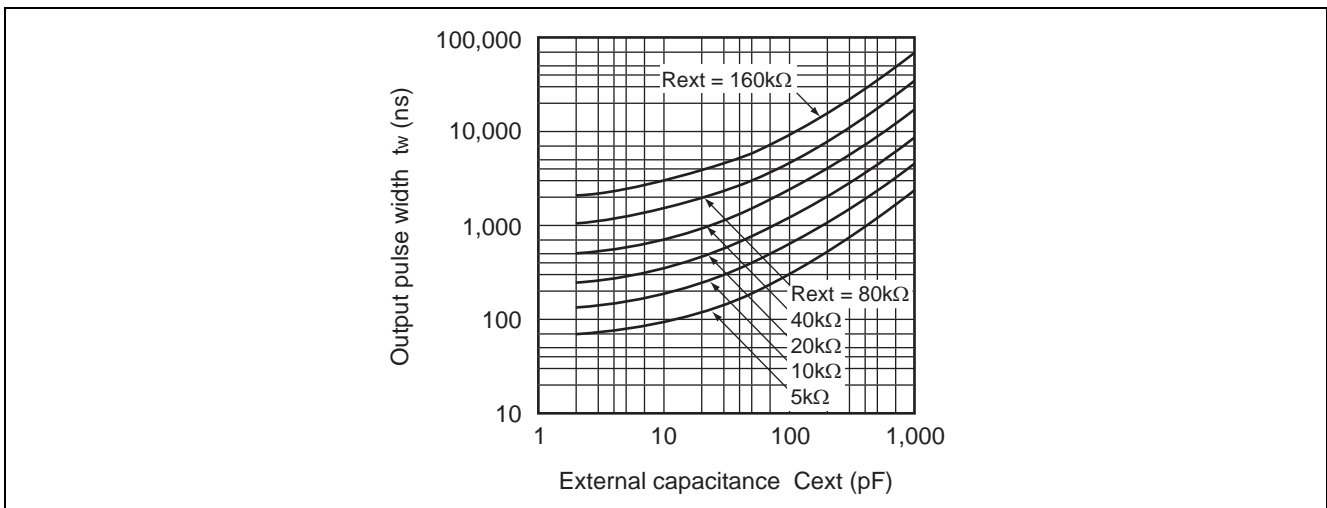
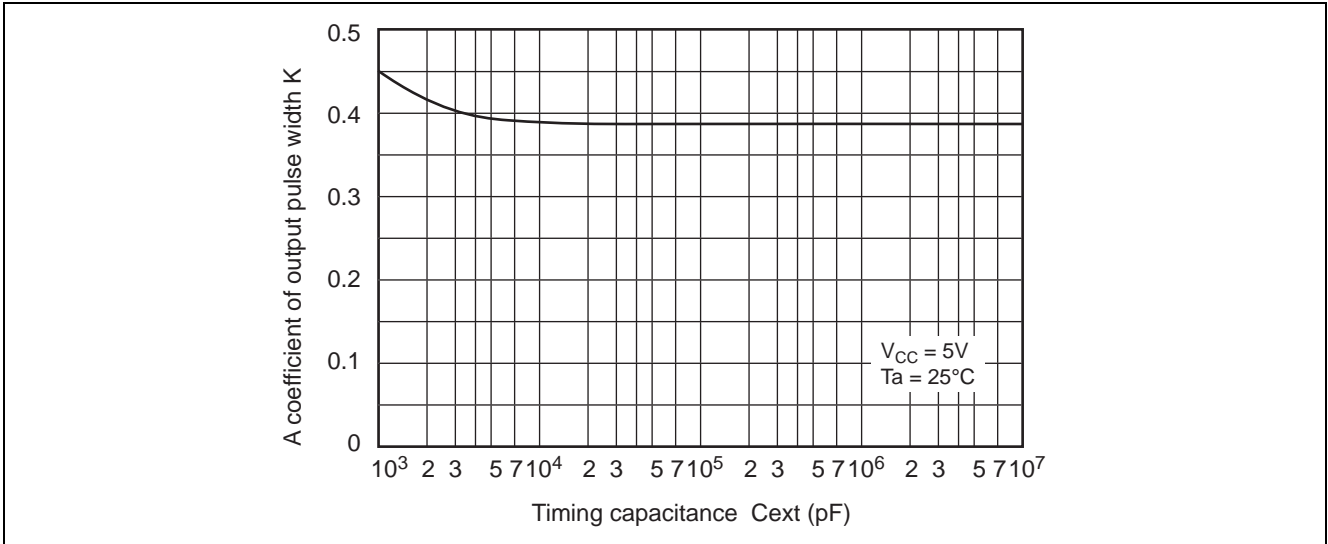


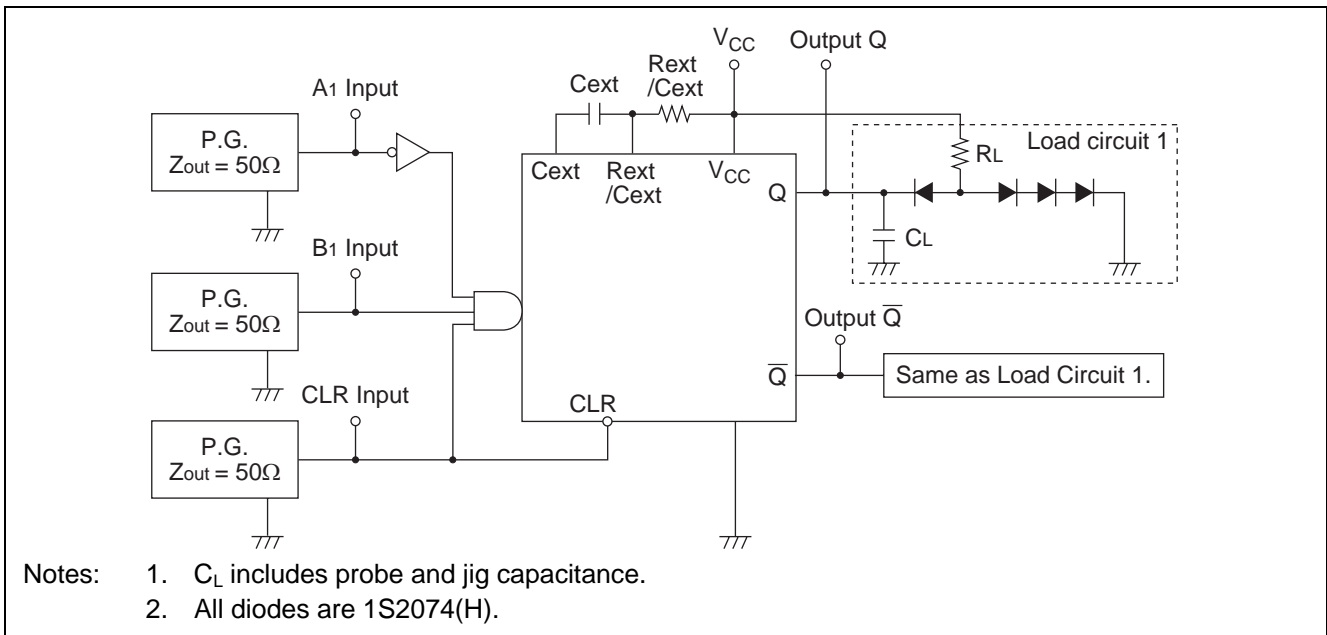
Figure 3 Typical Output Pulse Width ( $C_{ext} \leq 1000\text{ pF}$ )



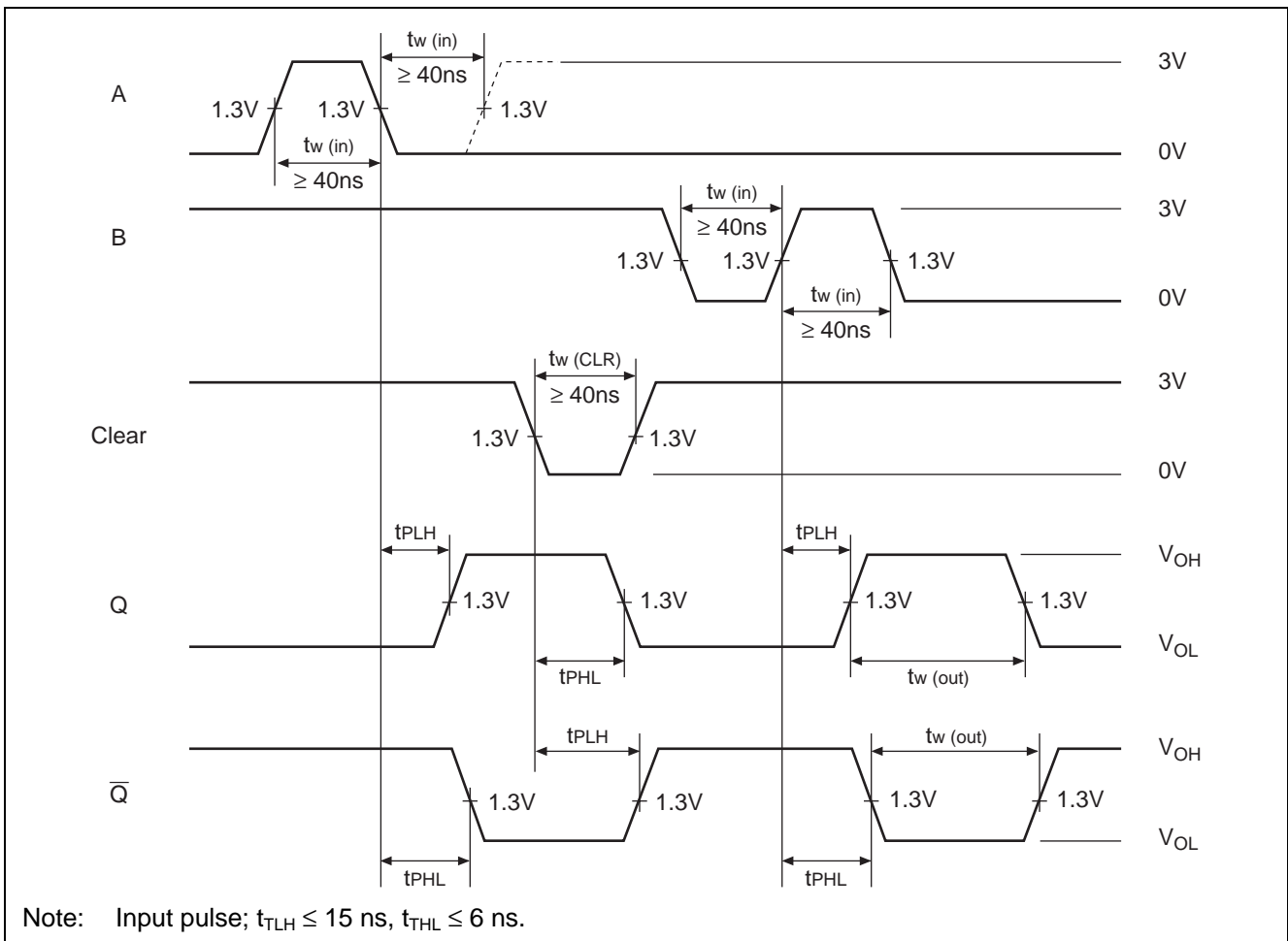
**Figure 4**  $C_{ext}$  vs.  $K$  ( $C_{ext} > 1000$  pF)

## Testing Method

### Test Circuit



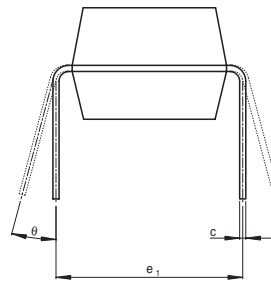
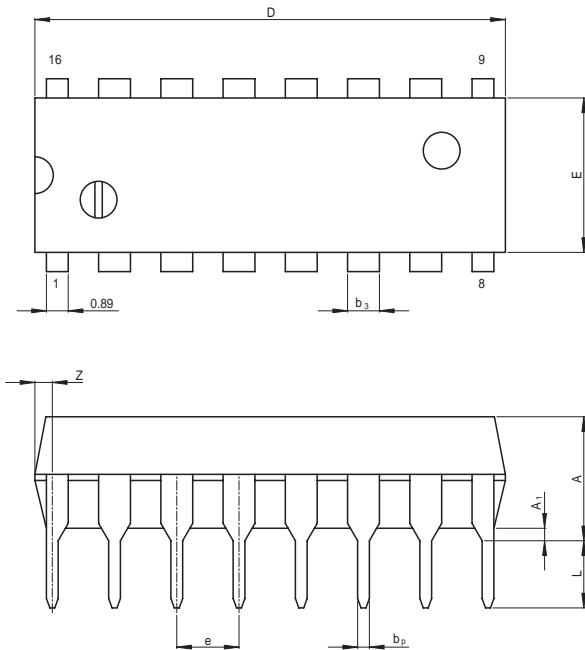
### Waveform





Package Dimensions

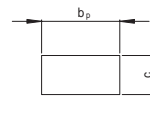
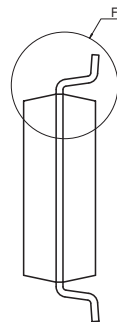
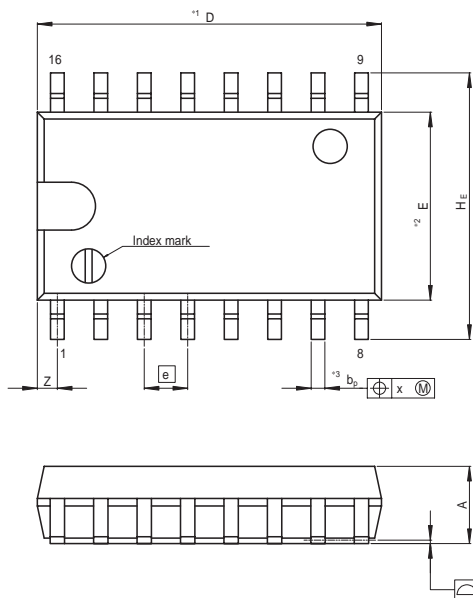
JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-DIP16-6.3x19.2-2.54	PRDP0016AE-B	DP-16FV	1.05g



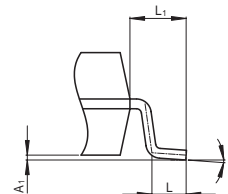
( Ni/Pd/Au plating )

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
e <sub>1</sub>	—	7.62	—
D	—	19.2	20.32
E	—	6.3	7.4
A	—	—	5.06
A <sub>1</sub>	0.51	—	—
b <sub>p</sub>	0.40	0.48	0.56
b <sub>3</sub>	—	1.30	—
c	0.19	0.25	0.31
θ	0°	—	15°
e	2.29	2.54	2.79
Z	—	—	1.12
L	2.54	—	—

JEITA Package Code	RENESAS Code	Previous Code	MASS[Typ.]
P-SOP16-5.5x10.06-1.27	PRSP0016DH-B	FP-16DAV	0.24g



Terminal cross section  
( Ni/Pd/Au plating )



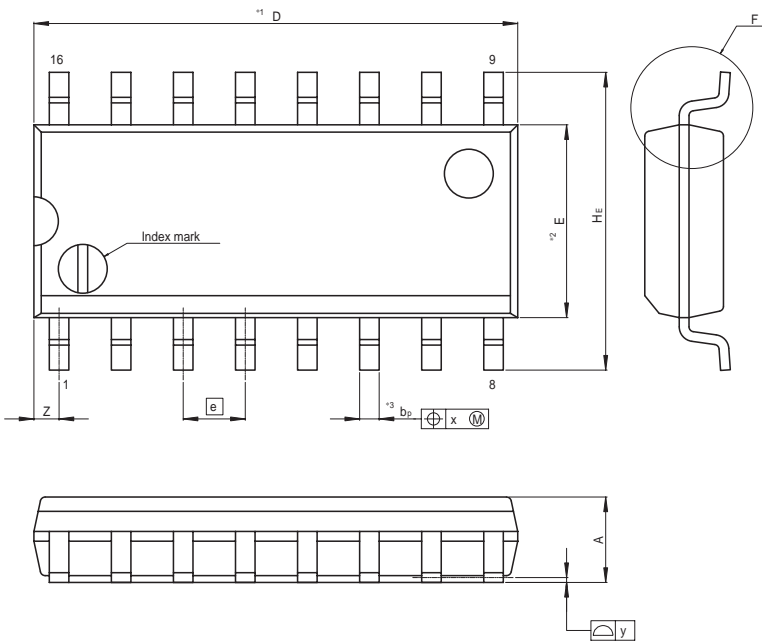
Detail F

NOTE)  
1. DIMENSIONS\*1 (Nom)\*AND\*2  
DO NOT INCLUDE MOLD FLASH.  
2. DIMENSION\*3\*DOES NOT  
INCLUDE TRIM OFFSET.

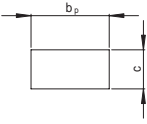
Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	10.06	10.5
E	—	5.50	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.00	0.10	0.20
A	—	—	2.20
b <sub>p</sub>	0.34	0.40	0.46
b <sub>1</sub>	—	—	—
c	0.15	0.20	0.25
c <sub>1</sub>	—	—	—
θ	0°	—	8°
H <sub>E</sub>	7.50	7.80	8.00
e	—	1.27	—
x	—	—	0.12
y	—	—	0.15
Z	—	—	0.80
L	0.50	0.70	0.90
L <sub>1</sub>	—	1.15	—

# HD74LS123

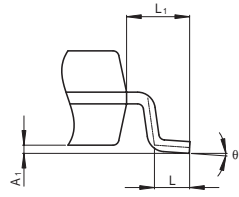
JEITA Package Code P-SOP16-3.95x9.9-1.27	RENESAS Code PRSP0016DG-A	Previous Code FP-16DNV	MASS[Typ.] 0.15g
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NOTE)  
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DO NOT INCLUDE MOLD FLASH.  
2. DIMENSION \*3\* DOES NOT  
INCLUDE TRIM OFFSET.



Terminal cross section  
( Ni/Pd/Au plating )



Detail F

Reference Symbol	Dimension in Millimeters		
	Min	Nom	Max
D	—	9.90	10.30
E	—	3.95	—
A <sub>2</sub>	—	—	—
A <sub>1</sub>	0.10	0.14	0.25
A	—	—	1.75
b <sub>p</sub>	0.34	0.40	0.46
b <sub>1</sub>	—	—	—
c	0.15	0.20	0.25
c <sub>1</sub>	—	—	—
$\theta$	0°	—	8°
H <sub>E</sub>	5.80	6.10	6.20
e	—	1.27	—
x	—	—	0.25
y	—	—	0.15
Z	—	—	0.635
L	0.40	0.60	1.27
L <sub>1</sub>	—	1.08	—

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