# 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.



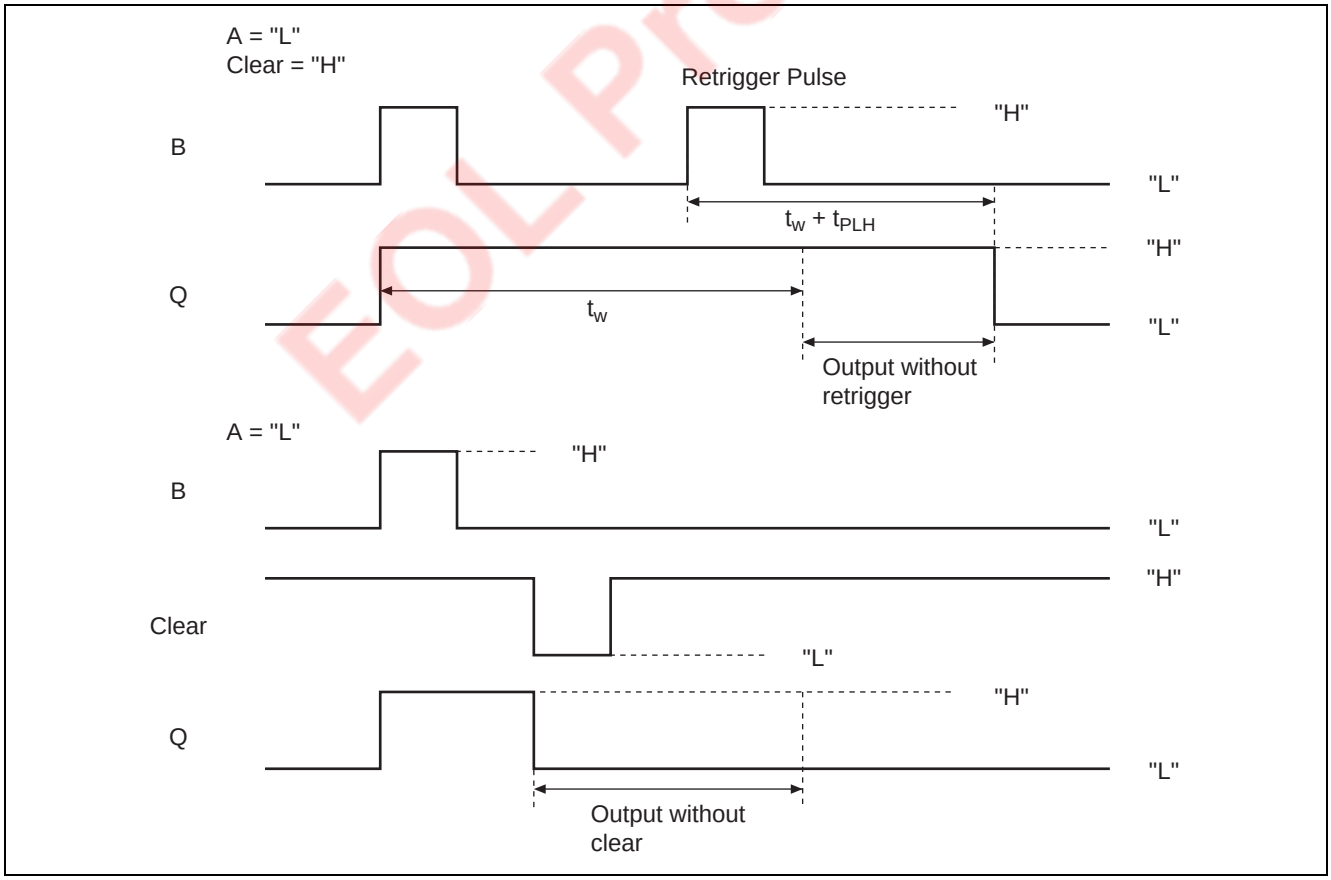
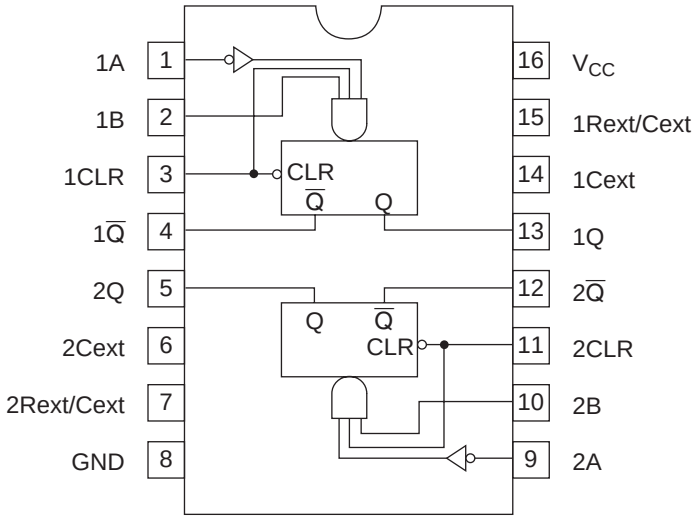



**Figure 1 Typical Input / Output Pulse**

## Pin Arrangement



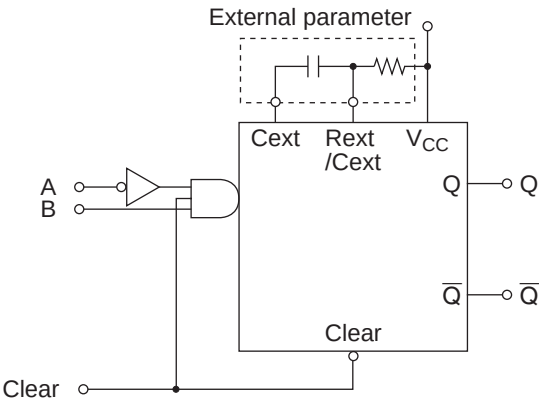

(Top view)

## Function Table

| Inputs | | | Outputs | |
|---|---|---|---|---|
| **Clear** | **$A_1$** | **$B_2$** | **Q** | **$\overline{Q}$** |
| 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 | Tstg | –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 | | | Topr | –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 Rext/Cext terminal | | | | — | — | 50 | pF |

## Electrical Characteristics

(Ta = –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 | $I_{OL}$ = 4 mA | $V_{CC}$ = 4.75 V, $V_{IH}$ = 2 V, $V_{IL}$ = 0.8 V |
| | | — | — | 0.5 | | $I_{OL}$ = 8 mA | |
| 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, Ta = 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 $\overline{Q}$, 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 V, Ta = 25°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 kΩ, $C_L$ = 15 pF, $R_L$ = 2 kΩ |
| | $t_{PHL}$ | | $\overline{Q}$ | — | 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 | µs | $C_{ext}$ = 1000 pF, $R_{ext}$ = 10 kΩ, $C_L$ = 15 pF, $R_L$ = 2 kΩ |
| | $t_{(out)}$ | | Q | 4 | 4.5 | 5 | | |

## Typical Application Data for HD74LS123

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

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

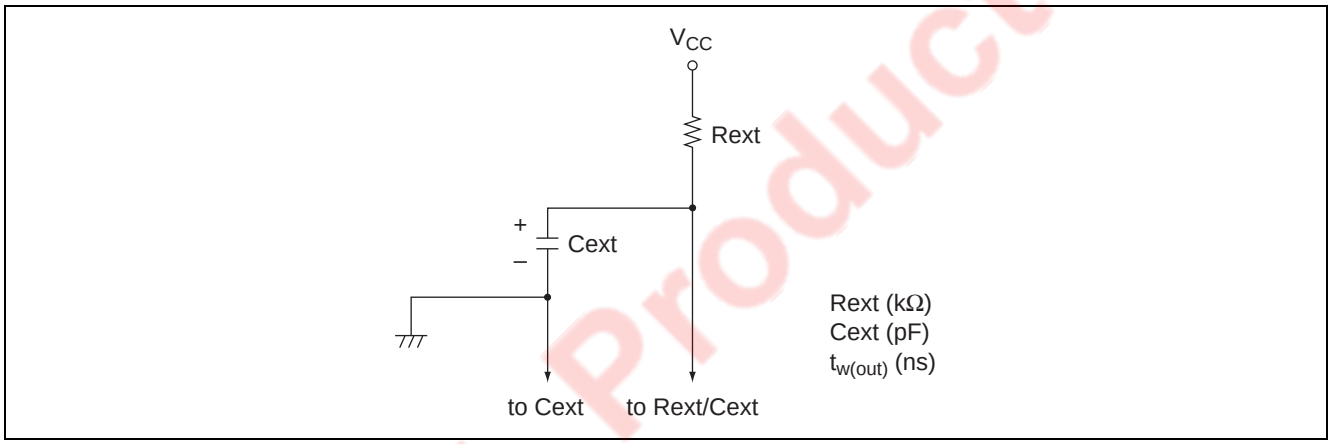



**Figure 2 Timing Component Connections**

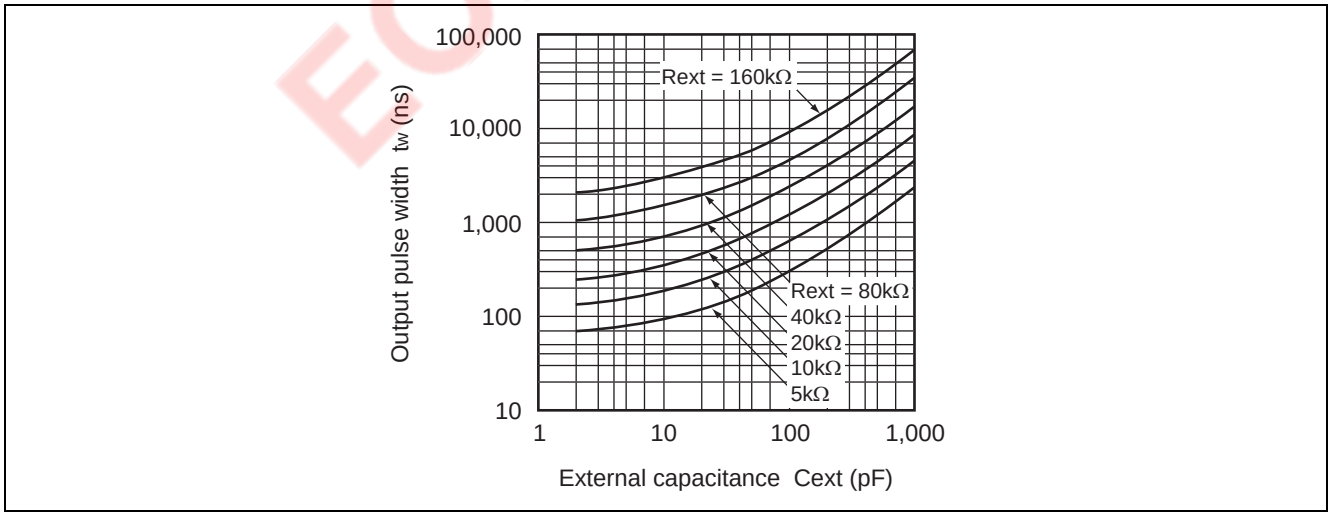



**Figure 3 Typical Output Pulse Width (Cext ≤ 1000 pF)**

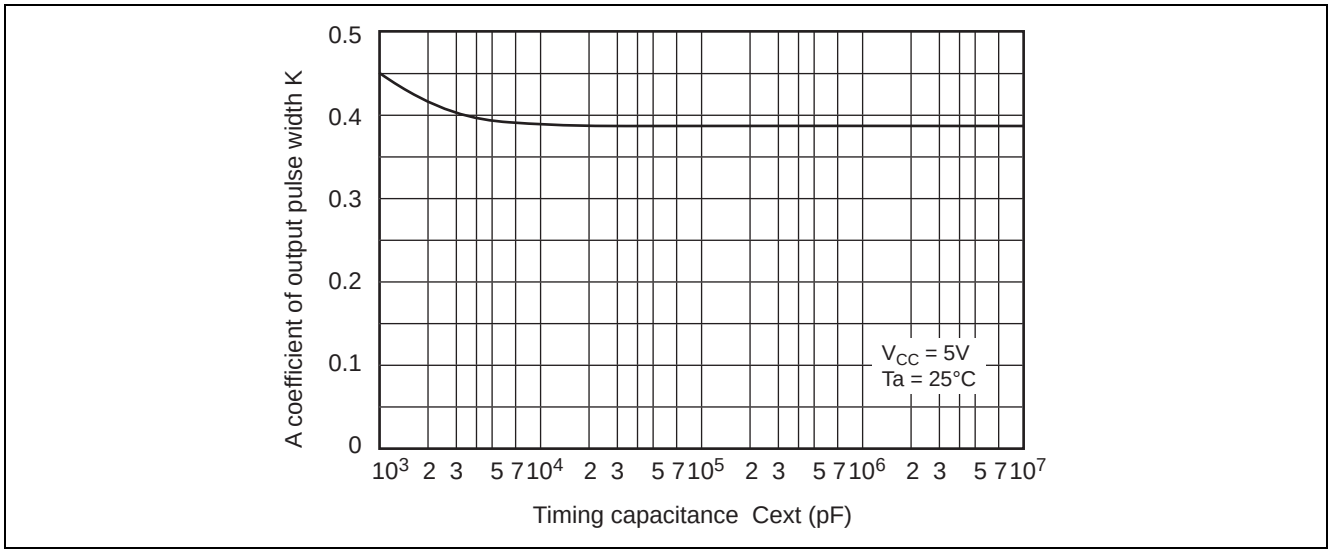
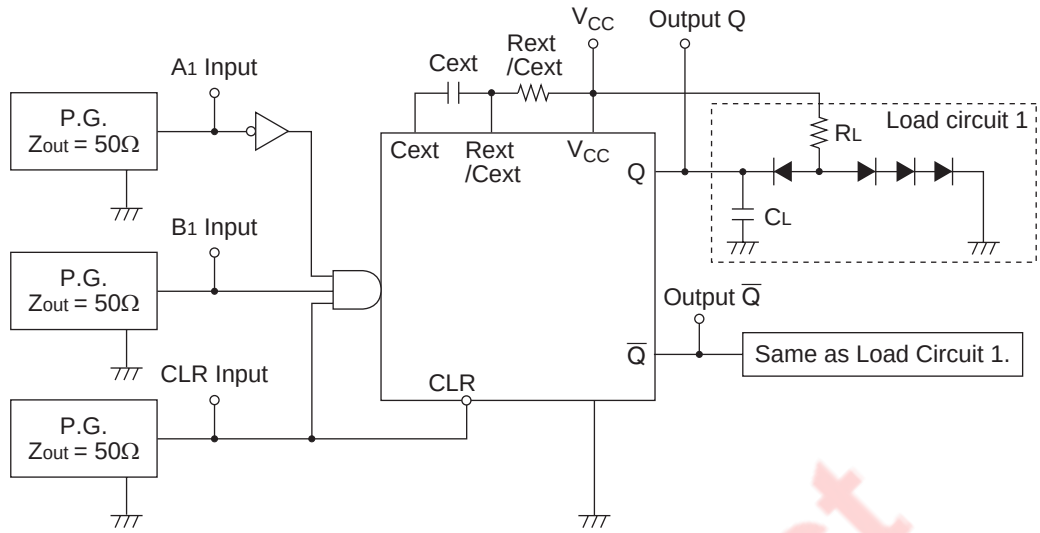



**Figure 4 $C_{ext}$ vs. K ($C_{ext}$ > 1000 pF)**

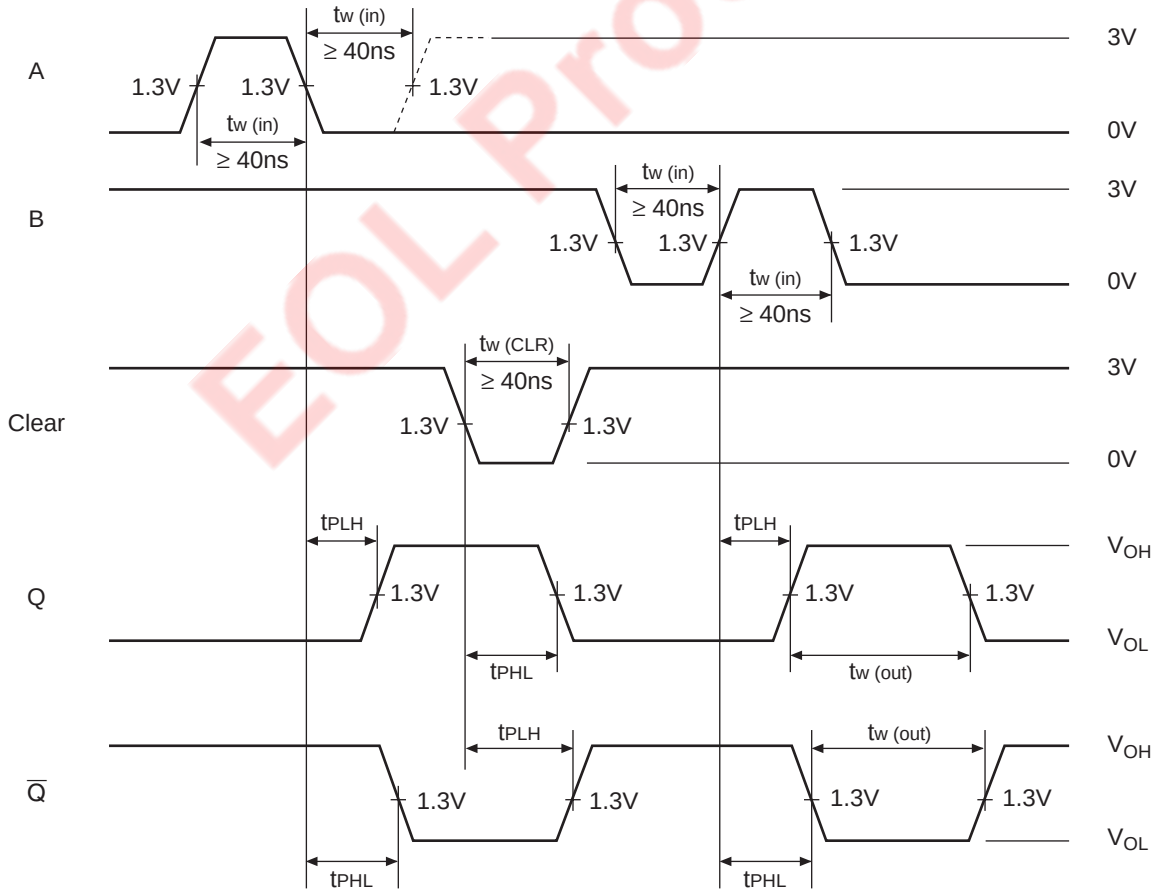
## Testing Method

### Test Circuit




Notes: 1. $C_L$ includes probe and jig capacitance.
2. All diodes are 1S2074(H).

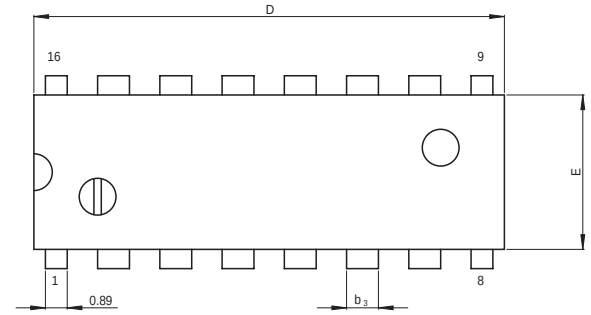
### Waveform

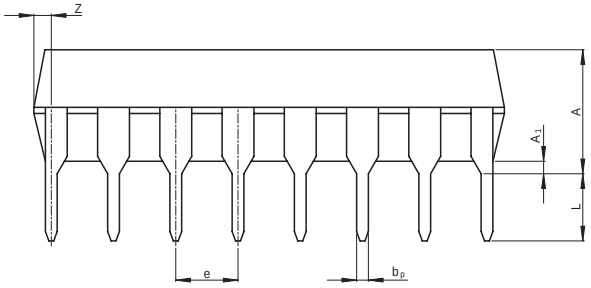


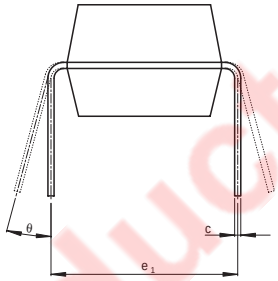

Note: Input pulse; $t_{TLH} \leq 15$ ns, $t_{THL} \leq 6$ ns.

# Package Dimensions

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



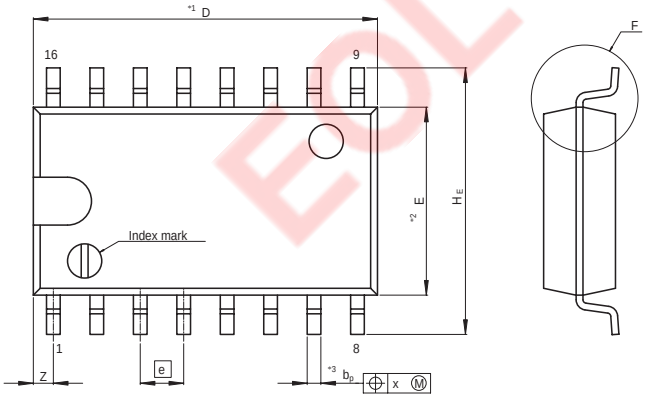



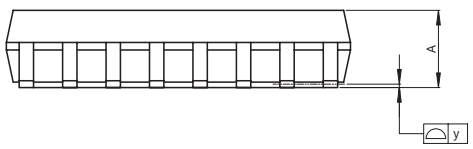

( Ni/Pd/Au plating )

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| e 1 | —— | 7.62 | —— |
| D | —— | 19.2 | 20.32 |
| E | —— | 6.3 | 7.4 |
| A | —— | —— | 5.06 |
| A 1 | 0.51 | —— | —— |
| b p | 0.40 | 0.48 | 0.56 |
| b 3 | —— | 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 | —— | —— |

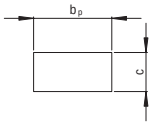


| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP16-5.5x10.06-1.27 | PRSP0016DH-B | FP-16DAV | 0.24g |

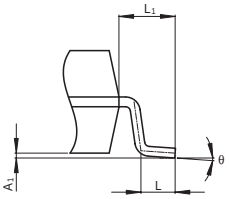



NOTE)
1. DIMENSIONS"*1 (Nom)"AND"*2"
   DO NOT INCLUDE MOLD FLASH.
2. DIMENSION"*3"DOES NOT
   INCLUDE TRIM OFFSET.



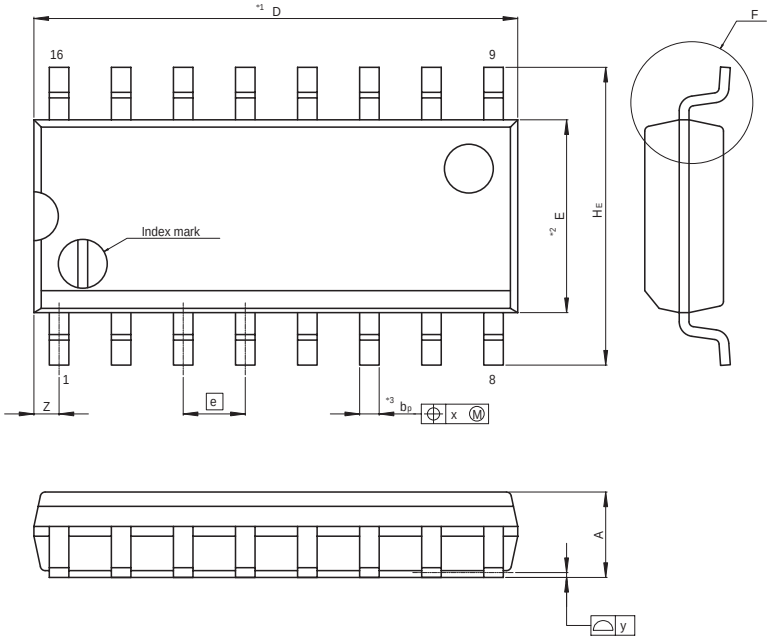

Terminal cross section
( Ni/Pd/Au plating )




Detail F

| Reference Symbol | Dimension in Millimeters | | |
|---|---|---|---|
| | Min | Nom | Max |
| D | —— | 10.06 | 10.5 |
| E | —— | 5.50 | —— |
| A 2 | —— | —— | —— |
| A 1 | 0.00 | 0.10 | 0.20 |
| A | —— | —— | 2.20 |
| b p | 0.34 | 0.40 | 0.46 |
| b 1 | —— | —— | —— |
| c | 0.15 | 0.20 | 0.25 |
| c 1 | —— | —— | —— |
| θ | 0° | —— | 8° |
| H E | 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 1 | —— | 1.15 | —— |

| JEITA Package Code | RENESAS Code | Previous Code | MASS[Typ.] |
|---|---|---|---|
| P-SOP16-3.95x9.9-1.27 | PRSP0016DG-A | FP-16DNV | 0.15g |




NOTE)
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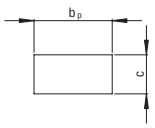
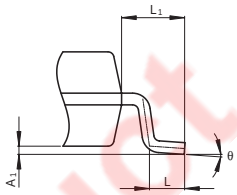
2. DIMENSION"*3"DOES NOT INCLUDE TRIM OFFSET.




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 | —— |
| $A_2$ | —— | —— | —— |
| $A_1$ | 0.10 | 0.14 | 0.25 |
| A | —— | —— | 1.75 |
| $b_p$ | 0.34 | 0.40 | 0.46 |
| $b_1$ | —— | —— | —— |
| c | 0.15 | 0.20 | 0.25 |
| $c_1$ | —— | —— | —— |
| θ | 0° | —— | 8° |
| $H_E$ | 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 |
| $L_1$ | —— | 1.08 | —— |

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