

# DATA SHEET

## **74LV123**

Dual retriggerable monostable  
multivibrator with reset

Product data  
Supersedes data of 1998 Apr 20

2003 Mar 13

# Dual retriggerable monostable multivibrator with reset

## 74LV123

### FEATURES

- Optimized for Low Voltage applications: 1.0 V to 5.5 V
- Accepts TTL input levels between  $V_{CC} = 2.7$  V and  $V_{CC} = 3.6$  V
- Typical  $V_{OLP}$  (output ground bounce)  $< 0.8$  V @  $V_{CC} = 3.3$  V,  $T_{amb} = 25$  °C
- Typical  $V_{OHV}$  (output  $V_{OH}$  undershoot)  $> 2$  V @  $V_{CC} = 3.3$  V,  $T_{amb} = 25$  °C
- DC triggered from active HIGH or active LOW inputs
- Retriggerable for very long pulses up to 100% duty factor
- Direct reset terminates output pulses
- Schmitt-trigger action on all inputs except for the reset input
- Output capability: standard (except for  $nR_{EXT}/C_{EXT}$ )
- $I_{CC}$  category: MSI

### DESCRIPTION

The 74LV123 is a low-voltage Si-gate CMOS device and is pin and function compatible with the 74HC/HCT123.

The 74LV123 is a dual retriggerable monostable multivibrator with output pulse width control by three methods. The basic pulse time is programmed by selection of an external resistor ( $R_{EXT}$ ) and capacitor ( $C_{EXT}$ ). They are normally connected as shown in Figure 1. Once triggered, the basic output pulse width may be extended by retriggering the gated active LOW-going edge input ( $n\bar{A}$ ) or the active HIGH-going edge input ( $nB$ ). By repeating this process, the output pulse period ( $nQ = \text{HIGH}$ ,  $n\bar{Q} = \text{LOW}$ ) can be made as long as desired. Alternatively, an output delay can be terminated at any time by a LOW-going edge on input  $n\bar{R}_D$ , which also inhibits the triggering. Figures 1 and 2 illustrate pulse control by retriggering and early reset. The basic output pulse width is essentially determined by the values of the external timing components  $R_{EXT}$  and  $C_{EXT}$ . For pulse width when  $C_{EXT} < 10000$  pF, see Figure 5. When  $C_{EXT} > 10,000$  pF, the typical output pulse width is defined as:  $t_W = 0.45 \times R_{EXT} \times C_{EXT}$  (typ.), where  $t_W$  = pulse width in ns;  $R_{EXT}$  = external resistor in k $\Omega$ ; and  $C_{EXT}$  = external capacitor in pF. Schmitt-trigger action in the  $n\bar{A}$  and  $nB$  inputs makes the circuit highly tolerant of slower input rise and fall times.

### QUICK REFERENCE DATA

GND = 0V;  $T_{amb} = 25$ °C;  $t_r = t_f \leq 2.5$  ns

| SYMBOL            | PARAMETER                                                                                        | CONDITIONS                                                                        | TYPICAL  | UNIT     |
|-------------------|--------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|----------|----------|
| $t_{PHL}/t_{PLH}$ | Propagation delay<br>$n\bar{A}$ , $nB$ to $nQ$ , $n\bar{Q}$<br>$n\bar{R}_D$ to $nQ$ , $n\bar{Q}$ | $C_L = 15$ pF<br>$V_{CC} = 3.3$ V<br>$R_{EXT} = 5$ k $\Omega$<br>$C_{EXT} = 0$ pF | 25<br>20 | ns<br>ns |
| $C_I$             | Input capacitance                                                                                |                                                                                   | 3.5      | pF       |
| $C_{PD}$          | Power dissipation capacitance per monostable                                                     | $V_{CC} = 3.3$ V, $V_I = \text{GND to } V_{CC}^1$                                 | 60       | pF       |

#### NOTES:

- $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W)  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma (C_L \times V_{CC}^2 \times f_o)$  where:  
 $N$  = number of outputs switching;  
 $f_i$  = input frequency in MHz;  $C_L$  = output load capacitance in pF;  
 $f_o$  = output frequency in MHz;  $V_{CC}$  = supply voltage in V;  
 $\Sigma (C_L \times V_{CC}^2 \times f_o)$  = sum of the outputs.

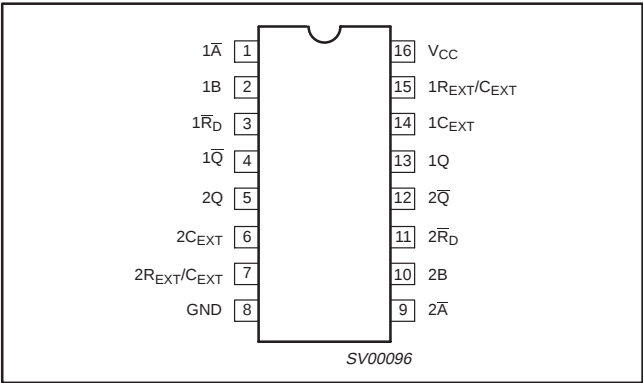
### ORDERING INFORMATION

| PACKAGES                    | TEMPERATURE RANGE | ORDER CODE | PKG. DWG. # |
|-----------------------------|-------------------|------------|-------------|
| 16-Pin Plastic DIL          | -40°C to +125°C   | 74LV123N   | SOT38-1     |
| 16-Pin Plastic SO           | -40°C to +125°C   | 74LV123D   | SOT109-1    |
| 16-Pin Plastic SSOP Type II | -40°C to +125°C   | 74LV123DB  | SOT338-1    |
| 16-Pin Plastic TSSOP Type I | -40°C to +125°C   | 74LV123PW  | SOT403-1    |

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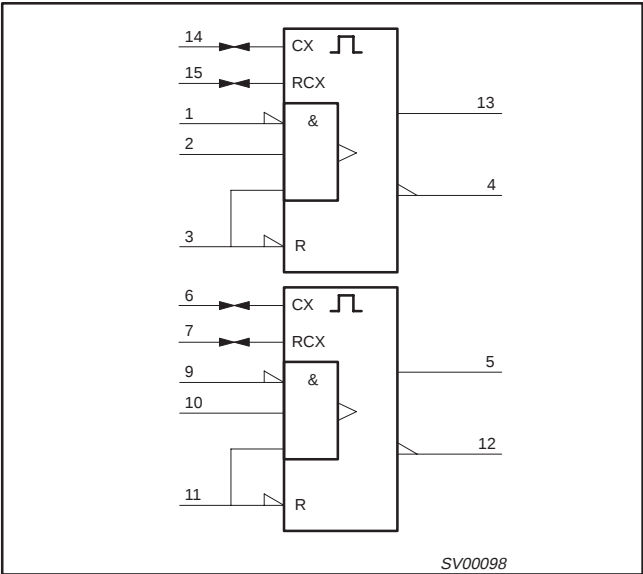
## PIN CONFIGURATION



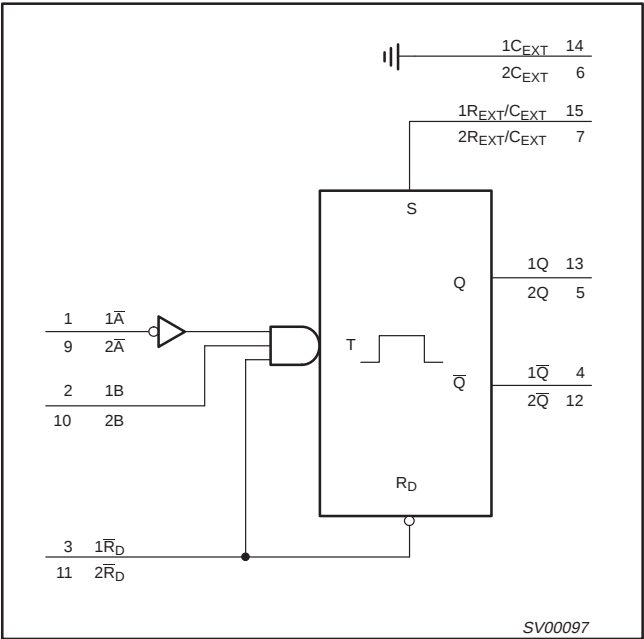
## PIN DESCRIPTION

| PIN NUMBER | SYMBOL                   | FUNCTION                                             |
|------------|--------------------------|------------------------------------------------------|
| 1,9        | $1\bar{A}, 2\bar{A}$     | Trigger inputs (negative-edge triggered)             |
| 2,10       | $1B, 2B$                 | Trigger inputs (positive-edge triggered)             |
| 3,11       | $1\bar{R}_D, 2\bar{R}_D$ | Direct reset LOW and trigger action at positive edge |
| 4, 12      | $1\bar{Q}, 2\bar{Q}$     | Outputs (active LOW)                                 |
| 7          | $2R_{EXT}/C_{EXT}$       | External resistor/capacitor connection               |
| 8          | GND                      | Ground (0V)                                          |
| 13, 5      | $1Q, 2Q$                 | Outputs (active HIGH)                                |
| 14, 6      | $1C_{EXT}, 2C_{EXT}$     | External capacitor connection                        |
| 15         | $1R_{EXT}/C_{EXT}$       | External resistor/capacitor connection               |
| 16         | $V_{CC}$                 | Positive supply voltage                              |

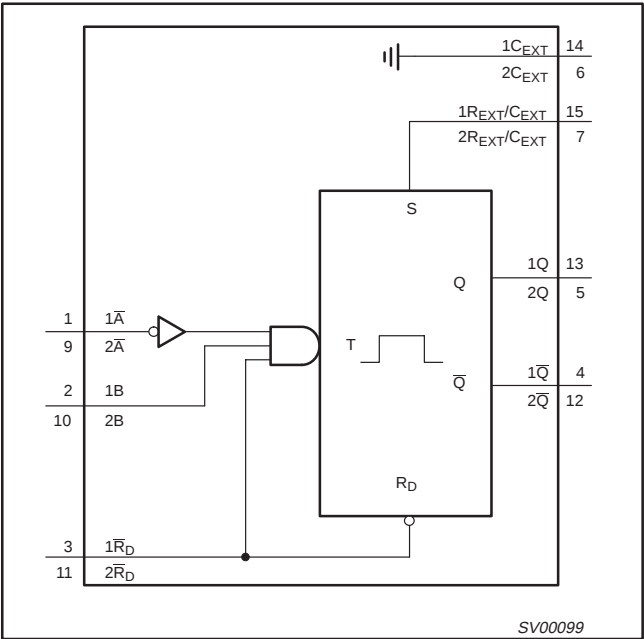
## LOGIC SYMBOL (IEEE/IEC)



## LOGIC SYMBOL



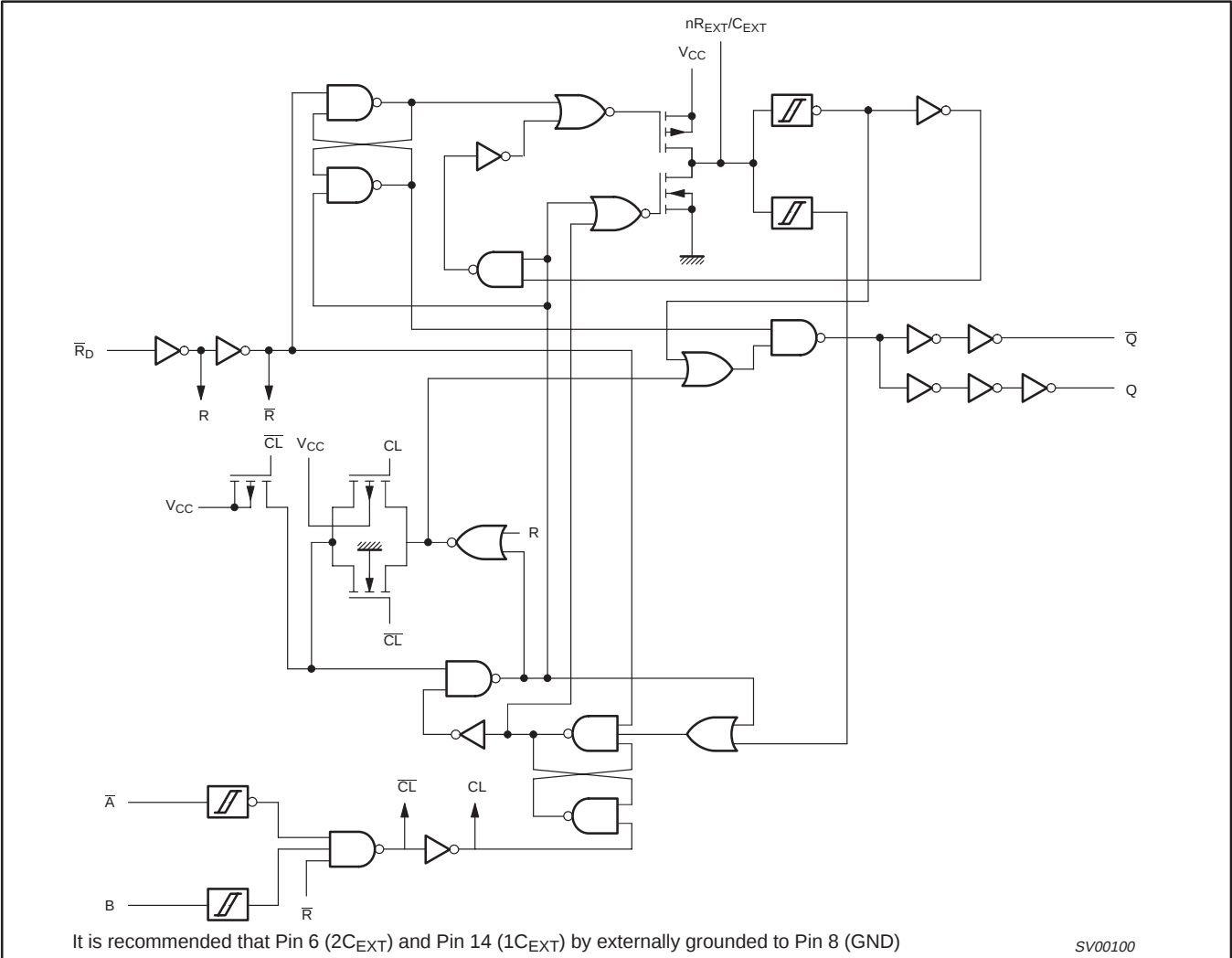
## FUNCTIONAL DIAGRAM



Dual retriggerable monostable multivibrator  
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LOGIC DIAGRAM



FUNCTION TABLE

| INPUTS |    |    | OUTPUTS |     |
|--------|----|----|---------|-----|
| nRD    | nA | nB | nQ      | nQ  |
| L      | X  | X  | L       | H   |
| X      | H  | X  | L *     | H * |
| X      | X  | L  | L *     | H * |
| H      | L  | ↑  | ⬆       | ⬆   |
| H      | ↓  | H  | ⬆       | ⬆   |
| ↑      | L  | H  | ⬆       | ⬆   |

NOTES:

\* If the monostable was triggered before this condition was established, the pulse will continue as programmed.

H = HIGH voltage level

L = LOW voltage level

X = don't care

↑ = LOW-to-HIGH transition

↓ = HIGH-to-LOW transition

⬆ = one HIGH level output pulse

⬆ = one LOW level output pulse

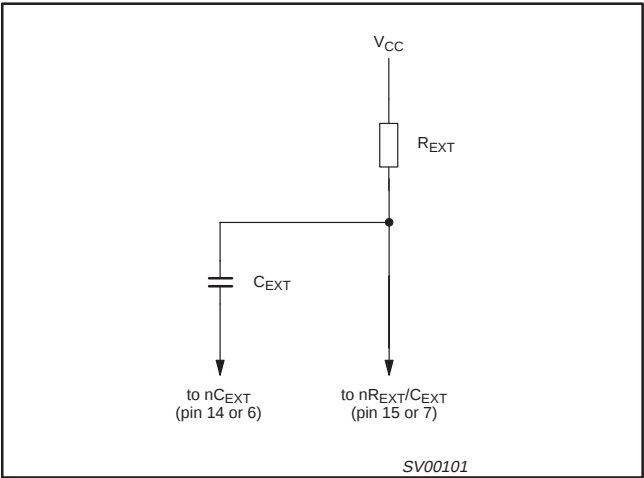


Figure 1. Timing component connection

# Dual retriggerable monostable multivibrator with reset

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## RECOMMENDED OPERATING CONDITIONS

| SYMBOL     | PARAMETER                                                   | CONDITIONS                                 | MIN        | TYP | MAX         | UNIT |
|------------|-------------------------------------------------------------|--------------------------------------------|------------|-----|-------------|------|
| $V_{CC}$   | DC supply voltage                                           | See Note <sup>1</sup>                      | 1.0        | 3.3 | 5.5         | V    |
| $V_I$      | Input voltage                                               |                                            | 0          | –   | $V_{CC}$    | V    |
| $V_O$      | Output voltage                                              |                                            | 0          | –   | $V_{CC}$    | V    |
| $T_{amb}$  | Operating ambient temperature range in free air             | See DC and AC characteristics              | –40<br>–40 |     | +85<br>+125 | °C   |
| $t_r, t_f$ | Input rise and fall times except for Schmitt-trigger inputs | $V_{CC} = 1.0 \text{ V to } 2.0 \text{ V}$ | –          | –   | 500         | ns/V |
|            |                                                             | $V_{CC} = 2.0 \text{ V to } 2.7 \text{ V}$ | –          | –   | 200         | ns/V |
|            |                                                             | $V_{CC} = 2.7 \text{ V to } 3.6 \text{ V}$ | –          | –   | 100         | ns/V |
|            |                                                             | $V_{CC} = 3.6 \text{ V to } 5.5 \text{ V}$ | –          | –   | 50          | ns/V |

### NOTE:

- The LV is guaranteed to function down to  $V_{CC} = 1.0 \text{ V}$  (input levels GND or  $V_{CC}$ ); DC characteristics are guaranteed from  $V_{CC} = 1.2 \text{ V}$  to  $V_{CC} = 5.5 \text{ V}$ .

## ABSOLUTE MAXIMUM RATINGS<sup>1, 2</sup>

In accordance with the Absolute Maximum Rating System (IEC 134).

Voltages are referenced to GND (ground = 0 V).

| SYMBOL                    | PARAMETER                                                                                                                 | CONDITIONS                                                                                                                                                                      | RATING            | UNIT |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|------|
| $V_{CC}$                  | DC supply voltage                                                                                                         |                                                                                                                                                                                 | –0.5 to +7.0      | V    |
| $\pm I_{IK}$              | DC input diode current                                                                                                    | $V_I < -0.5 \text{ V}$ or $V_I > V_{CC} + 0.5 \text{ V}$                                                                                                                        | 20                | mA   |
| $\pm I_{OK}$              | DC output diode current                                                                                                   | $V_O < -0.5 \text{ V}$ or $V_O > V_{CC} + 0.5 \text{ V}$                                                                                                                        | 50                | mA   |
| $\pm I_O$                 | DC output source or sink current (standard outputs)                                                                       | $-0.5 \text{ V} < V_O < V_{CC} + 0.5 \text{ V}$                                                                                                                                 | 25                | mA   |
| $\pm I_{GND}, \pm I_{CC}$ | DC $V_{CC}$ or GND current for types with standard outputs                                                                |                                                                                                                                                                                 | 50                | mA   |
| $T_{stg}$                 | Storage temperature range                                                                                                 |                                                                                                                                                                                 | –65 to +150       | °C   |
| $P_{TOT}$                 | Power dissipation per package<br>– plastic DIL<br>– plastic mini-pack (SO)<br>– plastic shrink mini-pack (SSOP and TSSOP) | for temperature range: –40 °C to +125 °C<br>above +70 °C derate linearly with 12 mW/K<br>above +70 °C derate linearly with 8 mW/K<br>above +60 °C derate linearly with 5.5 mW/K | 750<br>500<br>500 | mW   |

### NOTES:

- Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

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## DC ELECTRICAL CHARACTERISTICS

Over recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

| SYMBOL           | PARAMETER                                   | TEST CONDITIONS                                                                                         | LIMITS              |                  |                     |                     |                     | UNIT |
|------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------|------------------|---------------------|---------------------|---------------------|------|
|                  |                                             |                                                                                                         | −40 °C to +85 °C    |                  |                     | −40 °C to +125 °C   |                     |      |
|                  |                                             |                                                                                                         | MIN                 | TYP <sup>1</sup> | MAX                 | MIN                 | MAX                 |      |
| V <sub>IH</sub>  | HIGH level Input voltage                    | V <sub>CC</sub> = 1.2 V                                                                                 | 0.9                 |                  |                     | 0.9                 |                     | V    |
|                  |                                             | V <sub>CC</sub> = 2.0 V                                                                                 | 1.4                 |                  |                     | 1.4                 |                     |      |
|                  |                                             | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                        | 2.0                 |                  |                     | 2.0                 |                     |      |
|                  |                                             | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                        | 0.7*V <sub>CC</sub> |                  |                     | 0.7*V <sub>CC</sub> |                     |      |
| V <sub>IL</sub>  | LOW level Input voltage                     | V <sub>CC</sub> = 1.2 V                                                                                 |                     |                  | 0.3                 |                     | 0.3                 | V    |
|                  |                                             | V <sub>CC</sub> = 2.0 V                                                                                 |                     |                  | 0.6                 |                     | 0.6                 |      |
|                  |                                             | V <sub>CC</sub> = 2.7 V to 3.6 V                                                                        |                     |                  | 0.8                 |                     | 0.8                 |      |
|                  |                                             | V <sub>CC</sub> = 4.5 V to 5.5 V                                                                        |                     |                  | 0.3*V <sub>CC</sub> |                     | 0.3*V <sub>CC</sub> |      |
| V <sub>OH</sub>  | HIGH level output voltage; all outputs      | V <sub>CC</sub> = 1.2 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 100 μA |                     | 1.2              |                     |                     |                     | V    |
|                  |                                             | V <sub>CC</sub> = 2.0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 100 μA | 1.8                 | 2.0              |                     | 1.8                 |                     |      |
|                  |                                             | V <sub>CC</sub> = 2.7 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 100 μA | 2.5                 | 2.7              |                     | 2.5                 |                     |      |
|                  |                                             | V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 100 μA | 2.8                 | 3.0              |                     | 2.8                 |                     |      |
|                  |                                             | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 100 μA | 4.3                 | 4.5              |                     | 4.3                 |                     |      |
| V <sub>OH</sub>  | HIGH level output voltage; STANDARD outputs | V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 6 mA   | 2.40                | 2.82             |                     | 2.20                |                     | V    |
|                  |                                             | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; −I <sub>O</sub> = 12 mA  | 3.60                | 4.20             |                     | 3.50                |                     |      |
| V <sub>OL</sub>  | LOW level output voltage; all outputs       | V <sub>CC</sub> = 1.2 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100 μA  |                     | 0                |                     |                     |                     | V    |
|                  |                                             | V <sub>CC</sub> = 2.0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100 μA  |                     | 0                | 0.2                 |                     | 0.2                 |      |
|                  |                                             | V <sub>CC</sub> = 2.7 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100 μA  |                     | 0                | 0.2                 |                     | 0.2                 |      |
|                  |                                             | V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100 μA  |                     | 0                | 0.2                 |                     | 0.2                 |      |
|                  |                                             | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 100 μA  |                     | 0                | 0.2                 |                     | 0.2                 |      |
| V <sub>OL</sub>  | LOW level output voltage; STANDARD outputs  | V <sub>CC</sub> = 3.0 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 6 mA    |                     | 0.25             | 0.40                |                     | 0.50                | V    |
|                  |                                             | V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; I <sub>O</sub> = 12 mA   |                     | 0.35             | 0.55                |                     | 0.65                |      |
| I <sub>I</sub>   | Input leakage current                       | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND                                        |                     |                  | 1.0                 |                     | 1.0                 | μA   |
| I <sub>CC</sub>  | Quiescent supply current; MSI               | V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0                    |                     |                  | 20.0                |                     | 160                 | μA   |
| ΔI <sub>CC</sub> | Additional quiescent supply current         | V <sub>CC</sub> = 2.7 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> − 0.6 V                              |                     |                  | 500                 |                     | 850                 | μA   |

### NOTE:

1. All typical values are measured at  $T_{amb} = 25\text{ }^\circ\text{C}$ .

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## AC CHARACTERISTICS

GND = 0 V;  $t_r = t_f \leq 2.5$  ns;  $C_L = 50$  pF;  $R_L = 1$  k $\Omega$ 

| SYMBOL           | PARAMETER                                            | WAVEFORM                                                              | CONDITION           | LIMITS           |                  |     |                   |     | UNIT |
|------------------|------------------------------------------------------|-----------------------------------------------------------------------|---------------------|------------------|------------------|-----|-------------------|-----|------|
|                  |                                                      |                                                                       |                     | −40 °C to +85 °C |                  |     | −40 °C to +125 °C |     |      |
|                  |                                                      |                                                                       | V <sub>CC</sub> (V) | MIN              | TYP <sup>1</sup> | MAX | MIN               | MAX |      |
| t <sub>PHL</sub> | Propagation delay<br>nR <sub>D</sub> , nA, nB, to nQ | Figure 3<br>C <sub>EXT</sub> = 0 pF<br>R <sub>EXT</sub> = 5 kΩ        | 1.2                 |                  | 120              |     |                   |     | ns   |
|                  |                                                      |                                                                       | 2.0                 |                  | 40               | 76  |                   | 92  |      |
|                  |                                                      |                                                                       | 2.7                 |                  | 30               | 56  |                   | 68  |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 25 <sup>2</sup>  | 48  |                   | 57  |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 18 <sup>2</sup>  | 40  |                   | 46  |      |
| t <sub>PLH</sub> | Propagation delay<br>nR <sub>D</sub> , nA, nB, to nQ | Figure 3<br>C <sub>EXT</sub> = 0 pF<br>R <sub>EXT</sub> = 5 kΩ        | 1.2                 |                  | 120              |     |                   |     | ns   |
|                  |                                                      |                                                                       | 2.0                 |                  | 40               | 76  |                   | 92  |      |
|                  |                                                      |                                                                       | 2.7                 |                  | 30               | 56  |                   | 68  |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 25 <sup>2</sup>  | 48  |                   | 57  |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 18 <sup>2</sup>  | 40  |                   | 46  |      |
| t <sub>PHL</sub> | Propagation delay<br>nR <sub>D</sub> to nQ (reset)   | Figure 3<br>C <sub>EXT</sub> = 0 pF<br>R <sub>EXT</sub> = 5 kΩ        | 1.2                 |                  | 100              |     |                   |     | ns   |
|                  |                                                      |                                                                       | 2.0                 |                  | 30               | 57  |                   | 68  |      |
|                  |                                                      |                                                                       | 2.7                 |                  | 23               | 43  |                   | 51  |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 20 <sup>2</sup>  | 38  |                   | 45  |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 14 <sup>2</sup>  | 31  |                   | 36  |      |
| t <sub>PLH</sub> | Propagation delay<br>nR <sub>D</sub> to nQ (reset)   | Figure 3<br>C <sub>EXT</sub> = 0 pF<br>R <sub>EXT</sub> = 5 kΩ        | 1.2                 |                  | 100              |     |                   |     | ns   |
|                  |                                                      |                                                                       | 2.0                 |                  | 30               | 57  |                   | 68  |      |
|                  |                                                      |                                                                       | 2.7                 |                  | 23               | 43  |                   | 51  |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 20 <sup>2</sup>  | 38  |                   | 45  |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 14 <sup>2</sup>  | 31  |                   | 36  |      |
| t <sub>W</sub>   | Trigger pulse width<br>nA = LOW                      | Figure 3                                                              | 2.0                 | 30               | 5                |     | 40                |     | ns   |
|                  |                                                      |                                                                       | 2.7                 | 25               | 3.5              |     | 30                |     |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          | 20               | 3.0 <sup>2</sup> |     | 25                |     |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          | 15               | 2.5 <sup>2</sup> |     | 20                |     |      |
| t <sub>W</sub>   | Trigger pulse width<br>nB = HIGH                     | Figure 3                                                              | 2.0                 | 30               | 13               |     | 40                |     | ns   |
|                  |                                                      |                                                                       | 2.7                 | 25               | 8                |     | 30                |     |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          | 20               | 7 <sup>2</sup>   |     | 25                |     |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          | 15               | 5 <sup>2</sup>   |     | 20                |     |      |
| t <sub>W</sub>   | Reset pulse width<br>nR <sub>D</sub> = LOW           | Figure 2                                                              | 2.0                 | 35               | 6                |     | 45                |     | ns   |
|                  |                                                      |                                                                       | 2.7                 | 30               | 5                |     | 40                |     |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          | 25               | 4 <sup>2</sup>   |     | 30                |     |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          | 20               | 3 <sup>2</sup>   |     | 25                |     |      |
| t <sub>W</sub>   | Output pulse width<br>nQ = HIGH<br>nQ = LOW          | Figures 1, 2<br>C <sub>EXT</sub> = 100 nF<br>R <sub>EXT</sub> = 10 kΩ | 2.0                 |                  | 470              |     |                   |     | μs   |
|                  |                                                      |                                                                       | 2.7                 |                  | 460              |     |                   |     |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 450 <sup>2</sup> |     |                   |     |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 430 <sup>2</sup> |     |                   |     |      |
| t <sub>W</sub>   | Output pulse width<br>nQ = HIGH<br>nQ = LOW          | Figures 1, 2<br>C <sub>EXT</sub> = 0 pF<br>R <sub>EXT</sub> = 5 kΩ    | 2.0                 |                  | 100              |     |                   |     | ns   |
|                  |                                                      |                                                                       | 2.7                 |                  | 90               |     |                   |     |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 80 <sup>2</sup>  |     |                   |     |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 70 <sup>2</sup>  |     |                   |     |      |
| t <sub>rt</sub>  | Retrigger time<br>nA, nB                             | Figure 1<br>C <sub>EXT</sub> = 0 pF<br>R <sub>EXT</sub> = 5 kΩ        | 2.0                 |                  | 70               |     |                   |     | ns   |
|                  |                                                      |                                                                       | 2.7                 |                  | 55               |     |                   |     |      |
|                  |                                                      |                                                                       | 3.0 to 3.6          |                  | 45 <sup>2</sup>  |     |                   |     |      |
|                  |                                                      |                                                                       | 4.5 to 5.5          |                  | 40 <sup>2</sup>  |     |                   |     |      |

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AC CHARACTERISTICS (Continued)

GND = 0 V;  $t_r = t_f \leq 2.5$  ns;  $C_L = 50$  pF;  $R_L = 1$  k $\Omega$

| SYMBOL           | PARAMETER                 | WAVEFORM              | CONDITION           | LIMITS           |                  |      |                   |     | UNIT |
|------------------|---------------------------|-----------------------|---------------------|------------------|------------------|------|-------------------|-----|------|
|                  |                           |                       |                     | −40 °C to +85 °C |                  |      | −40 °C to +125 °C |     |      |
|                  |                           |                       | V <sub>CC</sub> (V) | MIN              | TYP <sup>1</sup> | MAX  | MIN               | MAX |      |
| R <sub>EXT</sub> | External timing resistor  | Figure 5              | 1.2                 | 10               |                  | 1000 |                   |     | kΩ   |
|                  |                           |                       | 2.0                 | 5                |                  | 1000 |                   |     |      |
|                  |                           |                       | 2.7                 | 3                |                  | 1000 |                   |     |      |
|                  |                           |                       | 3.0 to 3.6          | 2                |                  | 1000 |                   |     |      |
|                  |                           |                       | 4.5 to 5.5          | 2                |                  | 1000 |                   |     |      |
| C <sub>EXT</sub> | External timing capacitor | Figure 5 <sup>3</sup> | 1.2                 | No limits        |                  |      |                   |     | pF   |
|                  |                           |                       | 2.0                 |                  |                  |      |                   |     |      |
|                  |                           |                       | 2.7                 |                  |                  |      |                   |     |      |
|                  |                           |                       | 3.0 to 3.6          |                  |                  |      |                   |     |      |
|                  |                           |                       | 4.5 to 5.5          |                  |                  |      |                   |     |      |

NOTES:

- Unless otherwise stated, all typical values are at  $T_{amb} = 25$  °C.
- Typical value measured at  $V_{CC} = 3.3$  V.
- Typical value measured at  $V_{CC} = 5.0$  V.
- For other  $R_{EXT}$  and  $C_{EXT}$  combinations see Figure 5.  
if  $C_{EXT} > 10$  nF, the next formula is valid:  
 $t_W = K \times R_{EXT} \times C_{EXT}$  (typ.)  
where,  $t_W$  = output pulse width in ns;  
 $R_{EXT}$  = external resistor in k $\Omega$ ;  $C_{EXT}$  = external capacitor in pF;  
 $K$  = constant = 0.45 for  $V_{CC} = 5.0$  V and 0.48 for  $V_{CC} = 2.0$  V.  
The inherent test jig and pin capacitance at pins 15 and 7 ( $nR_{EXT}/C_{EXT}$ ) is approximately 7 pF.
- The time to retrigger the monostable multivibrator depends on the values of  $R_{EXT}$  and  $C_{EXT}$ .  
The output pulse width will only be extended when the time between the active-going edges of the trigger pulses meets the minimum retrigger time.  
If  $C_{EXT} > 10$  pF, the next formula (at  $V_{CC} = 5.0$  V) for the set-up time of a retrigger pulse is valid:  
 $t_{rt} = 30 + 0.19R \times C^{0.9} + 13 \times R^{1.05}$  (typ.)  
If  $C_{EXT} > 10$  pF, the next formula (at  $V_{CC} = 3.0$  V) for the set-up time of a retrigger pulse is valid:  
 $t_{rt} = 41 + 0.15R \times C^{0.9} \times R^{1.05}$  (typ.)  
where,  $t_{rt}$  = retrigger time in ns;  
 $C_{EXT}$  = external capacitor in pF;  
 $R_{EXT}$  = external resistor in k $\Omega$ .  
The inherent test jig and pin capacitance at pins 15 and 7 ( $nR_{EXT}/C_{EXT}$ ) is approximately 7 pF.
- When the device is powered up, initiate the device via a reset pulse, when  $C_{EXT} < 50$  pF.

AC WAVEFORMS

$V_M = 1.5$  V at  $V_{CC} \geq 2.7$  V;  $V_M = 0.5 V_{CC}$  at  $V_{CC} < 2.7$  V;  
 $V_{OL}$  and  $V_{OH}$  are the typical output voltage drop that occur with the output load.

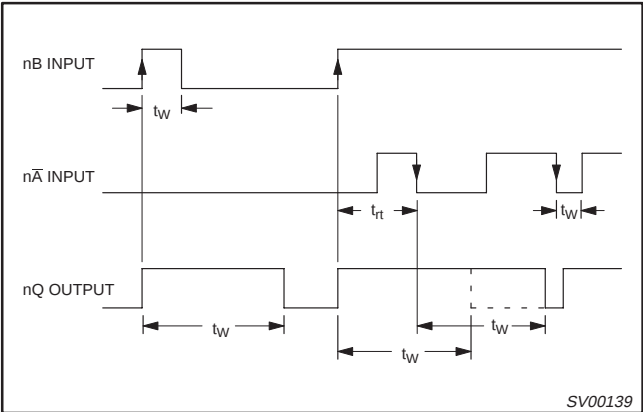


Figure 1. Output pulse control using retrigger pulse;  
 $n\overline{R}_D = \text{HIGH}$ .

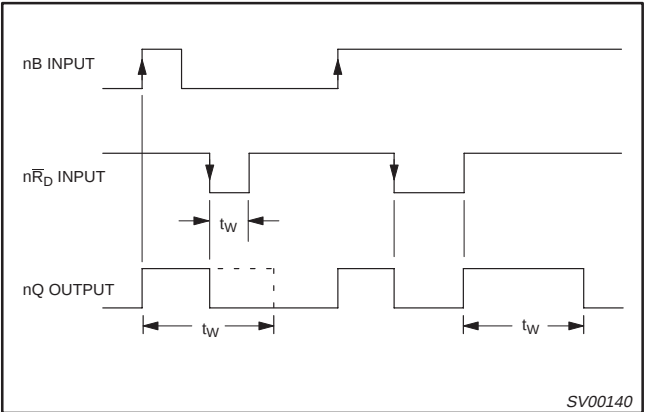
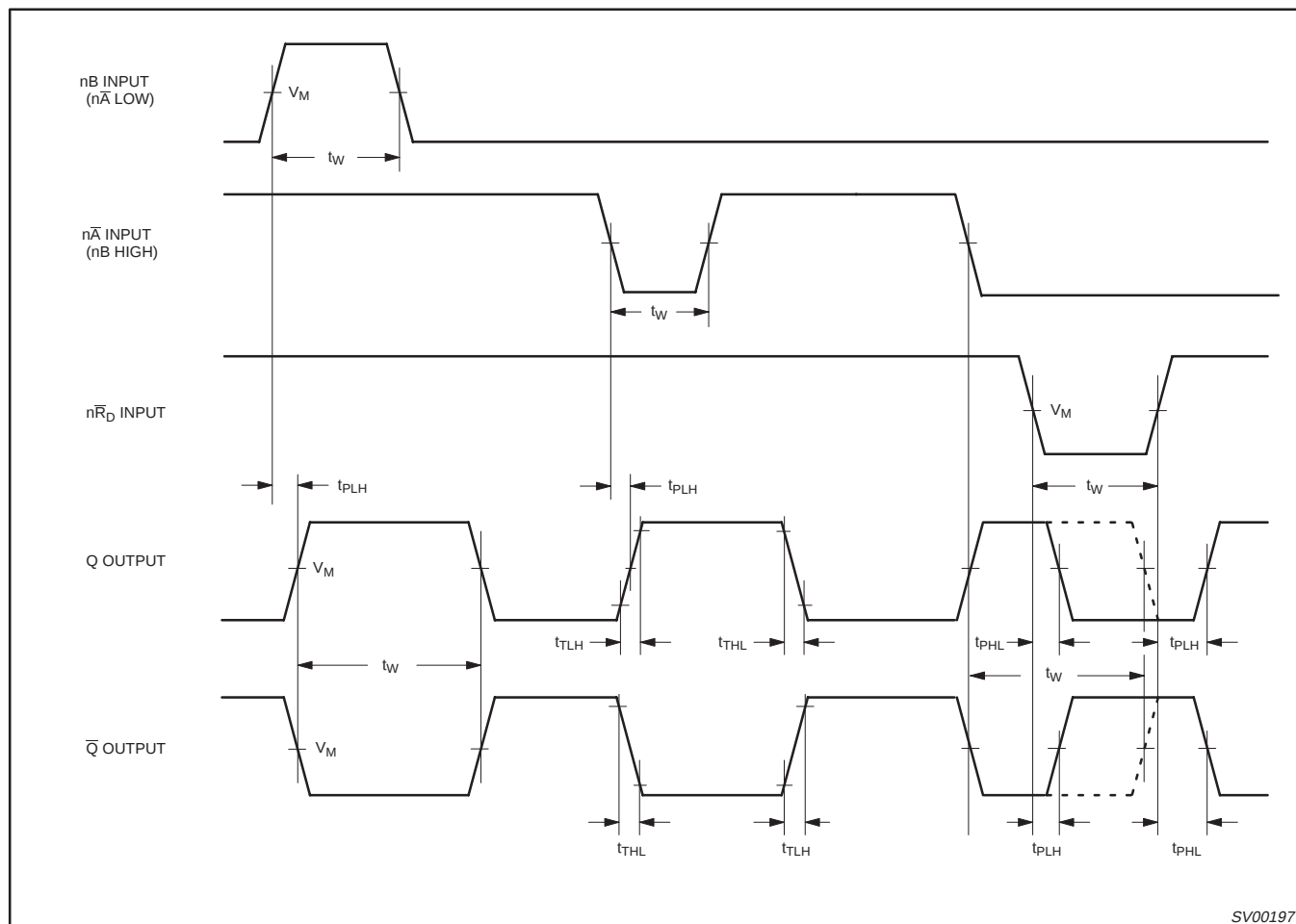


Figure 2. Output pulse control using reset input  $n\overline{R}_D$ ;  
 $n\overline{A} = \text{LOW}$ .

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Figure 3. Input ( $\overline{nA}$ ,  $nB$ ,  $\overline{nRD}$ ) to output ( $nQ$ ,  $\overline{nQ}$ ) propagation delays, the output transition times, and the input and output pulse widths.

# Dual retriggerable monostable multivibrator with reset

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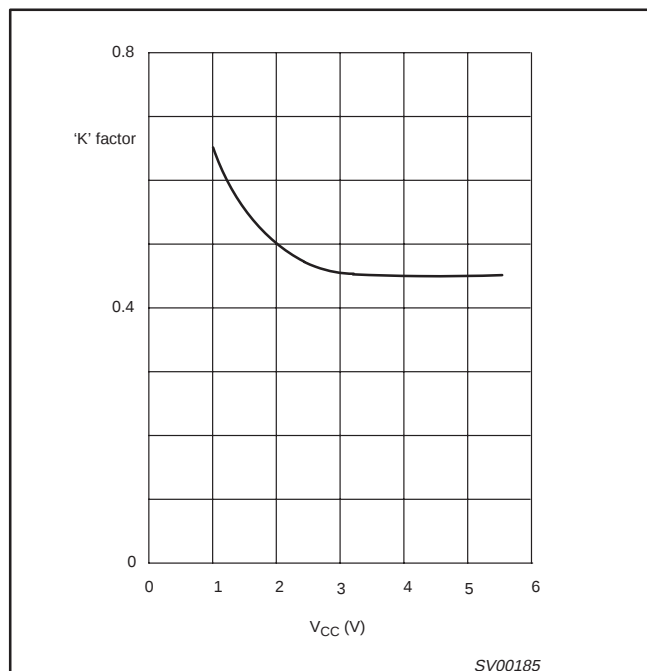


Figure 4. HCT typical "K" factor as a function of  $V_{CC}$ ;  $C_X = 10$  nF;  $R_X = 10$  k $\Omega$  to 100 k $\Omega$ .

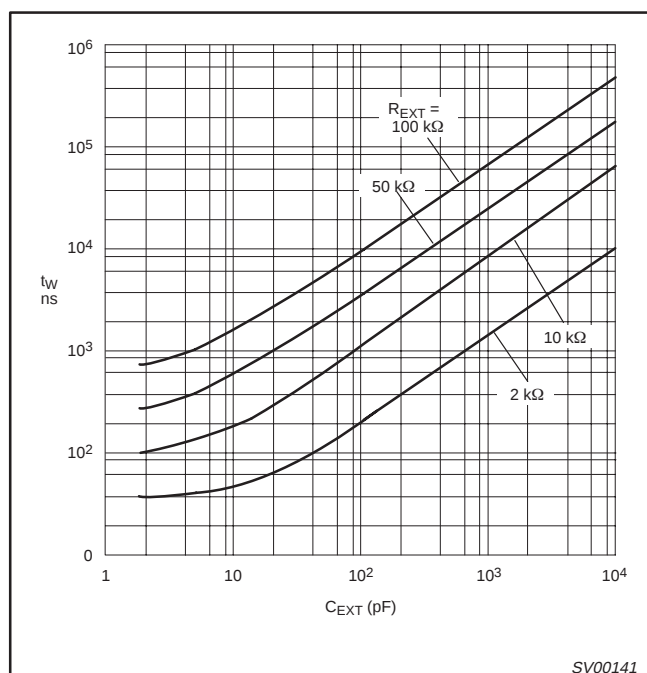


Figure 5. Typical output pulse width as a function of the external capacitor values at  $V_{CC} = 3.3$  V and  $T_{amb} = 25$  °C.

## APPLICATION INFORMATION

### Power-up considerations

When the monostable is powered-up it may produce an output pulse, with a pulse width defined by the values of  $R_X$  and  $C_X$ . This output pulse can be eliminated using the circuit shown in Figure 6.

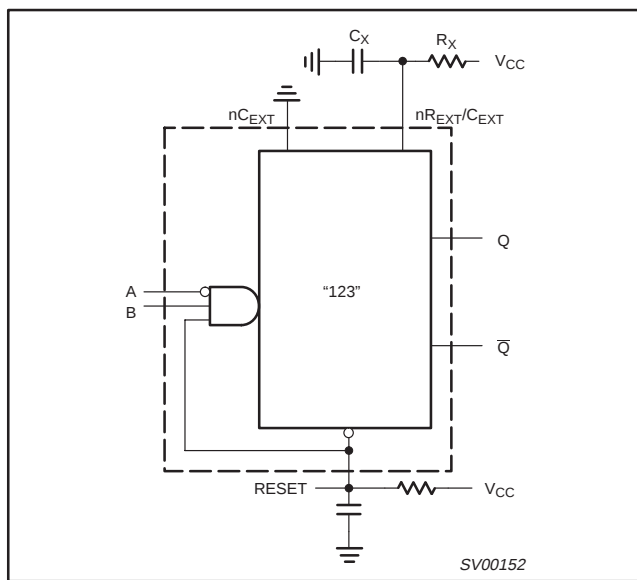


Figure 6. Power-up output pulse elimination circuit

### Power-down considerations

A large capacitor ( $C_X$ ) may cause problems when powering-down the monostable due to the energy stored in this capacitor. When a system containing this device is powered-down or a rapid decrease of  $V_{CC}$  to zero occurs, the monostable may sustain damage, due to the capacitor discharging through the input protection diodes. To avoid this possibility, connect a damping diode ( $D_X$ ) preferably a germanium or Schottky type diode able to withstand large current surges as shown in Figure 7.

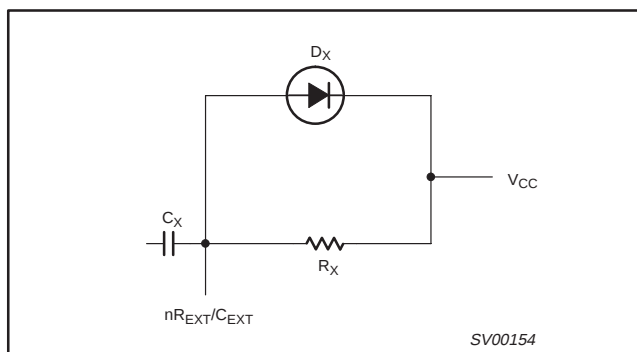


Figure 7. Power-down protection circuit

Dual retriggerable monostable multivibrator  
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TEST CIRCUIT

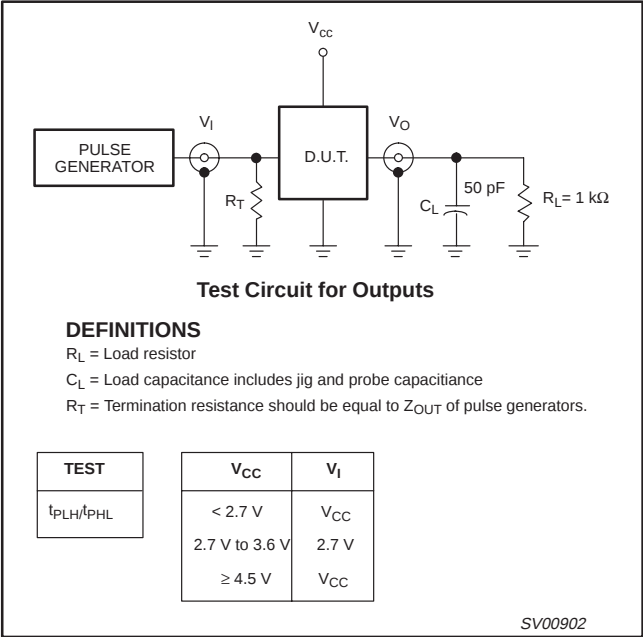


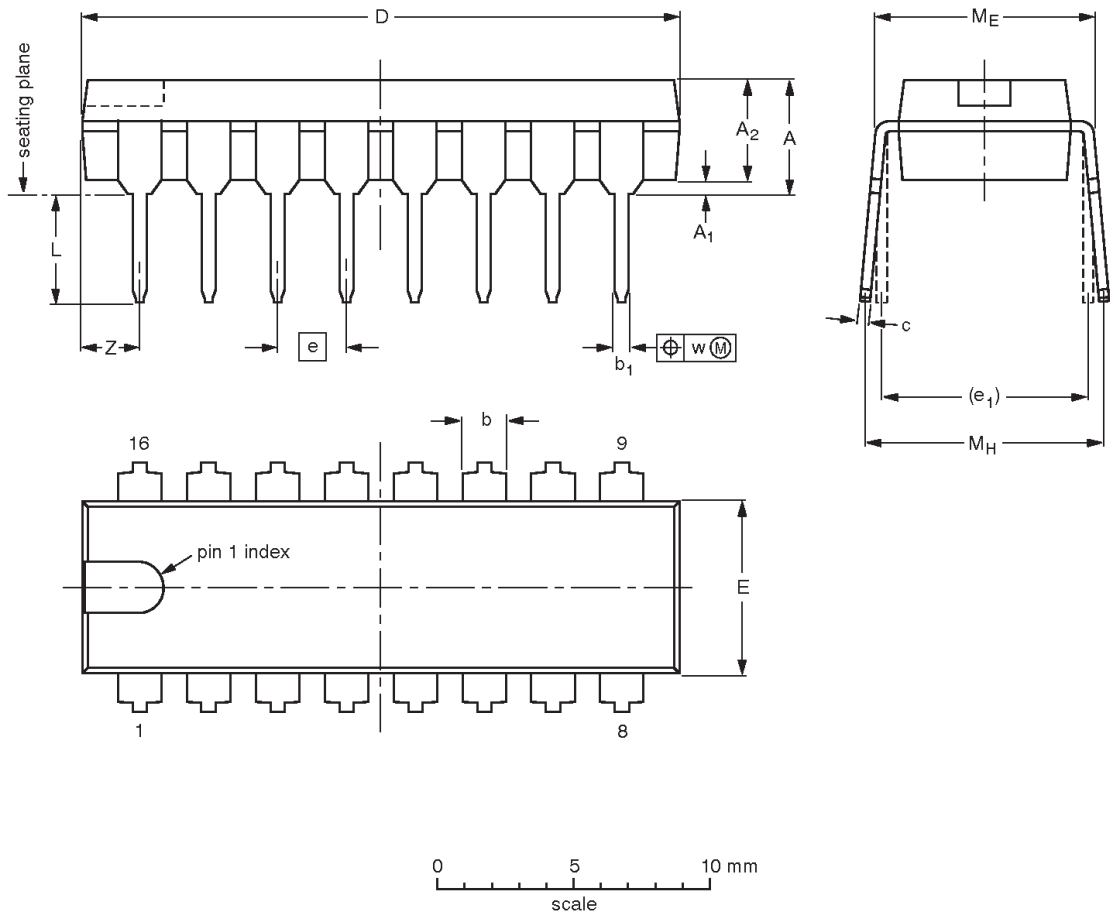
Figure 8. Load circuitry for switching times

Dual retriggerable monostable multivibrator  
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DIP16: plastic dual in-line package; 16 leads (300 mil); long body

SOT38-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A<br>max. | A <sub>1</sub><br>min. | A <sub>2</sub><br>max. | b              | b <sub>1</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | L            | M <sub>E</sub> | M <sub>H</sub> | w     | Z <sup>(1)</sup><br>max. |
|--------|-----------|------------------------|------------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|--------------------------|
| mm     | 4.7       | 0.51                   | 3.7                    | 1.40<br>1.14   | 0.53<br>0.38   | 0.32<br>0.23   | 21.8<br>21.4     | 6.48<br>6.20     | 2.54 | 7.62           | 3.9<br>3.4   | 8.25<br>7.80   | 9.5<br>8.3     | 0.254 | 2.2                      |
| inches | 0.19      | 0.020                  | 0.15                   | 0.055<br>0.045 | 0.021<br>0.015 | 0.013<br>0.009 | 0.86<br>0.84     | 0.26<br>0.24     | 0.10 | 0.30           | 0.15<br>0.13 | 0.32<br>0.31   | 0.37<br>0.33   | 0.01  | 0.087                    |

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

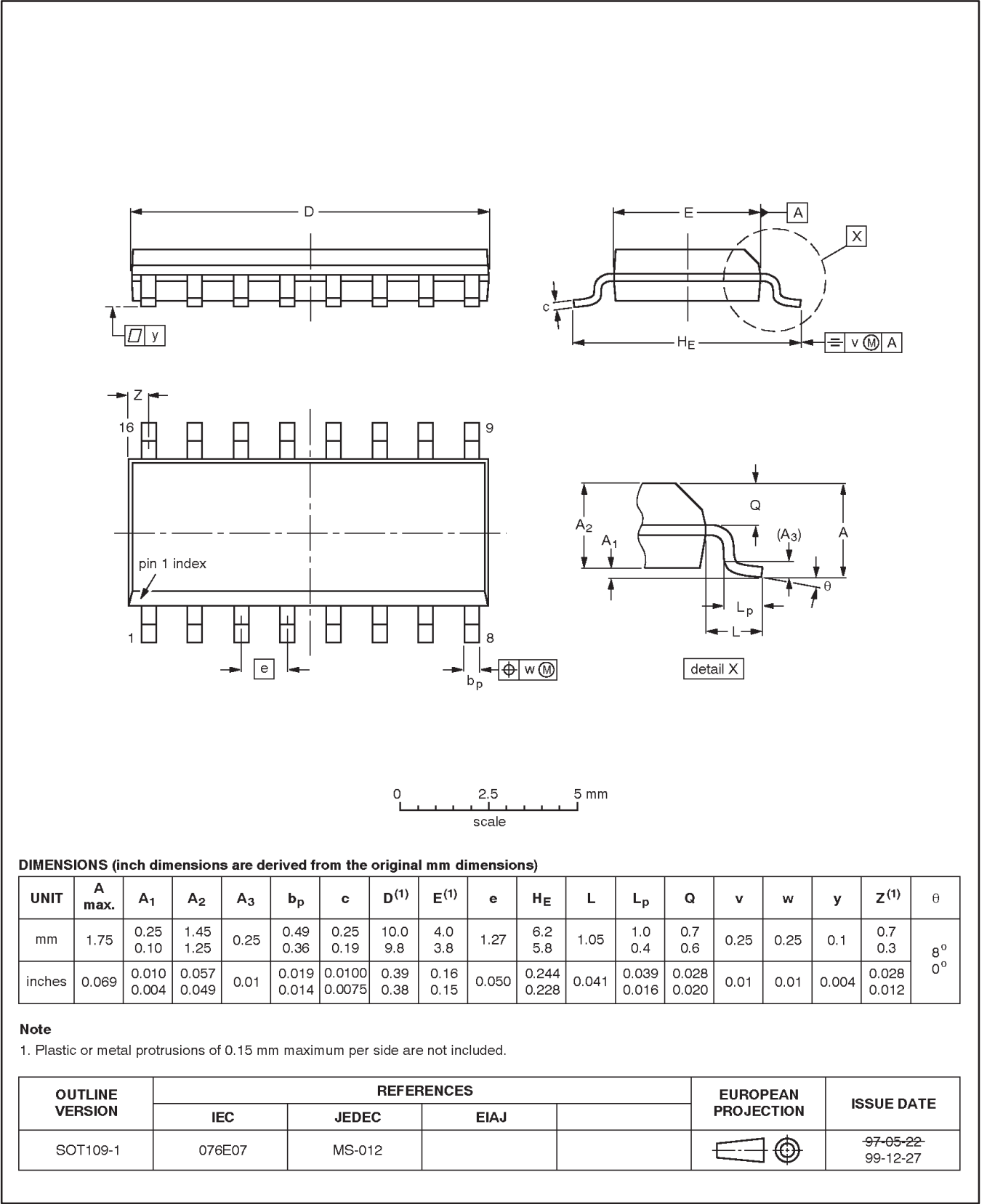
| OUTLINE<br>VERSION | REFERENCES |        |           |  | EUROPEAN<br>PROJECTION                                                                | ISSUE DATE           |
|--------------------|------------|--------|-----------|--|---------------------------------------------------------------------------------------|----------------------|
|                    | IEC        | JEDEC  | EIAJ      |  |                                                                                       |                      |
| SOT38-1            | 050G09     | MO-001 | SC-503-16 |  |  | 95-01-19<br>99-12-27 |

Dual retriggerable monostable multivibrator  
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SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

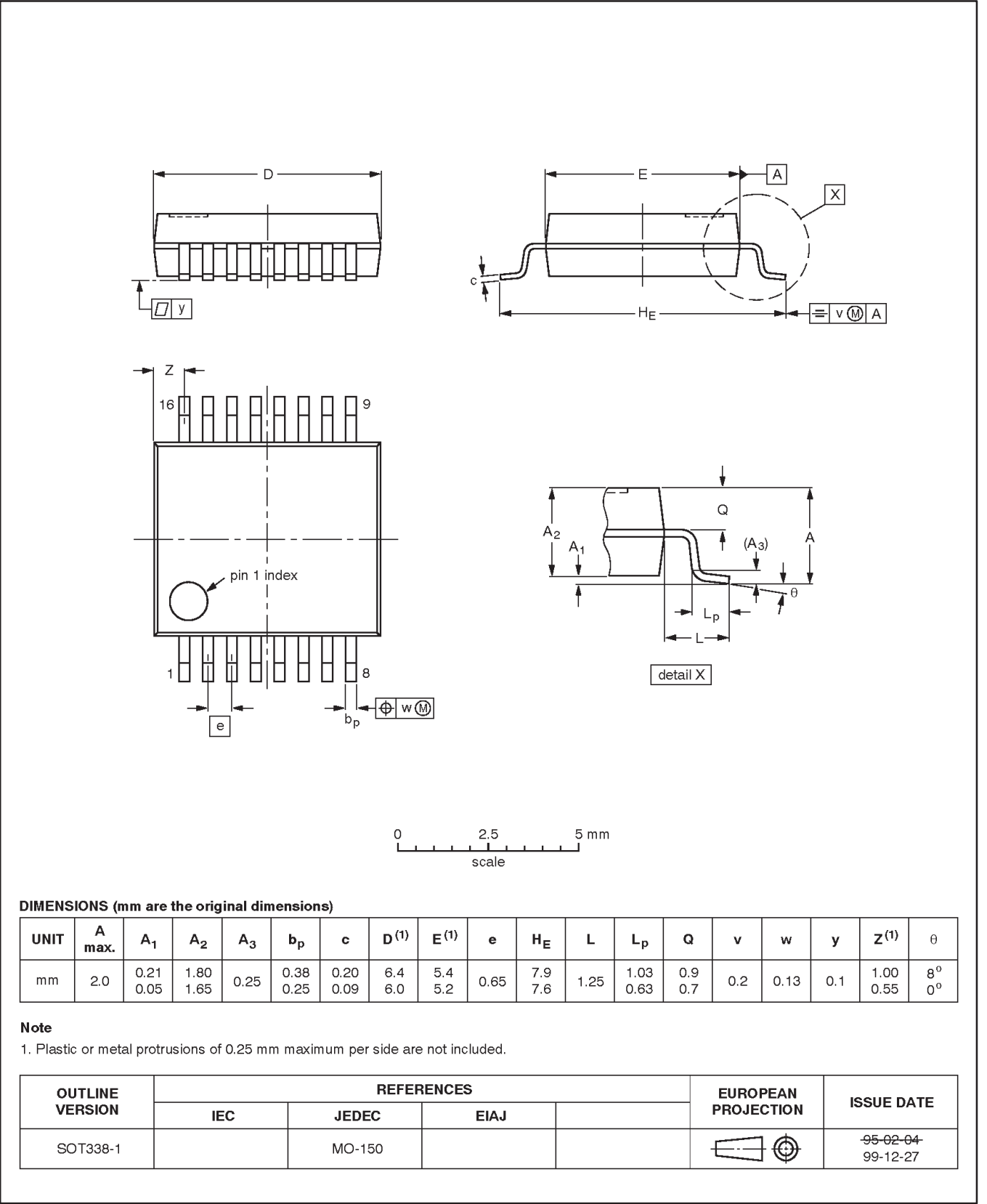


Dual retriggerable monostable multivibrator  
with reset

74LV123

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

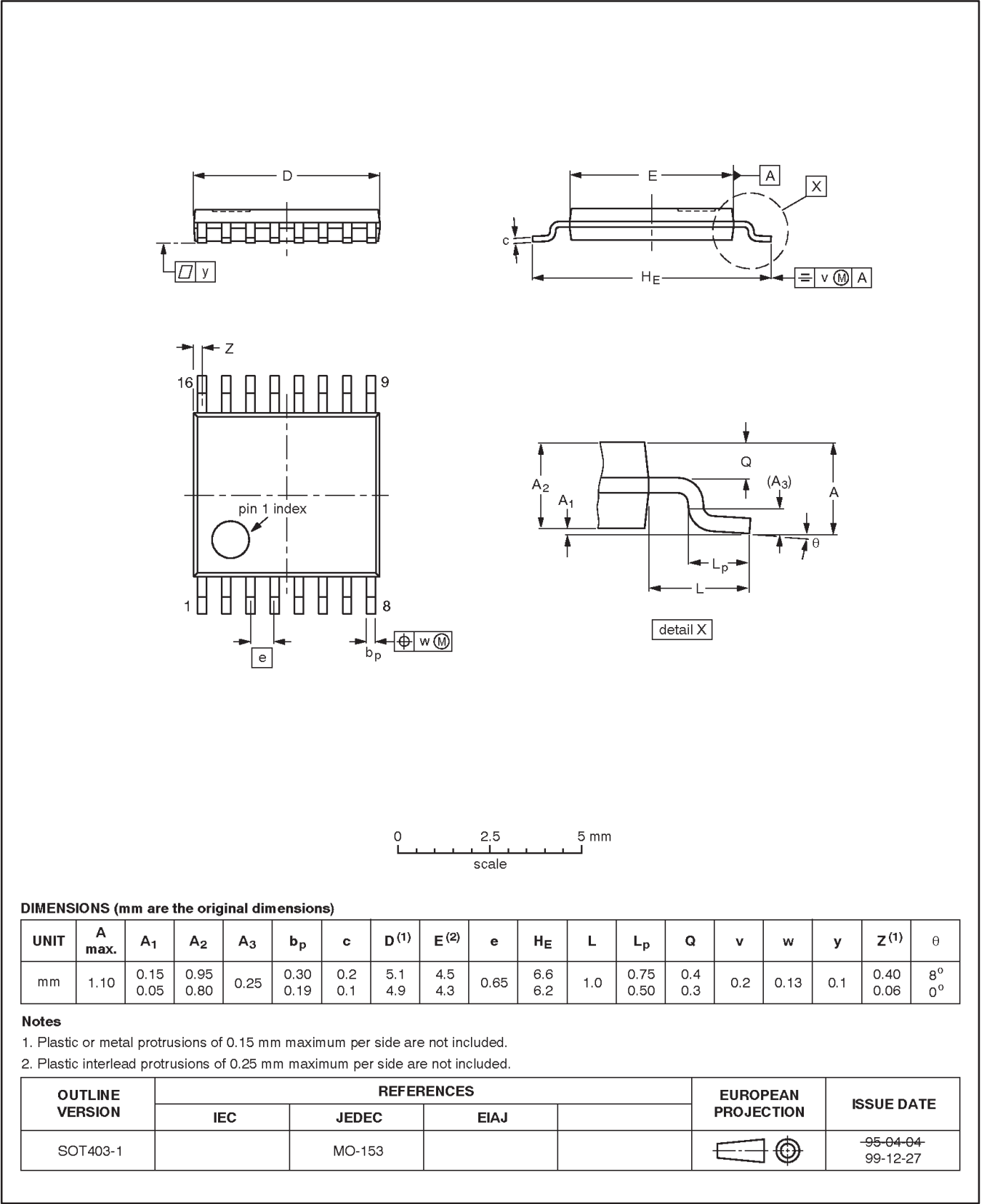


Dual retriggerable monostable multivibrator  
with reset

74LV123

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1



# Dual retriggerable monostable multivibrator with reset

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## REVISION HISTORY

| Rev | Date     | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-----|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| _3  | 20030313 | <b>Product data (9397 750 11244). ECN 853-1911 29490 of 07 February 2003.</b><br><b>Supersedes Product specification of 1998 Apr 20 (9397 750 04418).</b><br>Modifications: <ul style="list-style-type: none"> <li>• Quick Reference Data: Correct power dissipation formula in Note 1.</li> <li>• Ordering information: delete "North America"column; rename column from "Outside North America" to "Order Code".</li> <li>• AC characteristics, Note 5 (on page 8): correct C<sub>EXT</sub> value calculation formula for 5 V operation; add C<sub>EXT</sub> value calculation formula for 3.3 V operation.</li> </ul> |
| _2  | 19980420 | <b>Product specification (9397 750 04418). ECN 853-1911 19290 of 20 April 1998.</b><br><b>Supersedes data of 1997 Feb 04.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

# Dual retriggerable monostable multivibrator with reset

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## Data sheet status

| Level | Data sheet status <sup>[1]</sup> | Product status <sup>[2] [3]</sup> | Definitions                                                                                                                                                                                                                                                                                    |
|-------|----------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| I     | Objective data                   | Development                       | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.                                                                                                    |
| II    | Preliminary data                 | Qualification                     | This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.             |
| III   | Product data                     | Production                        | This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). |

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[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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