

# 74HC123; 74HCT123

Dual retriggerable monostable multivibrator with reset

Rev. 03 — 11 May 2004

Product data sheet

## 1. General description

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The 74HC123; 74HCT123 are high-speed Si-gate CMOS devices and are pin compatible with low power Schottky TTL (LSTTL). They are specified in compliance with JEDEC standard no. 7A.

The 74HC123; 74HCT123 are dual retriggerable monostable multivibrators with output pulse width control by three methods:

1. The basic pulse time is programmed by selection of an external resistor ( $R_{EXT}$ ) and capacitor ( $C_{EXT}$ ).
2. 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 ( $nQ = HIGH$ ,  $n\bar{Q} = LOW$ ) can be made as long as desired. Alternatively an output delay can be terminated at any time by a LOW-going edge on input  $n\bar{RD}$ , which also inhibits the triggering.
3. An internal connection from  $n\bar{RD}$  to the input gates makes it possible to trigger the circuit by a HIGH-going signal at input  $n\bar{RD}$  as shown in the function table.

Schmitt-trigger action in the  $n\bar{A}$  and  $nB$  inputs, makes the circuit highly tolerant to slower input rise and fall times.

The 74HC123; 74HCT123 is identical to the 74HC423; 74HCT423 but can be triggered via the reset input.

## 2. Features

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- DC triggered from active HIGH or active LOW inputs
- Retriggerable for very long pulses up to 100 % duty factor
- Direct reset terminates output pulse
- Schmitt-trigger action on all inputs except for the reset input
- ESD protection:
  - ◆ HBM EIA/JESD22-A114-B exceeds 2000 V
  - ◆ MM EIA/JESD22-A115-A exceeds 200 V.
- Specified from  $-40\text{ °C}$  to  $+80\text{ °C}$  and from  $-40\text{ °C}$  to  $+125\text{ °C}$ .

**PHILIPS**

### 3. Quick reference data

**Table 1: Quick reference data**
 $GND = 0\text{ V}; T_{amb} = 25\text{ °C}; t_r = t_f = 6\text{ ns}$ 

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Type 74HC123</b>						
$t_{PHL}, t_{PLH}$	propagation delay $n\bar{A}, nB$ to $nQ, n\bar{Q}$	$C_{EXT} = 0\text{ pF}; R_{EXT} = 5\text{ k}\Omega;$ $C_L = 15\text{ pF}; V_{CC} = 5\text{ V}$	-	26	-	ns
	propagation delay $n\bar{RD}$ to $nQ, n\bar{Q}$	$C_{EXT} = 0\text{ pF}; R_{EXT} = 5\text{ k}\Omega;$ $C_L = 15\text{ pF}; V_{CC} = 5\text{ V}$	-	20	-	ns
$C_I$	input capacitance		-	3.5	-	pF
$C_{PD}$	power dissipation capacitance per monostable		[1] [2]	54	-	pF
<b>Type 74HCT123</b>						
$t_{PHL}, t_{PLH}$	propagation delay $n\bar{A}, nB$ to $nQ, n\bar{Q}$	$C_{EXT} = 0\text{ pF}; R_{EXT} = 5\text{ k}\Omega;$ $C_L = 15\text{ pF}; V_{CC} = 5\text{ V}$	-	26	-	ns
	propagation delay $n\bar{RD}$ to $nQ, n\bar{Q}$	$C_{EXT} = 0\text{ pF}; R_{EXT} = 5\text{ k}\Omega;$ $C_L = 15\text{ pF}; V_{CC} = 5\text{ V}$	-	23	-	ns
$C_I$	input capacitance		-	3.5	-	pF
$C_{PD}$	power dissipation capacitance per monostable		[1] [3]	56	-	pF

[1]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) + 0.75 \times C_{EXT} \times V_{CC}^2 \times f_o + D \times 16 \times V_{CC}$$

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$D$  = duty factor in %;

$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$C_{EXT}$  = timing capacitance in pF;

$\sum (C_L \times V_{CC}^2 \times f_o)$  sum of outputs.

[2] For 74HC123 the condition is  $V_I = GND$  to  $V_{CC}$ .

[3] For 74HCT123 the condition is  $V_I = GND$  to  $V_{CC} - 1.5\text{ V}$ .

### 4. Ordering information

**Table 2: Ordering information**

Type number	Package			Version
	Temperature range	Name	Description	
74HC123N	-40 °C to +125 °C	DIP16	plastic dual in-line package; 16 leads (300 mil); long body	SOT38-1
74HCT123N	-40 °C to +125 °C			
74HC123D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT123D	-40 °C to +125 °C			

Table 2: Ordering information ...continued

Type number	Package			Version
	Temperature range	Name	Description	
74HC123DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HCT123DB	-40 °C to +125 °C			
74HC123PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HCT123PW	-40 °C to +125 °C			

## 5. Functional diagram

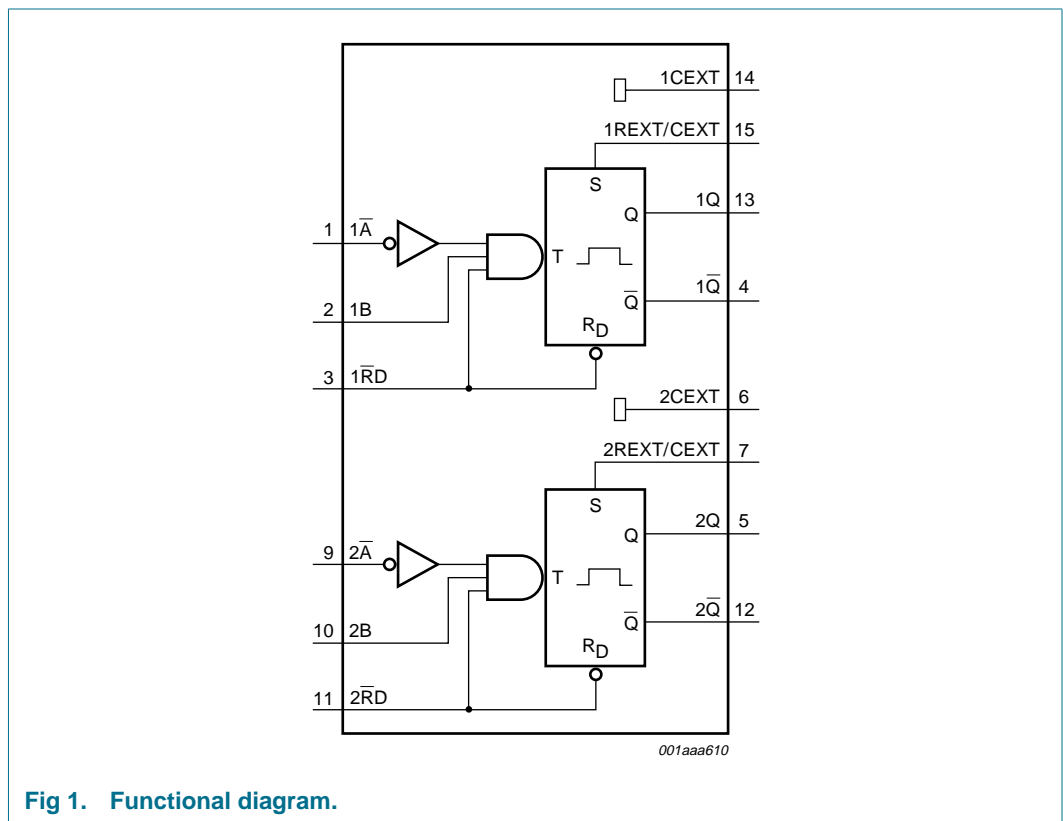


Fig 1. Functional diagram.

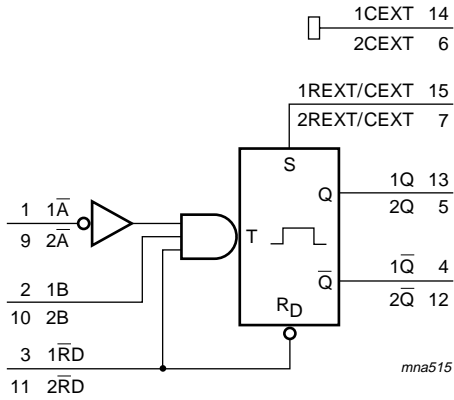


Fig 2. Logic symbol.

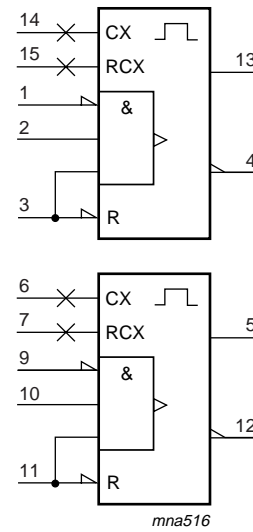


Fig 3. IEC logic symbol.

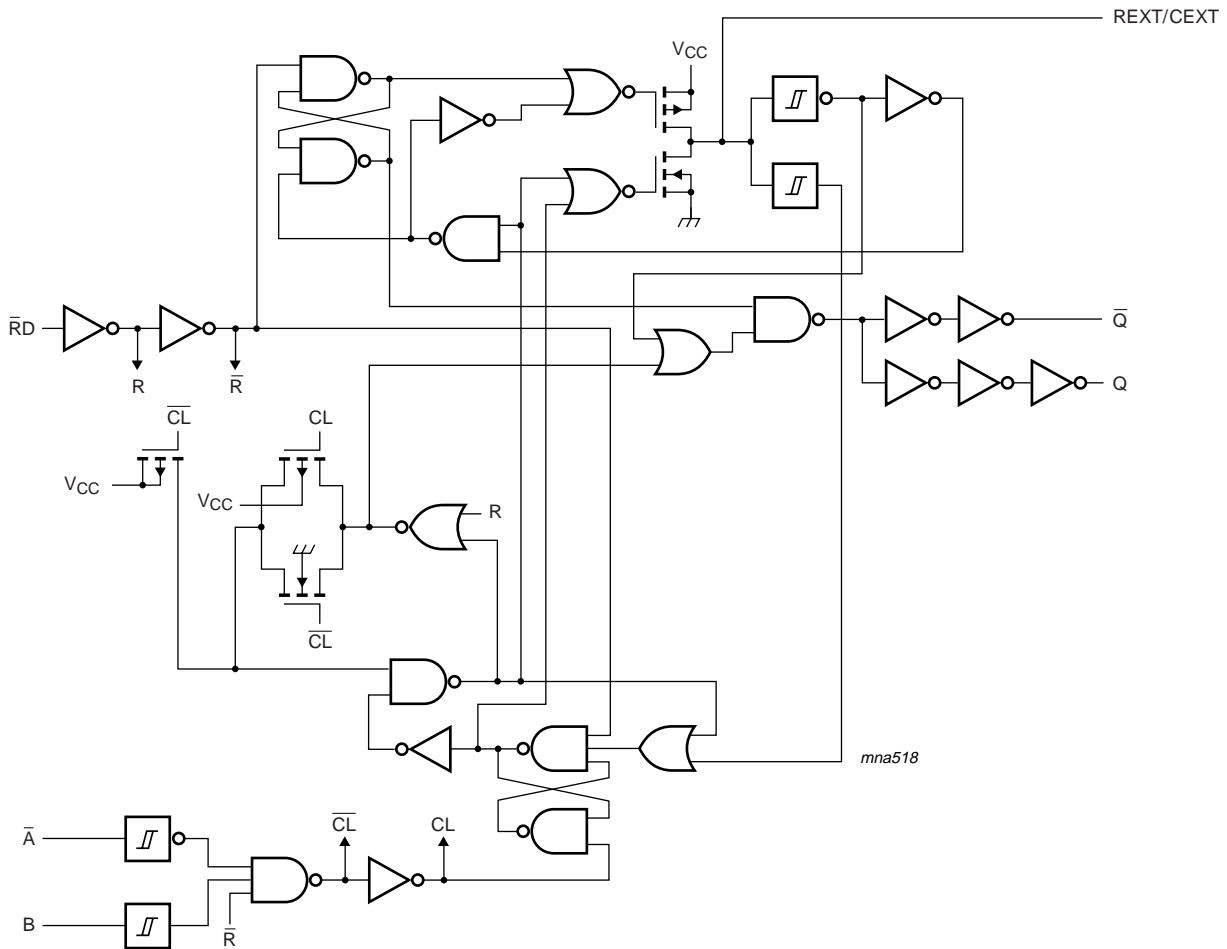
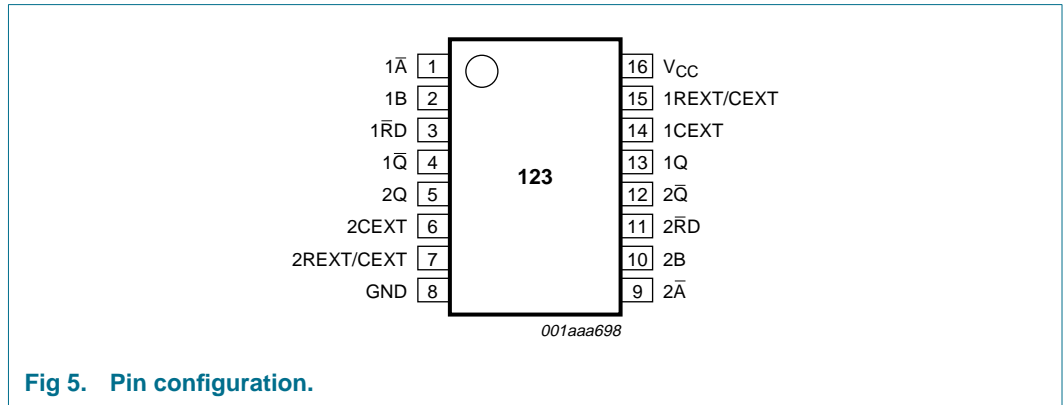


Fig 4. Logic diagram.

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description







Table 3: Pin description

Pin	Symbol	Description
1	1 $\bar{A}$	trigger inputs (negative-edge triggered)
2	1B	trigger inputs (positive-edge triggered)
3	1 $\bar{R}D$	direct reset LOW and trigger action at positive edge
4	1 $\bar{Q}$	outputs (active LOW)
5	2Q	outputs (active HIGH)
6	2CEXT	external capacitor connection
7	2REXT/CEXT	external resistor and capacitor connection
8	GND	ground (0 V)
9	2 $\bar{A}$	trigger inputs (negative-edge triggered)
10	2B	trigger inputs (positive-edge triggered)
11	2 $\bar{R}D$	direct reset LOW and trigger action at positive edge
12	2 $\bar{Q}$	outputs (active LOW)
13	1Q	outputs (active HIGH)
14	1CEXT	external capacitor connection
15	1REXT/CEXT	external resistor and capacitor connection
16	V <sub>CC</sub>	supply voltage

## 7. Functional description

### 7.1 Function table

Table 4: Function table [1]

Input			Output	
nRD	nA	nB	nQ	nQ
L	X	X	L	H
X	H	X	L [2]	H [2]
X	X	L	L [2]	H [2]
H	L	↑		
H	↓	H		
↑	L	H		


[1] 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.

[2] If the monostable was triggered before this condition was established, the pulse will continue as programmed.

## 8. Limiting values

Table 5: Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CC}$	supply voltage		-0.5	+7	V
$I_{IK}$	input diode current	$V_I < -0.5\text{ V}$ or $V_I > V_{CC} + 0.5\text{ V}$	-	±20	mA
$I_{OK}$	output diode current	$V_O < -0.5\text{ V}$ or $V_O > V_{CC} + 0.5\text{ V}$	-	±20	mA
$I_O$	output source or sink current, except for pins nREXT/CEXT	$V_O = -0.5\text{ V}$ to $V_{CC} + 0.5\text{ V}$	-	±25	mA
$I_{CC}, I_{GND}$	$V_{CC}$ or GND current		-	±50	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	power dissipation				
	DIP16 package		[1] -	750	mW
	SO16, SSOP16 and TSSOP16 packages		[2] -	500	mW

[1] Above 70 °C:  $P_{tot}$  derates linearly with 12 mW/K.

[2] Above 70 °C:  $P_{tot}$  derates linearly with 8 mW/K.

## 9. Recommended operating conditions

Table 6: Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Type 74HC123</b>						
$V_{CC}$	supply voltage		2.0	5.0	6.0	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$t_r, t_f$	input rise and fall times for $n\overline{RD}$ input	$V_{CC} = 2.0\text{ V}$	-	-	1000	ns
		$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
		$V_{CC} = 6.0\text{ V}$	-	-	400	ns
$T_{amb}$	operating ambient temperature	see <a href="#">Section 10</a> and <a href="#">11</a>	-40	-	+125	°C
<b>Type 74HCT123</b>						
$V_{CC}$	supply voltage		4.5	5.0	5.5	V
$V_I$	input voltage		0	-	$V_{CC}$	V
$V_O$	output voltage		0	-	$V_{CC}$	V
$t_r, t_f$	input rise and fall times for $n\overline{RD}$ input	$V_{CC} = 4.5\text{ V}$	-	6.0	500	ns
$T_{amb}$	operating ambient temperature	see <a href="#">Section 10</a> and <a href="#">11</a>	-40	-	+125	°C

## 10. Static characteristics

Table 7: Static characteristics type 74HC123

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{amb} = 25\text{ °C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0\text{ V}$	1.5	1.2	-	V
		$V_{CC} = 4.5\text{ V}$	3.15	2.4	-	V
		$V_{CC} = 6.0\text{ V}$	4.2	3.2	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0\text{ V}$	-	0.8	0.5	V
		$V_{CC} = 4.5\text{ V}$	-	2.1	1.35	V
		$V_{CC} = 6.0\text{ V}$	-	2.8	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 2.0\text{ V}$	1.9	2.0	-	V
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 4.5\text{ V}$	4.4	4.5	-	V
		$I_O = -20\text{ }\mu\text{A}; V_{CC} = 6.0\text{ V}$	5.9	6.0	-	V
		$I_O = -4\text{ mA}; V_{CC} = 4.5\text{ V}$	3.98	4.32	-	V
		$I_O = -5.2\text{ mA}; V_{CC} = 6.0\text{ V}$	5.48	5.81	-	V

**Table 7: Static characteristics type 74HC123 ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 20 \mu\text{A}; V_{CC} = 2.0 \text{ V}$	-	0	0.1	V
		$I_O = 20 \mu\text{A}; V_{CC} = 4.5 \text{ V}$	-	0	0.1	V
		$I_O = 20 \mu\text{A}; V_{CC} = 6.0 \text{ V}$	-	0	0.1	V
		$I_O = 4 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	0.15	0.26	V
		$I_O = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	0.16	0.26	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	$\pm 0.1$	$\mu\text{A}$
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}; V_{CC} = 6.0 \text{ V}$	-	-	8.0	$\mu\text{A}$
$C_I$	input capacitance		-	3.5	-	pF
<b><math>T_{amb} = -40 \text{ }^\circ\text{C}</math> to <math>+85 \text{ }^\circ\text{C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0 \text{ V}$	1.5	-	-	V
		$V_{CC} = 4.5 \text{ V}$	3.15	-	-	V
		$V_{CC} = 6.0 \text{ V}$	4.2	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0 \text{ V}$	-	-	0.5	V
		$V_{CC} = 4.5 \text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0 \text{ V}$	-	-	1.8	V
$V_{OH}$	HIGH-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = -20 \mu\text{A}; V_{CC} = 2.0 \text{ V}$	1.9	-	-	V
		$I_O = -20 \mu\text{A}; V_{CC} = 4.5 \text{ V}$	4.4	-	-	V
		$I_O = -20 \mu\text{A}; V_{CC} = 6.0 \text{ V}$	5.9	-	-	V
		$I_O = -4 \text{ mA}; V_{CC} = 4.5 \text{ V}$	3.84	-	-	V
		$I_O = -5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	5.34	-	-	V
$V_{OL}$	LOW-level output voltage	$V_I = V_{IH}$ or $V_{IL}$				
		$I_O = 20 \mu\text{A}; V_{CC} = 2.0 \text{ V}$	-	-	0.1	V
		$I_O = 20 \mu\text{A}; V_{CC} = 4.5 \text{ V}$	-	-	0.1	V
		$I_O = 20 \mu\text{A}; V_{CC} = 6.0 \text{ V}$	-	-	0.1	V
		$I_O = 4 \text{ mA}; V_{CC} = 4.5 \text{ V}$	-	-	0.33	V
		$I_O = 5.2 \text{ mA}; V_{CC} = 6.0 \text{ V}$	-	-	0.33	V
$I_{LI}$	input leakage current	$V_I = V_{CC}$ or GND; $V_{CC} = 6.0 \text{ V}$	-	-	$\pm 1.0$	$\mu\text{A}$
$I_{CC}$	quiescent supply current	$V_I = V_{CC}$ or GND; $I_O = 0 \text{ A}; V_{CC} = 6.0 \text{ V}$	-	-	80	$\mu\text{A}$
<b><math>T_{amb} = -40 \text{ }^\circ\text{C}</math> to <math>+125 \text{ }^\circ\text{C}</math></b>						
$V_{IH}$	HIGH-level input voltage	$V_{CC} = 2.0 \text{ V}$	1.5	-	-	V
		$V_{CC} = 4.5 \text{ V}$	3.15	-	-	V
		$V_{CC} = 6.0 \text{ V}$	4.2	-	-	V
$V_{IL}$	LOW-level input voltage	$V_{CC} = 2.0 \text{ V}$	-	-	0.5	V
		$V_{CC} = 4.5 \text{ V}$	-	-	1.35	V
		$V_{CC} = 6.0 \text{ V}$	-	-	1.8	V



**Table 7: Static characteristics type 74HC123 ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	-	-	-	-
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 2.0 V	1.9	-	-	V
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 4.5 V	4.4	-	-	V
		I <sub>O</sub> = -20 µA; V <sub>CC</sub> = 6.0 V	5.9	-	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 4.5 V	3.7	-	-	V
V <sub>OL</sub>	LOW-level output voltage	I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V	5.2	-	-	V
		V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>	-	-	-	-
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 2.0 V	-	-	0.1	V
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 4.5 V	-	-	0.1	V
		I <sub>O</sub> = 20 µA; V <sub>CC</sub> = 6.0 V	-	-	0.1	V
I <sub>LI</sub>	input leakage current	I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 4.5 V	-	-	0.4	V
		I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V	-	-	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V	-	-	±1.0	µA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V	-	-	160	µA

**Table 8: Static characteristics type 74HCT123**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>T<sub>amb</sub> = 25 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	1.6	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	1.2	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V	-	-	-	-
		I <sub>O</sub> = -20 µA	4.4	4.5	-	V
		I <sub>O</sub> = -4 mA	3.98	4.32	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V	-	-	-	-
		I <sub>O</sub> = 20 µA	-	0	0.1	V
		I <sub>O</sub> = 4.0 mA	-	0.15	0.26	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±0.1	µA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	8.0	µA
ΔI <sub>CC</sub>	additional quiescent supply current per input pin	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A	-	-	-	-
		pins n $\bar{A}$ , nB	-	35	125	µA
		pin n $\bar{R}D$	-	50	180	µA
C <sub>I</sub>	input capacitance		-	3.5	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.8	V

**Table 8: Static characteristics type 74HCT123 ...continued**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V				
		I <sub>O</sub> = -20 µA	4.4	-	-	V
		I <sub>O</sub> = -4 mA	3.84	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V				
		I <sub>O</sub> = 20 µA	-	-	0.1	V
		I <sub>O</sub> = 4.0 mA	-	-	0.33	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±1.0	µA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	80	µA
ΔI <sub>CC</sub>	additional quiescent supply current per input pin	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A				
		pins n $\bar{A}$ , nB	-	-	160	µA
		pin n $\bar{R}D$	-	-	225	µA
<b>T<sub>amb</sub> = -40 °C to +125 °C</b>						
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V				
		I <sub>O</sub> = -20 µA	4.4	-	-	V
		I <sub>O</sub> = -4 mA	3.7	-	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V				
		I <sub>O</sub> = 20 µA	-	-	0.1	V
		I <sub>O</sub> = 4.0 mA	-	-	0.4	V
I <sub>LI</sub>	input leakage current	V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 5.5 V	-	-	±10.0	µA
I <sub>CC</sub>	quiescent supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	160	µA
ΔI <sub>CC</sub>	additional quiescent supply current per input pin	V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other inputs V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 4.5 V to 5.5 V; I <sub>O</sub> = 0 A				
		pins n $\bar{A}$ , nB	-	-	170	µA
		pin n $\bar{R}D$	-	-	245	µA

## 11. Dynamic characteristics

**Table 9: Dynamic characteristics type 72HC123**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; unless otherwise specified; see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b><math>T_{amb} = 25\text{ °C}</math></b>							
$t_{PHL}$ , $t_{PLH}$	propagation delay $n\overline{RD}$ , $n\overline{A}$ , $nB$ to $nQ$ or $n\overline{Q}$	$C_{EXT} = 0\text{ pF}$ ; $R_{EXT} = 5\text{ k}\Omega$ ; see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0\text{ V}$	-	83	255	ns	
		$V_{CC} = 4.5\text{ V}$	-	30	51	ns	
		$V_{CC} = 6.0\text{ V}$	-	24	43	ns	
		$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	26	-	ns	
	propagation delay $n\overline{RD}$ to $nQ$ or $n\overline{Q}$ (reset)	$C_{EXT} = 0\text{ pF}$ ; $R_{EXT} = 5\text{ k}\Omega$ ; see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0\text{ V}$	-	66	215	ns	
		$V_{CC} = 4.5\text{ V}$	-	24	43		
$V_{CC} = 6.0\text{ V}$		-	19	37	ns		
	$C_L = 15\text{ pF}$ ; $V_{CC} = 5\text{ V}$	-	20	-	ns		
$t_{THL}$ , $t_{TLH}$	output transition time	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0\text{ V}$	-	19	75	ns	
		$V_{CC} = 4.5\text{ V}$	-	7	15	ns	
		$V_{CC} = 6.0\text{ V}$	-	6	13	ns	
$t_w$	trigger pulse width	$n\overline{A} = \text{LOW}$ ; see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0\text{ V}$	100	8	-	ns	
		$V_{CC} = 4.5\text{ V}$	20	3	-	ns	
		$V_{CC} = 6.0\text{ V}$	17	2	-	ns	
		$nB = \text{HIGH}$ ; see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0\text{ V}$	100	17	-	ns	
	reset pulse width	$n\overline{RD} = \text{LOW}$ ; see <a href="#">Figure 8</a>					
		$V_{CC} = 2.0\text{ V}$	100	14	-	ns	
		$V_{CC} = 4.5\text{ V}$	20	5	-	ns	
		$V_{CC} = 6.0\text{ V}$	17	4	-	ns	
		output pulse width	$C_{EXT} = 100\text{ nF}$ ; $R_{EXT} = 10\text{ k}\Omega$ ; $V_{CC} = 5.0\text{ V}$ ; $nQ = \text{HIGH}$ ; $n\overline{Q} = \text{LOW}$ ; see <a href="#">Figure 7</a> and <a href="#">8</a>	-	450	-	$\mu\text{s}$
		$C_{EXT} = 0\text{ pF}$ ; $R_{EXT} = 5\text{ k}\Omega$ ; $V_{CC} = 5.0\text{ V}$ ; $nQ = \text{HIGH}$ ; $n\overline{Q} = \text{LOW}$ ; see <a href="#">Figure 7</a> and <a href="#">8</a>	[1]	-	75	-	ns
$t_{rt}$	retrigger time $n\overline{A}$ , $nB$	$C_{EXT} = 0\text{ pF}$ ; $R_{EXT} = 5\text{ k}\Omega$ ; $V_{CC} = 5.0\text{ V}$ ; see <a href="#">Figure 7</a>	[2][3]	-	110	-	ns
$R_{EXT}$	external timing resistor	see <a href="#">Figure 10</a>					
		$V_{CC} = 2.0\text{ V}$	10	-	1000	$\text{k}\Omega$	
		$V_{CC} = 5.0\text{ V}$	2	-	1000	$\text{k}\Omega$	
$C_{EXT}$	external timing capacitor	$V_{CC} = 5.0\text{ V}$ ; see <a href="#">Figure 10</a>	[3]	no limits		$\text{pF}$	

**Table 9: Dynamic characteristics type 72HC123 ...continued**  
 GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF; unless otherwise specified; see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$C_{PD}$	power dissipation capacitance per monostable		[4] [5] -	54	-	pF	
<b><math>T_{amb} = -40</math> °C to <math>+85</math> °C</b>							
$t_{PHL}, t_{PLH}$	propagation delay $n\bar{R}D$ , $n\bar{A}$ , $nB$ to $nQ$ or $n\bar{Q}$	$C_{EXT} = 0$ pF; $R_{EXT} = 5$ k $\Omega$ ; see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	320	ns	
		$V_{CC} = 4.5$ V	-	-	64	ns	
		$V_{CC} = 6.0$ V	-	-	54	ns	
	propagation delay $n\bar{R}D$ to $nQ$ or $n\bar{Q}$ (reset)	$C_{EXT} = 0$ pF; $R_{EXT} = 5$ k $\Omega$ ; see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	270	ns	
$V_{CC} = 4.5$ V		-	-	54			
	$V_{CC} = 6.0$ V	-	-	46	ns		
$t_{THL}, t_{TLH}$	output transition time	see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	95	ns	
		$V_{CC} = 4.5$ V	-	-	19	ns	
		$V_{CC} = 6.0$ V	-	-	16	ns	
$t_w$	trigger pulse width	$n\bar{A} = \text{LOW}$ ; see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0$ V	125	-	-	ns	
		$V_{CC} = 4.5$ V	25	-	-	ns	
		$V_{CC} = 6.0$ V	21	-	-	ns	
		$nB = \text{HIGH}$ ; see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0$ V	125	-	-	ns	
		$V_{CC} = 4.5$ V	25	-	-	ns	
		$V_{CC} = 6.0$ V	21	-	-	ns	
	reset pulse width	$n\bar{R}D = \text{LOW}$ ; see <a href="#">Figure 8</a>					
		$V_{CC} = 2.0$ V	125	-	-	ns	
		$V_{CC} = 4.5$ V	25	-	-	ns	
		$V_{CC} = 6.0$ V	21	-	-	ns	
<b><math>T_{amb} = -40</math> °C to <math>+125</math> °C</b>							
$t_{PHL}, t_{PLH}$	propagation delay $n\bar{R}D$ , $n\bar{A}$ , $nB$ to $nQ$ or $n\bar{Q}$	$C_{EXT} = 0$ pF; $R_{EXT} = 5$ k $\Omega$ ; see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	385	ns	
		$V_{CC} = 4.5$ V	-	-	77	ns	
		$V_{CC} = 6.0$ V	-	-	65	ns	
	propagation delay $n\bar{R}D$ to $nQ$ or $n\bar{Q}$ (reset)	$C_{EXT} = 0$ pF; $R_{EXT} = 5$ k $\Omega$ ; see <a href="#">Figure 6</a>					
		$V_{CC} = 2.0$ V	-	-	325	ns	
		$V_{CC} = 4.5$ V	-	-	65		
		$V_{CC} = 6.0$ V	-	-	55	ns	
	$t_{THL}, t_{TLH}$	output transition time	see <a href="#">Figure 6</a>				
$V_{CC} = 2.0$ V			-	-	110	ns	
$V_{CC} = 4.5$ V			-	-	22	ns	
$V_{CC} = 6.0$ V			-	-	19	ns	

**Table 9: Dynamic characteristics type 72HC123 ...continued**  
*GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF; unless otherwise specified; see [Figure 9](#).*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$t_W$	trigger pulse width	$n\bar{A} = \text{LOW}$ ; see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0$ V	150	-	-	ns	
		$V_{CC} = 4.5$ V	30	-	-	ns	
			$V_{CC} = 6.0$ V	26	-	-	ns
	reset pulse width	$n\bar{B} = \text{HIGH}$ ; see <a href="#">Figure 7</a>					
		$V_{CC} = 2.0$ V	150	-	-	ns	
		$V_{CC} = 4.5$ V	30	-	-	ns	
		$V_{CC} = 6.0$ V	26	-	-	ns	
		$n\bar{RD} = \text{LOW}$ ; see <a href="#">Figure 8</a>					
$V_{CC} = 2.0$ V		150	-	-	ns		
		$V_{CC} = 4.5$ V	30	-	-	ns	
		$V_{CC} = 6.0$ V	26	-	-	ns	

- [1] For other  $R_{EXT}$  and  $C_{EXT}$  combinations see [Figure 10](#). If  $C_{EXT} > 10$  nF, the next formula is valid:  
 $t_W = K \times R_{EXT} \times C_{EXT}$ , where:  
 $t_W$  = typical 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.
- [2] 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 input 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:  
 $t_{rt} = 30 + 0.19 \times R_{EXT} \times C_{EXT}^{0.9} + 13 \times R_{EXT}^{1.05}$ , 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 7 pF.
- [3] When the device is powered-up, initiate the device via a reset pulse, when  $C_{EXT} < 50$  pF.
- [4]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu$ W):  
 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum(C_L \times V_{CC}^2 \times f_o) + 0.75 \times C_{EXT} \times V_{CC}^2 \times f_o + D \times 16 \times V_{CC}$  where:  
 $f_i$  = input frequency in MHz;  
 $f_o$  = output frequency in MHz;  
 $D$  = duty factor in %;  
 $C_L$  = output load capacitance in pF;  
 $V_{CC}$  = supply voltage in V;  
 $C_{EXT}$  = timing capacitance in pF;  
 $\sum(C_L \times V_{CC}^2 \times f_o)$  sum of outputs.
- [5] The condition is  $V_I = \text{GND}$  to  $V_{CC}$ .

Table 10: Dynamic characteristics type 72HCT123

GND = 0 V;  $t_r = t_f = 6$  ns;  $C_L = 50$  pF; unless otherwise specified; see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
<b>T<sub>amb</sub> = 25 °C</b>							
t <sub>PHL</sub>	propagation delay n $\overline{RD}$ , n $\overline{A}$ , nB to n $\overline{Q}$	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; see <a href="#">Figure 6</a> V <sub>CC</sub> = 4.5 V	-	30	51	ns	
		C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V	-	26	-	ns	
	propagation delay n $\overline{RD}$ to nQ (reset)	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; see <a href="#">Figure 6</a> V <sub>CC</sub> = 4.5 V	-	27	46	ns	
		C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V	-	23	-	ns	
t <sub>PLH</sub>	propagation delay n $\overline{RD}$ , n $\overline{A}$ , nB to nQ	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; see <a href="#">Figure 6</a> V <sub>CC</sub> = 4.5 V	-	28	51	ns	
		C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V	-	26	-	ns	
	propagation delay n $\overline{RD}$ to n $\overline{Q}$ (reset)	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; see <a href="#">Figure 6</a> V <sub>CC</sub> = 4.5 V	-	23	46	ns	
		C <sub>L</sub> = 15 pF; V <sub>CC</sub> = 5 V	-	23	-	ns	
t <sub>THL</sub> , t <sub>TLH</sub>	output transition time	V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 6</a>	-	7	15	ns	
t <sub>W</sub>	trigger pulse width	n $\overline{A}$ = LOW; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a>	20	3	-	ns	
		nB = HIGH; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a>	20	5	-	ns	
	reset pulse width	n $\overline{RD}$ = LOW; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 8</a>	20	7	-	ns	
	output pulse width	C <sub>EXT</sub> = 100 nF; R <sub>EXT</sub> = 10 k $\Omega$ ; V <sub>CC</sub> = 5.0 V; nQ = HIGH; n $\overline{Q}$ = LOW; see <a href="#">Figure 7</a> and <a href="#">8</a>	-	450	-	$\mu$ s	
		C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; V <sub>CC</sub> = 5.0 V; nQ = HIGH; n $\overline{Q}$ = LOW; see <a href="#">Figure 7</a> and <a href="#">8</a>	[1]	-	75	-	ns
t <sub>rt</sub>	retrigger time n $\overline{A}$ , nB	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; V <sub>CC</sub> = 5.0 V; see <a href="#">Figure 7</a>	[2][3]	-	110	-	ns
R <sub>EXT</sub>	external timing resistor	V <sub>CC</sub> = 5.0 V; see <a href="#">Figure 10</a>	2	-	1000	k $\Omega$	
C <sub>EXT</sub>	external timing capacitor	V <sub>CC</sub> = 5.0 V; see <a href="#">Figure 10</a>	[3]	no limits	-	pF	
C <sub>PD</sub>	power dissipation capacitance per monostable		[4][5]	-	56	-	pF
<b>T<sub>amb</sub> = -40 °C to +85 °C</b>							
t <sub>PHL</sub>	propagation delay n $\overline{RD}$ , n $\overline{A}$ , nB to n $\overline{Q}$	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 6</a>	-	-	64	ns	
		C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 6</a>	-	-	58	ns	
t <sub>PLH</sub>	propagation delay n $\overline{RD}$ , n $\overline{A}$ , nB to nQ	C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 6</a>	-	-	64	ns	
		C <sub>EXT</sub> = 0 pF; R <sub>EXT</sub> = 5 k $\Omega$ ; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 6</a>	-	-	58	ns	
t <sub>THL</sub> , t <sub>TLH</sub>	output transition time	V <sub>CC</sub> = 4.5 V	-	-	19	ns	
t <sub>W</sub>	trigger pulse width	n $\overline{A}$ = LOW; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a>	25	-	-	ns	
		nB = HIGH; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 7</a>	25	-	-	ns	
	reset pulse width	n $\overline{RD}$ = LOW; V <sub>CC</sub> = 4.5 V; see <a href="#">Figure 8</a>	25	-	-	ns	

**Table 10: Dynamic characteristics type 72HCT123 ...continued**

$GND = 0\text{ V}$ ;  $t_r = t_f = 6\text{ ns}$ ;  $C_L = 50\text{ pF}$ ; unless otherwise specified; see [Figure 9](#).

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b><math>T_{\text{amb}} = -40\text{ °C to }+125\text{ °C}</math></b>						
$t_{\text{PHL}}$	propagation delay $n\overline{RD}$ , $n\overline{A}$ , $nB$ to $n\overline{Q}$	$C_{\text{EXT}} = 0\text{ pF}$ ; $R_{\text{EXT}} = 5\text{ k}\Omega$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	77	ns
	propagation delay $n\overline{RD}$ to $nQ$ (reset)	$C_{\text{EXT}} = 0\text{ pF}$ ; $R_{\text{EXT}} = 5\text{ k}\Omega$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	69	ns
$t_{\text{PLH}}$	propagation delay $n\overline{RD}$ , $n\overline{A}$ , $nB$ to $nQ$	$C_{\text{EXT}} = 0\text{ pF}$ ; $R_{\text{EXT}} = 5\text{ k}\Omega$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	77	ns
	propagation delay $n\overline{RD}$ to $n\overline{Q}$ (reset)	$C_{\text{EXT}} = 0\text{ pF}$ ; $R_{\text{EXT}} = 5\text{ k}\Omega$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a>	-	-	69	ns
$t_{\text{THL}}, t_{\text{TLH}}$	output transition time	$V_{\text{CC}} = 4.5\text{ V}$	-	-	22	ns
$t_{\text{W}}$	trigger pulse width	$n\overline{A} = \text{LOW}$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 7</a>	30	-	-	ns
		$nB = \text{HIGH}$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 7</a>	30	-	-	ns
	reset pulse width	$n\overline{RD} = \text{LOW}$ ; $V_{\text{CC}} = 4.5\text{ V}$ ; see <a href="#">Figure 8</a>	30	-	-	ns

[1] For other  $R_{\text{EXT}}$  and  $C_{\text{EXT}}$  combinations see [Figure 10](#). If  $C_{\text{EXT}} > 10\text{ nF}$ , the next formula is valid:

$t_{\text{W}} = K \times R_{\text{EXT}} \times C_{\text{EXT}}$ , where:

$t_{\text{W}}$  = typical output pulse width in ns;

$R_{\text{EXT}}$  = external resistor in  $\text{k}\Omega$ ;

$C_{\text{EXT}}$  = external capacitor in pF;

$K$  = constant = 0.45 for  $V_{\text{CC}} = 5.0\text{ V}$  and 0.48 for  $V_{\text{CC}} = 2.0\text{ V}$ .

The inherent test jig and pin capacitance at pins 15 and 7 ( $n\text{REXT}/C_{\text{EXT}}$ ) is approximately 7 pF.

[2] The time to retrigger the monostable multivibrator depends on the values of  $R_{\text{EXT}}$  and  $C_{\text{EXT}}$ . The output pulse width will only be extended when the time between the active-going edges of the trigger input pulses meets the minimum retrigger time. If  $C_{\text{EXT}} > 10\text{ pF}$ , the next formula (at  $V_{\text{CC}} = 5.0\text{ V}$ ) for the set-up time of a retrigger pulse is valid:

$t_{\text{rt}} = 30 + 0.19 \times R_{\text{EXT}} \times C_{\text{EXT}}^{0.9} + 13 \times R_{\text{EXT}}^{1.05}$ , where:

$t_{\text{rt}}$  = typical retrigger time in ns;

$C_{\text{EXT}}$  = external capacitor in pF;

$R_{\text{EXT}}$  = external resistor in  $\text{k}\Omega$ .

The inherent test jig and pin capacitance at pins 15 and 7 ( $n\text{REXT}/C_{\text{EXT}}$ ) is 7 pF.

[3] When the device is powered-up, initiate the device via a reset pulse, when  $C_{\text{EXT}} < 50\text{ pF}$ .

[4]  $C_{\text{PD}}$  is used to determine the dynamic power dissipation ( $P_{\text{D}}$  in  $\mu\text{W}$ ):

$P_{\text{D}} = C_{\text{PD}} \times V_{\text{CC}}^2 \times f_i + \sum(C_L \times V_{\text{CC}}^2 \times f_o) + 0.75 \times C_{\text{EXT}} \times V_{\text{CC}}^2 \times f_o + D \times 16 \times V_{\text{CC}}$  where:

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

$D$  = duty factor in %;

$C_L$  = output load capacitance in pF;

$V_{\text{CC}}$  = supply voltage in V;

$C_{\text{EXT}}$  = timing capacitance in pF;

$\sum(C_L \times V_{\text{CC}}^2 \times f_o)$  sum of outputs.

[5] The condition is  $V_I = GND$  to  $V_{\text{CC}} - 1.5\text{ V}$ .

12. Waveforms

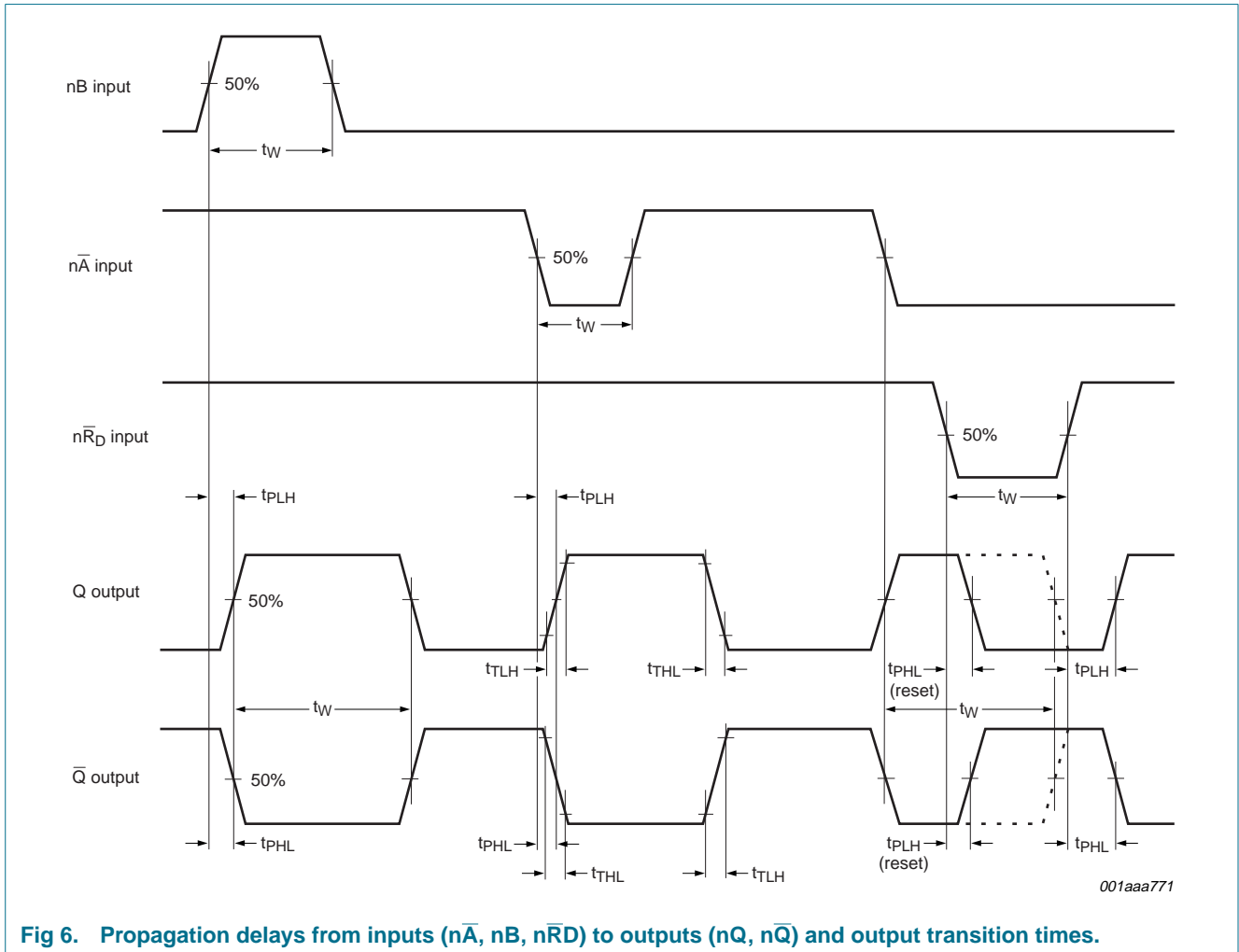


Fig 6. Propagation delays from inputs ( $n\bar{A}$ ,  $nB$ ,  $n\bar{RD}$ ) to outputs ( $nQ$ ,  $n\bar{Q}$ ) and output transition times.

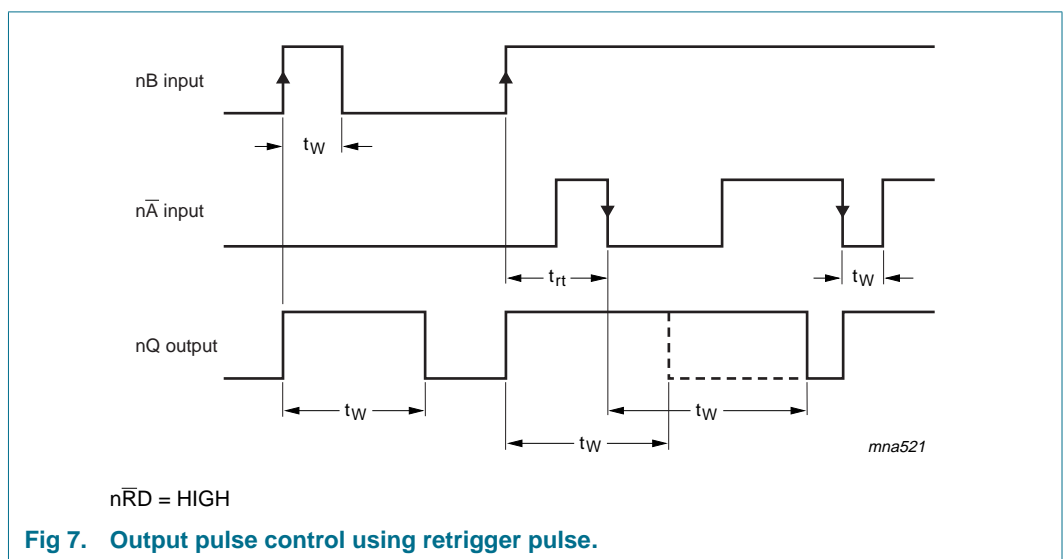
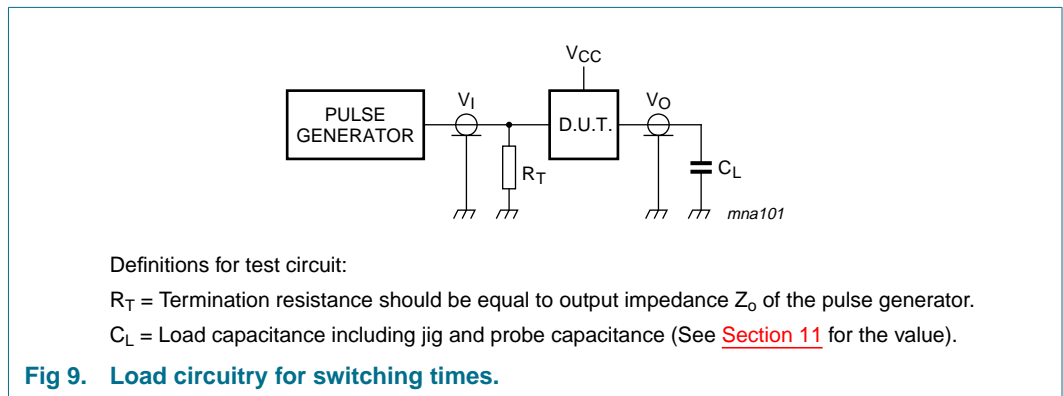
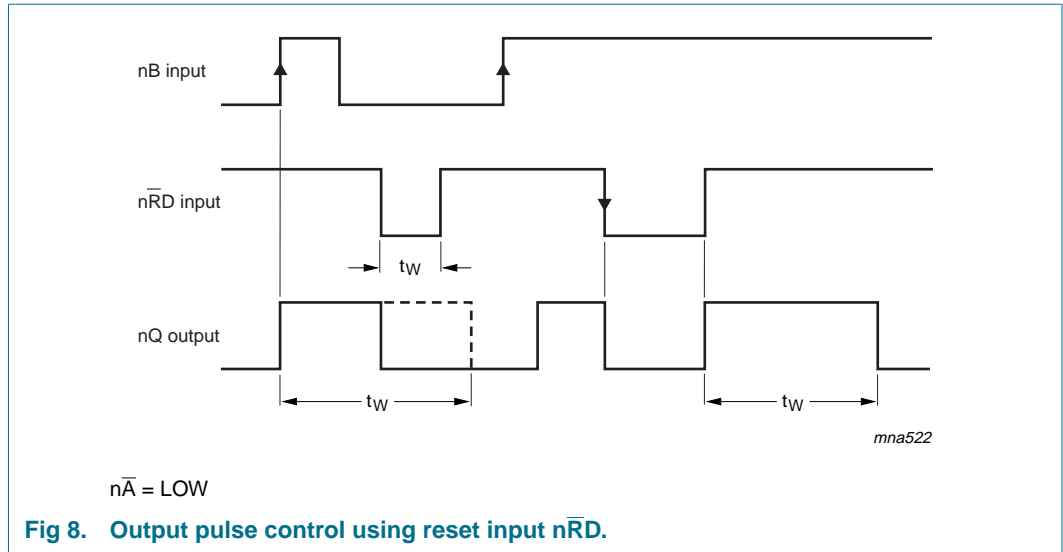
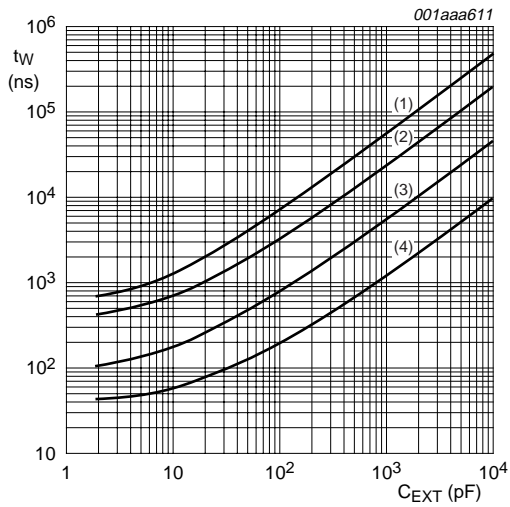


Fig 7. Output pulse control using retrigger pulse.



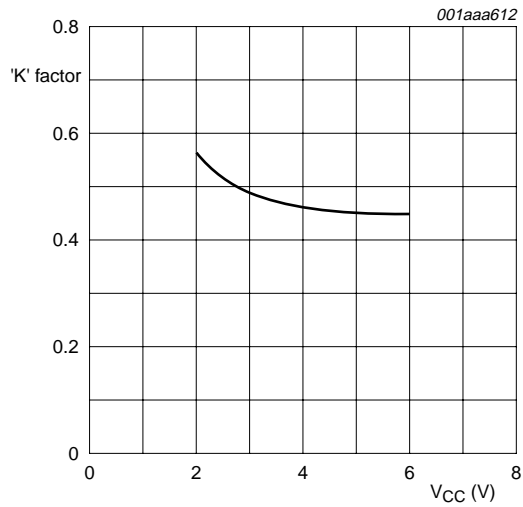




$V_{CC} = 5.0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}.$

- (1)  $R_{EXT} = 100 \text{ k}\Omega$
- (2)  $R_{EXT} = 50 \text{ k}\Omega$
- (3)  $R_{EXT} = 10 \text{ k}\Omega$
- (4)  $R_{EXT} = 2 \text{ k}\Omega$

Fig 10. Typical output pulse width as a function of the external capacitor value.



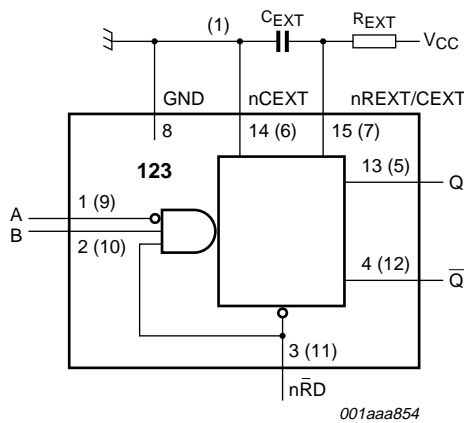
$C_X = 10 \text{ nF}; R_X = 10 \text{ k}\Omega \text{ to } 100 \text{ k}\Omega$

Fig 11. 74HCT123 typical 'K' factor as function of  $V_{CC}$ .

### 13. Application information

#### 13.1 Timing component connections

The basic output pulse width is essentially determined by the values of the external timing components  $R_{EXT}$  and  $C_{EXT}$ .



- (1) For minimum noise generation it is recommended to ground pins 6 (2CEXT) and 14 (1CEXT) externally to pin 8 (GND).

Fig 12. Timing component connections.

### 13.2 Power-up considerations

When the monostable is powered-up it may produce an output pulse, with a pulse width defined by the values of  $R_{EXT}$  and  $C_{EXT}$ . This output pulse can be eliminated using the circuit shown in [Figure 13](#).

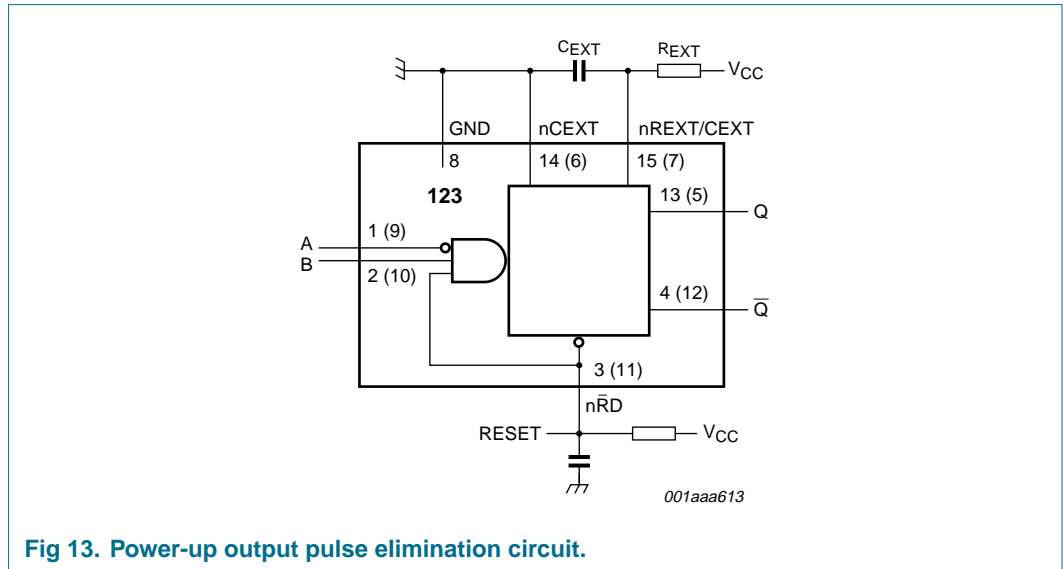


Fig 13. Power-up output pulse elimination circuit.

### 13.3 Power-down considerations

A large capacitor  $C_{EXT}$  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, use a damping diode ( $D_{EXT}$ ) preferably a germanium or Schottky type diode able to withstand large current surges and connect as shown in [Figure 14](#).

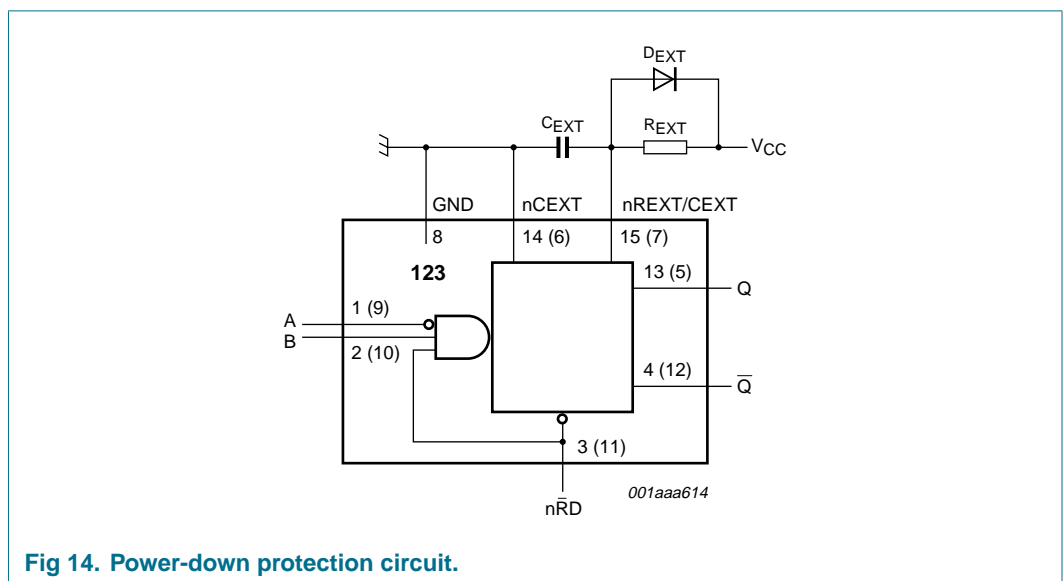


Fig 14. Power-down protection circuit.

14. Package outline

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

SOT38-1

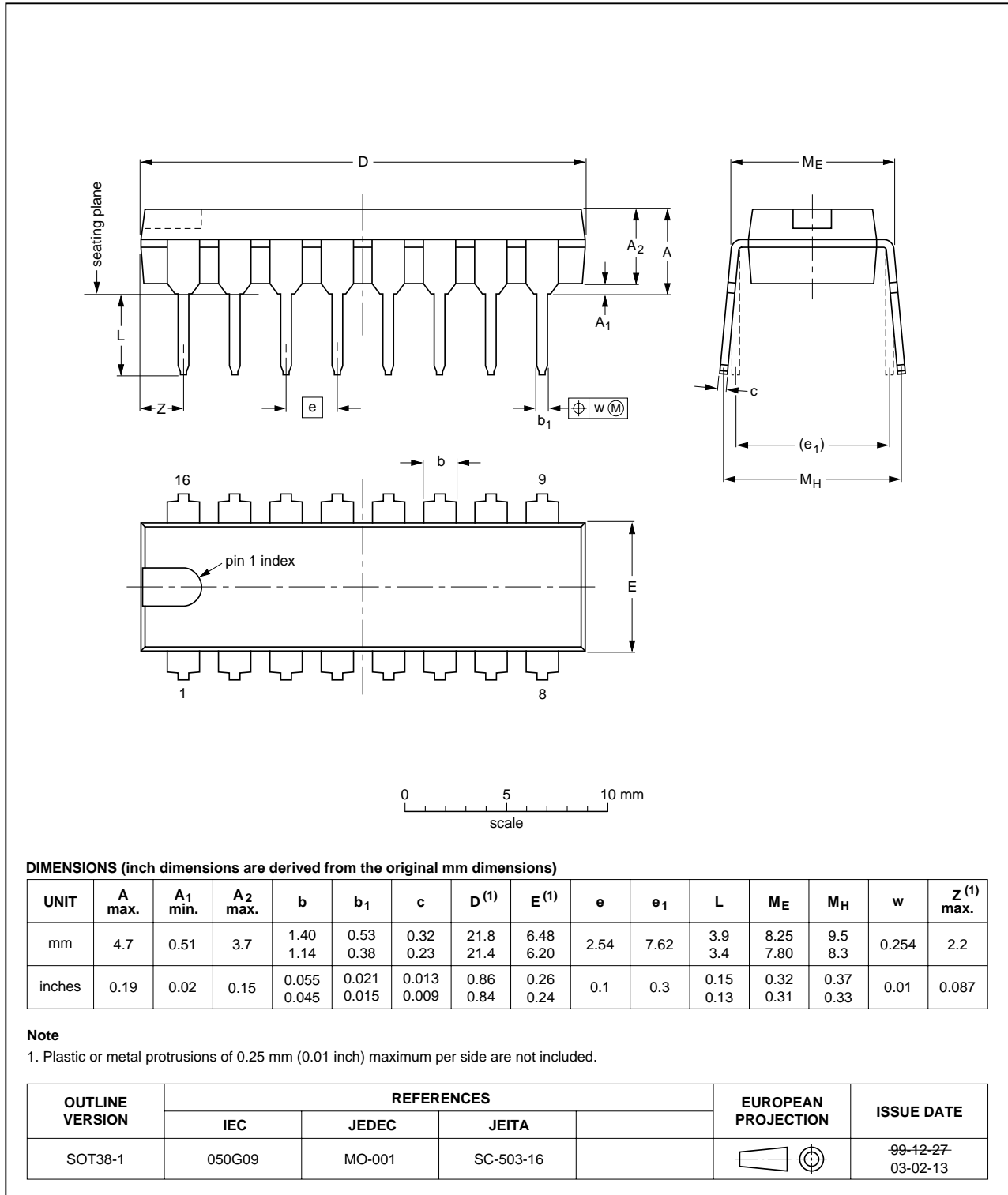


Fig 15. Package outline DIP16.

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

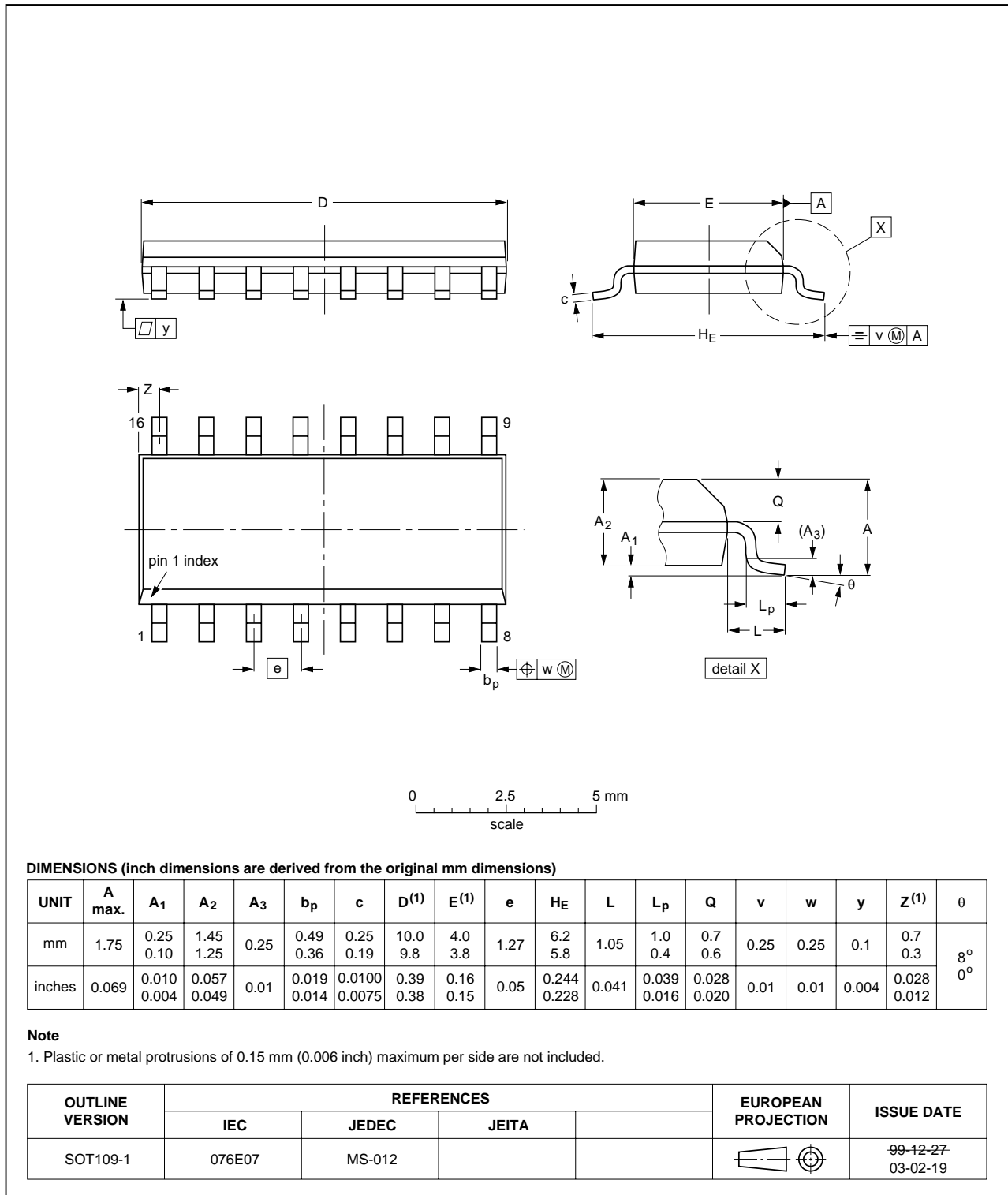


Fig 16. Package outline SO16.

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

SOT338-1

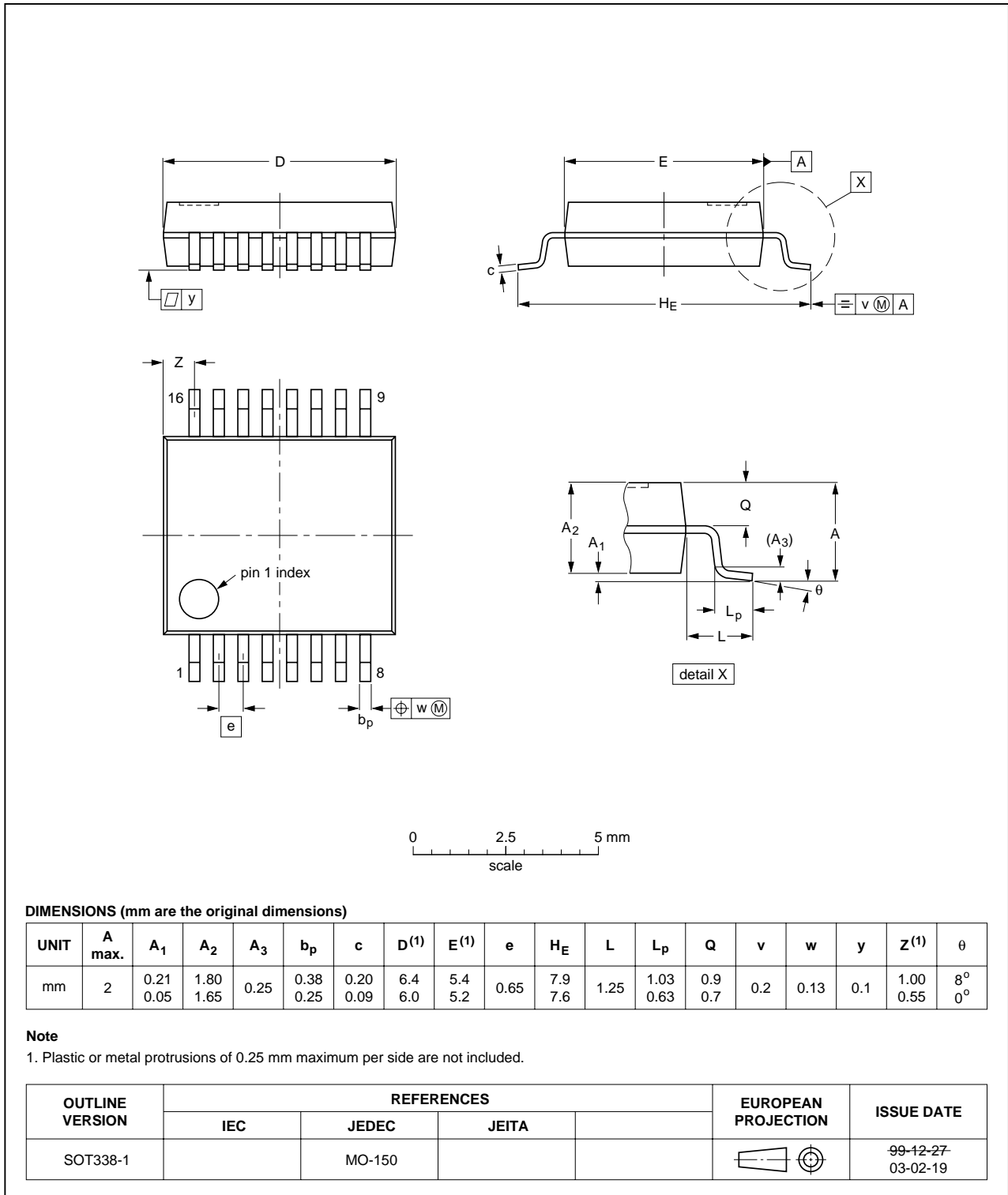


Fig 17. Package outline SSOP16.

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

SOT403-1

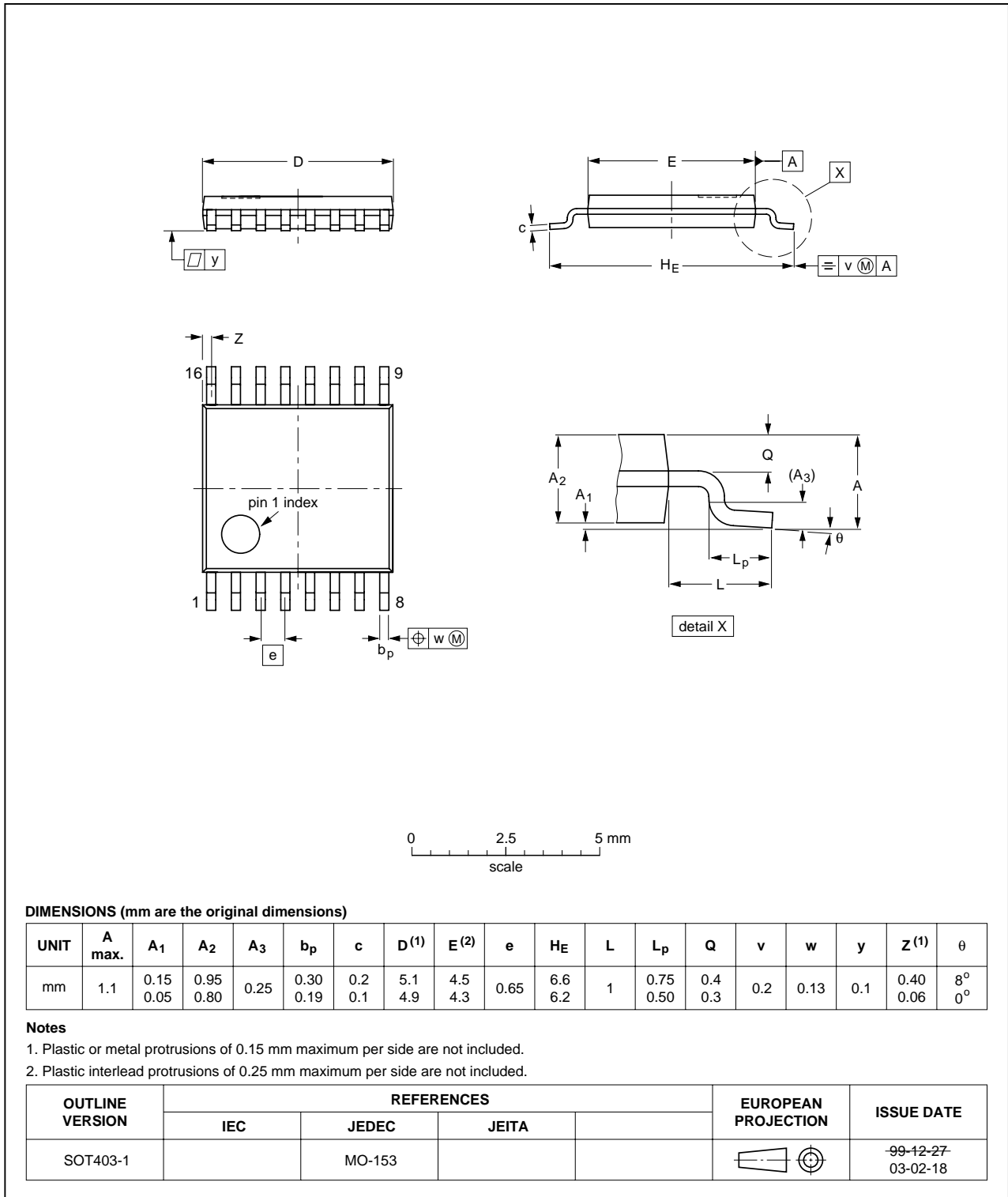


Fig 18. Package outline TSSOP16.

## 15. Revision history

Table 11: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
74HC_HCT123_3	20040511	Product data	-	9397 750 13024	74HC_HCT123_2
Modifications:					
					<ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the current presentation and information standard of Philips Semiconductors.</li><li>• <a href="#">Section 2 on page 1</a>: ESD clause added</li><li>• <a href="#">Section 8 on page 6</a>, <a href="#">Section 9 on page 7</a>, and <a href="#">Section 10 on page 7</a>: These sections replace references to family specifications</li><li>• <a href="#">Table note 1 on page 13</a>: Changed 'K' factor from 0.55 to 0.45</li><li>• <a href="#">Table note 1 on page 15</a>: Changed 'K' factor from 0.55 to 0.45</li></ul>
74HCHCT123_2	19980708	Product specification	-	-	74HC_HCT123_1



## 16. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2]</sup> <sup>[3]</sup>	Definition
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.
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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