74HC123; 74HCT123

Dual retriggerable monostable multivibrator with reset

Rev. 10 — 3 December 2015 Product data sheet

1. General description

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 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 ($n\overline{A}$) or the active HIGH-going edge input (nB). By repeating this process, the output pulse period (nQ = HIGH, $n\overline{Q}$ = 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 $n\overline{RD}$, which also inhibits the triggering.
3. An internal connection from $n\overline{RD}$ to the input gates makes it possible to trigger the circuit by a HIGH-going signal at input $n\overline{RD}$ as shown in Table 3.

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

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

2. Features and benefits

- 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 JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
- Specified from −40 °C to +85 °C and from −40 °C to +125 °C

3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74HC123D	–40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74HCT123D				
74HC123DB	–40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74HCT123DB				
74HC123PW	–40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74HCT123PW				
74HC123BQ	–40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1

4. Functional diagram

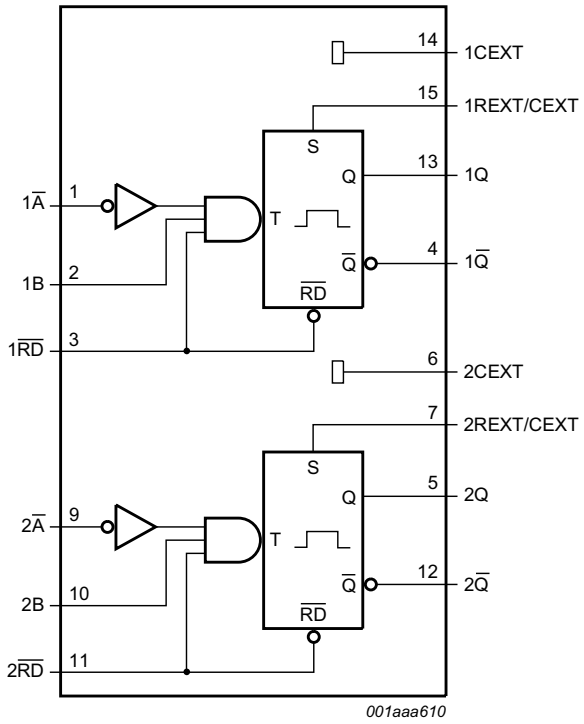


Fig 1. Functional diagram

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

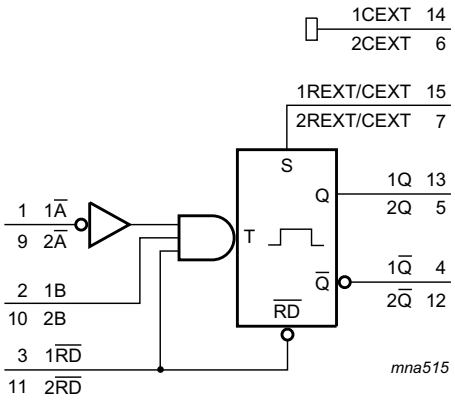


Fig 2. Logic symbol

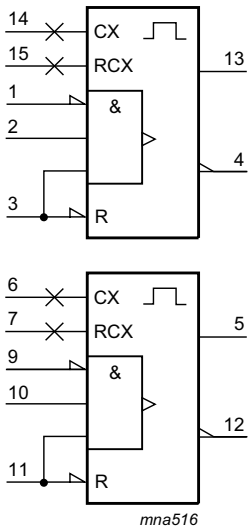


Fig 3. IEC logic symbol

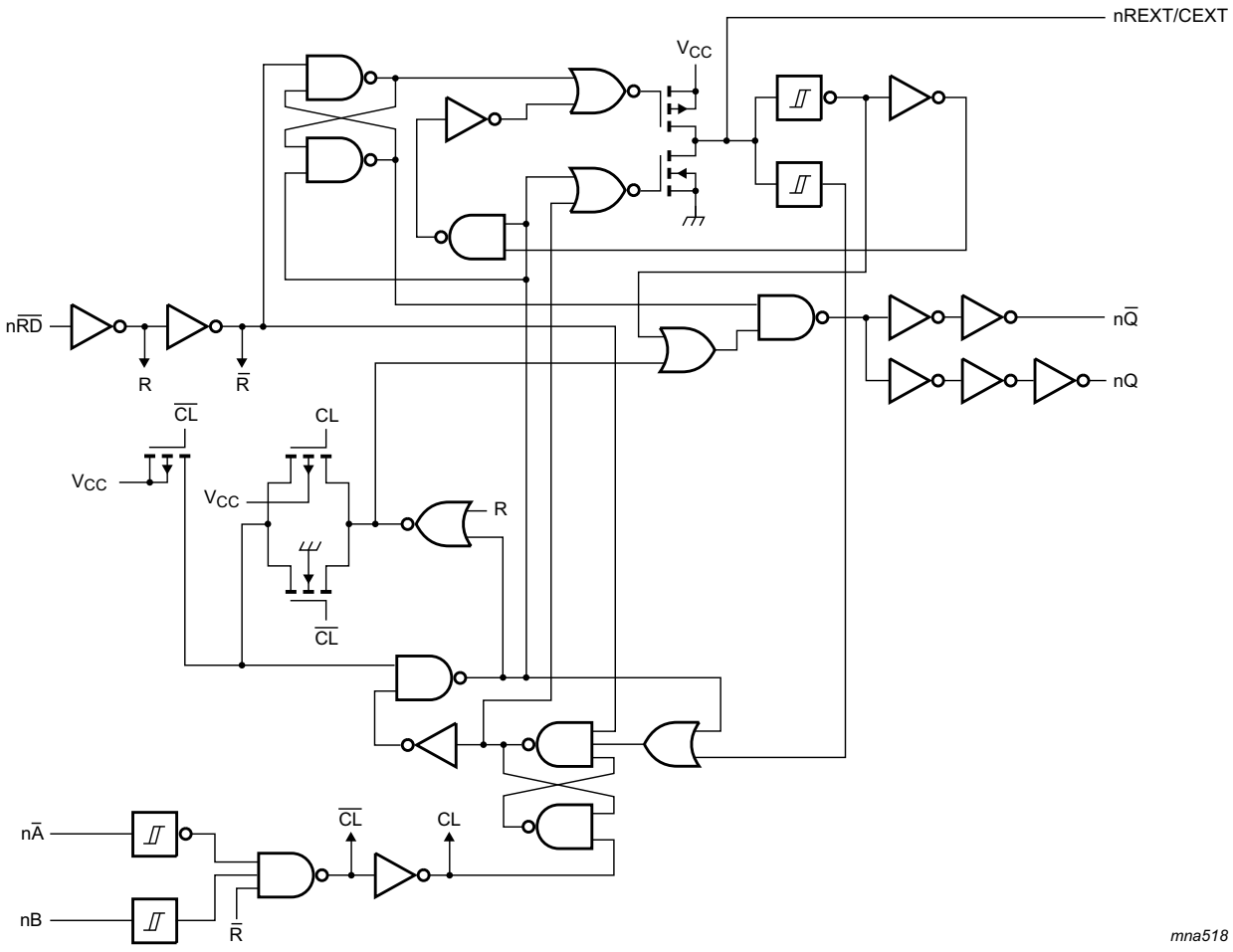


Fig 4. Logic diagram

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

5. Pinning information

5.1 Pinning

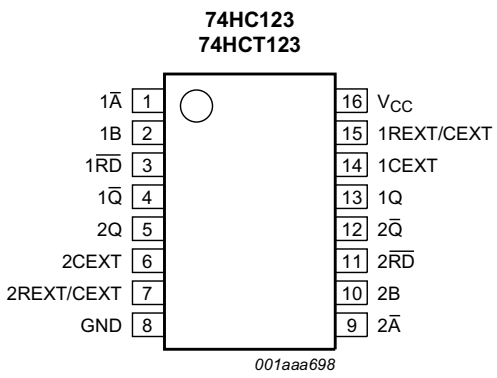
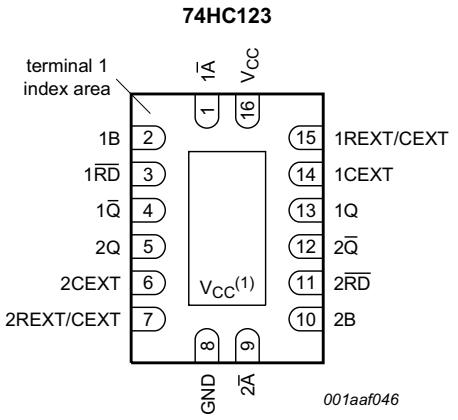


Fig 5. Pin configuration for SO16, SSOP16 and TSSOP16



Transparent top view

(1) This is not a supply pin. The substrate is attached to this pad using conductive die attach material. There is no electrical or mechanical requirement to solder this pad. However, if it is soldered, the solder land should remain floating or be connected to V_{CC}.

Fig 6. Pin configuration for DHVQFN16

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
$1\overline{A}$	1	negative-edge triggered input 1
1B	2	positive-edge triggered input 1
$1\overline{RD}$	3	direct reset LOW and positive-edge triggered input 1
$1\overline{Q}$	4	active LOW output 1
2Q	5	active HIGH output 2
2CEXT	6	external capacitor connection 2
2REXT/CEXT	7	external resistor and capacitor connection 2
GND	8	ground (0 V)
$2\overline{A}$	9	negative-edge triggered input 2
2B	10	positive-edge triggered input 2
$2\overline{RD}$	11	direct reset LOW and positive-edge triggered input 2
$2\overline{Q}$	12	active LOW output 2
1Q	13	active HIGH output 1
1CEXT	14	external capacitor connection 1
1REXT/CEXT	15	external resistor and capacitor connection 1
V_{CC}	16	supply voltage

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

6. Functional description

Table 3. Function table[1]

Input			Output	
$\overline{nRD}$	**$n\overline{A}$**	**nB**	**nQ**	**$n\overline{Q}$**
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.

7. Limiting values

Table 4. 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 clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V	-	±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V	-	±20	mA
I_O	output current	except for pins nREXT/CEXT; $V_O = -0.5$ V to $(V_{CC} + 0.5$ V)	-	±25	mA
I_{CC}	supply current		-	50	mA
I_{GND}	ground current		-	−50	mA
T_{stg}	storage temperature		−65	+150	°C
P_{tot}	total power dissipation	SO16 package [1]	-	500	mW
		SSOP16 package [2]	-	500	mW
		TSSOP16 package [2]	-	500	mW
		DHVQFN16 package [3]	-	500	mW

[1] For SO16 package: P_{tot} derates linearly with 8 mW/K above 70 °C.

[2] For SSOP16 and TSSOP16 packages: P_{tot} derates linearly with 5.5 mW/K above 60 °C.

[3] For DHVQFN16 package: P_{tot} derates linearly with 4.5 mW/K above 60 °C.

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	74HC123			74HCT123			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.0	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0	-	V_{CC}	0	-	V_{CC}	V
V_O	output voltage		0	-	V_{CC}	0	-	V_{CC}	V
$\Delta t/\Delta V$	input transition rise and fall rate	$n\overline{RD}$ input							
		V_{CC} = 2.0 V	-	-	625	-	-	-	ns/V
		V_{CC} = 4.5 V	-	1.67	139	-	1.67	139	ns/V
		V_{CC} = 6.0 V	-	-	83	-	-	-	ns/V
T_{amb}	ambient temperature		−40	+25	+125	−40	+25	+125	°C

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	25 °C			−40 °C to +85 °C		−40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC123										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	1.2	-	1.5	-	1.5	-	V
		V_{CC} = 4.5 V	3.15	2.4	-	3.15	-	3.15	-	V
		V_{CC} = 6.0 V	4.2	3.2	-	4.2	-	4.2	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	0.8	0.5	-	0.5	-	0.5	V
		V_{CC} = 4.5 V	-	2.1	1.35	-	1.35	-	1.35	V
		V_{CC} = 6.0 V	-	2.8	1.8	-	1.8	-	1.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = −20 μA; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I_O = −20 μA; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = −20 μA; V_{CC} = 6.0 V	5.9	6.0	-	5.9	-	5.9	-	V
		I_O = −4 mA; V_{CC} = 4.5 V	3.98	4.32	-	3.84	-	3.7	-	V
		I_O = −5.2 mA; V_{CC} = 6.0 V	5.48	5.81	-	5.34	-	5.2	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = 20 μA; V_{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 20 μA; V_{CC} = 6.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 4 mA; V_{CC} = 4.5 V	-	0.15	0.26	-	0.33	-	0.4	V
		I_O = 5.2 mA; V_{CC} = 6.0 V	-	0.16	0.26	-	0.33	-	0.4	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 6.0 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 6.0 V	-	-	8.0	-	80	-	160	μA

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

Table 6. Static characteristics *…continued*

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

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
C_I	input capacitance		-	3.5	-	-	-	-	-	pF
74HCT123										
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	1.6	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	1.2	0.8	-	0.8	-	0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		I_O = –20 μA	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –4 mA	3.98	4.32	-	3.84	-	3.7	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V								
		I_O = 20 μA	-	0	0.1	-	0.1	-	0.1	V
		I_O = 4.0 mA	-	0.15	0.26	-	0.33	-	0.4	V
I_I	input leakage current	V_I = V_{CC} or GND; V_{CC} = 5.5 V	-	-	±0.1	-	±1.0	-	±1.0	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	8.0	-	80	-	160	μA
ΔI_{CC}	additional supply current	per input pin; I_O = 0 A; V_I = V_{CC} − 2.1 V; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V								
		pins $n\overline{A}$, nB	-	35	125	-	160	-	170	μA
		pin $n\overline{RD}$	-	50	180	-	225	-	245	μA
C_I	input capacitance		-	3.5	-	-	-	-	-	pF

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

10. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit see Figure 12.

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74HC123										
t_{pd}	propagation delay	$n\overline{RD}$, $n\overline{A}$, nB to nQ or $n\overline{Q}$; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; see Figure 9 [1]								
		V_{CC} = 2.0 V	-	83	255	-	320	-	385	ns
		V_{CC} = 4.5 V	-	30	51	-	64	-	77	ns
		V_{CC} = 5 V; C_L = 15 pF	-	26	-	-	-	-	-	ns
		V_{CC} = 6.0 V	-	24	43	-	54	-	65	ns
		$n\overline{RD}$ (reset) to nQ or $n\overline{Q}$; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; see Figure 9								
		V_{CC} = 2.0 V	-	66	215	-	270	-	325	ns
		V_{CC} = 4.5 V	-	24	43	-	54	-	65	ns
		V_{CC} = 5 V; C_L = 15 pF	-	20	-	-	-	-	-	ns
		V_{CC} = 6.0 V	-	19	37	-	46	-	55	ns
t_t	transition time	see Figure 9 [1]								
		V_{CC} = 2.0 V	-	19	75	-	95	-	110	ns
		V_{CC} = 4.5 V	-	7	15	-	19	-	22	ns
		V_{CC} = 6.0 V	-	6	13	-	16	-	19	ns
t_W	pulse width	$n\overline{A}$ LOW; see Figure 10								
		V_{CC} = 2.0 V	100	8	-	125	-	150	-	ns
		V_{CC} = 4.5 V	20	3	-	25	-	30	-	ns
		V_{CC} = 6.0 V	17	2	-	21	-	26	-	ns
		nB HIGH; see Figure 10								
		V_{CC} = 2.0 V	100	17	-	125	-	150	-	ns
		V_{CC} = 4.5 V	20	6	-	25	-	30	-	ns
		V_{CC} = 6.0 V	17	5	-	21	-	26	-	ns
		$n\overline{RD}$ LOW; see Figure 11								
		V_{CC} = 2.0 V	100	14	-	125	-	150	-	ns
		V_{CC} = 4.5 V	20	5	-	25	-	30	-	ns
		V_{CC} = 6.0 V	17	4	-	21	-	26	-	ns
		nQ HIGH and $n\overline{Q}$ LOW; V_{CC} = 5.0 V; see Figure 10 and 11 [2]								
		C_{EXT} = 100 nF; R_{EXT} = 10 kΩ	-	450	-	-	-	-	-	µs
		C_{EXT} = 0 pF; R_{EXT} = 5 kΩ	-	75	-	-	-	-	-	ns

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

Table 7. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit see Figure 12.

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_{rtrig}	retrigger time	$n\overline{A}$, nB; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; V_{CC} = 5.0 V; see Figure 10 [3][4]	-	110	-	-	-	-	-	ns
R_{EXT}	external timing resistor	see Figure 7								
		V_{CC} = 2.0 V	10	-	1000	-	-	-	-	kΩ
		V_{CC} = 5.0 V	2	-	1000	-	-	-	-	kΩ
C_{EXT}	external timing capacitor	V_{CC} = 5.0 V; see Figure 7 [4]	-	-	-	-	-	-	-	pF
C_{PD}	power dissipation capacitance	per monostable; V_I = GND to V_{CC} [5]	-	54	-	-	-	-	-	pF
74HCT123										
t_{PHL}	HIGH to LOW propagation delay	$n\overline{RD}$, $n\overline{A}$, nB to nQ or $n\overline{Q}$; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; see Figure 9								
		V_{CC} = 4.5 V	-	30	51	-	64	-	77	ns
		V_{CC} = 5 V; C_L = 15 pF	-	26	-	-	-	-	-	ns
		$n\overline{RD}$ (reset) to nQ or $n\overline{Q}$; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; see Figure 9								
		V_{CC} = 4.5 V	-	27	46	-	58	-	69	ns
		V_{CC} = 5 V; C_L = 15 pF	-	23	-	-	-	-	-	ns
t_{PLH}	LOW to HIGH propagation delay	$n\overline{RD}$, $n\overline{A}$, nB to nQ or $n\overline{Q}$; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; see Figure 9								
		V_{CC} = 4.5 V	-	28	51	-	64	-	77	ns
		V_{CC} = 5 V; C_L = 15 pF	-	26	-	-	-	-	-	ns
		$n\overline{RD}$ (reset) to nQ or $n\overline{Q}$; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; see Figure 9								
		V_{CC} = 4.5 V	-	23	46	-	58	-	69	ns
		V_{CC} = 5 V; C_L = 15 pF	-	23	-	-	-	-	-	ns
t_t	transition time	V_{CC} = 4.5 V; see Figure 9 [1]	-	7	15	-	19	-	22	ns

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

Table 7. Dynamic characteristics *...continued*

Voltages are referenced to GND (ground = 0 V); C_L = 50 pF unless otherwise specified; for test circuit see Figure 12.

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
t_W	pulse width	V_{CC} = 4.5 V								
		$n\overline{A}$ LOW; see Figure 10	20	3	-	25	-	30	-	ns
		nB HIGH; see Figure 10	20	5	-	25	-	30	-	ns
		$n\overline{RD}$ LOW; see Figure 11	20	7	-	25	-	30	-	ns
		nQ HIGH and $n\overline{Q}$ LOW; V_{CC} = 5.0 V; see Figure 10 and 11 [2]								
		C_{EXT} = 100 nF; R_{EXT} = 10 kΩ	-	450	-	-	-	-	-	µs
		C_{EXT} = 0 pF; R_{EXT} = 5 kΩ	-	75	-	-	-	-	-	ns
t_{rtrig}	retrigger time	$n\overline{A}$, nB; C_{EXT} = 0 pF; R_{EXT} = 5 kΩ; V_{CC} = 5.0 V; see Figure 10 [3][4]	-	110	-	-	-	-	-	ns
R_{EXT}	external timing resistor	V_{CC} = 5.0 V; see Figure 7	2	-	1000	-	-	-	-	kΩ
C_{EXT}	external timing capacitor	V_{CC} = 5.0 V; see Figure 7 [4]	-	-	-	-	-	-	-	pF
C_{PD}	power dissipation capacitance	per monostable; V_I = GND to V_{CC} − 1.5 V [5]	-	56	-	-	-	-	-	pF

[1] t_{pd} is the same as t_{PHL} and t_{PLH}; t_t is the same as t_{THL} and t_{TLH}

[2] For other R_{EXT} and C_{EXT} combinations see Figure 7. 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 kΩ;

C_{EXT} = external capacitor in pF;

K = constant = 0.45 for V_{CC} = 5.0 V and 0.55 for V_{CC} = 2.0 V.

The inherent test jig and pin capacitance at pins 15 and 7 (nREXT/CEXT) is approximately 7 pF.

[3] 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 setup time of a retrigger pulse is valid:

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

t_{rtrig} = retrigger time in ns;

C_{EXT} = external capacitor in pF; R_{EXT} = external resistor in kΩ.

The inherent test jig and pin capacitance at pins 15 and 7 (nREXT/CEXT) is 7 pF.

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

[5] C_{PD} is used to determine the dynamic power dissipation (P_D in µW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

D = duty factor in %;

C_L = output load capacitance in pF;

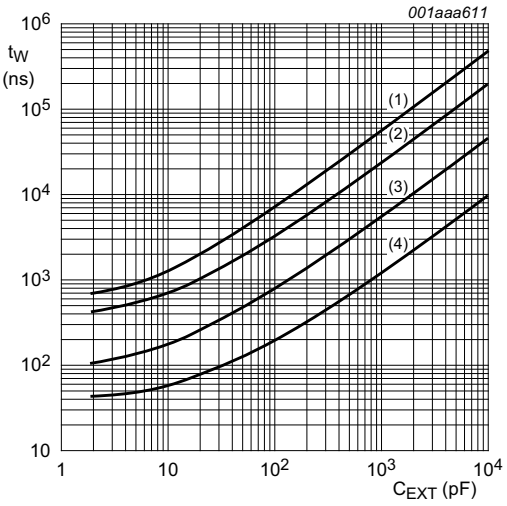
V_{CC} = supply voltage in V;

C_{EXT} = timing capacitance in pF;

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

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved



V_{CC} = 5.0 V; T_{amb} = 25 °C.

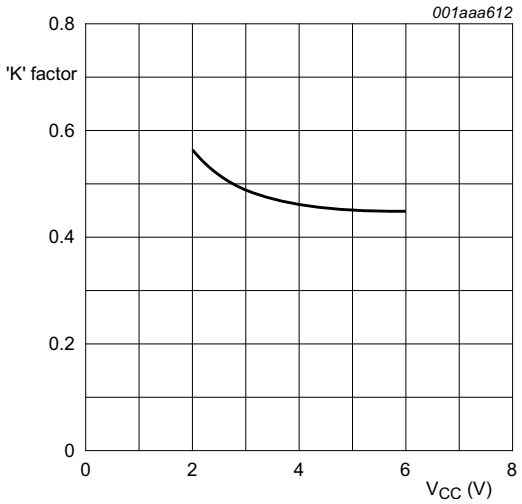
(1) R_{EXT} = 100 kΩ

(2) R_{EXT} = 50 kΩ

(3) R_{EXT} = 10 kΩ

(4) R_{EXT} = 2 kΩ

Fig 7. Typical output pulse width as a function of the external capacitor value



C_{EXT} = 10 nF; R_{EXT} = 10 kΩ to 100 kΩ.

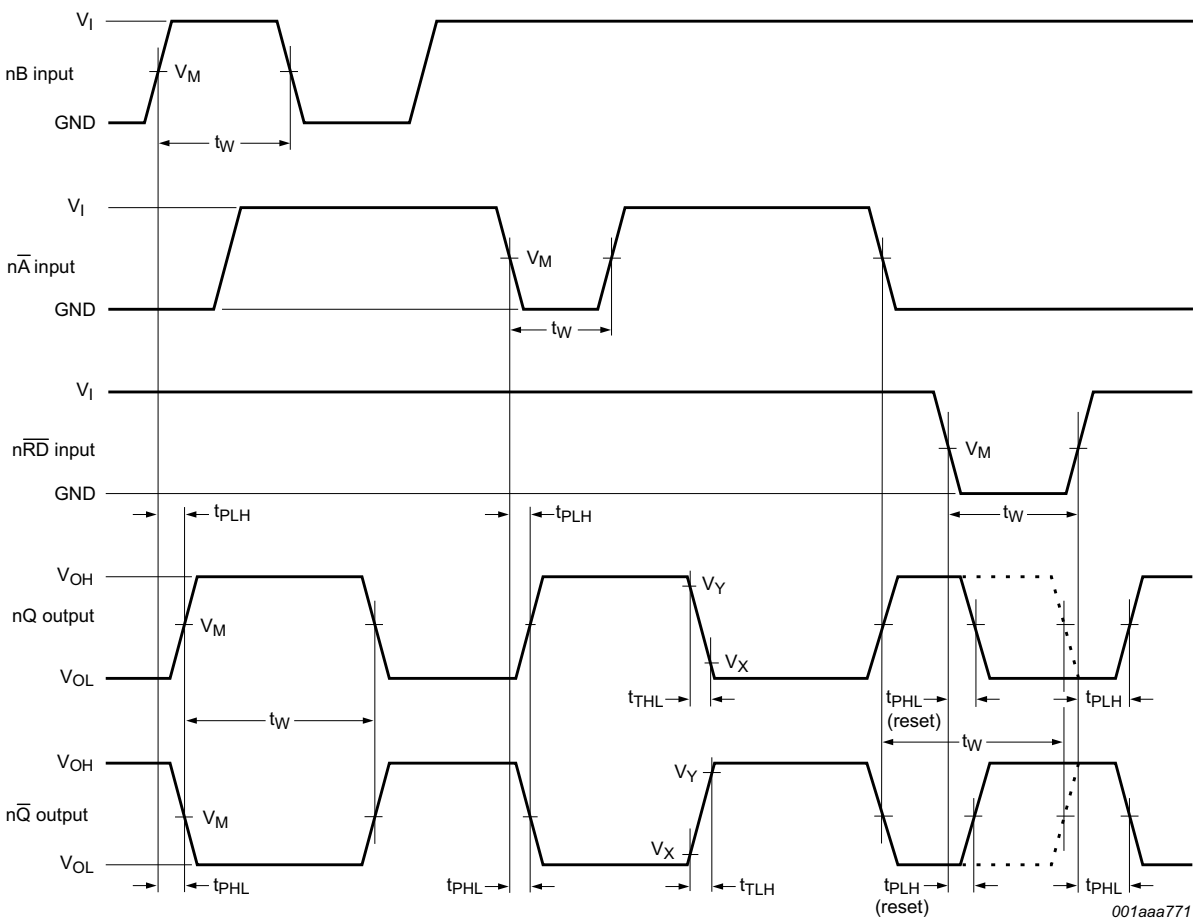
T_{amb} = 25 °C.

Fig 8. 74HC123 typical 'K' factor as function of V_{CC}

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

11. Waveforms



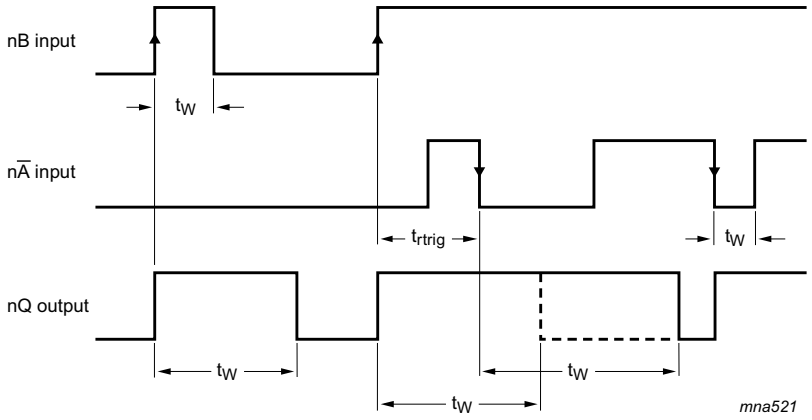
Measurement points are given in Table 8.

V_{OL} and V_{OH} are typical voltage output levels that occur with the output load.

Fig 9. Propagation delays from inputs ($\overline{nA}$, nB, $\overline{nRD}$) to outputs (nQ, $\overline{nQ}$) and output transition times

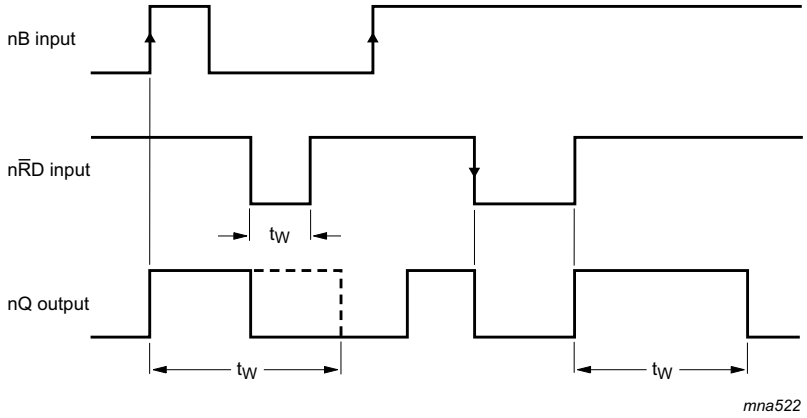
All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved



nR̅D̅ = HIGH

Fig 10. Output pulse control using retrigger pulse

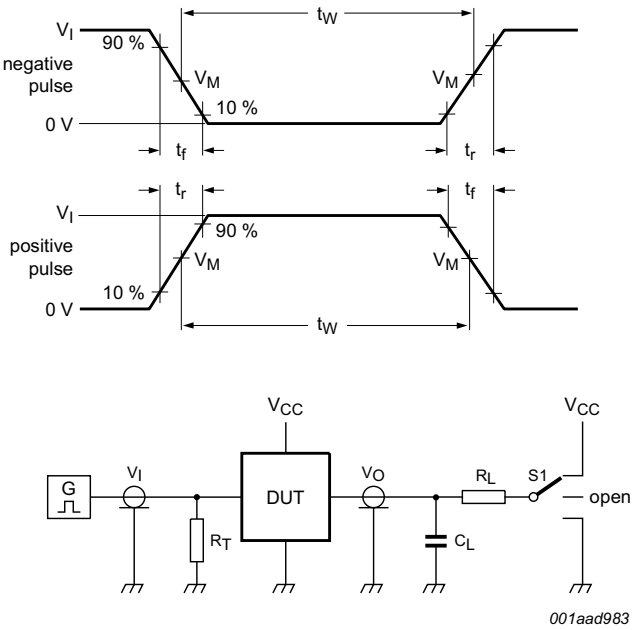


nA̅ = LOW

Fig 11. Output pulse control using reset input nR̅D̅

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved



Test data is given in Table 8.

Definitions test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

S1 = Test selection switch.

Fig 12. Test circuit for measuring switching times

Table 8. Test data

Type	Input		Load		S1 position
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}
74HC123	V_{CC}	6 ns	15 pF, 50 pF	1 kΩ	open
74HCT123	3 V	6 ns	15 pF, 50 pF	1 kΩ	open

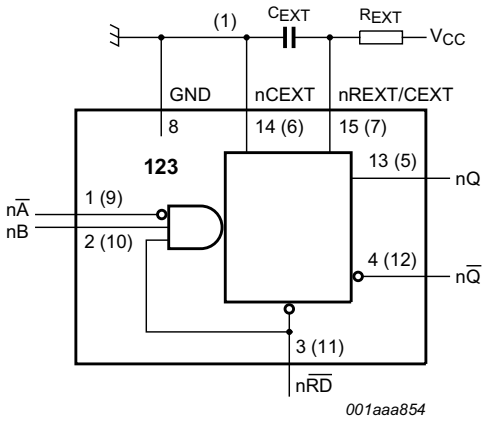
All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

12. Application information

12.1 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 13. Timing component connections

12.2 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 14.

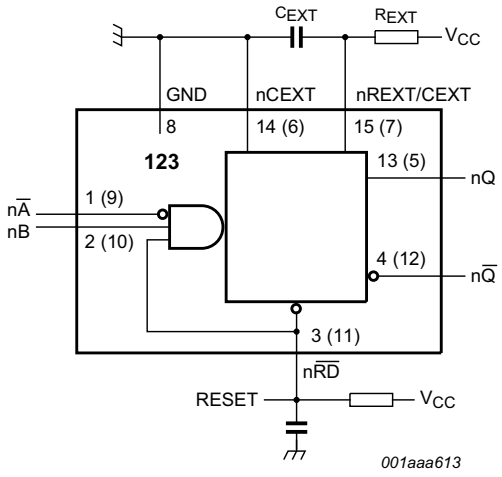


Fig 14. Power-up output pulse elimination circuit

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

12.3 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 15.

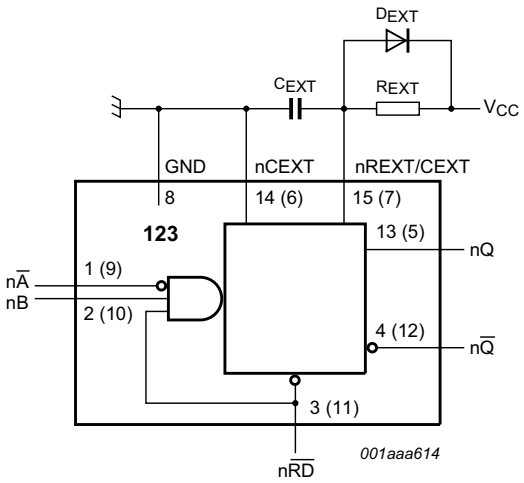


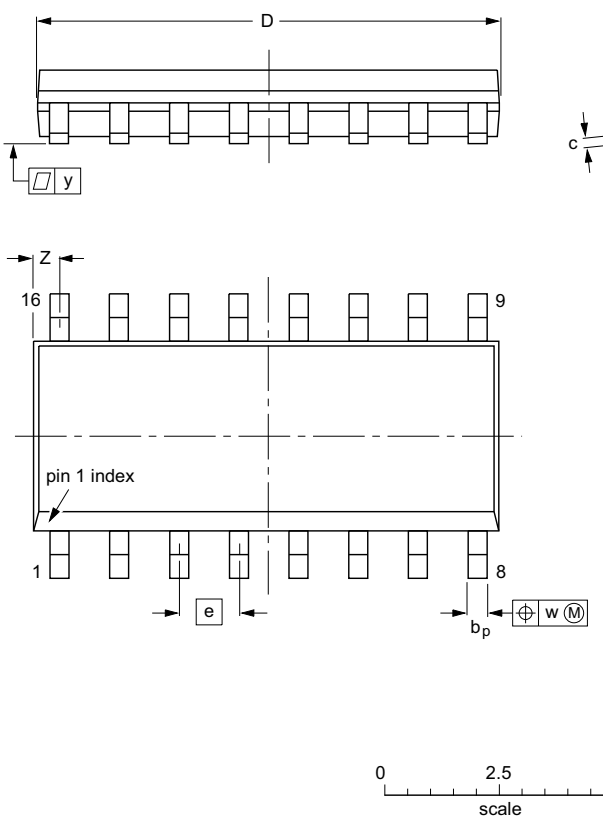
Fig 15. Power-down protection circuit

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

13. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm **SOT109-1**



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

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

Note

1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

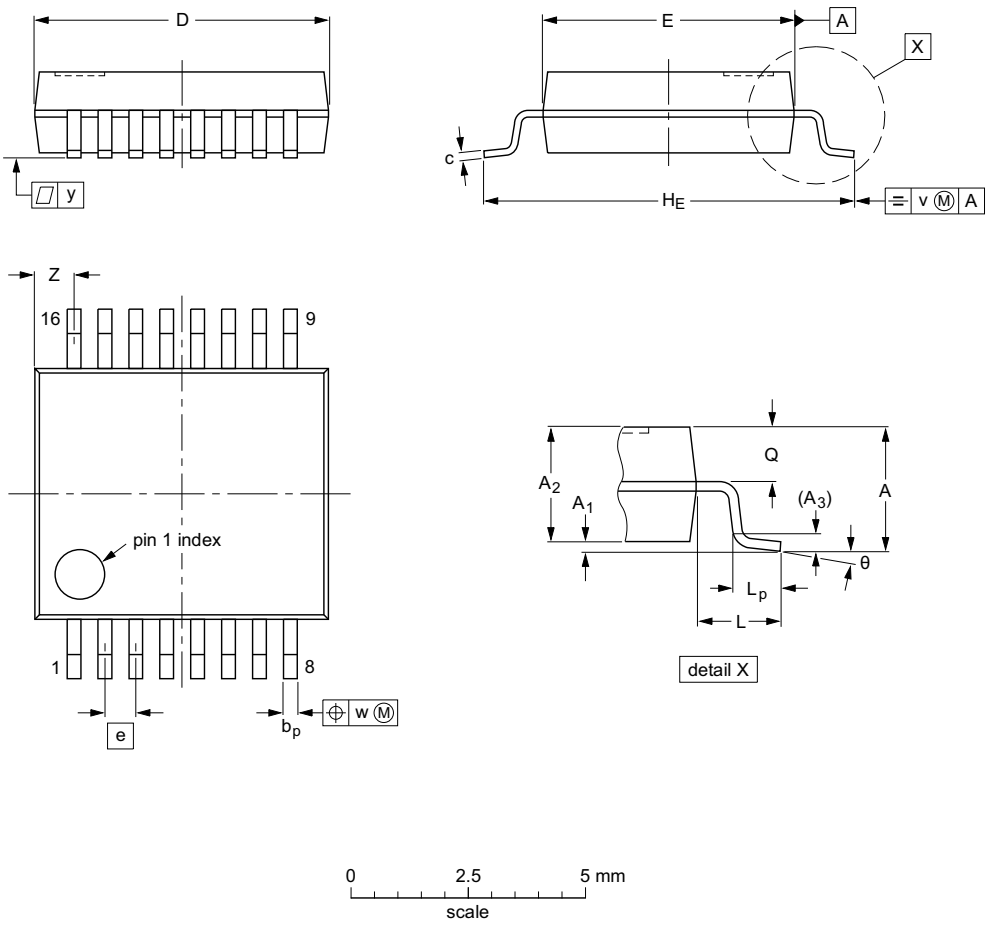
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				~~99-12-27~~ 03-02-19

Fig 16. Package outline SOT109-1 (SO16)

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm **SOT338-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.00 0.55	8° 0°

Note

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

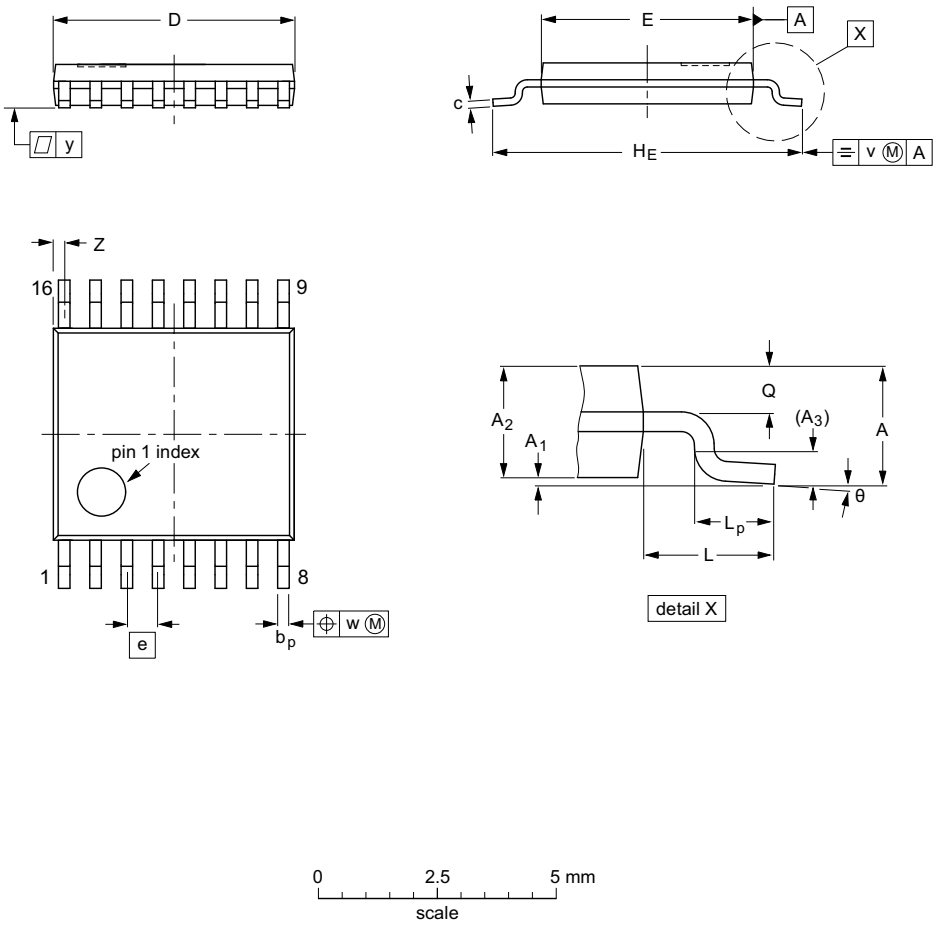
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT338-1		MO-150				~~99-12-27~~ 03-02-19

Fig 17. Package outline SOT338-1 (SSOP16)

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm **SOT403-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

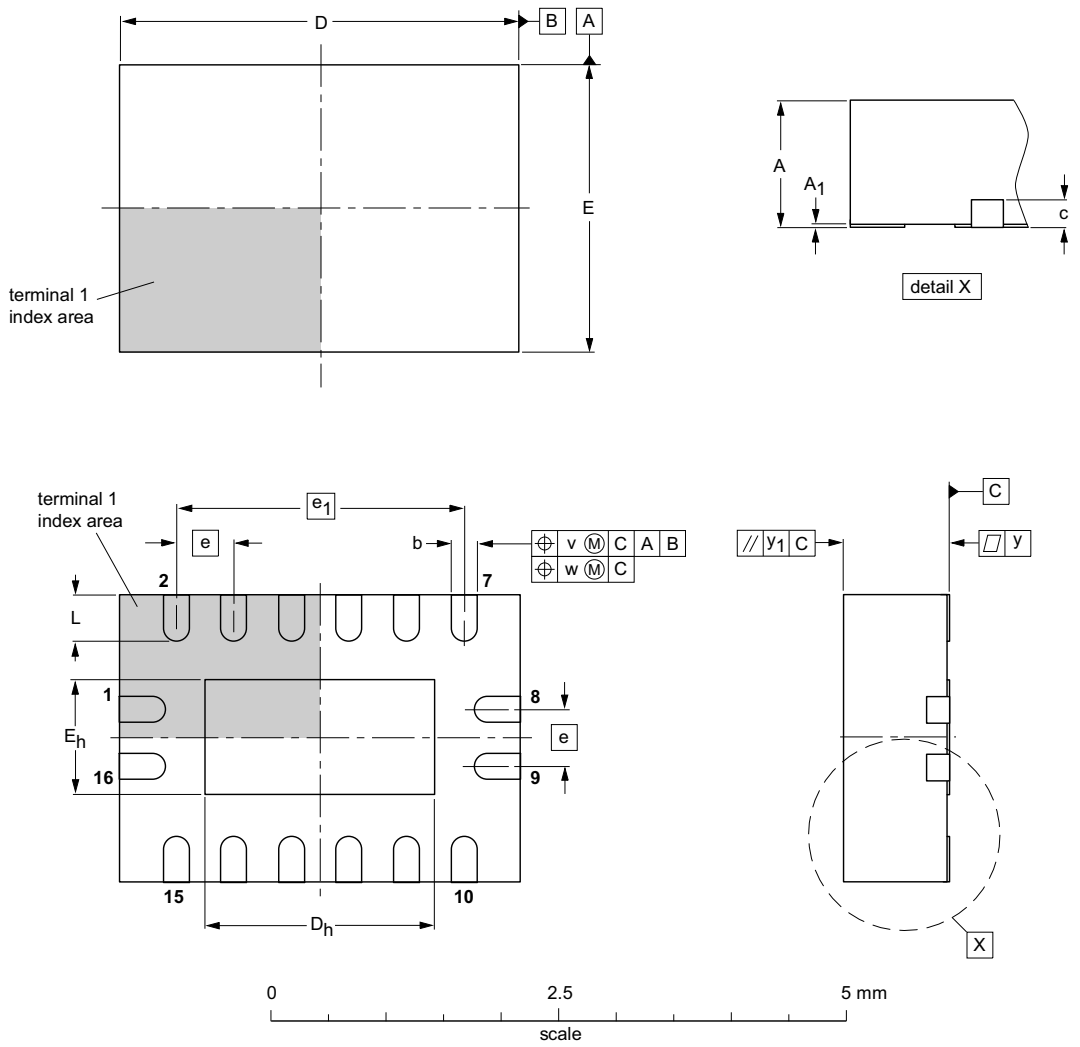
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				~~99-12-27~~ 03-02-18

Fig 18. Package outline SOT403-1 (TSSOP16)

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm **SOT763-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	3.6 3.4	2.15 1.85	2.6 2.4	1.15 0.85	0.5	2.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT763-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

Fig 19. Package outline SOT763-1 (DHVQFN16)

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

14. Abbreviations

Table 9. Abbreviations

Acronym	Abbreviation
CMOS	Complementary Metal Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
LSTTL	Low-power Schottky Transistor-Transistor Logic
MM	Machine Model

15. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74HC_HCT123 v.10	20151203	Product data sheet	-	74HC_HCT123 v.9
Modifications:	• Type numbers 74HC123N and 74HCT123N (SOT38-4) removed.			
74HC_HCT123 v.9	20150119	Product data sheet	-	74HC_HCT123 v.8
Modifications:	• Table 7: Power dissipation capacitance condition for 74HCT123 is corrected.			
74HC_HCT123 v.8	20111216	Product data sheet	-	74HC_HCT123 v.7
Modifications:	• Legal pages updated.			
74HC_HCT123 v.7	20110825	Product data sheet	-	74HC_HCT123 v.6
74HC_HCT123 v.6	20110314	Product data sheet	-	74HC_HCT123 v.5
74HC_HCT123 v.5	20090713	Product data sheet	-	74HC_HCT123 v.4
74HC_HCT123 v.4	20060616	Product data sheet	-	74HC_HCT123 v.3
74HC_HCT123 v.3	20040511	Product specification	-	74HC_HCT123_CNV v.2
74HC_HCT123_CNV v.2	19980708	Product specification	-	-

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

16. Legal information

16.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

16.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between Nexperia and its customer, unless Nexperia and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the Nexperia product is deemed to offer functions and qualities beyond those described in the Product data sheet.

16.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. Nexperia takes no responsibility for the content in this document if provided by an information source outside of Nexperia.

In no event shall Nexperia be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, Nexperia's aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of Nexperia.

Right to make changes — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Nexperia products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of a Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Nexperia and its suppliers accept no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using Nexperia products, and Nexperia accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the Nexperia product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

Nexperia does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using Nexperia products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). Nexperia does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at http://www.nexperia.com/profile/terms, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. Nexperia hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of Nexperia products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Non-automotive qualified products — Unless this data sheet expressly states that this specific Nexperia product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. Nexperia accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without Nexperia's warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond Nexperia's specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies Nexperia for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond Nexperia's standard warranty and Nexperia's product specifications.

Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

16.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

17. Contact information

For more information, please visit: **http://www.nexperia.com**

For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

All information provided in this document is subject to legal disclaimers.

© Nexperia B.V. 2017. All rights reserved

18. Contents

1 General description 1
2 Features and benefits 1
3 Ordering information 2
4 Functional diagram 2
5 Pinning information 4
5.1 Pinning 4
5.2 Pin description 4
6 Functional description 5
7 Limiting values 5
8 Recommended operating conditions 6
9 Static characteristics 6
10 Dynamic characteristics 8
11 Waveforms 12
12 Application information 15
12.1 Timing component connections 15
12.2 Power-up considerations 15
12.3 Power-down considerations 16
13 Package outline 17
14 Abbreviations 21
15 Revision history 21
16 Legal information 22
16.1 Data sheet status 22
16.2 Definitions 22
16.3 Disclaimers 22
16.4 Trademarks 23
17 Contact information 23
18 Contents 24

© **Nexperia B.V. 2017. All rights reserved**

For more information, please visit: http://www.nexperia.com
For sales office addresses, please send an email to: salesaddresses@nexperia.com
Date of release: 03 December 2015

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А