

Product Specification

XBLW SN74HC123

Dual Retriggerable Monostable
Multivibrator with Reset

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Description

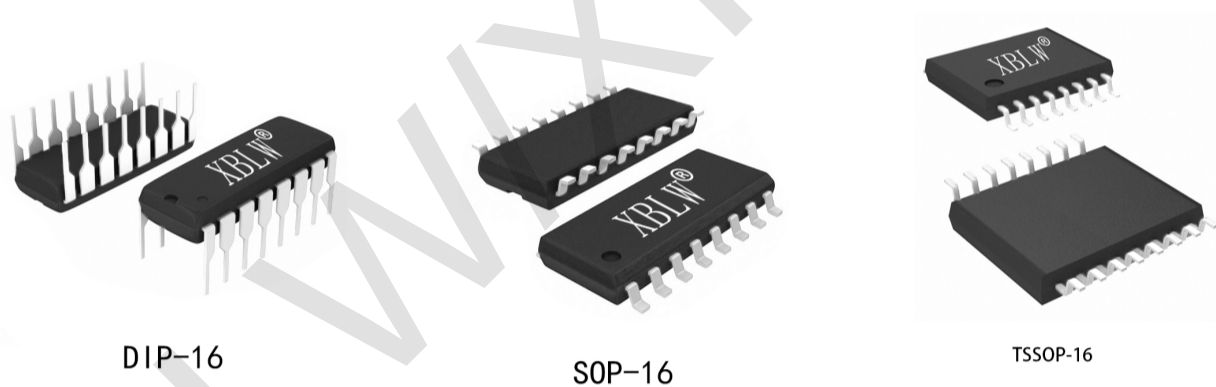
The SN74HC123 is high-speed Si-gate CMOS devices .

The SN74HC123 is 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 ($n\bar{A}$) 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 anytime 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 nRD .

Features

- DC triggered from active HIGH or active LOW inputs
- Retriggerable for very long pulses up to 100% duty factor
- Direct reset terminates output pulse
- Specified from $-40^{\circ}C$ to $+125^{\circ}C$
- Packaging information: DIP-16/SOP-16/TSSOP-16



Ordering Information

Product Model	Package Type	Marking	Packing	Packing Qty
XBLW SN74HC123N	DIP-16	74HC123N	Tube	1000Pcs/Box
XBLW SN74HC123DTR	SOP-16	74HC123	Tape	2500Pcs/Reel
XBLW SN74HC123TDTR	TSSOP-16	74HC123	Tape	3000Pcs/Reel

Block Diagram

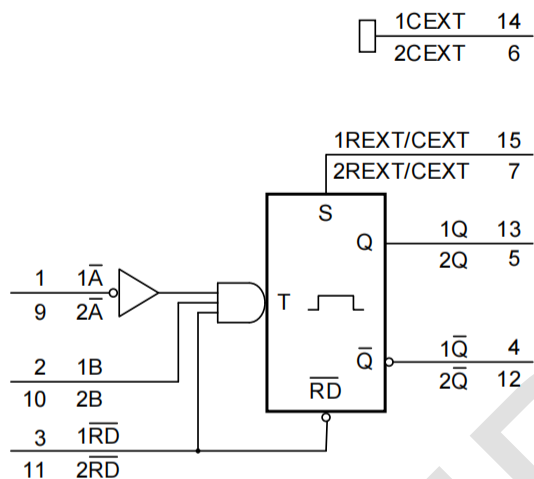


Figure 1. Logic symbol

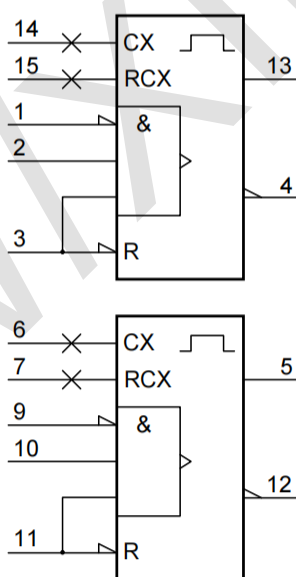


Figure 2. IEC logic symbol

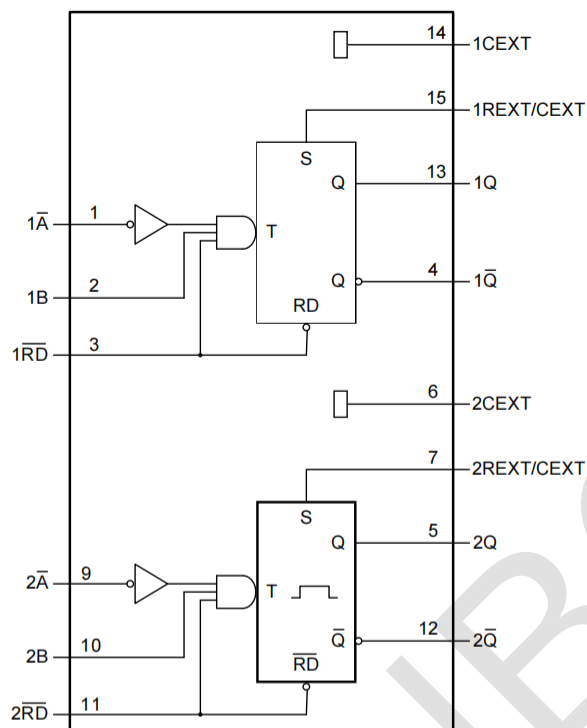


Figure 3. Functional diagram

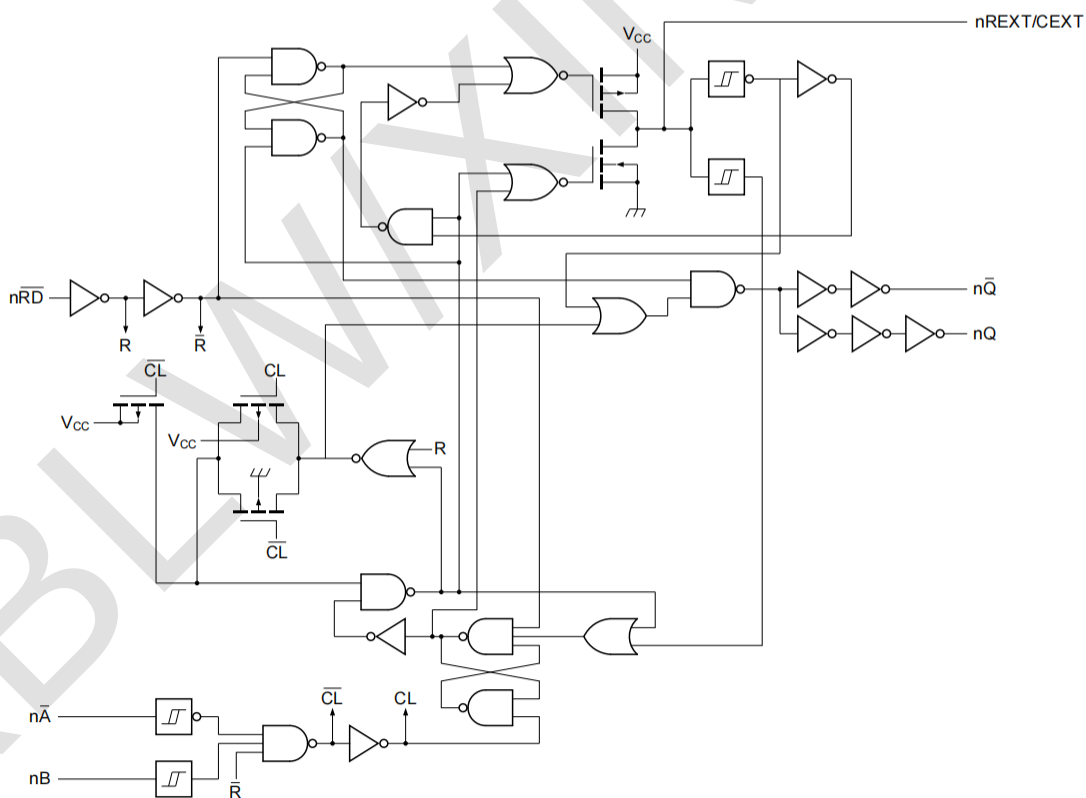
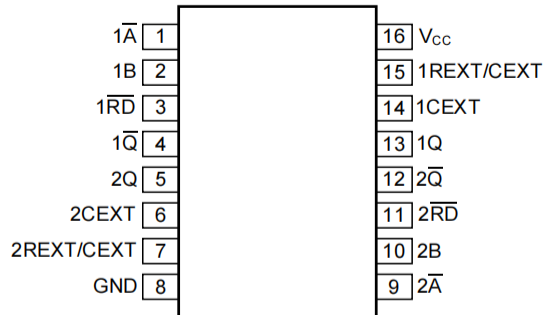


Figure 4. Logic diagram

Pin Configurations



Pin Description

Pin No.	Pin Name	Description
1	1 $\bar{A}$	negative-edge triggered input 1
2	1B	positive-edge triggered input 1
3	1 $\bar{RD}$	direct reset LOW and positive-edge triggered input 1
4	1 $\bar{Q}$	active LOW output 1
5	2Q	active HIGH output 2
6	2CEXT	external capacitor connection 2
7	2REXT/CEXT	external resistor and capacitor connection 2
8	GND	ground (0V)
9	2 $\bar{A}$	negative-edge triggered input 2
10	2B	positive-edge triggered input 2
11	2 $\bar{RD}$	direct reset LOW and positive-edge triggered input 2
12	2 $\bar{Q}$	active LOW output 2
13	1Q	active HIGH output 1
14	1CEXT	external capacitor connection 1
15	1REXT/CEXT	external resistor and capacitor connection 1
16	V _{CC}	supply voltage

Function Table

Input			Output	
n $\bar{RD}$	n $\bar{A}$	nB	nQ	n $\bar{Q}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑		
H	↓	H		
↑	L	H		

Note:

[1] H=HIGH voltage level; L=LOW voltage level; X=don't care.

[2] ↑=LOW-to-HIGH transition; ↓=HIGH-to-LOW transition.

[3] =one HIGH level output pulse; =one LOW level output pulse.

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

Electrical Parameter

Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Max.	Unit
supply voltage	V_{CC}	-		-0.5	+7.0	V
input clamping current	I_{IK}	$V_I < -0.5V$ or $V_I > V_{CC}+0.5V$		-	± 20	mA
output clamping current	I_{OK}	$V_O < -0.5V$ or $V_O > V_{CC}+0.5V$		-	± 20	mA
output current	I_O	except for pins nREXT/CEXT; $V_O = -0.5V$ to $(V_{CC}+0.5V)$		-	± 25	mA
supply current	I_{CC}	-		-	50	mA
ground current	I_{GND}	-		-	-50	mA
storage temperature	T_{stg}	-		-65	+150	°C
total power dissipation	P_{tot}	-		-	500	mW
soldering temperature	T_L	10s	DIP	245		°C
			SOP/TSSOP	260		°C

Recommended Operating Conditions

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

Electrical Characteristics

DC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	$V_{CC}=2.0V$		1.5	1.2	-	V
		$V_{CC}=4.5V$		3.15	2.4	-	V
		$V_{CC}=6.0V$		4.2	3.2	-	V
LOW-level input voltage	V_{IL}	$V_{CC}=2.0V$		-	0.8	0.5	V
		$V_{CC}=4.5V$		-	2.1	1.35	V
		$V_{CC}=6.0V$		-	2.8	1.8	V
HIGH-level output voltage	V_{OH}	$V_I=V_{IH} \text{ or } V_{IL}$	$I_O=-20\mu A; V_{CC}=2.0V$	1.9	2.0	-	V
			$I_O=-20\mu A; V_{CC}=4.5V$	4.4	4.5	-	V
			$I_O=-20\mu A; V_{CC}=6.0V$	5.9	6.0	-	V
			$I_O=-4mA; V_{CC}=4.5V$	3.98	4.32	-	V
			$I_O=-5.2mA; V_{CC}=6.0V$	5.48	5.81	-	V
LOW-level output voltage	V_{OL}	$V_I=V_{IH} \text{ or } V_{IL}$	$I_O=20\mu A; V_{CC}=2.0V$	-	0	0.1	V
			$I_O=20\mu A; V_{CC}=4.5V$	-	0	0.1	V
			$I_O=20\mu A; V_{CC}=6.0V$	-	0	0.1	V
			$I_O=4mA; V_{CC}=4.5V$	-	0.15	0.26	V
			$I_O=5.2mA; V_{CC}=6.0V$	-	0.16	0.26	V
input leakage current	I_I	$V_I=V_{CC} \text{ or } GND; V_{CC}=6.0V$		-	-	± 1.0	μA
supply current	I_{CC}	$V_I=V_{CC} \text{ or } GND; I_O=0A; V_{CC}=6.0V$		-	-	8.0	μA
input capacitance	C_I	-		-	3.5	-	pF

DC Characteristics 2

($T_{amb} = -40^{\circ}\text{C}$ to $+85^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	$V_{CC}=2.0V$		1.5	-	-	V
		$V_{CC}=4.5V$		3.15	-	-	V
		$V_{CC}=6.0V$		4.2	-	-	V
LOW-level input voltage	V_{IL}	$V_{CC}=2.0V$		-	-	0.5	V
		$V_{CC}=4.5V$		-	-	1.35	V
		$V_{CC}=6.0V$		-	-	1.8	V
HIGH-level output voltage	V_{OH}	$V_I = V_{IH} \text{ or } V_{IL}$	$I_O=-20\mu A; V_{CC}=2.0V$	1.9	-	-	V
			$I_O=-20\mu A; V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-20\mu A; V_{CC}=6.0V$	5.9	-	-	V
			$I_O=-4mA; V_{CC}=4.5V$	3.84	-	-	V
			$I_O=-5.2mA; V_{CC}=6.0V$	5.34	-	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{IH} \text{ or } V_{IL}$	$I_O=20\mu A; V_{CC}=2.0V$	-	-	0.1	V
			$I_O=20\mu A; V_{CC}=4.5V$	-	-	0.1	V
			$I_O=20\mu A; V_{CC}=6.0V$	-	-	0.1	V
			$I_O=4mA; V_{CC}=4.5V$	-	-	0.33	V
			$I_O=5.2mA; V_{CC}=6.0V$	-	-	0.33	V
input leakage current	I_I	$V_I=V_{CC} \text{ or } GND; V_{CC}=6.0V$		-	-	± 1.0	μA
supply current	I_{CC}	$V_I=V_{CC} \text{ or } GND; I_O=0A; V_{CC}=6.0V$		-	-	80	μA

DC Characteristics 3

($T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
HIGH-level input voltage	V_{IH}	$V_{CC}=2.0V$		1.5	-	-	V
		$V_{CC}=4.5V$		3.15	-	-	V
		$V_{CC}=6.0V$		4.2	-	-	V
LOW-level input voltage	V_{IL}	$V_{CC}=2.0V$		-	-	0.5	V
		$V_{CC}=4.5V$		-	-	1.35	V
		$V_{CC}=6.0V$		-	-	1.8	V
HIGH-level output voltage	V_{OH}	$V_I = V_{IH} \text{ or } V_{IL}$	$I_O=-20\mu A; V_{CC}=2.0V$	1.9	-	-	V
			$I_O=-20\mu A; V_{CC}=4.5V$	4.4	-	-	V
			$I_O=-20\mu A; V_{CC}=6.0V$	5.9	-	-	V
			$I_O=-4mA; V_{CC}=4.5V$	3.7	-	-	V
			$I_O=-5.2mA; V_{CC}=6.0V$	5.2	-	-	V
LOW-level output voltage	V_{OL}	$V_I = V_{IH} \text{ or } V_{IL}$	$I_O=20\mu A; V_{CC}=2.0V$	-	-	0.1	V
			$I_O=20\mu A; V_{CC}=4.5V$	-	-	0.1	V
			$I_O=20\mu A; V_{CC}=6.0V$	-	-	0.1	V
			$I_O=4mA; V_{CC}=4.5V$	-	-	0.4	V
			$I_O=5.2mA; V_{CC}=6.0V$	-	-	0.4	V
input leakage current	I_I	$V_I=V_{CC} \text{ or } GND; V_{CC}=6.0V$		-	-	± 1.0	μA
supply current	I_{CC}	$V_I=V_{CC} \text{ or } GND; I_O=0A; V_{CC}=6.0V$		-	-	160	μA

AC Characteristics 1

($T_{amb}=25^{\circ}\text{C}$, voltages are referenced to GND (ground=0V); $C_L=50\text{pF}$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t_{pd}	$n\bar{RD}, n\bar{A}, n\bar{B}$ to nQ or $n\bar{Q}$; $C_{EXT}=0pF$; $R_{EXT}=5k\Omega$; see Figure 6 ^[1]	$V_{CC}=2.0V$	-	83	255	ns
			$V_{CC}=4.5V$	-	30	51	ns
			$V_{CC}=5.0V$; $C_L=15pF$	-	26	-	ns
			$V_{CC}=6.0V$	-	24	43	ns
		$n\bar{RD}(\text{reset-})$ to nQ or $n\bar{Q}$; $C_{EXT}=0pF$; $R_{EXT}=5k\Omega$; see Figure 6	$V_{CC}=2.0V$	-	66	215	ns
			$V_{CC}=4.5V$	-	25	43	ns
			$V_{CC}=5.0V$; $C_L=15pF$	-	20	-	ns
			$V_{CC}=6.0V$	-	19	37	ns
transition time	t_t	see Figure 6 ^[1]	$V_{CC}=2.0V$	-	19	75	ns
			$V_{CC}=4.5V$	-	7	15	ns
			$V_{CC}=6.0V$	-	6	13	ns
pulse width	t_w	$n\bar{A}$ LOW; see Figure 7	$V_{CC}=2.0V$	100	8	-	ns
			$V_{CC}=4.5V$	20	3	-	ns
			$V_{CC}=6.0V$	17	2	-	ns
		$n\bar{B}$ HIGH; see Figure 7	$V_{CC}=2.0V$	100	17	-	ns
			$V_{CC}=4.5V$	20	6	-	ns
			$V_{CC}=6.0V$	17	5	-	ns
		$n\bar{RD}$ LOW; see Figure 8	$V_{CC}=2.0V$	100	14	-	ns
			$V_{CC}=4.5V$	20	5	-	ns
			$V_{CC}=6.0V$	17	4	-	ns
		nQ HIGH and $n\bar{Q}$ LOW; $V_{CC}=5.0V$; see Figure 7, 8 ^[2]	$C_{EXT}=100nF$; $R_{EXT}=10k\Omega$	-	450	-	us
			$C_{EXT}=0pF$; $R_{EXT}=5k\Omega$	-	75	-	ns
retrigger time	t_{trig}	$n\bar{A}, n\bar{B}$; $C_{EXT}=0pF$; $R_{EXT}=5k\Omega$; $V_{CC}=5.0V$; see Figure 7 ^{[3][4]}	-	110	-	ns	
external timing resistor	R_{EXT}	see Figure 7	$V_{CC}=2.0V$	10	-	1000	k Ω
			$V_{CC}=5.0V$	2	-	1000	k Ω
external timing capacitor	C_{EXT}	$V_{CC}=5.0V$; see Figure 9 ^[4]		-	-	-	pF
power dissipation capacitance	C_{PD}	per monostable; $V_I=GND$ to V_{CC} ^[5]		-	54	-	pF

Note:

- [1] t_{pd} is the same as t_{PLH} and t_{PHL} ; t_t is the same as t_{THL} and t_{TLH} .
- [2] For other R_{EXT} and C_{EXT} combinations see Figure 9. If $C_{EXT} > 10nF$, the next formula is valid.
 $t_W = K \times R_{EXT} \times C_{EXT}$, where: t_W = typical output pulse width inns;
 R_{EXT} = external resistor in $k\Omega$; C_{EXT} = external capacitor in pF; K = constant = 0.45 for $V_{CC} = 5.0V$ and 0.55 for $V_{CC} = 2.0V$. The inherent test jig and pin capacitance at pins 15 and 7 ($nREXT/CEXT$) is approximately 7pF.
- [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 $C_{EXT} > 10pF$, the next formula (at $V_{CC} = 5.0V$) for the setup time of a retrigger pulse is valid: $t_{trig} = 30 + 0.19 \times R_{EXT} \times C_{EXT}^{0.9} + 13 \times R_{EXT}^{1.05}$, where: t_{trig} = retrigger time inns; 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 ($nREXT/CEXT$) is 7pF.
- [4] When the device is powered-up, initiate the device via a reset pulse, when $C_{EXT} < 50pF$. [5] C_{PD} is used to determine the dynamic power dissipation (P_D in μW). $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o) + 0.75 \times C_{EXT} \times V_{CC}^2 \times f_o + D \times 16 \times V_{CC}$ 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.

AC Characteristics 2

($T_{amb} = -40^\circ C$ to $+85^\circ C$, $GND = 0V$; $C_L = 50pF$, unless otherwise specified.)

Parameter	Symbol	Conditions	Min.	Typ.	Max.	Unit
propagation delay	t_{pd}	$n\bar{RD}$, $n\bar{A}$, nB to nQ or $n\bar{Q}$; $C_{EXT} = 0pF$; $R_{EXT} = 5k\Omega$; see Figure 6 ^[1]	$V_{CC} = 2.0V$	-	-	320 ns
			$V_{CC} = 4.5V$	-	-	64 ns
			$V_{CC} = 6.0V$	-	-	54 ns
		$n\bar{RD}(\text{reset-})$ to nQ or $n\bar{Q}$; $C_{EXT} = 0pF$; $R_{EXT} = 5k\Omega$; see Figure 6	$V_{CC} = 2.0V$	-	-	270 ns
			$V_{CC} = 4.5V$	-	-	54 ns
			$V_{CC} = 6.0V$	-	-	46 ns
transition time	t_t	see Figure 6 ^[1]	$V_{CC} = 2.0V$	-	-	95 ns
			$V_{CC} = 4.5V$	-	-	19 ns
			$V_{CC} = 6.0V$	-	-	16 ns
pulse width	t_W	$n\bar{A}$ LOW; see Figure 7	$V_{CC} = 2.0V$	125	-	- ns
			$V_{CC} = 4.5V$	25	-	- ns
			$V_{CC} = 6.0V$	21	-	- ns
		nB HIGH; see Figure 7	$V_{CC} = 2.0V$	125	-	- ns
			$V_{CC} = 4.5V$	25	-	- ns
			$V_{CC} = 6.0V$	21	-	- ns
		$n\bar{RD}$ LOW; see Figure 8	$V_{CC} = 2.0V$	125	-	- ns
			$V_{CC} = 4.5V$	25	-	- ns
			$V_{CC} = 6.0V$	21	-	- ns

Note:

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

AC Characteristics 3

($T_{amb} = -40^{\circ}\text{C}$ to $+125^{\circ}\text{C}$, $GND = 0V$; $C_L = 50\text{pF}$, unless otherwise specified.)

Parameter	Symbol	Conditions		Min.	Typ.	Max.	Unit
propagation delay	t_{pd}	$n\overline{RD}$, $n\overline{A}$, $n\overline{B}$ to nQ or $n\overline{Q}$; $C_{EXT}=0pF$; $R_{EXT}=5k\Omega$; see Figure 6 ^[1]	$V_{CC}=2.0V$	-	-	385	ns
			$V_{CC}=4.5V$	-	-	77	ns
			$V_{CC}=6.0V$	-	-	65	ns
		$n\overline{RD}(\text{reset})$ to nQ or $n\overline{Q}$; $C_{EXT}=0pF$; $R_{EXT}=5k\Omega$; see Figure 6	$V_{CC}=2.0V$	-	-	325	ns
			$V_{CC}=4.5V$	-	-	65	ns
			$V_{CC}=6.0V$	-	-	55	ns
transition time	t_t	see Figure 6 ^[1]	$V_{CC}=2.0V$	-	-	110	ns
			$V_{CC}=4.5V$	-	-	22	ns
			$V_{CC}=6.0V$	-	-	19	ns
pulse width	t_w	$n\overline{A}$ LOW; see Figure 7	$V_{CC}=2.0V$	150	-	-	ns
			$V_{CC}=4.5V$	30	-	-	ns
			$V_{CC}=6.0V$	26	-	-	ns
		$n\overline{B}$ HIGH; see Figure 7	$V_{CC}=2.0V$	150	-	-	ns
			$V_{CC}=4.5V$	30	-	-	ns
			$V_{CC}=6.0V$	26	-	-	ns
		$n\overline{RD}$ LOW; see Figure 8	$V_{CC}=2.0V$	150	-	-	ns
			$V_{CC}=4.5V$	30	-	-	ns
			$V_{CC}=6.0V$	26	-	-	ns

Note:

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

Testing Circuit

AC Testing Circuit

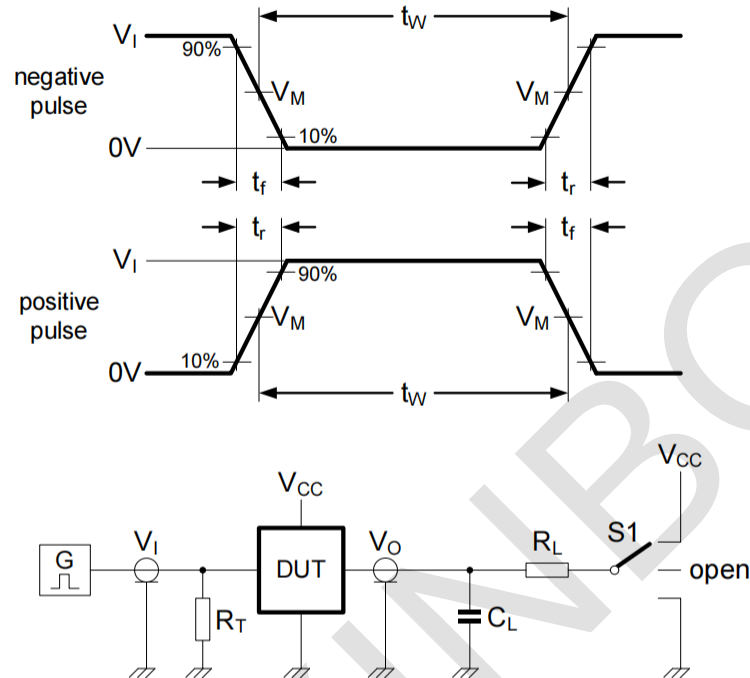


Figure 5. Test circuit for measuring switching times

Definitions for test circuit: R_L =Load resistance.

C_L =Load capacitance including jig and probe capacitance.

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

S1=Testselection switch.

AC Testing Waveforms

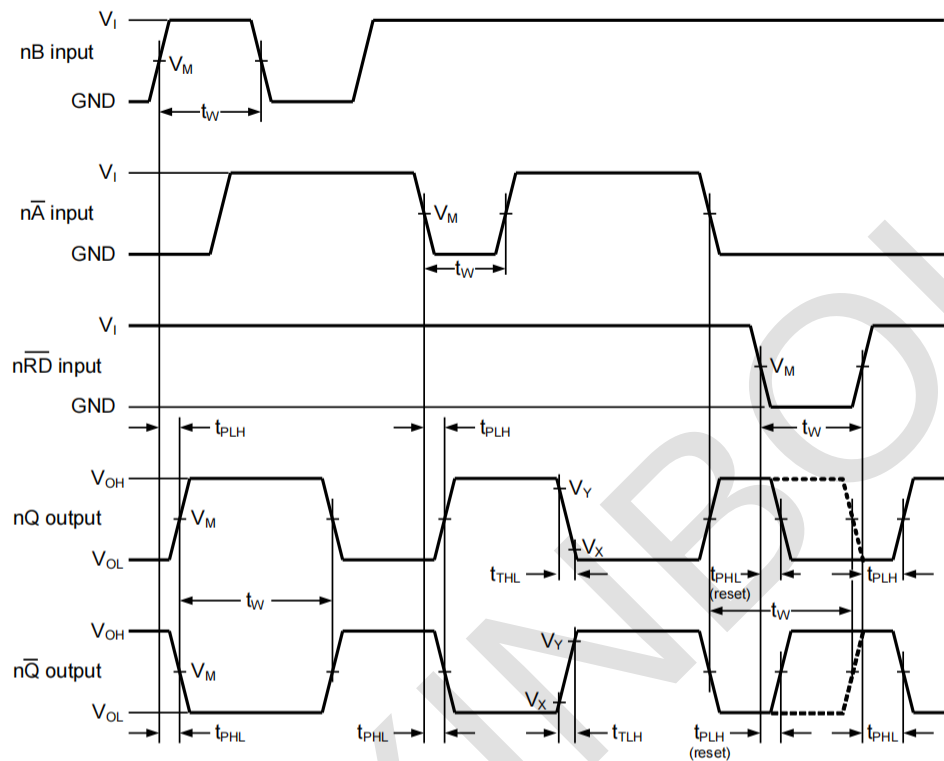


Figure 6. Propagation delays from inputs ($n\bar{A}$, nB , $n\bar{R}\bar{D}$) to outputs (nQ , $n\bar{Q}$) and output transition times

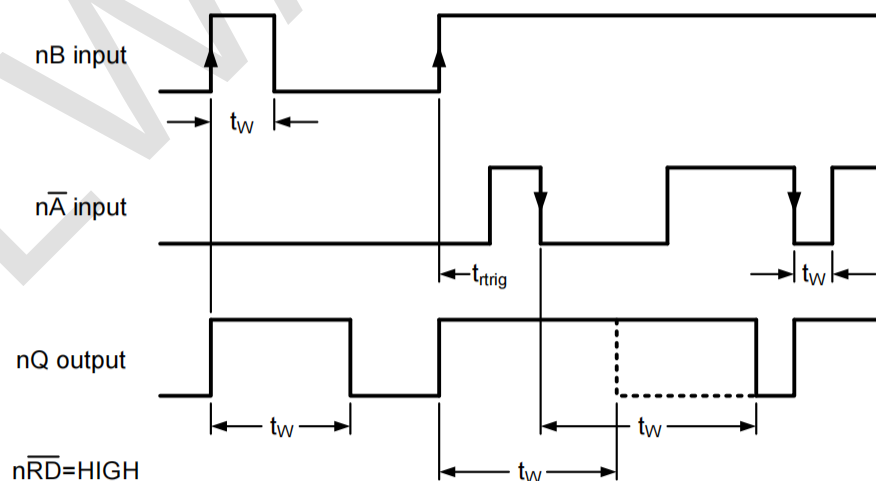


Figure 7. Output pulse control using retrigger pulse

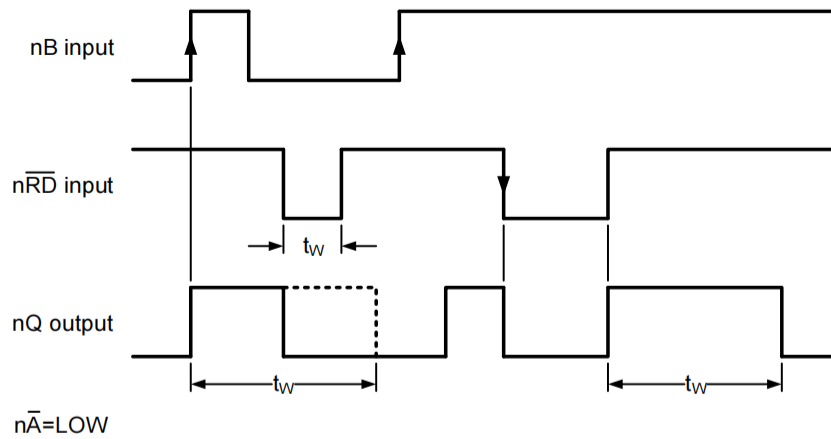
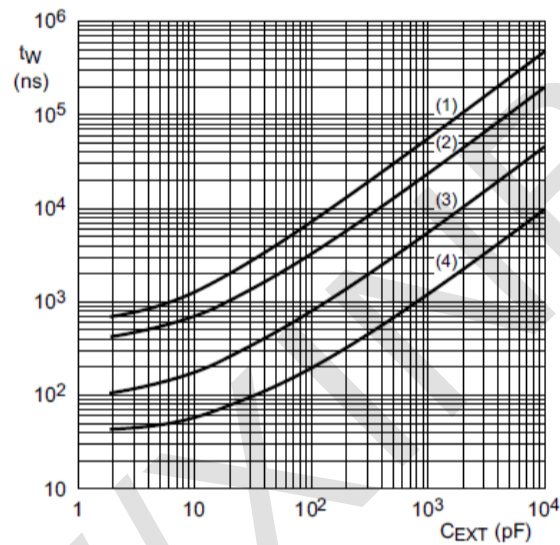


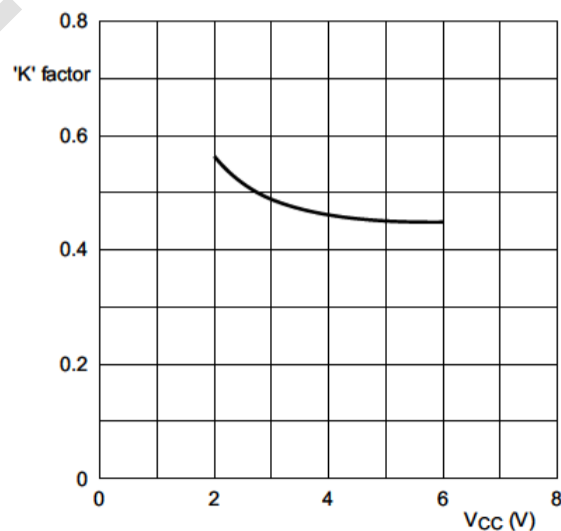
Figure 8. Output pulse control using reset input $\overline{nRD}$



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

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

Figure 9. Typical output pulse width as a function of the external capacitor value



$C_{EXT}=10nF$; $R_{EXT}=10k\Omega$ to $100k\Omega$. $T_{amb}=25^\circ C$.

Figure 10. SN74HC123 typical 'K' factor as function of V_{CC}

Measurement Points

Type	Input	Output
	V_M	V_M
SN74HC123	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$

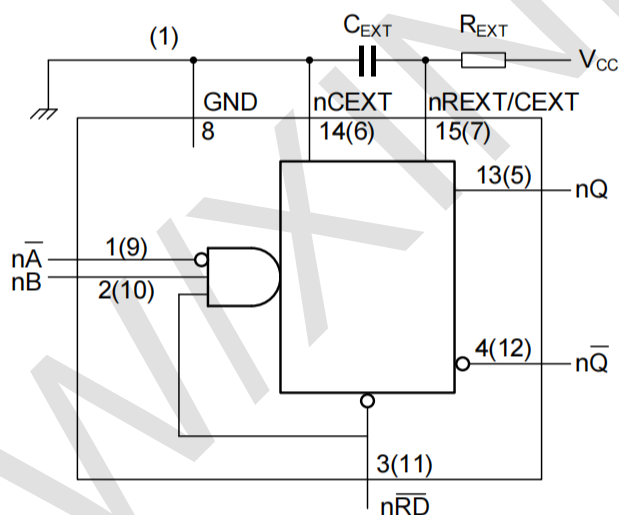
Test Data

Type	Input		Load		S1 position
	V_I	t_r, t_f	C_L	R_L	t_{PHL}, t_{PLH}
SN74HC123	V_{CC}	6ns	15pF, 50pF	1k Ω	open

Typical Application Circuit And Application Note

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 ($2C_{EXT}$) and 14 ($1C_{EXT}$) externally to pin 8 (GND).

Figure 11. Timing component connections

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 12.

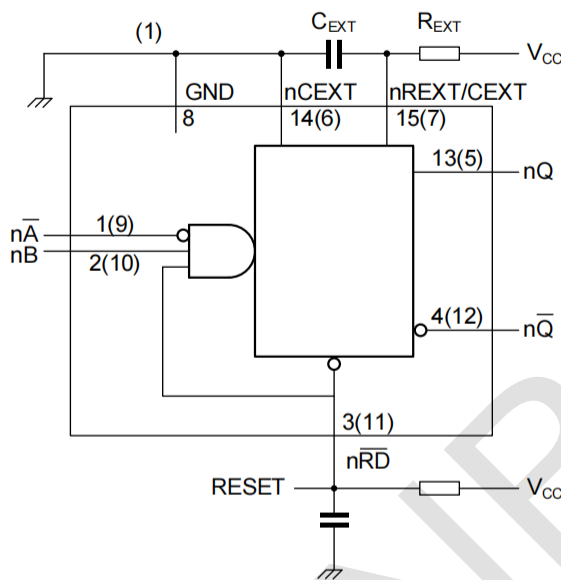


Figure 12. Power-up output pulse elimination circuit

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 13.

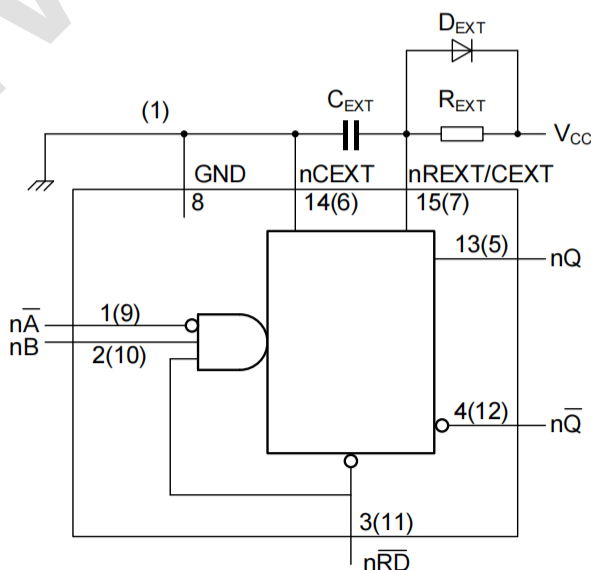
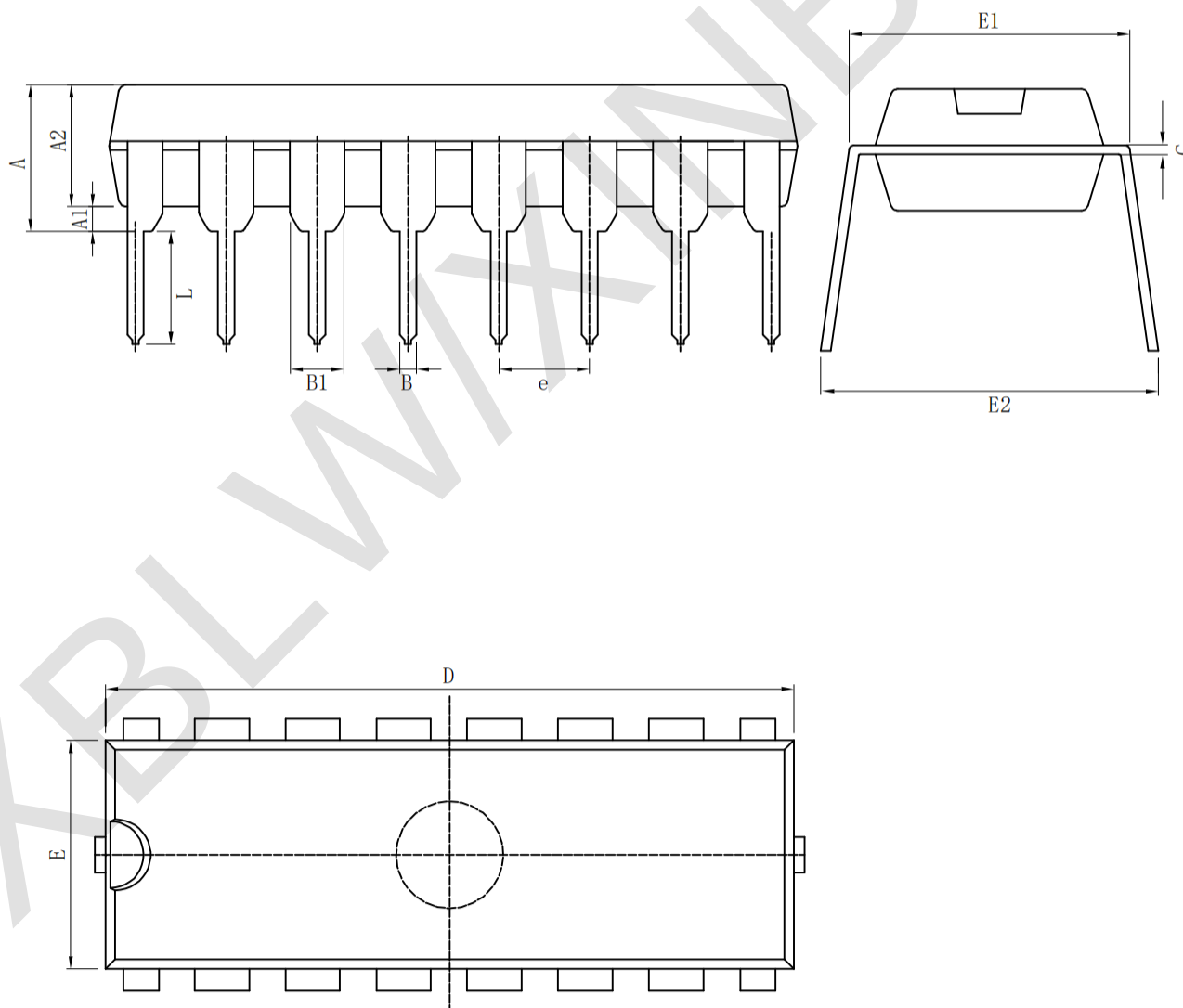


Figure 13. Power-down protection circuit

Package Information

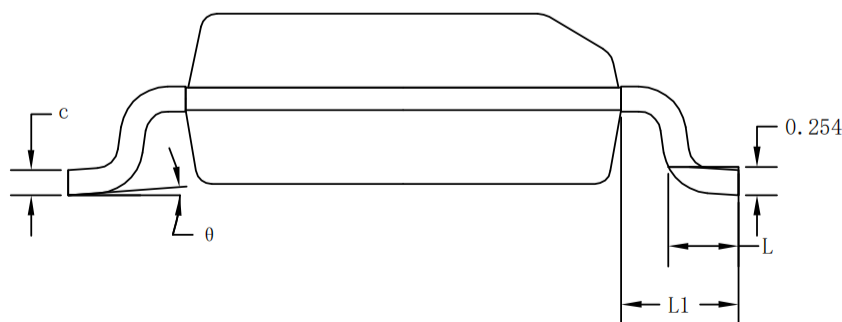
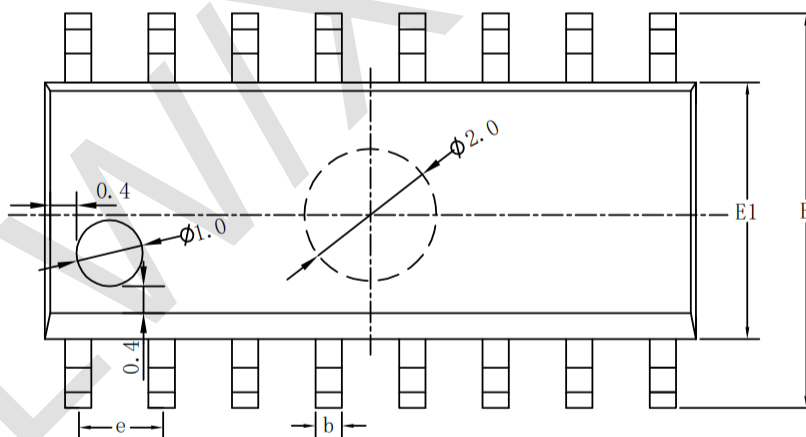
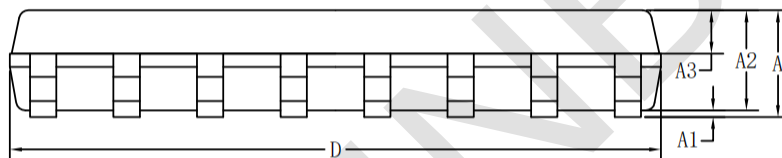
· DIP-16

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min(mm)	Max(mm)		Min(in)	Max(in)
A	3.710	4.310	A	0.146	0.170
A1	0.510		A1	0.020	
A2	3.200	3.600	A2	0.126	0.142
B	0.380	0.570	B	0.015	0.022
B1	1.524 (BSC)		B1	0.060 (BSC)	
C	0.204	0.360	C	0.008	0.014
D	18.80	19.20	D	0.740	0.756
E	6.200	6.600	E	0.244	0.260
E1	7.320	7.920	E1	0.288	0.312
e	2.540 (BSC)		e	0.100 (BSC)	
L	3.000	3.600	L	0.118	0.142
E2	8.400	9.000	E2	0.331	0.354



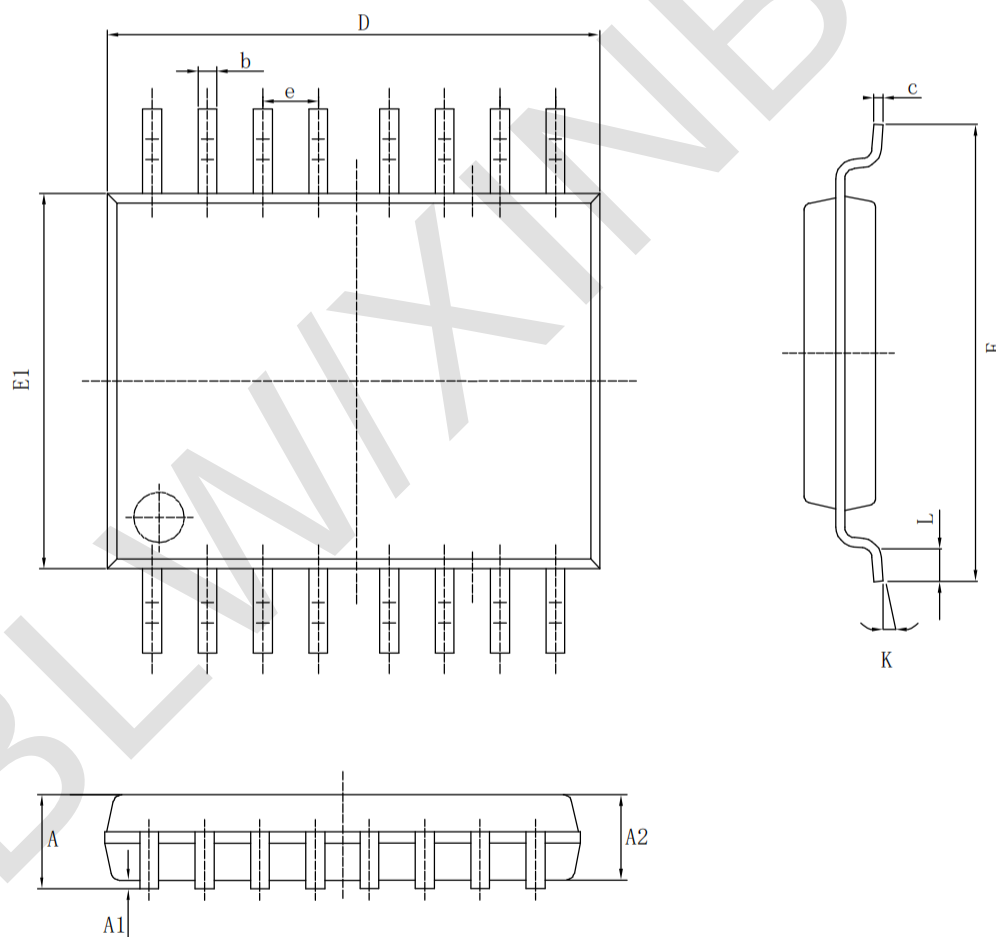
· SOP-16

Symbol	Size	Dimensions In Millimeters			Symbol	Size	Dimensions In Inches		
		Min (mm)	Nom (mm)	Max (mm)			Min (in)	Nom (in)	Max (in)
A		1.500	1.600	1.700	A		0.059	0.063	0.067
A1		0.100	0.150	0.250	A1		0.004	0.006	0.010
A2		1.400	1.450	1.500	A2		0.055	0.057	0.059
A3		0.600	0.650	0.700	A3		0.024	0.026	0.028
b		0.300	0.400	0.500	b		0.012	0.016	0.020
c		0.150	0.200	0.250	c		0.006	0.008	0.010
D		9.800	9.900	10.00	D		0.386	0.390	0.394
E		5.800	6.000	6.200	E		0.228	0.236	0.244
E1		3.850	3.900	3.950	E1		0.152	0.154	0.156
e		1.27 (BSC)			e		0.050 (BSC)		
L		0.500	0.600	0.700	L		0.020	0.024	0.028
L1		1.05 (BSC)			L1		0.041 (BSC)		
θ		0°	4°	8°	θ		0°	4°	8°



· TSSOP-16

Size Symbol	Dimensions In Millimeters		Size Symbol	Dimensions In Inches	
	Min (mm)	Max (mm)		Min (in)	Max (in)
A		1.200	A		0.047
A1	0.050	0.150	A1	0.002	0.006
A2	0.800	1.050	A2	0.031	0.041
b	0.190	0.300	b	0.007	0.012
c	0.090	0.200	c	0.004	0.0089
D	4.900	5.100	D	0.193	0.201
E	6.200	6.600	E	0.244	0.260
E1	4.300	4.480	E1	0.169	0.176
e	0.65 (BSC)		e	0.0256 (BSC)	
K	0°	8°	K	0°	8°
L	0.450	0.750	L	0.018	0.030



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