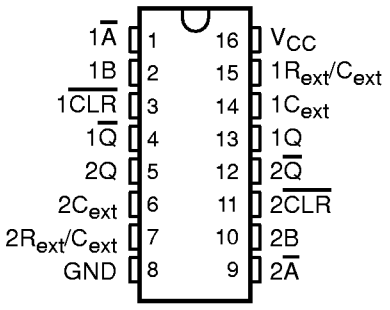
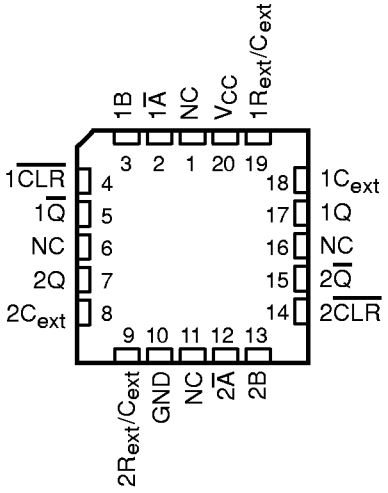
- *EPIC*™ (Enhanced-Performance Implanted CMOS) Process
- Typical V_{OLP} (Output Ground Bounce) < 0.8 V at V_{CC}, T_A = 25°C
- Typical V_{OHV} (Output V_{OH} Undershoot) > 2 V at V_{CC}, T_A = 25°C
- Edge Triggered From Active-High or Active-Low Gated Logic Inputs
- Retriggerable for Very Long Output Pulses, up to 100% Duty Cycle
- Overriding Clear Terminates Output Pulse
- Package Options Include Plastic Small-Outline (D, NS), Shrink Small-Outline (DB), Thin Very Small-Outline (DGV), and Thin Shrink Small-Outline (PW) Packages, Ceramic Flat (W) Packages, Chip Carriers (FK), and DIPs (J)

SN54LV123A . . . J OR W PACKAGE
SN74LV123A . . . D, DB, DGV, NS, OR PW PACKAGE
(TOP VIEW)



SN54LV123A . . . FK PACKAGE
(TOP VIEW)



NC – No internal connection

description

The 'LV123A devices are dual retriggerable monostable multivibrators designed for 2-V to 5.5-V V_{CC} operation.

These edge-triggered multivibrators feature output pulse-duration control by three methods. In the first method, the $\overline{A}$ input is low and the B input goes high. In the second method, the B input is high and the $\overline{A}$ input goes low. In the third method, the $\overline{A}$ input is low, the B input is high, and the clear ($\overline{CLR}$) input goes high.

The basic pulse duration is programmed by selecting external resistance and capacitance values. The external timing capacitor must be connected between C_{ext} and R_{ext}/C_{ext} (positive) and an external resistor connected between R_{ext}/C_{ext} and V_{CC}. To obtain variable pulse durations, connect an external variable resistance between R_{ext}/C_{ext} and V_{CC}.

Once triggered, the basic pulse duration can be extended by retriggering the gated low-level-active ($\overline{A}$) or high-level-active (B) input. Pulse duration can be reduced by taking $\overline{CLR}$ low. Figure 1 illustrates pulse control by retriggering the inputs and early clearing.

The SN54LV123A is characterized for operation over the full military temperature range of –55°C to 125°C. The SN74LV123A is characterized for operation from –40°C to 85°C.

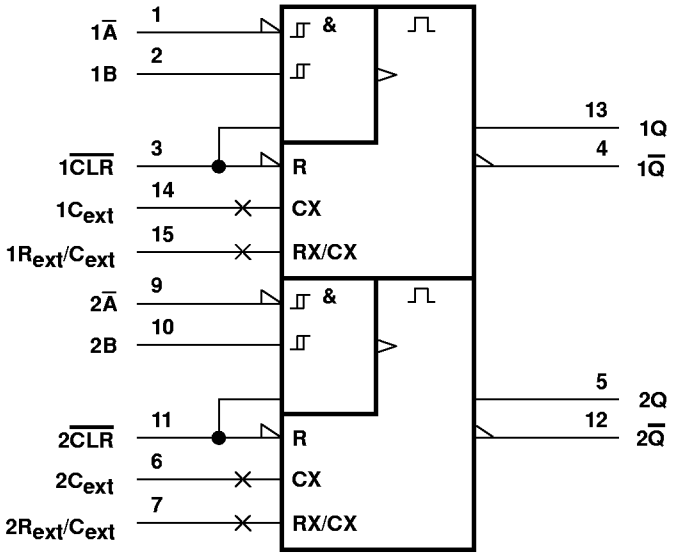
PRODUCT PREVIEW

FUNCTION TABLE

INPUTS			OUTPUTS	
$\overline{CLR}$	$\overline{A}$	B	Q	$\overline{Q}$
L	X	X	L	H
X	H	X	L†	H†
X	X	L	L†	H†
H	L	↑	⎍	⎎
H	↓	H	⎍	⎎
↑	L	H	⎍	⎎

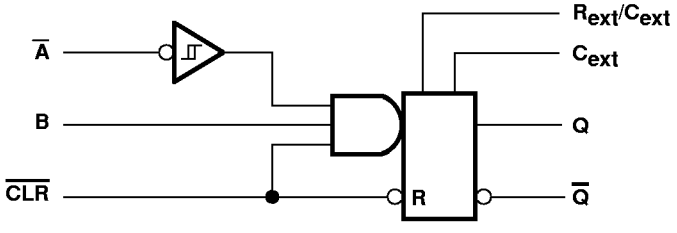
† These outputs are based on the assumption that the indicated steady-state conditions at the A and B inputs have been set up long enough to complete any pulse started before the setup.

logic symbol‡



‡ This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.
Pin numbers shown are for the D, DB, DGV, J, NS, PW, and W packages.

logic diagram, each multivibrator (positive logic)



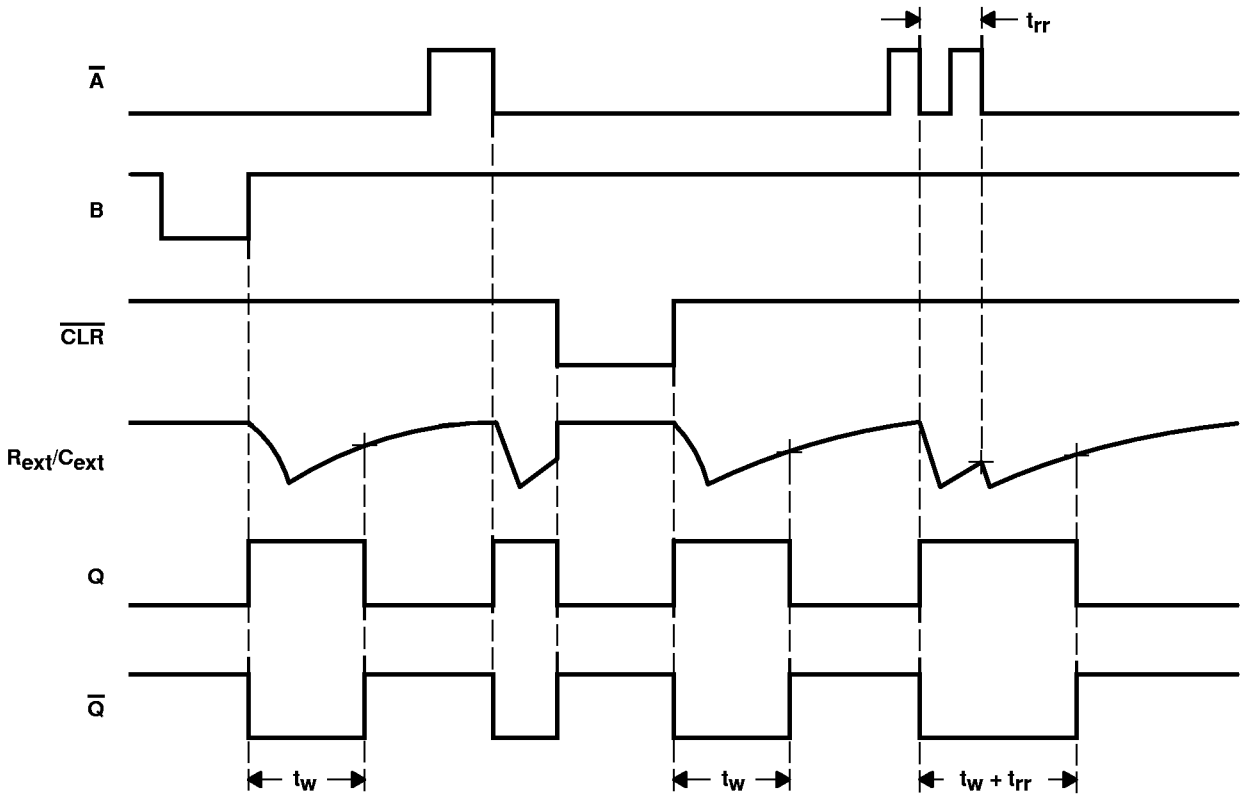


Figure 1. Input and Output Timing

absolute maximum ratings over operating free-air temperature (unless otherwise noted)†

Supply voltage range, V_{CC} . . . . . –0.5 V to 7 V
Input voltage range, V_I (see Note 1) . . . . . –0.5 V to 7 V
Output voltage range, V_O (see Notes 1 and 2) . . . . . –0.5 V to V_{CC} + 0.5 V
Input clamp current, I_{IK} (V_I < 0) . . . . . –20 mA
Output clamp current, I_{OK} (V_O < 0 or V_O > V_{CC}) . . . . . ±50 mA
Continuous output current, I_O (V_O = 0 to V_{CC}) . . . . . ±25 mA
Continuous current through V_{CC} or GND . . . . . ±50 mA
Package thermal impedance, θ_{JA} (see Note 3): D package . . . . . 113°C/W
DB package . . . . . 131°C/W
DGV package . . . . . 180°C/W
NS package . . . . . 111°C/W
PW package . . . . . 149°C/W
Storage temperature range, T_{stg} . . . . . –65°C to 150°C

† Stresses beyond those listed under "absolute maximum ratings" may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
2. This value is limited to 7 V maximum.
3. The package thermal impedance is calculated in accordance with JESD 51.

PRODUCT PREVIEW

recommended operating conditions (see Note 4)

			SN54LV123A		SN74LV123A		UNIT
			MIN	MAX	MIN	MAX	
V_{CC}	Supply voltage		2	5.5	2	5.5	V
V_{IH}	High-level input voltage	V_{CC} = 2 V	1.5		1.5		V
		V_{CC} = 2.3 V to 2.7 V	$V_{CC} \times 0.7$		$V_{CC} \times 0.7$		
		V_{CC} = 3 V to 3.6 V	$V_{CC} \times 0.7$		$V_{CC} \times 0.7$		
		V_{CC} = 4.5 V to 5.5 V	$V_{CC} \times 0.7$		$V_{CC} \times 0.7$		
V_{IL}	Low-level input voltage	V_{CC} = 2 V		0.5		0.5	V
		V_{CC} = 2.3 V to 2.7 V		$V_{CC} \times 0.3$		$V_{CC} \times 0.3$	
		V_{CC} = 3 V to 3.6 V		$V_{CC} \times 0.3$		$V_{CC} \times 0.3$	
		V_{CC} = 4.5 V to 5.5 V		$V_{CC} \times 0.3$		$V_{CC} \times 0.3$	
V_I	Input voltage		0	5.5	0	5.5	V
V_O	Output voltage		0	V_{CC}	0	V_{CC}	V
I_{OH}	High-level output current	V_{CC} = 2 V		–50		–50	μA
		V_{CC} = 2.3 V to 2.7 V		–2		–2	mA
		V_{CC} = 3 V to 3.6 V		–6		–6	
		V_{CC} = 4.5 V to 5.5 V		–12		–12	
I_{OL}	Low-level output current	V_{CC} = 2 V		50		50	μA
		V_{CC} = 2.3 V to 2.7 V		2		2	mA
		V_{CC} = 3 V to 3.6 V		6		6	
		V_{CC} = 4.5 V to 5.5 V		12		12	
$\Delta t/\Delta v$	Input transition rise or fall rate	V_{CC} = 2.3 V to 2.7 V	0	200	0	200	ns/V
		V_{CC} = 3 V to 3.6 V	0	100	0	100	
		V_{CC} = 4.5 V to 5.5 V	0	20	0	20	
T_A	Operating free-air temperature		–55	125	–40	85	°C

NOTE 4: All unused inputs of the device must be held at V_{CC} or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)

PARAMETER		TEST CONDITIONS	V_{CC}	SN54LV123A			SN74LV123A			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
V_{OH}		I_{OH} = –50 μA	2 V to 5.5 V	V_{CC}–0.1			V_{CC}–0.1			V
		I_{OH} = –2 mA	2.3 V	2			2			
		I_{OH} = –6 mA	3 V	2.48			2.48			
		I_{OH} = –12 mA	4.5 V	3.8			3.8			
V_{OL}		I_{OL} = 50 μA	2 V to 5.5 V			0.1			0.1	V
		I_{OL} = 2 mA	2.3 V			0.4			0.4	
		I_{OL} = 6 mA	3 V			0.44			0.44	
		I_{OL} = 12 mA	4.5 V			0.55			0.55	
I_I	R_{ext}/C_{ext}†	$V_I = V_{CC}$ or GND	5.5 V			±1			±1	μA
	$\overline{A}$, B, and $\overline{CLR}$	$V_I = V_{CC}$ or GND	0 V			±1			±1	
			5.5 V			±1			±1	
I_{CC}	Quiescent	$V_I = V_{CC}$ or GND, I_O = 0	5.5 V			40			40	μA
I_{CC}	Active state (per circuit)	$V_I = V_{CC}$ or GND, R_{ext}/C_{ext} = 0.5 V_{CC}	2.7 V							μA
			3.6 V							
			5.5 V							
I_{off}		V_I or V_O = 0 to 5.5 V	0 V						5	μA
C_i		$V_I = V_{CC}$ or GND	3.3 V							pF
			5 V							

† This test is performed with the terminal in the off-state condition.

timing requirements over recommended operating free-air temperature range, V_{CC} = 2.5 V ± 0.2 V (unless otherwise noted) (see Figures 1 and 2)

			TEST CONDITIONS		T_A = 25°C			SN54LV123A		SN74LV123A		UNIT
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	$\overline{CLR}$										ns
		$\overline{A}$ or B trigger										
t_{rr}	Pulse retrigger time		R_{ext} = 1 kΩ	C_{ext} = 100 pF								ns
				C_{ext} = 0.01 μF								μs

timing requirements over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figures 1 and 2)

			TEST CONDITIONS		T_A = 25°C			SN54LV123A		SN74LV123A		UNIT
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	$\overline{CLR}$										ns
		$\overline{A}$ or B trigger										
t_{rr}	Pulse retrigger time		R_{ext} = 1 kΩ	C_{ext} = 100 pF								ns
				C_{ext} = 0.01 μF								μs

PRODUCT PREVIEW

timing requirements over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figures 1 and 2)

			TEST CONDITIONS		T_A = 25°C			SN54LV123A		SN74LV123A		UNIT
					MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_w	Pulse duration	$\overline{CLR}$										ns
		$\overline{A}$ or B trigger										
t_{rr}	Pulse retrigger time		R_{ext} = 1 kΩ	C_{ext} = 100 pF								ns
				C_{ext} = 0.01 μF								μs

switching characteristics over recommended operating free-air temperature range, V_{CC} = 2.5 V ± 0.2 V (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	T_A = 25°C			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}*	$\overline{A}$ or B	Q or $\overline{Q}$	C_L = 15 pF								ns
t_{PHL}*											
t_{PLH}*	$\overline{CLR}$	Q or $\overline{Q}$									
t_{PHL}*											
t_{PLH}*	$\overline{CLR}$ trigger	Q or $\overline{Q}$									
t_{PHL}*											
t_{PLH}	$\overline{A}$ or B	Q or $\overline{Q}$	C_L = 50 pF								ns
t_{PHL}											
t_{PLH}	$\overline{CLR}$	Q or $\overline{Q}$									
t_{PHL}											
t_{PLH}	$\overline{CLR}$ trigger	Q or $\overline{Q}$									
t_{PHL}											
t_w†		Q or $\overline{Q}$	C_L = 50 pF, C_{ext} = 28 pF, R_{ext} = 2 kΩ								ns
			C_L = 50 pF, C_{ext} = 0.01 μF, R_{ext} = 10 kΩ								μs
			C_L = 50 pF, C_{ext} = 0.1 μF, R_{ext} = 10 kΩ								ms
Δt_w‡											%

* On products compliant to MIL-PRF-38535, this parameter is not production tested.
† t_w = Duration of pulse at Q and $\overline{Q}$ outputs
‡ Δt_w = Output pulse duration variation (Q and $\overline{Q}$) between circuits in same package

PRODUCT PREVIEW

switching characteristics over recommended operating free-air temperature range, V_{CC} = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	T_A = 25°C			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}*	$\overline{A}$ or B	Q or $\overline{Q}$	C_L = 15 pF								ns
t_{PHL}*											
t_{PLH}*	$\overline{CLR}$	Q or $\overline{Q}$									
t_{PHL}*											
t_{PLH}*	$\overline{CLR}$ trigger	Q or $\overline{Q}$									
t_{PHL}*											
t_{PLH}	$\overline{A}$ or B	Q or $\overline{Q}$	C_L = 50 pF								ns
t_{PHL}											
t_{PLH}	$\overline{CLR}$	Q or $\overline{Q}$									
t_{PHL}											
t_{PLH}	$\overline{CLR}$ trigger	Q or $\overline{Q}$									
t_{PHL}											
t_w†		Q or $\overline{Q}$	C_L = 50 pF, C_{ext} = 28 pF, R_{ext} = 2 kΩ								ns
			C_L = 50 pF, C_{ext} = 0.01 µF, R_{ext} = 10 kΩ								µs
			C_L = 50 pF, C_{ext} = 0.1 µF, R_{ext} = 10 kΩ								ms
Δt_w‡											%

* On products compliant to MIL-PRF-38535, this parameter is not production tested.
† t_w = Duration of pulse at Q and $\overline{Q}$ outputs
‡ Δt_w = Output pulse duration variation (Q and $\overline{Q}$) between circuits in same package

PRODUCT PREVIEW

switching characteristics over recommended operating free-air temperature range, V_{CC} = 5 V ± 0.5 V (unless otherwise noted) (see Figure 2)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	T_A = 25°C			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t_{PLH}*	$\overline{A}$ or B	Q or $\overline{Q}$	C_L = 15 pF								ns
t_{PHL}*											
t_{PLH}*	$\overline{CLR}$	Q or $\overline{Q}$									
t_{PHL}*											
t_{PLH}*	$\overline{CLR}$ trigger	Q or $\overline{Q}$									
t_{PHL}*											
t_{PLH}	$\overline{A}$ or B	Q or $\overline{Q}$	C_L = 50 pF								ns
t_{PHL}											
t_{PLH}	$\overline{CLR}$	Q or $\overline{Q}$									
t_{PHL}											
t_{PLH}	$\overline{CLR}$ trigger	Q or $\overline{Q}$									
t_{PHL}											
t_w†		Q or $\overline{Q}$	C_L = 50 pF, C_{ext} = 28 pF, R_{ext} = 2 kΩ								ns
			C_L = 50 pF, C_{ext} = 0.01 µF, R_{ext} = 10 kΩ								µs
			C_L = 50 pF, C_{ext} = 0.1 µF, R_{ext} = 10 kΩ								ms
Δt_w‡											%

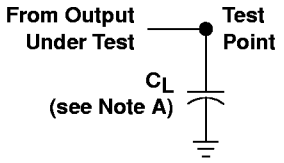
* On products compliant to MIL-PRF-38535, this parameter is not production tested.
† t_w = Duration of pulse at Q and $\overline{Q}$ outputs
‡ Δt_w = Output pulse duration variation (Q and $\overline{Q}$) between circuits in same package

operating characteristics, T_A = 25°C

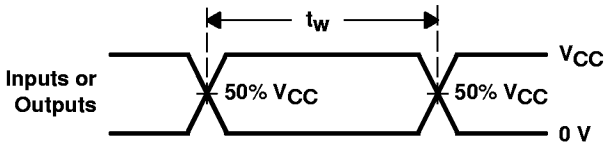
PARAMETER		TEST CONDITIONS	V_{CC}	TYP	UNIT
C_{pd}	Power dissipation capacitance	C_L = 50 pF, f = 10 MHz	3.3 V		pF
			5 V		

PRODUCT PREVIEW

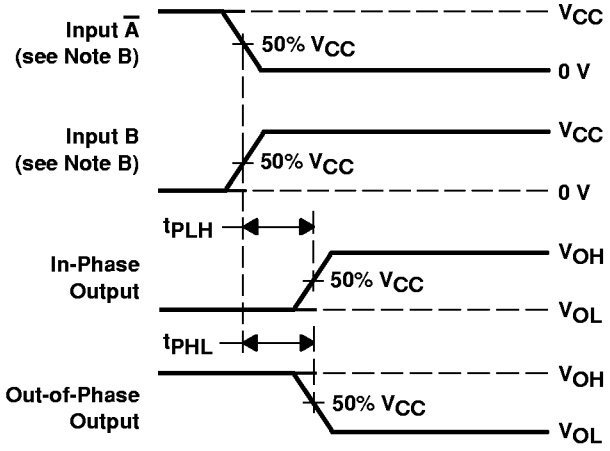
PARAMETER MEASUREMENT INFORMATION



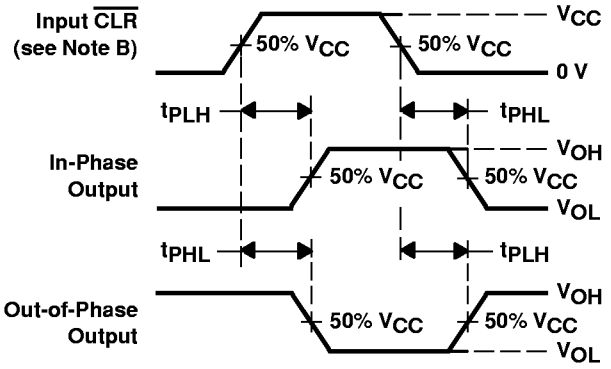
LOAD CIRCUIT



VOLTAGE WAVEFORMS
PULSE DURATION



VOLTAGE WAVEFORMS
DELAY TIMES



VOLTAGE WAVEFORMS
DELAY TIMES

NOTES: A. C_L includes probe and jig capacitance.
B. All input pulses are supplied by generators having the following characteristics: PRR ≤ 1 MHz, Z_O = 50 Ω, t_r = 3 ns, t_f = 3 ns.
C. The outputs are measured one at a time with one input transition per measurement.

Figure 2. Load Circuit and Voltage Waveforms

PRODUCT PREVIEW

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