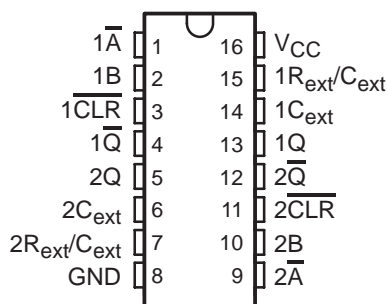


# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

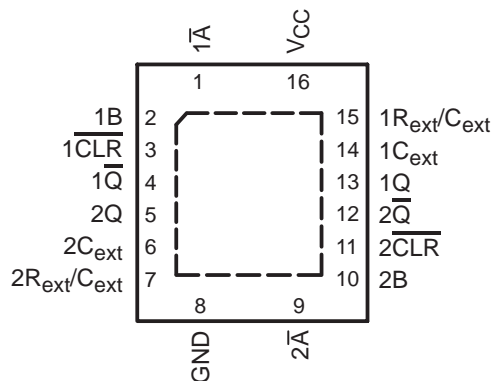
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- 2-V to 5.5-V  $V_{CC}$  Operation
- Max  $t_{pd}$  of 11 ns at 5 V
- Typical  $V_{OLP}$  (Output Ground Bounce) <0.8 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot) >2.3 V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$
- Support Mixed-Mode Voltage Operation on All Ports
- Schmitt-Trigger Circuitry on  $\overline{A}$ , B, and  $\overline{CLR}$  Inputs for Slow Input Transition Rates
- Edge Triggered From Active-High or Active-Low Gated Logic Inputs
- $I_{off}$  Supports Partial-Power-Down Mode Operation
- Retriggerable for Very Long Output Pulses, up to 100% Duty Cycle
- Overriding Clear Terminates Output Pulse
- Glitch-Free Power-Up Reset on Outputs
- Latch-Up Performance Exceeds 100 mA Per JESD 78, Class II
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

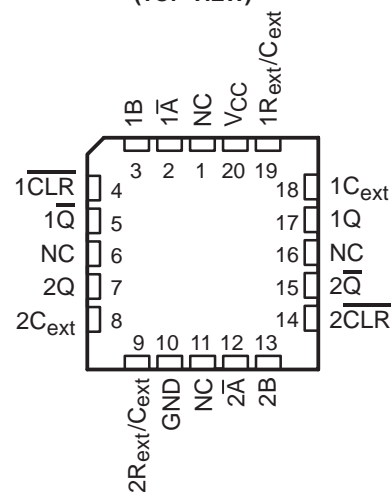
SN54LV123A . . . J OR W PACKAGE  
SN74LV123A . . . D, DB, DGV, NS,  
OR PW PACKAGE  
(TOP VIEW)



SN74LV123A . . . RGY PACKAGE  
(TOP VIEW)



SN54LV123A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

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 output pulse duration is programmable 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  $V_{CC}$ . The output pulse duration also can be reduced by taking  $\overline{CLR}$  low.

Pulse triggering occurs at a particular voltage level and is not directly related to the transition time of the input pulse. The  $\overline{A}$ , B, and  $\overline{CLR}$  inputs have Schmitt triggers with sufficient hysteresis to handle slow input transition rates with jitter-free triggering at the outputs.

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. The input/output timing diagram illustrates pulse control by retriggering the inputs and early clearing.



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UNLESS OTHERWISE NOTED this document contains PRODUCTION DATA information current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

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# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

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## description/ordering information (continued)

During power up, Q outputs are in the low state, and  $\bar{Q}$  outputs are in the high state. The outputs are glitch free, without applying a reset pulse.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.







Pin assignments for these devices are identical to those of the 'AHC123A and 'AHCT123A devices for interchangeability, when allowed.

### ORDERING INFORMATION

$T_A$	PACKAGE†		ORDERABLE PART NUMBER	TOP-SIDE MARKING
-40°C to 85°C	QFN – RGY	Reel of 1000	SN74LV123ARGYR	LV123A
	SOIC – D	Tube of 40	SN74LV123AD	LV123A
		Reel of 2500	SN74LV123ADR	
	SOP – NS	Reel of 2000	SN74LV123ANSR	74LV123A
	SSOP – DB	Reel of 2000	SN74LV123ADBR	LV123A
	TSSOP – PW	Tube of 90	SN74LV123APW	LV123A
		Reel of 2000	SN74LV123APWR	
Reel of 250		SN74LV123APWT		
TVSOP – DGV	Reel of 2000	SN74LV123ADGVR	LV123A	
-55°C to 125°C	CDIP – J	Tube of 25	SNJ54LV123AJ	SNJ54LV123AJ
	CFP – W	Tube of 150	SNJ54LV123AW	SNJ54LV123AW
	LCCC – FK	Tube of 55	SNJ54LV123AFK	SNJ54LV123AFK

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).

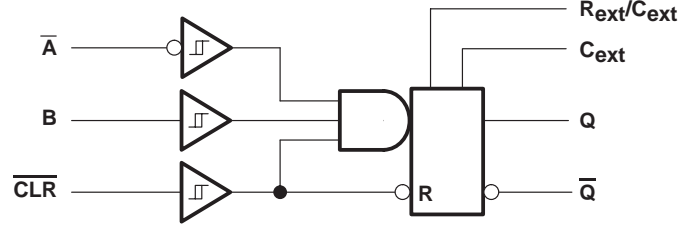
### FUNCTION TABLE (each multivibrator)

INPUTS			OUTPUTS	
CLR	$\bar{A}$	B	Q	$\bar{Q}$
L	X	X	L	H
X	H	X	L‡	H‡
X	X	L	L‡	H‡
H	L	↑		
H	↓	H		
↑	L	H		

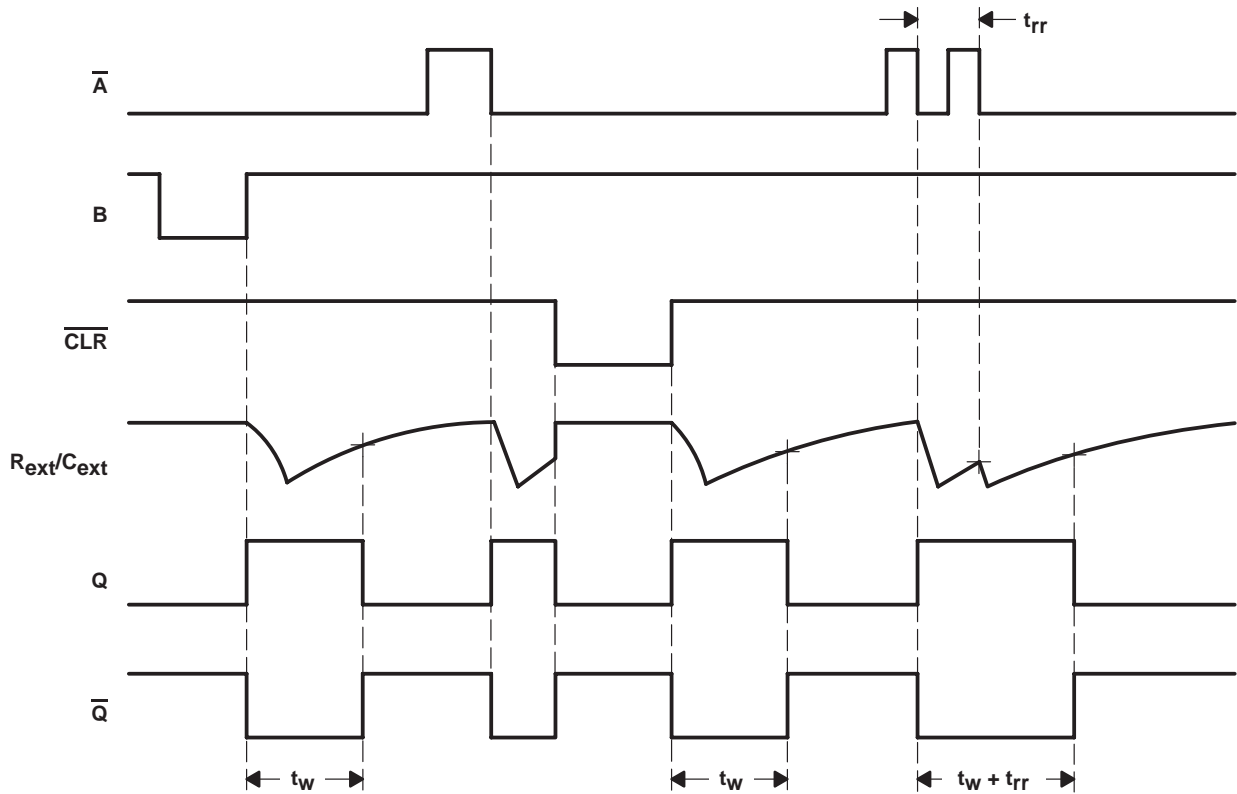
‡ These outputs are based on the assumption that the indicated steady-state conditions at the  $\bar{A}$  and B inputs have been set up long enough to complete any pulse started before the setup.

**SN54LV123A, SN74LV123A**  
**DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS**  
**WITH SCHMITT-TRIGGER INPUTS**  
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logic diagram, each multivibrator (positive logic)



input/output timing diagram



# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

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## 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
Voltage range applied to any output in the high-impedance or power-off state, $V_O$ (see Note 1) .....	-0.5 V to 7 V
Output voltage range in high or low state, $V_O$ (see Notes 1 and 2) .....	-0.5 V to $V_{CC} + 0.5$ V
Output voltage range in power-off state, $V_O$ (see Note 1) .....	-0.5 V to 7 V
Input clamp current, $I_{IK}$ ( $V_I < 0$ ) .....	-20 mA
Output clamp current, $I_{OK}$ ( $V_O < 0$ ) .....	-50 mA
Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ ) .....	$\pm 25$ mA
Continuous current through $V_{CC}$ or GND .....	$\pm 50$ mA
Package thermal impedance, $\theta_{JA}$ (see Note 3): D package .....	73°C/W
(see Note 3): DB package .....	82°C/W
(see Note 3): DGV package .....	120°C/W
(see Note 3): NS package .....	64°C/W
(see Note 3): PW package .....	108°C/W
(see Note 4): RGY package .....	39°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 negative-voltage ratings may be exceeded if the input and output current ratings are observed.
  2. This value is limited to 5.5 V maximum.
  3. The package thermal impedance is calculated in accordance with JESD 51-7.
  4. The package thermal impedance is calculated in accordance with JESD 51-5.



# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

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## recommended operating conditions (see Note 5)

		SN54LV123A		SN74LV123A		UNIT
		MIN	MAX	MIN	MAX	
V <sub>CC</sub>	Supply voltage	2	5.5	2	5.5	V
V <sub>IH</sub>	High-level input voltage	V <sub>CC</sub> = 2 V	1.5	1.5		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.7	V <sub>CC</sub> × 0.7		
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.7	V <sub>CC</sub> × 0.7		
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.7	V <sub>CC</sub> × 0.7		
V <sub>IL</sub>	Low-level input voltage	V <sub>CC</sub> = 2 V	0.5	0.5		V
		V <sub>CC</sub> = 2.3 V to 2.7 V	V <sub>CC</sub> × 0.3	V <sub>CC</sub> × 0.3		
		V <sub>CC</sub> = 3 V to 3.6 V	V <sub>CC</sub> × 0.3	V <sub>CC</sub> × 0.3		
		V <sub>CC</sub> = 4.5 V to 5.5 V	V <sub>CC</sub> × 0.3	V <sub>CC</sub> × 0.3		
V <sub>I</sub>	Input voltage	0	5.5	0	5.5	V
V <sub>O</sub>	Output voltage	0	V <sub>CC</sub>	0	V <sub>CC</sub>	V
I <sub>OH</sub>	High-level output current	V <sub>CC</sub> = 2 V		-50	-50	μA
		V <sub>CC</sub> = 2.3 V to 2.7 V		-2	-2	mA
		V <sub>CC</sub> = 3 V to 3.6 V		-6	-6	
		V <sub>CC</sub> = 4.5 V to 5.5 V		-12	-12	
I <sub>OL</sub>	Low-level output current	V <sub>CC</sub> = 2 V		50	50	μA
		V <sub>CC</sub> = 2.3 V to 2.7 V		2	2	mA
		V <sub>CC</sub> = 3 V to 3.6 V		6	6	
		V <sub>CC</sub> = 4.5 V to 5.5 V		12	12	
R <sub>ext</sub>	External timing resistance	V <sub>CC</sub> = 2 V	5k	5k		Ω
		V <sub>CC</sub> ≥ 3 V	1k	1k		
C <sub>ext</sub>	External timing capacitance	No restriction		No restriction		pF
Δt/ΔV <sub>CC</sub>	Power-up ramp rate	1		1		ms/V
T <sub>A</sub>	Operating free-air temperature	-55	125	-40	85	°C

NOTE 5: Unused R<sub>ext</sub>/C<sub>ext</sub> terminals should be left unconnected. All remaining unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

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

PARAMETER	TEST CONDITIONS	V <sub>CC</sub>	SN54LV123A			SN74LV123A			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
V <sub>OH</sub>	I <sub>OH</sub> = -50 μA	2 V to 5.5 V	V <sub>CC</sub> -0.1			V <sub>CC</sub> -0.1			V
	I <sub>OH</sub> = -2 mA	2.3 V	2			2			
	I <sub>OH</sub> = -6 mA	3 V	2.48			2.48			
	I <sub>OH</sub> = -12 mA	4.5 V	3.8			3.8			
V <sub>OL</sub>	I <sub>OL</sub> = 50 μA	2 V to 5.5 V	0.1			0.1			V
	I <sub>OL</sub> = 2 mA	2.3 V	0.4			0.4			
	I <sub>OL</sub> = 6 mA	3 V	0.44			0.44			
	I <sub>OL</sub> = 12 mA	4.5 V	0.55			0.55			
I <sub>I</sub>	R <sub>ext</sub> /C <sub>ext</sub> †	V <sub>I</sub> = 5.5 V or GND	2 V to 5.5 V			±2.5			μA
	$\overline{A}$ , B, and $\overline{CLR}$	V <sub>I</sub> = 5.5 V or GND	0 to 5.5 V			±1			
I <sub>CC</sub>	Quiescent	V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0	5.5 V			20			μA
I <sub>CC</sub>	Active state (per circuit)	V <sub>I</sub> = V <sub>CC</sub> or GND, R <sub>ext</sub> /C <sub>ext</sub> = 0.5 V <sub>CC</sub>	2.3 V			220			μA
			3 V			280			
			4.5 V			650			
			5.5 V			975			
I <sub>off</sub>		V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V	0			5			μA
C <sub>i</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V			1.9			pF
			5 V			1.9			

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

timing requirements over recommended operating free-air temperature range, V<sub>CC</sub> = 2.5 V ± 0.2 V (unless otherwise noted) (see Figure 1)

	TEST CONDITIONS	T <sub>A</sub> = 25°C			SN54LV123A		SN74LV123A		UNIT
		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub> Pulse duration	$\overline{CLR}$	6			6.5		6.5		ns
	$\overline{A}$ or B trigger	6			6.5		6.5		
t <sub>rr</sub> Pulse retrigger time	R <sub>ext</sub> = 1 kΩ	C <sub>ext</sub> = 100 pF		‡	94	‡	‡	ns	
		C <sub>ext</sub> = 0.01 μF		‡	2	‡	‡	μs	

‡ See retriggering data in the application information section.

timing requirements over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)

	TEST CONDITIONS	T <sub>A</sub> = 25°C			SN54LV123A		SN74LV123A		UNIT
		MIN	TYP	MAX	MIN	MAX	MIN	MAX	
t <sub>w</sub> Pulse duration	$\overline{CLR}$	5			5		5		ns
	$\overline{A}$ or B trigger	5			5		5		
t <sub>rr</sub> Pulse retrigger time	R <sub>ext</sub> = 1 kΩ	C <sub>ext</sub> = 100 pF		‡	76	‡	‡	ns	
		C <sub>ext</sub> = 0.01 μF		‡	1.8	‡	‡	μs	

‡ See retriggering data in the application information section.

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# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

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timing requirements over recommended operating free-air temperature range,  $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

		TEST CONDITIONS		$T_A = 25^\circ\text{C}$			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_w$	Pulse duration	$\overline{\text{CLR}}$			5			5		5	ns
		$\overline{\text{A}}$ or B trigger			5			5		5	
$t_{rr}$	Pulse retrigger time	$R_{ext} = 1\text{ k}\Omega$	$C_{ext} = 100\text{ pF}$	†	59		†		†		ns
			$C_{ext} = 0.01\text{ }\mu\text{F}$	†	1.5		†		†		$\mu\text{s}$

† See retriggering data in the *application information* section.

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 2.5\text{ V} \pm 0.2\text{ V}$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54LV123A		SN74LV123A		UNIT	
				MIN	TYP	MAX	MIN	MAX	MIN	MAX		
$t_{pd}$	$\overline{\text{A}}$ or B	Q or $\overline{\text{Q}}$	$C_L = 15\text{ pF}$	14.5*	31.4*		1*	37*	1	37	ns	
	$\overline{\text{CLR}}$	Q or $\overline{\text{Q}}$		13*	25*		1*	29.5*	1	29.5		
	$\overline{\text{CLR}}$ trigger	Q or $\overline{\text{Q}}$		15.1*	33.4*		1*	39*	1	39		
$t_{pd}$	$\overline{\text{A}}$ or B	Q or $\overline{\text{Q}}$	$C_L = 50\text{ pF}$	16.6	36		1	42	1	42	ns	
	$\overline{\text{CLR}}$	Q or $\overline{\text{Q}}$		14.7	32.8		1	34.5	1	34.5		
	$\overline{\text{CLR}}$ trigger	Q or $\overline{\text{Q}}$		17.4	38		1	44	1	44		
$t_w^\ddagger$		Q or $\overline{\text{Q}}$	$C_L = 50\text{ pF}$ , $C_{ext} = 28\text{ pF}$ , $R_{ext} = 2\text{ k}\Omega$	197	260			320		320	ns	
			$C_L = 50\text{ pF}$ , $C_{ext} = 0.01\text{ }\mu\text{F}$ , $R_{ext} = 10\text{ k}\Omega$	90	100	110		90	110	90	110	$\mu\text{s}$
			$C_L = 50\text{ pF}$ , $C_{ext} = 0.1\text{ }\mu\text{F}$ , $R_{ext} = 10\text{ k}\Omega$	0.9	1	1.1		0.9	1.1	0.9	1.1	ms
$\Delta t_w^\S$			$C_L = 50\text{ pF}$		$\pm 1$					%		

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

†  $t_w$  = Duration of pulse at Q and  $\overline{\text{Q}}$  outputs

§  $\Delta t_w$  = Output pulse-duration variation (Q and  $\overline{\text{Q}}$ ) between circuits in same package

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switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 3.3 V \pm 0.3 V$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ C$			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 15 \text{ pF}$	10.2*	20.6*	1*	24*	1	24	ns	
	$\overline{CLR}$	Q or $\overline{Q}$		9.3*	15.8*	1*	18.5*	1	18.5		
	$\overline{CLR}$ trigger	Q or $\overline{Q}$		10.6*	22.4*	1*	26*	1	26		
$t_{pd}$	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 50 \text{ pF}$	11.8	24.1	1	27.5	1	27.5	ns	
	$\overline{CLR}$	Q or $\overline{Q}$		10.5	19.3	1	22	1	22		
	$\overline{CLR}$ trigger	Q or $\overline{Q}$		12.3	25.9	1	29.5	1	29.5		
$t_w^\dagger$		Q or $\overline{Q}$	$C_L = 50 \text{ pF}$ , $C_{ext} = 28 \text{ pF}$ , $R_{ext} = 2 \text{ k}\Omega$	182	240		300		300	ns	
			$C_L = 50 \text{ pF}$ , $C_{ext} = 0.01 \mu\text{F}$ , $R_{ext} = 10 \text{ k}\Omega$	90	100	110	90	110	90	110	$\mu\text{s}$
			$C_L = 50 \text{ pF}$ , $C_{ext} = 0.1 \mu\text{F}$ , $R_{ext} = 10 \text{ k}\Omega$	0.9	1	1.1	0.9	1.1	0.9	1.1	ms
$\Delta t_w^\ddagger$			$C_L = 50 \text{ pF}$	$\pm 1$						%	

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$\dagger t_w$  = Duration of pulse at Q and  $\overline{Q}$  outputs

$\ddagger \Delta t_w$  = Output pulse-duration variation (Q and  $\overline{Q}$ ) between circuits in same package

switching characteristics over recommended operating free-air temperature range,  $V_{CC} = 5 V \pm 0.5 V$  (unless otherwise noted) (see Figure 1)

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ C$			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{pd}$	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 15 \text{ pF}$	7.1*	12*	1*	14*	1	14	ns	
	$\overline{CLR}$	Q or $\overline{Q}$		6.5*	9.4*	1*	11*	1	11		
	$\overline{CLR}$ trigger	Q or $\overline{Q}$		7.4*	12.9*	1*	15*	1	15		
$t_{pd}$	$\overline{A}$ or B	Q or $\overline{Q}$	$C_L = 50 \text{ pF}$	8.3	14	1	16	1	16	ns	
	$\overline{CLR}$	Q or $\overline{Q}$		7.4	11.4	1	13	1	13		
	$\overline{CLR}$ trigger	Q or $\overline{Q}$		8.7	14.9	1	17	1	17		
$t_w^\dagger$		Q or $\overline{Q}$	$C_L = 50 \text{ pF}$ , $C_{ext} = 28 \text{ pF}$ , $R_{ext} = 2 \text{ k}\Omega$	167	200		240		240	ns	
			$C_L = 50 \text{ pF}$ , $C_{ext} = 0.01 \mu\text{F}$ , $R_{ext} = 10 \text{ k}\Omega$	90	100	110	90	110	90	110	$\mu\text{s}$
			$C_L = 50 \text{ pF}$ , $C_{ext} = 0.1 \mu\text{F}$ , $R_{ext} = 10 \text{ k}\Omega$	0.9	1	1.1	0.9	1.1	0.9	1.1	ms
$\Delta t_w^\ddagger$				$\pm 1$						%	

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

$\dagger t_w$  = Duration of pulse at Q and  $\overline{Q}$  outputs

$\ddagger \Delta t_w$  = Output pulse-duration variation (Q and  $\overline{Q}$ ) between circuits in same package

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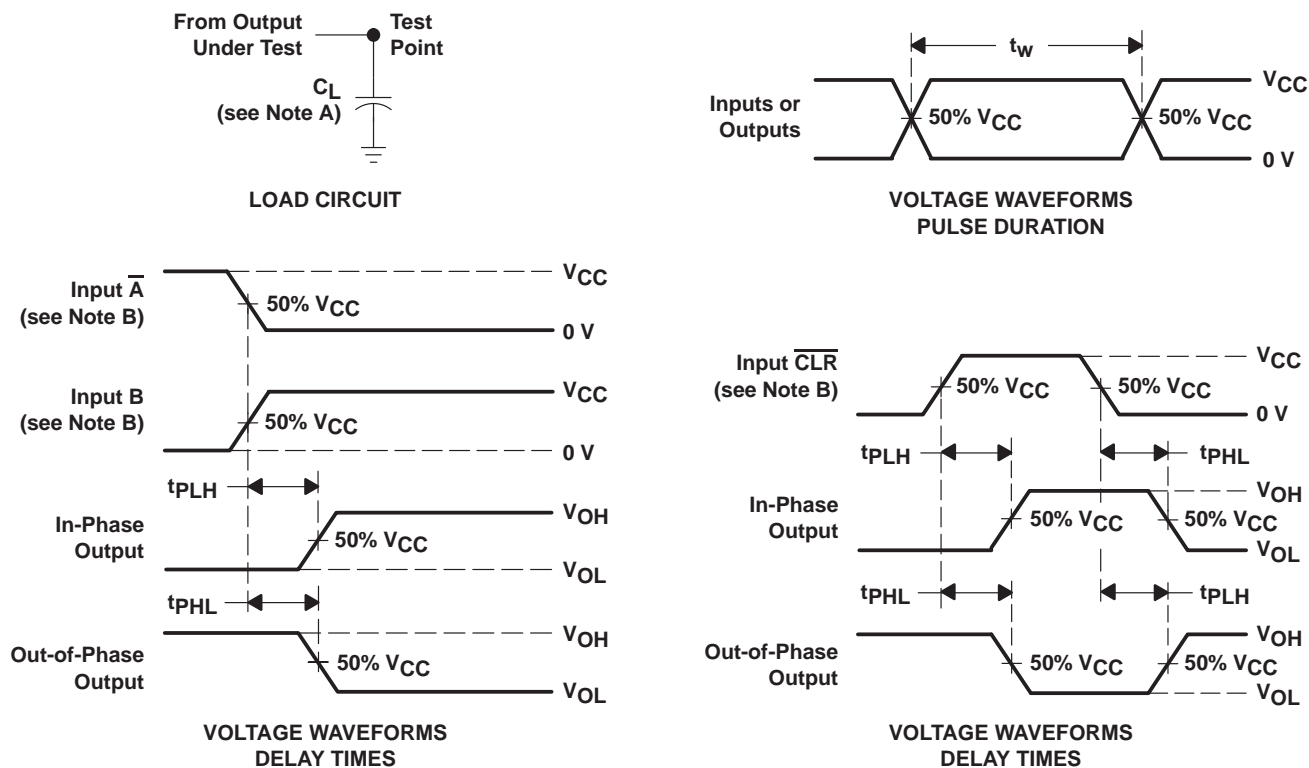
# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS WITH SCHMITT-TRIGGER INPUTS

SCLS3930 – APRIL 1998 – REVISED OCTOBER 2005

operating characteristics,  $T_A = 25^\circ\text{C}$

PARAMETER	TEST CONDITIONS	$V_{CC}$	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	$C_L = 50\text{ pF}, f = 10\text{ MHz}$	3.3 V	44	pF
		5 V	49	

## PARAMETER MEASUREMENT INFORMATION



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

**Figure 1. Load Circuit and Voltage Waveforms**

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## APPLICATION INFORMATION†

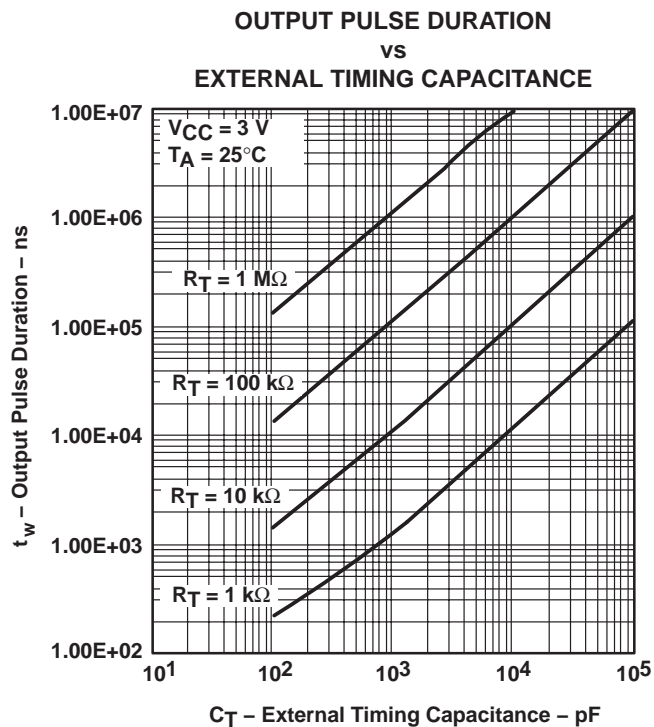


Figure 2

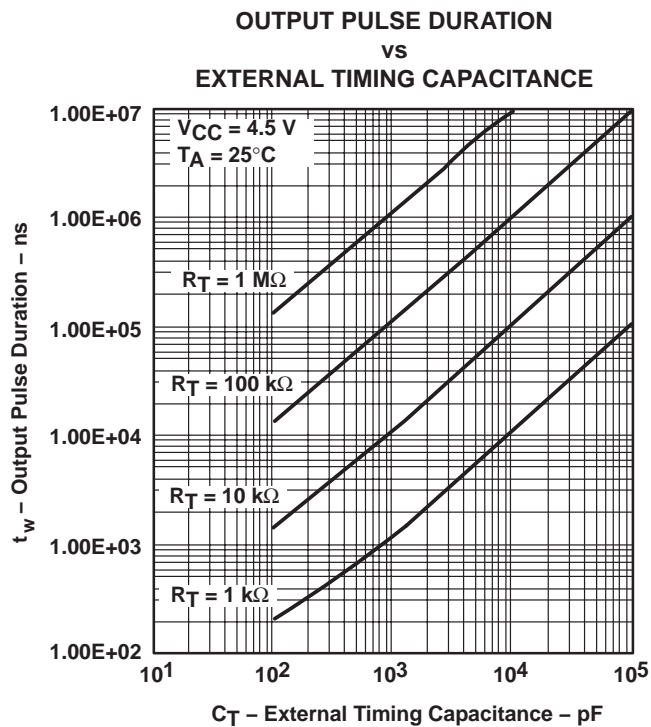


Figure 3

† Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

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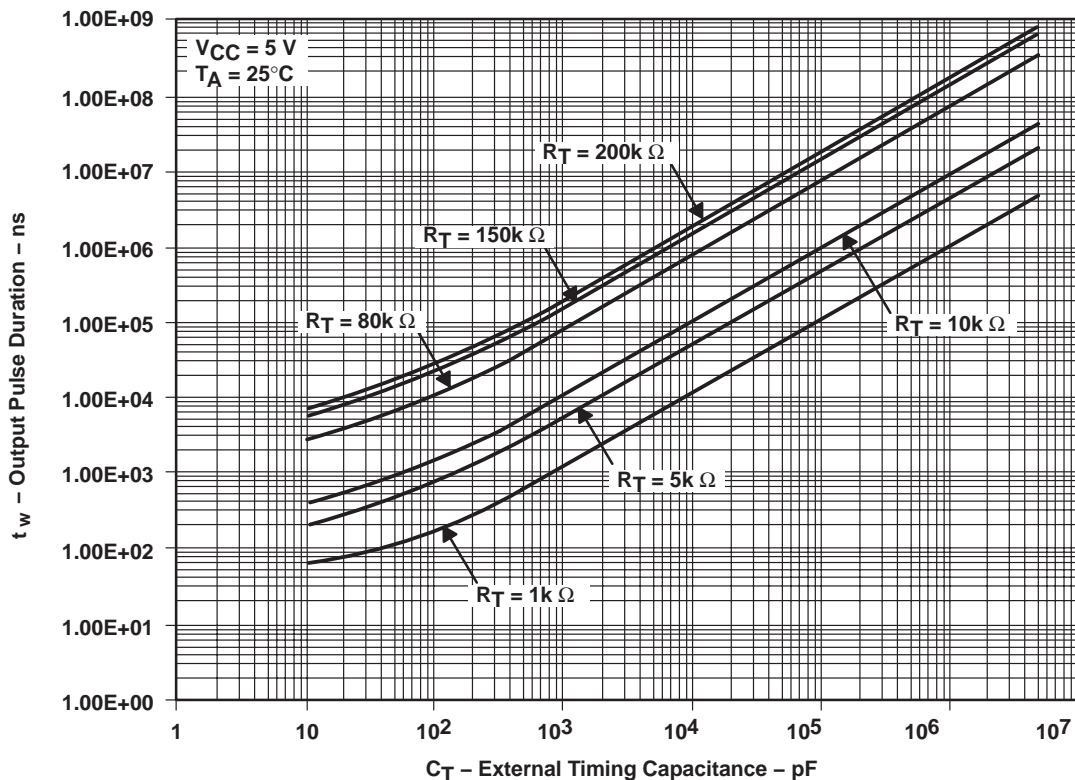


Figure 4. Output Pulse Duration vs External Timing Capacitance

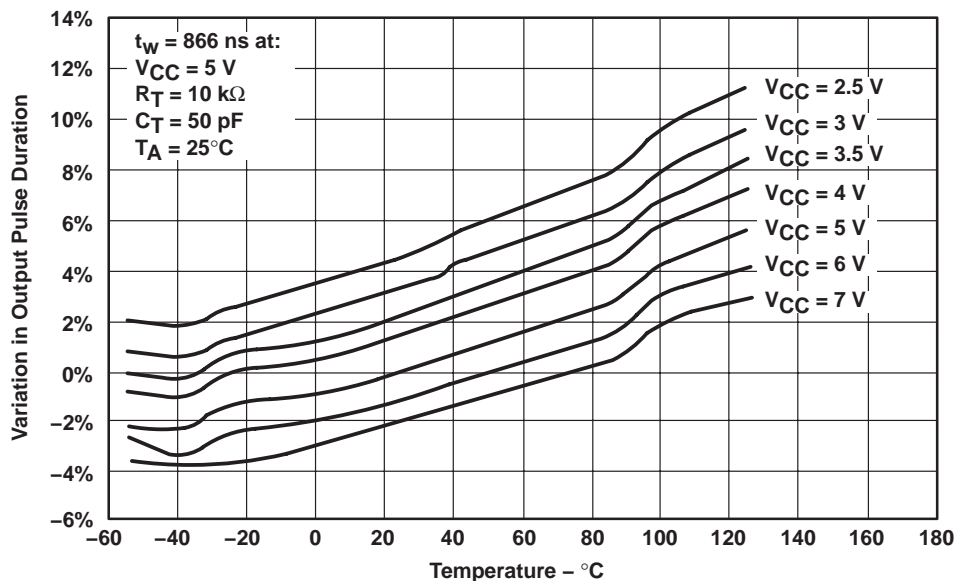


Figure 5. Variations in Output Pulse Duration vs Temperature

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## APPLICATION INFORMATION†

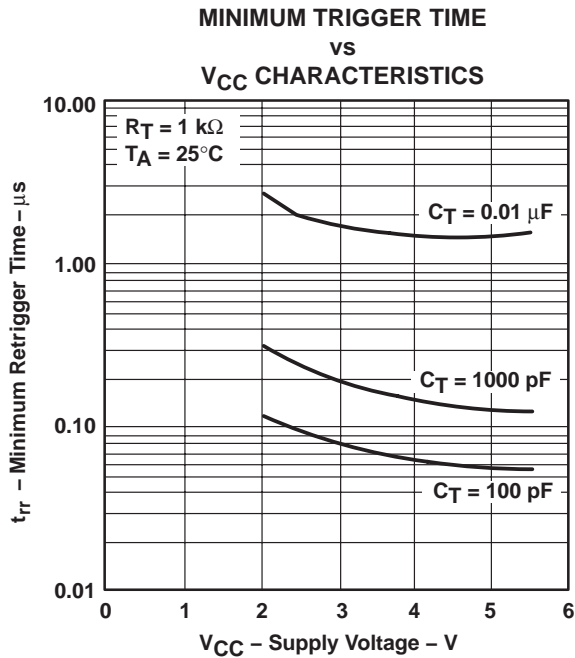


Figure 6

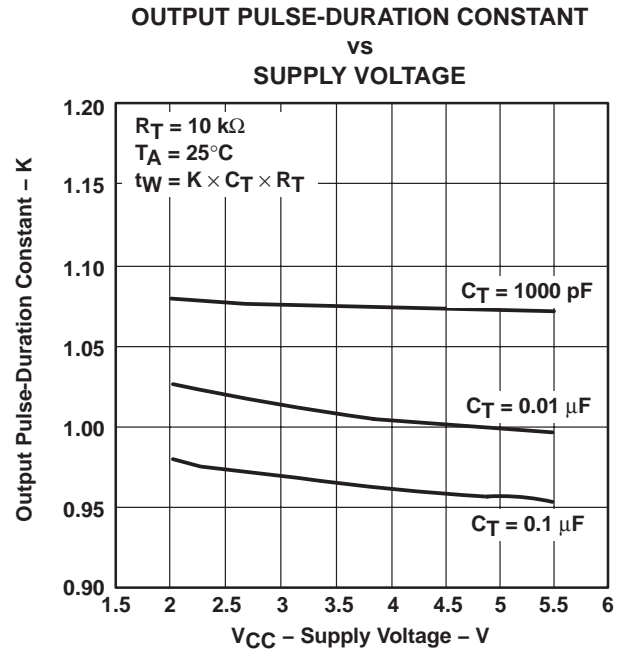


Figure 7



Figure 8

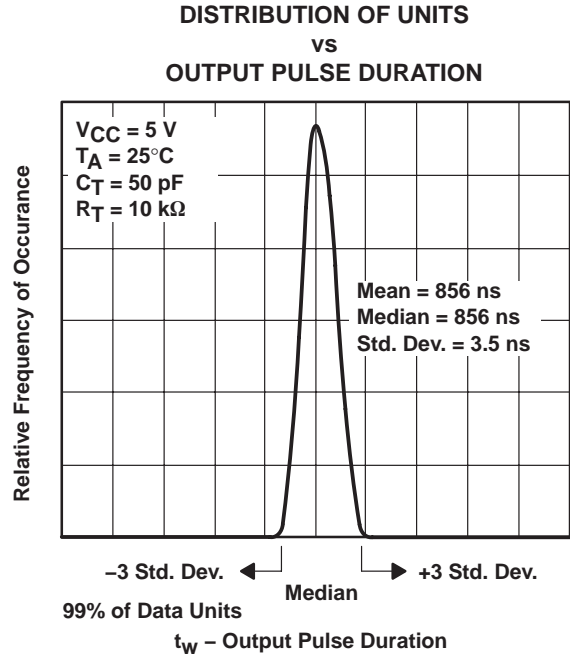


Figure 9

† Operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied.

## APPLICATION INFORMATION

### caution in use

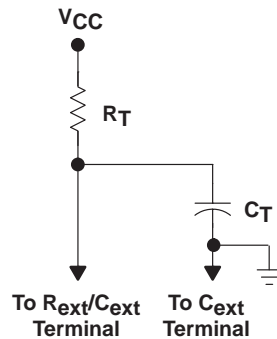
To prevent malfunctions due to noise, connect a high-frequency capacitor between  $V_{CC}$  and GND, and keep the wiring between the external components and  $C_{ext}$  and  $R_{ext}/C_{ext}$  terminals as short as possible.

### power-down considerations

Large values of  $C_{ext}$  can cause problems when powering down the 'LV123A devices because of the amount of energy stored in the capacitor. When a system containing this device is powered down, the capacitor can discharge from  $V_{CC}$  through the protection diodes at pin 2 or pin 14. Current through the input protection diodes must be limited to 30 mA; therefore, the turn-off time of the  $V_{CC}$  power supply must not be faster than  $t = V_{CC} \times C_{ext}/30 \text{ mA}$ . For example, if  $V_{CC} = 5 \text{ V}$  and  $C_{ext} = 15 \text{ pF}$ , the  $V_{CC}$  supply must turn off no faster than  $t = (5 \text{ V}) \times (15 \text{ pF})/30 \text{ mA} = 2.5 \text{ ns}$ . Usually, this is not a problem because power supplies are heavily filtered and cannot discharge at this rate. When a more rapid decrease of  $V_{CC}$  to zero occurs, the 'LV123A devices can sustain damage. To avoid this possibility, use external clamping diodes.

### output pulse duration

The output pulse duration,  $t_w$ , is determined primarily by the values of the external capacitance ( $C_T$ ) and timing resistance ( $R_T$ ). The timing components are connected as shown in Figure 10.



**Figure 10. Timing-Component Connections**

The pulse duration is given by:

$$t_w = K \times R_T \times C_T \tag{1}$$

if  $C_T$  is  $\geq 1000 \text{ pF}$ ,  $K = 1.0$  or  
 if  $C_T$  is  $< 1000 \text{ pF}$ ,  $K$  can be determined from Figure 8

where:

- $t_w$  = pulse duration in ns
- $R_T$  = external timing resistance in  $k\Omega$
- $C_T$  = external capacitance in pF
- $K$  = multiplier factor

Equation 1 and Figure 3 can be used to determine values for pulse duration, external resistance, and external capacitance.

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## APPLICATION INFORMATION

### retriggering data

The minimum input retriggering time ( $t_{MIR}$ ) is the minimum time required after the initial signal before retriggering the input. After  $t_{MIR}$ , the device retriggers the output. Experimentally, it also can be shown that to retrigger the output pulse, the two adjacent input signals should be  $t_{MIR}$  apart, where  $t_{MIR} = 0.30 \times t_w$ . The retrigger pulse duration is calculated as shown in Figure 11.

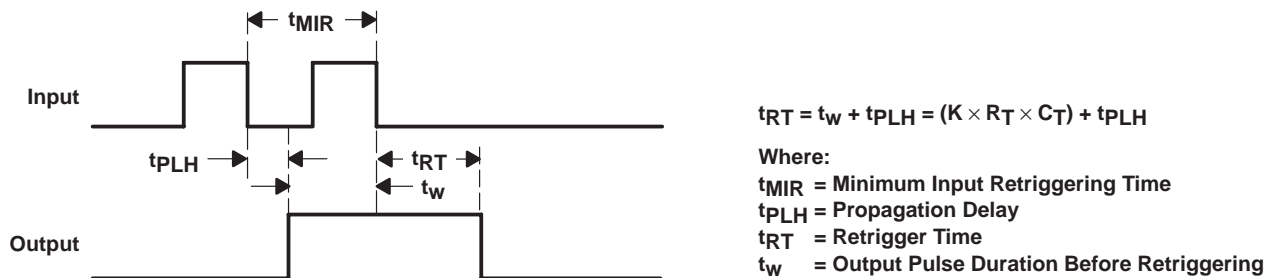
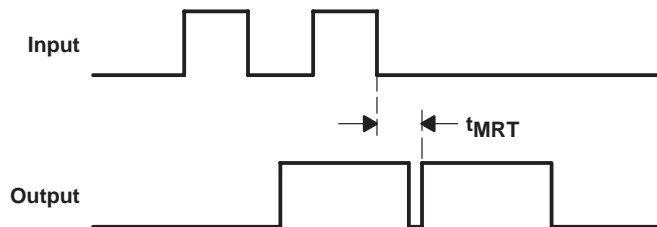


Figure 11. Retrigger Pulse Duration

The minimum value from the end of the input pulse to the beginning of the retriggered output should be approximately 15 ns to ensure a retriggered output (see Figure 12).



$t_{MRT}$  = Minimum Time Between the End of the Second Input Pulse and the Beginning of the Retriggered Output  
 $t_{MRT} = 15 \text{ ns}$

Figure 12. Input/Output Requirements

**PACKAGING INFORMATION**

Orderable Device	Status <sup>(1)</sup>	Package Type	Package Drawing	Pins	Package Qty	Eco Plan <sup>(2)</sup>	Lead/Ball Finish	MSL Peak Temp <sup>(3)</sup>
SN74LV123AD	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADBR	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADBRE4	ACTIVE	SSOP	DB	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADE4	ACTIVE	SOIC	D	16	40	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADGVR	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADGVRE4	ACTIVE	TVSOP	DGV	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADR	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ADRE4	ACTIVE	SOIC	D	16	2500	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ANSR	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ANSRE4	ACTIVE	SO	NS	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APW	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWE4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWG4	ACTIVE	TSSOP	PW	16	90	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWR	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWRE4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWRG4	ACTIVE	TSSOP	PW	16	2000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWT	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWTE4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123APWTG4	ACTIVE	TSSOP	PW	16	250	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-1-260C-UNLIM
SN74LV123ARGYR	ACTIVE	QFN	RGY	16	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR
SN74LV123ARGYRG4	ACTIVE	QFN	RGY	16	1000	Green (RoHS & no Sb/Br)	CU NIPDAU	Level-2-260C-1YEAR

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

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(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

(3) MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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DGV (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

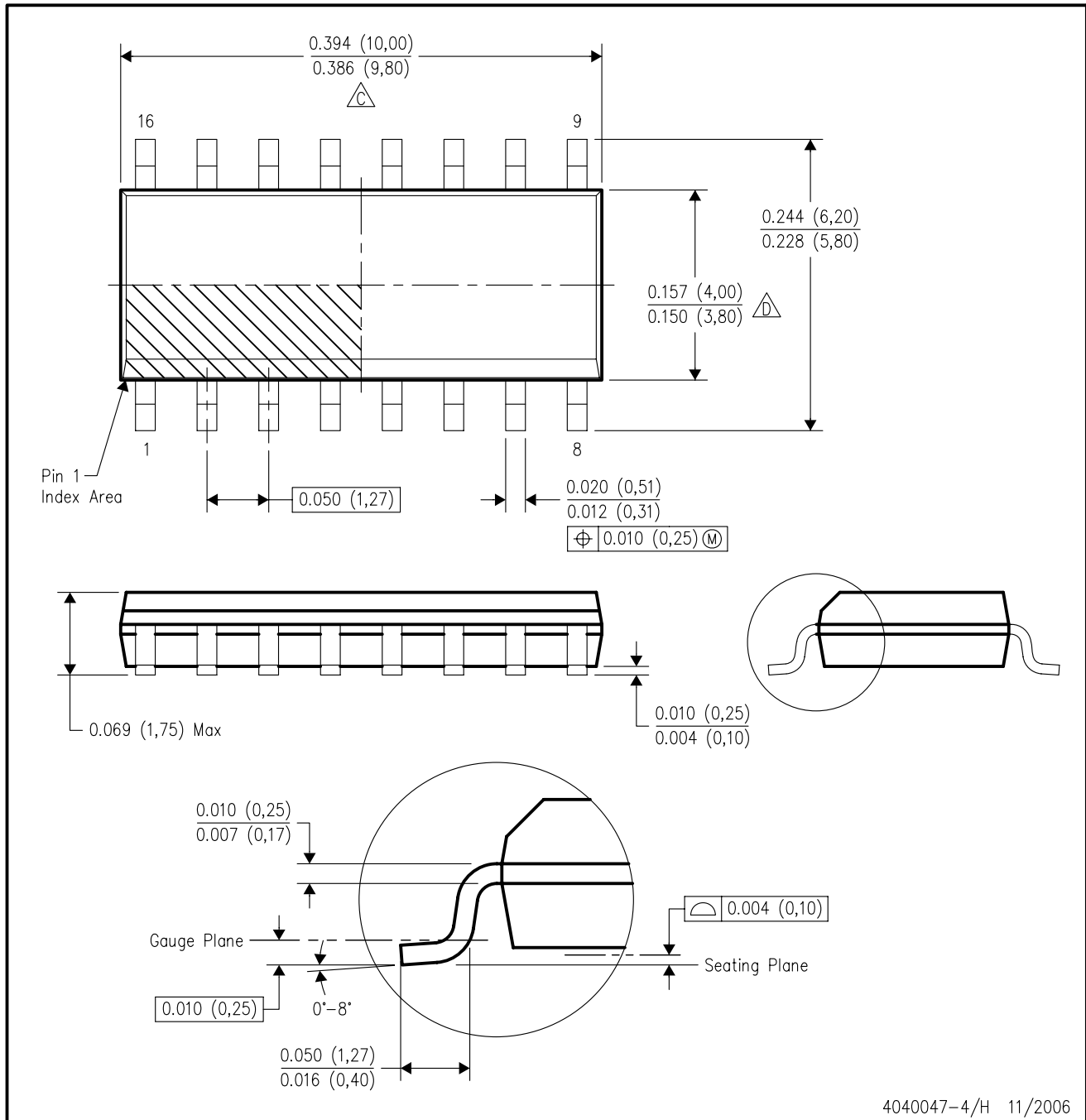
24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

D (R-PDSO-G16)

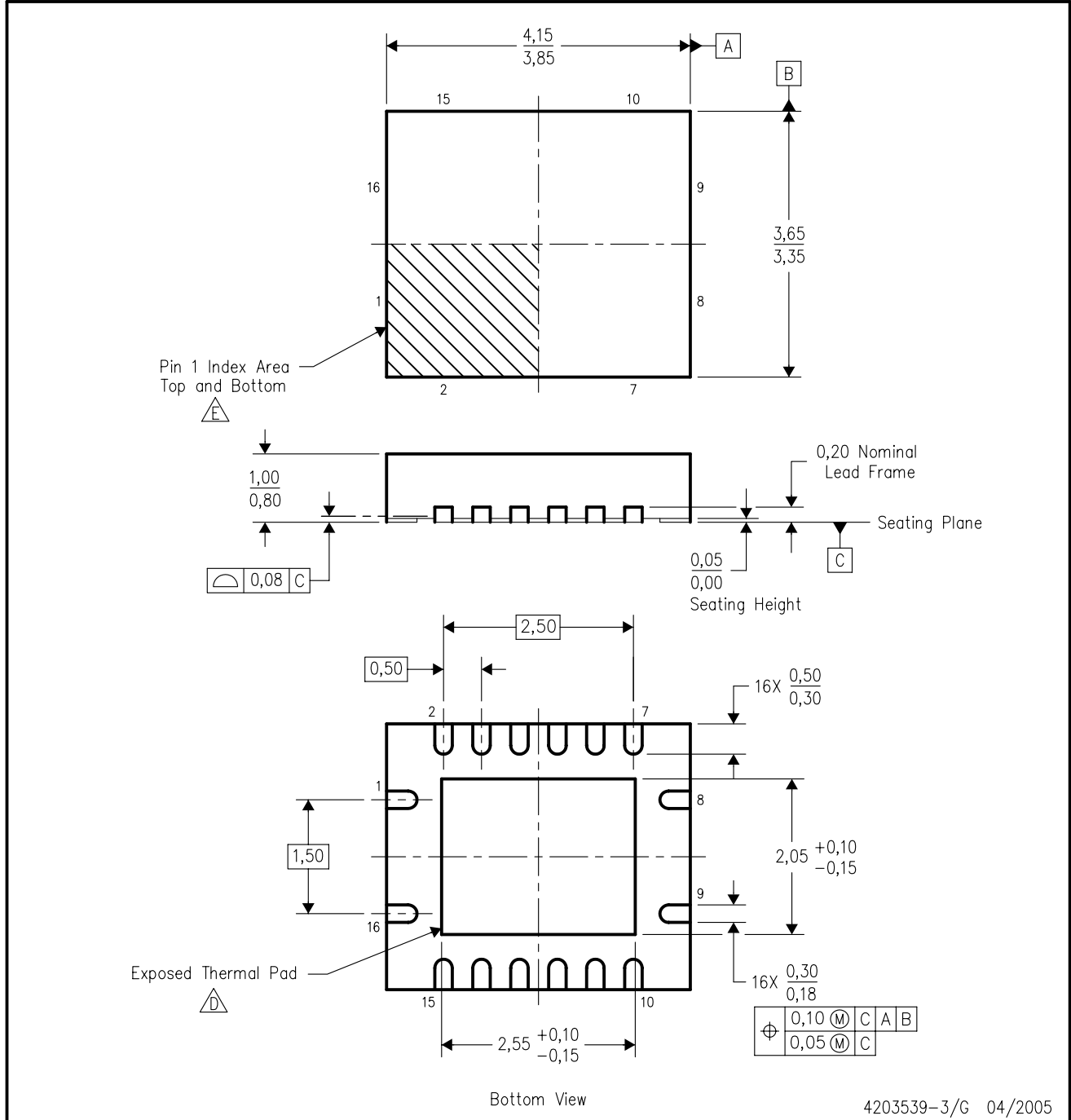
PLASTIC SMALL-OUTLINE PACKAGE





- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed .006 (0,15) per end.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
  - E. Reference JEDEC MS-012 variation AC.

RGY (R-PQFP-N16)

PLASTIC QUAD FLATPACK



4203539-3/G 04/2005

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. QFN (Quad Flatpack No-Lead) package configuration.
  -  The package thermal pad must be soldered to the board for thermal and mechanical performance.
  -  Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
  - F. Package complies to JEDEC MO-241 variation BB.

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

DB (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

PW (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



4040064/F 01/97

- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-153

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