

# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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- **EPIC™ (Enhanced-Performance Implanted CMOS) Process**
- **Typical  $V_{OLP}$  (Output Ground Bounce)  $< 0.8\text{ V}$  at  $V_{CC}$ ,  $T_A = 25^\circ\text{C}$**
- **Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $> 2\text{ V}$  at  $V_{CC}$ ,  $T_A = 25^\circ\text{C}$**
- **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)**

## description

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

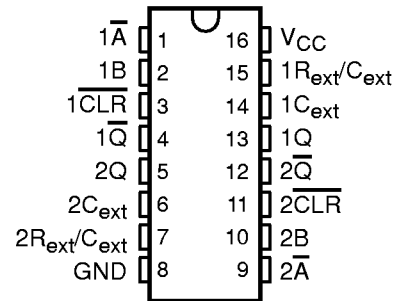
These edge-triggered multivibrators feature output pulse-duration control by three methods. In the first method, the  $\bar{A}$  input is low and the B input goes high. In the second method, the B input is high and the  $\bar{A}$  input goes low. In the third method, the  $\bar{A}$  input is low, the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

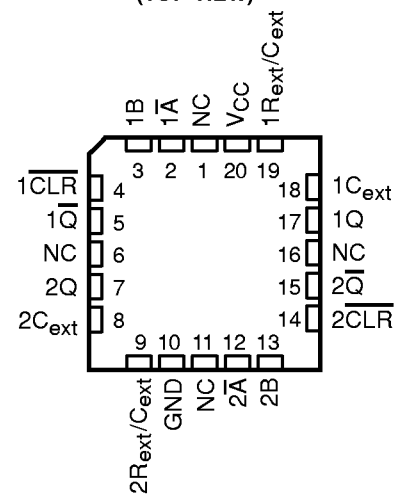
Once triggered, the basic pulse duration can be extended by retriggering the gated low-level-active ( $\bar{A}$ ) or high-level-active (B) input. Pulse duration can be reduced by taking CLR low. Figure 1 illustrates pulse control by retriggering the inputs and early clearing.

The SN54LV123A is characterized for operation over the full military temperature range of  $-55^\circ\text{C}$  to  $125^\circ\text{C}$ . The SN74LV123A is characterized for operation from  $-40^\circ\text{C}$  to  $85^\circ\text{C}$ .

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



SN54LV123A . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

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# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

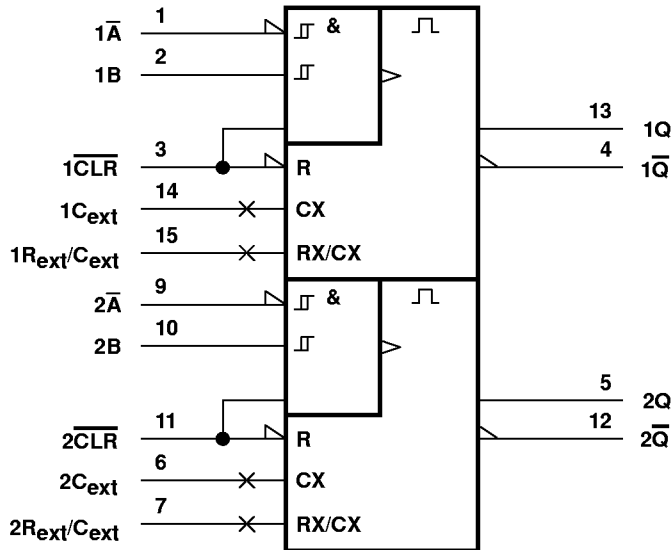
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FUNCTION TABLE

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

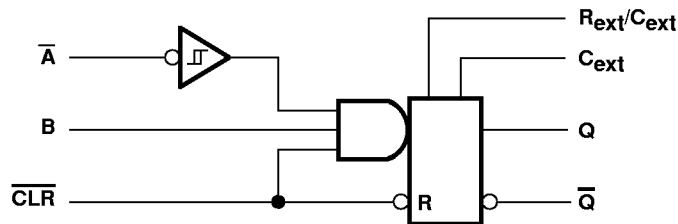
† These outputs are based on the assumption that the indicated steady-state conditions at the A and B inputs have been set up long enough to complete any pulse started before the setup.

## 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)



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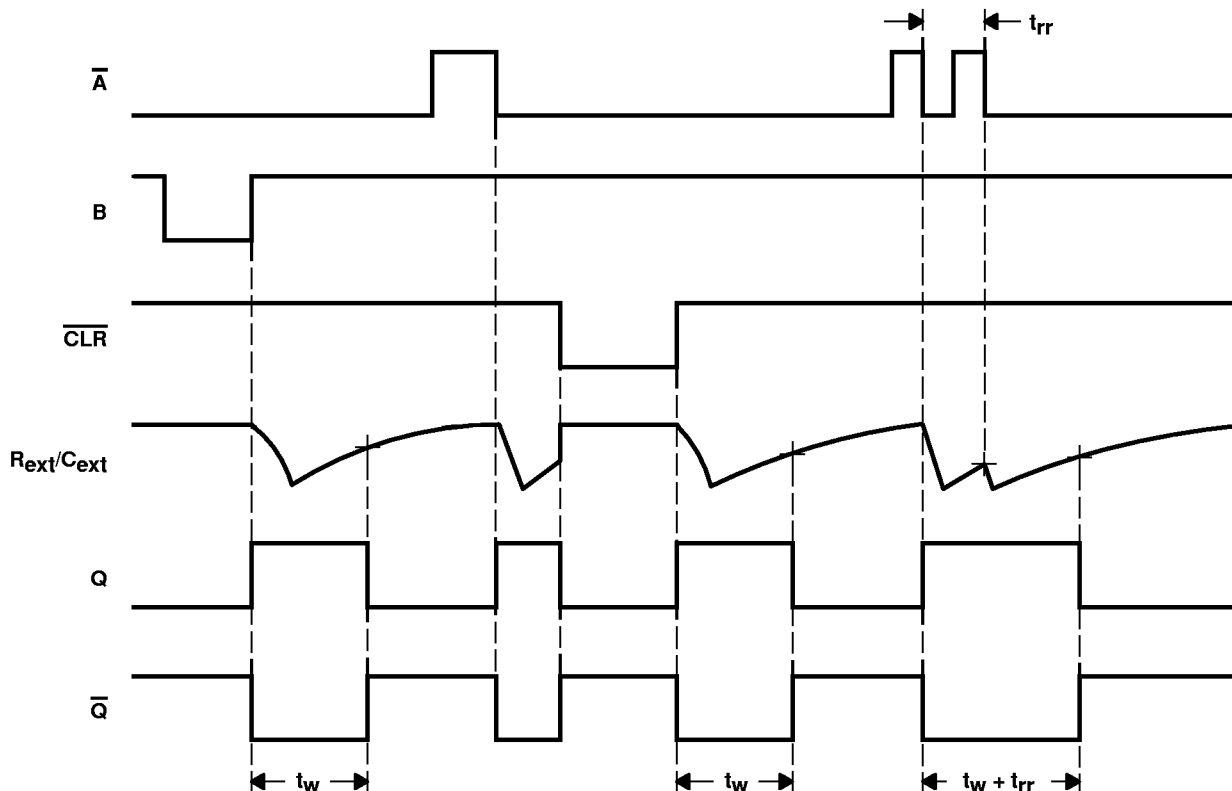


Figure 1. Input and Output Timing

**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 $V_O > V_{CC}$ ) .....	$\pm 50$ 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 .....	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.

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## 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	$V_{CC} = 2\text{ V}$	1.5	1.5		V	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	$V_{CC} \times 0.7$	$V_{CC} \times 0.7$			
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	$V_{CC} \times 0.7$	$V_{CC} \times 0.7$			
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$V_{CC} \times 0.7$	$V_{CC} \times 0.7$			
$V_{IL}$	Low-level input voltage	$V_{CC} = 2\text{ V}$	0.5	0.5		V	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	$V_{CC} \times 0.3$	$V_{CC} \times 0.3$			
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	$V_{CC} \times 0.3$	$V_{CC} \times 0.3$			
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	$V_{CC} \times 0.3$	$V_{CC} \times 0.3$			
$V_I$	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	$V_{CC} = 2\text{ V}$	-50	-50		$\mu\text{A}$	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-2	-2		mA	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	-6	-6			
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	-12	-12			
$I_{OL}$	Low-level output current	$V_{CC} = 2\text{ V}$	50	50		$\mu\text{A}$	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	2	2		mA	
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	6	6			
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	12	12			
$\Delta t/\Delta v$	Input transition rise or fall rate	$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	0	200	0	200	ns/V
		$V_{CC} = 3\text{ V to }3.6\text{ V}$	0	100	0	100	
		$V_{CC} = 4.5\text{ V to }5.5\text{ V}$	0	20	0	20	
$T_A$	Operating free-air temperature	-55	125	-40	85	$^{\circ}\text{C}$	

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.

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# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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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			V
	I <sub>OL</sub> = 2 mA	2.3 V				0.4			
	I <sub>OL</sub> = 6 mA	3 V				0.44			
	I <sub>OL</sub> = 12 mA	4.5 V				0.55			
I <sub>I</sub>	R <sub>ext</sub> /C <sub>ext</sub> <sup>†</sup>	V <sub>I</sub> = V <sub>CC</sub> or GND	5.5 V			±1			μA
	$\overline{A}$ , B, and $\overline{CLR}$	V <sub>I</sub> = V <sub>CC</sub> or GND	0 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			40			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>	2.7 V						μA
			3.6 V						
			5.5 V						
I <sub>off</sub>		V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V	0 V			5			μA
C <sub>i</sub>		V <sub>I</sub> = V <sub>CC</sub> or GND	3.3 V						pF
			5 V						

<sup>†</sup> 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 Figures 1 and 2)

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

timing requirements over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figures 1 and 2)

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

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# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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

		TEST CONDITIONS	$T_A = 25^\circ C$			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	$R_{ext} = 1 k\Omega$	$C_{ext} = 100 pF$						ns	
			$C_{ext} = 0.01 \mu F$						$\mu s$	

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ C$			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 $\overline{Q}$									
$t_{PHL}$											
$t_w^\dagger$		Q or $\overline{Q}$	$C_L = 50 pF,$ $C_{ext} = 28 pF,$ $R_{ext} = 2 k\Omega$						ns		
			$C_L = 50 pF,$ $C_{ext} = 0.01 \mu F,$ $R_{ext} = 10 k\Omega$						$\mu s$		
			$C_L = 50 pF,$ $C_{ext} = 0.1 \mu F,$ $R_{ext} = 10 k\Omega$						ms		
$\Delta t_w^\ddagger$									%		

\* 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

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}^*$	$\bar{A}$ or B	Q or $\bar{Q}$	$C_L = 15\text{ pF}$							ns	
$t_{PHL}^*$											
$t_{PLH}^*$	$\overline{\text{CLR}}$	Q or $\bar{Q}$									
$t_{PHL}^*$											
$t_{PLH}^*$	$\overline{\text{CLR}}$ trigger	Q or $\bar{Q}$									
$t_{PHL}^*$											
$t_{PLH}$	$\bar{A}$ or B	Q or $\bar{Q}$	$C_L = 50\text{ pF}$						ns		
$t_{PHL}$											
$t_{PLH}$	$\overline{\text{CLR}}$	Q or $\bar{Q}$									
$t_{PHL}$											
$t_{PLH}$	$\overline{\text{CLR}}$ trigger	Q or $\bar{Q}$									
$t_{PHL}$											
$t_w^\dagger$		Q or $\bar{Q}$		$C_L = 50\text{ pF},$ $C_{\text{ext}} = 28\text{ pF},$ $R_{\text{ext}} = 2\text{ k}\Omega$						ns	
				$C_L = 50\text{ pF},$ $C_{\text{ext}} = 0.01\text{ }\mu\text{F},$ $R_{\text{ext}} = 10\text{ k}\Omega$							$\mu\text{s}$
				$C_L = 50\text{ pF},$ $C_{\text{ext}} = 0.1\text{ }\mu\text{F},$ $R_{\text{ext}} = 10\text{ k}\Omega$							ms
$\Delta t_w^\ddagger$										%	

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

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

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

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# SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

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

PARAMETER	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS	$T_A = 25^\circ\text{C}$			SN54LV123A		SN74LV123A		UNIT
				MIN	TYP	MAX	MIN	MAX	MIN	MAX	
$t_{PLH}^*$	$\bar{A}$ or B	Q or $\bar{Q}$	$C_L = 15\text{ pF}$							ns	
$t_{PHL}^*$											
$t_{PLH}^*$	$\overline{\text{CLR}}$	Q or $\bar{Q}$									
$t_{PHL}^*$											
$t_{PLH}^*$	$\overline{\text{CLR}}$ trigger	Q or $\bar{Q}$									
$t_{PHL}^*$											
$t_{PLH}$	$\bar{A}$ or B	Q or $\bar{Q}$	$C_L = 50\text{ pF}$						ns		
$t_{PHL}$											
$t_{PLH}$	$\overline{\text{CLR}}$	Q or $\bar{Q}$									
$t_{PHL}$											
$t_{PLH}$	$\overline{\text{CLR}}$ trigger	Q or $\bar{Q}$									
$t_{PHL}$											
$t_w^\dagger$		Q or $\bar{Q}$	$C_L = 50\text{ pF}$ , $C_{ext} = 28\text{ pF}$ , $R_{ext} = 2\text{ k}\Omega$						ns		
			$C_L = 50\text{ pF}$ , $C_{ext} = 0.01\text{ }\mu\text{F}$ , $R_{ext} = 10\text{ k}\Omega$						$\mu\text{s}$		
			$C_L = 50\text{ pF}$ , $C_{ext} = 0.1\text{ }\mu\text{F}$ , $R_{ext} = 10\text{ k}\Omega$						ms		
$\Delta t_w^\ddagger$									%		

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

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

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

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

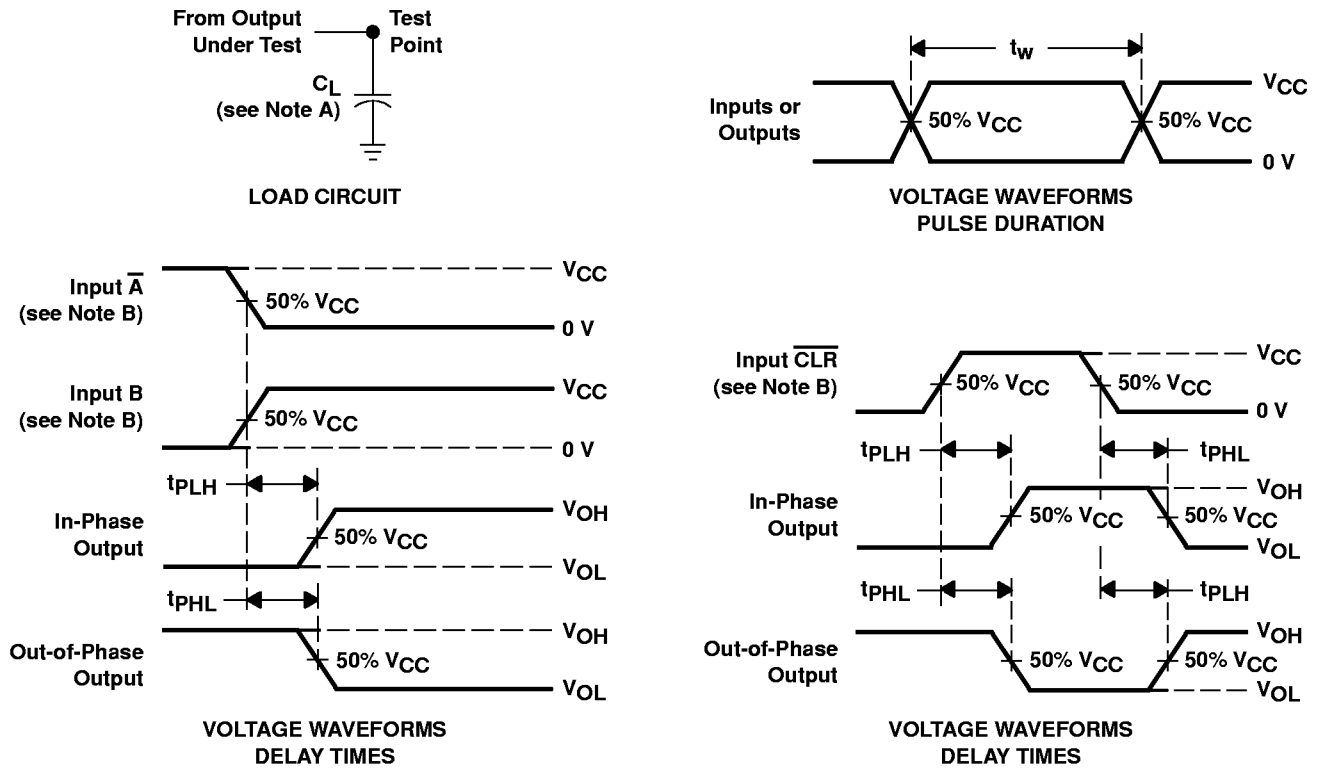
PARAMETER	TEST CONDITIONS	$V_{CC}$	TYP	UNIT
$C_{pd}$ Power dissipation capacitance	$C_L = 50\text{ pF}$ , $f = 10\text{ MHz}$	3.3 V		pF
		5 V		

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**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 2. Load Circuit and Voltage Waveforms**

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