

SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

- **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.

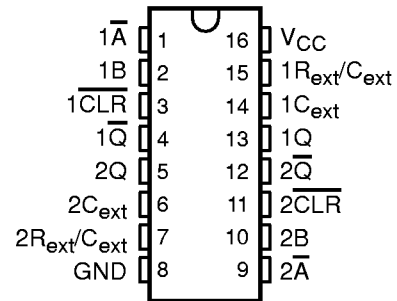
These edge-triggered multivibrators feature output pulse-duration control by three methods. In the first method, the \bar{A} input is low and the B input goes high. In the second method, the B input is high and the \bar{A} input goes low. In the third method, the \bar{A} input is low, the B input is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

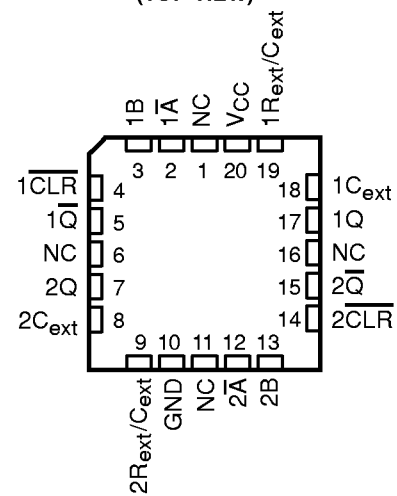
Once triggered, the basic pulse duration can be extended by retriggering the gated low-level-active (\bar{A}) or high-level-active (B) input. Pulse duration can be reduced by taking CLR low. Figure 1 illustrates pulse control by retriggering the inputs and early clearing.

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

PRODUCT PREVIEW



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

EPIC is a trademark of Texas Instruments Incorporated.

PRODUCT PREVIEW information concerns products in the formative or design phase of development. Characteristic data and other specifications are design goals. Texas Instruments reserves the right to change or discontinue these products without notice.



POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 1998, Texas Instruments Incorporated

SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

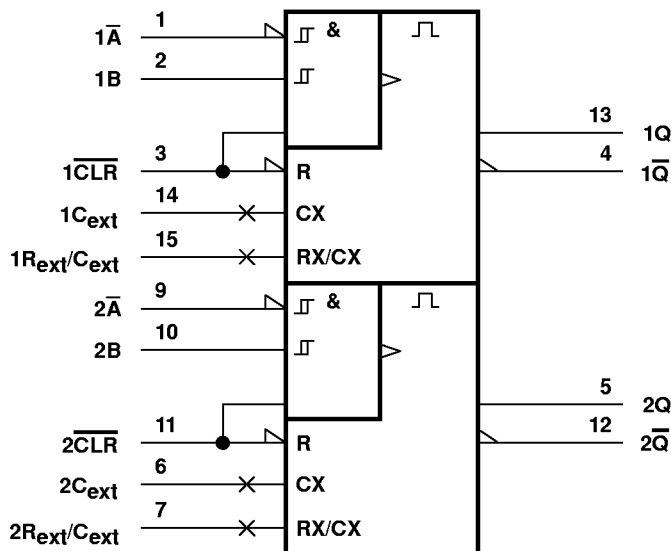
SCLS393 – APRIL 1998

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	⌋	⌋

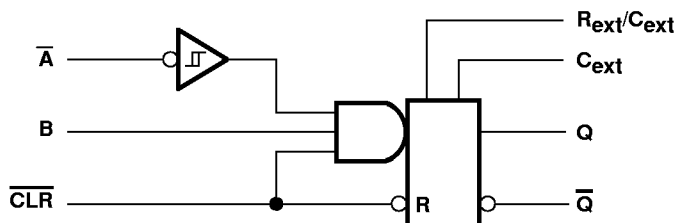
† These outputs are based on the assumption that the indicated steady-state conditions at the A and B inputs have been set up long enough to complete any pulse started before the setup.

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)



PRODUCT PREVIEW

SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

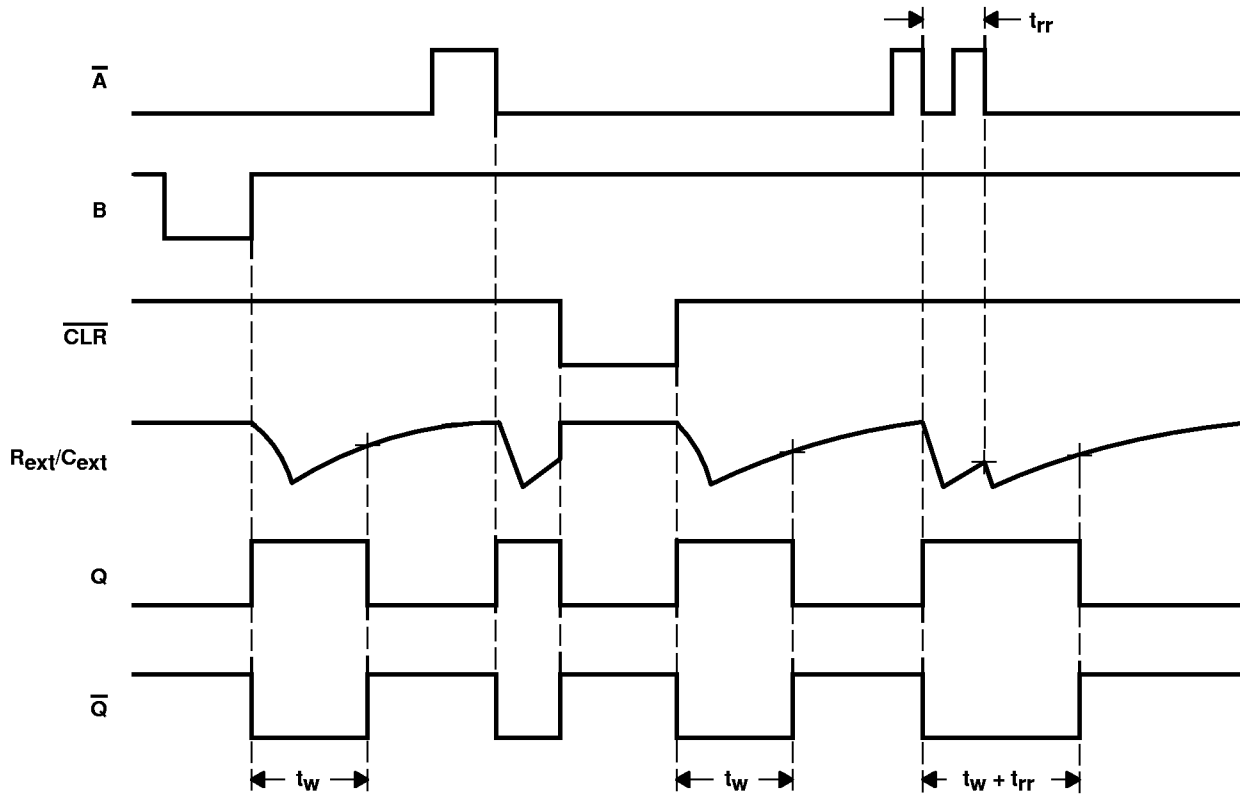


Figure 1. Input and Output Timing

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

SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

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		μA	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	-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		μA	
		$V_{CC} = 2.3\text{ V to }2.7\text{ V}$	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.

PRODUCT PREVIEW



SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

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			μA
	\overline{A} , B, and \overline{CLR}	V _I = V _{CC} or GND	0 V			±1			
I _{CC}	Quiescent	V _I = V _{CC} or GND, I _O = 0	5.5 V			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



SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

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	
			$C_{ext} = 0.01 \mu F$						μs	

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		
			$C_L = 50 pF,$ $C_{ext} = 0.01 \mu F,$ $R_{ext} = 10 k\Omega$						μs		
			$C_L = 50 pF,$ $C_{ext} = 0.1 \mu F,$ $R_{ext} = 10 k\Omega$						ms		
Δt_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

PRODUCT PREVIEW



SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

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}	$C_L = 50\text{ pF},$ $C_{ext} = 28\text{ pF},$ $R_{ext} = 2\text{ k}\Omega$							ns	
			$C_L = 50\text{ pF},$ $C_{ext} = 0.01\text{ }\mu\text{F},$ $R_{ext} = 10\text{ k}\Omega$								μs
			$C_L = 50\text{ pF},$ $C_{ext} = 0.1\text{ }\mu\text{F},$ $R_{ext} = 10\text{ k}\Omega$								ms
Δt_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

PRODUCT PREVIEW



SN54LV123A, SN74LV123A DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

SCLS393 – APRIL 1998

switching characteristics over recommended operating free-air temperature range,
 $V_{CC} = 5 V \pm 0.5 V$ (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}^*	\bar{A} or B	Q or \bar{Q}	$C_L = 15 pF$							ns	
t_{PHL}^*											
t_{PLH}^*	\overline{CLR}	Q or \bar{Q}									
t_{PHL}^*											
t_{PLH}^*	\overline{CLR} trigger	Q or \bar{Q}									
t_{PHL}^*											
t_{PLH}	\bar{A} or B	Q or \bar{Q}	$C_L = 50 pF$						ns		
t_{PHL}											
t_{PLH}	\overline{CLR}	Q or \bar{Q}									
t_{PHL}											
t_{PLH}	\overline{CLR} trigger	Q or \bar{Q}									
t_{PHL}											
t_w^\dagger		Q or \bar{Q}	$C_L = 50 pF,$ $C_{ext} = 28 pF,$ $R_{ext} = 2 k\Omega$						ns		
			$C_L = 50 pF,$ $C_{ext} = 0.01 \mu F,$ $R_{ext} = 10 k\Omega$						μs		
			$C_L = 50 pF,$ $C_{ext} = 0.1 \mu F,$ $R_{ext} = 10 k\Omega$						ms		
Δt_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

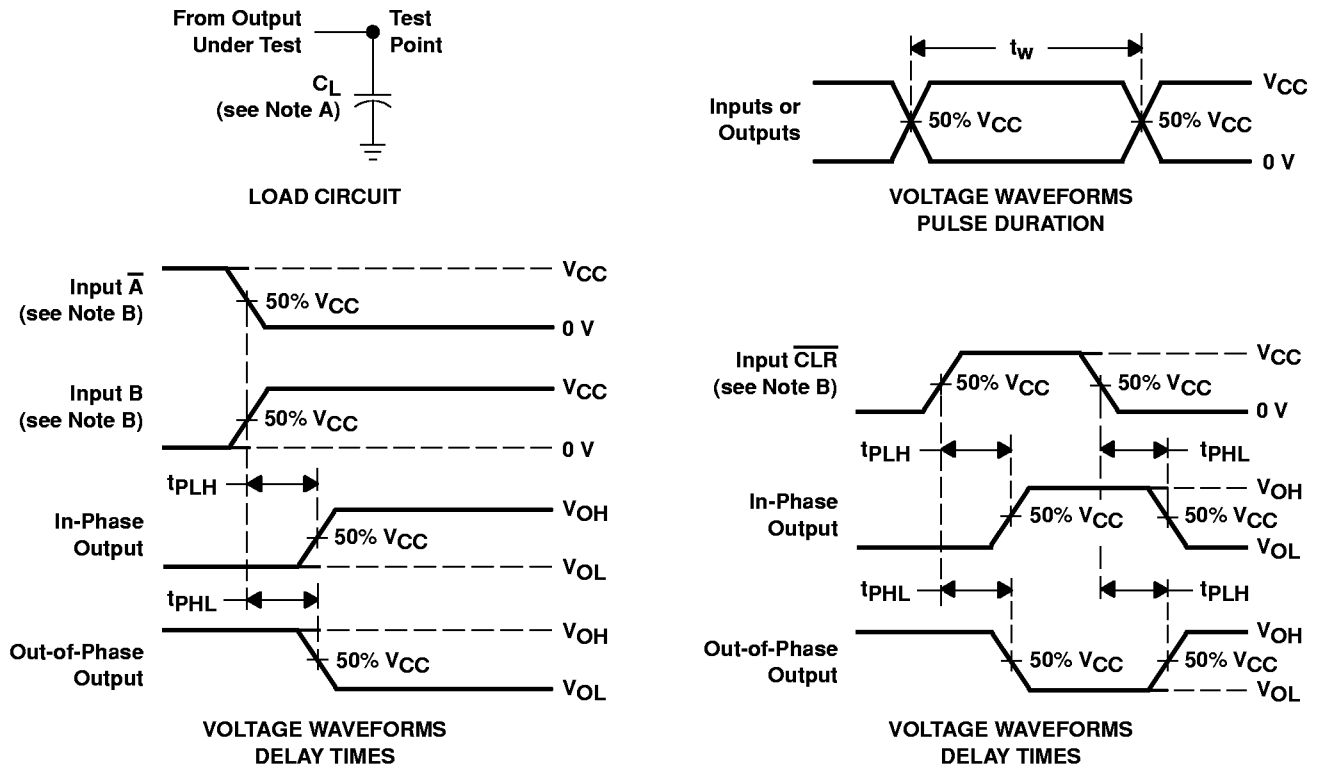
operating characteristics, $T_A = 25^\circ C$

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



- 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

PRODUCT PREVIEW

IMPORTANT NOTICE

Texas Instruments and its subsidiaries (TI) reserve the right to make changes to their products or to discontinue any product or service without notice, and advise customers to obtain the latest version of relevant information to verify, before placing orders, that information being relied on is current and complete. All products are sold subject to the terms and conditions of sale supplied at the time of order acknowledgement, including those pertaining to warranty, patent infringement, and limitation of liability.

TI warrants performance of its semiconductor products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are utilized to the extent TI deems necessary to support this warranty. Specific testing of all parameters of each device is not necessarily performed, except those mandated by government requirements.

CERTAIN APPLICATIONS USING SEMICONDUCTOR PRODUCTS MAY INVOLVE POTENTIAL RISKS OF DEATH, PERSONAL INJURY, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE ("CRITICAL APPLICATIONS"). TI SEMICONDUCTOR PRODUCTS ARE NOT DESIGNED, AUTHORIZED, OR WARRANTED TO BE SUITABLE FOR USE IN LIFE-SUPPORT DEVICES OR SYSTEMS OR OTHER CRITICAL APPLICATIONS. INCLUSION OF TI PRODUCTS IN SUCH APPLICATIONS IS UNDERSTOOD TO BE FULLY AT THE CUSTOMER'S RISK.

In order to minimize risks associated with the customer's applications, adequate design and operating safeguards must be provided by the customer to minimize inherent or procedural hazards.

TI assumes no liability for applications assistance or customer product design. TI does not warrant or represent that any license, either express or implied, is granted under any patent right, copyright, mask work right, or other intellectual property right of TI covering or relating to any combination, machine, or process in which such semiconductor products or services might be or are used. TI's publication of information regarding any third party's products or services does not constitute TI's approval, warranty or endorsement thereof.