

RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

These dc triggered multivibrators feature pulse width control by three methods. The basic pulse width is programmed by selection of external resistance and capacitance values. The LS122 has an internal timing resistor that allows the circuits to be used with only an external capacitor. Once triggered, the basic pulse width may be extended by retriggering the gated low-level-active (A) or high-level-active (B) inputs, or be reduced by use of the overriding clear.

- Overriding Clear Terminates Output Pulse
- Compensated for V_{CC} and Temperature Variations
- DC Triggered from Active-High or Active-Low Gated Logic Inputs
- Retriggerable for Very Long Output Pulses, up to 100% Duty Cycle
- Internal Timing Resistors on LS122



NC - NO INTERNAL CONNECTION.

NOTES:

- 1. An external timing capacitor may be connected between C_{ext} and R_{ext}/C_{ext} (positive).
- 2. To use the internal timing resistor of the LS122, connect R_{int} to $\mathsf{V}_{CC}.$
- 3. For improved pulse width accuracy connect an external resistor between R_{ext}/C_{ext} and V_{CC} with R_{int} open-circuited.
- To obtain variable pulse widths, connect an external variable resistance between R_{int}/C_{ext} and V_{CC}.

SN54/74LS122 SN54/74LS123

RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

LOW POWER SCHOTTKY



INPUTS OUTPUTS CLEAR A1 A2 **B1 B2** Q Q L Х Х Х Х L Н Х Н Н Х Х L Н Х Х Х L Х L Н Х Х Х Х L L н ↑ н L Х Н л ഹ Î н L Х н л ഹ Ŷ н Х L Н л ٦Г Х Î Н L Н л J Н Н \downarrow Н н л ഹ \downarrow \downarrow Н Н н л ഹ \downarrow Н Н Н н л ப î L Х Н н л ഹ ↑ Х L Н н л பா

LS122 FUNCTIONAL TABLE

TYPICAL	ICATION	DATA

The output pulse t_W is a function of the external components, C_{ext} and R_{ext} or C_{ext} and R_{int} on the LS122. For values of $C_{ext} \ge 1000 \text{ pF}$, the output pulse at $V_{CC} = 5.0 \text{ V}$ and $V_{RC} = 5.0 \text{ V}$ (see Figures 1, 2, and 3) is given by

tW = K Rext Cext where K is nominally 0.45

If C_{ext} is on pF and R_{ext} is in k Ω then t_W is in nanoseconds. The C_{ext} terminal of the LS122 and LS123 is an internal connection to ground, however for the best system performance C_{ext} should be hard-wired to ground.

Care should be taken to keep R_{ext} and C_{ext} as close to the monostable as possible with a minimum amount of inductance between the R_{ext}/C_{ext} junction and the R_{ext}/C_{ext} pin. Good groundplane and adequate bypassing should be designed into the system for optimum performance to insure that no false triggering occurs.

It should be noted that the C_{ext} pin is internally connected to ground on the LS122 and LS123, but not on the LS221. Therefore, if C_{ext} is hard-wired externally to ground, substitution of a LS221 onto a LS123 socket will cause the LS221 to become non-functional.

The switching diode is not needed for electrolytic capacitance application and should not be used on the LS122 and LS123.

To find the value of K for $C_{ext} \ge 1000 \text{ pF}$, refer to Figure 4. Variations on V_{CC} or V_{RC} can cause the value of K to change, as can the temperature of the LS123, LS122. Figures 5 and 6 show the behavior of the circuit shown in Figures 1 and 2 if

LS123 FUNCTIONAL TABLE

INF	Ουτ	PUTS		
CLEAR	Α	В	Q	Q
L	Х	Х	L	Н
Х	н	Х	L	н
Х	Х	L	L	н
н	L	\uparrow	л	പ
н	\downarrow	Н	1.	ഹ
↑	L	Н	л	J

separate power supplies are used for V_{CC} and V_{RC}. If V_{CC} is tied to V_{RC}, Figure 7 shows how K will vary with V_{CC} and temperature. Remember, the changes in R_{ext} and C_{ext} with temperature are not calculated and included in the graph.

As long as $C_{ext} \ge 1000$ pF and $5K \le R_{ext} \le 260K$ (SN74LS122/123) or $5K \le R_{ext} \le 160$ K (SN54LS122/123), the change in K with respect to R_{ext} is negligible.

If $C_{ext} \le 1000 \text{ pF}$ the graph shown on Figure 8 can be used to determine the output pulse width. Figure 9 shows how K will change for $C_{ext} \le 1000 \text{ pF}$ if V_{CC} and V_{RC} are connected to the same power supply. The pulse width t_W in nanoseconds is approximated by

t_W = 6 + 0.05 C_{ext} (pF) + 0.45 R_{ext} (kΩ) C_{ext} + 11.6 R_{ext}

In order to trim the output pulse width, it is necessary to include a variable resistor between V_{CC} and the R_{ext}/C_{ext} pin or between V_{CC} and the R_{ext} pin of the LS122. Figure 10, 11, and 12 show how this can be done. R_{ext} remote should be kept as close to the monostable as possible.

Retriggering of the part, as shown in Figure 3, must not occur before C_{ext} is discharged or the retrigger pulse will not have any effect. The discharge time of C_{ext} in nanoseconds is guaranteed to be less than 0.22 C_{ext} (pF) and is typically 0.05 C_{ext} (pF).

For the smallest possible deviation in output pulse widths from various devices, it is suggested that C_{ext} be kept $\ge 1000 \text{ pF}.$

GUARANTEED OPERATING RANGES

Symbol	Parameter		Min	Тур	Max	Unit
VCC	Supply Voltage	54 74	4.5 4.75	5.0 5.0	5.5 5.25	V
Т _А	Operating Ambient Temperature Range	54 74	-55 0	25 25	125 70	°C
ЮН	Output Current — High	54, 74			-0.4	mA
lol	Output Current — Low	54 74			4.0 8.0	mA
R _{ext}	External Timing Resistance	54 74	5.0 5.0		180 260	kΩ
C _{ext}	External Capacitance	54, 74	No Restriction			
R _{ext} /C _{ext}	Wiring Capacitance at Rext/Cext Terminal	54, 74	50		pF	

WAVEFORMS



				Limits				
Symbol	Parameter		Min	Тур	Max	Unit	Test C	conditions
VIH	Input HIGH Voltage		2.0			v	Guaranteed Inp All Inputs	ut HIGH Voltage for
Mar		54			0.7	V	Guaranteed Inp	ut LOW Voltage for
VIL	Input LOW Voltage	74			0.8	V	All Inputs	
VIK	Input Clamp Diode Voltage			-0.65	-1.5	V	V _{CC} = MIN, I _{IN} = -18 mA	
¥.		54	2.5	3.5		V	$V_{CC} = MIN, I_{OH} = MAX, V_{IN} = V_{OT}$ or V _{IL} per Truth Table	
VOH	Output HIGH Voltage	74	2.7	3.5		V		
		54, 74		0.25	0.4	V	I _{OL} = 4.0 mA	$V_{CC} = V_{CC} MIN$
VOL	Output LOW Voltage	74		0.35	0.5	V	I _{OL} = 8.0 mA	VIN = VIL or VIH per Truth Table
					20	μΑ	V _{CC} = MAX, V _I	N = 2.7 V
ΙН	Input HIGH Current				0.1	mA	V _{CC} = MAX, V _I	N = 7.0 V
۱ _{IL}	Input LOW Current				-0.4	mA	V _{CC} = MAX, V _{IN} = 0.4 V	
IOS	Short Circuit Current (Note 1)	-20		-100	mA	V _{CC} = MAX	
1	Dower Supply Current	LS122			11			
ICC Power Supply Curre	Power Supply Current	LS123			20	mA V _{CC} = MAX		

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (unless otherwise specified)

Note 1: Not more than one output should be shorted at a time, nor for more than 1 second.

AC CHARACTERISTICS (T_A = 25°C, V_{CC} = 5.0 V)

			Limits			
Symbol	Parameter	Min	Тур	Max	Unit	Test Conditions
^t PLH	Propagation Delay, A to \underline{Q}		23	33		
^t PHL	Propagation Delay, A to Q		32	45	ns	C _{ext} = 0
^t PLH	Propagation Delay, B to \underline{Q}		23	44		C _L = 15 pF
^t PHL	Propagation Delay, B to Q		34	56	ns	R _{ext} = 5.0 kΩ
^t PLH	Propagation Delay, Clear to Q		28	45		$R_L = 2.0 \text{ k}\Omega$
^t PHL	Propagation Delay, Clear to Q		20	27	ns	
^t W min	A or B to Q		116	200	ns	C _{ext} = 1000 pF, R _{ext} = 10 kΩ,
t _W Q	A to B to Q	4.0	4.5	5.0	μs	C_L = 15 pF, R_L = 2.0 k Ω

AC SETUP REQUIREMENTS (T_A = 25°C, V_{CC} = 5.0 V)

			Limits			
Symbol	Parameter	Min	Тур	Max	Unit	Test Conditions
tW	Pulse Width	40			ns	















Figure 4

FAST AND LS TTL DATA 5-201



Figure 5. K versus V_{CC}

Figure 6. K versus V_{RC}

Figure 7. K versus V_{CC} and V_{RC}



Figure 8







Figure 10. LS123 Remote Trimming Circuit



Figure 11. LS122 Remote Trimming Circuit Without Rext



Figure 12. LS122 Remote Trimming Circuit with Rint

Case 751B-03 D Suffix **16-Pin Plastic** SO-16



Case 648-08 N Suffix **16-Pin Plastic**





- NOTES: 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- CONTROLLING DIMENSION: MILLIMETER. DIMENSION A AND B DO NOT INCLUDE MOLD 2 3.
- PROTRUSION. MAXIMUM MOLD PROTRUSION 0.15 (0.006) 4.
- PER SIDE. 751B-01 IS OBSOLETE, NEW STANDARD 751B-03. 5.

	MILLIM	ETERS	INC	HES
DIM	MIN MAX		MIN	MAX
Α	9.80	10.00	0.386	0.393
В	3.80	4.00	0.150	0.157
С	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27	BSC	0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
М	0°	7 °	0°	7°
Р	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

NOTES:

- DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
- 2.
- CONTROLLING DIMENSION: INCH. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL. 3.
- DIMENSION "B" DOES NOT INCLUDE MOLD 4. FLASH.
- 5.
- ROUNDED CORNERS OPTIONAL. 648-01 THRU -07 OBSOLETE, NEW STANDARD 6. 648-08.

	MILLIM	ETERS	INC	HES		
DIM	MIN	MAX	MIN	MAX		
Α	18.80	19.55	0.740	0.770		
В	6.35	6.85	0.250	0.270		
С	3.69	4.44	0.145	0.175		
D	0.39	39 0.53 0.015		0.021		
F	1.02	1.77	0.040	0.070		
G	2.54	BSC	0.100 BSC			
н	1.27	BSC	0.050 BSC			
J	0.21	0.38	0.008	0.015		
K	2.80	3.30	0.110	0.130		
L	7.50	7.74	0.295	0.305		
М	0°	10°	0°	10°		
S	0.51	1.01	0.020	0.040		

- NOTES: 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982. 2. CONTROLLING DIMENSION: INCH. 3. DIMENSION L TO CENTER OF LEAD WHEN FORMED PARALLEL 4. DIM F MAY NARROW TO 0.76 (0.030) WHERE THE LEAD ENTERS THE CERAMIC BODY. 5. 620-01 THRU -08 OBSOLETE, NEW STANDARD 620-09.

- 620-09.

	MILLIM	ETERS	INC	HES	
DIM	MIN MAX		MIN	MAX	
Α	19.05	19.55	0.750	0.770	
В	6.10	7.36	0.240	0.290	
С	_	4.19	—	0.165	
D	0.39	0.53	0.015	0.021	
E	1.27	BSC	0.050 BSC		
F	1.40	1.77	0.055	0.070	
G	2.54	BSC	0.100 BSC		
J	0.23	0.27	0.009	0.011	
K	_	5.08	_	0.200	
L	7.62	BSC	0.300	BSC	
M	0°	15°	0°	15°	
N	0.39	0.88	0.015	0.035	

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