SDLS175 p2536, JANUARY 1980 - REVISED MARCH 1988

- · Will Not Trigger from Clear
- D-C Triggered from Active-High or Active-Low Gated Logic Inputs
- Retriggerable for Very Long Output Pulses, Up to 100% Duty Cycle
- . Overriding Clear Teminates Output Pulse
- 'LS422 Has Internal Timing Resistor

#### description

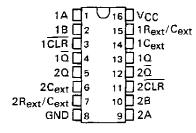
The 'LS422 and 'LS423 are identical to 'LS122 and 'LS123 except they cannot be triggered via clear.

These d-c triggered multivibrators feature output-pulse-width control by three methods. The basic pulse time is programmed by selection of external resistance and capacitance values (see typical application data). The 'LS422 contains an internal timing resistor that allows the circuits to be used with only an external capacitor, if so desired. 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. Figure 1 illustrates pulse control by retriggering and early clear.

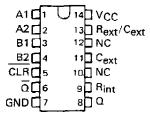
The 'LS422 and 'LS423 have enough Schmitt hysteresis to ensure jitter-free triggering from the B input with transition rates as slow as 0.1 millivolt per nanosecond. The 'LS422 Rint is nominally 10 k ohms.

The SN54LS422 and SN54LS423 are characterized for operation over the full military temperature range of  $-55\,^{\circ}\text{C}$  to 125 $^{\circ}\text{C}$ . The SN74LS422 and SN74LS423 are characterized for operation from 0 $^{\circ}\text{C}$  to 70 $^{\circ}\text{C}$ .

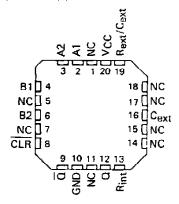
SN54LS423...J OR W PACKAGE SN74LS423...D OR N PACKAGE (TOP VIEW) (SEE NOTES 1 THRU 4)



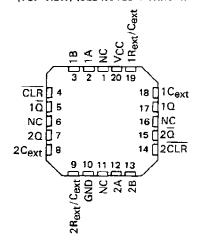
SN54LS422 ... J OR W PACKAGE SN74LS422 ... D OR N PACKAGE (TOP VIEW) (SEE NOTES 1 THRU 4)



SN54LS422 . . . FK PACKAGE (TOP VIEW) (SEE NOTES 1 THRU 4)



SN54LS423 . . . FK PACKAGE (TOP VIEW) (SEE NOTES 1 THRU 4)



- 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 'LS422, connect R<sub>int</sub> to V<sub>CC</sub>.
  - For improved pulse width accuracy and repeatability, connect an external resistor between R<sub>ext</sub>/C<sub>ext</sub> and V<sub>CC</sub> with R<sub>int</sub> open-circulted.
  - 4. To obtain variable pulse widths, connect an external variable resistance between Rint or Rext/Cext and VCC.

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# SN54LS422, SN54LS423, SN74LS422, SN74LS423 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

description (continued)

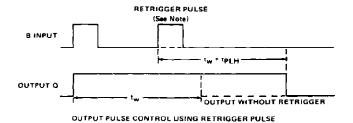
'L\$422 FUNCTION TABLE

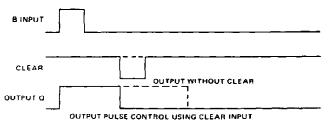
'LS423
FUNCTION TABLE

	INP	UTS			OUT	צדטי
CLEAR	Αì	A2	81	82	o	ā
L	Х	х	×	×	L	н
X	H	н	X	×	LŤ	нt
x	X	X	L	Х	LŤ	ΗŤ
× .	×	×	X	L	L.	нt
н	L	Х	†	н	$\Box$	Մ
н	L	×	н	1	л	П
₩	х	L	:	н	Λ.	IJ
H ;	×	L	H	٠	Л	П
: н	++	1	н	н	Л	¥
	1	1	н	Н	л	IJ
н	<b>.</b>	+4	+1	н	л	U

INPL	OUTPUTS			
CLEAR	A	8	Q	ã
L	×	×	L	H
×	Н	×	L.Ť	нt
х	×	L	LŤ	нТ
н	L	t	JŢ.	Л,
н		н	Л	ਪੁ

† These lines of the functional tables assume 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 set up.

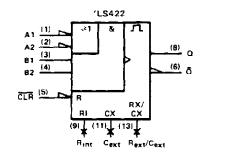


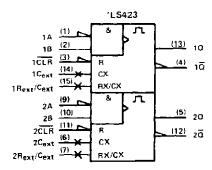


NOTE: Retrigger pulses starting before 0.22 C<sub>ext</sub> (in picofrads) nanoseconds after the initial trigger pulse will be ignored and the output pulse will remain unchanged.

FIGURE 1-TYPICAL INPUT/OUTPUT PULSES

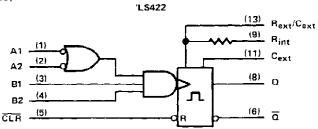
#### logic symbols†



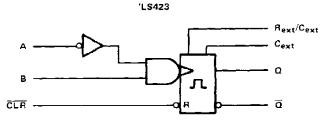


<sup>&</sup>lt;sup>†</sup> These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

## logic diagrams (positive logic)

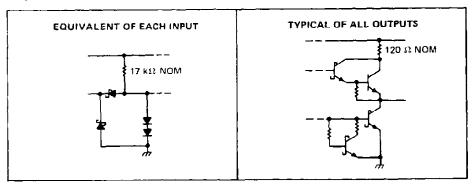


Rint is nominally 10 k ohms



Pin numbers shown are for D, J, N, and W packages.

## schematics of inputs and outputs





# SN54LS422, SN54LS423, SN74LS422, SN74LS423 RETRIGGERABLE MONOSTABLE MULTIVIBRATORS

## recommended operating conditions

	SN54LS'		SN74LS'				
	MIN	NOM	MAX	MIN	NOM	MAX	UNIT
Supply voltage, VCC	4.5	5	5.5	4.75	5	5.25	V
High-level output current, IOH			-400			<del>-40</del> 0	μΑ
Low-level output current, IOL			4			8	mA
Pulse width, tw	40			40			ns
External timing resistance, Rext	5		180	5		260	kΩ
External capacitance, C <sub>ext</sub>	No	No restriction No restri		restrict	tion		
Wiring capacitance at Rext/Cext terminal			50		-	50	ρF
Operating free-air temperature, TA	-55		125	0		70	°C

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

	PARAMETER	TEST CONDITIONS†			SN54LS'			SN74LS'			
	FARAMETER	TEST CONDITIONS				TYP‡	MAX	MIN	TYP‡	MAX	UNIT
VIH	High-level input voltage				2	_		2			V
VIL	Low-level input voltage						0.7			0.8	V
VIK	Input clamp voltage	VCC = MIN.	l <sub>I</sub> = -18 mA				-1.5			-1.5	V
voн	High-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = V <sub>IL</sub> max	V <sub>IH</sub> = 2 V, I <sub>OH</sub> = 400 μA		2,5	3,5		2.7	3.5		V
Vol	Low-level output voltage	V <sub>CC</sub> = MIN, V <sub>IL</sub> = V <sub>IL</sub> max	V <sub>IH</sub> = 2 V,	I <sub>OL</sub> = 4 mA		0,25	0,4		0.25 0.35	0.4 0.5	V
Ħ	Input current at maximum input voltage	VCC = MAX,	V <sub>1</sub> = 7 V				0.1			0.1	mΔ
ЧН	High-level input current	V <sub>CC</sub> = MAX,	V <sub>1</sub> = 2.7 V				20			20	μΑ
‡IL	Low-level input current	VCC = MAX,	V <sub>1</sub> ≈ 0.4 V				-0.4			-0.4	mA
los	Short-circuit output current §	V <sub>CC</sub> = MAX			-20		-100	-20		-100	mA
lcc	Supply current (quiescent or triggered)	V <sub>CC</sub> = MAX,	See Note 6	'L5422 'L5423		12	11 20		6 12	11 20	mΑ

<sup>&</sup>lt;sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

§ Not more than one output should be shorted at a time and duration of the short-circuit should not exceed one second. NOTES: 5. To measure  $V_{OH}$  at  $\overline{Q}$ ,  $V_{OL}$  at  $\overline{Q}$ , or  $I_{OS}$  at Q, ground  $R_{ext}/C_{ext}$ , apply 2 V to B and clear, and pulse A from 2 V to 0 V.

## switching characteristics, VCC = 5 V, TA = 25°C, see note 7

PARAMETER <sup>¶</sup>	FROM (INPUT)	TO (OUTPUT)	TEST CONDITIONS		MIN	TYP	MAX	UNIT
	Α	a	_ ·- ·- ·- ·- ·			23	3 <b>3</b>	
tPLH T	8					23	44	ns .
	A	~	C <sub>ext</sub> = 0, C <sub>L</sub> = 15 pF,	$R_{ext} = 5 k\Omega,$ $R_L = 2 k\Omega$	-	32	45	
tPHL -	В					34	56	ns -
t <sub>PHL</sub>		a	C[ * 15 pF,			20	27	
<sup>†</sup> PLH	Clear	Q				28	45	ns ·
twQ (min)	A or B	Q				116	200	ns
Dw <sup>‡</sup>	A or B	۵	C <sub>ext</sub> = 1000 pF, C <sub>L</sub> = 15 pF,	$R_{ext} = 10 \text{ k}\Omega$ , $R_L = 2 \text{ k}\Omega$	4	4.5	5	'ns

 $<sup>\</sup>P_{t_{\mathbf{WQ}}} = \text{width of pulse output Q.}$ 

NOTE 7: Load circuits and voltage waveforms are shown in Section 1.



 $<sup>^{\</sup>ddagger}$  All typical values are at VCC = 5 V, TA = 25 °C.

<sup>6.</sup> With all outputs open and 4.5 V applied to all data and clear inputs, ICC is measured after a momentary ground, then 4.5 V, is applied

## TYPICAL APPLICATION DATA FOR 'LS422, 'LS423<sup>†</sup>

The basic output pulse width is essentially determined by the values of external capacitance and timing resistance. For pulse widths when  $C_{\rm ext} \leq 1000\,$  pF, use Figure 3. For  $C_{\rm ext}$  between 0.1 nF and 1  $\mu$ F, the pulse width may be defined as:

with K obtained from Figure 4.

When  $C_{\text{ext}} \ge 1 \,\mu\text{F}$ , the output pulse width is defined as:

$$t_W \approx 0.33 \cdot R_T \cdot C_{ext}$$

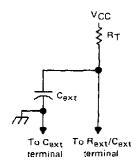
Where

RT is in kilohms (internal or external timing resistance)

Cext is in pF

tw is in nanoseconds

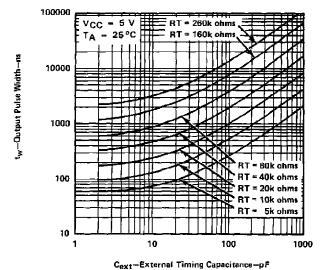
For maximum noise immunity, system ground should be applied to the  $C_{\text{ext}}$  node, even though the  $C_{\text{ext}}$  node is already tied to the ground lead internally. Due to the timing scheme used by the 'LS422 and 'LS423, a switching diode is not required to prevent reverse biasing when using electrolytic capacitors.



TIMING COMPONENT CONNECTIONS FIGURE 2

## 'LS422, 'LS423 TYPICAL OUTPUT PULSE WIDTH vs

#### **EXTERNAL TIMING CAPACITANCE**

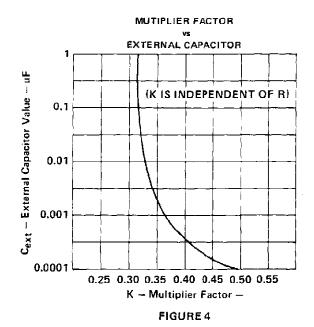


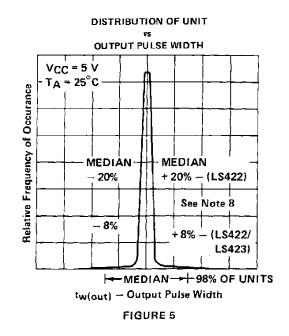
<sup>†</sup> This value of resistance exceeds the maximum recommended for use over the full temperature range of the SN54LS circuits.

FIGURE 3

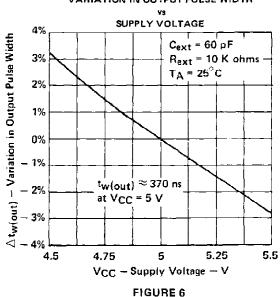


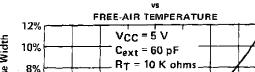
#### TYPICAL APPLICATION DATA FOR 'LS422, 'LS423 †





#### VARIATION IN OUTPUT PULSE WIDTH





VARIATION IN OUTPUT PULSE WIDTH

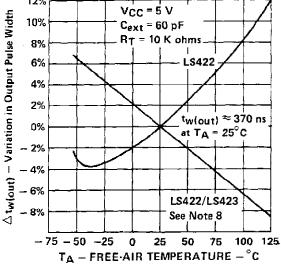


FIGURE 7

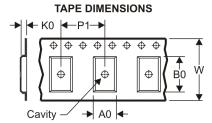
NOTE 8: For the LS422, the internal timing resistor, Rint was used. For the LS422/423, an external timing resistor was used for RT. † Data for temperatures below 0°C and above 70°C and for supply voltages below 4.75 V and above 5.25 V are applicable for \$N54L\$9422 and SN54LS423 only.

# PACKAGE MATERIALS INFORMATION

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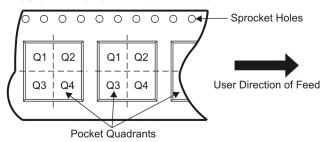
# TAPE AND REEL INFORMATION





	Dimension designed to accommodate the component width
B0	Dimension designed to accommodate the component length
K0	Dimension designed to accommodate the component thickness
W	Overall width of the carrier tape
P1	Pitch between successive cavity centers

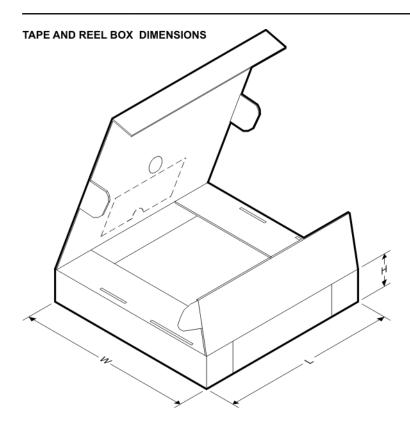
# QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE



## \*All dimensions are nominal

Device	Package Type	Package Drawing			Reel Diameter (mm)	Reel Width W1 (mm)	A0 (mm)	B0 (mm)	K0 (mm)	P1 (mm)	W (mm)	Pin1 Quadrant
SN74LS423NSR	SO	NS	16	2000	330.0	16.4	8.2	10.5	2.5	12.0	16.0	Q1

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#### \*All dimensions are nominal

Device	Package Type	Package Drawing	Pins	SPQ	Length (mm)	Width (mm)	Height (mm)
SN74LS423NSR	SO	NS	16	2000	346.0	346.0	33.0

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