Rochester Electronics®

Datasheet

PART NUMBER

DM54LS122JB-ROCV

Rochester Electronics Manufactured Components

Rochester branded components are manufactured using either die/wafers purchased from the original suppliers or Rochester wafers recreated from the original IP. All re-creations are done with the approval of the Original Component Manufacturer. (OCM)

Parts are tested using original factory test programs or Rochester developed test solutions to guarantee product meets or exceeds the OCM data sheet.

Quality Overview

- ISO-9001
- AS9120 certification
- Qualified Manufacturers List (QML) MIL-PRF-38535
  - Class Q Military
  - Class V Space Level

Qualified Suppliers List of Distributors (QSLD)

- Rochester is a critical supplier to DLA and meets all industry and DLA standards.

Rochester Electronics, LLC is committed to supplying products that satisfy customer expectations for quality and are equal to those originally supplied by industry manufacturers.

The original manufacturer's datasheet accompanying this document reflects the performance and specifications of the Rochester manufactured version of this device. Rochester Electronics guarantees the performance of its semiconductor products to the original OCM specifications. 'Typical' values are for reference purposes only. Certain minimum or maximum ratings may be based on product characterization, design, simulation, or sample testing.

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National Semiconductor Corporation

DM54LS122/DM74LS122 Retriggerable One-Shot with Clear and Complementary Outputs

General Description

The DM54/74LS122 is a retriggerable monostable multivibrator featuring both positive and negative edge triggering with complementary outputs. An internal 10 kΩ timing resistor is provided for design convenience minimizing component count and layout problems. This device can be used with a single external capacitor. The 'LS122 has two active-low transition triggering inputs (A), two active-high transition triggering inputs (B), and a CLEAR input that terminates the output pulse width at a predetermined time independent of the timing components. The clear (CLR) input also serves as a trigger input when it is pulsed with a low level pulse transition (⊔). To obtain optimum and trouble free operation please read operating rules and NSC one-shot application notes carefully and observe recommendations.

Features

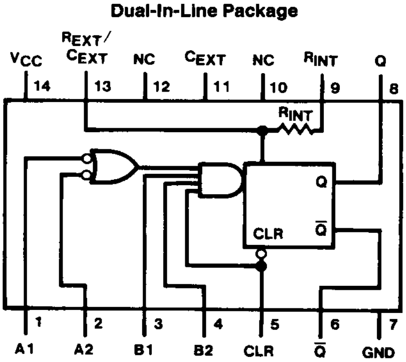
- DC triggered from active-high transition or active-low transition inputs
- Retriggerable to 100% duty cycle
- Over-riding clear terminates output pulse
- Internal 10 kΩ timing resistor
- TTL, DTL compatible
- Compensated for V_{CC} and temperature variations
- Input clamp diodes

Functional Description

The basic output pulse width is determined by selection of the internal resistor R_{INT} or an external resistor (R_X) and capacitor (C_X). Once triggered, the output pulse width may be extended by retriggering the gated active-low (A) transition inputs or the active-high transition (B) inputs or the CLEAR input. The output pulse width can be reduced or terminated by overriding it with the active-low CLEAR input.

Connection Diagram

Dual-In-Line Package



TL/F/6385-1

Order Number DM54LS122J, DM74LS122M or DM74LS122N
See NS Package Number J14A, M14A or N14A

Function Table

Inputs					Outputs	
CLEAR	A1	A2	B1	B2	Q	$\overline{Q}$
L	X	X	X	X	L	H
X	H	H	X	X	L	H
X	X	X	L	X	L	H
X	X	X	X	L	L	H
H	L	X	↑	H	⊓	⊔
H	L	X	H	↑	⊓	⊔
H	X	L	↑	H	⊓	⊔
H	X	L	H	↑	⊓	⊔
H	H	↓	H	H	⊓	⊔
H	↓	↓	H	H	⊓	⊔
H	↓	H	H	H	⊓	⊔
↑	L	X	H	H	⊓	⊔
↑	X	L	H	H	⊓	⊔

H = High Logic Level
L = Low Logic Level
X = Can Be Either Low or High
↑ = Positive Going Transition
↓ = Negative Going Transition
⊓ = A Positive Pulse
⊔ = A Negative Pulse

Absolute Maximum Ratings (Note)

Specifications for Military/Aerospace products are not contained in this datasheet. Refer to the associated reliability electrical test specifications document.

Supply Voltage	7V
Input Voltage	7V
Operating Free Air Temperature Range	
DM54LS	−55°C to +125°C
DM74LS	0°C to +70°C
Storage Temperature	−65°C to +150°C

Note: *The "Absolute Maximum Ratings" are those values beyond which the safety of the device cannot be guaranteed. The device should not be operated at these limits. The parametric values defined in the "Electrical Characteristics" table are not guaranteed at the absolute maximum ratings. The "Recommended Operating Conditions" table will define the conditions for actual device operation.*

Recommended Operating Conditions

Symbol	Parameters		DM54LS122 Min	DM54LS122 Nom	DM54LS122 Max	DM74LS122 Min	DM74LS122 Nom	DM74LS122 Max	Units
V_{CC}	Supply Voltage		4.5	5	5.5	4.75	5	5.25	V
V_{IH}	High Level Input Voltage		2			2			V
V_{IL}	Low Level Input Voltage				0.7			0.8	V
I_{OH}	High Level Output Current				−0.4			−0.4	mA
I_{OL}	Low Level Output Current				4			8	mA
t_W	Pulse Width (Note 6)	A or B High	40			40			ns
		A or B Low	40			40			
		Clear Low	40			40			
R_{EXT}	External Timing Resistor		5		180	5		260	kΩ
C_{EXT}	External Timing Capacitance		No Restriction			No Restriction			μF
C_{WIRE}	Wiring Capacitance at R_{EXT}/C_{EXT} Terminal				50			50	pF
T_A	Free Air Operating Temperature		−55		125	0		70	°C

Electrical Characteristics over recommended operating free air temperature range (unless otherwise noted)

Symbol	Parameter	Conditions		Min	Typ (Note 1)	Max	Units
V_I	Input Clamp Voltage	V_{CC} = Min, I = −18 mA				−1.5	V
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max, V_{IL} = Max, V_{IH} = Min	DM54	2.5	3.4		V
			DM74	2.7	3.4		
V_{OL}	Low Level Output Voltage	V_{CC} = Min, I_{OL} = Max, V_{IL} = Max, V_{IH} = Min	DM54		0.25	0.4	V
			DM74		0.35	0.5	
		I_{OL} = 4 mA, V_{CC} = Min	DM74		0.25	0.4	
I_I	Input Current @ Max Input Voltage	V_{CC} = Max, V_I = 7V				0.1	mA
I_{IH}	High Level Input Current	V_{CC} = Max, V_I = 2.7V				20	μA
I_{IL}	Low Level Input Current	V_{CC} = Max, V_I = 0.4V				−0.4	mA
I_{OS}	Short Circuit Output Current	V_{CC} = Max (Note 2)	DM54	−20		−100	mA
			DM74	−20		−100	
I_{CC}	Supply Current	V_{CC} = Max (Notes 3, 4 and 5)			6	11	mA

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Switching Characteristics at V_{CC} = 5V and T_A = 25°C (See Section 1 for Test Waveforms and Output Load)

Symbol	Parameter	From (Input) To (Output)	R_L = 2 kΩ				Units
			C_L = 15 pF C_{EXT} = 0 pF, R_{EXT} = 5 kΩ		C_L = 15 pF C_{EXT} = 1000 pF, R_{EXT} = 10 kΩ		
			Min	Max	Min	Max	
t_{PLH}	Propagation Delay Time Low to High Level Output	A to Q		33			ns
t_{PLH}	Propagation Delay Time Low to High Level Output	B to Q		44			ns
t_{PHL}	Propagation Delay Time High to Low Level Output	A to $\overline{Q}$		45			ns
t_{PHL}	Propagation Delay Time High to Low Level Output	B to $\overline{Q}$		56			ns
t_{PLH}	Propagation Delay Time Low to High Level Output	Clear to $\overline{Q}$		45			ns
t_{PHL}	Propagation Delay Time High to Low Level Output	Clear to Q		27			ns
$t_{WQ(Min)}$	Minimum Width of Pulse at Output Q	A or B to Q		200			ns
$t_{W(out)}$	Output Pulse Width	A or B to Q			4	5	μs

Note 1: All typicals are at V_{CC} = 5V, T_A = 25°C.

Note 2: Not more than one output should be shorted at a time, and the duration should not exceed one second.

Note 3: Quiescent I_{CC} is measured (after clearing) with 2.4V applied to all clear and A inputs, B inputs grounded, all outputs open, C_{EXT} = 0.02 μF, and R_{EXT} = 25 kΩ.

Note 4: I_{CC} is measured in the triggered state with 2.4V applied to all clear and B inputs, A inputs grounded, all outputs open, C_{EXT} = 0.02 μF, and R_{EXT} = 25 kΩ.

Note 5: With all outputs open and 4.5V applied to all data and clear inputs, I_{CC} is measured after a momentary ground, then 4.5V is applied to the clock.

Note 6: T_A = 25°C and V_{CC} = 5V.

Operating Rules

1. To use the internal 10 kΩ timing resistor, connect the R_{INT} pin to V_{CC}.
2. An external resistor (R_X) or the internal resistor (10 kΩ) and an external capacitor (C_X) are required for proper operation. The value of C_X may vary from 0 to any necessary value. For small time constants use high-quality mica, glass, polypropylene, polycarbonate, or polystyrene capacitors. For large time constants use solid tantalum or special aluminum capacitors. If the timing capacitors have leakages approaching 100 nA or if stray capacitance from either terminal to ground is greater than 50 pF the timing equations may not represent the pulse width the device generates.
3. The pulse width is essentially determined by external timing components R_X and C_X. For C_X < 1000 pF see *Figure 1;* design curves on T_W as function of timing components value. For C_X >> 1000 pF the output is defined as:

$$T_W = KR_XC_X$$

where [R_X is in kΩ]
[C_X is in pF]
[T_W is in ns]
K ≈ 0.37

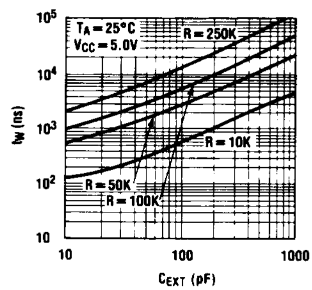

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FIGURE 1

Operating Rules (Continued)

The K factor is not a constant, but, varies with C_X. See *Figure 2*.

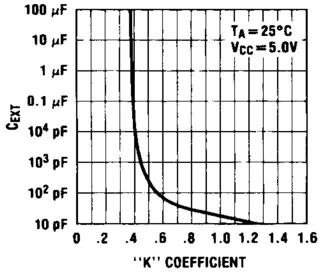

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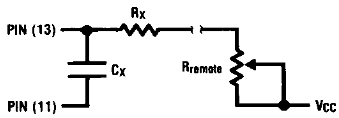
FIGURE 2

4. The switching diode required for most TTL one-shots when using an electrolytic timing capacitor is not needed for the 'LS122 and should not be used.
5. To obtain variable pulse width by remote trimming, the following circuit is recommended:



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Note: "R_{remote}" should be as close to the device pins as possible.

FIGURE 3

6. The retriggerable pulse width is calculated as shown below:

   $$T = T_W + t_{PLH} = 0.50 \times R_X \times C_X + T_{PLH}$$

   The retriggered pulse width is equal to the pulse width plus a delay time period *(Figure 4)*.

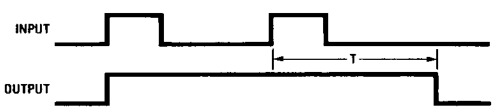

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FIGURE 4

7. Output pulse width variation versus V_{CC} and operation temperatures: *Figure 5* depicts the relationship between pulse width variation versus V_{CC}; and *Figure 6* depicts pulse width variation versus temperatures.

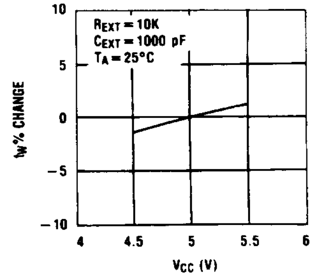

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FIGURE 5

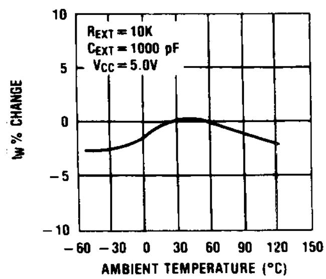

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FIGURE 6

8. Under any operating condition C_X and R_X must be kept as close to the one-shot device pins as possible to minimize stray capacitance, to reduce noise pick-up, and to reduce I-R and Ldi/dt voltage developed along their connecting paths. If the lead length from C_X to pins (13) and (11) is greater than 3 cm, for example, the output pulse width might be quite different from values predicted from the appropriate equations. A non-inductive and low capacitive path is necessary to ensure complete discharge of C_X in each cycle of its operation so that the output pulse width will be accurate.
9. V_{CC} and ground wiring should conform to good high-frequency standards and practices so that switching transients on the V_{CC} and ground return leads do not cause interaction between one-shots. A 0.01 μF to 0.10 μF bypass capacitor (disk ceramic or monolithic type) from V_{CC} to ground is necessary on each device. Furthermore, the bypass capacitor should be located as close to the V_{CC} pin as space permits.

***For further detailed device characteristics and output performance please refer to the NSC one-shot application note AN-366.**