

74123 Multivibrator

Dual Retriggerable Monostable Multivibrator
Product Specification

Logic Products

FEATURES

- DC triggered from active HIGH or active LOW inputs
- Retriggerable for very long pulses — up to 100% duty cycle
- Direct reset terminates output pulse
- Compensated for V_{CC} and temperature variations

DESCRIPTION

The '123 is a dual retriggerable monostable multivibrator with output pulse width control by three methods. The basic pulse time is programmed by selection of external resistance (R_{ext}) and capacitance (C_{ext}) values. Once triggered, the basic pulse width may be extended by retriggering the gated active LOW going edge input (\bar{A}) or the active HIGH going edge input (B), or be reduced by use of the overriding active LOW reset.

The basic output pulse width is essentially determined by the values of external capacitance and timing resistance.

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|-------|---------------------------|--------------------------------|
| 74123 | 24ns | 46mA |

NOTE:

For information regarding devices processed to Military Specifications, see the Signetics Military Products Data Manual.

ORDERING CODE

| PACKAGES | COMMERCIAL RANGE $V_{CC} = 5V \pm 5\%$; $T_A = 0^\circ C$ to $+70^\circ C$ |
|-------------|--|
| Plastic DIP | N74123N |
| Plastic SO | N74123D |

For pulse widths when $C_{ext} \leq 1000pF$, see Figure A.

When $C_{ext} > 1000pF$, the output pulse width is defined as:

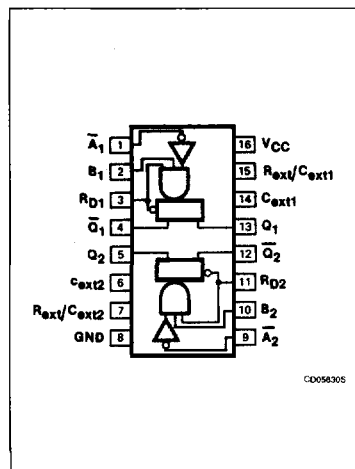
$$t_W = 0.28 R_{ext} \cdot C_{ext} \left(1 + \frac{0.7}{R_{ext}}\right)$$

The external resistance and capacitance are normally connected as shown in Figure B. If an electrolytic capacitor is to be used with an inverse voltage rating of

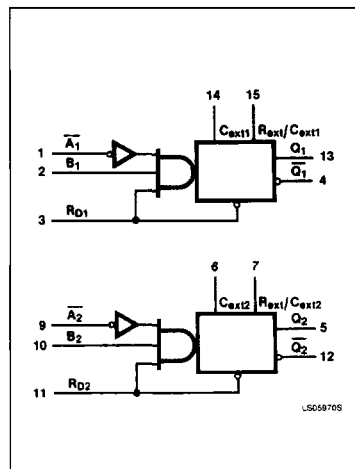
less than 1V then Figure C should be used. (Inverse voltage rating of an electrolytic is normally specified at 5% of the forward voltage rating.) If the inverse voltage rating is 1V or more (this includes a 100% safety margin) then Figure B can be used. Note that if Figure C is used the timing equations change as follows:

$$t_W \cong 0.25 R_{ext} \cdot C_{ext} \left(1 + \frac{0.7}{R_{ext}}\right)$$

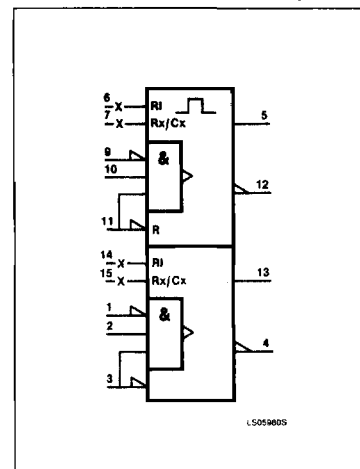
PIN CONFIGURATION



LOGIC SYMBOL



LOGIC SYMBOL (IEEE/IEC)



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FUNCTION TABLE

| INPUTS | | | OUTPUTS | |
|----------------|-----------|---|---------|-----------|
| R _D | \bar{A} | B | Q | \bar{Q} |
| L | X | X | L | H |
| X | H | X | L | H |
| X | X | L | L | H |
| H | L | ↑ | | |
| H | ↓ | H | | |
| ↑ | L | H | | |

H = HIGH voltage level
 L = LOW voltage level
 X = Don't care
 ↑ = LOW-to-HIGH transition
 ↓ = HIGH-to-LOW transition
 = One HIGH-level pulse
 = One LOW-level pulse

INPUT AND OUTPUT LOADING
AND FAN-OUT TABLE

| PINS | DESCRIPTION | 74 |
|----------------|-------------|------|
| \bar{A} , B | Inputs | 1ul |
| R _D | Input | 2ul |
| Q, \bar{Q} | Outputs | 10ul |

NOTE:

A 74 unit load (ul) is understood to be 40 μ A I_{IH} and -1.6mA I_{IL}.

ABSOLUTE MAXIMUM RATINGS (Over operating free-air temperature range unless otherwise noted.)

| PARAMETER | | 74 | UNIT |
|------------------|--|--------------------------|------|
| V _{CC} | Supply voltage | 7.0 | V |
| V _{IN} | Input voltage | -0.5 to +5.5 | V |
| I _{IN} | Input current | -30 to +5 | mA |
| V _{OUT} | Voltage applied to output in HIGH output state | -0.5 to +V _{CC} | V |
| T _A | Operating free-air temperature range | 0 to 70 | °C |

RECOMMENDED OPERATING CONDITIONS

| PARAMETER | | 74 | | | UNIT |
|-----------------|--------------------------------|------|-----|------|---------|
| | | Min | Nom | Max | |
| V _{CC} | Supply voltage | 4.75 | 5.0 | 5.25 | V |
| I _{IK} | Input clamp current | | | -12 | mA |
| I _{OH} | HIGH-level output current | | | -800 | μ A |
| I _{OL} | LOW-level output current | | | 16 | mA |
| T _A | Operating free-air temperature | 0 | | 70 | °C |
| V _{IH} | HIGH-level input voltage | 2.0 | | | V |
| V _{IL} | LOW-level input voltage | | | +0.8 | V |

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DC ELECTRICAL CHARACTERISTICS (Over recommended operating free-air temperature range unless otherwise noted.)

| PARAMETER | TEST CONDITIONS ¹ | 74123 | | | UNIT | |
|--|---|----------------------|------------------|------|------|----|
| | | Min | Typ ² | Max | | |
| V _{OH} HIGH-level output voltage ⁵ | V _{CC} = MIN, I _{OH} = MAX | 2.4 | 3.4 | | V | |
| V _{OL} LOW-level output voltage ⁵ | V _{CC} = MIN, I _{OL} = MAX | | 0.2 | 0.4 | V | |
| V _{IK} Input clamp voltage | V _{CC} = MIN, I _I = I _{IK} | | | -1.5 | V | |
| I _I Input current at maximum input voltage | V _{CC} = MAX, V _I = 5.5V | | | 1.0 | mA | |
| I _{IH} HIGH-level input current | V _{CC} = MAX, V _I = 2.4V | A, B inputs | | 40 | μA | |
| | | R _D input | | 80 | μA | |
| I _{IL} LOW-level input current | V _{CC} = MAX, V _I = 0.4V | A, B inputs | | -1.6 | mA | |
| | | R _D input | | -3.2 | mA | |
| I _{OS} Short-circuit output current ^{3, 5} | V _{CC} = MAX | -10 | | -40 | mA | |
| I _{CC} Supply current ⁴ (total) | V _{CC} = MAX | Quiescent | | 46 | 66 | mA |
| | | Triggered | | 46 | 66 | mA |

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_A = 25°C.
- I_{OS} is tested with V_{OUT} = +0.5V and V_{CC} = V_{CC} MAX + 0.5V. Not more than one output should be shorted at a time and duration of the short circuit should not exceed one second.
- Quiescent I_{CC} is measured (after being reset) with 2.4V applied to both R_D and A inputs, B inputs grounded and all outputs open. Triggered I_{CC} is measured with 2.4V applied to all R_D and B inputs, A inputs grounded and all outputs open. For both measurements, C_{ext} = 0.02μF and R_{ext} = 25kΩ.
- Ground C_{ext} to measure V_{OH} at Q, V_{OL} at Q, or I_{OS} at Q. C_{ext} is open to measure V_{OH} at Q, V_{OL} at Q, or I_{OS} at Q.

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

| PARAMETER | TEST CONDITIONS | 74 | | UNIT |
|--------------------------------------|--|--|----------|------|
| | | C _L = 15pF, R _L = 400Ω | | |
| | | Min | Max | |
| t _{PLH} t _{PHL} | Waveform 1 A input to Q & Q output C _{ext} = 0pF, R _{ext} = 5kΩ | | 33 40 | ns |
| t _{PLH} t _{PHL} | Waveform 2 B input to Q & Q output C _{ext} = 0pF, R _{ext} = 5kΩ | | 28 36 | ns |
| t _{PLH} t _{PHL} | Waveform 3 R _D input to Q & Q output C _{ext} = 0pF, R _{ext} = 5kΩ | | 40 27 | ns |
| t _{WQ} | Waveforms 1 & 2 Minimum Q pulse width C _{ext} = 0pF, R _{ext} = 5kΩ | | 65 | ns |
| t _{WQ} | Waveforms 1 & 2 Output pulse width C _{ext} = 1000pF, R _{ext} = 10kΩ | 2.76 | 3.37 | μs |

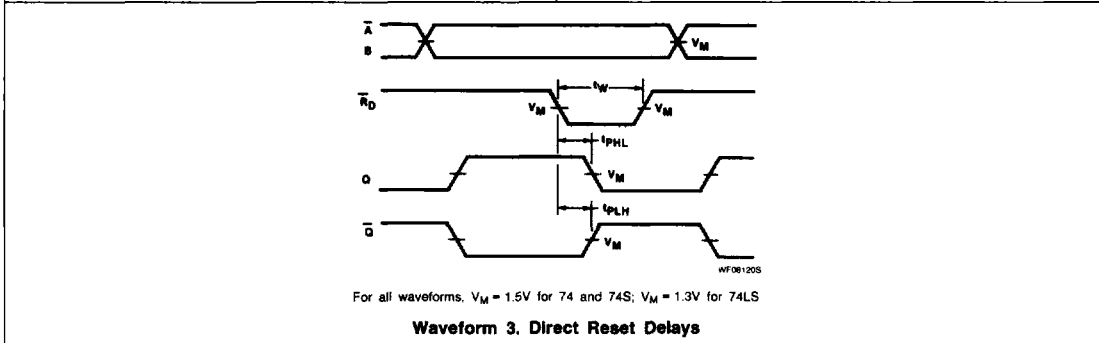
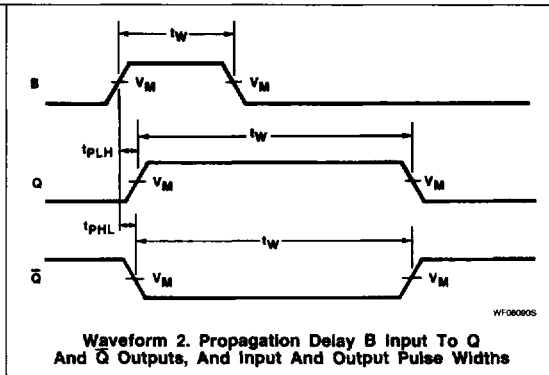
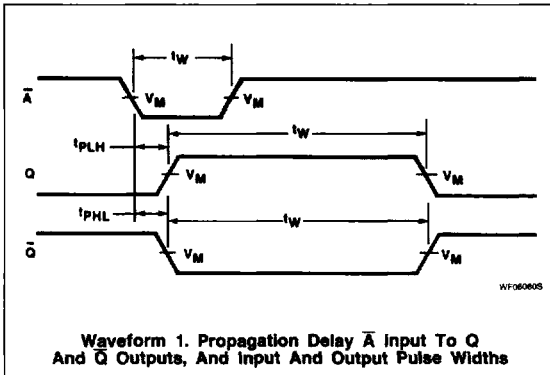
AC SET-UP REQUIREMENTS T_A = 25°C, V_{CC} = 5.0V

| PARAMETER | TEST CONDITIONS | 74 | | UNIT |
|--------------------|---|----------------|-----|------|
| | | Min | Max | |
| t _W | Waveforms 1, 2 & 3 Minimum input pulse width | 40 | | ns |
| R _{ext} | External timing resistor range | 5.0 | 50 | kΩ |
| C _{ext} | External timing capacitance range | No restriction | | pF |
| C _{Rx/Cx} | Stray capacitance to GND at R _{ext} /C _{ext} terminal | | 50 | pF |

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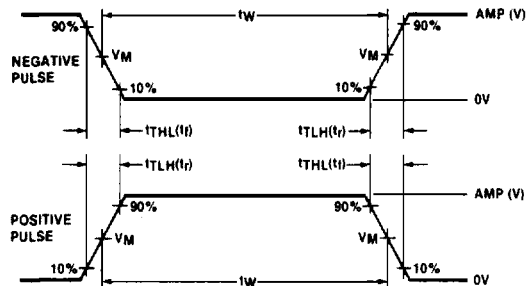
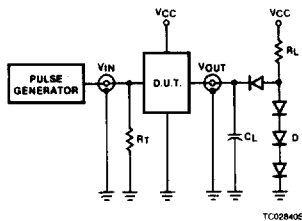
AC WAVEFORMS



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TEST CIRCUITS AND WAVEFORMS



$V_M = 1.3V$ for 74LS; $V_M = 1.5V$ for all other TTL families.

Test Circuit For 74 Totem-Pole Outputs

DEFINITIONS

R_L = Load resistor to V_{CC} ; see AC CHARACTERISTICS for value.

C_L = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

R_T = Termination resistance should be equal to Z_{OUT} of Pulse Generators.

D = Diodes are 1N916, 1N3064, or equivalent.

t_{TLH} , t_{THL} Values should be less than or equal to the table entries.

Input Pulse Definition

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|--------|--------------------------|-----------|-------------|-----------|-----------|
| | Amplitude | Rep. Rate | Pulse Width | t_{TLH} | t_{THL} |
| 74 | 3.0V | 1MHz | 500ns | 7ns | 7ns |
| 74LS | 3.0V | 1MHz | 500ns | 15ns | 6ns |
| 74S | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

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TYPICAL PERFORMANCE CHARACTERISTICS

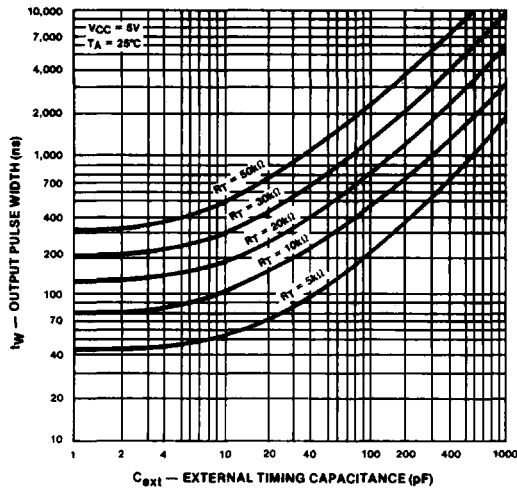


Figure A

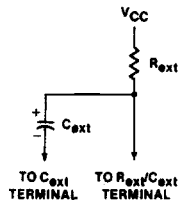


Figure B

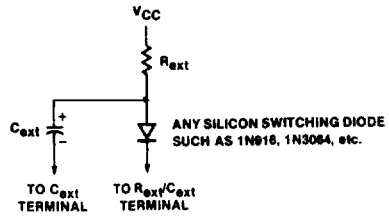


Figure C

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