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NTE74HC123
Integrated Circuit
TTL – High Speed CMOS,
Dual Retriggerable Monostable Multivibrator w/Resets

Description:

The NTE74HC123 is a dual monostable multivibrator with resets in a 16–Lead plastic DIP type package triggered by a negative to positive reset pulse. An external resistor (R_X) and an external capacitor (C_X) control the timing and the accuracy for the circuit. Adjustment of R_X and C_X provides a wide range of output pulse widths from the Q and $\overline{Q}$ terminals. Pulse triggering on the $\overline{A}$ and B inputs occur at a particular voltage level and is not related to the rise and fall times of the trigger pulses.

Once triggered, the output pulse width may be extended by retriggering inputs $\overline{A}$ and B. The output pulse can be terminated by a LOW level on the Reset (R) pin. Trailing edge triggering ($\overline{A}$) and leading edge triggering (B) inputs are provided for triggering from either edge of the input pulse. If either Mono is no used each input on the unused device ($\overline{A}$, B, and $\overline{R}$) must be terminated high or low.

The minimum value of external resistance, R_X, is typically 5kΩ. The minimum value external capacitance, C_X, is 0pF. The calculation for the pulse width is $t_W = 0.45\ R_X C_X$ at $V_{CC} = 5V$.

Features:

- Overriding Reset Terminates Output Pulse
- Triggering from the Leading or Trailing Edge
- Q and $\overline{Q}$ Buffered Outputs
- Separate Resets
- Wide Range of Output Pulse Widths
- Schmitt Trigger on Both $\overline{A}$ an B Inputs
- Fanout (Over Temperature Range):
  - Standard Outputs . . . . . 10 LS–TTL Loads
  - Bus Driver Outputs . . . . . 15 LS–TTL Loads
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LS–TTL Logic ICs

Absolute Maximum Ratings: (Note 1, Note 2)

Supply Voltage, V_{CC} . . . . . –0.5 to +7.0V
Clamp Diode Current, I_{IK}, I_{OK} . . . . . ±20mA
DC Output Current (Per Pin), I_{OUT} . . . . . ±25mA
DC V_{CC} or GND Current (Per Pin), I_{CC} . . . . . ±50mA
Maximum Junction Temperature, T_J . . . . . +150°C
Storage Temperature Range, T_{stg} . . . . . –65°C to +150°C
Typical Thermal Resistance, Junction–to–Ambient (Note 3), R_{thJA} . . . . . 67°C/W
Lead Temperature (During Soldering, 10sec), T_L . . . . . +300°C

Note 1. Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Note 2. Unless otherwise specified, all voltages are referenced to GND.

Recommended Operating Conditions:

Parameter	Symbol	Min	Typ	Max	Unit
Supply Voltage	V_{CC}	2.0	–	6.0	V
DC Input or Output Voltage	V_{IN}, V_{OUT}	0	–	V_{CC}	V
Operating Temperature Range	T_A	–55	–	+125	°C
Input Rise or Fall Times V_{CC} = 2.0V	t_r, t_f	–	–	1000	ns
V_{CC} = 4.5V		–	–	500	ns
V_{CC} = 6.0V		–	–	400	ns

DC Electrical Characteristics:

Parameter	Symbol	Test Conditions	V_{CC} (V)	+25°C			–40° to +85°C		–55° to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
High Level Input Voltage	V_{IH}		2.0	1.5	–	–	1.5	–	1.5	–	V
			4.5	3.15	–	–	3.15	–	3.15	–	V
			6.0	4.2	–	–	4.2	–	4.2	–	V
Low Level Input Voltage	V_{IH}		2.0	–	–	0.5	–	0.5	–	0.5	V
			4.5	–	–	1.35	–	1.35	–	1.35	V
			6.0	–	–	1.8	–	1.8	–	1.8	V
High Level Output Voltage CMOS Loads	V_{OH}	V_{IN} = V_{IH} or V_{IL}, I_O = –0.02mA	2.0	1.9	–	–	1.9	–	1.9	–	V
			4.5	4.4	–	–	4.4	–	4.4	–	V
			6.0	5.9	–	–	5.9	–	5.9	–	V
TTL Loads		V_I = V_{IH} or V_{IL}, I_O = –4mA	4.5	3.98	–	–	3.84	–	3.7	–	V
		V_I = V_{IH} or V_{IL}, I_O = –5.2mA	6.0	5.48	–	–	5.34	–	5.2	–	V
Low Level Output Voltage CMOS Loads	V_{OL}	V_{IN} = V_{IH} or V_{IL}, I_O = 0.02mA	2.0	–	–	0.1	–	0.1	–	0.1	V
			4.5	–	–	0.1	–	0.1	–	0.1	V
			6.0	–	–	0.1	–	0.1	–	0.1	V
TTL Loads		V_{IN} = V_{IH} or V_{IL}, I_O = 4mA	4.5	–	–	0.26	–	0.33	–	0.4	V
		V_{IN} = V_{IH} or V_{IL}, I_O = –5.2mA	6.0	–	–	0.26	–	0.33	–	0.4	V
Input Leakage Current	I_{IN}	V_{IN} = V_{CC} or GND	6.0	–	–	±0.1	–	±1.0	–	±1.0	µA
Quiescent Device Current	I_{CC}	V_{IN} = V_{CC} or GND, I_O = 0mA	6.0	–	–	8.0	–	80	–	160	µA

Prerequisite for Switching Characteristics:

Parameter	Symbol	Test Conditions	V_{CC} (V)	+25°C			–40° to +85°C		–55° to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
Minimum Input, Pulse Width $\overline{A}$	t_{WL}		2.0	100	–	–	125	–	150	–	ns
			4.5	20	–	–	25	–	30	–	ns
			6.0	17	–	–	21	–	26	–	ns

Prerequisite for Switching Characteristics (Cont'd):

Parameter	Symbol	Test Conditions	V_{CC} (V)	+25°C			−40° to +85°C		−55° to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
Minimum Input, Pulse Width B	t_{WH}		2.0	100	–	–	125	–	150	–	ns
			4.5	20	–	–	25	–	30	–	ns
			6.0	17	–	–	21	–	26	–	ns
Minimum Input, Pulse Width $\overline{R}$	t_{WL}		2.0	100	–	–	125	–	150	150	ns
			4.5	20	–	–	25	–	30	30	ns
			6.0	17	–	–	21	–	26	26	ns
$\overline{A}$ and B Hold Time	t_H		2.0	50	–	–	65	–	75	75	ns
			4.5	10	–	–	13	–	15	15	ns
			6.0	9	–	–	11	–	13	13	ns
Reset Removal Time	t_{REM}		2.0	50	–	–	65	–	75	75	ns
			4.5	10	–	–	13	–	15	15	ns
			6.0	9	–	–	11	–	13	13	ns
Retrigger Time Number	t_{rT}	R_X = 10KΩ, C_X = 0, Note 3	5.0	–	50	–	63 (Typ)		76 (Typ)		ns
Output Pulse Width Q or $\overline{Q}$	t_W	R_X = 10KΩ, C_X = 10nF	5.0	40	–	50	38.7	51.3	38.2	51.8	µs

Note 3. Time to trigger depends on the values of R_X and C_X. The output pulse width can only be extended when the time between the active−going edges of the trigger input pulses meet the minimum retrigger time requirement.

Switching Characteristics: ($t_r = t_f$ = 6ns, R_X = 10ΩK, C_X = 0 unless otherwise specified)

Parameter	Symbol	Test Conditions	V_{CC} (V)	+25°C			−40° to +85°C		−55° to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
Trigger Propagation Delay, $\overline{A}$, B, $\overline{R}$ to Q	t_{PLH}	C_L = 50pF	2.0	–	–	300	–	375	–	450	ns
		C_L = 50pF	4.5	–	–	60	–	75	–	90	ns
		C_L = 15pF	5.0	–	25	–	–	–	–	–	ns
		C_L = 50pF	6.0	–	–	51	–	64	–	76	ns
Trigger Propagation Delay, $\overline{A}$, B, $\overline{R}$ to $\overline{Q}$	t_{PHL}	C_L = 50pF	2.0	–	–	320	–	400	–	480	ns
		C_L = 50pF	4.5	–	–	64	–	80	–	96	ns
		C_L = 15pF	5.0	–	26	–	–	–	–	–	ns
		C_L = 50pF	6.0	–	–	54	–	68	–	82	ns
Reset Propagation Delay, $\overline{R}$ to Q or $\overline{Q}$	t_{PHL}, t_{PLH}	C_L = 50pF	2.0	–	–	215	–	270	–	325	ns
			4.5	–	–	43	–	54	–	65	ns
			6.0	–	–	37	–	46	–	55	ns
Output Transition Times	t_{TLH}, t_{THL}	C_L = 50pF	2.0	–	–	75	–	95	–	110	ns
			4.5	–	–	15	–	19	–	22	ns
			6.0	–	–	13	–	16	–	19	ns
Output Pulse Width		R_X = 10KΩ, C_X = 10nF	5.0	–	45	–	–	–	–	–	µs
Pulse Width Match Between Circuits in the Same Package		R_X = 10KΩ, C_X = 10nF	5.0	–	±2	–	–	–	–	–	%

Switching Characteristics (Cont'd): ($t_r = t_f$ = 6ns, R_X = 10ΩK, C_X = 0 unless otherwise specified)

Parameter	Symbol	Test Conditions	V_{CC} (V)	+25°C			−40° to +85°C		−55° to +125°C		Unit
				Min	Typ	Max	Min	Max	Min	Max	
Input Capacitance	C_{IN}	C_L = 50pF	–	10	–	10	–	10	–	10	pF
Power Dissipation Capacitance	C_{PD}	C_L = 15pF, Note 4	5.0	–	–	–	–	–	–	–	pF

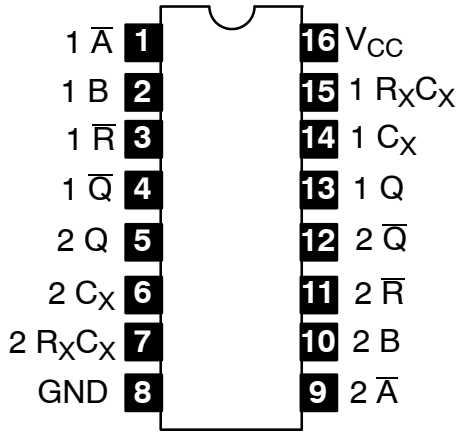
Note 4. C_{PD} is used to determine the dynamic power consumption, per multivibrator.
$P_D = (C_{PD} + C_X) V_{CC}^2 f_I + \Sigma (C_L V_{CC}^2 f_O)$ where f_I = input frequency, f_O = output frequency, C_L = output load capacitance, C_X = external capacitance, V_{CC} = supply voltage, assuming $f_I \ll I / t_W$.

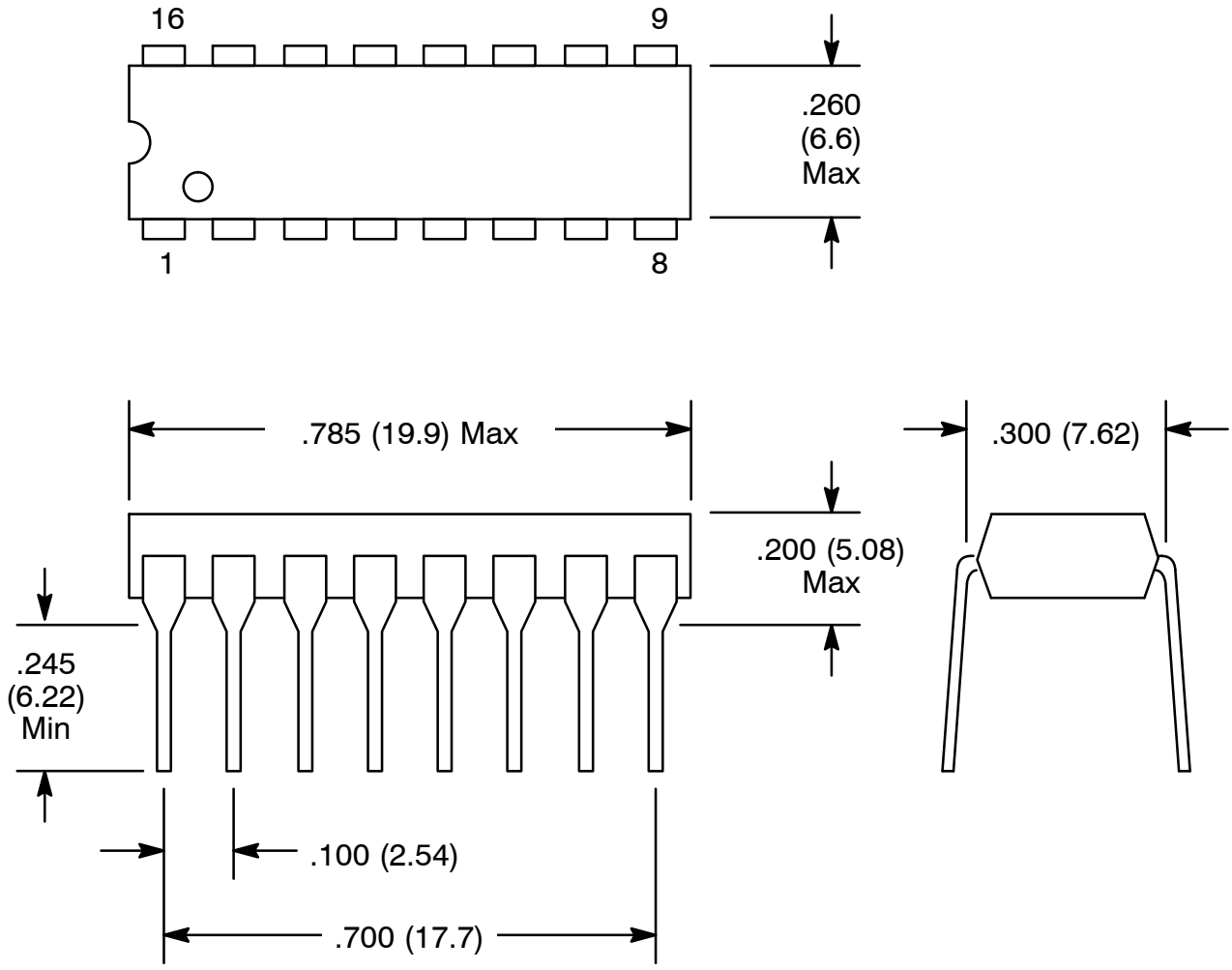
Truth Table:

Inputs			Output	
$\overline{A}$	B	$\overline{R}$	Q	$\overline{Q}$
H	X	H	L	H
X	L	H	L	H
L	↑	H	⎍	⎍
↓	H	H	⎍	⎍
X	X	L	L	H
L	H	↑	⎍	⎍

H = High Voltage Level
L = Low Voltage Level
X = Don't Care

Pin Connection Diagram




16
9
.260
(6.6)
Max
1
8
.785 (19.9) Max
.300 (7.62)
.200 (5.08)
Max
.245
(6.22)
Min
.100 (2.54)
.700 (17.7)