MM74HC123A
Dual Retriggerable Monostable Multivibrator

General Description

The MM74HC123A high speed monostable multivibrators (one shots) utilize advanced silicon-gate CMOS technology. They feature speeds comparable to low power Schottky TTL circuitry while retaining the low power and high noise immunity characteristic of CMOS circuits.

Each multivibrator features both a negative, A, and a positive, B, transition triggered input, either of which can be used as an inhibit input. Also included is a clear input that when taken low resets the one shot. The MM74HC123A can be triggered on the positive transition of the clear while A is held LOW and B is held HIGH.

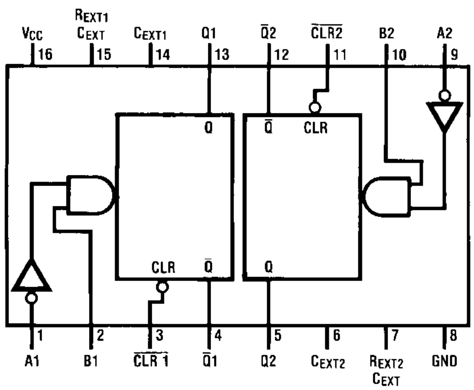
The MM74HC123A is retriggerable. That is it may be triggered repeatedly while their outputs are generating a pulse and the pulse will be extended.

Pulse width stability over a wide range of temperature and supply is achieved using linear CMOS techniques. The output pulse equation is simply: PW = (R_{EXT}) (C_{EXT}); where PW is in seconds, R is in ohms, and C is in farads. All inputs are protected from damage due to static discharge by diodes to V_{CC} and ground.

Features

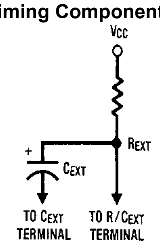
- Typical propagation delay: 25 ns
- Wide power supply range: 2V–6V
- Low quiescent current: 80 µA maximum (74HC Series)
- Low input current: 1 µA maximum
- Fanout of 10 LS-TTL loads
- Simple pulse width formula T = RC
- Wide pulse range: 400 ns to ∞ (typ)
- Part to part variation: ±5% (typ)
- Schmitt Trigger A & B inputs allow rise and fall times to be as slow as one second

Connection Diagram



Top View

Timing Component



Note: Pin 6 and Pin 14 must be hard-wired to GND.

Rochester Ordering Guide

**Most products can also be offered as RoHS compliant, designated by a –G suffix. Please contact factory for more information.*

Rochester Part Number	Fairchild Part Number	Package	Temperature
MM74HC123AN	MM74HC123AN	PDIP-16	-40° to +85°C
MM74HC123AM	MM74HC123AM	SOP-16, Plastic	-40° to +85°C
MM74HC123AMTC	MM74HC123AMTC	TSSOP-16, Plastic	-40° to +85°C
MM74HC123ASJ	MM74HC123ASJ	SOP-16, Plastic	-40° to +85°C

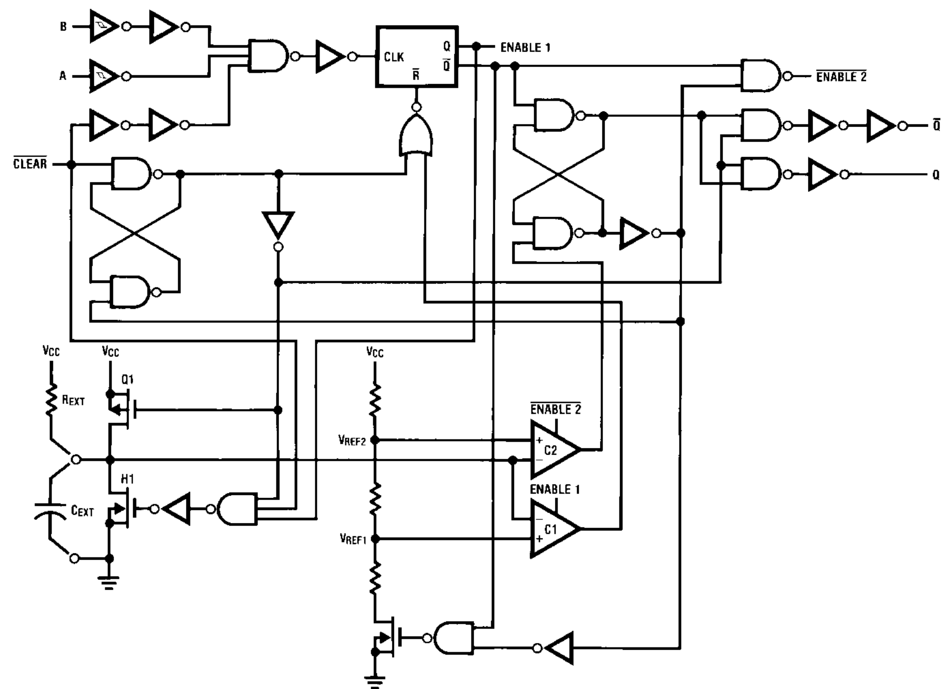
Please contact factory for specific package availability and Military/Aerospace specifications/availability.

Truth Table

Inputs			Outputs	
$\overline{\text{Clear}}$	A	B	Q	$\overline{\text{Q}}$
L	X	X	L	H
X	H	X	L	H
X	X	L	L	H
H	L	↑	⎍	⊔
H	↓	H	⎍	⊔
↑	L	H	⎍	⊔

H = HIGH Level
L = LOW Level
↑ = Transition from LOW-to-HIGH
↓ = Transition from HIGH-to-LOW
⎍ = One HIGH Level Pulse
⊔ = One LOW Level Pulse
X = Irrelevant

Logic Diagram



Absolute Maximum Ratings (Note 1)

(Note 2)

Supply Voltage (V_{CC})	–0.5V to +7.0V
DC Input Voltage (V_{IN})	–1.5V to V_{CC} +1.5V
DC Output Voltage (V_{OUT})	–0.5V to V_{CC} +0.5V
Clamp Diode Current (I_{IK}, I_{OK})	±20 mA
DC Output Current, per pin (I_{OUT})	±25 mA
DC V_{CC} or GND Current, per pin (I_{CC})	±50 mA
Storage Temperature Range (T_{STG})	–65°C to +150°C
Power Dissipation (P_D)	
(Note 3)	600 mW
S.O. Package only	500 mW
Lead Temperature (T_L)	
(Soldering 10 seconds)	260°C

Recommended Operating Conditions

	Min	Max	Units
Supply Voltage (V_{CC})	2	6	V
DC Input or Output Voltage (V_{IN}, V_{OUT})	0	V_{CC}	V
Operating Temperature Range (T_A)	–40	+85	°C
Input Rise or Fall Times			
(Clear Input)			
(t_r, t_f) V_{CC} = 2.0V		1000	ns
V_{CC} = 4.5V		500	ns
V_{CC} = 6.0V		400	ns

Note 1: Maximum Ratings are those values beyond which damage to the device may occur.

Note 2: Unless otherwise specified all voltages are referenced to ground.

Note 3: Power Dissipation Temperature Derating: Plastic "N" Package: –12mW/°C from 65°C to 85°C

DC Electrical Characteristics (Note 4)

Symbol	Parameter	Conditions	V_{CC}	T_A = 25°C		T_A = –40 to 85°C	T_A = –55 to 125°C	Units
				Typ	Guaranteed Limits			
V_{IH}	Minimum HIGH Level Input Voltage		2.0V		1.5	1.5	1.5	V
			4.5V		3.15	3.15	3.15	V
			6.0V		4.2	4.2	4.2	V
V_{IL}	Maximum LOW Level Input Voltage		2.0V		0.3	0.3	0.3	V
			4.5V		0.9	0.9	0.9	V
			6.0V		1.2	1.2	1.2	V
V_{OH}	Minimum HIGH Level Output Voltage	V_{IN} = V_{IH} or V_{IL}						
		$\|I_{OUT}\| \leq 20\ \mu A$	2.0V	2.0	1.9	1.9	1.9	V
			4.5V	4.5	4.4	4.4	4.4	V
			6.0V	6.0	5.9	5.9	5.9	V
		V_{IN} = V_{IH} or V_{IL}						V
		$\|I_{OUT}\| \leq 4.0$ mA	4.5V	4.2	3.98	3.84	3.7	V
		$\|I_{OUT}\| \leq 5.2$ mA	6.0V	5.7	5.48	5.34	5.2	V
V_{OL}	Maximum LOW Level Output Voltage	V_{IN} = V_{IH} or V_{IL}						
		$\|I_{OUT}\| \leq 20\ \mu A$	2.0V	0	0.1	0.1	0.1	V
			4.5V	0	0.1	0.1	0.1	V
			6.0V	0	0.1	0.1	0.1	V
		V_{IN} = V_{IH} or V_{IL}						V
		$\|I_{OUT}\| \leq 4$ mA	4.5V	0.2	0.26	0.33	0.4	V
		$\|I_{OUT}\| \leq 5.2$ mA	6.0V	0.2	0.26	0.33	0.4	V
I_{IN}	Maximum Input Current (Pins 7, 15)	V_{IN} = V_{CC} or GND	6.0V		±0.5	±5.0	±5.0	μA
I_{IN}	Maximum Input Current (all other pins)	V_{IN} = V_{CC} or GND	6.0V		±0.1	±1.0	±1.0	μA
I_{CC}	Maximum Quiescent Supply Current (standby)	V_{IN} = V_{CC} or GND, I_{OUT} = 0 μA	6.0V		8.0	80	160	μA
I_{CC}	Maximum Active Supply Current (per monostable)	V_{IN}= V_{CC} or GND	2.0V	36	80	110	130	μA
		R/C_{EXT} = 0.5V_{CC}	4.5V	0.33	1.0	1.3	1.6	mA
			6.0V	0.7	2.0	2.6	3.2	mA

Note 4: For a power supply of 5V ±10% the worst-case output voltages (V_{OH}, V_{OL}) occur for HC at 4.5V. Thus the 4.5V values should be used when designing with this supply. Worst-case V_{IH} and V_{IL} occur at V_{CC} = 5.5V and 4.5V respectively. (The V_{IH} value at 5.5V is 3.85V.) The worst-case leakage current (I_{IN}, I_{CC}, and I_{OZ}) occur for CMOS at the higher voltage and so the 6.0V values should be used.

AC Electrical Characteristics

$V_{CC} = 5V$, $T_A = 25°C$, $C_L = 15$ pF, $t_r = t_f = 6$ ns

Symbol	Parameter	Conditions	Typ	Limit	Units
t_{PLH}	Maximum Trigger Propagation Delay A, B or Clear to Q		22	33	ns
t_{PHL}	Maximum Trigger Propagation Delay A, B or Clear to $\overline{Q}$		25	42	ns
t_{PHL}	Maximum Propagation Delay, Clear to Q		20	27	ns
t_{PLH}	Maximum Propagation Delay, Clear to $\overline{Q}$		22	33	ns
t_W	Minimum Pulse Width, A, B or Clear		14	26	ns
t_{REM}	Minimum Clear Removal Time			0	ns
$t_{WQ(MIN)}$	Minimum Output Pulse Width	$C_{EXT} = 28$ pF $R_{EXT} = 2$ kΩ	400		ns
t_{WQ}	Output Pulse Width	$C_{EXT} = 1000$ pF $R_{EXT} = 10$ kΩ	10		µs

AC Electrical Characteristics

$C_L = 50$ pF $t_r = t_f = 6$ ns (unless otherwise specified)

Symbol	Parameter	Conditions		V_{CC}	$T_A = 25°C$		$T_A = -40$ to 85°C	$T_A = -55$ to 125°C	Units
					Typ	Guaranteed Limits			
t_{PLH}	Maximum Trigger Propagation Delay, A, B or Clear to Q			2.0V	77	169	194	210	ns
				4.5V	26	42	51	57	ns
				6.0V	21	32	39	44	ns
t_{PHL}	Maximum Trigger Propagation Delay, A, B or Clear to $\overline{Q}$			2.0V	88	197	229	250	ns
				4.5V	29	48	60	67	ns
				6.0V	24	38	46	51	ns
t_{PHL}	Maximum Propagation Delay Clear to Q			2.0V	54	114	132	143	ns
				4.5V	23	34	41	45	ns
				6.0V	19	28	33	36	ns
t_{PLH}	Maximum Propagation Delay Clear to $\overline{Q}$			2.0V	56	116	135	147	ns
				4.5V	25	36	42	46	ns
				6.0V	20	29	34	37	ns
t_W	Minimum Pulse Width A, B, Clear			2.0V	57	123	144	157	ns
				4.5V	17	30	37	42	ns
				6.0V	12	21	27	30	ns
t_{REM}	Minimum Clear Removal Time			2.0V		0	0	0	ns
				4.5V		0	0	0	ns
				6.0V		0	0	0	ns
t_{TLH}, t_{THL}	Maximum Output Rise and Fall Time			2.0V	30	75	95	110	ns
				4.5V	8	15	19	22	ns
				6.0V	7	13	16	19	ns
$t_{WQ(MIN)}$	Minimum Output Pulse Width	$C_{EXT} = 28$ pF		2.0V	1.5				µs
		$R_{EXT} = 2$ kΩ		4.5V	450				ns
		$R_{EXT} = 6$ kΩ ($V_{CC} = 2V$)		6.0V	380				ns
t_{WQ}	Output Pulse Width	$C_{EXT} = 0.1$ µF	Min	5.0V	1	0.9	0.86	0.85	ms
		$R_{EXT} = 10$ kΩ	Max	5.0V	1	1.1	1.14	1.15	ms
C_{IN}	Maximum Input Capacitance (Pins 7 & 15)				12	20	20	20	pF
C_{IN}	Maximum Input Capacitance (other inputs)				6	10	10	10	pF
C_{PD}	Power Dissipation Capacitance	(Note 5)			70				pF

Note 5: C_{PD} determines the no load dynamic power consumption, $P_D = C_{PD} V_{CC}^2 f + I_{CC} V_{CC}$, and the no load dynamic current consumption, $I_S = C_{PD} V_{CC} f + I_{CC}$.