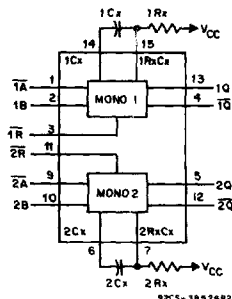


File Number 1708

Advance Information/
Preliminary Data**CD54/74HC123, CD54/74HCT123
CD54/74HC423, CD54/74HCT423****High-Speed CMOS Logic****FUNCTIONAL DIAGRAM**

The RCA-CD54/74HCT123,423 and CD54/74HCT123,423 are dual monostable multivibrators with resets. They are all retriggerable and differ only in that the 123 types can be triggered by a negative-to-positive reset pulse; whereas the 423 types do not have this feature. 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 $\bar{Q}$ terminals. Pulse triggering on the $\bar{A}$ 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 $\bar{A}$ and B. The output pulse can be terminated by a LOW level on the Reset (R) pin. Trailing-edge triggering ($\bar{A}$) and leading-edge triggering (B) inputs are provided for triggering from either edge of the input pulse. If either Mono is not used each input on the unused device ($\bar{A}$, B, and $\bar{R}$) must be terminated high or low.

The minimum value of external resistance, R_x is typically 5k Ω . The minimum value external capacitance, C_x , is 0 pF. The calculation for the pulse width is $t_w = 0.45 R_x C_x$ at $V_{cc} = 5$ V.

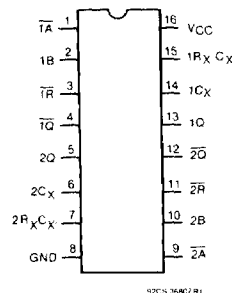
The CD54HC123,423 and CD54HCT123,423 are supplied in 16-lead hermetic dual-in-line ceramic packages (F suffix). The CD74HC123,423 and CD74HCT123,423 are supplied in 16-lead dual-in-line plastic packages (E suffix) and in 16-lead dual-in-line surface mount plastic packages (M suffix). All types are also available in chip form (H suffix).

Dual Retriggerable Monostable Multivibrators with Resets**Type Features:**

- Overriding RESET Terminates Output Pulse
- Triggering From the Leading or Trailing Edge
- Q and $\bar{Q}$ Buffered Outputs
- Separate Resets
- Wide Range of Output-Pulse Widths
- Schmitt Trigger on both $\bar{A}$ and B inputs

Family Features:

- Fanout (Over Temperature Range):
Standard Outputs - 10 LSTTL Loads
Bus Driver Outputs - 15 LSTTL Loads
- Wide Operating Temperature Range:
CD74HC/HCT: -40 to +85°C
- Balanced Propagation Delay and Transition Times
- Significant Power Reduction Compared to LSTTL Logic ICs
- Alternate Source is Philips/Sigmetrics
- CD54HC/CD74HC Types:
2 to 6 V Operation
High Noise Immunity:
 $N_{IL} = 30\%$, $N_{IH} = 30\%$ of V_{cc} ; @ $V_{cc} = 5$ V
- CD54HCT/CD74HCT Types:
4.5 to 5.5 V Operation
Direct LSTTL Input Logic Compatibility
 $V_{IL} = 0.8$ V Max., $V_{IH} = 2$ V Min.
CMOS Input Compatibility
 $I_i \leq 1 \mu A$ @ V_{OL} , V_{OH}

**TERMINAL ASSIGNMENT**

CD54/74HC123, CD54/74HCT123

CD54/74HC423, CD54/74HCT423

STATIC ELECTRICAL CHARACTERISTICS

CHARACTERISTIC	CD74HC123/CD54HC123 CD74HC423/CD54HC423											CD74HCT123/CD54HCT123 CD74HCT423/CD54HCT423											UNITS
	TEST CONDITIONS			74HC/54HC TYPES			74HC TYPES		54HC TYPES		TEST CONDITIONS		74HCT/54HCT TYPES			74HCT TYPES		54HCT TYPES					
	V _I V	I _O mA	V _{CC} V	+25° C			-40/ -85° C		-55/ +125° C		V _I V	V _{CC} V	+25° C			-40/ +85° C		-55/ +125° C					
				Min	Typ	Max	Min	Max	Min	Max			Min	Typ	Max	Min	Max	Min	Max				
High-Level Input Voltage	V _{IH}			2	1.5	—	—	1.5	—	1.5	—	—	4.5	to	2	—	—	2	—	2	—	V	
				4.5	3.15	—	—	3.15	—	3.15	—	—	5.5										
				6	4.2	—	—	4.2	—	4.2	—	—											
Low-Level Input Voltage	V _{IL}			2	—	—	0.5	—	0.5	—	0.5	—	—	4.5	to	—	—	0.8	—	0.8	—	0.8	V
				4.5	—	—	1.35	—	1.35	—	1.35	—	—	to									
				6	—	—	1.8	—	1.8	—	1.8	—	—	5.5									
High-Level Output Voltage	V _{OH}	V _{IL} or V _{IH}	-0.02	2	1.9	—	—	1.9	—	1.9	—	—	V _{IL} or V _{IH}	4.5	4.4	—	—	4.4	—	4.4	—	—	V
CMOS Loads				4.5	4.4	—	—	4.4	—	4.4	—	—											
				6	5.9	—	—	5.9	—	5.9	—	—											
TTL Loads	V _{IL} or V _{IH}			—	—	—	—	—	—	—	—	—	V _{IL} or V _{IH}	4.5	3.98	—	—	3.84	—	3.7	—	—	V
			-4	4.5	3.98	—	—	3.84	—	3.7	—	—											
			-5.2	6	5.48	—	—	5.34	—	5.2	—	—	V _{IH}										
Low-Level Output Voltage	V _{OL}	V _{IL} or V _{IH}	0.02	2	—	—	0.1	—	0.1	—	0.1	—	V _{IL} or V _{IH}	4.5	—	—	0.1	—	0.1	—	0.1	—	V
CMOS Loads				4.5	—	—	0.1	—	0.1	—	0.1	—											
				6	—	—	0.1	—	0.1	—	0.1	—											
TTL Loads	V _{IL} or V _{IH}			—	—	—	—	—	—	—	—	—	V _{IL} or V _{IH}	4.5	—	—	0.26	—	0.33	—	0.4	—	V
			4	4.5	—	—	0.26	—	0.33	—	0.4	—											
			5.2	6	—	—	0.26	—	0.33	—	0.4	—											
Input Leakage Current	I _I	V _{CC} or Gnd		6	—	—	±0.1	—	±1	—	±1	—	Any Voltage Between V _{CC} & Gnd	5.5	—	—	±0.1	—	±1	—	±1	—	μA
Quiescent Device Current	I _{CC}	V _{CC} or Gnd	0	6	—	—	8	—	80	—	160	—	V _{CC} or Gnd	5.5	—	—	8	—	80	—	160	—	μA
Additional Quiescent Device Current per input pin: 1 unit load	ΔI _{CC} *												V _{CC} - 2.1	4.5 to 5.5	—	100	360	—	450	—	490	—	μA

*For dual-supply systems theoretical worst case ($V_i = 2.4$ V, $V_{cc} = 5.5$ V) specification is 1.8 mA.

HCT INPUT LOADING TABLE

INPUT	UNIT LOADS *
All Inputs	0.35

* Unit Load is ΔI_{cc} limit specified in Static Characteristic Chart, e.g., 360 μA max. @ 25°C.

CD54/74HC123, CD54/74HCT123

CD54/74HC423, CD54/74HCT423

HC/HCT123 TRUTH TABLE

INPUTS			OUTPUTS	
$\bar{A}$	B	$\bar{R}$	Q	$\bar{Q}$
H	X	H	L	H
X	L	H	L	H
L	H	H		
		H		
X	X	L	L	H
L	H			

H = High Level
L = Low Level
X = Irrelevant

= Transition from Low to High
 = Transition from High to Low
 = One High Level Pulse
 = One Low Level Pulse

HC/HCT423 TRUTH TABLE

INPUTS			OUTPUTS	
$\bar{A}$	B	$\bar{R}$	Q	$\bar{Q}$
H	X	H	L	H
X	L	H	L	H
L	H	H		
		H		
X	X	L	L	H

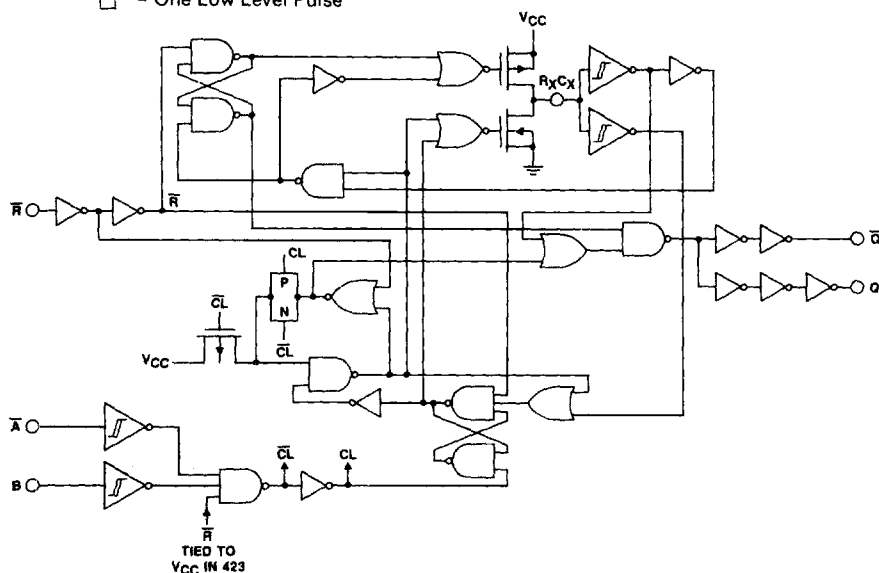


Fig. 1 - Logic diagram for HC/HCT123 and 423.

MAXIMUM RATINGS, Absolute-Maximum Values:

DC SUPPLY-VOLTAGE, (V_{cc}):	
(Voltages referenced to ground)	-0.5 to +7 V
DC INPUT DIODE CURRENT, I_{ik} (FOR $V_i < -0.5$ V OR $V_i > V_{cc} + 0.5$ V)	± 20 mA
DC OUTPUT DIODE CURRENT, I_{ok} (FOR $V_o < -0.5$ V OR $V_o > V_{cc} + 0.5$ V)	± 20 mA
DC DRAIN CURRENT, PER OUTPUT (I_o) (FOR -0.5 V $< V_o < V_{cc} + 0.5$ V)	± 25 mA
DC V_{cc} OR GROUND CURRENT, (I_{cc}):	± 50 mA
POWER DISSIPATION PER PACKAGE (P_o):	
For $T_A = -40$ to $+60^\circ\text{C}$ (PACKAGE TYPE E)	500 mW
For $T_A = +60$ to $+85^\circ\text{C}$ (PACKAGE TYPE E)	Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW
For $T_A = -55$ to $+100^\circ\text{C}$ (PACKAGE TYPE F, H)	500 mW
For $T_A = +100$ to $+125^\circ\text{C}$ (PACKAGE TYPE F, H)	Derate Linearly at 8 mW/ $^\circ\text{C}$ to 300 mW
For $T_A = -40$ to $+70^\circ\text{C}$ (PACKAGE TYPE M)	400 mW
For $T_A = +70$ to $+125^\circ\text{C}$ (PACKAGE TYPE M)	Derate Linearly at 6 mW/ $^\circ\text{C}$ to 70 mW
OPERATING-TEMPERATURE RANGE (T_A):	
PACKAGE TYPE F, H	-55 to $+125^\circ\text{C}$
PACKAGE TYPE E, M	-40 to $+85^\circ\text{C}$
STORAGE TEMPERATURE (T_{stg})	-65 to $+150^\circ\text{C}$
LEAD TEMPERATURE (DURING SOLDERING):	
At distance 1/16 $\pm$ 1/32 in. (1.59 $\pm$ 0.79 mm) from case for 10 s max.	$\pm 265^\circ\text{C}$
Unit inserted into a PC Board (min. thickness 1/16 in., 1.59 mm)	
with solder contacting lead tips only	$\pm 300^\circ\text{C}$

CD54/74HC123, CD54/74HCT123 **CD54/74HC423, CD54/74HCT423**

RECOMMENDED OPERATING CONDITIONS:

For maximum reliability, nominal operating conditions should be selected so that operation is always within the following ranges:

CHARACTERISTIC		LIMITS		UNITS
		MIN.	MAX.	
Supply-Voltage Range (For T_A = Full Package-Temperature Range) V_{CC} .*				
CD54/74HC Types		2	6	V
CD54/74HCT Types		4.5	5.5	V
DC Input or Output Voltage V_i , V_o		0	V_{CC}	V
Operating Temperature T_A :				
CD74 Types		-40	+85	°C
CD54 Types		-55	+125	°C
Input Rise and Fall Times t_r , t_f on Input $\bar{R}$				
at 2 V		0	1000	ns
at 4.5 V		0	500	ns
at 6 V		0	400	ns
Input Rise and Fall Times t_r , t_f on Input B and $\bar{A}$				
at 2 V		0	Unlimited	ns
at 4.5 V		0	Unlimited	ns
at 6 V		0	Unlimited	ns

*Unless otherwise specified, all voltages are referenced to Ground.

PREREQUISITE FOR SWITCHING FUNCTION

CHARACTERISTIC		V _{CC}	LIMITS												UNITS
			25° C				-40° C to +85° C				-55° CC to +125° C				
			HC		HCT		74HC		74HCT		54HC		54HCT		
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Minimum Input Pulse Width $\bar{A}$	t _{WL}	2	100	—	—	—	125	—	—	—	150	—	—	—	ns
		4.5	20	—	20	—	25	—	25	—	30	—	30	—	
		6	17	—	—	—	21	—	—	—	26	—	—	—	
B	t _{WH}	2	100	—	—	—	125	—	—	—	150	—	—	—	ns
		4.5	20	—	20	—	25	—	25	—	30	—	30	—	
		6	17	—	—	—	21	—	—	—	26	—	—	—	
$\bar{R}$	t _{WL}	2	100	—	—	—	125	—	—	—	150	—	—	—	ns
		4.5	20	—	20	—	25	—	25	—	30	—	30	—	
		6	17	—	—	—	21	—	—	—	26	—	—	—	
$\bar{A}$ & B Hold Time	t _H	2	50	—	—	—	65	—	—	—	75	—	—	—	ns
		4.5	10	—	10	—	13	—	13	—	15	—	15	—	
		6	9	—	—	—	11	—	—	—	13	—	—	—	
Reset Removal Time	t _{REM}	2	50	—	—	—	65	—	—	—	75	—	—	—	ns
		4.5	10	—	10	—	13	—	13	—	15	—	15	—	
		6	9	—	—	—	11	—	—	—	13	—	—	—	
Retrigger Time # R _s = 10 KΩ	t _{RT}	5	50 Typ.		50 Typ.		63 Typ.		63 Typ.		76 Typ.		76 Typ.		ns
Output Pulse Width Q or $\bar{Q}$ R _s = 10 KΩ, C _s = 10 nF	t _w	5	40	50	40	50	38.7	51.3	38.7	51.3	38.2	51.8	38.2	51.8	us

#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.

CD54/74HC123, CD54/74HCT123

CD54/74HC423, CD54/74HCT423

SWITCHING CHARACTERISTICS ($V_{CC} = 5\text{ V}$, $T_A = 25^\circ\text{C}$, Input t_i , $t_r = 6\text{ ns}$)

CHARACTERISTIC	C_L (pF)	TYPICAL VALUES		UNITS
		54/74HC	54/74HCT	
Propagation Delay $\bar{A}, B, \bar{R}$ to Q	t_{PLH}	25	25	ns
$\bar{A}, B, \bar{R}$ to $\bar{Q}$	t_{PHL}	26	27	ns
Output Pulse Width $R_x = 10\text{ K}\Omega$, $C_x = 10\text{ nF}$	—	45	45	μs
Pulse Width Match Between Circuits in the same Package $R_x = 10\text{ K}\Omega$, $C_x = 10\text{ nF}$	—	± 2	± 2	%
Power Dissipation Capacitance *	C_{PD}	—	—	pF

* CPD is used to determine the dynamic power consumption, per multivibrator.

$$P_D = (C_{PD} + C_x) V_{CC}^2 f_i + \Sigma (C_L V_{CC}^2 f_o) \text{ where:}$$

f_i = input frequency.

f_o = output frequency.

C_L = output load capacitance.

C_x = external capacitance.

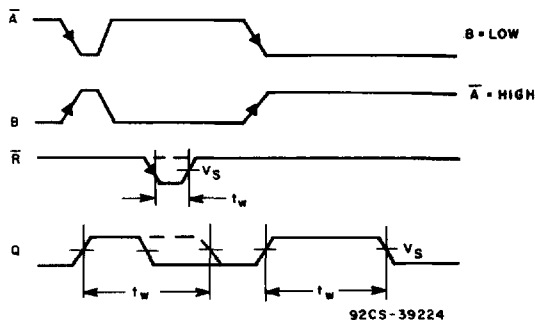
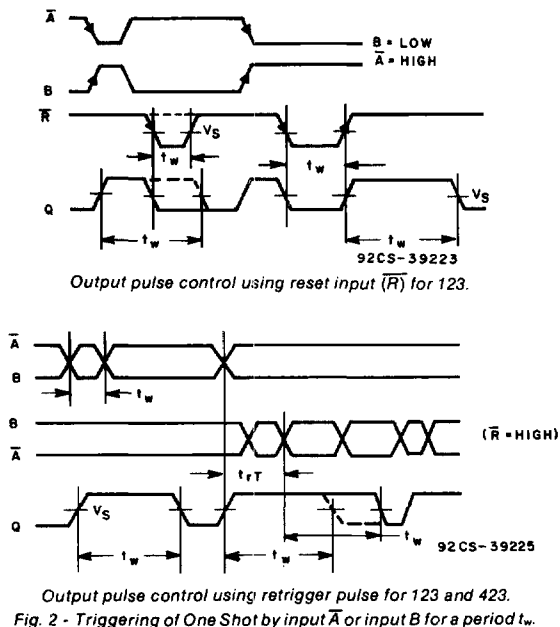
V_{CC} = supply voltage.

$$\text{assuming } f_i \ll \frac{1}{t_w}$$

SWITCHING CHARACTERISTICS ($C_L = 50\text{ pF}$, Input t_i , $t_r = 6\text{ ns}$, $R_x = 10\text{ K}\Omega$, $C_x = 0$)

CHARACTERISTIC	SYM-BOL	V _{CC}	LIMITS												UNITS
			25° C				-40° C to +85° C				-55° C to +125° C				
			HC		HCT		74HC		74HCT		54HC		54HCT		
			Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
Trigger Propagation Delay, A̅, B, R̅ to Q	t _{PLH}	2	—	300	—	—	—	375	—	—	—	450	—	—	ns
		4.5	—	60	—	60	—	75	—	75	—	90	—	90	
		6	—	51	—	—	—	64	—	—	—	76	—	—	
A̅, B, R̅ to Q̅	t _{PHL}	2	—	320	—	—	—	400	—	—	—	480	—	—	ns
		4.5	—	64	—	68	—	80	—	85	—	96	—	102	
		6	—	54	—	—	—	68	—	—	—	82	—	—	
Reset Propagation Delay, R̅ to Q or Q̅	t _{PHL} t _{PLH}	2	—	215	—	—	—	270	—	—	—	325	—	—	ns
		4.5	—	43	—	48	—	54	—	60	—	65	—	72	
		6	—	37	—	—	—	46	—	—	—	55	—	—	
Output Transition Time	t _{TLH} t _{THL}	2	—	75	—	—	—	95	—	—	—	110	—	—	ns
		4.5	—	15	—	15	—	19	—	19	—	22	—	22	
		6	—	13	—	—	—	16	—	—	—	19	—	—	
Input Capacitance	C _I		—	10	—	10	—	10	—	10	—	10	—	10	pF

CD54/74HC123, CD54/74HCT123 CD54/74HC423, CD54/74HCT423



	54/74HC	54/74HCT
Input Level	V_{CC}	3 V
Switching Voltage, V_S	50% V_{CC}	1.3 V

Fig. 2 - Triggering of One Shot by input $\overline{A}$ or input B for a period t_w .

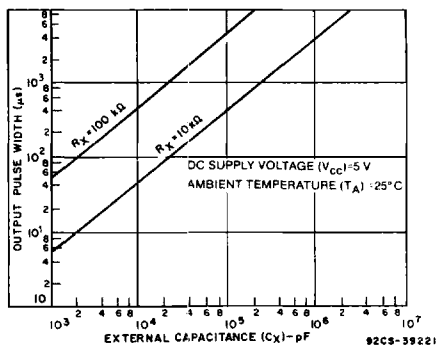


Fig. 3 - Typical output pulse width as a function of C_x for $R_x = 10 \text{ k}\Omega$ and $100 \text{ k}\Omega$.

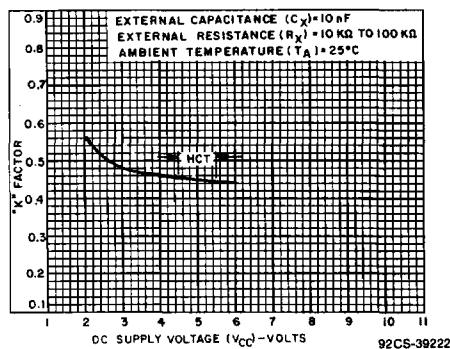


Fig. 4 - Typical "K" Factor as a function of V_{CC} .