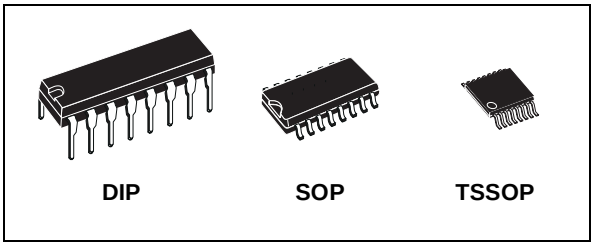
M74HC123

DUAL RETRIGGERABLE MONOSTABLE MULTIVIBRATOR

- HIGH SPEED :
  t_{PD} = 23 ns (TYP.) at V_{CC} = 6V
- LOW POWER DISSIPATION:
  STAND BY STATE :
  I_{CC}=4µA (MAX.) at T_A=25°C
  ACTIVE STATE :
  I_{CC}=200µA (MAX.) at V_{CC} = 5V
- HIGH NOISE IMMUNITY:
  $V_{NIH} = V_{NIL}$ = 28 % V_{CC} (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:
  $|I_{OH}| = I_{OL}$ = 4mA (MIN)
- BALANCED PROPAGATION DELAYS:
  $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
  V_{CC} (OPR) = 2V to 6V
- WIDE OUTPUT PULSE WIDTH RANGE :
  t_{WOUT} = 120 ns ~ 60 s OVER AT V_{CC} = 4.5 V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 123



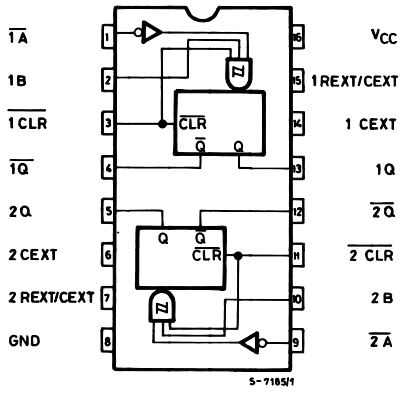
ORDER CODES

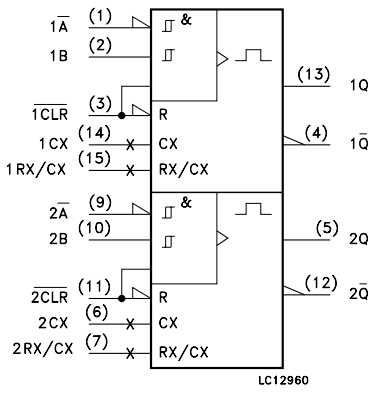
PACKAGE	TUBE	T & R
DIP	M74HC123B1R	
SOP	M74HC123M1R	M74HC123RM13TR
TSSOP		M74HC123TTR

DESCRIPTION

The M74HC123 is an high speed CMOS MONOSTABLE MULTIVIBRATOR fabricated with silicon gate C^2MOS technology.
There are two trigger inputs, A INPUT (negative edge) and B INPUT (positive edge). These inputs are valid for slow rising/falling signals, (tr=tf=l sec). The device may also be triggered by using the $\overline{CLR}$ input (positive-edge) because of the Schmitt-trigger input; after triggering the output maintains the MONOSTABLE state for the time period determined by the external resistor Rx and capacitor Cx. When Cx ≥ 10nF and Rx ≥ 10KΩ, the output pulse width value is approsimatively given by the formula : tW(OUT) = K · Cx · Rx.
(K ≅ 0.45).
Taking $\overline{CLR}$ low breaks this MONOSTABLE STATE. If the next trigger pulse occurs during the MONOSTABLE period it makes the MONOSTABLE period longer. Limit for values of Cx and Rx : Cx : NO LIMIT
Rx : V_{cc} < 3.0V 5KΩ to 1MΩ
V_{cc} ≥ 3.0V 1KΩ to 1MΩ
All inputs are equipped with protection circuits against static discharge and transient excess voltage.

PIN CONNECTION AND IEC LOGIC SYMBOLS





ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V_{CC}	Supply Voltage	-0.5 to +7	V
V_I	DC Input Voltage	-0.5 to V_{CC} + 0.5	V
V_O	DC Output Voltage	-0.5 to V_{CC} + 0.5	V
I_{IK}	DC Input Diode Current	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Current	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500(*)	mW
T_{stg}	Storage Temperature	-65 to +150	°C
T_L	Lead Temperature (10 sec)	300	°C

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied
(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Value	Unit
V_{CC}	Supply Voltage		2 to 6	V
V_I	Input Voltage		0 to V_{CC}	V
V_O	Output Voltage		0 to V_{CC}	V
T_{op}	Operating Temperature		-55 to 125	°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2.0V	0 to 1000	ns
		V_{CC} = 4.5V	0 to 500	ns
		V_{CC} = 6.0V	0 to 400	ns
Cx	External Capacitor		NO LIMITATION	pF
Rx	External Resistor	Vcc < 3V	5K to 1M	Ω
		Vcc ≥ 3V	1K to 1M	

The Maximum allowable values of Cx and Rx are a function of leakage of capacitor Cx, the leakage of device and leakage due to the board layout and surface resistance. Susceptibility to externally induced noise may occur for Rx > 1MΩ

DC SPECIFICATIONS

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	2.0		1.5			1.5		1.5		V
		4.5		3.15			3.15		3.15		
		6.0		4.2			4.2		4.2		
V_{IL}	Low Level Input Voltage	2.0				0.5		0.5		0.5	V
		4.5				1.35		1.35		1.35	
		6.0				1.8		1.8		1.8	
V_{OH}	High Level Output Voltage	2.0	I_O=-20 µA	1.9	2.0		1.9		1.9		V
		4.5	I_O=-20 µA	4.4	4.5		4.4		4.4		
		6.0	I_O=-20 µA	5.9	6.0		5.9		5.9		
		4.5	I_O=-4.0 mA	4.18	4.31		4.13		4.10		
		6.0	I_O=-5.2 mA	5.68	5.8		5.63		5.60		
V_{OL}	Low Level Output Voltage	2.0	I_O=20 µA		0.0	0.1		0.1		0.1	V
		4.5	I_O=20 µA		0.0	0.1		0.1		0.1	
		6.0	I_O=20 µA		0.0	0.1		0.1		0.1	
		4.5	I_O=4.0 mA		0.17	0.26		0.33		0.40	
		6.0	I_O=5.2 mA		0.18	0.26		0.33		0.40	
I_I	Input Leakage Current	6.0	V_I = V_{CC} or GND			± 0.1		± 1		± 1	µA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND			4		40		80	µA
$I_{CC'}$	Active State Supply Current (1)	2.0	V_I = V_{CC} or GND Pin 7 or 15 V_{IN} = V_{CC}/2		45	200		260		320	µA
		4.5			500	600		780		960	µA
		6.0			0.7	1		1.3		1.6	mA

(1) : Per Circuit

AC ELECTRICAL CHARACTERISTICS (C_L = 50 pF, Input $t_r = t_f$ = 6ns)

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	2.0			30	75		95		110	ns
		4.5			8	15		19		22	
		6.0			7	13		16		19	
t_{PLH} t_{PHL}	Propagation Delay Time ($\overline{A}$, B - Q, $\overline{Q}$)	2.0			102	210		265		315	ns
		4.5			29	42		53		63	
		6.0			22	36		45		54	
t_{PLH} t_{PHL}	Propagation Delay Time($\overline{CLR}$ TRIGGER - Q, $\overline{Q}$)	2.0			102	235		295		355	ns
		4.5			31	47		59		71	
		6.0			23	40		50		60	
t_{PLH} t_{PHL}	Propagation Delay Time ($\overline{CLR}$ - Q, $\overline{Q}$)	2.0			68	160		200		240	ns
		4.5			20	32		40		48	
		6.0			16	27		34		41	
t_{WOUT}	Output Pulse Width	2.0	Cx = 100 pF Rx = 10KΩ		1.4						µs
		4.5			1.2						
		6.0			1.1						
		2.0	Cx = 0.1µF Rx = 100KΩ		4.6						ms
		4.5			4.4						
		6.0			4.3						
Δt_{WOUT}	Output Pulse Width Error Between Circuits in Same Package				±1						%
$t_{W(H)}$ $t_{W(L)}$	Minimum Pulse Width	2.0				75		95		110	ns
		4.5				15		19		22	
		6.0				13		16		19	
$t_{W(L)}$	Minimum Pulse Width ($\overline{CLR}$)	2.0				75		95		110	ns
		4.5				15		19		22	
		6.0				13		16		19	
t_{rr}	Minimum Retrigger Time	2.0	Cx = 100 pF Rx = 10KΩ		325						ns
		4.5			108						
		6.0			78						
		2.0	Cx = 0.1µF Rx = 100KΩ		5						µs
		4.5			1.4						
		6.0			1.2						

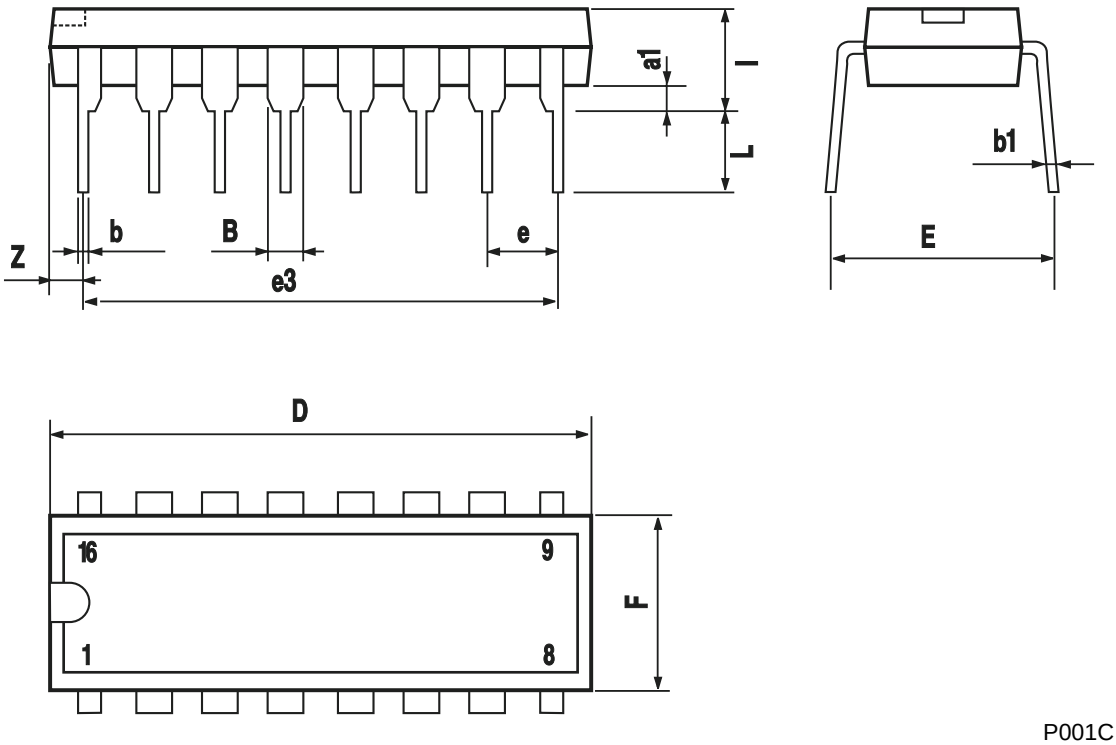
CAPACITIVE CHARACTERISTICS

Symbol	Parameter	Test Condition		Value							Unit
		V_{CC} (V)		T_A = 25°C			-40 to 85°C		-55 to 125°C		
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
C_{IN}	Input Capacitance	5.0			5	10		10		10	pF
C_{PD}	Power Dissipation Capacitance (note 1)	5.0			162						pF

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$' Duty/100 + Ic/2(per monostable) (I_{cc}' : Active Supply current) (Duty : %)

Plastic DIP-16 (0.25) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		17.78			0.700	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



P001C