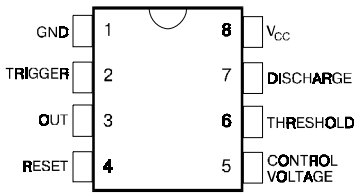
NE555
Precision Timing Circuit

DESCRIPTION
These devices are monolithic timing circuits capable of producing accurate time delays or oscillation. In the time delay mode of operation, the timed interval is controlled by a single external resistor and capacitor network. In the astable mode of operation, the frequency and duty cycle may be independently controlled with two external resistors and a single external capacitor.

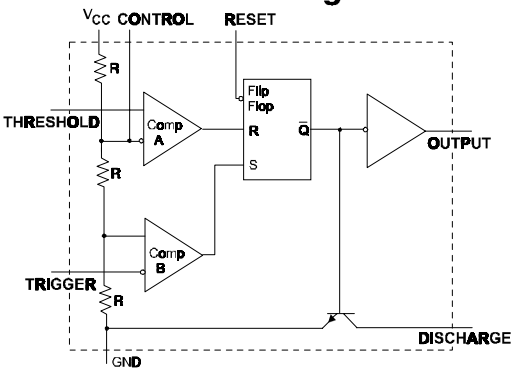
Pin Configuration
(TOP VIEW)



FEATURES
- Timing from Microseconds to Hours
- Astable or Monostable Operation
- Adjustable Duty Cycle
- TTL - Compatible Output Can Sink or Source Up to 200 mA
- Temperature Stability of 0.005% per °C
- Direct Replacement for Signetics NE555 Timer

APPLICATIONS
- Precision timing
- Pulse generation
- Sequential timing
- Time delay generation
- Pulse width modulation
- Pulse position modulation
- Missing pulse detector

Block diagram



RESET can override TRIGGER, which can override THRESHOLD

Absolute Maximum Ratings (T_A=25°C, unless otherwise specified)

PARAMETER	MIN	MAX	UNITS
Supply Voltage, V_{CC}	4.5	16	V
Input Voltage (control, reset, threshold and trigger)		V_{CC}	
Output Current, I_0		±200	mA
Operating Free-Air Temperature, T_A		70	°C
Storage Temperature Range, T_{STG}	-65	+150	

Function Table

RESET	TRIGGER VOLTAGE *	THRESHOLD VOLTAGE *	OUTPUT	DISCHARGE SWITCH
Low	Irrelevant	Irrelevant	Low	On
High	< 1/3 V_{CC}	High	High	Off
High	> 1/3 V_{CC}	> 2/3 V_{CC}	Low	On
High	> 1/3 V_{CC}	< 2/3 V_{CC}	As previously established	

* Voltage levels shown are nominal

TYPICAL APPLICATION DATA

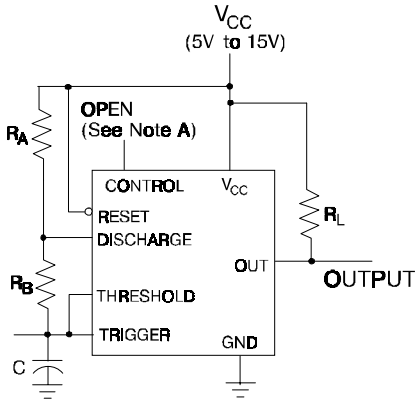


Fig. 1 Circuit for astable operation

NOTE A: Bypassing the control voltage input to ground with a capacitor may improve operation. This should be evaluated for individual applications.

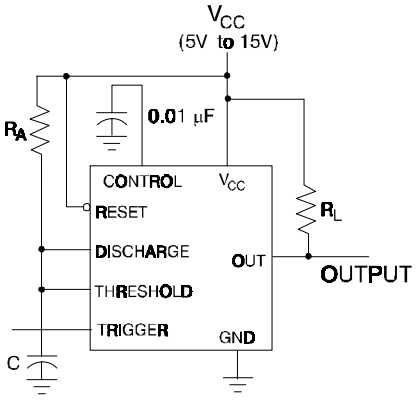


Fig. 2 Circuit for monostable operation

Electrical characteristics (T_A=25°C, V_{CC}=+5V to +15V, unless otherwise specified)

PARAMETER		TEST CONDITIONS (see Note 2)		MIN	TYP	MAX	UNITS
Operating Supply Voltage Range				4.5		16	V
Threshold Voltage Level		V_{CC}=15V		8.8	10	11.2	V
		V_{CC}=5V		2.4	3.3	4.2	
Threshold Current (see Note 1)		(see Note 1)			30	250	nA
Trigger Voltage Level		V_{CC}=15V		4.5	5	5.6	V
		V_{CC}=5V		1.1	1.67	2.2	
Trigger Current		Trigger at 0V			0.5	2	μA
Reset Voltage Level				0.3	0.7	1	V
Reset Current		Reset at V_{CC}			0.1	0.4	mA
		Reset at 0V			-0.4	-1.5	
Discharge Leakage Current					20	100	nA
Control Voltage Level		V_{CC}=15V		9	10	11	V
		V_{CC}=5V		2.6	3.3	4	
Low-level Output Voltage		V_{CC}=15V	I_{OL}=10mA		0.1	0.25	
			I_{OL}=50mA		0.4	0.75	
			I_{OL}=100mA		2	2.5	
			I_{OL}=200mA		2.5		
		V_{CC}=5V	I_{OL}=5mA		0.25	0.35	
			I_{OL}=8mA		0.3	0.4	
High-level Output Voltage		V_{CC}=15V	I_{OL}=-100mA	12.75	13.3		
			I_{OL}=-200mA		12.5		
		V_{CC}=5V	I_{OL}=-100mA	2.75	3.3		
Supply Current		Output Low, No Load	V_{CC}=15V		10	15	mA
			V_{CC}=5V		3	6	
		Output High, No Load	V_{CC}=15V		9	13	
			V_{CC}=5V		2	5	
Initial Error of Timing Interval (see Note 3)	monostable (see Note 4)	T_A=25°C			1	3	%
	astable (see Note 5)				5	13	
Temperature Coefficient of Timing Interval	monostable	T_A=MIN to MAX			50	150	ppm /°C
	astable				150	500	
Supply Voltage Sensitivity of Timing Interval	monostable	T_A=25°C			0.1	0.5	%/V
	astable				0.3	1	
Output Pulse Rise Time		C_L=15pF, T_A=25°C			100	300	ns
Output Pulse Fall Time					100	300	

Notes:
1. This parameter influences the maximum value of the timing resistors R_A and R_B in the circuit on Fig 1. For example, when V_{CC}=5V, the maximum value is R=R_A+R_B=3.4 MΩ, and V_{CC}=15V, the maximum value is 10 MΩ.
2. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.
3. Timing interval error is defined as the difference between the measured value and the average value of a random sample from each process run.
4. Values specified are for a device in a monostable circuit similar to Fig. 2, with component values as follow: R_A=2KΩ to 100 KΩ, C=0.1μF.
5. Values specified are for a device in an astable circuit similar to Fig. 1, with component values as follow: R_A, R_B=1KΩ to 100 KΩ, C=0.1μF.