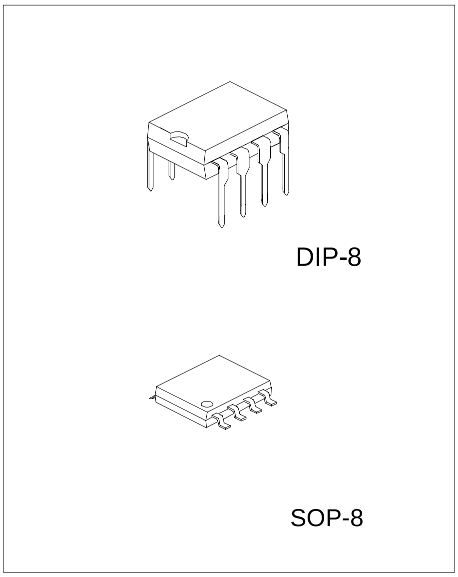
NE555 3SINGLE TIMERS

DESCRIPTION

The NE555 is a highly stable controller capable of producing accurate timing pulses. With monostable operation, the time delay is controlled by one external and one capacitor. With a stable operation, the frequency and duty cycle are accurately controlled with two external resistors and one capacitor.



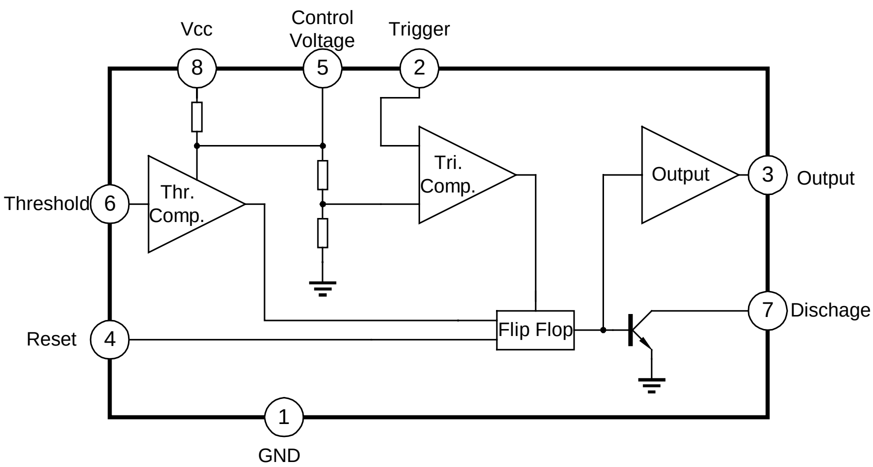
FEATURES

*High current driver capability(=200mA)
*Adjustable duty cycle
*Temperature stability of 0.005%/°C
*Timing from µSec to Hours
*Turn off time less than 2µSec

APPLICATION

*Precision timing
*Pulse generation
*Time delay generation
*Sequential timing

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS(Ta=25°C)

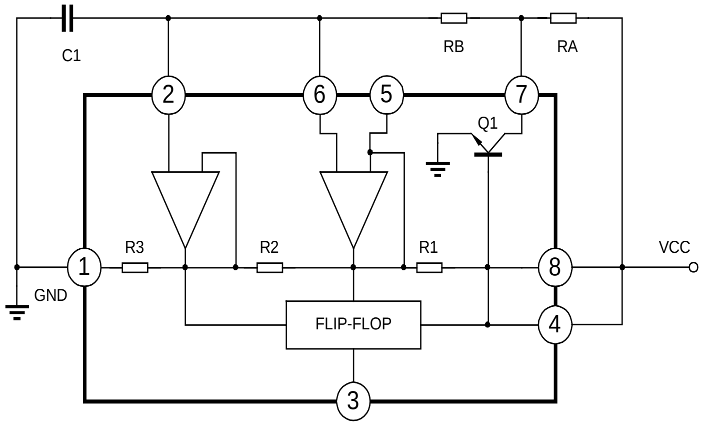
Characteristic	Symbol	Value	Unit
Supply Voltage	Vcc	16	V
Power Dissipation	Pd	600	mW
Lead temperature	Tlead	300	°C
Operating Temperature	Topr	0 to 70	°C
Storage Temperature	Tstg	-65 to 150	°C

ELECTRICAL CHARACTERISTICS(Ta=25°C ,Vcc=5~15V)

Characteristic	Symbol	Test Condition	Min	Typ.	Max	Unit
Supply voltage	Vcc		4.5		16	V
Supply Current (Note 1)	Icc	Vcc=5V,$R_L=\infty$		3	6	mA
		Vcc=15V,$R_L=\infty$		7.5	15	mA
Timing Error(monostable)						
Initial Accuracy(Note 2)	ACCUR	R_A=1k to 100kμΩ		1.0	3.0	%
Drift with Temperature	Δt/ΔT	C=0.1μF		50		ppm/°C
Drift with supply voltage	Δt/ΔVcc			0.1	0.5	%/V
Timing Error(astable)						
Initial Accurary(Note 2)	ACCUR	R_A=1k to 100kμΩ		2.25		%
Drift with Temperature	Δt/ΔT	C=0.1μF		150		ppm/°C
Drift with supply voltage	Δt/ΔVcc			0.3		%/V
Control Voltage	Vc	Vcc=15V	9.0	10.0	11.0	V
		Vcc=5V	2.6	3.33	4.0	V
Threshold Voltage	V_{TH}	Vcc=15V		10.0		V
		Vcc=5V		3.33		V
Threshold Current(Note 3)	I_{TH}			0.1	0.25	μA
Trigger voltage	Vtr	Vcc=5V	1.1	1.67	2.2	V
		Vcc=15V	4.5	5	5.6	V
Trigger Current	Itr	Vtr=0		0.01	2.0	μA
Reset Voltage	Vrst		0.4	0.7	1.0	V
Reset Current	Irst			0.1	0.4	mA
Low Output Voltage	V_{OL}	Vcc=15V				
		Isink=10mA		0.06	0.25	V
		Isink=50mA		0.3	0.75	V
		Vcc=5V				
		Isink=5mA		0.05	0.35	V
High Output Voltage	V_{OH}	Vcc=15V				
		Isource=200mA		12.5		V
		Isource=100mA	12.75	13.3		V
		Vcc=5V				
		Isource=100mA	2.75	3.3		V
Rise time of Output	t_R			100		nSec
Fall time of Output	t_F			100		nSec
Dischage Leakage Current	I_{LKG}			20	100	nA

Note 1: Supply current when output is high is typically imA less at Vcc 5V.
Note 2:Tested at Vcc=5.0V and Vcc=15V.
Note 3:this will determine the maximum value of RA+RB for 15V operation, The max total 20MΩ,and for 5V operation the maximum total R=6.7MΩ.

APPLICATION CIRCUIT



APPLICATION NOTE

The application circuit shows astable mode.
Pin 6(Threshold) is tied to Pin 2(Trigger) and Pin 4(reset) is tied to Vcc (Pin 8).
The external capacitor C1 of Pib 6 and Pin2 charges through RA,RB and discharges through RB only.
In the internal circuit of N E 555 one input of the upper compartor is the 2/3Vcc(R1=R2=R3),another input if it is connected Pin 6.

as soon as charging C1 is higher than 2/3Vcc, discharge transistor Q1 discharges to collector of transistor Q1.
Therefore, the flip-flop circuit is reset and output is low.
One input of lower compartor is the 1/3Vcc, discharge transistor Q1 turn off and C1 charges through RA and RB.
Therefore, the flip-flop circuit is set output high.

So to say, when C1 charges through RA and RB output is high and when C1 discharge RB output is low. The charge time(output is high) t1 is 0.693(RA+RB) C1 and the discharge time (output is low) T2 is 0.693 RB*C1.

$$\ln\left(\frac{Vcc-\frac{1}{3}Vcc}{Vcc-\frac{2}{3}Vcc}\right)=0.693$$

Thus the total period time T is given by

T=T1+T2=0.693(RA+2RB)*C1.

Then the frequency of astable mode is given by

$$f=\frac{1}{T}=\frac{1.44}{(RA+RB)*C1}$$

The duty cycle is given by

$$D.C.=\frac{T2}{T}=\frac{RB}{RA+2RB}$$.