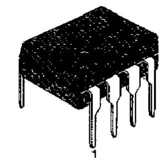
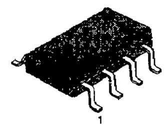
SINGLE TIMER

The NE555/I 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 astable operation, the frequency and duty cycle are accurately controlled with two external resistors and one capacitor.

8 DIP



8 SOP



FEATURES

- High Current Drive Capability (= 200mA)
- Adjustable Duty Cycle
- Temperature Stability of 0.005%/°C
- Timing From µSec To Hours
- Turn Off Time Less Than 2µSec

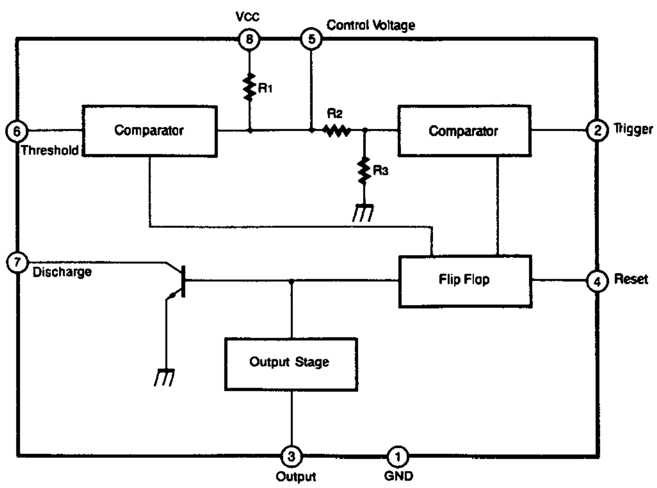
APPLICATIONS

- Precision Timing
- Pulse Generation
- Time Delay Generation
- Sequential Timing

ORDERING INFORMATION

Device	Package	Operating Temperature
NE555N	8 DIP	0 ~ +70°C
NE555M	8 SOP	
NE555IN	8 DIP	-40 ~ +85°C
NE555IM	8 SOP	

BLOCK DIAGRAM



ABSOLUTE MAXIMUM RATINGS (T_A = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	16	V
Lead Temperature (soldering 10sec)	T_{LEAD}	300	°C
Power Dissipation	P_D	600	mW
Operating Temperature Range NE555C NE555CI	T_{OPR}	0 ~ + 70 - 40 ~ + 85	°C °C
Storage Temperature Range	T_{STG}	- 65 ~ + 150	°C

ELECTRICAL CHARACTERISTICS

(T_A = 25°C, V_{CC} = 5 ~ 15V, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Supply Voltage	V_{CC}		4.5		16	V
Supply Current *[1](low stable)	I_{CC}	V_{CC} = 5V, $R_L = \infty$		3	6	mA
		V_{CC} = 15V, $R_L = \infty$		7.5	15	mA
*Timing Error (Monostable) [2]Initial Accuracy Drift with Temperature Drift with Supply Voltage	ACCUR $\Delta t/\Delta T$ $\Delta t/\Delta V_{CC}$	R_A = 1KΩ to 100KΩ C = 0.1µF		1.0 50 0.1	3.0 0.5	% ppm/°C %/V
*Timing Error (astable) [2]Intial Accuracy Drift with Temperature Drift with Supply Voltage	ACCUR $\Delta t/\Delta T$ $\Delta t/\Delta V_{CC}$	R_A = 1KΩ to 100KΩ C = 0.1µF		2.25 150 0.3		% ppm/°C %/V
Control Voltage	V_C	V_{CC} = 15V	9.0	10.0	11.0	V
		V_{CC} = 5V	2.6	3.33	4.0	V
Threshold Voltage	V_{TH}	V_{CC} = 15 V		10.0		V
		V_{CC} = 5V		3.33		V
*[3]Threshold Current	I_{TH}			0.1	0.25	µA
Trigger Voltage	V_{TR}	V_{CC} = 5V	1.1	1.67	2.2	V
Trigger Voltage	V_{TR}	V_{CC} = 15V	4.5	5	5.6	V
Trigger Current	I_{TR}	V_{TR} = 0V		0.01	2.0	µA
Reset Voltage	V_{RST}		0.4	0.7	1.0	V
Reset Current	I_{RST}			0.1	0.4	mA

ELECTRICAL CHARACTERISTICS

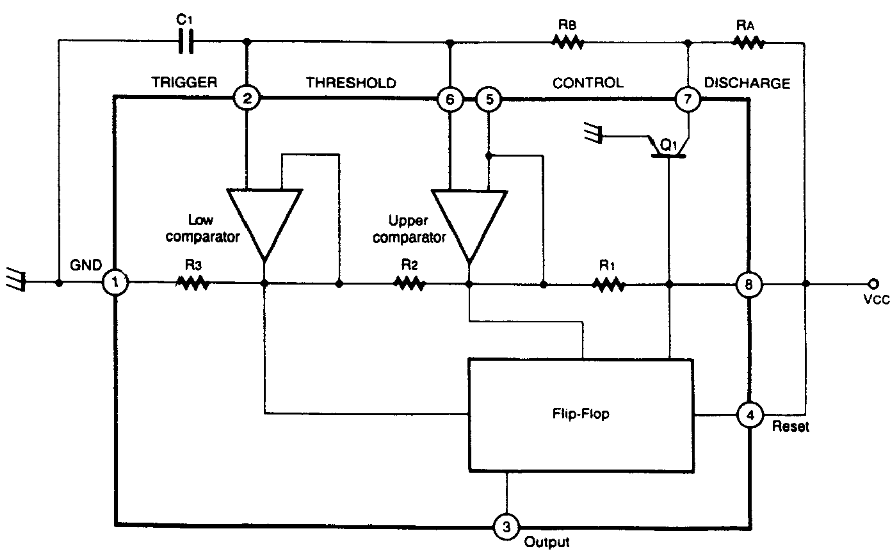
(T_A = 25°C, V_{CC} = 5 ~ 15V, unless otherwise specified)

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Low Output Voltage	V_{OL}	V_{CC} = 15V, I_{SINK} = 10mA		0.06	0.25	V
		I_{SINK} = 50mA		0.3	0.75	V
		V_{CC} = 5V, I_{SINK} = 5mA		0.05	0.35	V
High Output Voltage	V_{OH}	V_{CC} = 15V, I_{SOURCE} = 200mA		12.5		V
		I_{SOURCE} = 100mA	12.75	13.3		V
		V_{CC} = 5V, I_{SOURCE} = 100mA	2.75	3.3		V
Rise Time of Output	t_R			100		ns
Fall Time of Output	t_F			100		ns
Discharge Leakage Current	I_{LKG}			20	100	nA

Notes:

1. Supply current when output is high is typically 1mA less at V_{CC} = 5V
2. Tested at V_{CC} = 5.0V and V_{CC} = 15V
3. This will determine maximum value of $R_A + R_B$ for 15V operation, the max. total R = 20MΩ, and for 5V operation the max. 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 V_{CC} (Pin 8).
The external capacitor C_1 of Pin 6 and Pin 2 charges through R_A, R_B and discharges through R_B only.
In the internal circuit of the NE555 one input of the upper comparator is the 2/3 V_{CC} ($*R_1 = R_2 = R_3$, another input if it
If it is connected Pin 6.
As soon as charging C_1 is higher than 2/3 Vcc, discharge transistor Q_1 turns on and C_1 discharges to collector of transistor Q_1.
Therefore, the flip-flop circuit is reset and output is low.
One input of lower comparator is the 1/3 V_{CC}, discharge transistor Q_1 turn off and C_1 charges through R_A and R_B.
Therefore, the flip-flop circuit is set and output is high.
So to say, when C_1 charges through R_A and R_1 output is high and when C_1 discharges through R_B output is low.
The charge time (output is high) T_1 is 0.693 (R_A+R_B) C_1 and the discharge time (output is low) T_2 is 0.693 $(R_B C_1)$.

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

Thus the total period time T is given by
$T = T_1 + T_2 = 0.693\ (R_A + 2R_B)\ C_1$.
Then the frequency of astable mode is given by

$$f = \frac{1}{T} = \frac{1.44}{(R_A + 2R_B)C_1}$$

The duty cycle is given by

$$D.C = \frac{T_2}{T} = \frac{R_B}{R_A + 2R_B}$$

If you make use of the NE556 you can make two astable modes.

Astable Operation

The NE555 can free run as a mulitivibrator by triggering itself; refer to Fig.2. The output can swing from V_{DD} to GND and have 50 duty cycle square wave. Less than 1% frequency deviation can be observed, over a voltage range of 2 to 5V. f-1/1.4RC

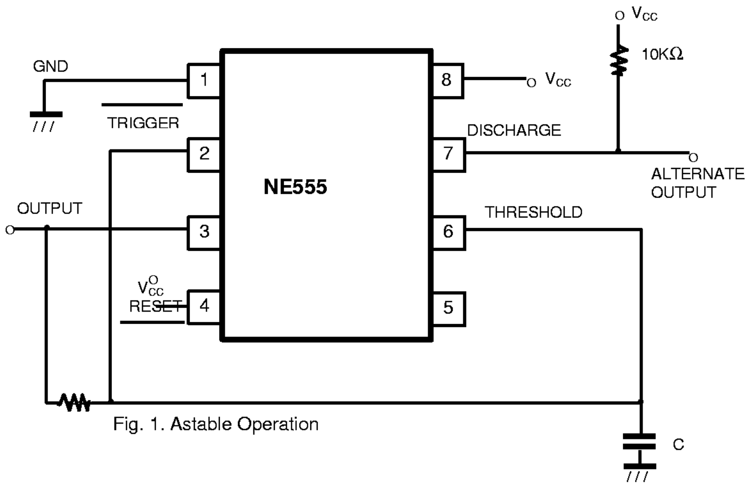


Fig. 1. Astable Operation

Monostable Operation

The NE555 can be used as a one-short, i.e. monostable multivibrator. Initially, because the inside discharge transistor is on state, external timing capacitor is held to GND potential. Upon application of a negative TRIGGER pulse pin 2, the intern discharge transistor is off state and the voltage across the capacitor increases with time constant $T = R_AC$ and OUTPUT goes to high state. When the voltage across the capacitor equals $2/3V_{CC}$ the inner comparator is reset by THRESHOLD input and the discharge transistor goes to on state, which in turn discharges the capacitor rapidly and drives the OUTPUT to its low state.

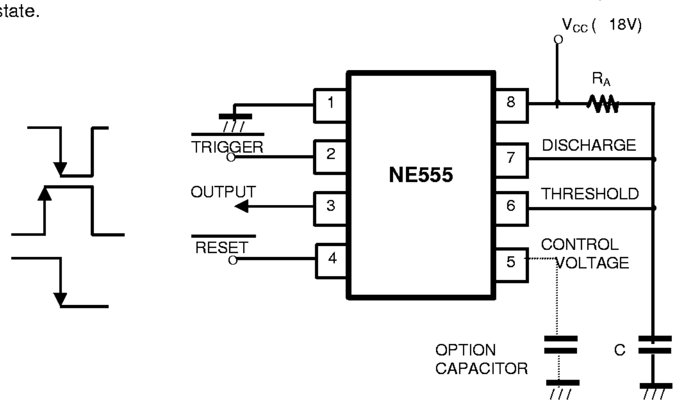


Fig. 2. Monostable Operation

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