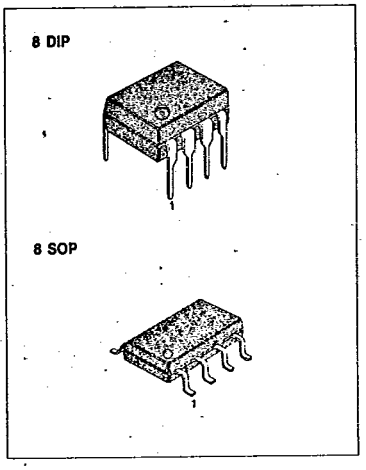
NE555 LINEAR INTEGRATED CIRCUIT

TIMER

The NE555 series are a monolithic integrated circuit and high stable device for generating accurate time delay or oscillation.



FEATURES

- **Turn off time less than 2μs**
- **Maximum operating frequency greater than 500KHz**
- **Timing from microseconds to hours**
- **Operates in both astable and monostable modes**
- **High output current**
- **Adjustable duty cycle**
- **Temperature stability of 0.005% per °C**

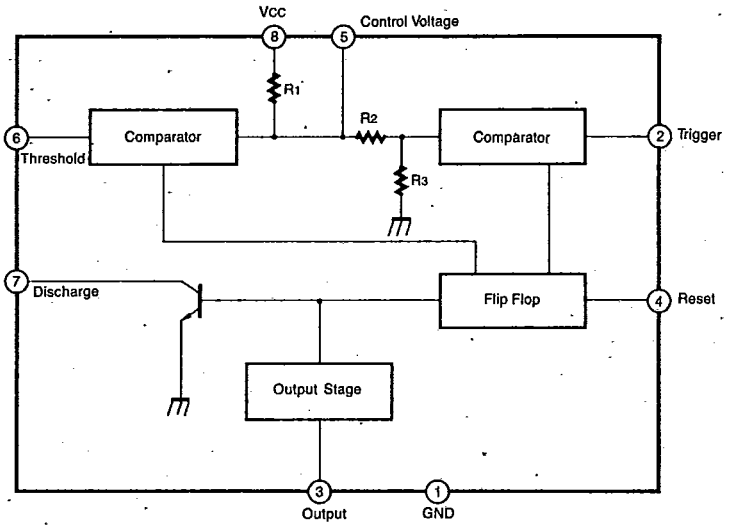
APPLICATIONS

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

ORDERING INFORMATION

Device	Package	Operating Temperature
NE555IN	8 DIP	−40 ~ +85°C
NE555ID	8 SOP	
NE555CN	8 DIP	0 ~ +70°C
NE555CD	8 SOP	

BLOCK DIAGRAM



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ABSOLUTE MAXIMUM RATINGS (Ta = 25°C)

Characteristic	Symbol	Value	Unit
Supply Voltage	V_{CC}	16	V
Lead Temperature (soldering 10 sec)	T_{lead}	300	°C
Power Dissipation	P_D	600	mW
Operating Temperature NE555I	T_{opr}	−40 ~ +85	°C
NE555C		0 ~ +70	°C
Storage Temperature	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 = ∞		3	6	mA
		V_{CC} = 15V, R_L = ∞		10	15	mA
*Timing Error (Monsotable) *2Initial Accurary Drift with Temperature Drift with Supply Voltage	MT_1	R_A = 1KΩ to 100KΩ C = 0.1μF		1.0 50 0.1	3.0 0.5	% ppm/°C %/V
*Timing Error (astable) *2Initial Accurary Drift with Temperature Drift with Supply Voltage	MT_2	R_A = 1K 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} = 15V		10.0		V
		V_{CC} = 5V		3.33		V
*3Threshold Current	I_{TH}			0.1	0.25	μA
Trigger Voltage	V_{TR}	V_{CC} = 5	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_T = 0V		0.5	2.0	μA
Reset Voltage	V_{RE}		0.4	0.7	1.0	V
Reset Current	I_{RE}			0.1	0.4	mA

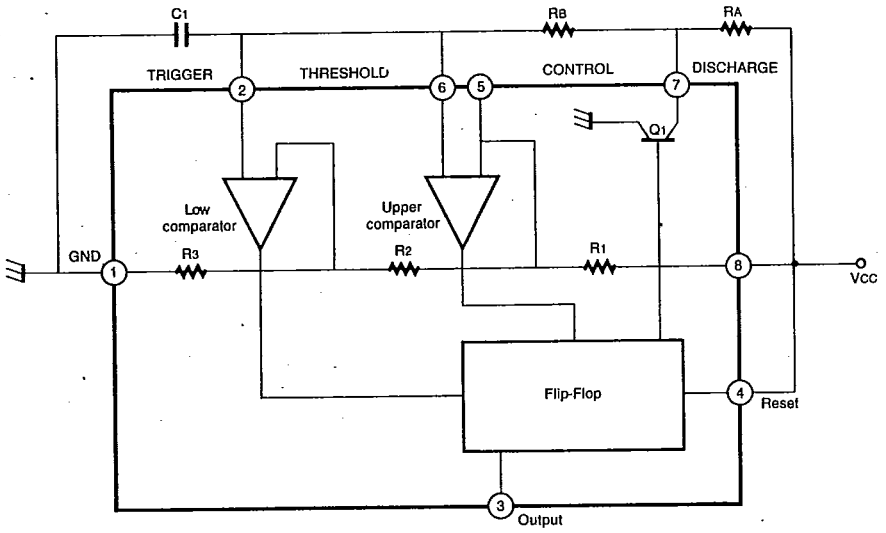
NE555 LINEAR INTEGRATED CIRCUIT

ELECTRICAL CHARACTERISTICS

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

Characteristic	Symbol	Test Conditions	Min	Typ	Max	Unit
Output Voltage (low)	V_{OL}	V_{CC}=15V I_{sink}=10mA I_{sink}=50mA		0.1 0.4	0.25 0.75	V V
		V_{CC}= 5V I_{sink}=5mA		0.25	0.35	V
Output Voltage (high)	V_{OH}	V_{CC}=15V I_{source}=200mA I_{source}=100mA	12.75	12.5 13.3		V V
		V_{CC}=5V I_{source}=100mA	2.75	3.3		V
Rise Time of Output	T_r			100		nsec
Fall Time of Output	T_f			100		nsec
Discharge Leakage Current	I_D			20	100	nA

APPLICATION CIRCUIT



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 the 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 NOTE

The application circuit shows astable mode.
The pin 6 (threshold) tied to the pin 2 (trigger) and pin 4 (reset) 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 upper comparator is the 2/3 V_{CC} ($^*R_1=R_2=R_3$), another input of it connected pin 6.
As soon as charging C_1 is higher than 2/3 V_{CC}, discharge transistor Q_1 turn on and C_1 discharges to collector of transistor Q_1.
Therefore 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 flip-flop circuit is set and output is high.
So to say, when C_1 charges through R_A and R_B 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 $(R_B C_1)$.

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

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 mode.
If you want another application note, request information on our timer IC application circuit designer.