

ASTABLE CIRCUITS

A monostable circuit produces a single pulse of fixed duration when triggered by a short pulse at its input. The trigger pulse drives the monostable into an unstable state. The time spent in this state depends upon the values of the resistor and capacitor used in the timing chain. We shall now consider how timing chains are used in astable circuits.

An **astable** circuit is 'free-running' i.e. it needs no trigger pulse and produces a continuous supply of pulses at its output.

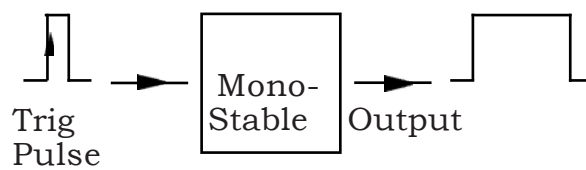


Fig.1a Monostable circuit

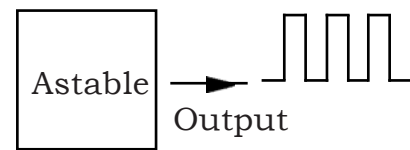


Fig. 1b Astable circuit

Firstly it is important to explain the terms used to describe the waveform.

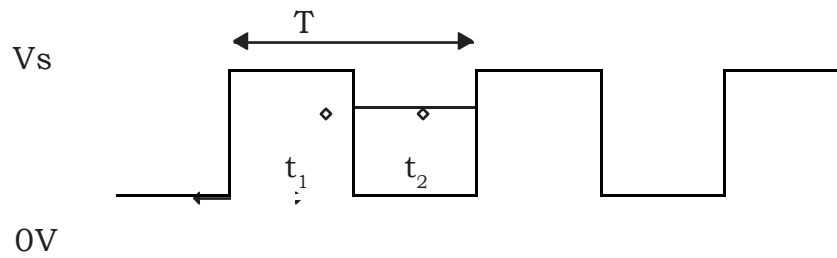


Fig 2. An astable output

From Fig 2, the time for one complete waveform is T , this is called the period or periodic time. The **frequency** of the waveform $= \frac{1}{T}$ IN Hz (T is in seconds). Frequency is the number of waveforms per second.

The mark to space ratio is the ratio of time the waveform is high (mark) to low (space) which is $t_1 ; t_2$.

The 555 - Timer astable

The 555 - Timer IC can be configured to produce an astable.

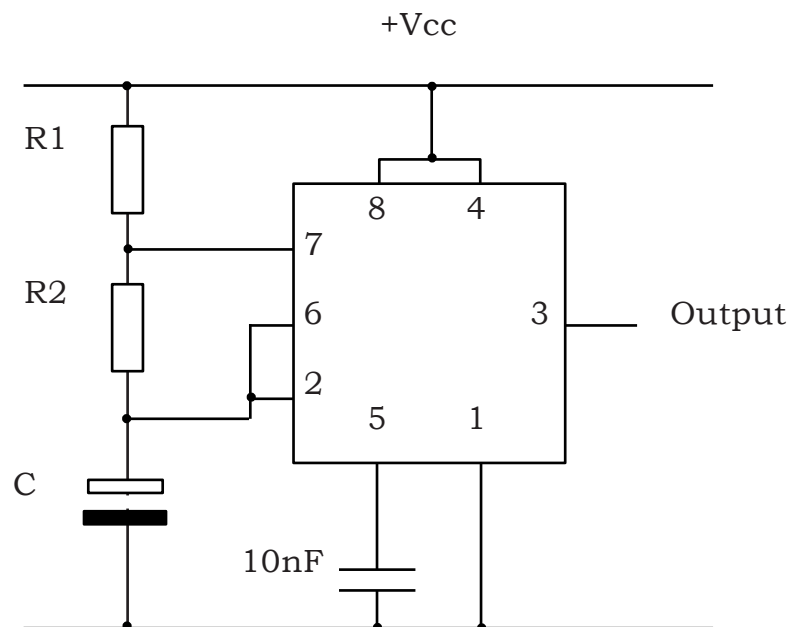


Fig. 3 The 555 configured as an astable

$$\text{Frequency } F = \frac{1.44}{(R_1 + 2R_2)C} \text{ Hz}$$

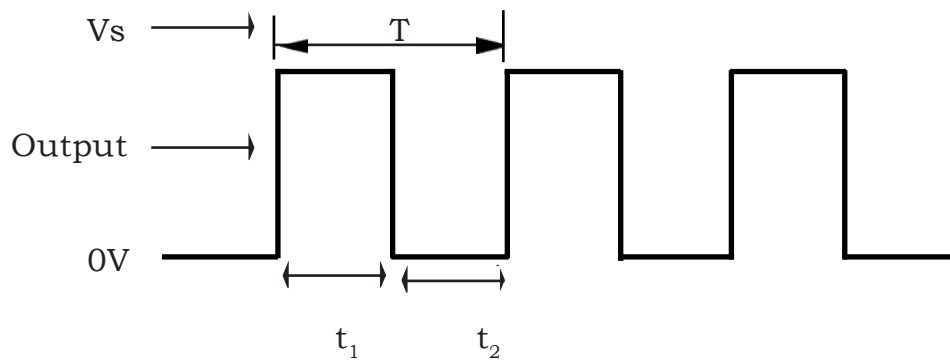


Fig.4 Timing diagram of the 555 astable.

$$t_1 = 0.69 (R_1 + R_2)C \quad t_2 = 0.69 R_2 C$$

$$T = 0.69 (R_1 + 2R_2) \times C$$

555 IC



Pin 3 is the output which can sink or source current, therefore 2 LEDs can be connected and will flash alternately. (Useful for warning applications like alarms, road crossings, signage and advertisements).