

Monostable and Astable Multivibrator

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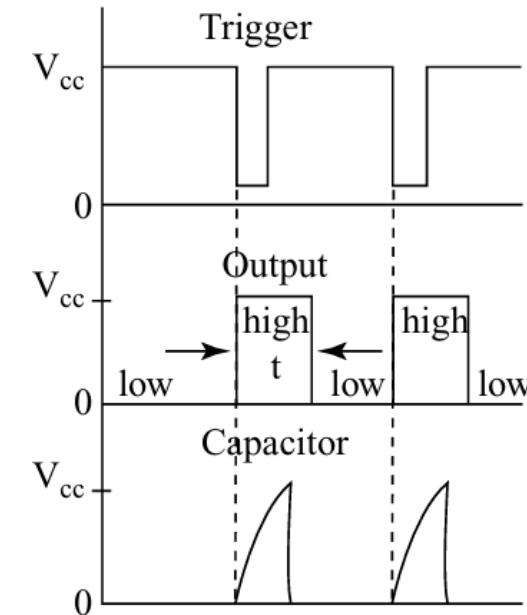
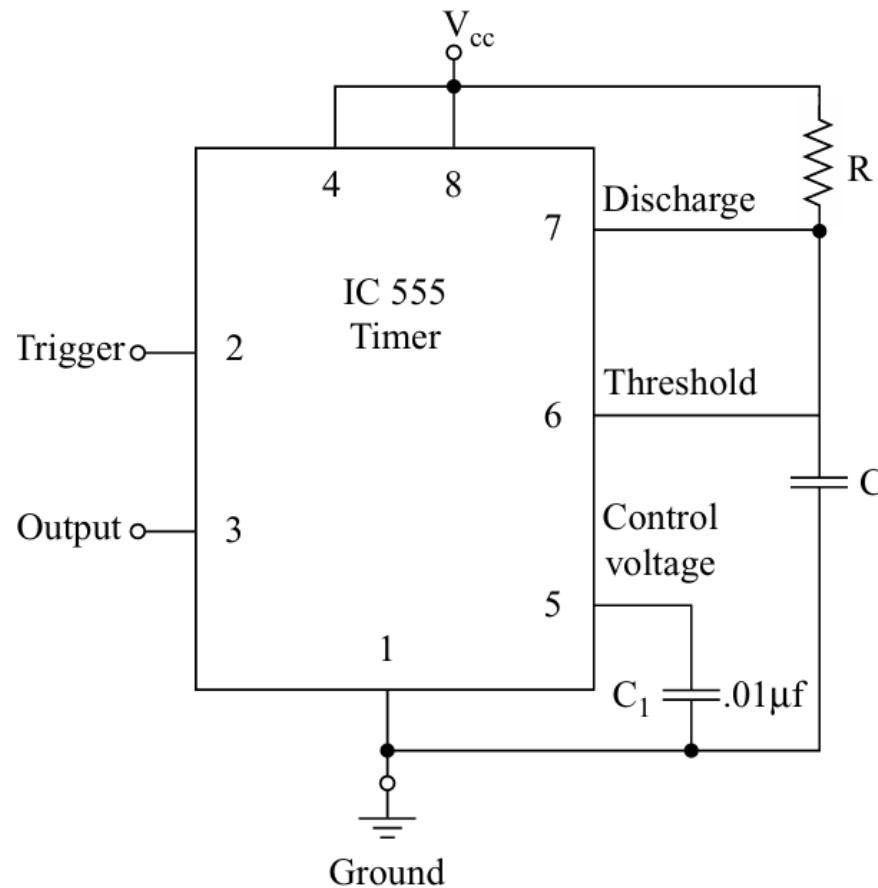
THREE OPERATING MODES OF IC 555:

The 555 timer has three operating modes:

- 1) Monostable mode: It is an oscillator operating in two modes or states. At stable state the output is low. When trigger pulse is applied, the output becomes high (quasi-stable state). The output then automatically returns to stable state (low output) after a time interval determined by externally connected RC network. Thus a monostable circuit has only one stable state and one quasi-stable state. Hence it is called monostable.
- 2) Astable mode: This operation has two states, both are quasi-stable. This circuit makes successive transition one quasi-stable state to other without external triggering signal. Hence astable multivibrator will alternate automatically and continuously between two states at a rate which is determined by the external components (resistors and capacitor)
- 3) Bistable mode: It is also called as Schmitt trigger. It operates in two states but requires an external trigger pulse to change from one state to the other.

Here, we will study monostable and astable modes only.

MONOSTABLE APPLICATION OF IC 555:



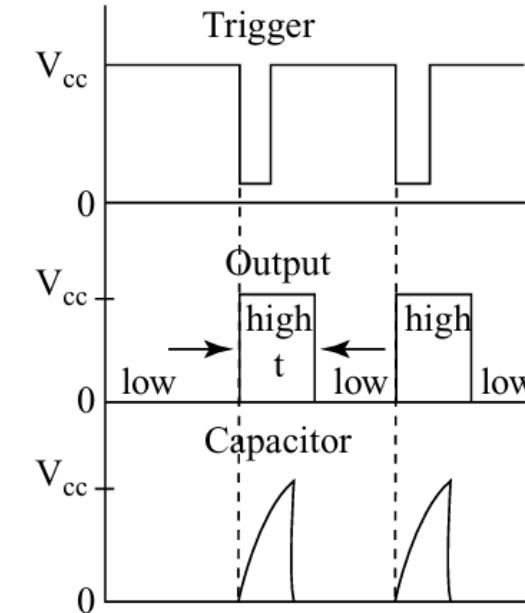
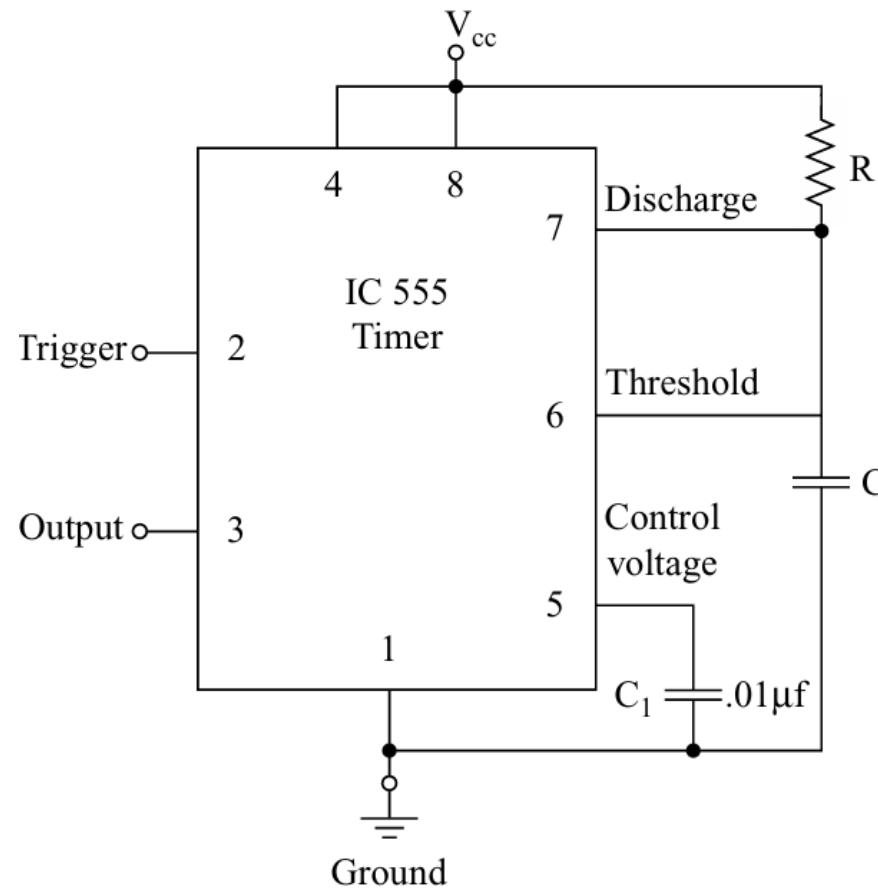
The output remains low until the trigger signal is applied.

When the negative pulse is given to the trigger, the output at pin 3 goes high.

As the \bar{Q} output of flip-flop is zero, the internal discharge transistor will turn off.

The capacitor C starts charging through the external resistance R.

MONOSTABLE APPLICATION OF IC 555:

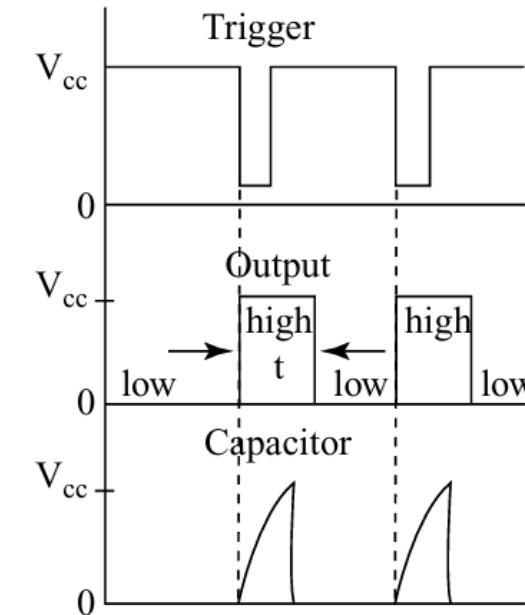
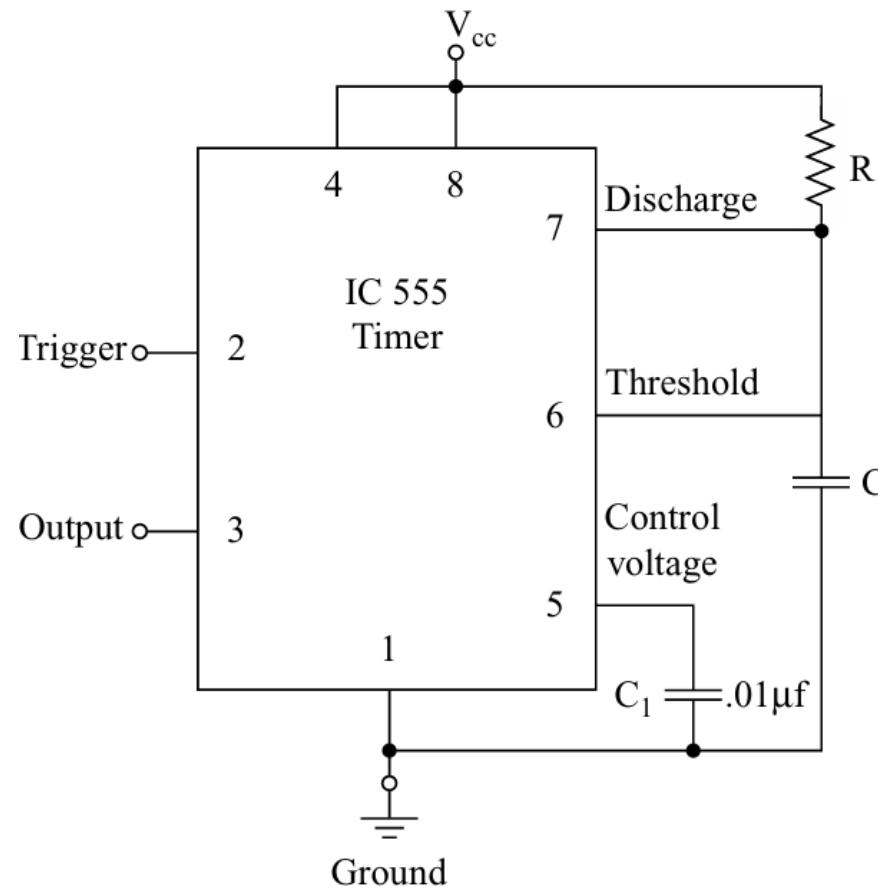


When the capacitor voltage reaches $+\frac{2}{3}V_{cc}$, the threshold signal causes the flip-flop to be reset, the output will become low..

The capacitor discharges through internal discharge resistor.

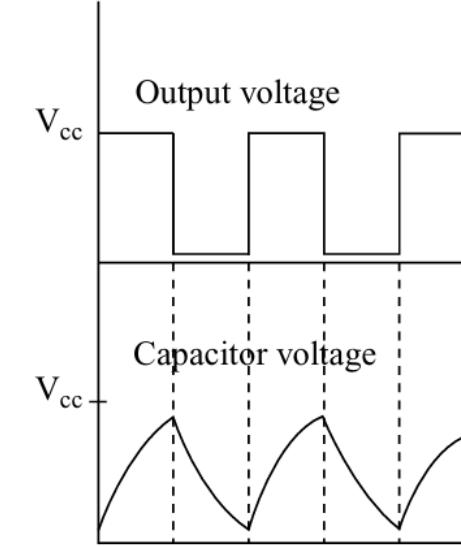
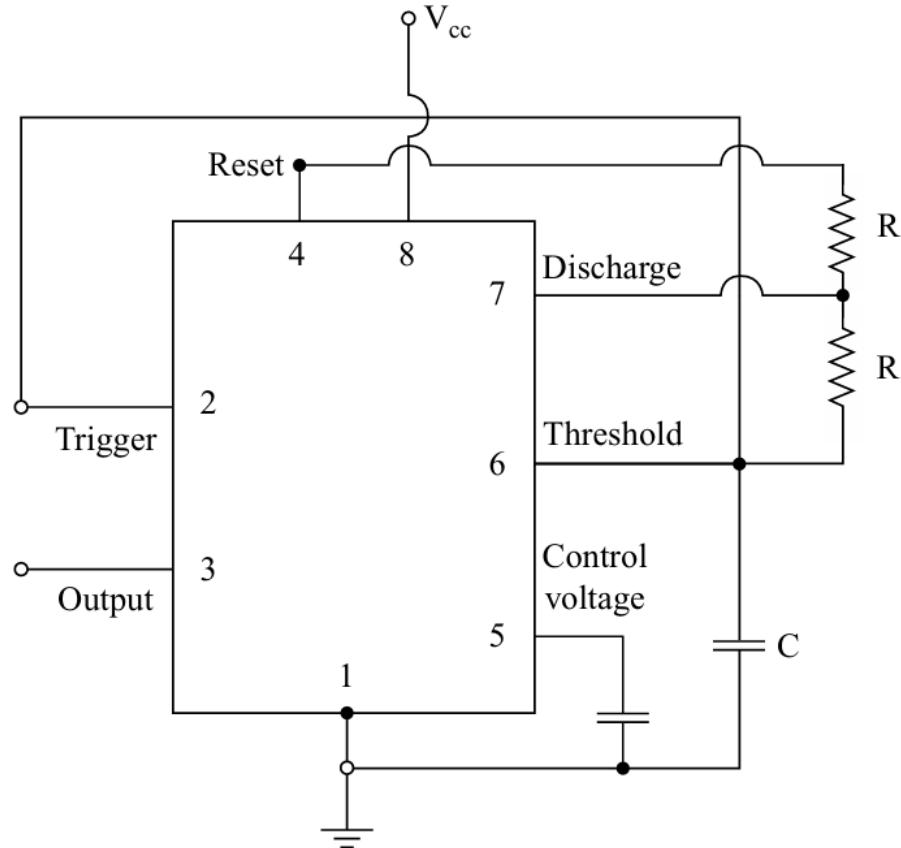
The output remains low until another trigger pulse is applied.

MONOSTABLE APPLICATION OF IC 555:



The time t of the output wave depends on the time taken by the capacitor to get charged from zero to $+\frac{2}{3}V_{cc}$.

ASTABLE APPLICATION OF IC 555:

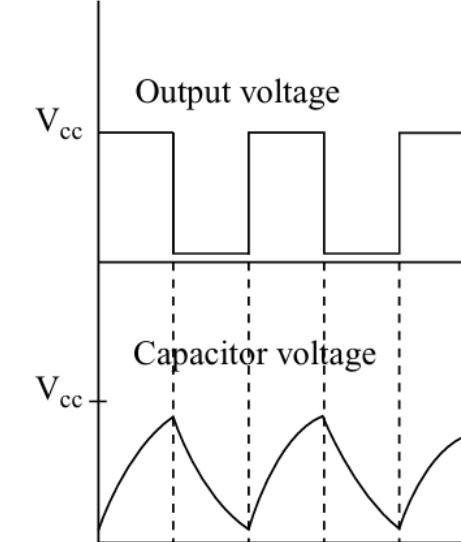
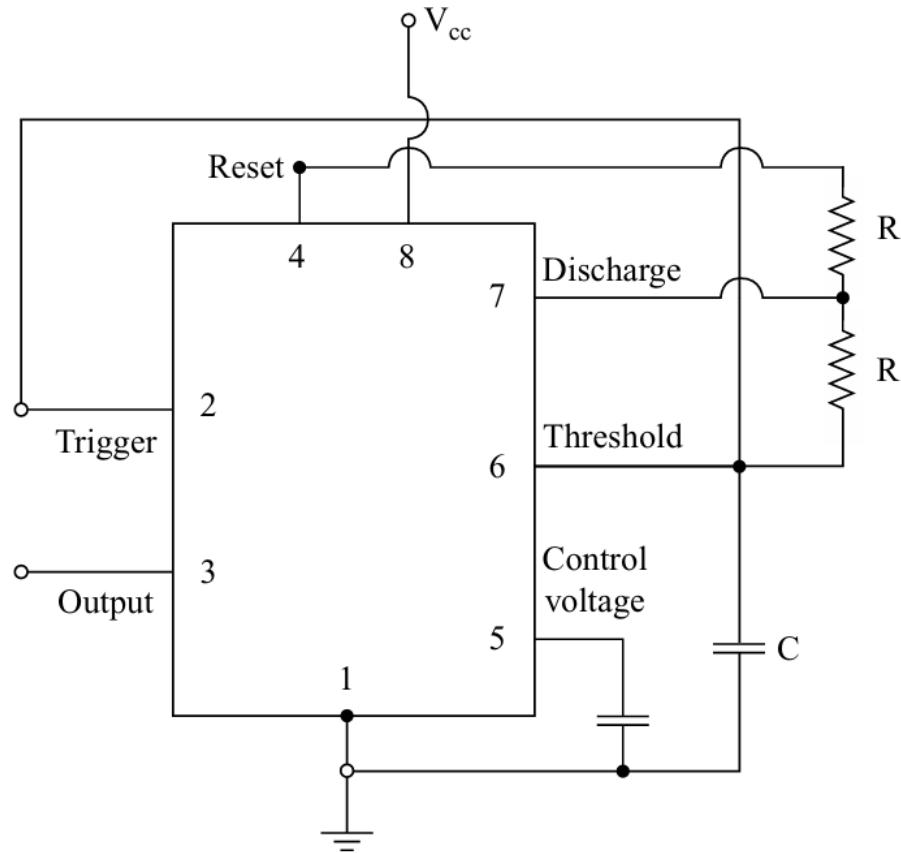


In astable application, the output will alternate between two states, i.e., high and low automatically and continuously without any trigger pulse.

In this circuit, both the trigger and threshold inputs are connected to the capacitor.

An additional resistance R_1 is connected between the capacitor and discharge transistor to slow down the rate of discharge of the capacitor.

ASTABLE APPLICATION OF IC 555:

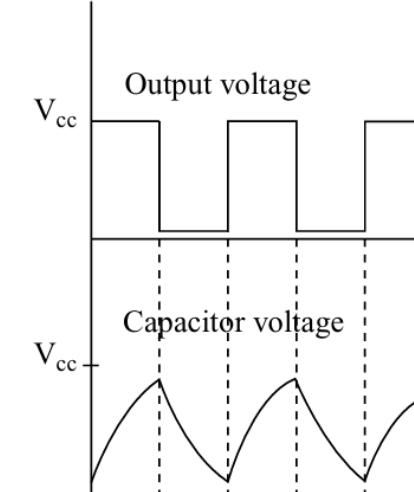
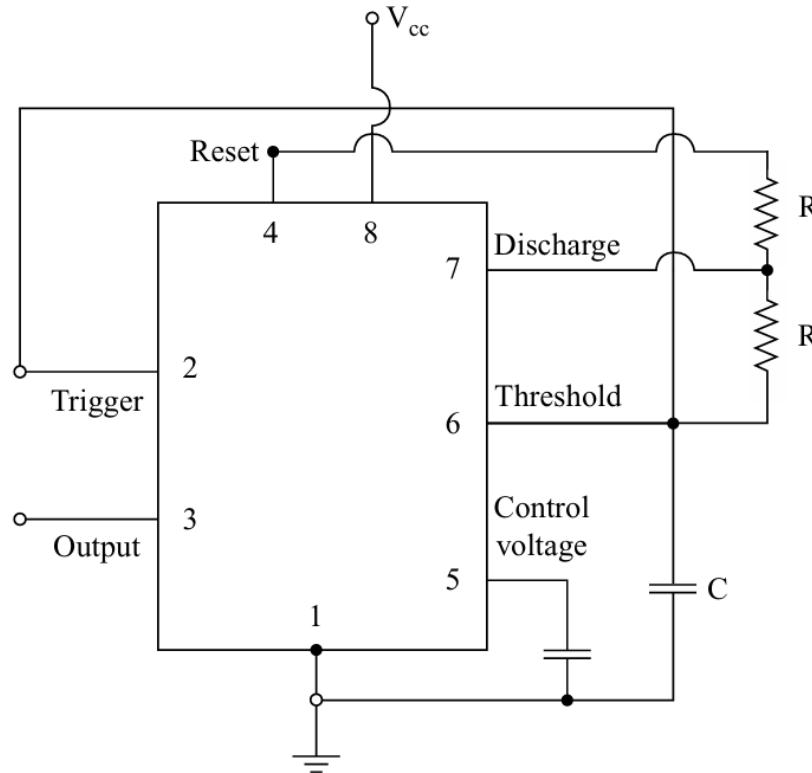


When the capacitor discharges to $+\frac{1}{3}V_{cc}$, the trigger comparator sets the flip-flop.

The output becomes high, and the internal discharge transistor turns off.

Thus, the capacitor starts charging through the resistors R and R_1 .

ASTABLE APPLICATION OF IC 555:



When the capacitor voltage reaches $+\frac{2}{3}V_{cc}$, the threshold comparator resets the flip-flop.

The output will become low, and the internal discharge transistor turns on.

The capacitor starts discharging again.

Therefore, the output will alternate between two states, i.e., high and low automatically and continuously without any trigger pulse.

Thank You