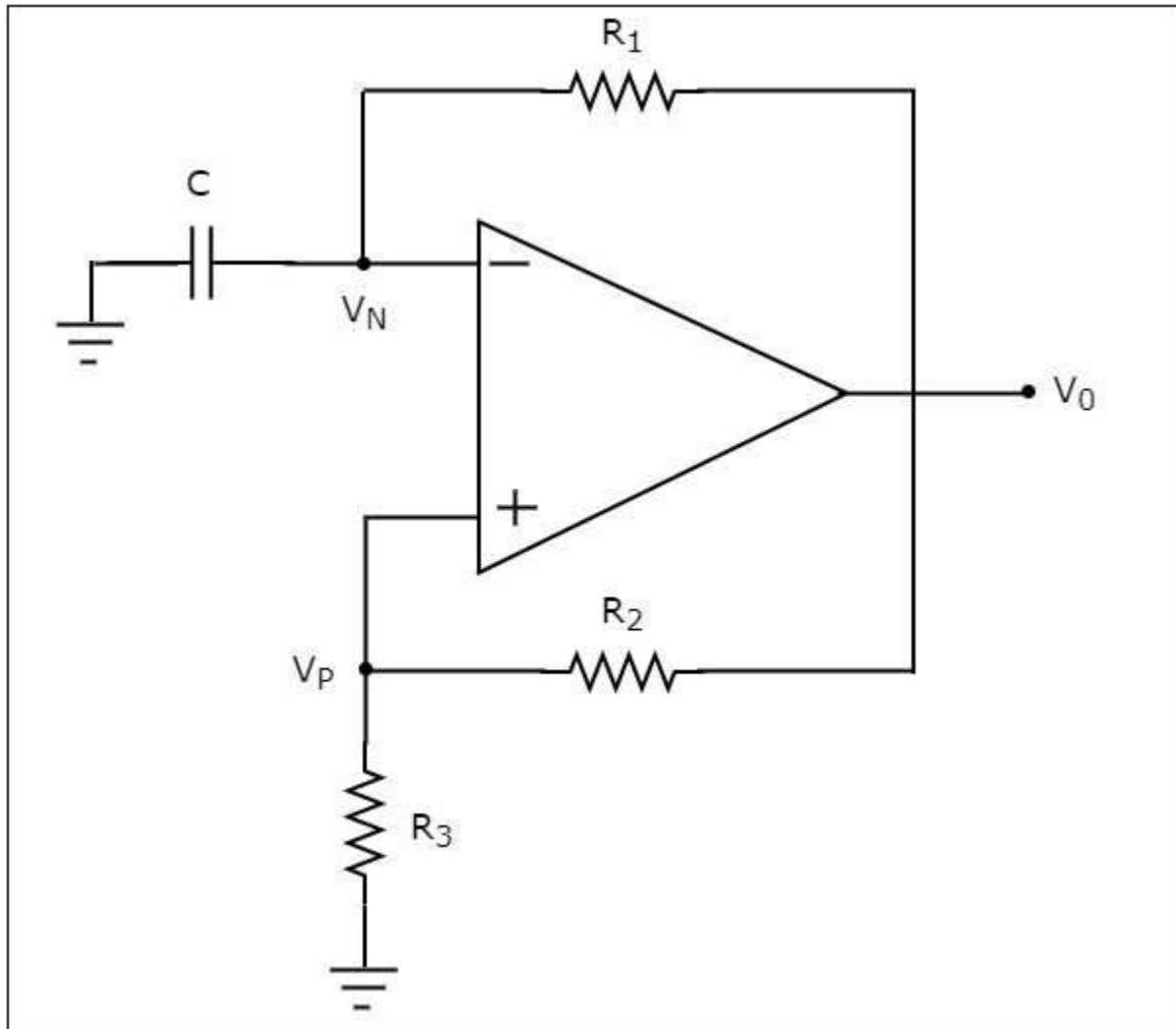# Square Wave Generator

A **square wave generator** is an electronic circuit which generates square wave. This section discusses about op-amp based square wave generators.

The **circuit diagram** of a op-amp based square wave generator is shown in the following figure

Observe that in the circuit diagram shown above, the resistor R1is connected between the inverting input terminal of the op-amp and its output of op-amp. So, the resistor R1R1 is used in the **negative feedback**. Similarly, the resistor R2 is connected between the noninverting input terminal of the op-amp and its output. So, the resistor R2R2 is used in the **positive feedback** path.

A capacitor C is connected between the inverting input terminal of the op-amp and ground. So, the **voltage across capacitor C** will be the input voltage at this inverting terminal of op-amp. Similarly, a resistor R3 is connected between the non-inverting input terminal of the op-amp and ground. So, the **voltage across resistor** R3R3 will be the input voltage at this non-inverting terminal of the op-amp.

The **operation** of a square wave generator is explained below −

- Assume, there is **no charge** stored in the capacitor initially. Then, the voltage present at the inverting terminal of the op-amp is zero volts. But, there is some offset voltage at non-inverting terminal of op-amp. Due to this, the value present at the output of above circuit will be +Vsat+
- Now, the capacitor C starts **charging** through a resistor R1. The value present at the output of the above circuit will change to –Vsat when the voltage across the capacitor C reaches just greater than the voltage (positive value) across resistor R3
- The capacitor C starts **discharging** through a resistor R1, when the output of above circuit is −Vsat The value present at the output of above circuit will change to +Vsat,when the voltage across capacitor C reaches just less than (more negative) the voltage (negative value) across resistor R3R3.

Thus, the circuit shown in the above diagram will produce a **square wave** at the output as shown in the following figure −

Output Signal
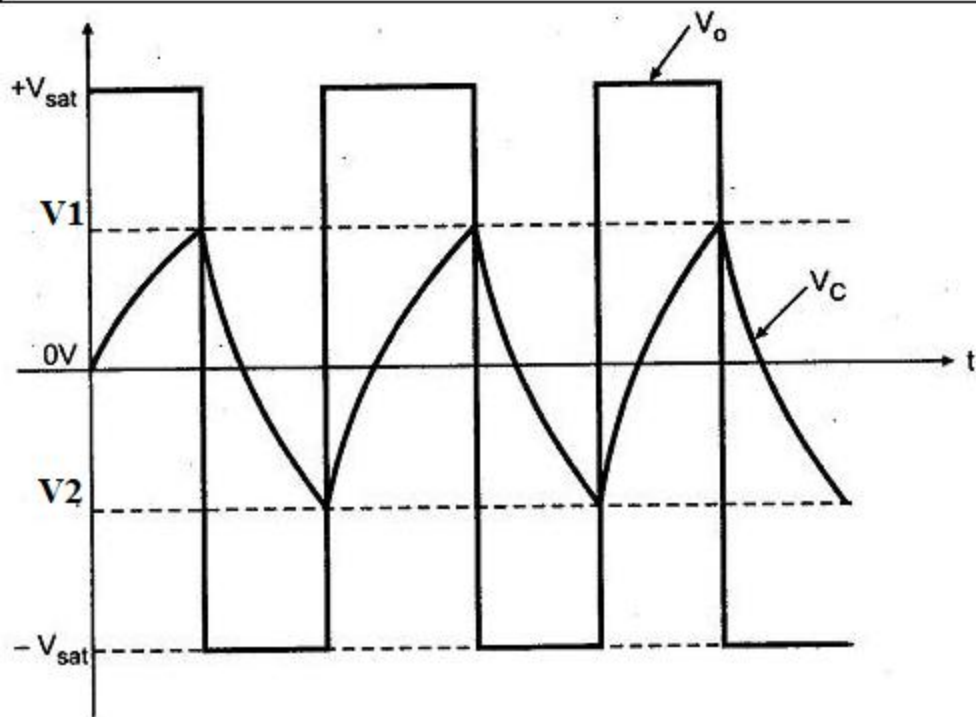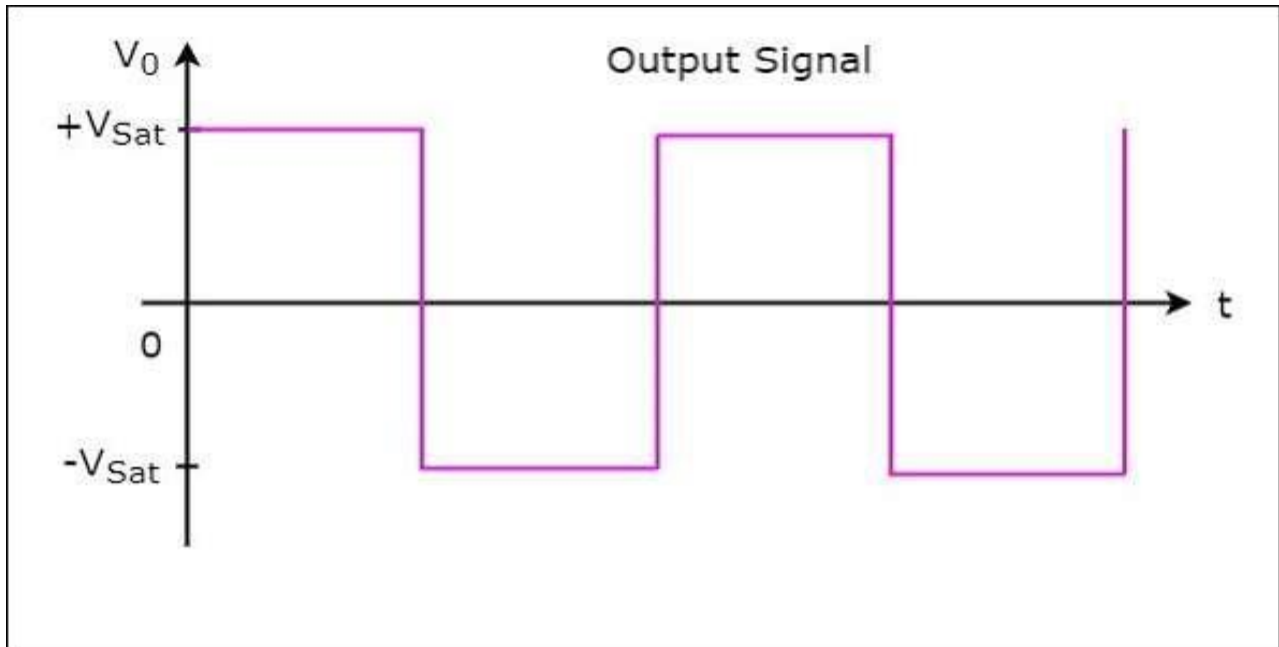
Waveforms

From the above figure we can observe that the output of square wave generator will have one of the two values: +Vsat and −Vsat. So, the output remains at one value for some duration and then transitions to another value and remains there for some duration. In this way, it continues.