Basic Astable 555 Oscillator Circuit.

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ABSTRACT

In this paper, I am going to Design and Implement a Basic Astable 555 Oscillator Circuit. it's an electronic circuit which is used to implement a variety of simple two-state devices such as relaxation oscillators, timers, and flip-flop. It has various applications such as wave generator, Voltage-frequency converter, pulse synchronization etc.

1. REFERENCE CIRCUIT DETAILS

In circuit diagram of 555 oscillator, in order to re trigger itself on every cycle the pin 2 and pin 6 are connected together allowing the circuit to operate as free running oscillator.

During each cycle the capacitor charges up through R1 and R2 which are timing resistors. But the circuit discharges itself only through R2 as the resistor is connected to discharge terminal (pin7)

After this the Capacitor charges up to 2/3Vcc which is determined by the 0.693(R1+R2)C combination & discharges itself down to 1/3Vcc determined by the 0.693(R2×C),which results in and output waveform whose output On & Off time periods are determined by the capacitors and resistors combination & the voltage level is approx. equal to Vcc-1.5V.

When it is connected as astable multivibrator, output from the oscillator will indefinitely charge and discharge between 2/3Vcc & 1/3Vcc until supply is removed.

Due to this condition, the frequencies are independent on supply voltages.

The duration of one full timing cycle is equal to the sum if two individual times.

555 Oscillator Cycle time

With the help of the eq we can find the output frequency of oscillations.

555 Oscillator Frequency equation

The Duty cycle is also known as Mark to Space, ratio of the output waveform can be accurately set and is given as the ratio of resistor R2 to resistor R1.

555 Oscillator Duty Cycle

It has no units but as it's a ratio it can be expressed in %

If R1 &R2 are equal then duty cycle is 2:1, which means 66% On time and 33% off time w.r.t period.

2. REFERENCE CIRCUIT

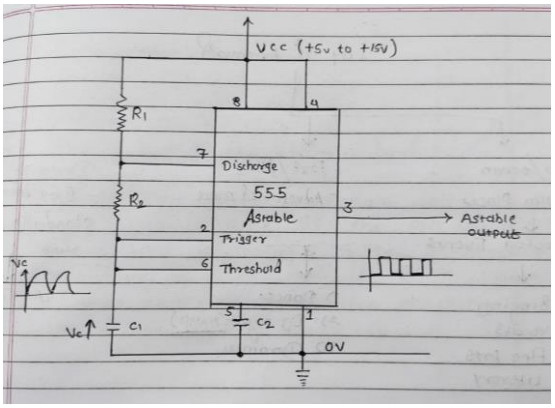

Fig.1 Reference circuit diagram.

3. REFERENCE CIRCUIT WAVEFORM

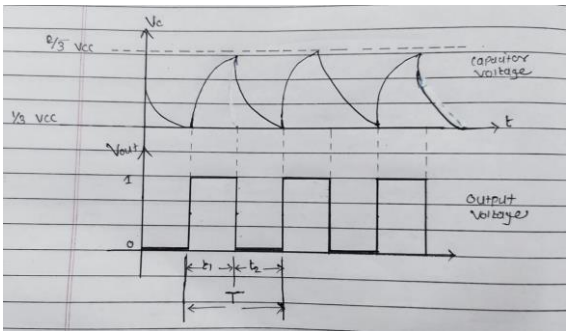

Fig.2 Reference waveforms.

4. REFERENCE

1) Multivibrator in IEEE Std. 100 Dictionary of Standards Terms 7th ed., IEEE Press, 2000 ISBN 0-7381-2601-2 page 718
2) https://www.electronics-tutorials.ws/waveforms/555_oscillator.html