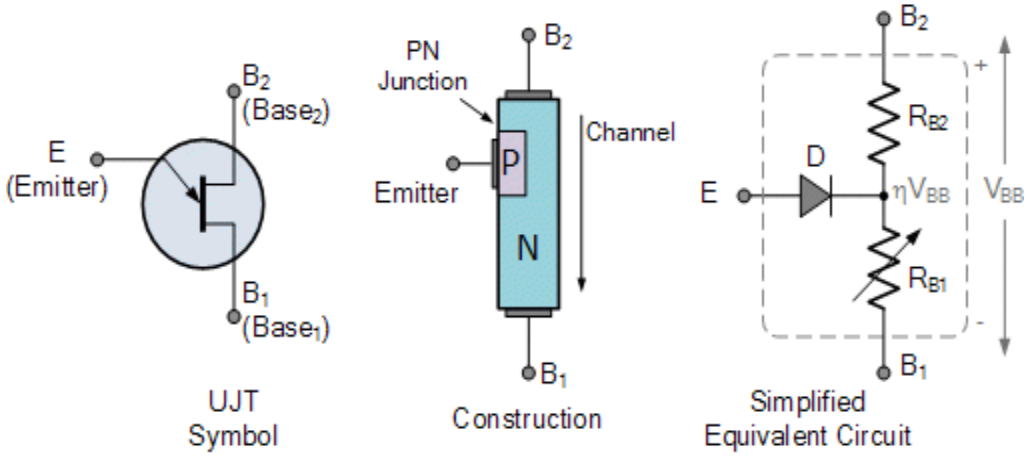
OVERVIEW OF UJT:

An UJT is formed from a P-type and the N-type material to create a single junction. These transistors doesn't suit for amplification techniques. This can be utilized during the switching of the devices to ON/OFF.

If the channel in this transistor is formed of N-type semiconductor that is low in doping concentration, the P-type is infused on it. This p-type is of high in doping concentration.

WORKING PRINCIPLE OF UJT:

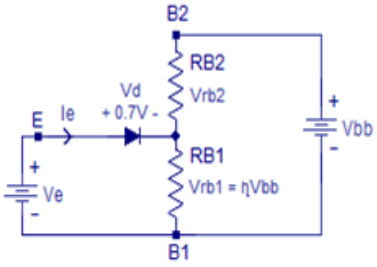
The basic functionality of the UJT depends on the value of the voltage applied. If the voltage applied in between the terminals of the emitter and the base1 are supposed to be zero this UJT doesn't conduct. Hence the N-Type material tends to acts as a resistor. As the applied voltage tends to increase at the terminal of emitter the value of resistance tends to increase and the device begin to conduct. In the whole process the conduction is completely dependent on the majority of the charge carriers. This is the basic principle involved in UJT.



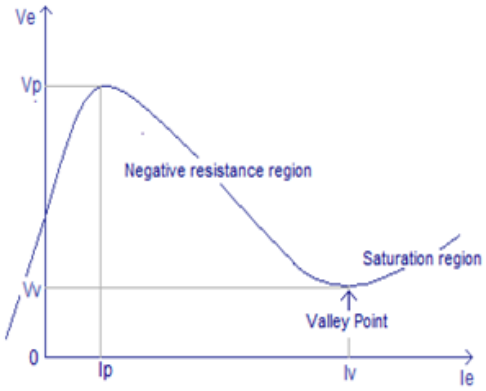
UJT Characteristics:

The characteristics of the UJT are as follows:

1. It requires very low amounts of the voltage to get triggered.
2. It is capable of controlling the current pulse.
3. It consists of the negative value of the resistance.
4. The cost of this transistor is very low.



typical UJT circuit

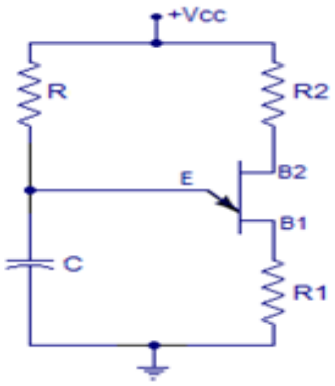


UJT characteristics

As the current in the UJT tends to increase there can be evident drop in voltage value. Hence this transistor shows the negative characteristics of resistance. This paves the way to make the UJT to work as a relaxation oscillator.

UJT RELAXATION OSCILLATOR:

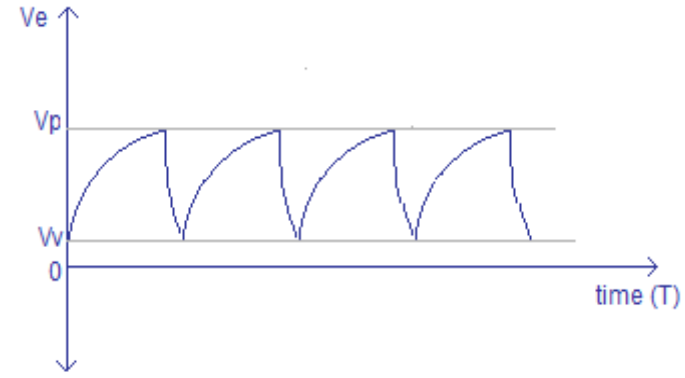
UJT is a transistor with one junction. This possesses the resistance with negative characteristics. This makes the UJT to function as an oscillator. This is an oscillator with the basic resistor and capacitor. As it is good at switching and it takes minimum value of the nano seconds for switching the devices.



UJT relaxation oscillator

The circuit diagram of a UJT relaxation oscillator is given shown above. R1 and R2 are current limiting resistors. Resistor R and capacitor C determines the frequency of the oscillator. The frequency of the UJT relaxation oscillator can be expressed by the equation $F = 1/ (RC \ln(1/(1-\eta))$ where η is the intrinsic standoff ratio and *ln* stand for natural logarithm.

When power supply is switched ON the capacitor C starts charging through resistor R. The capacitor keeps on charging until the voltage across it becomes equal to 0.7V plus ηVbb. This voltage is the peak voltage point "Vp" denoted in the characteristics curve. After this point the emitter to RB1 resistance drops drastically and the capacitors starts discharging through this path. When the capacitor is discharged to the valley point voltage "Vv", the emitter to RB1 resistance climbs again and the capacitor starts charging. This cycle is repeated and results in a sort of sawtooth waveform across the capacitor. The saw tooth waveform across the capacitor of a typical UJT relaxation oscillator is shown in the figure below.



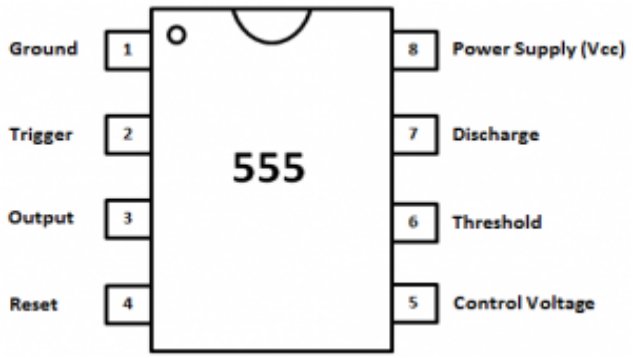
Wave form across the capacitor in a UJT relaxation oscillator

555 Timer IC:

The IC 555 timer is a one type of chip used in different applications like an oscillator, pulse generation, timer. The designing of IC 555 timers can be done by using various electrical and electronic components like transistors, resistors, diodes and a flip flop. The operating range of this IC ranges from 4.5V -15V DC supply. The functional parts of the 555 timer IC include flip-flop, voltage divider and a comparator. The main function of this IC is to generate an accurate timing pulse. In the monostable mode, the delay of this IC is controlled by the external components like a resistor and capacitor. In the astable mode, both the duty cycle & frequency are controlled by two external resistors and one capacitor.

555 Timer IC Pin Configurations

The 555 timer IC consist of 8-pins where each pin has some function. The pin configuration of this IC is shown below.



Pin Configuration of 555 Timer IC

GND Pin

Pin-1 is a GND pin which is used to supply a zero voltage to the IC.

Trigger Pin

Pin-2 is a trigger pin which is used to convert the FF from set to RST (reset). The output of the timer depends on the amplitude of the external trigger pulse that is applied to the trigger pin.

Output Pin

Pin-3 is an output pin.

Reset Pin

Pin-4 is a RST pin. When the negative pulse is applied to this pin to disable or reset, and false triggering can be neglected by connecting to VCC.

Control Voltage Pin

Pin-5 is the control voltage pin used to control the pulse width of the output waveform and also the levels of threshold and trigger. When an external voltage is applied to this pin, then the output waveform will be modulated

Threshold Pin

Pin-6 is the threshold pin, when the voltage is applied to threshold pin, then it contrasts with a reference voltage. The set state of the FF can be depends on the amplitude of this pin.

Discharge Pin

Pin-7 is the discharge pin, when the output of the open collector discharges a capacitor between the intervals, then it toggles the output from high to low.

Supply Terminal

Pin-8 is the voltage supply pin which is used to supply the voltage to the IC with respect to the ground terminal.

Applications of 555 Timer:

It include timers, missing pulse detection, bounce-free switches, touch switches, frequency divider, capacitance measurement, pulse-width modulation (PWM)