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Department of Biomedical Engineering

Course Name: 23BMB101-Electron Devices and Circuits

I Year : II Semester

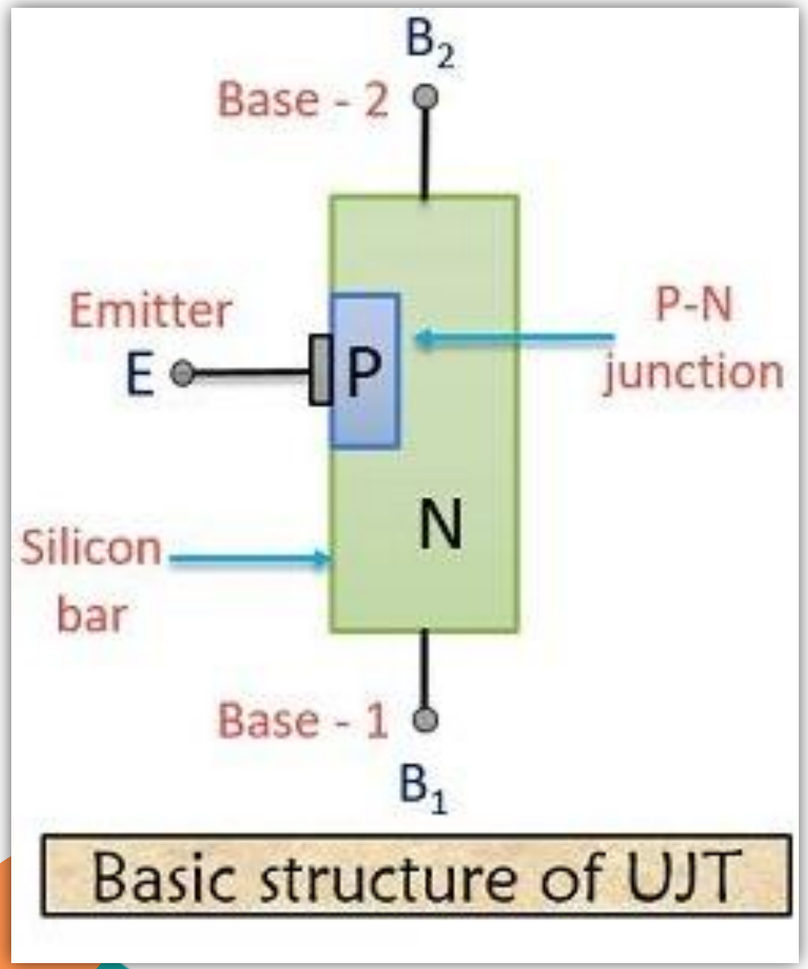
Unit II –Transistors

Topic : Unijunction Transistors

INTRODUCTION

- Unijunction Transistor is a semiconductor switching device having 2 layers and 3 terminals and is abbreviated as UJT.
- It is called so because of the presence of only one junction.
- It has the ability to limit large power with a small input signal and is also known as a double base diode.
- UJT is a device that possesses negative resistance characteristic that means its emitter current rises regeneratively when triggered[2]. Thus an emitter supply is needed in order to restrict it.

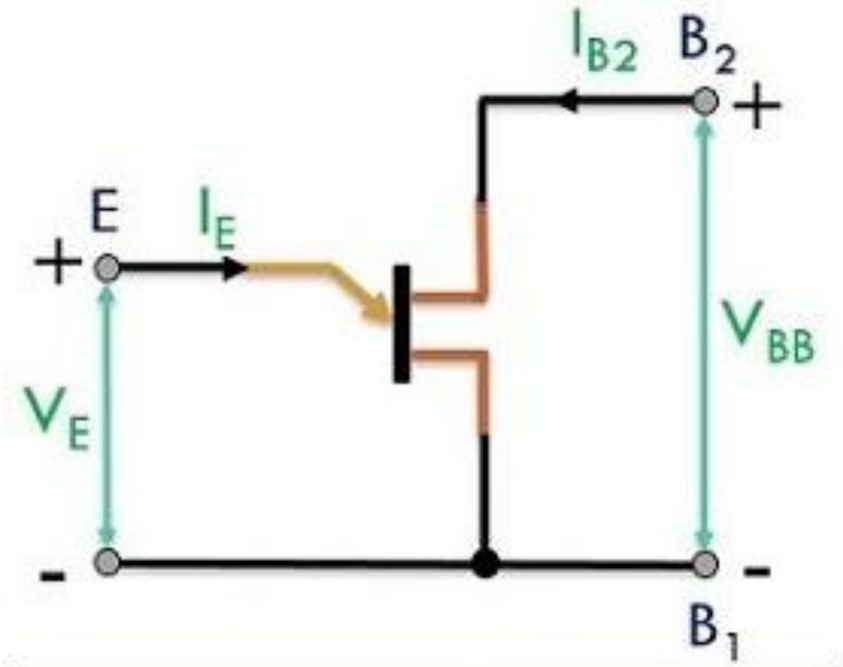
Constructionof Unijunction Transistors



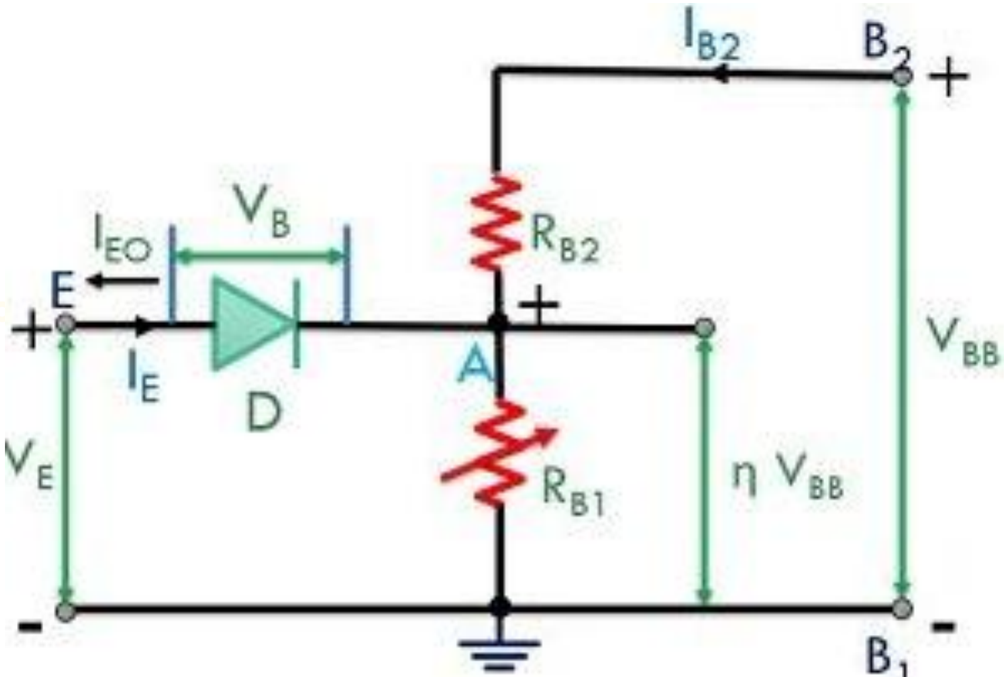
Basic structure of UJT

- Its structure is almost similar to an N-channel JFET. UJT consists of a lightly doped N-type silicon bar in which a P-type material is diffused thus producing PN junction.
- Due to the existence of a single PN junction, it is termed as a Unijunction device.
- It consists of two ohmic contacts at the end of the bar which is labelled as base 1 (B1) and base 2 (B2).
- Emitter region is closer to B2 in order to have the optimum electrical characteristic.

Basic arrangement of a UJT



Basic UJT arrangement



Equivalent circuit of UJT

Working of a UJT

- The two resistor of the circuit together constitutes the total resistance which is the resistance between B2 and B1 where the emitter is kept open is known as **Interbase resistance R_{BB}.**

$$R_{BB} = R_{B1} + R_{B2}$$

- Normally the value of RB1 is greater than that of RB2.

$$V_A = V_{BB} \times \frac{R_{B1}}{R_{B1} + R_{B2}}$$

$$V_A = \eta V_{BB}, \qquad \textit{where } \eta \textit{ is the intrinsic standoff ratio}$$

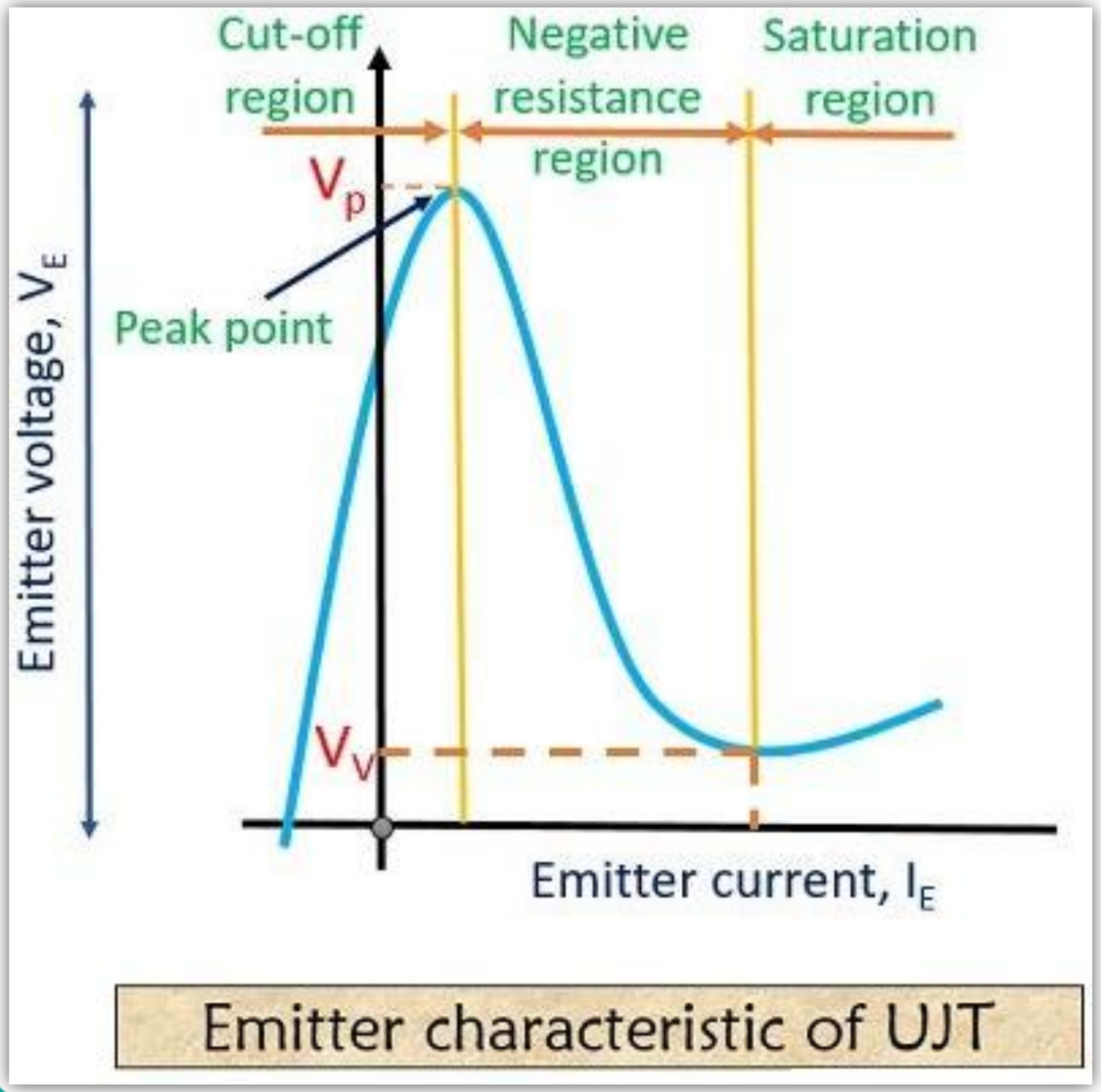
Working of a UJT

- Consider a condition when there is no emitter potential supplied to the circuit. In such a case the diode gets reverse biased.

$$V_A + V_B = \eta V_{BB} + V_B$$

- On proceeding further, if the emitter potential is increased more, the diode will now get forward biased. The emitter potential that puts the diode in forward biased condition is known as **peak point voltage** and is denoted by Vp.
- The minimum value of IE to trigger the device is known as **peak point current** of the emitter terminal denoted by Ip.

Characteristics of Unijunction transistor



Emitter characteristic of UJT