5.3 DIODE AC SWITCH (DIAC)

Diac is a device which has two electrodes. It is a member of the thyristor family. It is mainly used in triggering of thyristor. The advantage of using this device is that it can be turned on or off simply by reducing the voltage level below its avalanche breakdown voltage. Also, it can be either turned on or off for both the polarity of voltages. This device works when avalanche breakdown occurs.

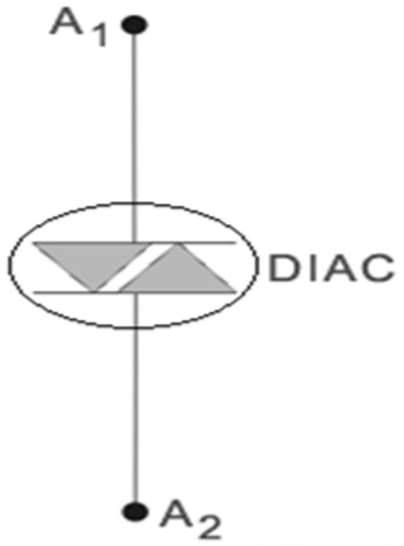

Fig:5.3.1 DIAC Symbol

The figure shows a symbol of diac which resembles the connection of two diodes in series. Also it can be called as a transistor without base.

Construction of Diac

It is a device which consists of four layers and two terminals. The construction is almost same as that of the transistor. But there are certain points which deviate from the construction from the transistor. The differentiating points are-

1. There is no base terminal in the diac.
2. The three regions have almost the same level of doping.
3. It gives symmetrical switching characteristics for either polarity of voltages.

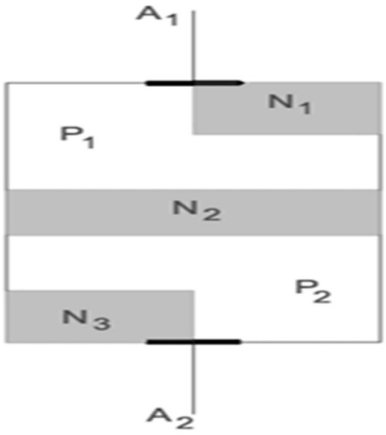

Fig:5.3.2 Construction of DIAC

Operation of Diac

From the figure, we see that it has two p-type material and three n-type materials. Also it does not have any gate terminal in it. The diac can be turned on for both the polarity of voltages. When A2 is more positive with respect to A1 then the current does not flows through the corresponding N-layer but flows from P2-N2-P1-N1. When A1 is more positive A2 then the current flows through P1-N2-P2-N3. The construction resembles the diode connected in series.

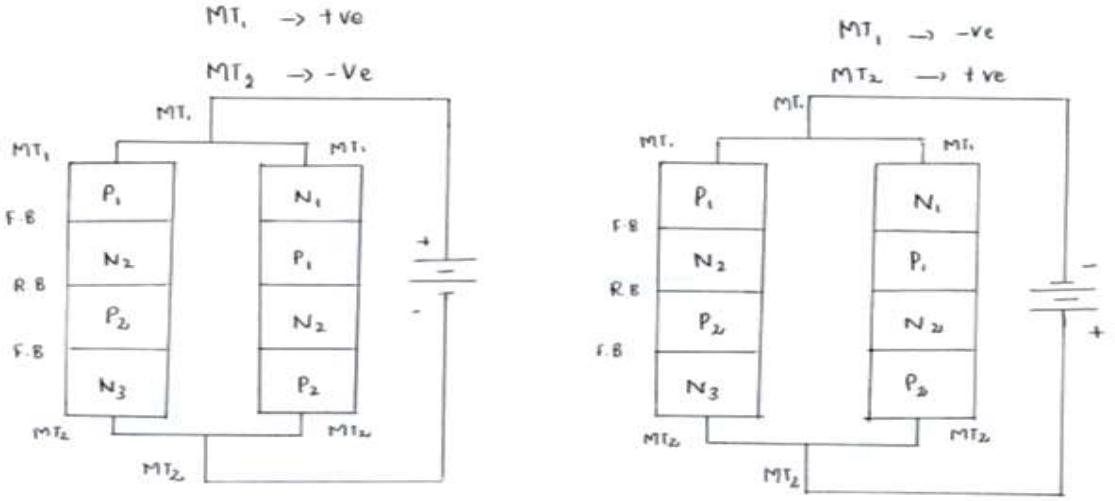

Fig:5.3.3 Biasing of DIAC

When applied voltage is small in either polarity, a very small current flows which is known as leakage current because of drift of electrons and holes in the depletion region. Although a small current flows, but it is not sufficient enough to produce avalanche breakdown so the device remains in the non conducting state. When the applied voltage

in either polarity exceeds the breakdown voltage, diac current rises and the device conducts in accordance with its V-I characteristics.

The V-I characteristics resembles the english word Z. The diac acts as open circuit when the voltage is less than its avalanche breakdown voltage. When the device has to be turned off, the voltage must be reduced below its avalanche breakdown voltage.

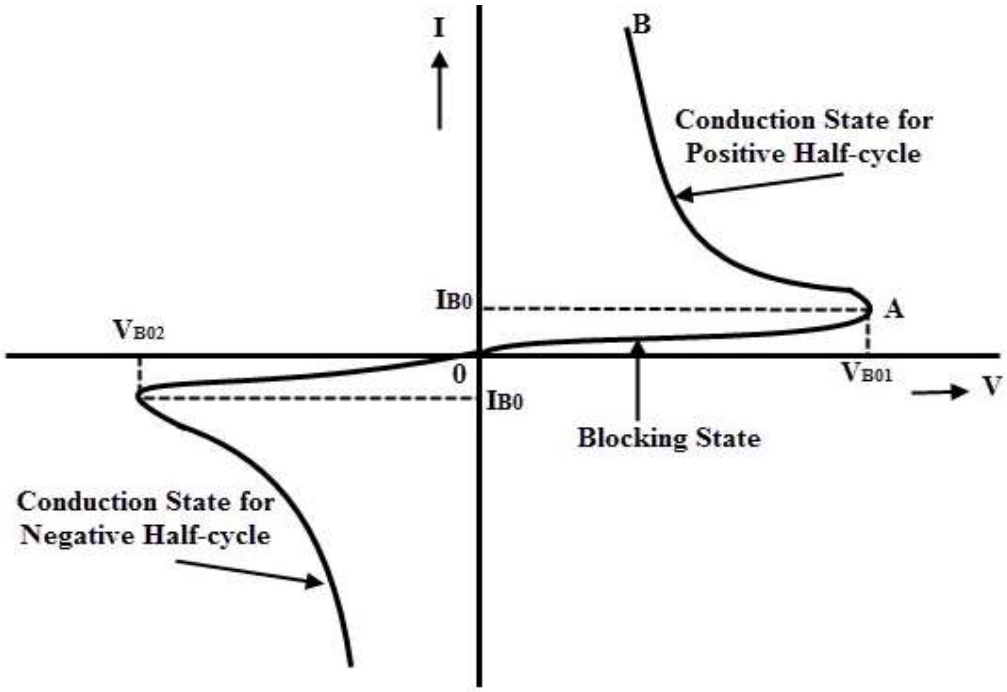

Fig:5.3.4 V-I Characteristics of DIAC

Application of Diac

It can be used mainly in the triac triggering circuit. The diac is connected in the gate terminal of the triac. When the voltage across the gate decreases below a predetermined value, the gate voltage will be zero and hence the triac will be turned off. The main applications are-

1. It can be used in the lamp dimmer circuit.
2. It is used in the heat control circuit.
3. It is used in the speed control of a universal motor.