STUDY ON ZENER DIODE

In a general purpose PN diode the doping is light; as a result of this the breakdown voltage is h igh. If a P and N region are heavily doped then the breakdown voltage can be reduced.

When the doping is heavy even the reverse voltage is low, the electric field at barrier will be so strong thus the electrons in the covalent bands can break away from the bonds. This effect is known as zener effect.

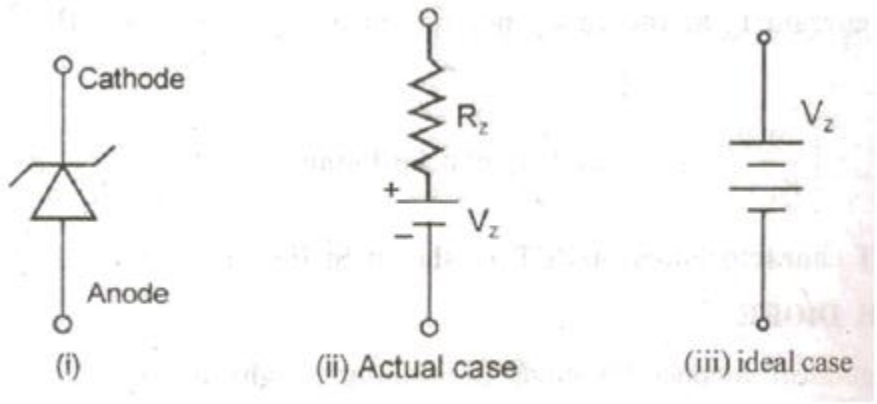
A diode which exhibits the zener effect is called a zener diode. Hence it is defined as a reverse biased heavily doped PN junction diode which operates in breakdown region. The zener diodes have been designed to operate at voltages ranging from a few volts to several hundred volts.

Zener breakdown occurs in junctions which is heavily doped and have narrow depletion layers. The breakdown voltage sets up a very strong electric field. This field is strong enough to break or rupture the covalent bonds thereby generating electron hole pairs.

Even a small reverse voltage is capable of producing large number of current carrier, When a zener diode is operated in the breakdown region care must be taken to see that the power dissipation across the junction is within the power rating of the diode otherwise heavy current flowing through the diode may destroy it.

Equivalent Circuit of Zener diode

The schematic symbol and its equivalent circuit are shown in figure 14. It is similar to that of normal diode except the line representing cathode is bent both ends are shown in figure 14.



V-I Characteristics of zenerdiode

The forward characteristic of a zener diode is similar to that of a P N Junction diode. The reverse characteristic of zener diode is obtained as follows.

The reverse current that is present at the origin and the knee of the curve is due to the reverse leakage current due to the minority carriers. This current is specified by stating its value at 80% of the zener voltage Vz

As the reverse voltage is gradually increased, the breakdown occurs at the knee and the current increases rapidly. To control this current a suitable external resistance has to be used. The maximum permissible value of the current is denoted by Izmax. The minimum usable current is Izmin

The voltage across the terminals of the diode for a current Iz which is the approximate midpoint of the linear range of the reverse characteristics in called the zener voltage Vz. At the knee point, the breakdown voltage remains constant between Izmax and Izmin. This ability of a diode is called regulating ability and is an important feature of a zenerdiode.

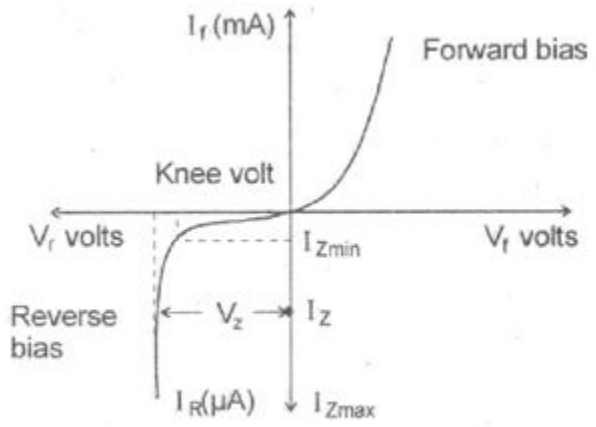


Figure 15 VI Characteristics of Zener diode

Application of Zener Diode

It can be used

a) As voltage regulators

b) As peak clippers

c) For reshaping waveforms

d) For meter protection against damage from accidental application of excessive voltage

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