ZENER & LIGHT EMITTING DIODES

The zener diode is diode which is similar to PN junction diode with high doping concentration. There are two breaking machanatisam named as

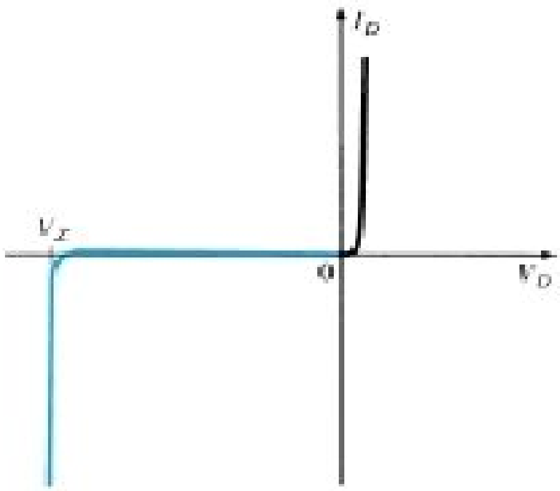
1. Avalanche braking mechanism
2. Zener braking mechanism

Avalanche braking mechanism

This junction breaking mechanism is due avalanche multiplication of majority carriers. Whenever a sufficient energy is applied to diode some of covalent bonds braking these electrons will strikes the one more atom results multiple electrons.

Zener braking mechanism

The char-acteristic drops in an almost vertical manner at a reverse-bias potential denoted *VZ.* The fact that the curve drops down and away from the horizontal axis rather than up and away for the positive *VD* region reveals that the current in the Zener region has a direction opposite to that of a forward-biased diode.



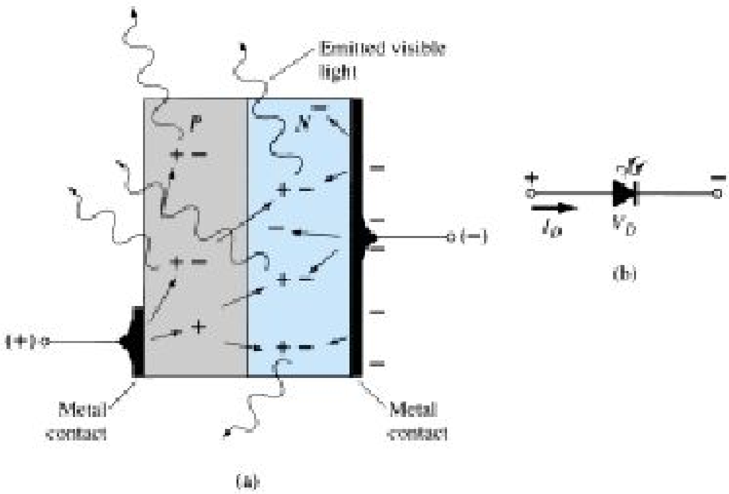
This region of unique characteristics is employed in the design of *Zener diodes*,which have the graphic symbol appearing in Fig. 1.48a. Both the semiconductor diode and zener diode are presented side by side in Fig. 1.48 to ensure that the direction of conduction of each is clearly understood together with the required polarity of the applied voltage. For the semiconductor diode the "on" state will support a current in the direction of the arrow in the symbol. For the Zener diode the direction of conduction is opposite to that of the arrow in the symbol as pointed out in the introduction to this section.

LIGHT-EMITTING DIODES

The increasing use of digital displays in calculators, watches, and all forms of in- strumentation has contributed to the current extensive interest in structures that will emit light when properly biased. The two types in common use today to perform this function are the ***light-emitting diode*** (LED) and the ***liquid-crystal display*** (LCD).

Since the LED falls within the family of ***p-n*** junction devices and will appear in some of As the name implies, the light-emitting diode (LED) is a diode that will give off visible light when it is energized. In any forward-biased ***p-n*** junction there is, within the structure and primarily close to the junction, a recombination of holes and electrons. This recombination requires that the energy possessed by the unbound free electron be transferred to another state. In all semiconductor ***p-n*** junctions some of this energy will be given off as heat and some in the form of photons. In silicon and germanium the greater percentage is given up in the form of heat and the emitted light is insignificant. In other materials, such as gallium arsenide phosphide (GaAsP) or gallium phosphide (GaP), the number of photons of light energy emitted is sufficient to create a very visible light source.

The process of giving off light by applying an electrical source of energy is called electroluminescence. As shown in Fig. 1.54 with its graphic symbol, the conducting surface connected to the ***p***-material is much smaller, to permit the emergence of the maximum number of photons of light energy. Note in the figure that the recombination of the injected carriers due to the forward-biased junction results in emitted light at the site of recombination. There may, of course, be some absorption of the packages of photon energy in the structure itself, but a very large percentage are able to leave, as shown in the figure.


Emitted visible light
P
N
(+)
(−)
Metal contact
Metal contact
(a)
+
−
I_D
V_D
(b)