

Lecture-5

So finally we can say in forward bias condition, near the ohmic contact drift current will be a dominating current. But at the junction dominating current will be diffusion. All current electrons in forward condition at diode is represented in fig 2.7.

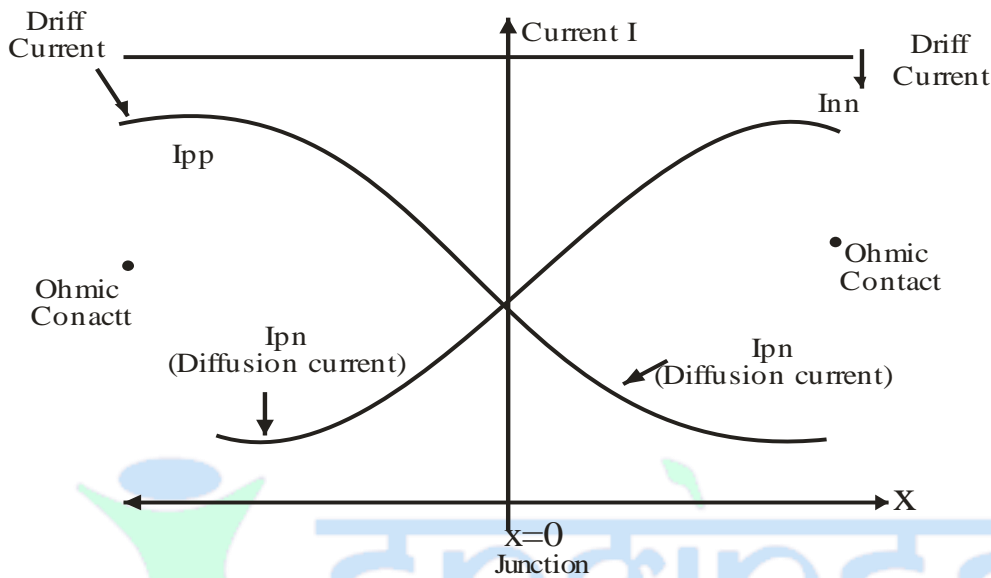


Fig 2.7

- I_{pp} \Rightarrow Drift current due to holes in P side
- I_{nn} \Rightarrow Drift current due to electrons in n-side
- I_{pn} \Rightarrow Diffusion current due to holes in n-side, injected from P-side
- I_{np} \Rightarrow Diffusion current due to electrons in p-side, injected from n-side
- I \Rightarrow Total Current

From fig (2.7) we can see at any point in the p-n junction diode the total current I is combination of some part of drift and some part of diffusion current. It can also be seen that the drift current is maximum at ohmic contact and decreasing towards junction. The domination current at the junction is diffusion current.

2.2.1 Reverse Bias Condition: Reverse bias condition diode means application of higher voltage to n-type semiconductor and lower voltage to p-type semiconductor. Due to reverse biasing holes available in p-side will be attracted towards ohmic contact or can say negative terminal of battery and all electrons available

towards positive terminal of battery. Hence the width of depletion region will be increased means barrier voltage at the junction will be increased. Means there will be no current from p to n-side (see fig.2.8) but if minority carries electrons are available in the p-side due to temperature will be drifted from p to n-side.

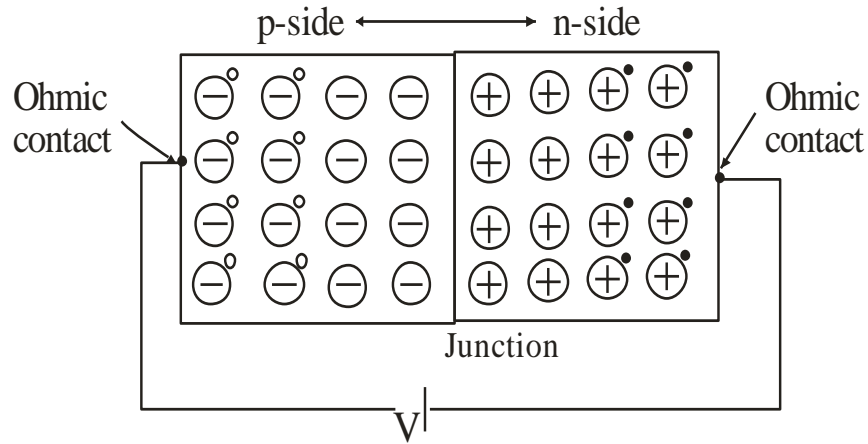


Fig. 2.8

Similarly if holes are available in n-side due to temperature will be drifted from n-to P side. It means there will be a drift current from n to P-side due to minority charge carriers.

Initially on increasing applied voltage this current will be increasing, but after some particular voltage this current will be constant means current will be saturated with respect to applied voltage. So this current will be called reverse saturation current.

This reverse saturation current can now be only changed by changing temperature.

Note: So finally in case of diode we can say in forward bias condition drift and diffusion both types of currents are possible, drift current is dominating at ohmic contact and diffusion current is dominating at p-n junction.

In reverse condition only drift current is possible from n to p but constant above some particular voltage. This current is due to minority carries