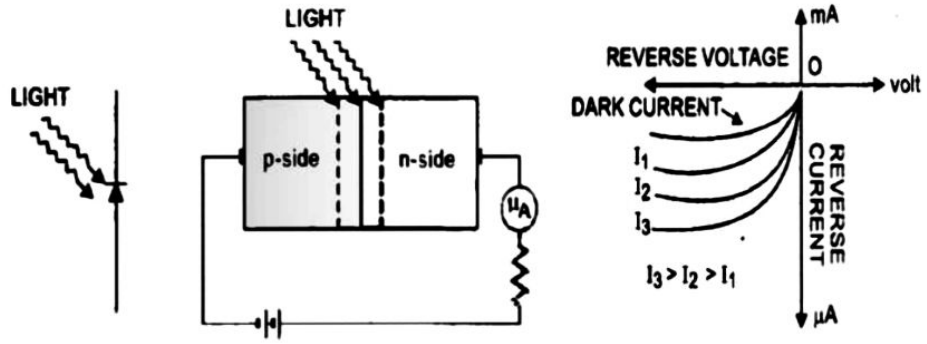
(ii) PHOTODIODE -

Photodiode is an optoelectronic device in which current carriers (electrons and holes) are generated by photons through photo excitation.

In photodiode a transparent window is made to allow the light of suitable frequency to fall on it. It is operated under reverse bias. The conductivity of p-n junction photodiode increases with the increase in intensity of light falling on it.



Working :-

When a light of energy greater than forbidden energy gap ($h\nu > E_g$) is incident on a reverse biased p-n junction photodiode, an additional electron hole pairs are created in the depletion layer. These charge carriers flow across the junction and generate a reverse current across the junction.

It is found that the reverse saturation current through the photodiode varies almost linearly with the light intensity.

When the photodiode is reverse biased, then a certain current exists in the circuit even when no light is incident on the p-n junction of photodiode. This current is called dark current.

Uses of Photodiodes -

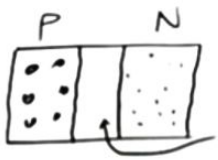
(i) In photodetection for optical signals.
(ii) In demodulation for optical signals.
(iii) In switching the light on and off.
(iv) In reading of computers, punched cards and tap

- Photodiodes are used in safety electronics such as fire and smoke detectors.
- Photodiodes are used in numerous medical applications. They are used in instruments that analyze samples, detectors for computed tomography and also used in blood gas monitors.
- Photodiodes are used in solar cell panels.
- Photodiodes are used in logic circuits.
- Photodiodes are used in the detection circuits.
- Photodiodes are used in character recognition circuits.
- Photodiodes are used for the exact measurement of the intensity of light in science and industry.
- Photodiodes are faster and more complex than normal PN junction diodes and hence are frequently used for lighting regulation and optical communication.

Tunnel Diode [Dec-'18 – 3marks]

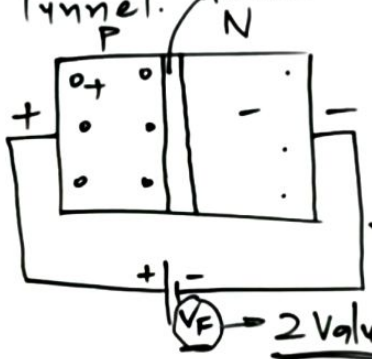
narrow passage

P & N semiconductors are connected to each other.



~ 10^3 more doping
~ 100 less width

— P and N type semiconductors are highly doped. So, that depletion layer becomes narrow. That narrow passage is called Tunnel. tunnel.



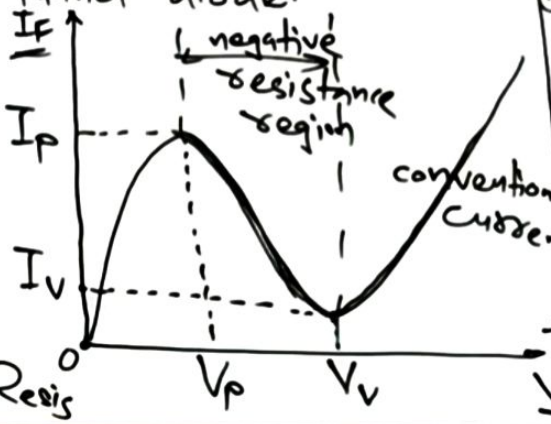
— when forward biasing is done then by appling a very less voltage, current can start to flow as depletion layer (tunnel) is small so that potential barrier is less.

→ "Such diode in which by appling small voltage, current can easily flow from tunnel (depletion layer) 2 Valve is called tunnel diode".

— "Such diode which shows the negative resistance between two values of forward potential is called tunnel diode"

— $V \propto I$ $V \uparrow I \uparrow$

$V \uparrow I \downarrow$ → negative Resis



Applications

- Clippers,
- clampers,
- Rectifiers
- Voltage multiplier
- Switch
- oscillator.

IN3712, IN3714, IN3128, etc.