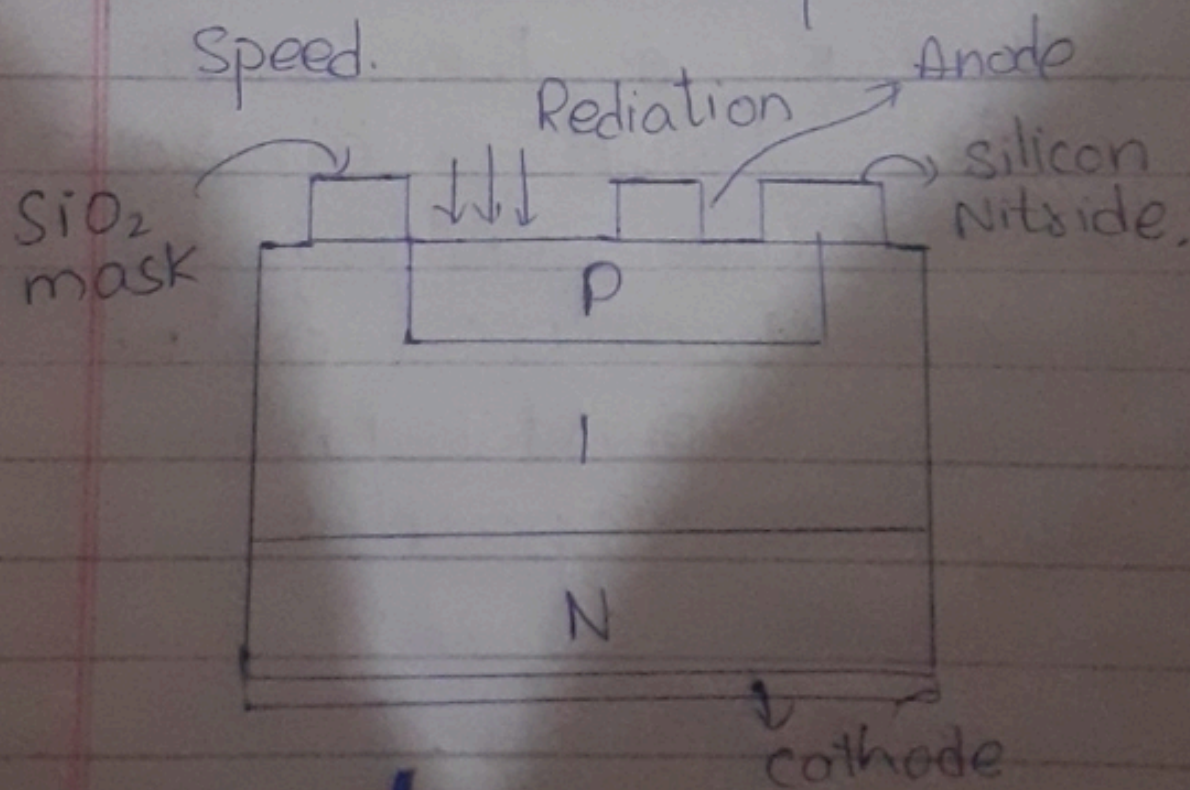


PIN Photodiode

“ PIN Photodiode is made of three layers or region namely are P-type, an intrinsic region and a N-type. ”

→ PIN Photodiode are Used to increase the response speed.



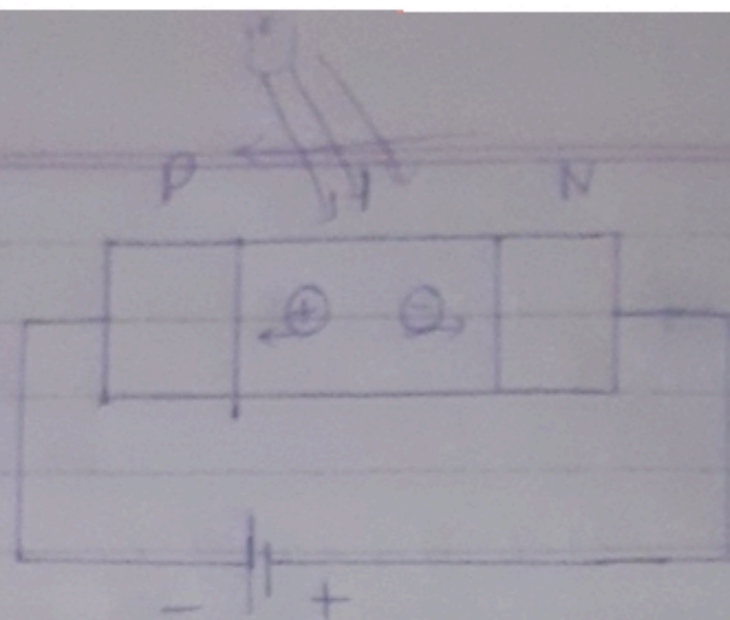
Construction:

↳ A PIN Photodiode is made up of three semiconductor material. The intrinsic semiconductor separated by two heavily doped P and n type semiconductor material. Top layer (P) of PIN photodiode is thickness is low around $1\text{ }\mu\text{m}$.

↳ The top face of the diode is protected by a layer of SiO_2 , in which there is a window for light to shine on the semiconductor.

↳ The window is coated with a thin anti reflective layer of silicon Nitride.

Working:

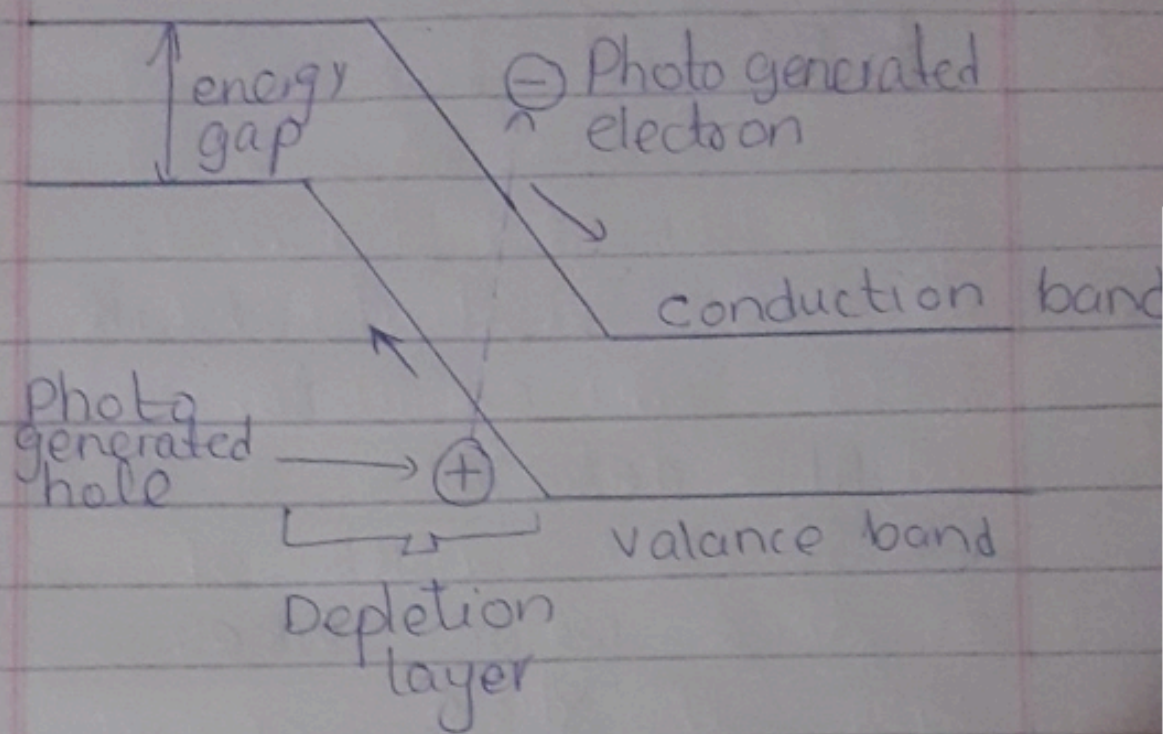


↳ when the reverse biased is applied to PIN diode the width of depletion region starts increasing in the intrinsic region

↳ In this point, the intrinsic layer is swept free of mobile charge carrier

↳ In this condition, there is no electron-hole recombination takes place within the depletion region as it is completely free of mobile charge carriers.

Energy band:-



Advantage:-

- PIN Photodiode have low noise.
- PIN Photodiode have low dark current means very low electric current.
- PIN Photodiode have large depletion region and low junction capacitance.

Avalanche Photodiode

→ Avalanche photodiode are high sensitivity, high speed semi-conductor "light" detector.

→ It is consist of a three region like PIN Photodiode

- ❖ P-region

- ❖ intrinsic region

- ❖ N-region

→ Avalanche photodiode operates under a high reverse biased condition (avalanche breakdown condition).

→ These are The current sensitivity is increase

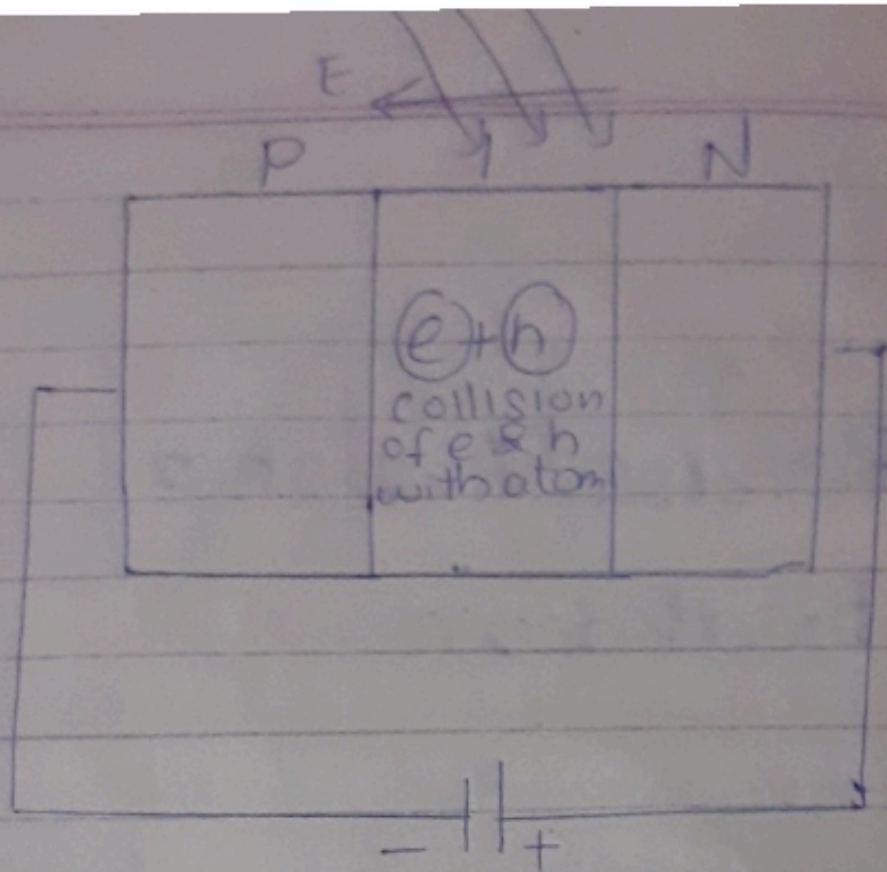
from 30 to 100 times
due to its avalanche
operation.

Reverse / Avalanche breakdown

→ Avalanche breakdown occurs when diode is connected with high reverse voltage.

→ The reverse biased voltage is increased the electric field across the depletion region

→ The velocity of a minority charge carrier crossing the depletion region increase due to generated E across the depletion region



→ These carriers collide with the atom of the crystal. Because of the violent collision, the charge carrier takes out the electrons from the atom.

Uses & Advantage

→ distance measurement

→ data transmission (over fiber or through free space)

→ Range finding

→ In various medical and Scientific instrument

Avalanche characteristics

