

Nalanda Open University

B.Sc Part-III

Course- Physics

Paper-VIII

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Topic- Photodiode (Electronics)

Photodiode: - The photodiode is a semiconductor P-N junction diode that is specially prepared to take advantage of its internal photo-electric properties. Figure 1(a) shows a grown germanium P - N junction diode. Here a parallel ray of light is focussed on the junction between the P and N region.

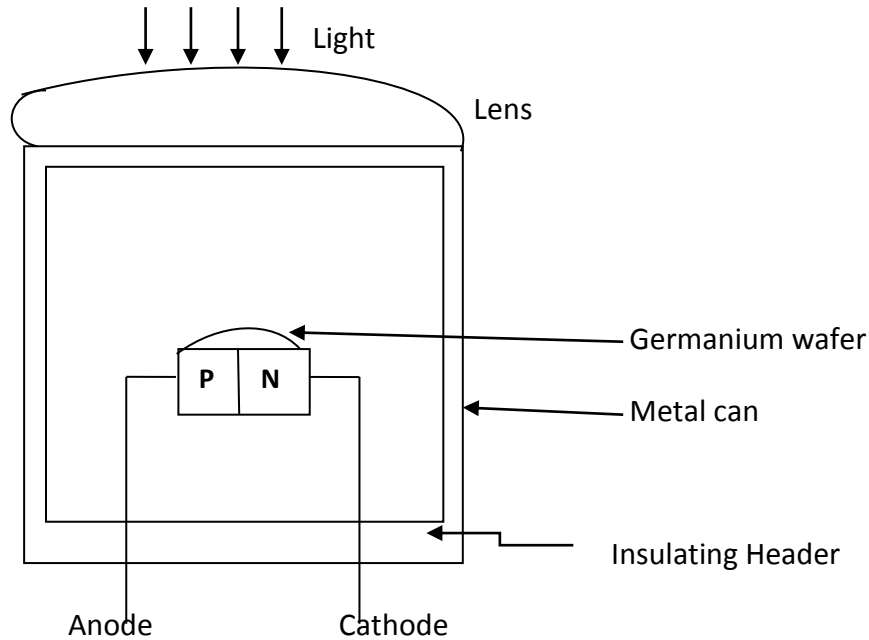


Figure. 1 (a) : (A junction type Photodiode)

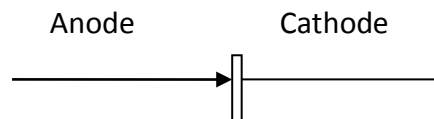


Figure. 1(b)

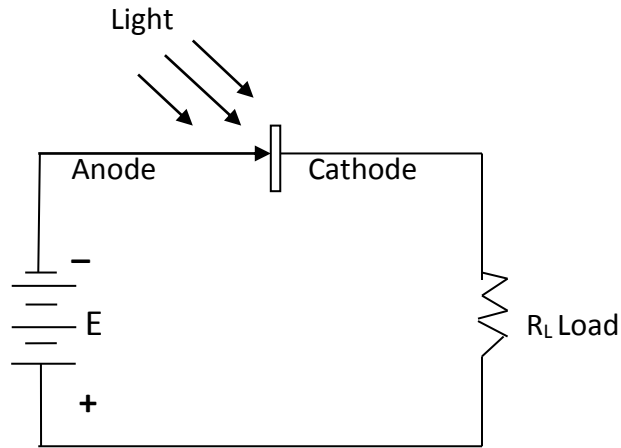


Figure.2 : (A basic Circuit of Photodiode)

To operate a photodiode, the battery voltage E is applied in series with R_L and diode is biased in the reverse direction as shown in figure-2. Without any radiation falling on the diode, it exhibits an extremely high resistance and a very small current of the order of a few micro - amperes flows in the circuit. This is the saturation current of reverse biased P-N – junction and is very sensitive to the variation of temperature. If the junction is illuminated by any radiation, an additional electron-hole pair will be created in the region depending on the intensity of radiation. With constant reverse voltage E , the reverse current increases proportionally with light intensity.

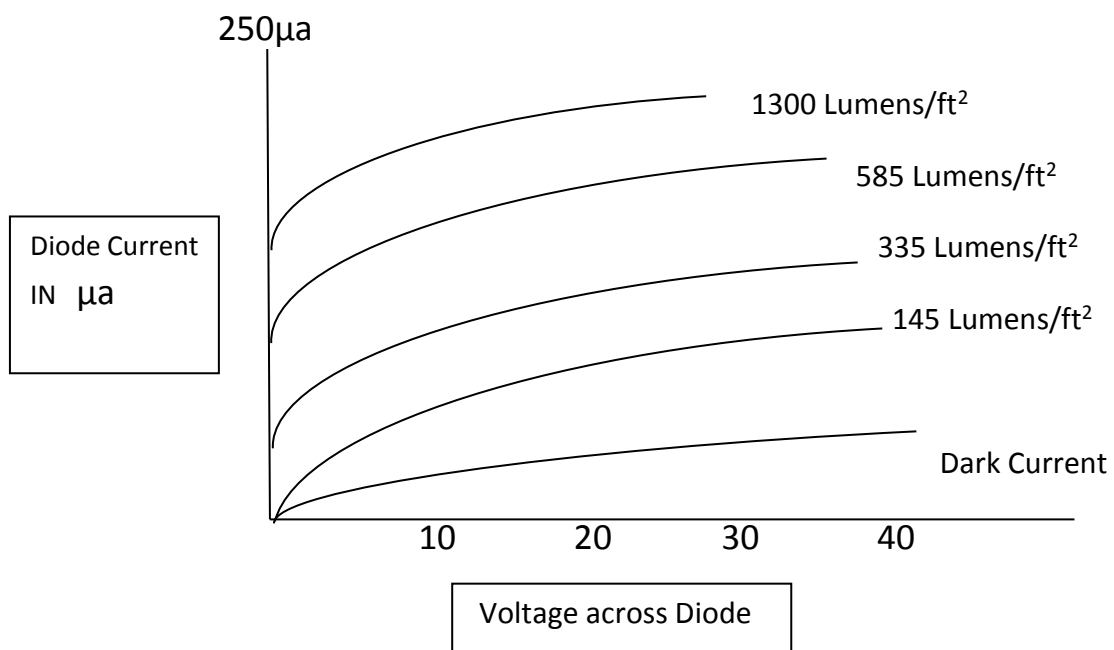


Figure. 3 : (The Volt - Ampere characteristics of a typical Photo – diode)

Figure - 3 shows the volt-ampere characteristics of a typical diode with different values of light intensity as a parameter.

When the junction of the photodiode is illuminated and the applied reverse voltage (Figure-3). E is reduced to zero, it is observed that a current flows in the circuit and a voltage develops across the terminal of the photodiode. The photodiode behaves as an energy generator that converts light energy into electrical energy. This is the principle on which the solar battery is based .