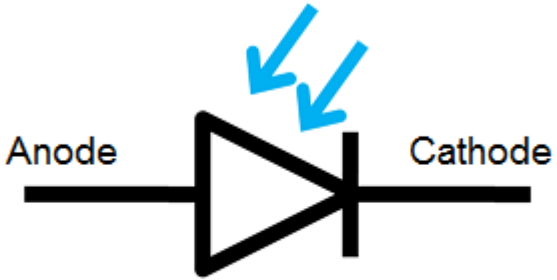
SUBJECT: BASIC ELECTRONICS

Photodiode: Introduction, Working, V-I Characteristics

Elementrix Classes

Photodiode

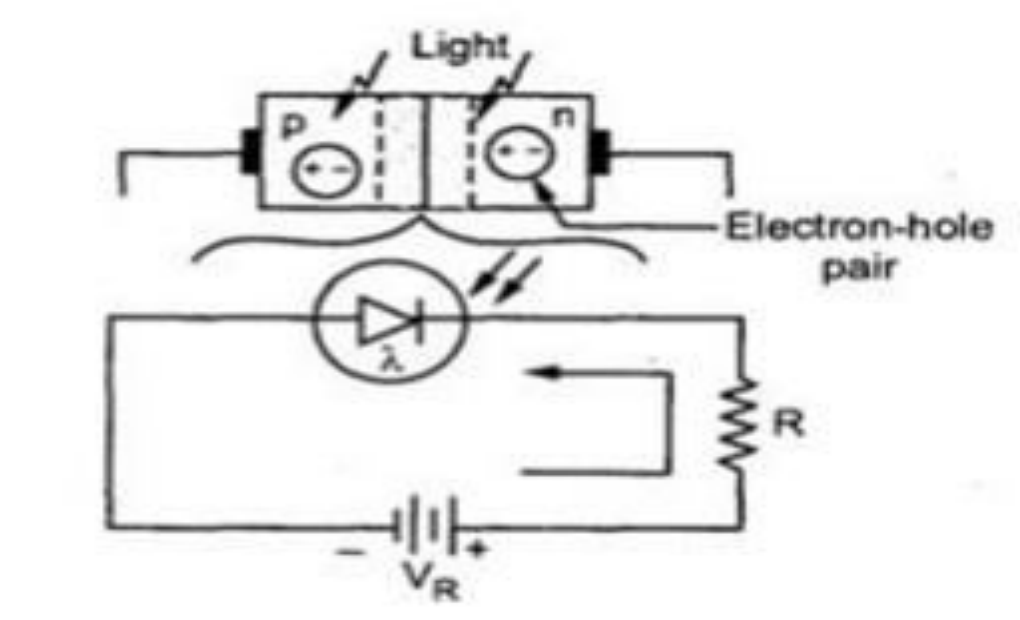
A photodiode is a semiconductor device which converts the light to electric energy when exposed to light. It is also sometimes referred as photo-detector, photo-sensor, or light detector.



Photodiode symbol

Working

The photodiode is a semiconductor p-n junction device whose region of operation is limited to the reverse biased region.



- **Depletion Region Width:** The photodiode is indeed connected in reverse bias to increase the width of the depletion region, enhancing its sensitivity to incident light.

- **Normal Reverse Current:** The photodiode does have a small reverse current even in the absence of light, referred to as the dark current. This is typically due to thermally generated minority charge carriers.

- **Photon Interaction:** The energy from the photons is absorbed by electrons, promoting them to the conduction band and creating electron-hole pairs.

- **Increase in Minority Charge Carriers:** The absorption of photons results in the creation of more electron-hole pairs, increasing the number of minority charge carriers in the depletion region.

- **Reverse Current Variation:** The increase in minority charge carriers leads to an increase in the reverse current when light is incident. The photodiode responds to incident light by generating a photocurrent proportional to the intensity of the light.

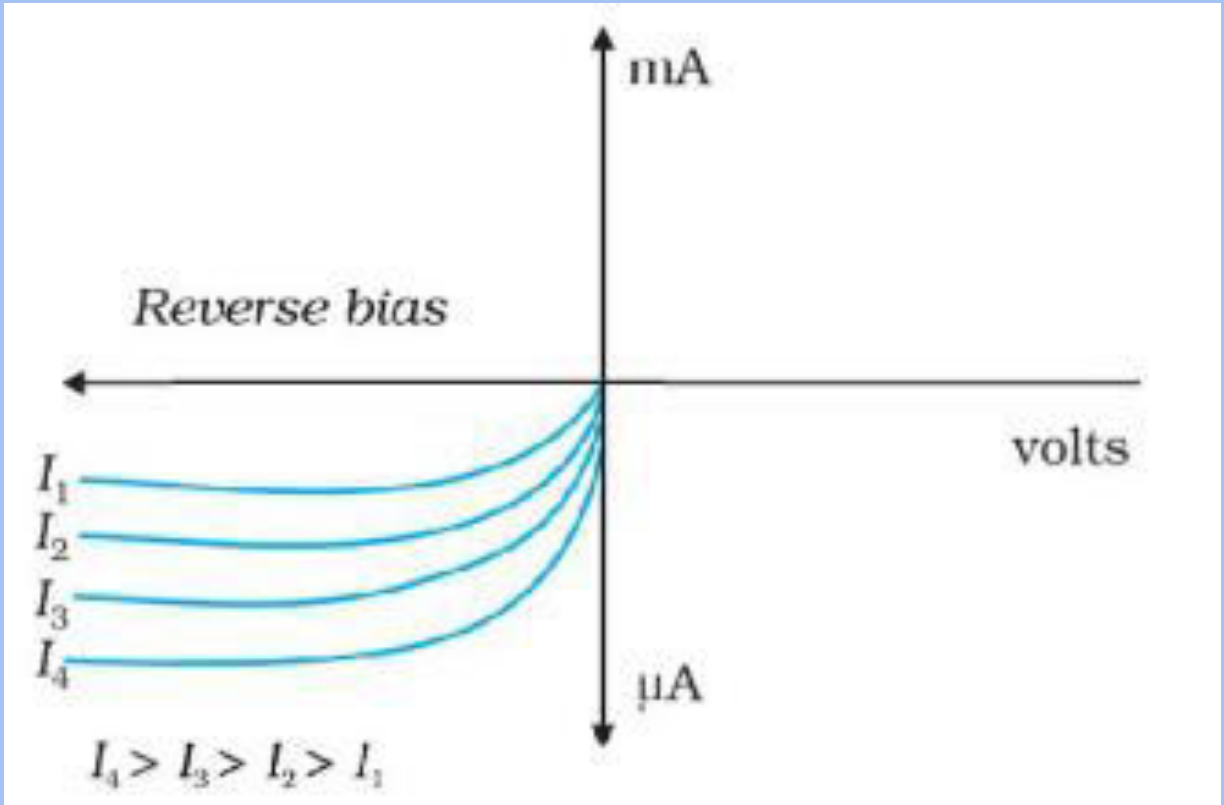
- **Reverse Current in Dark:** The dark current in a reverse-biased photodiode is indeed typically in the range of microamperes, representing the current flow in the absence of light due to thermally generated minority charge carriers.

- **Change in Reverse Current Due to Light:** The change in reverse current induced by incident light is the photocurrent, and it is indeed in the range of microamperes. This change is significant and proportional to the intensity of incident light.

- **Forward Bias Operation:** In forward bias, the photodiode conducts more heavily, and the current flow is dominated by the applied voltage. The change in current due to light in forward bias is indeed negligible compared to the overall current controlled by the voltage.

- **Negligible Change in Forward Current:** The applied forward voltage controls the current flow through the diode in forward bias, and the change in current due to light is often overshadowed by this voltage-controlled behavior.

V-I Characteristics of Photodiode



Types of Photodiodes

The working operation of all types of photodiodes is same. Different types of photodiodes are developed based on specific application. For example, PIN photodiodes are developed to increase the response speed. PIN photodiodes are used where high response speed is needed.

The different types of photodiodes are

- PN junction photodiode
- PIN photodiode
- Avalanche photodiode

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