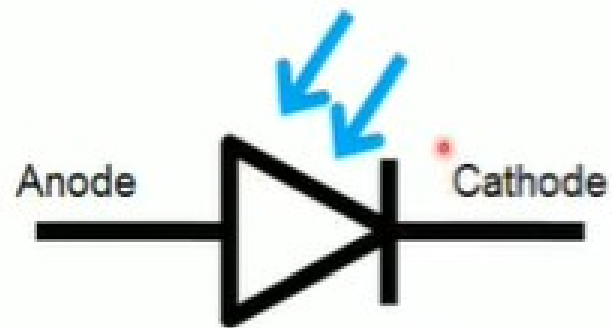


# PHOTODIODE

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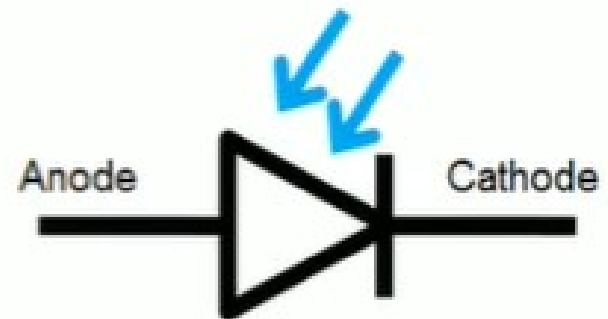
- A photodiode is basically a PN-junction diode in which current through it is proportional to the light energy incident on it.
- It is also known as photo detector, photo-sensor or light detector.
- Photodiodes are like to regular semiconductor diodes, but have an optical window to let the light to reach.



Photodiode symbol

- It is always operated in reverse bias condition.
- That is the P-side of the photodiode is connected to the negative terminal of the battery and n-side of the diode is connected to the positive terminal of the battery.

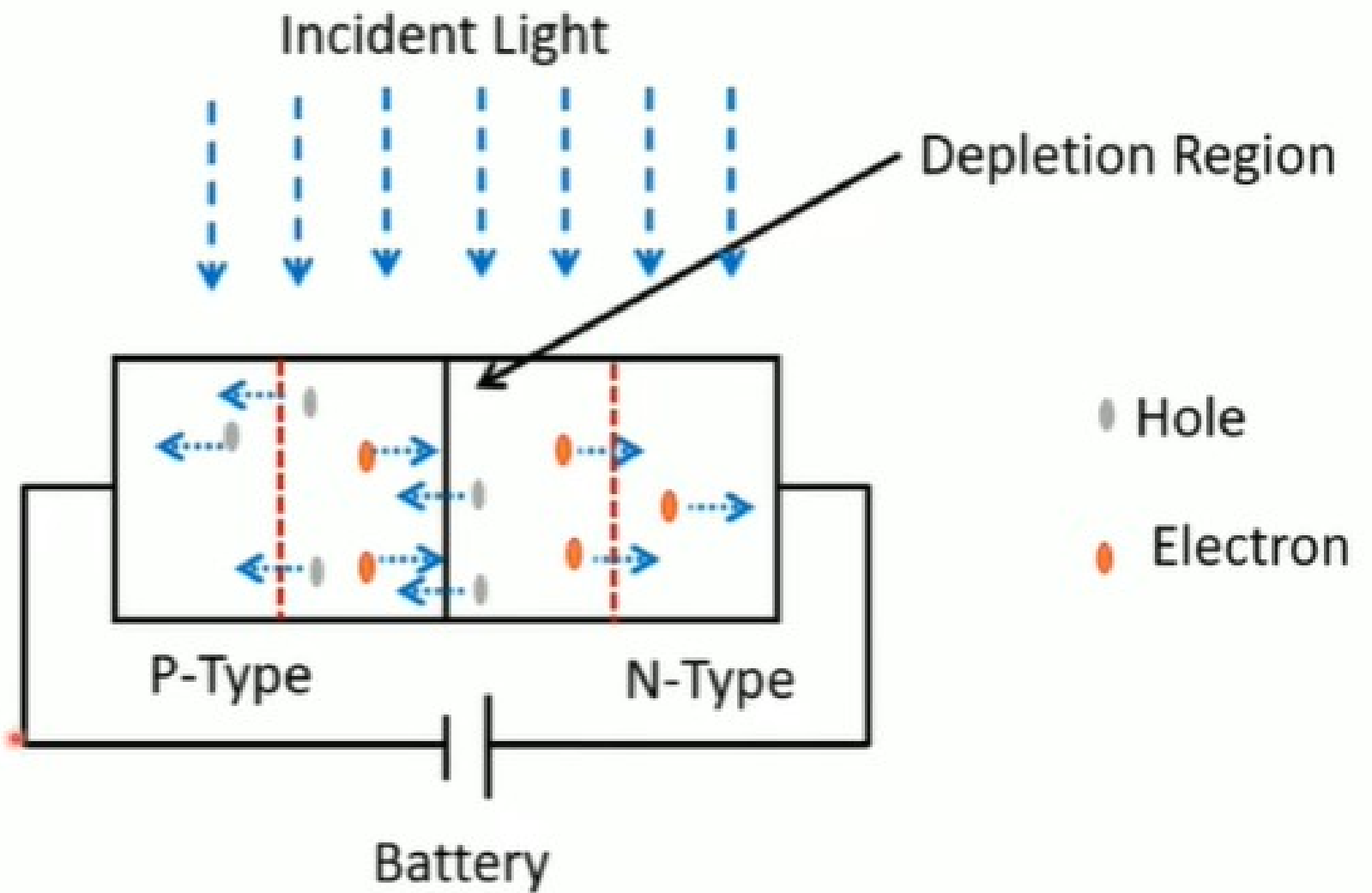
- Under forward bias condition, it operates like an ordinary diode. The conventional current will flow from the anode to the cathode which is indicated as arrowhead in the diode symbol. The photocurrent flows in the reverse direction.



- The photodiodes can be classified based on its construction as follows
  1. PN Photodiode
  2. Schottky Photo Diode
  3. PIN Photodiode
  4. Avalanche Photodiode

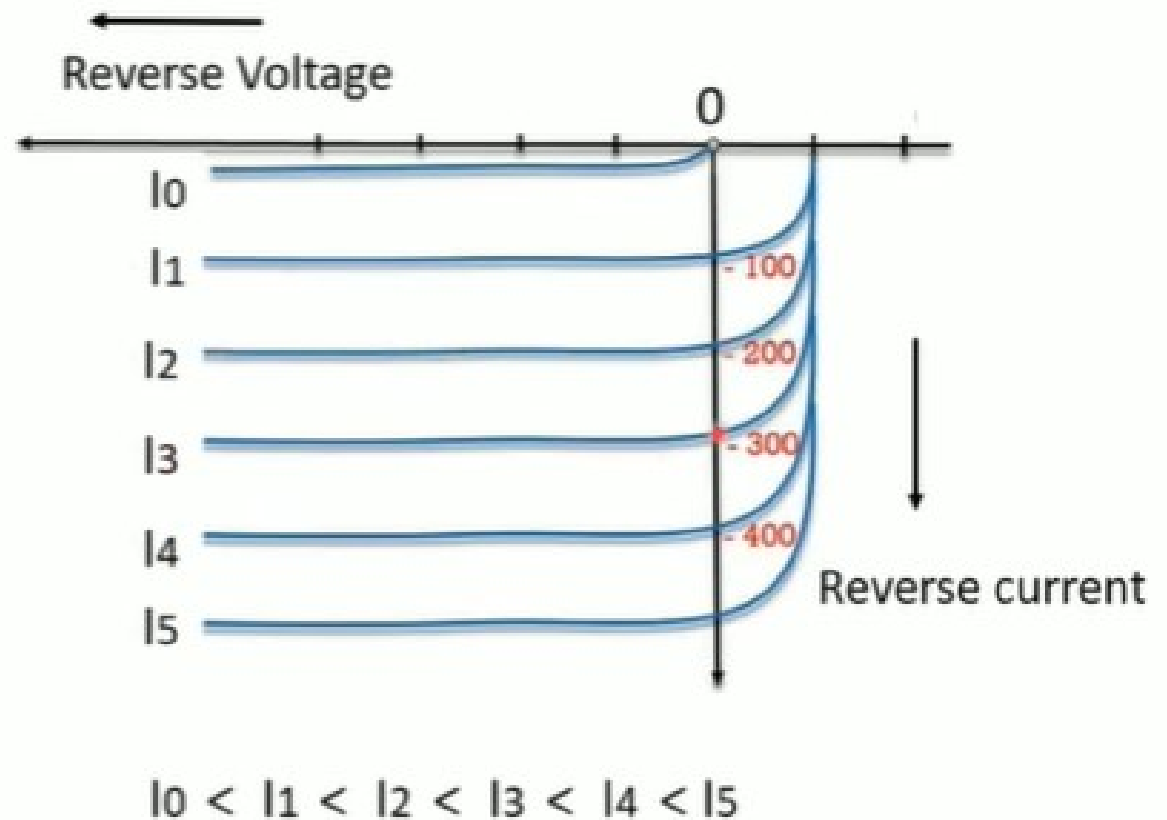
## Working of Photodiode

- The diode is reverse biased.
- When a photon of enough energy strikes the junction of the diode, an electron-hole pair is created in the depletion region.
- Therefore, holes generated in the depletion region move toward the anode (p side), and electrons generated in the depletion region move toward the cathode (n side).
- Hence a photocurrent will be generated.



## V-I Characteristics of Photodiode

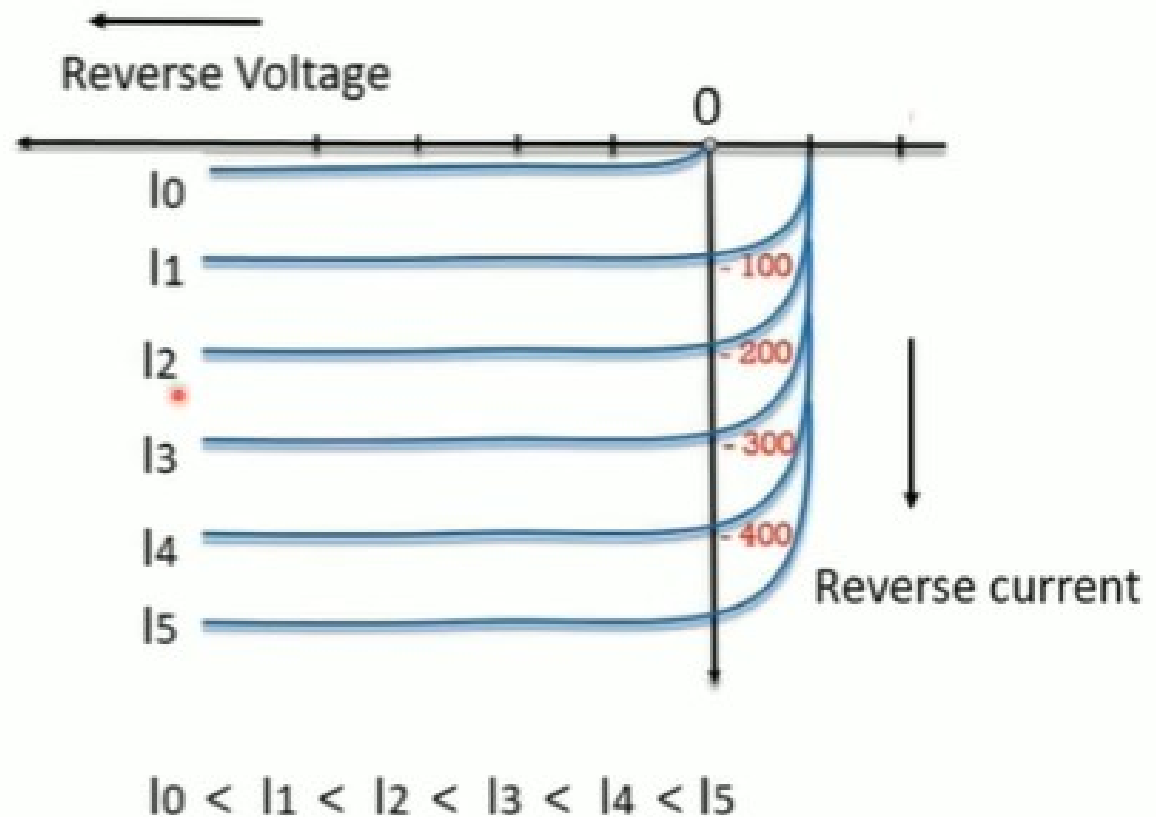
- The photocurrent is nearly independent of reverse bias voltage which is applied.





## V-I Characteristics of Photodiode

- For zero luminance, the photocurrent is almost zero excluding for small dark current. It is of the order of nano amperes. As optical power rises the photocurrent also rises linearly.



# Modes of Operation

- The operating modes of the photodiode are
  1. Photovoltaic mode
  2. Photoconductive mode
  3. Avalanche diode mode

- **Photovoltaic Mode**

- **Photovoltaic Mode** is also known as zero bias mode. It does not require an external biasing.
- A photo diode produces a small voltage when it is exposed to light. The amount of such voltage is proportional to the amount of incident light.

- **Photoconductive Mode:**
- **In Photoconductive Mode:** The photodiode used in this photoconductive mode is reverse biased. The reverse voltage application will increase the depletion layer's width, which in turn decreases the response time.

- **Avalanche Diode Mode:**

- Avalanche diodes operate in a high reverse bias condition. It utilizes avalanche breakdown and avalanche multiplication. So internal gain of photo diode increases.