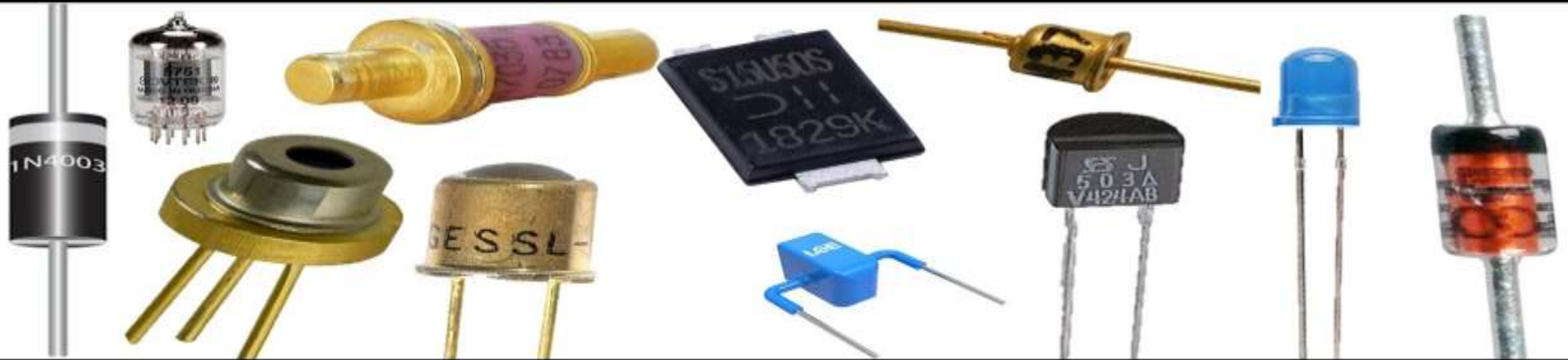




DIODE



DIODE के प्रकार



PREPARED BY

SMT.RUBINA ROU TRAY

ATO, GOVT. ITI, BHUBANESWAR

INTRODUCTION :

- What is Diode ?
- Construction of Diode.
- Working of Diode
- Biasing of Diodes.
- Types of Diode.
- Brief description on each Diode.
- Application of Diode.
- Circuit symbols of Diodes.



WHAT IS DIODE?


- *“Di “= Two, and “Ode “= Electrodes*
- A diode is a two-terminal electronic component that that conducts electricity only in one direction.
- A diode is a specialized electronic component with two electrodes called the anode and the cathode. Most diodes are made with semiconductor materials such as silicon, germanium, or selenium.
- It has low (ideally zero) resistance in one direction and high (ideally infinite) resistance in the other.



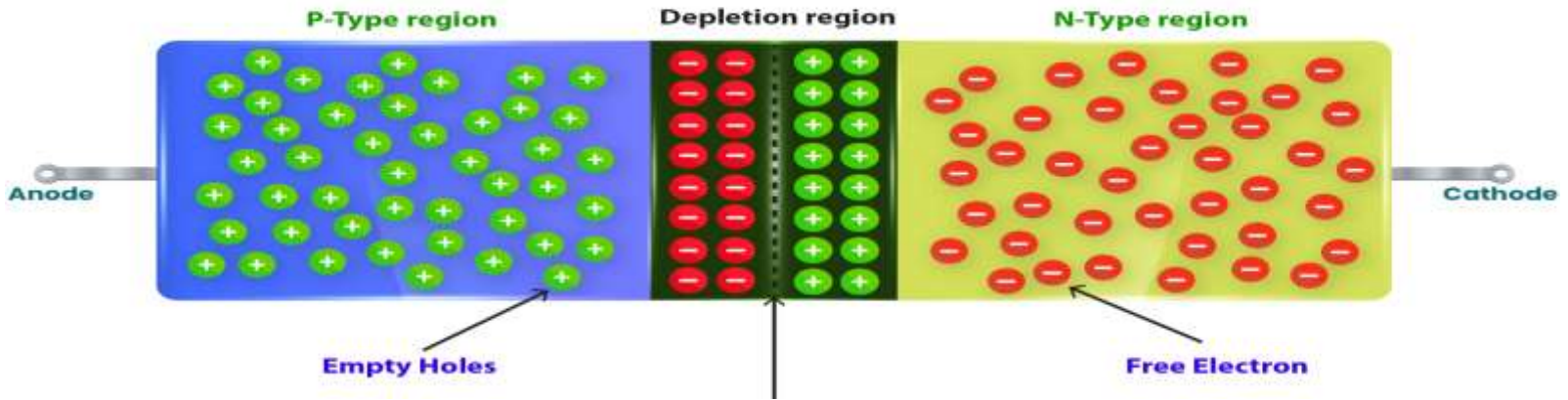
CONSTRUCTION OF DIODE

- There are two types of semiconductor material; Intrinsic and Extrinsic semiconductor.
- An intrinsic semiconductor is a pure semiconductor.
- In an extrinsic semiconductor, impurities are added to increase the number of holes or the number of electrons.
- These impurities are tri-valent (boron, indium, aluminium) or pentavalent (phosphorous, Arsenic, Antimony).
- A semiconductor diode has two layers. One layer is made of a P-type semiconductor layer and the second layer is made of an N-type semiconductor layer.
- If we add trivalent impurities in silicon or germanium, a greater number of holes are present and it is a positive charge. Hence, this layer is known as the P-type layer.
- If we add pentavalent impurities in silicon or germanium, a greater number of electrons are present and it is a negative charge. Hence, this layer is known as the N-type layer.

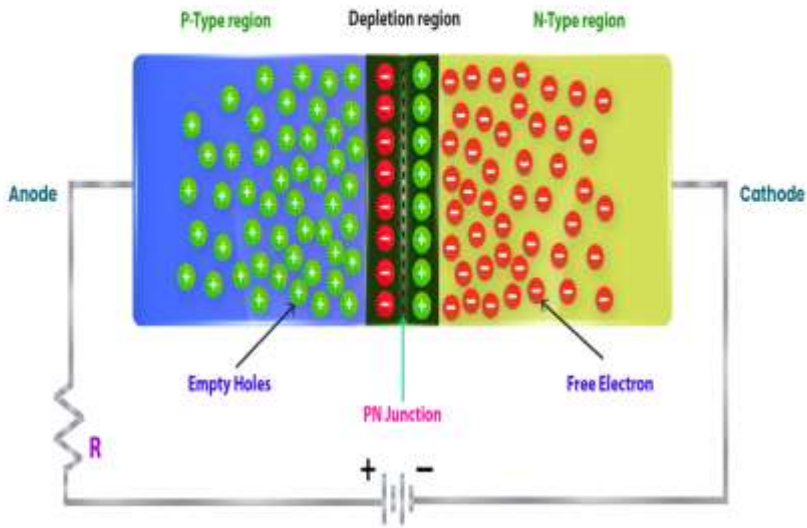
WORKING OF DIODE

- In the N-type region, electrons are the majority charge carriers and holes are minority charge carriers.
 - In the P-type region, the holes are majority charge carrier and the electrons are negative charge carriers.
 - Because of the concentration difference, majority charge carriers diffuse and recombine with the opposite charge.
 - It makes a positive or negative ion. These ions are collected at the junction. And this region is known as the depletion region.
 - When anode terminal of diode is connected with a negative terminal and cathode is connected with the positive terminal of a battery, the diode is said to be connected in reverse bias.
 - Similarly, when anode terminal is connected with a positive terminal and cathode is connected with the negative terminal of the battery, the diode is said to be connected in forward bias.
- 

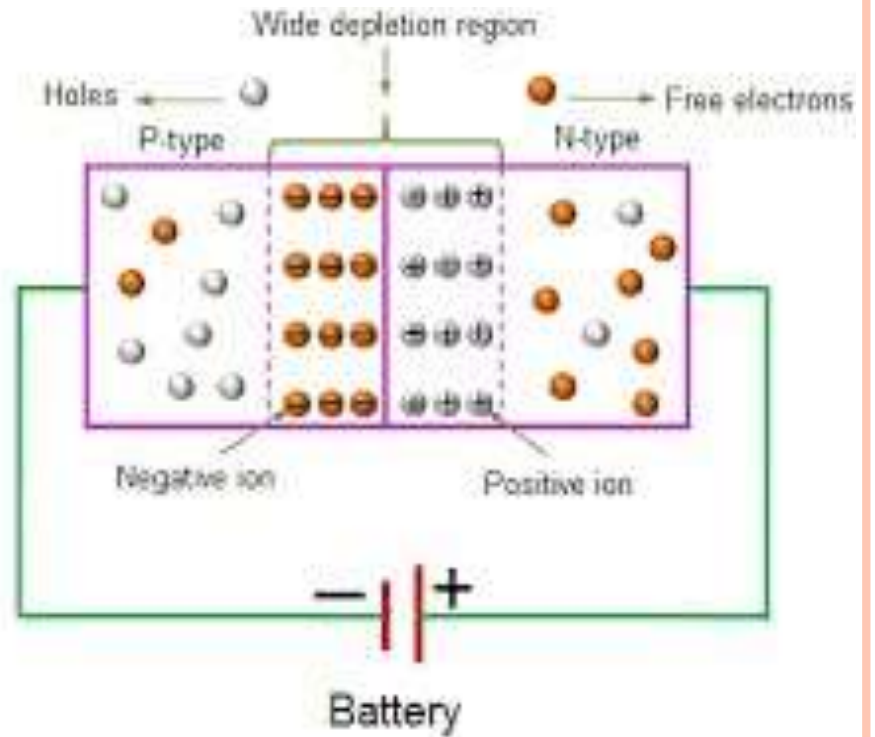
Unbiased PN Junction



Forward-Biased PN Junction



Forward bias

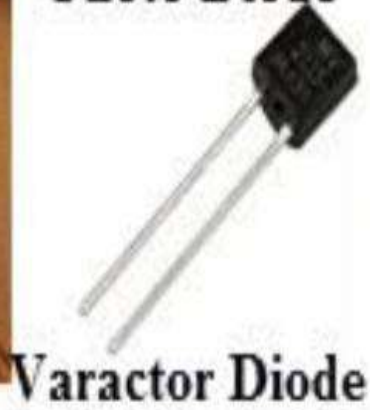
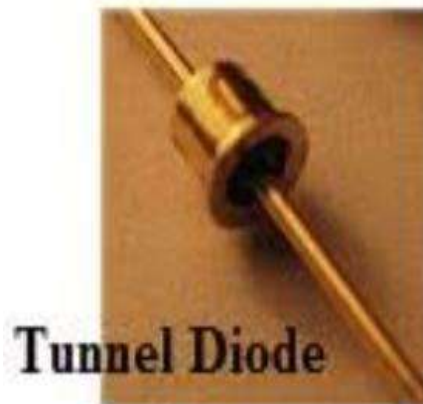
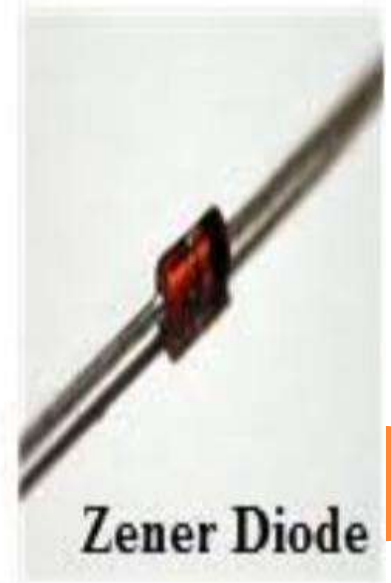
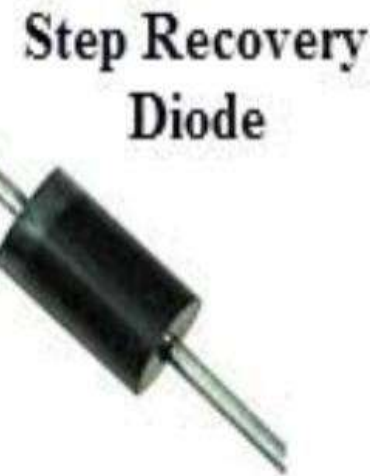
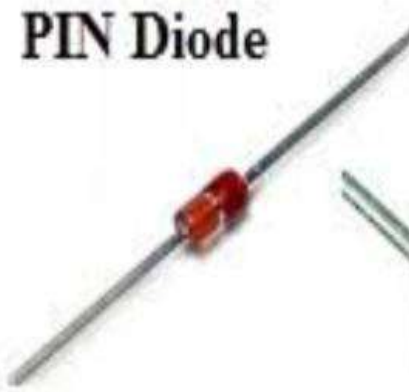
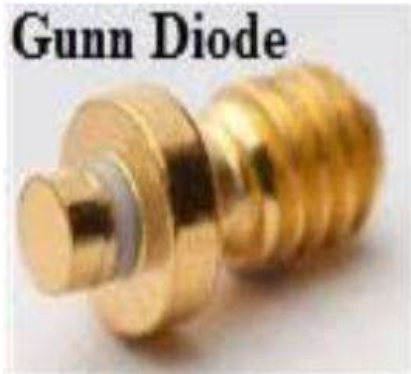


Reverse bias

TYPES OF DIODE

- Light Emitting Diode.
- Laser diode.
- Avalanche diode.
- Zener diode.
- Schottky diode.
- Photodiode.
- PN junction diode.
- Gunn Diode

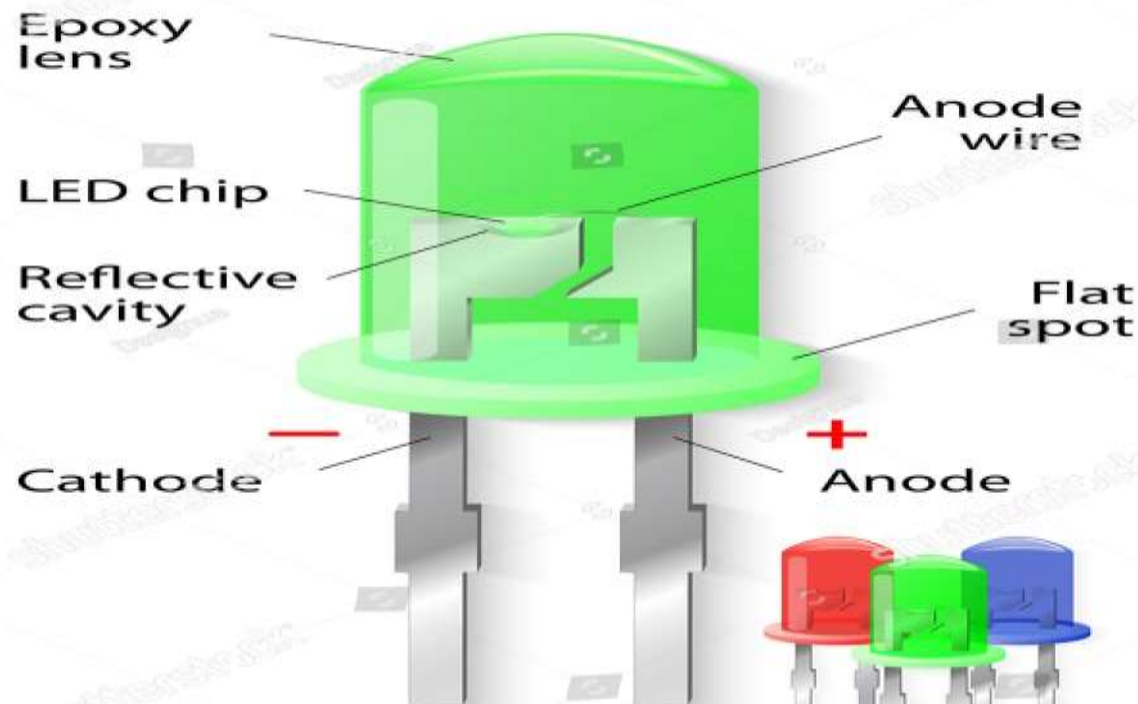




LIGHT EMITTING DIODE

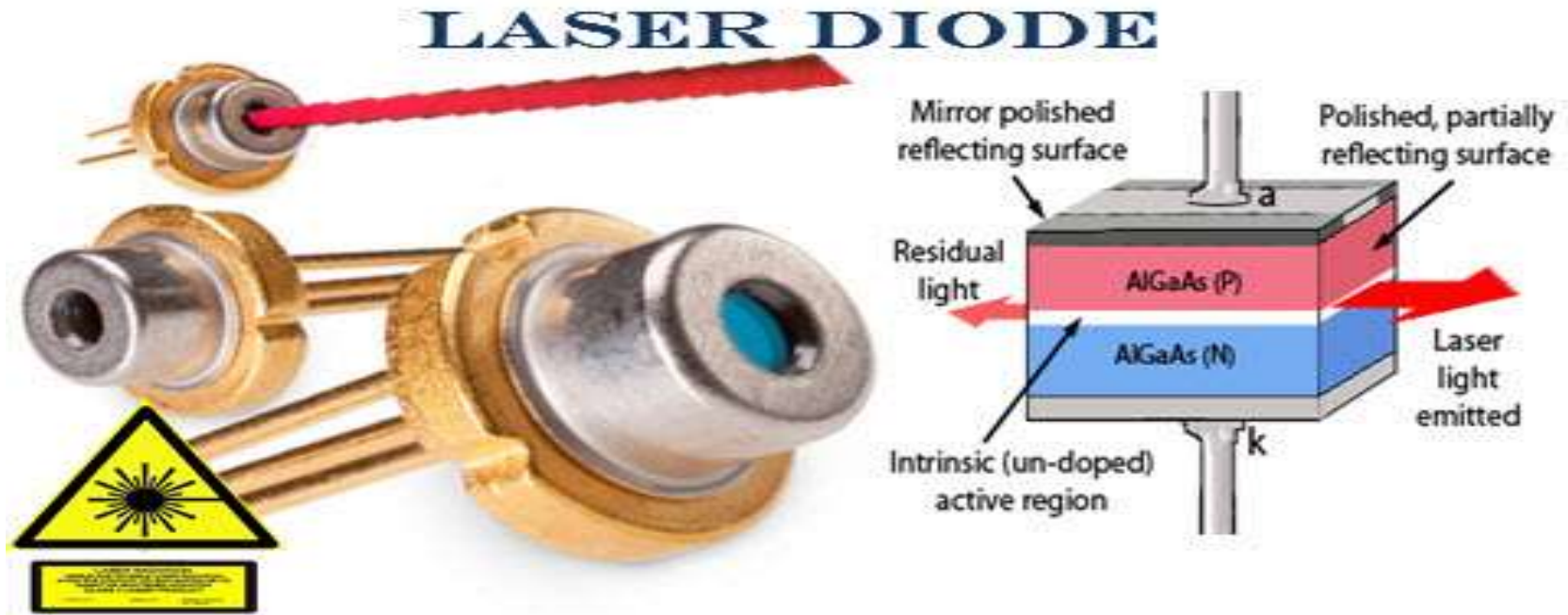
- LED is also called a Light Emitting Diode, it is the most useful kind of diode when the diode is attached in forwarding bias, then-current that flows through the junction produces light and hence they are widely used as bulbs for providing light.

LIGHT-EMITTING DIODE



LASER DIODE

- The LASER in Laser Diode is an acronym for 'Light Amplification by Stimulated Emission of Radiation'. It is also referred to as a semiconductor laser and generally abbreviated as LD. Its main feature is high coherency, making it possible to emit light with the same phase and wavelength.



AVALANCHE DIODE

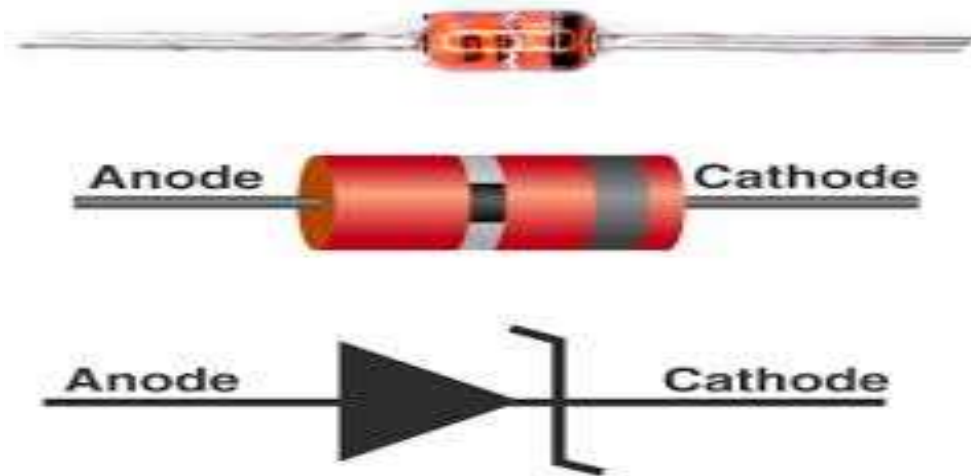
- **Avalanche diodes** generate radio-frequency noise. They are commonly used as noise sources in radio equipment and hardware random number generators.
- An avalanche diode is a one kind of semiconductor device specially designed to work in the reverse breakdown region.
- These diodes are used as relief valves which are used for controlling the system's pressure to guard electrical systems from surplus voltages. The symbol of this diode is same to as Zener diode.



ZENER DIODE

Zener diode work in reverse conditions, the Zener diode has an application in voltage regulation

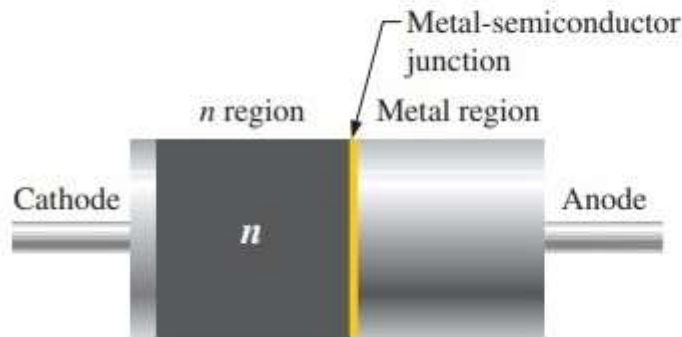
The Zener diode is a heavily doped p-n junction diode made to work in reverse bias condition.



SCHOTTKY DIODE

- Schottky Diodes are special P-N junction diodes that are made to work in low-voltage regions ideally in voltage ranges between 0.15 and 0.4 volts.
- Schottky diode offers fast switching action and has a low forward voltage drop.

Introduction to Schottky Diode

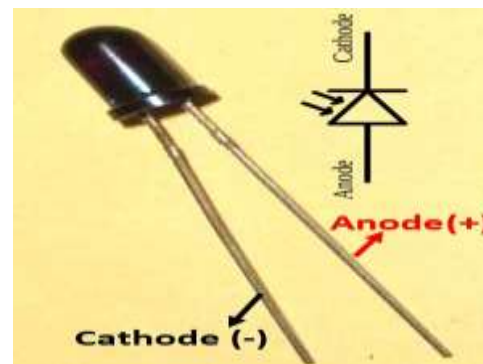
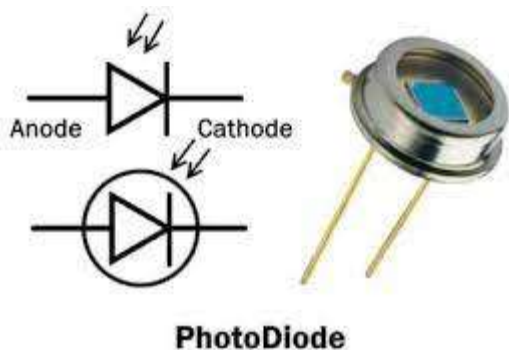


Schottky Diode Symbol



PHOTO DIODE

- A photodiode is a PN-junction diode that consumes light energy to produce an electric current. They are also called a photo-detector, a light detector, and a photo-sensor. Photodiodes are designed to work in reverse bias condition.
- Typical photodiode materials are Silicon, Germanium and Indium gallium arsenide.
- Photodiodes are used in solar cell panels.
- Photodiodes are used in logic circuits.
- Photodiodes are used in the detection circuits.
- Photodiodes are used for the exact measurement of the intensity of light in science and industry.

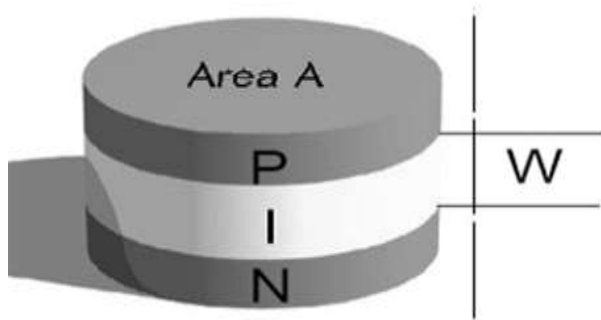


TYPES OF A PHOTODIODE.

- PN photodiode - This photodiode provides useful in a variety of situations. The photo detection occurs within the depletion area of the diode. As this is relatively small, the sensitivity is not as great as that for some other forms of photo diode.
- PIN photodiode - It catches photons of light with greater effect than that of a PN photodiode, it has a huge surface for collecting as well as converting light photons.
- The PIN photodiode is similar to the P-N Junction with one major difference. Instead of placing the P and N layers together to create a depletion region, an intrinsic layer is placed between the two doped layers.



SOME IMAGES OF PHOTO DIODE



GUNN DIODE

- A **Gunn diode**, also known as a **transferred electron device (TED)**, is a form of diode, a two-terminal semiconductor electronic component.
- Its internal construction is unlike other diodes in that it consists only of N-doped semiconductor material, whereas most diodes consist of both P and N-doped regions. It, therefore, conducts in both directions and cannot rectify alternating current like other diodes



Symbol of Gunn Diode

Electronics Coach



APPLICATIONS OF DIODE

- A **Gunn diode** main uses are in electronic oscillators to generate microwaves, in applications such as radar speed guns, microwave relay data link transmitters, and automatic door openers.
- **Some Common Applications of Diodes are:**
- **Rectifiers**
- **Voltage Multipliers**
- **Clipper Circuit**
- **Clamping Circuit**
- **Protection Circuit**
- **In Logic Gates**
- **Flyback Circuits**
- **Light Emission**
- **Light Detection**
- **AM Envelope Detector**
- **Frequency Mixer**



CIRCUIT SYMBOLS OF DIODES



Junction Diode



Zener Diode



Tunnel Diode



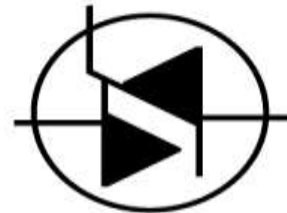
Schottky Diode



Varactor Diode



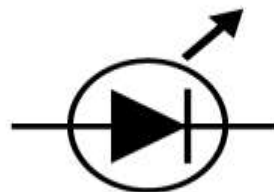
Diac



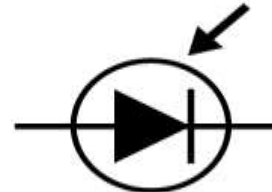
Triac



SCR



Light Emitting Diode (LED)



Photodiode



THANK YOU

