

كلية : التربية للعلوم الصرفة

القسم او الفرع: الفيزياء

المرحلة: الثالثة

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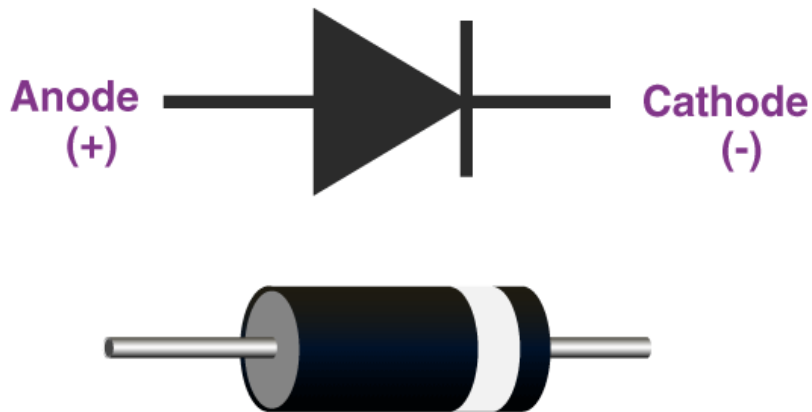
اسم المادة باللغة الإنكليزية: **Electronics Laboratory**

اسم المحاضرة باللغة العربية: الداوود

اسم المحاضرة باللغة الإنكليزية: **Diodes**

Diodes

Diodes are employed for circuit protection by restricting voltage and converting AC to DC. Silicon and germanium semiconductors are utilized to maximize diode performance. Despite their uni-directional current transmission, diodes vary in their transmission methods. Various types of diodes exist, each with specific purposes.



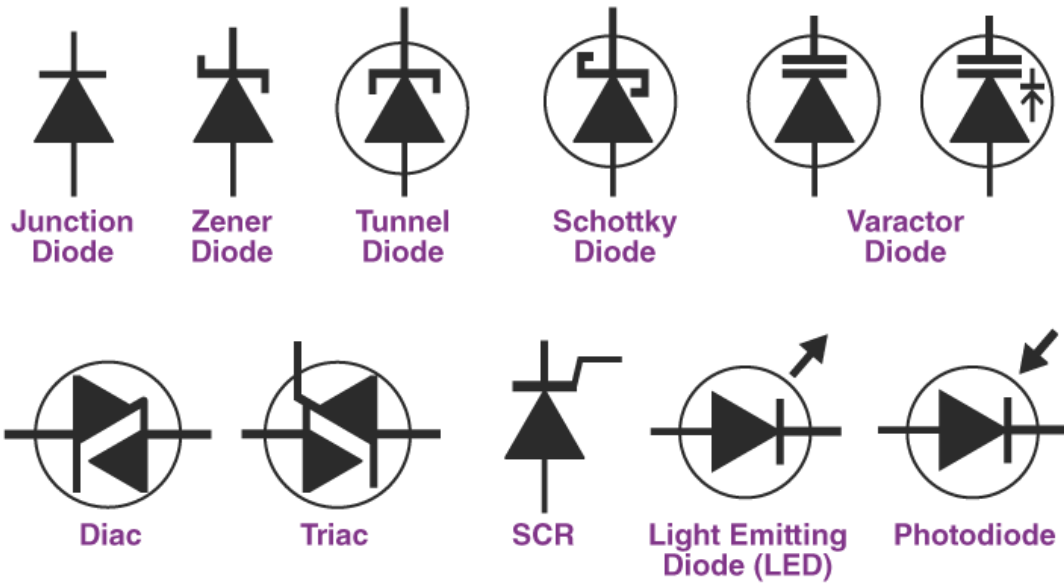
The diagram shows a typical diode symbol with an anode and cathode terminal. The arrow at the anode signifies the direction of current flow in forward bias.

Diode Construction

Diodes are constructed using semiconductor materials such as silicon or germanium. A forward-biased diode conducts easily with a low voltage drop when the anode voltage is higher than the cathode, while a reverse-biased diode conducts in the opposite situation. The arrow in the diode symbol indicates the direction of current flow. The article provides comprehensive information on different diode types.

Types of Diodes

1. PN junction diode
2. Light Emitting Diode
3. Avalanche diode
4. Zener diode
5. Schottky diode
6. Laser diode
7. Photodiode



P-N Junction Diode

The P-N junction diode is also known as rectifier diodes. These diodes are used for the rectification process and are made up of semiconductor material. The P-N junction diode includes two layers of semiconductors. One layer of the semiconductor material is doped with P-type material and the other layer with N-type material. The combination of these both P and N-type layers form a junction known as the P-N junction. Hence, the name P-N junction diode allows the current to flow in the .P-N junction diode

forward direction and blocks the flow of current in the reverse direction

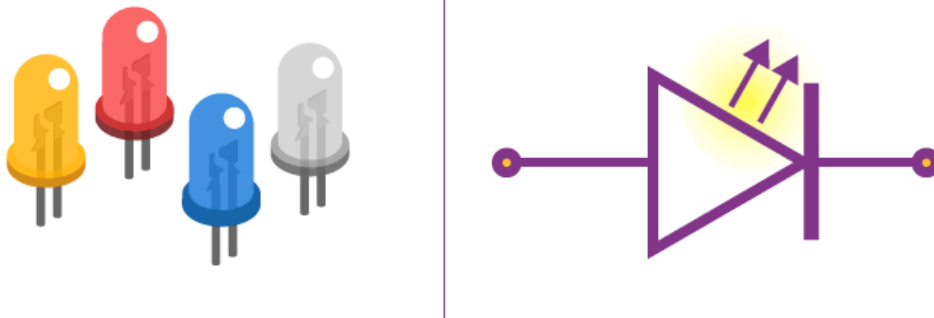


pn junction diode

Light Emitting Diode (LED)

When an electric current between the electrodes passes through this diode, light is produced. In other words, light is generated when a sufficient amount of forwarding current passes through it. In many diodes, this light generated is not visible as there are frequency levels that do not allow visibility. LEDs are available in different colors. There are tricolor LEDs that can emit three colors at a time. Light color depends on the energy gap

.of the semiconductor used



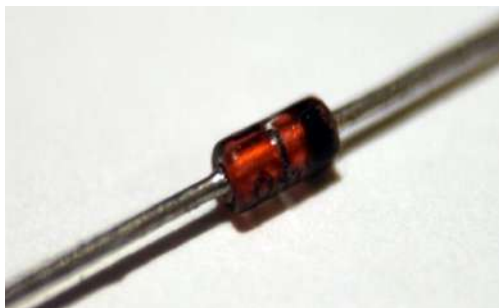
Avalanche Diode

This diode belongs to a reverse bias type and operates using the avalanche effect. When voltage drop is constant and is independent of current, the breakdown of avalanche takes place. They exhibit high levels of sensitivity and hence are used for photo detection.



Zener Diode

It is the most useful type of diode as it can provide a stable reference voltage. These are operated in reverse bias and break down on the arrival of a certain voltage. If current passing through the resistor is limited, a stable voltage is generated. Zener diodes are widely used in power supplies to provide a reference voltage.



Schottky Diode

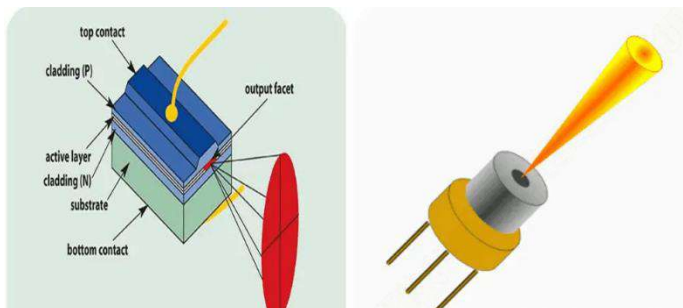
It has a lower forward voltage than other silicon PN junction diodes. The drop will be seen where there is low current and at that stage, voltage ranges between 0.15 and 0.4 volts. These are constructed differently in order to obtain that performance. Schottky diodes are highly used in rectifier applications.



Diode

It is a different type of diode as it produces coherent light. It is highly used in CD drives, DVDs and laser devices. These are costly when compared to LEDs and are cheaper when compared to other laser generators. Limited life is the only drawback of these diodes.

Laser



Photodiode

A photo-diode can identify even a small amount of current flow resulting from the light. These are very helpful in the detection of the light. This is a reverse bias diode and used in solar cells and photometers. They are even used to generate electricity.



Forward-biased Diode

There is a small drop of voltage across the diode when the diode is forward-biased and the current is conducting. For silicon diodes, the forward voltage is 690mV and for germanium, 300mV is the forward voltage. The potential energy across the p-type material is positive and across the n-type material, the potential energy is negative

Reverse-biased Diode

A diode is said to be reverse-biased when the battery's voltage is dropped completely. For silicon diodes, the reverse current is $-20\mu\text{A}$ and for germanium, $-50\mu\text{A}$ is the reverse current. The potential energy across the p-type material is negative and across the n-type material, the potential energy is positive

Zero-biased Diode

When the diode is zero-biased, the voltage potential across the diode is zero

Diode Applications

Following are the applications and uses of the diode:

Diodes as a rectifier

Diodes in the clipping circuit

Diodes in clamping circuits

Diodes in logical gates

Diodes in reverse current protection