

# Diode resistance

A [p-n junction diode](#) allows electric current in one direction and blocks electric current in another direction. It allows electric current when it is forward biased and blocks electric current when it is reverse biased. However, no diode allows electric current completely even in forward biased condition.

The [depletion region](#) present in a diode acts like barrier to electric current. Hence, it offers resistance to the electric current. Also, the atoms present in the diode provide some resistance to the electric current.

When charge carriers (free electrons and [holes](#)) flowing through the diode collides with [atoms](#), they lose [energy](#) in the form of heat. Thus, depletion region and atoms offer resistance to the electric current.

When forward biased [voltage](#) is applied to the p-n junction diode, the [width of depletion region](#) decreases. However, the depletion region cannot be completely vanished. There exists a thin depletion region or depletion layer in the [forward biased diode](#). Therefore, a thin depletion region and atoms in the diode offer some resistance to electric current. This resistance is called forward resistance.

When the diode is reverse biased, the width of depletion region increases. As a result, a large number of charge carriers (free electrons and holes) flowing through the diode will be blocked by the depletion region.

In a **reverse biased diode**, only a small amount of electric current flows. The minority carriers present in the diode carry this electric current. Thus, reverse biased diode offer large resistance to the electric current. This resistance is called reverse resistance.

The two types of resistance takes place in the p-n junction diode are:

- Forward resistance
- Reverse resistance

## **Forward resistance**

Forward resistance is a resistance offered by the p-n junction diode when it is forward biased.

In a forward biased p-n junction diode, two type of resistance takes place based on the voltage applied.

The two types of resistance takes place in forward biased diode are

- Static resistance or DC resistance
- Dynamic resistance or AC resistance

## **Static resistance or DC resistance**

When forward biased voltage is applied to a diode that is connected to a DC circuit, a DC or direct current flows through the diode. Direct current or electric current is nothing but the flow of charge carriers (free electrons or holes) through a conductor. In DC circuit, the charge carriers flow steadily in single direction or forward direction.

The resistance offered by a p-n junction diode when it is connected to a DC circuit is called static resistance.

Static resistance is also defined as the ratio of DC voltage applied across diode to the DC current or direct current flowing through the diode.

The resistance offered by the p-n junction diode under forward biased condition is denoted as  $R_f$ .

$$R_f = \frac{\text{DC voltage}}{\text{DC current}}$$

## Dynamic resistance or AC resistance

The dynamic resistance is the resistance offered by the p-n junction diode when AC voltage is applied.

When forward biased voltage is applied to a diode that is connected to AC circuit, an AC or alternating current flows through the diode.

In AC circuit, charge carriers or electric current does not flow in single direction. It flows in both forward and reverse direction.

Dynamic resistance is also defined as the ratio of change in voltage to the change in current. It is denoted as  $r_f$ .

$$r_f = \frac{\text{Change in voltage}}{\text{Change in current}}$$

## Reverse resistance

Reverse resistance is the resistance offered by the p-n junction diode when it is reverse biased.

When reverse biased voltage is applied to the p-n junction diode, the width of depletion region increases. This depletion region acts as barrier to the electric current. Hence, a large amount of electric current is blocked by the depletion region. Thus, reverse biased diode offer large resistance to the electric current.

The resistance offered by the reverse biased p-n junction diode is very large compared to the forward biased diode. The reverse resistance is in the range of mega ohms (MΩ).