

**Subject** : Basic electronics engineering

**Question** : Why extrinsic semiconductor has positive temperature coefficient and intrinsic has negative temperature coefficient?

**Answer** :

In general, we have two types of semiconductor material.

1. Intrinsic Semiconductor
2. Extrinsic semiconductor

**Intrinsic Semiconductor:**

In an Intrinsic semiconductor, electrons and holes are equal in number. At absolute zero temperature ( $-273^{\circ}\text{C}$ ), the intrinsic semiconductor, all the electrons are tightly held by their atoms. With an increase in temperature, the electrons break from the atoms and move from valence band to conduction band. As the temperature increases, the electron - hole pair generation also increases. This will increase the conductivity of the intrinsic semiconductor. As the conductivity increases, it will decrease the resistivity of the material. That's the intrinsic semiconductor has a negative temperature coefficient.

**Extrinsic semiconductor:**

Doped intrinsic semiconductors are called as extrinsic semiconductors. The number of free electrons and holes are high. It will increase the conductivity if the semiconductor is heavily doped it has more number of free electrons. When the temperature increases the free electrons collide more frequently with vibrating atoms. This will reduce the drift speed of electrons. This will reduce the conductivity of the material. The resistivity of the material increased. Thus, the extrinsic semiconductor has a positive temperature coefficient.