

1310 Formula list 1.0

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1 Semiconductor

1.1 Basic definitions

To find the density of electrons in a material, we have

$$n_i = 5.2 * 10^{15} T^{\frac{3}{2}} \exp \frac{-E_g}{2kT} \text{ electrons/cm}^3$$

In both intrinsic and extrinsic conductors, the electron density and hole density is equal. Thus:

$$np = n_i^2$$

where n_i is the densities of intrinsic material.

For a p-type semiconductor, holes are the majority carrier and electrons are the minority carrier. Thus,

Majority Carriers: $n \approx N_D$ which N_D is the density of donor atoms

$$\text{Minority Carriers: } p \approx \frac{n_i^2}{N_D}$$

Similarly, for a density of N_A acceptor atoms per cubic centimeter, we have:

$$\text{Majority Carriers: } p \approx N_A$$

$$\text{Minority Carriers: } n \approx \frac{n_i^2}{N_A}$$

1.2 Drift