

#### 4.7 SEMICONDUCTORS TYPES / CLASSIFICATIONS

There are two basic groups or classifications that can be used to define the different semiconductor types:

***Intrinsic material:*** An intrinsic type of semiconductor material made to be very pure chemically. As a result it possesses a very low conductivity level having very few number of charge carriers, namely holes and electrons, which it possesses in equal quantities.

***Extrinsic material:*** Extrinsic types of semiconductor are those where a small amount of impurity has been added to the basic intrinsic material. This 'doping' uses an element from a different periodic table group and in this way it will either have more or less electrons in the valence band than the semiconductor itself. This creates either an excess or shortage of electrons. In this way two types of semiconductor are available: Electrons are negatively charged carriers.

- ***N-type:*** An N-type semiconductor material has an excess of electrons. In this way, free electrons are available within the lattices and their overall movement in one direction under the influence of a potential difference results in an electric current flow. This in an N-type semiconductor, the charge carriers are electrons.
- ***P-type:*** In a P-type semiconductor material there is a shortage of electrons, i.e. there are 'holes' in the crystal lattice. Electrons may move from one empty position to another and in this case it can be considered that the holes are moving. This can happen under the influence of a potential difference and the holes can be seen to flow in one direction resulting in an electric current flow. It is actually harder for holes to move than for free electrons to move and therefore the mobility of holes is less than that of free electrons. Holes are positively charged carriers.