pn Junction

By Samantha Muchongwe

pn Junction

- a semi conductor device that has p-type and n-type semi conductor "pieces" attached together with two terminals at both ends.

- It also has several applications eg in resistors, switches etc

- It is a necessity in all electronic devices and is sometimes called a diode and some applications can be found in chargers and adaptors.

How to make the pn junction?

- Let's suppose we have an n-type/p-type semiconductor and we apply some variable voltage.

- Looking individually at either an n-type or p-type semiconductor

- Doping one piece of a silicon semiconductor to make a pn junction

- Net charge?

pn Junction in Equilibrium

- In this case, the terminals are not connected to anything

- Current diffusion (due to?) until an equilibrium is reached when …?

Equilibrium conditions:

- Diffusion current of electrons= Drift current of electrons

- Diffusion current of holes= Drift current of holes(eqn)

- This leads to a built in potential, $V_o = (kT/q) \ln (N_a N_d / n_i{}^2)$

Some Observations

- If N_a and N_d are on the order of 10^16, V_o becomes approximately 720mV

- V_o is localized in the depletion region

- We cannot measure V_o from outside

- We get the same expression for built in potential is we use electrons instead of holes in the derivation