IGBT and its Characteristics

Vertical cross section of a n channel IGBT cell is shown in Figure. Although p channel IGBTs are possible n channel devices are more common and will be the one discussed in this lesson. The major difference with the corresponding MOSFET cell structure lies in the addition of a p+ injecting layer. This layer forms a pn junction with the drain layer and injects minority carriers into it.

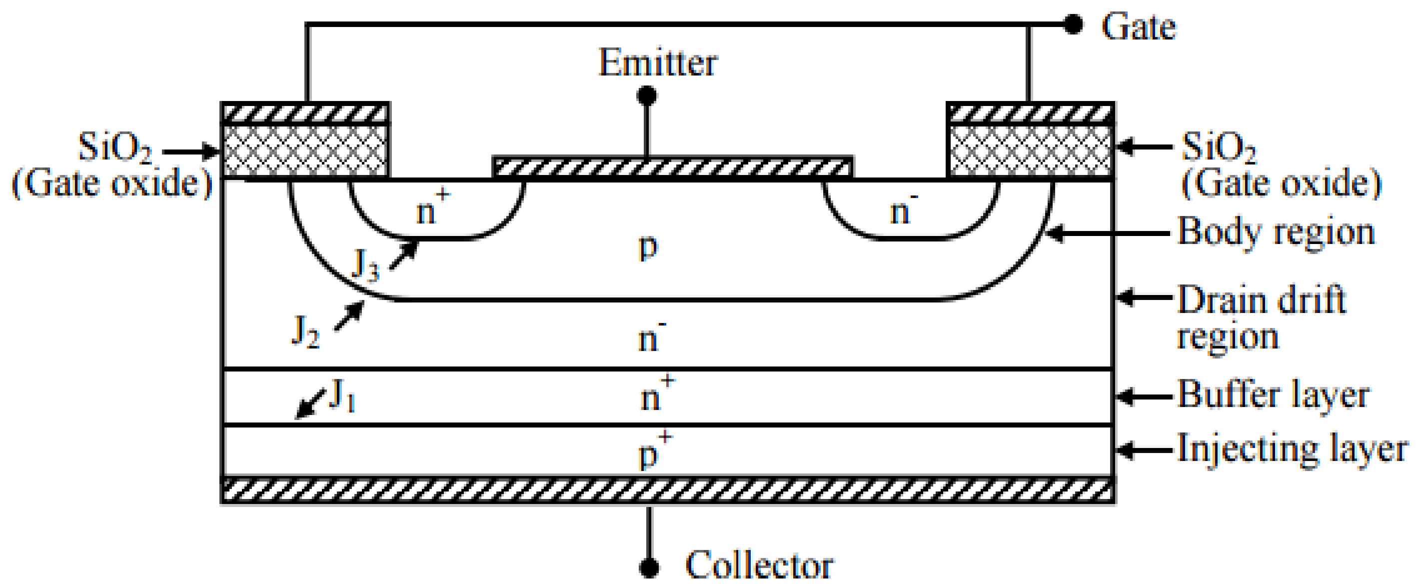

Fig.- Construction of IGBT

The n type drain layer itself may have two different doping levels. The lightly doped n region is called the drain drift region. Doping level and width of this layer sets the forward blocking voltage (determined by the reverse break down voltage of J2) of the device. However, it does not affect the on state voltage drop of the device due to conductivity modulation as discussed in connection with the power diode.

This construction of the device is called “Punch Trough” (PT) design. The Non-Punch Through (NPT) construction does not have this added n+ buffer layer. The PT construction does offer lower on state voltage drop compared to the NPT construction particularly for lower voltage rated devices. However, it does so at the cost of lower reverse break down voltage for the device, since the reverse break down voltage of the junction J1 is small.

Characteristics of IGBT