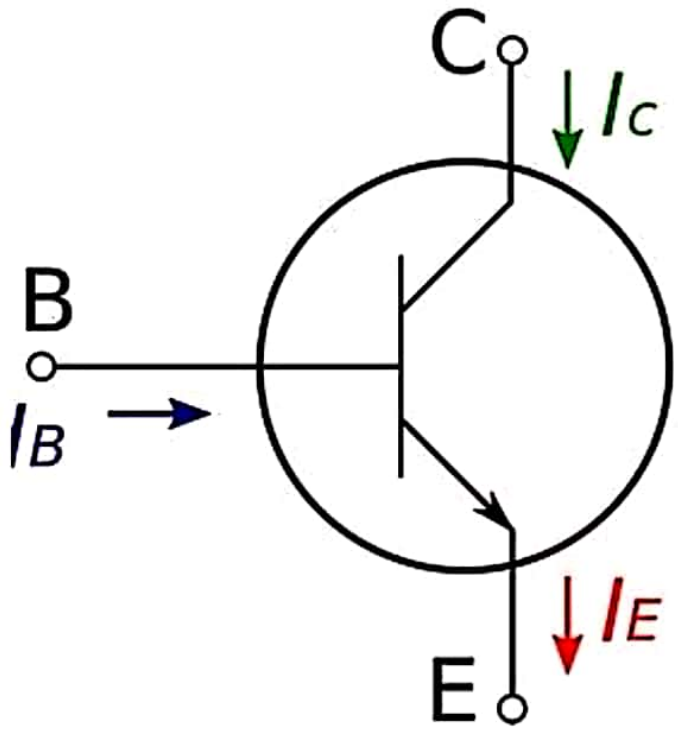
What is an N-P-N Transistor?

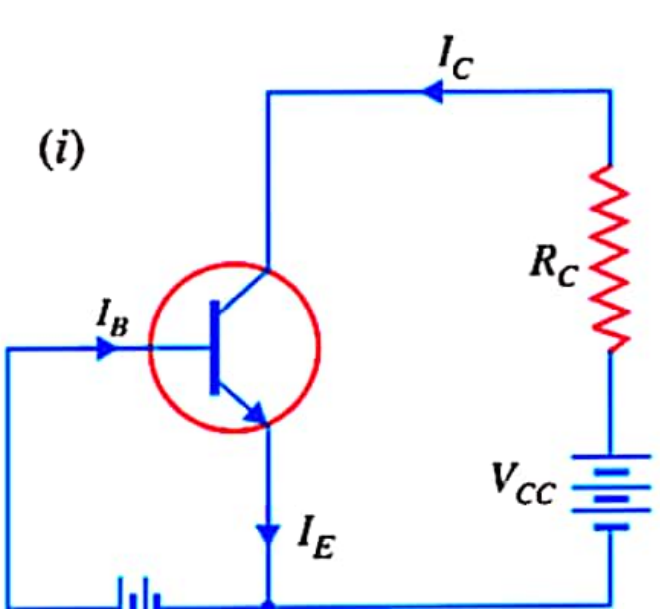
A bipolar junction transistor that is formed because of the connection established between two n-types and one p-type in the middle of it. This type formed is referred to as the N-P-N transistor.

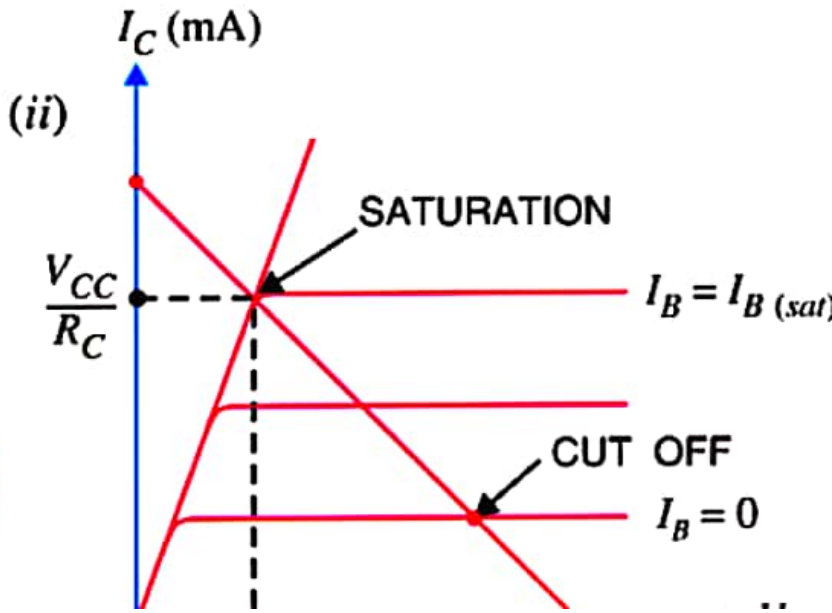
In this way, we can define the N-P-N transistor. For the applications of switching and regarding the amplification of the signals this N-P-N transistor is preferred.



Symbol of N-P-N Transistor

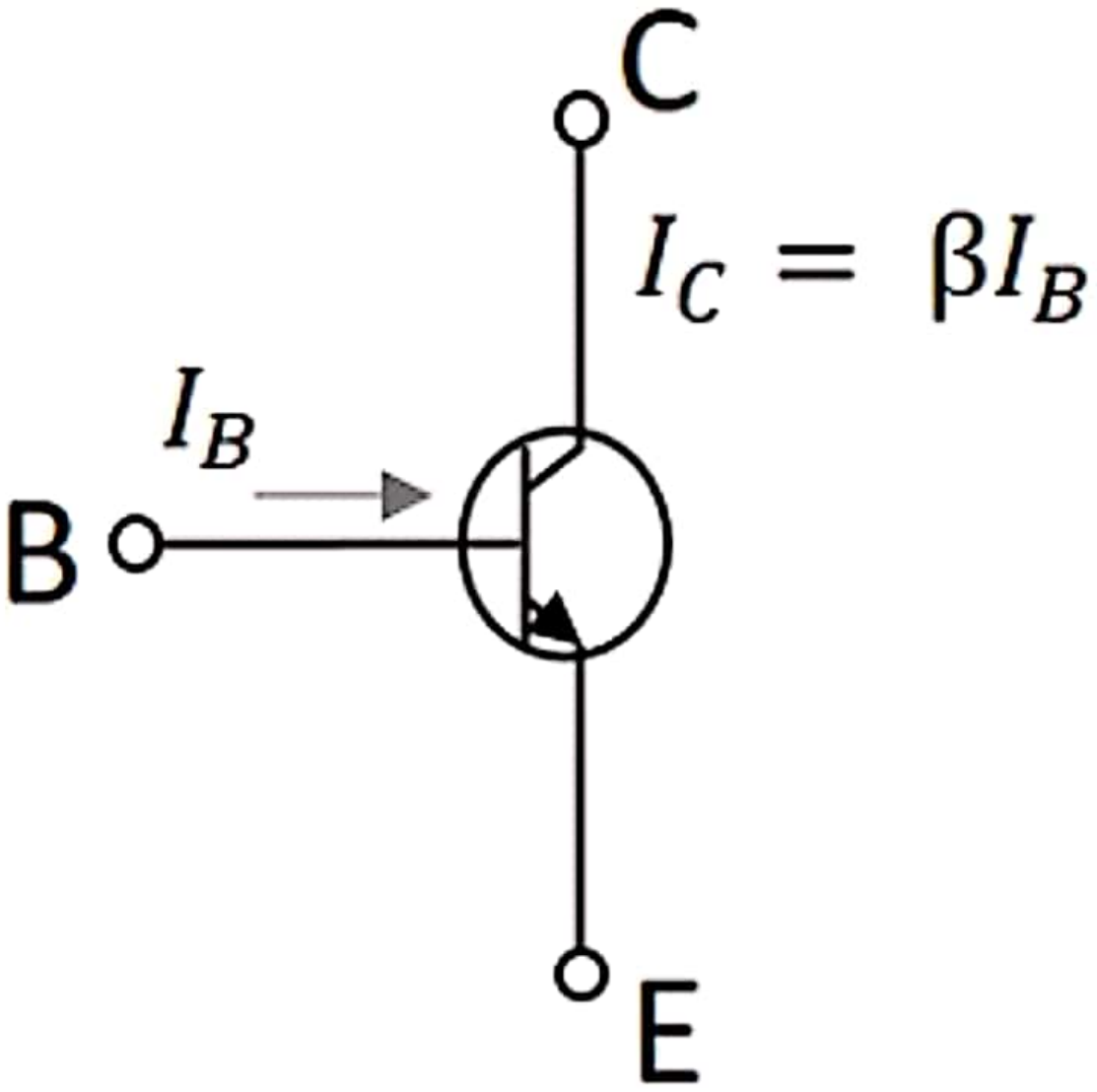
Transistor Cut off, Saturation & Active Regions





Active region

This is the region in which transistors have many applications. This is also called as **linear region**. A transistor while in this region, acts better as an **Amplifier**.



This region lies between saturation and cutoff. The transistor operates in active region when the emitter junction is forward biased and collector junction is reverse biased. In the active state, collector current is β times the base current, i.e.,

$$I_C = \beta I_B$$

Where,

I_C = collector current

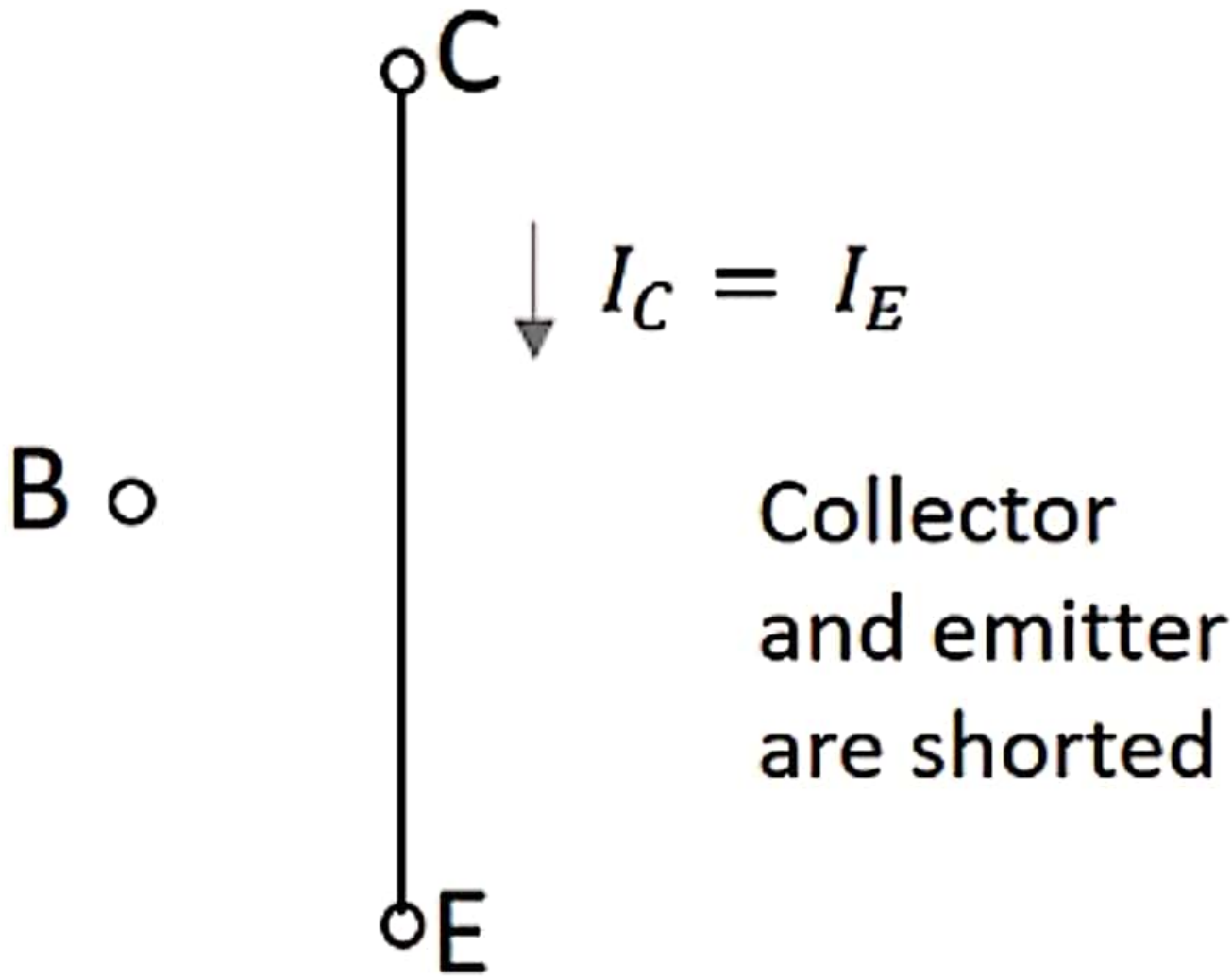
β = current amplification factor

I_B = base current

Saturation region

This is the region in which transistor tends to behave as a closed switch. The transistor has the effect of its collector and Emitter being shorted. The collector and Emitter currents are maximum in this mode of operation.

The figure below shows a transistor working in saturation region.



The transistor operates in saturation region when both the emitter and collector junctions are forward biased. As it is understood that, in the saturation region the transistor tends to behave as a closed switch, we can say that,

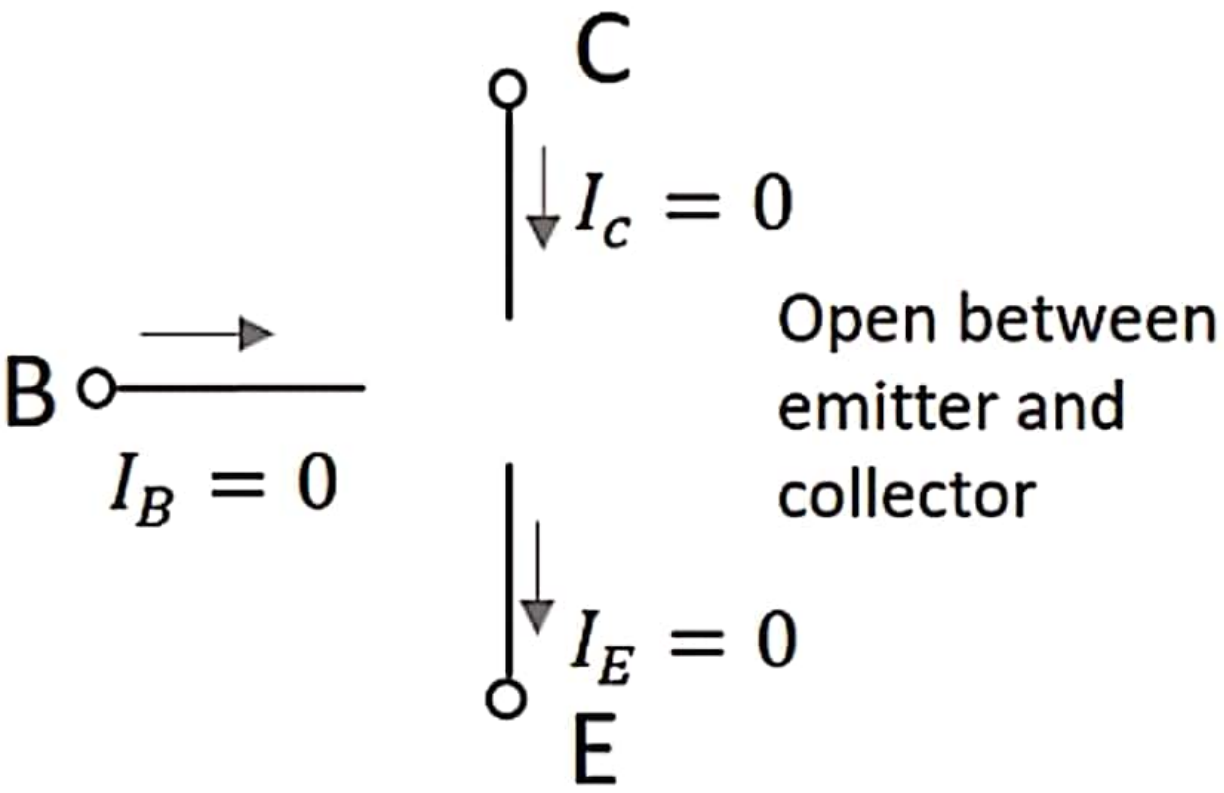
$$I_C = I_E$$

Where I_C = collector current and I_E = emitter current.

Cutoff region

This is the region in which transistor tends to behave as an open switch. The transistor has the effect of its collector and base being opened. The collector, emitter and base currents are all zero in this mode of operation.

The following figure shows a transistor working in cutoff region.



In Cutoff region

The transistor operates in cutoff region when both the emitter and collector junctions are reverse biased. As in cutoff region, the collector current, emitter current and base currents are nil, we can write as

$$I_C = I_E = I_B = 0$$