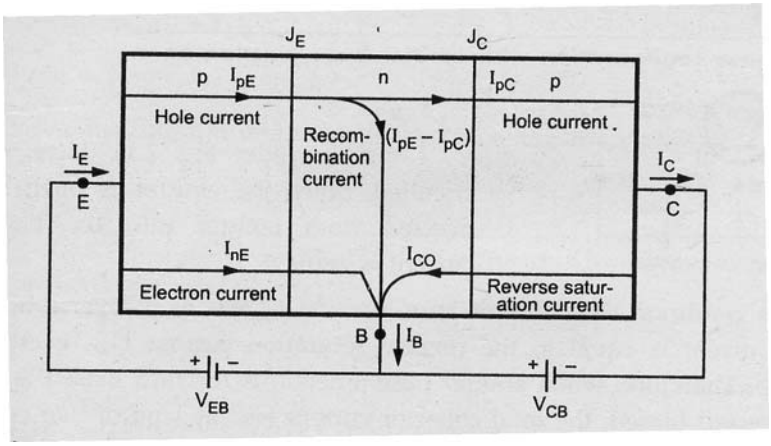
TRANSISTOR CURRENT COMPONENTS

In the figure we show the various components which flow across the forward-based emitter junction and the reverse-biased collector junction. The emitter current I_E consists of hole current I_{pE} (holes crossing from the emitter into base) and electron current I_{nE} (electron crossing from base into the emitter). The ratio of hole to electron currents, I_{pE} / I_{nE}, crossing the emitter junction is proportional to the ratio of the conductivity of the p material to that of the n material. In the commercial transistor the doping of the emitter is made much larger than the doping of the base. This future ensures (in a p-n-p transistor) that the emitter current consists almost entirely of the holes. Such a situation is desired since the current which results from electrons crossing the emitter junction from base to emitter does not contribute carriers which can reach the collector.

Not all the holes crossing the emitter junction J_E reach the collector junction J_c because some of them combine with the electrons in the n – type base. If I_{pc} is the hole current at J_c, there must be a bulk recombination current I_{pE} - I_{pC} leaving the base, as indicated in figure. (actually, electrons enter the base region through the base lead to supply those charges which have been lost by recombination with the holes injected into the base across $J_{E)}$.



Transistor current components

If the emitter were open-circuited so that $I_E = 0$, then I_{pC} would be zero. Under these circumstances, the base and collector would act as a reverse-biased diode, and the collector current I_c would equal the reverse saturation current I_{CO}. If $I_E \neq 0$, then, from figure, we note that

$$I_c = I_{co} - I_{pC}$$

For a p-n-p transistor, I_{co} consists of holes moving across J_c from left to right (base to collector) and electrons crossing J_c in the opposite direction. Since the assumed reference direction for I_{co} in figure is from right to left, then for a p-n-p transistor, I_{co} is negative. For an n-p-n transistor, I_{co} is positive.

transistor as an amplifier

Transistor has property that after cut in voltage a small change in input voltage results large change in input current. As we know that output current is dc current current gain times of the input current so this large current flows through load resistance results amplified output voltage