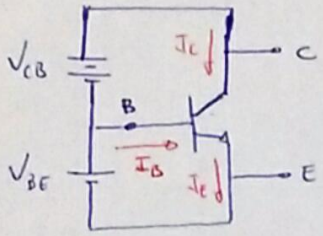
→ Podemos resumir as relações de corrente do transistor Bipolar em região ativa direta ($V_{BE} > 0$ e $V_{CB} > 0$) por:



$$I_C = I_S \cdot \exp\left(\frac{V_{BE}}{V_T}\right)$$

$$I_B = \frac{I_C}{\beta} = \frac{I_S}{\beta} \exp\left(\frac{V_{BE}}{V_T}\right)$$

$$\boxed{\alpha_f = \frac{\beta}{\beta + 1}}$$

α_f é o ganho de corrente base comum $\left(\frac{I_C}{I_E} < 1\right)$

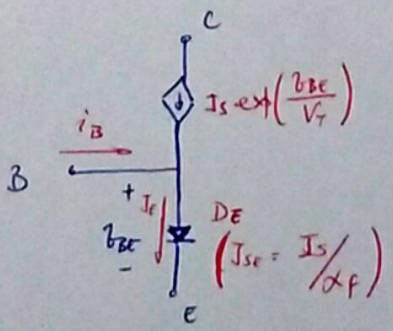
$$I_E = I_C + I_B$$

$$I_E = I_C + \frac{I_C}{\beta}$$

$$I_E = \left(1 + \frac{1}{\beta}\right) I_C$$

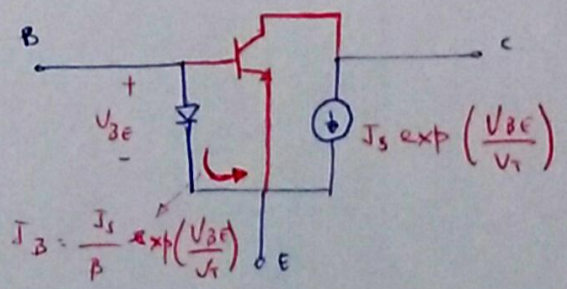
$$\boxed{I_E = \frac{\beta + 1}{\beta} I_C}$$

Modelos não-lineares do transistor bipolar devem ser utilizados. Dentre eles:



$$I_C = I_S \exp\left(\frac{V_{BE}}{V_T}\right)$$

$$I_E = \frac{I_S}{\alpha_f} \exp\left(\frac{V_{BE}}{V_T}\right)$$



$$I_C = I_S \exp\left(\frac{V_{BE}}{V_T}\right)$$

$$I_B = \frac{I_S}{\beta} \exp\left(\frac{V_{BE}}{V_T}\right)$$