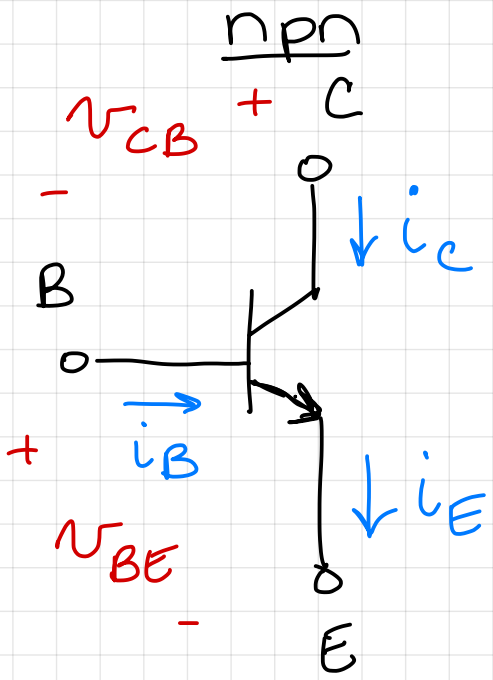
BJT Operation / DC Biasing



$$i_C = I_S \exp\left(\frac{v_{BE}}{V_T}\right)$$

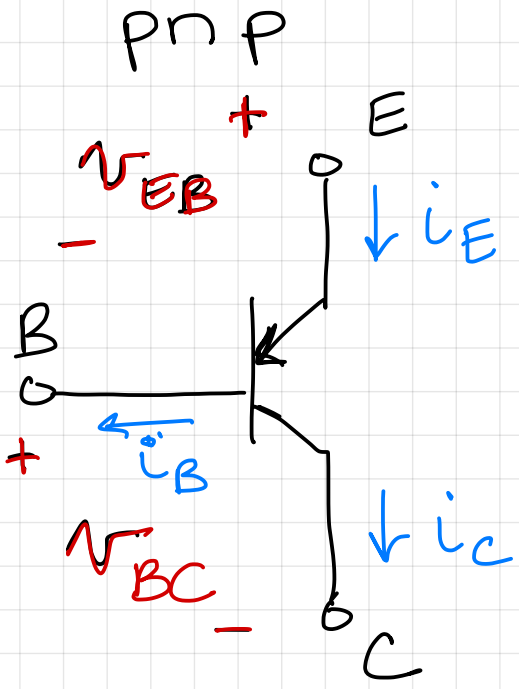
$$i_B = \frac{i_C}{\beta}$$

$$i_E = i_B + i_C$$

$$i_C = \alpha i_E$$

$$\beta = \frac{\alpha}{\alpha - 1} \qquad \alpha = \frac{\beta}{\beta + 1}$$

active $\quad v_{BE} > 0 \quad v_{CB} > -0.4\,V$



$$i_C = I_S \exp(v_{EB}/V_T)$$

$$i_C + i_B = i_E$$

$$i_B = \frac{i_C}{\beta} \qquad \beta = \frac{\alpha}{1-\alpha}$$

$$i_C = \alpha\, i_E \qquad \alpha = \frac{\beta}{\beta+1}$$

active mode $\quad v_{EB} > 0$

$v_{BC} > -0.4V$