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* $I_E = I_C + I_B$
* $I_C = \beta \cdot I_B$
* $I_E = \beta \cdot I_B + I_B$
* $I_E = (\beta + 1) I_B$
* $\beta >> 1$
* $I_E \cong \beta I_B \cong I_C$

$$\alpha = \frac{I_C}{I_E}$$

$$\alpha = \frac{\beta \cancel{I_B}}{(\beta+1)\cancel{I_B}}$$

* $$\boxed{\alpha = \frac{\beta}{\beta+1}} < 1$$

$$\alpha\beta + \alpha = \beta$$

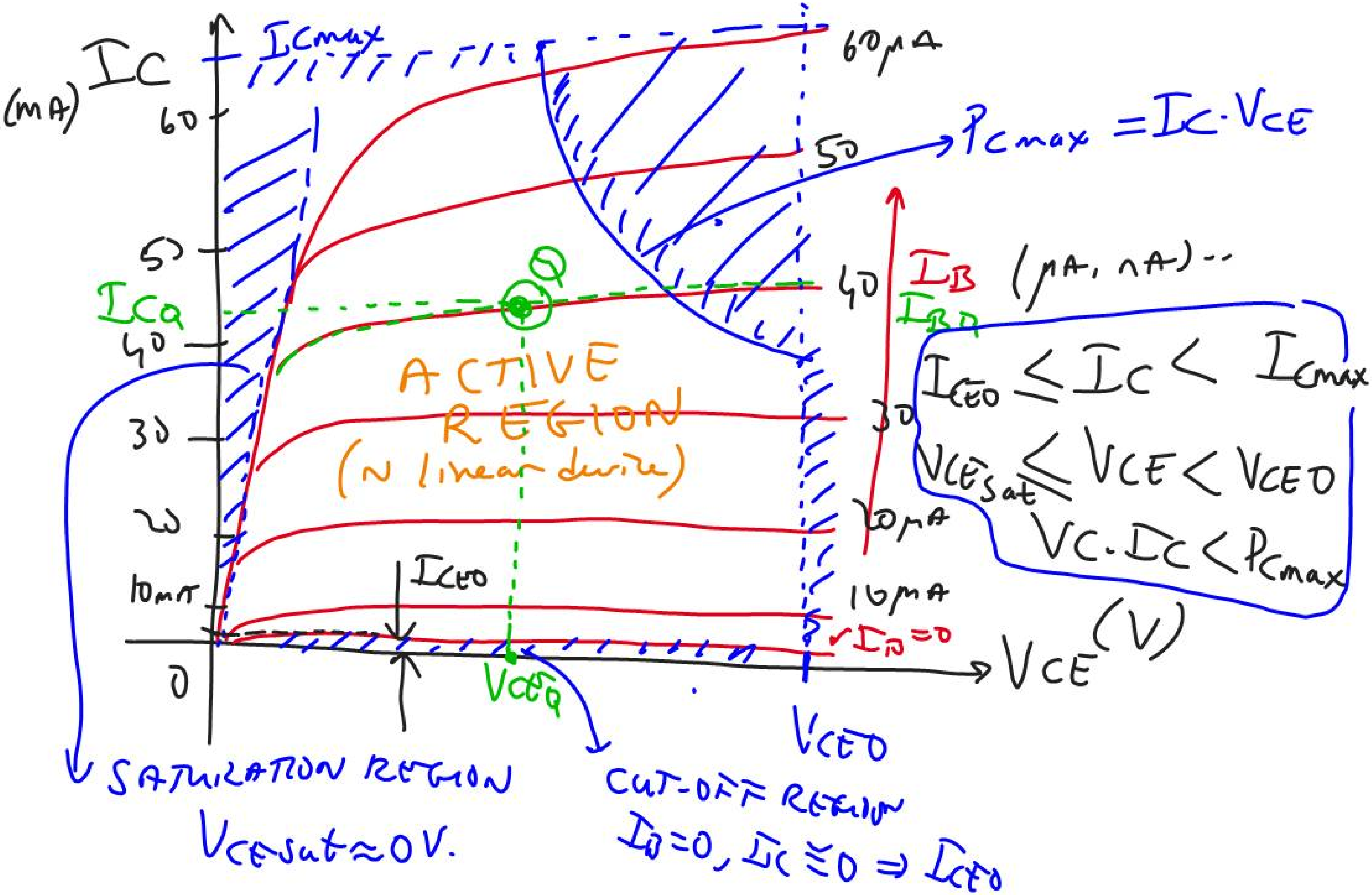
$$\alpha\beta - \beta = -\alpha$$

$$\beta - \alpha\beta = \alpha$$

$$\beta(1-\alpha) = \alpha$$

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

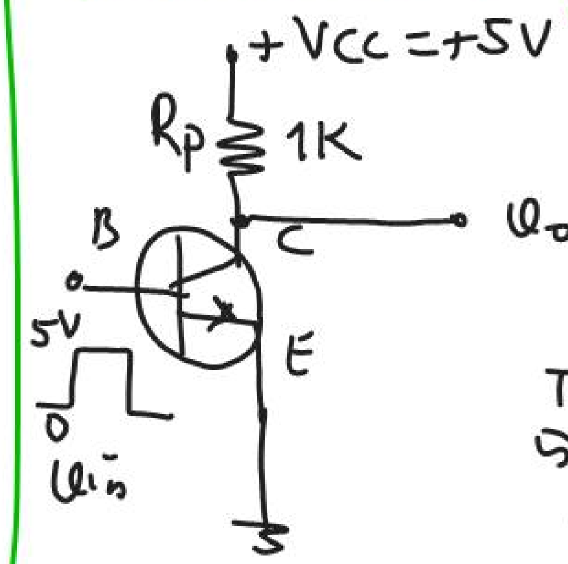
DC BIASING the BJTs



Biasing ⇒ is made to make the BJT operate in the desired operating point
⇓
the quiescent point (Q)

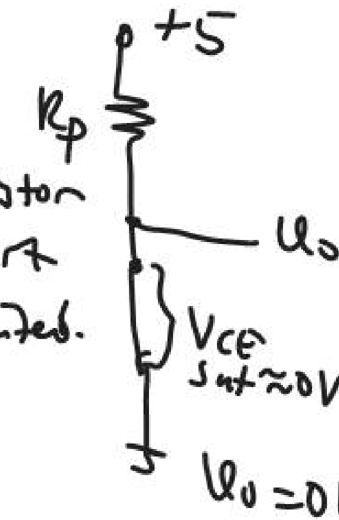
In active area we use transistors as Linear Devices to amplify the small signals. (to some extent)

Nonlinear Operation of a Transistors ⇒ Transistor as a SWITCH for example.



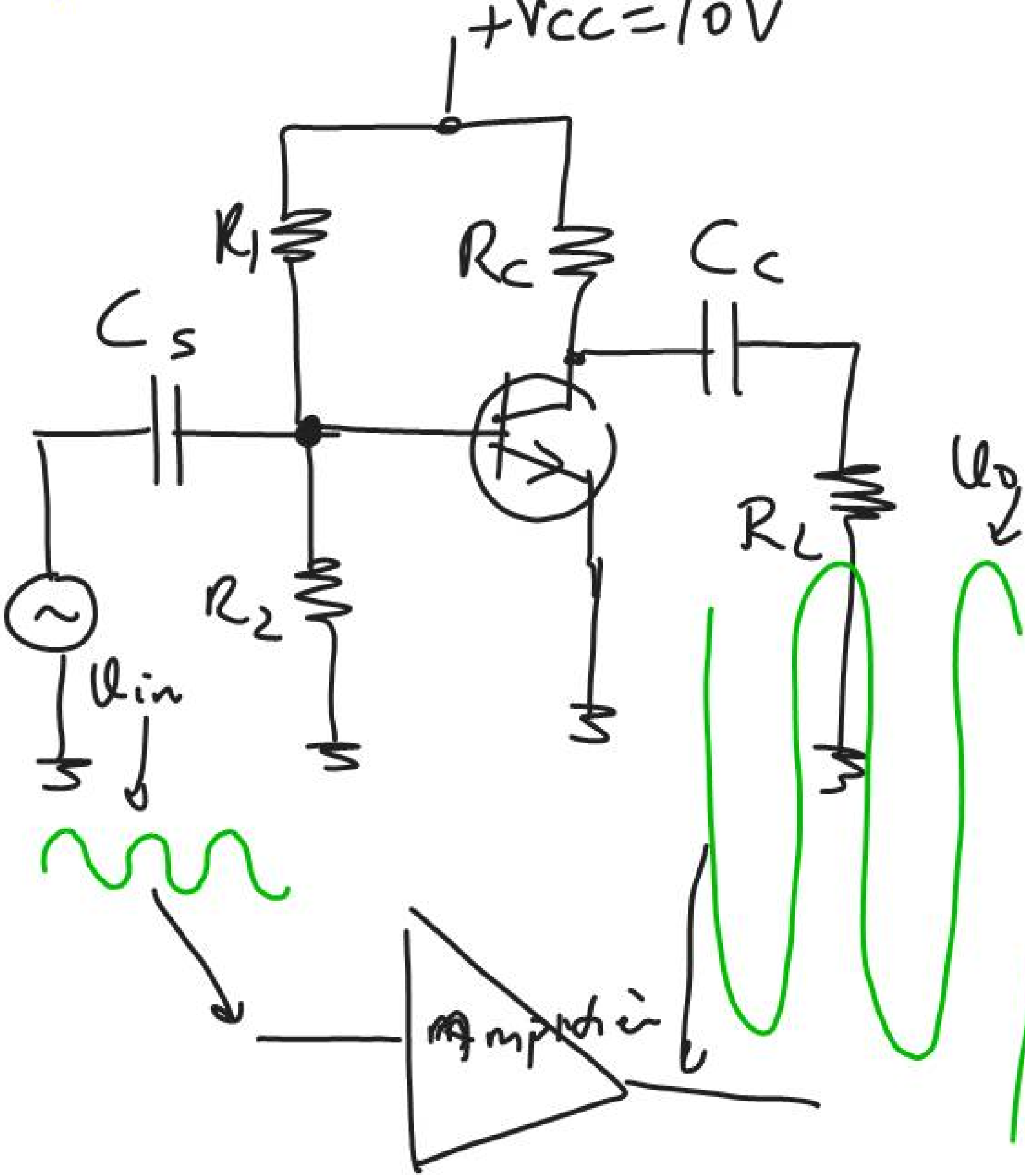
when $v_{in} = 5V$

Transistor is short circuited.



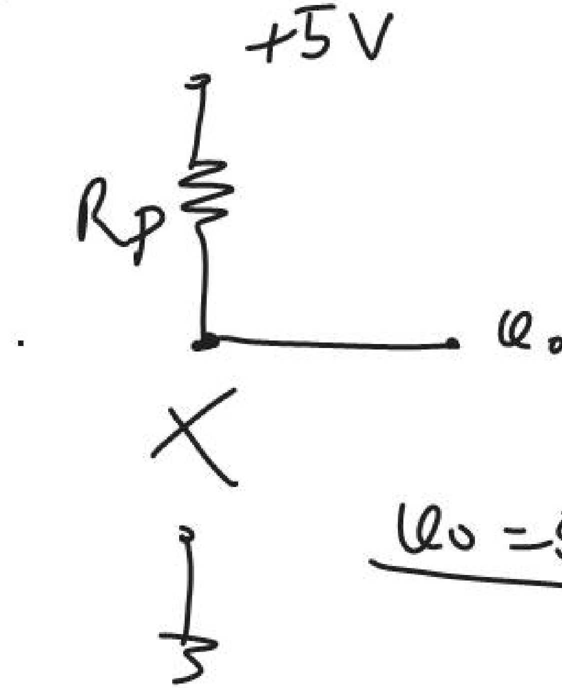
For linear operation

The transistors as an <u>amplifier</u>

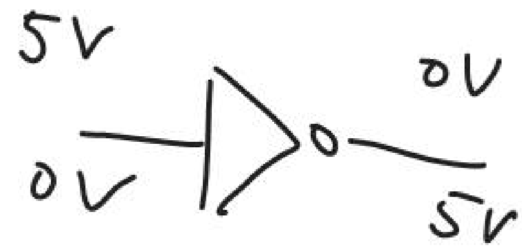


When $v_{in} = 0V$

The transistor goes into CUTOFF region → $I_C = 0$



$v_o = 5V$



"0" → "1"

"1" → "0"