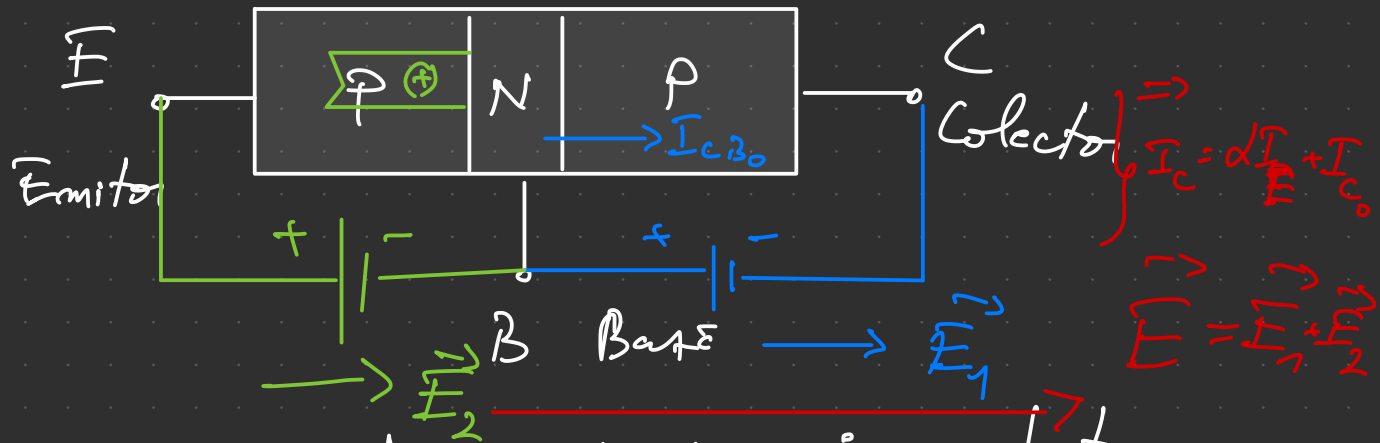


Tranzistorul Bipolar



Emitor \rightarrow puternic dopat cu impurități
 Colector \rightarrow slab —||—
 Baza \rightarrow slab —||— ; dimensiune foarte mică

$E \rightarrow C \rightarrow$ funcționare

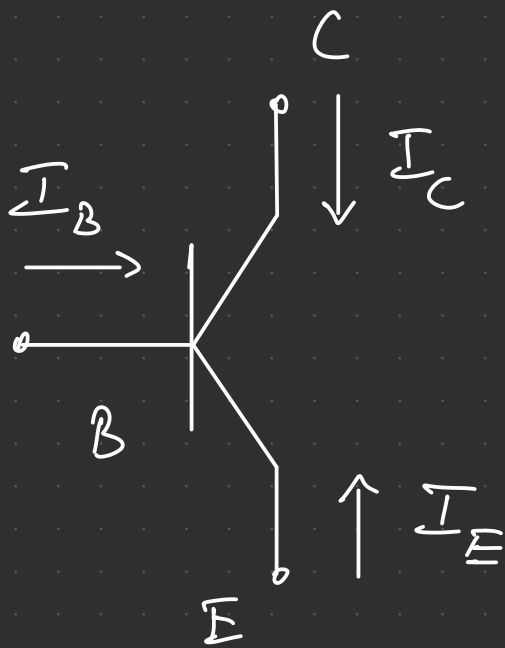
a) polarizare inversă j.c.

I_{C0} \rightarrow curent colector - bază residual
 (sarcini minoritare din B)

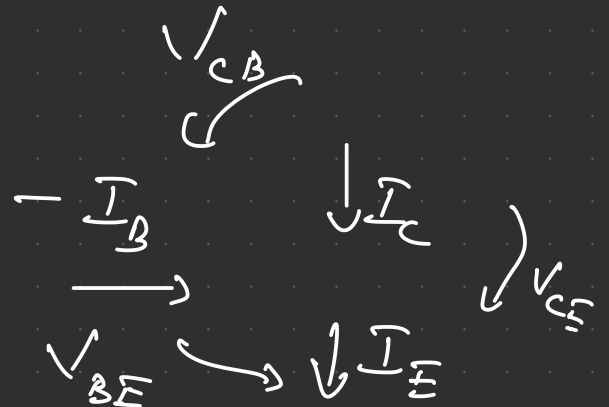
b) polarizare directă j.e

$$I_C = \alpha I_E + I_{C0}$$

$$\alpha = 0,98 \div 0,99$$



$$I_E + I_C + I_B = 0$$

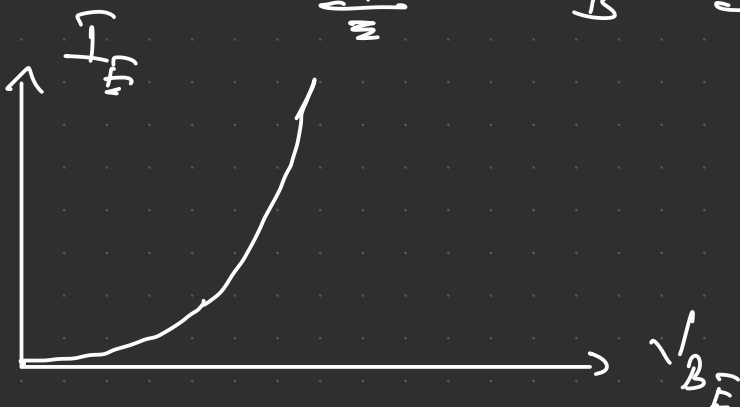
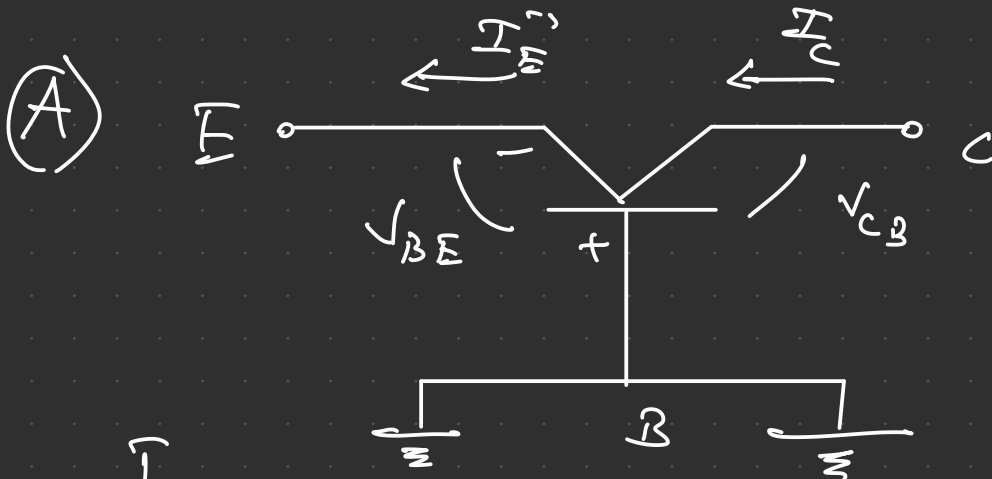
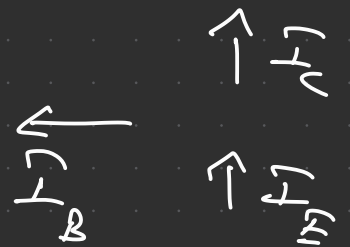


a) NPN

$$\rightarrow I_E = I_C + I_B$$

b) PNP

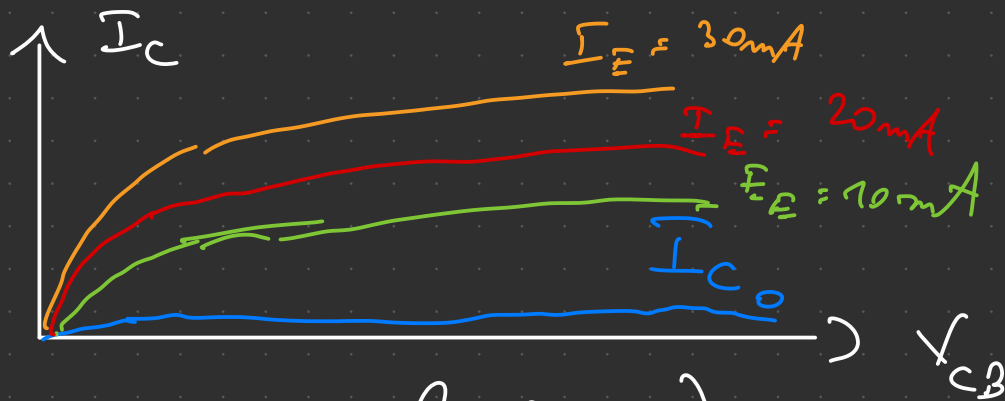
$$\rightarrow I_E = I_C + I_B$$



Characteristics
Volt - Amper

$$I_E = f(V_{BE})$$

(caracteristică de intrare a tranzistorului)



$$I_C = f(V_{CB})$$

$$\frac{I_C}{I_B} = \beta \rightarrow \text{factor de amplificare}$$

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

$|_{\text{pt } V_{BC} = 0}$

Relatii fundamentale

$$(1) \quad I_C = \alpha I_E + I_{C0}$$

$$(2) \quad I_E = I_C + I_B$$

$$(3) \quad \alpha = \frac{\beta}{1 + \beta}$$

$$(4) \quad \beta = \frac{\alpha}{1 - \alpha}$$

$$\frac{I_C}{I_C} = 1 + \frac{I_B}{I_C} \rightarrow \frac{1}{\alpha} = 1 + \frac{1}{\beta}$$

$$(1) \quad I_E = f(V_{BE}) \quad \text{c. int } (BC)$$

$$(2) \quad I_C = f(V_{CB}) \quad \text{c. ieșire } (BC)$$

$$(3) \quad I_B = f(V_{BE}) \quad \text{c. int. } (EC)$$

$$(4) \quad I_C = f(V_{CE}) \quad \text{c. ieșire } (EC)$$

\rightarrow generarea curentului de colector

Regimul de funcționare

dispozitiv cu 2 joncțiuni:

I_E I_C (polarizate direct și invers) \rightarrow 4 regimuri fct.

a) pol. inv. inv. \rightarrow regim blocat
 \rightarrow comutator deschis $I_C = I_{C0} [\mu A \div 10 nA]$

$$I_C = \min, I_{CE} = \max$$

b) pol. direct inv. \rightarrow regim normal

- (A) repetor pe emitor (BC)
 $I_C \approx \alpha I_E \approx I_E$
- (B) amplificator (EC)
 $I_C = \beta I_B$

$$\beta \gg 1$$

c) pol. direct direct \rightarrow saturat
 \rightarrow se comportă ca o rezistență \rightarrow

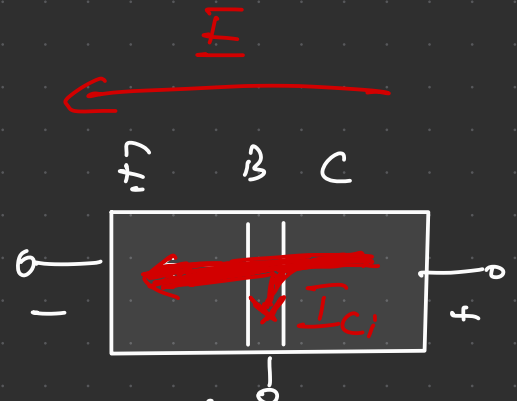
$$\begin{cases} V_{CEs} \approx 0,1 V \text{ (constantă } \rightarrow \text{ min-limit)} \\ I_C = I_{Cs} \text{ (max-limit)} \\ V_{BE} = V_{BES} (\sim 0,7 V) \end{cases}$$

→ face ca tranzistorul să lucreze ca un comutator închis

$$I_C = \max$$

$$V_{CE} = \min$$

$$R_{CE} = \min$$



d) pol. inversă directă

→ colecatorul schimbă rolul cu emitorul

$$I_{E_i} = \alpha_i \cdot I_{C_i} + I_{C_0} \quad \alpha_i = 0,4 \div 0,5$$

→ regim invers, tranzistor → atenuator de curent