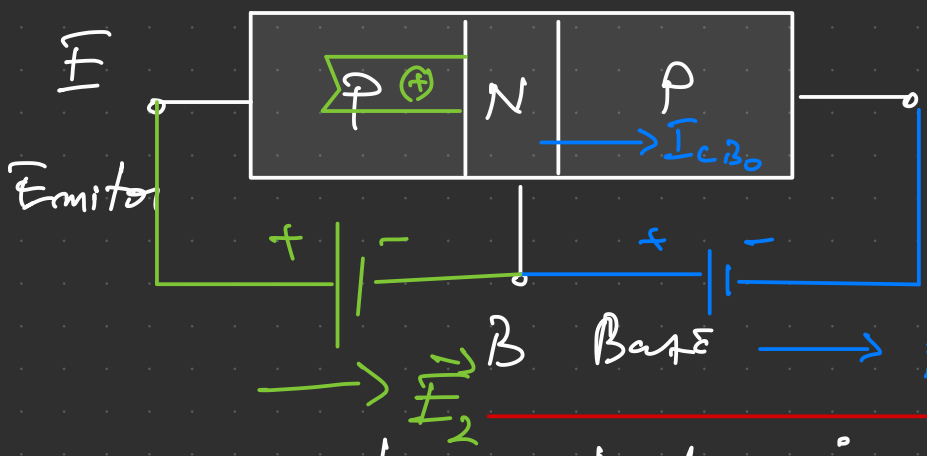
Tranzistorul Bipolar



$\Rightarrow I_C = \alpha I_E + I_{C_0}$

$\vec{E} = \vec{E}_1 + \vec{E}_2$

Emitor -> puternic dopat cu impurități

Colector -> slab -11-

Bază -> slab -11- și dimensiune foarte mică

E → C -> joncțiune

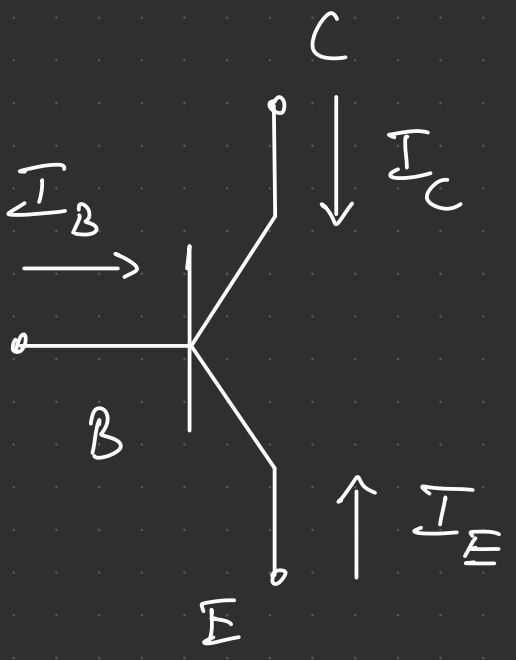
a) polarizare inversă jC.

I_{CB_0} -> curent colector - bază rezidual (sarcini minoritare din B)

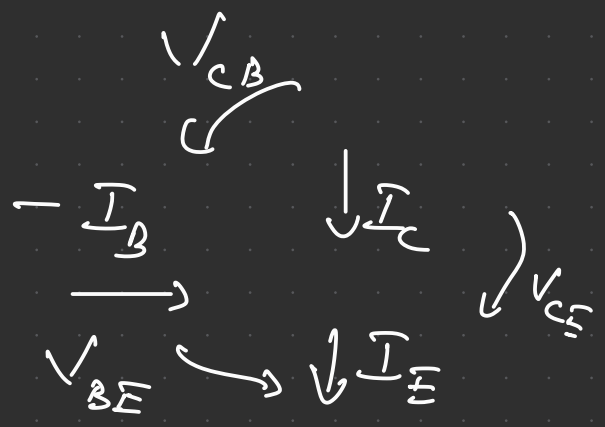
b) polarizare directă jE

$$I_C = \alpha I_E + I_{C_0}$$

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

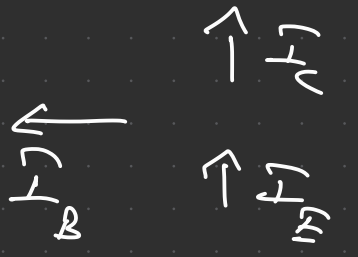


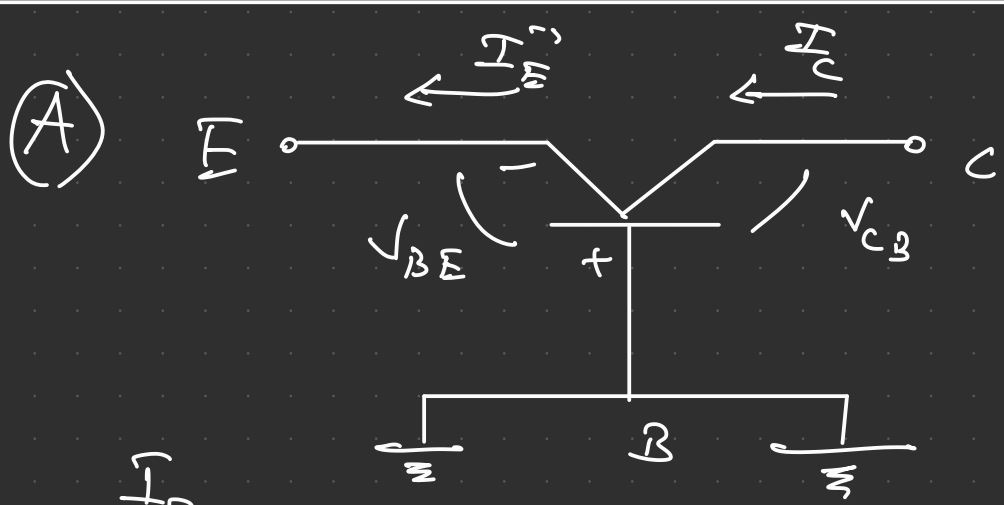
$$I_E + I_C + I_B = 0$$

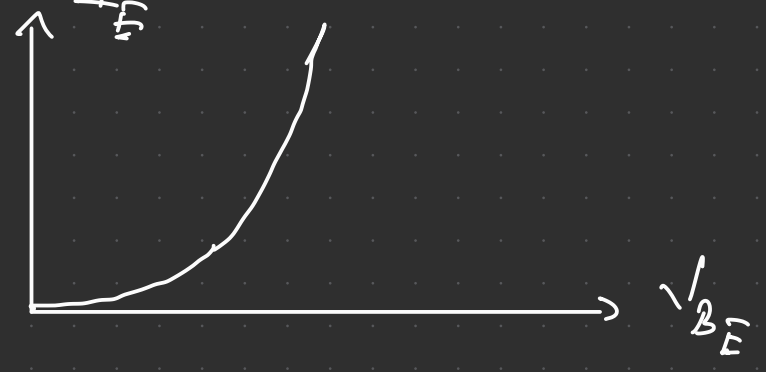


a) NPN → $I_E = I_C + I_B$

b) PNP → $I_E = I_C + I_B$



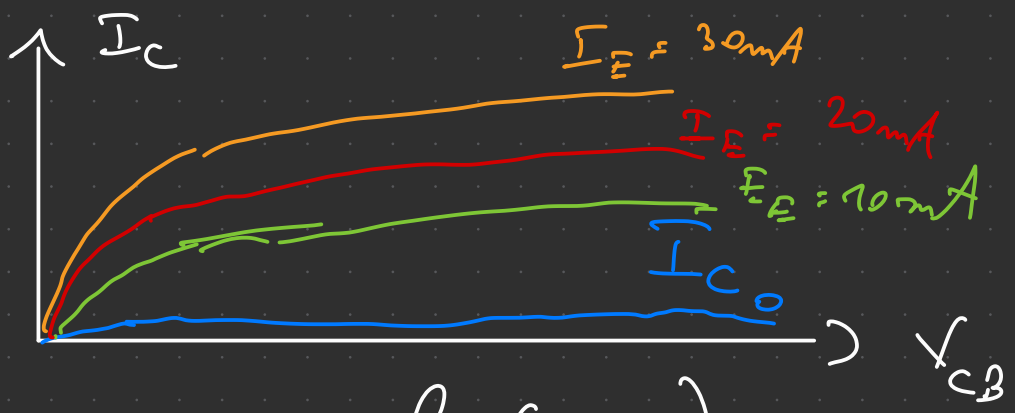




Caracteristica Volt - Amper

$I_E = f(V_{BE})$

(caracteristică de intrare a tranzistorului)



$I_C = f(V_{CB})$

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

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

$I_{pt}\ V_{BC} = ct$

Relații fundamentale

(1) $I_C = \alpha I_E + I_{C_0}$

(2) $I_E = I_C + I_B$

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

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

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(1) $I_E = f(V_{BE})$ C. int (BC)

(2) $I_C = f(V_{CB})$ C. ieșire (BC)

(3) $I_B = f(V_{BE})$ C int. (EC)

(4) $I_C = f(V_{CE})$ C ieșire (EC)

→ generează curentul de colector

Regimul de funcționare

dispozitiv cu 2 joncțiuni (polarizate direct și invers)

J_E J_C → 4 regimuri fct.

a) pol. inv. inv. → regim blocat
→ comutator deschis
$I_C = I_{C_0}$ [$\mu A \div 10 mA$]
$I_C = min$, $R_{CE} = max$

b) pol. direct inv. → regim normal

(A) repetor pe emitor (BC)
$I_C \simeq \alpha I_E$ $\alpha \sim 1$

(B) amplificator (EC)
$I_C = \beta I_B$
$\beta >> 1$

c) pol. direct direct → saturat
→ se comportă ca o rezistență

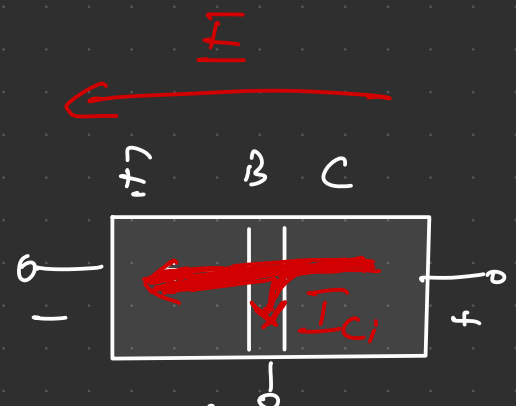
$V_{CE_S} \sim 0,1 V$ (constantă → min-limit)
$I_C = I_{C_S}$ (max-limit)
$V_{BE} = V_{BE_S}$ ($\sim 0,75 V$)

-> face ca tranzistorul să lucreze ca un comutator închis

I_C = max

V_{CE} = min

R_{CE} = min



d) pol. inversă directă

-> colectorul schimbă rolul cu emitorul

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

-> regim invers, tranzistor = atenuator de curent