Laborator nr. 4 FIZ :

Tranzistorul cu efect de câmp (TEC)

- controlăm un curent I_D folosind o tensiune V_G
- dispozitiv comandat în tensiune

FET → „field-effect transistor".

TEC cu joncțiune (TEC J, JFET)
- cu canal n
- cu canal p

„depletion-mode" (în regim de sărăcire)

TEC de tip MOS („metal-oxide-semiconductor")
- cu canal inițial
- cu canal indus

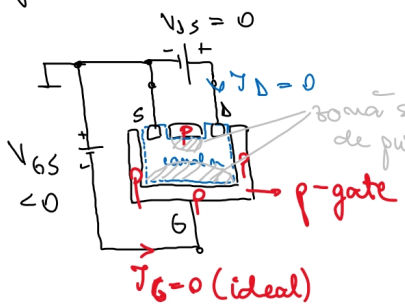
MOSFET

„enhancement-mode" (în regim de îmbogățire)

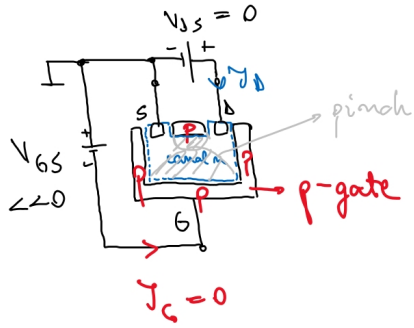
FET → limitează valoarea curentului de drenă I_D

JFET:

JFET cu canal n

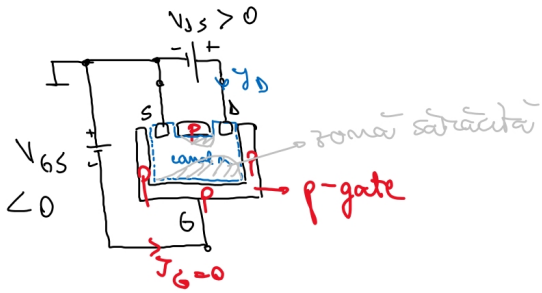


D - dreană ("drain")
S - sursă ("source")
G - gate (grilă)



$\Rightarrow I_D = 0$

↳ pinch-off voltage V_T, V_p.



$$I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_T}\right)^2$$

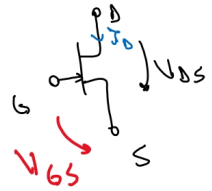
I_{DSS}, V_T - tabelate (datasheet)

↓

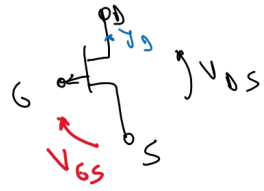
curent I_D de saturație

simboluri JFET

cu canal n



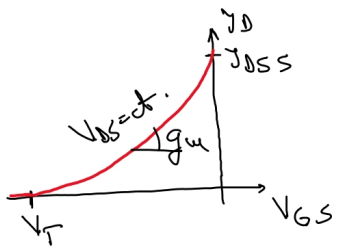
cu canal p

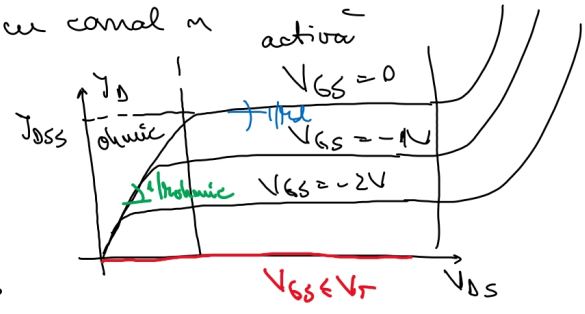


$V_{GS} = 0 \Rightarrow I_D = I_{DSS}$

$V_{GS} = V_T \Rightarrow I_D = 0$

Caracteristici JFET cu canal n





(străpungere)

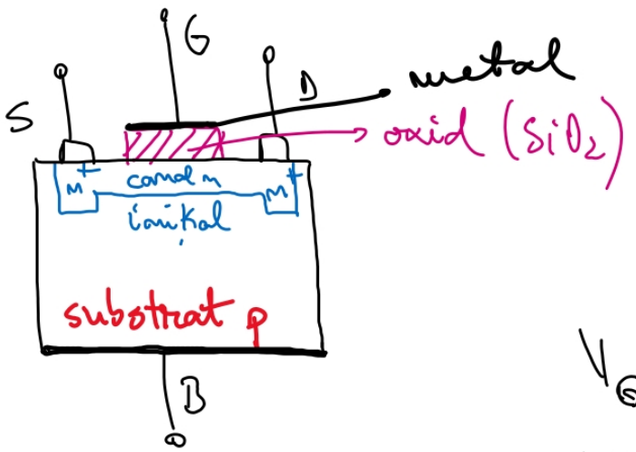
parametrii de semnal mic ai FET

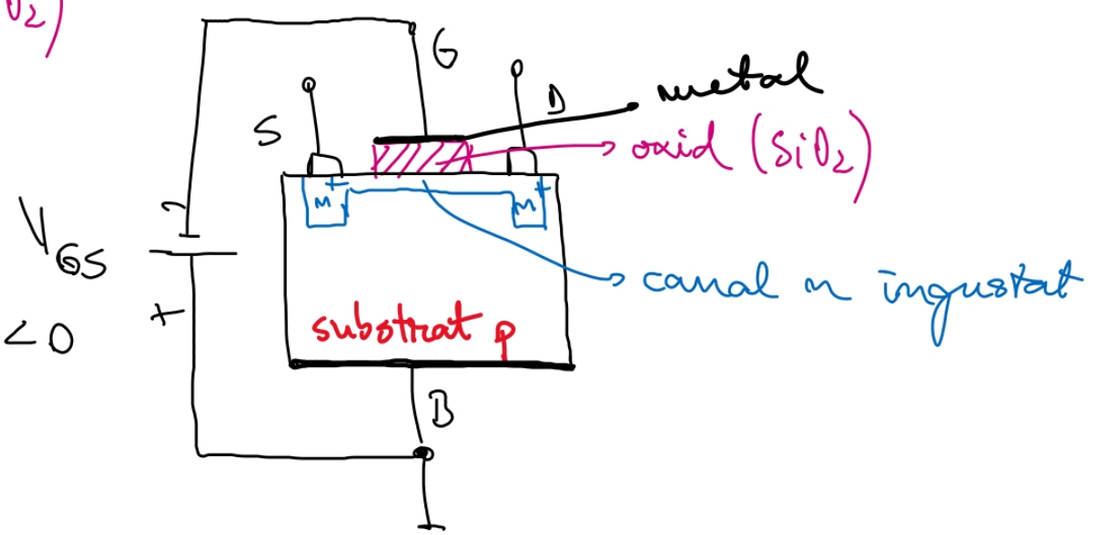
$$g_m = \left.\frac{\partial I_D}{\partial V_{GS}}\right|_{V_{DS}=ct.}$$

$$r_{d,\,ohmic} = \left.\frac{\partial V_{DS}}{\partial I_D}\right|_{V_{GS}=ct.}$$

MOSFET cu canal inițial: (mai rar)

MOSFET → canal – f. mică (câțiva ohmi)
Rin – f. mare

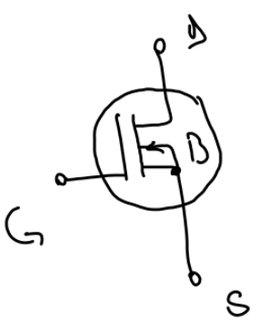




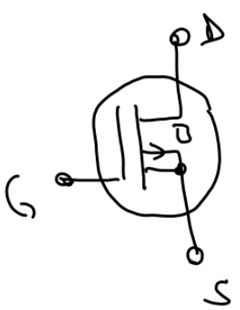
normally ON

caract. MOSFET cu canal inițial ≡ JFET.

simboluri MOSFET cu canal inițial:



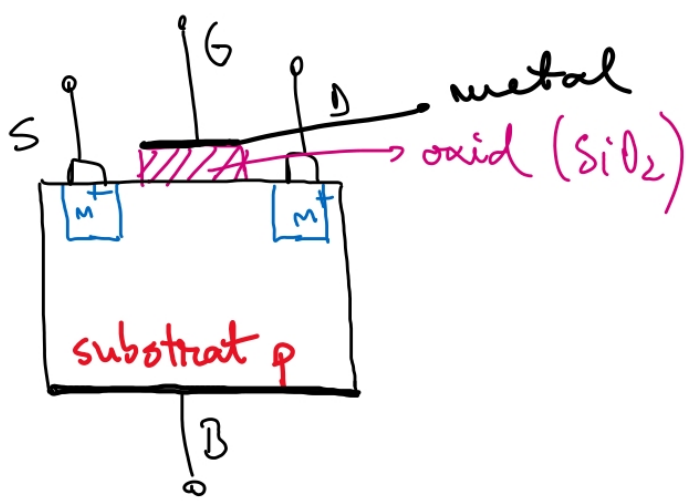
cu canal n

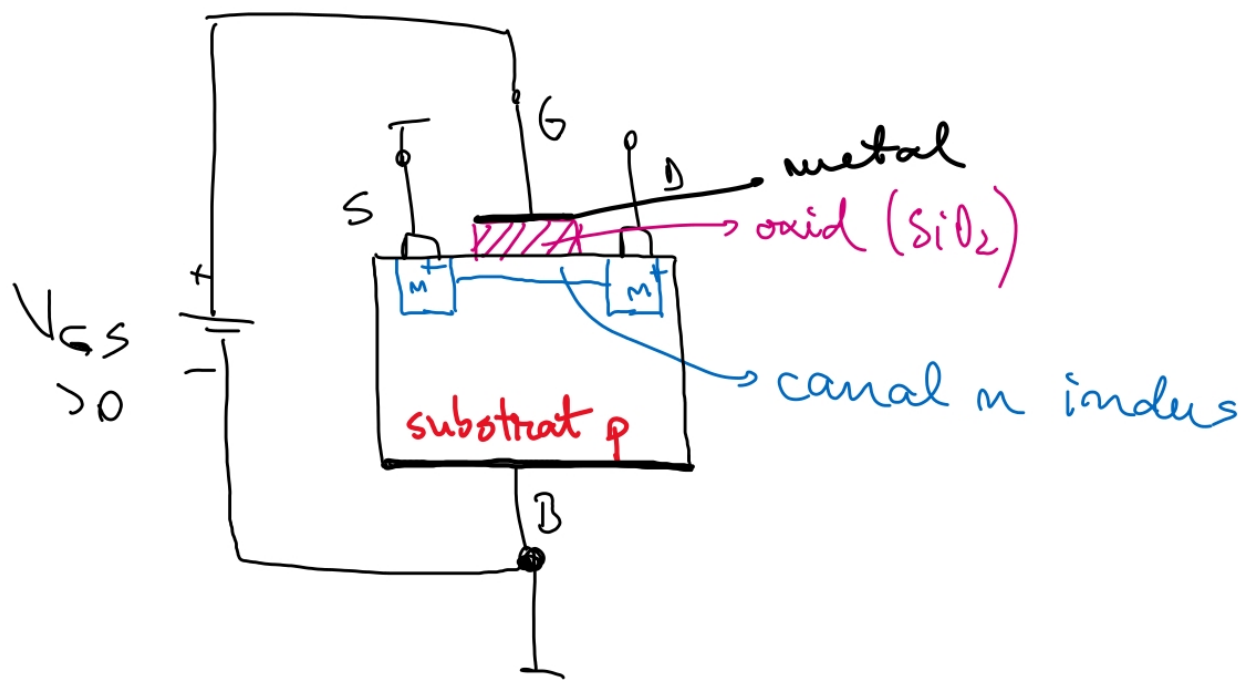


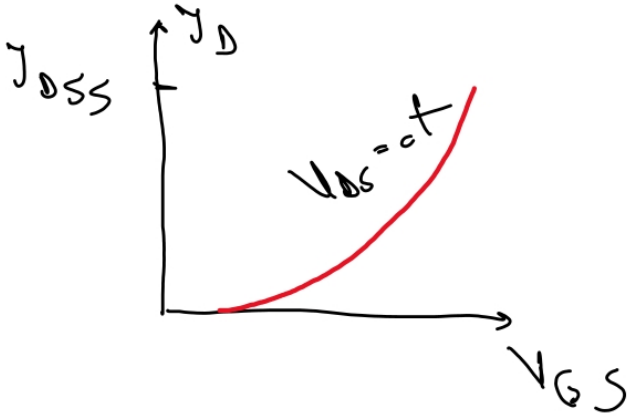
cu canal p

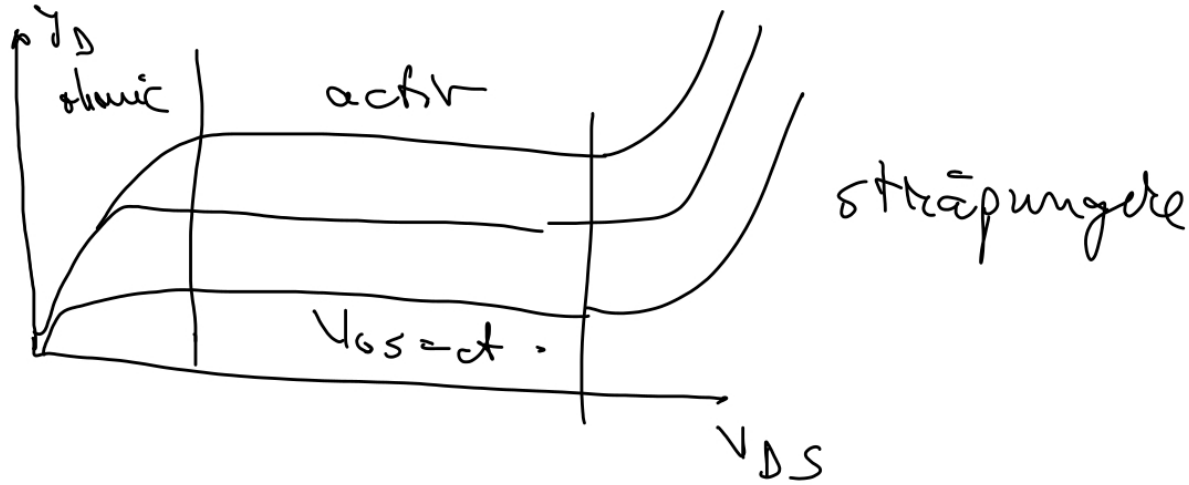
MOSFET cu canal indus:

"normally OFF"



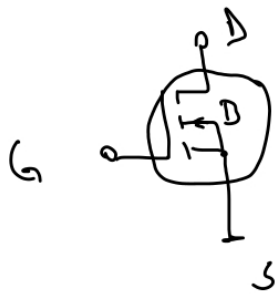




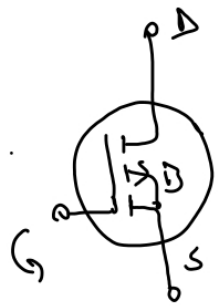


străpungere

simboluri

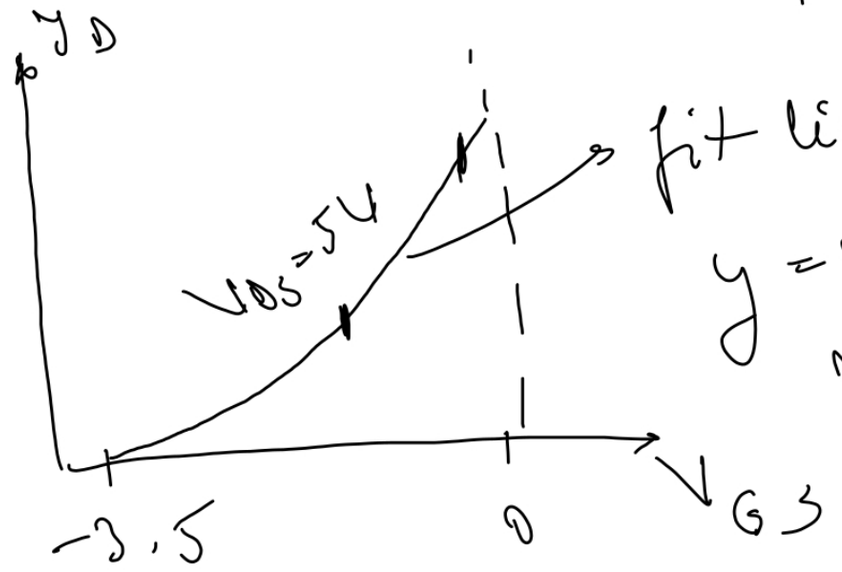


cu canal n



cu canal p

V_{GS} (V)	$V_{DS} = 5V$ I_D (mA)	$V_{DS} = 10V$ I_D (mA)
0	11.958	11.994
-0.1	11.555	11.59
⋮	⋮	⋮
-3.5	0	0



fit liniar

$y = mx + n$

$m = g_m \cdot p.t.$ $V_{DS}=5V$