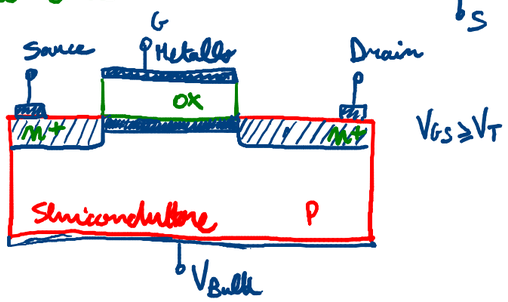
FET Field Effect Transistor

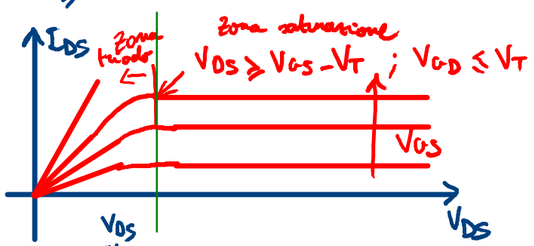
MOS FET
Metal Oxide Semiconductor

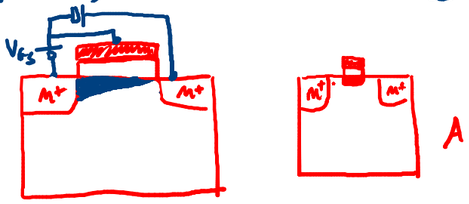


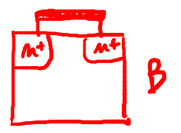
$V_{GS} \geq V_T$

$V_{GS} < V_T$ $I_{DS} = 0\ A$: Interdizione

$V_{GS} \geq V_T$ Inversione







$V_{DS} \geq V_T$

$V_{DS} < V_{GS} - V_T$ $I_{DS} = \mu_n C_{ox} \frac{W}{2L} V_{DS} \left(V_{GS} + V_{GD} - 2V_T\right)$

$= \mu_n C_{ox} \frac{W}{2L} V_{DS} \left(V_{GS} + V_G - V_D - 2V_T\right) =$

$= \mu_n C_{ox} \frac{W}{2L} V_{DS} \left(V_{GS} + V_G - V_S + V_S - V_D - 2V_T\right)$

$= \mu_n C_{ox} \frac{W}{2L} V_{DS} \left(2V_{GS} - V_{DS} - 2V_T\right)$

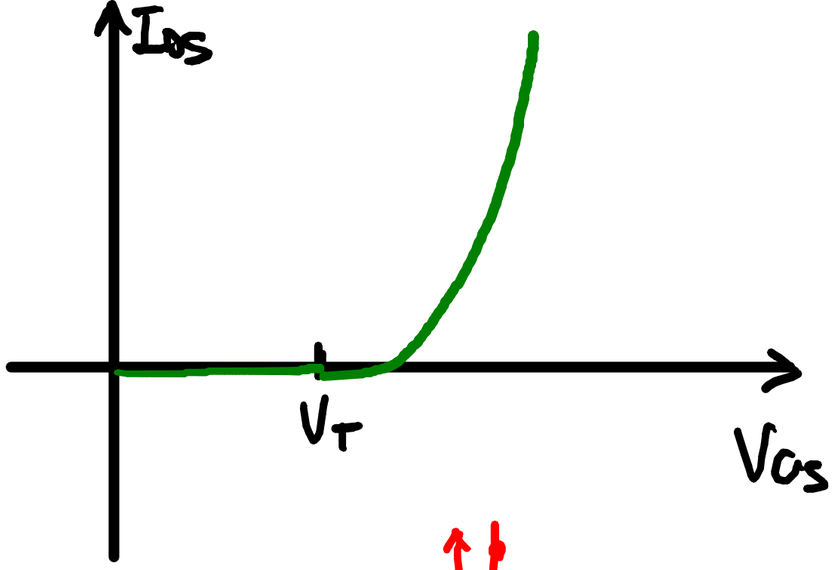
$= \mu_n C_{ox} \frac{W}{2L} \left[2V_{GS}V_{DS} - V_{DS}^2 - 2V_{DS}V_T\right] =$

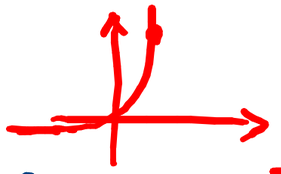
$= \mu_n \frac{C_{ox}}{2L} W \left[2(V_{GS} - V_T)V_{DS} - V_{DS}^2\right] =$

$= \mu_n \frac{C_{ox}}{L} W \left[(V_{GS} - V_T)V_{DS} - \frac{V_{DS}^2}{2}\right]$

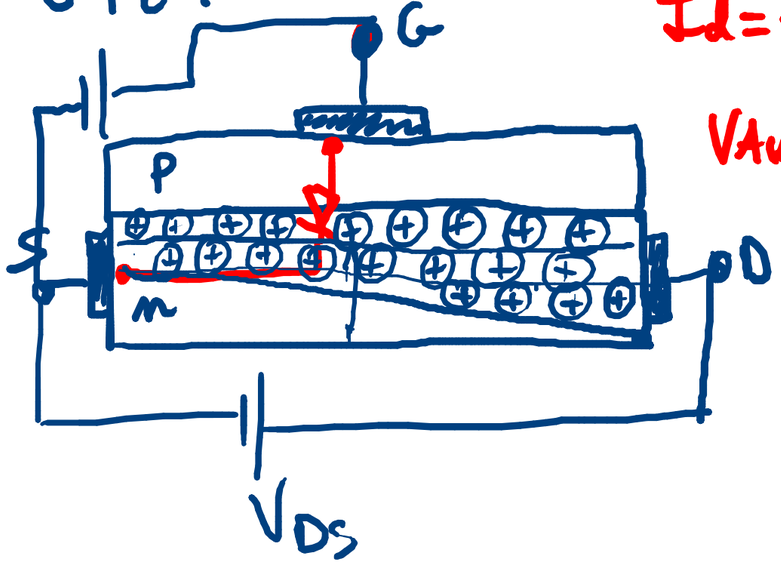
$V_{DS} = V_{GS} - V_T$

$I_{DS} = \mu_n C_{ox} \frac{W}{2L} (V_{GS} - V_T)^2$





JFET



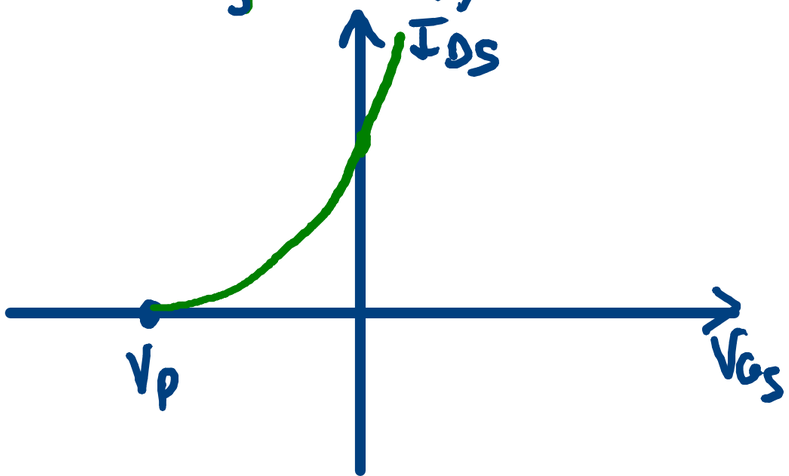
$$I_d = I_S\left(e^{\frac{V_{AK}}{\eta V_T}} - 1\right)$$

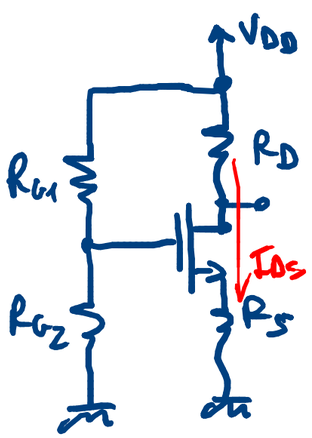
$$V_{AK} = V_{GS}$$

$V_{GS} < 0$

$$I_{DS} = k_j V_{DS}\left(V_{GS} + V_{bi} - 2V_p\right)$$

$$I_{DS} = k_j (V_{GS} - V_p)^2$$





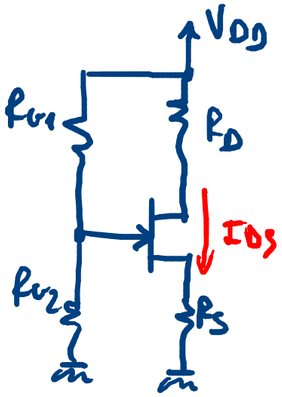
$$V_G = \frac{V_{DD}\, R_{G2}}{R_{G1}+R_{G2}}$$

$$\begin{cases} V_{GS} \geq V_T \\ V_{DS} \geq V_{GS} - V_T \end{cases}$$

$$I_{DS} = \frac{K}{2}(V_{GS}-V_T)^2$$

$I_D = I_S$ perché $I_G = 0A$ $\quad K = \mu_n C_{ox} \frac{W}{L}$

$$\begin{cases} V_{DD} = (R_S + R_D) I_{DS} + V_{DS} \\ I_{DS} = \frac{K}{2}(V_{GS}-V_T)^2 \\ V_G = \frac{R_{G2}}{R_{G1}+R_{G2}} V_{DD} \end{cases}$$

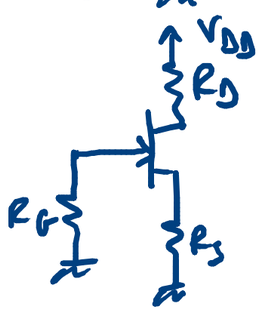


$$V_G = \frac{V_{DD}\, R_{G2}}{R_{G1}+R_{G2}}$$

$$V_{GS} = V_G - V_S$$

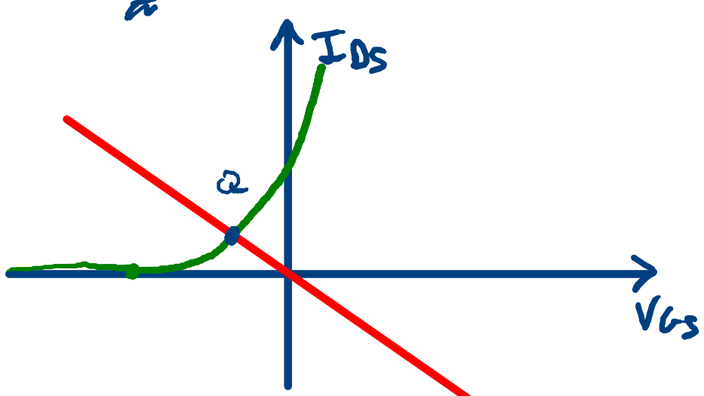
$$V_S = R_S I_{DS}$$

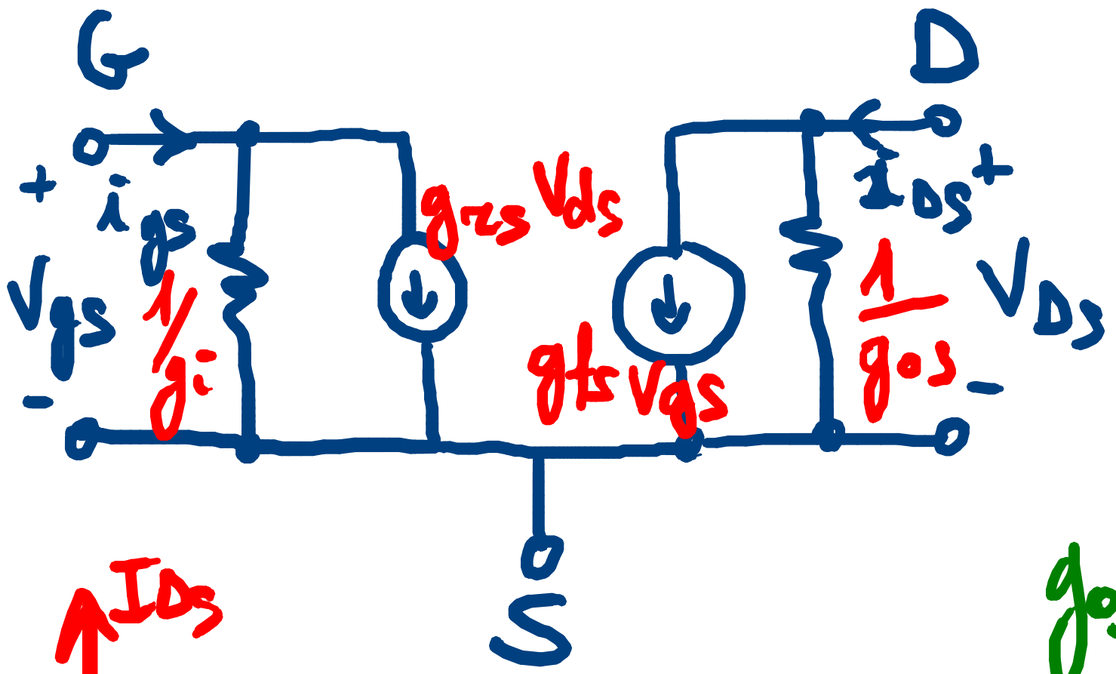
$$V_{GS} = V_G - R_S I_{DS}$$



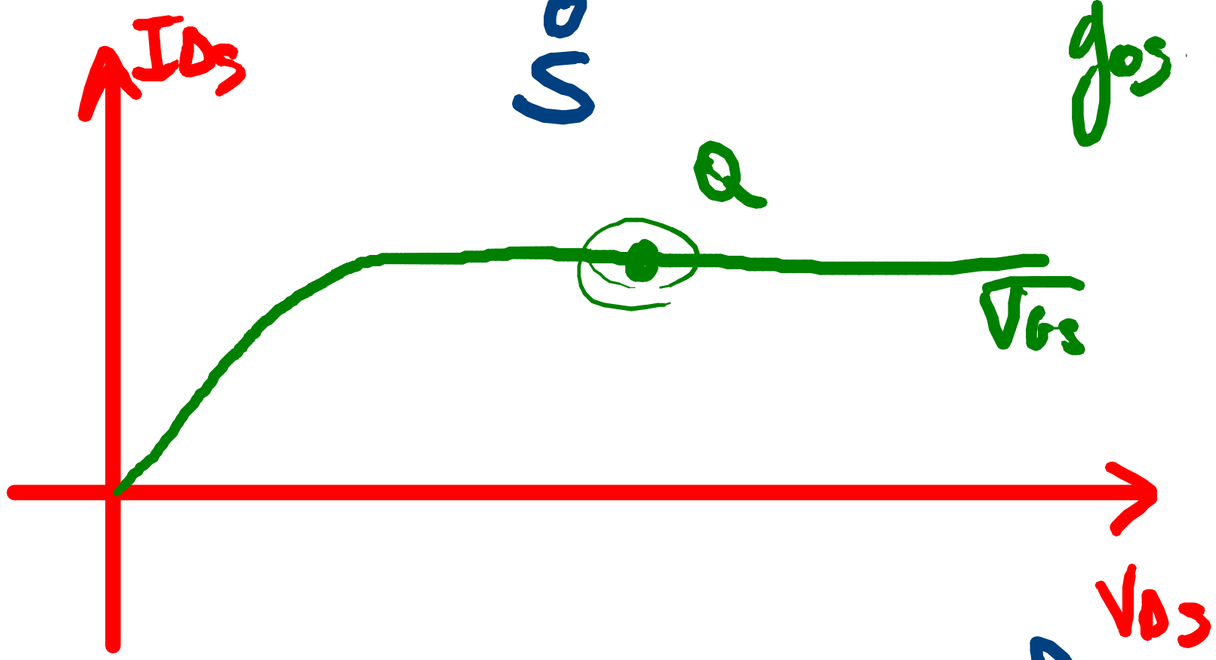
$$V_G = 0V$$

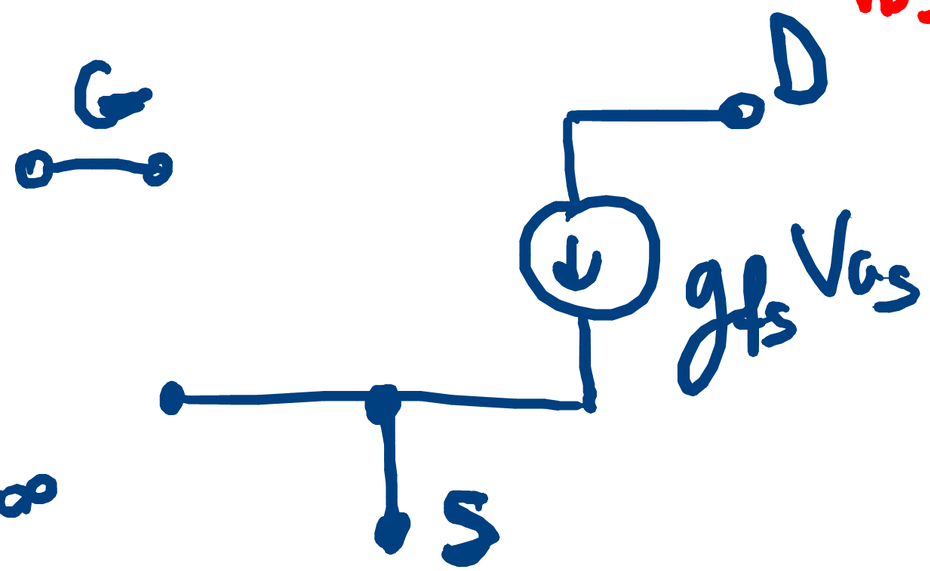
$$V_{GS} = V_G - V_S = -R_S I_{DS}$$





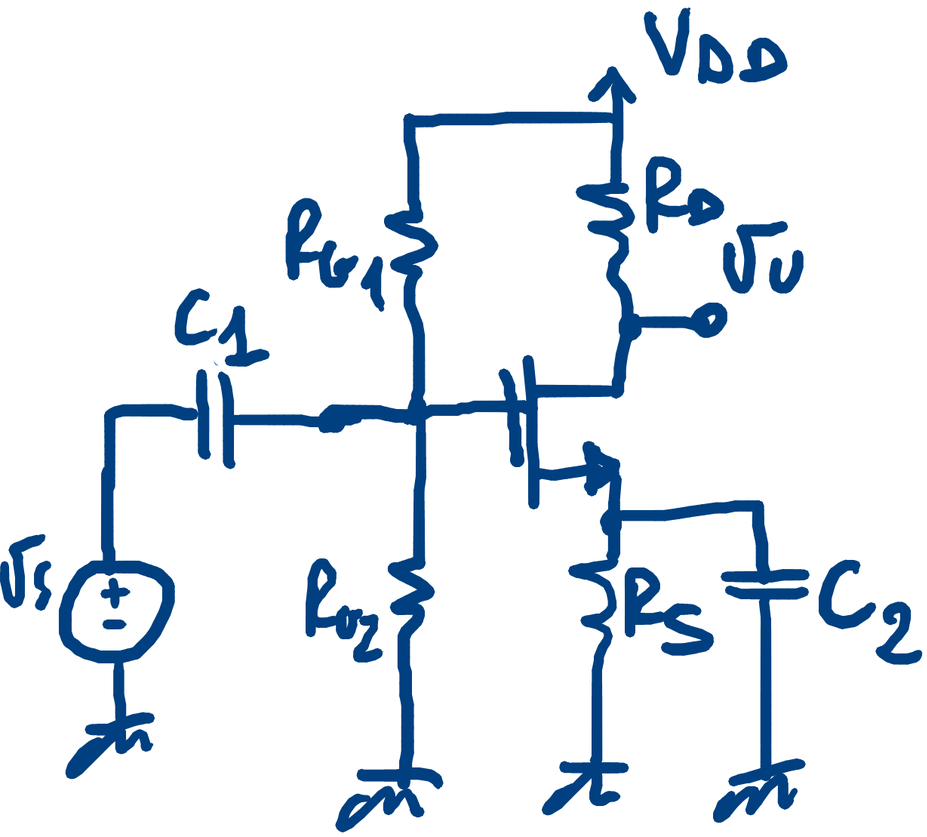
$$g_{os} = \left.\frac{\partial I_{DS}}{\partial V_{DS}}\right|_{V_{GS}}$$

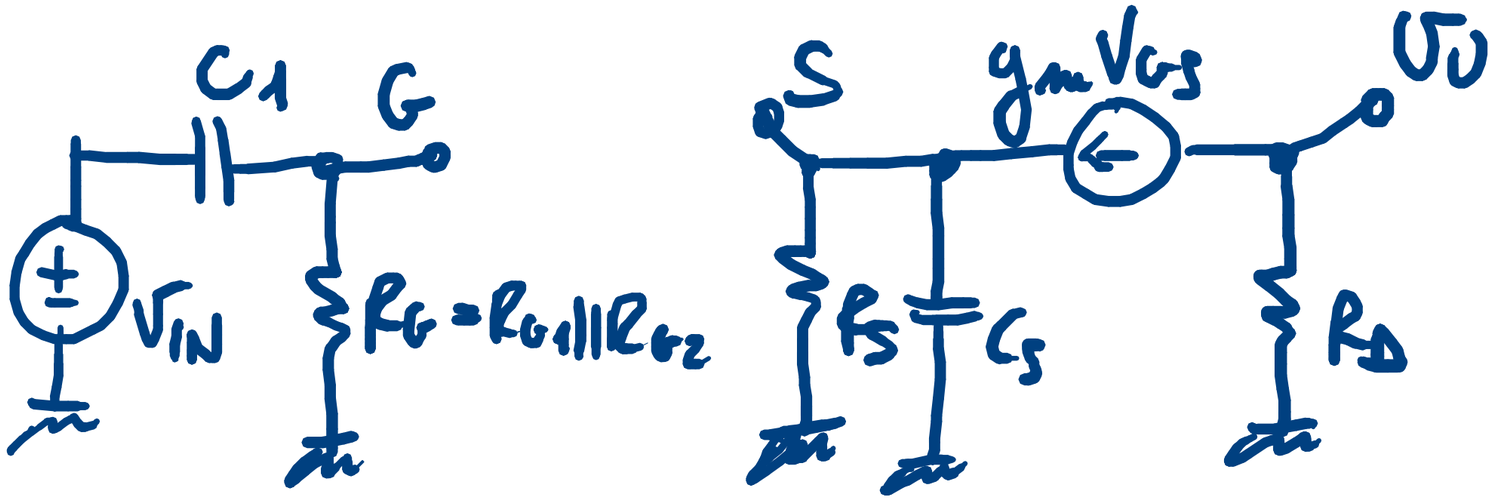




$h_{ie} \to +\infty$

$\frac{h_{fe}}{h_{ie}} \to g_m$





$$A_V(s) = \frac{V_U(s)}{V_{IN}(s)} = \frac{k\,N(s)}{D(s)} = k\,\frac{\prod_{i=1}^{M}(s - s_{0i})}{\prod_{j=1}^{N}(s - s_{pi})}$$