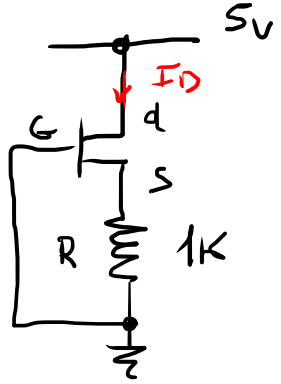
J107 $\quad I_{DSS} = 100\,mA$

$V_{GS\,off} = V_P = -4{,}5\,V \qquad I_D$



$$\rightarrow I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2 = 100m\left(1 + \frac{V_{GS}}{4{,}5}\right)^2$$

$V_{GS} = V_G - V_S = 0 - V_S = -V_S$

$I_D \simeq I_S \qquad V_S = I_D \cdot R \rightsquigarrow I_D = \frac{V_S}{R} = -\frac{V_{GS}}{R}$

$$-\frac{V_{GS}}{R} = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2 \;;\; -\frac{V_{GS}}{R} = I_{DSS}\left(1 + \left(\frac{V_{GS}}{V_P}\right)^2 - 2\cdot\frac{V_{GS}}{V_P}\right)$$

$$I_{DSS} + I_{DSS}\cdot\left(\frac{V_{GS}}{V_P}\right)^2 - 2\frac{V_{GS}}{V_P}\cdot I_{DSS} + \frac{V_{GS}}{R} = 0$$

$$V_{GS}^2 \underbrace{\frac{I_{DSS}}{V_P^2}}_{a} + V_{GS}\underbrace{\left(\frac{1}{R} - 2\frac{V_{GS}}{V_P}\right)}_{b} + \underbrace{I_{DSS}\left(\frac{V_{GS}}{V_P}\right)^2}_{c} = 0$$

$$V_{GS} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \begin{cases} -0{,}49\,V \\ -9{,}5 \end{cases}$$