common source amplifier

- SPICE simulation

$A_{V0} = 4.7$ V/V

$f_{3dB} = 31.52$ MHz

$I_D = I_B = 500\,\mu A$

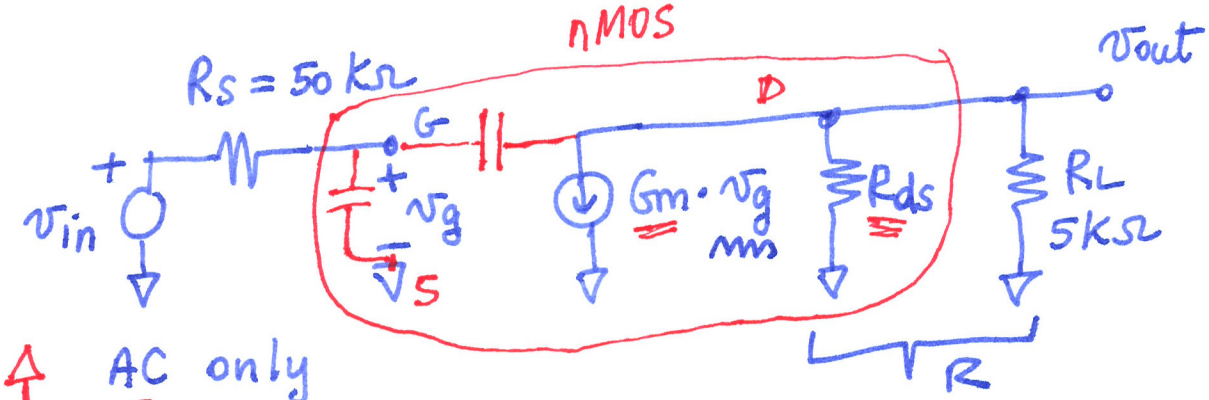
$V_{GS} = 1.39$ V

$V_{th} = 0.5$ V

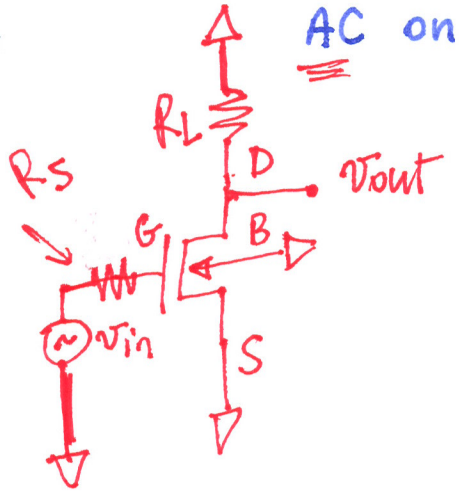
$G_m = 1.12$ mS

$G_{ds} = 40\,\mu S$

$\left(R_{ds} = \frac{1}{G_{ds}} = 25\,k\Omega\right)$



AC only



$$G_m = \frac{2I_D}{V_{GS} - V_{th}} \approx 1.12\,mS$$

$$G_{ds} \approx \lambda \cdot I_D \approx 50\,\mu S$$

$$R_{ds} = \frac{1}{G_{ds}} \approx 20\,k\Omega$$

$$A_{V0} = \left|\frac{v_{out}}{v_{in}}\right| = G_m \cdot R = 1.12\,mS \cdot 4\,k\Omega = \cong 4.48\ V/V$$