0.1   Theory and Procedure

Figure 1: Common-Drain Amplifier
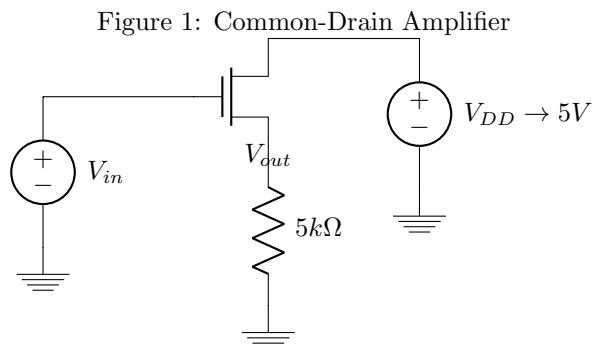

A common-drain amplifier is to be constructed. V_{in} is swept from 0V to 5V. The following is the saturation condition for the NMOS transistor:

$$V_{DS} > V_{GS} - V_T \rightarrow V_D > V_G - V_T \rightarrow V_{in} < 5V + V_T \tag{1}$$

So long as V_{in} stays below 5V and high enough that the MOSFET does not enter the cutoff region, it remains in saturation. So, for small values of V_{in}, the transistor operates in the cutoff region because a current-enabling channel cannot form. Once V_{in} is high enough that the channel can form, the transistor operates in the saturation region due to the high drain voltage "pinching-off" the channel. By design, V_{in} never exceeds 5V. So, the transistor transitions from cutoff to saturation during the DC sweep.
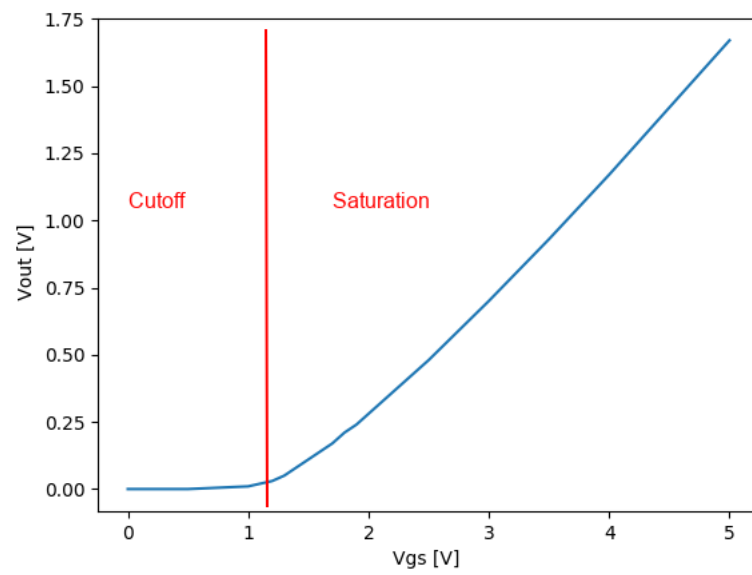
0.2   Results

Figure 2: Common Drain Amplifier Voltage Transfer Characteristic