

EE105 Lab Experiments

Report 9: MOS Characterization and Amplifiers

Solutions

1 Lab Questions

3.1.2 Attach your printout.

3.1.3 Approximately what criterion determines the boundary between saturation and triode?

When V_{DS} is approximately $V_{GS} - V_{TH}$.

3.1.4 Properties (Part 1)

$$g_m = 6.68 \text{ mS}$$

$$r_o = 190 \text{ k}\Omega$$

Region of Operation: Saturation Region

3.1.5 Properties (Part 2)

$$g_m = 2.09 \text{ mS}$$

$$r_o = 333 \text{ }\Omega$$

Region of Operation: Triode Region

3.2.1 Channel Length Modulation Factor

$$\lambda = 0.0107 \text{ V}^{-1}$$

3.2.3 Attach plot of $(I_D)^{\frac{1}{2}}$ vs. V_G .

3.2.4 Find K_n .

$$K_n = 0.222 \text{ A/V}^2$$

3.2.5 Find V_{TH} .

$$V_{TH} = 1.8 \text{ V}$$

3.3.2 Identify the two amplifier stages.

It is a common-source cascaded with a common drain.

3.2.3 Find the DC bias of V_{IN} for maximum output swing. Find the gain and output swing at this bias point.

$$V_{IN} = 2.12 \text{ V}$$

$$A_v = 50$$

$$\text{Output Voltage Swing: } 10 \text{ V}$$

3.3.4 What problems might we run into if the resistor were too big or too small?

If the resistor was too big, we would need a very high V_S in order to supply a sufficient amount of current to the microphone. If the resistor was too small, the microphone would have trouble outputting a signal as the small resistor creates a very small load resistance for the microphone.