Lab 7 Report

Ty Davis

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1 Introduction

In this lab our task is to study the performance of an NMOS "Source Follower" or common-drain amplifier. We will first perform an analysis of the DC component of the circuit, then we will analyze its performance with small signals. Our goal is to define an amplifier with a gain of 0.8 V/V, using voltage supplies of $V_+ = -V_- = 15$ V, $R_{sig} = 50\ \Omega$, and $R_G = 10$ kΩ. The main circuit to be analyzed is shown in Figure 1.

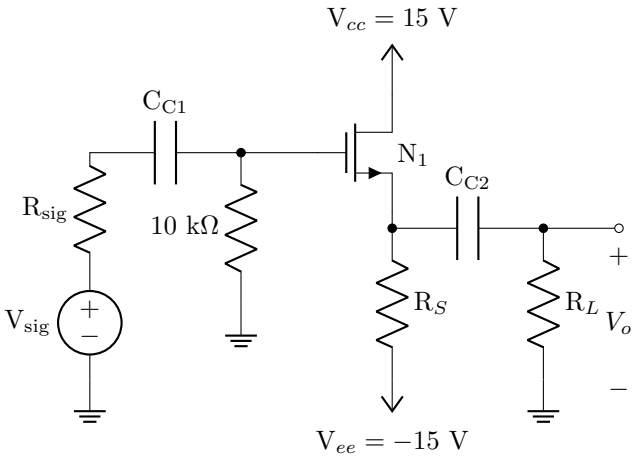

Figure 1: Main Circuit for Analysis in this Lab

2 DC Analysis

Refer to the circuit in Figure 2 to see a circuit that has reduced for DC Analysis by removing the components that occur outside the capacitors. From the last lab we know that the k_n value is $k_n = 0.23781$ and the threshold voltage is $V_T = 2.1$ V. We are designing the circuit such that $I_D = 1$ mA, and using the equation $I_D = \frac{1}{2}k_n(V_{OV})^2$ we can solve for V_{OV}. For V_{OV} we get the value $V_{OV} = 0.0917$ V, and that results in a V_{GS} value of $V_{GS} = 2.1917$ V. Because there is no current through the gate, the current through R_G is 0 Aand the voltage at $V_G = 0$ V. Using this we can find that the voltage at V_S is $V_S = -2.1917$ V, and the resistor we should use to obtain that value and the appropriate current is $R_S = 12.808$ kΩ.

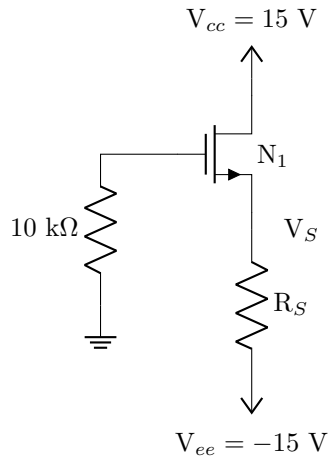

Figure 2: Circuit Reduced for Small Signal Analysis

3 Small Signal Analysis

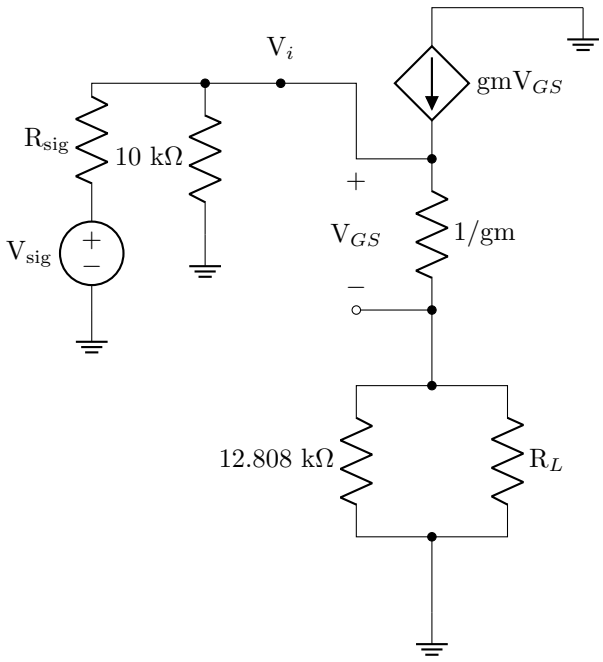

Figure 3: Circuit for AC Analysis