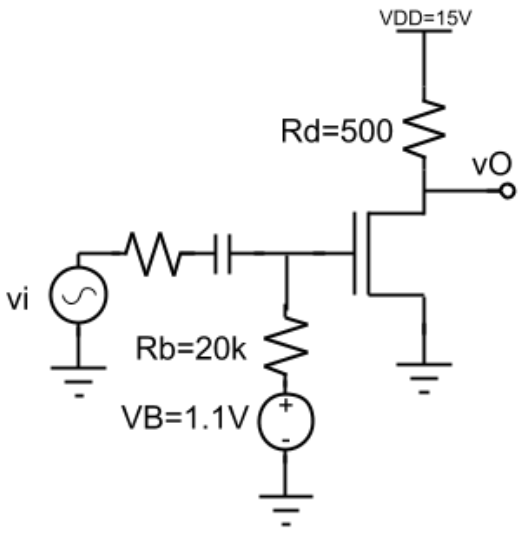

Figure 1: A sample design for a resistively loaded common source amplifier.

1 Lab Introduction

In this lab you will build and characterize a common-source amplifier(loaded resistively and actively) and a current mirror using MOSFETs. The learning goals are listed below:

- Get som practice wtih MOSFET equations and amplifiers.
- Observe the difference between actively and passively loaded amplifiers

You will need to make use of the formula $g_m(V_{GS} - V_T) = 2I_D$, which applies when a MOSFET is in saturation. A quick derivation will be given at the start of class.

2 Resistively Loaded Common Source Amplifier

Build the common source amplifier picture in Figure 1 using the TN2106 N-channel MOSFET. Measure r_{in}, r_{out}, g_m, a_v, and V_{SW} for this design. Derive expressions for g_m and a_v and compare them to your measurements. You will need V_T for these calculations, and you can find it on the datasheet. Also, vary V_B and plot the large-signal transfer function (V_O vs. V_B) for this amplifier.

3 Current Mirror

Build the current mirror pictured in Figure 2 using ttwo 2P2104 MOSFETs. Verify that the current in the source and load branches match as you vary the bias current and the load resistance.

4 Current Mirror Loaded Common Source Amplifier

Build the common source amplifier picture in Figure 3 by combining your circuits from the first two sections. Biasing this amplifier is going to be a little bit tricky. Vary the current in your current source until V_O is at 7.5V. Then measure r_{out}, g_m, a_v, and V_{SW} for this design. As before, derive expressions for g_m and a_v and compare them to your measurements. Also, vary V_B and plot the large-signal transfer function (V_O vs. V_B) for this amplifier. Comment on differences in your results as compared to the resistively loaded common source amplifier.

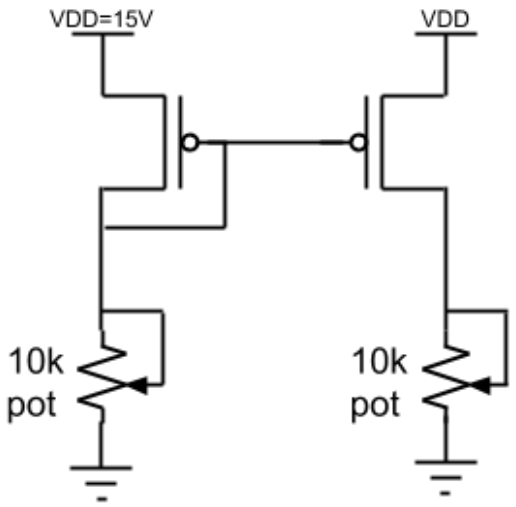

Figure 2: A sample design for a PMOS current mirror.

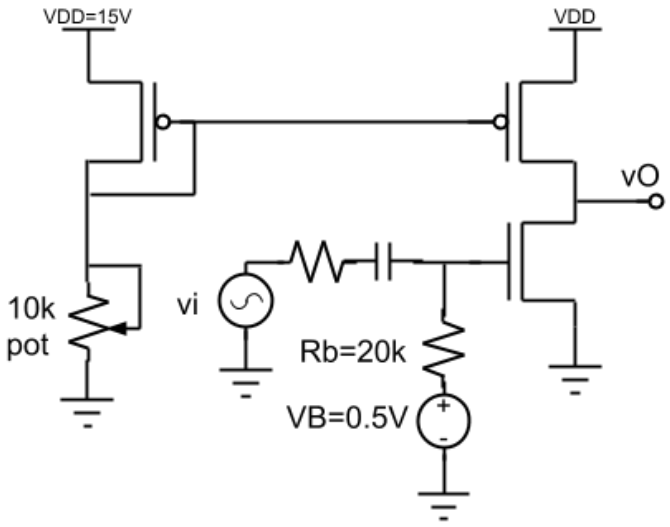

Figure 3: A sample design for an actively loaded common source amplifier.