

# EECS 170LC Laboratory Assignment #2 *Measurement*

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## Overview

In this lab we measure the behavior of single-transistor and multi-stage amplifiers.

## Measurement Assignment

You will be using the CD4007 MOSFET transistors provided to you by your lab TA.

- Construct the circuit shown in Fig. 1, and measure  $V_{out}$  for 10 values of  $V_{in}$  ranging from 0 to 5 V. Identify the transistor operating regions from each segment of the curve. Then find the dc value of  $V_{in} = V_{in(eq1)}$  that corresponds to the center of the saturation operating region.
  - Apply to  $V_{in}$  a sine wave with dc component equal to  $V_{in(eq1)}$ , 10mV amplitude and 1 MHz frequency. Then view the output waveform on the oscilloscope. What is the amplifier gain that you measure?
  - Increase the dc component of  $V_{in}$  by 10mV and repeat part (b). What do you observe?
- Construct the circuit shown in Fig. 2 and measure  $V_{out}$  for 10 values of  $V_{in}$  ranging from 0 to 2 V. Identify the transistor operating regions from each segment of the curve. Then find the dc value of  $V_{in} = V_{in(eq2)}$  that corresponds to the center of the saturation operating region.
  - Apply to  $V_{in}$  a sine wave with dc component  $V_{in(eq2)}$ , 1 mV amplitude and 1 MHz frequency. Then view the output waveform on the oscilloscope. What is the amplifier gain that you measure?
  - Increase the dc component of  $V_{in}$  by 10mV and repeat part (b). What do you observe?
- Construct the circuit shown in Fig. 3(a), bias the input at  $V_{in(eq2)}$  found in the previous problem, and apply to  $V_{in}$  a sine wave with 1 mV amplitude and 1 MHz frequency.

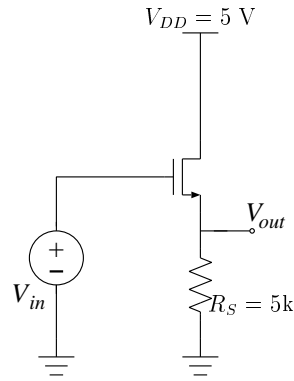


Figure 1:

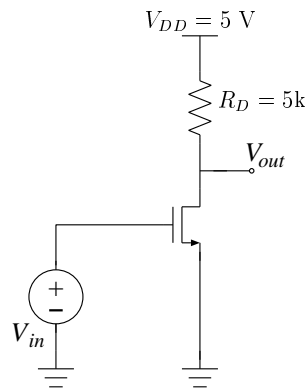


Figure 2:

Then view the output waveform on the oscilloscope. What is the amplifier gain that you measure? Explain any difference you see between this measurement and the gain measurement in part 2(c).

- (b) Repeat part (a) for the two-stage amplifier shown in Fig. 3(b). Explain why this gain is different from the one you found in part (a).

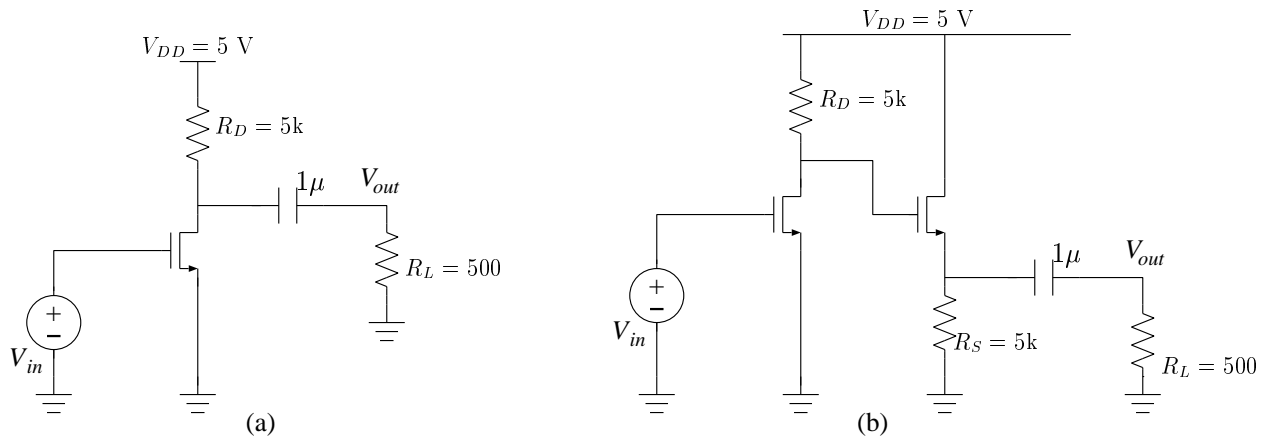


Figure 3: