CE3101 Lab 5: MOS transistors

Objectives

- Explore MOSFETs and Circuits

Prelab **student check off**

- Checkout an Analog Discovery 2 kit from the Tech Center ☐
- Checkout needed components from the Tech Center ☐

Assignment

Part 1: Simulation: MOSFET I-V Curves

Create a DC Sweep simulation of the 2n7000 n-mos device. With the source grounded, sweep the drain from 0 – 5v in 0.2V increments (source 1), sweep the gate from 0 – 5V at 0.1V increments (source 2).

a) Estimate Vth, then estimate Kn

b) Verify your estimates with at least 3 points on the I-V curves (3 gate voltages)

c) Assuming K'n = 20uA, what is the W/L ratio for this device ☐

Part 2: Implementation: MOSFET I-V Curves

Due to current limitations on the AD2 we can only replicate the I-V curves for gate voltage very close to the threshold voltage.

Set W1 (use custom mode) to create six gate voltage steps. Initially center (offset) the steps on your calculated Vth from part 1, with a 100Hz frequency and 100mv amplitude.

Set W2 to a 1.2KHz triangle wave with 0-5v amplitude.

(You will need to move the W1 offset to match your particular MOSFET. It will probably be below your calculated value. Shift it until you get a "good" looking I-V curve set.)

a) Estimate Vth, then estimate Kn

b) Verify your estimates with at least 3 points on the I-V curves (3 gate voltages)☐

Check Off

- Demo and document part 1 40%
- Demo and document part 2 60%

Demo (in-person or via Teams chat) and Report (in the box) due by 4:00 pm Wednesday of the week following the lab.