UNIVERSITY OF CALIFORNIA AT BERKELEY
College of Engineering
Department of Electrical Engineering and Computer Sciences
EE105 Lab Experiments

Experiment 5: MOSFET Characterization
Lab Report

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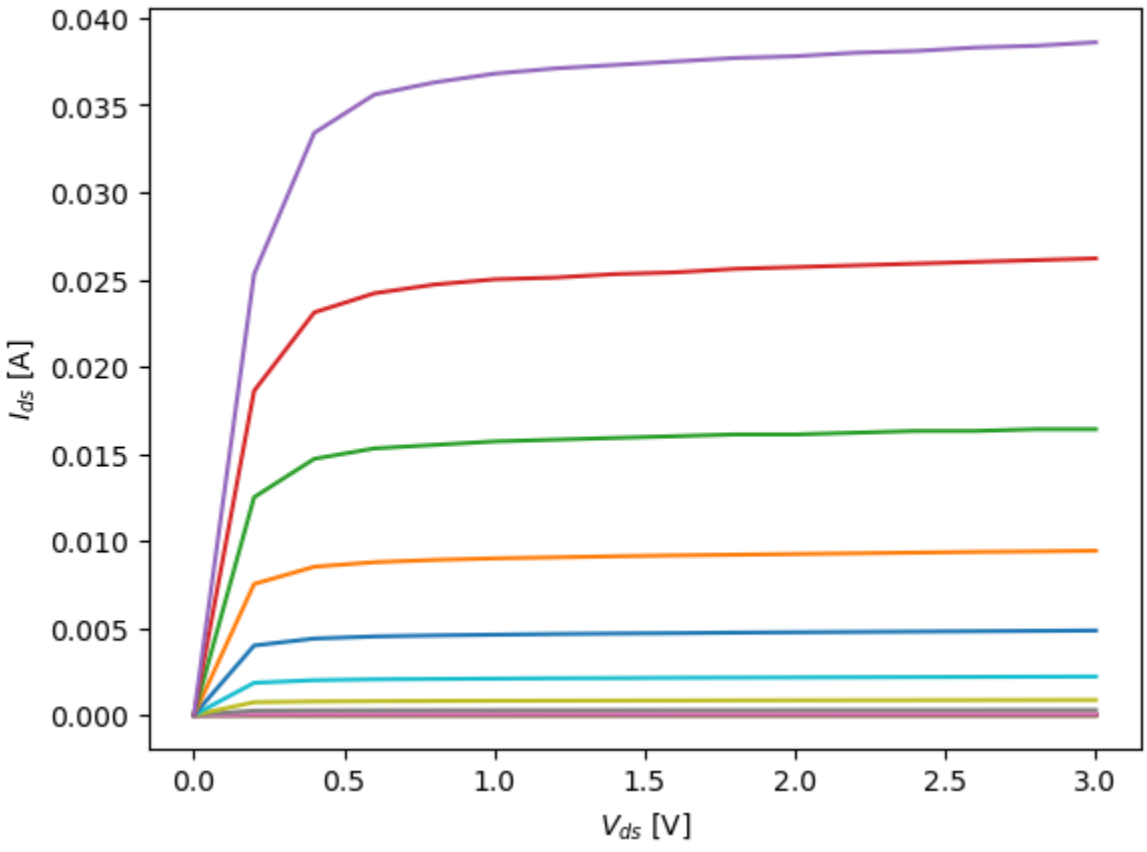
Lab group: Tuesday 8-11 / Tuesday 5-8 / Thursday 8-11 / Thursday 5-8

3. Lab

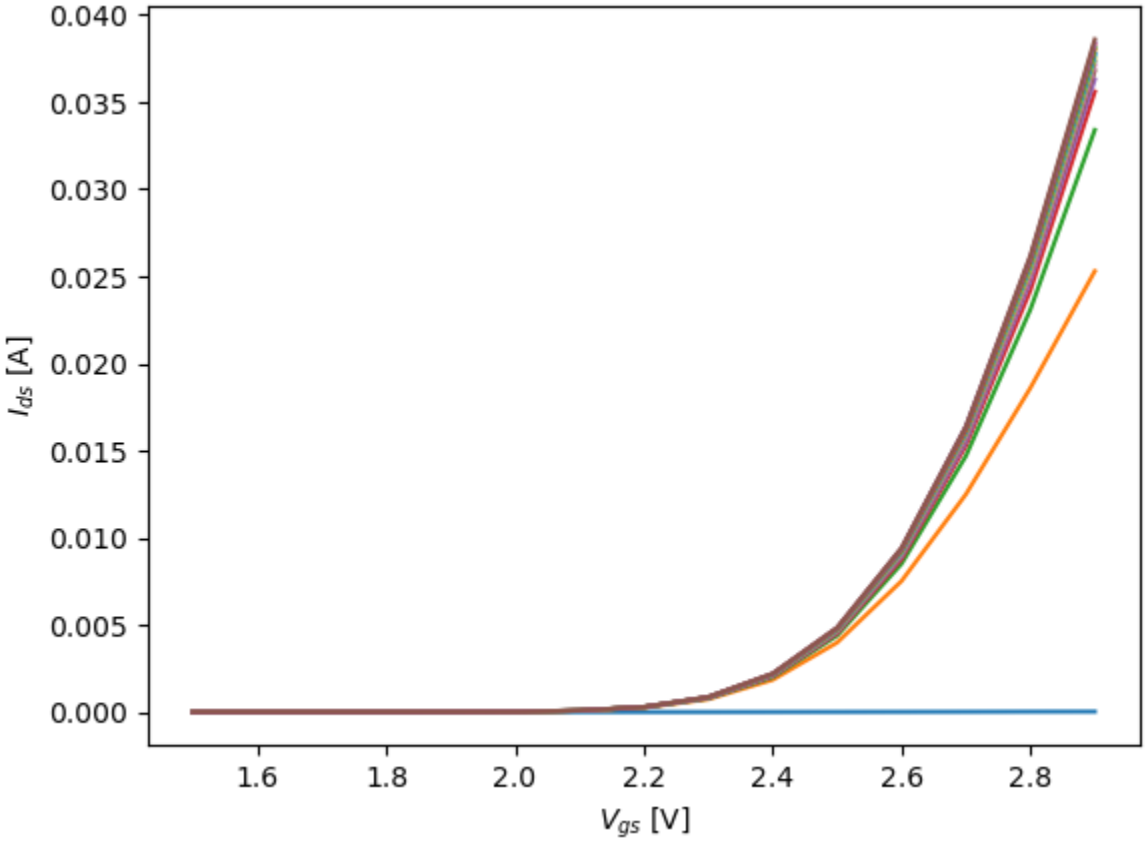
3.1. MOSFET Characterization

Using Python/Matlab, find V_T, K_P, and channel length modulation (λ) of the transistor. You can use curve fitting packages/toolboxes.

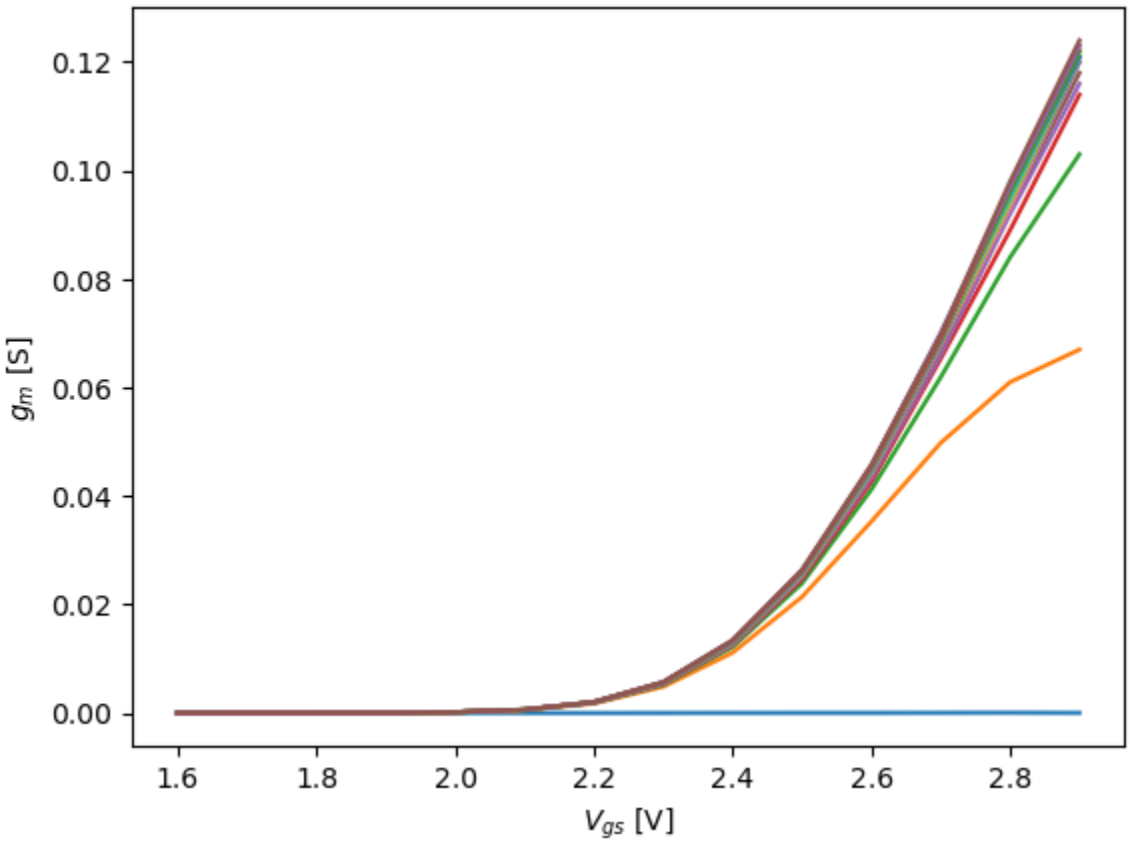
$V_T = 2$ V
$K_P = 0.16\ \Omega\ V^{-1}$
$\lambda = -0.12\ V^{-1}$



Plot I_D vs. V_{GS}.

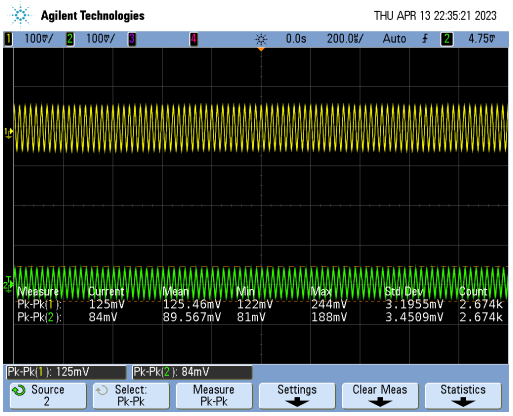


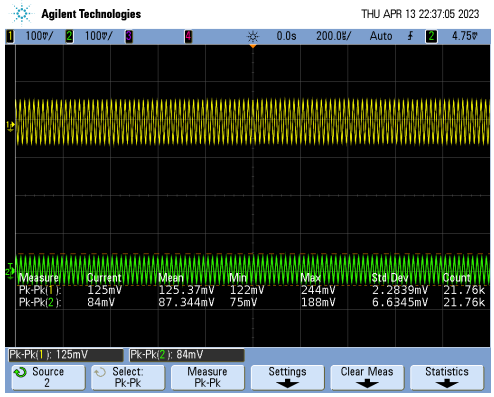
Plot g_m vs. V_{GS}.

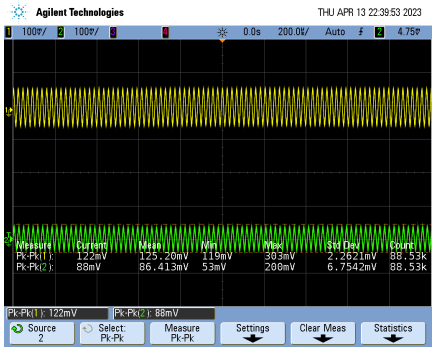


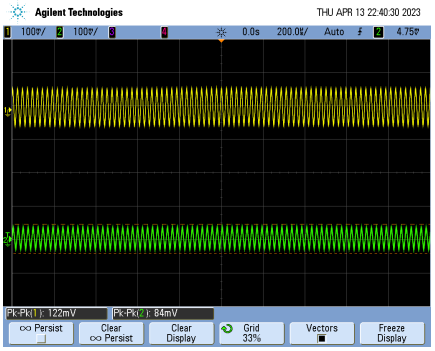
3.2. MOSFET Capacitance vs. Voltage

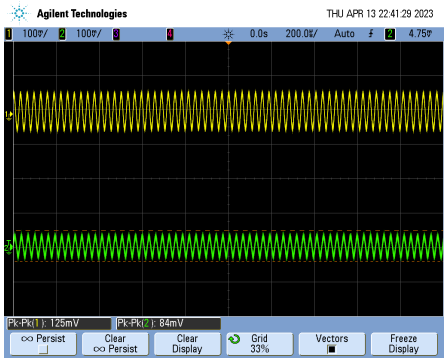
Oscilloscope traces (showing input and output) for Vgs = 1.2V to 2.2V in 0.1V steps

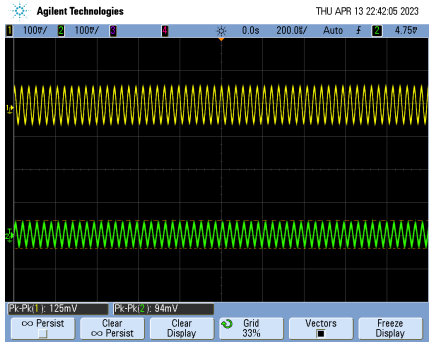


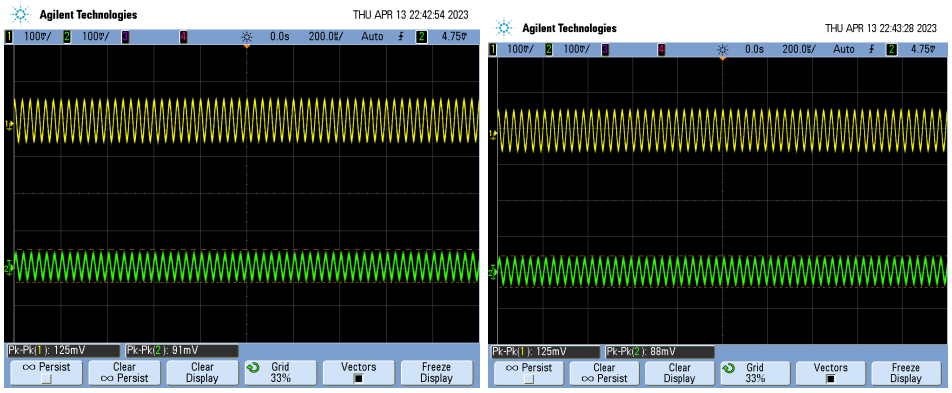


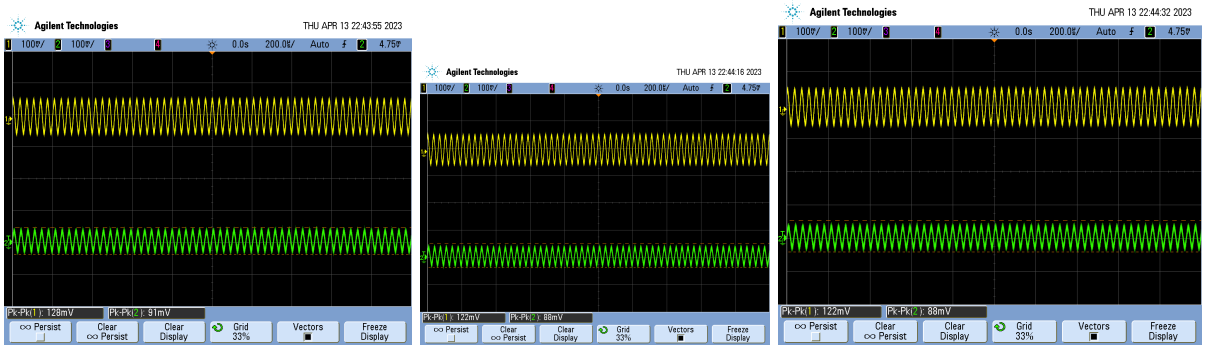




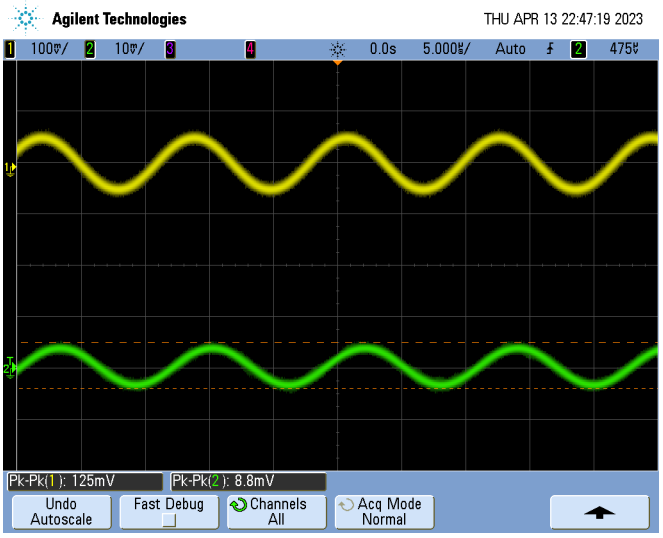






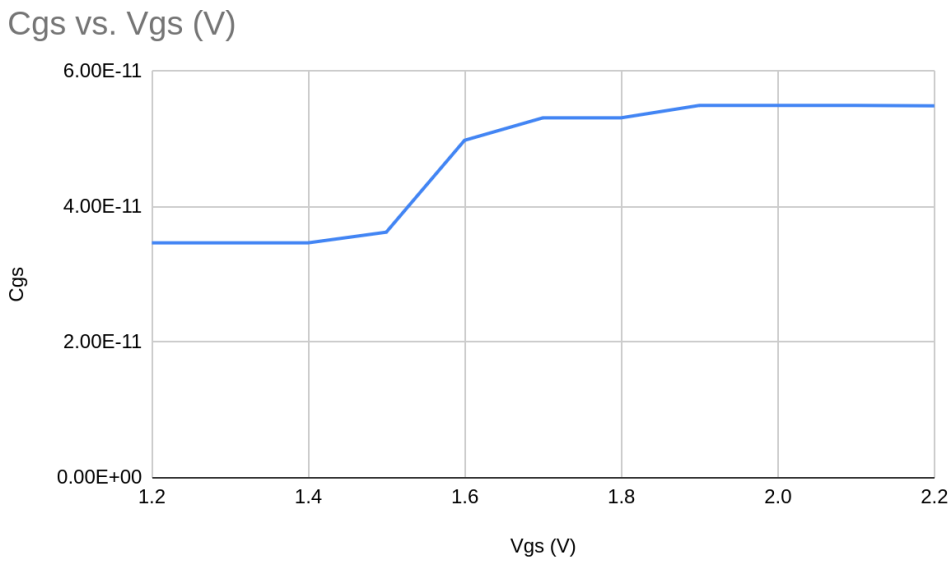


Parasitic Capacitance trace:



C_p = 19 pF

Plot of Vgs vs. Cgs:



Why does the capacitance change with gate-source voltage? Explain it briefly.

The charge between the substrate and the metal of the MOSFET changes with gate-source voltage, so the MOSCAP's capacitance will change as a result.

3.3. Resistive Touch Sensor

Before touching

- V_D = 1.2 V
- V_G = 3 V
- V_S = 0.43 V
- I_D = 4.3 mA
- Region: Saturation

After touching

- V_D = 1.7 V
- V_G = 1 V
- V_S = 0 V
- I_D = 0 A
- Region: Cutoff