Field-Effect Transistors

Daniel Lucero[1] and ssheppard3[2]

[1]California State University, Chico
[2]Affiliation not available

May 15, 2018

Purpose:

To measure and plot the characteristic curves for a TN2106 MOSFET in order to better understand field effect transistors and how it can behave as a function of terminal voltages.

Procedure:

A LabVIEW program measures the drain current for a TN2106 MOSFET while varying the drain source and gate voltage through a range of values. The LabView program has a for loop nested in a for loop. The Elvis board provided both gate voltage and drain voltage sources which is synchronized in the program. Next a TN2106 and a 20kOhm potentiometer are used to build a circuit that varies the brightness of a light bulb. The transistor switching circuit works as expected and varies the light brightness by changing the drain source voltage.

Data:

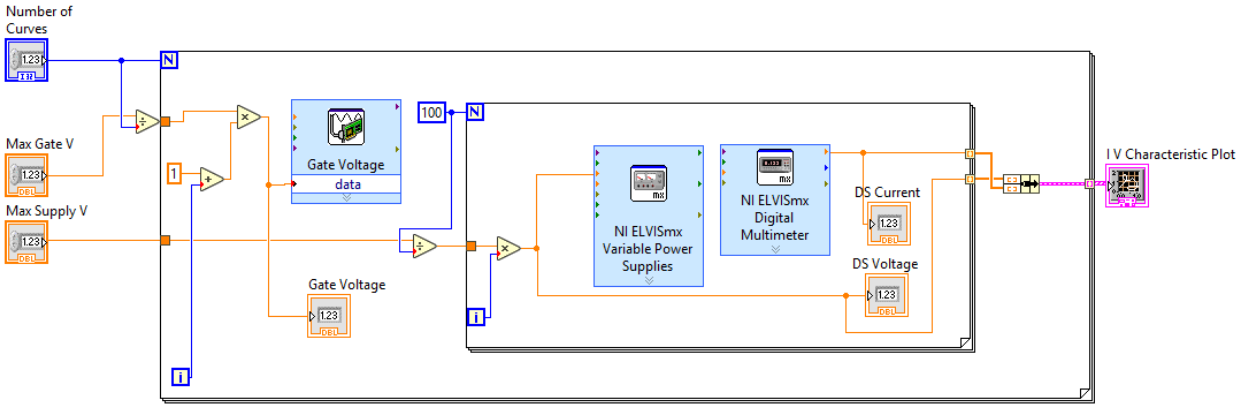

Figure 1: **Block Diagram of LabView program. Refer to the front panel for program results**

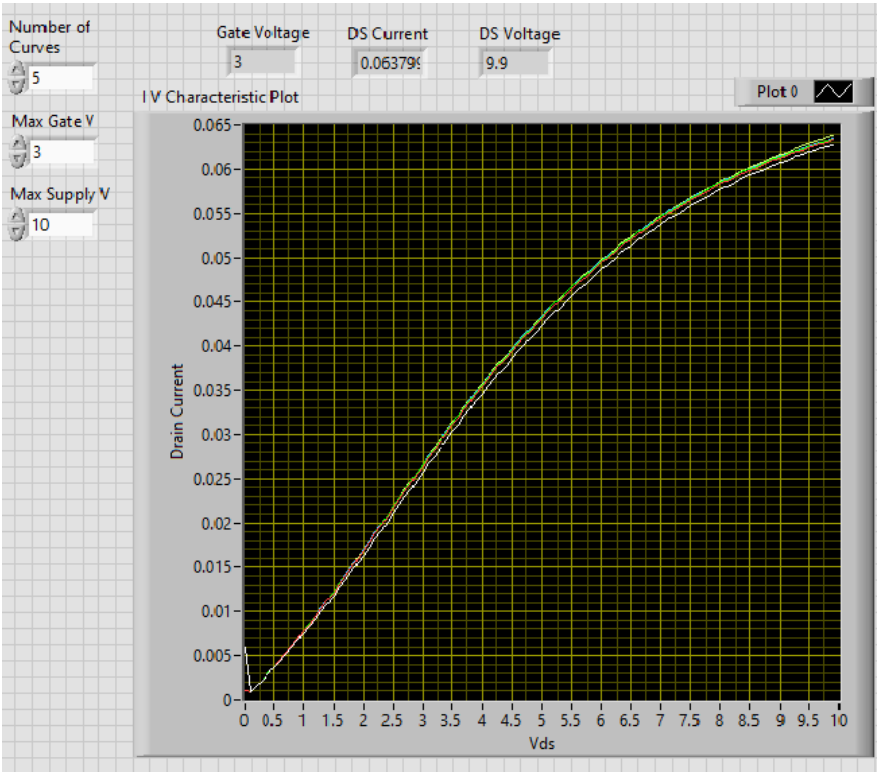

Figure 2: **Front Panel has numeric controls for the number of sample gate voltages and the maximum voltages. In addition indicators show live values during data collection.**

Fig. (3) shows a close up of Fig. (2) from the V_{DS} range of 1.8 V to 3.0V. Plotted on Python from data collected on the LabVIEW V.I. The resulting curves are not evenly spaced. The spacing between lines

increases as the gate voltage increases. The duration of the experiement focuses on the I/V portion before breakdown occurs. The current increases linearly until about 5 volts then becomes asymptotic approaching the peak current.

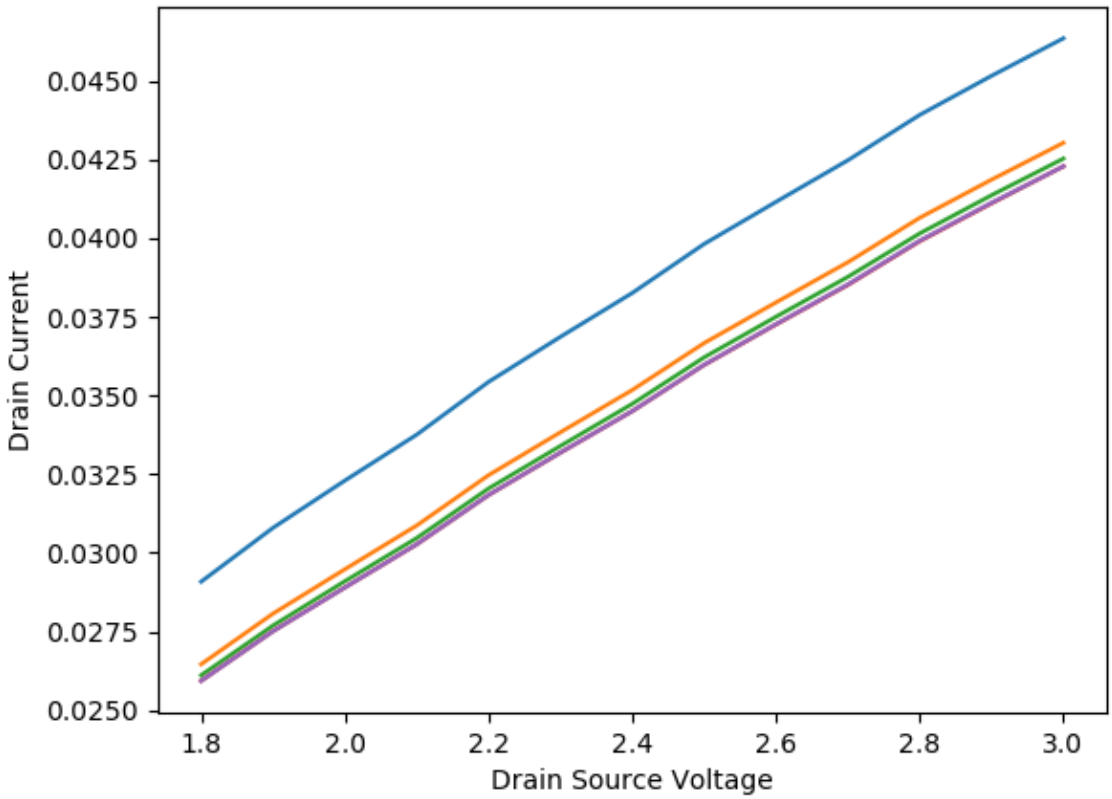

Figure 3: $\mathbf{I_d}$ **vs.** $\mathbf{V_{DS}}$