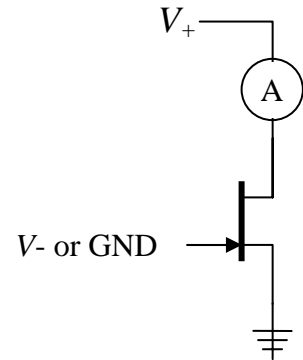


Lab 8: Introduction to FETs

1. N-JFET Basics (1.5 hours)

a) Measure the characteristics of a 2N5485 *n*-channel JFET by measuring I_D versus V_{DS} while the gate is tied to the source (i.e. $V_{GS} = 0$). Construct a sketch as you make your measurements. Using the Formulas 1 and 2 from the text and data in the linear and saturated regions, compute V_P and k .

b) Measure the characteristics of the JFET by measuring I_D versus V_{DS} for an additional value of V_{GS} between V_P and ground. Does this agree with our model (i.e. does one value of k fit all your data)?



Do lab exercise 2 or 3.

2. Voltage controlled JFET attenuators (1.5 hours)

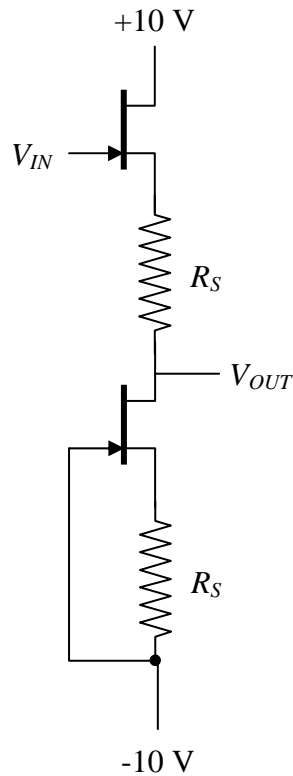
a) Construct an uncompensated attenuator with $R_D = 10\text{ K}\Omega$. Use a voltage divider with your variable -15 V supply to generate the V_{GS} control voltage in the approximate range of -0.5 V to -5 V . Connect the output of the voltage divider to the gate through a $1\text{ M}\Omega$ gate resistor. Try to attenuate your input by a factor of 10 using this device when you drive the drain with a small signal ($<1\text{ V}$) around 1 kHz . Note that this attenuator even works for the negative values of V_{DS} function generator. Check for distortion using the FFT feature on the oscilloscope.

b) Now compensate your attenuator using a second $1\text{ M}\Omega$ feedback resistor between the drain and the gate. Use a $\sim 0.1\text{ }\mu\text{F}$ capacitor to block the DC drain voltage. Measure the new attenuation and distortion. How do the new characteristics compare to the uncompensated ones?

c) Connect the signal from another function generator to the voltage divider to form a bias-T using another capacitor. Set this frequency to be roughly 10 times lower than the frequency on the drain. Use small AC inputs for both signals (tenths of volts) and describe the output. Describe the signal in the time domain and in frequency space. Do your results agree with theory? What arithmetic operation does your circuit implement on the two input signals?

3. Matched-pair source-follower (1.5 hours)

- a)** Construct a simple source follower with a 2N3958 (or U441) JFET. Use a $4.7\text{ k}\Omega$ source resistor. Using a small sine wave around 1 kHz, measure its gain and DC offset. Estimate g_m from the attenuation. Measure its output impedance. Do they agree?
- b)** Add an active load to your source follower using the second JFET from the matched pair. Measure its new gain, its DC offset and its output impedance.



A matched-pair follower