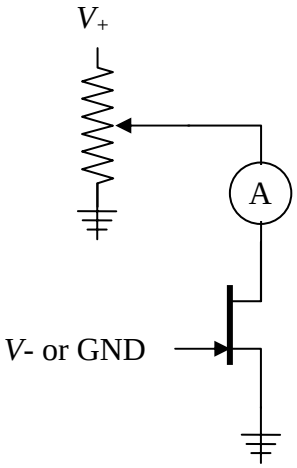
Lab 8: FETs



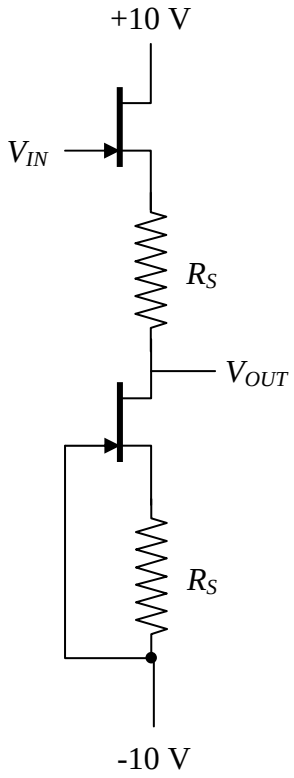
1. Measure the characteristics of a 2N5485 *n*-channel JFET by measuring I_D versus V_{DS} while the gate is tied to the source (i.e. $V_{GS} = 0$). Construct a sketch as you make your measurements. Using the Formulas 1 and 2 from the text and data in the linear and saturated regions, compute V_P and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

Bonus: 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)?

2. Construct an uncompensated attenuator with $R_D = 10$ KΩ. Use a voltage divider with your variable –15 V supply to generate the V_{GS} control voltage in the range 0 to –5 V. Connect that to the gate through a 1 MΩ 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 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.

3. Now compensate your attenuator using a second 1 MΩ feedback resistor between the drain and the gate. Use a ~0.1 μF capacitor to block the DC drain voltage. Measure the new attenuation and distortion. How do the new characteristics compare to the uncompensated ones?

Bonus: Connect the signal from another function generator to the potentiometer sweeper arm using another capacitor to block the DC. Set this frequency to be roughly 10 times lower than the frequency on the drain. Use small inputs for both signals (tenths of volts). Describe the output when both function generators are set to sine waves.



A matched-pair follower

4. Construct a simple source follower with a 2N3958 JFET. Use a 4.7 KΩ 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?

5. 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.