

Laboratory Application Assignment

In this lab application assignment you will examine a biasing technique commonly used with JFETs known as self-bias. Due to the wide range over which JFET parameters can vary, predicting exact circuit values can be difficult. Therefore, this experiment is unique in that you will not make any circuit calculations, only measurements. You will build a common-source amplifier and determine its voltage gain, A_v .

Equipment: Obtain the following items from your instructor.

- Two MPF102 n -channel JFETs or equivalent
- 0.1- μF capacitor and two 100- μF electrolytic capacitors
- Assortment of carbon-film resistors
- Oscilloscope
- DMM
- Variable dc power supply
- Function generator

Self-Bias

Construct the circuit in Fig. 30-35a. Measure and record the following dc values:

$V_G =$ _____, $I_D =$ _____, $V_S =$ _____,
 $V_D =$ _____, $V_{DS} =$ _____

Based on your measured values of V_G and V_S , calculate V_{GS} .
 $V_{GS} =$ _____

Replace the JFET in Fig. 30-35a with a different MPF102, and repeat the same measurements.

$V_G =$ _____, $I_D =$ _____, $V_S =$ _____,
 $V_D =$ _____, $V_{DS} =$ _____

Based on your measured values of V_G and V_S , calculate V_{GS} .
 $V_{GS} =$ _____

Was there any difference in V_{GS} and I_D from one JFET to the next?

Common-Source Amplifier

Modify the circuit in Fig. 30-35a to that shown in Fig. 30-35b. (Which JFET you use doesn't matter.) Connect channel 1 of the oscilloscope to the gate and channel 2 to the load resistor, R_L .

With the input voltage, V_{in} , adjusted to exactly 100 mV_{p-p}, measure and record the peak-to-peak output voltage. $V_{out(p-p)} =$ _____

Calculate the voltage gain, A_v , based on the measured values of V_{out} and V_{in} . $A_v =$ _____

Remove the source bypass capacitor, C_S , and remeasure $V_{out(p-p)}$.
 $V_{out(p-p)} =$ _____ Also, recalculate A_v . $A_v =$ _____

How did removing the source bypass capacitor affect the voltage gain, A_v ? _____

Measure and record the phase relationship between V_{in} and V_{out} .
 $\theta =$ _____

In general, is the voltage gain of a common-source amplifier less than or greater than that of a common-emitter amplifier? _____

Figure 30–35

