

Lab 9

JFET Amplifiers

Purpose

This experiment will investigate the characteristics of the common-source and common-drain amplifier.

Material and Equipment

NI ELVIS

NTE 312 N Channel JFET.

Resistors: 2 k (2), 3.9k, 10 k (2), 100 k, 200 k, 1 M.

Capacitors: 100 μ F, 47 μ F, 1 μ F.

Theory

In this lab, two JFET amplifier configurations will be investigated; the common-source, and the common-drain amplifier.

The basic common-source(CS) circuit is shown in Figure 9-1. In comparison to the BJT common-emitter amplifier, the FET amplifier has a much higher input impedance, but a lower voltage gain.

The voltage gain of the circuit can be expressed as

$$A_v = -g_m R_D$$

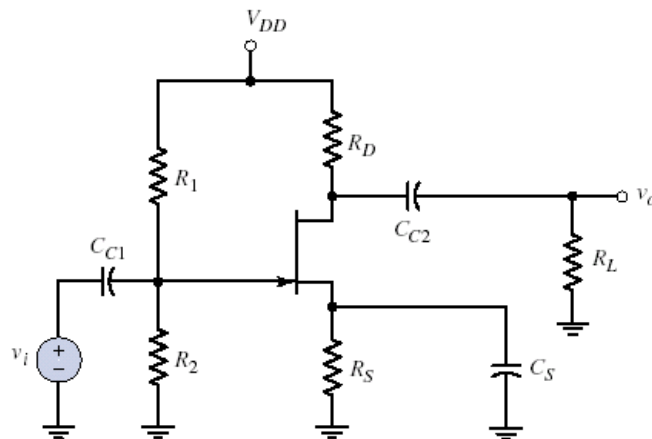


Figure 9-1: Common-Source Amplifier

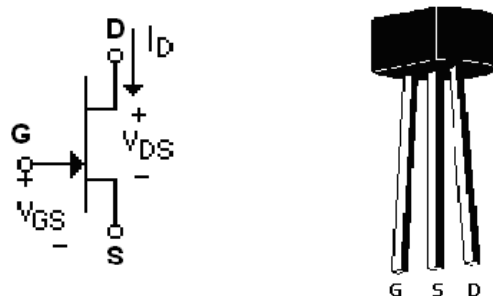


Figure 9-2: The Junction Field Effect Transistor(NTE 312)

Figure 9-2 shows the transistor terminals for your reference..

The common-drain(CD) amplifier is shown in figure 9-3. The common-drain configuration is often called a source follower as the voltage gain is nearly unity. The common drain FET amplifier is similar to the common collector configuration of the bipolar junction transistor.

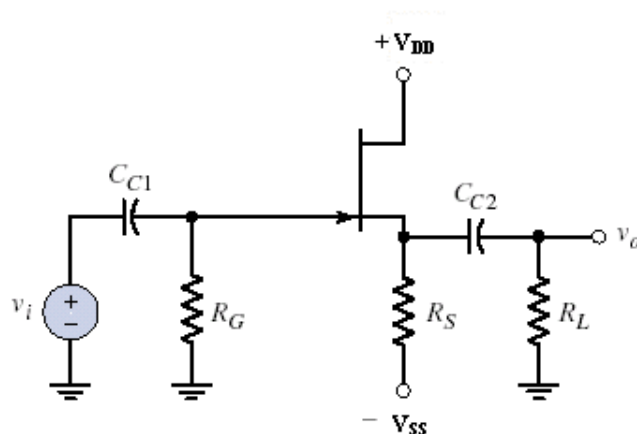


Figure 9-3: Common-Drain Amplifier

Procedure

- 1) Common-Source Amplifier
 - a) Connect the circuit as shown in figure 9-1.
 - b) Use $C_{c1} = 1\mu\text{F}$, $C_{c2} = 47\mu\text{F}$, $C_s = 100\mu\text{F}$, $R_L = 3.9\text{ k}$, $R_S = R_D = 2\text{ k}$, $R_1 = 200\text{ k}$, $R_2 = 100\text{ k}$, $V_{DD} = 12\text{V}$.
 - c) Apply a sinusoidal signal with frequency 1kHz, amplitude 1Vp-p, supply voltages at 10V.
 - d) Observe the output.
 - e) Capture both input and output waveforms.
 - f) Calculate the voltage gain.
 - g) Measure the operating point.

2) Common-Drain Amplifier

- a) Connect the circuit as shown in figure 9-2.
- b) Use $R_G = 1\text{M}\Omega$, $R_S = R_L = 10\text{k}\Omega$, supply $V_{DD} = 10\text{ V}$ and $V_{SS} = -10\text{ V}$.
- c) Apply a sinusoidal signal with frequency 1kHz, amplitude 2Vp-p.
- d) Observe the output.
- e) Capture both input and output waveforms.
- f) Calculate the voltage gain.
- g) Measure the operating point.

Questions for the Lab Report

Compare BJT and JFET.(in terms of characteristics, applications, merits and demerits but not constructional details)