

Experiment 14

Frequency response of FET

Objective

To study and analyze the frequency response of FETs.

Equipment

IT-2012 Trainer

DMM

Dc supply

Oscilloscope with probes

Function generator with probes

Theory

The frequency response of an amplifier is the change in gain or phase shift over a specified range of input signal frequencies.

There are two kinds of frequency response.

1. Low frequency response
2. High frequency response

This lab demonstrates the effect of low frequency response only.

Low frequency response

The voltage gain and phase shift of capacitively coupled FET amplifier are affected when signal frequency is below a critical value. At low frequencies the reactance of coupling capacitors becomes significant resulting in reduction in voltage gain and increase in phase shift. This response for the Figure 14.1 is given by input RC circuit and output RC circuit.

At input RC circuit

The lower critical frequency of given amplifier RC input circuit is given as

$$f_{c(input)} = \frac{1}{2\pi R_{in} C_1} \quad (14.1)$$

Where R_{in} is $R_1 \parallel R_2$ and C_1 is input coupling capacitor

Phase shift is given as,

$$\theta = \tan^{-1} \frac{X_{C1}}{R_{in}} \quad (14.2)$$

At Output RC circuit

The lower critical frequency at output Rc circuit is given as

$$f_c = \frac{1}{2\pi(R_D+R_L)*C_2} \quad (14.3)$$

Where C_2 is output coupling capacitors.

Phase shift is given as

$$\theta = \tan^{-1} \frac{X_{c2}}{R_D+R_L} \quad (14.4)$$

Circuit Diagram

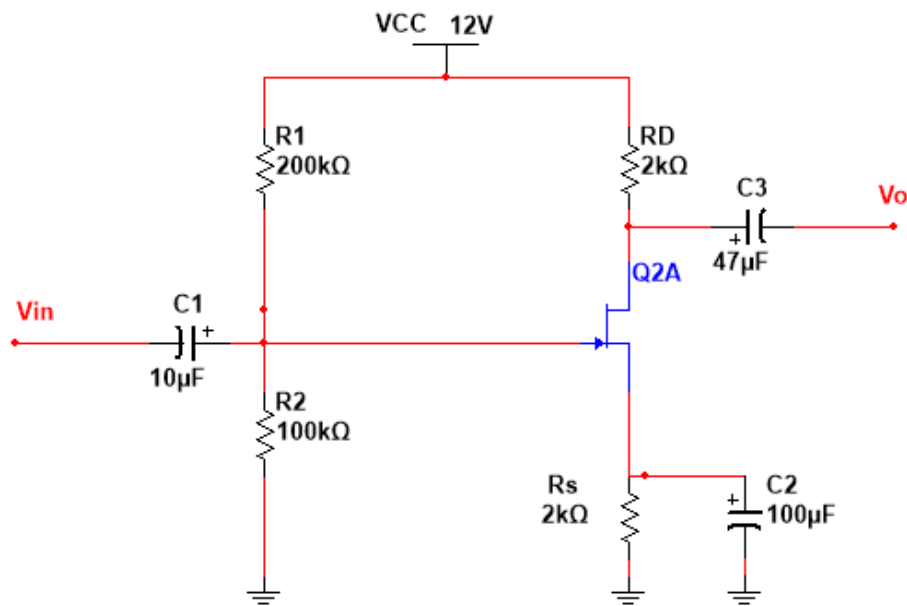


Figure 14.1: Common Source Amplifier

Procedure

1. Collect the components required for the experiment.
2. Insert the transistor in the breadboard and construct circuit according to given circuit diagram shown in Figure 14.1.
3. Perform DC and AC analysis as done in experiment#6.
4. Calculate the lower cutoff frequencies.
5. Apply AC signal of different frequencies and find the gain.

6. Record the values in the table.
7. Observe the effect of frequencies on the gain.

Observations

f(Hz)												
A _v												

Lab task

1. Analyze frequency response of given FET amplifier and draw Bode plot shown in Figure 14.2.
2. Calculate lower critical frequency of given amplifier.

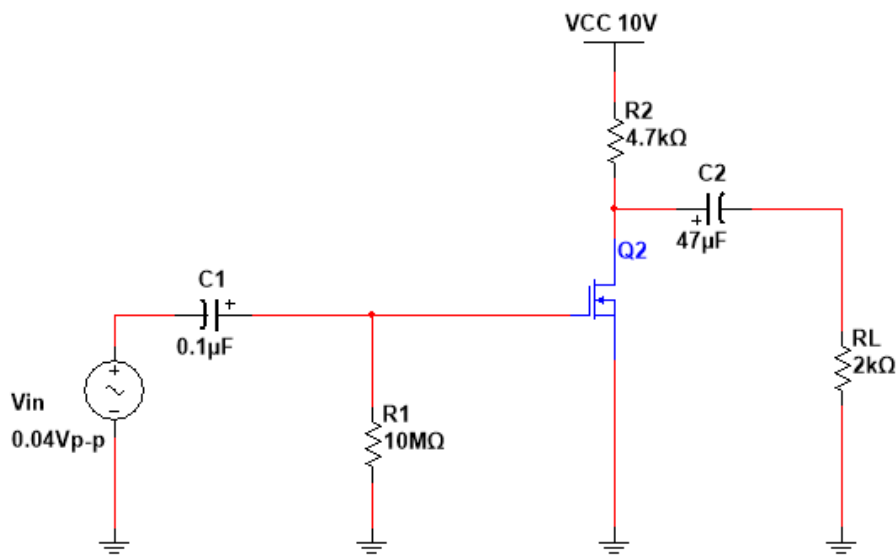


Figure 14.2: Frequency Response of Common Source Amplifier

Conclusion
