Experiment 7

MOS Field-Effect Transistors and amplifiers

1. OBJECTIVES

- To examine the performance of Common Source MOSFET Single stage amplifiers.

2. **THEORY** – In order to appreciate how these circuits amplify an input, you should know the small signal models for MOSFET. See the text book, Sedra and Smith for details.

**COMMON-SOURCE MOSFET AMPLIFIER (Simulation)**

1. Draw the schematic shown in Fig. 1. For NMOS use the Power NMOS. This device can be obtained from the Capture toolbar by clicking on PLACE-🡪PSPICE COMPONENTS-🡪DISCRETE. The voltage source V2 is available in the SOURCE library and is called VAC.



Vout

Fig. 1

1. Create a Simulation Profile “Frequency Domain”.
2. Set the Simulation Settings as follows: Analysis Type to AC Sweep/Noise, Start Frequency =10, End Frequency 100k and Points/Decade 11.
3. From the PSPICE menu, select **Markers Advanced** ** dB Magnitude of Voltage** and place it at the output VOUT.
4. Run the simulation. User Cursor to determine the upper 3dB point, the lower 3dB point, Gain, and BW.
5. **6-** Remove the 50μF capacitor from the circuit and obtain the upper 3dB point, the lower 3dB point, Gain, and BW.

QUESTIONS AND DISCUSSION

1. What is the role of R4 in Fig. 1?
2. Which of the 3 capacitors in Fig. 1 is the bypass capacitor? What is its role? What is the role of other two 10 μF capacitors?
3. Compare the voltage gain obtained for the circuit in figure 1, with, and without 50μF capacitor. Discuss the influence of the bypass capacitor on these values.
4. Compare the bandwidth obtained for the circuit in figure 1 with, and without 50μF capacitor. Discuss the influence of the bypass capacitor on these values. Can you explain the sizable difference in the bandwidth?