

**University of Michigan**  
**EECS 311: Electronic Circuits**  
**Fall 2009**

**LAB 6 – COMMON-GATE AMPLIFIER**

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Completed in by Lab 12/14/2008

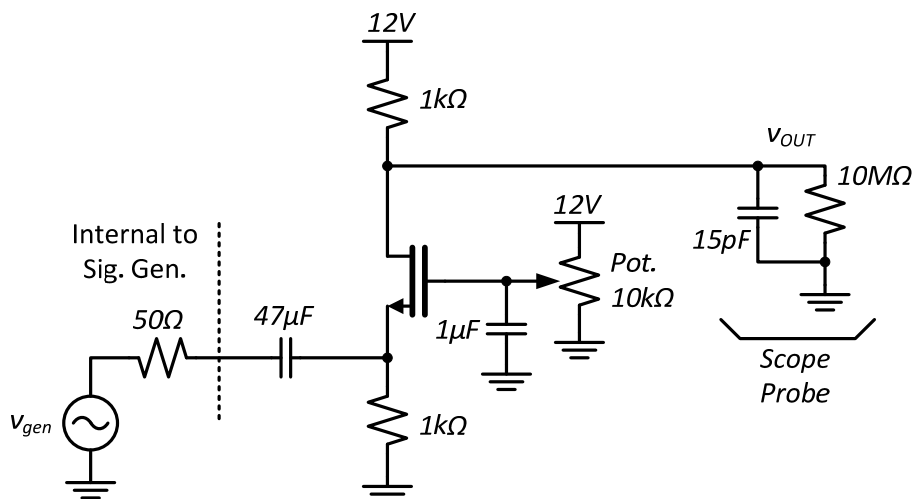
### Introduction

Common-gate amplifiers are used to provide low input resistance, high gain, and high-bandwidth. In this lab you will build a C-G amplifier, tune its DC bias point until the input resistance is  $50\Omega$ , and then measure its gain and bandwidth.

There are no pre-lab or post-lab components to this lab. Each group only needs to build and measure one circuit, and show the working circuit to the GSI to complete the lab.

### In-Lab Component

- L6.1** Build the common-gate amplifier shown below.
- L6.2** Apply a small-signal input directly from the signal generator to the input of the amplifier. Set the output of the generator to  $50\Omega$  mode, and verify the frequency is in the midband range. Tune the DC bias voltage on the gate using the potentiometer until the input impedance of the amplifier is  $50\Omega$ . Approximate the value of  $g_m$  at this bias point.
- L6.3** Measure the small-signal gain and bandwidth of the amplifier *with an oscilloscope probe connected to the output*. Calculate the gain-bandwidth product.
- L6.4** While probing the voltages at the source and drain of the MOSFET, slowly increase the amplitude of the input voltage until you see clipping on the top and bottom of the drain voltage. What limits the range of swing at the output?



**Figure 1. Single-stage amplifier schematic.**



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**LAB 6 – CHECK-OFF SHEET**

NAMES: \_\_\_\_\_

Have the GSI check you off once your circuit is complete and characterized. Be prepared to answer questions about your circuit or the results.

**Results Summary**

Parameter	Measured	Units
DC Gate Voltage for $50\Omega$ input impedance		V
DC Source Voltage for $50\Omega$ input impedance		V
Midband small-signal gain		V/V
Upper 3dB bandwidth		MHz
Gain-bandwidth product		MHz
Upper clipped voltage		V
Lower clipped voltage		V

**Table 1. Results summary table.**

**Exercise .....** **Date Completed**

Demonstrated working amplifier.....