

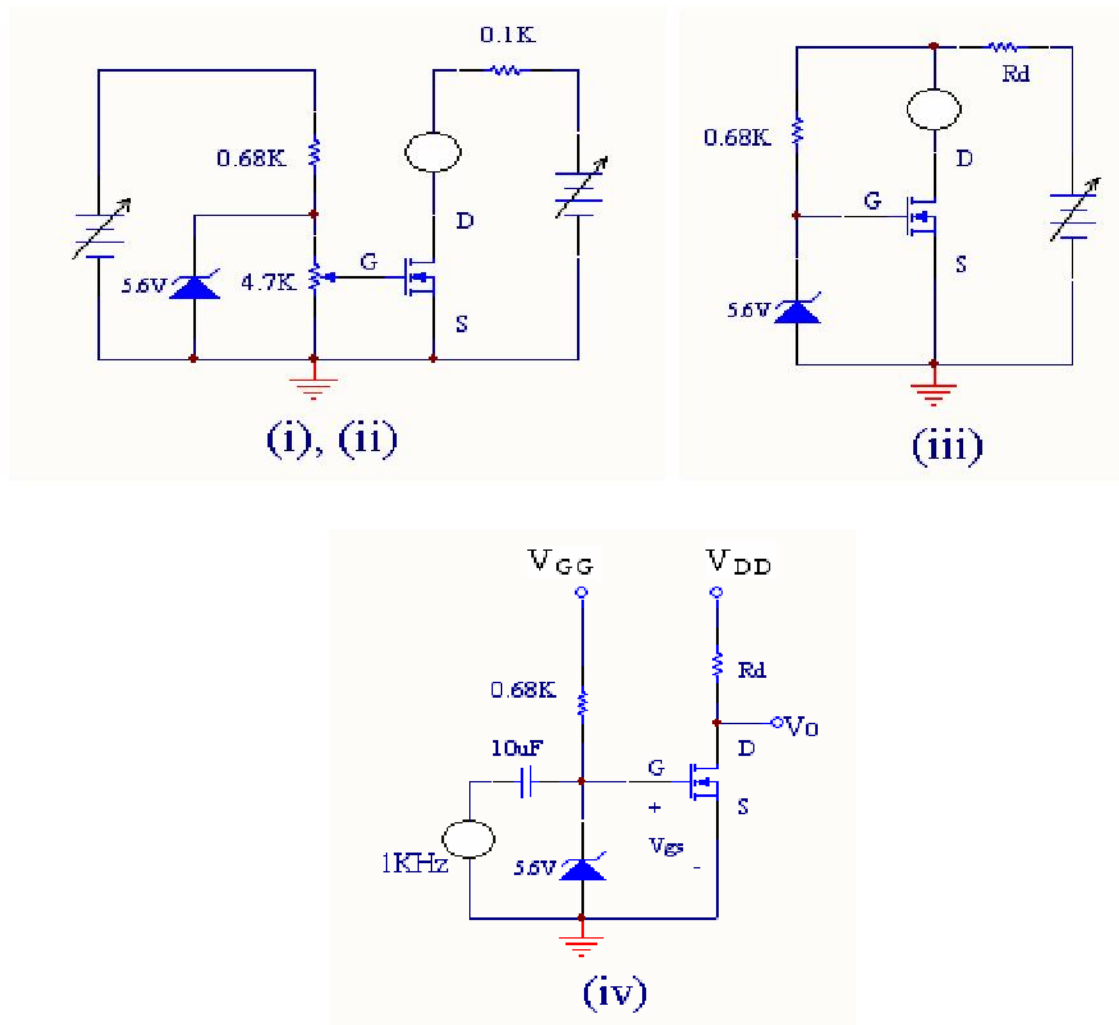
MOSFET Parameters

Objective: To obtain MOSFET parameters from DC current-voltage measurements

Background: MOSFETs make up more than 99% of semiconductor devices currently being used from short-channel deep submicron devices for ULSI to large area power devices for switching and control. They pose challenges in fabrication, modeling and characterization and are therefore subject of numerous papers. In this experiment, we want to measure I-V characteristics of a MOSFET and estimate device parameter from the data obtained.

Experiments:

Wire up the circuit shown in the figure (The Zener diode is meant for protection).



- i) Measure I_D versus V_{GS} for $V_{DS} = 250\text{mV}$. Estimate the threshold voltage V_{TH} from this data.
- ii) Obtain five output (I_D versus V_{DS}) characteristics V_{DS} with varying from 0 to 5V, and $V_{GS} = 1, 1.5, 2, 2.5$ and 3 V.
- iii) Make $V_{GS} = V_{DS}$ and measure I_D versus V_{GS} for V_{GS} from 1 V to 3V.
- iv) Obtain the trans-conductance for $V_{GS} = 2\text{V}$ and $V_{DS} = 5\text{V}$ using a small signal measurement.

Note: Use one of the NMOS transistors from the IC- CD 4007 whose internal circuit diagram is as shown below:

