



ULAB

UNIVERSITY OF LIBERAL ARTS
BANGLADESH

Lab Experiment No: 09

Course Code: EEE 1302

Course Title: Electronic Circuits Lab I

Experiment Name:

Study of n-channel MOSFET Characteristics

Submitted to:

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Objectives:

The objective of this experiment is to study the Output Characteristics and Transfer Characteristics of an n-channel Metal Oxide Semiconductor Field Effect Transistor (MOSFET) in Common-Source Configuration.

Apparatus:

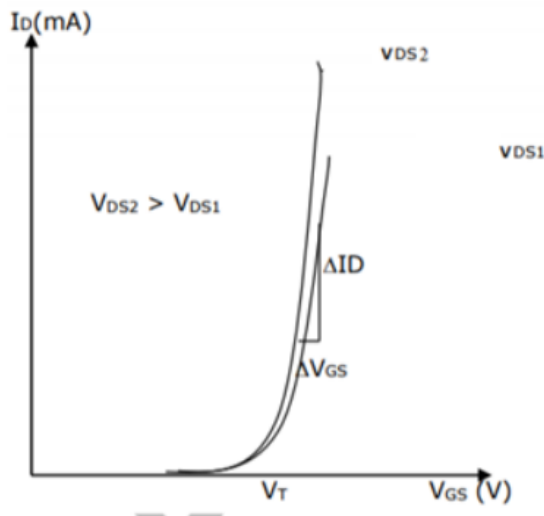
1. Dual Regulated DC Power supply (0–30 Volts)
2. MOSFET IRF510
3. Resistors (1 k and 100 k)
4. DC Ammeters (0-40 A)
5. DC Voltmeters (0-30V)
6. Bread Board and connecting wires

Theory :

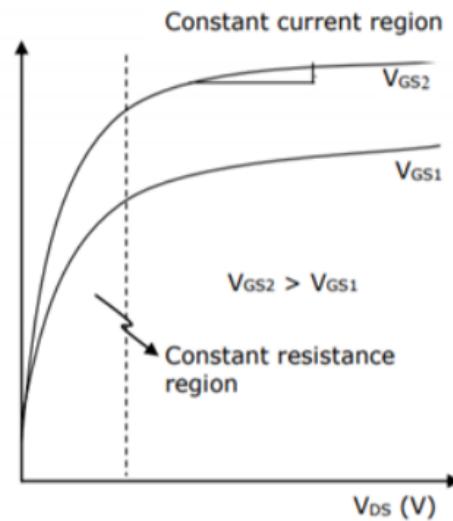
The MOSFET is actually a four-terminal device, whose substrate, or body terminal must be always held at one of the extreme voltages in the circuit, either the most positive for the PMOS or the most negative for the NMOS. One unique property of the MOSFET is that the gate draws no measurable current.

Ideal Graph

Transfer Characteristics:



Drain Characteristics



Procedure:

Output characteristics :

- ☐ Connecting the circuit as per the given diagram properly.
- ☐ Keeping V_{GS} constant at some value 3V by varying V_{GG}
- ☐ Vary V_{DS} in the step of 0V up to 20 volts and measure the drain current I_D . Tabulate all the readings.
- ☐ Repeat the above procedure for V_{GS} as 3V, 5V, 10 V etc

Transfer characteristics :

- ☐ Connect the circuit as per the given diagram properly.
- ☐ Set the voltage V_{DS} constant at 20 V.
- ☐ Vary V_{GS} by varying V_{GG} in the step of 0.1 up to 15 V and note down the value of drain current I_D . Tabulate all the readings.
- ☐ Plot the output characteristics V_{DS} vs I_D and transfer characteristics V_{GS} vs I_D .

Calculate V_T , r_d and g_m from the graphs and verify it from the datasheet.

Observation Table:

Table 1

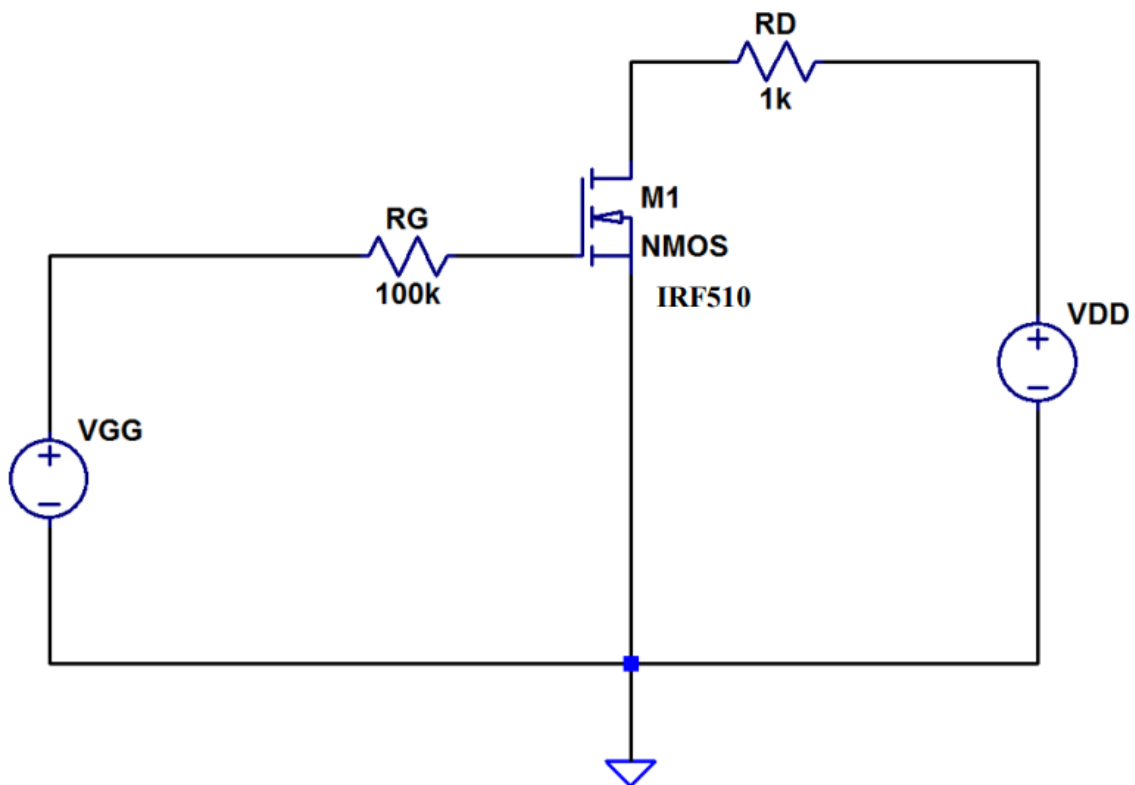
$V_{ds} = 20V$	
V_{gs} (V)	I_d(mA)
0	0.1
5	6.57
10	10.75
15	15.45

Table 2

$V_{gs} = 5V$	
V_{ds} (V)	I_d (mA)
0	0.02
5	0.05
10	0.10

15	0.15
20	0.20
25	0.25
30	0.30

Circuit Diagram:



Discussion:

The motive for this experiment was to study the Output Characteristics and Transfer

Characteristics of an n-channel Metal Oxide Semiconductor Field Effect Transistor (MOSFET) in Common-Source Configuration. For the transfer characteristics, it can be seen that from the I_d vs V_{GS} graph the current will remain zero until a certain threshold voltage has been reached. Because, in this case, there will be a void of a channel and in this condition even if we increase the voltage the current will remain null. the current will start flowing once the threshold voltage has been reached. In this case, the threshold voltage is 3V. For output characteristics, V_{GS} crosses the Threshold voltage; there is a slight increase in current initially and then with the increase of V_{GS} , the current reaches a saturation point where even with the increment of voltage the current will only increase slightly. This particular region is the saturation region quite opposite to BJT.