# Experiment 4

**MOSFET as a switch**

## OBJECTIVE

* + Verify that a MOSFET can work as a switch which is controlled by the gate voltage.

## 2. Theory

### MOSFET as a switch -

A MOSFET can create a conducting path across the channel provided there is sufficient voltage between the gate and the Source (VGS). This voltage is known as threshold voltage (VT). In other words if VGS > VT then the channel is on and the input signal applied to the Drain would be transmitted to the Source. The circuit below illustrates the operation.

Vout



Fig.1

The output (Vout) is a bit smaller than the input Vin because of the channel resistance (RCH) of the MOSFET. It is given by

 (1)

For VGS < VT, MOSFET is off and RCH = ∞.

## 3 SIMULATION PROCEDURE

### 3.1 MOSFET as a switch (Fig. 1)-

1. Using CAPTURE window of PSPICE draw the circuit shown in Fig. 1. For the NMOS choose POWER NMOS from the component list located in the PLACE menu. This transistor is not present in the EVAL library.
2. Create a simulation profile with the following setting – Analysis Type = TIME DOMAIN; Run to Time = 5ms
3. Run simulation for Vg = 0, 1, 2, 3, 4 and record the amplitude of the output. Can you now estimate VT of the MOSFET? Find out VT from the output file which is accessible through the output window.