EXP.NO: 2

Name of experiment: Field Effect Transistor (FET)

Purpose of experiment: To study the output or drain and transfer characteristic of field effect transistor.

Apparatus: N channel J-FET (BF W-10), variable DC source of range 0-3 volt and 0-15volts, mili-ammeter, wires.

Theory:

The field-effect transistor (FET) is a semiconductor device, which depends for its operation on the control of current by an electric field. Today FETs are the most widely used components in integrated circuits. There are two of field effect transistors:

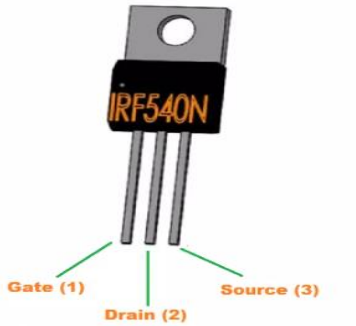
1. JFET (Junction Field-Effect Transistor).
2. MOSFET (Metal Oxide Semiconductor Field Effect Transistor).

The FET has several advantages over conventional transistor.

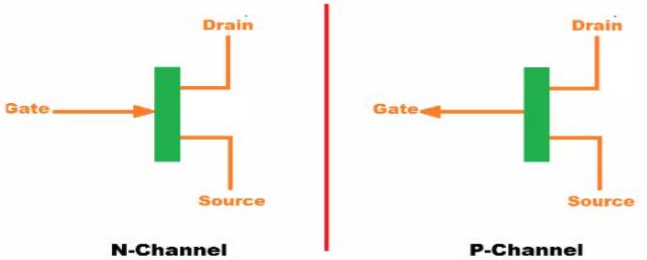
1. In a conventional transistor, the operation depends upon the flow of majority and minority carriers. That is why it is called bipolar transistor. In FET the operation depends upon the flow of majority carriers only. It is called unipolar device.
2. The input to conventional transistor amplifier involves a forward biased PN junction with its inherently low dynamic impedance. The input to FET involves a reverse biased PN junction hence the high input impedance of the order of M ohm.
3. It is less noisy than a bipolar transistor.
4. It exhibits no offset voltage at zero drain current.
5. It has thermal stability.
6. It is relatively immune to radiation.

The main disadvantage is its relatively small gain bandwidth product in comparison with conventional transistor.

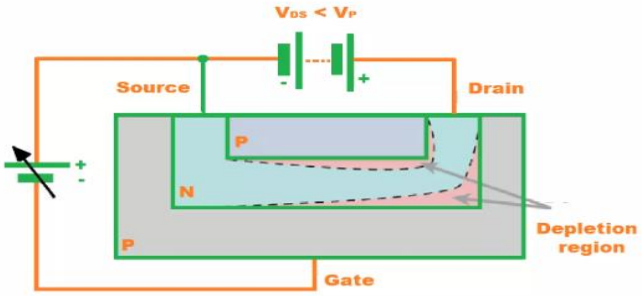
Feild Effect Transistor



Field Effect Transistor



Symbol of Field Effect transistor

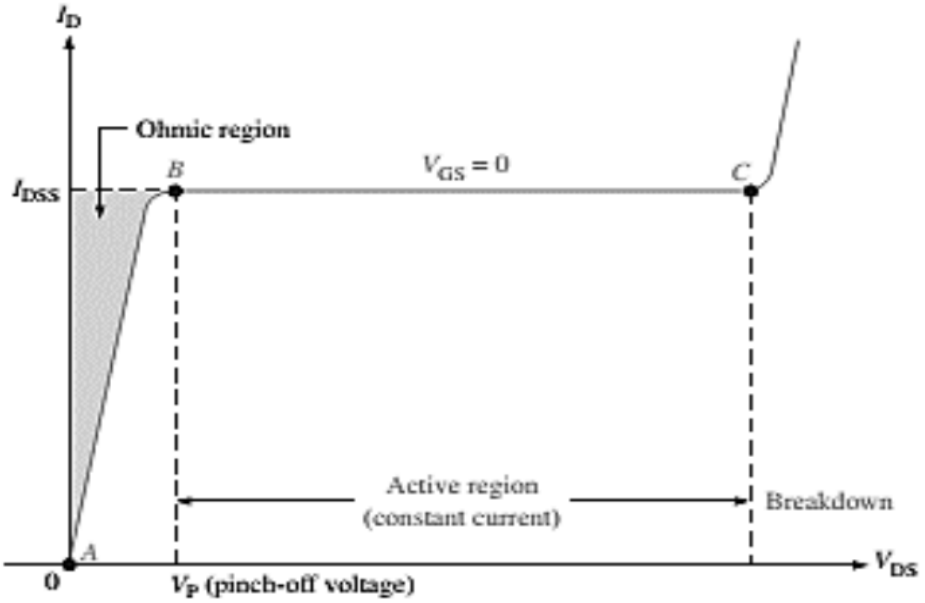


Working of FET

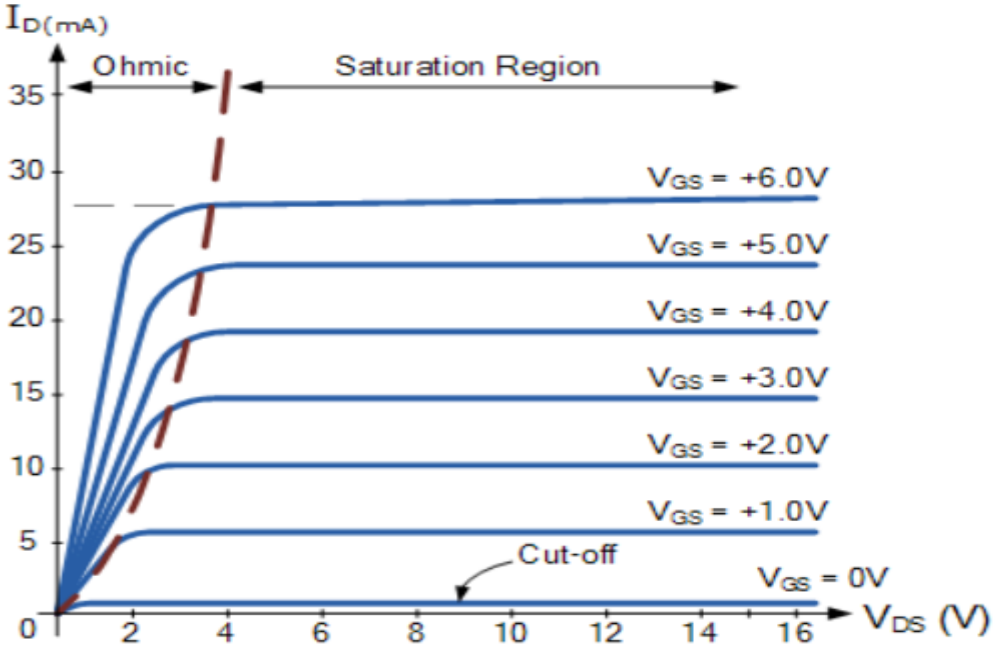
The FET operates based on the principle that an electric field applied to the gate terminal can control the flow of current between the source and drain terminals through the channel.

Characteristics of FET:

There are three regions in the characteristic curve for a JFET as illustrated for the case when VGS=0V. Between A and B is the Ohmic region, where current and voltage are related by Ohm's law. From B to C is the active (constant-current) region where current is essentially independent of VDS. Beyond C is the breakdown region. Operation here can damage the FET



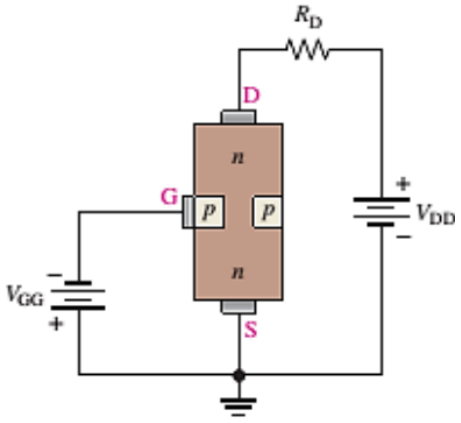
When VGS is set to different values, the relationship between VDS and ID develops a family of characteristic curves for the device. An n-channel characteristic is illustrated below figure.



Procedure

1- Connect the test circuit shown in Fig. to measure IDSS and.

2- Let VGS =(0,0.5,1,1.5,2,2.5)V measure ID



VGS	ID	VDS
0		
0.5		
1		
1.5		
2		
3		

Results:

Draw (drain characteristics) between ID & VDS for different values of VGS.

Discussion

1. What are the key differences between an N-channel and a P-channel FET?
2. What is the basic principle of operation of a field-effect transistor (FET)?
3. Compared between the transistor & FET
4. Draw FET characteristics between ID & VDS for different values of VGS.
5. What are the advantages of using a FET over a bipolar junction transistor (BJT) in certain applications?
6. How do process variations affect the performance and characteristics of FETs in integrated circuits?
7. Discus how does the drain current of a FET vary with the gate-source voltage?