Final Exam (EEE)

- FET & Multification (Book + Others)

Group-B

- OP-Amp (gaye wared + others)
- Op-Amp Application Compercator (Slide)
- Feedback and Oscillator (V.K. Mehta)

Field Effect Transistors

- FET (Field effect transistor) (Only ১টি Current বাহক থাকবে)
- MOSFET (Metal Oxide Semiconductor Field effect transistor)

FET Types → Junction field effect transistor (JFET)
→ MOSFET (Metal Oxide Semiconductor field effect transistor)

- FET is one Kind of unipolar junction transistor.

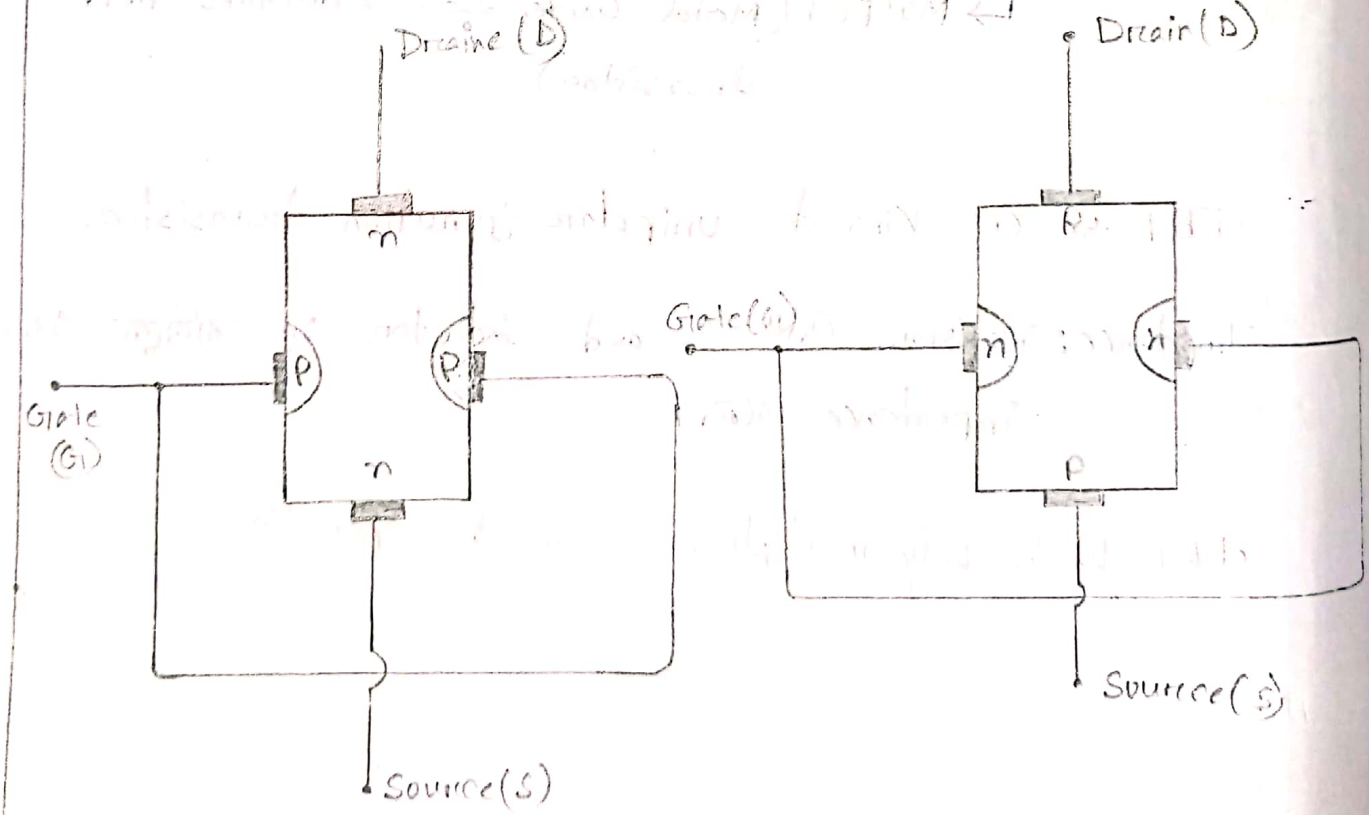
Impedance: Resistor Collector and inductor এর বিরুদ্ধে একসাথে impedence বলা

- FET Works Only in depletion mode of operation

Junction field effect transistor (JFET):-

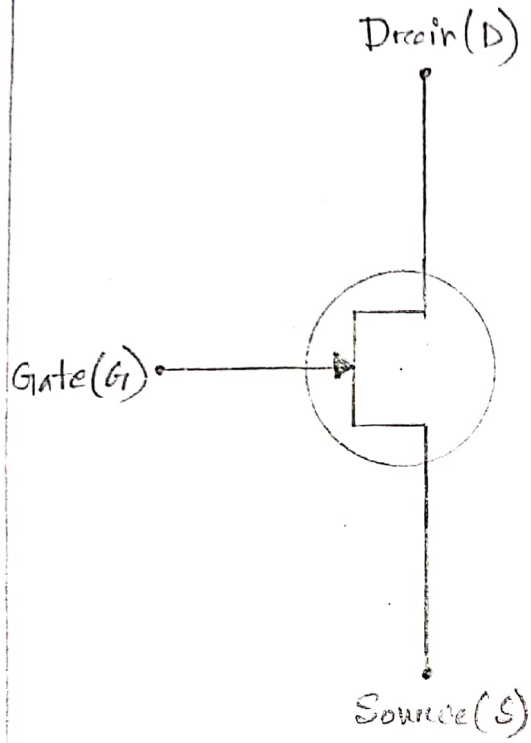
A junction field effect transistor is a three terminal semiconductor device in which current conduction is by one type of carrier electrons or holes.

Constructional details: A JFET consists of a p-type or n-type silicon bar containing two p-n junctions at the sides as shown. If the bar is of n-type it is called n-channel JFET and if the bar is of p-type it is called a p-channel JFET

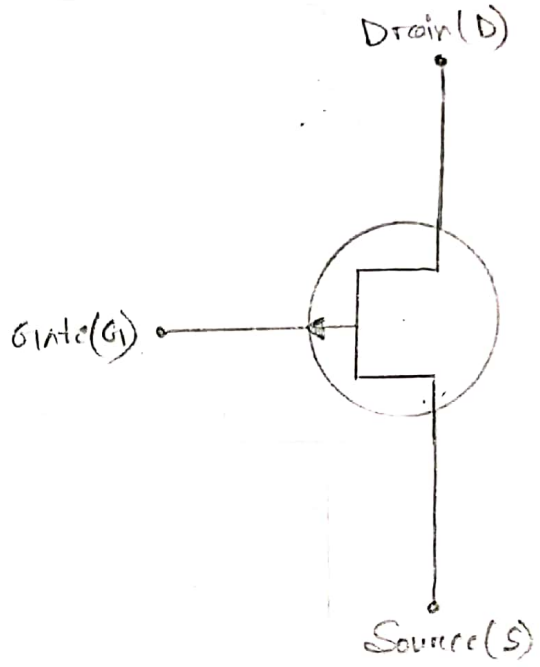


n-channel JFET

P-channel JFET



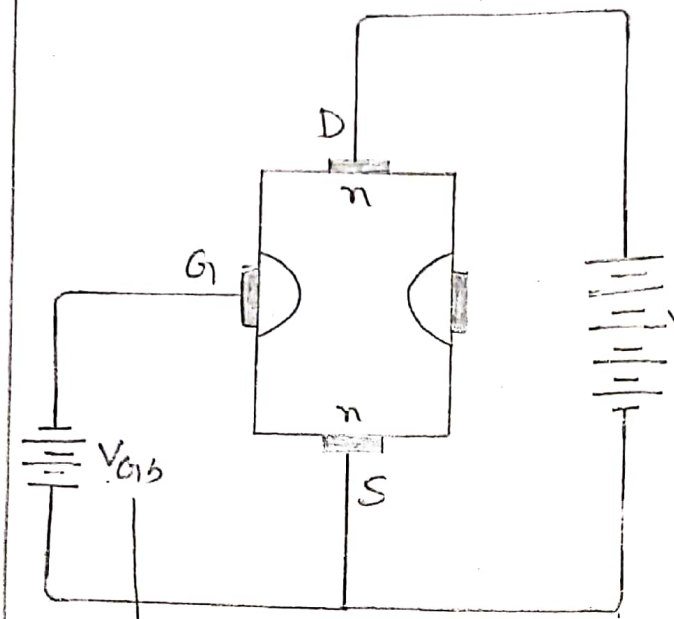
n-channel JFET Symbool

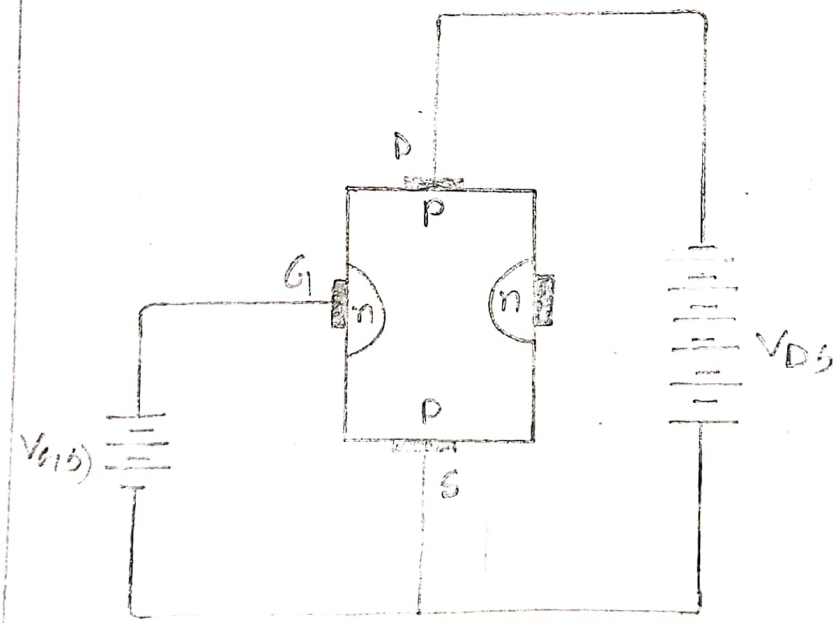


P-type channel JEFT Symbool.

JFET Biasing:-

Shows n-channel JFET polarities whereas. Show the P-Channel JFET polarities. The voltage between the gate and ~~source~~ sources is such that the gate is reverse biased. This is the normal way of JFET connection.


D
n
G1
n
S
V_{DS} (Drain - to Source voltage)
V_{GS}
(Gate - to Source Voltage)


D
P
G1
n
n
P
S
V_{DS}
V_{GS}

The following point maybe noted:

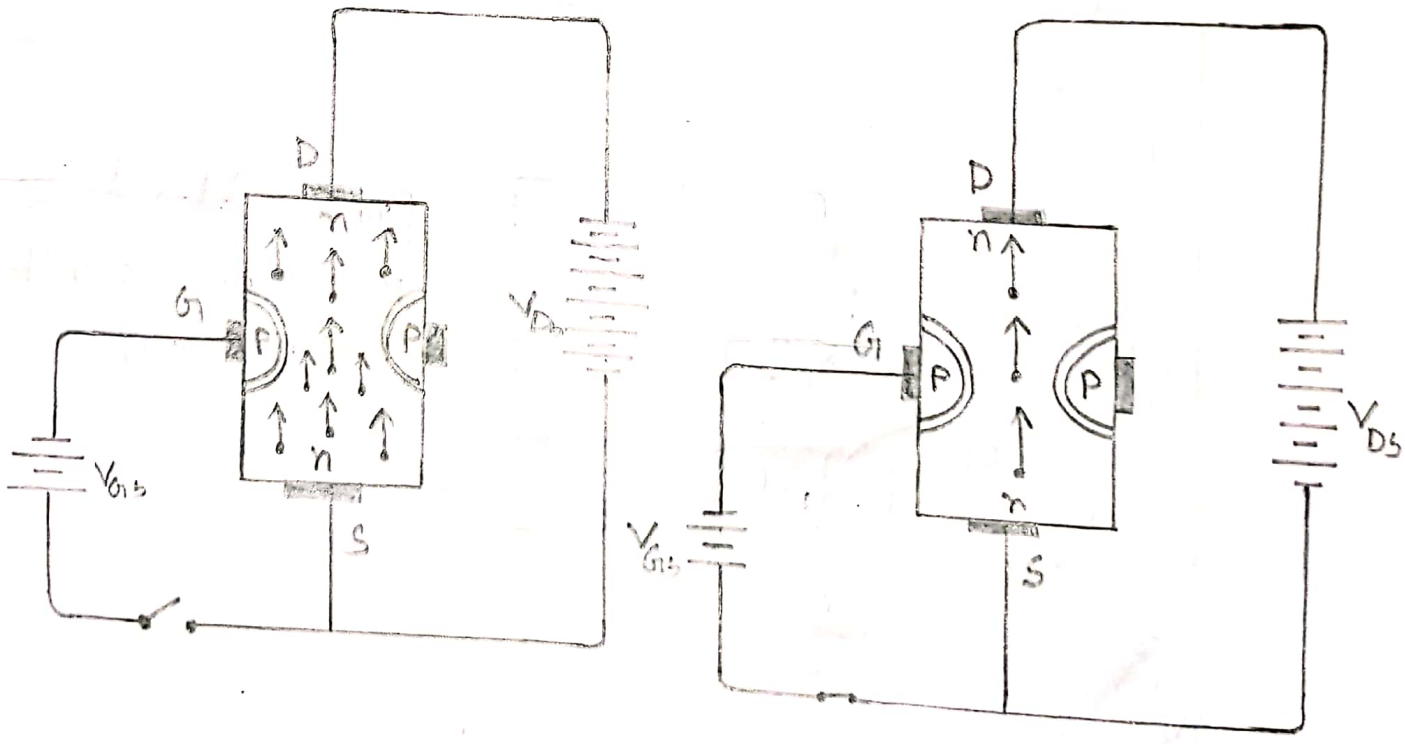
i) The input circuit of a JFET is reverse biased. This means that the device has high input impedance.

ii) The drain is so biased w.r.t source that the drain current I_D flows from the source to drain

iii) In all JFET source current I_S is equal to the drain current $I_S = I_D$.

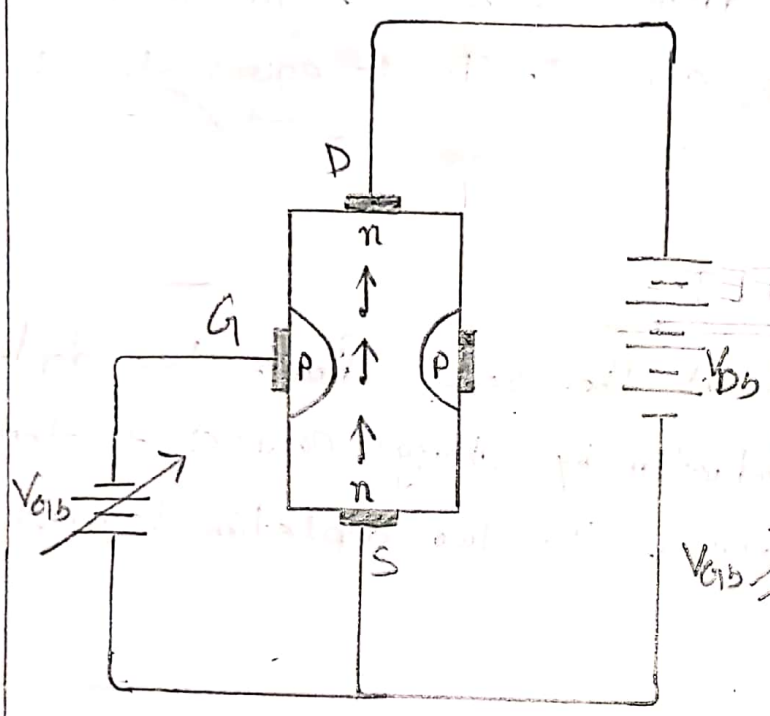
Working Principle of JFET:-

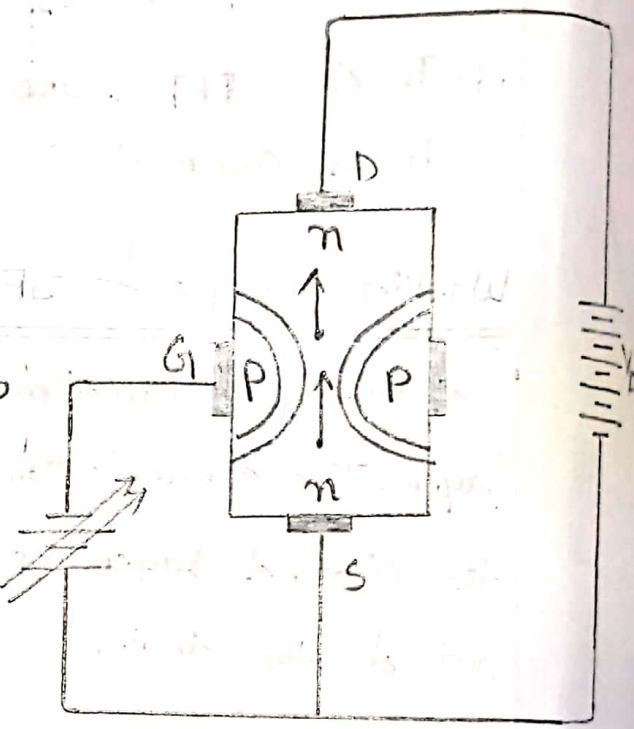
The two p-n junction at the sides from two depletion layer. The current Conductim by charge carrecies is through the channel layer between the two depletim layers and out of the drain.

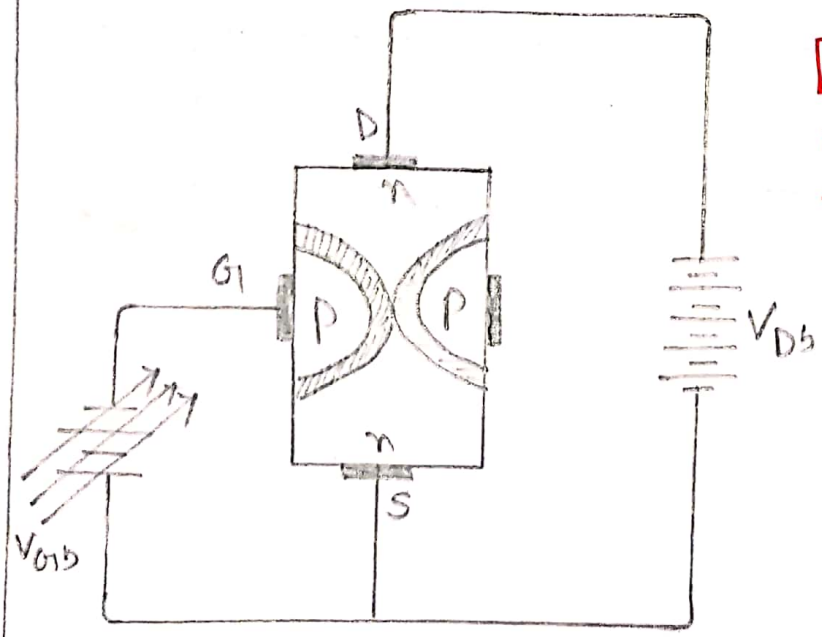


• reverse bias এর voltage (V_{GS}) বাড়লে depletion layer মোটা হতে থাকে এবং Current flow বন্ধ হয়ে যায়।

• যখন Gate এ থাকে না, তখন Source থেকে maximum current Drain এ পৌঁছায়।



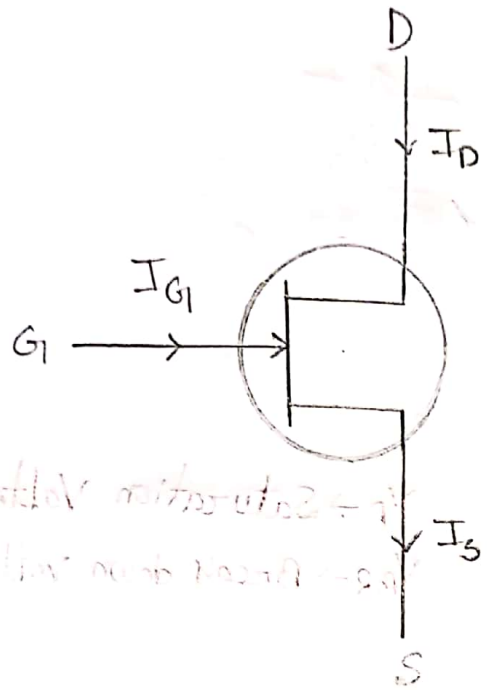




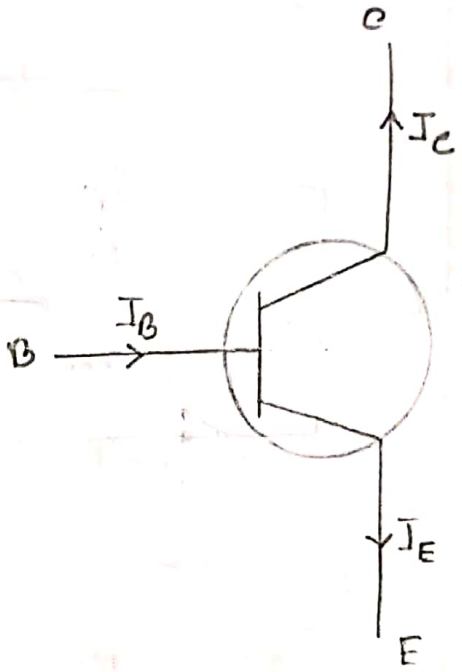
[Current flow এ যেহেতু reverse bias এর voltage বাড়ানো হচ্ছে।]

Comparison with BJT:-

FET



BJT

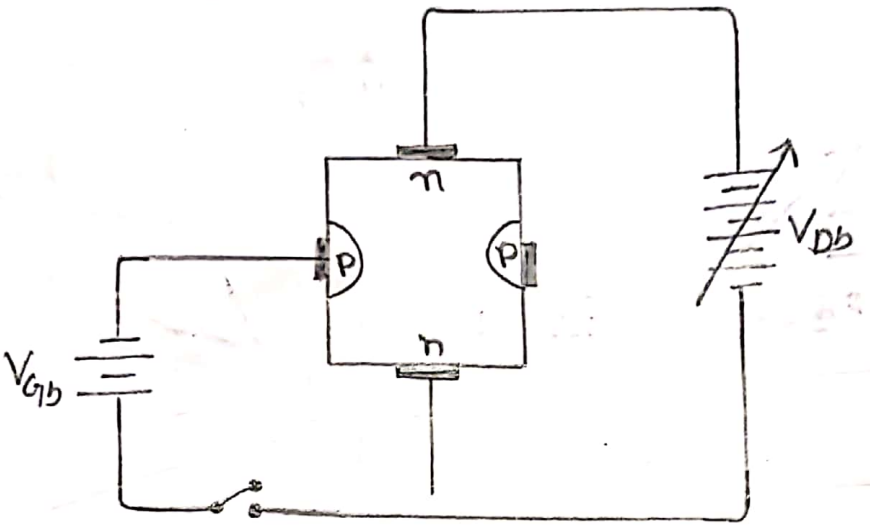


- Input Impedence High is good. We will known later.
- Difference between FET (Field Effect Transistor) & BJT (Bipolar junctim transistor).

Input Voltage	Input Current
• High Input resistance.	• Low Input resistance.
• Noise level is very low.	• Noise level is High.
• One type carrier.	• Both electron & hole are carrier.
• Unipolar transistor.	• Bipolar transistor

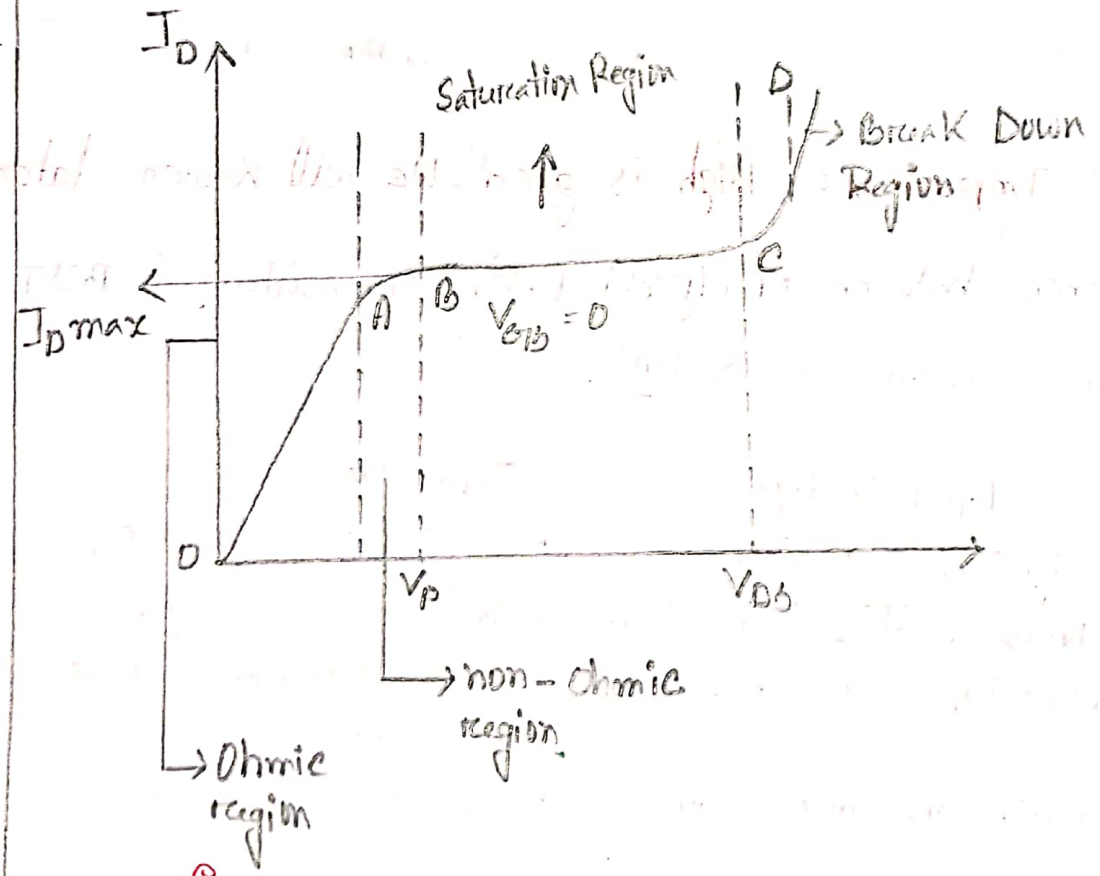
(NOT UJT - Uni Junction Transistor)

Output Characteristics of JFET:-

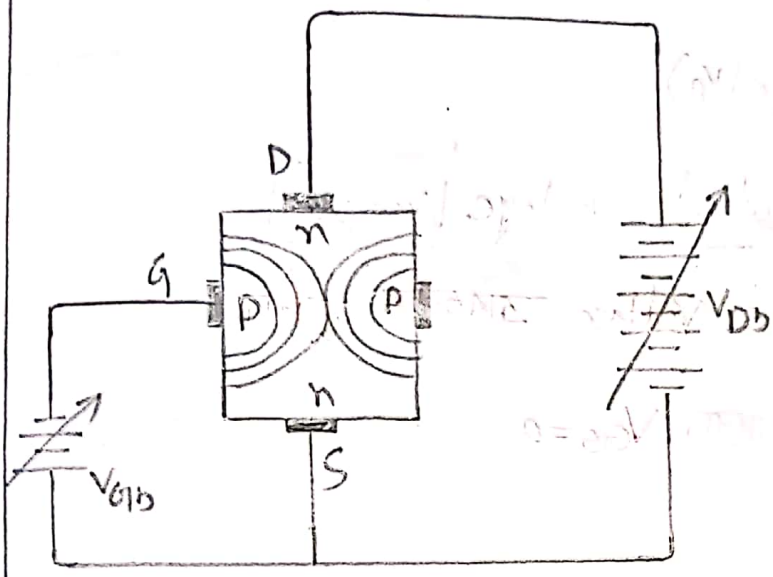


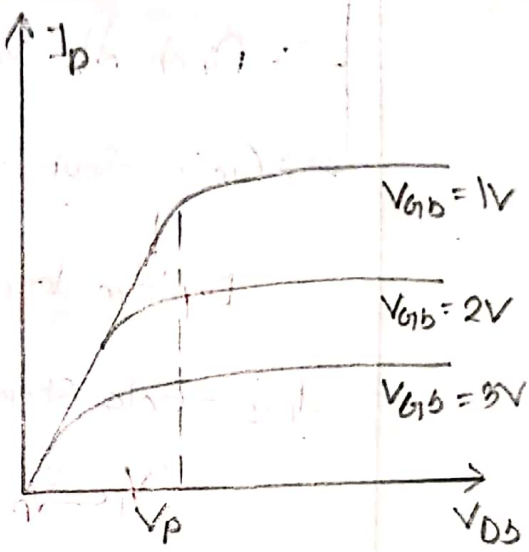
$V_P \rightarrow$ Saturation Voltage

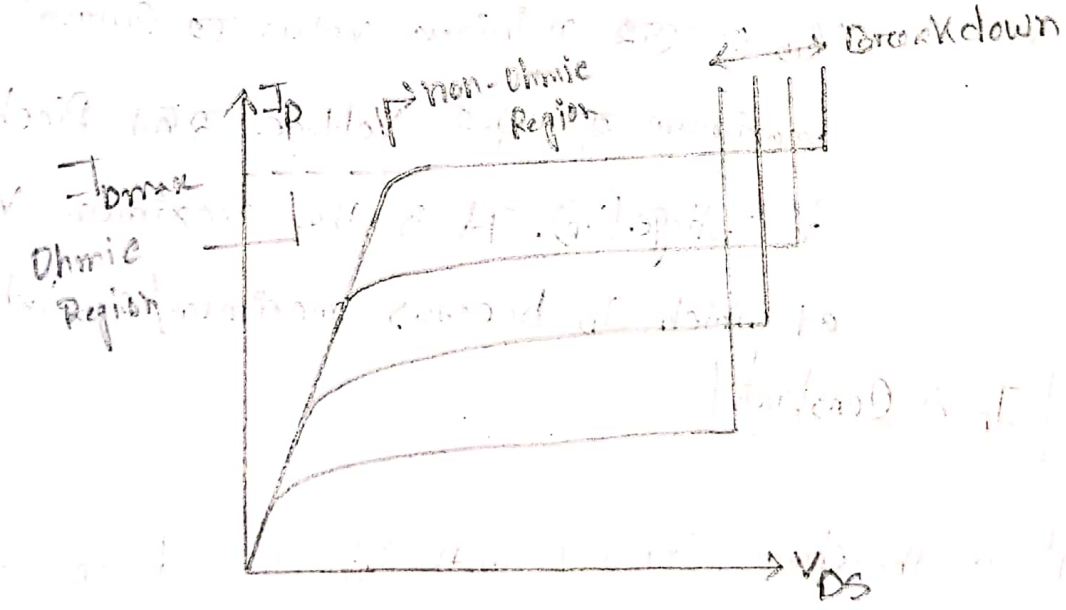
$V_{BR} \rightarrow$ Break down Voltage



- V_{GS} ঋনাত্মক,
- V_{DS} এর সাথে সমানুপাতিক হারে I_D বাড়তেছে।







- V_{GS} যত কম হবে, breakdown তত দেরিতে হবে।

Some Important terms:-

- Shorted-gate drain Current (I_{DSS})
- Pinch off Voltage (V_P)
- Gate Source cut off Voltage [$V_{GS(off)}$]

↓ Depletion layer দুটো Voltage অবশ্যয় বেশি।

I_{DSS} → Gate Short থাকবে, $V_{GS}=0$

$V_{DS}=V_P$

Pinch off Voltage - Minimum V_{GS} এ যে maximum Current V_{GS} এর সেই minimum value তে Current maximum হয়, সেই Voltage কে Pinch off Voltage (V_P). It is the maximum V_{DS} at which I_D becomes maximum/constant

[I_D is Constant]

I_{DS} - It is the drain Current with $V_{GS}=0$ and $V_{DS}=V_P$

$V_{GS(off)}$ - It is the V_{GS} where the channel is completely cut off and $I_D = 0$.

• V_{GS} (Cut-off) Voltage এ Channel এ কোনো Current flow হয় না.