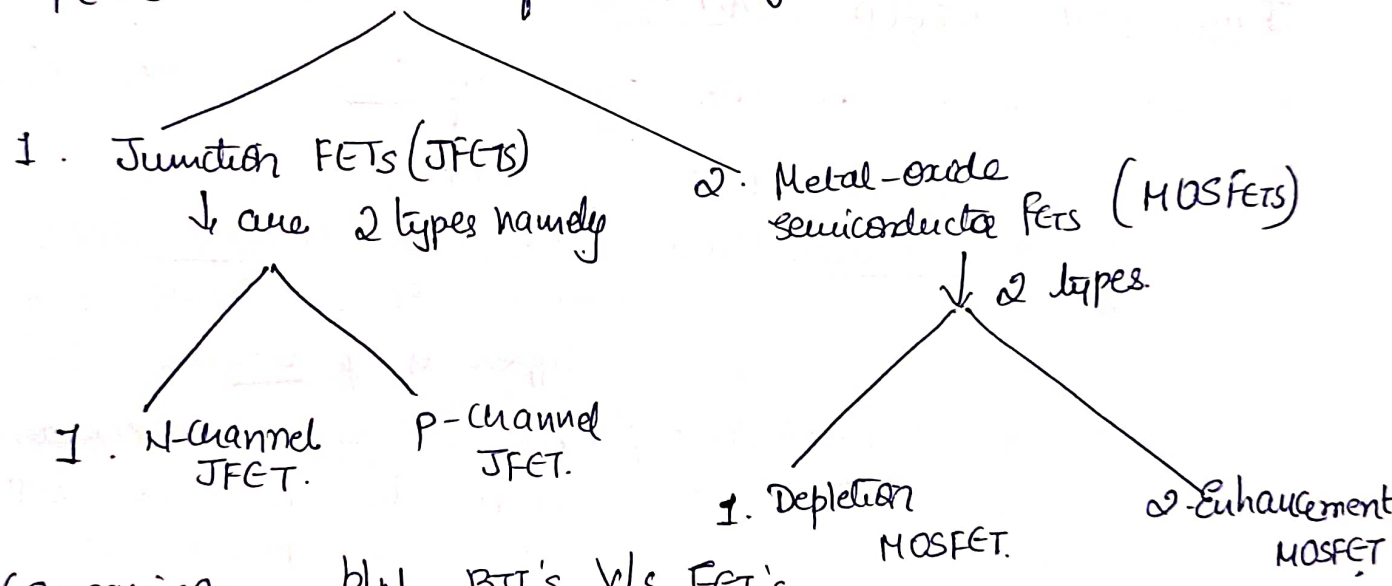
FET: [Field Effect transistor].

- Field effect transistors (FETs) are 3 terminal semiconductor devices.
- These 3 terminals are drain (D), the gate (G) and the source (S).
- In these devices, the conduction of current is controlled by the electric field created by the carriers present in the channel.
- FET's are classified into group's.



⇒ Comparison b/N BJT's V/s FET's

BJT	FET
1.) It is a bipolar device	1) It is a unipolar device
2) Both electrons & holes contribute to flow of current	2) Either electrons or holes contribute to flow of current.
3) It is a current-controlled device.	3) It is a voltage-controlled device.
4) so Base current controls the device current i.e, collector current	4) Gate-source voltage controls the device current i.e, Drain current.
5) only 2 types exists namely NPN & PNP transistors	6) several type exhibits namely N-channel, P-channel JFETs, E & D MOSFET
6) It exhibits low i/p resistance (KΩ).	7) It exhibits very high i/p impedance (MΩ)

7) It is too noisy due to Carriers crossing junctions

8) Thermal stability is low

9) Large in size

10) Gain is large in BJT amplifiers. Hence gain B.W is Quite large

7) It is less noisy (in JFETs) to carriers crossing the channel

8) Thermal stability is high

9) Smaller in size. [So preferred in fabrication of IC's]

10) Gain is less in JFET amplifiers. Hence gain B.W is low.

JUNCTION FIELD TRANSISTOR's

→ The simplest possible type of FET is the JFET.

→ as said 2 types of JFET's.

1. n-Channel JFET [where the semiconductor channel is an 'n' type material & the other type is p-Channel JFET.]
2. p-Channel JFET [where the semiconducting channel is 'p'-type material & the other type is N-channel JFET]

→ These are Voltage-controlled devices.

[in the sense that the voltage applied at one terminal controls the flow of current between the 2 terminals]

CONSTRUCTION & STRUCTURE

Fig ① n-Channel JFET → Symbol

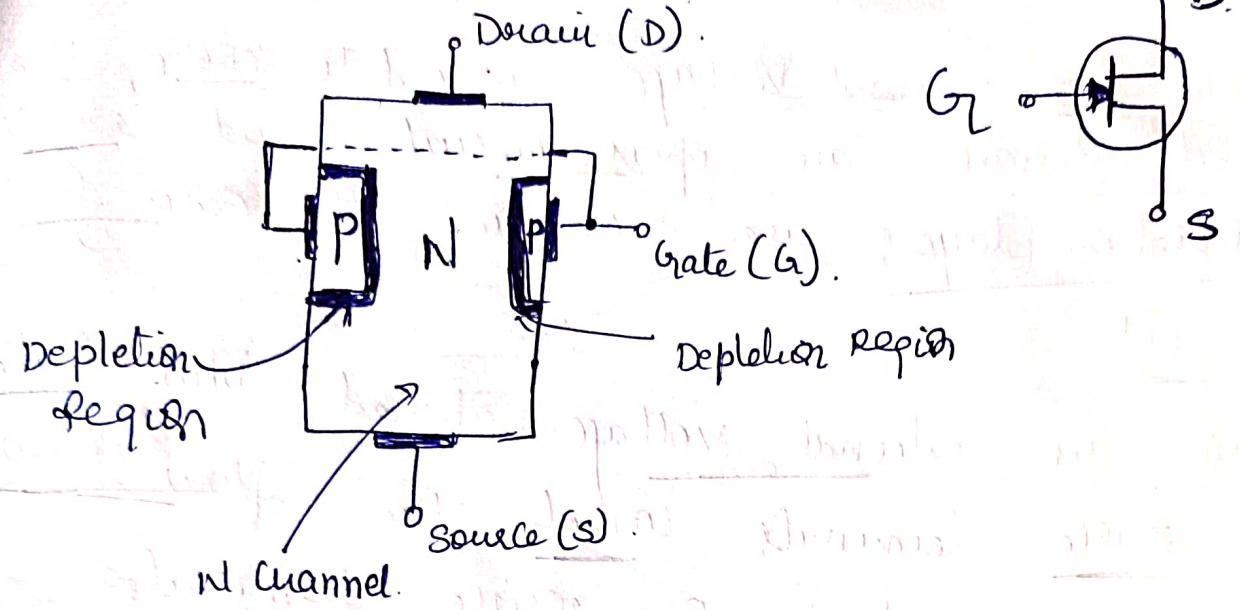
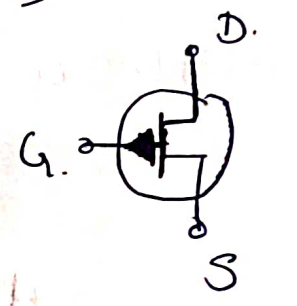


Fig ② p-Channel JFET → Symbol



⇓

channel is 'p' & other two is 'n' channel.

→ The structure and construction of an n-channel JFET is as shown in fig ①. and also the symbol.

→ (from fig ①) A 'n' type semiconductor material forms the channel b/w the Embedded layers of p-type semiconductor material

→ An ohmic contact attached at the top of the n-type channel forms the "Drain terminal (D)" &

→ while the ohmic contact attached at the bottom of the forms the "source terminal (S)".

→ The p-type materials are shorted together to form the "Gate terminal" (G).

→ Illy in p-channel JFET, a p-type s/c material forms p-channel b/w the embedded layers of n-type s/c.

* → with No external voltage applied to JFET, the p-N junctions are open circuit and small depletion layers are observed at each of the jun

* → If an external voltage applied b/w Gate & source terminals controls the flow of current b/w the drain & source terminals

PRINCIPLE OPERATION & CHARACTERISTIC CURVES

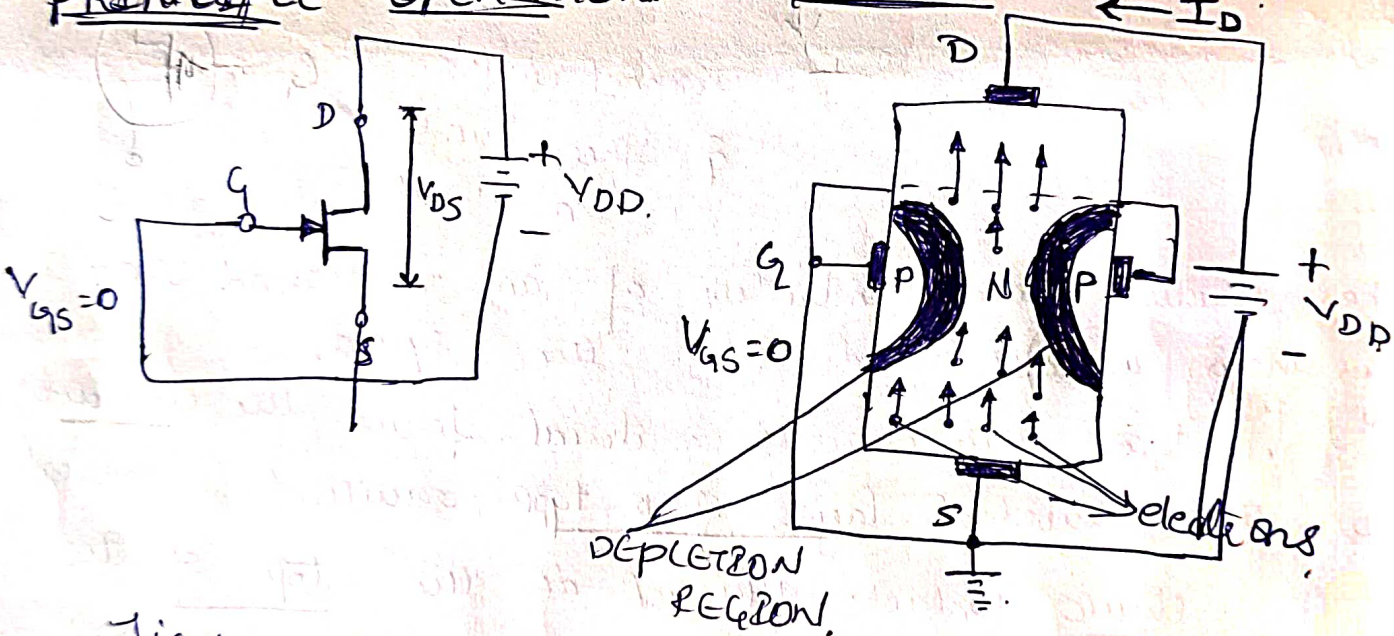


Fig:- Ckt showing n-channel JFET with $V_{GS}=0$ & V_{DS} = a positive value.

→ let us consider an N-channel J-FET and discuss the principle of operation with

* → Gate shorted to the source terminal (i.e, $V_{GS}=0$)

& → let a positive Voltage V_{DD} is applied to the device

Define fig shows the internal structure of JFET.

→ The applied potential V_{DD} directly appears across the drain - source terminals. labelled as V_{DS} as shown in fig

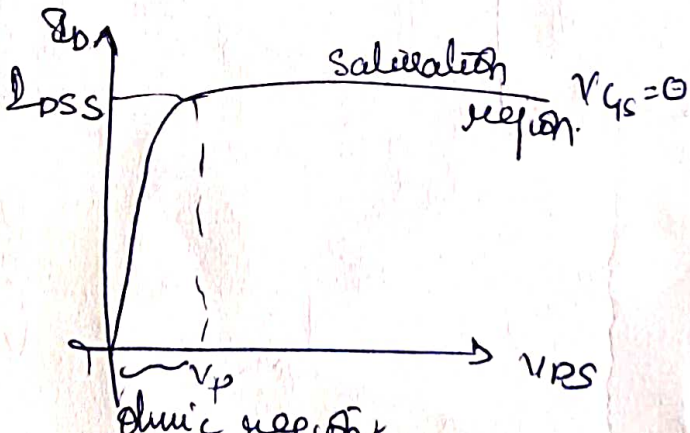
→. Due to +ve voltage on Drain terminal, $\bar{e}$ in the N- channel get energy from the applied voltage and move towards the drain

→ As a result, a current I_D flows from +ve terminal of V_{DD}, through drain terminal to source terminal & back to -ve terminal of V_{DD}

→. The magnitude of this current depends on the value of V_{DS} & the channel resistance b/w D & S terminals.

→ Due to flow of Drain current I_D, the voltage. V_{DS} will be uniformly dropped across the channel resistance.

→. This voltage Reverse biases the P-n junction



Explain about
[pinch of voltage]