Field Effect Transistor (FET) :—

→ FET is a unipolar Device because its operation depends on the flow of either free electrons or holes.

→ FET's are more temperature stable than BJT and are much smaller than BJT therefore suitable for use in IC.

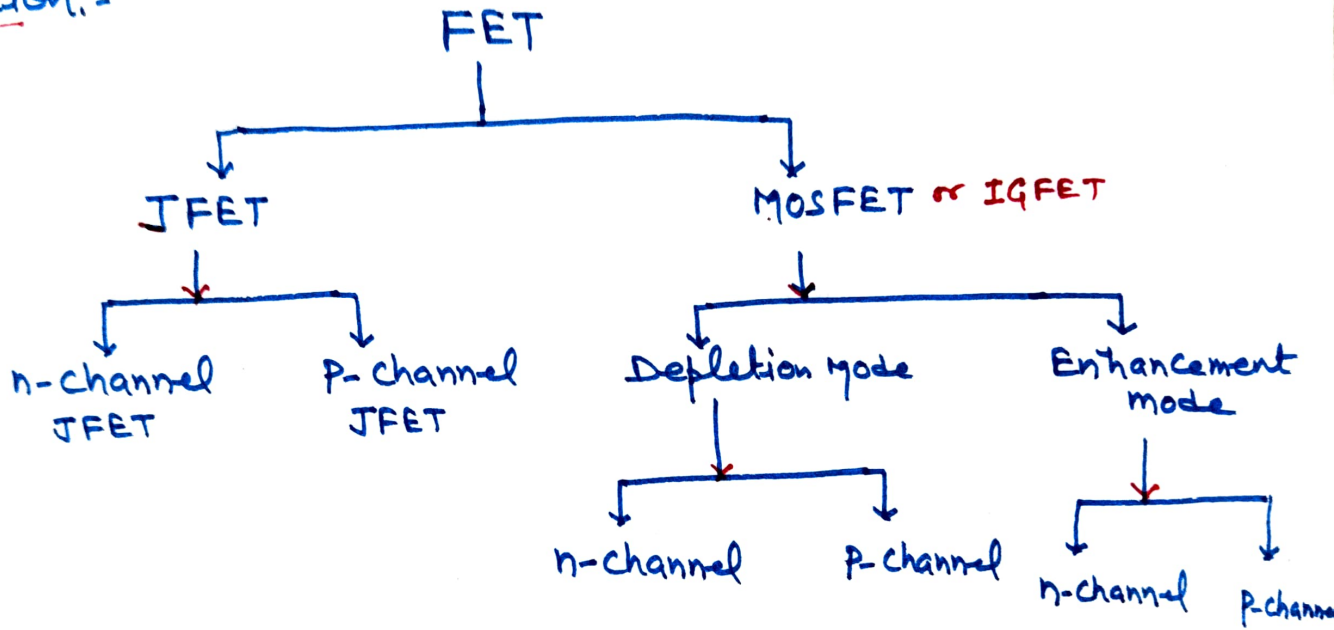
→ FET's are preffered for switching applications because there are no minority carriers therefore no stored charge problem.

→ Less Noisy.

→ FET input resistance is very high (in MΩ)

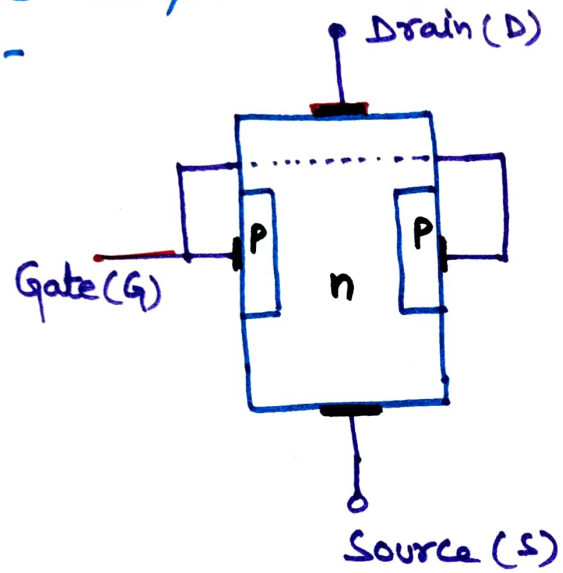
→ FET has smaller Gain Bandwidth product.

Classification:-

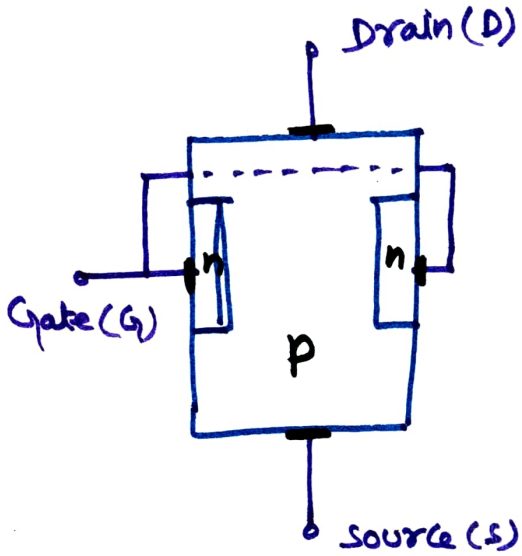


Basic Construction :-

JFET :-

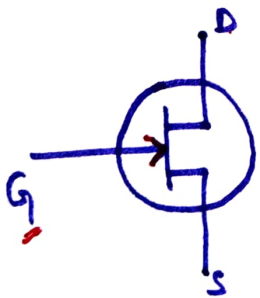


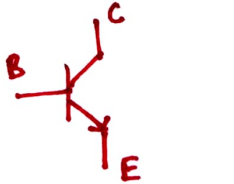
n-channel JFET

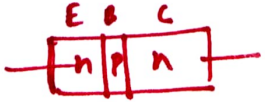


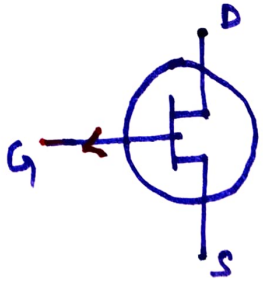
P-channel JFET

Symbol



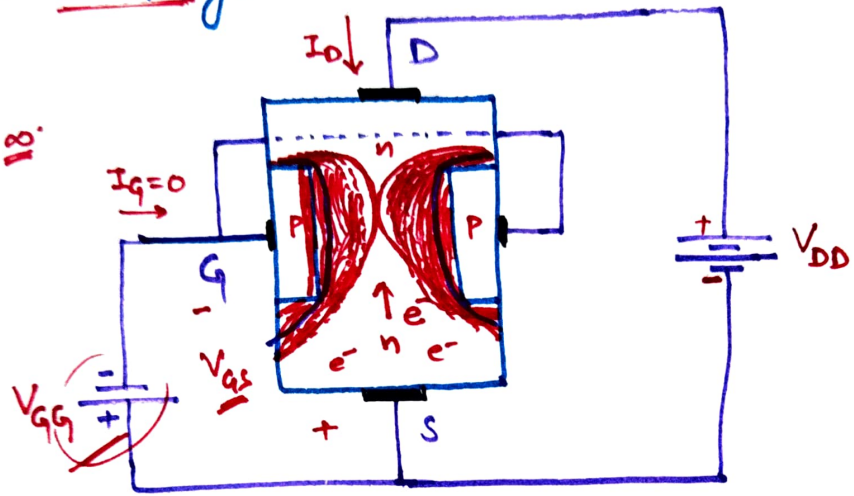






Operation or Working :-

$R = \frac{V}{I} = \frac{V}{0} = \infty$



→ We always kept Gate-Source diode in Reverse bias.

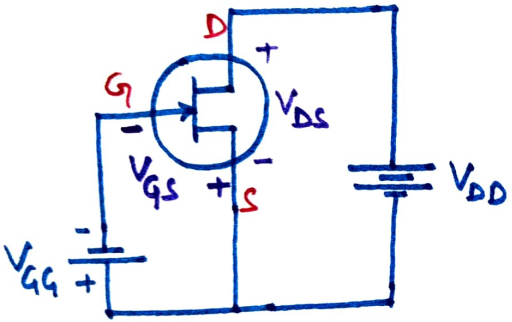
→ The more negative the Gate voltage, the smaller the current between the source and drain

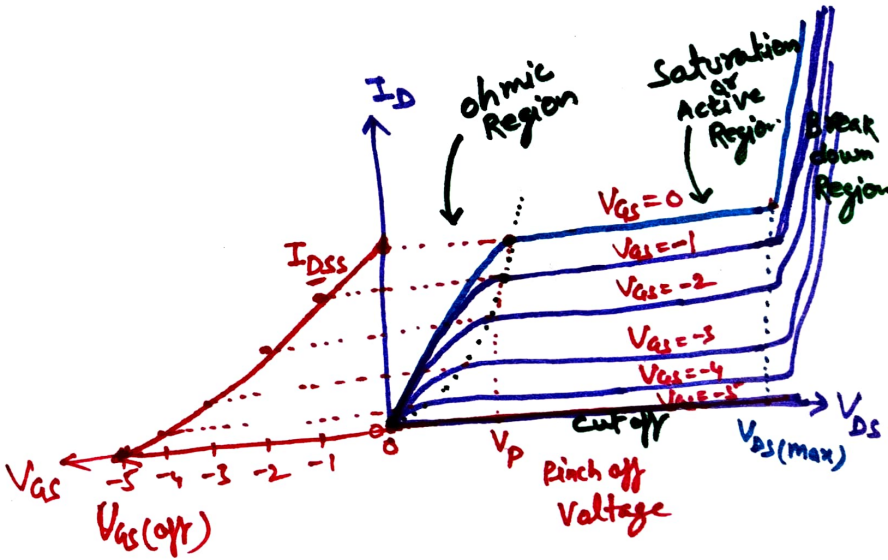
→ Therefore JFET is called as a voltage controlled device.

Characteristics of JFET :-

→ Drain characteristics or Drain curves

→ Transfer characteristics or Transconductance curve.

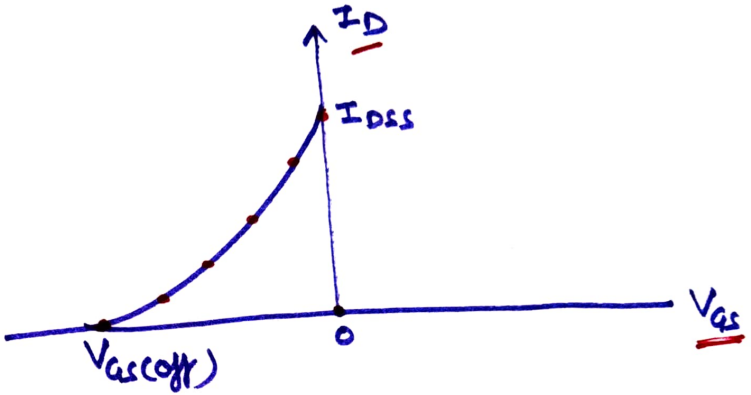




→ When JFET operates in ohmic Region it is equivalent to a resistor with value

$$R_{DS} = \frac{V_P}{I_{DSS}}$$

Transfer characteristic :-



The curve is non-linear because the current increases faster when V_{GS} approaches to zero

The equation for this graph is

$$I_D = I_{DSS}\left(1 - \frac{V_{GS}}{V_P}\right)^2$$

JFET is called square law device.