

Parameters of JFET

PAGE:
 DATE: / /

There are following parameters of JFET.

i) A.C. drain resistance (r_d)

ii) Transconductance (g_m)

iii) Amplification factor.

i) **A.C. drain resistance (r_d):** - It is the ratio of change in drain source voltage (ΔV_{DS}) to change in drain current (ΔI_D) at constant V_{GS} .

i.e.

$$r_d = \frac{\Delta V_{DS}}{\Delta I_D} \text{ at constant } V_{GS}$$

ii) **Transconductance (g_m):** - It is the ratio of change in drain current to change in gate-source voltage at constant drain-source voltage.

i.e.

$$g_m = \frac{\Delta I_D}{\Delta V_{GS}} \text{ at constant } V_{DS}$$

iii) **Amplification factor (μ):** - It is the ratio of change in drain-source voltage to change in gate-source voltage at constant drain current (I_D).

i.e.

$$\mu = \frac{\Delta V_{DS}}{\Delta V_{GS}} \text{ at constant } I_D$$

Relation between A_v , g_m and r_d

PAGE:
 DATE: / /

$$A_v = \frac{\Delta V_{out}}{\Delta V_{in}}$$
$$= \frac{\Delta V_{out} \times R_D}{\Delta V_{in} \times R_D}$$
$$= \frac{\Delta V_{out}}{\Delta V_{in}} \times \frac{R_D}{R_D}$$

$$A_v = r_d \times g_m$$

Variation of Transconductance (g_m) of JFET.

The transconductance g_m of a JFET is an important parameter because it is a major factor in determining the voltage gain of amplifiers.

The variation of transconductance (g_m) with V_{GS} is given by:

$$g_m = g_{m0} \left(1 - \frac{V_{GS}}{V_{GS(off)}} \right)$$

where

g_m = Value of transconductance at any point on the transfer characteristic curve.

g_{m0} = Value of transconductance (maximum) at $V_{GS} = 0$.

also,

$$g_{m0} = \frac{2 I_{DSS}}{|V_{GS(off)}|}$$

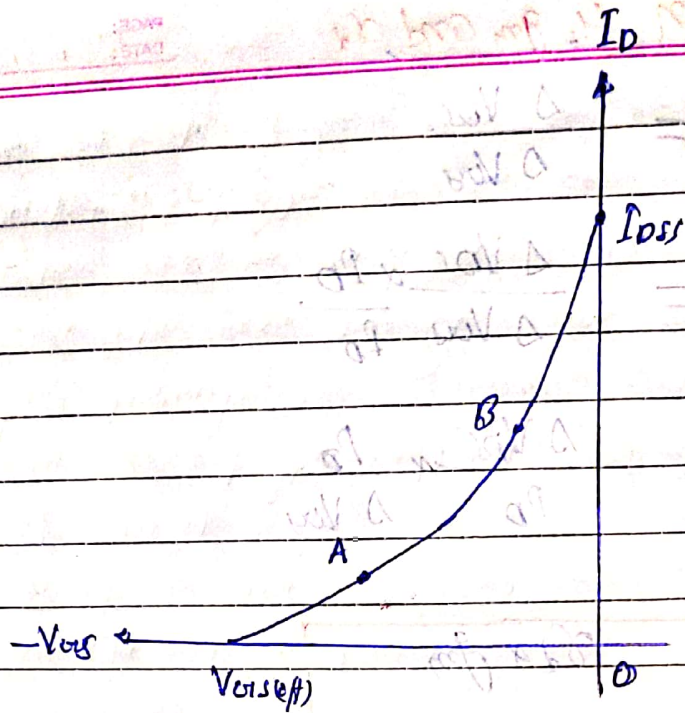


Fig: Variation of I_D with V_{GS}

JFET Application

Application of JFET

There are following application of JFET

- i) As a buffer amplifier.
- ii) phase shift Oscillator
- iii) As a RF amplifier.

cell vary from a maximum of loss to minimum of 0.

IV) Because of two gates are at the same potential both depletion layers extend or narrow down by an equal amount.

V) The JFET is not subject to thermal runaway when the temperature of device increases.

VI) Since JFET has no gate current, there is no heating of the device.

Important parameters of JFET.

There are following parameters of JFET.

i) Shorted gate-drain current (I_{DSS})

ii) Pinchoff voltage (V_p)

iii) Gate-source cut-off voltage ($V_{GS(off)}$)

i) **Shorted gate drain current (I_{DSS}):** - It is the drain current with short circuited gate (ie $V_{GS} = 0V$) and drain source voltage (V_{DS}) is equal to pinchoff voltage. It is sometimes called zero bias current.

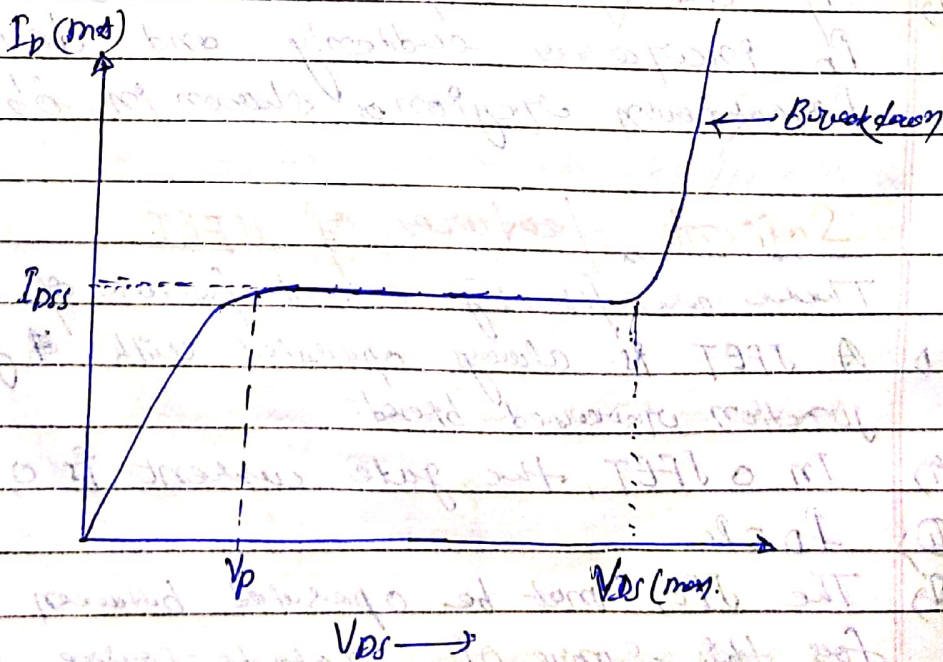


Fig: Characteristics of JFET.

II) pinch off voltage (V_p):- It is the minimum drain-source voltage at which the drain current becomes constant.

III) Gate-source cutoff voltage ($V_{GS(off)}$):- It is the gate-source voltage at which channel is completely cutoff and drain current becomes zero which is shown below.

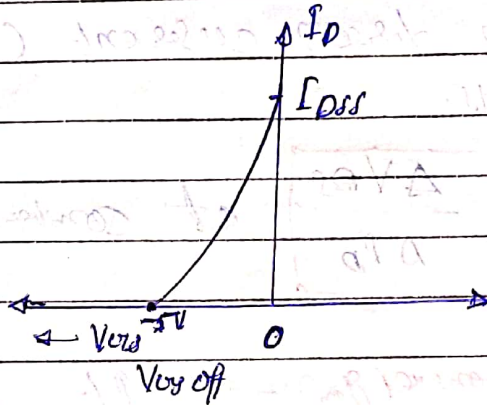


Fig. Variation of I_D with V_{GS} .

Expression for drain current

From ^{transfer} characteristic curve of JFET.

$$V_p = |V_{GS(off)}|$$

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

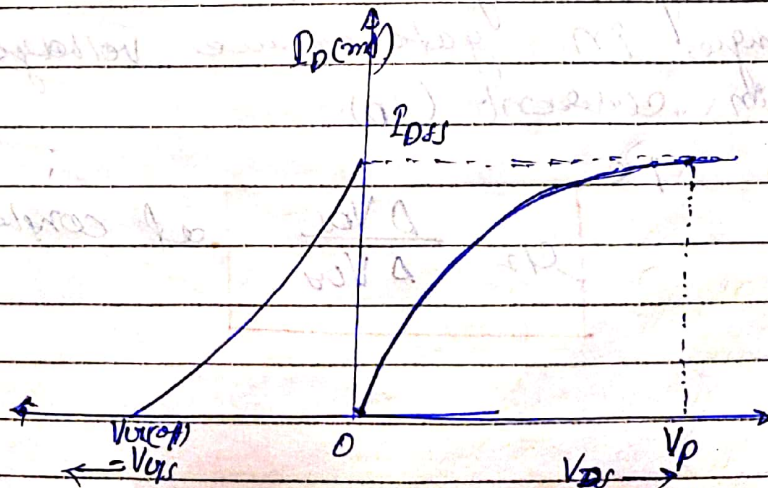


Fig. Transfer characteristic of JFET