Experiment 8
The Field Effect Transistor

Symbol :   n-channel JFET

I_D ohmic region   saturation Region
$V_{GS} = 0$

Avalanche Region

$V_{GS} = -0.5$

$G_{GS} = -1.0$

$V_{GS} = -1.5$

$V_{GS} = -2$

$V_{GS} = -2.5$

15 V V_{DS}

Gate G   Drain D   Source S
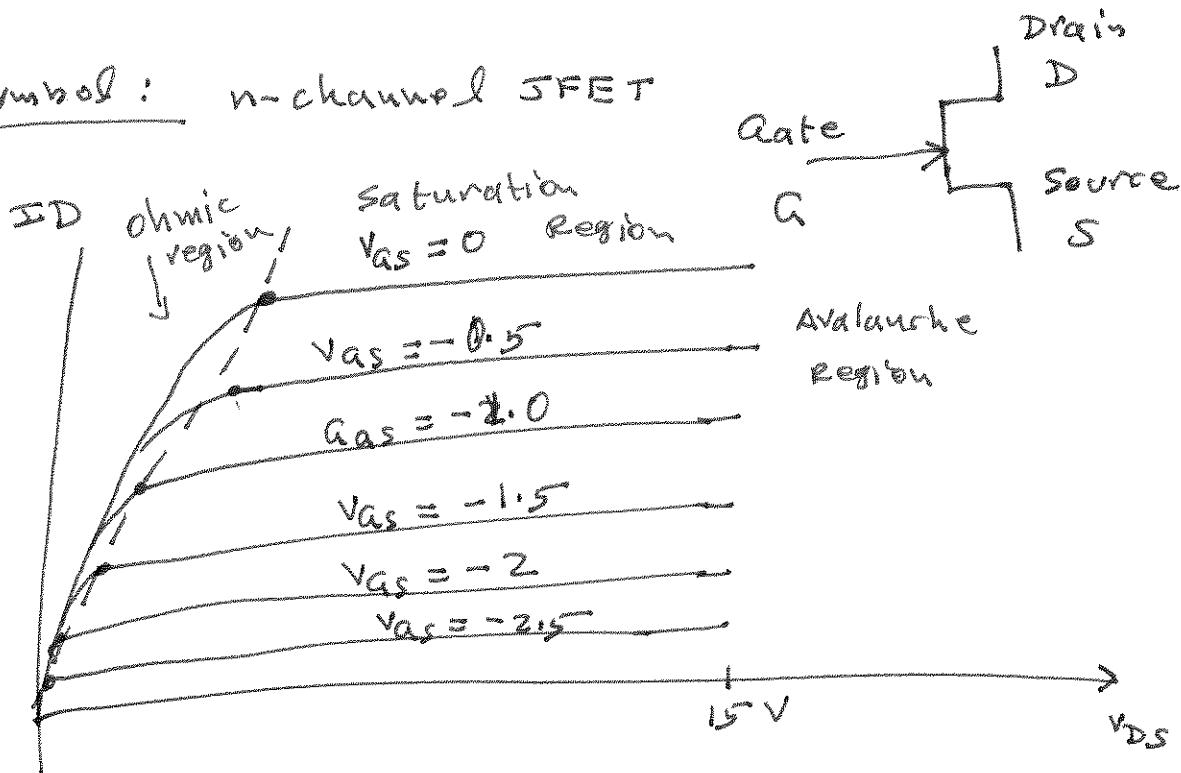
Transfer characteristic curve

when V_{DS} is held constant

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

I_{DSS} : saturation current for D~S
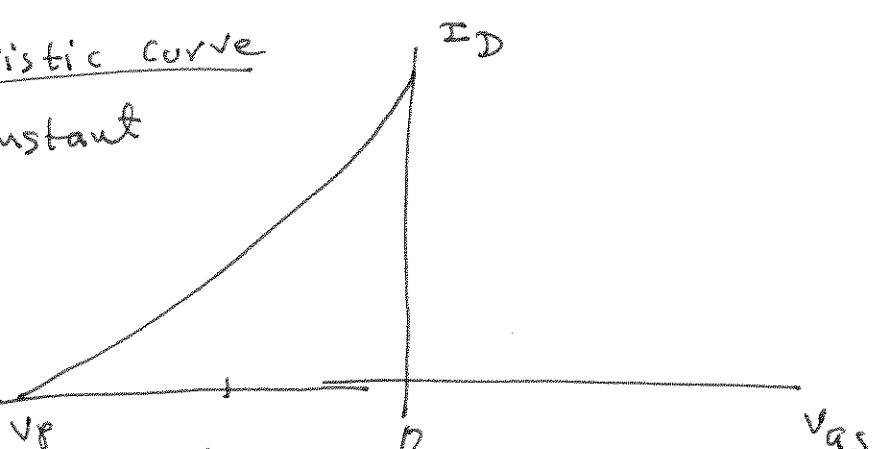
V_P : pinchoff voltage, at voltage voltage below which the transistor turns off.

threshold

I_D

V_P 0 V_{GS}

JFET Amplifier

$\Rightarrow$
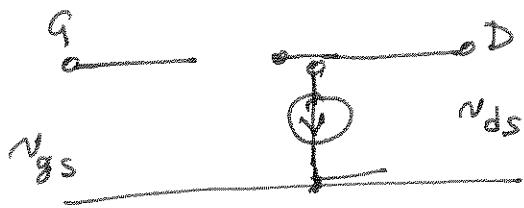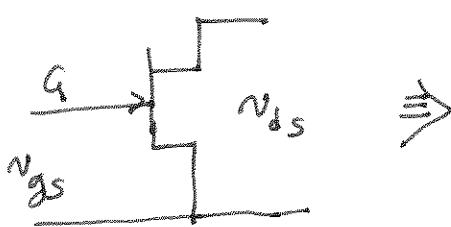
○ JFET : $i_d = g_m v_{gs}$: voltage-controlled current amplifier

○ BJT : $i_c = h_{fe} i_b$: current-controlled current amplifier

set $v_{DS} = 10V$

$R_x = 0$

$v_i' = 2V\ p\text{-}p$

gain = $\dfrac{v_o}{v_i}$

$R_i = \dfrac{v_i'}{i_i}$
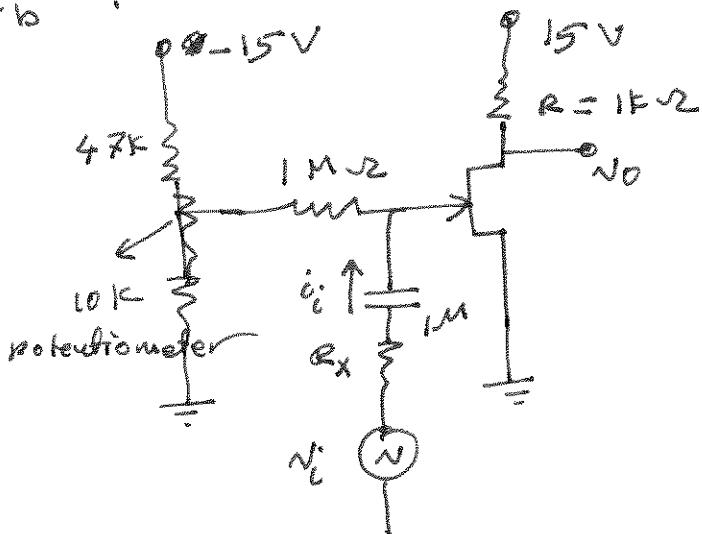
Constant current source

Here, $V_{GS} = 0$

$V_{DD} = I_D R_L + V_{GS}$

$I_D R_L = V_{DD} - V_{GS}$

$I_D = \dfrac{V_{DD} - V_{GS}}{R_L}$
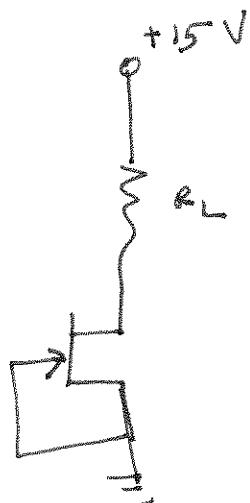
I_D will remain almost constant over a wide range of load resistance.