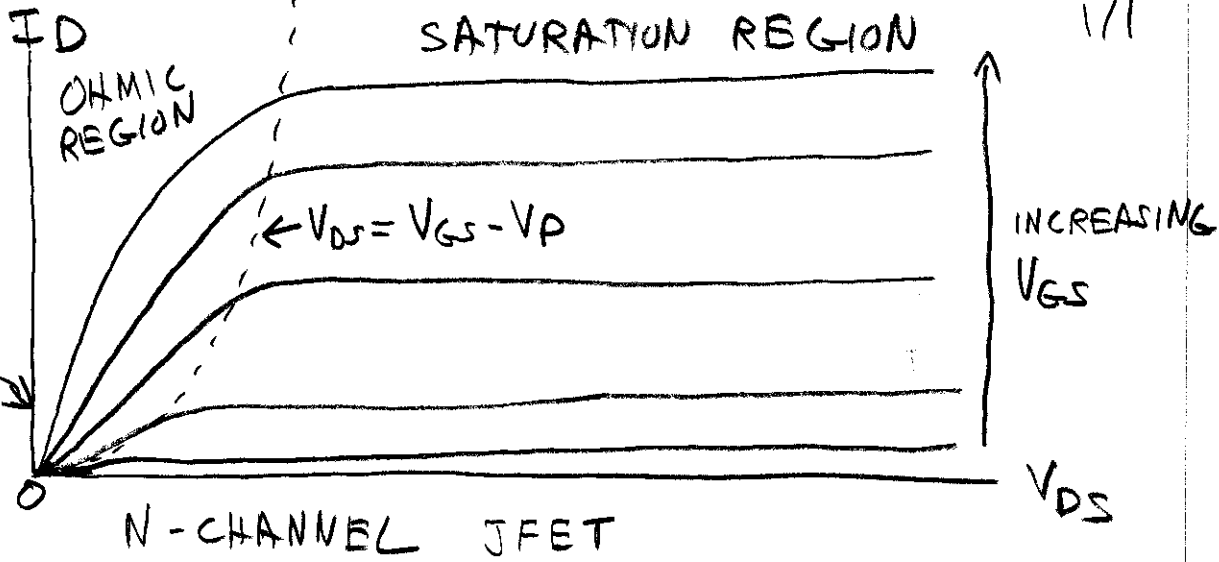


JFET Basics

FET CHARACTERISTICS

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COMPARISON OF FET TO BJT (BIPOlar JUNCTION TRANSISTOR)

	INPUT IMPEDANCE	OUTPUT IMPEDANCE	g_m
BJT COMMON-EMITTER	1 - 10 $k\Omega$	50k - 1M	$g_m \approx \frac{1}{r_e}$ 10-4000 MS
JFET COMMON SOURCE	10 - 1000 $M\Omega$	50k - 1M	1 - 10 MS
MOSFET COMMON SOURCE	$10^{10} - 10^{14} \Omega$	5k - 100k	1 - 50 MS

THE PRIMARY ADVANTAGE OF FETs IS HIGH INPUT IMPEDANCE.

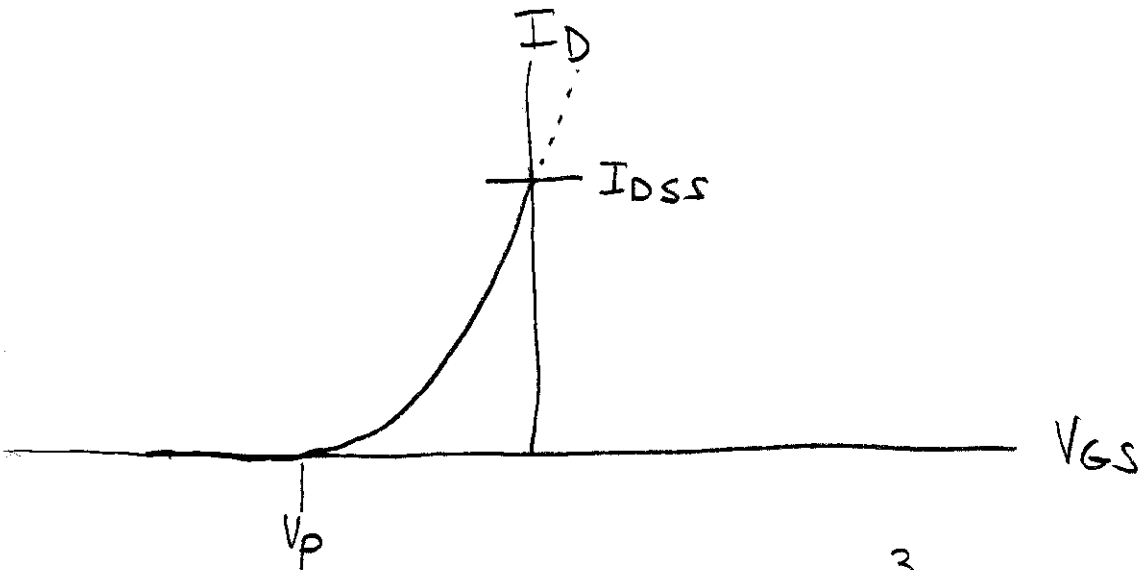
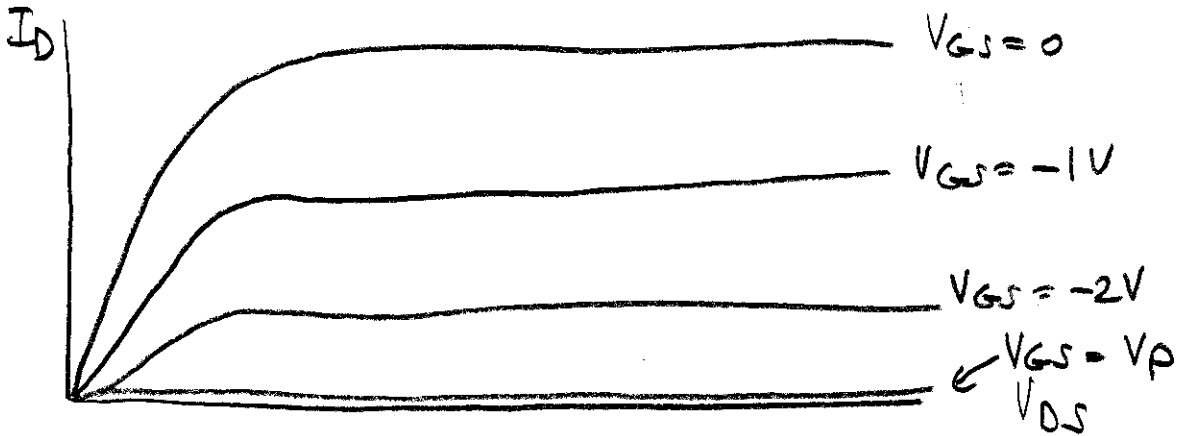
JFETS

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THERE ARE 2 PARAMETERS.

I_{DSS} - SATURATION DRAIN CURRENT AT $V_{GS} = 0$

V_p - V_{GS} PINCH-OFF VOLTAGE, $I_D = 0$



$$I_D = I_{DSS} \left[1 - 3 \left(\frac{V_{GS}}{V_p} \right) + 2 \left(\frac{V_{GS}}{V_p} \right)^{\frac{3}{2}} \right]$$

CAN BE APPROXIMATED WITHIN 7% AS:

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

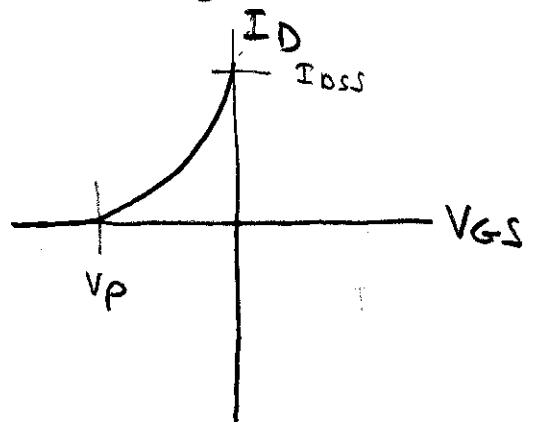
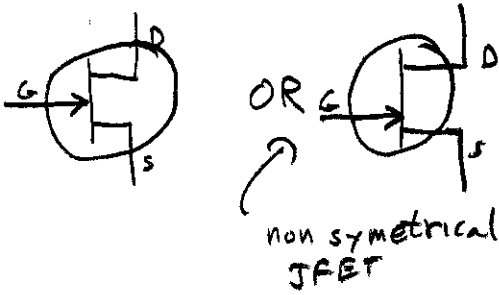
$$I_D = I_{DSS} \left[1 - \left(\frac{V_{GS}}{V_p} \right) \right]^2$$

TRUE ONLY IF
 $V_{DS} > (V_{GS} - V_p)$!!!

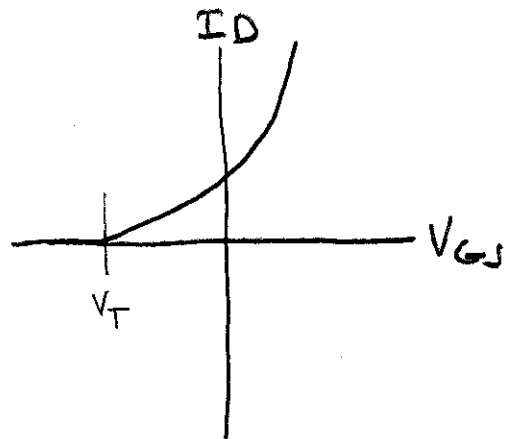
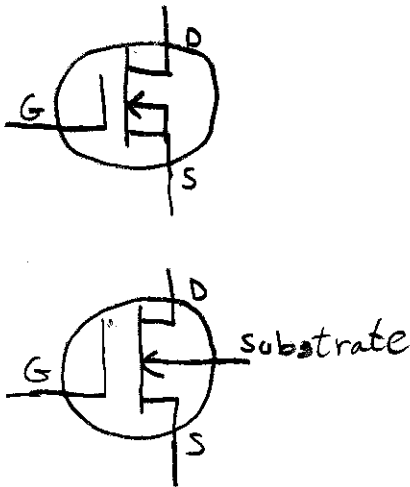
JFET Basics

SUMMARY OF FET SYMBOLS AND CHARACTERISTICS

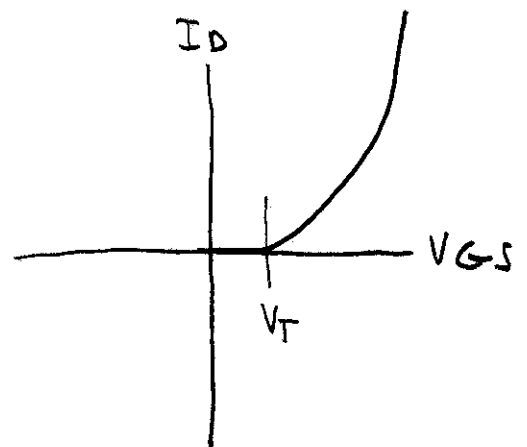
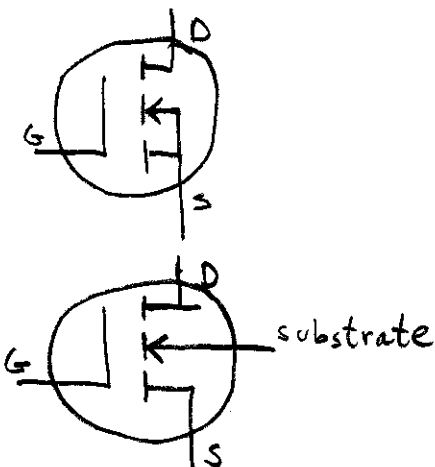
N-CHANNEL JFET (DEPLETION MODE)



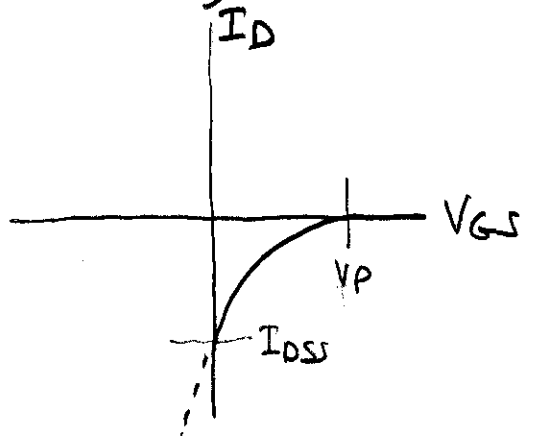
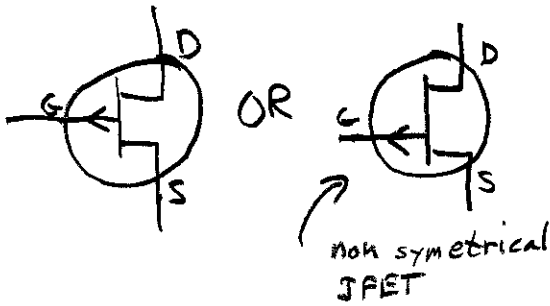
N-CHANNEL MOSFET (DEPLETION MODE)



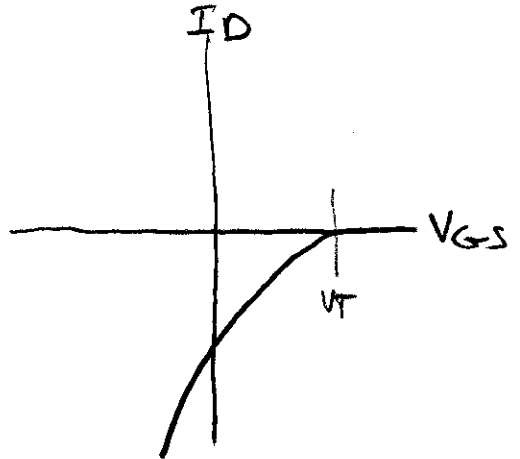
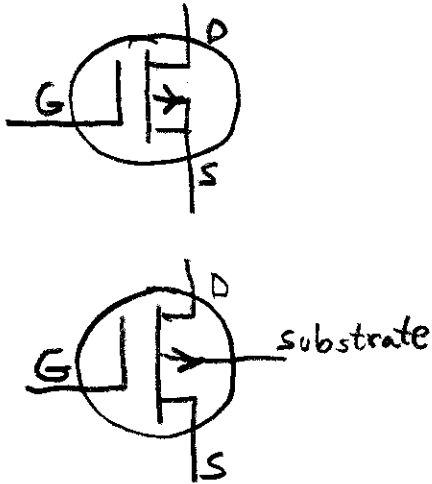
N-CHANNEL MOSFET (ENHANCEMENT MODE)



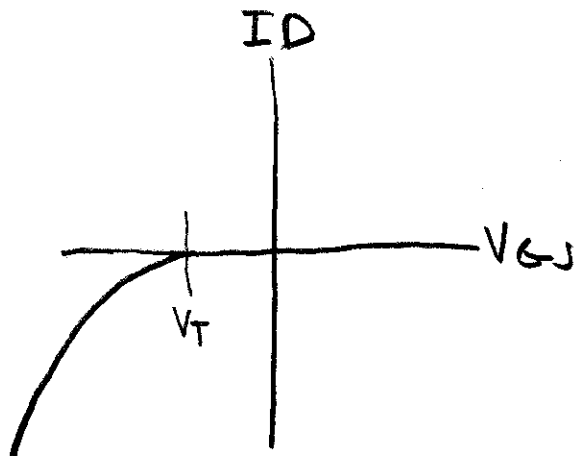
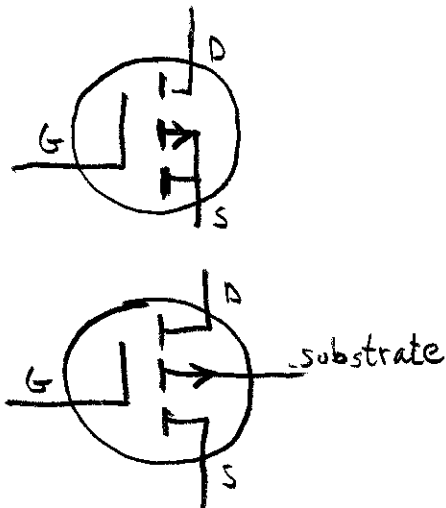
P-CHANNEL JFET (DEPLETION MODE)



P-CHANNEL MOSFET (DEPLETION MODE)

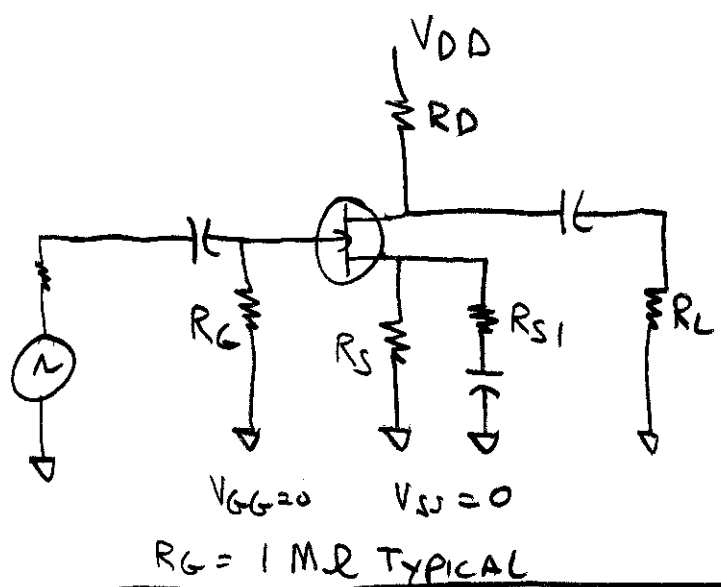


P-CHANNEL MOSFET (ENHANCEMENT MODE)

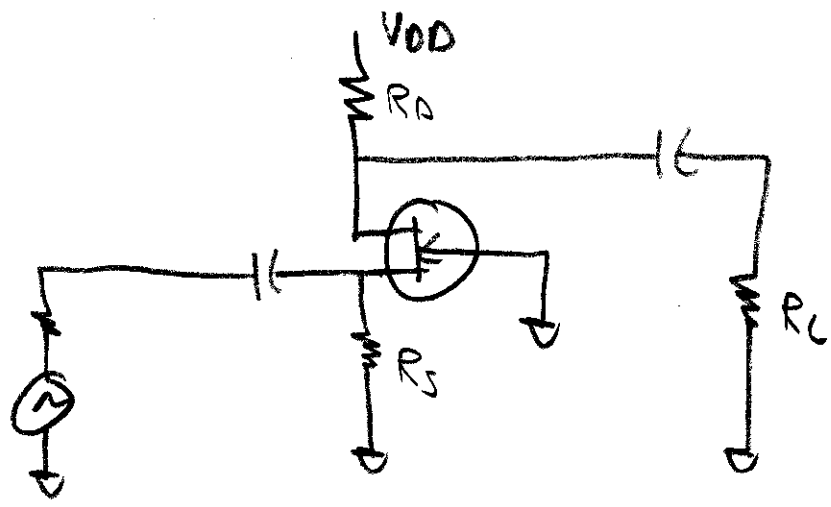


TYPICAL JFET CIRCUITS

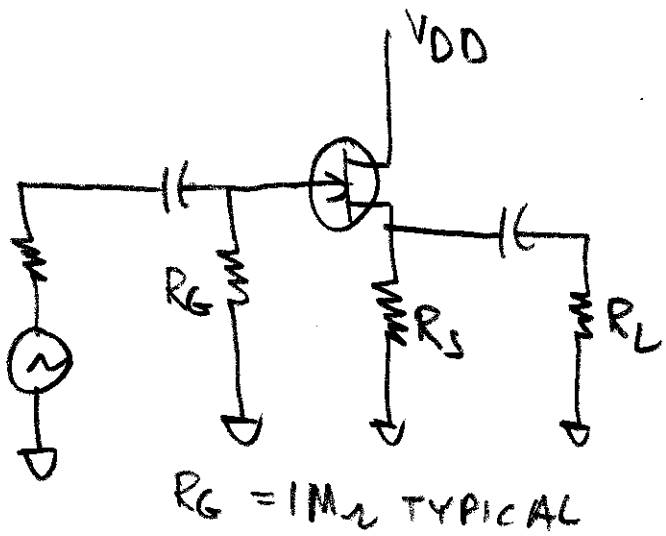
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COMMON SOURCE



COMMON GATE

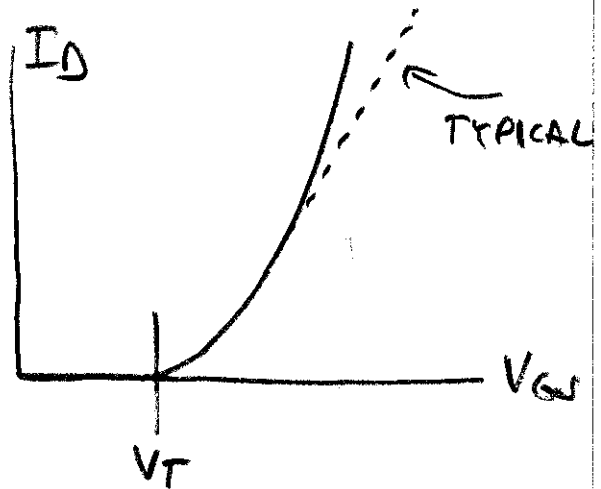


COMMON DRAIN

- ARE PRIMARILY USED IN SWITCHING CIRCUITS.

$$I_D = k (V_{GS} - V_T)^2$$

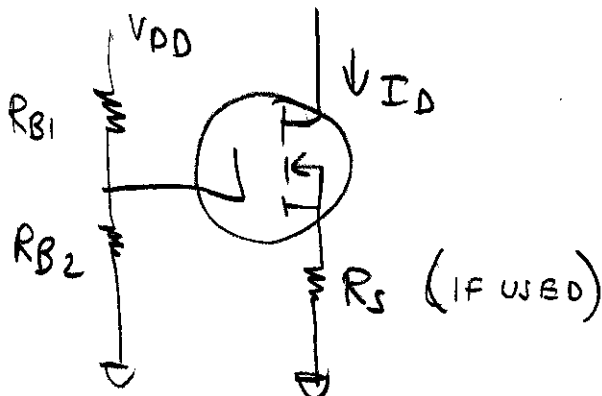
k TYPICALLY ABOUT
0.05 S/V



$$g_m = \frac{\partial I_D}{\partial V_{GS}} = 2k(V_{GS} - V_T) = 2\sqrt{kI_D}$$

- AS A SWITCH, THE MOSFET CAN ACHIEVE "ON" RESISTANCE OF 1 OHM OR SMALLER.

CRUDE BIAS FOR LINEAR APPLICATIONS



① FROM DATA BOOK, DETERMINE V_{GS} FOR DESIRED I_D

② $I_D R_S + V_{GS} = V_G$

$$V_G = \frac{V_{DD} R_{B2}}{R_{B1} + R_{B2}}$$

DETERMINE APPROPRIATE R_{B1} , R_{B2}