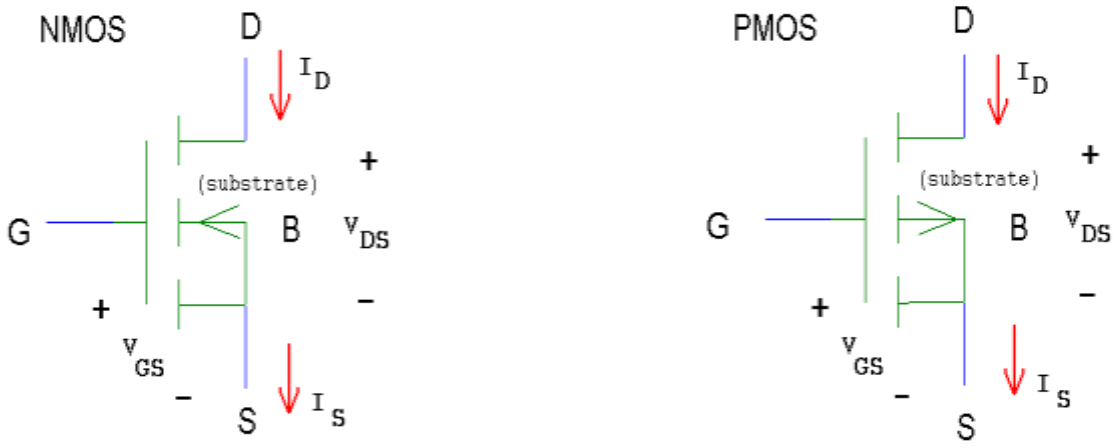
Field Effect Transistor Models

Enhancement Mode Metal-Oxide-Semiconductor Field Effect Transistors

$I_G = 0$

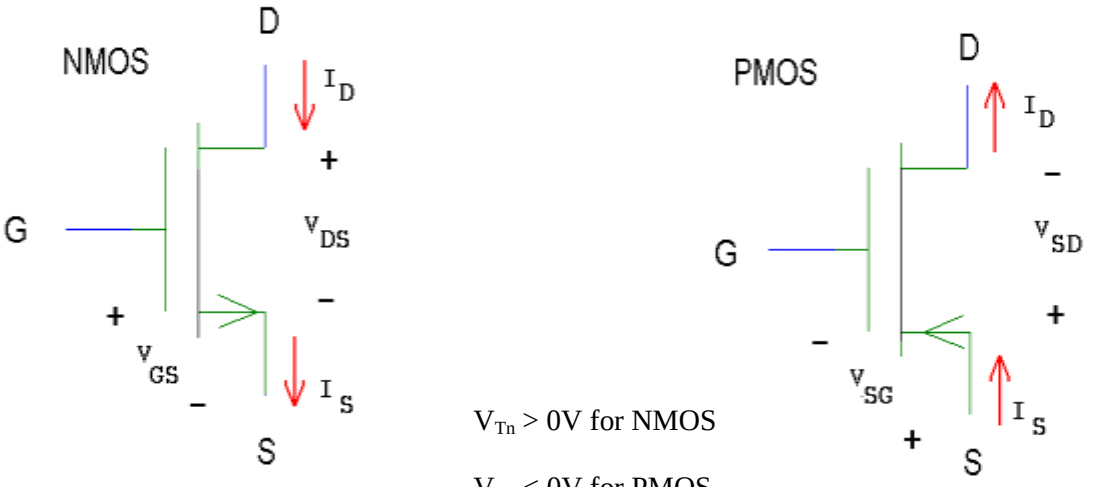
Symbol Used in Jaeger



$V_{TN} > 0V$ for NMOS

$V_{TP} < 0V$ for PMOS

Symbol Used in Neamen

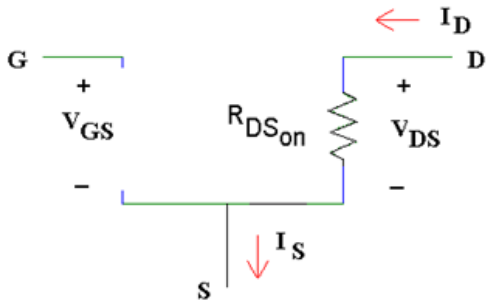


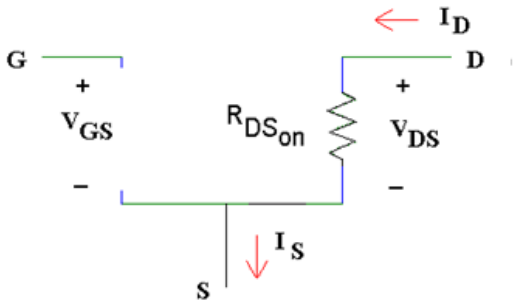
$V_{Tn} > 0V$ for NMOS

$V_{Tp} < 0V$ for PMOS

DC FET Enhancement Mode Models - Jaeger

Triode: $I_G = 0$ $I_D < I_{Dsat}$





$V_{GS} > V_{TN}$ $V_{DS} < V_{GS} - V_{TN}$

$I_D = Kn[(V_{GS} - V_{TN})V_{DS} - 0.5V_{DS}^2]$

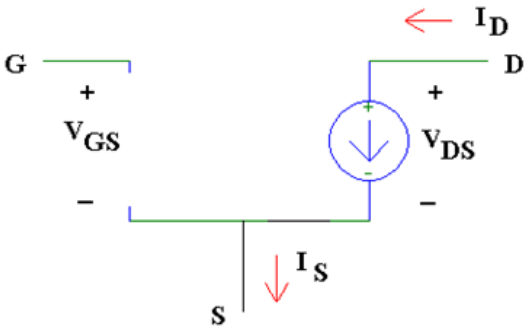
$R_{DSon} = V_{DS}/I_D$

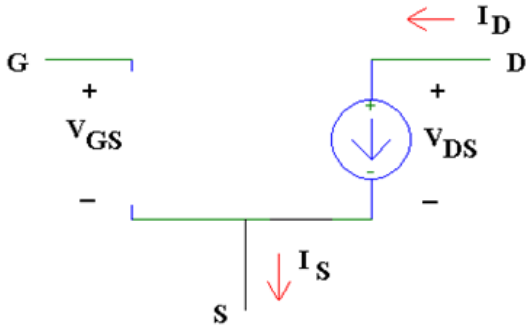
$V_{GS} < V_{TP}$ $V_{DS} > V_{GS} - V_{TP}$

$I_D = Kp[(V_{GS} - V_{TN})V_{DS} - 0.5V_{DS}^2]$

$R_{DSon} = V_{DS}/I_D$

Saturation: $I_G = 0$, $I_D = I_{Dsat}$ (a constant)





$V_{GS} > V_{TN}$ $V_{DS} > V_{DSsat}$

$V_{DSsat} = V_{GS} - V_{TN}$

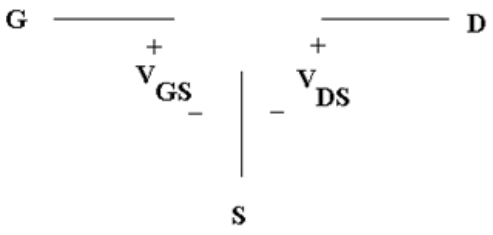
$I_D = (Kn/2)(V_{GS} - V_{TN})^2 = (Kn/2)V_{DSsat}^2$

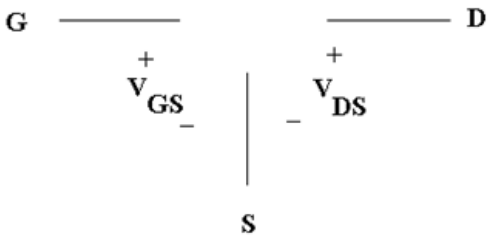
$V_{GS} < V_{TP}$ $V_{DS} < V_{DSsat}$

$V_{DSsat} = V_{GS} - V_{TP}$

$I_D = (Kp/2)(V_{GS} - V_{TP})^2 = (Kp/2)V_{DSsat}^2$

Cut-Off: $I_D = I_S = 0$





$V_{GS} < V_{TN}$

$V_{GS} > V_{TP}$