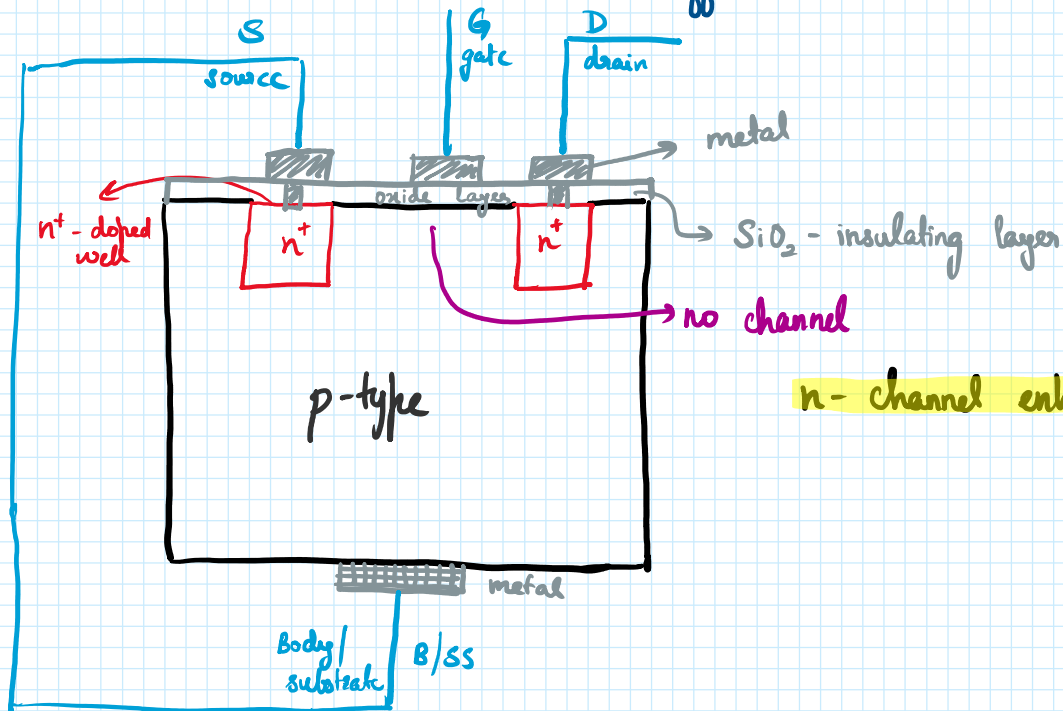


8. MOSFET

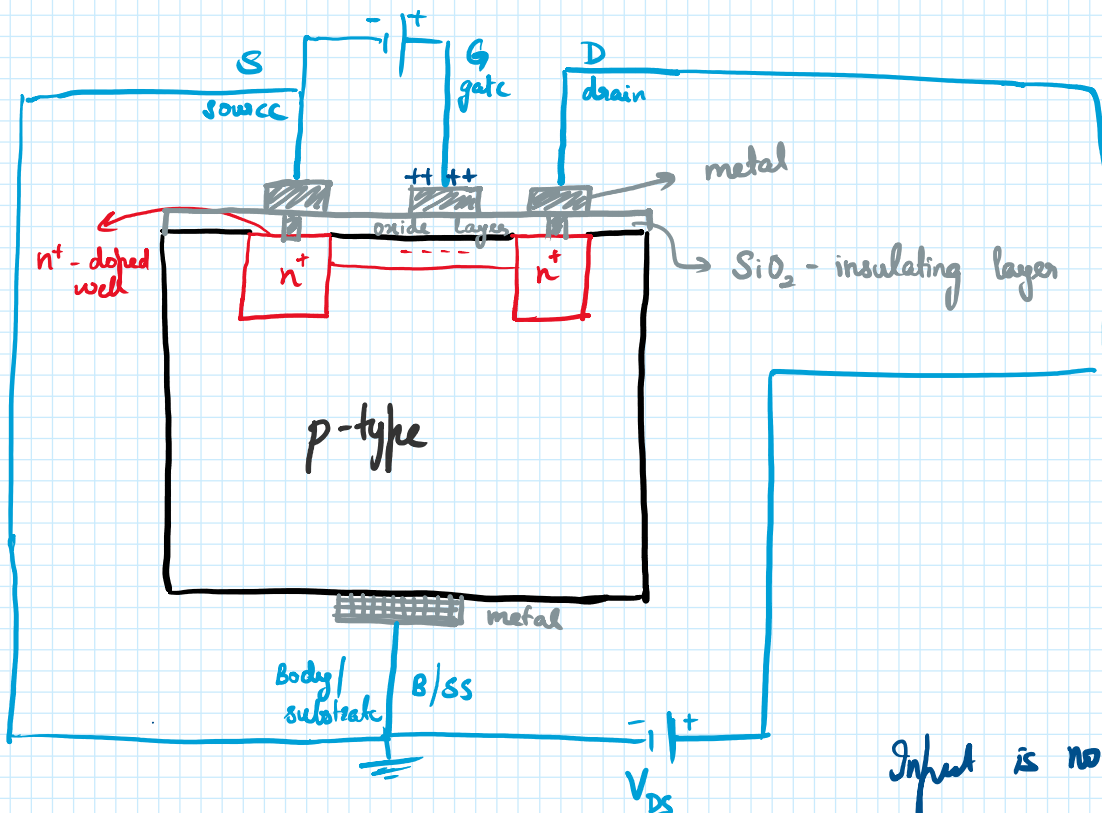
04 October 2023 11:39

MOSFET

Metal Oxide Semiconductor Field Effect Transistor



n-channel enhanced type MOSFET



- gate V_T
 $V_{GS} > V_T$ only then MOSFET is ON
 $(I_D = I_C)$

Input is normally V_{GS}

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

$$k = I_{D,sat}$$

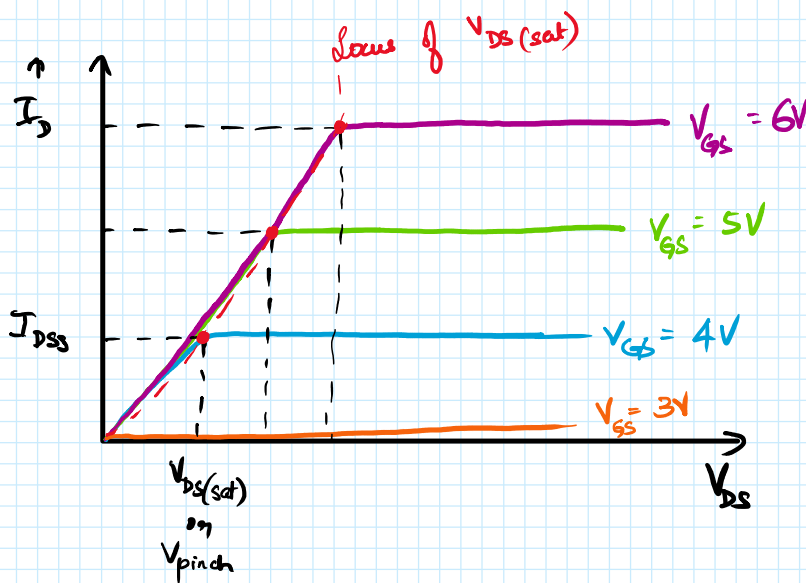
$V_{GS} > V_T \xrightarrow{\text{on then}} \text{MOSFET is ON}$
 $(I_D = I_S)$

$$k = \frac{I_{D(on)}}{(V_{GS(on)} - V_T)^2}$$

• Keeping $V_{GS} > V_T$ as constant,
 increase V_{DS} as $(I_D \text{ or } I_S) \uparrow$

• $V_{DS} \uparrow$ till V_{DS} or V_{pinch}
 $I_{DSS} \rightarrow \text{max current}$
 $\xrightarrow{\text{sat}} \text{sat}$

Drain / Output Characteristics



$$V_{DS(sat)} = V_{GS} - V_T$$

$$k = \frac{I_{D(on)}}{(V_{GS(on)} - V_T)^2}$$

NUMERICALS

① If $V_{GS} = 6V$ and $V_T = 3V$, find $V_{DS(sat)}$

Soln

$$V_{DS(sat)} = V_{GS} - V_T$$

$$= 6 - 3$$

$$= \underline{\underline{3V}}$$

② For $V_{GS} = 6V$, $I_D = 10mA$, find k

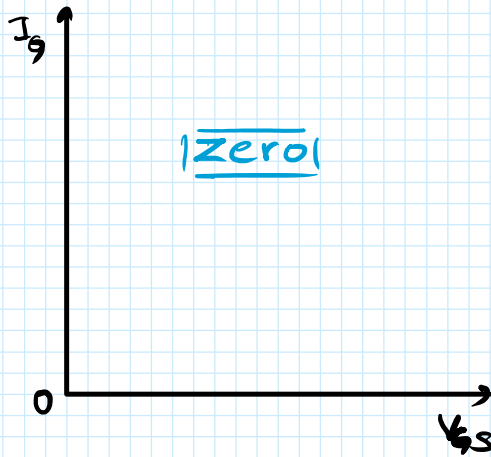
Soln

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

$$k = \frac{10 \times 10^{-3}}{(6 - 3)^2} = \frac{10 \times 10^{-3}}{9} = 1.11 \text{ mA/V}^2$$

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Input or gate Characteristics

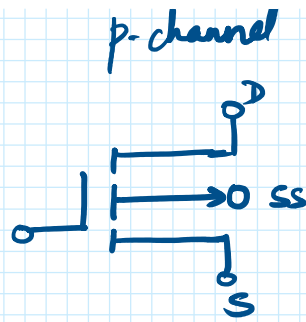
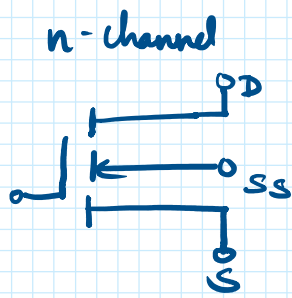


Difference from BJT

- MOSFET \rightarrow voltage controlled
- Higher input impedance for MOSFET

n-channel

p-channel



- source and drain is interchangeable as they are made of same material, same doping concentration