

UNIT 2. MOSFETS:'S THEORY

1.1 What of the following statements on the MOSFET transistor is FALSE?

- [A] It has an insulated gate made by a thin SiO_2 layer ✓
- [B] In the ohmic region, the transistor is equivalent to a resistance that increases if $|V_{GS}|$ increases ✗
- [C] In the saturation region, the current increases on a quadratic law with $|V_{GS}|$ ✓
- [D] The PMOS transistor is slower than the NMOS. ✓

$$\mu_p < \mu_n \Rightarrow (K_p)_p < (K_p)_n$$
$$K_p = \mu C_{ox}$$

$$R_{ON} = \frac{1}{2K(V_{GS} - V_T)}$$

$V_{GS} \uparrow \Rightarrow R_{ON} \downarrow$

1.3. Indicate the FALSE statement among the following related to the enhancement MOSFET:

- [A] It has an insulated gate. ✓
- [B] It is a unipolar and symmetrical device. ✓
- [C] In linear region, it works as a variable resistor dependent on the gate-source voltage V_{GS} . ✓
- [D] In the saturation region, the current has a linear dependence on gate-source voltage V_{GS} . ✗

$$R_{ON} = \frac{1}{2K(V_{GS} - V_T)}$$

$$I_{DS} = K(V_{GS} - V_T)^2$$

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1.4. What of the following statements on the MOSFET transistor is FALSE?

[A] The gate current I_G is always zero since it is isolated.. ✓

[B] An N-channel MOSFET will be saturated when $V_{DS} < (V_{GS} - V_T)$ ✗ $V_{DS} > (V_{GS} - V_T)$

[C] I_{DS} will be constant for a given V_{GS} in the saturation zone, though V_{DS} be variable. ✓ $I_{DS} = K(V_{GS} - V_T)^2$

[D] In the ohmic region, for low values of V_{DS} , the MOSFET behaves like a resistor dependent on a voltage V_{GS} . ✓

$$R_{ON} = \frac{1}{2K(V_{GS} - V_T)}$$

1.2. Indicate the FALSE statement among the following related to a P channel enhancement Mosfet, and assuming the threshold voltage V_T in absolute value,

[A] The substrate is of N type. ✓

[B] The channel formation is obtained with voltages $V_{GS} < -V_T$ ✓

[C] The transistor operates in linear or ohmic region when $V_{DS} < V_{GS} + V_T$ ✗ $V_{DS} > V_{GS} + V_T$

[D] It is slower than the NMOS because the mobility of the holes is smaller than the electrons. ✓