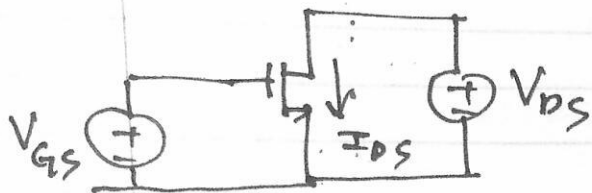


Mos I-V characteristics

(1)



1) long-channel NMOS ($L \gg 1 \mu m$)

① Linear (triode) region

$$\Rightarrow V_{DS} < V_{GS} - V_{th} = V_{DS,sat}$$

overdriving voltage
= Δ

$$\Rightarrow I_{DS} = \mu_n C_{ox} \frac{W}{L} \left\{ (V_{GS} - V_{th}) V_{DS} - \frac{1}{2} V_{DS}^2 \right\}$$

\Rightarrow Effective dynamic channel conductance
- g_{do} @ $V_{DS} = 0$

$$g_{do} = \left(\frac{2 I_{DS}}{2 V_{DS}} \right) @ V_{DS} = 0 = \mu_n C_{ox} \frac{W}{L} (V_{GS} - V_{th})$$

$$= \mu_n C_{ox} \frac{W}{L} \cdot \Delta$$

\Rightarrow Effective dynamic channel resistance

$$r_{ds} = \frac{1}{g_{do}} = \frac{1}{\mu_n C_{ox} \frac{W}{L} \cdot \Delta} \quad @ V_{DS} \text{ is very small.}$$

\Rightarrow Can be used as variable resistor

