

MosFets And Amplifiers

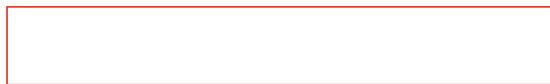
nmos device

$i_D \downarrow$

$i_D =$

o Cutoff:

o Saturation:



[not linear]

o Triode:

↳ neglect since very small.

o Voltage transfer characteristic:

o Edge of saturation:

$$(V_{GS} - V_t) = V_{DD} - \frac{1}{2} R_D k'_n \frac{W}{L} (V_{GS} - V_t)^2$$

$$\frac{1}{2} R_D k'_n \frac{W}{L} (V_{GS} - V_t)^2 + (-1)(V_{GS} - V_t) - V_{DD} = 0$$

$$V_{GS} - V_t = \frac{-1 \pm \sqrt{1^2 - 4\left(\frac{1}{2} R_D k'_n \frac{W}{L}\right)(-V_{DD})}}{2\left(\frac{1}{2} R_D k'_n \frac{W}{L}\right)}$$

$$V_{GS} - V_t = \frac{\sqrt{1 + 2\left(R_D k'_n \frac{W}{L} V_{DD}\right)} - 1}{R_D k'_n \frac{W}{L}}$$

$$V_{GS} = V_t + \frac{\sqrt{1 + 2\left(R_D k'_n \frac{W}{L} V_{DD}\right)} - 1}{R_D k'_n \frac{W}{L}}$$

↗
edge of saturation.

$$V_{DS} = V_{GS} - V_t$$

