

NMOS:

Nasičenje:  $v_{DS} > v_{DS}(sat) = v_{GS} - V_{TN}$ 

$$i_D = K_N(v_{GS} - V_{TN})^2(1 + \lambda v_{DS})$$

Triodno področje:  $v_{DS} < v_{DS}(sat)$ 

$$i_D = K_N(2(v_{GS} - V_{TN})v_{DS} - v_{DS}^2)$$

$$K_N = \frac{1}{2}k'_n \frac{W}{L} = \frac{1}{2}\mu_n C_{ox} \frac{W}{L} = \frac{1}{2}\mu_n \frac{\epsilon_{ox}}{t_{ox}} \frac{W}{L}$$

PMOS:

Nasičenje:  $v_{SD} > v_{SD}(sat) = v_{SG} + V_{TP}$ 

$$i_D = K_P(v_{SG} + V_{TP})^2(1 + \lambda v_{SD})$$

Triodno področje:  $v_{SD} < v_{SD}(sat)$ 

$$i_D = K_P(2(v_{SG} + V_{TP})v_{SD} - v_{SD}^2)$$

$$K_P = \frac{1}{2}k'_p \frac{W}{L} = \frac{1}{2}\mu_p C_{ox} \frac{W}{L} = \frac{1}{2}\mu_p \frac{\epsilon_{ox}}{t_{ox}} \frac{W}{L}$$

Malosignalni parametri:

$$g_m = 2\sqrt{K_N|P}I_{DQ}, r_o = \frac{1}{\lambda I_{DQ}}$$

NPN:

Aktivno področje:  $i_C = I_S e^{\frac{v_{BE}}{V_T}} (1 + \frac{v_{CE}}{V_A})$ 

PNP:

Aktivno področje:  $i_C = I_S e^{\frac{v_{EB}}{V_T}} (1 + \frac{v_{EC}}{V_A})$ Malosignalni parametri:  $g_m = \frac{I_{CQ}}{V_T}, r_\pi = \frac{V_T}{I_{BQ}}, r_o = \frac{V_A}{I_{CQ}}$ 

$$\beta = \frac{\alpha}{1-\alpha}, g_m r_\pi = \beta$$

$$V_T = 26\text{mV}$$

Kvadratna enačba:

$$ax^2 + bx + c = 0$$

$$D = b^2 - 4ac$$

$$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a}$$