3. Előadás

$\boldsymbol{W_i = \frac{W_c + W_v}{2} = W_F}$ intrinsic félvezető esetén

$$n = const\ T^{3/2}\ exp\left(-\frac{W_c - W_F}{kT}\right)$$

$$p = const\ T^{3/2}\ exp\left(-\frac{W_F - W_v}{kT}\right)$$

$$n = n_i\ \ exp\left(\frac{W_F - W_i}{kT}\right)$$

$$p = n_i\ \ exp\left(-\frac{W_F - W_i}{kT}\right)$$

$$\boldsymbol{n \cdot p = n_i^2}$$

$$\boldsymbol{\overline{J_n} = qn\mu_n\overline{E}}$$

$$\overline{J_p} = qp\mu_p\overline{E}$$

$$\overline{J} = q(n\mu_n + p\mu_p)\overline{E}$$

$$\sigma_e = q(n\mu_n + p\mu_p)$$

$$\boldsymbol{\overline{J_n} = qD_n\overline{grad}\ n}$$

$$\overline{J_p} = -qD_p\overline{grad}\ p$$

$$\overline{J_n} = qn\mu_n\overline{E} + qD_n\overline{grad}\ n$$

$$\overline{J_p} = qp\mu_p\overline{E} - qD_p\overline{grad}\ p$$

$$D = \frac{kT}{q}\mu$$

$$\frac{dn}{dt} = \frac{1}{q}\mathrm{div}(\overline{J_n}) + g_n - \frac{n}{\tau_n}$$

$$\boldsymbol{n(x) = n_p + (n_0 - n_p)\exp(-x/\sqrt{D_n\tau_n})}$$

$$\boldsymbol{L_n = \sqrt{D_N\tau_n}}$$

4. előadás

$$U_D = U_T \ ln\frac{N_d N_a}{n_i^2}$$

$$\boldsymbol{S_p = \sqrt{\frac{2\varepsilon}{qN_a}}\sqrt{U_{np}} = \sqrt{\frac{2\varepsilon}{qN_a}}\sqrt{U_D - U}}$$

$$S_n = \frac{N_a}{N_d} S_p$$

$$\boldsymbol{n_0 = n_p\, exp\left(\frac{q \cdot U}{k \cdot T}\right) = n_p\, exp\left(\frac{U}{U_T}\right)}$$

$$\boldsymbol{I = I_0 \cdot \left(e^{U/U_T} - 1\right)}$$

5. előadás

$$I_G = const \cdot n_i\sqrt{-U_R}$$

$$C_T = A\sqrt{\frac{q\varepsilon N_a}{2}}\frac{1}{\sqrt{U_D - U}}$$

$$Q_D = \mathrm{I_n} \cdot \tau_n$$

$$C_D = \tau_{n(p)}\frac{1}{r_d} = \tau_{n(p)}\frac{I}{U_T} = const \cdot I$$

$$\frac{dU}{dT} = \frac{U - 3U_T - W_g/q}{T}$$

7. előadás

$$\boldsymbol{I_C = -A \cdot I_E - I_{CB0}}$$

$$\eta_e = \frac{I_{En}}{I_E}$$

$$\eta_{tr} = \frac{I_{Cn}}{I_{En}}$$

$$A = \eta_e \cdot \eta_{tr}$$

$$U_B = U_T \ln\frac{N_B(0)}{N_B(w_B)}$$

8. előadás

$$\boldsymbol{r_d = \frac{U_T}{I} + r_s}$$

9. előadás

$$U_0 = \frac{qN_d}{8\varepsilon} d^2$$

$$\boldsymbol{I_D = I_0 \cdot \left(1 - \frac{U_{GS}}{U_0}\right)^2}$$

11. előadás

$$\Phi_F \cong U_T \, ln \frac{N_a}{n_i}$$

Erős inverzió: $\mathbf{U_F = 2\,\Phi_F}$

$$V_{Th} = 2\Phi_F + \Phi_{MS} + \frac{\sqrt{2\epsilon_S q N_a}}{C_0} \cdot \sqrt{2\Phi_F + U_{SB}} - \frac{Q_{SS}}{C_0}$$

$$\boldsymbol{V_{Th} = 2\Phi_F + \Phi_{FB} + \gamma\sqrt{2\Phi_F + U_{SB}}}$$

$$\boldsymbol{I_D = \frac{W}{L} \cdot \frac{C_0 \mu}{2} \cdot (U_{GS} - V_{th})^2}$$

12. előadás

$$\boldsymbol{P_{CP} = f \cdot C_L \cdot V_{DD}^2}$$