Notiztitel 24.02.2010

1.2)

1) $N(x>0, t=0) = N_B$

2) $N(x=0, t>0) = 0$

$$N_1(x,t) = N_B \left(1 - \operatorname{erfc} \frac{x}{2\sqrt{D_B t}}\right) = N_B \operatorname{erf} \frac{x}{2\sqrt{D_B t}}$$

$$N_2(x,t) = N_A \operatorname{erfc}\left(\frac{x}{2\sqrt{D_A t}}\right)$$

$$N_{netto}(x,t) = N_A \operatorname{erfc}\left(\frac{x}{2\sqrt{D_A t}}\right) + N_B \operatorname{erfc}\left(\frac{x}{2\sqrt{D_B t}}\right) - N_B$$

$$D_A = D_B$$

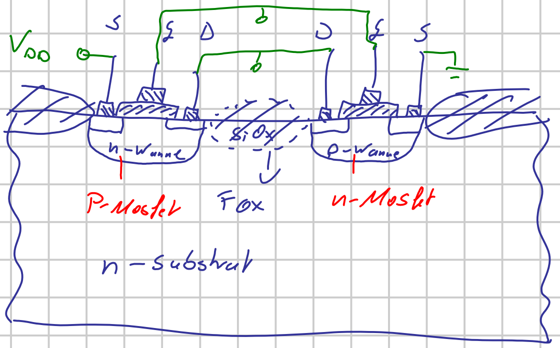
3)

a) • Dotierung

• Werkstoffmodifikation

• siehe Folie

1.4

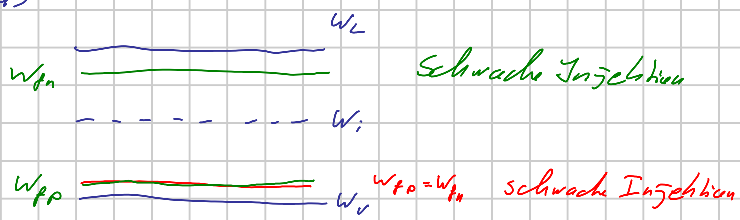


Fox = Feld-Oxid

2 Physikalische Grundlagen

2.1 ???

2.2 a)



b) (I) $W_{fn} - W_i = kT \ln\left(\frac{n}{n_i}\right)$

(II) $W_i - W_{fp} = kT \ln\left(\frac{p}{n_i}\right)$

$n = n_0 + \Delta n$

$p = p_0 + \Delta p$

Schwache Injektion: $\Delta n = \Delta p \ll n_i$

starke Injektion: $\Delta n \simeq \Delta p \gg n_i \Rightarrow n = p = \Delta n$

$\Rightarrow \quad I = II \Rightarrow W_{fn} - W_i = W_i - W_{fp}$

2.3

$$\frac{\partial n}{\partial t} = \frac{1}{q} \cancelto{0}{\operatorname{div}(J_n)} - R + g_{opt}$$

$$\begin{cases} t = 0 & \Rightarrow g_{opt} = 0 \\ \operatorname{div}(J_n) = 0 & \end{cases}$$

$$\frac{\partial \overset{\to n_0 + \Delta n}{n}}{\partial t} = -R = -\frac{\Delta n}{\tau}$$

$$\frac{\partial \Delta n}{\partial t} = -\frac{\Delta n}{\tau}$$

$$\Delta n(t) = C_1 e^{-\frac{t}{\tau}} + C_2$$

$$\begin{cases} \Delta n(t \to 0) = C_1 + C_2 = g_{opt} \cdot \tau \\ \Delta n(t \to \infty) = 0 \Rightarrow C_2 \stackrel{!}{=} 0, \; C_1 = g_{opt} \cdot \tau \end{cases}$$

$$\boxed{\Delta n(t) = g_{opt} \cdot \tau \, e^{-\frac{t}{\tau}}}$$

2.4 a)

$\begin{pmatrix} \frac{1}{2} & -1 & \infty \end{pmatrix}$ | $\begin{pmatrix} 4 & 1 & -\frac{1}{2} \end{pmatrix}$

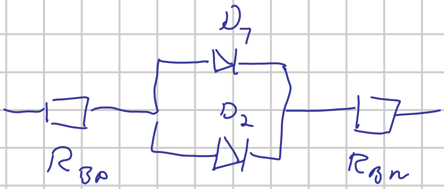
$\begin{pmatrix} 2 & 1 & 0 \end{pmatrix}$ | $\begin{pmatrix} 2 & 2 & -1 \end{pmatrix}$

2.4 b)

$\begin{pmatrix} -4 & 1 & \infty \end{pmatrix}$

$\begin{pmatrix} \frac{1}{2} & -\frac{1}{2} & -1 \end{pmatrix}$

3.2 c)



$$D_1: \; I_D(U) = I_n\left(e^{\frac{U}{U_T}} - 1\right)$$

$$D_2: \; I_{D2}(U) = I_{gen}\left(e^{\frac{U}{2U_T}} - 1\right)$$