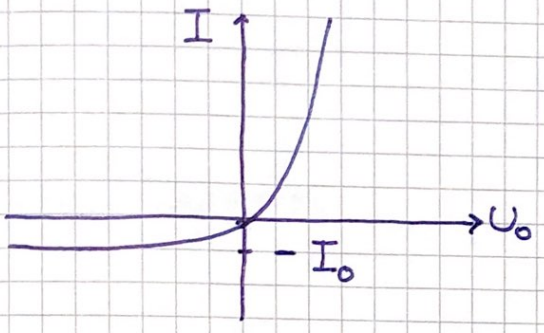
Strømmen I øker proporsjonalt med Boltzmannfaktoren

$$\exp\{e \cdot U_0 / k_B T\} \qquad (\text{for } U_0 > 0)$$

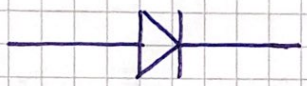
som sammen med at $I = 0$ for $U_0 = 0$ gir $I(U_0)$ på formen

$$I(U_0) = I_0 \{\exp(eU_0/k_BT) - 1\}$$

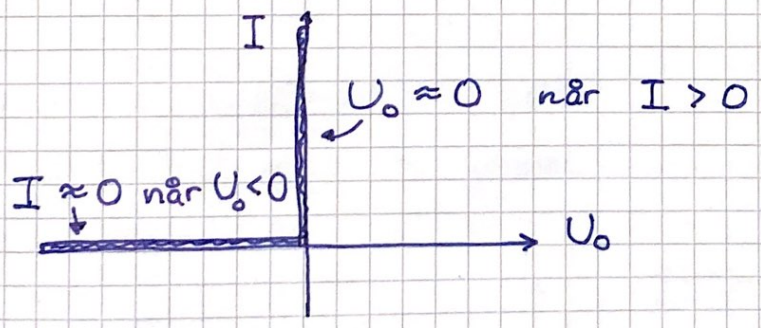


Likeretter: Leder godt fra p til n, dårlig fra n til p.

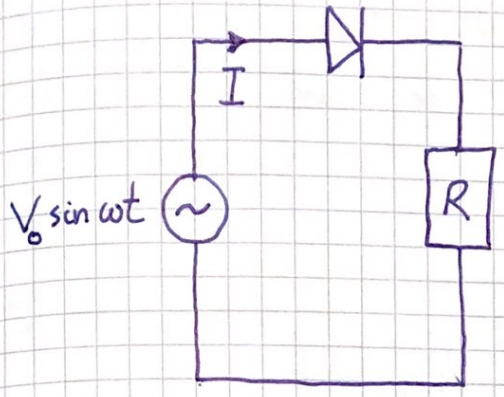
Kretssymbol:

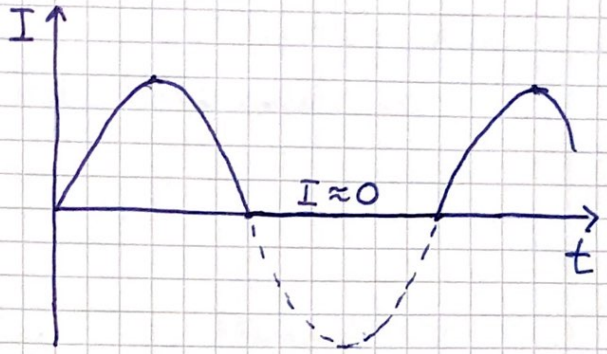


Idealisert strøm-spennings-karakterisitikk:

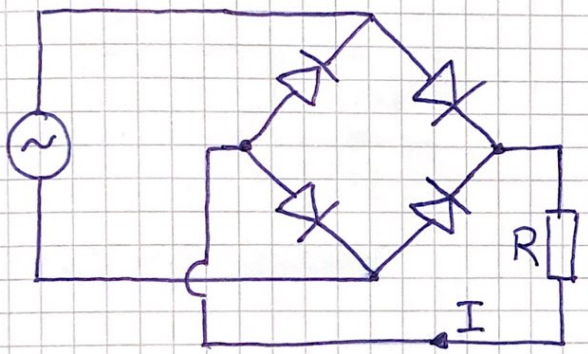


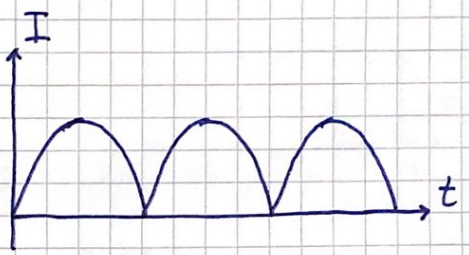
Halvbølge likeretter:



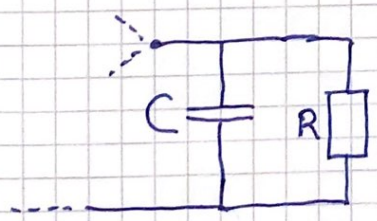


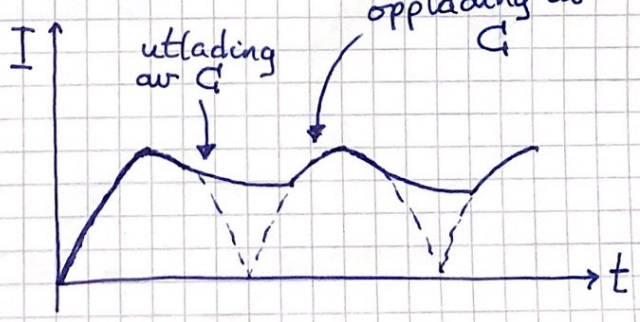
Helbølge likeretter:





Med en kondensator koblet i parallell med R jevnes I(t) ut:

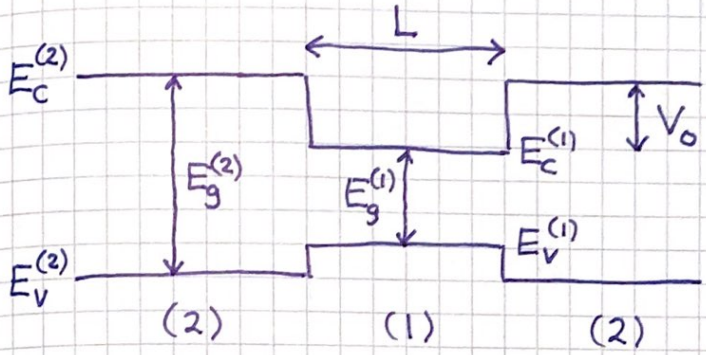




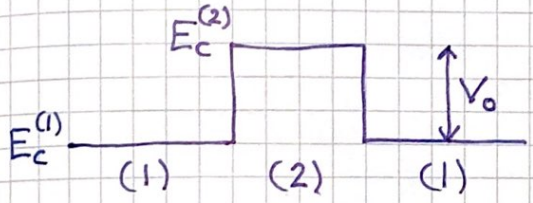
Mer om diode og transistor i FY6018.

Lagdelte halvledere : Heterostrukturer

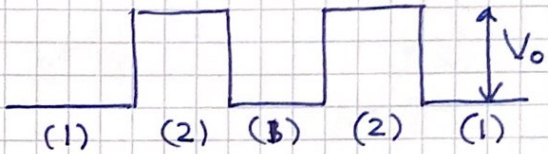
Halvledere med ulike båndgap $E_g = E_c - E_v$ kan skjøtes sammen og danne potensialbrønner og -barrierer :



Potensialbrønn med dybde $V_0 = E_c^{(2)} - E_c^{(1)}$ og bredde L.



Potensialbarriere



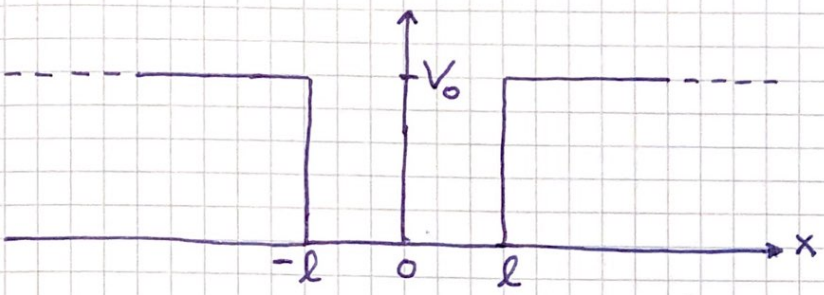
Dobbelbarriere

Eks: (1) GaAs $E_g^{(1)} = 1.43\ eV$

(2) $Al_{0.3}Ga_{0.7}As$ $E_g^{(2)} = 1.84\ eV$

Gir $V_0 = 0.23\ eV$

Endelig potensialbrønn [YF 40.3]



$$V(x) = \begin{cases} 0 \; ; & |x| < \ell \\ V_0 \; ; & |x| > \ell \end{cases}$$

TUSL:

$$\psi''(x) = \frac{2m}{\hbar^2}\left[V(x) - E\right]\psi(x) = \begin{cases} -k^2\psi(x) \; ; & |x| < \ell \; ; \quad k^2 = \frac{2mE}{\hbar^2} \\ \varkappa^2\psi(x) \; ; & |x| > \ell \; ; \quad \varkappa^2 = \frac{2m(V_0 - E)}{\hbar^2} \end{cases}$$

Mest interessant med <u>bundne</u> tilstander, med $E < V_0$:

$$\psi(x) = \begin{cases} A\, e^{\varkappa x} & (x < -\ell) \\ C \sin kx \quad (AS) \text{ eller } D\cos kx \quad (S) & (|x| < \ell) \\ B\, e^{-\varkappa x} & (x > \ell) \end{cases}$$

Med symmetrisk $V(x)$ er $\psi(x)$ enten symm. (S) eller antisymm. (AS); derfor enten $\sin kx$ (AS) eller $\cos kx$ (S) inne i brønnen.
Bruker nå at ψ og $d\psi/dx$ er kontinuerlige overalt, for å bestemme de tillatte energiene E.

S, $x = \ell$:

$$B\, e^{-\varkappa\ell} = D\cos k\ell$$
$$-\varkappa B\, e^{-\varkappa\ell} = -kD\sin k\ell$$
$$\Rightarrow \tan k\ell = \varkappa/k$$

AS, $x = \ell$:

$$B\, e^{-\varkappa\ell} = C\sin k\ell$$
$$-\varkappa B\, e^{-\varkappa\ell} = kC\cos k\ell$$
$$\Rightarrow \tan k\ell = -k/\varkappa$$