$I_{out} := 2.5\ A$ $f_s := 100\ kHz$ $T := \frac{1}{f_s} = 10\ \mu s$ $V_{inmin} := 26\ V$

$V_{out} := 21\ V$ $V_{inmax} := 50\ V$ $V_D := 0\ V$ $\eta := 1$ $N_{ps} := 1$

$$D_{max} := \frac{V_{out}}{V_{inmin} + V_{out}} = 0.447 \qquad D_{min} := \frac{V_{out}}{V_{inmax} + V_{out}} = 0.296$$

Strøm i transformator

$$I_{ripple} := 0.6 \cdot \frac{V_{out} \cdot I_{out}}{V_{inmax} \cdot D_{min}} = 2.13\ A$$

Beregner induktans ud fra ripple strøm

$$L := \frac{V_{inmax} \cdot D_{min}}{I_{ripple} \cdot f_s} = 69.431\ \mu H$$

$$I_{ripple26} := \frac{V_{inmin} \cdot D_{max}}{L \cdot f_s} = 1.673\ A \qquad I_{ripple50} := \frac{V_{inmax} \cdot D_{min}}{L \cdot f_s} = 2.13\ A$$

$$I_{pkavg26} := \frac{I_{out}}{1 - D_{max}} = 4.519\ A \qquad I_{pkavg50} := \frac{I_{out}}{1 - D_{min}} = 3.55\ A$$

$$I_{pk26} := I_{pkavg26} + \frac{I_{ripple26}}{2} = 5.356\ A \qquad I_{pk50} := I_{pkavg50} + \frac{I_{ripple50}}{2} = 4.615\ A$$

$$I_{RMSp26} := \sqrt{D_{max} \cdot I_{pkavg26}^{\ 2}} = 3.021\ A \qquad I_{RMSp50} := \sqrt{D_{min} \cdot I_{pkavg50}^{\ 2}} = 1.931\ A$$

$$I_{RMSs26} := \sqrt{(1 - D_{max}) \cdot I_{pkavg26}^{\ 2}} = 3.361\ A \qquad I_{RMSs50} := \sqrt{(1 - D_{min}) \cdot I_{pkavg50}^{\ 2}} = 2.979\ A$$

Beregner luft-gab i kernen

$$\frac{1}{2}\cdot L\cdot I_{pk26}{}^{2}=0.996\ \boldsymbol{J}\cdot 10^{-3}$$

$A_0 := 63\ \boldsymbol{mm}^2 \qquad B := 0.25\ \boldsymbol{T}$

$$l_g := \frac{L\cdot I_{pk26}{}^{2}\cdot \mu_0}{B^2\cdot A_0}=635.613\ \boldsymbol{\mu m}$$

Der tages udgangspunkt i en 3f3 kerne.
lg rundes af til den nærmeste værdi i databladet, og den tilhørende AL-værdi noteres.

$l_g := 488\ \boldsymbol{\mu m} \qquad A_L := 160\ \boldsymbol{H}\cdot 10^{-9}$

$$L_1 := l_g = \frac{L_1\cdot I_{pk26}{}^{2}\cdot \mu_0}{B^2\cdot A_0}\ \xrightarrow{solve,\,L_1}\ \frac{66.986621905380636135\cdot mm^2\cdot \boldsymbol{T}^2\cdot \mu m}{A^2\cdot \mu_0}=53.306\ \boldsymbol{\mu H}$$

$$I_{ripple} := \frac{V_{inmin}\cdot D_{max}}{L_1\cdot f_s}=2.179\ \boldsymbol{A}$$

$$N := \sqrt{\frac{L_1}{A_L}}=18.253 \qquad N := 19$$

$$L_2 := N = \sqrt{\frac{L_2}{A_L}}\ \xrightarrow{solve,\,L_2}\ \frac{361\cdot H}{6250000}=57.76\ \boldsymbol{\mu H}$$

$$I_{ripple} := \frac{V_{inmin}\cdot D_{max}}{L_2\cdot f_s}=2.011\ \boldsymbol{A}$$

$$I_{pkavg} := \frac{I_{out}}{1-D_{max}}=4.519\ \boldsymbol{A}$$

$$I_{pk} := I_{pkavg}+\frac{I_{ripple}}{2}=5.525\ \boldsymbol{A}$$

$$I_{RMSp} := \sqrt{D_{max}\cdot I_{pkavg}{}^{2}}=3.021\ \boldsymbol{A}$$

$$I_{RMSs} := \sqrt{\left(1-D_{max}\right)\cdot I_{pkavg}{}^{2}}=3.361\ \boldsymbol{A}$$

Beregning af minimumsværdi for udgangskondensator

$V_{ripple} := 50\ \boldsymbol{mV}$

$C_{out} := \frac{I_{out} \cdot D_{max}}{V_{ripple} \cdot f_s} = 223.404\ \boldsymbol{\mu F}$

$R_{ESR} := \frac{V_{ripple} \cdot \left(1 - D_{max}\right)}{I_{out}} = 11.064\ \boldsymbol{\Omega} \cdot 10^{-3}$

Diode krav

$V_{break} := V_{out} + V_{inmax} = 71\ \boldsymbol{V}$

$V_D := 0.8\ \boldsymbol{V}$

MOSFET krav

$V_L := V_{inmax} \cdot 0 = 0\ \boldsymbol{V}$

$V_{ds} := \left(\left(V_{inmax} + V_L\right) + 1 \cdot \left(V_{out} + V_D\right)\right) \cdot 1.3 = 93.34\ \boldsymbol{V}$