Son Hesaplama

$n = 35:8 = 4.375 \pm \%3$

$L_p = 600\,\mu H \pm 10\%$

$L_r = 100\,\mu H \pm 10\% \rightarrow L_{r\,max} = 110\,\mu F$

Input Voltage = 400 Vdc

Output Current = 3.1 A } 148.8 W = Pout

Output Voltage = 48 V }

Holdup Time requirement = 20 ms (50 Hz line freq)

DC Link Capacitor = 220 µF

$L_p = M \cdot L_r$

$600\,\mu F = M \times 110\,\mu F$

$M = 5.45455$

$M_{min} = 1.1066$

$P_{in} = \frac{P_{out}}{Eff \rightarrow 0.96}$

$P_{in} = \frac{148.8}{0.96} = 156.167$

$V_{in}^{min} = \sqrt{400^2 - \frac{2 \times 156.67 \times 20 \times 10^{-3}}{220 \times 10^{-6}}}$

$V_{in}^{min} = 363.276\,V$

$V_{in}^{max} = 400\,V$

$M^{max} = \frac{400}{363.267} \times 1.1066 = 1.22$

$R_{ac} = 251.9\,\Omega$

$f_s^{min} = 85\,kHz$

$n = \frac{400}{2(48 + 2 \times 0.7)} \times 1.1066 = 4.48$

Diode → AN-4151'd "2" yok
Çünkü 2 diyot kullanıyo
be 4 tane kullancan.

$N_p^{min} = \frac{4.48(48 \times 2 \times 0.7)}{2 \times f_s^{min} \times 1.1066 \times 0.8 \times 371 \times 10^{-6}}$

$N_p^{min} = 30.3$

$N_p = n \cdot N_s$

$N_p = 4.48 \times 7 = 31.36$

$4.48 \times 8 = 35.84$

$N_s = 8$, $N_p = 36$ → 35:8 olarak girildi

$f_{rezonant} = 110\,kHz$

$C_r = \frac{1}{(2\pi \times 110 \times 10^3)^2 \times 110 \times 10^{-6}} = 19.03\,nF$

$Q = \frac{1}{2\pi \times 110 \times 10^3 \times 251.9 \times 19.03 \times 10^{-9}} = 0.302$

$M_{max} = 1.22$

%20 marjin

1.5

$L_p = L_m + L_{lkp}$ $\quad L_{lkp} = n^2 L_{ls}$

$L_r = L_{lkp} + L_m // L_{lkp}$

$600\,\mu H = L_m + L_{lkp}$

$L_{lkp} = 600\,\mu H - L_m$

$L_r = L_{lkp} + \frac{L_m \times L_{lkp}}{L_m + L_{lkp}}$

$110\,\mu F = 600\,\mu H - L_m + \frac{L_m \times (600\,\mu H - L_m)}{600\,\mu H}$

$66000 = 360000 - 600 L_m + L_m^2 + 600 L_m$

$L_m^2 = 294000 \rightarrow L_m = 542.2177$

$600\,\mu H - 542.2177\,\mu H = 57.78\,\mu H = L_{lkp}$

$L_{lks} = 2.879\,\mu H$

* $I_{cr}^{RMS} = \frac{1}{0.96}\sqrt{\left[\frac{\pi \times 3.1}{2\sqrt{2} \times 4.48}\right]^2 + \left[\frac{4.48(48+2\times0.7)}{4\sqrt{2}\times110\times10^3\times1.1066(500)\times10^{-6}}\right]^2}$

$I_{cr}^{rms} = 1.046\,A$ $\quad$ $I_{cr}^{peak} = \sqrt{2} \times I_{cr}^{rms} = 1.476\,A$

* $V_{cr}^{nom} = \frac{400}{2} + \frac{\sqrt{2} \times 1.044}{2\times\pi\times110\times10^3\times19.03\times10^{-9}} = 312.255V$

* $V_{cr}^{max} = \frac{400}{2} + \frac{3}{2\times\pi\times85\times10^3\times19.03\times10^{-9}} = \underline{495\,V}$

* $V_D = (48+2\times0.7) = 49.4V$

* $I_D^{RMS} = \frac{\pi}{4} \times 3.1 = 2.435\,A$

* $\Delta V_o = \frac{\pi}{2} \times 3.1 \times 0.04 = 0.2\,V$

* $I_{co}^{rms} = \sqrt{\left(\frac{\pi\times3.1}{2\sqrt{2}}\right)^2 - 3.1^2} = 1.5\,A$

* $P_{loss,co} = 1.5^2 \times 0.04 = \underline{0.09\,W}$

Control Circuit

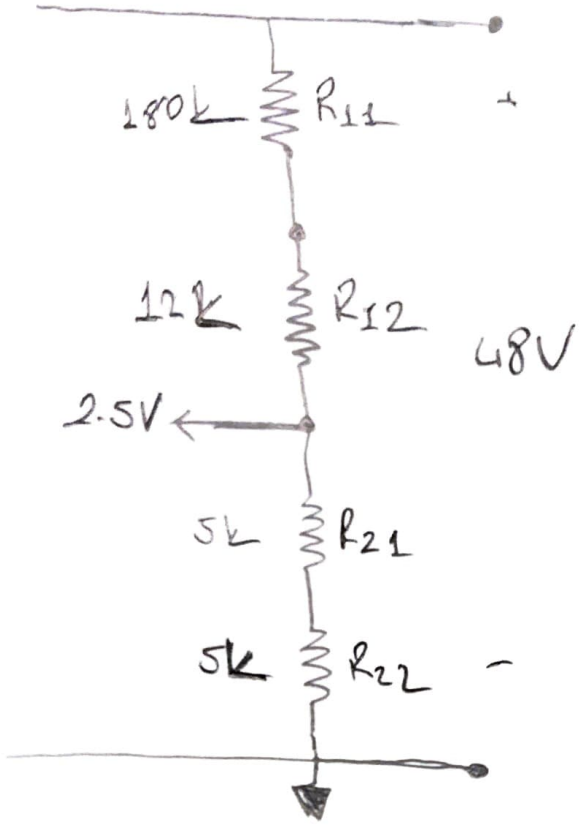
* $f_{min} = \frac{5.2k\Omega}{R_{min}} \times 100kHz \Rightarrow R_{min} = \frac{5.2k\Omega}{85kHz} \times 100kHz = \underline{\underline{6.12k\Omega}}$

* $f_{max} = \left(\frac{5.2k\Omega}{R_{min}} + \frac{4.68k\Omega}{R_{max}}\right) \times 100kHz \Rightarrow R_{max} = \frac{4.68k\Omega}{\left(\frac{120kHz}{100kHz} - \frac{5.2k\Omega}{6.12k\Omega}\right)} = \underline{\underline{13.36k\Omega}}$

* $f_{SS} = \left(\frac{5.2k\Omega}{R_{min}} + \frac{5.2k\Omega}{R_{SS}}\right) \times 100kHz + 40kHz \Rightarrow R_{SS} = \frac{5.2k\Omega}{\left(\frac{235kHz}{100kHz} - \frac{5.2k\Omega}{6.12k\Omega}\right)}$

$R_{SS} = \underline{\underline{3.466k\Omega}}$

* $R_{sense} - 0.2\Omega$
* $R_C = 1k\Omega$
* $C_C = 100pF$



$$\frac{48 \times R_2}{R_1 + R_2} = 2.5\,V$$

$$\frac{10k}{R_2} \quad \frac{R_1 + R_2}{182k \quad 10k} = \frac{2.5\,V}{48\,V}$$

→ $I_{Lim} = 3.1\,A$
$R_{sense} = 50m\Omega$

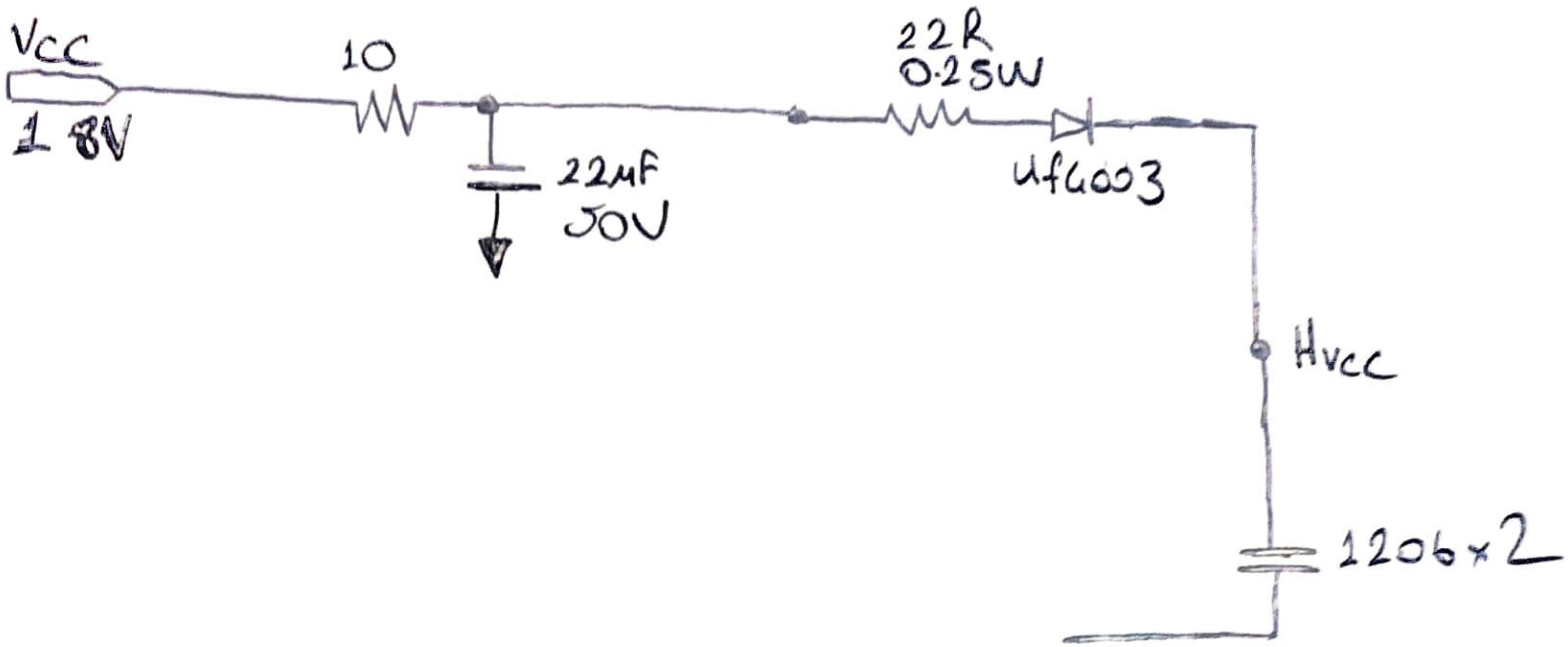
→ $R_{sense} \times I_{Lim} = V_{sense}$
$50m\Omega \times 3.1A = \underline{0.155\,V}$

→ $0.155 = \dfrac{R_S \times 2.5}{R_u - R_S}$ (1kΩ) (15.13k) (1kΩ)

→ $R_S = 1k\Omega$
$R_u = 1.13k\Omega + 1k\Omega$

→ $P_{lim} = 0.155\,V \times 3.1A = \underline{0.4805\,W}$

→ $\boxed{R_{Limit} = 1k\Omega}$?



$T = R_{SS} . C_{SS}$

$3.5k\Omega \times 250nF$

$T_{SS} = 3.5 \times T$

$C_B = 12nF$