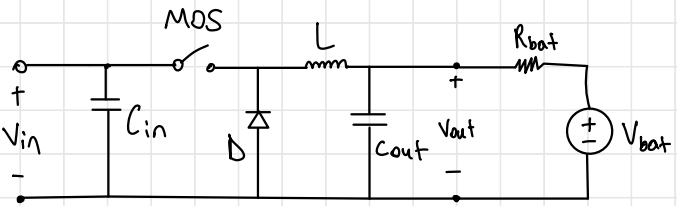

R_{bat} : Typically between 0.1Ω and 0.9Ω, take it as 0.5Ω

$V_{bat\,max} = 12V$

$V_{in} \cong 33V$ (ideal and max case)

If $R_{bat} = 0.5\Omega$ and battery is fully charged, V_o must be 17V to supply 10A

If $R_{bat} = 0.5\Omega$ and battery is close to dead, V_o must be 9V ($V_{bat} \approx 4V$)

$$D = \frac{V_{out}}{V_{in} \times \eta} \rightarrow D_{case-1} = \frac{17}{33 \times 0.9} = 0.572$$

η: efficiency of the conv. typ. 0.9

$$D_{case-2} = \frac{9}{33 \times 0.9} = 0.3$$

Rough est. of D : $0.3 \leq D \leq 0.575$

$$\Delta I_L = \frac{(V_{IN(max)} - V_{out}) \times D}{f_s \times L} \rightarrow L = \frac{V_{out} \times (V_{IN} - V_{out})}{\Delta I_L \times f_s \times V_{IN}}$$

* (Selection Criteria) → $I_{sw(max)} = \frac{\Delta I_L}{2} + I_{out(max)} \rightarrow \cong$ for us 12-13 A

↓ MOSFET current for us

$$L = \frac{17 \times (33-17)}{2 \times 50e3 \times 33} = 82.4\,\mu H \rightarrow \text{case 1}$$

$$L = \frac{9 \times (33-9)}{2 \times 50e3 \times 33} = 65.45\,\mu H \rightarrow \text{case 2}$$

L must be, $L > 82.4\mu H$ //

Diode: use schottky diodes!

$$I_F = I_{out(max)} \times (1-D)$$

↓ ≈12A

↳ min = 0.3

$$I_F = 12 \times (1-0.3) = 8.4A$$

Cout:

$$Cout_{cmin)} = \frac{\Delta I_L}{8 \times fs \times \Delta Vout} \qquad \Delta V_{out} = ESR \times \Delta I_L$$

$$Cout_{cmin)} = \frac{2}{8 \times 50e3 \times 2} = 2.5\mu F$$

→ Simülasyonda Deredim Sonuçlar Mantıklı Çıkmadı

$$V_o = DV_{in}$$

$$I_{L_{MIN}} = V_o\left[\frac{1}{R} - \frac{(1-D)}{2Lf}\right] \rightarrow L = \frac{(1-D)RV_o}{2f(V_o - RI_{Lmin})}$$

$$I_{Lmax} = V_o\left[\frac{1}{R} + \frac{(1-D)}{2Lf}\right] \Rightarrow L = \frac{RV_o(1-D)}{2f(RI_{Lmax} - V_o)}$$

$$L_{min} = \frac{(1-D_{max})\,R_{max}}{2f}$$

$$L_{min} = V_o\,\frac{(1-D)}{\Delta i_L\, f}$$

$$C_{in} = \frac{(1-D).D.I_{omax}}{f\,\Delta V_{in}} \qquad C_o = \frac{(1-D_{min})}{8Lf^2\left(\frac{\Delta V_o}{V_o}\right)}$$

$V_{out} = 14V$

$V_{in} = 33V$

$D = 0.424$

$$L_{min} = 14 \frac{(1-0.424)}{2 \times 50e3} = 80.64 \mu H$$

$$L_{I_{Lmin}} = \frac{(1-0.424) \cdot 0.5 \times 14}{2 \times 50 \times 10^3 \times (14 - 0.5 \times 9)} = 4.24 \mu H$$

$$L_{I_{Lmax}} = \frac{(1-0.424) \times 0.5 \times 14}{2 \times 50 \times 10^3 \times (0.5 \times 11 - 14)} =$$

3

?

$$L > 80.64 \mu H$$

$$C_{in} = \frac{(1-0.5) \cdot 0.5 \times 11}{50e3 \times 8} = 6.875 \mu F$$

$$C_o = \frac{(1-0.3)}{8 \times 200e-6 \times (150e3)^2 \left(\frac{4}{12}\right)} = 525 nF$$