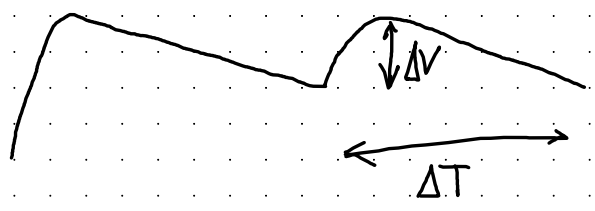
Calculations

Rectifier ripple



$$I = C\frac{dV}{dt} \rightarrow \Delta V = \frac{I\Delta t}{C}$$

$$\Delta t = \frac{1}{2 \cdot 50\,Hz} = 10\,ms$$

$$I_{max} = \frac{P_{max}}{V_{max}} \simeq \frac{160}{28\cdot\sqrt{2}} = 4\,A$$

$$\Delta V = \frac{I\Delta t}{C} = 4.25\,V$$

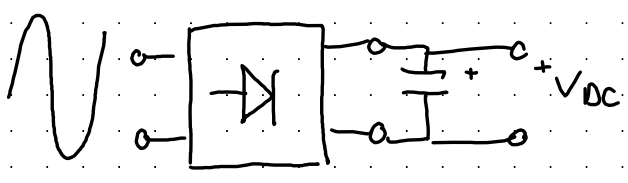
$$C = 2 \cdot 4700\,\mu F$$

Toroid specs

2x 160 VA 28

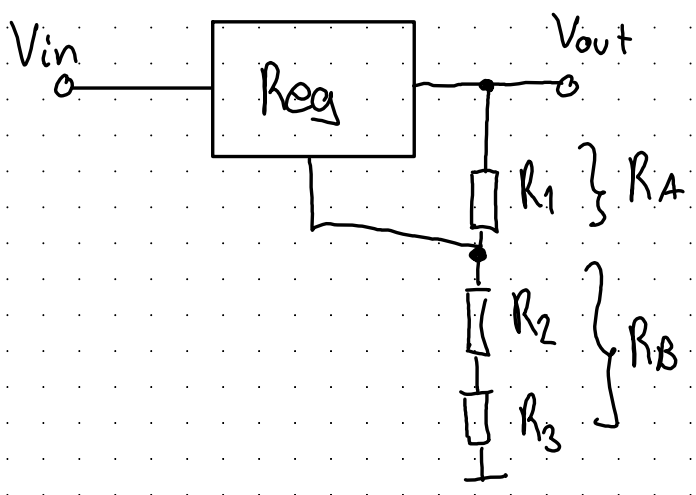
$$I_{max,rms} = \frac{P_{max}}{V_{S,rms}}$$

V_{DC} rectifier voltage



$V_{DC} =$

Regulator voltage trim



$$V_{out} = V_{REF}\left(1 + \frac{R_B}{R_A}\right) + I_{ADJ} \cdot R_B$$

$$V_{out,min} = V_{REF,min}\left(1 + \frac{R_{B,min}}{R_{A,max}}\right) + I_{ADJ} \cdot R_{B,min}$$

$$V_{out,max} = V_{REF,max}\left(1 + \frac{R_{B,max}}{R_{A,min}}\right) + I_{ADJ}\,R_{B\,max}$$

Comparator - current limit

$$V_+ = V_-$$

$$V_+ = \underbrace{\frac{R_{20}}{R_{16}+R_{20}}}_{V_{REG}}$$

$$V_- = (V_{REG} - I R_{11}) \cdot \frac{R_{19}+R_{V3}}{R_{14}+R_{19}+R_{V3}} + V_{offset}$$

V_{REF}

$$(V_{REG} - I R_{11}) \cdot \frac{R_{19}+R_{V3}}{R_{14}+R_{19}+R_{V3}} + V_{offset} = V_{REF}$$

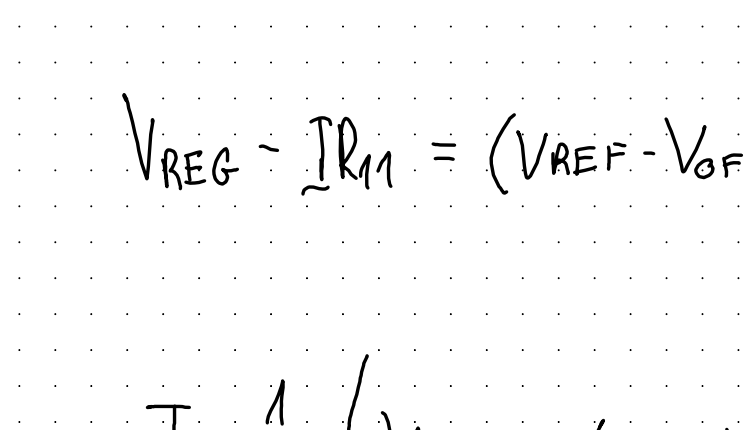
$$V_{REG} - I R_{11} = (V_{REF} - V_{OFFSET})\frac{R_{14}+R_{19}+R_{V3}}{R_{19}+R_{V3}}$$

$$I = \frac{1}{R_{11}}\left(V_{REG} - (V_{REF} - V_{off})\frac{R_{14}+R_{19}+R_{V3}}{R_{19}+R_{V3}}\right) \quad \text{manje}$$

$$I_{max} = \frac{1}{R_{11}}\left(V_{REG} - (V_{REF} - V_{OFF}) \cdot \frac{R_{14}+R_{19}+R_{V3}}{R_{19}+R_{V3}}\right)$$

$$I_{min} = \frac{1}{R_{11}}\left(V_{REG} - (V_{REF} + V_{OFF}) \cdot \frac{R_{14}+R_{19}}{R_{19}}\right)$$

LED current



$$I_B = \frac{12 - 0.7}{R_B}$$

$$I_{LED} = \frac{V_{CC} - V_{LED} - V_{CE,sat}}{R_C} = \frac{10\,V}{4.7k} \approx 2\,mA$$

Disipation

Retifier diodes $= I_{rms,max} \cdot V_D$