

Boost konverter beregninger:

Parametre:

$$\begin{aligned} V_{\text{OUT}} &:= 3.3 \text{ V} & V_{\text{IN_min}} &:= 1.2 \text{ V} & I_{\text{OUT_max}} &:= 100 \text{ mA} & R_{31} &:= 562 \text{ k}\Omega \\ V_{\text{Ripple}} &:= 50 \text{ mV} & V_{\text{IN_max}} &:= 3.4 \text{ V} & f &:= 500 \text{ kHz} & V_{\text{REF}} &:= 1.21 \text{ V} \end{aligned}$$

Switching spole - L4

Duty cycle ved laveste inputspænding:

$$\begin{aligned} \eta &:= 80\% & \text{effektivitet ved } V_{\text{IN_min}} \\ D_{\text{max}} &:= 1 - \frac{V_{\text{IN_min}} \cdot \eta}{V_{\text{OUT}}} = 0.709 \end{aligned}$$

Spolens maksimale Ripple strøm:

$$\begin{aligned} \Delta I_L &:= 0.4 \cdot I_{\text{OUT_max}} \frac{V_{\text{OUT}}}{V_{\text{IN_min}}} = 110 \text{ mA} \\ I_{\text{SW_max}} &:= \frac{\Delta I_L}{2} + \frac{I_{\text{OUT_max}}}{1 - D_{\text{max}}} = 398.75 \text{ mA} \end{aligned}$$

Spolens minimumsværdi:

$$L_{4\text{min}} := \frac{V_{\text{IN_min}} \cdot (V_{\text{OUT}} - V_{\text{IN_min}})}{f \cdot I_{\text{SW_max}} \cdot V_{\text{OUT}}} = (3.83 \cdot 10^{-6}) \text{ H}$$

Udgangskondensator - C36:

$$C_{\text{out_min}} := \frac{I_{\text{OUT_max}} \cdot (V_{\text{OUT}} - V_{\text{IN_min}})}{f \cdot V_{\text{Ripple}} \cdot V_{\text{OUT}}} = (2.545 \cdot 10^{-6}) \text{ F}$$

Udgangsspænding ved feedback

$$R_{30} := R_{31} \cdot \left(\frac{V_{\text{OUT}}}{V_{\text{REF}}} - 1 \right) = 970.727 \text{ k}\Omega$$

Ved $R_{30} := 976 \text{ k}\Omega$ (denne værdi findes i E48, E96 samt E192)

$$V_{\text{OUT_real}} := V_{\text{REF}} \cdot \frac{(R_{30} + R_{31})}{R_{31}} = 3.311 \text{ V}$$

Termiske beregning ved maksimal belastning

$$\theta_{JA} := 190.5 \frac{1}{\text{W}} \text{ } ^\circ\text{C}$$

$$T_{\text{amb}} := 60 \text{ } ^\circ\text{C}$$

$$P_{\text{Dissipated}} := \left(\frac{V_{\text{OUT}} \cdot I_{\text{OUT_max}}}{\eta} \right) - (V_{\text{OUT}} \cdot I_{\text{OUT_max}}) = 82.5 \text{ mW}$$

$$T_{\text{max}} := (P_{\text{Dissipated}} \cdot \theta_{JA}) + T_{\text{amb}} = 75.716 \text{ } ^\circ\text{C}$$