Beregning af modstandsværdier til spændingsdeler i feedback

$V_{out} := 21\ V$ $V_{FB} := 2.5\ V$ $I_{FB1} := 1\ mA$

$R_{FB1} := \frac{V_{out} - V_{FB}}{I_{FB1}} = 18.5\ k\Omega$ $R_{FB1} := 18.7\ k\Omega$

$R_{FB2} := \frac{\frac{V_{FB}}{R_{FB}}}{R_{FB1} + R_{FB}} = V_{out} \xrightarrow{solve, R_{FB}} 2.527027027027027 \cdot k\Omega$

$R_{FB21} := \frac{V_{FB}}{I_{FB1}} = 2.5\ k\Omega$ $R_{FB21} := 2.55\ k\Omega$

$R_{FB22} := R_{FB2} = \left(R_{FB21}^{-1} + R_{FB22}^{-1}\right)^{-1} \xrightarrow{solve, R_{FB22}} 280.4999999999999969 \cdot k\Omega$

$R_{FB22} := 280\ k\Omega$

$R_{FB2} := \left(R_{FB21}^{-1} + R_{FB22}^{-1}\right)^{-1} = 2.527\ k\Omega$

$V_{FB} := \frac{R_{FB2}}{R_{FB1} + R_{FB2}} \cdot V_{out} = 2.5\ V$

Beregning af RC komponenter til oscillator

$f_{osc} := 200\ kHz$

$C_T := 200\ pF$ Foreslået 100pF til 1000pF

$R_T := \frac{1.5}{C_T \cdot f_{osc}} = 37.5\ k\Omega$ Foreslået værdi mellem 10k og 200k ifølge datablad

$R_T := 33.2\ k\Omega$

$f_s := \frac{f_{osc}}{2} = 100\ kHz$

Beregning af formodstand til MOSFET ud fra charge tid

$t_{ch} := 150\ ns \qquad Q_{gd} := 19\ nC \qquad V_{DD} := 12\ V \qquad V_{gs} := 5\ V$

$R_g := t_{ch} = \frac{Q_{gd} \cdot R_g}{V_{DD} - V_{gs}} \xrightarrow{solve, R_g} \frac{1050 \cdot V \cdot ns}{19 \cdot nC} = 55.263\ \Omega$

$R_g := 51.1\ \Omega \qquad Q_{gd} := 19\ nC$

$t_{ch} := \frac{Q_{gd} \cdot R_g}{V_{DD} - V_{gs}} = 138.7\ ns$

Beregning af current sense modstand og offset netværk

$I_{ppk} := 5.65\ A \qquad V_{Rcs} := 1\ V$

$R_{CS} := \frac{V_{Rcs}}{I_{ppk}} = 0.177\ \Omega$

Lavpas filter, for at fjerne spikes fra CS signal

$t_r := 100\ ns \qquad C_{lp} := 100\ pF$

$BW := \frac{0.34}{t_r} = 3.4\ MHz$

$R_{lp} := BW = \frac{1}{2\ \pi \cdot R_{lp} \cdot C_{lp}} \xrightarrow{solve, R_{lp}} \frac{0.00046810277379969216403}{pF \cdot MHz} = 468.103\ \Omega$

Snubber netværk til MOSFET

$L_m := 152\ H \cdot 10^{-9} \qquad f := \frac{1}{40\ ns} = 25\ MHz \qquad C_{oss} := 170\ pF$

$C_{trans} := f = \frac{1}{2\ \pi \cdot \sqrt{L_m \cdot C_{trans}}} \xrightarrow{solve, C_{trans}} \frac{50000}{19 \cdot \pi^2 \cdot H \cdot MHz^2} = 266.635\ pF$

$X_{Lm} := 2\ \pi \cdot L_m \cdot f = 23.876\ \Omega \qquad R_{snubM} := X_{Lm} = 23.876\ \Omega$

$C_{snubM} := 2 \cdot C_{trans} = 533.269\ pF$

Snubber netværk til diode

$C_D := 80\ pF$ $\quad f := \frac{1}{35\ ns} = 28.571\ MHz$

$$C_{diode} := f = \frac{1}{2\ \pi \cdot \sqrt{L_m \cdot C_{diode}}} \xrightarrow{solve,\, C_{diode}} \frac{204.14218743727597224}{H \cdot MHz^2} = 204.142\ pF$$

$R_{snubD} := 2\ \pi \cdot L_m \cdot f = 27.287\ \Omega$ $\quad P_{snubM} := C_{snubM} \cdot (70\ V)^2 \cdot f_s = 261.302\ mW$

$C_{snubD} := 2 \cdot C_{diode} = 408.284\ pF$ $\quad P_{snubD} := C_{snubD} \cdot (44\ V)^2 \cdot f_s = 79.044\ mW$

Output kondensator parasitter

$C_{out} := 56\ \mu F$ $\quad f_{res} := 108\ kHz$

$$L_{ESL} := f_{res} = \frac{1}{2 \cdot \pi \cdot \sqrt{C_{out} \cdot L_{cout}}} \xrightarrow{solve,\, L_{cout}} \frac{1}{2612736 \cdot \pi^2 \cdot kHz^2 \cdot \mu F} = 38.78\ H \cdot 10^{-9}$$

$$\left((L_{ESL})^{-1} \cdot 4\right)^{-1} = 9.695\ H \cdot 10^{-9}$$