$P_{out} := 120\ W$

$V_{in\_min} := 85\ V$ $V_{in\_max} := 264\ V$ $f_{line} := 60\ Hz$ $F_{sw} := 277\ kHz$

$V_{dc} := 385\ V$ $\eta := 0.95$ $V_{dyn} := 1\ V$ $V_{ref} := 7.5\ V$

$V_{hold} := 330\ V$ $I_{ac\_pk} := 500 \cdot 10^{-6}\ A$ $V_{ff\_min} := 1.4\ V$ $A_{ff} := 0.022$

$t_h := \frac{1}{47\ Hz} = 0.021\ s$ $g\_m := 1\ S$

$\Delta I := \frac{\left(P_{out} \cdot 0.25 \cdot \sqrt{2}\right)}{\eta \cdot V_{in\_min}} = 0.525\ A$

$D := 1 - \frac{\left(V_{in\_min} \cdot \sqrt{2}\right)}{V_{dc}} = 0.688$

$L_1 := \frac{\left(V_{in\_min} \cdot D \cdot \sqrt{2}\right)}{\Delta I \cdot F_{sw}} = \left(5.681 \cdot 10^{-4}\right)\ H$

$L_{max} := V_{dc} \cdot 0.5 \cdot \frac{(1 - 0.5)}{F_{sw} \cdot \Delta I} = \left(6.613 \cdot 10^{-4}\right)\ H$ Max inductance when D=0.5 for max ripple

$I_{rms\_fet} := \frac{(P_{out})}{V_{in\_min}} \cdot \left(\sqrt{2 - \frac{\left(V_{in\_min} \cdot 16 \cdot \sqrt{2}\right)}{3 \cdot \pi \cdot V_{dc}}}\right) = 1.712\ A$

$I_{pk} := \frac{\left(P_{out} \cdot \sqrt{2}\right)}{\eta \cdot V_{in\_min}} = 2.102\ A$

$I_{pk\_max} := I_{pk} + \frac{\Delta I}{2} = 2.364\ A$

Sense resistor

$R_2 := \frac{V_{dyn}}{I_{pk\_max}} = 0.423\ \Omega$

$R_{14} := 10 \cdot 10^3\ ohm$

$R_7 := \frac{1}{\left(\frac{V_{ref}}{I_{pk\_max} \cdot R_2} - 1\right)} \cdot R_{14} = \left(1.538 \cdot 10^3\right)\ \Omega$

Output capacitor and Input feedforward terms

$$C_1 := 2 \cdot P_{out} \cdot \frac{t_h}{\left(V_{dc}^{\ 2} - V_{hold}^{\ 2}\right)} = \left(1.299 \cdot 10^{-4}\right)\ \boldsymbol{F} \qquad V_{vao} := 5\ \boldsymbol{V}$$

$$R_1 := \sqrt{2} \cdot \frac{V_{in\_max}}{I_{ac\_pk}} = \left(7.467 \cdot 10^{5}\right)\ \boldsymbol{\Omega}$$

$$R_{15} := 2 \cdot R_1 \cdot \frac{V_{ff\_min}}{V_{in\_min} \cdot 0.9} = \left(2.733 \cdot 10^{4}\right)\ \boldsymbol{\Omega}$$

$$C_8 := \frac{1}{2 \cdot \pi \cdot f_{line} \cdot 2 \cdot A_{ff} \cdot R_{15}} = \left(2.206 \cdot 10^{-6}\right)\ \boldsymbol{F}$$

$$R_{8\_12} := \frac{\left(I_{pk} \cdot R_1 \cdot R_2 \cdot V_{ff\_min}^{\ 2}\right)}{\sqrt{2} \cdot V_{in\_min} \cdot \left(V_{vao} - 1\ \boldsymbol{V}\right)} = \left(2.706 \cdot 10^{3}\right)\ \frac{\boldsymbol{kg}^2 \cdot \boldsymbol{m}^4}{\boldsymbol{s}^6 \cdot \boldsymbol{A}^3}$$

Multiplier resistor

$$R_{8\_12} := 2.7 \cdot 10^{3}\ \boldsymbol{ohm}$$

Current loop

$$f_c := \frac{F_{sw}}{10} = \left(2.77 \cdot 10^{4}\right)\ \frac{1}{\boldsymbol{s}} \qquad V_{ramp} := 5\ \boldsymbol{V}$$

$$\Delta V_{rs} := \frac{\left(V_{dc} \cdot R_2\right)}{L_{max} \cdot F_{sw}} = 0.889\ \boldsymbol{V}$$

$$G_{ca} := \frac{V_{ramp}}{\Delta V_{rs}} = 5.625$$

$$R_{13} := G_{ca} \cdot R_{8\_12} = \left(1.519 \cdot 10^{4}\right)\ \boldsymbol{\Omega}$$

$$f_{ci} := \frac{\left(V_{dc} \cdot R_2 \cdot G_{ca}\right)}{V_{ramp} \cdot 2 \cdot \pi \cdot L_{max}} = \left(4.409 \cdot 10^{4}\right)\ \frac{1}{\boldsymbol{s}}$$

$$C_6 := \frac{1}{2 \cdot \pi \cdot f_{ci} \cdot R_{13}} = \left(2.377 \cdot 10^{-10}\right)\ \boldsymbol{F}$$

$$C_7 := \frac{1}{2 \cdot \pi \cdot R_{13} \cdot F_{sw}} = \left(3.783 \cdot 10^{-11}\right)\ F$$

Override current loop parameters here

$R_{13} := 55000\ ohm$ $g\_m := 100 \cdot 10^{-6}\ S$ $C_6 := 237.7 \cdot 10^{-12}\ F$ $C_7 := 38 \cdot 10^{-12}\ F$

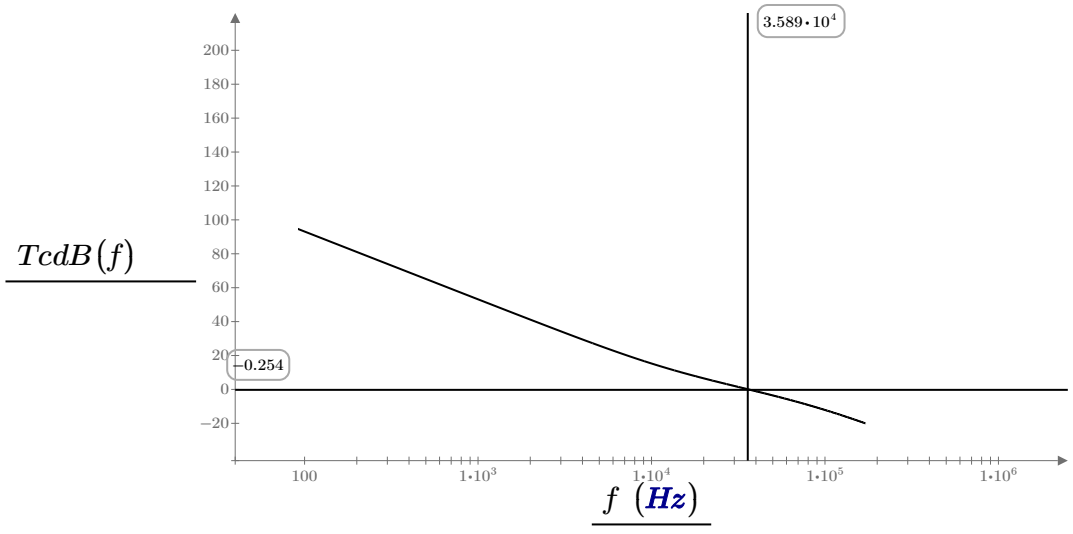
$f := 1 \cdot Hz, 10 \cdot Hz .. 5 \cdot 10^5 \cdot Hz$

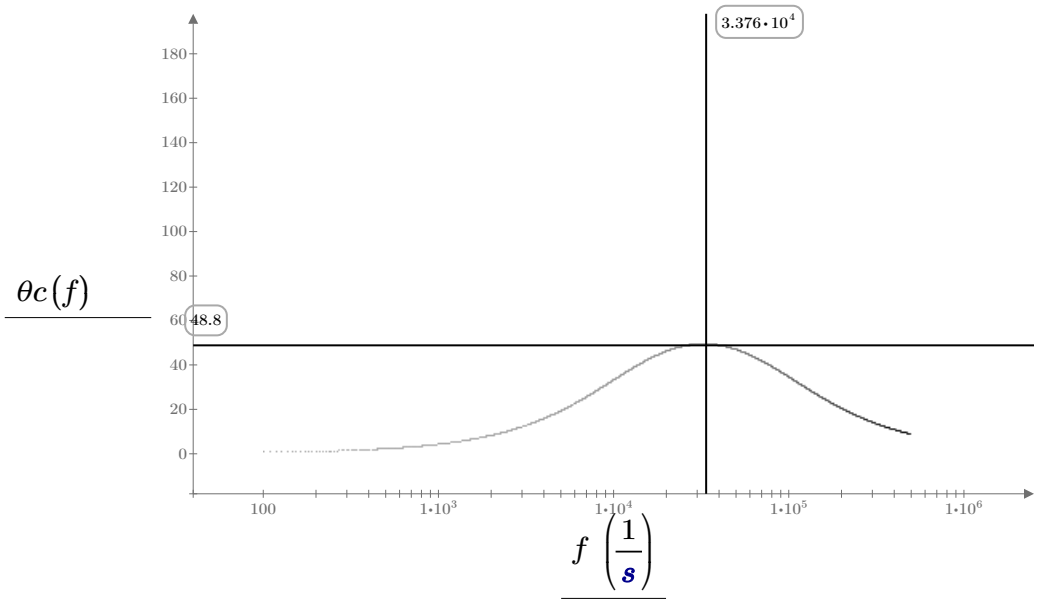
$$s(f) := 2\mathrm{j} \cdot \pi \cdot f$$

$$T(f) := \frac{V_{dc} \cdot R_2 \cdot g\_m}{s(f) \cdot L_{max} \cdot V_{ramp}} \cdot \left(\frac{s(f) \cdot R_{13} \cdot C_6 + 1}{s(f) \cdot (C_6 + C_7) \cdot \left(\frac{s(f) \cdot R_{13} \cdot C_6 \cdot C_7}{C_6 + C_7} + 1 \right)} \right)$$

$$\theta c(f) := \arg(T(f)) \cdot \frac{180}{\pi} + 180$$

$$TcdB(f) := 20 \cdot \log(|T(f)|)$$





$\theta c(35 \cdot kHz) = 49.204$ $TcdB(35 \cdot kHz) = 0.384$

Voltage Loop Calculations

$R_4 := 22.1 \cdot 10^3 \ ohm$ $R_3 := 1124 \cdot 10^3 \ ohm$

$H := \frac{R_4}{R_3 + R_4} = 0.019$ $g\_mv := 100 \cdot 10^{-6} \ S$

$f_{cv} := 10 \ Hz$

$V_{ea\_max} := 5.2 \ V$

$V_{ripple} := 20 \ V$

$Z_{out} := V_{ea\_max} \cdot 0.03 \cdot \frac{(R_3 + R_4)}{g\_mv \cdot V_{ripple} \cdot R_4} = (4.045 \cdot 10^3) \ \Omega$

$Cpv := \frac{1}{(2 \cdot \pi \cdot 2 \cdot f_{line} \cdot Z_{out})} = (3.279 \cdot 10^{-7}) \ F$

$f := 1 \cdot Hz, 2 \cdot Hz .. 0.2 \cdot 10^3 \cdot Hz$

$$s(f) := 2j \cdot \pi \cdot f$$

$$fc := \sqrt{\frac{R_4}{R_3 + R_4} \cdot g\_mv \cdot \left(\frac{\frac{P_{out}}{\eta}}{V_{ea\_max}} \cdot \frac{\frac{1}{2 \cdot \pi \cdot C_1}}{V_{dc}} \right) \cdot \frac{1}{2 \cdot \pi \cdot Cpv}} = 8.508 \ \frac{1}{s}$$

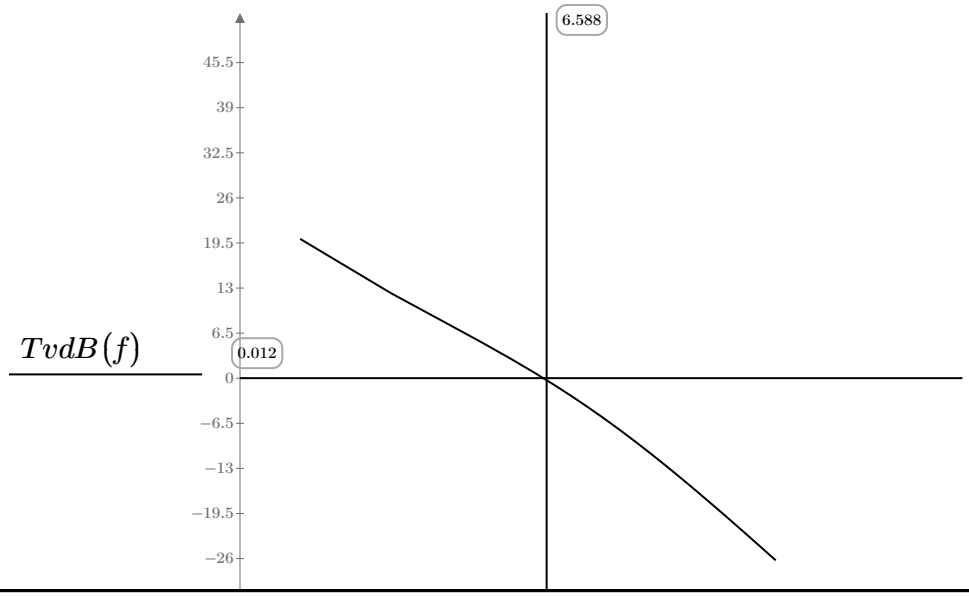
$$Rzv := \frac{1}{2 \cdot \pi \cdot fc \cdot Cpv} = \left(5.705 \cdot 10^{4}\right) \ \Omega$$

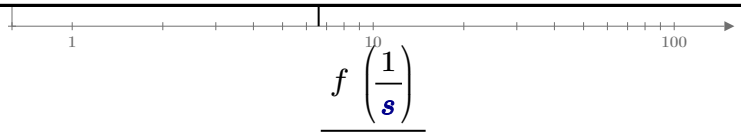
$$Czv := \frac{1}{2 \cdot \pi \cdot \frac{fc}{10} \cdot Rzv} = \left(3.279 \cdot 10^{-6}\right) \ F$$

$$Tv(f) := \frac{R_4}{R_3 + R_4} \cdot g\_mv \cdot \left(\frac{\frac{P_{out}}{\eta}}{V_{ea\_max}} \cdot \frac{\frac{1}{s(f) \cdot C_1}}{V_{dc}} \right) \cdot \frac{s(f) \cdot Rzv \cdot Czv + 1}{s(f) \cdot (Czv + Cpv) \cdot \left(\frac{s(f) \cdot Rzv \cdot Czv \cdot Cpv}{Czv + Cpv} + 1 \right)}$$

$$\theta v(f) := \arg(Tv(f)) \cdot \frac{180}{\pi} + 180$$

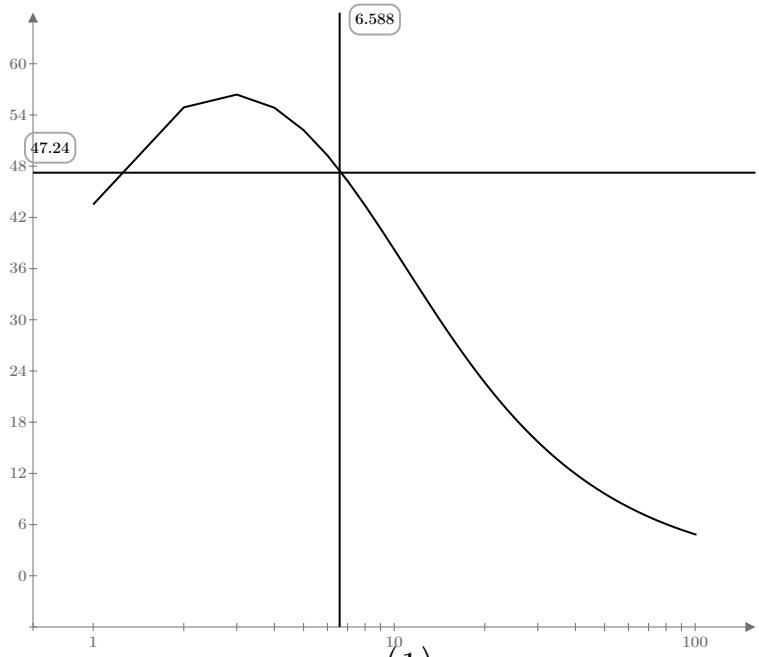
$$TvdB(f) := 20 \cdot \log(|Tv(f)|)$$





$f\left(\frac{1}{s}\right)$

$\theta v(f)$



$f\left(\frac{1}{s}\right)$

$\theta v(6.5 \cdot Hz) = 47.761$

$TvdB(6.5 \cdot Hz) = -0.126$

RefDes on data sheet	RefDes in design	values
R1	R47+R50	766K
R2	R43	0.22
R8/R12	R4/R9	3.16K
R3	R44+R49	1124K
R4	R60	22.1k
C1	C32	150uF
L1	L2	660uH
R13	R10	15.8K
C6	C6	680pF
C7	C8	150pF
R15	R11	30.1K
C8	C9	4.7uF
C10	C1	1.5uF
C11	C2	150nF
R21	R1	48.7K
R14	R13	10K
R7	R5	1.18K
C9	C4	1uF