$p := 10^{-12}$
$n := 10^{-9}$
$u := 10^{-6}$
$m := 10^{-3}$
$k := 10^{3}$
$M := 10^{6}$

$F_{SW} := 250\ k$

$V_{IN\_MAX} := 60$

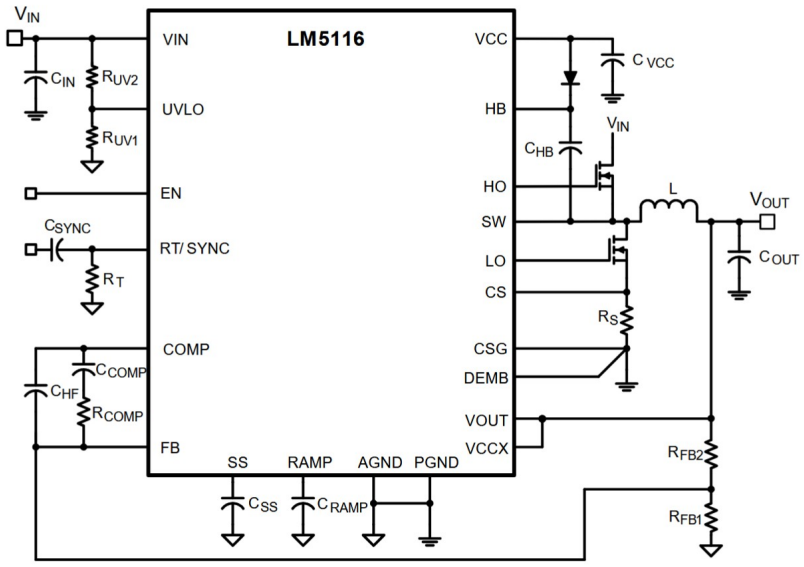
$V_{IN\_MIN} := 16$

$V_{IN} := 22.2$

$V_{OUT} := 12$

$I_{OUT} := 6$

Typical Application



расчет R_T задающего частоту

$$R_T = \frac{\frac{1}{250\ kHz} - 450\ ns}{284\ pF} = 12.5\ k\Omega$$

$$R_T := \frac{\frac{1}{F_{SW}} - 450\ n}{284\ p} = 12.5\ k \qquad R_T := 12.4\ k$$

расчет L

$I_{PP} := 0.4 \cdot I_{OUT} = 2.4$

$$L = \frac{V_{OUT}}{I_{PP} \times f_{SW}} \times \left(1 - \frac{V_{OUT}}{V_{IN(MAX)}}\right)$$

$$L := \frac{V_{OUT}}{I_{PP} \cdot F_{SW}} \cdot \left(1 - \frac{V_{OUT}}{V_{IN\_MAX}}\right) = 16\ u \qquad L := 15\ u$$

расчет R_S current sense резистора

$V_{CS\_TH} := 0.11$

$$R_S \le \frac{V_{CS(TH)}}{I_O + \frac{V_{OUT}}{2 \times L \times f_{SW}} \times \left(1 + \frac{V_{OUT}}{V_{IN(MIN)}}\right)}$$

$$R_S := \frac{V_{CS\_TH}}{I_{OUT} + \frac{V_{OUT}}{2 \cdot L \cdot F_{SW}} \cdot \left(1 + \frac{V_{OUT}}{V_{IN\_MIN}}\right)} = 12.5\ m \qquad R_S := 10\ m$$

расчет C_{RAMP}

$g_m := 5\ \boldsymbol{u}$

$A := 10$

$$C_{RAMP} \approx \frac{g_m \times L}{A \times R_S} \qquad C_{RAMP} := \frac{g_m \cdot L}{A \cdot R_S} = 0.75\ \boldsymbol{n}$$

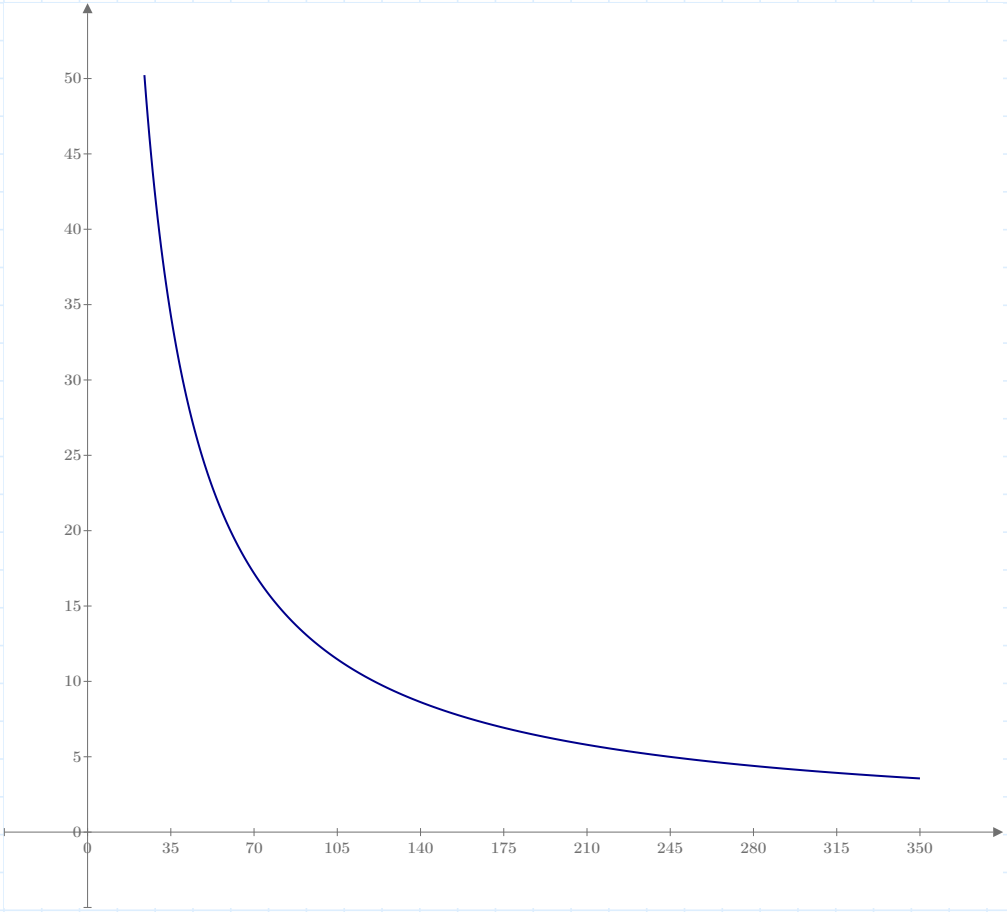
расчет C_{OUT}

$ESR := 0.4\ \boldsymbol{m}$

ΔV_{OUT} – амплитуда пульсации напряжения

$$\Delta V_{OUT} = I_{PP} \times \sqrt{ESR^2 + \left(\frac{1}{8 \times f_{SW} \times C_{OUT}}\right)^2} \qquad \Delta V_{OUT}(C_{OUT}) := I_{PP} \cdot \sqrt{ESR^2 + \left(\frac{1}{8 \cdot F_{SW} \cdot C_{OUT}}\right)^2}$$

$\Delta V_{OUT}(C_{OUT})\ (\boldsymbol{m})$



$C_{OUT}\ (\boldsymbol{u})$

$C_{OUT} := 22\ \boldsymbol{u} \cdot 12 = 264\ \boldsymbol{u}$ тогда: $\Delta V_{OUT}(C_{OUT}) = 4.646\ \boldsymbol{m}$

$C_{OUT} := 22\ \boldsymbol{u} \cdot 4 = 88\ \boldsymbol{u}$ тогда: $\Delta V_{OUT}(C_{OUT}) = 13.67\ \boldsymbol{m}$

расчет выходного делителя напряжния который задает $V_{OUT} = 12$

$$\frac{R_{FB2}}{R_{FB1}} = \frac{V_{OUT}}{1.215V} - 1$$

$R_{FB1} := 1.21\ k$

$R_{FB2} := R_{FB1} \cdot \left(\frac{V_{OUT}}{1.215} - 1\right) = 10.741\ k$ $\quad R_{FB2} := 10.7\ k$

$V_{OUT} := 1.215 \cdot \left(\frac{R_{FB2}}{R_{FB1}} + 1\right) = 11.959$

для $V_{OUT} = 5$

$R_{FB1\_5V} := 1.5\ k$ $\quad R_{FB2\_5V} := R_{FB1\_5V} \cdot \left(\frac{5}{1.215} - 1\right) = 4.673\ k$ $\quad R_{FB2\_5V} := 4.7\ k$

$V_{OUT\_5V} := 1.215 \cdot \left(\frac{R_{FB2\_5V}}{R_{FB1\_5V}} + 1\right) = 5.022$

расчет делителя напряжния UVLO

$R_{UV2} > 500 \times V_{IN(MAX)}$ $\quad R_{UV2} := 500 \cdot V_{IN\_MAX} = 30\ k$ $\quad R_{UV2} := 33\ k$

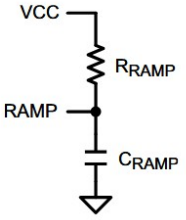
$$R_{UV1} = 1.215 \times \left(\frac{R_{UV2}}{V_{IN(MIN)} + (5\ \mu A \times R_{UV2}) - 1.215}\right)$$

$R_{UV1} := 1.215 \cdot \left(\frac{R_{UV2}}{V_{IN\_MIN} + (5\ u \cdot R_{UV2}) - 1.215}\right) = 2.682\ k$ $\quad R_{UV1} := 2.7\ k$

расчет R_{RAMP}

$T := \frac{1}{F_{SW}} = 4 \cdot 10^{-6}$

$VCC := 7.4$



$I_{OS} = (V_{OUT} / 3) \times 10\ \mu A/V$ $\quad I_{OS} := \frac{V_{OUT}}{3} \cdot 10\ u = 39.864\ u$

$$V_{RAMP} = \frac{V_{OUT}}{V_{IN}} \times \frac{((V_{IN} - V_{OUT}) \times g_m + I_{OS}) \times T}{C_{RAMP}}$$

$V_{RAMP} := \frac{V_{OUT}}{V_{IN}} \cdot \frac{\left(\left(V_{IN} - V_{OUT}\right) \cdot g_m + I_{OS}\right) \cdot T}{C_{RAMP}} = 0.262$

$$R_{RAMP} = \frac{VCC - V_{RAMP}}{I_{OS} - 25\ \mu A}$$

$R_{RAMP} := \frac{VCC - V_{RAMP}}{I_{OS} - 25\ u} = 480.243\ k$ $\quad R_{RAMP} := 470\ k$