

LM21212-1 Design Spreadsheet

Rev. 3.2

The cells corresponding to parameters in Blue Text can be edited by the user.

Red cells indicate potential design problems. Cells with comments are shown as:

Part 1: Power Stage Component Selection

Enter Your Application Parameters

Enter Your Input Voltage:	5 V
Enter Your Output Voltage:	0.9 V
Enter the Maximum Output Current:	12 A
Enter the Switching Frequency:	500 kHz
Enter the Maximum Output Voltage Ripple%:	1 %
Enter the Maximum Load Step Transient Magnitude:	8 A

Inductor Selection (L)

Recommended L:	0.41 μ H
Recommended I_{SA} :	19.0 A
Enter Your Chosen Inductor Value:	0.68 μ H
Enter The DCR of Your Inductor:	5.5 m Ω

Capacitor Selection (C_{IN} and C_{OUT})

Minimum Recommended Input Capacitance:	47 μ F
Minimum Input Capacitor RMS current rating:	4.88 Arms
Minimum Recommended Output Capacitance:	472 μ F
Maximum Output Capacitor ESR:	4 m Ω
Enter Your Output Capacitor Value:	330 μ F
Enter Your Output Capacitor ESR:	3 m Ω
Estimated Transient Droop:	56 mV
Estimated Output Voltage Ripple:	8 mV

If the transient droop or output voltage ripple are larger than desired, then increase the output capacitor value or decrease the output capacitor ESR.

Part 2: Compensation

Compensation Component Selection (R_{C1} , C_{C1} , C_{C2})

Enter Your Desired Crossover Frequency:	80 kHz
Recommended Standard Value for C_{C1} :	1.2 nF
Recommended 1% Standard Value for R_{C1} :	22.6 k Ω
Recommended Standard Value for C_{C2} :	27 pF
Recommended 1% Standard Value for R_{C2} :	0.649 k Ω
Recommended Standard Value for C_{C3} :	1500 pF
UPDATE	Enter Your Value for C_{C1} : 2.7 nF
	Enter Your Value for R_{C1} : 4.53 k Ω
	Enter Your Value for C_{C2} : 560 pF
	Enter Your Value for R_{C2} : 0.75 k Ω
	Enter Your Value for C_{C3} : 1200 pF

Loop Characteristics

Expected Crossover Frequency:	19 kHz
Expected Phase Margin:	37 °

If the phase margin is less than desired, decrease the desired crossover frequency, increase the value of C_{C1} , or decrease the value of C_{C2} . A good starting point for the crossover frequency is 80kHz.

Part 3: Output Voltage and Soft-Start

Feedback Resistors (R_{FB1} , R_{FB2})

Enter a Value for R_{FB1} :	9.1 k Ω
Recommended 1% Standard Value for R_{FB2} :	18.2 k Ω

Soft-Start Capacitor (C_{SS})

Enter Desired Startup Time:	30 ms
Recommended Standard Value for C_{SS} :	100 nF

For the soft-start capacitor to have any effect on the circuit, the desired startup time must be greater than 1ms.

Part 4: Miscellaneous Components

Recommended Value for C_{VCC} :	1 μ F
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Part 5: Thermal Performance

Enter Your Board Parameters

Copper Area	1 in ²
Airflow	0 LFPM

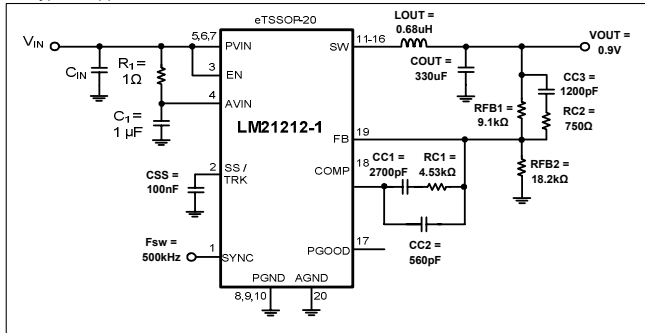
Thermal Characteristics

THETA JA:	24.8 °C/W
Ambient Temperature:	25 °C
Internal PD at Full Load Current:	0.96 W
TJ at Full Load Current:	48.9 °C

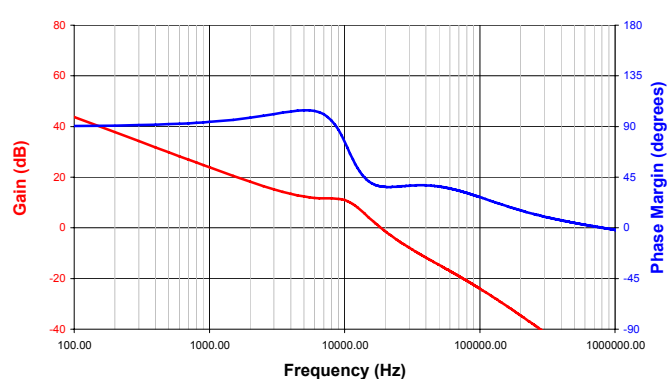
If the junction temperature (TJ) is greater than desired, increase the copper area or the airflow, or choose a lower switching frequency.

NOTE: THETA JA is reported as an estimate only. Measurements should always be taken to verify the junction temperature in the final design.

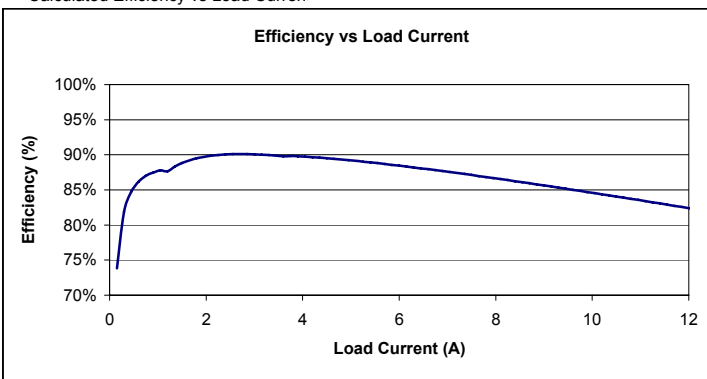
Typical Application Circuit



LM21212-1 Bode Plot



Calculated Efficiency vs Load Current



For datasheets, samples, evaluation boards, and design collateral visit:

<http://www.national.com/pdf/LM/LM21212-1.html>