

500-W Interleaved SEPIC Power Supply Reference Design



Description

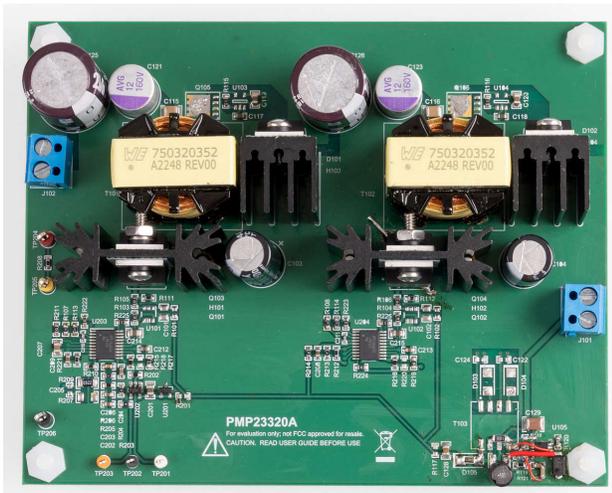
This 500-W interleaved SEPIC converter reference design supplies a non-isolated adjustable 5-V to 110-V output voltage with a maximum output current of 5 A.

Features

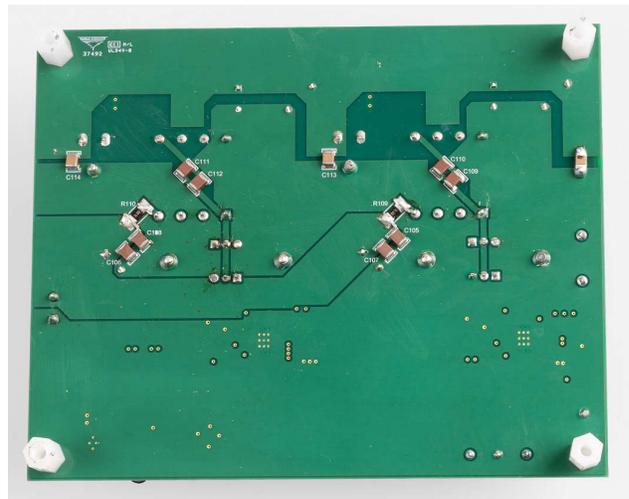
- Interleaved power stages reduces output capacitance
- 1-V peak-to-peak ripple at full load with output voltage = 110 V
- Achieves over 96% efficiency above 500-W loading across input voltage range

Applications

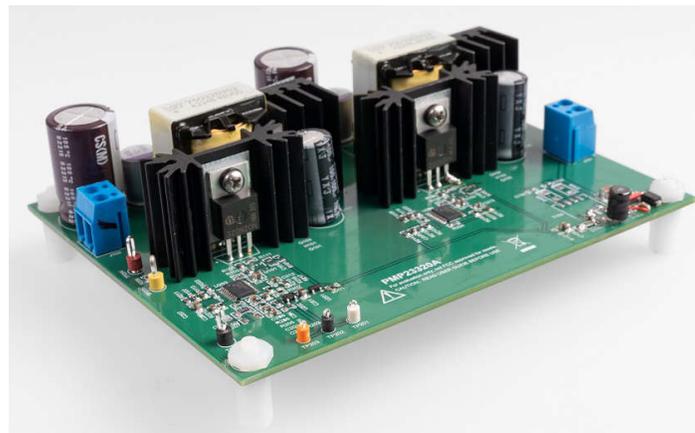
- [Power supply module](#)



Top of Board



Bottom of Board



Angled Board Photo

1 Test Prerequisites

1.1 Voltage and Current Requirements

Table 1-1. Voltage and Current Requirements

Parameter	Specifications
Input Voltage	45 V to 60 V, 48-V nominal
Output Voltage	110 V
Output Current	5-A maximum, 3-A nominal

1.2 Required Equipment

- DC power supply
- Electronic load
- Digital multimeters
- Oscilloscope

1.3 Considerations

- Unless noted, all waveforms were captured at full load with a 48-V_{DC} input.

1.4 Dimensions

The PCB is a two-layer, 1-oz per layer design. The dimensions are 5 in × 4 in with a maximum component height of 1.16 in.

2 Testing and Results

2.1 Efficiency Graphs

Figure 2-1 shows the efficiency graph.

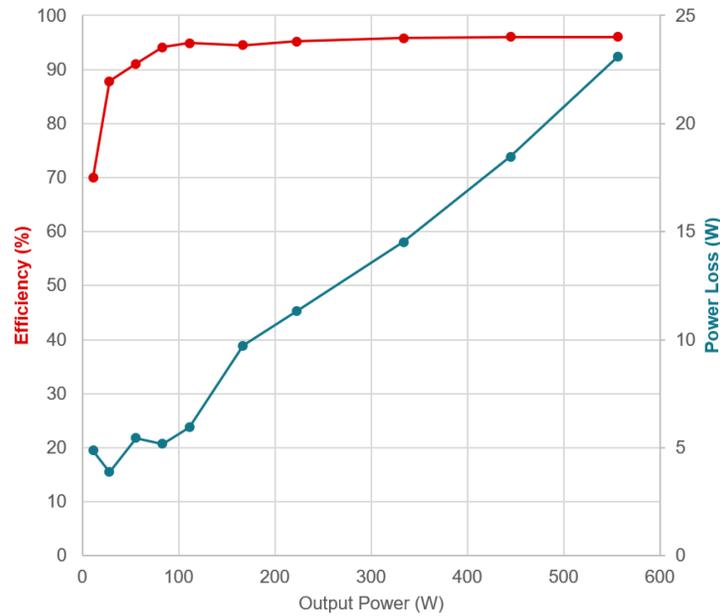


Figure 2-1. Efficiency Graph

2.2 Efficiency Data

Efficiency data is shown in the following table.

Table 2-1. PMP23320 Efficiency Data

Input			Input			Total	
Voltage (V)	Current (A)	Power (W)	Current (A)	Voltage (V)	Power (W)	Loss (W)	Efficiency (%)
47.944	0.338	16.217	0.102	111.25	11.348	4.869	69.975
47.944	0.663	31.796	0.251	111.25	27.924	3.873	87.820
47.943	1.274	61.075	0.500	111.26	55.630	5.445	91.085
47.943	1.849	88.627	0.750	111.26	83.445	5.182	94.153
47.942	2.445	117.213	1.000	111.26	111.260	5.953	94.921
47.942	3.684	176.618	1.500	111.27	166.905	9.713	94.500
47.941	4.876	233.736	1.999	111.27	222.429	11.308	95.162
47.938	7.264	348.222	2.999	111.27	333.699	14.523	95.829
47.937	9.666	463.359	3.998	111.28	444.897	18.462	96.016
47.935	12.082	579.151	4.997	111.28	556.066	23.085	96.014

Input			Output			Total	
Voltage (V)	Current (A)	Power (W)	Current (A)	Voltage (V)	Power (W)	Loss (W)	Efficiency (%)
59.949	0.225	13.498	0.101	111.30	11.241	2.257	83.281
59.950	0.567	34.001	0.250	111.30	27.825	6.176	81.835
59.950	0.987	59.189	0.500	111.30	55.650	3.539	94.021
59.949	1.497	89.756	0.750	111.30	83.475	6.281	93.003
59.949	1.967	117.908	1.000	111.31	111.310	6.598	94.404
59.948	2.922	175.174	1.499	111.31	166.854	8.320	95.250
59.947	3.903	233.961	1.999	111.31	222.509	11.452	95.105
59.946	5.820	348.874	2.999	111.32	333.849	15.025	95.693
59.944	7.733	463.547	3.999	111.32	445.169	18.378	96.035
59.943	9.658	578.929	4.996	111.32	556.155	22.775	96.066

2.3 Thermal Images

Thermal image was captured after 15 minutes of operation with 48-V input, 3-A loading, with no airflow.

Measurements

Bx1	Max	64.7 °C
Bx2	Max	68.8 °C

Parameters

Emissivity	0.95
Refl. temp.	20 °C

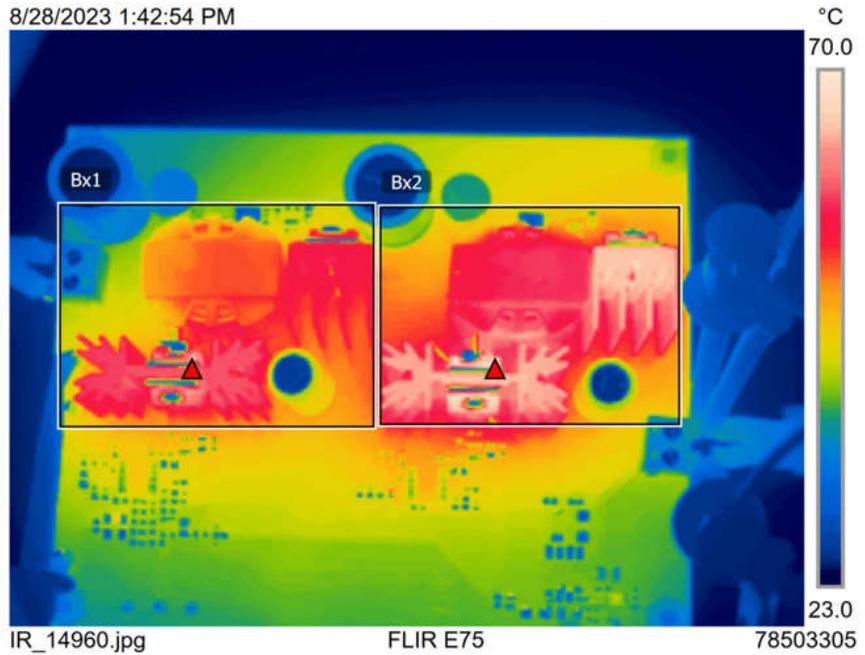


Figure 2-2. Thermal Image

3 Waveforms

3.1 Switching

The following waveform shows the primary switching node for both phases.

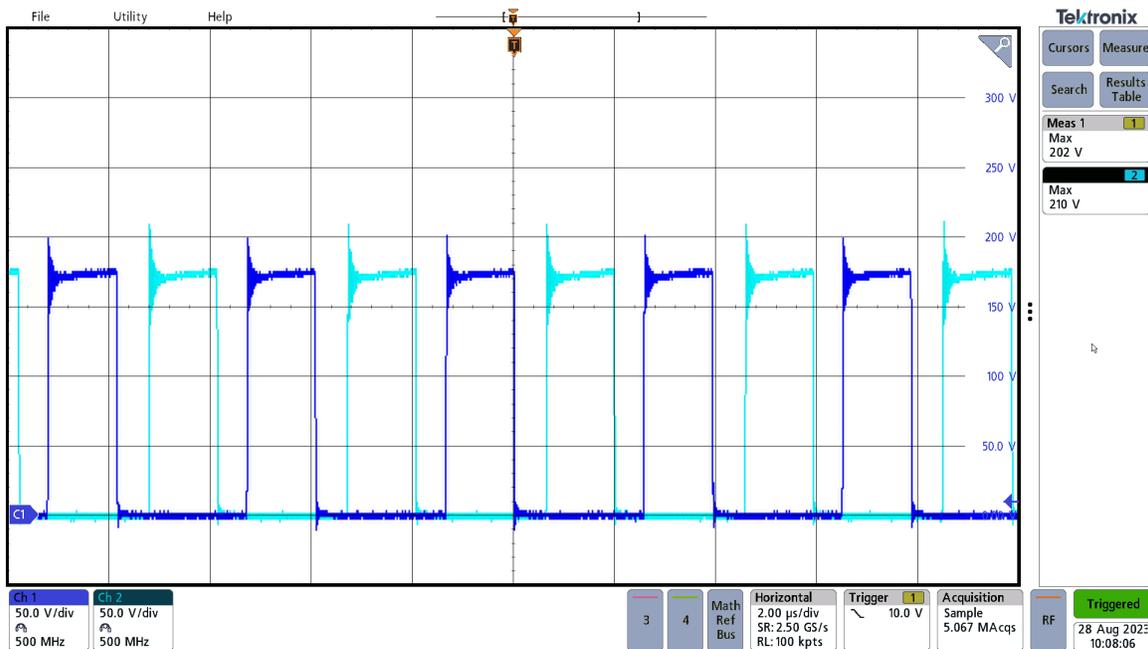


Figure 3-1. 60-V Input

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