Test Data
For PMP10595
01/19/2015

TEXAS INSTRUMENTS

Overview

The PMP10595 reference design is a miniature 1.8V, 2A output power supply using SIMPLE SWITCHER® LMZ20502 nano module. The solution size is about 5x6mm, 30mm^2.The input range of the LMZ20502 is 2.7V to 5.5V. On the reference board the LMZ20502 is set in AUTO mode, and it will operate in PFM at light load to achieve higher efficiency.

Power Specification

Vin range: 2.7V – 5.5V

Output voltage: 1.8V

Output current: 2A max

Switching Frequency: 3 MHz in PWM mode
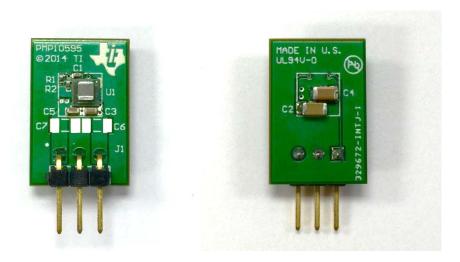
Reference Board

Figure 1 Board photos

The board size is 6.35x19 mm, and the component area is about 5x6 mm.

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Efficiency

The efficiency measurement was taken at 3V, 4V and 5V inputs. The peak efficiency is 91%
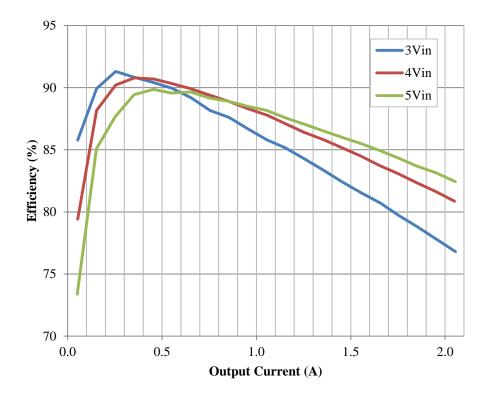

Figure 2 Power efficiency in AUTO mode

Thermal

The thermal image was taken at 23°C room temperature, no air flow. The board was operating at 5V input, 2A output. The thermal performance can be further improved by increasing the board size and using thicker copper layers.
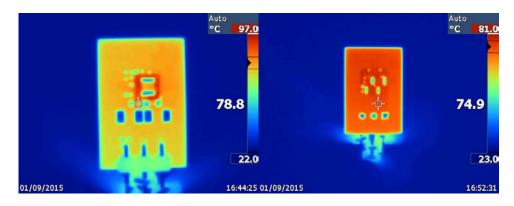
3

Figure 3 Board thermal images

Regulation

The overall variation on the 1.8V output is within 1%
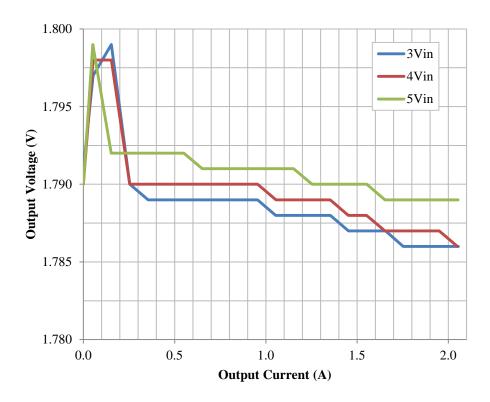

Figure 4 Regulation in AUTO mode

Start Up

Ch1 (yellow) is the input voltage, and Ch2 (green) is the output voltage.

Figure 5 Start up into no load at 5Vin

Switching Waveforms

Since the integrated inductor of the LMZ20502 power module can still be probed, the switching waveforms were measured under full load and no load conditions. The switching waveforms show its operation in the PWM and PFM. Ch1 (yellow) is the switch node voltage.
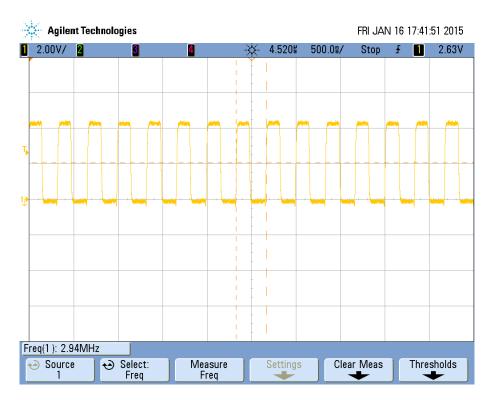
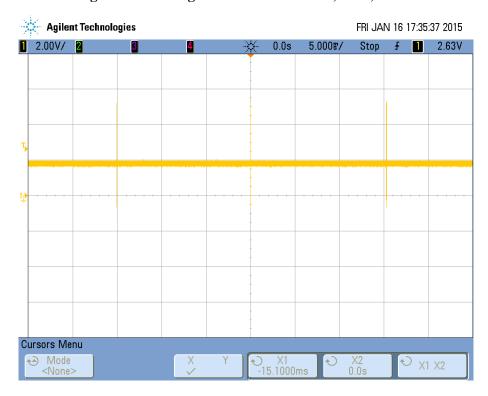**Figure 6 Switching waveform at full load, 5Vin, PWM**

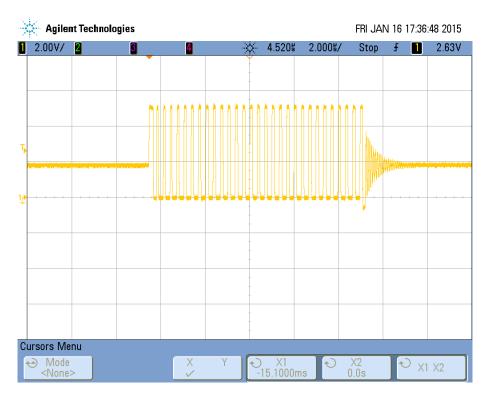**Figure 7 Switching waveform at no load, 5Vin, PFM**

Figure 8 Zoom-in switching waveform at no load, 5Vin, PFM

Load Transients

The load transient response was tested by adding load step from 1A to 2A on the output at 5V input. Ch1 (yellow) is the output voltage in AC mode, and Ch4 (magenta) is the output current.
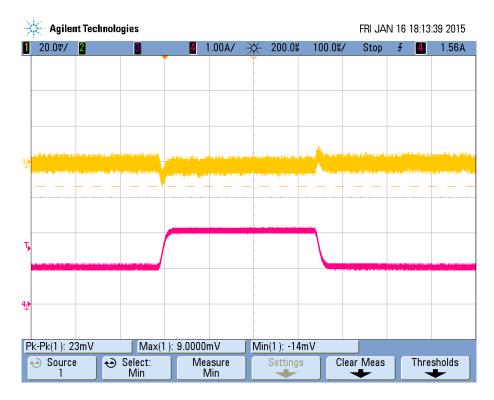
Figure 9 Output load transient at 5Vin

Output Voltage Ripples

The output ripples were measured directly at the output capacitors. Ch1 (yellow) is the output voltage ripple in AC mode.
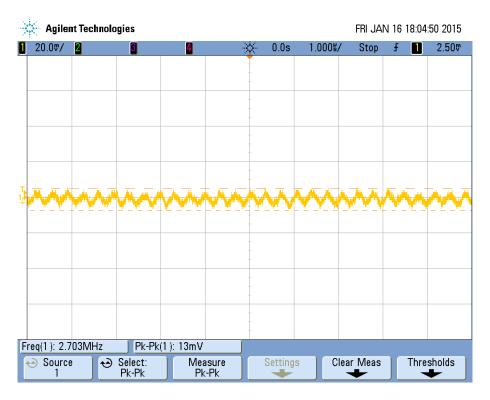
Figure 10 Output ripple at full load, 5Vin

Appendix: Efficiency and Regulation Test Data

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
3.001	0.000	1.791	0.000	0.000
3.001	0.037	1.797	0.053	85.774
3.001	0.102	1.799	0.153	89.920
3.000	0.166	1.790	0.254	91.297
3.001	0.233	1.789	0.355	90.827
3.001	0.300	1.789	0.455	90.414
3.000	0.368	1.789	0.555	89.936
3.000	0.438	1.789	0.655	89.178
3.000	0.510	1.789	0.754	88.164
3.000	0.582	1.789	0.855	87.606
3.000	0.657	1.789	0.955	86.682
3.000	0.732	1.788	1.054	85.817
3.000	0.807	1.788	1.153	85.153
3.000	0.886	1.788	1.253	84.288
3.000	0.968	1.788	1.354	83.366
3.000	1.050	1.787	1.453	82.429
3.000	1.136	1.787	1.555	81.537
3.000	1.222	1.787	1.656	80.722
3.000	1.309	1.786	1.753	79.726
3.000	1.400	1.786	1.853	78.797
3.000	1.496	1.786	1.955	77.799
3.000	1.593	1.786	2.055	76.799

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
4.000	0.000	1.790	0.000	0.000
4.000	0.030	1.798	0.053	79.412
4.000	0.078	1.798	0.153	88.171
4.000	0.126	1.790	0.254	90.210
4.000	0.174	1.790	0.353	90.786
4.000	0.225	1.790	0.456	90.693
4.000	0.274	1.790	0.553	90.317
4.000	0.325	1.790	0.653	89.913
4.000	0.378	1.790	0.755	89.382
4.000	0.431	1.790	0.856	88.877
4.000	0.484	1.790	0.955	88.298

4.000	0.538	1.789	1.056	87.787
4.000	0.592	1.789	1.153	87.108
4.000	0.648	1.789	1.252	86.413
4.000	0.705	1.789	1.353	85.834
4.000	0.762	1.788	1.452	85.176
4.000	0.821	1.788	1.552	84.500
4.000	0.882	1.787	1.653	83.728
4.000	0.941	1.787	1.750	83.083
4.000	1.003	1.787	1.849	82.357
4.000	1.067	1.787	1.950	81.646
4.000	1.132	1.786	2.050	80.859

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Efficiency(%)
5.002	0.000	1.790	0.000	0.000
5.002	0.025	1.799	0.051	73.370
5.002	0.064	1.792	0.152	85.086
5.002	0.103	1.792	0.252	87.651
5.002	0.141	1.792	0.352	89.437
5.002	0.181	1.792	0.454	89.861
5.002	0.220	1.792	0.550	89.564
5.002	0.260	1.791	0.651	89.652
5.002	0.302	1.791	0.752	89.159
5.002	0.344	1.791	0.854	88.890
5.002	0.386	1.791	0.954	88.494
5.002	0.428	1.791	1.054	88.176
5.002	0.471	1.791	1.152	87.576
5.002	0.515	1.790	1.253	87.067
5.002	0.560	1.790	1.354	86.525
5.003	0.604	1.790	1.452	86.011
5.002	0.650	1.790	1.553	85.500
5.002	0.696	1.789	1.653	84.944
5.002	0.743	1.789	1.752	84.336
5.003	0.791	1.789	1.851	83.678
5.003	0.840	1.789	1.953	83.139
5.003	0.891	1.789	2.054	82.433

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