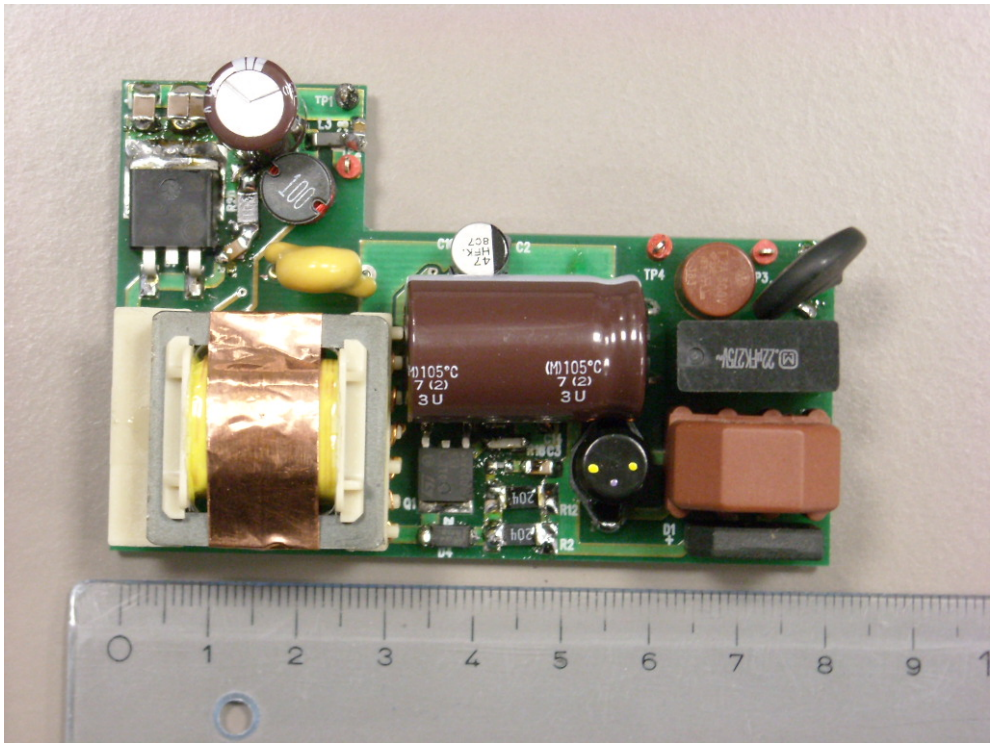
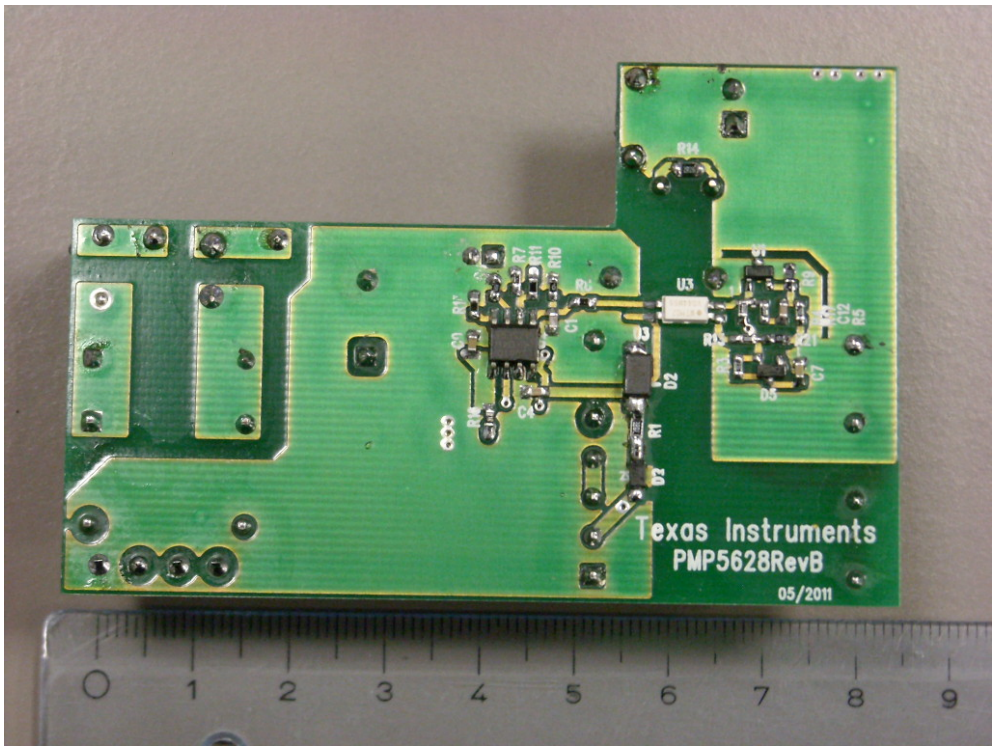
Photo of the prototype

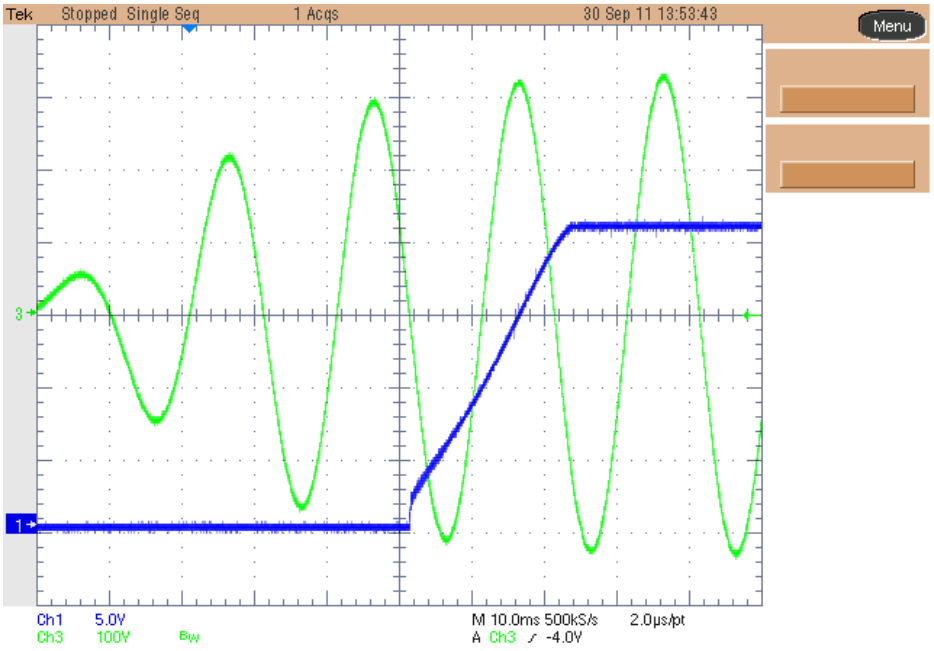


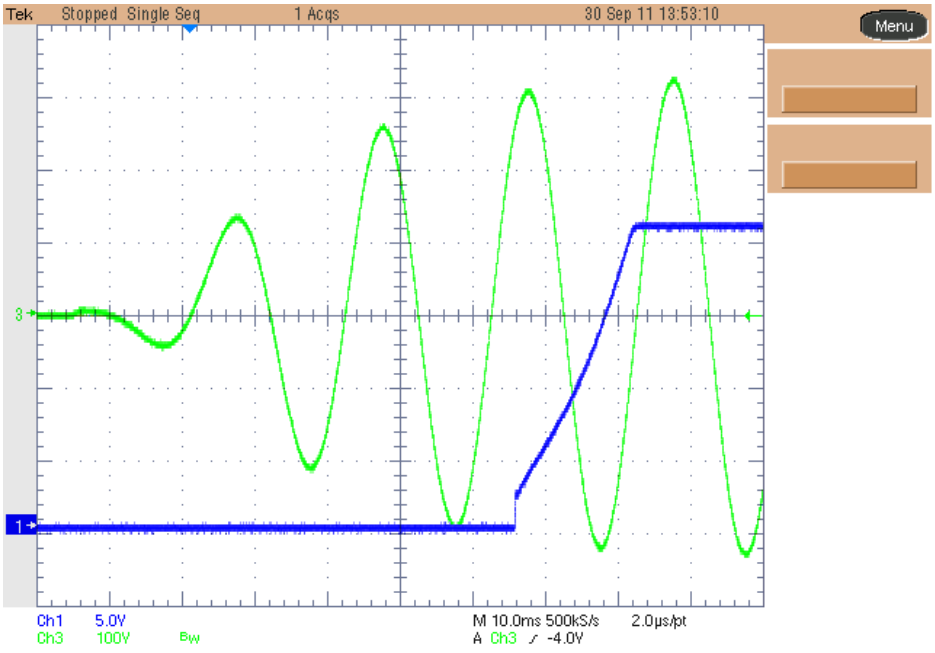


1. Startup

The input and output voltage waveforms at startup are shown in the images below. The input voltage has been set at 230Vac, 50Hz. The output was loaded with 2.8A constant current for the upper picture and with no load for the lower one.

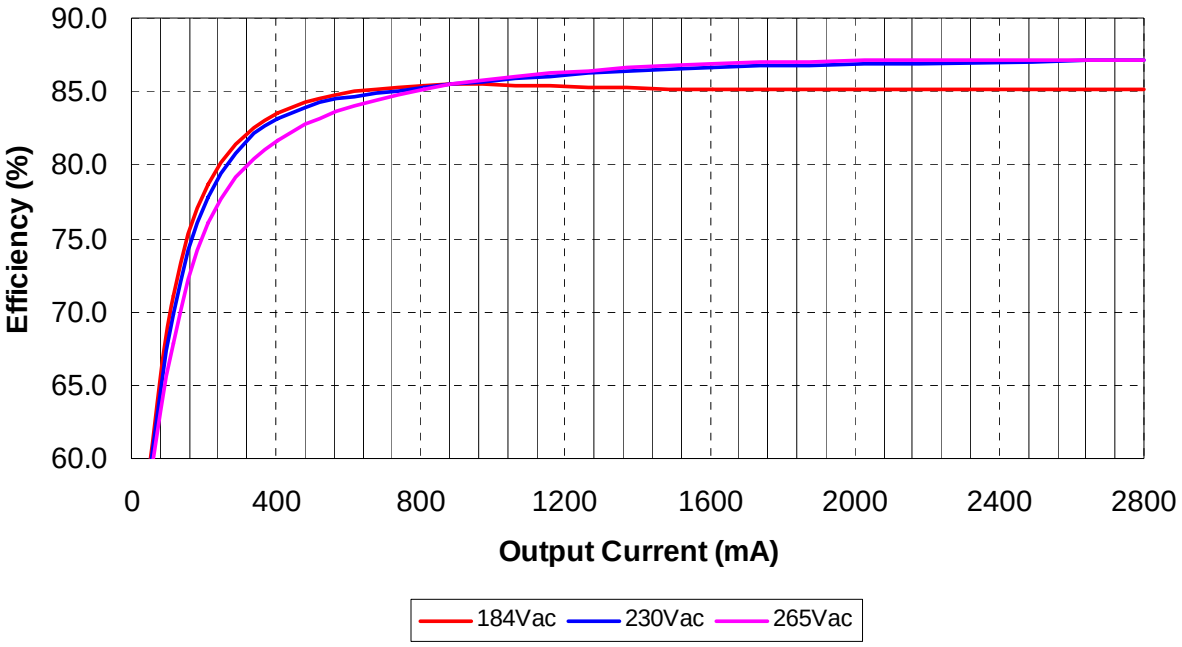
Channel 3: Input voltage (100 V/div, 10ms/div, 20MHz BWL).
Channel 1: Output Voltage (5V/div, no BWL).





2. Efficiency

The efficiency data versus output current is shown in the tables and graph below. The converter has been supplied with an AC 50Hz source.



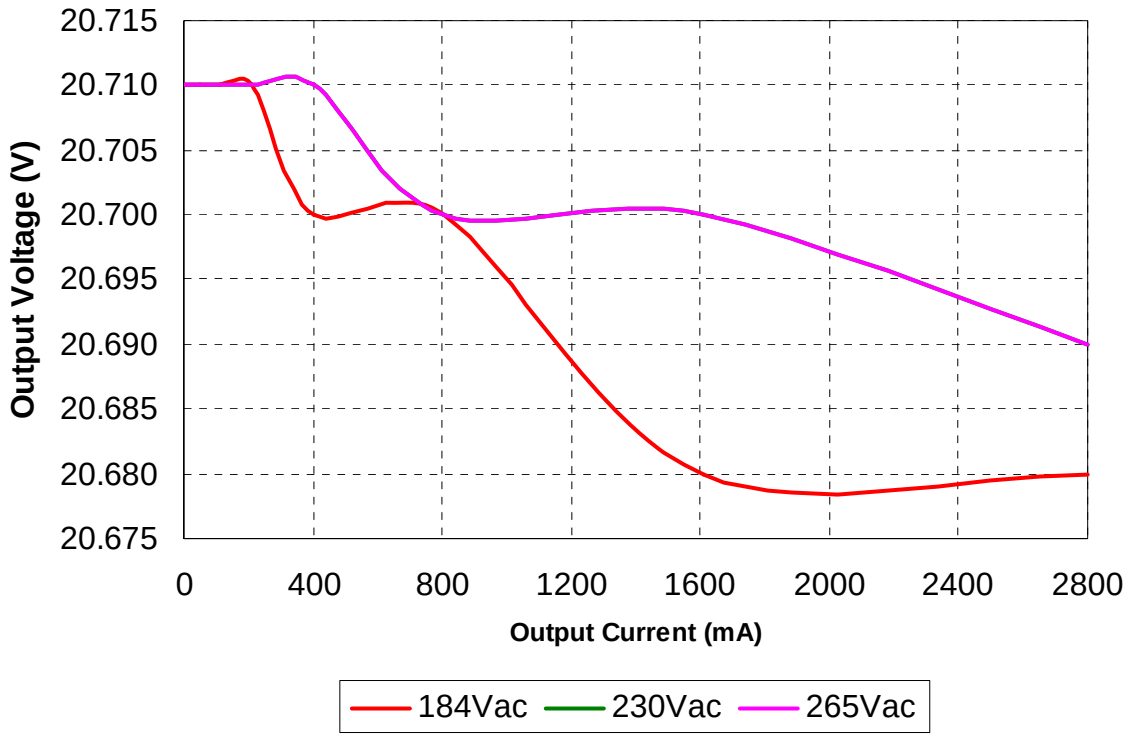
Iout (mA)	Vout (Vdc)	Pout (W)	Vin (Vac)	Pin (W)	Ploss (W)	Eff (%)
0.0	20.71	0.00	184	0.130	0.130	0.0
50.4	20.71	1.044	184	1.750	0.706	59.6
114.0	20.71	2.36	184	3.32	0.959	71.1
210.3	20.71	4.36	184	5.54	1.185	78.6
402.5	20.70	8.33	184	9.98	1.648	83.5
807.5	20.70	16.72	184	19.56	2.845	85.5
1608	20.68	33.25	184	39.06	5.807	85.1
2800	20.68	57.90	184	68.02	10.116	85.1

Iout (mA)	Vout (Vdc)	Pout (W)	Vin (Vac)	Pin (W)	Ploss (W)	Eff (%)
0.0	20.71	0.00	230	0.190	0.190	0.0
50.3	20.71	1.042	230	1.760	0.718	59.2
113.9	20.71	2.36	230	3.38	1.021	69.8
210.4	20.71	4.36	230	5.60	1.243	77.8
402.6	20.71	8.34	230	10.02	1.682	83.2
807.5	20.70	16.72	230	19.61	2.895	85.2
1608	20.70	33.29	230	38.41	5.124	86.7
2800	20.69	57.93	230	66.52	8.588	87.1

Iout (mA)	Vout (Vdc)	Pout (W)	Vin (Vac)	Pin (W)	Ploss (W)	Eff (%)
0.0	20.71	0.00	265	0.230	0.230	0.0
50.2	20.71	1.040	265	1.780	0.740	58.4
113.9	20.71	2.36	265	3.48	1.121	67.8
210.3	20.71	4.36	265	5.73	1.375	76.0
402.6	20.71	8.34	265	10.21	1.872	81.7
807.6	20.70	16.72	265	19.63	2.913	85.2
1608	20.70	33.29	265	38.33	5.044	86.8
2800	20.69	57.93	265	66.45	8.518	87.2

3. Output voltage regulation

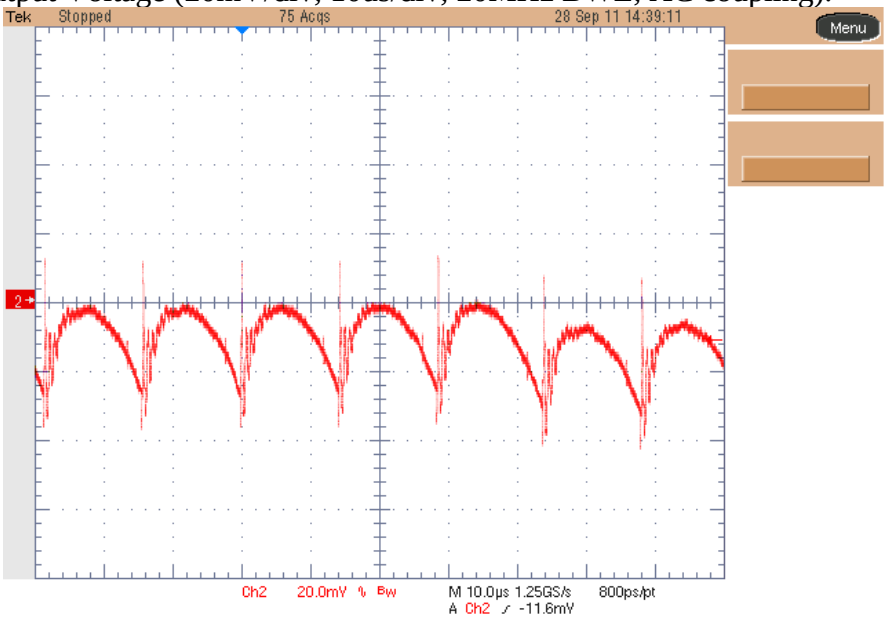
The output voltage versus output current is plotted below. The two curves @ 230Vac and 265Vac are coincident.



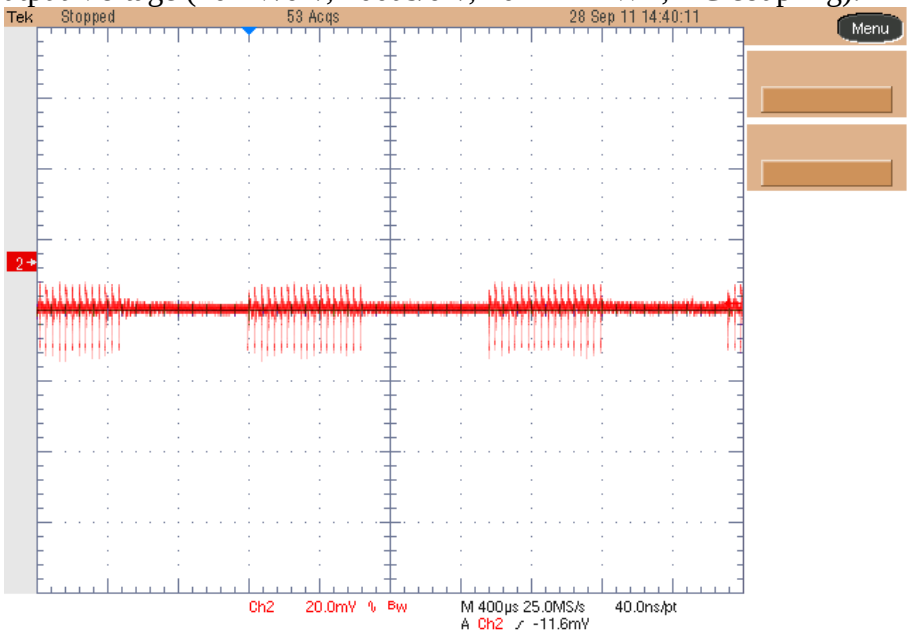
4. Output ripple voltage

The output ripple voltage plots are shown below. A DC power supply has been used as source, set to 300Vdc.

Output current: 2A
Channel 2: Output Voltage (20mV/div, 10us/div, 20MHz BWL, AC coupling).



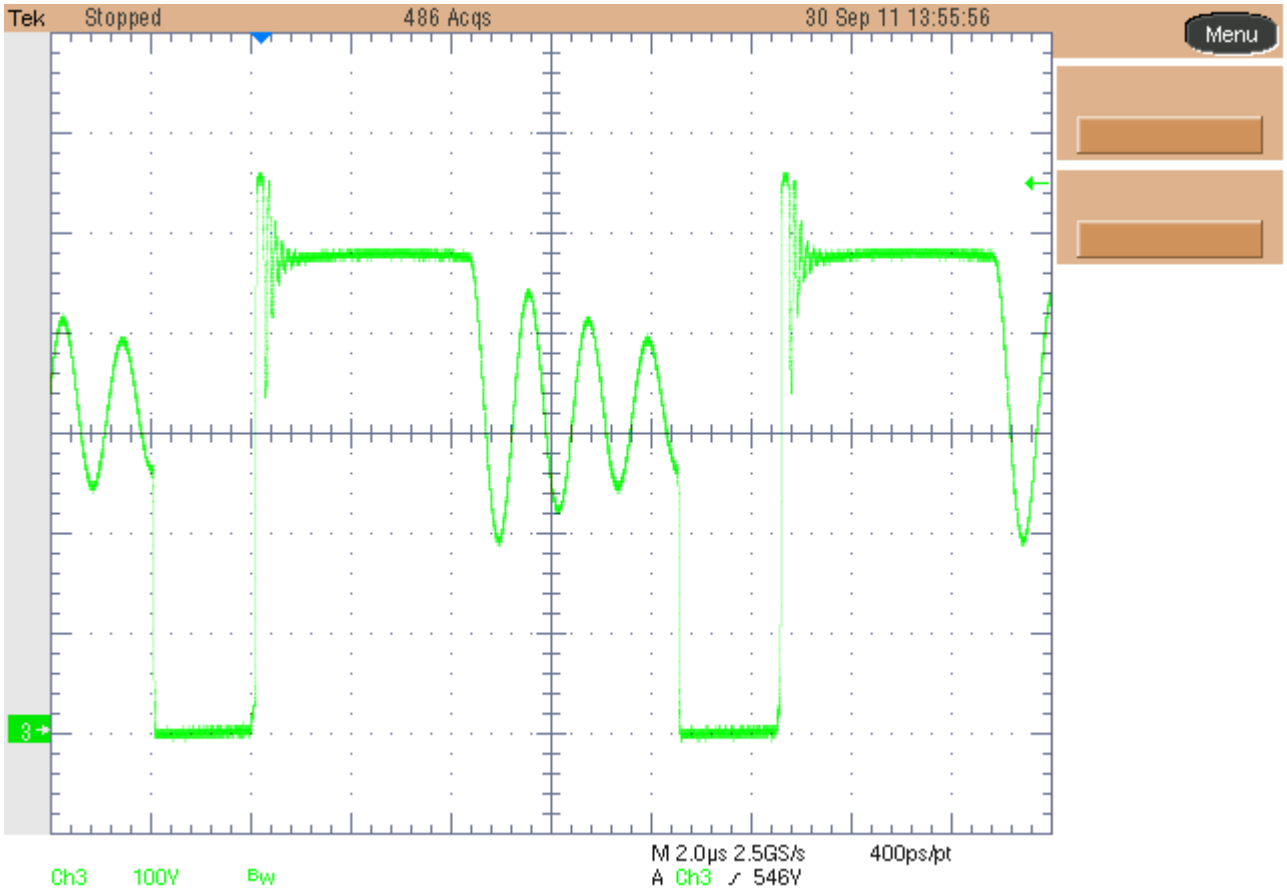
Output current: 30mA
Channel 2: Output Voltage (20mV/div, 400us/div, 20MHz BWL, AC coupling).



5. Switching Node Waveform: Q1 drain

The image below shows the voltage on the drain of the switching node with a 230Vac input, and 2.8A load.

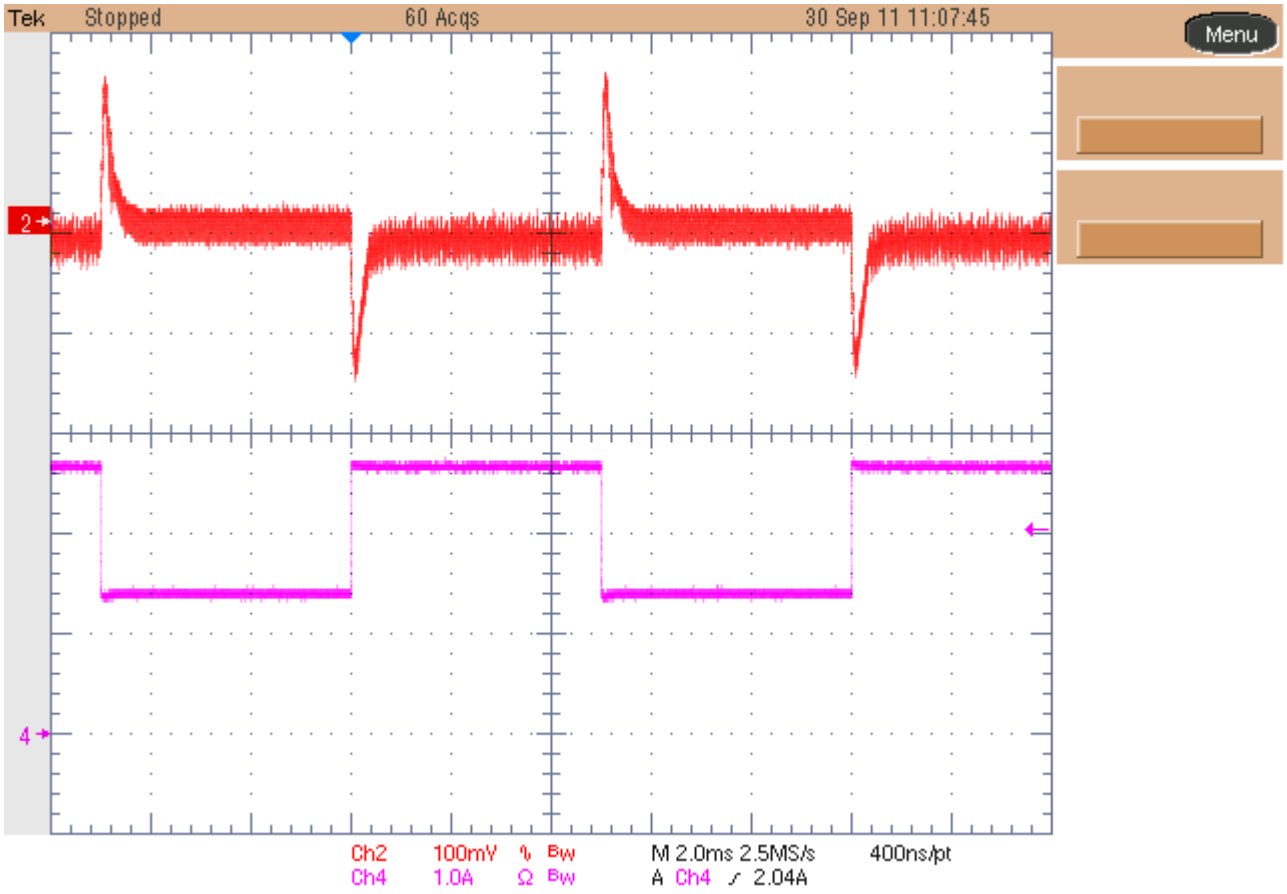
Channel 3: Voltage on Q1 Mosfet's drain (100 V/div, 2us/div, 20MHz BWL).



6. Transient Response

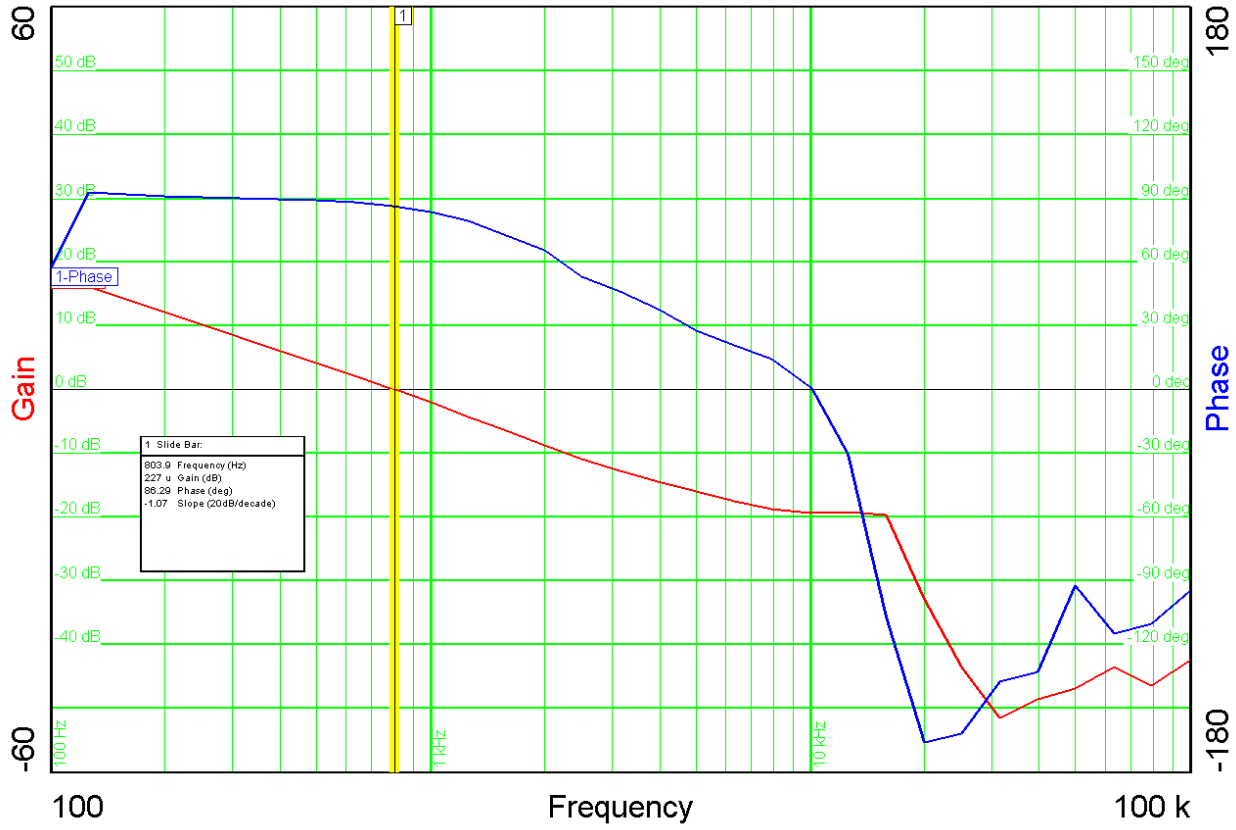
The image below shows the transient response of the output voltage while the load has been switched from 1.4A to 2.8A (50% to 100% of nominal load). The input voltage was 320Vdc.

Channel 2: Output Voltage (100mV/div, 2ms/div, 20MHz BWL, AC coupling).
Channel 4: Output Current (1A/div, 20MHz BWL, DC coupling).



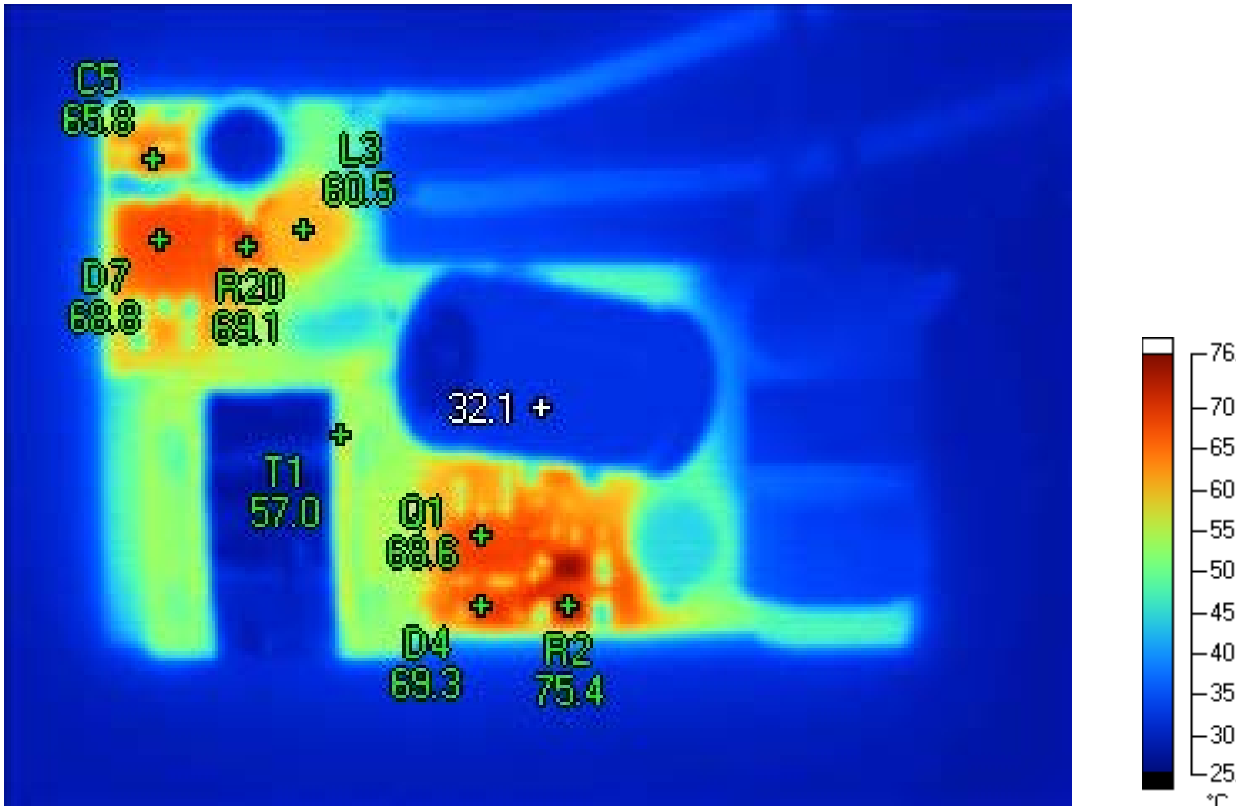
7. Feedback loop

The graph below shows the bode-plot measurement taken on the prototype while the input voltage has been set to 320Vdc and the output load to 1.8A.
The crossover frequency was 803.9 Hz, the phase margin 86.29 deg. and the gain margin 19.43dB.



8. Thermal Image

The image below shows the thermal image of the prototype taken after 30 seconds, 2.8A load and after several cycles of 30 sec. 2.8A, 20 sec. 0A. The input voltage has been set at 230Vac input; the air temperature (still air condition) was 23C; the board was horizontal on the bench.



9/28/2011 3:02:01 PM

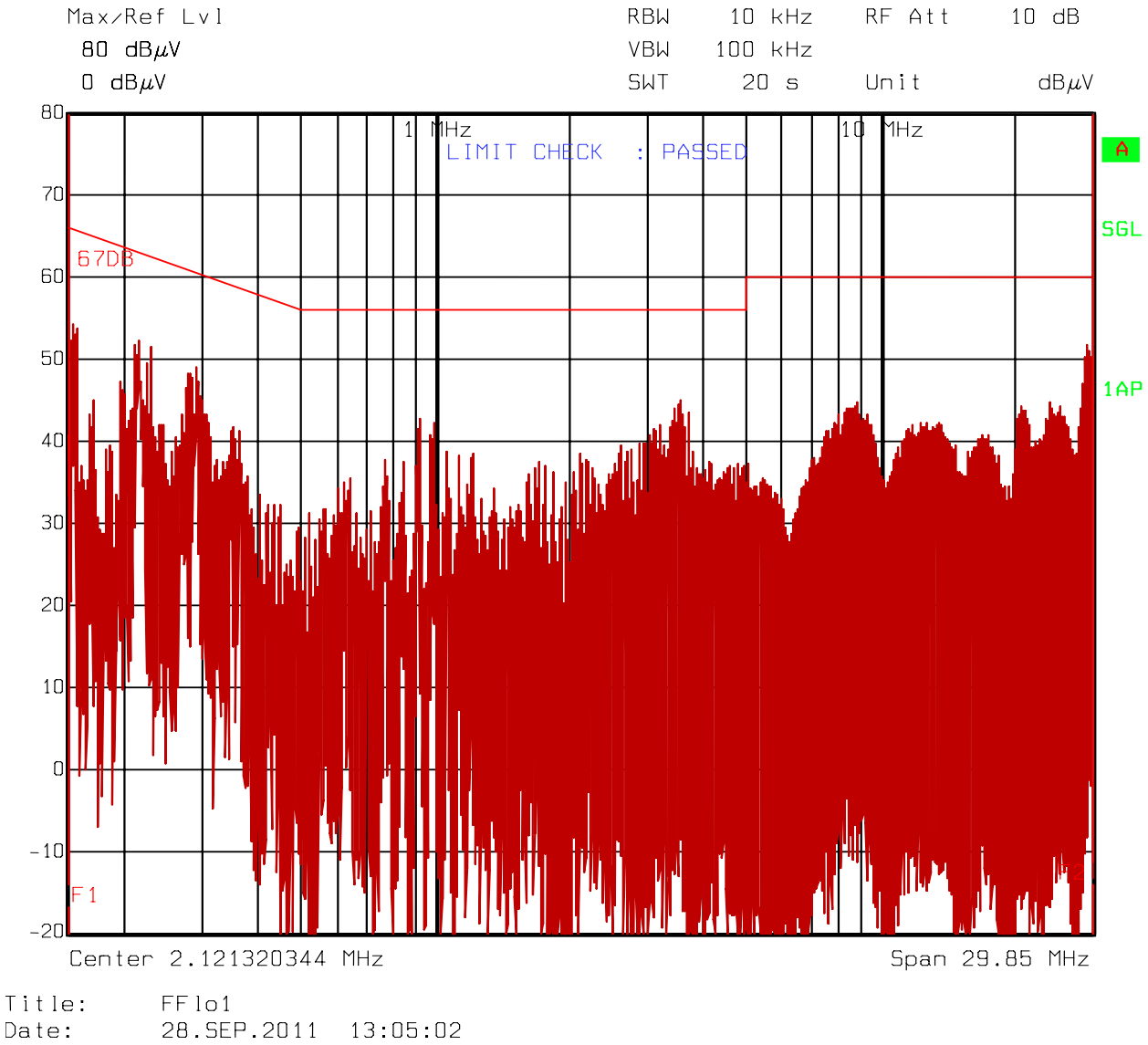
Image Info

Background	23.0 °C
Average Temperature	36.3 °C
Calibration Range	-20.0 °C to 350.0 °C
Camera Model	Ti40FT
Image Range	26.9 °C to 76.3 °C
Manufacturer	Fluke
Camera Serial Number	Ti40FT-070263

Markers			
Label	Temperature	Emissivity	Background
Center Point	32.1 °C	0.95	23.0 °C
R2	75.4 °C	0.95	23.0 °C
Q1	68.6 °C	0.95	23.0 °C
D4	69.3 °C	0.95	23.0 °C
T1	57.0 °C	0.95	23.0 °C
D7	68.8 °C	0.95	23.0 °C
L3	60.5 °C	0.95	23.0 °C
C5	65.8 °C	0.95	23.0 °C
R20	69.1 °C	0.95	23.0 °C

9. EMI conducted emissions

The image below shows the EMI measurement taken while the power supply was connected through a LISN (model Hameg HM6050-2), and an isolation transformer, to the mains. The load was a 10 Ohm power resistor, and the ground of the output terminal was connected to the ground of the LISN. The measure was a “quasi-peak” and the limit was EN55022 Class-B. The receiver was a Rohde & Schwarz spectrum analyzer 9 KHz…2.08 GHz.



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