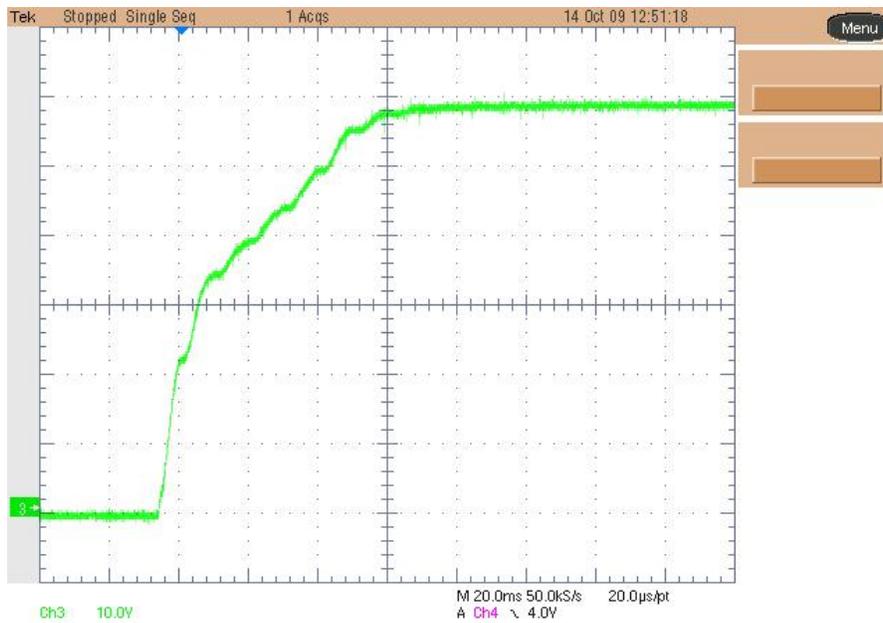


1 Startup

The output voltage at startup is shown in the images below. Input voltage is 230Vac. Channel 3 shows the output voltage (10V/div, 20ms/div).

No Load:

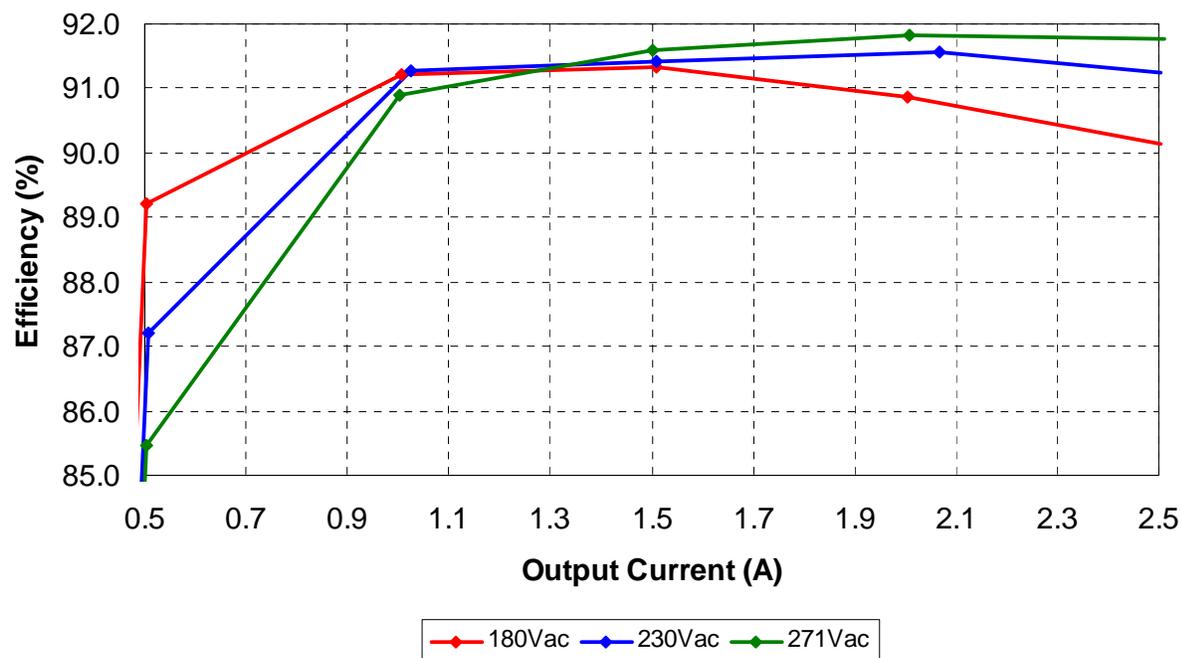


Full Load:



2 Efficiency

The efficiency data are shown in the tables and graph below.



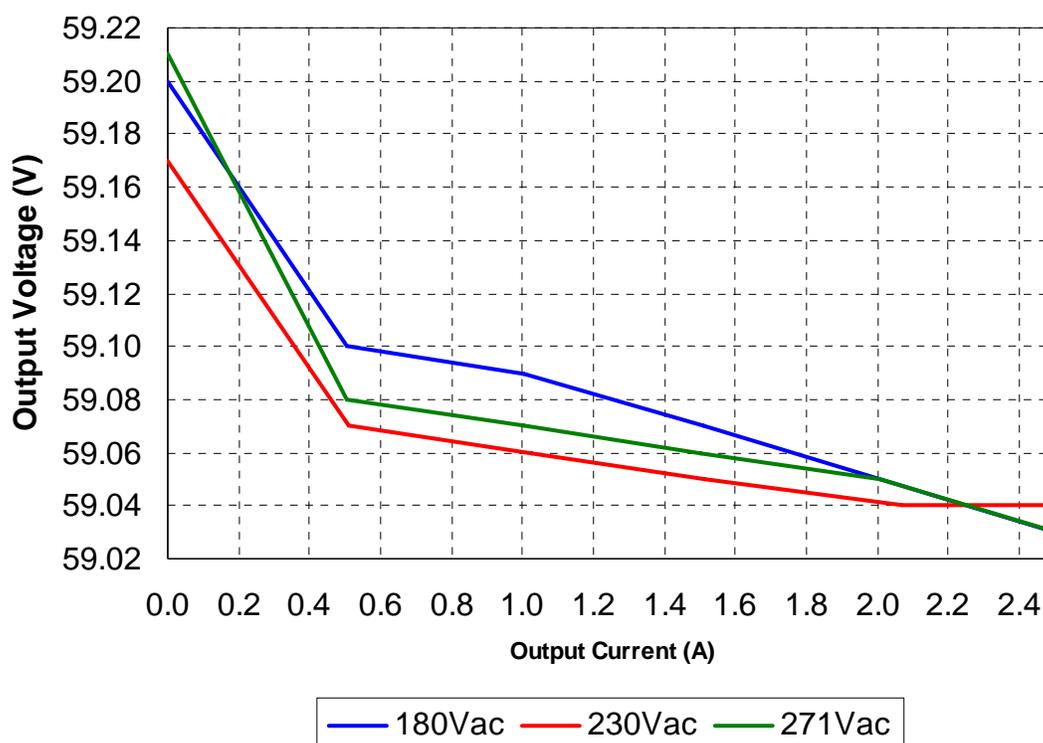
Iout (A)	Vout (Vdc)	Pout (W)	Vin (Vac)	Pin (W)	Ploss (W)	Eff (%)	PF
0.0000	59.20	0.00	180	0.8	0.80	0.00	0
0.5041	59.10	29.79	180	33.4	3.61	89.20	0.94
1.0049	59.09	59.38	180	65.1	5.72	91.21	0.96
1.5090	59.07	89.14	180	97.6	8.46	91.33	0.95
2.0050	59.05	118.40	180	130.3	11.90	90.86	0.96
2.5040	59.03	147.81	180	164.0	16.19	90.13	0.955

Iout (A)	Vout (Vdc)	Pout (W)	Vin (Vac)	Pin (W)	Ploss (W)	Eff (%)	PF
0.0000	59.17	0.00	230	0.9	0.90	0.00	0
0.5078	59.07	30.00	230	34.4	4.40	87.20	0.87
1.0263	59.06	60.61	230	66.4	5.79	91.29	0.93
1.5110	59.05	89.22	230	97.6	8.38	91.42	0.94
2.0660	59.04	121.98	230	133.2	11.22	91.57	0.945
2.5040	59.04	147.84	230	162.0	14.16	91.26	0.95

Iout (A)	Vout (Vdc)	Pout (W)	Vin (Vac)	Pin (W)	Ploss (W)	Eff (%)	PF
0.0000	59.21	0.00	271	1.0	1.00	0.00	0
0.5035	59.08	29.75	271	34.8	5.05	85.48	0.8
1.0034	59.07	59.27	271	65.2	5.93	90.91	0.89
1.5010	59.06	88.65	271	96.8	8.15	91.58	0.915
2.0090	59.05	118.63	271	129.2	10.57	91.82	0.93
2.5120	59.03	148.28	271	161.6	13.32	91.76	0.94

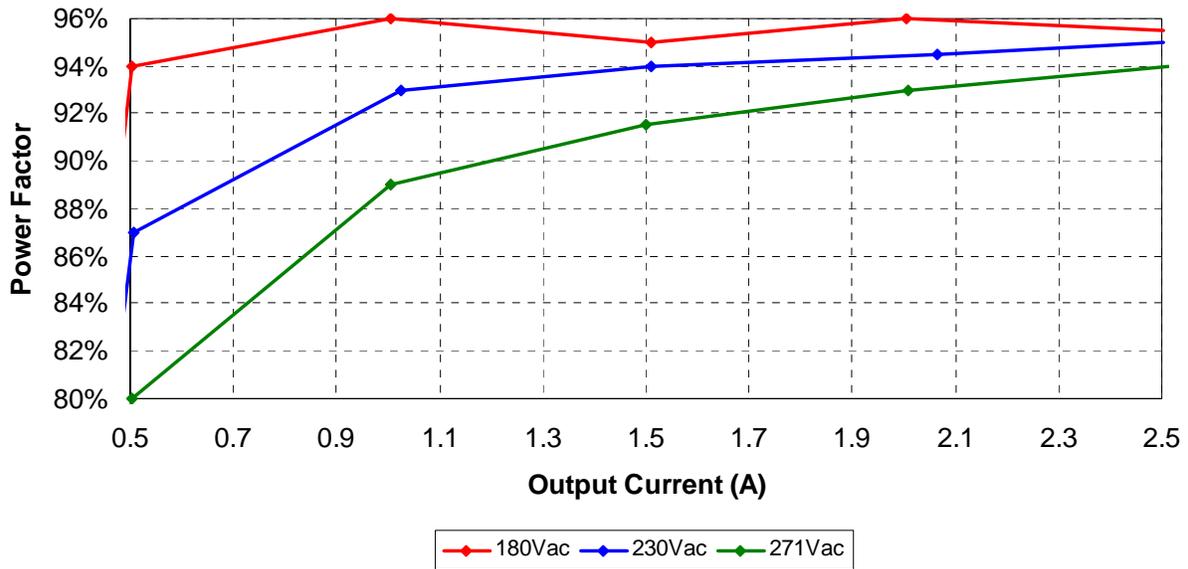
3 Output Voltage Regulation

The output voltage versus output current graph is plotted below.



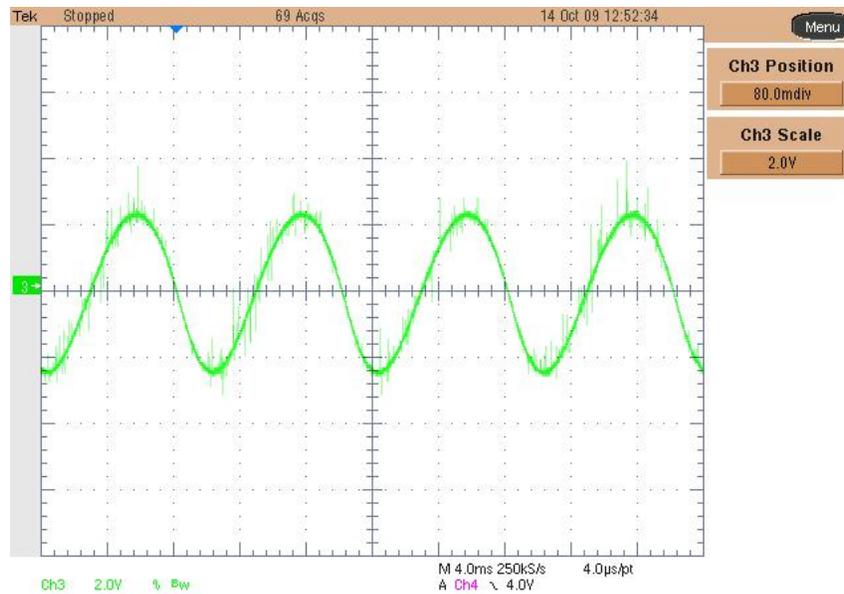
4 Power Factor

The Power Factor graph for the three input voltages is shown below:



5 Output Ripple Voltage

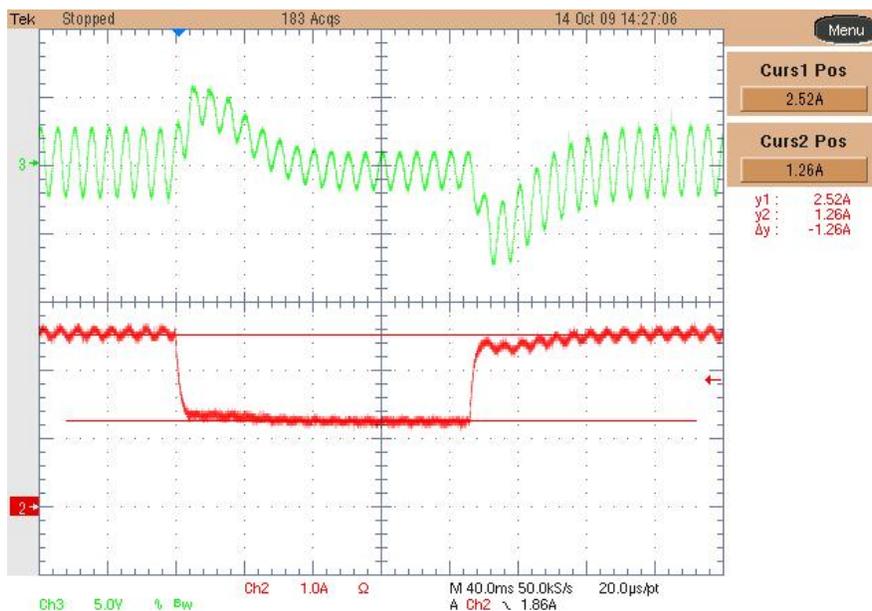
The output ripple voltage is shown in the plot below. The input was set to 230Vac and the load was set to 2.5A. Channel 3 shows the output ac voltage (2 V/div, 4ms/div).



6 Transient Response

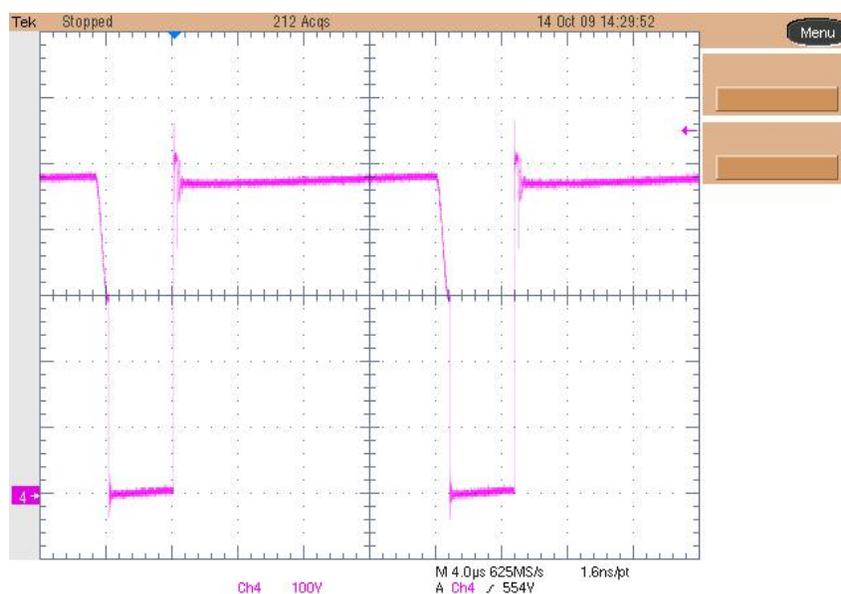
The output voltage transient response is shown in the plot below. The input was set to 230Vac and the load switched between 1.26A and 2.52A (74.34W to 148.68W).

Channel 3: output voltage (5 V/div, ac coupled, 40ms/div), Channel 2: output current (1A/div)



7 Switching Node Waveform

The image below shows the voltage on the drain of Q4, with a 271Vac input, and full load. Channel 4 shows the drain voltage (100V/div, 4μs/div).

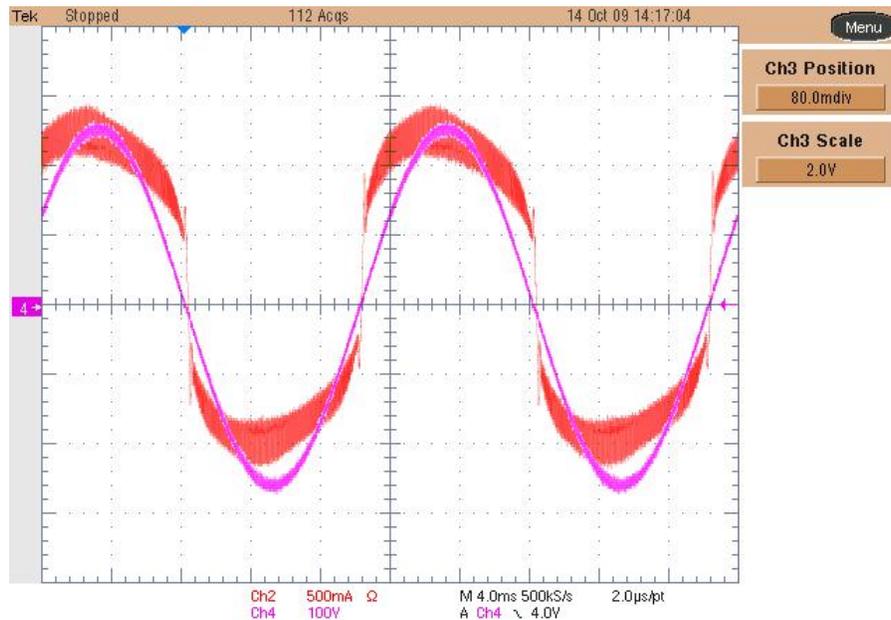


8 Input Voltage and Current Waveforms

The images below show the input voltage and current while the source was set to the three different input voltages and the converter was fully loaded.

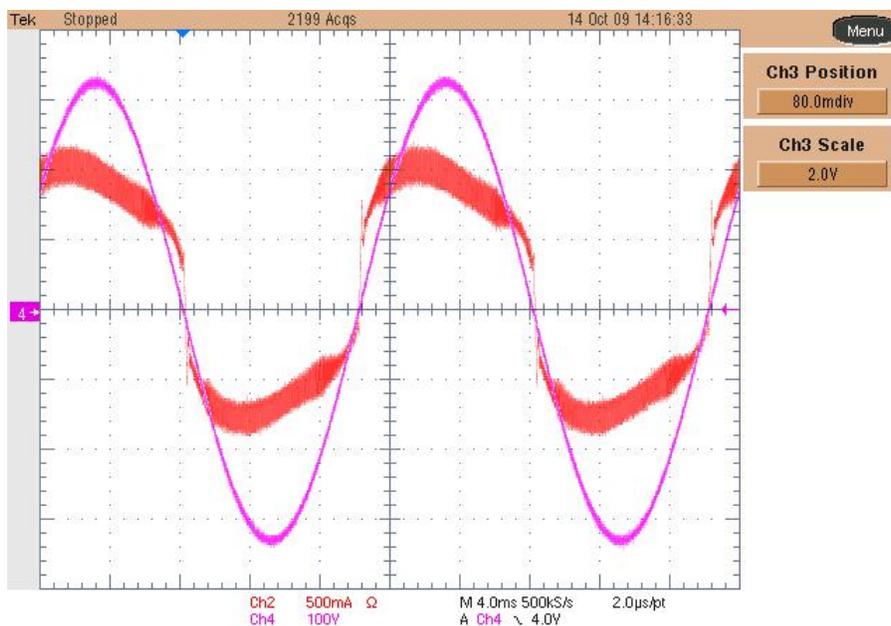
$V_{in} = 180V_{ac}$

Channel 4: input voltage (100V/div, 4ms/div); Channel 2: input current (500mA/div)



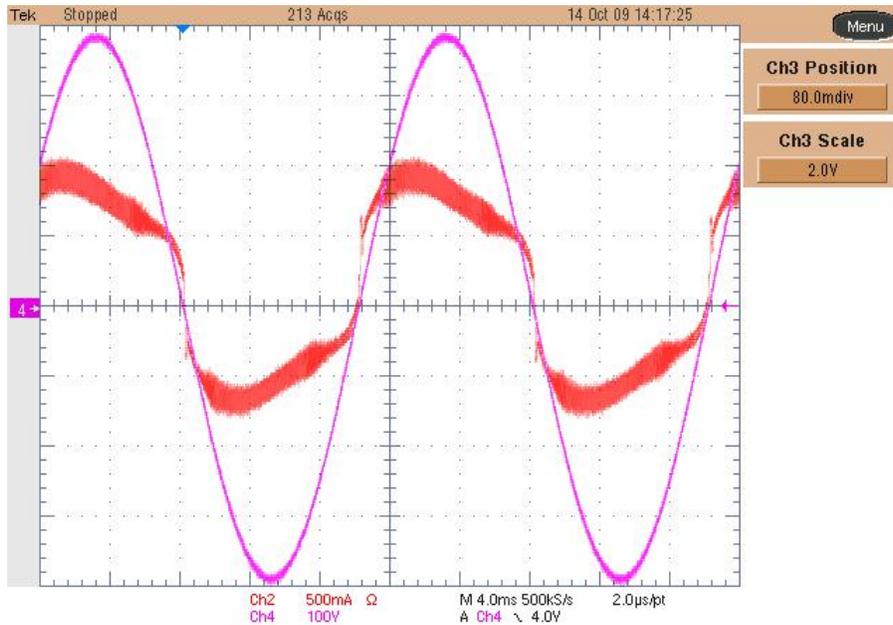
$V_{in} = 230V_{ac}$

Channel 4: input voltage (100V/div, 4ms/div); Channel 2: input current (500mA/div)



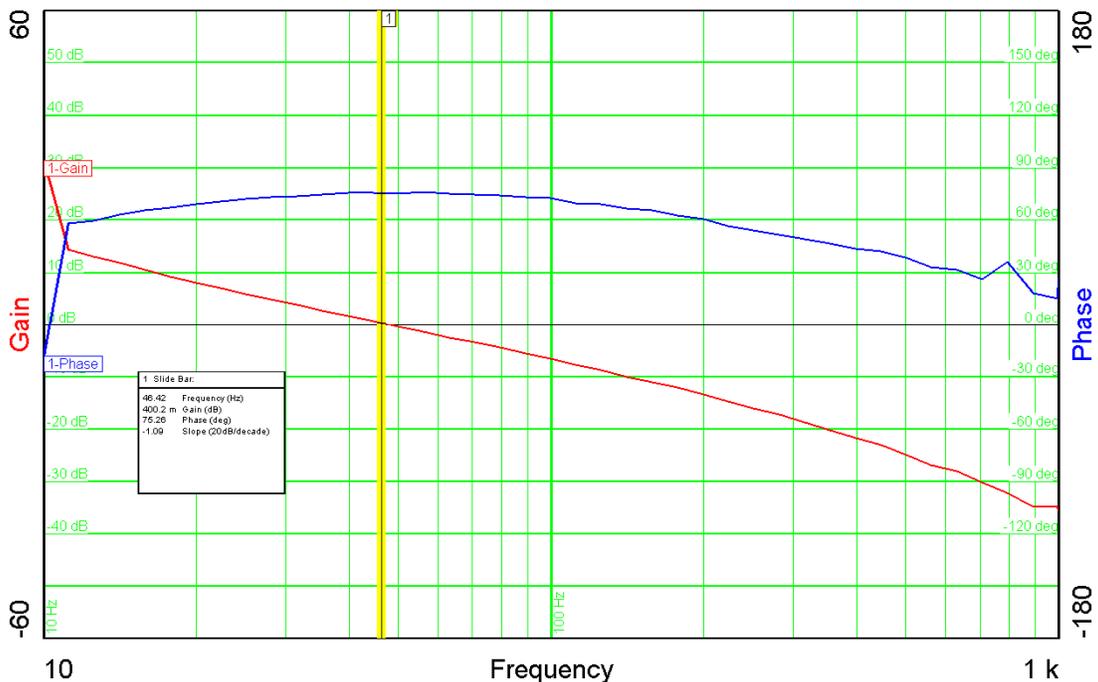
V_{in} = 271Vac

Channel 4: input voltage (100V/div, 4ms/div); Channel 2: input current (500mA/div)



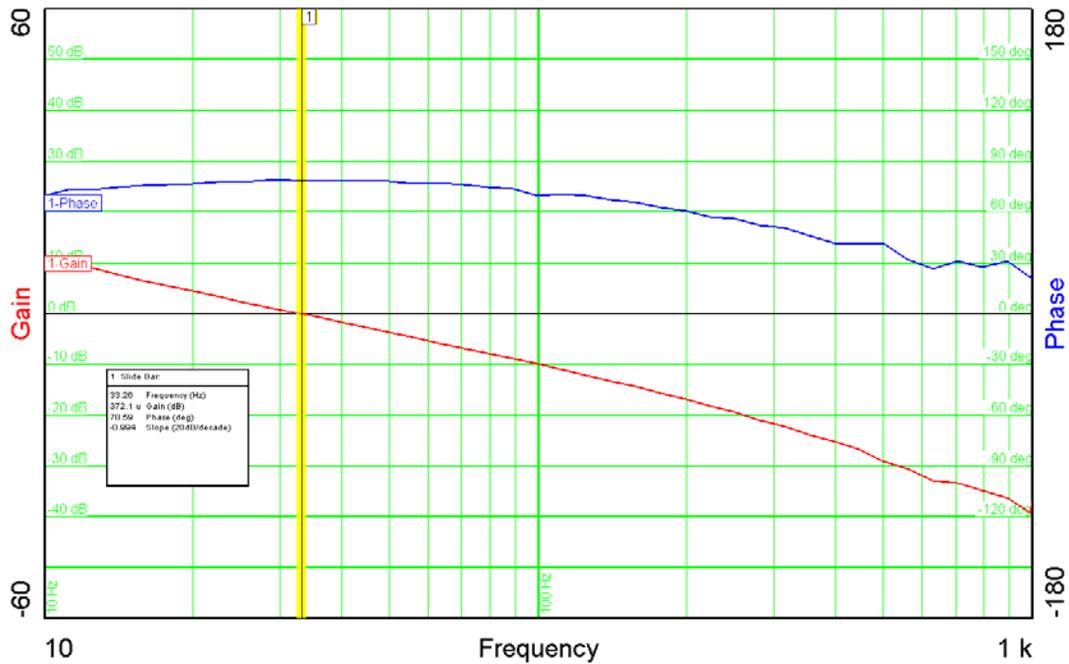
9 Loop Response

The image below shows the loop response of the converter measured with a 300Vdc input and 0.5A load. Phase margin is 75.26 deg. and crossover frequency is 46.42 Hz.

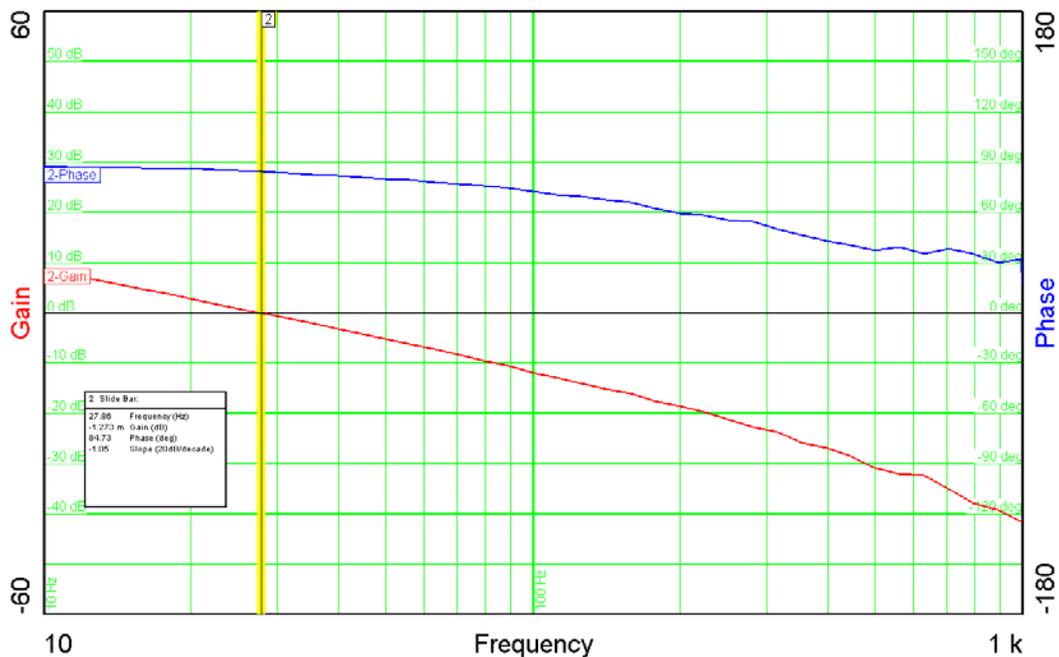


The loop response of the converter was measured again with the same input voltage but at half load and full load.

Half Load: Phase margin 78.59 deg., crossover frequency 33.26 Hz.



Full Load: Phase margin 84.73 deg., crossover frequency 27.86 Hz.



10 Thermal Analysis

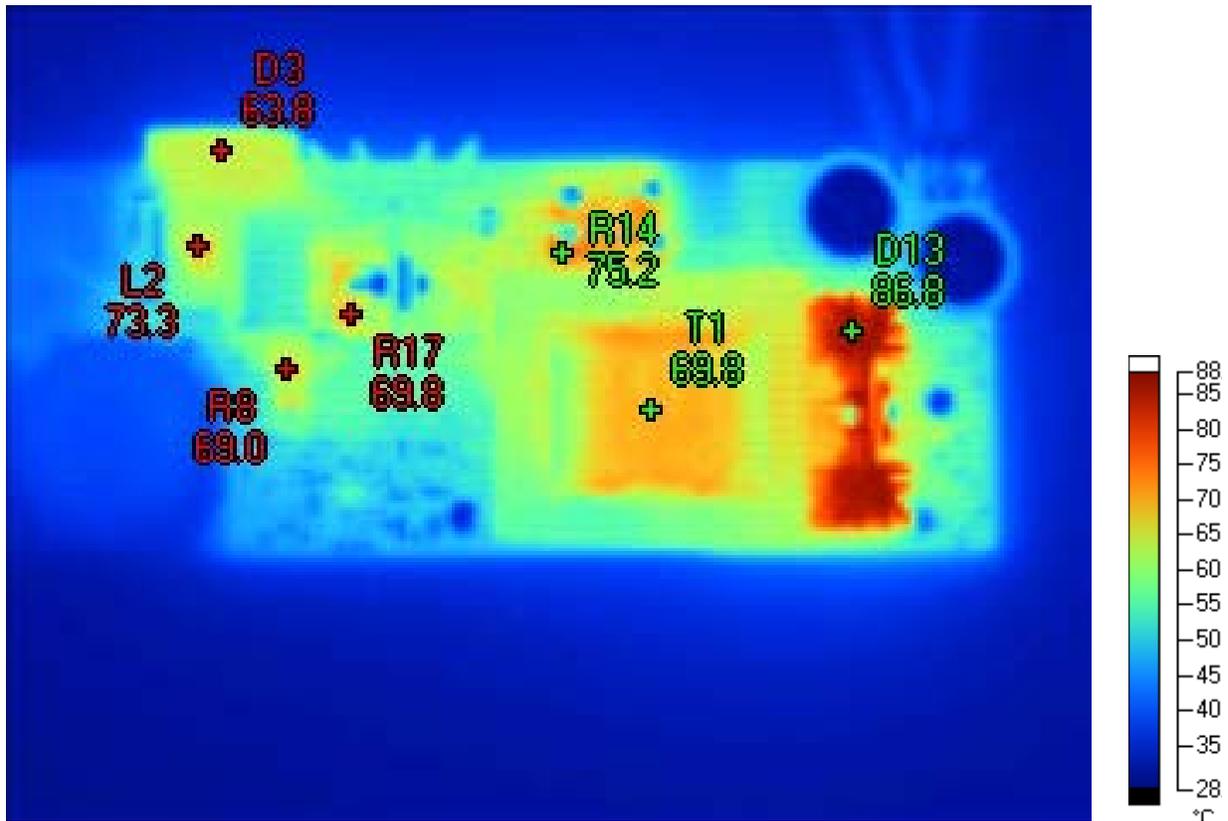


Image Info

Emissivity	0.95
Background	23.0 °C
Average Temperature	43.1 °C
Camera Model	Ti40FT
Image Range	29.5 °C to 87.2 °C
Image Time	10/14/2009 1:53:16 PM
Manufacturer	Fluke
Camera Serial Number	Ti40FT-070263

Markers

Label	Temperature	Emissivity	Background
D13	86.8 °C	0.95	23.0 °C
T1	69.8 °C	0.95	23.0 °C
D3	63.8 °C	0.95	23.0 °C
L2	73.3 °C	0.95	23.0 °C
R8	69.0 °C	0.95	23.0 °C
R17	69.8 °C	0.95	23.0 °C
R14	75.2 °C	0.95	23.0 °C

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