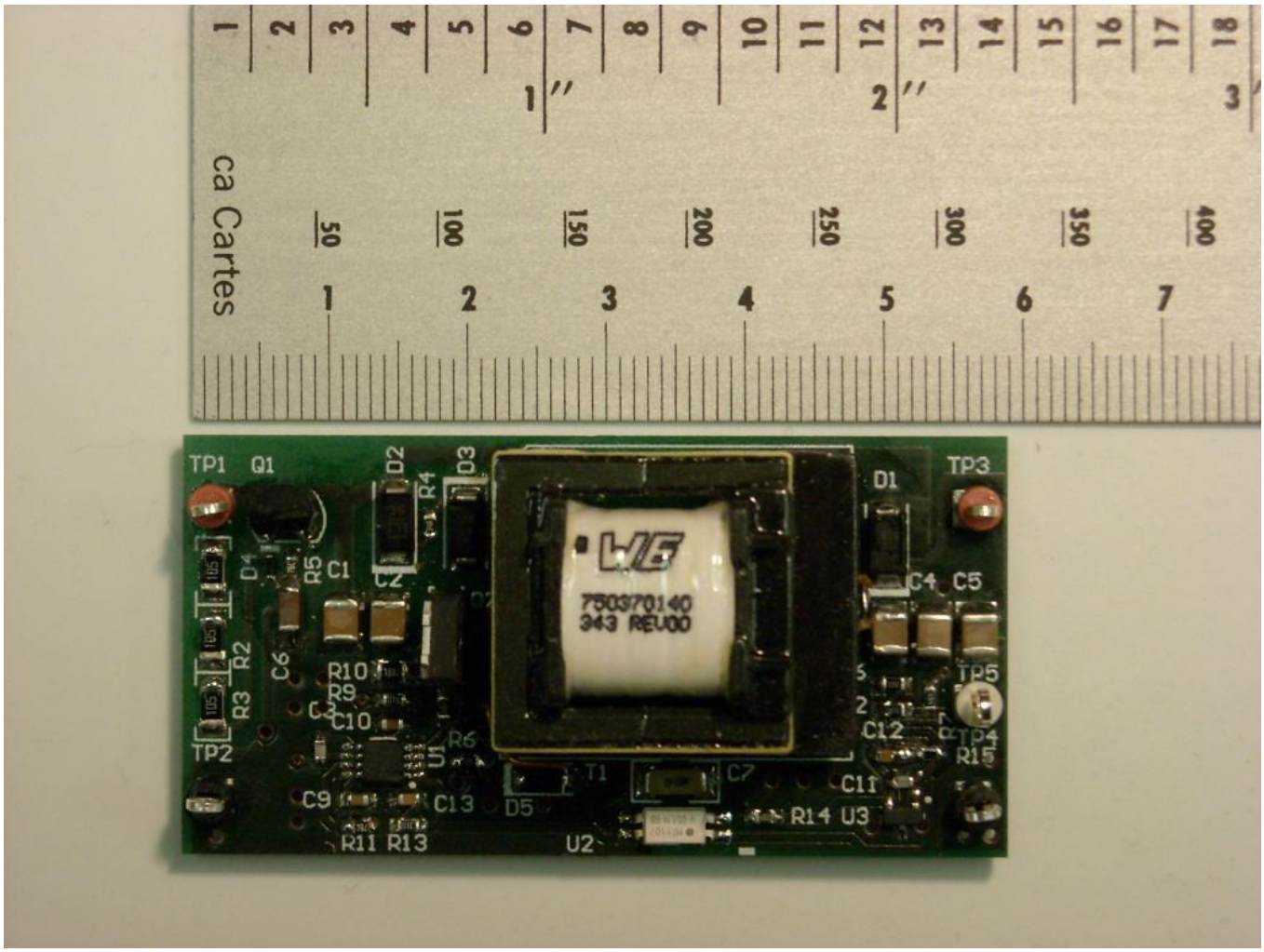
PICTURE OF THE BOARD:

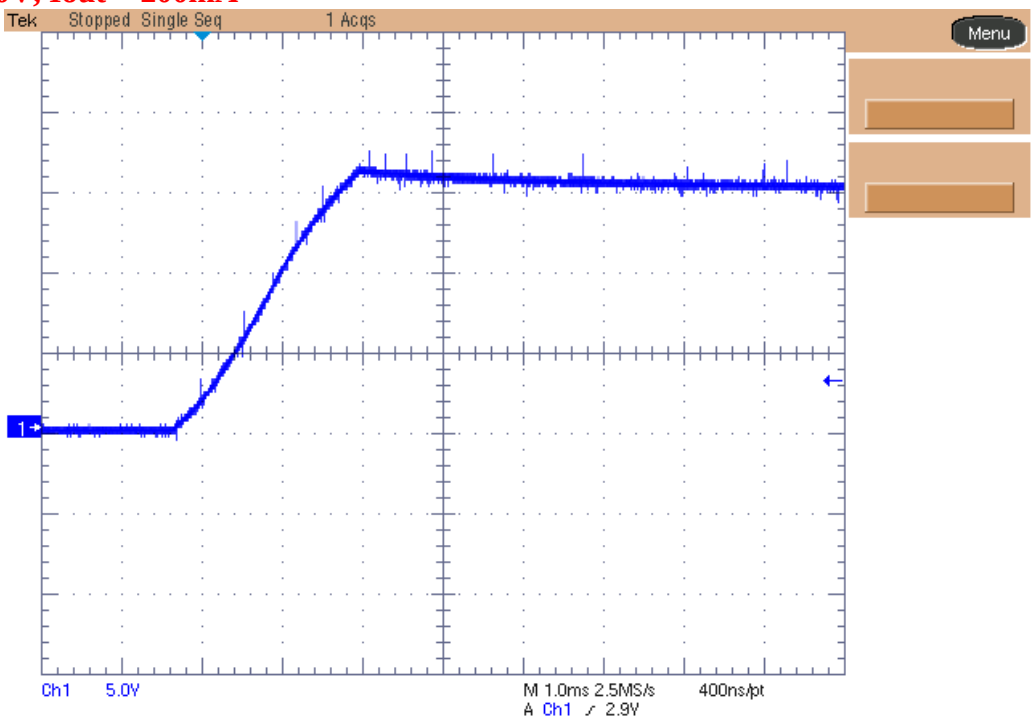


1. Startup

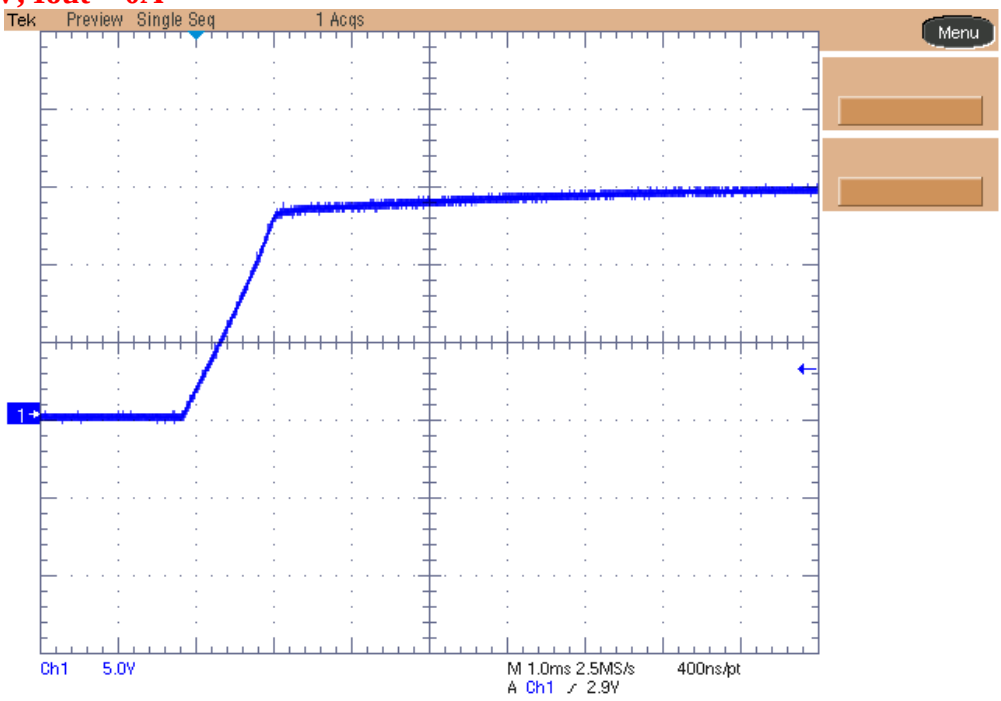
The output voltage behavior at startup is shown in the images below. The input voltage was set to 50V and 400V.

Ch.1: Output voltage (5V/div, 1ms/div, DC coupling, no BWL)

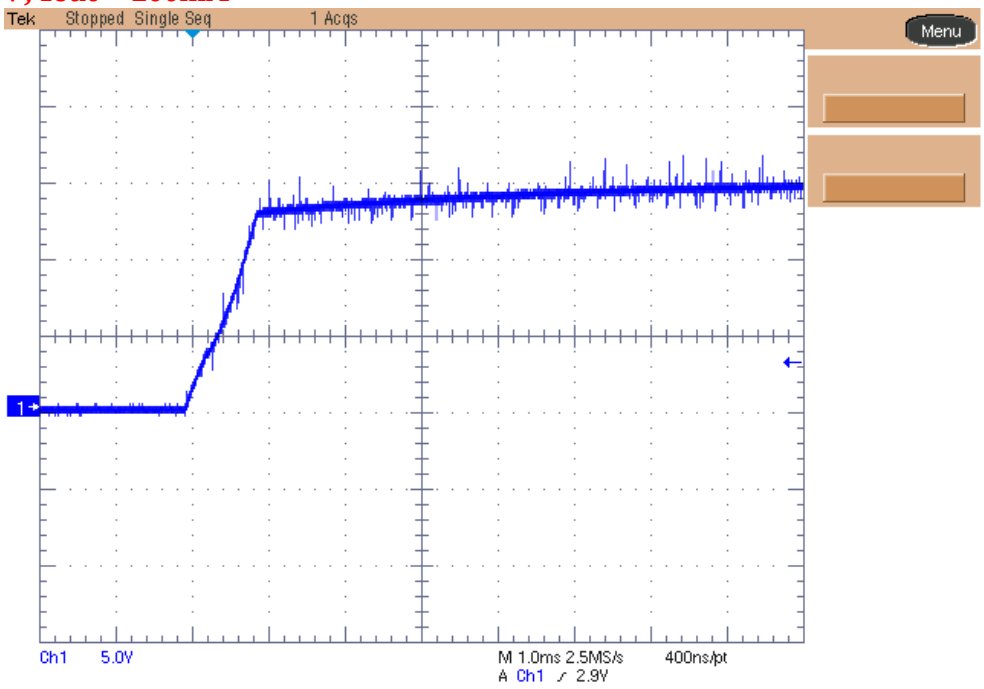
Vin = 50V, Iout = 200mA



Vin = 50V, Iout = 0A

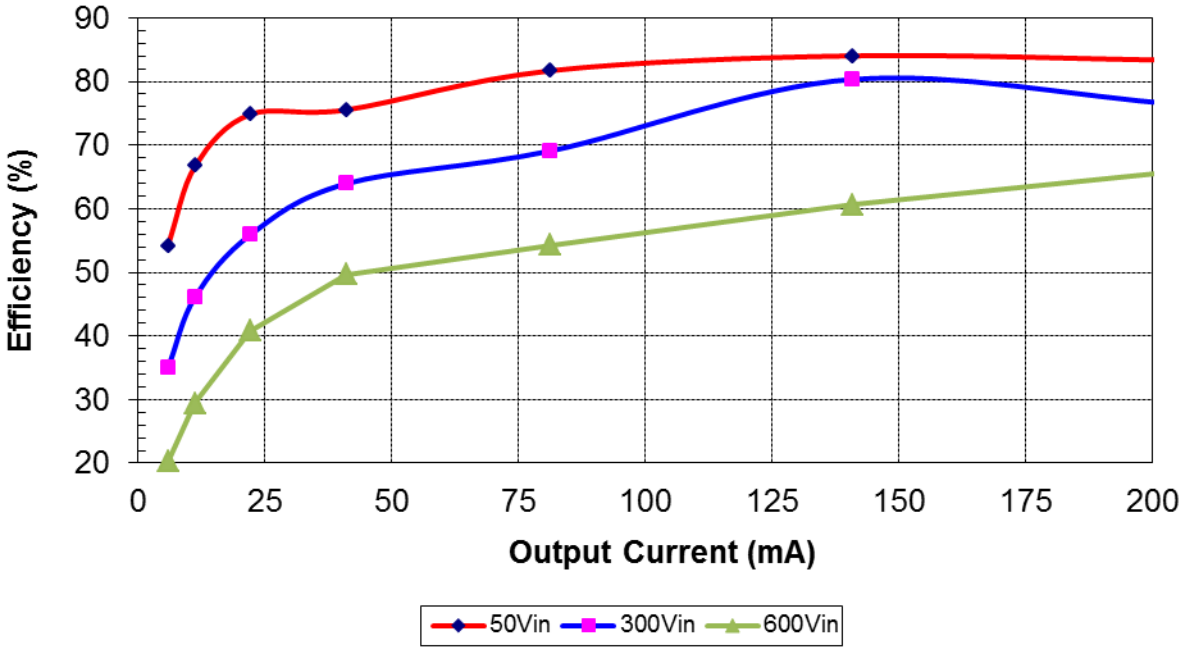


Vin = 400V, Iout = 200mA



2 Efficiency

The efficiency data are shown in the tables and graph below. A DC voltage source has been set to 50V, 300V and 600V.



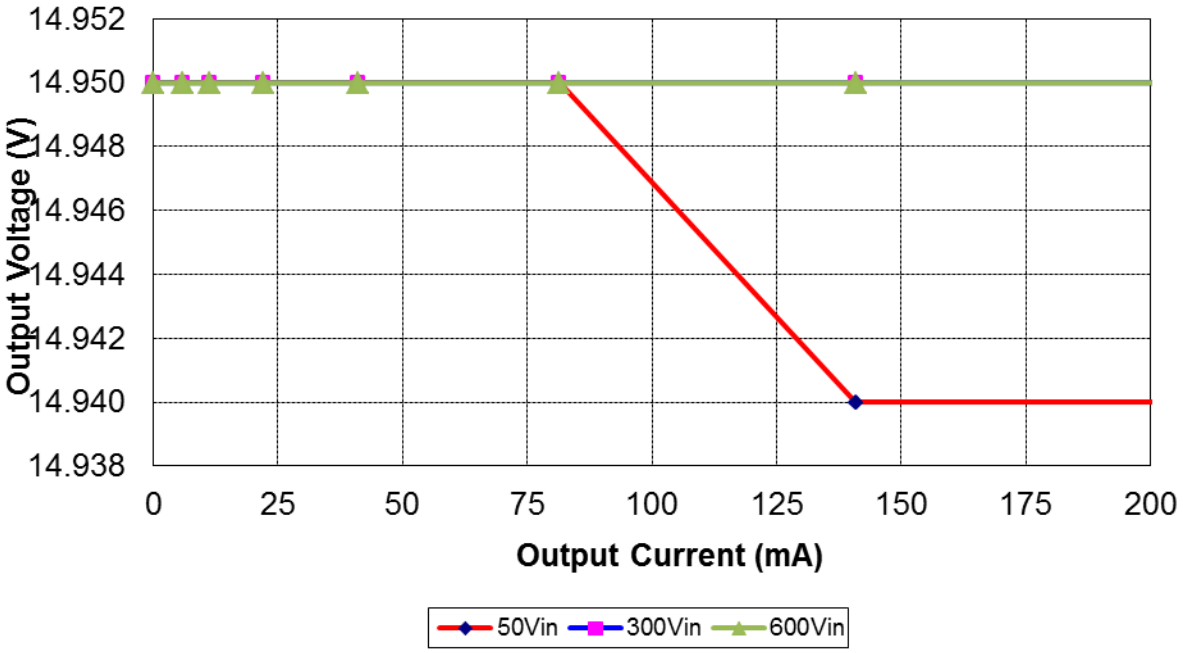
Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (Vdc)	Pin (W)	Ploss (W)	Eff (%)
0	14.95	0	1.250	50	0.063	0.0625	0.00
5.9	14.95	0.088	3.257	50	0.163	0.0746	54.16
11.3	14.95	0.169	5.06	50	0.253	0.0841	66.77
22.1	14.95	0.330	8.83	50	0.442	0.1111	74.83
41.0	14.95	0.613	16.23	50	0.812	0.1986	75.53
81.4	14.95	1.217	29.79	50	1.490	0.2726	81.70
140.9	14.94	2.105	50.1	50	2.505	0.4000	84.03
205.5	14.94	3.070	73.7	50	3.685	0.6148	83.32

Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (Vdc)	Pin (W)	Ploss (W)	Eff (%)
0	14.95	0	0.436	300	0.131	0.1308	0.00
5.9	14.95	0.088	0.842	300	0.253	0.1644	34.92
11.2	14.95	0.167	1.211	300	0.363	0.1959	46.09
22.1	14.95	0.330	1.971	300	0.591	0.2609	55.88
41.0	14.95	0.613	3.196	300	0.959	0.3459	63.93
81.4	14.95	1.217	5.87	300	1.761	0.5441	69.10
140.9	14.95	2.106	8.74	300	2.622	0.5155	80.34
205.5	14.95	3.072	13.41	300	4.023	0.9508	76.37

Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (Vdc)	Pin (W)	Ploss (W)	Eff (%)
0	14.95	0	0.480	600	0.288	0.2880	0.00
5.9	14.95	0.088	0.727	600	0.436	0.3480	20.22
11.2	14.95	0.167	0.948	600	0.569	0.4014	29.44
22.1	14.95	0.330	1.351	600	0.811	0.4802	40.76
41.0	14.95	0.613	2.058	600	1.235	0.6219	49.64
81.4	14.95	1.217	3.738	600	2.243	1.0259	54.26
140.9	14.95	2.106	5.79	600	3.474	1.3675	60.63
205.5	14.95	3.072	7.78	600	4.668	1.5958	65.81

3 Output Voltage Regulation

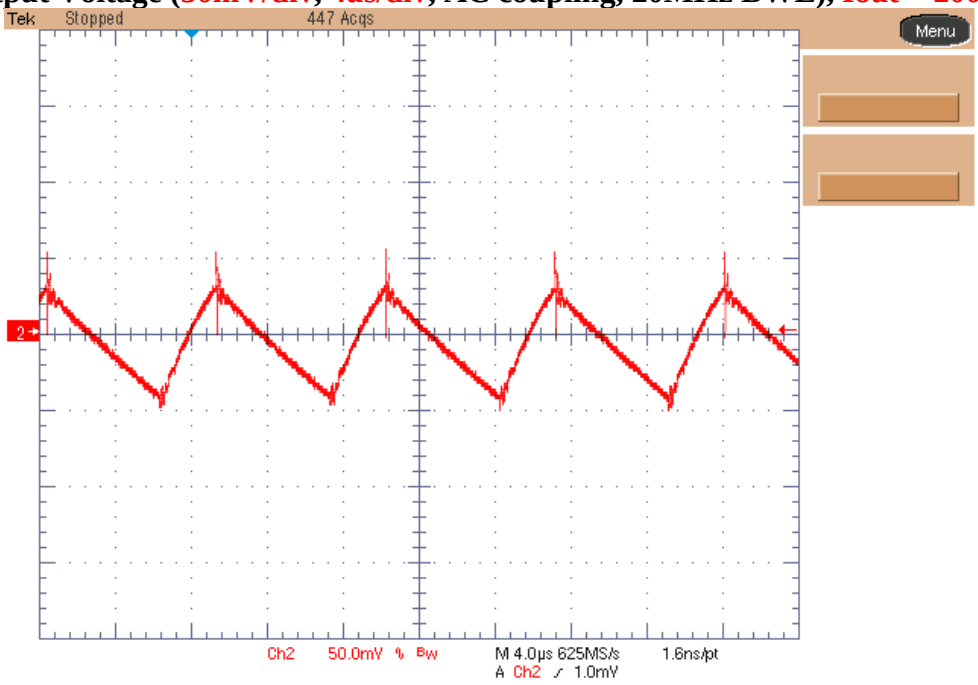
The output voltage variation as function of load and input voltage is shown below:



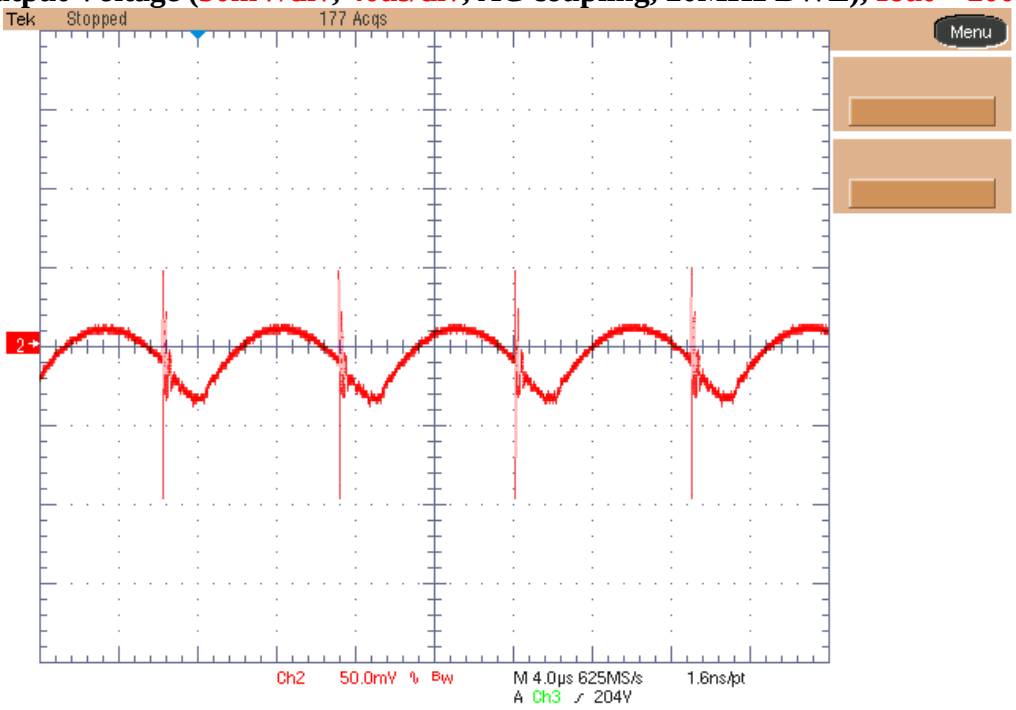
4 Output Ripple Voltage

The output ripple voltage is shown in the plots below. The load was 200mA and input was set to 50V (upper picture) and 400V (bottom one).

Ch.2: Output Voltage (50mV/div, 4us/div, AC coupling, 20MHz BWL), Iout = 200mA



Ch.2: Output Voltage (50mV/div, 40us/div, AC coupling, 20MHz BWL), Iout = 200mA

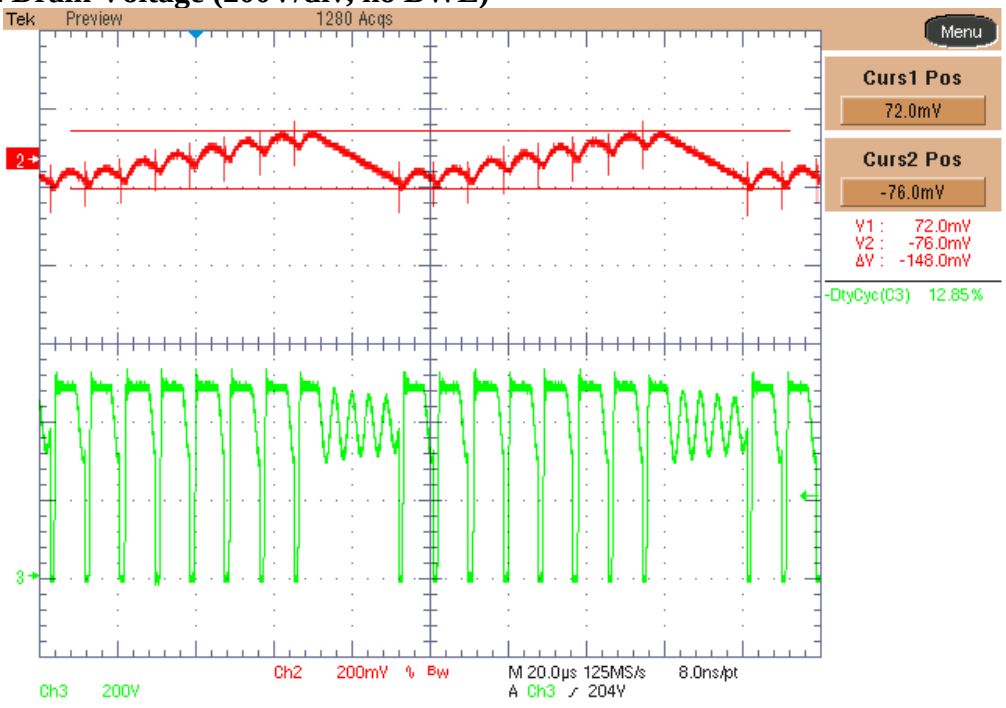


5 Burst Mode Operation

The ripple voltage on output terminals has been measured when the input voltage was 400V and the load 100mA.

Ch.2: Output Voltage (200mV/div, 20usec/div, AC coupling, 20MHz BWL), Iout = 100mA

Ch.3: Q2 Drain Voltage (200V/div, no BWL)

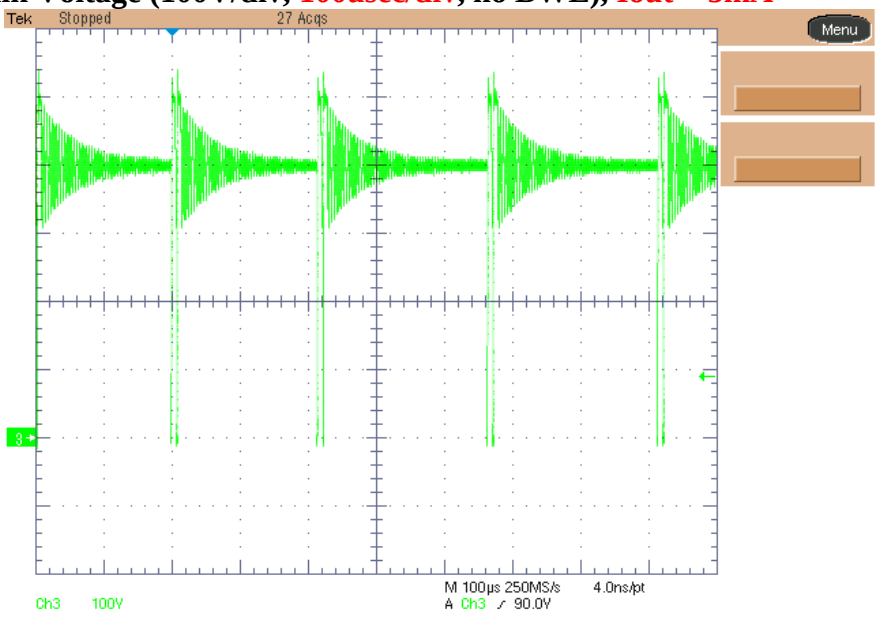


6 Switching Node Waveforms

6.1 Skip Cycle Mode:

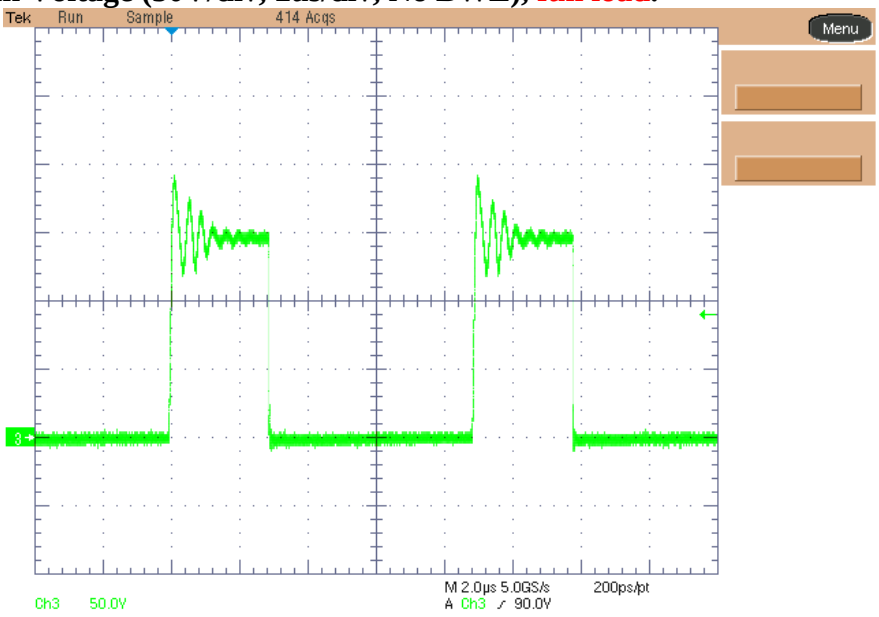
The images below show the voltage on the drain of Q2 during light load operation (Iout=5mA) and full load, when Vin was set to 50V and 400V.

Ch.3: Q2 Drain Voltage (100V/div, 100usec/div, no BWL), Iout = 5mA



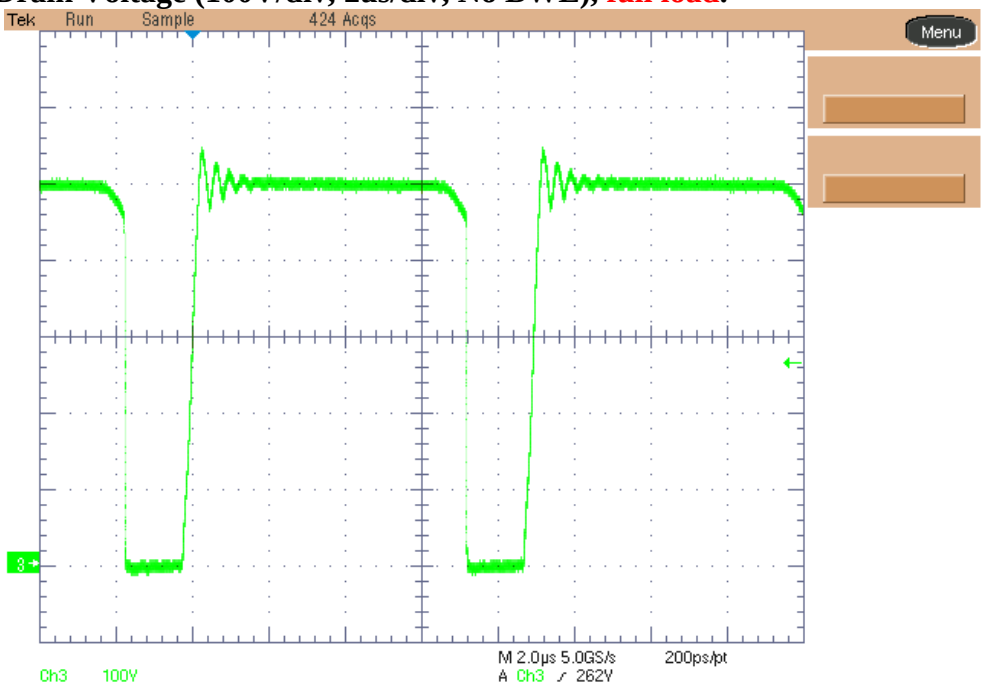
6.2 Full load @ 50Vin:

Ch3: Q2 Drain Voltage (50V/div, 2us/div, No BWL), full load.



6.3 Full load @ 400Vin:

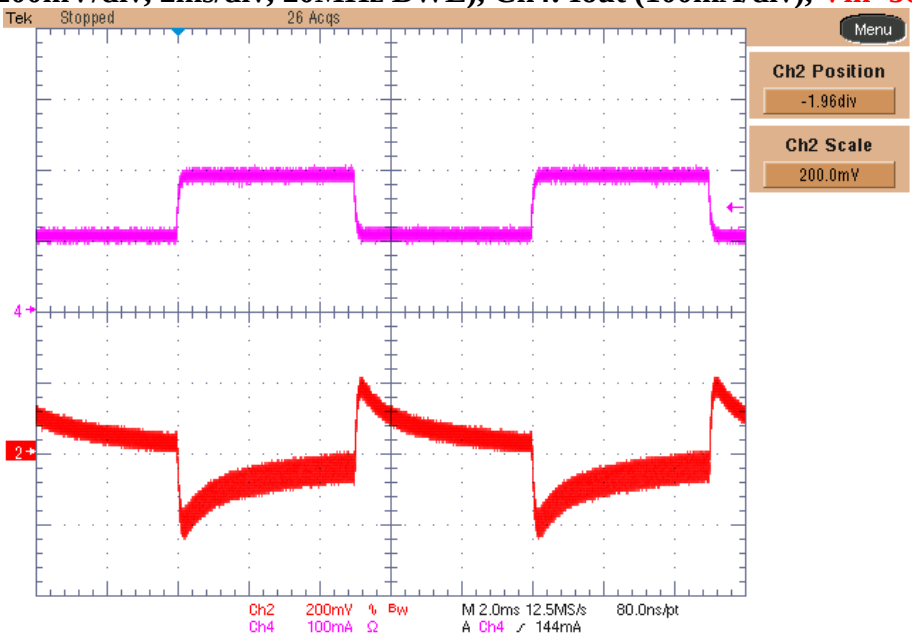
Ch3: Q2 Drain Voltage (100V/div, 2us/div, No BWL), full load.



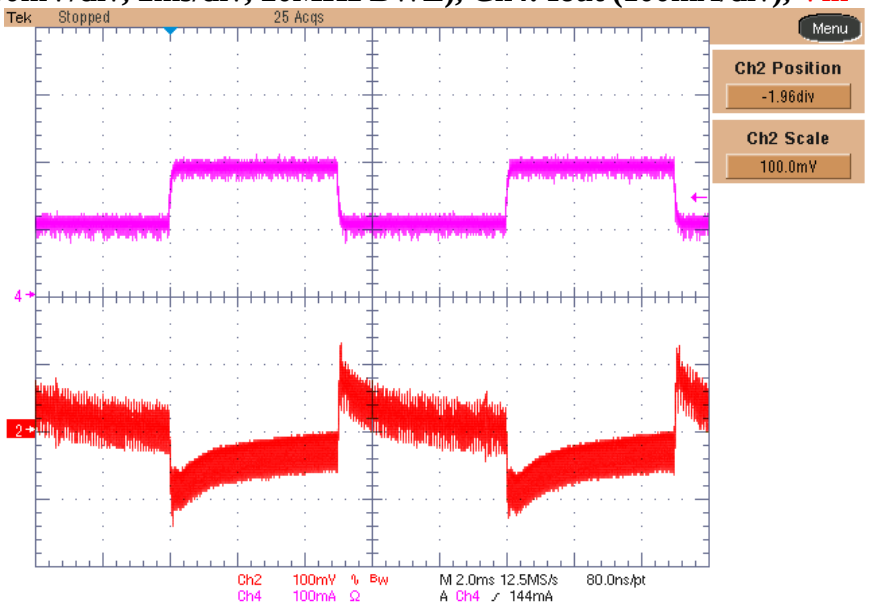
7 Transient Response

The image below shows the transient response on the output voltage when the load has been switched between 50% and 100% of nominal load while Vin = 50V (upper picture) and 400V (bottom one).

Ch2: Vout (200mV/div, 2ms/div, 20MHz BWL), Ch4: Iout (100mA/div), Vin=50V

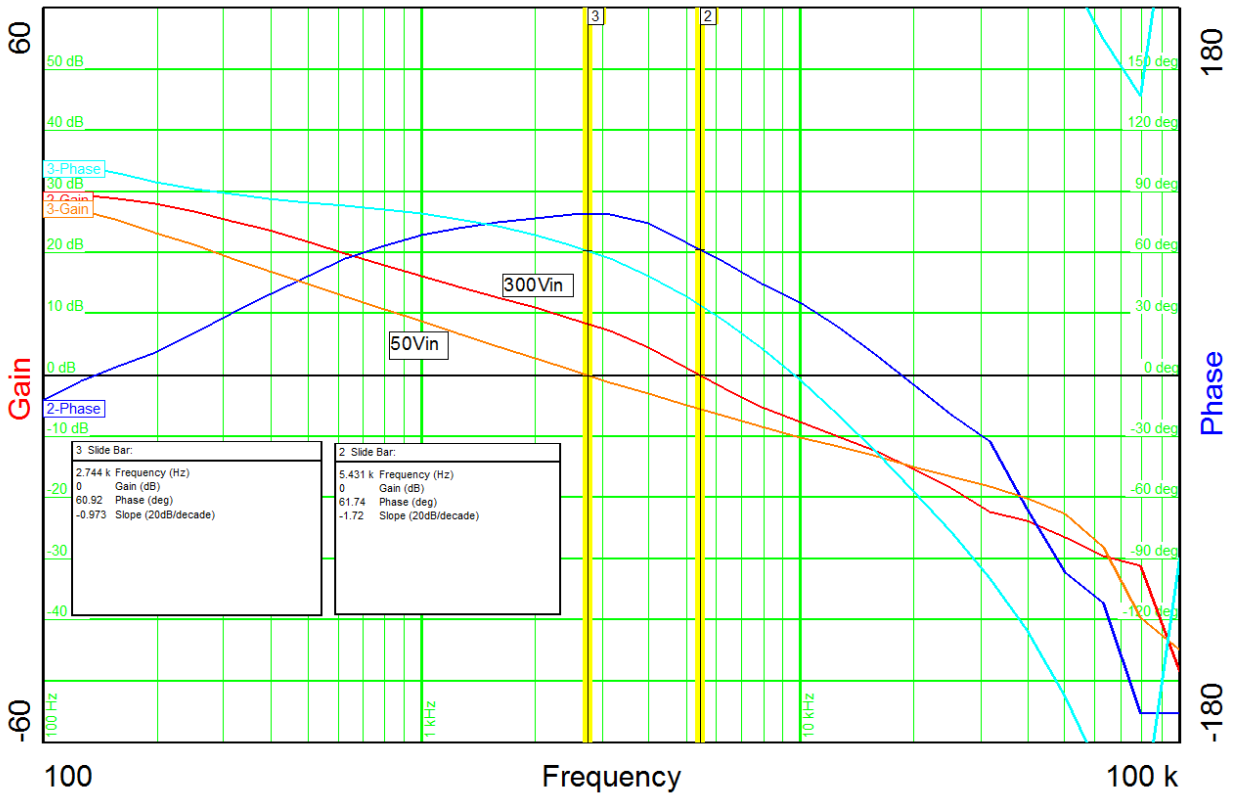


Ch2: Vout (100mV/div, 2ms/div, 20MHz BWL), Ch4: Iout (100mA/div), Vin=400V



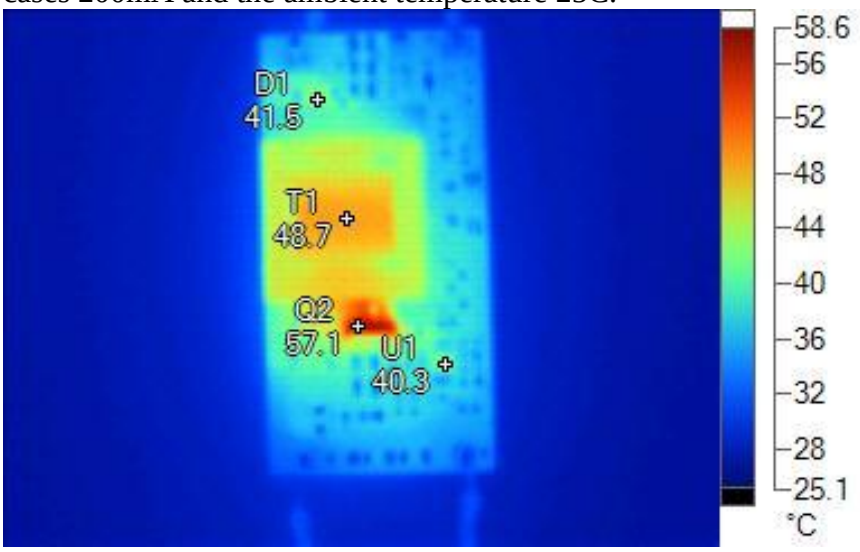
8 Loop Analysis

The open loop measurement has been performed at 50Vin and 300Vin in full load conditions. The worst case bandwidth was 2.744KHz (@ 50Vin) and the phase margin 60.92Hz.

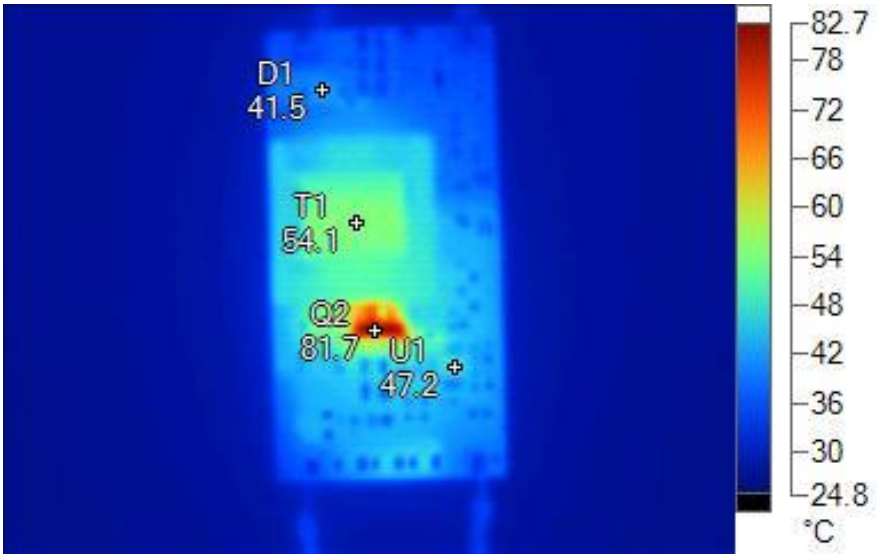


9 Thermal Analysis

The thermal analysis of the converter shows the temperatures for each component, in the graphs below. The converter has been placed horizontally on the bench without any forced convection. The input voltage was 300V for the first thermal image and 600V for the second one. The load was on both cases 200mA and the ambient temperature 25C.



Name	Temperature	Emissivity
T1	48.7°C	0.95
Q2	57.1°C	0.95
U1	40.3°C	0.95
D1	41.5°C	0.95



Name	Temperature	Emissivity
T1	54.1°C	0.95
D1	41.5°C	0.95
Q2	81.7°C	0.95
U1	47.2°C	0.95

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