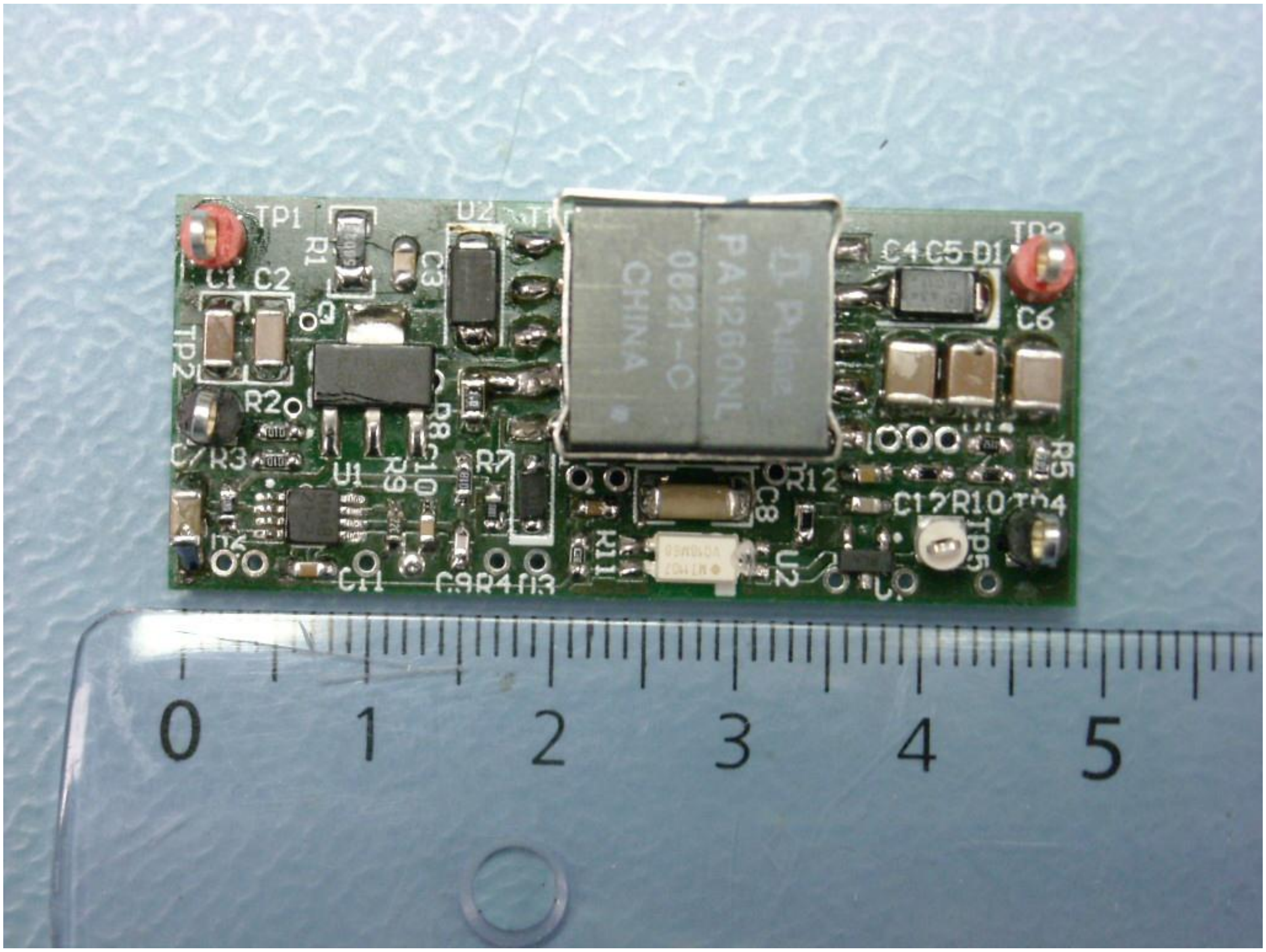
PICTURE OF THE BOARD:

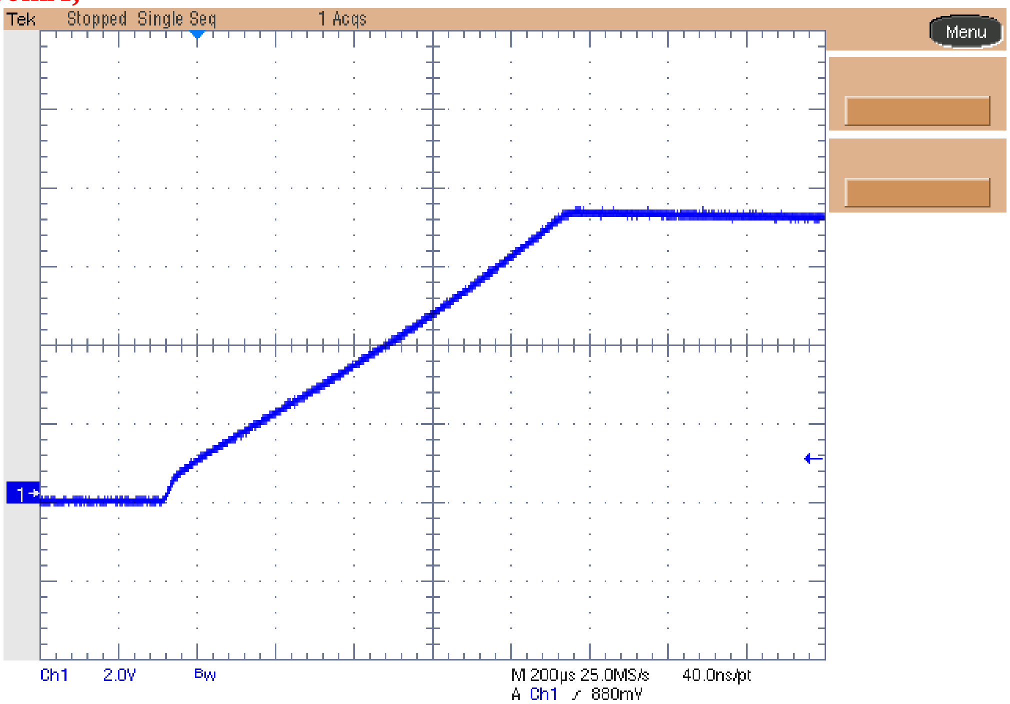


1. Startup

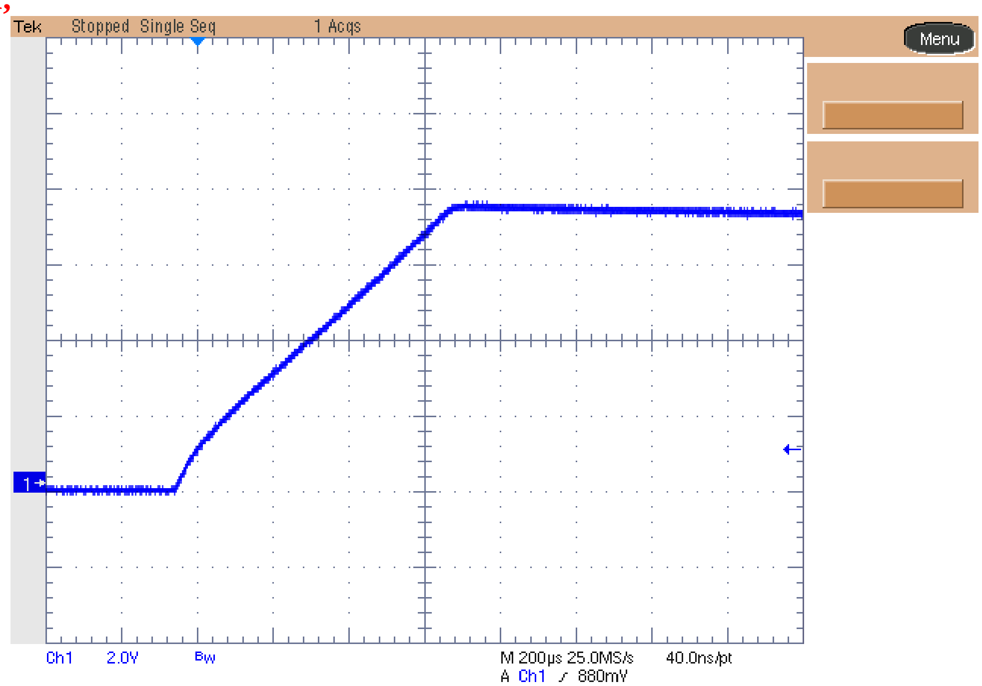
The output voltage behavior at startup is shown in the images below. The input voltage was set to 48Vdc. The converter was fully loaded for the upper picture and unloaded for the bottom one.

Ch.1: Output voltage (2V/div, 200us/div, DC coupling, 20MHz BWL)

Iout = 500mA;

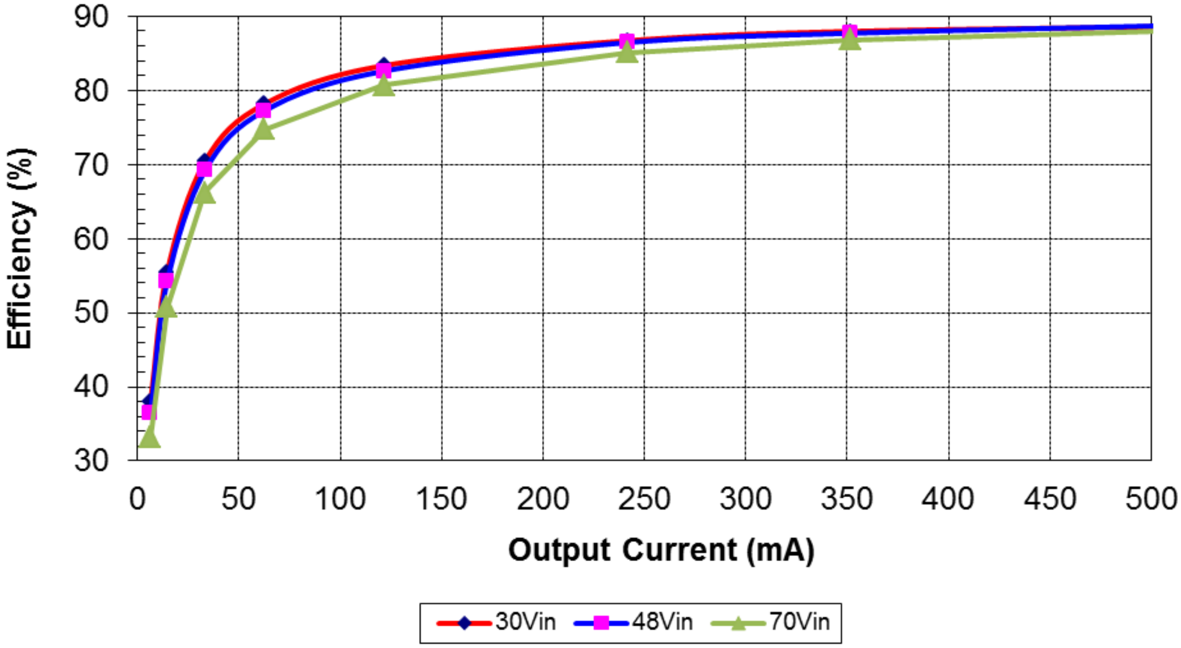


Iout = 0A;



1 Efficiency

The efficiency data are shown in the tables and graph below. A DC voltage source has been set to the maximum and minimum input voltage (30V and 70V), as well as the nominal 48V.



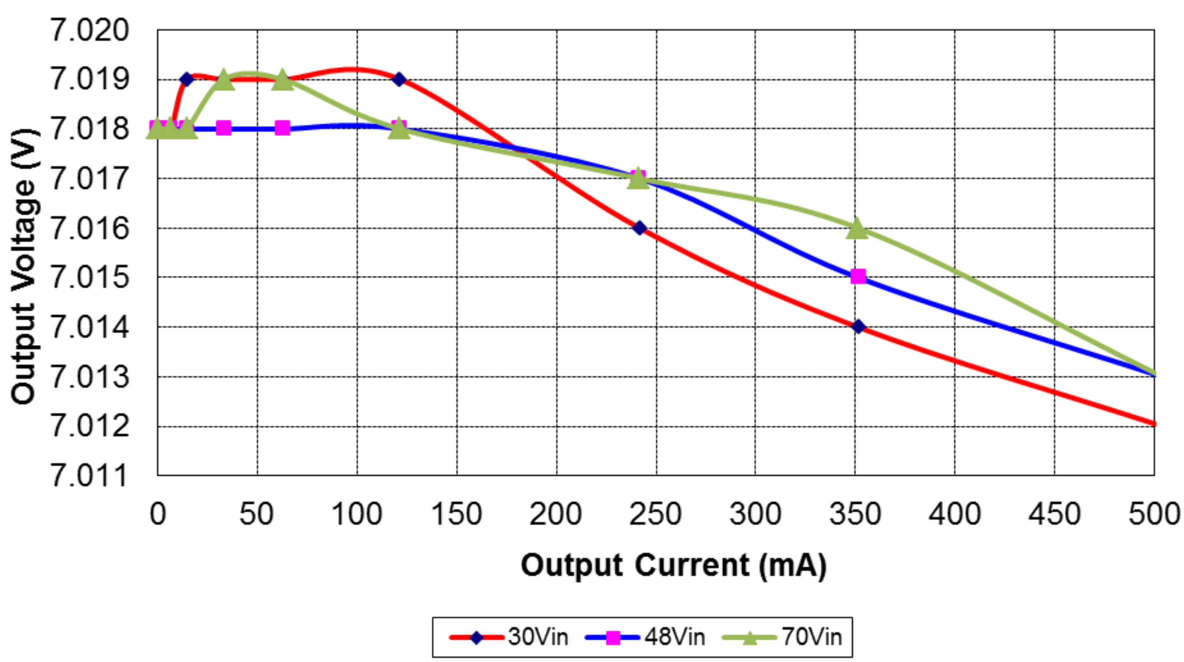
Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (Vdc)	Pin (W)	Ploss (W)	Eff (%)
0	7.018	0	2.197	30.02	0.066	0.0660	0.00
6.5	7.018	0.046	3.985	30.08	0.120	0.0743	38.06
14.6	7.019	0.102	6.13	30.11	0.185	0.0821	55.52
33.3	7.019	0.234	11.02	30.11	0.332	0.0981	70.44
62.7	7.019	0.440	18.70	30.10	0.563	0.1228	78.19
121.6	7.019	0.854	34.04	30.08	1.024	0.1704	83.36
241.7	7.016	1.696	65.1	30.04	1.956	0.2598	86.71
351.4	7.014	2.465	93.4	30.00	2.802	0.3373	87.96
504.1	7.012	3.535	133.0	30.00	3.990	0.4553	88.59

Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (Vdc)	Pin (W)	Ploss (W)	Eff (%)
0	7.018	0	1.451	48.09	0.070	0.0698	0.00
6.5	7.018	0.046	2.601	47.98	0.125	0.0792	36.55
14.6	7.018	0.102	3.933	48.02	0.189	0.0864	54.25
33.3	7.018	0.234	7.02	48.11	0.338	0.1040	69.20
62.7	7.018	0.440	11.84	48.10	0.570	0.1295	77.27
121.6	7.018	0.853	21.48	48.09	1.033	0.1796	82.61
241.6	7.017	1.695	40.8	48.06	1.961	0.2655	86.46
351.4	7.015	2.465	58.5	48.04	2.810	0.3453	87.71
504.1	7.013	3.535	83.0	48.01	3.985	0.4496	88.72

Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (Vdc)	Pin (W)	Ploss (W)	Eff (%)
0	7.018	0	1.134	70.12	0.080	0.0795	0.00
6.4	7.018	0.045	1.931	70.04	0.135	0.0903	33.21
14.5	7.018	0.102	2.866	69.95	0.200	0.0987	50.76
33.2	7.019	0.233	5.01	70.22	0.352	0.1188	66.24
62.6	7.019	0.439	8.37	70.22	0.588	0.1484	74.76
121.6	7.018	0.853	15.06	70.21	1.057	0.2040	80.71
241.6	7.017	1.695	28.37	70.19	1.991	0.2960	85.14
351.3	7.016	2.465	40.45	70.18	2.839	0.3741	86.82
504.0	7.013	3.535	57.3	70.15	4.020	0.4850	87.93

2 Output Voltage Regulation

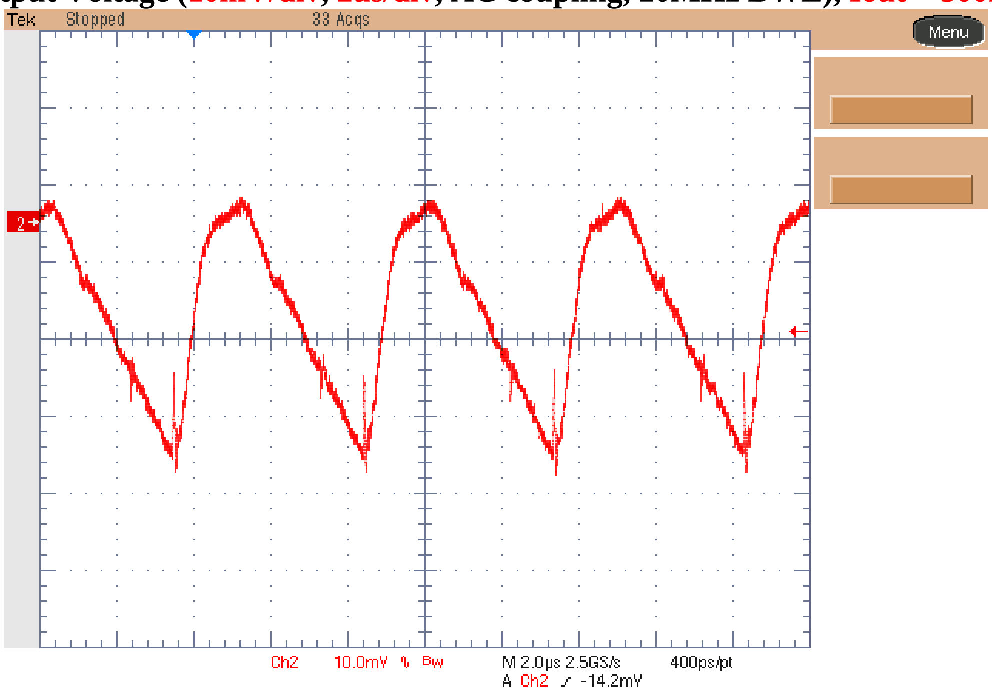
The output voltage variation as function of load and input voltage is shown below:



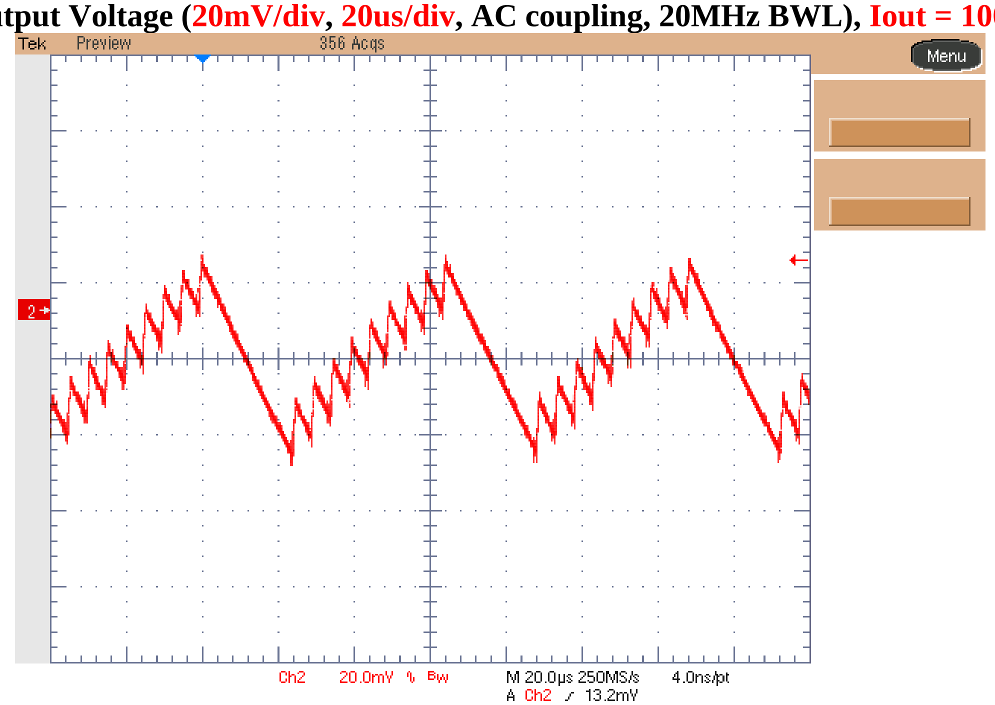
3 Output Ripple Voltage

The output ripple voltage is shown in the plots below. The input was set to 48V and the output fully loaded (upper one) and unloaded (bottom one).

Ch.2: Output Voltage (10mV/div, 2us/div, AC coupling, 20MHz BWL), Iout = 500mA



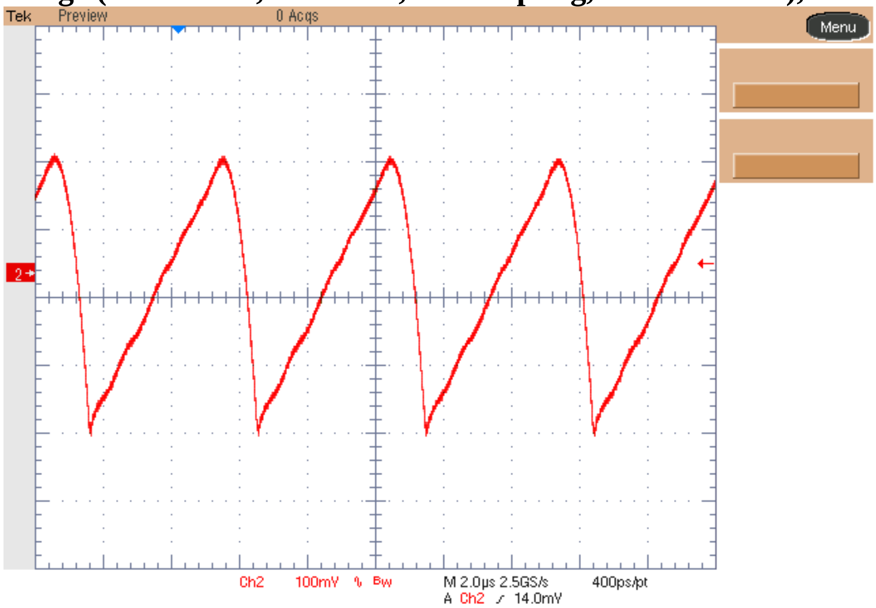
Ch.2: Output Voltage (20mV/div, 20us/div, AC coupling, 20MHz BWL), Iout = 100mA



4 Input Ripple Voltage

The ripple voltage measured at input terminal is shown below. A 330uH inductor has been placed in series to the converter therefore simulating a high impedance source. The input voltage value and load were the same like in the previous conditions.

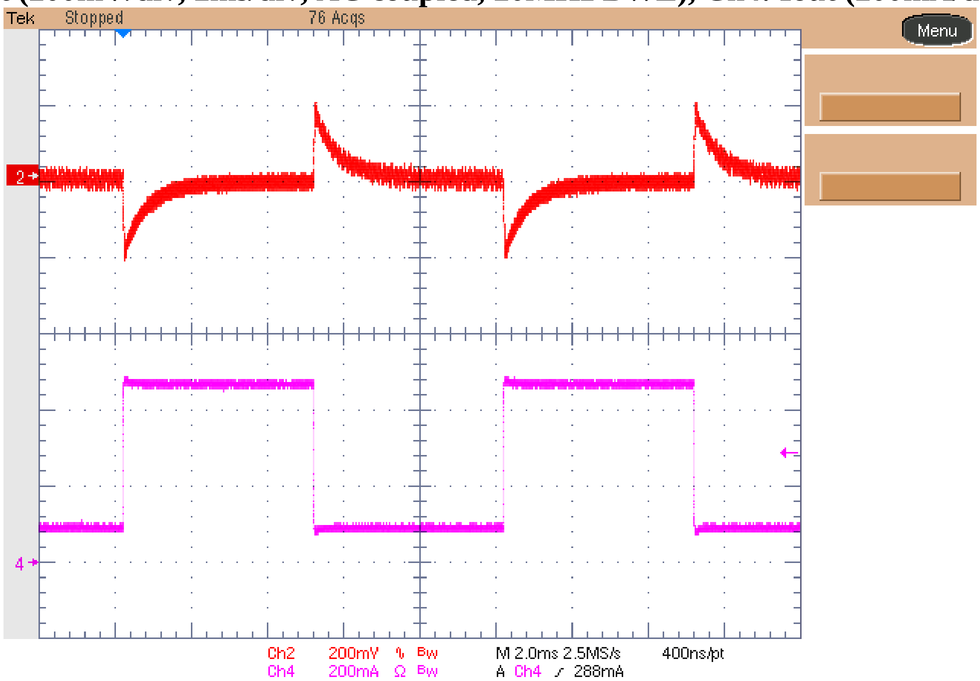
Ch.2: Input Voltage (100mV/div, 2usec/div, AC coupling, 20MHz BWL), Iout = 500mA



5 Transient Response

The image below shows the transient response on the output voltage when the load has been switched between 20% and 100% of nominal load while Vin = 48V.

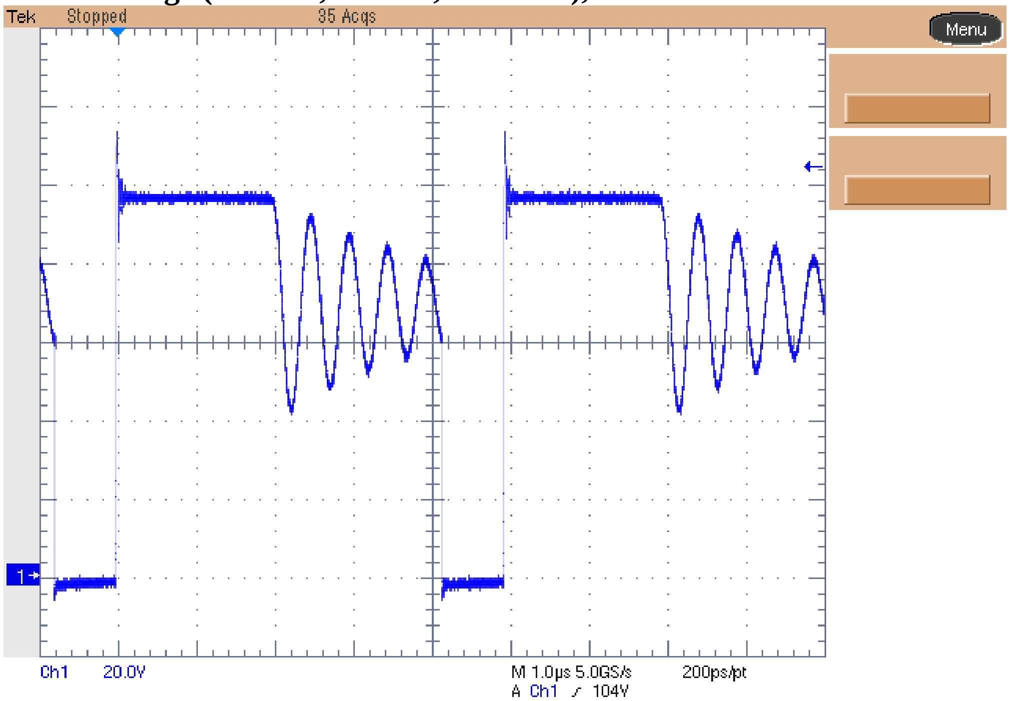
Ch2: Vout (200mV/div, 2ms/div, AC coupled, 20MHz BWL), Ch4: Iout (200mA/div)



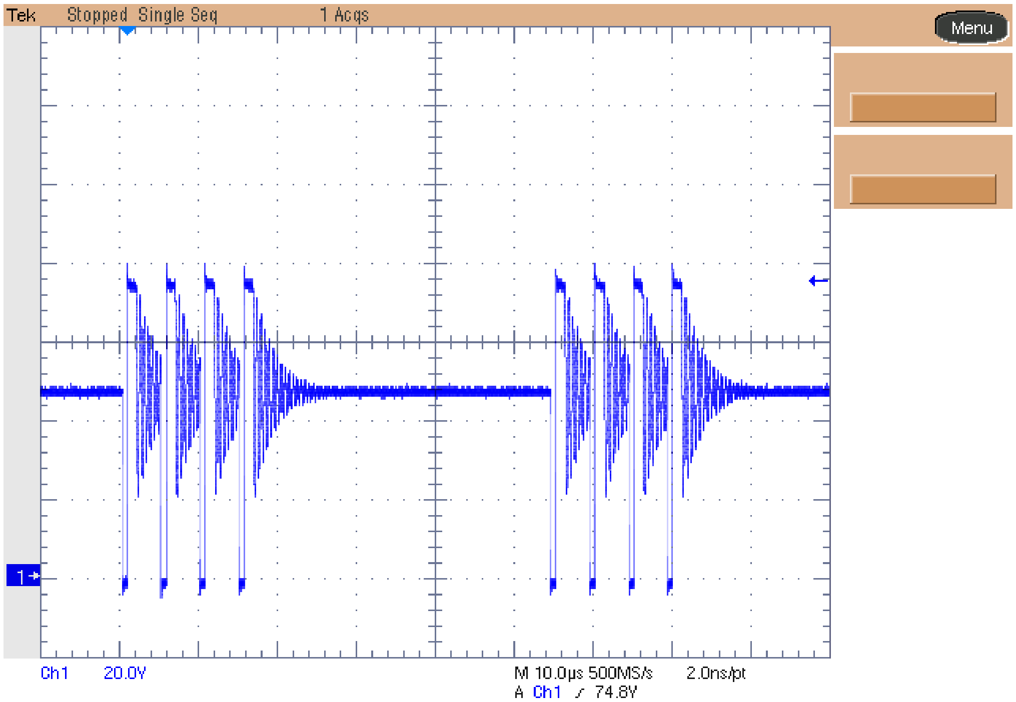
6 Switching Node Waveform

The image below shows the peak voltage on drain of Q1 with 70V input voltage and full load.

Ch1: Q1 drain Voltage (20V/div, 1us/div, No BWL), full load.

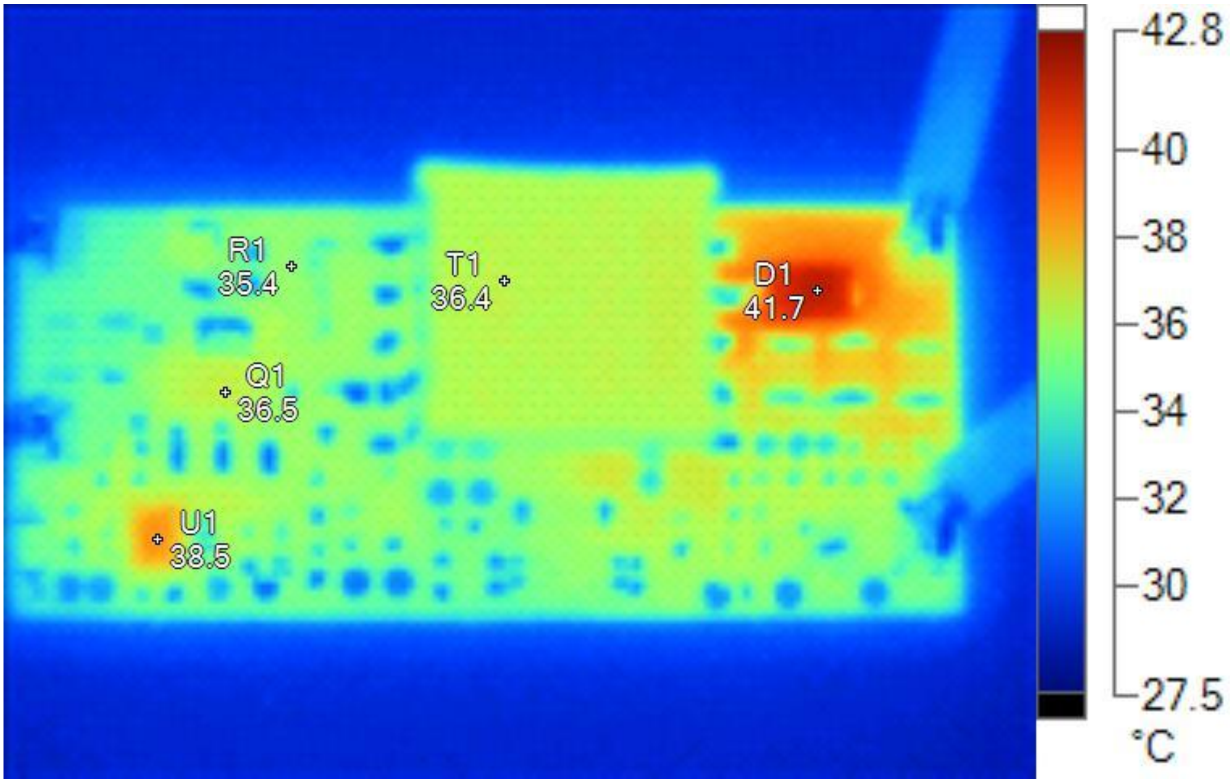


Ch1: Q1 drain Voltage (20V/div, 10us/div, No BWL), 50mA load, Burst mode operation



7 Thermal Analysis

The thermal analysis of the converter shows the temperatures for each component, in the graph below. The converter has been placed horizontally on the bench without any forced convection. The input voltage was 70V, the load 500mA and the ambient temperature 25C.



IR20130731_0329.is2
7/31/2013 6:42:45 PM

Image Info

Background temperature	25.0°C
Average Temperature	32.6°C
Image Range	28.3°C to 41.8°C
Camera Model	Ti40FT
Camera Manufacturer	Fluke
Image Time	7/31/2013 6:42:45 PM

Main Image Markers

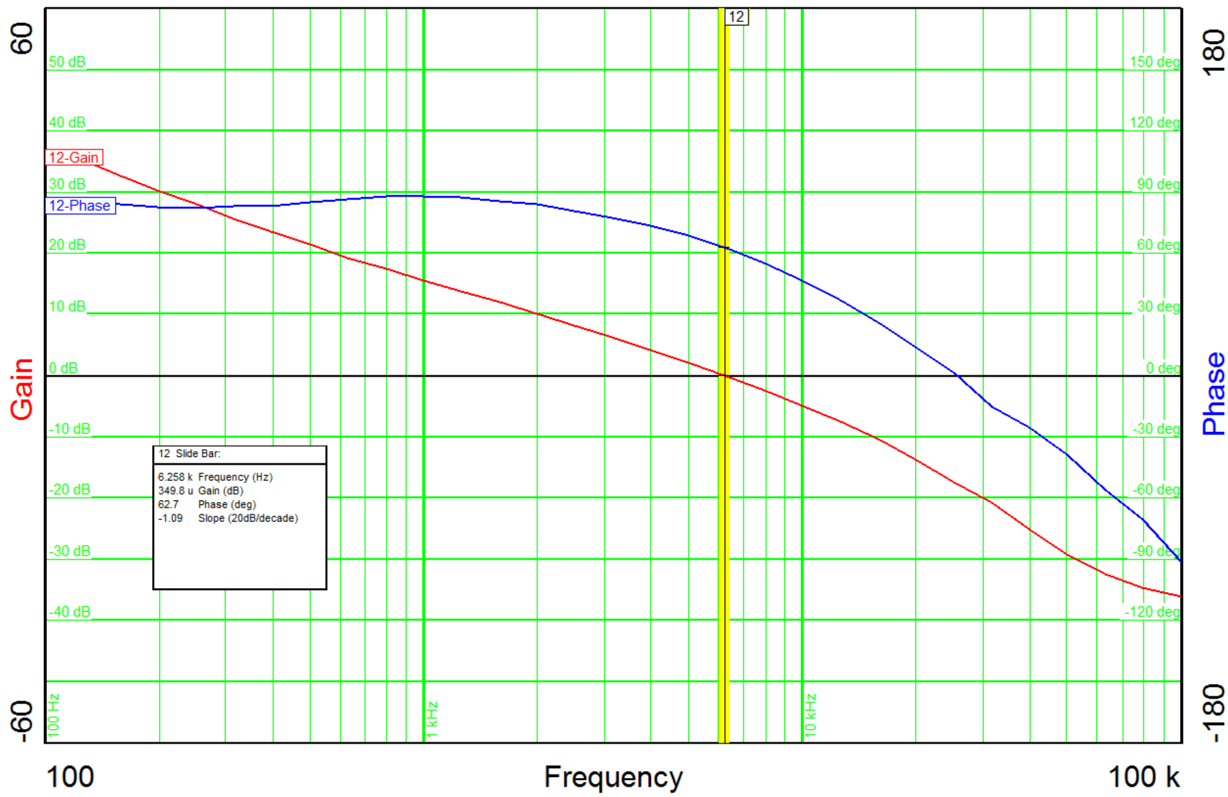
Name	Temperature
U1	38.5°C
T1	36.4°C
D1	41.7°C
Q1	36.5°C
R1	35.4°C

8 Loop Analysis

The loop analysis on the converter shows results regarding phase margin and gain margin, as well as crossover frequency. The converter has been supplied @ 50Vin, and fully loaded.

The measurement showed these results:

1) Phase margin = 62.7 deg.
2) Gain margin = 17.58 dB
3) Crossover frequency = 6.258 KHz



EVALUATION BOARD/KIT/MODULE (EVM) WARNINGS, RESTRICTIONS AND DISCLAIMER

For Feasibility Evaluation Only, in Laboratory/Development Environments. The EVM is not a complete product. It is intended solely for use for preliminary feasibility evaluation in laboratory / development environments by technically qualified electronics experts who are familiar with the dangers and application risks associated with handling electrical / mechanical components, systems and subsystems. It should not be used as all or part of a production unit.

Your Sole Responsibility and Risk. You acknowledge, represent and agree that:

1. You have unique knowledge concerning Federal, State and local regulatory requirements (including but not limited to Food and Drug Administration regulations, if applicable) which relate to your products and which relate to your use (and/or that of your employees, affiliates, contractors or designees) of the EVM for evaluation, testing and other purposes.
2. You have full and exclusive responsibility to assure the safety and compliance of your products with all such laws and other applicable regulatory requirements, and also to assure the safety of any activities to be conducted by you and/or your employees, affiliates, contractors or designees, using the EVM. Further, you are responsible to assure that any interfaces (electronic and/or mechanical) between the EVM and any human body are designed with suitable isolation and means to safely limit accessible leakage currents to minimize the risk of electrical shock hazard.
3. Since the EVM is not a completed product, it may not meet all applicable regulatory and safety compliance standards (such as UL, CSA, VDE, CE, RoHS and WEEE) which may normally be associated with similar items. You assume full responsibility to determine and/or assure compliance with any such standards and related certifications as may be applicable. You will employ reasonable safeguards to ensure that your use of the EVM will not result in any property damage, injury or death, even if the EVM should fail to perform as described or expected.

Certain Instructions. Exceeding the specified EVM ratings (including but not limited to input and output voltage, current, power, and environmental ranges) may cause property damage, personal injury or death. If there are questions concerning these ratings please contact a TI field representative prior to connecting interface electronics including input power and intended loads. Any loads applied outside of the specified output range may result in unintended and/or inaccurate operation and/or possible permanent damage to the EVM and/or interface electronics. Please consult the EVM User's Guide prior to connecting any load to the EVM output. If there is uncertainty as to the load specification, please contact a TI field representative. During normal operation, some circuit components may have case temperatures greater than 60°C as long as the input and output ranges are maintained at nominal ambient operating temperature. These components include but are not limited to linear regulators, switching transistors, pass transistors, and current sense resistors which can be indentified using the EVM schematic located in the EVM User's Guide. When placing measurement probes near these devices during normal operation, please be aware that these devices may be very warm to the touch.

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