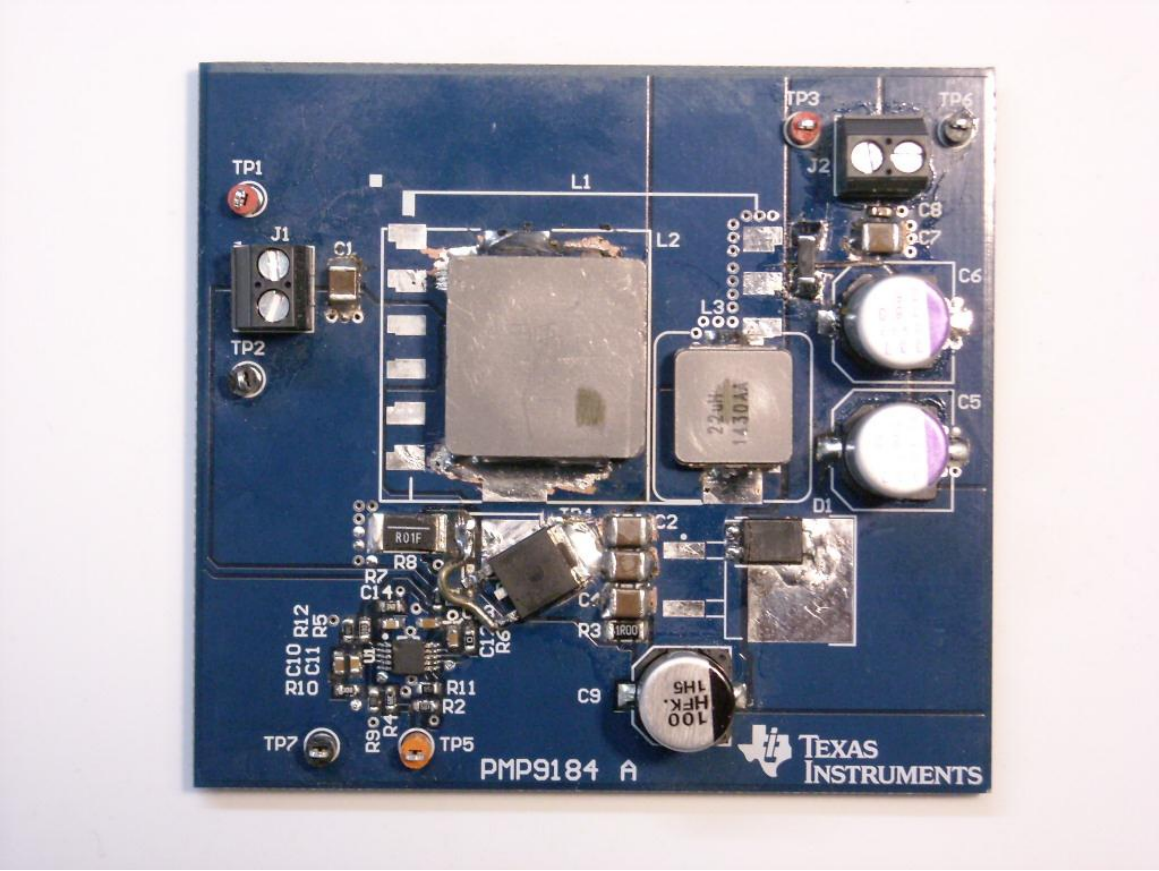
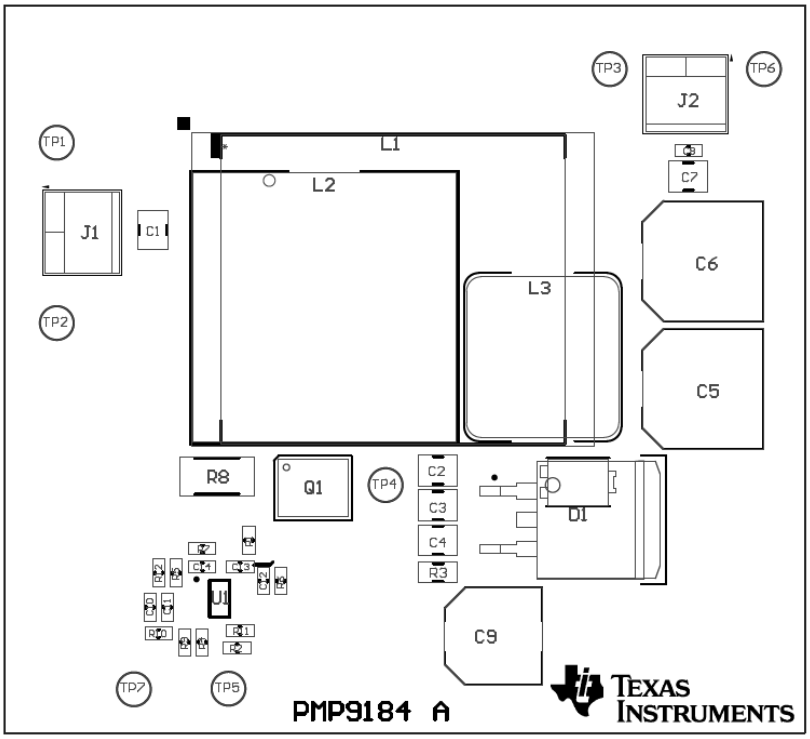
PHOTO OF THE PROTOTYPE:



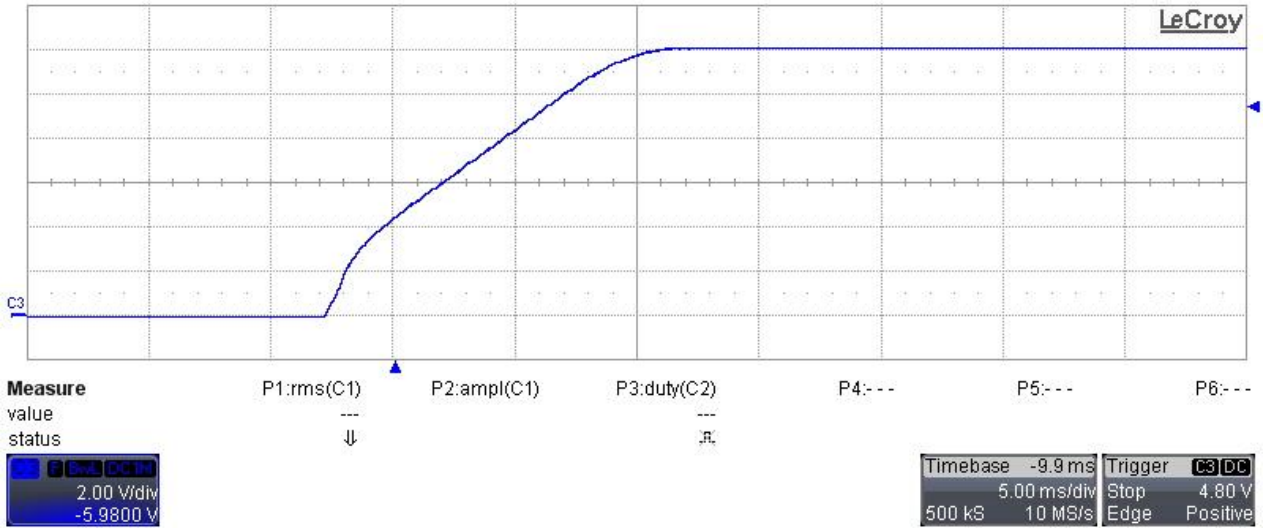


1 Startup

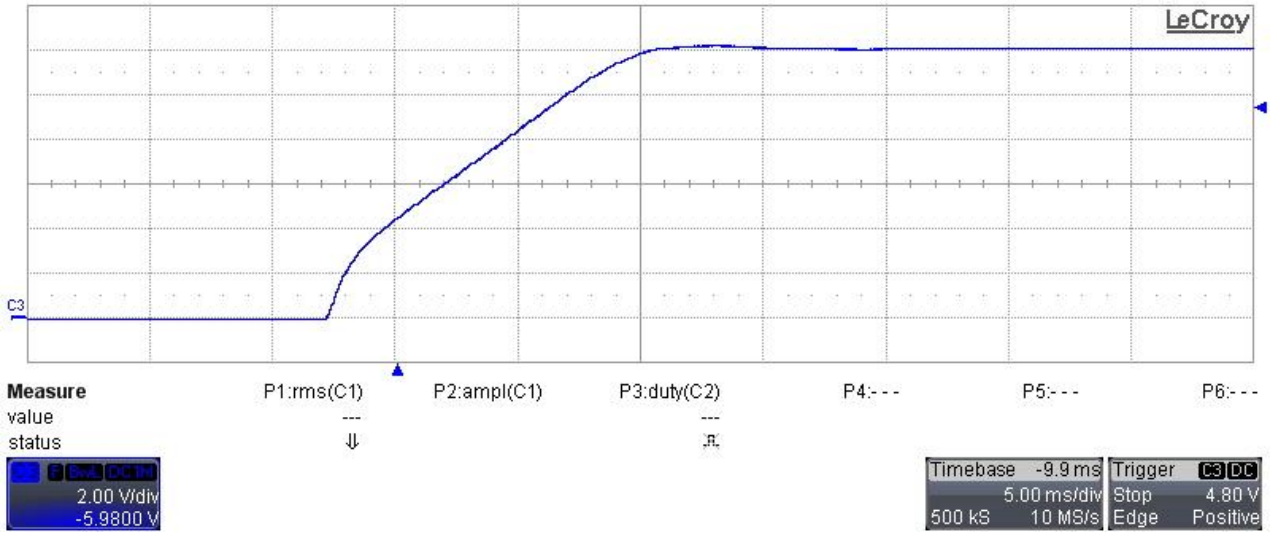
The output voltage behavior at startup is shown in the images below.
The output was loaded @ 2.5A in constant current mode for the first screenshot and unloaded for the second one. The input voltage was set to 12V.

Ch.3: Output voltage (2V/div, 5ms/div, 20MHz BWL)

Iout = 2.5A

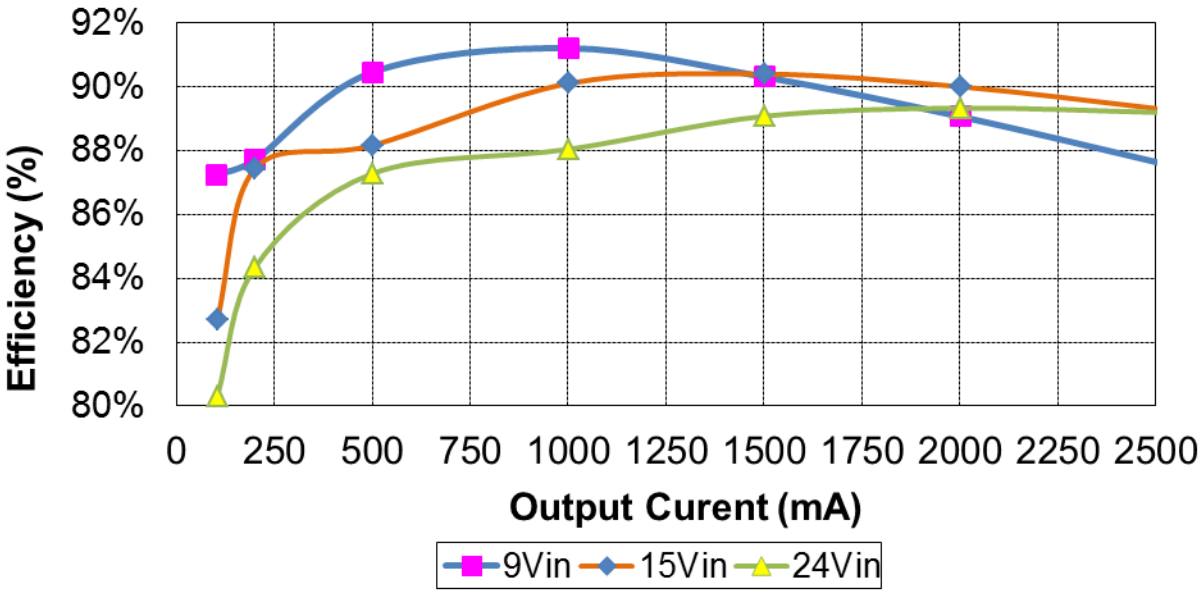


Iout = 0



2 Efficiency

The efficiency data are shown in the tables and graph below. The input source has been set to 9V, 15V and 24V, while the load has been varied between 0 and 2.5A.



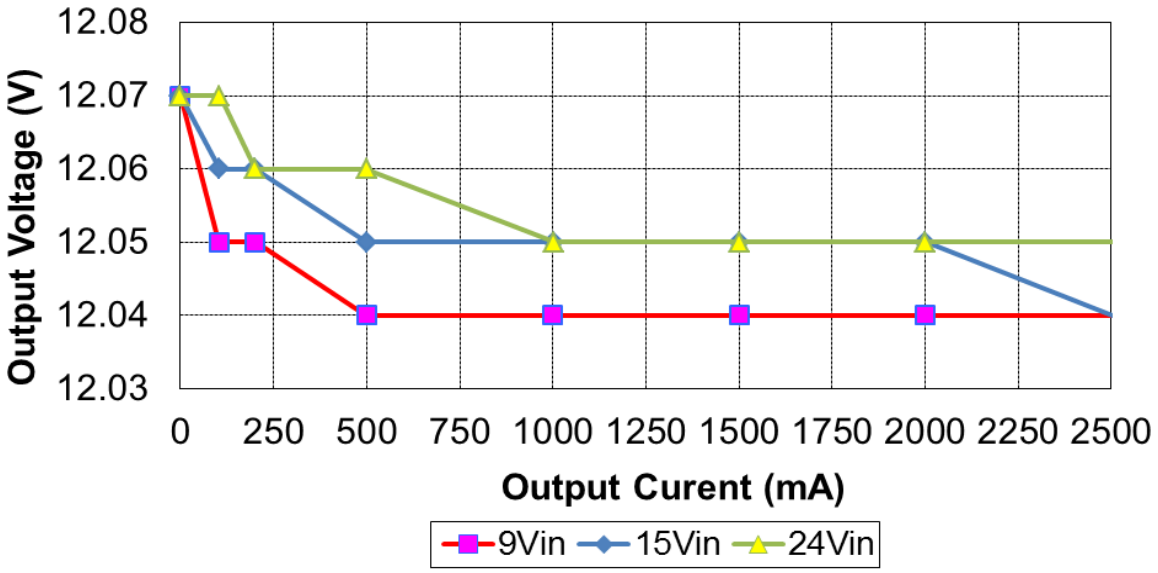
Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (V)	Pin (W)	Ploss (W)	Eff. (%)
0	12.07	0.00	2.4	9.000	0.022	0.022	0.0%
104.1	12.05	1.25	159.7	9.003	1.44	0.18	87.2%
200.2	12.05	2.41	305.6	9.001	2.75	0.34	87.7%
500.1	12.04	6.02	739.5	9.002	6.66	0.64	90.4%
1000.2	12.04	12.04	1467	9.001	13.20	1.16	91.2%
1501	12.04	18.07	2222	9.007	20.01	1.94	90.3%
2001	12.04	24.09	3004	9.005	27.05	2.96	89.1%
2504	12.04	30.15	3821	9.004	34.40	4.26	87.6%

Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (V)	Pin (W)	Ploss (W)	Eff. (%)
0	12.07	0.00	2.3	15.01	0.035	0.035	0.0%
104.3	12.06	1.26	101.4	15.00	1.52	0.26	82.7%
200.4	12.06	2.42	184.3	15.00	2.76	0.35	87.4%
500.2	12.05	6.03	455.8	15.00	6.84	0.81	88.2%
1002.9	12.05	12.08	894	15.01	13.41	1.33	90.1%
1501	12.05	18.09	1334	15.00	20.01	1.92	90.4%
2001	12.05	24.11	1785	15.01	26.79	2.68	90.0%
2503	12.04	30.14	2248	15.01	33.74	3.61	89.3%

Iout (mA)	Vout (V)	Pout (W)	Iin (mA)	Vin (V)	Pin (W)	Ploss (W)	Eff. (%)
0	12.07	0.00	2.2	24.02	0.053	0.053	0.0%
104.3	12.07	1.26	65.3	24.01	1.57	0.31	80.3%
200.4	12.06	2.42	119.4	24.00	2.87	0.45	84.3%
500.2	12.06	6.03	288.0	24.00	6.91	0.88	87.3%
1002.9	12.05	12.08	571.7	24.01	13.73	1.64	88.0%
1501	12.05	18.09	846.1	24.00	20.31	2.22	89.1%
2001	12.05	24.11	1123.8	24.02	26.99	2.88	89.3%
2503	12.05	30.16	1409.0	24.00	33.82	3.65	89.2%

3 Output voltage regulation vs. load

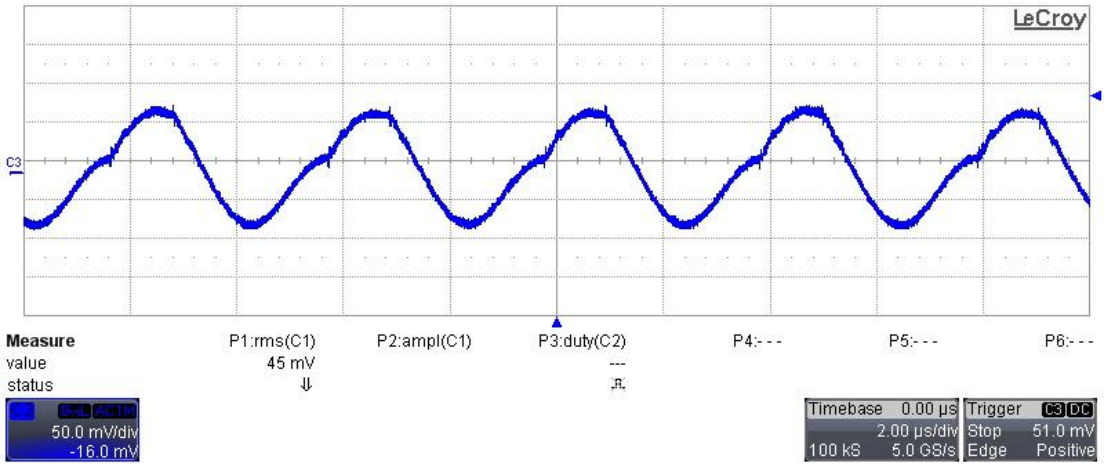
The output voltage variation versus load current, for the three input voltages, is plotted below.



4 Output ripple voltage

The output ripple voltage has been measured by supplying the converter @ 6Vdc and full load.

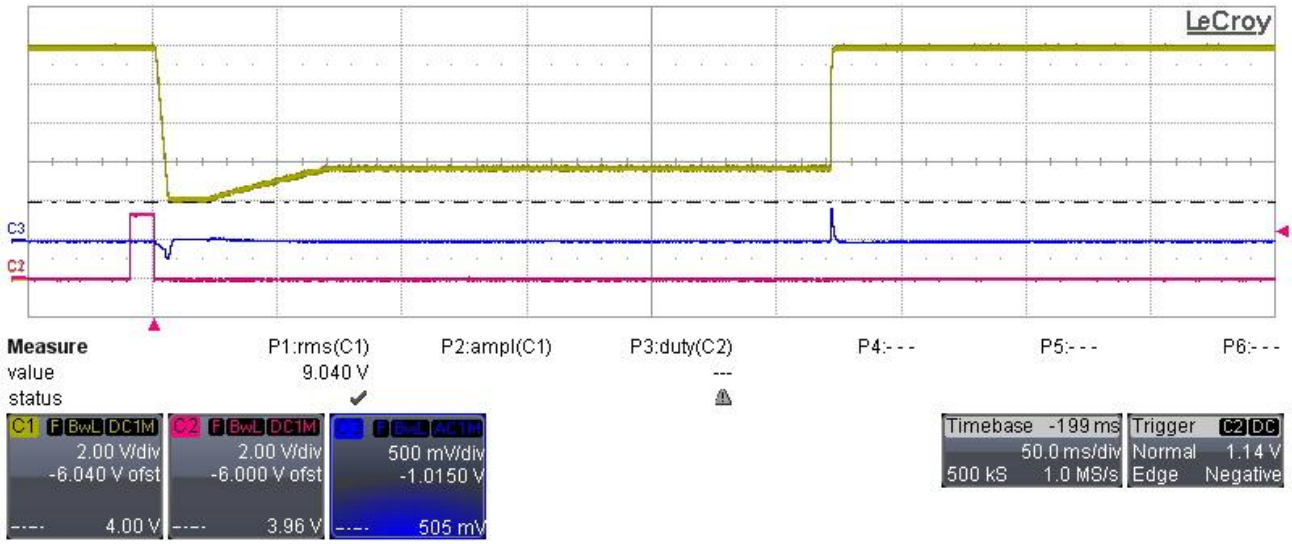
Ch.3: Output ripple voltage (50mV/div, 2us/div, 20MHz BWL, AC coupling)



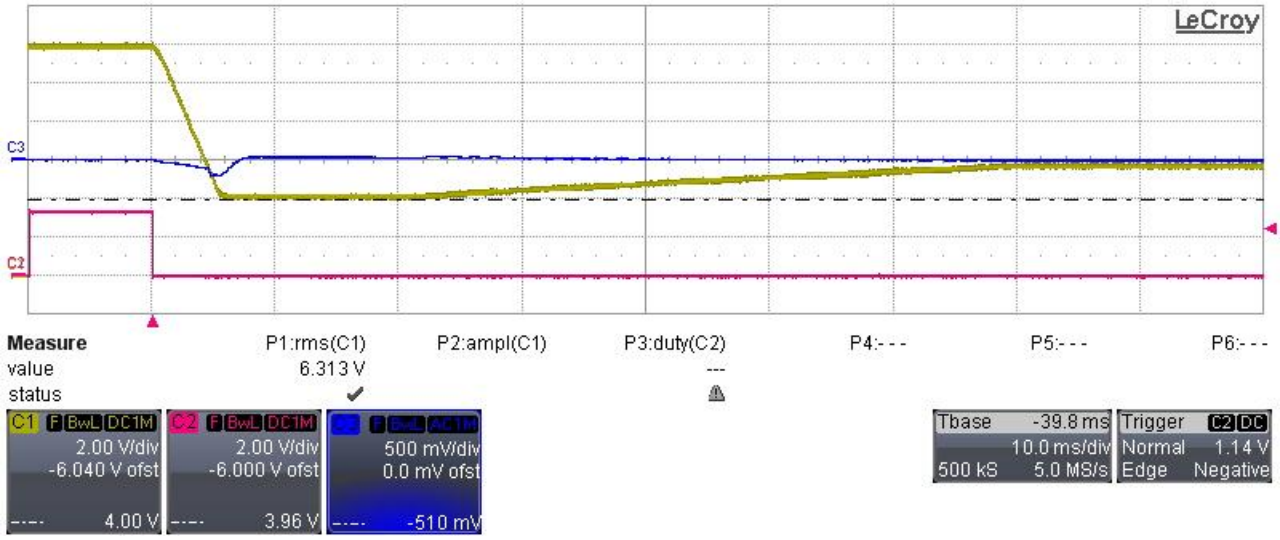
5 Cold crank simulation

In the pictures below are shown the output voltage variation, at full load and by applying the "cold crank" profile to input terminals.

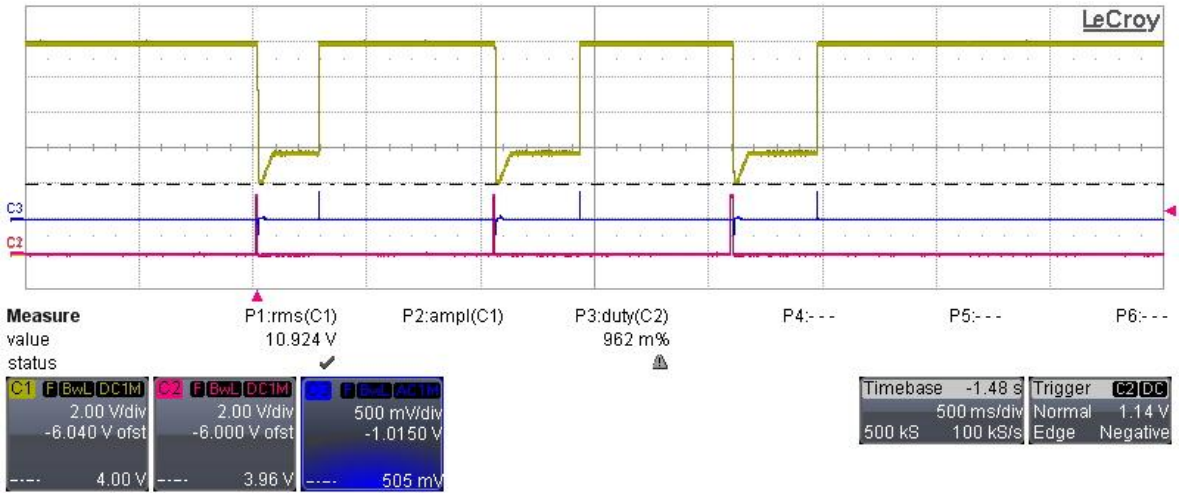
Ch.1: Input voltage (2V/div, 50msec/div, 20MHz BWL, DC coupling)
Ch.2: Sync signal coming from the generator (used only to trigger the oscilloscope)
Ch.3: Output voltage (500mV/div, 20MHz BWL, AC coupling)



In picture below we see the same test but magnified at the downslope of the input voltage:
The time division is in this case 10msec/div.

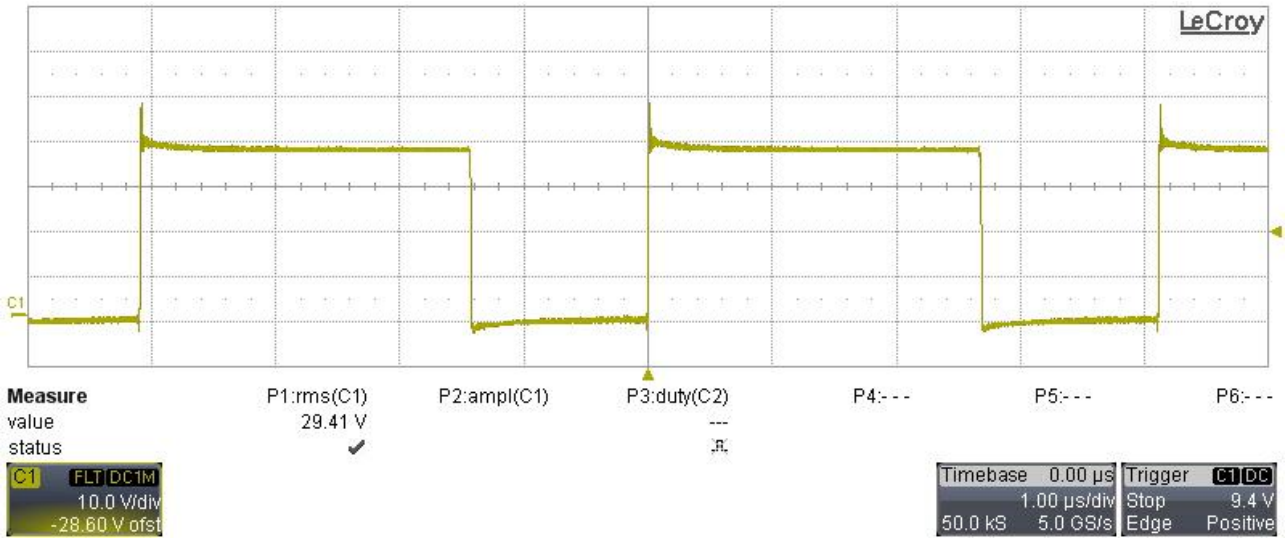


In the picture below we see the test repeated three times (distance between transients ~ 1 sec.)
The conditions are the same like above, the time division is 500msec/div.



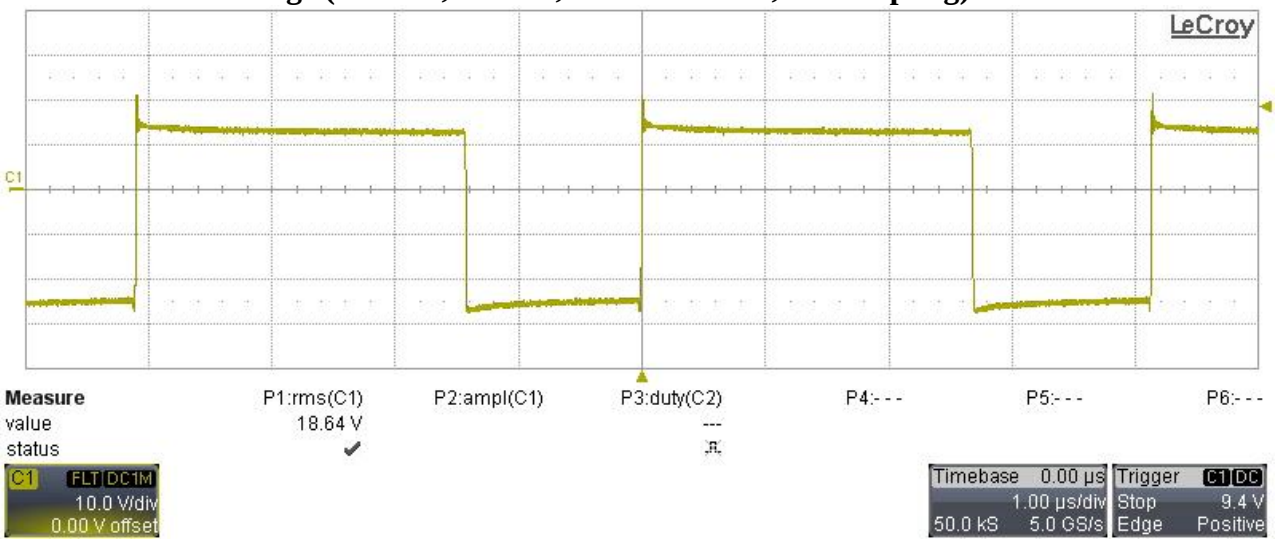
6 Switch-node

The image below shows the switch-node waveform (drain of Q1) at 24Vdc input and full load.
Ch.1: Q1 drain voltage (10V/div, 1us/div, 200MHz BWL, DC coupling)



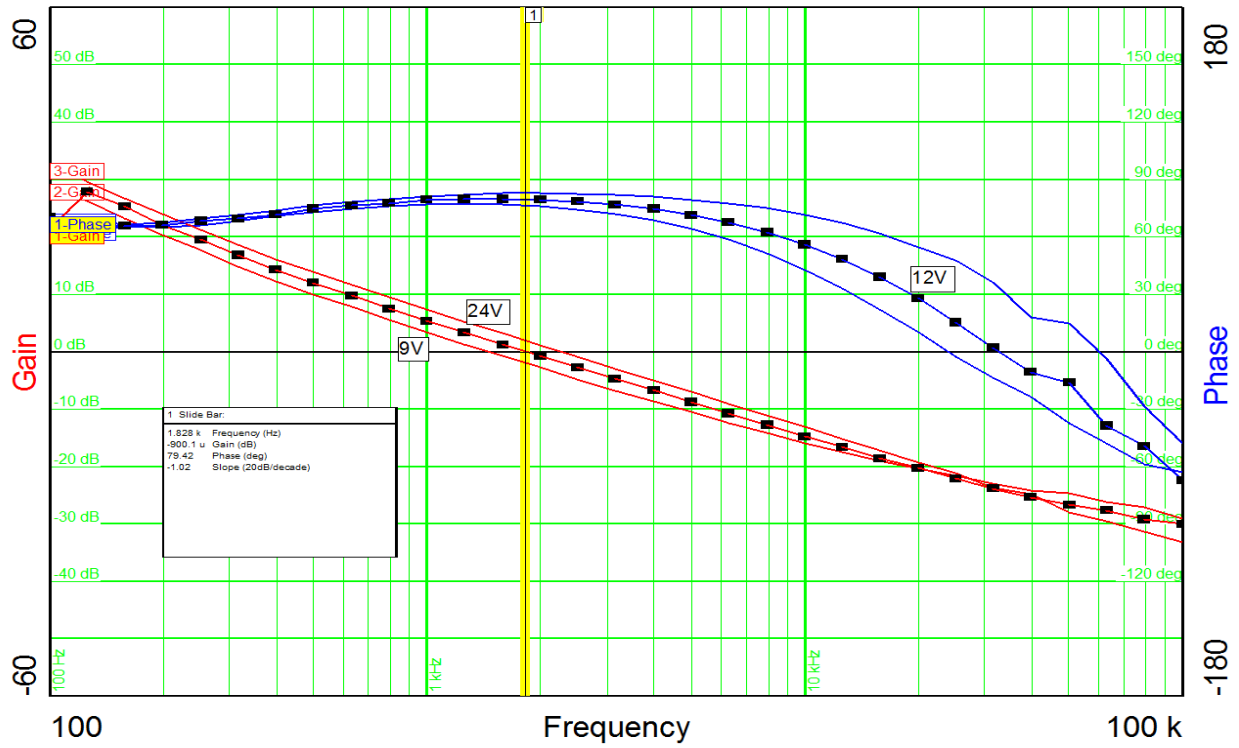
The next image shows the voltage of the anode of D1 at the same conditions as above.

Ch.1: D1 anode voltage (10V/div, 1us/div, 200MHz BWL, DC coupling)



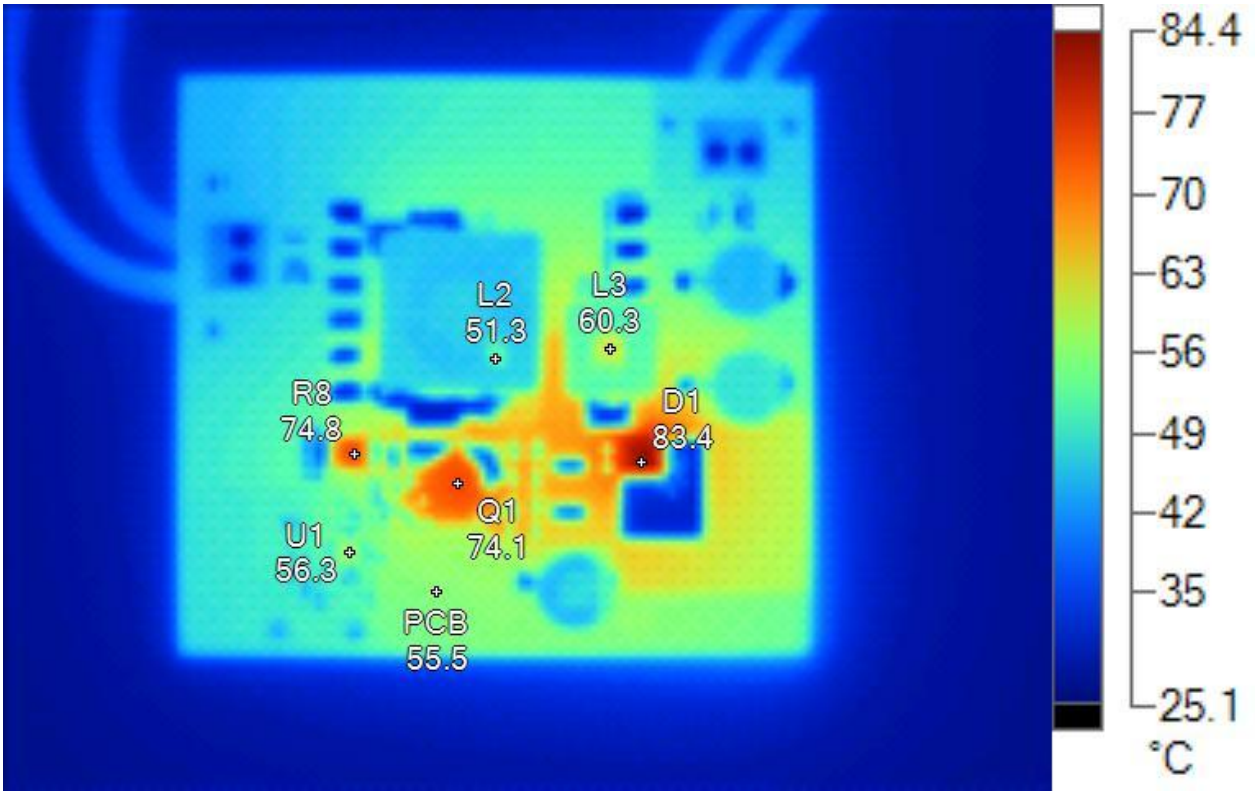
7 Loop Response

The picture below shows the loop response of the converter measured at 9V, 12V and 24V input voltage and full load. The crossover frequency, at 12Vin, was 1.828 KHz, the phase margin 79.42 deg. and the gain margin 23.85 dB.



8 Thermal Analysis

The picture below shows the thermal graph taken from the infrared camera, when the converter was supplied at 9Vin and fully loaded. The board has been placed horizontally on the bench in still air condition. The hot spot 83.4C concerns the diode D1. Due to small package of this diode and the surrounding temperature reaching 55C, we suggest to increase the PCB surface, improve the thermal contact of D1 on the copper and/or choose a D2PAK case.



Background temperature	25.1°C
Average Temperature	39.1°C
Image Range	25.9°C to 83.4°C
Camera Model	Ti40FT
Camera Manufacturer	Fluke
Image Time	11/19/2014 1:13:18 PM

Main Image Markers

Name	Temperature
D1	83.4°C
Q1	74.1°C
R8	74.8°C
L3	60.3°C
L2	51.3°C
U1	56.3°C
PCB	55.5°C

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