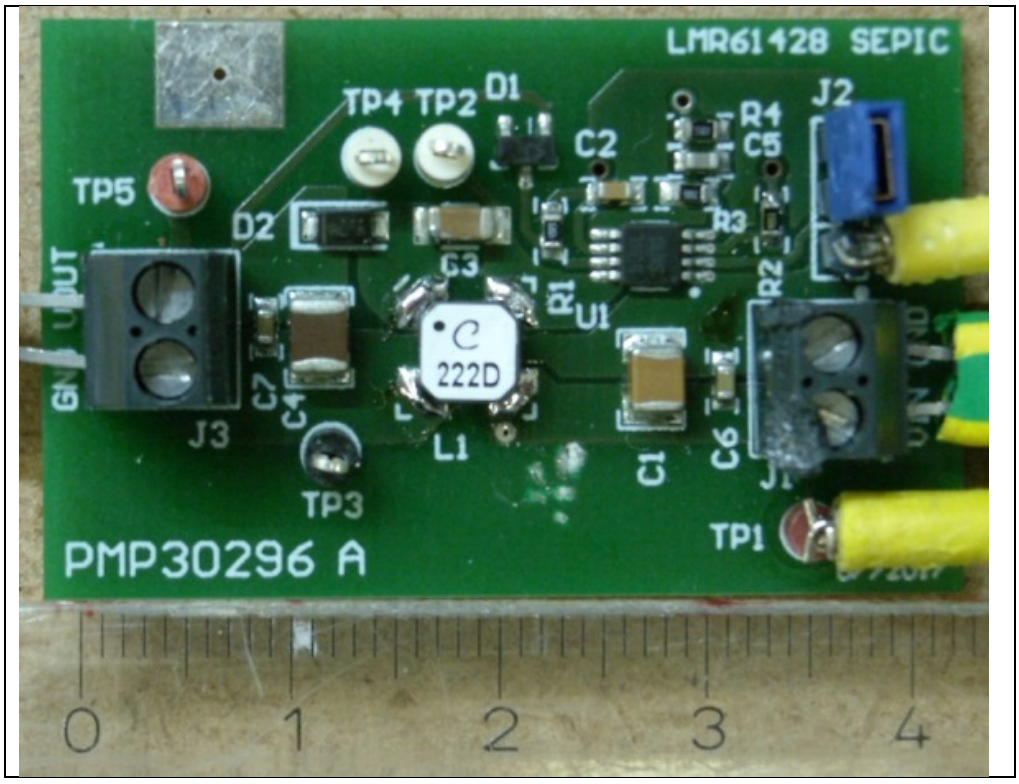
PMP30296RevB Test Results

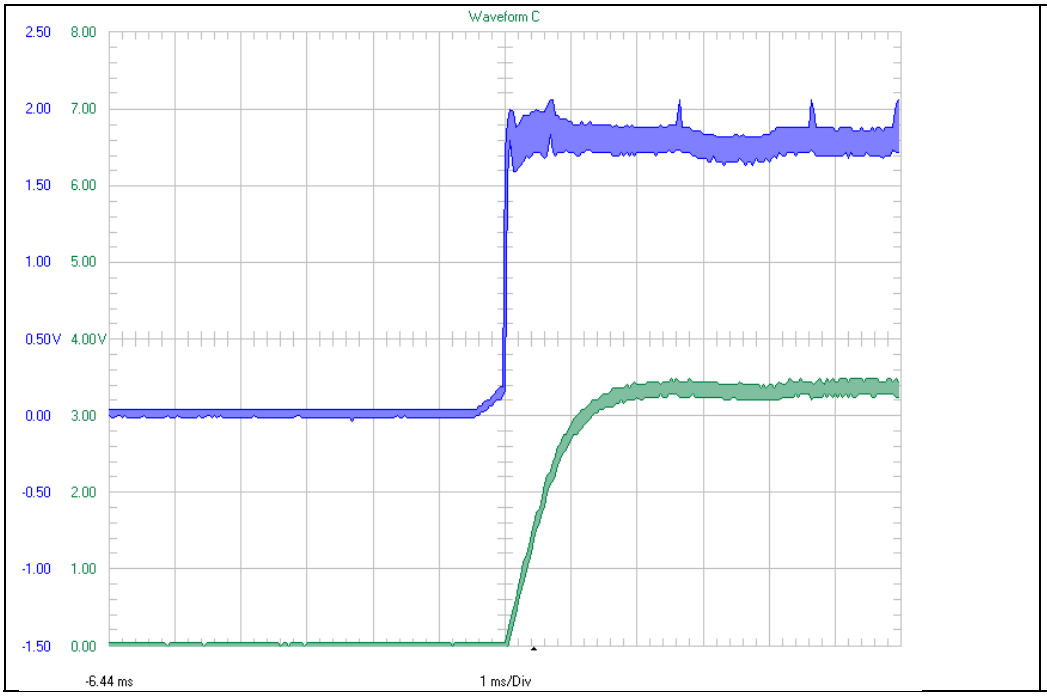
Topology: SEPIC
Device: LMR61428
This controller works in hysteretic mode, so constant duty cycle approx. 60% to 70%;
This control strategy results in burst mode – and modulation of the output voltage in between
The lower and upper limit of the output voltage.

Unless otherwise mentioned the output current was set to 0.2A (with resistor as load).



1 Startup

The startup waveform is shown in the Figure 1. The input voltage was set to 2V.



Ch1=> input voltage 0.5V/div

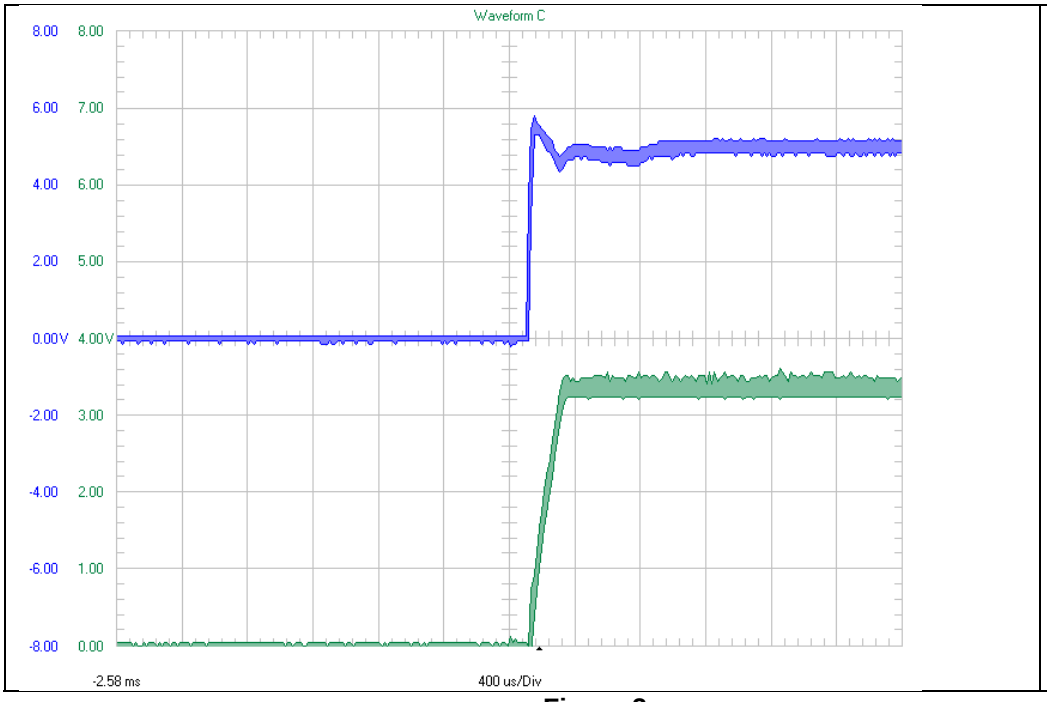
Ch2=> output voltage 1V/div

1ms/div

20MHz bw

Figure 1

The startup waveform is shown in the Figure 2. The input voltage was set to 5V.



Ch1=> input voltage 2V/div

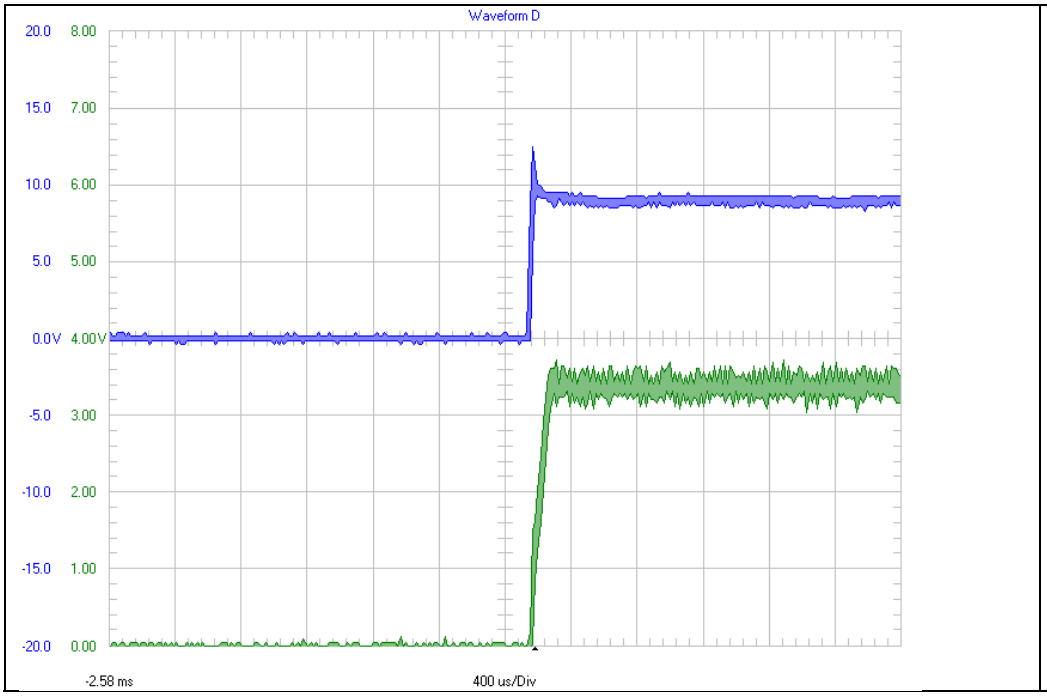
Ch2=> output voltage 1V/div

400µs/div

20MHz bw

Figure 2

The startup waveform is shown in the Figure 3. The input voltage was set to 9V.



Ch1=> input voltage 5V/div

Ch2=> output voltage 1V/div

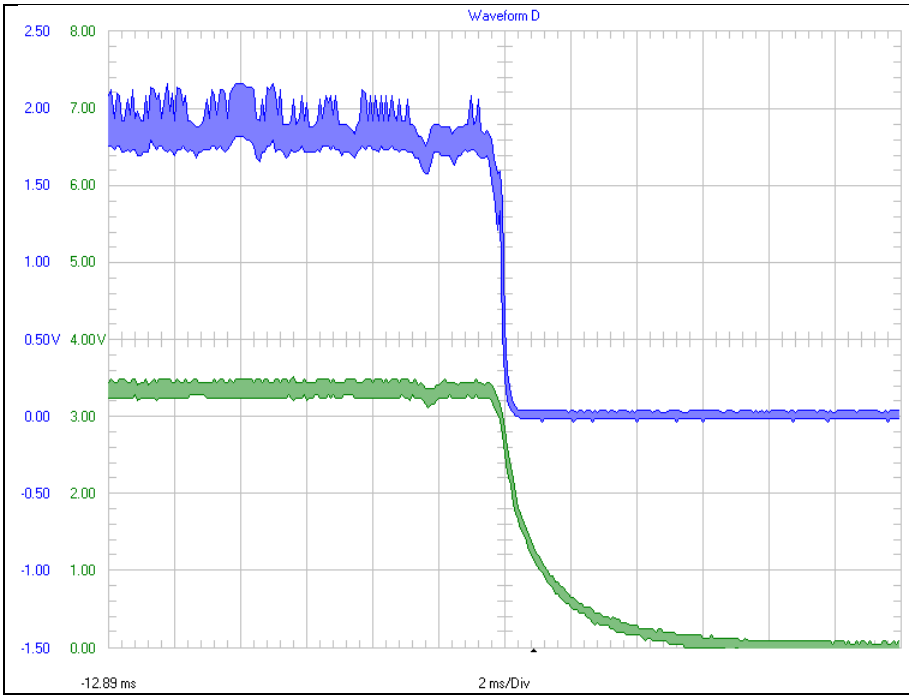
400µs/div

20MHz bw

Figure 3

2 Shutdown

The shutdown waveform is shown in the Figure 4. The input voltage was set to 2 V.
The power supply was disconnected**.**



Ch1=> input voltage 0.5V/div

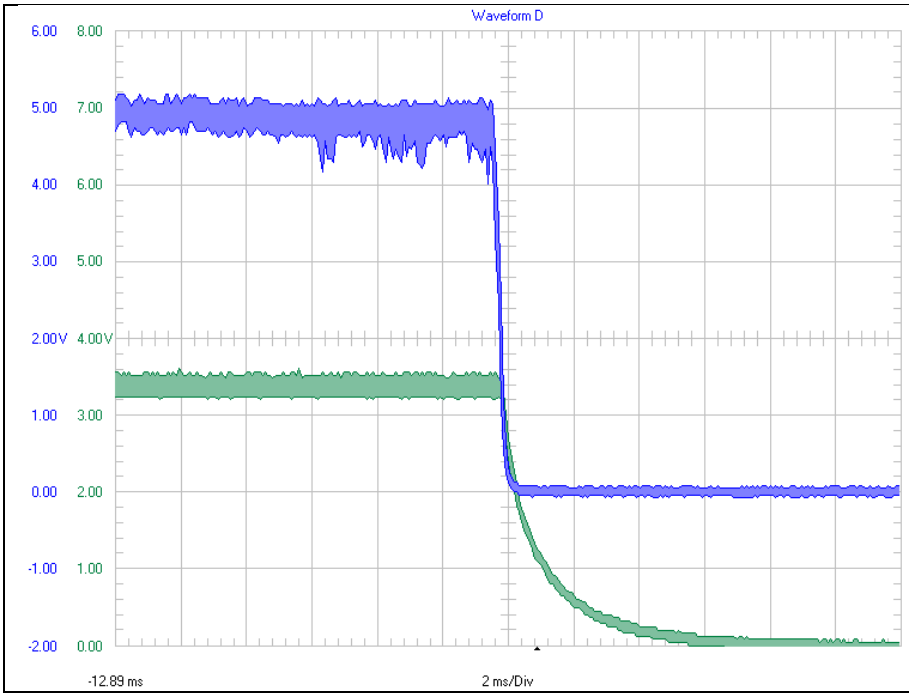
Ch2=> output voltage 1V/div

2ms/div

20MHz bw

Figure 4

The shutdown waveform is shown in the Figure 5. The input voltage was set to 5 V.
The power supply was disconnected**.**



Ch1=> input voltage 1V/div

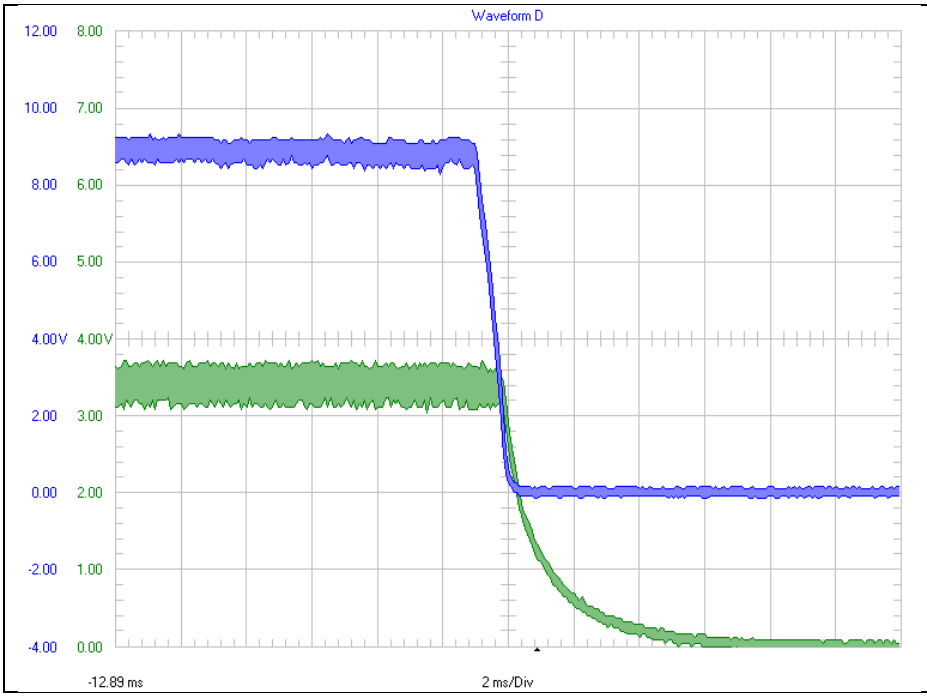
Ch2=> output voltage 1V/div

2ms/div

20MHz bw

Figure 5

The shutdown waveform is shown in the Figure 6. The input voltage was set to 9V.
The power supply was disconnected.



Ch1=> input voltage 2V/div

Ch2=> output voltage 1V/div

2ms/div

20MHz bw

Figure 6

3 Efficiency

The efficiency is shown in the Figure 7 below. The input voltage was set to 2V, 5V and 9V.

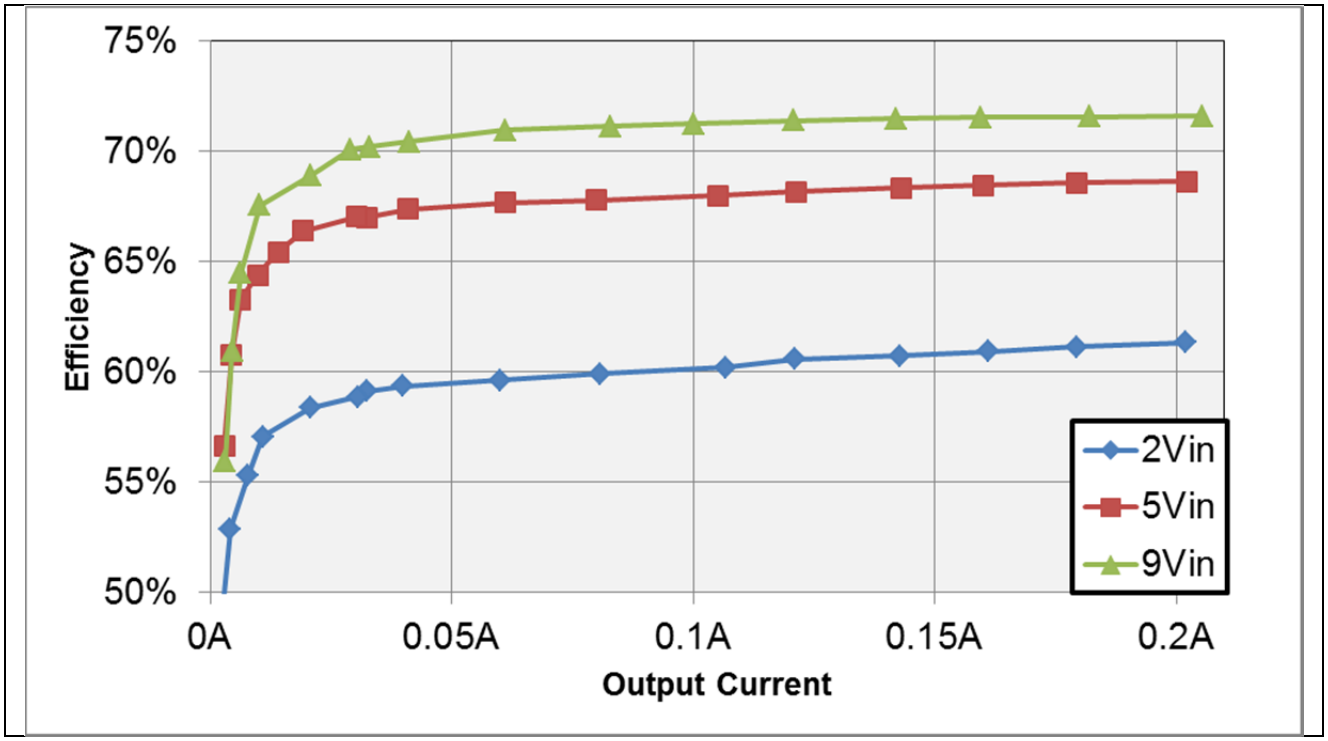


Figure 7

Loss (PIN-POUT) is shown in the Figure 8 below. The input voltage was set to 2V, 5V and 9V.

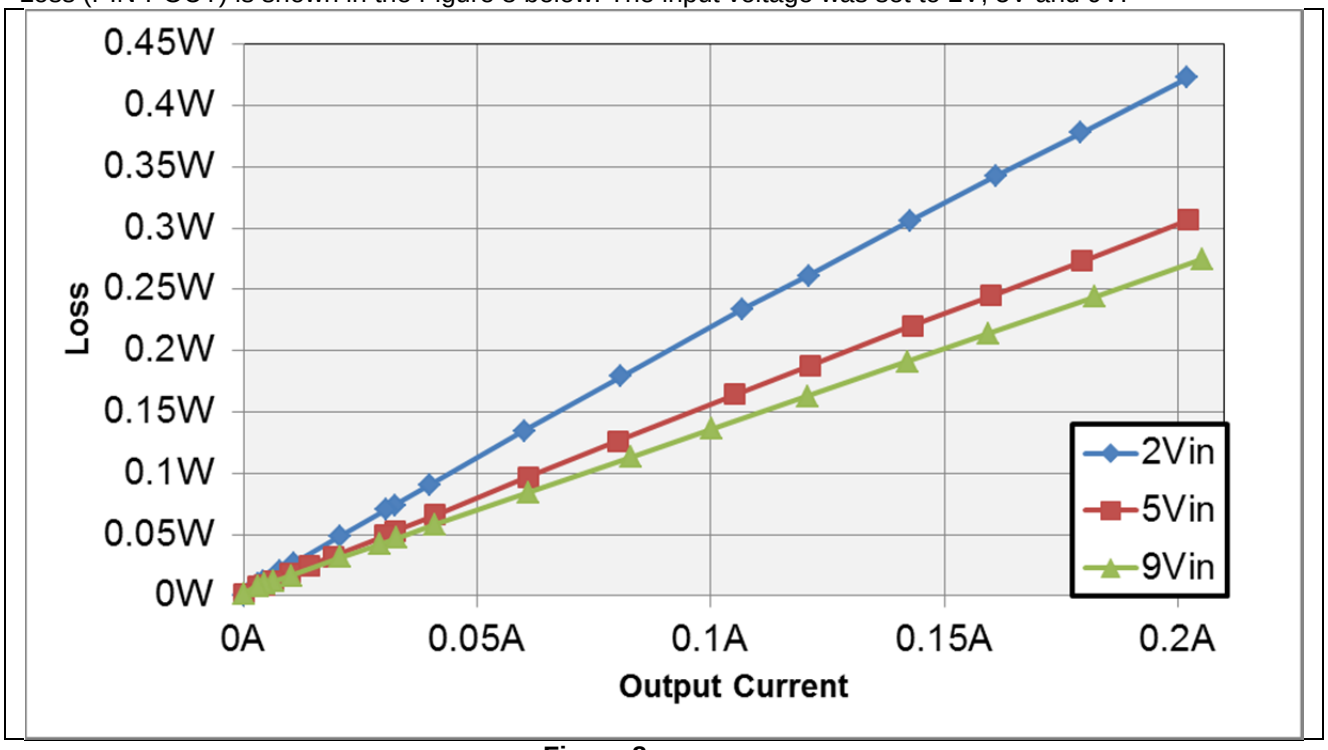


Figure 8

4 Load Regulation

The load regulation of the output is shown in the Figure 9 below.
The input voltage was set to 2V, 5V and 9V.

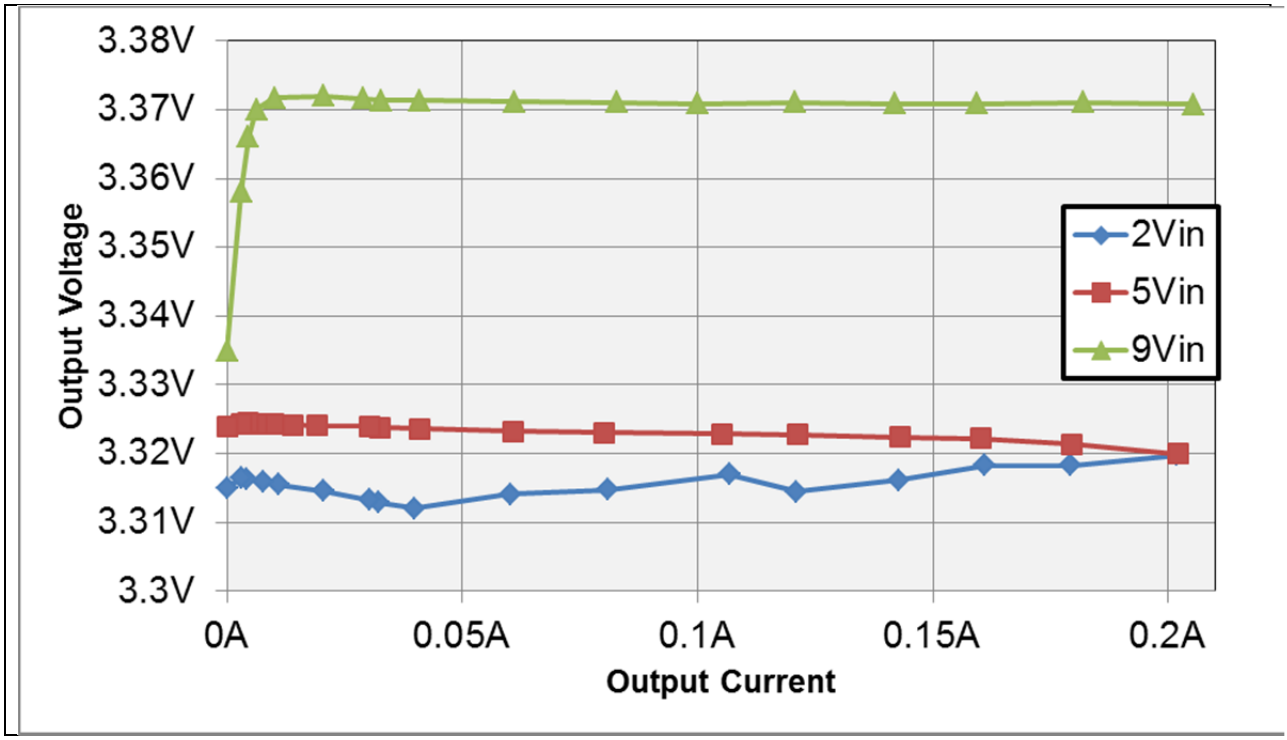


Figure 9

5 Line Regulation

The line regulation is shown in Figure 10. The output current was set about 0.2A.

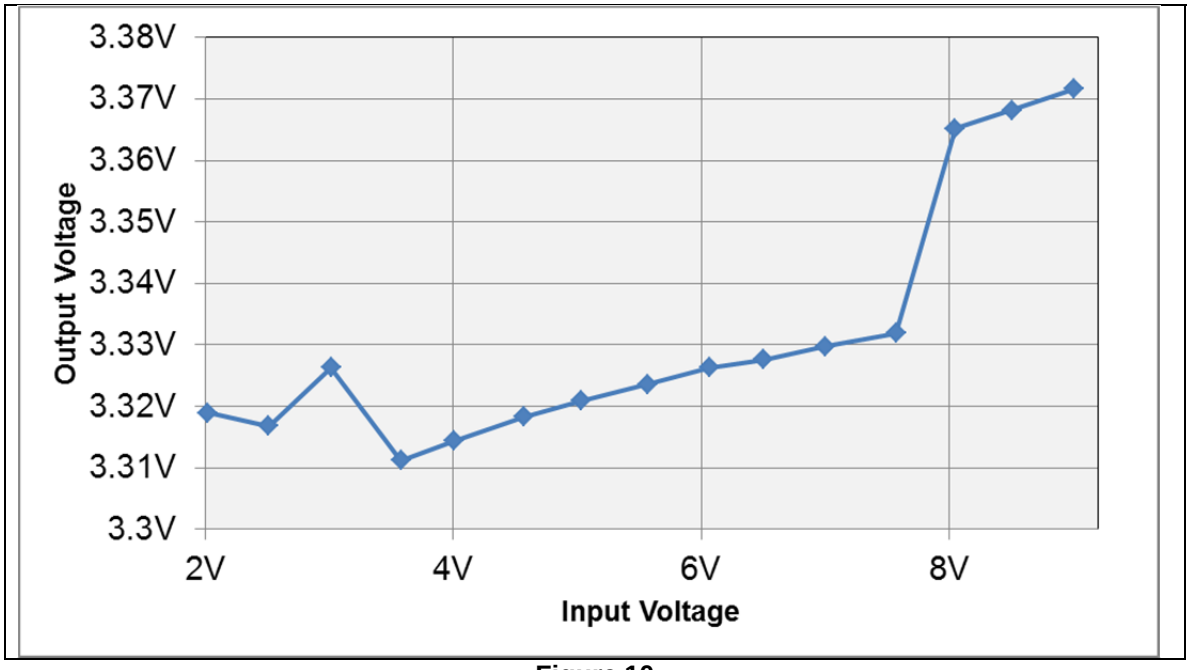


Figure 10

With the same setup efficiencies and losses were calculated. This is shown in Figure 11

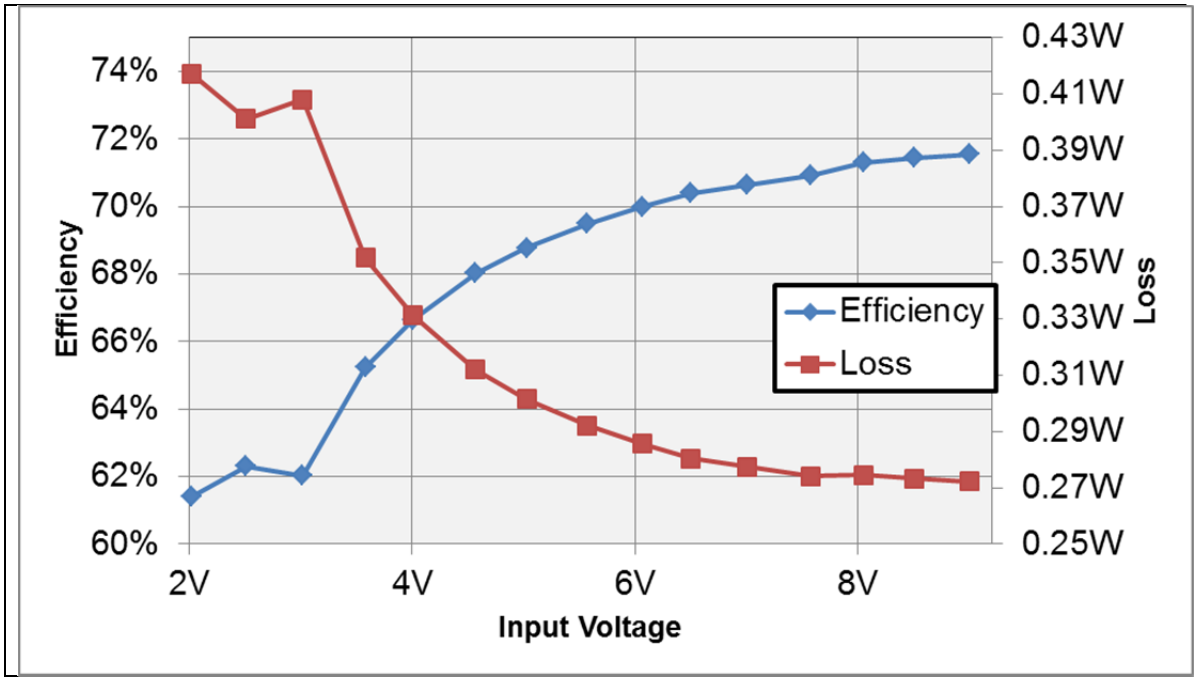
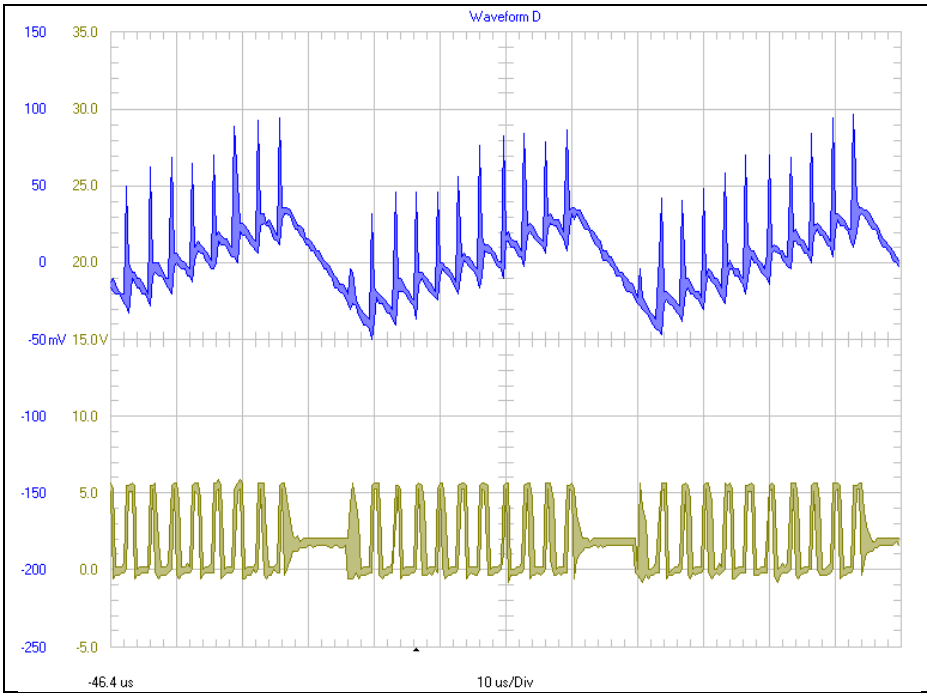


Figure 11

6 Output Ripple Voltage

The output ripple voltage is shown in Figure 12. Input voltage was set to 2V

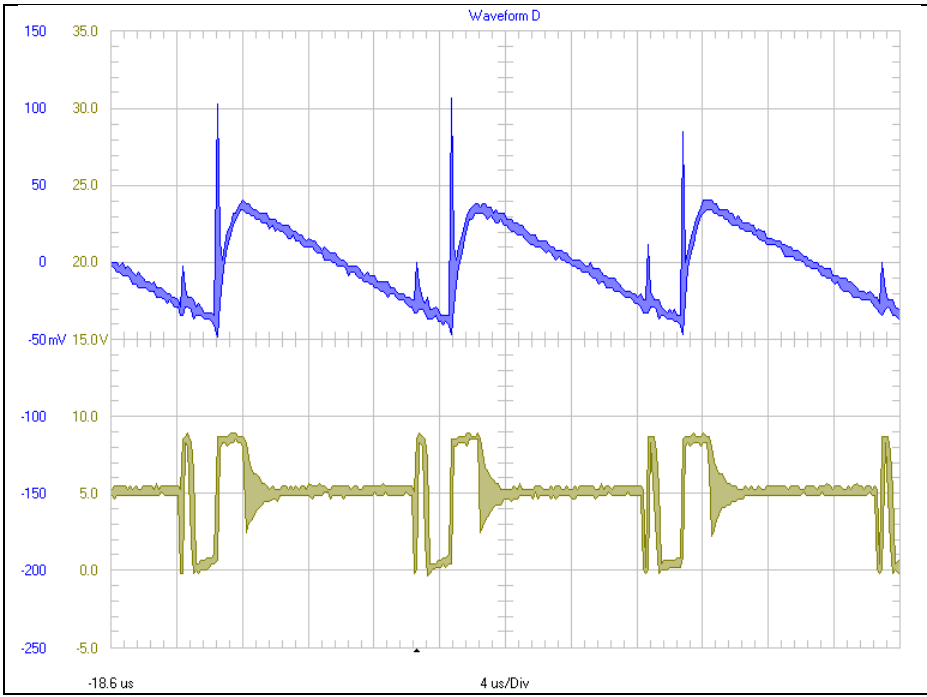


Ch1 => output ripple
50mV/div
AC coupled

Ch2 => SW
5V/div
20MHz bw
10µs/div

Figure 12 – the hysteretic mode could be seen here

The output ripple voltage is shown in Figure 13. Input voltage was set to 5V

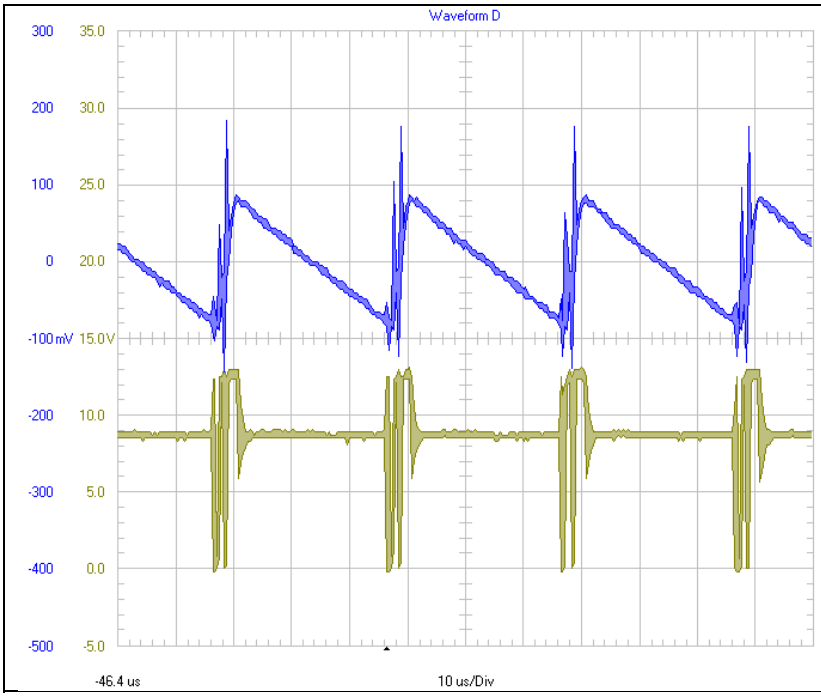


Ch1 => output ripple
50mV/div
AC coupled

Ch2 => SW
5V/div
20MHz bw
4µs/div

Figure 13

The output ripple voltage is shown in Figure 14. Input voltage was set to 9V



Ch1 => output ripple
100mV/div

AC coupled

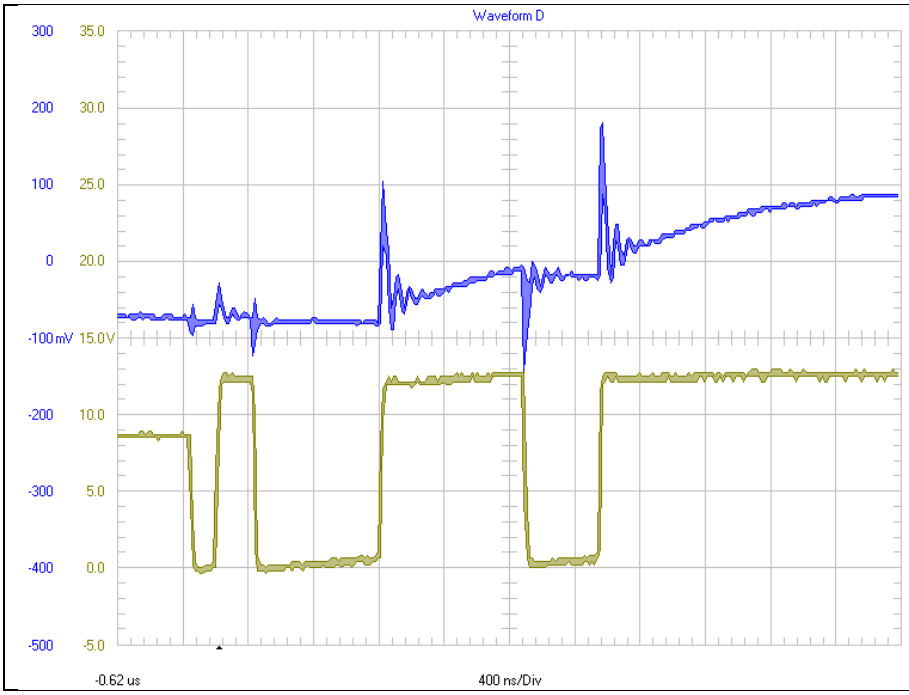
Ch2 => SW
5V/div

20MHz bw

10µs/div

Figure 14

Figure 15. shows a detail of Figure 14



Ch1 => output ripple
100mV/div

AC coupled

Ch2 => SW
5V/div

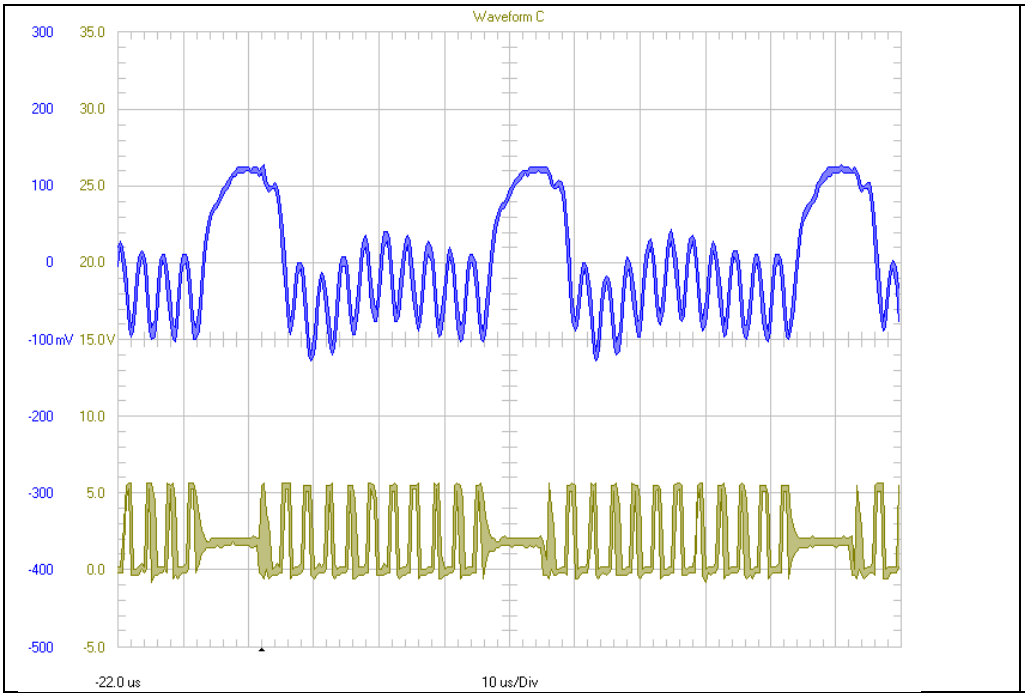
20MHz bw

400ns/div

Figure 15

7 Input Ripple Voltage

The input ripple voltage is shown in Figure 16. Input voltage was set to 2V.



Ch1 => input ripple
100mV/div

AC coupled

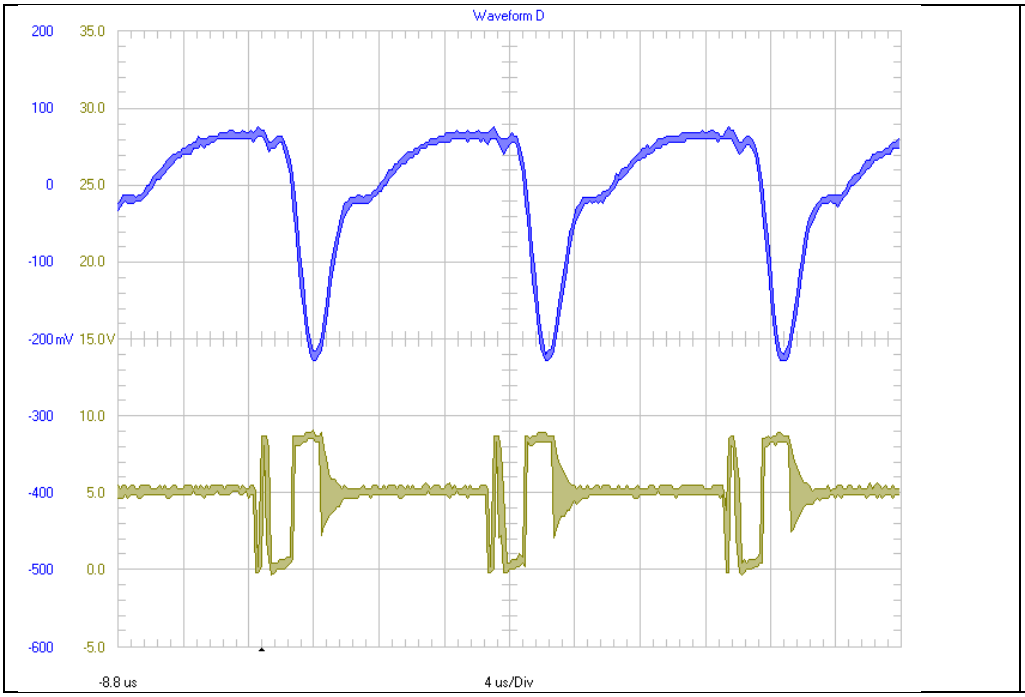
Ch2 => SW
5V/div

20MHz bw

10µs/div

Figure 16

The input ripple voltage is shown in Figure 17. Input voltage was set to 5V.



Ch1 => input ripple
100mV/div

AC coupled

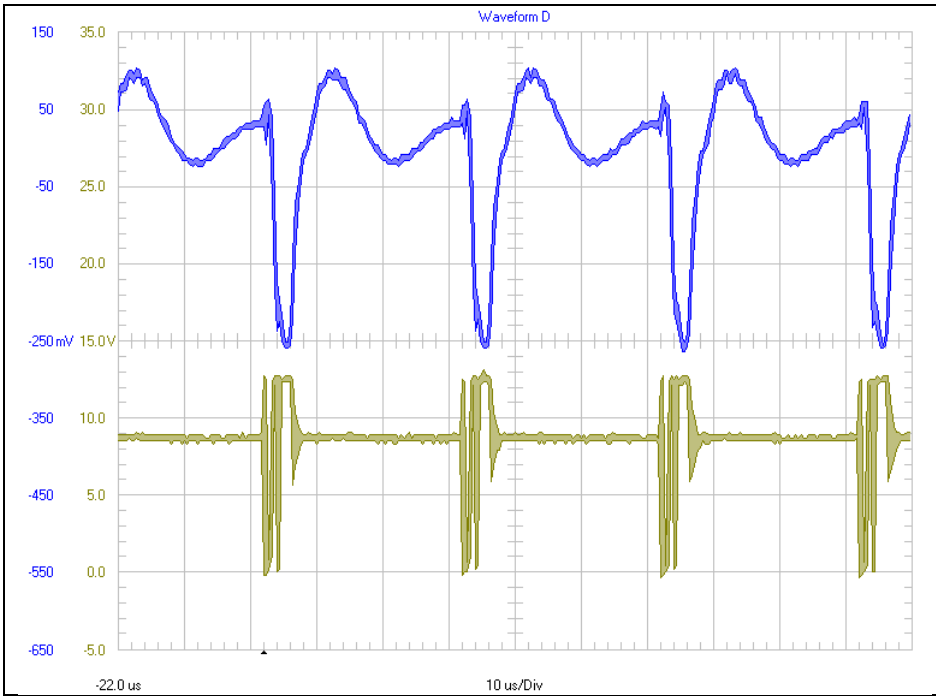
Ch2 => SW
5V/div

20MHz bw

4µs/div

Figure 17

The input ripple voltage is shown in Figure 18. Input voltage was set to 9V.



Ch1 => input ripple 100mV/div

AC coupled

Ch2 => SW 5V/div

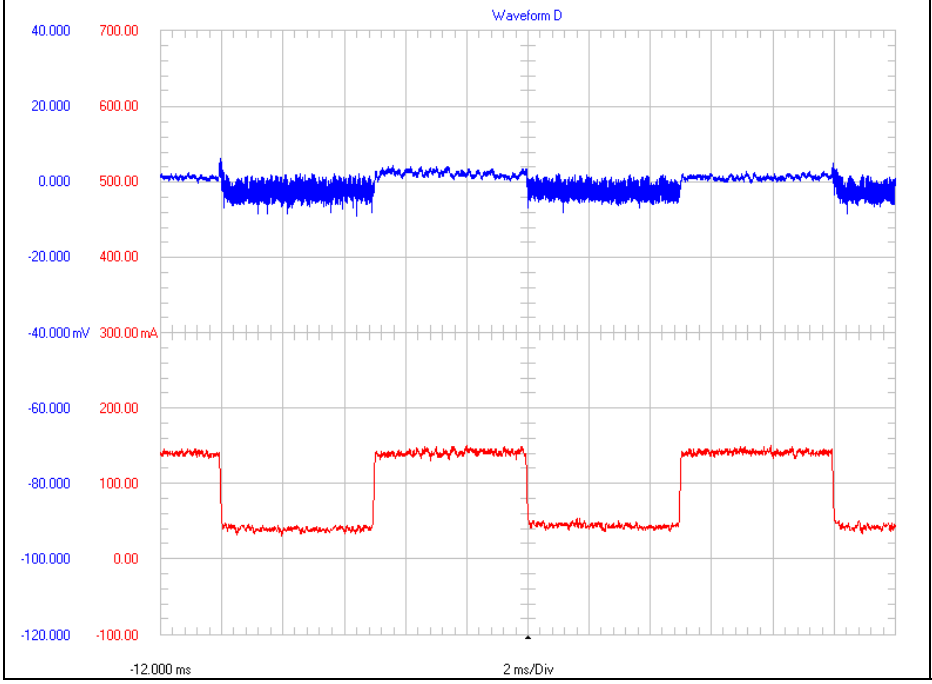
20MHz bw

10µs/div

Figure 18

8 Load Transients

The Figure 19 shows the response to load transients for 2V input voltage. The load is switching from 0.05A to 0.15A (100Hz). Electronic load was used



Ch1 => output voltage
20mV/div
AC coupling

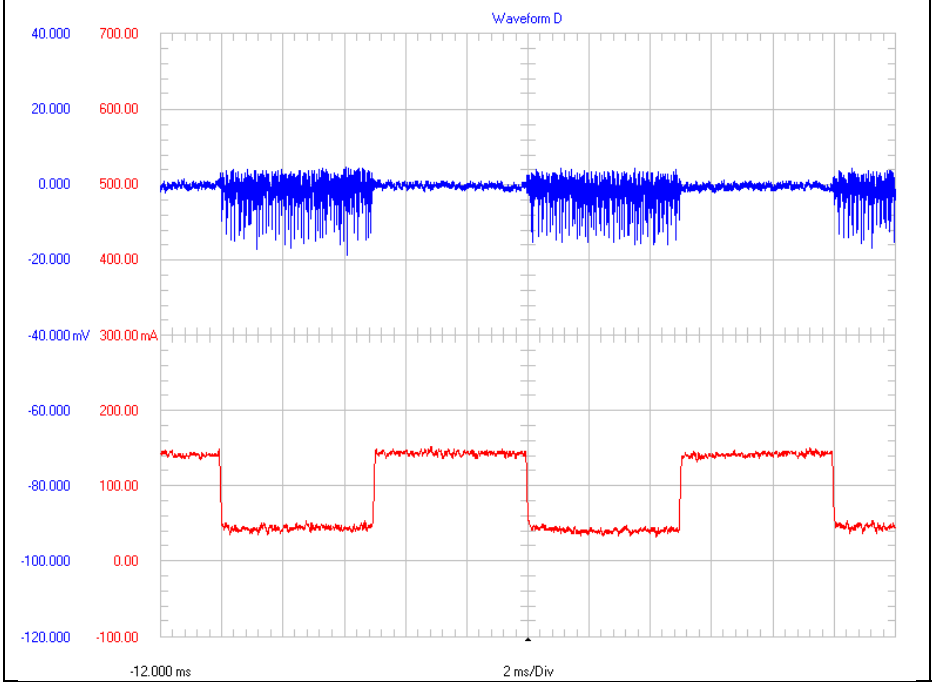
Ch2 => output current 100mA/div

10kHz bw

2ms/div

Figure 19 – the OPEN LOOP control architecture provides fine transient response

The Figure 19 shows the response to load transients for 5V input voltage. The load is switching from 0.05A to 0.15A (100Hz) Electronic load was used



Ch1 => output voltage
20mV/div
AC coupling

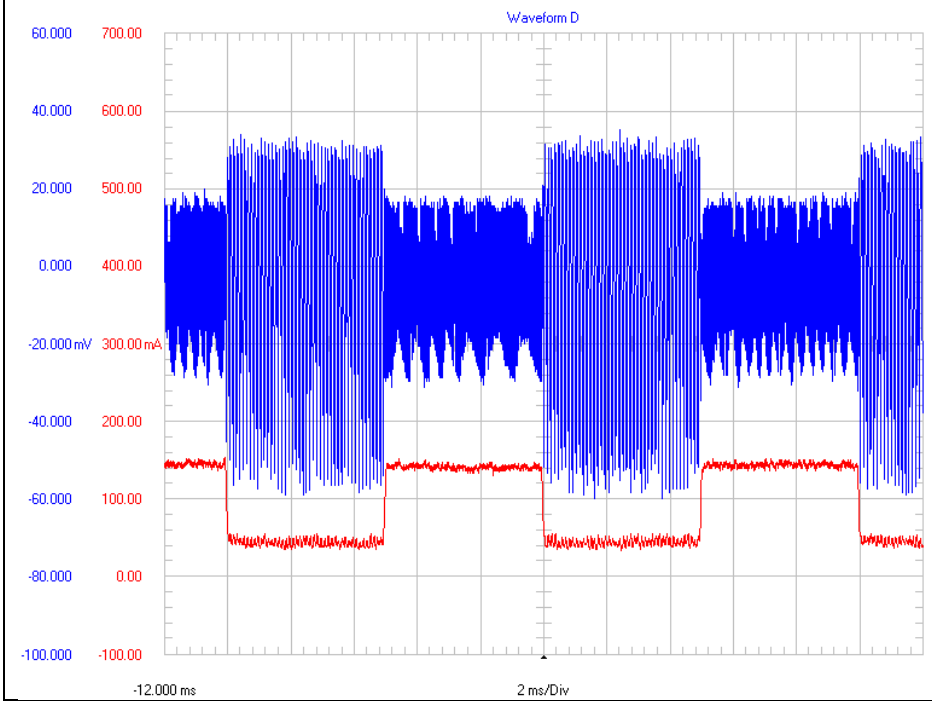
Ch2 => output current 100mA/div

10kHz bw

2ms/div

Figure 20

The Figure 21 shows the response to load transients for 9V input voltage. The load is switching from 0.05A to 0.15A (100Hz). Electronic load was used



Ch1 => output voltage 20mV/div

Ch2 => output current 100mA/div

10kHz bw

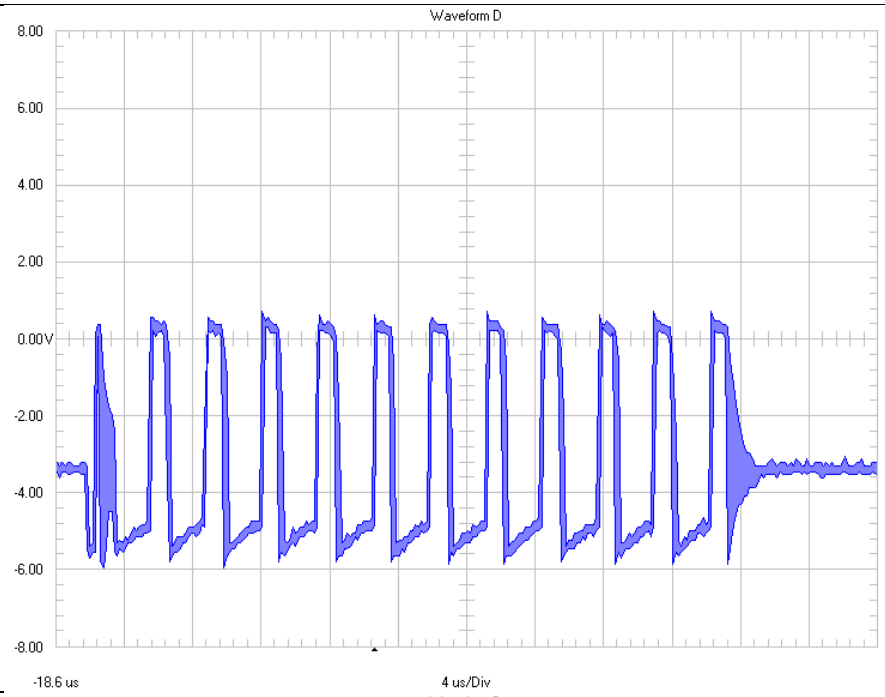
2ms/div

Figure 21

9 Miscellaneous Waveforms

9.1 Diode D2 (referenced to VOUT)

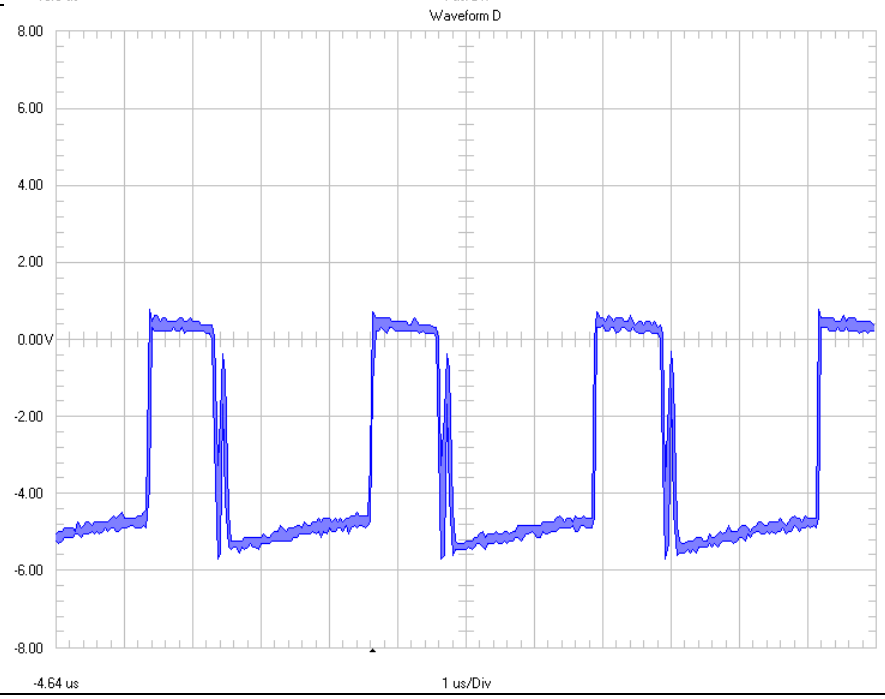
The waveform of the voltage on diode D2 is shown in Figure 22. Input voltage was set to 2V.



Ch1 =>
2V/div

4µs/div

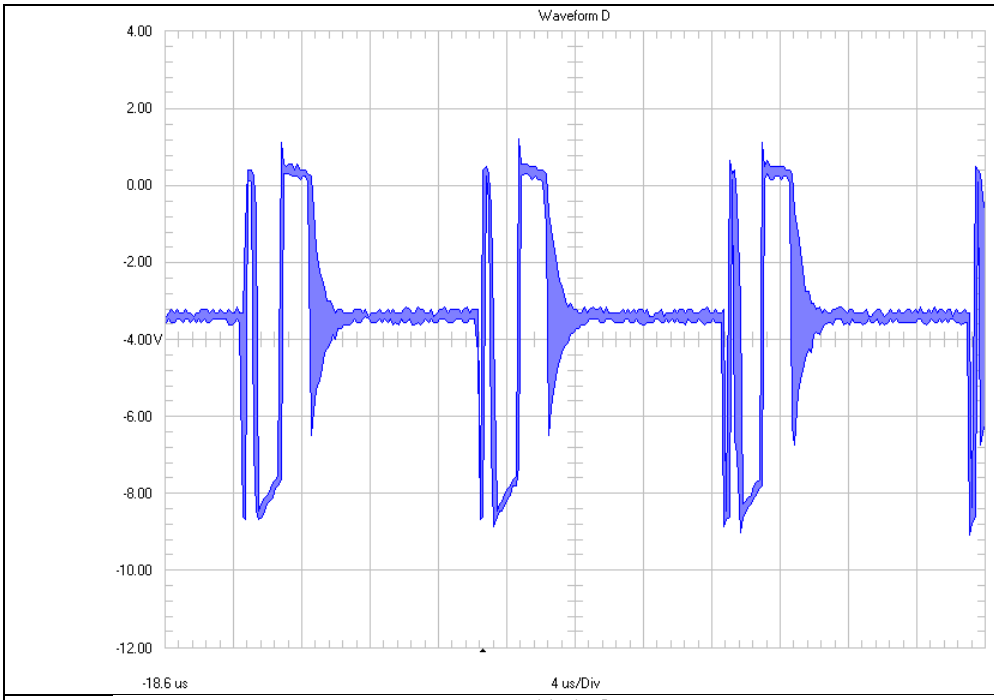
full bandwidth



Ch1 =>
2V/div
1µs/ div

Figure 22

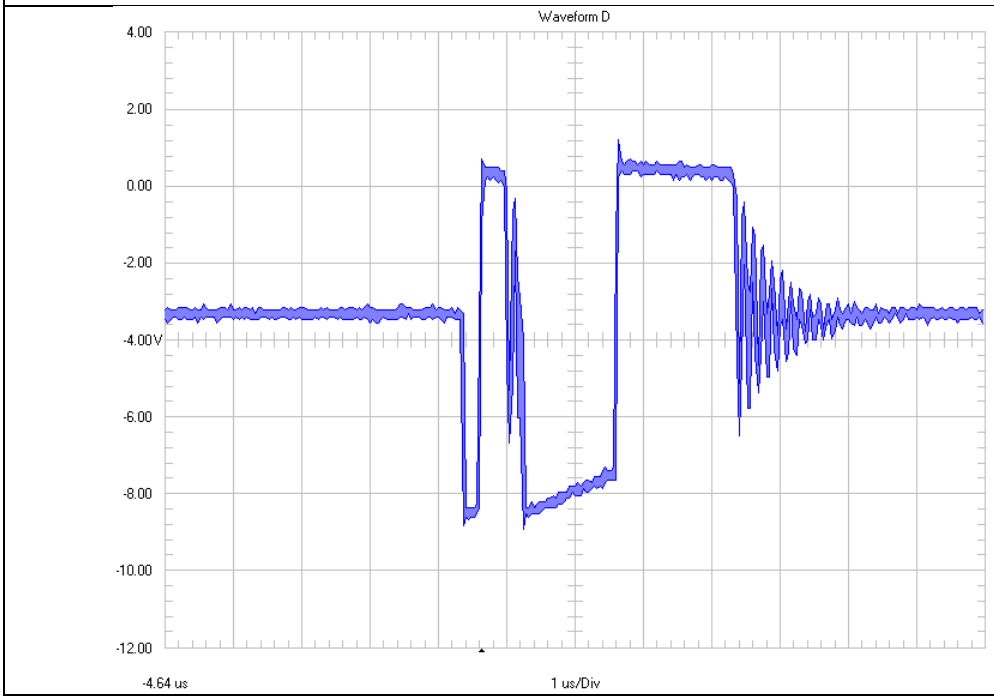
The waveform of the voltage on diode D2 is shown in Figure 23. Input voltage was set to 5V.



Ch1 =>
2V/div

4µs/div

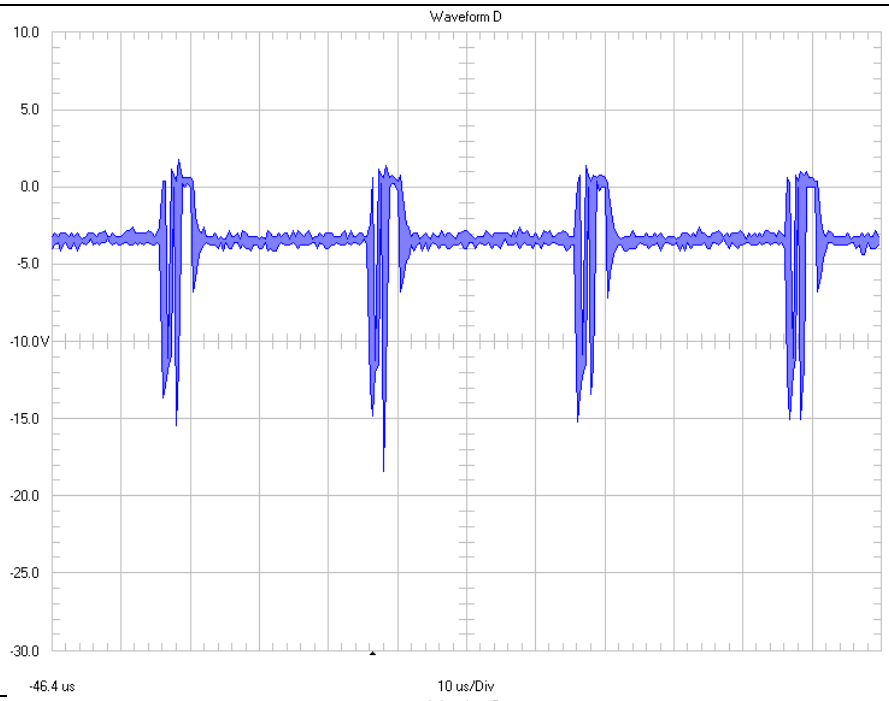
full bandwidth



Ch1 =>
2V/div
1µs/div

Figure 23

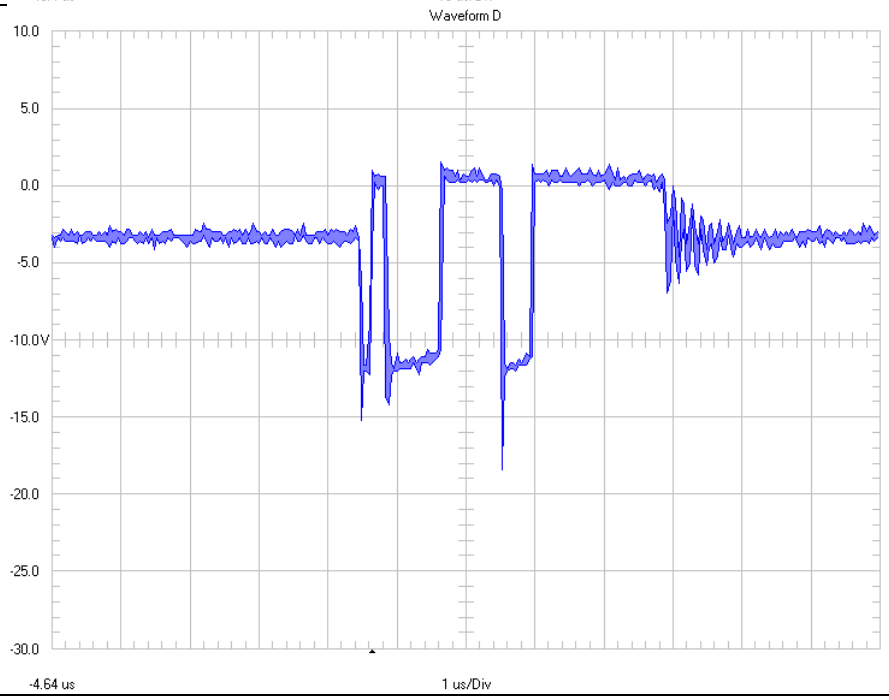
The waveform of the voltage on the diode D2 is shown in Figure 24. Input voltage was set to 9V.



Ch1 =>
5V/div

10µs/div

full bandwidth



Ch1 =>
5V/div
1µs/div

Figure 24

9.2 Switchnode (SW-GND)

The waveform of the voltage is shown in Figure 25. Input voltage was set to 2V.

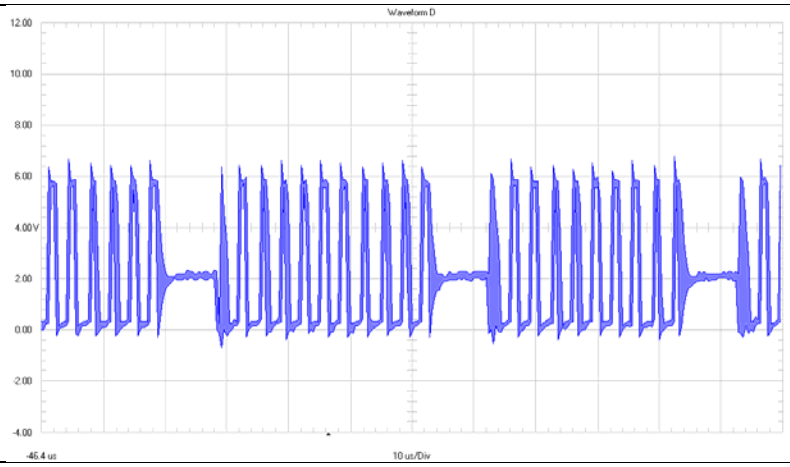
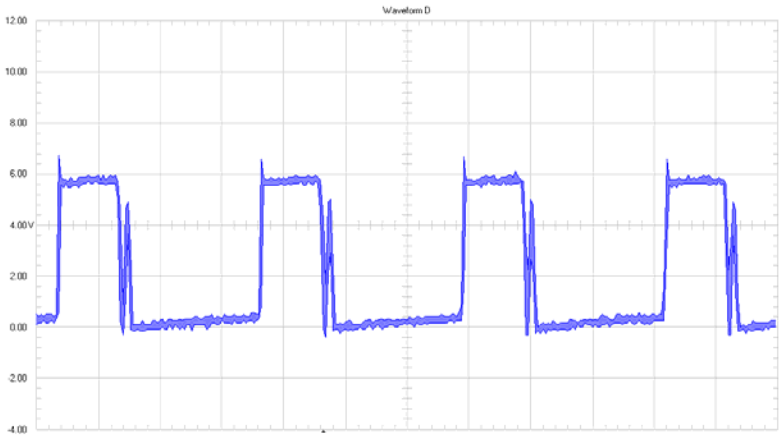
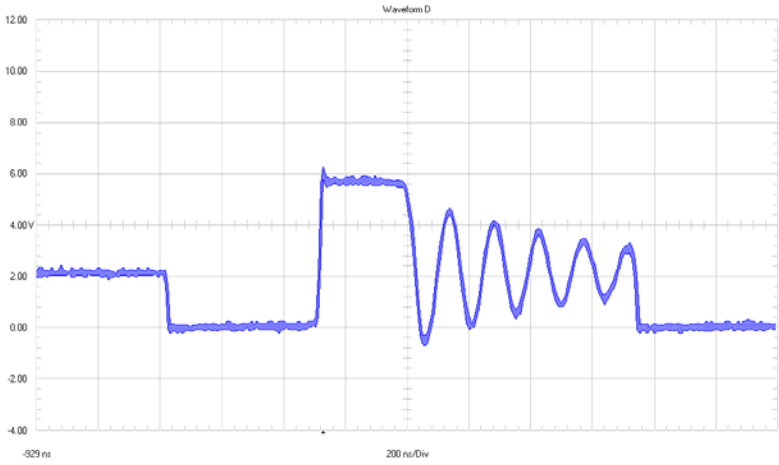
	Ch1 => 2V/div 10µs/div full bandwidth
	Ch1 => 2V/div 1µs/div
	Ch1 => 2V/div 200ns

Figure 25

The waveform of the voltage is shown in Figure 26. Input voltage was set to 5V.

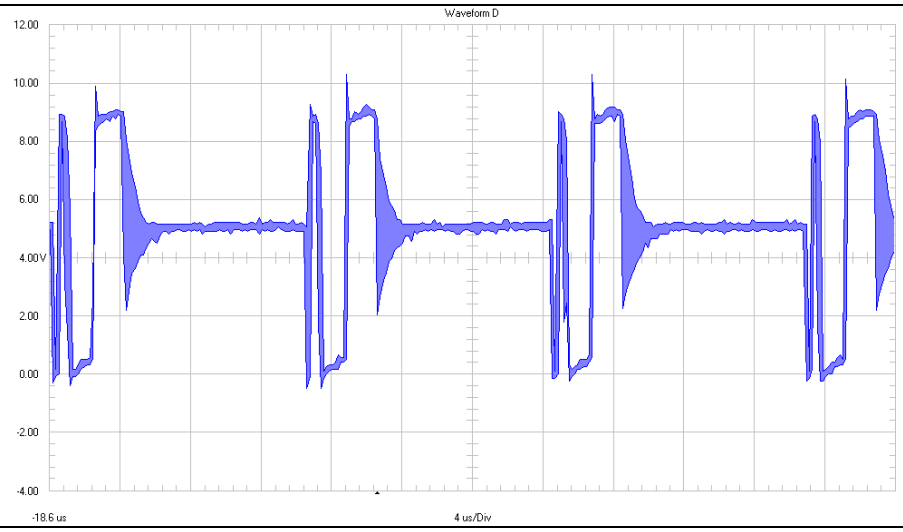
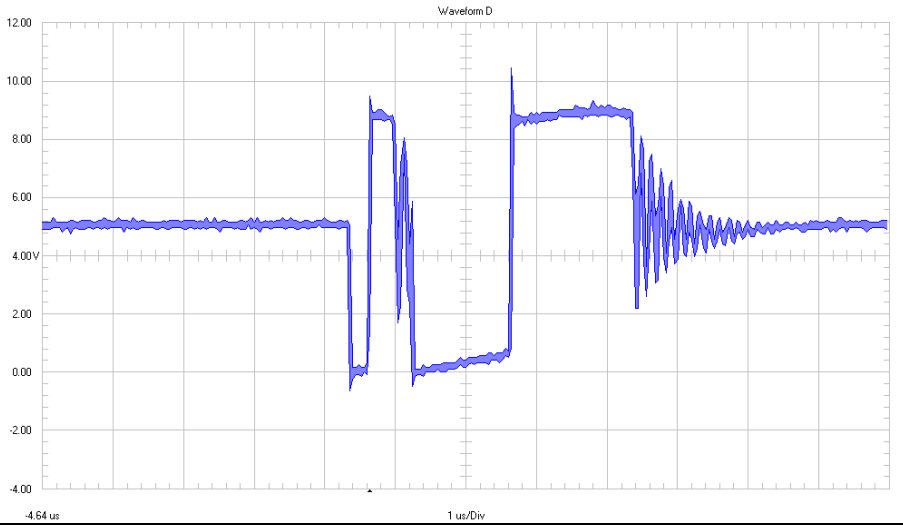
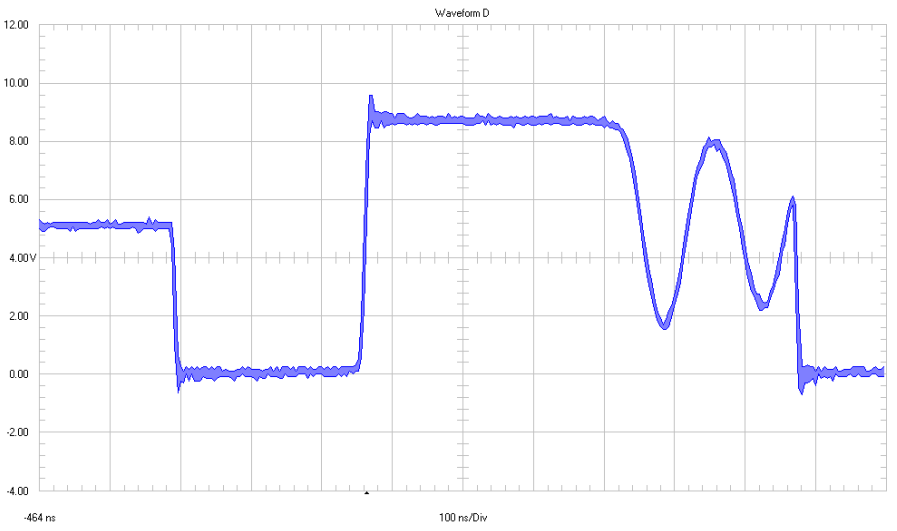
	Ch1 => 2V/div 4µs/div full bandwidth
	Ch1 => 2V/div 1µs/ div
	Ch1 => 2V/div 100ns/ div

Figure 26 – the SEPIC itself runs in discontinous mode DCM

The waveform of the voltage is shown in Figure 27. Input voltage was set to 9V.

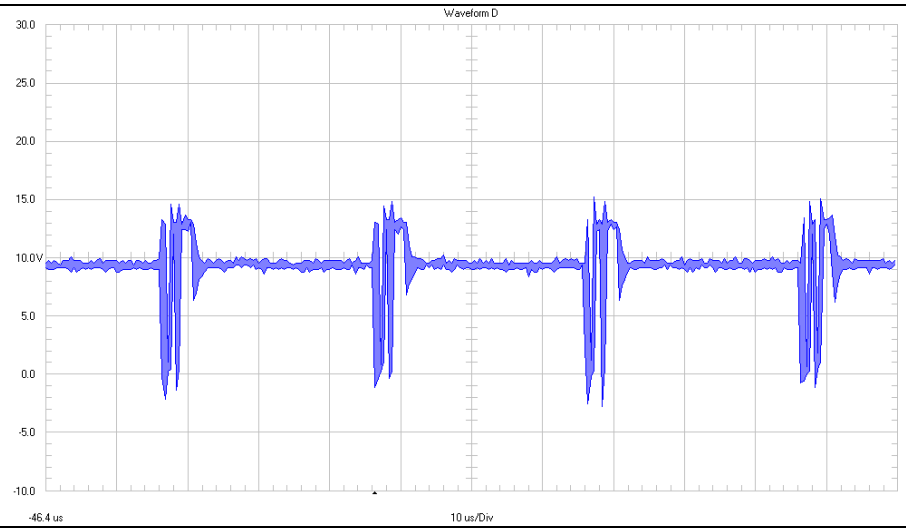
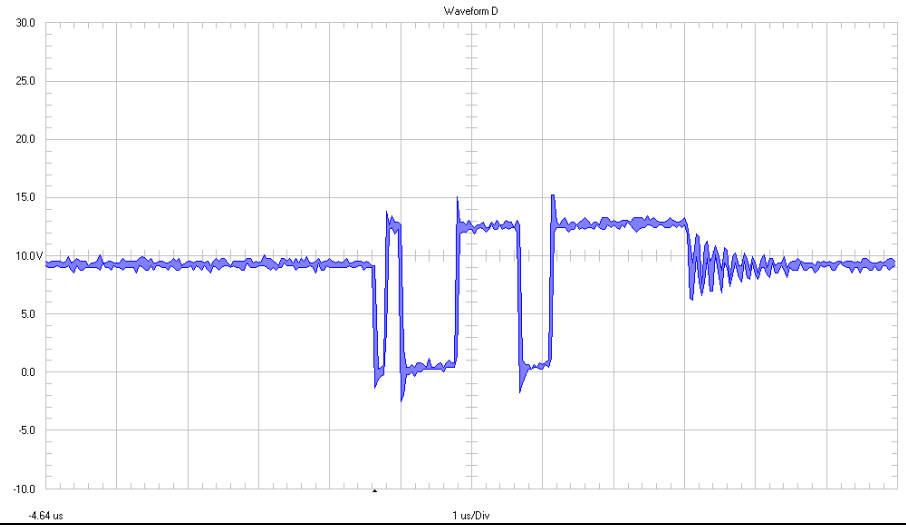
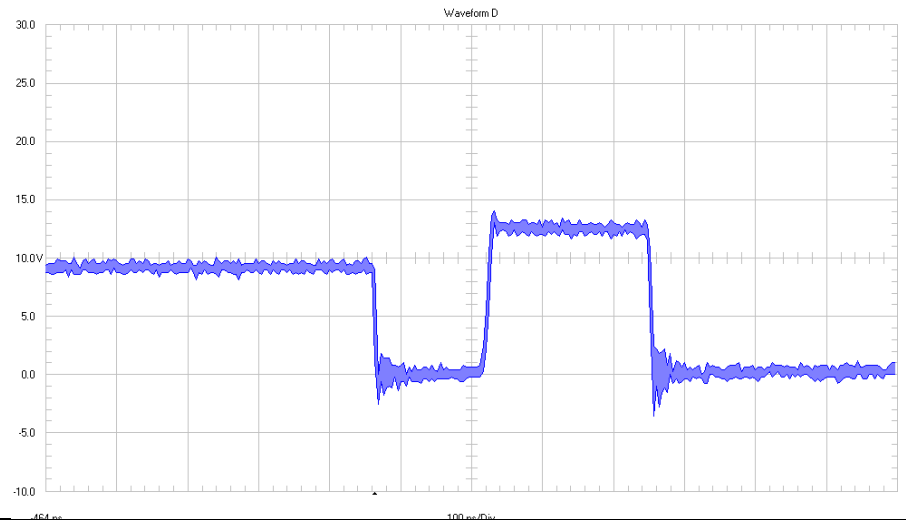
	Ch1 => 5V/div 10µs/div full bandwidth
	Ch1 => 5V/div 1µs/div
	Ch1 => 5V/div 100ns/div

Figure 27

10 Thermal Image

Figure 28 shows the thermal image at 5V input voltage and 0.2A output current.

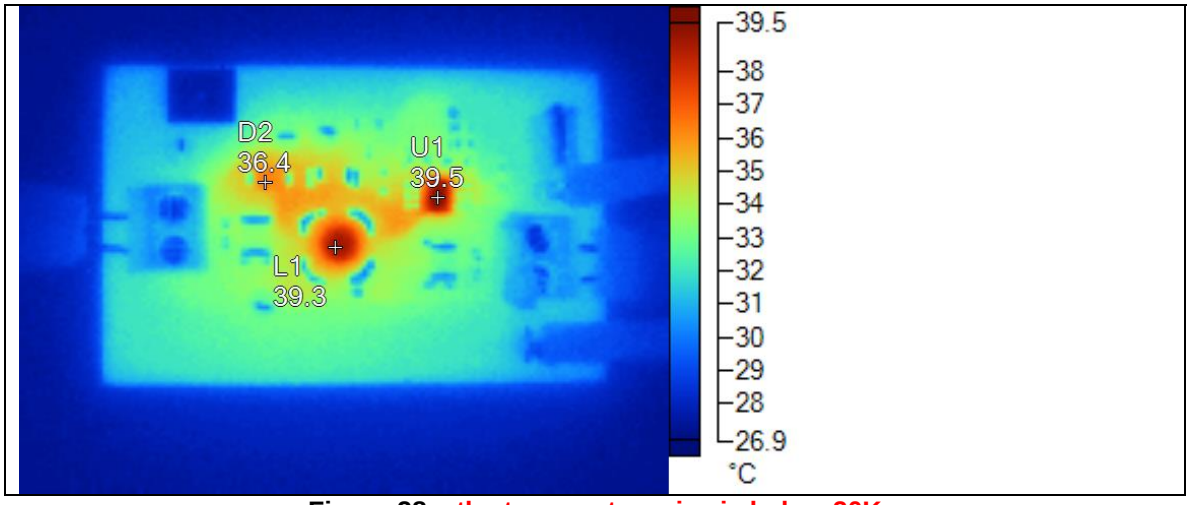


Figure 28 – the temperature rise is below 20K

Name	Temperature
U1	39.5°C
L1	39.3°C
D2	36.4°C

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