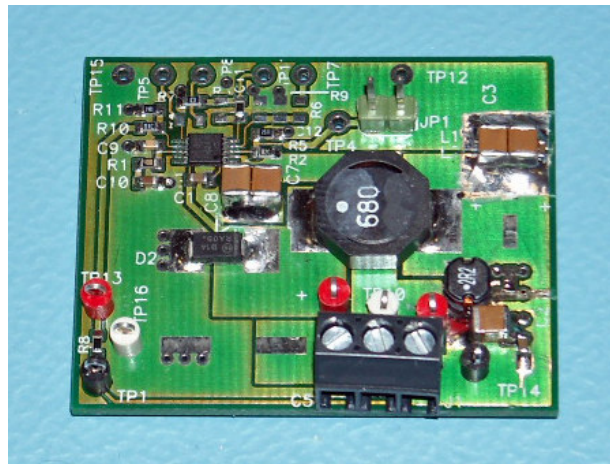


Inverting Buck-Boost with -6.5V @ 400mA

- Input 9..16V DC
- Output -6.5V @ 400mA
- Converter TPS54260
- Working in continuous conduction mode
- Post-Filter is optional
- Built on PCB PMP2763 Rev.A



1 Startup

The startup waveform is shown in Figure 1. The input voltage is set at 12V, with no load on the -6.5V output.

- Channel C1: **Input voltage**
5V/div, 2ms/div
- Channel C2: **Output voltage**
2V/div, 2ms/div

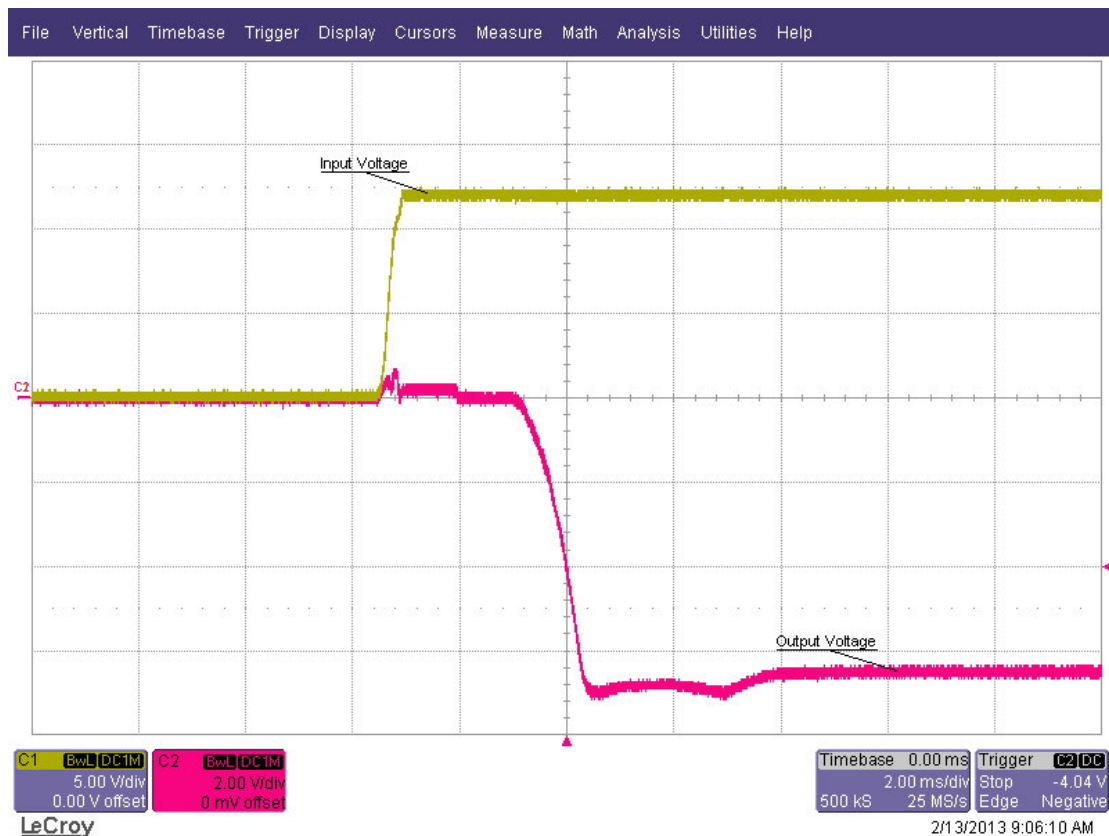


Figure 1

2 Shutdown

The shutdown waveform is shown in Figure 2. The input voltage is set at 12V with a 0.4A load on the -6.5V output.

- Channel C1: **Input voltage**
5V/div, 2ms/div
- Channel C2: **Output voltage**
2V/div, 2ms/div

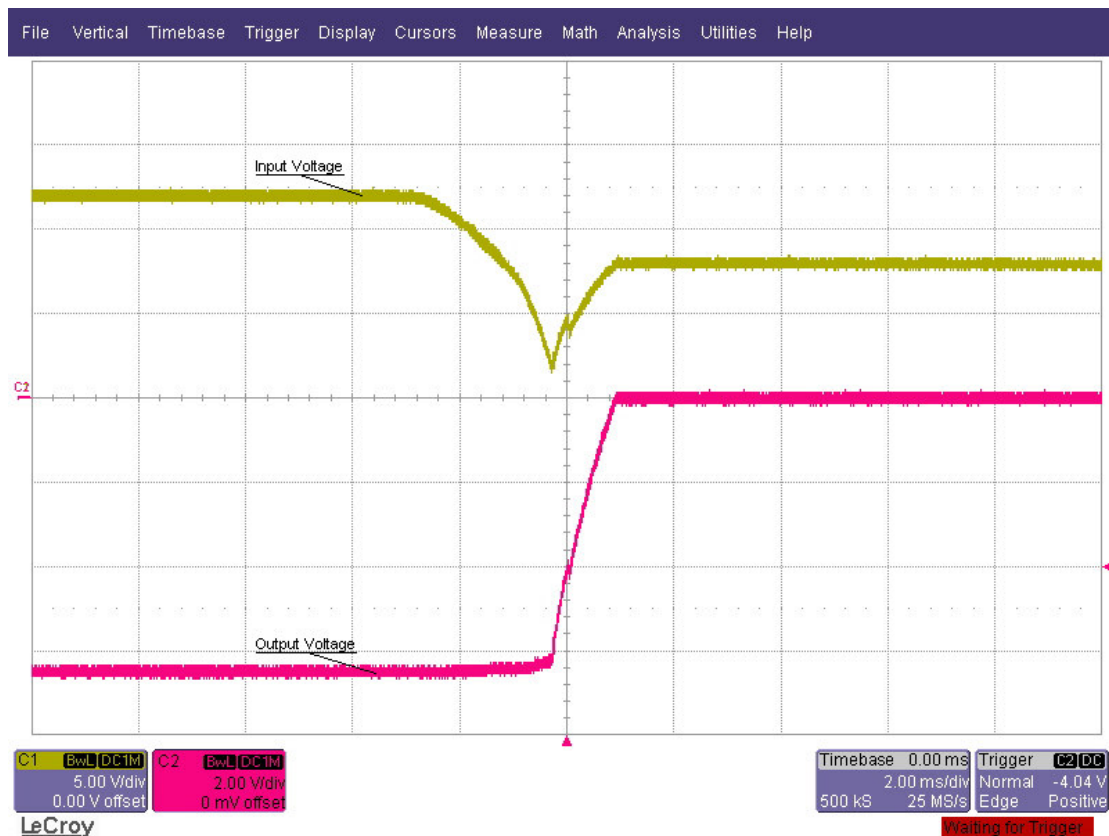


Figure 2

3 Efficiency

The efficiency and load regulation at 12V input voltage are shown in Figure 3 and Figure 4.

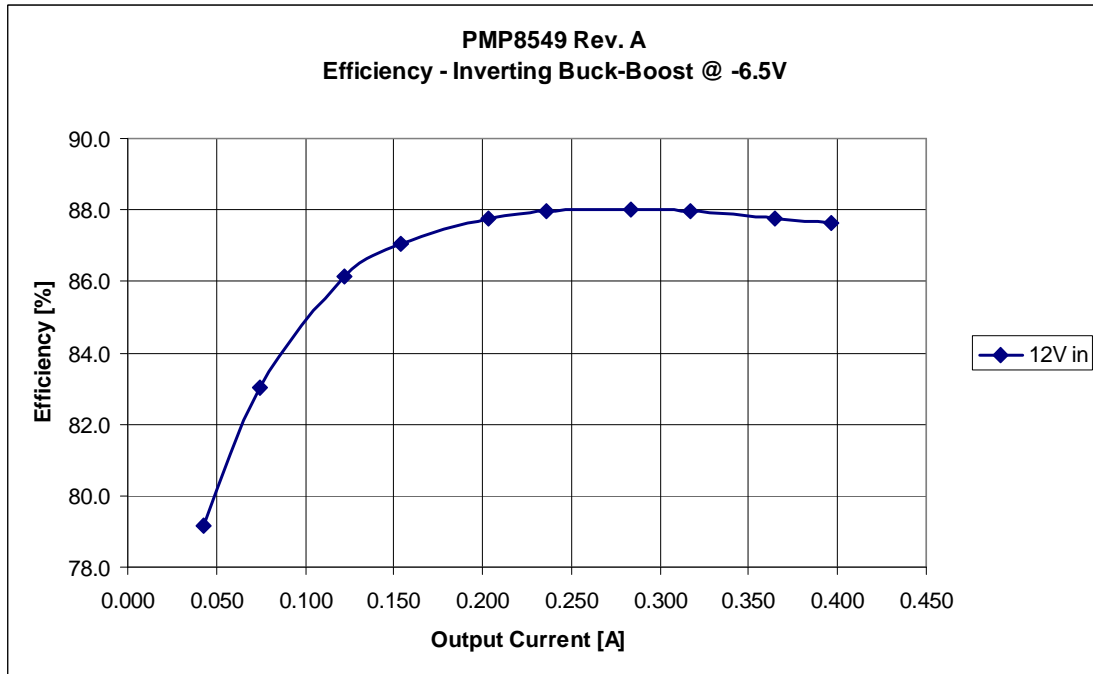


Figure 3

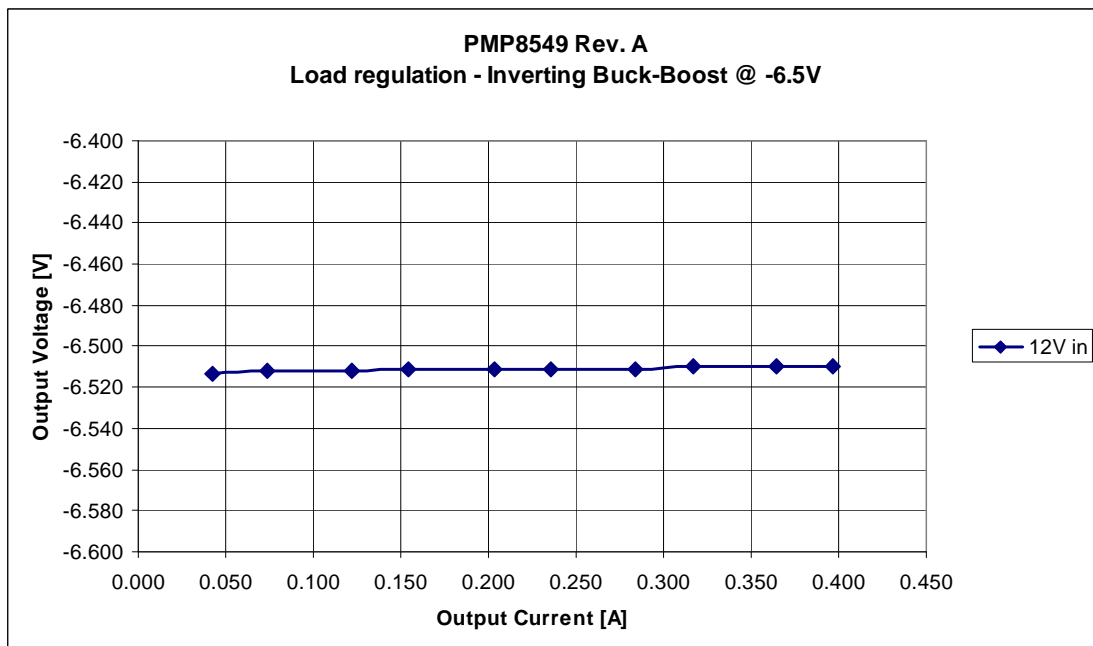


Figure 4

4 Output ripple voltage

The output ripple voltage at 9V, 12V and 16V input voltage are shown in Figure 5 and **Error! Reference source not found..**

Figure 5 shows the voltage before the post-filter, **Error! Reference source not found.** after it.

Figure 5 (before post-filter)

Channel M1: **Output voltage**, AC coupled, 12mV peak-peak @ 9V input voltage
20mV/div, 5us/div

Channel M2: **Output voltage**, AC coupled, 12mV peak-peak @ 12V input voltage
20mV/div, 5us/div

Channel M3: **Output voltage**, AC coupled, 11mV peak-peak @ 16V input voltage
20mV/div, 5us/div

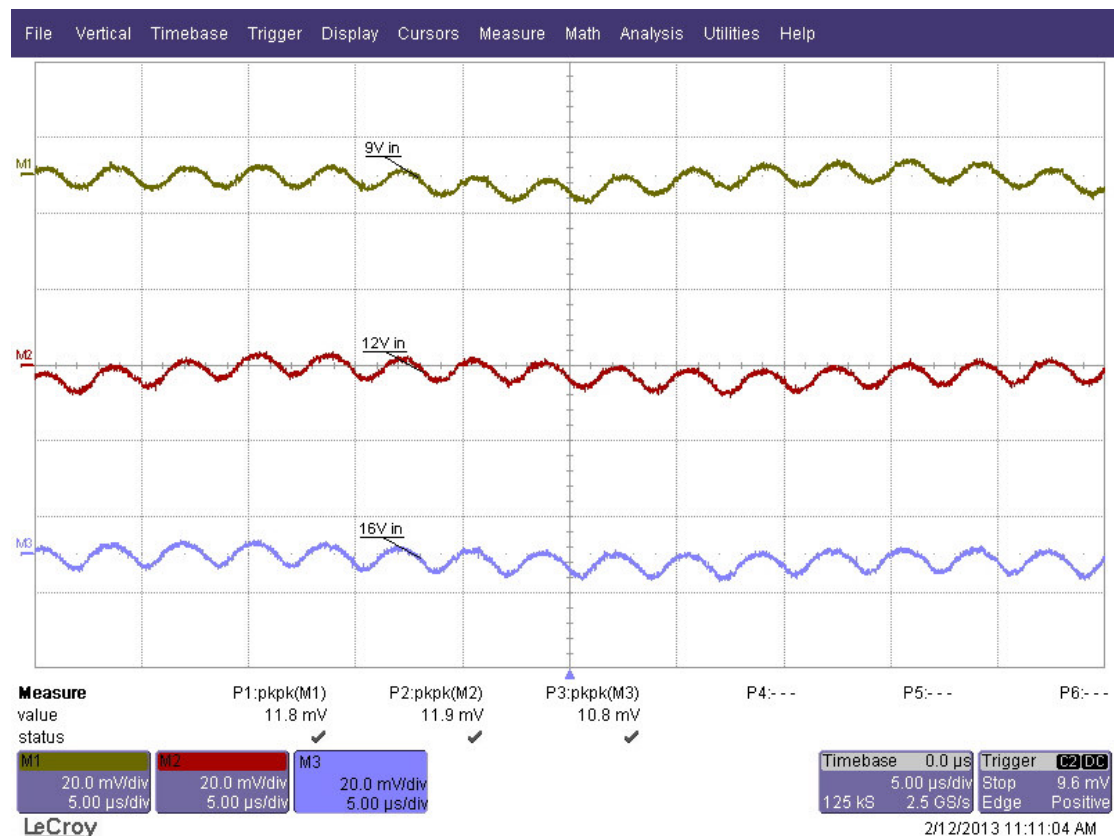


Figure 5

Figure 6 (after post-filter)

Channel M1: **Output voltage**, AC coupled, 10mV peak-peak @ 9V input voltage
20mV/div, 5us/div

Channel M2: **Output voltage**, AC coupled, 10mV peak-peak @ 12V input voltage
20mV/div, 5us/div

Channel M3: **Output voltage**, AC coupled, 10mV peak-peak @ 16V input voltage
20mV/div, 5us/div

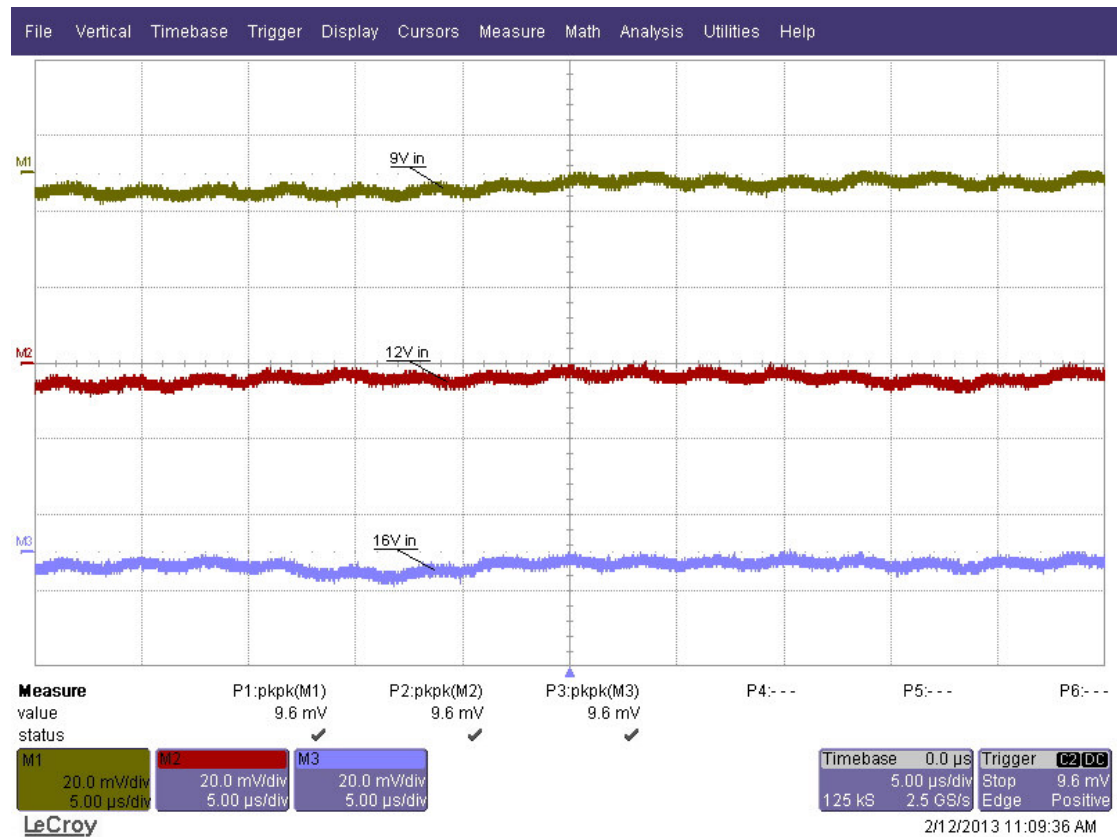


Figure 6

5 Load step

The response to a load step and a load dump after the post-filter at an input voltage of 12V is shown in Figure 7.

Channel C2: **Output voltage**, -408mV undershoot, 408mV overshoot
 500mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 0.2A to 0.4A
 0.2A/div, 1ms/div

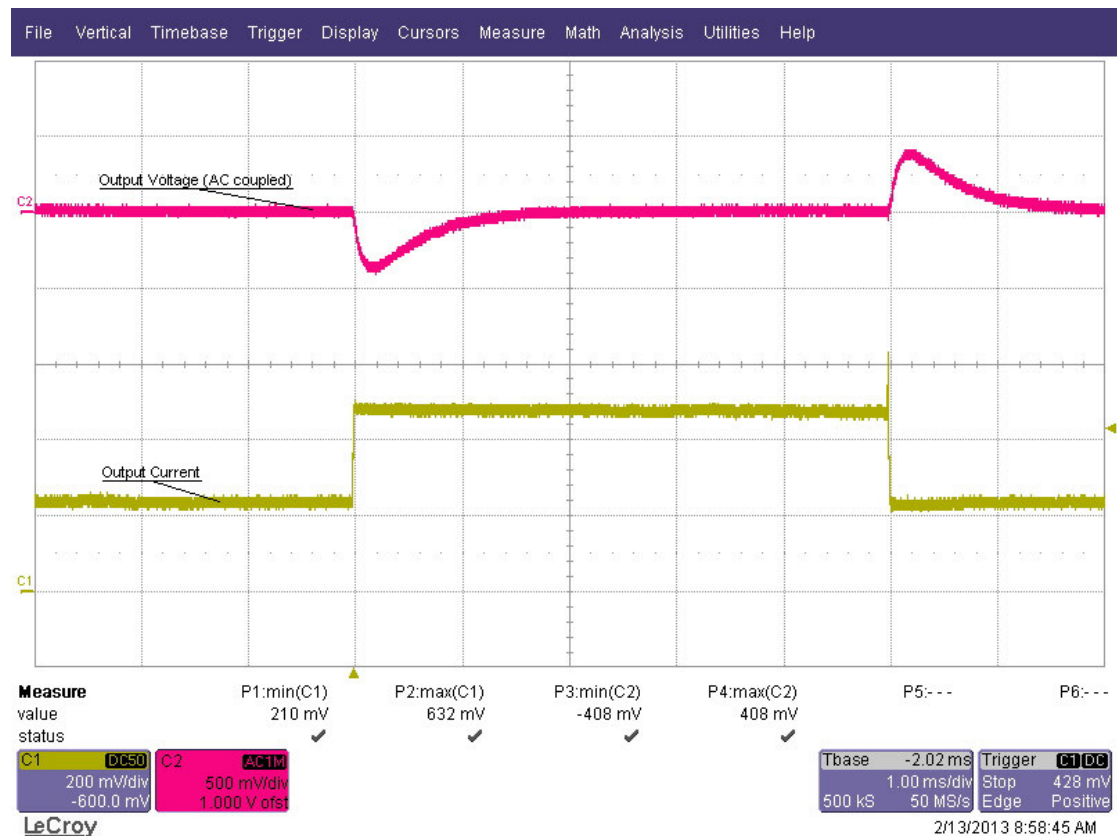


Figure 7

6 Frequency response

Figure 8 shows the loop response of the -6.5V output with 9V, 12V and 16V V input voltage and a 0.4A load.

9V input

- 71 deg phase margin @ crossover frequency 1.4 kHz
- -22 db gain margin

12V input

- 71 deg phase margin @ crossover frequency 1.6 kHz
- -21 db gain margin

16V input

- 70 deg phase margin @ crossover frequency 1.9 kHz
- -21 db gain margin

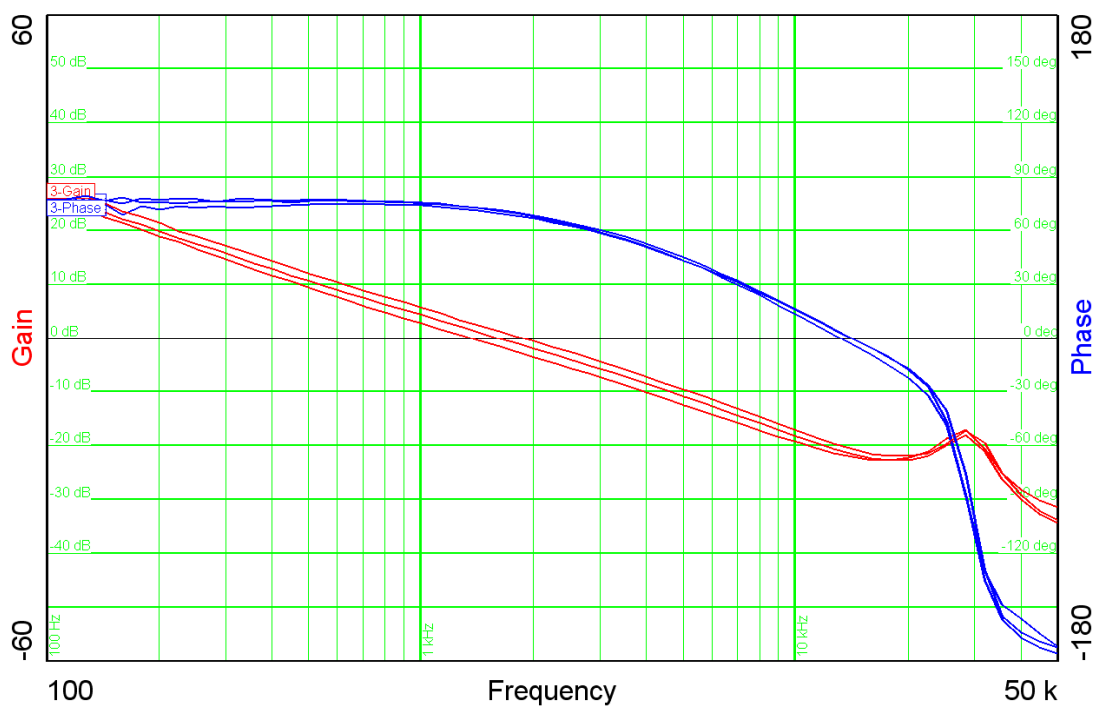


Figure 8

7 Switching Node

The drain-source voltage on the switching node is shown in Figure 9. The image was captured with 9V input and a 0.4A load.

Channel C2: **Drain-source voltage**, -1.4V minimum voltage, 16.6V maximum voltage
5V/div, 2us/div

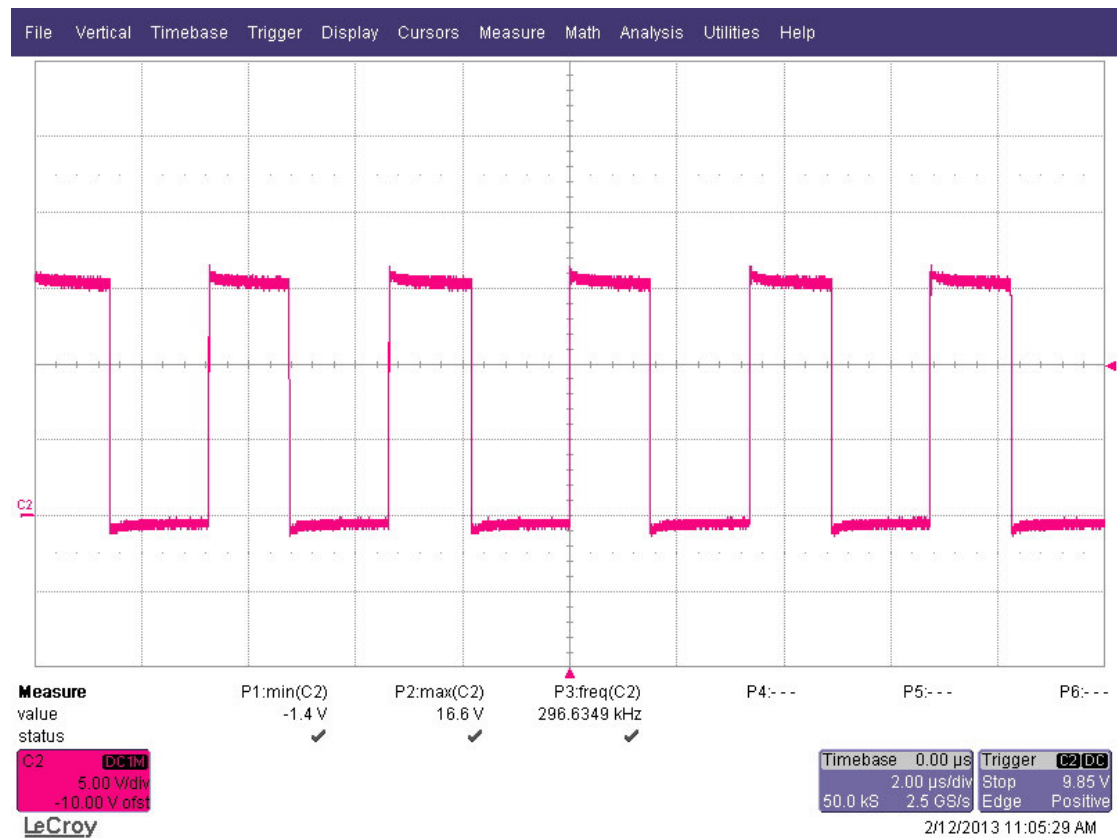


Figure 9

8 Thermal measurement

The thermal image (Figure 10) shows the circuit at an ambient temperature of 21 °C with an input voltage of 12.0V and a load of 0.4A.

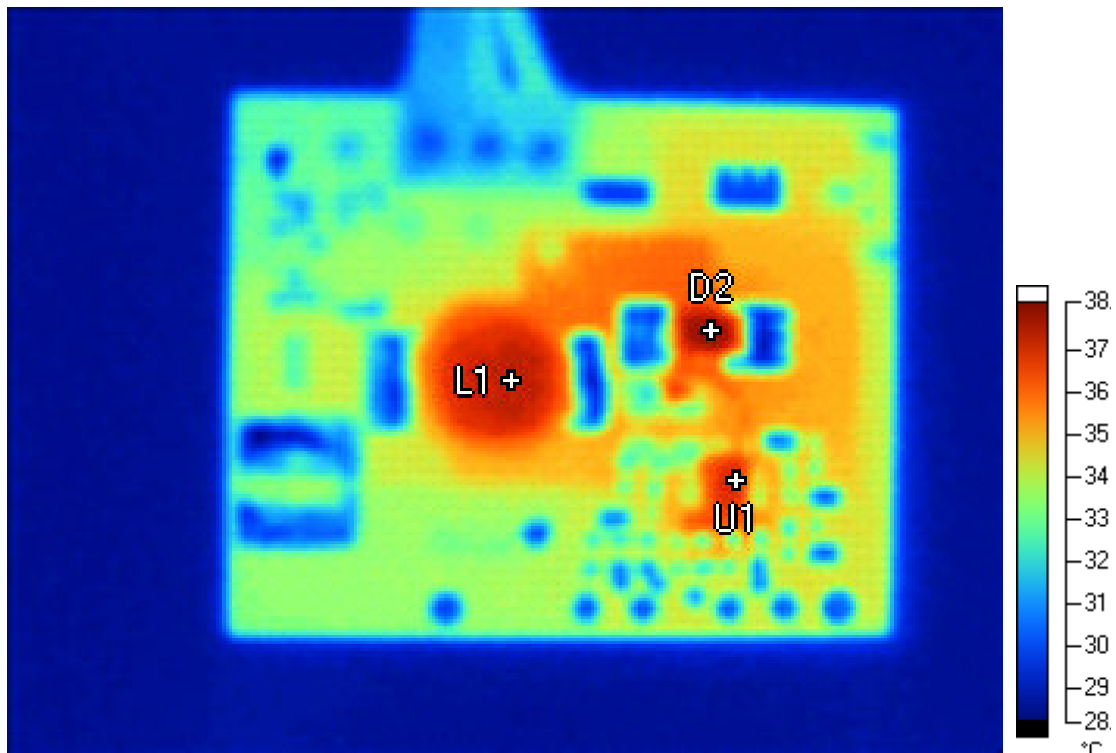


Figure 10

Markers

Label	Temperature	Emissivity	Background
L1	37.4 °C	0.95	21.0 °C
D2	38.0 °C	0.95	21.0 °C
U1	37.2 °C	0.95	21.0 °C

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