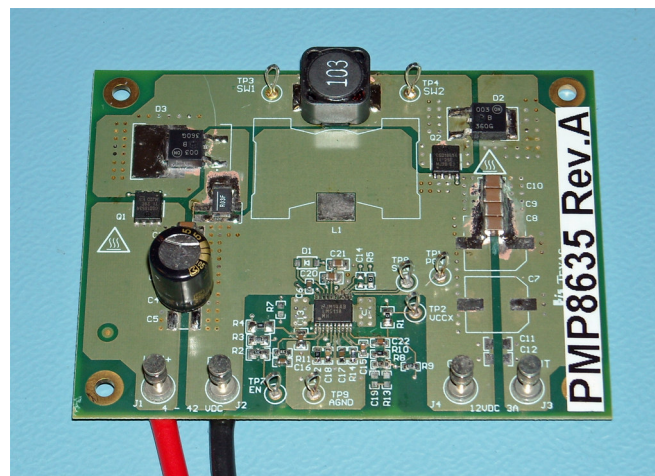


Automotive Buck-Boost with 8.0V @ 1.5A / 2.5A peak

- Input 2..20V DC
- Output 5..20V input: 8.0V @ 1.5A continuous / 2.5A peak
2..5V input: 8.0V @ 0.75A / 1.0A peak
- Controller LM5118-Q1
- Free-Running switching frequency of 300 kHz
- Modified LM25118 EVM



1 Startup

The startup waveform is shown in Figure 1. The input voltage is set at 14V, with no load on the 8V output.

Channel C1: **14V Input voltage**
5V/div, 10ms/div

Channel C2: **8V Output voltage**
5V/div, 10ms/div

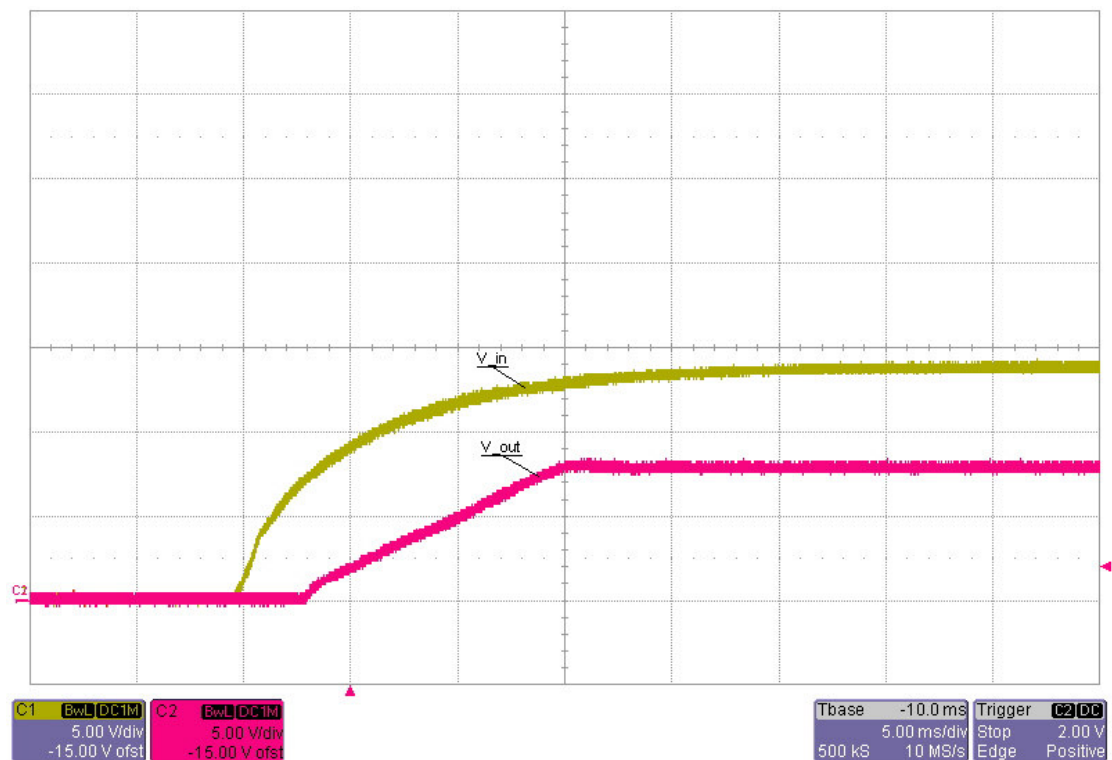


Figure 1

2 Shutdown

The shutdown waveform is shown in Figure 2. The input voltage is set at 14V with a 1.5A load on the 8V output.

Channel C1: **14V Input voltage**
5V/div, 10ms/div

Channel C2: **8V Output voltage**
5V/div, 10ms/div

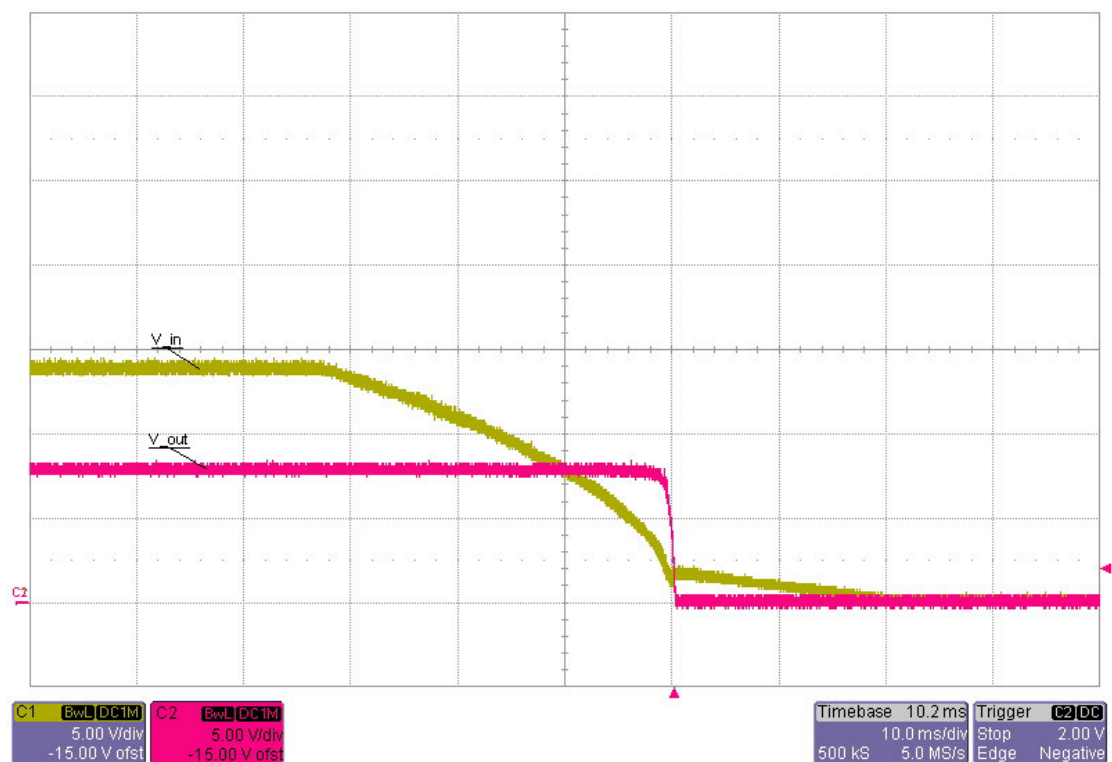


Figure 2

3 Efficiency

The efficiency and load regulation for 5..20V input voltage range are shown in Figure 3 and Figure 4.

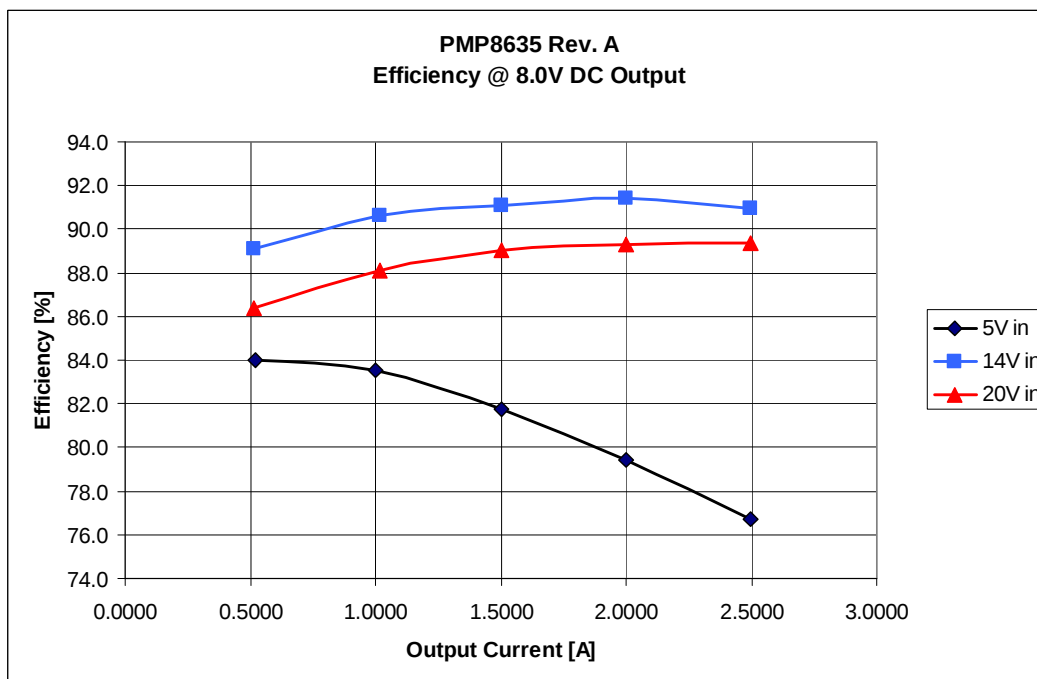


Figure 3

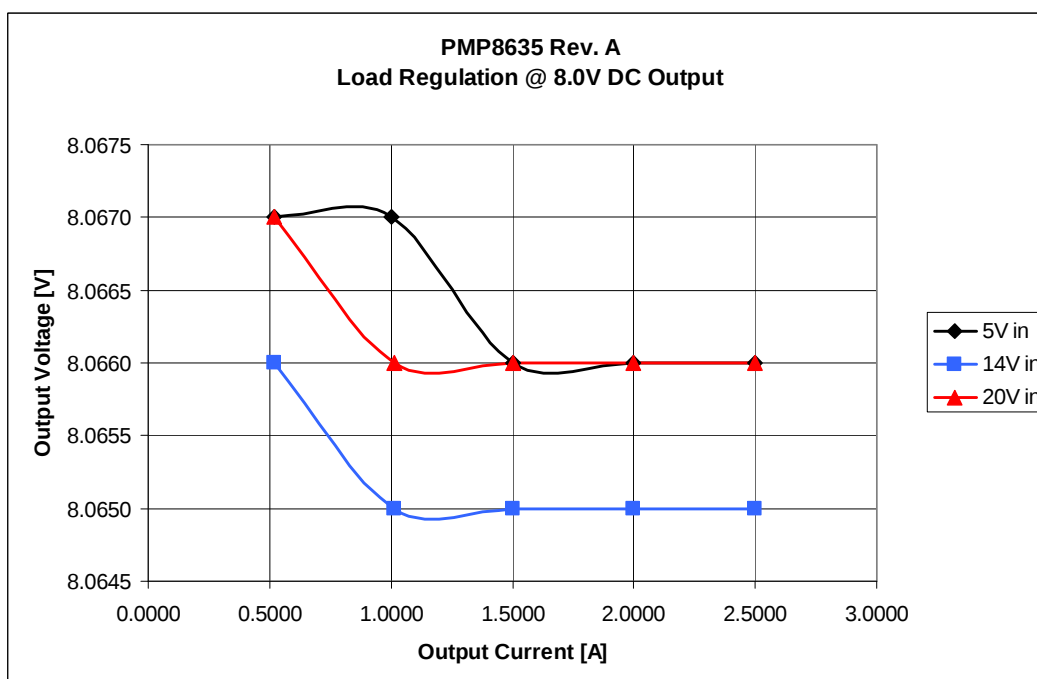


Figure 4

The efficiency and load regulation for the 2..5V input voltage range are shown in Figure 5 and Figure 6.

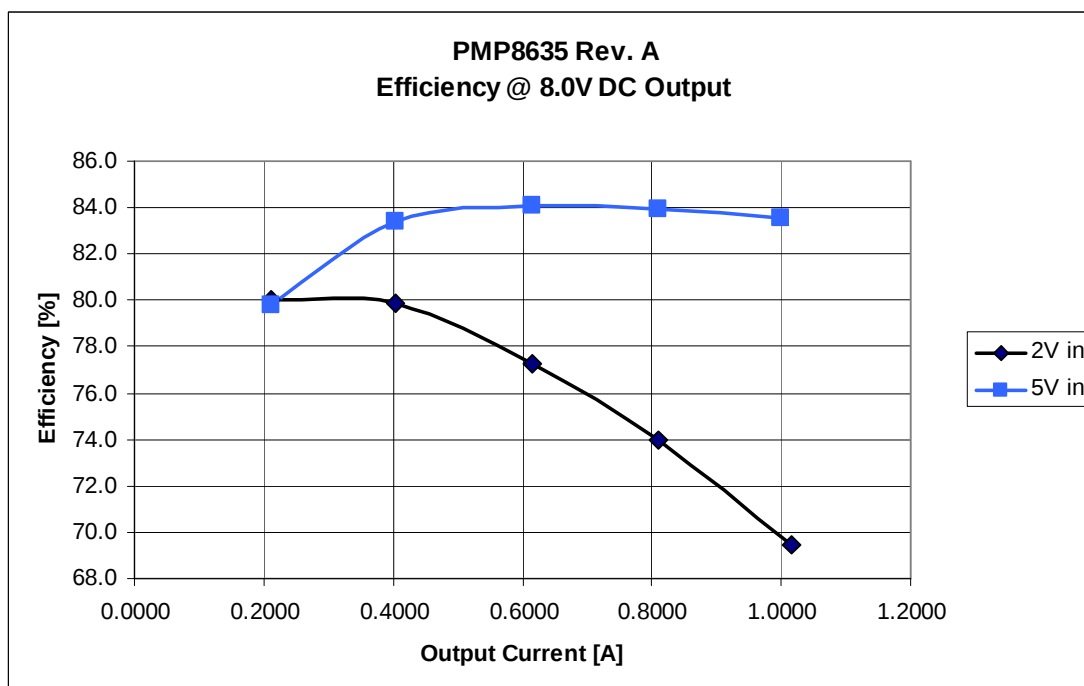


Figure 5

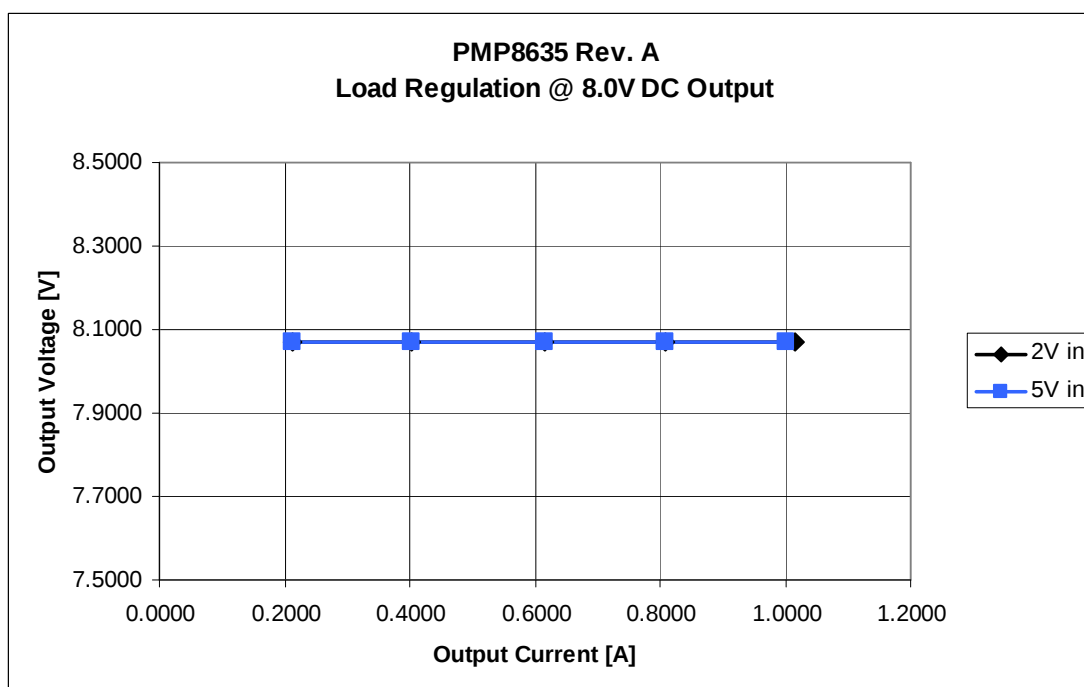


Figure 6

4 Load step

The response to a load step and a load dump for the 8V output at an input voltage of 14V is shown in Figure 7.

Channel C2: **Output voltage**, -536mV undershoot, 536mV overshoot
500mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 1.5A to 2.5A and vice versa
500mA/div, 1ms/div

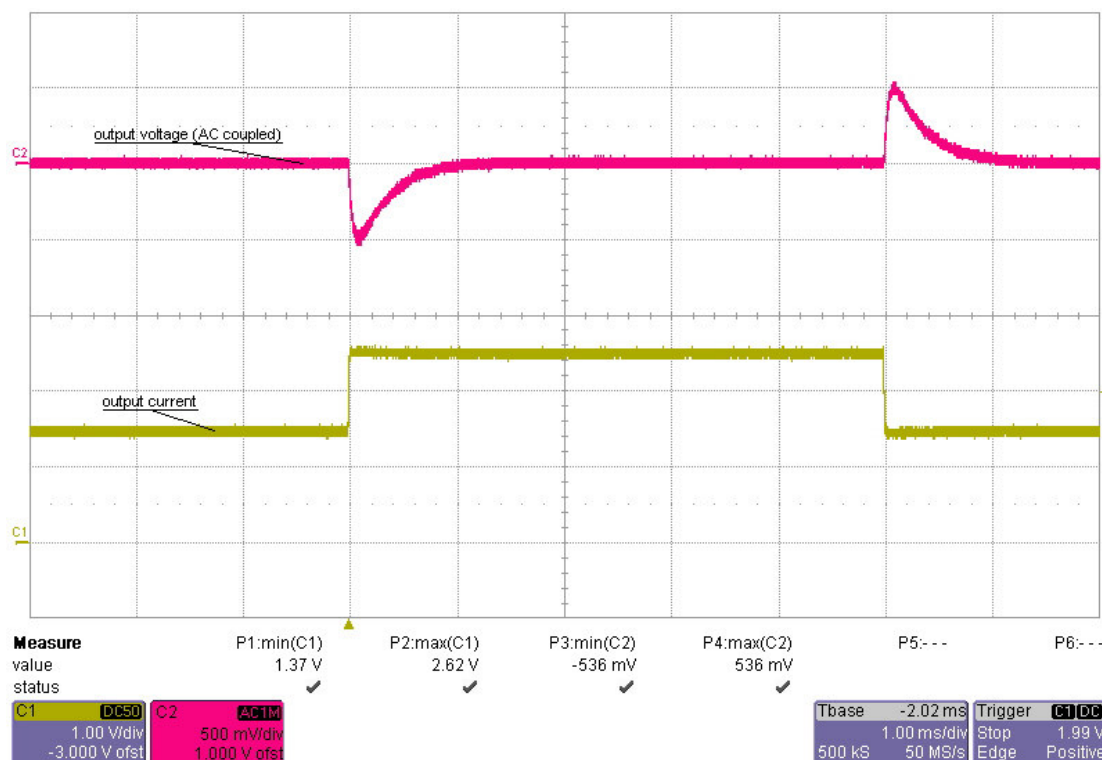


Figure 7

5 Frequency response

Figure 8 shows the loop response at 5V, 14V and 20V input voltage and a load of 2.5A.

5V input

- 80 deg phase margin @ crossover frequency 1.2 kHz
- -16 db gain margin

14V input

- 85 deg phase margin @ crossover frequency 4.1 kHz
- -28 db gain margin

20V input

- 85 deg phase margin @ crossover frequency 4.1 kHz
- -28 db gain margin

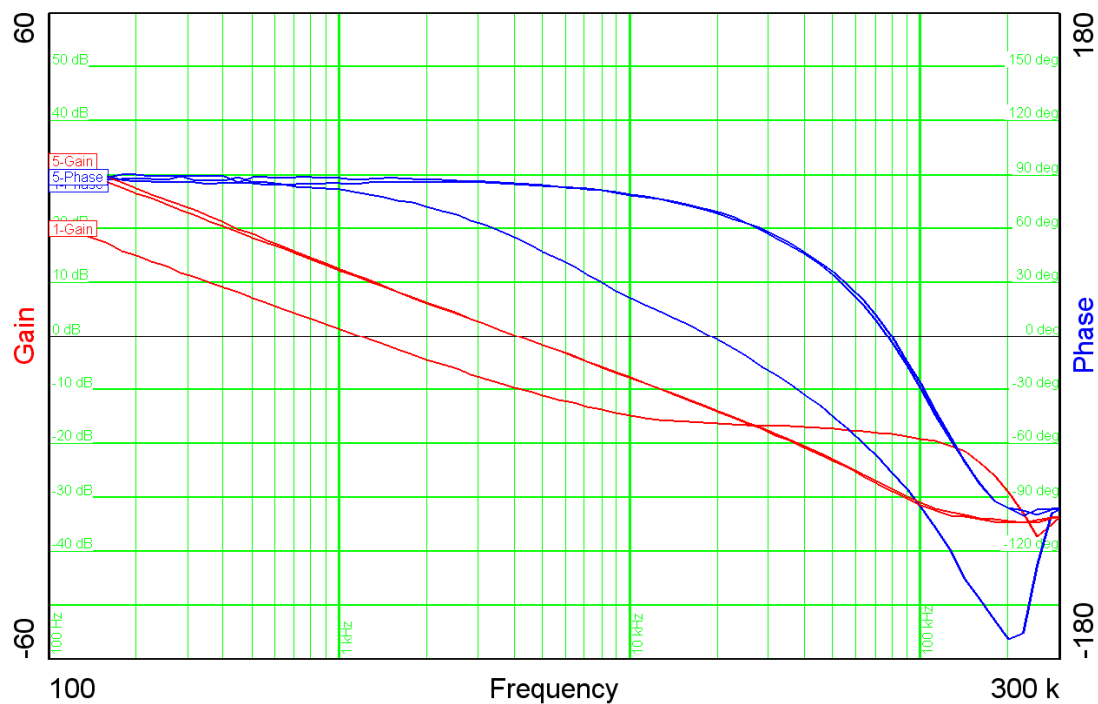


Figure 8

Figure 9 shows the loop response at 2V and 5V input voltage and a load of 1.0A.

2V input

- 58 deg phase margin @ crossover frequency 0.6 kHz
- -19 db gain margin

5V input

- 75 deg phase margin @ crossover frequency 1.5 kHz
- -26 db gain margin

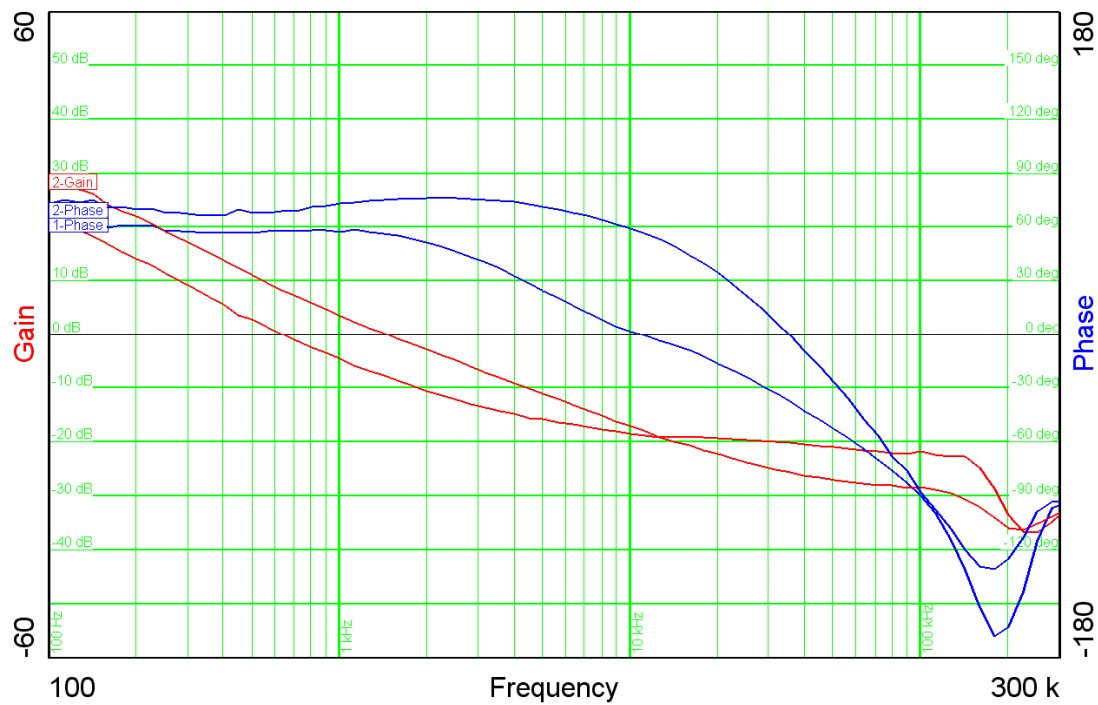


Figure 9

6 Switching Node on Q1

The drain-source voltage on the switching node of Q1 is shown in Figure 10. The image was captured with 20V input and 2.5A load.

Channel C2: **Drain-source voltage**, -2.6V minimum voltage, 24.6V maximum voltage
5V/div, 2 μ s/div

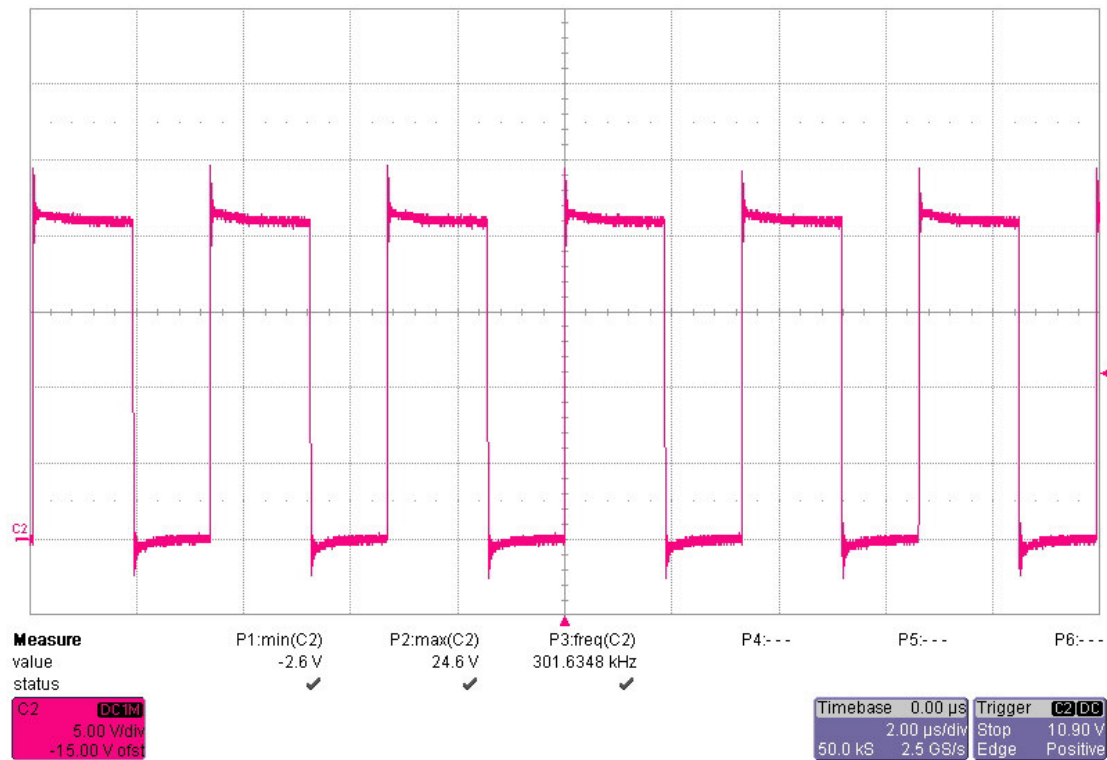


Figure 10

7 Thermal measurement

The thermal image (Figure 11) shows the circuit at an ambient temperature of 21 °C with an input voltage of 14V and a load of 2.5A.

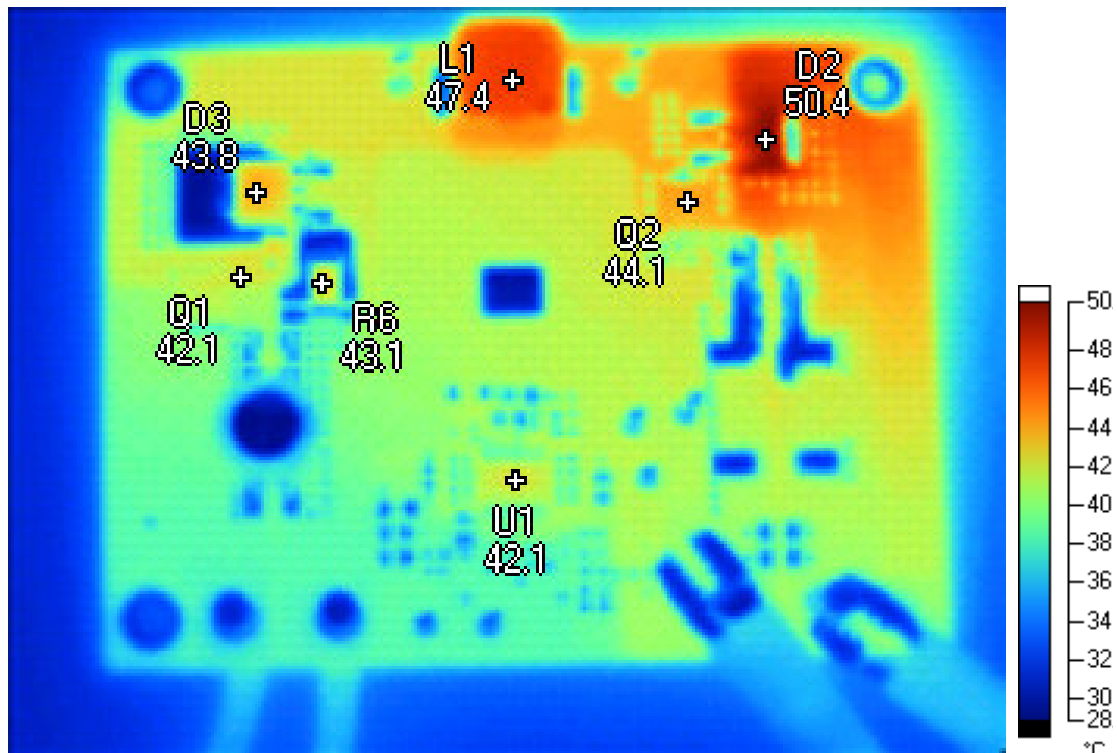


Figure 11

Markers

Label	Temperature	Emissivity	Background
L1	47.4 °C	0.95	21.0 °C
D2	50.4 °C	0.95	21.0 °C
Q2	44.1 °C	0.95	21.0 °C
Q1	42.1 °C	0.95	21.0 °C
U1	42.1 °C	0.95	21.0 °C
R6	43.1 °C	0.95	21.0 °C
D3	43.8 °C	0.95	21.0 °C

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