1 Startup

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

Channel C1: **input voltage**
2V/div, 5ms/div

Channel C2: **output voltage**
1V/div, 5ms/div

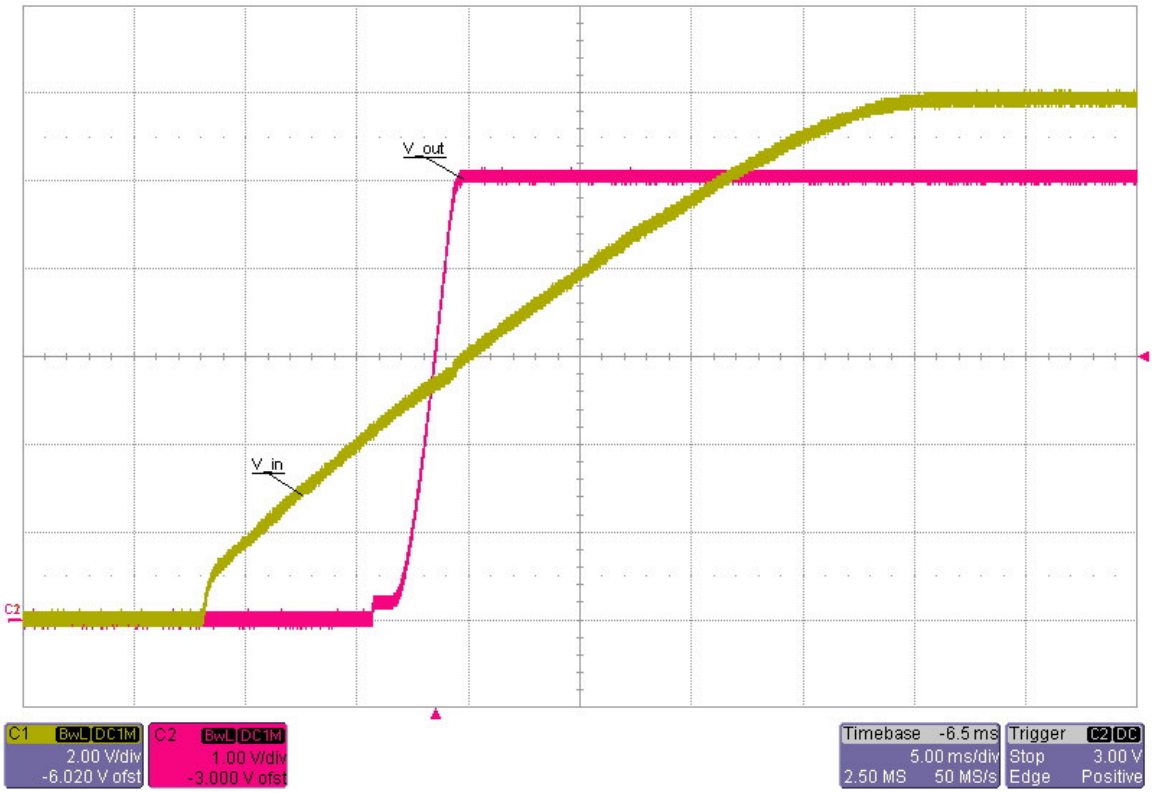

Figure 1

2 Shutdown

The shutdown waveform is shown in Figure 2. The input voltage is set at 12V with a 2.5A load on the output.

Channel C1: **input voltage**
2V/div, 10ms/div

Channel C2: **output voltage**
1V/div, 10ms/div

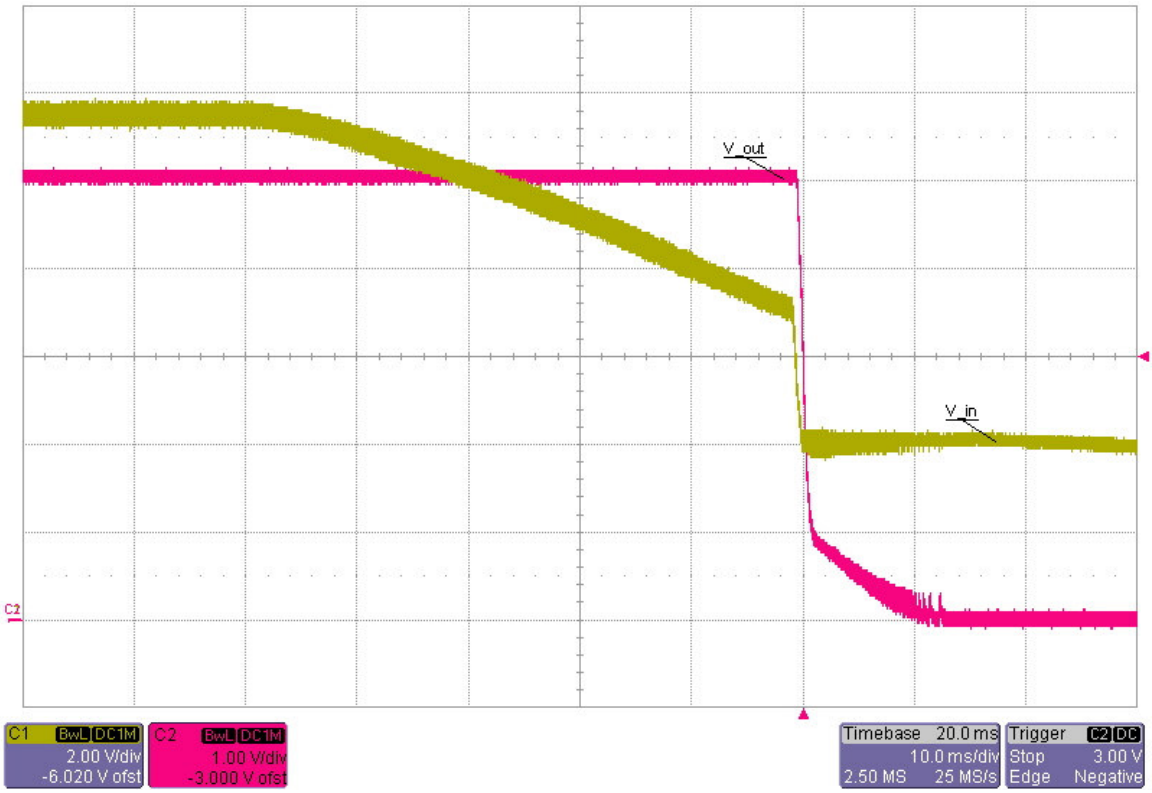

Figure 2

3 Efficiency

The efficiency is shown in Figure 3.

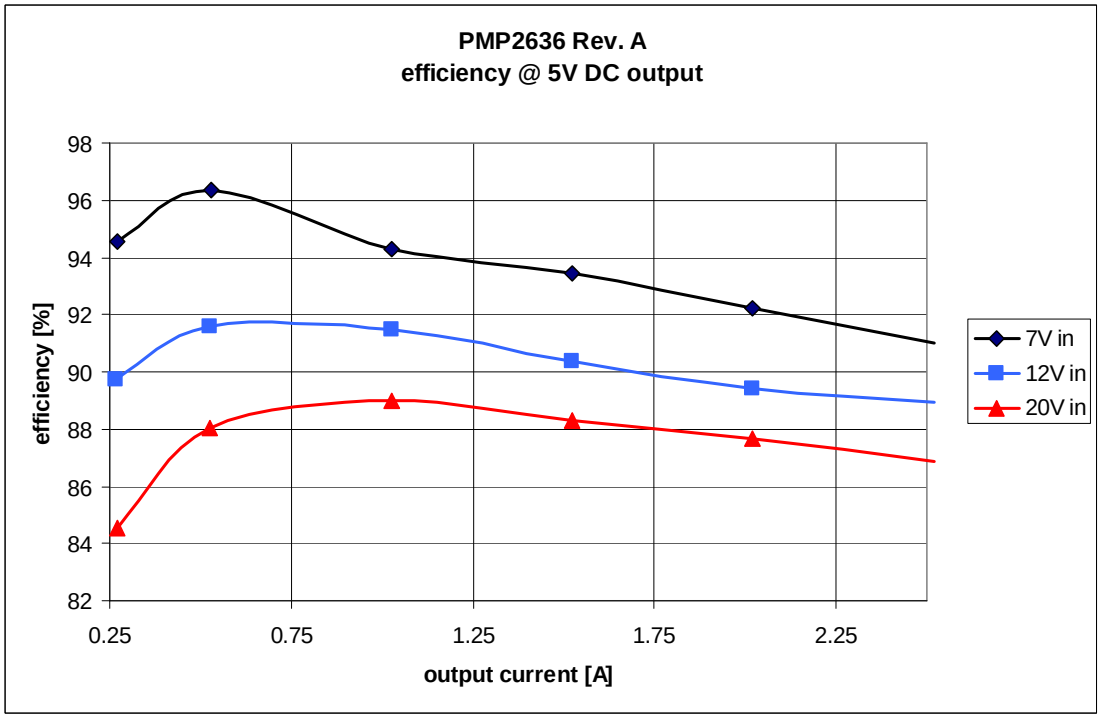

Figure 3

4 Load regulation

The load regulation of the 5V output is shown in Figure 4.

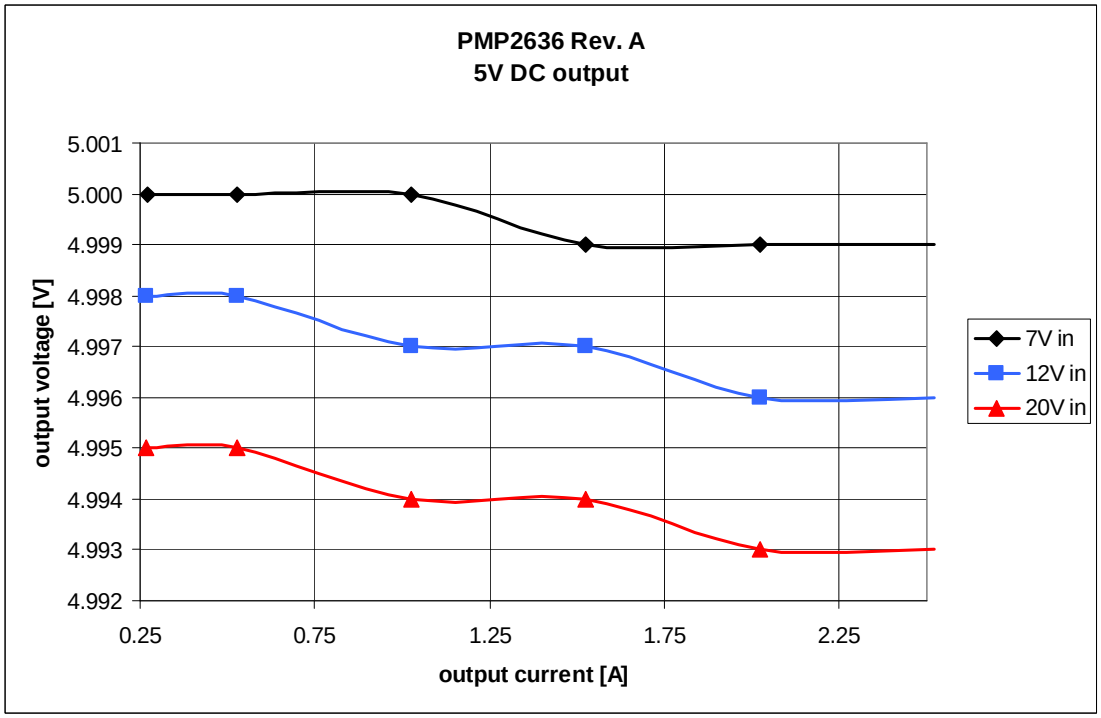

Figure 4

5 Output ripple voltage

The output ripple voltage at 2.5A load and 7V, 12V and 20V input voltage is shown in Figure 5.

Channel M1: **output voltage**, 22mV peak-peak
20mV/div, 5us/div, AC coupled

Channel M1: **output voltage**, 30mV peak-peak
20mV/div, 5us/div, AC coupled

Channel M3: **output voltage**, 33mV peak-peak
20mV/div, 5us/div, AC coupled

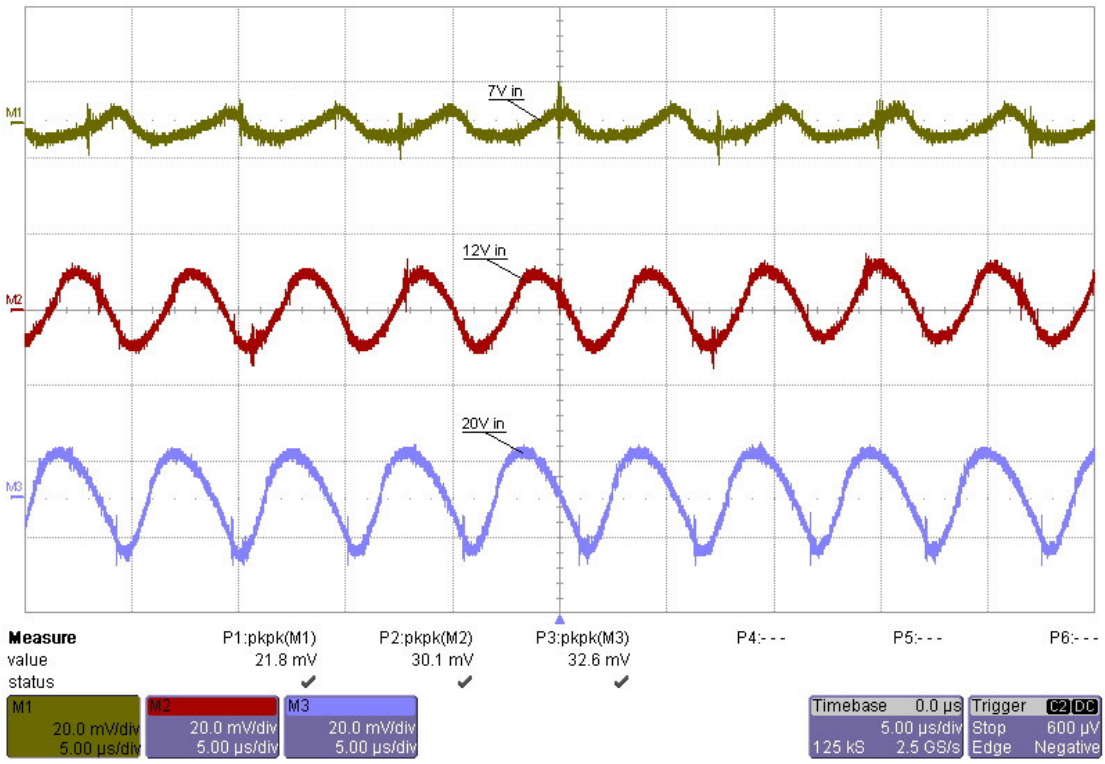

Figure 5

6 Load transients

The response to a load step and a load dump at an input voltage of 12V is shown in Figure 6 and Figure 7.

Channel C2: **output voltage**, -178mV undershoot, 82mV overshoot
100mV/div, 50us/div, AC coupled

Channel C4: **load current**, load step 0.625A to 2.5A
1A/div, 50us/div

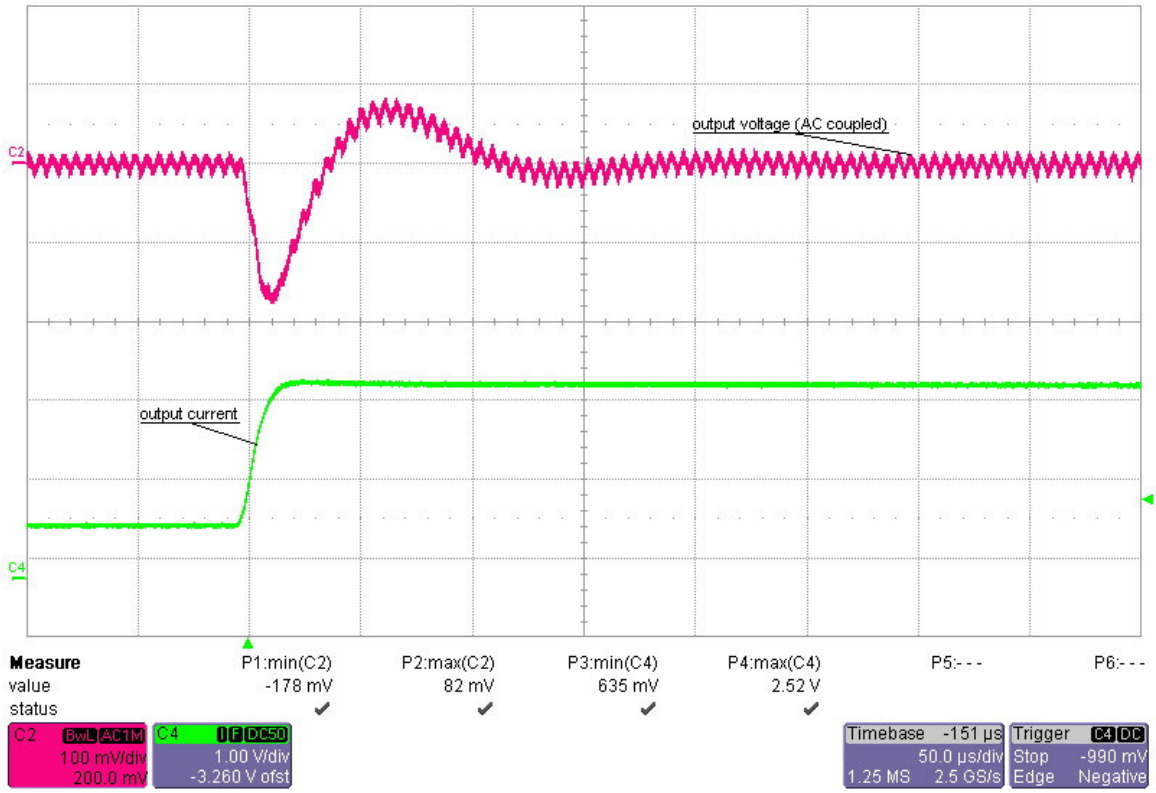

Figure 6

Channel C2: **output voltage**, 165mV overshoot, -85mV undershoot
100mV/div, 50us/div, AC coupled

Channel C4: **load current**, load dump 2.5A to 0.625A
1A/div, 50us/div

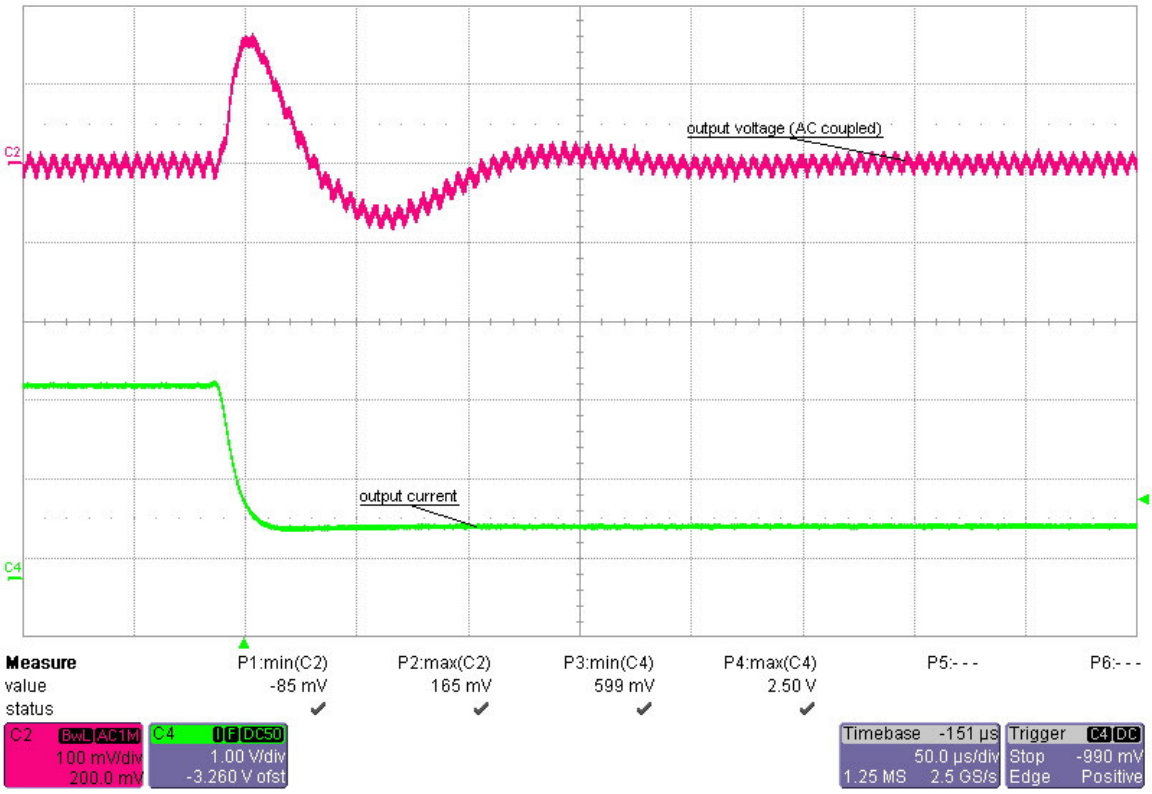

Figure 7

7 Frequency response

Figure 8 shows the loop response of the 5V output with 12V input and a 2.5A load.

64 deg phase margin @ crossover frequency 15.2kHz

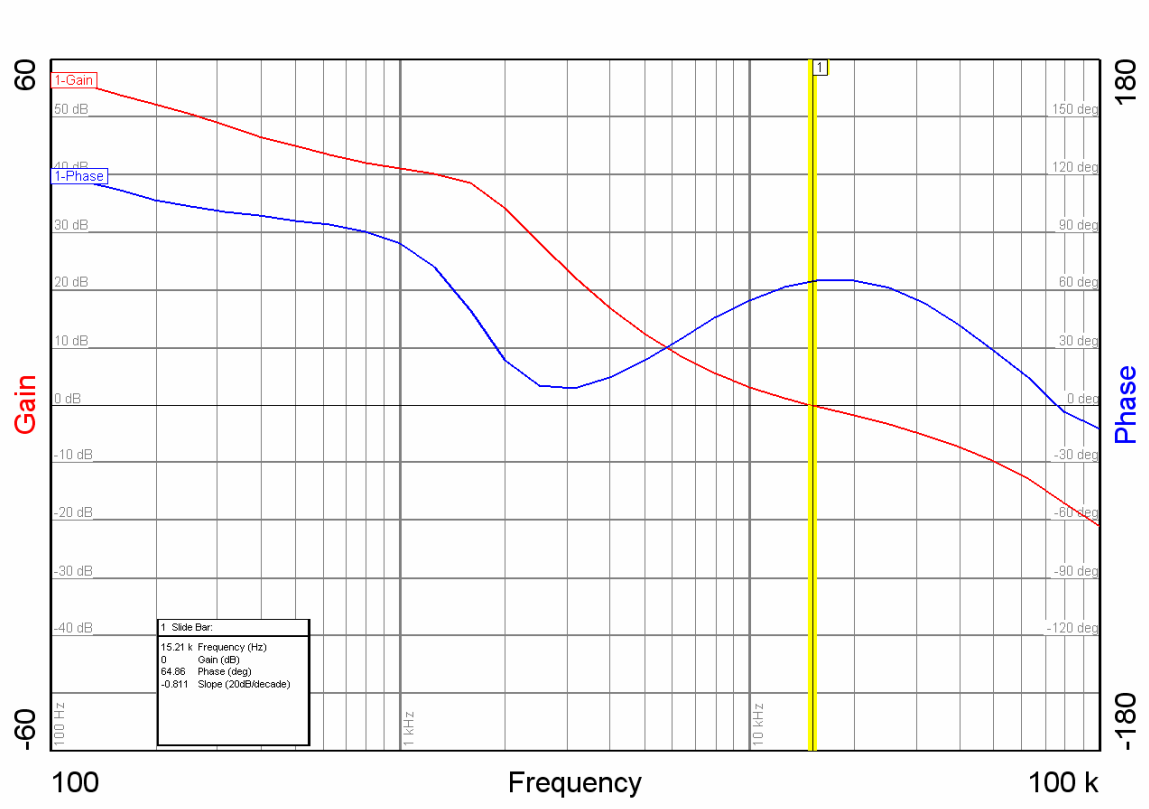

Figure 8

8 Miscellaneous waveforms

The drain-source voltage on the switch node is shown in Figure 9. The image was captured with a 20V input and a 2.5A load.

Channel C2: **drain-source voltage**, -1.4V minimum voltage, 20.9V maximum voltage 5V/div, 2us/div

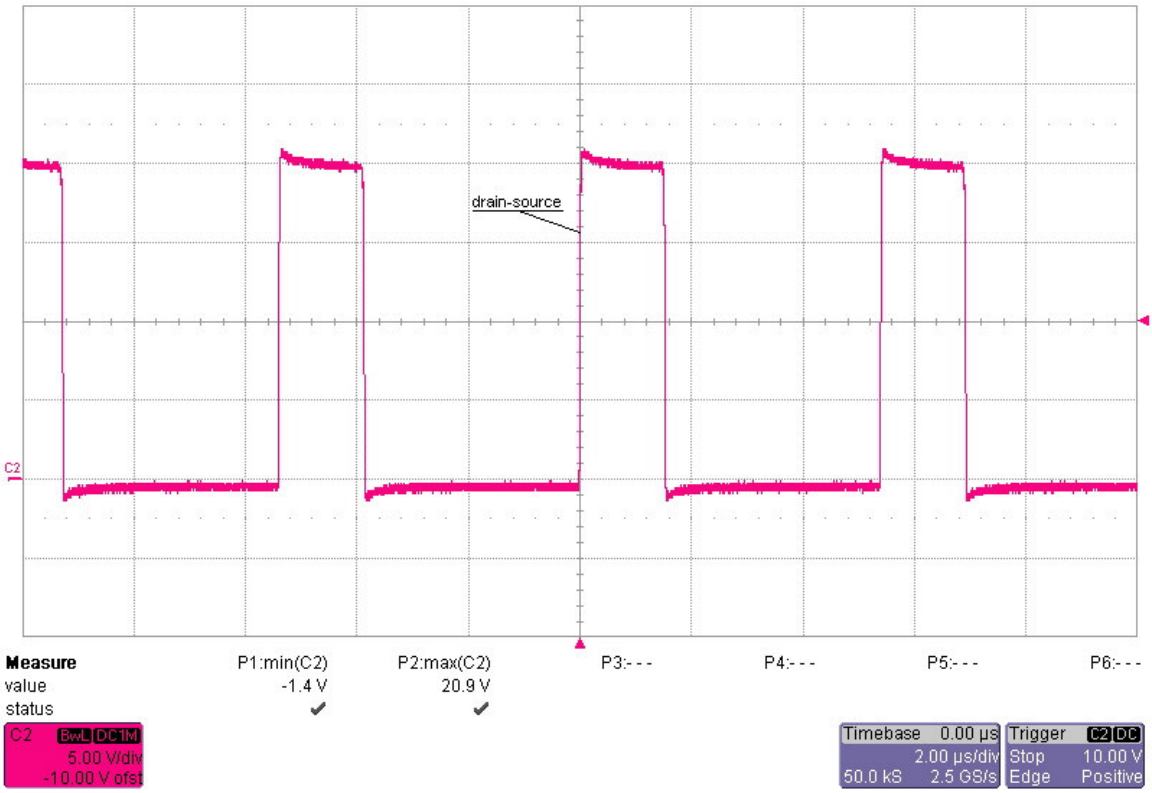

Figure 9

9 Thermal measurement

The thermal image (Figure 10) shows the circuit at an ambient temperature of 25 °C with an input voltage of 20V and a load of 2.5A (worst case).

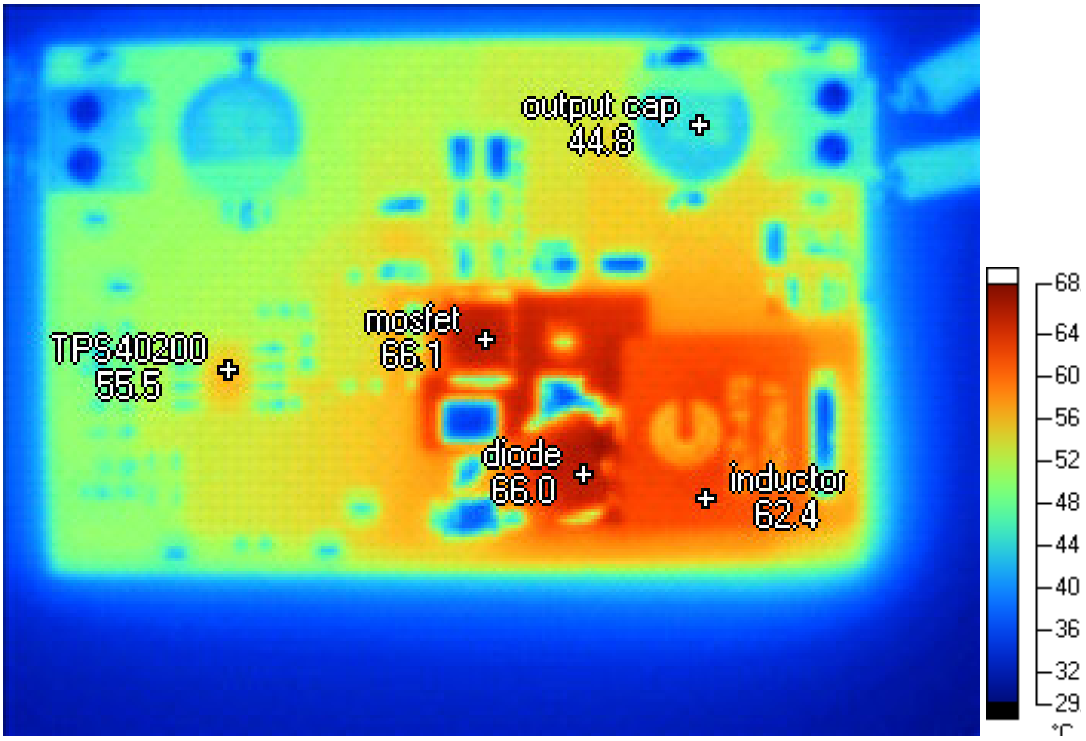

Figure 10

device	max. temperature	measured temp. @ 25 °C	calculated temp. @ 95 °C
TPS40200-Q1	150 °C	55.5 °C	125.5 °C
mosfet Si7465DP	150 °C	66.1 °C	136.1 °C
diode MBRD650CT	175 °C	66.0 °C	136.0 °C
inductor HC9-470-R	155 °C	62.4 °C	132.4 °C
output capacitor 220uF	105 °C	44.8 °C	114.8 °C

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