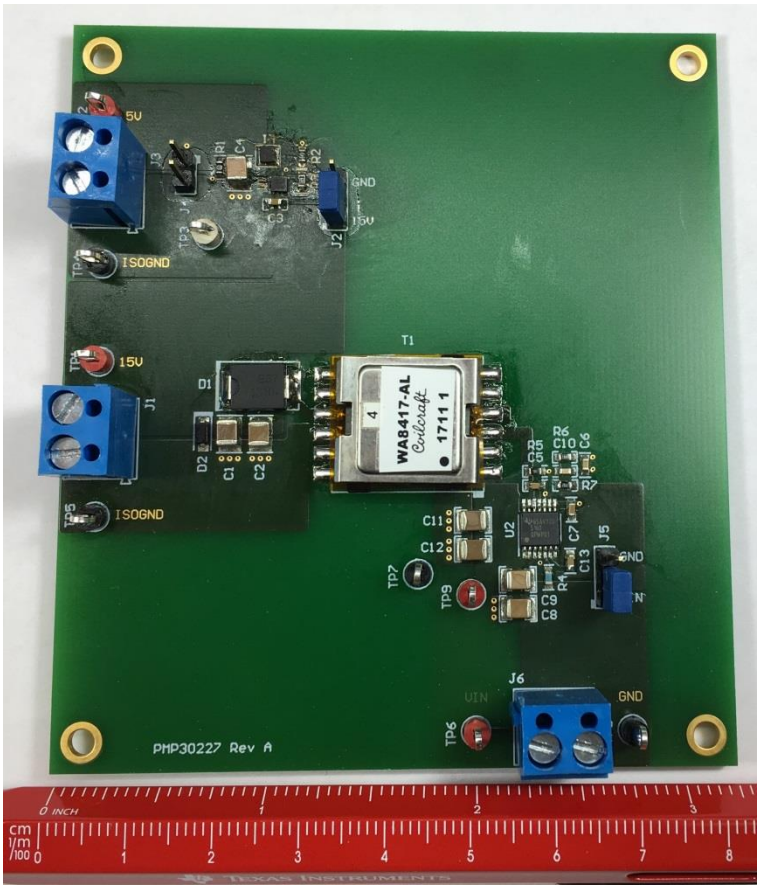
Automotive Flybuck-Boost Converter with 15V @ 0.25A

- Input 8.0 .. 16.0V, 28V peak
- Output 15.0V @ 0.25A
- Free-Running-Switching Frequency of 440 kHz

Automotive Buck Converter with 5V@0.2A

- Input 12.0 .. 16.0V
- Output 5.0V @ 0.2A
- Free-Running-Switching Frequency of 2.25 MHz



Automotive Flybuck-Boost Converter with 15V @ 0.25A

1. Startup

The startup waveform at 12.0V input voltage and no load on the output is shown in Figure 1.

Channel C1 **12.0V Input Voltage**
10V/div, 10ms/div

Channel C3 **15.0V Output Voltage**
10V/div, 10ms/div

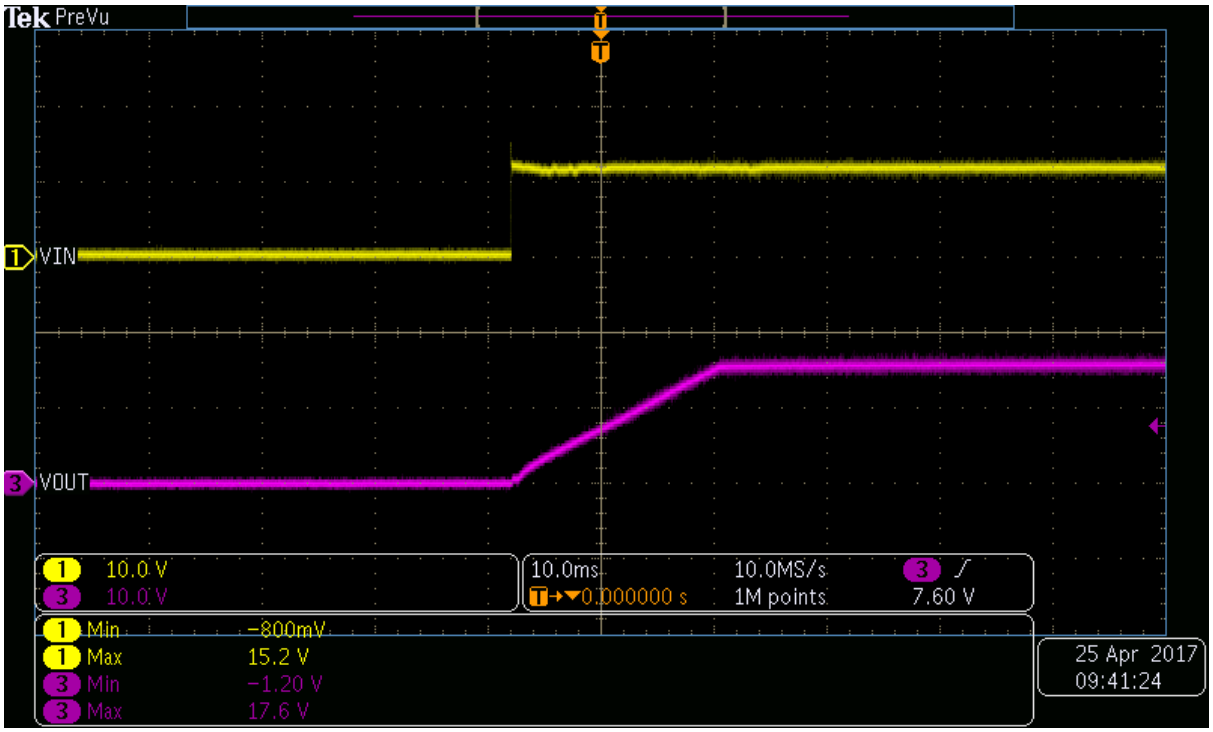


Figure 1

2. Shutdown

The shutdown waveform at 12.0V input voltage and 0.25A load on the output is shown in Figure 2.

Channel C1 **12.0V Input Voltage**
10V/div, 4ms/div

Channel C3 **15.0V Output Voltage**
10V/div, 4ms/div

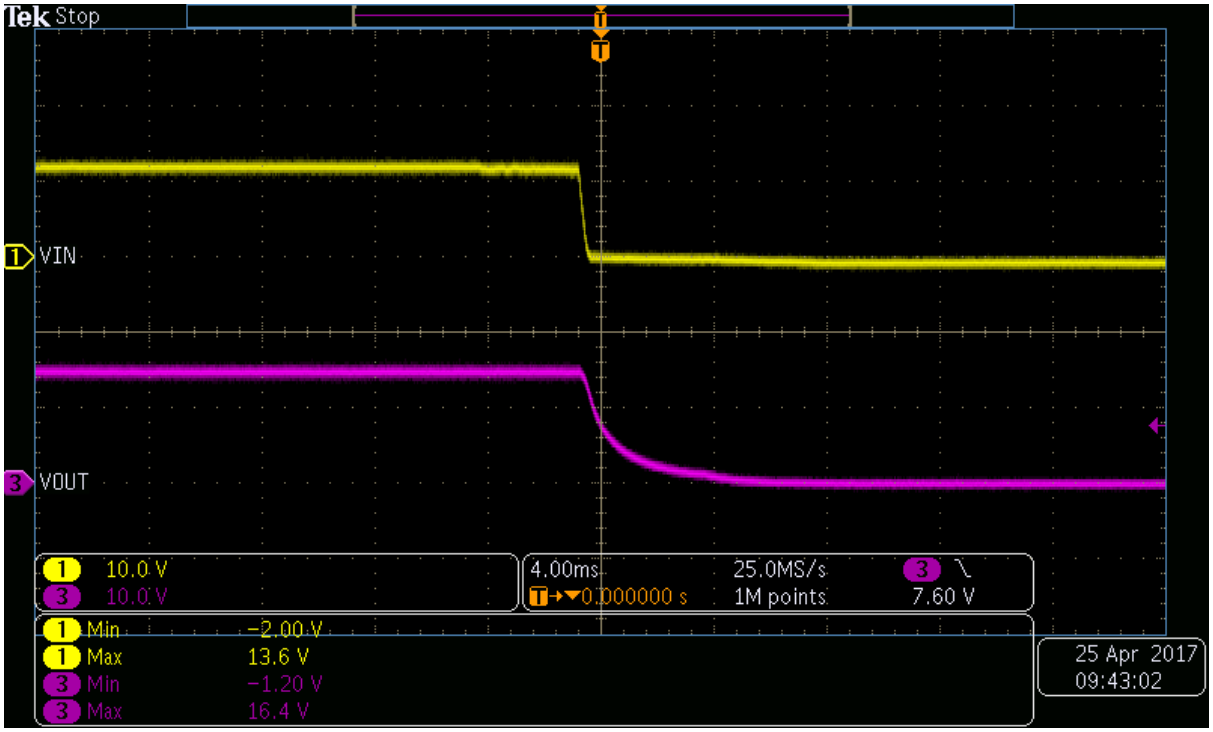


Figure 2

3. Efficiency

The efficiency and load regulation with MBRS3100 (D1) are shown in Figure 3 and Figure 4.

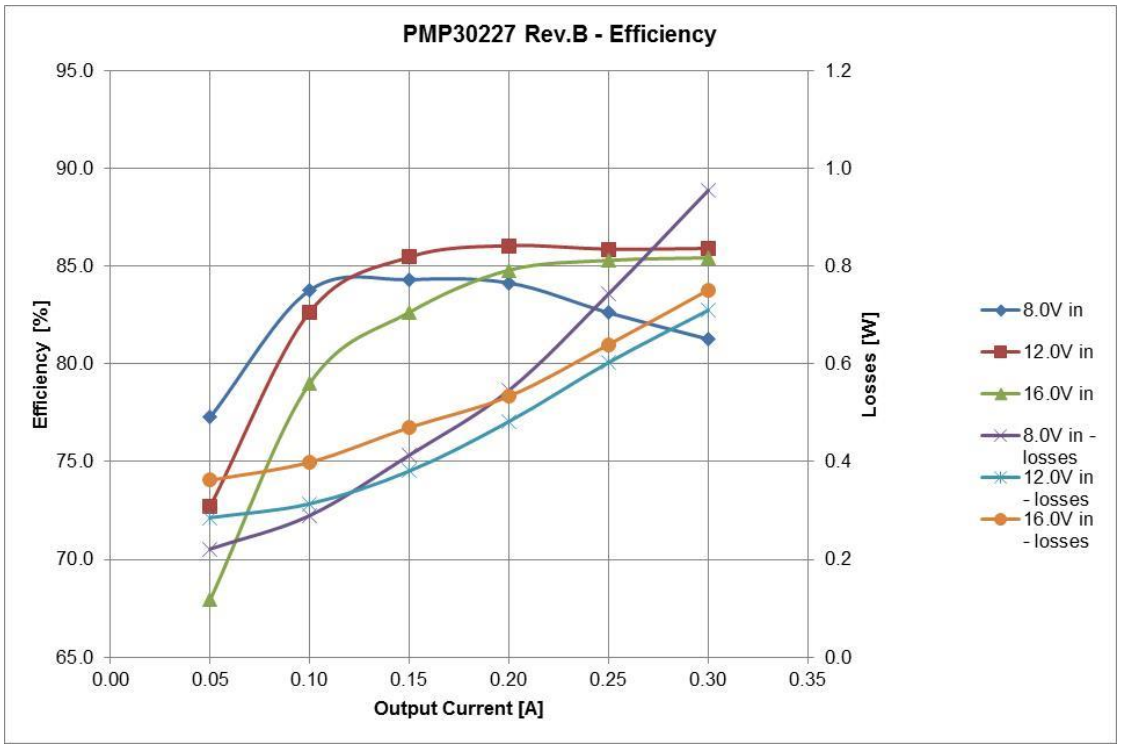


Figure 3

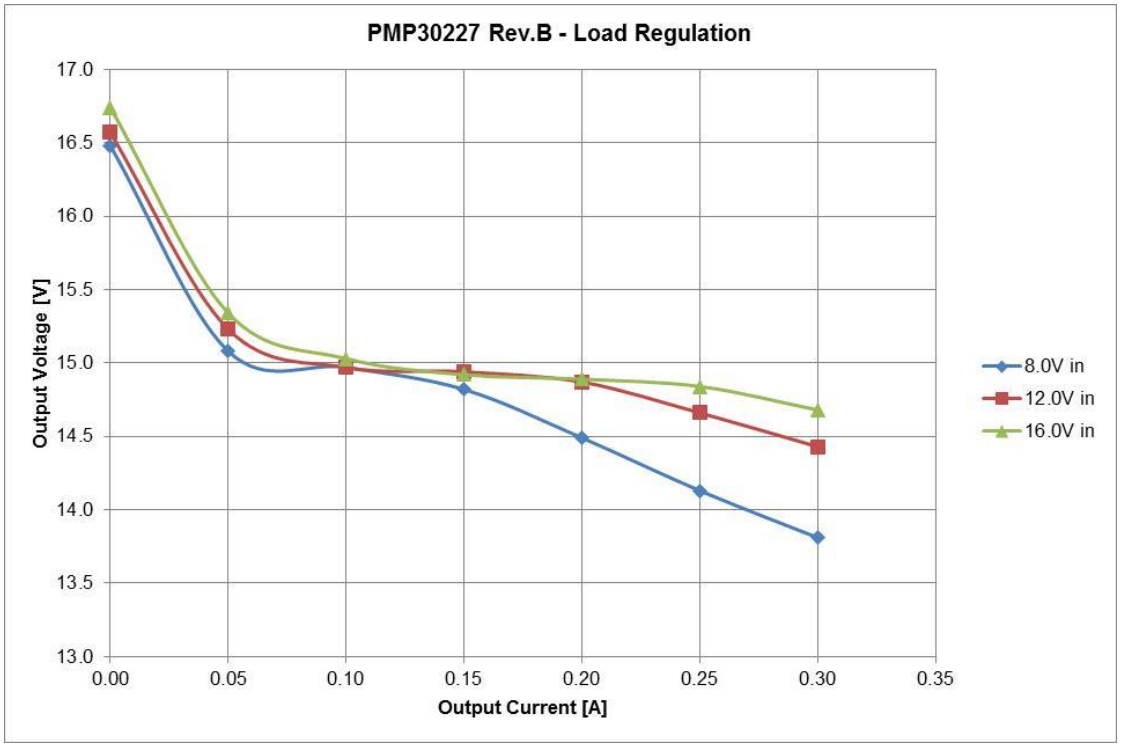


Figure 4

4. Transient Response

The response to a load step at 12.0V input voltage is shown in Figure 5.

Channel C1 **Output Current**, Load Step 0.125A to 0.25A
100mA/div, 1ms/div

Channel C2 **Output Voltage**, -283mV undershoot (1.9%), 345mV overshoot (2.3%)
200mV/div, 1ms/div, AC coupled

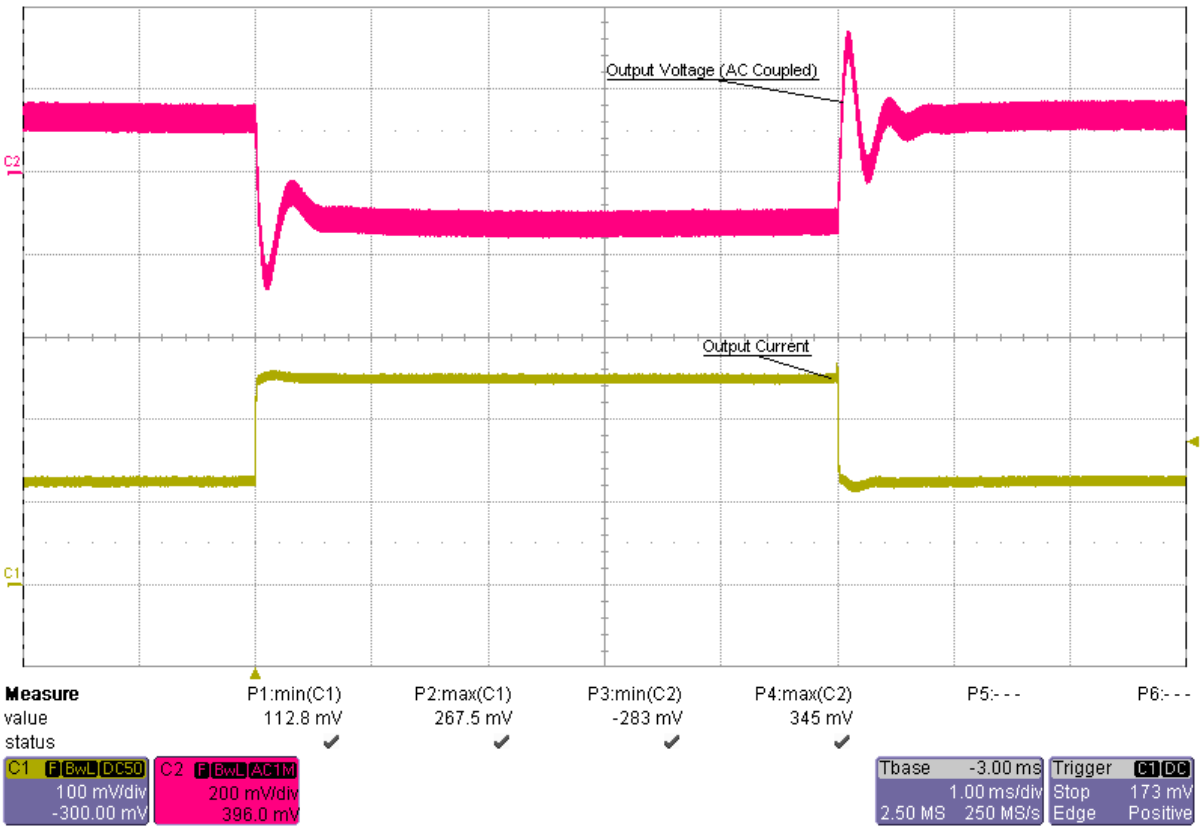


Figure 5

5. Input Ripple

The input ripple voltage at 0.25A load is shown in Figure 6.

Channel R1 **Input Voltage @ 16.0V Input**, 156mV peak-peak
100mV/div, 1us/div

Channel R2 **Input Voltage @ 12.0V Input**, 168mV peak-peak
100mV/div, 1us/div

Channel R3 **Input Voltage @ 8.0V Input**, 192mV peak-peak
100mV/div, 1us/div

Figure 6

6. Output Ripple

The output ripple voltage at 0.25A load is shown in Figure 7.

Channel R1 **Output Voltage @ 16.0V Input**, 92.0mV peak-peak
50mV/div, 1us/div

Channel R2 **Output Voltage @ 12.0V Input**, 100mV peak-peak
50mV/div, 1us/div

Channel R3 **Output Voltage @ 8.0V Input**, 116mV peak-peak
50mV/div, 1us/div

Figure 7

7. FET (Switching Node)

The drain-source voltage of the low-side FET at 12.0V input voltage and 0.25A load on the isolated output is shown in Figure 8.

Channel C2 **Drain-Source Voltage**, -8.70V minimum, 12.7V maximum
5V/div, 1us/div

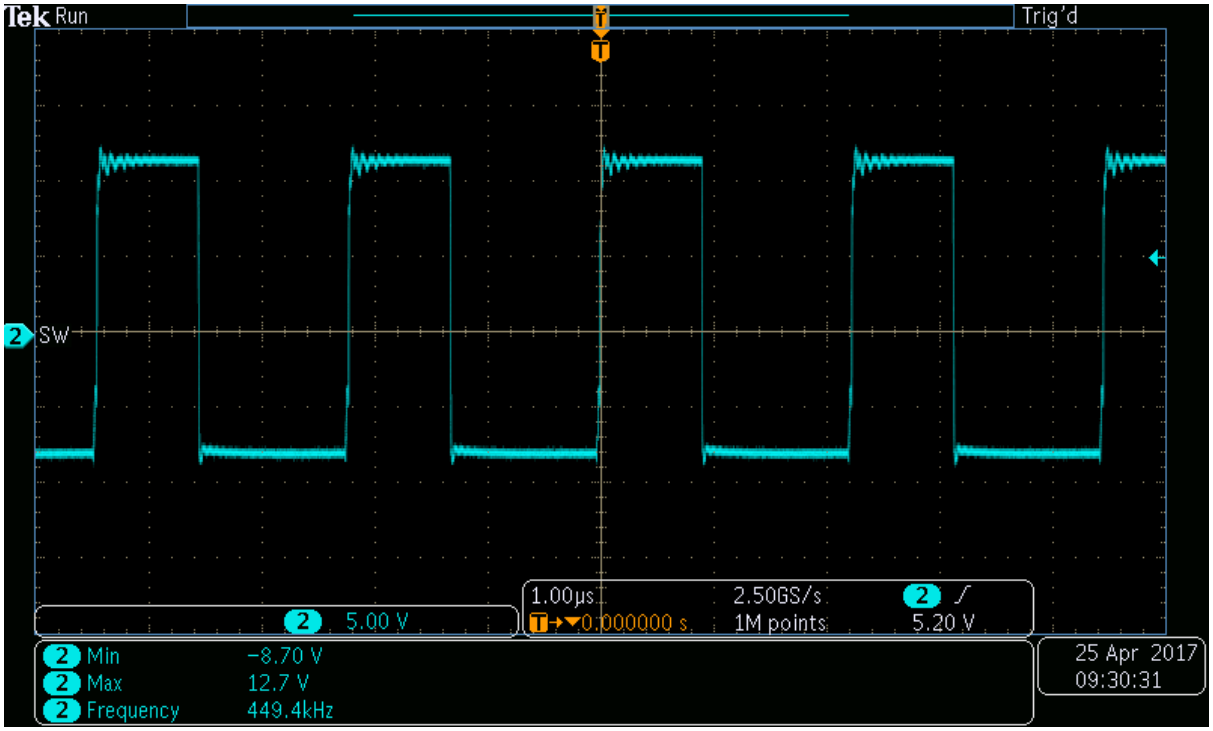


Figure 8

Automotive Buck Converter with 5V@0.2A

8. Startup

The startup waveform at 15.0V input voltage and no load on the output is shown in Figure 9.

Channel C1 **15.0V Input Voltage**
10V/div, 400us/div

Channel C3 **5.0V Output Voltage**
5V/div, 400us/div

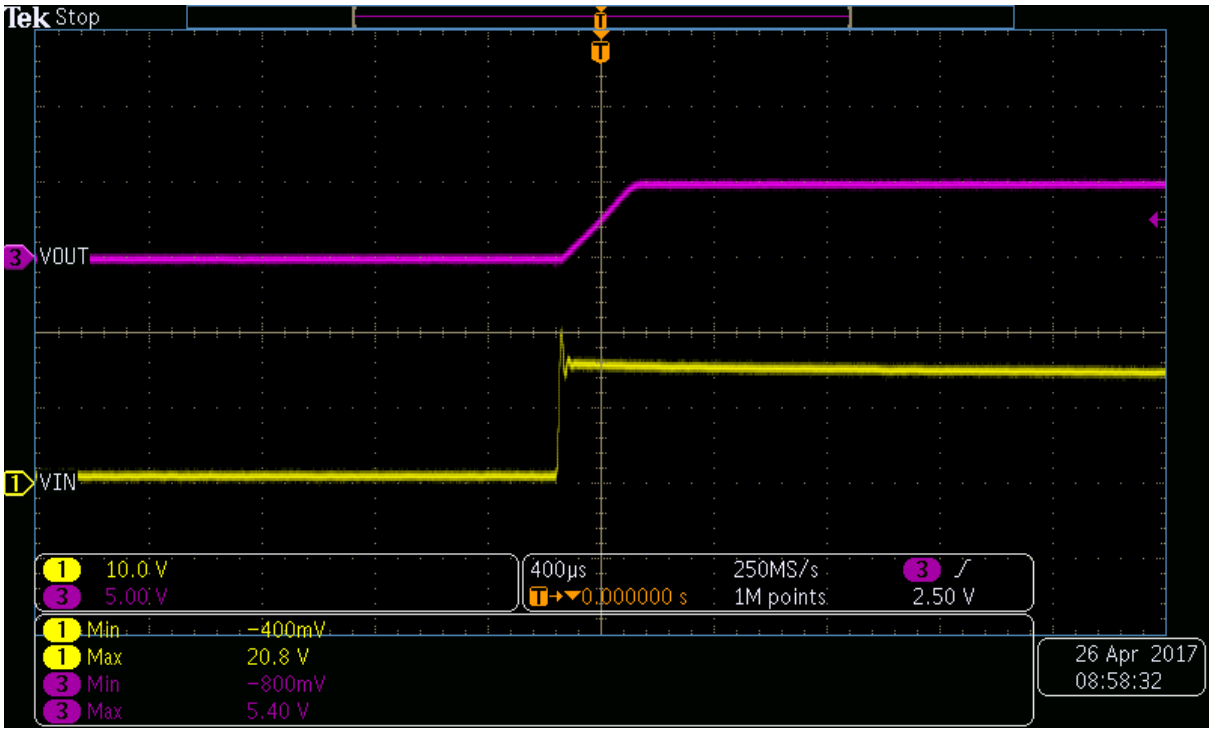


Figure 9

9. Shutdown

The shutdown waveform at 15.0V input voltage and 0.2A load on the output is shown in Figure 10.

Channel C1 **15.0V Input Voltage**
10V/div, 1ms/div

Channel C3 **5V Output Voltage**
5V/div, 1ms/div

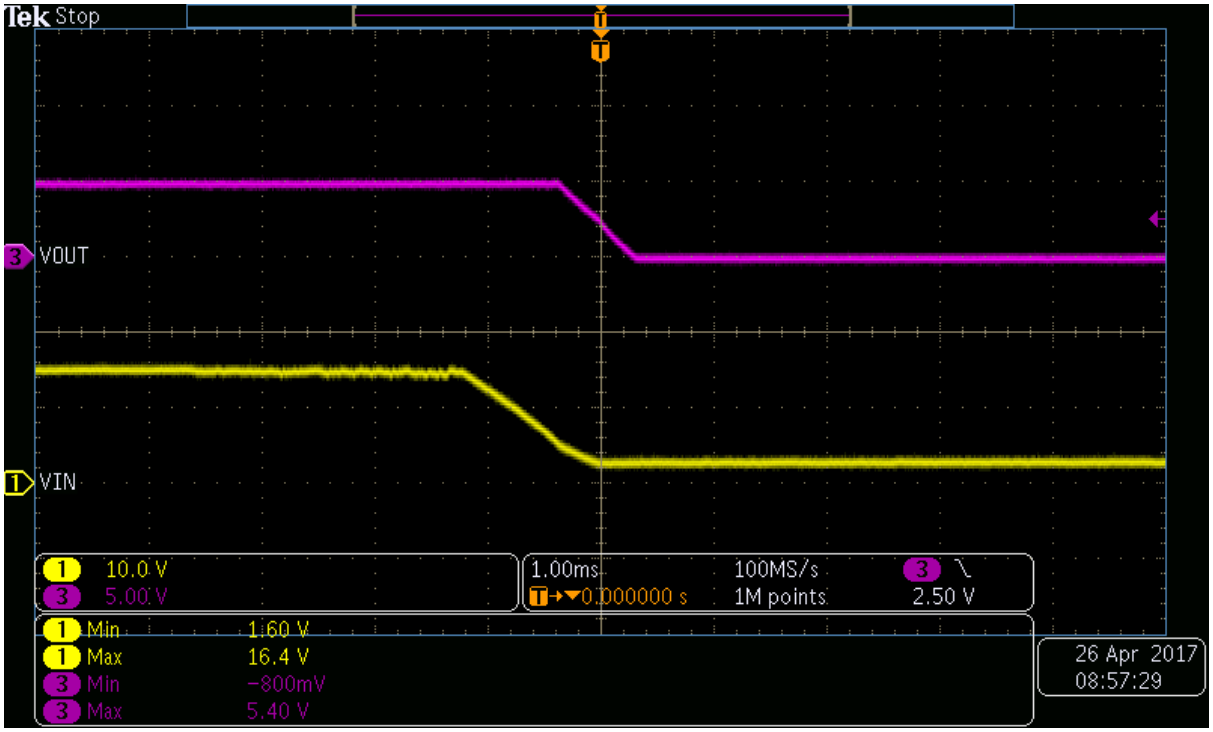


Figure 10

10.Efficiency

The efficiency and load regulation of the 5V Buck converter are shown in Figure 11 and Figure 12.

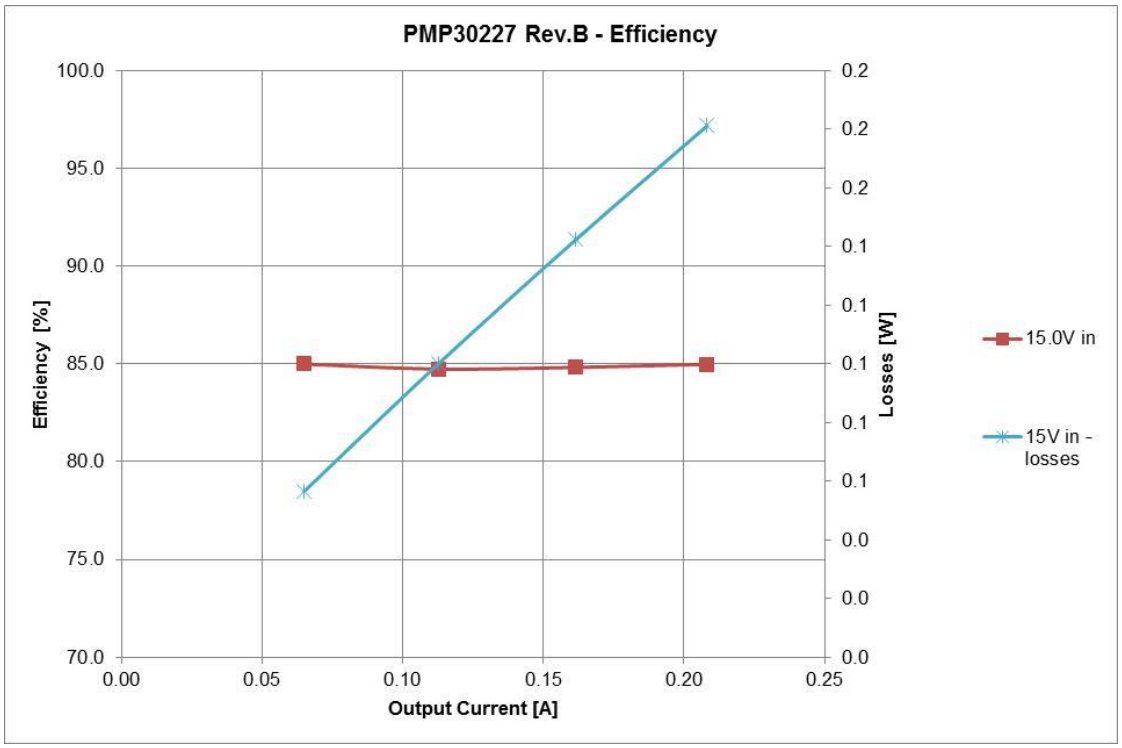


Figure 11

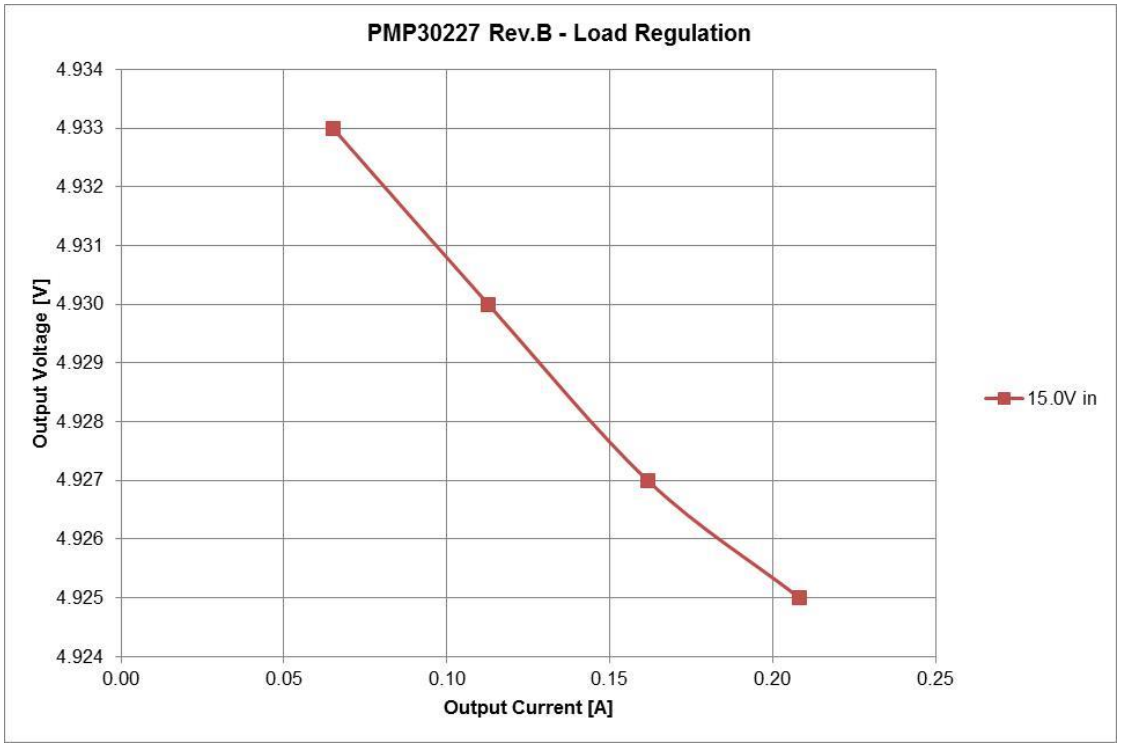


Figure 12

11.Transient Response

The response to a load step at 15.0V input voltage is shown in Figure 13.

Channel C4 **Output Current**, Load Step 0.15A to 0.3A
200mA/div, 2ms/div

Channel C2 **Output Voltage**, -14.4mV undershoot (0.3%), 17.6mV overshoot (0.4%)
20mV/div, 2ms/div, AC coupled

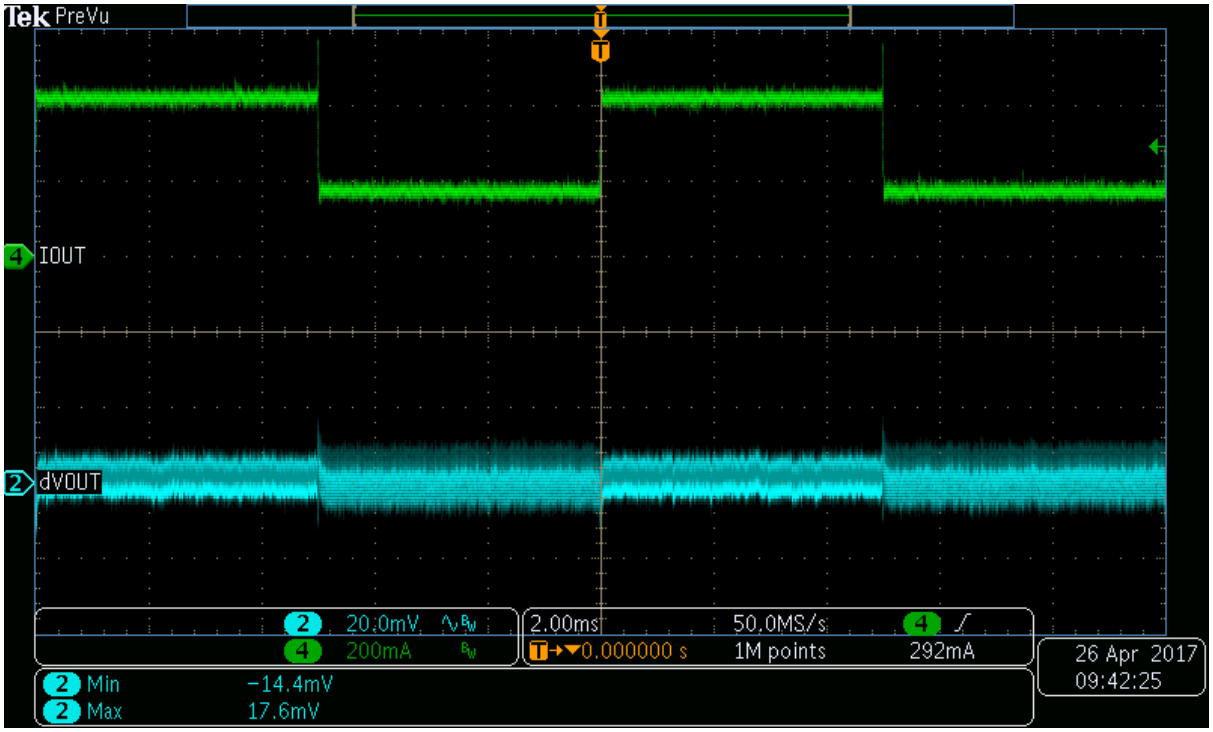


Figure 13

12.Input Ripple

The input ripple voltage at 0.2A load is shown in Figure 14.

Channel C2 **Input Voltage @ 15.0V Input**, 280mV peak-peak
100mV/div, 1us/div

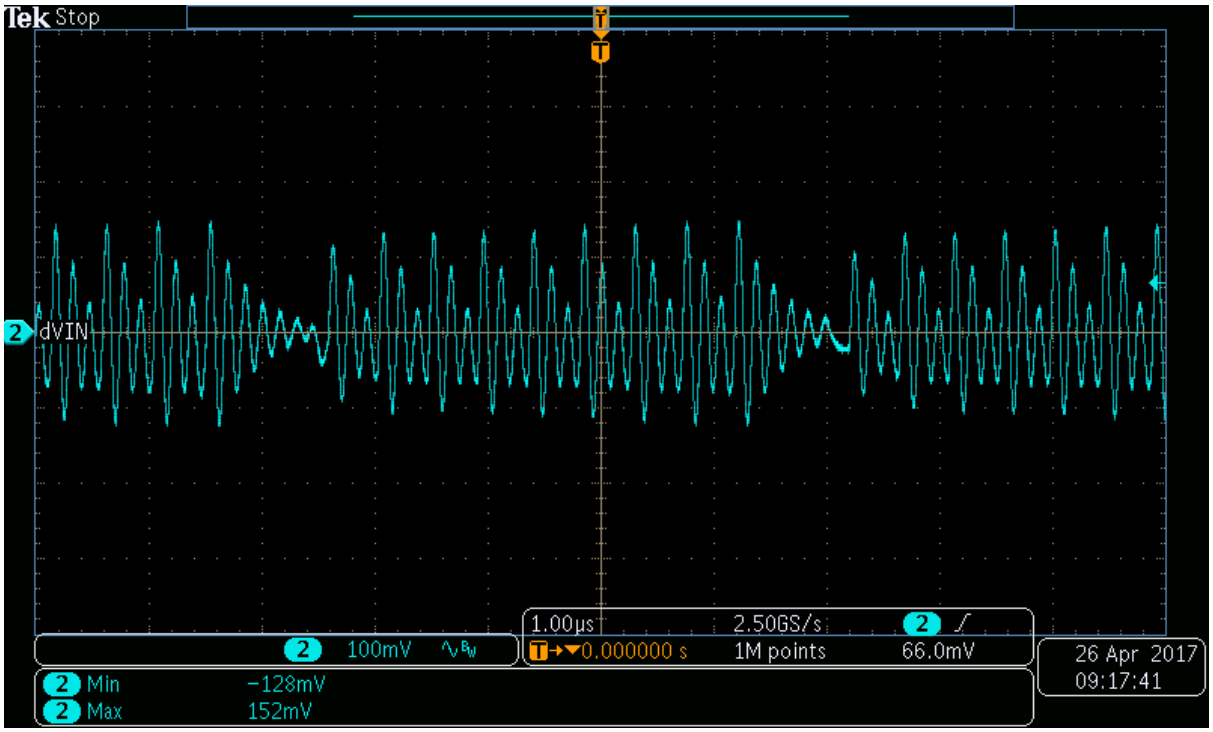


Figure 14

13.Output Ripple

The output ripple voltage at 0.2A load is shown in Figure 15.

Channel R2 **Output Voltage @ 5.0V Input**, 8.96mV peak-peak
2mV/div, 400ns/div

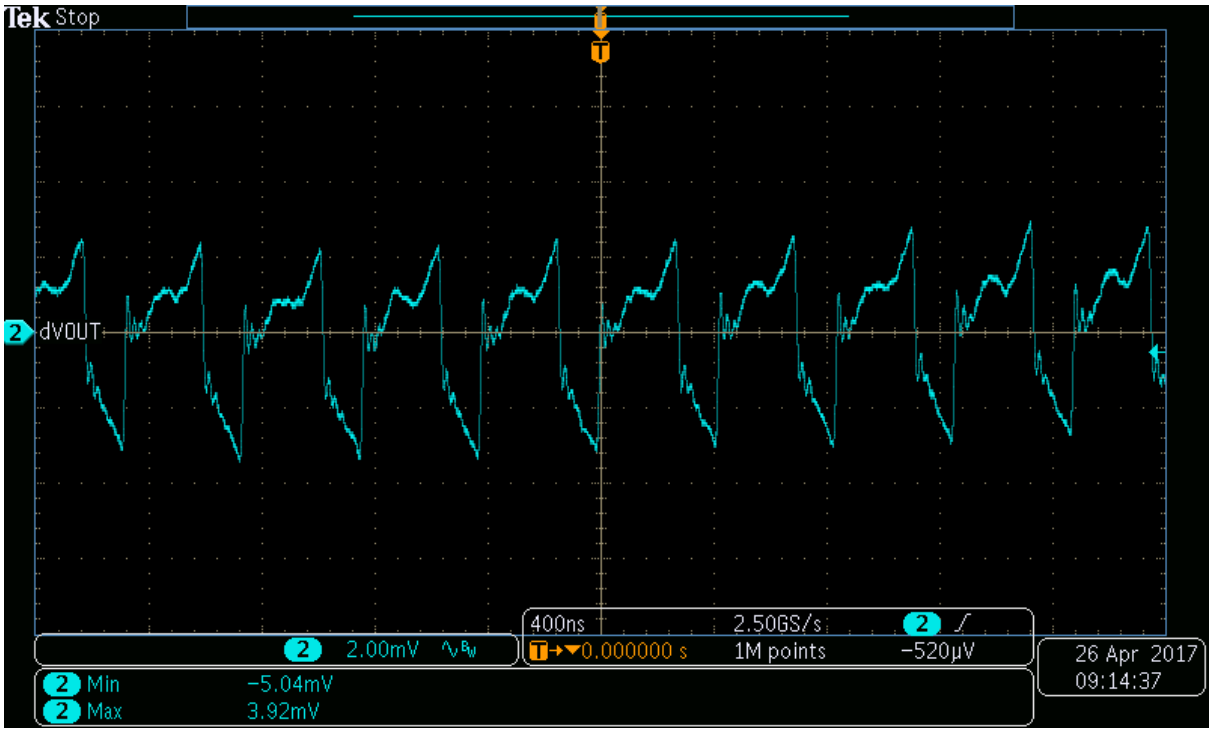


Figure 15

14.FET (Switching Node)

The drain-source voltage of the low-side FET at 15.0V input voltage and 0.2A load on the 5V output is shown in Figure 16.

Channel C2 **Drain-Source Voltage**, -1.60V minimum, 18.2V maximum
5V/div, 2us/div

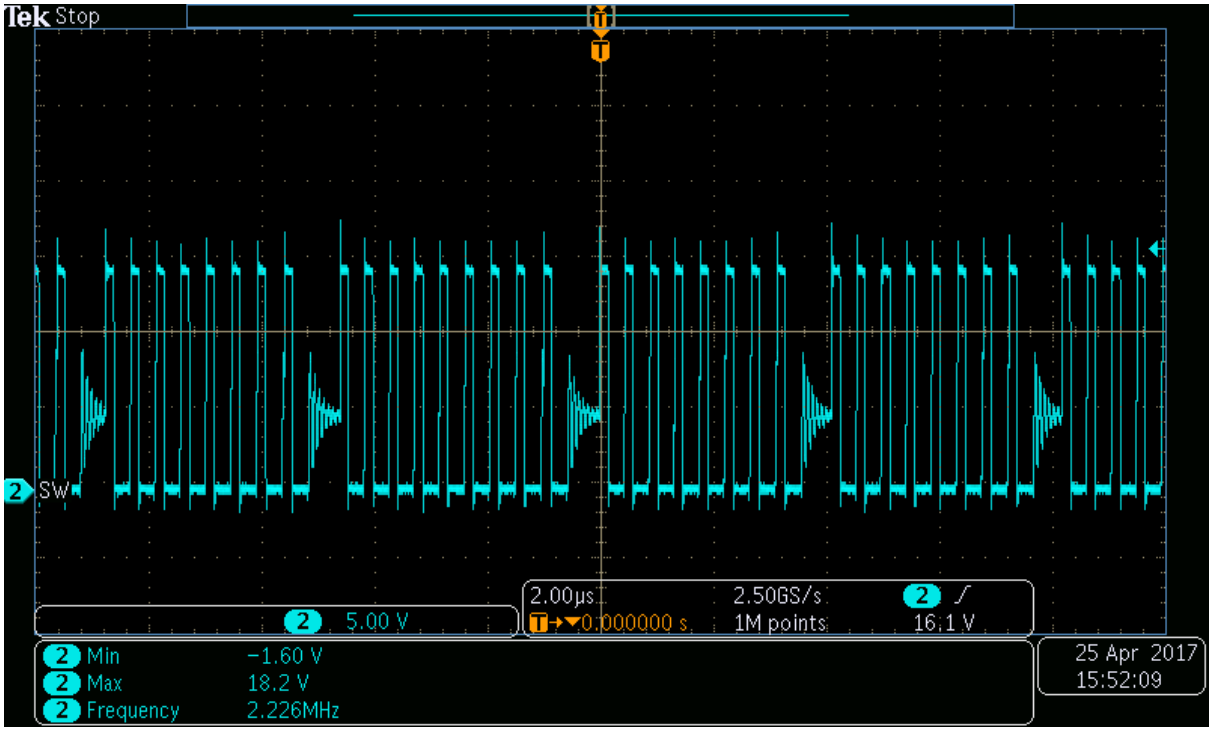


Figure 16

15.Thermal Image

The thermal image (Figure 17) shows the circuit at an ambient temperature of 20°C with an input voltage of 12.0V and 0.15A load on the 15V output and 0.2A load on the 5V output.

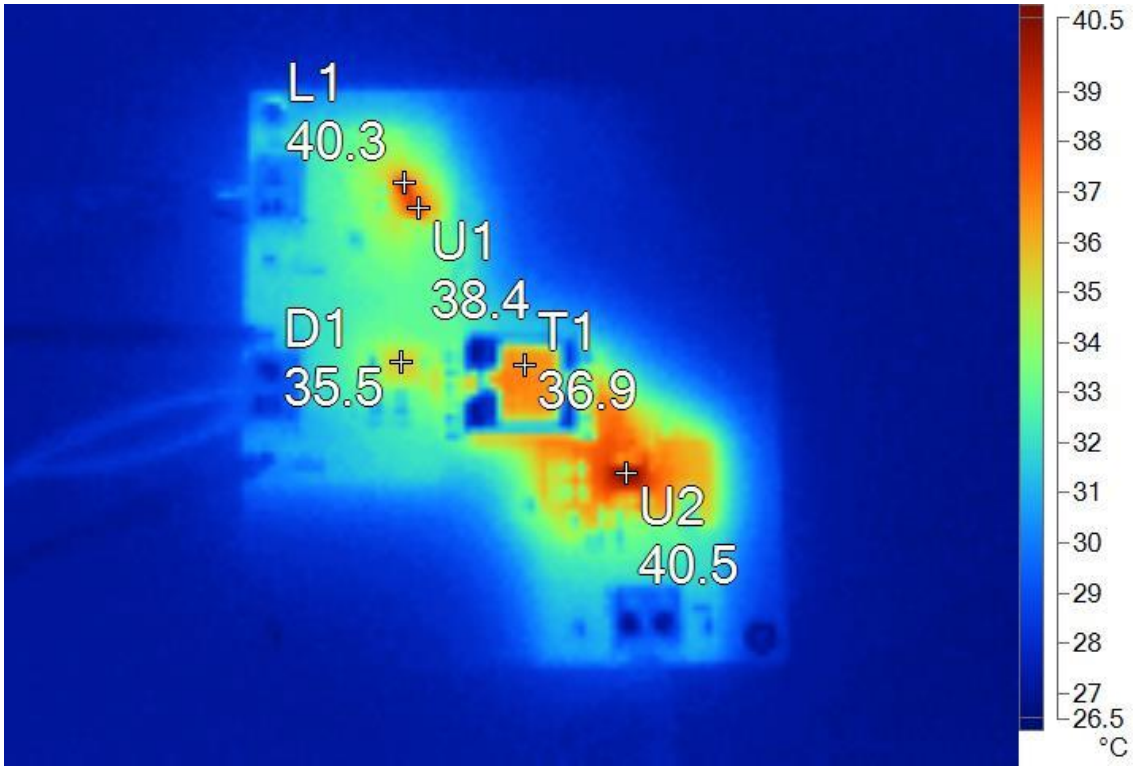


Figure 17

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