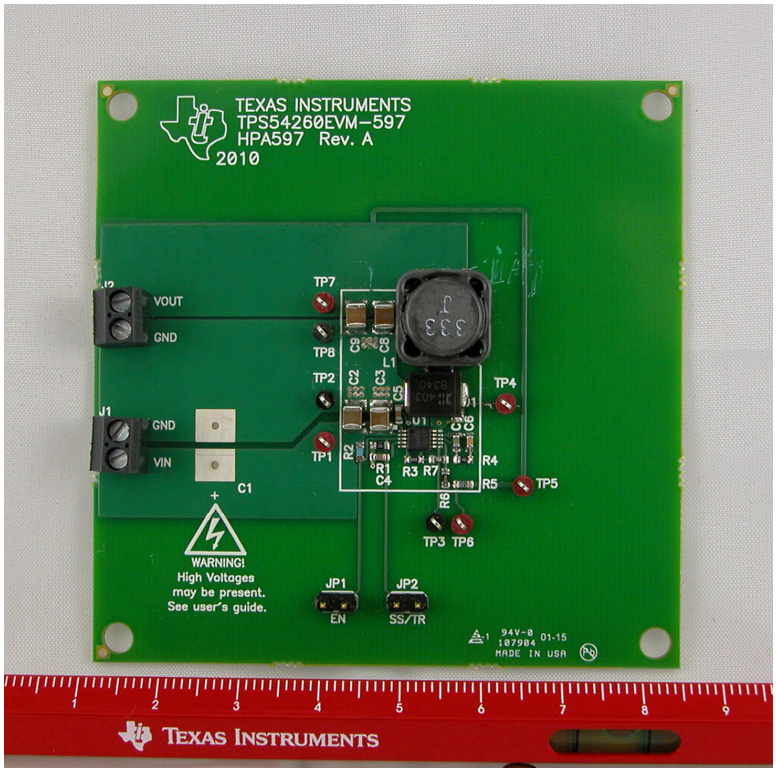
Automotive Non-Synchronous Buck – 13.2V @ 2.0A

- Input 16..34V DC
- Output 13.2V @ 2.0A
- Converter TPS54260
- Free-Running switching frequency of 400 kHz
- Working in continuous conduction mode
- Modified TPS54260EVM-597



1 Startup

The startup waveform is shown in Figure 1. The input voltage is set at 24.0V, with no load on the 13.2V output.

Channel C1: **24.0V Input voltage**
5V/div, 10ms/div

Channel C2: **13.2V Output voltage**
5V/div, 10ms/div

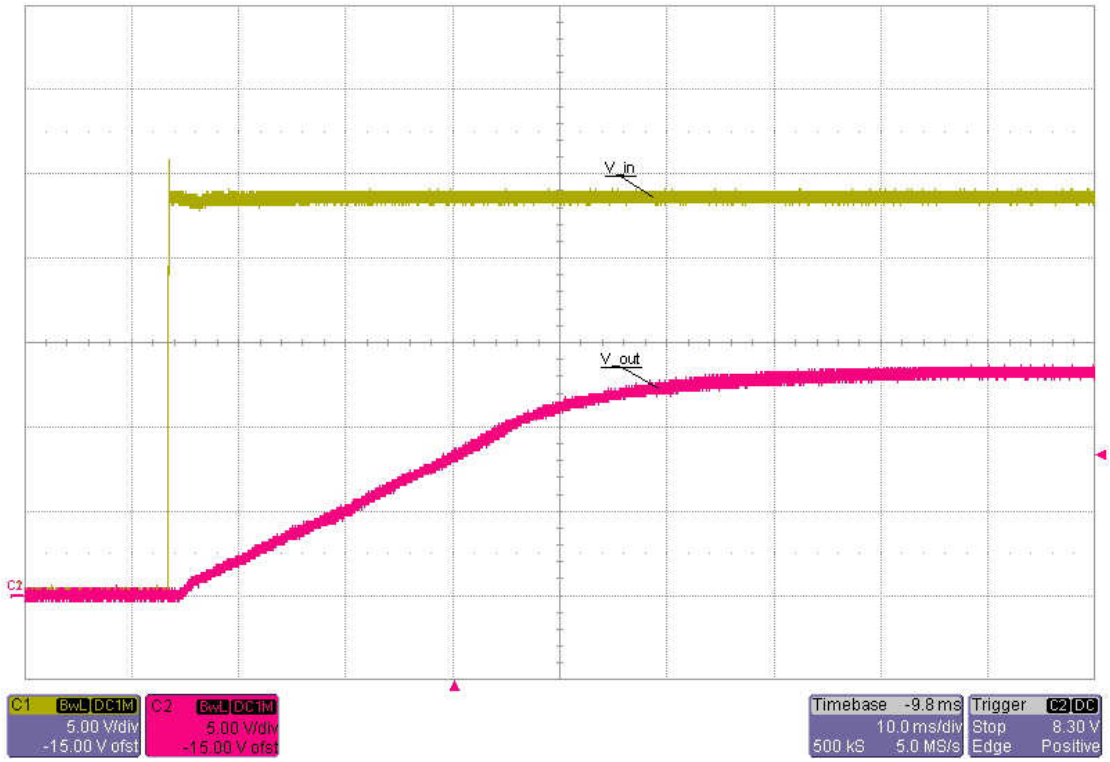


Figure 1

2 Shutdown

The shutdown waveform is shown in Figure 2. The input voltage is set at 24.0V with a 2.0A load on the 13.2V output.

Channel C1: **24.0V Input voltage**
5V/div, 100us/div

Channel C2: **13.2V Output voltage**
5V/div, 100us/div

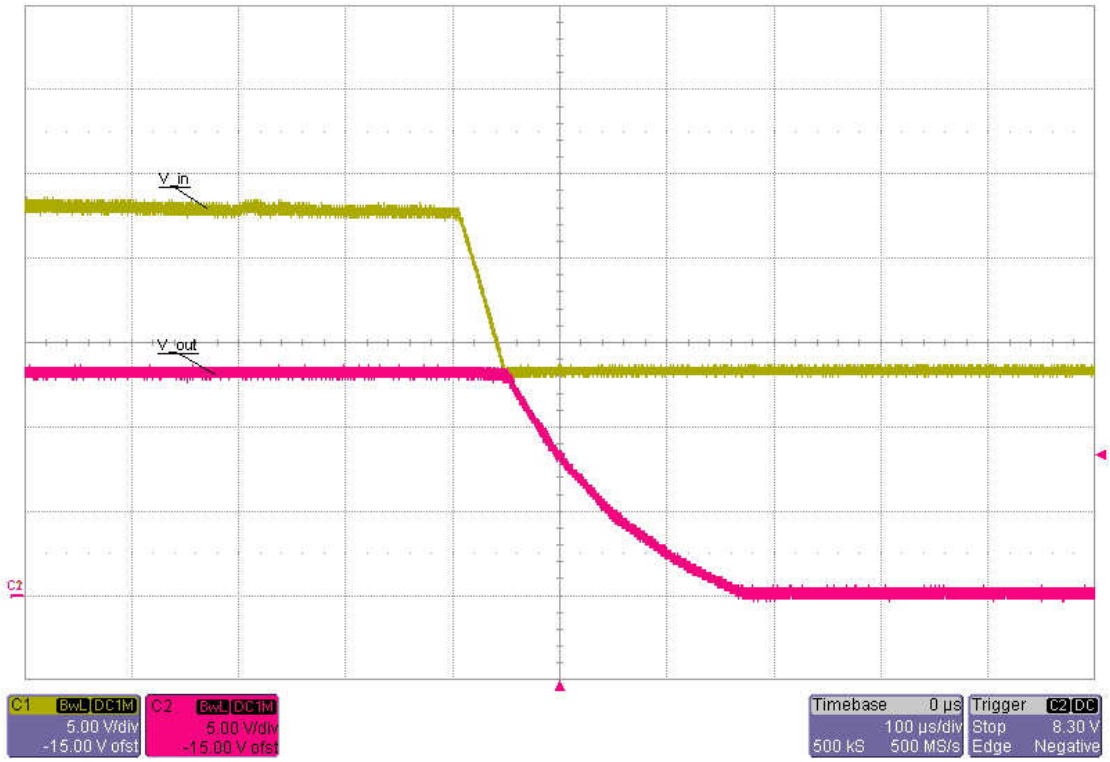


Figure 2

3 Efficiency & Load Regulation

The efficiency and load regulation are shown in Figure 3 and Figure 4.

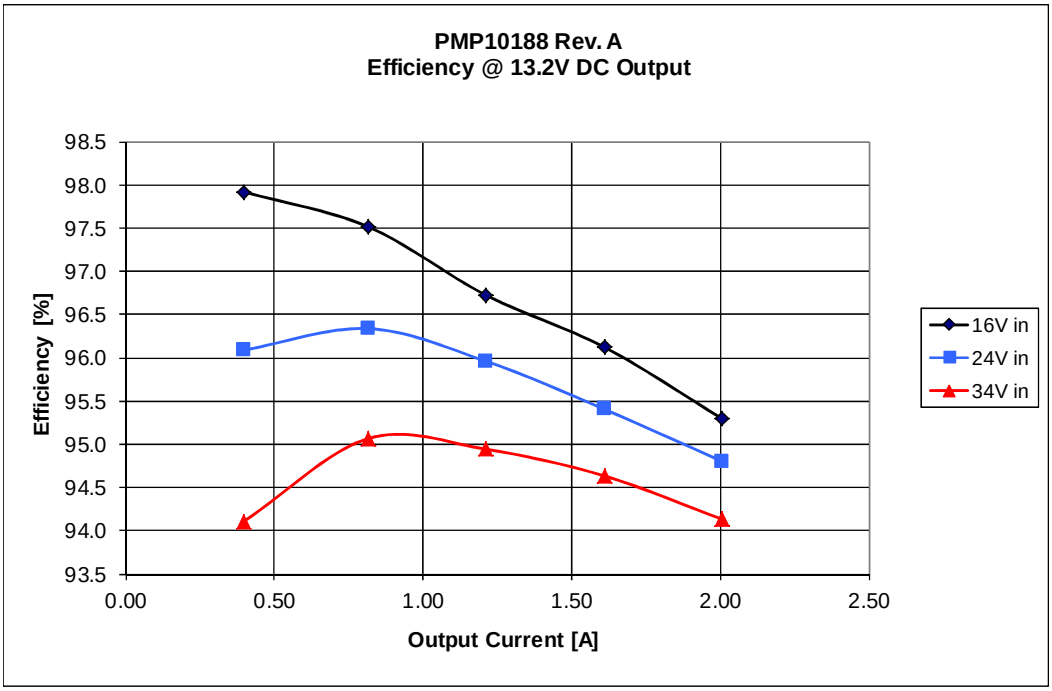


Figure 3

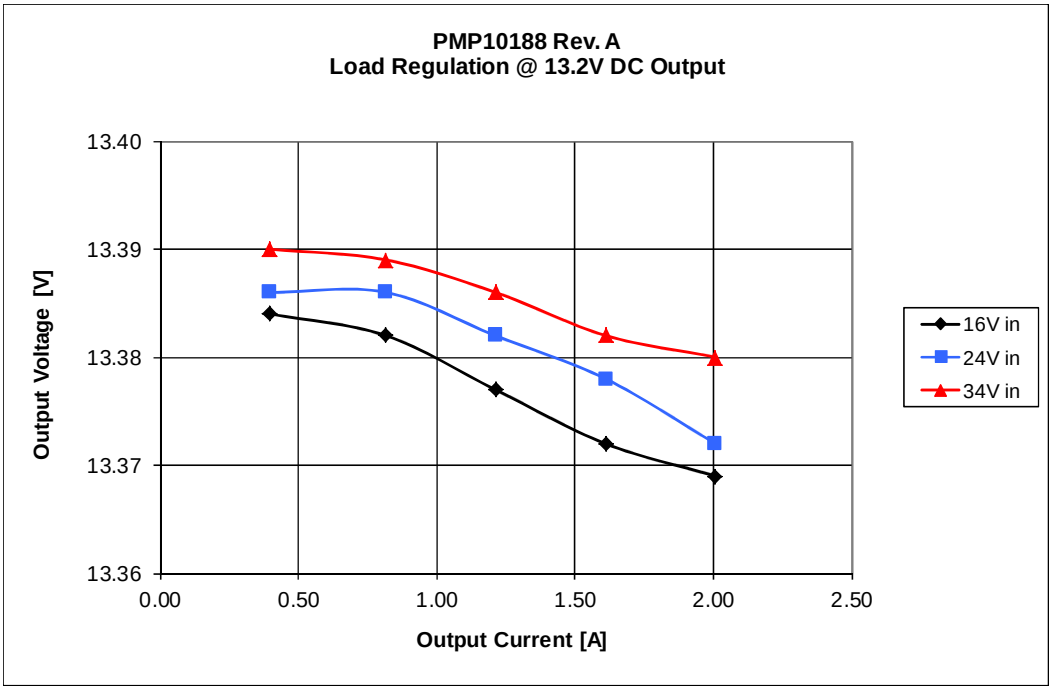


Figure 4

4 Load Step

The response to a load step and a load dump for the 13.2V output at an input voltage of 24.0V is shown in Figure 5.

Channel C2: **Output voltage**, -494mV undershoot (3.7%), 482mV overshoot (3.7%)
500mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 1.0A to 2.0A and vice versa
1A/div, 1ms/div

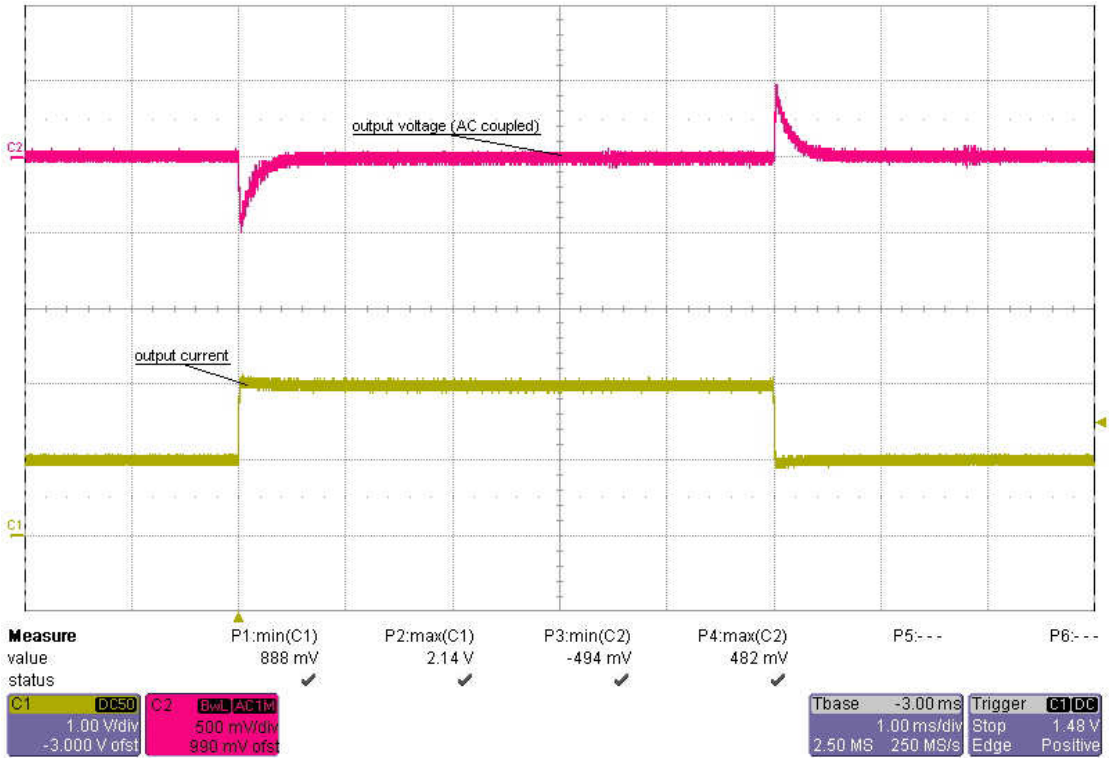


Figure 5

5 Frequency Response

Figure 6 shows the loop response at 16V, 24V and 34V input voltage and 2.0A load.

16V input

- 2.0A load 73 deg phase margin, 22.3 kHz bandwidth, -15 dB gain margin

24V input

- 2.0A load 74 deg phase margin, 22.1 kHz bandwidth, -15 dB gain margin

34V input

- 2.0A load 74 deg phase margin, 22.3 kHz bandwidth, -15 dB gain margin

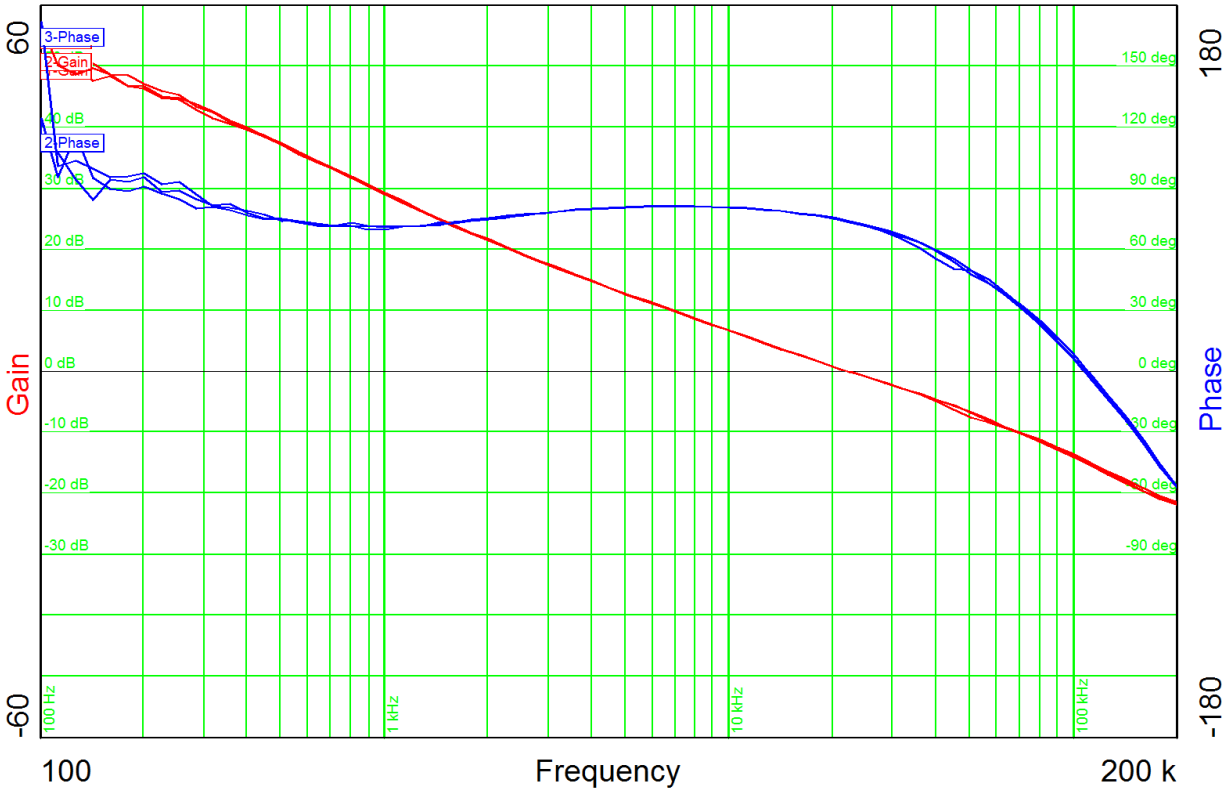


Figure 6

6 Switching Node

The drain-source voltage on the switching node is shown in Figure 7. The image was captured with 34V input and 2.0A load.

Channel C2: **Drain-source voltage**, -2.0V minimum voltage, 34.5V maximum voltage 5V/div, 1us/div

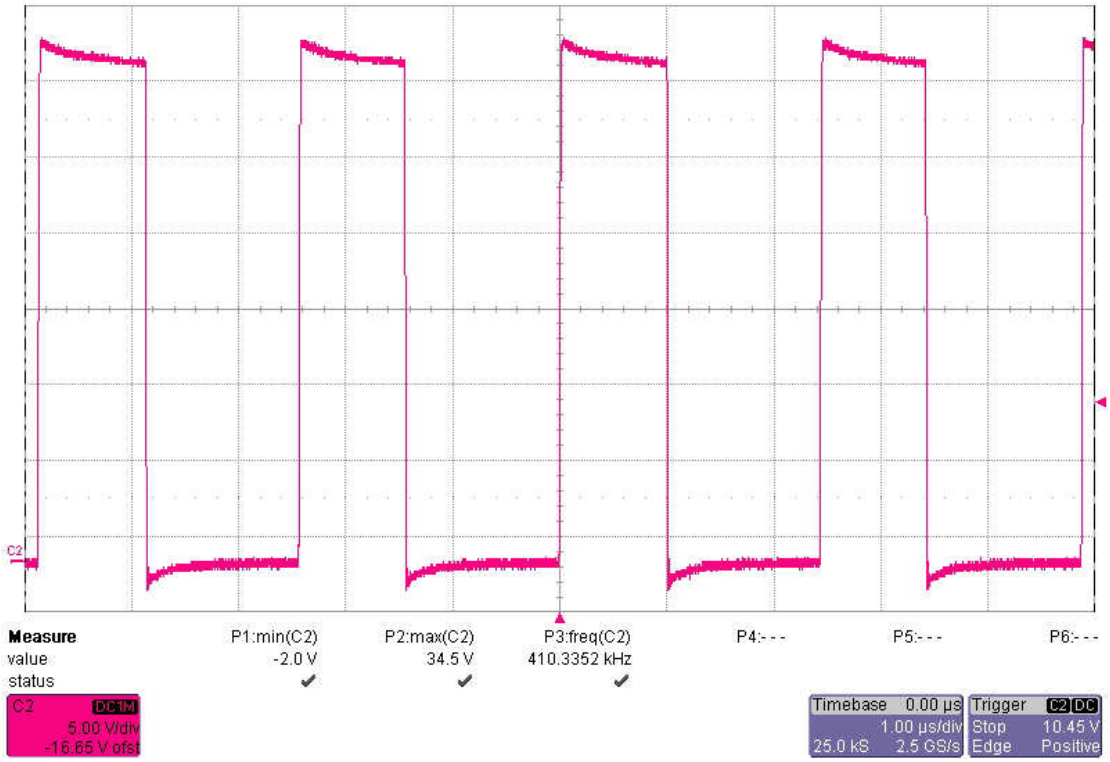


Figure 7

7 Output Ripple Voltage

The output ripple voltage at 2.0A load and 16V, 24V and 34V input voltage is shown in Figure 8.

Channel M1: **Output voltage @ 16V input**, 16mV peak-peak
20mV/div, 2us/div, AC coupled

Channel M2: **Output voltage @ 24V input**, 22mV peak-peak
20mV/div, 2us/div, AC coupled

Channel M3: **Output voltage @ 34V input**, 24mV peak-peak
20mV/div, 2us/div, AC coupled

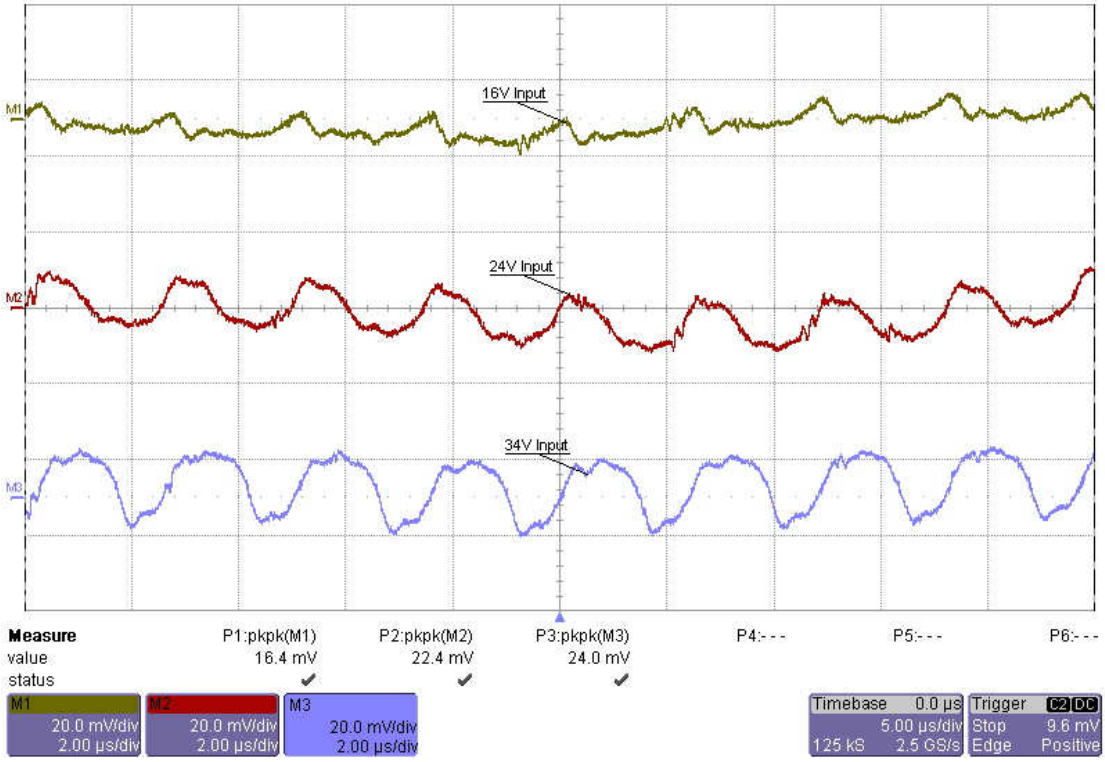


Figure 8

8 Input Ripple Voltage

The input ripple voltage at 2.0A load and 16V, 24V and 34V input voltage is shown in Figure 9.

Channel M1: **Input voltage @ 16V input**, 126mV peak-peak
200mV/div, 2us/div, AC coupled

Channel M2: **Input voltage @ 24V input**, 258mV peak-peak
200mV/div, 2us/div, AC coupled

Channel M3: **Input voltage @ 34V input**, 312mV peak-peak
200mV/div, 2us/div, AC coupled

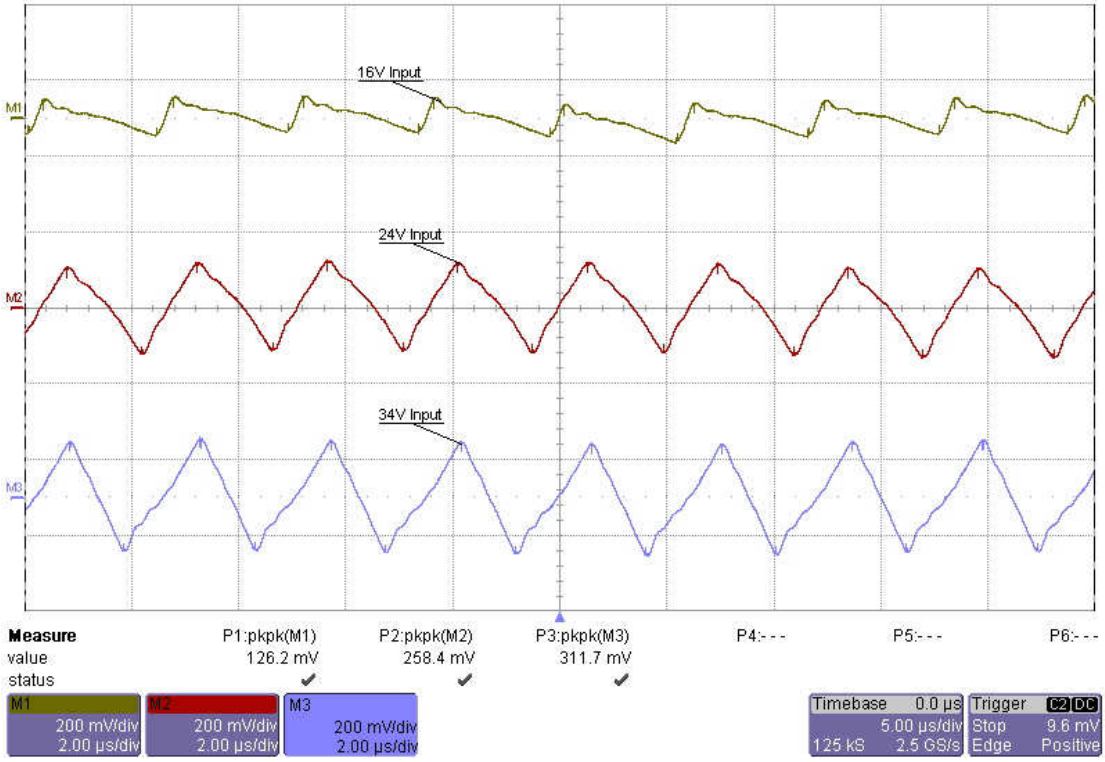


Figure 9

9 Thermal measurement

The thermal image (Figure 10) shows the circuit at an ambient temperature of 21 °C with an input voltage of 24.0V and a load of 2.0A.

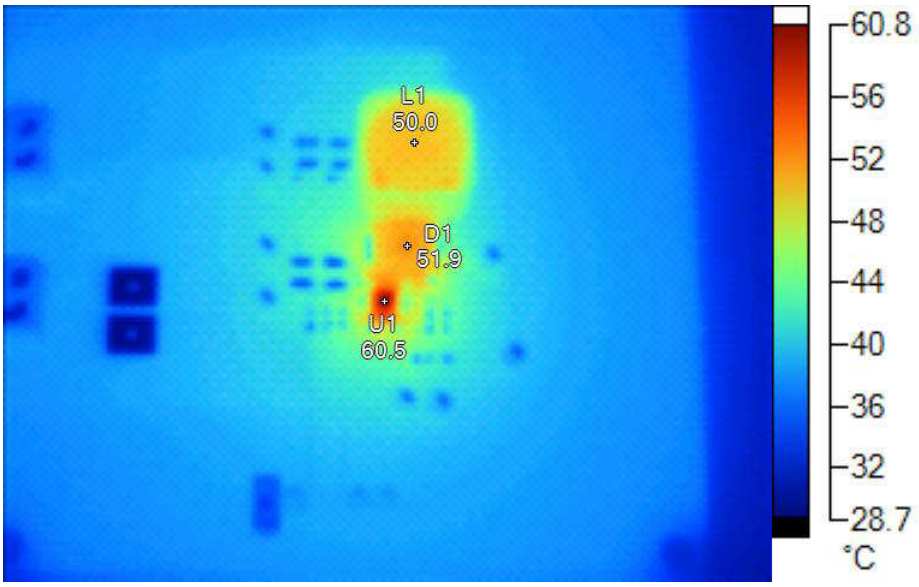


Figure 10

Markers

Label	Temperature	Emissivity	Background
U1	60.5 °C	0.95	21.0 °C
L1	50.0 °C	0.95	21.0 °C
D1	51.9 °C	0.95	21.0 °C

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