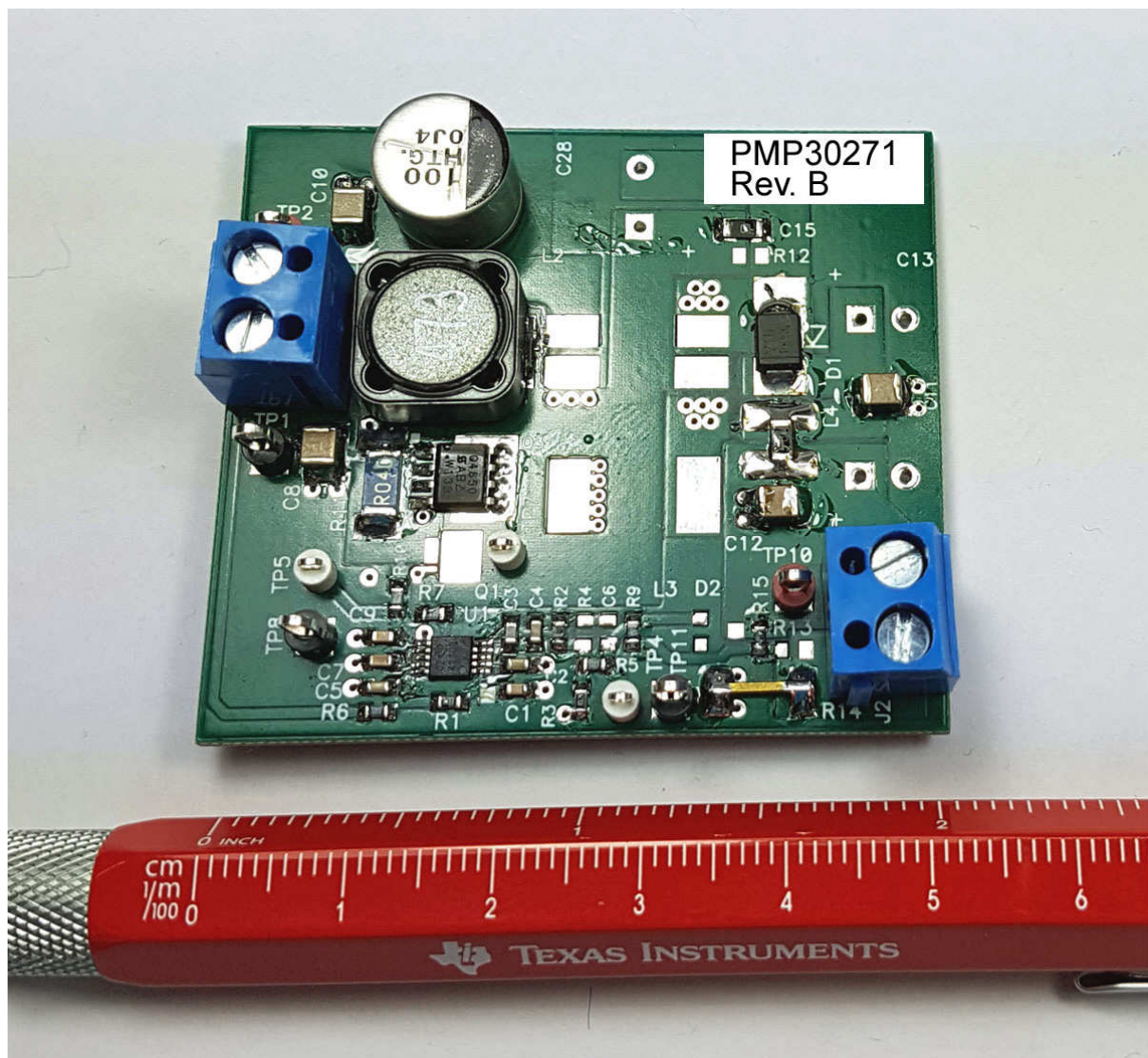


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Automotive Boost Converter

- Input 6.0 .. 16.0V nominal, 42.0V peak
- Output 24.0V @ 0.5A
- Controller TPS40210-Q1
- Free-Running-Switching Frequency of 350 kHz
- Built on PCB PMP2773 Rev.B



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1. Startup

The startup waveform at 12.0V input voltage and no load on the 24.0V output is shown in Figure 1.

Channel C1 **12.0V Input Voltage**

5V/div, 5ms/div

Channel C2 **24.0V Output Voltage**

5V/div, 5ms/div

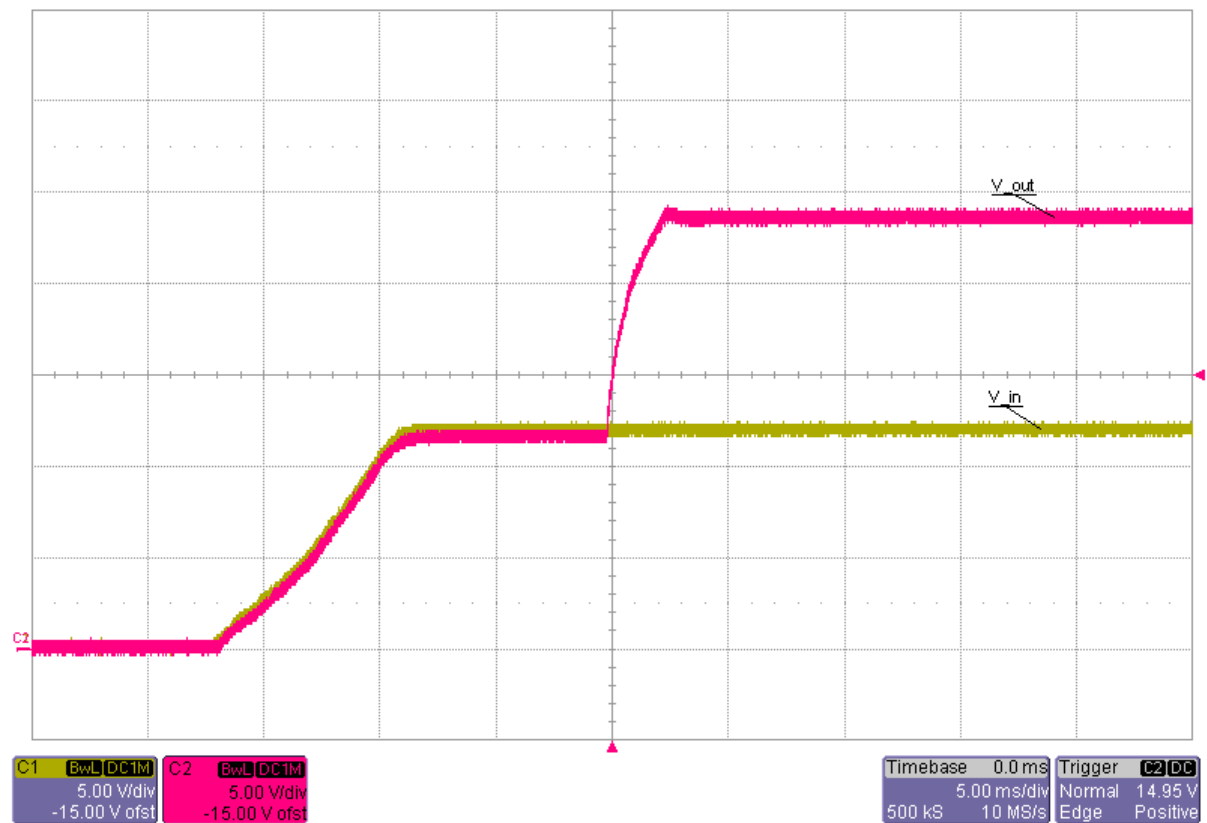


Figure 1

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2. Shutdown

The shutdown waveform at 12.0V input voltage and 0.5A load at 24.0V output voltage is shown in Figure 2.

Channel C1 **12.0V Input Voltage**

5V/div, 20ms/div

Channel C2 **24.0V Output Voltage**

5V/div, 20ms/div

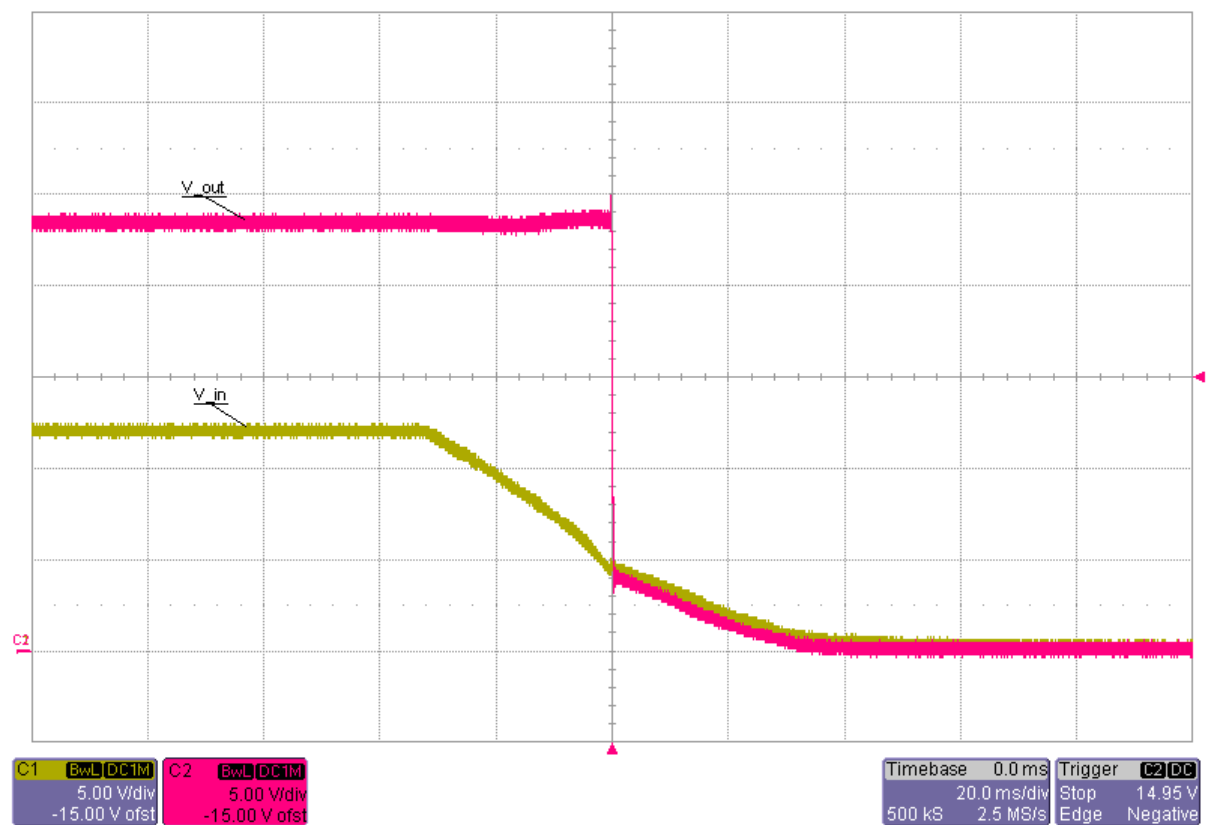


Figure 2

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3. Efficiency

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

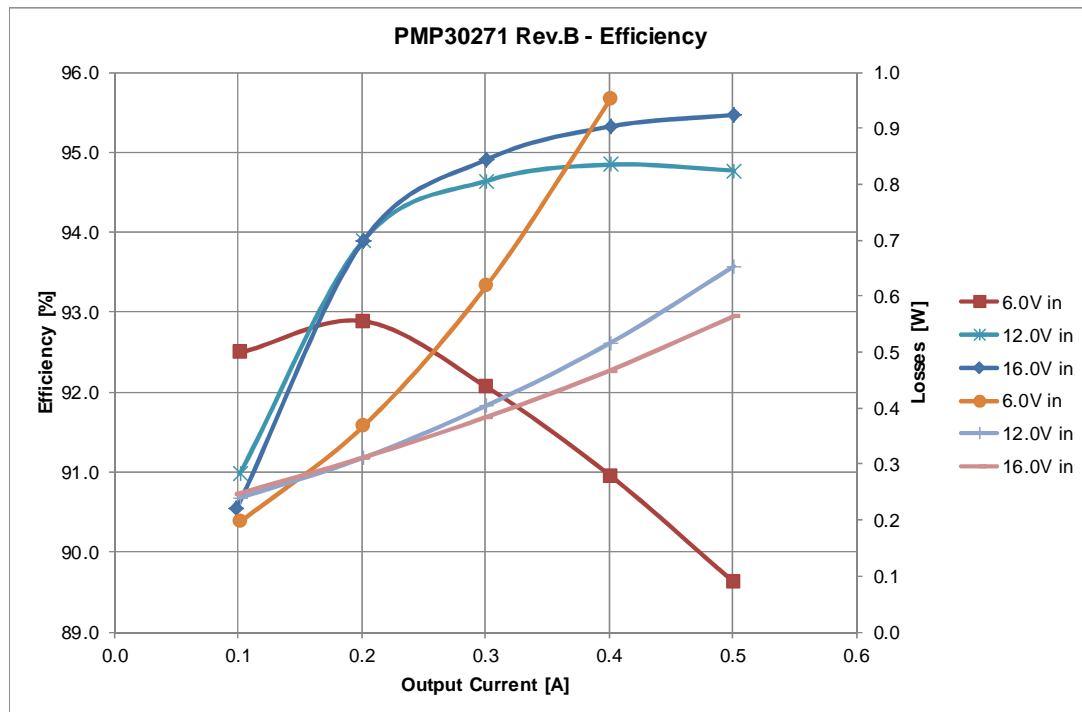


Figure 3

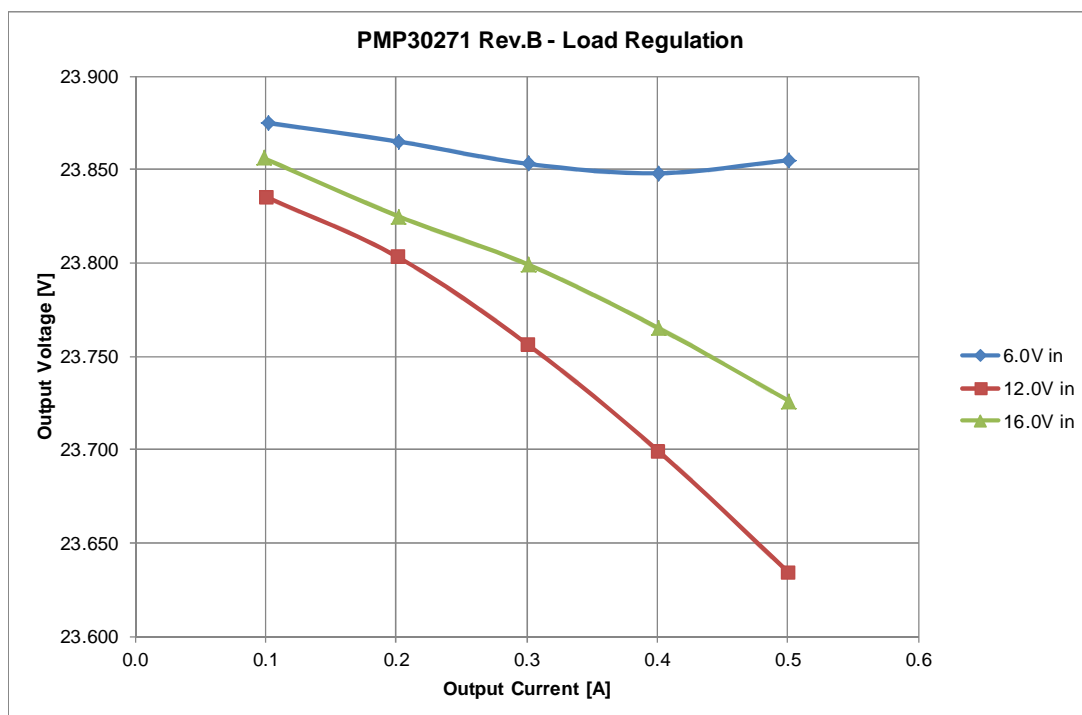


Figure 4

4. Transient Response

The response to a load step at 24.0V output voltage is shown in Figure 5.

Channel C1 **Output Current**, Load Step 0.25A to 0.5A

200mA/div, 1ms/div

Channel C2 **Output Voltage**, -1.44V undershoot (6.0%), 1.75V overshoot (7.3%)

1V/div, 1ms/div, AC coupled

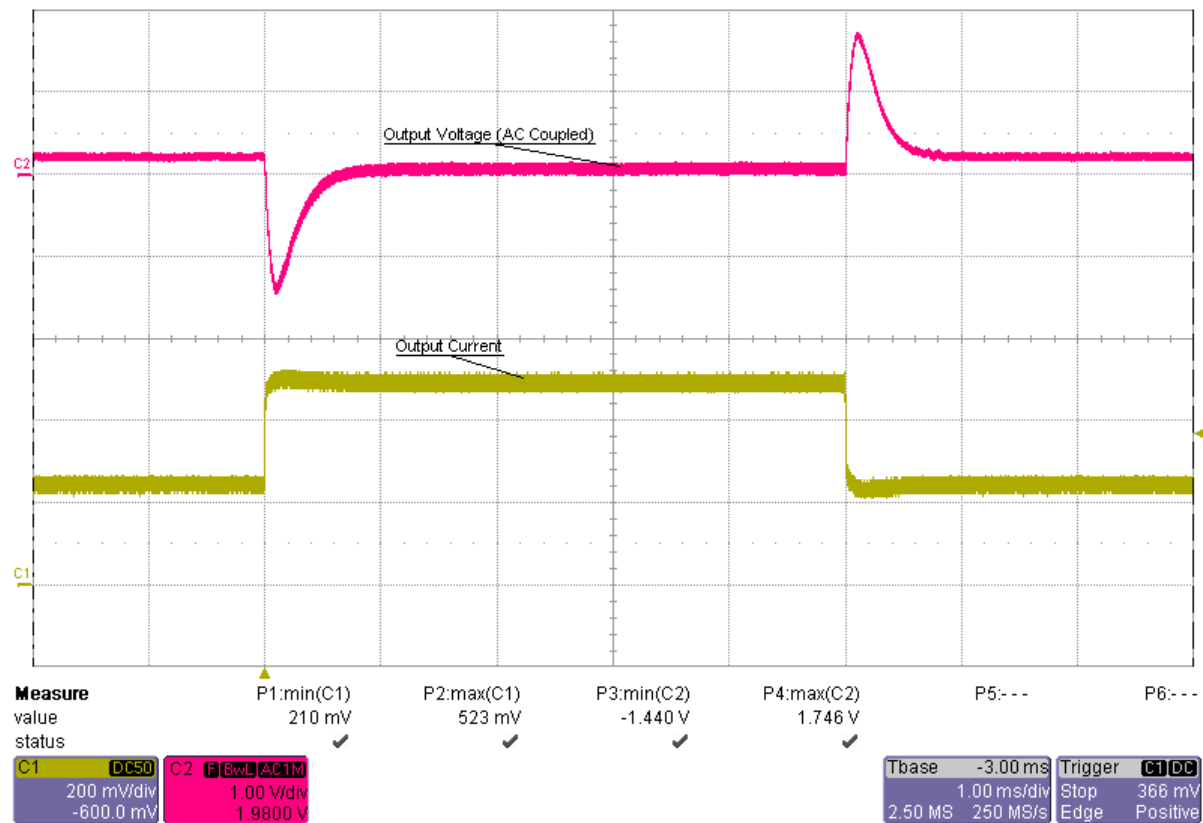


Figure 5

5. Frequency Response

The frequency response is shown in Figure 6.

6.0V Input, 0.5A Load	1.1 kHz Bandwidth, 62 deg Phase Margin, -18 dB Gain Margin
12.0V Input, 0.5A Load	1.9 kHz Bandwidth, 86 deg Phase Margin, -25 dB Gain Margin
16.0V Input, 0.5A Load	2.2 kHz Bandwidth, 101 deg Phase Margin, -27 dB Gain Margin

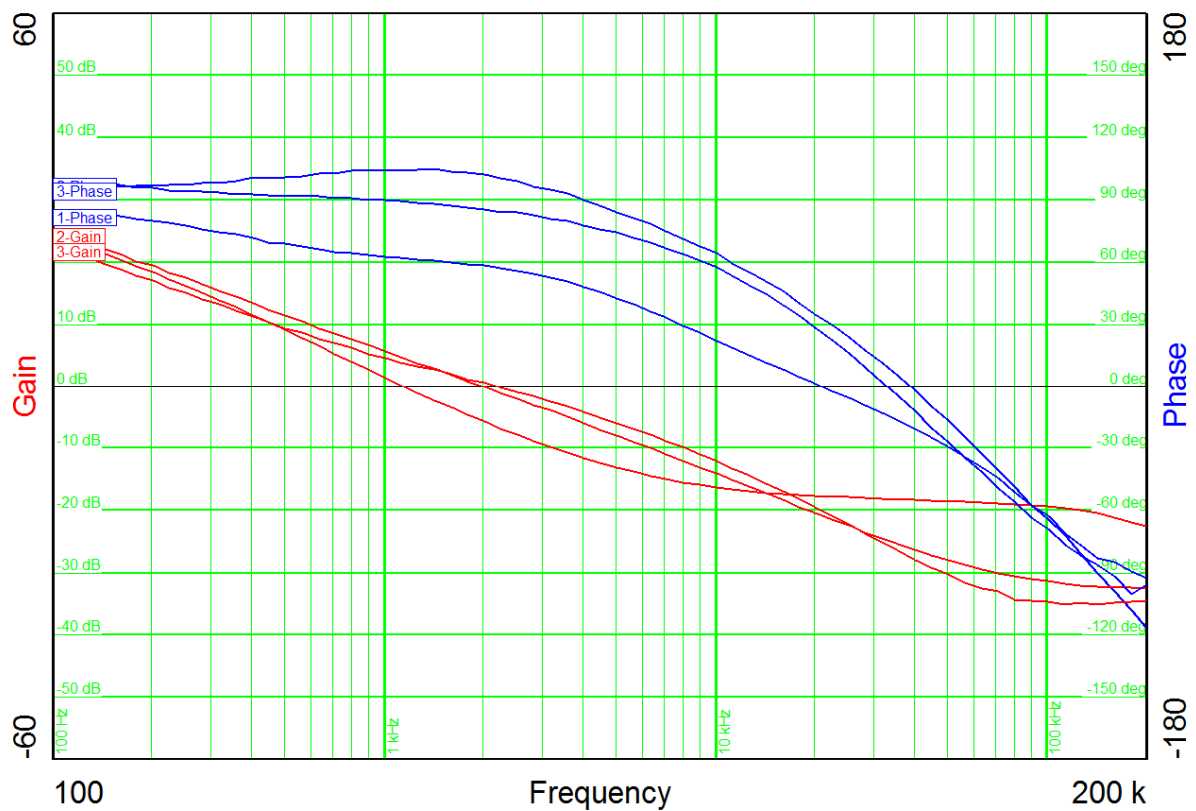


Figure 6

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6. Input Ripple

The input ripple is shown in Figure 7.

Channel M1 **Input Voltage @ 6.0V Input / 0.5A Load**, 147mV peak-peak (2.5%)

100mV/div, 2us/div, AC coupled

Channel M2 **Input Voltage @ 12.0V Input / 0.5A Load**, 119mV peak-peak (1.0%)

100mV/div, 2us/div, AC coupled

Channel M3 **Input Voltage @ 16.0V Input / 0.5A Load**, 108mV peak-peak (0.7%)

100mV/div, 2us/div, AC coupled

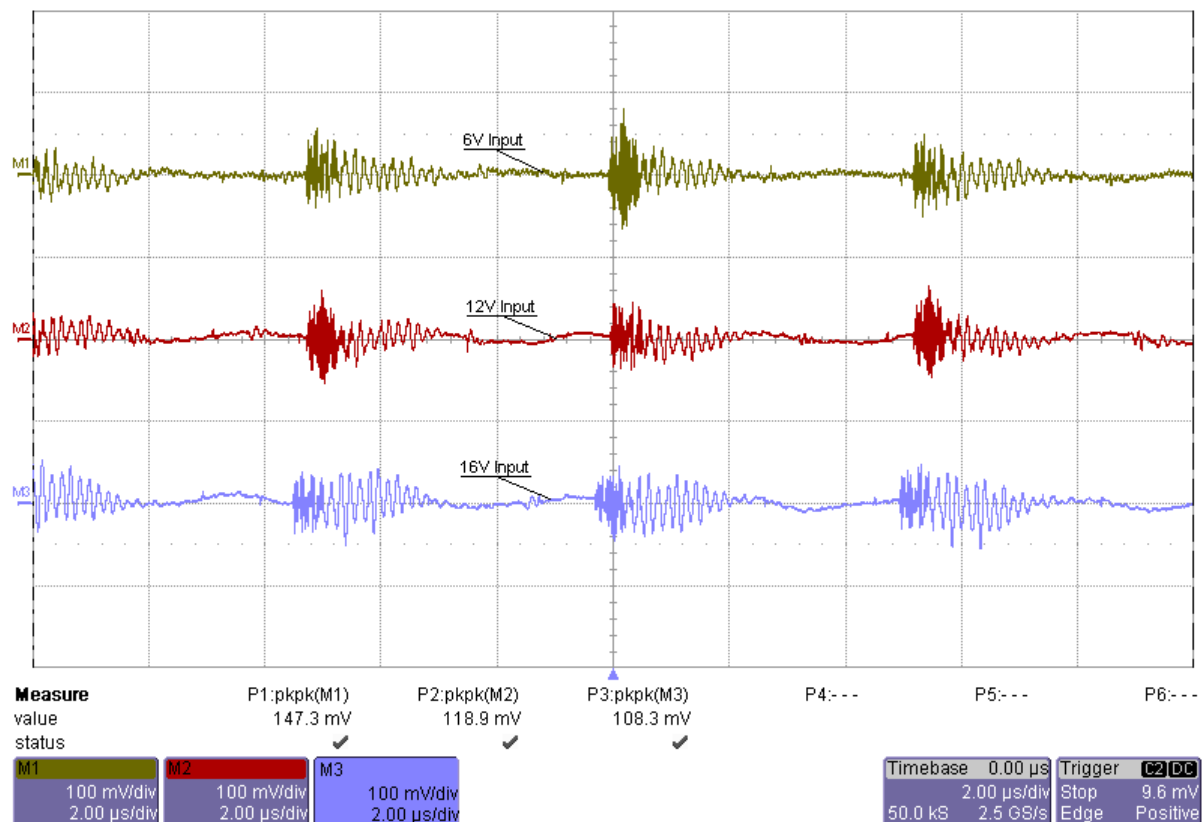


Figure 7

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7. Output Ripple

The output ripple voltage is shown in Figure 8.

Channel M1 **Output Voltage @ 6.0V Input / 0.5A Load**, 200mV peak-peak (0.8%)

5mV/div, 2us/div, AC coupled

Channel M2 **Output Voltage @ 12.0V Input / 0.5A Load**, 162mV peak-peak (0.7%)

5mV/div, 2us/div, AC coupled

Channel M3 **Output Voltage @ 16.0V Input / 0.5A Load**, 114mV peak-peak (0.5%)

5mV/div, 2us/div, AC coupled

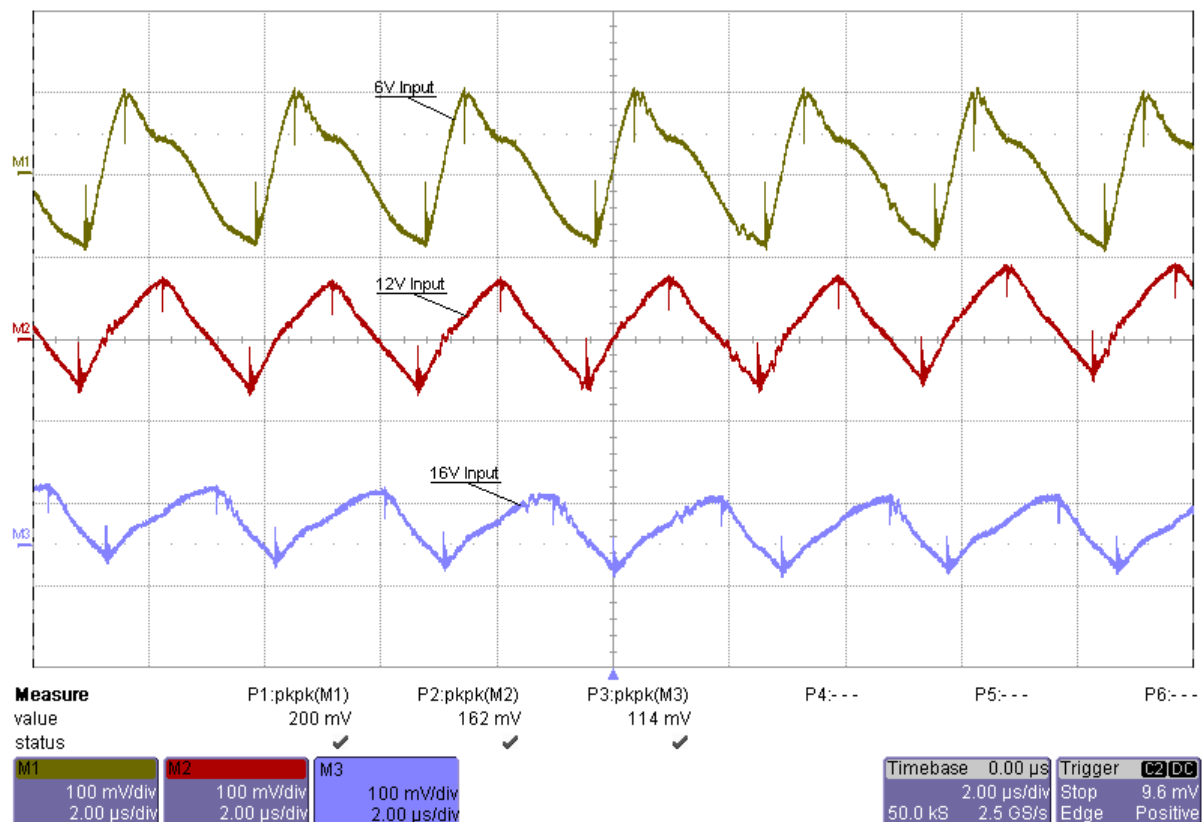


Figure 8

8. Low-Side FET (Switching Node)

The drain-source voltage of the low-side FET at 12.0V input voltage and 0.5A load on the output is shown in Figure 9.

Channel C2 **Drain-Source Voltage**, -0.8V minimum, 28.9V maximum
5V/div, 1us/div

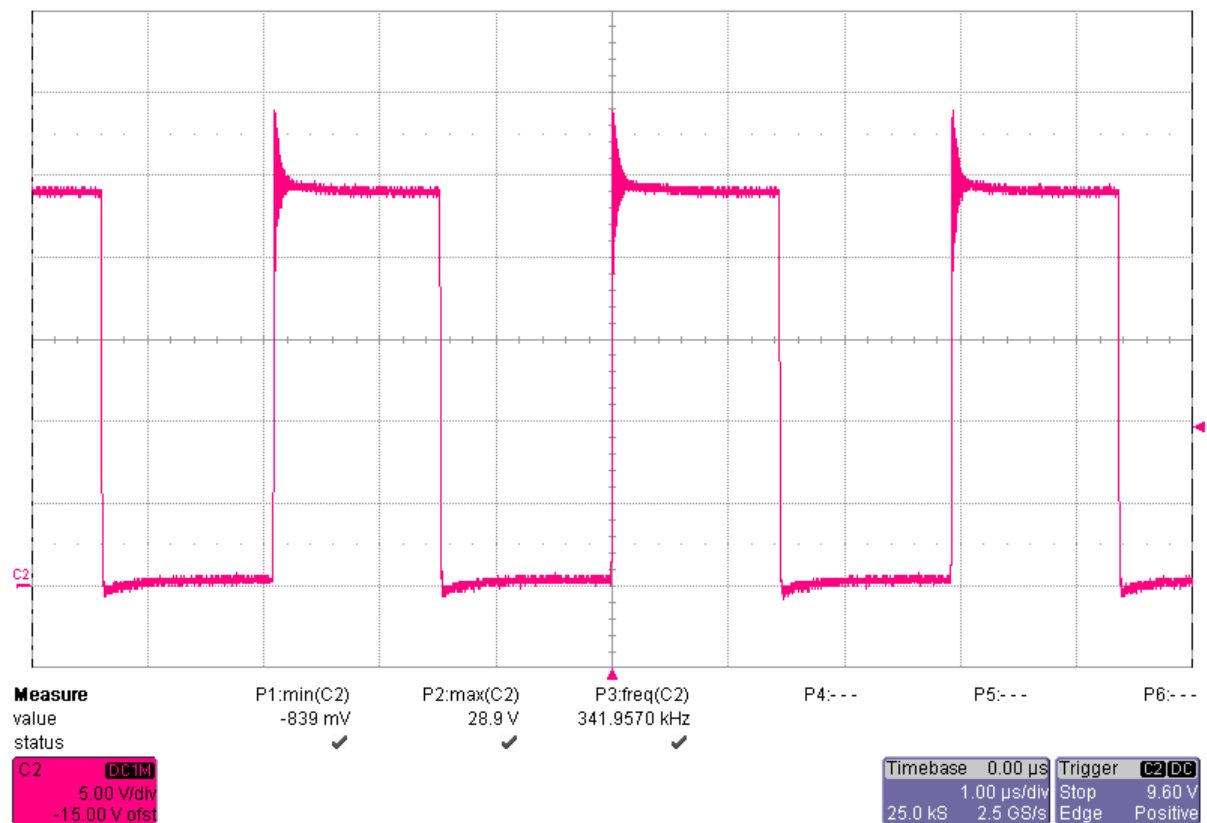


Figure 9

9. Diode

The drain-source voltage of the diode at 12.0V input voltage and 6.0A load on the output is shown in Figure 10.

Channel C2 **Drain-Source Voltage**, -28.0V minimum, 1.6V maximum
5V/div, 1us/div

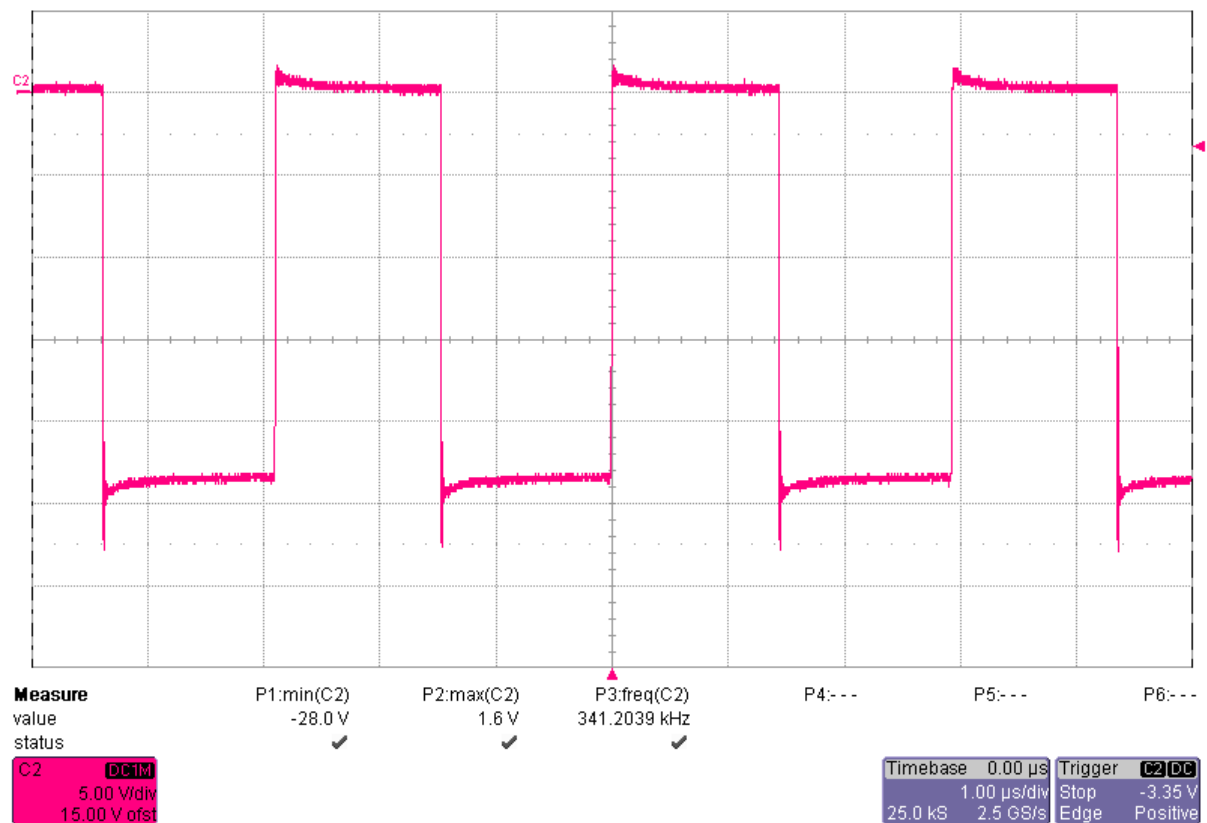


Figure 10

10. Thermal Image

The thermal image (Figure 11) shows the circuit at an ambient temperature of 20°C with an input voltage of 12.0V and 0.5A load on the output.

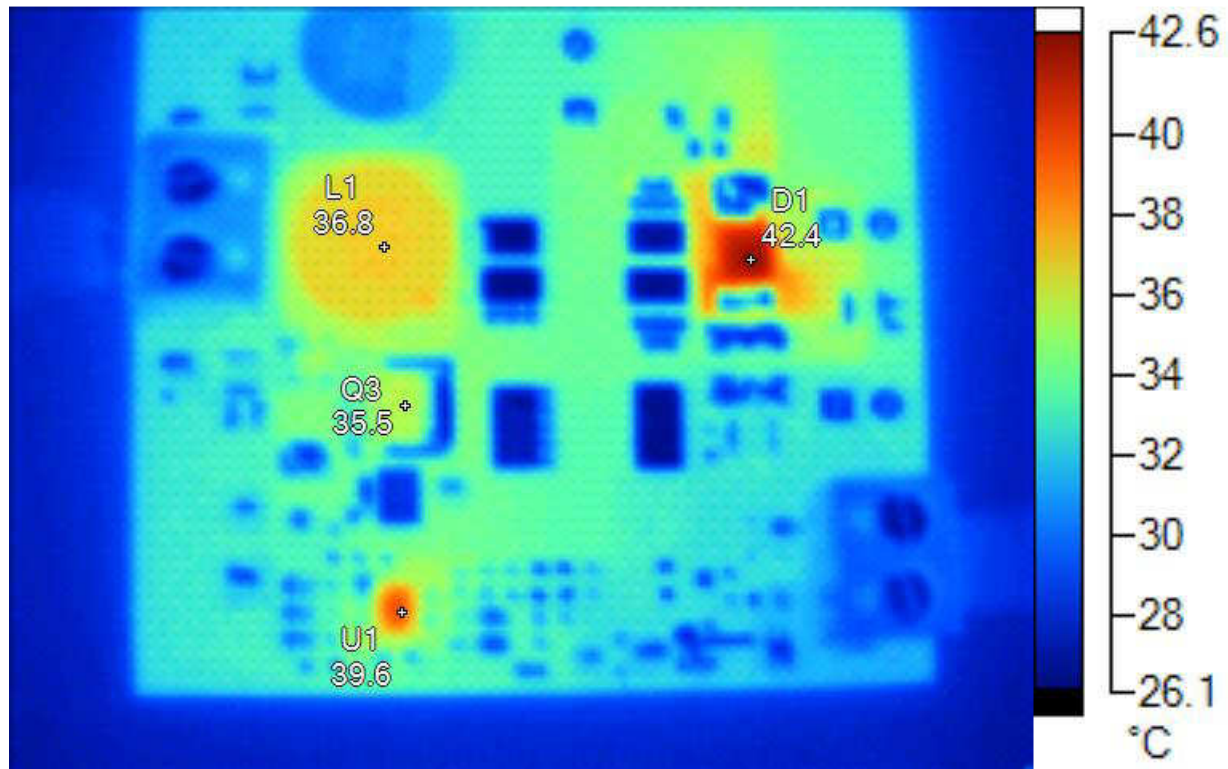


Figure 11

Name	Temperature	Emissivity	Background
L1	36.8°C	0.95	20.0°C
D1	42.4°C	0.95	20.0°C
U1	39.6°C	0.95	20.0°C
Q3	35.5°C	0.95	20.0°C

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