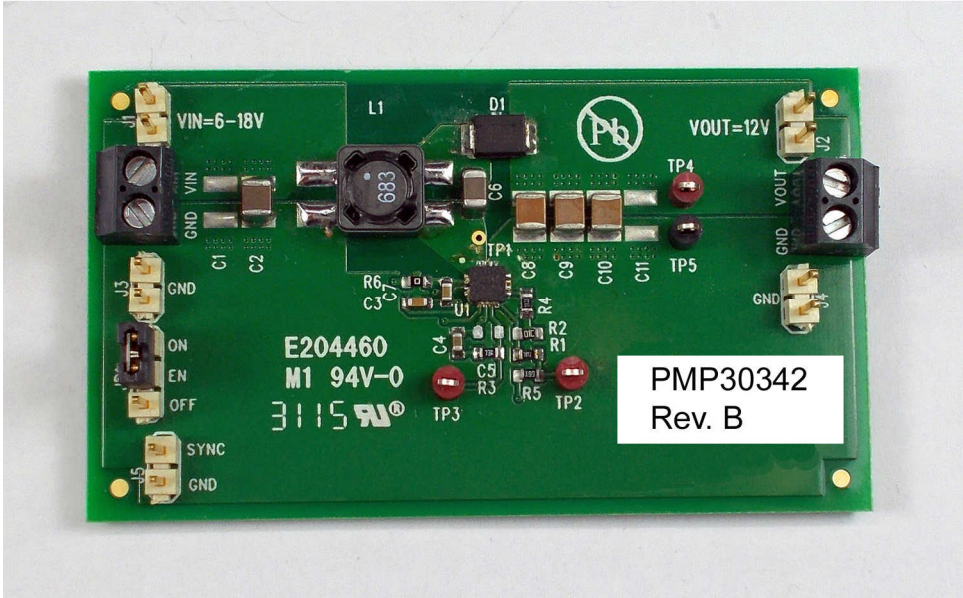
Automotive Sepic

- Input 4.0 .. 13.0V
- Output 11.0V @ 0.3A
- Free-Running-Switching Frequency of 400 kHz



1. Startup

The startup waveform at 13.0V input voltage and no load on the 11.0V output is shown in Figure 1.

Channel C1 **13.0V Input Voltage**
2V/div, 20ms/div

Channel C2 **11.0V Output Voltage**
2V/div, 20ms/div

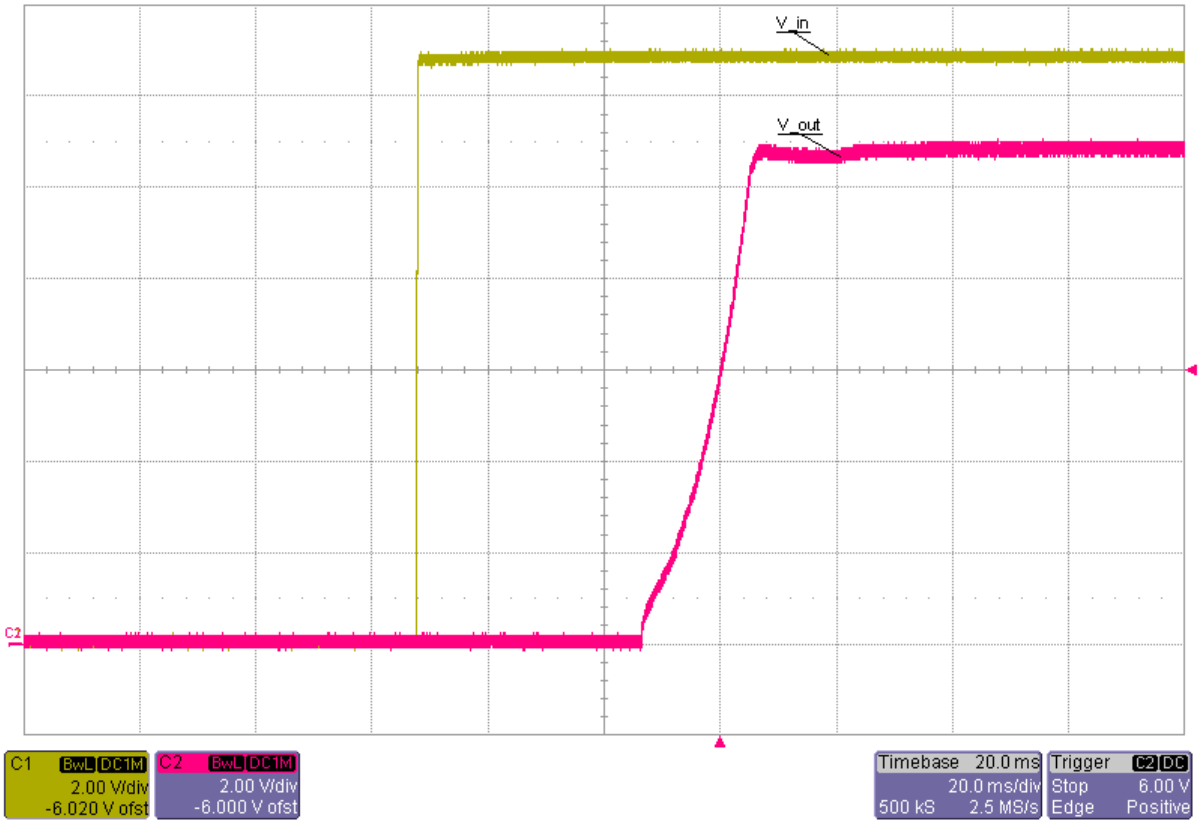


Figure 1

2. Shutdown

The shutdown waveform at 13.0V input voltage and 0.3A load at 11.0V output voltage is shown in Figure 2.

Channel C1 **13.0V Input Voltage**
2V/div, 1ms/div

Channel C1 **11.0V Output Voltage**
2V/div, 1ms/div

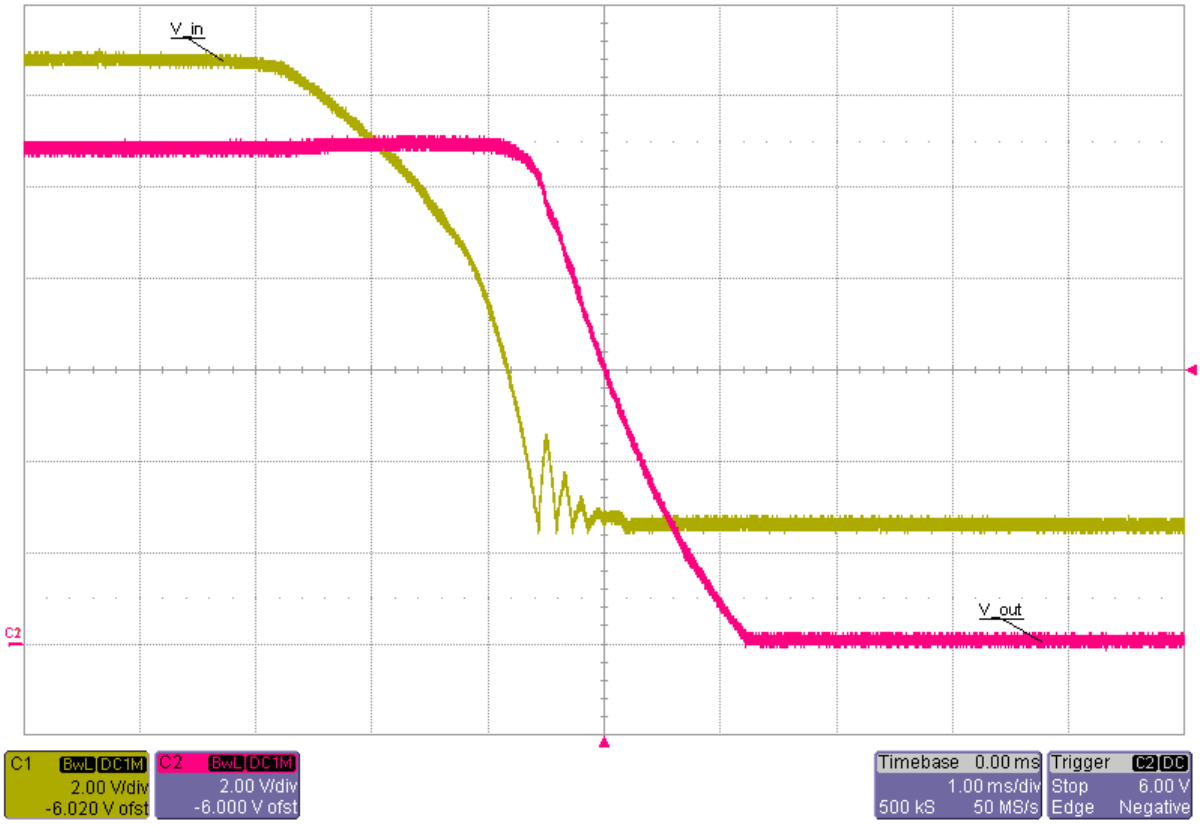


Figure 2

3. Efficiency

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

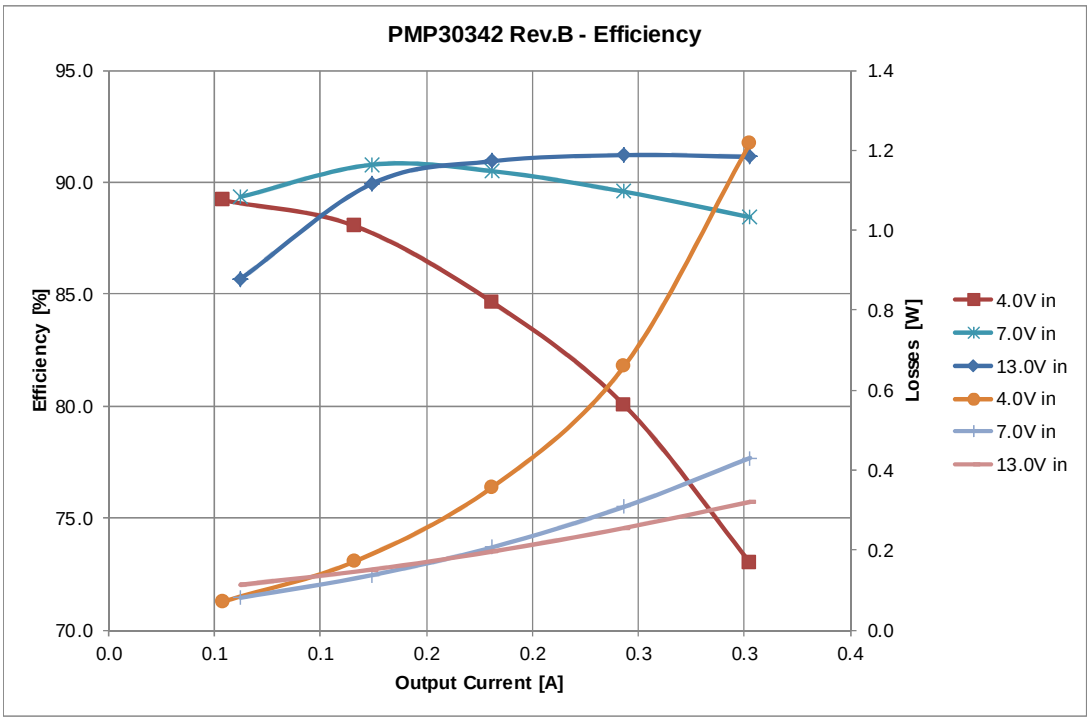


Figure 3

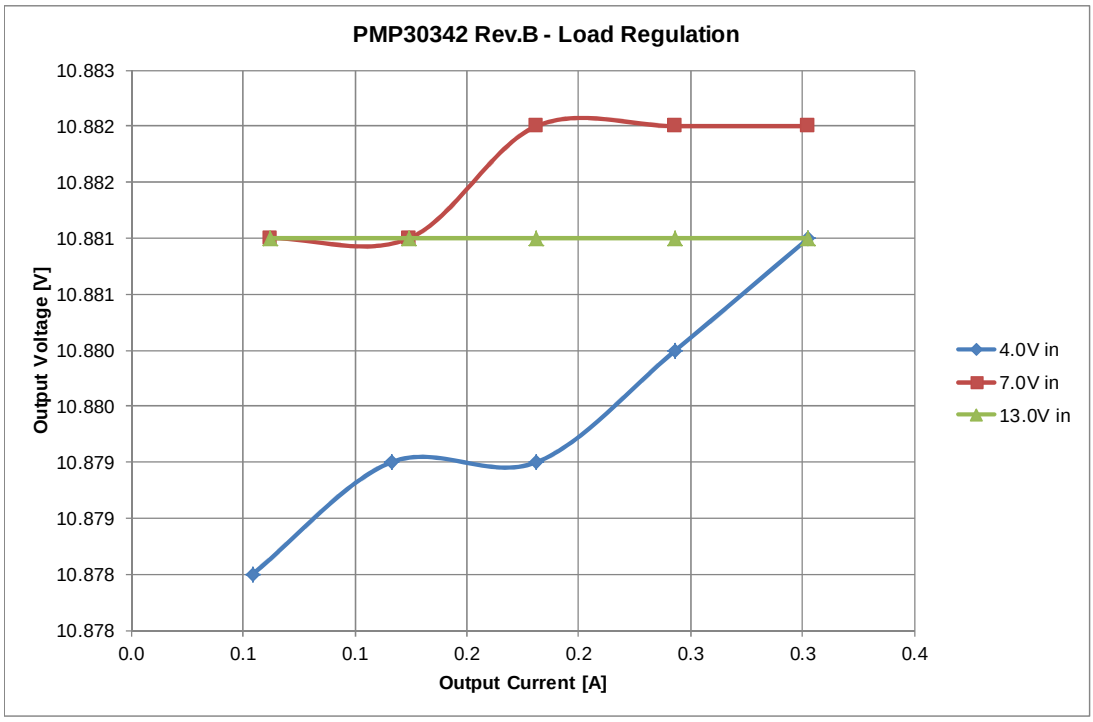


Figure 4

4. Transient Response

The response to a load step at 11.0V output voltage is shown in Figure 5.

Channel C1 **Output Current**, Load Step 0.15A to 0.3A
100mA/div, 1ms/div

Channel C2 **Output Voltage**, -232mV undershoot (2.1%), 268mV overshoot (2.4%)
200mV/div, 1ms/div, AC coupled

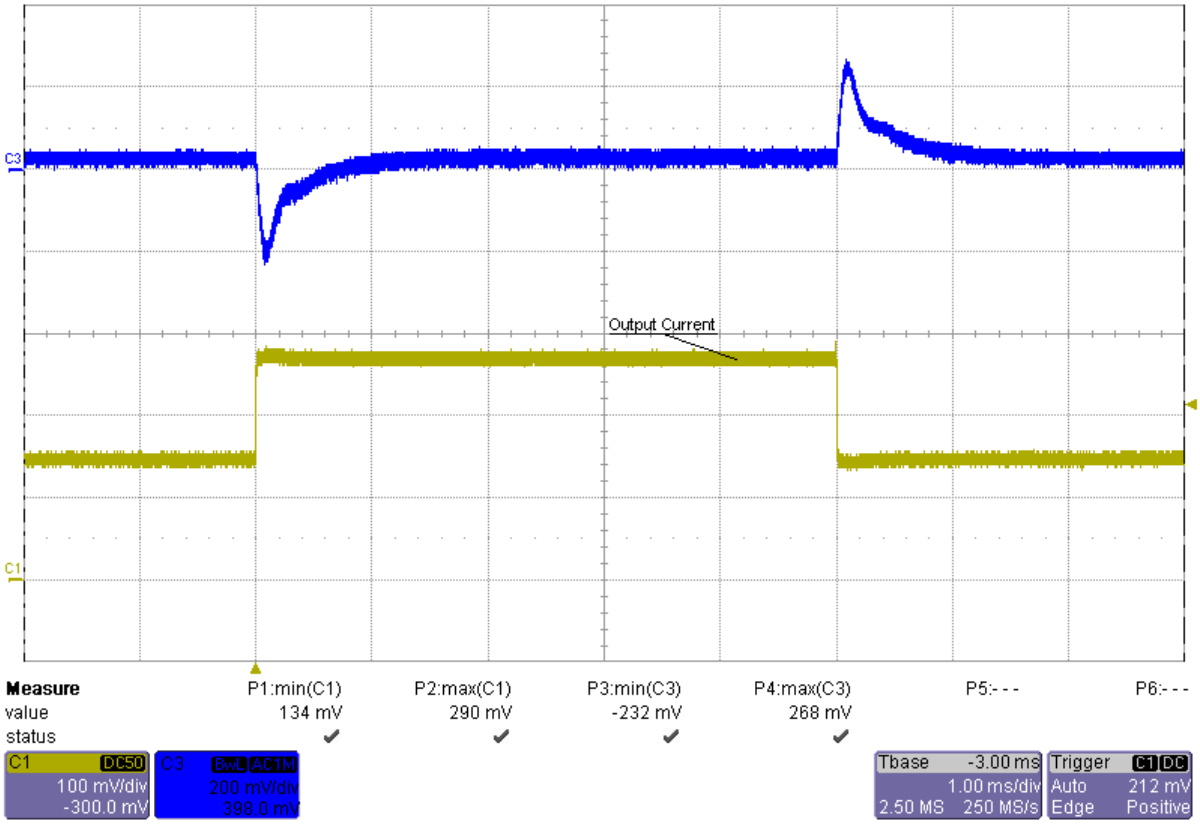


Figure 5

5. Frequency Response

The frequency response is shown in Figure 6.

4.0V Input, 0.3A Load	0.6 kHz Bandwidth, 66 deg Phase Margin, -29 dB Gain Margin
7.0V Input, 0.3A Load	1.8 kHz Bandwidth, 59 deg Phase Margin, -19 dB Gain Margin
13.0V Input, 0.3A Load	2.8 kHz Bandwidth, 59 deg Phase Margin, -23 dB Gain Margin

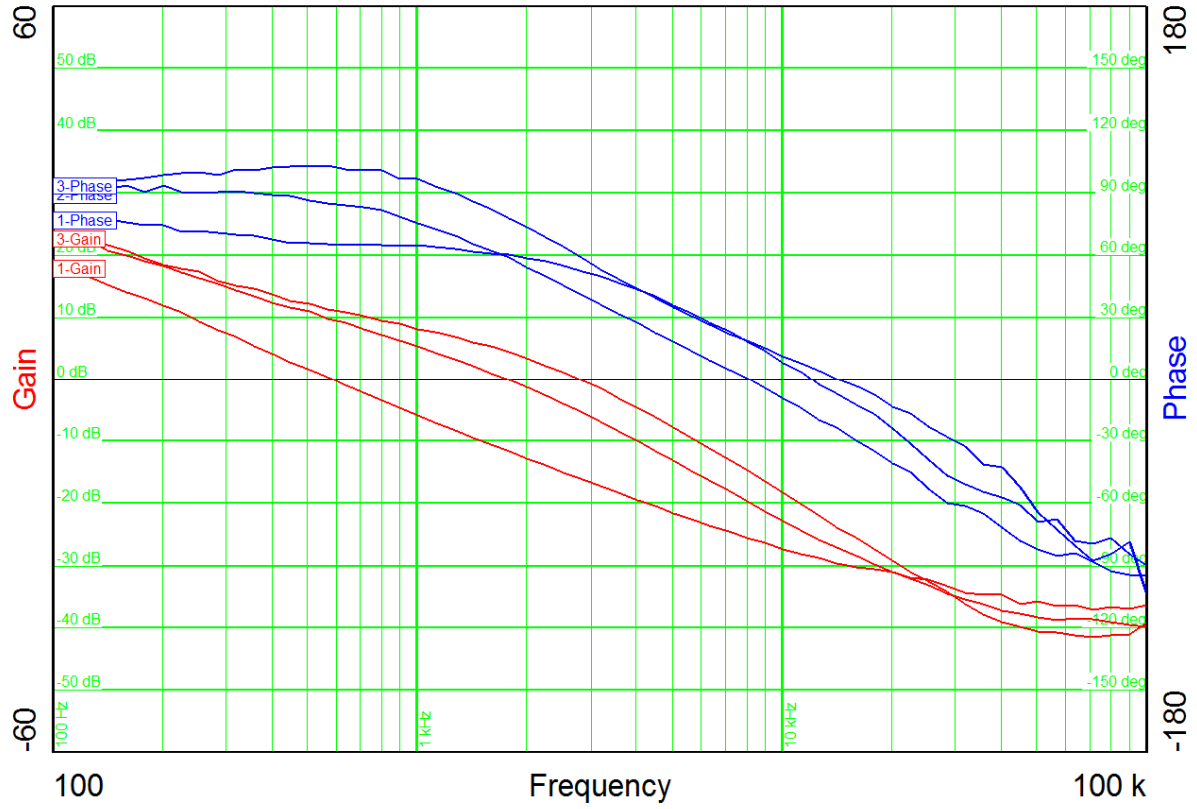


Figure 6

6. Input Ripple

The input ripple is shown in Figure 7.

Channel M1 **Input Voltage @ 4.0V Input / 0.3A Load**
100mV/div, 1us/div

Channel M2 **Input Voltage @ 7.0V Input / 0.3A Load**
100mV/div, 1us/div

Channel M3 **Input Voltage @ 13.0V Input / 0.3A Load**
100mV/div, 1us/div

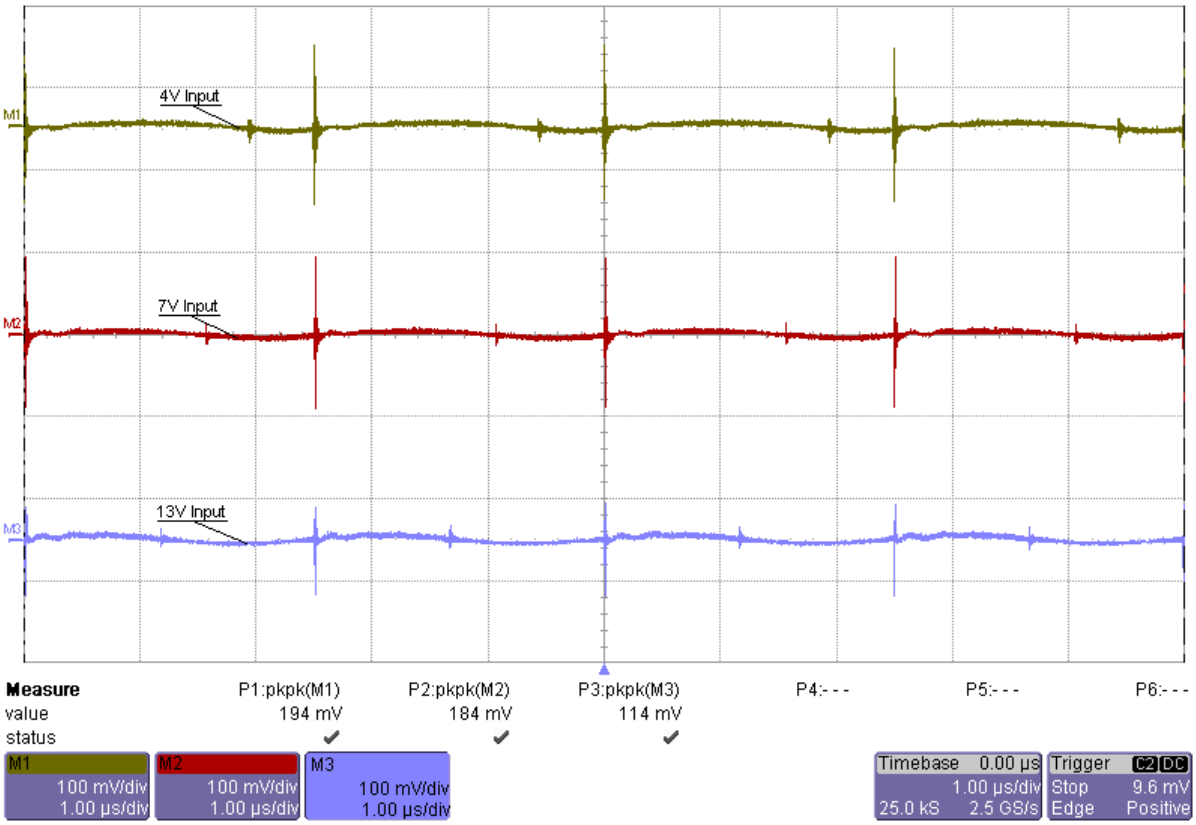


Figure 7

7. Output Ripple

The output ripple voltage is shown in Figure 8.

Channel M1 **Output Voltage @ 4.0V Input / 0.3A Load**
200mV/div, 1us/div

Channel M2 **Output Voltage @ 7.0V Input / 0.3A Load**
200mV/div, 1us/div

Channel M3 **Output Voltage @ 13.0V Input / 0.3A Load**
200mV/div, 1us/div

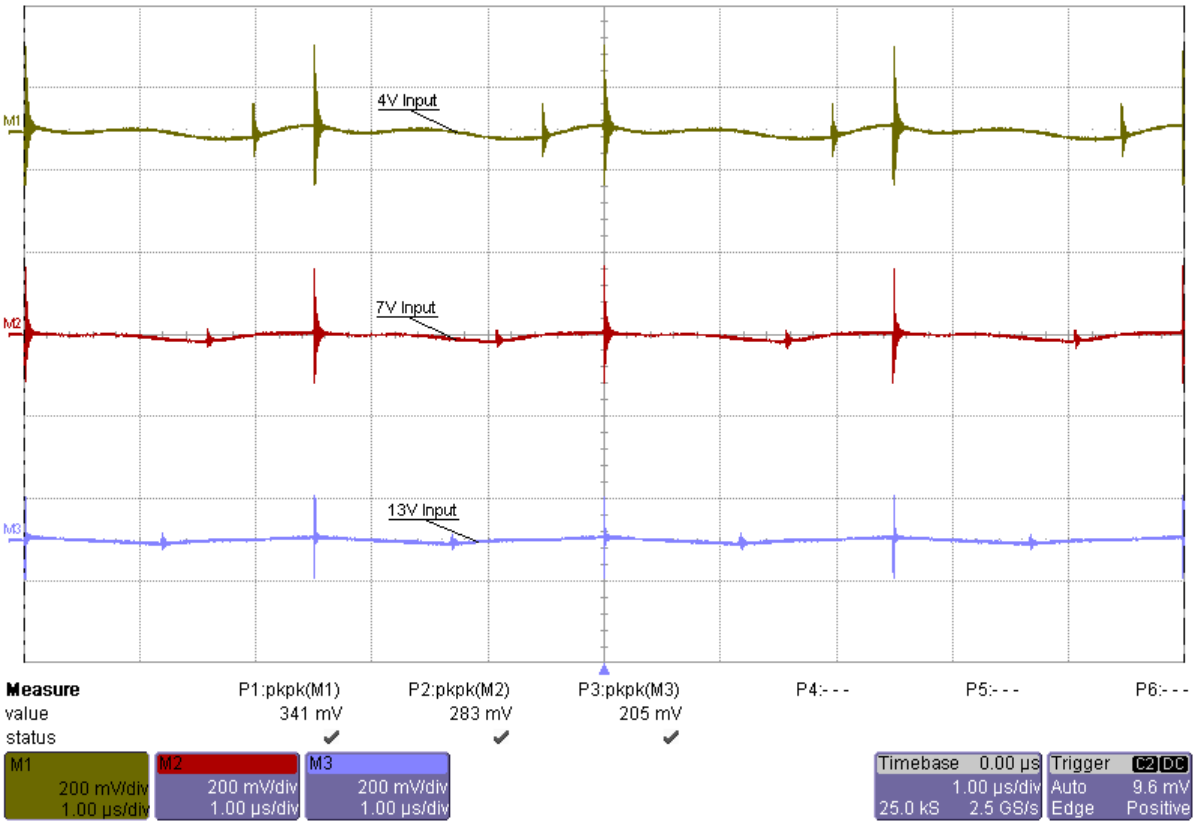


Figure 8

8. Low-Side FET (Switching Node)

The drain-source voltage of the low-side FET at 13.0V input voltage and 0.3A load on the output is shown in Figure 9.

Channel C1 **Drain-Source Voltage**, -0.8V minimum, 25.1V maximum
5V/div, 1us/div

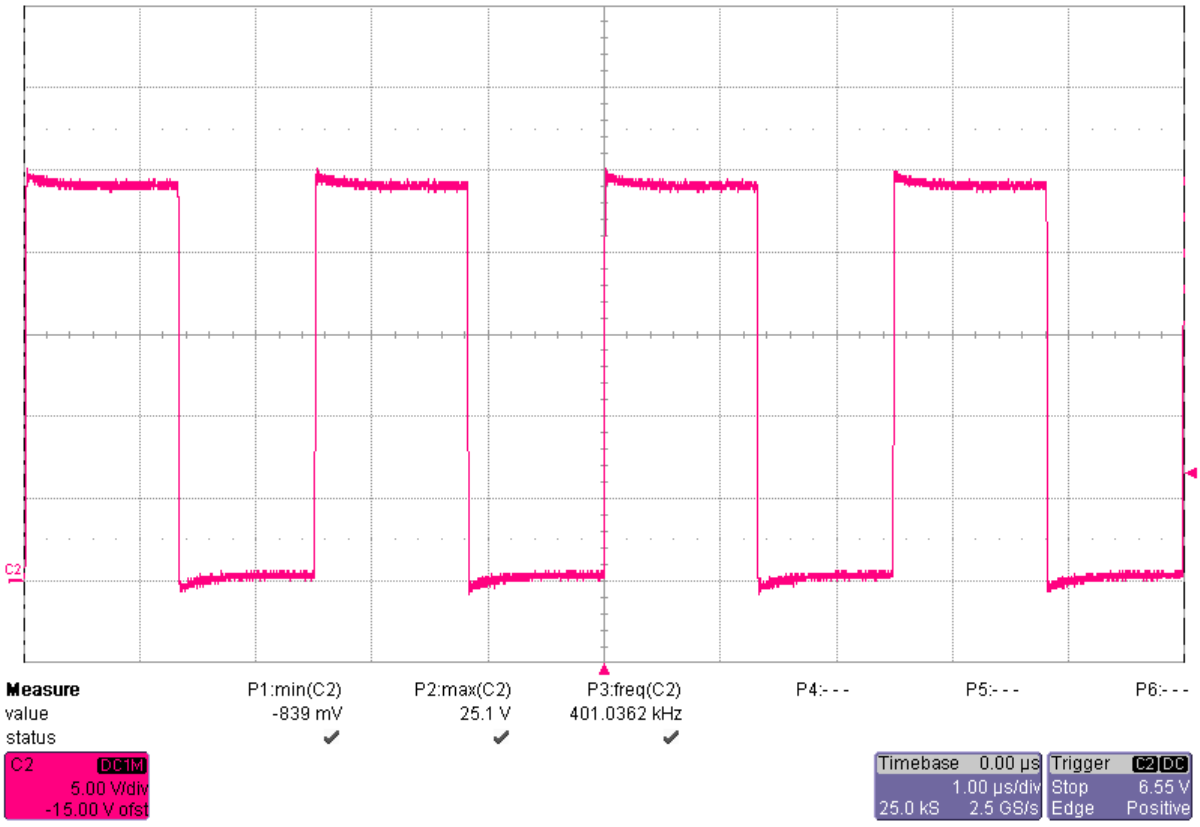


Figure 9

10.Diode Voltage

The voltage of the diode at 13.0V input voltage and 0.3A load on the output is shown in Figure 10.

Channel C1 **Drain-Source Voltage**, -1.3V minimum, 24.9V maximum
5V/div, 1us/div

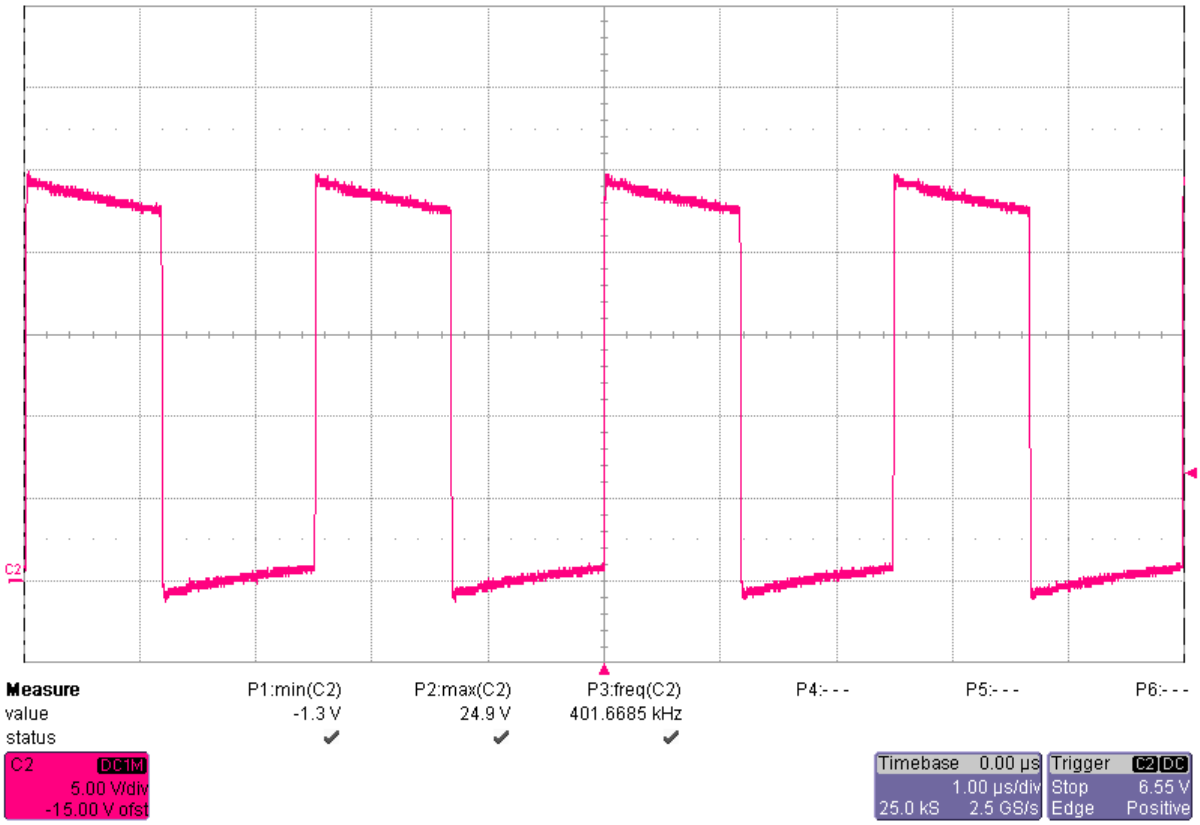


Figure 10

11.Thermal Image

The thermal image (Figure 11) shows the circuit at an ambient temperature of 20°C with an input voltage of 13.0V and 0.3A load on the output.

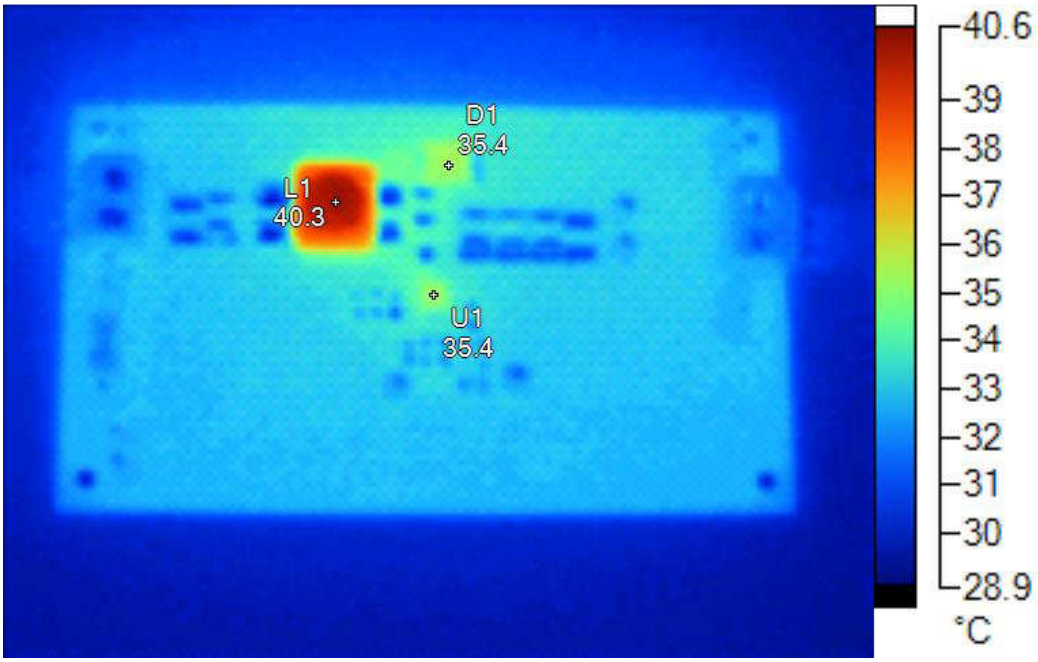


Figure 11

Name	Temperature	Emissivity	Background
L1	40.3°C	0.95	20.0°C
D1	35.4°C	0.95	20.0°C
U1	35.4°C	0.95	20.0°C

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