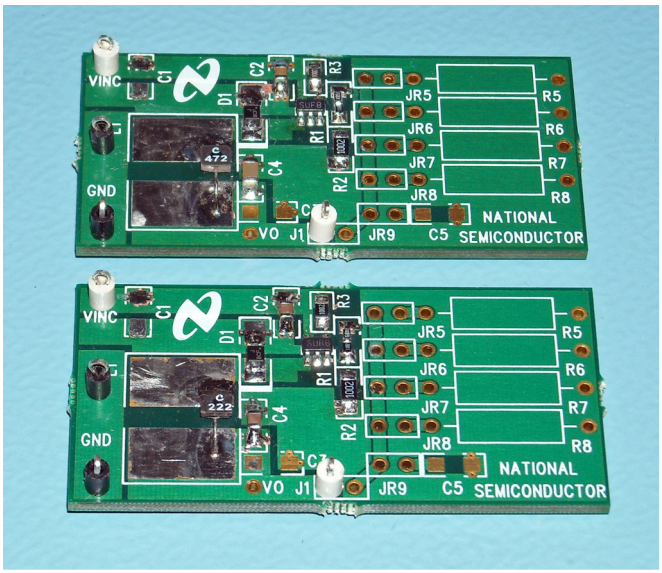
Non-Synchronous Buck with 1.3V @ 600mA

- Input 4.5 ..5.5V DC
- Output 1.3V @ 600mA
- Controller LM2830X-Q1 / LM2830Z-Q1
- Free-Running switching frequency of 1.6 / 3.0 MHz
- Built on “LM2830/31 SOT23-5 EVAL”
- Two setups with different switching frequencies (1.6 / 3.0 MHz) were built to compare the performance of the converters.
  The passive components were selected in such a way to achieve a comparable performance.

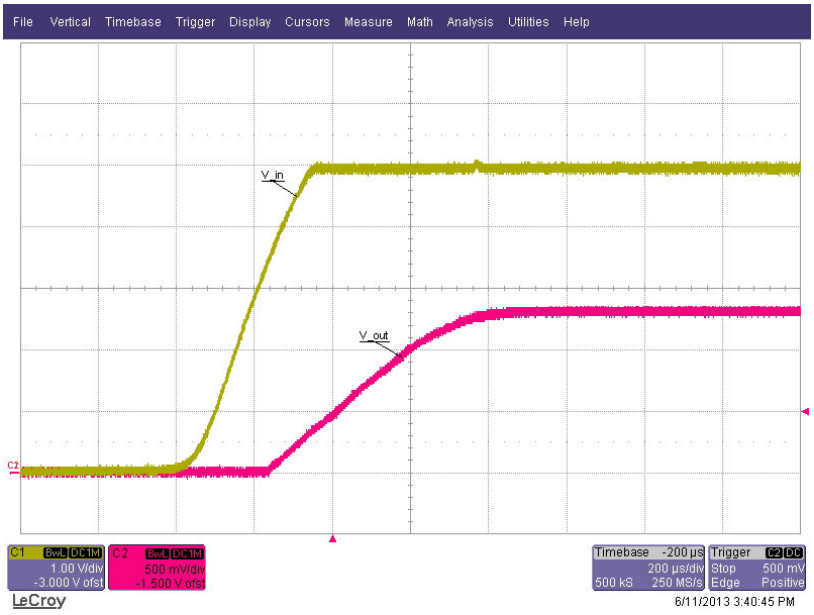


1 Startup

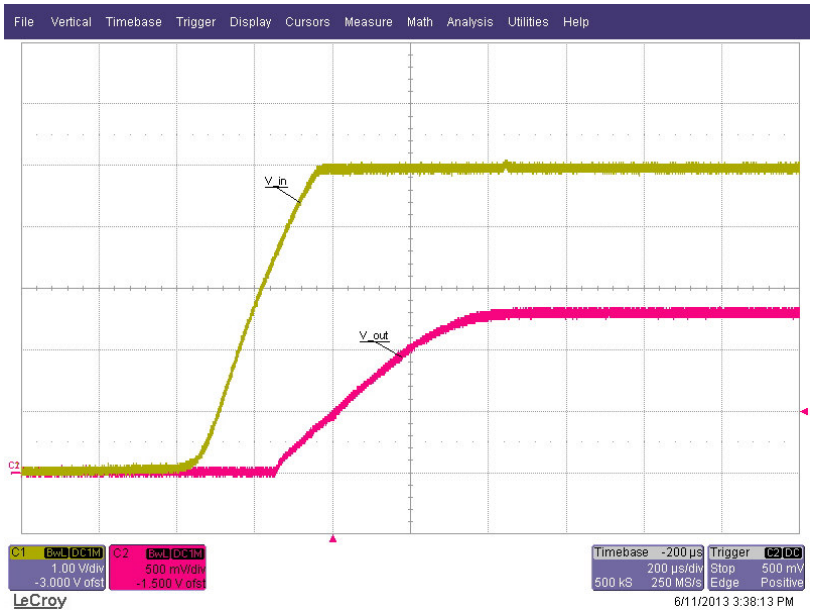
The startup waveforms are shown in Figure 1. The input voltage is set at 5.0V, with no load on the 1.3V outputs.

Channel C1: **Input voltage**
1V/div, 200us/div

Channel C2: **Output voltage**
500mV/div, 200us/div



1.6 MHz Switching Frequency



3.0 MHz Switching Frequency

Figure 1

2 Efficiency

The efficiency and load regulation are shown in Figure 2 and Figure 3.

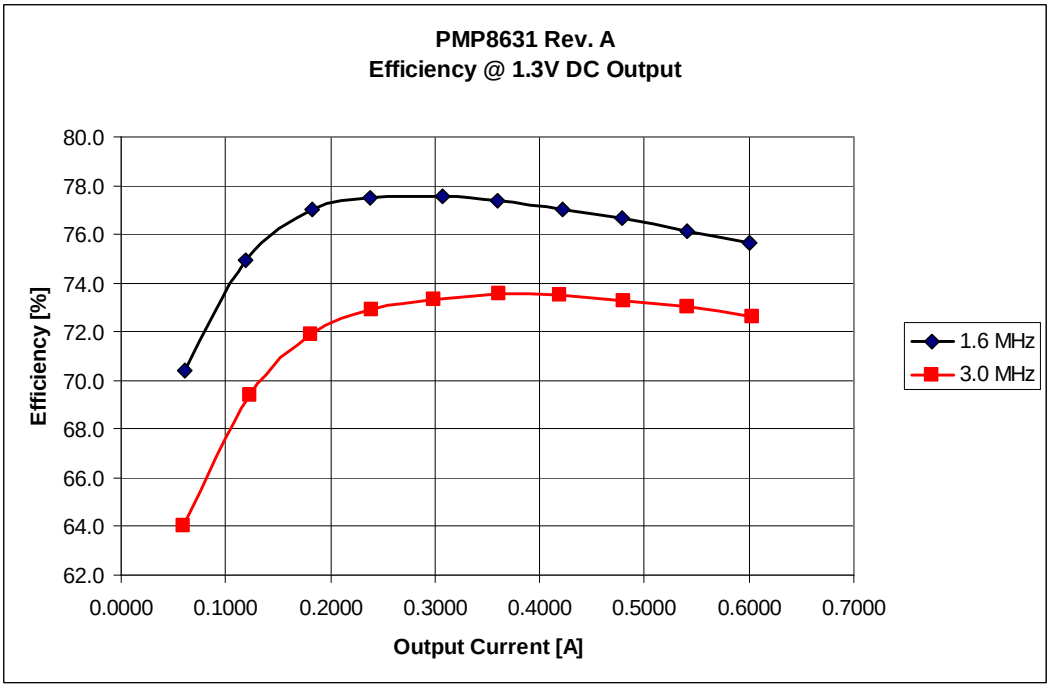


Figure 2

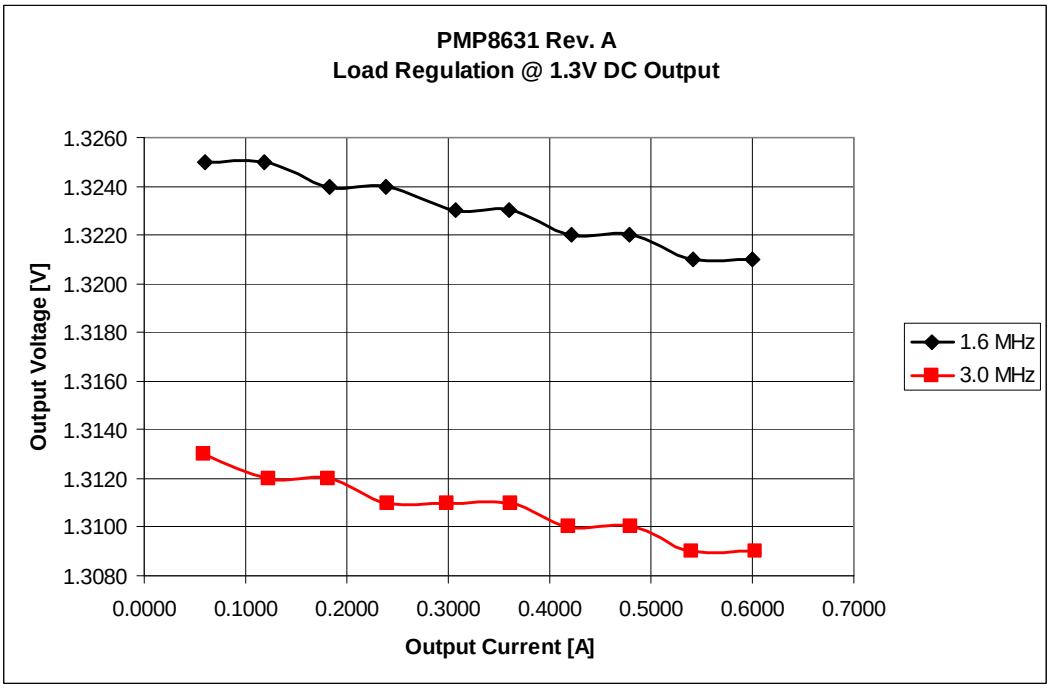


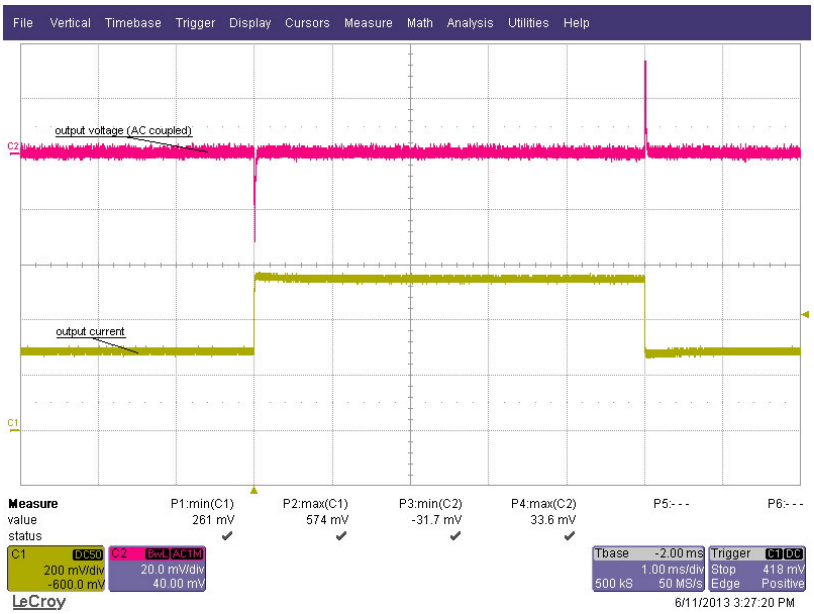
Figure 3

3 Load step

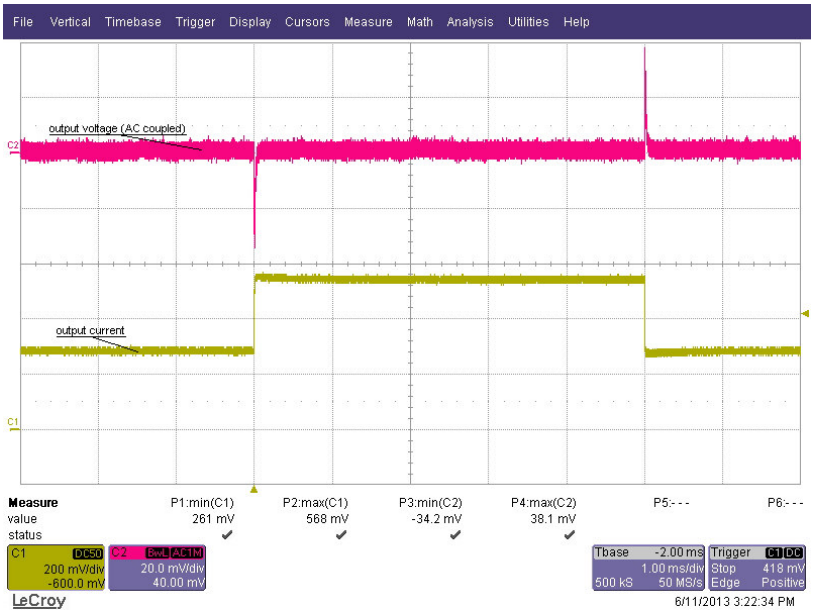
The response to a load step and a load dump for the 1.3V outputs at an input voltage of 5.0V are shown in Figure 4.

Channel C2: **Output voltage**, -32/+34mV @ 1.6 MHz, -34/+38mV @ 3.0 MHz
20mV/div, 1ms/div, AC coupled

Channel C1: **Load current**, load step 300mA to 600mA and vice versa
200mA/div, 1ms/div



1.6 MHz Switching Frequency



3.0 MHz Switching Frequency

Figure 4

4 Frequency response

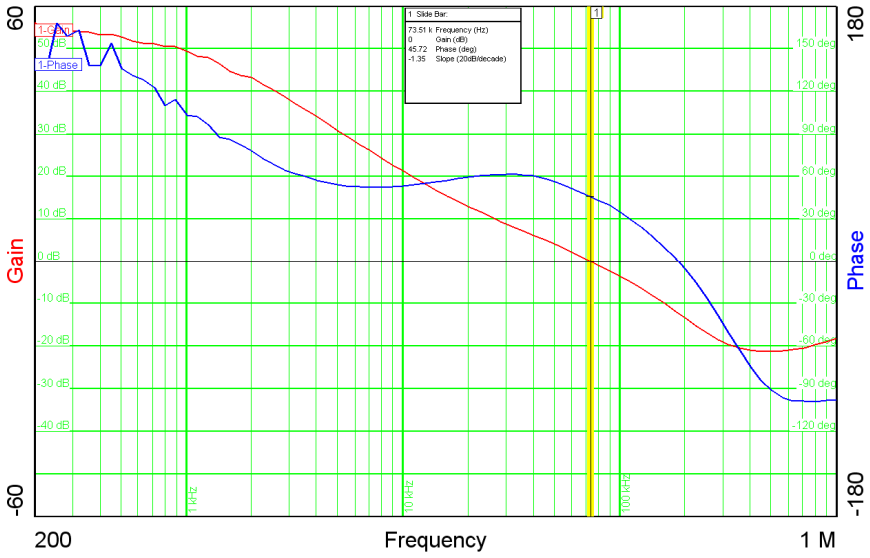
Figure 5 shows the loop response with 600mA load.

1.6 MH

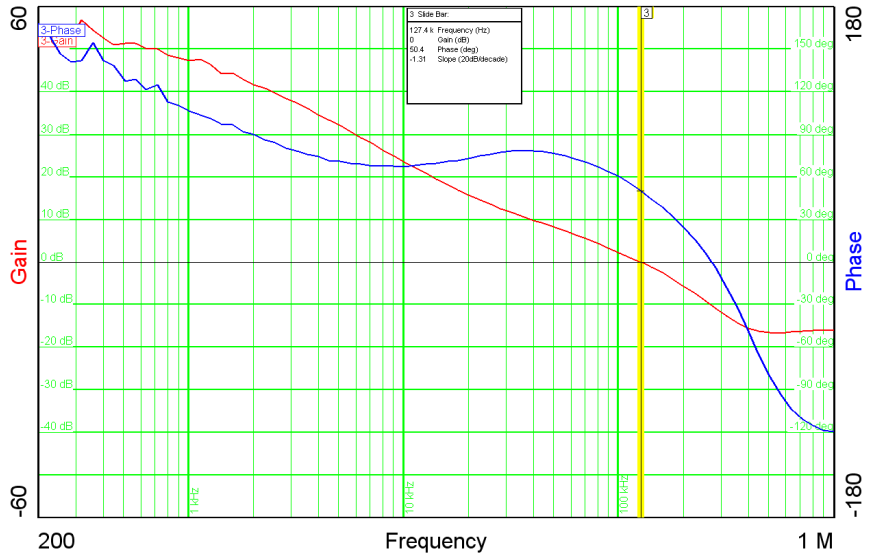
- 46 deg phase margin @ crossover frequency 74 kHz
- -12 db gain margin

3.0 MHz

- 50 deg phase margin @ crossover frequency 127 kHz
- -10 db gain margin



1.6 MHz Switching Frequency



1.3 MHz Switching Frequency

Figure 5

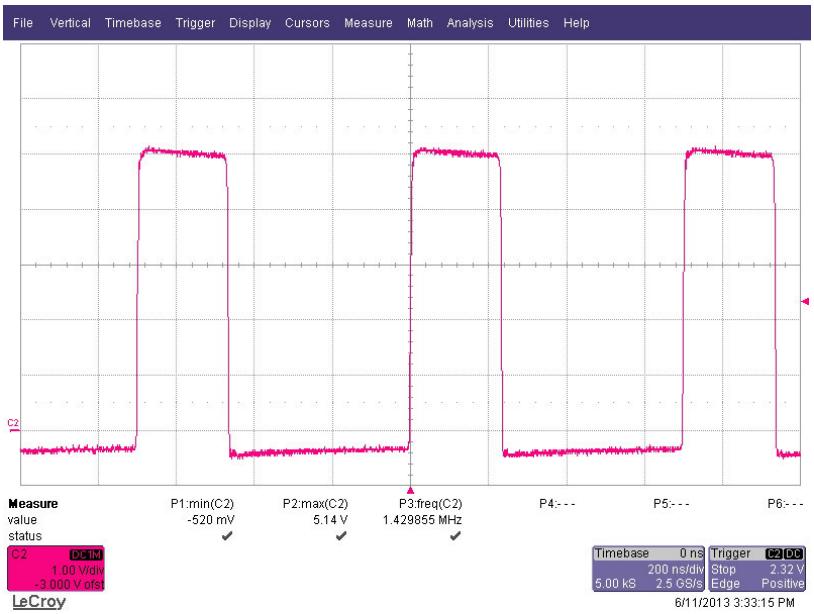
5 Switching Node

The drain-source voltages on the switching nodes are shown in Figure 6. The images were captured with 5.0V input and 600mA load.

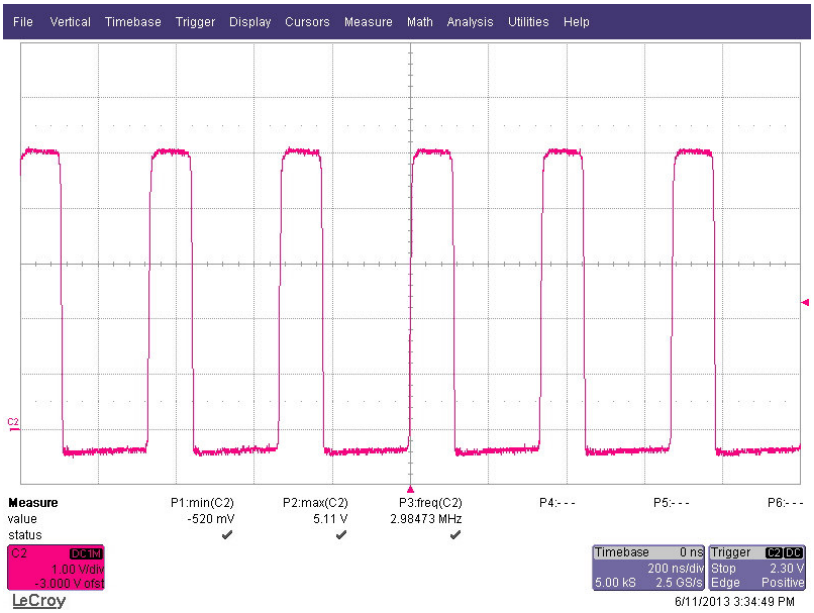
Channel C2: **Drain-source voltage**
1V/div, 200ns/div

1.6 MHz -520mV minimum, 5.14V maximum

3.0 MHz -520mV minimum, 5.11V maximum



1.6 MHz Switching Frequency

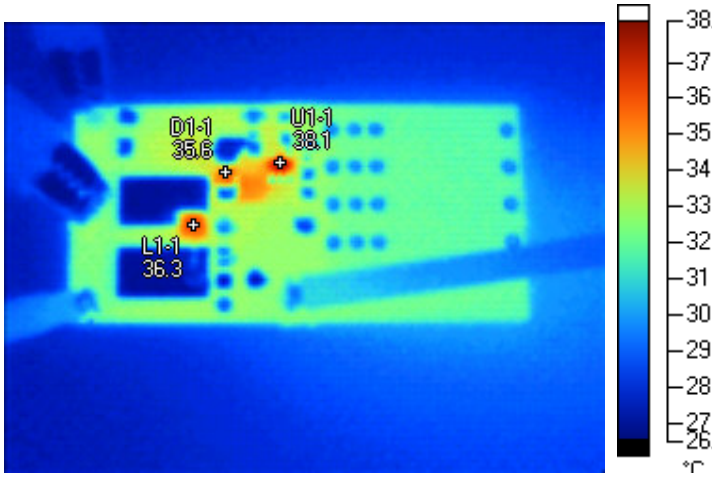


3.0 MHz Switching Frequency

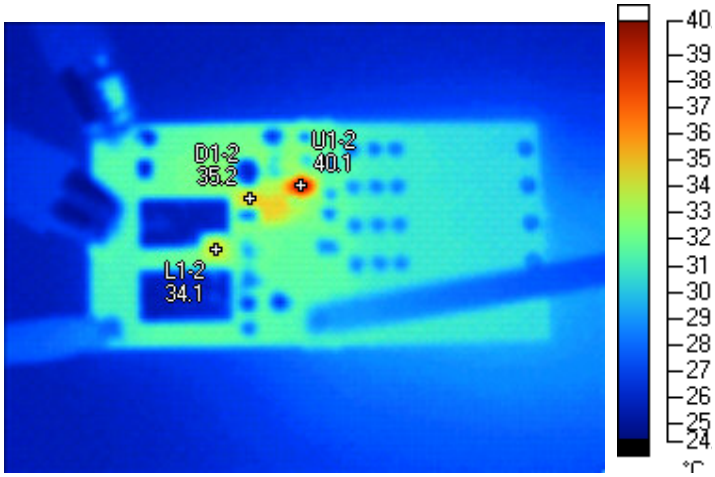
Figure 6

6 Thermal measurement

The thermal images (Figure 7) show the circuits at an ambient temperature of 21 °C with an input voltage of 5.0V and a load of 600mA.



1.6 MHz Switching Frequency



3.0 MHz Switching Frequency

Figure 7

Markers

Label	Temperature	Emissivity	Background
U1-1	38.1 °C	0.95	21.0 °C
L1-1	36.3 °C	0.95	21.0 °C
D1-1	35.6 °C	0.95	21.0 °C
U1-2	40.1 °C	0.95	21.0 °C
L1-2	34.1 °C	0.95	21.0 °C
D1-2	35.2 °C	0.95	21.0 °C

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265