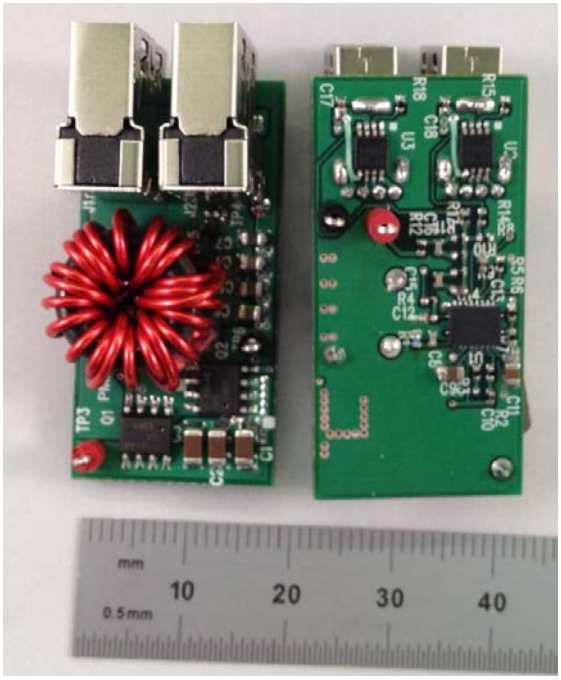
TPS40170 + TPS2511 – 5V@2.1A (x2)
Universal USB Car Charger
PMP7390_REVA
5/8/12

The tests performed were as follows:

A. TPS40170 – 5V@2.1A (x2)
   1. Board Photo
   2. Thermal Image
   3. Turn-On (No Load)
   4. Output Voltage Ripple
   5. Transient Response
   6. Switching Behavior
   7. Efficiency
   8. Load Regulation
   9. Loop Response

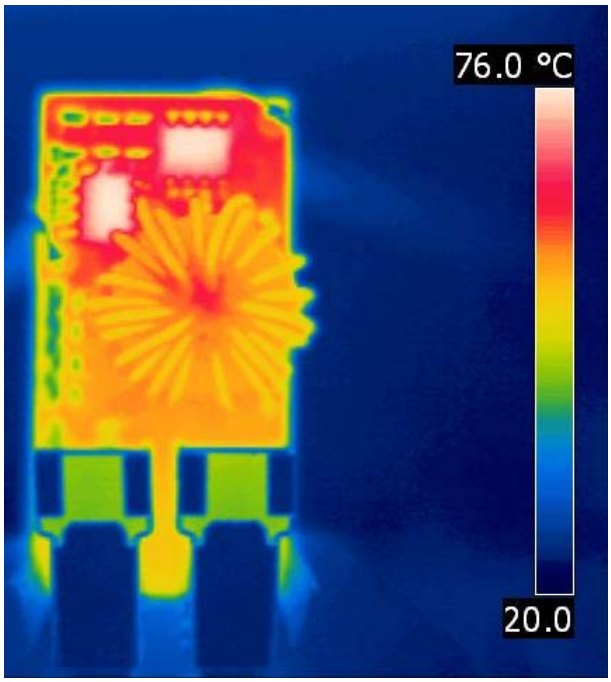
1 Board Photo

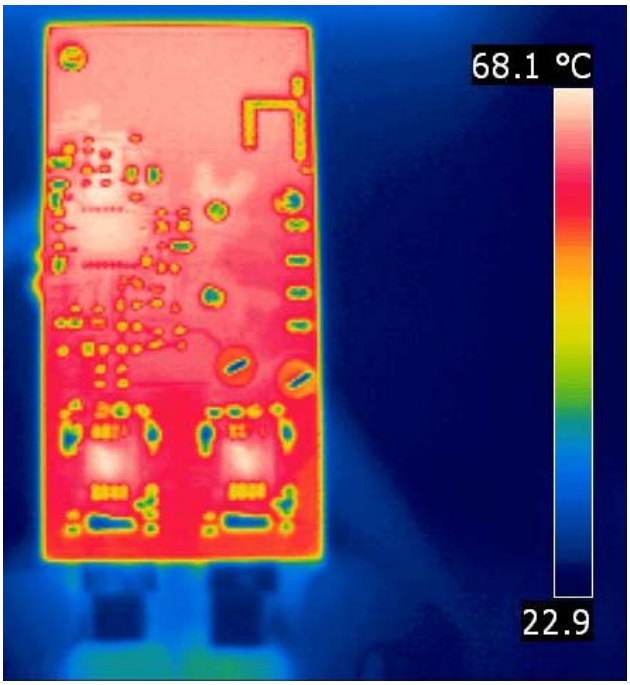
The photo below shows the front and back of the PMP7390 board.



2 Thermal Image

The thermal images of the board are taken with 2A load. The input voltage is 12V.

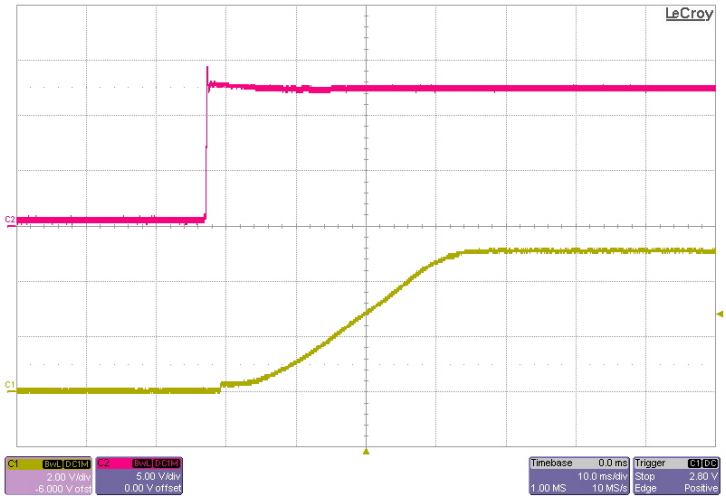




3 Turn-On – (TPS40170 : 5V@0A)

The photo below shows the startup waveforms. The output is not loaded. The timebase is set to 10ms/Division. The input voltage is 12V.

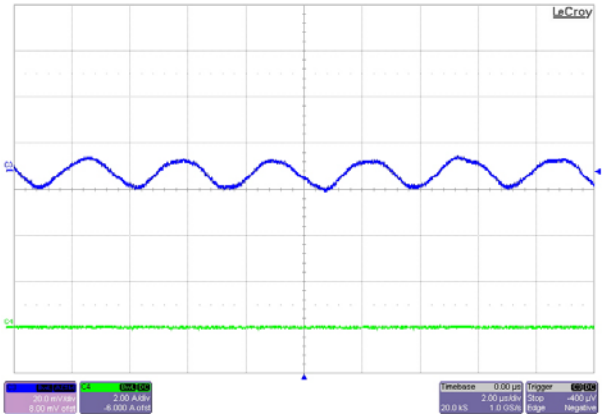
Channel 1 – Yellow : 5V Output After the USB Switch – (2V/Division)
Channel 2 – Pink : Input Voltage – (5V/Division)



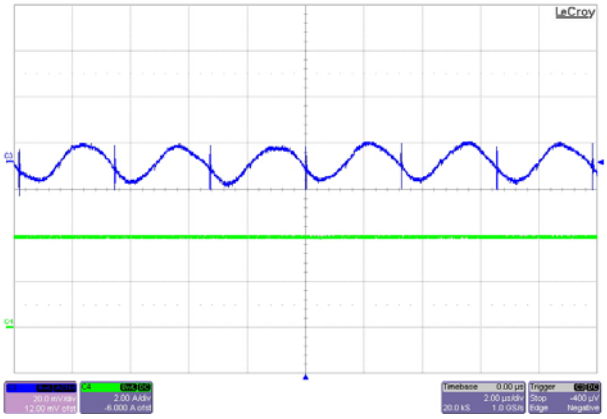
4 Output Voltage Ripple – (TPS40170 : 5V@2.1A (x2))

The photo below shows the output voltage ripple. The input voltage is 12V. The timebase is set to 2us/division.

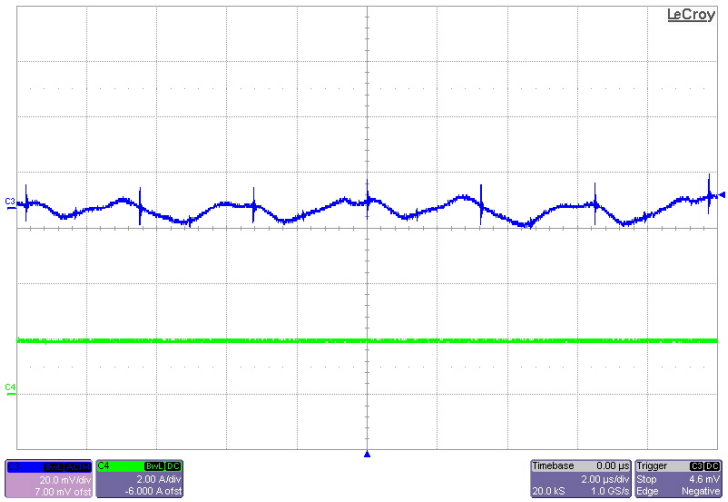
Channel 3 – Blue : Output Voltage Ripple – (20mV/Division; AC Coupled)
Channel 4 – Green : Output Current – (2A/Division)



No Load, Measured Before the USB Switch



4.2A Load, Measured Before the USB Switch

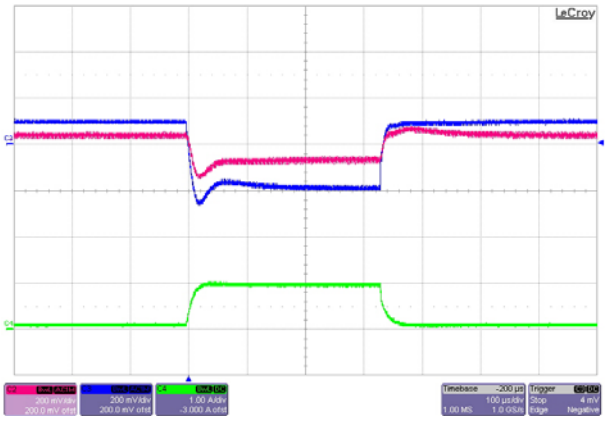


2.1A Load, Measured After the USB Switch at the End of an iPhone Cable

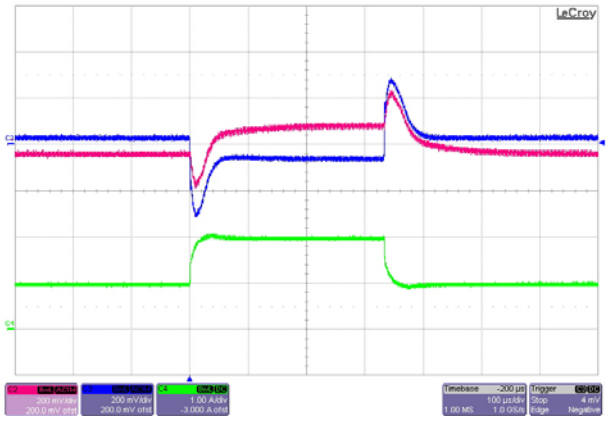
5 Transient Response – (TPS40170 : 5V@2.1A (x2))

The transient response of the converter is shown in the figure below. The input voltage is 12V. The current is pulsed from 0.1A to 1A, 1A to 2A and 0.1A to 2A. The timebase is set to 2ms/Division. The cable droop compensation is set to increase the output voltage 200mV at ~1.3A

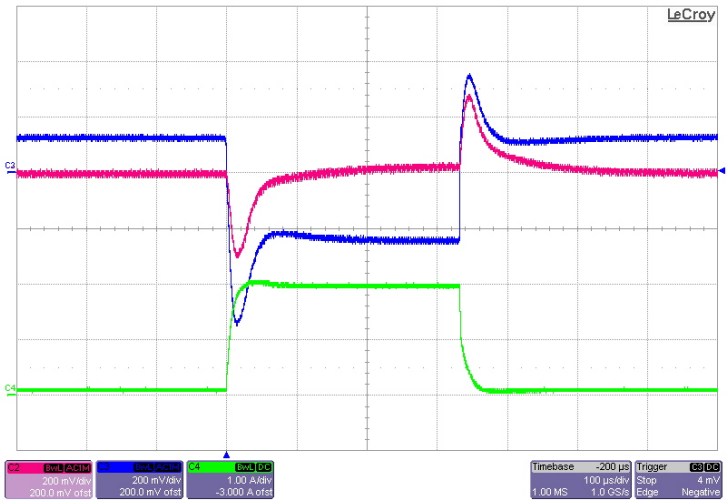
Channel 2 – Pink : Output Voltage Before the USB Switch – (200mV/Division; AC Coupled)
Channel 3 – Blue : Output Voltage After the USB Switch – (200mV/Division; AC Coupled)
Channel 4 – Green : Output Current – (1A/Division)



0.1A to 1A (no cable droop compensation)



1A to 2A

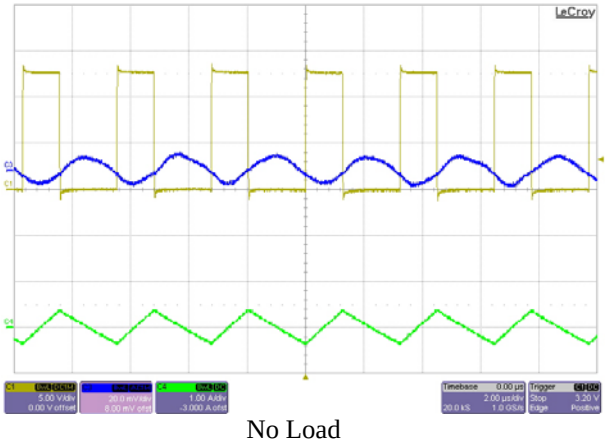


0.1 to 2A

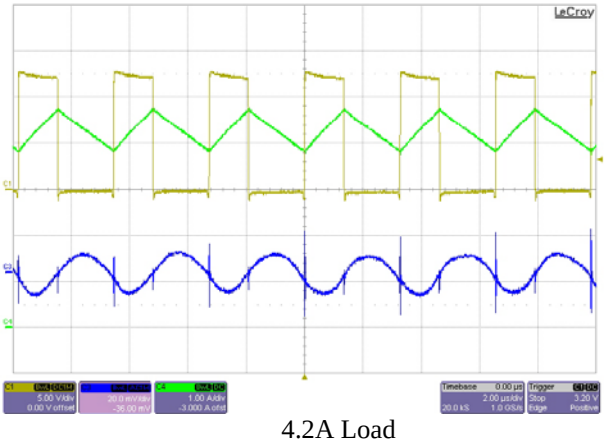
6 Switching Behavior – (TPS40170 : 5V@2.1A (x2))

The switching behavior of the converter is shown in the figure below. The input voltage is set to 12V, the output current is set to 4.2A. The timebase is set to 2us/Divison.

Channel 1 – Yellow : Switch Node – (5V/Division
Channel 3 – Blue : Output Voltage Before the USB Switch – (20mV/Division; AC Coupled)
Channel 4 – Green : Inductor Ripple Current – (1A/Division)



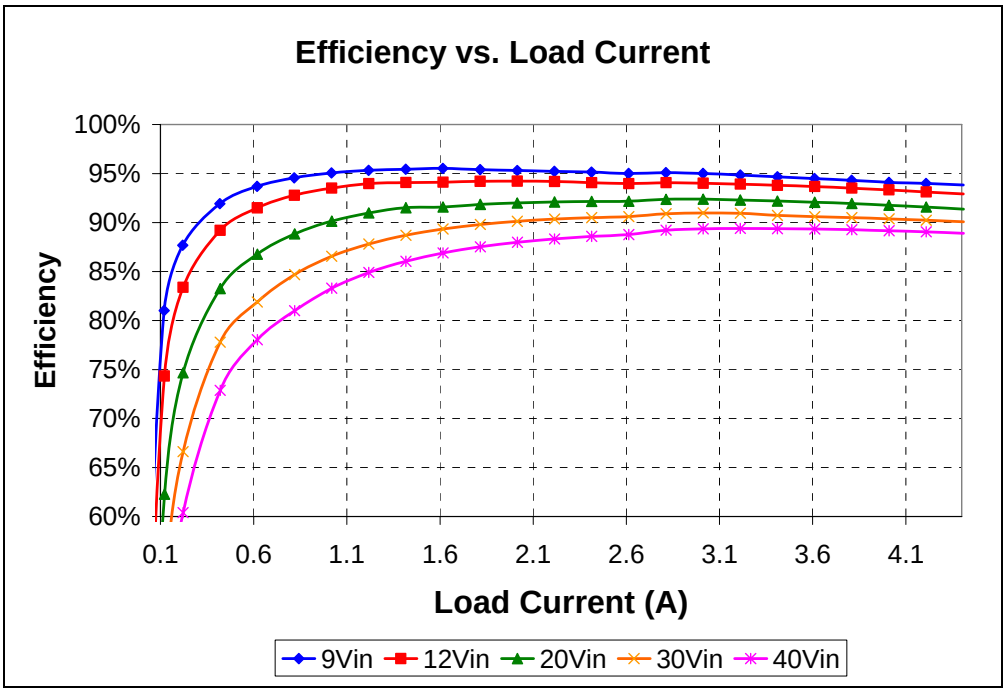
No Load



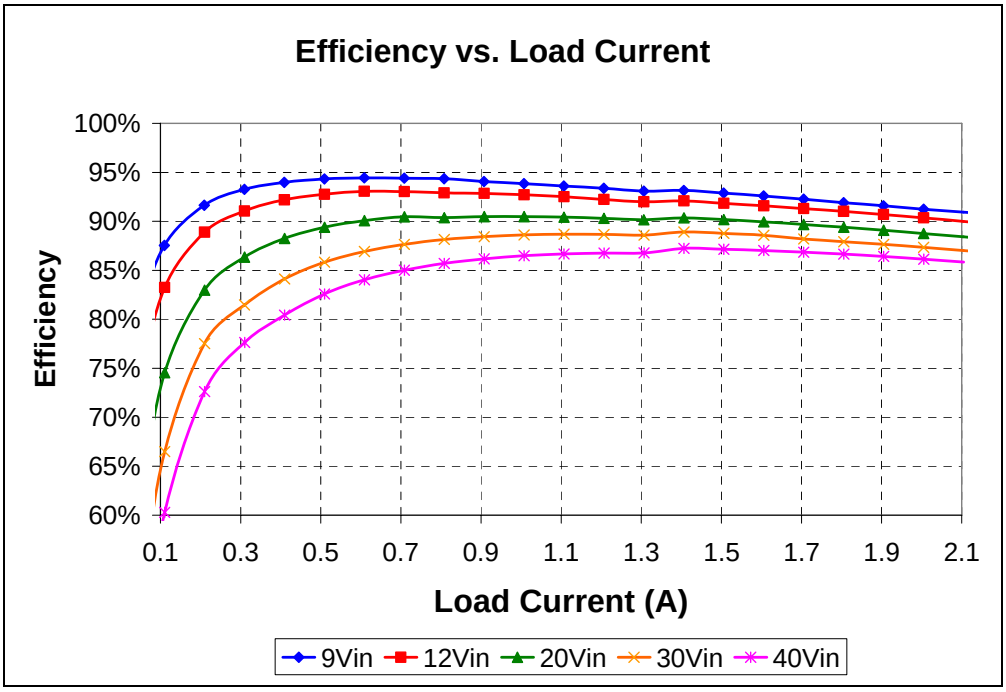
4.2A Load

7 Efficiency – (TPS40170 : 5V@2.1A (x2))

The efficiency of the converter is shown in the figures below.



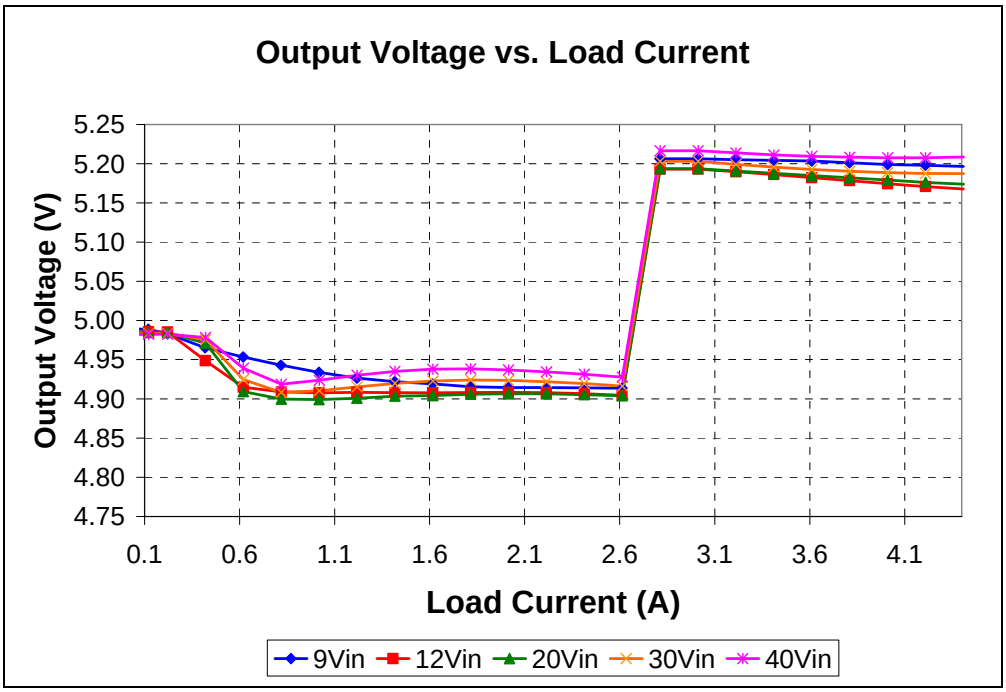
Efficiency Before the USB Switch



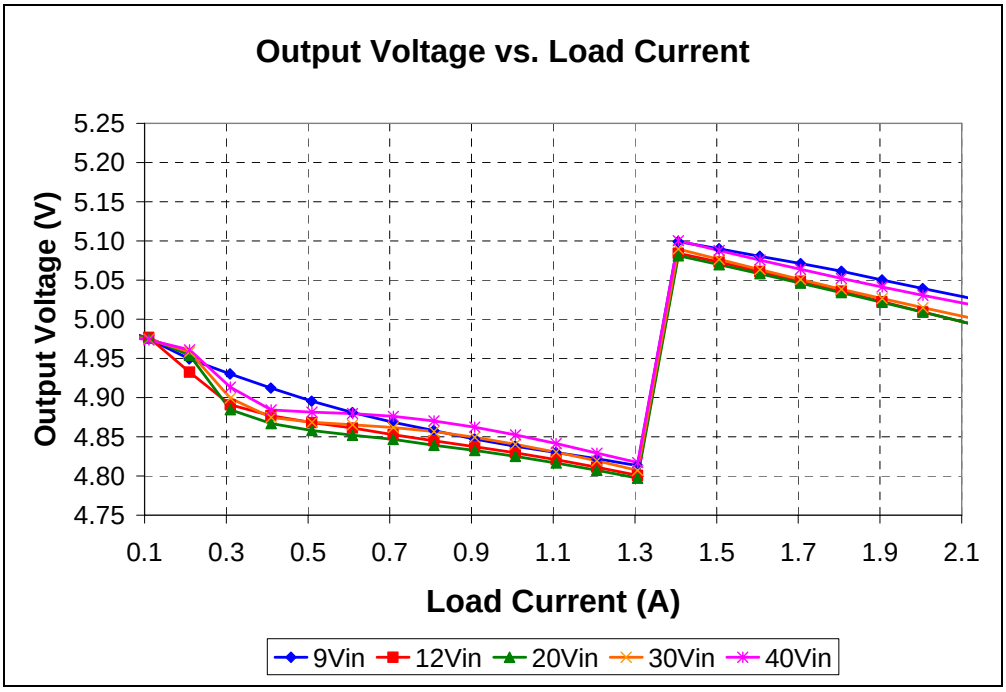
Efficiency After the USB Switch

8 Load Regulation – (TPS40170 : 5V@2.1A (x2))

The load regulation of the converter is shown in the figure below.



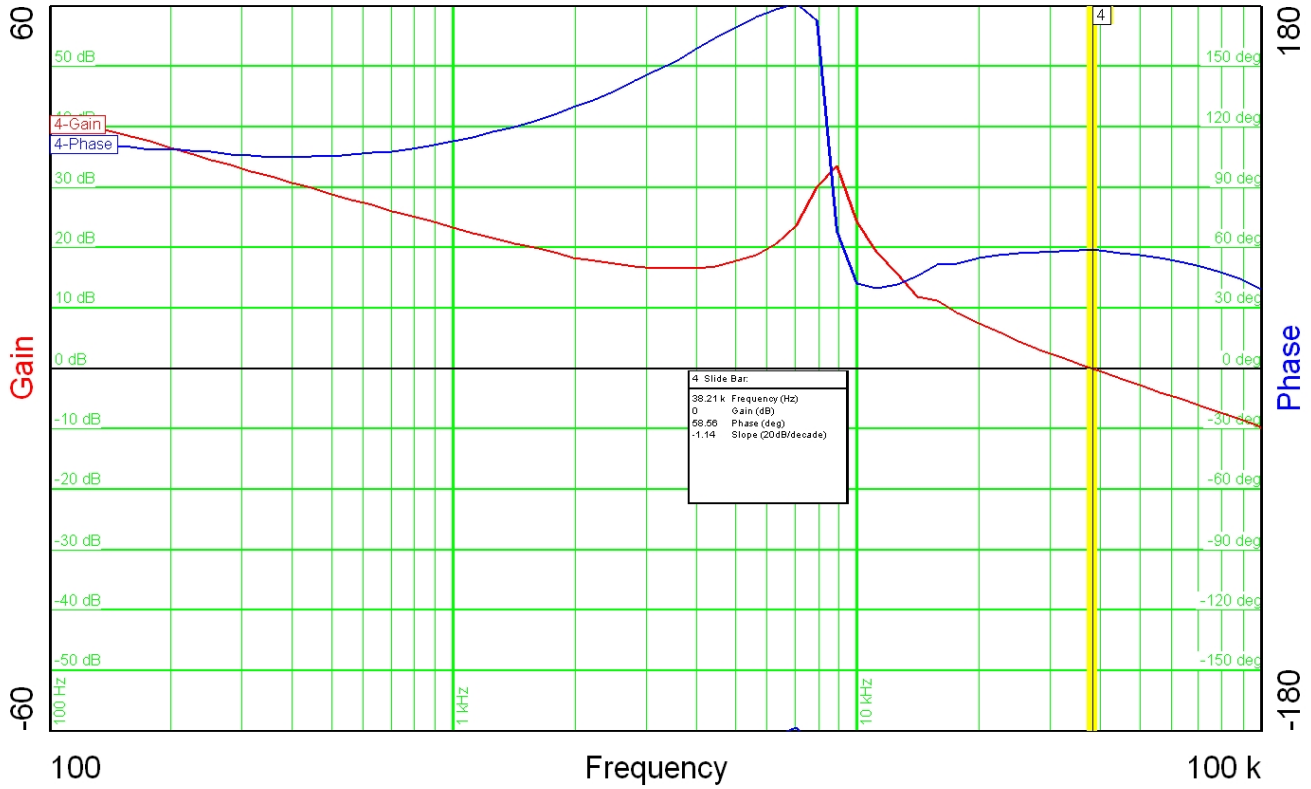
Output Load Regulation Before the USB Switch



Output Load Regulation After the USB Switch

9 Loop Response – (TPS40170 : 5V@2.1A (x2))

The loop response of the converter is shown in the image below. The input is 12V, the outputs are fully loaded.



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