TIDA-00783
Test Report
10/13/2015

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I. Overview

The TIDA-00783 reference design is a triple output wide Vin power module reference design. It provides three output voltages: 3.3V, 1.8V and 1.2V, and total 6W power, and has a wide input range of 4.5V to 40V. The reference design features the LMZ36002 wide Vin power module and LMZ20502 nano module from SIMPLE SWITCHER®. The layout is optimized for space constrained application, and the total solution size is about 400 mm^2.

II. Power Specification

Input Voltage:	4.5V – 40V
Output:	3.3V @ 0.9A, 1.8V @ 1A, 1.2V @ 1A
Total output power:	6W
Switching frequency:	400 kHz (LMZ36002), 3 MHz (LMZ20502)

III. Reference Board

The board size is 38 x 38 mm (1.5 x 1.5 inch). The solution size is about 400 mm^2.

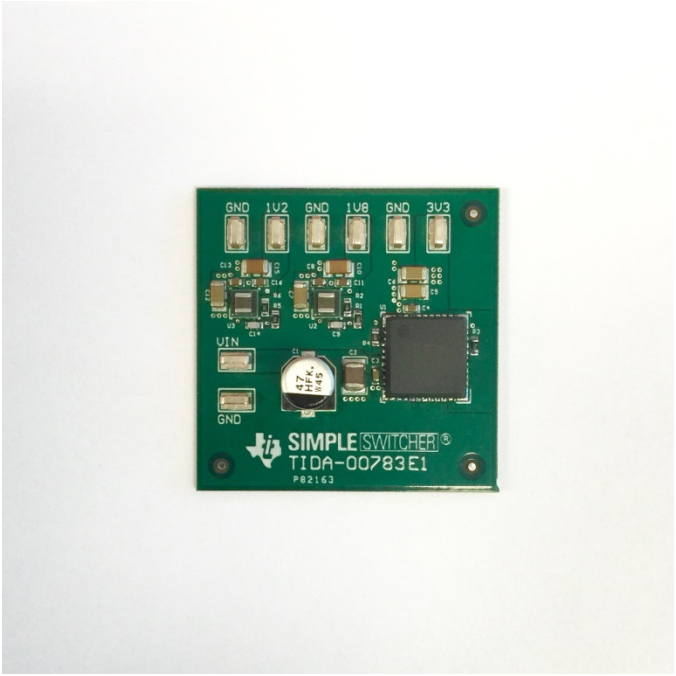

Figure 1 Reference board top view

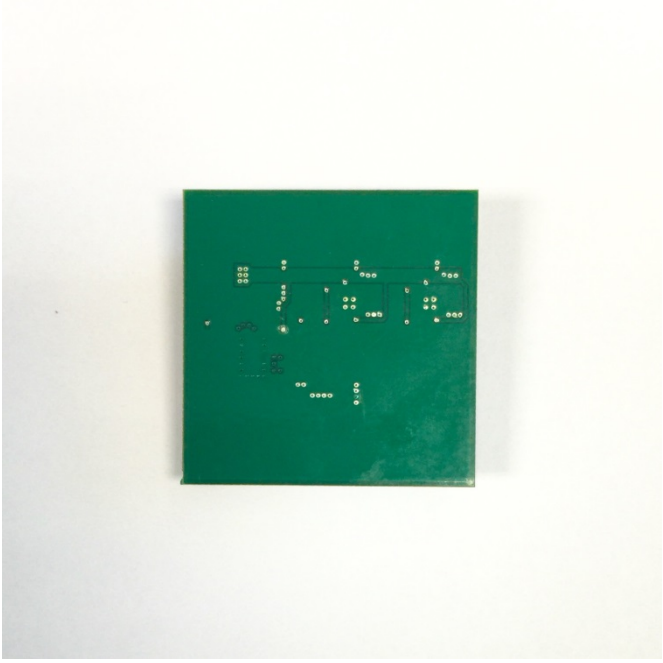

Figure 2 Reference board bottom view

IV. Efficiency

The efficiency was measured with equal load current on each output. Note that at 1A load for each output, the LMZ36002 module operated at overcurrent condition, and the design should not operate in this condition for too long.

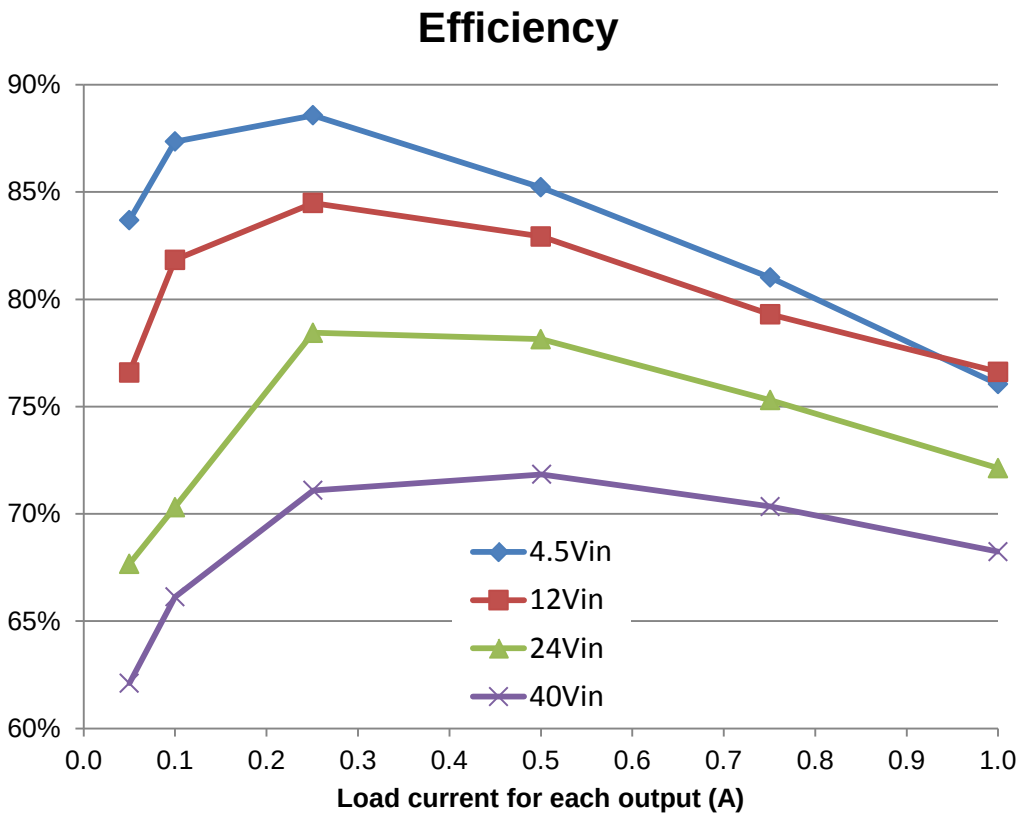

Figure 3 Power efficiency with the input filter

V. Input Current at No Load

The input current was measured at no load condition. The modules operated in PFM, and drew low input current at no load condition.

Vin (V)	Iin (µA)	3V3 (V)	1V8 (V)	1V2 (V)
4.509	330	3.341	1.809	1.201
12.004	201	3.339	1.809	1.201
24.003	178	3.334	1.809	1.201
40.007	189	3.340	1.809	1.201

VI. Thermal

The thermal image was taken at 23°C room temperature, no air flow. The board was operating at 24V input, full load condition.

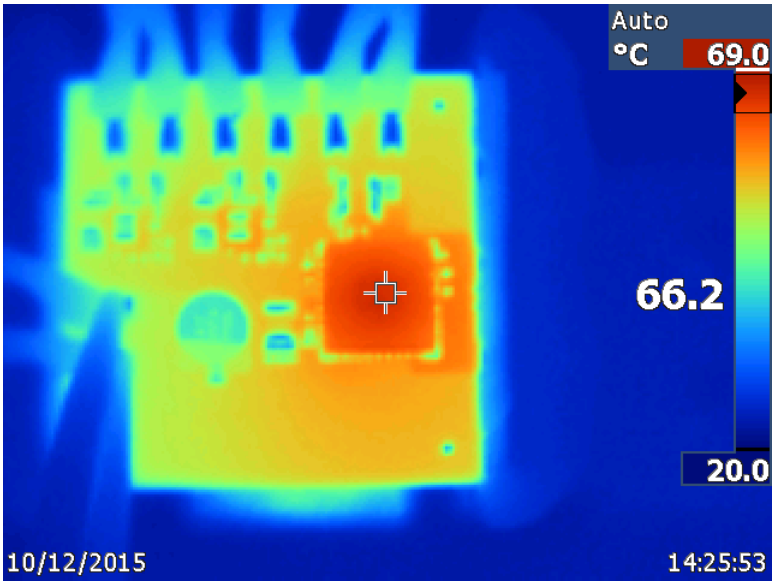

Figure 4 Thermal image from top view

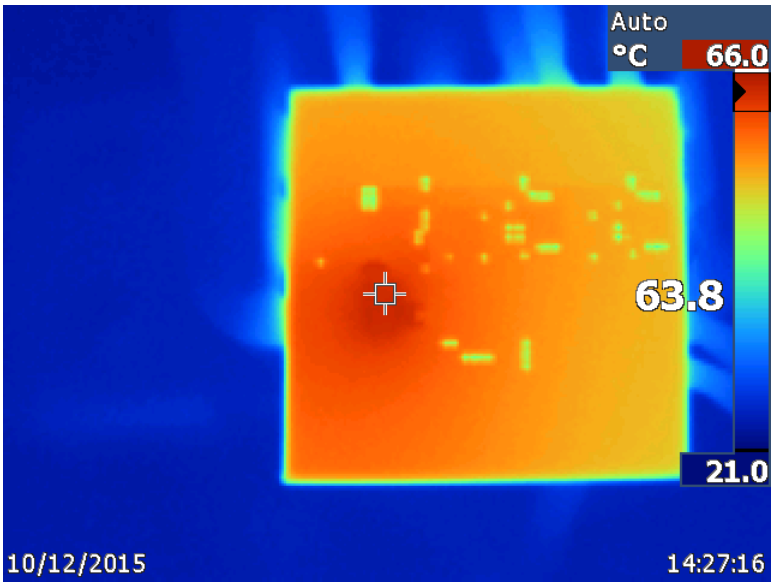

Figure 5 Thermal image from bottom view

VII. Power Up

The reference board was tested under no load and full load at 24V input. Ch1 (yellow) is the input voltage, Ch2 (magenta) is the 3.3V output voltage, Ch3 (blue) is the 1.8V output voltage, and Ch4 (green) is the 1.2V output voltage.

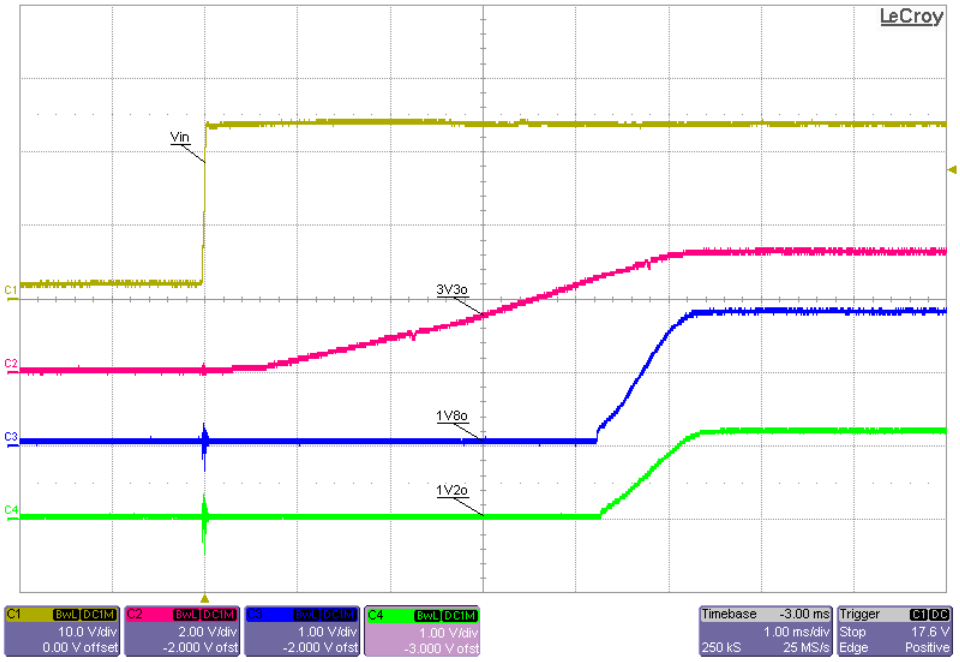

Figure 6 Power up into no load at 24V input

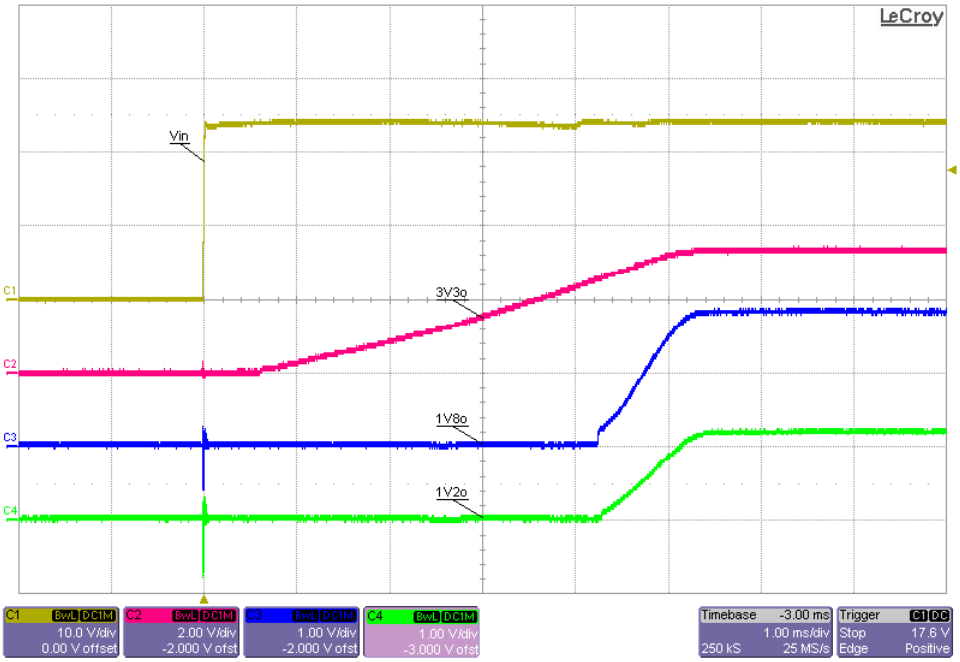

Figure 7 Power up into full load at 24V input

VIII. Switching Waveforms

The switching waveform of the 3.3V output LMZ36002 module was measured at the PH pins. For 1.8V and 1.2V output LMZ20502 module, the switching nodes were probed at the top of the integrated inductors. Ch1 (yellow) is the switch node voltage.

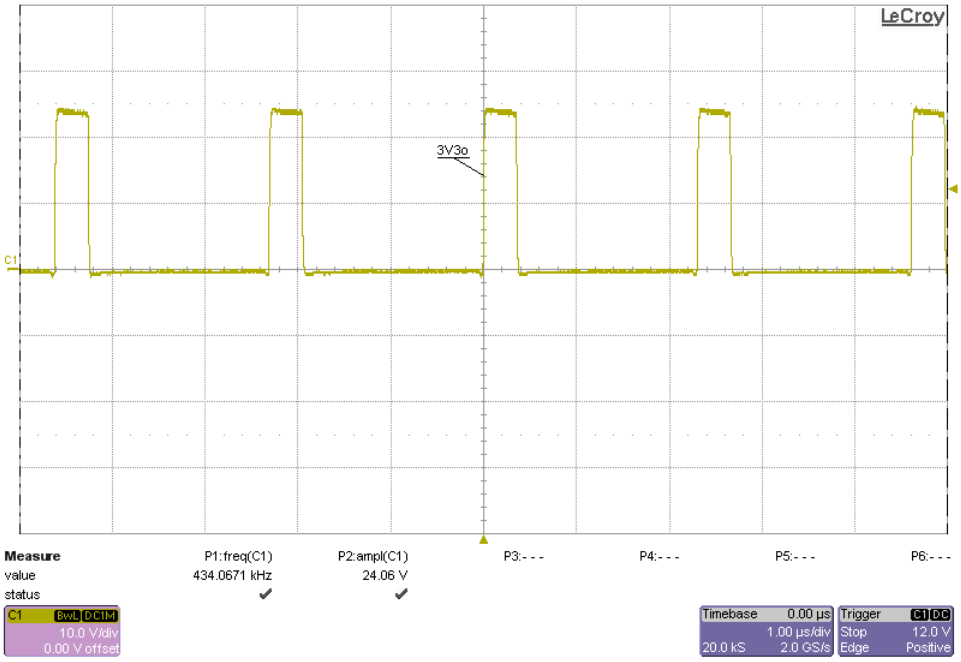

Figure 8 3.3V output switching waveform at full load, 24V input

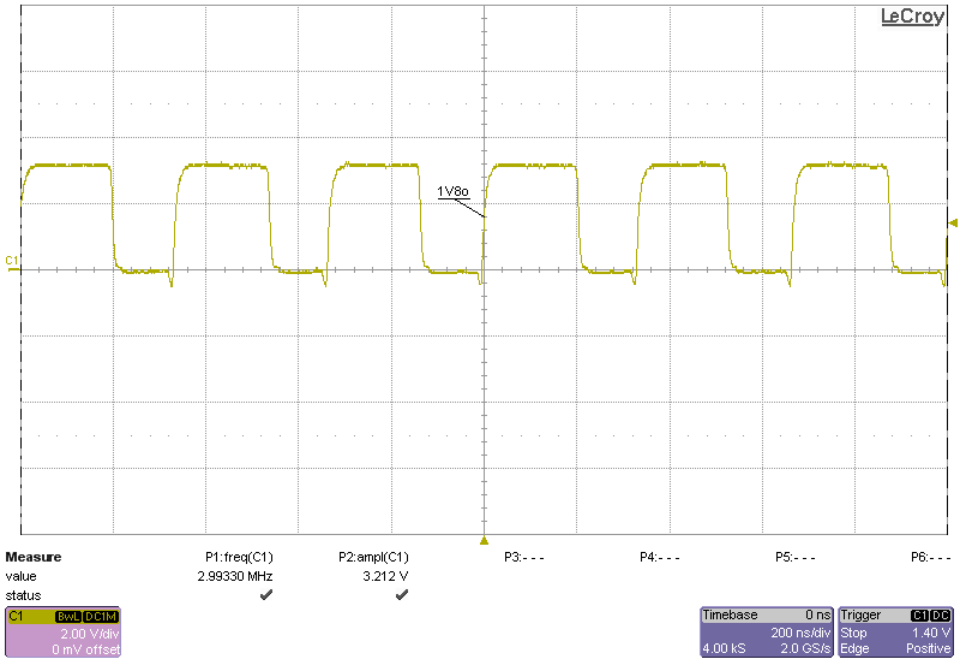

Figure 9 1.8V output module switching waveform at 1A load

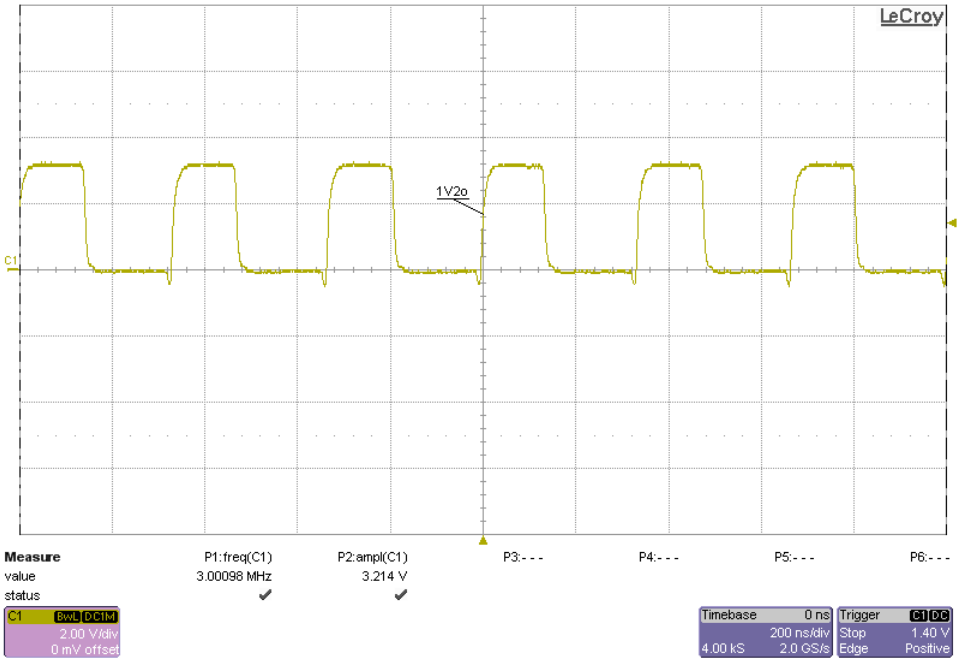

Figure 10 1.2V output module switching waveform at 1A load

IX. Load Transients

The load transient responses were tested by applying output load steps from 0 to 1A to the 3.3V output module. Ch1 (yellow) is the 3.3V output voltage in AC mode, and Ch4 (green) is the 3.3V output current.

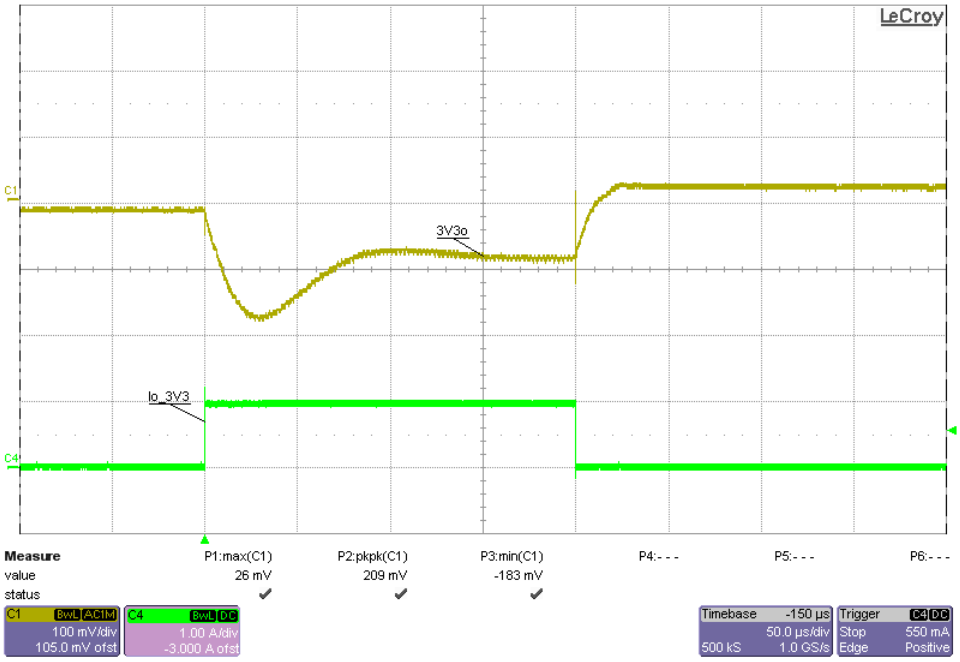

Figure 11 3.3V output load transient at 24V input, no load on other outputs

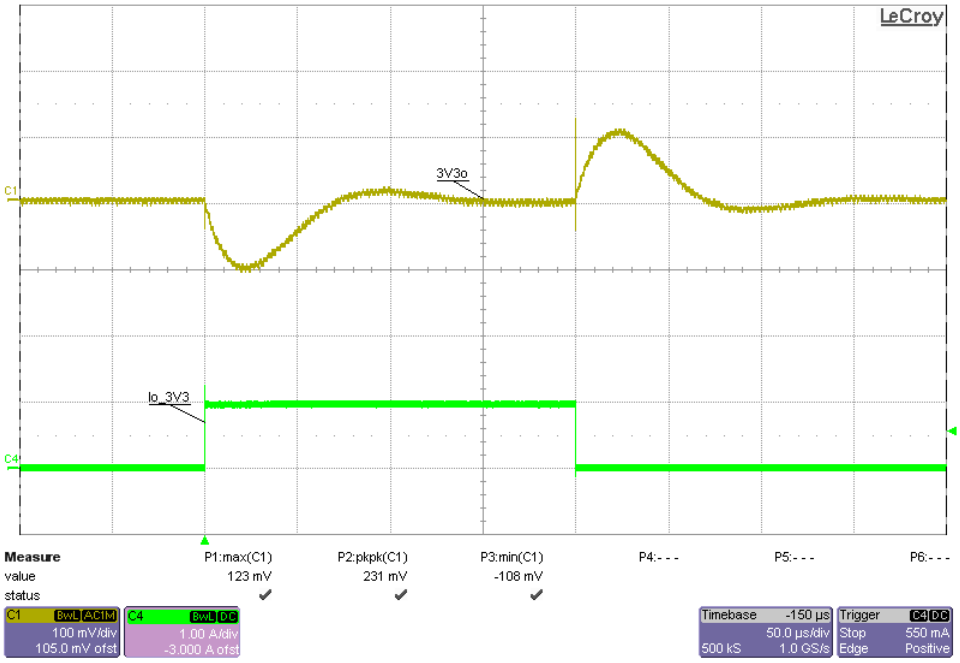

Figure 12 3.3V output load transient at 24V input, full load on other outputs

X. Output Voltage Ripples

The output ripples were measured directly at the output capacitors at full load condition. Ch1 (yellow) is the output voltage ripple in AC mode.

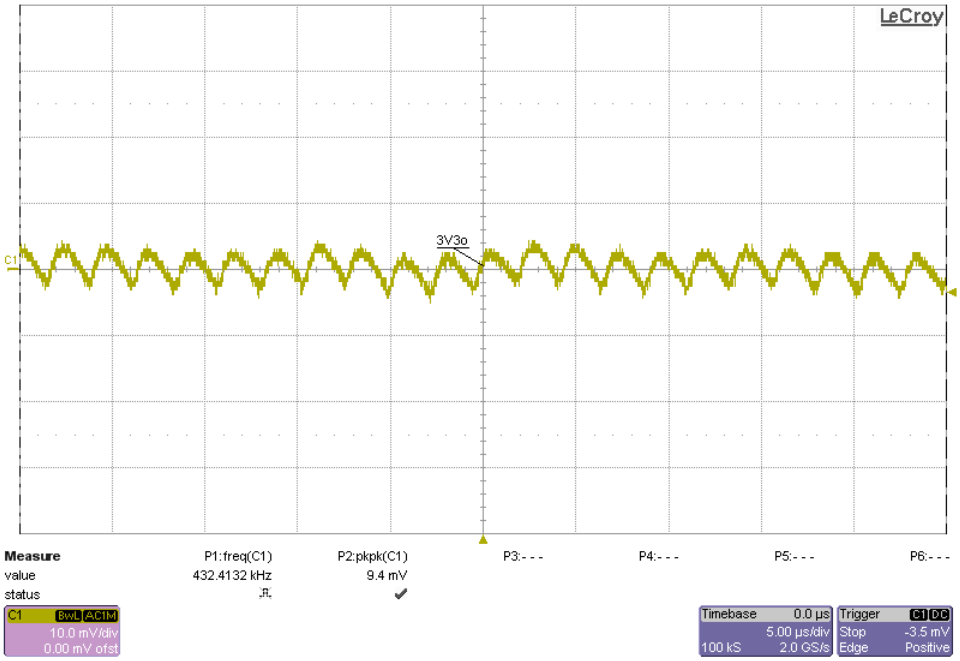

Figure 13 3.3V output ripple at full load, 24Vin

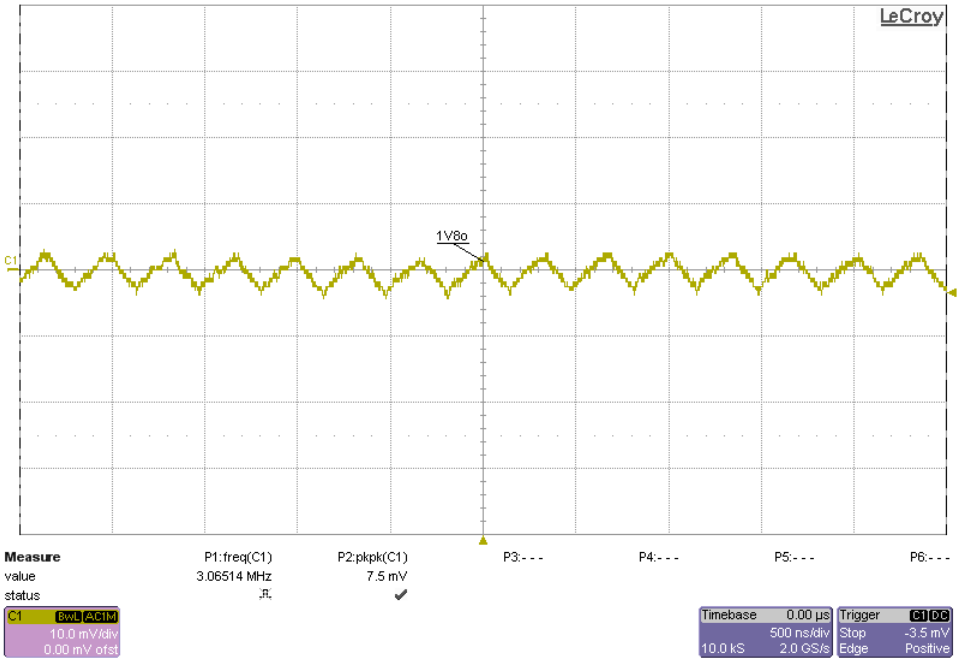

Figure 14 1.8V output ripple at full load, 24Vin

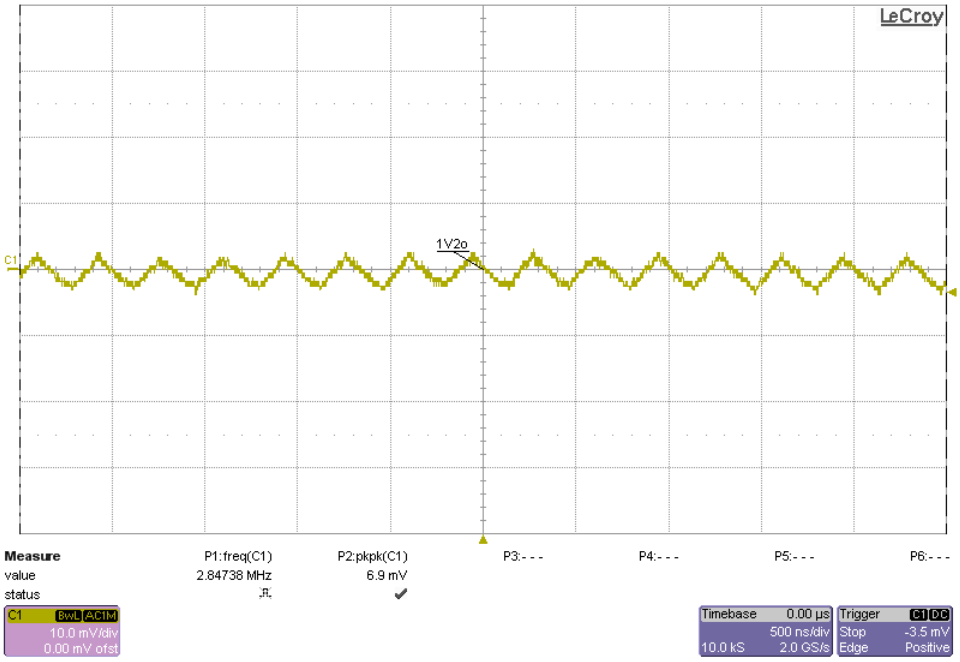

Figure 15 1.2V output ripple at full load, 24Vin

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