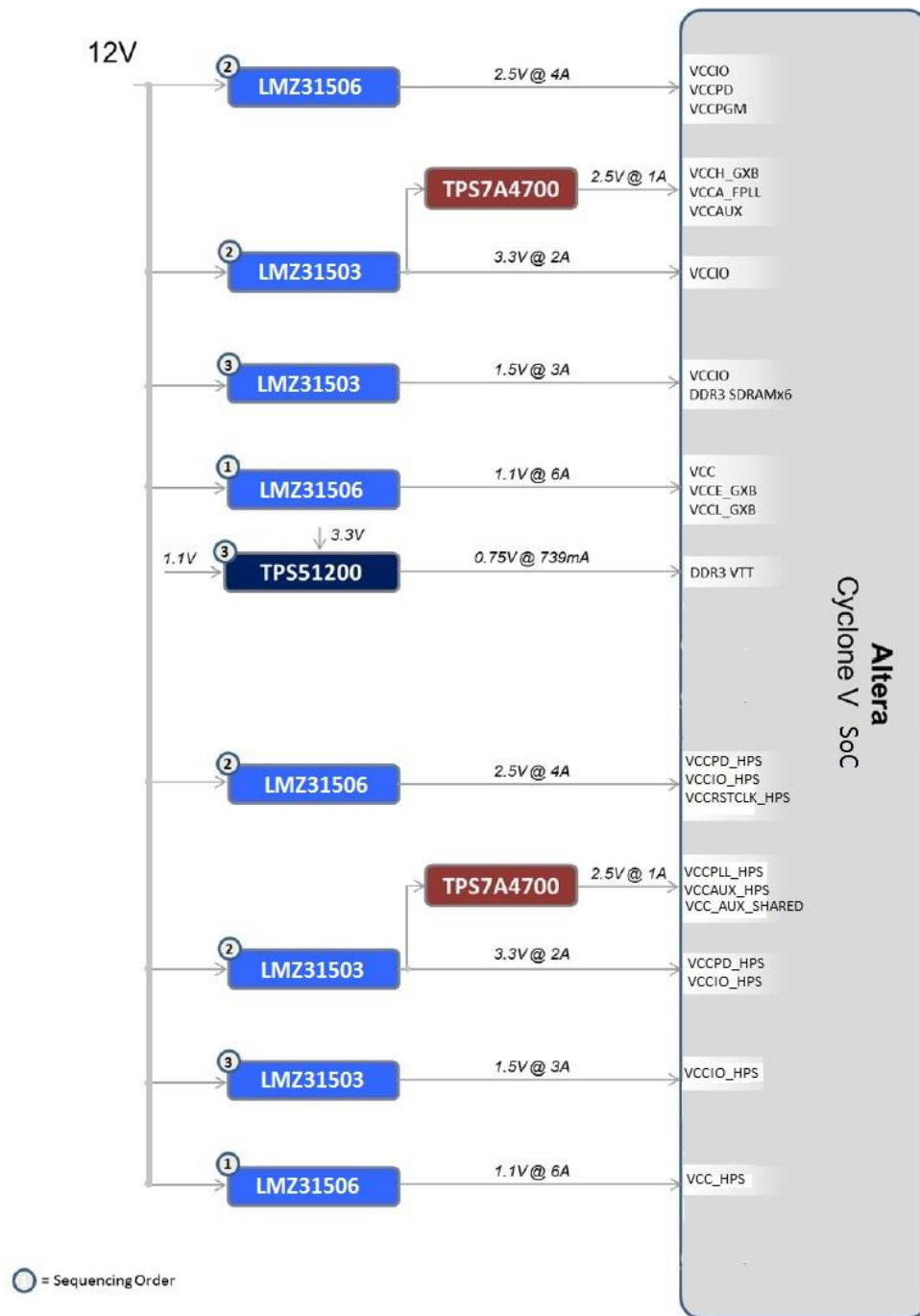


PMP9353_RevA Test Results

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1. Block Diagram



2. Startup/Sequencing

The startup waveform is shown in Figure 1. The input voltage is 12V, with no load at the output.

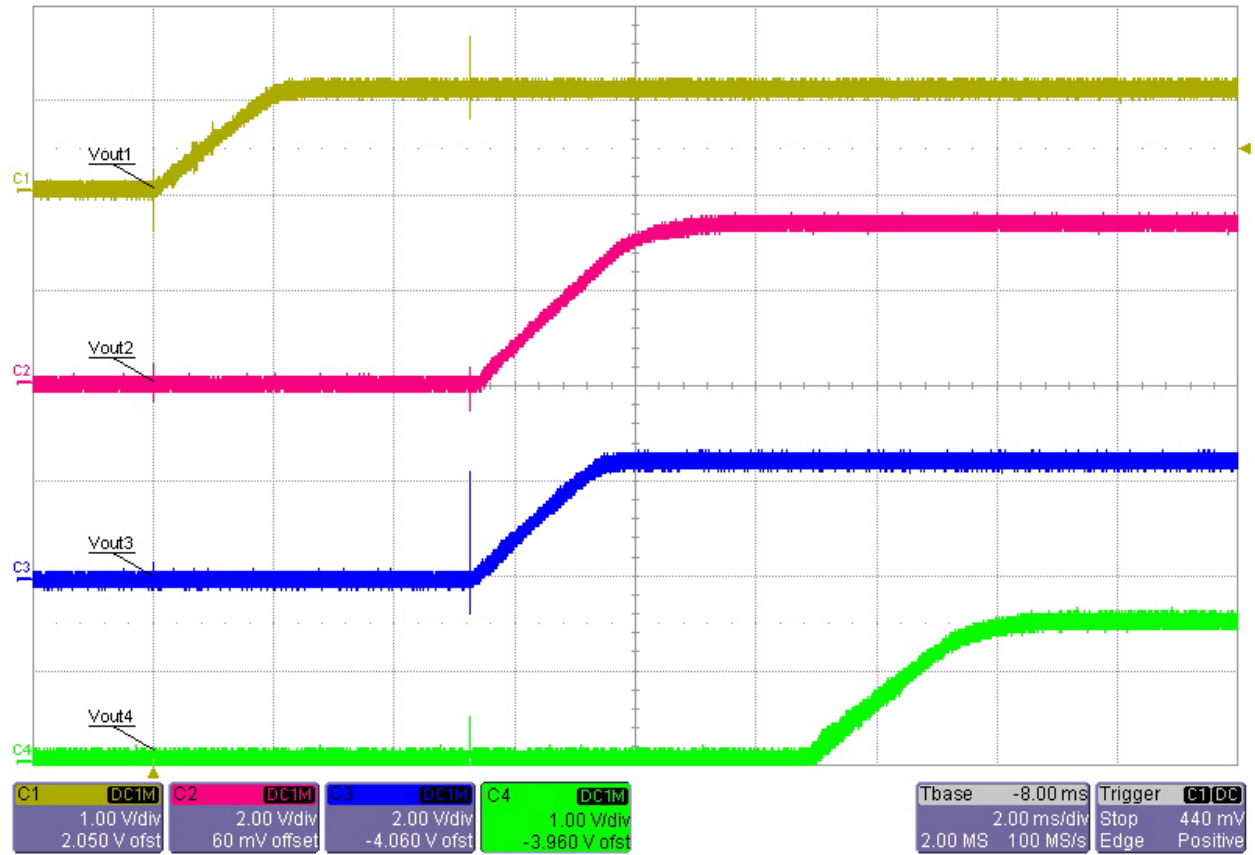


Figure 1

Ch1 => Output voltage 1.1V order #1

Ch2 => Output voltage 3.3V order #2

Ch3 => Output voltage 2.5V order #2

Ch4 => Output voltage 1.5V order #3

2ms/div

Full Bandwidth

A selection of startup waveforms is shown in Figure 1.1 to demonstrate LDO startup. The input voltage is 12V, with no load at the output.

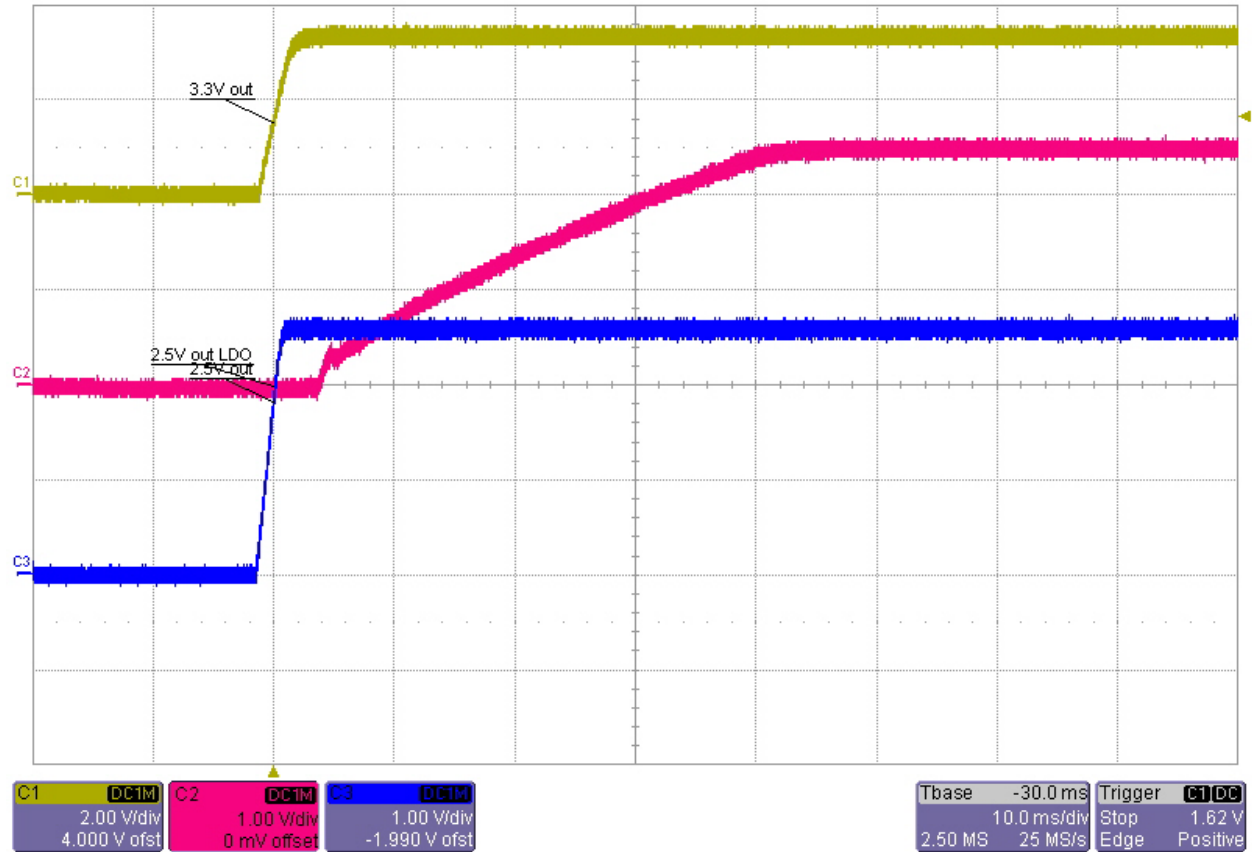


Figure 1.1

Ch1 => Output voltage 3.3V order #2

Ch3 => Output voltage 2.5V order #2

Ch2 => LDO Output voltage 2.5V order #2 + LDO delay

2ms/div

Full Bandwidth

3. Synchronization

The switching nodes of the buck stages are shown in Figure 2. The input voltage is 12V, with no load at the output.

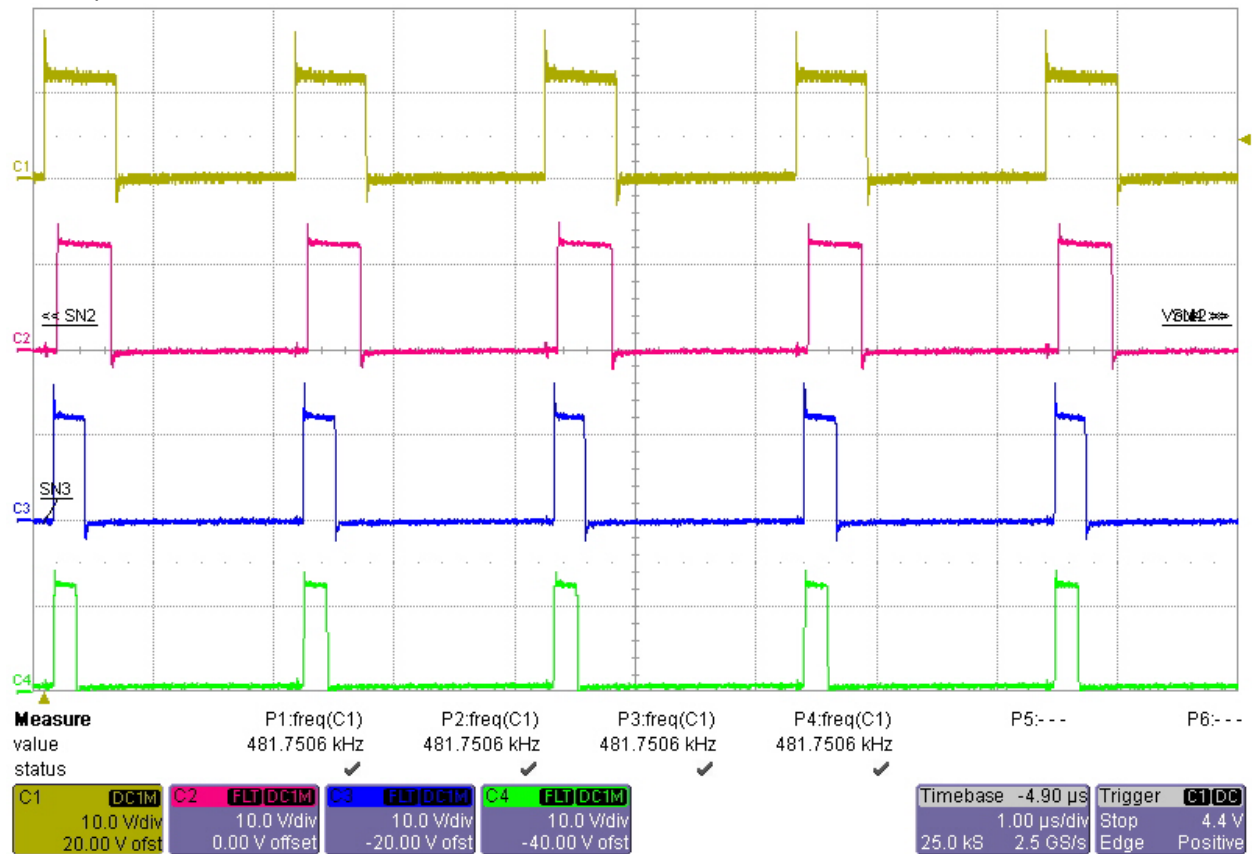


Figure 2

Ch1 => Switching node for 3.3 Vout

Ch2 => Switching node for 2.5 Vout

Ch3 => Switching node for 1.5 Vout

Ch4 => Switching node for 1.1 Vout

Common frequency: 481.75 kHz

1 μs/div

Full Bandwidth

4. DDR Tracking

DDR tracking is shown in the Figures 3 and 4.

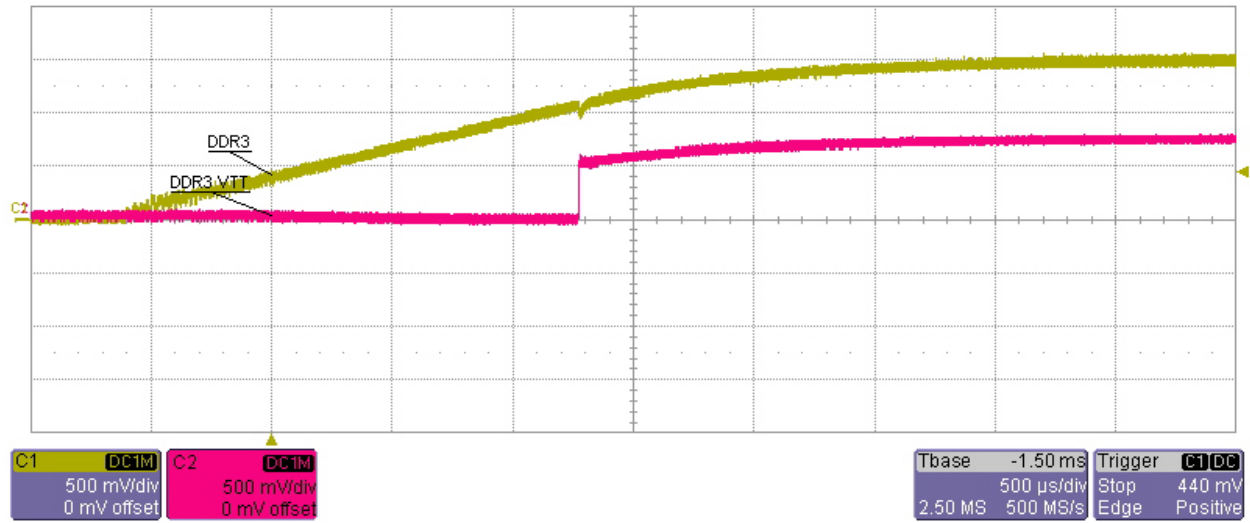


Figure 3

Ch1 => DDR3 1.5V output voltage from buck stage

Ch2 => DDR3 0.75V termination voltage from TPS51200

500 μ s/div

Full Bandwidth

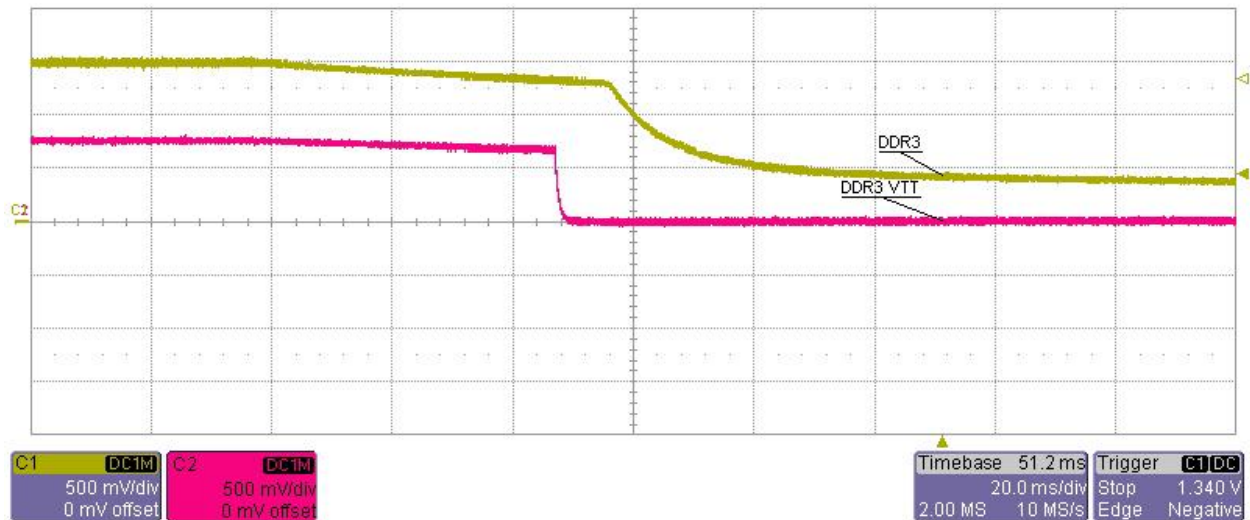


Figure 4

Ch1 => DDR3 1.5V output voltage from buck stage

Ch2 => DDR3 0.75V termination voltage from TPS51200

20ms/div

Full Bandwidth

5. Efficiency

The respective efficiencies of the buck stages providing 1.1V, 1.5V, 3.3V, and 2.5V are shown in Figures 5, 6, 7, and 8 below. The input voltage is 12V.

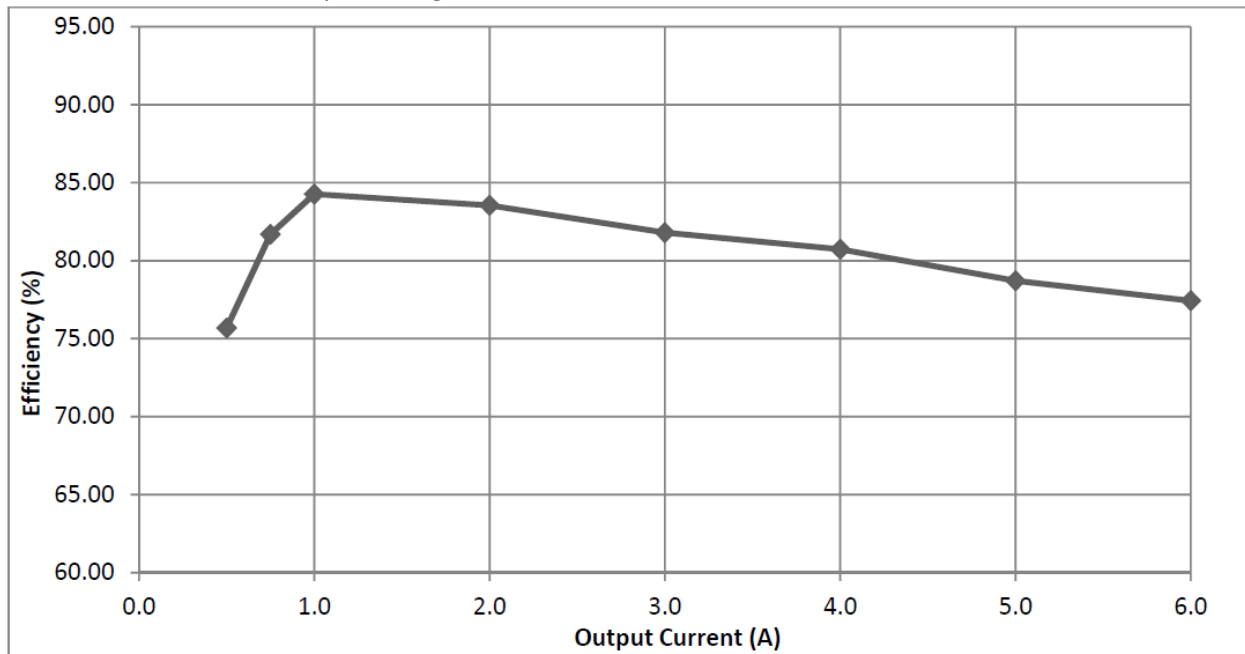


Figure 5: 1.1V Output

| V _{IN} (V) | I _{IN} (A) | V _{OUT} (V) | I _{OUT} (A) | P _{IN} (W) | P _{OUT} (W) | Eff (%) |
|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------|
| 12.01 | 0.06 | 1.11 | 0.5 | 0.734 | 0.556 | 75.68 |
| 12.00 | 0.09 | 1.11 | 0.8 | 1.020 | 0.833 | 81.69 |
| 11.99 | 0.11 | 1.11 | 1.0 | 1.319 | 1.111 | 84.27 |
| 11.98 | 0.22 | 1.11 | 2.0 | 2.660 | 2.222 | 83.55 |
| 11.98 | 0.34 | 1.11 | 3.0 | 4.073 | 3.332 | 81.80 |
| 11.96 | 0.46 | 1.11 | 4.0 | 5.502 | 4.441 | 80.73 |
| 11.95 | 0.59 | 1.11 | 5.0 | 7.051 | 5.550 | 78.71 |
| 11.94 | 0.72 | 1.11 | 6.0 | 8.597 | 6.656 | 77.43 |

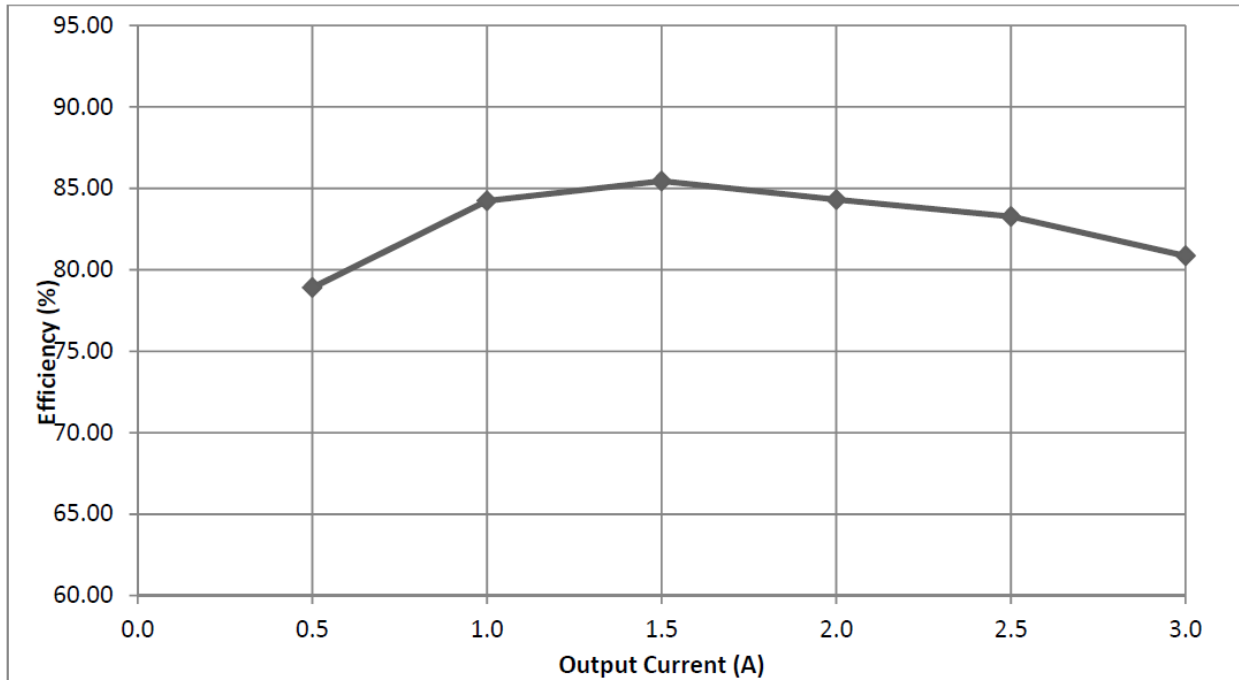


Figure 6: 1.5V Output

| V _{IN} (V) | I _{IN} (A) | V _{OUT} (V) | I _{OUT} (A) | P _{IN} (W) | P _{OUT} (W) | Eff (%) |
|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------|
| 12.00 | 0.08 | 1.52 | 0.5 | 0.960 | 0.758 | 78.91 |
| 11.99 | 0.15 | 1.52 | 1.0 | 1.799 | 1.515 | 84.24 |
| 11.98 | 0.22 | 1.52 | 1.5 | 2.660 | 2.273 | 85.45 |
| 11.98 | 0.30 | 1.52 | 2.0 | 3.594 | 3.030 | 84.31 |
| 11.97 | 0.38 | 1.52 | 2.5 | 4.549 | 3.788 | 83.27 |
| 11.96 | 0.47 | 1.52 | 3.0 | 5.621 | 4.545 | 80.85 |

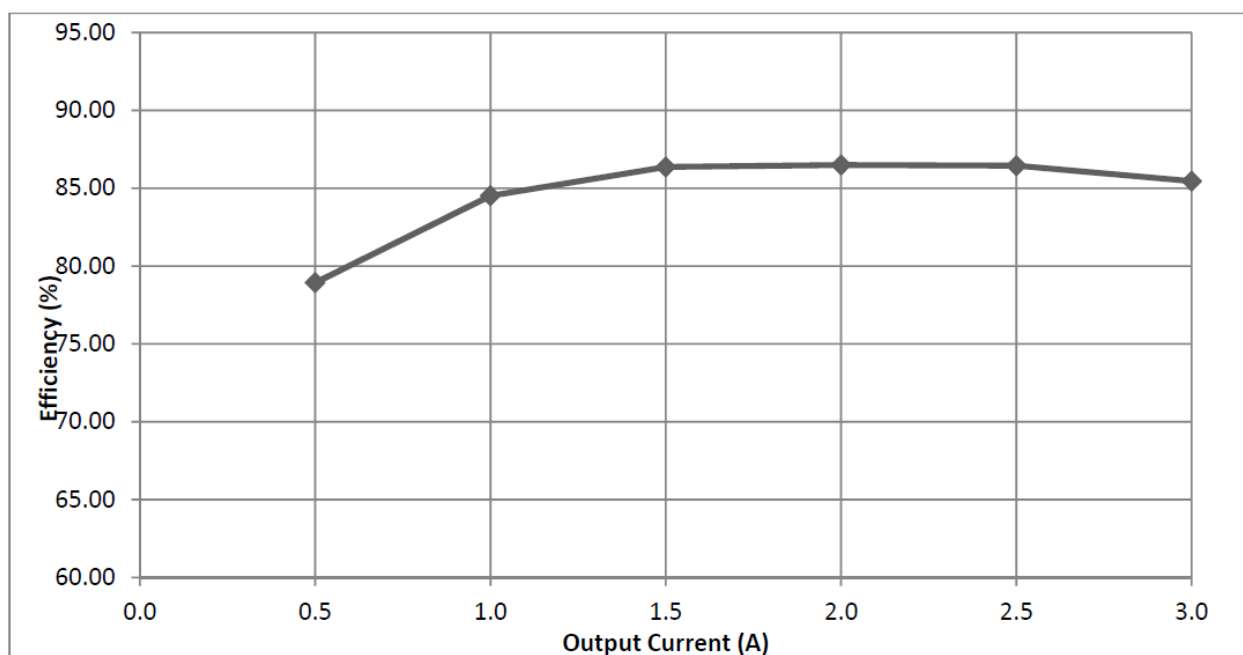


Figure 7: 3.3V Output

| V _{IN} (V) | I _{IN} (A) | V _{OUT} (V) | I _{OUT} (A) | P _{IN} (W) | P _{OUT} (W) | Eff (%) |
|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------|
| 11.99 | 0.18 | 3.41 | 0.5 | 2.158 | 1.704 | 78.93 |
| 11.98 | 0.34 | 3.39 | 1.0 | 4.013 | 3.392 | 84.52 |
| 11.97 | 0.49 | 3.38 | 1.5 | 5.865 | 5.066 | 86.36 |
| 11.96 | 0.65 | 3.36 | 2.0 | 7.774 | 6.724 | 86.49 |
| 11.95 | 0.81 | 3.35 | 2.5 | 9.680 | 8.368 | 86.45 |
| 11.94 | 0.98 | 3.33 | 3.0 | 11.701 | 9.999 | 85.45 |

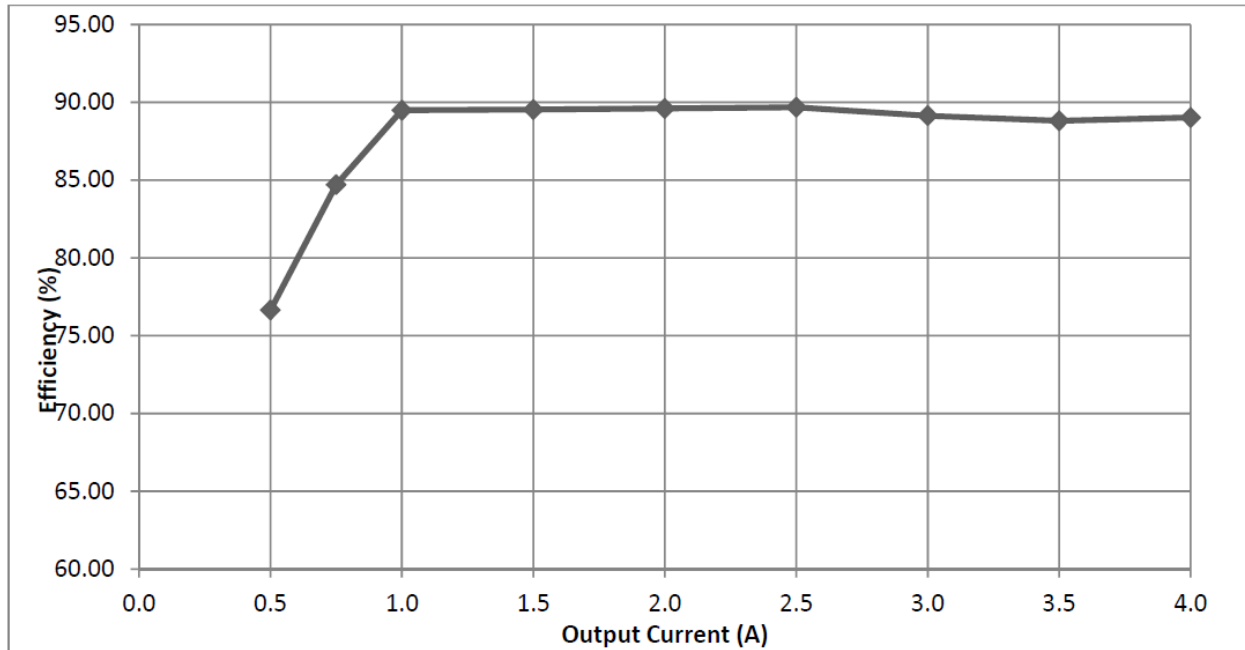


Figure 8: 2.5V Output

| V _{IN} (V) | I _{IN} (A) | V _{OUT} (V) | I _{OUT} (A) | P _{IN} (W) | P _{OUT} (W) | Eff (%) |
|---------------------|---------------------|----------------------|----------------------|---------------------|----------------------|---------|
| 11.99 | 0.14 | 2.57 | 0.5 | 1.679 | 1.287 | 76.64 |
| 11.99 | 0.19 | 2.57 | 0.8 | 2.278 | 1.930 | 84.71 |
| 11.98 | 0.24 | 2.57 | 1.0 | 2.875 | 2.573 | 89.49 |
| 11.97 | 0.36 | 2.57 | 1.5 | 4.309 | 3.858 | 89.53 |
| 11.96 | 0.48 | 2.57 | 2.0 | 5.741 | 5.144 | 89.60 |
| 11.95 | 0.60 | 2.57 | 2.5 | 7.170 | 6.430 | 89.68 |
| 11.94 | 0.73 | 2.57 | 3.0 | 8.657 | 7.716 | 89.14 |
| 11.92 | 0.85 | 2.57 | 3.5 | 10.132 | 8.999 | 88.81 |
| 11.91 | 0.97 | 2.57 | 4.0 | 11.553 | 10.284 | 89.02 |

6. Load Step

The load regulation of the 1.1V output is shown in Figures 9 and 10 below. The input voltage is 12V. The load step increases from 3A to 6A.

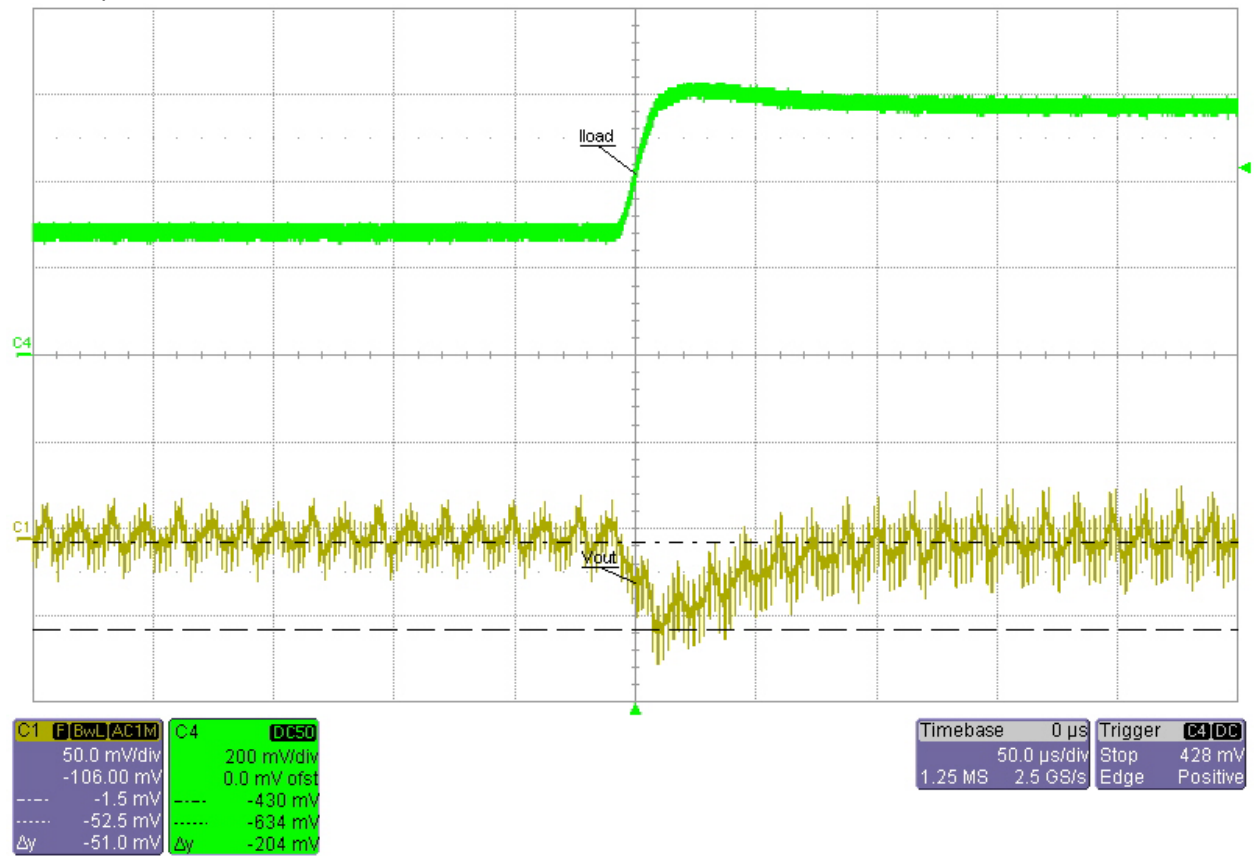


Figure 9

Ch1 => AC coupled output voltage

Ch2 => Output current 1V = 10A

Slope of step: 3A/16.6 μ s

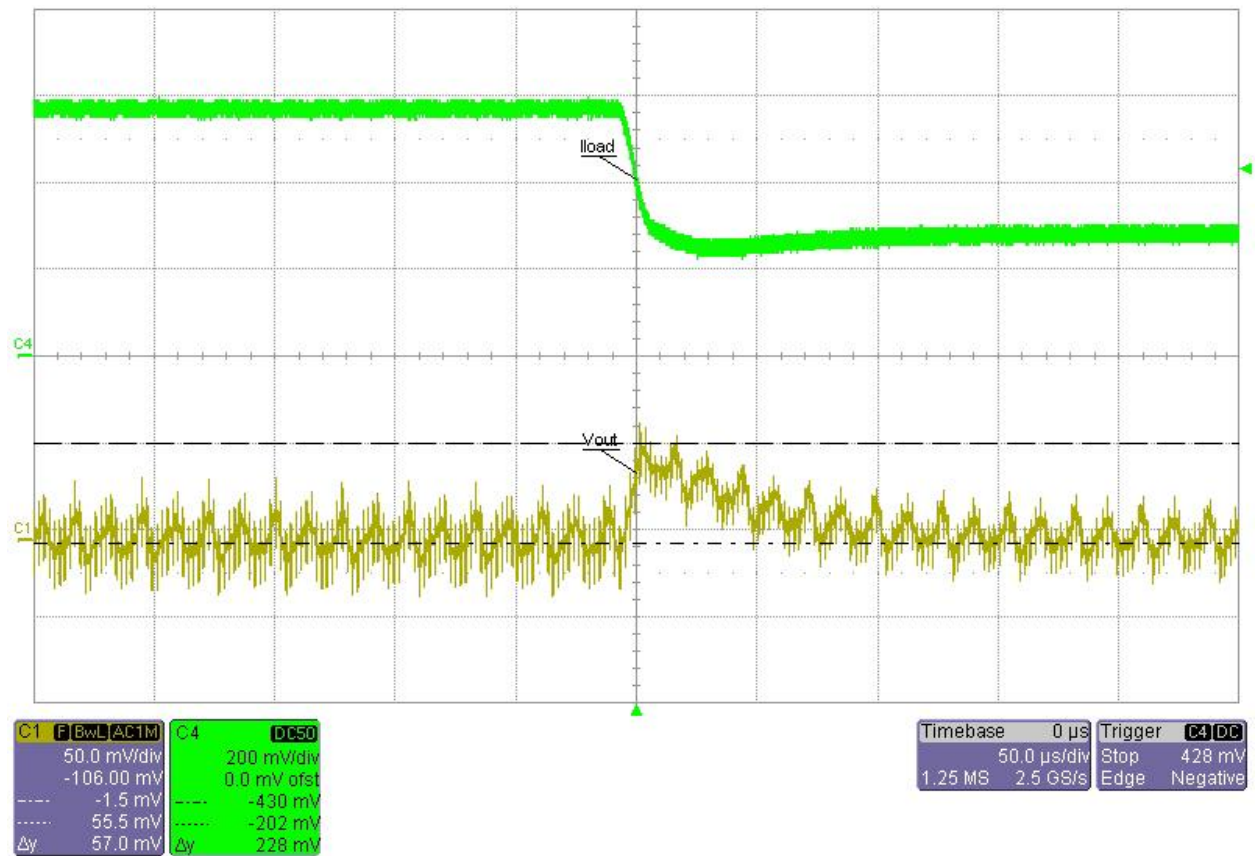


Figure 10

Ch1 \Rightarrow AC coupled output voltage

Ch2 \Rightarrow Output current $1V = 10A$

Slope of step: $3A/11\mu s$

The load regulation of the 1.5V output is shown in Figures 11 and 12 below. The input voltage is 12V. The load step increases from 1.5A to 3A.

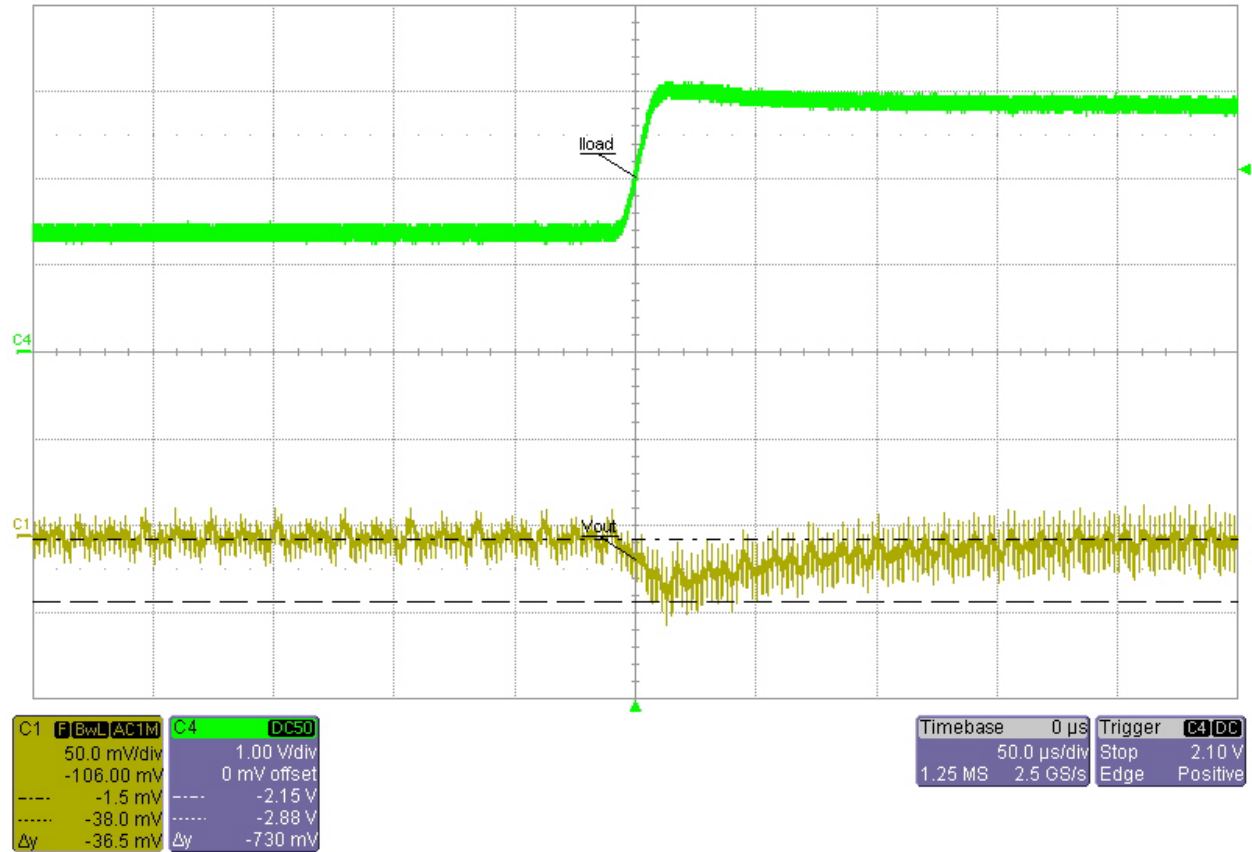


Figure 11

Ch1 => AC coupled output voltage

Ch2 => Output current 1V = 10A

Slope of step: 1.5A/16.3μs

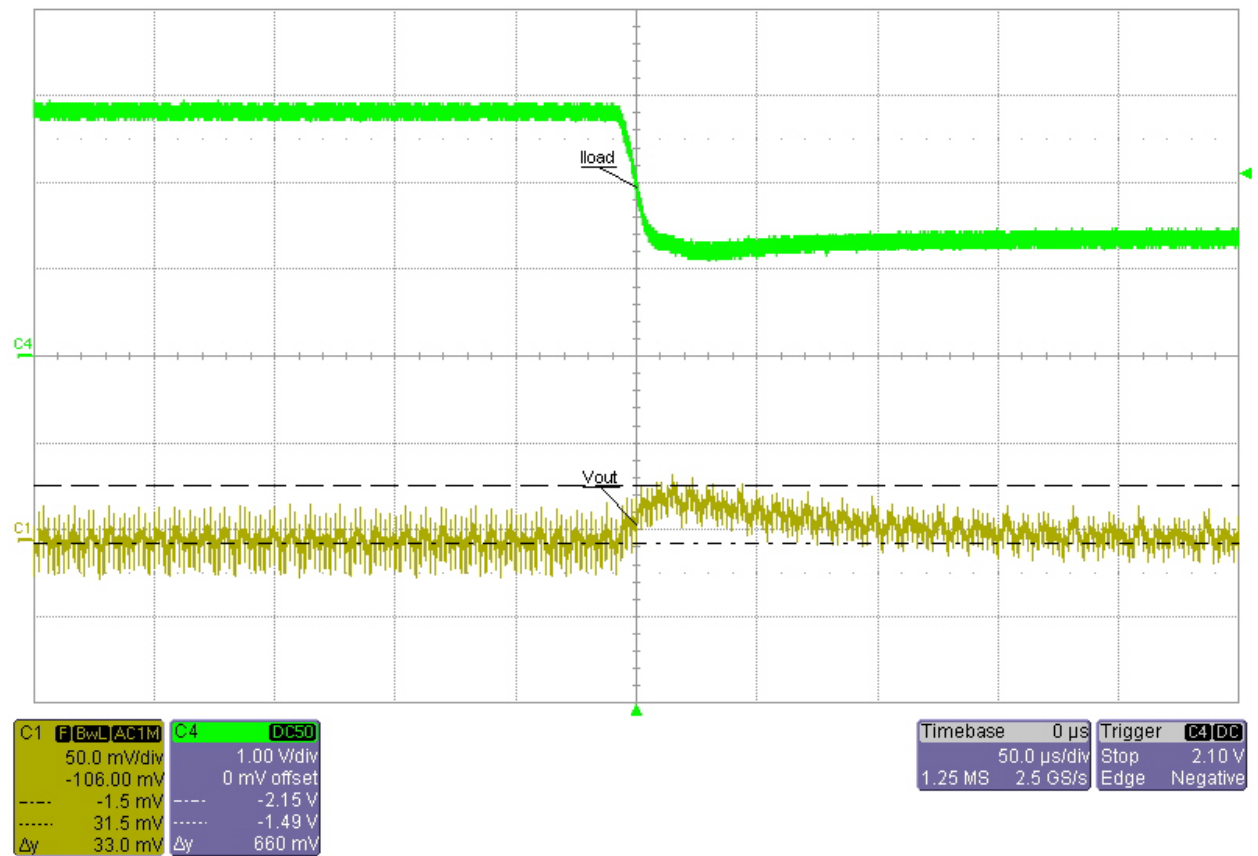


Figure 12

Ch1 => AC coupled output voltage

Ch2 => Output current 1V = 10A

Slope of step: 1.5A/13.7 μ s

The load regulation of the 3.3V output is shown in Figures 13 and 14 below. The input voltage is 12V. The load step increases from 1.25A to 2.5A.

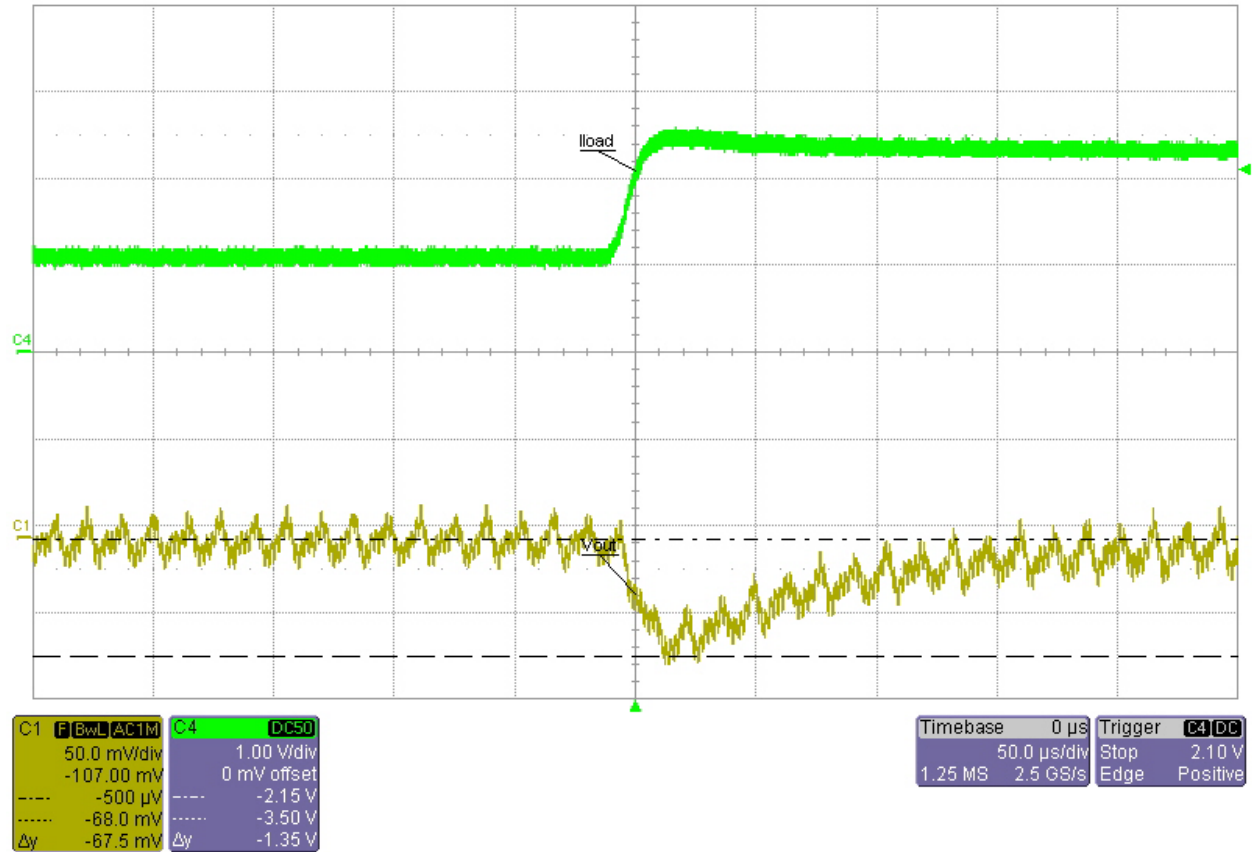


Figure 13

Ch1 => AC coupled output voltage

Ch2 => Output current 1V = 10A

Slope of step: 1.25A/17.1 μ s

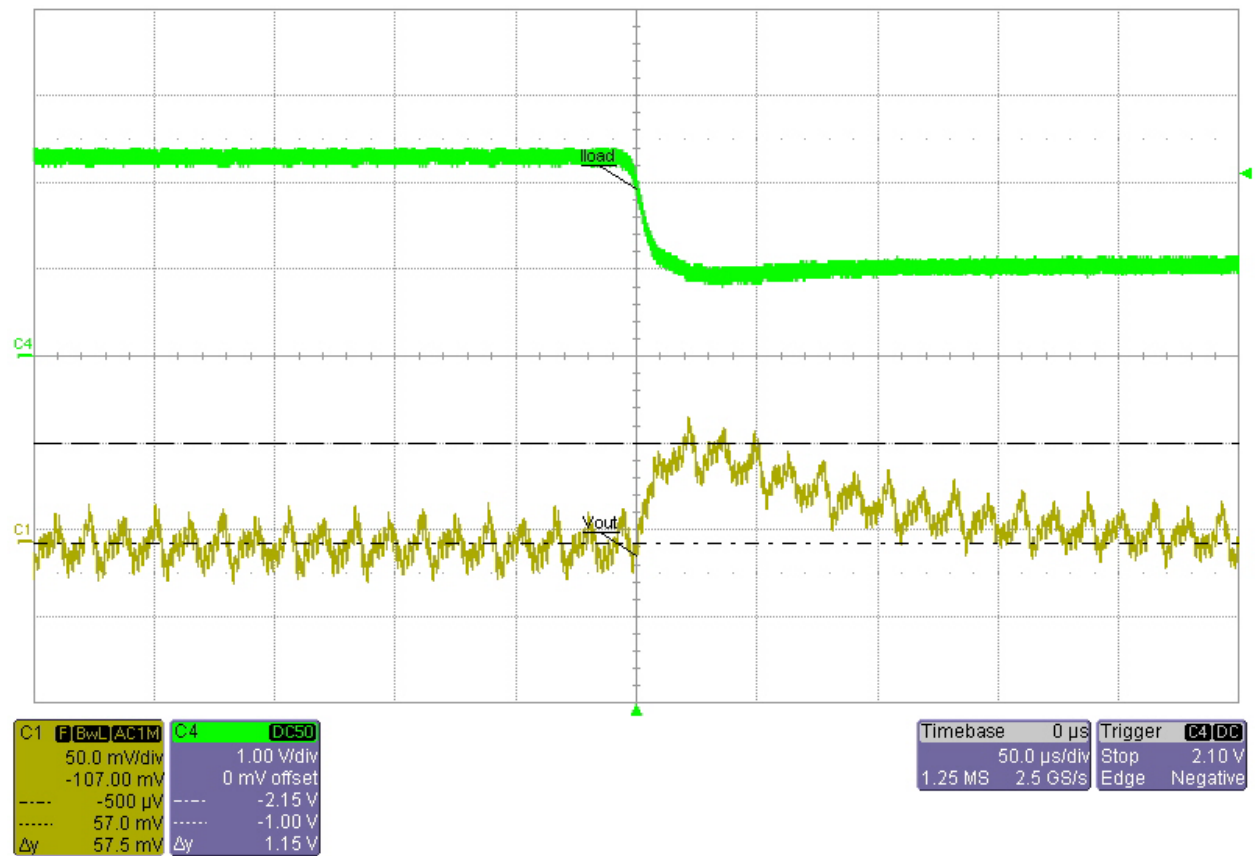


Figure 14

Ch1 => AC coupled output voltage

Ch2 => Output current 1V = 10A

Slope of step: 1.25A/13.3 μ s

The load regulation of the 2.5V output is shown in the Figures 15 and 16 below. The input voltage is 12V. The load step increases from 1.75A to 3.5A.

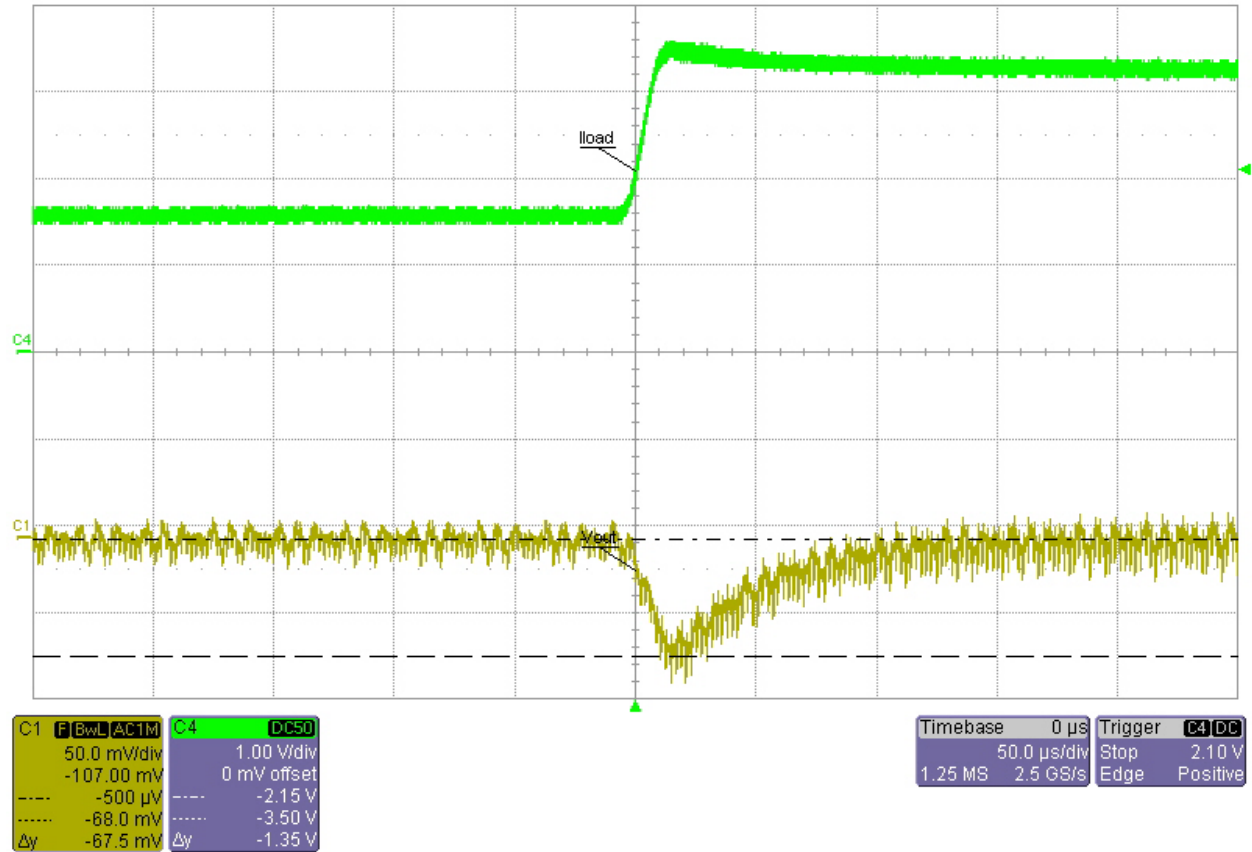


Figure 15

Ch1 => AC coupled output voltage

Ch2 => Output current 1V= 10A

Slope of step: 1.75A/15.8 μ s

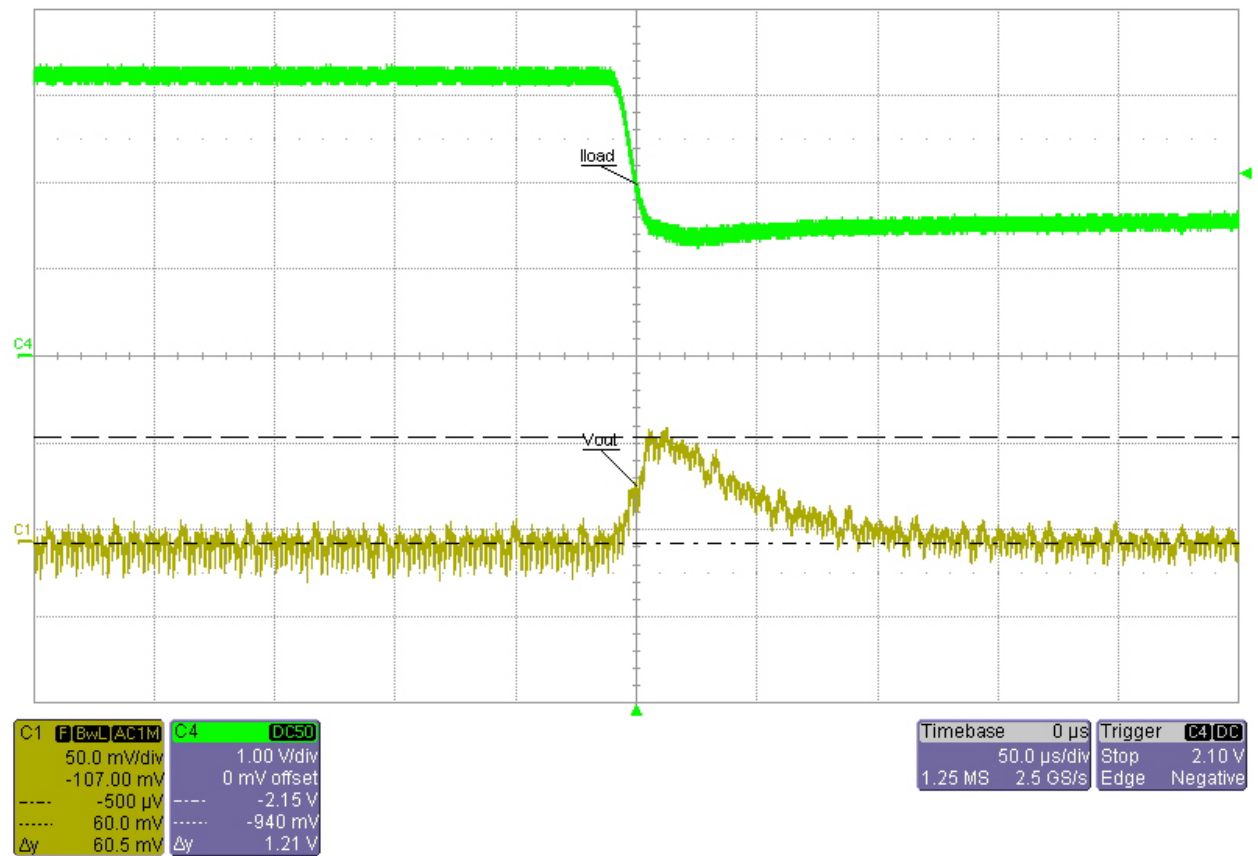


Figure 16

Ch1 => AC coupled output voltage

Ch2 => Output current $I_V = 10A$

Slope of step: $1.75A/14.2\mu s$

The load regulation of the 2.5V LDO output is shown in the Figures 17 and 18 below. The input voltage is 12V. The load step increases from 0A to 1A.

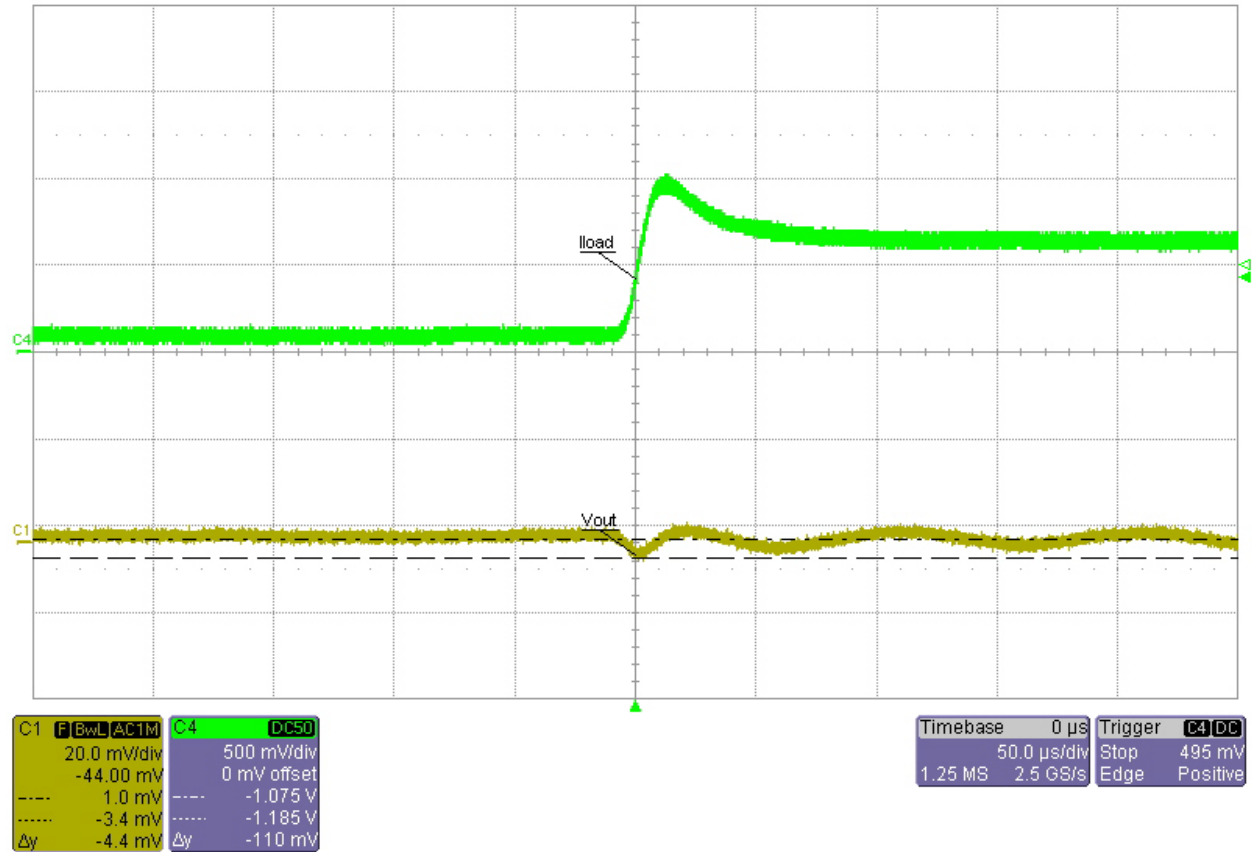


Figure 17

Ch1 => AC coupled output voltage

Ch2 => Output current $I_V = 10A$

Slope of step: $1A/17\mu s$

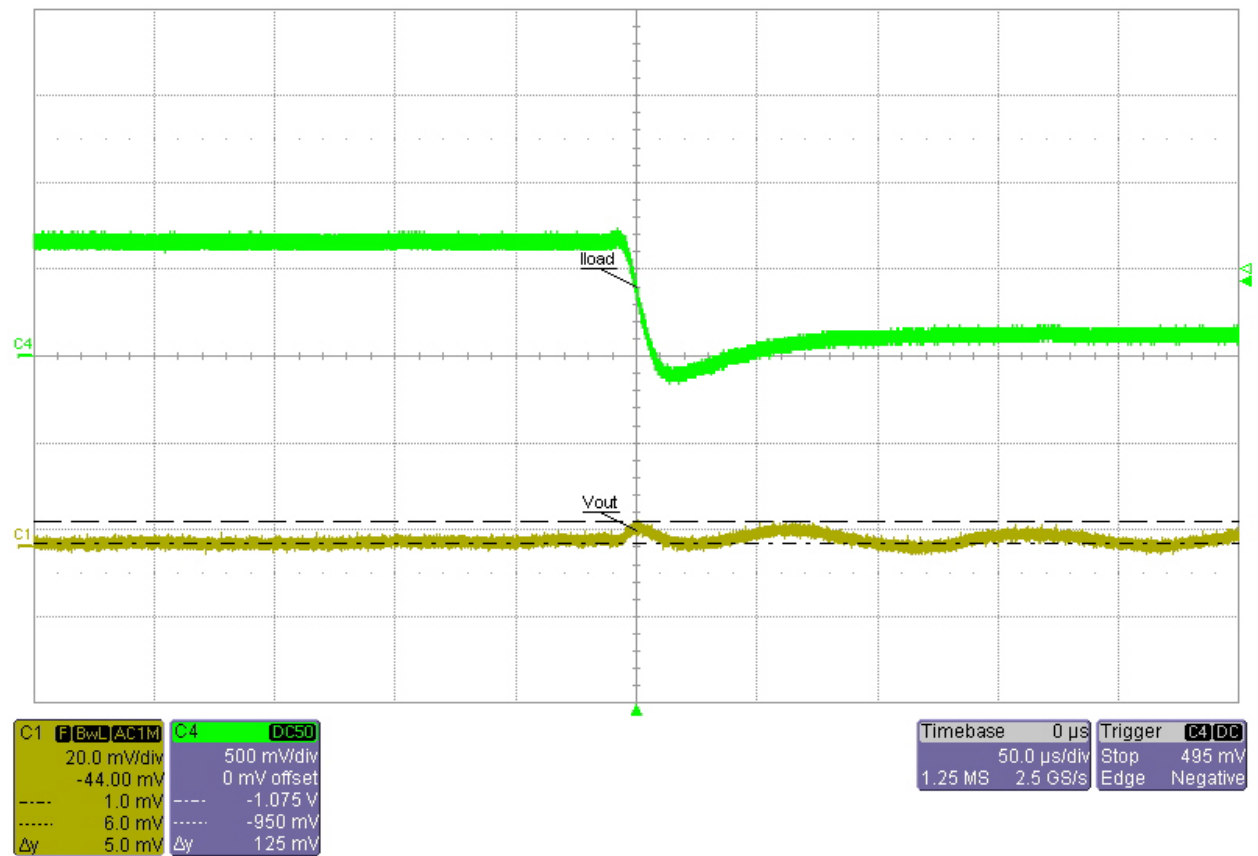


Figure 18

Ch1 => AC coupled output voltage

Ch2 => Output current 1V = 10A

Slope of step: 1A/17 μ s

7. Frequency Response

Figure 19 shows the loop response of the 1.1V output with 2A load and 12V input.

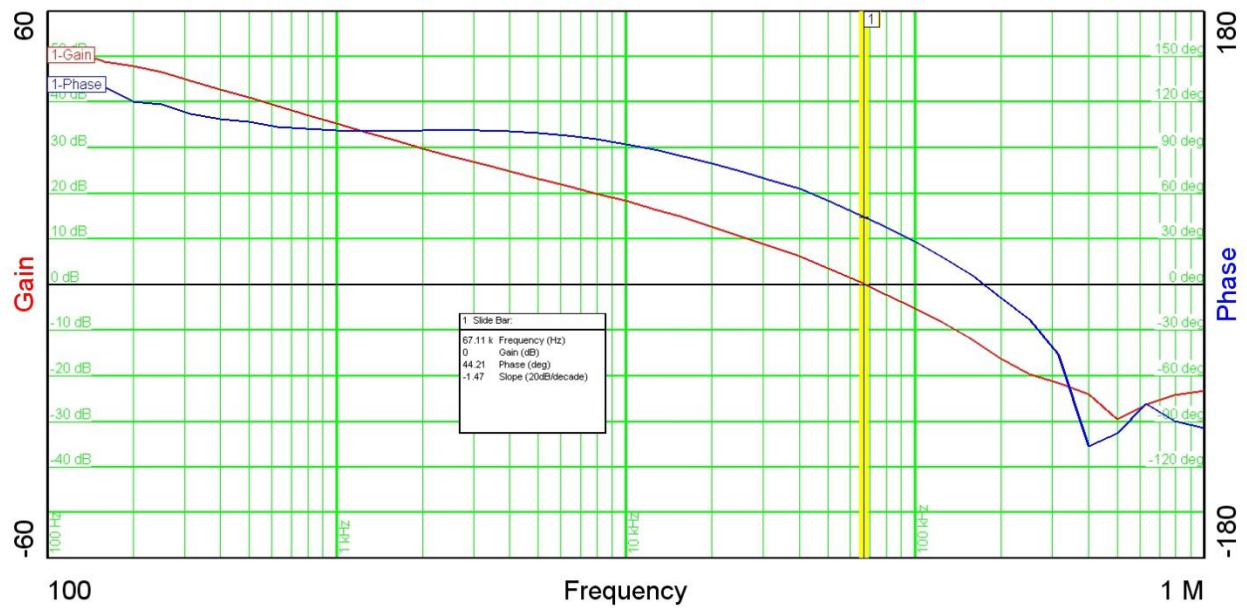


Figure 19

Table 1 summarizes the results from Figure 19.

| | |
|----------------------------|--------|
| Bandwidth (kHz) | 67.11 |
| Phase Margin | 44.21° |
| Slope (20dB/Decade) | -1.47 |

Table 1

Figure 20 shows the loop response of the 1.5V output with 2A load and 12V input.

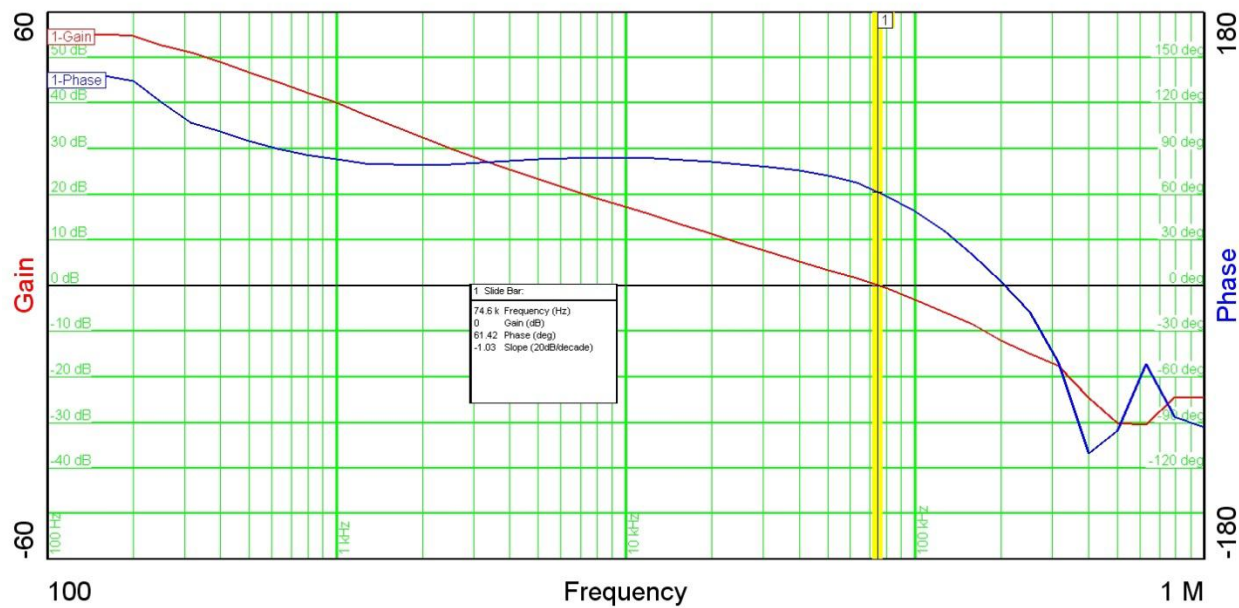


Figure 20

Table 2 summarizes the results from Figure 20.

| | |
|---------------------|--------|
| Bandwidth (kHz) | 75.6 |
| Phase Margin | 61.42° |
| Slope (20dB/Decade) | -1.03 |

Table 2

Figure 21 shows the loop response of the 3.3V output with 2A load and 12V input.

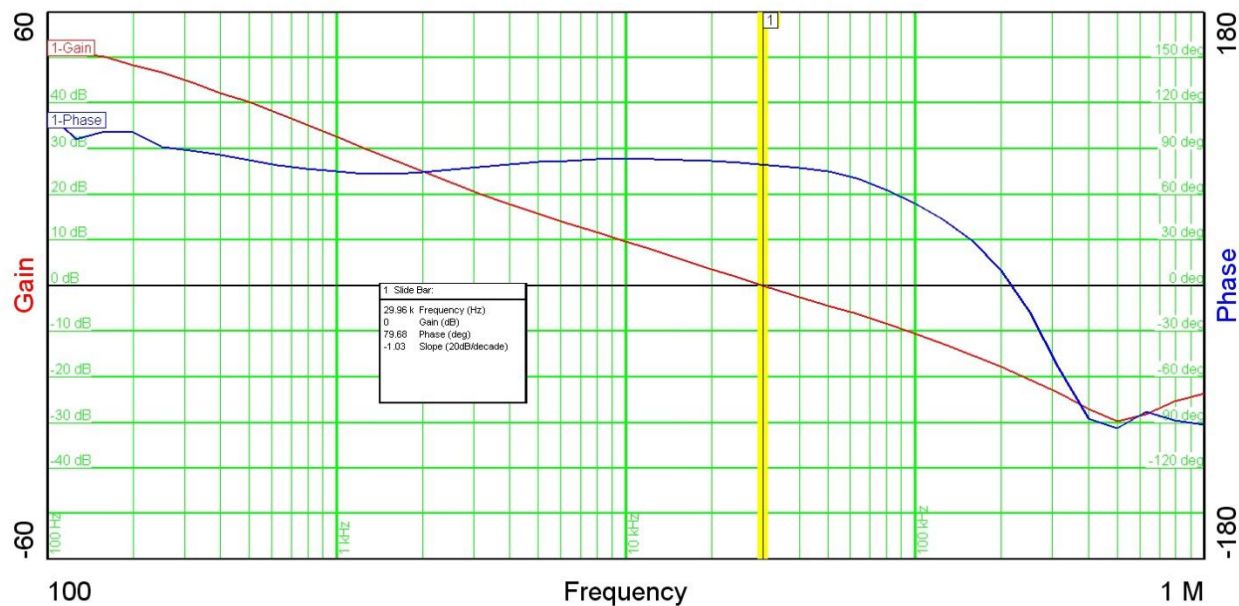


Figure 21

Table 3 summarizes the results from Figure 21.

| | |
|----------------------------|--------|
| Bandwidth (kHz) | 29.96 |
| Phase Margin | 79.68° |
| Slope (20dB/Decade) | -1.03 |

Table 3

Figure 22 shows the loop response of the 2.5V output with 2A load and 12V input.

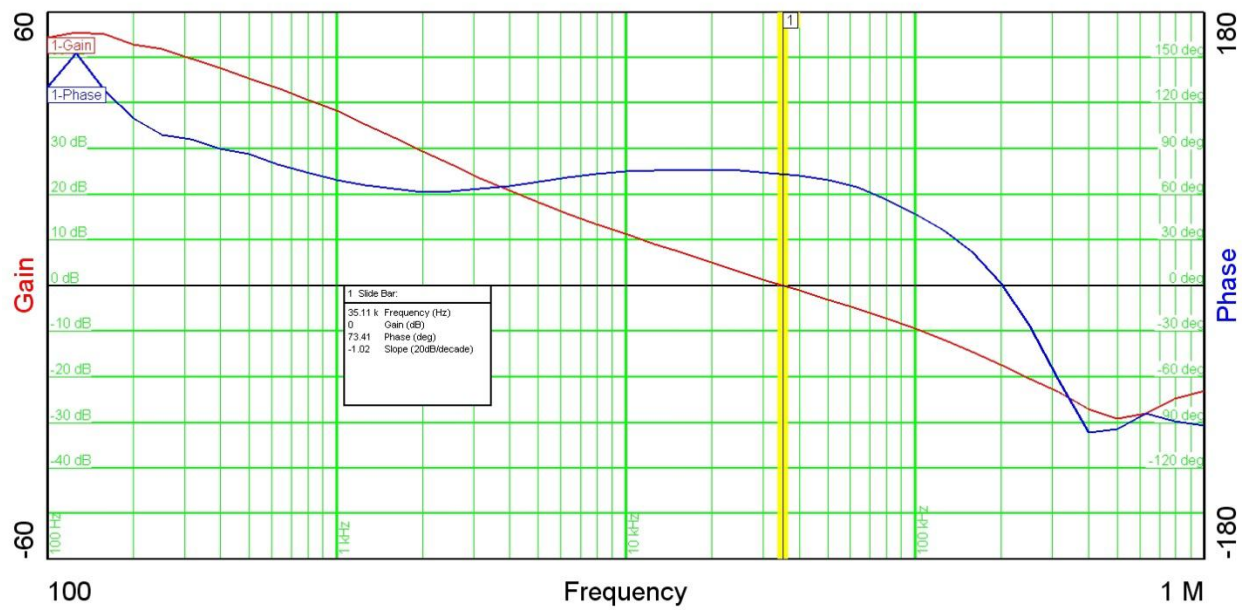


Figure 22

Table 4 summarizes the results from Figure 22.

| | |
|---------------------|--------|
| Bandwidth (kHz) | 35.11 |
| Phase Margin | 73.41° |
| Slope (20dB/Decade) | -1.02 |

Table 4

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