Test Data
For PMP9256
4/9/2015

Table of Contents

1. Design Specifications

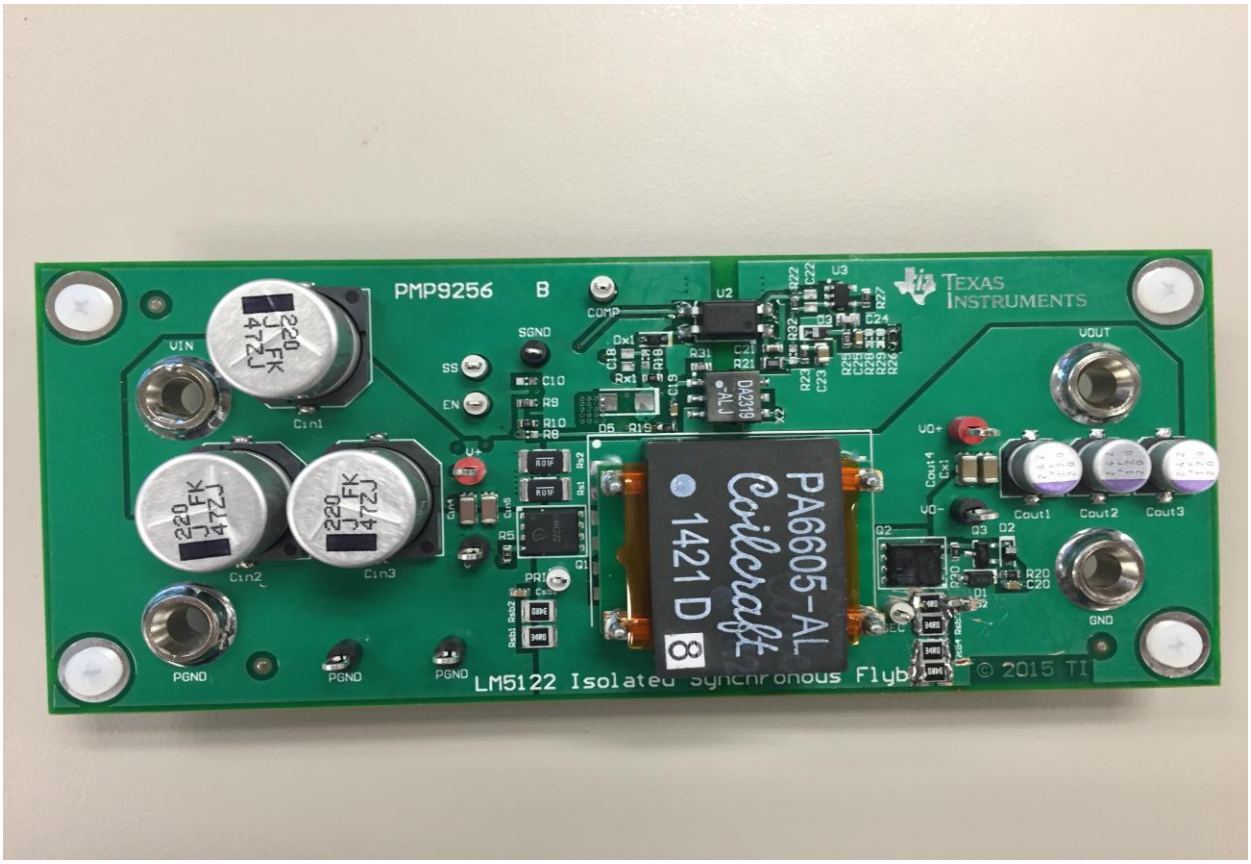
Vin Minimum	**9VDC**
Vin Maximum	**60VDC**
Vout	**+12VDC @ 5A**
Nominal Switching Frequency	**≈ 230KHz**

2. Circuit Description

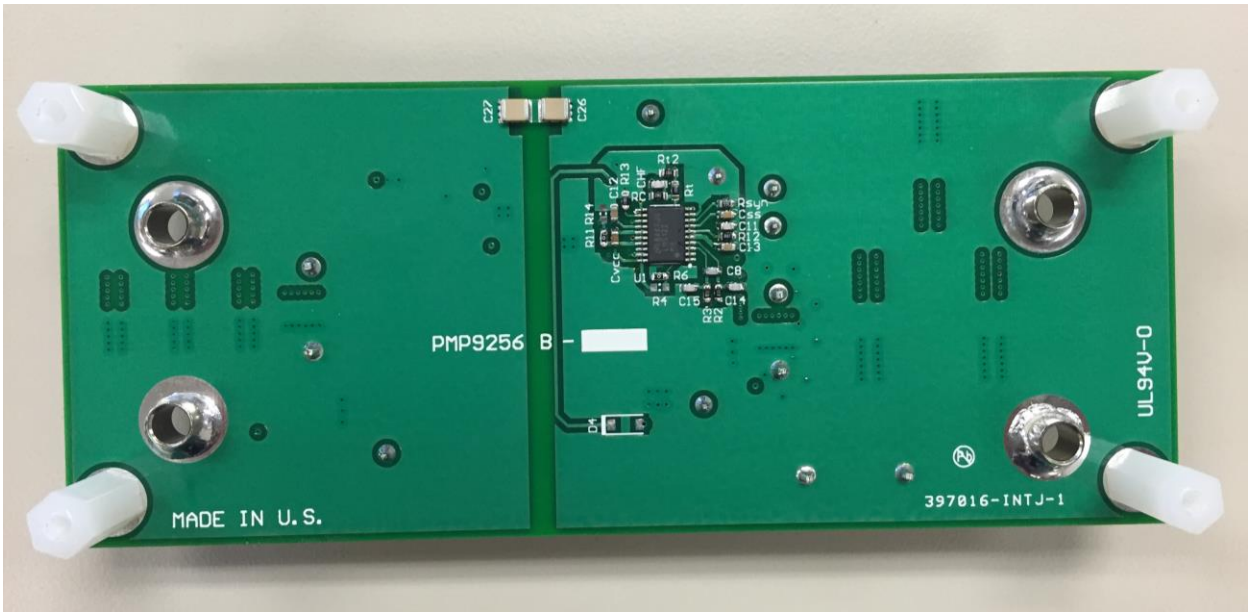
PMP9256 is an isolated synchronous flyback converter utilizing the LM5122 for industrial applications. The benefit of using a synchronous flyback is higher efficiency compared to a non-synchronous flyback. This design has a minimum operating input voltage of 9V and an absolute maximum input voltage of 60V. The test report here is for 9V, 24V and 60Vin/~12V out @ 5A of load current. Switching frequency is set to 230 kHz. A custom flyback transformer from Coilcraft is used in this design.

3. PMP9256 Board Photos

Board Dimensions: 127.6mm x 52.6mm



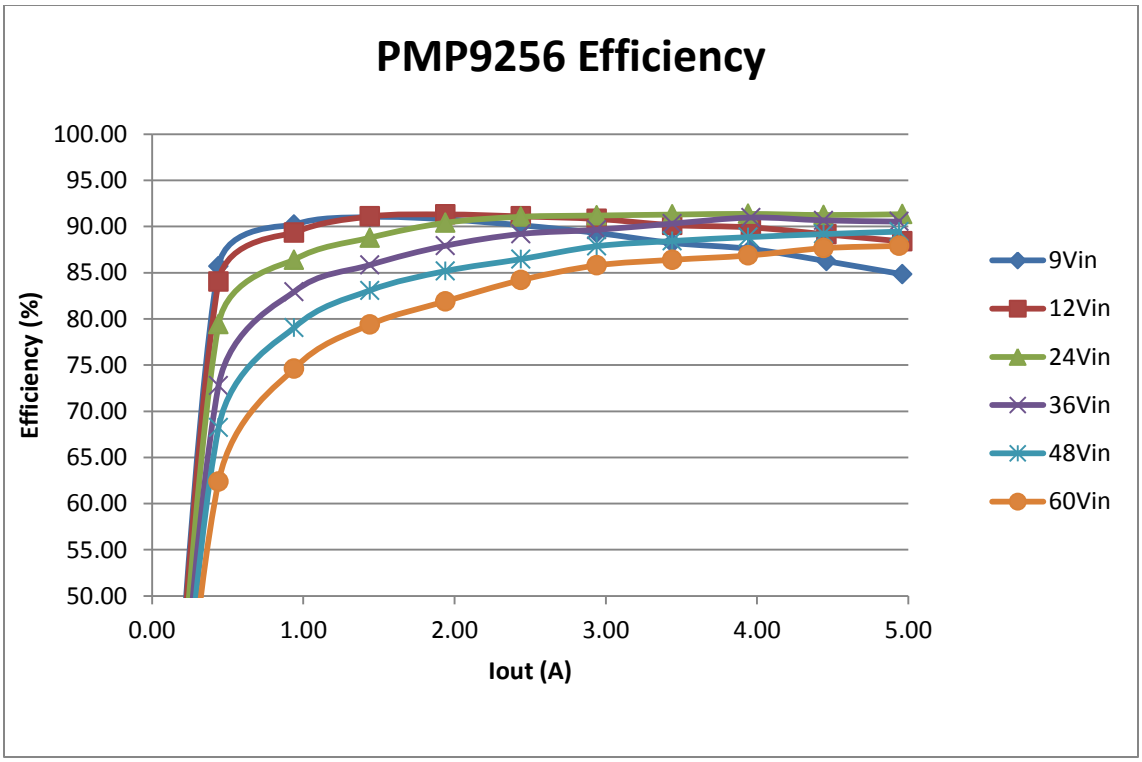
Board Photo (Top)



Board Photo (Bottom)

4. Efficiency

4.1 Efficiency Chart



4.2 Efficiency Data

Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Losses(W)	Efficiency(%)
9.00	0.04	0.36	11.92	0.00	0.00	0.36	0.00
9.00	0.68	6.12	11.92	0.44	5.25	0.88	85.69
9.00	1.38	12.42	11.92	0.94	11.21	1.22	90.20
9.00	2.10	18.86	11.92	1.44	17.17	1.69	91.02
9.00	2.83	25.47	11.92	1.94	23.12	2.35	90.78
9.00	3.59	32.27	11.92	2.44	29.08	3.18	90.13
9.00	4.36	39.24	11.92	2.94	35.04	4.20	89.31
9.00	5.17	46.48	11.92	3.44	41.00	5.48	88.22
9.00	5.99	53.90	11.92	3.96	47.20	6.70	87.56
9.00	6.85	61.64	11.92	4.46	53.16	8.48	86.25
9.00	7.75	69.68	11.92	4.96	59.11	10.57	84.83

Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Losses(W)	Efficiency(%)
12.00	0.04	0.48	11.92	0.00	0.00	0.48	0.00
12.00	0.52	6.24	11.92	0.44	5.24	1.00	84.03
12.00	1.05	12.54	11.92	0.94	11.20	1.34	89.33
12.00	1.57	18.84	11.92	1.44	17.16	1.68	91.09
12.00	2.11	25.32	11.92	1.94	23.12	2.20	91.31
12.00	2.66	31.92	11.92	2.44	29.08	2.84	91.10
12.00	3.22	38.58	11.92	2.94	35.04	3.54	90.82
12.00	3.79	45.47	11.92	3.44	40.99	4.48	90.15
12.00	4.38	52.49	11.92	3.96	47.19	5.30	89.90
12.00	4.97	59.62	11.92	4.46	53.15	6.47	89.15
11.99	5.58	66.87	11.92	4.96	59.10	7.77	88.38

Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Losses(W)	Efficiency(%)
24.01	0.04	0.96	11.92	0.00	0.00	0.96	0.00
24.01	0.28	6.60	11.92	0.44	5.24	1.36	79.42
24.01	0.54	12.96	11.92	0.94	11.20	1.76	86.40
24.01	0.81	19.33	11.92	1.44	17.16	2.17	88.79
24.01	1.07	25.57	11.92	1.94	23.12	2.45	90.41
24.01	1.33	31.93	11.92	2.44	29.07	2.86	91.05
24.01	1.60	38.41	11.91	2.94	35.03	3.38	91.19
24.01	1.87	44.89	11.91	3.44	40.98	3.91	91.29
24.01	2.14	51.37	11.91	3.94	46.94	4.43	91.37
24.01	2.42	57.97	11.91	4.44	52.90	5.08	91.24
24.01	2.70	64.70	11.91	4.96	59.09	5.61	91.33

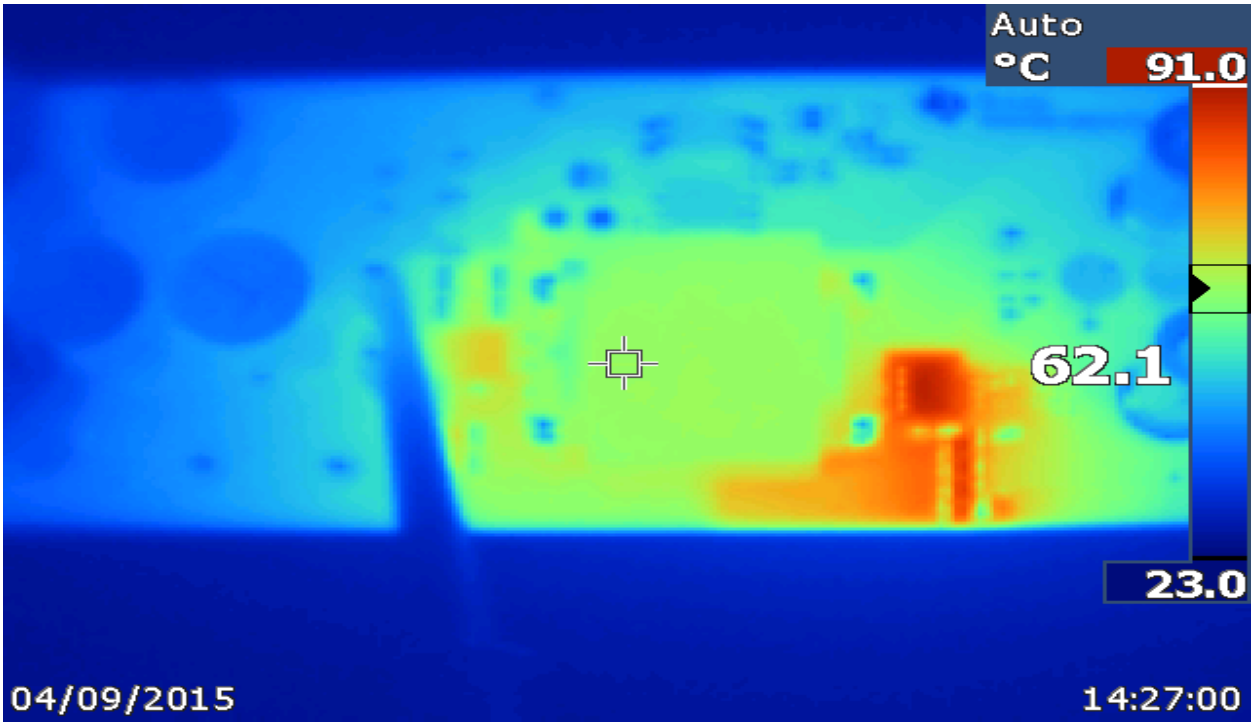
Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Losses(W)	Efficiency(%)
36.01	0.04	1.44	11.92	0.00	0.00	1.44	0.00
36.01	0.20	7.20	11.92	0.44	5.24	1.96	72.79
36.01	0.38	13.50	11.92	0.94	11.20	2.30	82.93
36.01	0.56	19.99	11.91	1.44	17.16	2.83	85.84
36.01	0.73	26.29	11.91	1.94	23.11	3.18	87.92
36.01	0.91	32.59	11.91	2.44	29.07	3.52	89.20
36.01	1.09	39.07	11.91	2.94	35.03	4.05	89.64
36.01	1.26	45.38	11.91	3.44	40.98	4.39	90.32
36.01	1.44	51.86	11.91	3.96	47.18	4.68	90.97
36.01	1.62	58.34	11.91	4.44	52.89	5.45	90.67
36.01	1.81	65.00	11.91	4.94	58.85	6.15	90.53

Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Losses(W)	Efficiency(%)
48.02	0.04	1.92	11.91	0.00	0.00	1.92	0.00
48.02	0.16	7.68	11.91	0.44	5.24	2.44	68.23
48.02	0.30	14.17	11.91	0.94	11.20	2.97	79.05
48.02	0.43	20.65	11.91	1.44	17.15	3.49	83.08
48.02	0.57	27.13	11.91	1.94	23.11	4.02	85.18
48.02	0.70	33.61	11.91	2.44	29.07	4.55	86.47
48.02	0.83	39.86	11.91	2.94	35.02	4.83	87.87
48.02	0.97	46.34	11.91	3.44	40.98	5.36	88.43
48.02	1.10	52.82	11.91	3.94	46.93	5.89	88.85
48.02	1.24	59.30	11.91	4.44	52.88	6.42	89.18
48.02	1.37	65.78	11.91	4.94	58.84	6.94	89.45

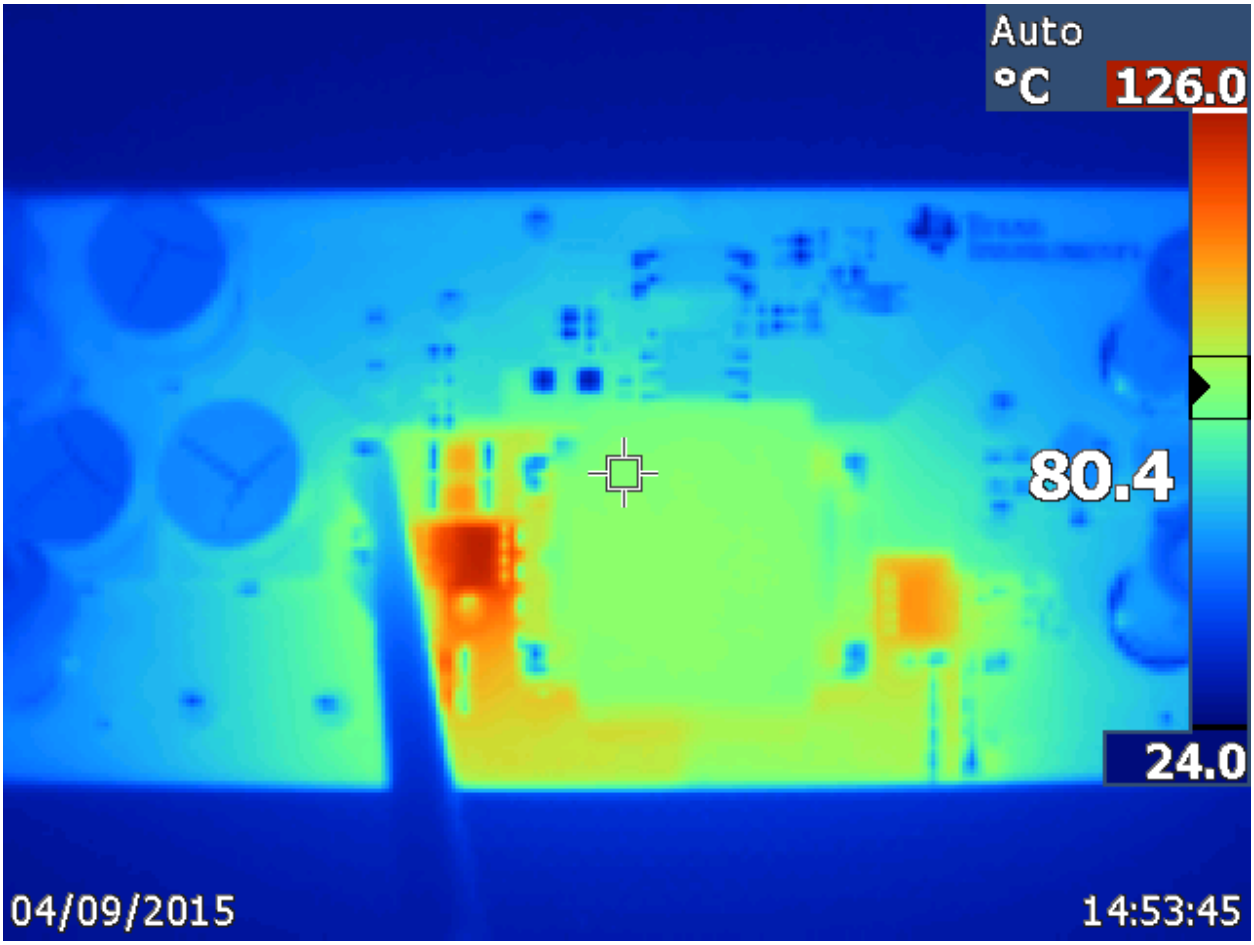
Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Losses(W)	Efficiency(%)
60.03	0.05	2.70	11.91	0.00	0.00	2.70	0.00
60.03	0.14	8.40	11.91	0.44	5.24	3.16	62.37
60.03	0.25	15.01	11.91	0.94	11.20	3.81	74.61
60.03	0.36	21.61	11.91	1.44	17.15	4.46	79.37
60.03	0.47	28.21	11.91	1.94	23.11	5.11	81.90
60.02	0.58	34.51	11.91	2.44	29.06	5.45	84.20
60.02	0.68	40.82	11.91	2.94	35.02	5.80	85.79
60.02	0.79	47.42	11.91	3.44	40.97	6.45	86.40
60.02	0.90	54.02	11.91	3.94	46.92	7.10	86.86
60.02	1.01	60.32	11.91	4.44	52.88	7.45	87.66
60.02	1.12	66.92	11.91	4.94	58.83	8.10	87.90

5 Thermal Images

Thermal image was taken at 60Vin, 5A load when the board reaches equilibrium.



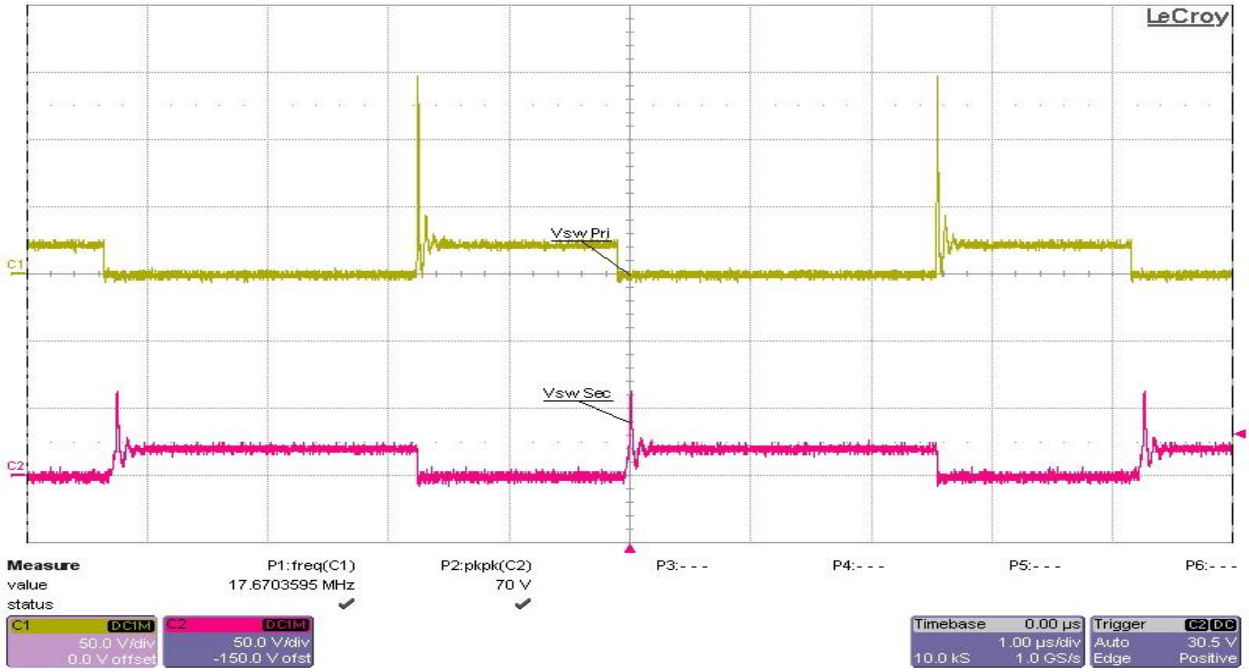
Thermal image was taken at 24Vin, 5A load when the board reaches equilibrium.



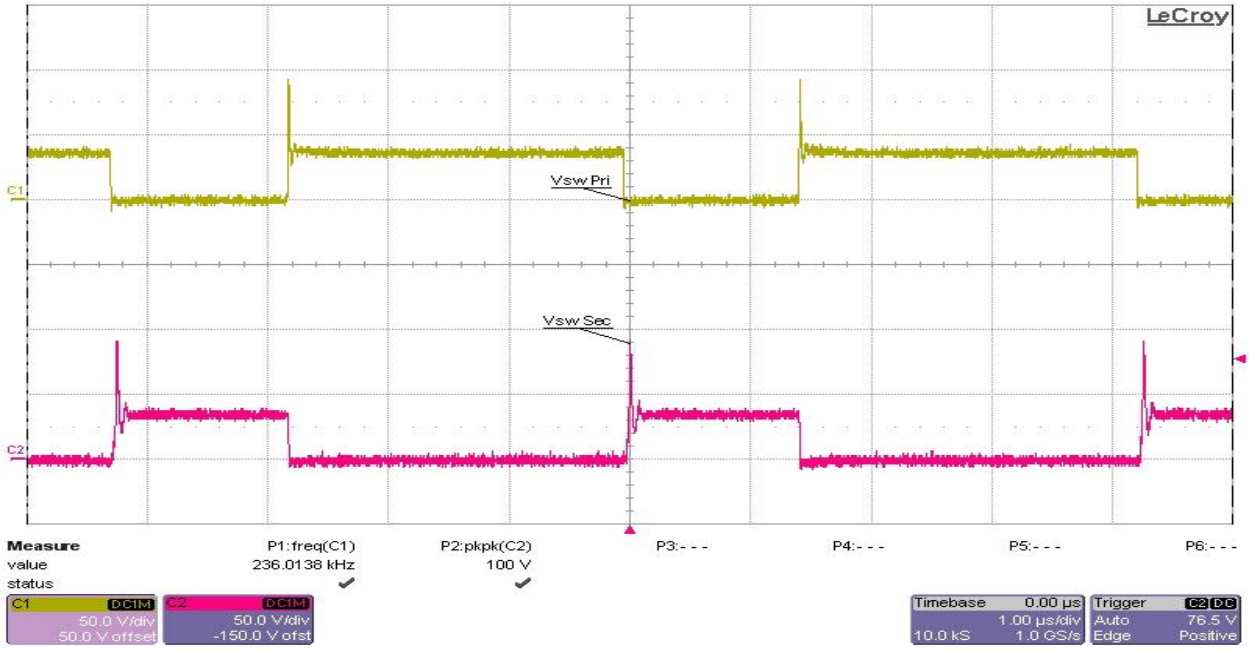
Thermal image was taken at 9Vin, 4.25A load when the board reaches equilibrium. Heat sink or air flow is required if intended to run continuous at 9Vin/5A full load.

6 Waveform

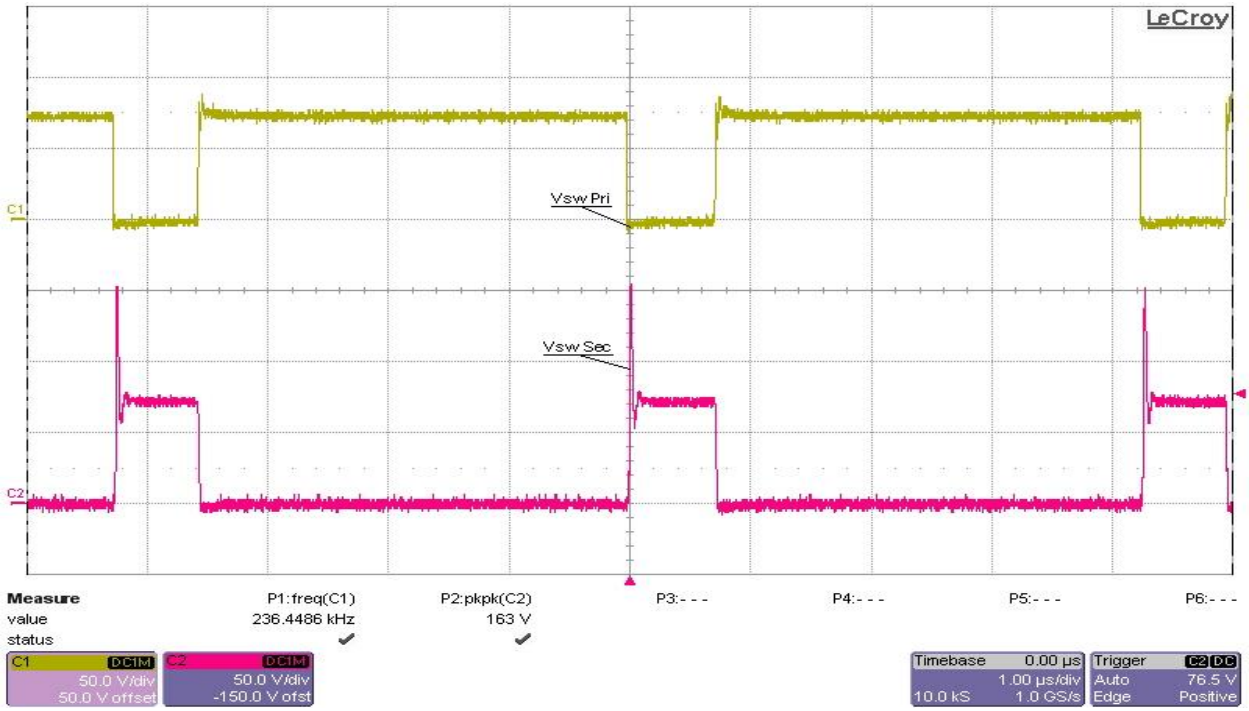
6.1 Switching Waveform



9Vin, 5A load. Ch1 measures primary switching waveform, Ch2 measures secondary switching waveform.

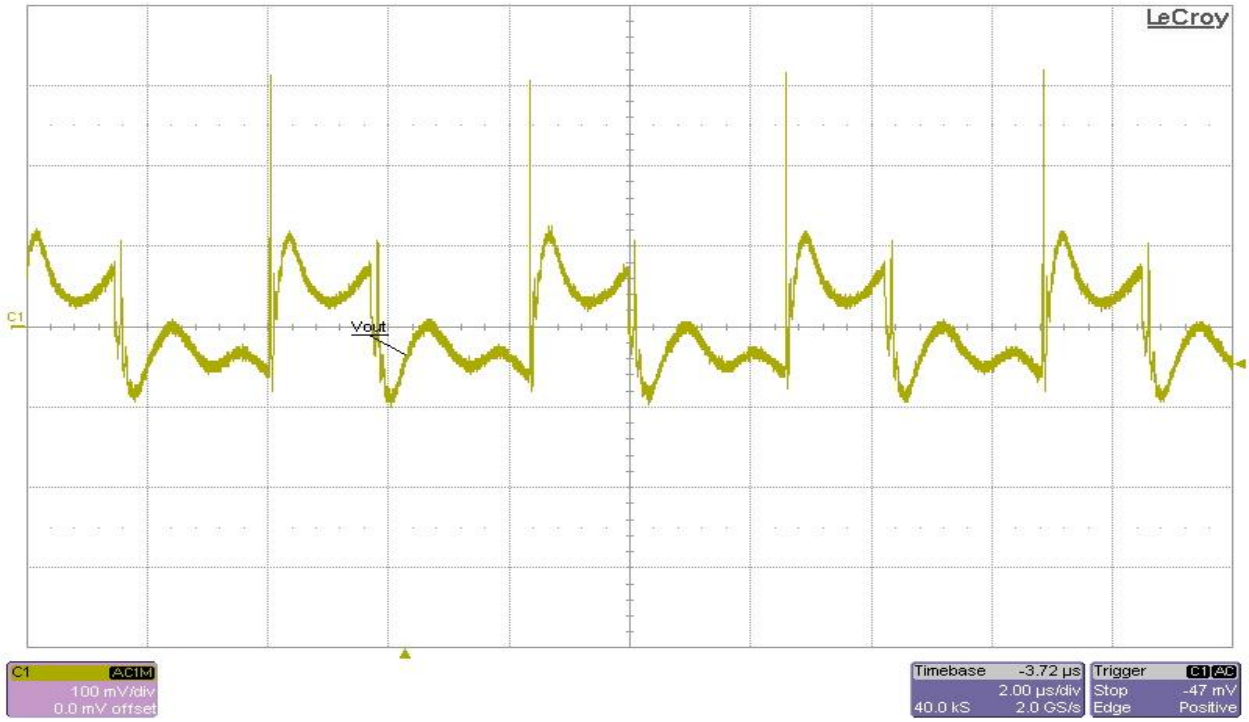


24Vin, 5A load. Ch1 measures primary switching waveform, Ch2 measures secondary switching waveform.

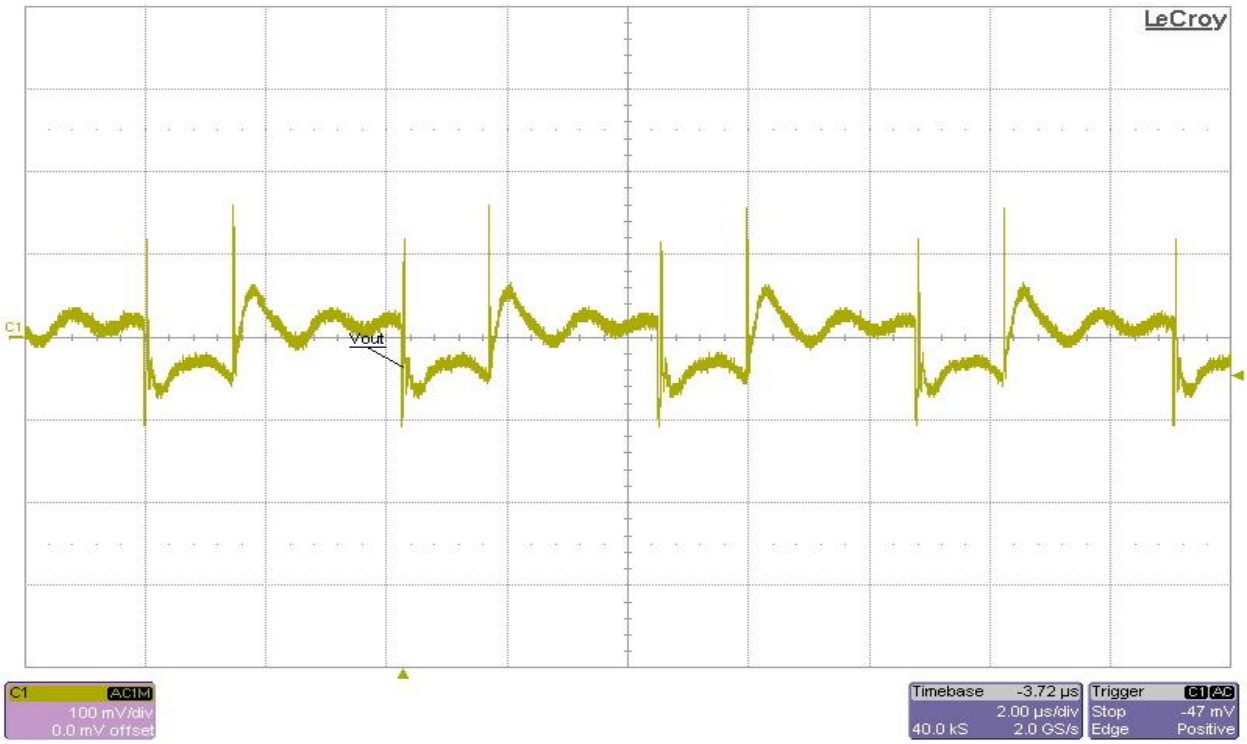


60Vin, 5A load. Ch1 measures primary switching waveform, Ch2 measures secondary switching waveform.

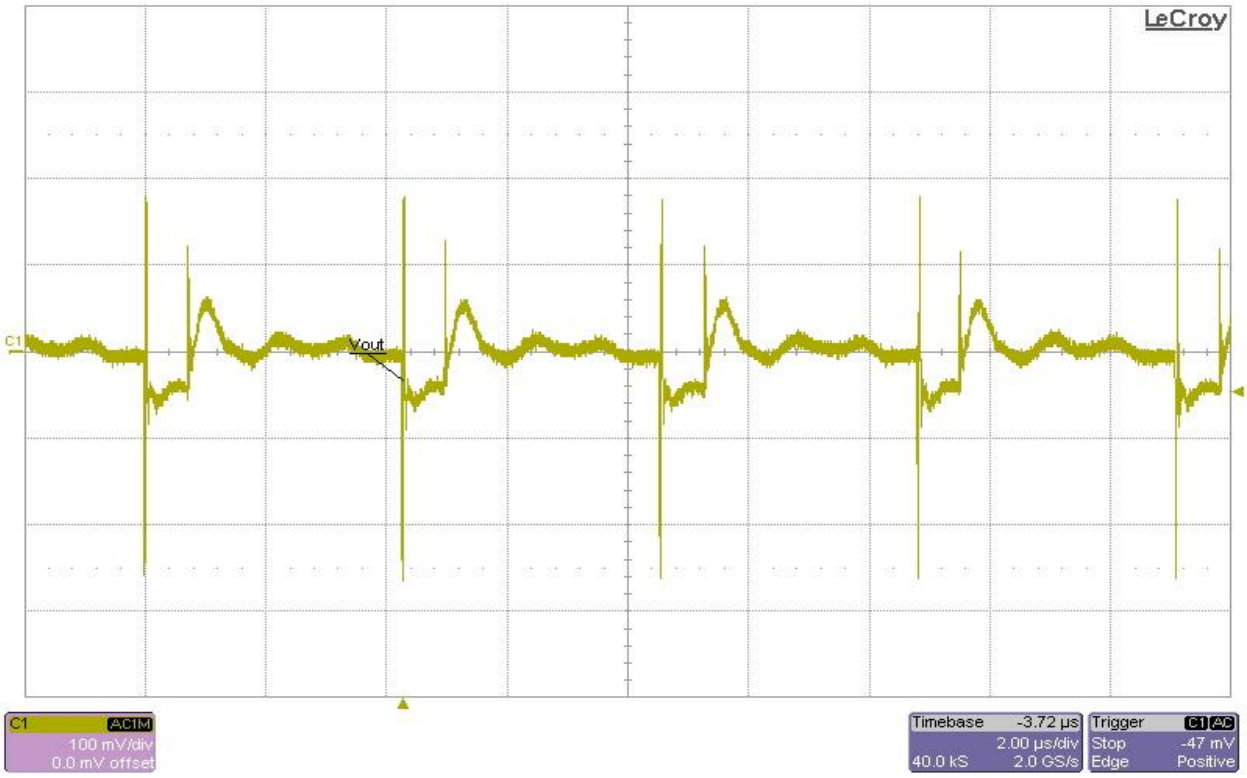
6.2 Output Ripple



9Vin, 5A load. Ch1 measures output ripple.

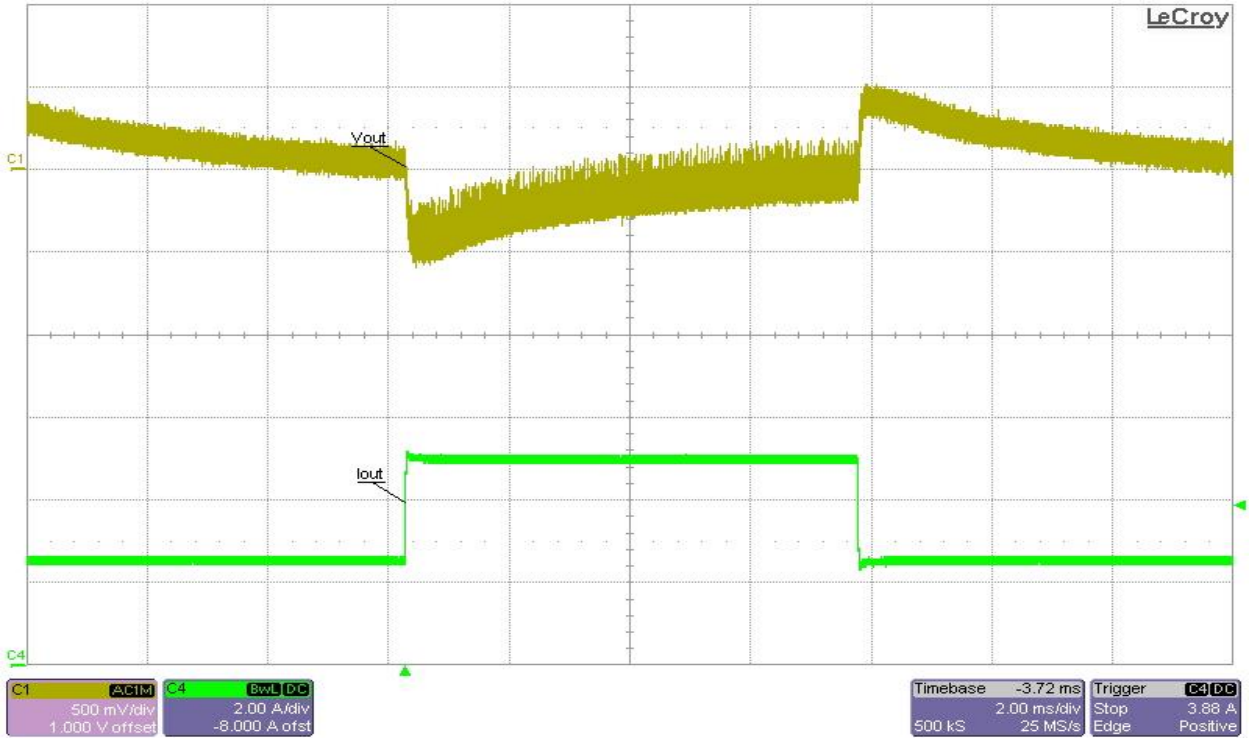


24Vin, 5A load. Ch1 measures output ripple.

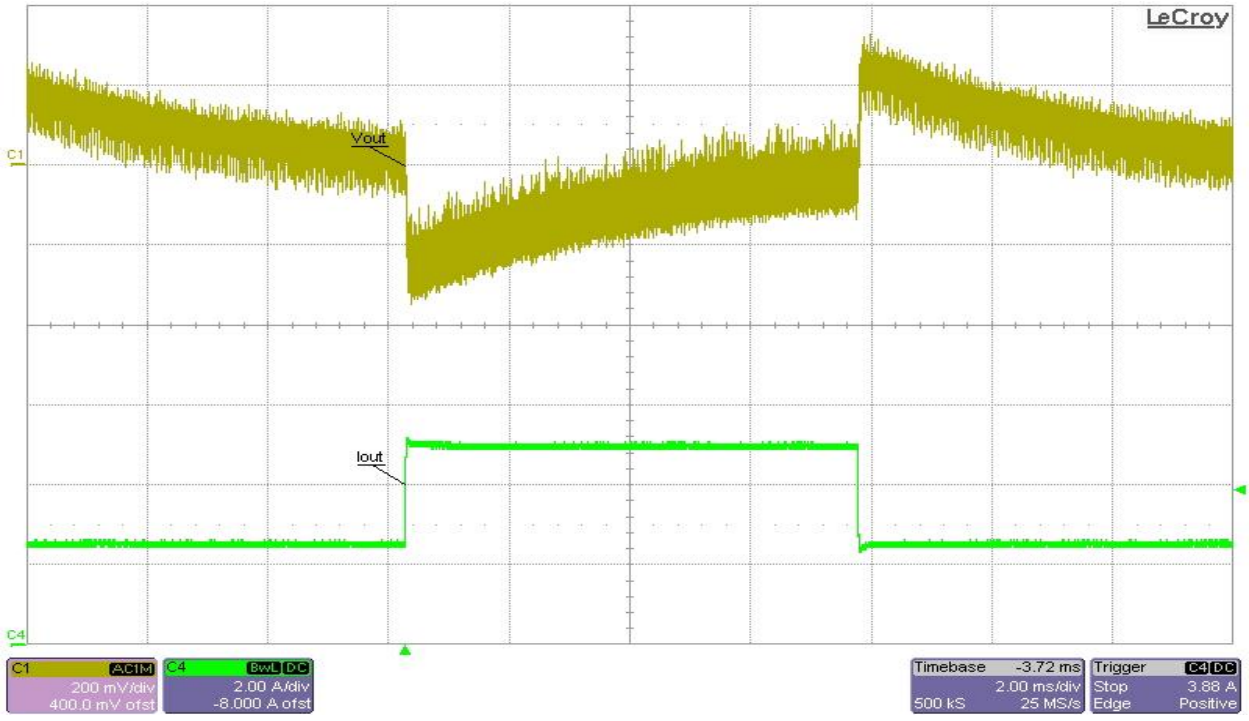


60Vin, 5A load. Ch1 measures output ripple.

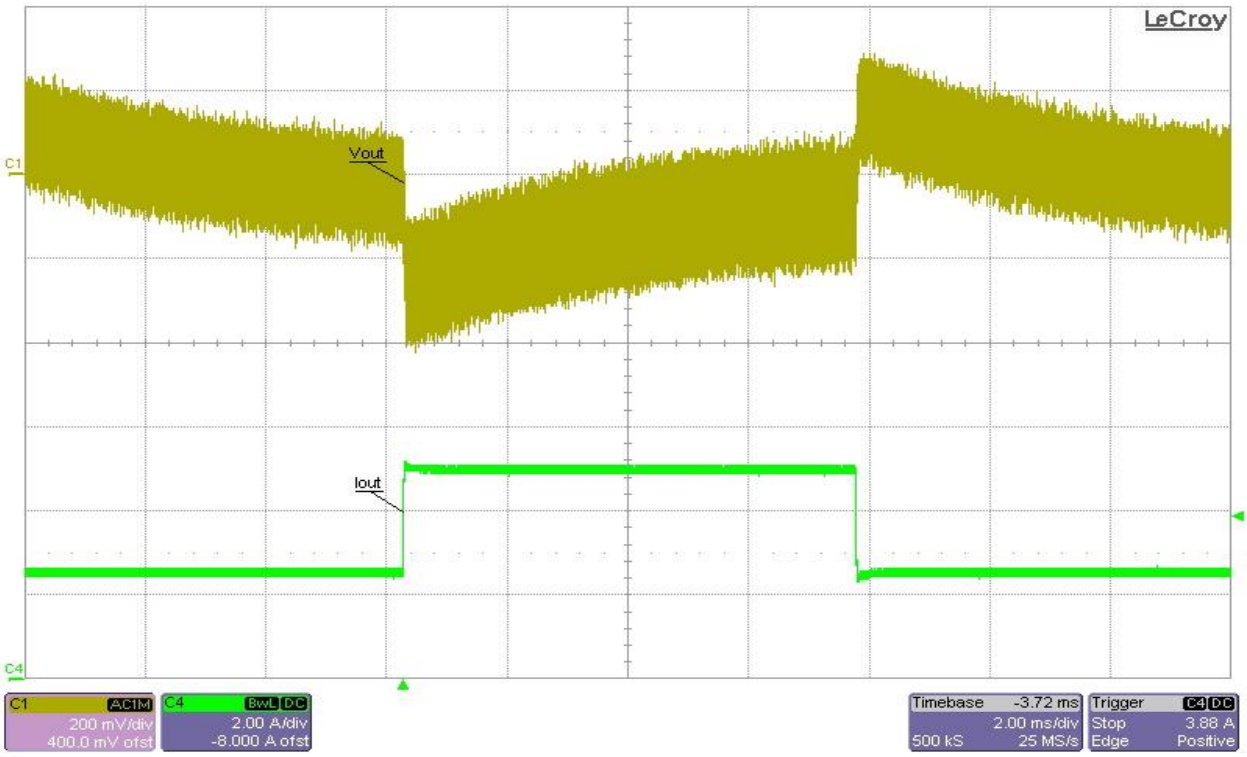
6.3 Load Transient



9Vin, 2.5A-5A load step. Ch1 measures output voltage, Ch4 measures output load current.

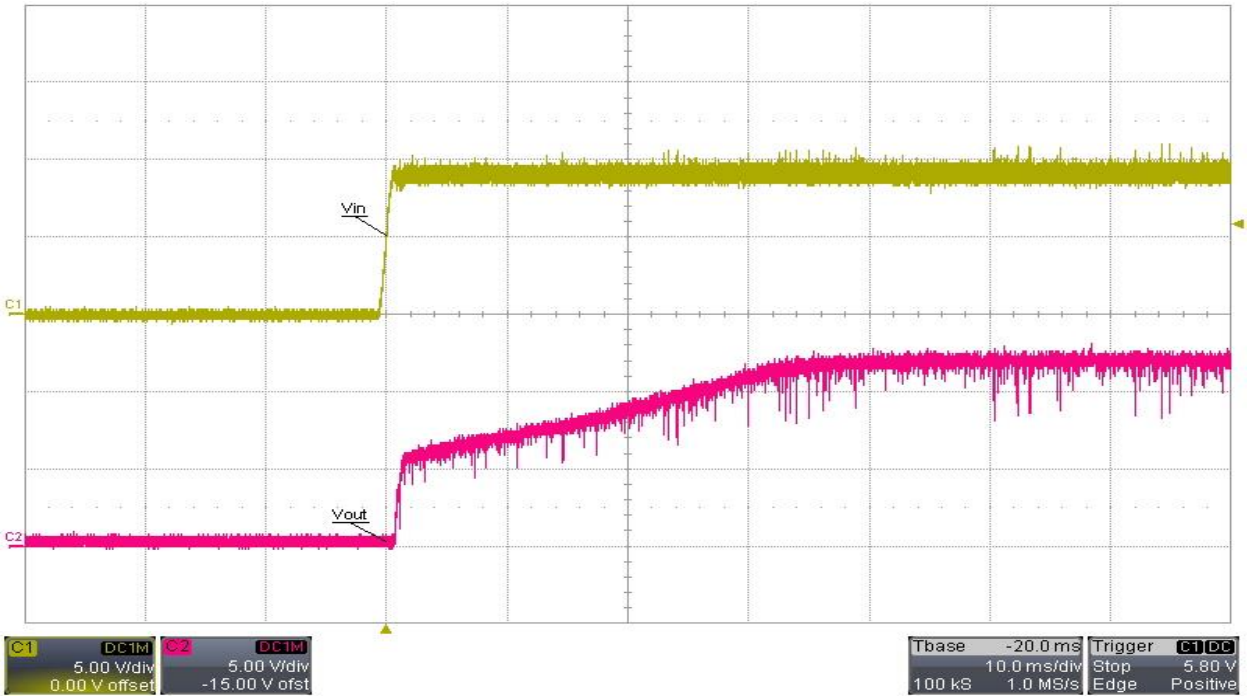


24Vin, 2.5A-5A load step. Ch1 measures output voltage, Ch4 measures output load current.

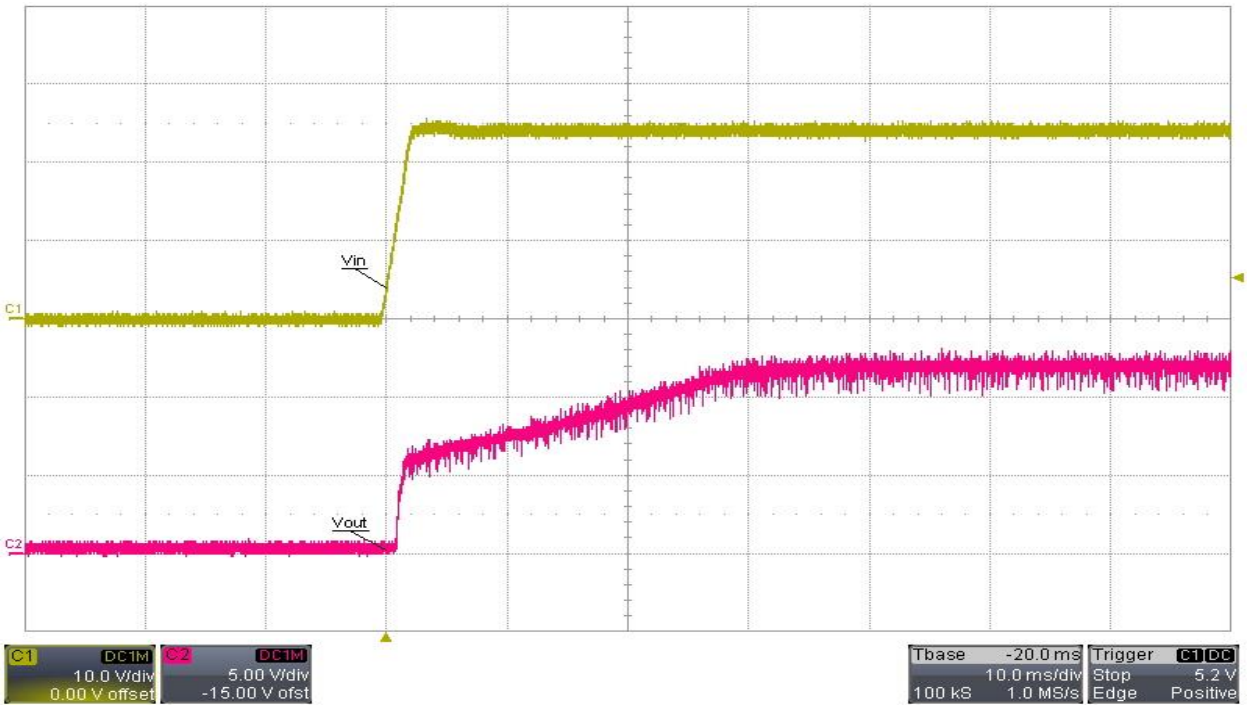


60Vin, 2.5A-5A load step. Ch1 measures output voltage, Ch4 measures output load current.

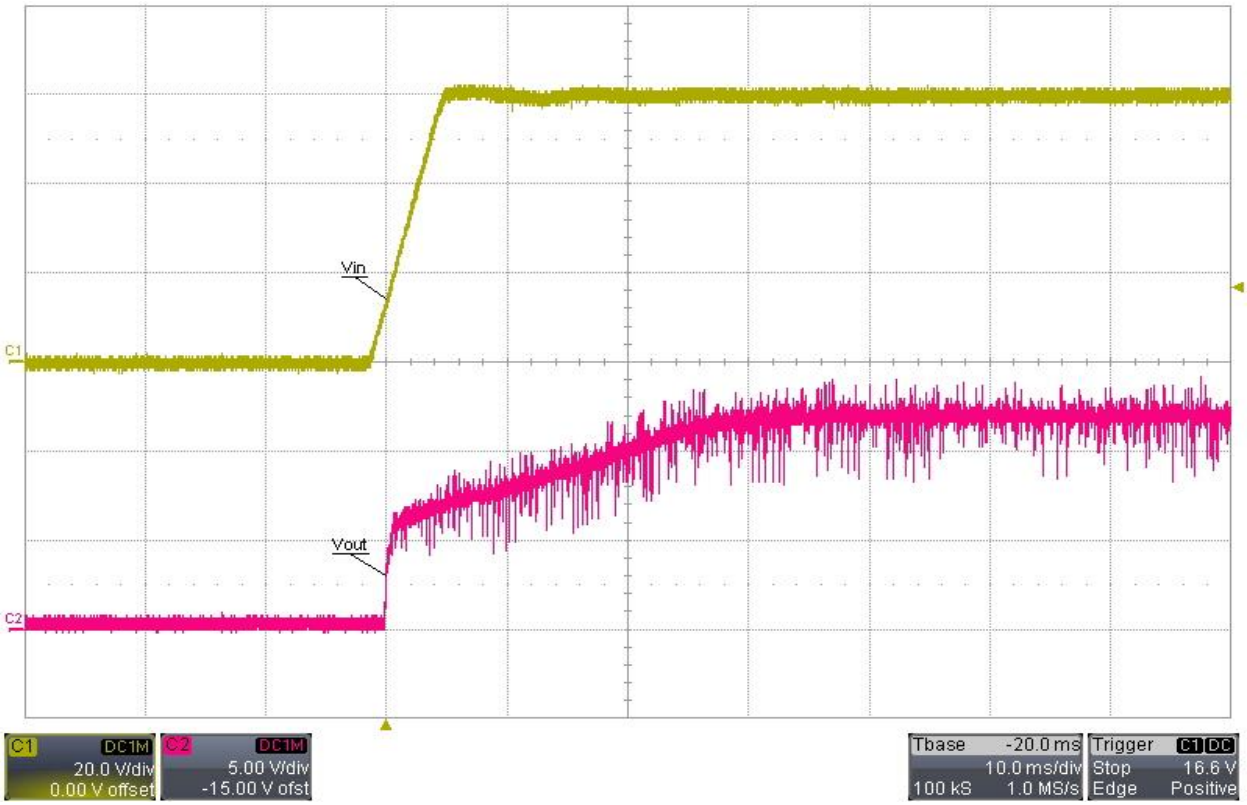
6.4 Start Up



9Vin, 5A load. Ch1 measures input voltage, Ch2 measures output voltage.

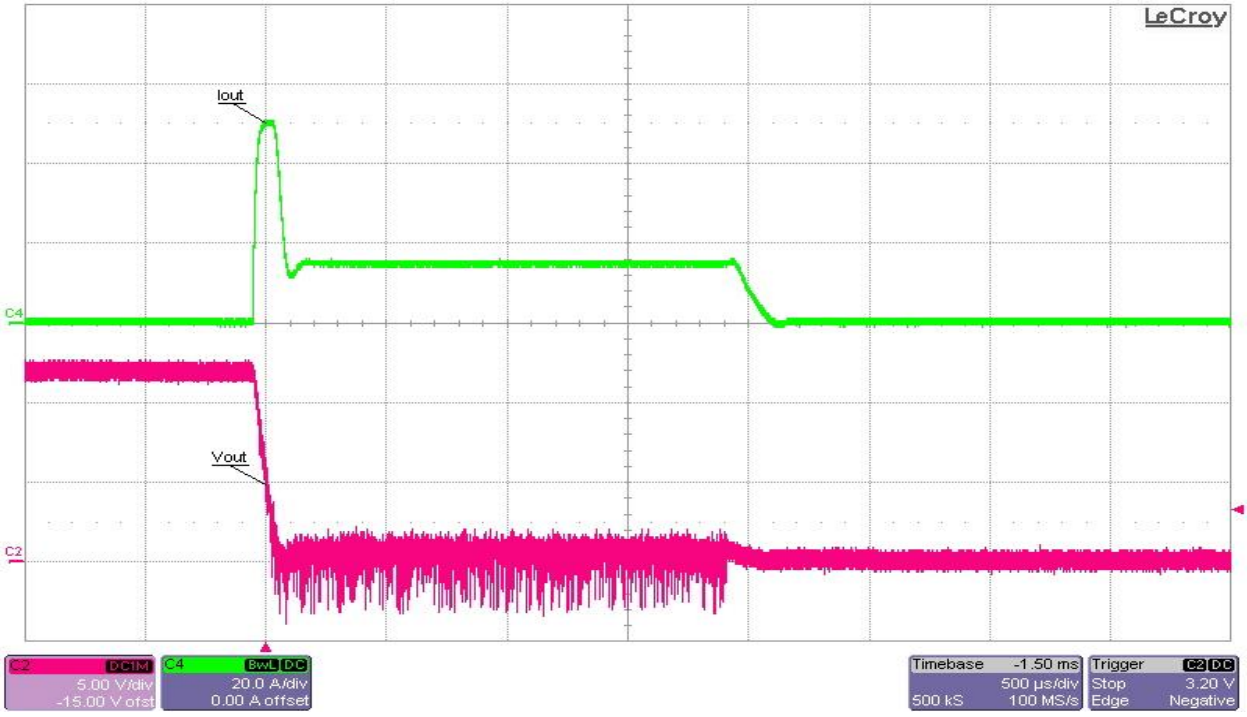


24Vin, 5A load. Ch1 measures input voltage, Ch2 measures output voltage.

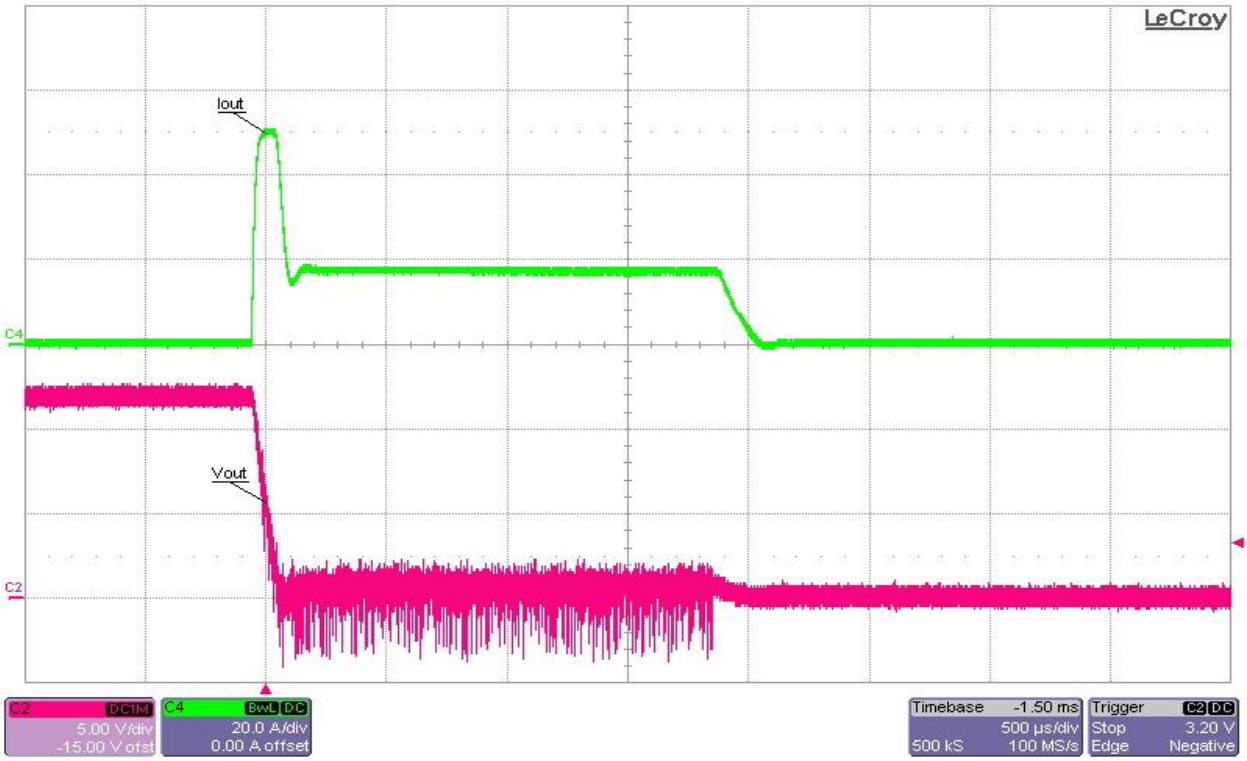


60Vin, 5A load. Ch1 measures input voltage, Ch2 measures output voltage.

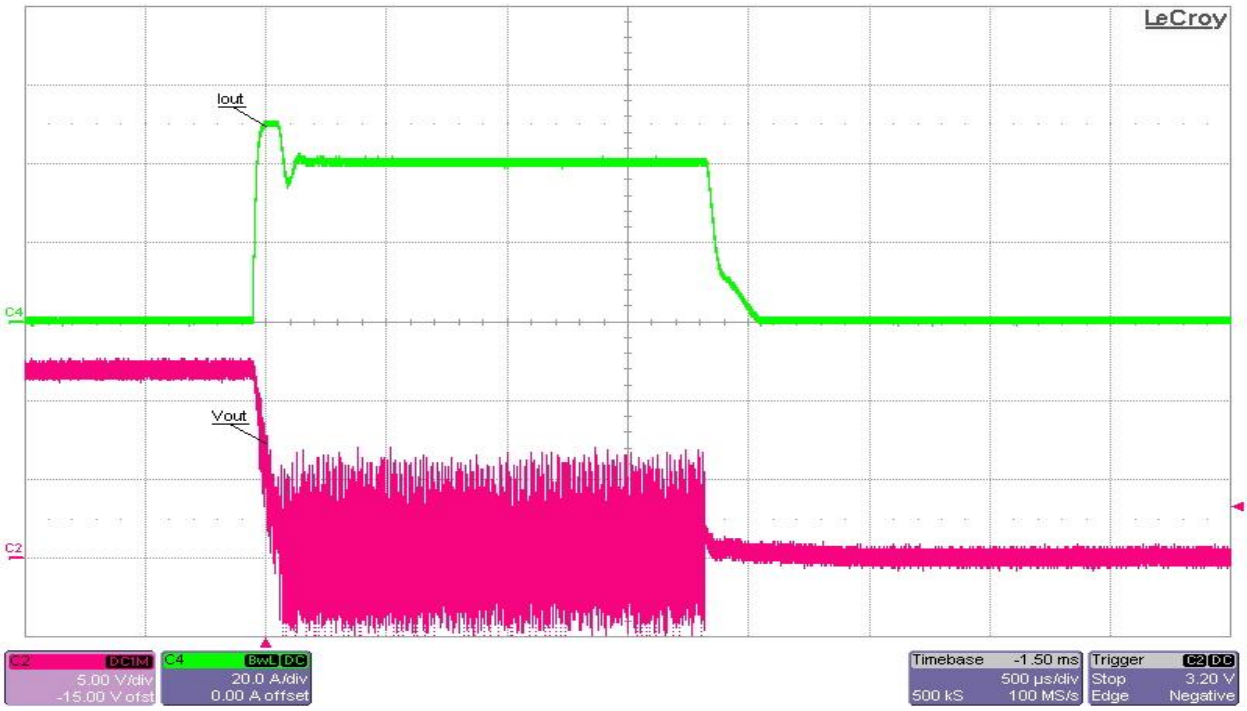
6.5 Short Circuit



9Vin, 0A load. Ch2 measures output voltage, Ch4 measures output current.

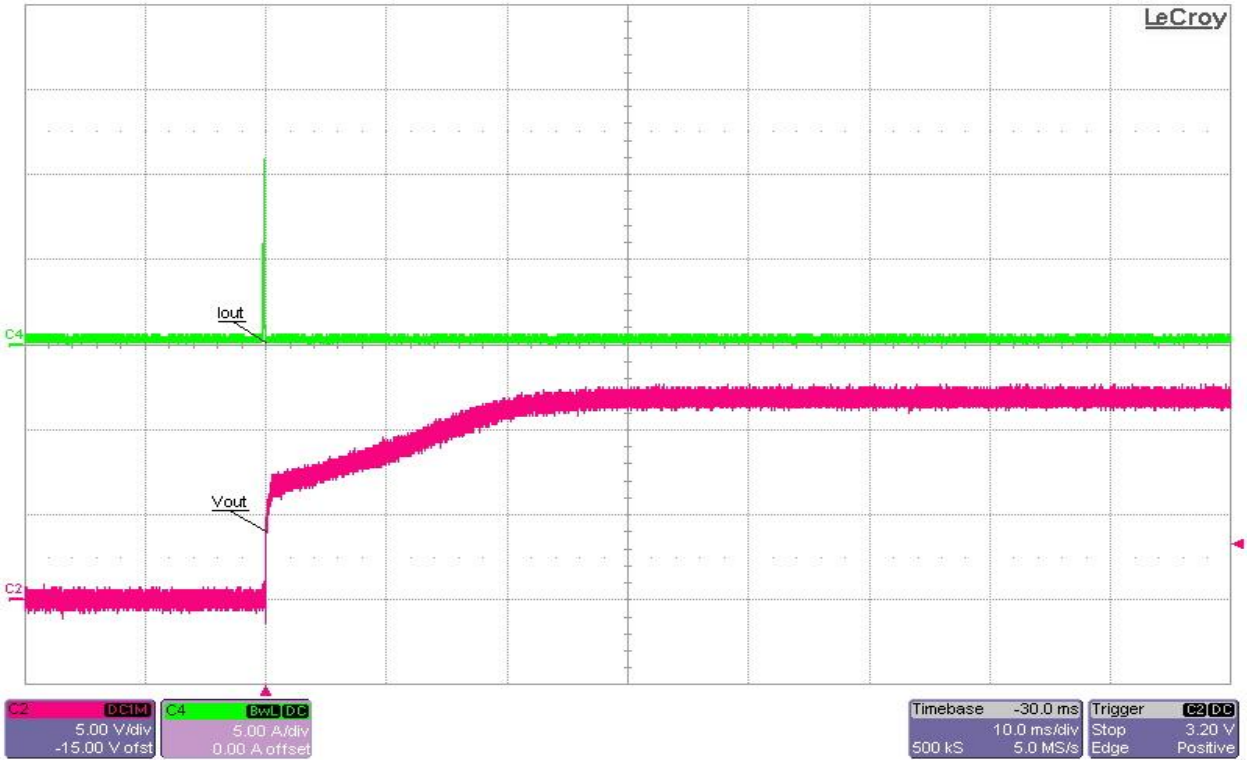


24Vin, 0A load. Ch2 measures output voltage, Ch4 measures output current.

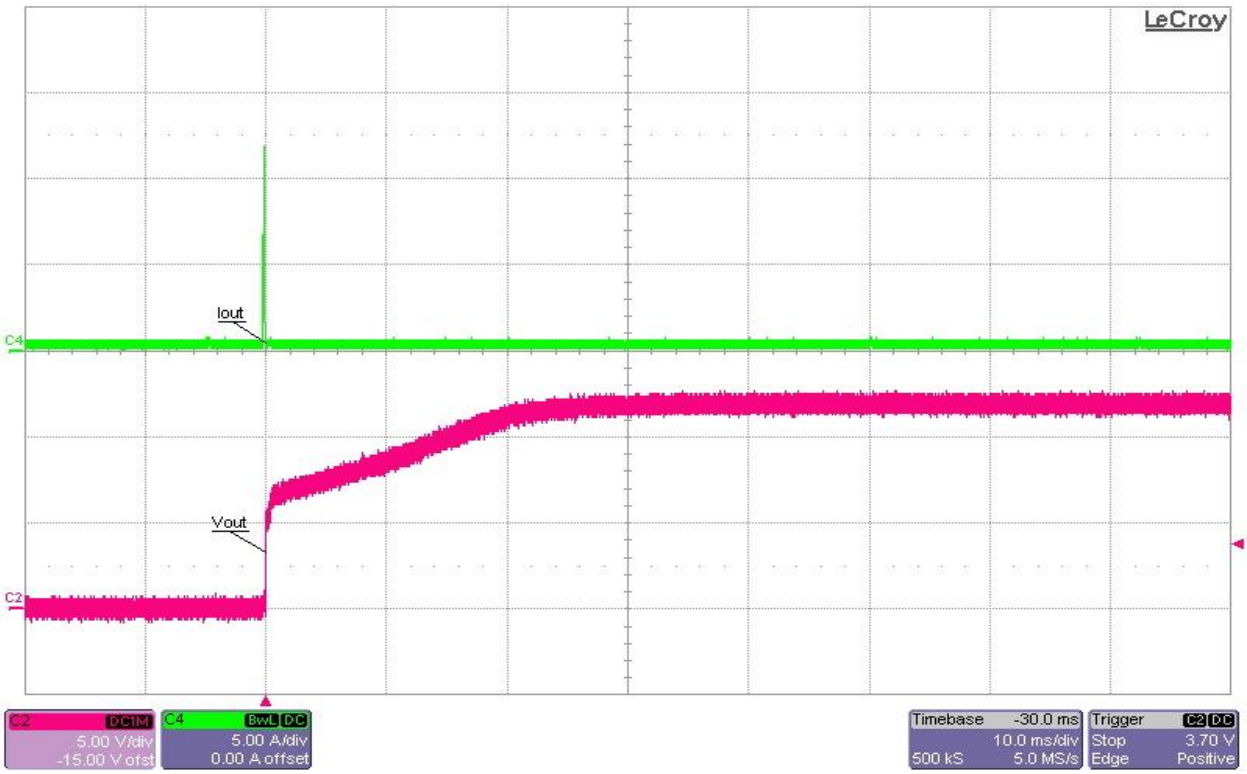


60Vin, 0A load. Ch2 measures output voltage, Ch4 measures output current.

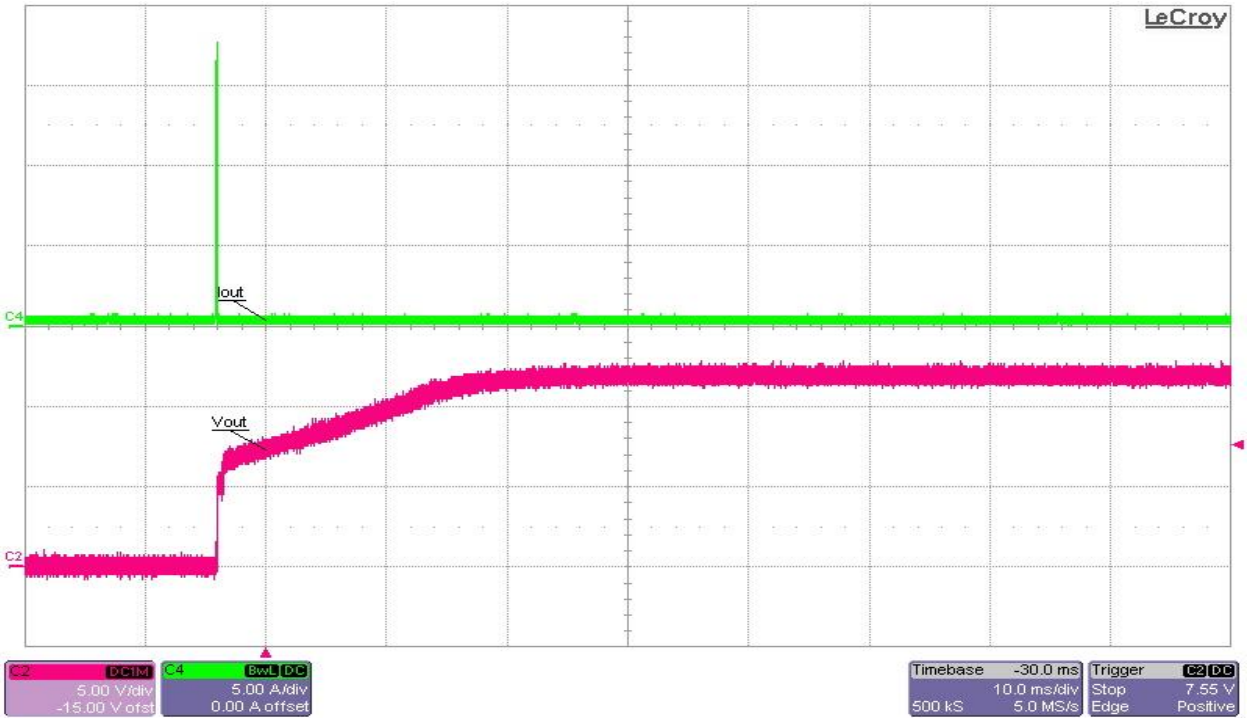
6.6 Short Circuit Recovery



9Vin, 0A load. Ch2 measures output voltage, Ch4 measures output current.

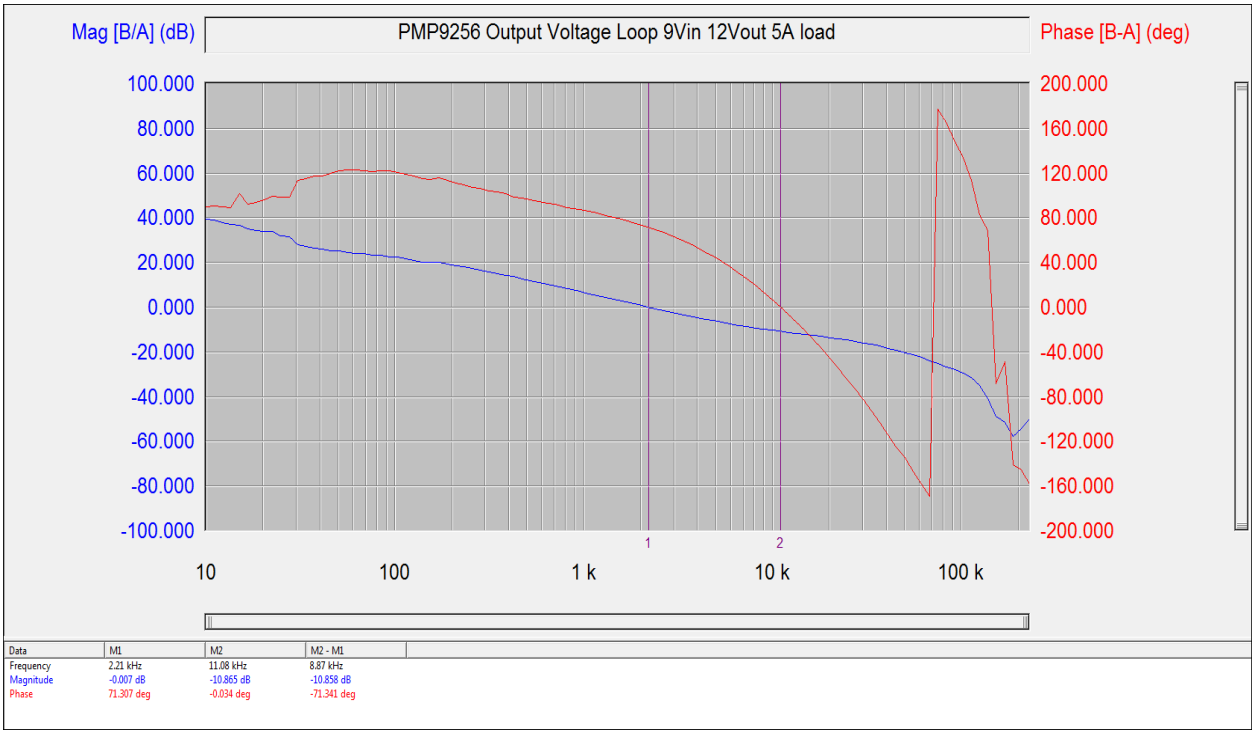


24Vin, 0A load. Ch2 measures output voltage, Ch4 measures output current.

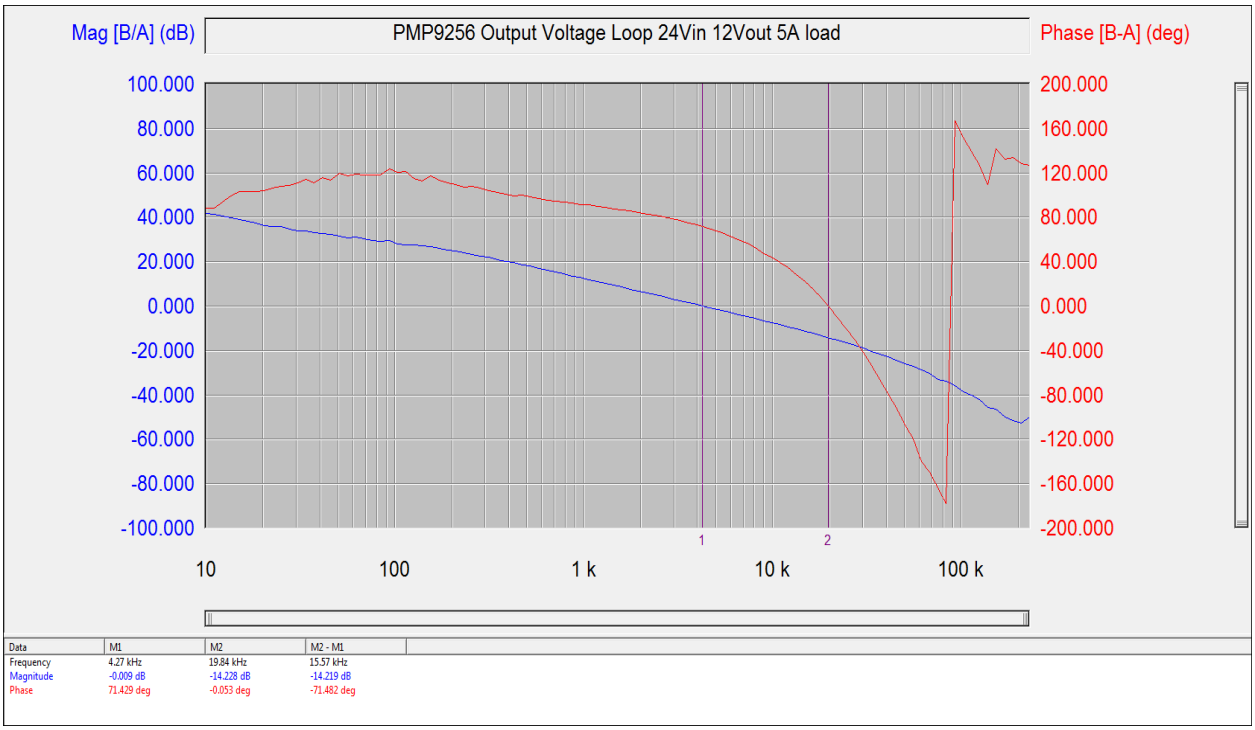


60Vin, 0A load. Ch2 measures output voltage, Ch4 measures output current.

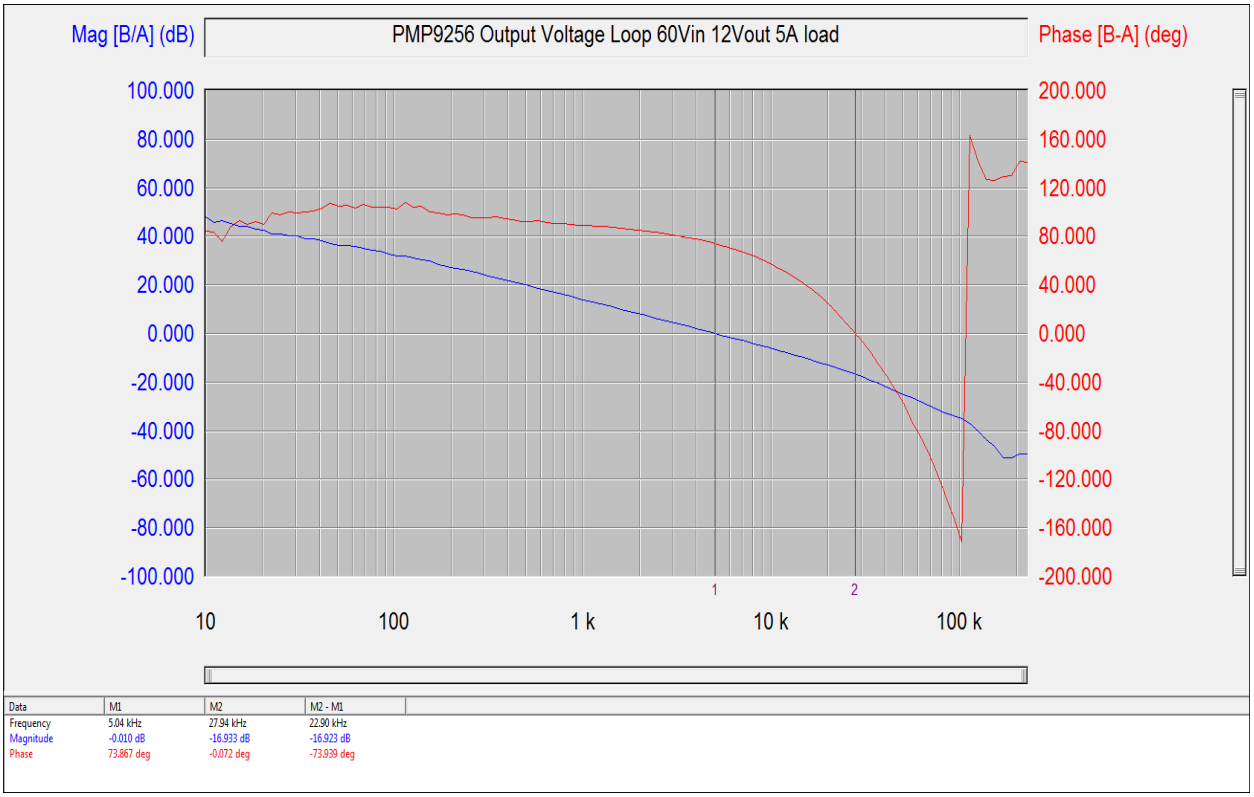
6.7 Bode Plot



9Vin, 5A load bode plot, 71.3 degrees phase margin, and 10.865dB gain margin.



24Vin, 5A load bode plot, 71.4 degrees phase margin, and 14.228dB gain margin.



60Vin, 5A load bode plot, 73.867 degrees phase margin, and 17dB gain margin.

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