Test Data
For PMP20107
4/6/2016

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1. Design Specifications

Vin Minimum	**3.5VDC**
Vin Maximum	**30VDC**
Vout	**+5VDC @ 3A**
Nominal Switching Frequency	**≈ 300KHz**

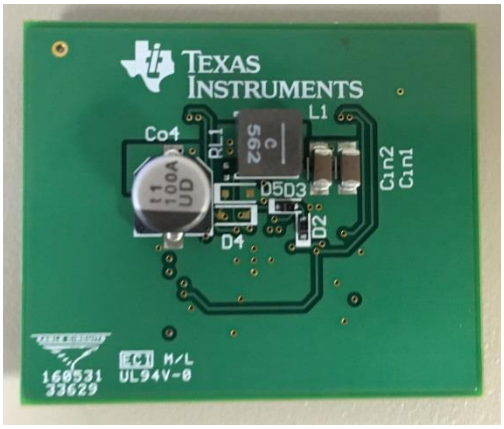
2. Circuit Description

PMP20107 is a 4-switch buck-boost controler utilizing the LM5175 for consumer applications. This design has a minimum operating input voltage of 3.5V after start up and a maximum input voltage of 30V. Switching frequency is set to 300kHz. A charge pump voltage doubler is added to ensure VCC voltage under low Vin.

3. PMP20107 Board Photos

Board Dimensions: 40.13mm x 33.02mm

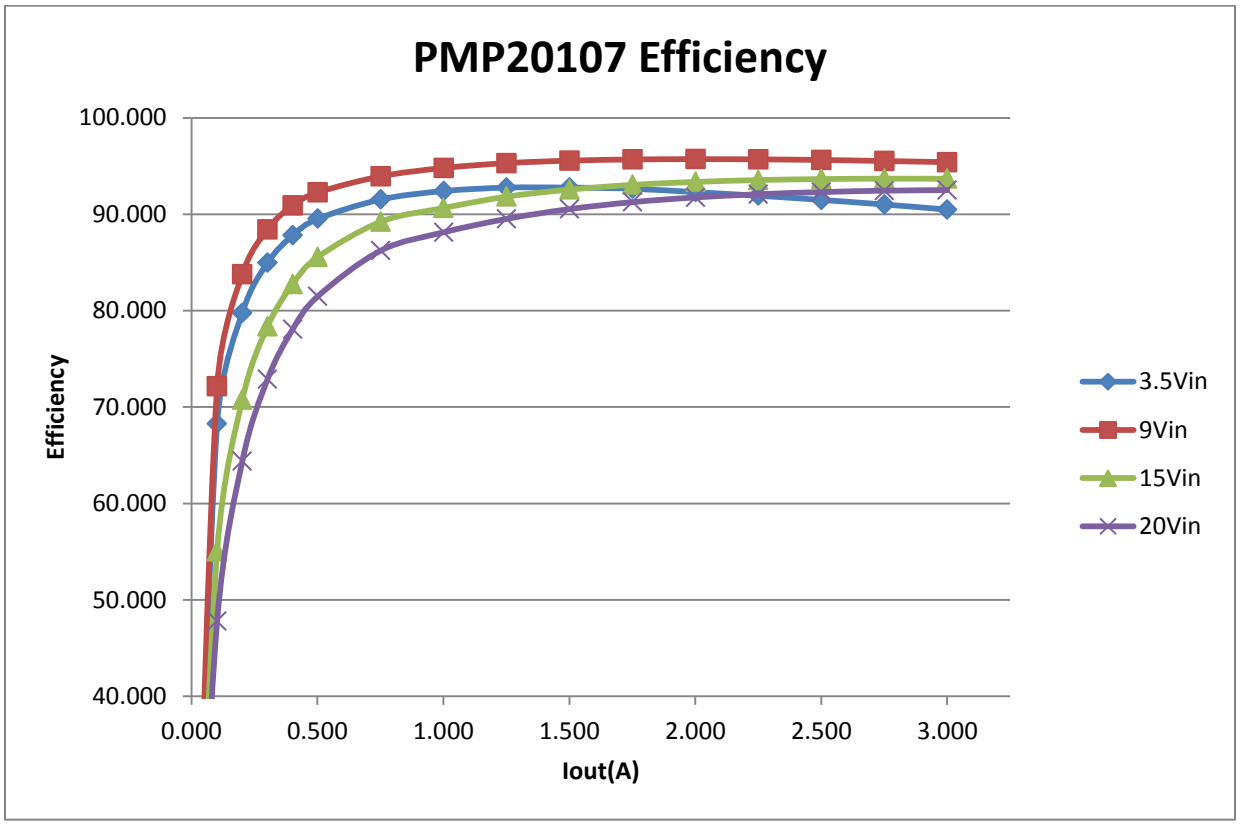
Board Photo (Top)



Board Photo (Bottom)

4. Efficiency

4.1 Efficiency Chart



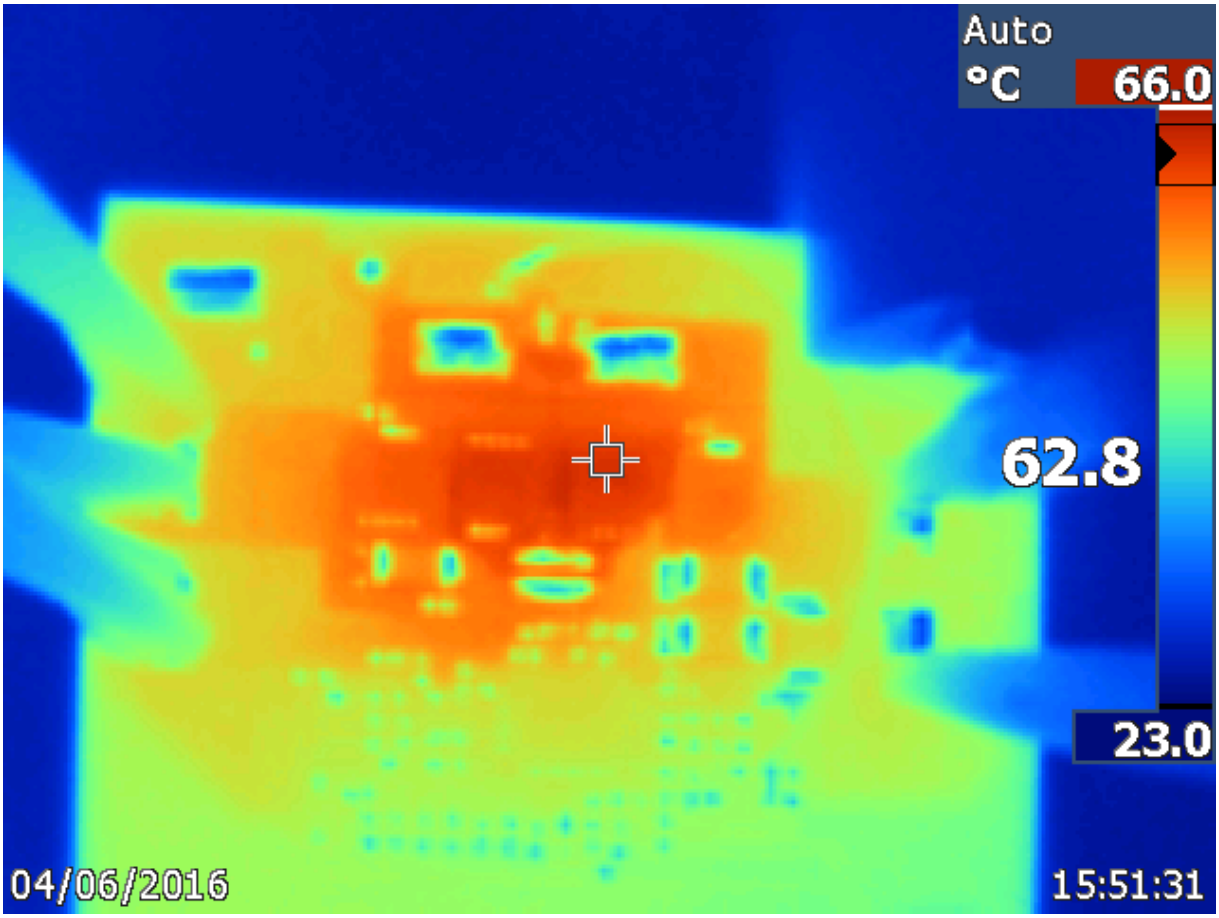
4.2 Efficiency Data

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Pin(W)	Pout(W)	Losses(W)	Efficiency
3.500	0.065	5.022	0.000	0.229	0.001	0.228	0.220
3.500	0.214	5.022	0.102	0.749	0.511	0.237	68.282
3.500	0.363	5.022	0.202	1.271	1.013	0.257	79.759
3.500	0.510	5.022	0.302	1.784	1.516	0.268	84.969
3.500	0.656	5.022	0.402	2.298	2.018	0.280	87.813
3.500	0.804	5.022	0.502	2.814	2.520	0.295	89.534
3.500	1.178	5.022	0.751	4.123	3.774	0.349	91.536
3.500	1.555	5.022	1.001	5.443	5.030	0.413	92.407
3.500	1.936	5.023	1.251	6.774	6.284	0.490	92.765
3.500	2.322	5.023	1.501	8.127	7.540	0.588	92.770
3.500	2.712	5.023	1.751	9.493	8.794	0.698	92.646
3.499	3.112	5.023	2.001	10.890	10.051	0.839	92.295
3.499	3.515	5.023	2.251	12.299	11.306	0.993	91.923

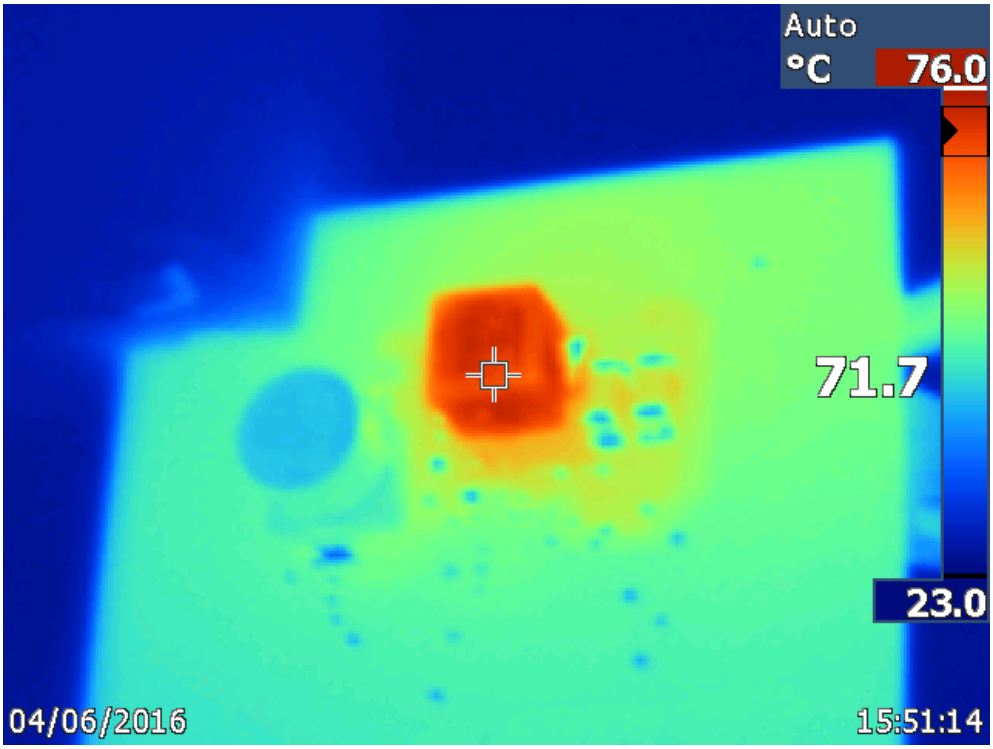
3.499	3.924	5.023	2.501	13.730	12.561	1.169	91.488
3.499	4.339	5.024	2.751	15.181	13.817	1.364	91.015
3.499	4.760	5.024	3.000	16.656	15.072	1.584	90.490
9.006	0.022	5.011	0.000	0.197	0.000	0.197	0.000
9.006	0.079	5.011	0.102	0.708	0.511	0.197	72.143
9.006	0.134	5.012	0.202	1.209	1.012	0.196	83.764
9.006	0.190	5.012	0.302	1.711	1.513	0.198	88.422
9.006	0.246	5.012	0.402	2.215	2.014	0.201	90.915
9.005	0.303	5.012	0.502	2.725	2.514	0.211	92.265
9.005	0.445	5.011	0.752	4.009	3.766	0.243	93.940
9.006	0.588	5.011	1.002	5.293	5.018	0.275	94.804
9.005	0.731	5.011	1.251	6.578	6.270	0.309	95.306
9.005	0.874	5.011	1.501	7.872	7.522	0.349	95.562
9.005	1.018	5.011	1.751	9.169	8.774	0.396	95.686
9.005	1.163	5.011	2.001	10.475	10.027	0.448	95.720
9.005	1.309	5.011	2.251	11.786	11.278	0.507	95.697
9.005	1.455	5.011	2.501	13.104	12.532	0.572	95.634
9.005	1.603	5.012	2.751	14.430	13.785	0.646	95.526
9.004	1.750	5.012	3.000	15.760	15.037	0.724	95.407
15.005	0.028	5.012	0.000	0.420	0.000	0.420	0.000
15.005	0.062	5.012	0.102	0.927	0.510	0.417	55.020
15.005	0.095	5.012	0.202	1.430	1.012	0.418	70.762
15.005	0.129	5.012	0.302	1.931	1.513	0.418	78.353
15.005	0.162	5.012	0.402	2.434	2.014	0.420	82.743
15.005	0.196	5.012	0.502	2.938	2.514	0.424	85.567
15.005	0.281	5.012	0.751	4.221	3.766	0.455	89.228
15.005	0.369	5.011	1.001	5.534	5.017	0.517	90.654
15.005	0.455	5.010	1.251	6.826	6.268	0.558	91.829
15.004	0.541	5.010	1.501	8.125	7.520	0.604	92.561
15.004	0.628	5.009	1.751	9.426	8.771	0.655	93.054
15.004	0.716	5.009	2.001	10.737	10.024	0.713	93.355
15.004	0.803	5.009	2.251	12.051	11.274	0.777	93.549
15.004	0.891	5.009	2.501	13.374	12.525	0.849	93.651
15.004	0.980	5.009	2.751	14.704	13.777	0.927	93.695
15.003	1.069	5.009	3.000	16.040	15.027	1.013	93.686
20.006	0.028	5.015	0.000	0.556	0.001	0.556	0.090
20.006	0.053	5.015	0.102	1.068	0.511	0.558	47.786

20.006	0.079	5.015	0.202	1.573	1.012	0.560	64.387
20.006	0.104	5.015	0.302	2.077	1.513	0.563	72.878
20.006	0.129	5.014	0.402	2.581	2.015	0.566	78.069
20.006	0.154	5.014	0.502	3.087	2.516	0.571	81.494
20.006	0.218	5.014	0.751	4.369	3.768	0.601	86.235
20.006	0.285	5.013	1.001	5.696	5.020	0.676	88.133
20.006	0.350	5.011	1.251	7.004	6.270	0.734	89.524
20.006	0.415	5.011	1.501	8.308	7.522	0.786	90.540
20.006	0.480	5.010	1.751	9.613	8.773	0.840	91.263
20.005	0.546	5.010	2.001	10.927	10.025	0.901	91.750
20.005	0.612	5.010	2.251	12.245	11.275	0.970	92.081
20.005	0.678	5.010	2.501	13.571	12.527	1.044	92.305
20.004	0.745	5.009	2.751	14.903	13.778	1.126	92.448
20.004	0.812	5.009	3.000	16.245	15.028	1.217	92.510

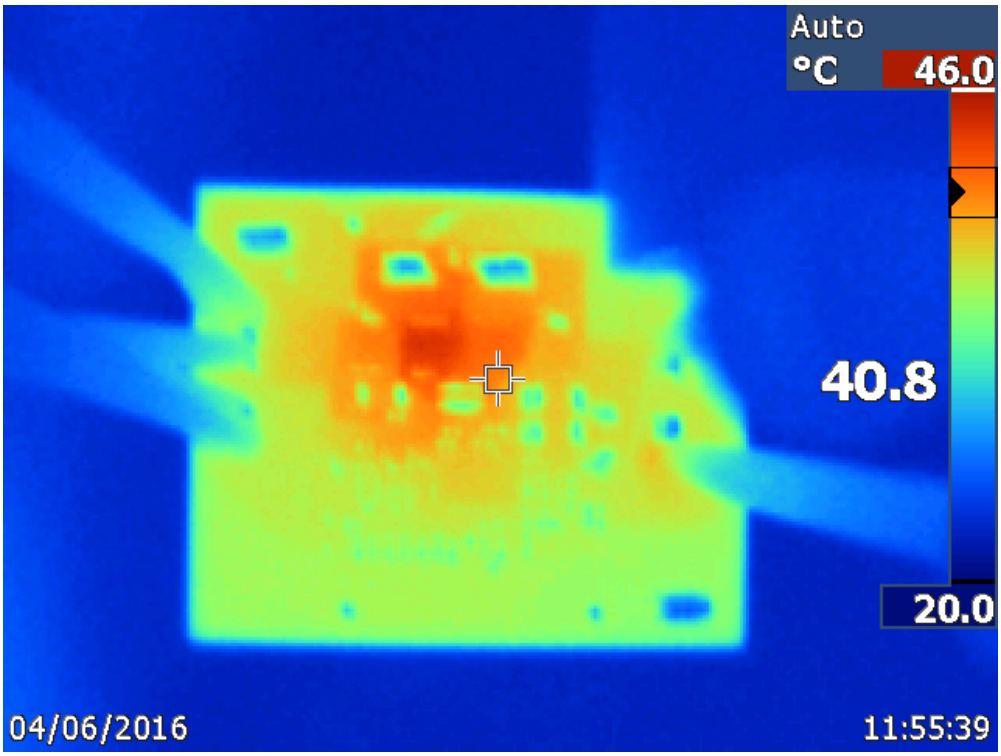
5 Thermal Images



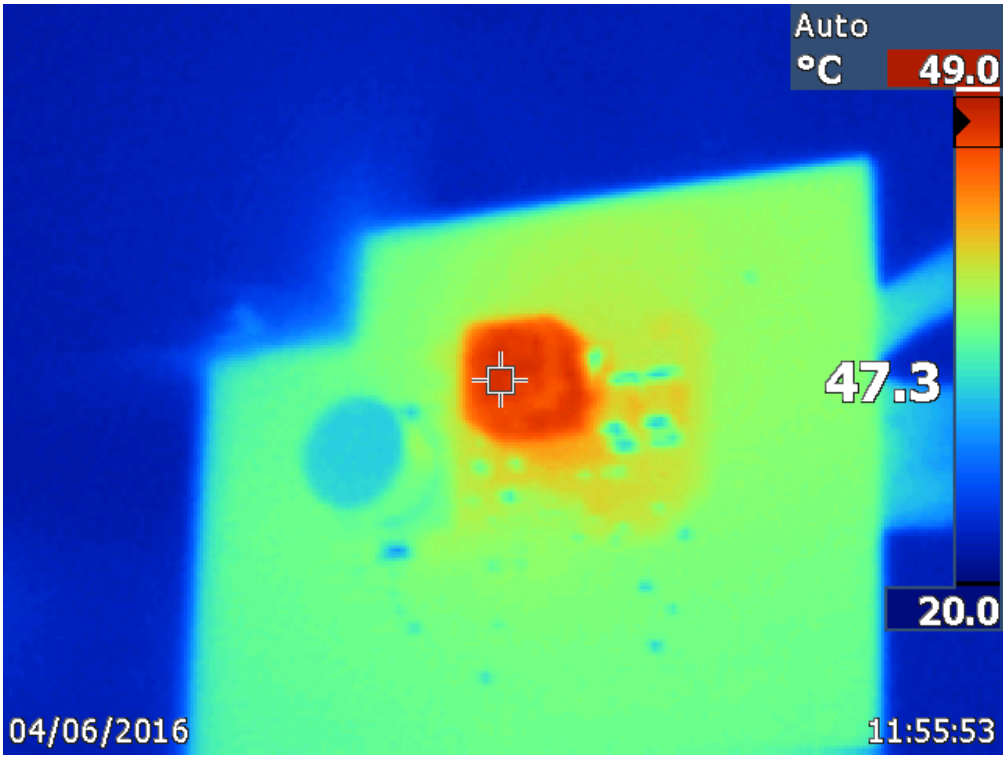
Thermal image was taken at 3.5Vin, 3A load when the board reaches equilibrium without airflow.



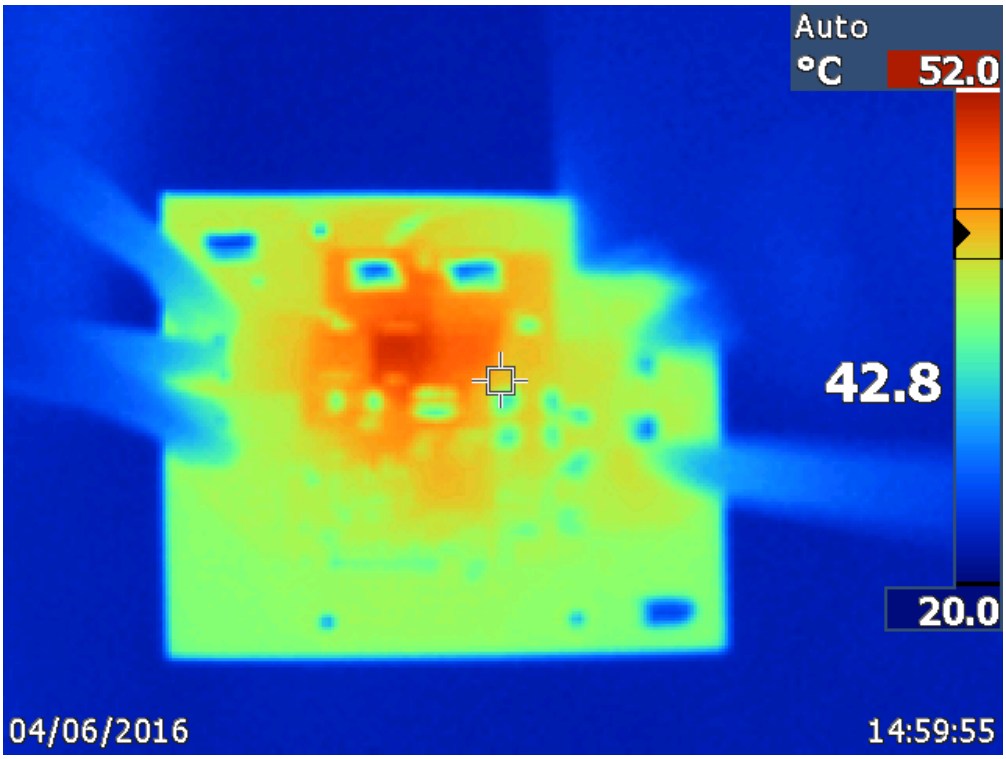
Thermal image was taken at 3.5Vin, 3A load when the board reaches equilibrium.



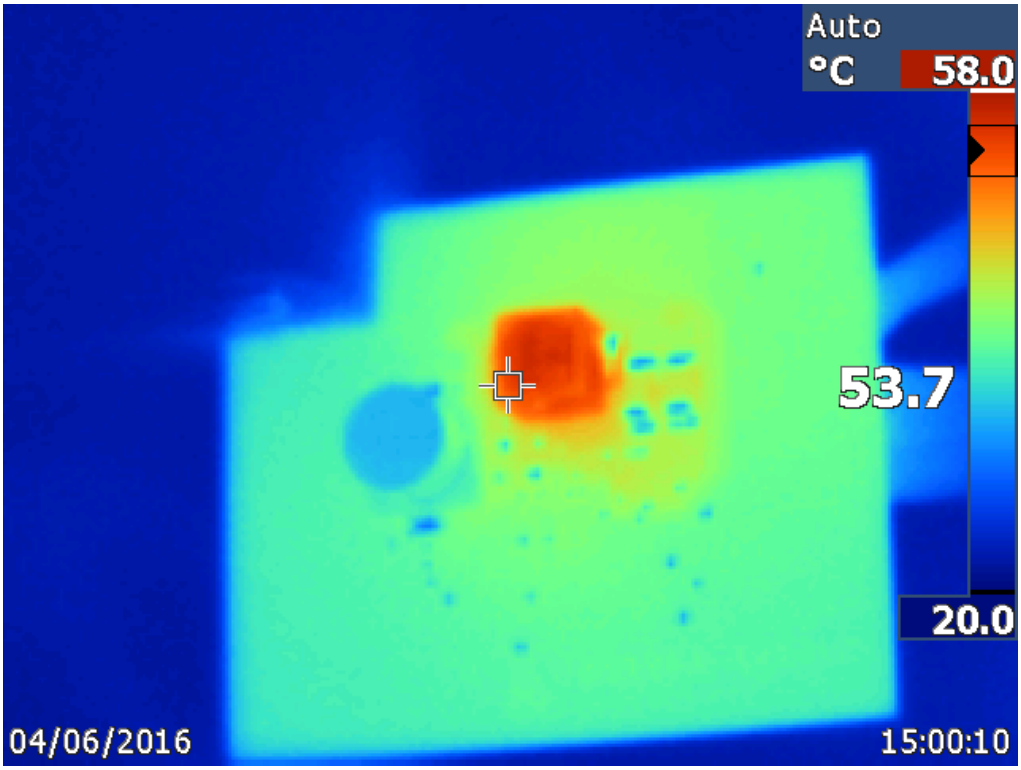
Thermal image was taken at 9Vin, 3A load when the board reaches equilibrium.



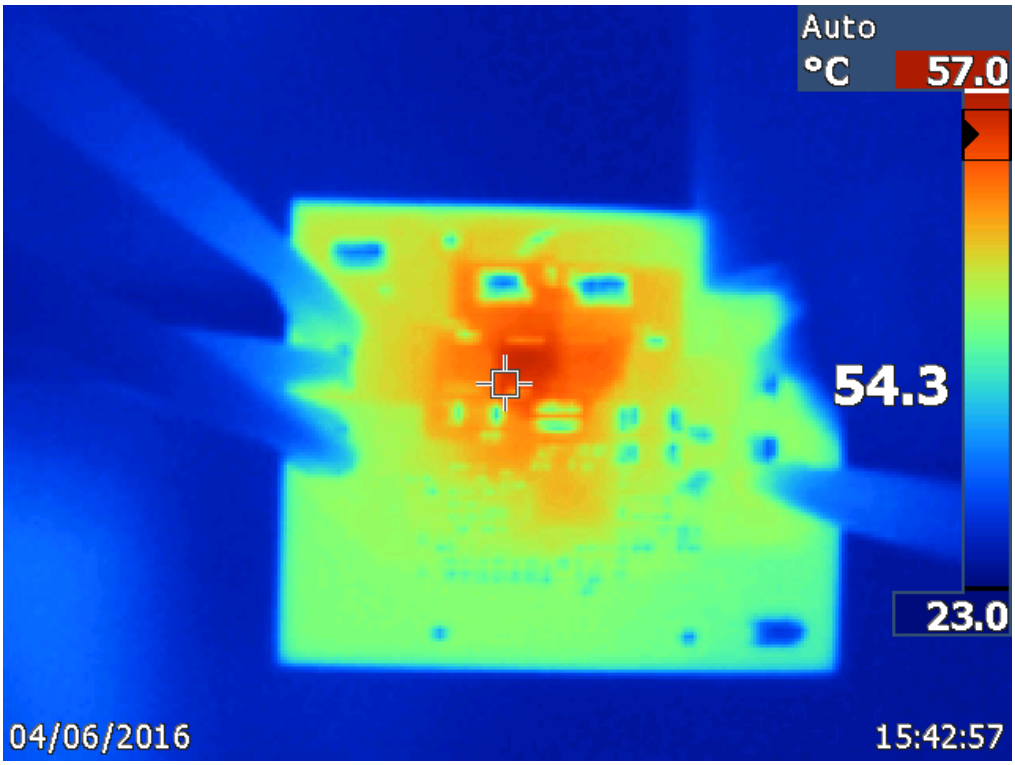
Thermal image was taken at 9Vin, 3A load when the board reaches equilibrium.



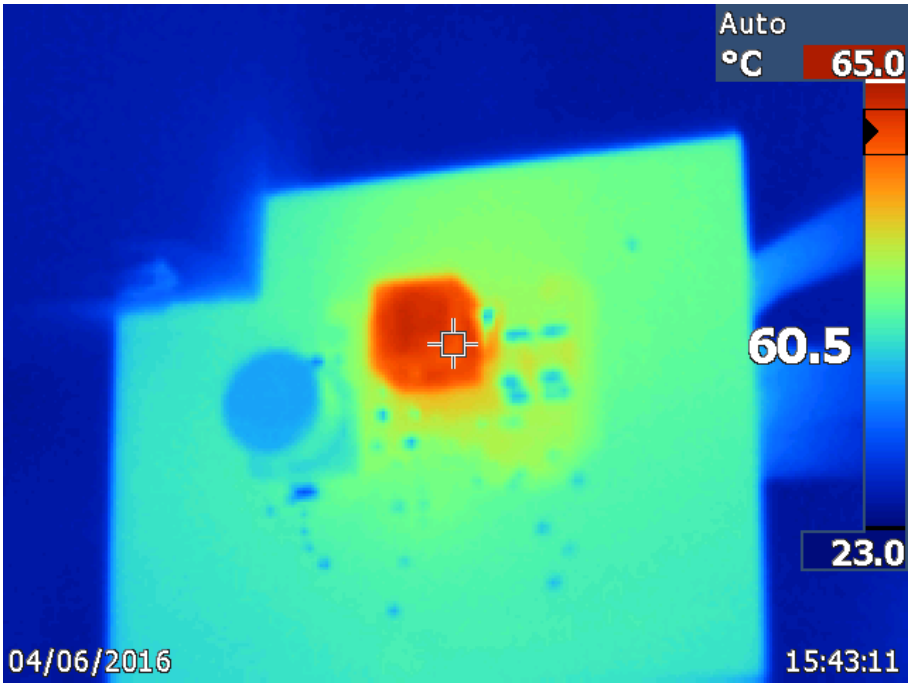
Thermal image was taken at 15Vin, 3A load when the board reaches equilibrium.



Thermal image was taken at 15Vin, 3A load when the board reaches equilibrium.



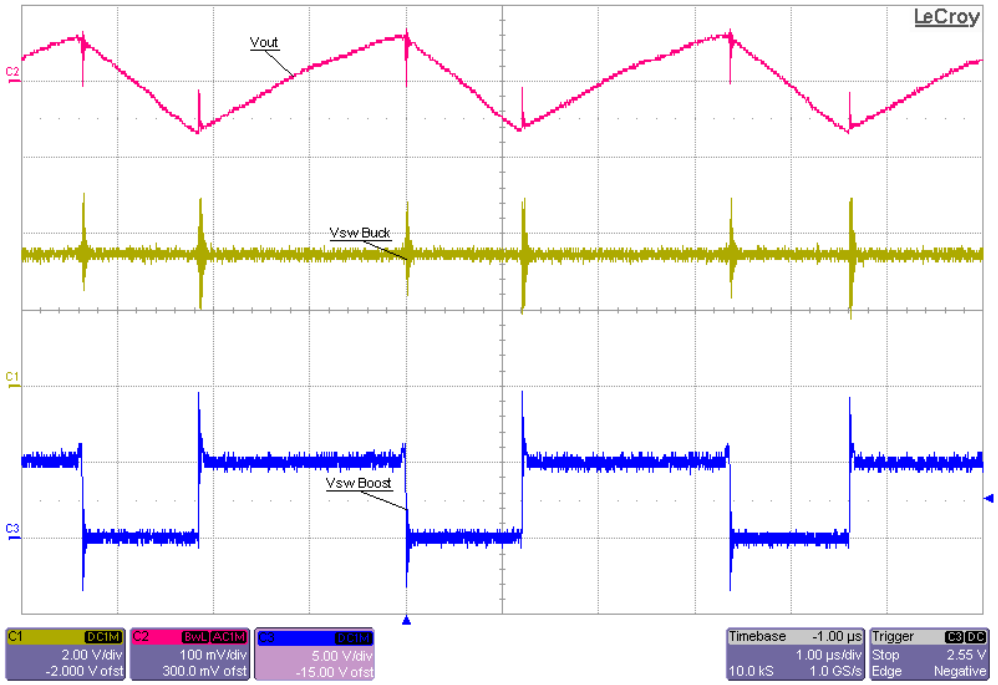
Thermal image was taken at 20Vin, 3A load when the board reaches equilibrium.



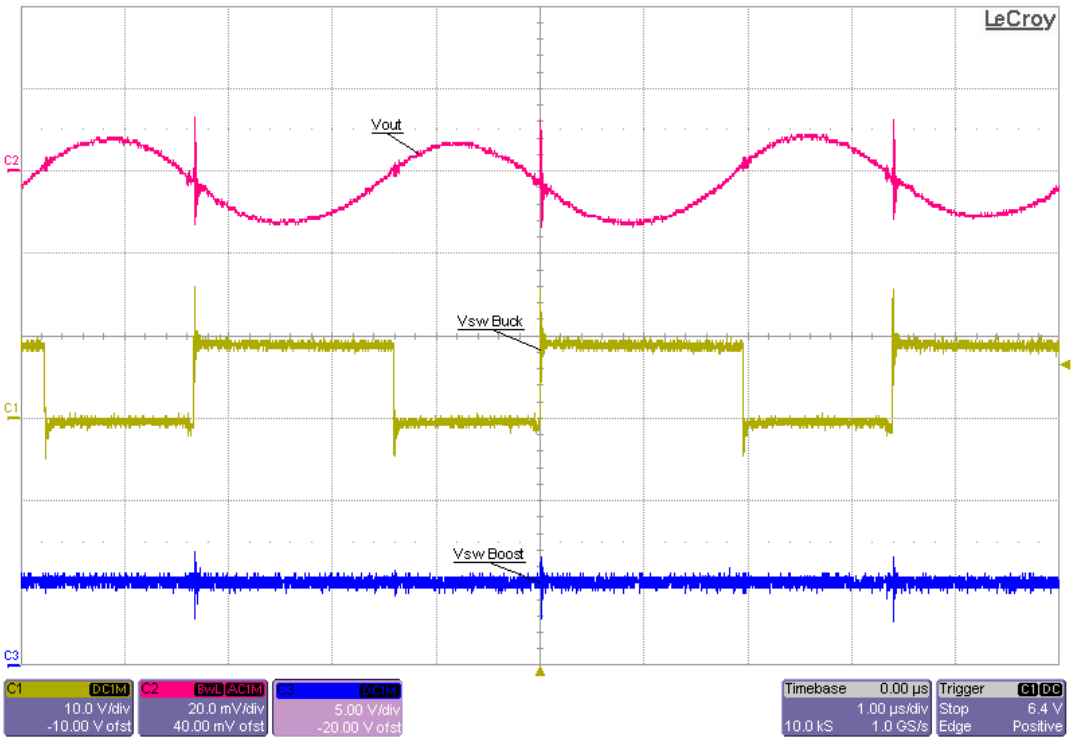
Thermal image was taken at 20Vin, 3A load when the board reaches equilibrium.

6 Waveform

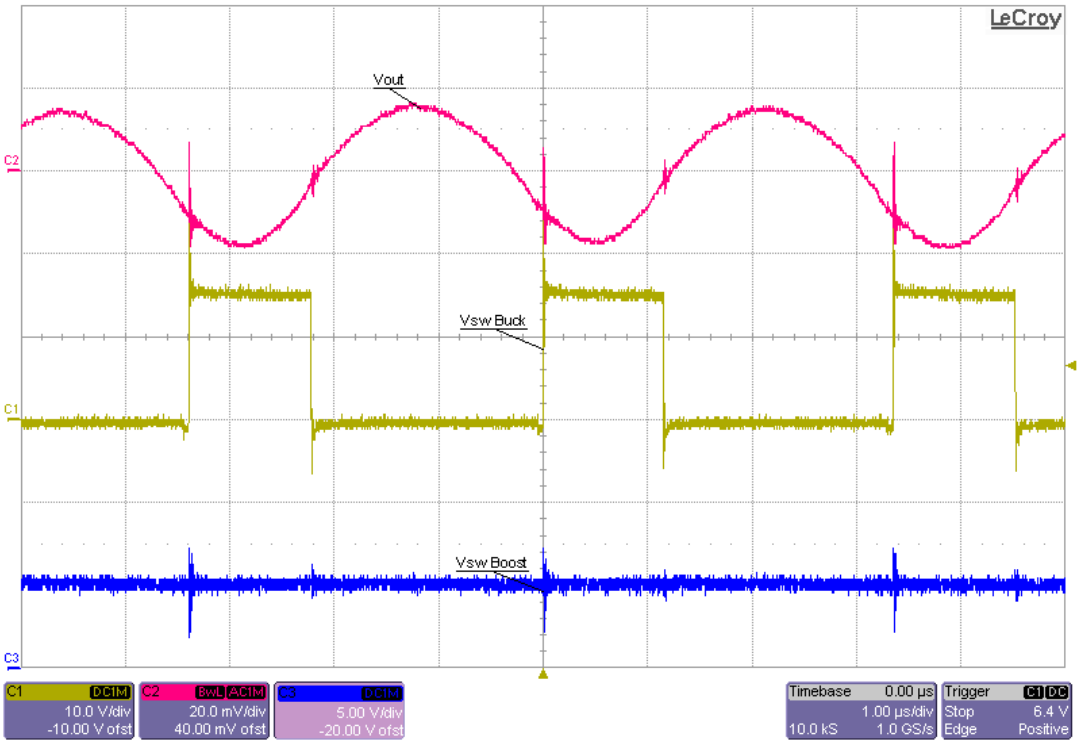
6.1 Switching and Ripple Waveform



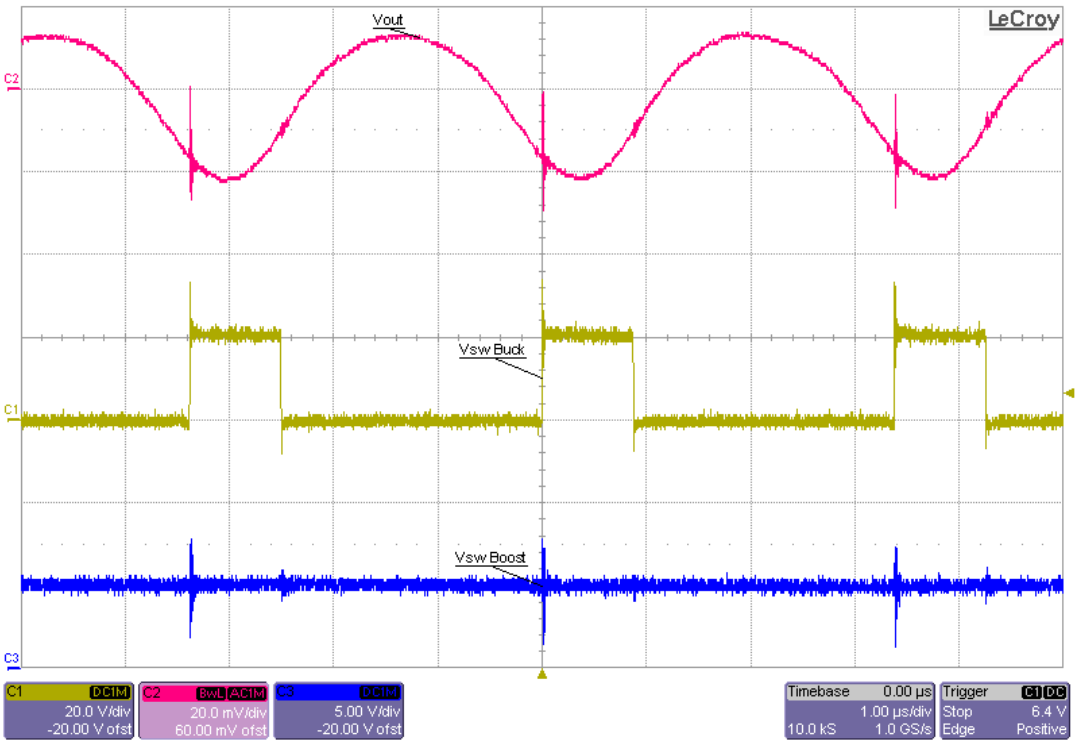
3.5Vin, 3A load. Ch1 measures buck switch, Ch3 measures boost switch, Ch2 measures output ripple.



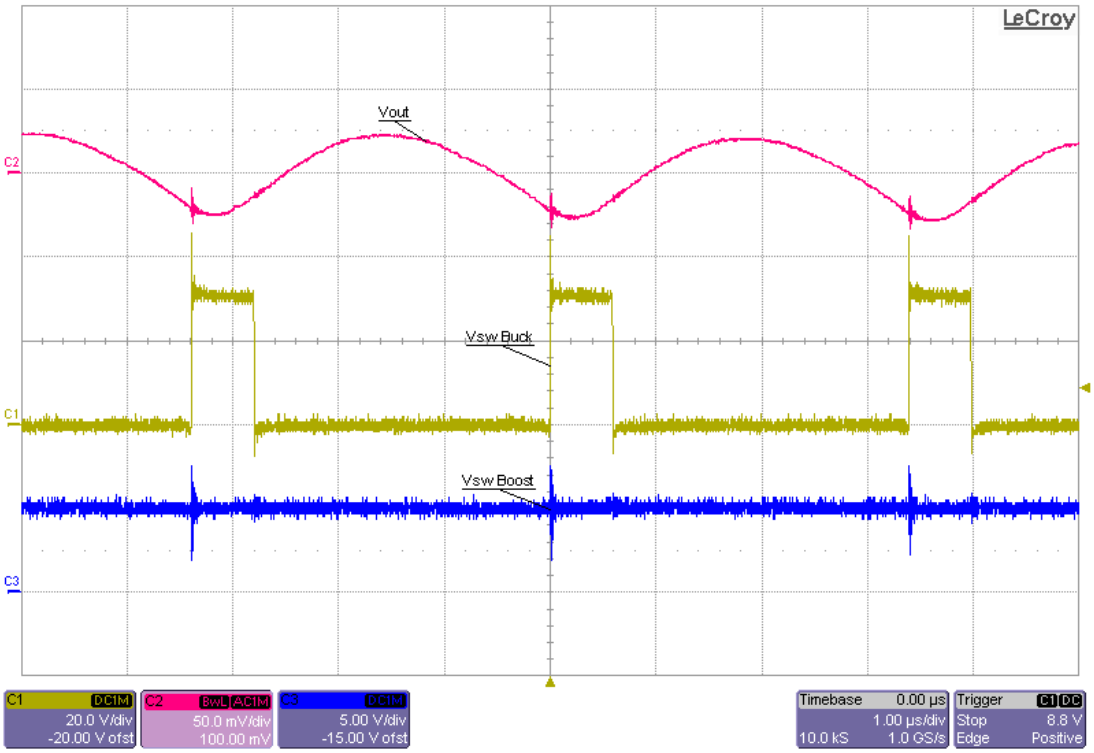
9Vin, 3A load. Ch1 measures buck switch, Ch3 measures boost switch, Ch2 measures output ripple.



15Vin, 3A load. Ch1 measures buck switch, Ch3 measures boost switch, Ch2 measures output ripple.

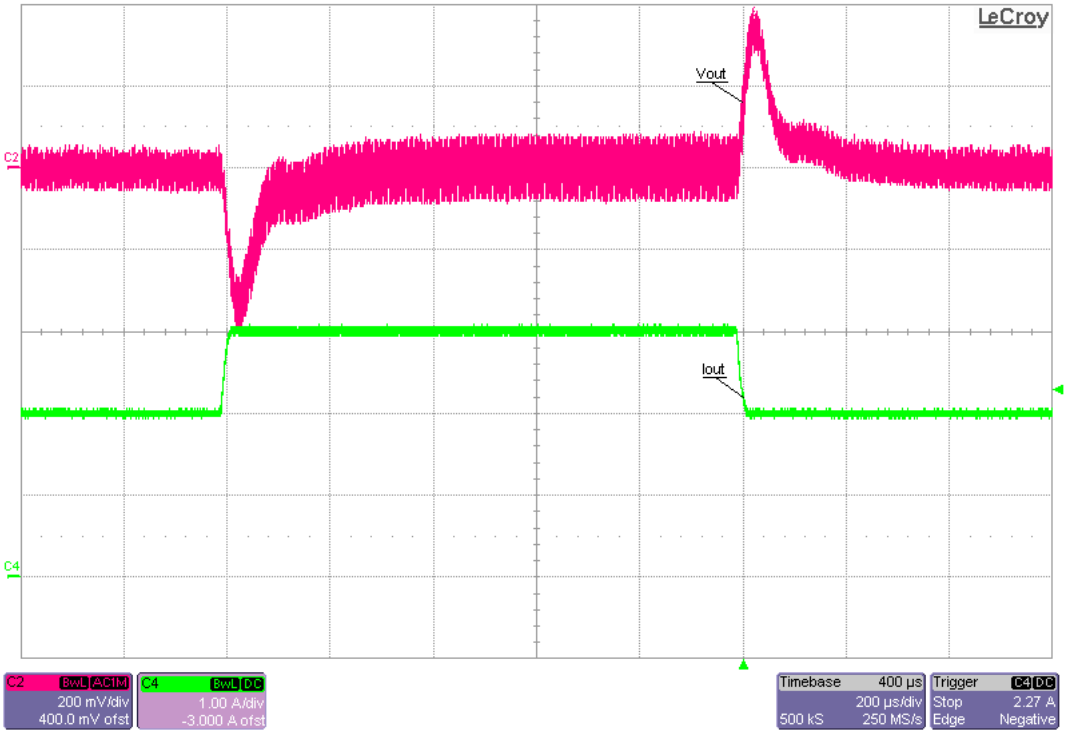


20Vin, 3A load. Ch1 measures buck switch, Ch3 measures boost switch, Ch2 measures output ripple.

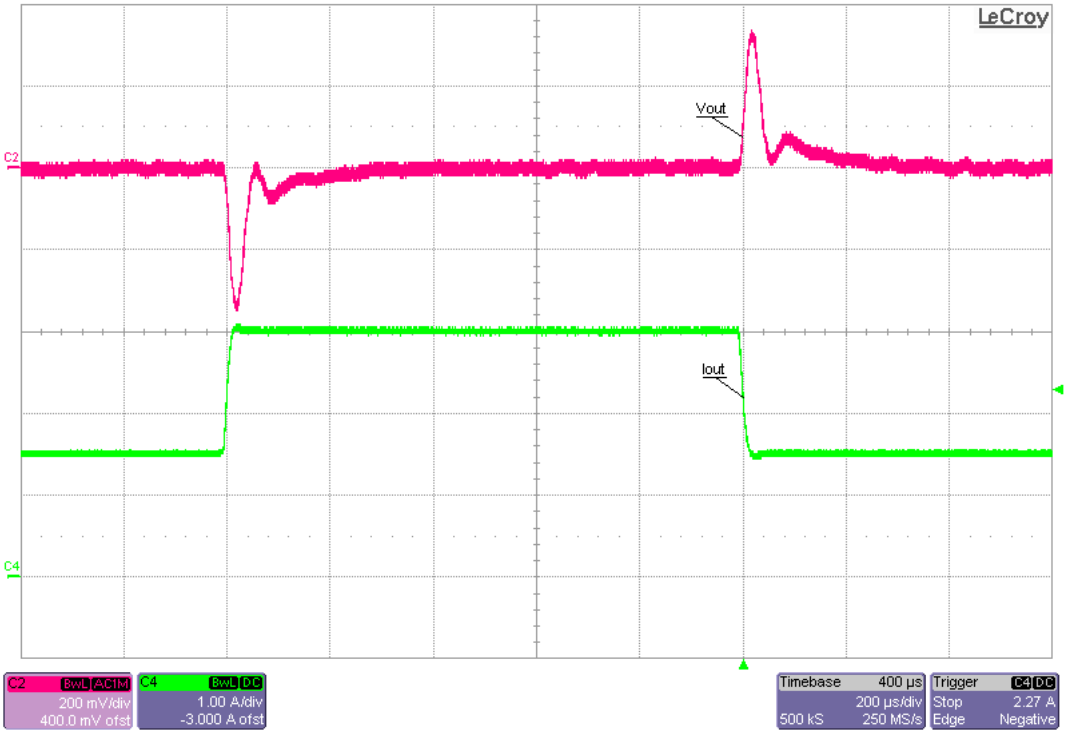


30Vin, 3A load. Ch1 measures buck switch, Ch3 measures boost switch, Ch2 measures output ripple.

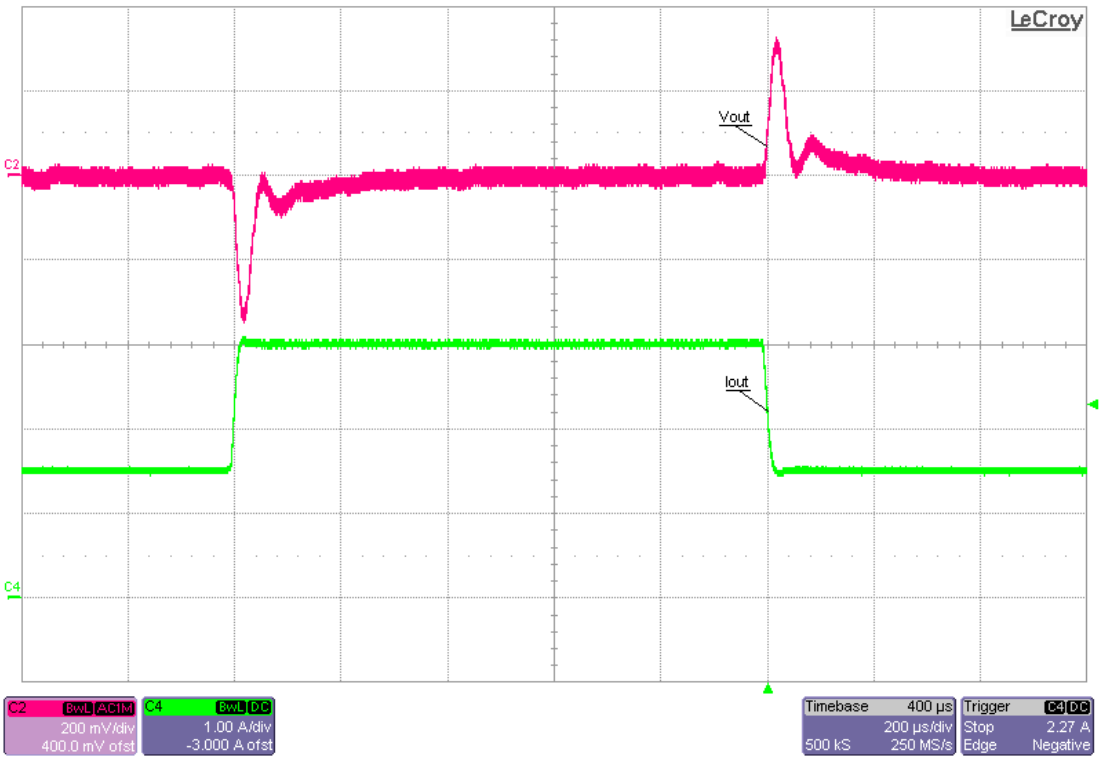
6.2 Load Transient



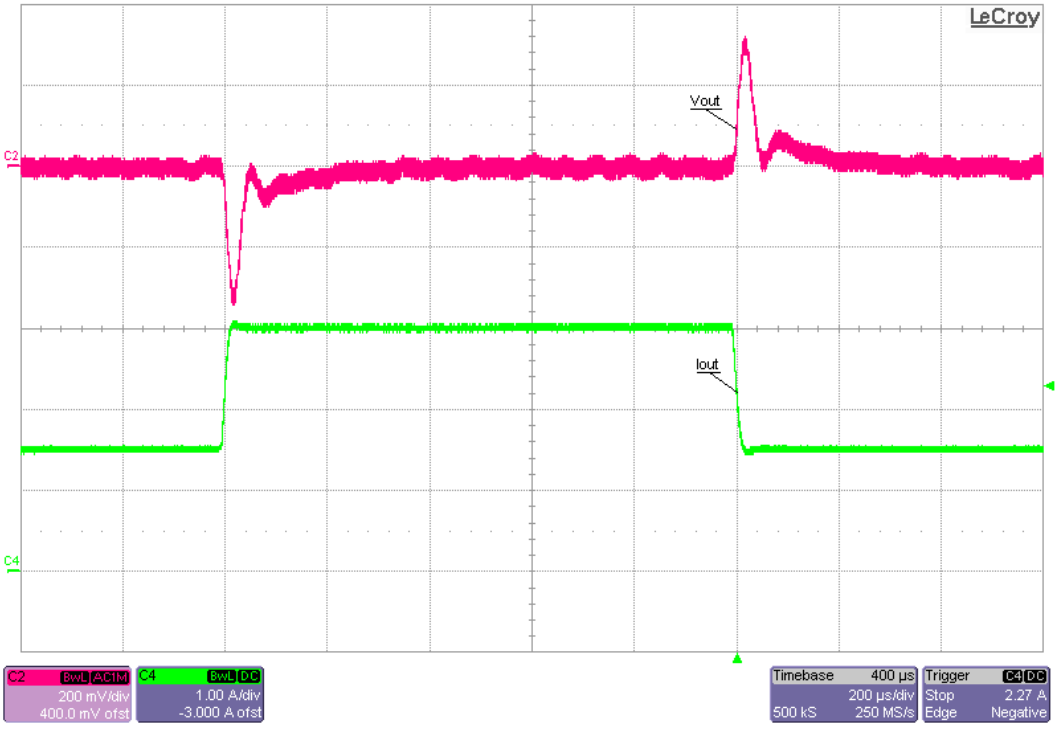
3.5Vin, 2A-3A load step. Ch2 measures output voltage, Ch4 measures load current.



9Vin, 1.5A-3A load step. Ch2 measures output voltage, Ch4 measures load current.

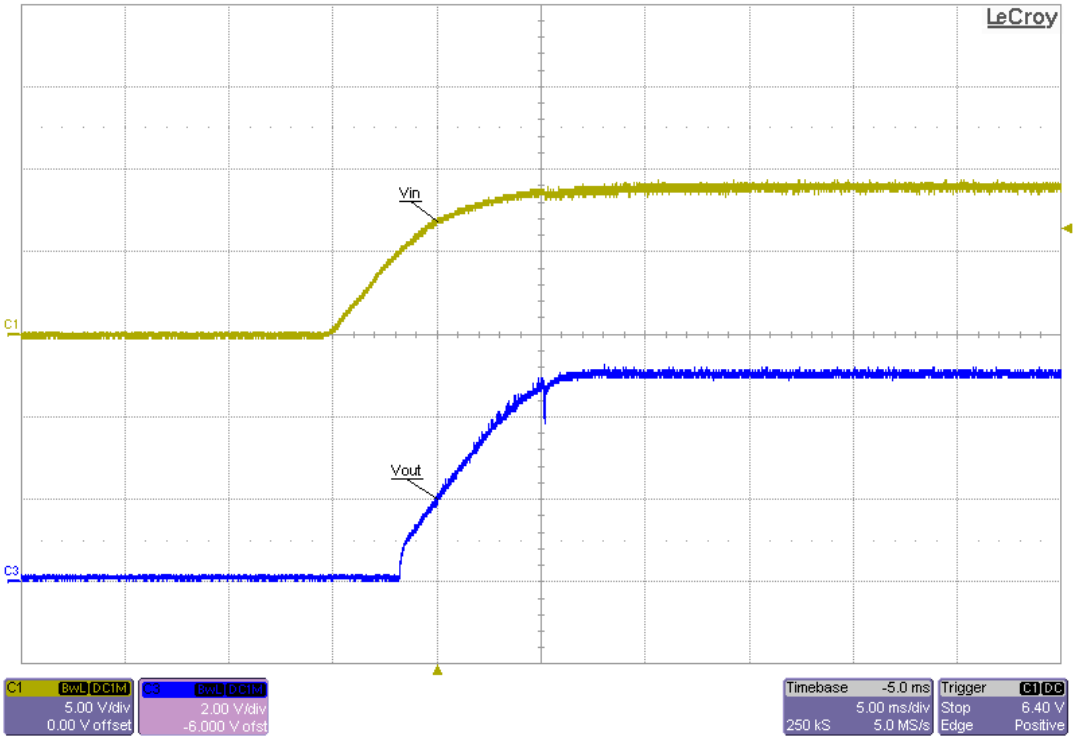


15Vin, 1.5A-3A load step . Ch2 measures output voltage, Ch4 measures load current.

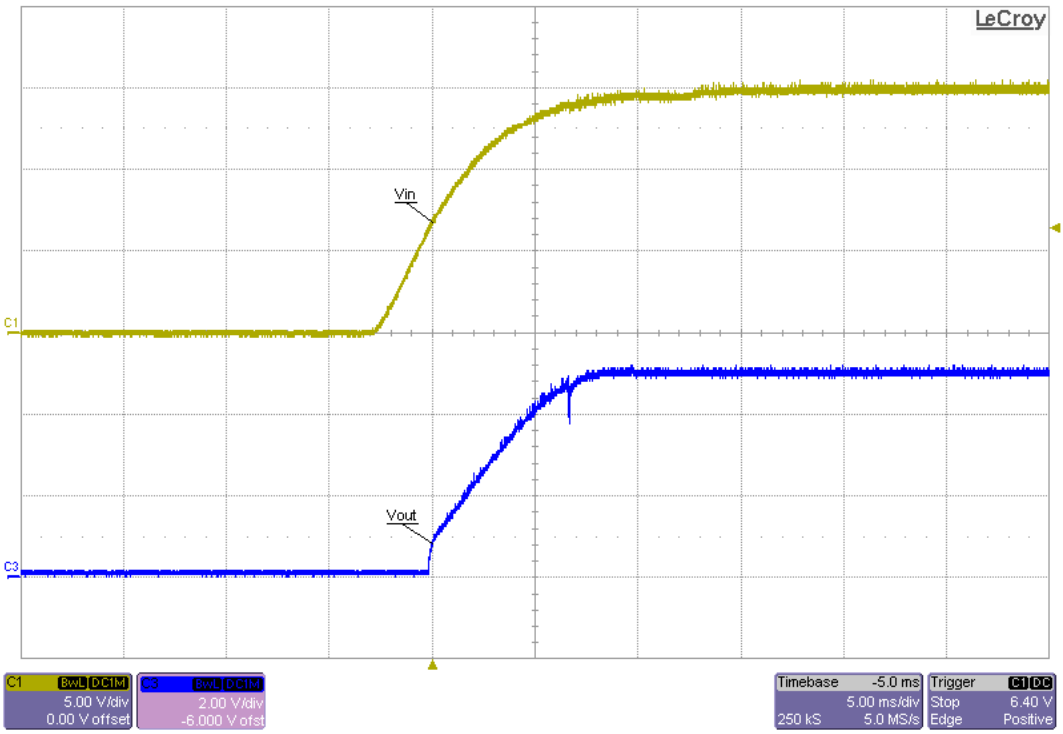


20Vin, 1.5A-3A load step. Ch2 measures output voltage, Ch4 measures load current.

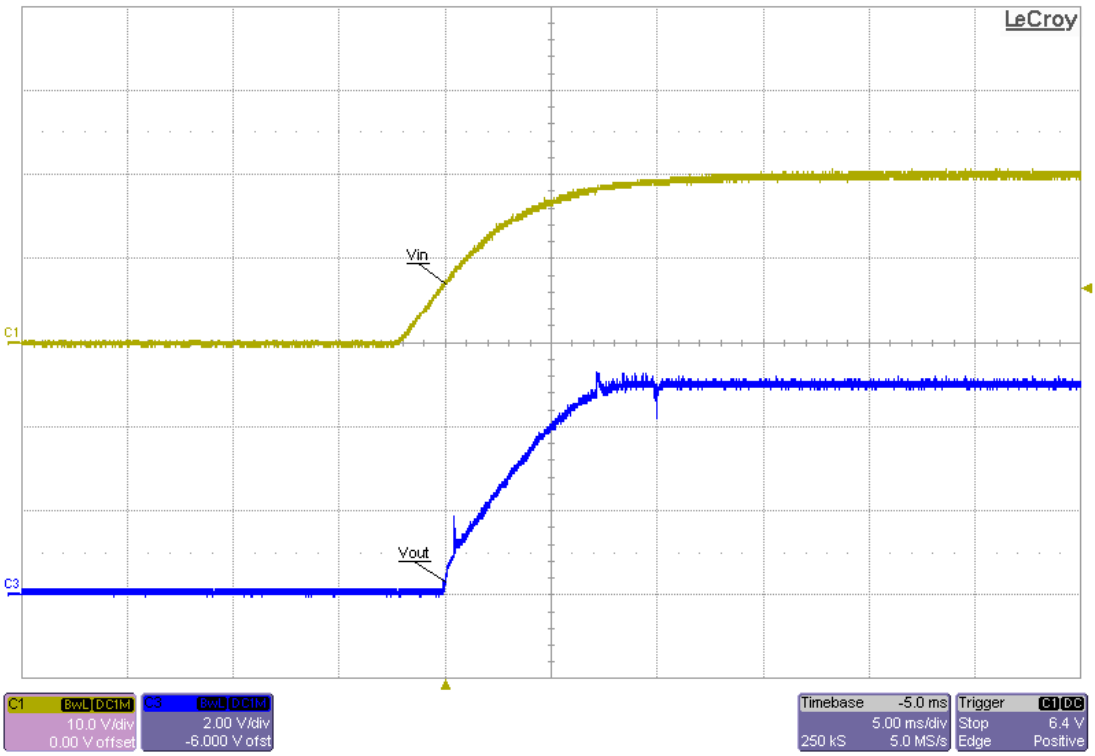
6.3 Start Up



9Vin, 3A load. Ch1 measures input voltage, Ch3 measures output voltage.

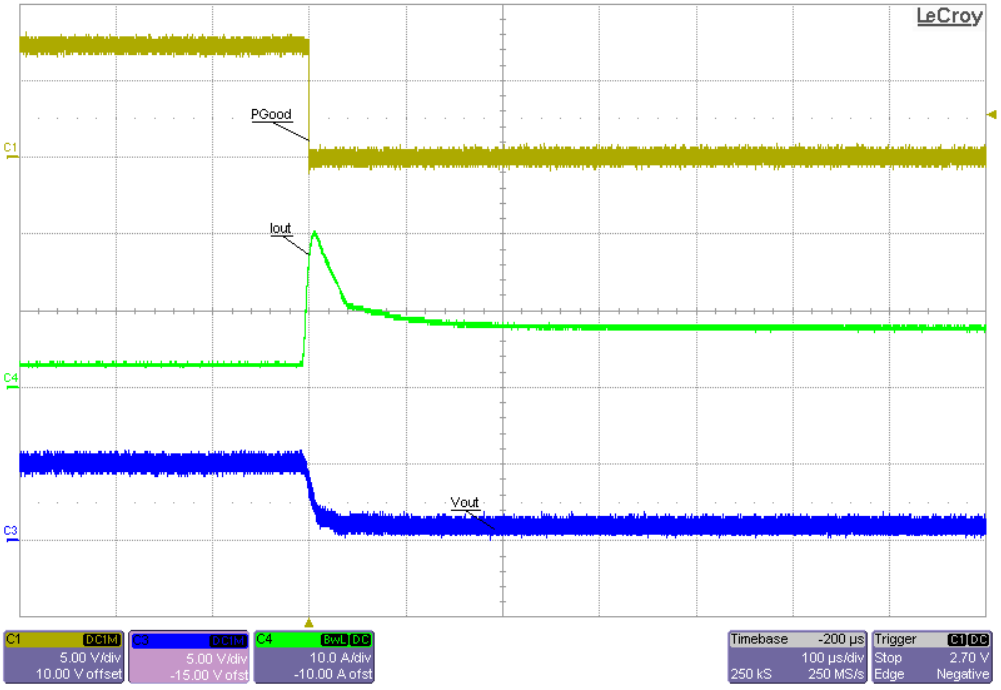


15Vin, 3A load. Ch1 measures input voltage, Ch3 measures output voltage.

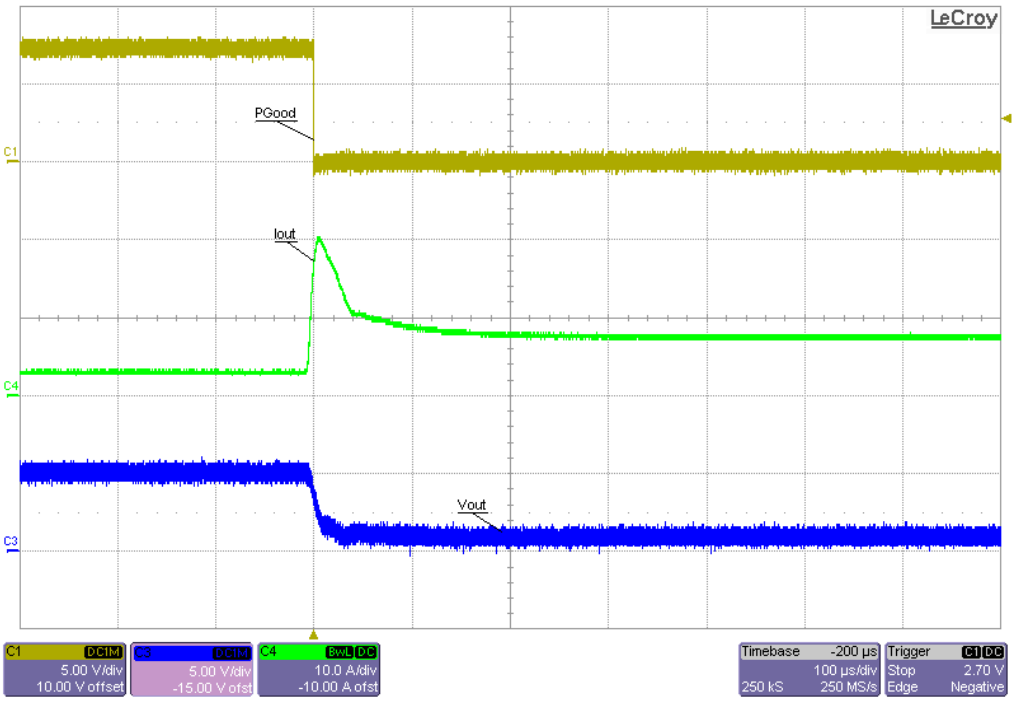


20Vin, 3A load. Ch1 measures input voltage, Ch3 measures output voltage.

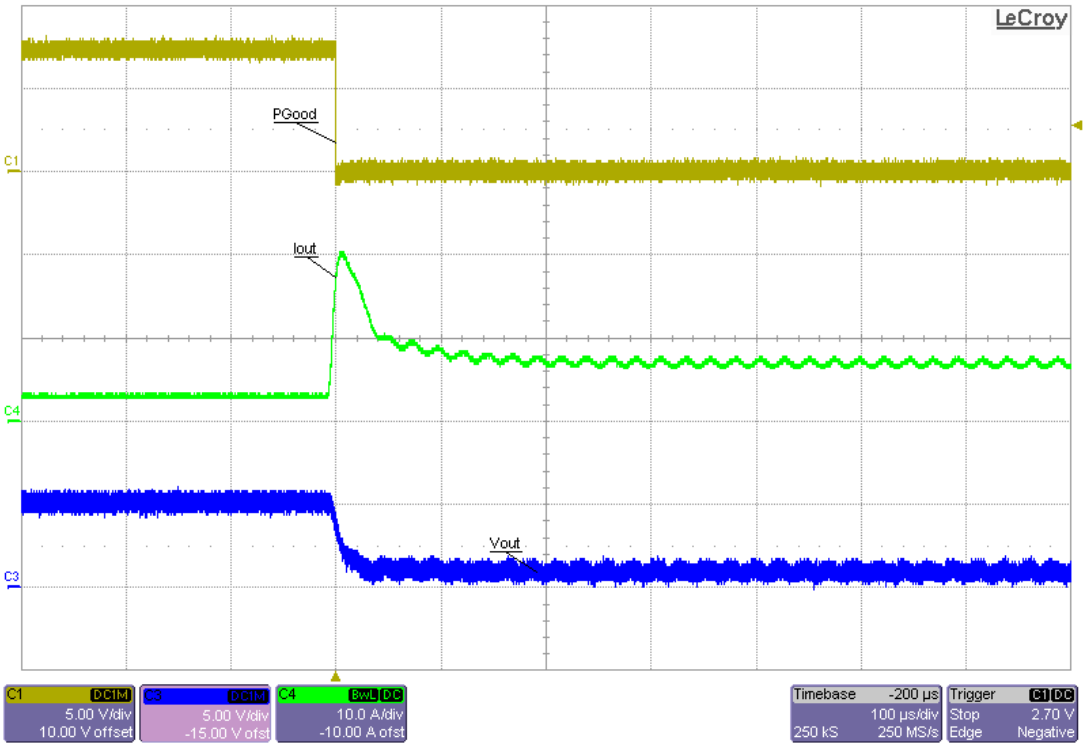
6.4 Short Circuit



9Vin, 3A load short circuit. Ch1 measures PGOOD, Ch3 measures output voltage, Ch4 measures output current.

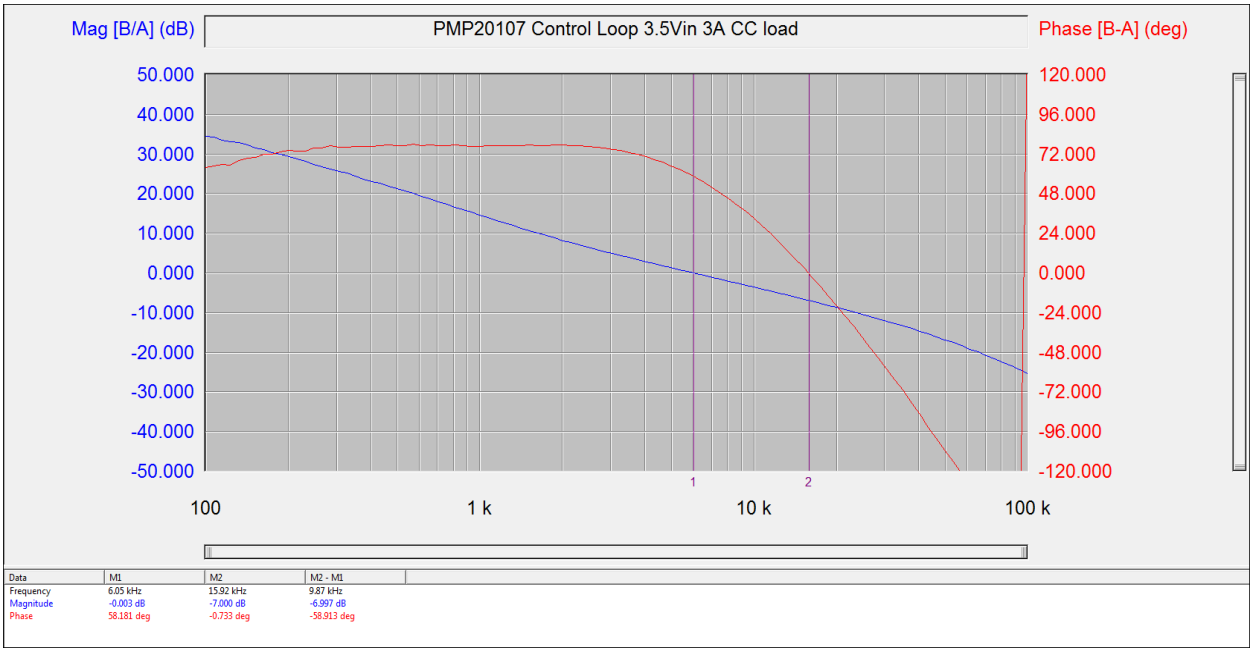


15Vin, 3A load short circuit. Ch1 measures PGOOD, Ch3 measures output voltage, Ch4 measures output current.

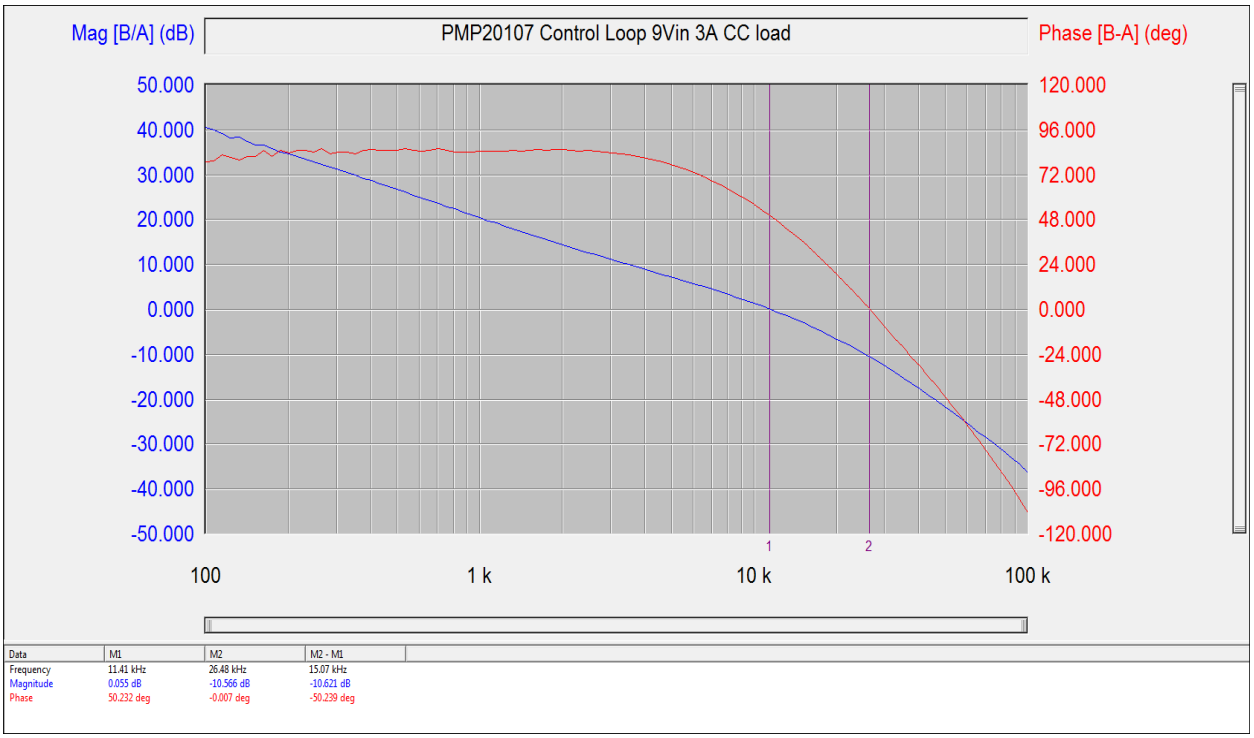


20Vin, 3A load short circuit. Ch1 measures PGOOD, Ch3 measures output voltage, Ch4 measures output current.

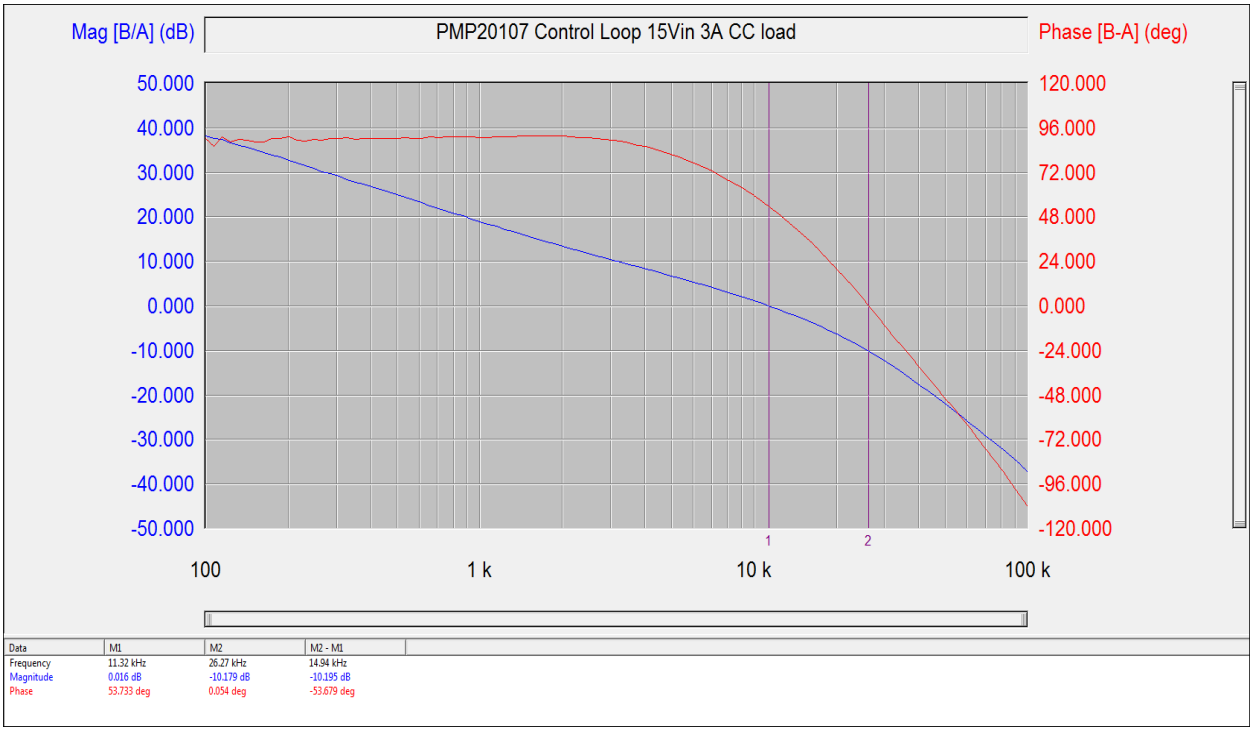
6.5 Bode Plot



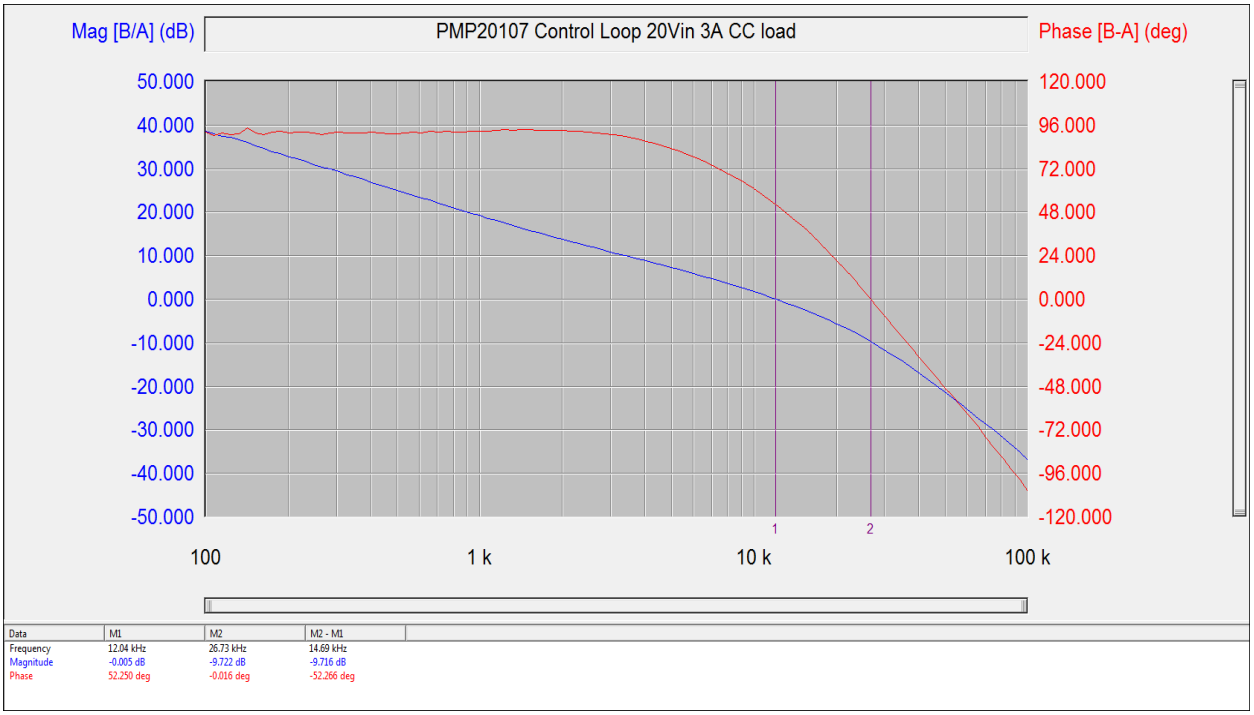
3.5Vin, 3A load bode plot, 58.2 degrees phase margin, and 7dB gain margin.



9Vin, 3A load bode plot, 50.3 degrees phase margin, and 10.62dB gain margin.



15Vin, 3A load bode plot, 53.73 degrees phase margin, and 10.18dB gain margin.



20Vin, 3A load bode plot, 52.25 degrees phase margin, and 9.72dB gain margin.

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