Test Data
For PMP20430
8/6/2016

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1. Design Specifications

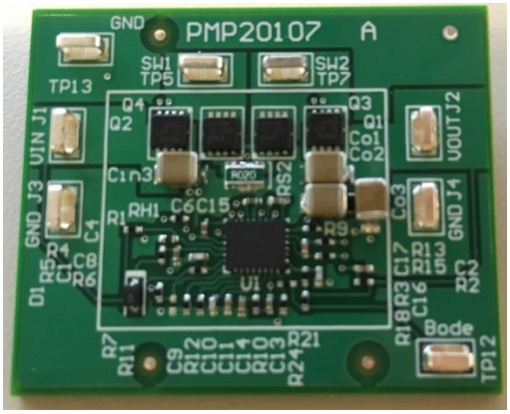
Vin Minimum	**10VDC**
Vin Maximum	**32VDC**
Vout	**+25VDC @ 1A**
Nominal Switching Frequency	**≈ 600KHz**

2. Circuit Description

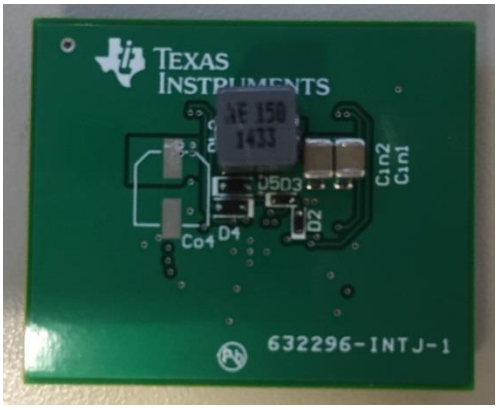
PMP20430 is a 4-switch buck-boost controller utilizing the LM5175 for industrial applications. This design has a minimum operating input voltage of 10V and a maximum input voltage of 32V, supports 25Vout @ 1A. Switching frequency is set to 600kHz, during buck-boost mode, switching frequency drops in half, the buck and boost switches at 300kHz alternately with respected max and min duty cycle.

3. PMP20430 Board Photos

Board Dimensions: 40.13mm x 33.02mm



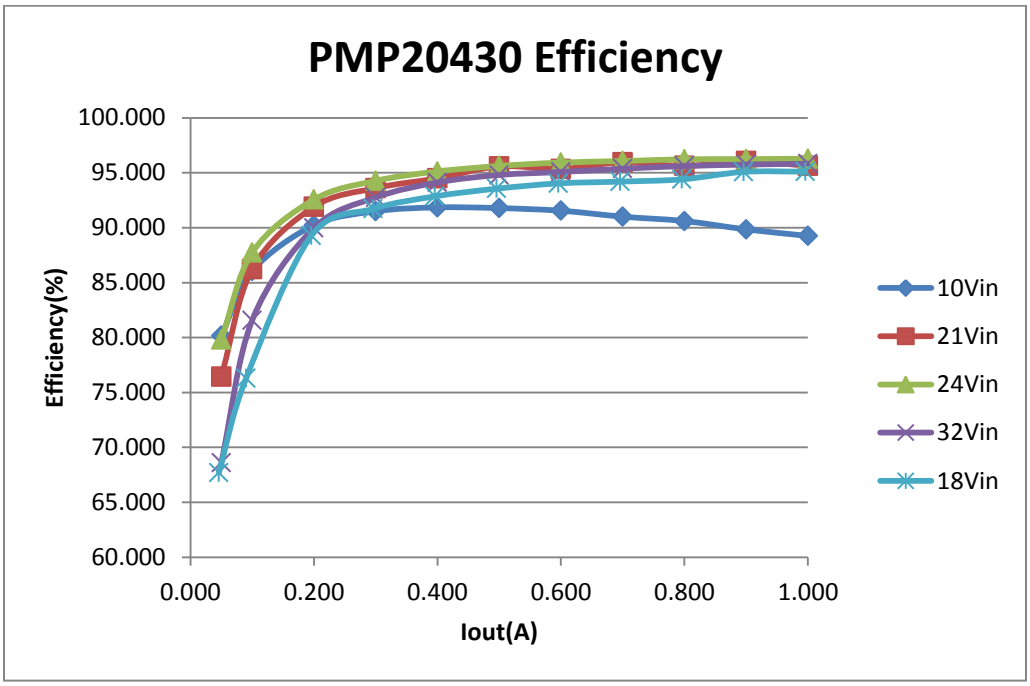
Board Photo (Top)



Board Photo (Bottom)

4. Efficiency

4.1 Efficiency Chart



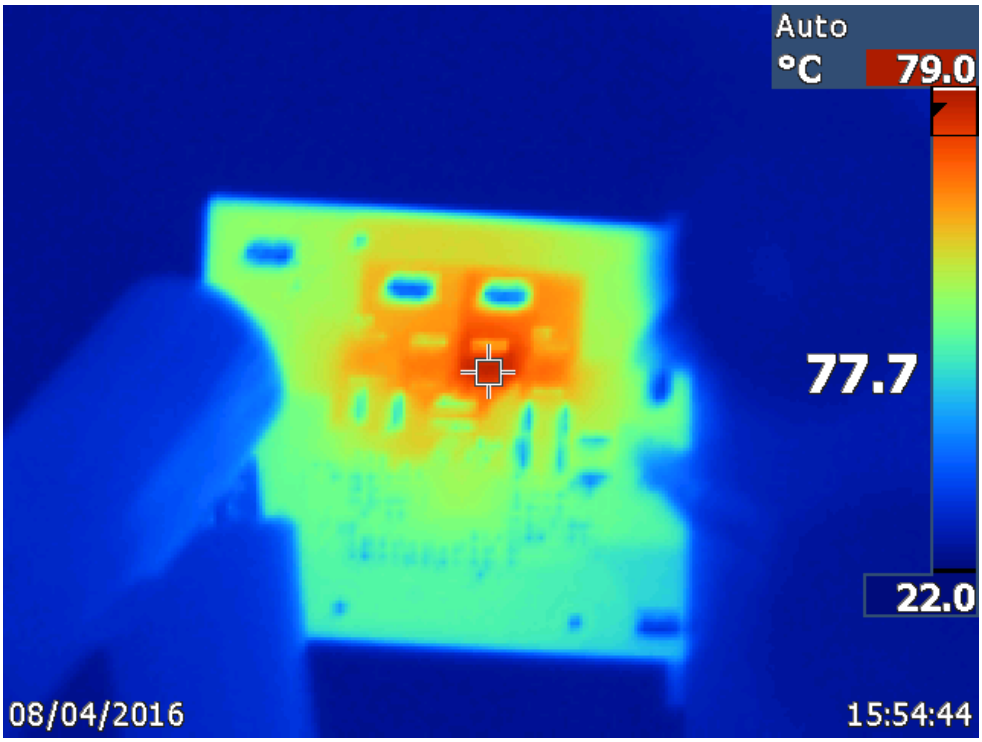
4.2 Efficiency Data

Vin(V)	Iin(A)	Vout(V)	Iout(A)	Pin(W)	Pout(W)	Losses(W)	Efficiency
10.000	0.029	25.184	0.000	0.287	0.000	0.287	0.000
10.000	0.157	25.173	0.050	1.570	1.259	0.311	80.169
10.000	0.292	25.130	0.100	2.920	2.513	0.407	86.062
10.000	0.557	25.142	0.200	5.573	5.028	0.545	90.228
10.000	0.825	25.157	0.300	8.248	7.547	0.701	91.502
10.000	1.096	25.169	0.400	10.961	10.068	0.893	91.849
10.000	1.372	25.177	0.500	13.715	12.589	1.127	91.786
10.000	1.650	25.180	0.600	16.503	15.108	1.395	91.547
10.000	1.937	25.182	0.700	19.370	17.627	1.743	91.004
10.000	2.223	25.182	0.800	22.234	20.146	2.088	90.607
10.000	2.523	25.184	0.900	25.227	22.666	2.561	89.847
10.000	2.821	25.182	1.000	28.213	25.182	3.031	89.257
18.005	0.019	25.176	0.000	0.342	0.000	0.342	0.000
18.005	0.095	25.176	0.046	1.710	1.158	0.552	67.706
18.005	0.165	25.179	0.090	2.971	2.266	0.705	76.278

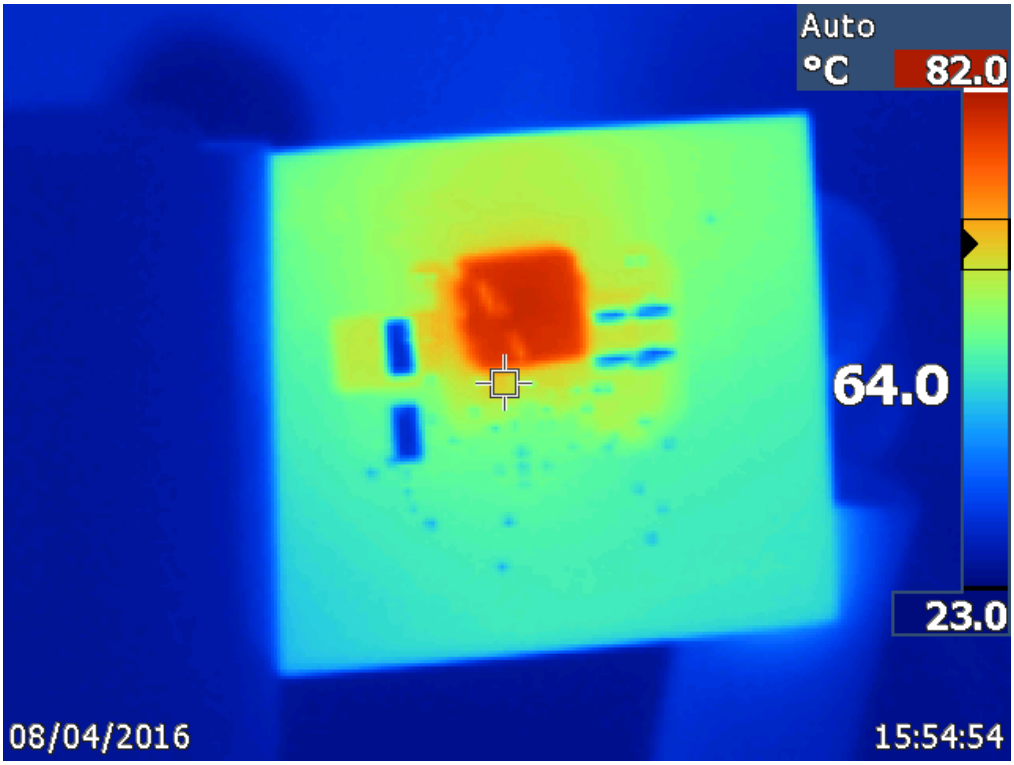
18.005	0.307	25.181	0.196	5.528	4.935	0.592	89.287
18.005	0.451	25.163	0.296	8.120	7.448	0.672	91.723
18.005	0.596	25.162	0.396	10.731	9.964	0.767	92.855
18.005	0.741	25.165	0.496	13.342	12.482	0.860	93.556
18.005	0.886	25.170	0.596	15.952	15.001	0.951	94.037
18.005	1.033	25.172	0.696	18.599	17.520	1.079	94.198
18.005	1.179	25.175	0.796	21.227	20.040	1.188	94.404
18.005	1.318	25.183	0.896	23.730	22.564	1.166	95.084
18.005	1.465	25.187	0.996	26.377	25.086	1.291	95.106
21.000	0.018	25.174	0.000	0.372	0.000	0.372	0.000
21.000	0.078	25.172	0.050	1.646	1.259	0.388	76.446
21.000	0.139	25.173	0.100	2.919	2.517	0.402	86.238
21.000	0.261	25.168	0.200	5.477	5.034	0.443	91.908
21.000	0.384	25.155	0.300	8.062	7.547	0.515	93.607
21.000	0.507	25.159	0.400	10.649	10.064	0.586	94.502
21.000	0.627	25.154	0.500	13.159	12.577	0.582	95.580
21.000	0.754	25.167	0.600	15.838	15.100	0.738	95.340
21.000	0.874	25.163	0.700	18.354	17.614	0.740	95.969
21.000	1.003	25.171	0.800	21.059	20.137	0.922	95.622
21.000	1.123	25.171	0.900	23.581	22.654	0.927	96.069
21.000	1.254	25.176	1.000	26.326	25.176	1.150	95.633
24.000	0.013	25.170	0.000	0.300	0.000	0.300	0.000
24.000	0.066	25.169	0.050	1.577	1.258	0.318	79.810
24.000	0.120	25.164	0.100	2.868	2.516	0.352	87.741
24.000	0.226	25.149	0.200	5.434	5.030	0.404	92.568
24.000	0.334	25.152	0.300	8.004	7.546	0.458	94.273
24.000	0.441	25.158	0.400	10.579	10.063	0.516	95.123
24.000	0.548	25.162	0.500	13.157	12.581	0.576	95.624
24.000	0.656	25.165	0.600	15.739	15.099	0.640	95.932
24.000	0.764	25.168	0.700	18.338	17.618	0.721	96.069
24.000	0.872	25.171	0.800	20.926	20.137	0.789	96.230
24.000	0.981	25.173	0.900	23.539	22.656	0.884	96.247
24.000	1.089	25.175	1.000	26.146	25.175	0.971	96.288
32.000	0.019	25.155	0.000	0.602	0.000	0.602	0.000
32.000	0.057	25.161	0.050	1.834	1.258	0.576	68.611
32.000	0.096	25.165	0.100	3.085	2.517	0.568	81.577
32.000	0.175	25.163	0.200	5.594	5.033	0.561	89.971

32.000	0.254	25.150	0.300	8.134	7.545	0.589	92.754
32.000	0.334	25.150	0.400	10.688	10.060	0.628	94.124
32.000	0.415	25.149	0.500	13.264	12.575	0.689	94.802
32.000	0.496	25.146	0.600	15.869	15.088	0.781	95.077
32.000	0.577	25.152	0.700	18.461	17.606	0.854	95.372
32.000	0.658	25.157	0.800	21.050	20.126	0.924	95.610
32.000	0.739	25.161	0.900	23.651	22.645	1.006	95.745
32.000	0.821	25.164	1.000	26.259	25.164	1.095	95.829

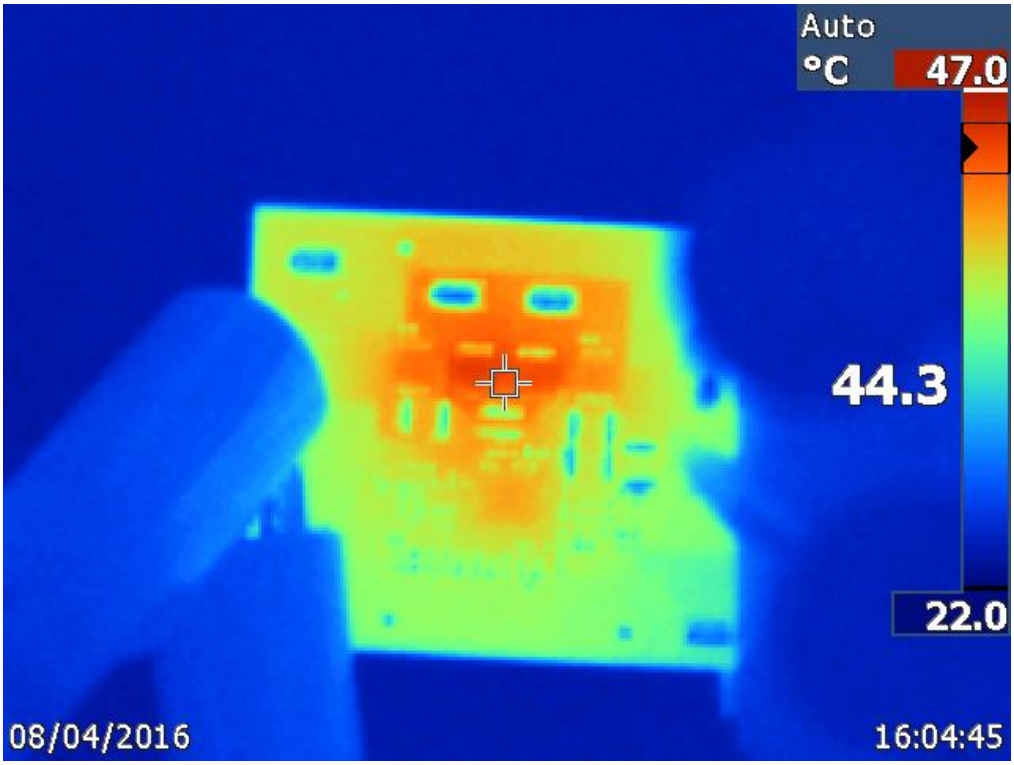
5 Thermal Images



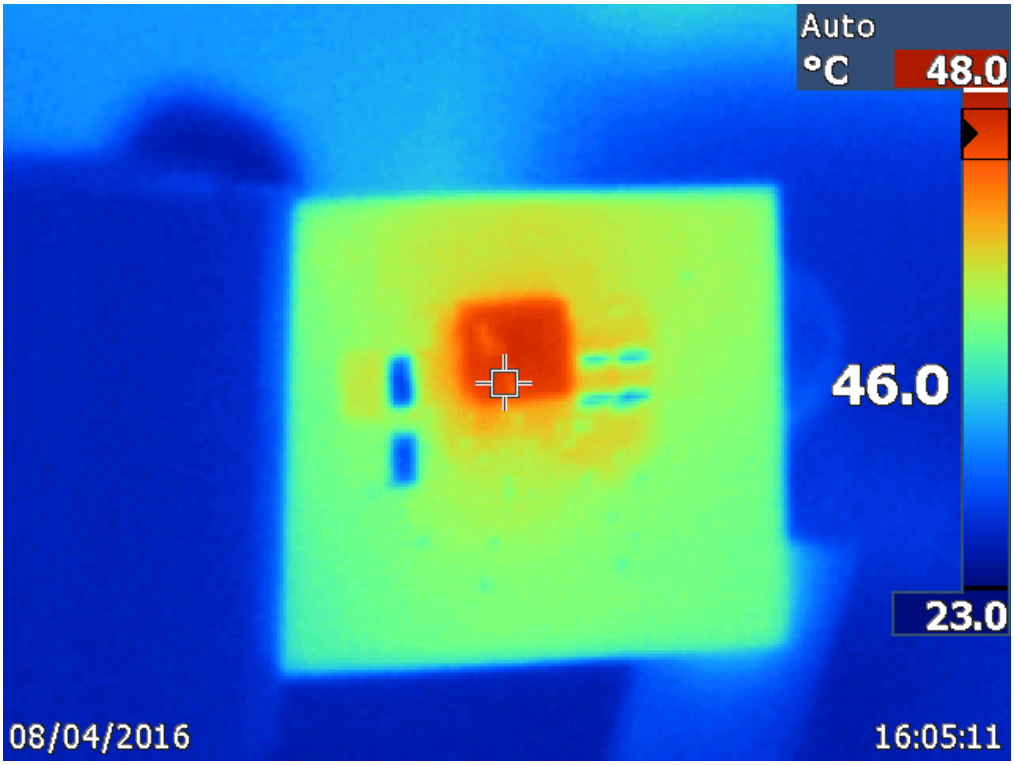
Thermal image was taken at 10Vin, 1A load when the board reaches equilibrium without airflow.



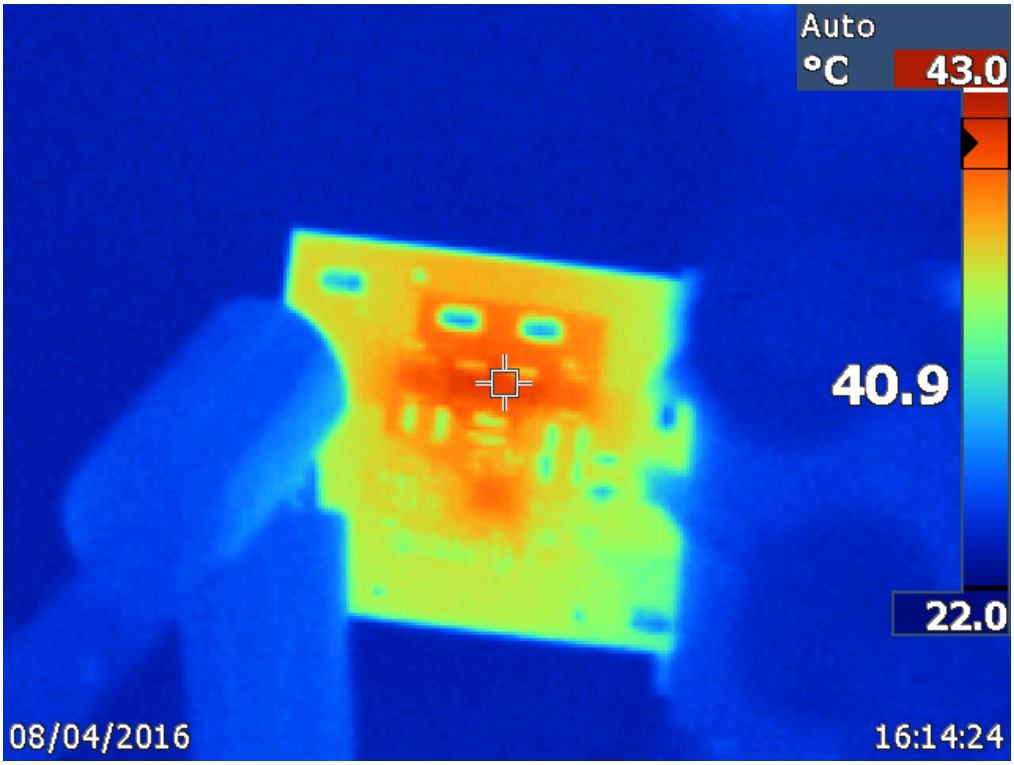
Thermal image was taken at 10Vin, 1A load when the board reaches equilibrium.



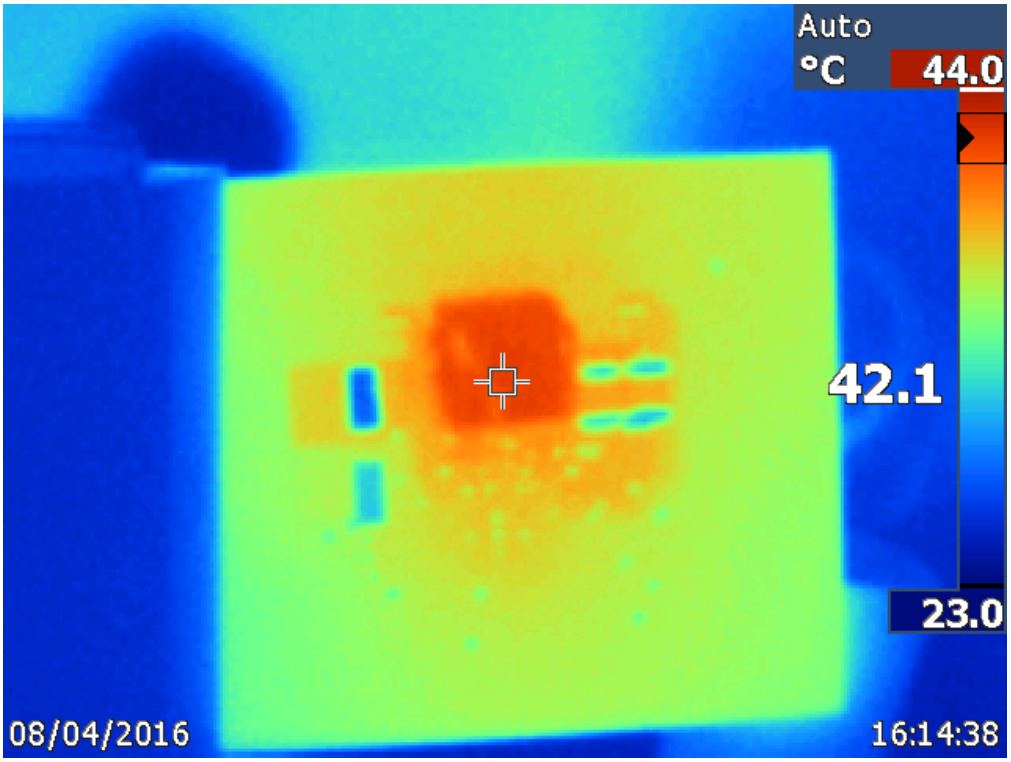
Thermal image was taken at 21Vin, 1A load when the board reaches equilibrium.



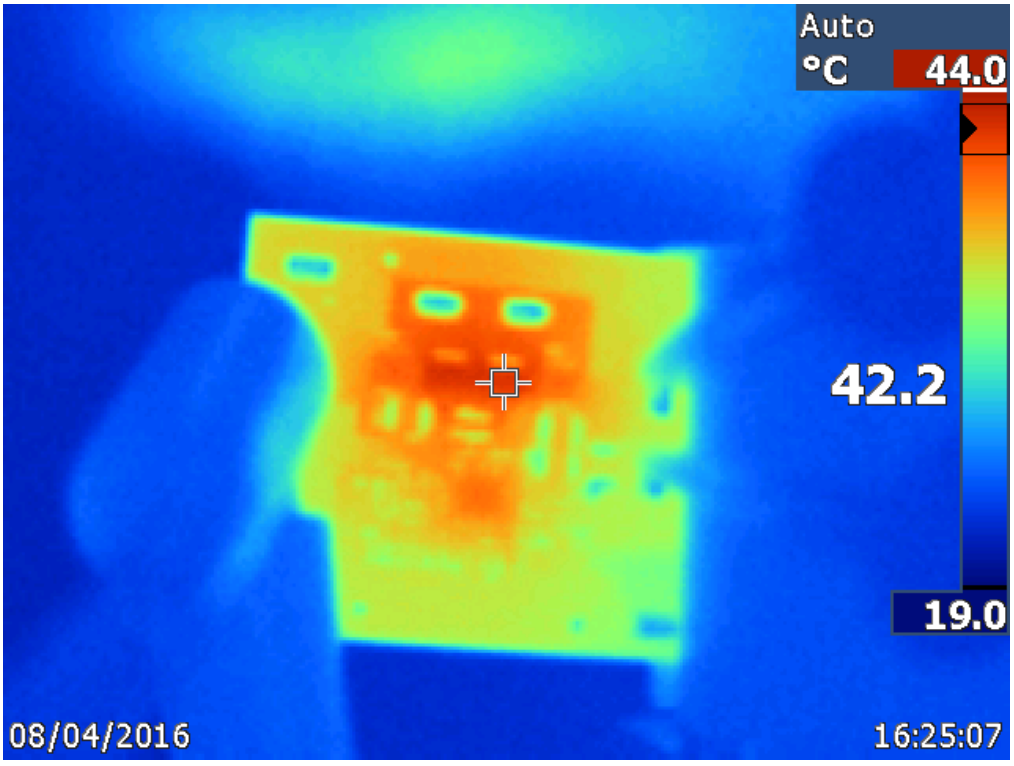
Thermal image was taken at 21Vin, 1A load when the board reaches equilibrium.



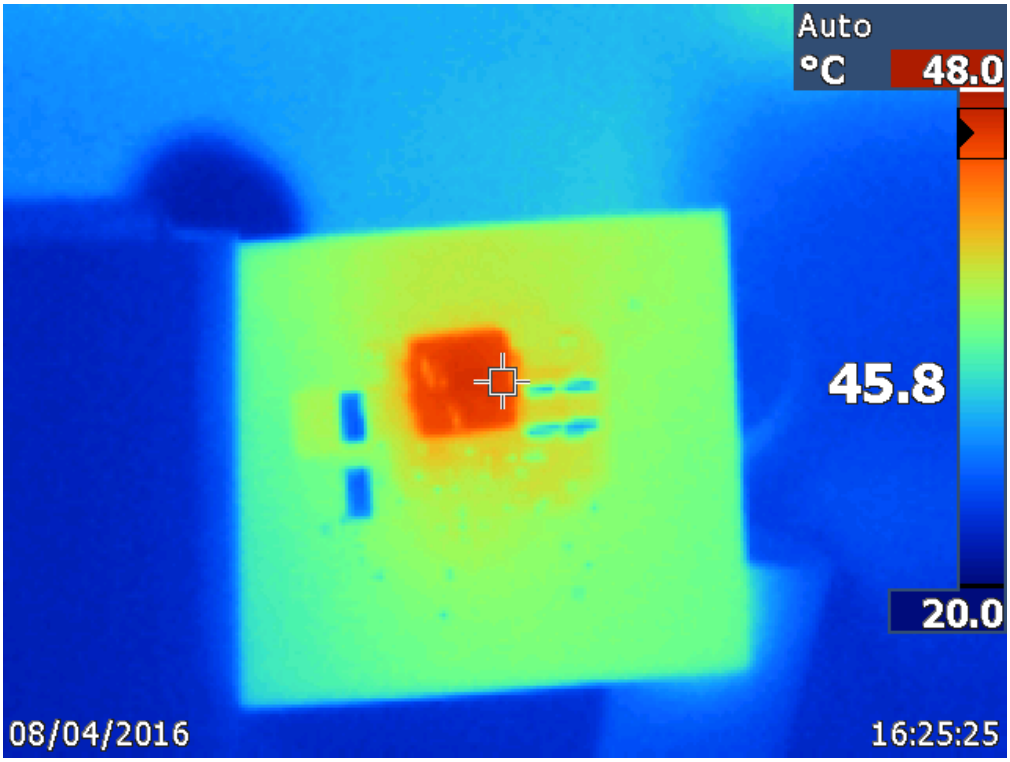
Thermal image was taken at 24Vin, 1A load when the board reaches equilibrium.



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



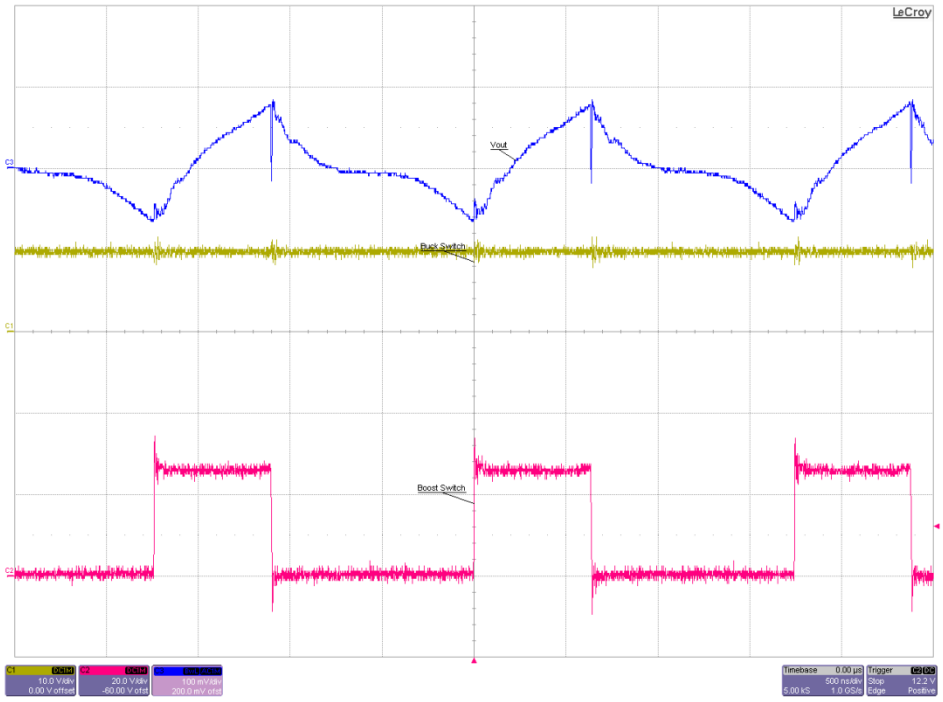
Thermal image was taken at 32Vin, 1A load when the board reaches equilibrium.



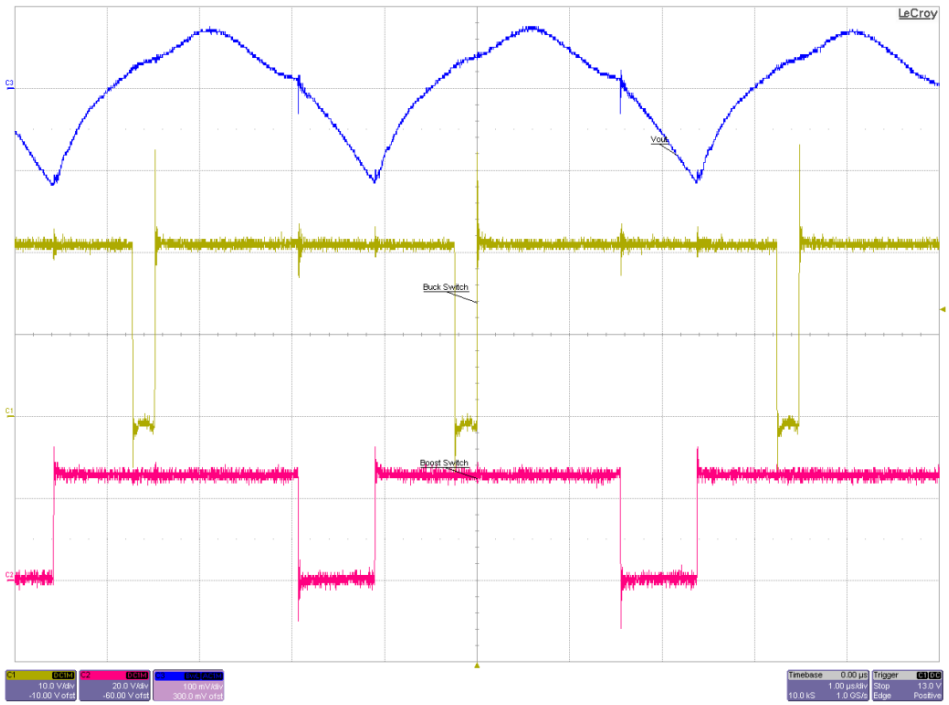
Thermal image was taken at 32Vin, 1A load when the board reaches equilibrium.

6 Waveform

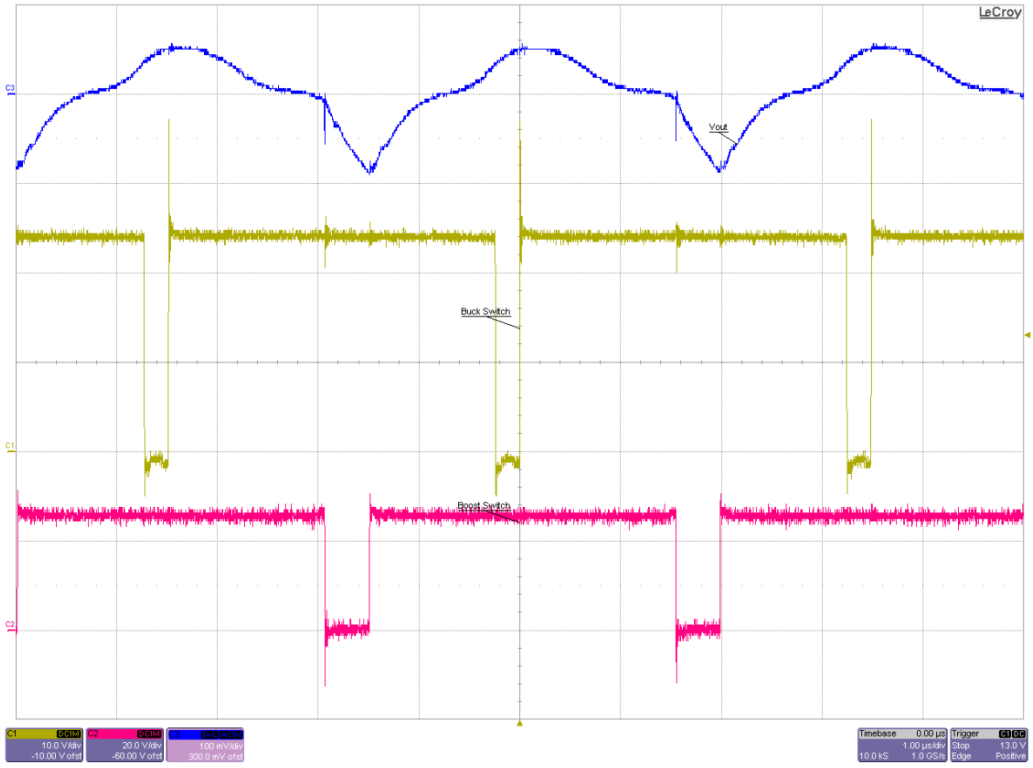
6.1 Switching and Ripple Waveform



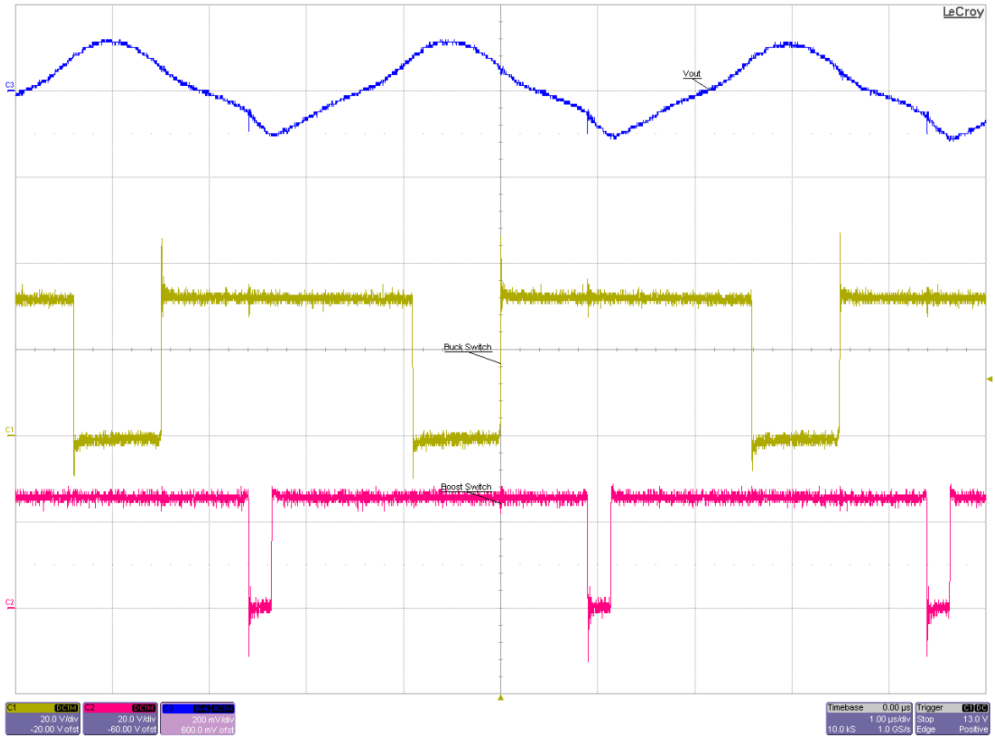
10Vin, 1A load. Ch1 measures buck switch, Ch2 measures boost switch, Ch3 measures output ripple.



21Vin, 1A load. Ch1 measures buck switch, Ch2 measures boost switch, Ch3 measures output ripple.

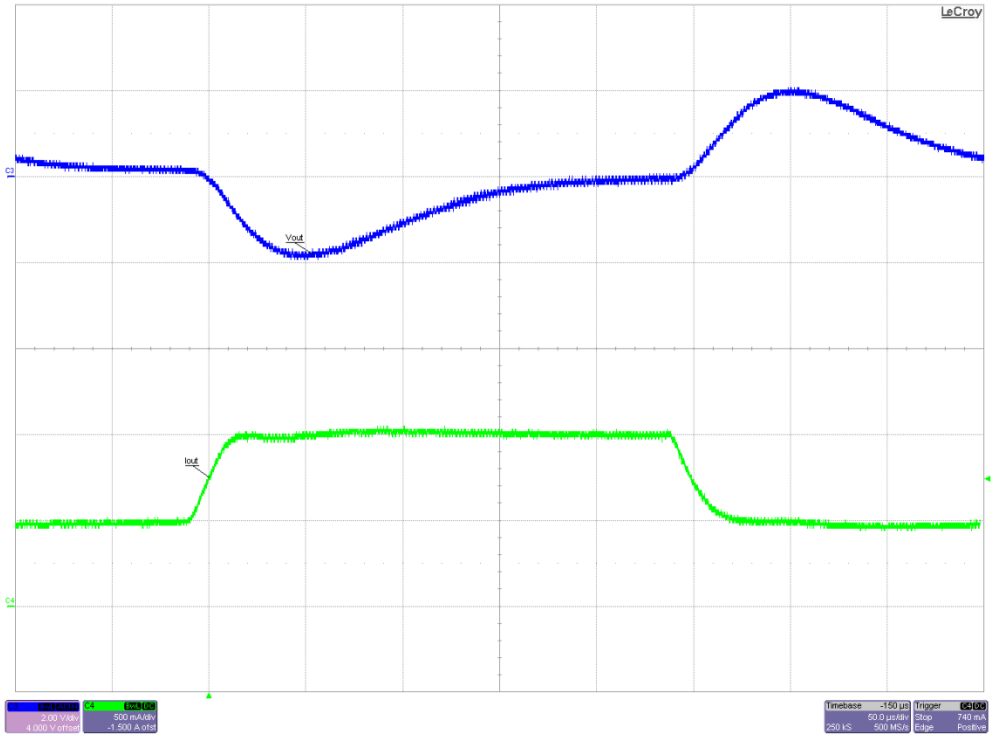


24Vin, 1A load. Ch1 measures buck switch, Ch2 measures boost switch, Ch3 measures output ripple.

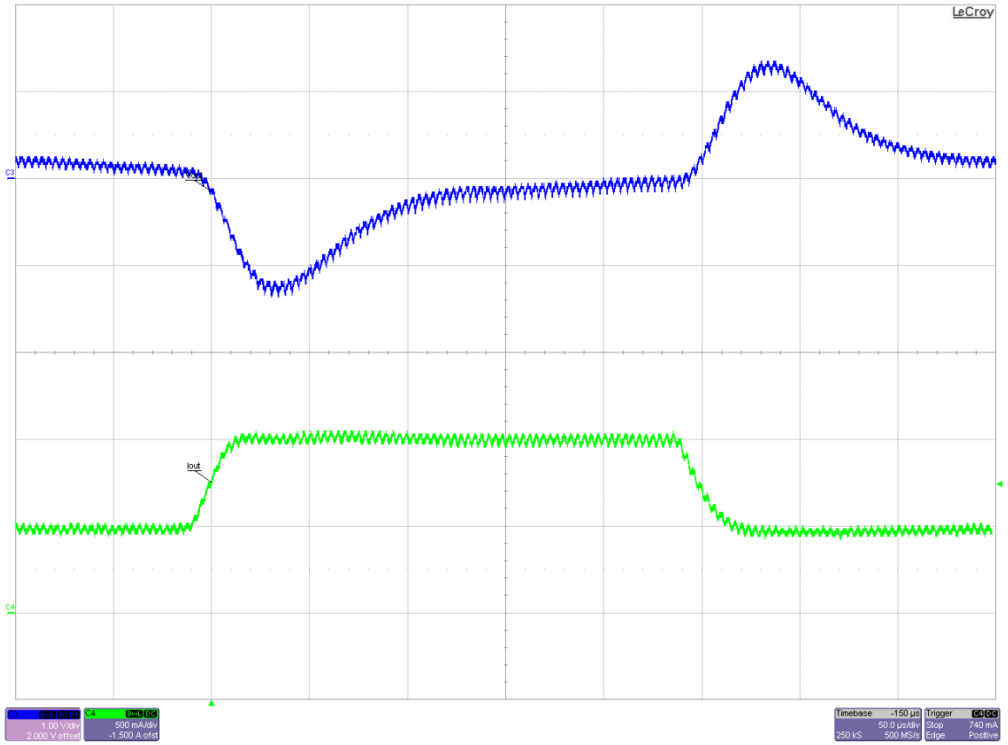


32Vin, 1A load. Ch1 measures buck switch, Ch2 measures boost switch, Ch3 measures output ripple.

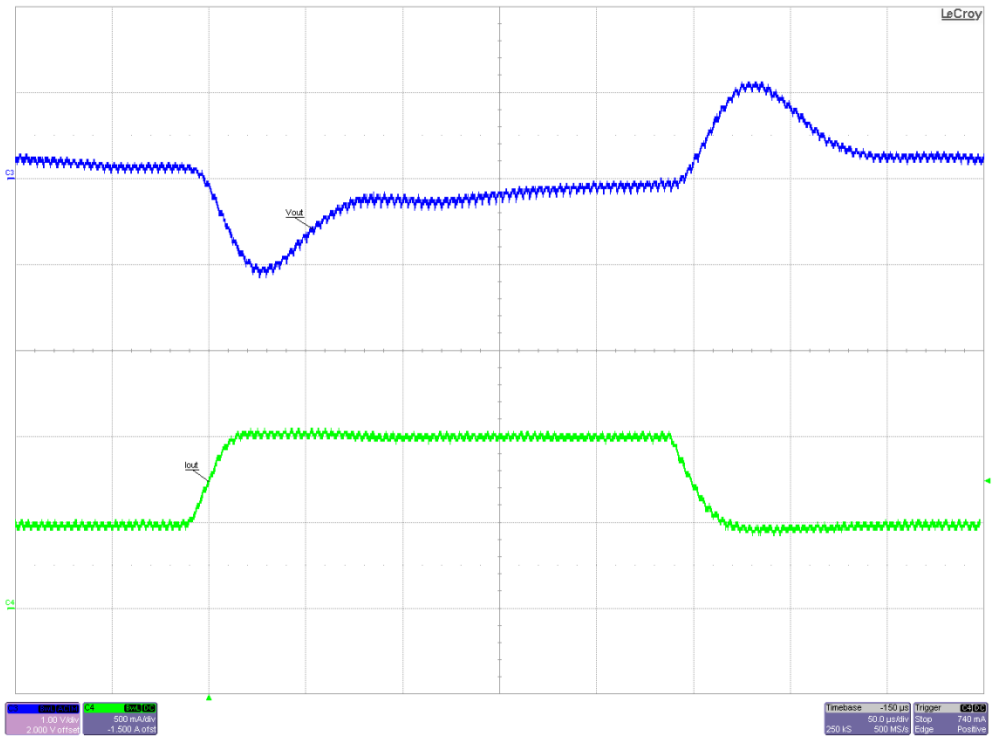
6.2 Load Transient



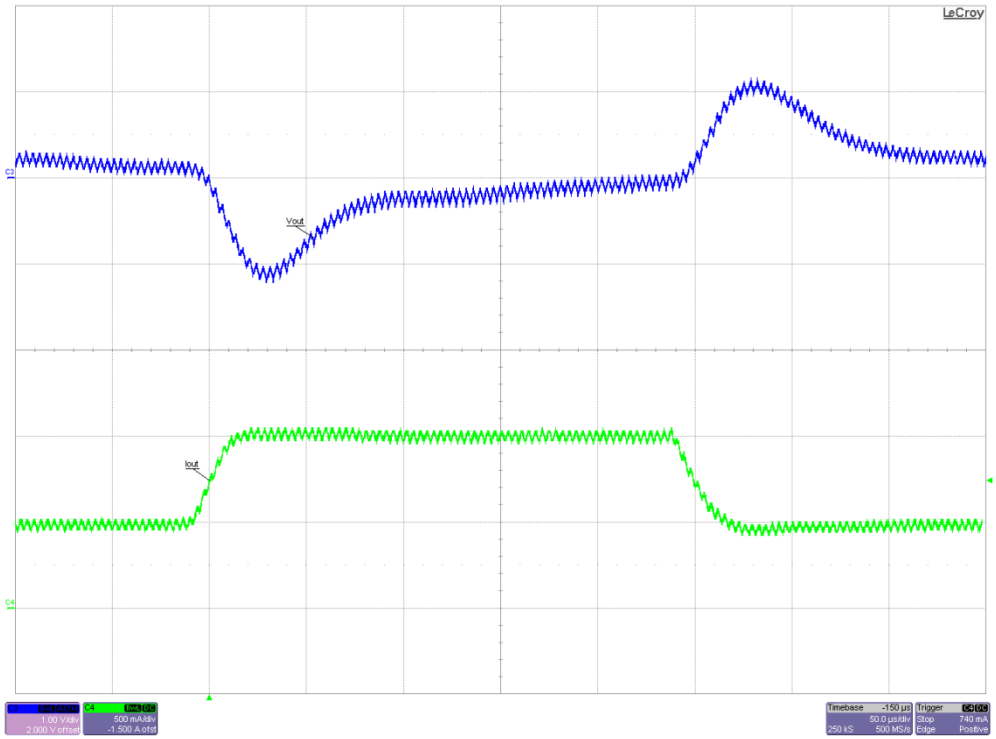
12Vin, 0.5A-1A load step. Ch3 measures output voltage, Ch4 measures load current.



21Vin, 0.5A-1A load step. Ch3 measures output voltage, Ch4 measures load current.

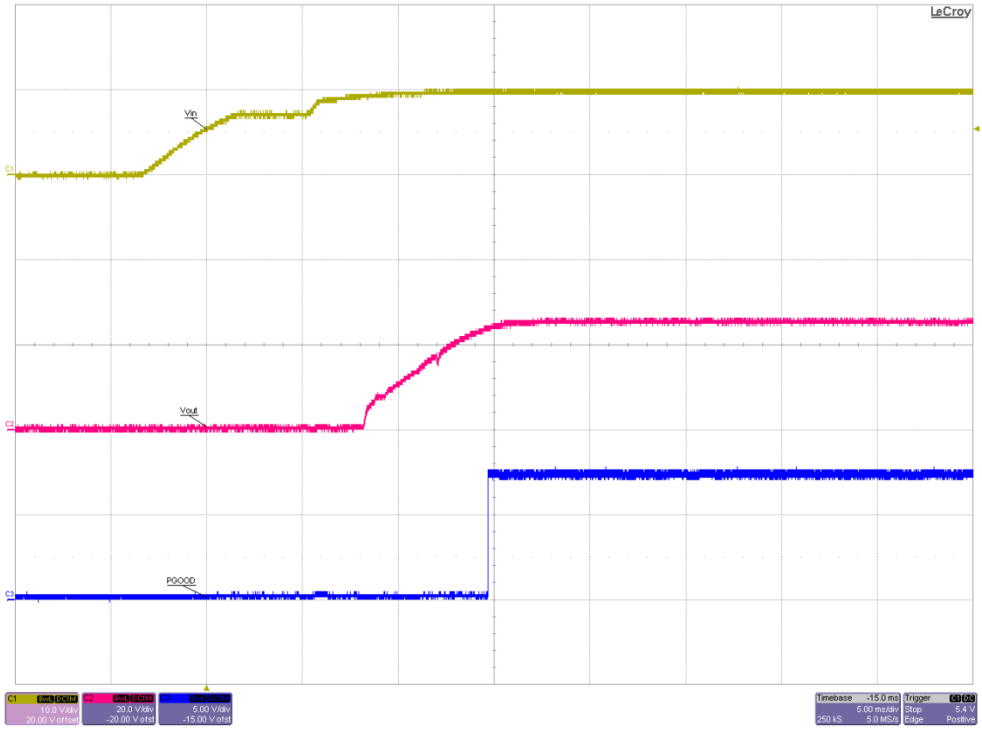


24Vin, 0.5A-1A load step. Ch3 measures output voltage, Ch4 measures load current.

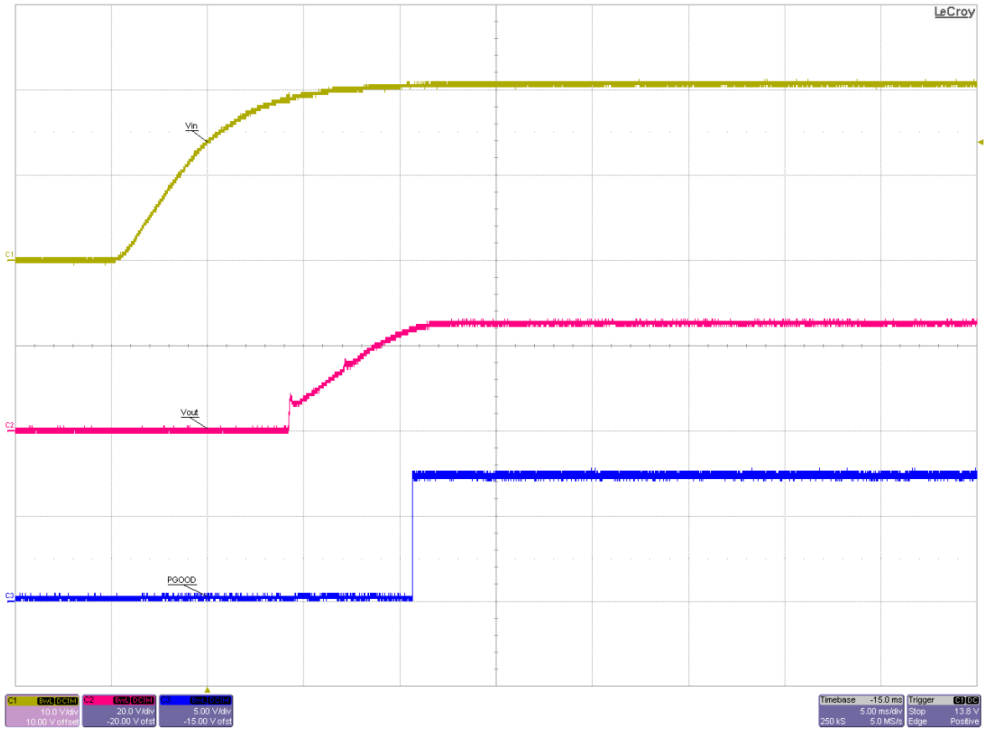


32Vin, 0.5A-1A load step. Ch3 measures output voltage, Ch4 measures load current.

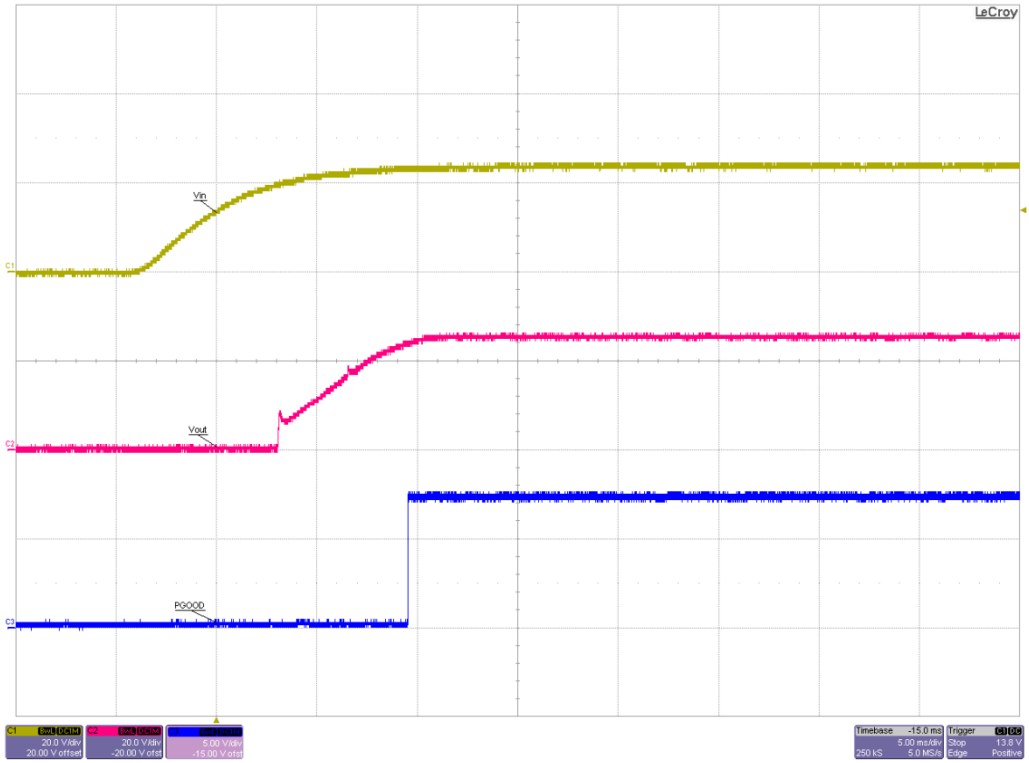
6.3 Start Up



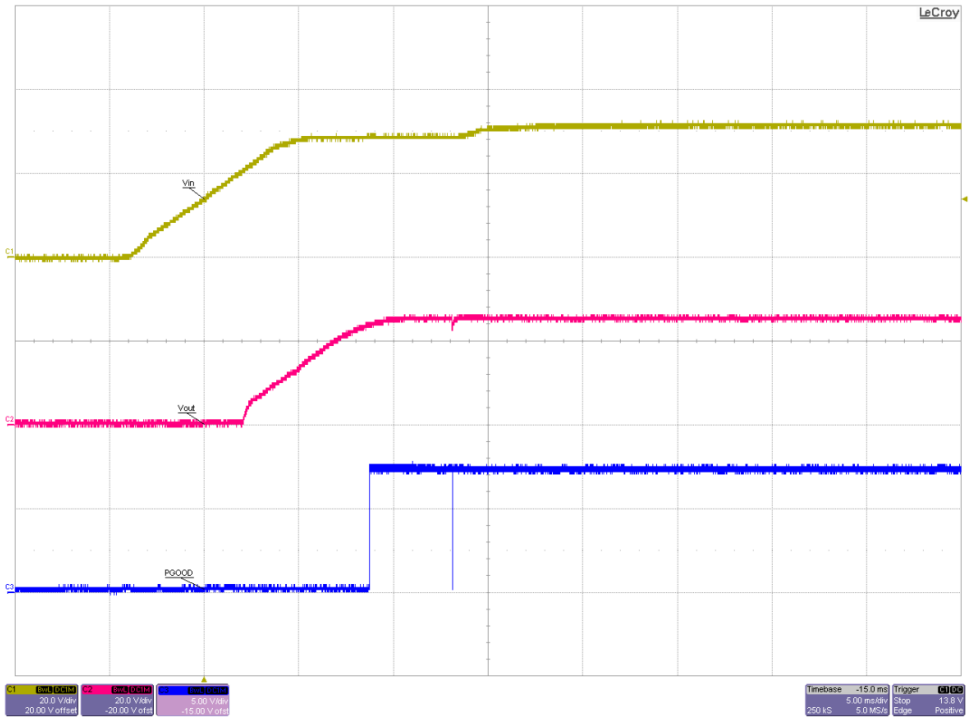
10Vin, 1A load. Ch1 measures input voltage, Ch2 measures output voltage, Ch3 measures PGOOD.



21Vin, 1A load. Ch1 measures input voltage, Ch2 measures output voltage, Ch3 measures PGOOD.

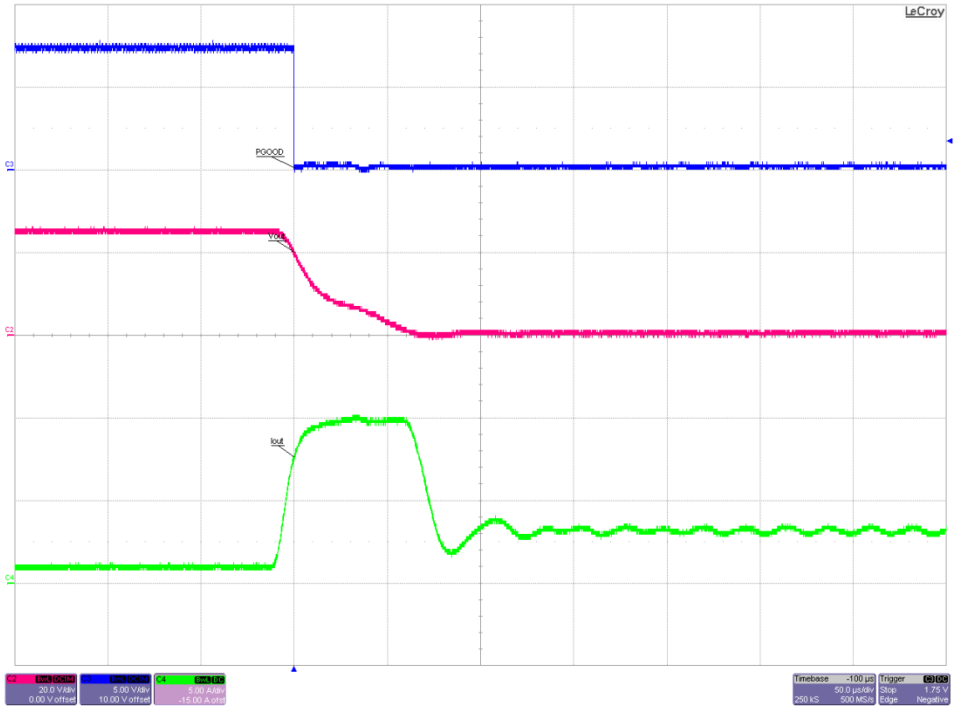


24Vin, 1A load. Ch1 measures input voltage, Ch2 measures output voltage, Ch3 measures PGOOD.

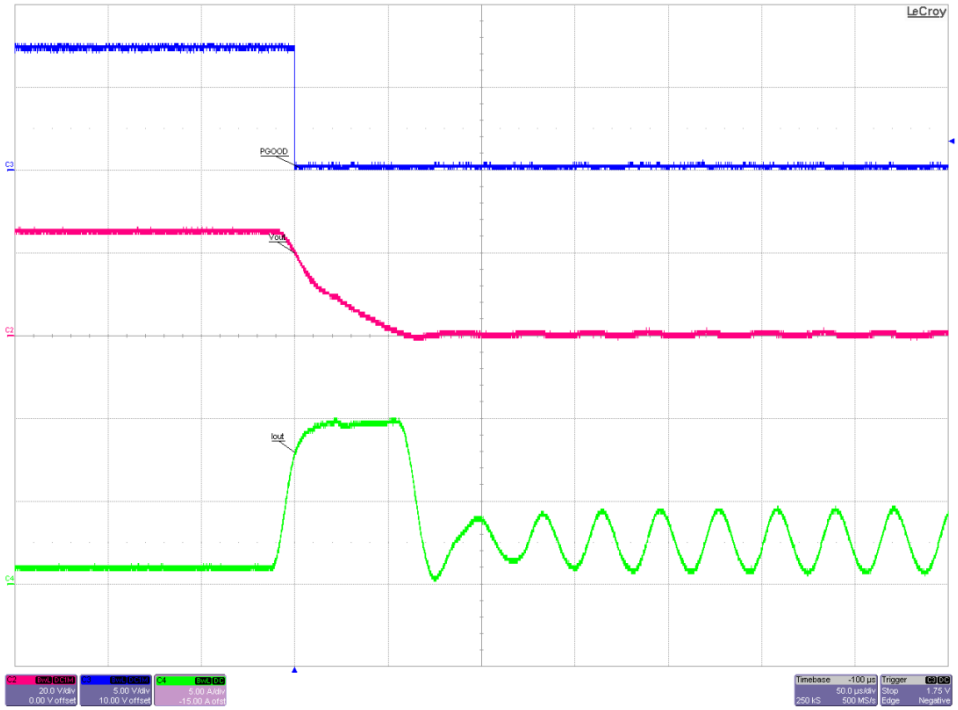


32Vin, 1A load. Ch1 measures input voltage, Ch2 measures output voltage, Ch3 measures PGOOD.

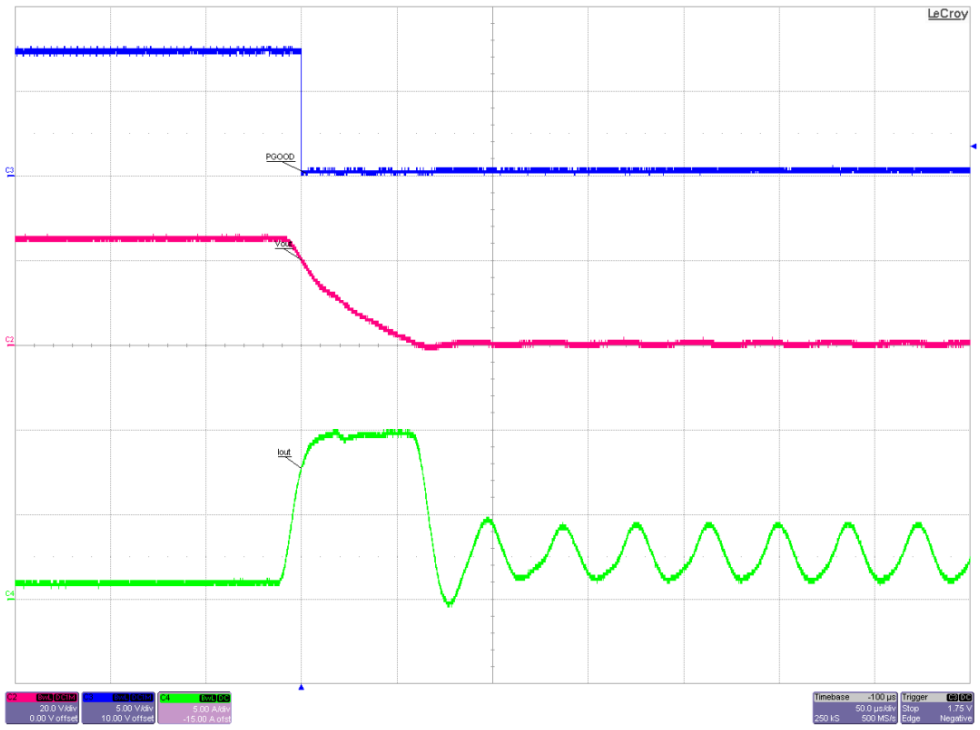
6.4 Short Circuit



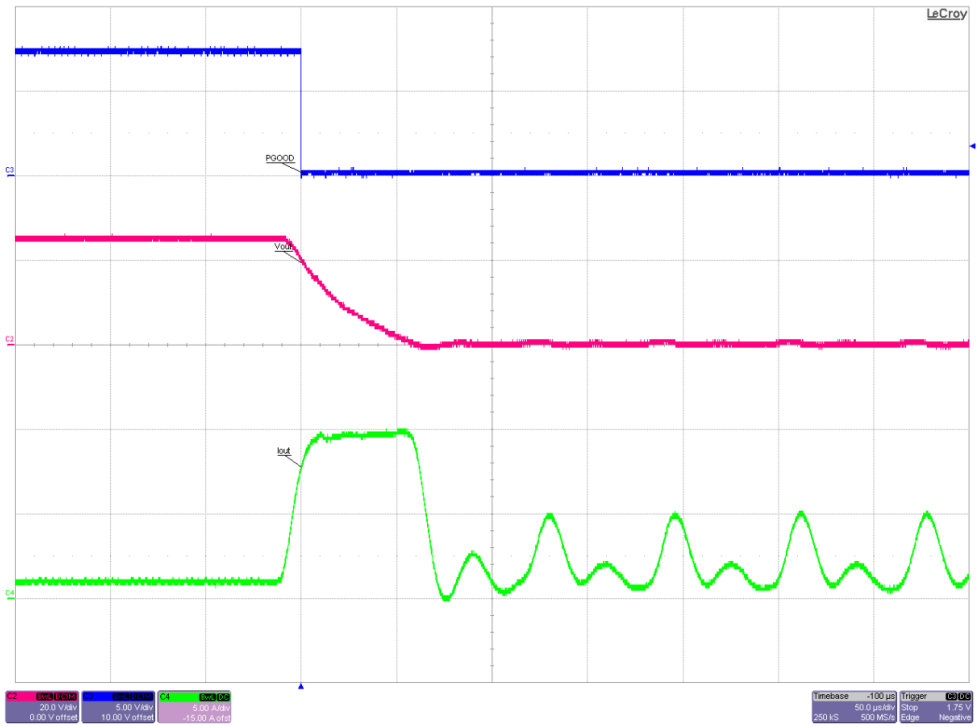
10Vin, 1A load short circuit. Ch3 measures PGOOD, Ch2 measures output voltage, Ch4 measures output current.



21Vin, 1A load short circuit. Ch3 measures PGOOD, Ch2 measures output voltage, Ch4 measures output current.

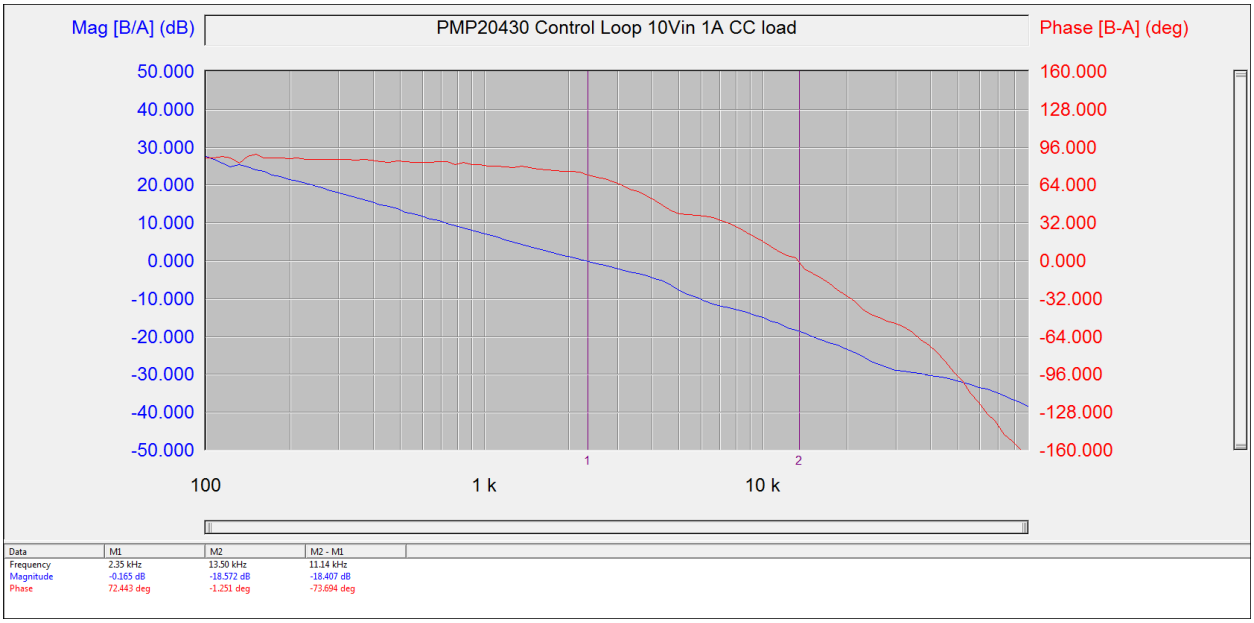


24Vin, 1A load short circuit. Ch3 measures PGOOD, Ch2 measures output voltage, Ch4 measures output current.

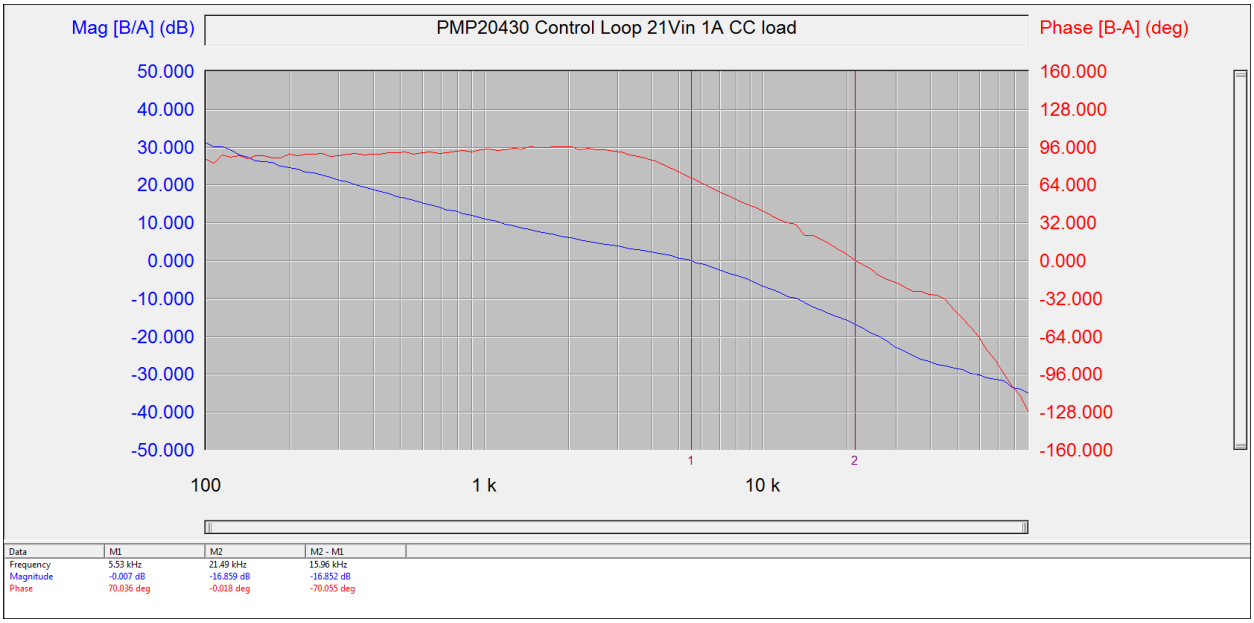


32Vin, 1A load short circuit. Ch3 measures PGOOD, Ch2 measures output voltage, Ch4 measures output current.

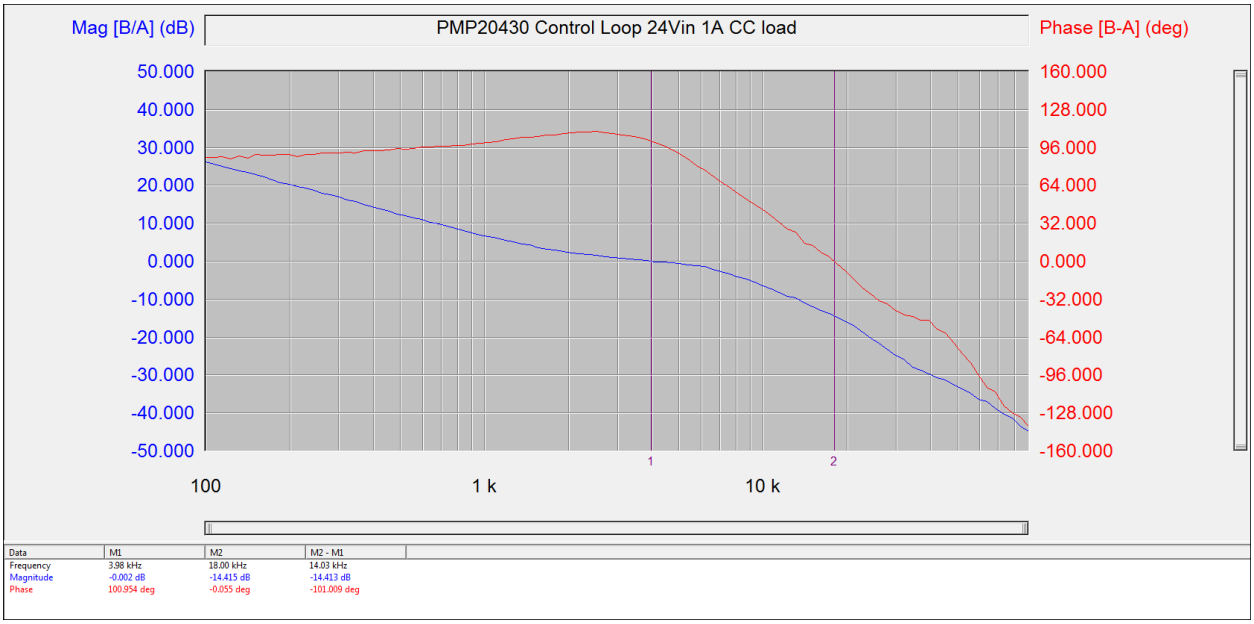
6.5 Bode Plot



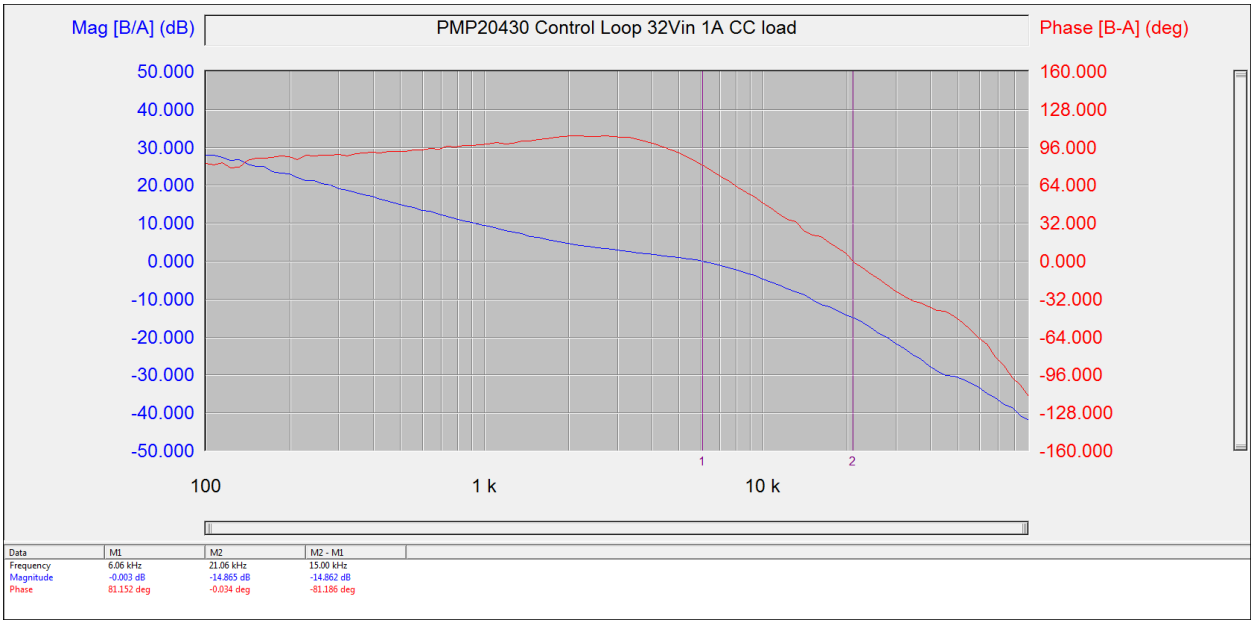
10Vin, 1A load bode plot, 72.4 degrees phase margin, and 18.6dB gain margin.



21Vin, 1A load bode plot, 70 degrees phase margin, and 16.9dB gain margin.



24Vin, 1A load bode plot, 100.9 degrees phase margin, and 14.4dB gain margin.



32Vin, 1A load bode plot, 81.1 degrees phase margin, and 14.9dB gain margin.

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