

**Test Data
For PMP20210
4/18/2016**



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1. Design Specifications

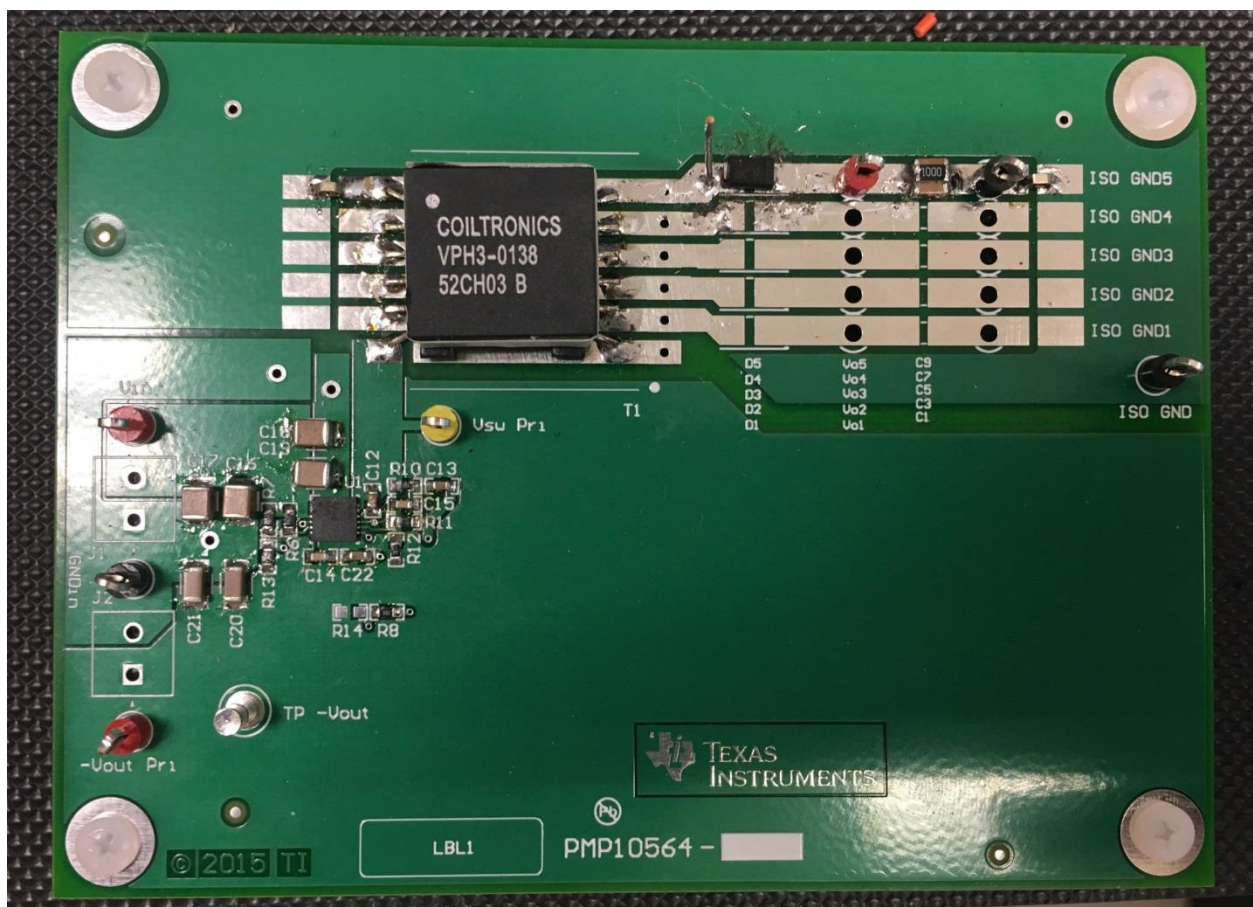
Vin Minimum	12VDC
Vin Maximum	56VDC
Vout	+3.3VDC @ 0.6A
Nominal Switching Frequency	≈ 200KHz

2. Circuit Description

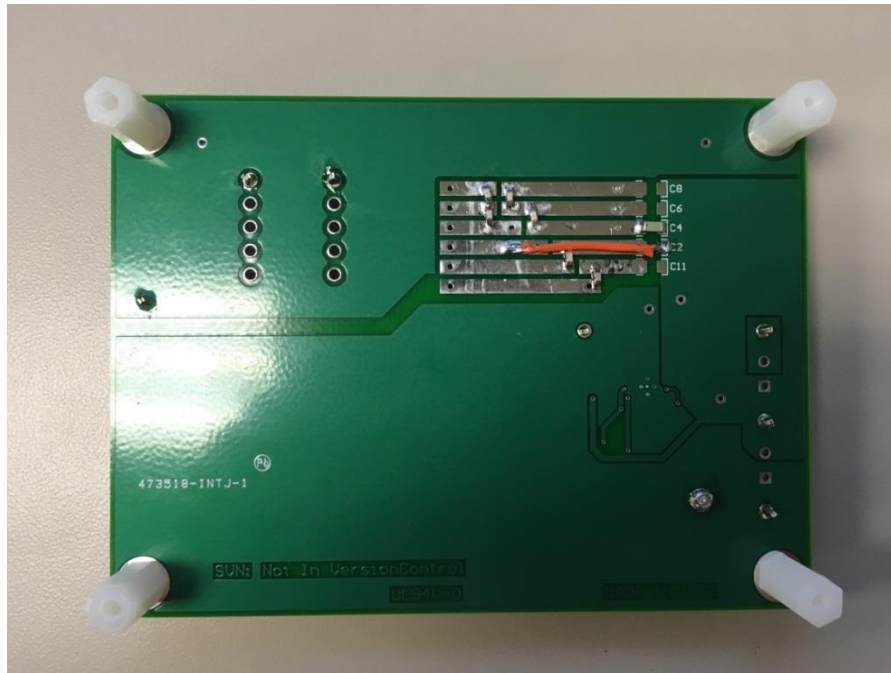
PMP20210 is an isolated Flybuck-boost converter utilizing the LM5160 for industrial applications. This design has a minimum operating input voltage of 12V and a maximum input voltage of 56V. The design is capable of sourcing 0.6A continuous current at 3.3Vout. Switching frequency is set to 200kHz. A VERSA-PAC transformer VPH3-0138-R is used for this design. PMP20210 is assembled on PMP10564 PCB.

3. PMP20210 Board Photos

Board Dimensions: 79mm x 107mm



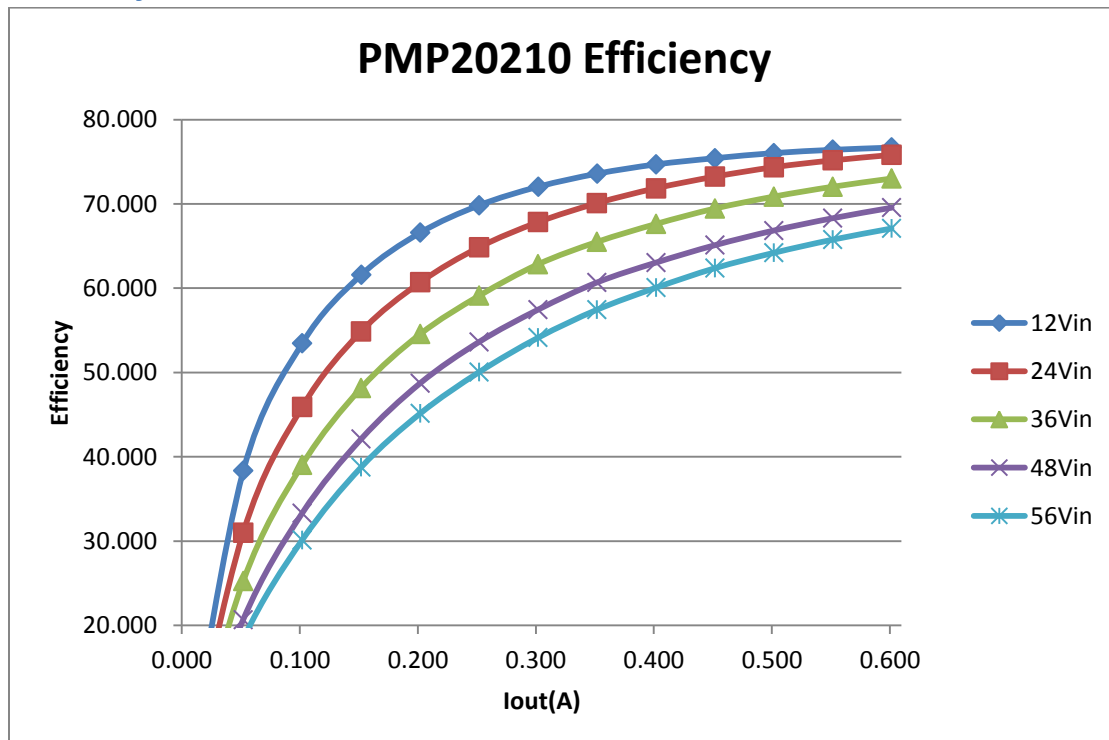
Board Photo (Top)



Board Photo (Bottom)

4. Efficiency

4.1 Efficiency Chart

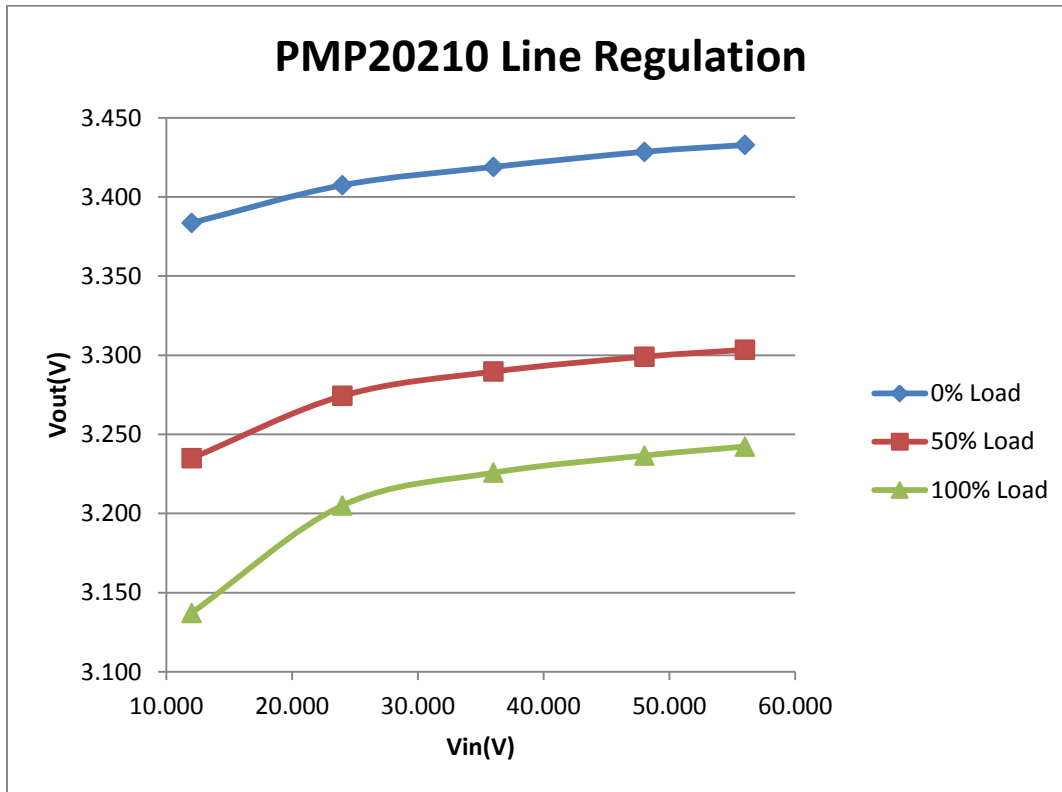


4.2 Efficiency Data

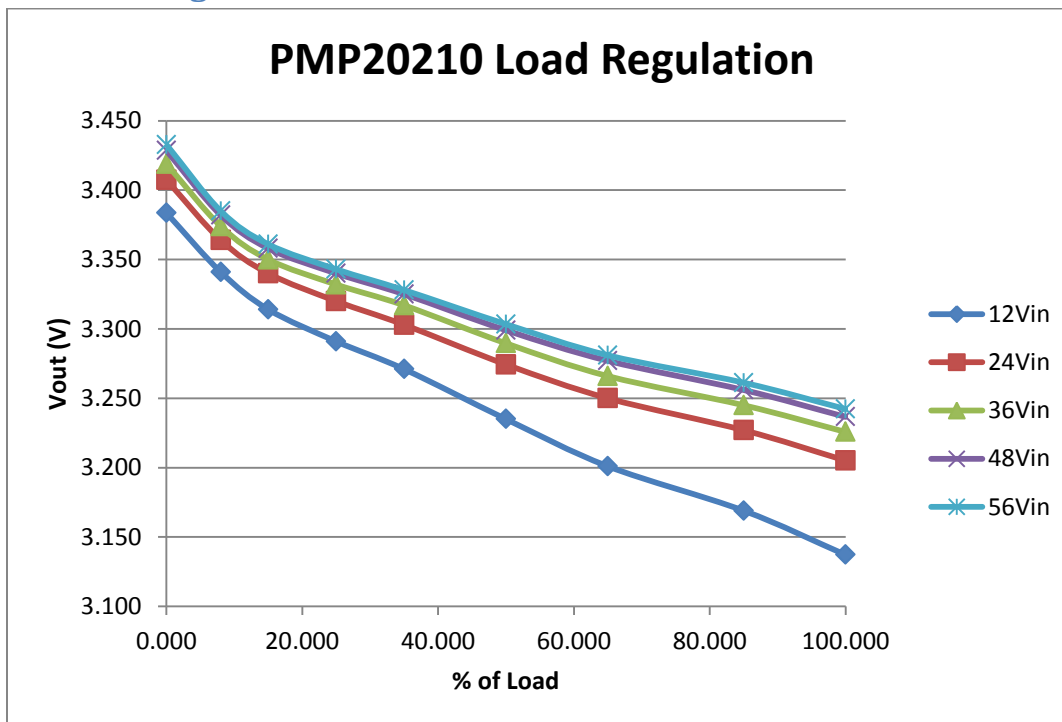
Vin(V)	Iin(A)	Vout(V)	Iout(A)	Pin(W)	Pout(W)	Losses(W)	Efficiency
12.005	0.022	3.384	0.000	0.268	0.000	0.268	0.000
12.005	0.038	3.341	0.052	0.454	0.174	0.280	38.358
12.005	0.053	3.314	0.102	0.633	0.338	0.294	53.475
12.005	0.068	3.291	0.152	0.813	0.501	0.312	61.590
12.005	0.083	3.271	0.202	0.993	0.661	0.332	66.594
12.005	0.098	3.253	0.252	1.174	0.820	0.354	69.846
12.005	0.113	3.235	0.302	1.357	0.977	0.379	72.041
12.005	0.128	3.218	0.352	1.539	1.133	0.407	73.587
12.005	0.143	3.201	0.402	1.723	1.287	0.436	74.690
12.005	0.159	3.185	0.452	1.908	1.439	0.469	75.425
12.005	0.174	3.169	0.502	2.091	1.590	0.501	76.031
12.005	0.190	3.153	0.552	2.276	1.739	0.537	76.421
12.005	0.205	3.137	0.602	2.461	1.887	0.574	76.688
24.013	0.016	3.407	0.000	0.379	0.000	0.379	0.000
24.013	0.024	3.364	0.052	0.564	0.175	0.389	31.002
24.013	0.031	3.340	0.102	0.742	0.341	0.401	45.910
24.013	0.038	3.320	0.152	0.920	0.505	0.415	54.875
24.013	0.046	3.303	0.202	1.100	0.668	0.432	60.703
24.013	0.053	3.288	0.252	1.278	0.829	0.449	64.862
24.013	0.061	3.274	0.302	1.458	0.989	0.469	67.842
24.013	0.068	3.262	0.352	1.638	1.148	0.490	70.092
24.013	0.076	3.250	0.402	1.818	1.306	0.512	71.861
24.013	0.083	3.239	0.452	1.998	1.463	0.535	73.241
24.013	0.091	3.227	0.502	2.178	1.620	0.558	74.359
24.013	0.098	3.216	0.552	2.361	1.774	0.586	75.170
24.013	0.106	3.205	0.602	2.543	1.928	0.615	75.812
36.010	0.014	3.419	0.000	0.511	0.000	0.511	0.000
36.010	0.019	3.374	0.052	0.695	0.175	0.520	25.247
36.010	0.024	3.350	0.102	0.875	0.342	0.533	39.054
36.010	0.029	3.332	0.152	1.052	0.506	0.545	48.167
36.011	0.034	3.317	0.202	1.228	0.670	0.558	54.557
36.010	0.039	3.303	0.252	1.408	0.832	0.576	59.108
36.011	0.044	3.290	0.302	1.581	0.993	0.587	62.844
36.010	0.049	3.277	0.352	1.761	1.153	0.608	65.496
36.010	0.054	3.266	0.402	1.941	1.313	0.628	67.624
36.011	0.059	3.255	0.452	2.117	1.471	0.647	69.452

36.010	0.064	3.245	0.502	2.297	1.628	0.669	70.871
36.010	0.069	3.235	0.552	2.478	1.785	0.693	72.041
36.010	0.074	3.226	0.602	2.658	1.940	0.717	73.010
48.018	0.014	3.428	0.000	0.663	0.000	0.663	0.000
48.018	0.018	3.382	0.052	0.850	0.176	0.674	20.690
48.018	0.021	3.358	0.102	1.028	0.342	0.685	33.296
48.017	0.025	3.340	0.152	1.205	0.508	0.698	42.119
48.018	0.029	3.325	0.202	1.378	0.672	0.707	48.732
48.018	0.032	3.311	0.252	1.556	0.834	0.721	53.636
48.018	0.036	3.299	0.302	1.733	0.996	0.737	57.457
48.018	0.040	3.288	0.352	1.906	1.157	0.749	60.687
48.018	0.043	3.277	0.402	2.089	1.317	0.772	63.045
48.018	0.047	3.266	0.452	2.266	1.476	0.791	65.106
48.018	0.051	3.256	0.502	2.444	1.634	0.810	66.849
48.018	0.055	3.246	0.552	2.622	1.791	0.831	68.308
48.018	0.058	3.237	0.602	2.799	1.947	0.852	69.555
56.014	0.014	3.433	0.000	0.773	0.000	0.773	0.000
56.014	0.017	3.385	0.052	0.958	0.176	0.782	18.376
56.014	0.020	3.361	0.102	1.137	0.342	0.795	30.119
56.014	0.023	3.343	0.152	1.311	0.508	0.803	38.770
56.014	0.027	3.328	0.202	1.490	0.673	0.817	45.147
56.014	0.030	3.315	0.252	1.669	0.835	0.834	50.052
56.013	0.033	3.303	0.302	1.843	0.998	0.845	54.136
56.014	0.036	3.292	0.352	2.016	1.158	0.858	57.451
56.014	0.039	3.281	0.402	2.196	1.319	0.877	60.062
56.014	0.042	3.271	0.452	2.369	1.478	0.891	62.376
56.014	0.045	3.261	0.502	2.549	1.636	0.912	64.198
56.013	0.049	3.252	0.552	2.728	1.794	0.934	65.764
56.014	0.052	3.242	0.602	2.907	1.950	0.957	67.086

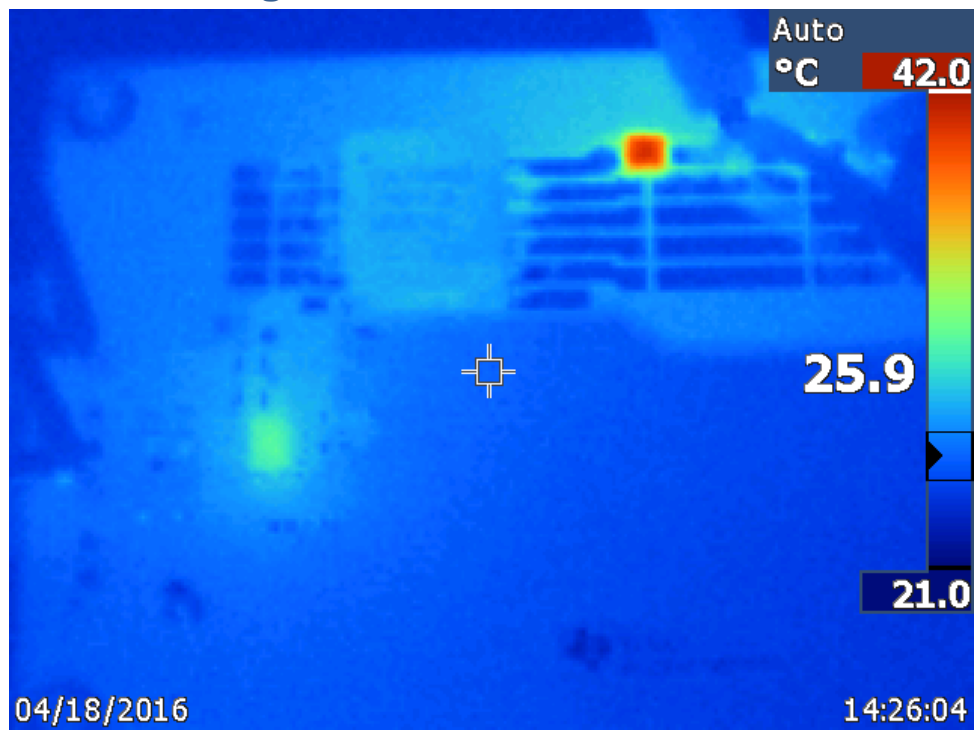
4.3 Line Regulation



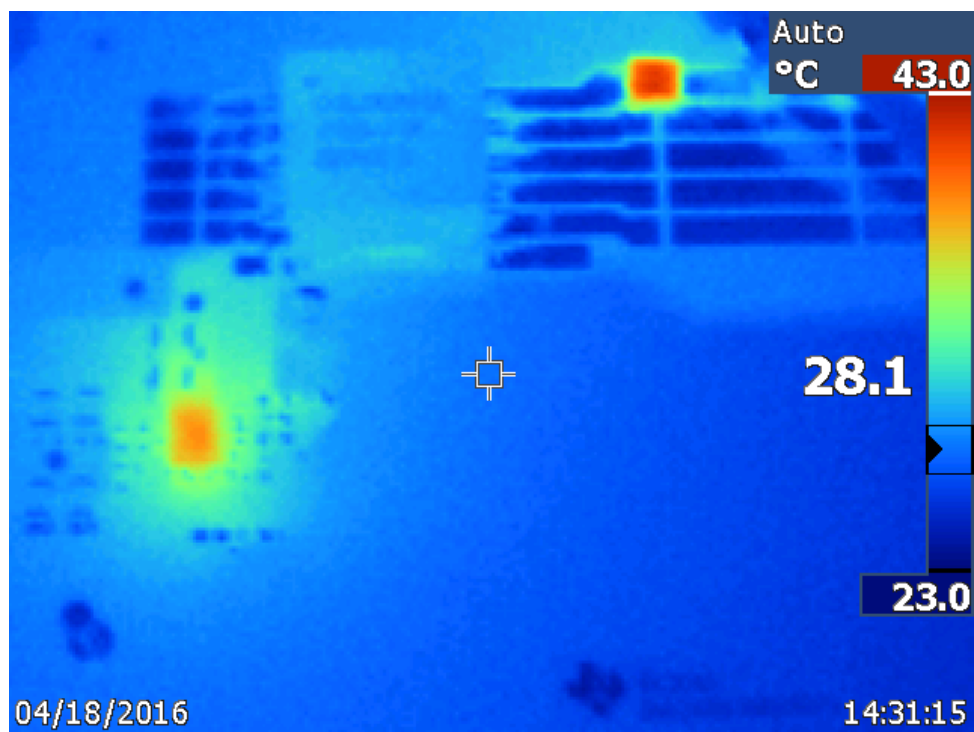
4.4 Load Regulation



5 Thermal Images



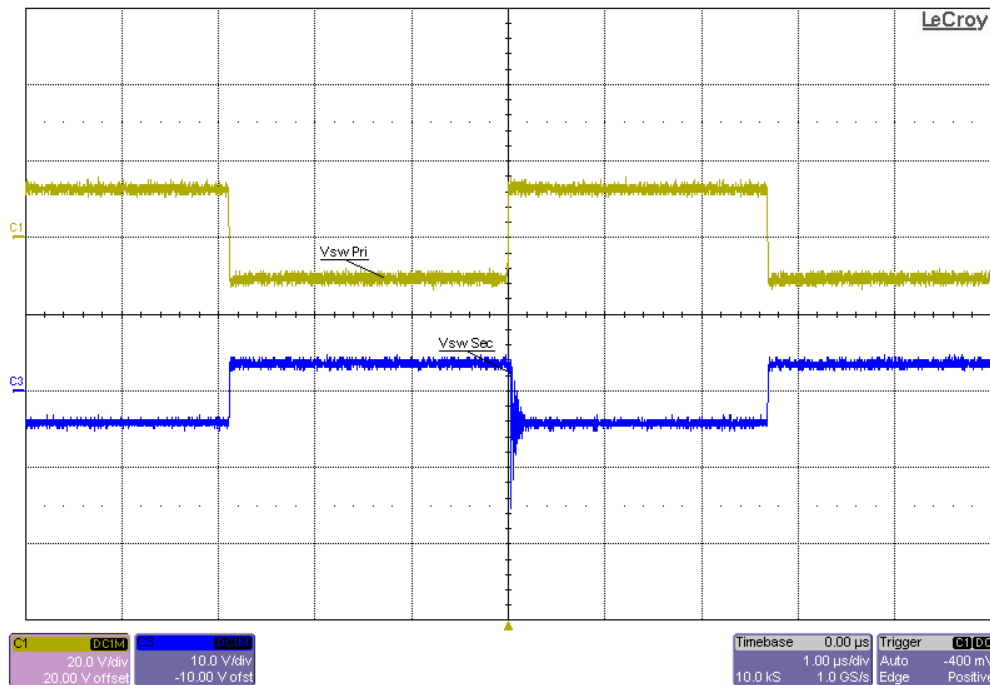
Thermal image was taken at 24Vin, 0.6A load when the board reaches equilibrium without airflow.



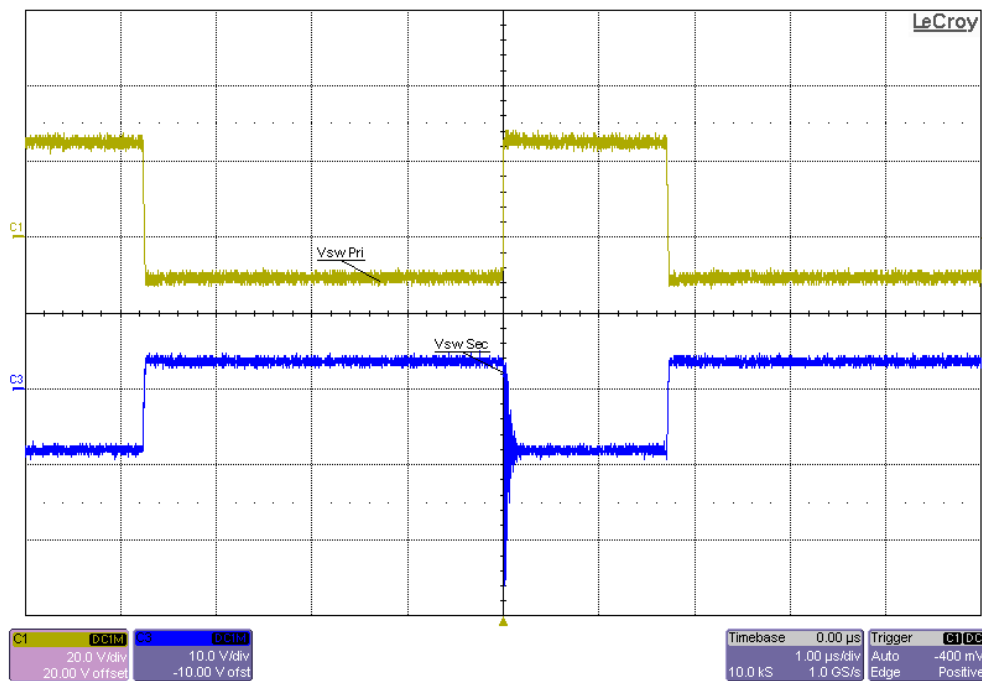
Thermal image was taken at 48Vin, 0.6A load when the board reaches equilibrium without airflow.

6 Waveform

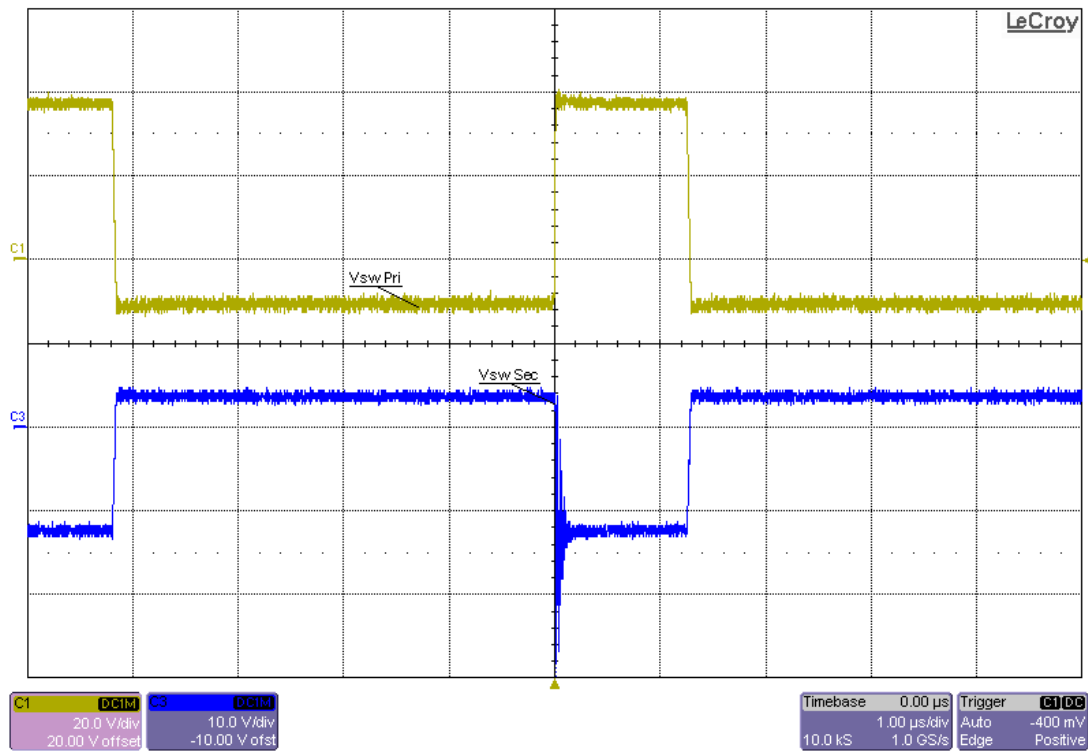
6.1 Switching Waveform



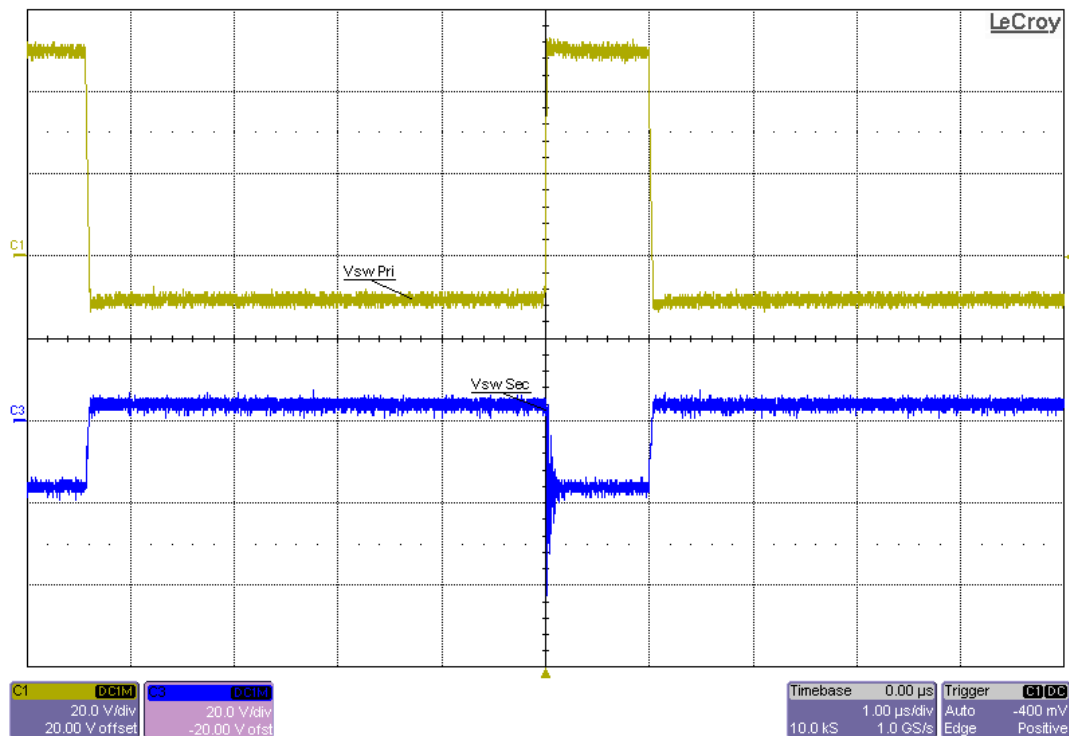
12Vin, 0.6A load. Ch1 measures primary switch, Ch3 measures secondary switch.



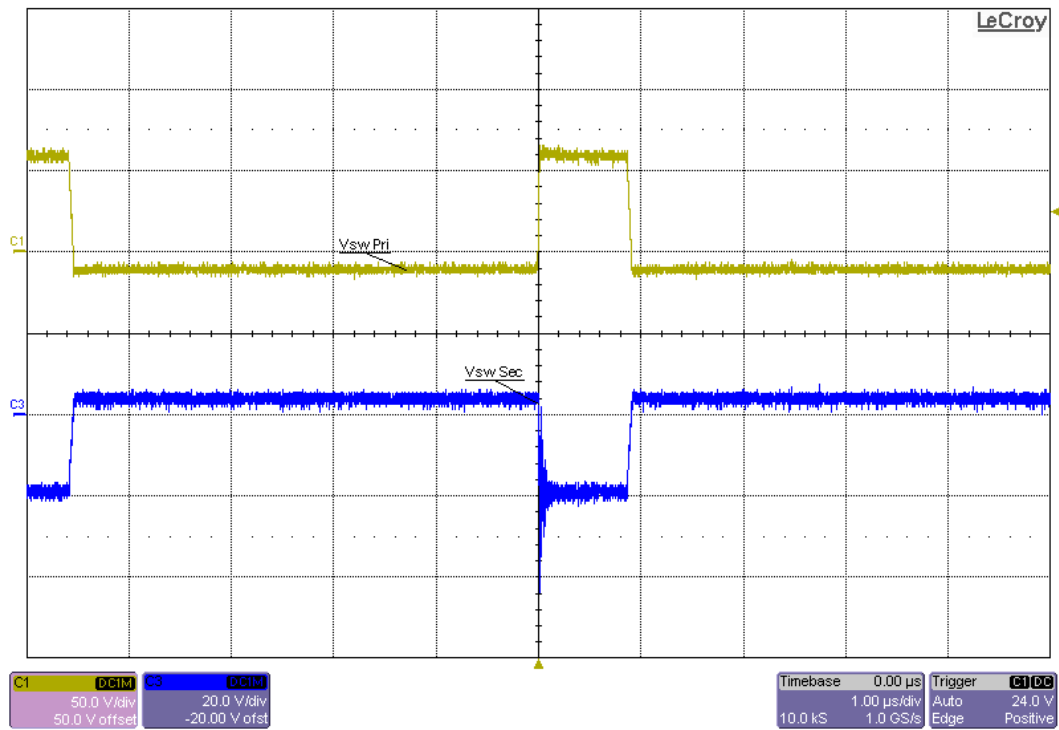
24Vin, 0.6A load. Ch1 measures primary switch, Ch3 measures secondary switch.



36Vin, 0.6A load. Ch1 measures primary switch, Ch3 measures secondary switch.

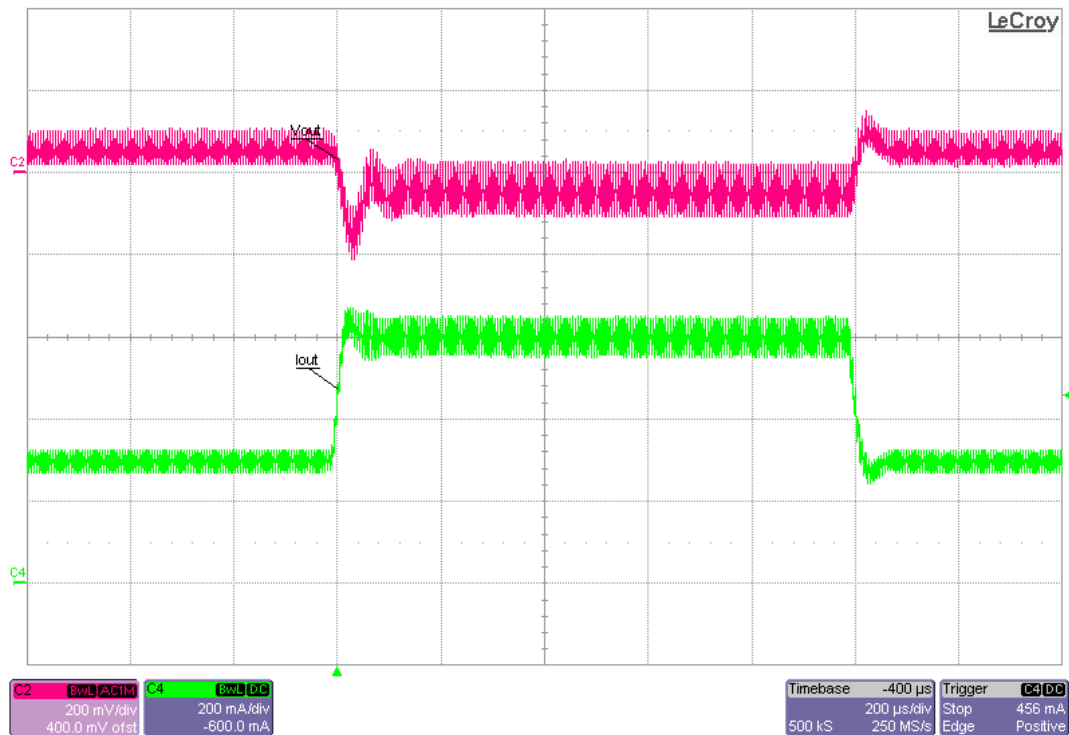


48Vin, 0.6A load. Ch1 measures primary switch, Ch3 measures secondary switch.

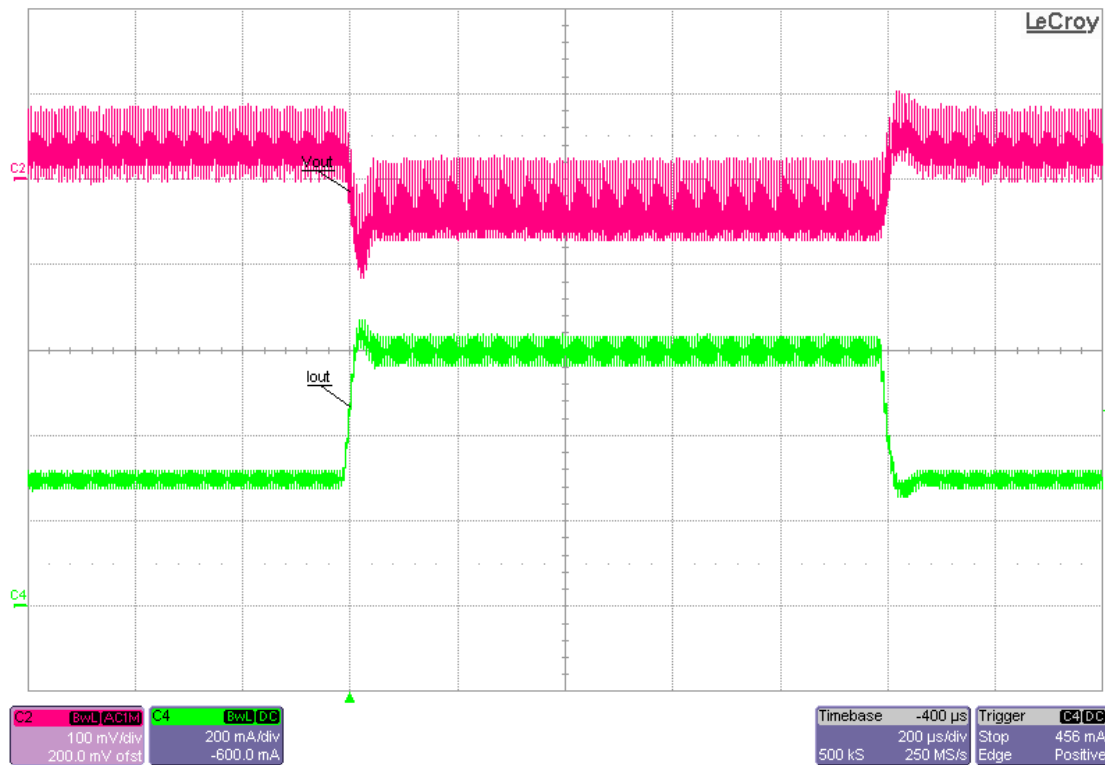


56Vin, 0.6A load. Ch1 measures primary switch, Ch3 measures secondary switch.

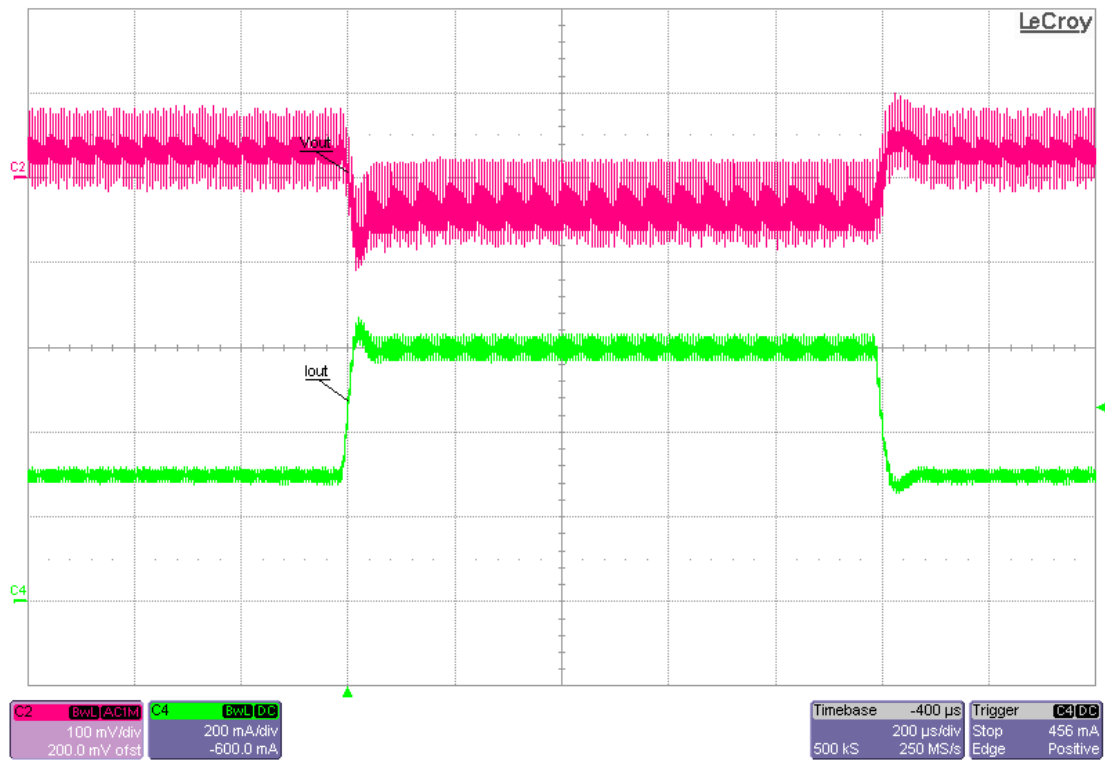
6.2 Load Transient



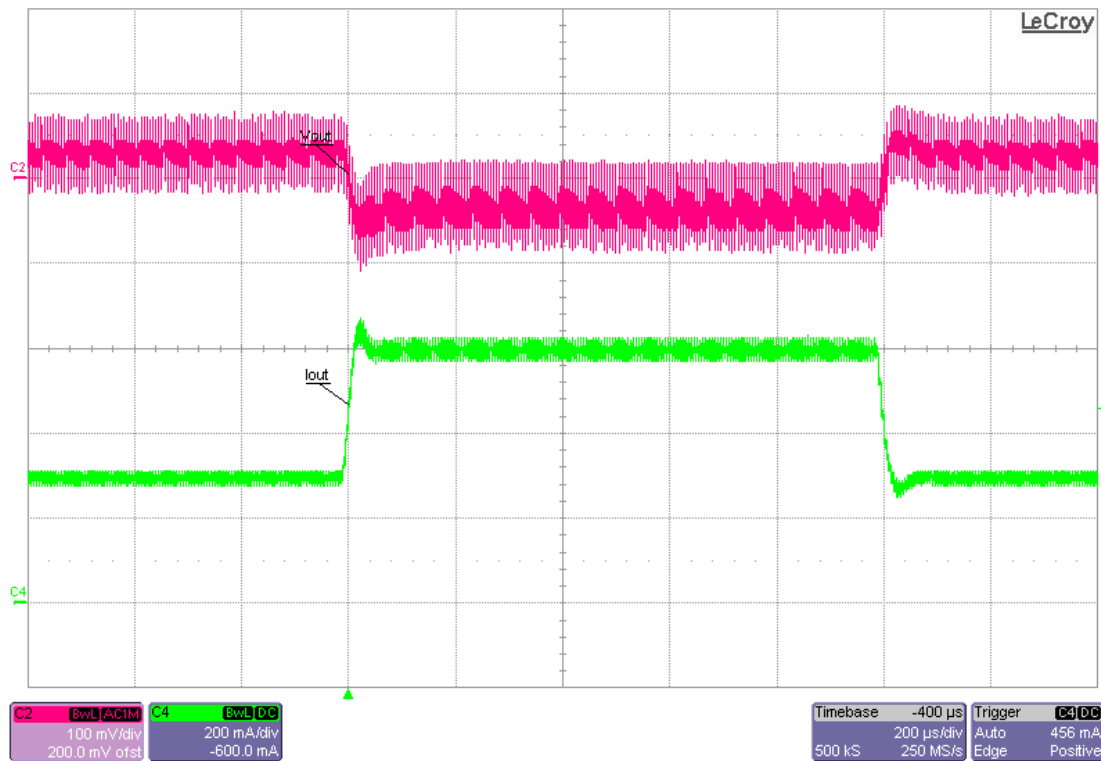
12Vin, 0.3A to 0.6A load transient. Ch2 measures output voltage, Ch4 measures output current.



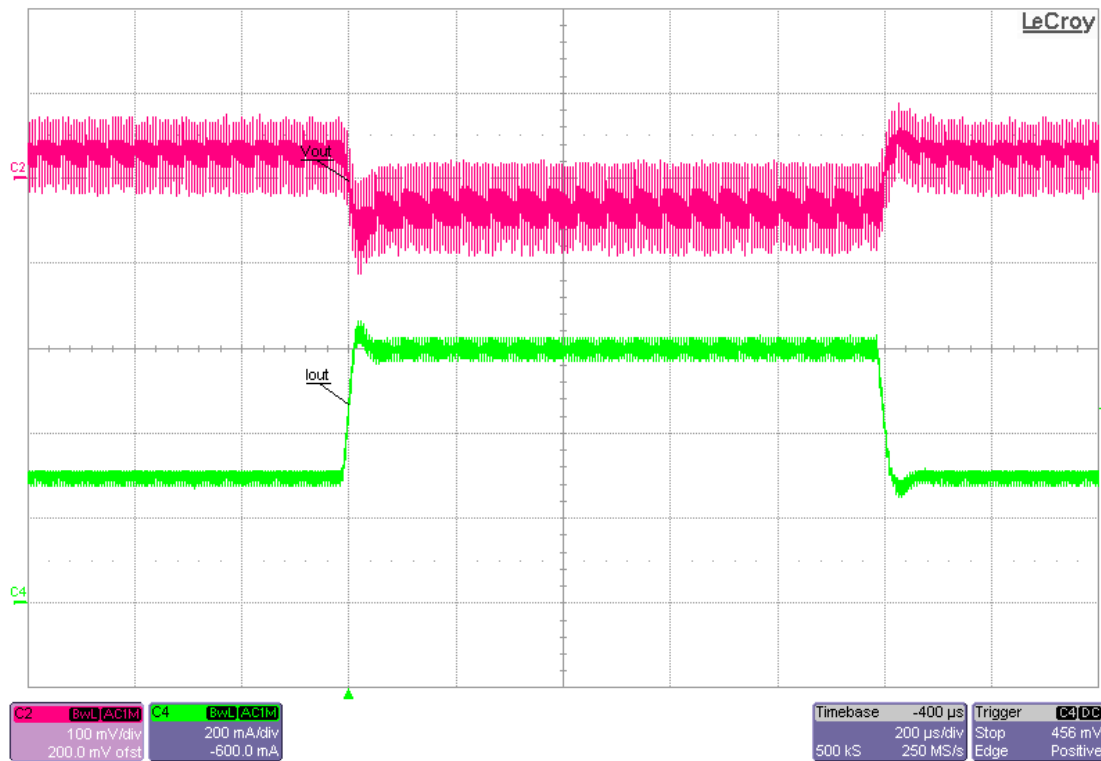
24Vin, 0.3A to 0.6A load transient. Ch2 measures output voltage, Ch4 measures output current.



36Vin, 0.3A to 0.6A load transient. Ch2 measures output voltage, Ch4 measures output current.

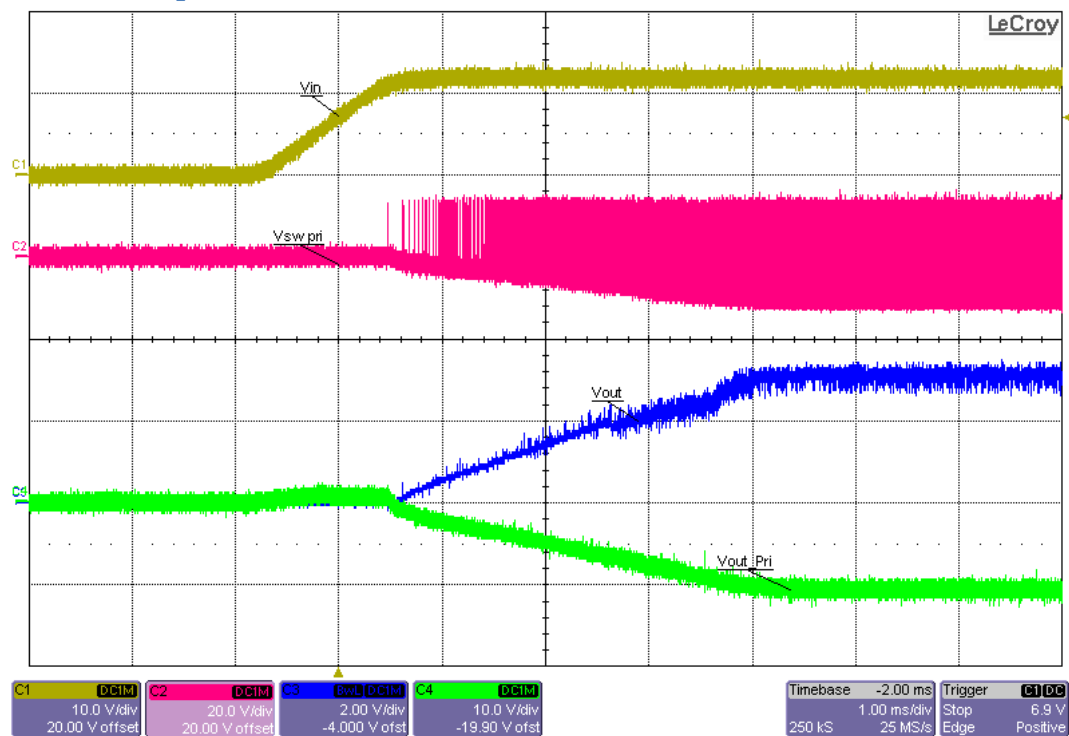


48Vin, 0.3A to 0.6A load transient. Ch2 measures output voltage, Ch4 measures output current.

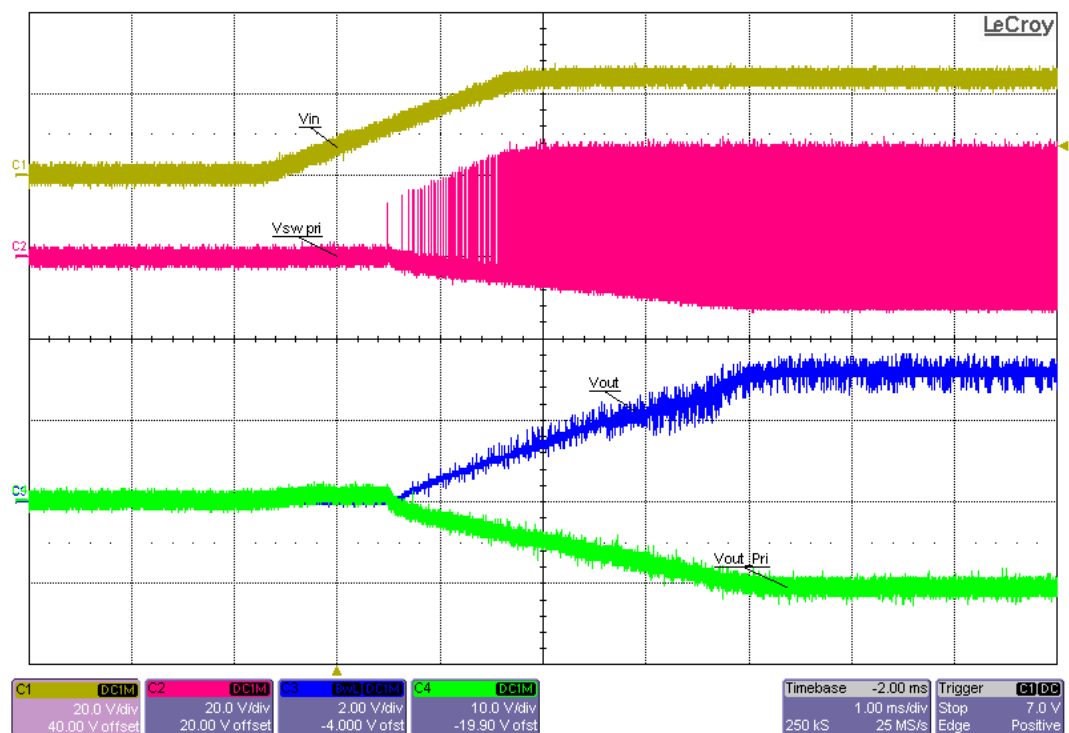


56Vin, 0.3A to 0.6A load transient. Ch2 measures output voltage, Ch4 measures output current.

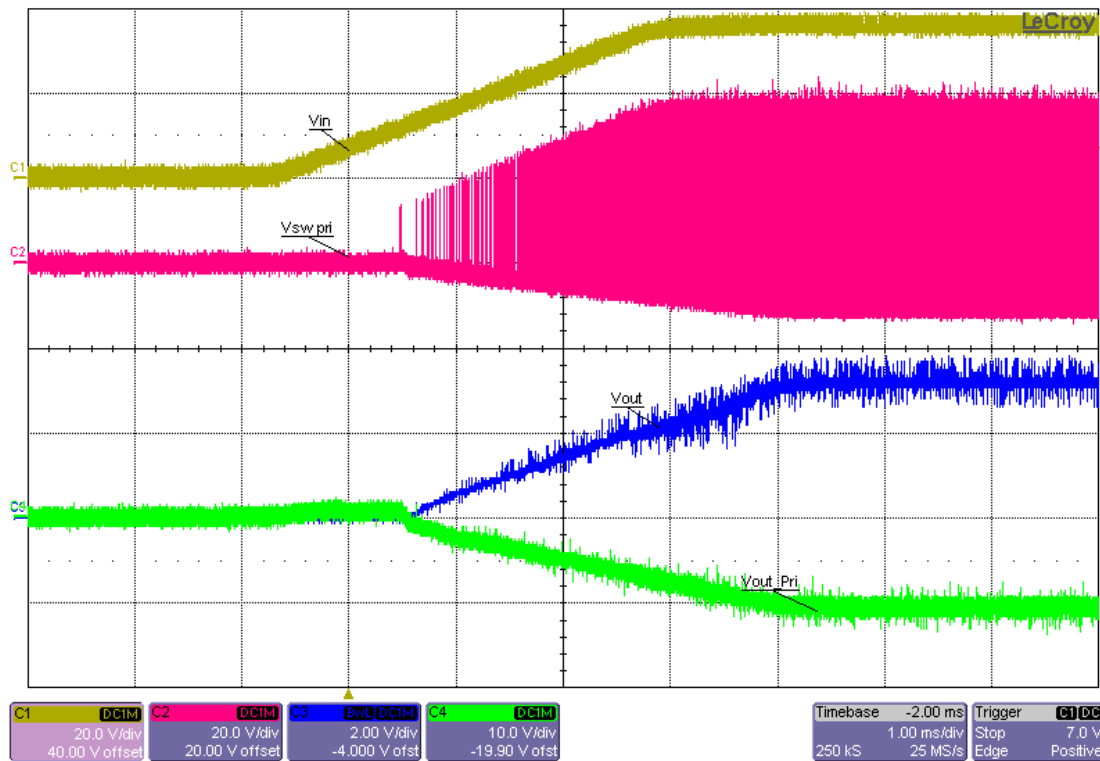
6.3 Start-Up



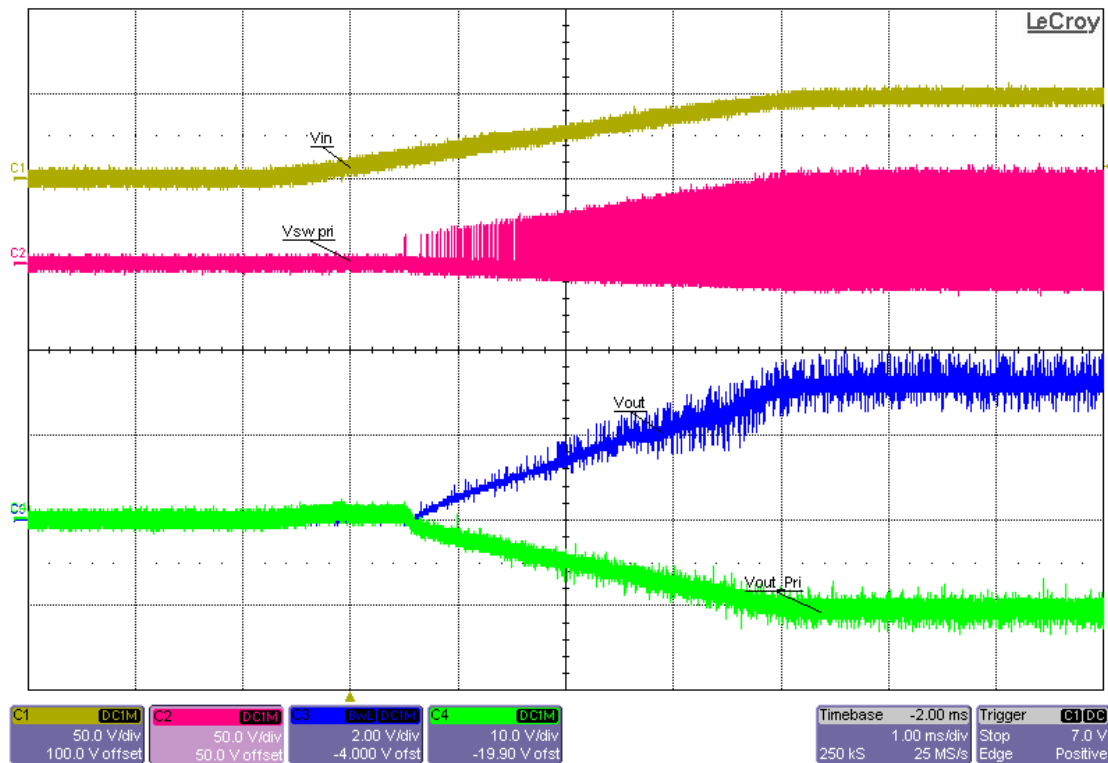
12Vin, 0.6A load. Ch1-Vin, Ch2-Vsw Primary, Ch3-Vout, Ch4-primary output.



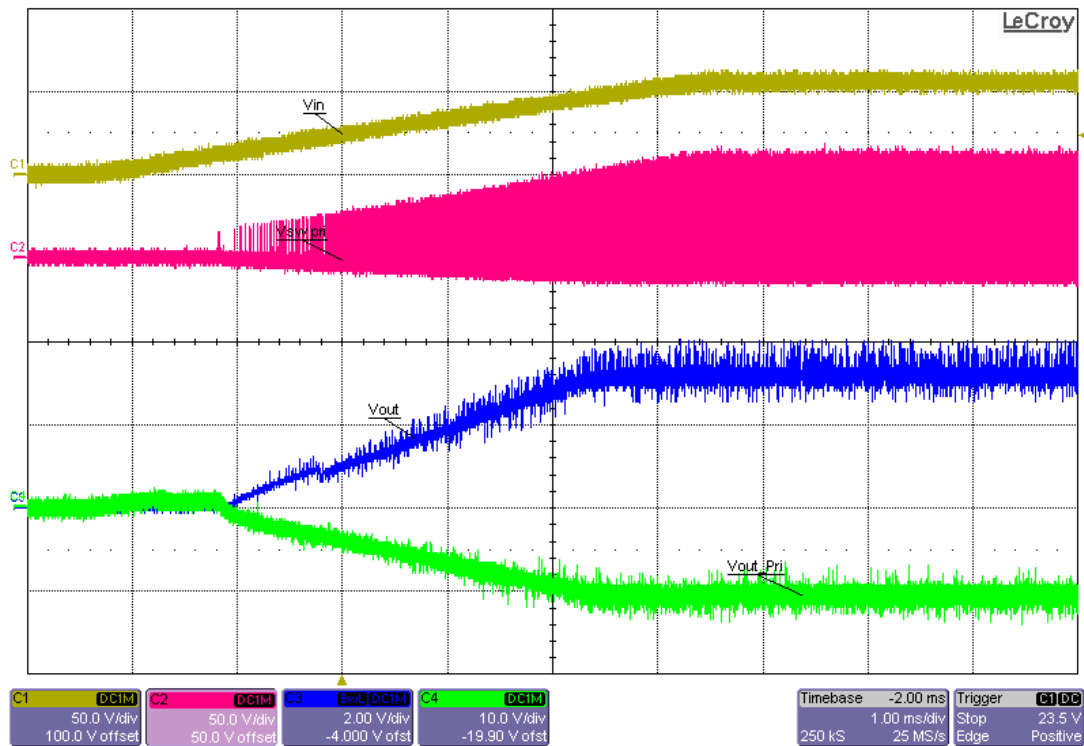
24Vin, 0.6A load. Ch1-Vin, Ch2-Vsw Primary, Ch3-Vout, Ch4-primary output.



36Vin, 0.6A load. Ch1-Vin, Ch2-Vsw Primary, Ch3-Vout, Ch4-primary output.

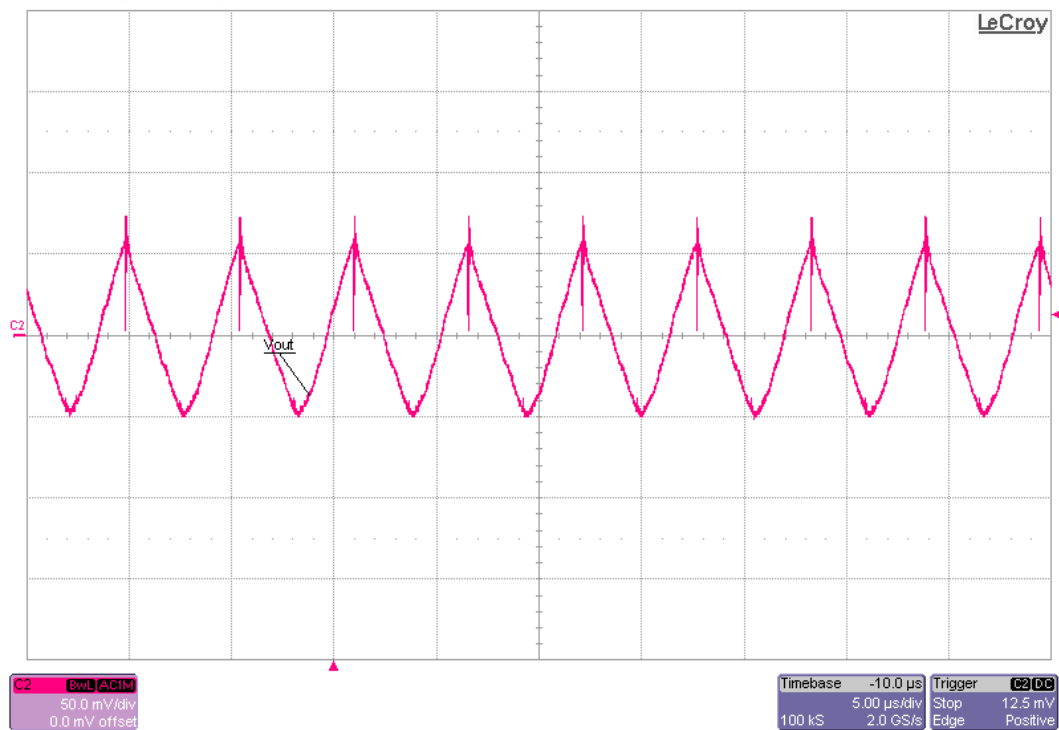


48Vin, 0.6A load. Ch1-Vin, Ch2-Vsw Primary, Ch3-Vout, Ch4-primary output.

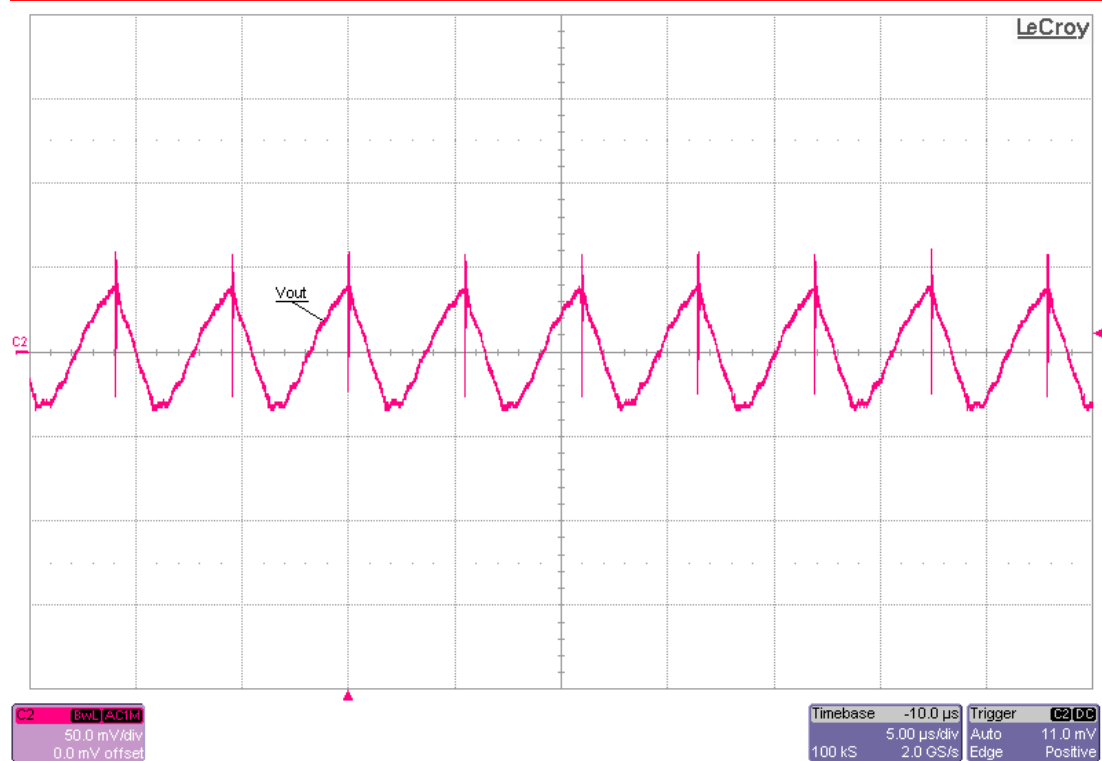


56Vin, 0.6A load. Ch1-Vin, Ch2-Vsw Primary, Ch3-Vout, Ch4-primary output.

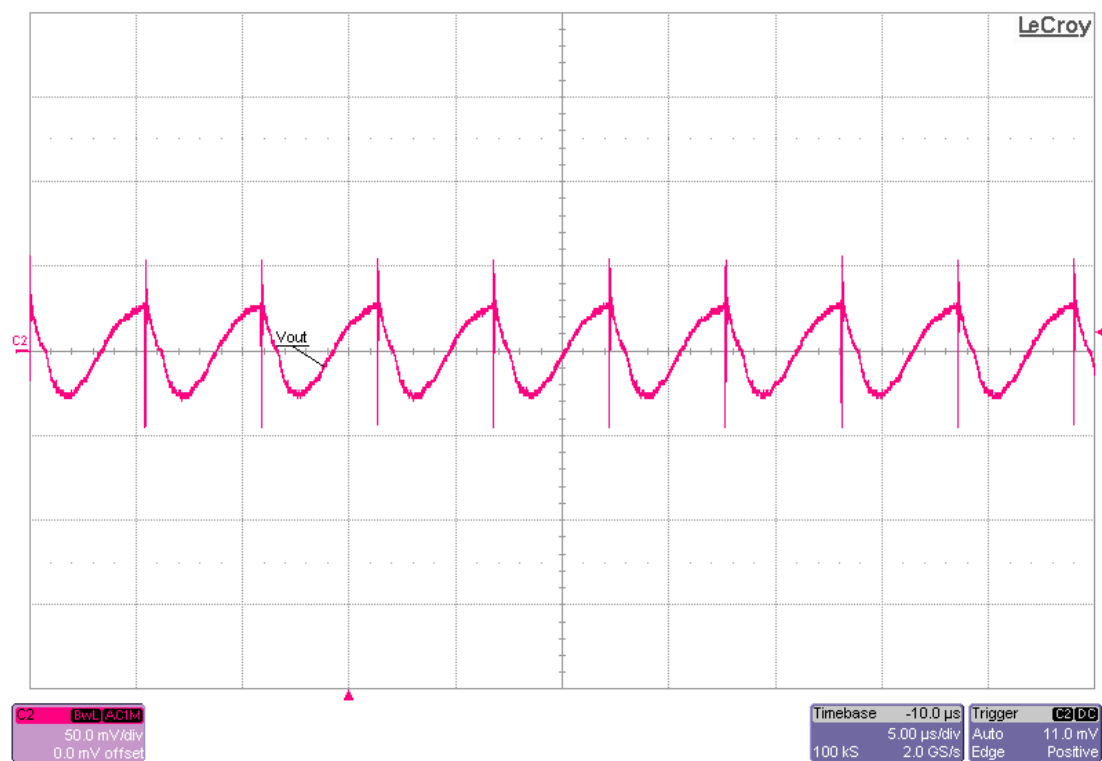
6.4 Output Ripple



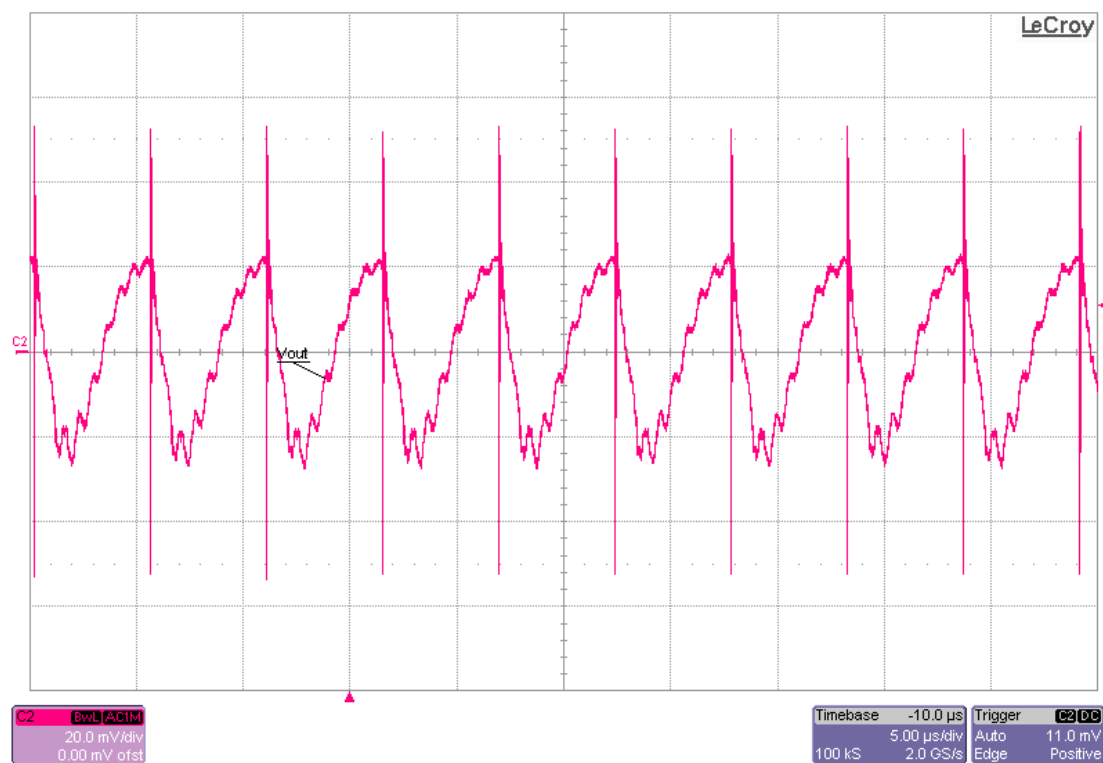
12Vin, 0.6A load. Ch2-Vout.



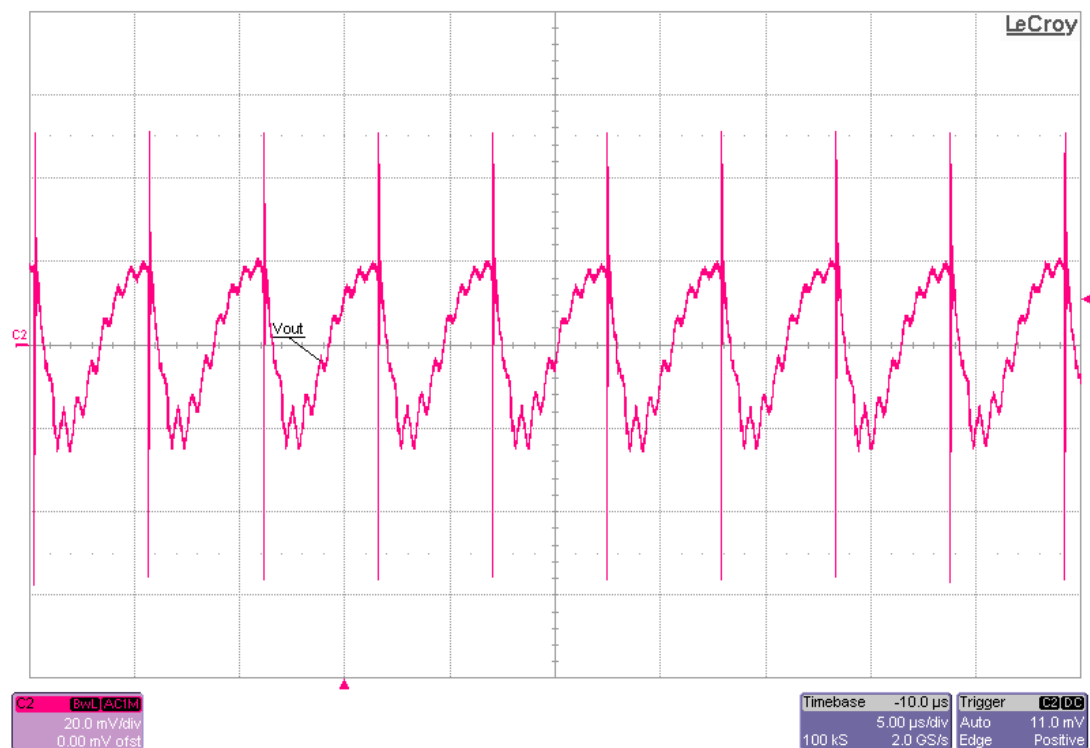
24Vin, 0.6A load. Ch2-Vout.



36Vin, 0.6A load. Ch2-Vout.



48Vin, 0.6A load. Ch2-Vout.



56Vin, 0.6A load. Ch2-Vout.

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