

**Test Data
For PMP9350
2/24/2014
Rev 2**



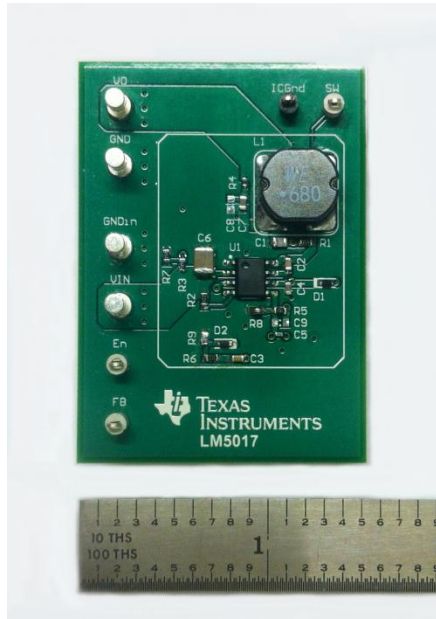
1. Circuit Description

PMP9350 is a Constant On-Time synchronous buck regulator utilizing the LM5017 wide-vin with integrated HS and LS MOSFETs. For industrial/automotive applications. The switching frequency has been set to 575 kHz. This board was developed to fit into space-constrained applications. It also uses an external SS circuit for a reduced start-up time.

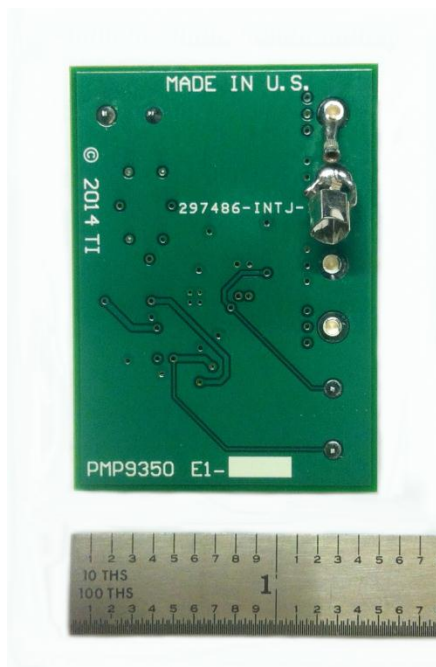
Vin	20V-100V +/-10%
Vout(s)	12V
Iout Max	400mA
FSW	~575kHz

2. Photos

Top Side:

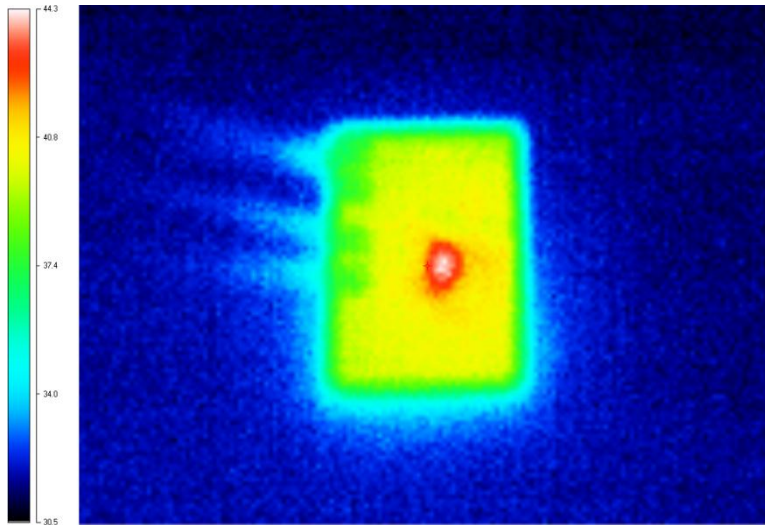


Bottom Side:



3. Thermal Images.

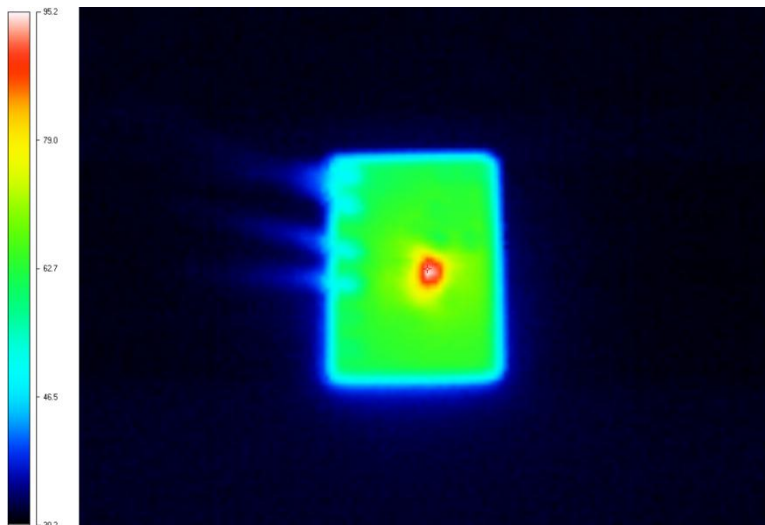
Steady State Temp – 20Vin, 12Vout at 400mA. (10min run time)



The IC is the hottest item. Temp rise is approximately 19.2°C

**Note: Board copper weight is 1oz, 0.5oz, 0.5oz, 1oz. Suggest increasing copper weight for improved thermal performance.*

Steady State Temp – 100Vin, 12Vout at 400mA. (10min run time)

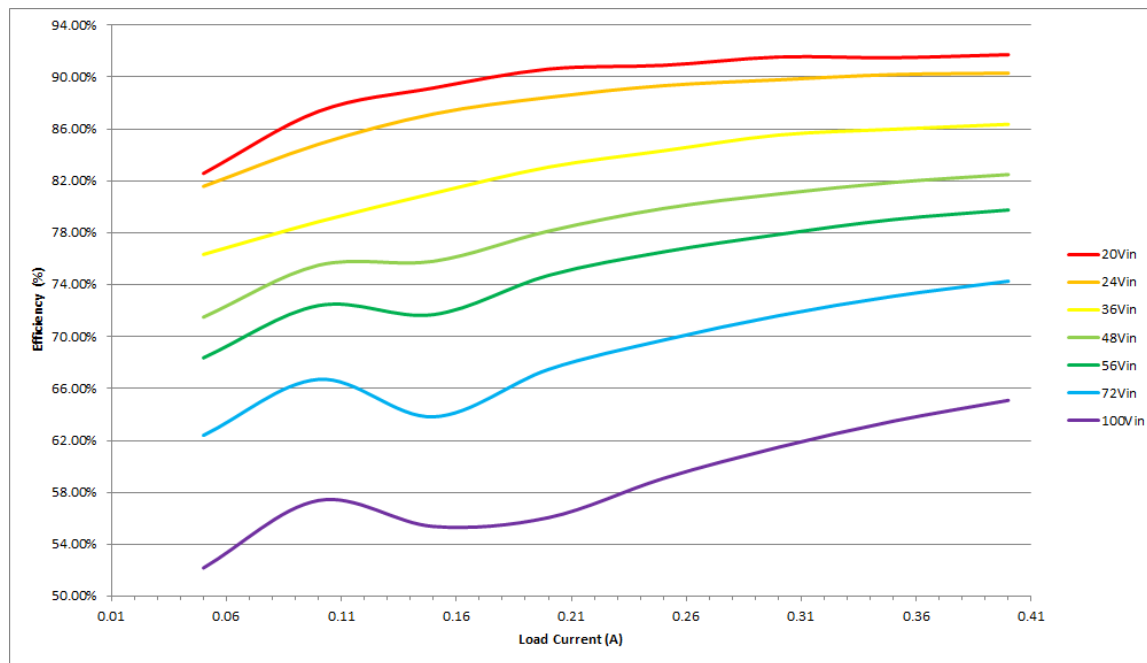


The IC is the hottest item. Temp rise is approximately 70.2°C

**Note: Board copper weight is 1oz, 0.5oz, 0.5oz, 1oz. Suggest increasing copper weight for improved thermal performance.*

4. Efficiency Data

Efficiency Curve



Efficiency Curve Data

(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
20.00	0.0107	12.046	0.01	0.21	0.12	0.09	56.29%
20.00	0.0364	12.024	0.05	0.73	0.60	0.13	82.58%
20.00	0.0688	12.021	0.10	1.38	1.20	0.17	87.36%
20.00	0.1011	12.019	0.15	2.02	1.80	0.22	89.16%
20.00	0.1326	12.016	0.20	2.65	2.40	0.25	90.62%
20.00	0.1652	12.014	0.25	3.30	3.00	0.30	90.90%
20.00	0.1968	12.011	0.30	3.94	3.60	0.33	91.55%
20.00	0.2297	12.009	0.35	4.59	4.20	0.39	91.49%
20.00	0.2618	12.007	0.40	5.24	4.80	0.43	91.73%

(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
24.00	0.0096	12.132	0.01	0.23	0.12	0.11	52.66%
24.00	0.0309	12.101	0.05	0.74	0.61	0.14	81.59%
24.00	0.0594	12.093	0.10	1.43	1.21	0.22	84.83%
24.00	0.0867	12.091	0.15	2.08	1.81	0.27	87.16%
24.00	0.1139	12.088	0.20	2.73	2.42	0.32	88.44%
24.00	0.1409	12.085	0.25	3.38	3.02	0.36	89.34%
24.00	0.1682	12.082	0.30	4.04	3.62	0.41	89.79%
24.00	0.1953	12.079	0.35	4.69	4.23	0.46	90.20%
24.00	0.2229	12.077	0.40	5.35	4.83	0.52	90.30%

(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
36.00	0.0082	12.299	0.01	0.30	0.12	0.17	41.66%
36.00	0.0223	12.258	0.05	0.80	0.61	0.19	76.35%
36.00	0.0431	12.236	0.10	1.55	1.22	0.33	78.86%
36.00	0.0629	12.235	0.15	2.26	1.84	0.43	81.05%
36.00	0.0818	12.231	0.20	2.94	2.45	0.50	83.07%
36.00	0.1007	12.228	0.25	3.63	3.06	0.57	84.33%
36.00	0.1191	12.225	0.30	4.29	3.67	0.62	85.54%
36.00	0.1382	12.222	0.35	4.98	4.28	0.70	85.98%
36.00	0.1572	12.219	0.40	5.66	4.89	0.77	86.37%

(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
48.00	0.0071	12.406	0.01	0.34	0.12	0.22	36.40%
48.00	0.0180	12.357	0.05	0.86	0.62	0.25	71.51%
48.00	0.0340	12.323	0.10	1.63	1.23	0.40	75.51%
48.00	0.0508	12.324	0.15	2.44	1.85	0.59	75.81%
48.00	0.0657	12.321	0.20	3.15	2.46	0.69	78.14%
48.00	0.0803	12.316	0.25	3.85	3.08	0.78	79.88%
48.00	0.0950	12.312	0.30	4.56	3.69	0.87	81.00%
48.00	0.1096	12.309	0.35	5.26	4.31	0.95	81.89%
48.00	0.1243	12.305	0.40	5.97	4.92	1.04	82.50%

(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
56.00	0.0069	12.460	0.01	0.39	0.12	0.26	32.25%
56.00	0.0162	12.407	0.05	0.91	0.62	0.29	68.38%
56.00	0.0305	12.366	0.10	1.71	1.24	0.47	72.40%
56.00	0.0462	12.368	0.15	2.59	1.86	0.73	71.71%
56.00	0.0591	12.366	0.20	3.31	2.47	0.84	74.73%
56.00	0.0721	12.361	0.25	4.04	3.09	0.95	76.54%
56.00	0.0850	12.357	0.30	4.76	3.71	1.05	77.88%
56.00	0.0977	12.354	0.35	5.47	4.32	1.15	79.03%
56.00	0.1106	12.351	0.40	6.19	4.94	1.25	79.77%

(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
72.00	0.0064	12.552	0.01	0.46	0.13	0.34	27.24%
72.00	0.0139	12.491	0.05	1.00	0.62	0.38	62.41%
72.00	0.0259	12.442	0.10	1.86	1.24	0.62	66.72%
72.00	0.0406	12.440	0.15	2.92	1.87	1.06	63.83%
72.00	0.0512	12.438	0.20	3.69	2.49	1.20	67.48%
72.00	0.0619	12.433	0.25	4.46	3.11	1.35	69.74%
72.00	0.0723	12.428	0.30	5.21	3.73	1.48	71.62%
72.00	0.0826	12.425	0.35	5.95	4.35	1.60	73.12%
72.00	0.0929	12.421	0.40	6.69	4.97	1.72	74.28%

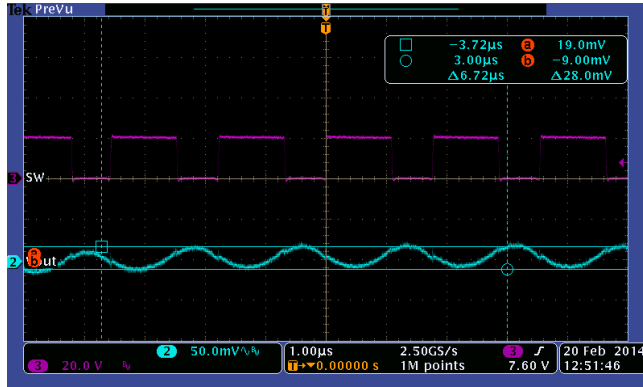
(V _{IN})	(I _{IN})	(V _{OUT})	(I _{OUT})	(P _{IN})	(P _{OUT})	(P _{LOSS})	(Eff%)
100.00	0.0062	12.704	0.01	0.62	0.13	0.49	20.49%
100.00	0.0121	12.631	0.05	1.21	0.63	0.58	52.19%
100.00	0.0219	12.569	0.10	2.19	1.26	0.93	57.39%
100.00	0.0340	12.554	0.15	3.40	1.88	1.52	55.39%
100.00	0.0448	12.560	0.20	4.48	2.51	1.97	56.07%
100.00	0.0531	12.551	0.25	5.31	3.14	2.17	59.09%
100.00	0.0612	12.544	0.30	6.12	3.76	2.36	61.49%
100.00	0.0691	12.537	0.35	6.91	4.39	2.52	63.50%
100.00	0.0770	12.532	0.40	7.70	5.01	2.69	65.10%

5. Waveforms

Switch-Node & Output Ripple Voltage

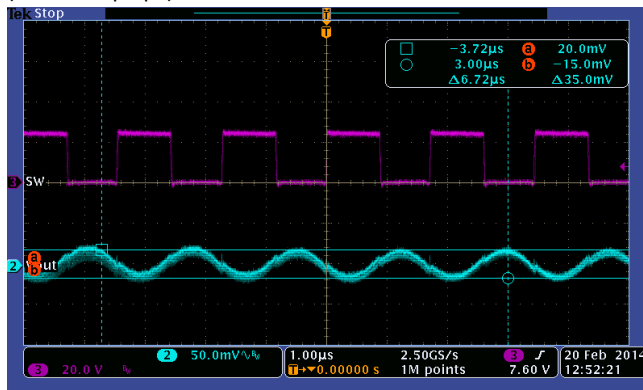
20Vin, 12Vout @ 400mA load current.

(~ 28.0mV pk-pk)



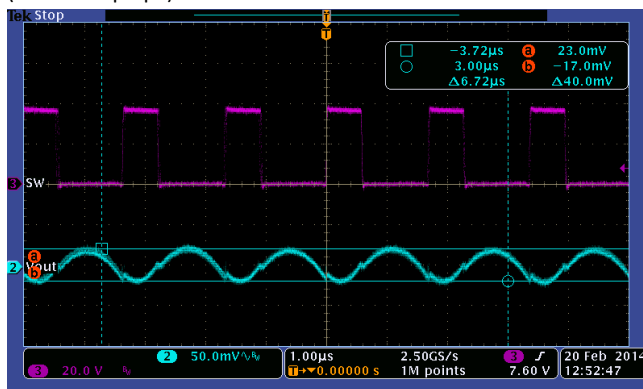
24Vin, 12Vout @ 400mA load current.

(~ 35.0mV pk-pk)

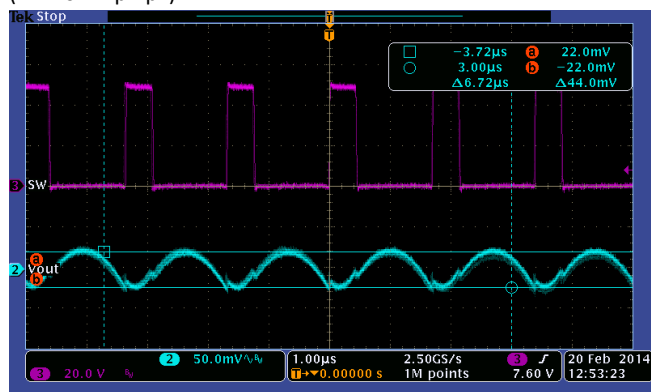


36Vin, 12Vout @ 400mA load current.

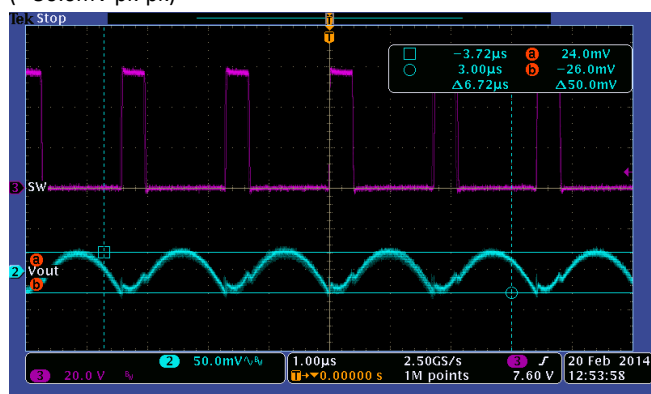
(~ 40.0mV pk-pk)



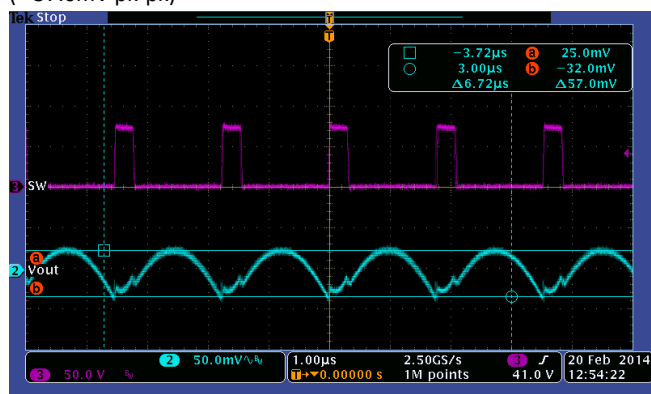
48Vin, 12Vout @ 400mA load current.
(~ 44.0mV pk-pk)



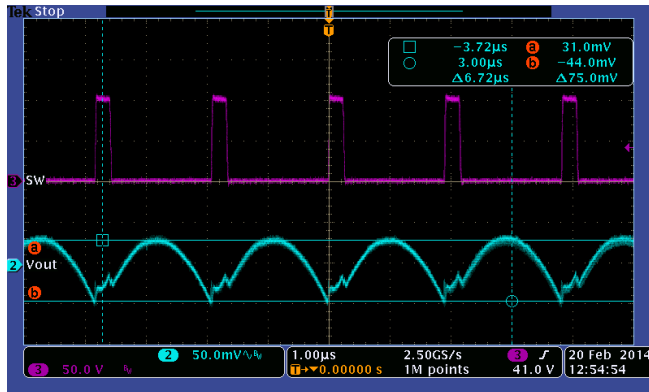
56Vin, 12Vout @ 400mA load current.
(~ 50.0mV pk-pk)



72Vin, 12Vout @ 400mA load current.
(~ 57.0mV pk-pk)

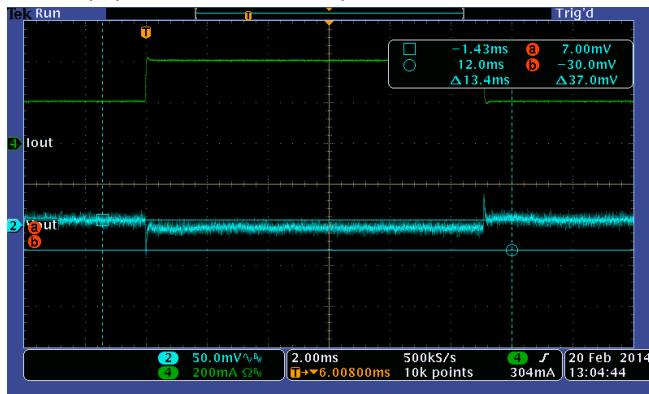


100Vin, 12Vout @ 400mA load current.
(~ 75.0mV pk-pk)

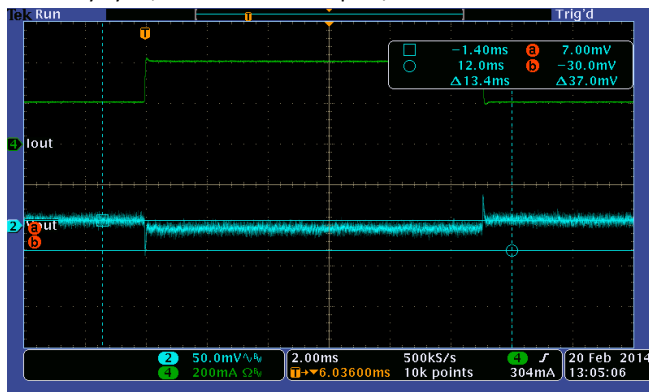


Transient Response Test

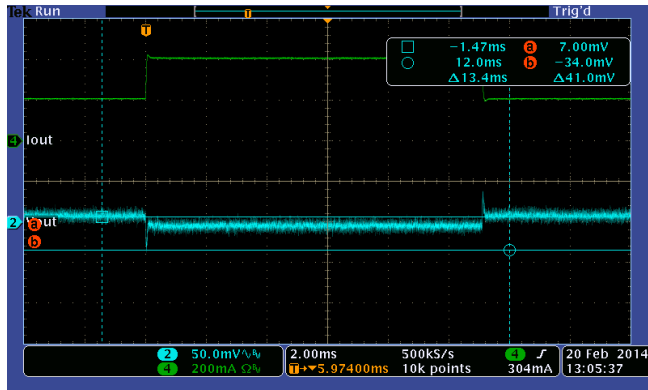
20Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.



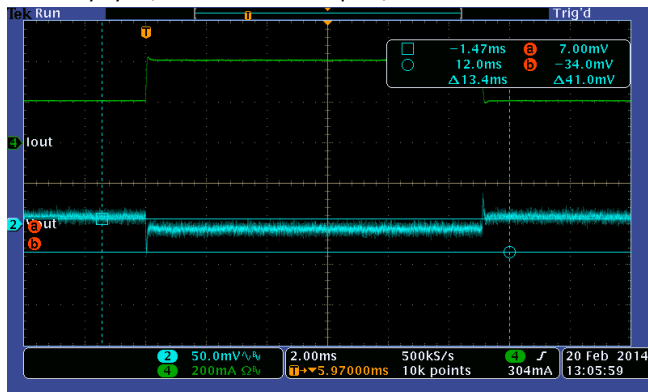
24Vin @ 200mA to 400mA, 100mA/µs, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.



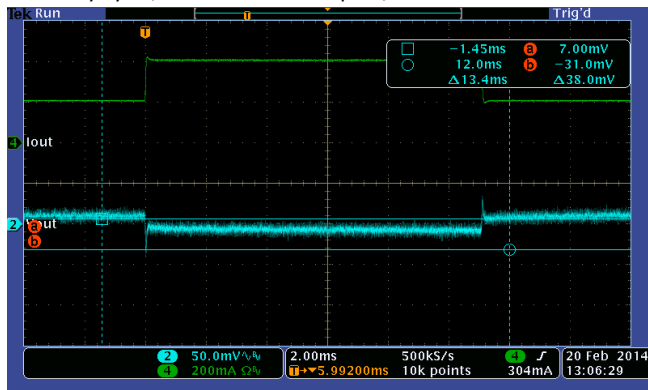
36Vin @ 200mA to 400mA, 100mA/ μ s, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.



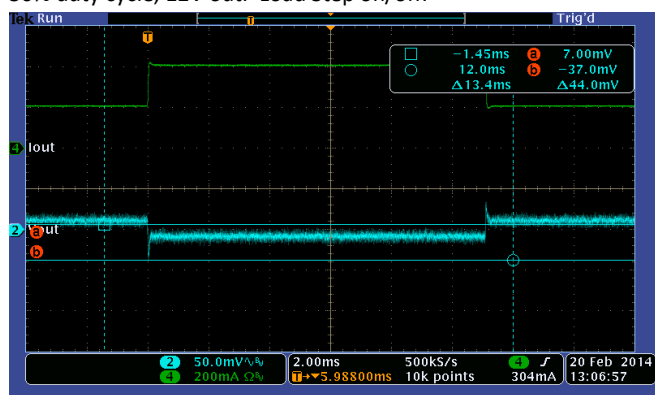
48Vin @ 200mA to 400mA, 100mA/ μ s, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.



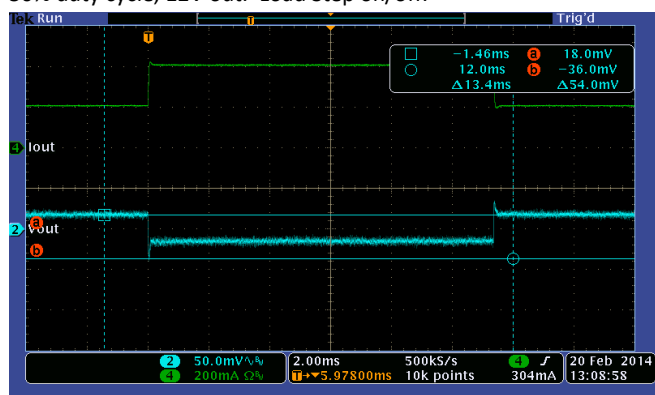
56Vin @ 200mA to 400mA, 100mA/ μ s, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.



72Vin @ 200mA to 400mA, 100mA/ μ s, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.

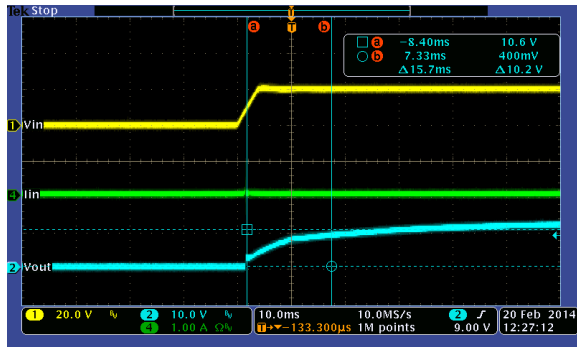


100Vin @ 200mA to 400mA, 100mA/ μ s, Pulse f @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.

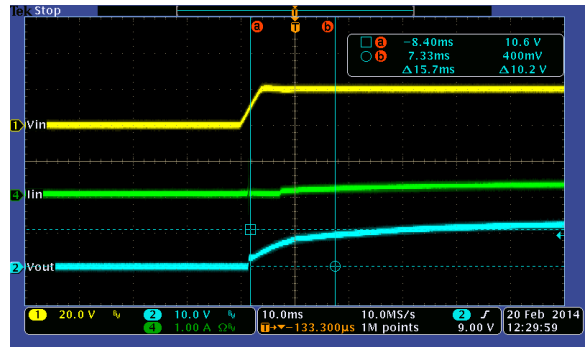


Startup Test

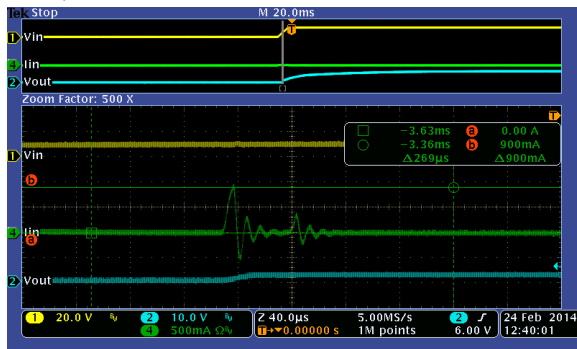
20Vin, 12Vout @ no load current.



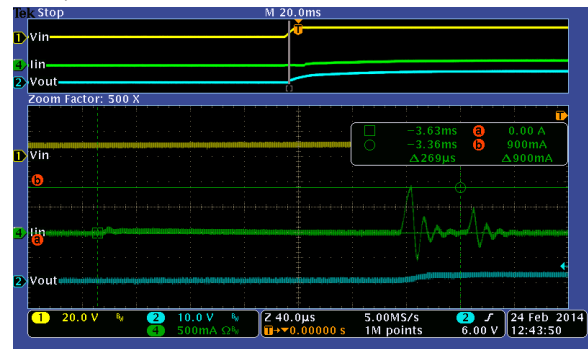
20Vin, 12Vout @ 27.77 Ω Load.



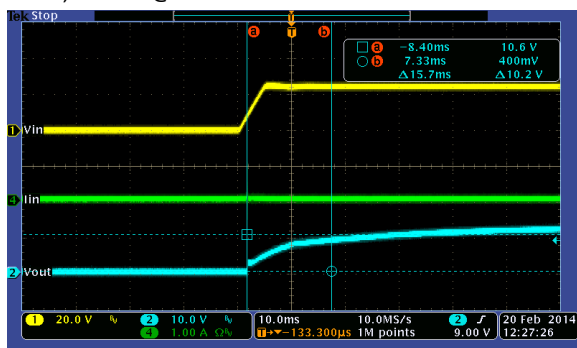
20Vin, 12Vout @ no load current. In-rush zoom.



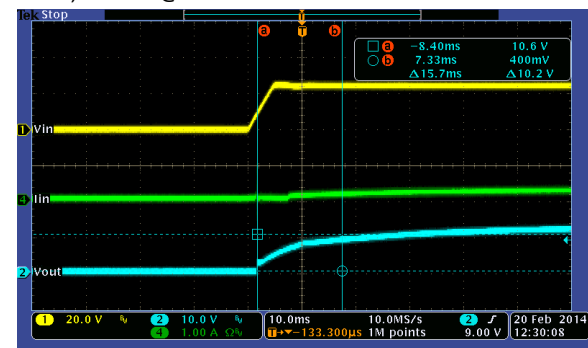
20Vin, 12Vout @ 27.77 Ω Load. In-rush zoom.



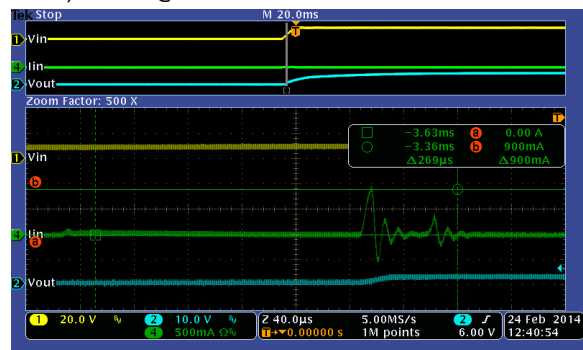
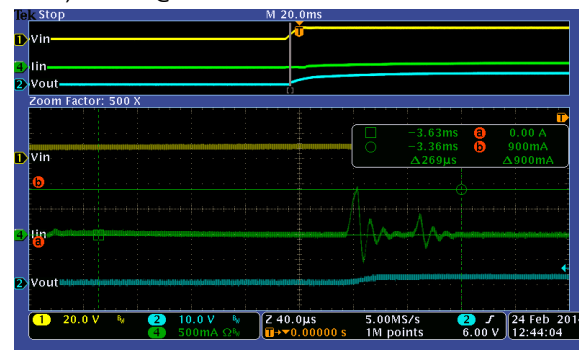
24Vin, 12Vout @ no load current.



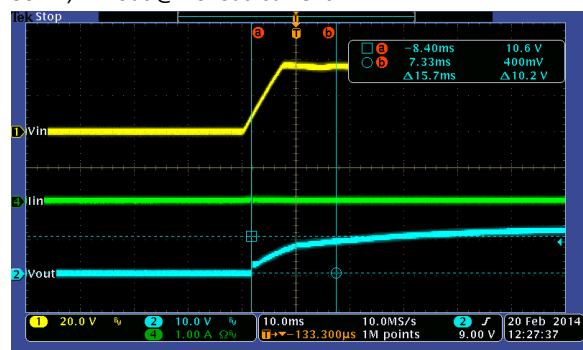
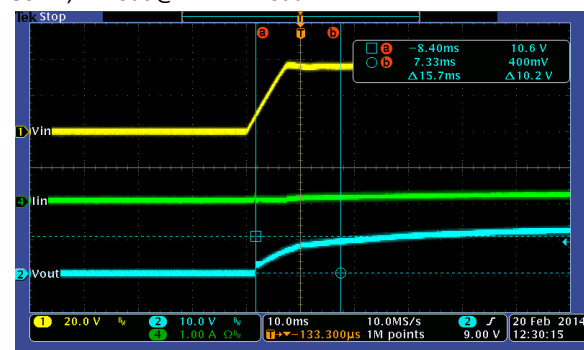
24Vin, 12Vout @ 27.77 Ω Load.



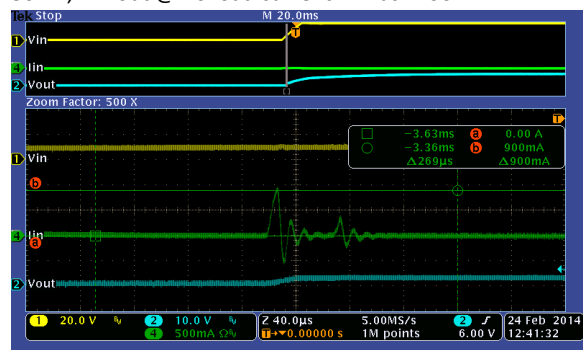
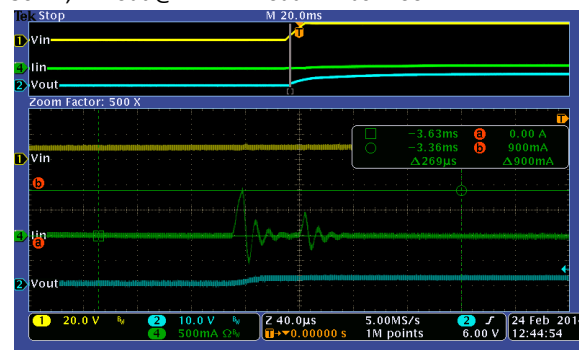
24Vin, 12Vout @ no load current. In-rush zoom.


24Vin, 12Vout @ 27.77 Ω Load. In-rush zoom.


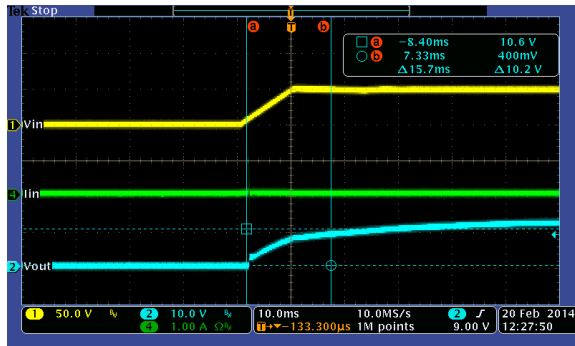
36Vin, 12Vout @ no load current.


36Vin, 12Vout @ 27.77 Ω Load.


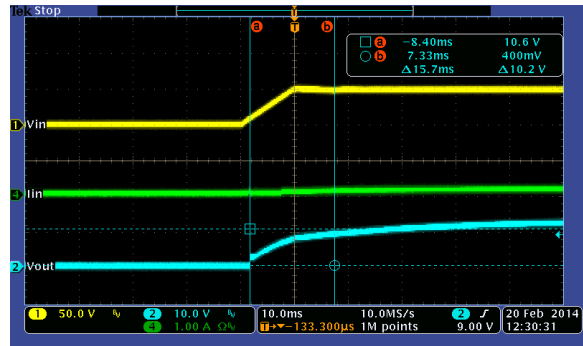
36Vin, 12Vout @ no load current. In-rush zoom.


36Vin, 12Vout @ 27.77 Ω Load. In-rush zoom.


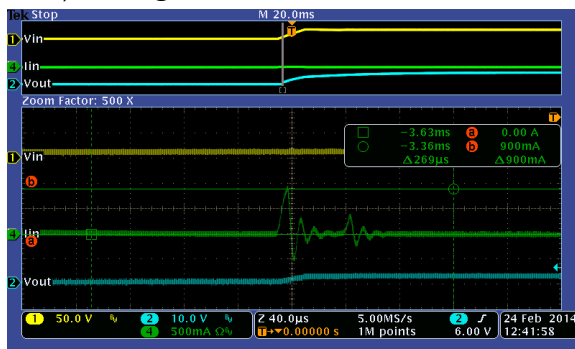
48Vin, 12Vout @ no load current.



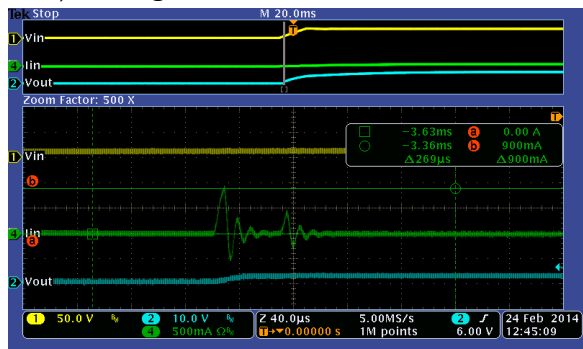
48Vin, 12Vout @ 27.77Ω Load.



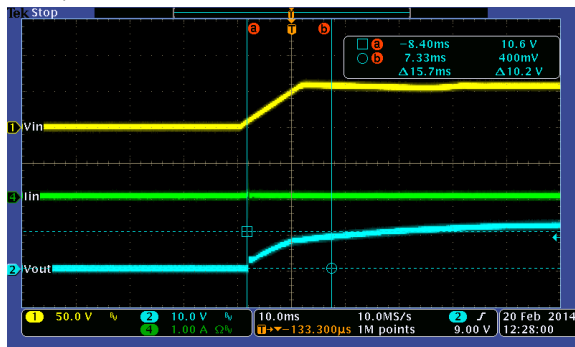
48Vin, 12Vout @ no load current. In-rush zoom.



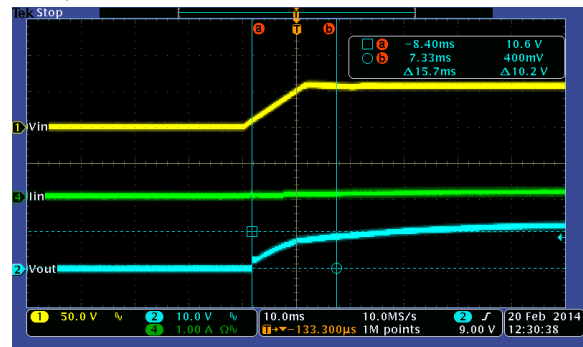
48Vin, 12Vout @ 27.77Ω Load. In-rush zoom.



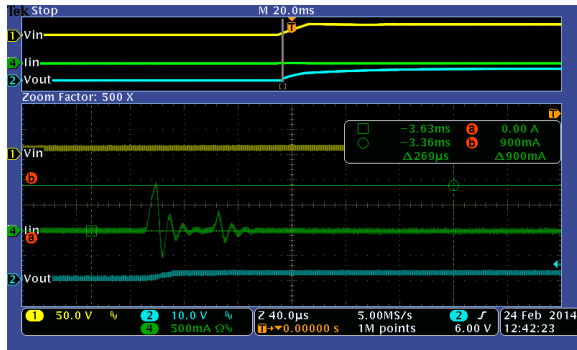
56Vin, 12Vout @ no load current.



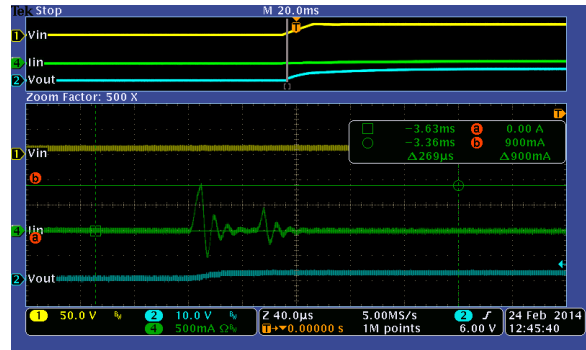
56Vin, 12Vout @ 27.77Ω Load.



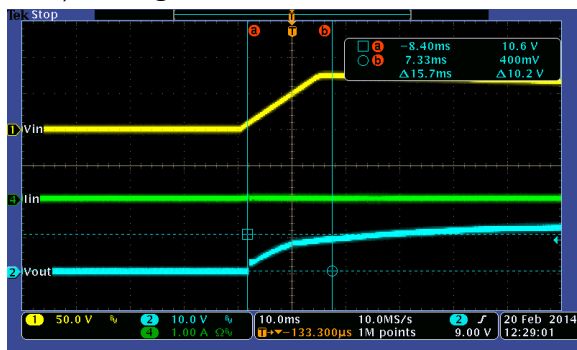
56Vin, 12Vout @ no load current. In-rush zoom.



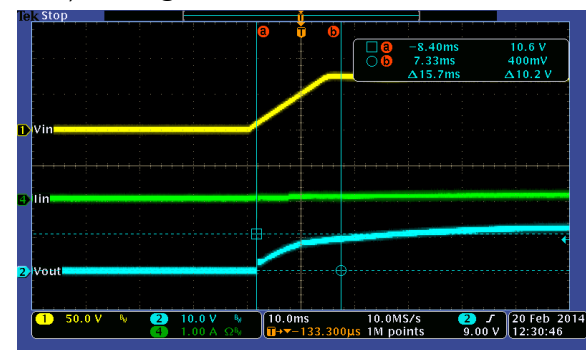
56Vin, 12Vout @ 27.77Ω Load. In-rush zoom.



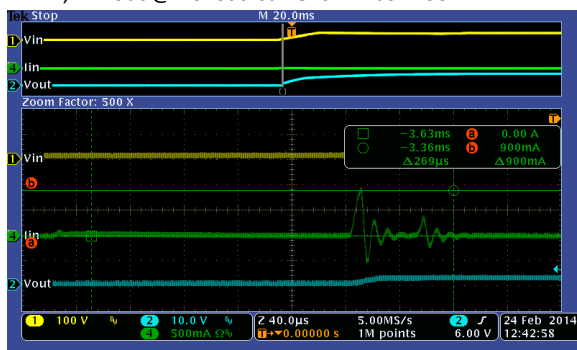
72Vin, 12Vout @ no load current.



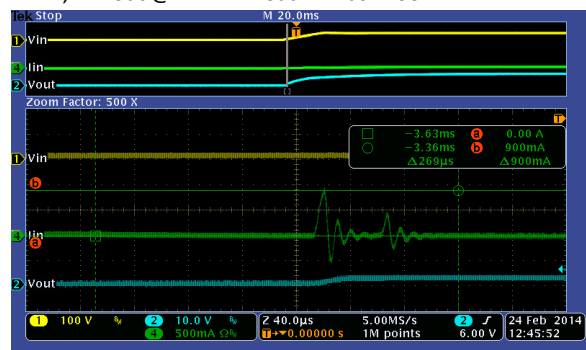
72Vin, 12Vout @ 27.77Ω Load.



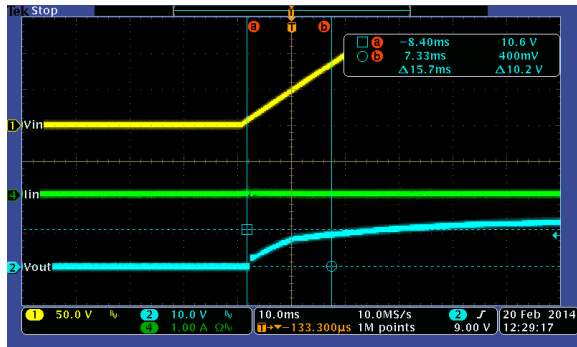
72Vin, 12Vout @ no load current. In-rush zoom.



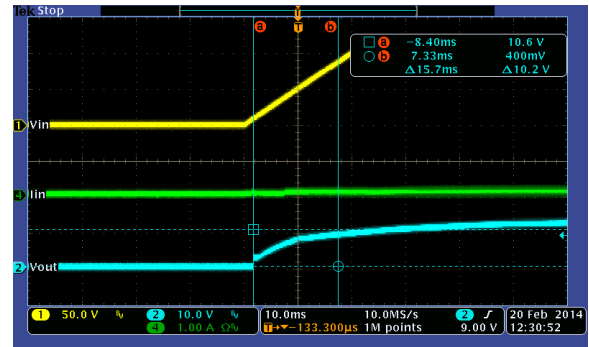
72Vin, 12Vout @ 27.77Ω Load. In-rush zoom.



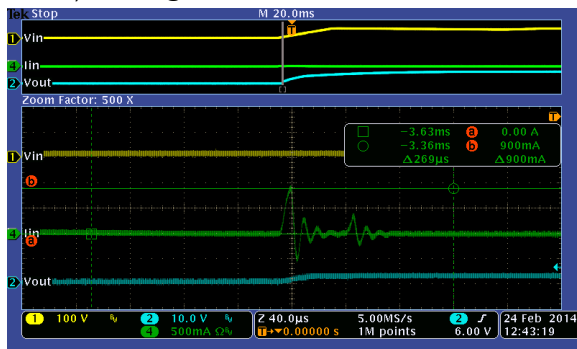
100Vin, 12Vout @ no load current.



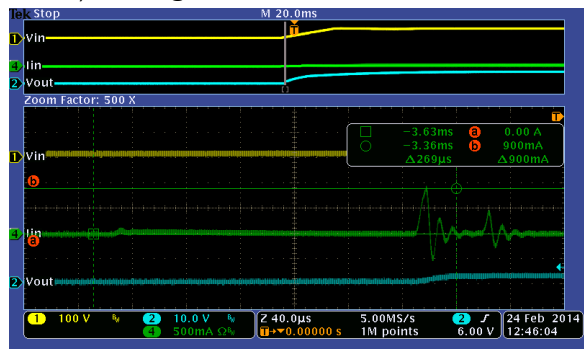
100Vin, 12Vout @ 27.77Ω Load.



100Vin, 12Vout @ no load current. In-rush zoom.



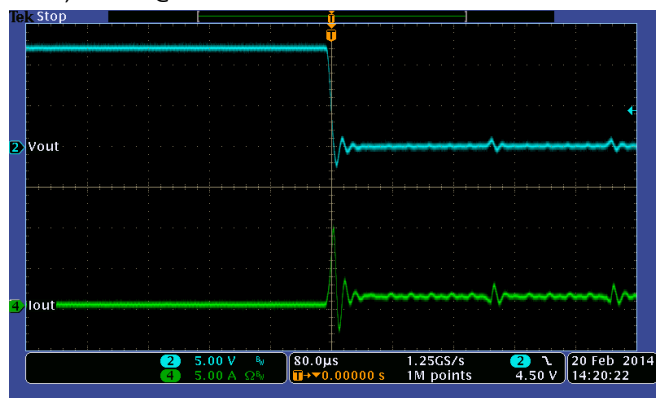
100Vin, 12Vout @ 27.77Ω Load. In-rush zoom.



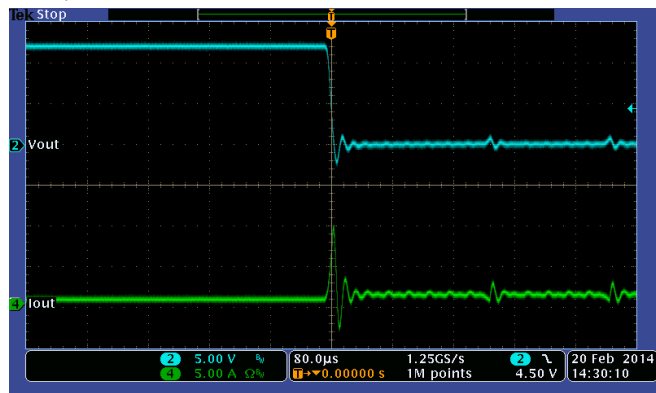
Short-Circuit Test

Applied to board under the following conditions:

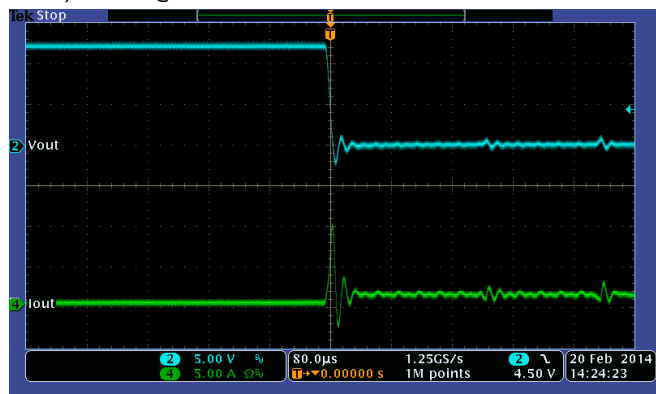
20Vin, 12Vout @ no load current.



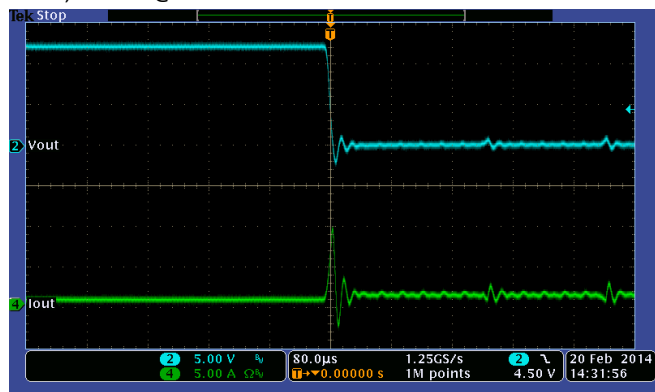
20Vin, 12Vout @ 400mA Load.



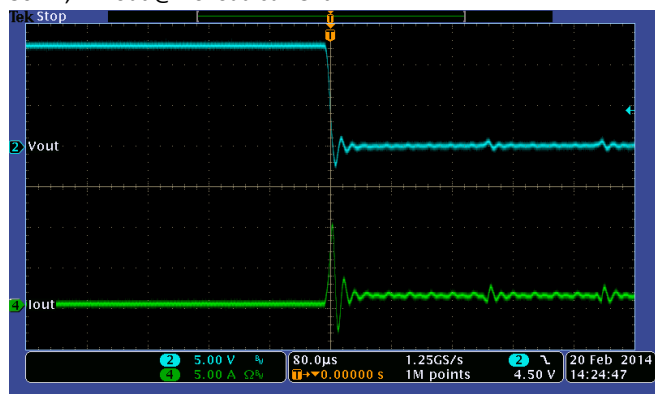
24Vin, 12Vout @ no load current.



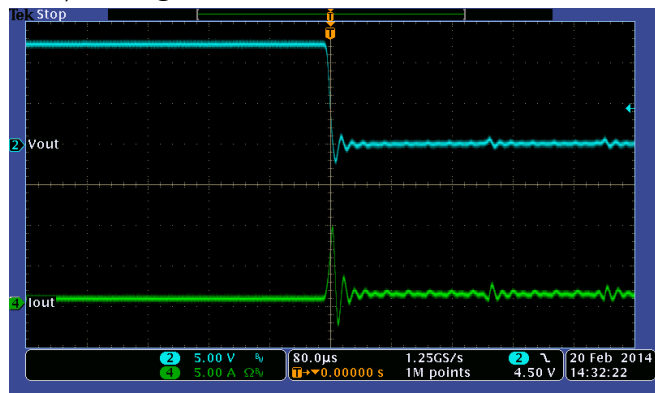
24Vin, 12Vout @400mA Load.



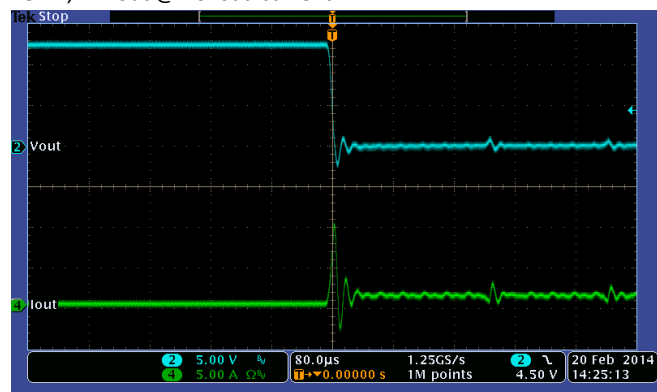
36Vin, 12Vout @ no load current.



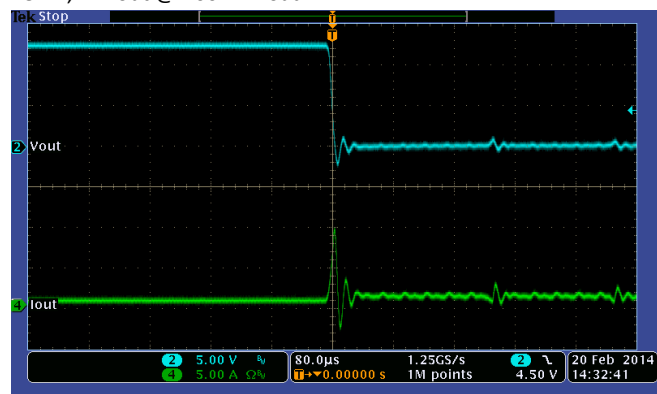
36Vin, 12Vout @ 400mA Load.



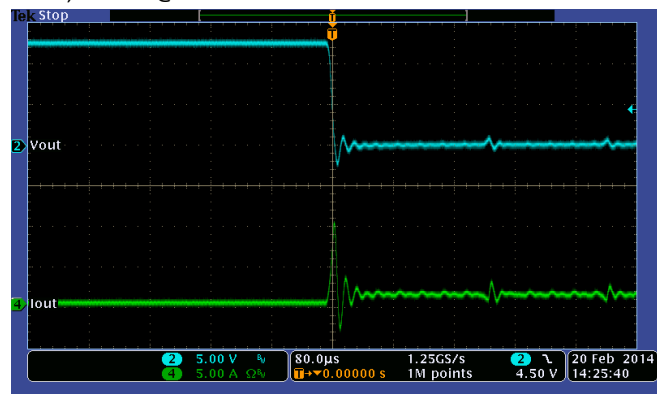
48Vin, 12Vout @ no load current.



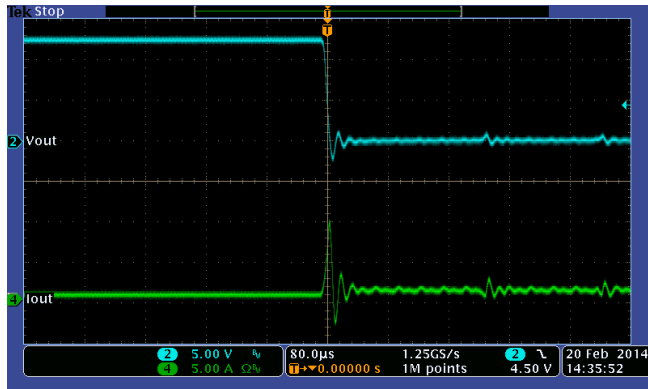
48Vin, 12Vout @ 400mA Load.



56Vin, 12Vout @ no load current.



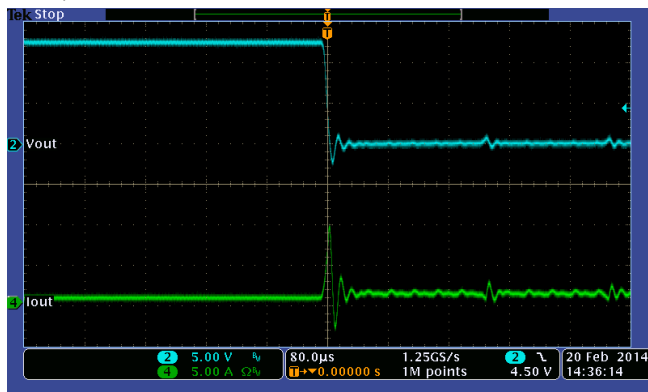
56Vin, 12Vout @ 400mA Load.



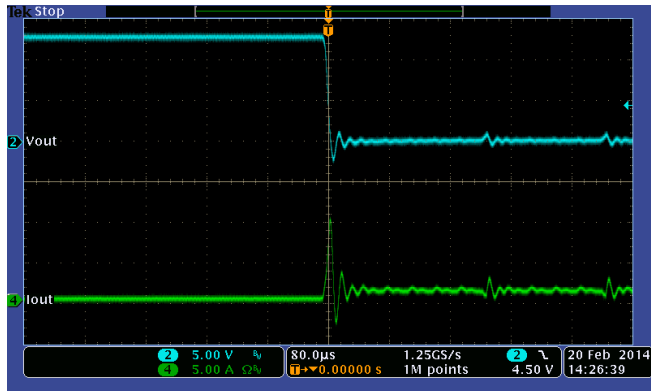
72Vin, 12Vout @ no load current.



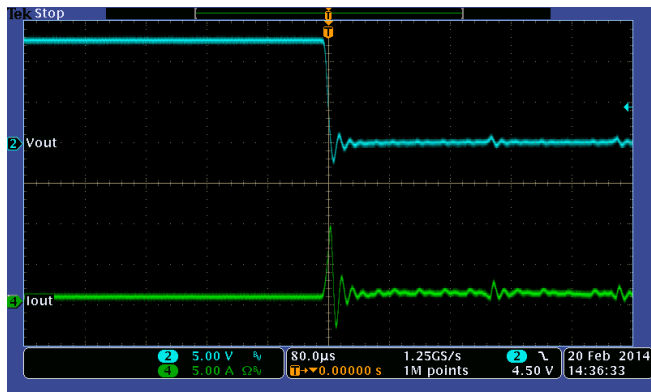
72Vin, 12Vout @ 400mA Load.



100Vin, 12Vout @ no load current.



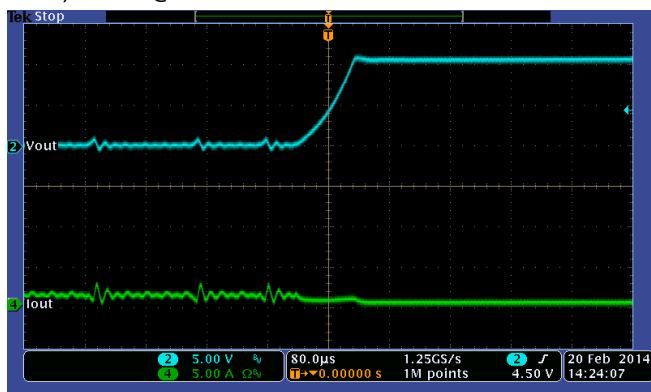
100Vin, 12Vout @ 400mA Load.



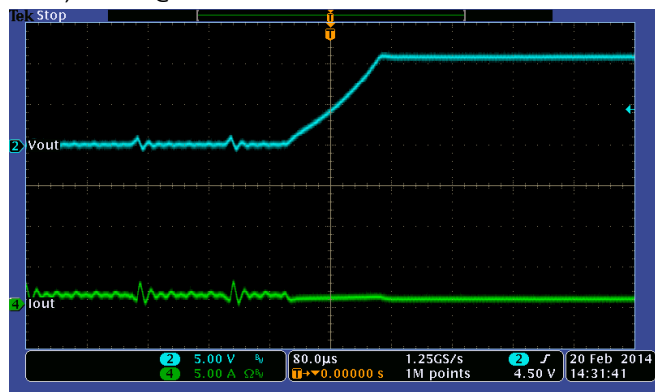
Short-Circuit Recovery Test

Applied to board under the following conditions:

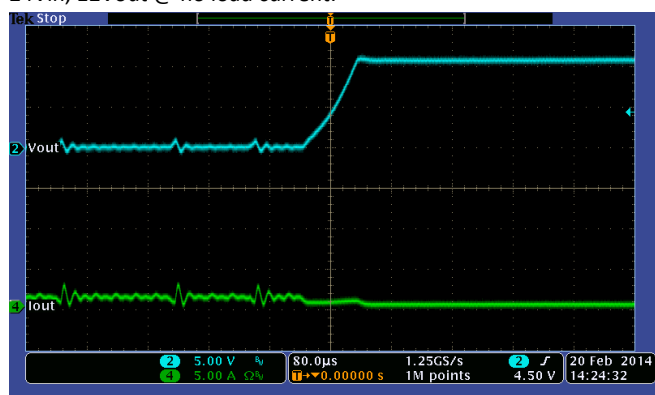
20Vin, 12Vout @ no load current.



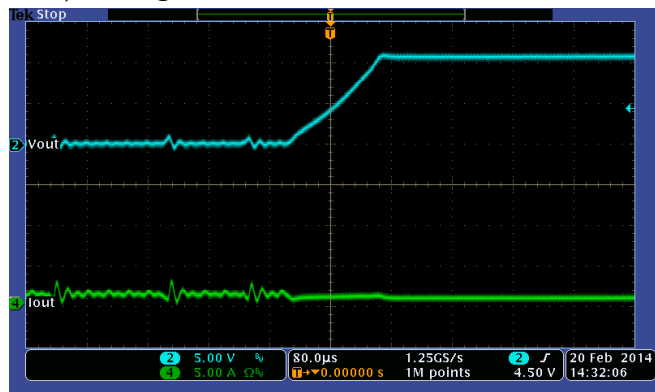
20Vin, 12Vout @ 400mA Load.



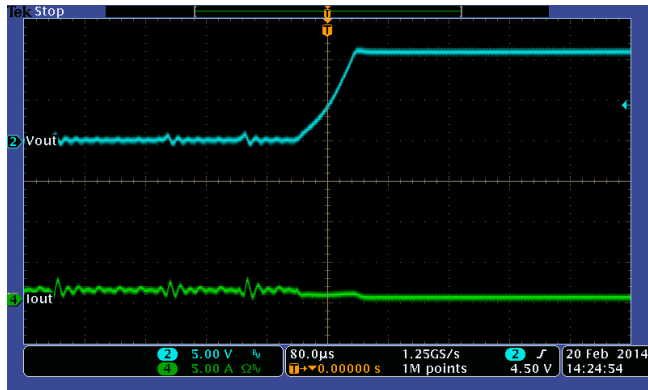
24Vin, 12Vout @ no load current.



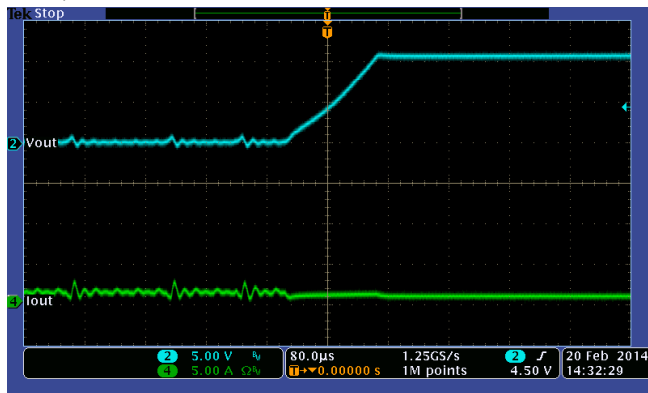
24Vin, 12Vout @400mA Load.



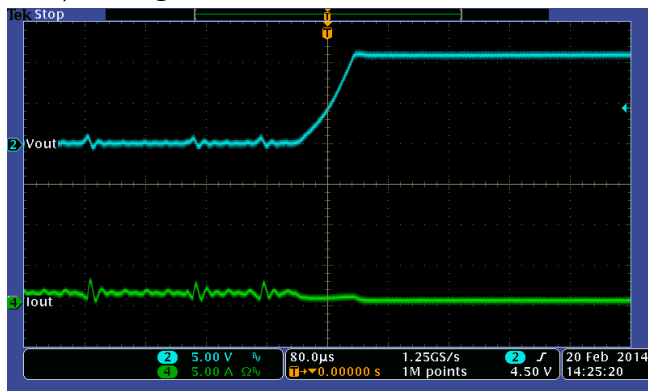
36Vin, 12Vout @ no load current.



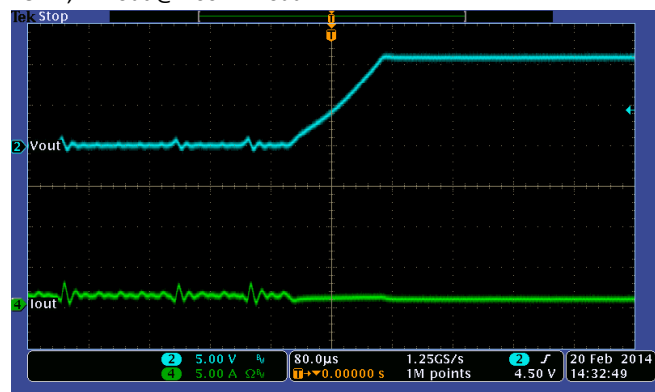
36Vin, 12Vout @ 400mA Load.



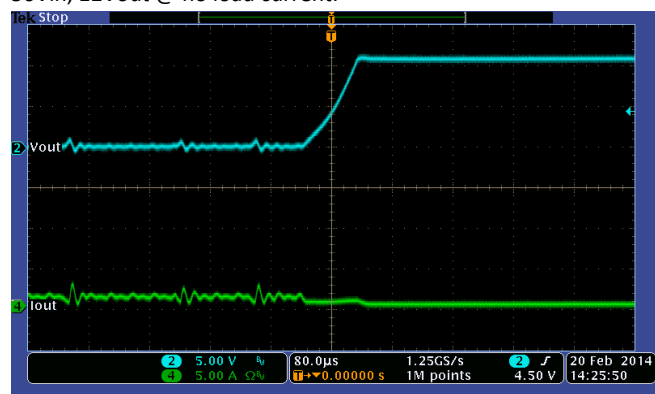
48Vin, 12Vout @ no load current.



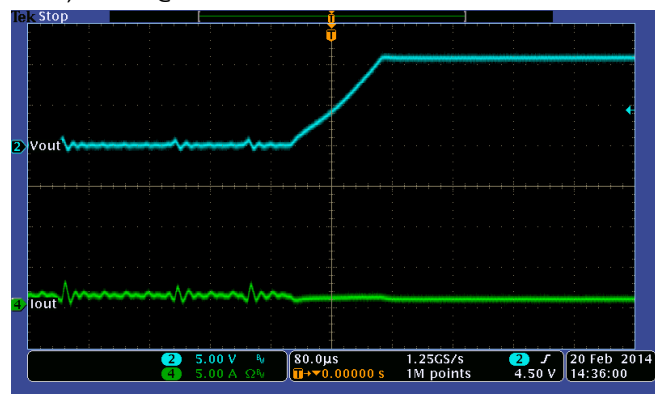
48Vin, 12Vout @ 400mA Load.



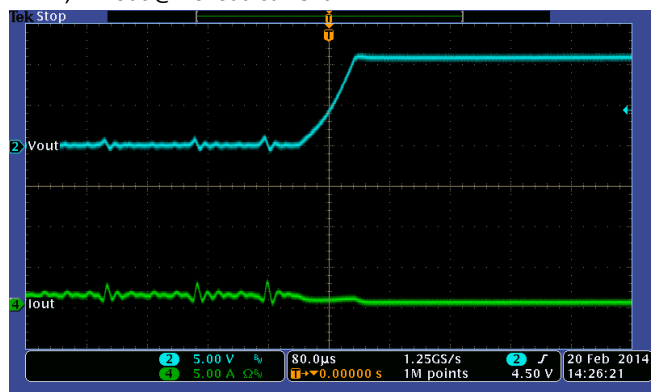
56Vin, 12Vout @ no load current.



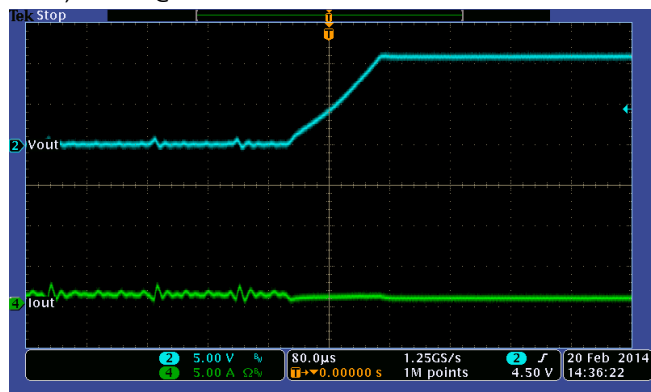
56Vin, 12Vout @ 400mA Load.



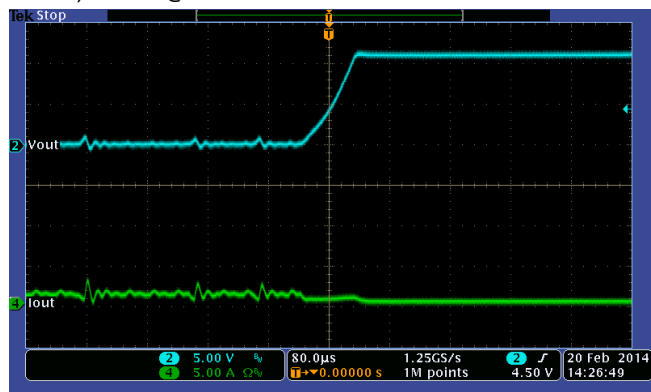
72Vin, 12Vout @ no load current.



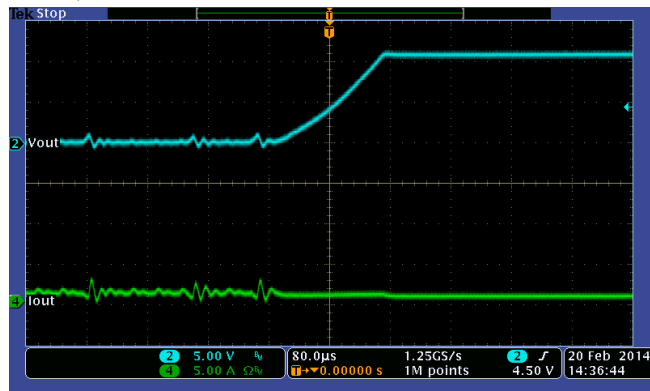
72Vin, 12Vout @ 400mA Load.



100Vin, 12Vout @ no load current.



100Vin, 12Vout @ 400mA Load.



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