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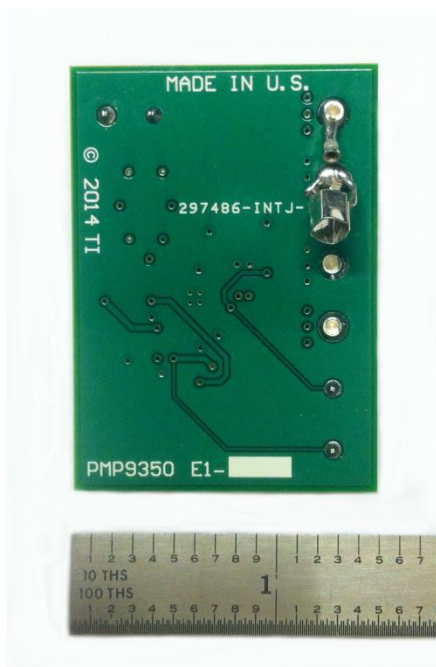
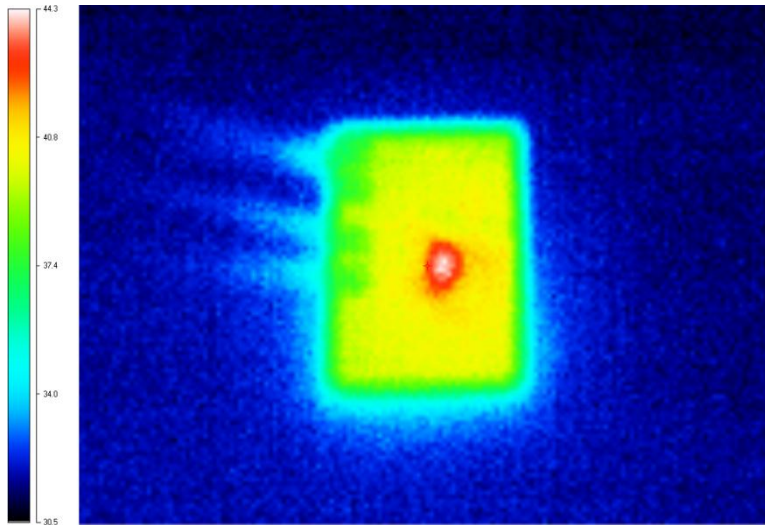| Vin	20V-100V +/-10%
Vout(s)	12V
Iout Max	400mA
FSW	~575kHz

2. Photos
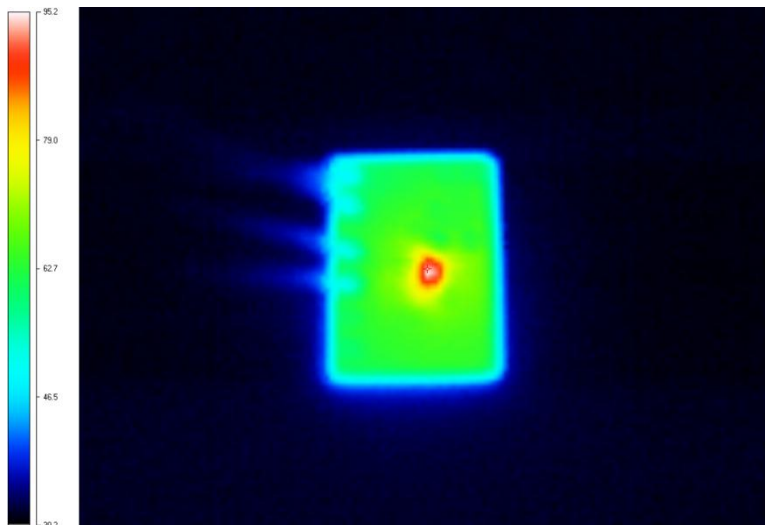
Top Side:
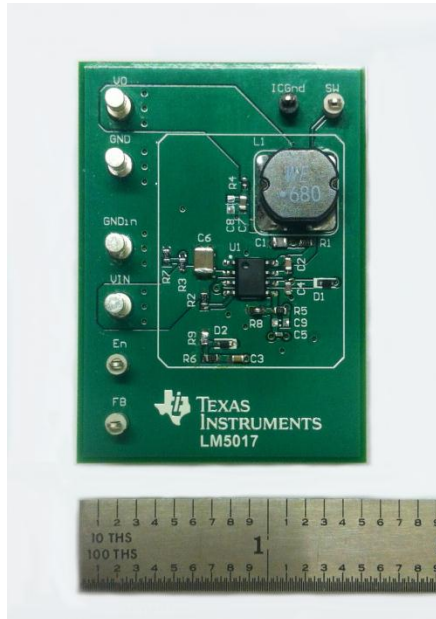
Bottom Side:

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.

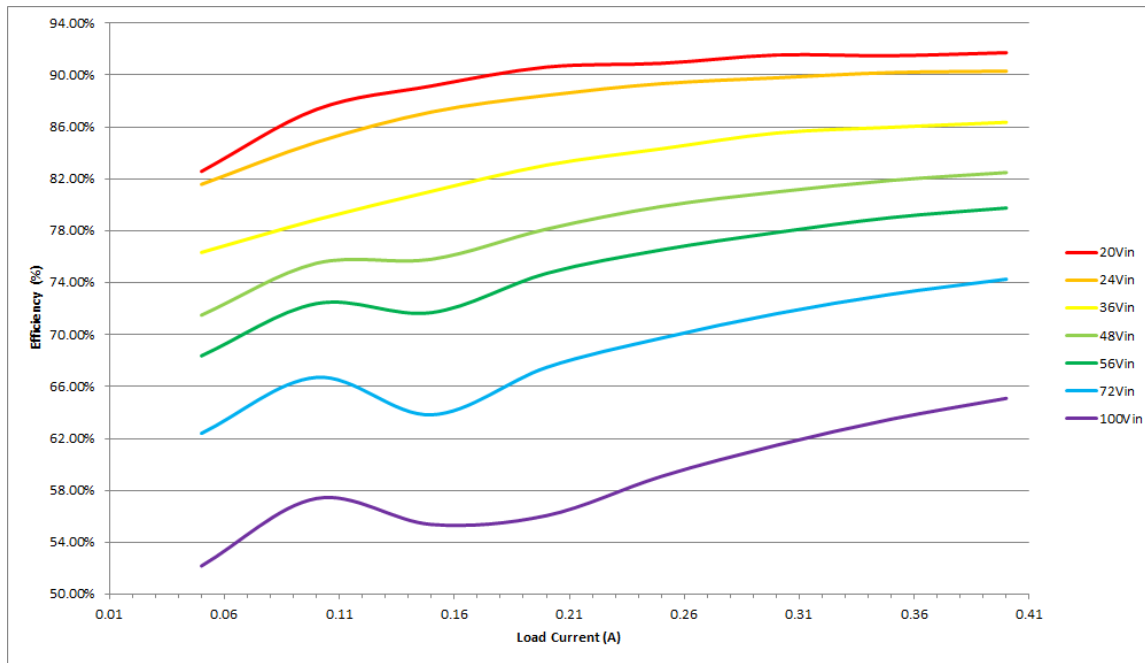Steady State Temp – 100Vin, 12Vout at 400mA. (10min run time)

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.

2/24/14

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

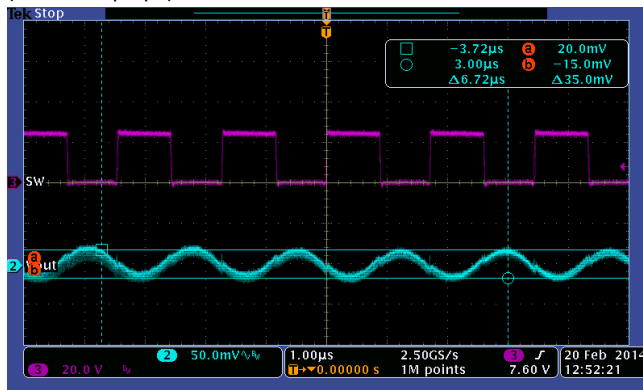### Switch-Node & Output Ripple Voltage

20Vin, 12Vout @ 400mA load current.
(~ 28.0mV pk-pk)
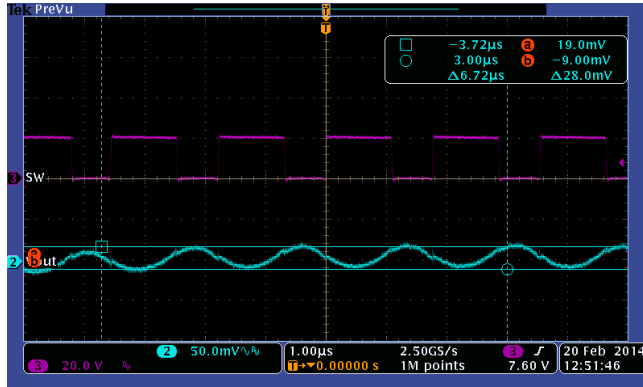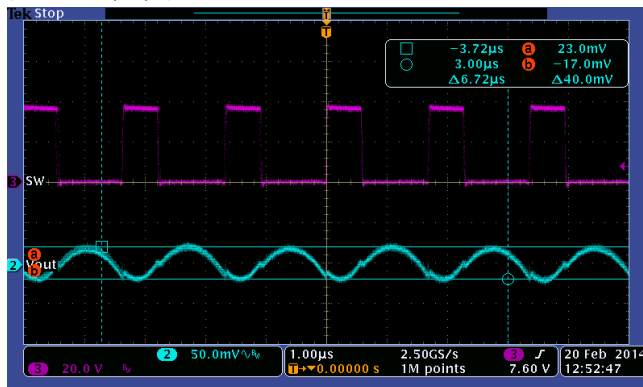

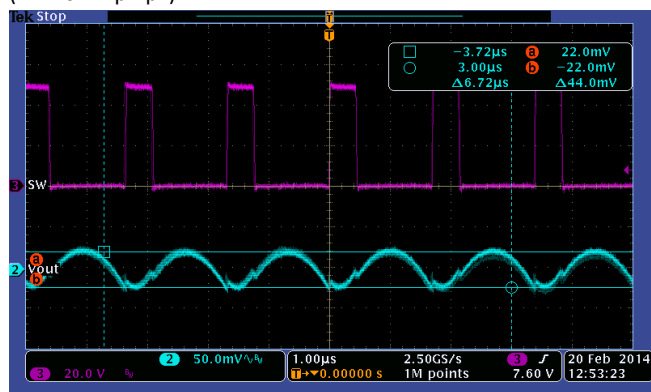
24Vin, 12Vout @ 400mA load current.
(~ 35.0mV pk-pk)

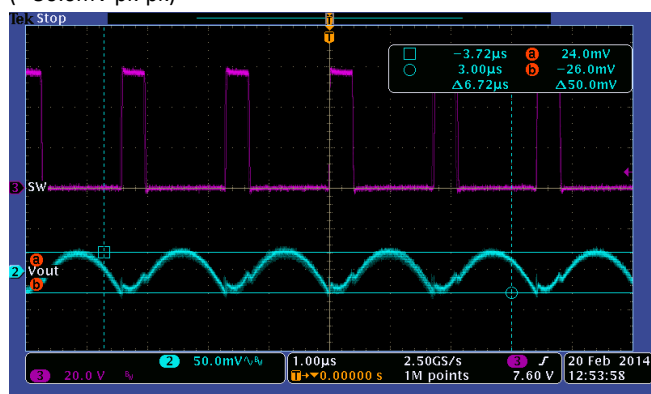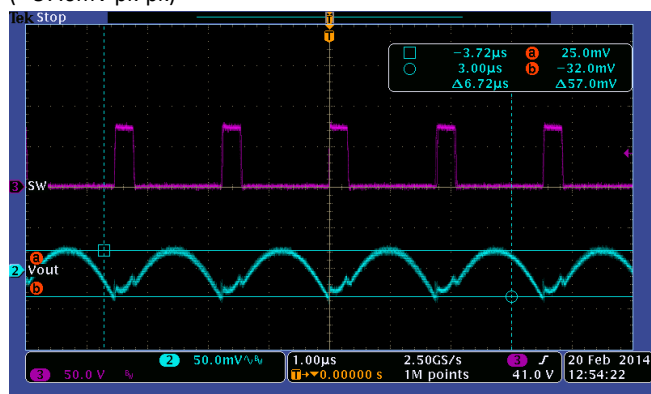36Vin, 12Vout @ 400mA load current.
(~ 40.0mV pk-pk)

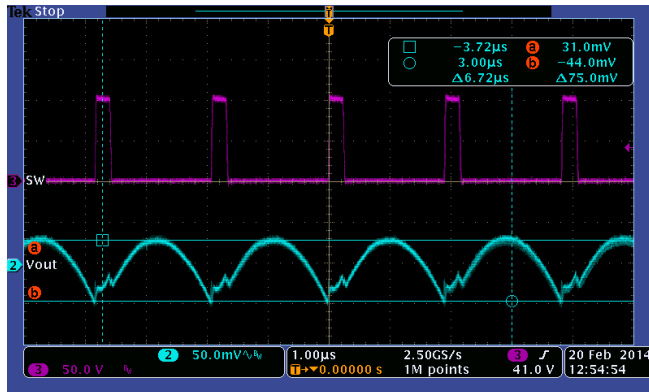48Vin, 12Vout @ 400mA load current.

(~ 44.0mV pk-pk)

56Vin, 12Vout @ 400mA load current.

(~ 50.0mV pk-pk)

72Vin, 12Vout @ 400mA load current.
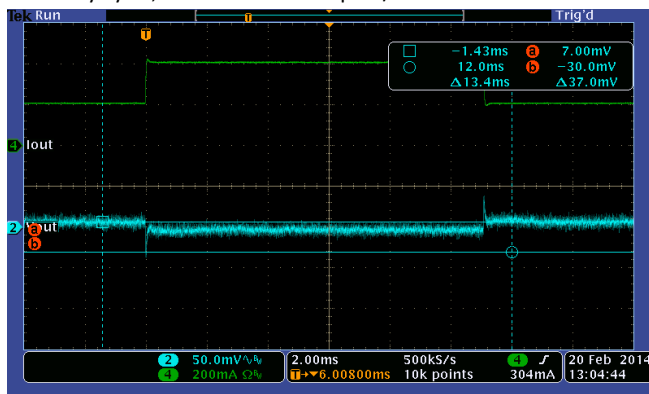
(~ 57.0mV pk-pk)
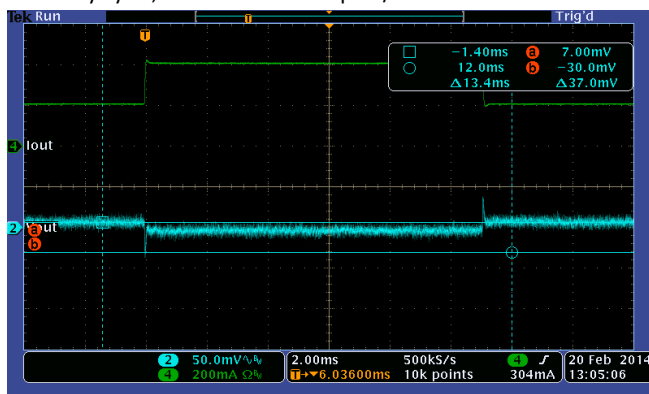
100Vin, 12Vout @ 400mA load current.
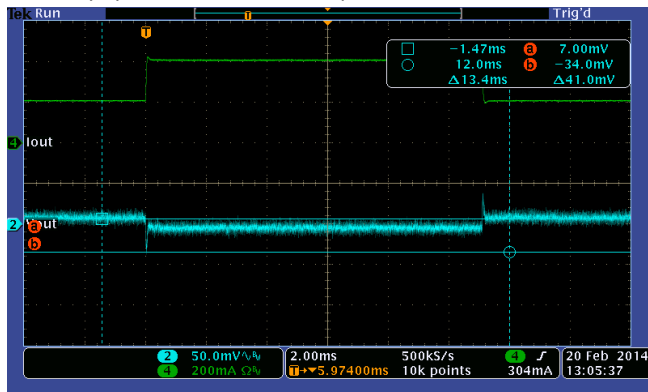(~ 75.0mV pk-pk)

Transient Response Test

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

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

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

48Vin @ 200mA to 400mA, 100mA/µs, Pulse ʃ @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.
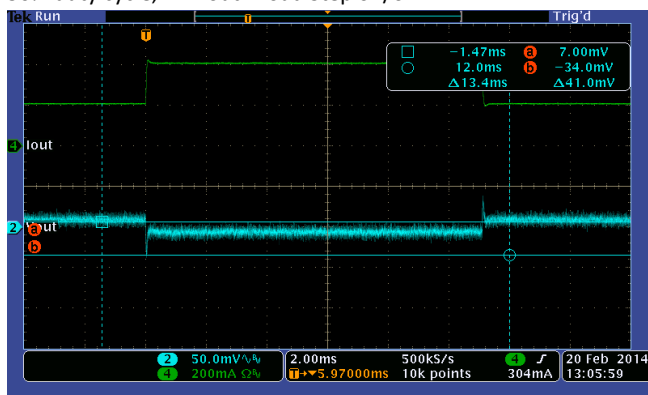
56Vin @ 200mA to 400mA, 100mA/µs, Pulse ʃ @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.
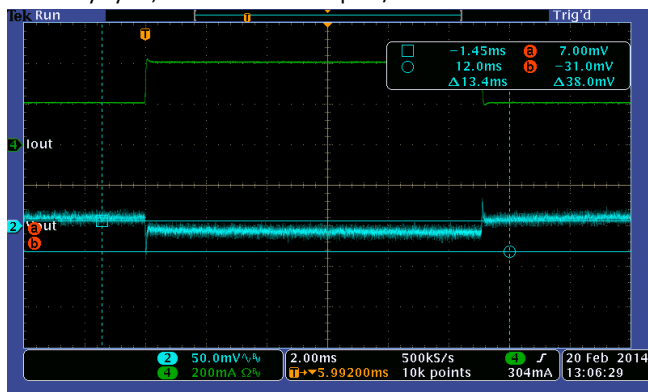
72Vin @ 200mA to 400mA, 100mA/µs, Pulse ʃ @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.
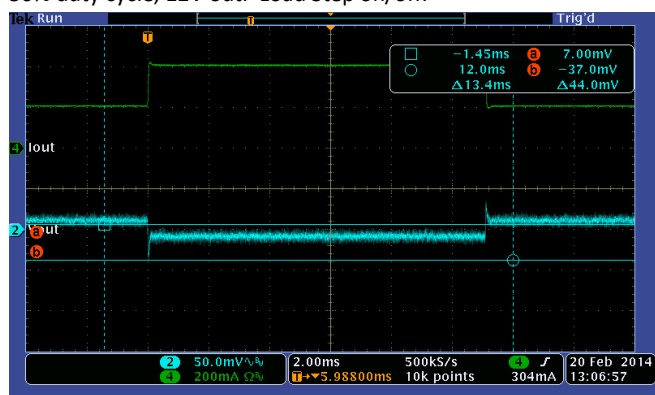
100Vin @ 200mA to 400mA, 100mA/µs, Pulse ʃ @ 45 Hz,
50% duty cycle, 12V out. Load Step on/off.
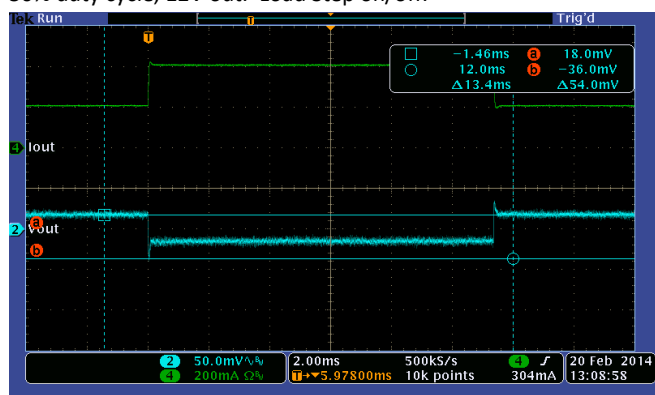
Startup Test

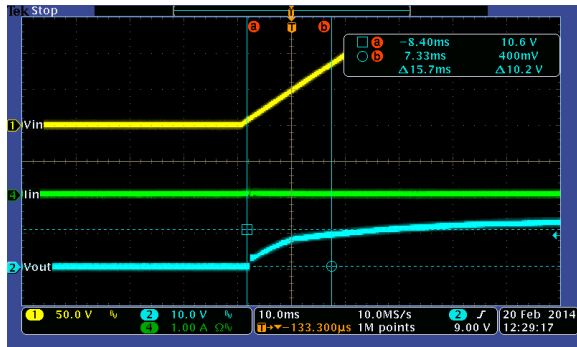20Vin, 12Vout @ no load current.
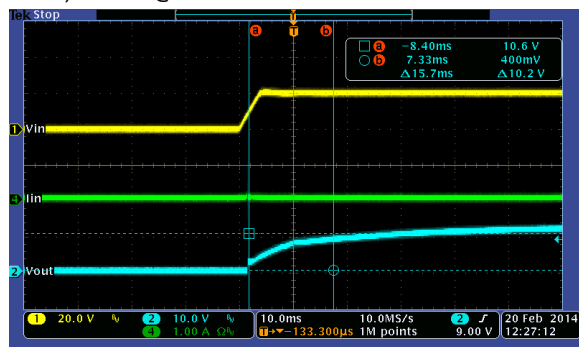
20Vin, 12Vout @ 27.77Ω Load.
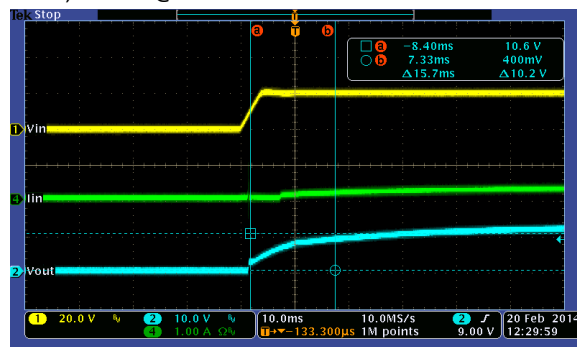
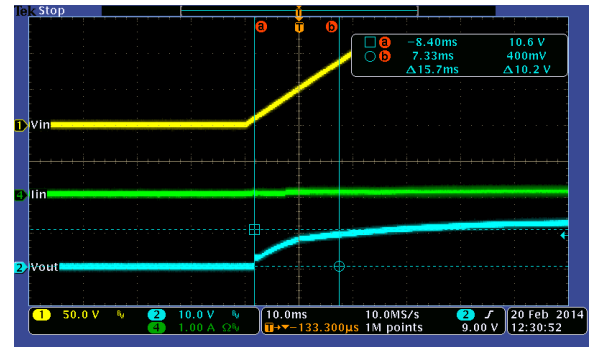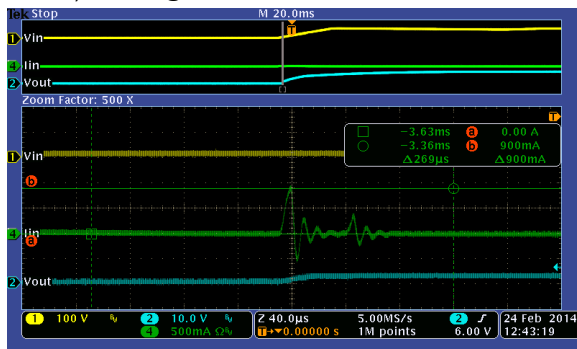20Vin, 12Vout @ no load current. In-rush zoom.
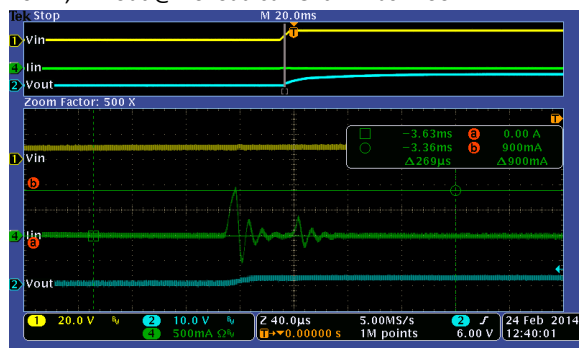
20Vin, 12Vout @ 27.77Ω Load. In-rush zoom.

24Vin, 12Vout @ no load current.

24Vin, 12Vout @ 27.77Ω Load.
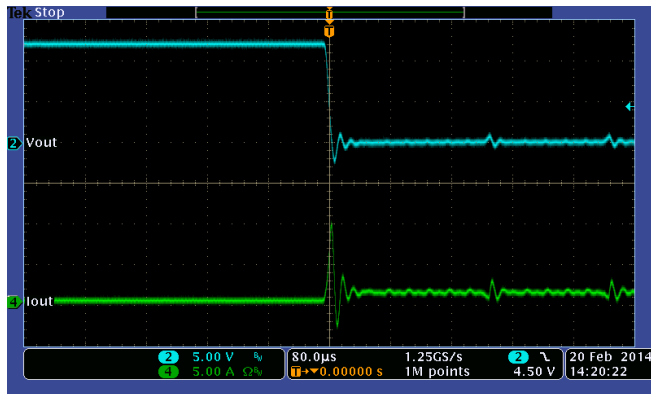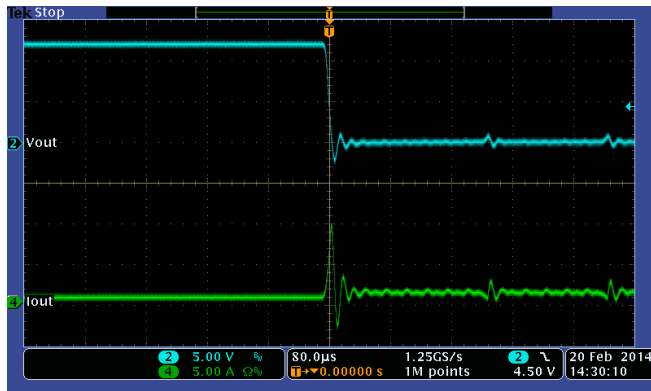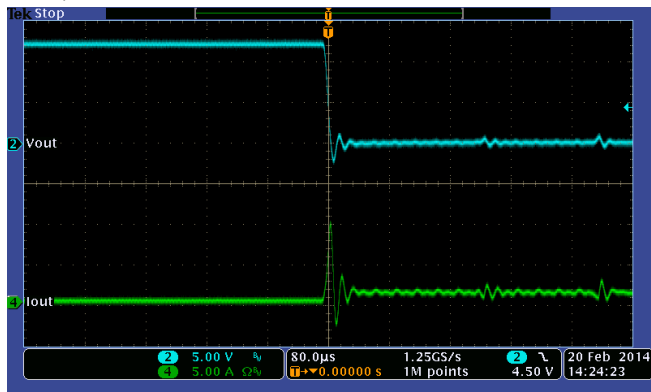
2/24/14
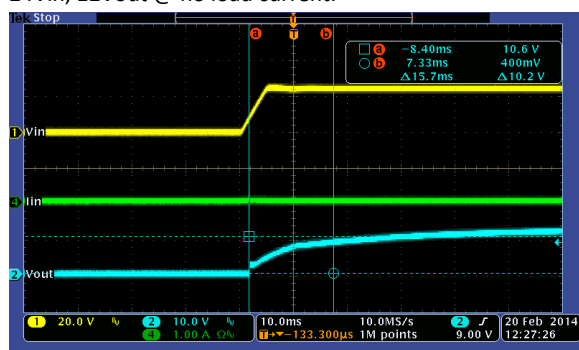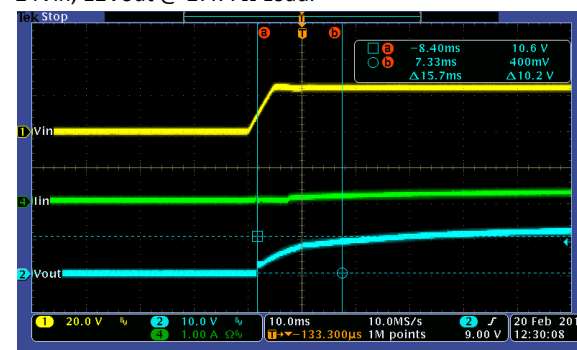
24Vin, 12Vout @ no load current. In-rush zoom.
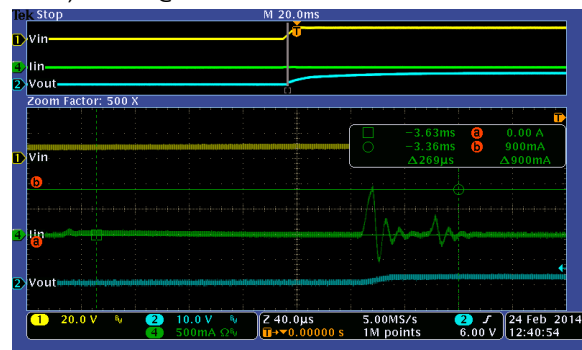
24Vin, 12Vout @ 27.77Ω Load. In-rush zoom.
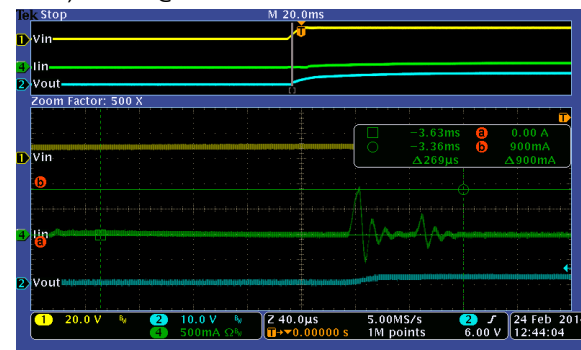
36Vin, 12Vout @ no load current.
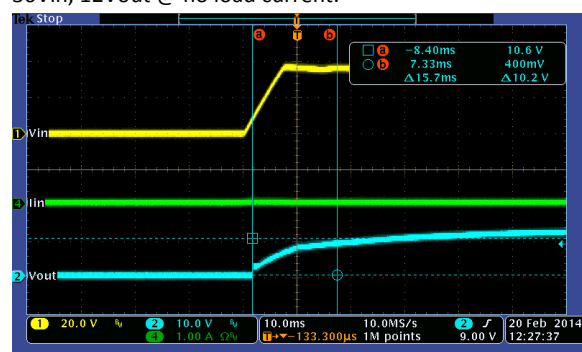
36Vin, 12Vout @ 27.77Ω Load.
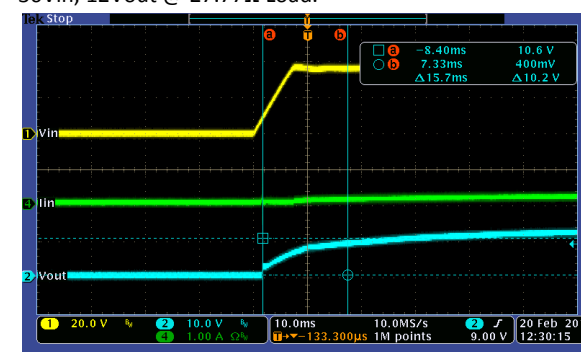
36Vin, 12Vout @ no load current. In-rush zoom.

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

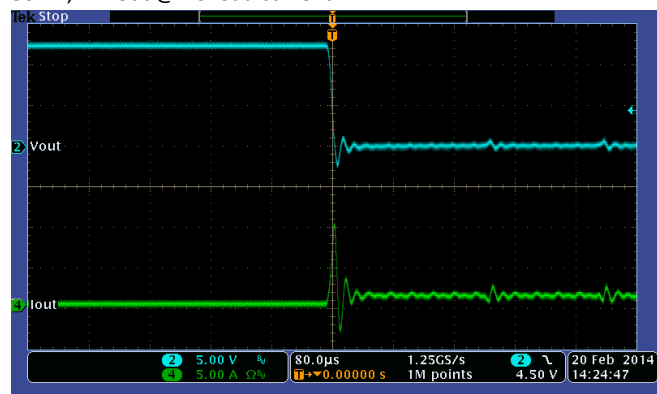2/24/14

48Vin, 12Vout @ no load current.
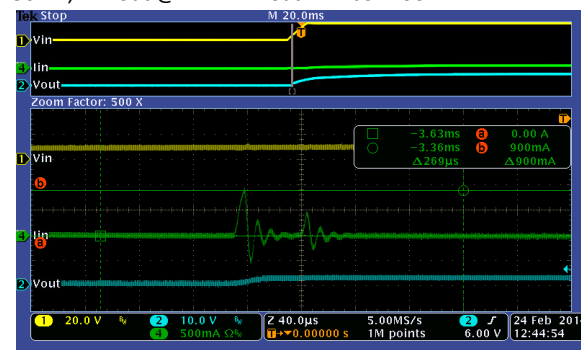
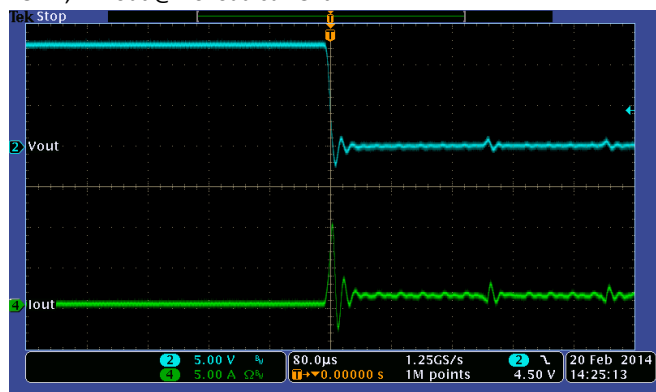48Vin, 12Vout @ 27.77Ω Load.

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

48Vin, 12Vout @ 27.77Ω Load. In-rush zoom.
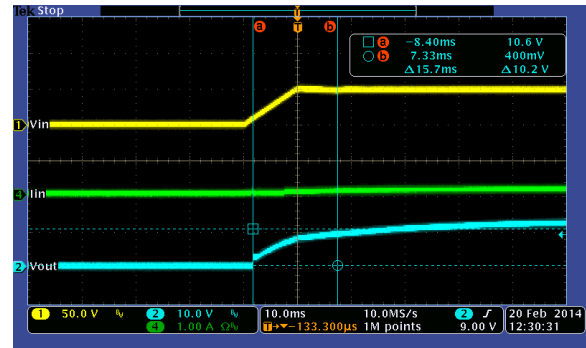
56Vin, 12Vout @ no load current.
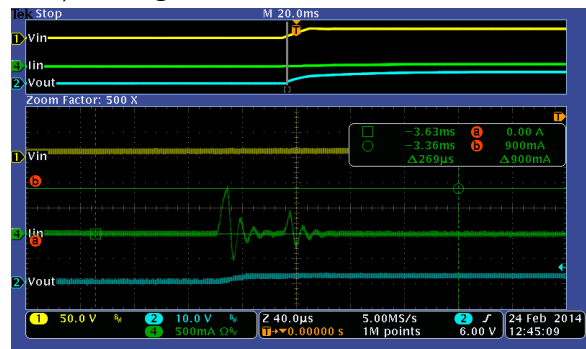
56Vin, 12Vout @ 27.77Ω Load.
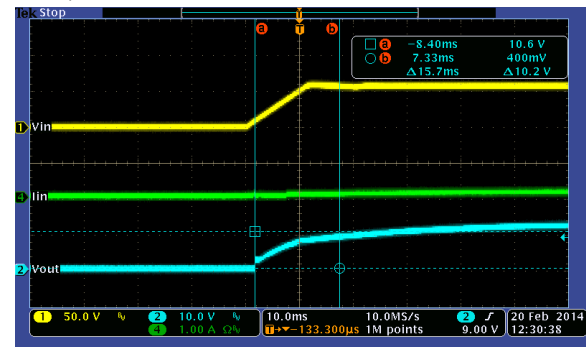
56Vin, 12Vout @ no load current. In-rush zoom.
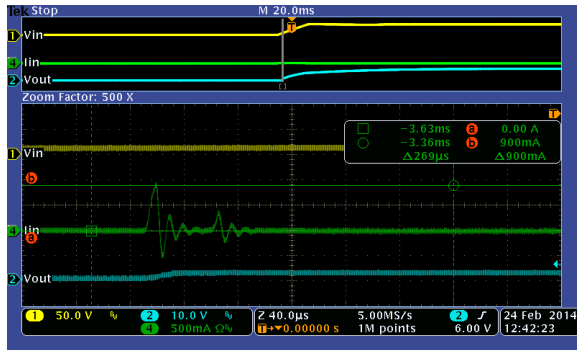
56Vin, 12Vout @ 27.77Ω Load. In-rush zoom.
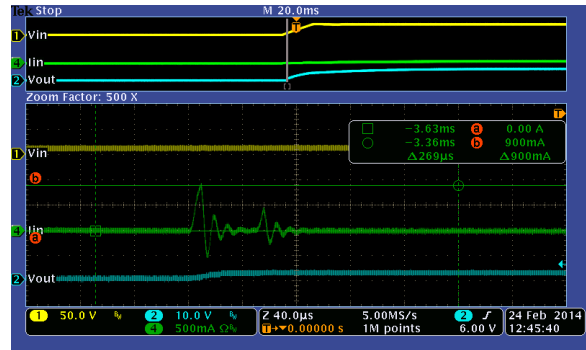
72Vin, 12Vout @ no load current.
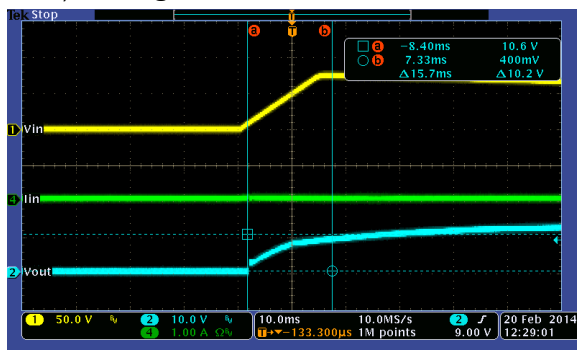
72Vin, 12Vout @ 27.77Ω Load.
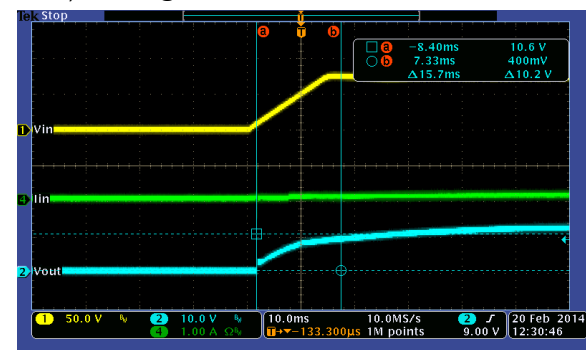
72Vin, 12Vout @ no load current. In-rush zoom.

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

2/24/14
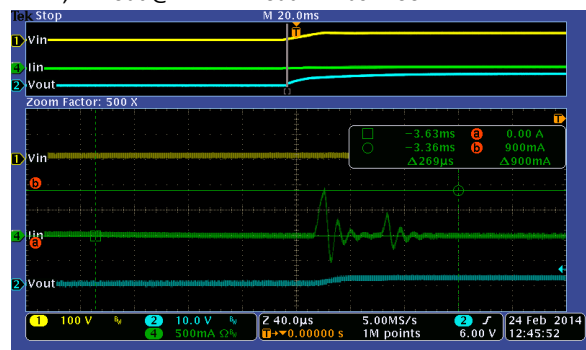
100Vin, 12Vout @ no load current.

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.

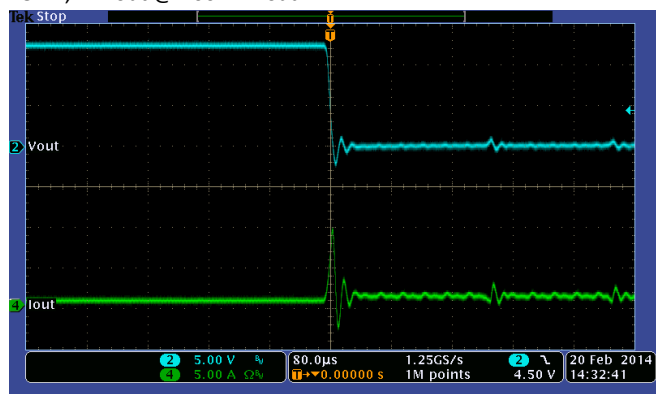20Vin, 12Vout @ 400mA Load.

24Vin, 12Vout @ no load current.

2/24/14

24Vin, 12Vout @400mA Load.

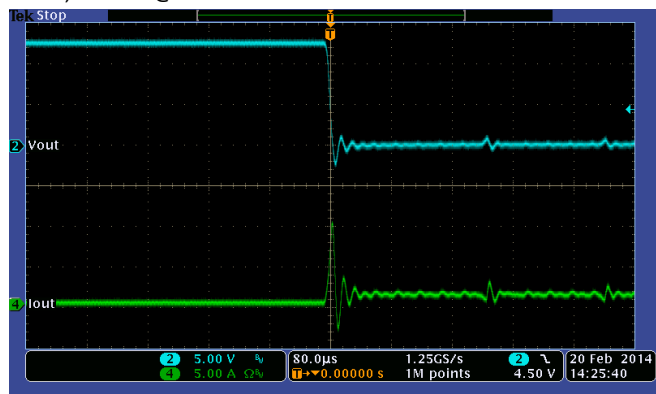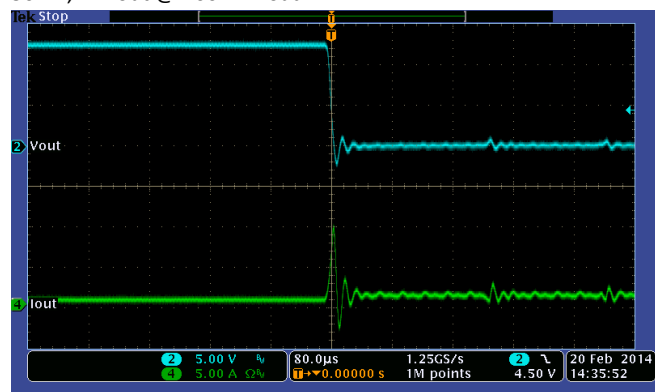36Vin, 12Vout @ no load current.

36Vin, 12Vout @ 400mA Load.

2/24/14
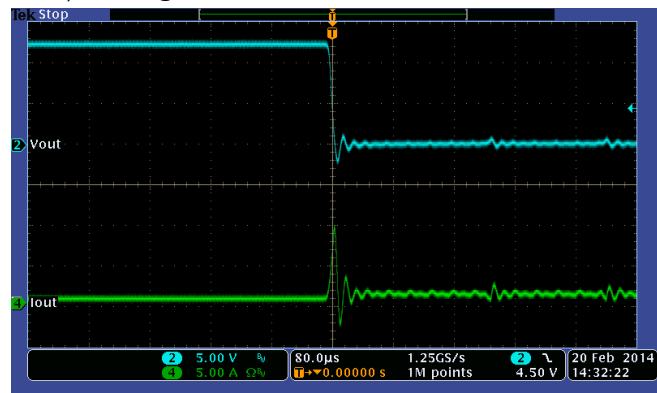
48Vin, 12Vout @ no load current.

48Vin, 12Vout @ 400mA Load.

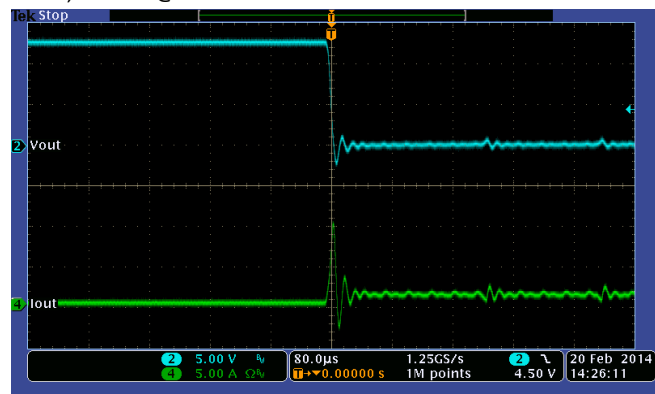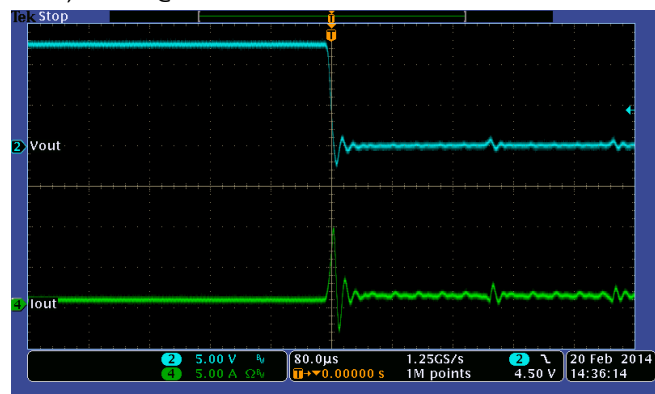56Vin, 12Vout @ no load current.
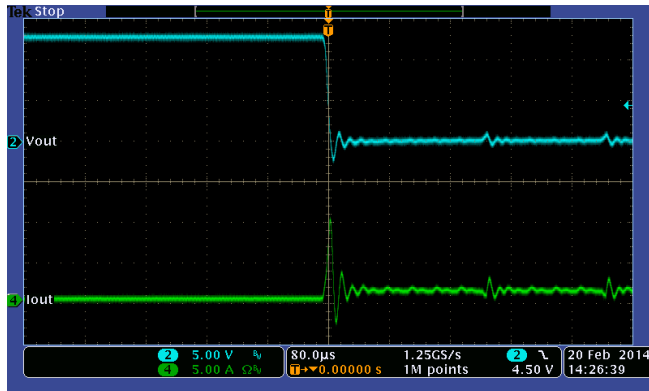
56Vin, 12Vout @ 400mA Load.

72Vin, 12Vout @ no load current.

72Vin, 12Vout @ 400mA Load.
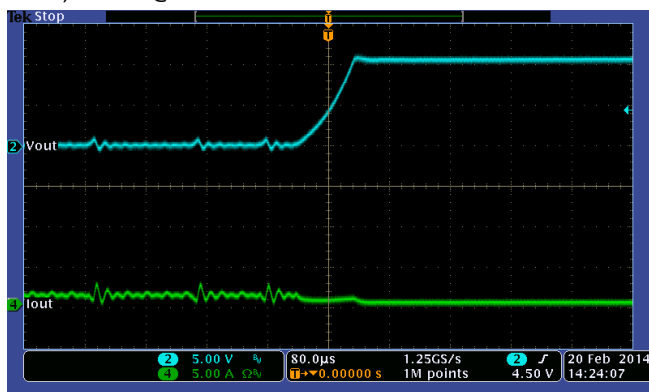
100Vin, 12Vout @ no load current.
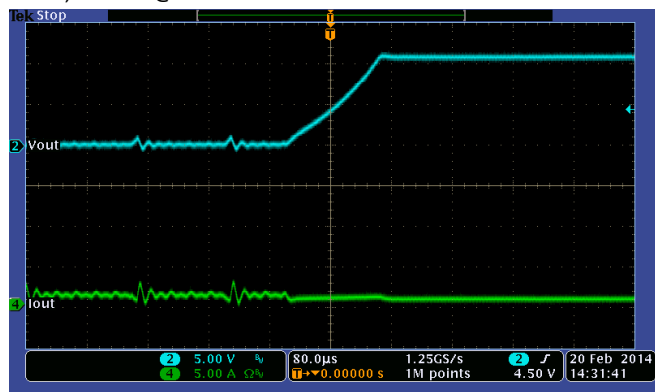

100Vin, 12Vout @ 400mA Load.

Short-Circuit Recovery Test

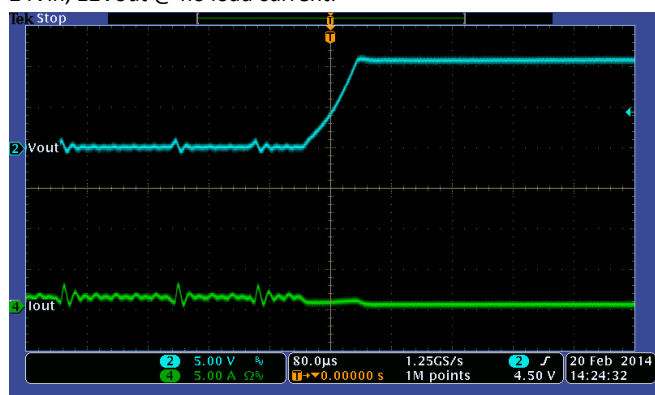Applied to board under the following conditions:
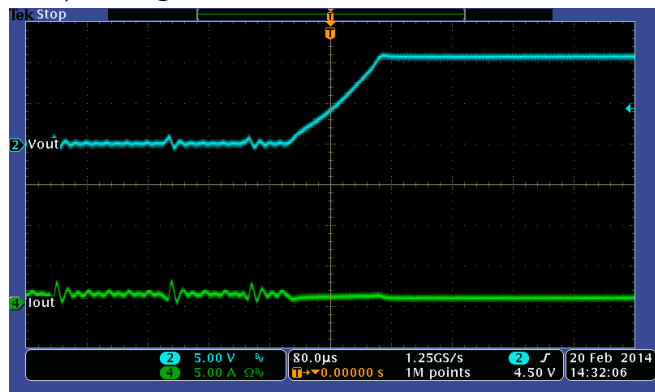
20Vin, 12Vout @ no load current.
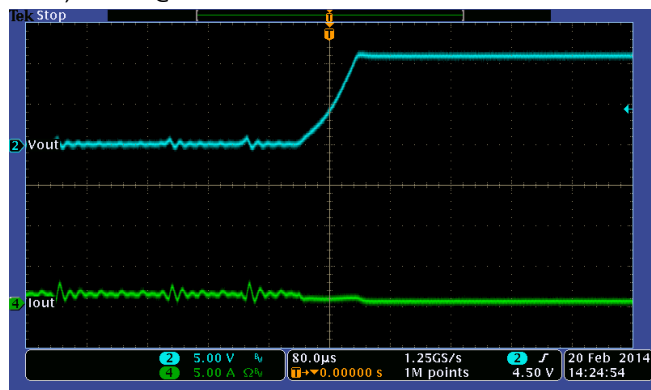
20Vin, 12Vout @ 400mA Load.
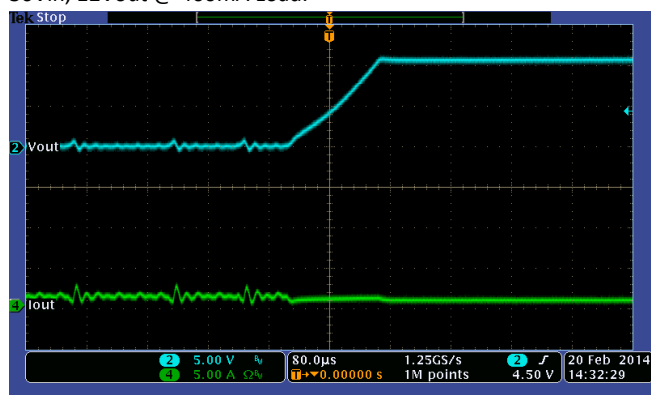

24Vin, 12Vout @ no load current.

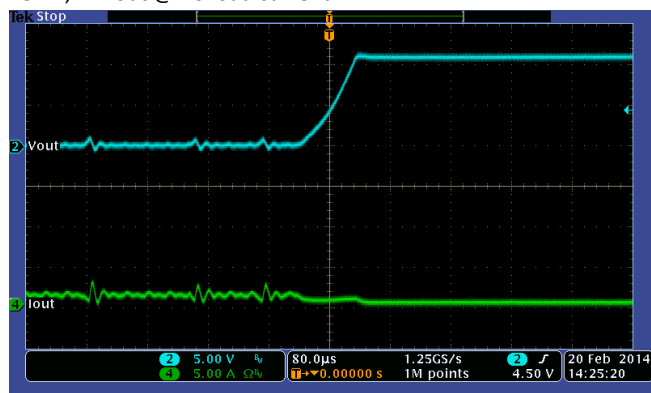24Vin, 12Vout @400mA Load.

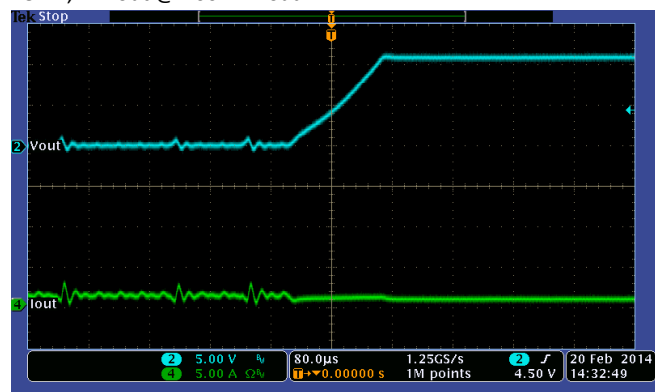36Vin, 12Vout @ no load current.
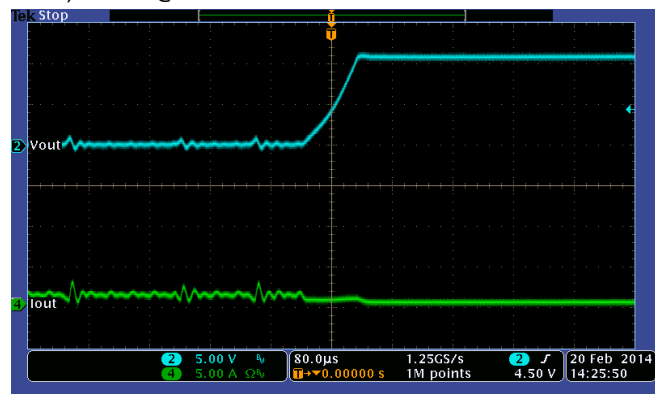

36Vin, 12Vout @ 400mA Load.
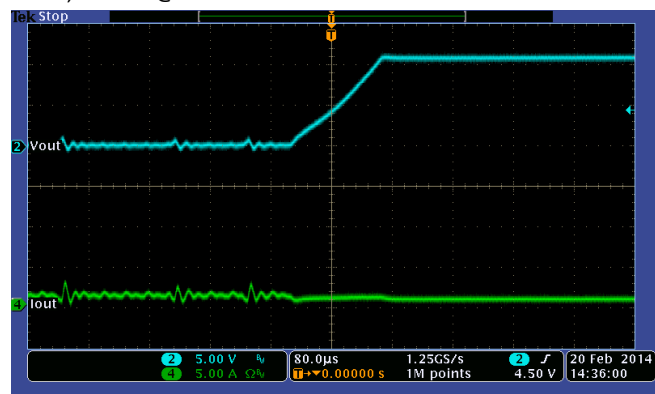

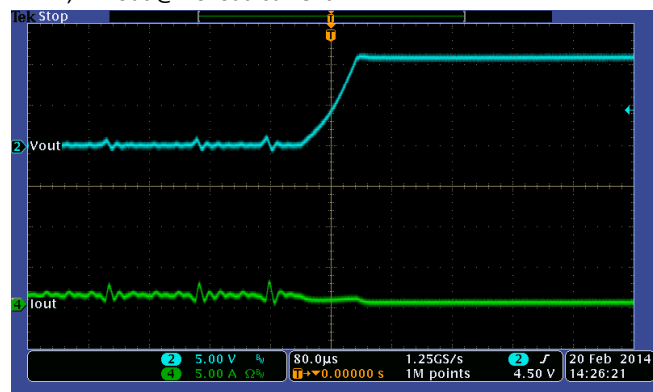48Vin, 12Vout @ no load current.

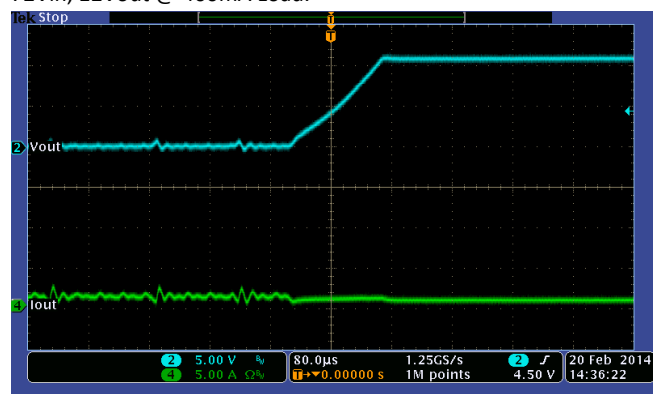48Vin, 12Vout @ 400mA Load.

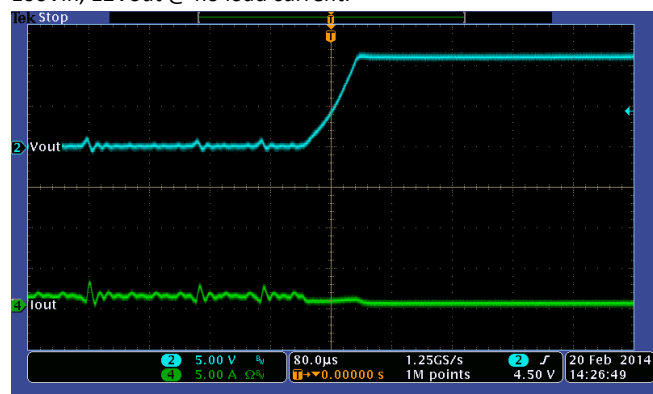56Vin, 12Vout @ no load current.

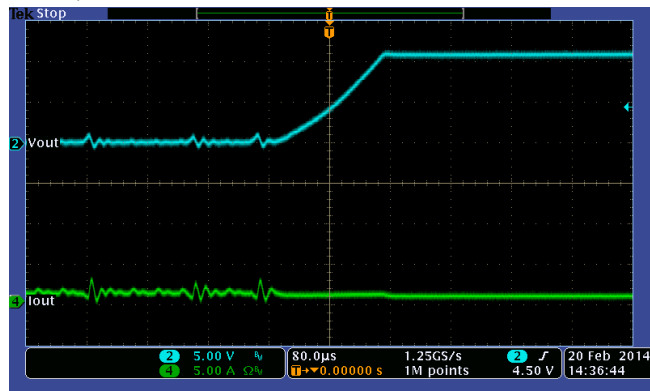56Vin, 12Vout @ 400mA Load.

72Vin, 12Vout @ no load current.

72Vin, 12Vout @ 400mA Load.

100Vin, 12Vout @ no load current.

100Vin, 12Vout @ 400mA Load.

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (https:www.ti.com/legal/termsofsale.html) or other applicable terms available either on ti.com or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.