



LM5122 4-Phase Boost Converter

TI reference design number: PMP7967 Rev A

Input: 6V to 42V

Output: 90V @ 1.5A

DC – DC Test Results

Table of Contents

1	Circuit Description.....	3
2	Photos	3
3	Efficiency	5
4	Thermal Test	7
4.1	12V Input, 1.5A Load, No Airflow.....	7
5	Startup Behavior	8
5.1	Turn-on from Vin.....	8
6	Switching Behavior	8
6.1	Switching at No Load and Full Load	8
7	Ripple Voltage	10
7.1	Input and Output Ripple.....	10
8	Load Transient Response.....	11
8.1	Load Transient at 12V, 24V and 42V Input.....	11
9	Frequency Response.....	12
9.1	Frequency Response at 12V and 24V Input.....	12
10	Over-Current Protection.....	13
10.1	Current Limit Protection.....	13

1 Circuit Description

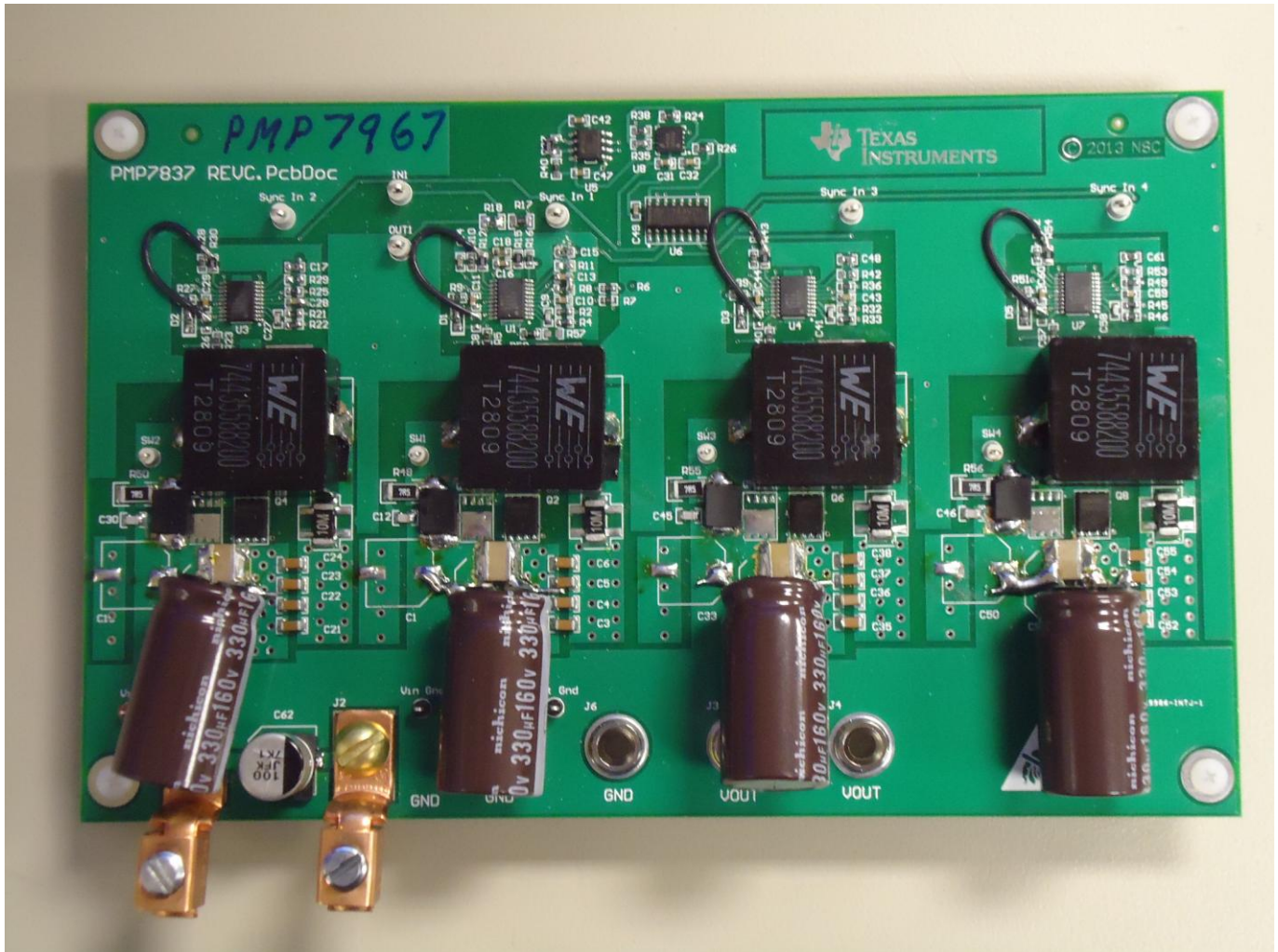
PMP7967 is a 4-phase boost converter rated for 90V output at 1.5A from an input voltage of 6V to 42V. This design uses LM5122 boost controllers at a switching frequency of 100 kHz each phase, resulting in 400 kHz input and output ripple. 330 μ F aluminum electrolytic capacitors are used at the output of each phase, providing hold-up to support large transient currents.

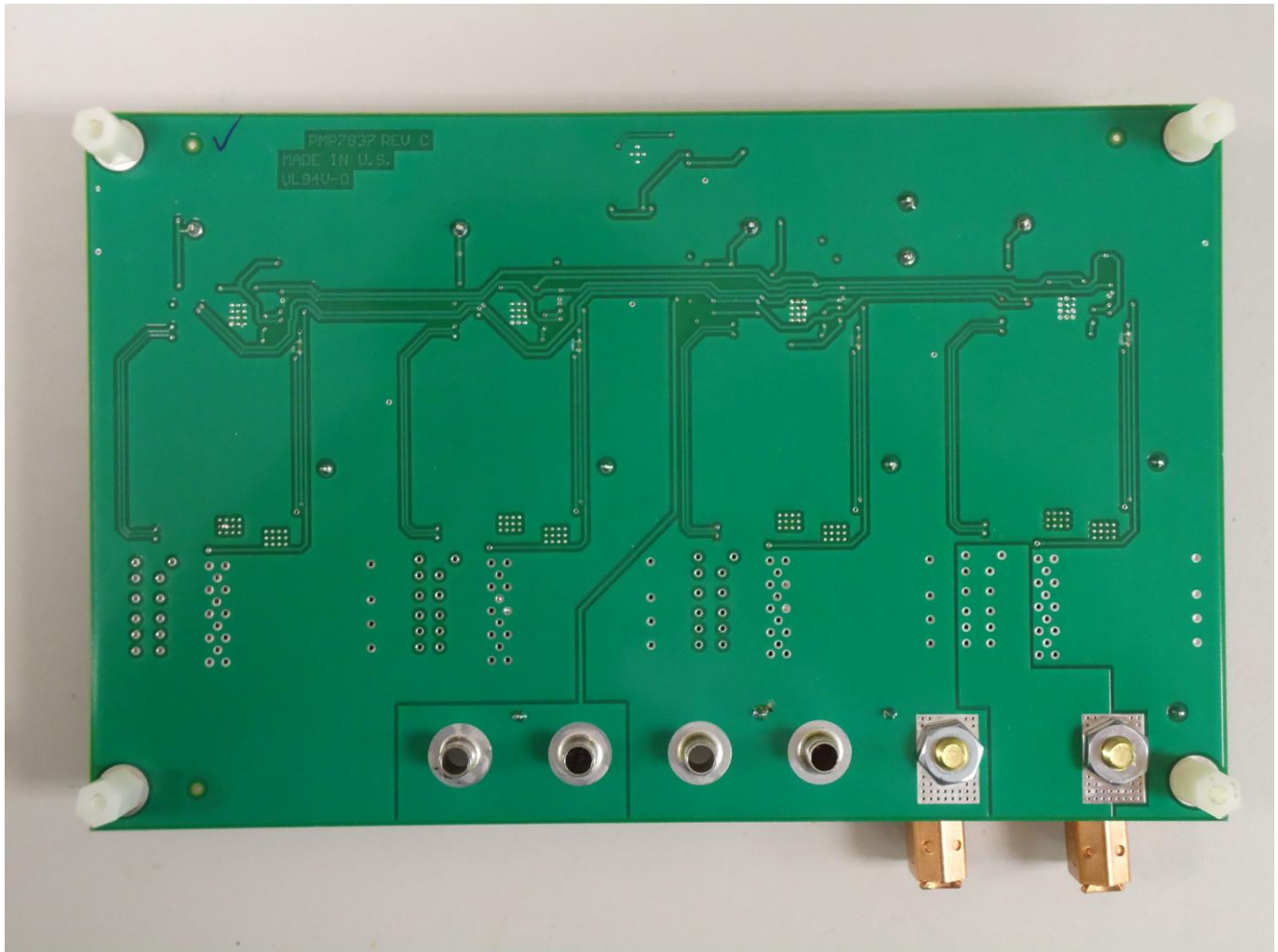
An LMC555 timer and CD4017 decade counter are powered by an LP2951 linear regulator, providing the system clock and synchronization to each controller.

At tests were performed at room temperature on an open bench.

2 Photos

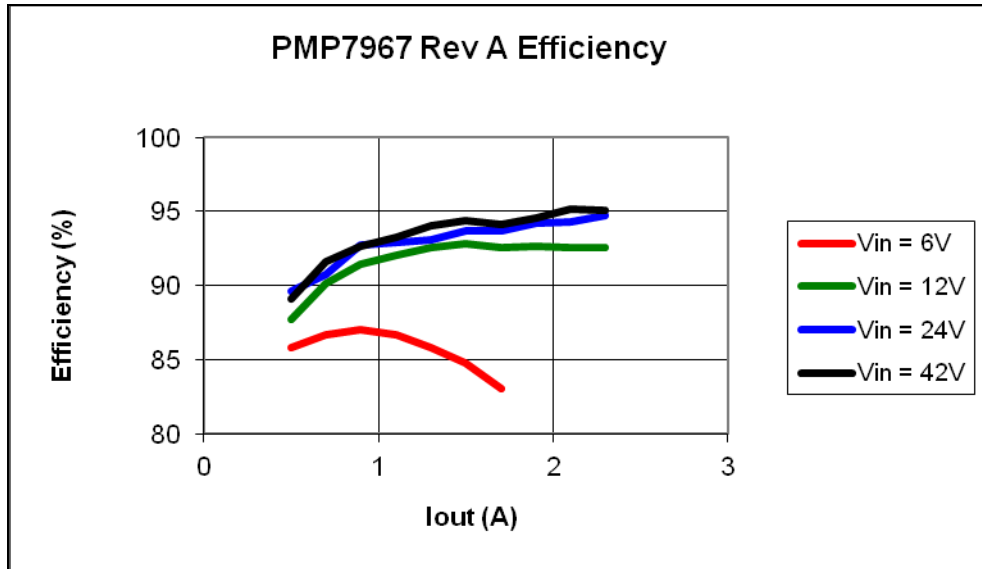
The photographs below show the PMP7967 Rev A assembly as built on PMP7837-C printed circuit board. This is a 4 layer board using 1 ounce copper on external layers and 0.5 ounce copper on internal layers. All components are mounted on the top side of the board. The overall board dimensions are 4.455" x 7.055".





3 Efficiency

The efficiency data is shown in the tables and graph below.



Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
5.999	0.150	89.023	0.000	0.000	0.90	0.00	0.90
5.998	8.650	89.025	0.500	85.794	51.88	44.51	7.37
5.998	11.980	89.024	0.700	86.725	71.86	62.32	9.54
5.998	15.340	89.024	0.900	87.080	92.01	80.12	11.89
5.998	18.840	89.024	1.100	86.659	113.00	97.93	15.08
5.998	22.490	89.025	1.300	85.794	134.90	115.73	19.16
5.998	26.250	89.026	1.500	84.815	157.45	133.54	23.91
5.998	30.390	89.027	1.700	83.030	182.28	151.35	30.93
5.999	5.140	5.330	1.900	32.843	30.83	10.13	20.71
5.998	4.950	11.620	2.100	82.189	29.69	24.40	5.29
5.998	4.950	9.101	2.300	70.503	29.69	20.93	8.76

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
12.004	0.080	89.066	0.000	0.000	0.96	0.00	0.96
12.004	4.230	89.067	0.500	87.704	50.78	44.53	6.24
12.004	5.760	89.068	0.700	90.172	69.14	62.35	6.80
12.003	7.300	89.069	0.900	91.486	87.62	80.16	7.46
12.004	8.870	89.069	1.100	92.017	106.48	97.98	8.50
12.004	10.420	89.069	1.300	92.571	125.08	115.79	9.29
12.004	11.990	89.067	1.500	92.825	143.93	133.60	10.33
12.004	13.630	89.066	1.700	92.542	163.61	151.41	12.20
12.003	15.210	89.064	1.900	92.691	182.57	169.22	13.34
12.003	16.830	89.062	2.100	92.584	202.01	187.03	14.98
12.003	18.440	89.059	2.300	92.545	221.34	204.84	16.50

PMP7967 Rev A Test Results



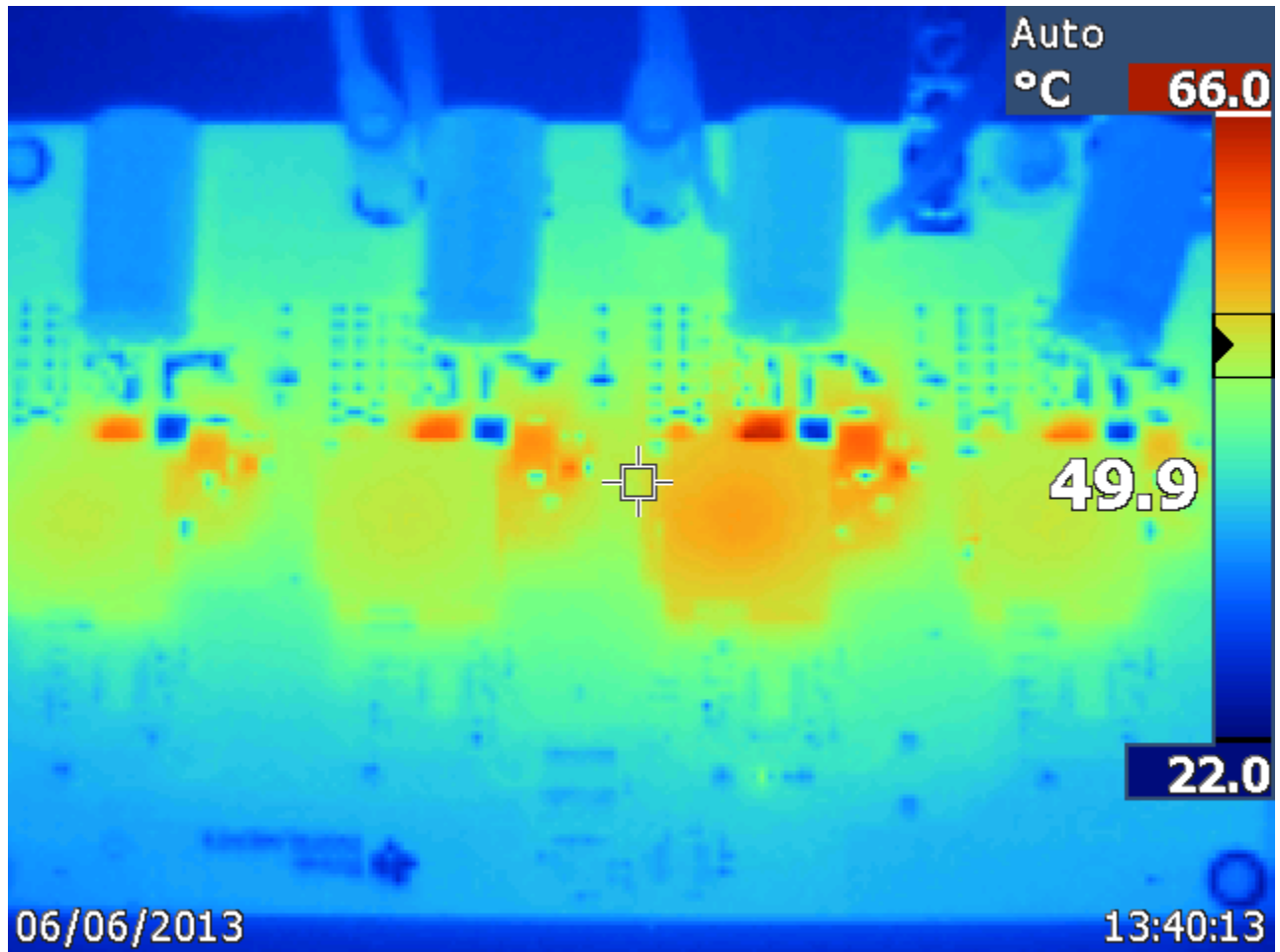
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
24.012	0.070	89.072	0.000	0.000	1.68	0.00	1.68
24.012	2.070	89.073	0.500	89.602	49.70	44.54	5.17
24.011	2.860	89.074	0.700	90.797	68.67	62.35	6.32
24.011	3.600	89.075	0.900	92.744	86.44	80.17	6.27
24.011	4.390	89.076	1.100	92.956	105.41	97.98	7.42
24.011	5.180	89.077	1.300	93.104	124.38	115.80	8.58
24.011	5.940	89.077	1.500	93.683	142.63	133.62	9.01
24.011	6.730	89.077	1.700	93.711	161.59	151.43	10.16
24.011	7.480	89.077	1.900	94.234	179.60	169.25	10.36
24.011	8.260	89.077	2.100	94.318	198.33	187.06	11.27
24.011	9.010	89.078	2.300	94.703	216.34	204.88	11.46

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
42.011	0.020	89.079	0.000	0.000	0.84	0.00	0.84
42.011	1.190	89.081	0.500	89.093	49.99	44.54	5.45
42.011	1.620	89.082	0.700	91.624	68.06	62.36	5.70
42.011	2.060	89.083	0.900	92.642	86.54	80.17	6.37
42.011	2.500	89.083	1.100	93.301	105.03	97.99	7.04
42.011	2.930	89.083	1.300	94.082	123.09	115.81	7.28
42.011	3.370	89.084	1.500	94.384	141.58	133.63	7.95
42.011	3.830	89.085	1.700	94.122	160.90	151.44	9.46
42.010	4.260	89.085	1.900	94.579	178.96	169.26	9.70
42.011	4.680	89.085	2.100	95.151	196.61	187.08	9.53
42.011	5.130	89.086	2.300	95.073	215.52	204.90	10.62

4 Thermal Test

All tests were performed at room temperature on an open bench.

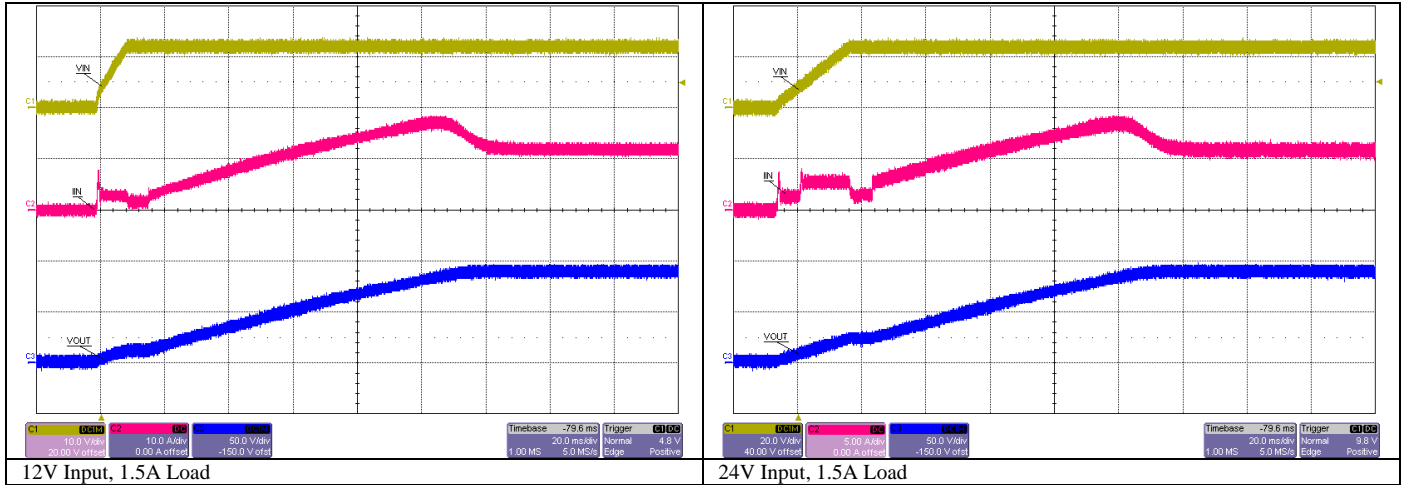
4.1 12V Input, 1.5A Load, No Airflow



5 Startup Behavior

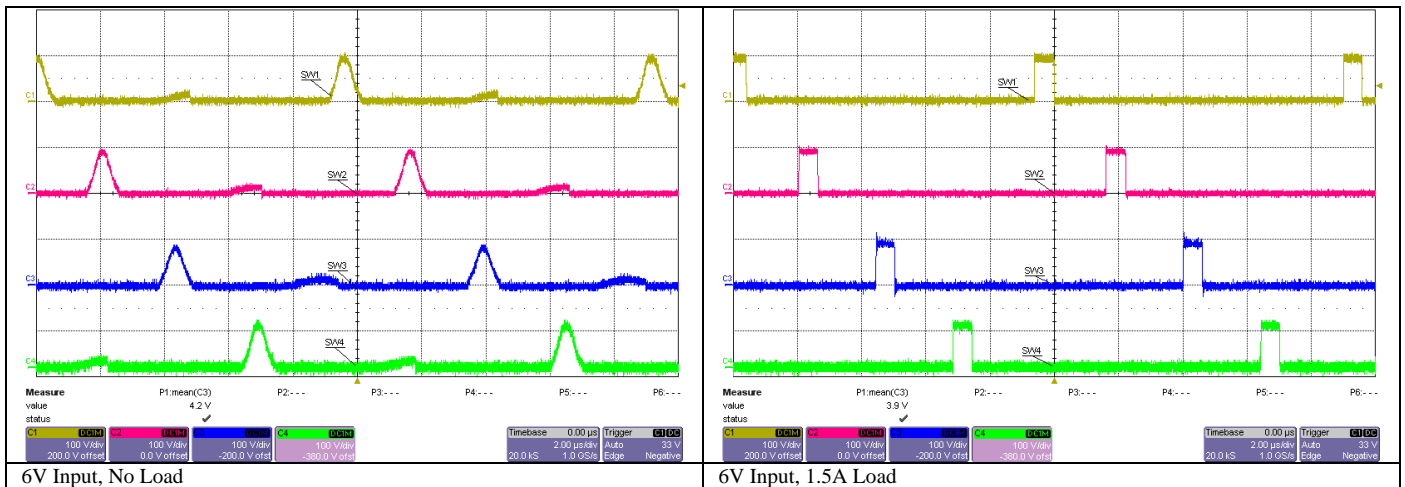
5.1 Turn-on from Vin

The output voltage is well controlled at turn-on, showing no evidence of over-shoot.

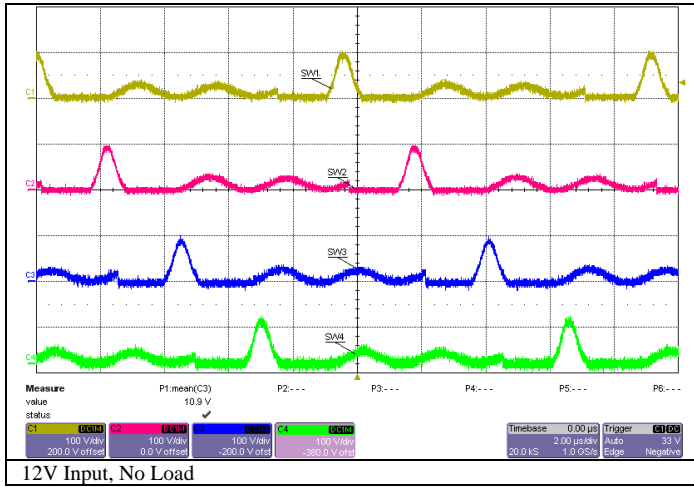


6 Switching Behavior

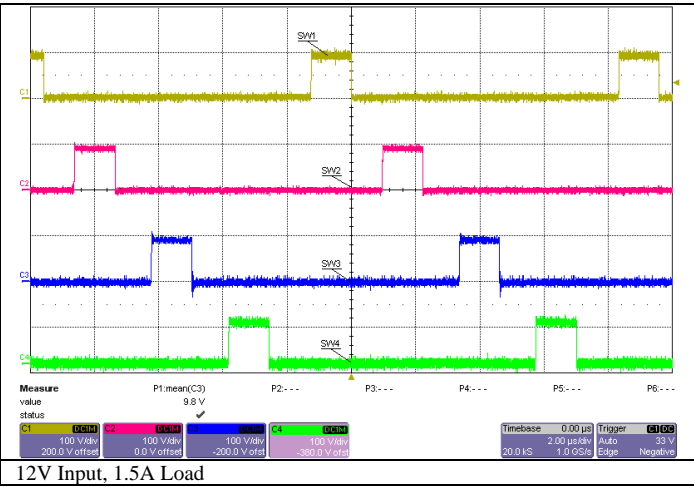
6.1 Switching at No Load and Full Load



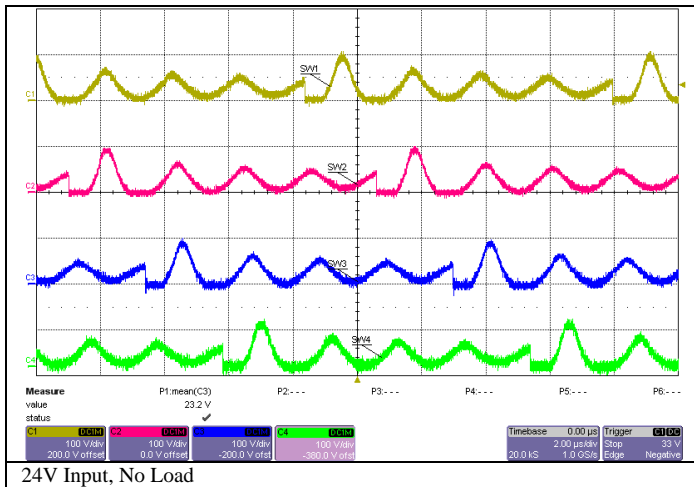
PMP7967 Rev A Test Results



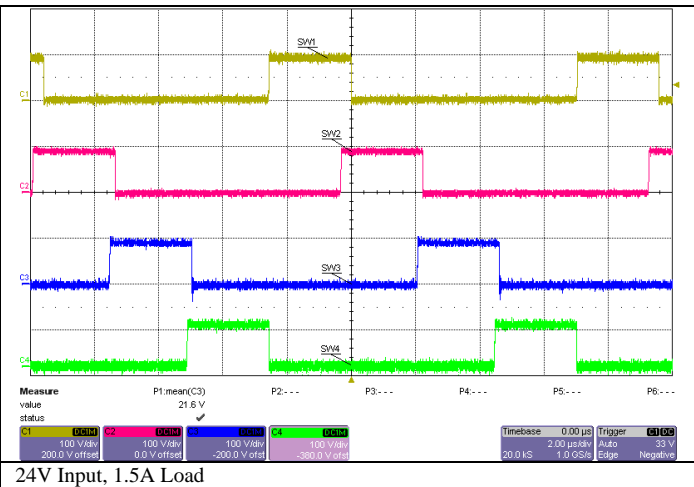
12V Input, No Load



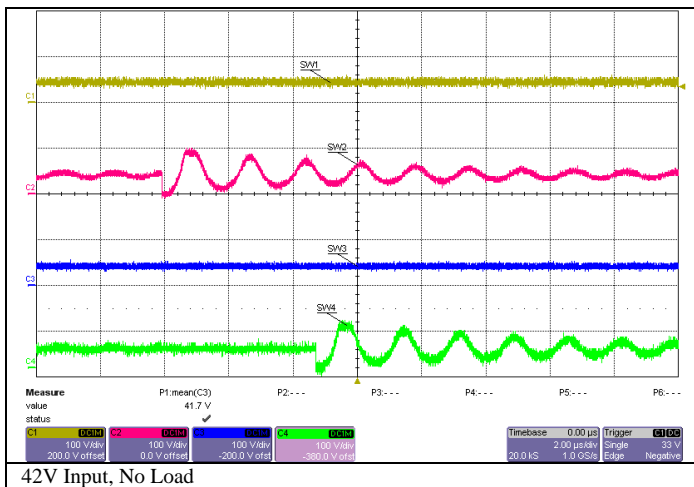
12V Input, 1.5A Load



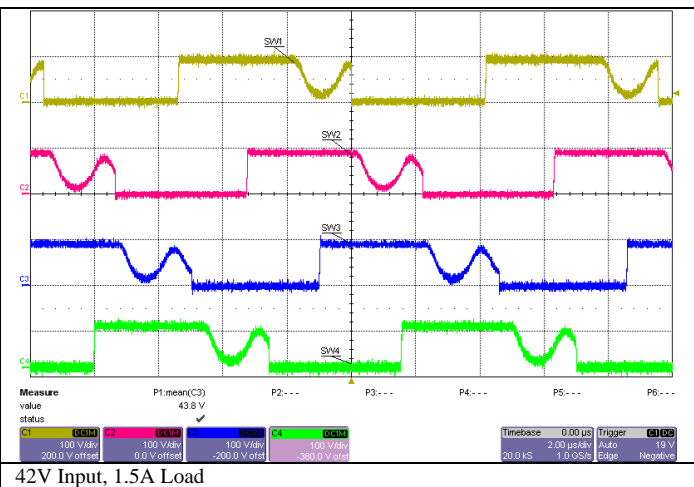
24V Input, No Load



24V Input, 1.5A Load



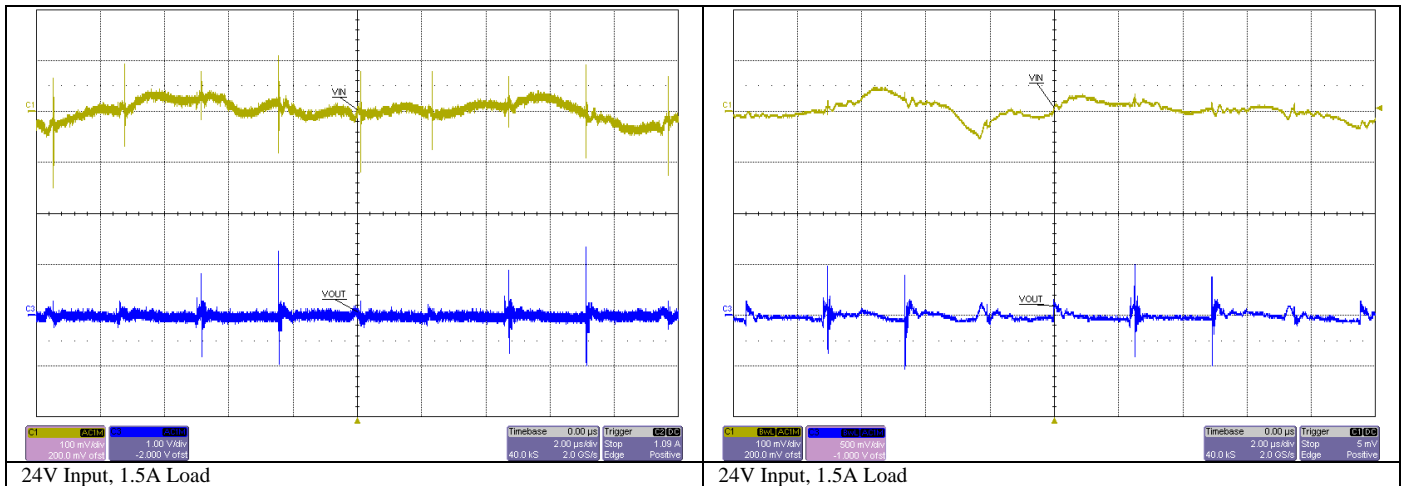
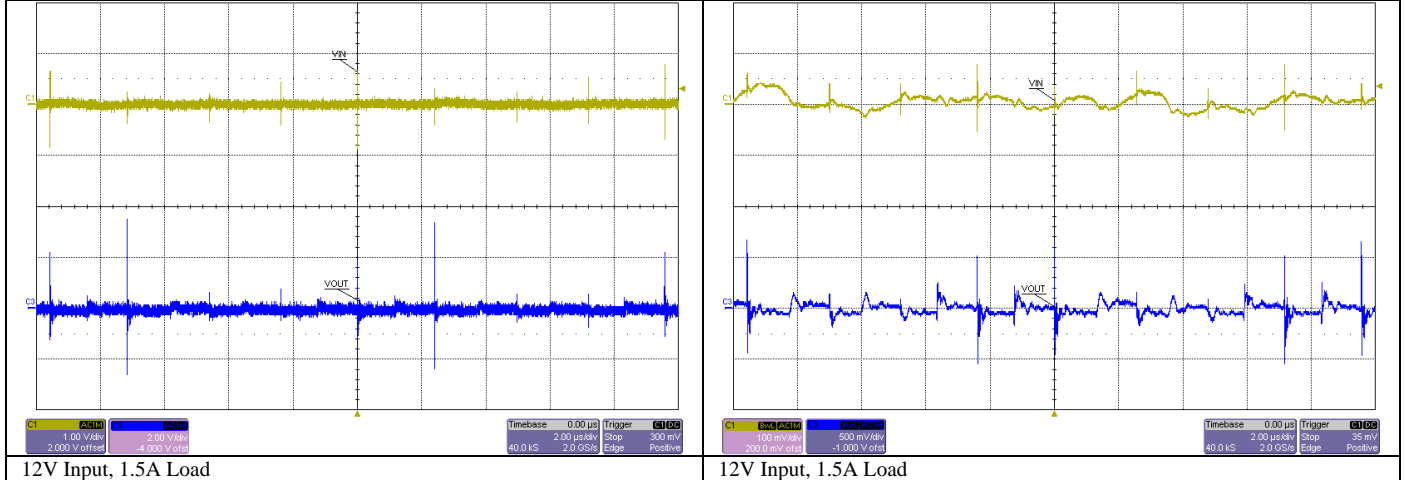
42V Input, No Load



42V Input, 1.5A Load

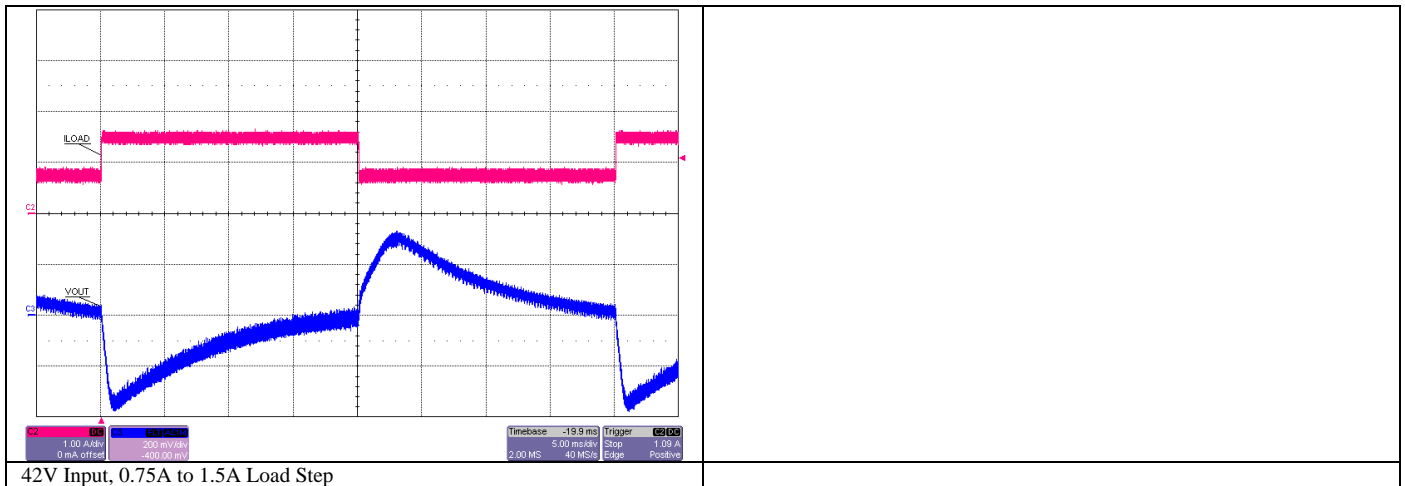
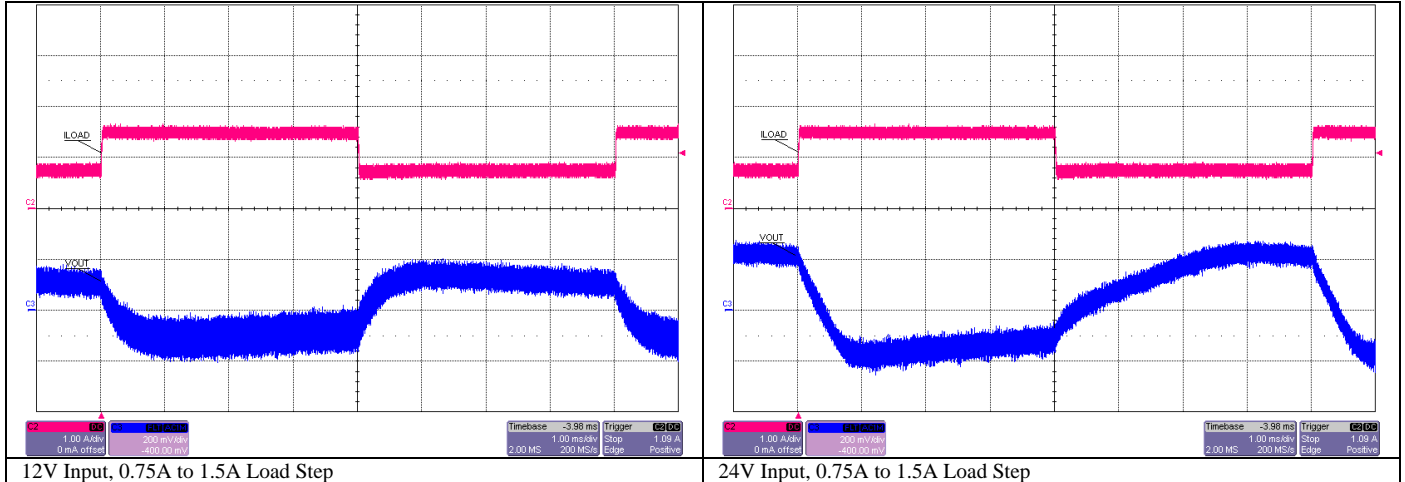
7 Ripple Voltage

7.1 Input and Output Ripple



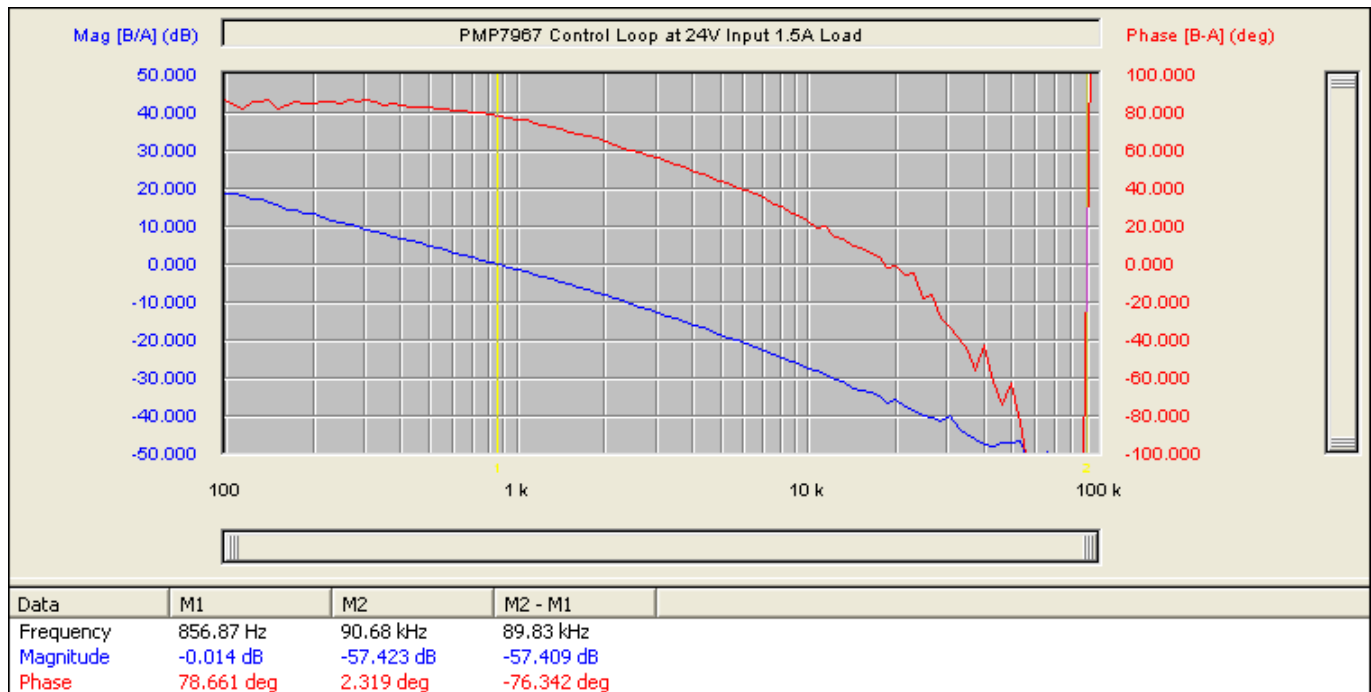
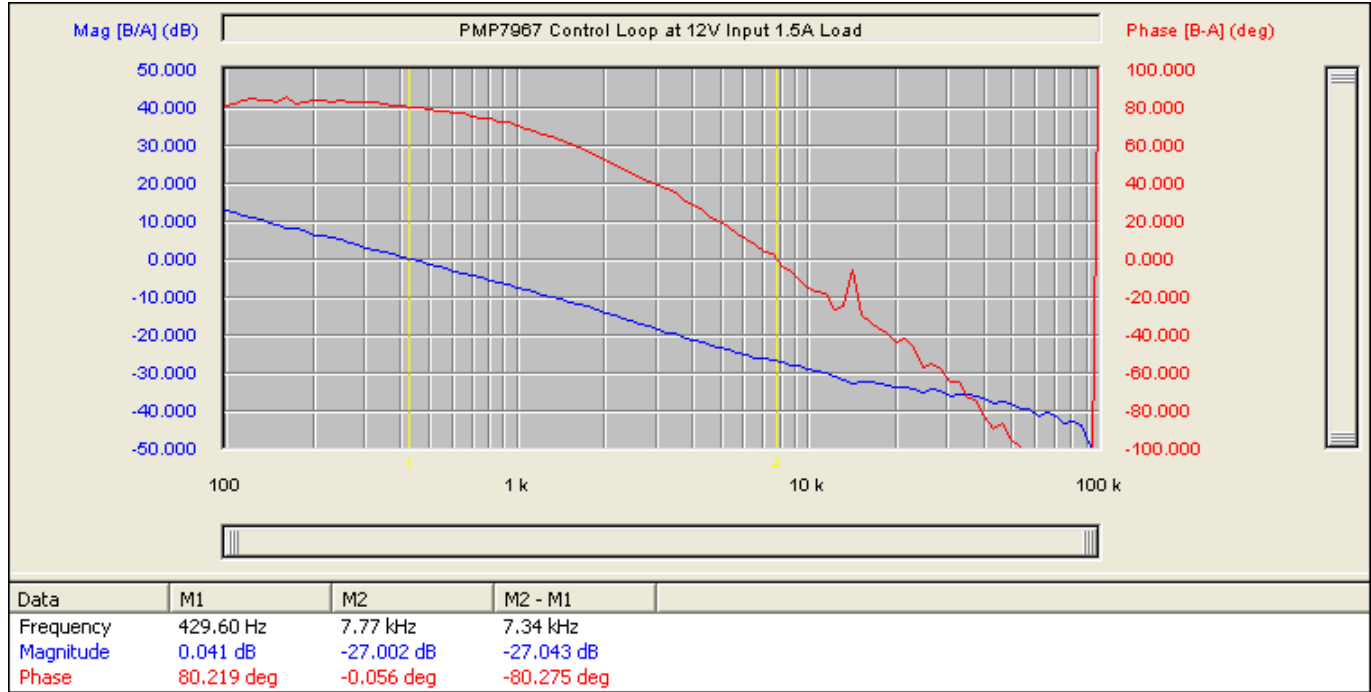
8 Load Transient Response

8.1 Load Transient at 12V, 24V and 42V Input



9 Frequency Response

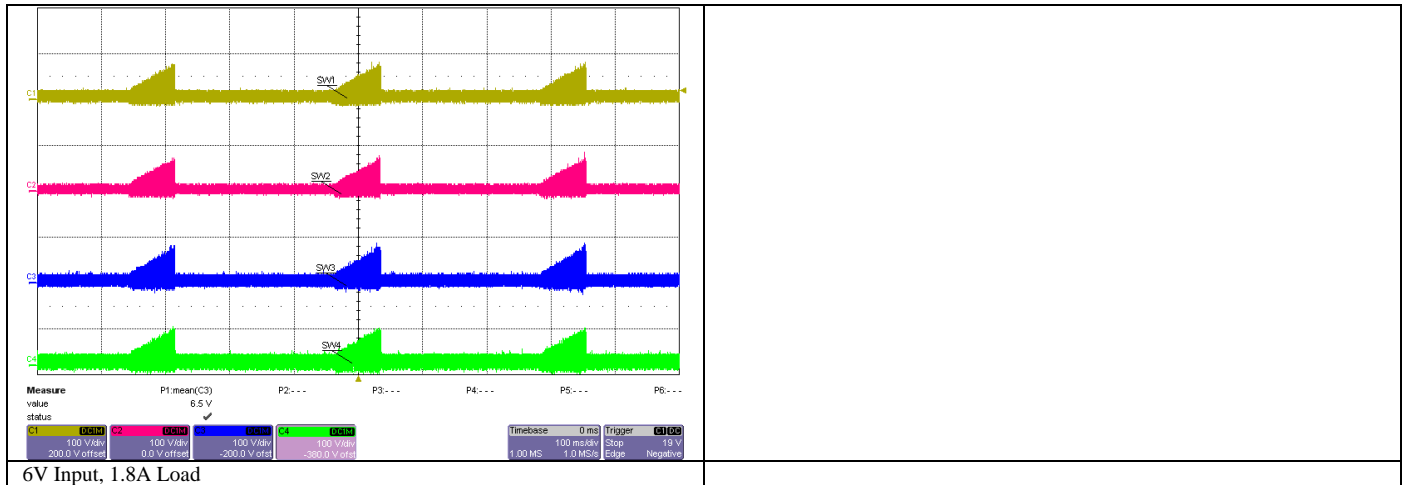
9.1 Frequency Response at 12V and 24V Input



10 Over-Current Protection

10.1 Current Limit Protection

Current limit test was performed at the minimum input voltage to check the current limit threshold. The measured threshold occurred at 32A of input current with 1.8A load. The results show current limit with hiccup protection.



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