



## **LM5118 Two-Switch Buck-Boost Converter**

**TI reference design number: PMP7905 Rev A**

**Input: 8V – 75V**  
**Output: 12V @ 10A**

**DC – DC Test Results**

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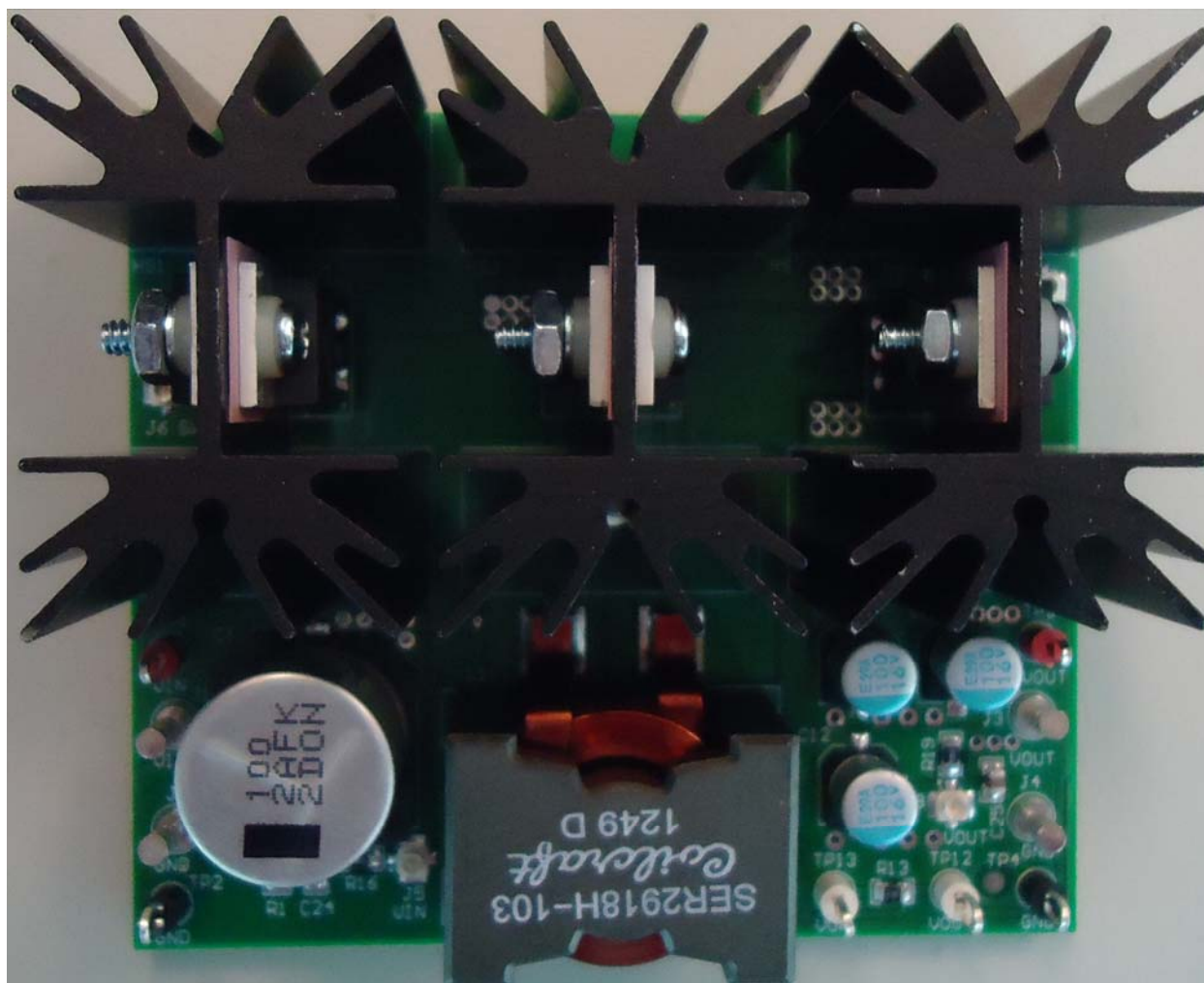
## 1 Circuit Description

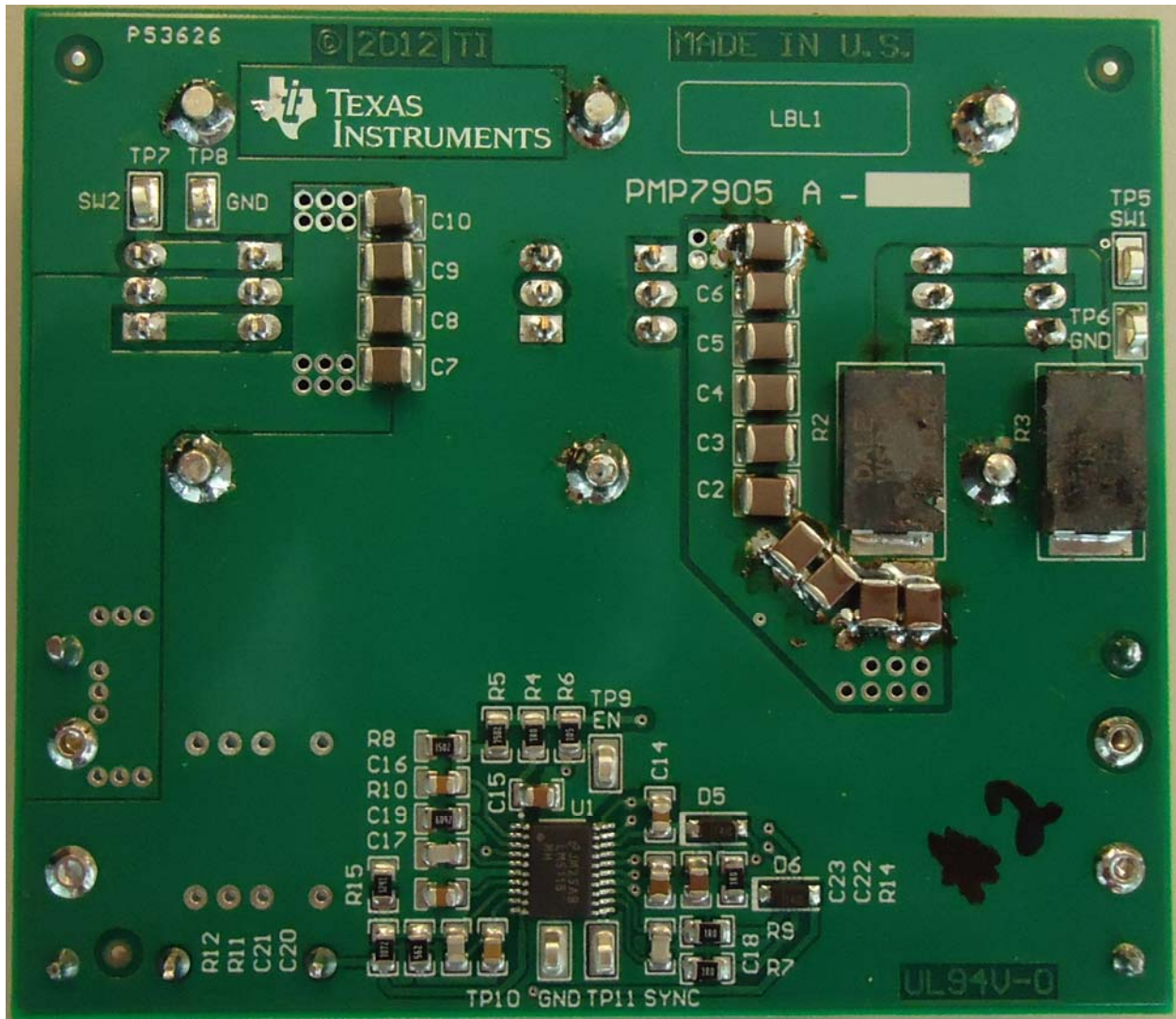
PMP7905 is a two-switch buck-boost converter capable of 120W output power. This design uses the LM5118 wide voltage range buck-boost controller. 100V Schottky rectifiers and MOSFET are used for input switching, while 30V Schottky rectifiers and MOSFET are used for output switching. The operating input voltage range is targeted for automotive applications as 8V to 16V with 75V transient capability.

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

## 2 Photos

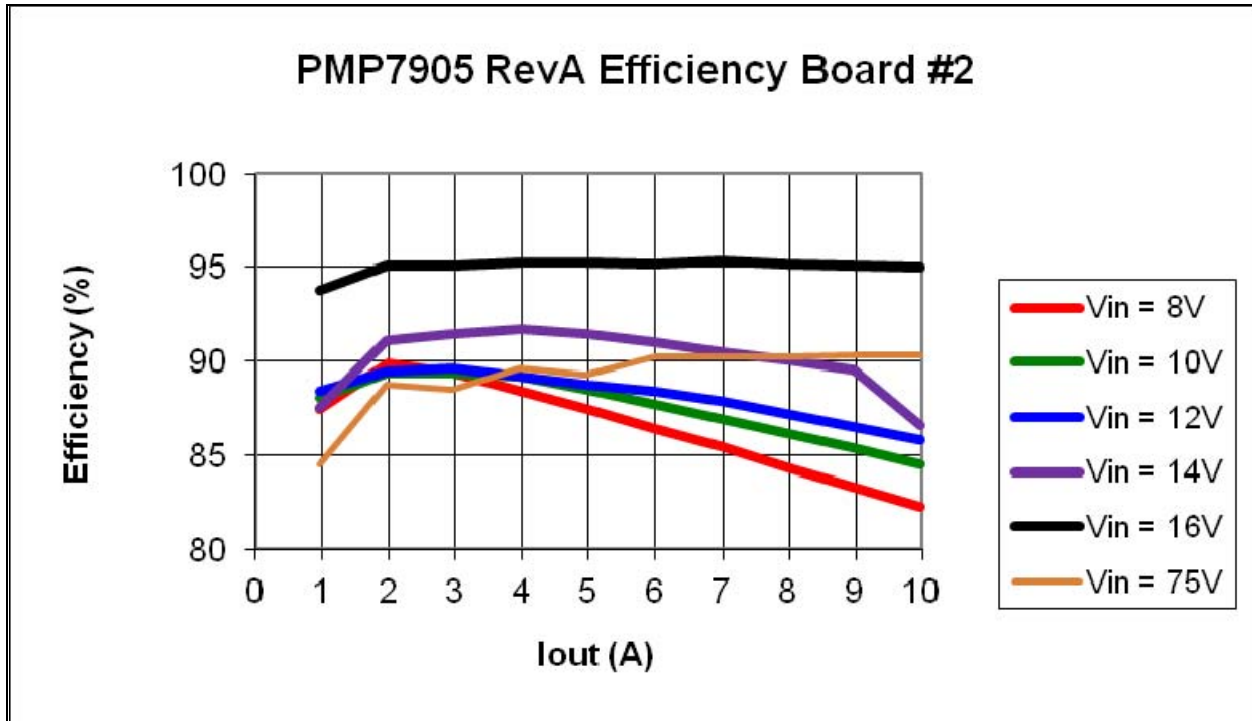
The circuit was built on PMP7905 Rev A printed circuit board. This is a four layer board with two ounce copper on external layers and one ounce copper on internal layers. The overall dimensions are 2.8" x 3.2". Top-side heat sinks are 1" high.





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## 3 Efficiency



### 3.1 Efficiency Data

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
8.002	0.035	11.882	0.000	0.000	0.28	0.00	0.28
8.002	1.630	11.881	0.960	87.446	13.04	11.41	1.64
8.002	3.270	11.880	1.980	89.895	26.17	23.52	2.64
8.001	4.950	11.879	2.980	89.381	39.60	35.40	4.21
8.001	6.680	11.878	3.980	88.452	53.45	47.27	6.17
8.001	8.450	11.877	4.980	87.485	67.61	59.15	8.46
8.001	10.270	11.876	5.980	86.428	82.17	71.02	11.15
8.000	12.125	11.875	6.980	85.451	97.00	82.89	14.11
8.000	14.040	11.874	7.980	84.361	112.32	94.75	17.57
7.999	15.990	11.873	8.980	83.359	127.90	106.62	21.28
7.999	18.005	11.872	9.980	82.267	144.02	118.48	25.54

## PMP7905 Rev A Test Results

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
10.002	0.030	11.881	0.000	0.000	0.30	0.00	0.30
10.002	1.295	11.881	0.960	88.058	12.95	11.41	1.55
10.002	2.605	11.880	1.960	89.367	26.06	23.28	2.77
10.002	3.935	11.879	2.960	89.339	39.36	35.16	4.20
10.002	5.300	11.878	3.980	89.179	53.01	47.27	5.74
10.001	6.685	11.877	4.980	88.469	66.86	59.15	7.71
10.001	8.095	11.876	5.980	87.723	80.96	71.02	9.94
10.001	9.530	11.875	6.980	86.967	95.31	82.89	12.42
10.000	11.000	11.874	7.980	86.140	110.00	94.75	15.25
10.000	12.490	11.874	8.980	85.371	124.90	106.63	18.27
10.000	14.015	11.873	9.980	84.547	140.15	118.49	21.66

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
12.001	0.030	11.881	0.000	0.000	0.36	0.00	0.36
12.000	1.075	11.881	0.960	88.417	12.90	11.41	1.49
12.000	2.170	11.880	1.960	89.419	26.04	23.28	2.76
12.000	3.270	11.879	2.960	89.607	39.24	35.16	4.08
12.000	4.395	11.878	3.960	89.186	52.74	47.04	5.70
12.000	5.530	11.877	4.960	88.773	66.36	58.91	7.45
12.000	6.690	11.876	5.980	88.463	80.28	71.02	9.26
11.999	7.860	11.875	6.980	87.886	94.31	82.89	11.42
11.999	9.060	11.875	7.980	87.169	108.71	94.76	13.95
11.999	10.270	11.874	8.980	86.528	123.23	106.63	16.60
11.999	11.505	11.873	9.980	85.834	138.05	118.49	19.56

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
14.003	0.025	11.881	0.000	0.000	0.35	0.00	0.35
14.003	0.930	11.881	0.960	87.583	13.02	11.41	1.62
14.003	1.825	11.880	1.960	91.115	25.56	23.28	2.27
14.003	2.745	11.879	2.960	91.476	38.44	35.16	3.28
14.003	3.680	11.878	3.980	91.740	51.53	47.27	4.26
14.002	4.620	11.877	4.980	91.433	64.69	59.15	5.54
14.002	5.575	11.877	5.980	90.986	78.06	71.02	7.04
14.002	6.540	11.876	6.980	90.523	91.57	82.89	8.68
14.002	7.515	11.875	7.980	90.057	105.23	94.76	10.46
14.002	8.505	11.874	8.980	89.538	119.09	106.63	12.46
14.002	9.770	11.873	9.980	86.618	136.80	118.49	18.31



## PMP7905 Rev A Test Results

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
16.006	0.010	11.882	0.000	0.000	0.16	0.00	0.16
16.007	0.760	11.881	0.960	93.756	12.17	11.41	0.76
16.006	1.530	11.880	1.960	95.082	24.49	23.28	1.20
16.006	2.310	11.879	2.960	95.099	36.97	35.16	1.81
16.006	3.085	11.879	3.960	95.266	49.38	47.04	2.34
16.006	3.865	11.878	4.960	95.234	61.86	58.91	2.95
16.006	4.645	11.877	5.960	95.210	74.35	70.79	3.56
16.006	5.430	11.876	6.980	95.377	86.91	82.89	4.02
16.006	6.220	11.876	7.980	95.192	99.56	94.77	4.79
16.006	7.010	11.875	8.980	95.041	112.20	106.64	5.56
16.006	7.795	11.874	9.980	94.979	124.77	118.50	6.26

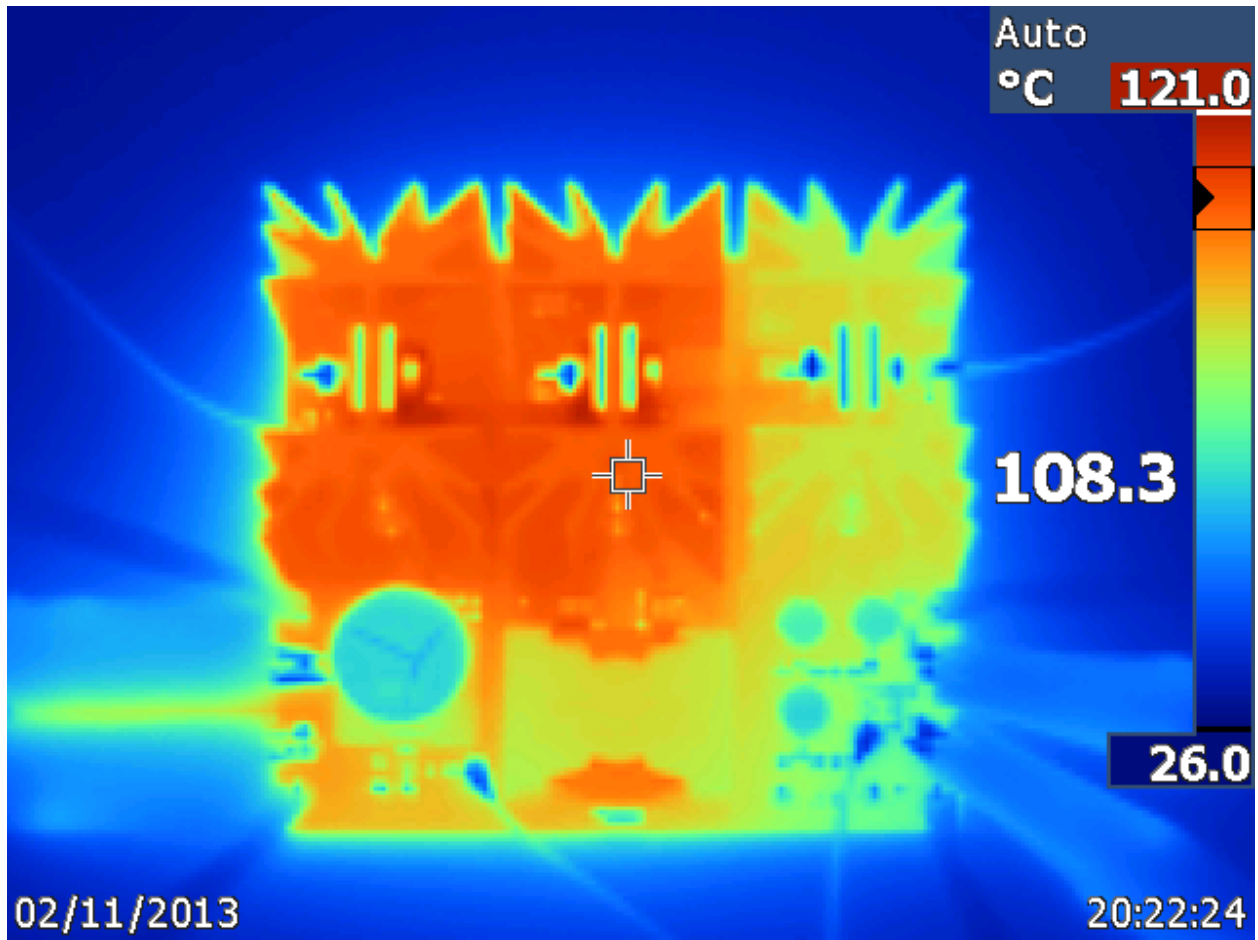
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
75.023	0.005	11.888	0.000	0.000	0.38	0.00	0.38
75.023	0.180	11.887	0.960	84.504	13.50	11.41	2.09
75.023	0.350	11.887	1.960	88.729	26.26	23.30	2.96
75.022	0.530	11.886	2.960	88.484	39.76	35.18	4.58
75.022	0.700	11.885	3.960	89.621	52.52	47.06	5.45
75.022	0.880	11.885	4.960	89.291	66.02	58.95	7.07
75.021	1.050	11.884	5.980	90.218	78.77	71.07	7.71
75.021	1.225	11.883	6.980	90.253	91.90	82.94	8.96
75.021	1.400	11.882	7.980	90.278	105.03	94.82	10.21
75.020	1.575	11.881	8.980	90.297	118.16	106.69	11.47
75.020	1.750	11.880	9.980	90.309	131.29	118.56	12.72



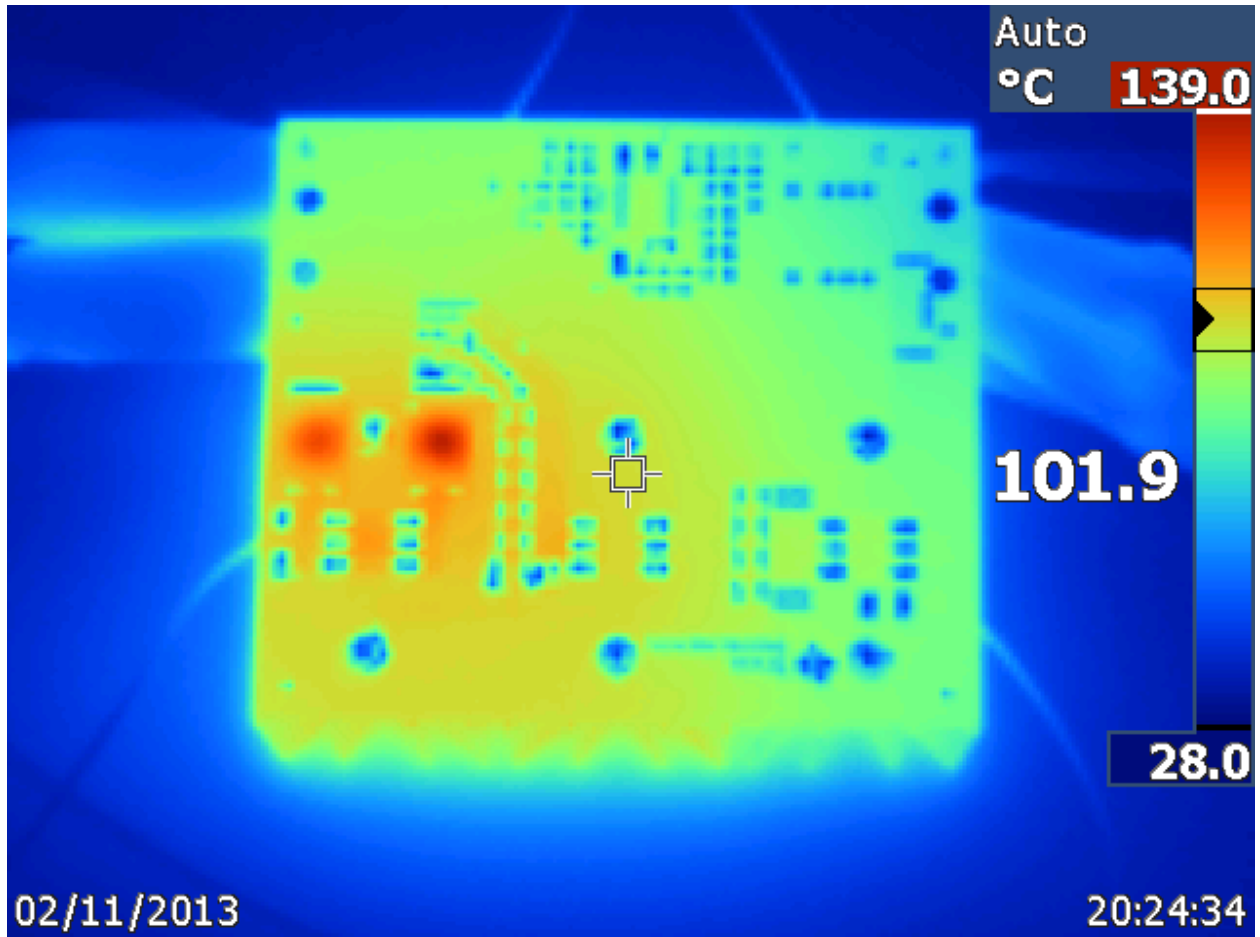
## 4 Thermal Tests

Thermal tests were performed at 25°C ambient.

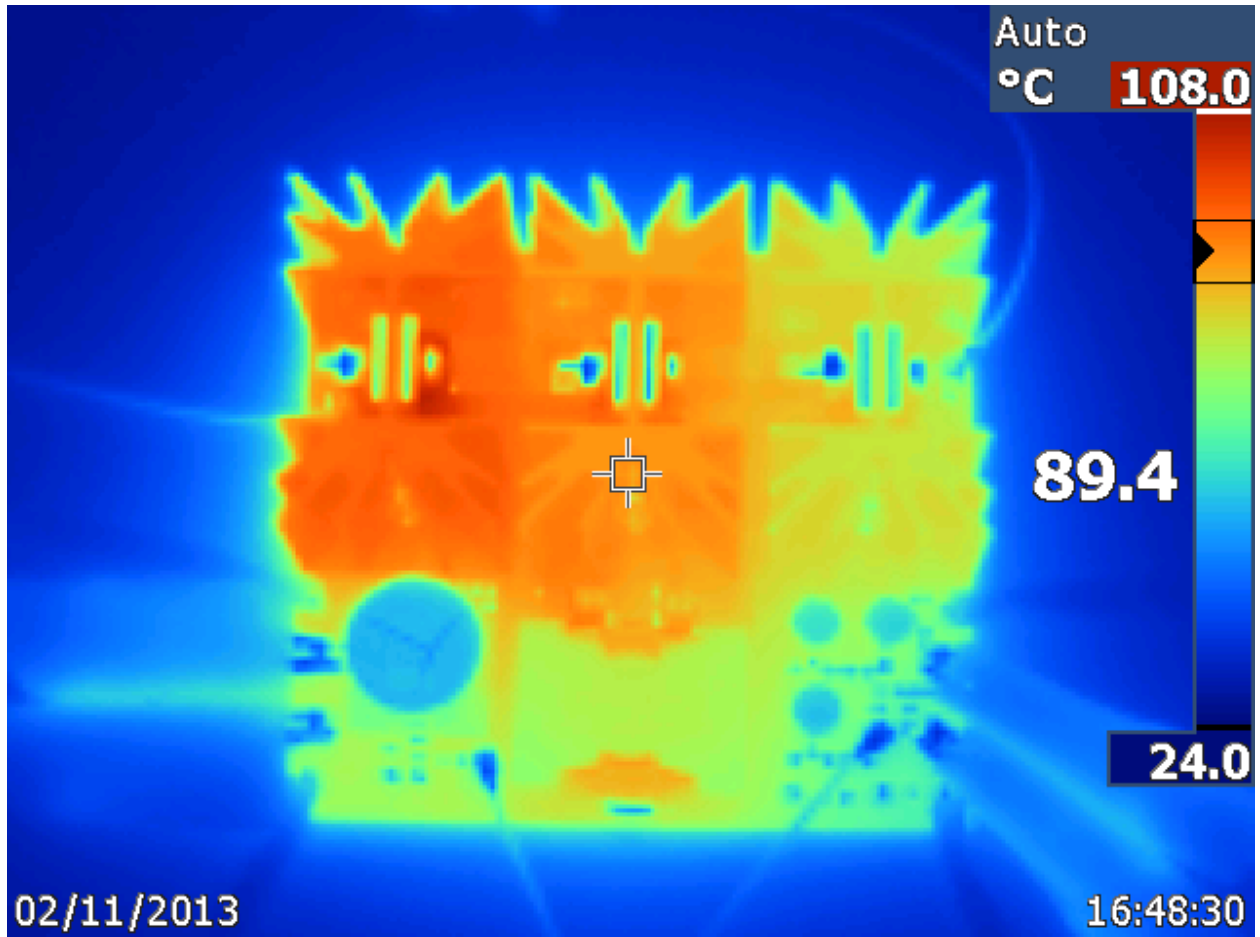
### 4.1 10V Input – 10A Load – Top



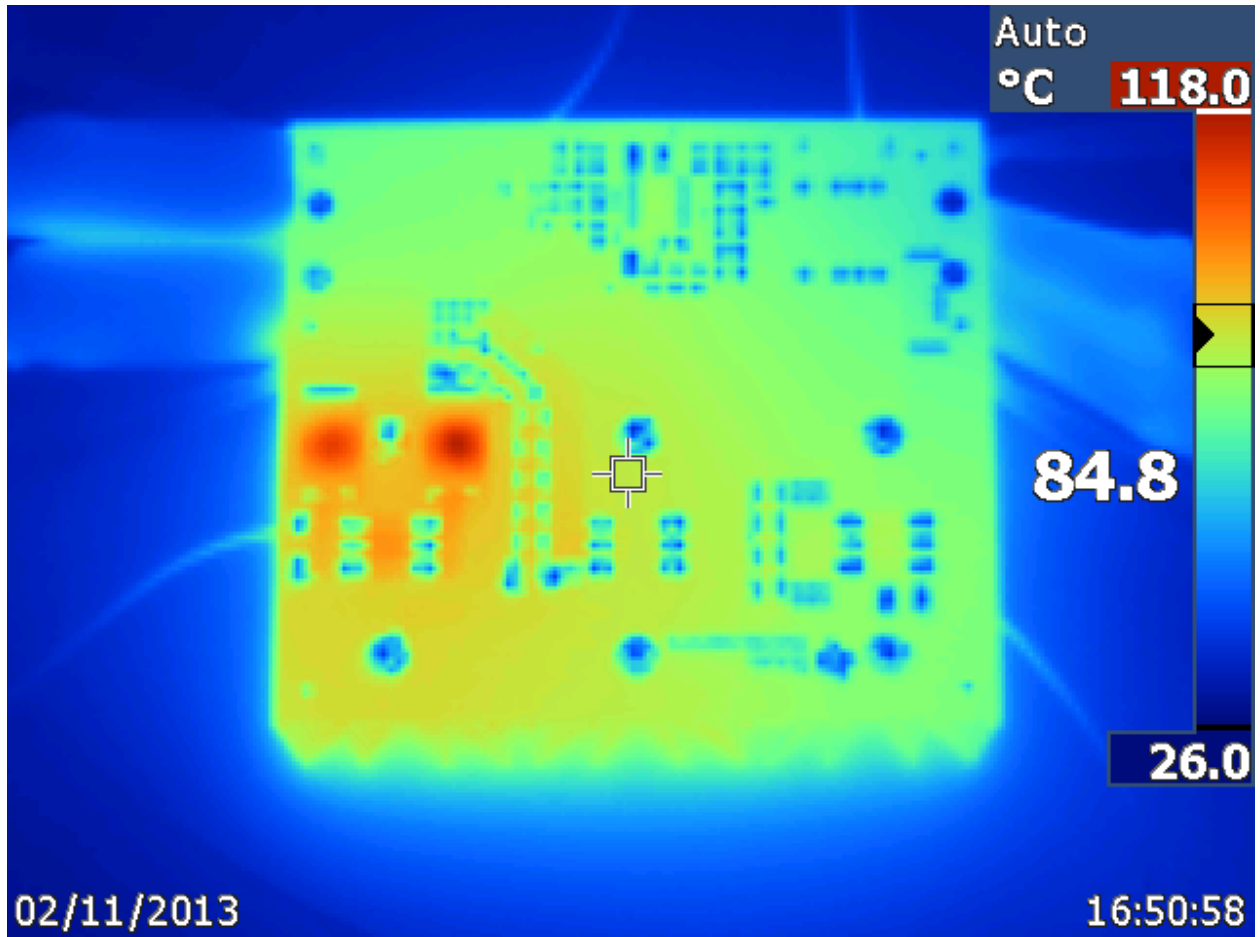
## 4.2 10V Input – 10A Load – Bottom



**4.1 14V Input – 10A Load – Top**

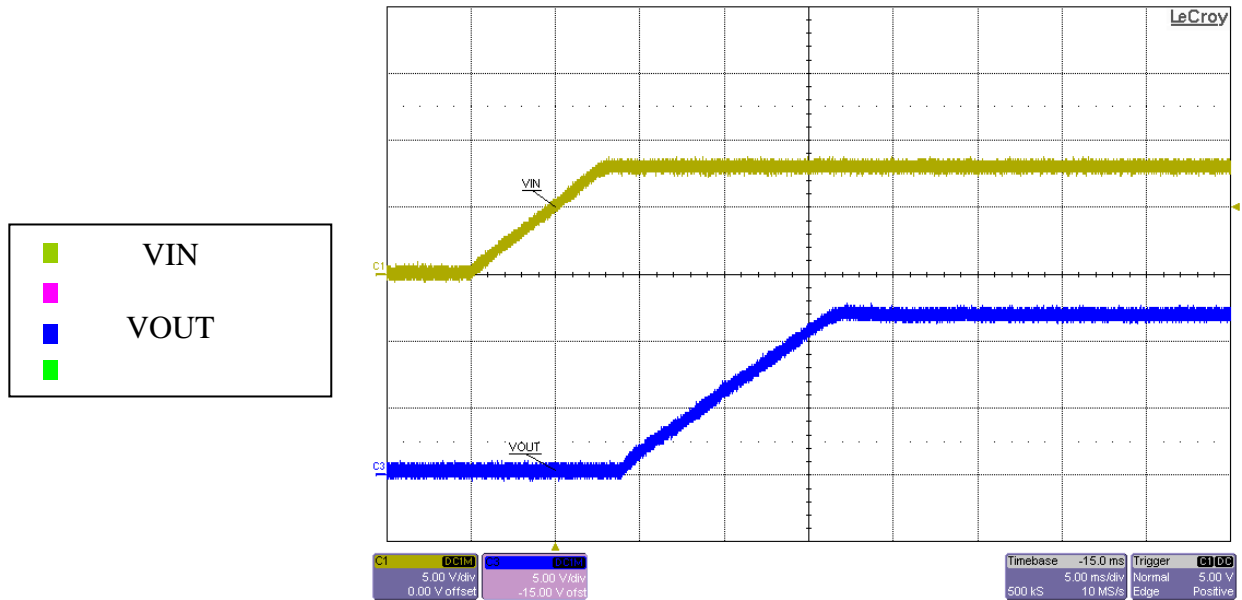


## 4.2 14V Input – 10A Load – Bottom

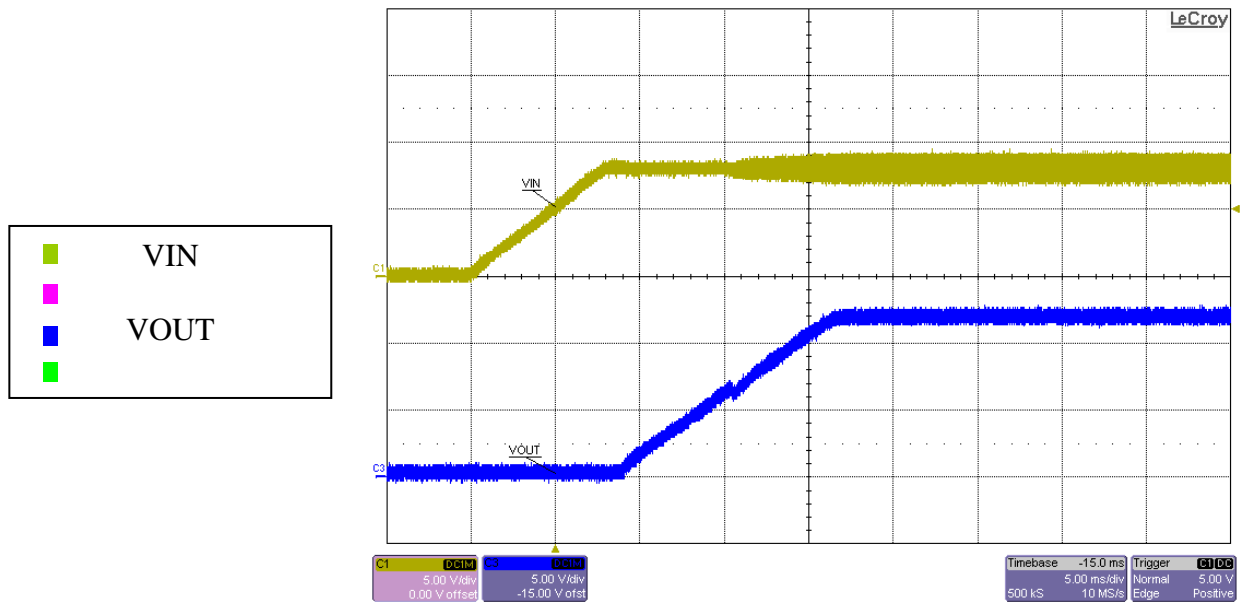


## 5 Power Up and Power Down

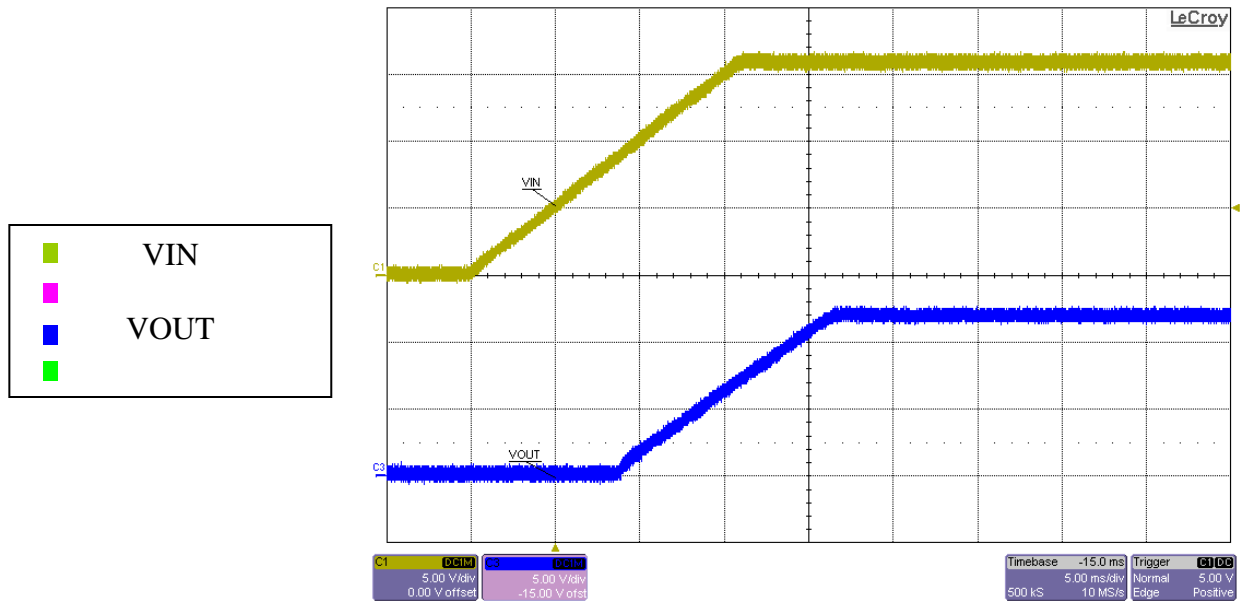
### 5.1 Power Up at 8V Input – No Load



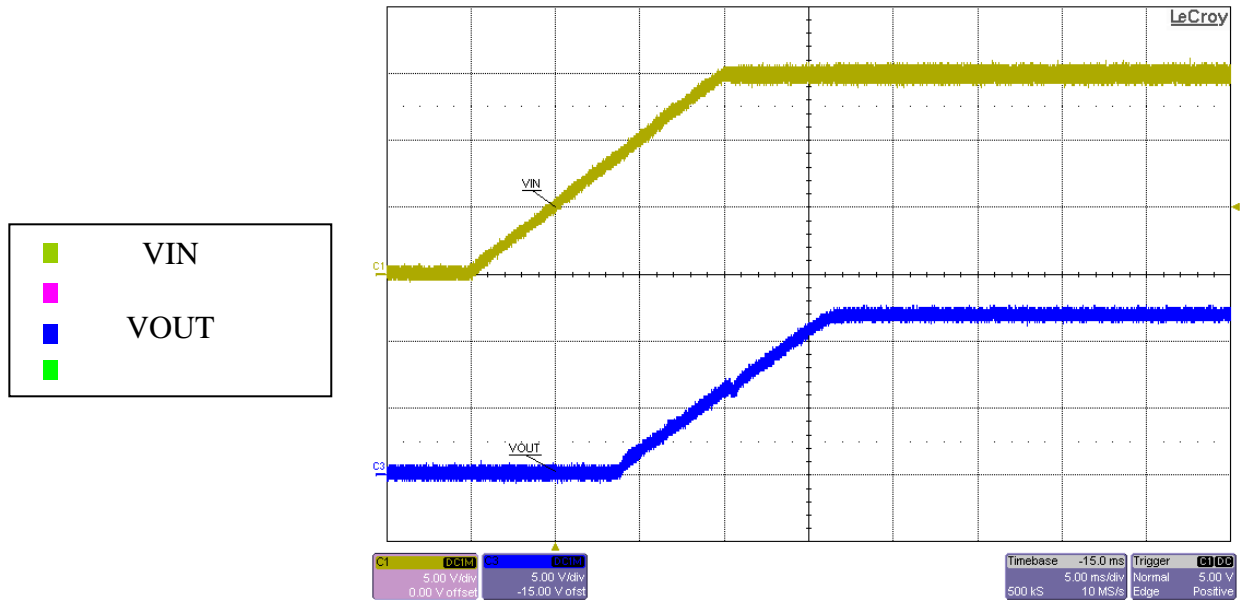
### 5.2 Power Up at 8V Input – 10A Load



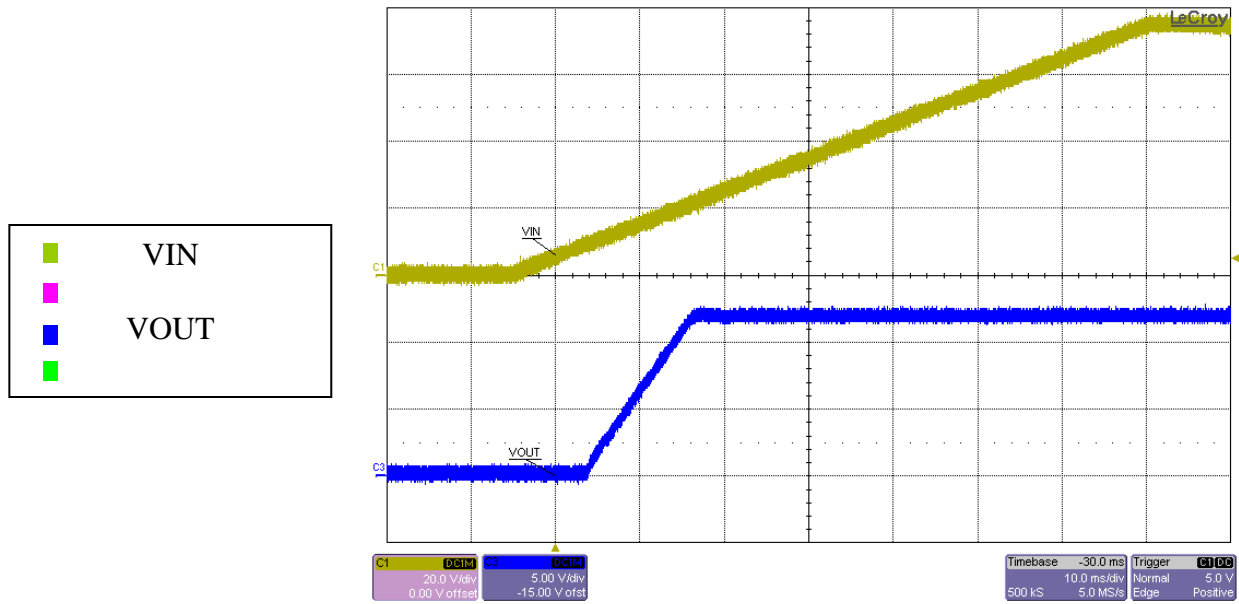
### 5.3 Power Up at 16V Input – No Load



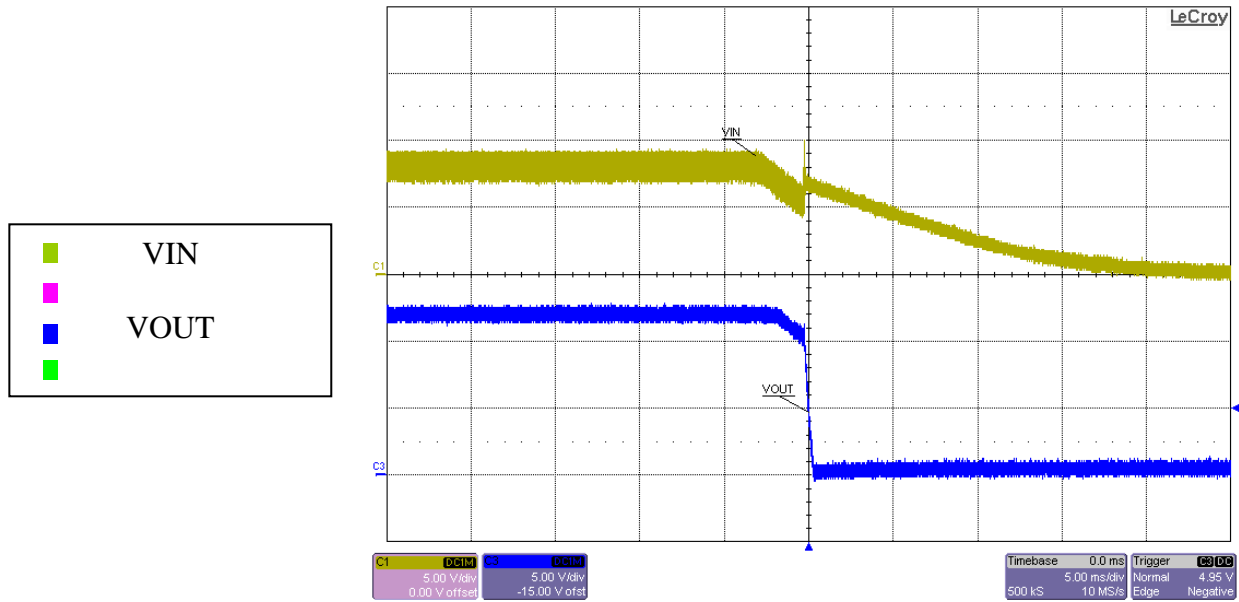
### 5.4 Power Up at 16V Input – 10A Load



## 5.5 Power Up at 75V Input – No Load

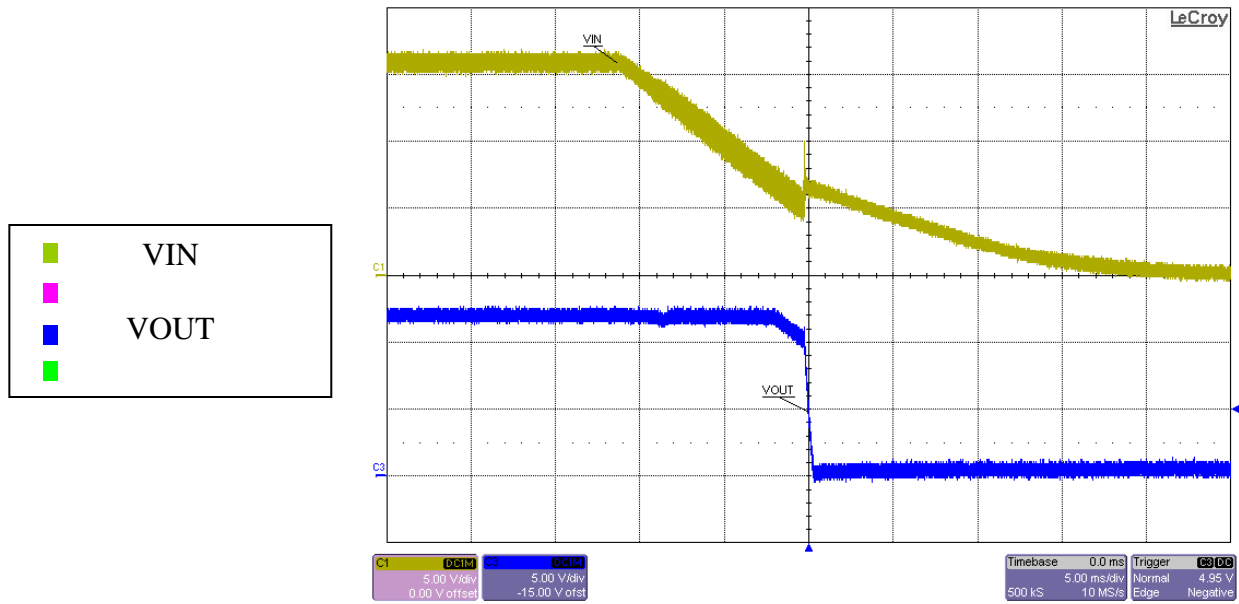


## 5.6 Power Down at 8V Input – 10A Load

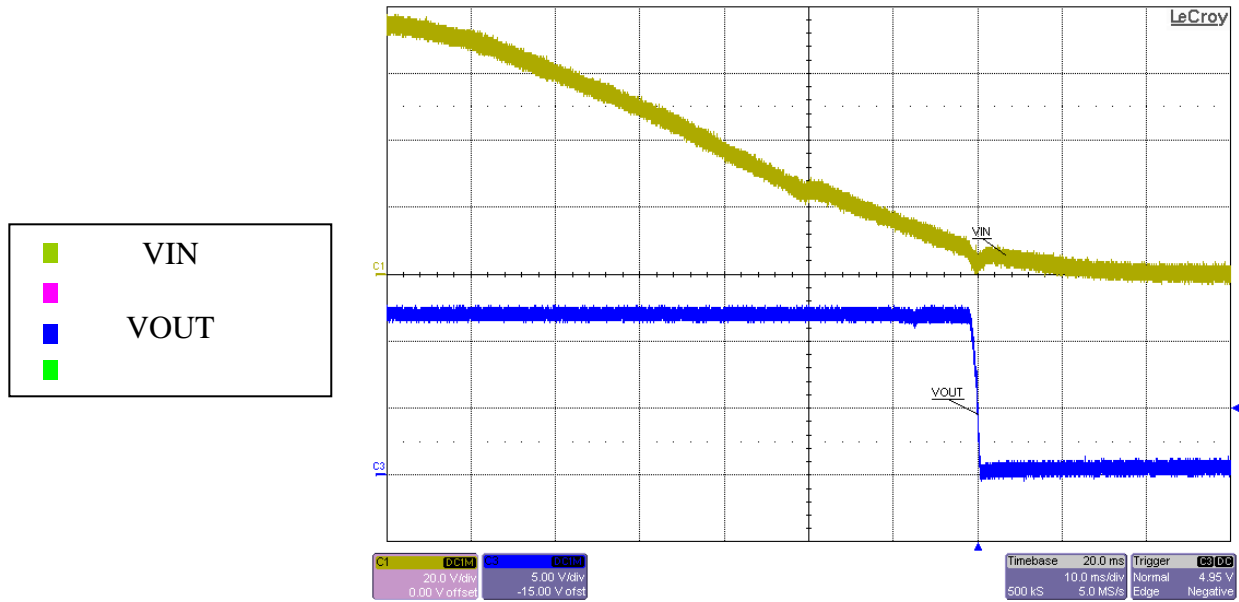




## 5.7 Power Down at 16V Input – 10A Load

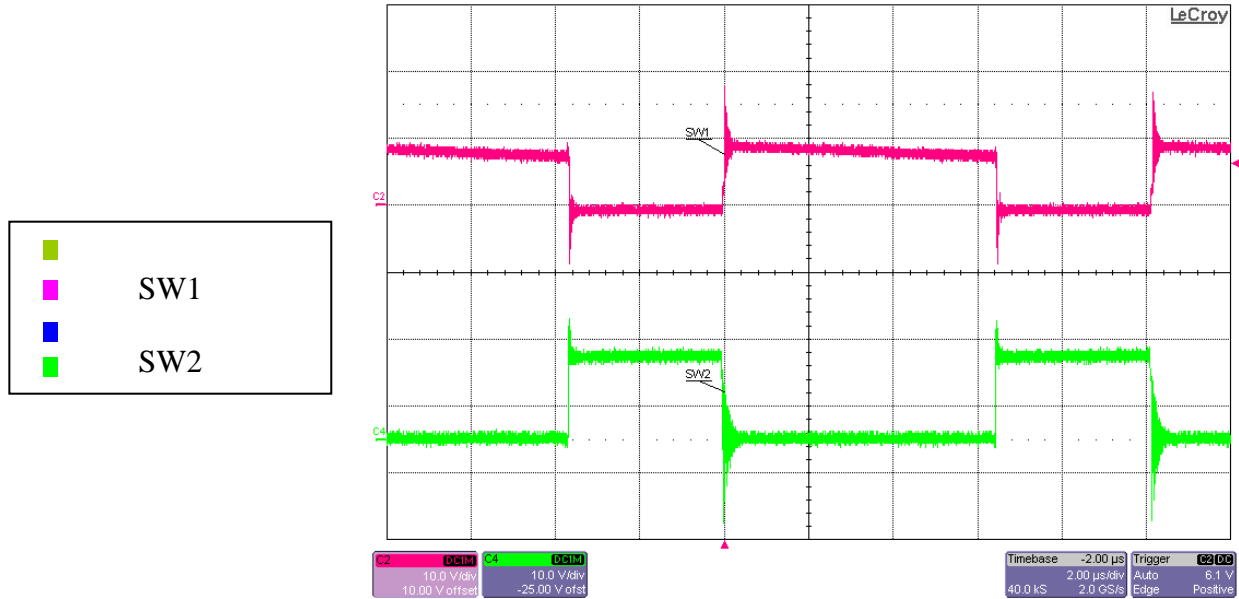


## 5.8 Power Down at 75V Input – 10A Load

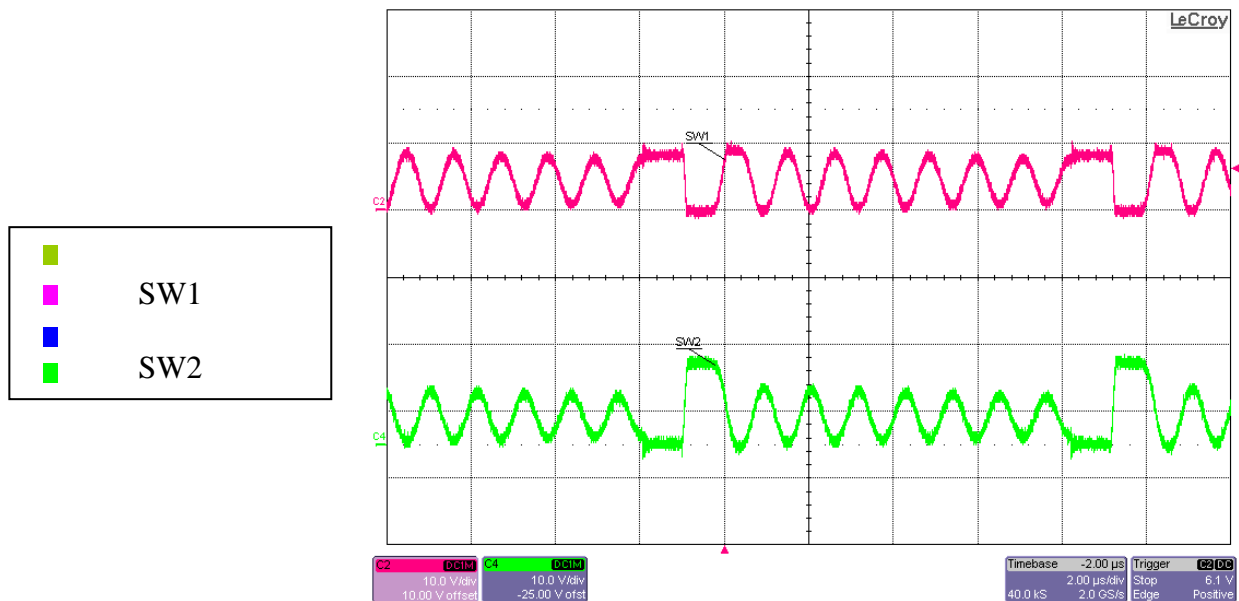


## 6 Switching Voltages

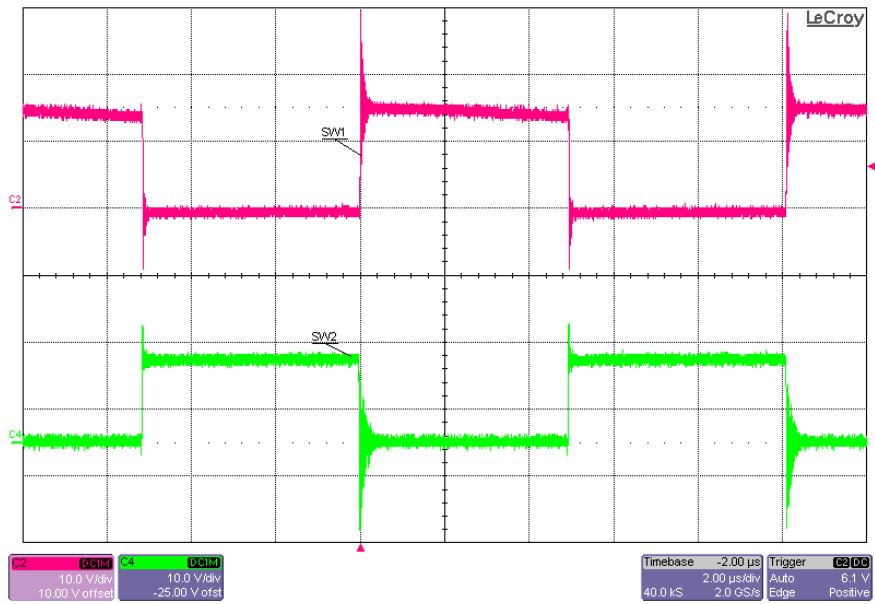
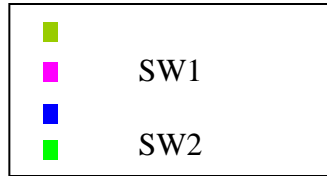
### 6.1 8V Input – 10A Load



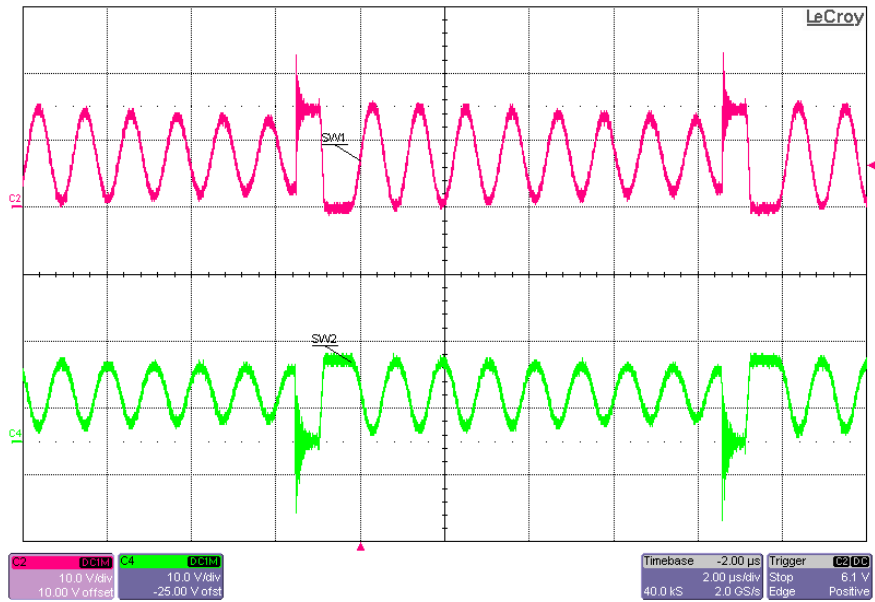
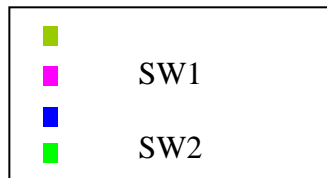
### 6.2 8V Input – No Load



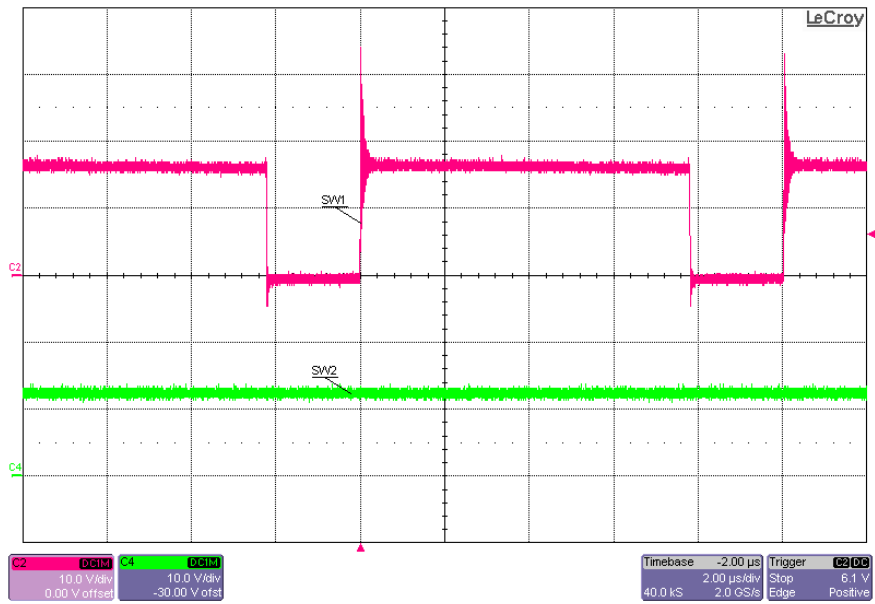
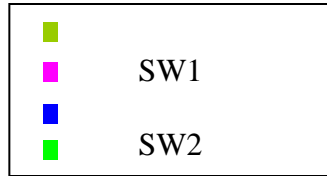
## 6.3 14V Input – 10A Load



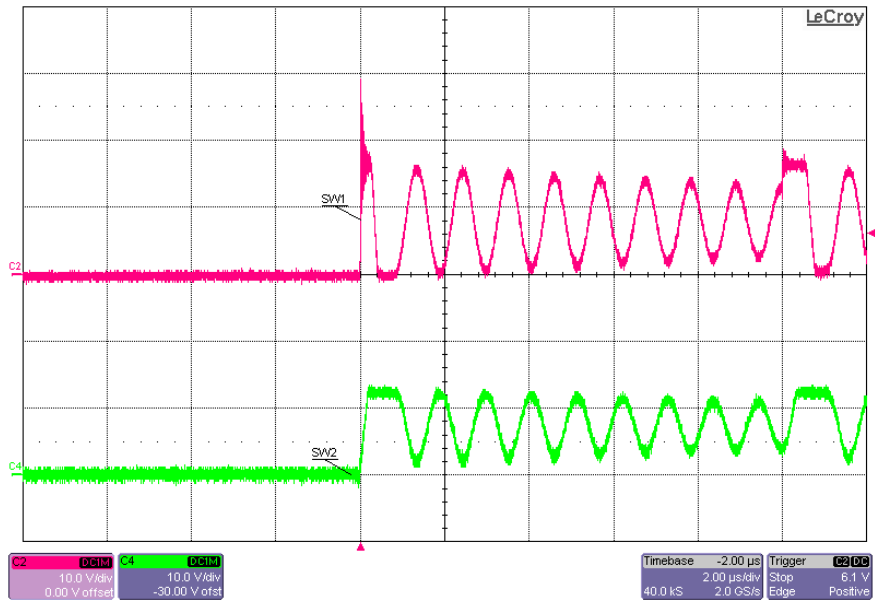
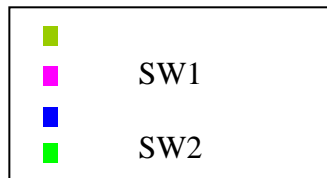
## 6.4 14V Input – No Load



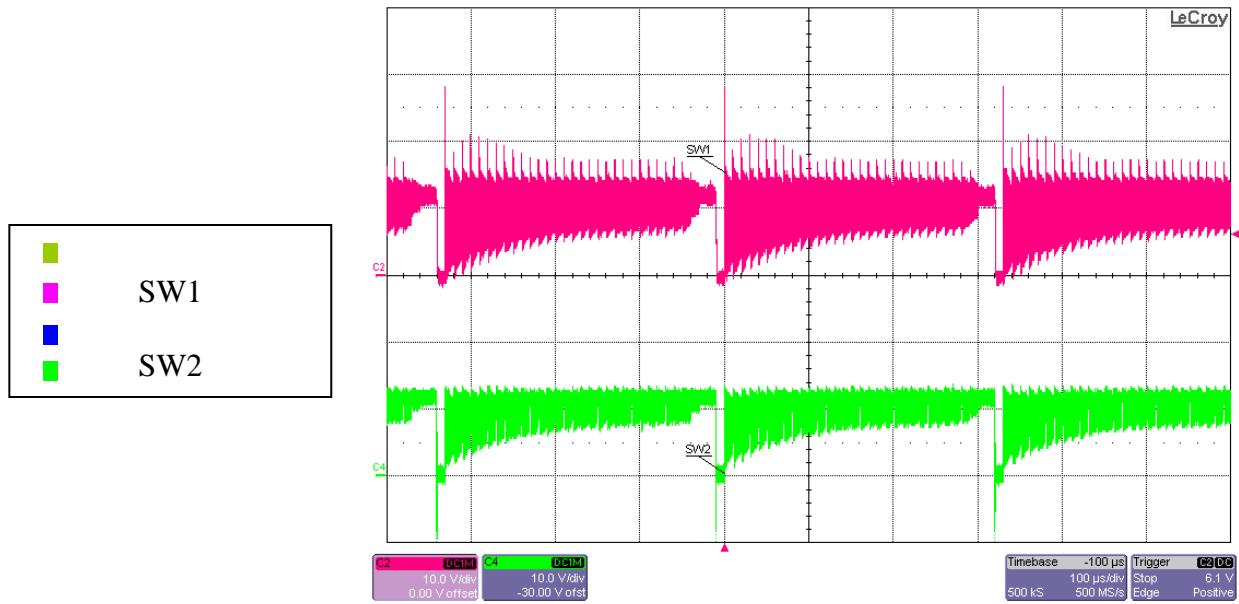
## 6.5 16V Input – 10A Load



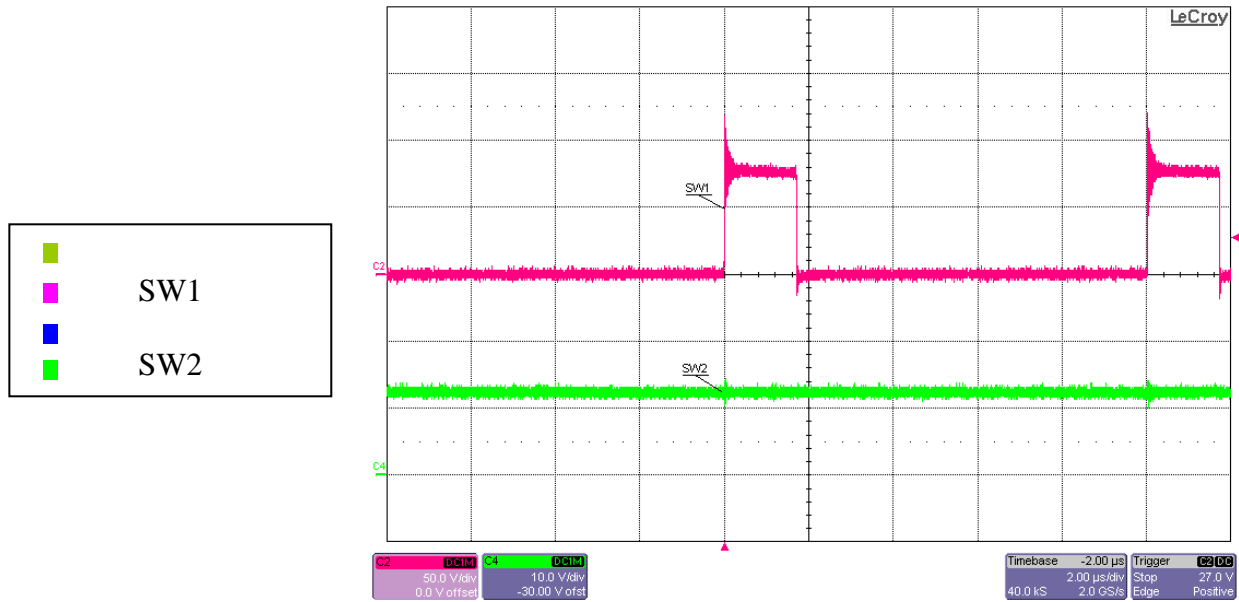
## 6.6 16V Input – No Load



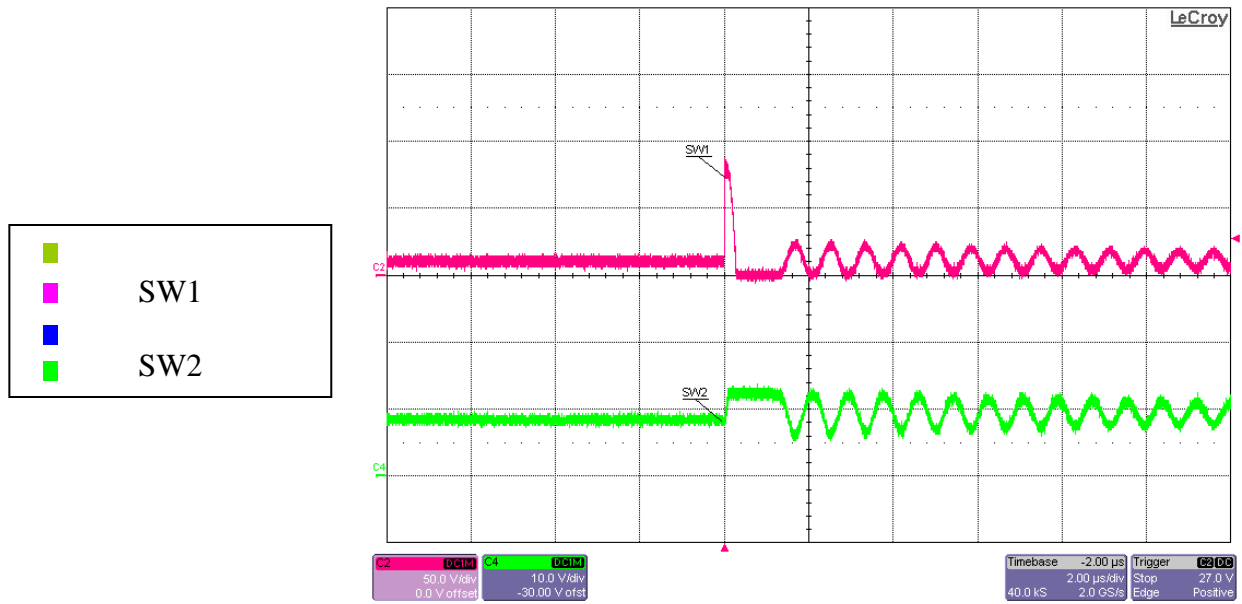
## 6.7 16V Input – No Load



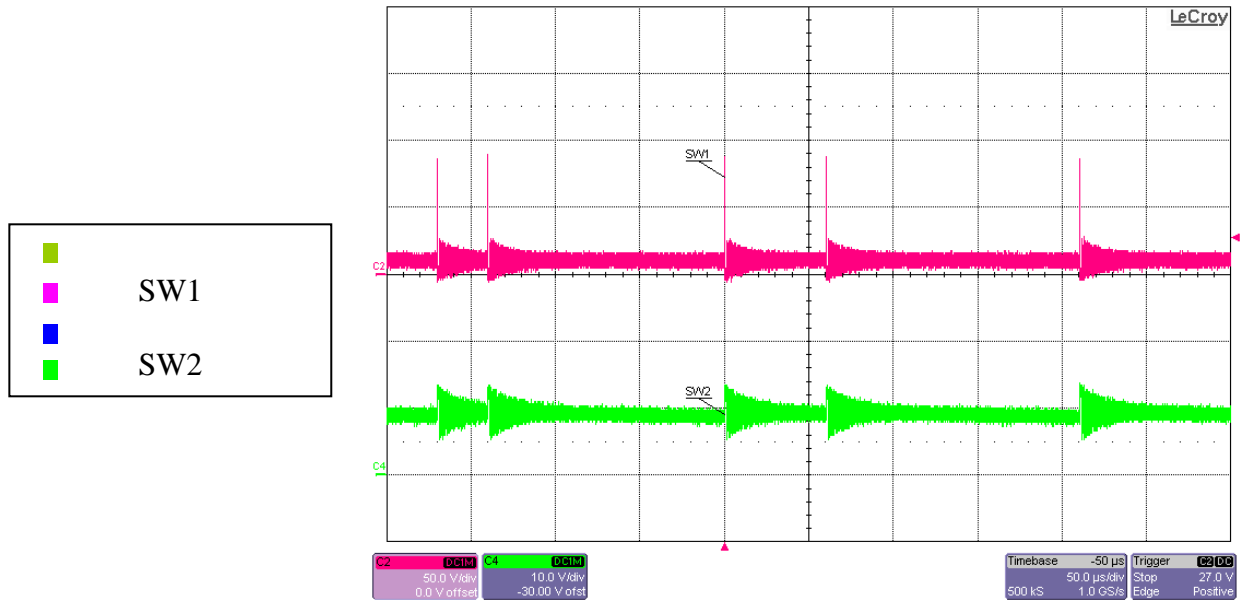
## 6.8 75V Input – 10A Load



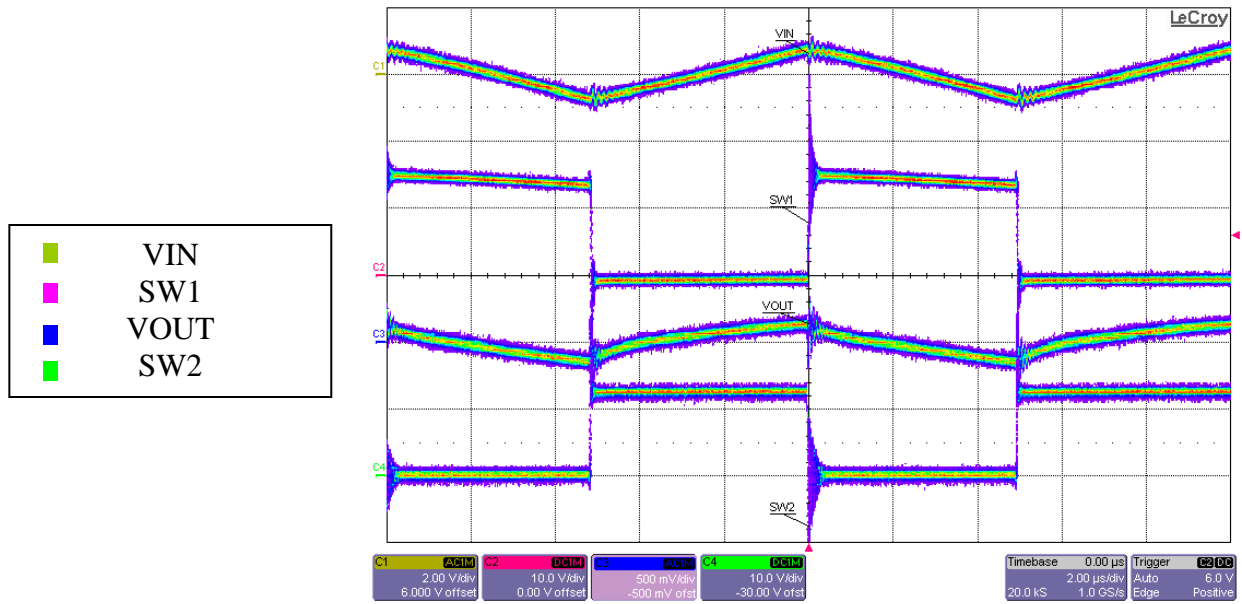
## 6.9 75V Input – No Load



## 6.10 75V Input – No Load



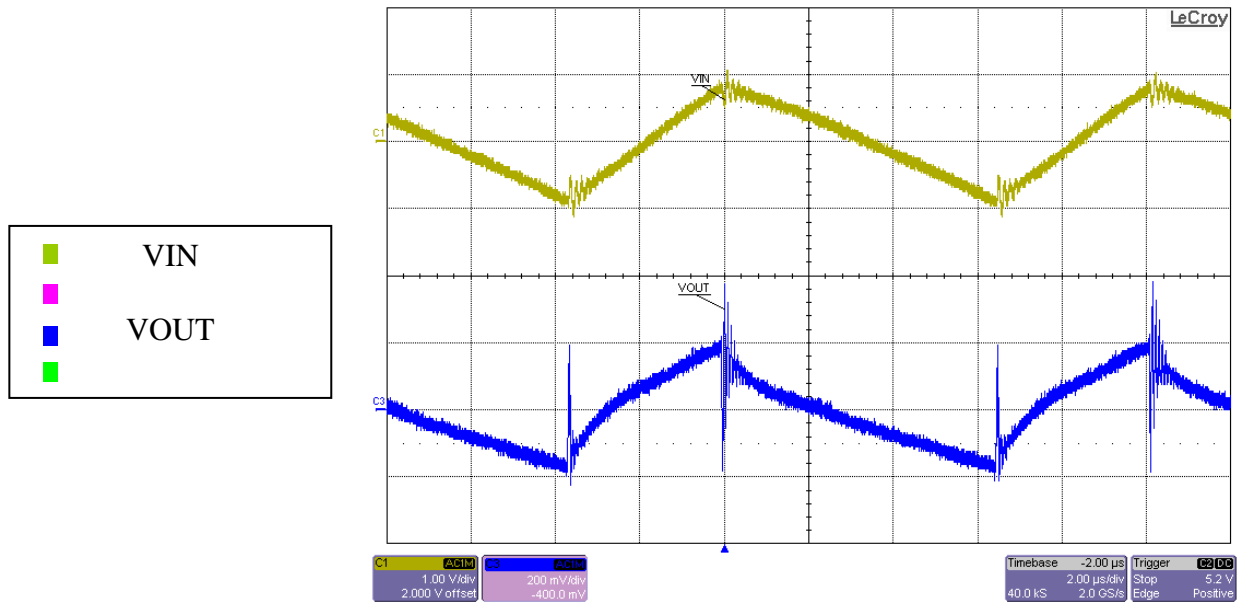
## 6.11 Jitter at 14V Input – 10A Load



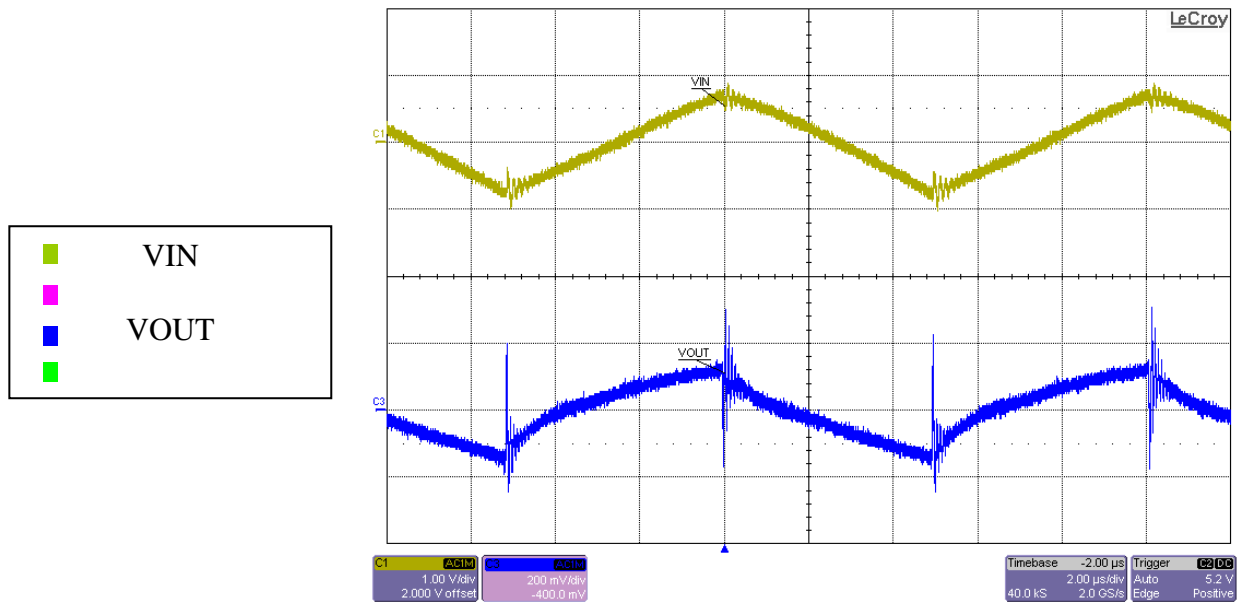


## 7 Ripple Voltages

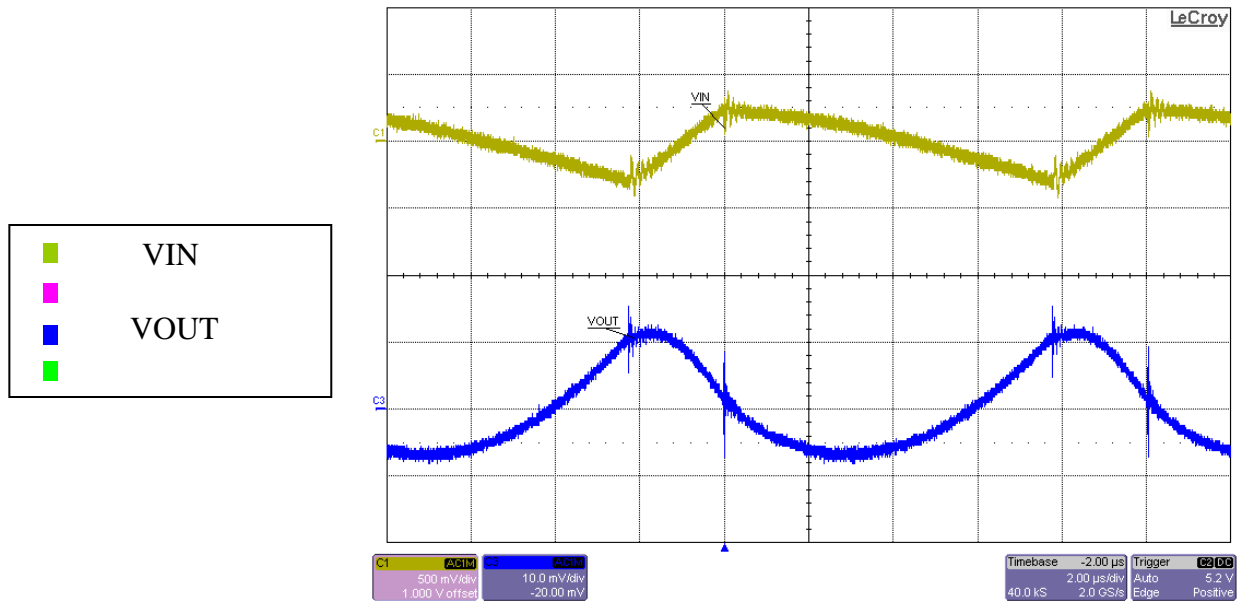
### 7.1 8V Input – 10A Load



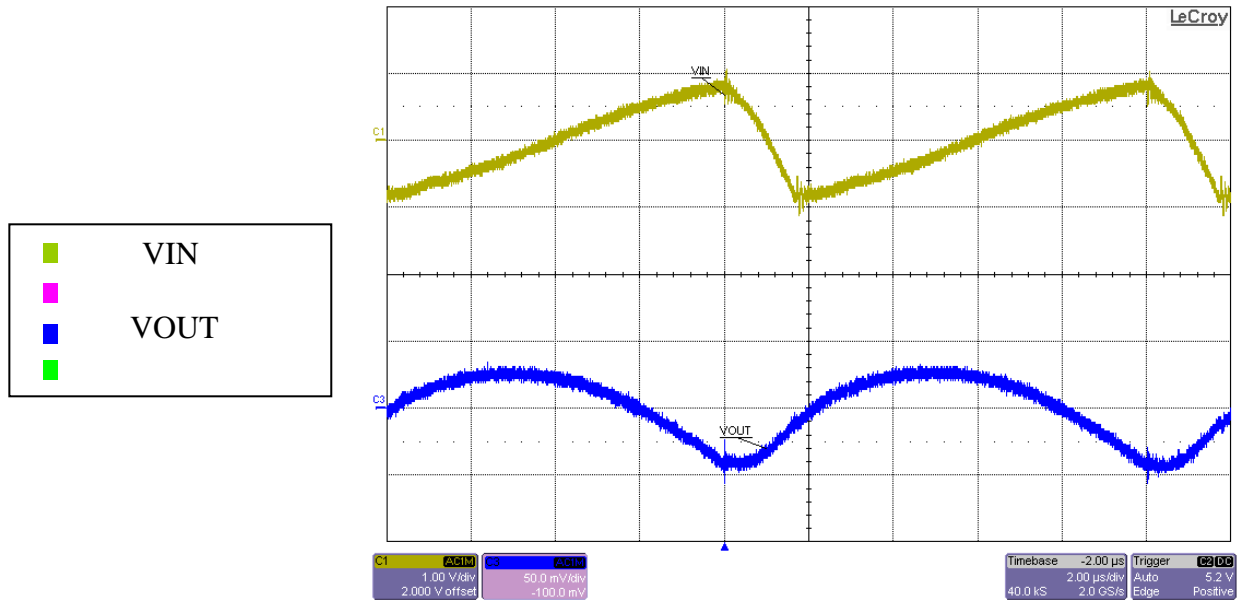
### 7.2 14V Input – 10A Load



## 7.3 16V Input – 10A Load

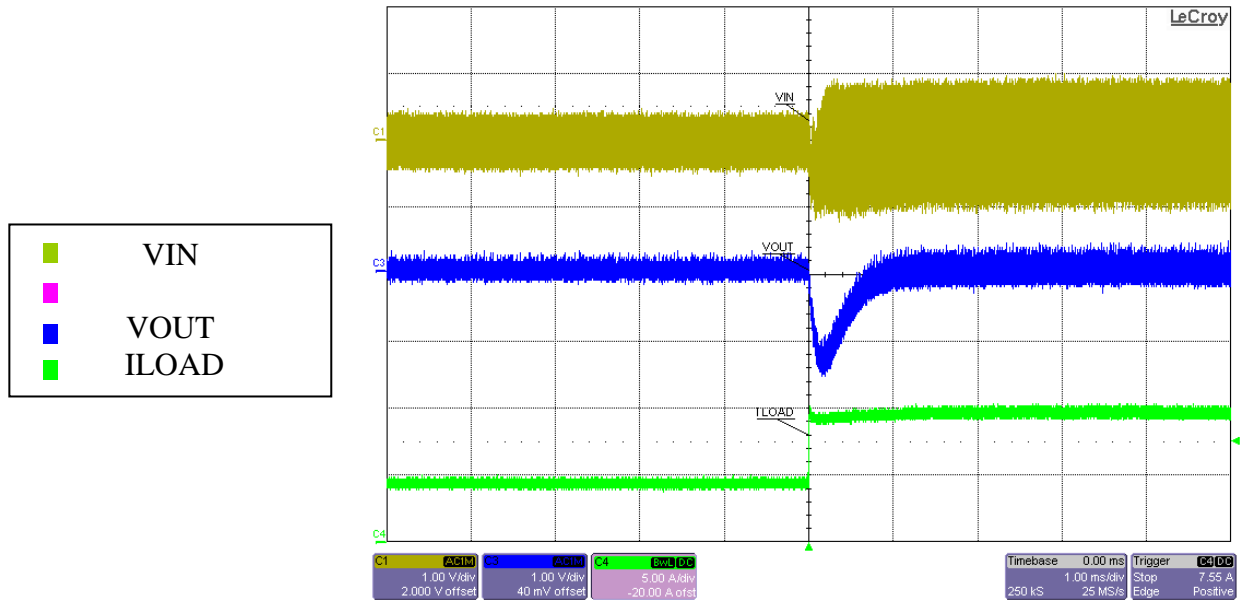


## 7.4 75V Input – 10A Load

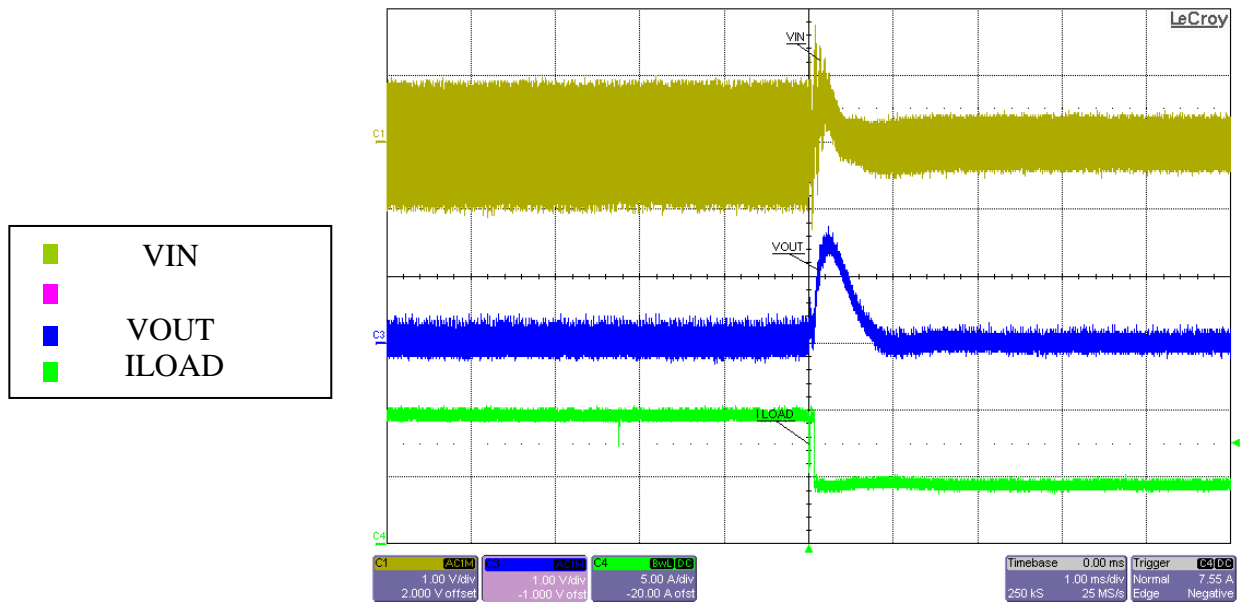


## 8 Transient Response

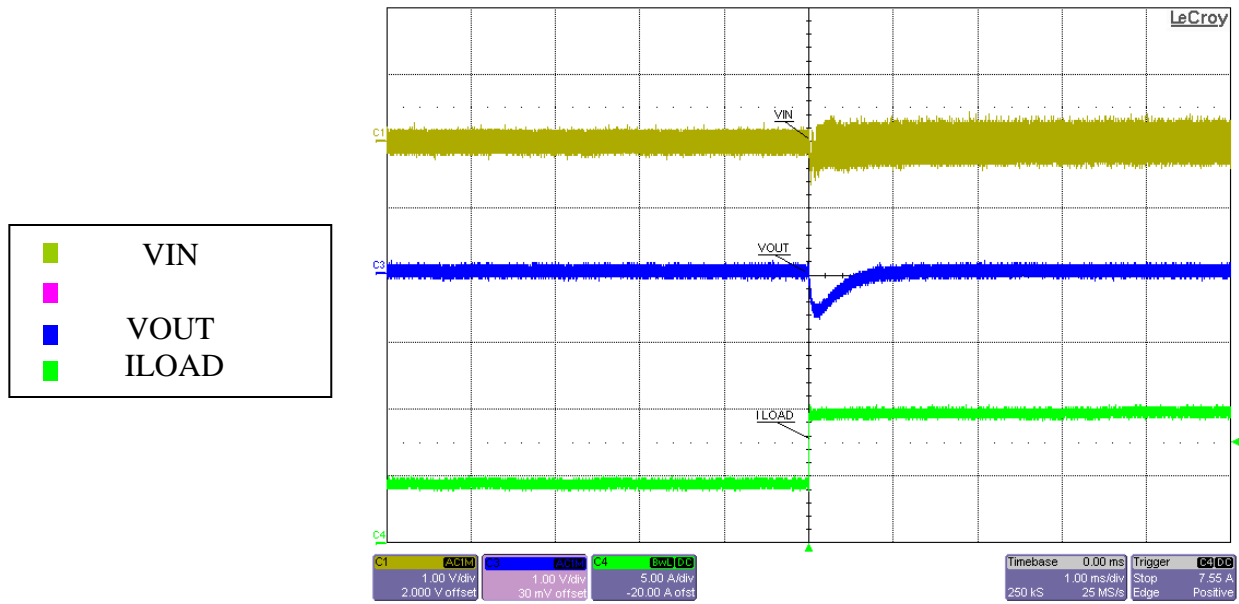
### 8.1 8V Input – 5A Load Step



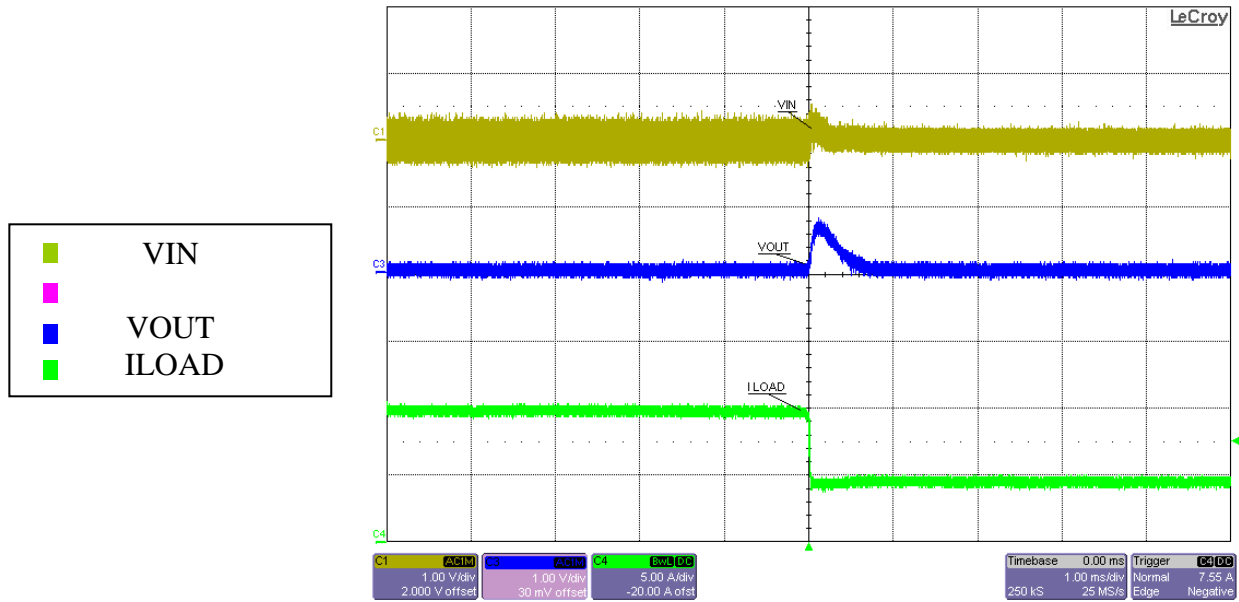
### 8.2 8V Input – 5A Load Step



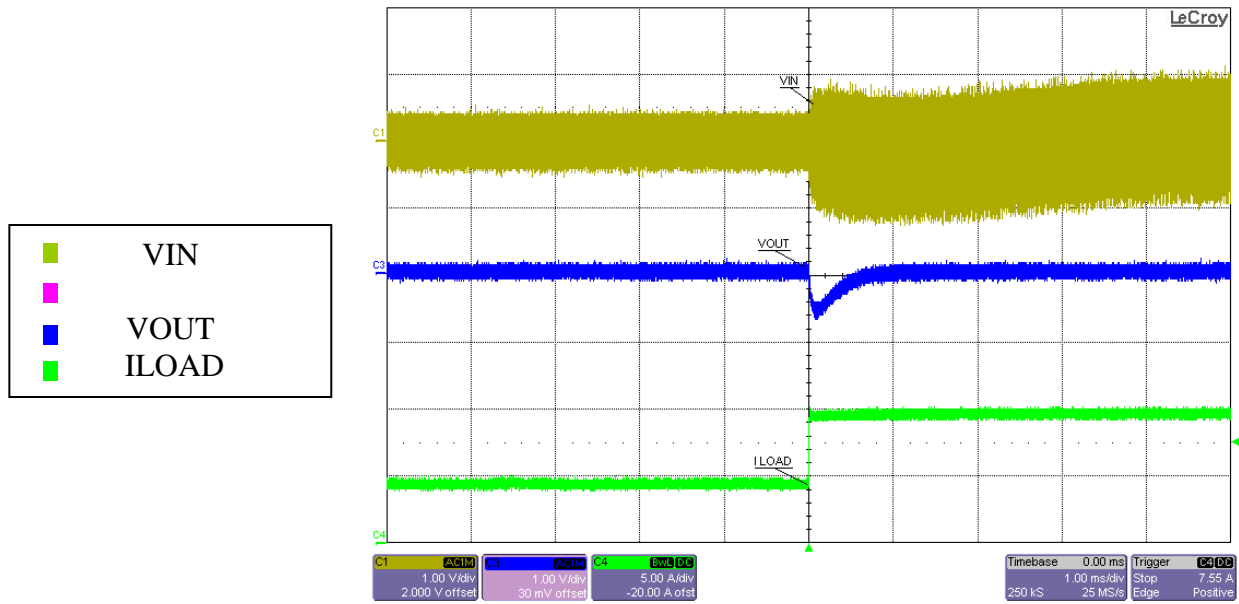
## 8.3 16V Input – 5A Load Step



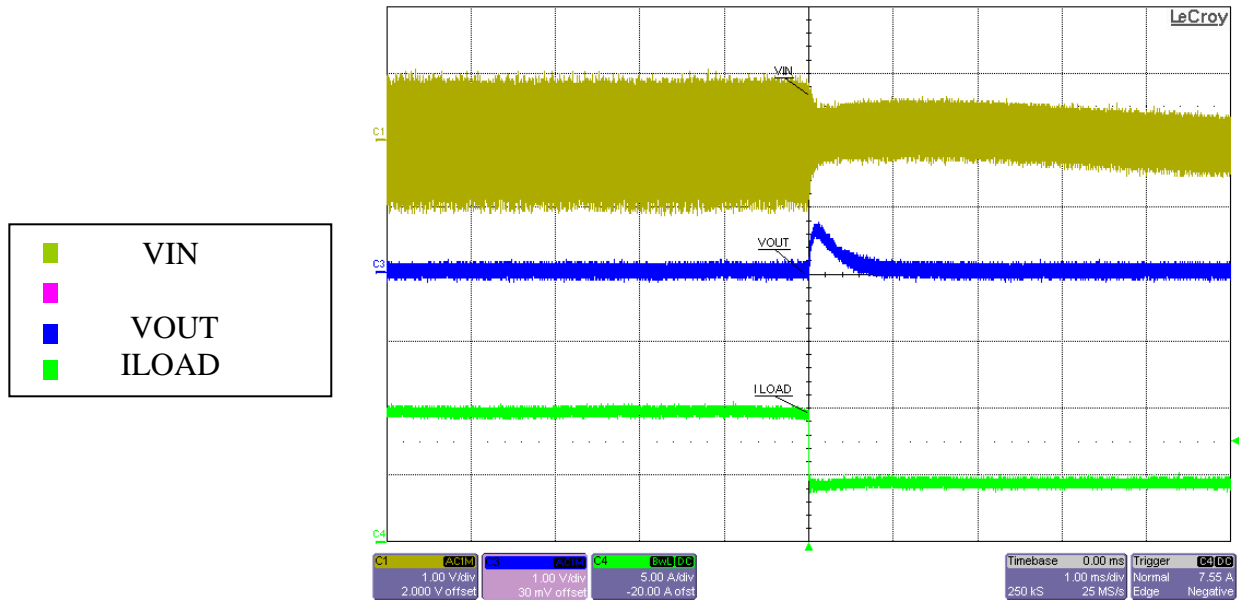
## 8.4 16V Input – 5A Load Step



## 8.5 75V Input – 5A Load Step



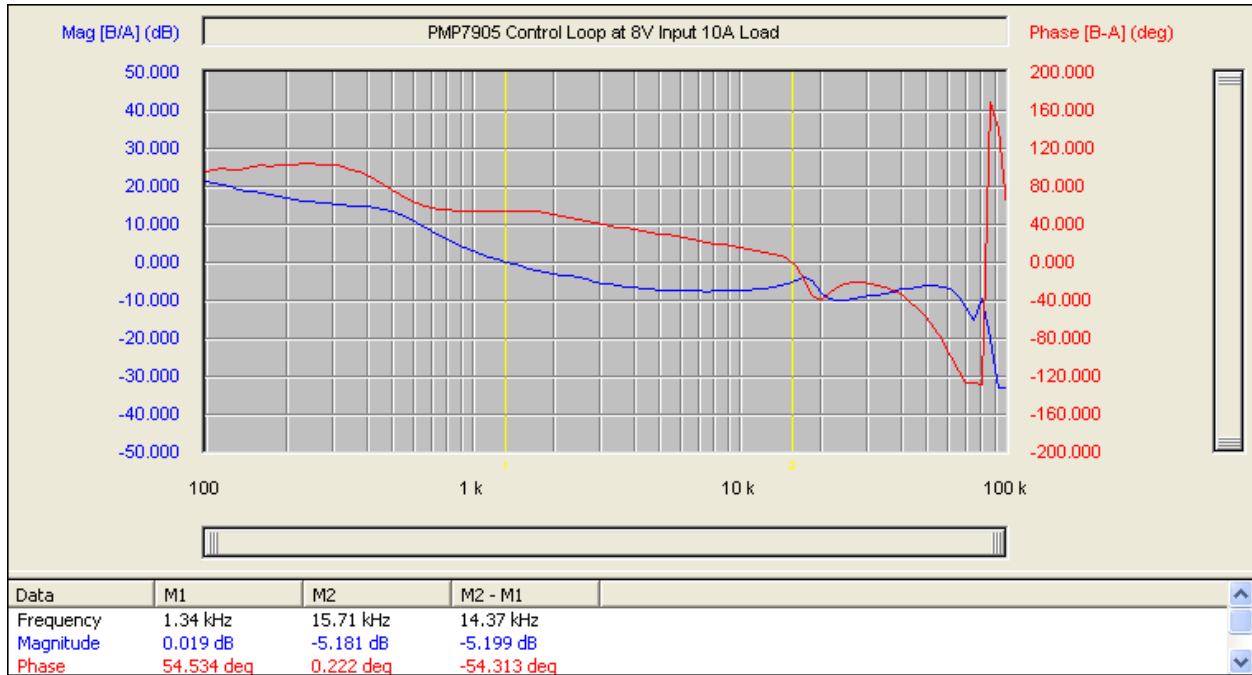
## 8.6 75V Input – 5A Load Step



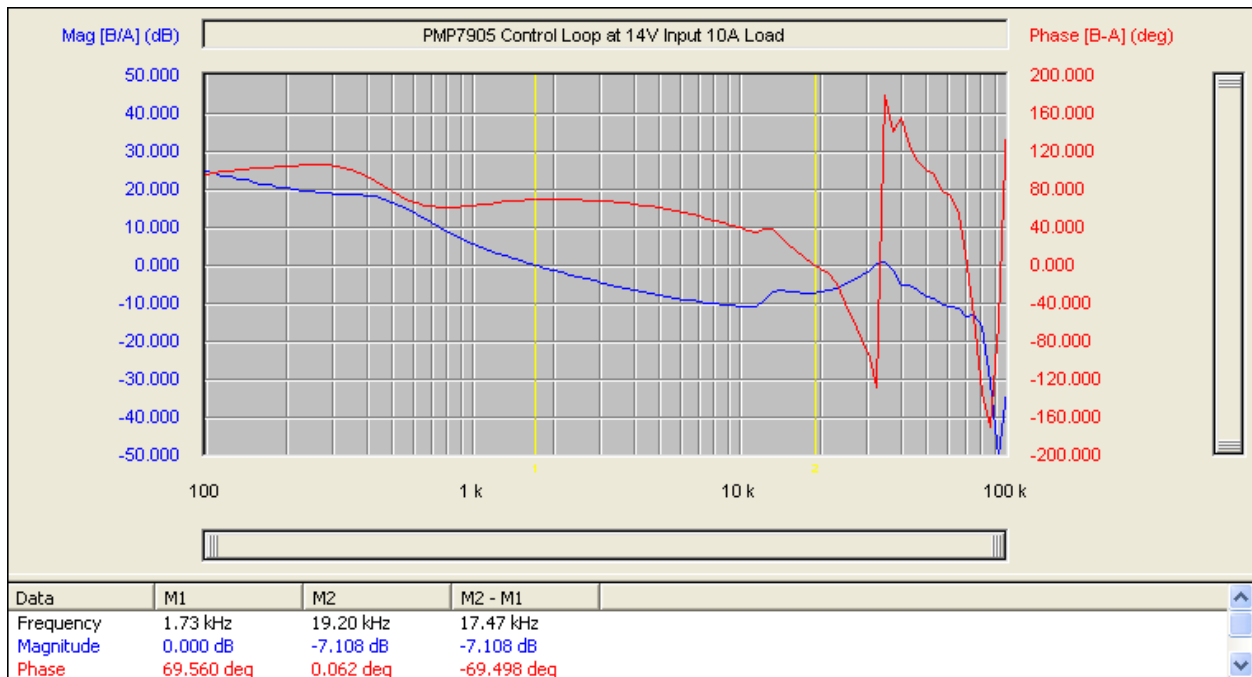
# PMP7905 Rev A Test Results

## 9 Frequency Response

### 9.1 8V Input – 10A Load

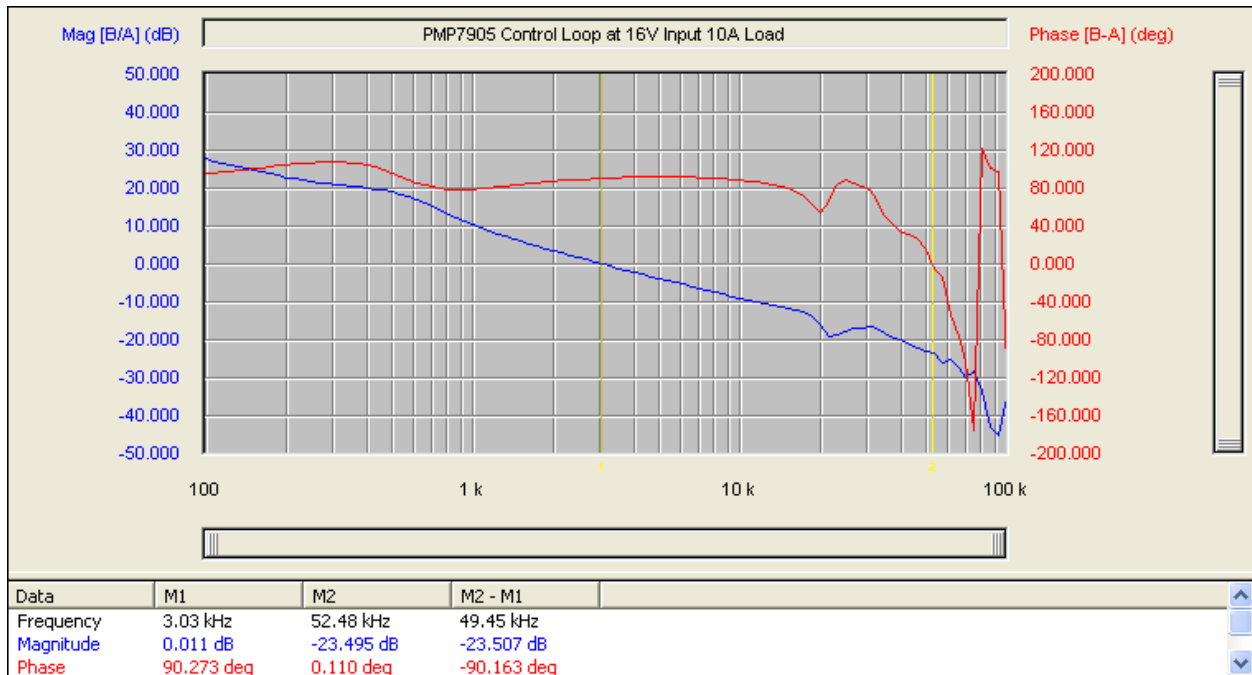


### 9.2 14V Input – 10A Load

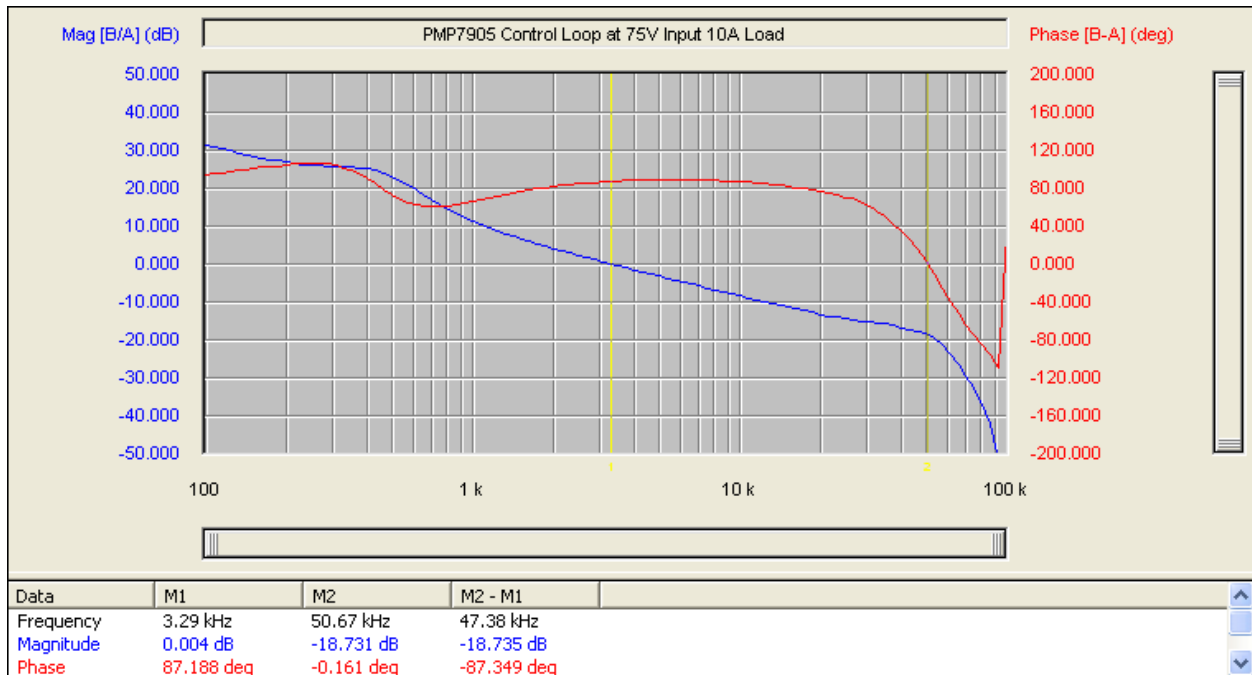


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## 9.3 16V Input – 10A Load



## 9.4 75V Input – 10A Load





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