



## **LM27403 Synchronous Buck Converter**

**TI reference design number: PMP10740 Rev A**

**Input: 5V**

**Output: 1V @ 35A**

**DC – DC Test Results**

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## Table of Contents

1	Circuit Description.....	3
2	Photos .....	3
3	Efficiency .....	5
4	Thermal Tests.....	6
4.1	35A Load, No Airflow .....	6
5	Startup and Shutdown Behavior .....	8
5.1	Turn-on and Turn-off from Vin .....	8
5.2	Turn-on and Turn-off from EN .....	9
6	Switching and Ripple .....	10
6.1	Switching and Ripple .....	10
7	Load Transient Response.....	11
7.1	Load Transient Response.....	11
8	Frequency Response.....	12
8.1	Frequency Response .....	12
9	Over-Current Protection.....	13
9.1	Short Circuit Protection.....	13

# PMP10740 Rev A Test Results

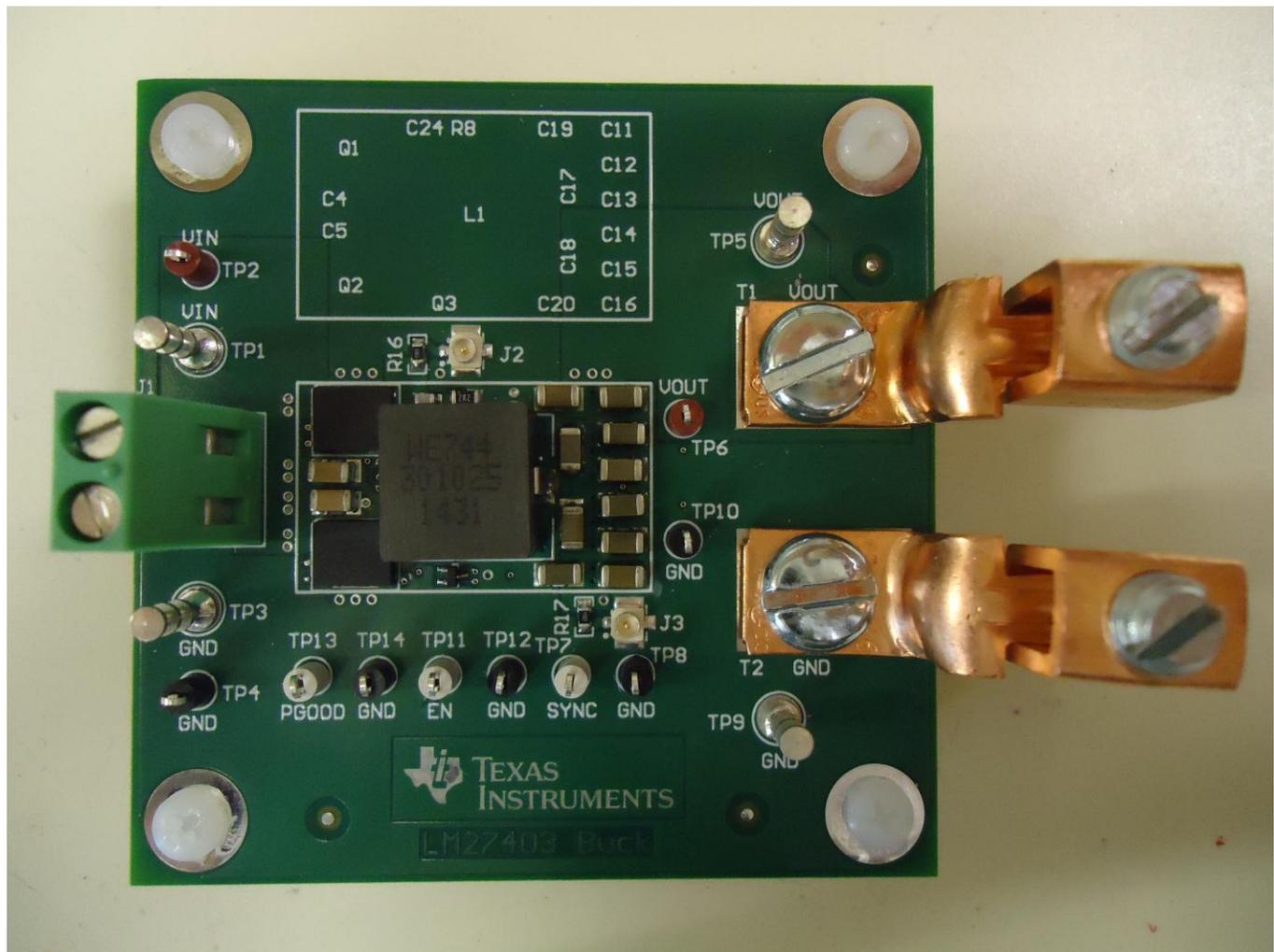
## 1 Circuit Description

PMP10740 is a single-phase synchronous buck converter rated for 1V output at 35A from an input voltage of 5V. This design uses the LM27403 synchronous buck controller at a switching frequency of 300 kHz. CSD87350Q5D power block MOSFETs provide maximum efficiency when combined with a 250 nH ferrite output inductor. The design solution uses all ceramic capacitors to fit into a minimum board area.

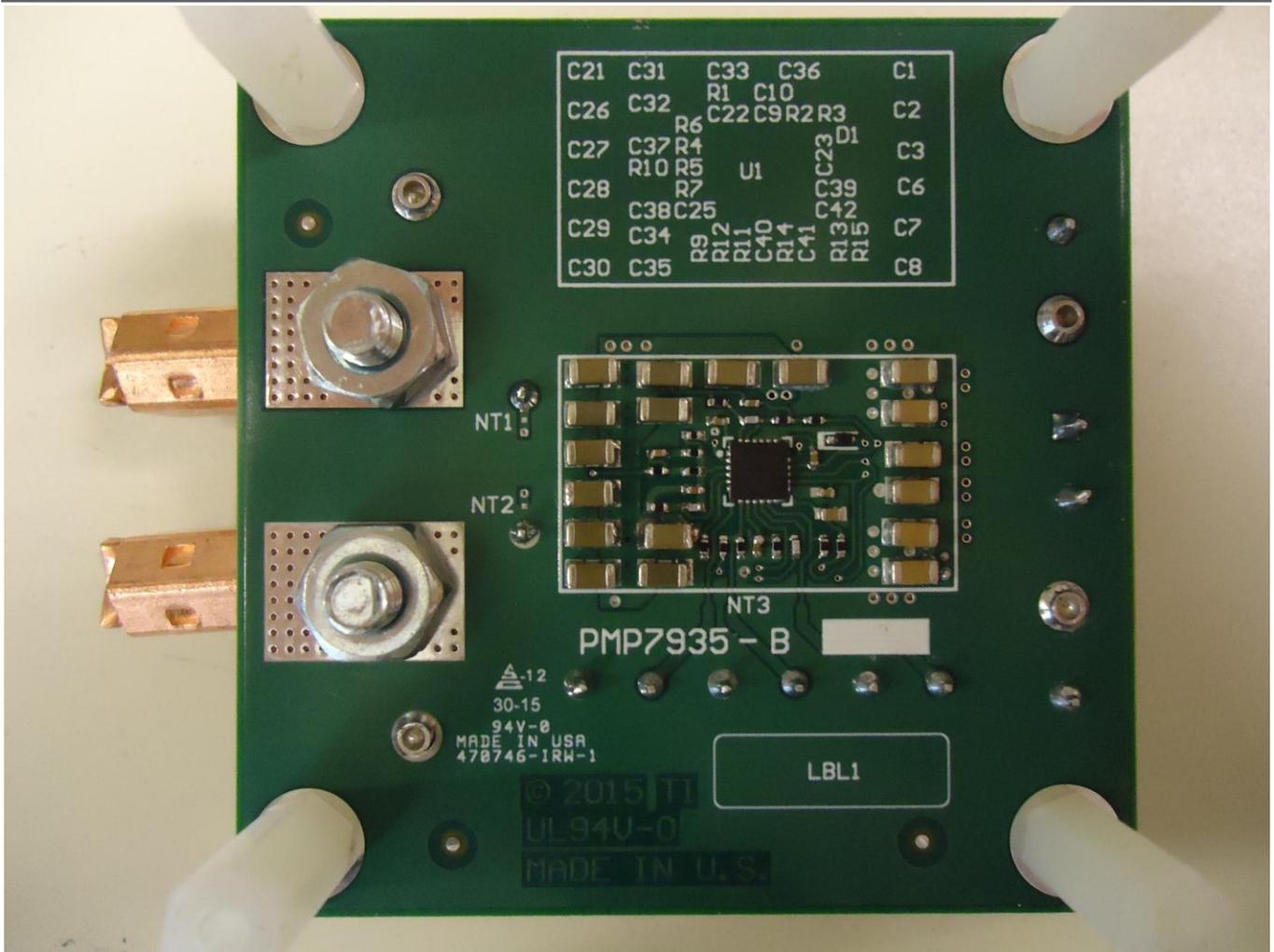
At tests were performed at room temperature on an open bench. A 330  $\mu$ F, 35V aluminum electrolytic input capacitor was used for input filter damping.

## 2 Photos

The photographs below show the PMP10740 Rev A assembly as built on PMP7935-B printed circuit board. This is a 4 layer board using 2 ounce copper on external layers and 1 ounce copper on internal layers. Power components are mounted on the top side of the board, with the control circuit on the bottom. The overall board dimensions are 2.5" x 2.5". The solution size component area is 1.1" x 0.65". The maximum component height is set by the inductor at 9.4 mm.



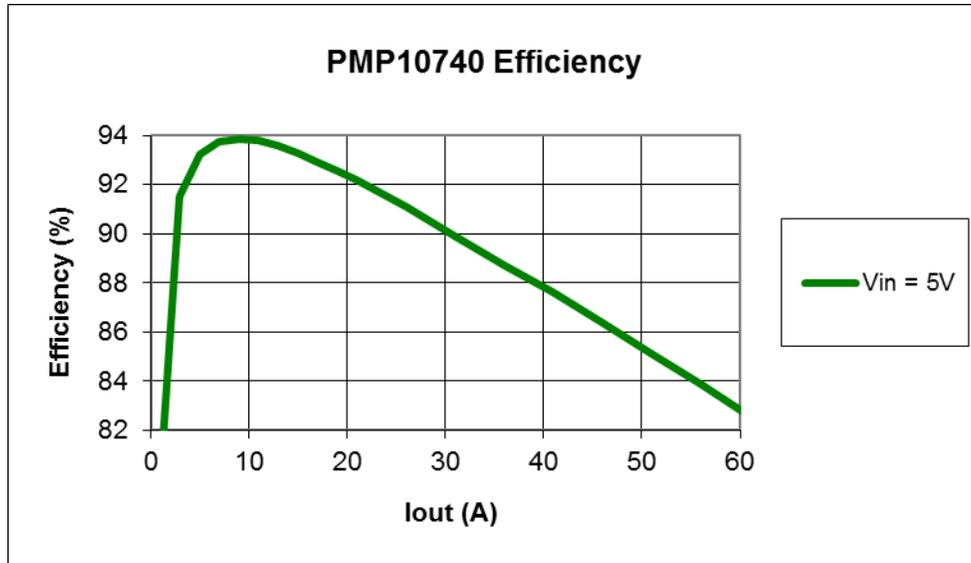
# PMP10740 Rev A Test Results



# PMP10740 Rev A Test Results

## 3 Efficiency

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

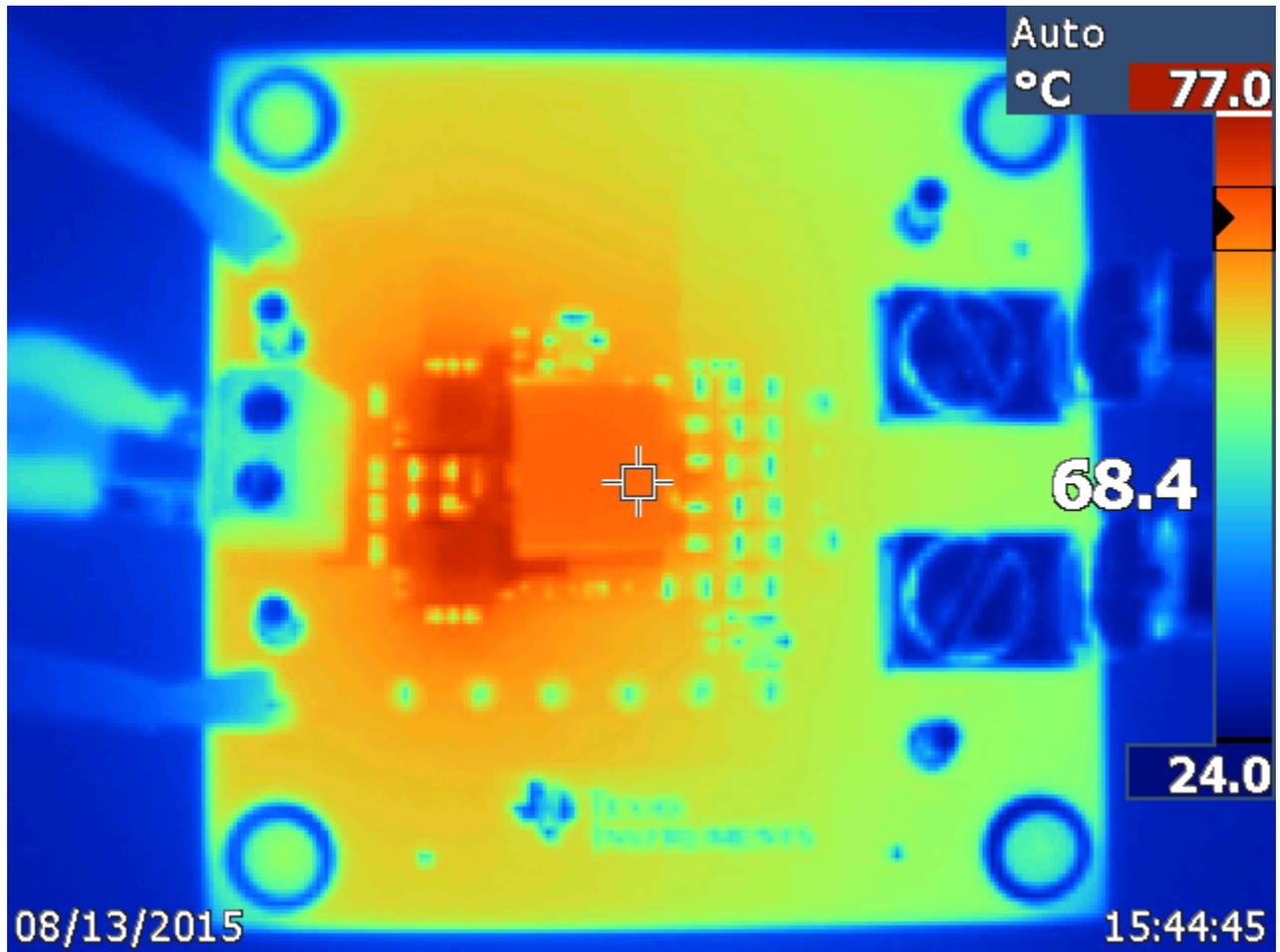


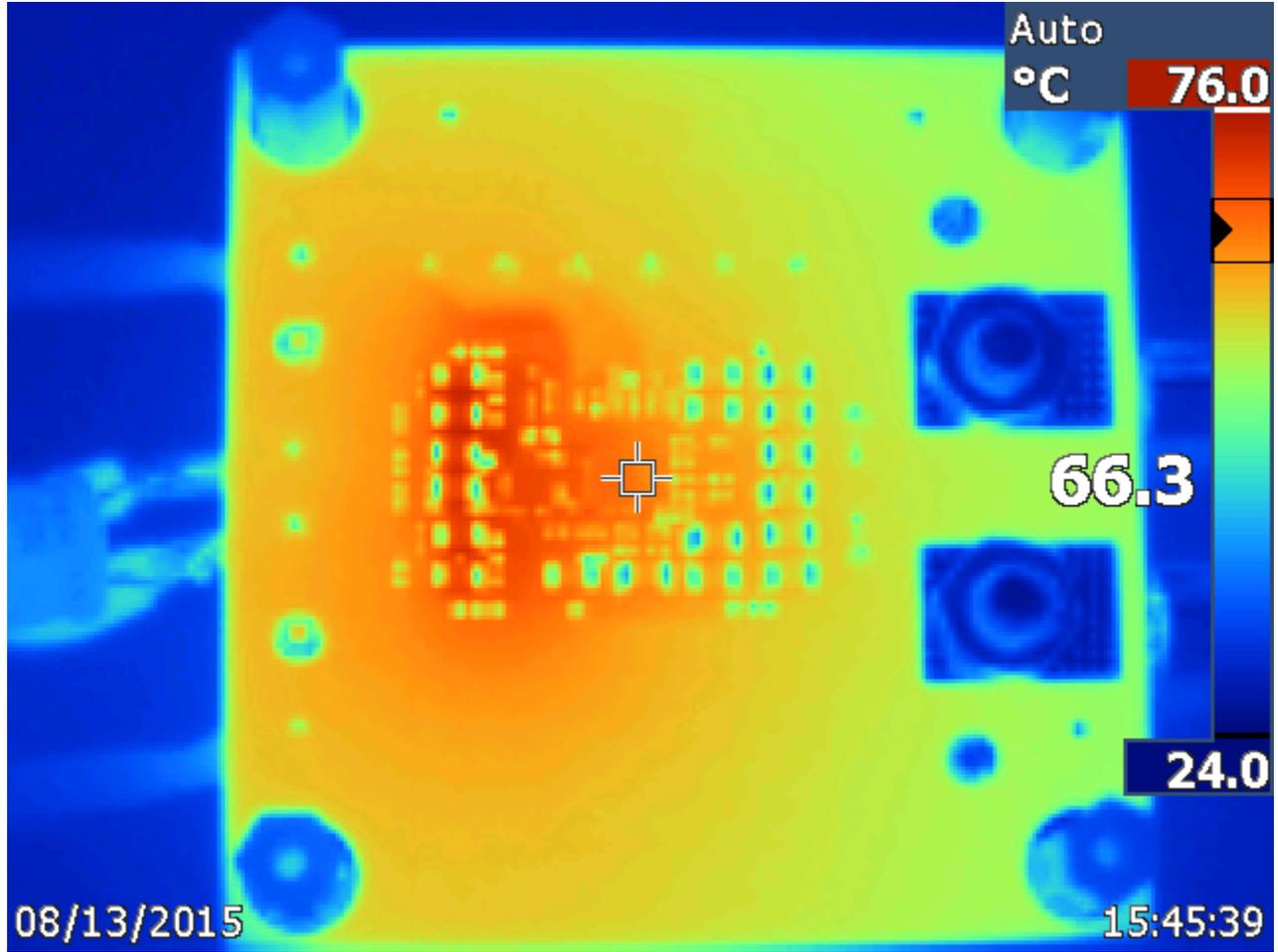
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Efficiency (%)	Pin (W)	Pout (W)	Losses (W)
4.999	0.048	1.014	0.000	0.000	0.24	0.00	0.24
4.999	0.246	1.014	0.970	79.982	1.23	0.98	0.25
4.999	0.655	1.014	2.956	91.541	3.27	3.00	0.28
4.998	1.082	1.014	4.972	93.228	5.41	5.04	0.37
4.998	1.506	1.014	6.958	93.735	7.53	7.06	0.47
4.998	1.940	1.014	8.976	93.869	9.70	9.10	0.59
4.998	2.371	1.014	10.964	93.816	11.85	11.12	0.73
4.998	2.807	1.014	12.946	93.570	14.03	13.13	0.90
4.997	3.255	1.014	14.964	93.288	16.27	15.17	1.09
4.997	3.701	1.014	16.948	92.924	18.49	17.19	1.31
4.996	4.160	1.014	18.966	92.533	20.78	19.23	1.55
4.996	4.617	1.015	20.952	92.195	23.07	21.27	1.80
4.994	5.790	1.015	25.948	91.084	28.92	26.34	2.58
4.993	7.004	1.015	30.978	89.911	34.97	31.44	3.53
4.991	8.246	1.015	35.976	88.725	41.16	36.52	4.64
4.989	9.524	1.016	40.968	87.600	47.52	41.62	5.89
4.987	10.844	1.016	45.972	86.369	54.08	46.71	7.37
4.984	12.207	1.016	50.966	85.111	60.84	51.78	9.06
4.982	13.617	1.017	55.964	83.897	67.84	56.92	10.92
4.979	15.077	1.017	60.960	82.586	75.07	62.00	13.07
4.998	1.596	0.056	15.700	11.022	7.98	0.88	7.10
4.997	1.591	0.116	15.678	22.875	7.95	1.82	6.13

## 4 Thermal Tests

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

### 4.1 35A Load, No Airflow

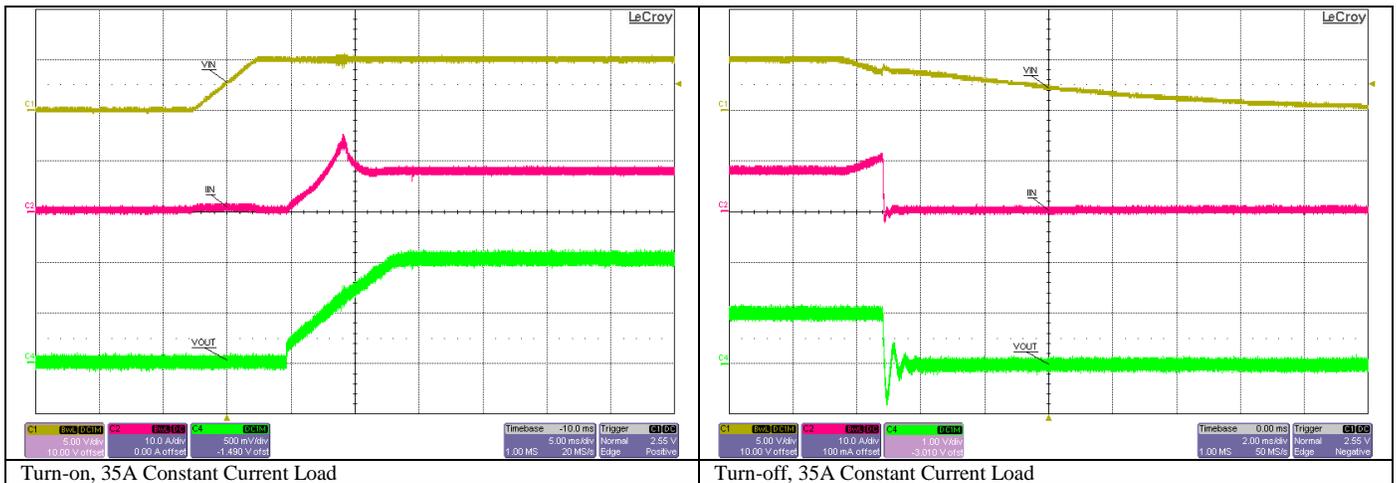
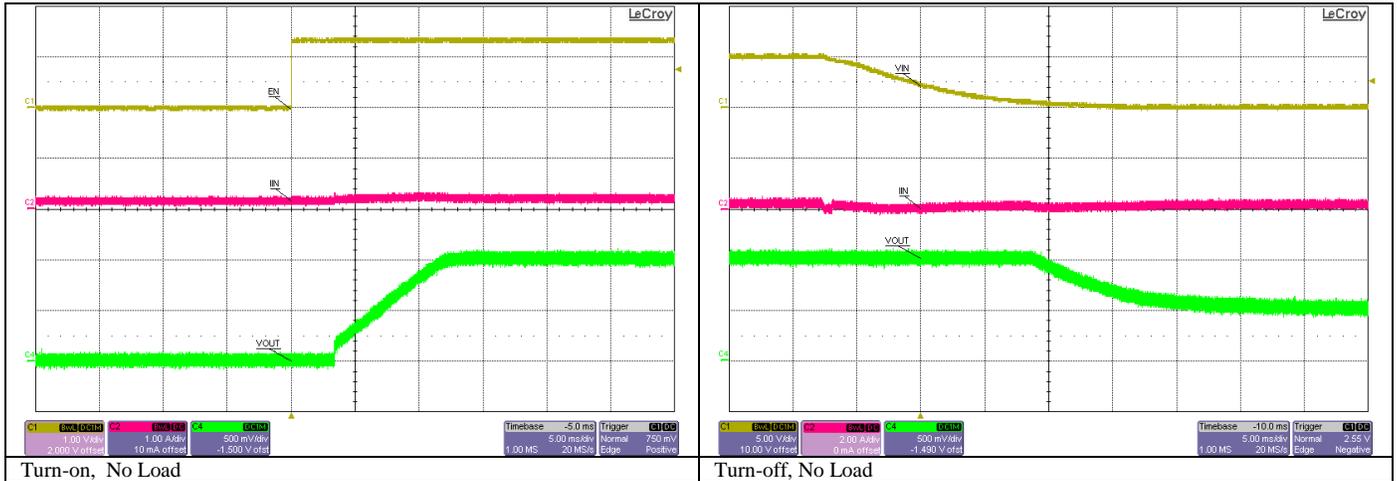




## 5 Startup and Shutdown Behavior

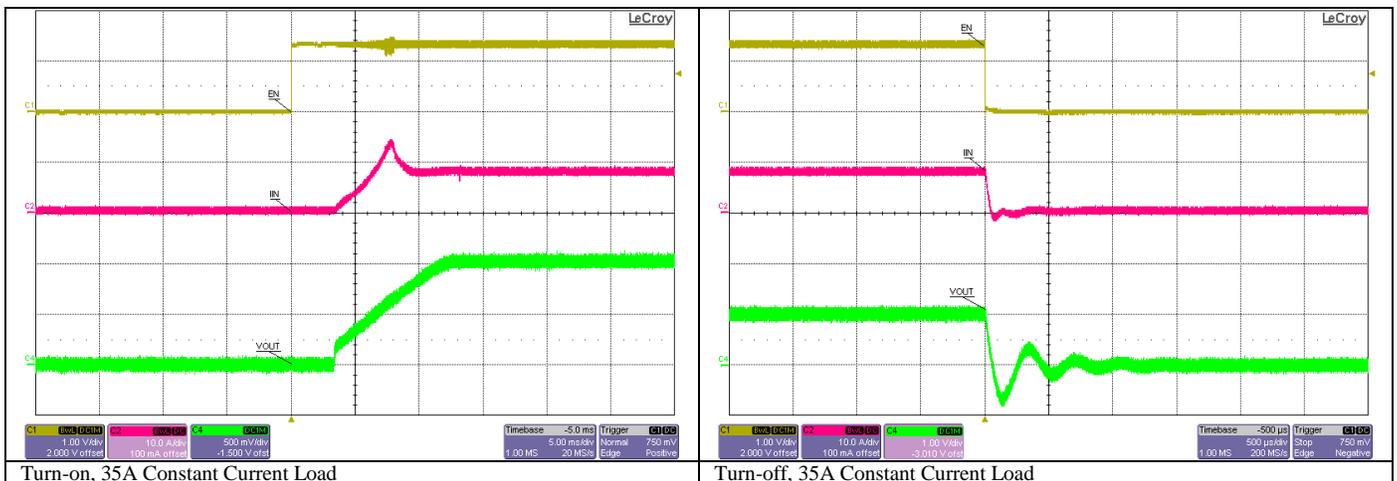
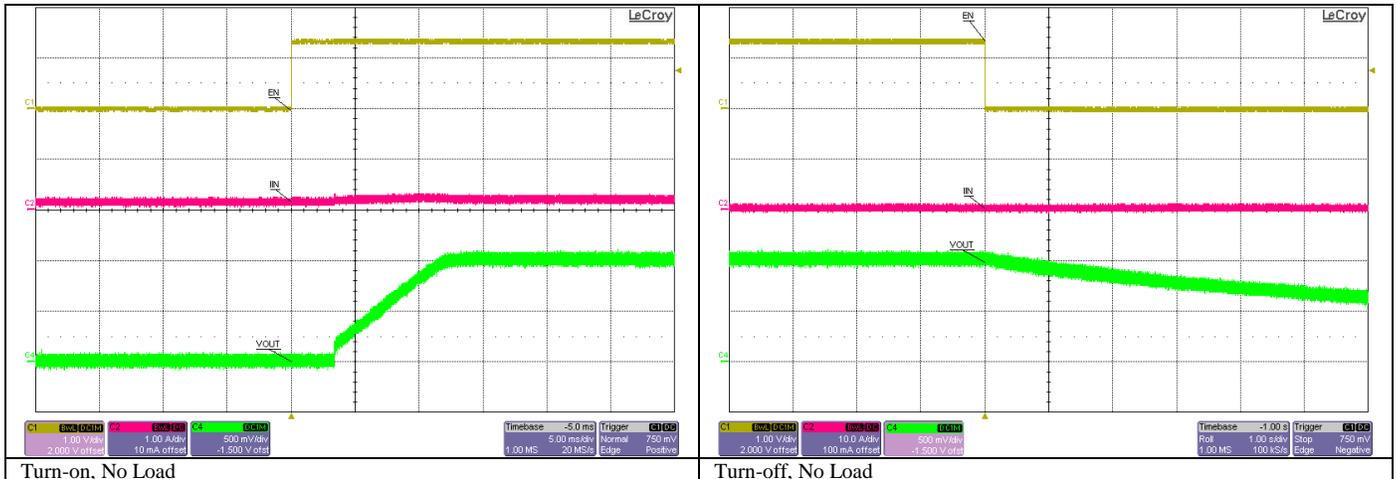
### 5.1 Turn-on and Turn-off from Vin

The output voltage is well controlled at turn-on, showing no evidence of over-shoot. Some ringing occurs at turn-off with load due to the output filter resonance.



## 5.2 Turn-on and Turn-off from EN

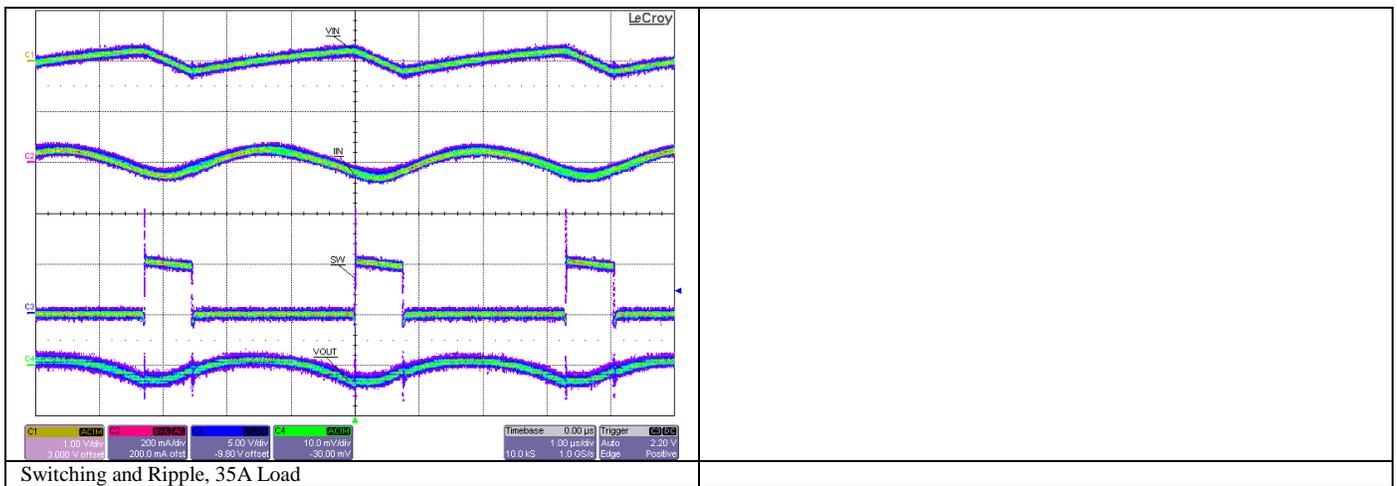
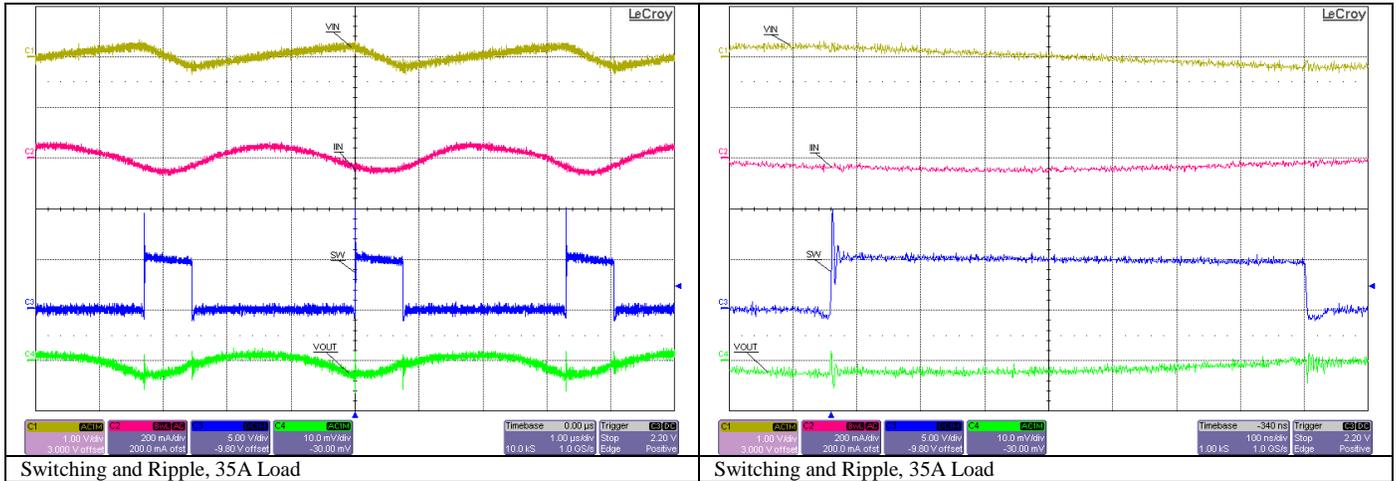
The output voltage is well controlled at turn-on, showing no evidence of over-shoot. Some ringing occurs at turn-off with load due to the output filter resonance.



## 6 Switching and Ripple

### 6.1 Switching and Ripple

Switching and ripple tests were made with a 330  $\mu\text{F}$ , 35V aluminum electrolytic input capacitor for input filter damping.

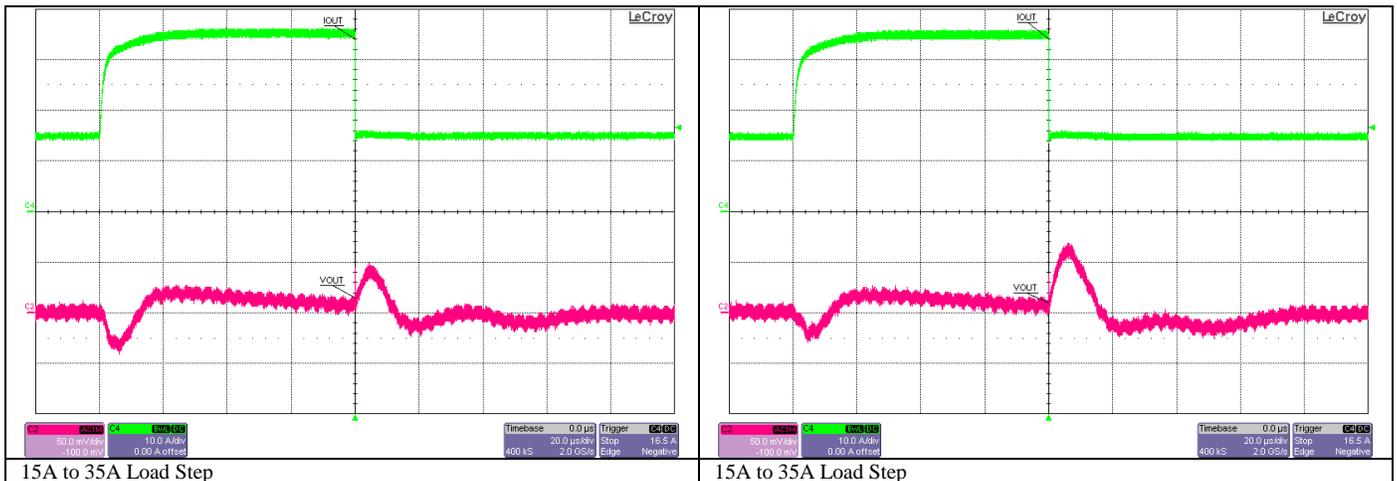
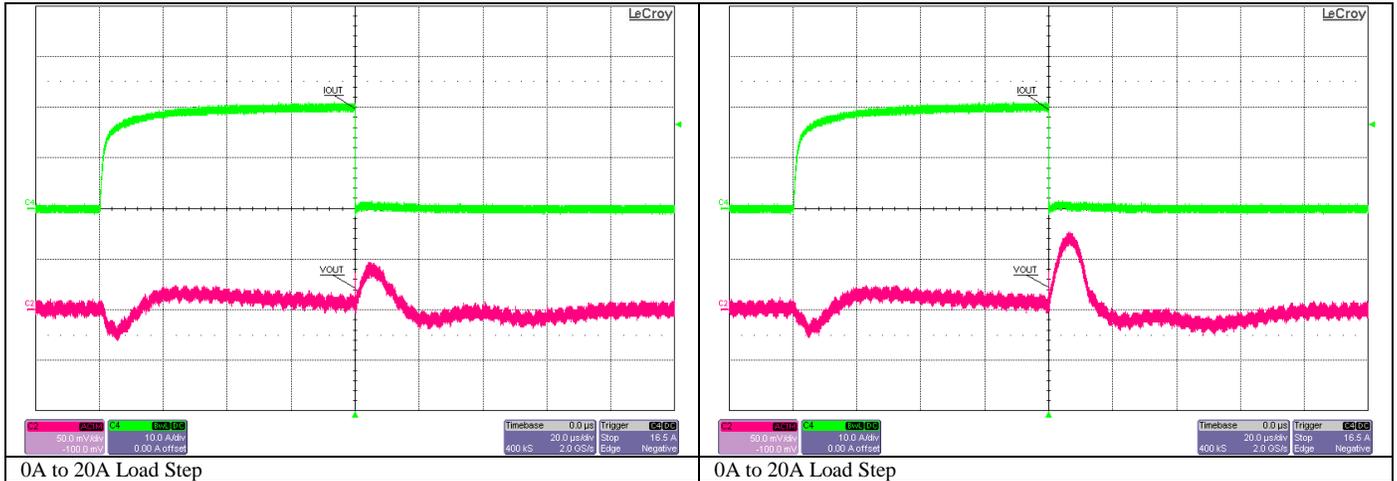


## 7 Load Transient Response

Load transient response for each condition was taken at two points to represent the minimum and maximum deviation. This difference occurs when the transient step coincides with either the converter off-time or on-time interval.

### 7.1 Load Transient Response

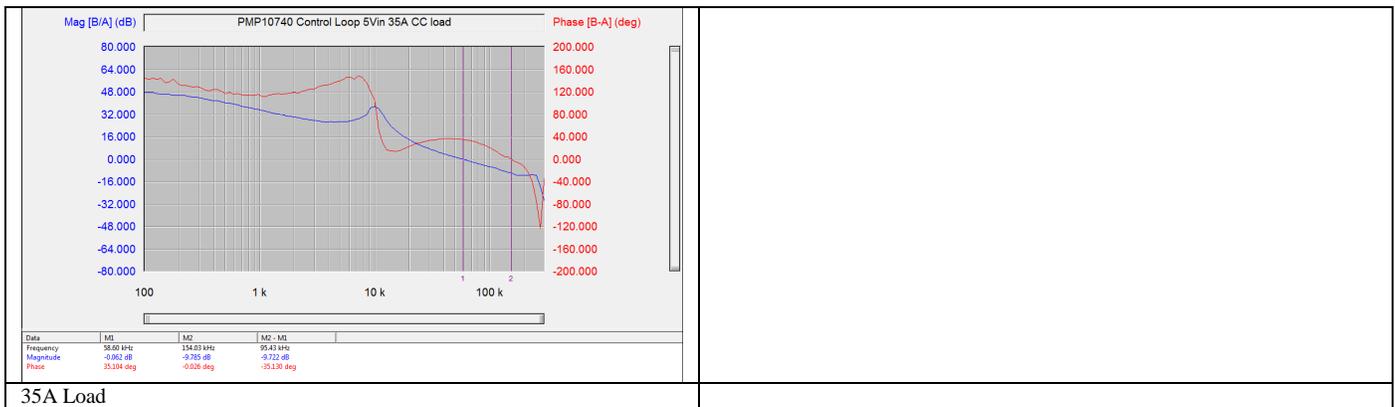
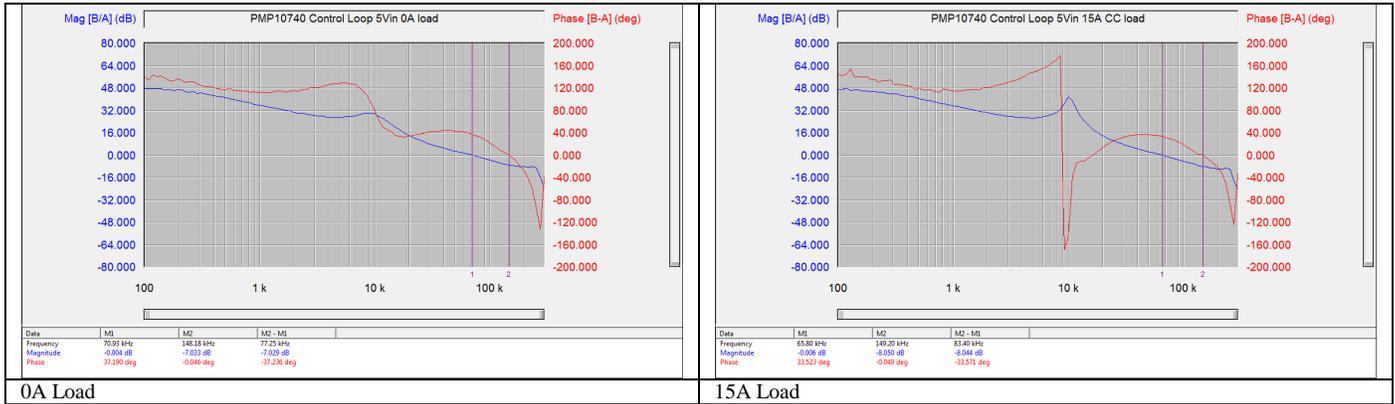
The worst case output voltage transient is 70mV for a 20A load step.



## 8 Frequency Response

### 8.1 Frequency Response

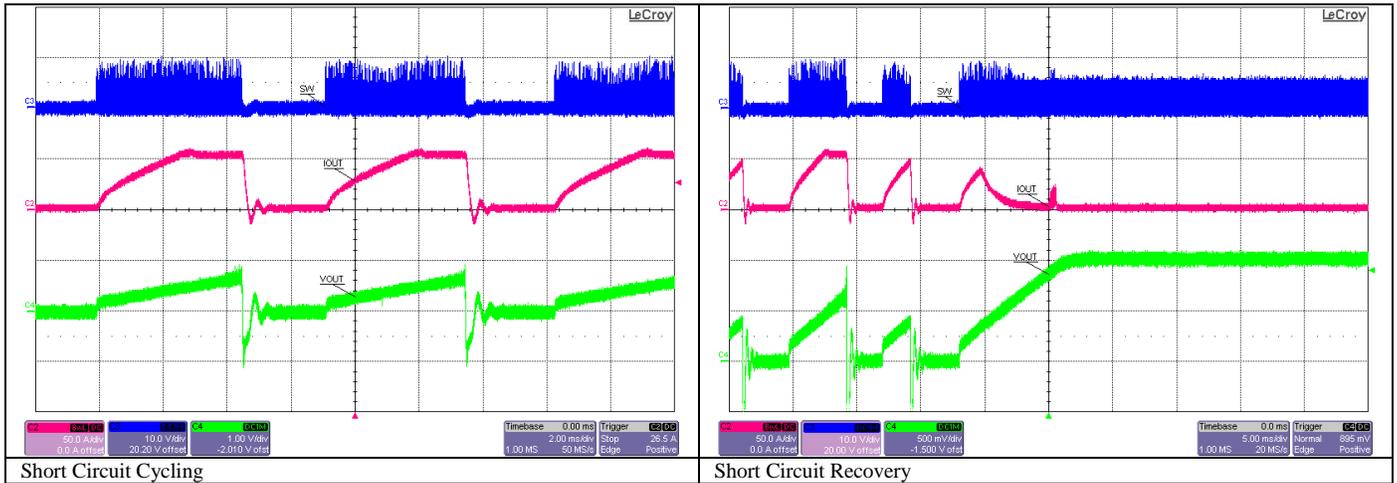
The control loop exhibits a bandwidth of 58 kHz and phase margin of 35° at full load.



## 9 Over-Current Protection

### 9.1 Short Circuit Protection

An active load was used to check short circuit protection. The results show hiccup protection with normal restart of the output voltage when the short is removed.



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