

**Test Data  
For PMP10514  
7/28/2014**



---

## Table of Contents

1. Design Specifications .....	3
2. Circuit Description.....	3
3. PMP10514 Board Photos .....	4
4. Thermal Data.....	6
5. Efficiency .....	7
5.1 Efficiency Chart .....	7
5.2 Efficiency Data.....	7
6 Waveforms.....	9
6.1 Load Transient Response .....	9
6.2 Startup .....	12
6.3 Output Voltage Ripple and Switch Node Voltage .....	18
6.4 Short Circuit .....	21

---

## 1. Design Specifications

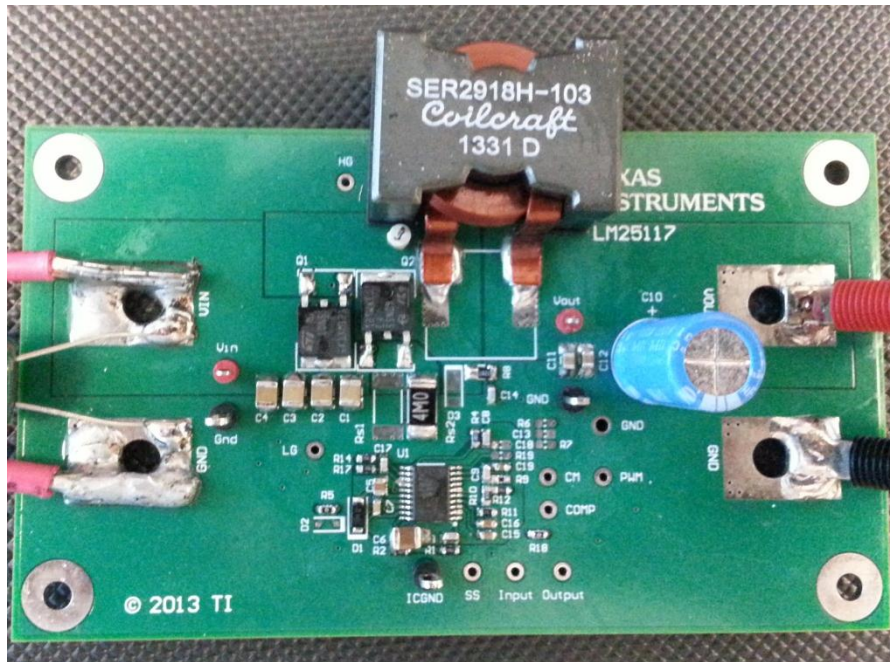
<b>Vin Minimum</b>	<b>30.4VDC</b>
<b>Vin Maximum</b>	<b>33.6VDC</b>
<b>Vin Nominal</b>	<b>32VDC</b>
<b>Vout</b>	<b>20VDC</b>
<b>Iout</b>	<b>15A Max.</b>
<b>Switching Frequency</b>	<b>200KHz</b>

## 2. Circuit Description

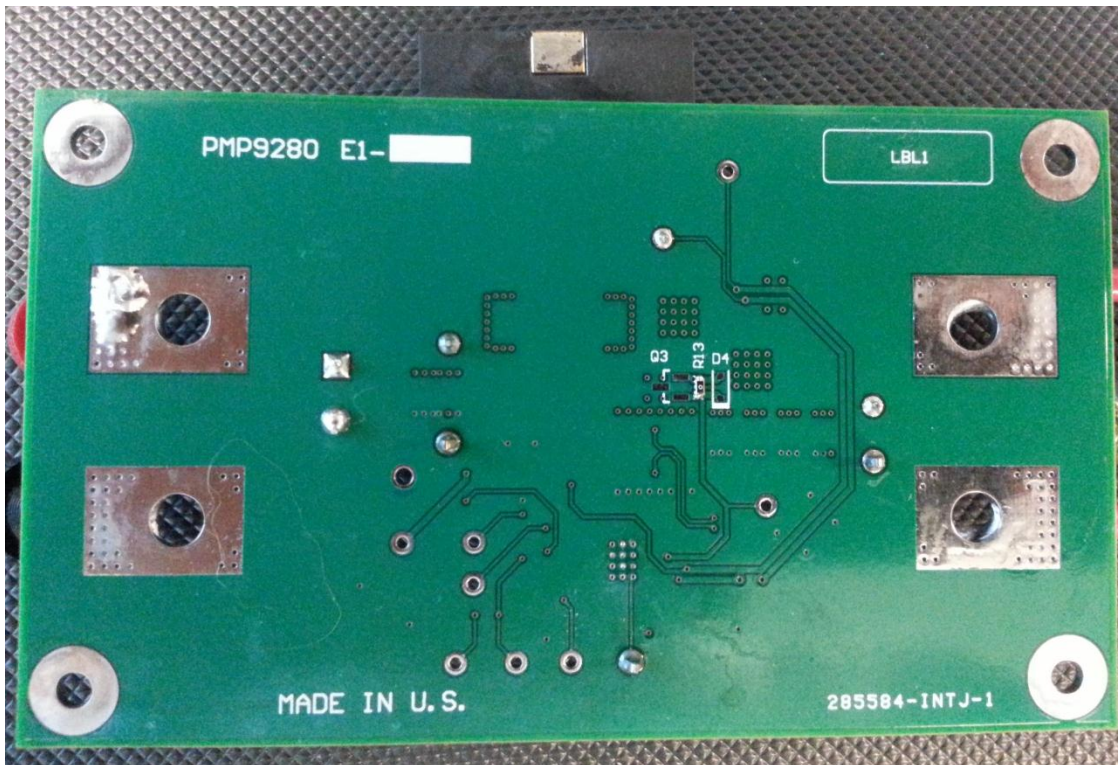
PMP10514 is a Single-Phase Synchronous Buck Converter using the LM25117 controller IC. The design accepts an input voltage of 30.4Vin to 33.6Vin (32Vin Nominal) and provides an output of 20Vout capable of supplying 15A of continuous current to the load. The design was built on the PMP9280 PCB, which was modified to the PMP10514 design configuration and requirements. Please note, that Cx1 (see schematic) is a bulk capacitor that was used to dampen the input supply. When building this design please ensure to use input bulk capacitor(s) that can handle a total of 7.5Arms.

### 3. PMP10514 Board Photos

Board Dimensions: 2.36" x 4.05"

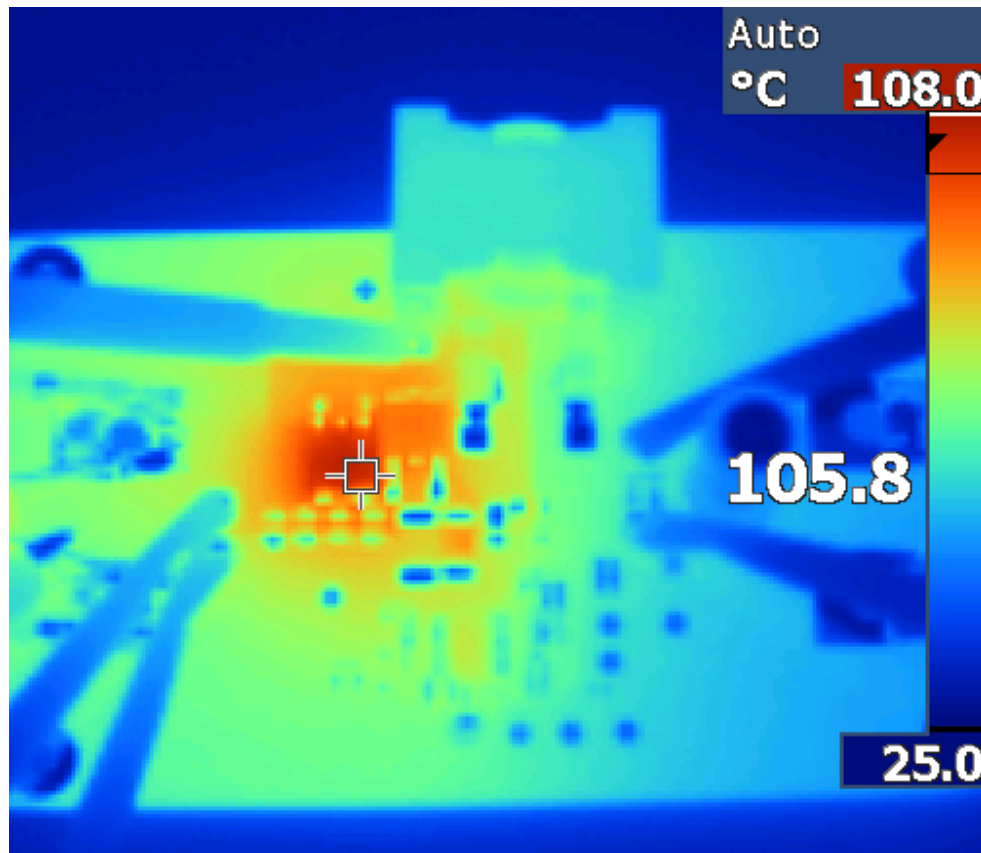


Board Photo (Top)



**Board Photo (Bottom)**

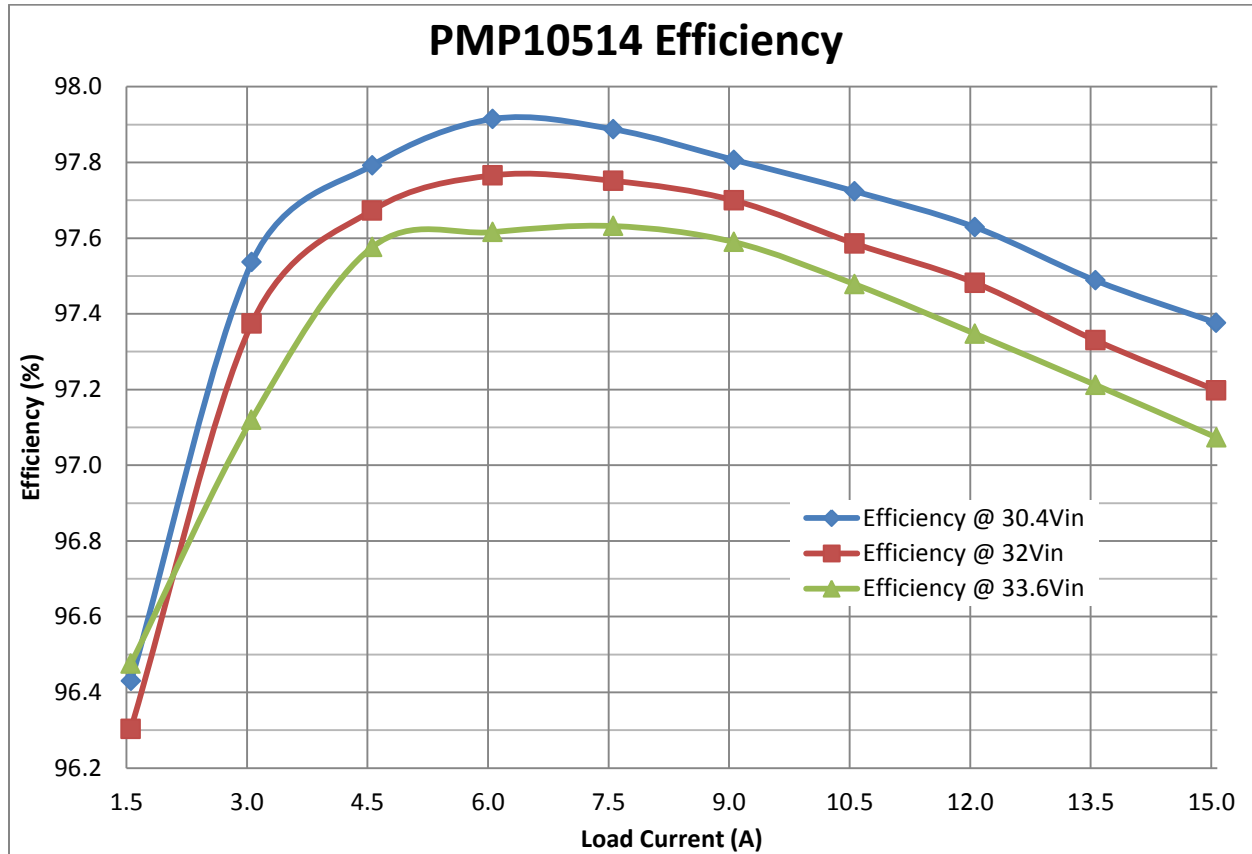
#### 4. Thermal Data



IR thermal image taken at steady state with 32Vin and 15A load (no airflow; Ambient at room temp.)

## 5. Efficiency

### 5.1 Efficiency Chart



### 5.2 Efficiency Data

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
30.41	1.091	20.561	1.556	33.17731	31.99292	96.4
30.41	2.121	20.559	3.06	64.49961	62.91054	97.5
30.409	3.151	20.558	4.558	95.81876	93.70336	97.8
30.407	4.183	20.558	6.058	127.1925	124.5404	97.9
30.406	5.222	20.559	7.56	158.7801	155.426	97.9
30.404	6.264	20.56	9.06	190.4507	186.2736	97.8
30.401	7.308	20.56	10.56	222.1705	217.1136	97.7
30.398	8.355	20.56	12.06	253.9753	247.9536	97.6
30.394	9.409	20.56	13.56	285.9771	278.7936	97.5
30.39	10.467	20.562	15.064	318.0921	309.746	97.4

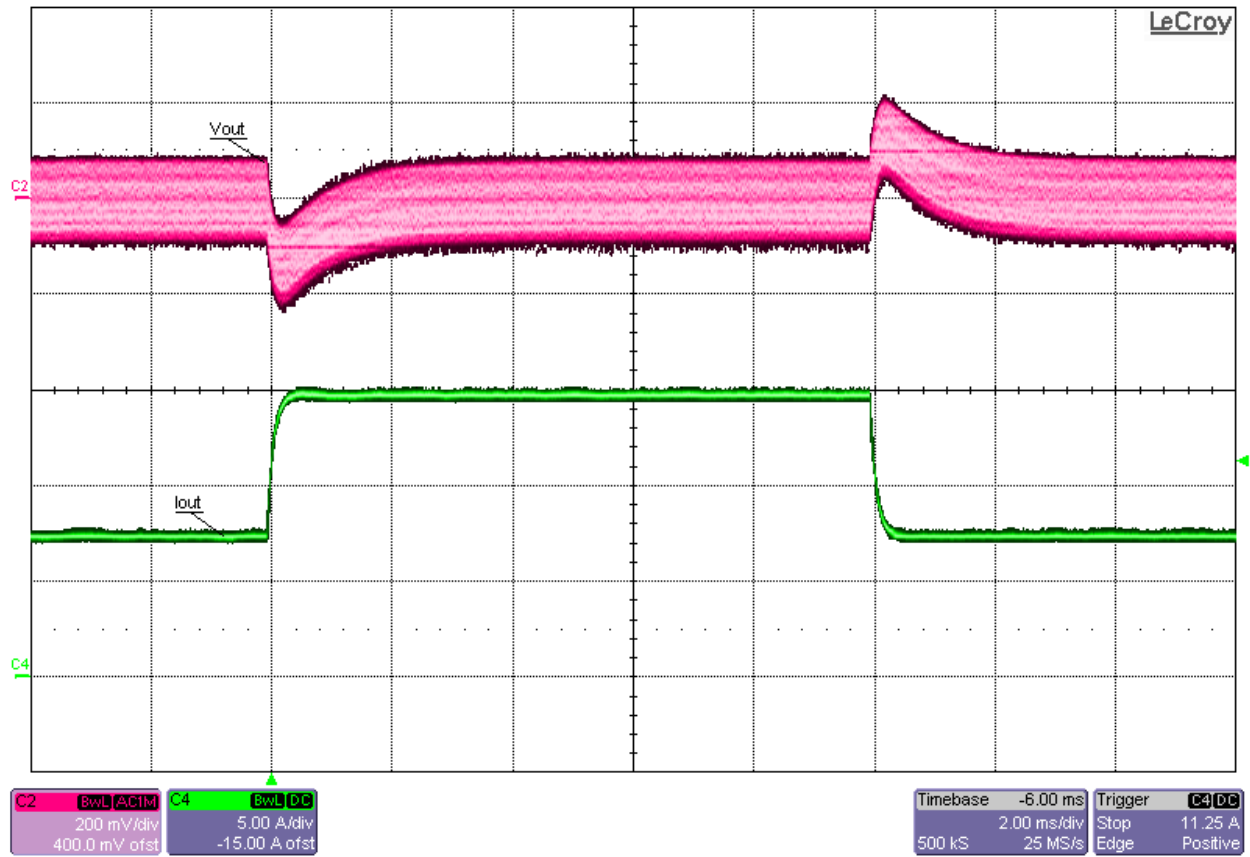
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
32.01	1.037	20.571	1.554	33.19437	31.96733	96.3
32.01	2.018	20.569	3.058	64.59618	62.9	97.4
32.009	2.997	20.566	4.556	95.93097	93.6987	97.7
32.007	3.98	20.565	6.056	127.3879	124.5416	97.8
32.006	4.968	20.565	7.558	159.0058	155.4303	97.8
32.003	5.959	20.565	9.06	190.7059	186.3189	97.7
32	6.954	20.564	10.56	222.528	217.1558	97.6
31.997	7.951	20.564	12.06	254.4081	248.0018	97.5
31.993	8.955	20.564	13.56	286.4973	278.8478	97.3
31.989	9.963	20.564	15.064	318.7064	309.7761	97.2

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
33.609	0.986	20.573	1.554	33.13847	31.97044	96.5
33.608	1.926	20.571	3.056	64.72901	62.86498	97.1
33.607	2.859	20.569	4.558	96.08241	93.7535	97.6
33.606	3.797	20.568	6.056	127.602	124.5598	97.6
33.604	4.738	20.567	7.558	159.2158	155.4454	97.6
33.601	5.682	20.565	9.06	190.9209	186.3189	97.6
33.599	6.631	20.566	10.56	222.795	217.177	97.5
33.595	7.584	20.566	12.06	254.7845	248.026	97.3
33.592	8.542	20.568	13.562	286.9429	278.9432	97.2
33.588	9.504	20.568	15.066	319.2204	309.8775	97.1

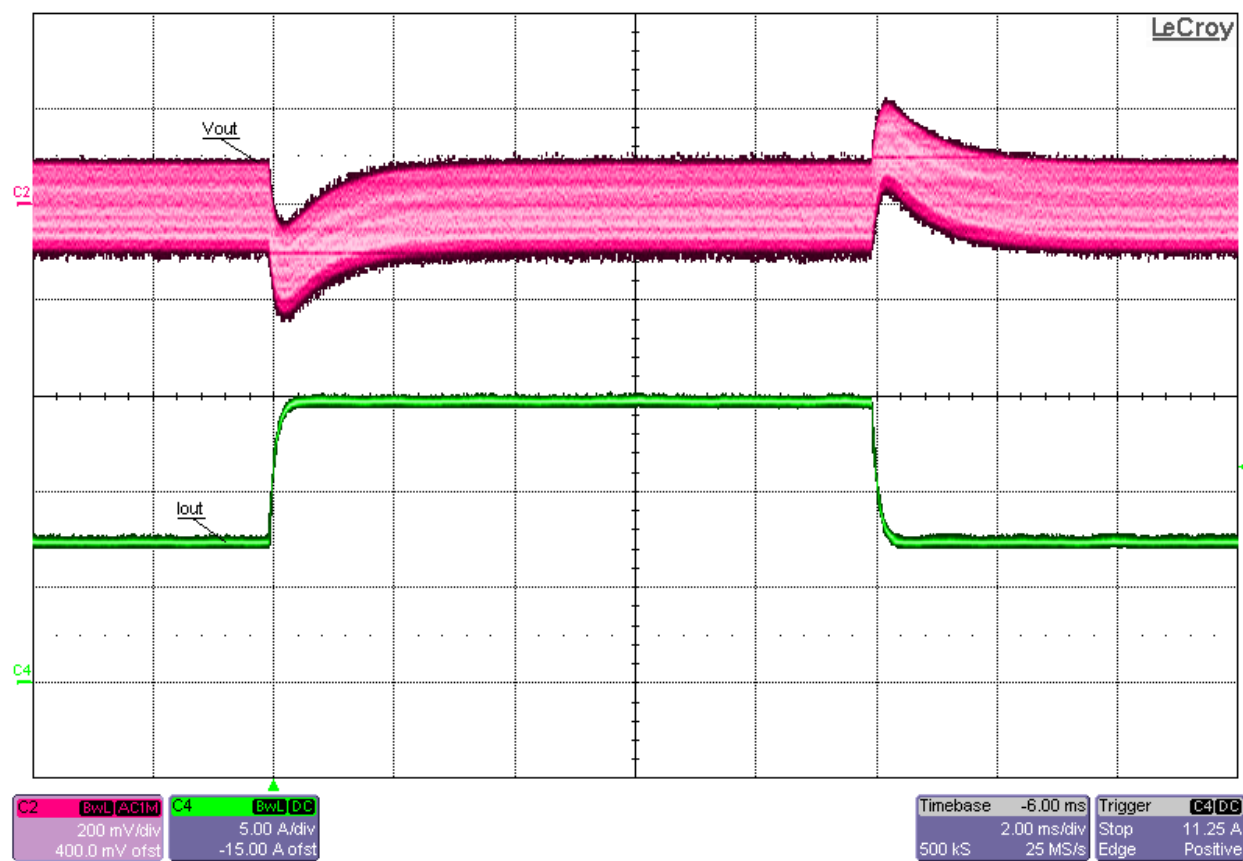


## 6 Waveforms

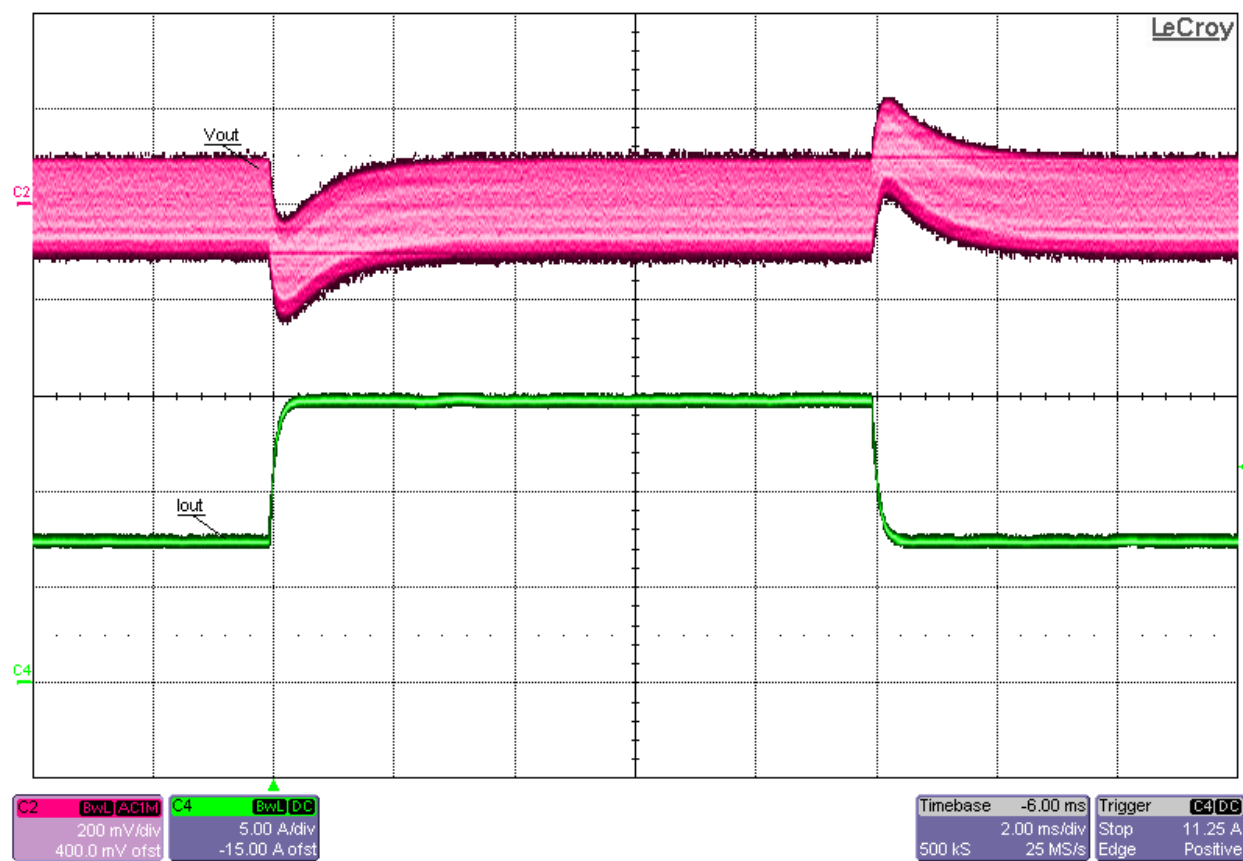
### 6.1 Load Transient Response



**Load Transient Response at 30.4V<sub>in</sub> and 50%-to-100% (7.5A-to-15A) Load Step**

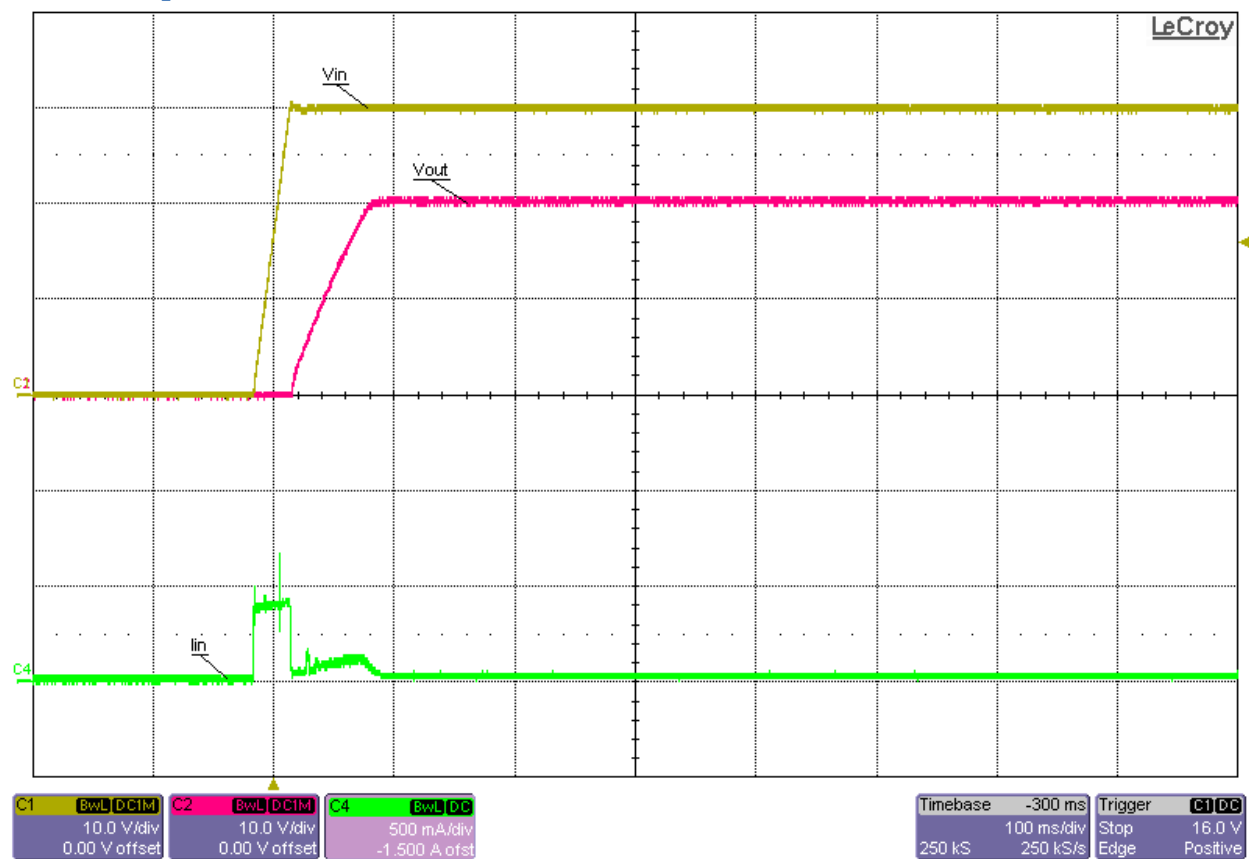


**Load Transient Response at 32Vin and 50%-to-100% (7.5A-to-15A) Load Step**

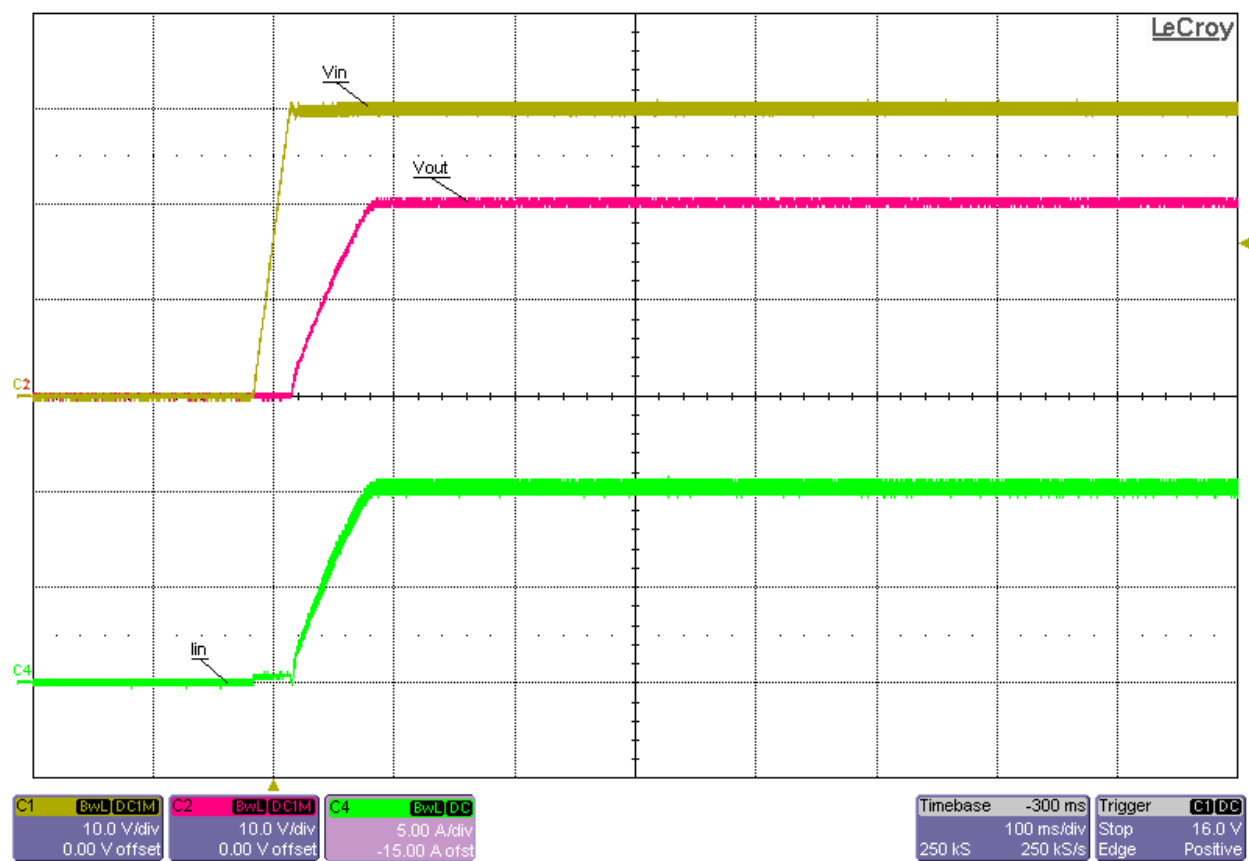


**Load Transient Response at 33.6Vin and 50%-to-100% (7.5A-to-15A) Load Step**

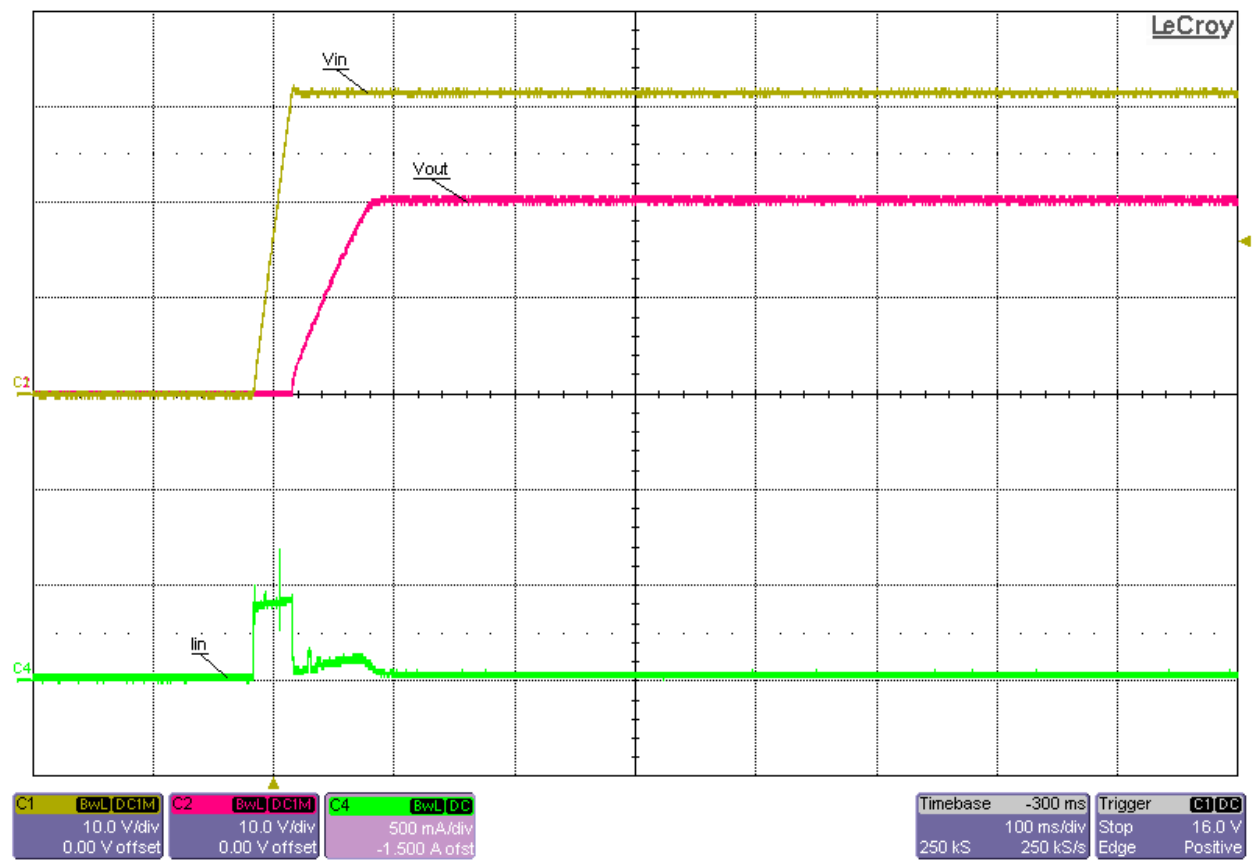
## 6.2 Startup



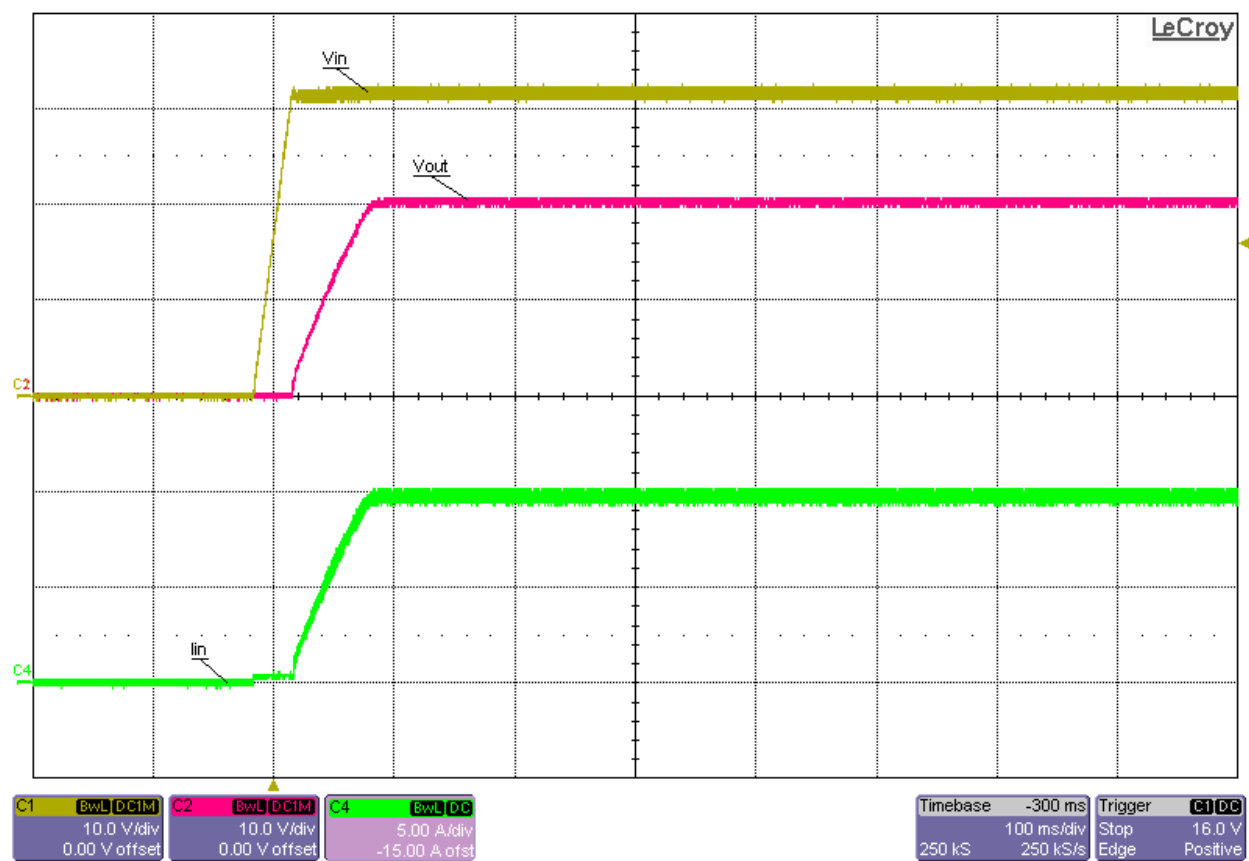
Startup into No Load at 30.4V<sub>in</sub>



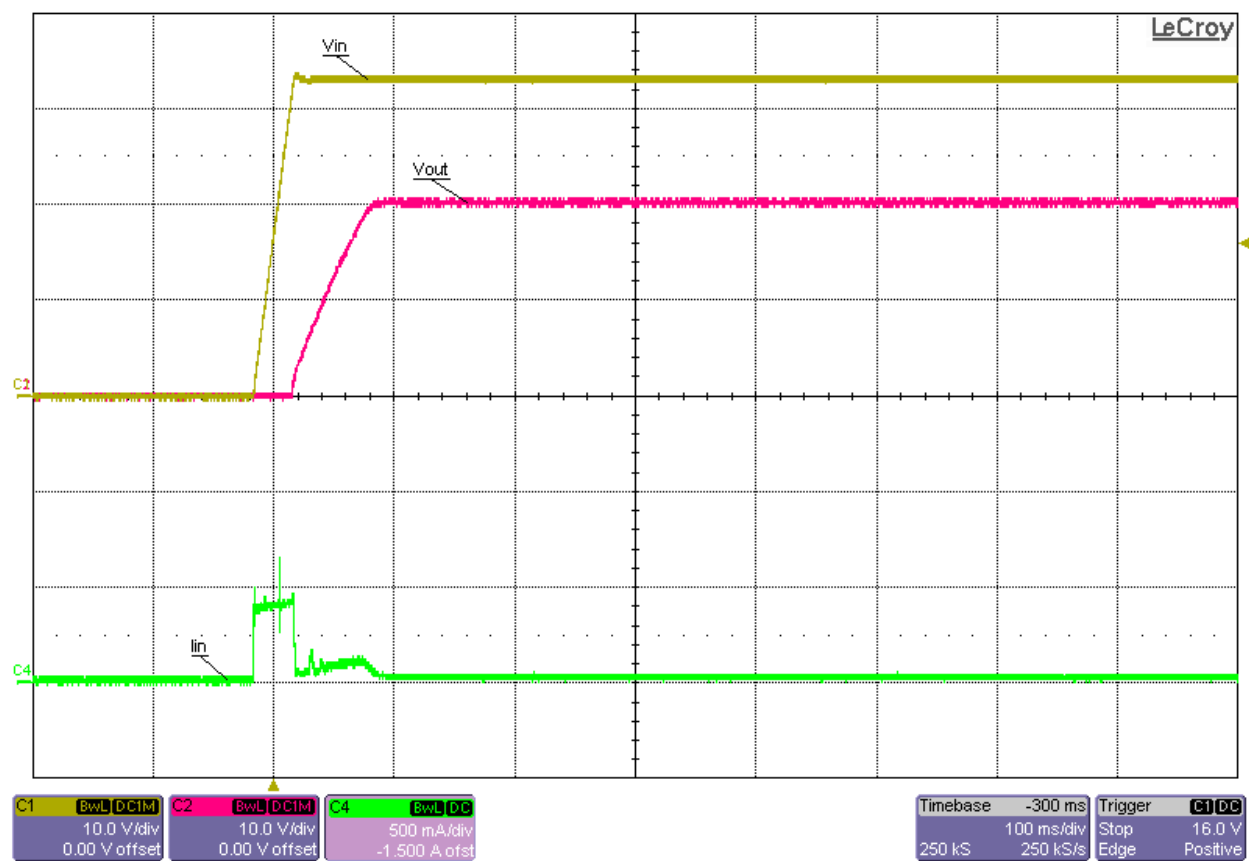
**Startup into 15A Constant-Current Load at 30.4V<sub>in</sub>**



**Startup into No Load at 32V<sub>in</sub>**

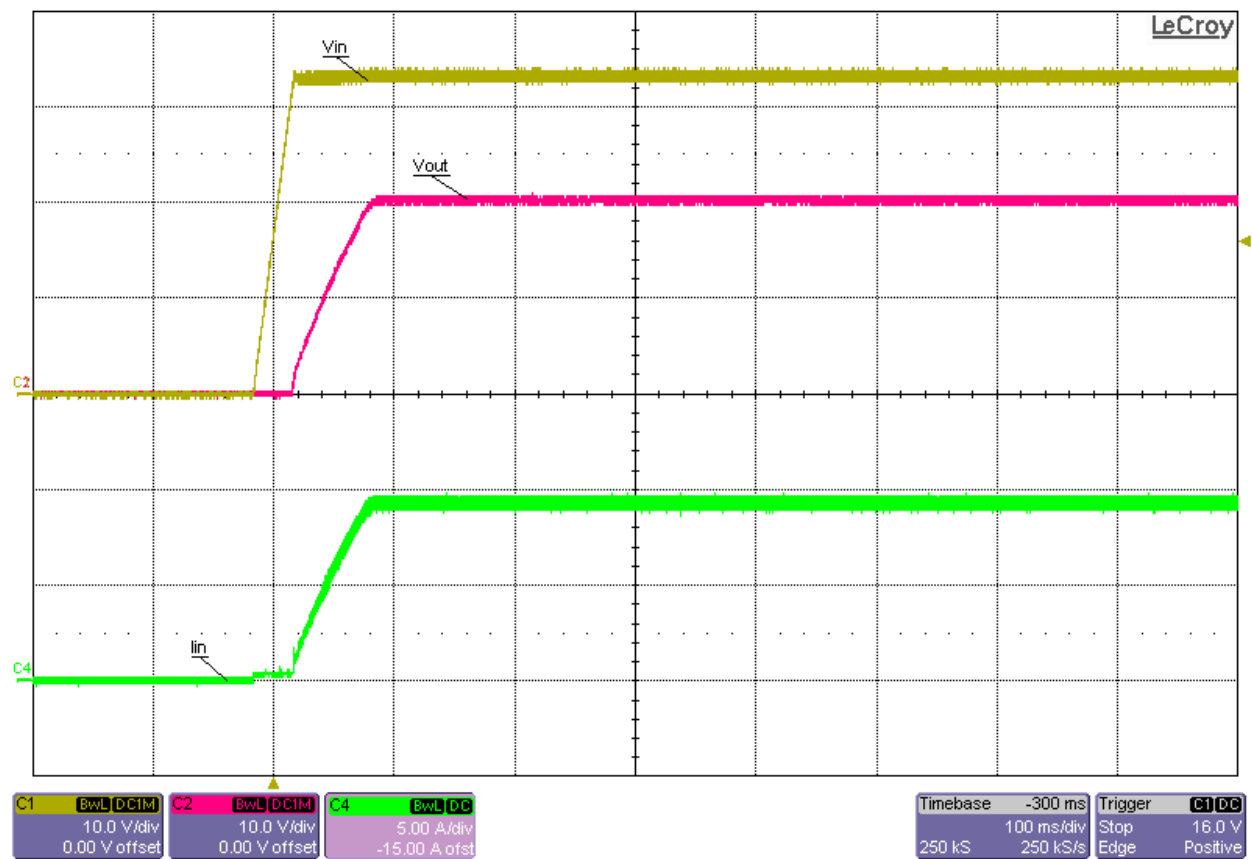


**Startup into 15A Constant-Current Load at 32V<sub>in</sub>**



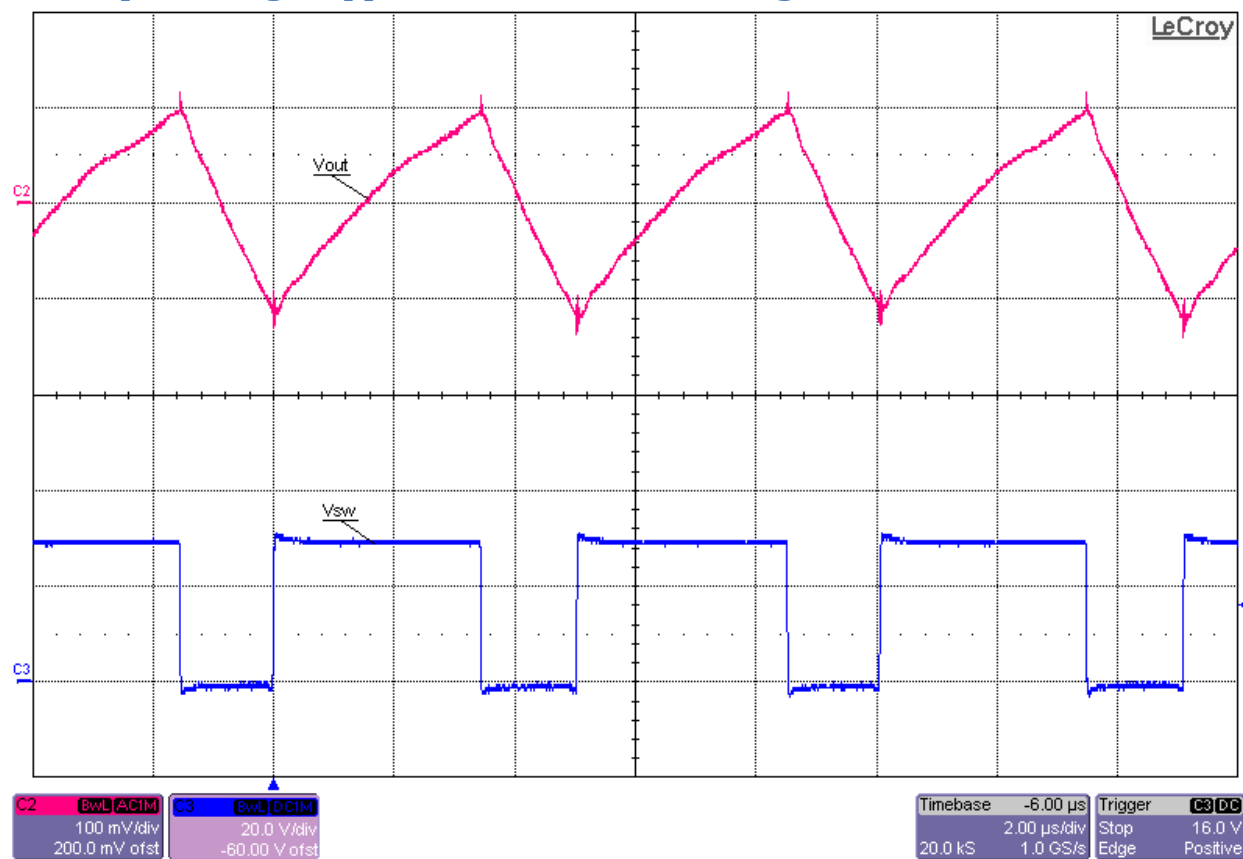
**Startup into No Load at 33.6V<sub>in</sub>**



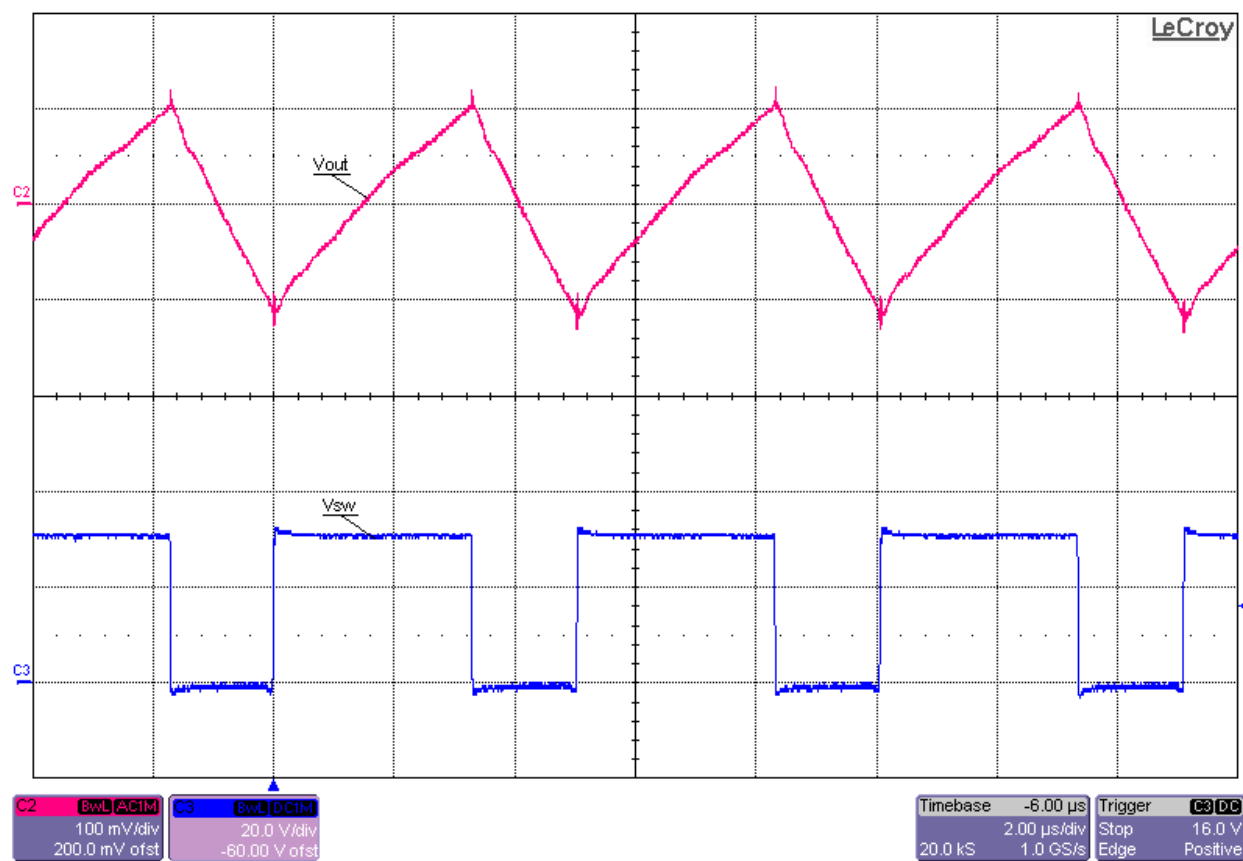


**Startup into 15A Constant-Current Load at 33.6V<sub>in</sub>**

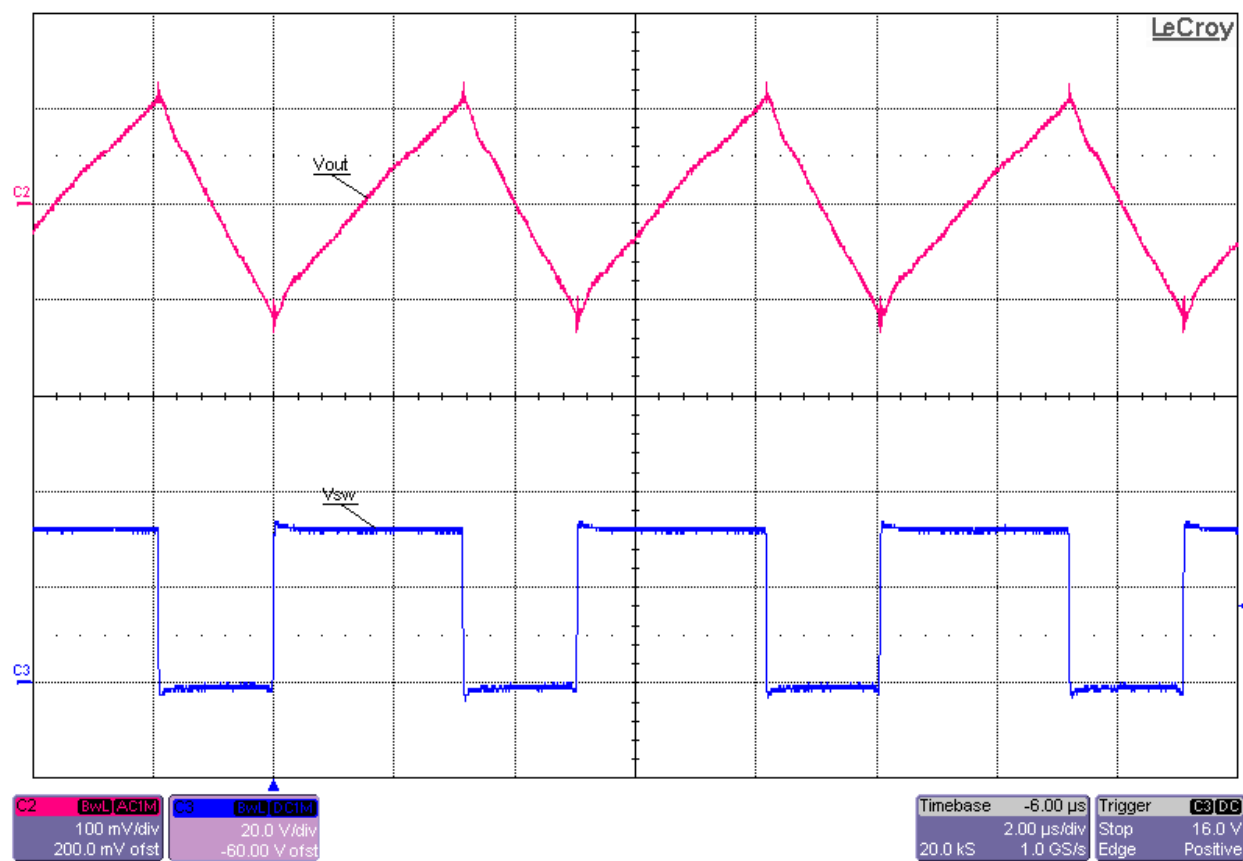
### 6.3 Output Voltage Ripple and Switch Node Voltage



Switch Node Voltage and Output Voltage Ripple at 30.4Vin and 15A Load ( $V_{\text{ripple}} \approx 220\text{mVp-p}$ )

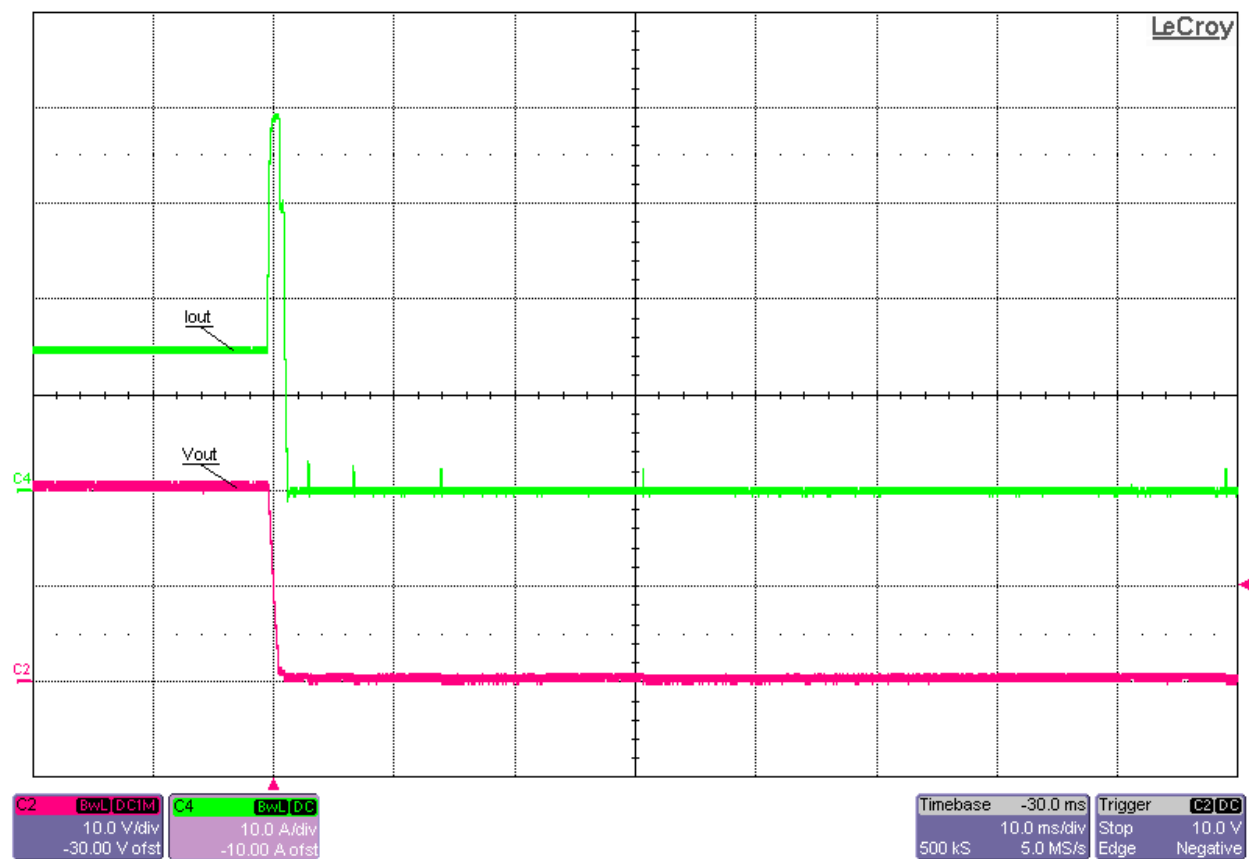


Switch Node Voltage and Output Voltage Ripple at 32Vin and 15A Load (Vripple  $\approx$  230mVp-p)

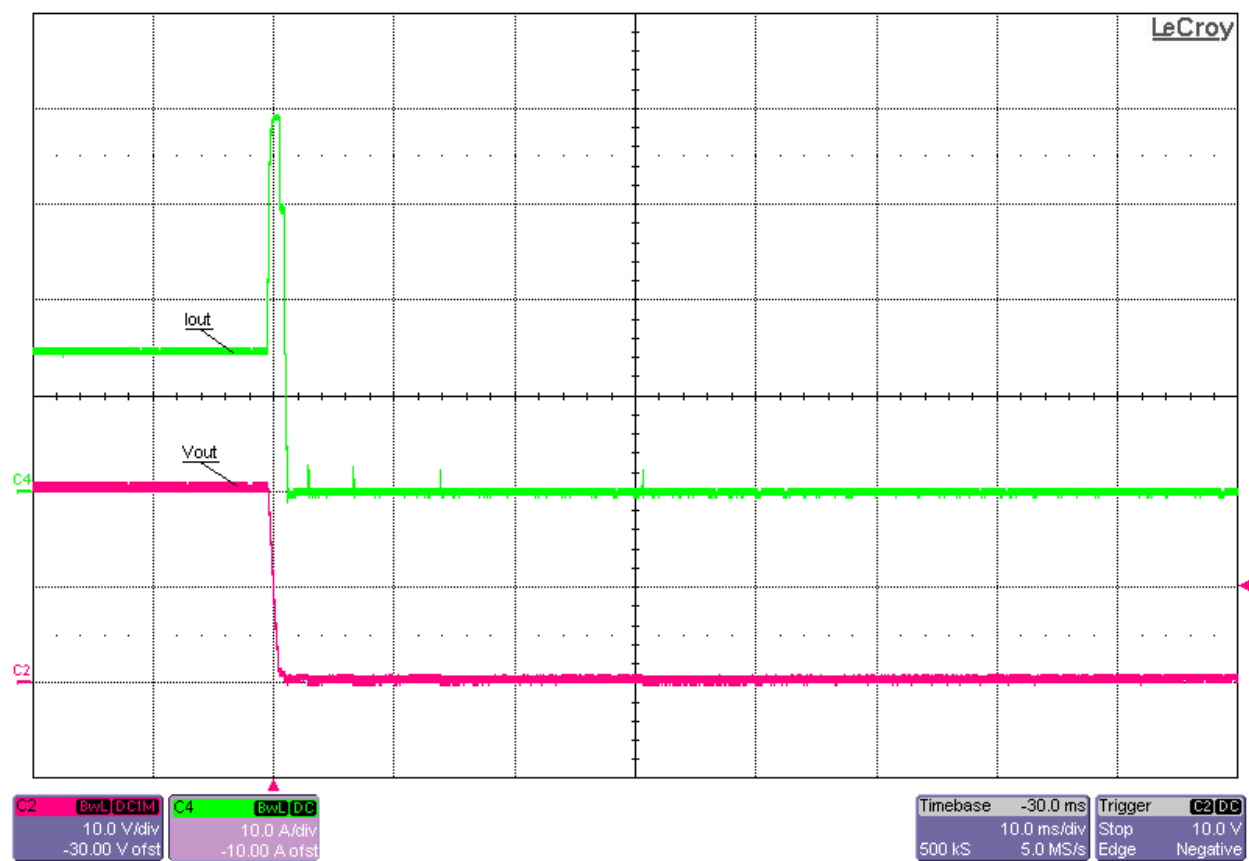


Switch Node Voltage and Output Voltage Ripple at 33.6Vin and 15A Load (Vripple  $\approx$  250mVp-p)

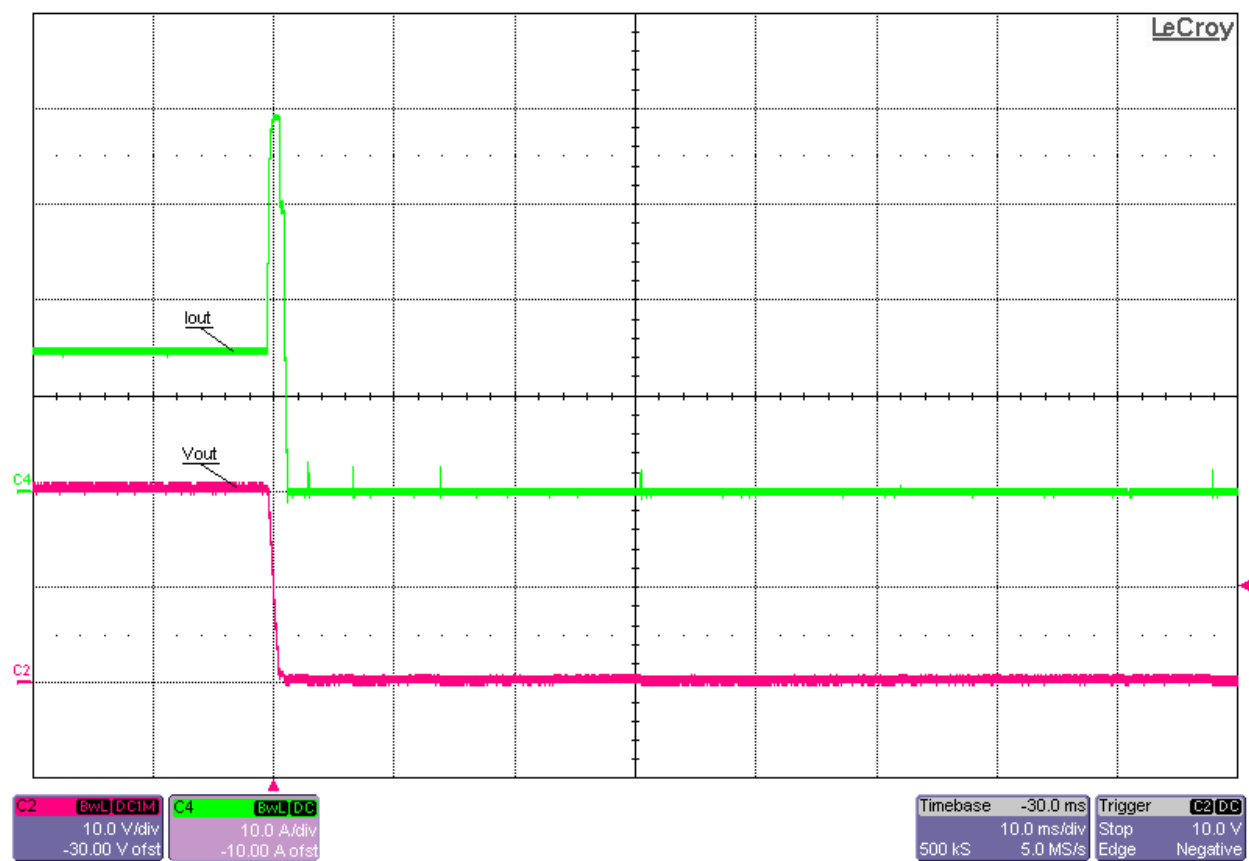
## 6.4 Short Circuit



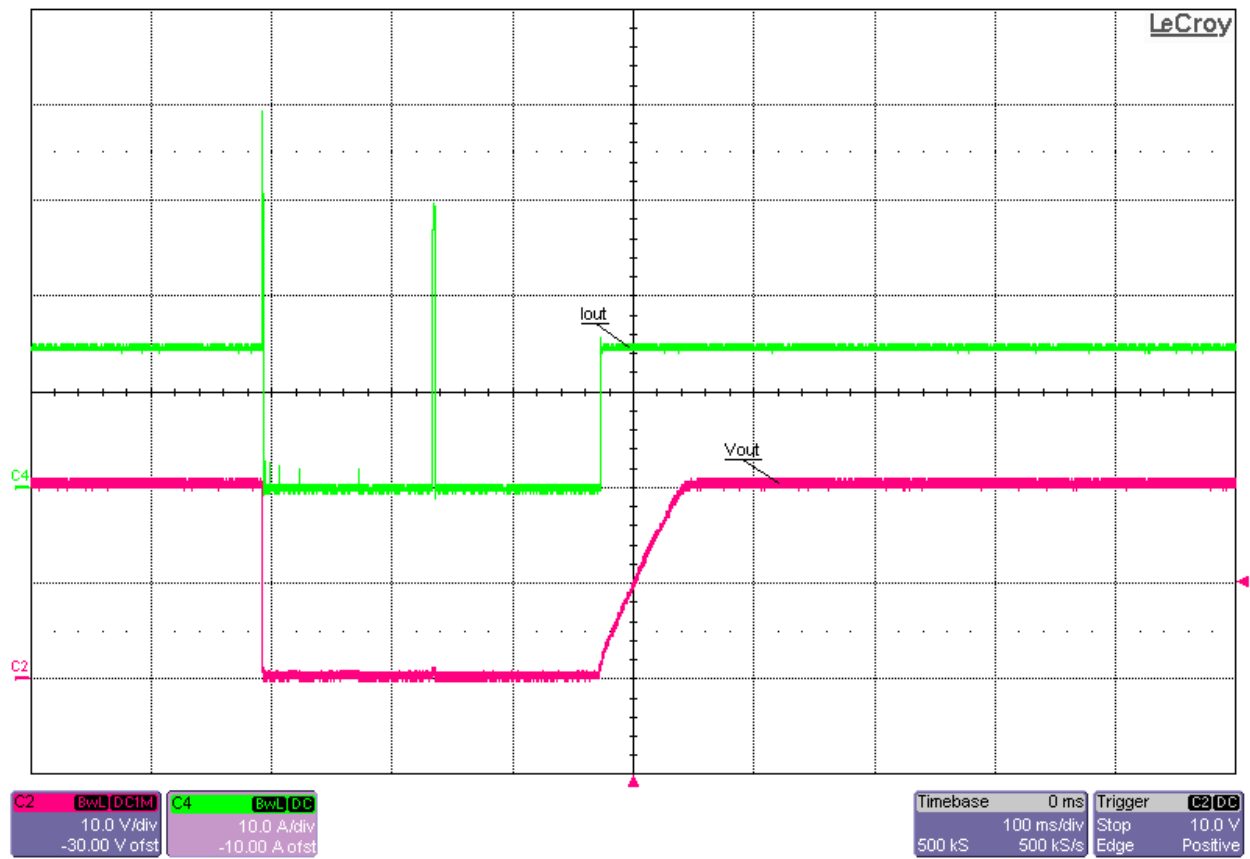
Short Circuit Applied at 30.4Vin from 15A Load



**Short Circuit Applied at 32Vin from 15A Load**

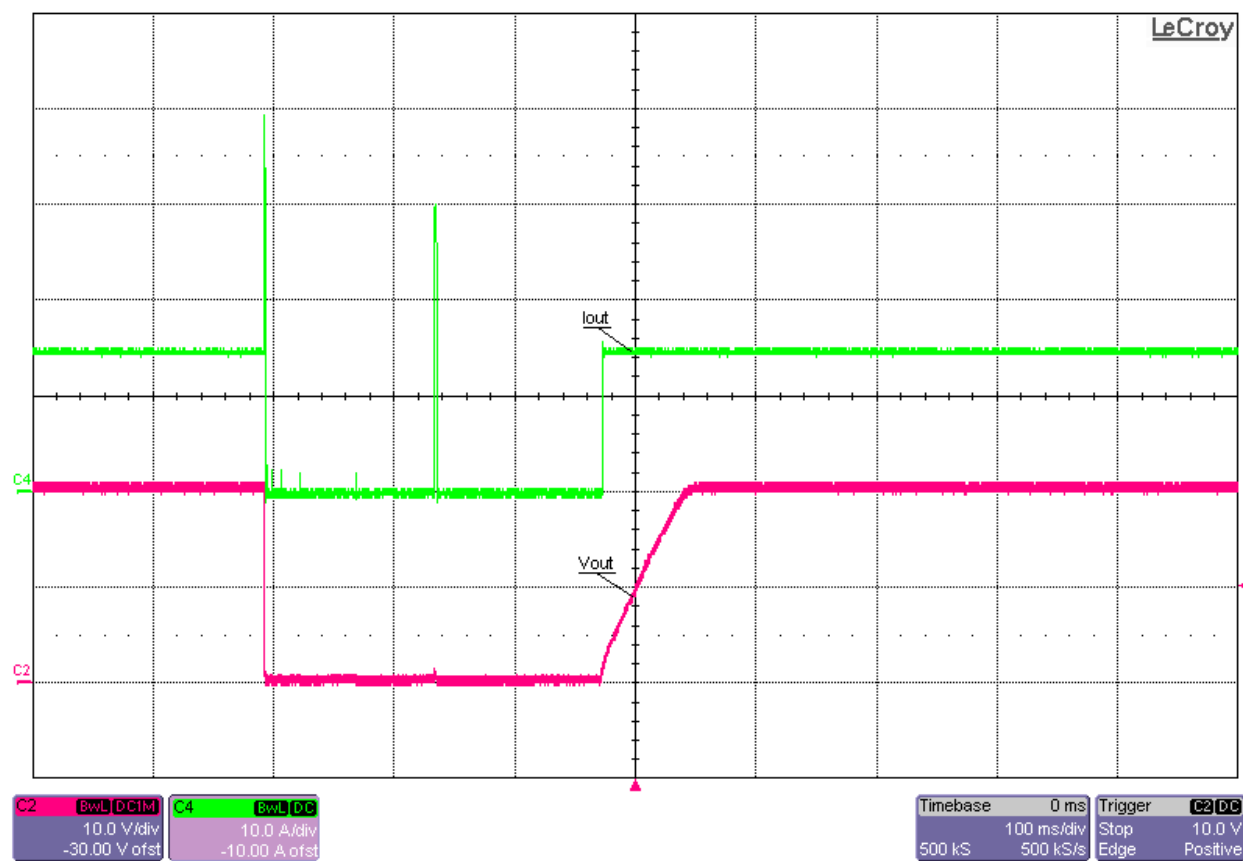


**Short Circuit Applied at 33.6Vin from 15A Load**

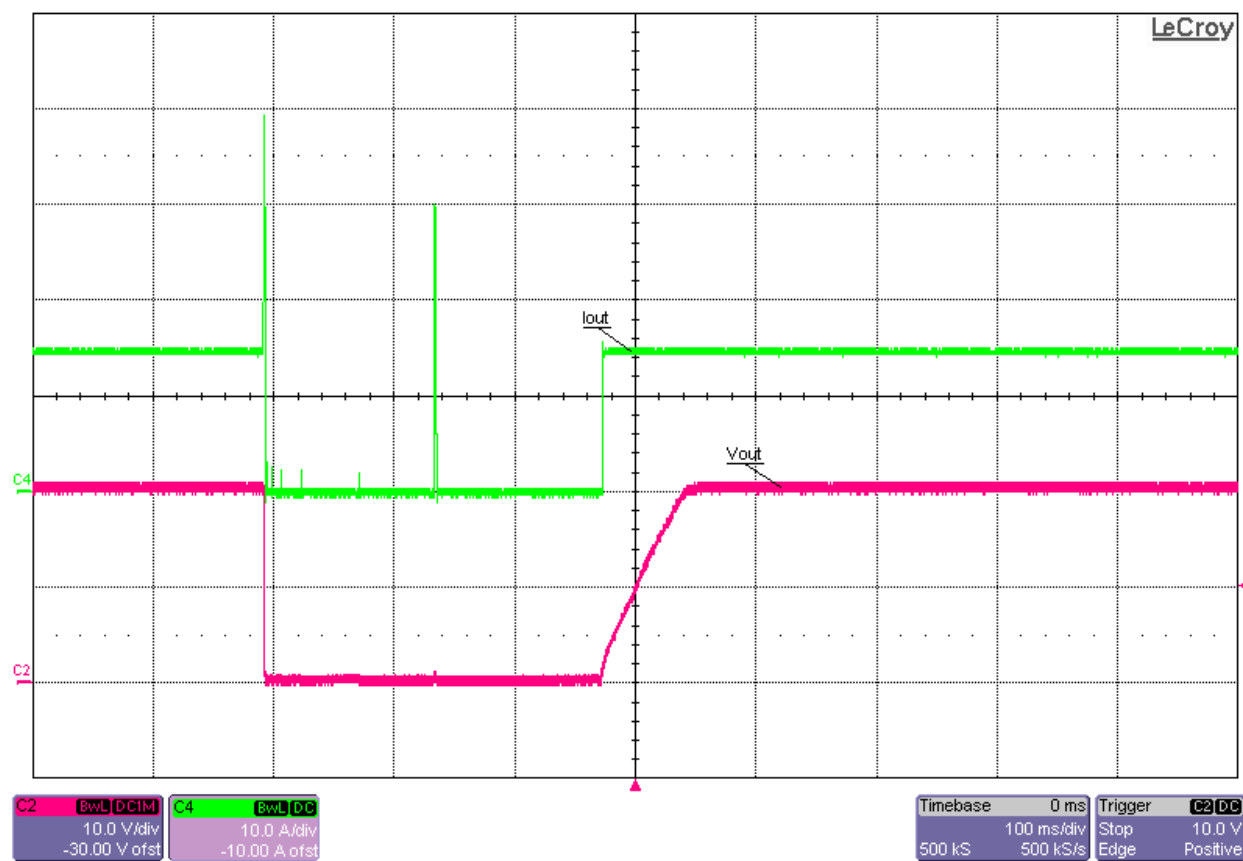


**Short Circuit Released at 30.4V<sub>in</sub> into 15A Load**





**Short Circuit Released at 32Vin into 15A Load**



**Short Circuit Released at 33.6V<sub>in</sub> into 15A Load**

## IMPORTANT NOTICE FOR TI REFERENCE DESIGNS

Texas Instruments Incorporated ("TI") reference designs are solely intended to assist designers ("Buyers") who are developing systems that incorporate TI semiconductor products (also referred to herein as "components"). Buyer understands and agrees that Buyer remains responsible for using its independent analysis, evaluation and judgment in designing Buyer's systems and products.

TI reference designs have been created using standard laboratory conditions and engineering practices. **TI has not conducted any testing other than that specifically described in the published documentation for a particular reference design.** TI may make corrections, enhancements, improvements and other changes to its reference designs.

Buyers are authorized to use TI reference designs with the TI component(s) identified in each particular reference design and to modify the reference design in the development of their end products. HOWEVER, NO OTHER LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE TO ANY OTHER TI INTELLECTUAL PROPERTY RIGHT, AND NO LICENSE TO ANY THIRD PARTY TECHNOLOGY OR INTELLECTUAL PROPERTY RIGHT, IS GRANTED HEREIN, including but not limited to any patent right, copyright, mask work right, or other intellectual property right relating to any combination, machine, or process in which TI components or services are used. Information published by TI regarding third-party products or services does not constitute a license to use such products or services, or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

TI REFERENCE DESIGNS ARE PROVIDED "AS IS". TI MAKES NO WARRANTIES OR REPRESENTATIONS WITH REGARD TO THE REFERENCE DESIGNS OR USE OF THE REFERENCE DESIGNS, EXPRESS, IMPLIED OR STATUTORY, INCLUDING ACCURACY OR COMPLETENESS. TI DISCLAIMS ANY WARRANTY OF TITLE AND ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, QUIET ENJOYMENT, QUIET POSSESSION, AND NON-INFRINGEMENT OF ANY THIRD PARTY INTELLECTUAL PROPERTY RIGHTS WITH REGARD TO TI REFERENCE DESIGNS OR USE THEREOF. TI SHALL NOT BE LIABLE FOR AND SHALL NOT DEFEND OR INDEMNIFY BUYERS AGAINST ANY THIRD PARTY INFRINGEMENT CLAIM THAT RELATES TO OR IS BASED ON A COMBINATION OF COMPONENTS PROVIDED IN A TI REFERENCE DESIGN. IN NO EVENT SHALL TI BE LIABLE FOR ANY ACTUAL, SPECIAL, INCIDENTAL, CONSEQUENTIAL OR INDIRECT DAMAGES, HOWEVER CAUSED, ON ANY THEORY OF LIABILITY AND WHETHER OR NOT TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES, ARISING IN ANY WAY OUT OF TI REFERENCE DESIGNS OR BUYER'S USE OF TI REFERENCE DESIGNS.

TI reserves the right to make corrections, enhancements, improvements and other changes to its semiconductor products and services per JESD46, latest issue, and to discontinue any product or service per JESD48, latest issue. Buyers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All semiconductor products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its components to the specifications applicable at the time of sale, in accordance with the warranty in TI's terms and conditions of sale of semiconductor products. Testing and other quality control techniques for TI components are used to the extent TI deems necessary to support this warranty. Except where mandated by applicable law, testing of all parameters of each component is not necessarily performed.

TI assumes no liability for applications assistance or the design of Buyers' products. Buyers are responsible for their products and applications using TI components. To minimize the risks associated with Buyers' products and applications, Buyers should provide adequate design and operating safeguards.

Reproduction of significant portions of TI information in TI data books, data sheets or reference designs is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Buyer acknowledges and agrees that it is solely responsible for compliance with all legal, regulatory and safety-related requirements concerning its products, and any use of TI components in its applications, notwithstanding any applications-related information or support that may be provided by TI. Buyer represents and agrees that it has all the necessary expertise to create and implement safeguards that anticipate dangerous failures, monitor failures and their consequences, lessen the likelihood of dangerous failures and take appropriate remedial actions. Buyer will fully indemnify TI and its representatives against any damages arising out of the use of any TI components in Buyer's safety-critical applications.

In some cases, TI components may be promoted specifically to facilitate safety-related applications. With such components, TI's goal is to help enable customers to design and create their own end-product solutions that meet applicable functional safety standards and requirements. Nonetheless, such components are subject to these terms.

No TI components are authorized for use in FDA Class III (or similar life-critical medical equipment) unless authorized officers of the parties have executed an agreement specifically governing such use.

Only those TI components that TI has specifically designated as military grade or "enhanced plastic" are designed and intended for use in military/aerospace applications or environments. Buyer acknowledges and agrees that any military or aerospace use of TI components that have **not** been so designated is solely at Buyer's risk, and Buyer is solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI has specifically designated certain components as meeting ISO/TS16949 requirements, mainly for automotive use. In any case of use of non-designated products, TI will not be responsible for any failure to meet ISO/TS16949.