Test Data
For PMP10534
8/15/2014

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1. Design Specifications

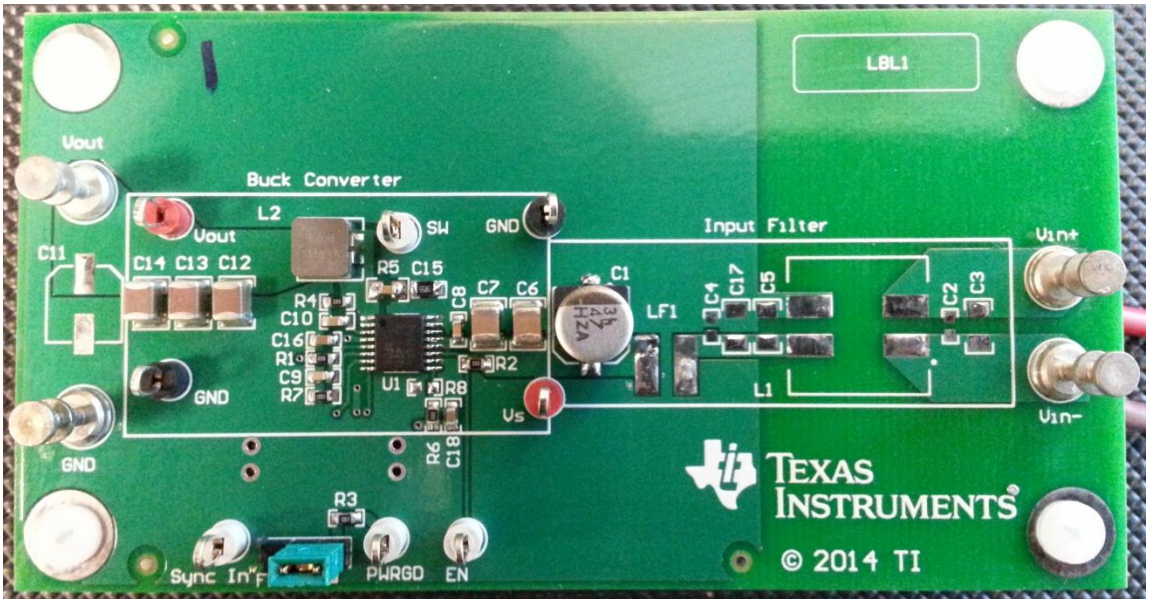
Vin Minimum	**7VDC**
Vin Maximum	**36VDC**
Vout	**5VDC**
Iout	**3A Max.**
Nominal Switching Frequency	**≈ 2.1MHz**

2. Circuit Description

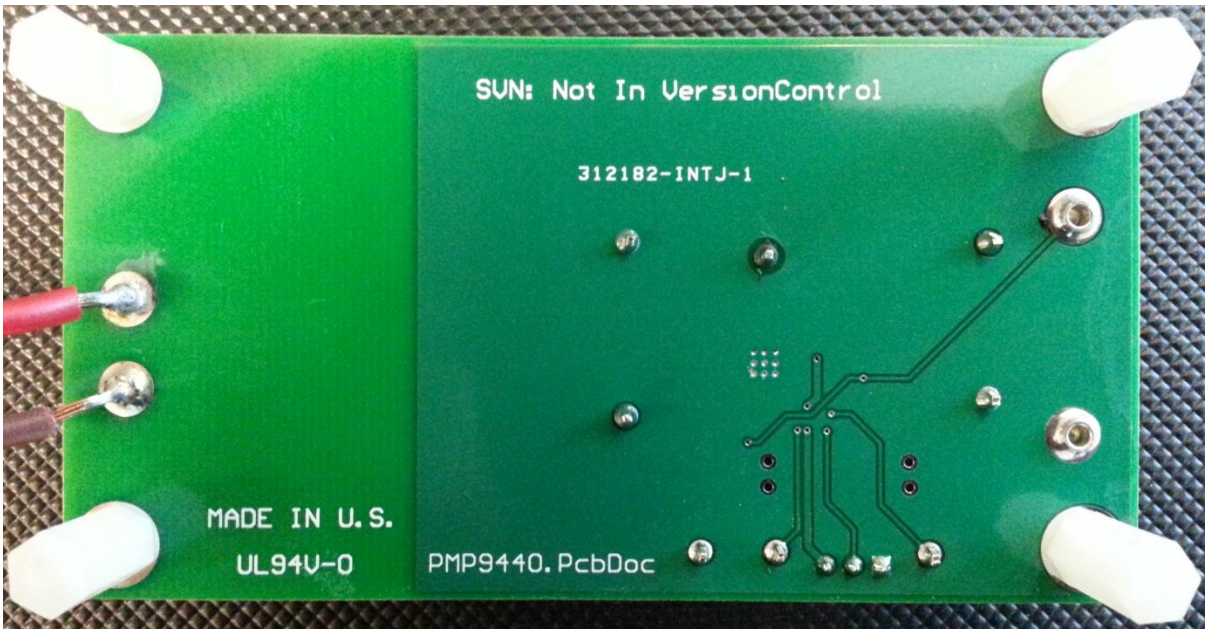
PMP10534 is a Single-Phase Synchronous Buck Converter using the LM53603 regulator IC, which contains internal top-side and bottom-side FETs. The design accepts an input voltage of 7Vin to 36Vin and provides an output of 5Vout capable of supplying 3A of continuous current to the load. The design was built on the PMP9440 PCB, which was modified to the PMP10534 design configuration and requirements. The board is a 2-layer PCB with 1 oz. copper on each side.

3. PMP10534 Board Photos

Board Dimensions: 3.9” x 2.05” (Actual power stage dimensions ≈ 1.8” x 0.85”)

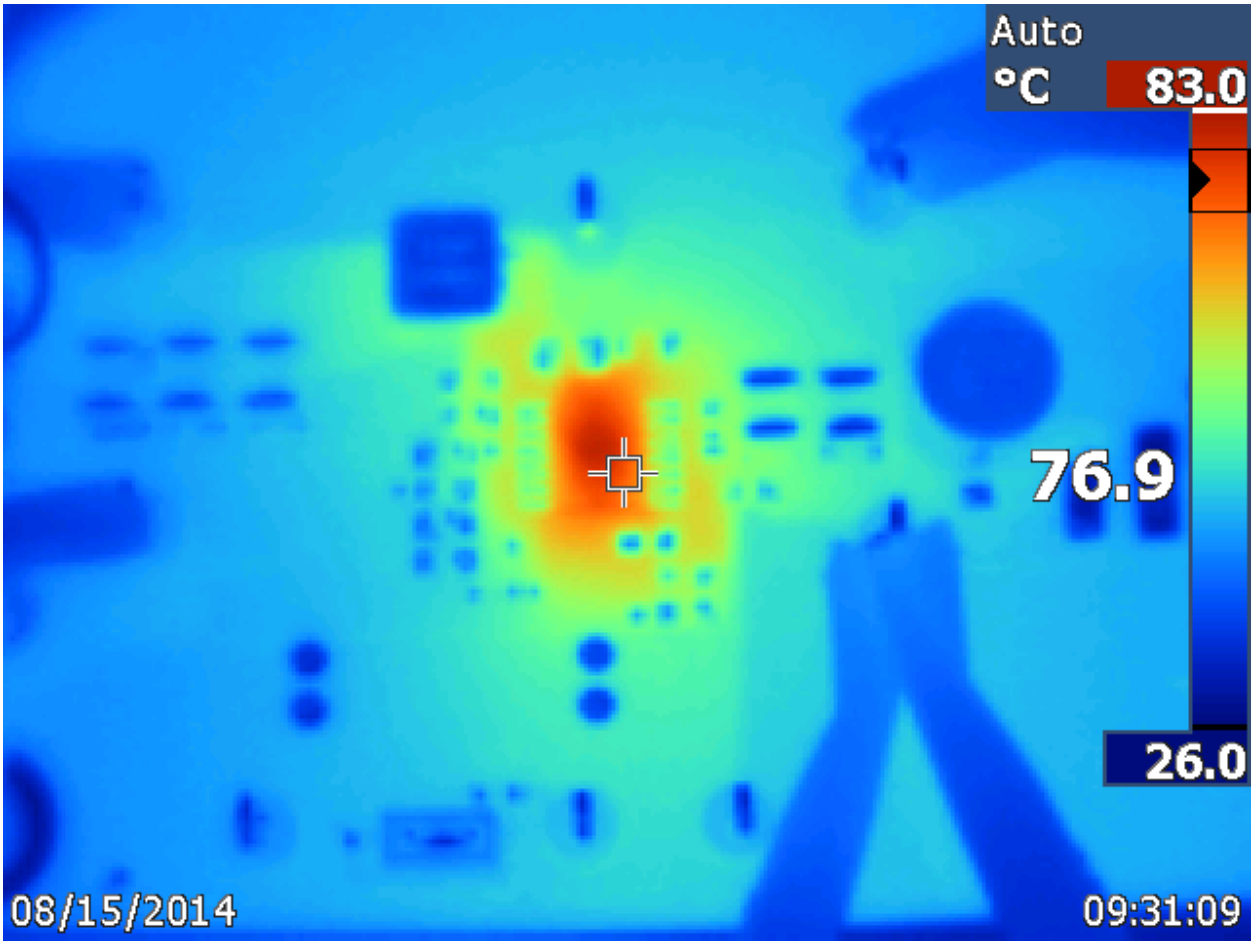


Board Photo (Top)

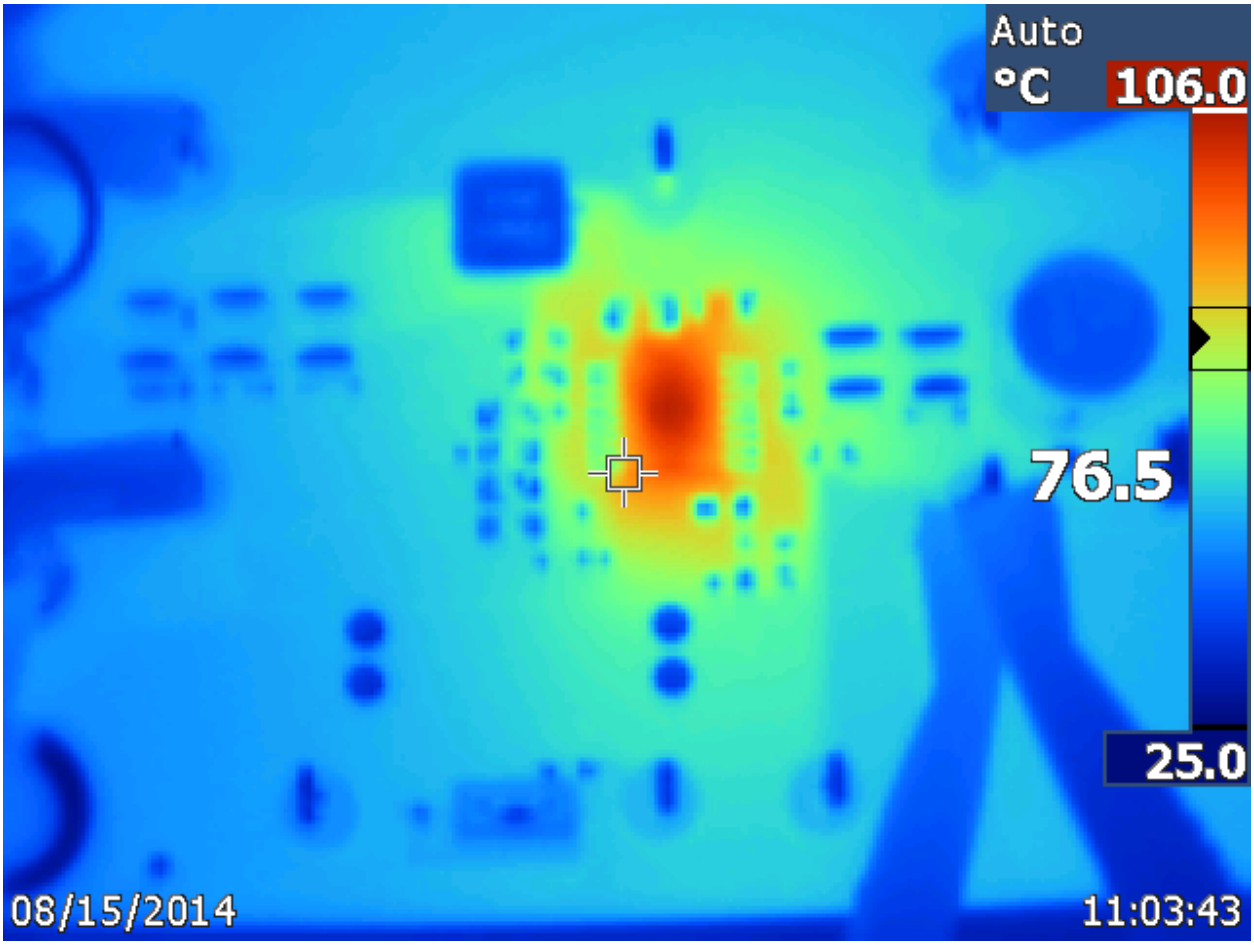


Board Photo (Bottom)

4. Thermal Data



IR thermal image taken at steady state with 7Vin and 3A load (no airflow; Ambient at room temp.)



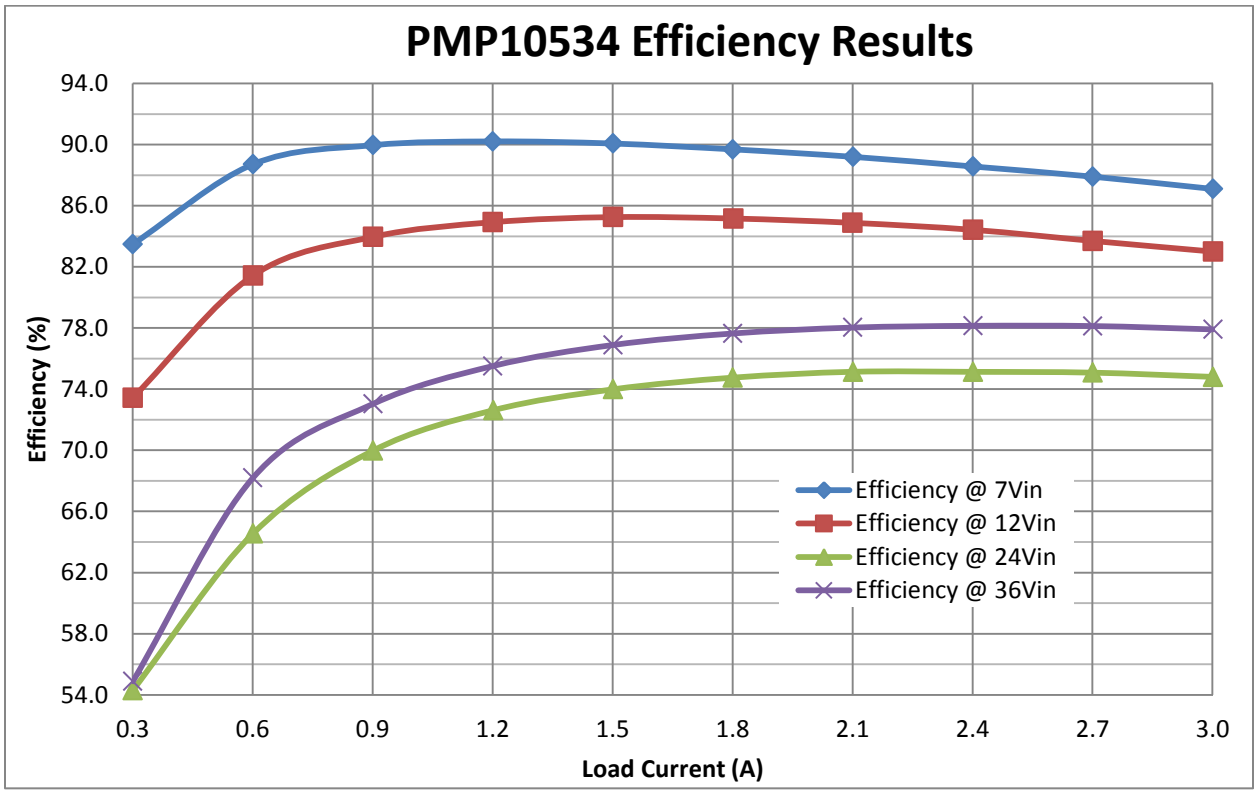
IR thermal image taken at steady state with 12Vin and 3A load (no airflow; Ambient at room temp.)

Note: If better thermal performance is required one or more of the following suggestions can be implemented:

- **Using 2 oz. copper (or greater), instead of 1 oz. copper as was used for this project PCB**
- **Add two additional layers in the middle (i.e. having a 4-layer PCB)**
- **Active cooling using forced airflow**

5. Efficiency

5.1 Efficiency Chart



5.2 Efficiency Data

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
7	0.2567	4.999	0.3001	1.7969	1.5002	83.5
7	0.4835	5	0.6005	3.3845	3.0025	88.7
7	0.7156	5.001	0.9011	5.0092	4.506401	90.0
7	0.9509	5.002	1.2004	6.6563	6.004401	90.2
7	1.191	5.003	1.5009	8.337	7.509003	90.1
7	1.4353	5.005	1.8004	10.0471	9.011002	89.7
7	1.6848	5.007	2.101	11.7936	10.51971	89.2
7	1.94	5.008	2.4016	13.58	12.02721	88.6
7	2.1985	5.009	2.7006	15.3895	13.52731	87.9
7	2.467	5.011	3.0015	17.269	15.04052	87.1

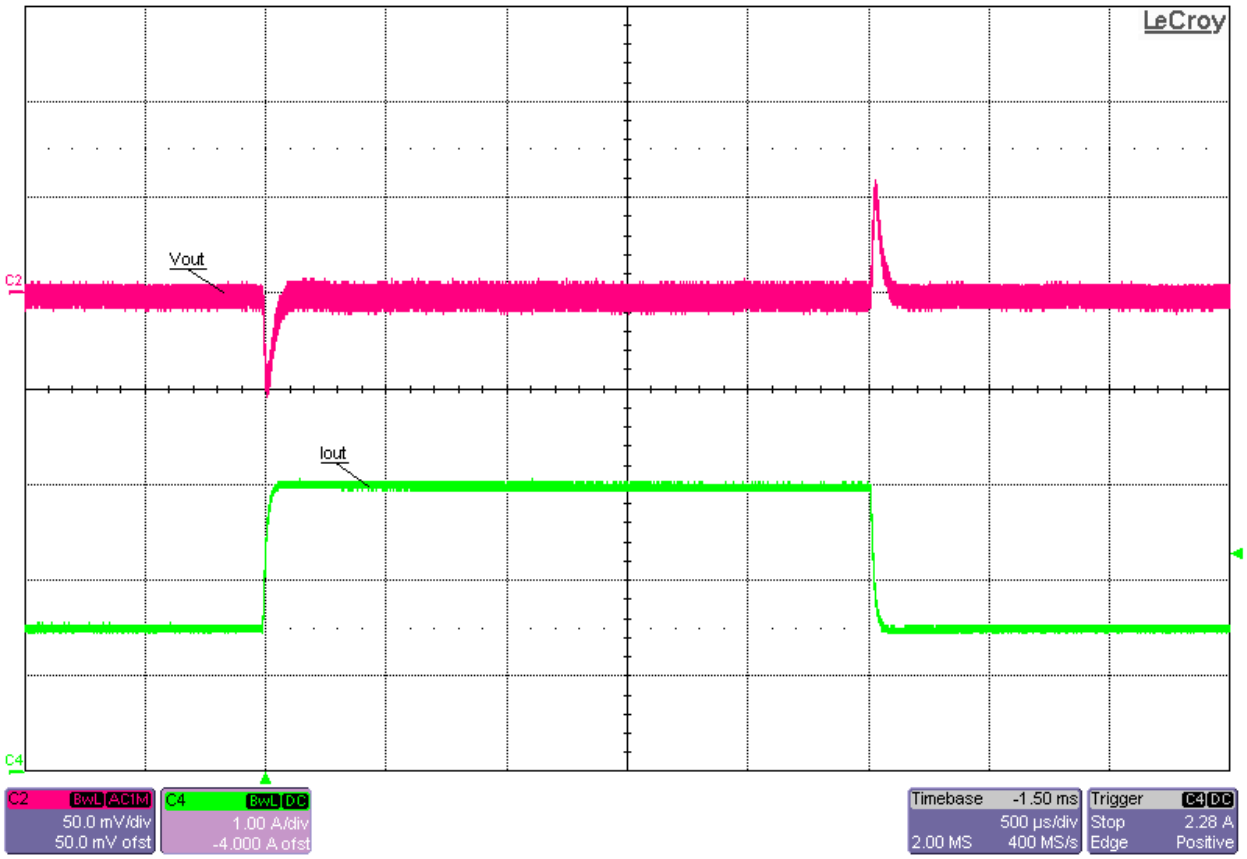
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
12	0.1703	5.004	0.2999	2.0436	1.5007	73.4
12	0.3075	5.004	0.6005	3.69	3.004902	81.4
12	0.4476	5.005	0.9011	5.3712	4.510006	84.0
12	0.5898	5.007	1.2004	7.0776	6.010403	84.9
12	0.7347	5.008	1.5009	8.8164	7.516507	85.3
12	0.8833	5.01	1.8018	10.5996	9.027018	85.2
12	1.0332	5.012	2.0997	12.3984	10.5237	84.9
12	1.1884	5.013	2.4016	14.2608	12.03922	84.4
12	1.348	5.013	2.7007	16.176	13.53861	83.7
12	1.5108	5.013	3.0016	18.1296	15.04702	83.0

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
24	0.1155	5.019	0.2999	2.772	1.505198	54.3
24	0.1942	5.01	0.6005	4.6608	3.008505	64.5
24	0.2689	5.012	0.9011	6.4536	4.516313	70.0
24	0.3457	5.014	1.2017	8.2968	6.025324	72.6
24	0.424	5.016	1.501	10.176	7.529016	74.0
24	0.5036	5.018	1.8005	12.0864	9.034909	74.8
24	0.5848	5.019	2.1011	14.0352	10.54542	75.1
24	0.6689	5.022	2.4017	16.0536	12.06134	75.1
24	0.753	5.024	2.7007	18.072	13.56832	75.1
24	0.8405	5.027	3.0016	20.172	15.08904	74.8

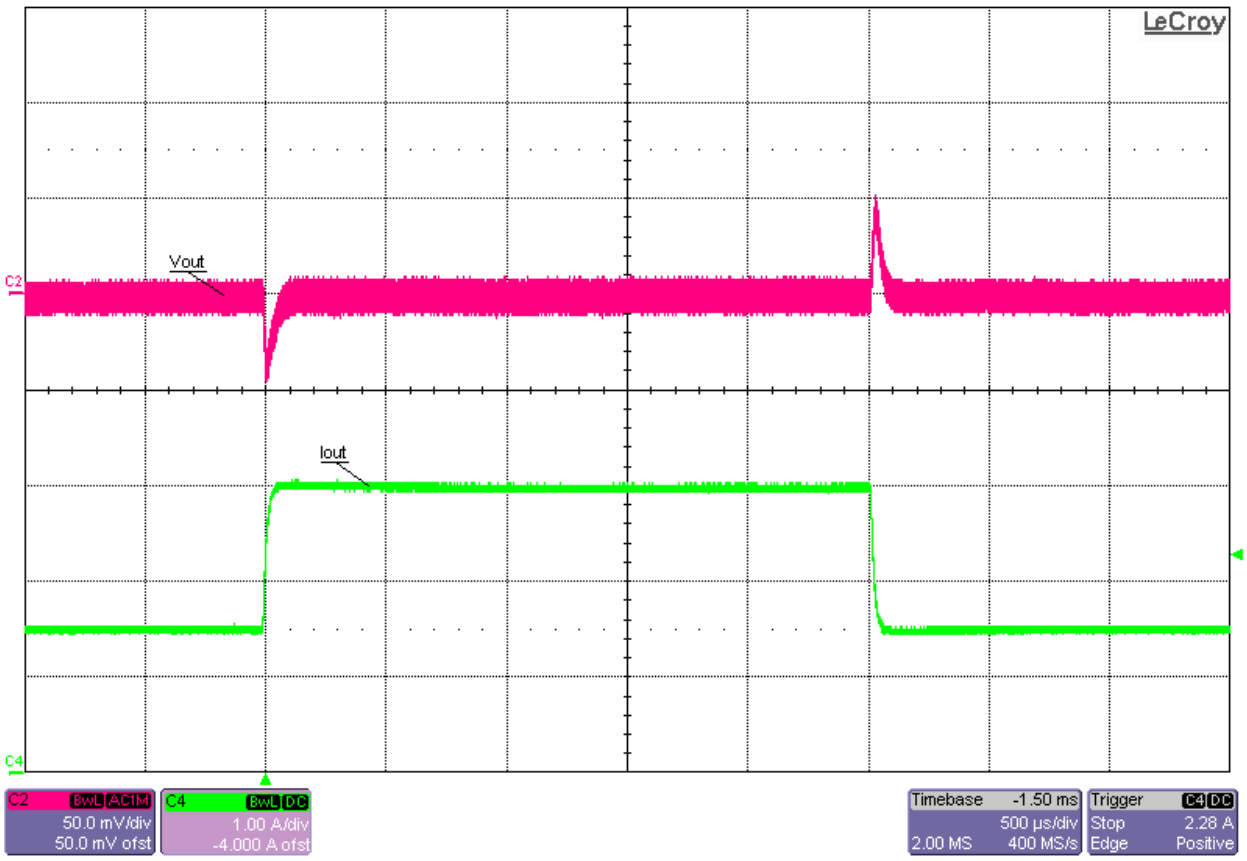
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Efficiency (%)
36	0.07595	5.002	0.3	2.7342	1.5006	54.9
36	0.12237	5.004	0.6004	4.40532	3.004402	68.2
36	0.17154	5.006	0.901	6.17544	4.510406	73.0
36	0.22114	5.008	1.2004	7.96104	6.011603	75.5
36	0.27164	5.01	1.5008	9.77904	7.519008	76.9
36	0.32282	5.012	1.8003	11.62152	9.023104	77.6
36	0.375	5.014	2.1009	13.5	10.53391	78.0
36	0.4282	5.016	2.4015	15.4152	12.04592	78.1
36	0.4817	5.017	2.7005	17.3412	13.54841	78.1
36	0.5372	5.02	3.0014	19.3392	15.06703	77.9

6 Waveforms

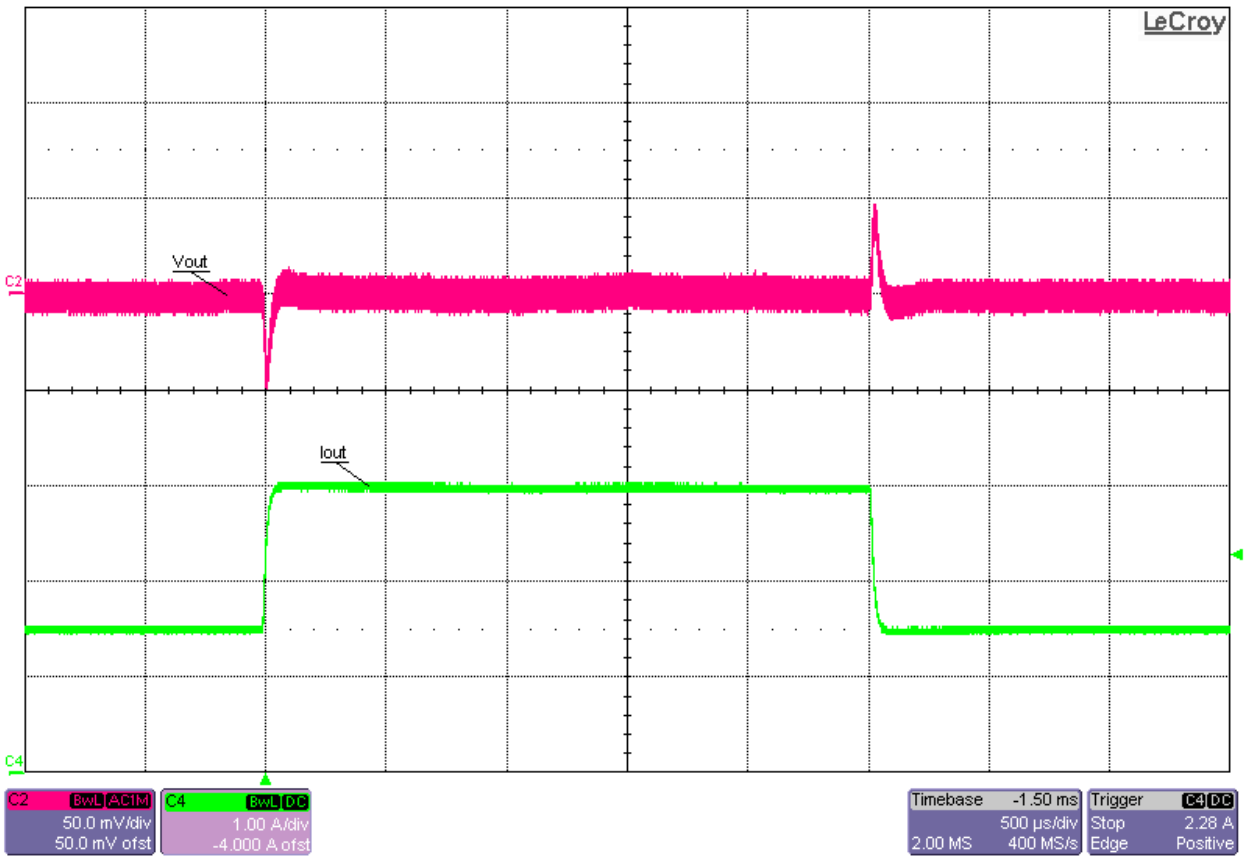
6.1 Load Transient Response



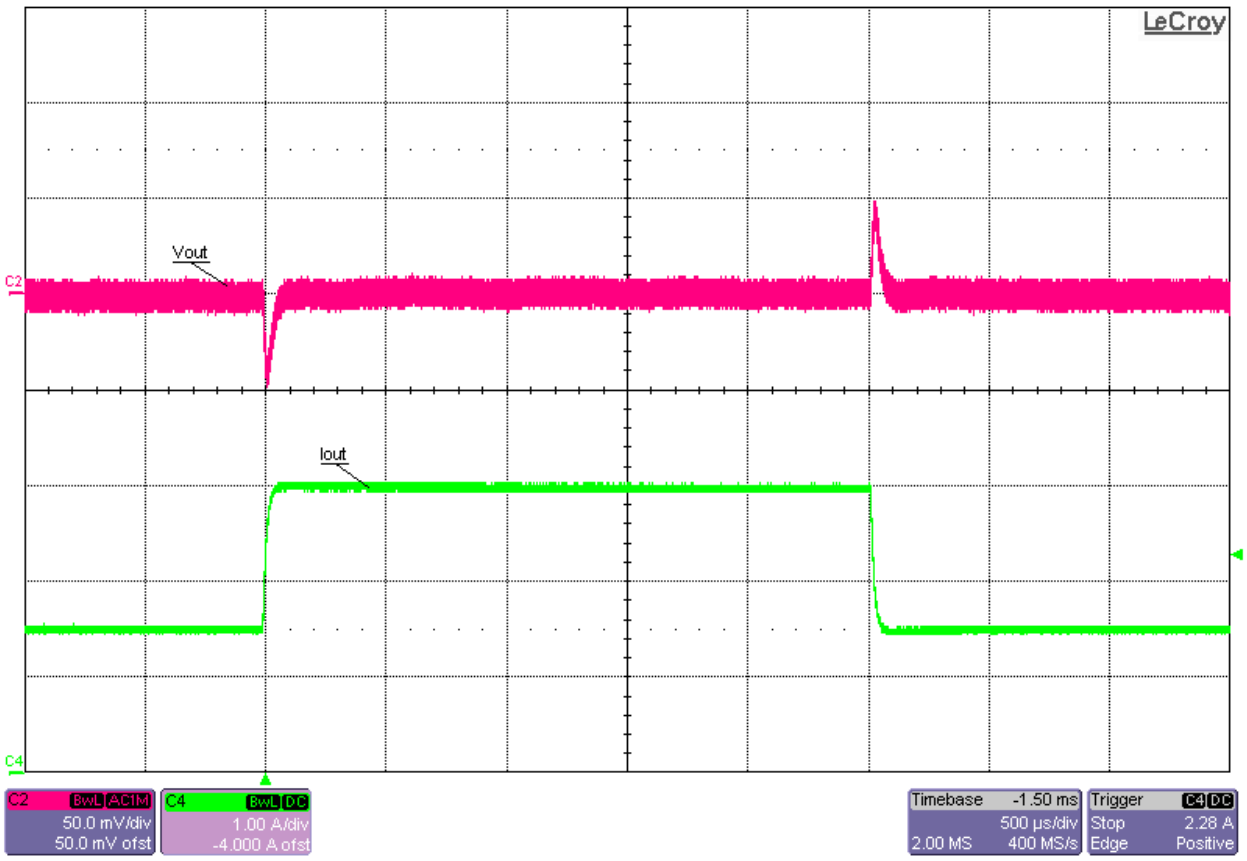
Load Transient Response at 7Vin and 50%-to-100% (1.5A-to-3A) Load Step



Load Transient Response at 12Vin and 50%-to-100% (1.5A-to-3A) Load Step

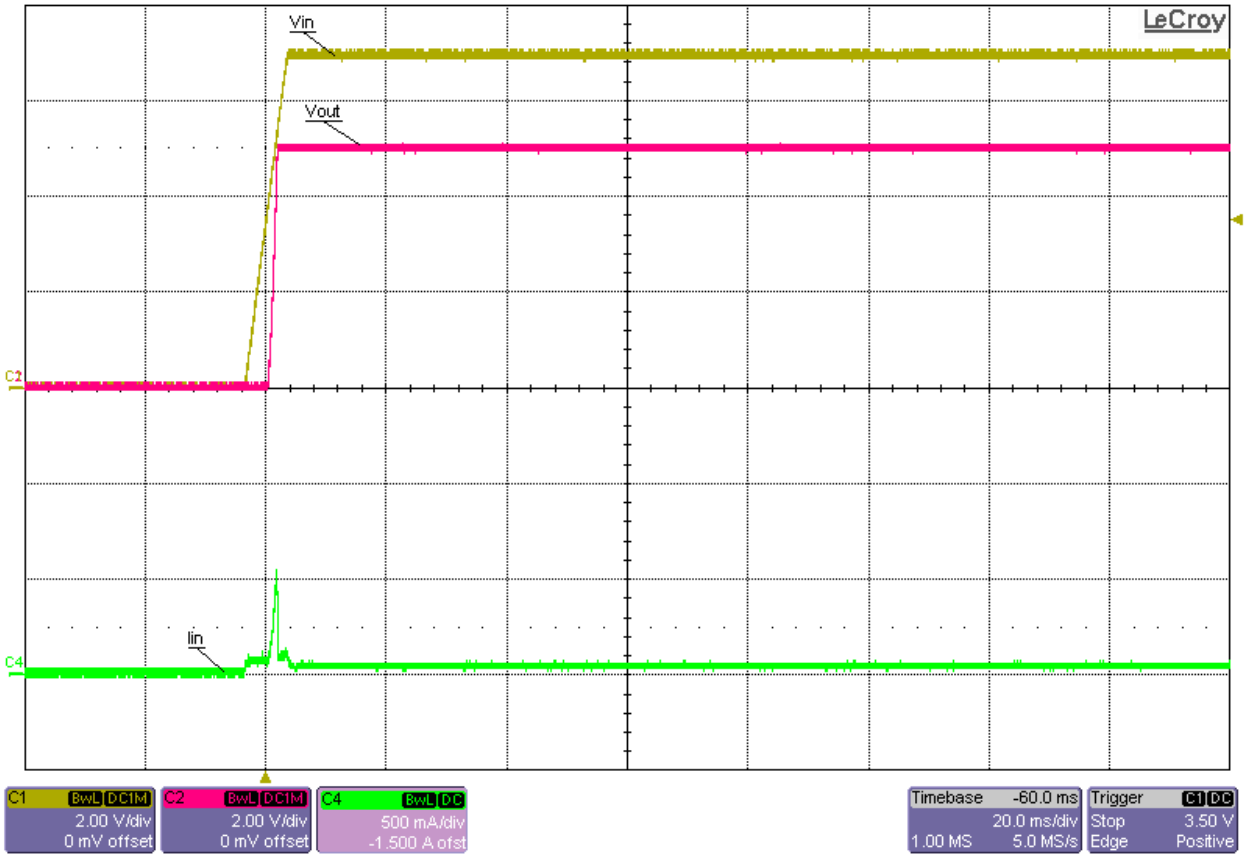


Load Transient Response at 24Vin and 50%-to-100% (1.5A-to-3A) Load Step

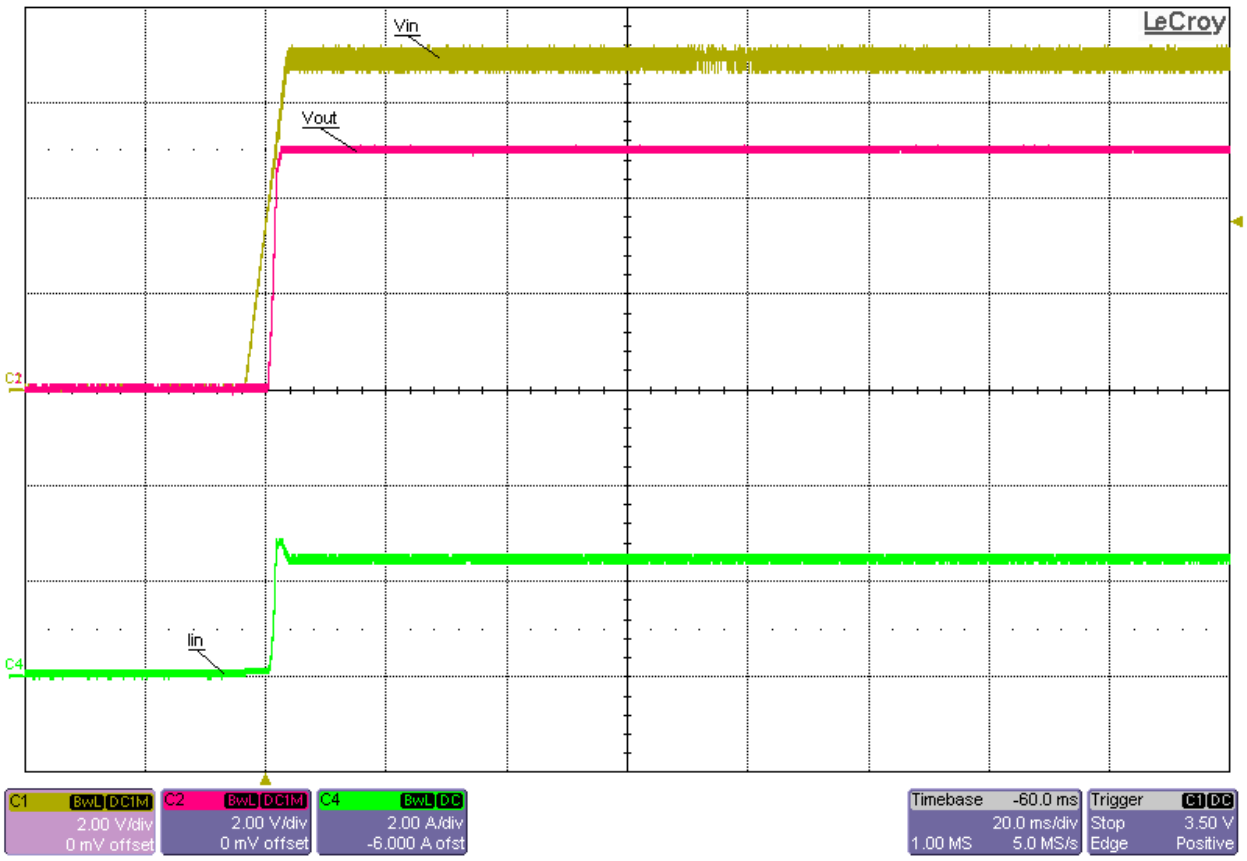


Load Transient Response at 36Vin and 50%-to-100% (1.5A-to-3A) Load Step

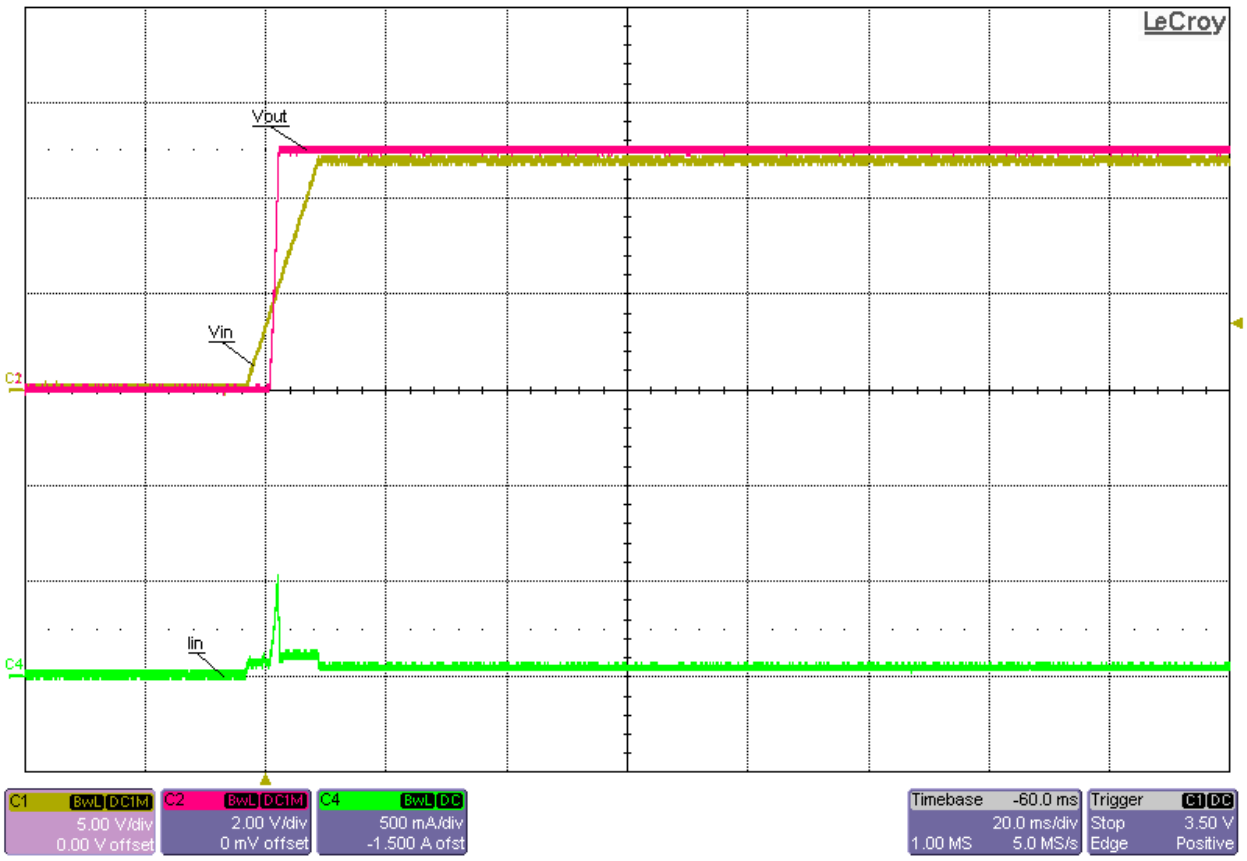
6.2 Startup



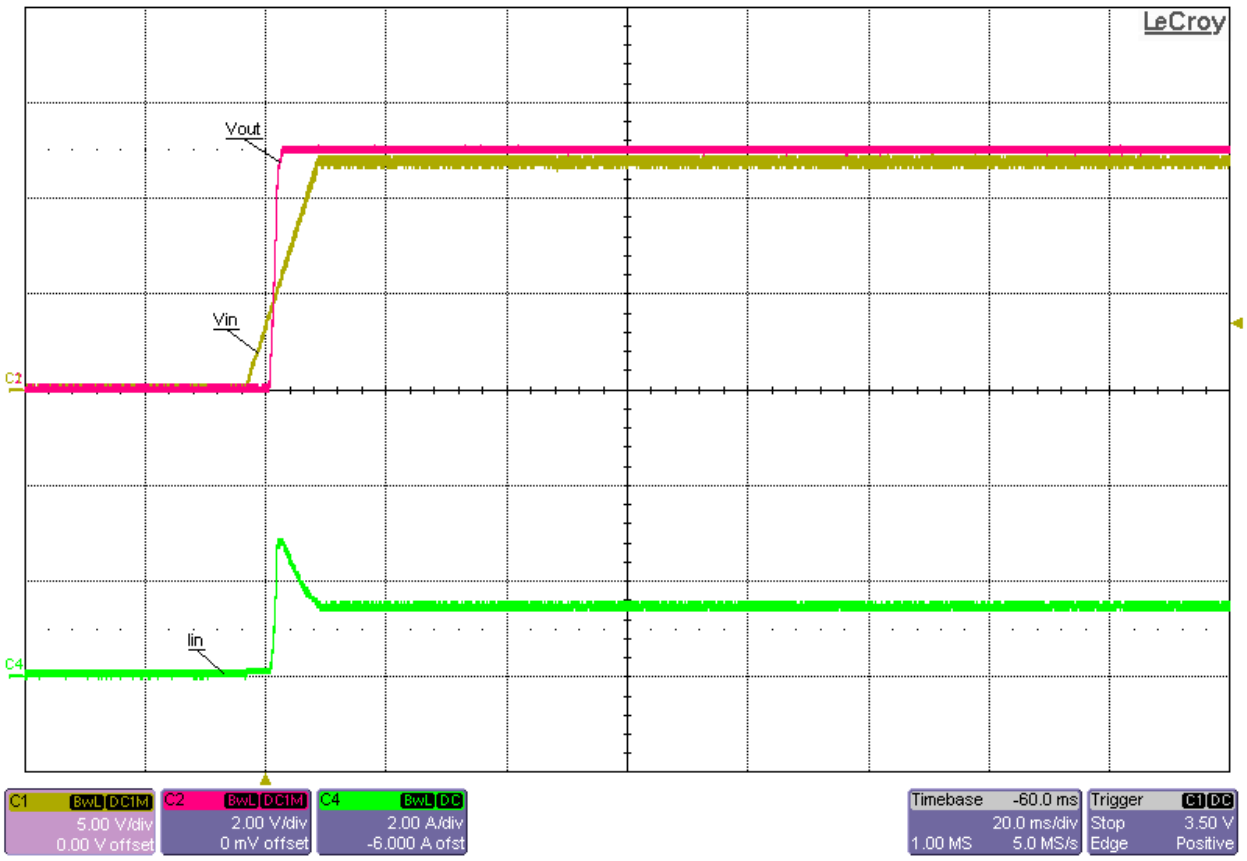
Startup into No Load at 7Vin



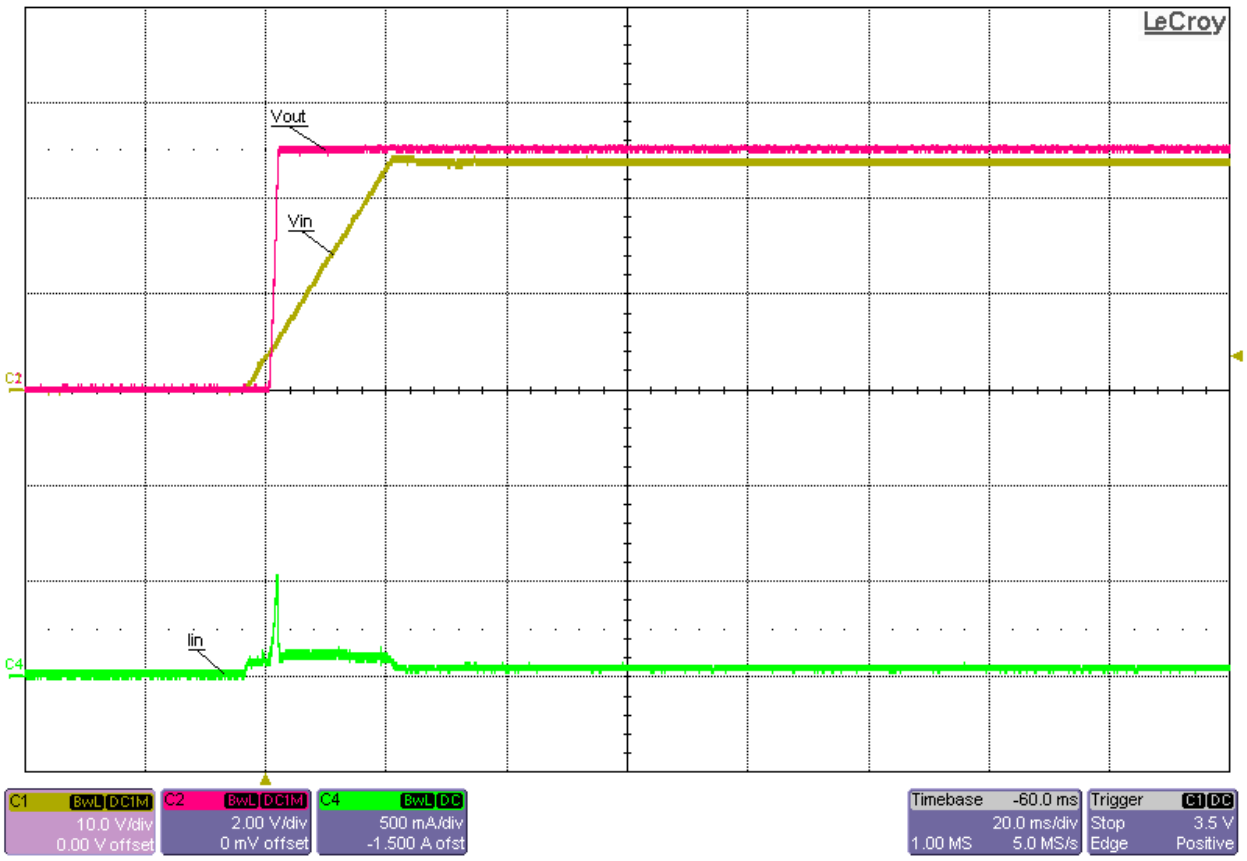
Startup into 3A Resistive Load at 7Vin



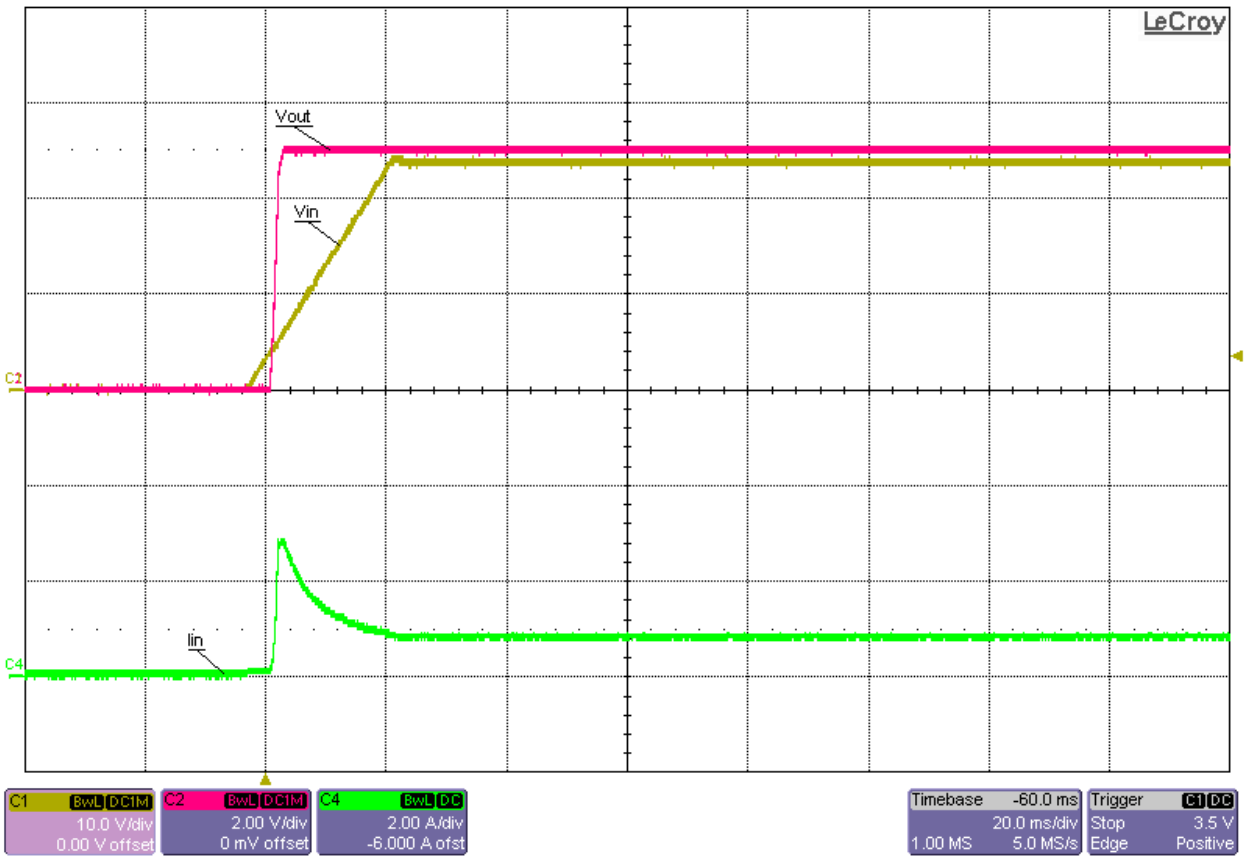
Startup into No Load at 12Vin



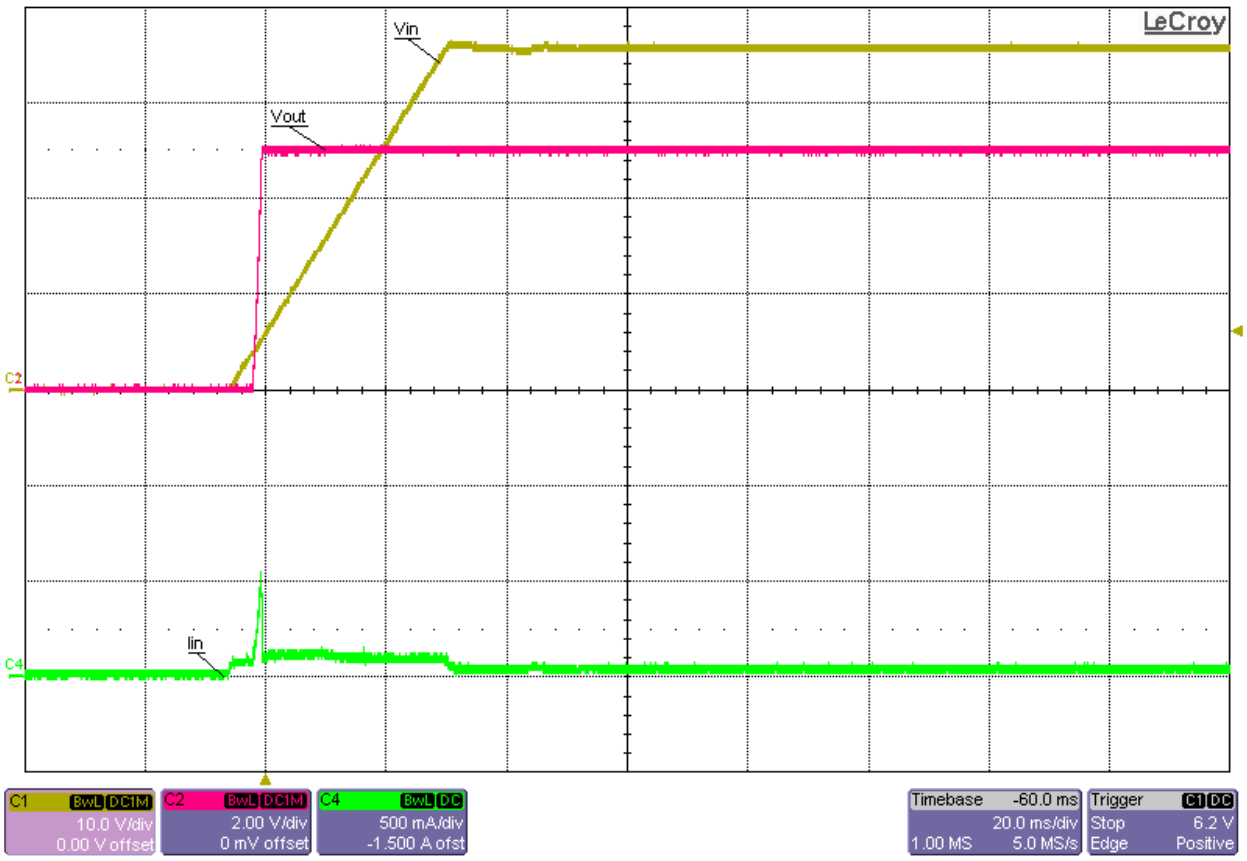
Startup into 3A Resistive Load at 12Vin



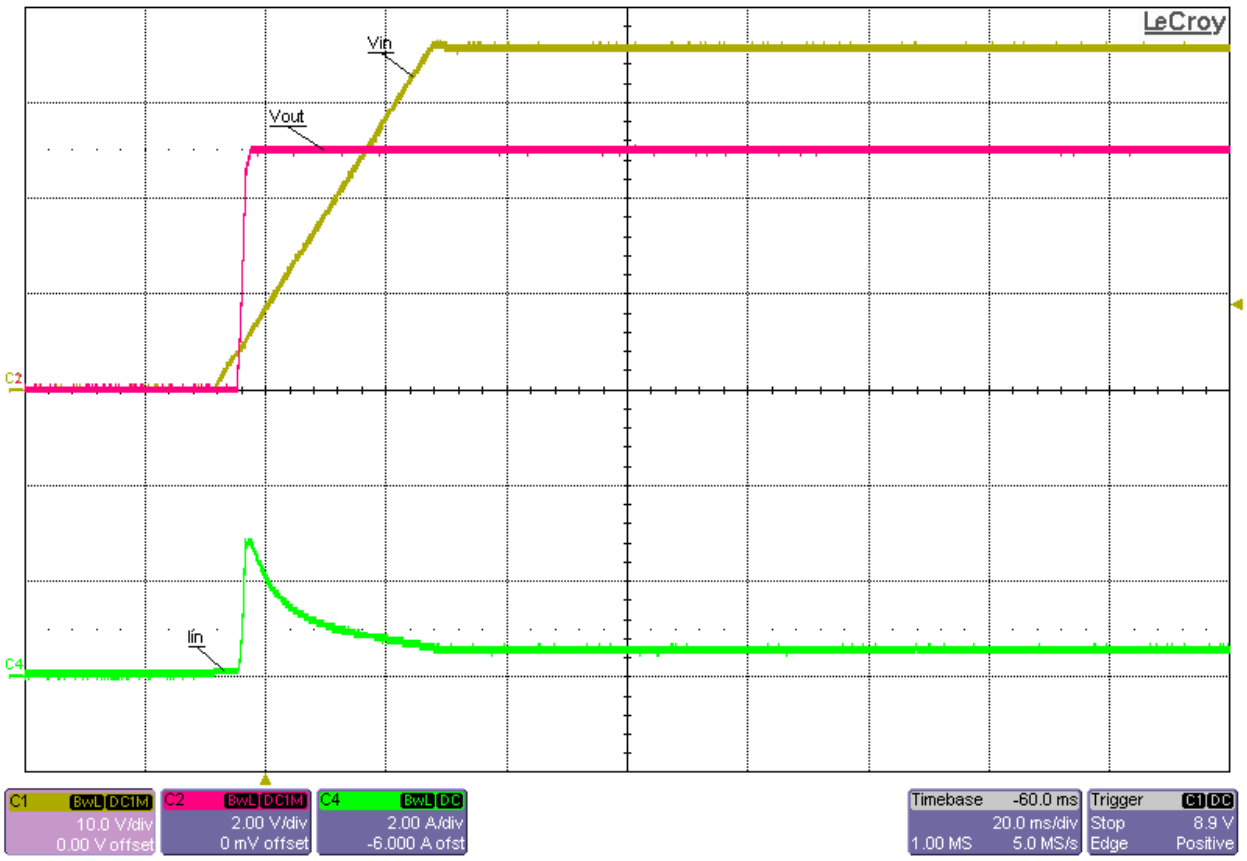
Startup into No Load at 24Vin



Startup into 3A Resistive Load at 24Vin

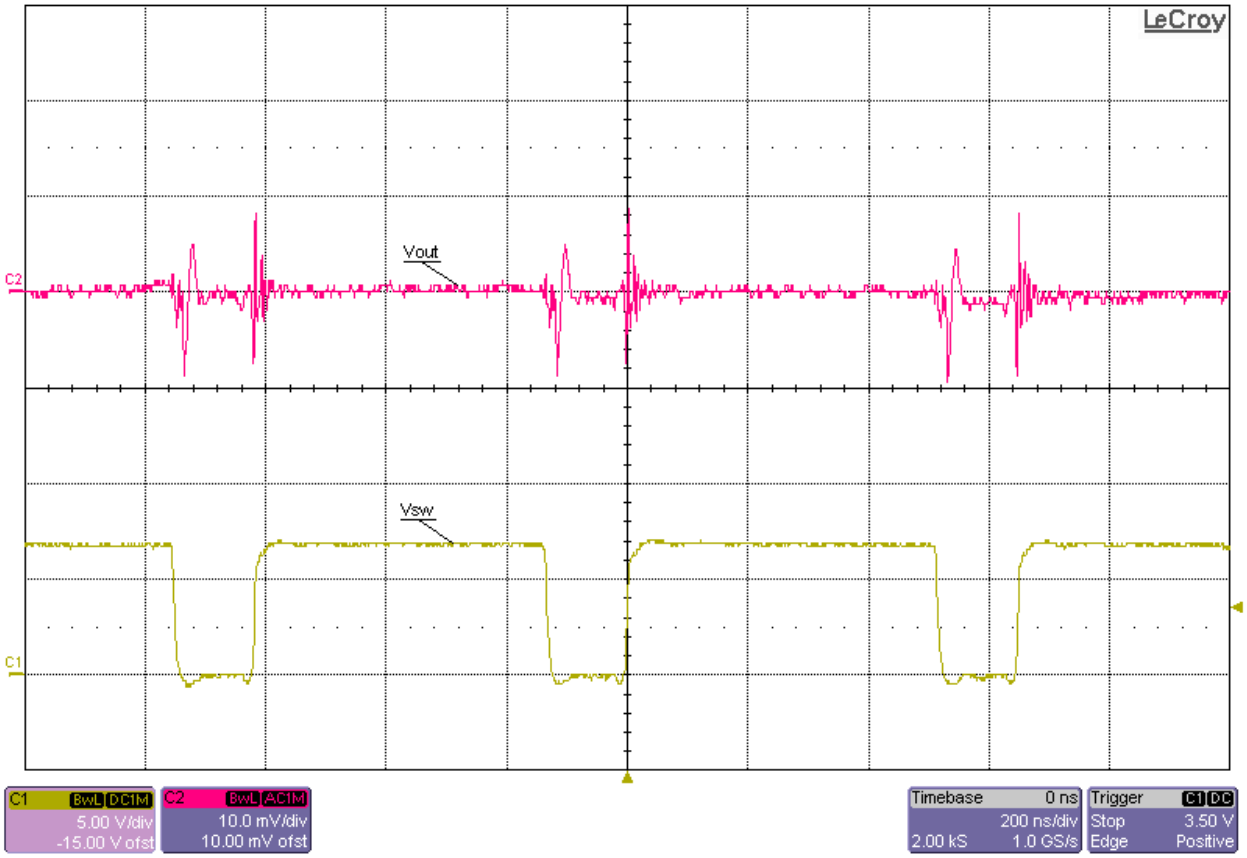


Startup into No Load at 36Vin

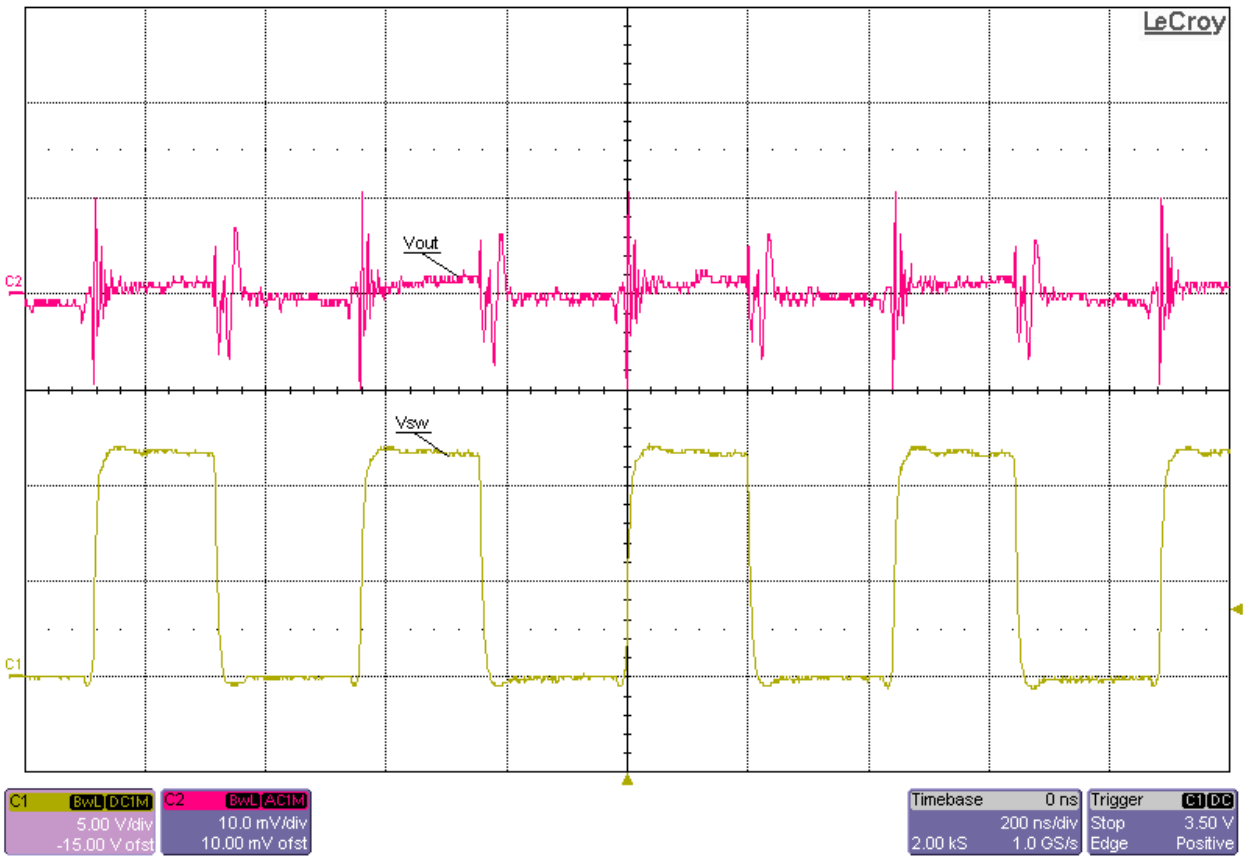


Startup into 3A Resistive Load at 36Vin

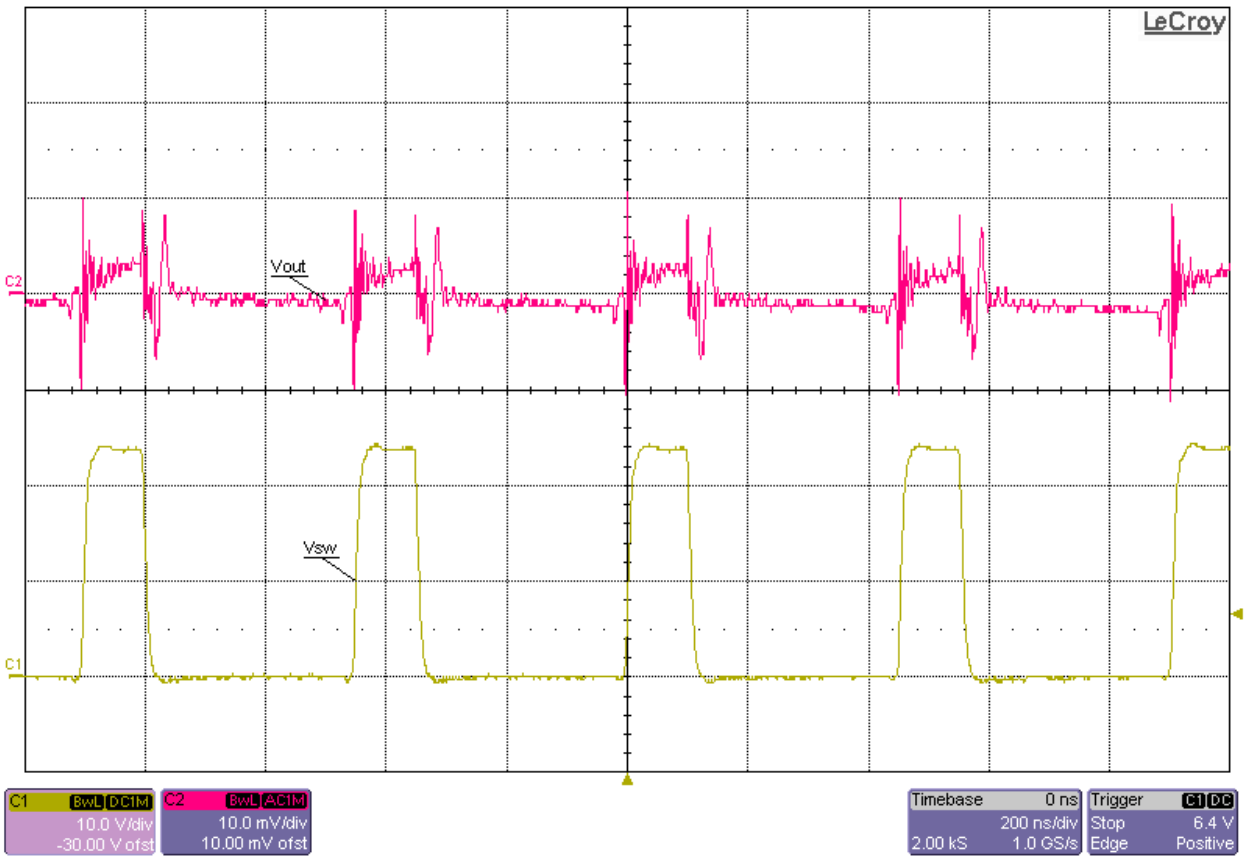
6.3 Output Voltage Ripple and Switch Node Voltage



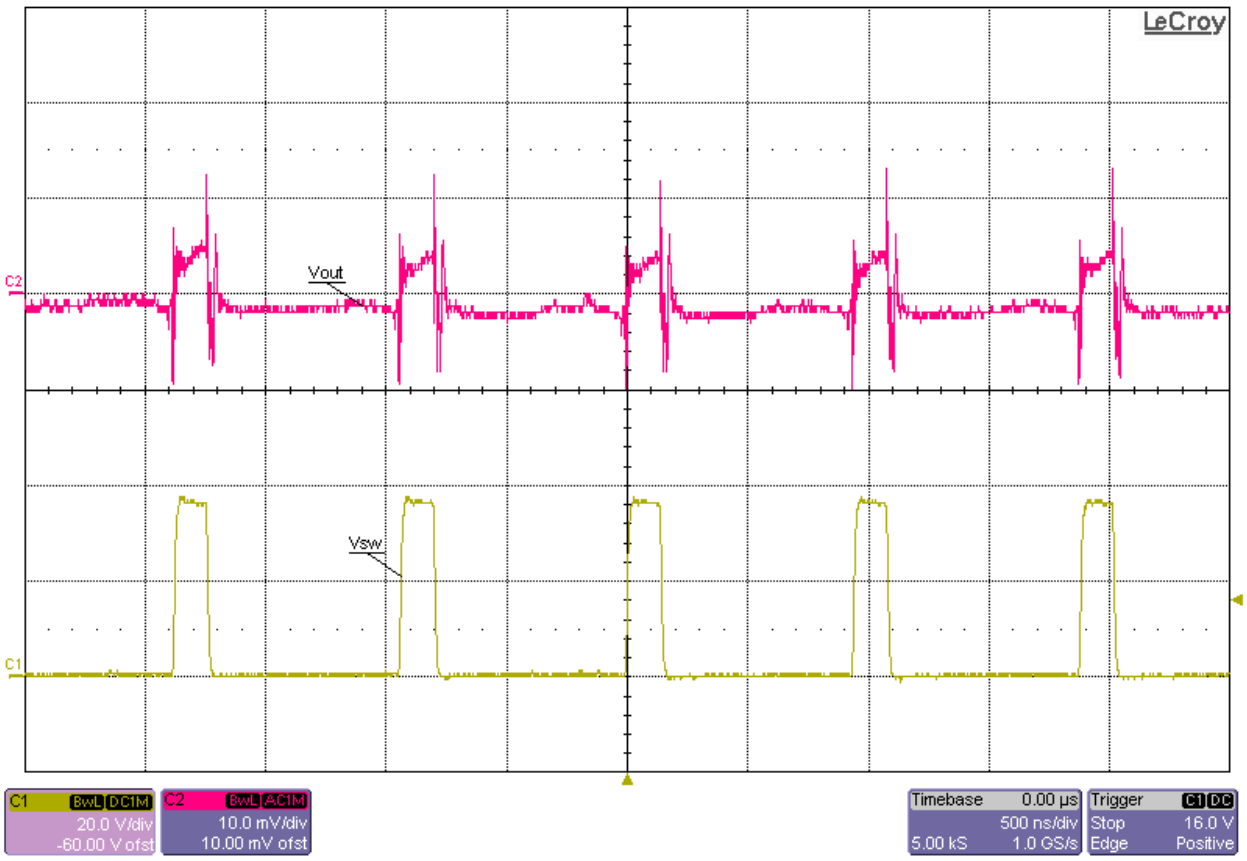
Switch Node Voltage and Output Voltage Ripple at 7Vin and 3A Load (Vripple ≈ 18mVp-p)



Switch Node Voltage and Output Voltage Ripple at 12Vin and 3A Load (Vripple ≈ 21mVp-p)

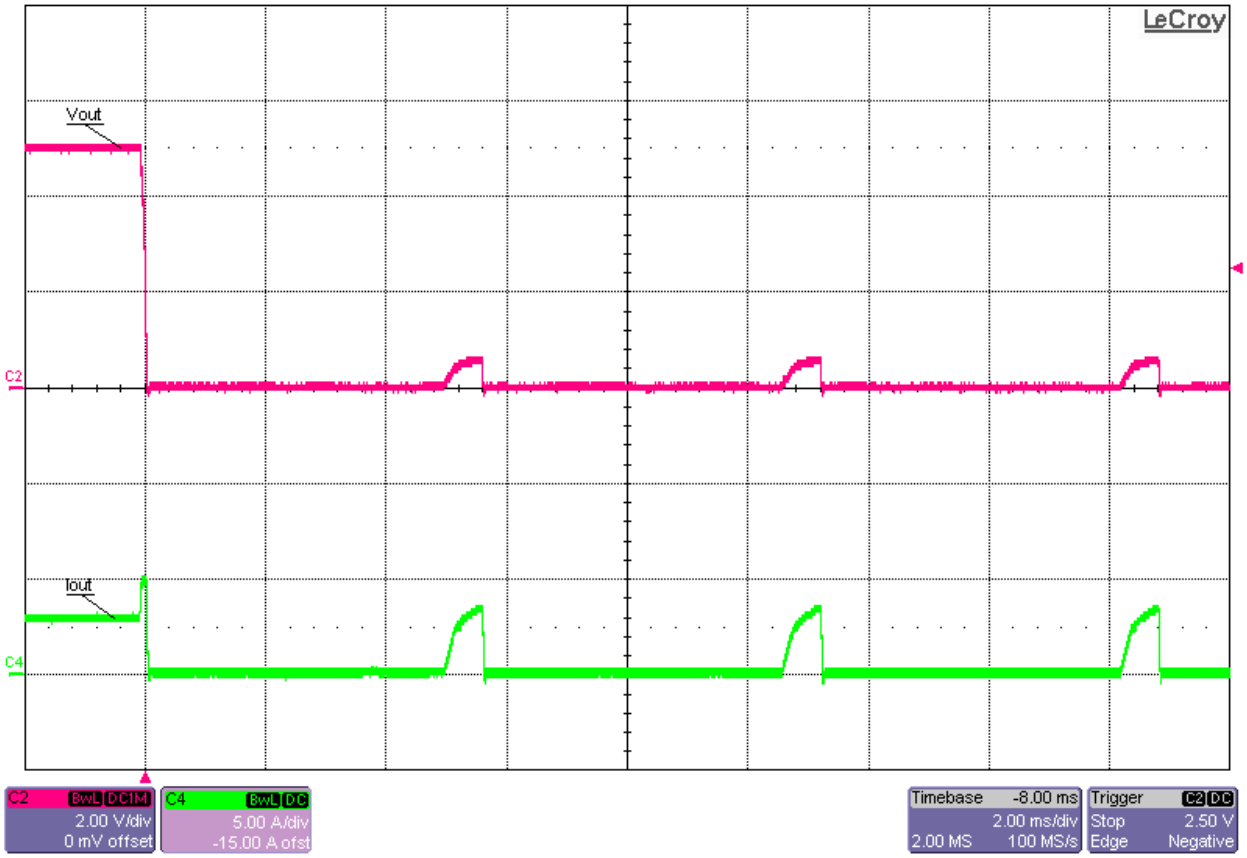


Switch Node Voltage and Output Voltage Ripple at 24Vin and 3A Load (Vripple ≈ 21mVp-p)

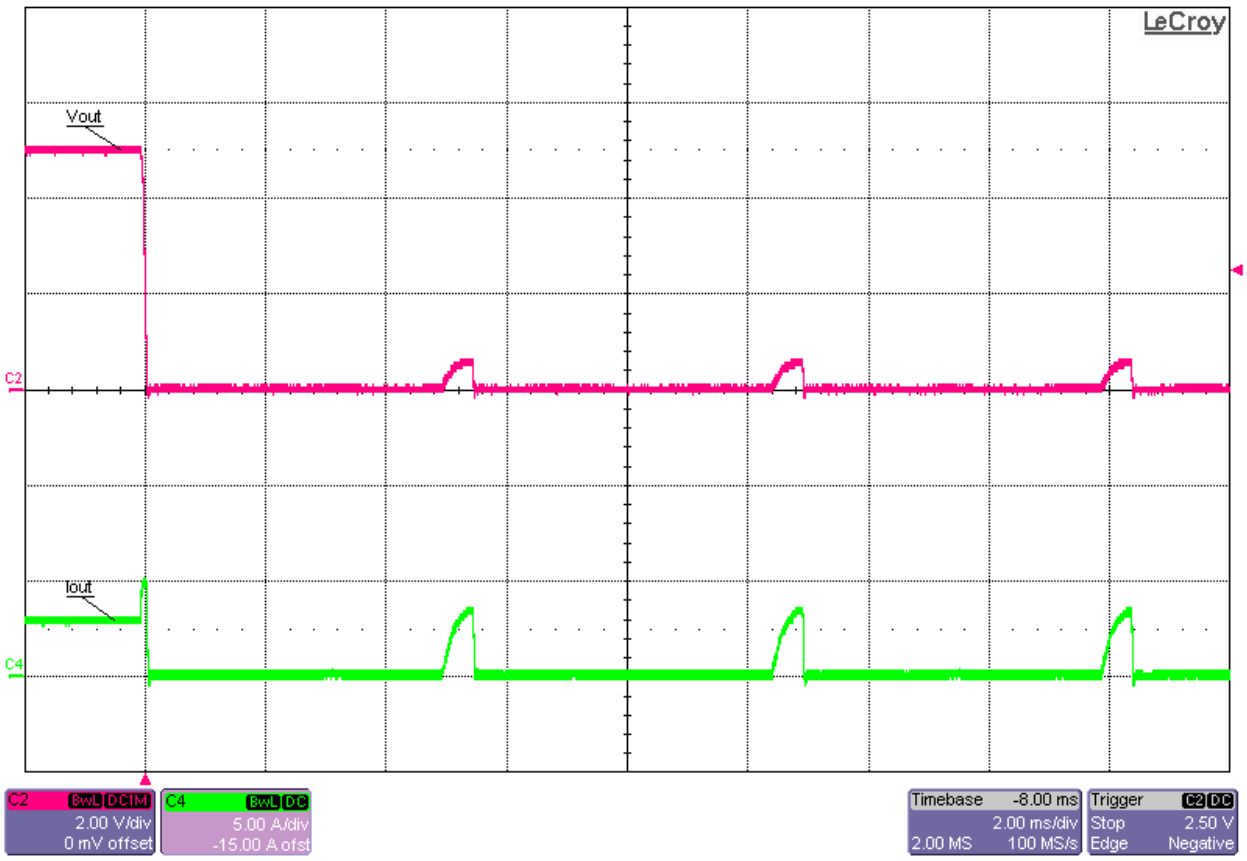


Switch Node Voltage and Output Voltage Ripple at 36Vin and 3A Load (Vripple ≈ 23mVp-p)

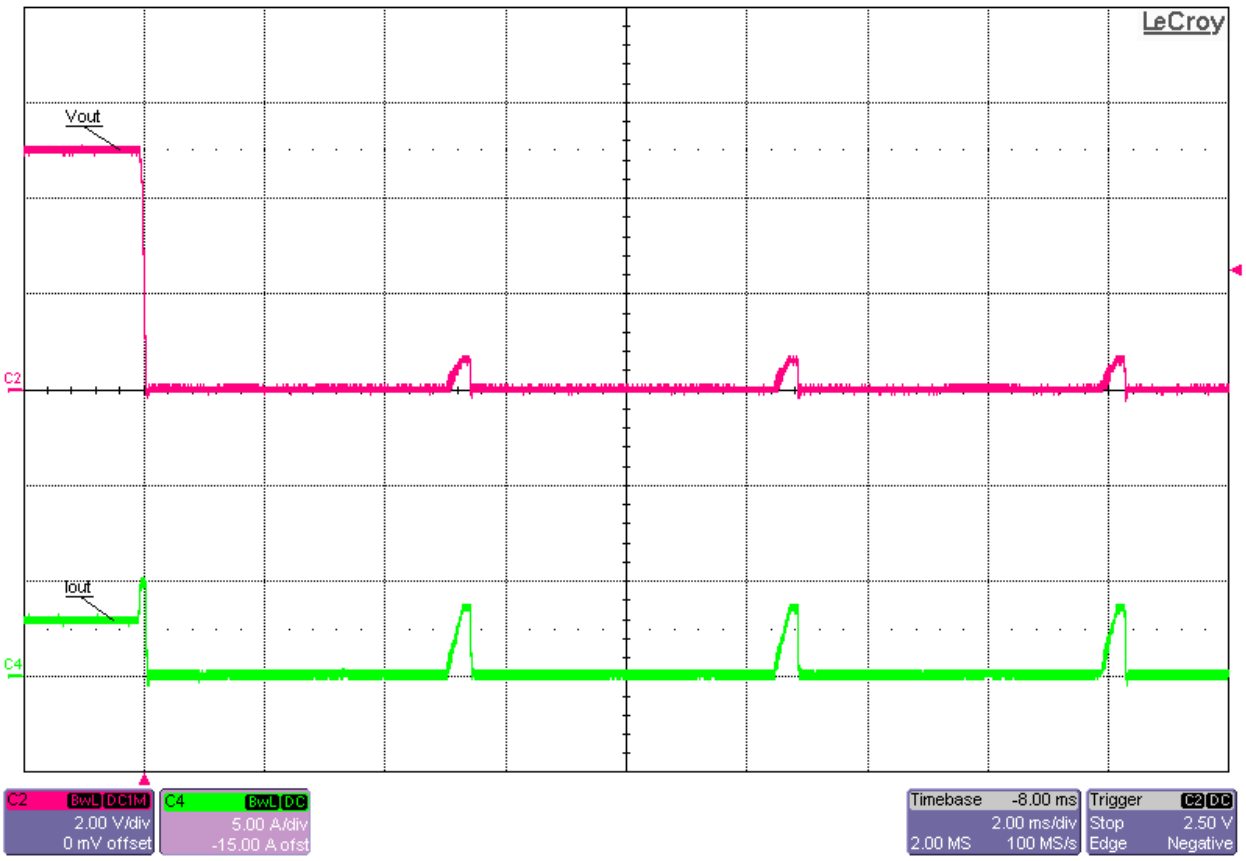
6.4 Short Circuit



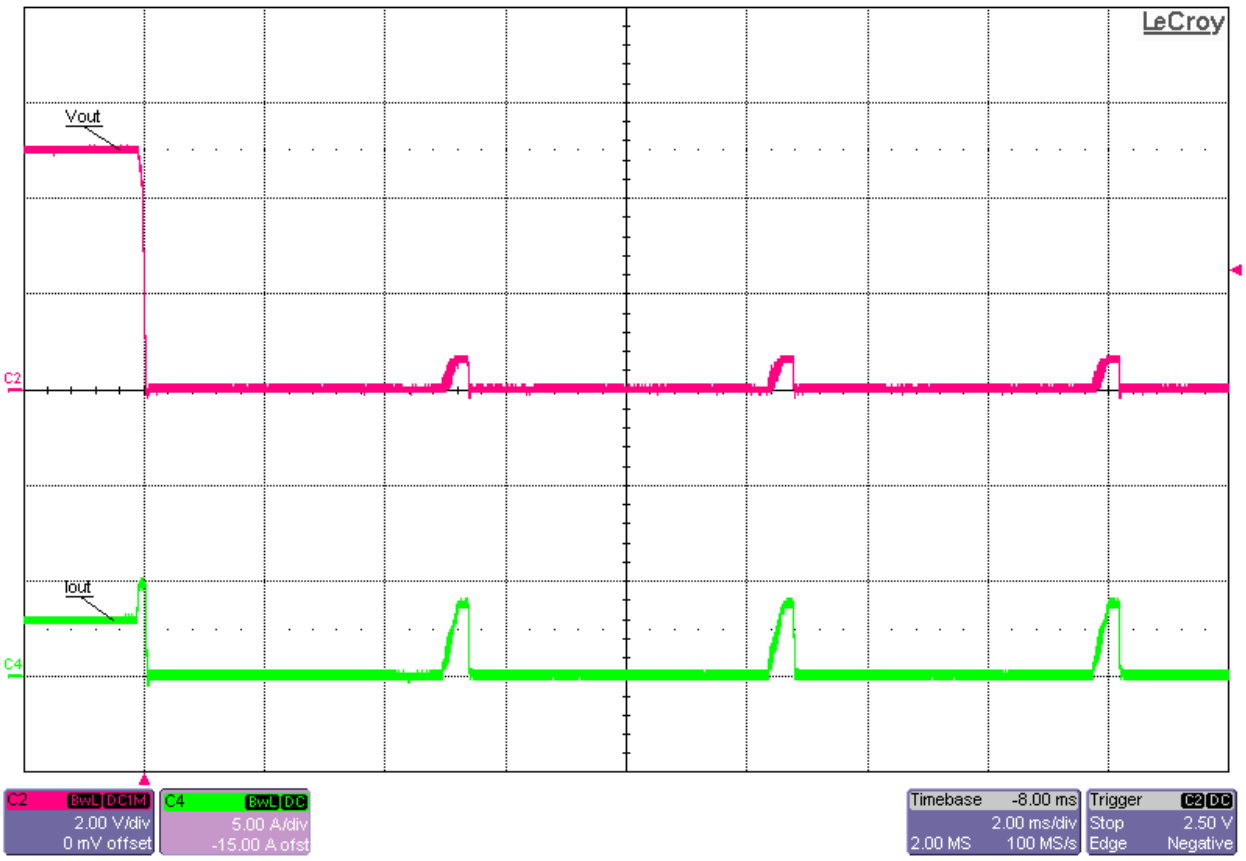
Short Circuit Applied at 7Vin from 3A Load



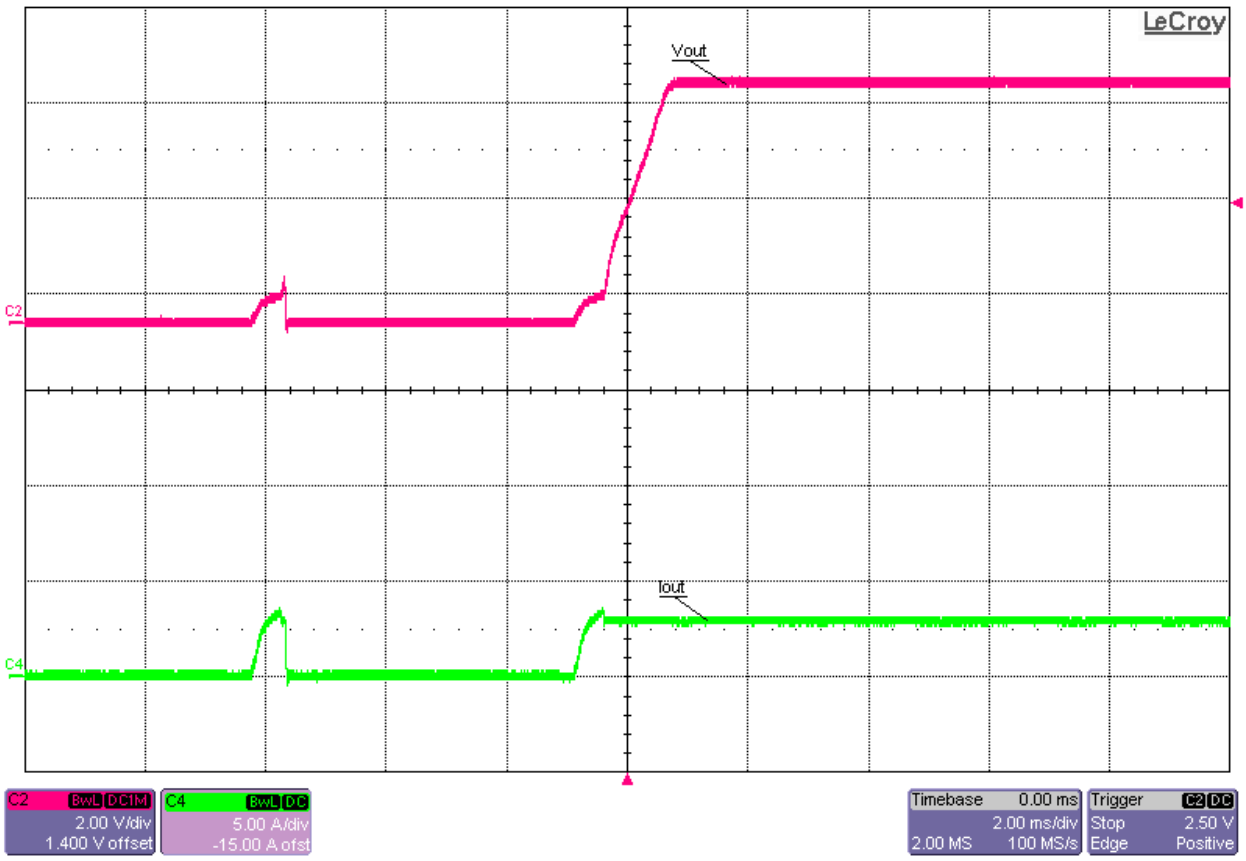
Short Circuit Applied at 12Vin from 3A Load



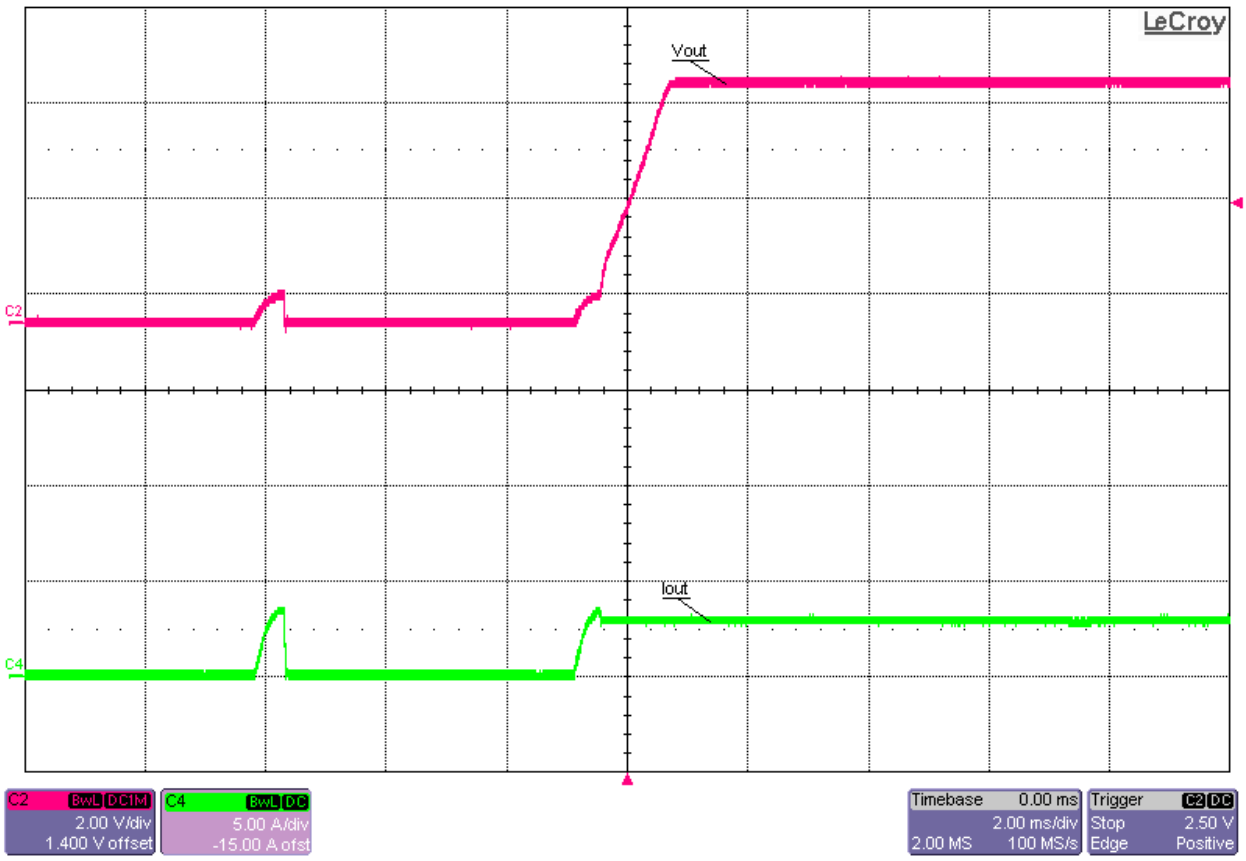
Short Circuit Applied at 24Vin from 3A Load



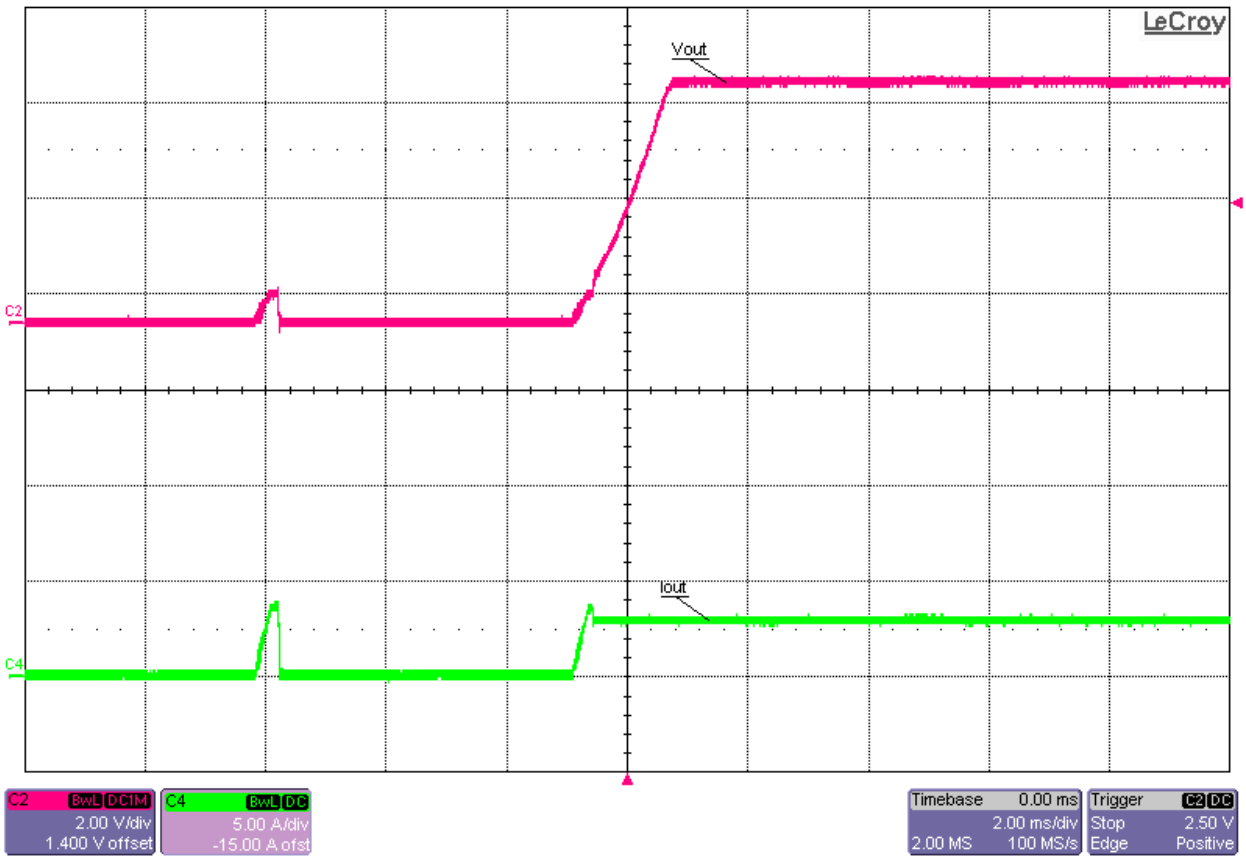
Short Circuit Applied at 36Vin from 3A Load



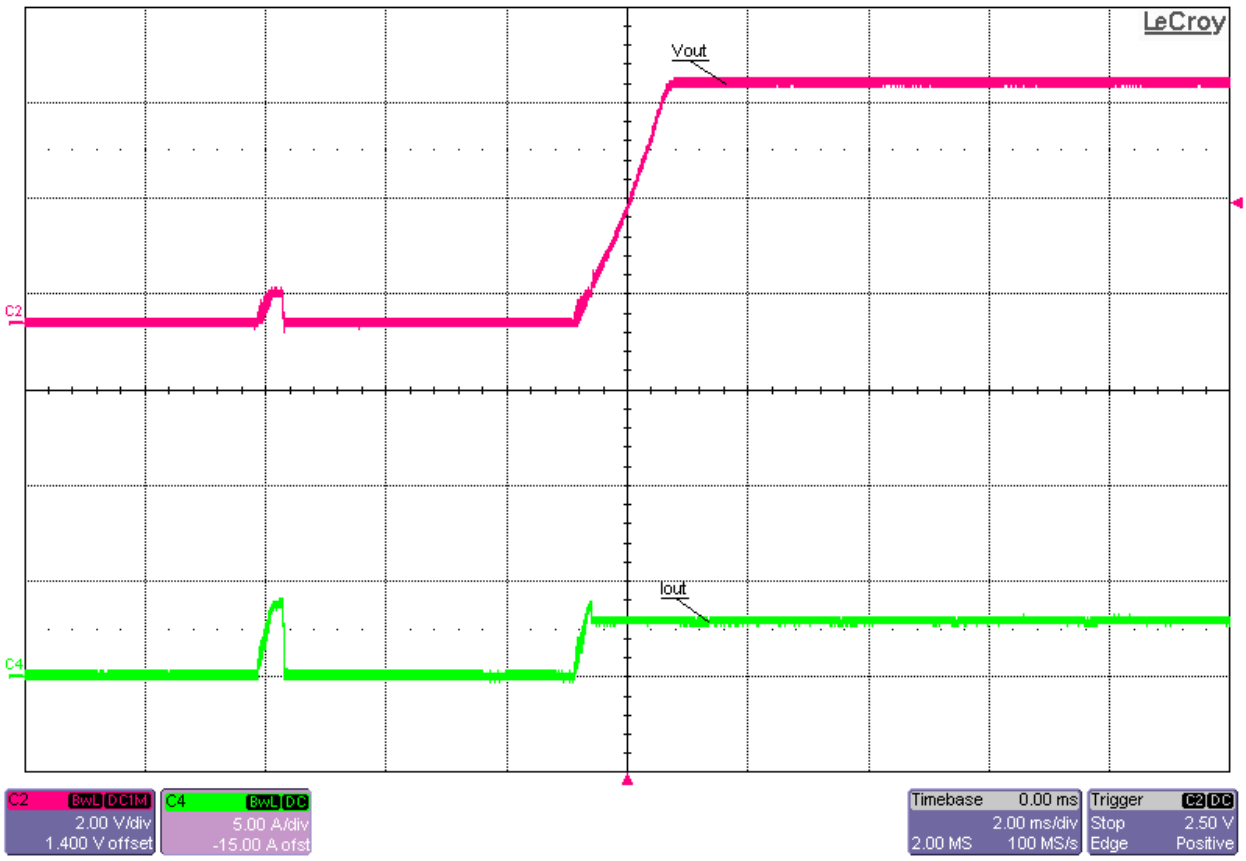
Short Circuit Released at 7Vin into 3A Load



Short Circuit Released at 12Vin into 3A Load



Short Circuit Released at 24Vin into 3A Load



Short Circuit Released at 36Vin into 3A Load

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Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265