Test Data
For PMP10538
10/8/2014

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1. Design Specifications

Vin Minimum	**18VDC**
Vin Maximum	**20VDC**
Vout	**30VDC to 54VDC**
Iout	**1.7A Continuous (3.4A Max. at 120Hz, 50% Duty Cycle)**
Nominal Switching Frequency	**≈ 250KHz**

2. Circuit Description

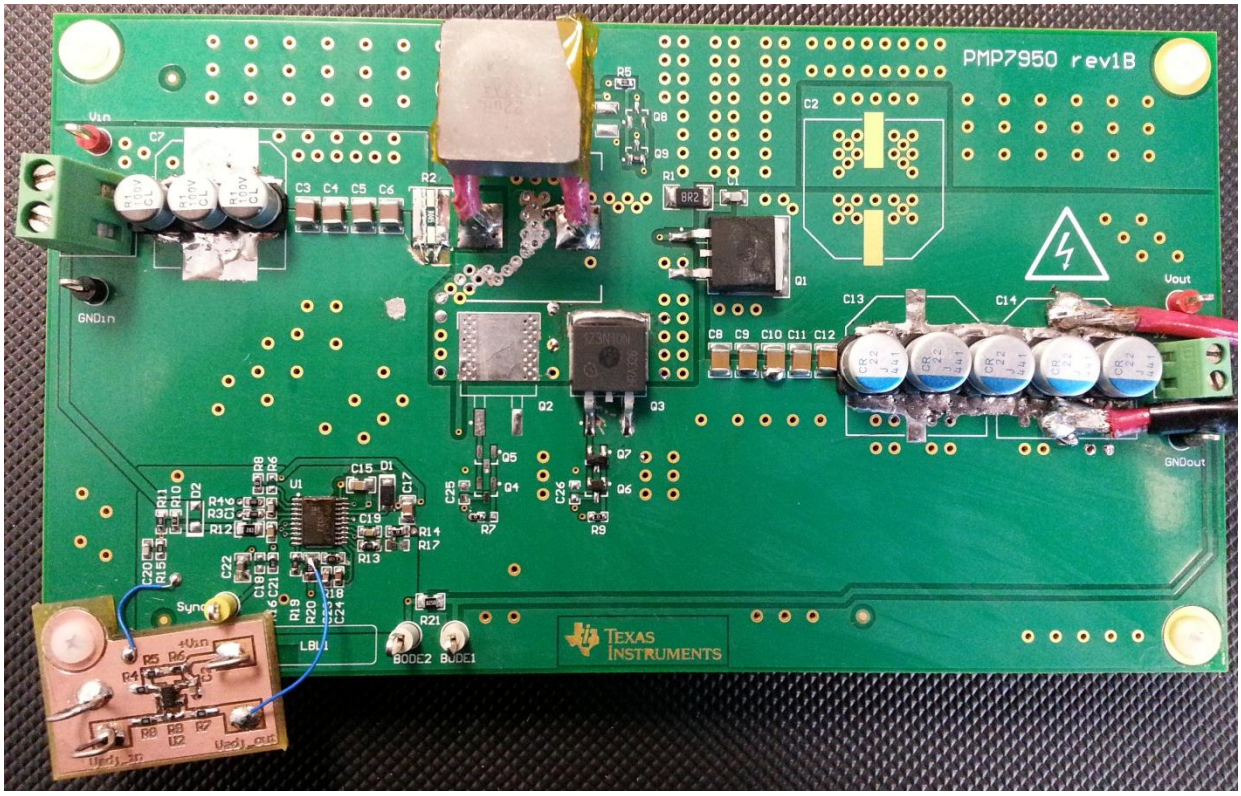
PMP10538 is a Single-Phase Synchronous Boost Converter using the LM5122 controller IC. The design accepts an input voltage of 18Vin to 20Vin and provides an output of 30Vout to 54Vout, capable of supplying 1.7A of continuous current to the load (or 0A to 3.4A Max. load pulses at 120Hz and 50% duty cycle). The output voltage can be adjusted between 30Vout and 54Vout by driving the Vadj. input of the Op-Amp circuit between 0V and 3V. The design was built on the PMP7950 Rev1B PCB, which was modified to the PMP10538 design configuration and requirements. The board is a 4-layer PCB with 2 oz. copper on the top and bottom layers, and 1oz. copper for the two mid-layers.

Regarding the Output Vadj. Circuit, the values for the 12.2V auxiliary supply were actually measured to be 12.09Vin. The actual "Vadj_In" voltages that were fed to the circuit to produce the corresponding boost circuit output voltages were recorded and are shown in the table below:

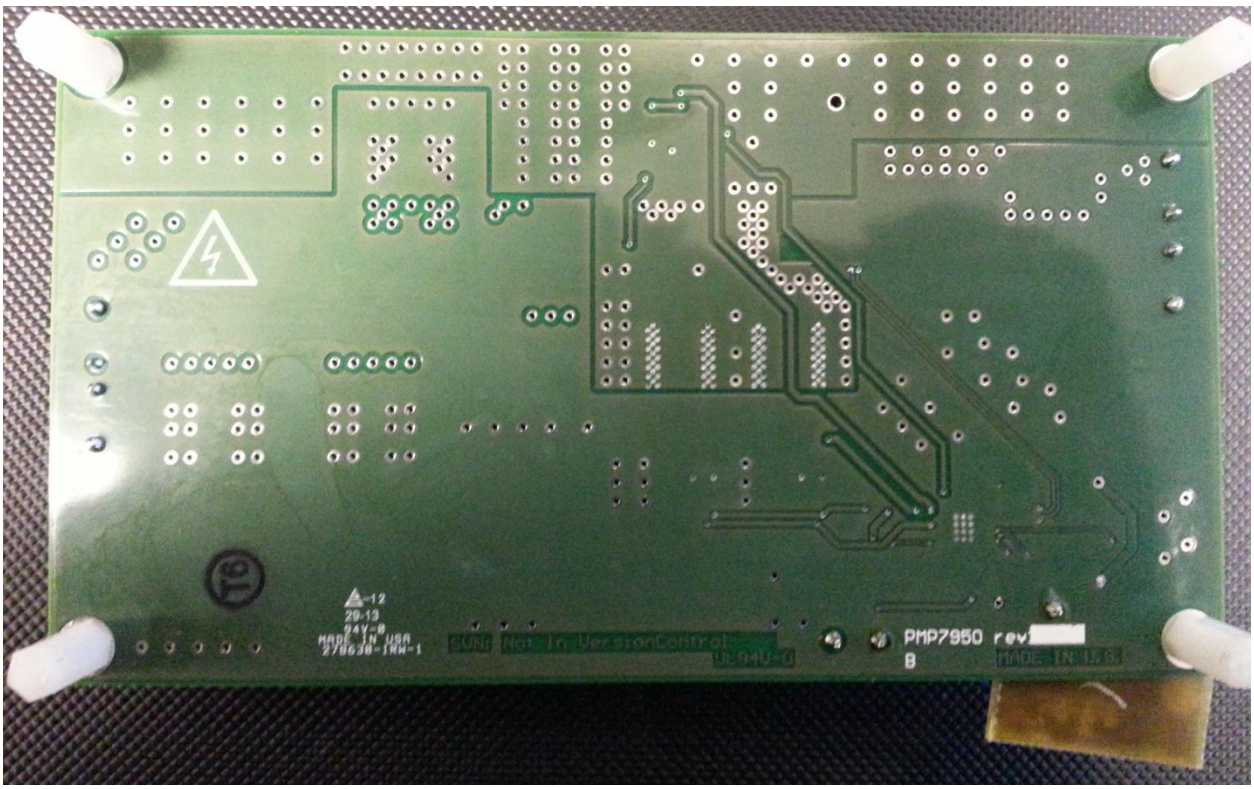
Vadj_In Voltage	Corresponding Output Voltage of Boost Circuit
0V	30.3V
2.98V	54V

3. PMP10538 Board Photos

Board Dimensions: 6.3” x 3.5”

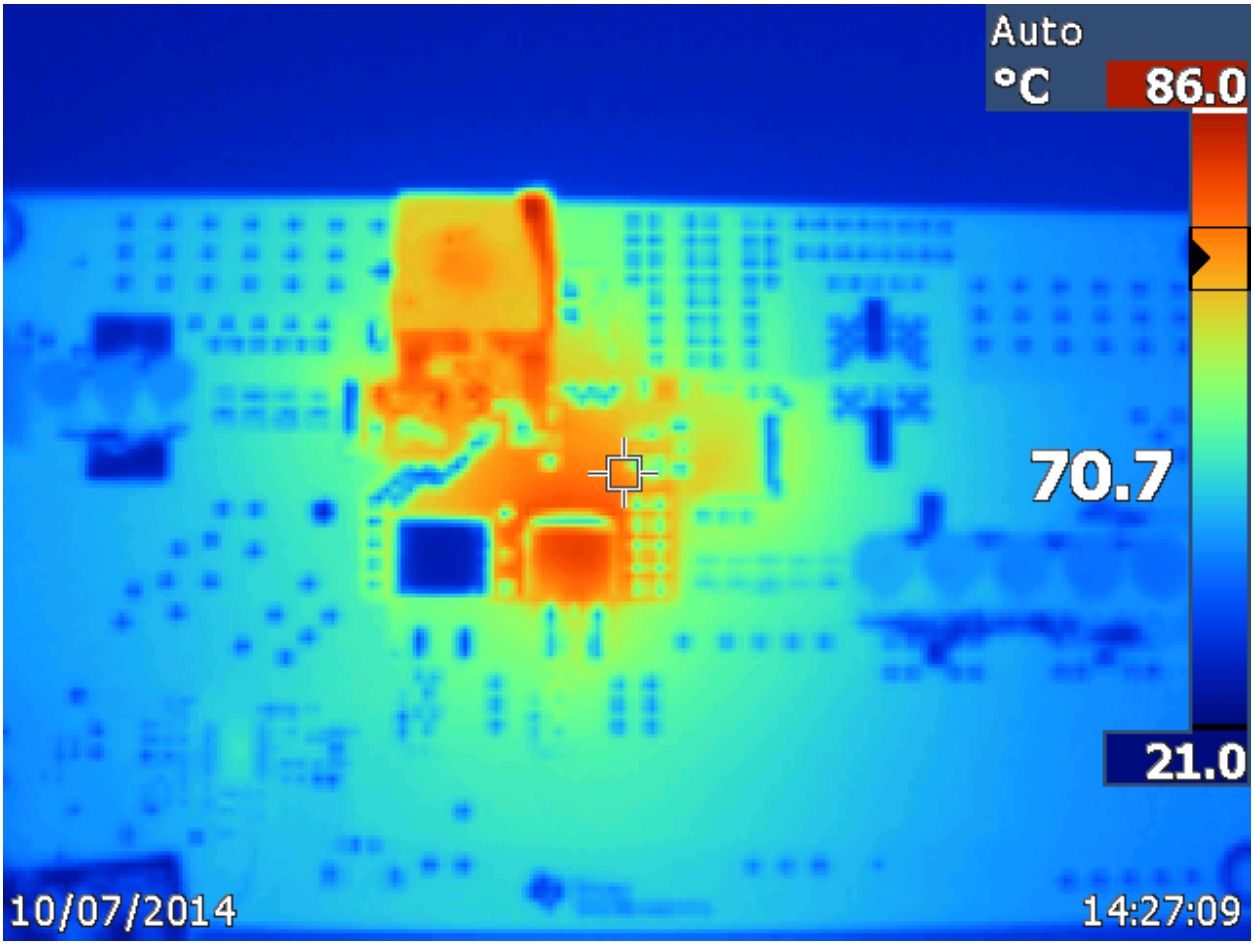


Board Photo (Top)

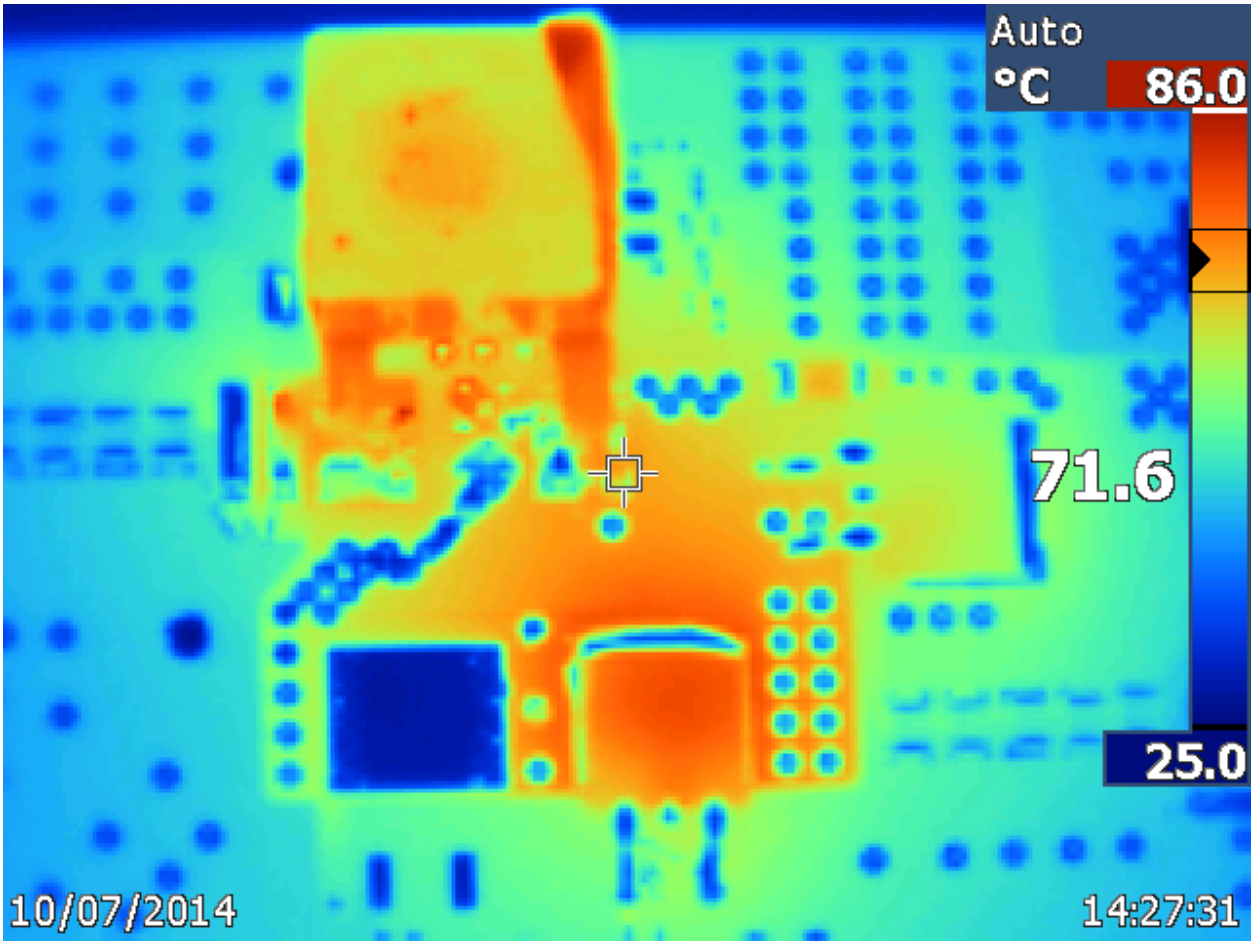


Board Photo (Bottom)

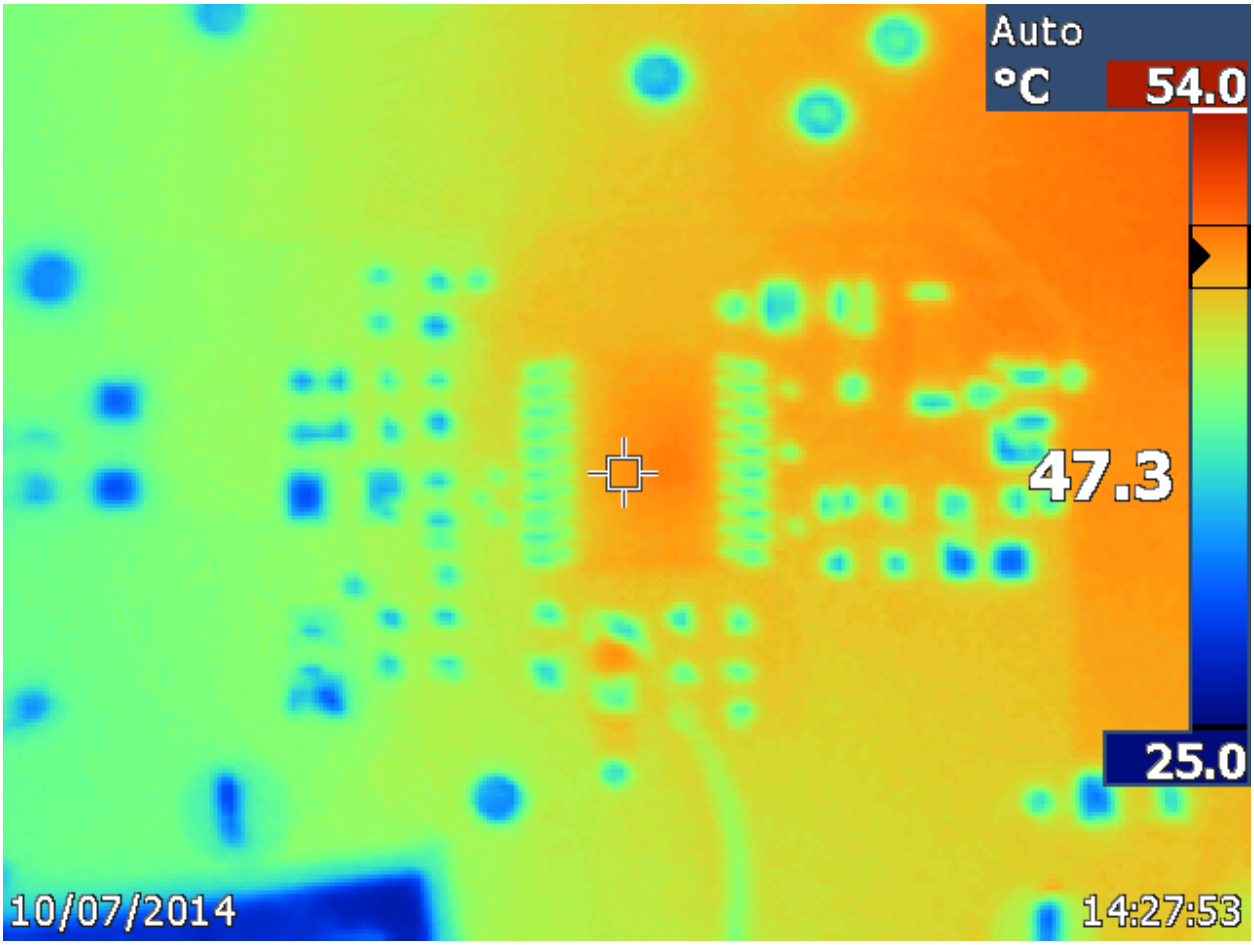
4. Thermal Data



IR thermal image taken at steady state with 18Vin, 54Vout, and 3.4A load driven at 120Hz and 50% duty cycle (no airflow; ambient at room temp.)



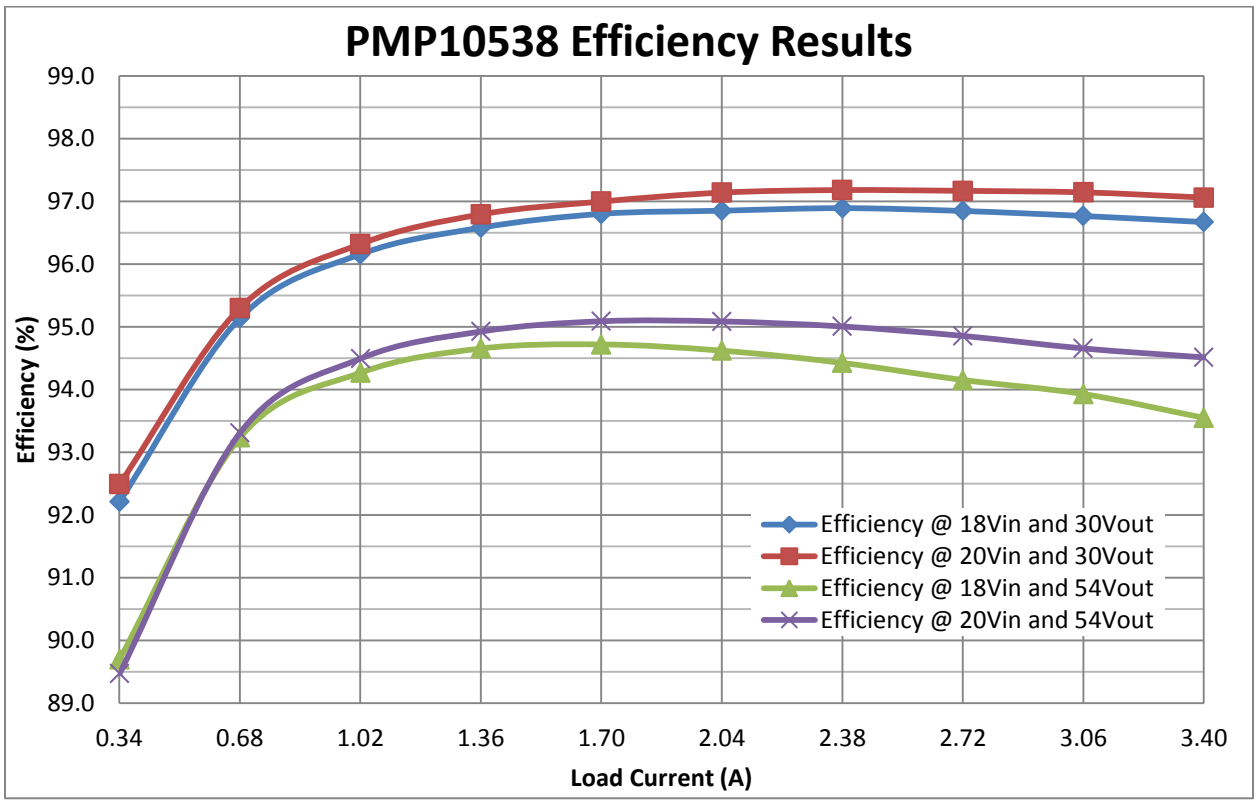
Zoomed view of thermal image around FETs and inductor



Zoomed view of thermal image around LM5122 controller IC

5. Efficiency

5.1 Efficiency Chart



5.2 Efficiency Data

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Ploss (W)	Efficiency (%)
18	0.622	30.303	0.3407	11.1960	10.3242	0.8718	92.2
18	1.204	30.299	0.6805	21.6720	20.6185	1.0535	95.1
18	1.786	30.295	1.0204	32.1480	30.9130	1.2350	96.2
18	2.37	30.293	1.3601	42.6600	41.2015	1.4585	96.6
18	2.955	30.291	1.6998	53.1900	51.4886	1.7014	96.8
18	3.546	30.29	2.0409	63.8280	61.8189	2.0091	96.9
18	4.135	30.29	2.3809	74.4300	72.1175	2.3125	96.9
18	4.727	30.291	2.7204	85.0860	82.4036	2.6824	96.8
18	5.322	30.292	3.0602	95.7960	92.6996	3.0964	96.8
18	5.92	30.294	3.4004	106.5600	103.0117	3.5483	96.7

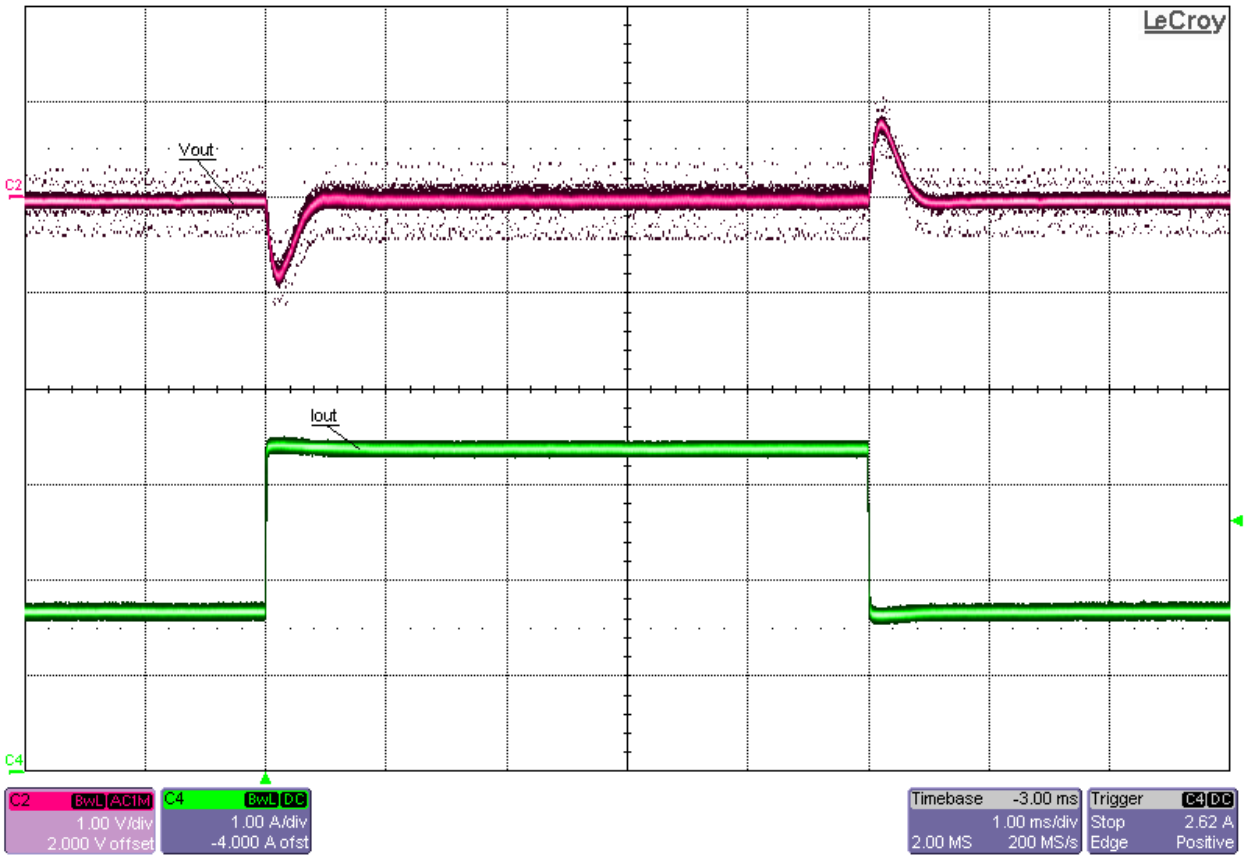
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Ploss (W)	Efficiency (%)
20	0.558	30.306	0.3406	11.1600	10.3222	0.8378	92.5
20	1.082	30.301	0.6806	21.6400	20.6229	1.0171	95.3
20	1.605	30.298	1.0205	32.1000	30.9191	1.1809	96.3
20	2.129	30.296	1.3604	42.5800	41.2147	1.3653	96.8
20	2.655	30.294	1.7002	53.1000	51.5059	1.5941	97.0
20	3.181	30.293	2.0401	63.6200	61.8007	1.8193	97.1
20	3.709	30.292	2.3798	74.1800	72.0889	2.0911	97.2
20	4.241	30.293	2.7207	84.8200	82.4182	2.4018	97.2
20	4.772	30.293	3.0606	95.4400	92.7148	2.7252	97.1
20	5.307	30.294	3.4007	106.1400	103.0208	3.1192	97.1

Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Ploss (W)	Efficiency (%)
18	1.141	54.041	0.3409	20.5380	18.4226	2.1154	89.7
18	2.192	54.036	0.6808	39.4560	36.7877	2.6683	93.2
18	3.25	54.034	1.0206	58.5000	55.1471	3.3529	94.3
18	4.315	54.034	1.3606	77.6700	73.5187	4.1513	94.7
18	5.388	54.034	1.7001	96.9840	91.8632	5.1208	94.7
18	6.472	54.034	2.04	116.4960	110.2294	6.2666	94.6
18	7.565	54.034	2.3796	136.1700	128.5793	7.5907	94.4
18	8.673	54.027	2.7206	156.1140	146.9859	9.1281	94.2
18	9.78	54.017	3.0611	176.0400	165.3514	10.6886	93.9
18	10.906	54.014	3.4	196.3080	183.6476	12.6604	93.6

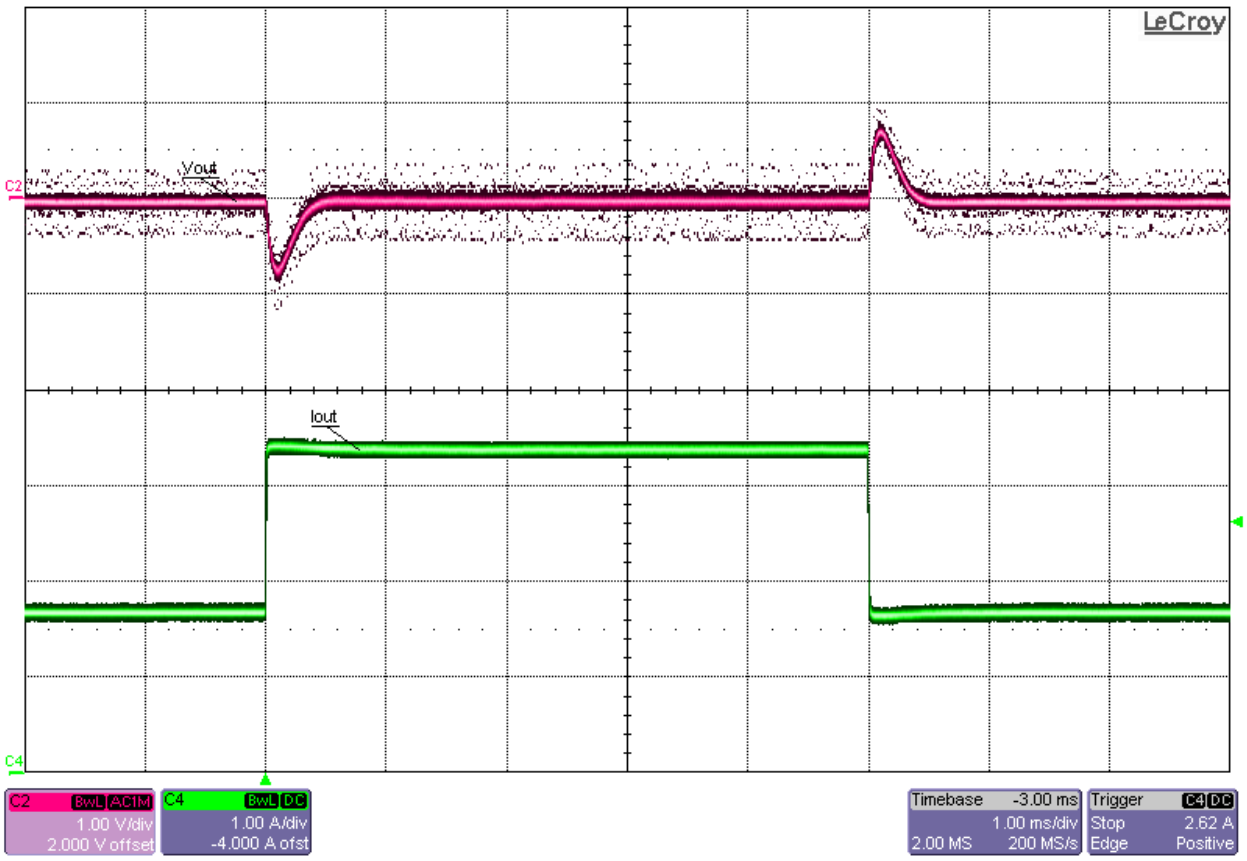
Vin (V)	Iin (A)	Vout (V)	Iout (A)	Pin (W)	Pout (W)	Ploss (W)	Efficiency (%)
20	1.03	54.052	0.341	20.6000	18.4317	2.1683	89.5
20	1.972	54.049	0.6809	39.4400	36.8020	2.6380	93.3
20	2.919	54.047	1.0207	58.3800	55.1658	3.2142	94.5
20	3.873	54.046	1.3605	77.4600	73.5296	3.9304	94.9
20	4.832	54.046	1.7003	96.6400	91.8944	4.7456	95.1
20	5.798	54.045	2.0402	115.9600	110.2626	5.6974	95.1
20	6.77	54.043	2.3803	135.4000	128.6386	6.7614	95.0
20	7.748	54.04	2.72	154.9600	146.9888	7.9712	94.9
20	8.733	54.032	3.0598	174.6600	165.3271	9.3329	94.7
20	9.718	54.02	3.4005	194.3600	183.6950	10.6650	94.5

6 Waveforms

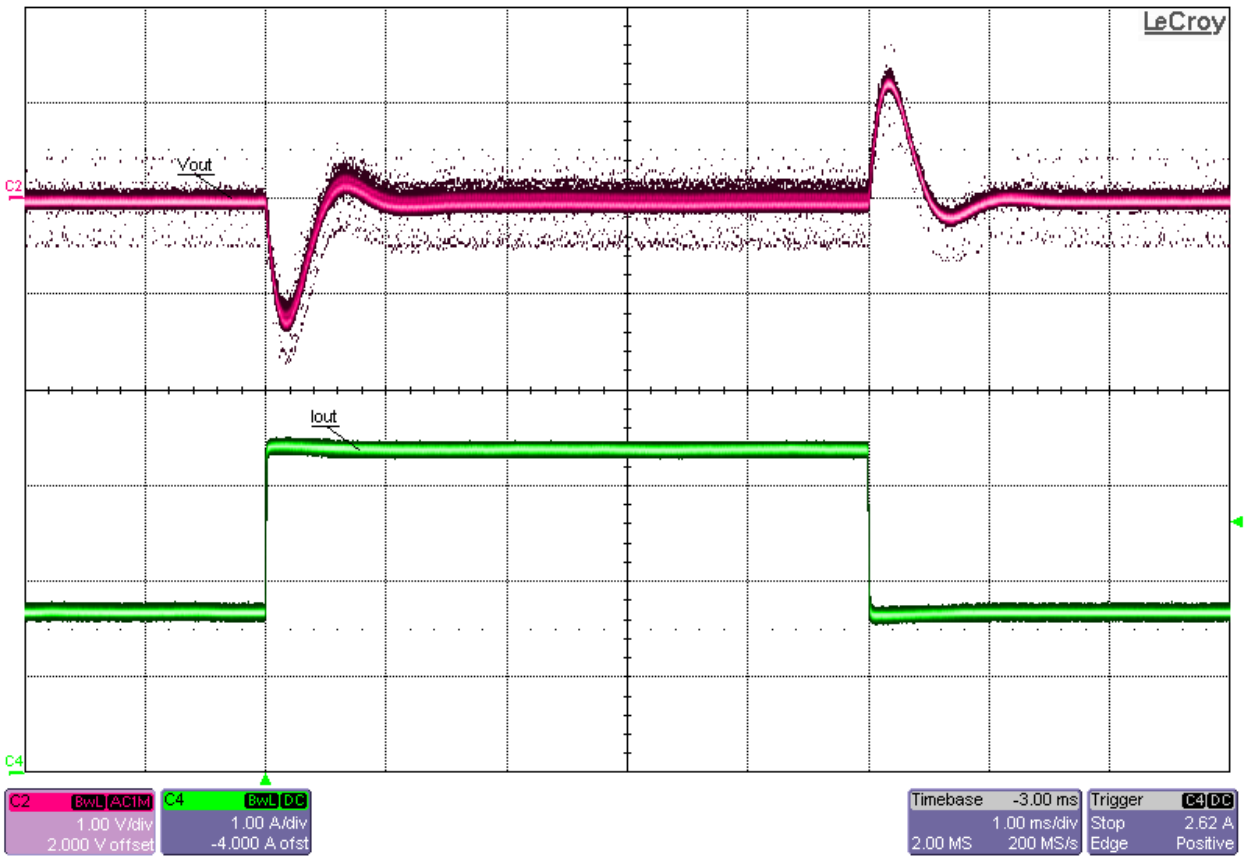
6.1 Load Transient Response



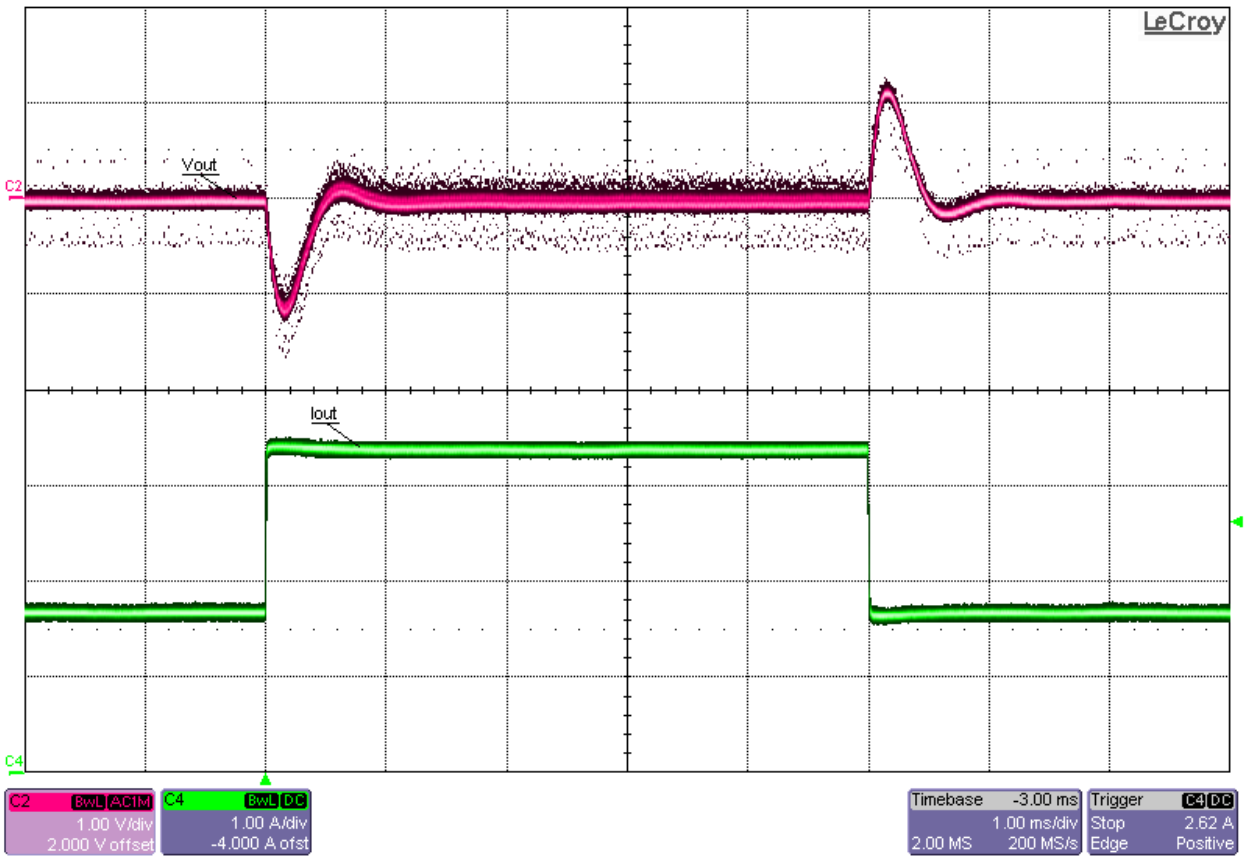
Load Transient Response at 18Vin, 30Vout, and 1.7A-to-3.4A Load Step



Load Transient Response at 20Vin, 30Vout, and 1.7A-to-3.4A Load Step

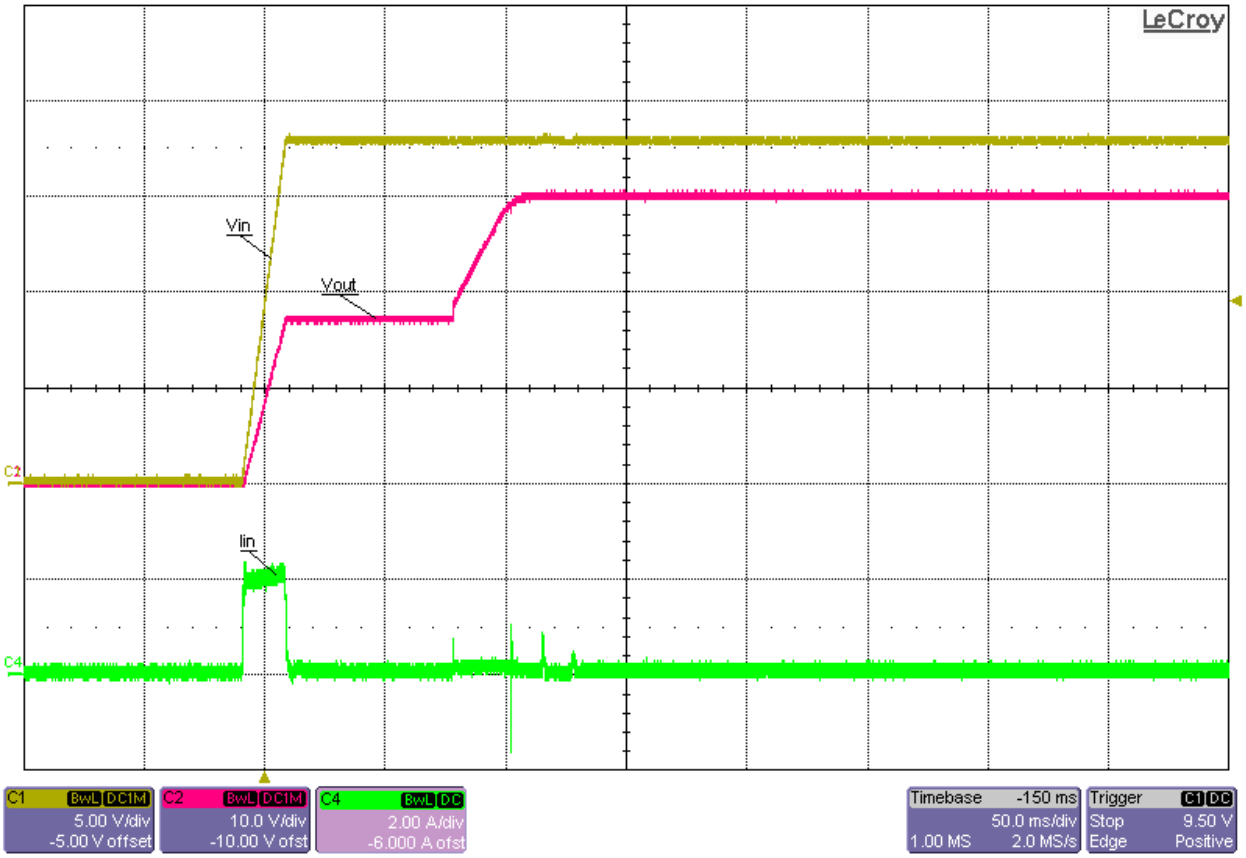


Load Transient Response at 18Vin, 54Vout, and 1.7A-to-3.4A Load Step

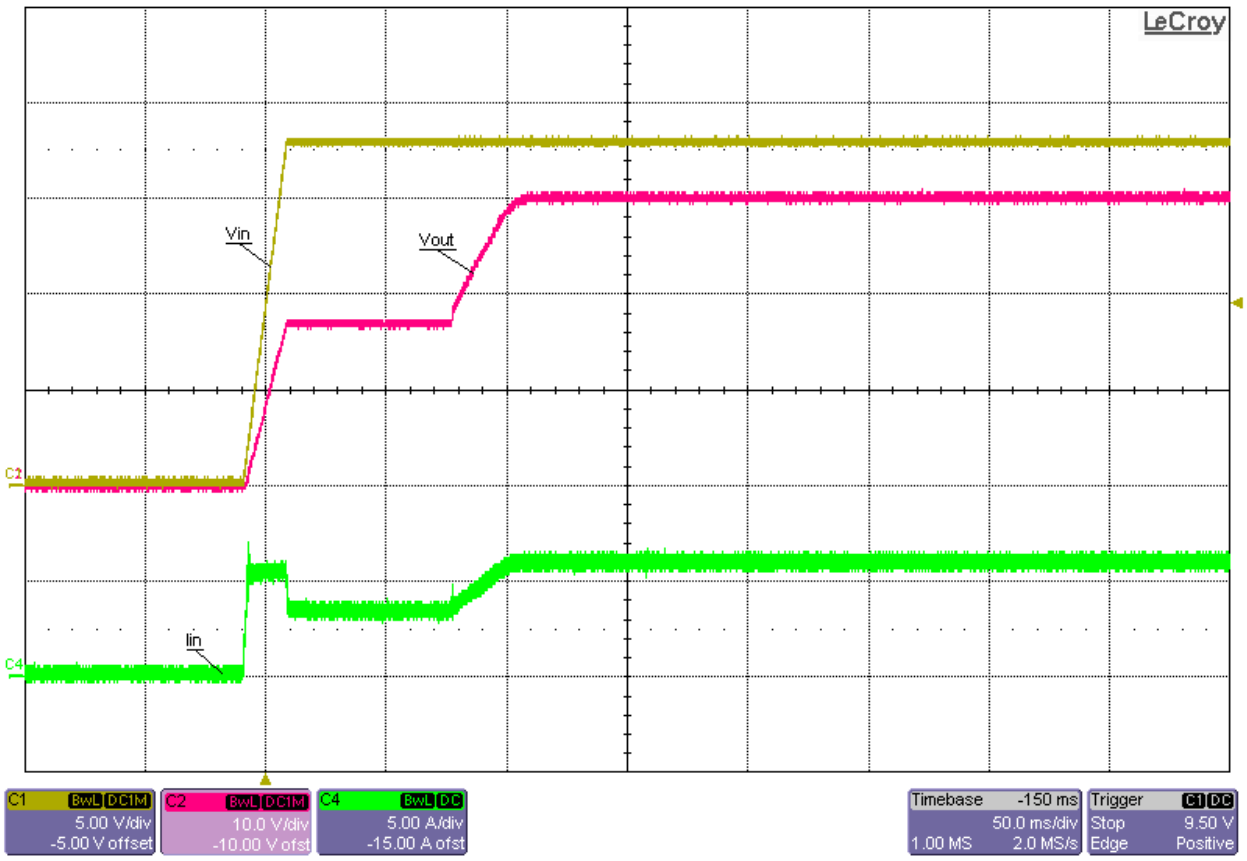


Load Transient Response at 20Vin, 54Vout, and 1.7A-to-3.4A Load Step

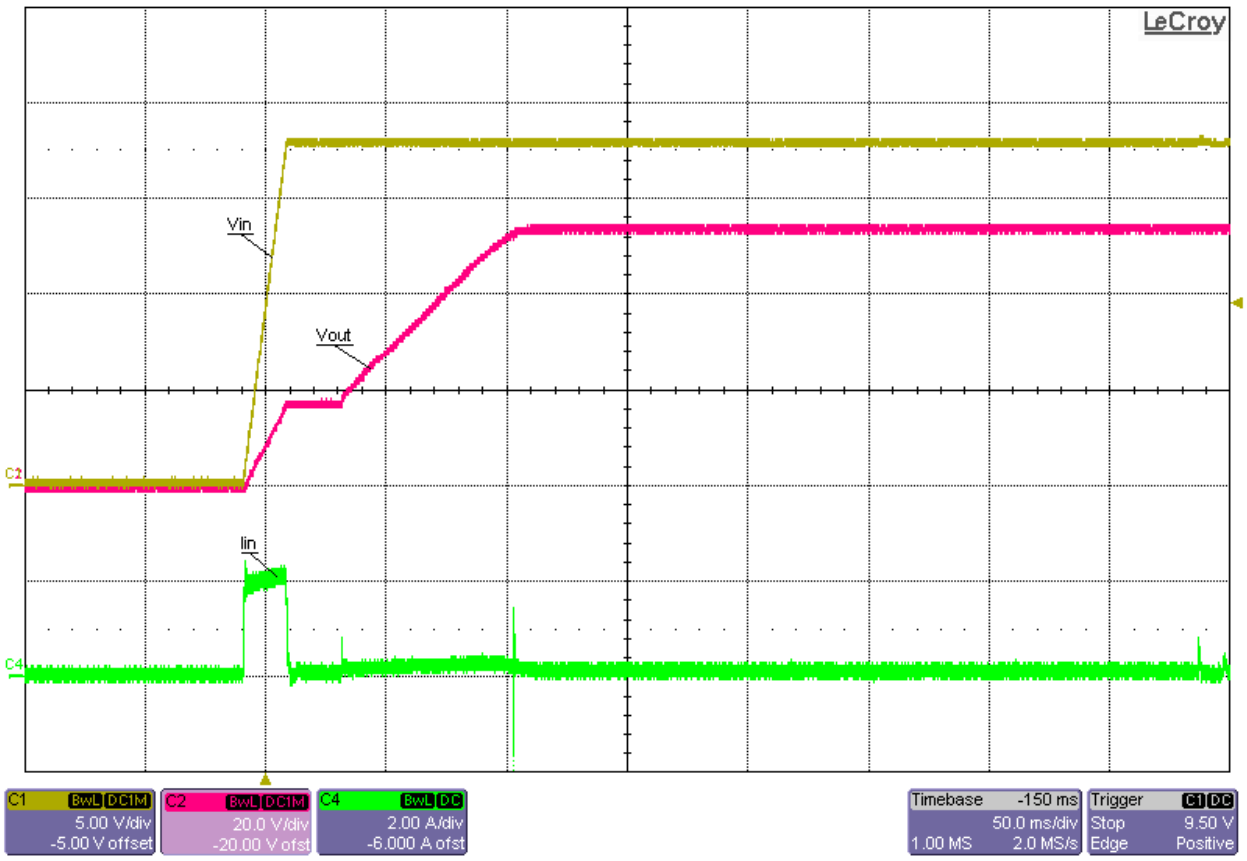
6.2 Startup



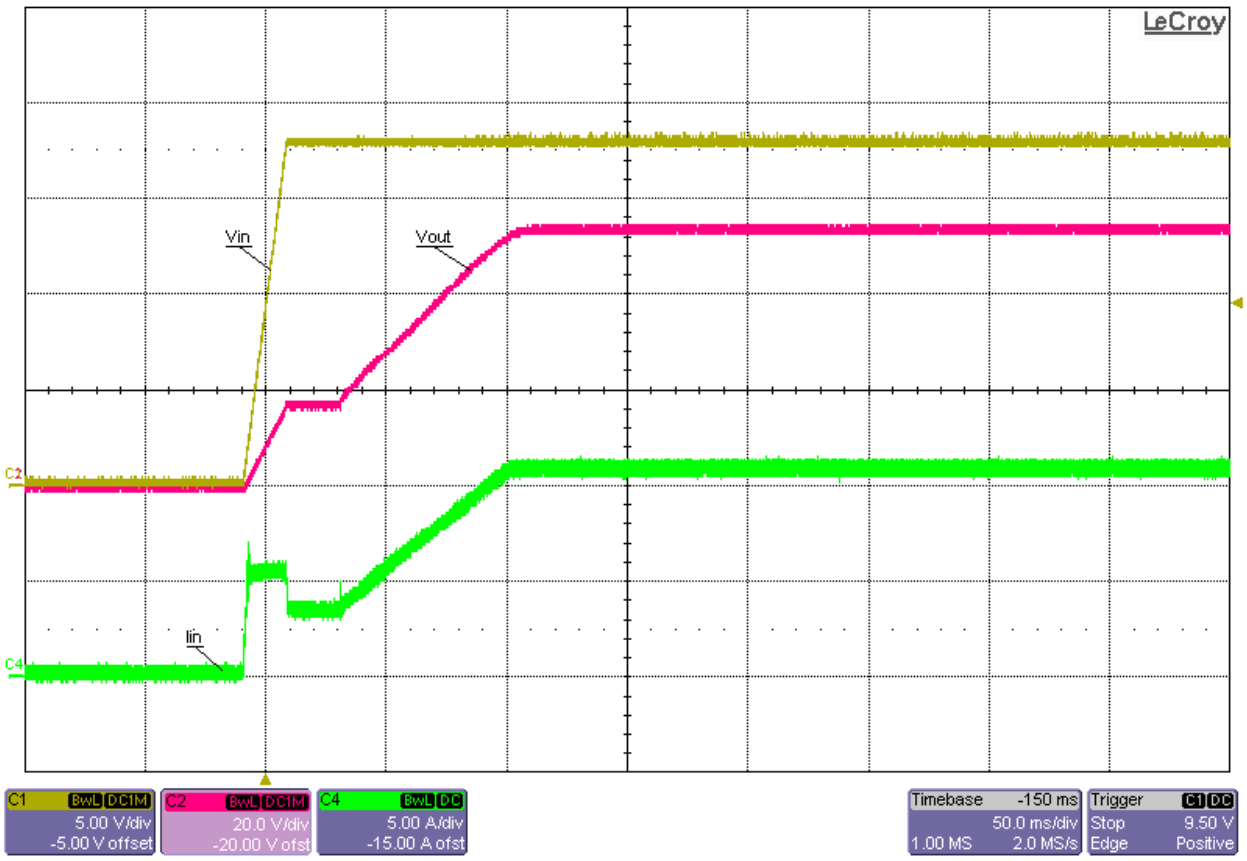
Startup into No Load at 18Vin and 30Vout



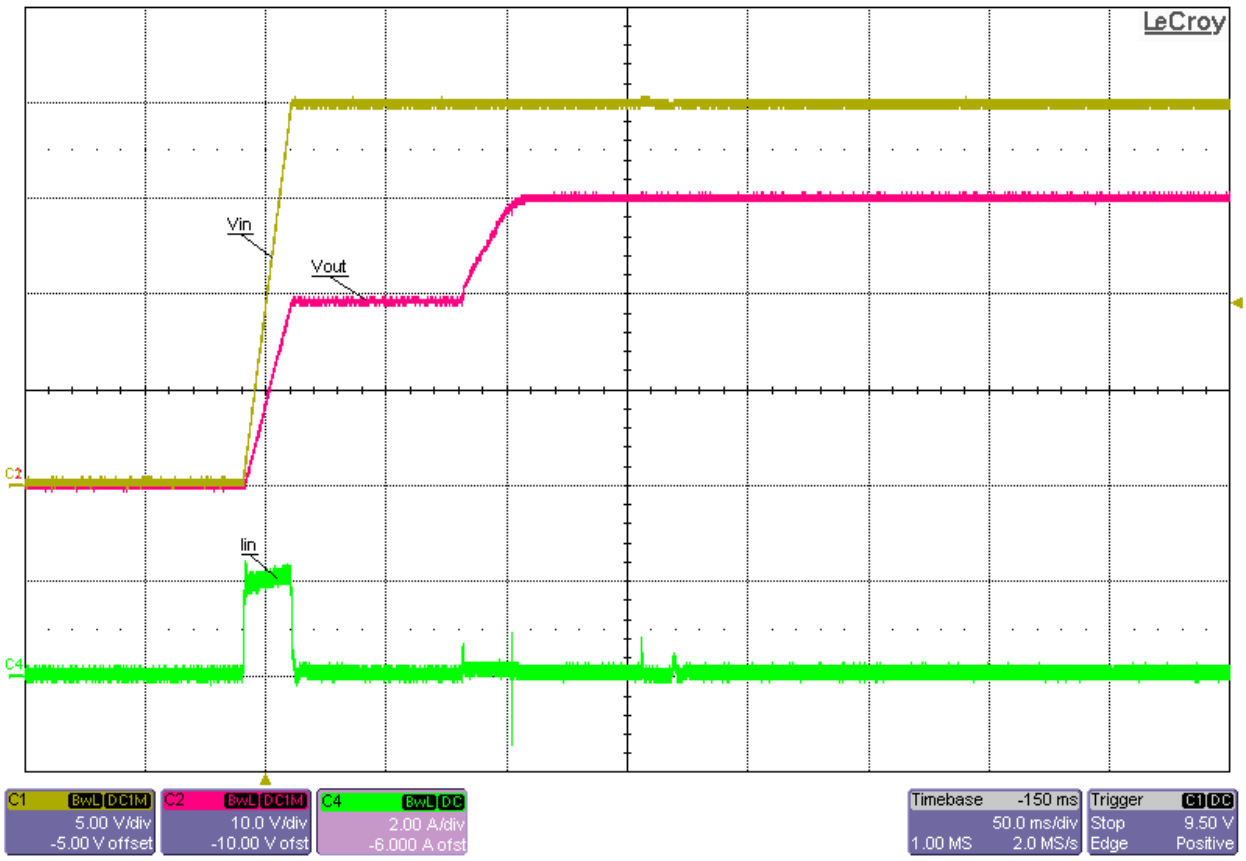
Startup into 3.4A Constant-Current Load at 18Vin and 30Vout



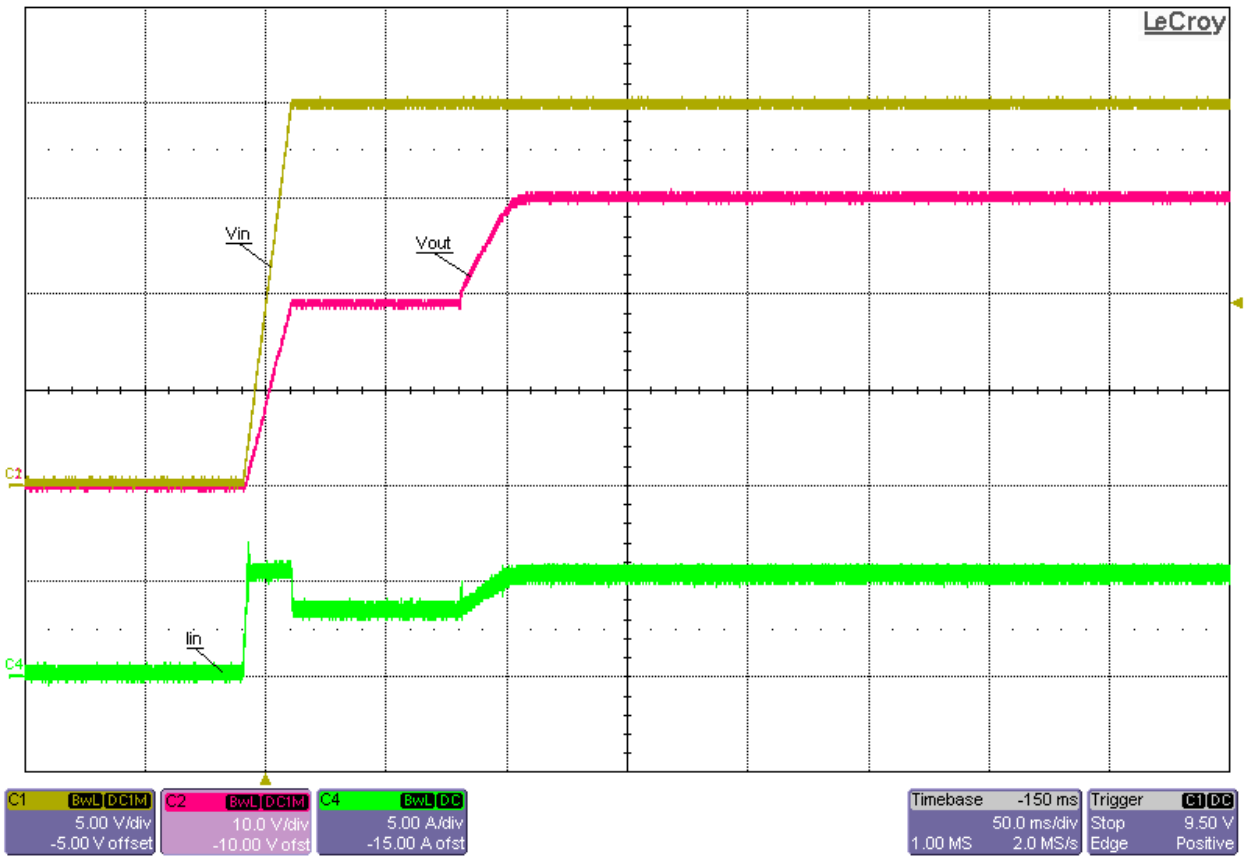
Startup into No Load at 18Vin and 54Vout



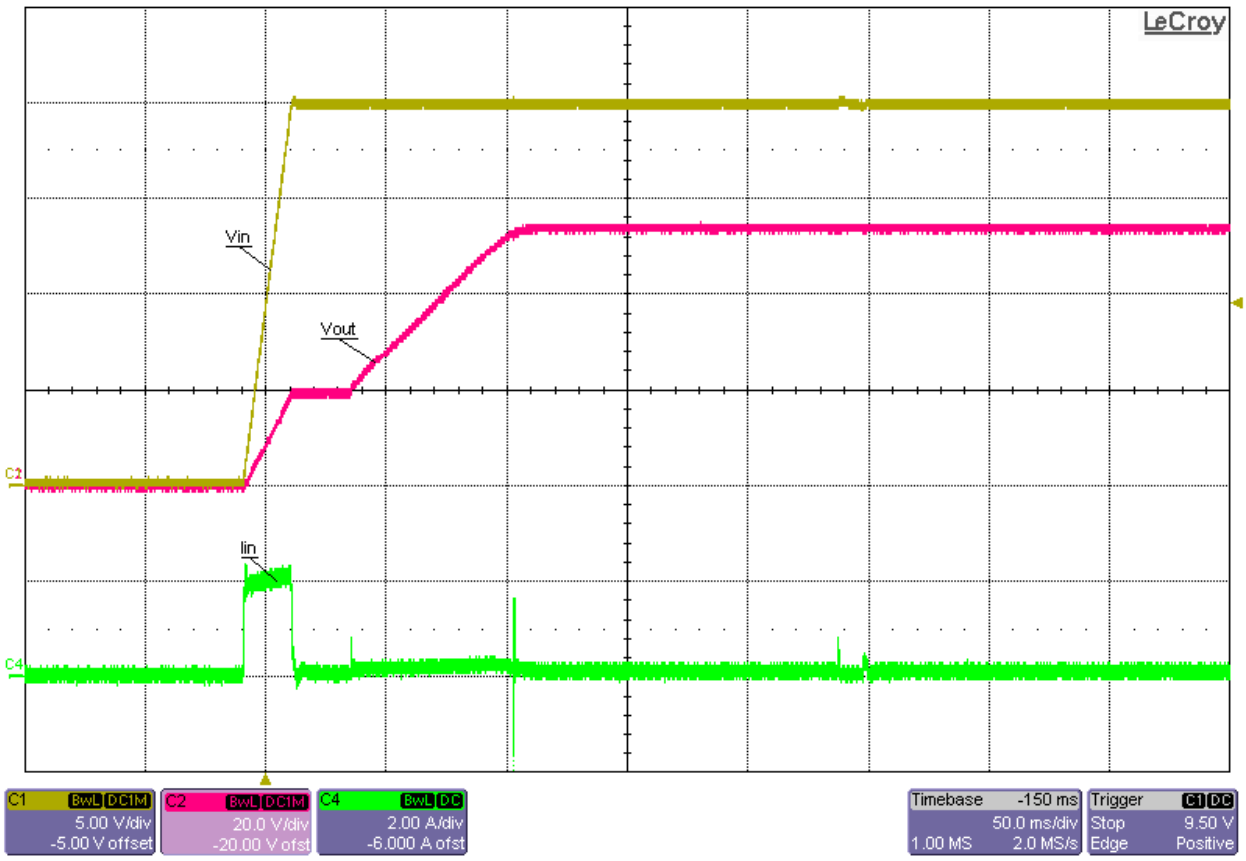
Startup into 3.4A Constant-Current Load at 18Vin and 54Vout



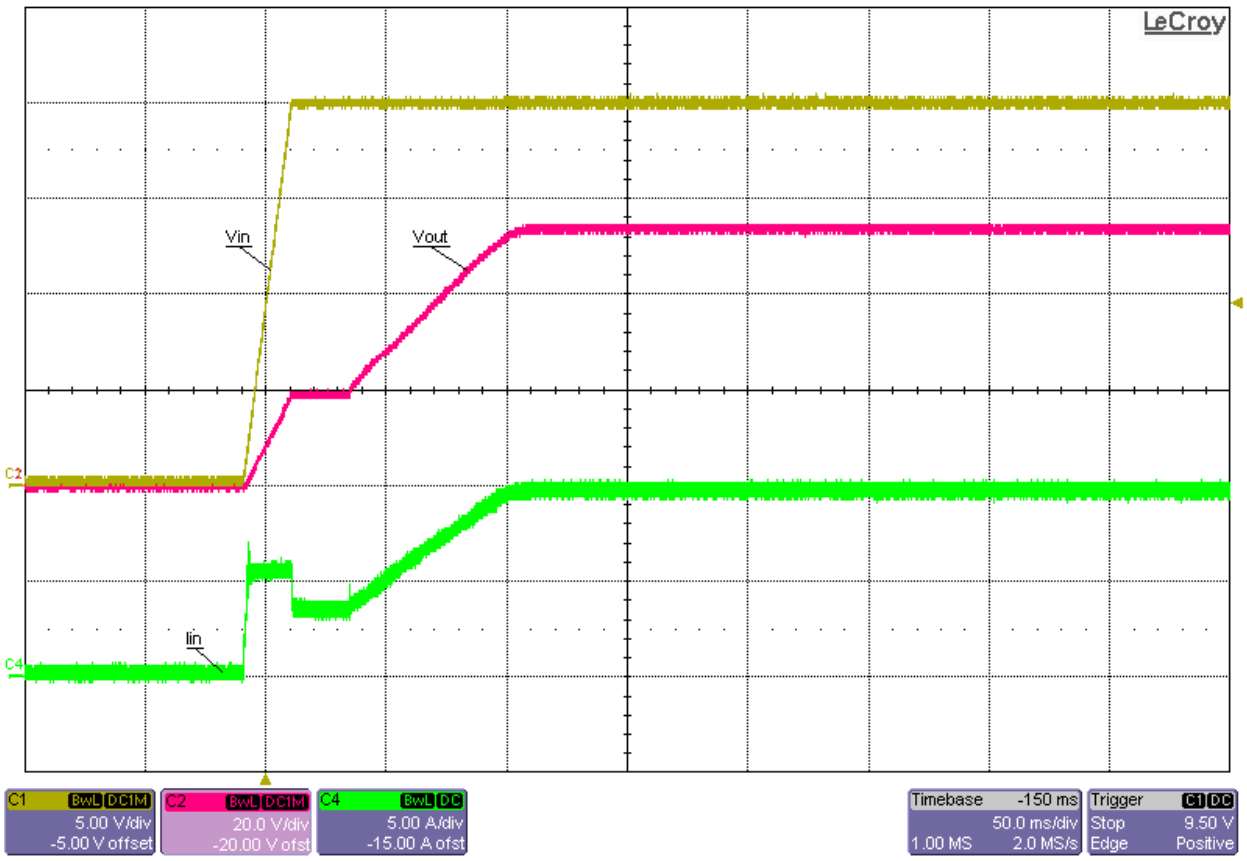
Startup into No Load at 20Vin and 30Vout



Startup into 3.4A Constant-Current Load at 20Vin and 30Vout

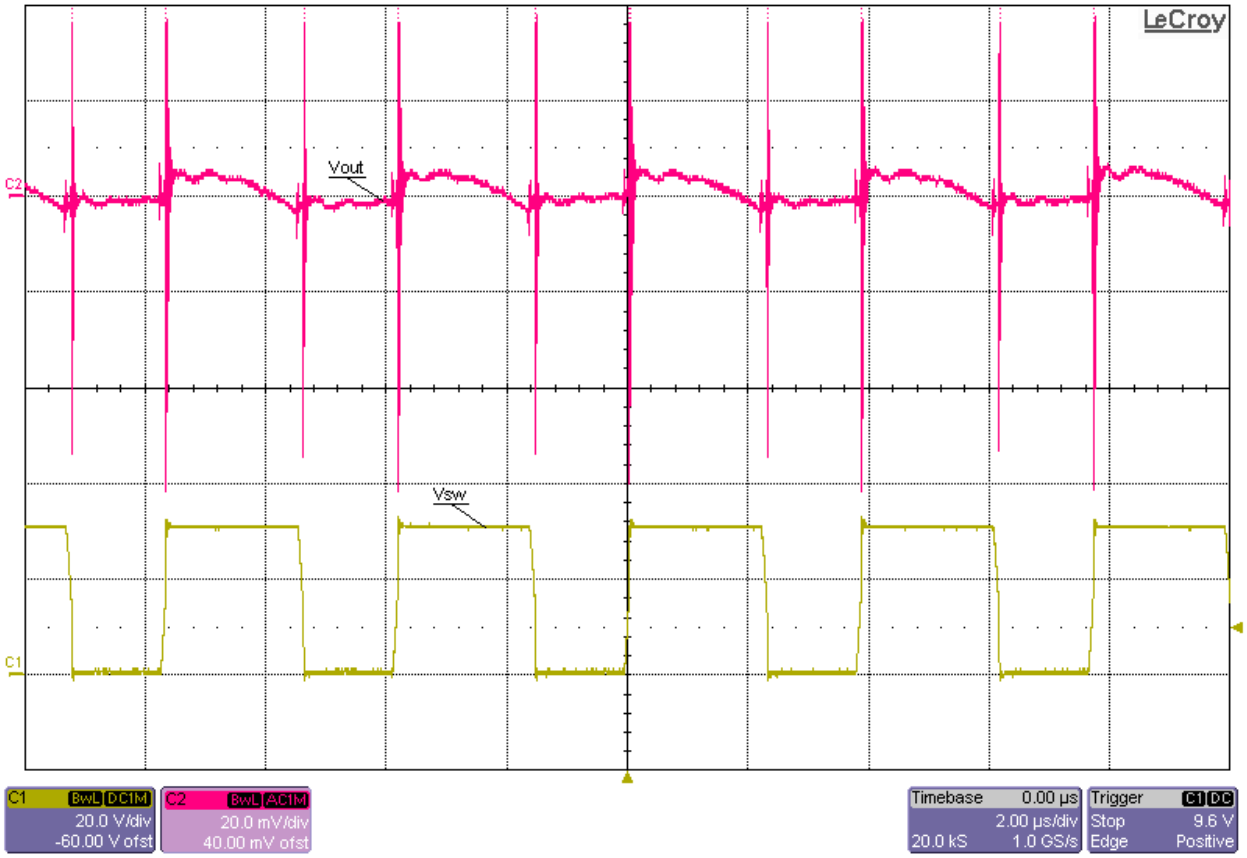


Startup into No Load at 20Vin and 54Vout

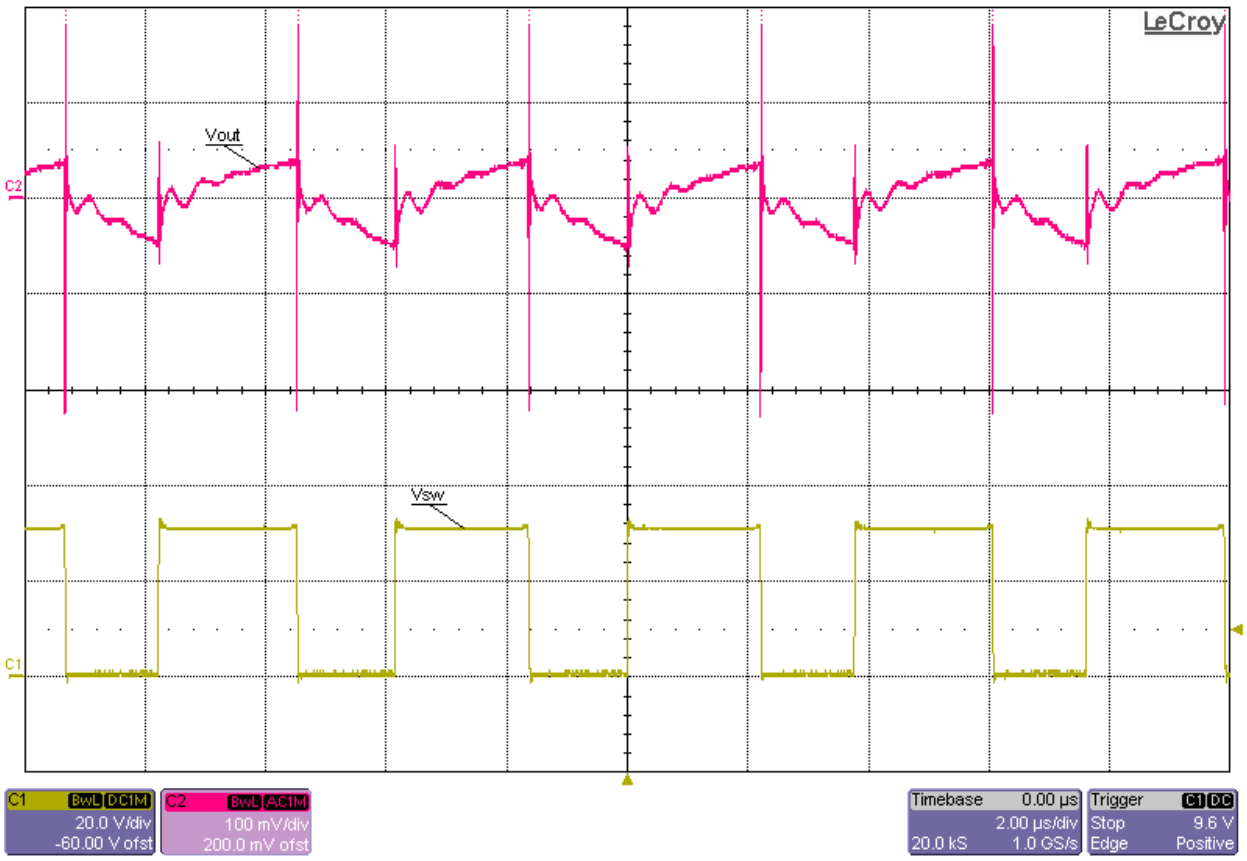


Startup into 3.4A Constant-Current Load at 20Vin and 54Vout

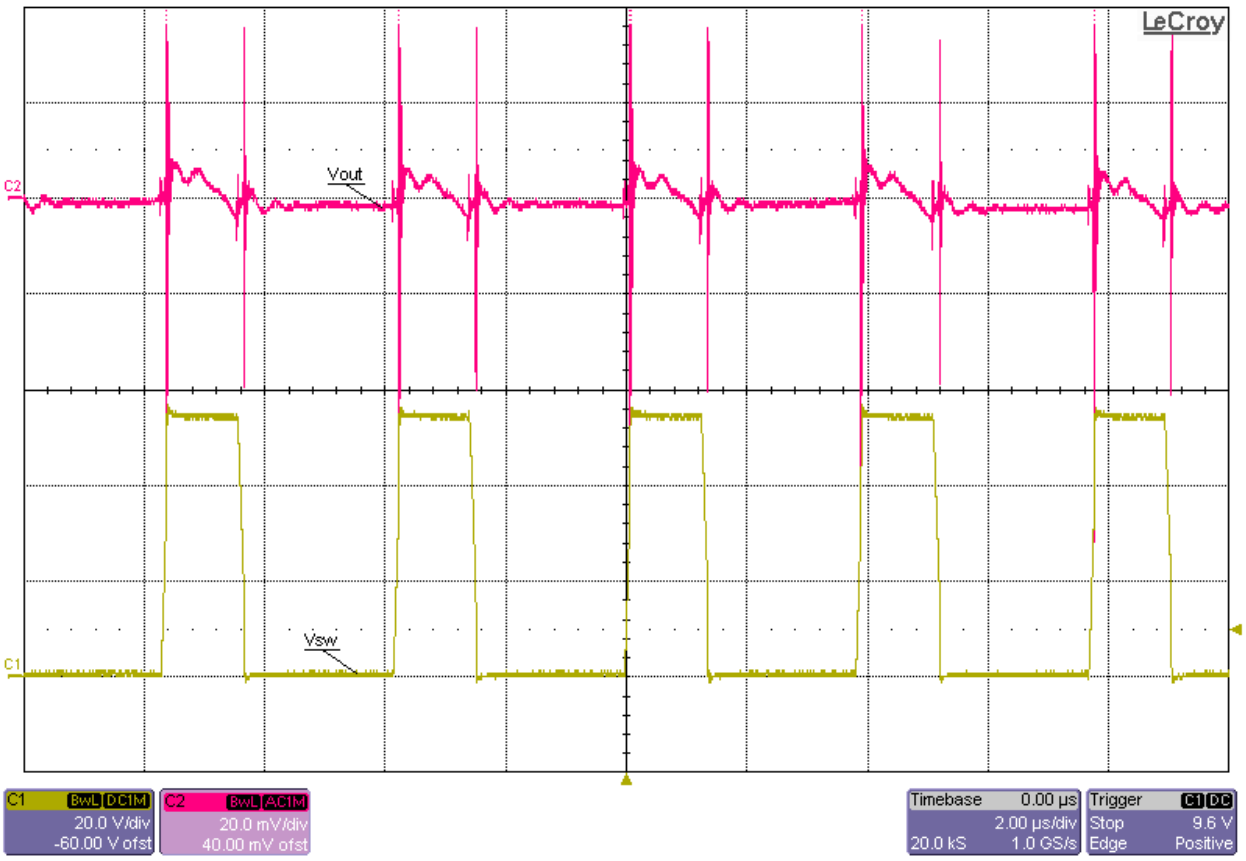
6.3 Output Voltage Ripple and Switch Node Voltage



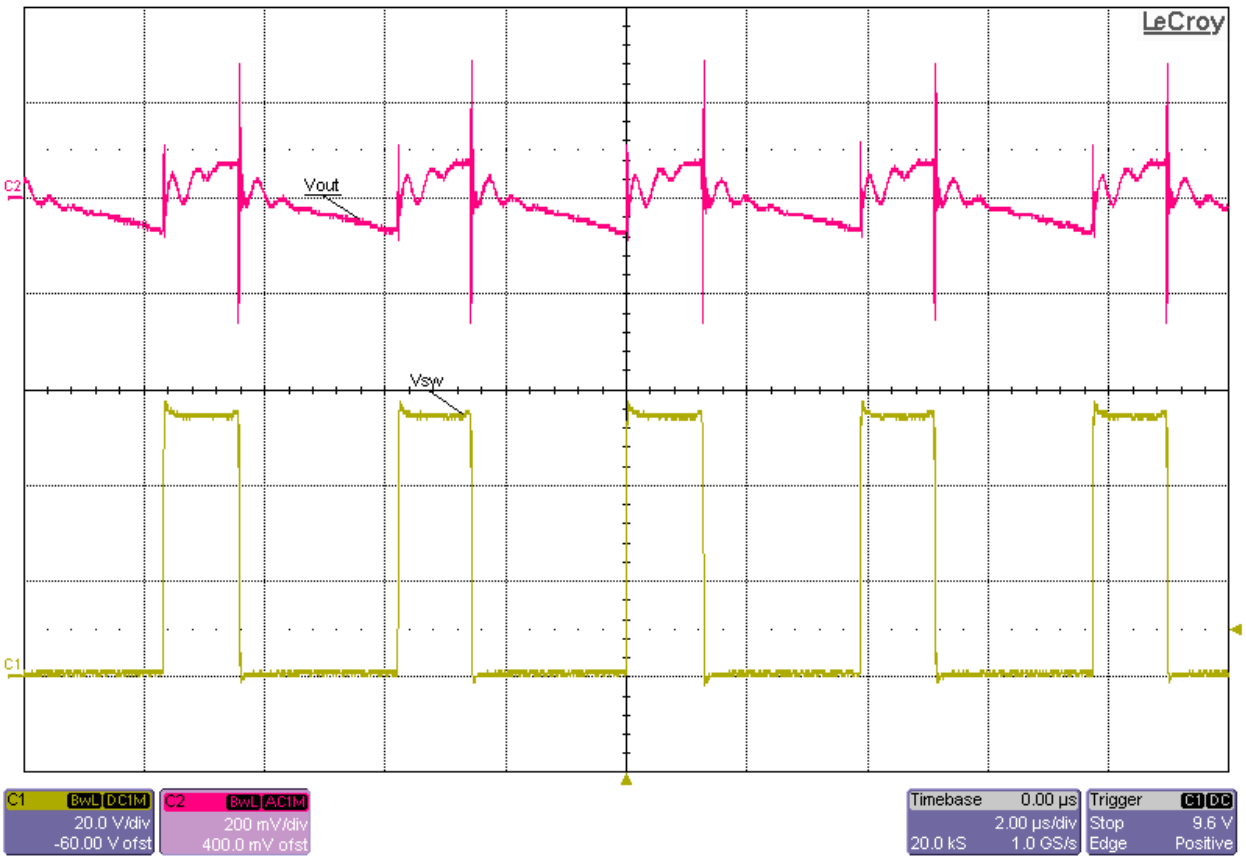
Switch Node Voltage and Output Voltage Ripple at 18Vin, 30Vout, and 0A Load (Vripple ≈ 16mVp-p)



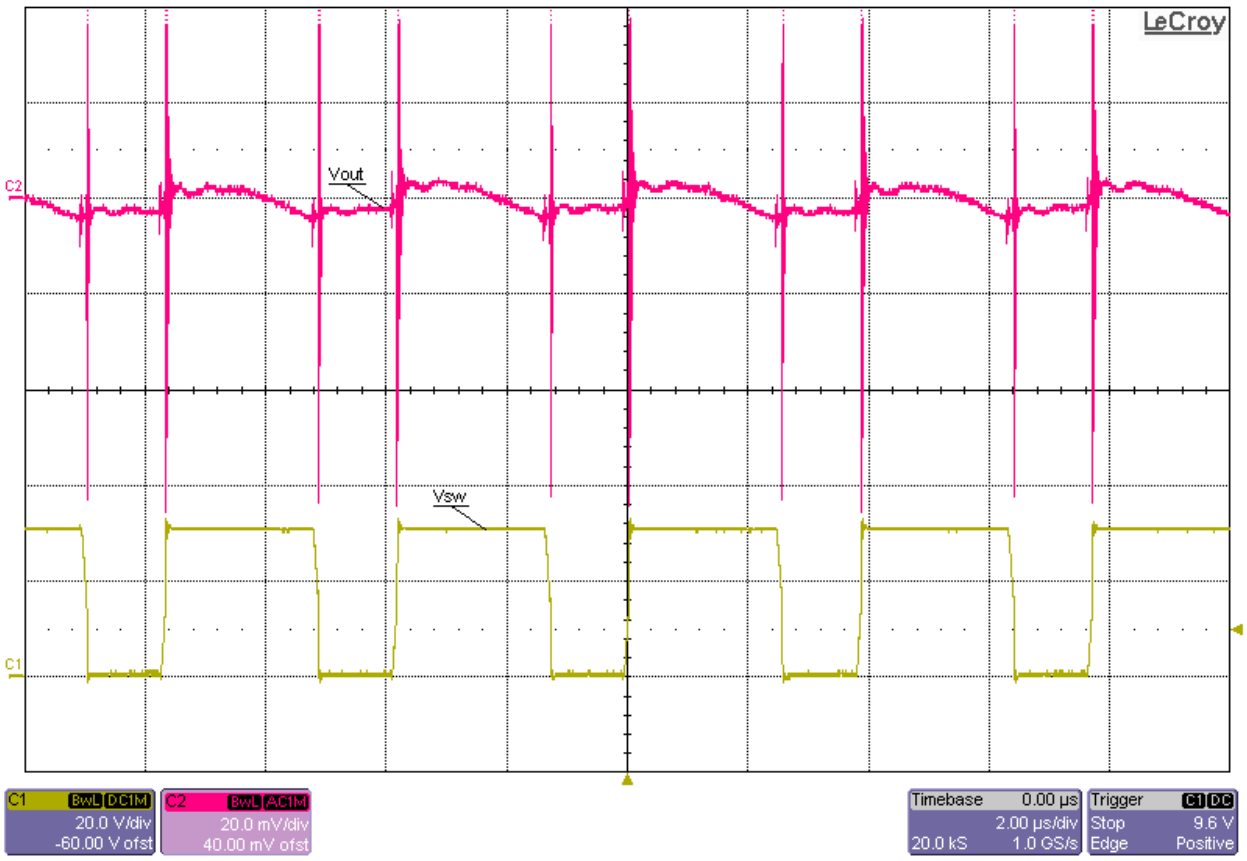
Switch Node Voltage and Output Voltage Ripple at 18Vin, 30Vout, and 3.4A Load (Vripple≈ 100mVp-p)



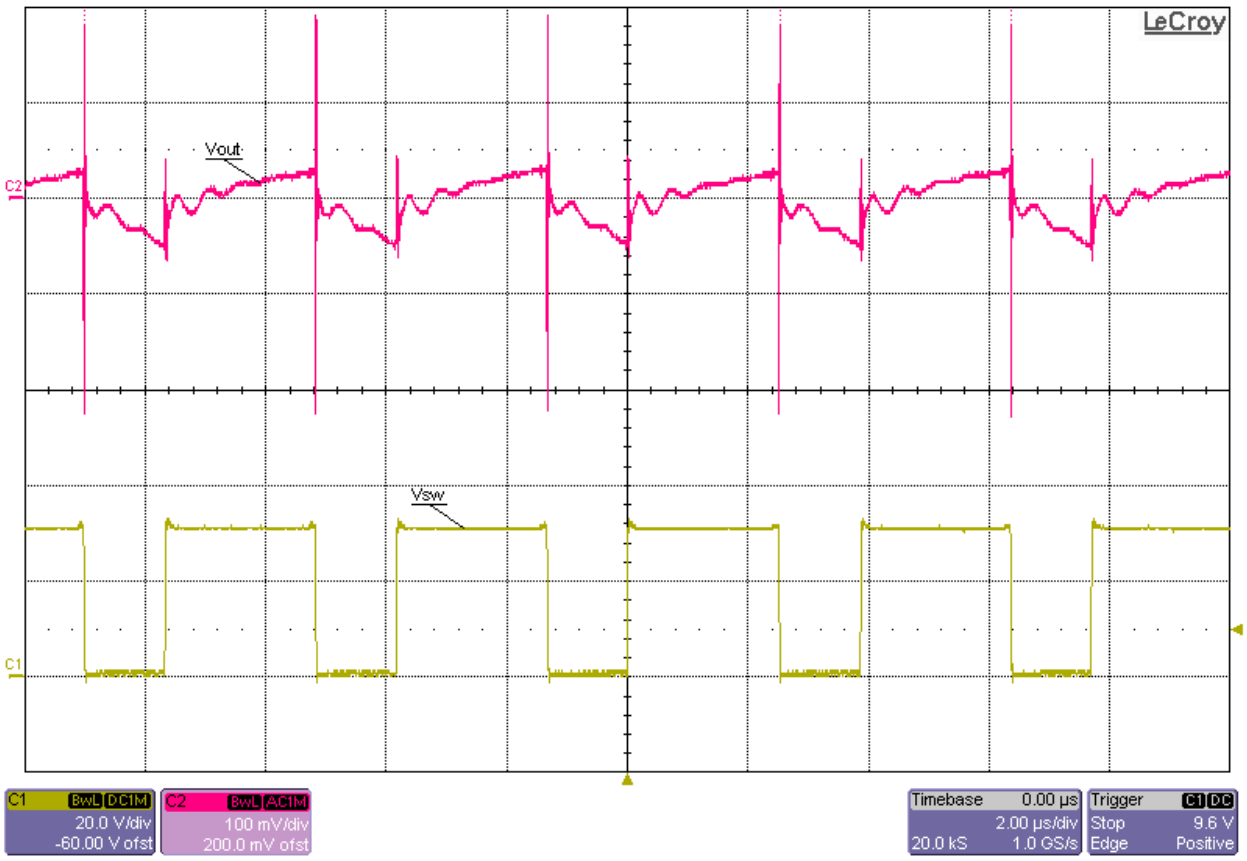
Switch Node Voltage and Output Voltage Ripple at 18Vin, 54Vout, and 0A Load (Vripple ≈ 15mVp-p)



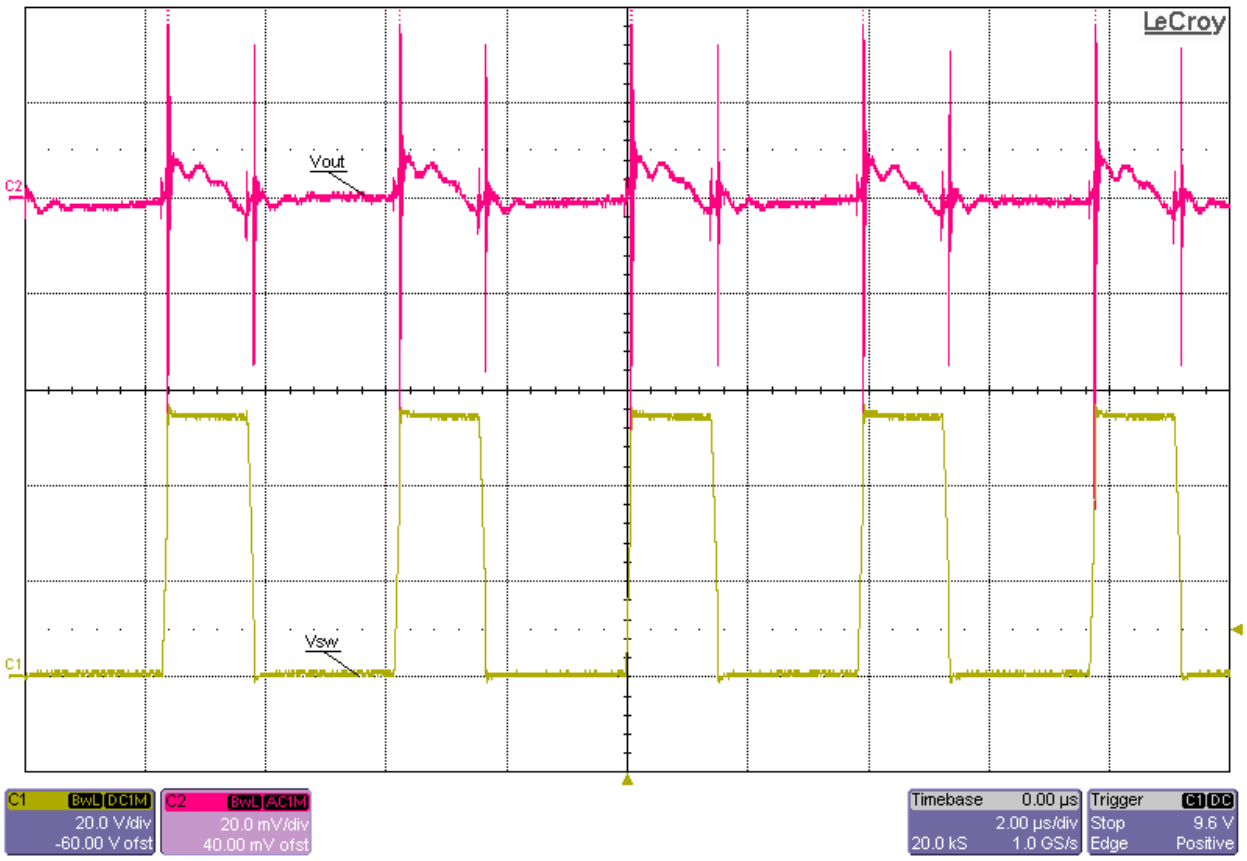
Switch Node Voltage and Output Voltage Ripple at 18Vin, 54Vout, and 3.4A Load (Vripple≈ 160mVp-p)



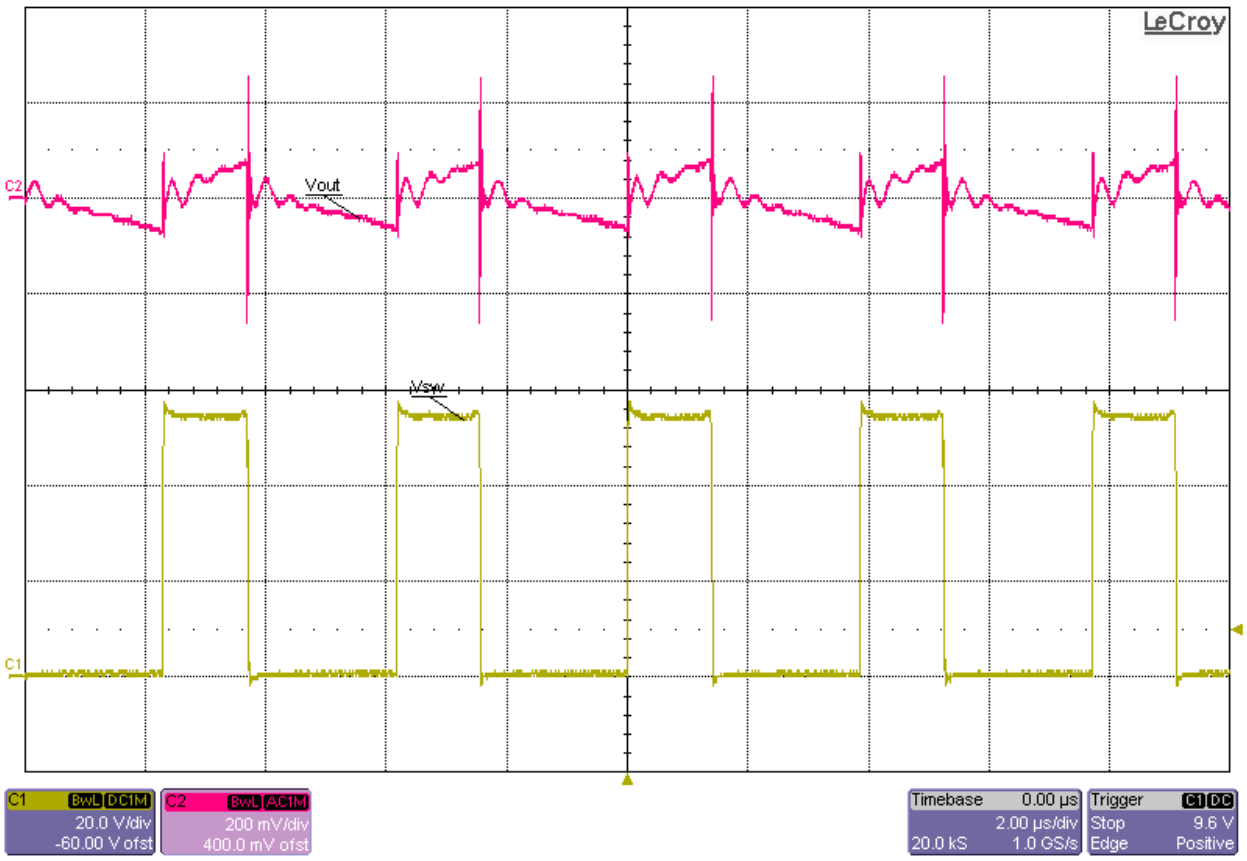
Switch Node Voltage and Output Voltage Ripple at 20Vin, 30Vout, and 0A Load (Vripple ≈ 12mVp-p)



Switch Node Voltage and Output Voltage Ripple at 20Vin, 30Vout, and 3.4A Load (Vripple≈ 110mVp-p)



Switch Node Voltage and Output Voltage Ripple at 20Vin, 54Vout, and 0A Load (Vripple ≈ 16mVp-p)



Switch Node Voltage and Output Voltage Ripple at 20Vin, 54Vout, and 3.4A Load (Vripple≈ 180mVp-p)

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