1   Photos

2 Efficiency

18Vin			Shunt Resistance:	0.001999				
Vshunt mV	Iout	Vout	Vin	Iin	Pin	Pout	Losses	Efficiency
0.00	0.0000	5.970	18.008	0.1046	1.884	0.00	1.88	
8.01	4.0073	5.969	18.014	1.4604	26.308	23.92	2.39	90.9%
15.87	7.9395	5.968	18.021	2.820	50.819	47.38	3.44	93.2%
23.83	11.9217	5.969	18.029	4.202	75.758	71.16	4.60	93.9%
31.79	15.9039	5.968	18.029	5.604	101.035	94.91	6.12	93.9%
39.68	19.8512	5.968	18.037	7.009	126.421	118.47	7.95	93.7%
47.74	23.8834	5.969	18.041	8.468	152.771	142.56	10.21	93.3%
55.53	27.7806	5.968	18.041	9.888	178.389	165.79	12.59	92.9%
61.45	30.7423	5.969	18.000	11.017	198.306	183.50	14.81	92.5%

24Vin								
Vshunt mV	Iout	Vout	Vin	Iin	Pin	Pout	Losses	Efficiency
0.00	0.0000	5.975	23.96	0.0833	1.996	0.00	2.00	
7.97	3.9872	5.972	24.04	1.0894	26.189	23.81	2.38	90.9%
15.88	7.9445	5.970	24.01	2.118	50.853	47.43	3.42	93.3%
23.81	11.9117	5.969	24.02	3.144	75.519	71.10	4.42	94.1%
31.74	15.8789	5.968	24.03	4.177	100.373	94.77	5.61	94.4%
39.67	19.8462	5.968	24.07	5.217	125.573	118.44	7.13	94.3%
47.63	23.8284	5.968	24.03	6.291	151.173	142.21	8.96	94.1%
53.57	26.8001	5.969	24.04	7.100	170.684	159.97	10.71	93.7%
61.58	30.8073	5.969	23.96	8.236	197.335	183.89	13.45	93.2%

48Vin

Vshunt mV	Iout	Vout	Vin	Iin	Pin	Pout	Losses	Efficiency
0.00	0.0000	5.972	48.01	0.0654	3.140	0.00	3.14	
7.95	3.9772	5.971	48.02	0.5635	27.059	23.75	3.31	87.8%
15.88	7.9445	5.970	47.99	1.0840	52.021	47.43	4.59	91.2%
23.87	11.9417	5.970	47.99	1.6062	77.082	71.29	5.79	92.5%
31.73	15.8739	5.969	48.00	2.116	101.568	94.75	6.82	93.3%
39.67	19.8462	5.970	48.01	2.639	126.698	118.48	8.22	93.5%
47.65	23.8384	5.970	47.99	3.172	152.224	142.32	9.91	93.5%
55.54	27.7856	5.970	48.00	3.703	177.744	165.88	11.86	93.3%
61.50	30.7673	5.970	48.05	4.105	197.245	183.68	13.56	93.1%

60Vin

Vshunt mV	Iout	Vout	Vin	Iin	Pin	Pout	Losses	Efficiency
0.00	0.0000	5.975	60.01	0.0596	3.577	0.00	3.58	
7.99	3.9972	5.972	60.02	0.4601	27.615	23.87	3.74	86.4%
16.00	8.0045	5.971	60.00	0.8848	53.088	47.79	5.29	90.0%
23.83	11.9217	5.970	60.00	1.2986	77.916	71.17	6.74	91.3%
31.73	15.8739	5.971	60.00	1.7117	102.702	94.78	7.92	92.3%
39.73	19.8762	5.969	60.00	2.131	127.860	118.64	9.22	92.8%
47.61	23.8184	5.970	60.01	2.553	153.206	142.20	11.01	92.8%
55.72	27.8757	5.970	60.00	2.990	179.400	166.42	12.98	92.8%
61.49	30.7623	5.970	60.02	3.304	198.306	183.65	14.66	92.6%

3 Thermal

The thermal images below show the circuit board with a 31A load. The ambient temperature was 25C with approximately 250LFM of air flow.

3.1 24V Input

Area analysis	Value	
Q4Max	60.2°C	NO.1
Q6Max	61.1°C	
T1Max	74.2°C	
Q7Max	72.5°C	
Q1Max	76.6°C	
Q2Max	76.9°C	
Q5Max	76.1°C	
L1 Max	54.6°C	
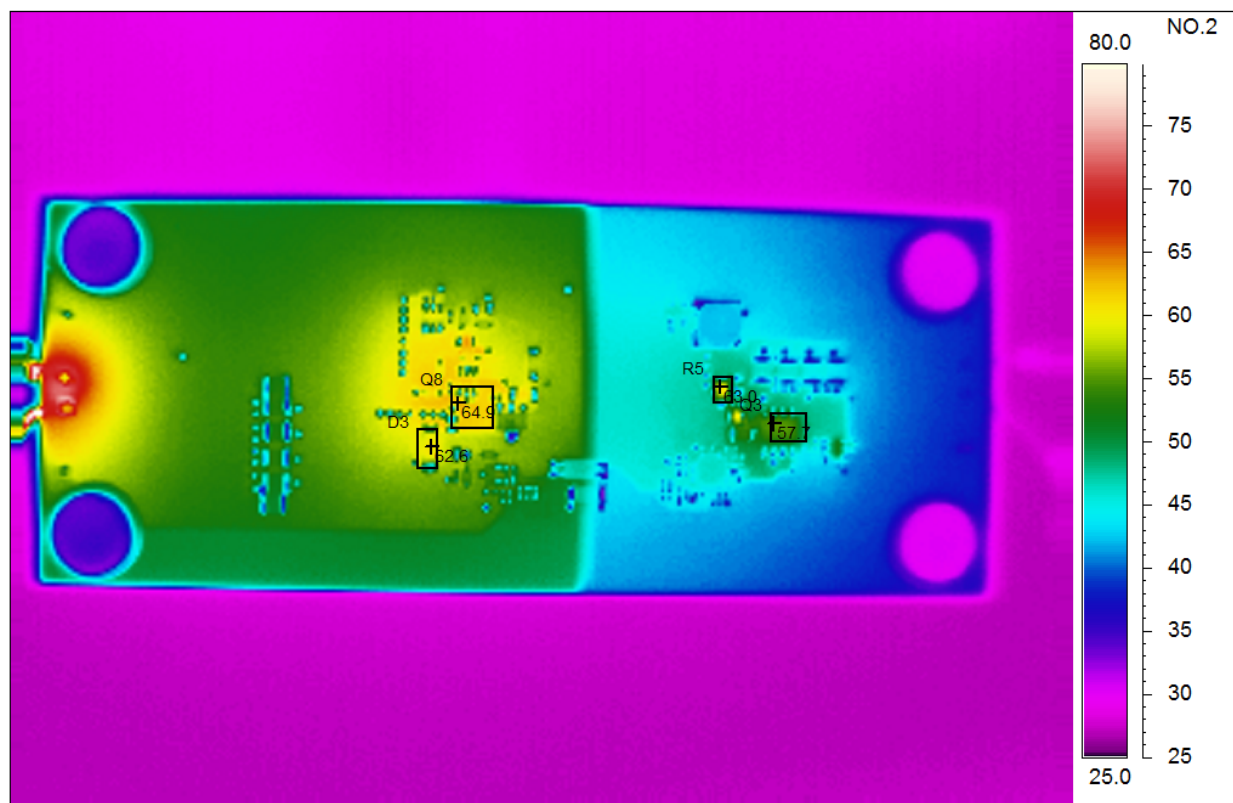
Area analysis	Value	NO.2
D3Max	62.6°C	
Q8Max	64.9°C	
Q3Max	57.7°C	
R5 Max	63.0°C	

3.2   48V Input
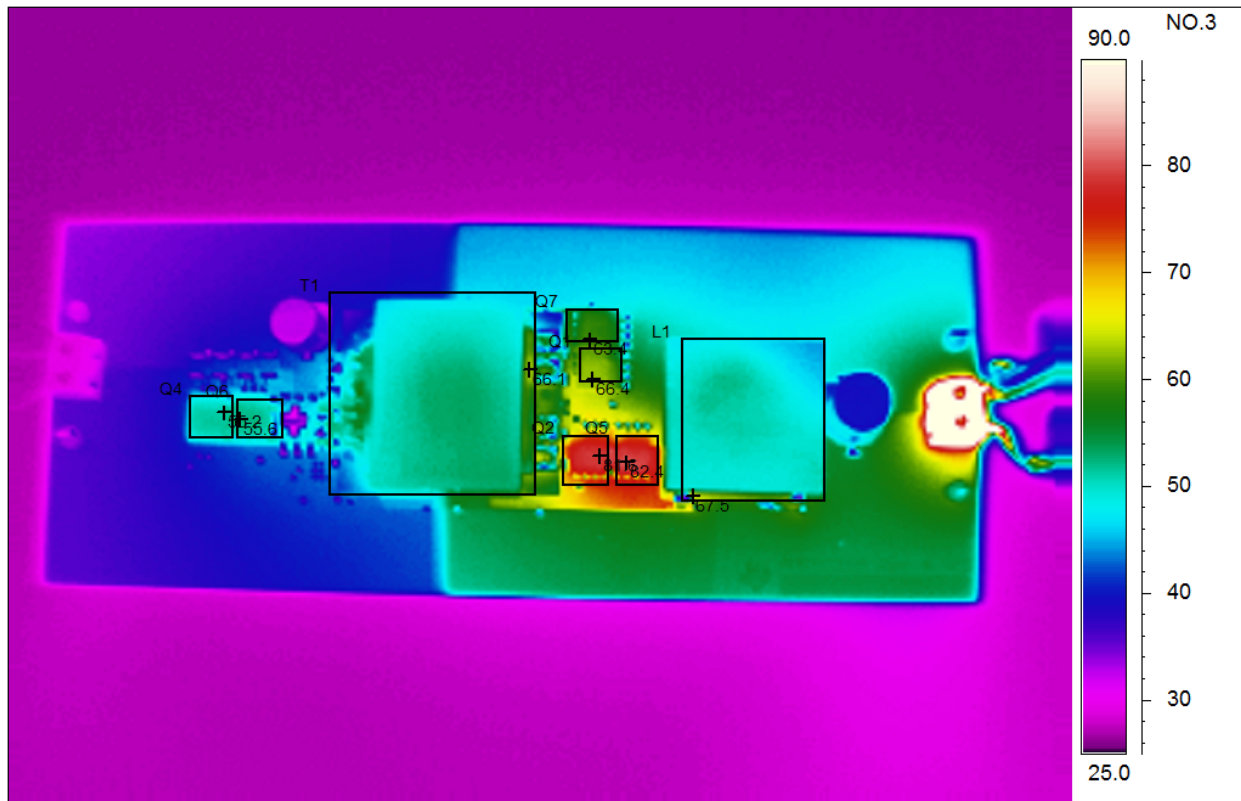
Area analysis	Value
Q4 Max	55.2°C
Q6Max	55.6°C
T1Max	66.1°C
Q7Max	63.4°C
Q1Max	66.4°C
Q2Max	81.6°C
Q5Max	82.4°C
L1 Max	67.5°C

NO.3
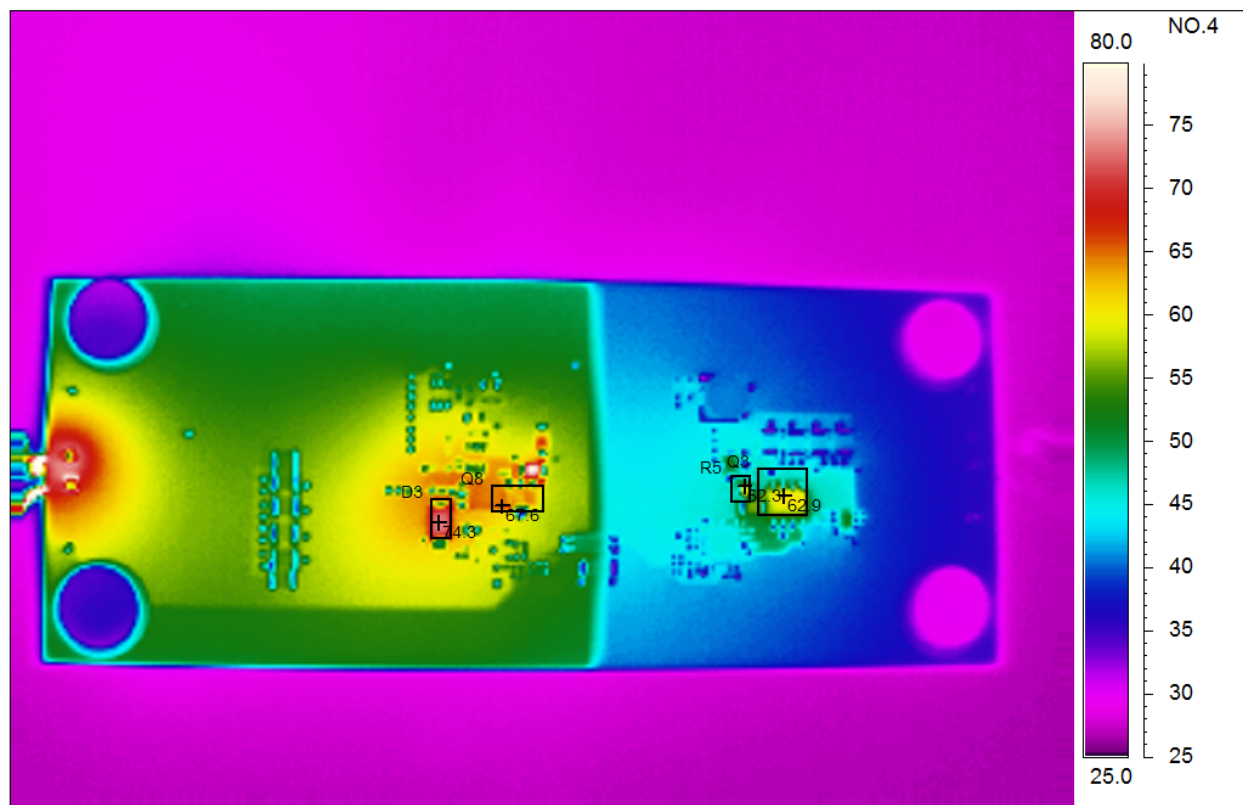
Area analysis	Value
D3 Max	74.3°C
Q8Max	67.6°C
Q3Max	62.9°C
R5 Max	62.3°C

NO.4

Power Management Solutions

4 Startup

4.1 18V Input, No Load
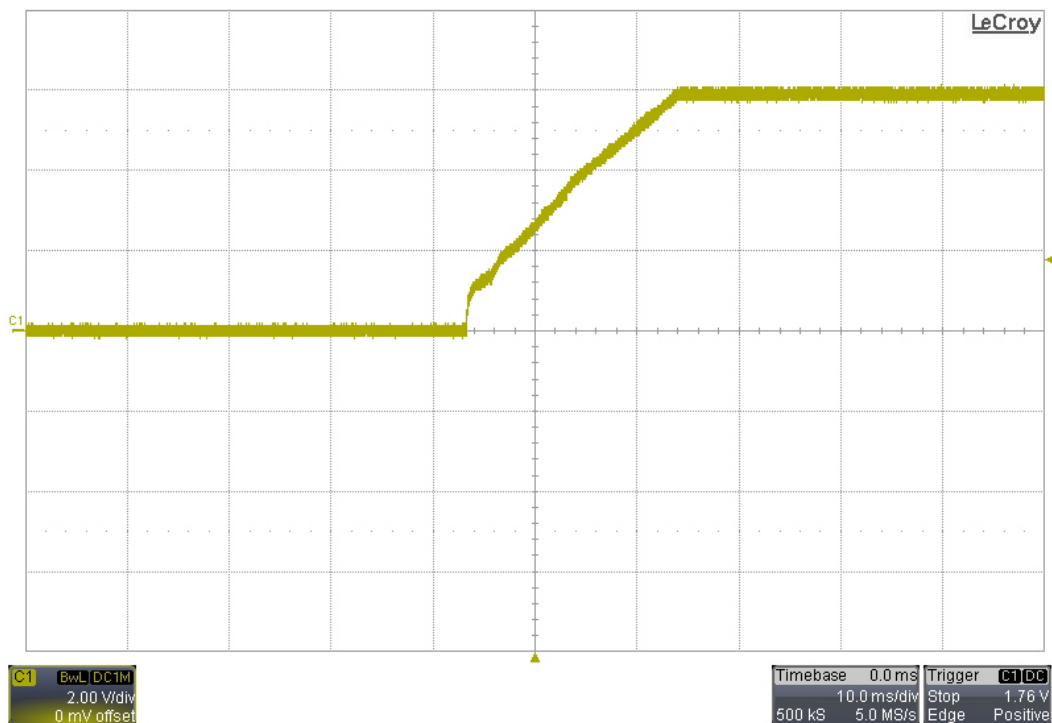
4.2 60V Input, No Load
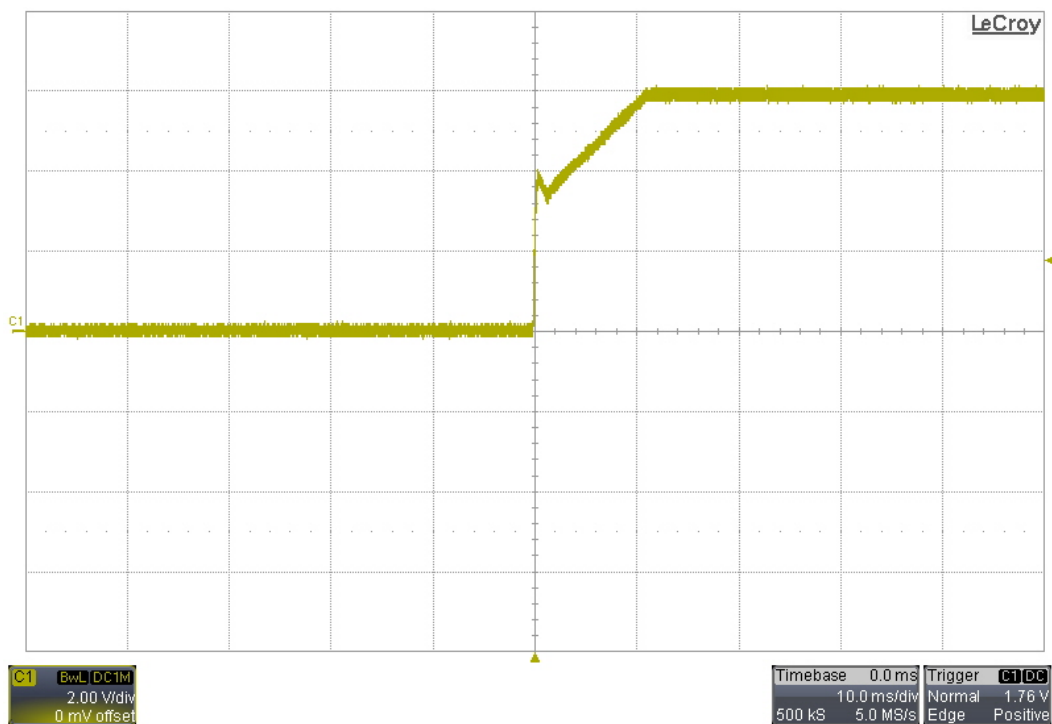
4.3 18V Input, 0.5Ω Load
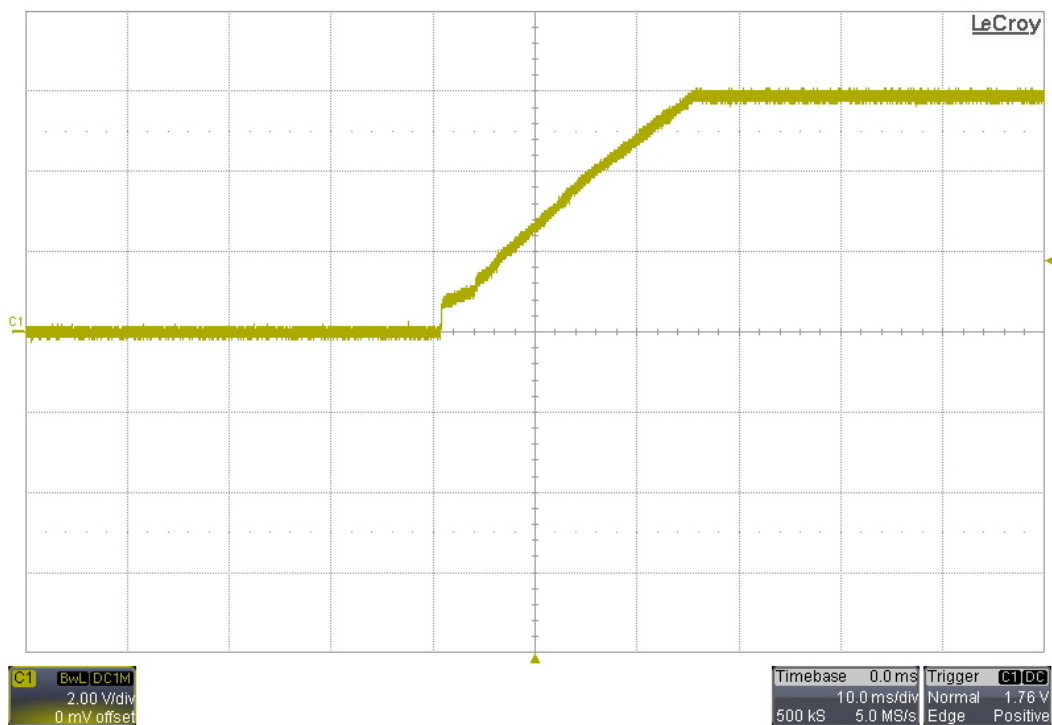
4.4 60V Input, 0.5Ω Load
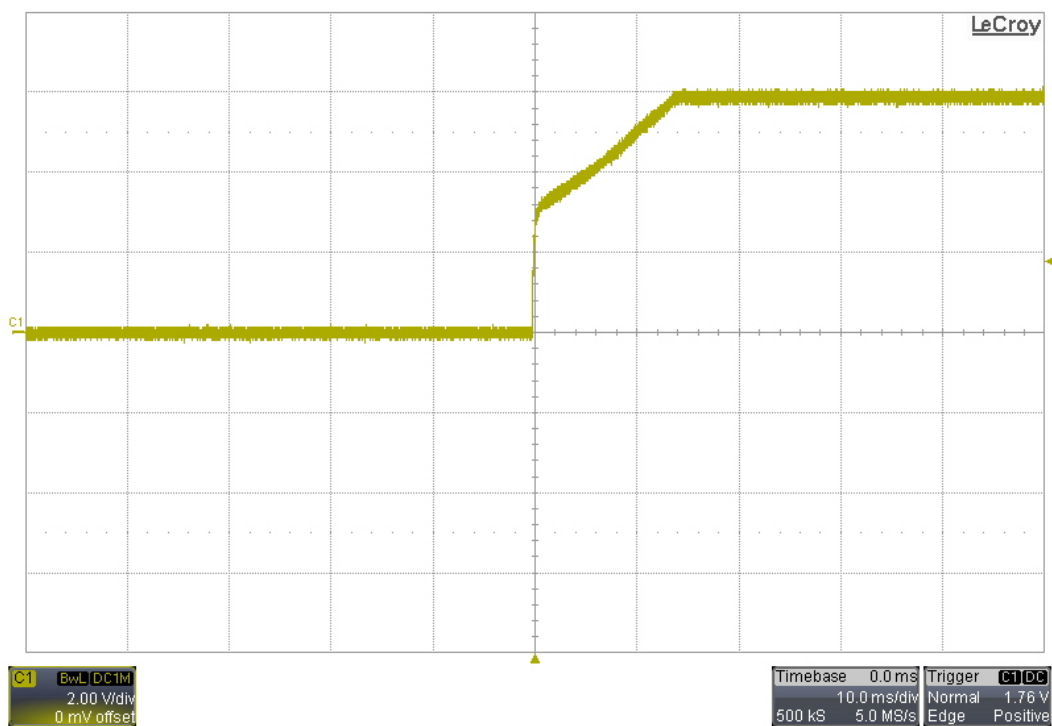
5   Output Ripple Voltage

5.1   18V Input, 31A Load
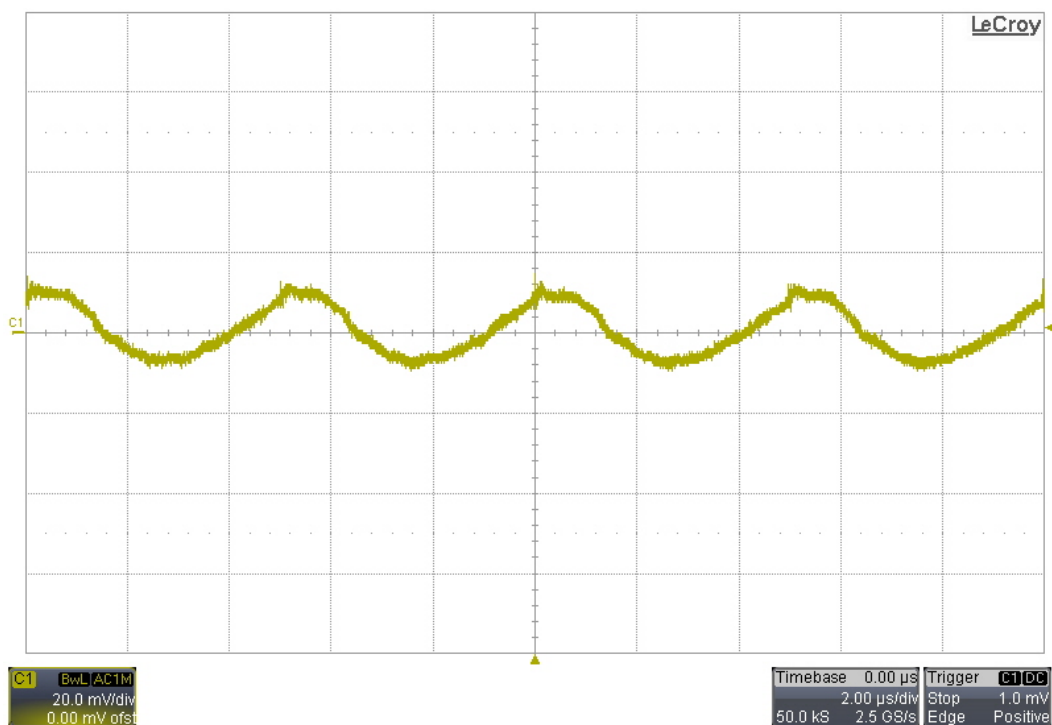
5.2   60V Input, 31A Load
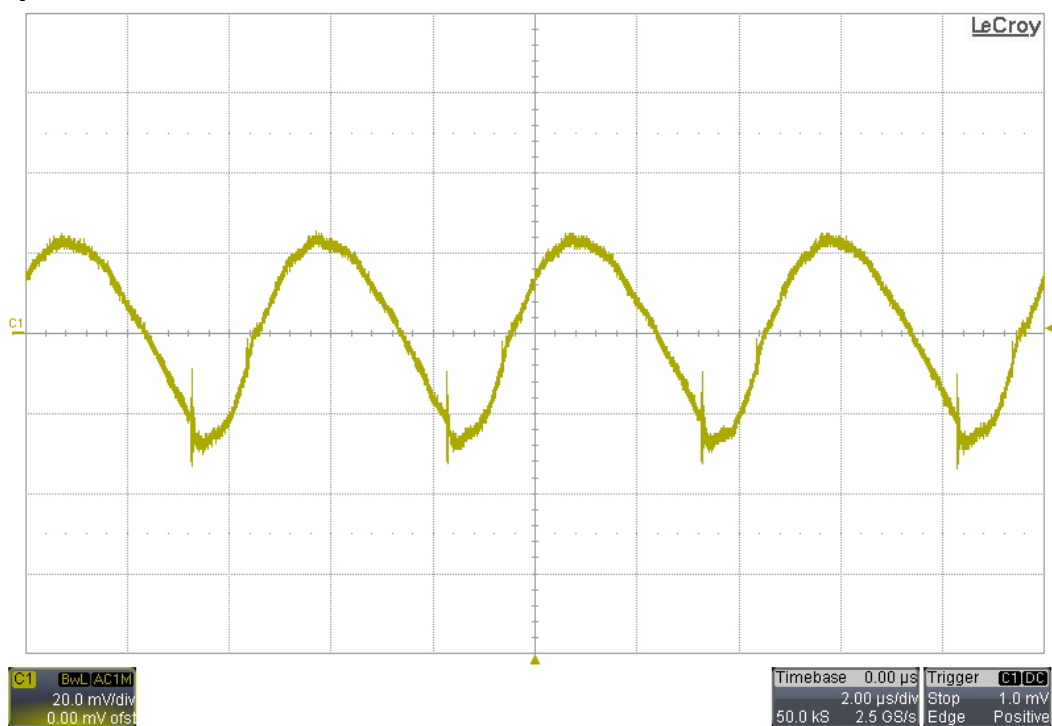
6 Frequency Response
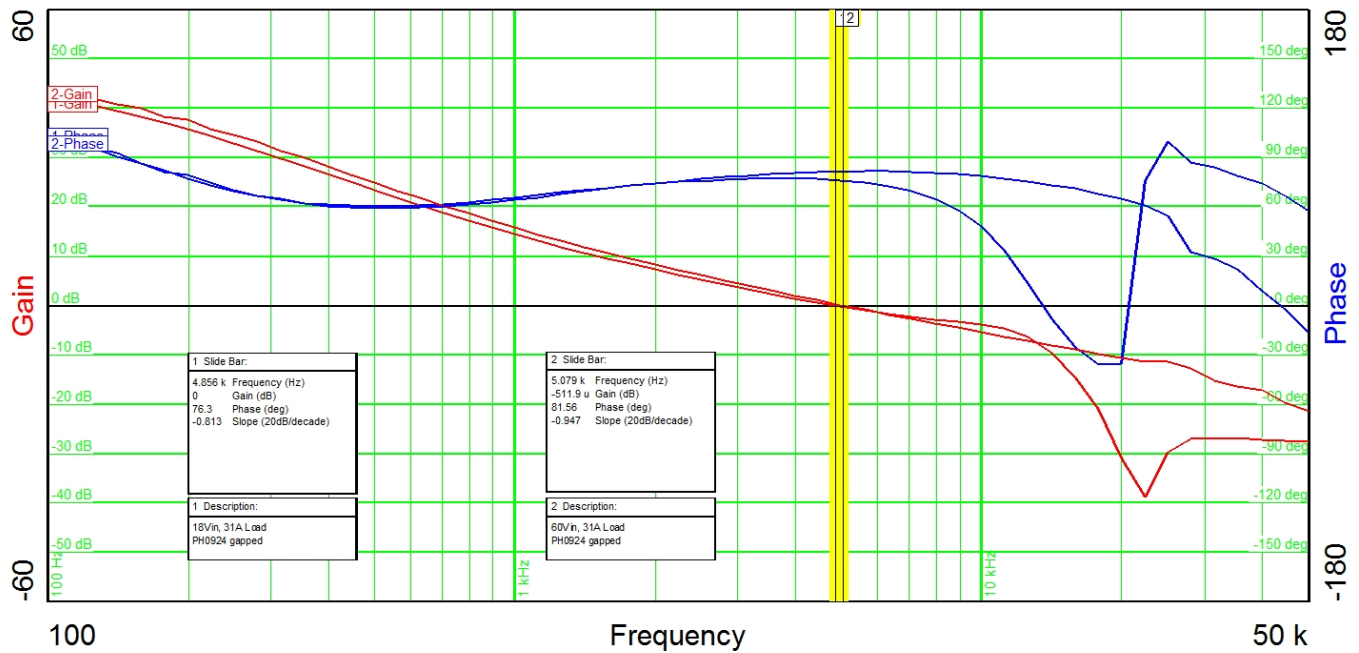
7 Load Transients

7.1 18V Input
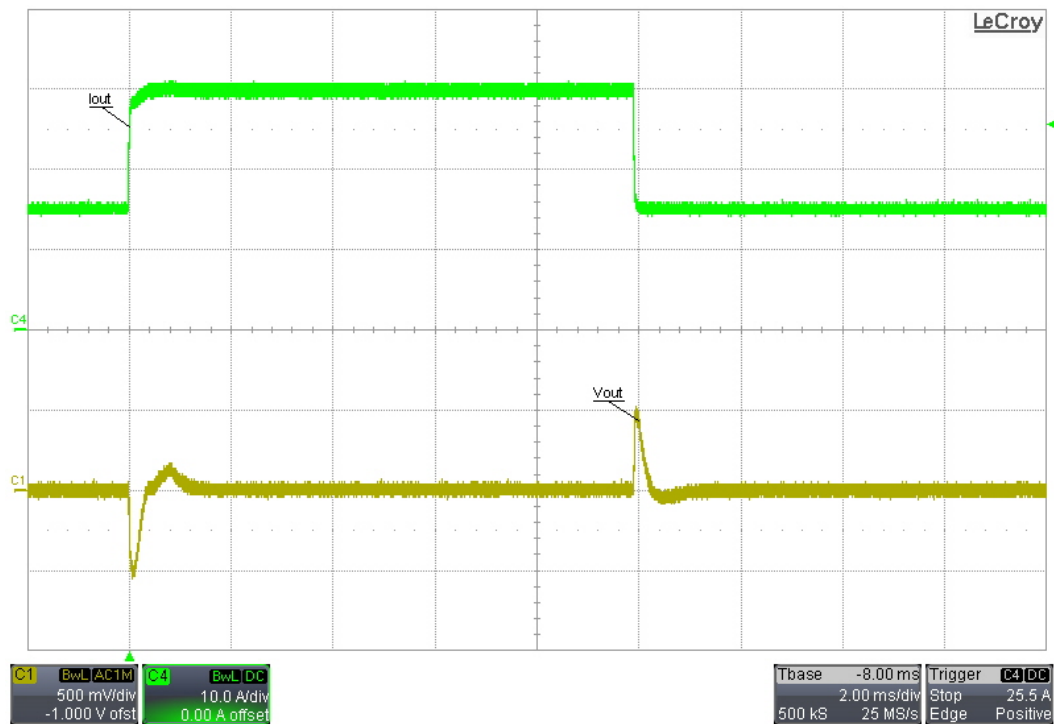
7.2   60V Input
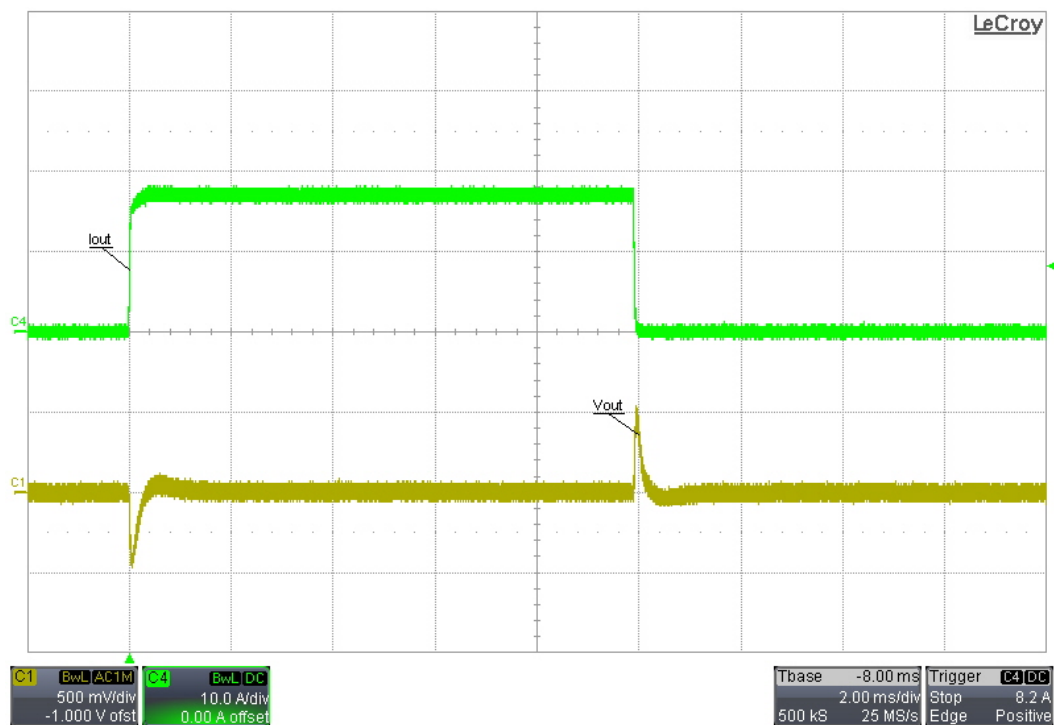
8   Switching Waveforms

8.1   Primary FET Vds (Q4 & Q6) – 18Vin, 31A Load
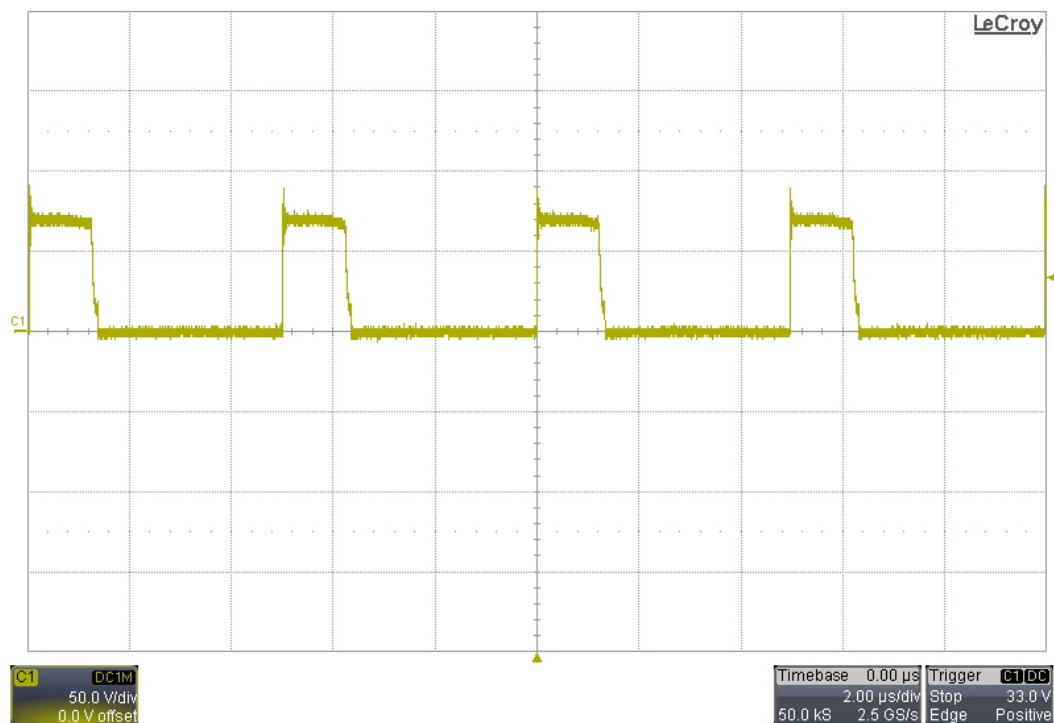
8.2   Primary FET Vds (Q4 & Q6) – 60Vin, 31A Load
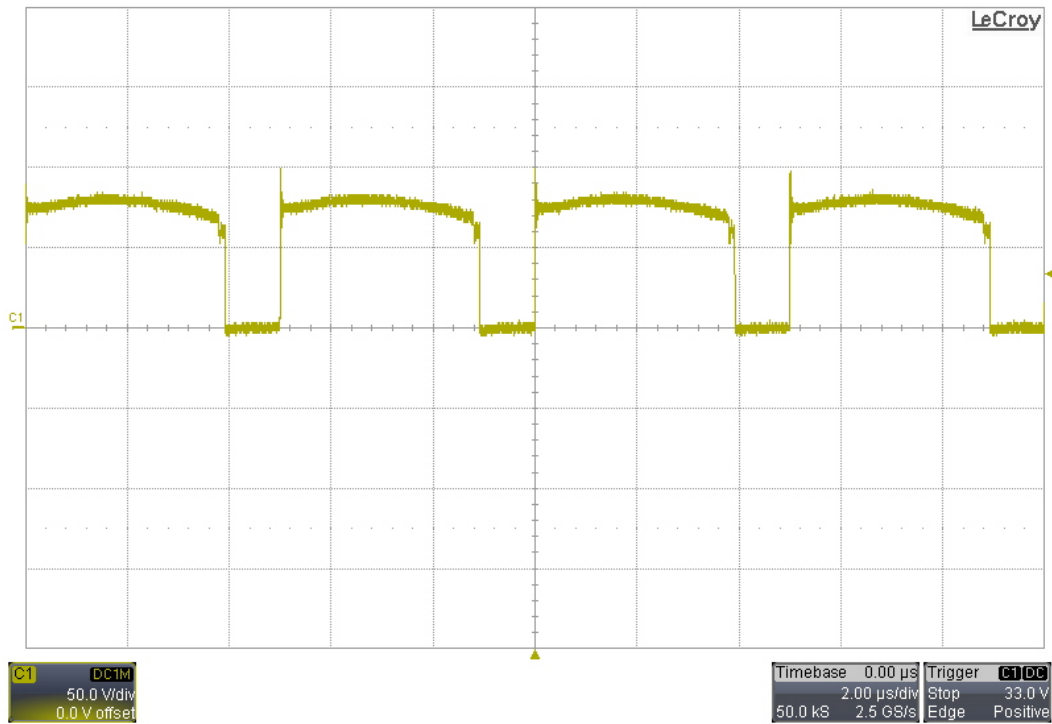
8.3   Sync FET Vds (Q1 & Q7) – 18Vin, 31A Load
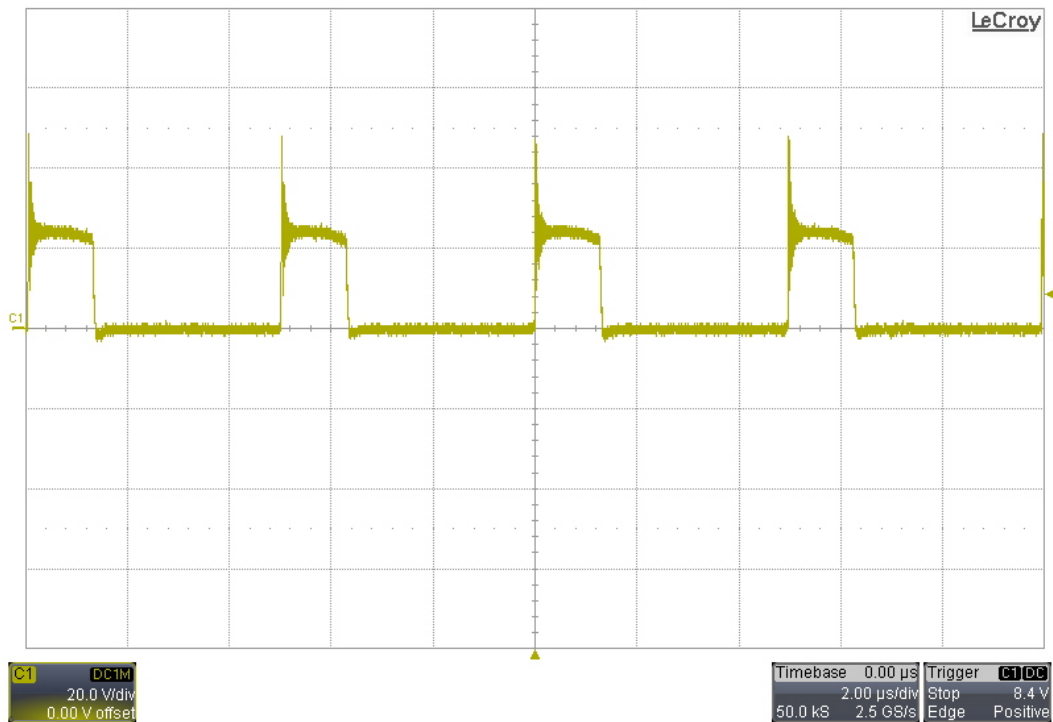
8.4 Sync FET Vds (Q1 & Q7) – 60Vin, 31A Load
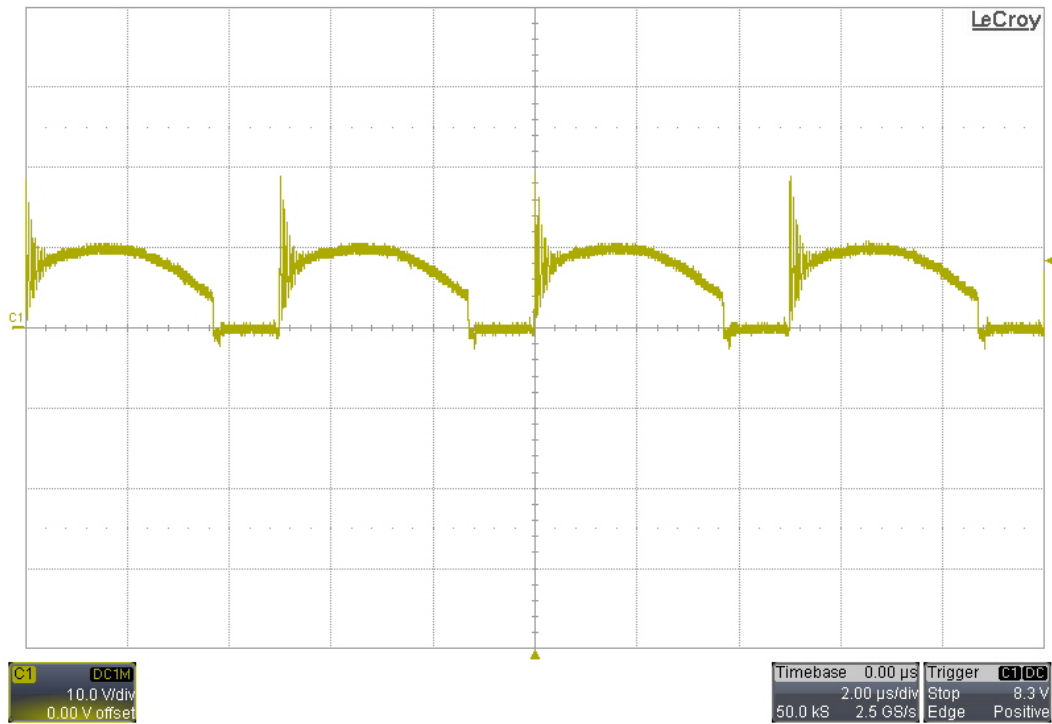
8.5 Sync FETs Vds (Q2 & Q5) – 18Vin, 31A Load
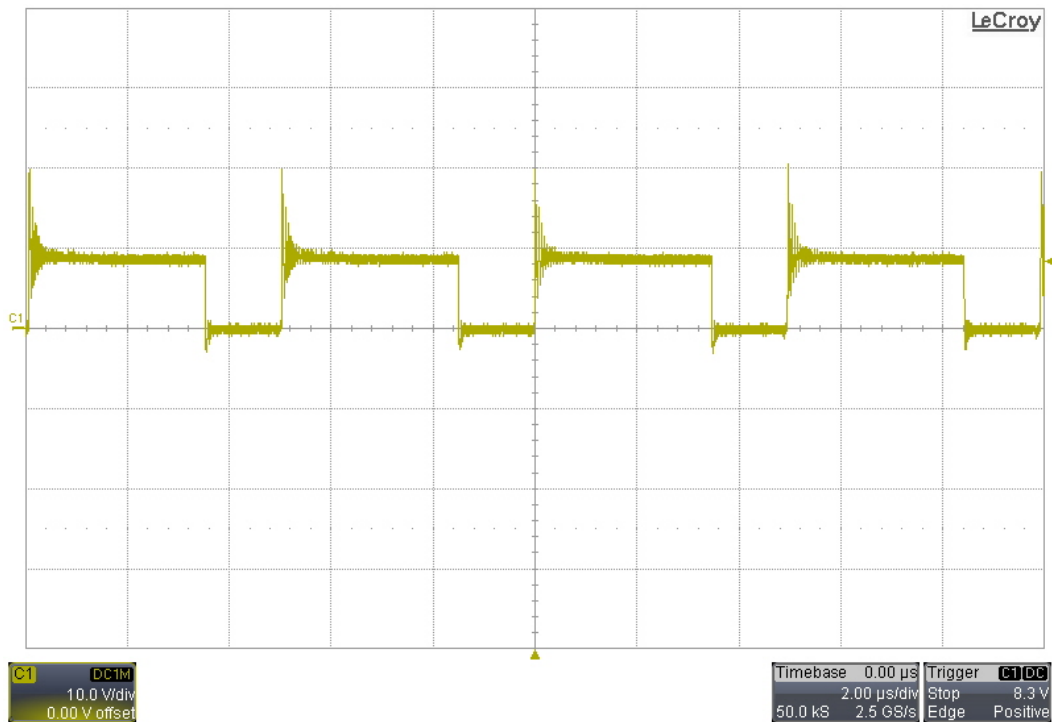
8.6   Sync FET Vds (Q2 & q5) – 60Vin, 31A Load
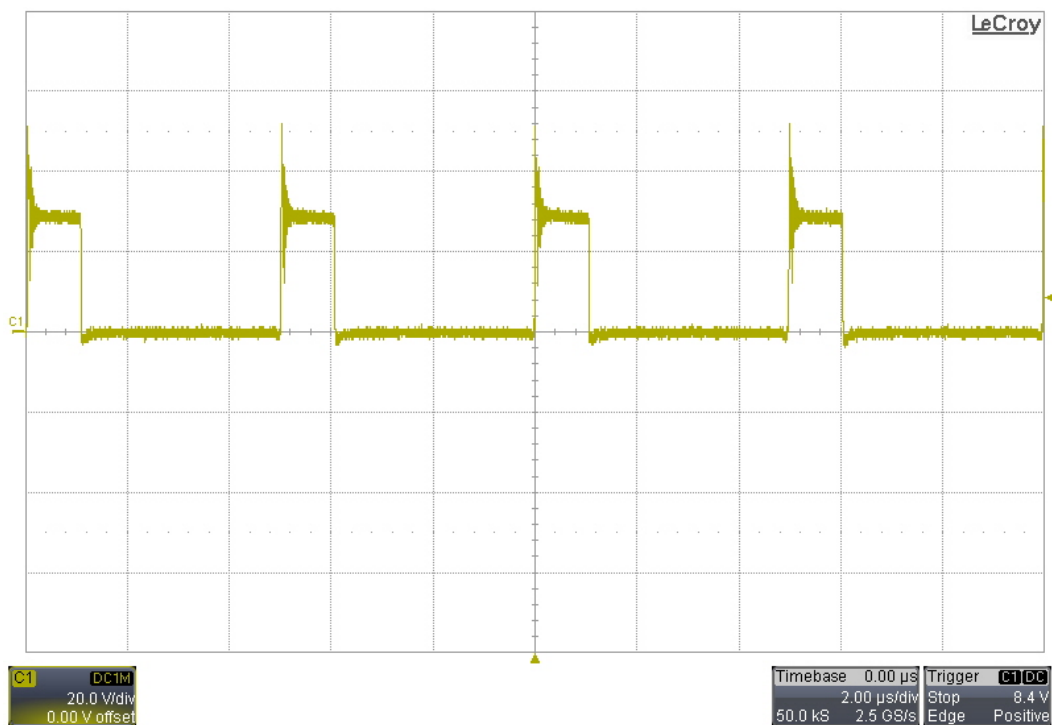
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