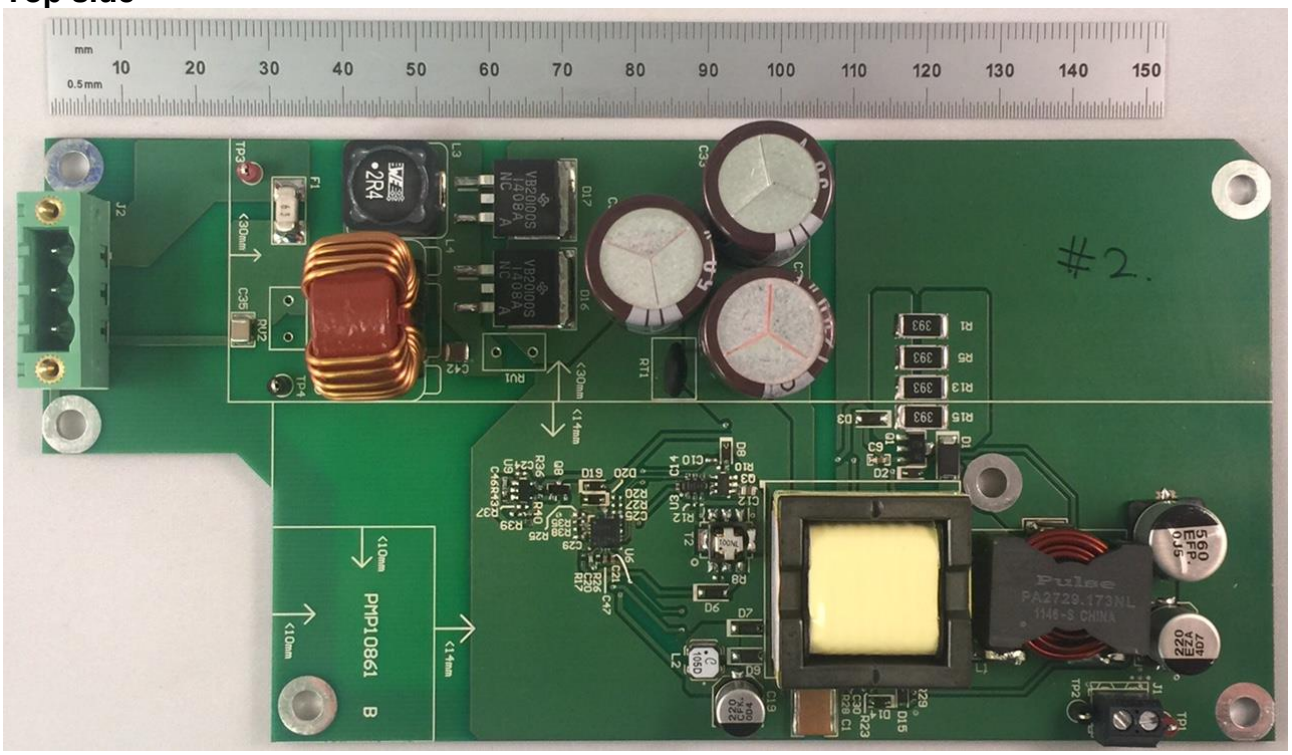
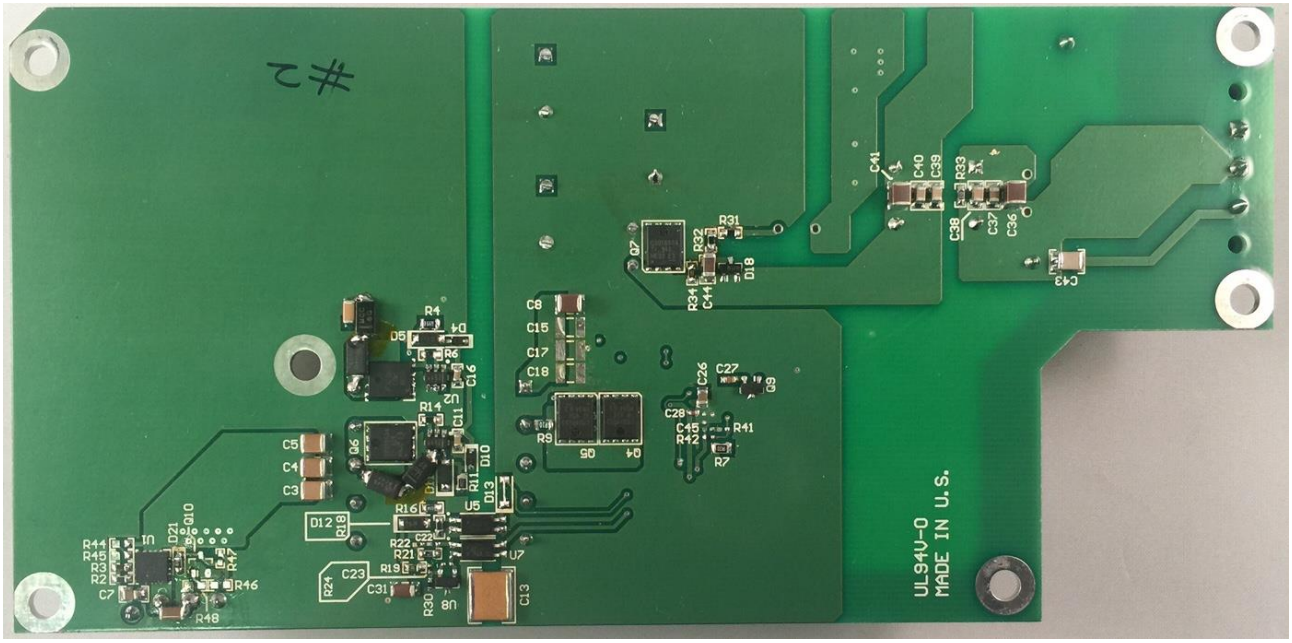
1 Photo

The photographs below show the PMP10861 Rev B assembly. This circuit was built on a PMP10861 Rev B PCB.

Top side

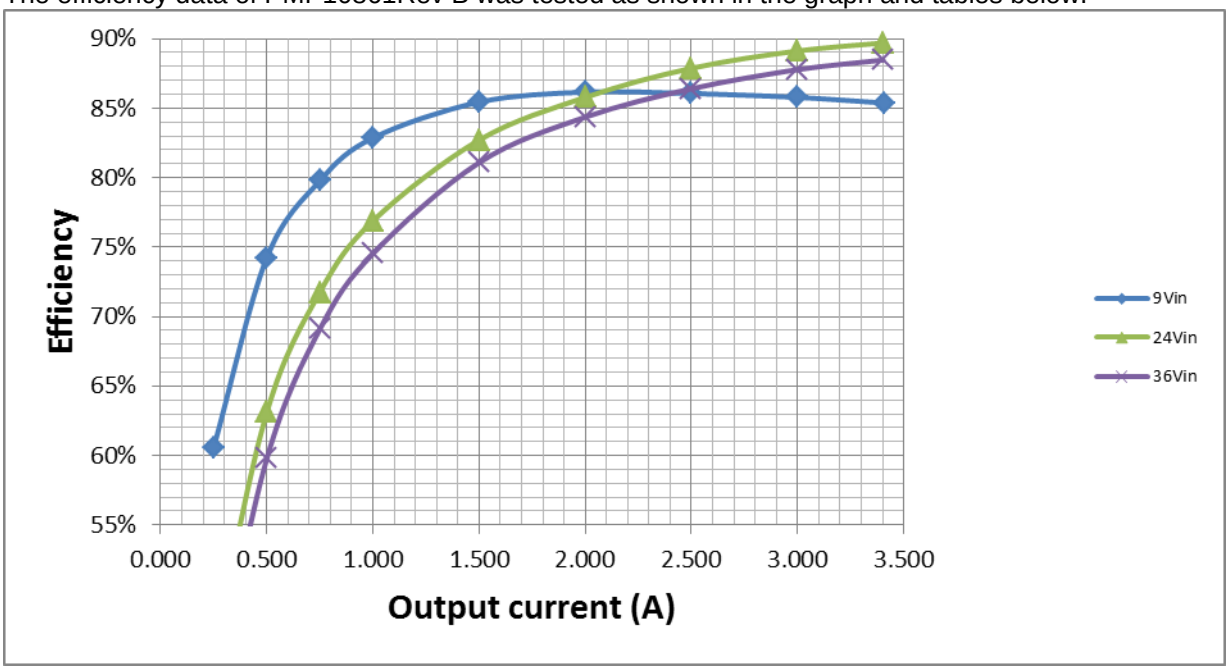


Bottom side



2 Converter Efficiency

The efficiency data of PMP10861Rev B was tested as shown in the graph and tables below.



$9V_{in}$

Vin(V)	Iin(A)	Pin(W)	Vout(V)	Iout(A)	Pout(W)	Eff. (%)
9.04	5.231	47.288	11.84	3.410	40.374	85.38%
9.04	4.586	41.457	11.85	3.001	35.562	85.78%
9.04	3.813	34.470	11.87	2.499	29.663	86.06%
9.04	3.053	27.599	11.89	2.000	23.780	86.16%
9.04	2.313	20.910	11.91	1.500	17.865	85.44%
9.04	1.594	14.410	11.93	1.001	11.942	82.87%
9.03	1.243	11.224	11.94	0.750	8.955	79.78%
9.03	0.89	8.037	11.95	0.499	5.963	74.20%
9.03	0.545	4.921	11.96	0.249	2.978	60.51%
9.03	0.206	1.860	11.97	0.000	0.000	0.00%

24V$_{in}$

Vin(V)	Iin(A)	Pin(W)	Vo1(V)	Io1(A)	Pout(W)	Eff. (%)
24.02	1.871	44.941	11.84	3.405	40.315	89.71%
24.02	1.662	39.921	11.86	3.000	35.580	89.13%
24.02	1.407	33.796	11.88	2.500	29.700	87.88%
24.02	1.155	27.743	11.9	2.000	23.800	85.79%
24.02	0.9	21.618	11.92	1.500	17.880	82.71%
24.02	0.647	15.541	11.94	1.001	11.952	76.91%
24.02	0.52	12.490	11.95	0.750	8.963	71.76%
24.02	0.395	9.488	11.96	0.501	5.992	63.15%
24.02	0.27	6.485	11.97	0.249	2.981	45.96%
24.02	0.147	3.531	11.98	0.000	0.000	0.00%

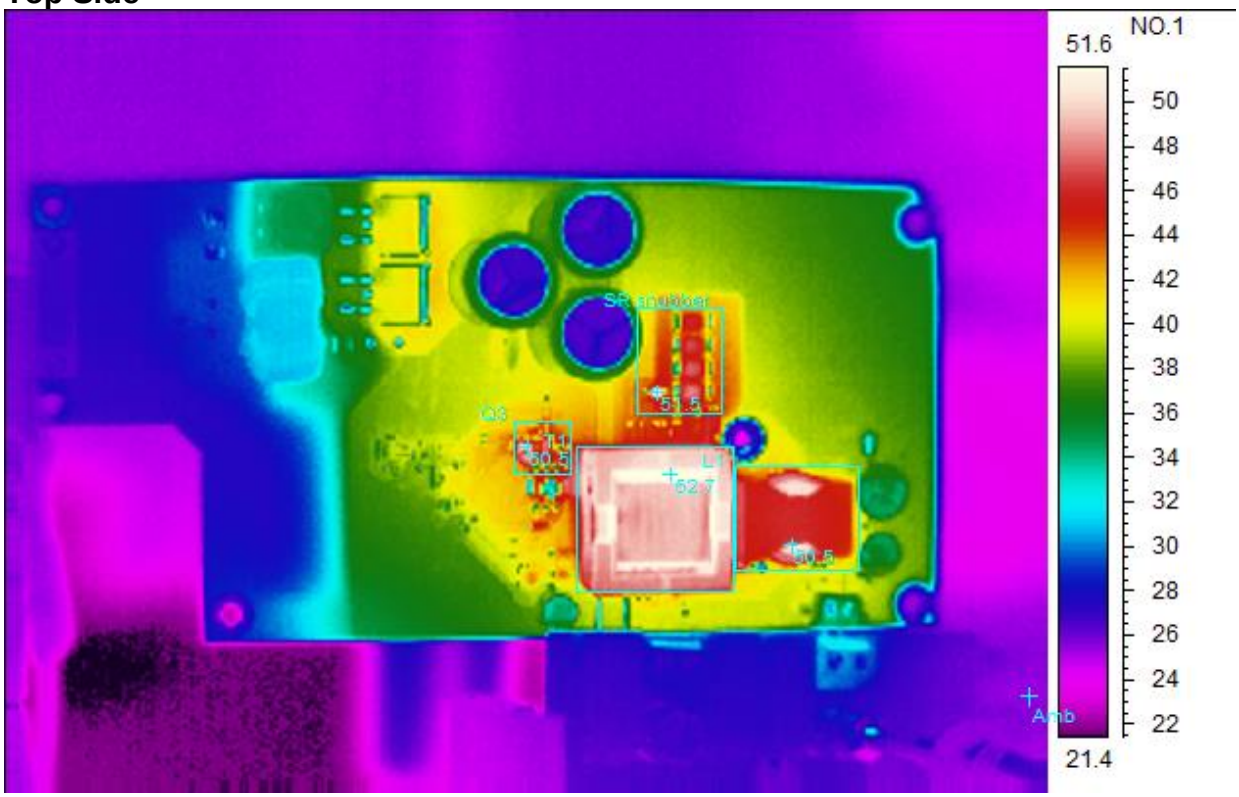
36V$_{in}$

Vin(V)	Iin(A)	Pin(W)	Vo1(V)	Io1(A)	Pout(W)	Eff. (%)
36.03	1.264	45.542	11.84	3.403	40.292	88.47%
36.03	1.125	40.534	11.86	3.000	35.580	87.78%
36.03	0.954	34.373	11.88	2.500	29.700	86.41%
36.03	0.783	28.211	11.9	2.000	23.800	84.36%
36.03	0.612	22.050	11.92	1.500	17.880	81.09%
36.03	0.445	16.033	11.94	1.001	11.952	74.54%
36.03	0.36	12.971	11.95	0.750	8.963	69.10%
36.03	0.278	10.016	11.96	0.501	5.992	59.82%
36.03	0.196	7.062	11.97	0.251	3.004	42.54%
36.03	0.113	4.071	11.98	0.000	0.000	0.00%

3 Thermal Images

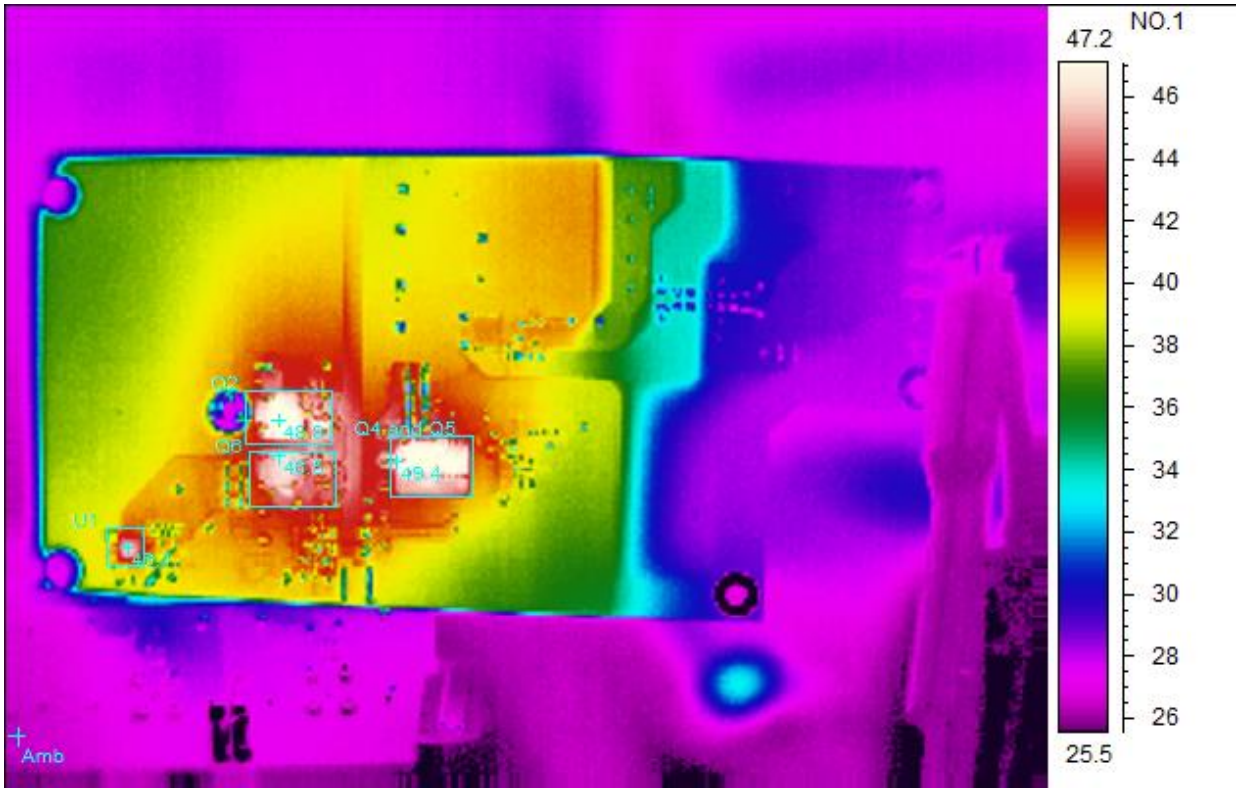
The thermal images below show a top view and bottom view of the board at 24V input. The ambient temperature was 20ºC with no forced air flow. The output was loaded with 12V/3.4A.

Top Side



Spot analysis	Value
Amb Temperature	25.8°C
Area analysis	**Value**
T1Max	52.7°C
L1Max	50.5°C
Q3Max	50.5°C
SR snubberMax	51.5°C

Bottom Side



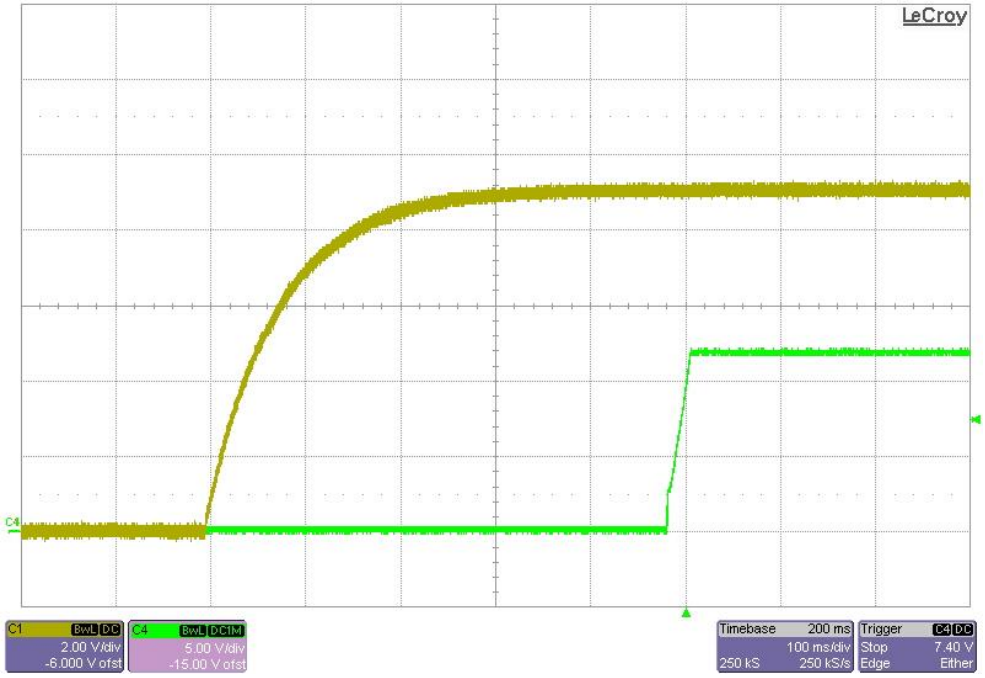
Spot analysis	Value
Amb Temperature	26.5°C
Area analysis	**Value**
Q2Max	48.9°C
Q6Max	46.5°C
Q4 and Q5Max	49.4°C
U1Max	46.1°C

4 Startup

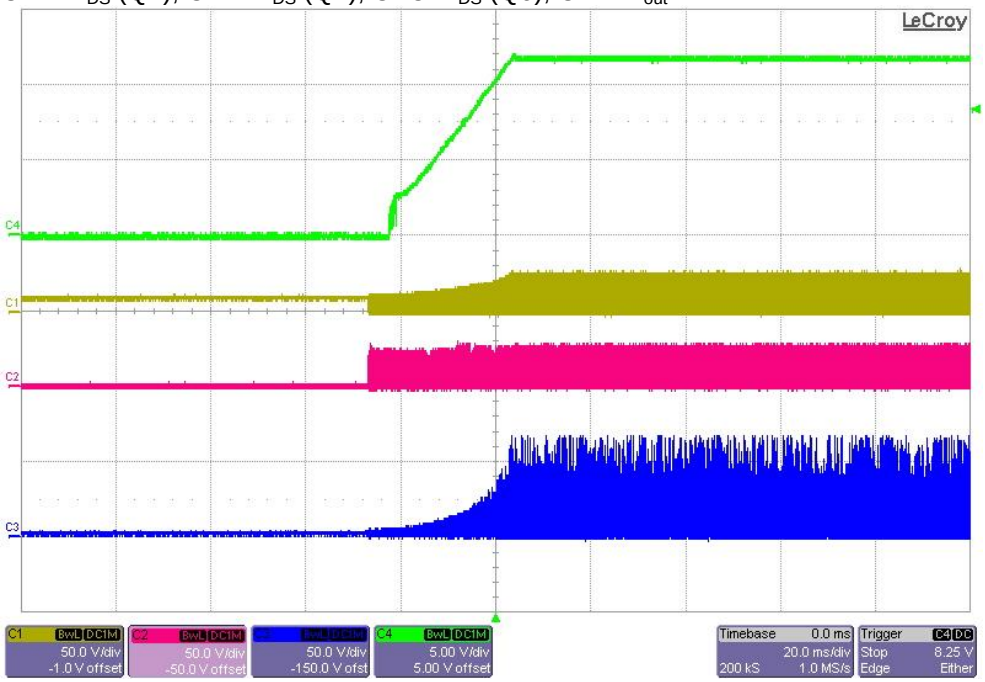
The output voltages at startup are shown in the images below.

4.1 Full load startup @ 9V_{in}, 12V_{out}/3.4Ω load.

CH1: V_{in}, CH4: V_{out}

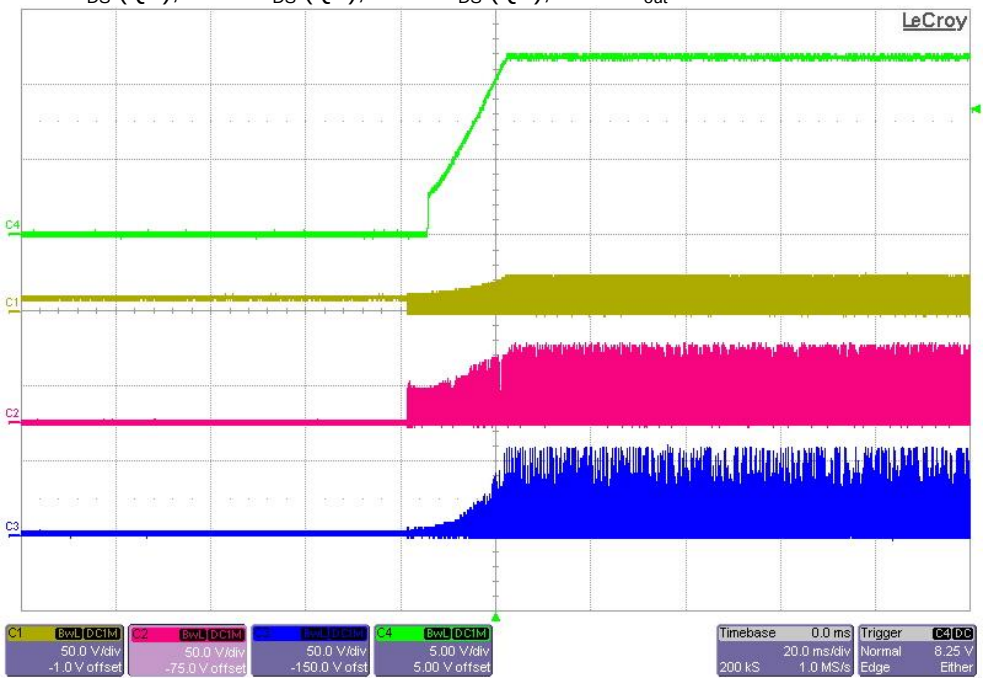


CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}



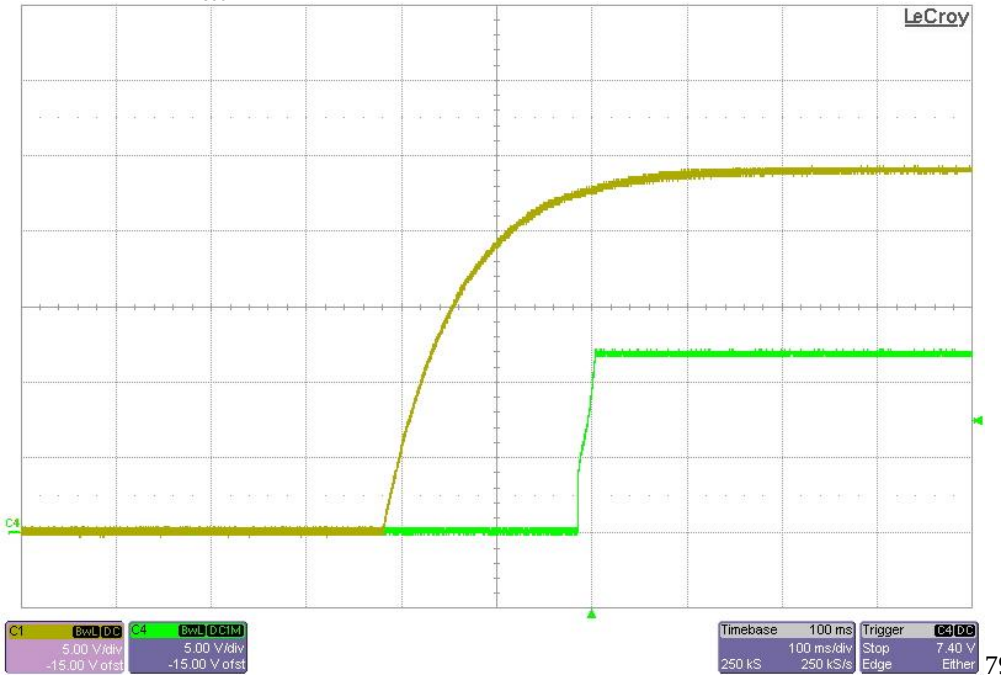
4.2 No load startup @ $9V_{in}$, $12V_{out}$/0A.

CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}



4.3 Full load startup @ 24V_{in}, 12V_{out}/3.4Ω load.

CH1: V_{in}, CH4: V_{out}



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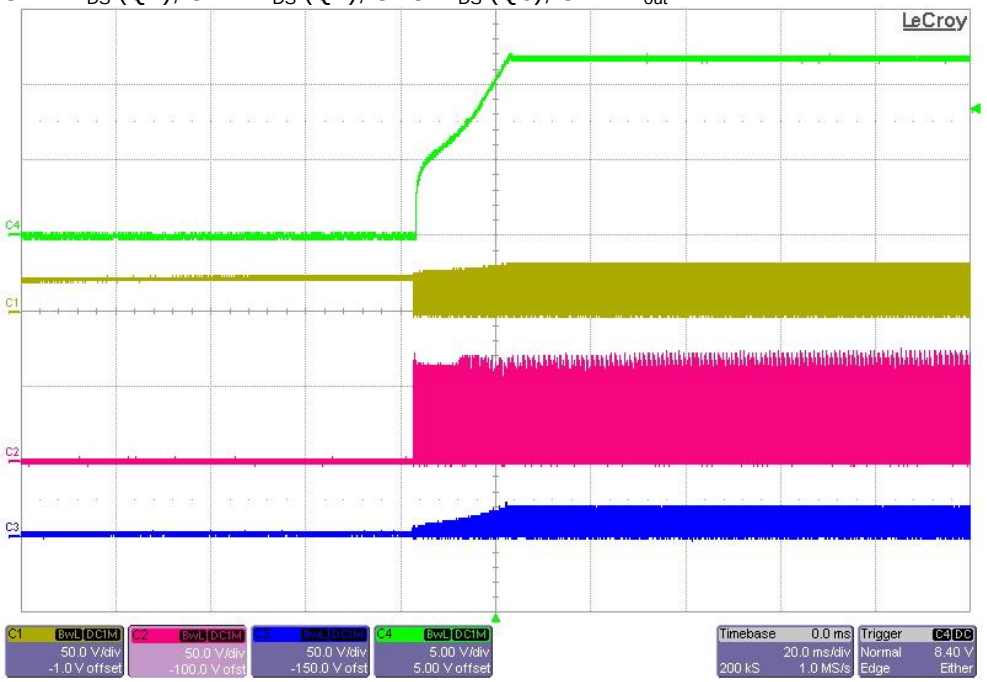
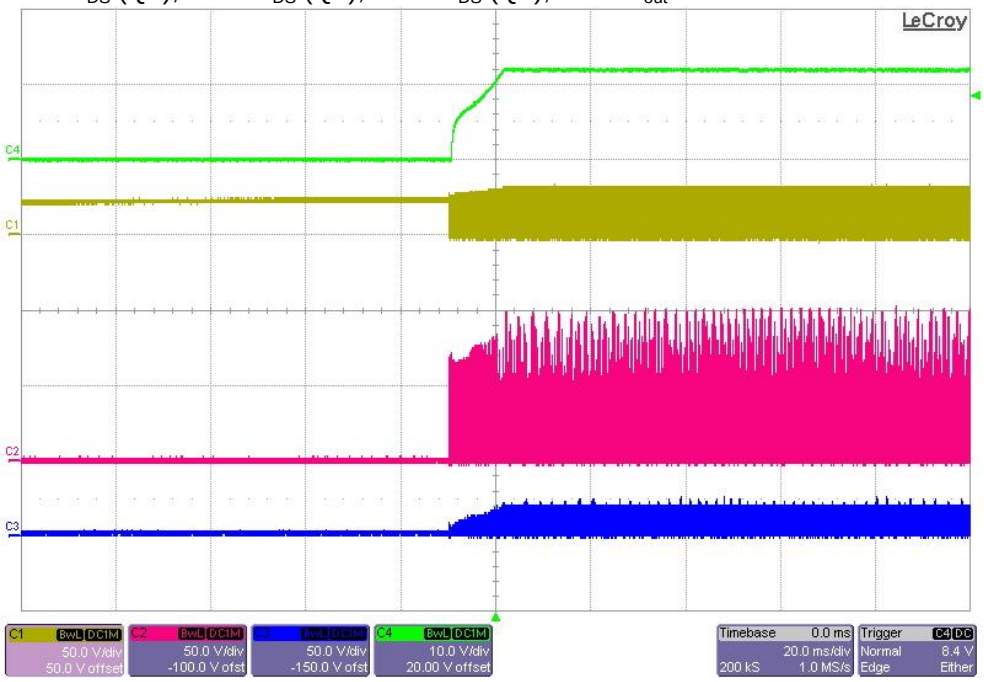
CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}



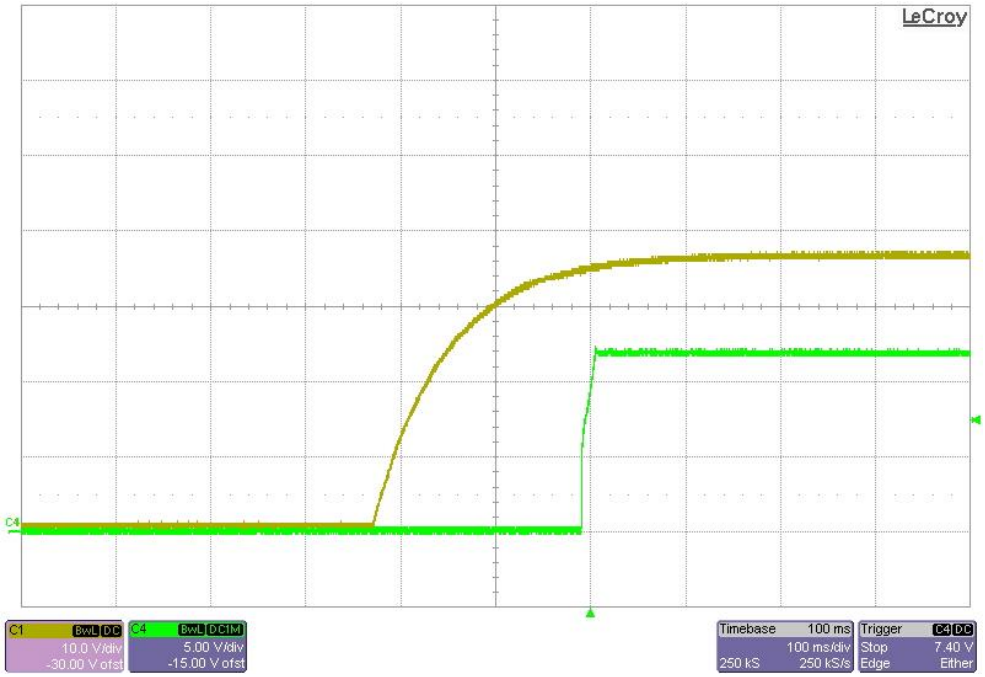
4.4 No load startup @ 24V_{in}, 12V_{out}/0A.

CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}

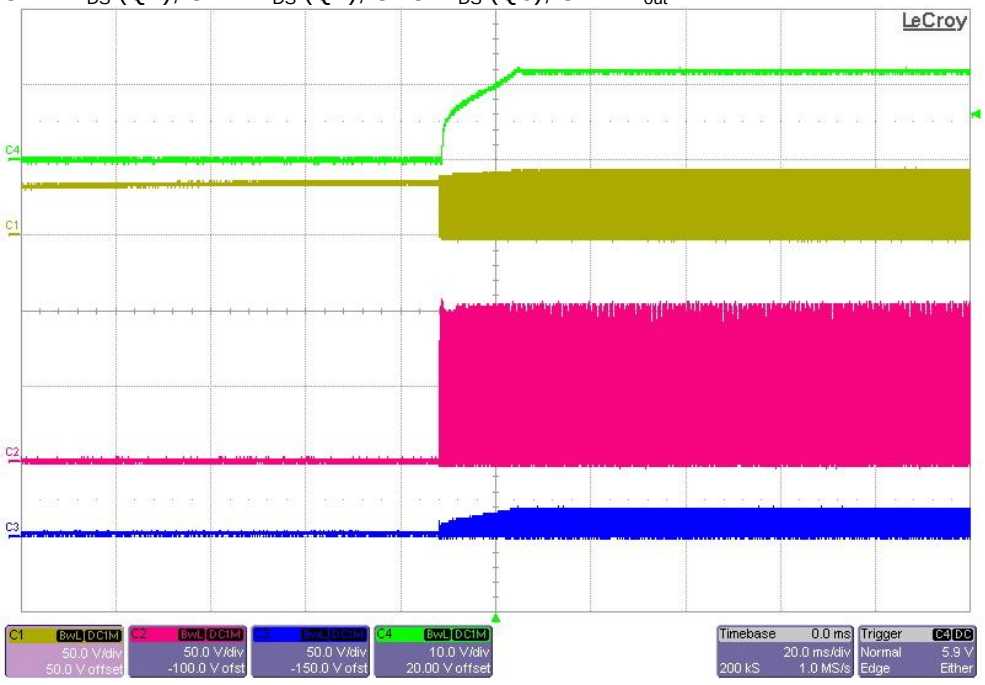


4.5 Full load startup @ 36V_{in}, 12V_{out}/3.4Ω load.

CH1: V_{in}, CH4: V_{out}

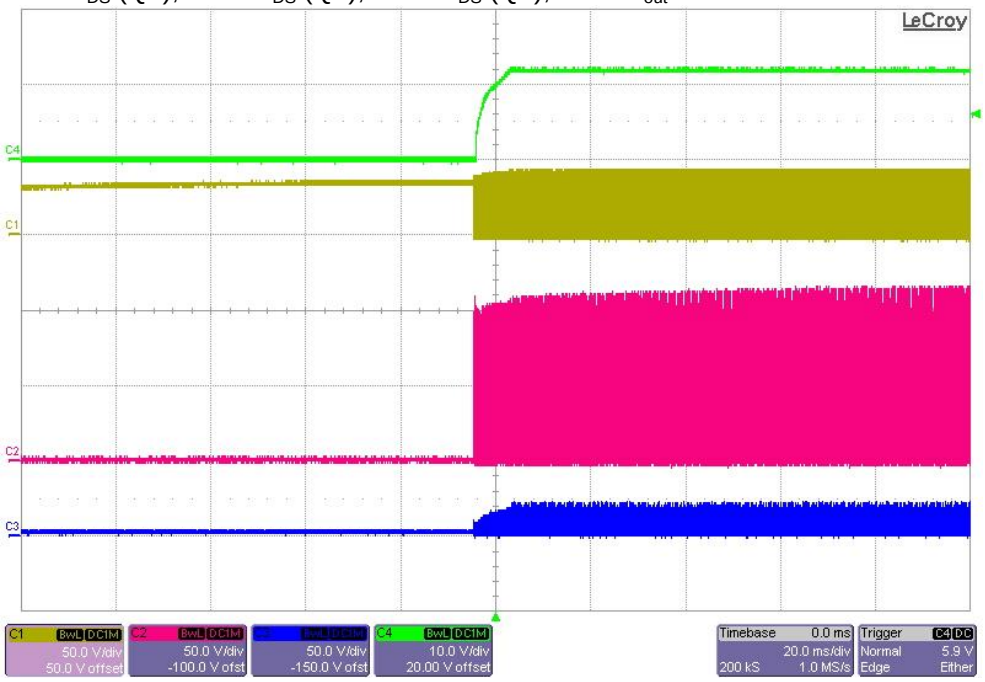


CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}



4.6 No load startup @ 36V_{in}, 12V_{out}/0A.

CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}

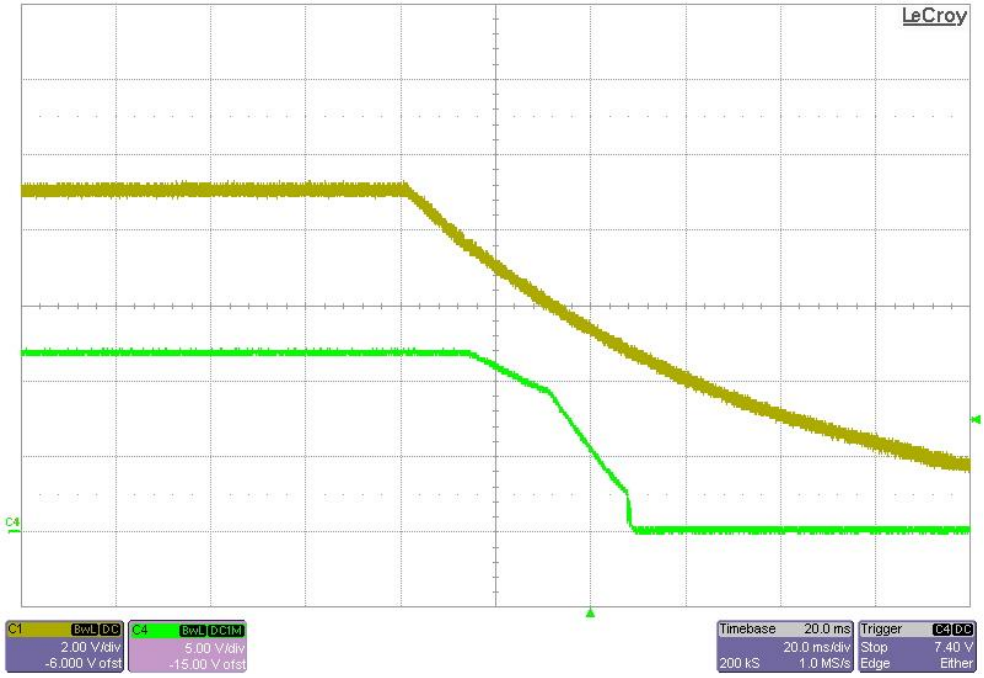


5 Turn-off

The output voltages at turn-off with 3.4Ω load resistor are shown in the images below.

5.1 9V_{in}

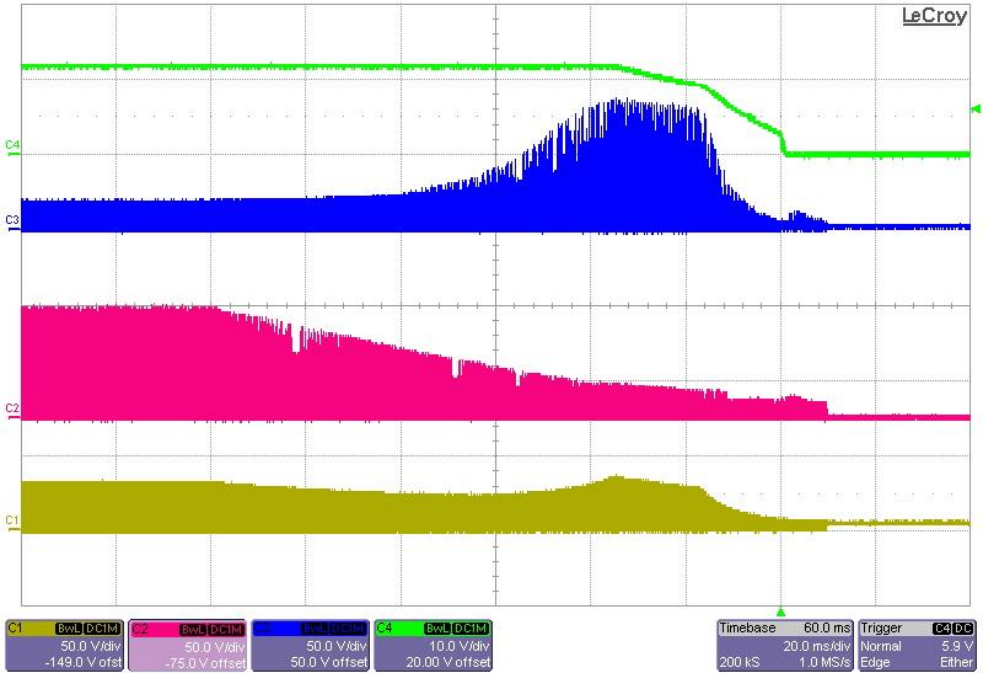
CH1: V_{in}, CH4: V_{out}



5.2 $24V_{in}$

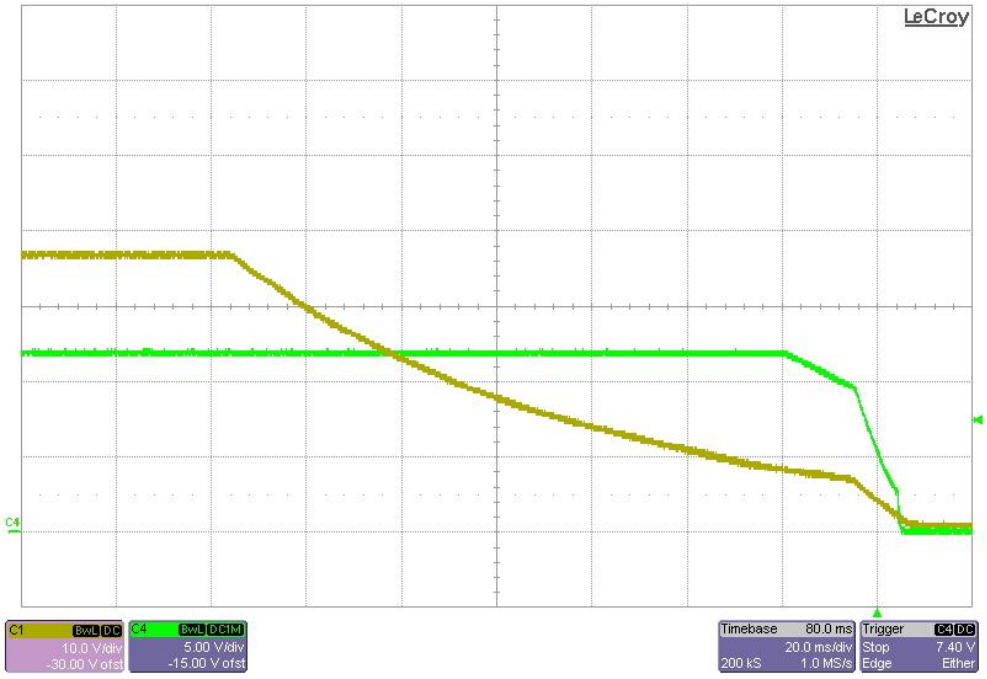
CH1: V_{in}, CH4: V_{out}

CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}

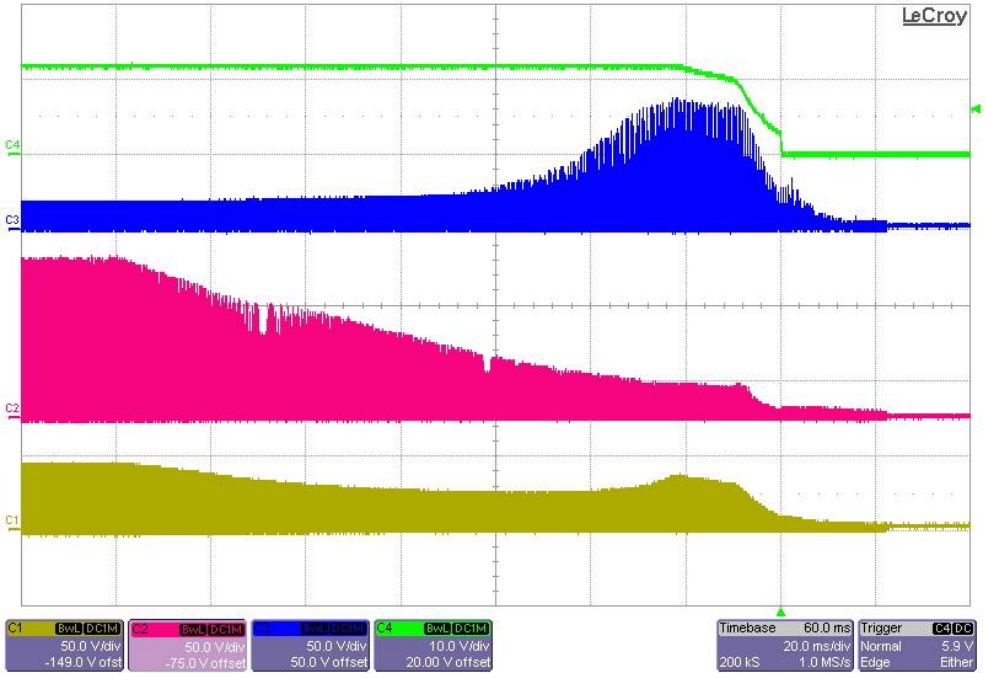


5.3 $36V_{in}$

CH1: V_{in}, CH4: V_{out}



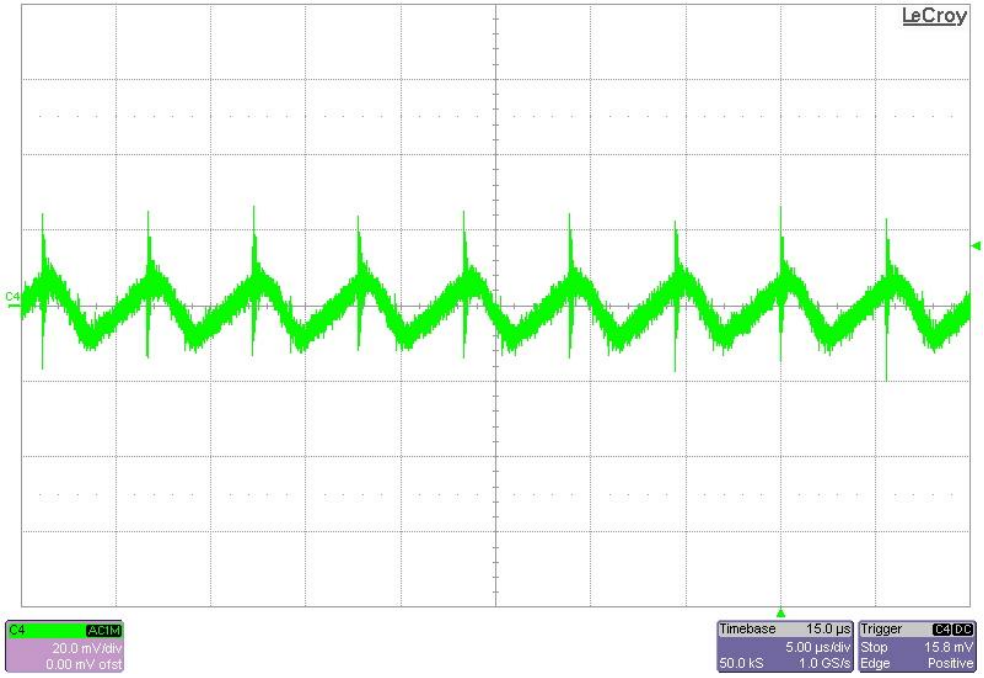
CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}



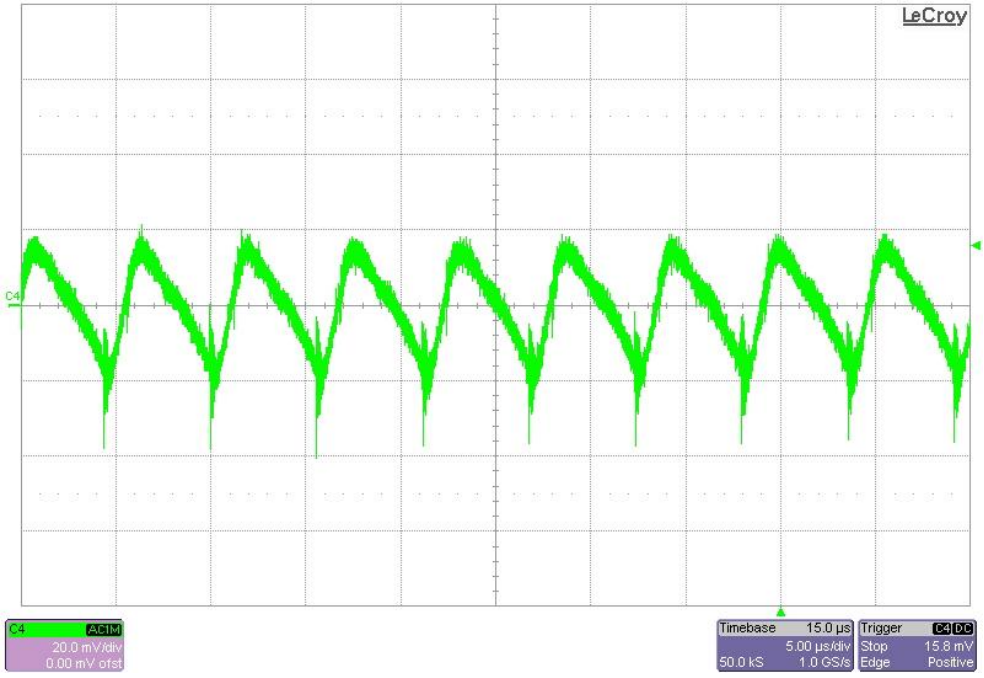
6 Output Ripple Voltages

The output ripple voltages are shown in the plots below with 3.4A full load. Waveforms are measured with 200MHz full oscilloscope bandwidth.

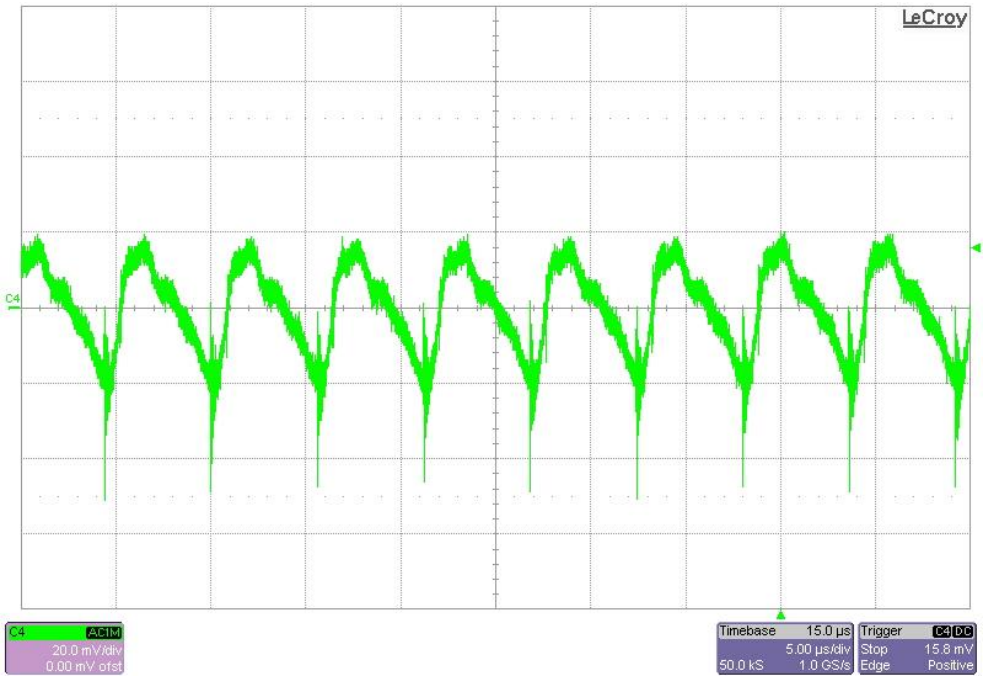
6.1 9V_{in}.



6.2 24V_{in}.



6.3 $36V_{in}$.

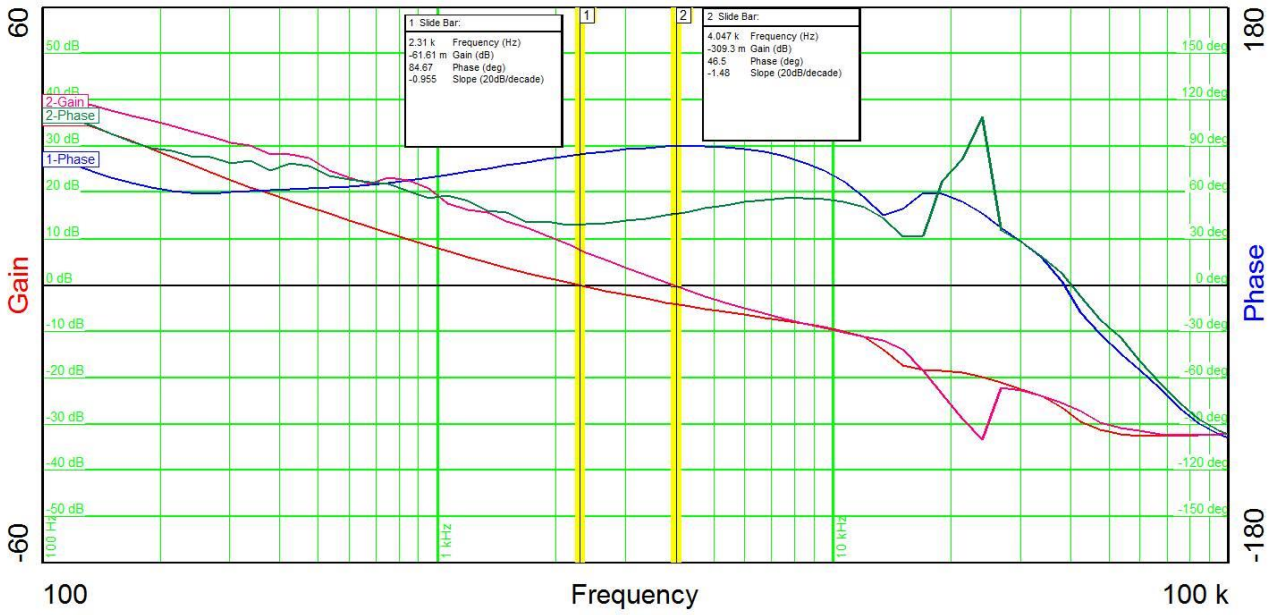

LeCroy
C4
C4 AC1M
20.0 mV/div
0.00 mV ofst
Timebase 15.0 µs
5.00 µs/div
50.0 kS 1.0 GS/s
Trigger C4 DC
Stop 15.8 mV
Edge Positive

7 Frequency Response

The image below shows the frequency responses under different input/output conditions.

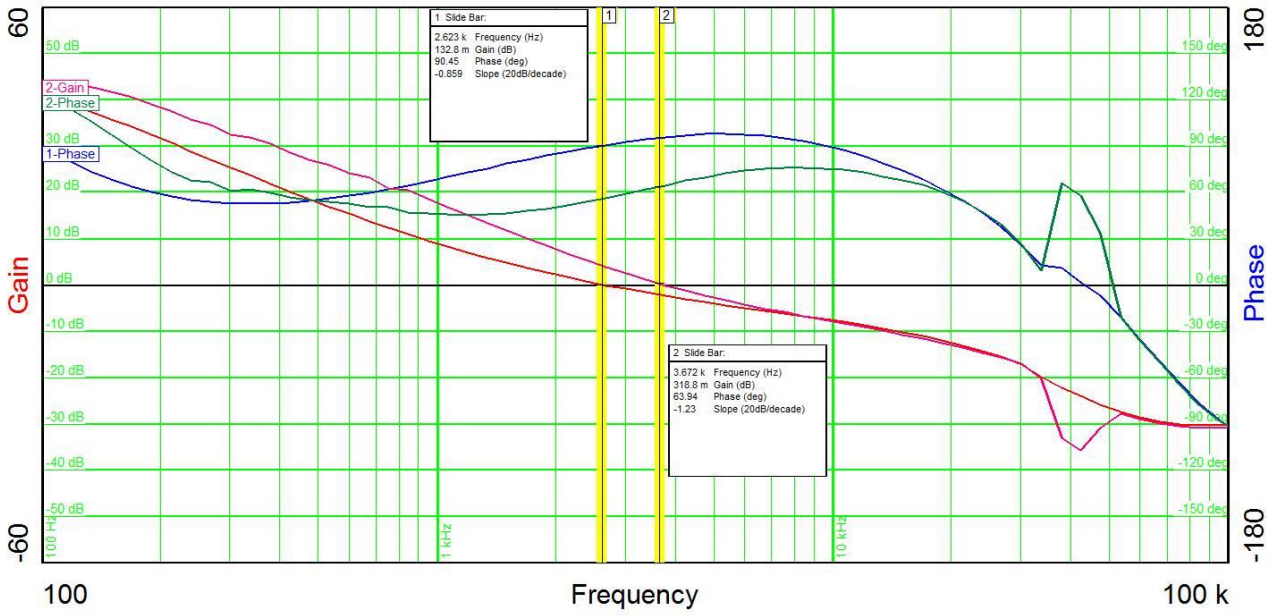
7.1 9V$_{in}$.

Curve 1 is measured at 3.4A load.
Curve 2 is measured at no load.



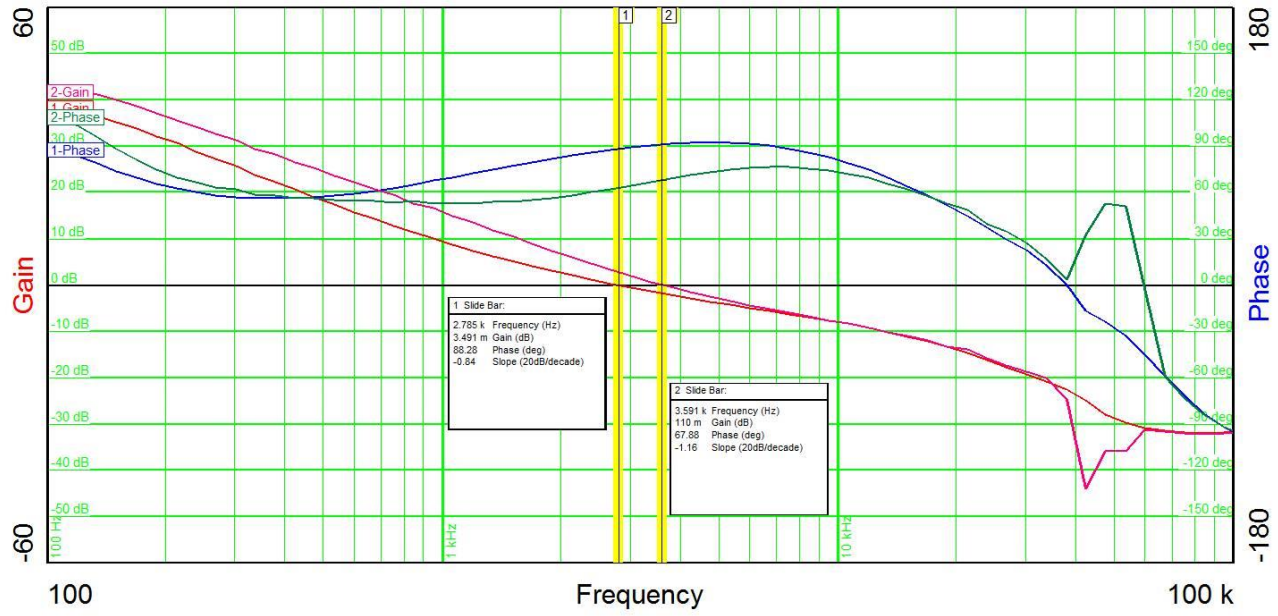
7.2 $24V_{in}$.

Curve 1 is measured at 3.4A load.
Curve 2 is measured at no load.



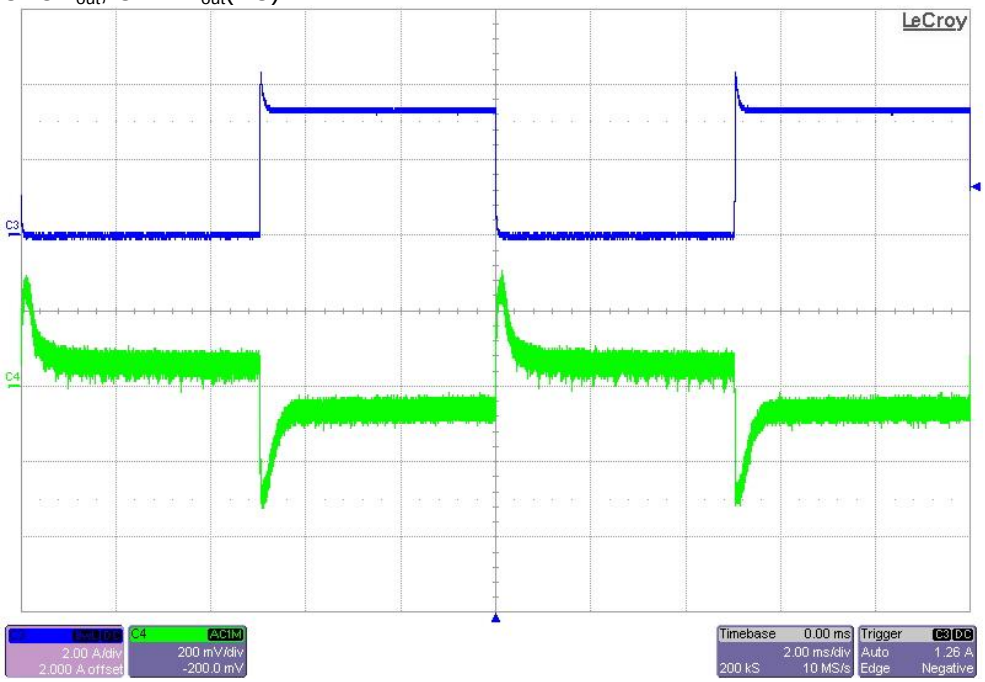
7.3 $36V_{in}$.

Curve 1 is measured at 3.4A load.
Curve 2 is measured at no load.



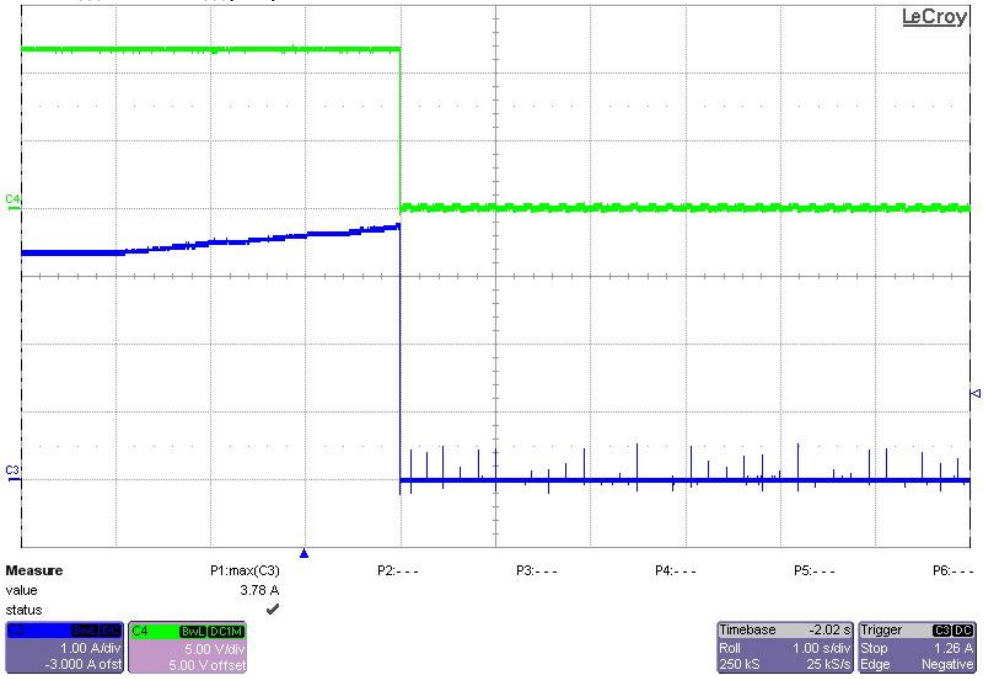
8 Dynamic Load Response

The image below shows the dynamic load response on $12V_{out}$ at $24V_{in}$. Load step is from 0A to 3.4A.
CH3: I_{out}, CH4: V_{out}(AC)



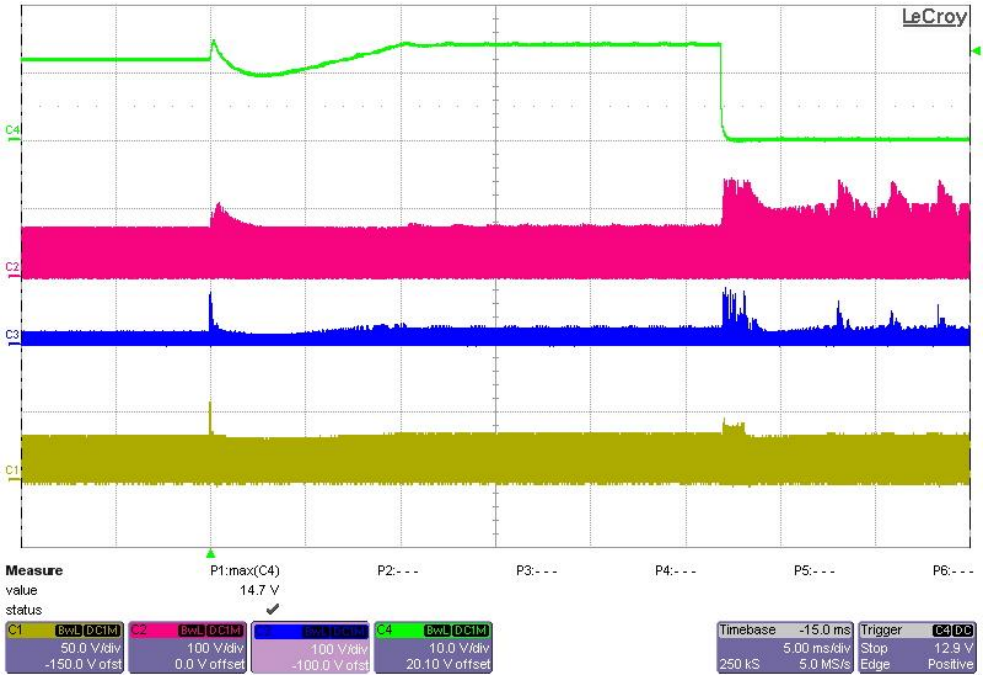
9 Over current protection

The image below shows the over current protection test on $12V_{out}$ at $24V_{in}$. Over current protection point on the tested board is at **3.78A**.
CH3: I_{out}, CH4: V_{out}(AC)



10 Over voltage protection

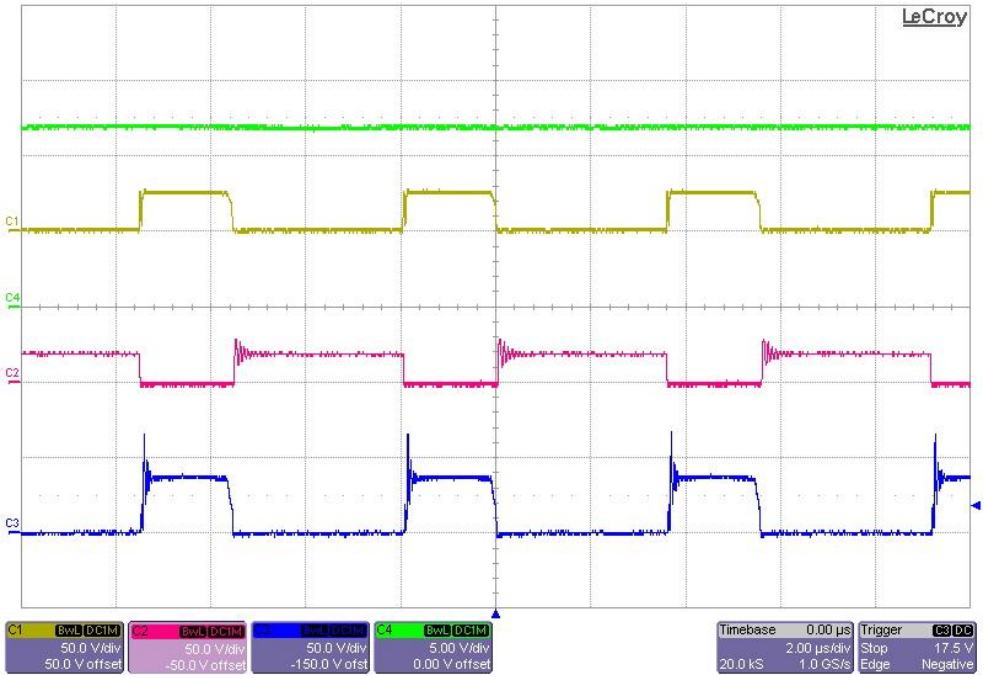
The image below shows the over voltage protection test on $12V_{out}$ /3.4A at $24V_{in}$. The over voltage protection test is done by short resistor R30, and the over voltage protection point on the tested board is at **14.7V**.
CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}



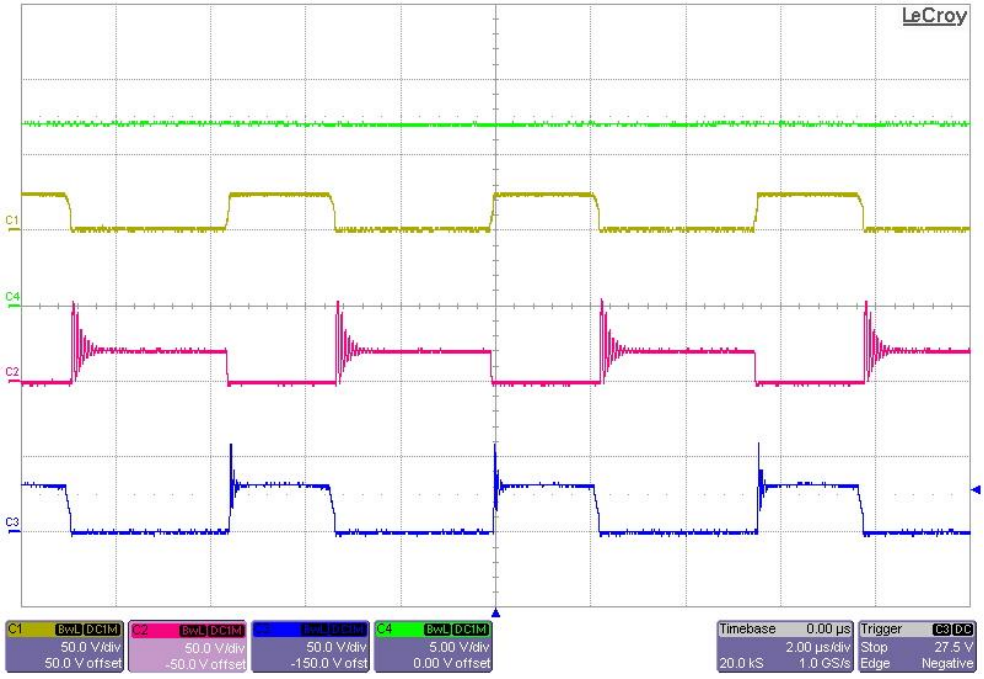
11 Switching Waveforms

The images below show key switching waveforms of PMP10861RevB. The waveforms are measured with 3.4Ω resistive load. CH1: V_{DS} (Q4), CH2: V_{DS} (Q2), CH3: V_{DS} (Q6), CH4: V_{out}

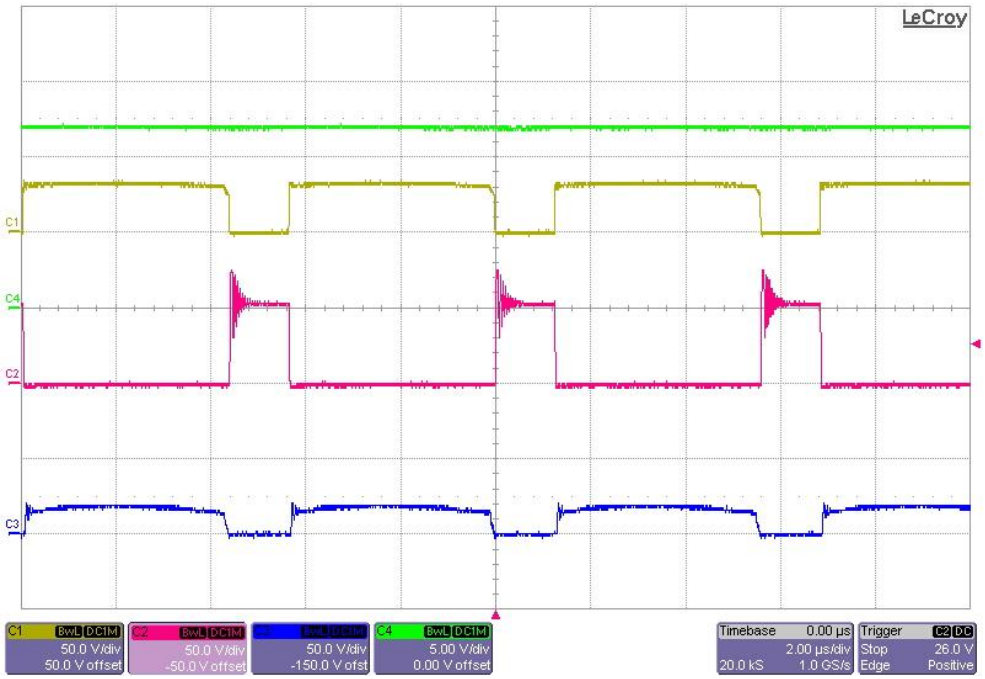
11.1 Voltage stresses on power MOSFETs V_{DS} @ 9V_{in} and 3.4Ω load resistor



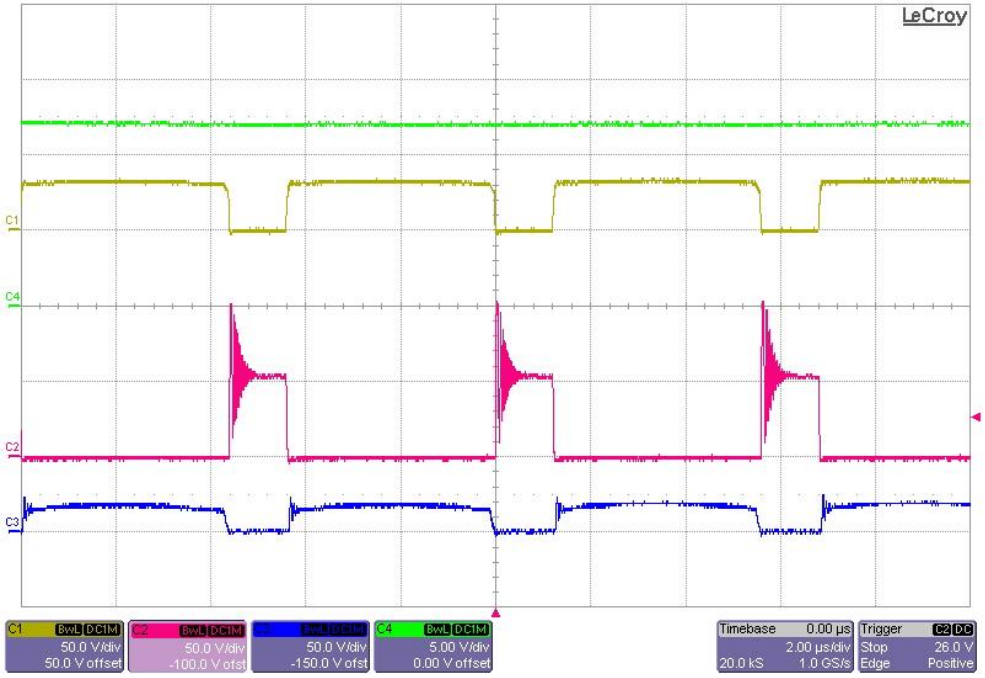
11.2 Voltage stresses on power MOSFETs V_{DS} @ 9V_{in} and no load



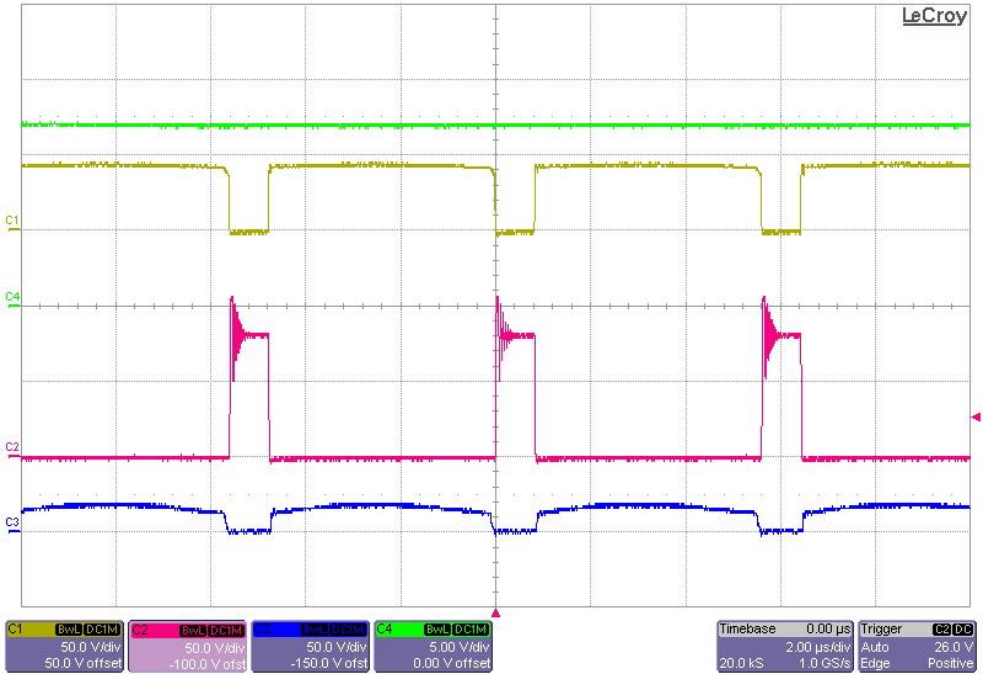
11.3 Voltage stresses on power MOSFETs V_{DS} @ 24V_{in} and 3.4Ω load resistor



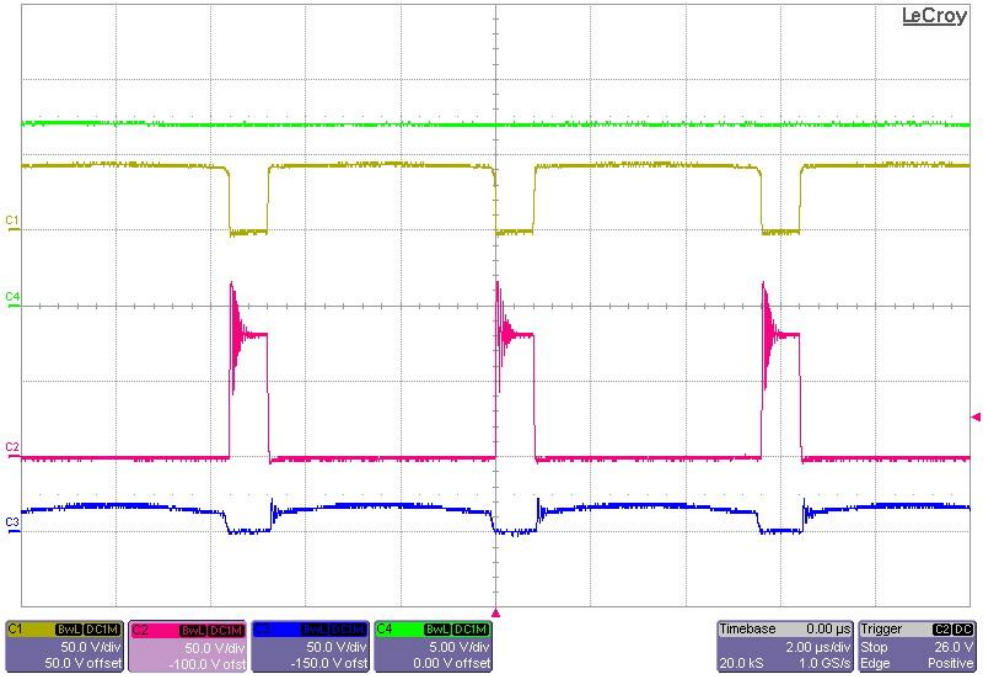
11.4 Voltage stresses on power MOSFETs V_{DS} @ 24V_{in} and no load



11.5 Voltage stresses on power MOSFETs V_{DS} @ 36V_{in} and 3.4Ω load resistor



11.6 Voltage stresses on power MOSFETs V_{DS} @ 36V_{in} and no load



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