

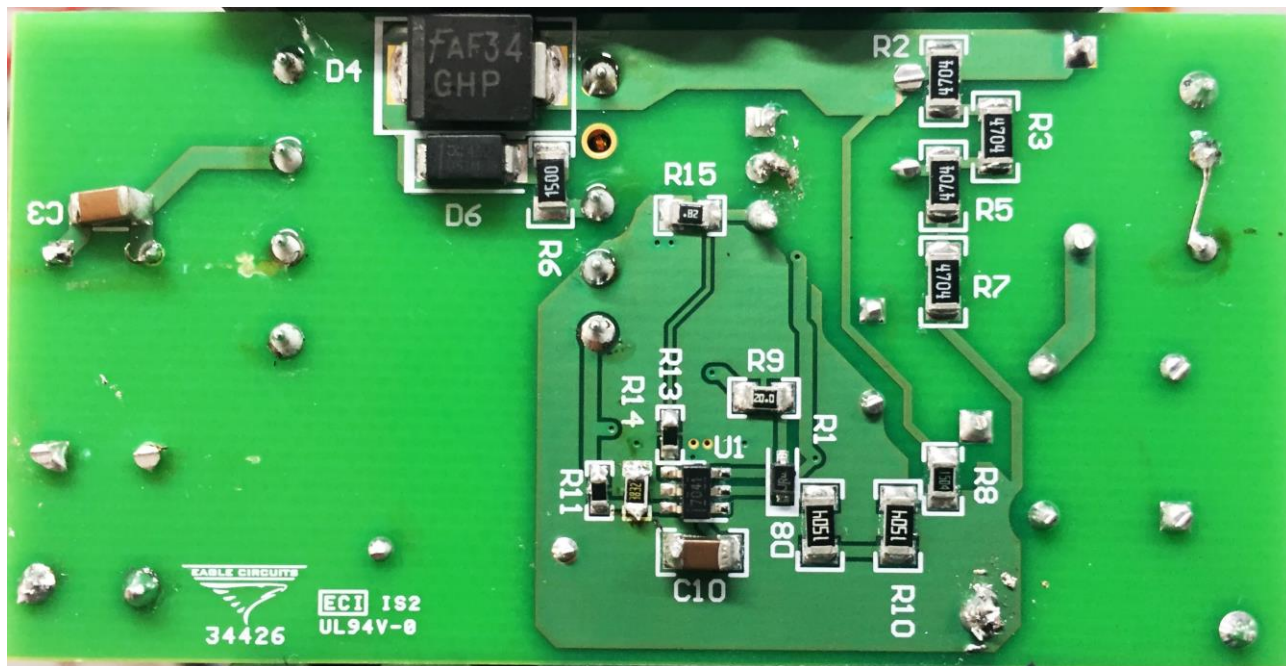
1 Photo

The photographs below show the PMP20990 Rev A assembly.

Top side



Bottom side

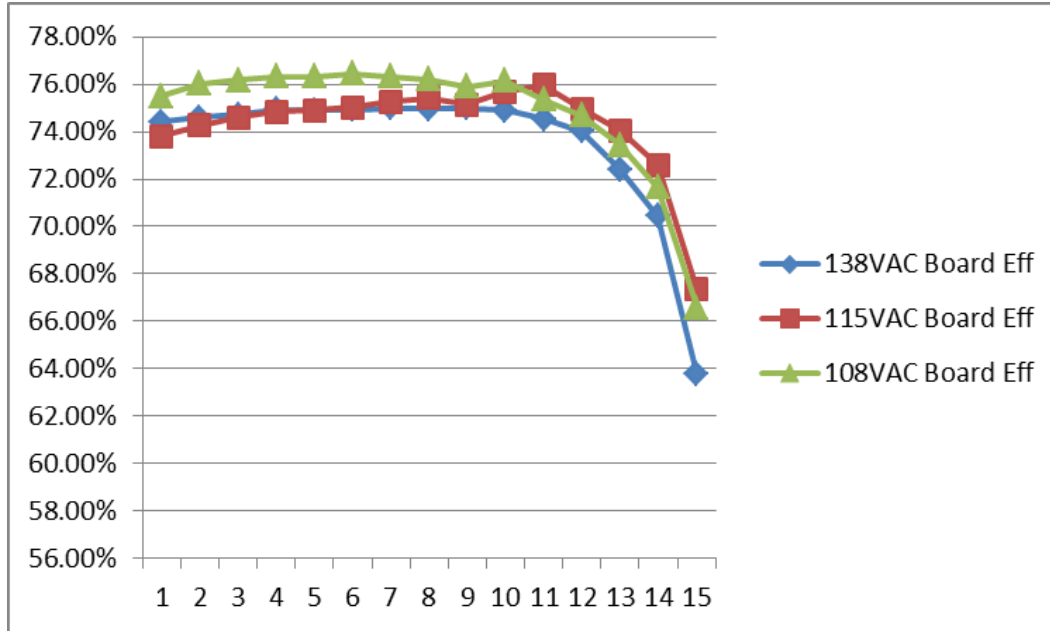


2 Cross regulation

Vin(VAC)	Pin(W)	Vout(V)	Iout(A)
108	24.43	12.26	1.5
108	0.132	11.78	0.00
Vin(V)	Pin(W)	Vout1(V)	Iout1(A)
115	24.26	12.25	1.5
115	0.14	11.76	0.00
Vin(V)	Pin(W)	Vout1(V)	Iout1(A)
138	24.22	12.24	1.5
138	0.162	11.74	0.00

3 Converter efficiency

The efficiency data is shown in the table and graph below.



Vin(V)	Pin(W)	Vout (V)	Iout1(A)	Pout(W)	108VAC Board_3 Eff(%)
108	24.3	12.23	1.5	18.345	75.49%
108	22.5	12.22	1.4	17.108	76.04%
108	20.8	12.19	1.3	15.847	76.19%
108	19.12	12.16	1.2	14.592	76.32%
108	17.47	12.12	1.1	13.332	76.31%
108	15.8	12.08	1	12.08	76.46%
108	14.2	12.04	0.9	10.836	76.31%
108	12.61	12.01	0.8	9.608	76.19%
108	11.04	11.97	0.7	8.379	75.90%
108	9.4	11.93	0.6	7.158	76.15%
108	7.87	11.86	0.5	5.93	75.35%
108	6.33	11.82	0.4	4.728	74.69%
108	4.82	11.8	0.3	3.54	73.44%
108	3.28	11.75	0.2	2.35	71.65%
108	1.76	11.72	0.1	1.172	66.59%

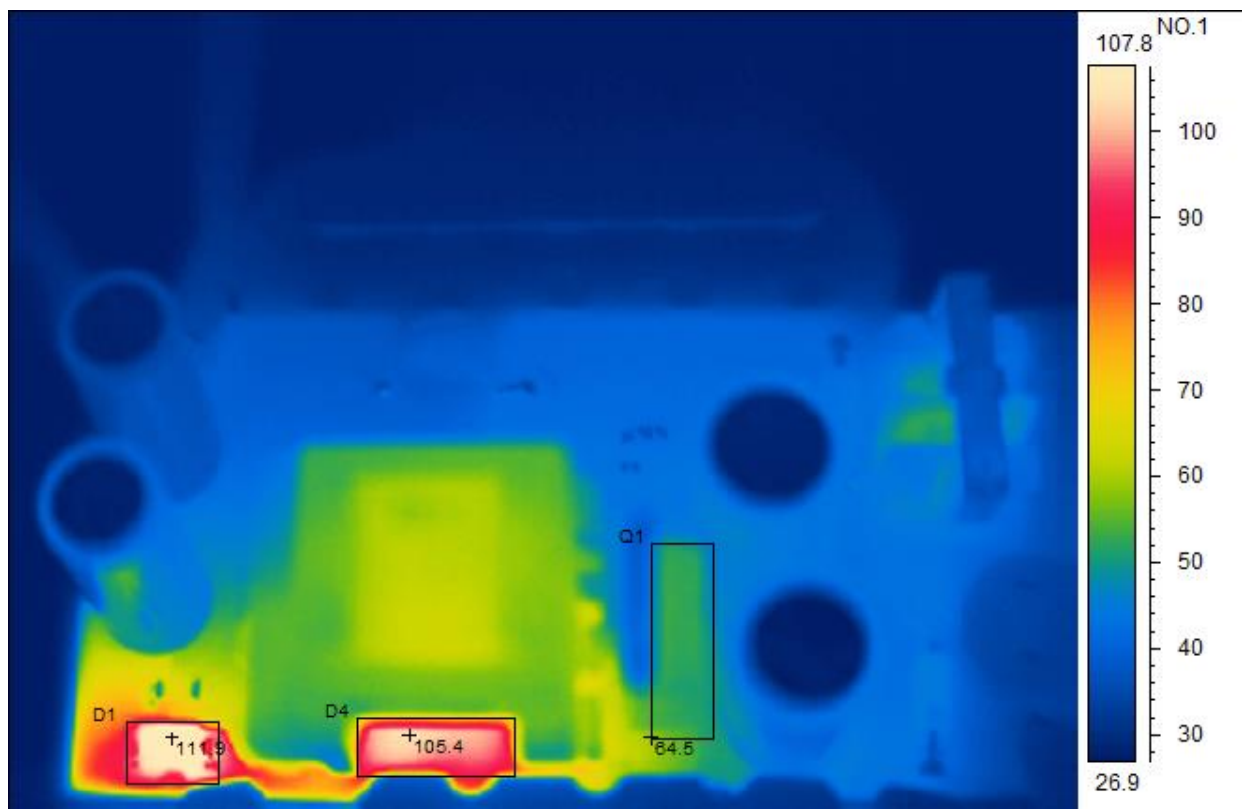
Vin(V)	Pin(W)	Vout (V)	Iout1(A)	Pout(W)	115VAC Board_3 Eff(%)
115	24.27	12.25	1.5	17.91	73.79%
115	22.49	12.23	1.4	16.702	74.26%
115	20.79	12.2	1.3	15.509	74.60%
115	19.11	12.17	1.2	14.304	74.85%
115	17.48	12.13	1.1	13.09	74.89%
115	15.85	12.08	1	11.89	75.02%
115	14.22	12.04	0.9	10.701	75.25%
115	12.6	12.01	0.8	9.504	75.43%
115	11.06	11.98	0.7	8.309	75.13%
115	9.4	11.91	0.6	7.116	75.70%
115	7.8	11.86	0.5	5.925	75.96%
115	6.33	11.83	0.4	4.744	74.94%
115	4.8	11.8	0.3	3.555	74.06%
115	3.27	11.76	0.2	2.374	72.60%
115	1.78	11.73	0.1	1.199	67.36%

Vin(V)	Pin(W)	Vout (V)	Iout1(A)	Pout(W)	138VAC Board_3 Eff(%)
138	24.07	12.26	1.5	17.91	74.41%
138	22.39	12.23	1.4	16.702	74.60%
138	20.76	12.2	1.3	15.509	74.71%
138	19.09	12.16	1.2	14.304	74.93%
138	17.48	12.12	1.1	13.09	74.89%
138	15.87	12.08	1	11.89	74.92%
138	14.27	12.05	0.9	10.701	74.99%
138	12.68	12.01	0.8	9.504	74.95%
138	11.08	11.97	0.7	8.309	74.99%
138	9.5	11.9	0.6	7.116	74.91%
138	7.95	11.86	0.5	5.925	74.53%
138	6.41	11.82	0.4	4.744	74.01%
138	4.91	11.8	0.3	3.555	72.40%
138	3.37	11.76	0.2	2.374	70.45%
138	1.88	11.73	0.1	1.199	63.78%

4 Thermal Images

The thermal images below show a top view and bottom view of the board. The ambient temperature was 20°C with no forced air flow. The outputs were at 12V/1.5A loads.

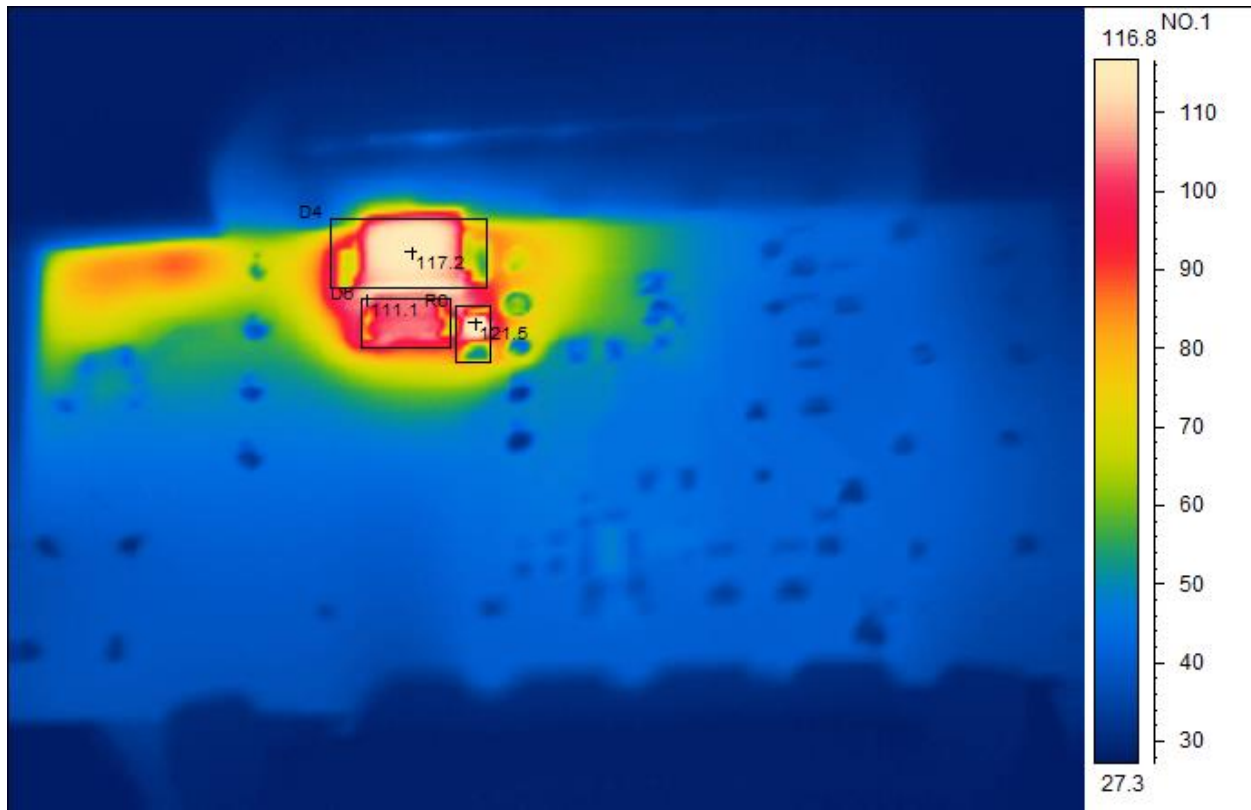
- **Top side** Vin : 108Vac



Parameters	Value
Ambient	27.9°C
Area analysis	Value
D1Max	111.9°C
D4Max	105.4°C
Q1 Max	64.5°C

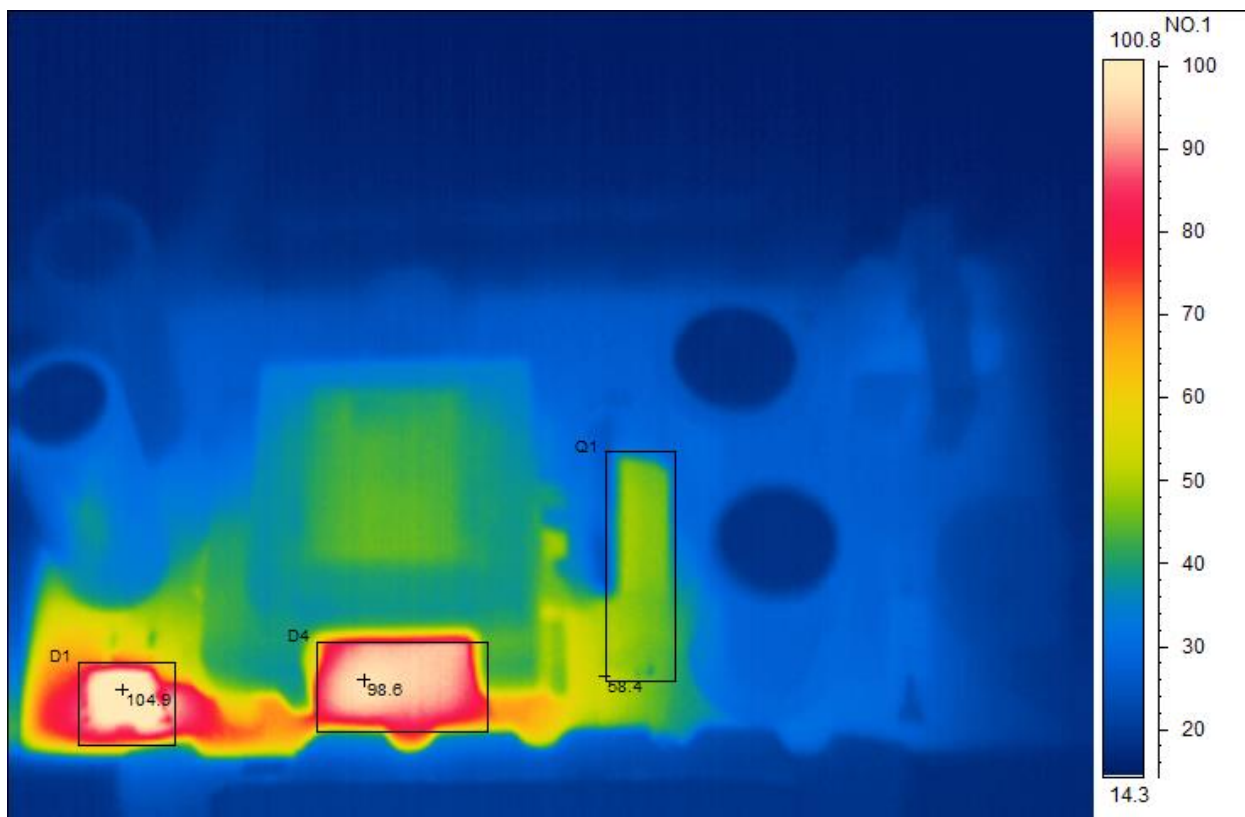
- **Bottom side**

Vin : 108Vac



Parameters	Value
Ambient	27.6°C
Area analysis	Value
D4Max	117.2°C
D6Max	111.1°C
R6 Max	121.5°C

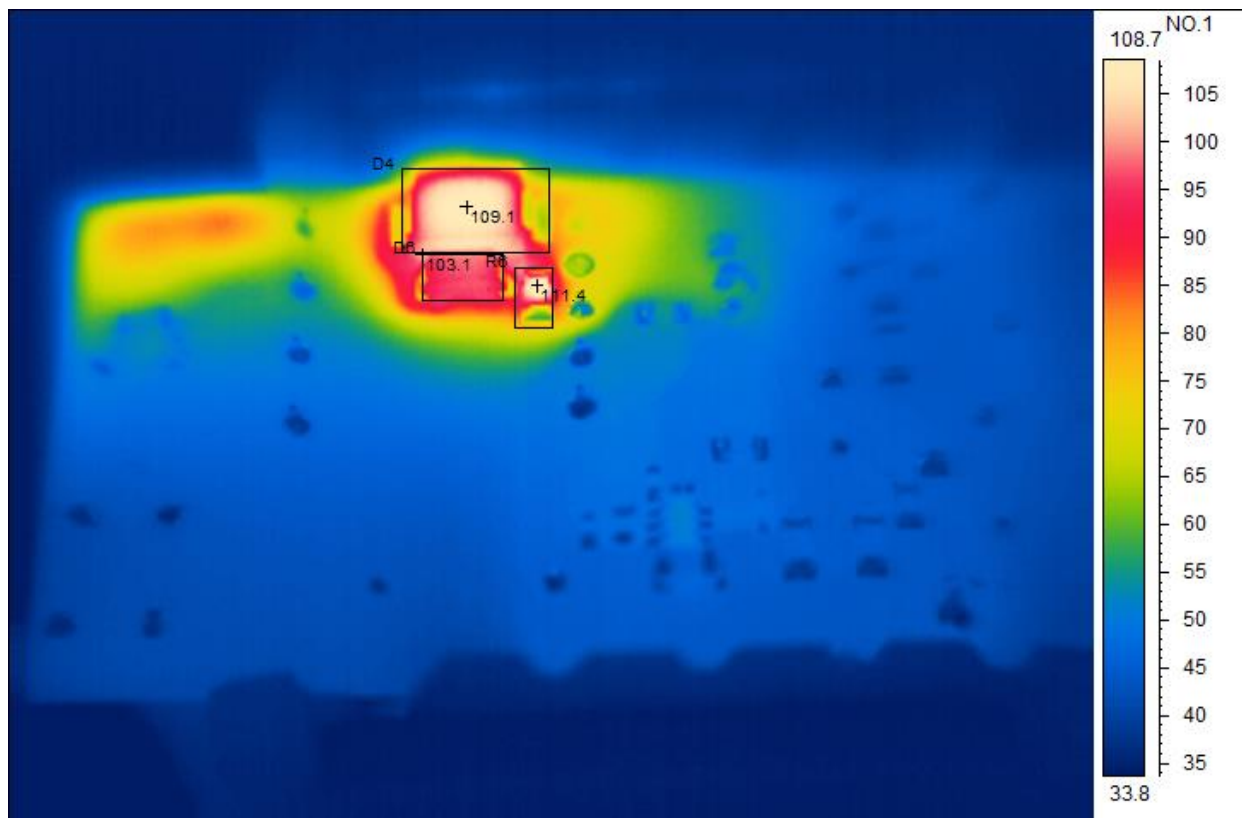
- **Top side** Vin : 138Vac



Parameters	Value
Ambient	27.1°C
Area analysis	Value
D4 Max	98.6°C
D1 Max	104.9°C
Q1 Max	58.4°C

- **Bottom side**

Vin : 138Vac

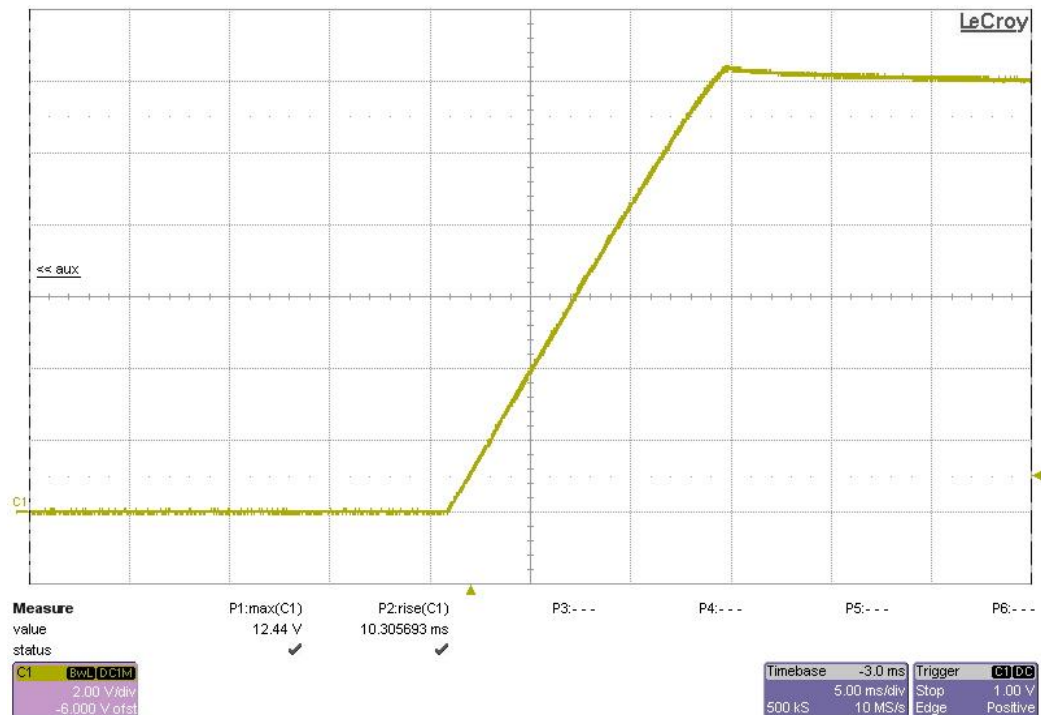


Parameters	Value
Ambient	27.3°C
Area analysis	Value
D4Max	109.1°C
R6Max	111.4°C
D6 Max	103.1°C

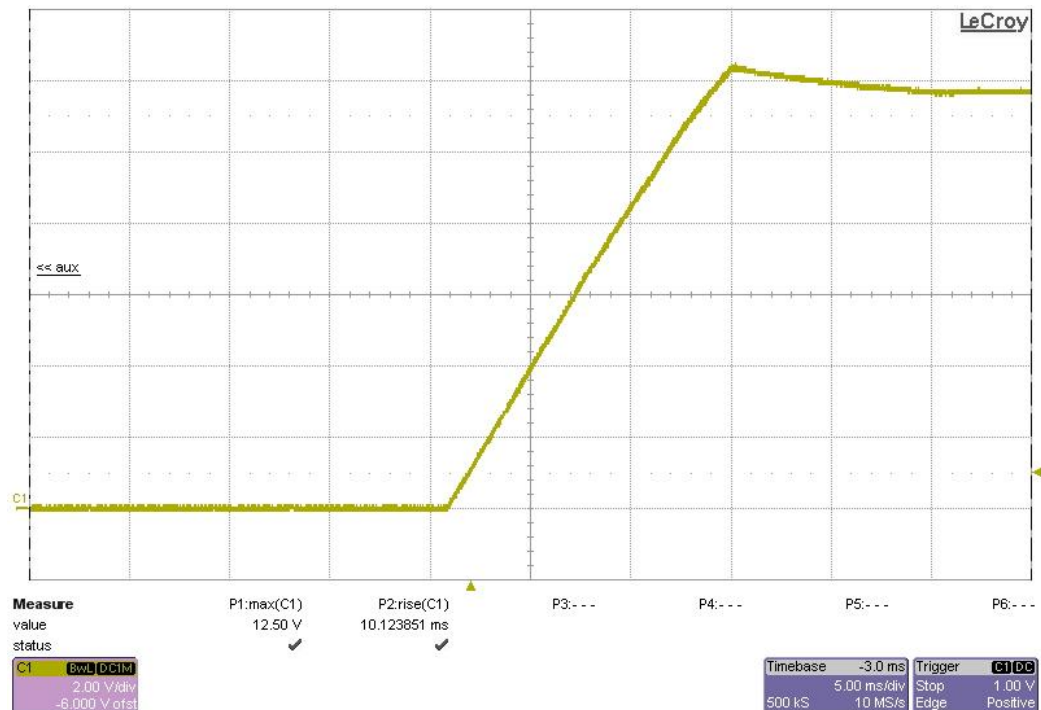
5 Startup

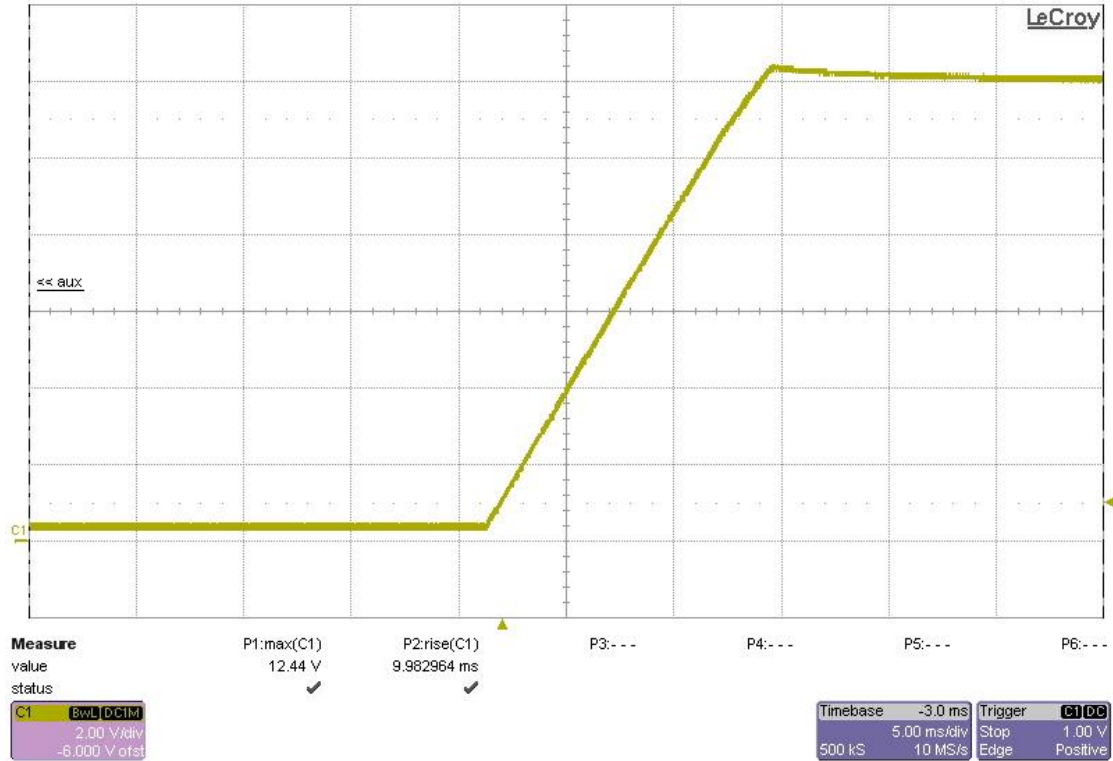
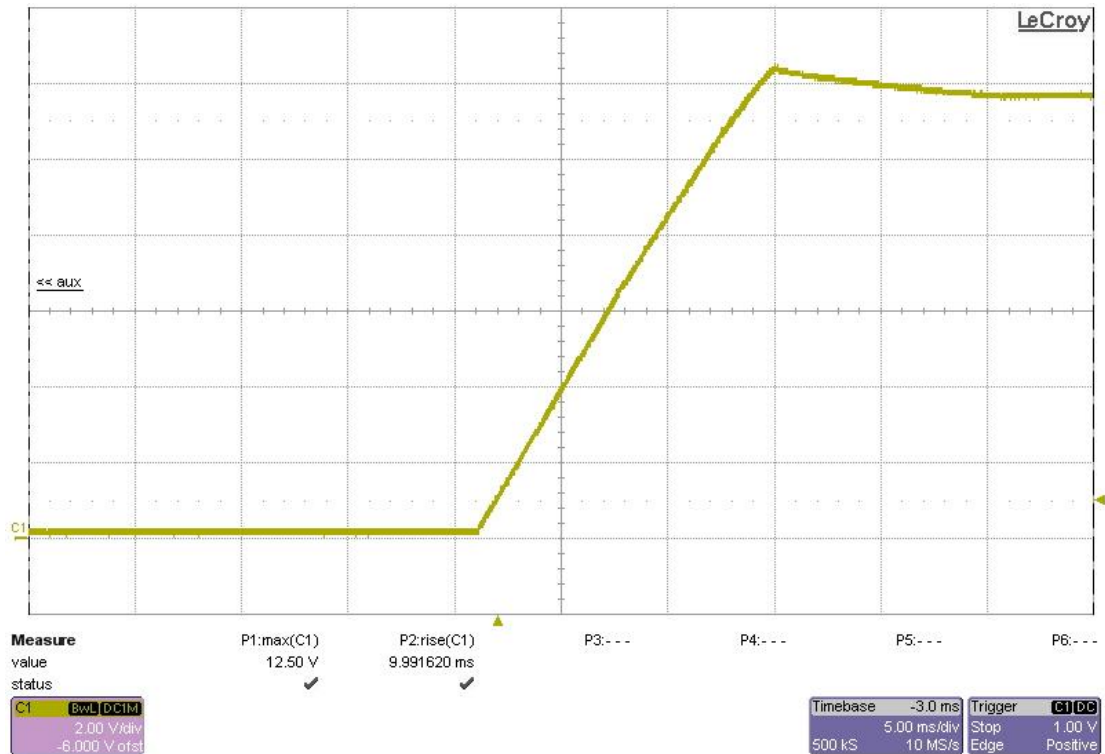
The output voltages at startup are shown in the images below.

5.1.1 Start Up @ 108V_{AC}: 12V/0A



5.1.2 Start Up @ 108V_{AC}: 12V/1.5A



5.1.3 Start Up @ 115V_{AC}: 12V/0A**5.1.4 Start Up @ 115V_{AC}: 12V/1.5A**

LeCroy

2004 04 04 12 00 00 00 2004 04 04 12 00 00 00 2004 04 04 12 00 00 00 2004 04 04 12 00 00 00 2004 04 04 12 00 00 00

≤≤ aux

C1

Measure value status

P1:max(C1) 12.44 V ✓

P2:rise(C1) 10.188746 ms ✓

P3:---

P4:---

P5:---

P6:---

C1 BwL DC1M 2.00 V/div -6.000 V ofst

Timebase -3.0 ms 5.00 ms/div 500 kS

Trigger Stop 1.00 V Edge Positive

LeCroy

Measure value status

P1:max(C1) 12.50 V ✓

P2:rise(C1) 9.911590 ms ✓

P3:---

P4:---

P5:---

P6:---

C1

Timebase -3.0 ms

500 kS

2.00 V/div

10 MS/s

Stop

Edge

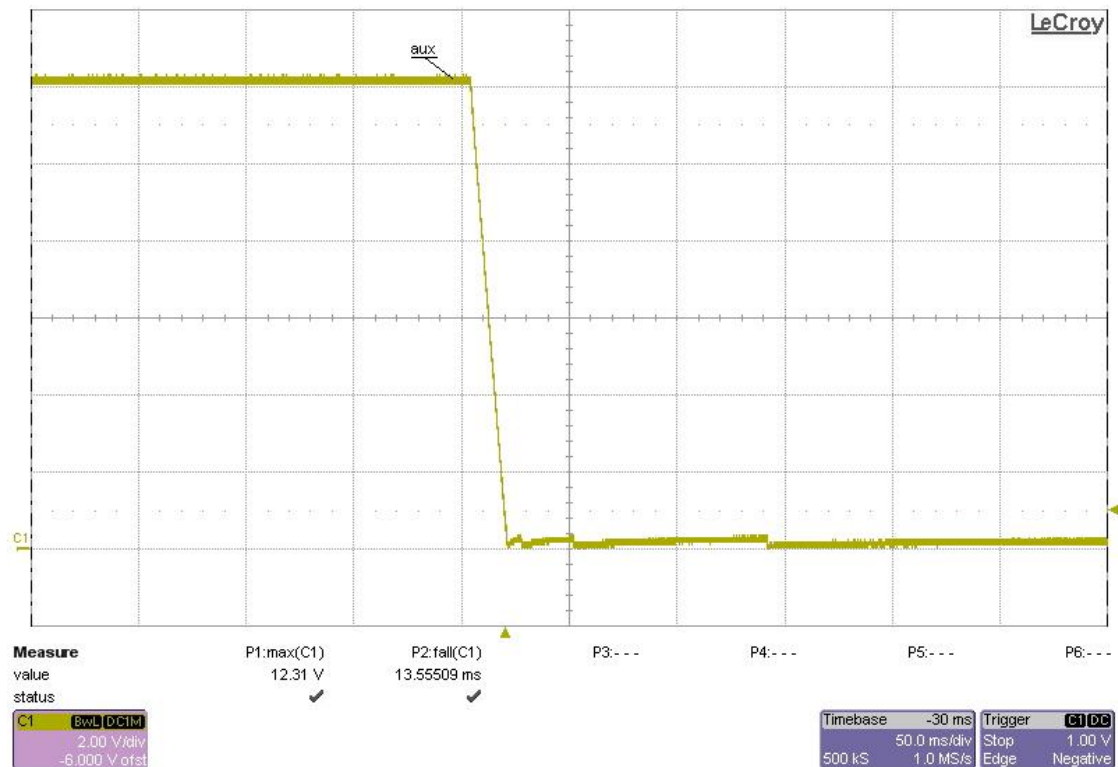
1.00 V

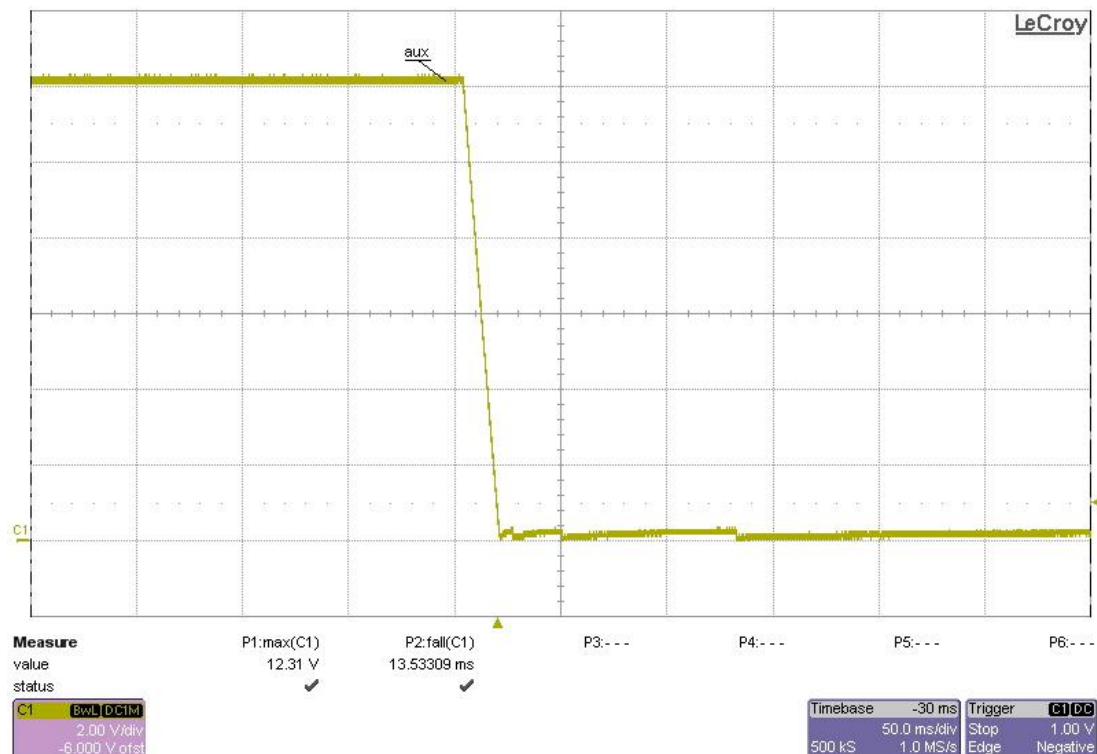
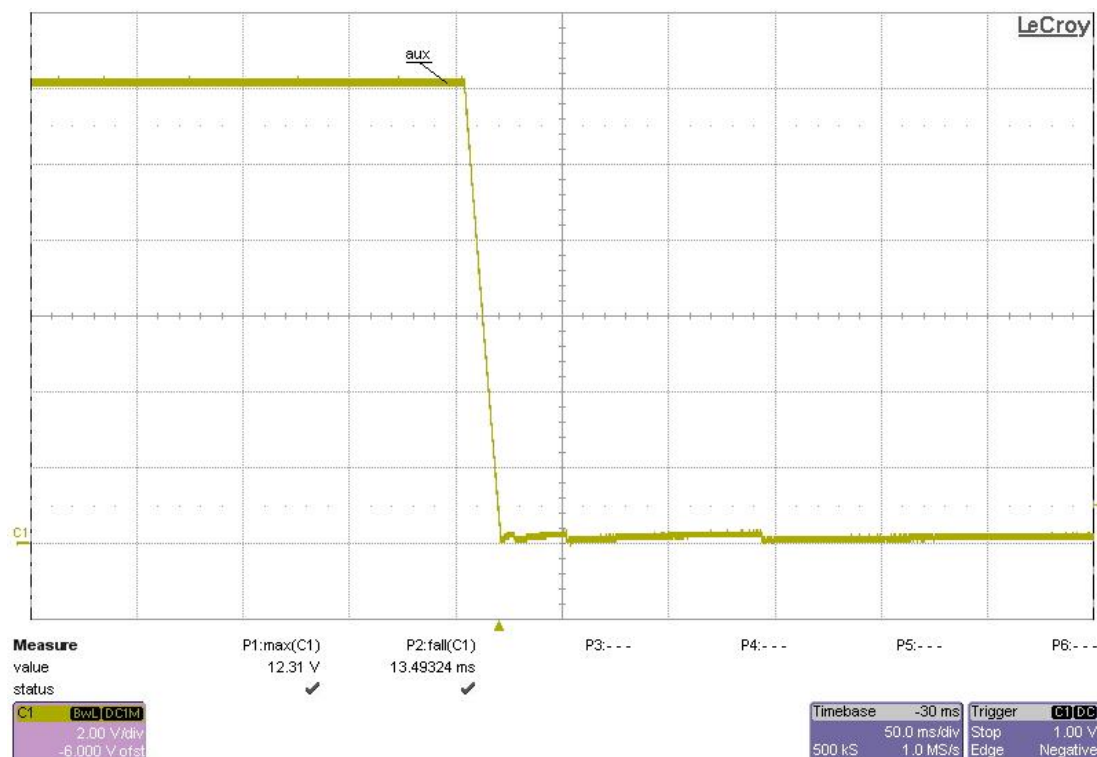
Positiv

6 Turnoff

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

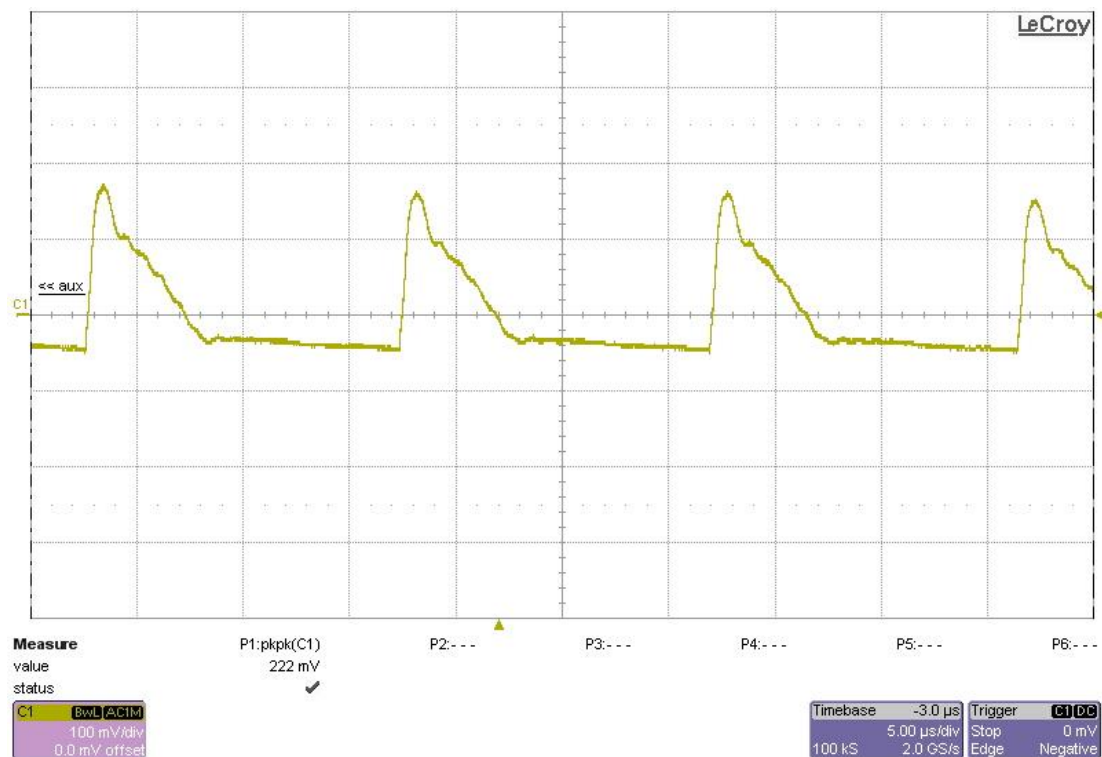
6.1.1 Turnoff @ 108V_{AC}: 12V/1.5A

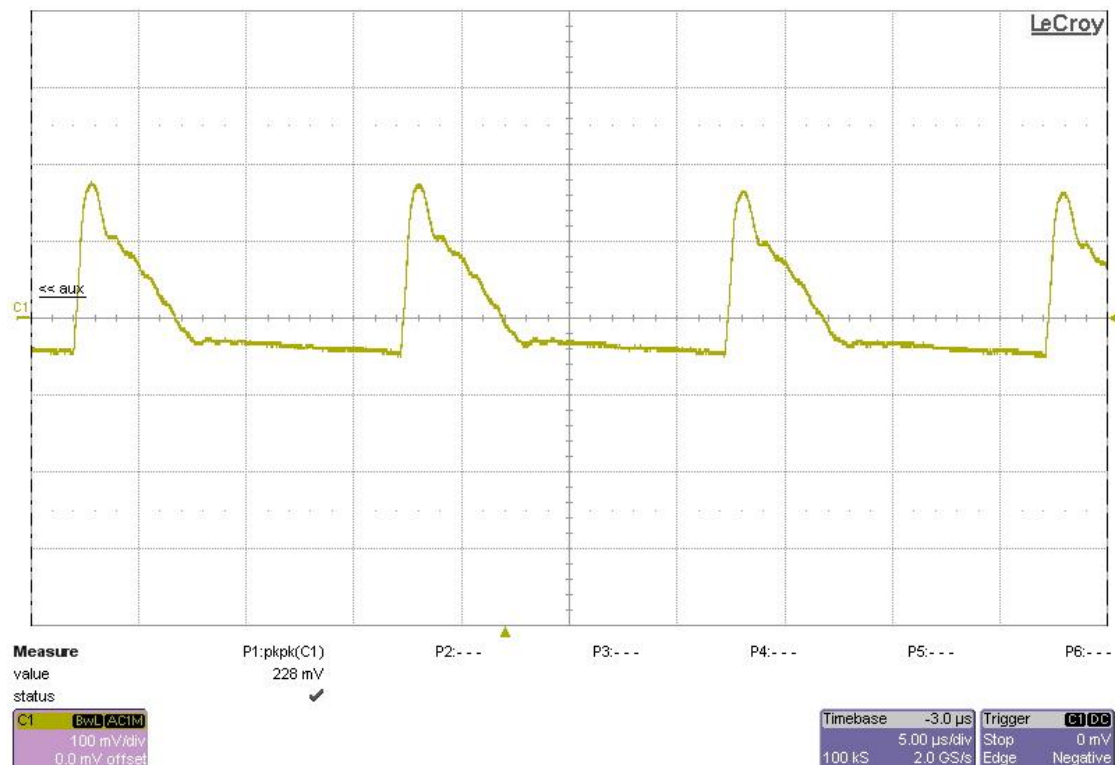
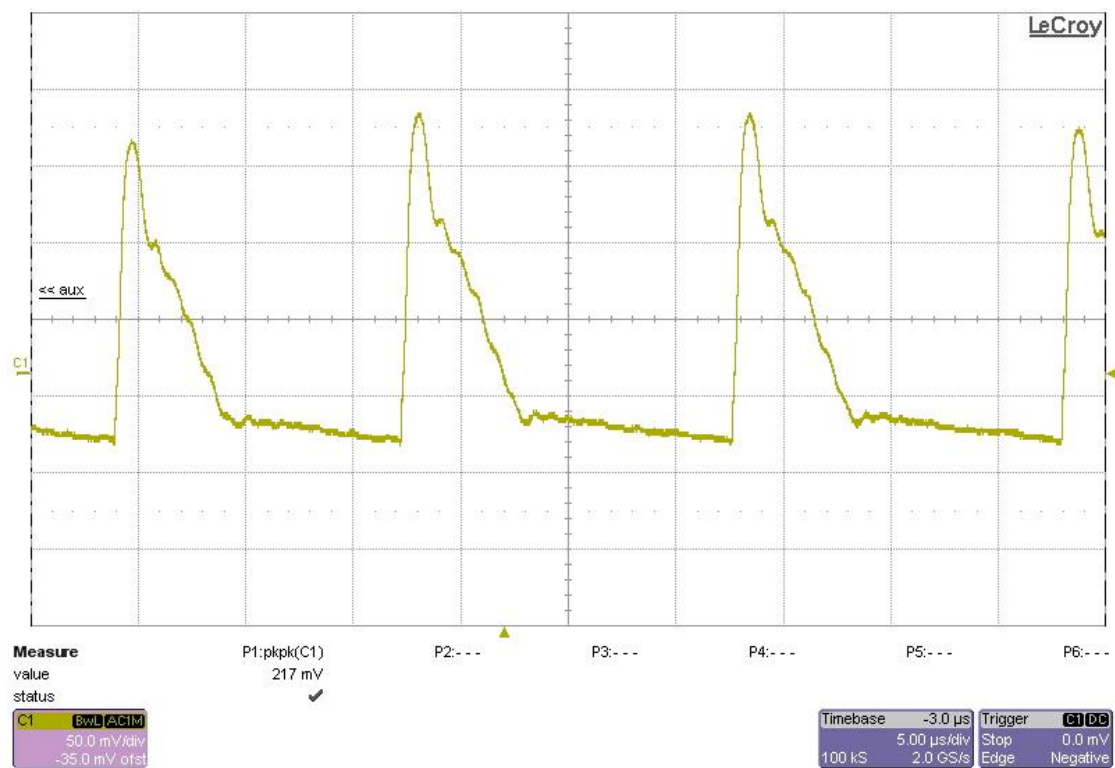


6.1.2 Turnoff @ 115V_{AC}: 12V/1.5A**6.1.3 Turnoff @ 138V_{AC}: 12V/1.5A**

7 Output Ripple Voltage

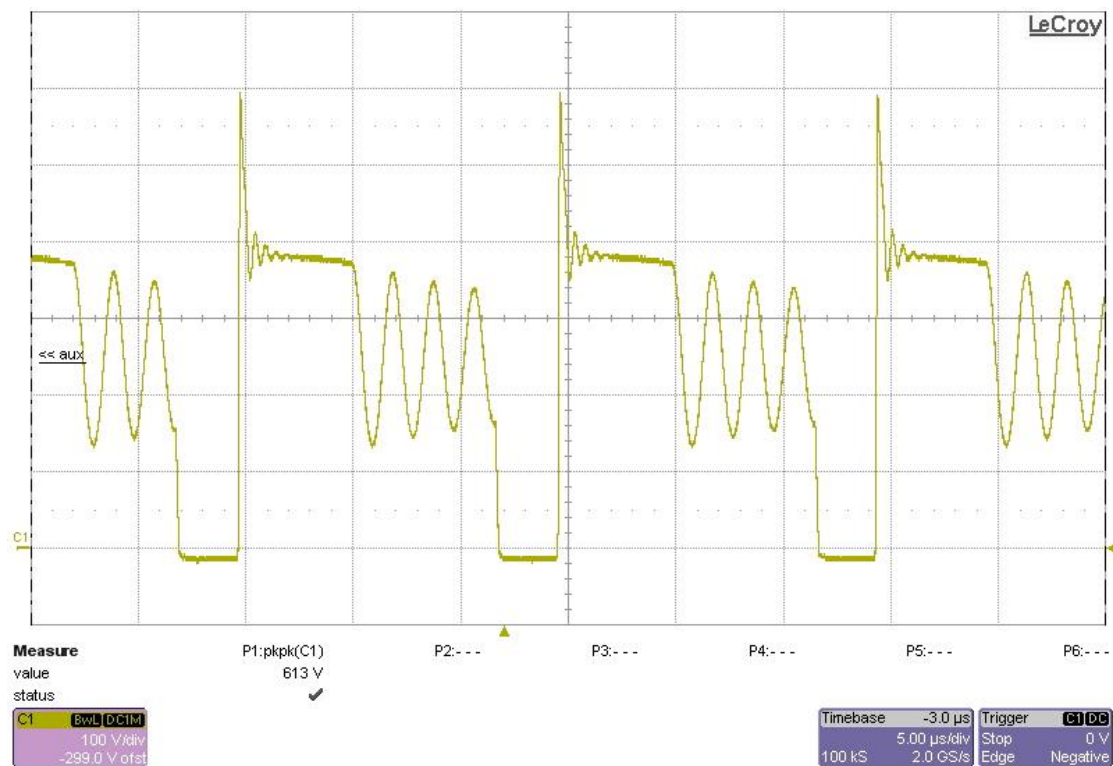
7.1.1 Output Ripple 12V @ 108V_{AC}: 12V/1.5A

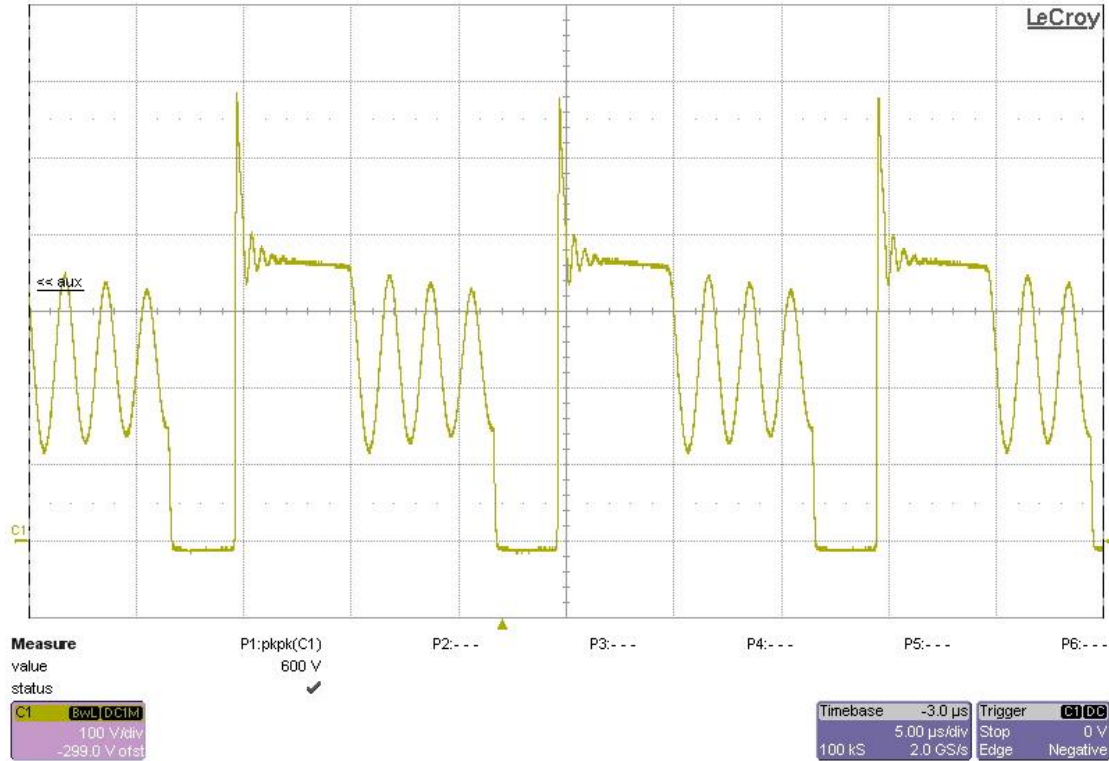
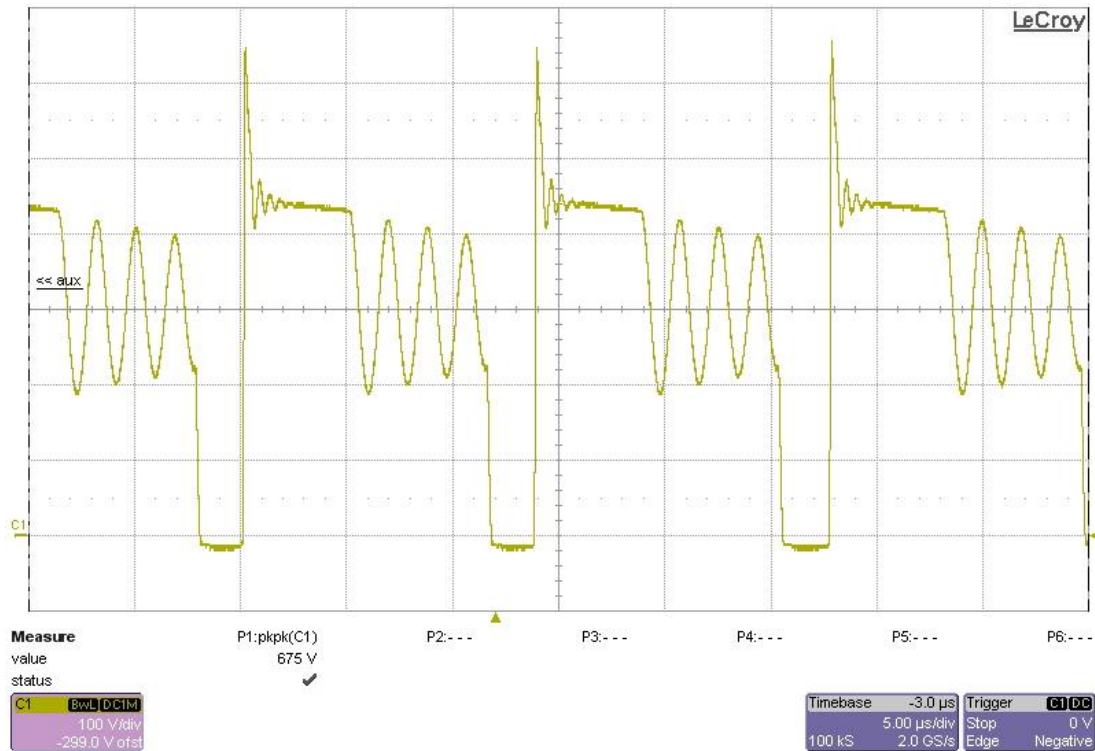


7.1.2 Output Ripple 12V @ 115V_{AC}: 12V/1.5A**7.1.3 Output Ripple 12V @ 138V_{AC}: 12V/1.5A**

8 Switching Waveforms

8.1.1 Switching Waveform @ 108V_{AC}: 12V/1.5A



8.1.2 Switching Waveform @ 115V_{AC}: 12V/1.5A**8.1.3 Switching Waveform @ 138V_{AC}: 12V/1.5A**

IMPORTANT NOTICE AND DISCLAIMER

TI PROVIDES TECHNICAL AND RELIABILITY DATA (INCLUDING DATASHEETS), DESIGN RESOURCES (INCLUDING REFERENCE DESIGNS), APPLICATION OR OTHER DESIGN ADVICE, WEB TOOLS, SAFETY INFORMATION, AND OTHER RESOURCES "AS IS" AND WITH ALL FAULTS, AND DISCLAIMS ALL WARRANTIES, EXPRESS AND IMPLIED, INCLUDING WITHOUT LIMITATION ANY IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF THIRD PARTY INTELLECTUAL PROPERTY RIGHTS.

These resources are intended for skilled developers designing with TI products. You are solely responsible for (1) selecting the appropriate TI products for your application, (2) designing, validating and testing your application, and (3) ensuring your application meets applicable standards, and any other safety, security, or other requirements. These resources are subject to change without notice. TI grants you permission to use these resources only for development of an application that uses the TI products described in the resource. Other reproduction and display of these resources is prohibited. No license is granted to any other TI intellectual property right or to any third party intellectual property right. TI disclaims responsibility for, and you will fully indemnify TI and its representatives against, any claims, damages, costs, losses, and liabilities arising out of your use of these resources.

TI's products are provided subject to TI's Terms of Sale (<https://www.ti.com/legal/termsofsale.html>) or other applicable terms available either on [ti.com](https://www.ti.com) or provided in conjunction with such TI products. TI's provision of these resources does not expand or otherwise alter TI's applicable warranties or warranty disclaimers for TI products.

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265
Copyright © 2021, Texas Instruments Incorporated