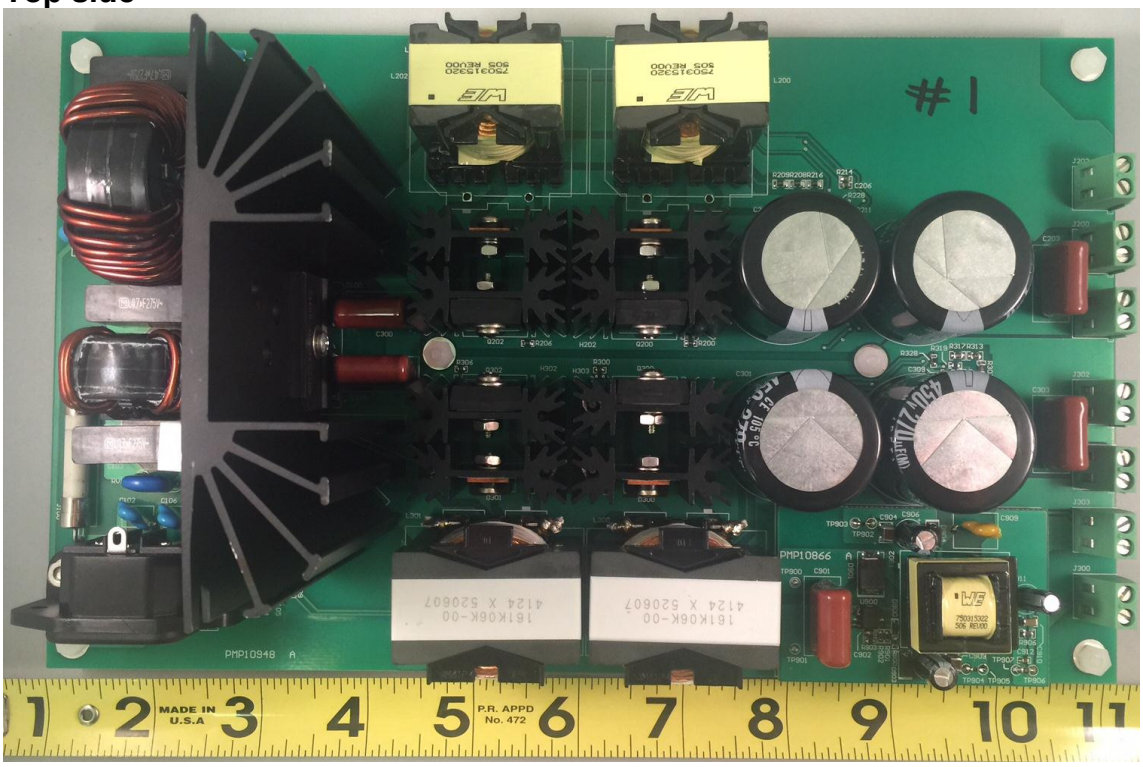
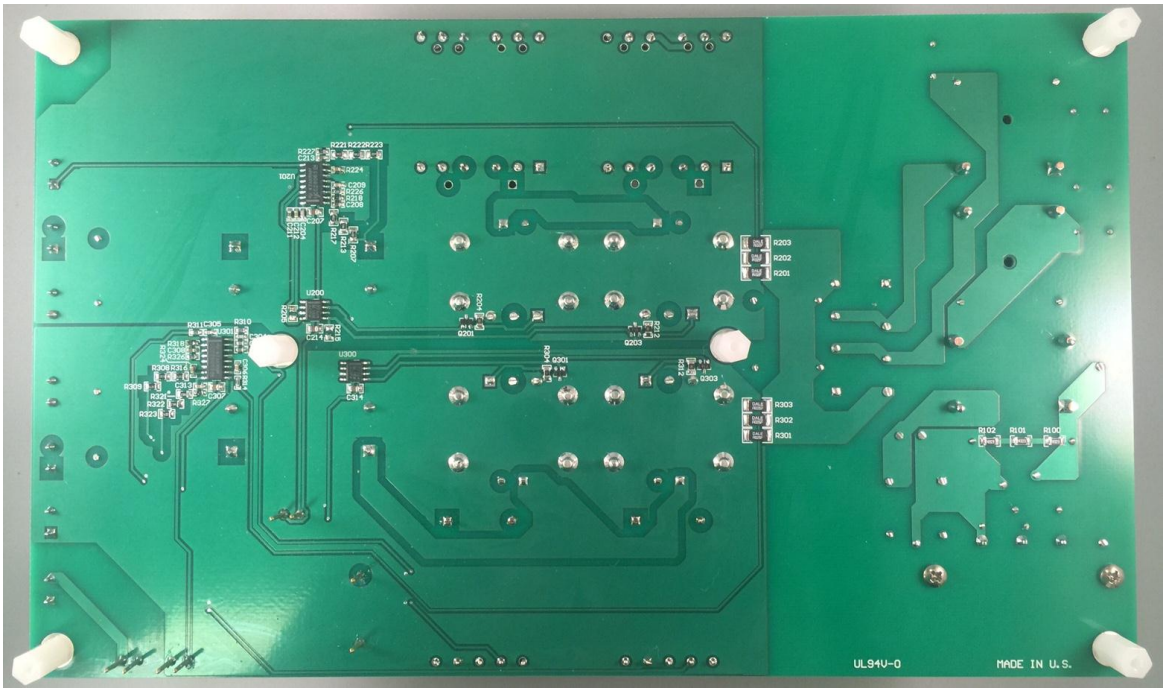
# 1 Photo

The photographs below show the PMP10948 Rev A assembly. This circuit was built on a PMP10948 Rev A PCB.

### Top side

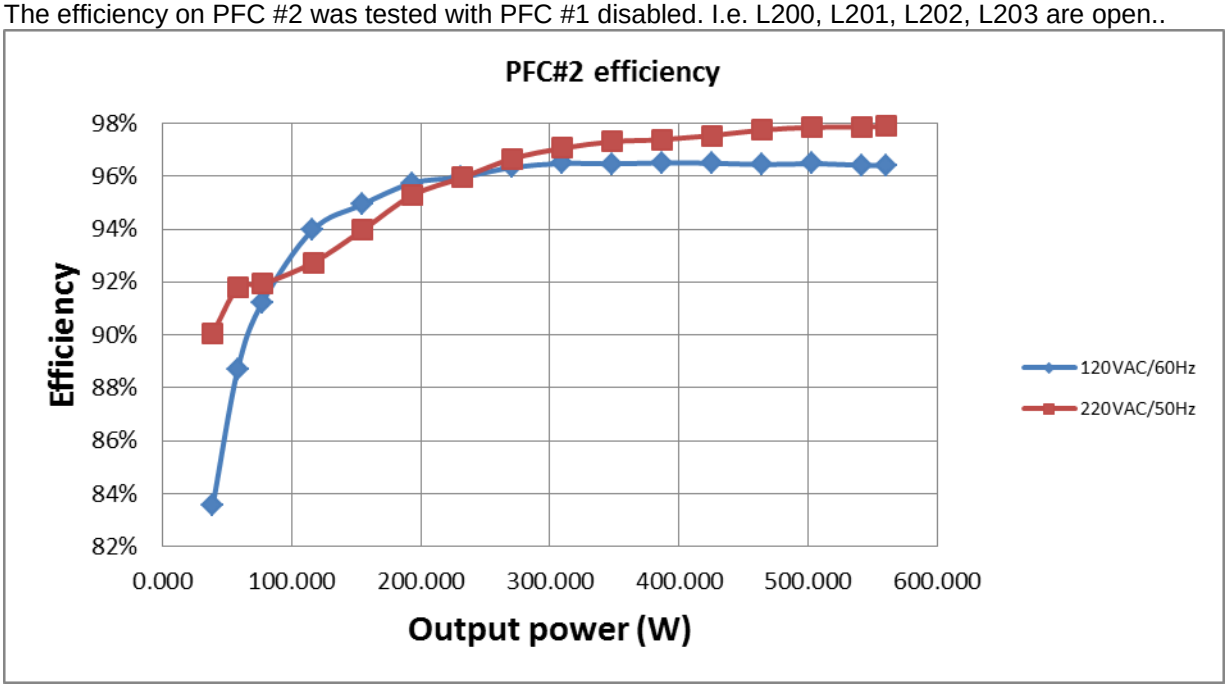



### Bottom side



## 2 Efficiency on PFC #2:

The efficiency on PFC #2 was tested with PFC #1 disabled. I.e. L200, L201, L202, L203 are open..




### 120$V_{AC}$/60Hz

| Vin,rms(V) | Iin,rms(A) | Pin(W) | P.F. | Vout(V) | Iout(A) | Pout(W) | Eff. (%) |
|---|---|---|---|---|---|---|---|
| 120.07 | 4.852 | 581.20 | 0.998 | 386.4 | 1.450 | 560.280 | 96.40% |
| 119.93 | 4.693 | 561.50 | 0.998 | 386.4 | 1.401 | 541.346 | 96.41% |
| 120.02 | 4.354 | 521.10 | 0.997 | 386.4 | 1.301 | 502.706 | 96.47% |
| 120.03 | 4.019 | 480.80 | 0.997 | 386.4 | 1.200 | 463.680 | 96.44% |
| 120.03 | 3.685 | 440.50 | 0.996 | 386.4 | 1.100 | 425.040 | 96.49% |
| 120.04 | 3.355 | 400.80 | 0.995 | 386.4 | 1.001 | 386.786 | 96.50% |
| 120.05 | 3.020 | 360.50 | 0.994 | 386.4 | 0.900 | 347.760 | 96.47% |
| 120.05 | 2.692 | 320.80 | 0.993 | 386.4 | 0.801 | 309.506 | 96.48% |
| 120.05 | 2.361 | 280.80 | 0.991 | 386.4 | 0.700 | 270.480 | 96.32% |
| 120.06 | 2.033 | 241.20 | 0.988 | 386.4 | 0.599 | 231.454 | 95.96% |
| 120.06 | 1.713 | 202.20 | 0.983 | 386.4 | 0.501 | 193.586 | 95.74% |
| 120.08 | 1.391 | 162.83 | 0.975 | 386.4 | 0.400 | 154.560 | 94.92% |
| 120.08 | 1.074 | 123.81 | 0.960 | 386.5 | 0.301 | 116.337 | 93.96% |
| 120.08 | 0.763 | 84.75 | 0.925 | 386.5 | 0.200 | 77.300 | 91.21% |
| 120.13 | 0.617 | 65.82 | 0.888 | 386.6 | 0.151 | 58.377 | 88.69% |
| 120.08 | 0.470 | 46.86 | 0.831 | 387.7 | 0.101 | 39.158 | 83.56% |

### 220$V_{AC}$/50Hz

| Vin,rms(V) | Iin,rms(A) | Pin(W) | P.F. | Vout(V) | Iout(A) | Pout(W) | Eff. (%) |
|---|---|---|---|---|---|---|---|
| 220 | 2.643 | 572.40 | 0.984 | 386.4 | 1.450 | 560.280 | 97.88% |
| 220 | 2.555 | 552.80 | 0.984 | 386.4 | 1.400 | 540.960 | 97.86% |
| 220 | 2.378 | 513.80 | 0.982 | 386.4 | 1.301 | 502.706 | 97.84% |
| 220 | 2.199 | 474.40 | 0.980 | 386.4 | 1.200 | 463.680 | 97.74% |
| 220 | 2.026 | 435.80 | 0.978 | 386.4 | 1.100 | 425.040 | 97.53% |
| 220 | 1.850 | 396.80 | 0.975 | 386.4 | 1.000 | 386.400 | 97.38% |
| 220 | 1.676 | 357.80 | 0.971 | 386.4 | 0.901 | 348.146 | 97.30% |
| 220 | 1.501 | 318.90 | 0.966 | 386.4 | 0.801 | 309.506 | 97.05% |
| 220 | 1.329 | 280.30 | 0.959 | 386.5 | 0.701 | 270.937 | 96.66% |
| 220 | 1.158 | 241.70 | 0.949 | 386.5 | 0.600 | 231.900 | 95.95% |
| 220 | 0.986 | 202.90 | 0.935 | 386.6 | 0.500 | 193.300 | 95.27% |
| 220 | 0.816 | 164.80 | 0.918 | 387.1 | 0.400 | 154.840 | 93.96% |
| 220 | 0.675 | 125.97 | 0.849 | 389.4 | 0.300 | 116.820 | 92.74% |
| 220 | 0.521 | 84.82 | 0.739 | 389.9 | 0.200 | 77.980 | 91.94% |
| 220 | 0.372 | 63.74 | 0.780 | 390 | 0.150 | 58.500 | 91.78% |
| 220 | 0.338 | 43.33 | 0.583 | 390.2 | 0.100 | 39.020 | 90.05% |

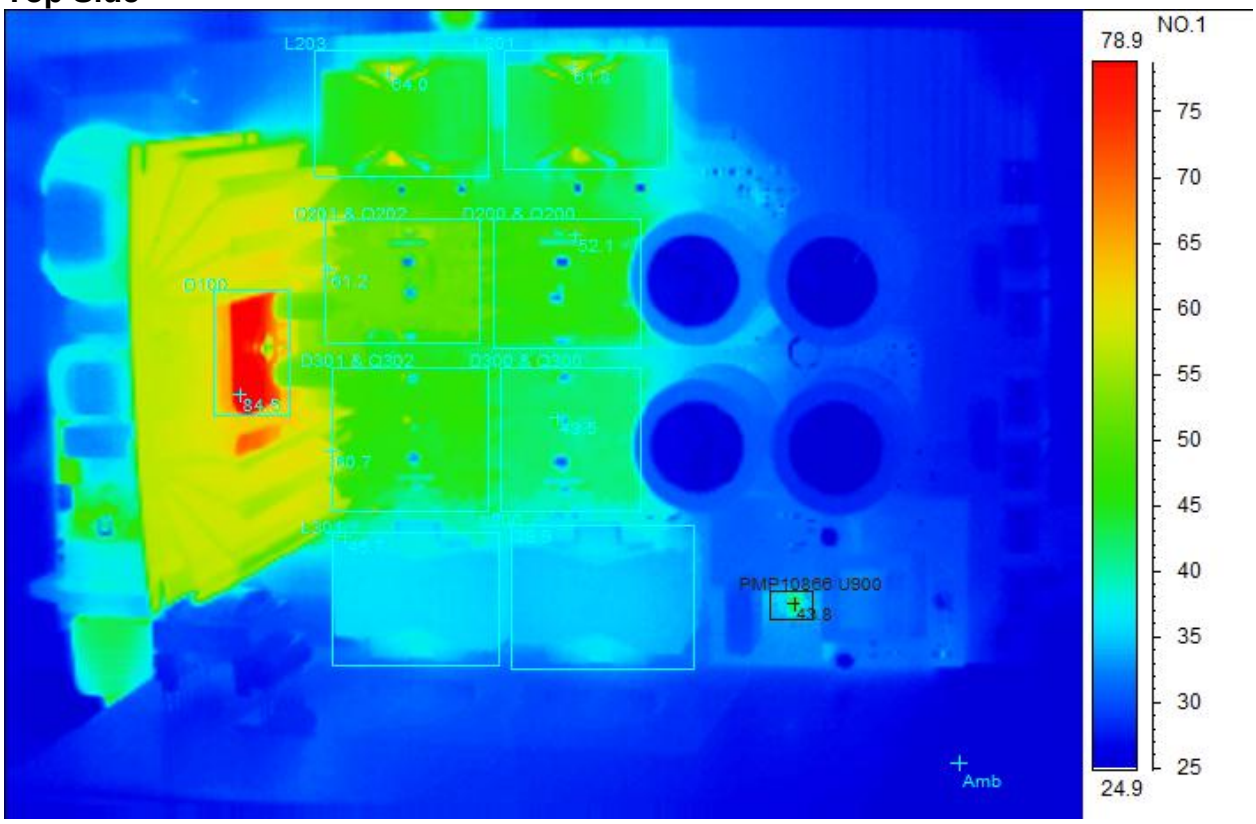
# 3 Thermal Images

The thermal images below show a top view and bottom view of the board. The ambient temperature was 20ºC with no forced air flow. The outputs were at 1300W full load (750W to $V_{BULK}$ and 550W to B+).

**120$V_{AC}$/60Hz**

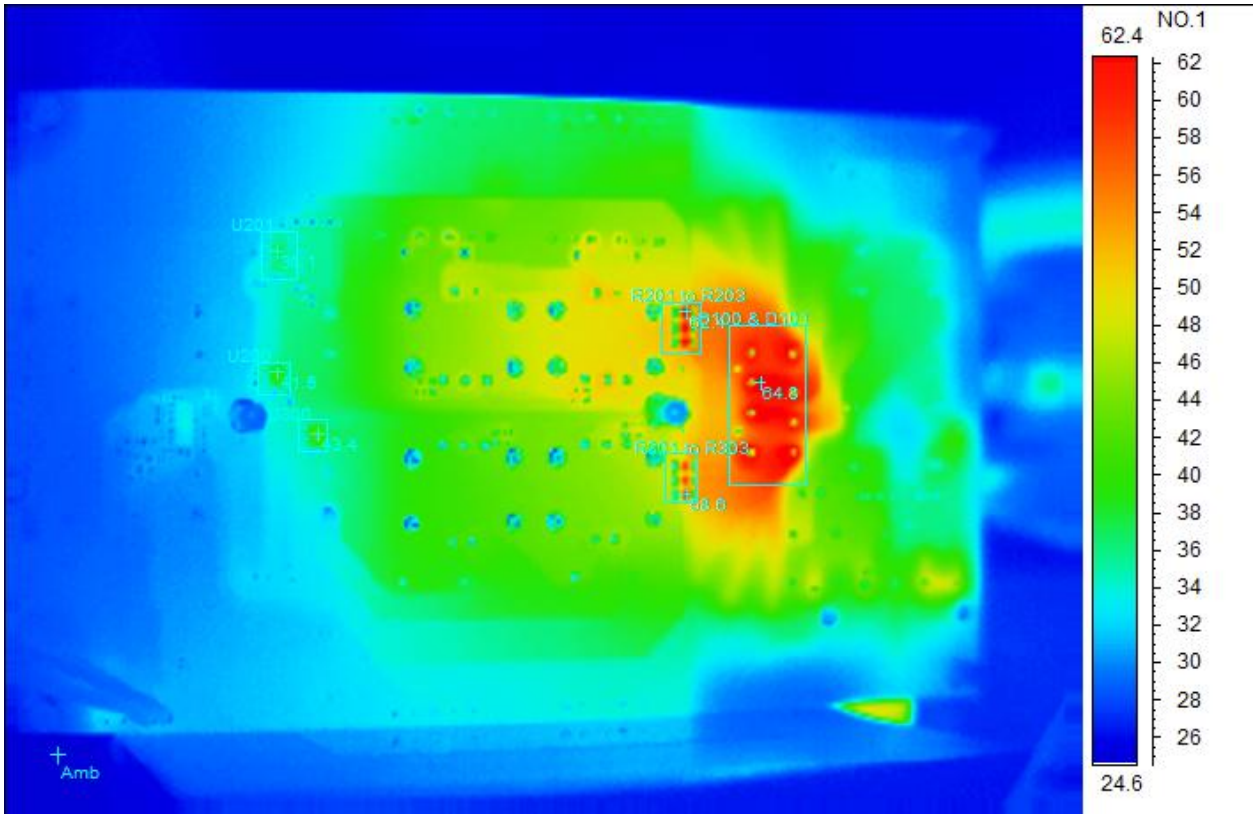
- $P_{in}$=1348W, P.F. 0.999, B+:386.3V/1.451A, $V_{BULK}$:387.2V/1.879A, Efficiency: 95.6%

**Top Side**




| Spot analysis | Value |
|---|---|
| Amb Temperature | 25.5°C |
| **Area analysis** | **Value** |
| D100Max | 84.5°C |
| L203Max | 64.0°C |
| L201Max | 61.8°C |
| D201 & Q202Max | 61.2°C |
| D200 & Q200Max | 52.1°C |
| L301Max | 45.7°C |
| L300Max | 39.9°C |
| D301 & Q302Max | 60.7°C |
| D300 & Q300Max | 49.5°C |
| PMP10866 U900 Max | 43.8°C |

## Bottom Side

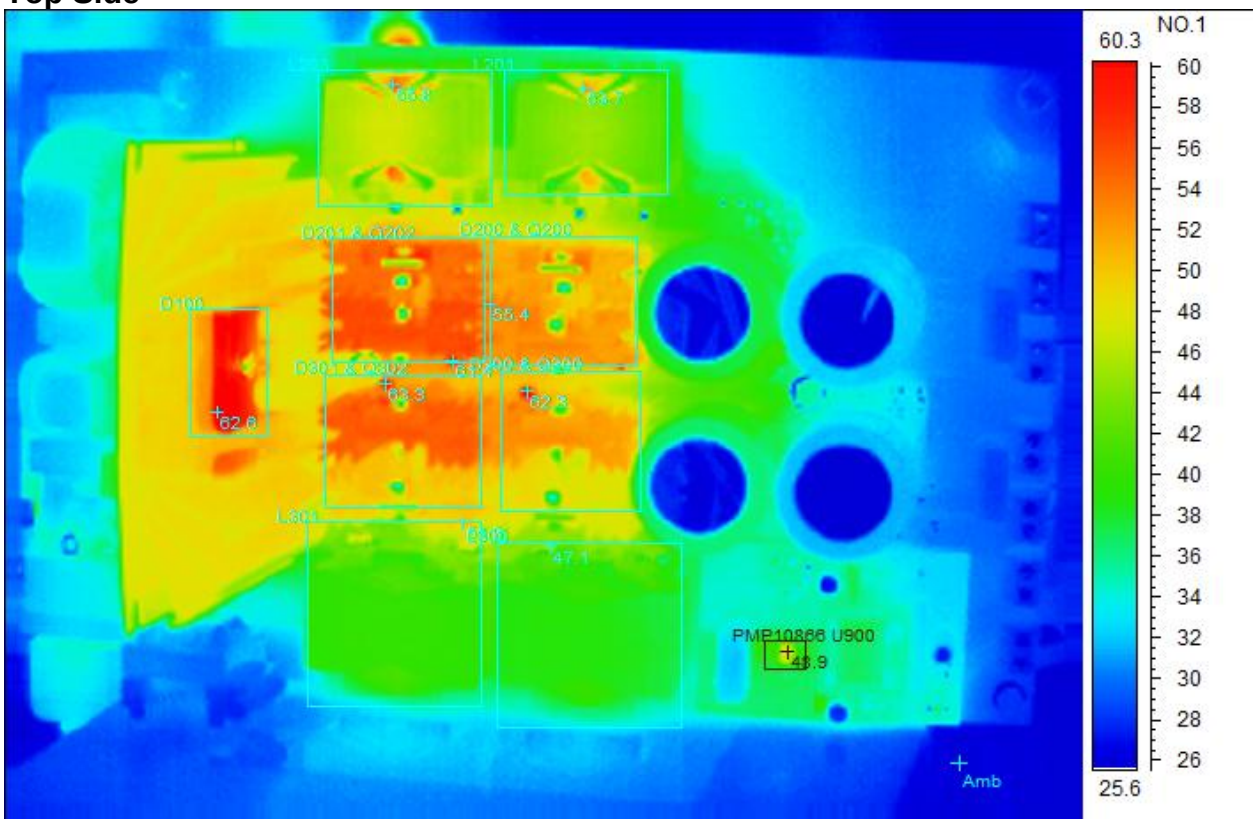



| Spot analysis | Value |
|---|---|
| Amb Temperature | 24.2°C |
| **Area analysis** | **Value** |
| R201 to R203Max | 62.4°C |
| R301 to R303Max | 58.6°C |
| D100 & D101Max | 64.8°C |
| U300Max | 43.4°C |
| U200Max | 41.5°C |
| U201 Max | 38.1°C |

### 220$V_{AC}$/50Hz

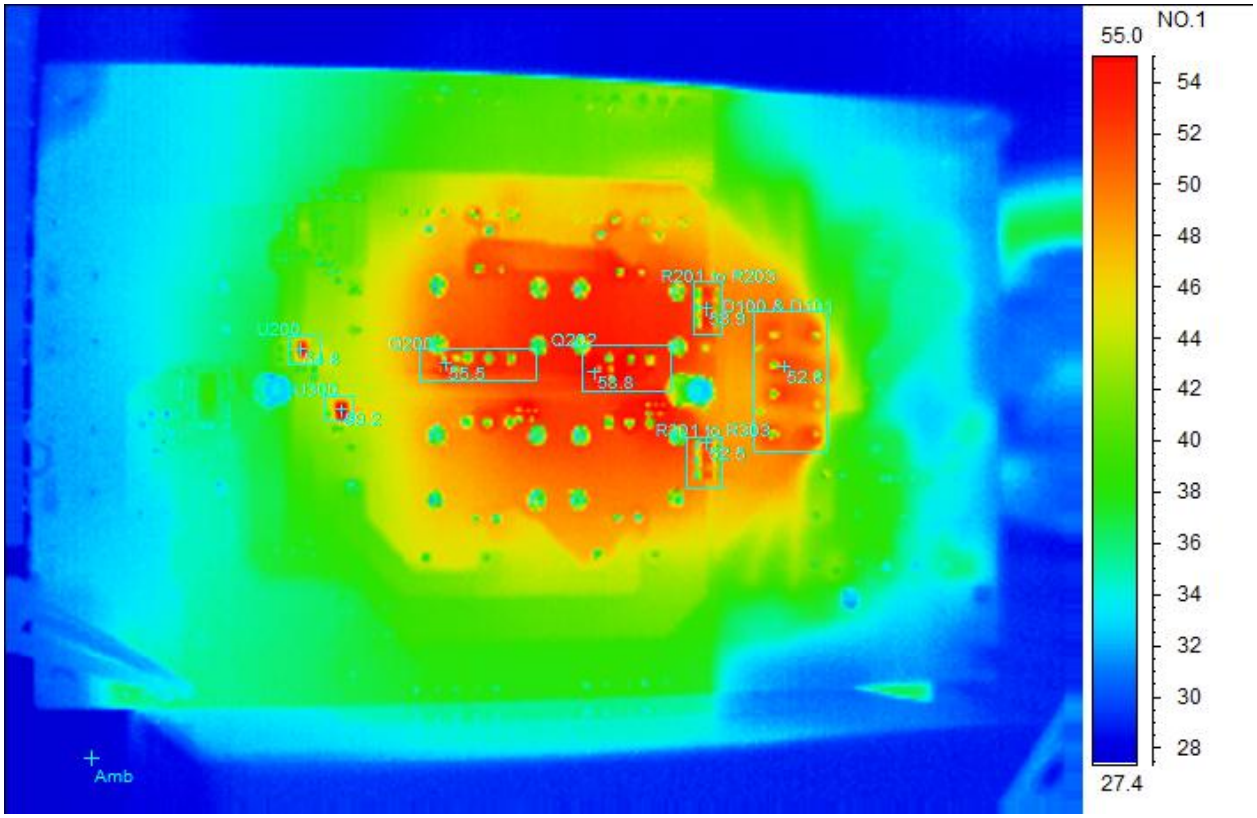
- $P_{in}$=1316W, P.F. 0.992, B+:386.3V/1.451A, $V_{BULK}$:387.4V/1.881A, Efficiency: 98%

### Top Side




| Spot analysis | Value |
|---|---|
| Amb Temperature | 25.9°C |
| **Area analysis** | **Value** |
| D100Max | 62.6°C |
| L203Max | 55.8°C |
| L201Max | 53.7°C |
| D201 & Q202Max | 61.4°C |
| D200 & Q200Max | 55.4°C |
| L301Max | 51.3°C |
| L300Max | 47.1°C |
| D301 & Q302Max | 63.3°C |
| D300 & Q300Max | 62.3°C |
| PMP10866 U900 Max | 48.9°C |

## Bottom Side

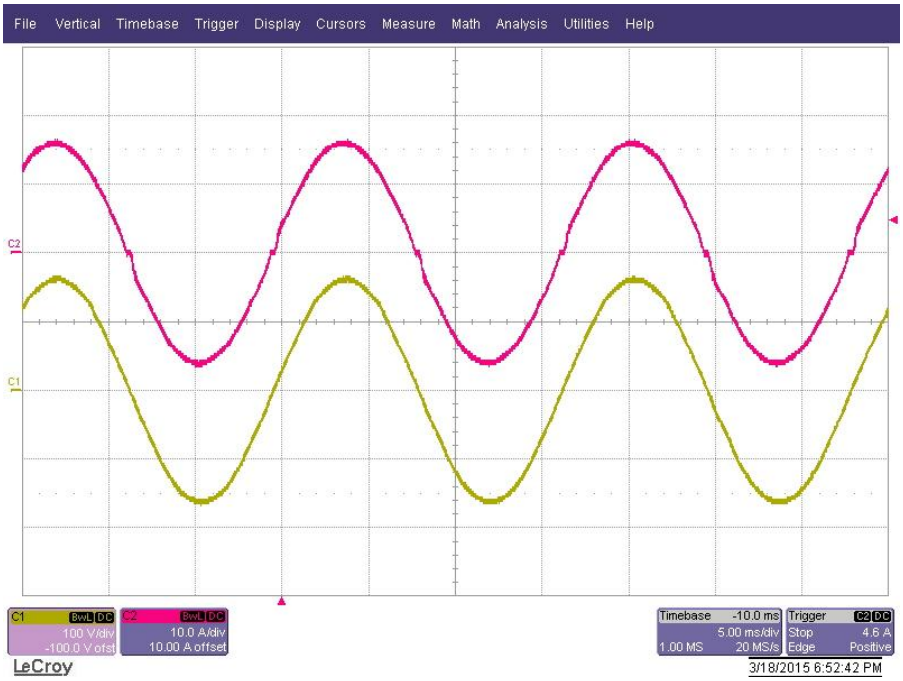



| Spot analysis | Value |
|---|---|
| Amb Temperature | 27.7°C |
| **Area analysis** | **Value** |
| R201 to R203Max | 53.9°C |
| R301 to R303Max | 52.5°C |
| D100 & D101Max | 52.8°C |
| Q200Max | 55.5°C |
| Q202Max | 58.8°C |
| U300Max | 59.2°C |
| U200 Max | 54.8°C |

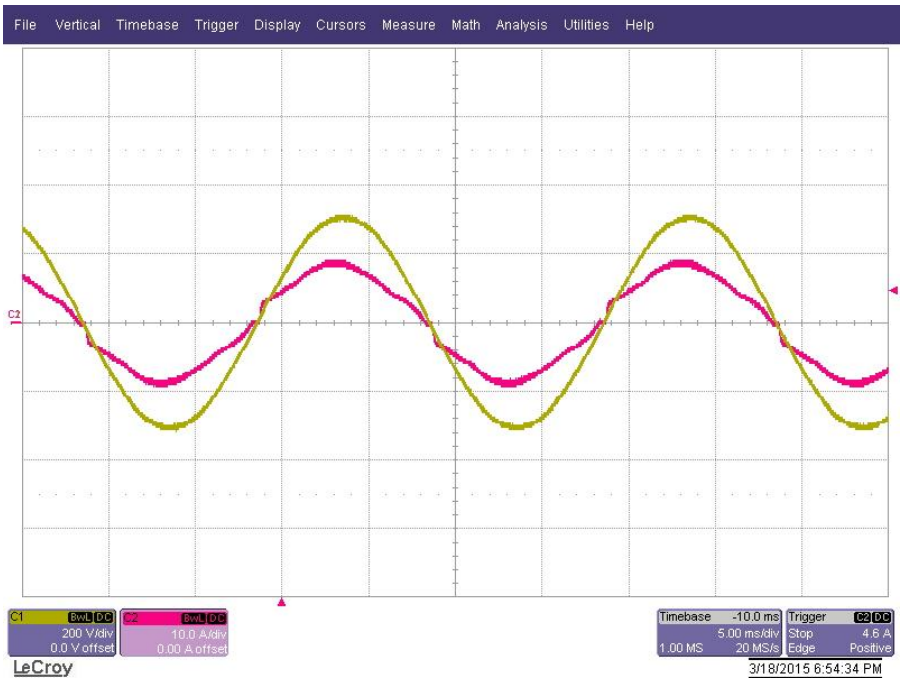
# 4 Input current and voltage

The input current and voltage waveforms are shown in the plots below at 1300W full load (750W to $V_{BULK}$ and 550W to B+).

## *4.1 120$V_{AC}$/60Hz input.*




## *4.2 220$V_{AC}$/50Hz input.*

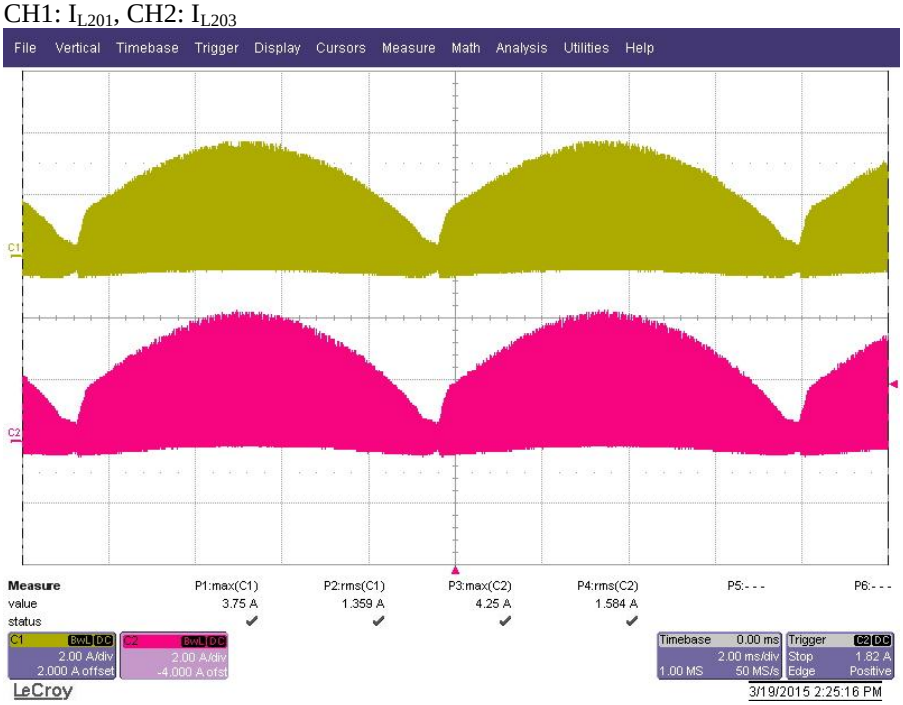


# 5 PFC inductor currents

The PFC inductor currents are shown in the images below.

## *5.1 L201, L203 @ 120$V_{AC}$/60Hz: $V_{BULK}$: 386V/0.75A, B+:386V/0.1A.*

CH1: $I_{L201}$, CH2: $I_{L203}$

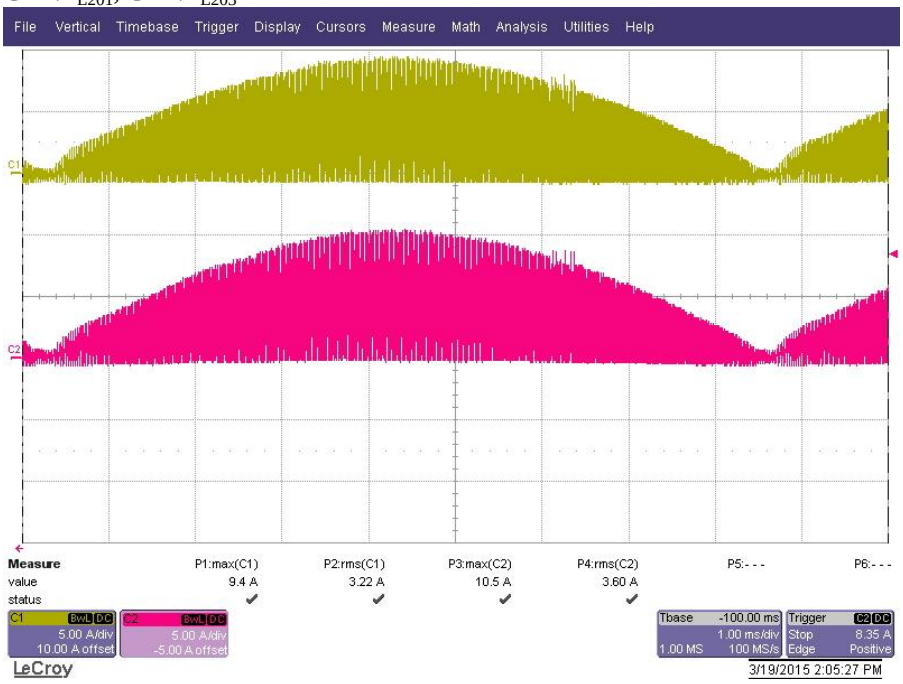



### 5.2 L300, L301 @ 120$V_{AC}$/60Hz: $V_{BULK}$: 386V/0.75A, B+:386V/0.1A.

CH1: $I_{L300}$, CH2: $I_{L301}$

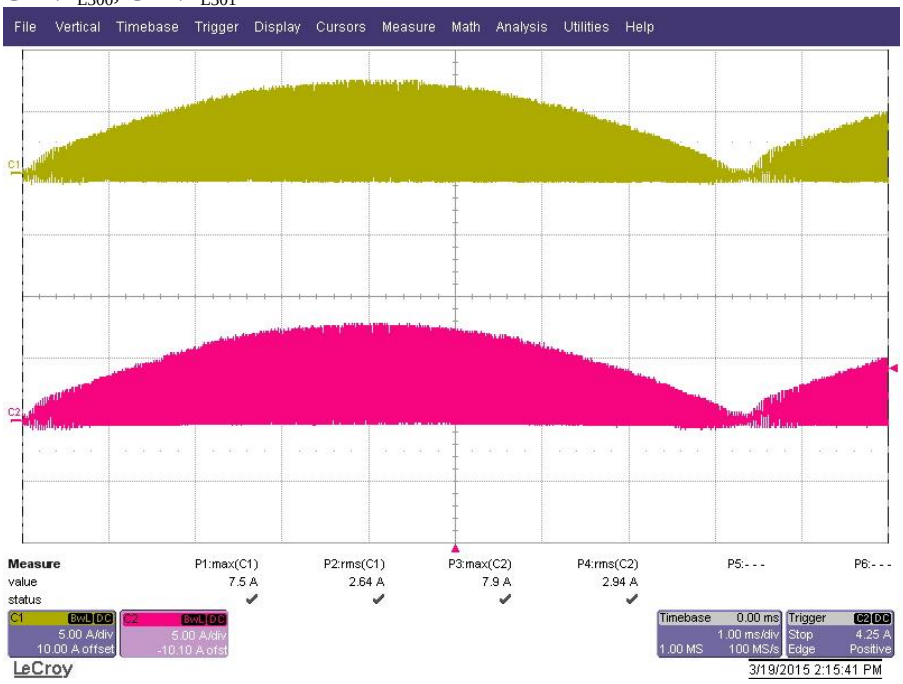

### 5.3 L201, L203 @ 120$V_{AC}$/60Hz: $V_{BULK}$: 386V/1.9A, B+:386V/1.4A.

CH1: $I_{L201}$, CH2: $I_{L203}$



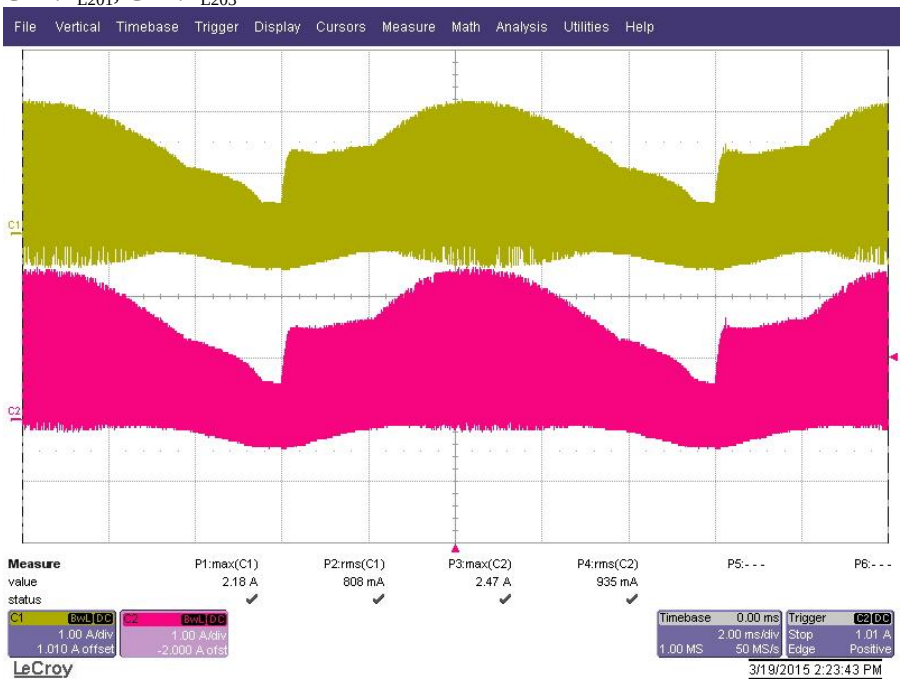

### *5.4 L300, L301 @ 120$V_{AC}$/60Hz: $V_{BULK}$: 386V/1.9A, B+:386V/1.4A.*

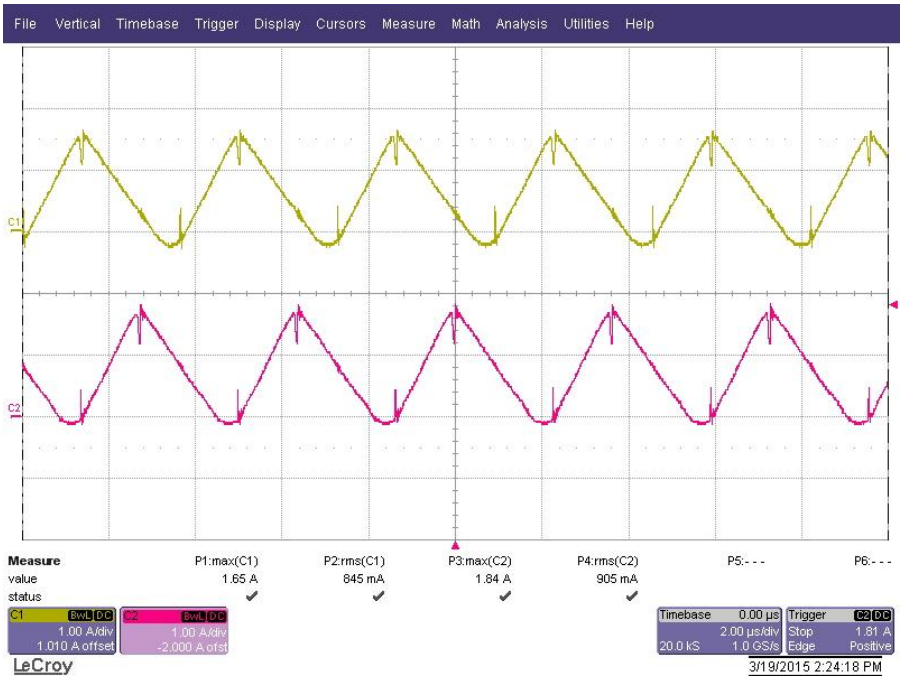
CH1: $I_{L300}$, CH2: $I_{L301}$




### 5.5 L201, L203 @ 220$V_{AC}$/50Hz: $V_{BULK}$: 386V/0.75A, B+:386V/0.1A.

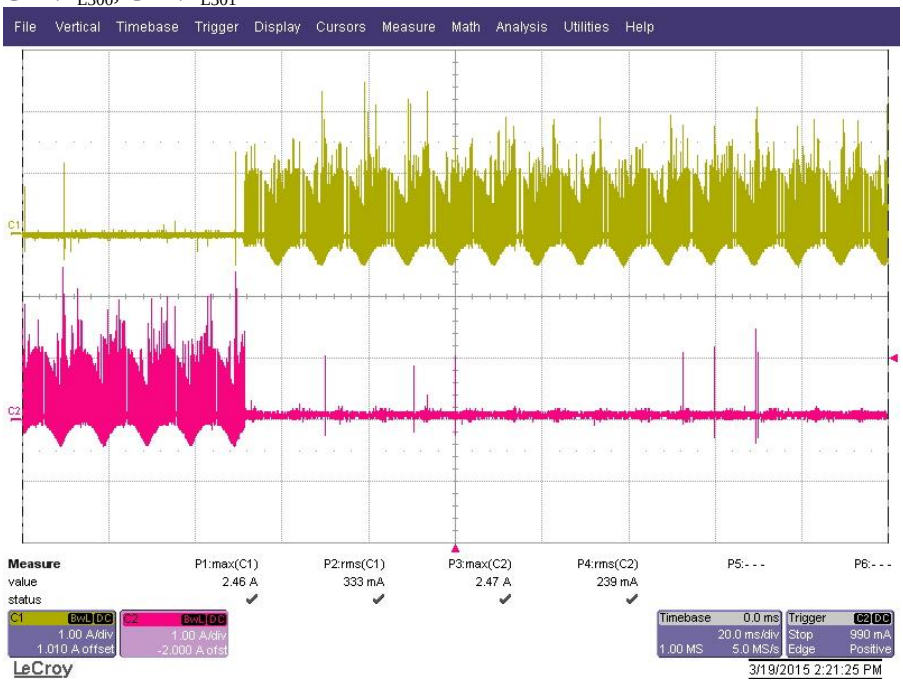
CH1: $I_{L201}$, CH2: $I_{L203}$

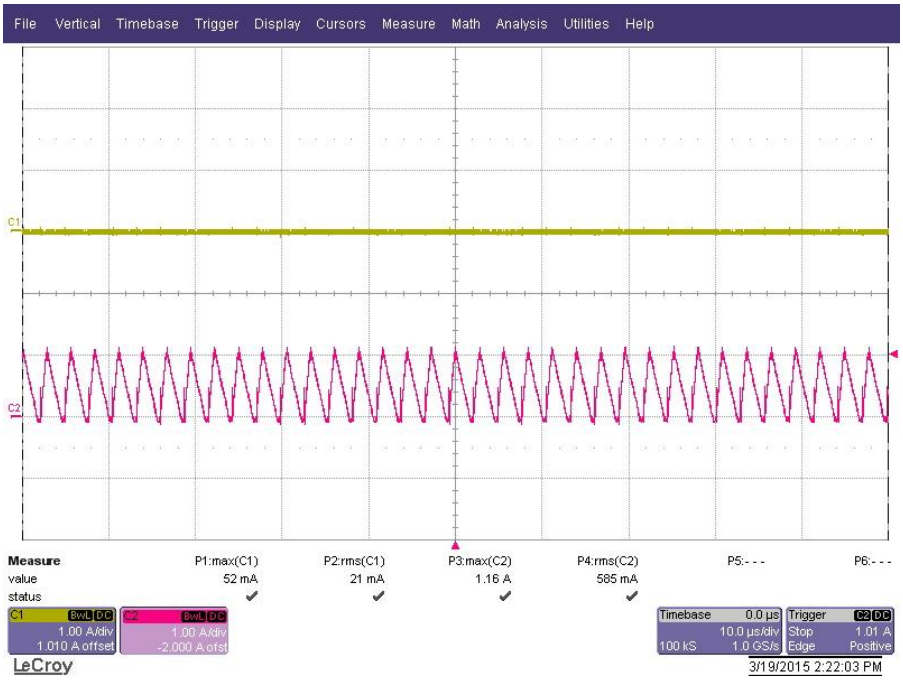


### 5.6 L300, L301 @ 220$V_{AC}$/50Hz: $V_{BULK}$: 386V/0.75A, B+:386V/0.1A.

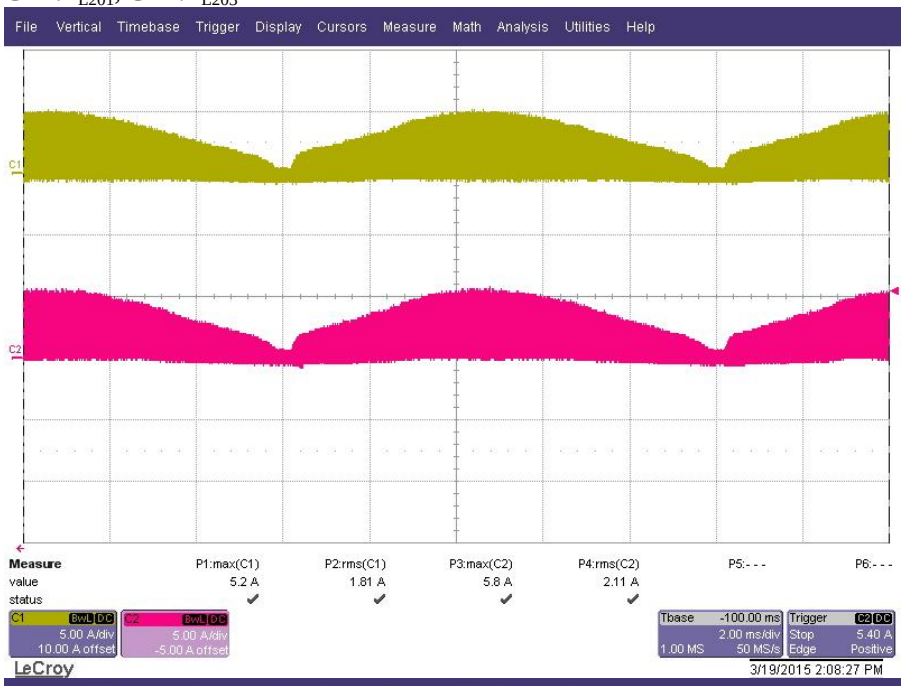
CH1: $I_{L300}$, CH2: $I_{L301}$



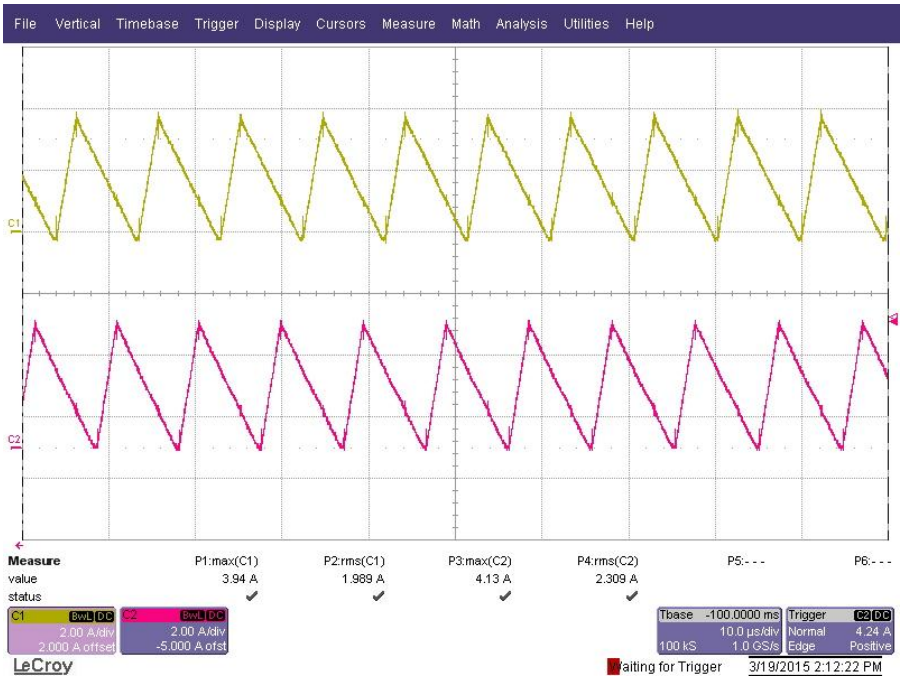
### 5.7 L201, L203 @ 220$V_{AC}$/50Hz: $V_{BULK}$: 386V/1.9A, B+:386V/1.4A.

CH1: $I_{L201}$, CH2: $I_{L203}$




### 5.8 L300, L301 @ 220$V_{AC}$/50Hz: $V_{BULK}$: 386V/1.9A, B+:386V/1.4A.

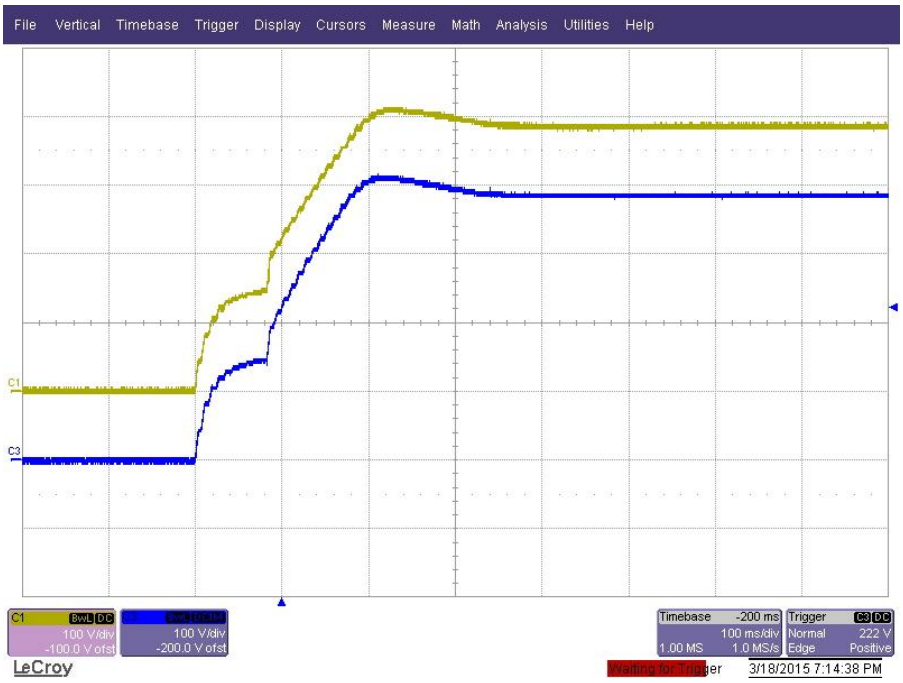
CH1: $I_{L300}$, CH2: $I_{L301}$

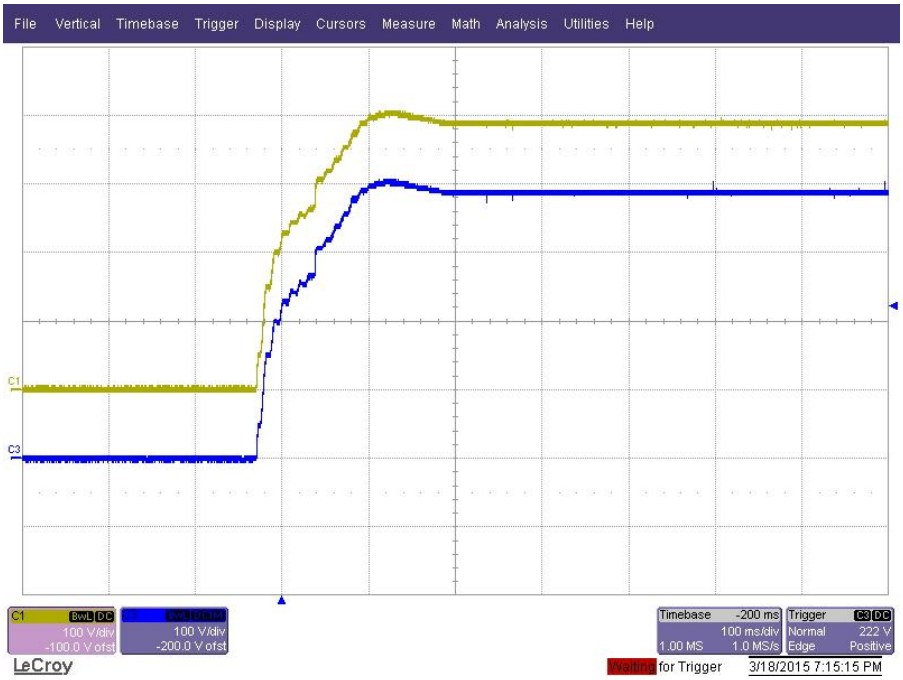
# 6 Startup

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

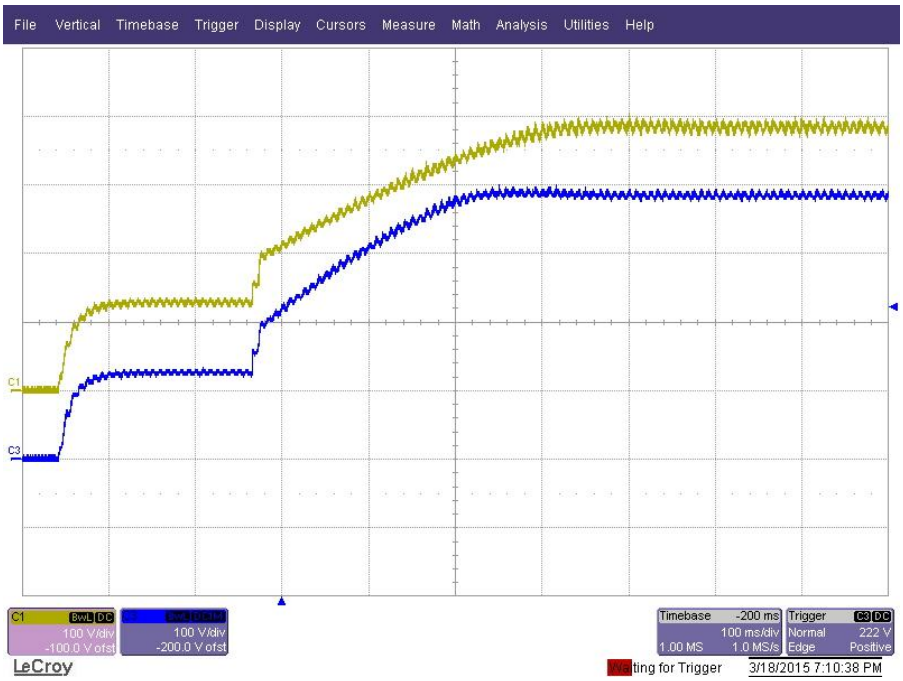
## 6.1 Start Up @ 120$V_{AC}$/60Hz: $V_{BULK}$: 386V/0.1A, B+:386V/0.1A.




## 6.2 Start Up @ 220$V_{AC}$/50Hz: $V_{BULK}$: 386V/0.1A, B+:386V/0.1A.



### 6.3 Start Up @ 120$V_{AC}$/60Hz: $V_{BULK}$: 386V/1.9A, B+:386V/1.4A. (Notice that resistive loads are applied here.)

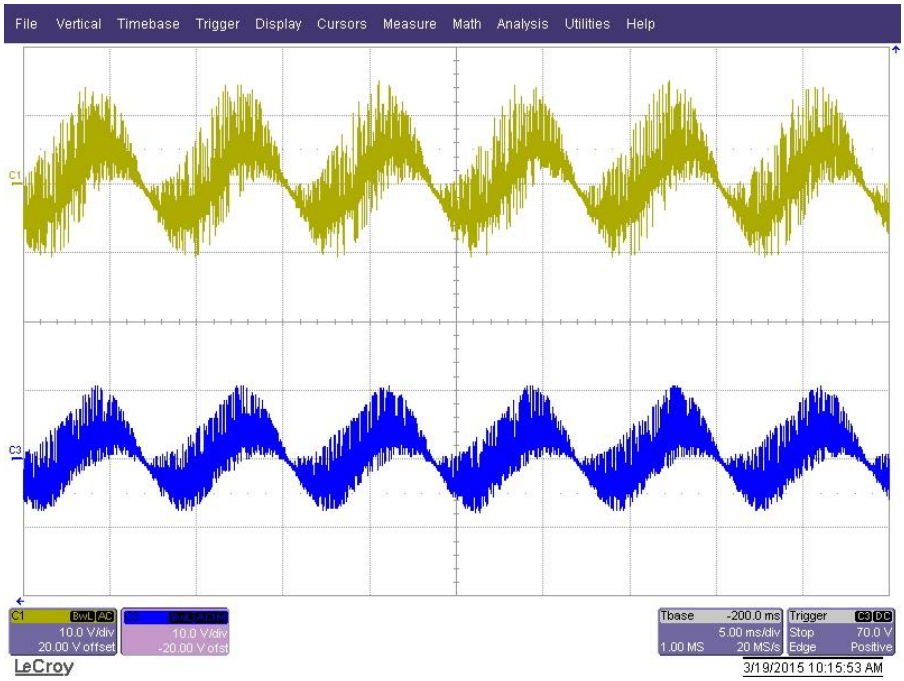



### 6.4 Start Up @ 220$V_{AC}$/50Hz: $V_{BULK}$: 386V/1.9A, B+:386V/1.4A. (Notice that resistive loads are applied here.)

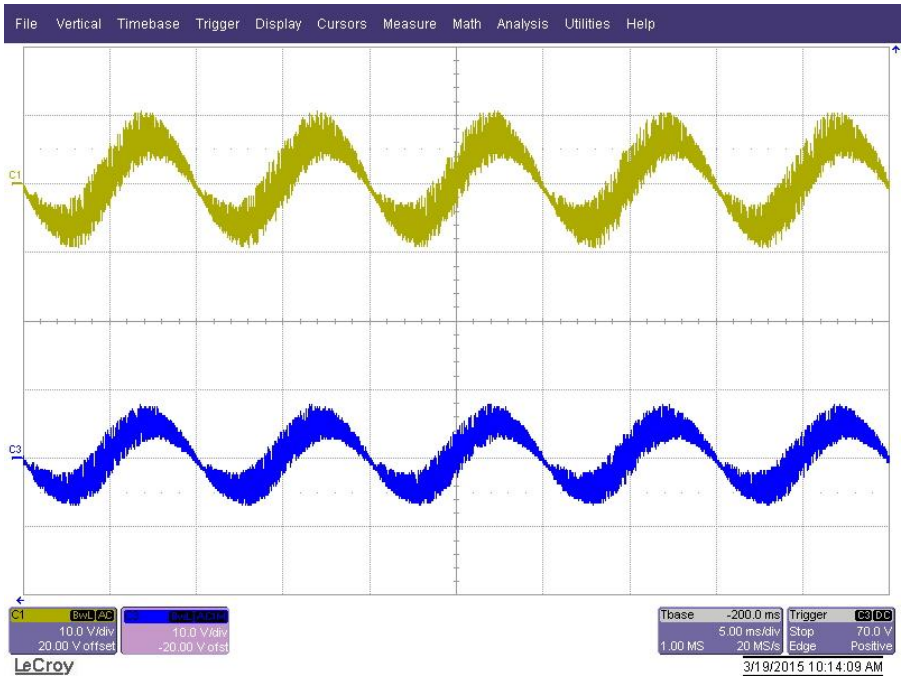
# 7 Output Ripple Voltages

The output ripple voltages are shown in the plots below at 1300W full load (750W to $V_{BULK}$ and 550W to B+). CH1: $V_{BULK}$, CH3: B+

## *7.1 Output ripples @ 120$V_{AC}$/60Hz input.*




## *7.2 Output ripples @ 220$V_{AC}$/50Hz input.*

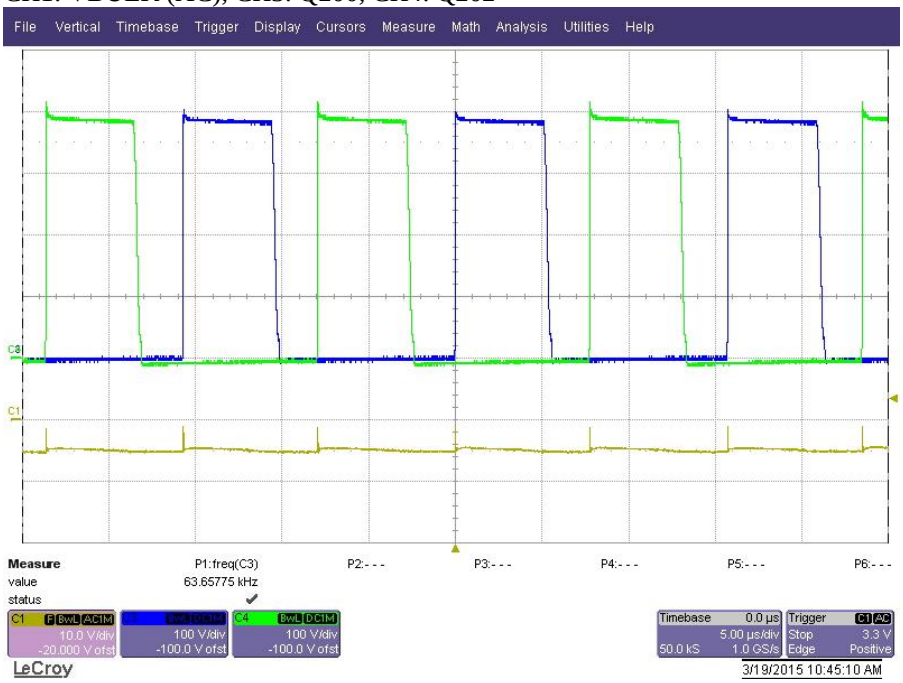


# 8 Switching Waveforms

The images below show key switching waveforms of PMP10948RevA. The waveforms are measured with 1300W full load (750W to $V_{BULK}$ and 550W to B+).

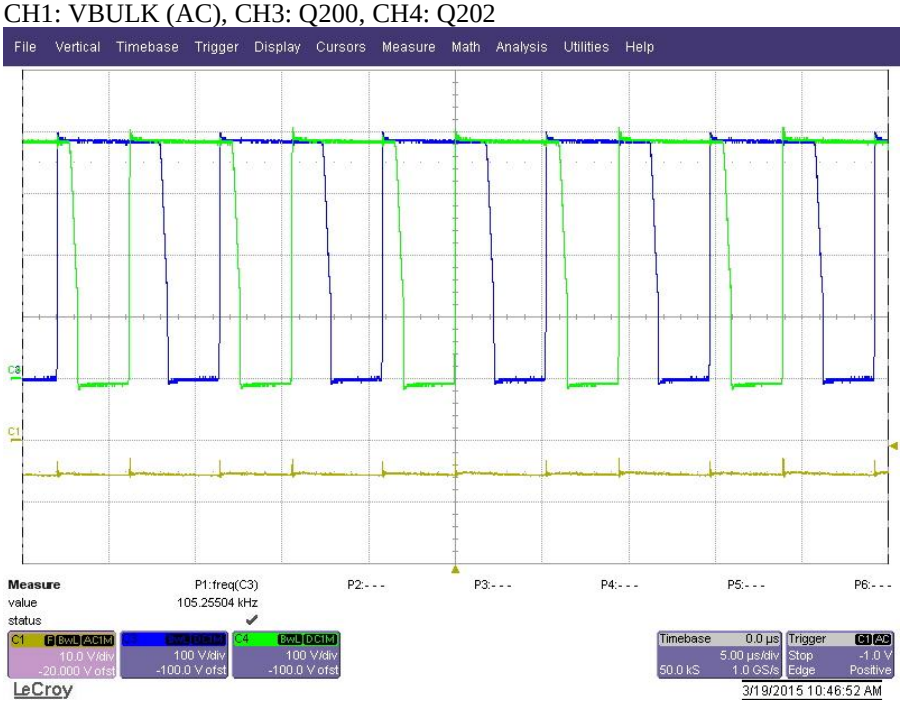
## *8.1 Q200, Q202 @ 120$V_{AC}$/60Hz*

CH1: VBULK (AC), CH3: Q200, CH4: Q202



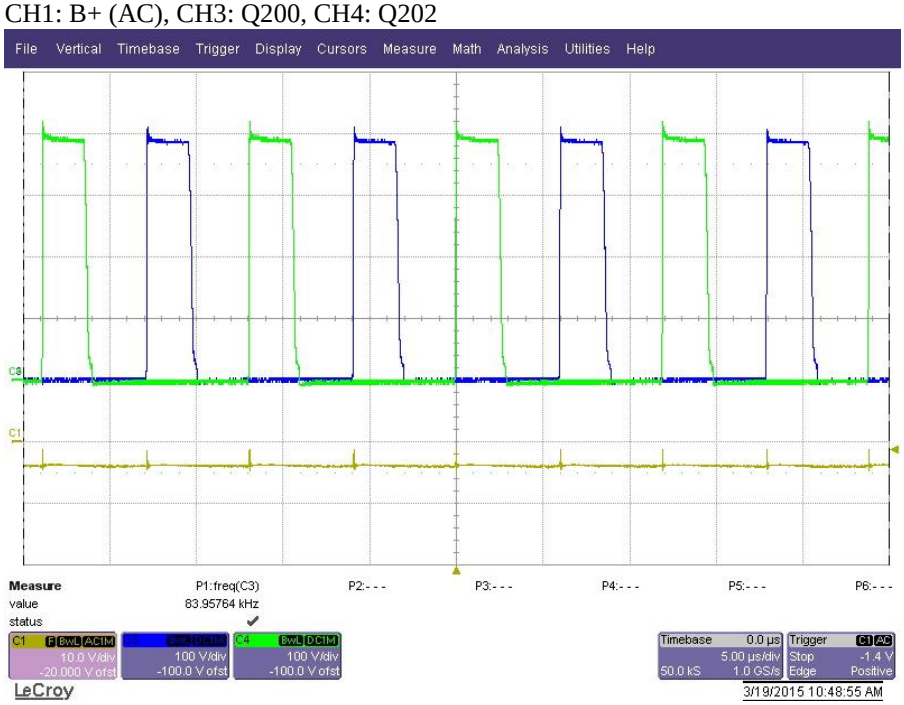

## *8.2 Q200, Q202 @ 220$V_{AC}$/50Hz*

CH1: VBULK (AC), CH3: Q200, CH4: Q202



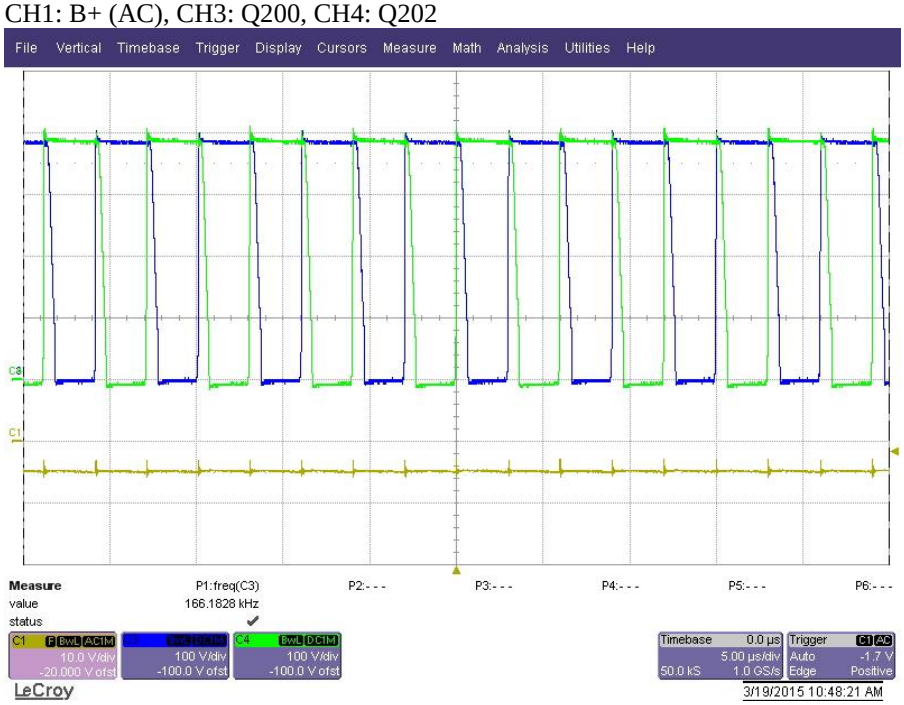
## 8.3 Q300, Q302 @ 120$V_{AC}$/60Hz

CH1: B+ (AC), CH3: Q200, CH4: Q202




## 8.4 Q300, Q302 @ 220$V_{AC}$/50Hz

CH1: B+ (AC), CH3: Q200, CH4: Q202



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