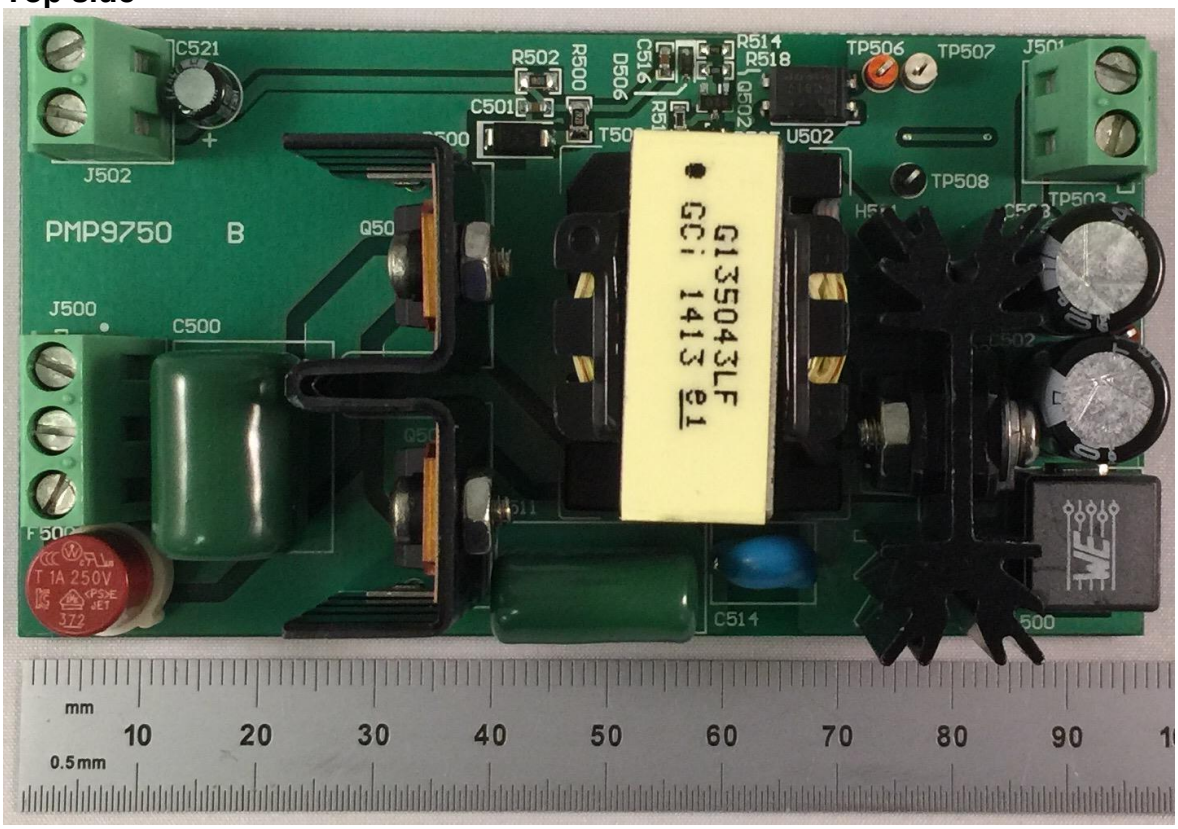
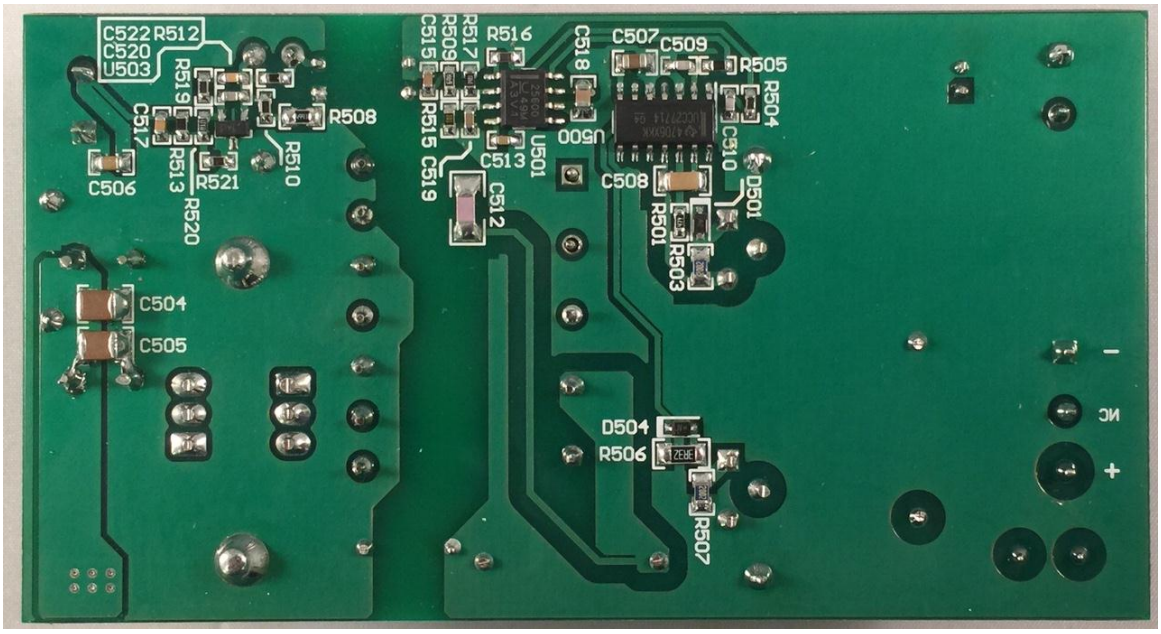
# 1 Photo

The photographs below show the PMP9750 Rev B assembly. This circuit was built on a PMP9750 Rev B PCB.

**Top side**



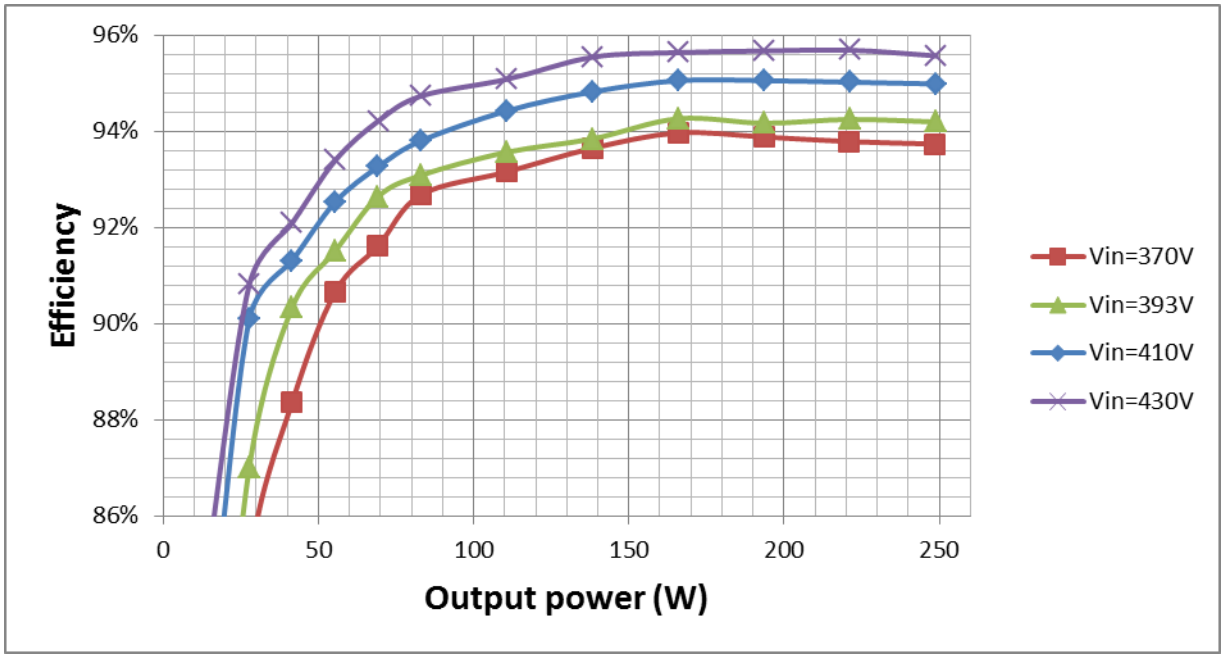

**Bottom side**



## 2 Converter Efficiency:

The efficiency curve is shown in the tables and graph below. Driving losses and controller losses from Bias supply are not included here.

### *2.1 Efficiencies with 28Vout and various input voltages:*



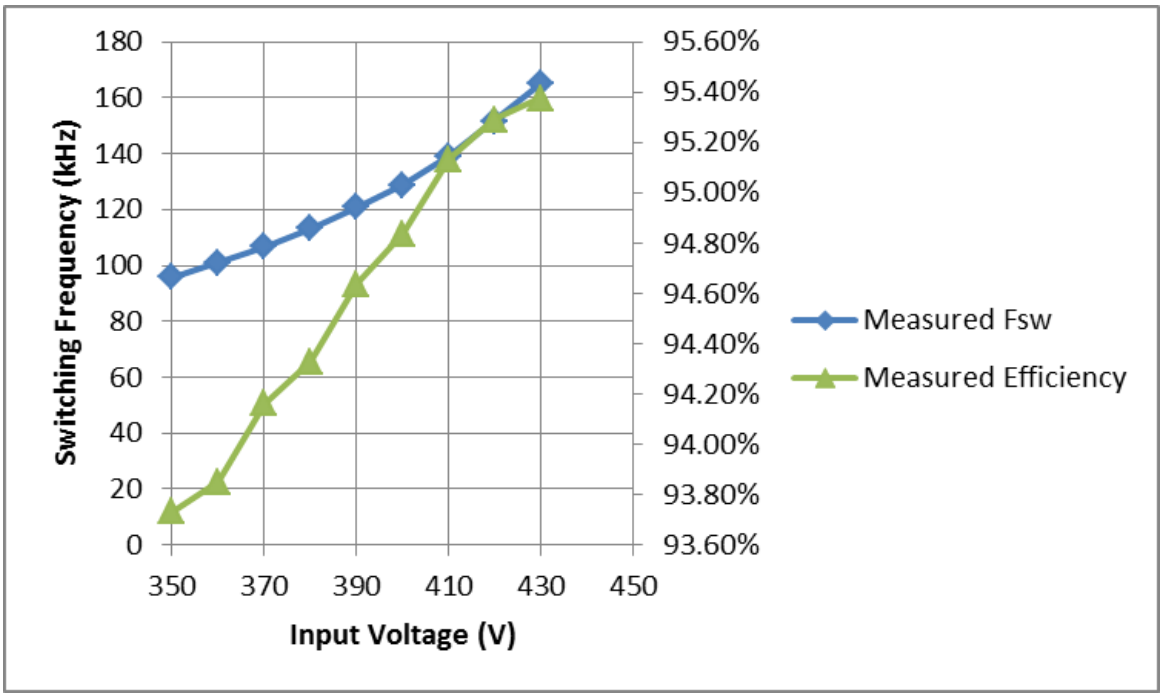

| Vin(V) | Iin(A) | Pin(W) | Vout(V) | Iout(A) | Pout(W) | Losses(W) | Efficiency (%) |
|---|---|---|---|---|---|---|---|
| 370 | 0.717 | 265.29 | 27.63 | 9 | 248.67 | 16.62 | 93.74% |
| 370 | 0.637 | 235.69 | 27.63 | 8 | 221.04 | 14.65 | 93.78% |
| 370 | 0.557 | 206.09 | 27.64 | 7 | 193.48 | 12.61 | 93.88% |
| 370 | 0.477 | 176.49 | 27.64 | 6 | 165.84 | 10.65 | 93.97% |
| 370 | 0.399 | 147.63 | 27.65 | 5 | 138.25 | 9.38 | 93.65% |
| 370 | 0.321 | 118.77 | 27.66 | 4 | 110.64 | 8.13 | 93.15% |
| 370 | 0.242 | 89.54 | 27.67 | 2.999 | 82.98233 | 6.55767 | 92.68% |
| 370 | 0.204 | 75.48 | 27.67 | 2.499 | 69.14733 | 6.33267 | 91.61% |
| 370 | 0.165 | 61.05 | 27.67 | 2 | 55.34 | 5.71 | 90.65% |
| 370 | 0.127 | 46.99 | 27.68 | 1.5 | 41.52 | 5.47 | 88.36% |
| 370 | 0.088 | 32.56 | 27.68 | 1 | 27.68 | 4.88 | 85.01% |
| 370.1 | 0.049 | 18.1349 | 27.69 | 0.501 | 13.87269 | 4.26221 | 76.50% |
| 370 | 0.01 | 3.7 | 27.69 | 0 | 0 | 3.7 | 0.00% |

| Vin(V) | Iin(A) | Pin(W) | Vout(V) | Iout(A) | Pout(W) | Losses(W) | Efficiency (%) |
|---|---|---|---|---|---|---|---|
| 393 | 0.672 | 264.096 | 27.64 | 9 | 248.76 | 15.336 | 94.19% |
| 393 | 0.597 | 234.621 | 27.64 | 8 | 221.12 | 13.501 | 94.25% |
| 393 | 0.523 | 205.539 | 27.65 | 7 | 193.55 | 11.989 | 94.17% |
| 393 | 0.448 | 176.064 | 27.66 | 6 | 165.96 | 10.104 | 94.26% |
| 393 | 0.375 | 147.375 | 27.66 | 5 | 138.3 | 9.075 | 93.84% |
| 393 | 0.301 | 118.293 | 27.67 | 4 | 110.68 | 7.613 | 93.56% |
| 393 | 0.227 | 89.211 | 27.68 | 3 | 83.04 | 6.171 | 93.08% |
| 393 | 0.19 | 74.67 | 27.68 | 2.499 | 69.17232 | 5.49768 | 92.64% |
| 393 | 0.154 | 60.522 | 27.69 | 2 | 55.38 | 5.142 | 91.50% |
| 393 | 0.117 | 45.981 | 27.69 | 1.5 | 41.535 | 4.446 | 90.33% |
| 393.1 | 0.081 | 31.8411 | 27.7 | 1 | 27.7 | 4.1411 | 86.99% |
| 393.1 | 0.045 | 17.6895 | 27.7 | 0.5 | 13.85 | 3.8395 | 78.30% |
| 393.1 | 0.005 | 1.9655 | 27.74 | 0 | 0 | 1.9655 | 0.00% |

| Vin(V) | Iin(A) | Pin(W) | Vout(V) | Iout(A) | Pout(W) | Losses(W) | Efficiency (%) |
|---|---|---|---|---|---|---|---|
| 410 | 0.639 | 261.99 | 27.65 | 9 | 248.85 | 13.14 | 94.98% |
| 410 | 0.568 | 232.88 | 27.66 | 8 | 221.28 | 11.6 | 95.02% |
| 410 | 0.497 | 203.77 | 27.67 | 7 | 193.69 | 10.08 | 95.05% |
| 410 | 0.426 | 174.66 | 27.67 | 6 | 166.02 | 8.64 | 95.05% |
| 410 | 0.356 | 145.96 | 27.68 | 5 | 138.4 | 7.56 | 94.82% |
| 410 | 0.286 | 117.26 | 27.68 | 4 | 110.72 | 6.54 | 94.42% |
| 410 | 0.216 | 88.56 | 27.69 | 3 | 83.07 | 5.49 | 93.80% |
| 410.1 | 0.181 | 74.2281 | 27.69 | 2.5 | 69.225 | 5.0031 | 93.26% |
| 410.1 | 0.146 | 59.8746 | 27.7 | 2 | 55.4 | 4.4746 | 92.53% |
| 410.1 | 0.111 | 45.5211 | 27.71 | 1.5 | 41.565 | 3.9561 | 91.31% |
| 410.1 | 0.075 | 30.7575 | 27.71 | 1 | 27.71 | 3.0475 | 90.09% |
| 410.1 | 0.041 | 16.8141 | 27.71 | 0.501 | 13.88271 | 2.93139 | 82.57% |
| 410.1 | 0.005 | 2.0505 | 27.79 | 0 | 0 | 2.0505 | 0.00% |

| Vin(V) | Iin(A) | Pin(W) | Vout(V) | Iout(A) | Pout(W) | Losses(W) | Efficiency (%) |
|---|---|---|---|---|---|---|---|
| 430 | 0.606 | 260.58 | 27.67 | 9 | 249.03 | 11.55 | 95.57% |
| 430 | 0.538 | 231.34 | 27.67 | 8 | 221.36 | 9.98 | 95.69% |
| 430 | 0.471 | 202.53 | 27.68 | 7 | 193.76 | 8.77 | 95.67% |
| 430 | 0.404 | 173.72 | 27.69 | 6 | 166.14 | 7.58 | 95.64% |
| 430 | 0.337 | 144.91 | 27.69 | 5 | 138.45 | 6.46 | 95.54% |
| 430 | 0.271 | 116.53 | 27.7 | 4 | 110.8 | 5.73 | 95.08% |
| 430 | 0.204 | 87.72 | 27.7 | 3 | 83.1 | 4.62 | 94.73% |
| 430 | 0.171 | 73.53 | 27.71 | 2.5 | 69.275 | 4.255 | 94.21% |
| 430 | 0.138 | 59.34 | 27.71 | 2 | 55.42 | 3.92 | 93.39% |
| 430 | 0.105 | 45.15 | 27.72 | 1.5 | 41.58 | 3.57 | 92.09% |
| 430.1 | 0.071 | 30.5371 | 27.73 | 1 | 27.73 | 2.8071 | 90.81% |
| 430.1 | 0.038 | 16.3438 | 27.74 | 0.5 | 13.87 | 2.4738 | 84.86% |
| 430.1 | 0.002 | 0.8602 | 27.84 | 0 | 0 | 0.8602 | 0.00% |

### 2.2 Efficiencies and switching frequencies with 28Vout/9A and various input voltages:

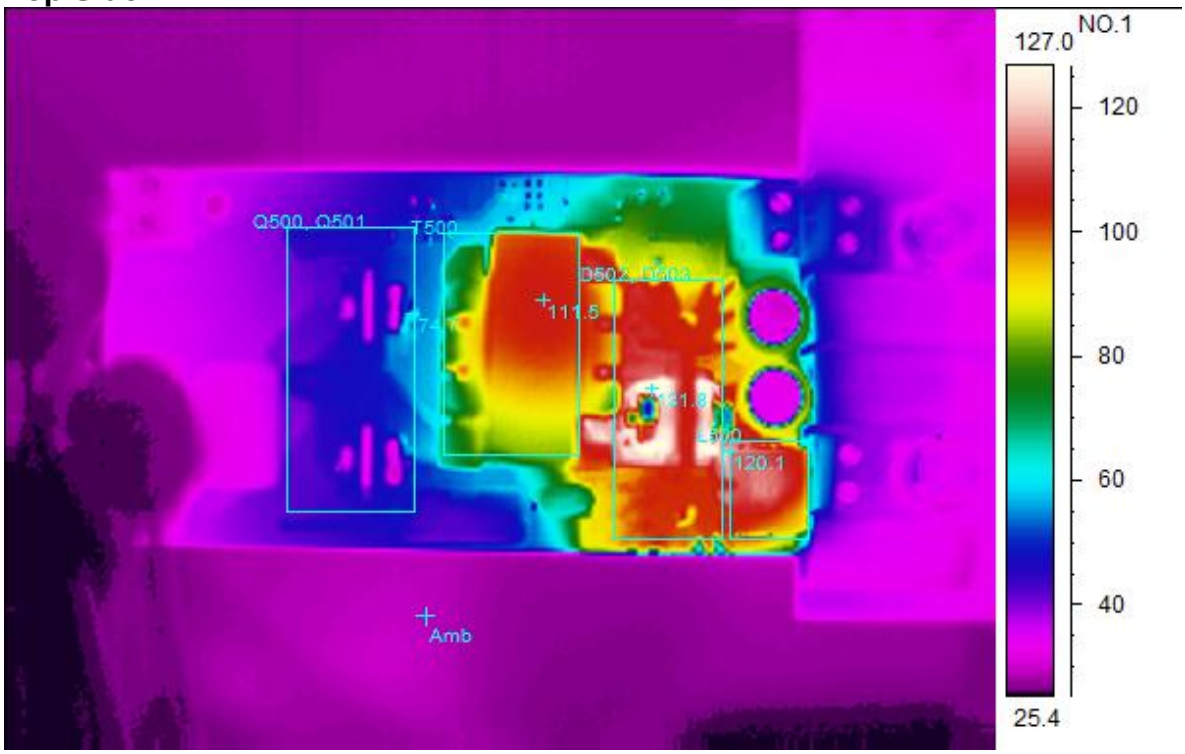



| Vin(V) | Iin(A) | Pin(W) | Vout(V) | Iout(A) | Pout(W) | Losses(W) | Efficiency (%) |
|---|---|---|---|---|---|---|---|
| 430 | 0.607 | 261.01 | 27.66 | 9 | 248.94 | 12.07 | 95.38% |
| 420 | 0.622 | 261.24 | 27.66 | 9 | 248.94 | 12.3 | 95.29% |
| 410 | 0.638 | 261.58 | 27.65 | 9 | 248.85 | 12.73 | 95.13% |
| 400 | 0.656 | 262.4 | 27.65 | 9 | 248.85 | 13.55 | 94.84% |
| 390 | 0.674 | 262.86 | 27.64 | 9 | 248.76 | 14.1 | 94.64% |
| 380 | 0.694 | 263.72 | 27.64 | 9 | 248.76 | 14.96 | 94.33% |
| 370 | 0.714 | 264.18 | 27.64 | 9 | 248.76 | 15.42 | 94.16% |
| 360 | 0.736 | 264.96 | 27.63 | 9 | 248.67 | 16.29 | 93.85% |
| 350 | 0.758 | 265.3 | 27.63 | 9 | 248.67 | 16.63 | 93.73% |

# 3 Thermal Images

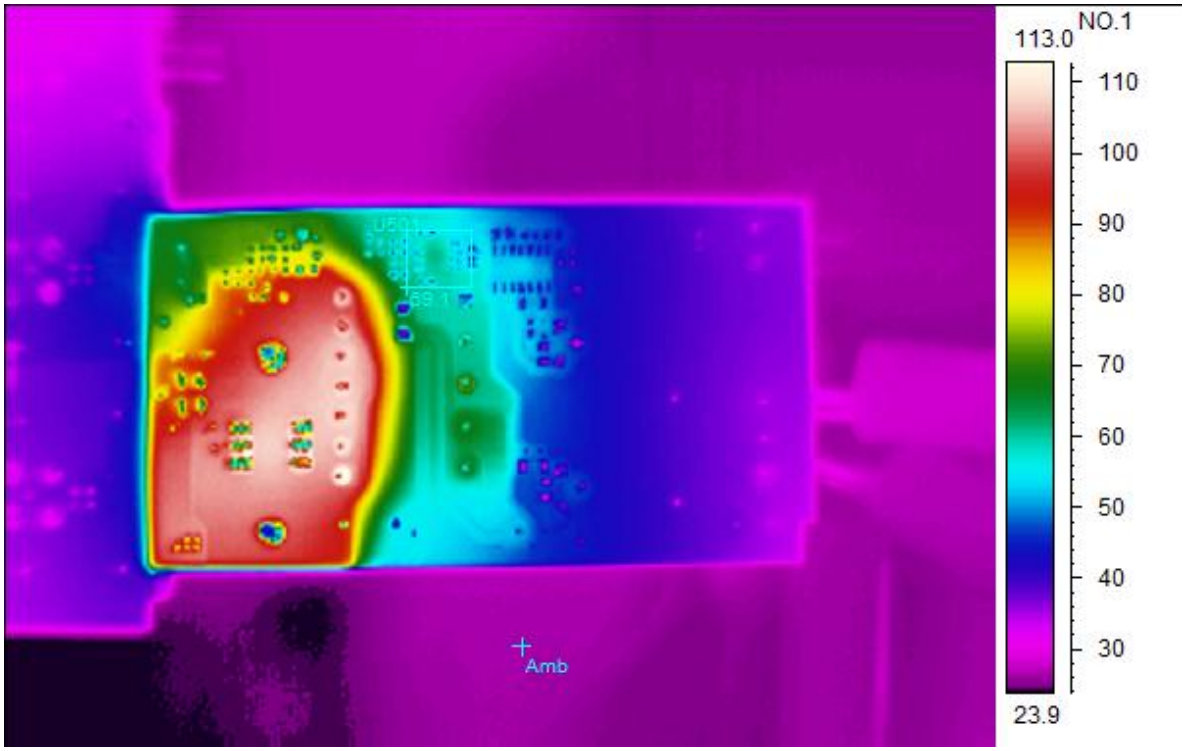
The thermal images below show a top view and bottom view of the board. The thermal images are taken after the board was powered for over 30min. with 20ºC ambient temperature and no forced air flow. The input voltage is at 380V and output was loaded with 28V/9A.

## Top Side




| Spot analysis | Value |
|---|---|
| Amb Temperature | 30.8°C |
| **Area analysis** | **Value** |
| T500Max | 111.5°C |
| D502, D503Max | 131.8°C |
| L500Max | 120.1°C |
| Q500, Q501Max | 74.7°C |

## Bottom Side

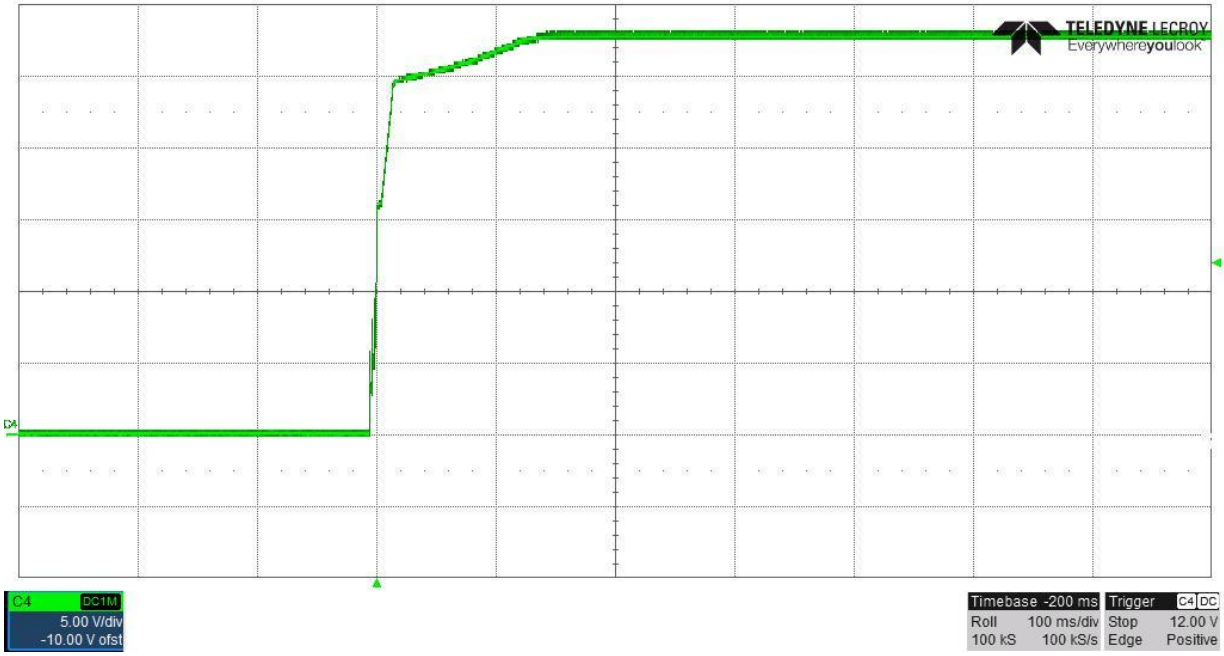



| Spot analysis | Value |
|---|---|
| Amb Temperature | 27.3°C |
| **Area analysis** | **Value** |
| U501Max | 69.1°C |

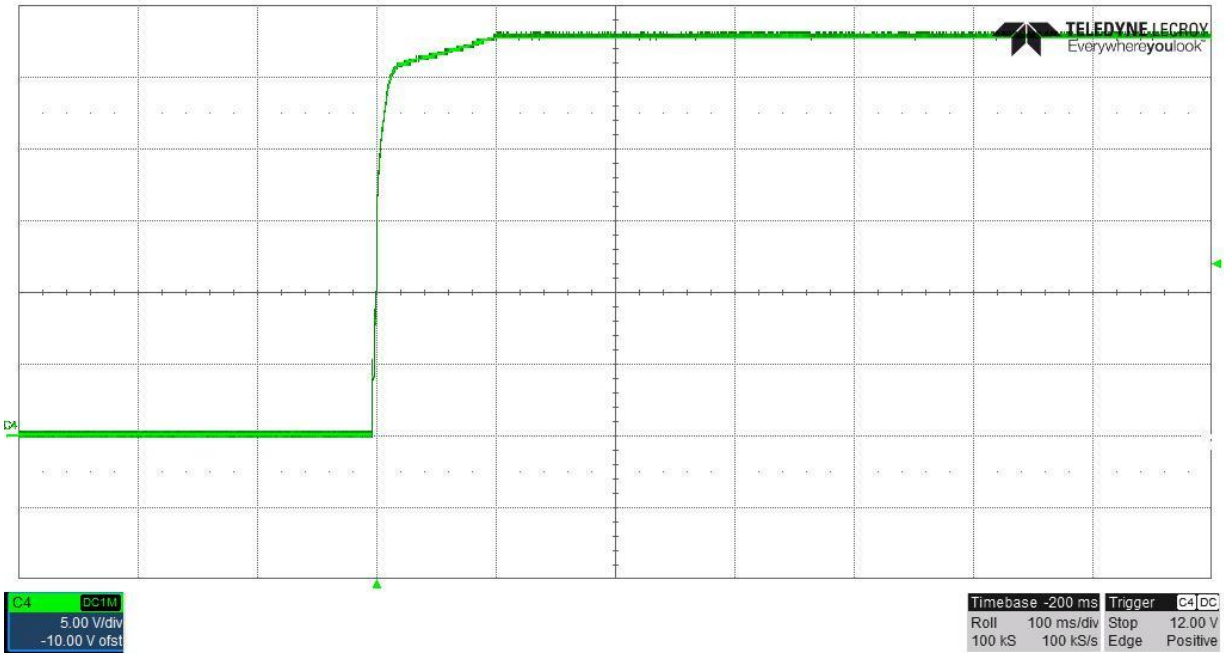
# 4 Startup

The input/output voltages at startup are shown in the images below, where CH2: $V_{in}$, CH3: $85V_{OUT}$, CH4: $28V_{OUT}$.

## *4.1 Start Up @ 380$V_{in}$, 28V/9A:*



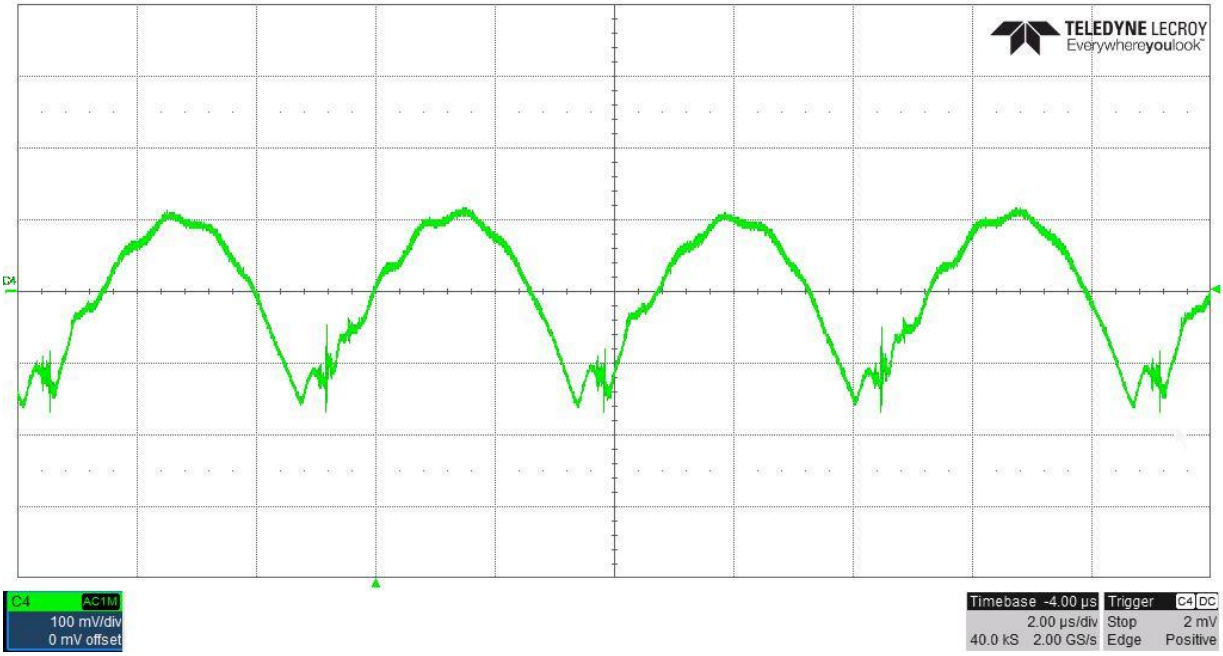

## *4.2 Start Up @ 380$V_{in}$, 28V/0A:*



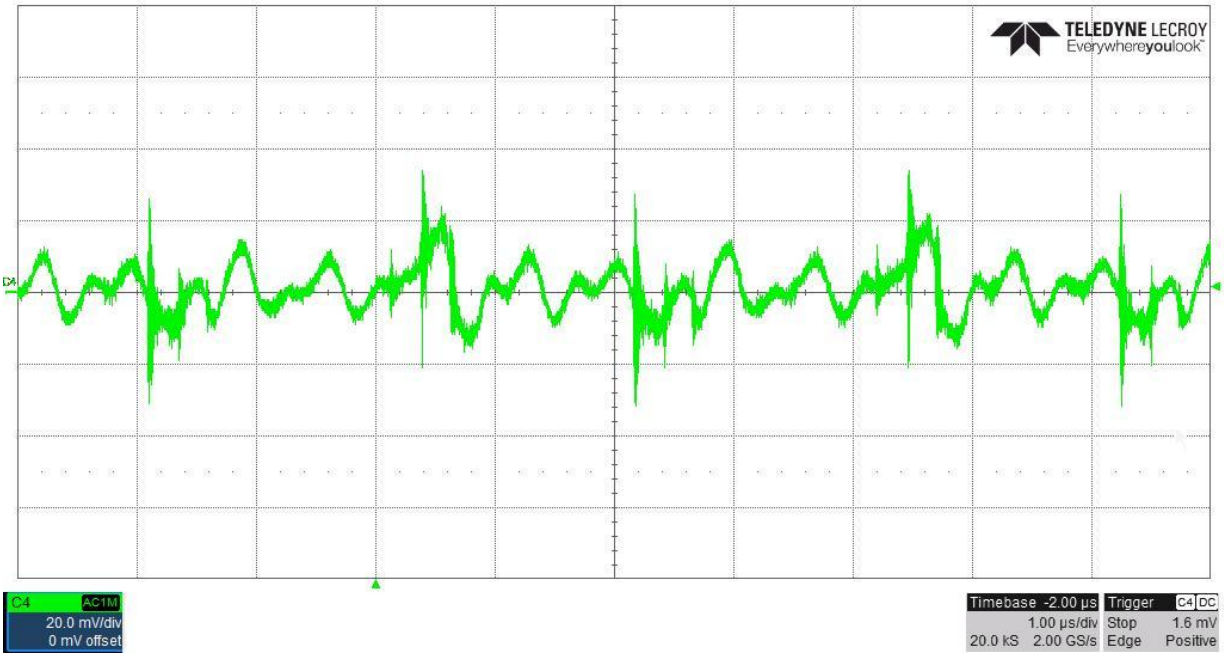
# 5 Output Ripple Voltages

The output ripple voltages are shown in the plots below with $380V_{DC}$ input.
CH4: 28V.

## *5.1 Output ripples @ 28V/9A*

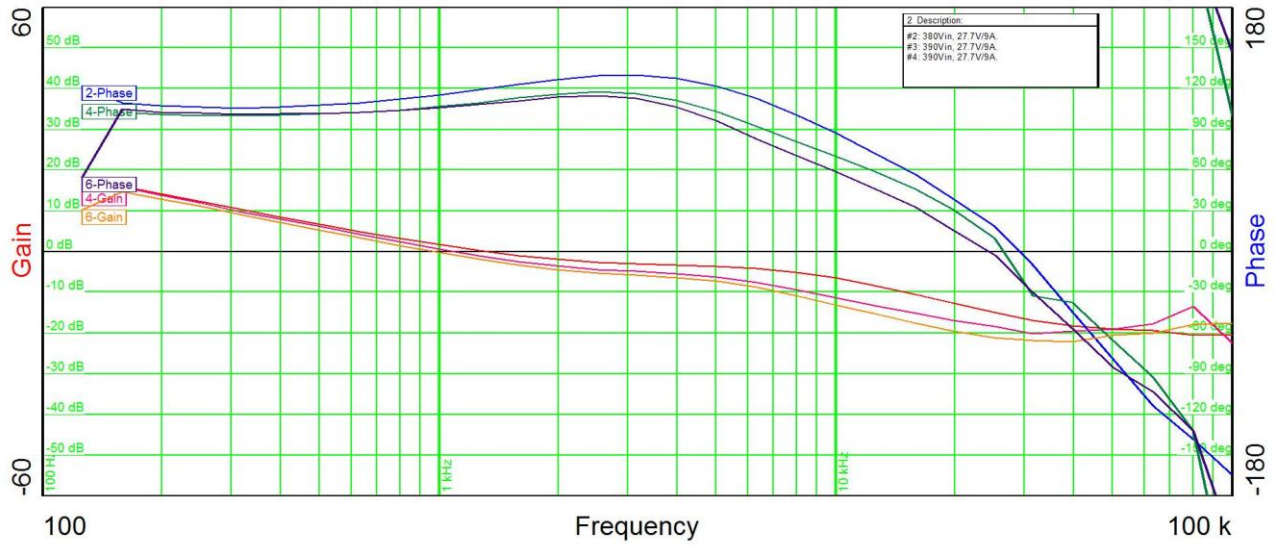



## *5.2 Output ripples @ 28V/0A*



## 6 Frequency Response

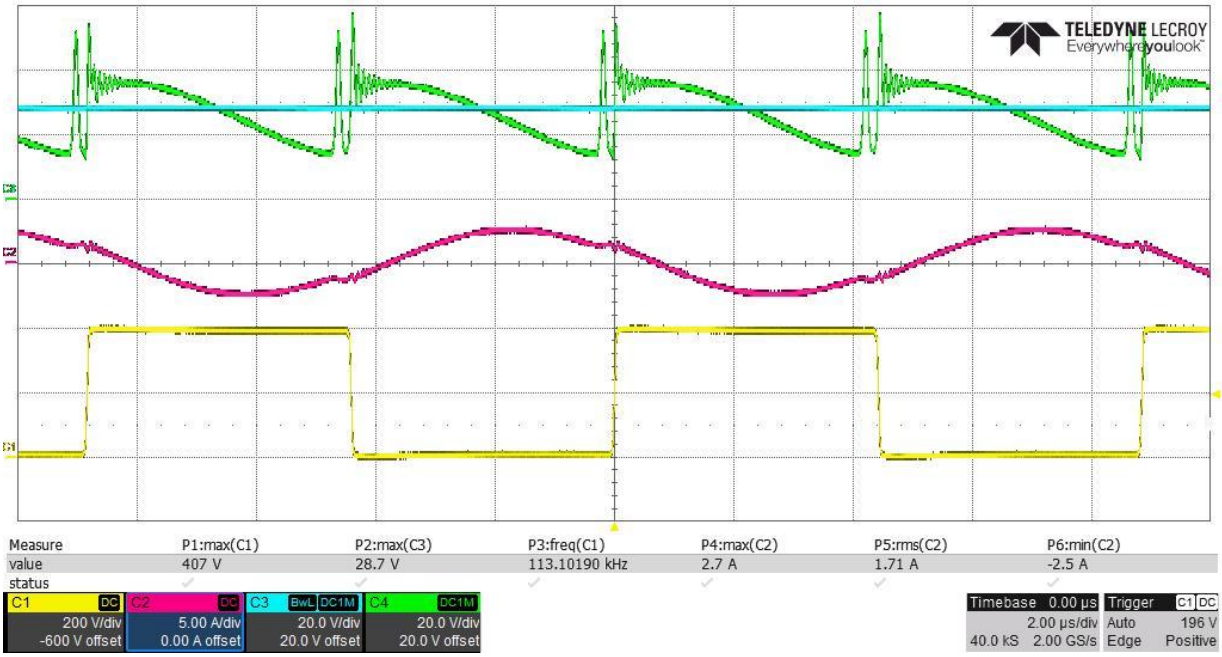
Frequency responses of PMP9750 were measured at 28V/9A output.



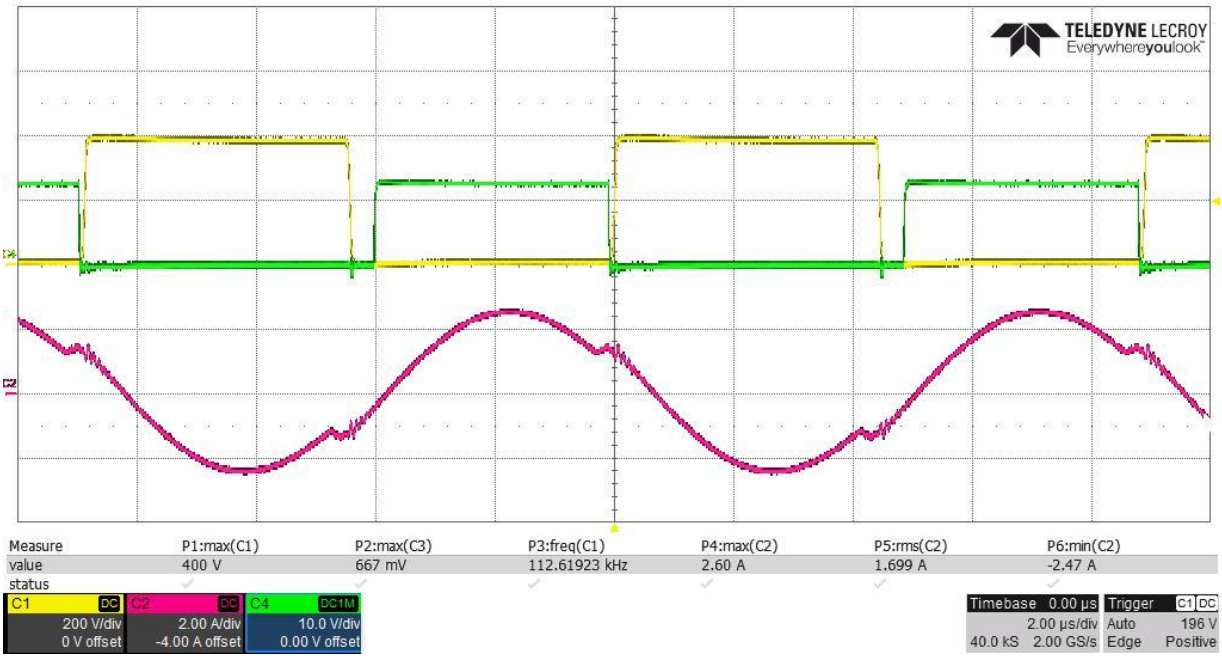
# 7 Switching Waveforms

The switching waveforms are shown in the plots below with 380$V_{DC}$ input and 28V/9A output.

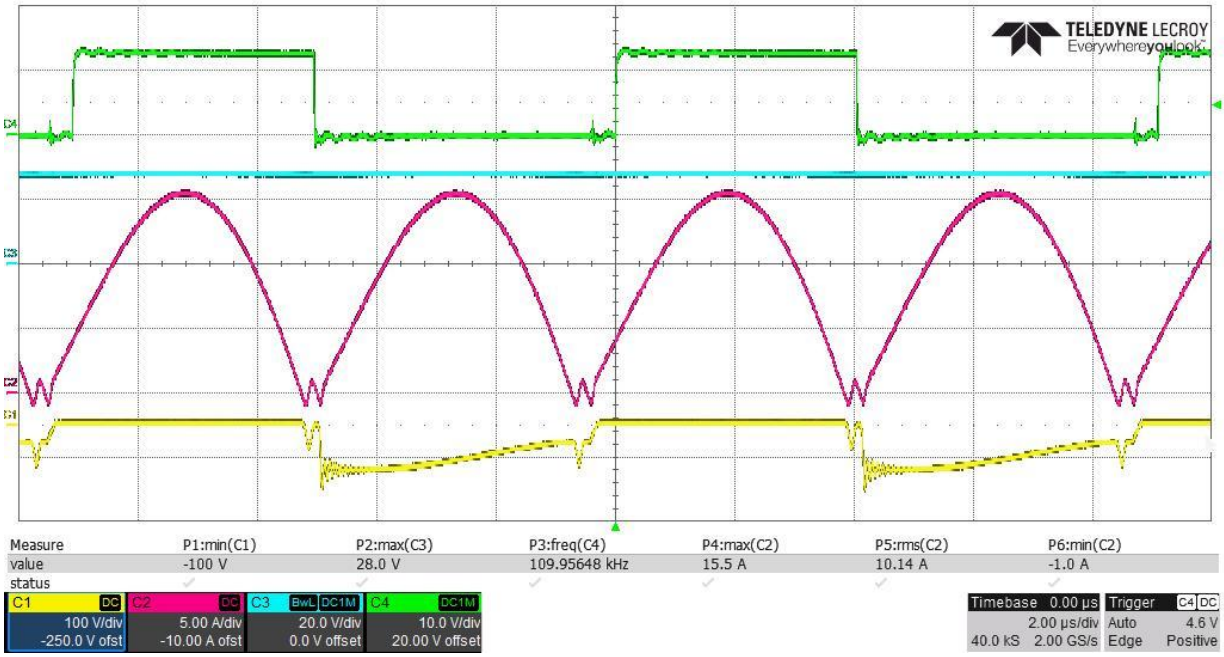
## 7.1 CH1: Q501 $V_{DS}$, CH2: C511 Current, CH3: Vout, CH4: Vsec to GND (Voltage after D502 & D503 rectifier).




## 7.2 CH1: Q501 $V_{DS}$, CH2: C511 Current, CH4: Q501 $V_{GS}$.



### 7.3 CH1: D502 ($V_{CA}$), CH2: L500 Current, CH3: $V_{out}$, CH4: Q501 $V_{GS}$.



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