# Texas Instruments

# PMP4419 Test Procedure

# China Power Reference Design

**05/21/2014**

# 1 GENERAL

## 1.1 PURPOSE

This report provides the detailed data for evaluating and verifying the PMP4419, which provide triple output with one LM5023 – the QR Flyback controller.

## 1.2 REFERENCE DOCUMENTATION

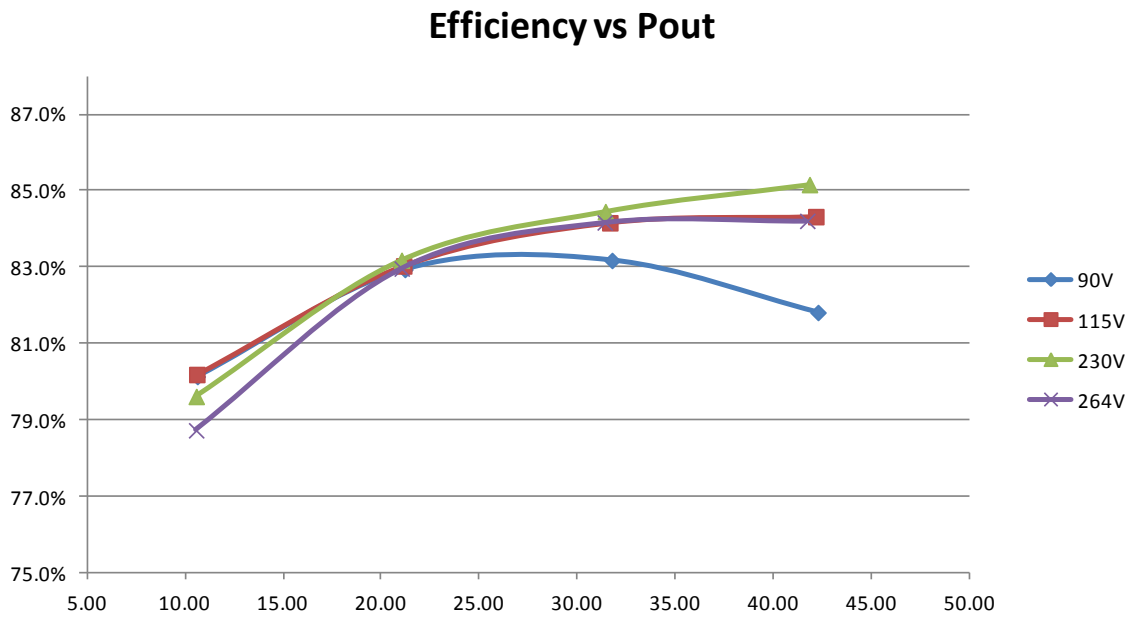
Schematic PMP4419_SCH.PDF
Assembly PMP4419_PCB.PDF
BOM

## 1.3 TEST EQUIPMENTS

Multi-meter(Voltage): Fluke 287C
AC Source: Chroma 61503
E-Load: Chroma 63101*3 63105*1 module
Power Meter: WT210 (YOKOGAWA)

# 2 Performance data and waveform

## 2.1 EFFICIENCY




| Vin=90V, for the Iout=0, the data is standby power loss. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Pin (W)** | **24Vo** | | **15Vo** | | **-15Vo** | | **Pout (W)** | **Eff.** |
| | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | | |
| 1.04 | 24.826 | 0.00 | 15.167 | 0.00 | 15.159 | 0.00 | 0.00 | 1.04 |
| 13.24 | 24.314 | 0.25 | 15.115 | 0.15 | 15.101 | 0.15 | 10.61 | 80.14% |
| 25.56 | 24.306 | 0.50 | 15.076 | 0.30 | 15.081 | 0.30 | 21.20 | 82.94% |
| 38.19 | 24.317 | 0.75 | 15.016 | 0.45 | 15.047 | 0.45 | 31.77 | 83.18% |
| 51.67 | 24.319 | 1.00 | 14.987 | 0.60 | 14.940 | 0.60 | 42.28 | 81.82% |

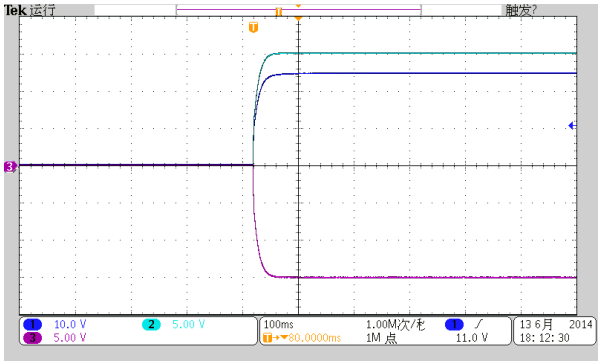
| Vin=115V, for the Iout=0, the data is standby power loss. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Pin (W)** | **24Vo** | | **15Vo** | | **-15Vo** | | **Pout (W)** | **Eff.** |
| | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | | |
| 1.05 | 24.804 | 0.00 | 15.165 | 0.00 | 15.158 | 0.00 | 0.00 | 1.05 |
| 13.20 | 24.256 | 0.25 | 15.091 | 0.15 | 15.055 | 0.15 | 10.59 | 80.20% |
| 25.46 | 24.231 | 0.50 | 15.039 | 0.30 | 15.046 | 0.30 | 21.14 | 83.04% |
| 37.61 | 24.236 | 0.75 | 14.995 | 0.45 | 14.955 | 0.45 | 31.65 | 84.17% |
| 50.00 | 24.235 | 1.00 | 14.961 | 0.60 | 14.919 | 0.60 | 42.16 | 84.33% |

| Vin=230V, for the Iout=0, the data is standby power loss. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Pin (W)** | **24Vo** | | **15Vo** | | **-15Vo** | | **Pout (W)** | **Eff.** |
| | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | | |
| 1.34 | 24.648 | 0.00 | 15.162 | 0.00 | 15.154 | 0.00 | 0.00 | 1.34 |
| 13.26 | 24.199 | 0.25 | 15.046 | 0.15 | 15.008 | 0.15 | 10.56 | 79.62% |
| 25.28 | 24.115 | 0.50 | 14.973 | 0.30 | 14.932 | 0.30 | 21.03 | 83.18% |
| 37.21 | 24.050 | 0.75 | 14.899 | 0.45 | 14.855 | 0.45 | 31.43 | 84.46% |
| 49.13 | 24.050 | 1.00 | 14.844 | 0.60 | 14.808 | 0.60 | 41.84 | 85.16% |

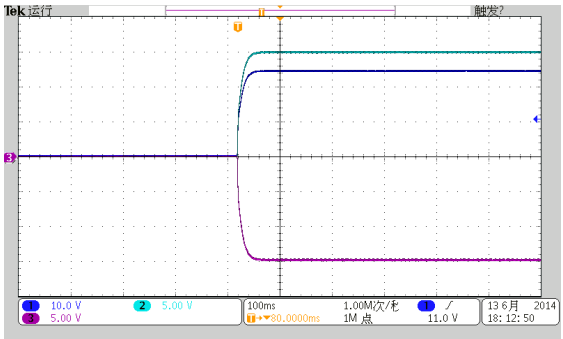
| Vin=264V, for the Iout=0, the data is standby power loss. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Pin (W)** | **24Vo** | | **15Vo** | | **-15Vo** | | **Pout (W)** | **Eff.** |
| | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | **Vout(V)** | **Iout(A)** | | |
| 1.26 | 24.682 | 0.00 | 15.162 | 0.00 | 15.155 | 0.00 | 0.00 | 1.26 |
| 13.40 | 24.177 | 0.25 | 15.033 | 0.15 | 15.010 | 0.15 | 10.55 | 78.74% |
| 25.36 | 24.102 | 0.50 | 14.983 | 0.30 | 14.982 | 0.30 | 21.04 | 82.97% |
| 37.30 | 24.022 | 0.75 | 14.888 | 0.45 | 14.846 | 0.45 | 31.40 | 84.17% |
| 49.55 | 23.952 | 1.00 | 14.843 | 0.60 | 14.783 | 0.60 | 41.73 | 84.21% |

## 2.2 **Start Up**

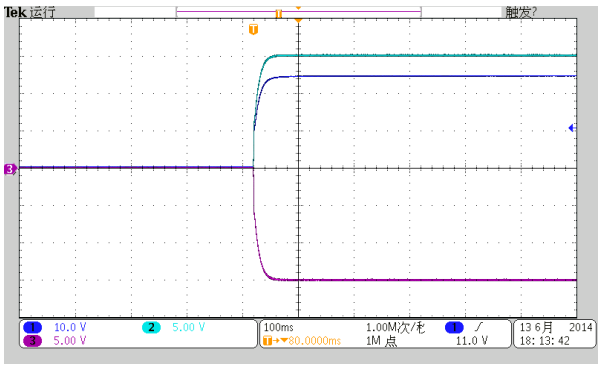
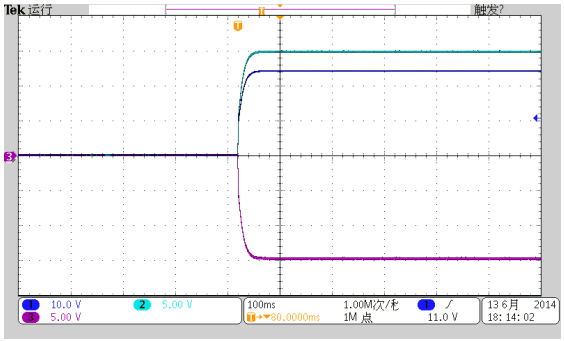
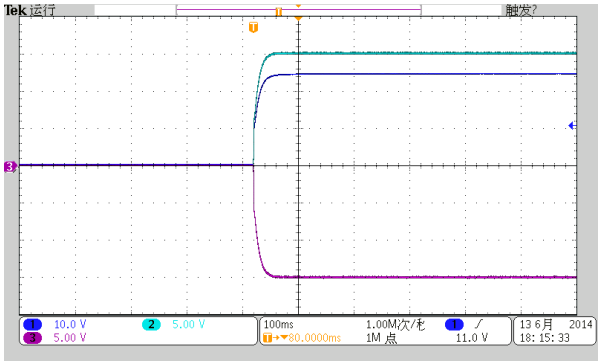
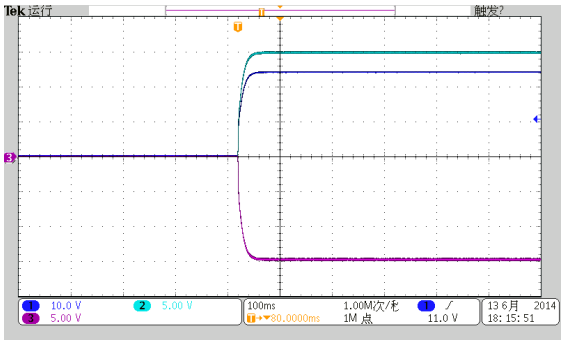
Start up test result: Ch1: 24Vout Ch2:15Vout Ch3:-15Vout




90Vac No load Start Up

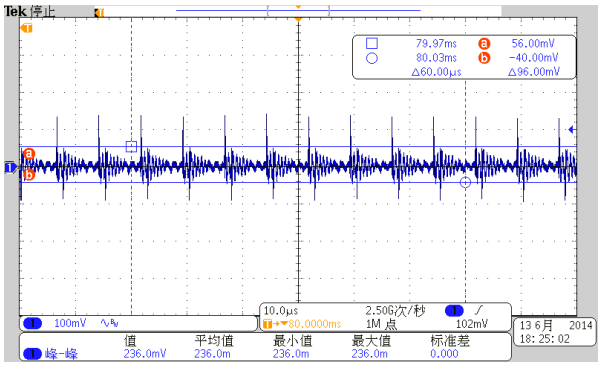
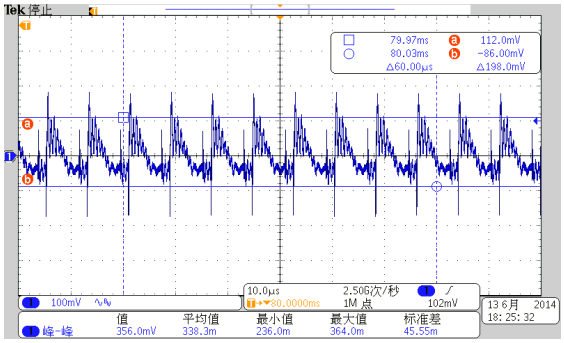


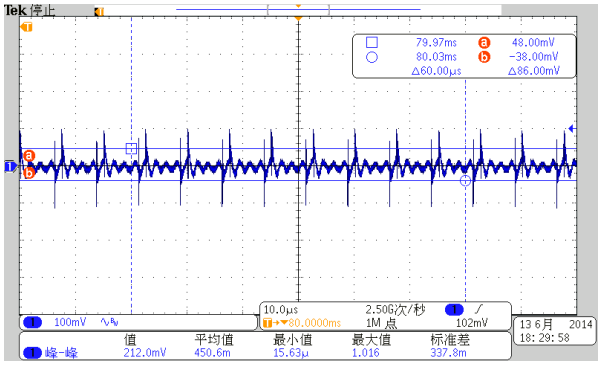
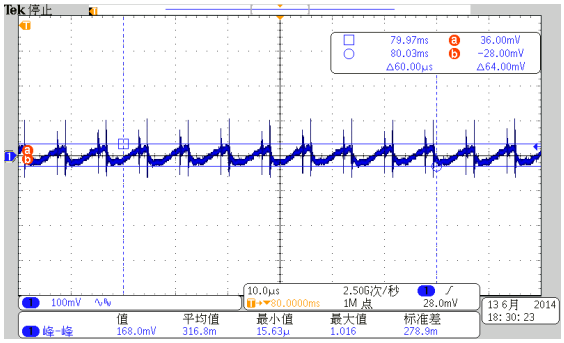
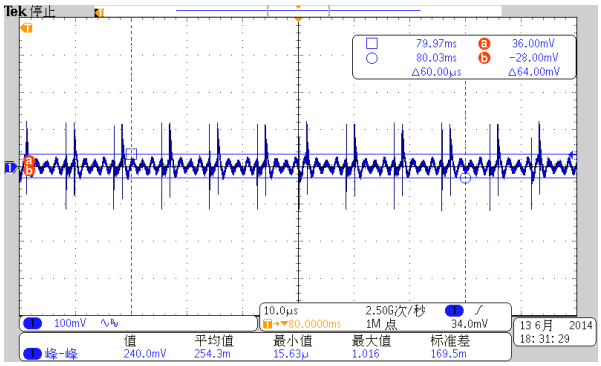
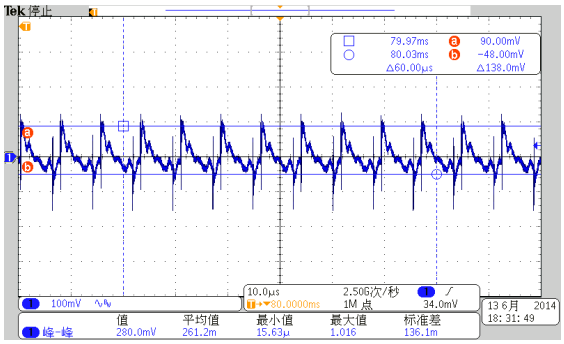

90Vac Full load Start Up

| | |
|---|---|
|  |  |
| 230Vac No load Start Up | 230Vac Full load Start Up |
|  |  |
| 264Vac No load Start Up | 264Vac Full load Start Up |

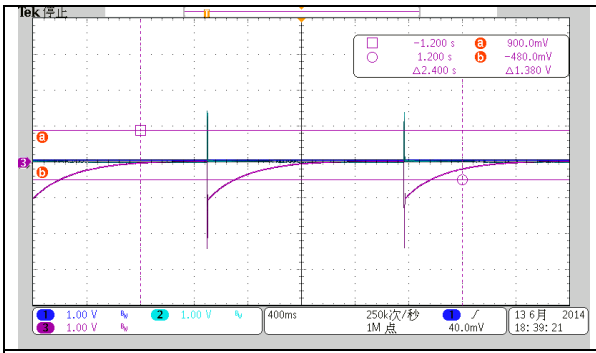
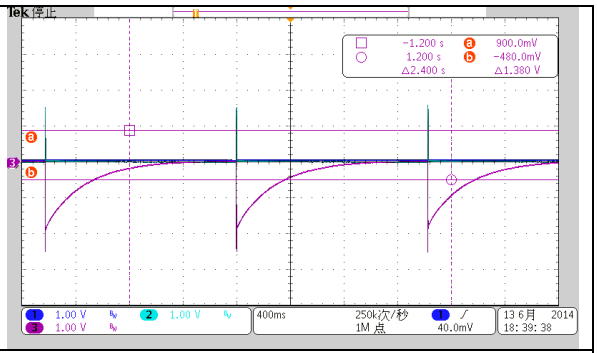
## 2.3 Output voltage ripple

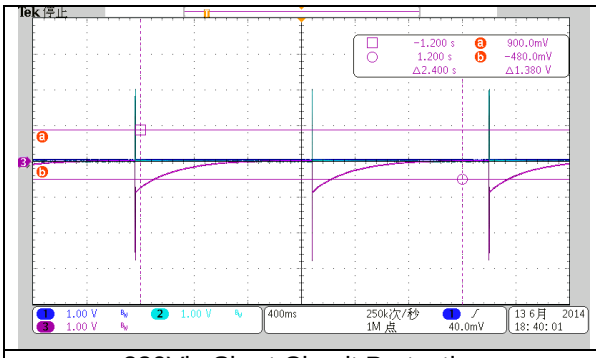
Ripple Test Result:

| | |
|---|---|
|  |  |

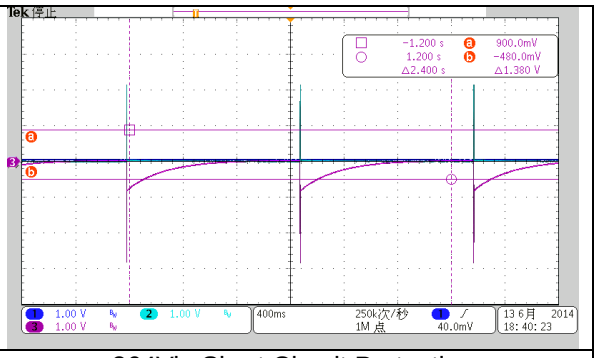
| 230Vac No load ripple<br>CH1: 24Vout | 230Vac Full load ripple<br>CH1: 24Vout |
|---|---|
|  |  |
| 230Vac No load ripple<br>CH1: +15Vout | 230Vac Full load ripple<br>CH1: +15Vout |
|  |  |
| 230Vac No load ripple<br>CH1: -15Vout | 230Vac Full load ripple<br>CH1: -15Vout |

## 2.4 Short circuit protection

| | |
|---|---|
|  |  |
| 90Vin Short Circuit Protection | 115Vin Short Circuit Protection |

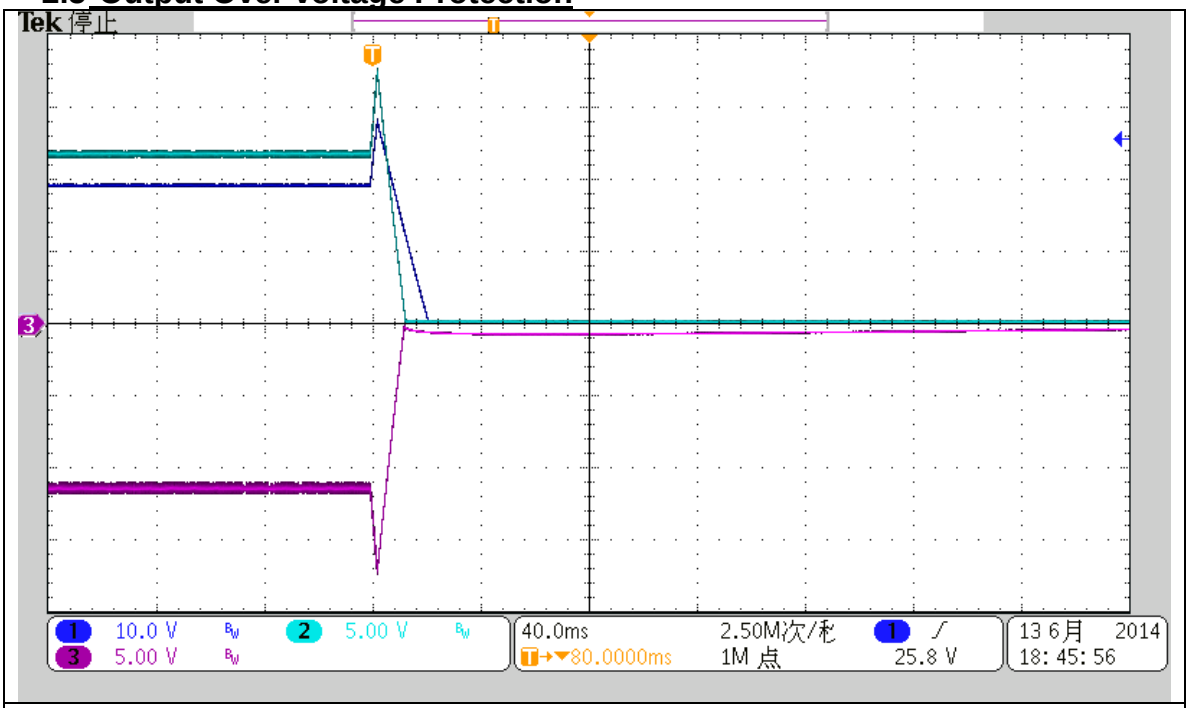



230Vin Short Circuit Protection



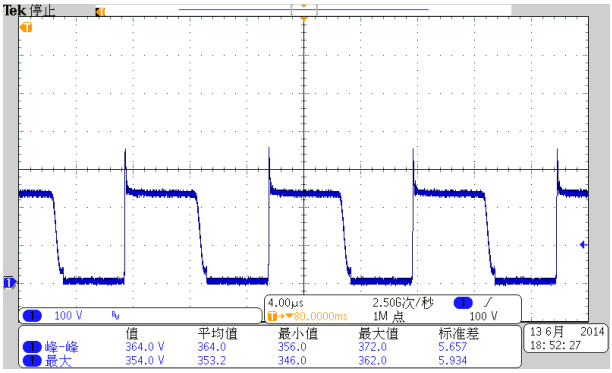

264Vin Short Circuit Protection

## 2.5 Output Over voltage Protection

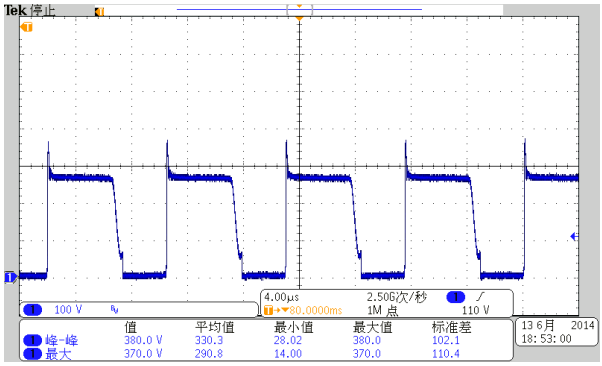



Output Over Voltage Protection

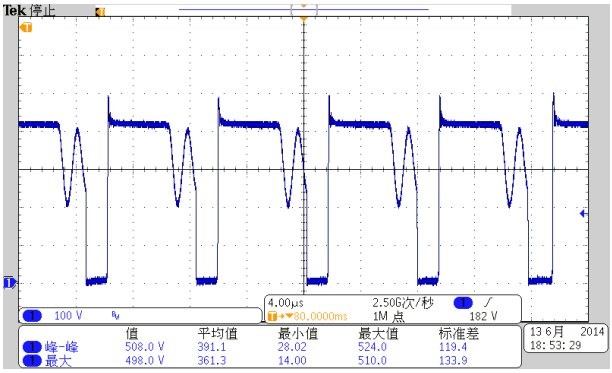
## 2.6 Mosfet Voltage Stress



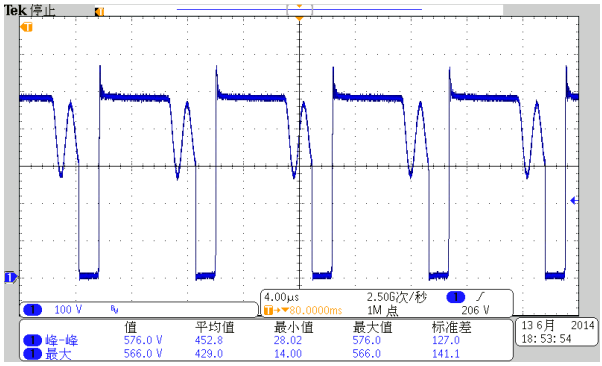

90Vin Full load Vds




115Vin Full load Vds



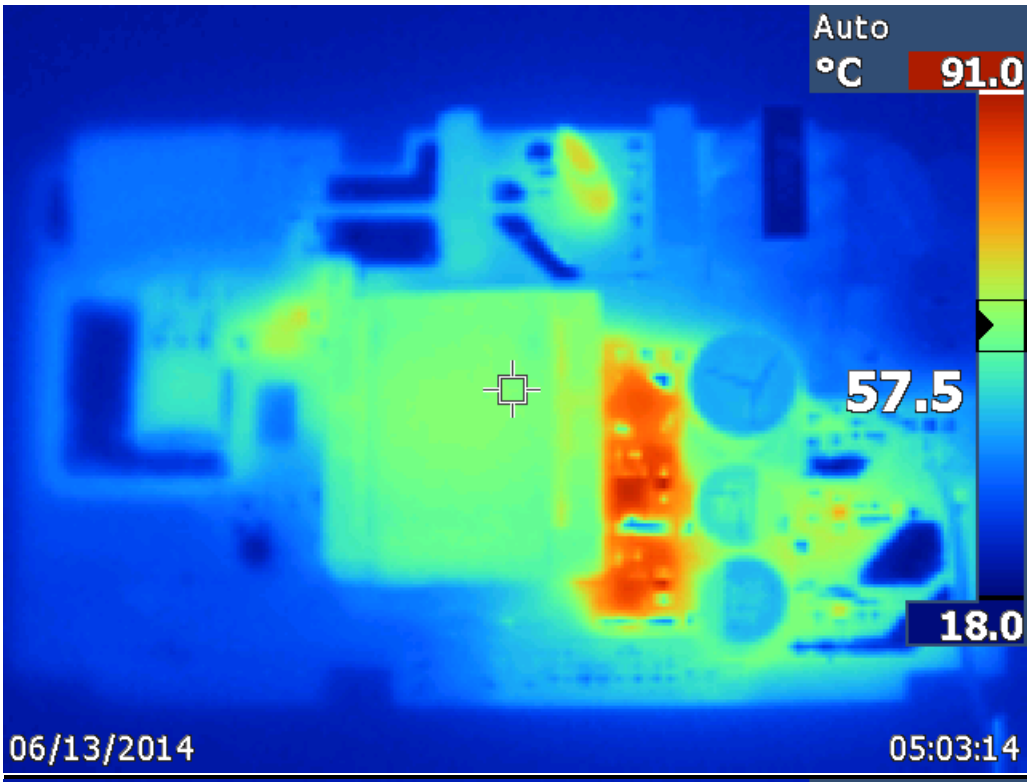

230Vin Full load Vds

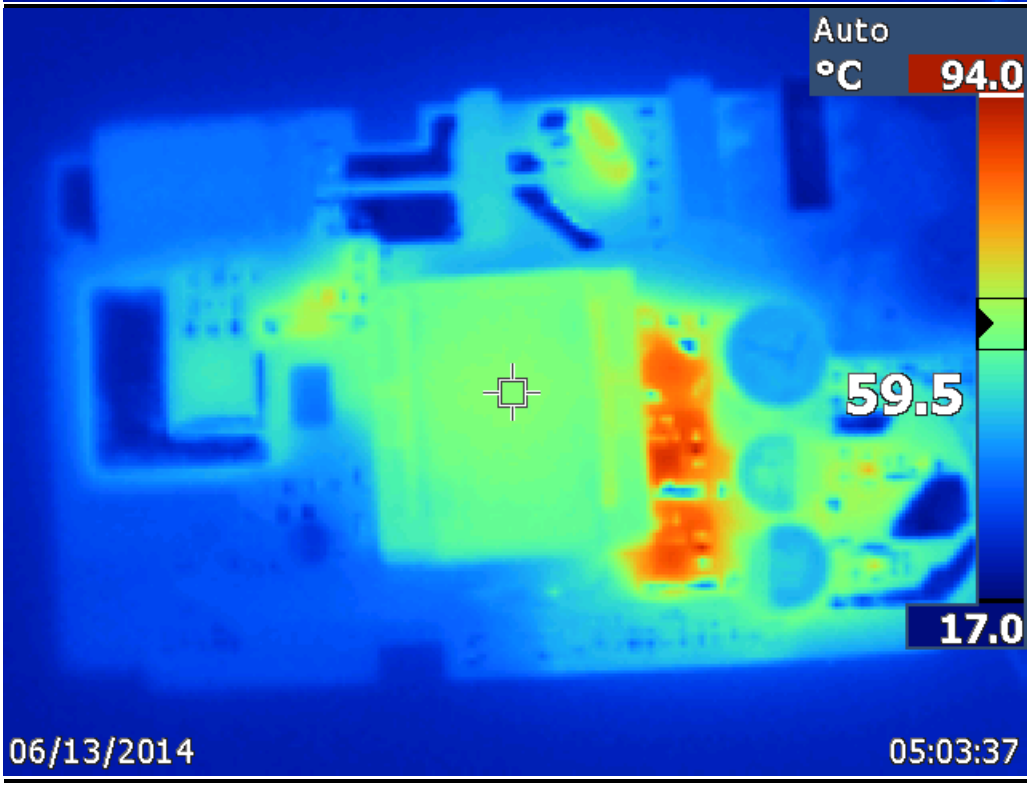



264Vin Full load Vds

## 2.7 Thermal IR Scan

90V input with full load after 15 minutes preheat.



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