



Texas Instruments

PMP4298A REVA Test Procedure

China Power Reference Design

REVA

10/31/10

1 General

1.1 PURPOSE

To provide detailed data for evaluating and verifying the PMP4298.

1.2 REFERENCE DOCUMENTATION

Schematic PMP4298A_REVA_SCH.PDF

Assembly PMP4298A_REVB_PCB.PDF

BOM

1.3 TEST EQUIPMENTS

Multi-meter: Fluke 289

Power Analyser: PM100

AC Source: Agilent 6813B

Ambient Temperature at 25DegC

2: INPUT CHARACTERISTICS

2.1 Light Load Standby Power

| 25°C | 90Vac/60Hz | 110Vac/60Hz | 230Vac/50Hz | 264Vac/50Hz | Remarks |
|---|------------|-------------|-------------|-------------|---------|
| 5Vsb | 4.9996 | 4.9996 | 5.000 | 4.9998 | |
| 5V | X | X | X | X | |
| 12V | X | X | X | X | |
| 24V | X | X | X | X | |
| Power Loss | 395 | 397 | 463 | 497 | |
| ※SPEC <300mW with 5V/30mA output Test Condition: 5V@30mA | | | | | |
| 25°C | 90Vac/60Hz | 110Vac/60Hz | 230Vac/50Hz | 264Vac/50Hz | Remarks |
| 5Vsb | 5.0001 | 5.0001 | 5.0002 | 5.0001 | |
| 5V | X | X | X | X | |
| 12V | X | X | X | X | |
| 24V | X | X | X | X | |
| Power Loss | 156 | 161 | 228 | 260 | |
| ※SPEC <300mW with 5V/30mA output Test Condition: 5V@0mA | | | | | |

2.2 PWM Dimming Performance

| Vin (Vac) | V_LED (V) | PWM Dimming Duty | Io_LED (A) | 5Vsb (V) | Io_5Vsb (A) | 5V (V) | Io_5V (A) | 24V (V) | Io_24V (A) | Pin (W) | Po (W) | PF | Efficiency % |
|-----------|-----------|------------------|------------|----------|-------------|--------|-----------|---------|------------|----------|----------|----------|--------------|
| 90 | 69.087 | 10% | 0.96 | 4.788 | 1 | 4.6785 | 3 | 24.29 | 2 | 97.41 | 74.25485 | 0.999 | 0.762292 |
| | 69.081 | 20% | 0.96 | 4.783 | 1 | 4.6716 | 3 | 24.278 | 2 | 107.91 | 80.84015 | 0.999 | 0.749144 |
| | 69.065 | 30% | 0.96 | 4.782 | 1 | 4.6698 | 3 | 24.332 | 2 | 120.18 | 87.57052 | 0.999 | 0.728661 |
| | 63.965 | 40% | 0.96 | 4.79 | 1 | 4.6741 | 3 | 22.575 | 2 | 121.26 | 88.75666 | 0.998 | 0.731953 |
| | 69.035 | 50% | 0.96 | 4.78 | 1 | 4.663 | 3 | 24.468 | 2 | 135.2 | 101.0758 | 0.999 | 0.747602 |
| | 69.012 | 60% | 0.96 | 4.78 | 1 | 4.6656 | 3 | 24.515 | 2 | 142.16 | 107.7865 | 0.999 | 0.758206 |
| | 64.758 | 70% | 0.96 | 4.78 | 1 | 4.6651 | 3 | 22.967 | 2 | 140.89 | 108.4565 | 0.999 | 0.769795 |
| | 64.552 | 80% | 0.96 | 4.78 | 1 | 4.6645 | 3 | 22.964 | 2 | 145.15 | 114.5084 | 0.999 | 0.788897 |
| | 64.542 | 90% | 0.96 | 4.78 | 1 | 4.6643 | 3 | 22.991 | 2 | 149.74 | 120.7506 | 0.999 | 0.806402 |
| 64.528 | 100% | 0.96 | 4.78 | 1 | 4.6643 | 3 | 23.015 | 2 | 153.54 | 126.9812 | 0.999 | 0.827023 | |

| Vin (Vac) | V_LED (V) | PWM Dimming Duty | Io_LED (A) | 5Vsb (V) | Io_5Vsb (A) | 5V (V) | Io_5V (V) | 24V (V) | Io_24V (A) | Pin (W) | Po (W) | PF | Efficiency % |
|-----------|-----------|------------------|------------|----------|-------------|--------|-----------|---------|------------|----------|----------|----------|--------------|
| 110 | 64.368 | 10% | 0.96 | 4.776 | 1 | 4.6614 | 3 | 22.512 | 2 | 90.89 | 69.96353 | 0.999 | 0.76976 |
| | 64.353 | 20% | 0.96 | 4.776 | 1 | 4.6618 | 3 | 22.609 | 2 | 100.02 | 76.33518 | 0.994 | 0.763199 |
| | 64.34 | 30% | 0.96 | 4.777 | 1 | 4.6621 | 3 | 22.656 | 2 | 109.72 | 82.60522 | 0.994 | 0.752873 |
| | 64.33 | 40% | 0.96 | 4.778 | 1 | 4.6624 | 3 | 22.7 | 2 | 117.82 | 88.86792 | 0.995 | 0.754269 |
| | 64.32 | 50% | 0.96 | 4.778 | 1 | 4.6626 | 3 | 22.75 | 2 | 125.15 | 95.1394 | 0.998 | 0.760203 |
| | 64.309 | 60% | 0.96 | 4.778 | 1 | 4.6629 | 3 | 22.8 | 2 | 132.5 | 101.4087 | 0.998 | 0.765349 |
| | 64.299 | 70% | 0.96 | 4.779 | 1 | 4.6632 | 3 | 22.839 | 2 | 138.28 | 107.6555 | 0.996 | 0.778533 |
| | 64.289 | 80% | 0.96 | 4.78 | 1 | 4.6634 | 3 | 22.87 | 2 | 143.27 | 113.8842 | 0.996 | 0.794892 |
| | 64.455 | 90% | 0.96 | 4.78 | 1 | 4.6636 | 3 | 22.962 | 2 | 148.52 | 120.3839 | 0.998 | 0.810557 |
| 64.53 | 100% | 0.96 | 4.781 | 1 | 4.664 | 3 | 23.017 | 2 | 153.47 | 126.7558 | 0.999 | 0.825932 | |

| Vin (Vac) | V_LED (V) | PWM Dimming Duty | Io_LED (A) | 5Vsb (V) | Io_5Vsb (A) | 5V (V) | Io_5V (V) | 24V (V) | Io_24V (A) | Pin (W) | Po (W) | PF | Efficiency % |
|-----------|-----------|------------------|------------|----------|-------------|--------|-----------|---------|------------|---------|----------|-------|--------------|
| 230 | 64.369 | 10% | 0.96 | 4.775 | 1 | 4.6615 | 3 | 22.51 | 2 | 90.09 | 69.95892 | 0.944 | 0.776545 |
| | 64.356 | 20% | 0.96 | 4.776 | 1 | 4.6622 | 3 | 22.608 | 2 | 99.01 | 76.33495 | 0.951 | 0.770982 |
| | 64.342 | 30% | 0.96 | 4.777 | 1 | 4.6626 | 3 | 22.652 | 2 | 108.5 | 82.5993 | 0.959 | 0.761284 |
| | 64.333 | 40% | 0.96 | 4.778 | 1 | 4.6631 | 3 | 22.695 | 2 | 116.37 | 88.86117 | 0.969 | 0.763609 |
| | 64.322 | 50% | 0.96 | 4.779 | 1 | 4.663 | 3 | 22.746 | 2 | 123.62 | 95.13456 | 0.979 | 0.769573 |
| | 64.31 | 60% | 0.96 | 4.779 | 1 | 4.6635 | 3 | 22.797 | 2 | 130.58 | 101.4061 | 0.984 | 0.776582 |
| | 64.3 | 70% | 0.96 | 4.78 | 1 | 4.6638 | 3 | 22.836 | 2 | 136.19 | 107.653 | 0.993 | 0.790462 |
| | 64.286 | 80% | 0.96 | 4.78 | 1 | 4.6636 | 3 | 22.866 | 2 | 140.86 | 113.8744 | 0.994 | 0.808423 |
| | 64.274 | 90% | 0.96 | 4.781 | 1 | 4.6638 | 3 | 22.892 | 2 | 145.56 | 120.0891 | 0.994 | 0.825015 |
| | 64.258 | 100% | 0.96 | 4.781 | 1 | 4.664 | 3 | 22.914 | 2 | 149.66 | 126.2887 | 0.994 | 0.843837 |

| Vin (Vac) | V_LED (V) | PWM Dimming Duty | Io_LED (A) | 5Vsb (V) | Io_5Vsb (A) | 5V (V) | Io_5V (V) | 24V (V) | Io_24V (A) | Pin (W) | Po (W) | PF | Efficiency % |
|-----------|-----------|------------------|------------|----------|-------------|--------|-----------|---------|------------|---------|----------|-------|--------------|
| 264 | 64.184 | 10% | 0.96 | 4.776 | 1 | 4.6618 | 3 | 22.44 | 2 | 89.78 | 69.80306 | 0.943 | 0.77749 |
| | 64.17 | 20% | 0.96 | 4.777 | 1 | 4.6621 | 3 | 22.539 | 2 | 98.72 | 76.16194 | 0.946 | 0.771495 |
| | 64.156 | 30% | 0.96 | 4.778 | 1 | 4.6625 | 3 | 22.587 | 2 | 108.04 | 82.41643 | 0.951 | 0.762833 |
| | 64.147 | 40% | 0.96 | 4.778 | 1 | 4.6627 | 3 | 22.631 | 2 | 115.93 | 88.66055 | 0.957 | 0.764777 |
| | 64.137 | 50% | 0.96 | 4.779 | 1 | 4.6629 | 3 | 22.681 | 2 | 122.97 | 94.91546 | 0.961 | 0.771859 |
| | 64.125 | 60% | 0.96 | 4.78 | 1 | 4.6631 | 3 | 22.732 | 2 | 129.8 | 101.1693 | 0.966 | 0.779424 |
| | 64.114 | 70% | 0.96 | 4.78 | 1 | 4.6634 | 3 | 22.77 | 2 | 135.44 | 107.3948 | 0.971 | 0.792933 |
| | 64.105 | 80% | 0.96 | 4.78 | 1 | 4.6636 | 3 | 22.801 | 2 | 140.06 | 113.6054 | 0.975 | 0.81112 |
| | 64.272 | 90% | 0.96 | 4.781 | 1 | 4.6639 | 3 | 22.894 | 2 | 144.86 | 120.0917 | 0.98 | 0.829019 |
| | 64.258 | 100% | 0.96 | 4.781 | 1 | 4.664 | 3 | 22.916 | 2 | 149.16 | 126.2927 | 0.982 | 0.846693 |

2.3 Line and Load Regulationss

| Vin (Vac) | Output Load | | | | | Output Measurement | | | |
|--------------|-------------|-----------|------------|------------------------|---------|--------------------|-----------|------------|---------------|
| | 5Vsb (A) | 5V (A) | 24V (A) | PWM Dimming Duty | Strings | 5Vsb (V) | 5V (V) | 24V (V) | Vo_LED (V) |
| 90 | 0.1 | 0 | 0.5 | 10% | 8 | 5 | 4.9925 | 23.078 | 64.133 |
| | 0.1 | 1 | 1 | 20% | 8 | 4.949 | 4.9088 | 22.986 | 64.126 |
| | 0.1 | 2 | 1.5 | 30% | 8 | 4.898 | 4.8226 | 22.839 | 64.13 |
| | 0.1 | 3 | 2 | 40% | 8 | 4.843 | 4.7323 | 22.626 | 64.134 |
| | 0.5 | 3 | 2 | 50% | 8 | 4.818 | 4.7022 | 22.614 | 63.955 |
| | 1 | 2 | 2 | 60% | 8 | 4.845 | 4.765 | 22.66 | 63.938 |
| | 1 | 1 | 1.5 | 70% | 8 | 4.903 | 4.8577 | 22.989 | 64.095 |
| | 1 | 1 | 1 | 80% | 8 | 4.904 | 4.8583 | 23.242 | 64.089 |
| | 1 | 0.5 | 0.5 | 90% | 8 | 4.931 | 4.9028 | 23.492 | 64.077 |

| Vin (Vac) | Output Load | | | | | Output Measurement | | | |
|--------------|-------------|-----------|------------|------------------------|---------|--------------------|-----------|------------|---------------|
| | 5Vsb (A) | 5V (A) | 24V (A) | PWM Dimming Duty | Strings | 5Vsb (V) | 5V (V) | 24V (V) | Vo_LED (V) |
| 110 | 0.1 | 0 | 0.5 | 10% | 8 | 5 | 4.9926 | 23.078 | 64.132 |
| | 0.1 | 1 | 1 | 20% | 8 | 4.95 | 4.9089 | 22.985 | 64.126 |
| | 0.1 | 2 | 1.5 | 30% | 8 | 4.898 | 4.8227 | 22.84 | 64.129 |
| | 0.1 | 3 | 2 | 40% | 8 | 4.842 | 4.7301 | 22.621 | 64.136 |
| | 0.5 | 3 | 2 | 50% | 8 | 4.817 | 4.7025 | 22.675 | 64.135 |
| | 1 | 2 | 2 | 60% | 8 | 4.845 | 4.7647 | 22.725 | 64.117 |
| | 1 | 1 | 1.5 | 70% | 8 | 4.903 | 4.8575 | 22.988 | 64.095 |
| | 1 | 1 | 1 | 80% | 8 | 4.904 | 4.8585 | 23.243 | 64.089 |
| | 1 | 0.5 | 0.5 | 90% | 8 | 4.931 | 4.9027 | 23.492 | 64.077 |

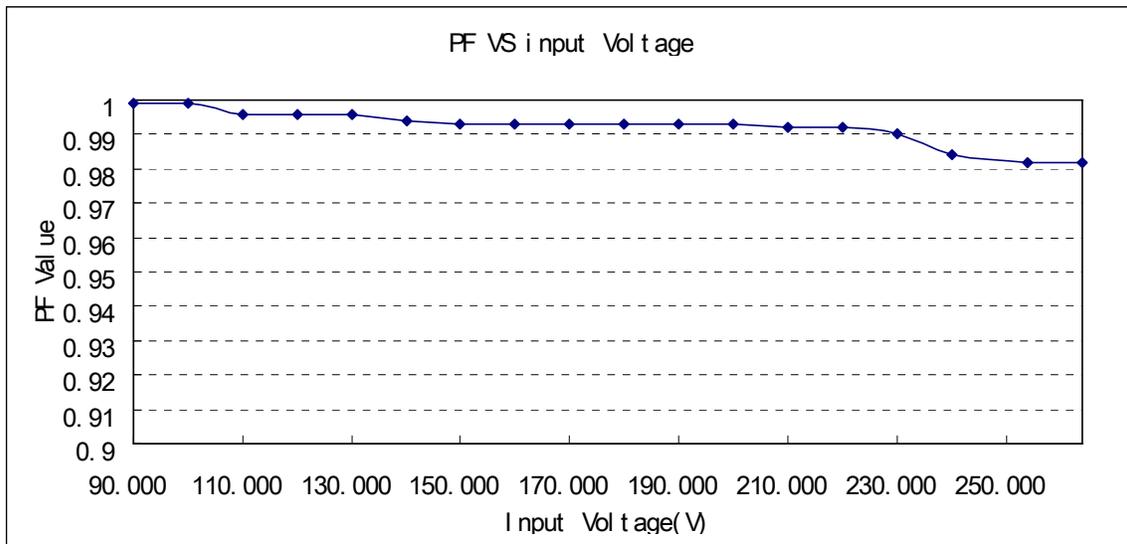
| Vin (Vac) | Output Load | | | | | Output Measurement | | | |
|--------------|-------------|-----------|------------|------------------------|---------|--------------------|-----------|------------|---------------|
| | 5Vsb (A) | 5V (A) | 24V (A) | PWM Dimming Duty | Strings | 5Vsb (V) | 5V (V) | 24V (V) | Vo_LED (V) |
| 230 | 0.1 | 0 | 0.5 | 10% | 8 | 5 | 4.9926 | 23.077 | 64.133 |
| | 0.1 | 1 | 1 | 20% | 8 | 4.95 | 4.9091 | 22.985 | 64.13 |
| | 0.1 | 2 | 1.5 | 30% | 8 | 4.898 | 4.8229 | 22.84 | 64.128 |
| | 0.1 | 3 | 2 | 40% | 8 | 4.842 | 4.73 | 22.62 | 64.137 |
| | 0.5 | 3 | 2 | 50% | 8 | 4.818 | 4.7033 | 22.675 | 64.133 |
| | 1 | 2 | 2 | 60% | 8 | 4.845 | 4.7648 | 22.723 | 64.117 |
| | 1 | 1 | 1.5 | 70% | 8 | 4.903 | 4.857 | 22.986 | 64.095 |
| | 1 | 1 | 1 | 80% | 8 | 4.904 | 4.8586 | 23.243 | 64.087 |
| | 1 | 0.5 | 0.5 | 90% | 8 | 4.931 | 4.9026 | 23.491 | 64.076 |

| Vin (Vac) | Output Load | | | | | Output Measurement | | | |
|-----------|-------------|--------|---------|------------------|---------|--------------------|--------|---------|------------|
| | 5Vsb (A) | 5V (A) | 24V (A) | PWM Dimming Duty | Strings | 5Vsb (V) | 5V (V) | 24V (V) | Vo_LED (V) |
| 264 | 0.1 | 0 | 0.5 | 10% | 8 | 5.001 | 4.9928 | 23.077 | 64.135 |
| | 0.1 | 1 | 1 | 20% | 8 | 4.95 | 4.9093 | 22.985 | 64.127 |
| | 0.1 | 2 | 1.5 | 30% | 8 | 4.898 | 4.8232 | 22.841 | 64.128 |
| | 0.1 | 3 | 2 | 40% | 8 | 4.842 | 4.7293 | 22.619 | 64.138 |
| | 0.5 | 3 | 2 | 50% | 8 | 4.819 | 4.704 | 22.674 | 64.132 |
| | 1 | 2 | 2 | 60% | 8 | 4.845 | 4.7649 | 22.725 | 64.116 |
| | 1 | 1 | 1.5 | 70% | 8 | 4.902 | 4.8566 | 22.984 | 64.096 |
| | 1 | 1 | 1 | 80% | 8 | 4.904 | 4.8587 | 23.243 | 64.088 |
| | 1 | 0.5 | 0.5 | 90% | 8 | 4.931 | 4.9024 | 23.492 | 64.076 |

2.4 Power Factor

Pass/Fail criteria: 0.99 typical at 100% load.

| Vin(Vac) | Freq(Hz) | PF | Io(Arms) |
|----------|----------|--------------|-----------|
| 90 | 60 | 0.999 | Full Load |
| 230 | 50 | 0.990 | Full Load |
| 264 | 50 | 0.982 | Full Load |



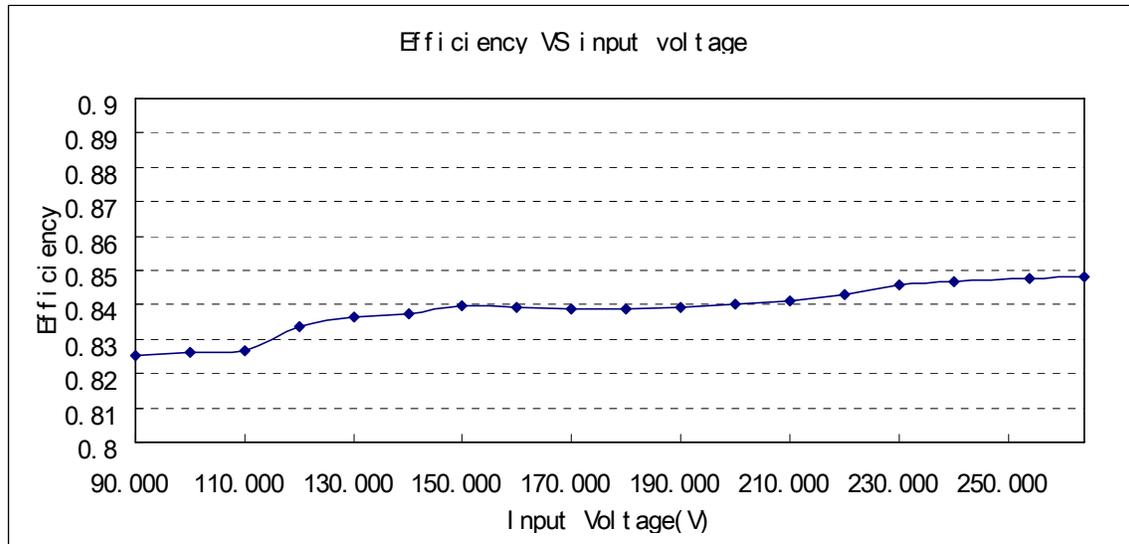
The test was executed under the condition of full load.

Remark: Compensation network had been modified for high PF value under the condition of 264Vac input. R19 change to 10K/F and C30 changed to 2.2u

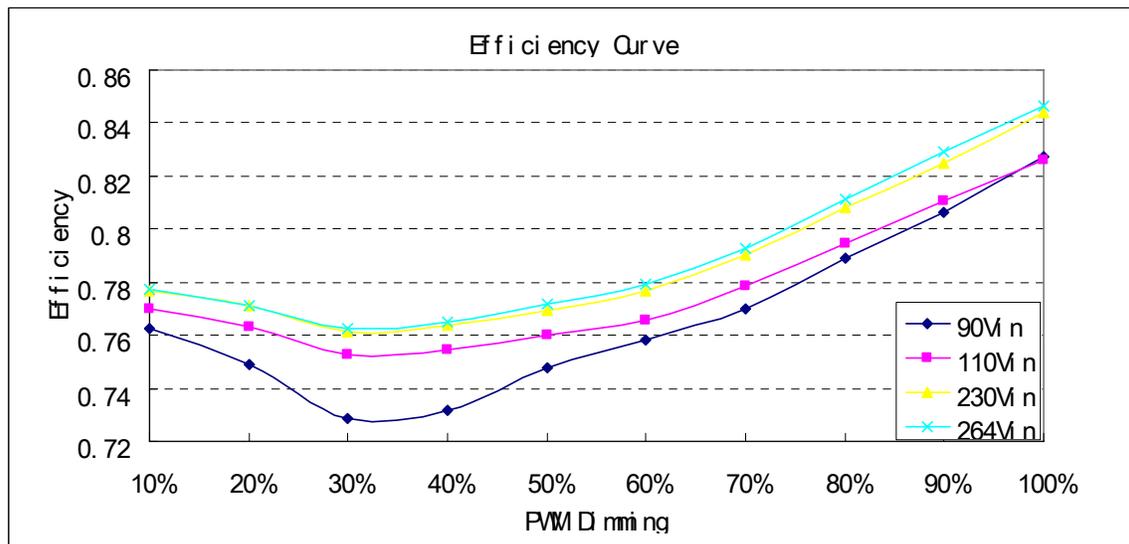
2.5: Efficiency

Pass/Fail criteria: 85% minimum with 230V AC input at 100% load.

| Vin(Vac) | Freq(Hz) | Pin | Po | Eff(%) | Pass/Fail |
|----------|----------|--------|----------|----------|-------------|
| 90 | 60 | 152.9 | 126.1624 | 0.82513 | PASS |
| 230 | 50 | 149.15 | 126.1666 | 0.845904 | PASS |
| 264 | 50 | 148.75 | 126.1649 | 0.848168 | PASS |



The test was executed under the condition of full load.



The test was executed under the condition of LED Dimming duty cycle increased .

2.6: Maximum input current

Pass/Fail criteria: XX Amps RMS maximum at low line, full load.

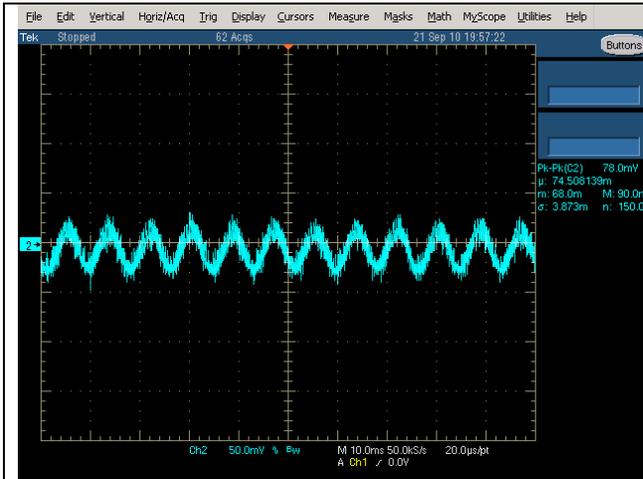
| Vin(Vac) | Freq(Hz) | Iin(Arms) | Pass/Fail |
|----------|----------|---------------|-------------|
| 90 | 60 | 1.7591 | PASS |

2.7: Output Ripple Voltage

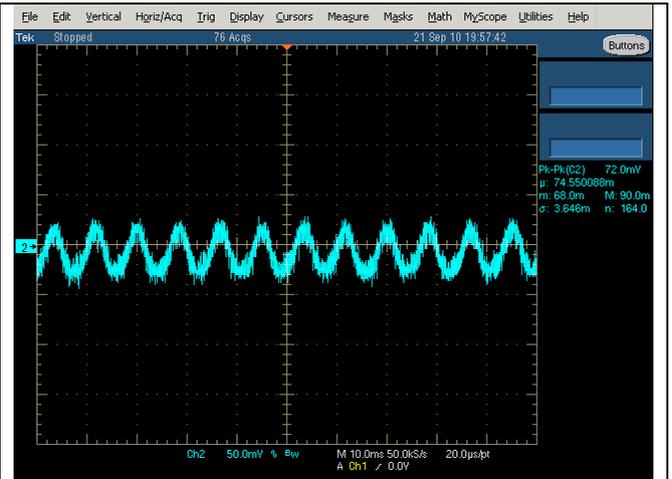
Output voltage ripple waveforms at 90V, 110V, 230V and 264Vac input

DC Output: 5Vsb @1A, 5V@3A and 24V@2A

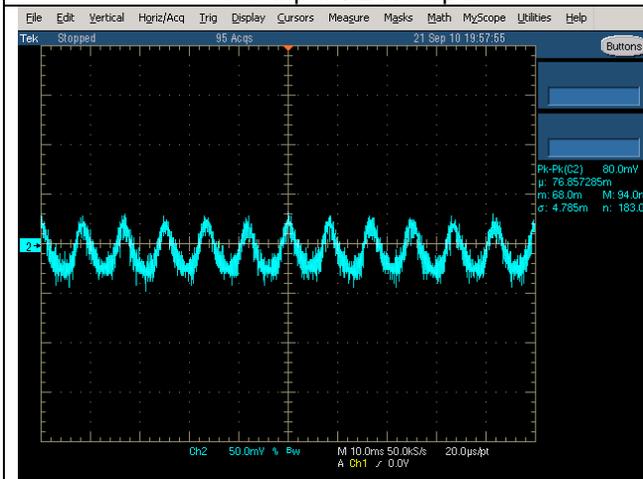
(Specs: 5V and 5Vsb ripple less than 50mV and 24V ripple less than 240mV)



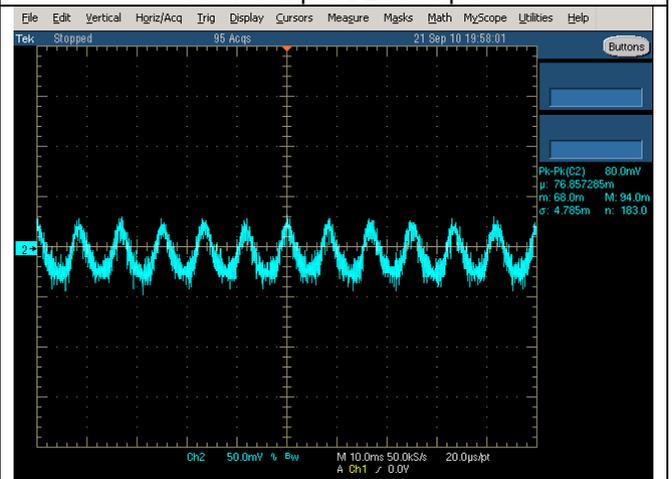
90Vac input@24Voutput



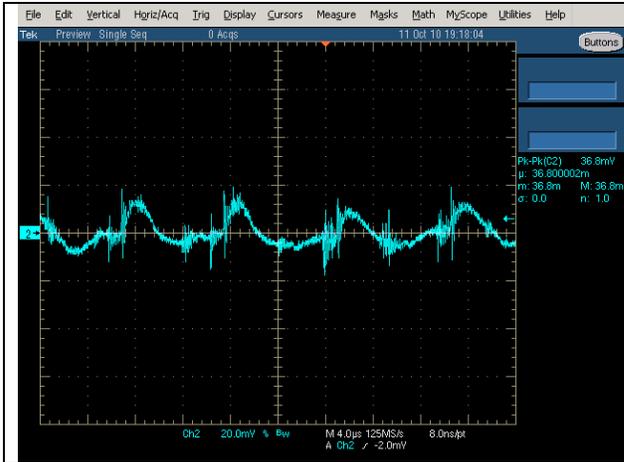
110Vac input@24Voutput



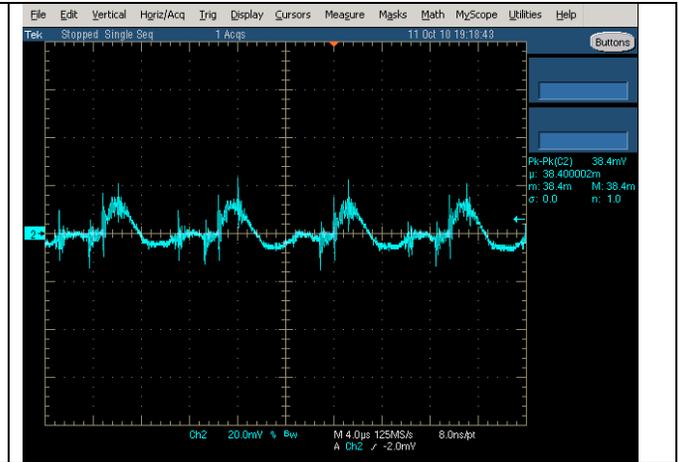
230Vac input@24Voutput



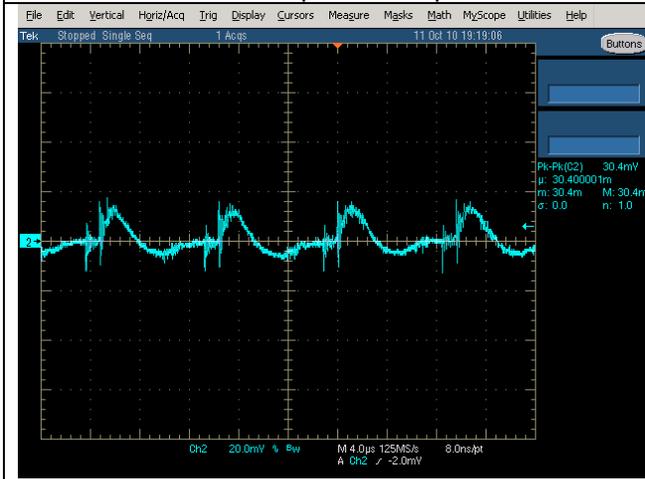
264Vac input@24Voutput



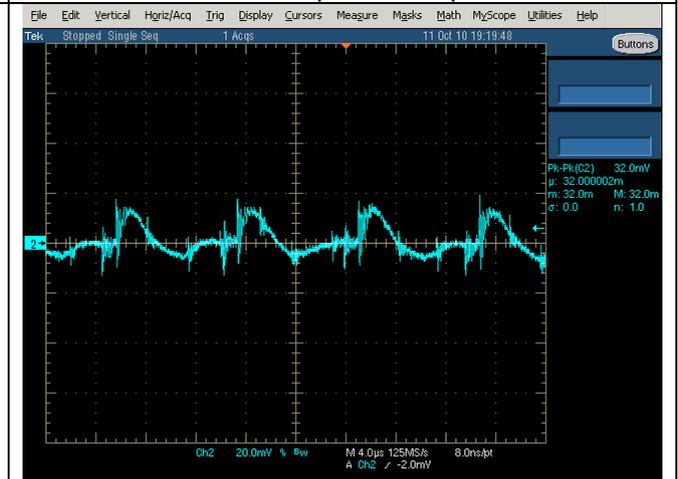
90Vac input@5Voutput



110Vac input@5Voutput



230Vac input@5Voutput

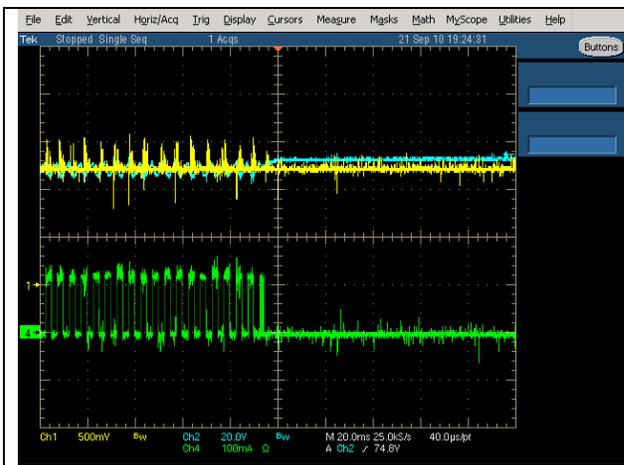


264Vac input@5Voutput

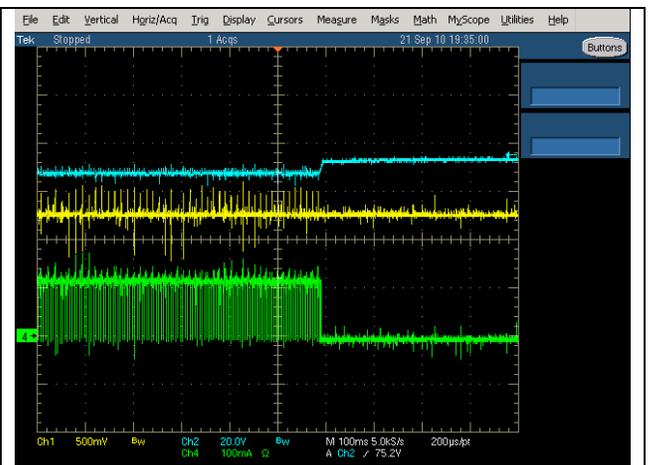
Remark: 5V output voltage ripple had been improved by add a choke PCH-45-473L.

2.8: Output Headroom Voltage Control

1. Waveform from LED ON to OFF at 50% and 90% PWM dimming for Vo_LED, HVM and Output LED current

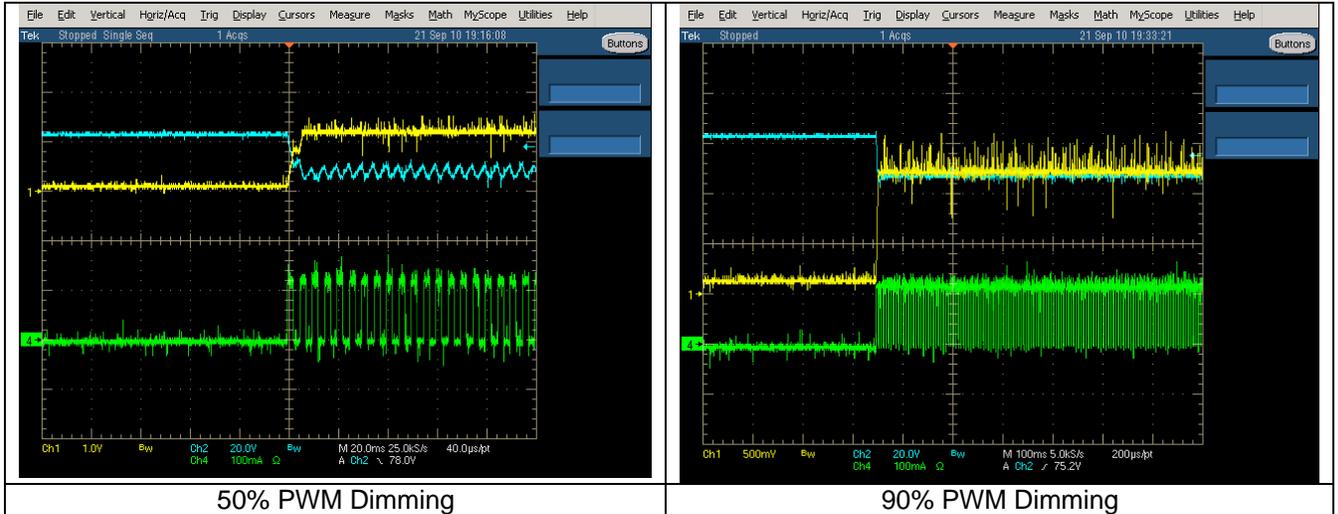


50% PWM Dimming



90% PWM Dimming

2. Waveform from LED OFF to ON at 50% and 90% PWM dimming for Vo_LED, HVM and Output LED current



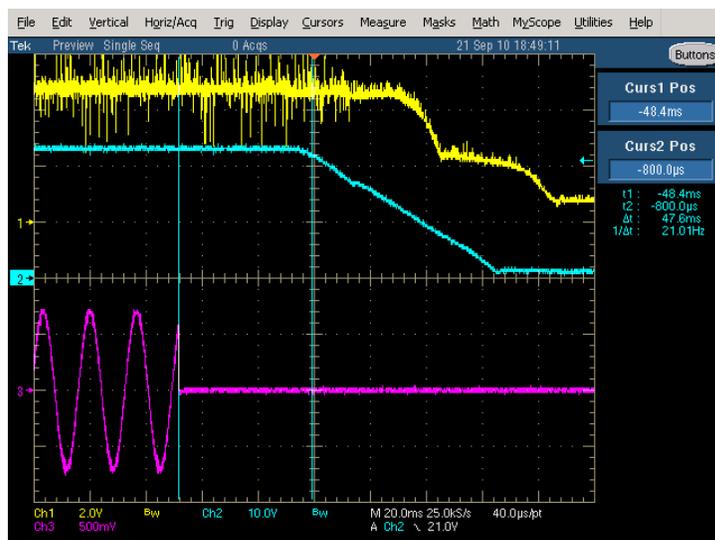
2.9: Hold up time

Test conditions: The test conditions are as followings: **100Vac/60Hz** and full load. The minimum time interval

Measurement is from AC interrupted to when the outputs go down to SPEC: **> 20ms**

Max load: 5Vsb@1A; 5V system @3A and 24V @2A

Waveforms for 5Vsb, 5V system and 24V rail



CH1: 2V/Div 5Vsb

CH2:10V/Div 24V
CH3: 100V/Div input voltage
Hold-up time is 47ms.

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| Security | www.ti.com/security |
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