



Texas Instruments

PMP4298 REVB Test Procedure

China Power Reference Design

REVB

9/20/10

1 General

1.1 PURPOSE

To provide detailed data for evaluating and verifying the PMP4298.

1.2 REFERENCE DOCUMENTATION

Schematic PMP4298_REVB_SCH.PDF
Assembly PMP4298_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/60H	110Vac/60H	230Vac/50H	264Vac/50H	Remarks
	z	z	z	z	
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/60H	110Vac/60H	230Vac/50H	264Vac/50H	Remarks
	z	z	z	z	
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 (V)	24V (V)	Io_24V (A)	Pin (W)	Po (W)	PF	Efficiency %
90	69.94	10%	0.96	4.886	1	4.802	3	23.581	2	92.77	73.16824	0.997	0.788706
	69.72	20%	0.96	4.891	1	4.802	3	23.569	2	100.26	79.82124	0.995	0.796142
	69.25	30%	0.96	4.895	1	4.802	3	23.563	2	107.66	86.371	0.995	0.802257
	69.125	40%	0.96	4.897	1	4.802	3	23.564	2	115.59	92.975	0.995	0.804352
	69.031	50%	0.96	4.897	1	4.803	3	23.565	2	123.15	99.57088	0.995	0.808533
	68.959	60%	0.96	4.896	1	4.81	3	23.565	2	129.6	106.1764	0.995	0.819262
	68.767	70%	0.96	4.899	1	4.812	3	23.566	2	136.69	112.6784	0.995	0.824336
	68.646	80%	0.96	4.902	1	4.815	3	23.567	2	143.5	119.2011	0.995	0.83067
	68.656	90%	0.96	4.904	1	4.816	3	23.568	2	150.41	125.8068	0.995	0.836426
	68.73	100%	0.96	4.905	1	4.816	3	23.57	2	156.55	132.4738	0.995	0.846208

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	70.657	10%	0.96	4.893	1	4.804	3	23.577	2	91.93	73.24207	0.994	0.796716
	69.609	20%	0.96	4.899	1	4.812	3	23.576	2	99.27	79.85193	0.994	0.804391
	68.932	30%	0.96	4.899	1	4.812	3	23.588	2	105.94	86.36342	0.994	0.815211
	68.938	40%	0.96	4.897	1	4.802	3	23.572	2	112.87	92.91919	0.995	0.823241
	68.883	50%	0.96	4.881	1	4.797	3	23.571	2	120.02	99.47784	0.998	0.828844
	68.825	60%	0.96	4.882	1	4.798	3	23.571	2	127.3	106.0612	0.998	0.833159
	68.661	70%	0.96	4.886	1	4.801	3	23.572	2	134.6	112.5732	0.996	0.836354
	68.535	80%	0.96	4.887	1	4.802	3	23.573	2	141.97	119.0739	0.996	0.838726
	68.534	90%	0.96	4.889	1	4.805	3	23.573	2	149.74	125.6634	0.998	0.83921
	68.662	100%	0.96	4.891	1	4.806	3	23.574	2	156.58	132.3725	0.996	0.845399

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	71.783	10%	0.96	4.829	1	4.744	3	23.582	2	90.46	73.11617	0.944	0.808271
	69.982	20%	0.96	4.831	1	4.746	3	23.577	2	97.27	79.65954	0.951	0.818953
	69.356	30%	0.96	4.835	1	4.748	3	23.574	2	104.1	86.20153	0.959	0.828065
	69.167	40%	0.96	4.838	1	4.754	3	23.574	2	110.89	92.80813	0.969	0.836939
	69.039	50%	0.96	4.844	1	4.758	3	23.576	2	117.75	99.40872	0.979	0.844235
	68.942	60%	0.96	4.847	1	4.763	3	23.574	2	124.85	105.9946	0.984	0.848976
	68.733	70%	0.96	4.85	1	4.766	3	23.574	2	131.76	112.4846	0.986	0.853708
	68.584	80%	0.96	4.856	1	4.771	3	23.574	2	138.96	118.9895	0.988	0.856286
	68.654	90%	0.96	4.857	1	4.771	3	23.575	2	146.01	125.6371	0.989	0.860469
	68.694	100%	0.96	4.857	1	4.771	3	23.575	2	152.57	132.2662	0.99	0.866922

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	71.676	10%	0.96	4.866	1	4.781	3	23.581	2	90.53	73.2519	0.945	0.809145
	69.941	20%	0.96	4.861	1	4.776	3	23.576	2	97.38	79.76967	0.946	0.819159
	69.338	30%	0.96	4.86	1	4.775	3	23.574	2	104.23	86.30234	0.949	0.827999
	69.163	40%	0.96	4.861	1	4.776	3	23.574	2	110.96	92.89559	0.955	0.837199
	69.033	50%	0.96	4.862	1	4.778	3	23.574	2	117.79	99.47984	0.959	0.844553
	68.928	60%	0.96	4.864	1	4.779	3	23.574	2	124.86	106.0515	0.964	0.849364
	68.724	70%	0.96	4.862	1	4.778	3	23.574	2	131.79	112.5265	0.969	0.853832
	68.572	80%	0.96	4.864	1	4.778	3	23.574	2	138.71	119.0093	0.976	0.857972
	68.566	90%	0.96	4.863	1	4.779	3	23.575	2	145.85	125.591	0.982	0.861097
	68.615	100%	0.96	4.867	1	4.781	3	23.576	2	152.29	132.2324	0.982	0.868293

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	4.999	4.9976	23.846	71.131
	0.1	1	1	20%	8	4.986	4.9539	23.773	69.874
	0.1	2	1.5	30%	8	4.974	4.9087	23.688	69.258
	0.1	3	2	40%	8	4.96	4.8587	23.577	69.193
	0.5	3	2	50%	8	4.946	4.8512	23.575	69.07
	1	2	2	60%	8	4.948	4.8943	23.575	69.026
	1	1	1.5	70%	8	4.963	4.9417	23.674	68.798
	1	1	1	80%	8	4.962	4.9416	23.776	68.657
	1	0.5	0.5	90%	8	4.969	4.9648	23.855	68.646

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	4.999	4.9976	23.85	71.178
	0.1	1	1	20%	8	4.986	4.9539	23.773	69.861
	0.1	2	1.5	30%	8	4.974	4.9086	23.685	69.272
	0.1	3	2	40%	8	4.96	4.859	23.579	69.176
	0.5	3	2	50%	8	4.947	4.851	23.575	69.082
	1	2	2	60%	8	4.948	4.8942	23.575	69.02
	1	1	1.5	70%	8	4.962	4.9416	23.679	68.798
	1	1	1	80%	8	4.962	4.9416	23.774	68.651
	1	0.5	0.5	90%	8	4.969	4.9647	23.856	68.643

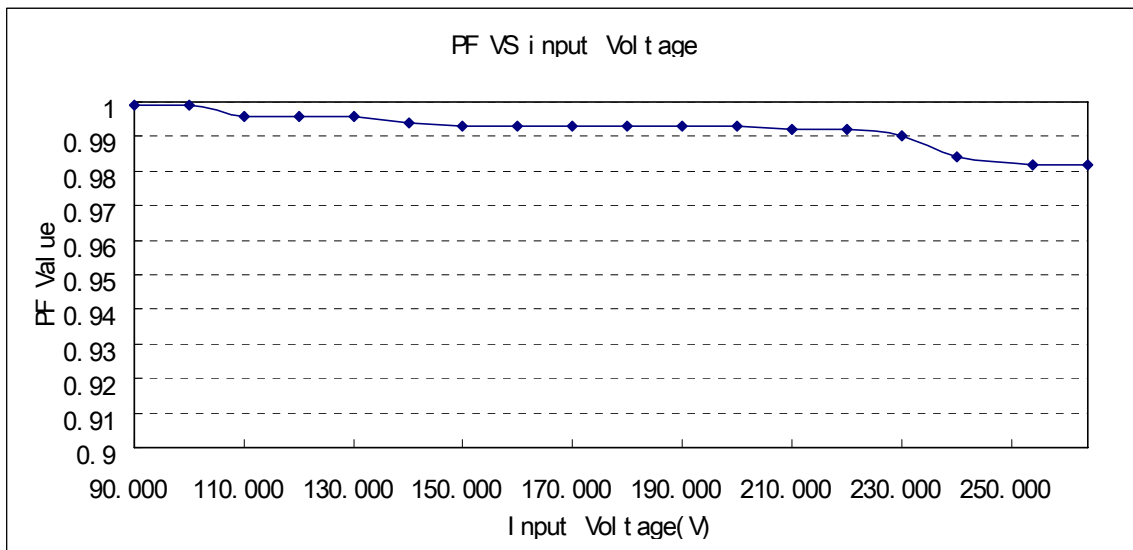
Vin (Vac)	Output Load					Output Measurement			
	5Vsb (A)	5V (A)	24V (A)	PWM Dimming Duty	Strings	5Vsb (V)	5V (V)	24V (V)	Vo_LED (V)
230	0.1	0	0.5	10%	8	4.999	4.9975	23.852	71.23
	0.1	1	1	20%	8	4.987	4.9539	23.772	69.845
	0.1	2	1.5	30%	8	4.974	4.9084	23.685	69.283
	0.1	3	2	40%	8	4.96	4.8592	23.582	69.159
	0.5	3	2	50%	8	4.946	4.8508	23.575	69.097
	1	2	2	60%	8	4.948	4.8934	23.575	69.008
	1	1	1.5	70%	8	4.962	4.9415	23.682	68.805
	1	1	1	80%	8	4.962	4.9417	23.773	68.651
	1	0.5	0.5	90%	8	4.969	4.9646	23.857	68.638

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	4.999	4.9974	23.853	71.248
	0.1	1	1	20%	8	4.986	4.9539	23.772	69.815
	0.1	2	1.5	30%	8	4.974	4.9083	23.684	69.296
	0.1	3	2	40%	8	4.96	4.8599	23.593	69.131
	0.5	3	2	50%	8	4.946	4.8507	23.574	69.107
	1	2	2	60%	8	4.948	4.8937	23.575	69.006
	1	1	1.5	70%	8	4.962	4.9415	23.684	68.806
	1	1	1	80%	8	4.963	4.9417	23.77	68.642
	1	0.5	0.5	90%	8	4.968	4.9646	23.856	68.653

2.4 Power Factor

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

Vin(Vac)	Freq(Hz)	PF	Io(Arms)
90	60	0.998	Full Load
230	50	0.990	Full Load
264	50	0.982	Full Load



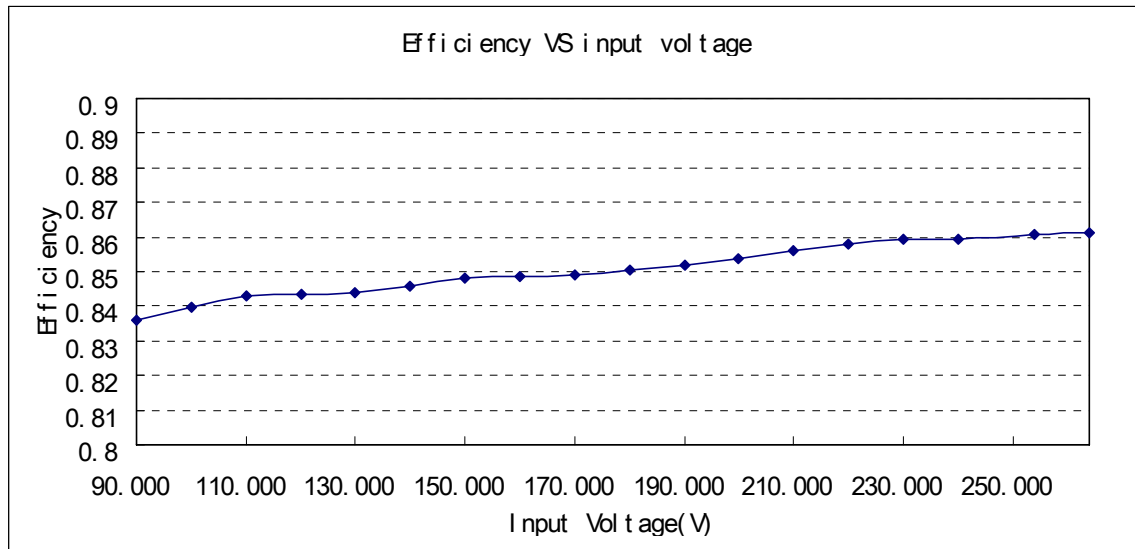
The test was executed under the condition of full load.

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 2.2uF.

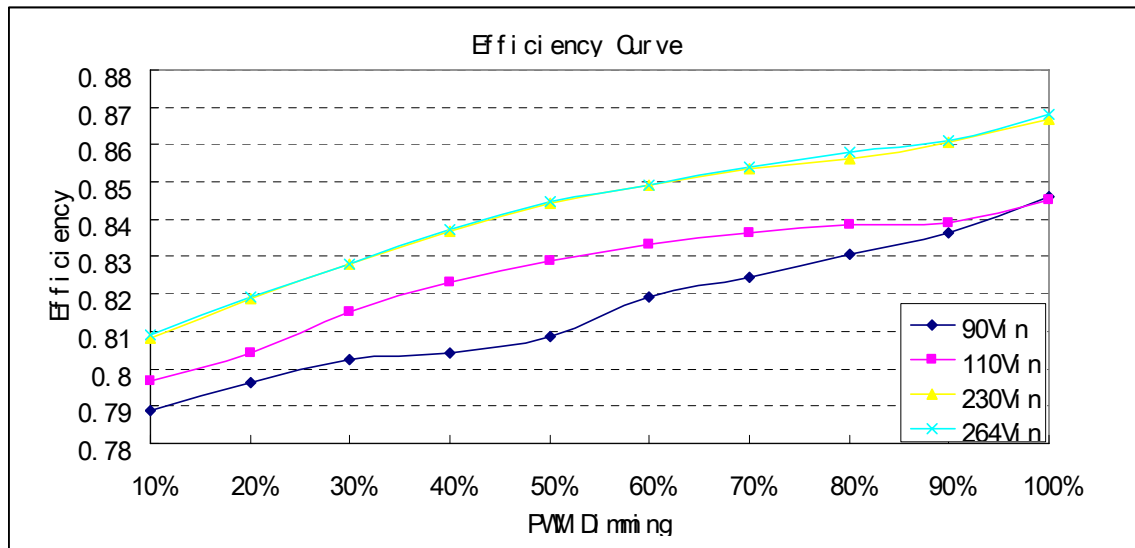
2.5: Efficiency

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

Vin(Vac)	Freq(Hz)	Pin	Po	Eff(%)	Pass/Fail
90	60	157.39	131.5393	0.835754	PASS
230	50	153.05	131.5393	0.859453	PASS
264	50	152.71	131.5393	0.861367	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.

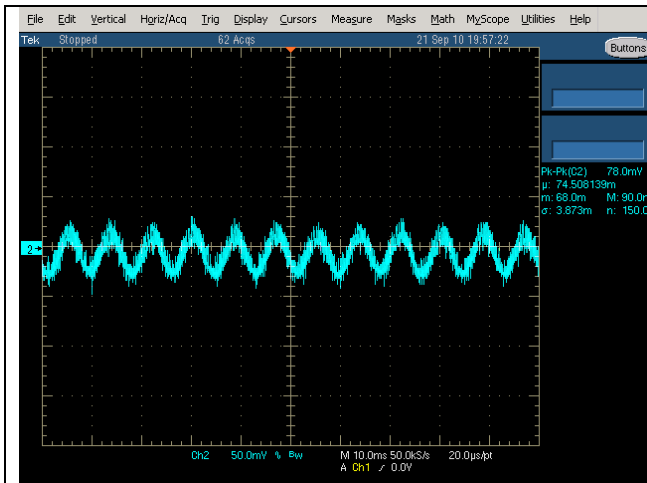
Vin(Vac)	Freq(Hz)	Iin(Arms)	Pass/Fail
90	60	1.7591	PASS

2.7: Output Ripple Voltage

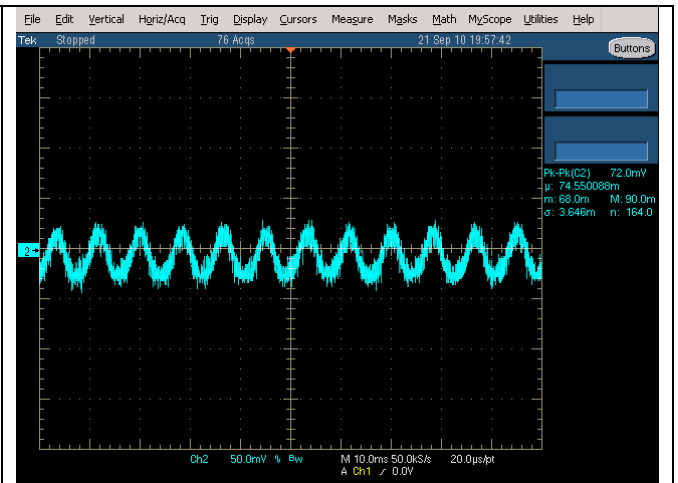
Output voltage ripple waveforms at 90V, 110V, 230V and 264Vac input

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

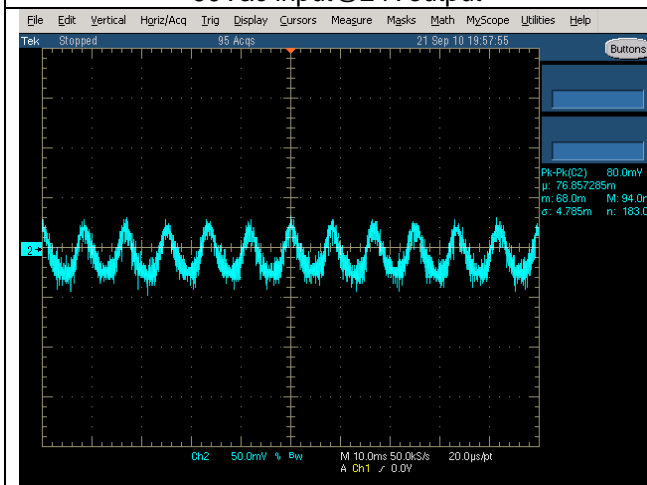
(Specs: 5V and 5Vsb ripple less than 50mV and 24V ripple less than 240mV)



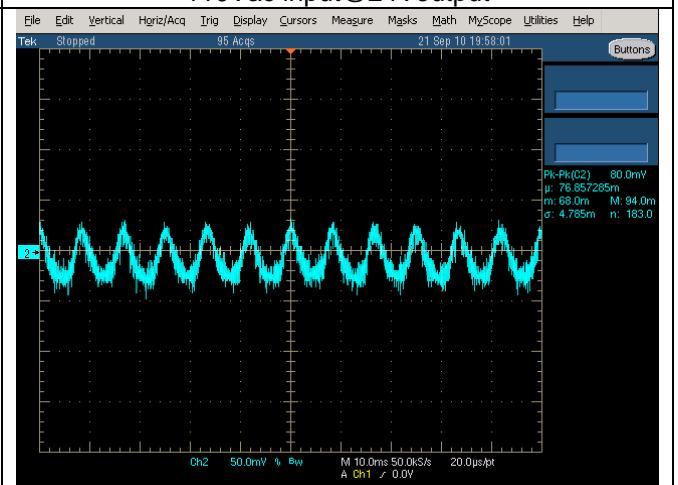
90Vac input@24Voutput



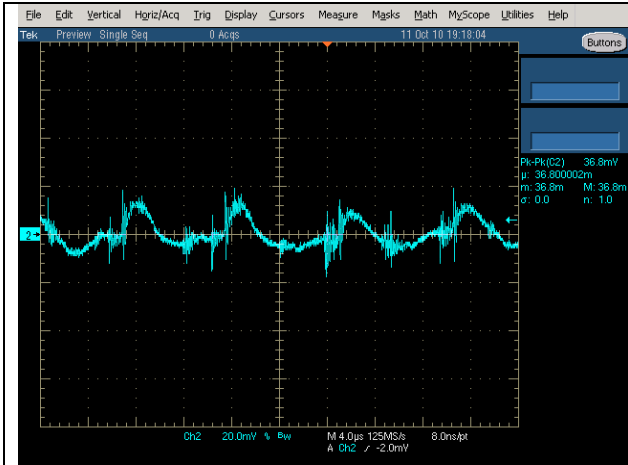
110Vac input@24Voutput



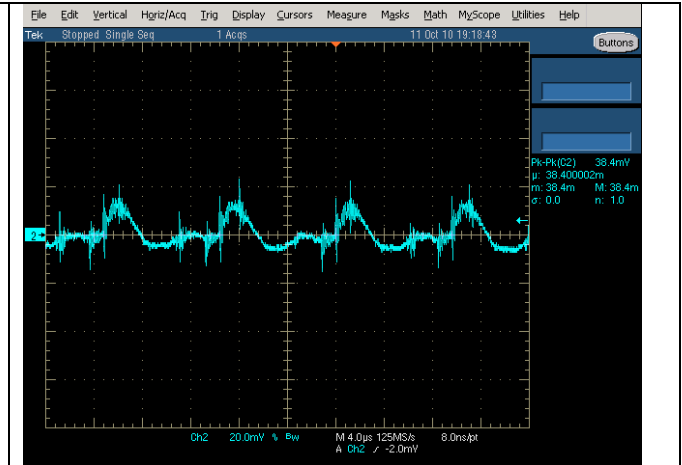
230Vac input@24Voutput



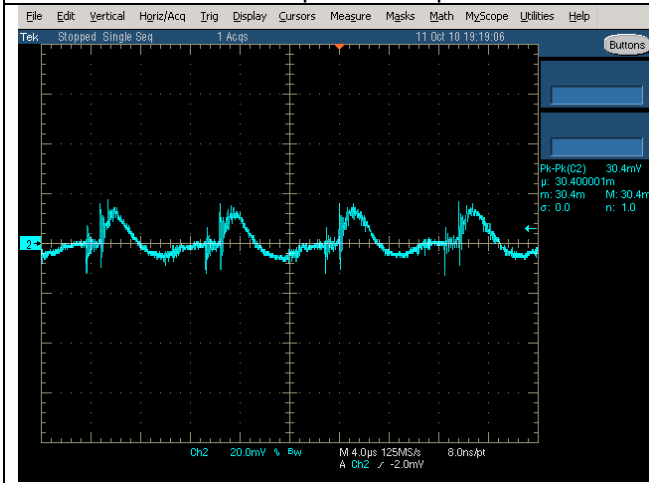
264Vac input@24Voutput



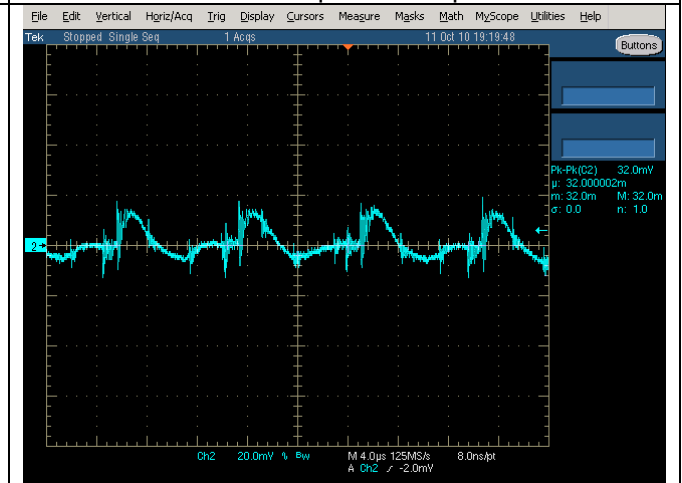
90Vac input@5Voutput



110Vac input@5Voutput



230Vac input@5Voutput

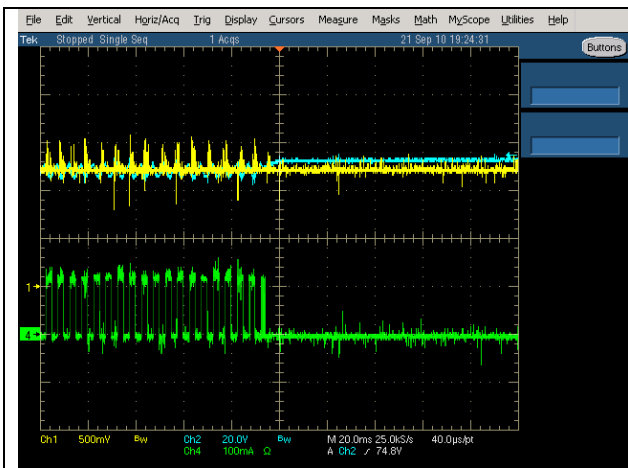


264Vac input@5Voutput

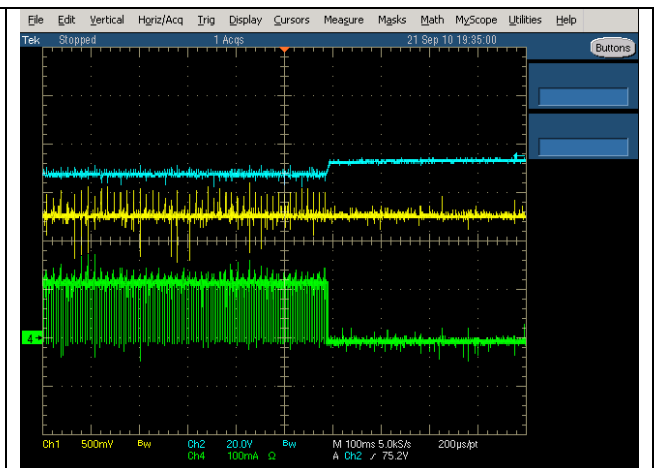
Remark: 5V output voltage ripple had been improved by add a choke PCH-45-473L.

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

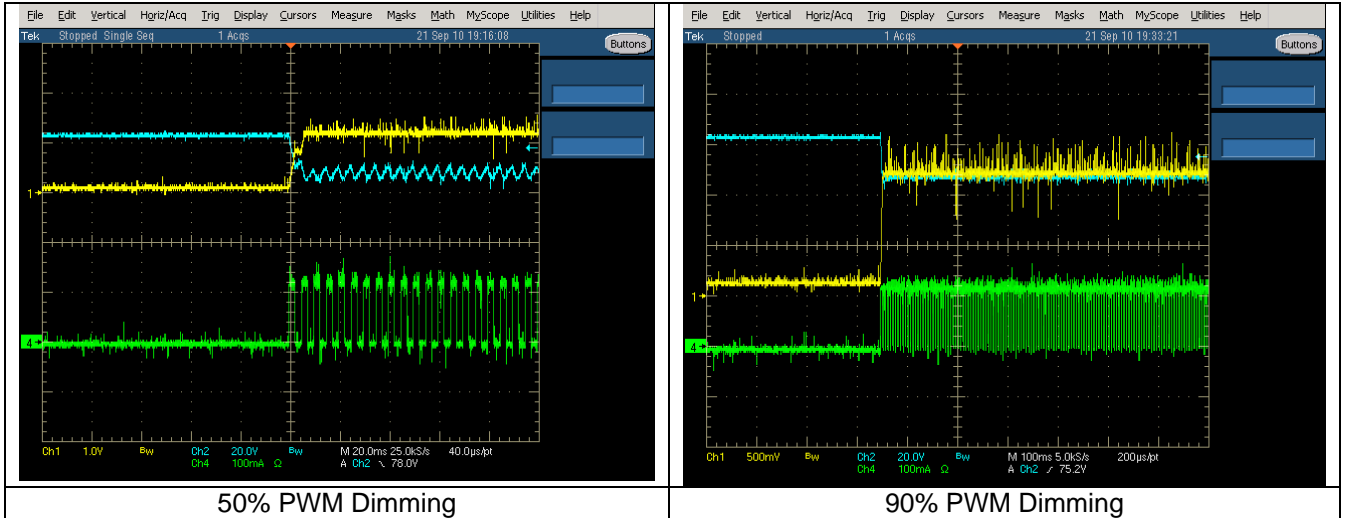


50% PWM Dimming



90% PWM Dimming

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



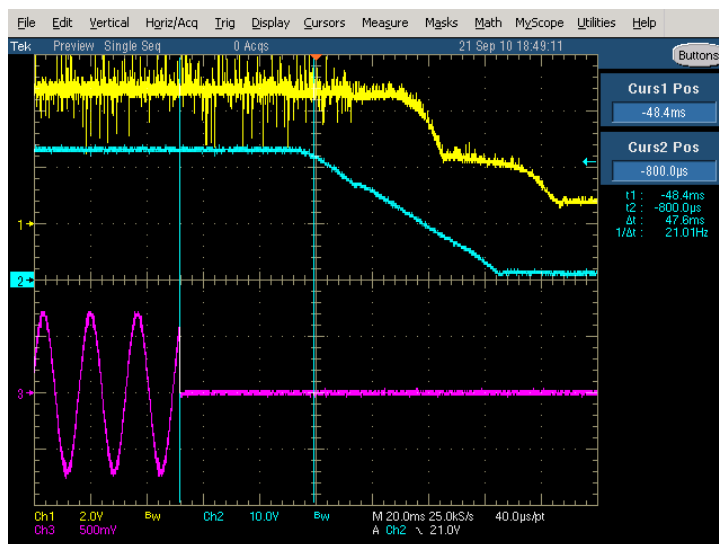
2.9: Hold up time

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



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

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