Texas Instruments

PMP4302A REVA Test Procedure

China Power Reference Design

REVA

5/26/11

1 General

1.1 PURPOSE

To provide detailed data for evaluating and verifying the PMP4302A.

1.2 REFERENCE DOCUMENTATION

Schematic PMP4302A_REVA_SCH.PDF
Assembly PMP4302A_REVA_PCB.PDF
BOM

1.3 TEST EQUIPMENTS

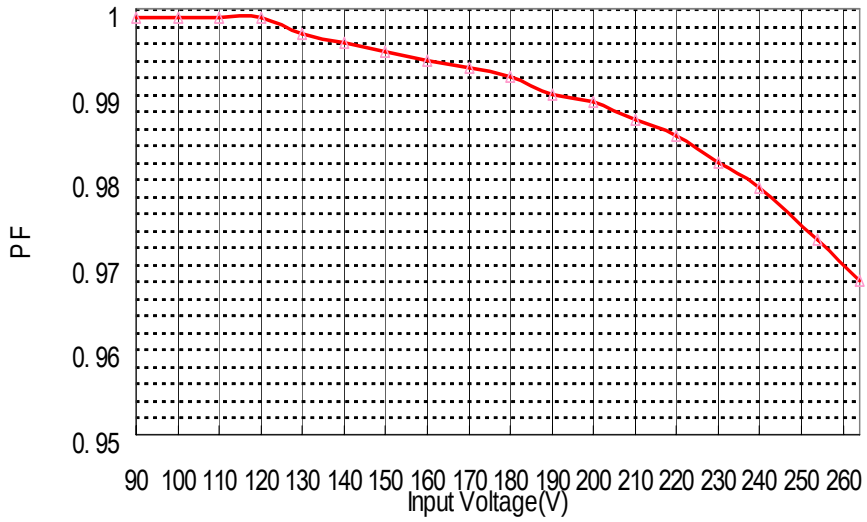
Multi-meter: Fluke 289
Power Analyser:PM100
AC Source: Agilent 6813B
Ambient Temperature at 25DegC

2: INPUT CHARACTERISTICS

2.1 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	**0.982**	Full Load
264	50	**0.968**	Full Load

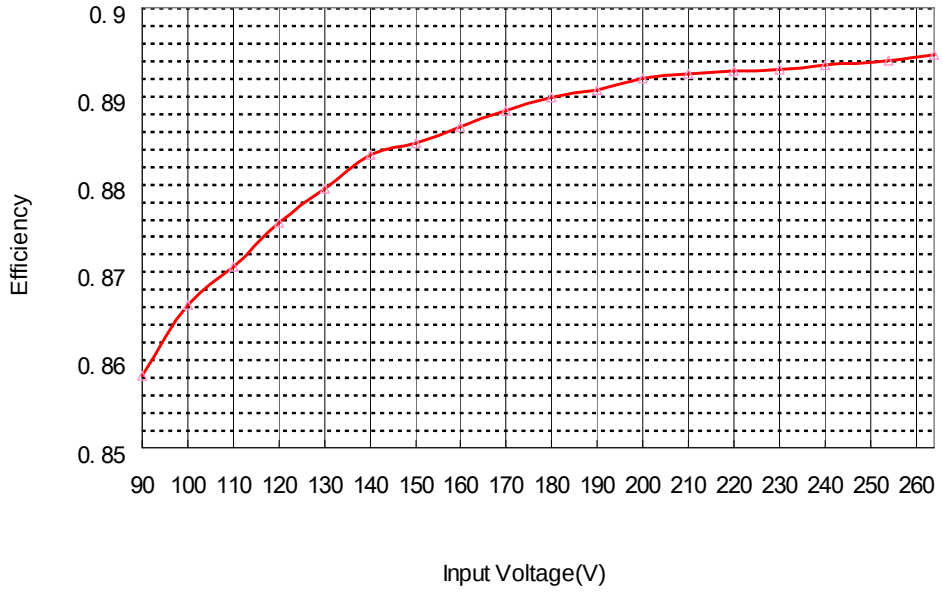


The test was executed under the condition of full load.

2.2: Efficiency

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

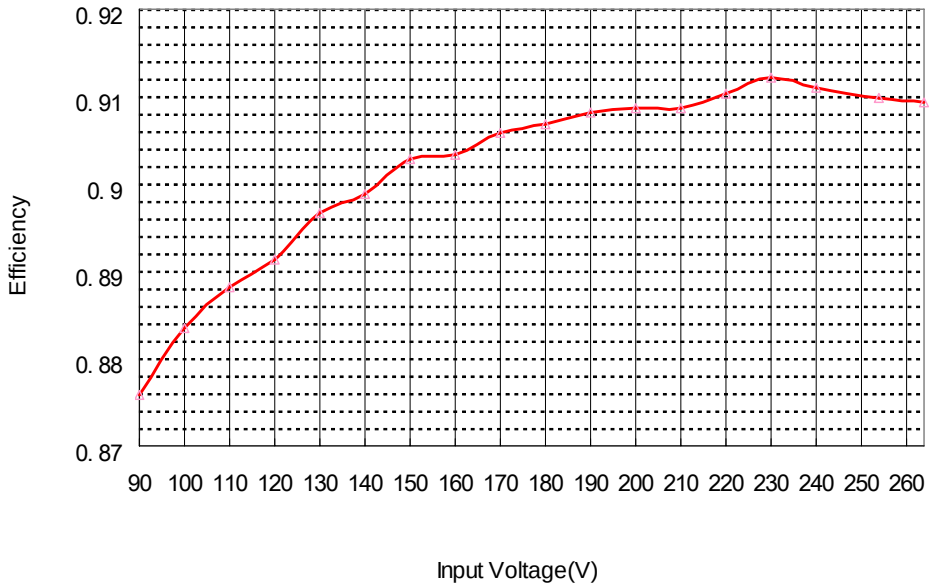
Vin(Vac)	Freq(Hz)	Pin	Po	Eff(%)	Pass/Fail
90	60	110.62	94.93	85.82	**PASS**
230	50	106.35	94.97	89.30	**PASS**
264	50	106.13	94.94	89.46	**PASS**



The test was executed under the condition of full load.

90% minimum with 230V AC input at 100% load (Non-dimming).

Vin(Vac)	Freq(Hz)	Pin	Po	Eff(%)	Pass/Fail
90	60	109.6	95.98	87.58	**PASS**
230	50	105.47	96.20	91.21	**PASS**
264	50	105.51	95.94	90.93	**PASS**



The test was executed under the condition of full load.

2.3: Maximum input current

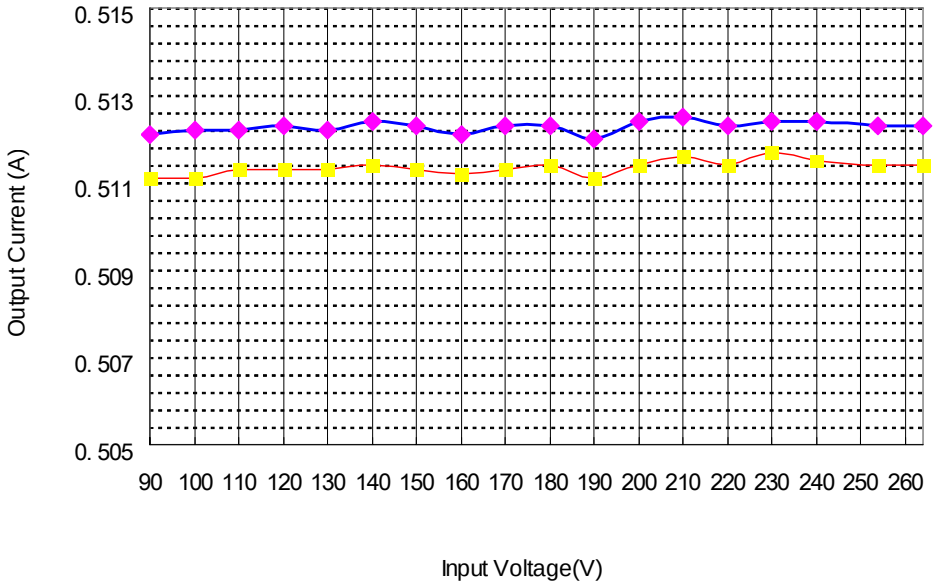
Pass/Fail criteria: XX Amps RMS maximum at low line, full load.

Vin(Vac)	Freq(Hz)	Iin(Arms)	Pass/Fail
90	60	1.2325	**PASS**

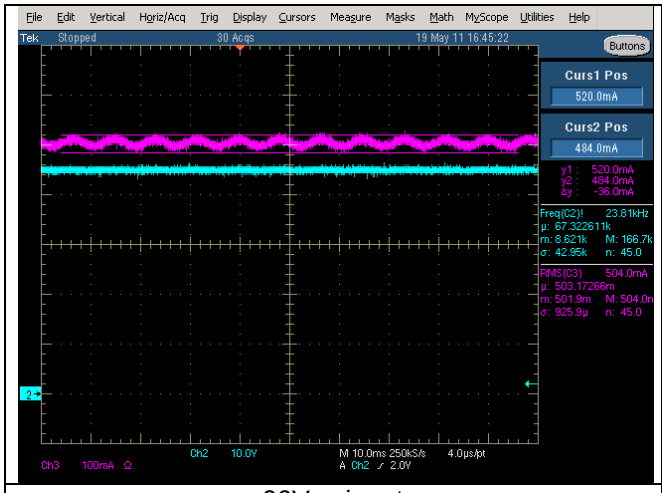
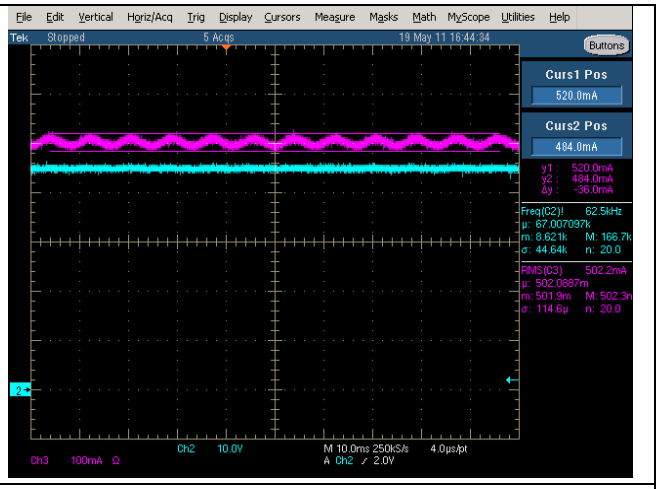
2.4: Output Current

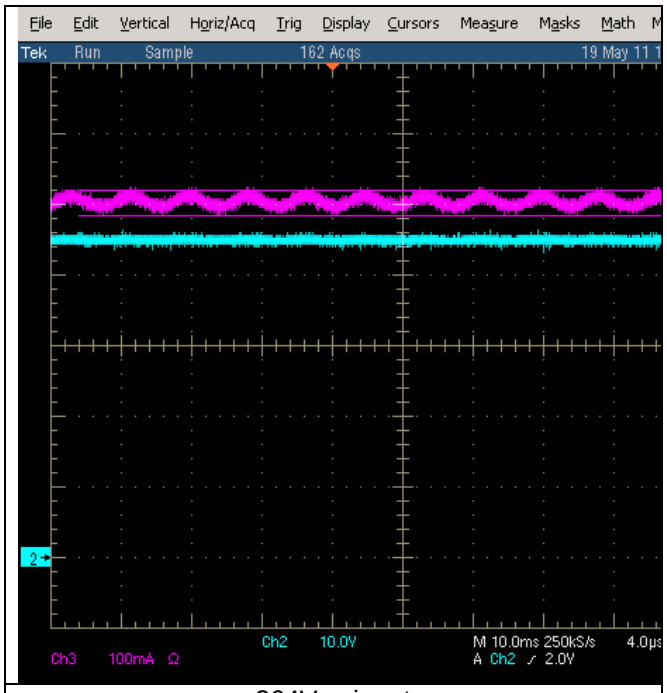
Vin	Io1	Io2	Io3	Io4
90	0.5038	0.5015	0.5121	0.5111
100	0.5039	0.5014	0.5122	0.5111
110	0.5039	0.5015	0.5122	0.5113
120	0.5041	0.5017	0.5123	0.5113
130	0.5041	0.5016	0.5122	0.5113
140	0.504	0.5016	0.5124	0.5114
150	0.504	0.5015	0.5123	0.5113
160	0.5041	0.5014	0.5121	0.5112
170	0.5041	0.5016	0.5123	0.5113
180	0.5041	0.5016	0.5123	0.5114
190	0.5044	0.5019	0.512	0.5111
200	0.5042	0.5018	0.5124	0.5114
210	0.5041	0.5015	0.5125	0.5116
220	0.5038	0.5014	0.5123	0.5114
230	0.5039	0.5014	0.5124	0.5117
240	0.504	0.5014	0.5124	0.5115
254	0.504	0.5014	0.5123	0.5114

264	0.504	0.5014	0.5123	0.5114



Output current ripple waveforms at 230V input
CH2: LED Output Voltage 10V/Div
CH3: LED Output Current 100mA/Div

	
90Vac input	230Vac input



264Vac input

2.6: <u>Output Dimming Control</u>

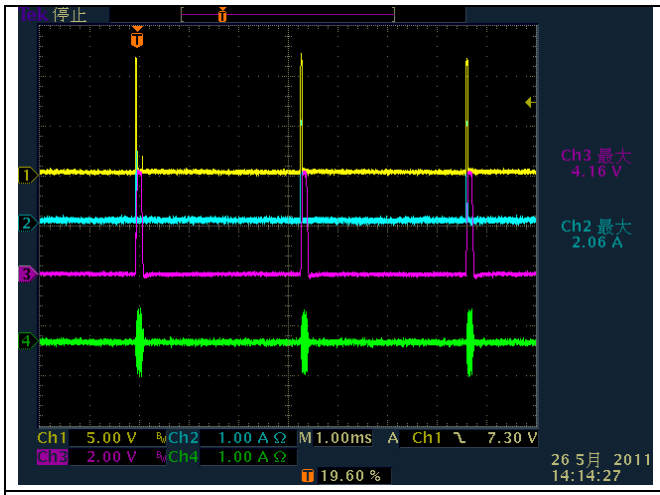
90Vin								
Dimming	Io1	Io2	Io3	Io4	Max	Min	Ave	%
1%	5	4.4	5.2	5.2	5.2	4.4	4.95	8.080808
2%	10	9.5	10.4	10.3	10.4	9.5	10.05	4.477612
5%	25.1	24.6	25.8	25.7	25.8	24.6	25.3	2.371542
10%	50.4	49.7	51.4	51.4	51.4	49.7	50.725	1.675702
20%	100.9	100.1	102.8	102.5	102.8	100.1	101.575	1.329067
30%	151.4	150.4	154.1	153.8	154.1	150.4	152.425	1.213712
40%	201.9	200.7	205.4	204.9	205.4	200.7	203.225	1.156354
50%	252.5	251	256.3	255.6	256.3	251	253.85	1.043924
60%	302.8	301.5	307.7	307.4	307.7	301.5	304.85	1.016894
70%	353.5	351.8	358.6	357.8	358.6	351.8	355.425	0.956601
80%	403.9	402.2	409.7	408.8	409.7	402.2	406.15	0.923304
90%	454.3	452.2	461.1	460.1	461.1	452.2	456.925	0.973902
99%	499.3	496.7	507.2	506.2	507.2	496.7	502.35	1.045088
100%	503.9	501.4	512.4	511.7	512.4	501.4	507.35	1.084064

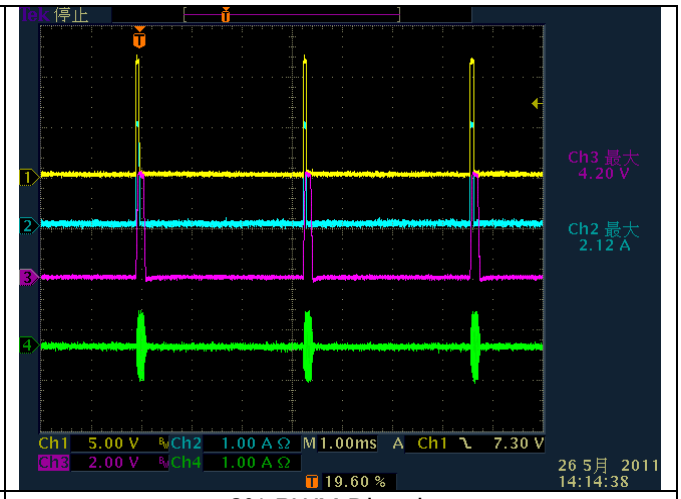
230Vin								
Dimming	Io1	Io2	Io3	Io4	Max	Min	Ave	%
1%	4.9	4.4	5.3	5.1	5.3	4.4	4.925	9.137056
2%	10	9.4	10.4	10.3	10.4	9.4	10.025	4.987531
5%	25.2	24.5	25.9	25.7	25.9	24.5	25.325	2.764067
10%	50.4	49.7	51.5	51.3	51.5	49.7	50.725	1.774273
20%	100.9	100.1	102.7	102.5	102.7	100.1	101.55	1.280158

30%	151.4	150.4	154.1	153.6	154.1	150.4	152.375	1.21411
40%	201.9	200.9	205.1	204.9	205.1	200.9	203.2	1.033465
50%	252.4	251.1	256.4	255.8	256.4	251.1	253.925	1.043615
60%	302.9	301.4	307.7	307	307.7	301.4	304.75	1.033634
70%	353.5	351.8	358.6	357.8	358.6	351.8	355.425	0.956601
80%	403.9	402.2	409.7	408.8	409.7	402.2	406.15	0.923304
90%	454.3	452.2	461.1	460.1	461.1	452.2	456.925	0.973902
99%	499.3	496.7	507.2	506.2	507.2	496.7	502.35	1.045088
100%	503.9	501.4	512.4	511.7	512.4	501.4	507.35	1.084064

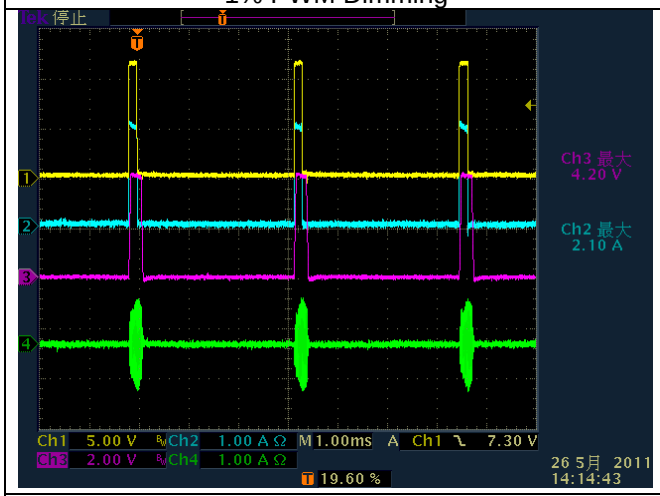
264Vin								
Dimming	Io1	Io2	Io3	Io4	Max	Min	Ave	%
1%	5	4.6	5.2	5.2	5.2	4.6	5	6
2%	10	9.5	10.2	10.3	10.3	9.5	10	4
5%	25.1	24.6	25.8	25.7	25.8	24.6	25.3	2.371542
10%	50.4	49.7	51.4	51.4	51.4	49.7	50.725	1.675702
20%	100.9	100.1	102.8	102.5	102.8	100.1	101.575	1.329067
30%	151.4	150.4	154.1	153.8	154.1	150.4	152.425	1.213712
40%	201.9	200.7	205.4	204.9	205.4	200.7	203.225	1.156354
50%	252.5	251	256.3	255.6	256.3	251	253.85	1.043924
60%	302.8	301.5	307.7	307.4	307.7	301.5	304.85	1.016894
70%	353.5	351.8	358.6	357.8	358.6	351.8	355.425	0.956601
80%	403.9	402.2	409.8	408.6	409.8	402.2	406.125	0.935673
90%	454.3	452.4	461.1	460.3	461.1	452.4	457.025	0.951808
99%	499.4	496.7	507.2	506.2	507.2	496.7	502.375	1.045036
100%	503.9	501.4	512.4	511.7	512.4	501.4	507.35	1.084064

1. Waveform from LED Output Current is controlled by 300Hz PWM dimming.
It was tested under the condition of 230Vac input.
CH1: LEDSW MOSFET Vgs 5V/Div CH2: LED Output Current 1A/Div
CH3: DSR 2V/Div CH4: Primary Current 1A/Div

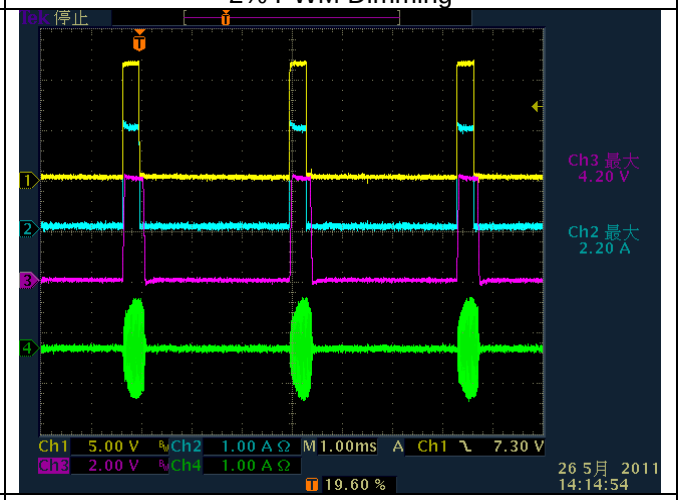




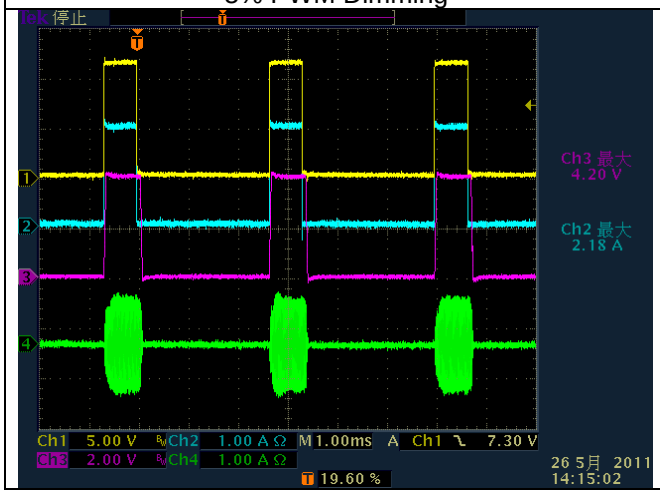
1% PWM Dimming



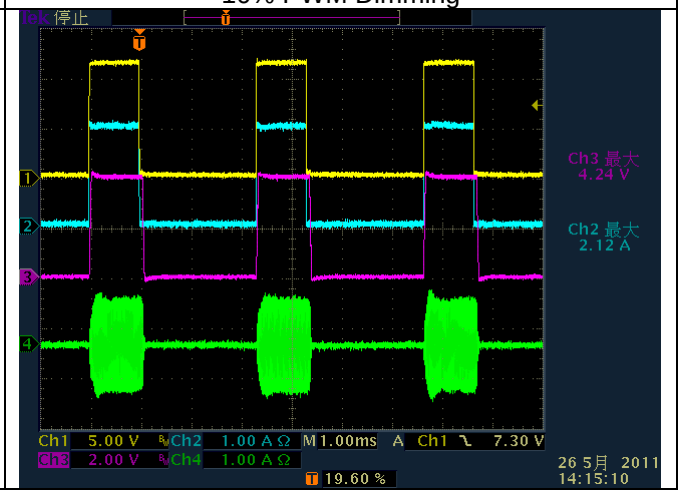
2% PWM Dimming

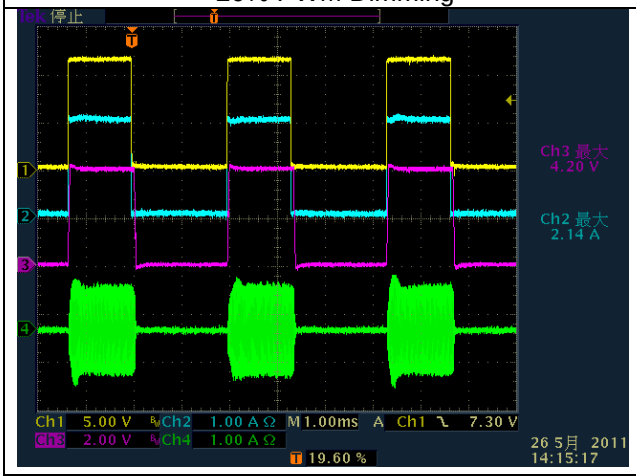
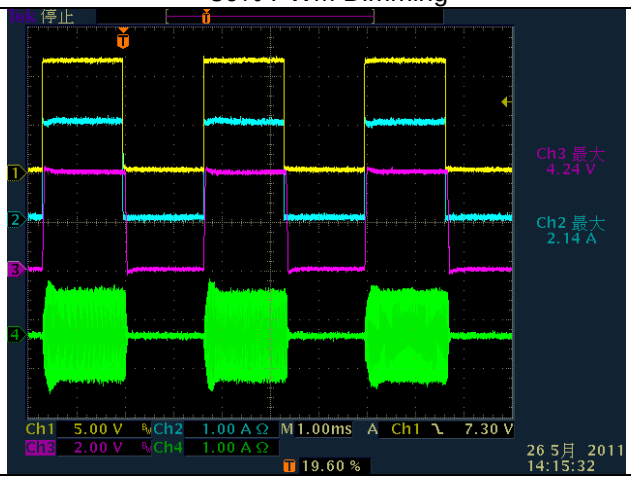
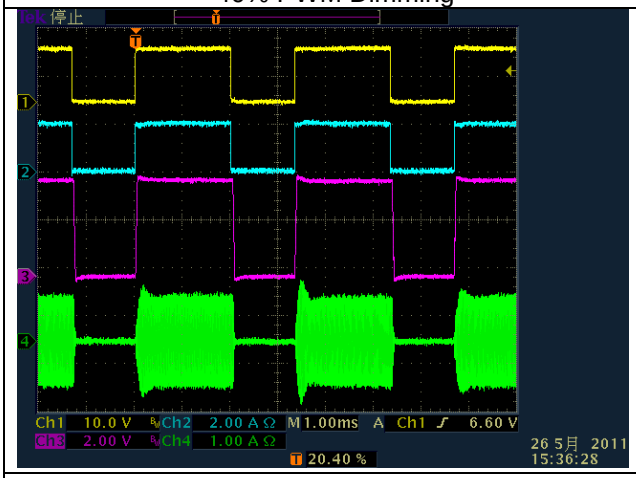
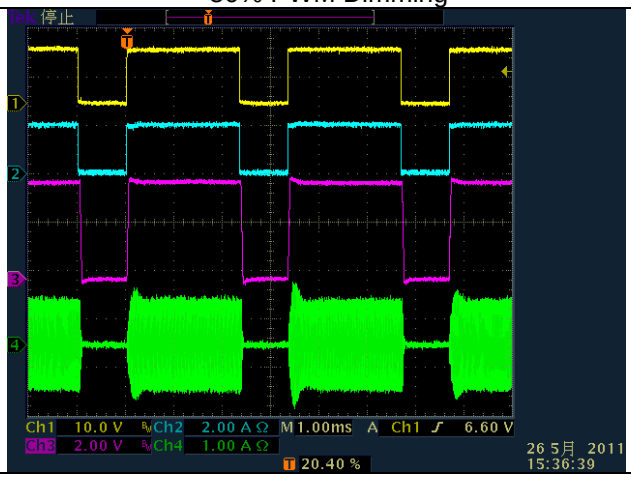
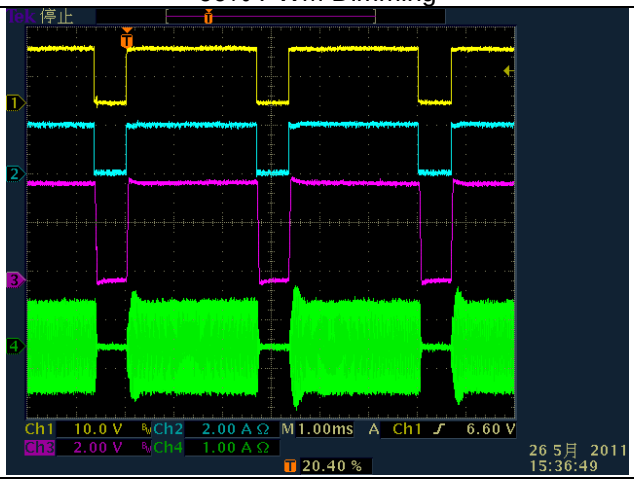
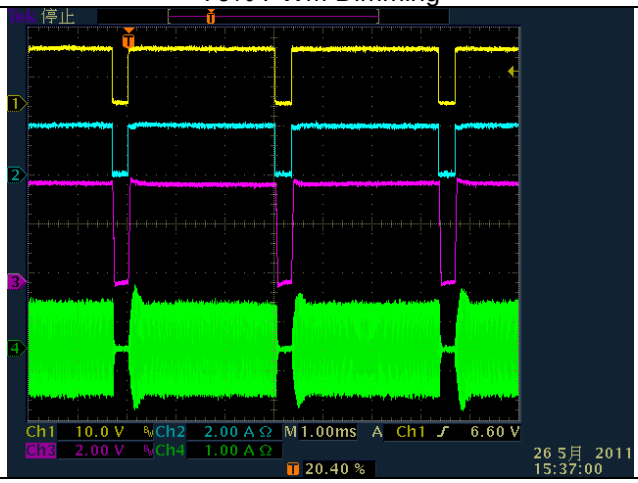


5% PWM Dimming



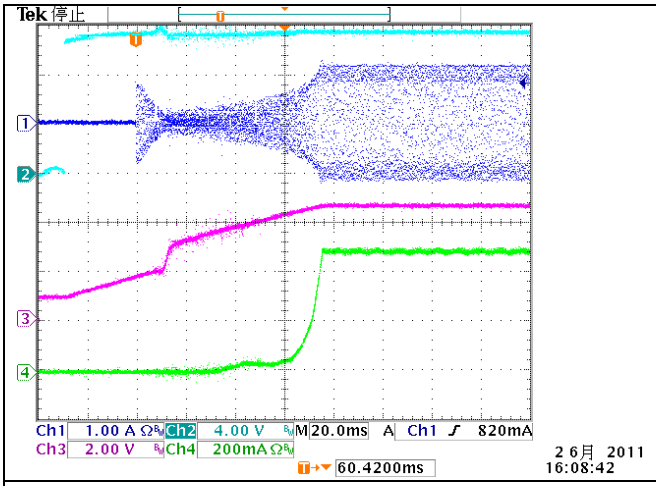
10% PWM Dimming



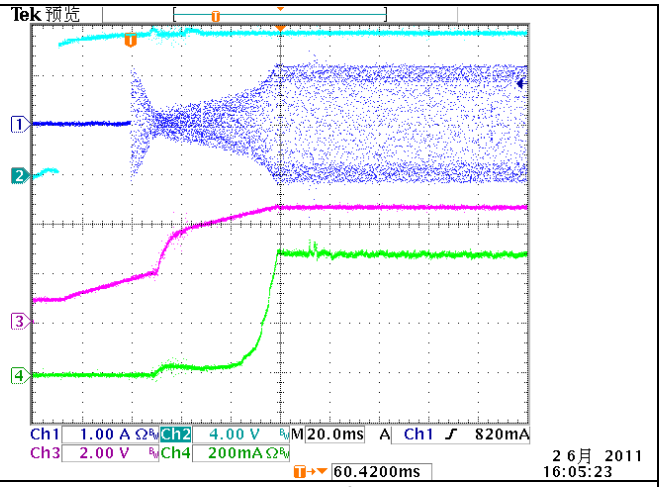
20% PWM Dimming	30% PWM Dimming
	
40% PWM Dimming	50% PWM Dimming
	
60% PWM Dimming	70% PWM Dimming
	
80% PWM Dimming	90% PWM Dimming

2.7: Start-up waveform

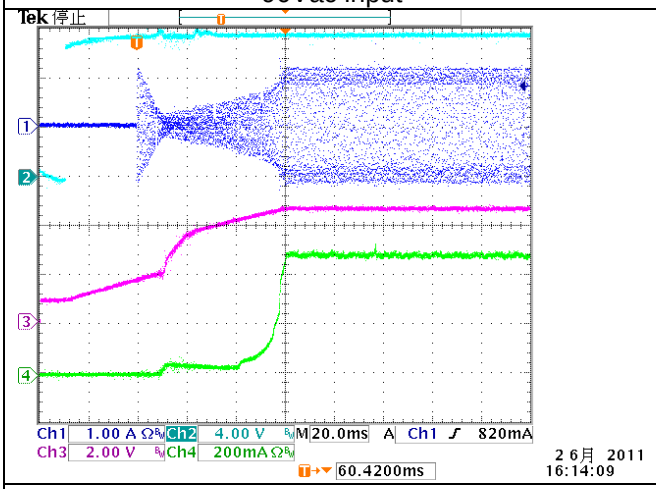
CH1: Primary Current 1A/Div
CH2: LEDSW MOSFET Vgs 4V/Div
CH3: DSR 2V/Div
CH4: LED Output Current 200mA/Div



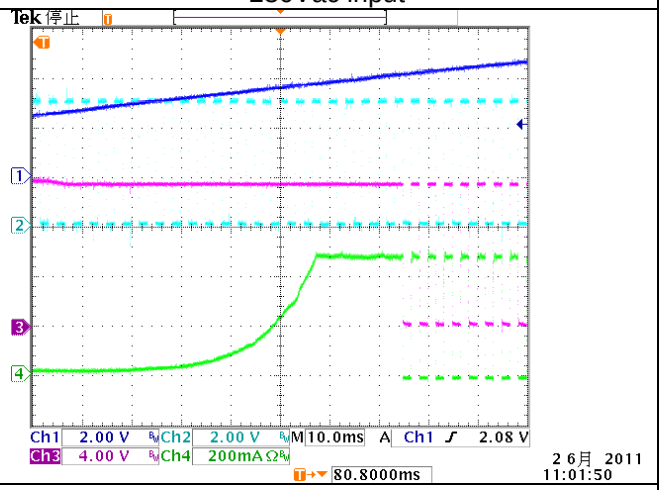
90Vac input



230Vac input



264Vac input

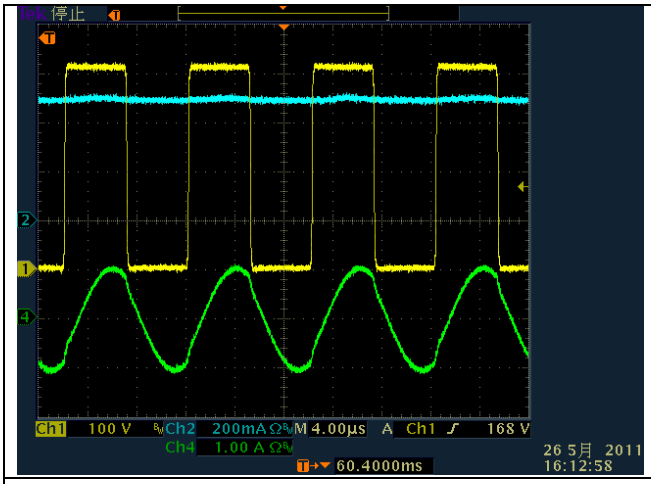
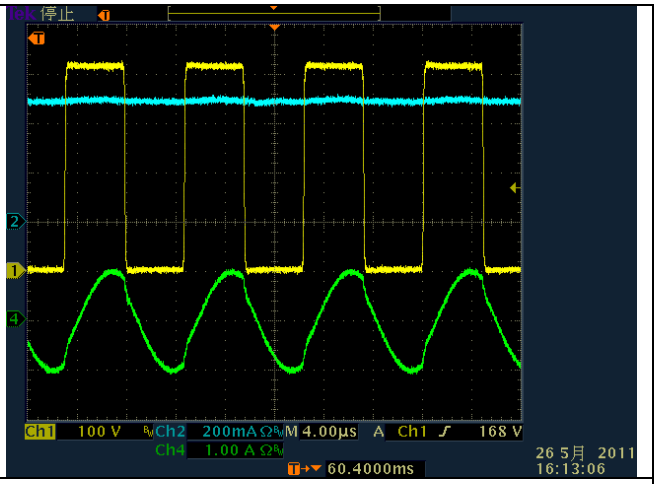


Start up with 50% dimming 230Vac input
CH1: SS pin Voltage 2V/Div
CH2: Input Dimming signal 2V/Div
CH3: LEDSW MOSFET Vgs 4V/Div
CH4: LED Output Current 200mA/Div

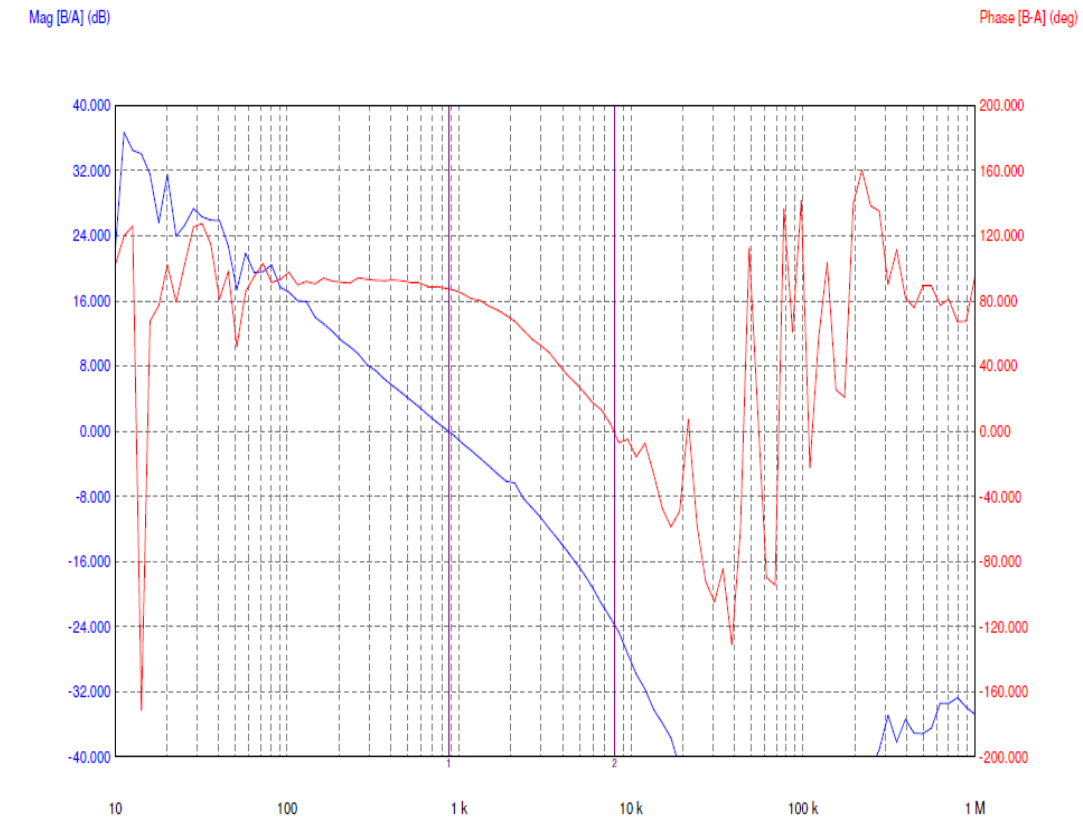
Remark: The start up current would be decreased by increasing the Maximum Frequency.

2.8: Operating waveform

CH1: Primary MOSFET Vds 100V/Div CH2: LED Output Current 200mA/Div
CH4: Primary Current 1A/Div

	
90Vac input	230Vac input

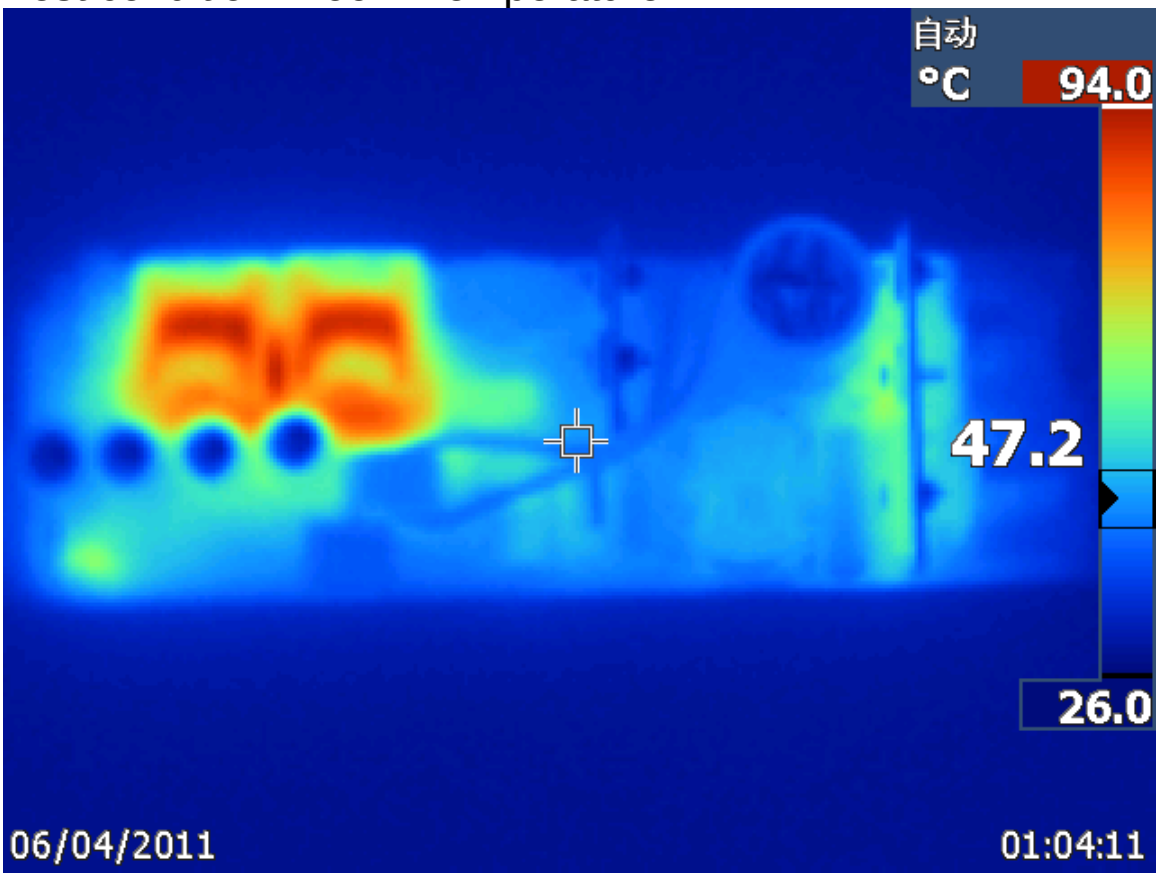
2.9: Bode Plot



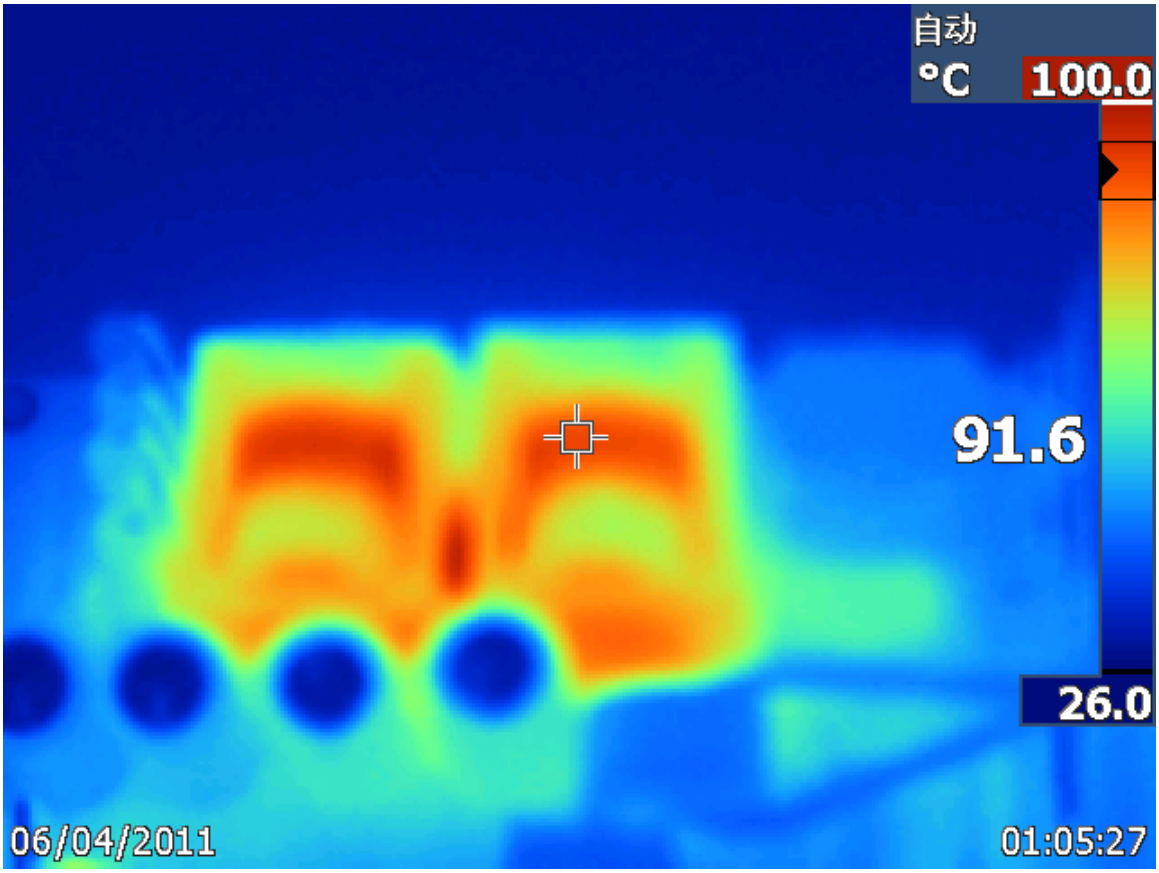
	M1	M2	M2 - M1
Frequency	871.72 Hz	7.99 kHz	7.12 kHz
Magnitude	-0.048 dB	-23.740 dB	-23.693 dB
Phase	87.264 deg	-0.838 deg	-88.102 deg

2.10: Thermal Test

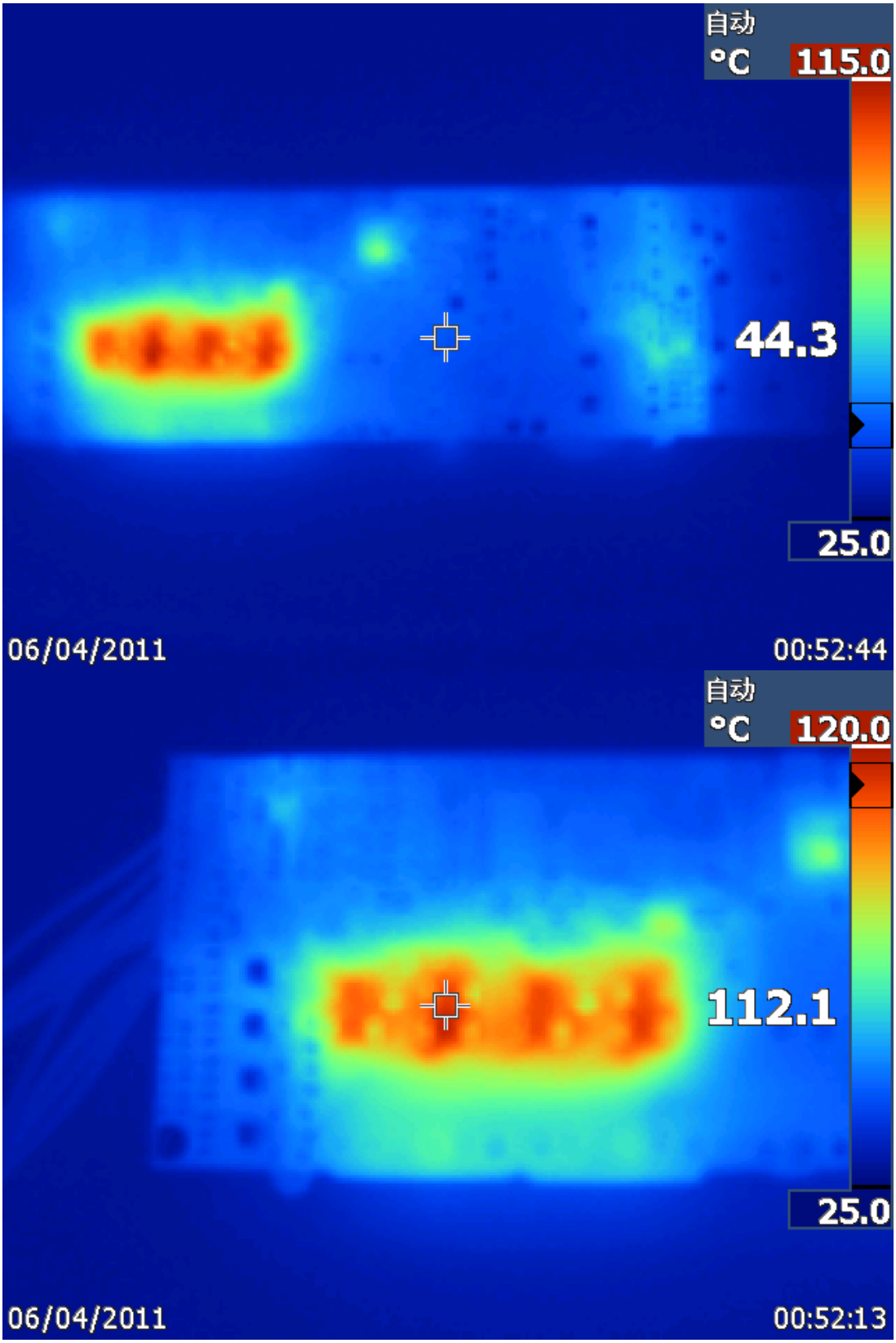
Test condition: Room Temperature



Top Side full view

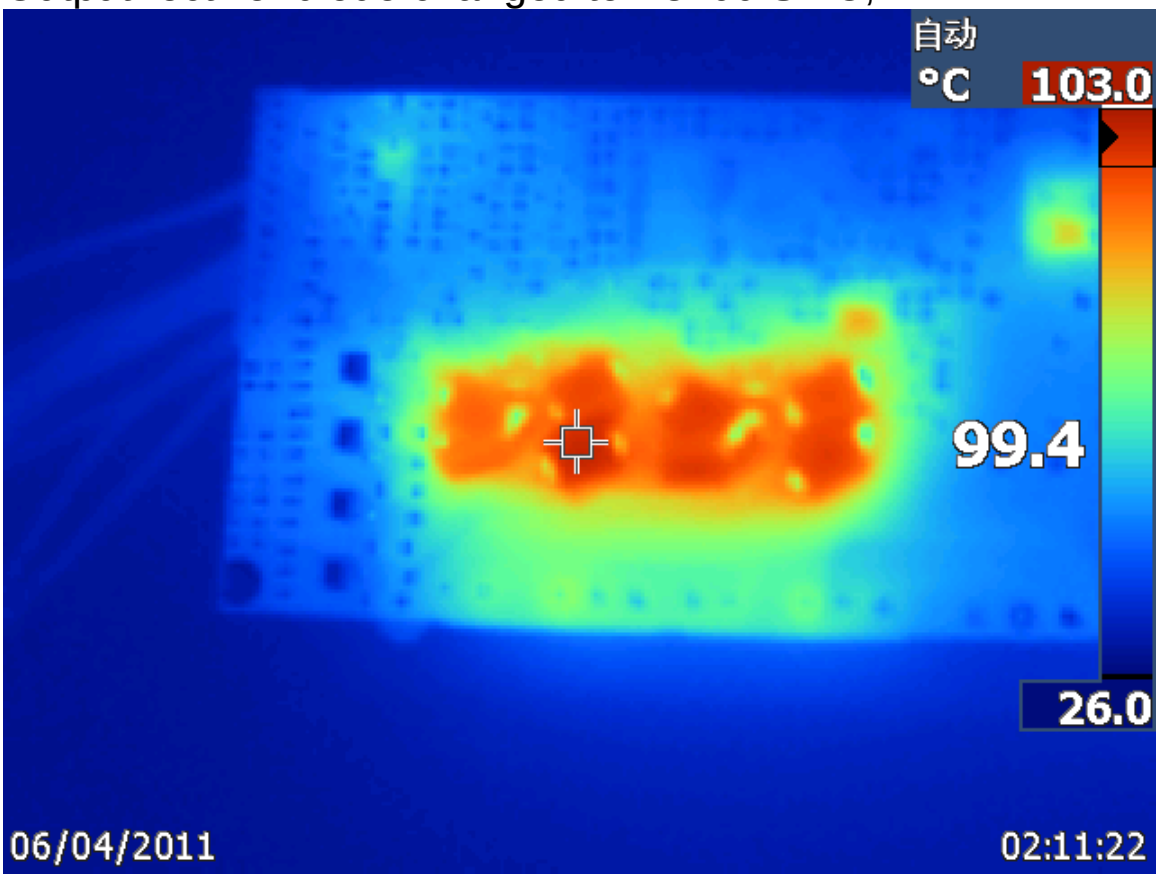


Main Transformer Temperature view



Bottom Output rectifier diode view

Output rectifier diode changed to B3100 SMC,



When the output rectifier diode changed to B3100, there is no difference about the efficiency, however the thermal would become better than before.
Better solution is to change the output rectifier diode from SMA to To-220 with heatsink.

2.11: EMI test

C3 changed to 330nF
C8 changed to 820nF
R3 changed to 10ohm,
L6 changed to 12mH common mode choke \
L5 changed to 100uH common mode choke for higher frequency noise,
C4/C5/C6/C7 changed to 2.2nF
Add one differential mode choke 320uH in the position of R1,at the same time, R1 deleted.

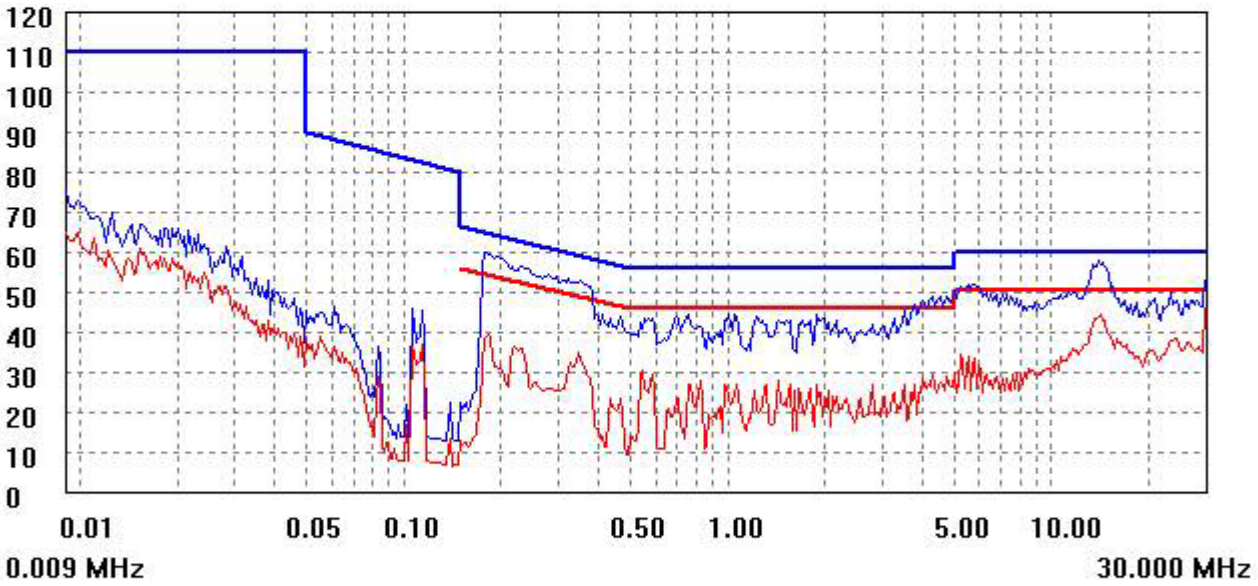
para

Organization:	TI	Operator:	Pony	EUT:	PMP4302A
Place:	SZ	Time:	2011/6/14/18:36		
Detector:	PK+AV	Test-time(ms):	30		
Limit:	EN55015	Transductor(PK/AV):	PK1 / AV1		
Remark:	qp -7db av -6db				

freq

Start(MHz)	End(MHz)	Step(MHz)
0.009	0.150	0.000
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

scan



final

[QP]	freq(MHz)	lev(dBuV)	Lim(dBuV)	Δ(lev-Lim)
	14.475	52.8	60.0	-7.2
[AV]	freq(MHz)	lev(dBuV)	Lim(dBuV)	Δ(lev-Lim)
	14.475	43.4	50.0	-6.6

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