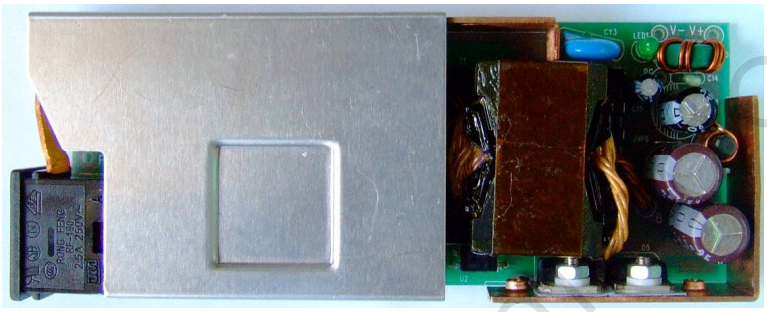
Subject **OB2202 Demo Board Manual**	Board Model: AD19V3.42A2202.00 Doc. No.: OB_DOC_DBM_0200



Key Features

- Standby power less than 0.21W under 240VAC no load
- High efficiency more than 89.20% under normal line with full load
- OCP with line compensation
- Programmable soft start
- Precise OVP
- Low components count
- Meet EN55022 EMI
- Pass 4kV surge test
- Pass 15kV/8kV ESD test

Revision History

Revise Date	Version	Reason/Issue
2007-09-30	00	First issue

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1 Adaptor Module Specification

1.1 Input Characteristics

- AC input voltage rating 100Vac ~ 240Vac
- AC input voltage range 90Vac ~ 264Vac
- AC input frequency range 47Hz ~ 63Hz
- Input current 1.50 Arms max.

1.2 Output Characteristics

- Output Voltage 19.0V
- Output Tolerance ±5%
- Min. load current 0A
- Max. load current 3.42A

1.3 Performance Specifications

- Max. Output Power 65W
- Standby Power <0.5W @ 240V/50Hz, no load
- Efficiency >85% @Ave. 25/50/75/100%Load, normal line, 25℃
- Line Regulation ±2%
- Load Regulation ±5%
- Ripple and Noise <380mVpp
- Hold up Time 10m Sec. Min. @100Vac with full load
- Turn on Delay Time 2 Sec. Max. @100Vac with full load

1.4 Protection Features

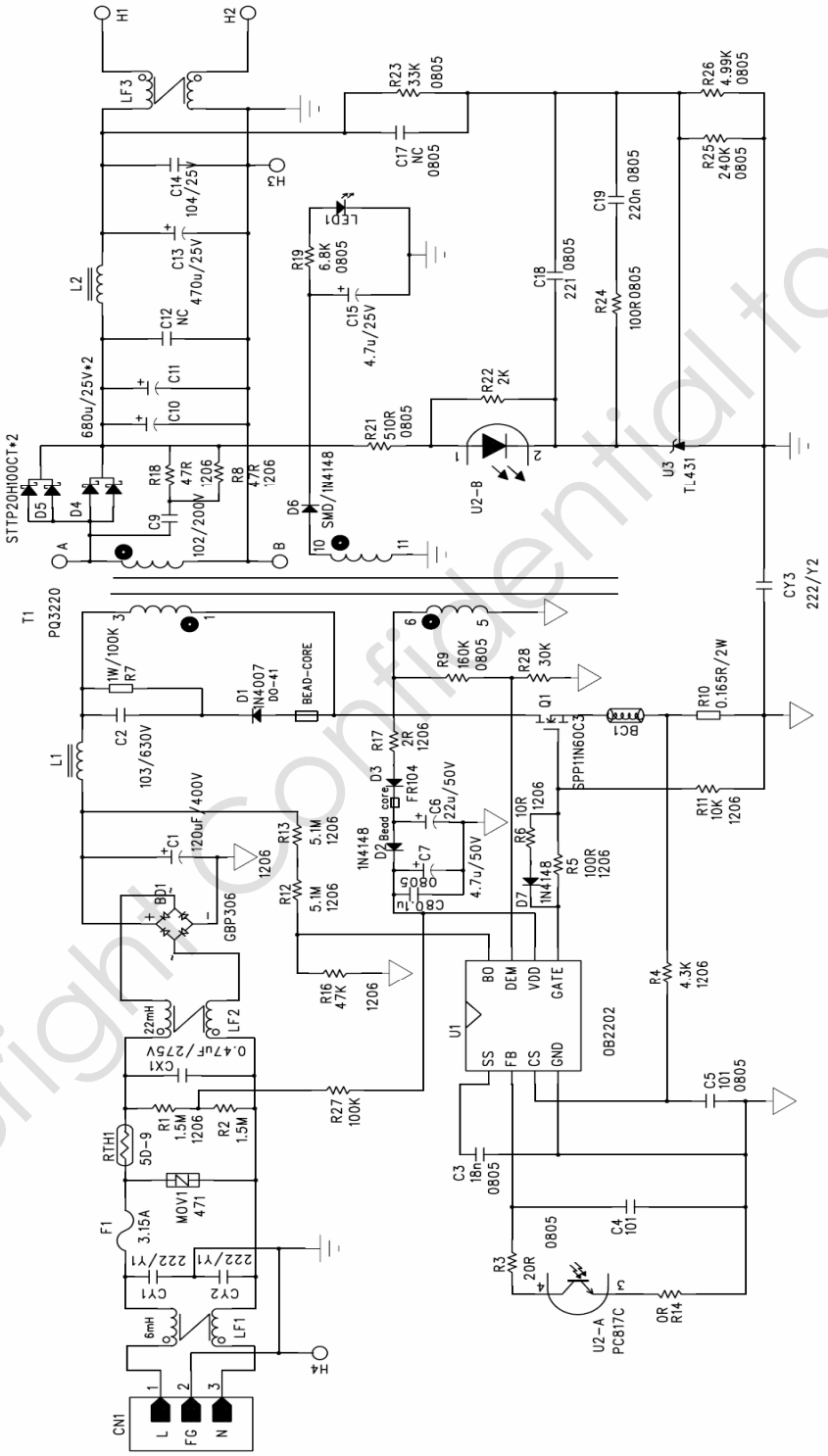
- Short circuit Protection Output shut down with automatic recovery
- Over Voltage Protection Output shut down without automatic recovery

1.5 Environments

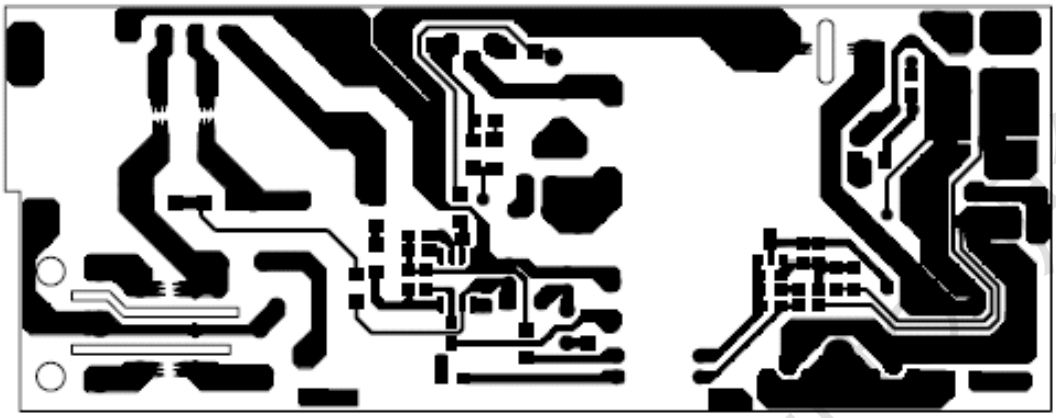
- Operating Temperature 0℃ to +40℃
- Operating Humidity 20% to 90% R.H.
- Storage Temperature -40℃ to +60℃
- Storage Humidity 0% to 95% R.H.

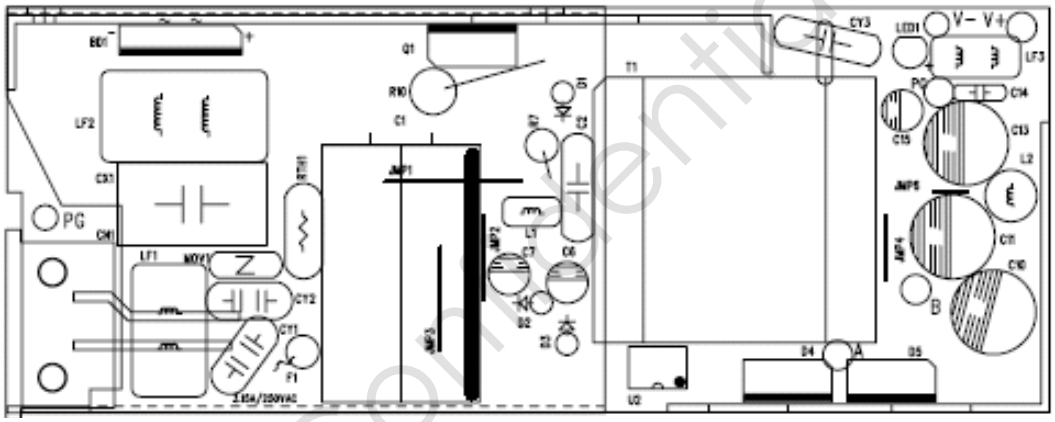
2 Adaptor Module Information

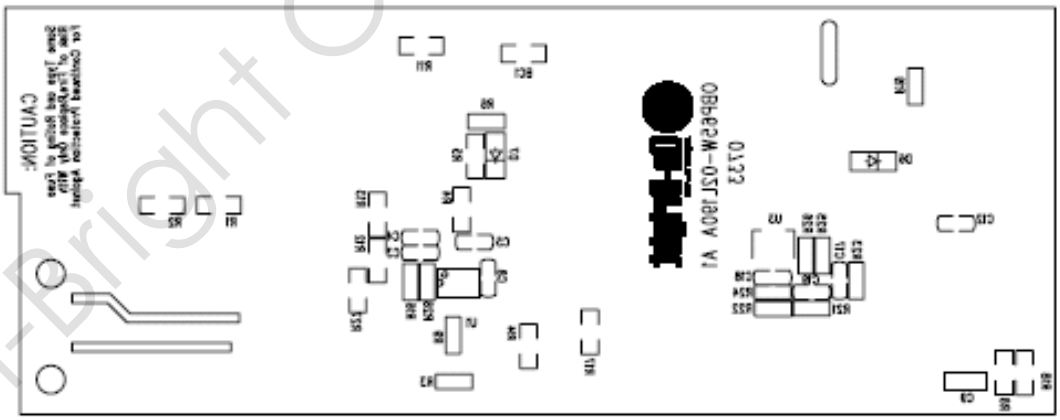
2.1 Schematic



2.2 PCB Gerber File







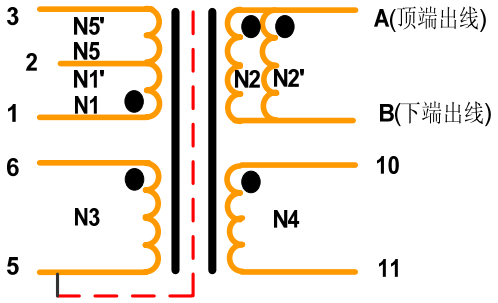
2.3 Bill of material

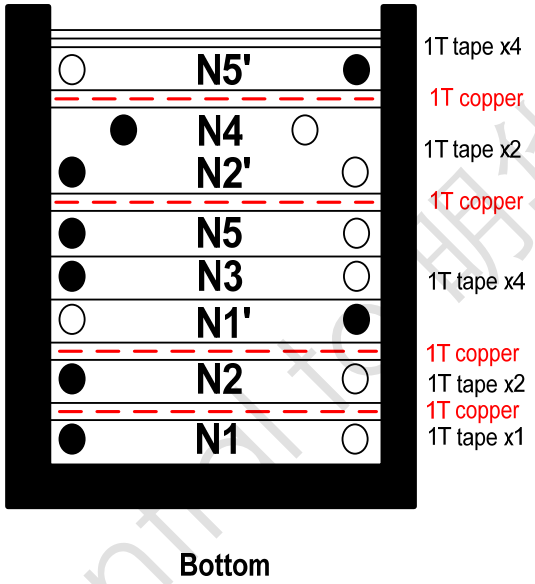
Position	Description	QTY
BD1	Diode, bridge recovery, GBP306, 3A/ 600V	1
C1	Capacitor, aluminum electrolytic, 120uF/400V, -40/105℃,±20%,Φ18*30mm	1
C2	Capacitor, metal poly, 10nF/630V, -40/105℃,±20%	1
C3	Capacitor, ceramic,18nF/25V, X7R, ±10%,SMD0805	1
C4.C5	Capacitor, ceramic,100PF/25V, X7R, ±10%,SMD1206	2
C6	Capacitor, aluminum electrolytic, 22uF/50V, -40/105℃,±20%	1
C7.C15	Capacitor, aluminum electrolytic, 4.7uF/50V, -40/105℃,±20%	2
C8	Capacitor, ceramic,100nF/50V, X7R, ±10%,SMD0805	1
C9	Capacitor, ceramic,1nF/200V, X7R, ±10%,SMD1206	1
C10.C11	Capacitor, aluminum electrolytic, 680uF/25V, -40/105℃,±20%,Φ10*20mm	2
C13	Capacitor, aluminum electrolytic, 470uF/25V, -40/105℃,±20%,Φ10*16mm	1
C14	Capacitor, film,100nF/50V, -40/105℃,±10%,	1
C18	Capacitor, ceramic,220PF/25V, X7R, ±10%,SMD0805	1
C19	Capacitor, ceramic,220nF/25V, X7R, ±10%,SMD0805	1
CON1	Connect,AC SOCKET,2.5A/250Vac,3PIN	1
CX1	Capacitor,X2, 0.47uF/275VAC, -40/105℃,±20%	1
CY1.CY2. CY3	Capacitor,Y2,disk, 2.2nF /250VAC, -40/105℃,±20%	3
D1	Diode ,fast recovery, 1N4007, 1A/1000V,DO-401	1
D2	Diode ,fast recovery, 1N4148, 0.1A /100V,DO-35	1
D3	Diode ,fast recovery, FR104, 1A/600V,DO-401	1
D4.D5	Diode,dual schottky, STPS20H100CT, 2*10A/100V,TO-220	2
D6.D7	Diode ,fast recovery, 1N4148, 0.1A /100V,SMD1206H	2
F1	Fuse, 3.15A/250V, Φ4*10mm	1
L1	Bead Core, 1 uH,±10%, core2.2*5.5*7.5mm,Φ0.80mm*1Ts	1
L2	Inductor,power choke,3.3uH,±10%,core, Φ4*15mm, Φ0.90mm*10.5Ts	1
BC1	Bead Core,0.8uH ,0.05R,±10%,SMD1206	1
CORE	Bead Core,for D8 cathode,3.5*8*0.8mm	1
LED	LED, Φ5mm	1
LF1	Inductor, choke,dual winding,6mH min, core13.8*7.5 *7.5mm, Φ0.50mm*2P*30Ts	1
LF2	Inductor, choke,dual winding,18mH min, core18 *9.5*7.5mm, Φ0.50mm*42Ts*2	1
LF3	Inductor, choke,dual winding, 80uH min, core10.5*5.5*4.5mm, Φ0.80mm*3Ts*2	1
MOV1	Varistor ,disk, 7D471,300Vac rms max,385Vdc rms max, 600Amax,Φ7mm	1
Q1	MOSFET,cool MOS power N-channel, SPP11N60C3, 11A/650V,0.38R,TO-220	1
R1.R2.	Resistor,chip, 1.5M ,1/2W,±5%,SMD1206	2
R3	Resistor,chip, 22R,1/4W,±5%,SMD0805	1
R4	Resistor,chip, 4.3K,1/2W,±5%,SMD1206	1
R5	Resistor,chip, 100R,1/2W,±5%,SMD1206	1
R6	Resistor,chip,10R,1/4W,±5%,SMD0805	1
R7	Resistor,metal film,axial,RN55,100K, 1W, ±5%	1
R8.R18	Resistor, chip, 47R,1/2W,±5%,SMD1206	2

R9	Resistor,chip, 160K,1/4W,±1%,SMD0805	1
R10	Resistor,metal film,axial,RN55,0R16, 2W, ±1%	1
R11	Resistor,chip, 10K ,1/2W,±5%,SMD1206	1
R12.R13	Resistor,chip, 5.1M ,1/2W,±5%,SMD1206	2
R14	Resistor,chip, 0R ,1/2W,±5%,SMD1206	1
R16	Resistor,chip, 47K,1/2W,±5%,SMD1206	1
R17	Resistor,chip, 2R ,1/2W,±5%,SMD1206	1
R19	Resistor,chip, 6.8K,1/4W,±5%,SMD0805	1
R21	Resistor,chip, 510R ,1/4W,±5%,SMD0805	1
R22	Resistor,chip, 2K,1/4W,±5%,SMD0805	1
R23	Resistor,chip, 33K,1/4W,±1%,SMD0805	1
R24	Resistor,chip, 100R,1/4W,±5%,SMD0805	1
R25	Resistor,chip, 240K,1/4W,±1%,SMD0805	1
R26	Resistor,chip, 4.99K,1/4W,±1%,SMD0805	1
R27	Resistor,chip, 100K ,1/2W,±5%,SMD1206	1
R28	Resistor,chip, 30K,1/4W,±1%,SMD0805	1
RTH1	NTC thermistor,disk, 5R-9,5R,8Arms, Φ9mm	short
T1	Transformer, 385uH,10KHz/1V,PQ3218	1
U1	IC,QR controller, OB2202, SO-8	1
U2	IC,Photocoupler ,PC817C, DIP4	1
U3	IC,Precision Adjustable Shunt Regulator ,TL431, SOT-89	1
PCB	OBPD65W,49.2*125.9mm	1

2.4 Transformer Design

2.4.1 Transformer Specification





Bottom

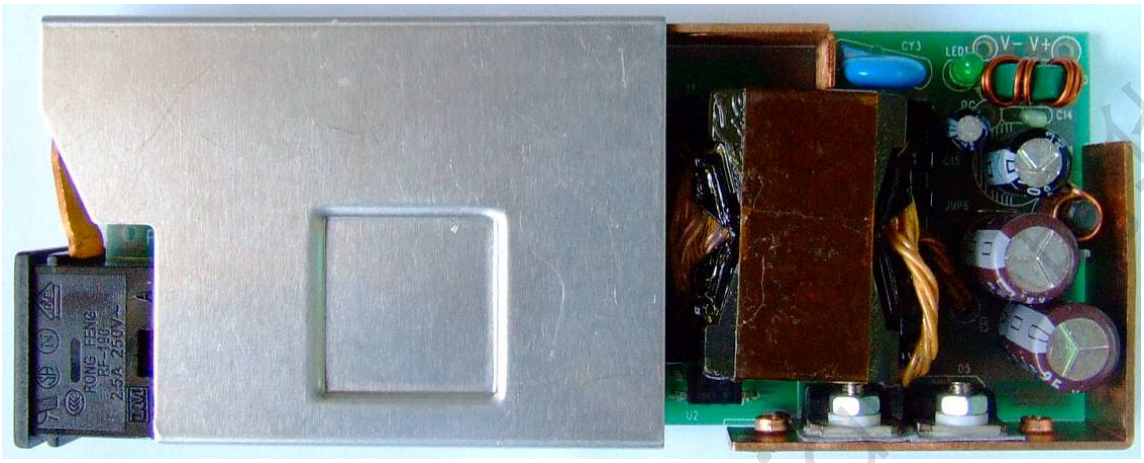
Note:

1. Bobbin: PG3218 (12 Pin) ;其中Pin4.7.8.9. cut off
2. Core 材质: TDK PC 40~44或等同.
3. L1-3=385u H +/- 5%. (at: 10 K Hz, 0.3 V)
4. HI-POT: (60 Hz/5 m A/2 SET)
   Pri to Sec 3750 Vac; Pri to core 1800Vac

2.4.2 Transformer Winding data

c	Winging	Material	Start	Turns	Finish	Remark
1	N1	Φ0.45*2 2UEW	1	**7**	→	不断线
2	TAPE	TAPE W=8.5mm (Y)		1.3		
3	Copper	Copper W=8mm P=0.02mm		1.1	5	
4	TAPE	TAPE W=8.5mm (Y)		1.3		
5	N2	Φ0.60*2 三层绝缘线	A	**5**	B	
6	TAPE	TAPE W=8.5mm (Y)		1.3		
7	Copper	Copper W=8mm P=0.02mm		1.1	5	
8	TAPE	TAPE W=8.5mm (Y)		1.3		
9	N3	Φ0.45*2 2UEW	→	**7**	2	
10	TAPE	TAPE W=8.5mm (Y)		1.3		
11	N1’	Φ0.12*3 2UEW	6	**5**	5	间绕
12	TAPE	TAPE W=8.5mm (Y)		1.3		
13	N5	Φ0.45*2 2UEW	2	**7**	→	不断线
14	TAPE	TAPE W=8.5mm (Y)		1.3		
15	Copper	Copper W=8mm P=0.02mm		1.1	5	
16	TAPE	TAPE W=8.5mm (Y)		1.3		
17	N2’	Φ0.60*2 三层绝缘线	A	**5**	B	
18	N4	Φ0.20*1 三层绝缘线	10	**2**	11	间绕到N2
19	TAPE	TAPE W=8.5mm (Y)		1.3		
20	Copper	Copper W=8mm P=0.02mm		1.1	5	
21	TAPE	TAPE W=8.5mm (Y)		1.3		
22	N5’	Φ0.45*2 2UEW	→	**6**	3	
23	TAPE	TAPE W=8.5mm (Y)		3		

2.5 Adaptor Module Snapshot



3 Performance Evaluation

This session presents the test results of OBPD65W-H190A module up to date. Results on inrush current and safety test are not included and will be added when they become available.
Overall, the module meets design specifications.

Performance Highlights

- The standby power is about 0.21W under 240Vac/50HZ no load.
- The efficiency more than 89.20% under normal line with full load.
- ESD passed 15kV air discharge and 8kV contact discharge test.
- EMI passed EN55022 and FCC15 Class B test with more than 6dB margin.

Characterization Results Summary

Test Item	Test result
1. Input characteristics	
Input current (90V/60Hz, full load)	1.35A Max
Standby power at no load with LED (240Vac)	0.21W
Averaged Efficiency (110Vac, 25%~100% load for PCB end)	89.20%
2 .Output characteristics	
Line regulation	0.3%
Load regulation	0.26%
Ripple & noise	63mV
Over shoot	0.93% Max
Under shoot	0.85% Max
Dynamic test	238mV
3. Time sequence (90Vac, Full load)	
Turn on delay time	1790mS
Hold up time	12mS
Rise time	19.7mS
4. Protections	
Over voltage protection	23.9V
Over current protection (90Vac ~264Vac)	4.16A ~4.64A
Short Circuit protection	OK

Test Equipments

Item	Vender	Module
AC Source:	WEST	WEW1010
Digital Power Meter	YOKOGAWA	WT210
Electrical Load	Prodigit	3315C
Oscilloscope	LeCroy	WS424
Multimeter	VICTORY	VC9807A

3.1 Input Characteristics

3.1. 1 Input current and Standby power

The module was tested at different input voltages (from 90Vac to 264Vac)

Table 1 Input current at full load

Input Voltage	90V/60Hz	110V/60Hz	132V/60Hz	180V/50Hz	220V/50Hz	264V/50Hz
Input Current(A)	1.35	1.14	1.00	0.80	0.69	0.62

Table 2 Standby power at no load with LED

Input Voltage	90V/60Hz	110V/60Hz	132V/60Hz	180V/50Hz	220V/50Hz	264V/50Hz
Pin (W)	0.130	0.138	0.146	0.170	0.194	0.239

3.1. 2 Efficiency

Table 3 Efficiency

Vin	Efficiency (%)				Average Eff (%)
	25% Load	50% Load	75% Load	100% Load	
90V/60Hz	88.52	89.11	88.48	86.92	88.25
110V/60Hz	88.85	89.72	89.56	88.68	89.20
132V/60Hz	88.95	89.86	90.17	89.63	89.65
180V/50Hz	88.37	89.66	90.36	90.32	89.67
220V/50Hz	87.98	89.17	90.06	90.34	89.38
264V/50Hz	87.18	88.60	89.36	90.02	88.79
Average Eff (%)	88.30	89.35	89.66	89.31	

Note: All data was measurement at PCB end.

3.2 Output Characteristics

3.2.1 Line Regulation & Load Regulation

Table 4 Line Regulation & Load Regulation

Input Voltage	Output Voltage (V)			Load Regulation (%)
	No Load	Half Load	Full Load	
90V/47Hz	19.18	19.17	19.17	0.05
110V/60Hz	19.18	19.17	19.17	0.05
132V/63Hz	19.18	19.17	19.17	0.05
180V/47Hz	19.18	19.16	19.16	0.1
240V/50Hz	19.18	19.14	19.14	0.2
264V/63Hz	19.18	19.12	19.12	0.3
Line Regulation (%)	0	0.26	0.26	

Note: All data was measured at PCB end.

3.2.2 Ripple & Noise

Table 5 Ripple & Noise measure results

Input Voltage	R&N (mV)		Waveform
	No Load	Full Load	
90Vac/60HZ	50mV	61mV	Fig.1
132Vac/60HZ	56mV	31mV	Fig.2
180Vac/50HZ	59mV	20mV	Fig.3
264Vac/50HZ	63mV	30mV	Fig.4

Note: Ripple & noise were measured at DC cord end with a 0.1uF/100V ceramic cap connected in parallel with a 10uF/50V Electrolytic cap. Bandwidth was limited to 20MHZ.

R&N Waveform

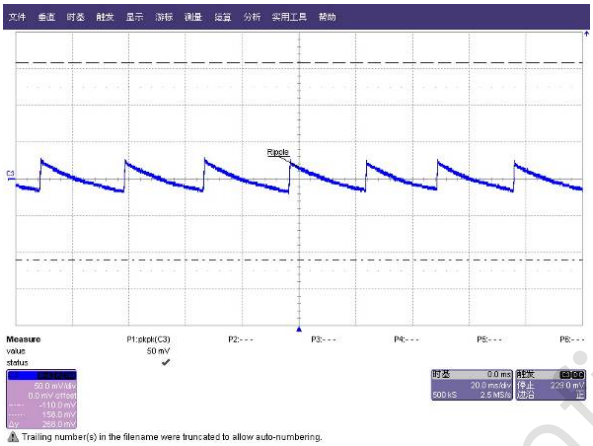


Fig. 1 R&N waveform@90Vac; no load

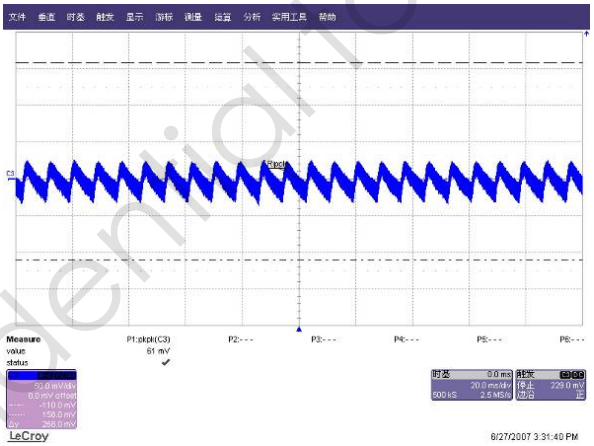


Fig. 2 R&N waveform@90Vac; full load

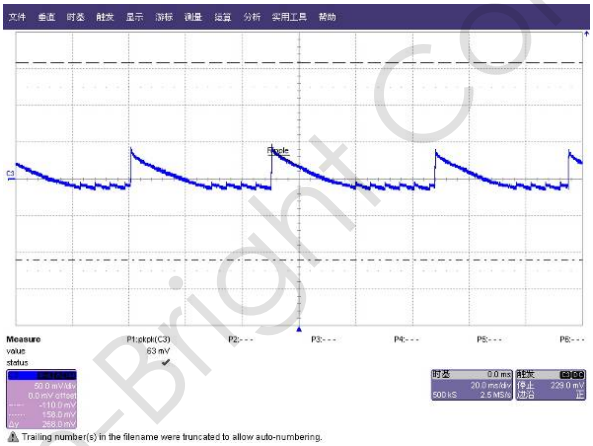


Fig. 3 R&N waveform@264Vac; no load

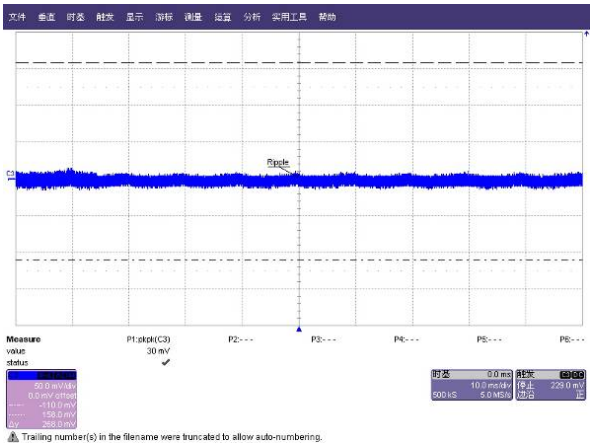


Fig. 4 R&N waveform@264Vac; full load

3.2.3 Overshoot & Undershoot

Ac input switches ON for overshoot and OFF for undershoot

Table 6 Overshoot/undershoot measurement results

Input Voltage	Load	Item	Meas. Data (%)	Waveform
90V/60Hz	Full load	overshoot	0.93	Fig.5
		undershoot		
	No load	overshoot	0.74	Fig.6
		undershoot		
264V/50Hz	Full load	overshoot	0.83	Fig.7
		undershoot	0.85	Fig.9
	No load	overshoot	0.87	Fig.8
		undershoot		

Overshoot and undershoot waveform

Fig. 5 Overshoot waveform@90Vac; full load

Fig. 6 Overshoot waveform @90Vac; no load

Fig. 7 Overshoot waveform @264Vac; full load

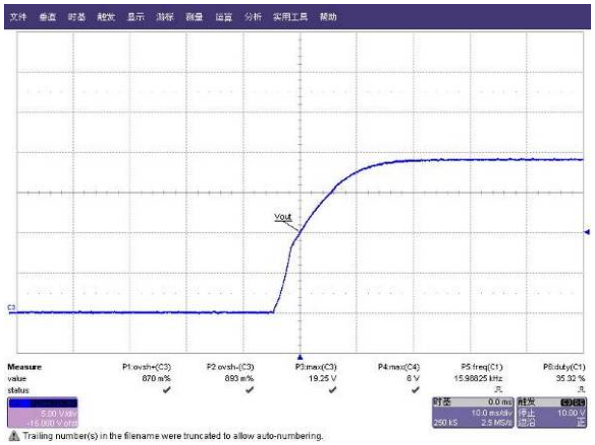


Fig. 8 Overshoot waveform @264Vac; no load

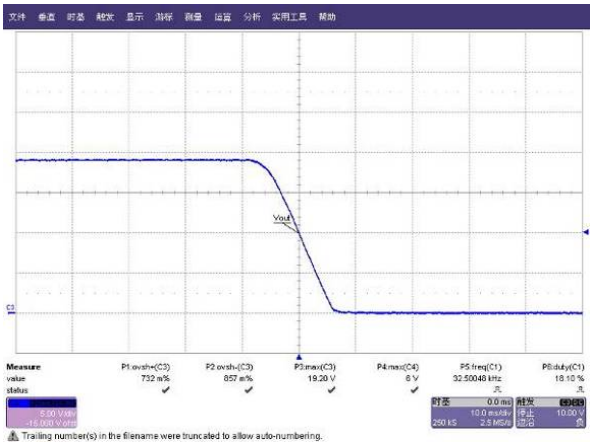


Fig. 9 Undershoot waveform @264Vac; full load

3.2.4 Dynamic Test

A dynamic loading with low set at 0.68 A lasting for 10mS and high set at 2.73A lasting for 20mS is added to output. The ramp is set at 0.25A/uS at transient.
All data was measurement at PCB end.

Table 7 Output voltage under dynamic test

Input voltage	Output voltage (mV)	Waveform
90V/60HZ	122	Fig.10
132V/60HZ	117	Fig.11
180V/50HZ	115	Fig.12
264V/50HZ	97	Fig.13

Dynamic waveform

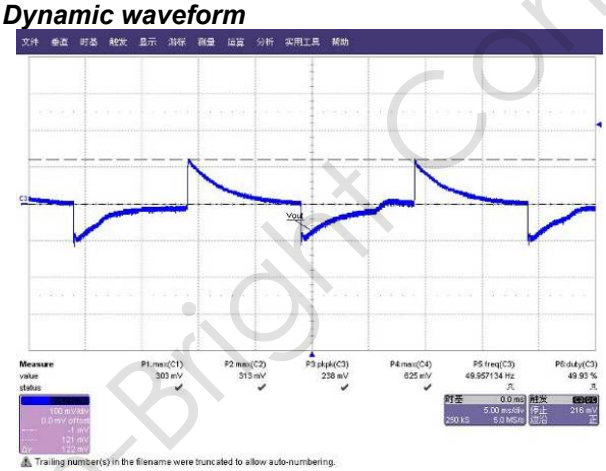


Fig. 10 Dynamic waveform @90Vac input

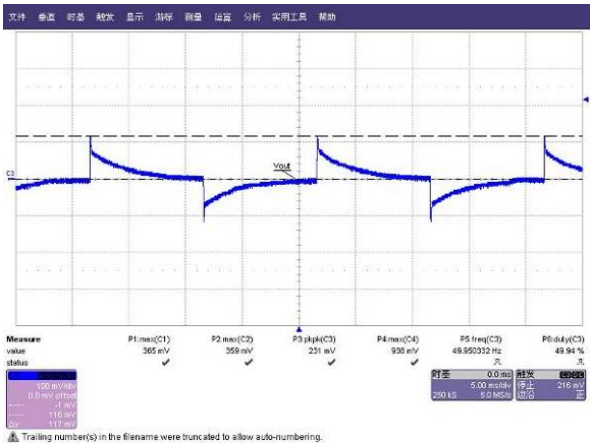


Fig. 11 Dynamic waveform @132Vac input

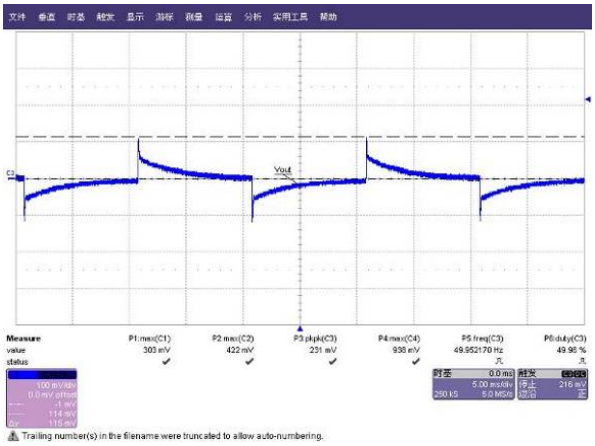


Fig. 12 Dynamic waveform @180Vac input

Fig. 13 Dynamic waveform @264Vac input

3.2.5 Time Sequence

Load condition: Full load

Table 8 Turn-on delay /hold-up/Rise time measurement results

Item	Input voltage	Meas. Data (mS)	Remark
Turn-on delay time	90V/60Hz	1793	Fig.14
	264V/50Hz	492	Fig.15
Hold-up time	90V/60Hz	12	Fig.16
	264V/50Hz	112	Fig.17
Rise Time	90V/60Hz	19.7	Fig.18
	264V/50Hz	18.5	Fig.19

Time sequence waveform

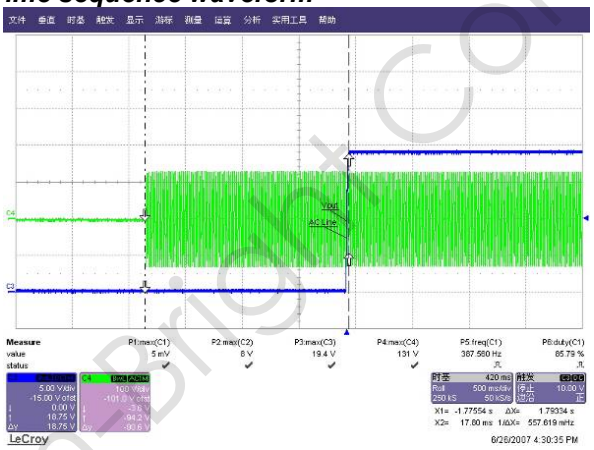


Fig. 14 Turn on waveform @90Vac; full load

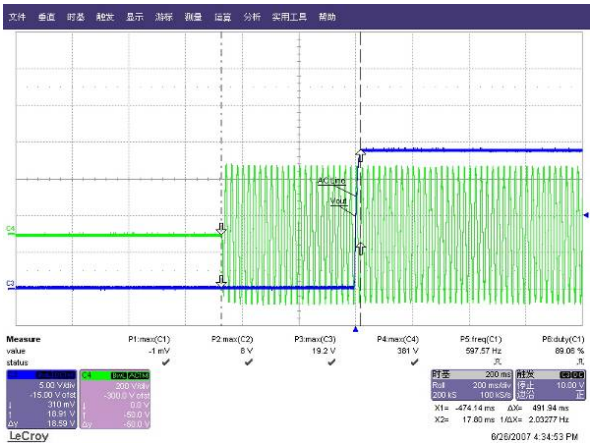


Fig. 15 Turn on waveform @264Vac; full load

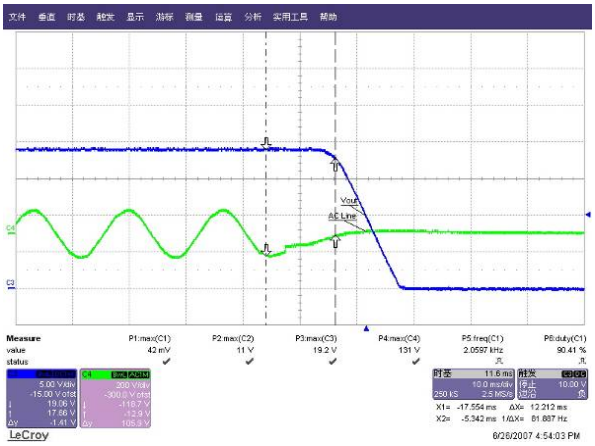


Fig. 16 Hold up waveform @90Vac; full load

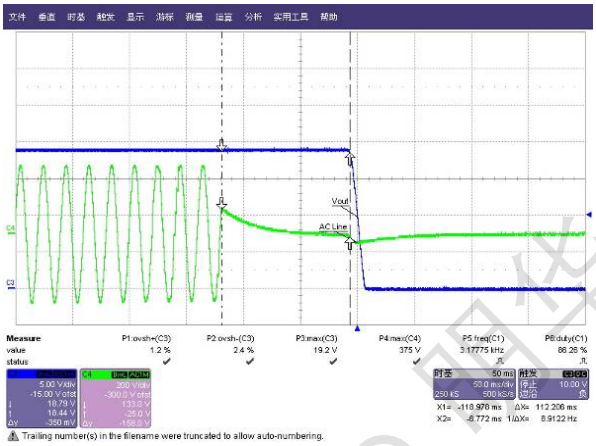


Fig. 17 Hold up waveform @264Vac; full load

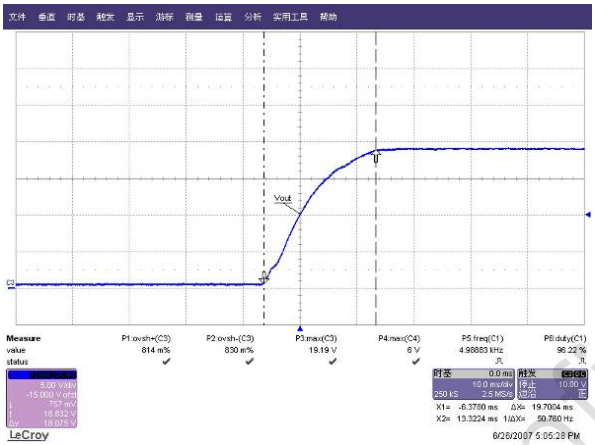


Fig. 18 Rise waveform @90Vac; full load

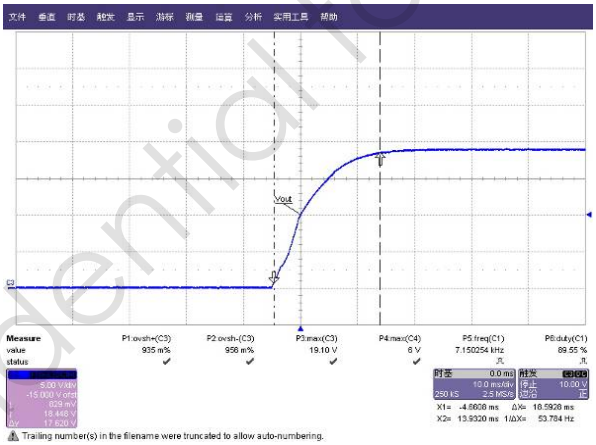


Fig. 19 Rise waveform @264Vac; full load

3.3 Protections

3.3.1 Over Current Protection (OCP)

The power supply will shut down when output current exceeds 4.1A~4.8A, and it should recover when the over current condition is removed.

Table 9 OCP value vs. input voltage

Input Voltage	90V/60Hz	120V/60Hz	132V/60Hz	180V/50Hz	240V/50Hz	264V/50Hz
OCP (A)	4.16A	4.35A	4.30A	4.43A	4.59A	4.64A

3.3.2 Over Voltage Protection (OVP)

The power supply will shut down and latch when feedback circuit is disabled, and the output voltage can not be over 26.6V. The unit should recover when the protection condition is removed and restart input.

Table 10 Load OVP test result

Input Voltage	OVP Trigger Voltage (V)	
	No Load	Full Load
90V/60Hz	23.6	23.7
132V/60Hz	23.6	22.8
180V/50Hz	23.4	23.0
264V/50Hz	23.9	23.6

3.3.3 Brownout/ Brownout recovery test

Brownout / Brownout recovery test is OK.

Table 11 Brownout test result

AC input	Power off	Power on
0%~100% load	67Vac	72Vac

3.3.4 Line Over Volgate Protection

Line Over Volgate Protection test is OK

Table 12 Line OVP test result

AC input	OVP
0%~100% load	294Vac

3.3.5 Short Circuit Protection

Short circuit placed on output will shut down the power supply and the unit should automatic recover after the short circuit condition is removed.

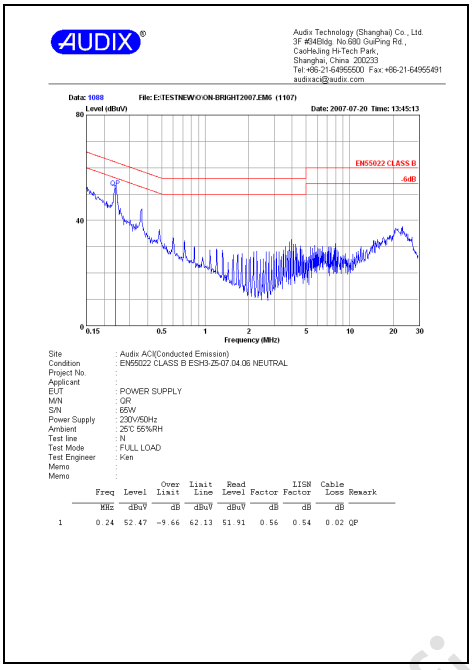
Table 13 SCP test result

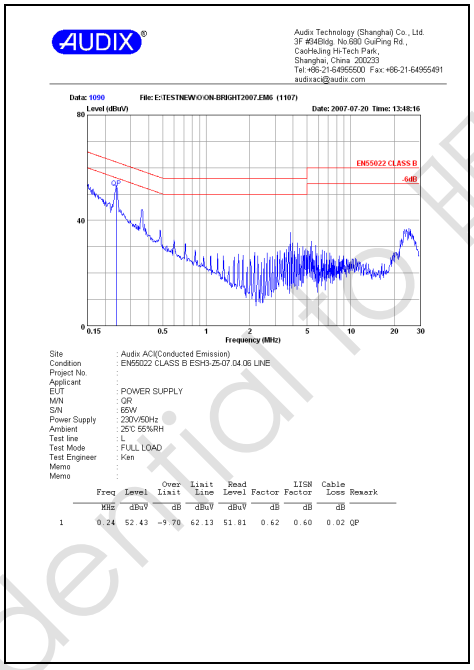
Input voltage	90V/60Hz	264V/50Hz
Test Result	OK	OK
Input Power (W)		

3.4 EMI Test

3.4.1 Conducted EMI Test

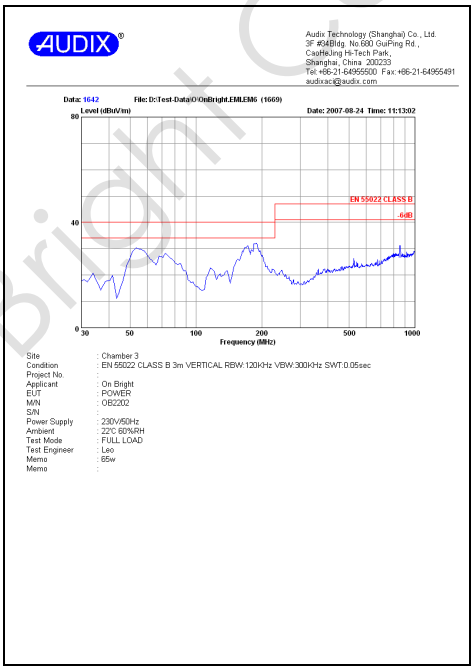
EN55022 CLASS B @ full load report

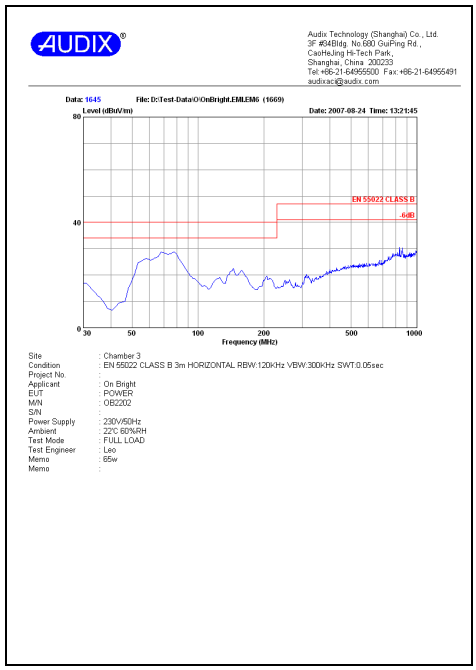




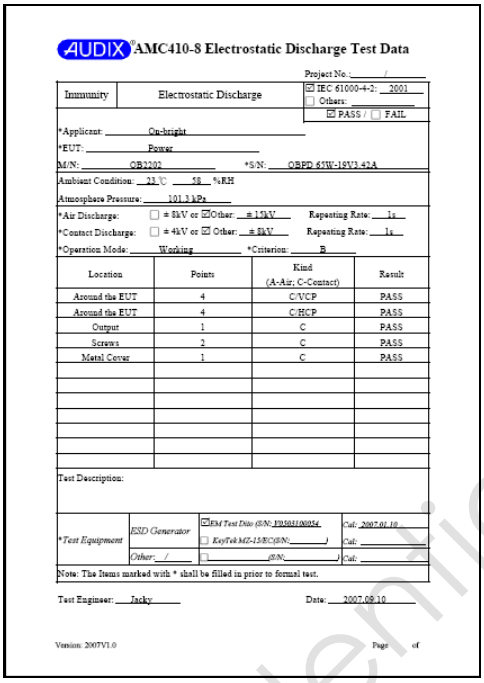
3.4.2 Radiation EMI Test

EN55022 CLASS B @ full load report





3.4 ESD Test



AUDIX AMC410-8 Electrostatic Discharge Test Data

Project No.: /

Immunity	Electrostatic Discharge	☑ IEC 61000-4-2: 2001 ☐ Others: ☑ PASS / ☐ FAIL

*Applicant: On-bright
*EUT: Power
M/N: OB2202 *S/N: OBPD 65W-19V3.42A
Ambient Condition: 23 ℃ 58 %RH
Atmosphere Pressure: 101.3 kPa
*Air Discharge: ☐ ± 8kV or ☑Other: ± 15kV Repeating Rate: 1s
*Contact Discharge: ☐ ± 4kV or ☑ Other: ± 8kV Repeating Rate: 1s
*Operation Mode: Working *Criterion: B

Location	Points	Kind (A-Air; C-Contact)	Result
Around the EUT	4	C/VCP	PASS
Around the EUT	4	C/HCP	PASS
Output	1	C	PASS
Screws	2	C	PASS
Metal Cover	1	C	PASS

Test Description:

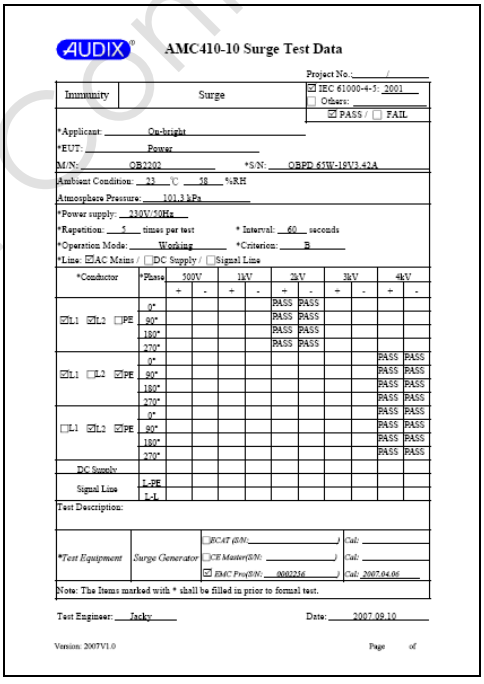
*Test Equipment	ESD Generator	☑EM Test Dito (S/N: 1V0503100054	Cal: 2007.01.10
		☐ KeyTek MZ-15/C(S/N:_____)	Cal:
	Other: /	☐ (S/N:_____)	Cal:

Note: The Items marked with * shall be filled in prior to formal test.

Test Engineer: Jacky Date: 2007.09.10

Version: 2007V1.0 Page of

3.5 Lighting Test



AUDIX AMC410-10 Surge Test Data

Project No.: /

Immunity	Surge	☑ IEC 61000-4-5: 2001 ☐ Others: ☑ PASS / ☐ FAIL

*Applicant: On-bright
*EUT: Power
M/N: OB2202 *S/N: OBPD 65W-19V3.42A
Ambient Condition: 23 ℃ 58 %RH
Atmosphere Pressure: 101.3 kPa
*Power supply: 230V/50Hz
*Repetition: 5 times per test * Interval: 60 seconds
*Operation Mode: Working *Criterion: B
*Line: ☑AC Mains / ☐DC Supply / ☐Signal Line

*Conductor	*Phase	500V		1kV		2kV		3kV		4kV	
		+	-	+	-	+	-	+	-	+	-
☑L1 ☑L2 ☐PE	0°					PASS	PASS				
	90°					PASS	PASS				
	180°					PASS	PASS				
	270°					PASS	PASS				
☑L1 ☐L2 ☑PE	0°									PASS	PASS
	90°									PASS	PASS
	180°									PASS	PASS
	270°									PASS	PASS
☐L1 ☑L2 ☑PE	0°									PASS	PASS
	90°									PASS	PASS
	180°									PASS	PASS
	270°									PASS	PASS
DC Supply											
Signal Line	L-PE										
	L-L										

Test Description:

*Test Equipment	Surge Generator	☐ (SCAT (S/N:_____)	Cal:
		☐CE Master(S/N: _____)	Cal:
		☑ EMC Pro(S/N: 0002256)	Cal: 2007.04.06

Note: The Items marked with * shall be filled in prior to formal test.

Test Engineer: Jacky Date: 2007.09.10

Version: 2007V1.0 Page of

4 Other important waveform

4.1 Vdd, FB, Sense& Gate waveform at no load/25% load/50% load/full load.

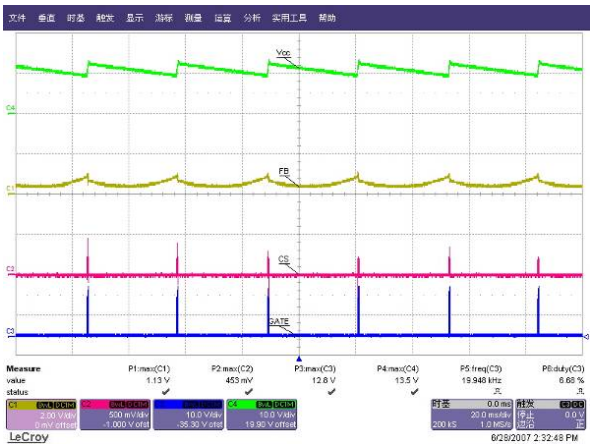


Fig. 20 Vdd,FB,Sense&Gate wave form@90Vac; no load

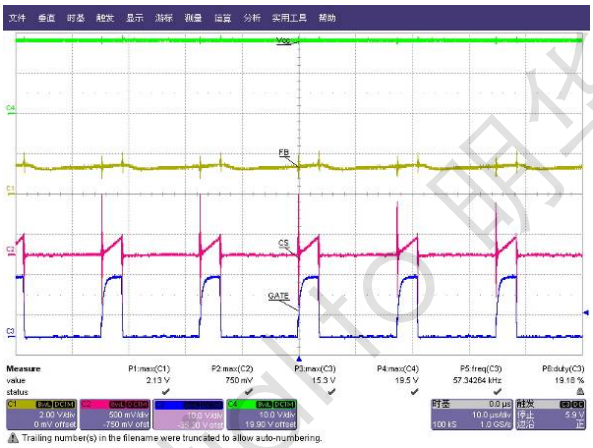


Fig. 21 Vdd,FB,Sense&Gate wave form@90Vac; 25% load

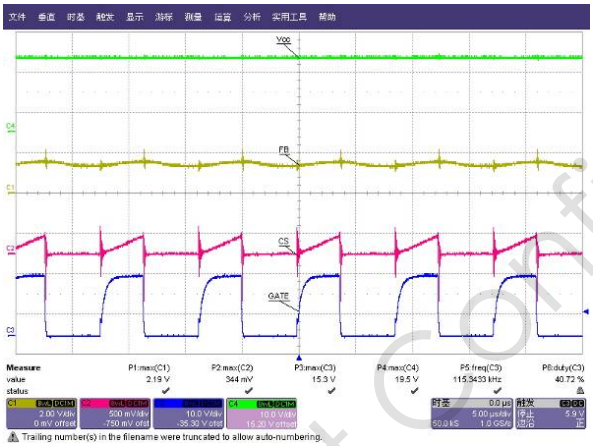


Fig. 22 Vdd,FB,Sense&Gate wave form@90Vac; 50% load

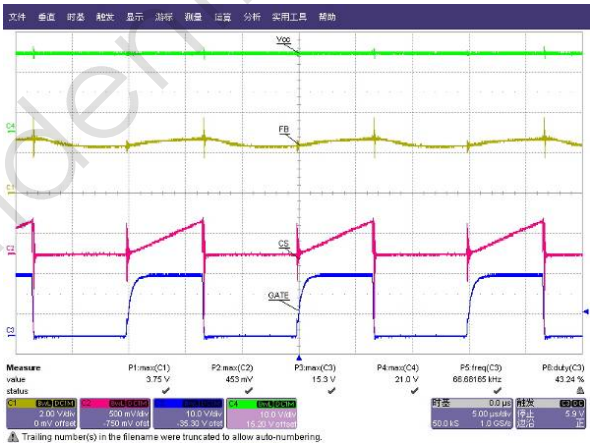


Fig. 23 Vdd,FB,Sense&Gate wave form@90Vac; full load

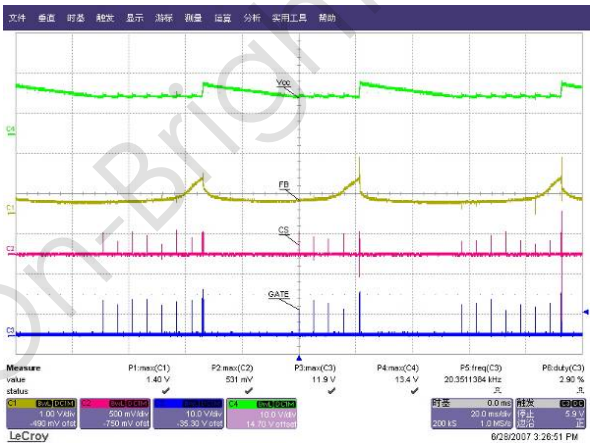


Fig. 24 Vdd,FB,Sense&Gate wave form@264Vac; no load

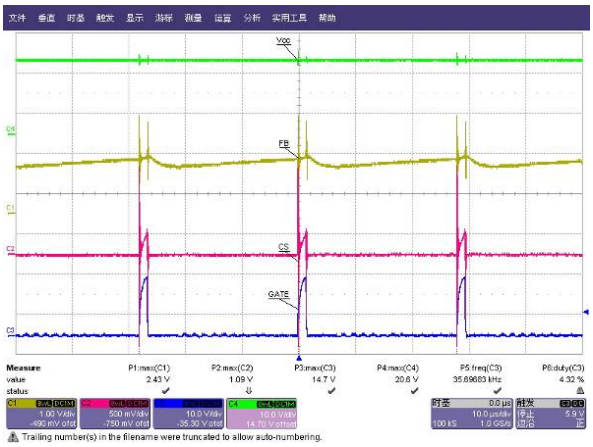


Fig. 25 Vdd,FB,Sense&Gate wave form@264Vac; 25% load

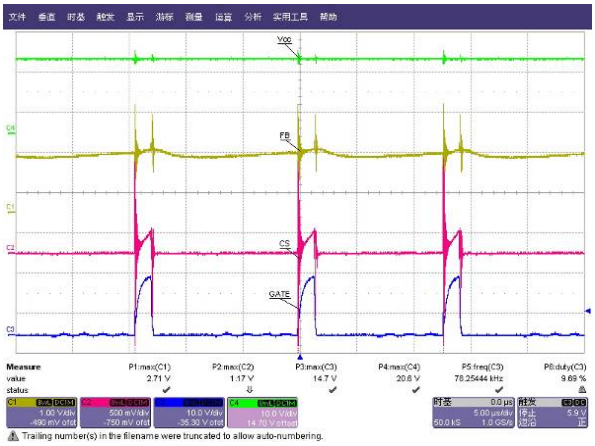


Fig. 26 Vdd,FB,Sense&Gate wave form@264Vac; 50% load

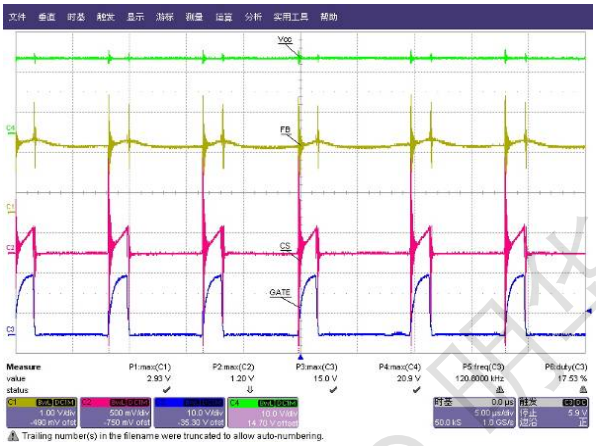


Fig. 27 Vdd,FB,Sense&Gate wave form@264Vac; full load

4.2 MOSFET VDS , CS ,Output diode VAK waveform at full load, start/normal/output short

4.2.1 VDS and VAK at full load, start/normal/output short

Input Voltage	start		normal		Output short	
	VDS	VAK	VDS	VAK	VDS	VAK
90V/60Hz	340V	43V	334V	40V	344V	43V
264V/50Hz	558V	96V	544V	96V	556V	96V

4.2.2 VDS ,CS & VAK at full load, start waveform

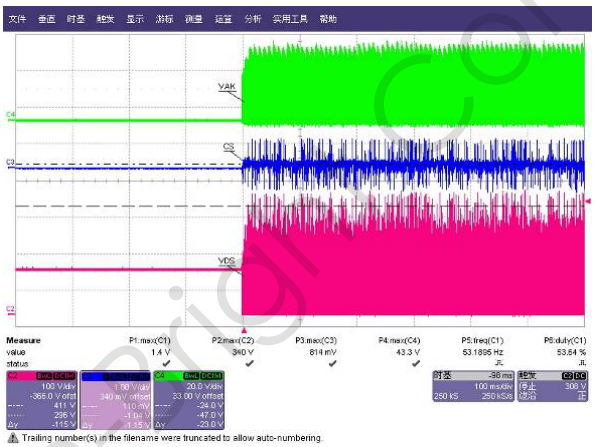


Fig. 28 VDS ,CS & VAK start waveform@90Vac; full load

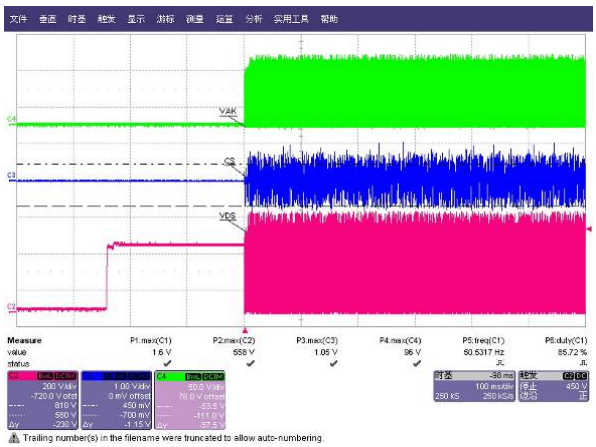


Fig. 29 VDS ,CS & VAK start waveform@264Vac; full load

4.2.3 VDS ,CS & VAK at full load, normal waveform

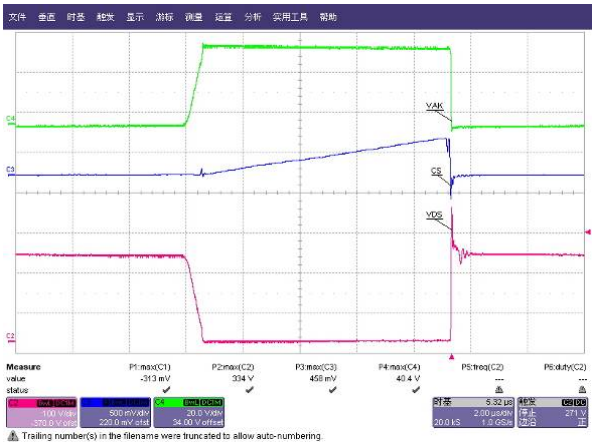


Fig. 30 VDS ,CS & VAK normal waveform@90Vac; full load

Fig. 31 VDS ,CS & VAK normal waveform@90Vac; 50% load

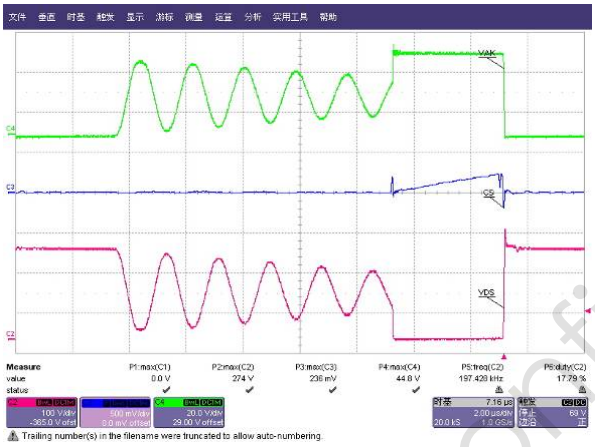


Fig. 32 VDS ,CS & VAK normal waveform@90Vac; 25% load

Fig. 33 VDS ,CS & VAK normal waveform@264Vac; full load

Fig. 34 VDS ,CS & VAK normal waveform@264Vac; 50% load

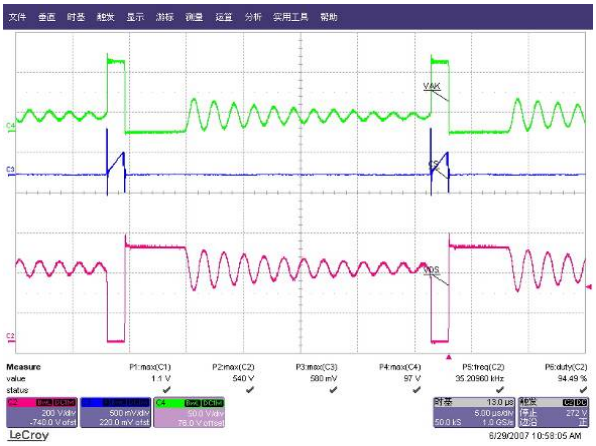


Fig. 35 VDS ,CS & VAK normal waveform@264Vac; 25% load

4.2.4 VDS ,CS & VAK at full load, output short waveform

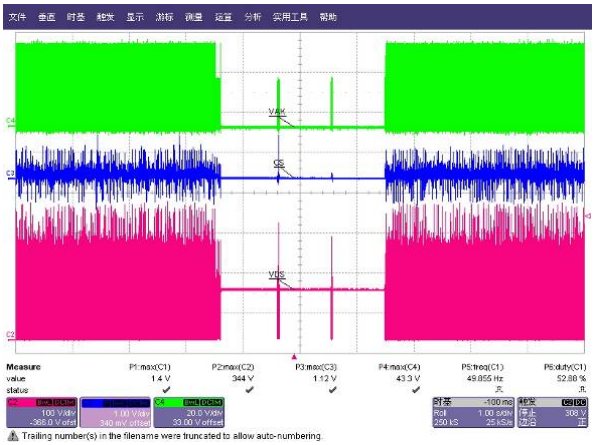


Fig. 36 VDS ,CS & VAK output short waveform@90Vac; full load

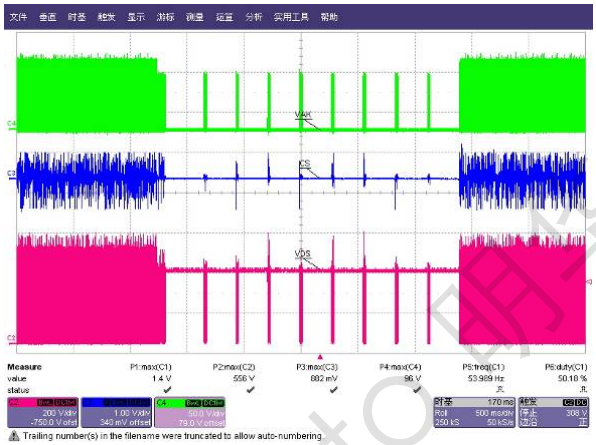


Fig. 37 VDS ,CS & VAK output short waveform@264Vac; full load

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