

Subject
OB2225N Demo Board Manual

Board Model: AD12V0.35A2225N.00
Doc. No.: OB_DOC_DBM_2225NA0



Key features:

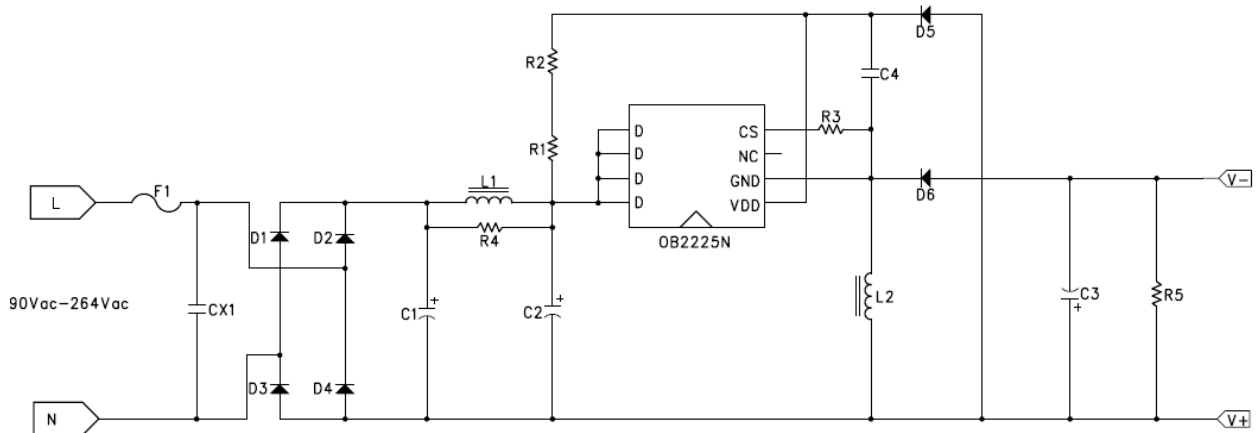
- Lowest possible component count
- Standby power <100mW @264Vac
- Efficiency measured >75% at full load
- Good dynamic response
- Comprehensive protection including output short protection, OTP, OCP etc.

Revision History

Revise Date	Version	Reason/Issue
2014-6-20	00	First issue
2015-12-17	A0	Updated schematic

1. Board Information

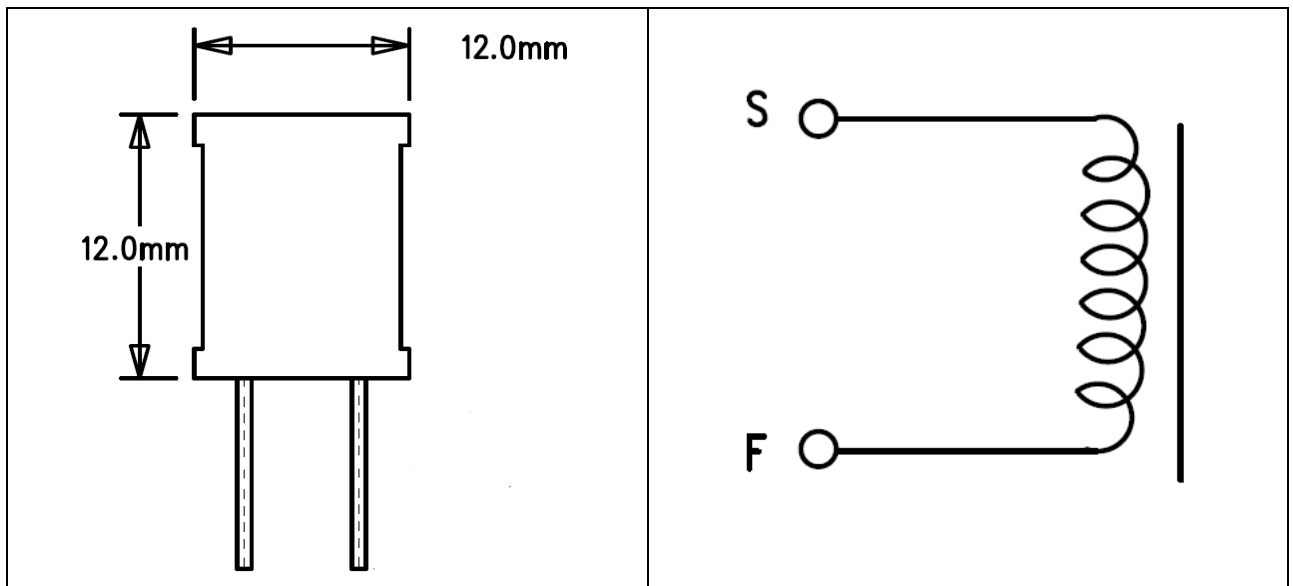
1.1. Board schematic



1.2. Component list

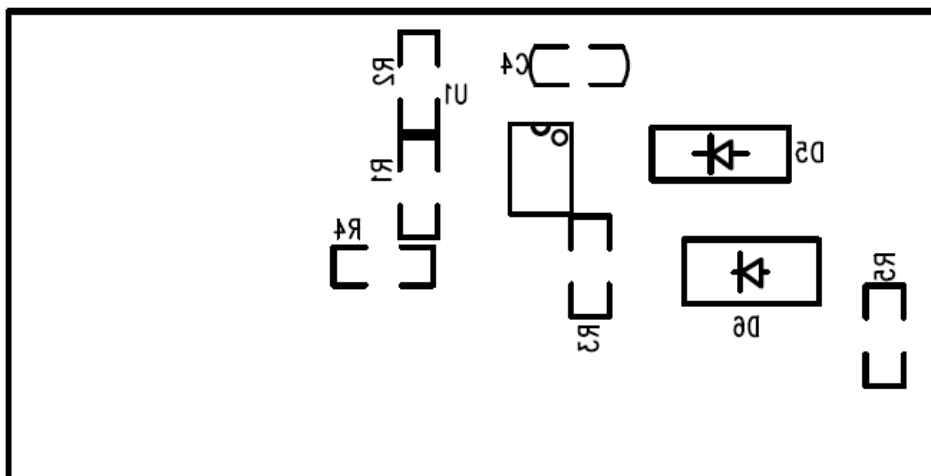
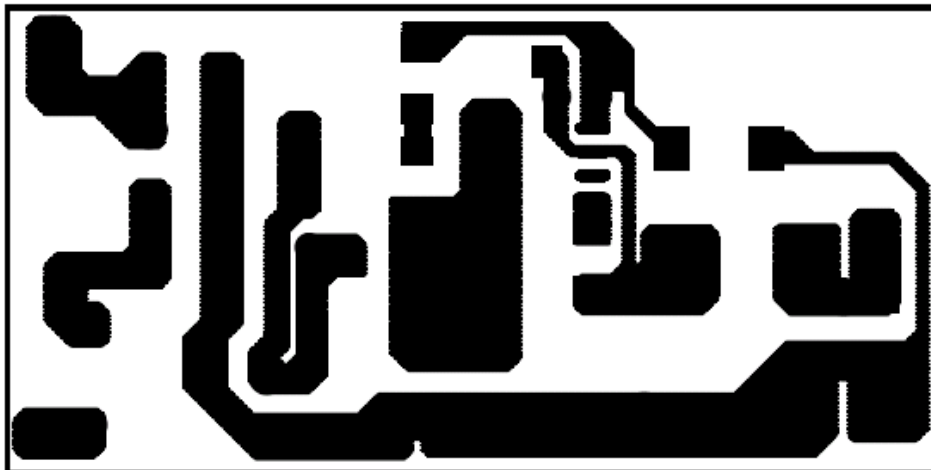
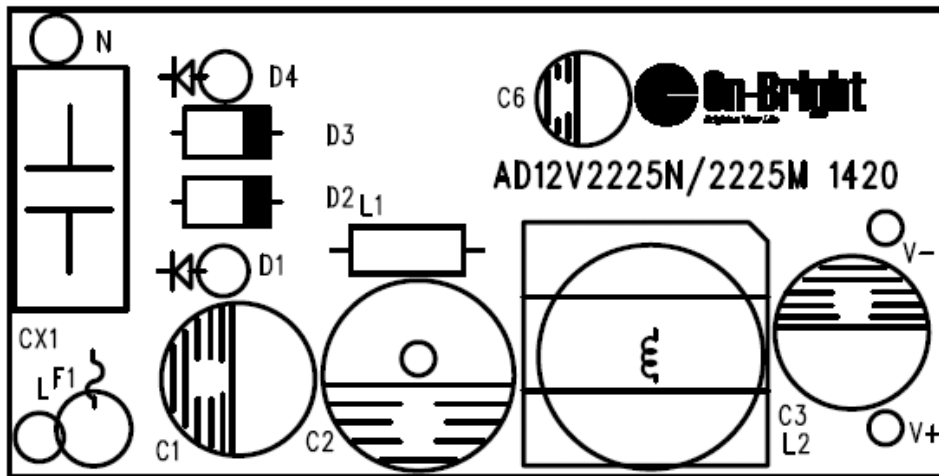
No.	Position	Description	Quantity
1	F1	Resistor fuse 10R/1W	1
2	D1,D2,D3,D4	Diode 1N4007	4
3	D5	Diode M7	1
4	D6	Fast diode ES2J	1
5	CX1	X-cap 104P /X2	1
6	C1, C2	E.C. 4.7uF /400V	2
7	C3	E.C. 470uF /16V	1
7	C4	SMD cap 4.7uF /25V	1
9	R1,R2	SMD RES 2M /5% /1206	2
10	R3	SMD RES 0R62 /1% /1206	1
11	R4	SMD RES 10K /5% /1206	1
12	R5	SMD RES 20K /5% /1206	1
13	U1	OB2225N SOP8	1
14	L1	Inductor 2.2mH /0510	1
15	L2	Inductor 500uH /Φ12*12	1
	Total		20

1.3. Inductor design

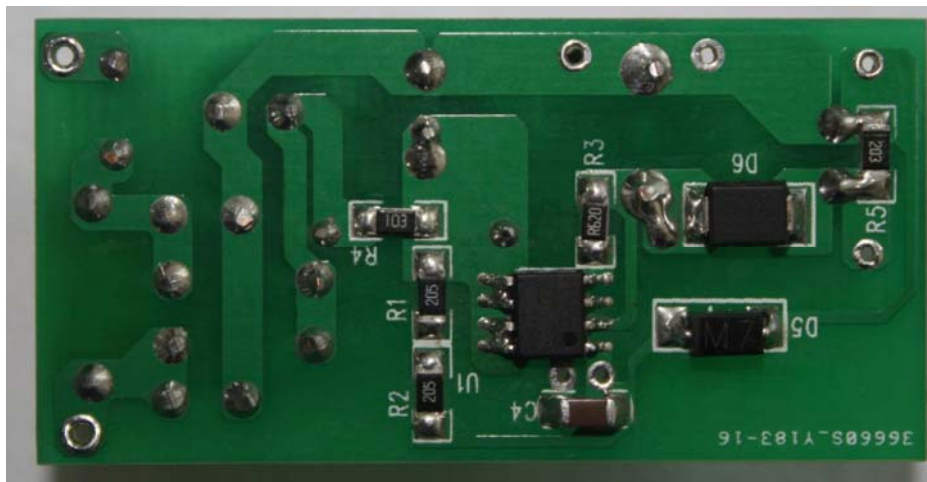


Material	Turns	Inductance & Tolerance
Φ0.35 *1 2UEW	100	500uH ± 10%

1.4. PCB Gerber File



1.5. Snapshot



2. Converter Specification

2.1. Input Characteristics

- AC input voltage range 90Vac ~ 264Vac
- AC input frequency range 47Hz ~ 63Hz

2.2. Output Characteristics

- Output voltage V_{OUT} 12.0V
- Output current I_{OUT} 350mA
- Operating frequency 40KHz
- Output power 4.2W

2.3. Performance Function

- Standby Power < 100mW @ 264Vac/50Hz, no load, 25°C
- Efficiency >75%
- Ripple & Noise <100mV

2.4. Protection Function

- Short Circuit Protection Output shut down with auto-restart
- Over Temperature Protection Output shut down with auto-restart
- Over Current Protection Output shut down with auto-restart

3. Performance Evaluation

3.1. Standby Power

Input voltage	P_{IN} (mW)	Spec	Remark
90Vac/60Hz	24	<100mW	Pass
115Vac/60Hz	27		Pass
230Vac/50Hz	53		Pass
264Vac/50Hz	67		Pass

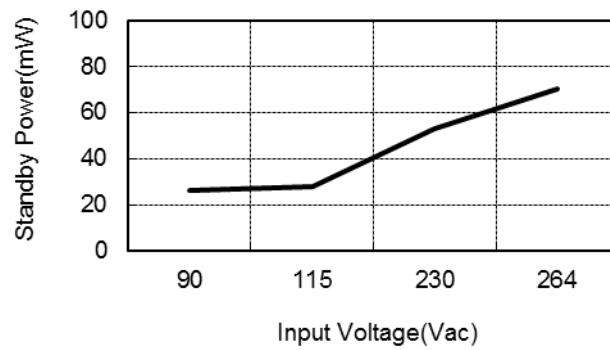


Figure 1. Standby input power

3.2. Efficiency

Input voltage	load 20mA	load 100mA	load 200mA	load 350mA	Spec	Remark
90Vac/60Hz	72.93	78.65	77.13	75.76	>75%	Pass
115Vac/60Hz	72.32	79.10	78.95	76.30		Pass
230Vac/50Hz	66.46	77.40	78.98	78.84		Pass
264Vac/50Hz	64.16	76.18	78.21	78.47		Pass

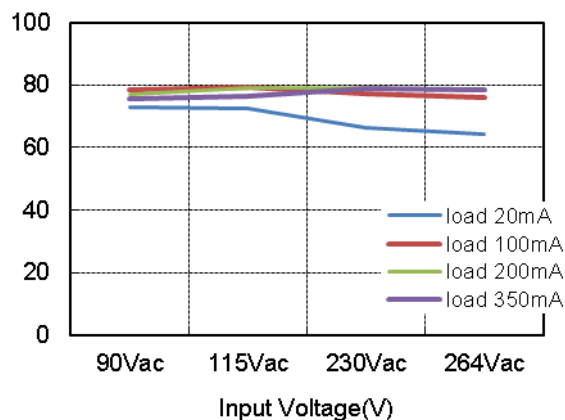


Figure 2. Efficiency @ different load

3.3. Output Voltage

Input voltage	0mA	100mA	200mA	350mA	Spec	Remark
90Vac/60Hz	12.93	12.39	12.27	12.14	11.0~14.0V	Pass
115Vac/60Hz	12.94	12.40	12.29	12.15		Pass
230Vac/50Hz	13.02	12.41	12.31	12.18		Pass
264Vac/50Hz	13.03	12.41	12.32	12.19		Pass

3.4. Dynamic (Figure 9)

Input voltage	V _{OUT-MAX} (V)	V _{OUT-MIN} (V)	Spec	Remark
90Vac/60Hz	12.75	12.08	11.0~14.0V	Pass
115Vac/60Hz	12.75	12.08		Pass
230Vac/50Hz	12.80	12.03		Pass
264Vac/50Hz	12.80	12.03		Pass

Note: A dynamic loading with low load set at 0mA load lasting for 5ms and high set at 350mA load lasting for 5ms is added to output. The ramp is set at 0.25A/us at transient.

3.5. Over Current Protection & Recovery

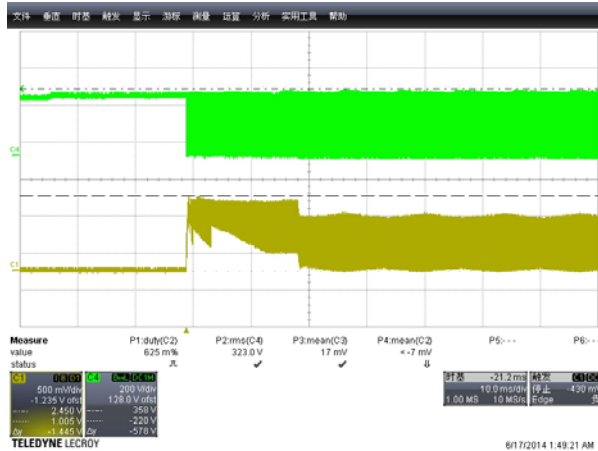
Input voltage	OCP (A)	Recovery (A)	Spec	Remark
90Vac/60Hz	406	404	$\geq 1.1 \cdot I_{OUT}$	Pass
115Vac/60Hz	427	424		Pass
230Vac/50Hz	490	486		Pass
264Vac/50Hz	509	507		Pass

3.6. Ripple & Noise (Figure 7&8)

Input voltage	No load (mV)	Full load (mV)	Spec	Remark
90Vac/60Hz	17	68	<100mV	Pass
115Vac/60Hz	19	72		Pass
230Vac/50Hz	16.2	76		Pass
264Vac/50Hz	18	75		Pass

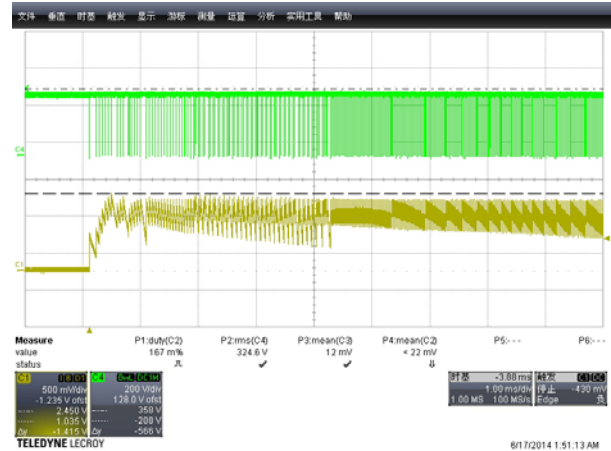
3.7. Waveforms

Figure 3: 230Vac, start at full load



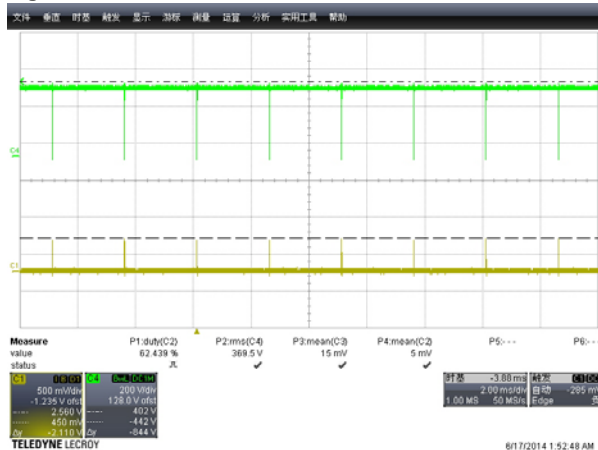
CH1: V_{DS} CH4: $I_{Inductor}$
 230Vac 输入, 满载启动, $V_{DS}=358V$

Figure 4: 230Vac, start at full load



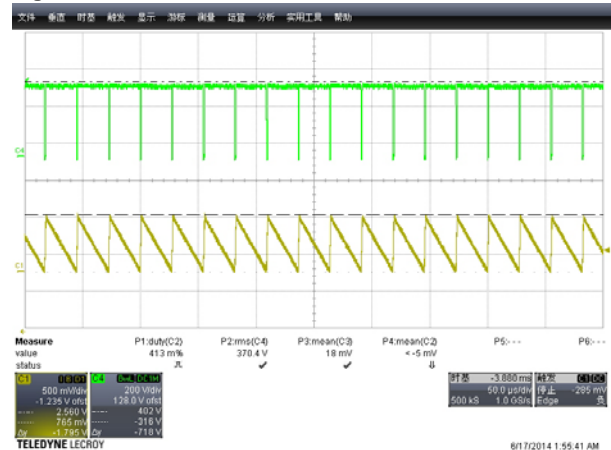
CH1: V_{DS} CH4: $I_{Inductor}$
 230Vac 输入, 满载启动波形展开, $V_{DS}=358V$

Figure 5: 264Vac, No-load



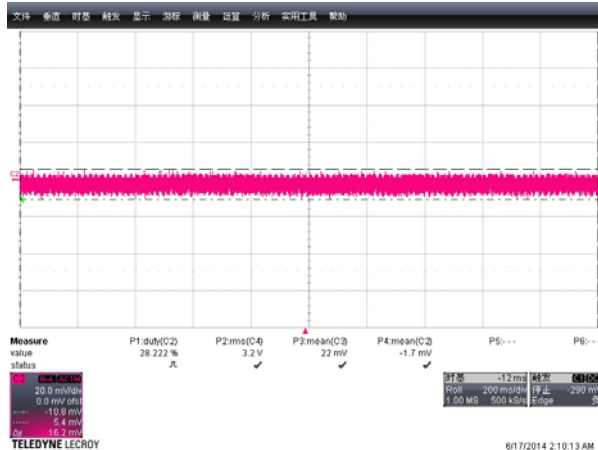
CH1: V_{DS} CH4: $I_{Inductor}$
 264Vac 输入, 空载, $V_{DS}=402V$

Figure 6: 264Vac, Full load



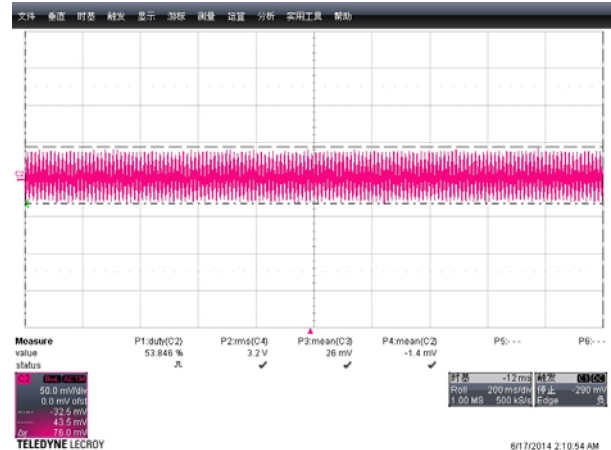
CH1: V_{DS} CH4: $I_{Inductor}$
 264Vac 输入, 满载, $V_{DS}=402V$

Figure 7: 230Vac, No-load

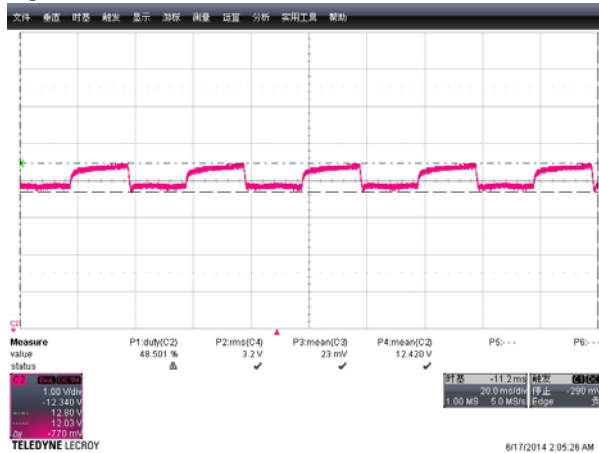


CH2: V_{ripple}
 230Vac 输入, 空载, $V_{ripple}=16.2mV$

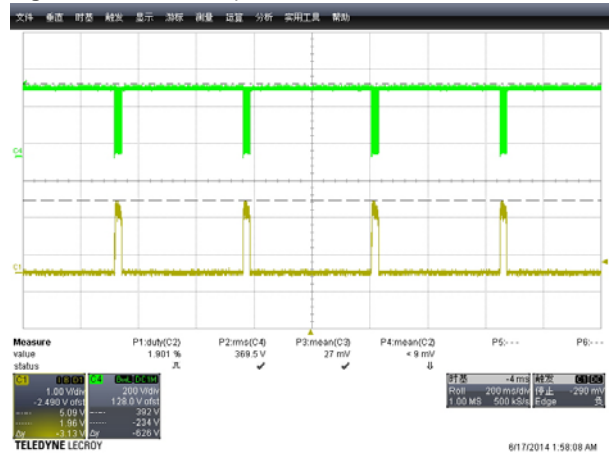
Figure 8: 230Vac, Full load



CH2: V_{ripple}
 230Vac 输入, 满载, $V_{ripple}=76mV$

Figure 9: 230Vac, 0~200mA load


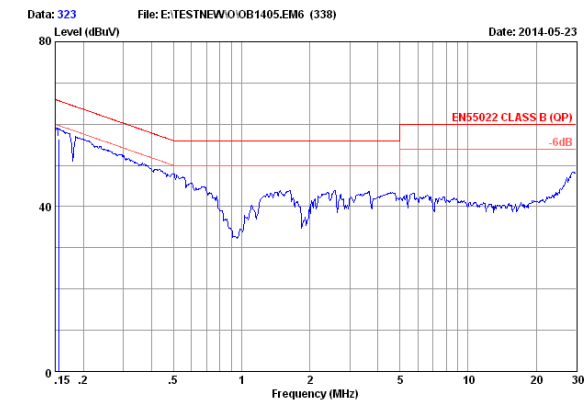
CH2: V_{OUT}
 230Vac 输入, 负载变化, $V_{out} = 12.03-12.80V$

Figure 10: 264Vac, Output short to GND


CH1: V_{DS} CH4: $I_{Inductor}$
 230Vac 输入, 输出短路

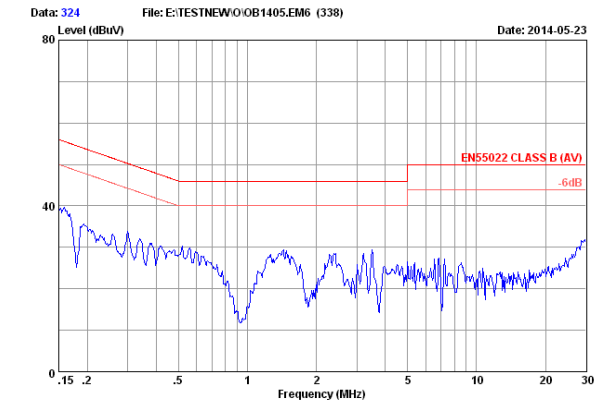
Input	$V_{DS_MAX}(V)$	Remark
264Vac @ No load	402	Figure 5
264Vac @ Full load	402	Figure 6
264Vac @ Output short	392	Figure10

3.8. Conducted EMI Test (EN55022 CLASS B standard)

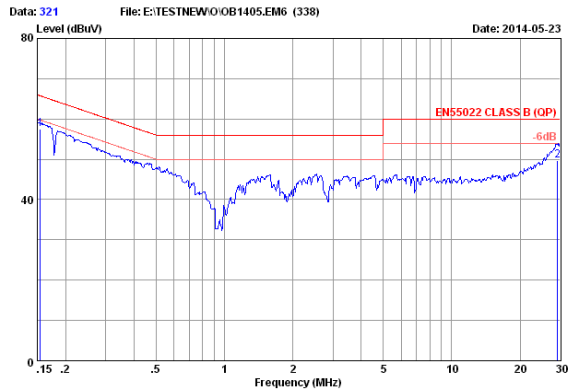
Figure 11: 230Vac, Line QP


Site : Audix(Shanghai) Shielded1
 Condition : EN55022 CLASS B (QP) ESH2-25-2013 LINE
 Project No. :
 Applicant :
 EUT : OB2225N
 M/N : 12V
 S/N :
 Power Supply : 230V/50Hz
 Ambient : 22°C 48%RH
 Test line : L
 Test Mode :
 Test Engineer : Jarey
 Memo : 2.2mH

Freq	Level	Read Level	Cable Loss	LISN Factor	Limit Line	Over Limit	Remark
MHz	dBuV	dBuV	dB	dB	dB	dB	
1	0.155000	56.45	56.30	0.06	0.09	0.15	65.73 -9.28 QP

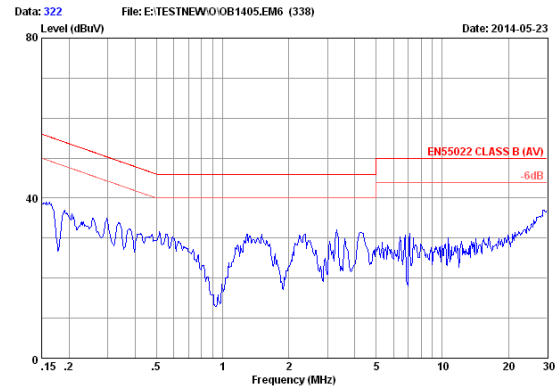
Figure 12: 230Vac, Line AVG


Site : Audix(Shanghai) Shielded1
 Condition : EN55022 CLASS B (AVG) ESH2-25-2013 LINE
 Project No. :
 Applicant :
 EUT : OB2225N
 M/N : 12V
 S/N :
 Power Supply : 230V/50Hz
 Ambient : 22°C 48%RH
 Test line : L
 Test Mode :
 Test Engineer : Jarey
 Memo : 2.2mH

Figure 13: 230Vac, Neutral QP


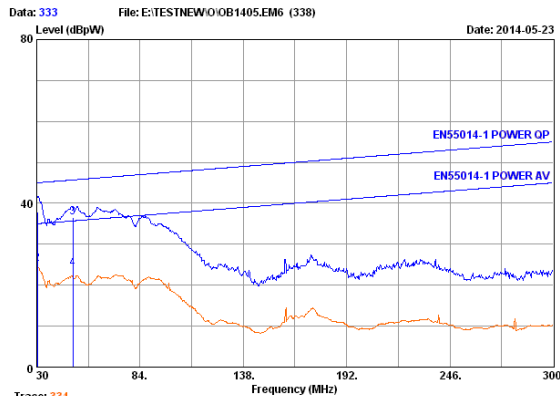
Data: 321 File: E:\TESTNEW\OB1405.EM6 (338) Date: 2014-05-23
 Site : Audix(Shanghai) Shielded1
 Condition : EN55022 CLASS B (QP) ESH2-25-2013 NEUTRAL
 Project No. :
 Applicant :
 EUT : OB2225N
 M/N : 12V
 S/N :
 Power Supply : 230V/50Hz
 Ambient : 22°C 48%RH
 Test line : N
 Test Mode :
 Test Engineer : Jarey
 Memo : 2.2mH

Freq	Level	Read	Cable	LISN	Factor	Factor	Limit	Over	Remark
MHz	dBuV	dBuV	dB	dB	dB	dB	dBuV	dB	
1	0.154400	57.55	57.40	0.06	0.09	0.15	65.76	-8.21	QP
2	29.290000	49.76	48.70	0.37	0.69	1.06	60.00	-10.24	QP

Figure 14: 230Vac, Neutral AVG


Data: 322 File: E:\TESTNEW\OB1405.EM6 (338) Date: 2014-05-23
 Site : Audix(Shanghai) Shielded1
 Condition : EN55022 CLASS B (AV) ESH2-25-2013 NEUTRAL
 Project No. :
 Applicant :
 EUT : OB2225N
 M/N : 12V
 S/N :
 Power Supply : 230V/50Hz
 Ambient : 22°C 48%RH
 Test line : N
 Test Mode :
 Test Engineer : Jarey
 Memo : 2.2mH

3.9. Power Disturbance Test

Figure 15: 230Vac, QP& AVG


Data: 333 File: E:\TESTNEW\OB1405.EM6 (338) Date: 2014-05-23
 Site : Audix(Shanghai) Shielded1
 Condition : EN55014-1 POWER QP CLAMP-MD521-2013
 Project No. :
 Applicant :
 EUT : OB2225N
 M/N : 12V
 S/N :
 Power Supply : 230V/50Hz
 Ambient : 22°C 48%RH
 Test line : AC Line
 Test Mode :
 Test Engineer : Jarey
 Memo : 2.2mH

Freq	Level	Read	Cable	LISN	Factor	Factor	Limit	Over	Remark
MHz	dBpW	dBpW	dB	dB	dB	dB	dBpW	dB	
1	30.290000	37.93	20.01	0.89	17.03	17.92	45.02	-7.09	QP
2	30.290000	25.23	7.31	0.89	17.03	17.92	35.02	-9.79	Average
3	48.980000	36.66	18.02	1.18	17.46	18.64	45.71	-9.05	QP
4	48.980000	24.16	5.52	1.18	17.46	18.64	35.71	-11.55	Average

Disclaimer

On-Bright Electronics reserves the right to make corrections, modifications, enhancements, improvements, and other changes to its documents, products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete.

This document is under copy right protection. Non of any part of document could be reproduced, modified without prior written approval from On-Bright Electronics.