Subject **OB2222LM Demo Board Manual**	Board Model:AD5.0V0.3A2222LM.00 Doc. No.: OB_DOC_DBM_2222LM00

Key features:

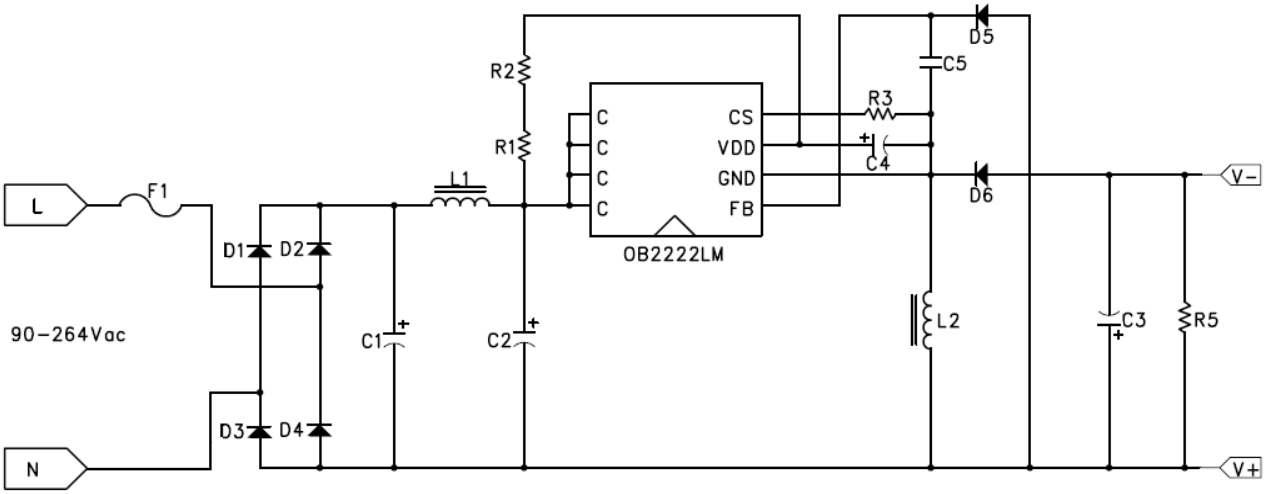
- Lowest possible component count
- Standby power <100mW @264Vac
- Efficiency measured >60% at full load
- Peak load operation with increased frequency
- Good dynamic response
- Comprehensive protection including output short protection, OTP, OLP, etc.

Revision History

Revise Date	Version	Reason/Issue
2015-8-1	00	First issue

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 FR107	4
3	D5	Diode M7	1
4	D6	Superfast diode ES2J（LITE-ON）	1
5	C1, C2	E.C. 2.2uF /400V	2
6	C3	E.C. 470uF /10V	1
7	C4	E.C. 4.7uF /50V	1
8	C5	SMD Cap 1uF /25V	1
9	R1,R2	SMD RES 2M /5% /1206	2
10	R3	SMD RES 0R62 /1% /1206	1
11	R5	SMD RES 1K /5% /0805	1
12	U1	OB2222LM SOP8	1
13	L1	Inductor 1mH /0510	1
14	L2	Inductor 280uH /Φ9*12	1
15	L3	Jumper	1
	Total		20

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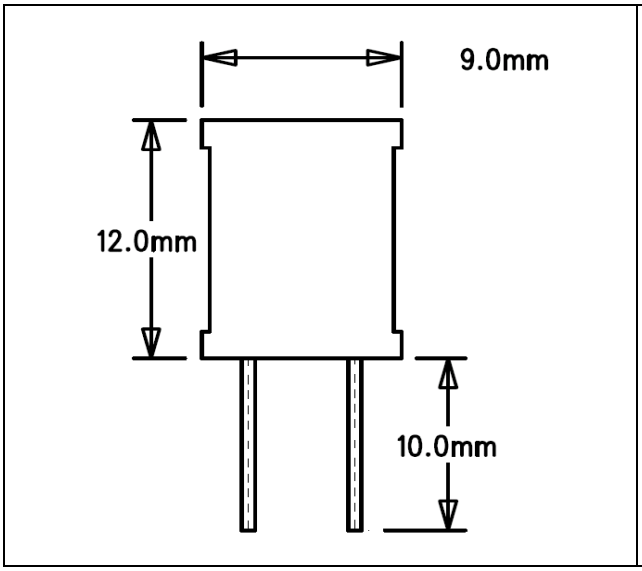
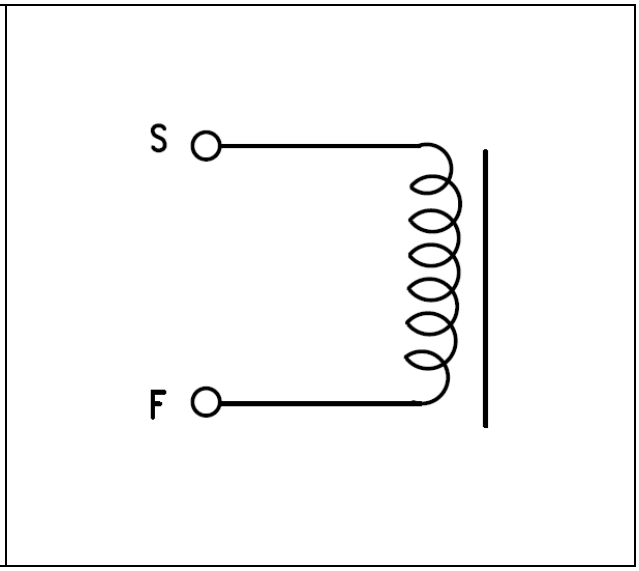
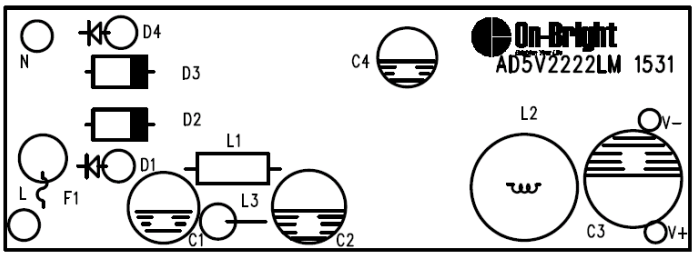
1.3. Inductor design





Material	Turns	Inductance & Tolerance
Φ0.3*1　2UEW	85	280uH±10%

1.4. PCB Gerber File



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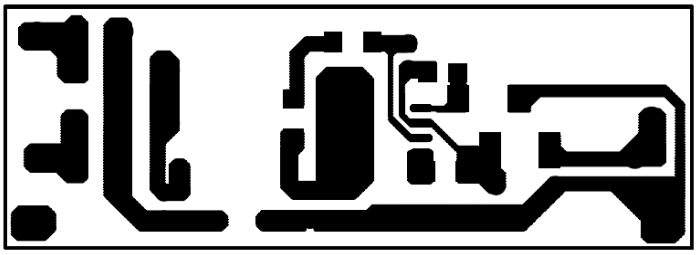

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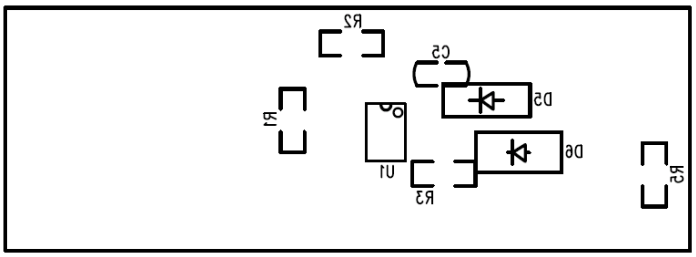

Silkscreen Bottom

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} 5.0V
- Output current I_{OUT} 300mA（450mA/5mS peak load）
- Operating frequency 40KHz（Peak load increased frequency 60KHz）
- Output power 1.5W

2.3. Performance Function

- Standby Power < 100mW @ 264Vac/50Hz, no-load, 25℃
- Efficiency >60%
- 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 Load Protection Output shut down with auto-restart

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3. Performance Evaluation

3.1. Standby Power

Input voltage	P_{IN} (mW)	Spec	Remark
90Vac/60Hz	46	<100mW	Pass
115Vac/60Hz	50		Pass
230Vac/50Hz	70		Pass
264Vac/50Hz	87		Pass

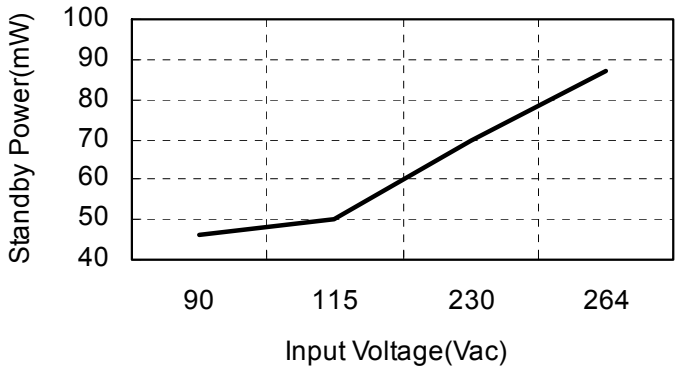


Figure 1. Standby input power

3.2. Efficiency

Input voltage	load 300mA	Spec	Remark
90Vac/60Hz	66.28	>60%	Pass
115Vac/60Hz	67.26		Pass
230Vac/50Hz	66.51		Pass
264Vac/50Hz	65.80		Pass

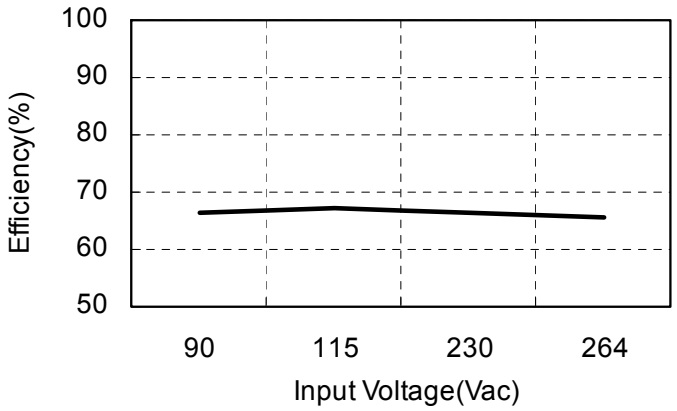


Figure 2. Efficiency @300mA load

3.3. Output Voltage

Input voltage	0mA	5mA	100mA	200mA	300mA	Spec	Remark
90Vac/60Hz	5.19	5.11	5.15	5.08	5.03	4.5~5.5V	Pass
115Vac/60Hz	5.19	5.09	5.13	5.07	5.02		Pass
230Vac/50Hz	5.27	5.10	5.10	5.05	5.00		Pass
264Vac/50Hz	5.30	5.11	5.01	5.05	5.00		Pass

3.4. Dynamic（Figure 13&14）

Input voltage	$V_{OUT-MAX}$ (V)	$V_{OUT-MIN}$(V)	Spec	Remark
90Vac/60Hz	5.33	4.84	4.5~5.5V	Pass
115Vac/60Hz	5.33	4.85		Pass
230Vac/50Hz	5.32	4.83		Pass
264Vac/50Hz	5.32	4.83		Pass

Note: A dynamic loading with low load set at 5mA load lasting for 5ms and high set at 300mA load lasting for 5ms is added to output. The ramp is set at 0.25A/us at transient.

3.5. Over Current Protection & Recovery

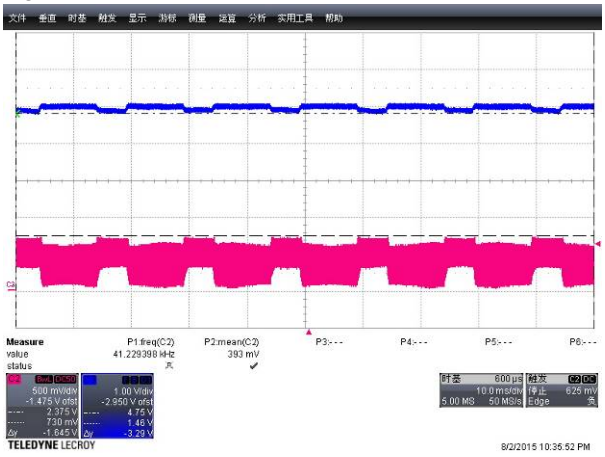
Input voltage	OCP (A)	Recovery (A)	Spec	Remark
90Vac/60Hz	0.418	0.394	≥1.1*I_{OUT}	Pass
115Vac/60Hz	0.435	0.421		Pass
230Vac/50Hz	0.480	0.475		Pass
264Vac/50Hz	0.495	0.490		Pass

3.6. Ripple & Noise（Figure 9&10 11&12）

Input voltage	No load (mV)	Full load (mV)	Spec	Remark
90Vac/60Hz	22	56	<100mV	Pass
115Vac/60Hz	25	55		Pass
230Vac/50Hz	32	52		Pass
264Vac/50Hz	33	52		Pass

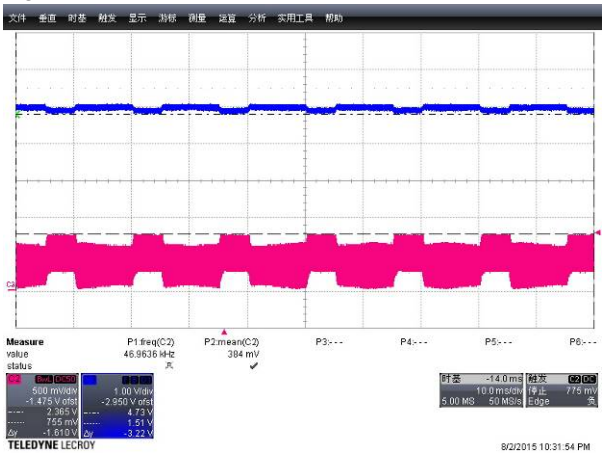
3.7. Waveforms

Figure 3: 115Vac, 300mA/10mS & 450mA/5mS load



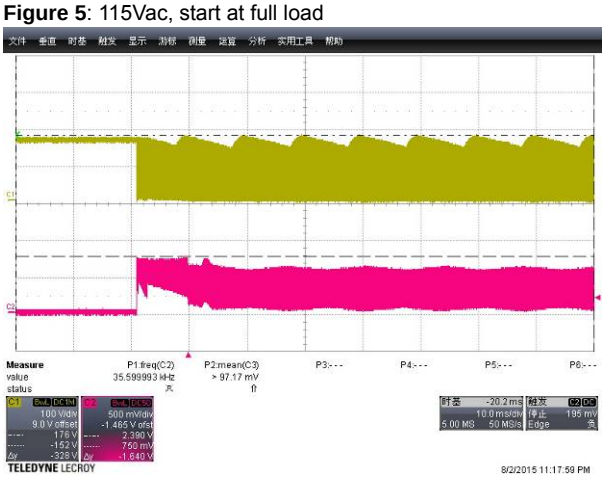
CH3: V_{out} CH2: $I_{Inductor}$
115Vac 输入，负载带 peak load, V_{out}=4.75V_{min}

Figure 4: 230Vac, 300mA/10mS & 450mA/5mS load



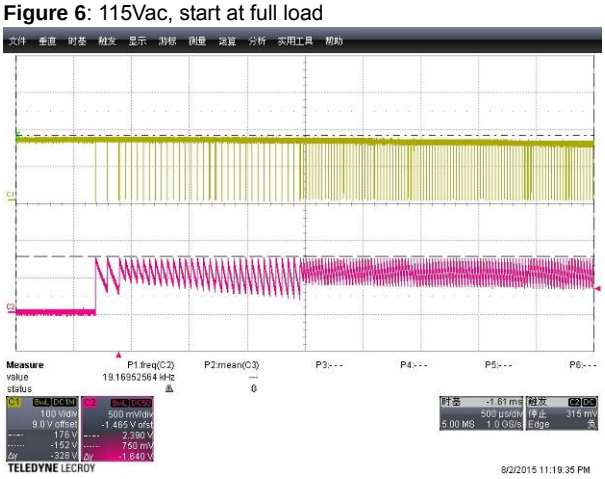
CH1: V_{out} CH2: $I_{Inductor}$
230Vac 输入，负载带 peak load, V_{out}=4.73V_{min}

Figure 5: 115Vac, start at full load



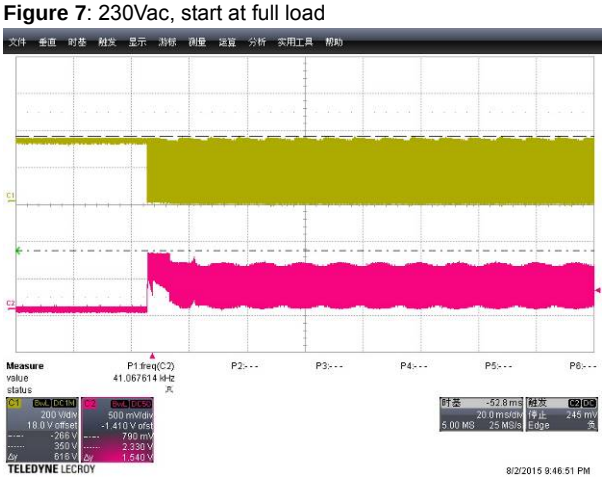
CH1: V_{ds} CH2: $I_{Inductor}$
115Vac 输入，满载启动，V_{ds}=176V

Figure 6: 115Vac, start at full load



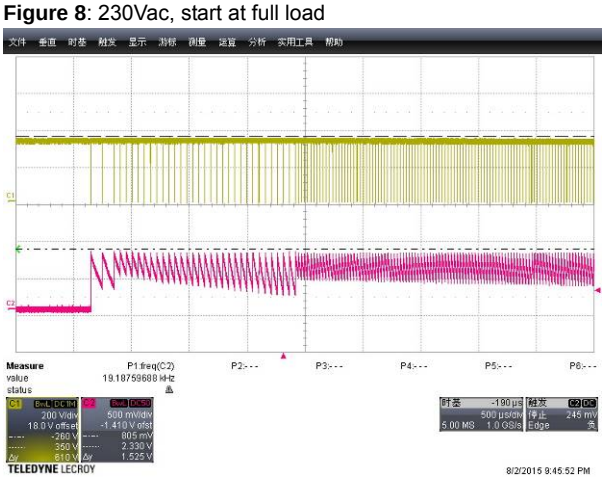
CH1: V_{ds} CH2: $I_{Inductor}$
115Vac 输入，满载启动波形展开，V_{ds}=176V

Figure 7: 230Vac, start at full load



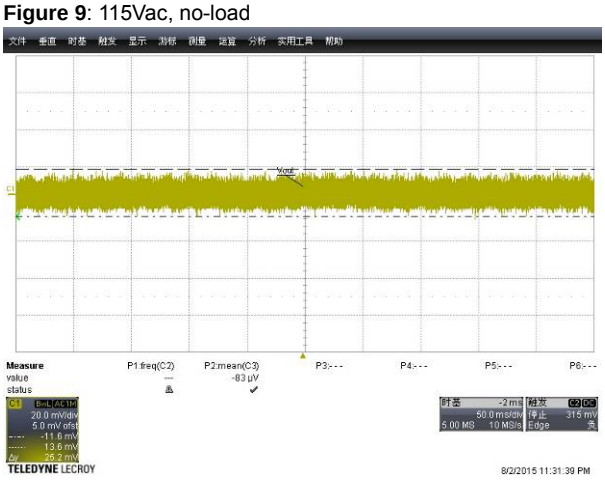
CH1: V_{ds} CH2: $I_{Inductor}$
230Vac 输入，满载启动，V_{ds}=350V

Figure 8: 230Vac, start at full load



CH1: V_{ds} CH2: $I_{Inductor}$
230Vac 输入，满载启动波形展开，V_{ds}=350V

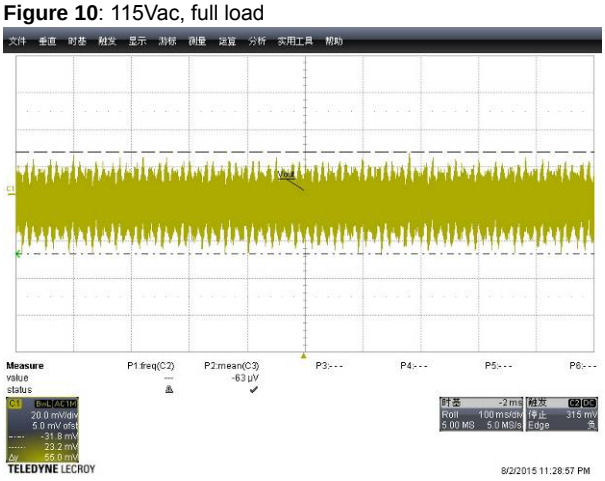
Figure 9: 115Vac, no-load



CH1: V_{ripple}

115Vac 输入，空载，V_{ripple} =25mV

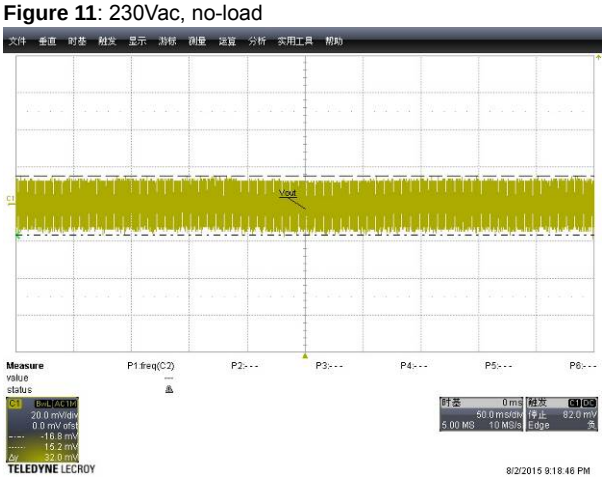
Figure 10: 115Vac, full load



CH1: V_{ripple}

115Vac 输入，满载，V_{ripple}=55mV

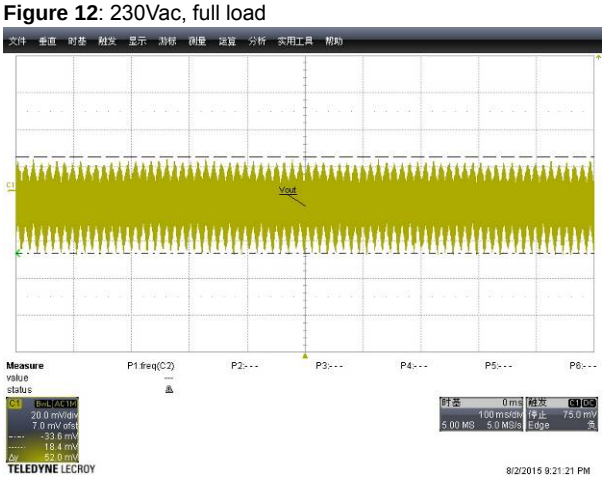
Figure 11: 230Vac, no-load



CH2: V_{ripple}

230Vac 输入，空载，V_{ripple} =32mV

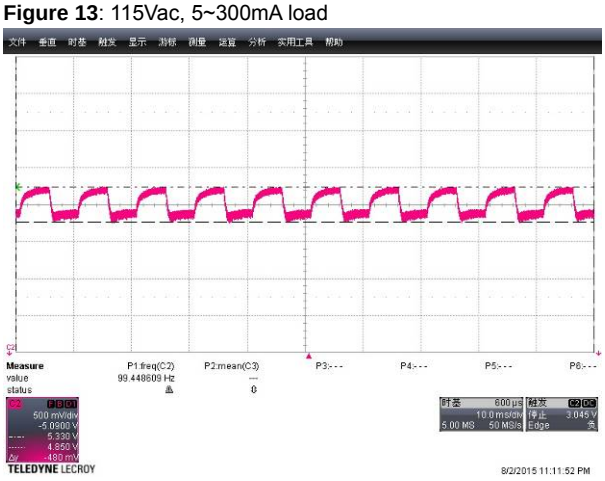
Figure 12: 230Vac, full load



CH2: V_{ripple}

230Vac 输入，满载，V_{ripple}=52mV

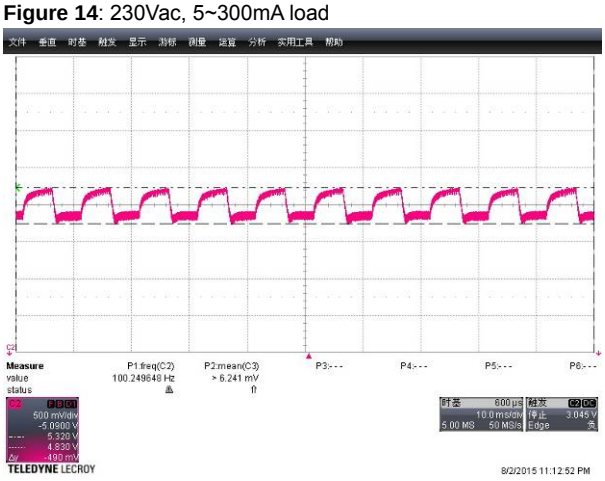
Figure 13: 115Vac, 5~300mA load



CH2: V_{out}

115Vac 输入，负载变化，V_{out} =4.85-5.33V

Figure 14: 230Vac, 5~300mA load



CH2: V_{out}

230Vac 输入，负载变化，V_{out} =4.83-5.32V

Figure 15: 264Vac, no-load

CH1: V_{ds} CH2: $I_{Inductor}$

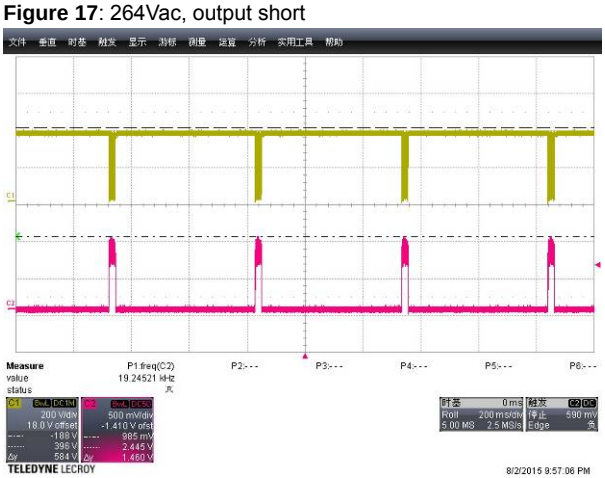
264Vac 输入，空载，V_{ds}=398V

Figure 16: 264Vac, full load

CH1: V_{ds} CH2: $I_{Inductor}$

264Vac 输入，满载，V_{ds}=398V

Figure 17: 264Vac, output short



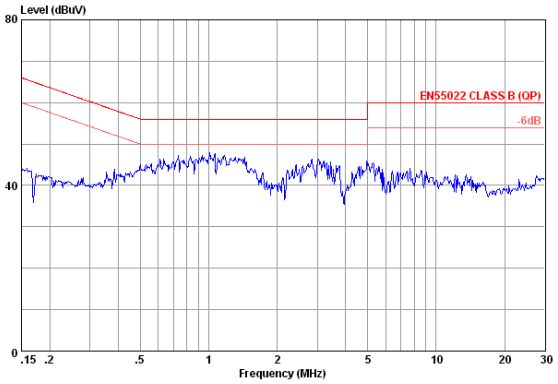
CH1: V_{ds} CH2: $I_{Inductor}$

264Vac 输入，输出短路，V_{ds}=396V

Input	V_{ds_max}(V)	Remark
264Vac @ no-load	398	Figure 15
264Vac @ full load	398	Figure 16
264Vac @ output short	396	Figure 17

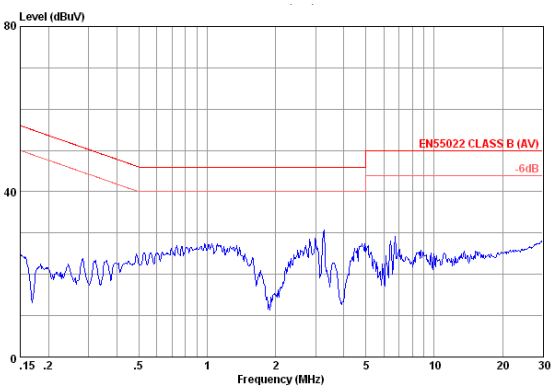
3.8. Conducted EMI Test（EN55014 Class B Standard）

Figure 19: 230Vac, Line QP



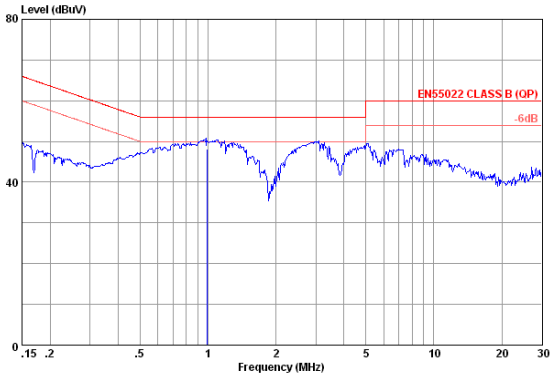
Site : Audix(Shanghai) Shielded1
Condition : EN55022 CLASS B (QP) ESH2-Z5-2015 LINE
Project No. :
Applicant :
EUT : OB2222LM
M/N : 5V 0.3A
S/N :
Power Supply : 230V/50Hz
Ambient : 22'C 48%RH
Test line : L
Test Mode :
Test Engineer : Eric
Memo :

Figure 20: 230Vac, Line AVG



Site : Audix(Shanghai) Shielded1
Condition : EN55022 CLASS B (AV) ESH2-Z5-2015 LINE
Project No. :
Applicant :
EUT : OB2222LM
M/N : 5V 0.3A
S/N :
Power Supply : 230V/50Hz
Ambient : 22'C 48%RH
Test line : L
Test Mode :
Test Engineer : Eric
Memo :

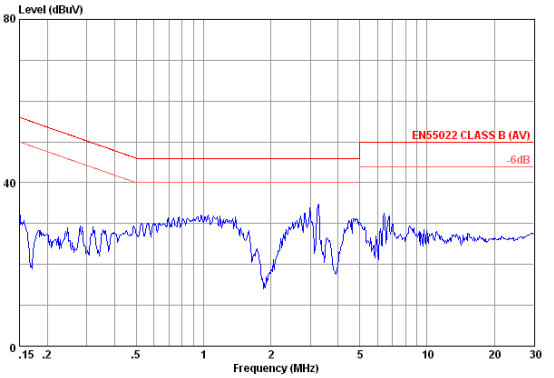
Figure 21: 230Vac, Neutral QP



Site : Audix(Shanghai) Shielded1
Condition : EN55022 CLASS B (QP) ESH2-Z5-2015 NEUTRAL
Project No. :
Applicant :
EUT : OB2222LM
M/N : 5V 0.3A
S/N :
Power Supply : 230V/50Hz
Ambient : 22'C 48%RH
Test line : N
Test Mode :
Test Engineer : Eric
Memo :

	Freq	Level	Read Level	Cable Loss	LISN Factor	Factor	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dB	dBuV	dB	
1	0.986700	48.04	47.80	0.09	0.15	0.24	56.00	-7.96	QP

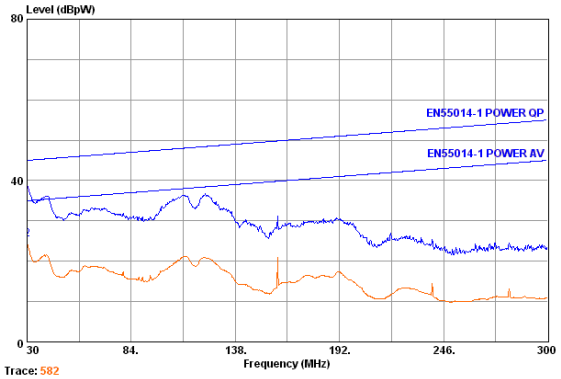
Figure 22: 230Vac, Neutral AVG



Site : Audix(Shanghai) Shielded1
Condition : EN55022 CLASS B (AV) ESH2-Z5-2015 NEUTRAL
Project No. :
Applicant :
EUT : OB2222LM
M/N : 5V 0.3A
S/N :
Power Supply : 230V/50Hz
Ambient : 22'C 48%RH
Test line : N
Test Mode :
Test Engineer : Eric
Memo :

3.9. Power Disturbance Test

Figure 23: 230Vac, QP & AVG



Trace: 582

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Condition           : EN55014-1 POWER QP MDS-21-2015
Project No.         :
Applicant           :
EUT                 : OB2222LM
M/N                 : 5V 0.3A
S/N                 :
Power Supply        : 230V/50Hz
Ambient             : 22'C 48%RH
Test line           : AC Line
Test Mode           :
Test Engineer       : Eric
Memo                :
```

	Freq	Level	Read Level	Cable Loss	LISN Factor	Factor	Limit Line	Over Limit	Remark
	MHz	dBpW	dBpW	dB	dB	dB	dBpW	dB	
1	30.000000	37.07	17.51	0.85	18.71	19.56	45.01	-7.94	QP
2	30.000000	25.37	5.81	0.85	18.71	19.56	35.01	-9.64	Average

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