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1. Test Equipments

Name	Mark
AC Source	Extech 6905
Oscilloscope	Tektronix DPO3014
Power Meter	IV1001
Load	5W LED
True RMS Multi-meter	Fluke 287
Differential Probe	LDP-6002

2. Demo Board Specification

Parameter	Specification
Input Voltage	90Vac~264Vac
Input Frequency	47Hz~63Hz
Output Voltage and Current	15.6V/0.32A
Output Power	5W (max.)
Efficiency	> 80% Full Load
Conduction	EN55015 Class B

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3. Demo Board Test Item List

All test conditions is base on ambient temperature 25°C;

Test item	Specification	Result
Efficiency	>80% Full Load	Pass
Ripple & Noise	---	---
Overshoot	---	---
Turn on time	<2S	Pass
Voltage stress on MOSFET	≤650V	Pass
Constant Current	0.32A (±3%)	Pass
Short Circuit Protection	Recovery	Pass
EMI Test - Conduction	EN55015 Class B	Pass

4. Electronic Characteristics Test Items List

All test conditions is base on ambient temperature 27°C;

4.1 Efficiency

Test Condition:

We chose input voltage value, including 90V, 100V, 115V, 220V, 240V, 264V and 100% Load Current, Then Calculate the efficiency.

	90Vac	100Vac	115Vac
Vout (V)	15.65	15.63	15.63
Iout (mA)	334	334	334
Pin (W)	6.17	6.17	6.18
Pout (W)	5.22	5.22	5.22
PF	0.994	0.994	0.998
η (%)	84.2	84.2	84.5

	220Vac	240Vac	264Vac
Vout (V)	15.63	15.63	15.62
Iout (mA)	334	334	334
Pin (W)	6.27	6.33	6.42
Pout (W)	5.22	5.22	5.217
PF	0.946	0.925	0.889
η (%)	83.25	82.46	81.26

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4.2 Ripple & Noise

Test Condition:

The ripple & noise are measured by using 20MHz bandwidth Limited oscilloscope with a 10uF low impedance electronic capacitor and a 0.1uF Ceramic capacitor.

Test data and results are as follows:

Vin	V(p-p)Full Load	Spec	Result	Note			
90V/60Hz	1.4 V	2V	OK	Figure 1			
110V/60Hz	1.44 V	2V	OK	Figure 2			
220V/50Hz	1.7 V	2V	OK	Figure 3			
264V/50Hz	1.6 V	2V	OK	Figure 4			

Full Load: 15.6V/0.334A

Figure 1 The waveform of Ripple & Noise at Vin = 90Vac/60Hz & full-load

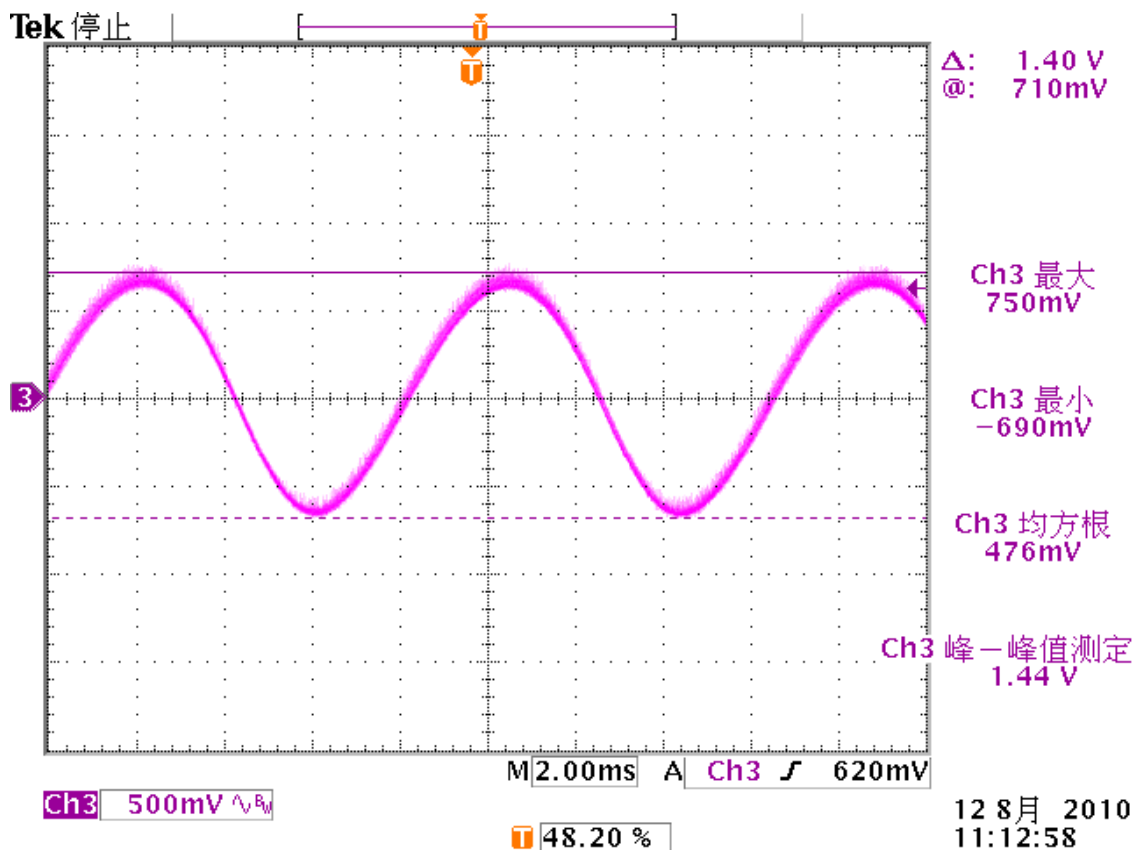


Figure 2 The waveform of Ripple & Noise at $V_{in} = 110V_{ac}/60Hz$ & full-load

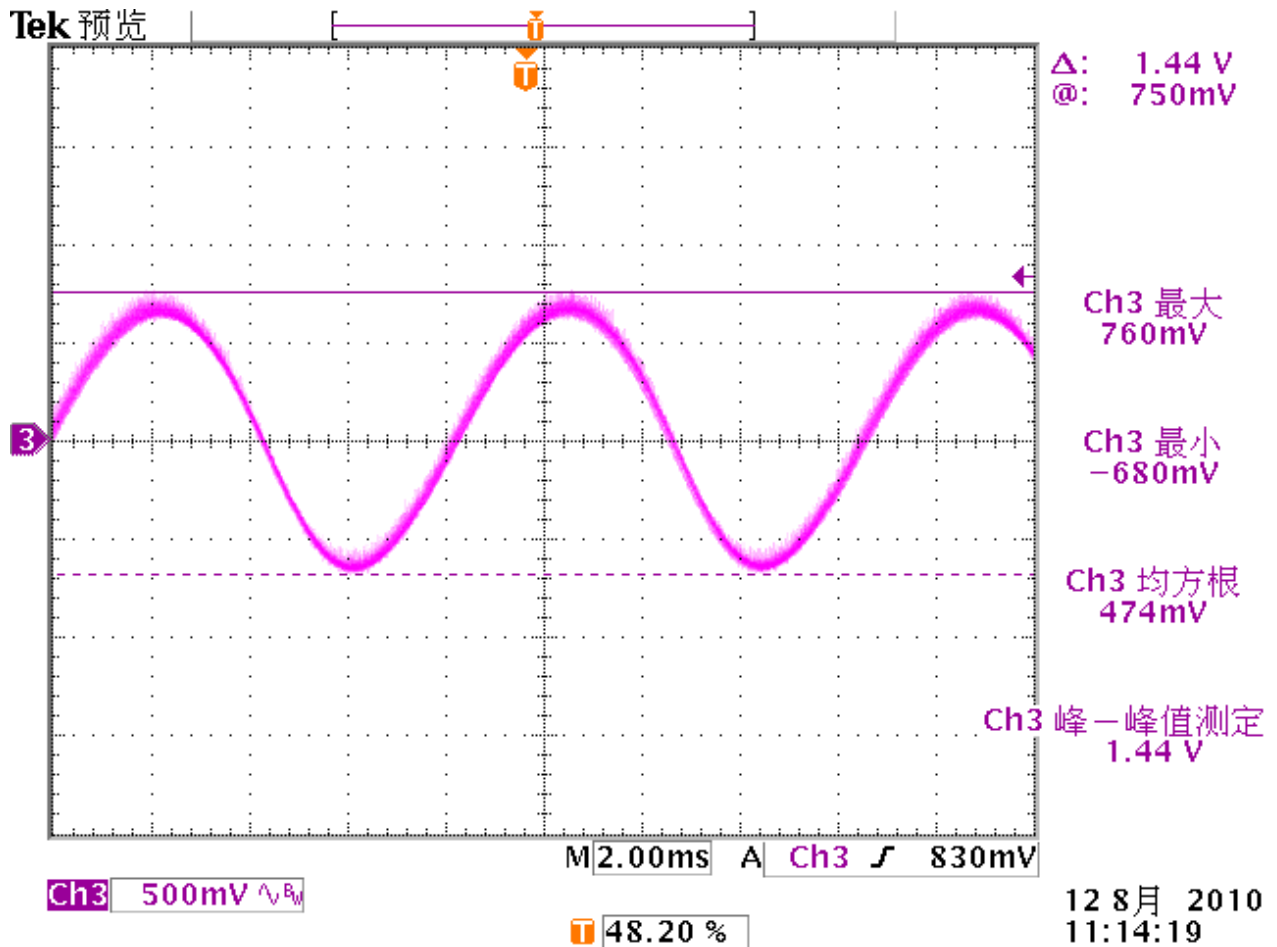


Figure 3 The waveform of Ripple & Noise at $V_{in} = 220V_{ac}/50Hz$ & full-load

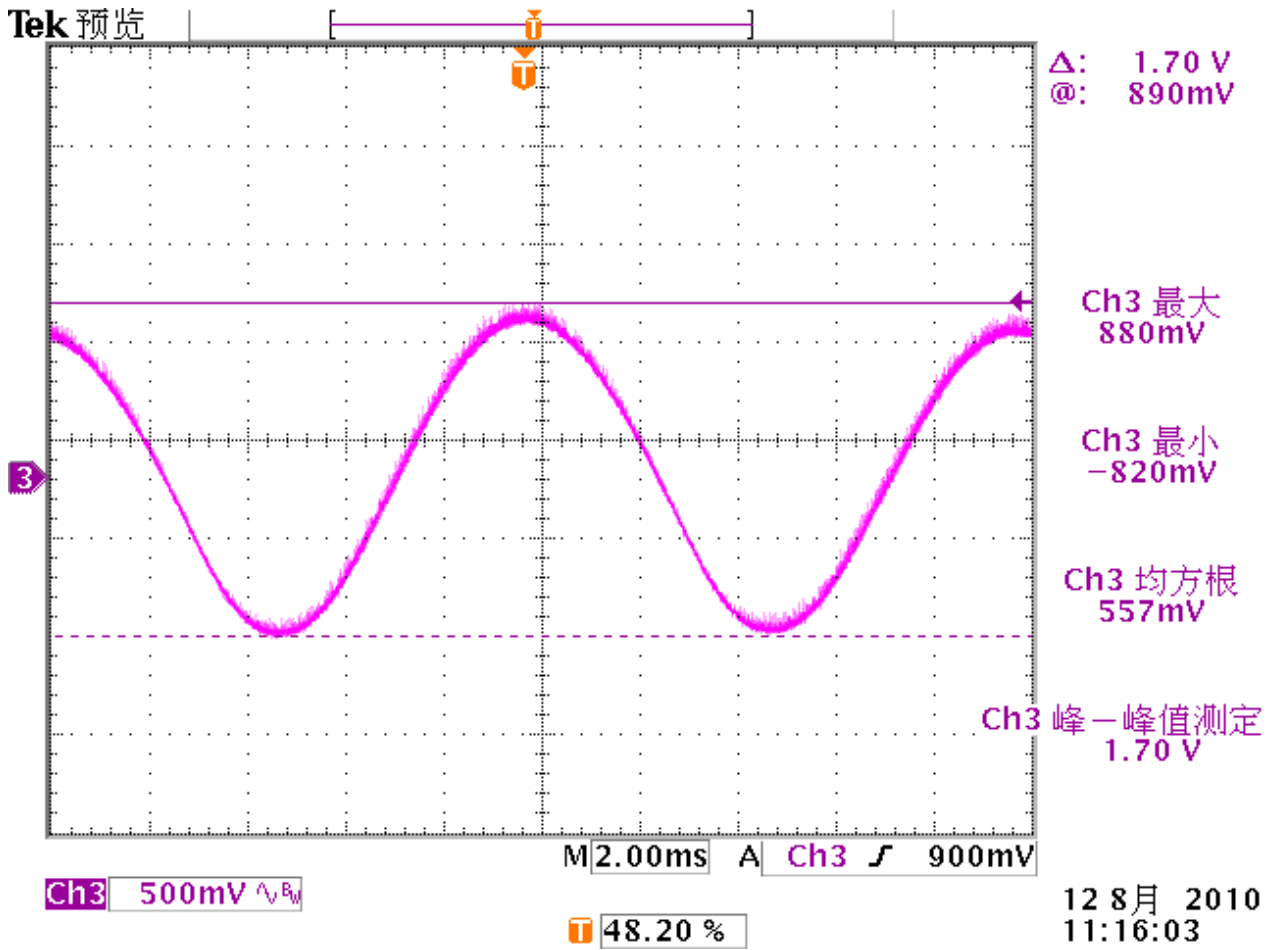
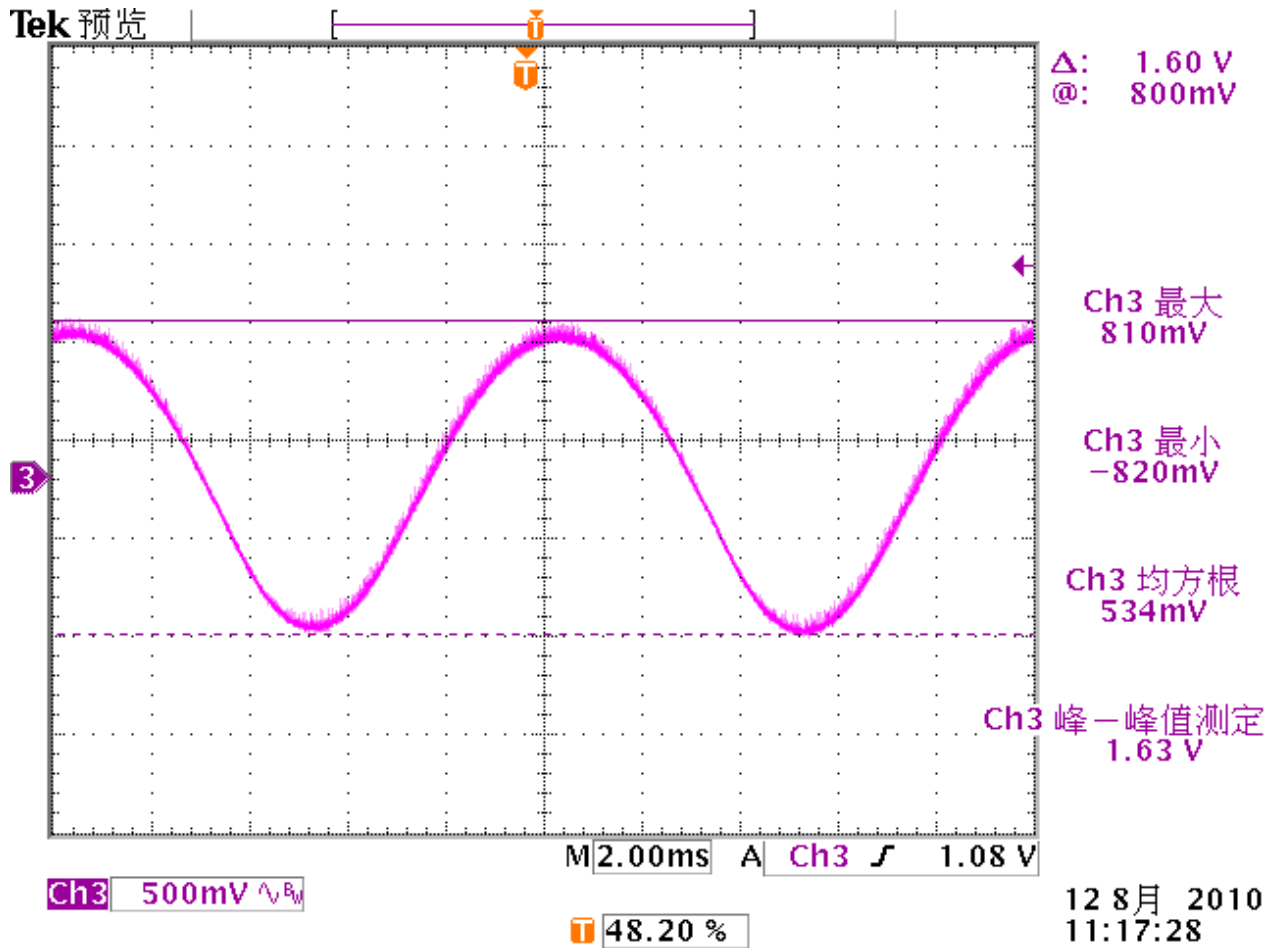


Figure 4 The waveform of Ripple & Noise at $V_{in} = 264V_{ac}/50Hz$ & full-load



4.3 Over Shoot

Test Condition:

Over Shoot value test point are all at PCB end

Test data and results are as follows:

Vin	Load	Test Item	Spec(%)	Test Data	Result	Note
90V/60Hz	Full Load	Over Shoot		14%	--	Figure5
110V/60Hz	Full Load	Over Shoot	--	12%	--	Figure6
220V/50Hz	Full Load	Over Shoot	--	18%	--	Figure7
264V/50Hz	Full Load	Over Shoot	--	19%	--	Figure8

Figure 5 The waveform of Over shoot at Vin = 90Vac/60Hz & Full load

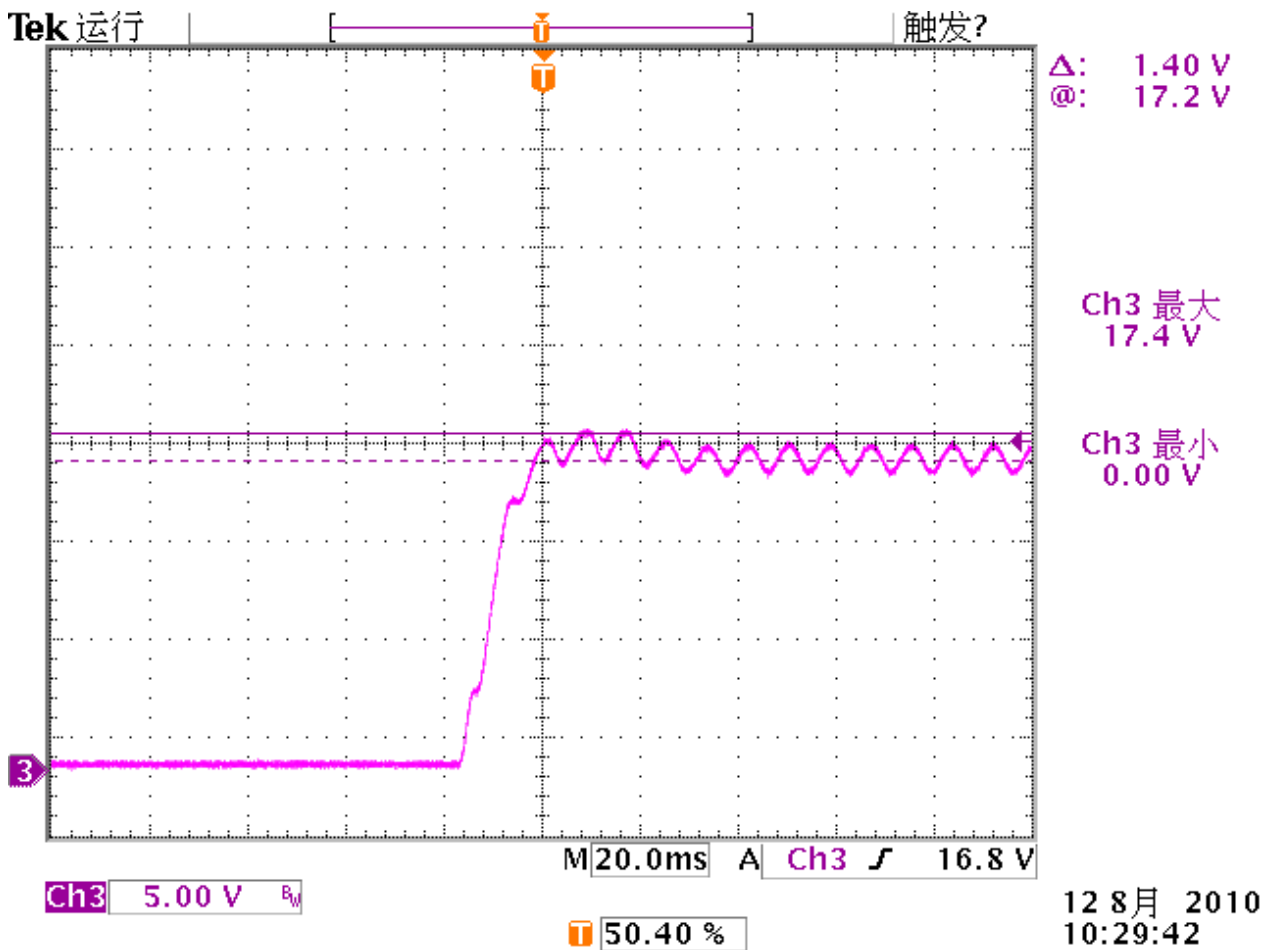


Figure 6 The waveform of Over Shoot at Vin = 110Vac/60Hz & Full load

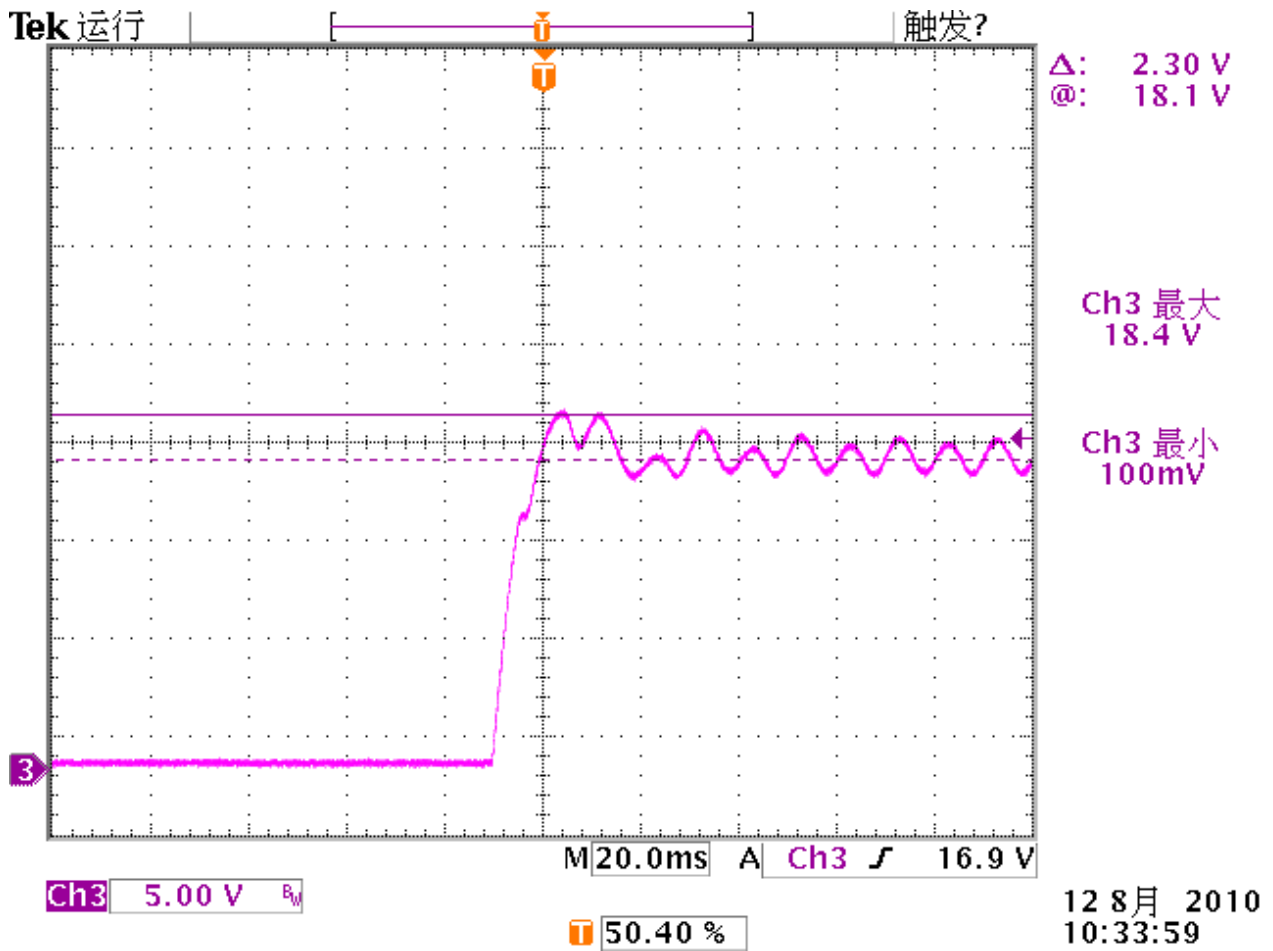


Figure 7 The waveform of Over Shoot at Vin = 220Vac/50Hz & Full load

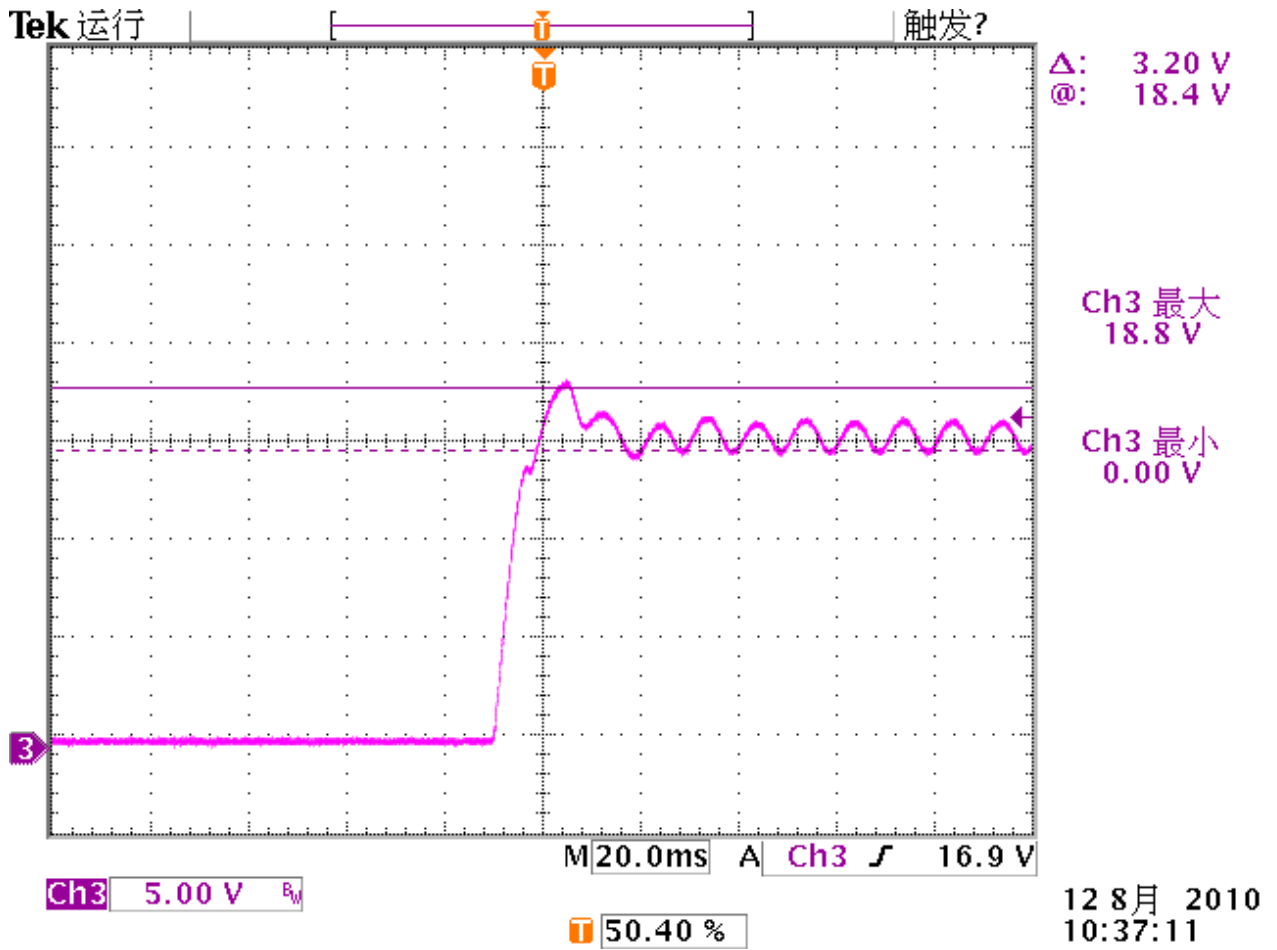


Figure 8 The waveform of Over Shoot at Vin = 264Vac/50Hz & Full load

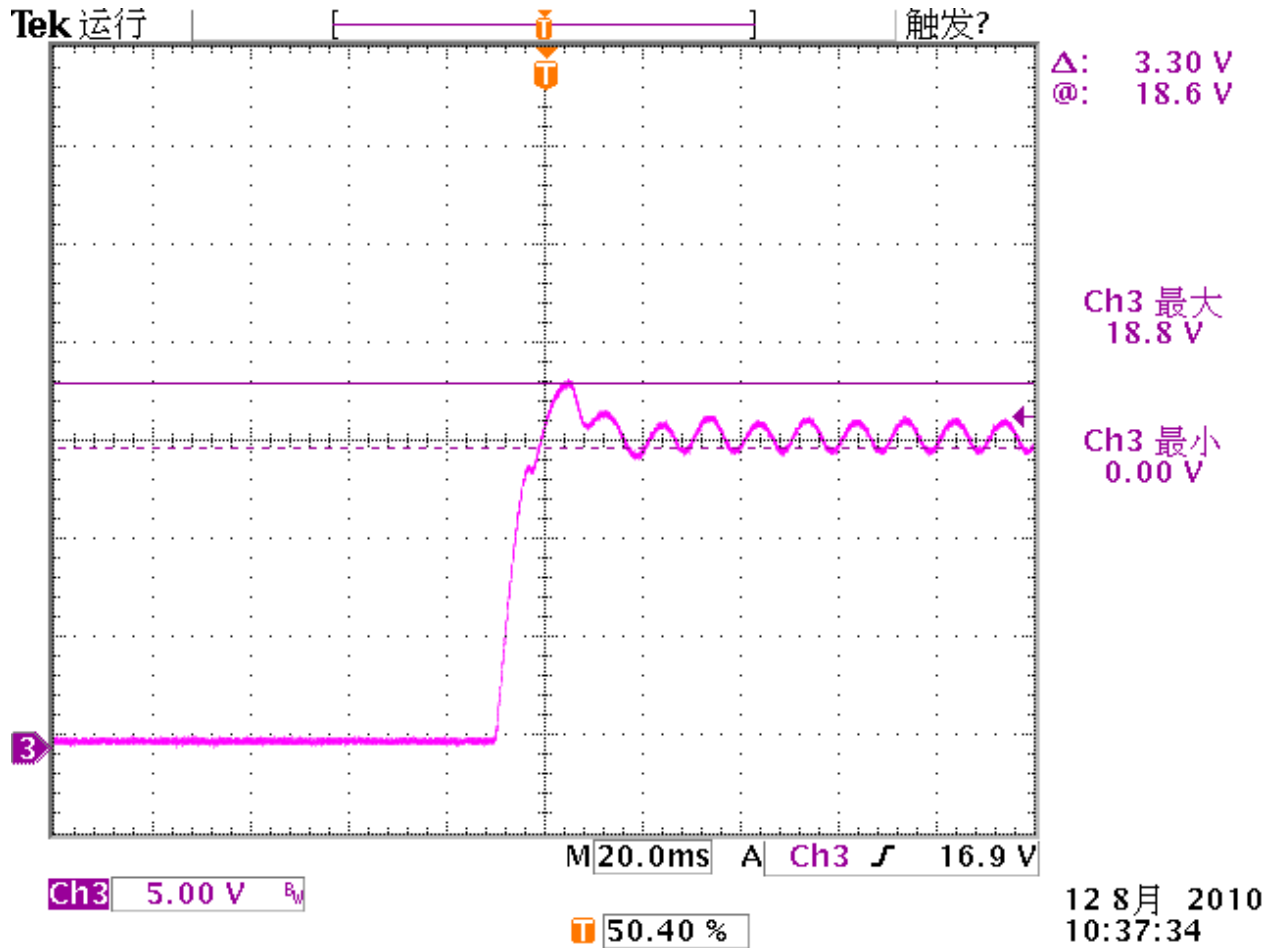


Figure 10 The waveform of Turn on Time at $V_{in} = 110V_{ac}/60Hz$ & full-load

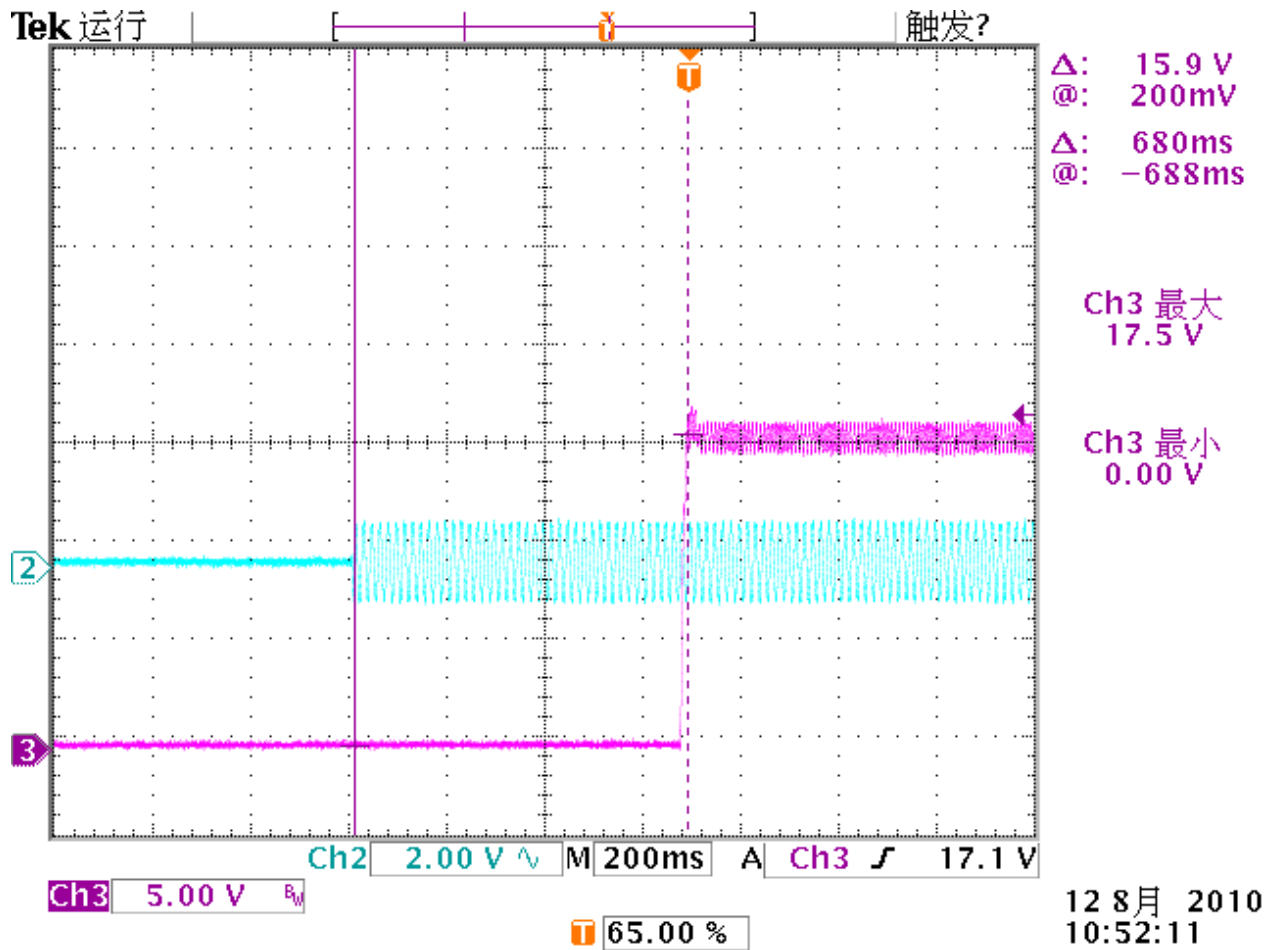


Figure 11 The waveform of Turn on Time at $V_{in} = 220V_{ac}/50Hz$ & full-load

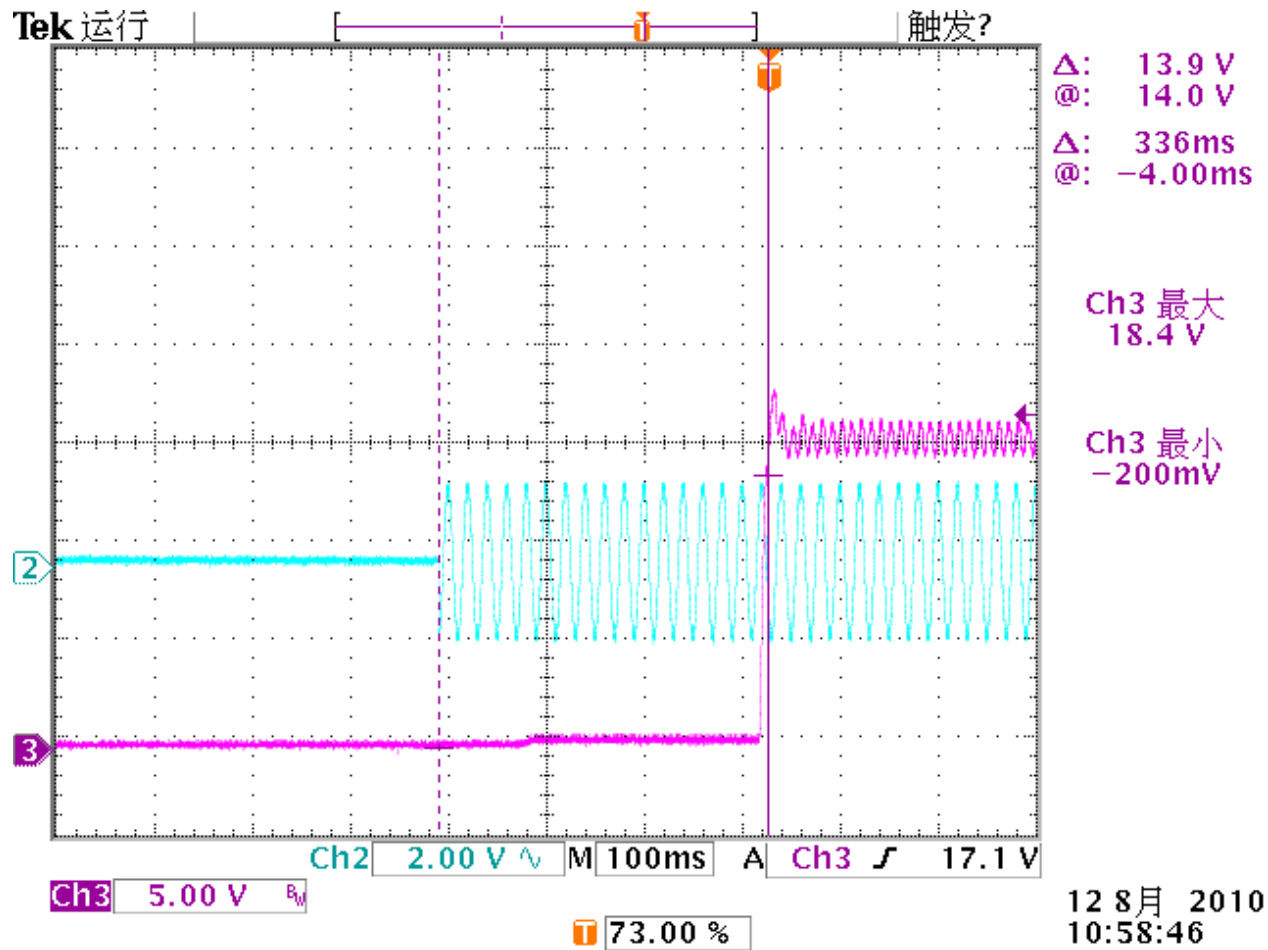
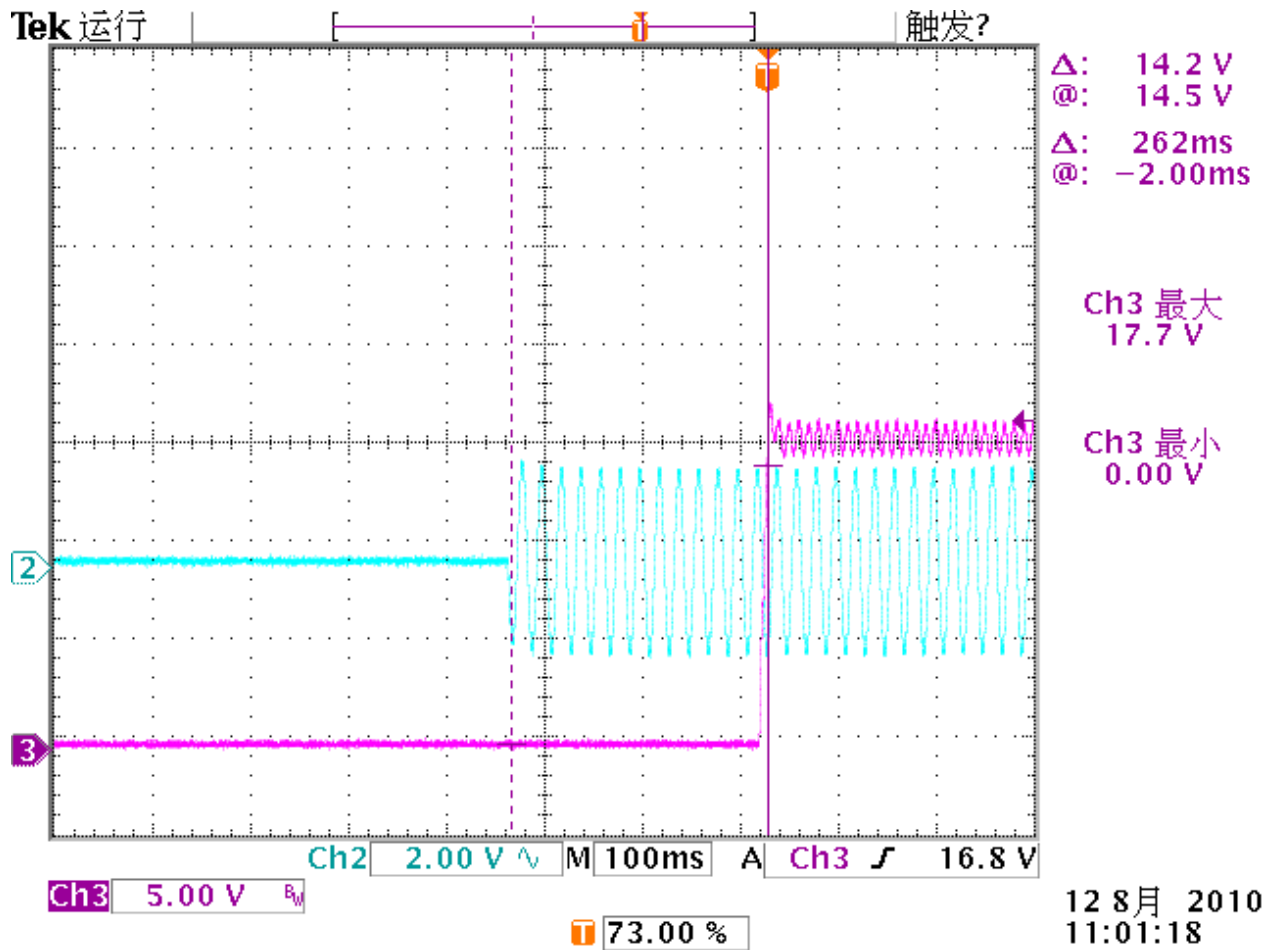


Figure 12 The waveform of Turn on Time at Vin = 264Vac/50Hz & full-load



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4.5 Voltage stress on MOSFET

Test Condition:

Measure the voltage on MOSFET and secondary rectifiers on full load.

Vin(V)	State	Stress on MOSFET	Note	Rating			
264	Normal	584V	Figure13	650V			
	Startup	600V	Figure14				

Figure 13 The waveform of Drain at Vin = 264Vac/50Hz & full-load

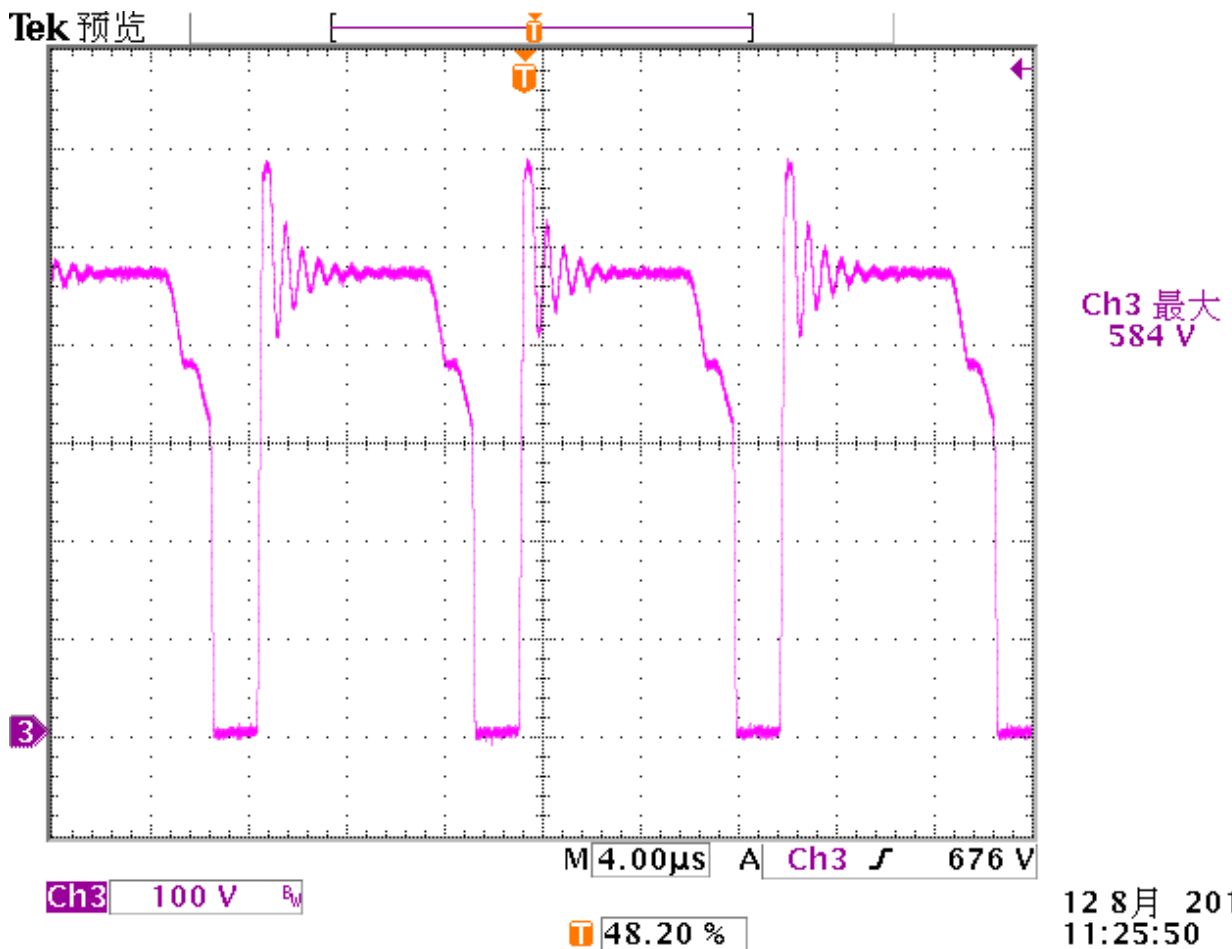
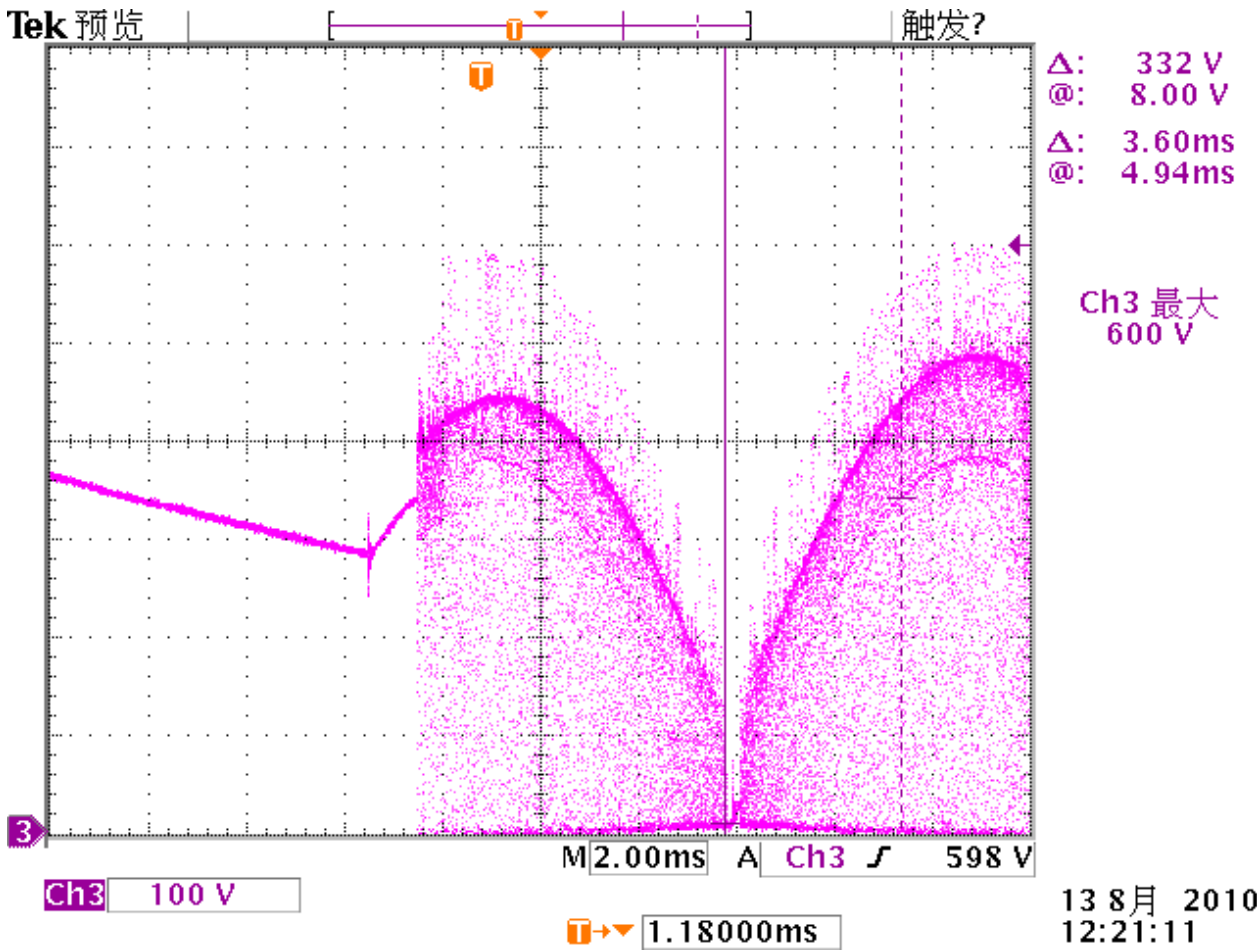


Figure 14 The waveform of Drain at $V_{in} = 264V_{ac}/50Hz$ & full-load Startup



4.6 Constant Current

Input Voltage	Current Limit Value(A)	Result
90V /60Hz	0.334	PASS
100V /60Hz	0.334	
110V /60Hz	0.334	
220V /50Hz	0.334	
230V /50Hz	0.334	
264V /50Hz	0.334	

6. BOM List

序號	品名	規格	數量	製程	打件位置
1	晶片電阻	RES SMD 1/2W 390K F 1206	2	SMD	R1,R2
2	晶片電阻	RES SMD 1/2W 560K F 1206	2	SMD	R3,R4
3	晶片電阻	RES SMD 1/4W 4R7 F 0805	1	SMD	R6
4	晶片電阻	RES SMD 1/4W 13K F 0805	1	SMD	R5
5	晶片電阻	RES SMD 1/4W 43k F 0805	1	SMD	R7
6	晶片電阻	RES SMD 1/4W 10R F 0805	1	SMD	R8
7	晶片電阻	RES SMD 1/2W 3.3R F 1206	1	SMD	R10
8	晶片電阻	RES SMD 1/8W 10K F 0603	4	SMD	R12,R13,R18,R19
9	晶片電阻	RES SMD 1/8W 13K F 0603	2	SMD	R14
10	晶片電阻	RES SMD 1/8W 1K F 0603	2	SMD	R15,R20
11	晶片電阻	RES SMD 1/8W 47K F 0603	2	SMD	R16,R22
12	晶片電阻	RES SMD 1/8W 0R F 0603	1	SMD	R17
13	晶片電容	CAP SMD X7R 10 50V 0805	1	SMD	C3
14	晶片電容	CAP SMD X7R 103 50V 0805	2	SMD	C4
15	晶片電容	CAP SMD X7R 223 50V 0805	1	SMD	C5
16	晶片電容	CAP SMD X7R 103 50V 0603	2	SMD	C6
17	晶片電容	CAP SMD X7R 104 50V 0805	1	SMD	C7
18	晶片電容	CAP SMD X7R 334 50V 0805	1	SMD	C8
19	晶片電容	CAP SMD X7R 105 50V 0805	1	SMD	C9
20	PWM IC	iP7302 SO8	1	SMD	IC1
21	REFERENCE IC	iP7700 SOT-23-6	1	SMD	IC3
22	橋式整流器	B6S 600V/0.8A	1	SMD	BD1
23	穩壓二極管	5.1V MLL-34	1	SMD	ZD2
24	穩壓二極管	12V MLL-34	1	SMD	ZD2
25	三極管	3904	1	SMD	Q2
26	二極體	1N4007 SOT-123	1	SMD	D2
27	FUSE	1A/250V	1	DIP	F1
28	X-CAP	0.1uF/275VAC	1	DIP	CX1
29	电感	3mH	1	DIP	L1
30	金屬皮膜電容	103/630V	1	DIP	C1
31	金屬皮膜電容	473/630V	1	DIP	C2
32	鋁質電解電容	10uF/50V LONG LIFE	1	DIP	E1
33	鋁質電解電容	470uF/25V LONG LIFE	1	DIP	E2
34	二極管	P6KE200A TVS	1	DIP	Z1

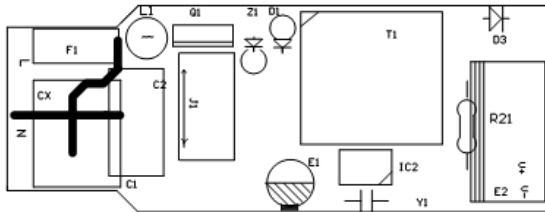
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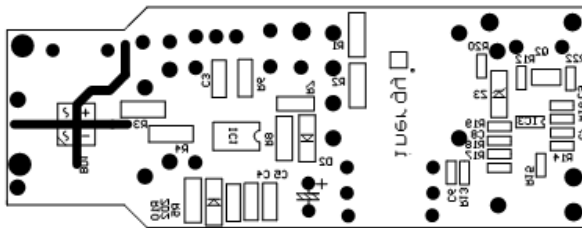
35	跳线	10mm	1	DIP	J1
36	电阻	0R68 1W	1	DIP	R21
37	二极管	1N4007 1A/600V	1	DIP	D1
38	變壓器	2.0mH EFD15	1	DIP	T1
39	二极管	SB2100 2A/100V	1	DIP	D3
40	光耦合器	PC817B DIP4	1	DIP	IC2
41	MOSFET	2N70L 2A/700V	1	DIP	Q1
42	Y-CAP	222M	1	DIP	Y1

7. PCB Layout

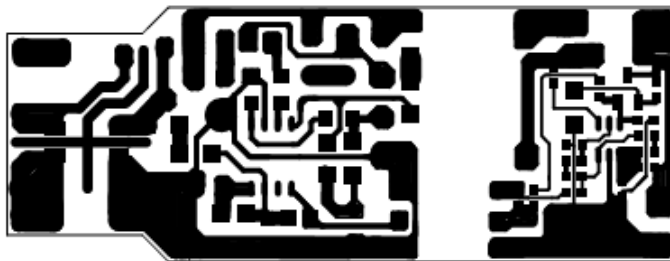
7.1 Top Silkscreen



7.2 Bottom Silkscreen



7.3 Bottom Layer

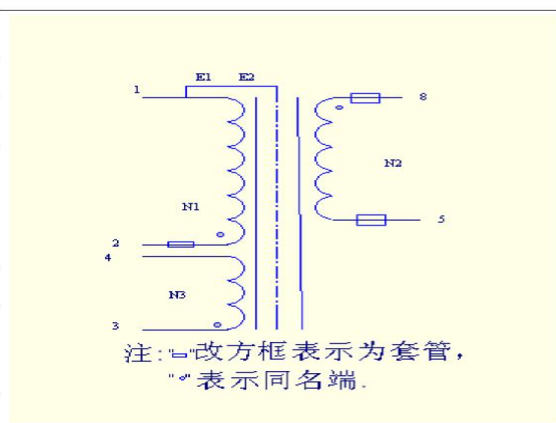


8. Transformer

8.1 Schematic & Winding

高频变压器规格

纸编号:		型号: TF_1901				图示:	
骨架:		EFD15_4+4					
磁芯:		PC40 或同等材质 EE19					
输入电压:		85V~265V					
绕制说明							
1~2	主绕组	电感量: $L_p=2.0\text{mH} \pm 5\%$					
初级绕组	脚位	股数 (C)	线径 (mm)	匝数 (T)			
E1	1	4	0.1	30			
N1	2~1	1	0.15	162			
次级绕组	脚位	股数 (C)	线径 (mm)	匝数 (T)	输出电压电流		
E2	4	1	0.05mm*7mm*0.9TS (铜箔居中)				
N2	8~5-	1	0.3	27	16V~0.3A		
N3	3~4	1	0.15	25	15V~0.1A		
注: 绕制依此顺序是 E1,N1 , E2,N2, N3 都是密绕。							
制表: Redsun wang		审核:		批准:		日期: 2010-8-3	



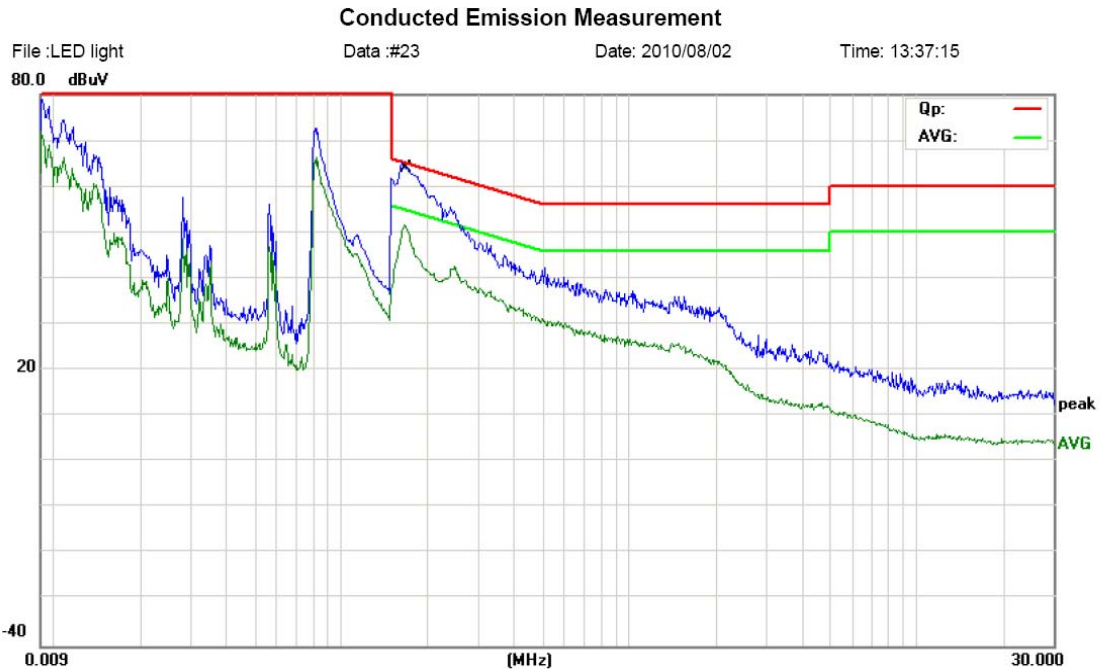
9. EMI Test

9.1 Conduction (EN55015 Class B)

Figure 15 The waveform of Conduction – L at Vin =230Vac/50Hz & full-load



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
Guangdong, China
Tel: 0755-86170306 Fax: 0755-86170310



Site site #1	Phase: L1	Temperature: 26
Limit: EN55015 Conduction QP	Power: AC 230V/50Hz	Humidity: 60 %
EUT: LED light		
M/N: 5W		
Mode: ON		
Note:		

No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV	Limit dBuV	Over dB	Detector	Comment
1	*	0.1700	49.00	10.20	59.20	64.96	-5.76	QP	
2		0.1700	38.00	10.20	48.20	54.96	-6.76	AVG	



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
Guangdong, China
Tel: 0755-86170306 Fax: 0755-86170310

Radiated Emission Measurement

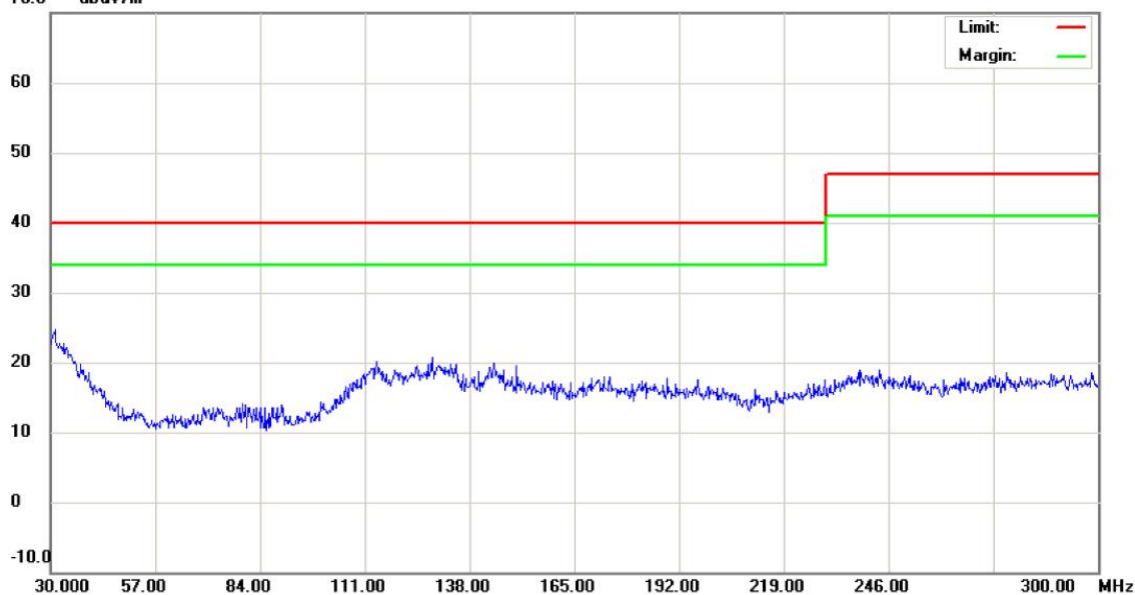
File : 7302-6W

Data : #16

Date: 2010-8-2

Time: 13:18:12

70.0 dBuV/m



Site site MOST 3M

Polarization: **Vertical**

Temperature: 26

Limit: EN 55015 3m Radiation

Power: AC 230V/50Hz

Humidity: 60 %

EUT: LED Light

Distance:

M/N: 7302-5W

Mode: On

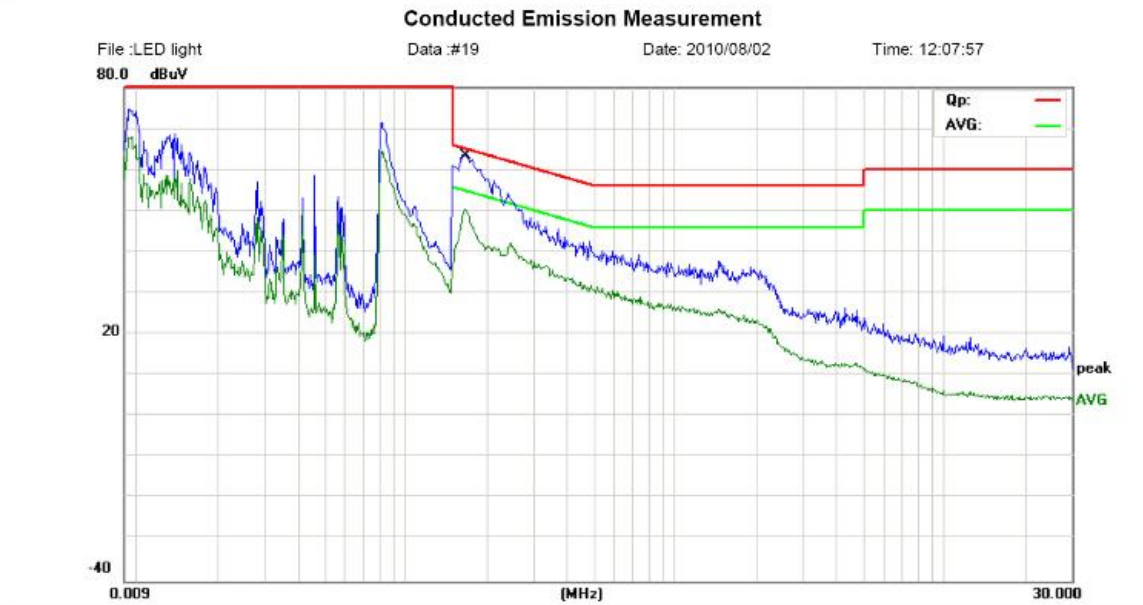
Note: 无共模电感

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment

Figure 16 The waveform of Conduction – N at Vin =230Vac/50Hz & full-load



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
Guangdong, China
Tel: 0755-86170306 Fax: 0755-86170310



Site site #1 Phase: **N** Temperature: 26
 Limit: EN55015 Conduction QP Power: AC 230V/50Hz Humidity: 60 %
 EUT: LED light
 M/N: 5W
 Mode: ON
 Note:

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Detector	Comment
		MHz	dBuV	dB	dBuV	dBuV	dB		
1	*	0.1700	48.00	10.20	58.20	64.96	-6.76	QP	
2		0.1700	37.00	10.20	47.20	54.96	-7.76	AVG	



Address: No.5, Langshan 2nd Rd., North Hi-Tech Industrial park
Guangdong, China
Tel: 0755-86170306 Fax: 0755-86170310

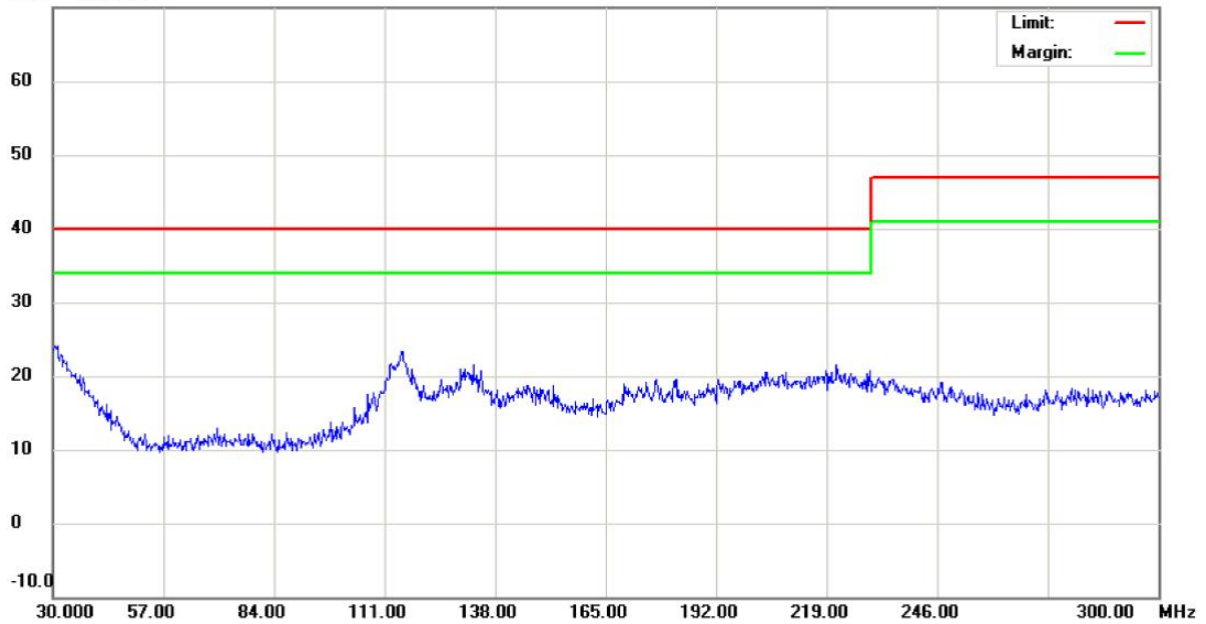
Radiated Emission Measurement

File: 7302-6W
70.0 dBuV/m

Data: #15

Date: 2010-8-2

Time: 13:17:29



Site: site MOST 3M

Polarization: *Horizontal*

Temperature: 26

Limit: EN 55015 3m Radiation

Power: AC 230V/50Hz

Humidity: 60 %

EUT: LED Light

Distance:

M/N: 7302-5W

Mode: On

Note: 无共模电感

No.	Mk.	Freq.	Reading Level	Correct Factor	Measurement	Limit	Over	Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	cm	degree	Comment

10. Revision History

Ver.	Date	Change Notice
1.0	2010/08/17	Original