

Z

TR-P7302-1



iP7302 16W LED Driver with iP7700 Test Report

16W LED Driver Demo Board Base on

PFC Flyback Switch iP7302

Part Number: IS7302_7700_ZP01_LED7W (41V0.4A)

Outline Dimension: L x W x H (264.4mm / 18mm / 12mm)



Photo1. Top View



Photo3. Bottom View



Contents

1. Test Equipments	4
2. Demo Board Specification	4
3. Demo Board Test Item List	5
4. Electronic Characteristics Test Data	6
4.1 Efficiency	6
4.2 Ripple & Noise	7~10
4.3 Over Shoot	11~14
4.4 Time Sequence Characteristic	15~18
4.5 Voltage stress on MOSFET.....	19~20
4.5 Voltage stress on MOSFET.....	19~20
4.6 Constant Current.....	21
5. Schematic	22
6. BOM List	23~24
7. PCB Layout	25~27
7.1 Top silkscreen	25
7.2 Top layer	26
7.3 Bottom layer	27
8. Transformer.....	28
8.1 Schematic & Winding	28
9. EMI Test	29~32
9.1 Conduction (EN55015 Class B)	29~32
10. Revision History	33



Figure List

Figure 1	The waveform of Ripple & Noise at Vin = 90Vac/60Hz & full-load	-----7
Figure 2	The waveform of Ripple & Noise at Vin = 110Vac/60Hz & full-load	-----8
Figure 3	The waveform of Ripple & Noise at Vin = 220Vac/50Hz & full-load	-----9
Figure 4	The waveform of Ripple & Noise at Vin = 264Vac/50Hz & full-load	-----10
Figure 5	The waveform of Over shoot at Vin = 90Vac/60Hz & full-load	-----11
Figure 6	The waveform of Over shoot at Vin = 110Vac/60Hz & full-load	-----12
Figure 7	The waveform of Over shoot at Vin = 220Vac/50Hz & full-load	-----13
Figure 8	The waveform of Over shoot at Vin = 264Vac/50Hz & full-load	-----14
Figure 9	The waveform of Turn on Time at Vin = 90Vac/60Hz & full-load	----- 15
Figure 10	The waveform of Turn on Time at Vin = 110Vac/60Hz & full-load	-----16
Figure 11	The waveform of Turn on Time at Vin = 220Vac/50Hz & full-load	----- 17
Figure 12	The waveform of Turn on Time at Vin = 264Vac/50Hz & full-load	-----18
Figure 13	The waveform of Drain at Vin = 264Vac/50Hz & full-load	-----19
Figure 14	The waveform of Drain at Vin = 264Vac/50Hz & full-load startup	----- 20
Figure 15	The waveform of Conduction-L at Vin = 230Vac/50Hz & full-load	----- 29
Figure 16	The waveform of Conduction-N at Vin = 230Vac/50Hz & full-load	----- 30
Figure 17	The waveform of Conduction-L at Vin = 120Vac/60Hz & full-load	----- 31
Figure 18	The waveform of Conduction-N at Vin = 120Vac/60Hz & full-load	----- 32



1. Test Equipments

Name	Mark
AC Source	Extech 6905
Oscilloscope	Tektronix DPO3014
Power Meter	IV1001
Load	16W 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	41V/0.4A
Output Power	18W (max.)
Efficiency	> 80% Full Load
Conduction	EN55015 Class B

**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	<3S	Pass
Voltage stress on MOSFET	≤800V	Pass
Constant Current	0.4A (±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)	41.6	41.7	41.6
Iout (mA)	363	3975	3979
Pin (W)	17.4	19.1	19.0
Pout (W)	15.1	16.575	16.55
PF	0.998	0.996	0.995
η (%)	86.78	86.78	87.10

	220Vac	240Vac	264Vac
Vout (V)	41.5	41.5	41.4
Iout (mA)	3991	4025	3976
Pin (W)	19.2	19.5	19.4
Pout (W)	16.56	16.70	16.46
PF	0.965	0.955	0.937
η (%)	86.25	85.64	84.84



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	2.35 V	3V	OK	Figure 1			
110V/60Hz	2.52V	3V	OK	Figure 2			
220V/50Hz	2.47V	3V	OK	Figure 3			
264V/50Hz	2.40 V	3V	OK	Figure 4			

Full Load: 41V/0.4A

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

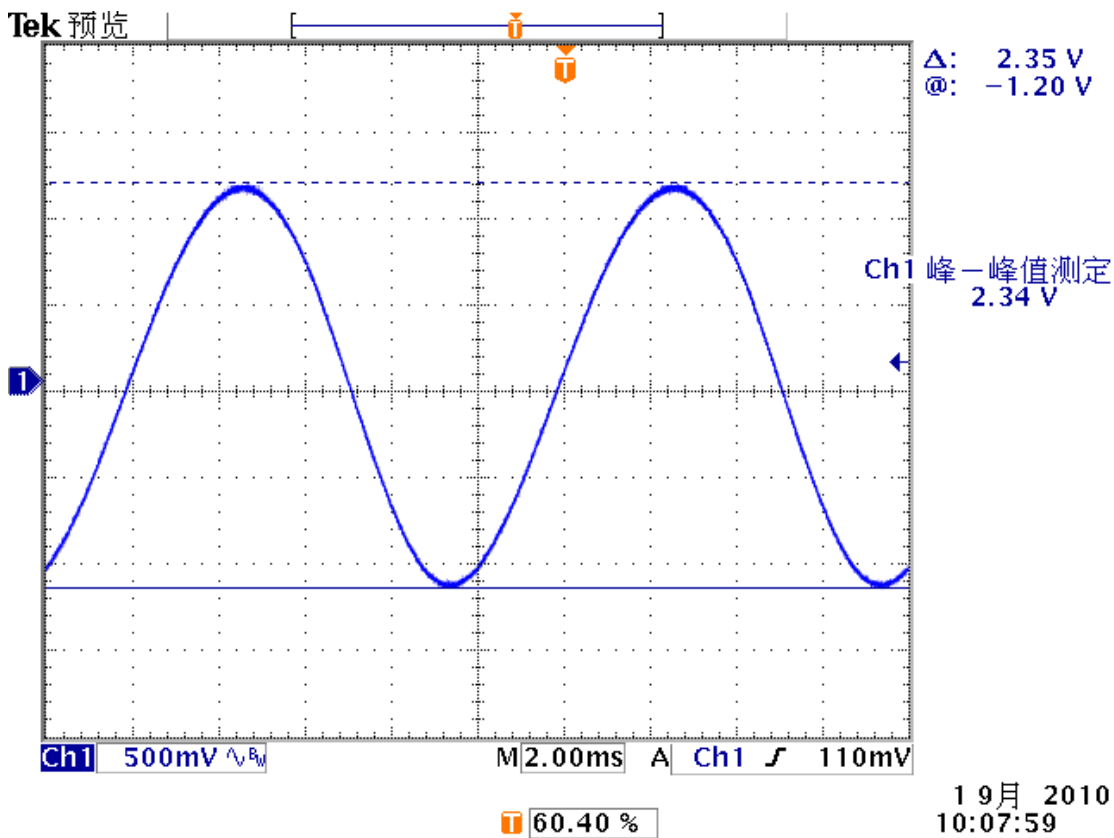




Figure 2 The waveform of Ripple & Noise at Vin = 110Vac/60Hz & full-load

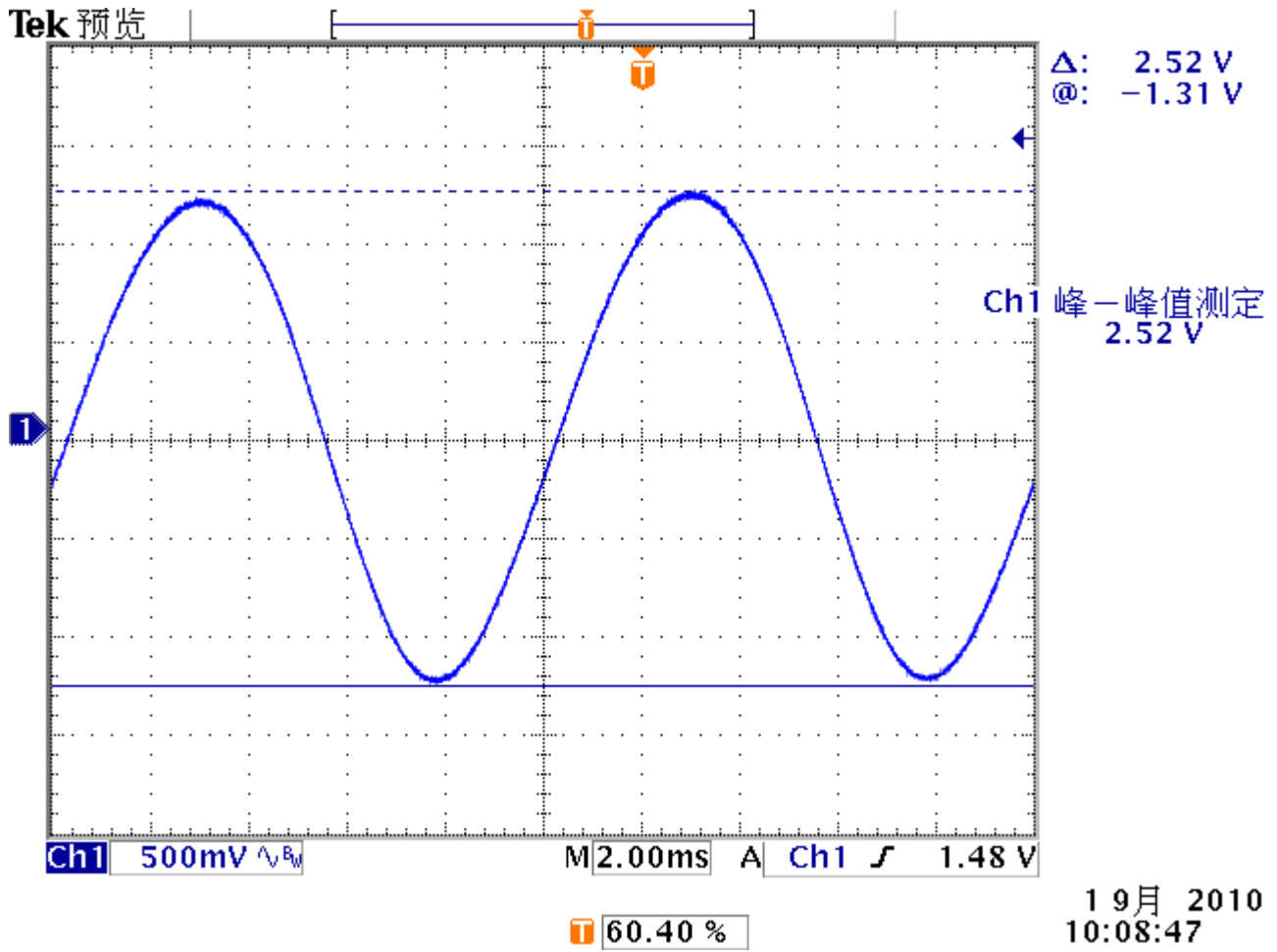




Figure 3 The waveform of Ripple & Noise at $V_{in} = 220V_{ac}/50Hz$ & full-load

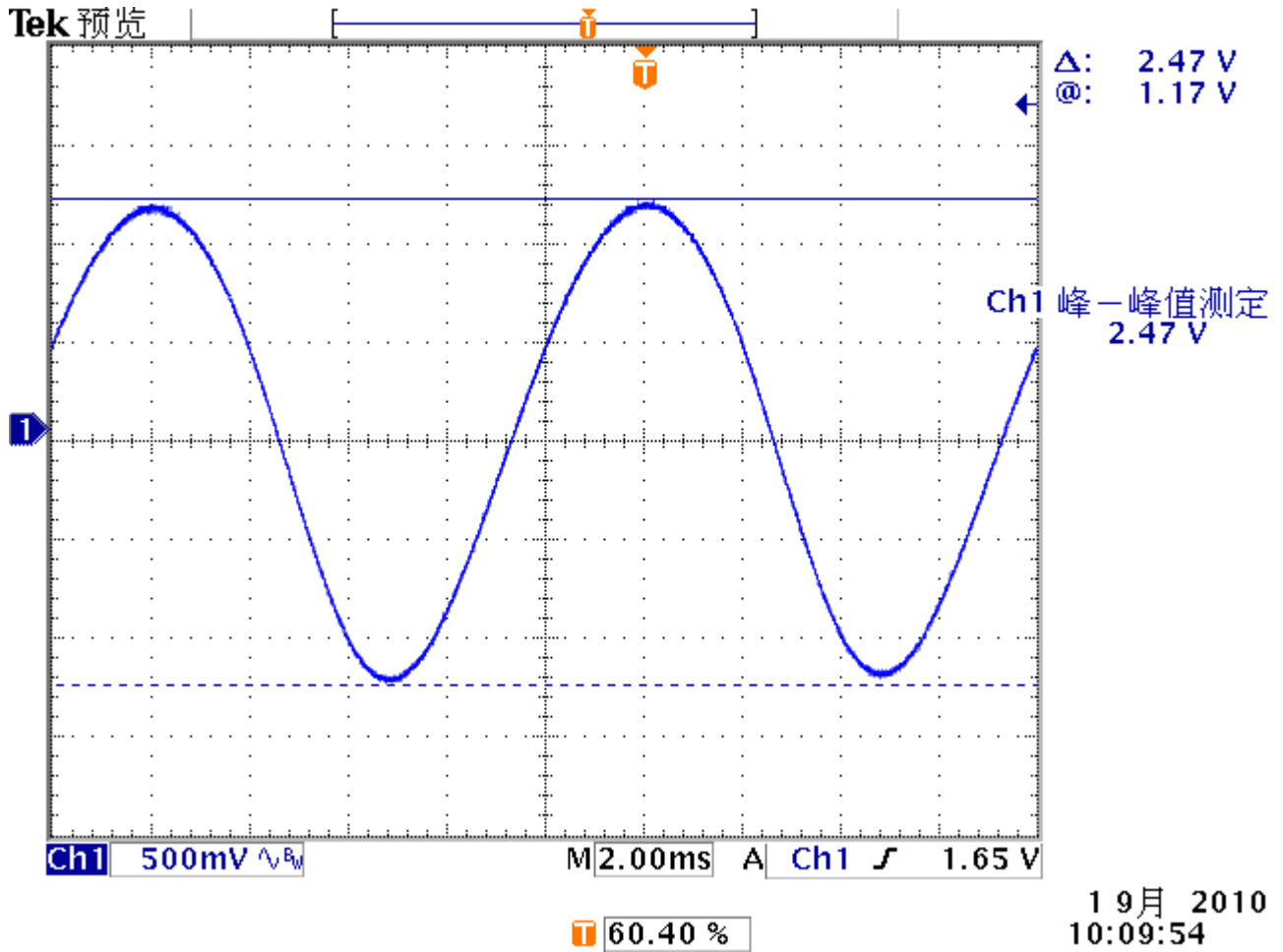
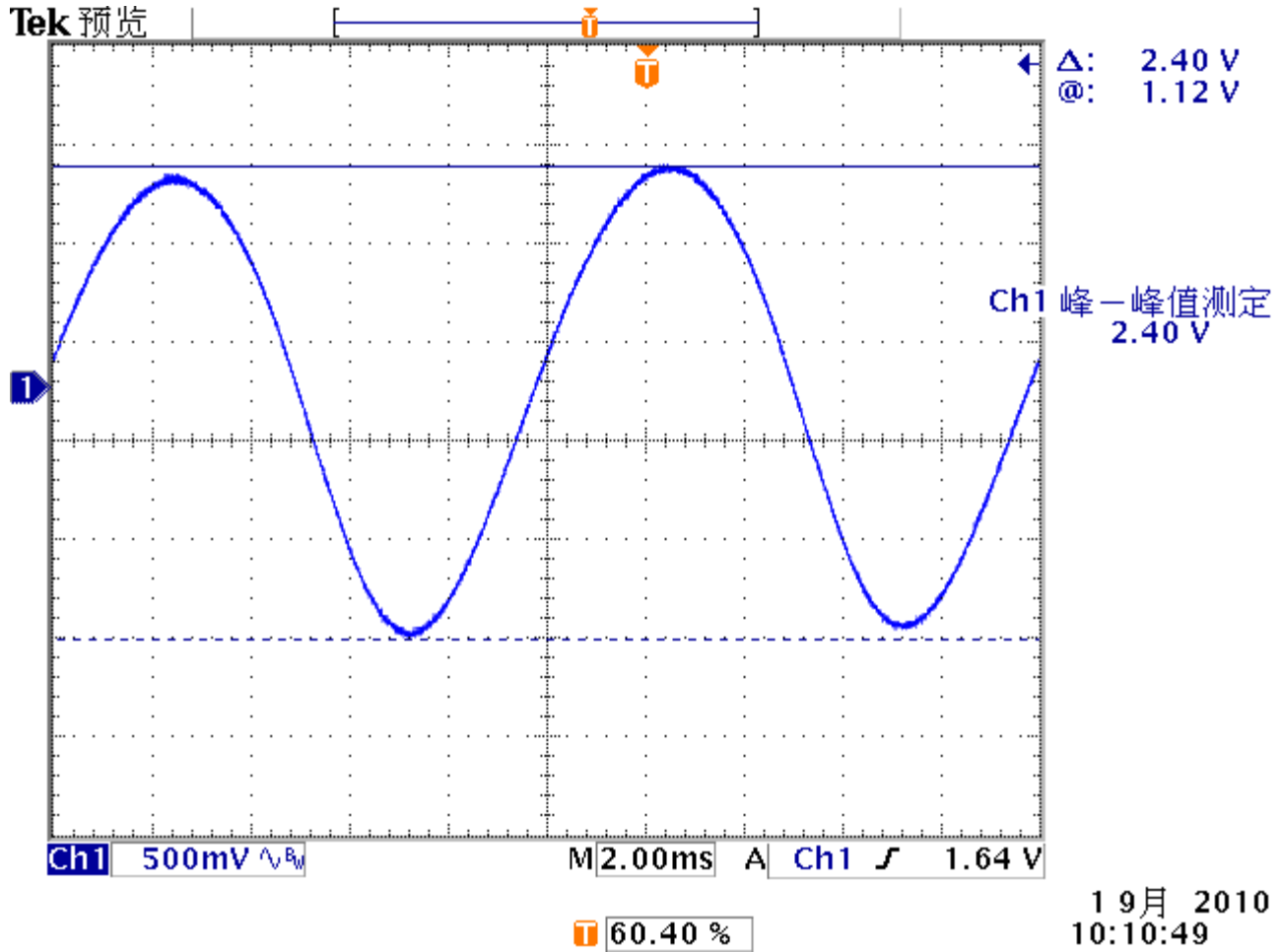




Figure 4 The waveform of Ripple & Noise at Vin = 264Vac/50Hz & full-load





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	--	20%	--	Figure8

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

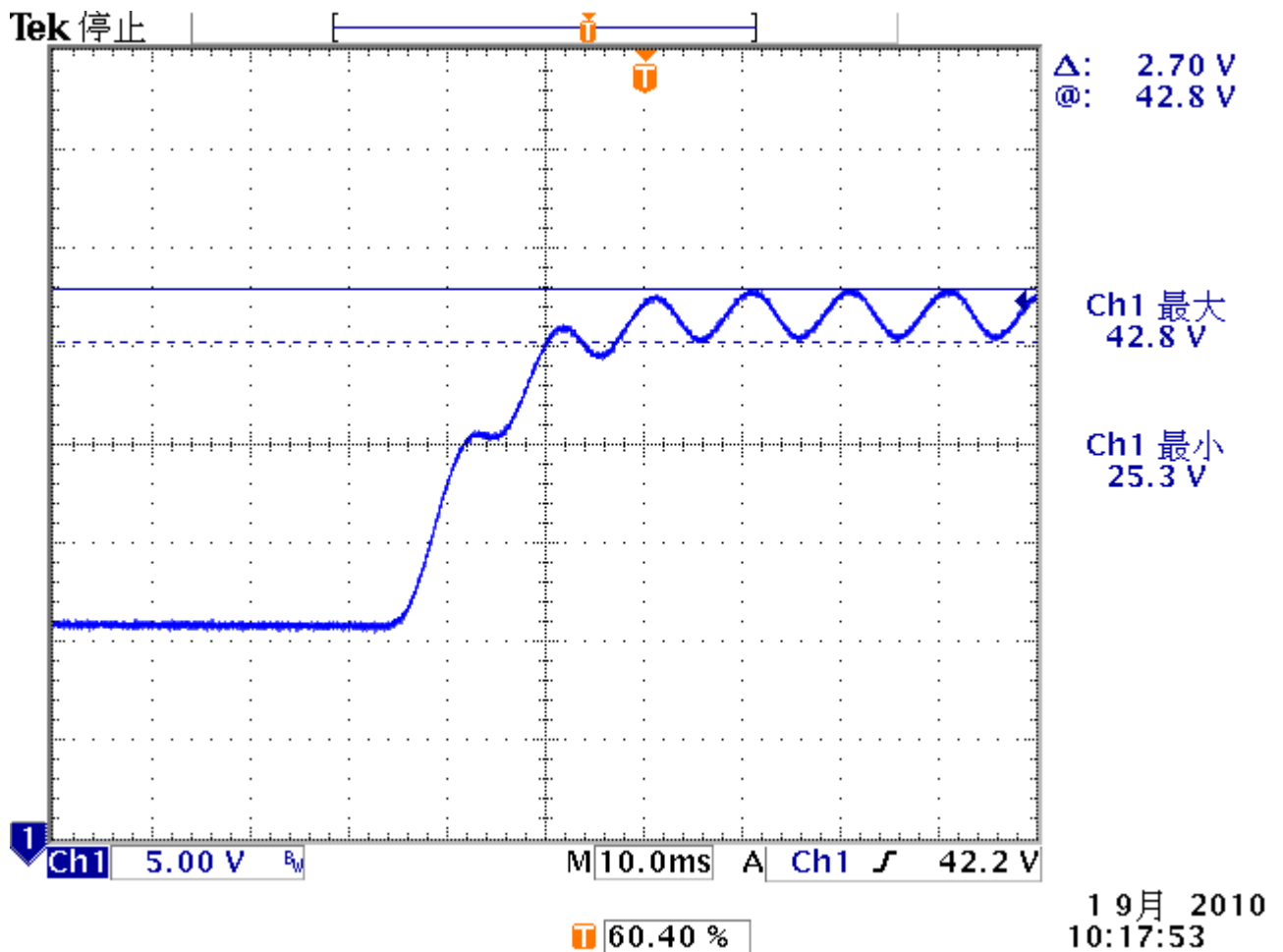




Figure 6 The waveform of Over Shoot at Vin = 110Vac/60Hz & Full load

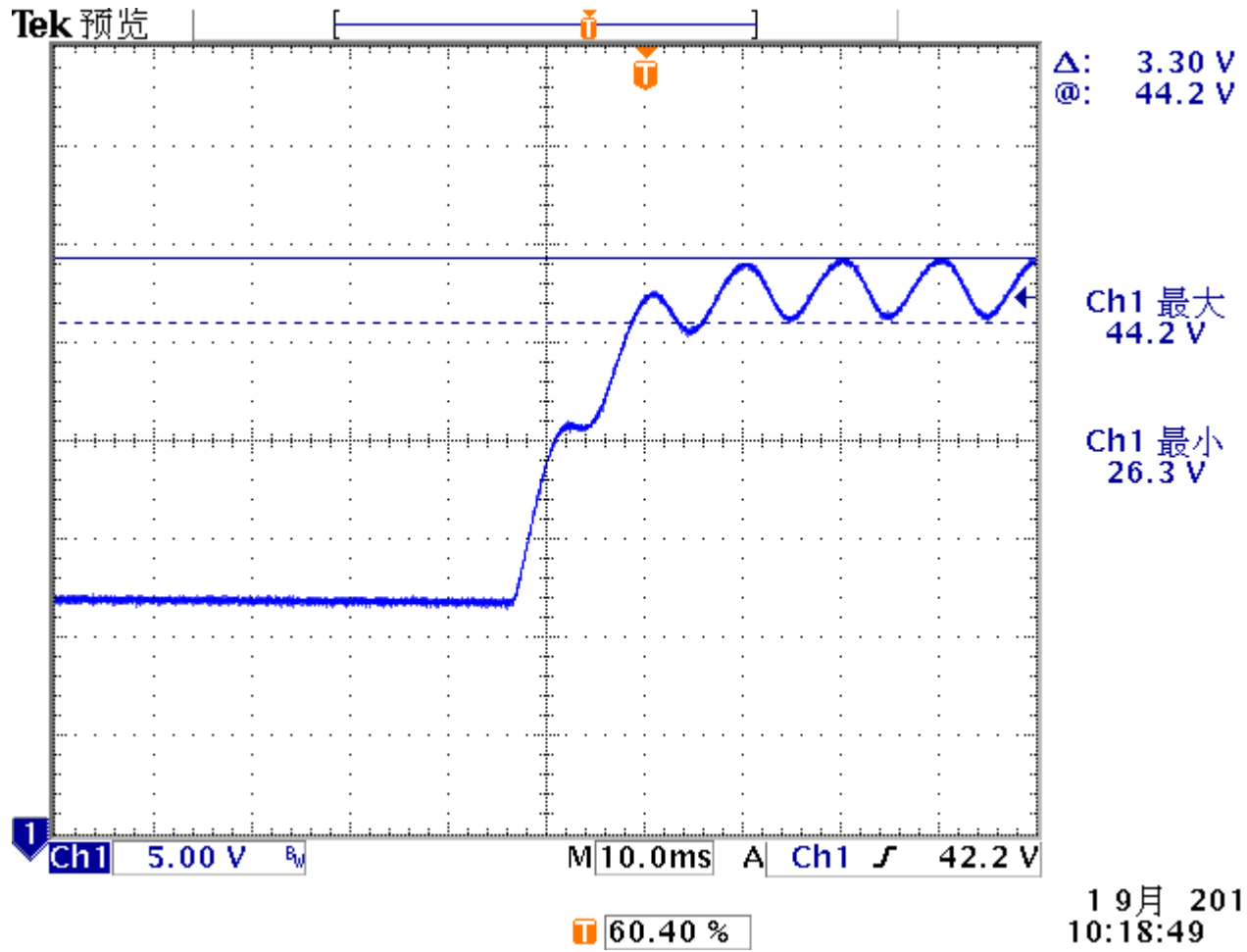




Figure 7 The waveform of Over Shoot at Vin = 220Vac/50Hz & Full load

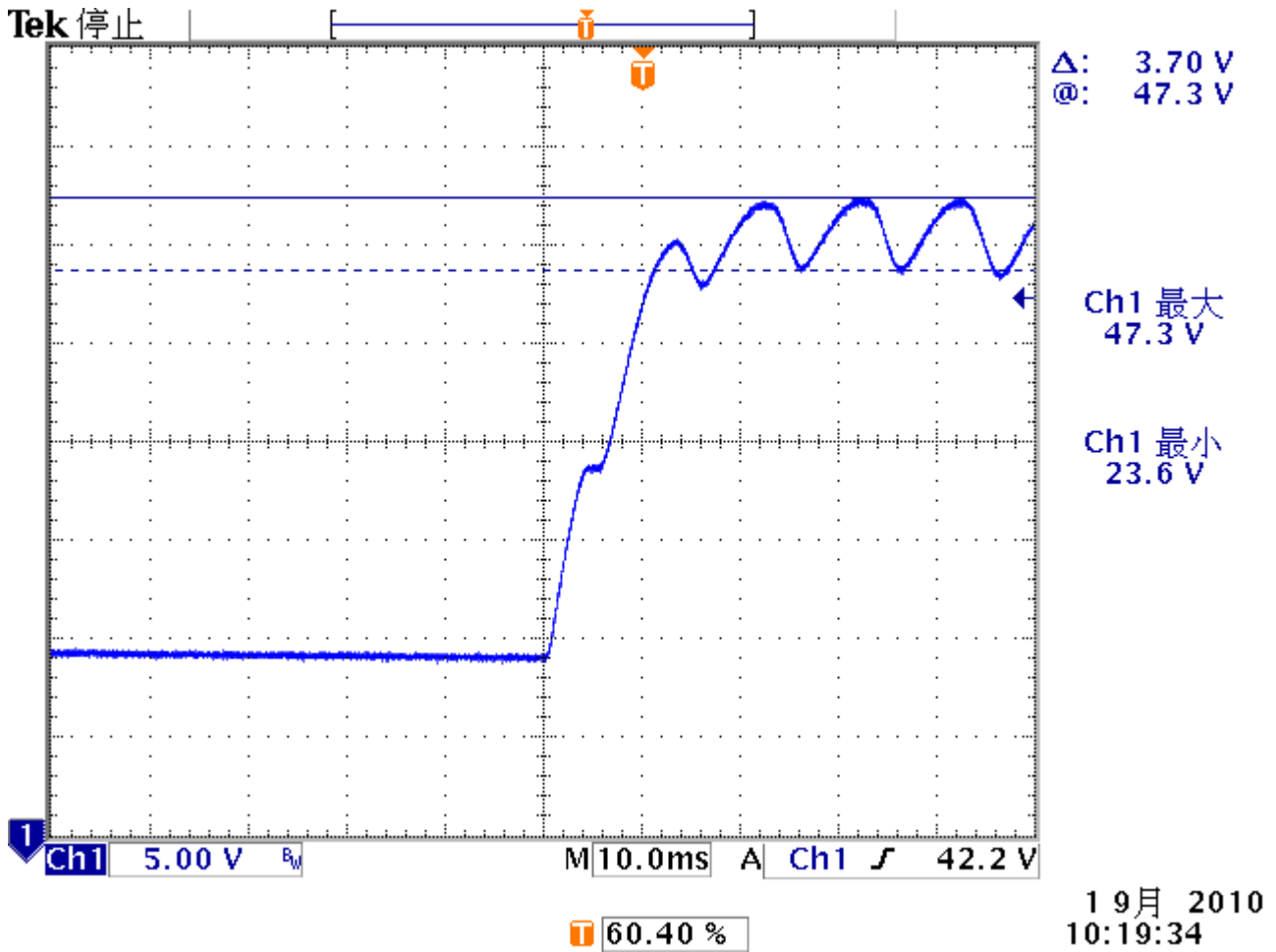
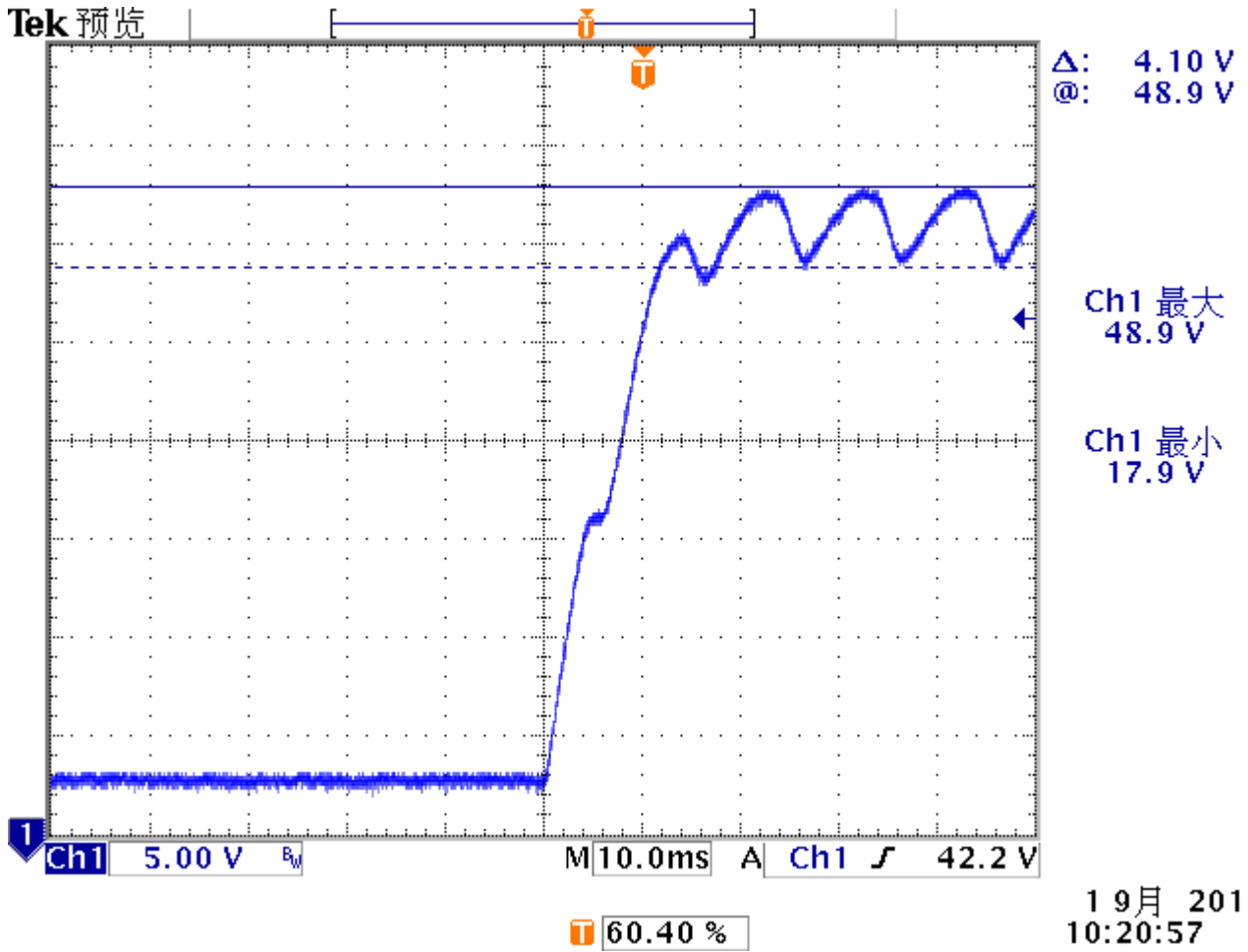




Figure 8 The waveform of Over Shoot at Vin = 264Vac/50Hz & Full load



4.4 Time Sequence Characteristic

Test Condition:

Turn on delay time , Hold up time, Rising time and Falling time are all base on full load.

Test data and results are as follows:

Item	Vin(ac)	Test Data	Spec	Result	Note
Turn on delay time	90V/60Hz	2.84S	<3S	Pass	Figure 9
	110V/60Hz	2S	<3S	Pass	Figure 10
	220V/50Hz	776mS	<3S	Pass	Figure 11
	264V/50Hz	648mS	<3S	Pass	Figure 12

Figure 9 The waveform of Turn on Time at Vin = 90Vac/60Hz & full-load

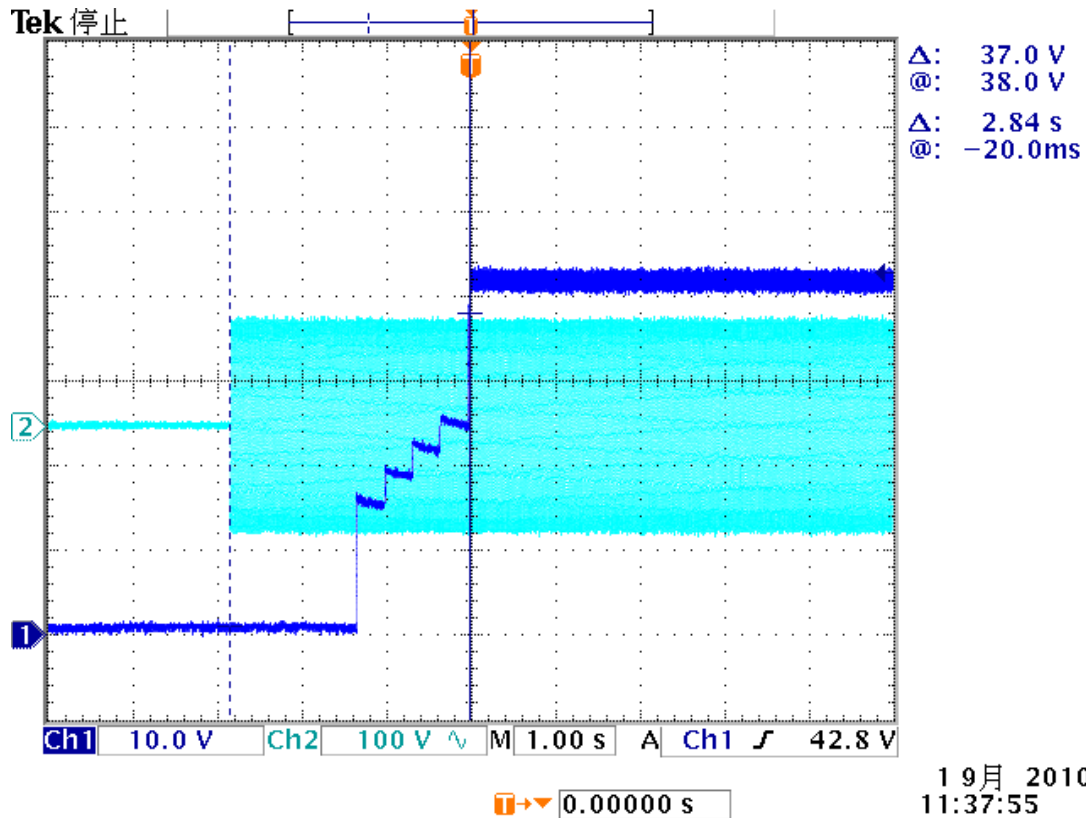




Figure 10 The waveform of Turn on Time at Vin = 110Vac/60Hz & full-load

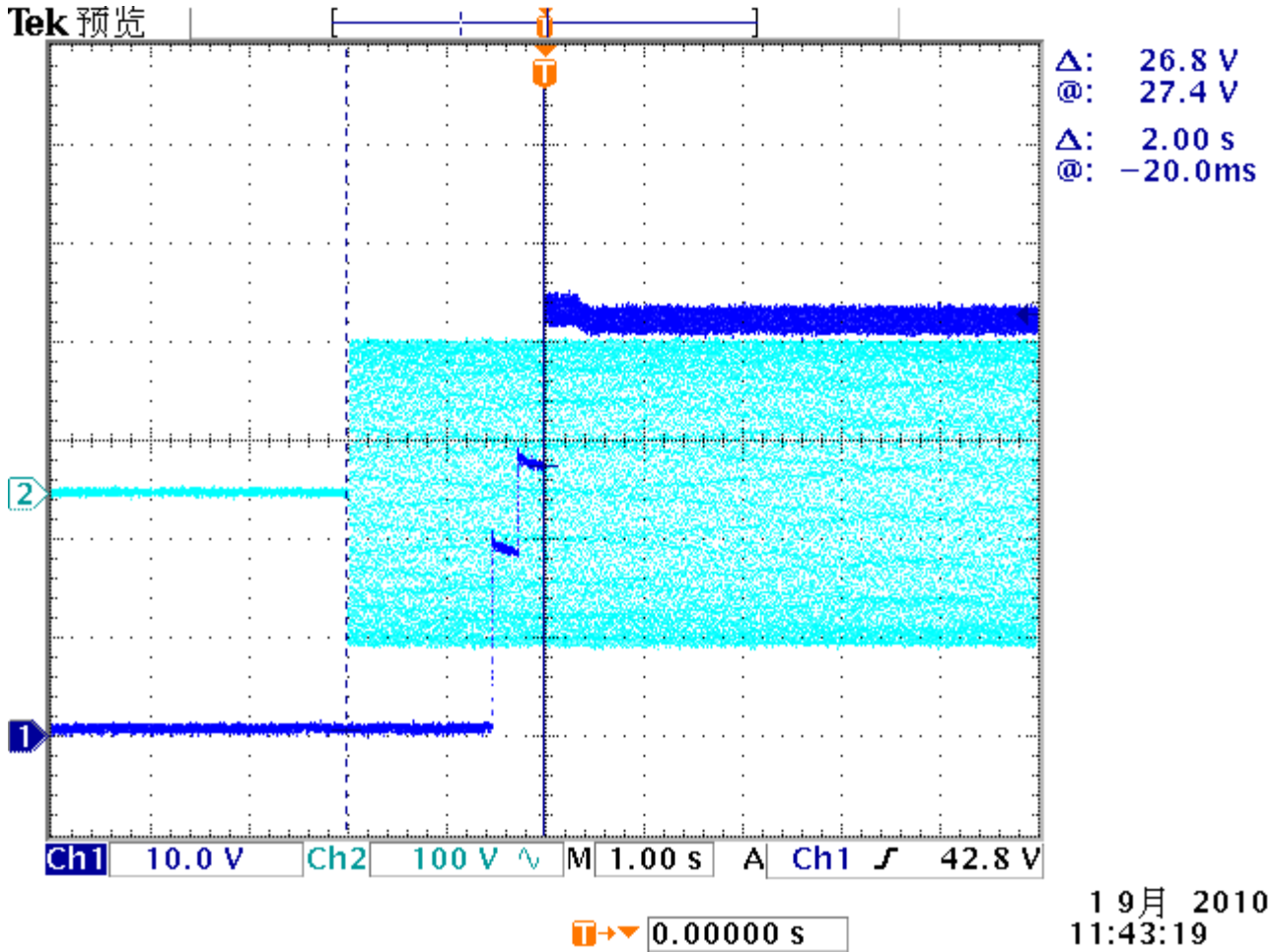




Figure 11 The waveform of Turn on Time at $V_{in} = 220V_{ac}/50Hz$ & full-load

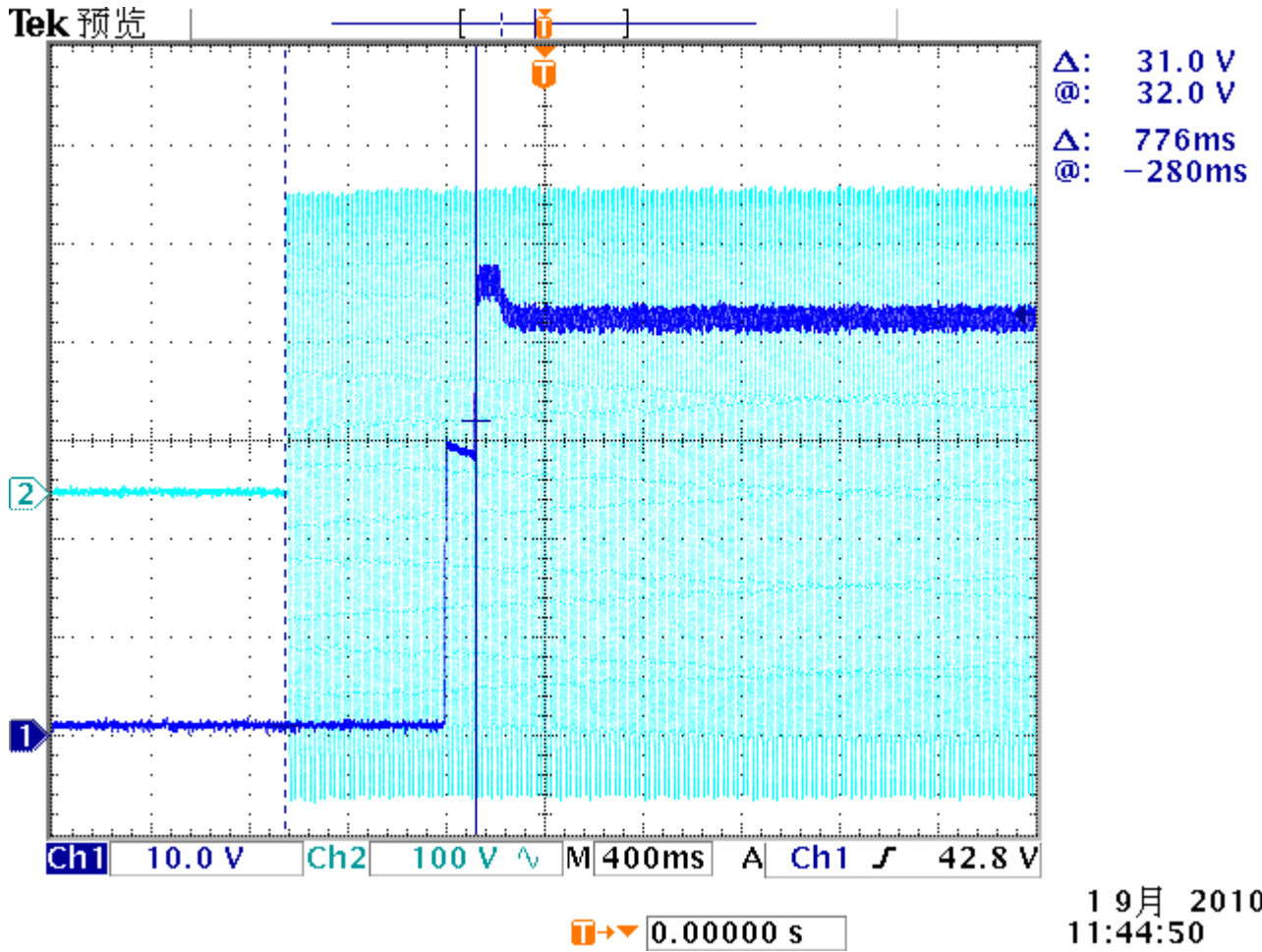
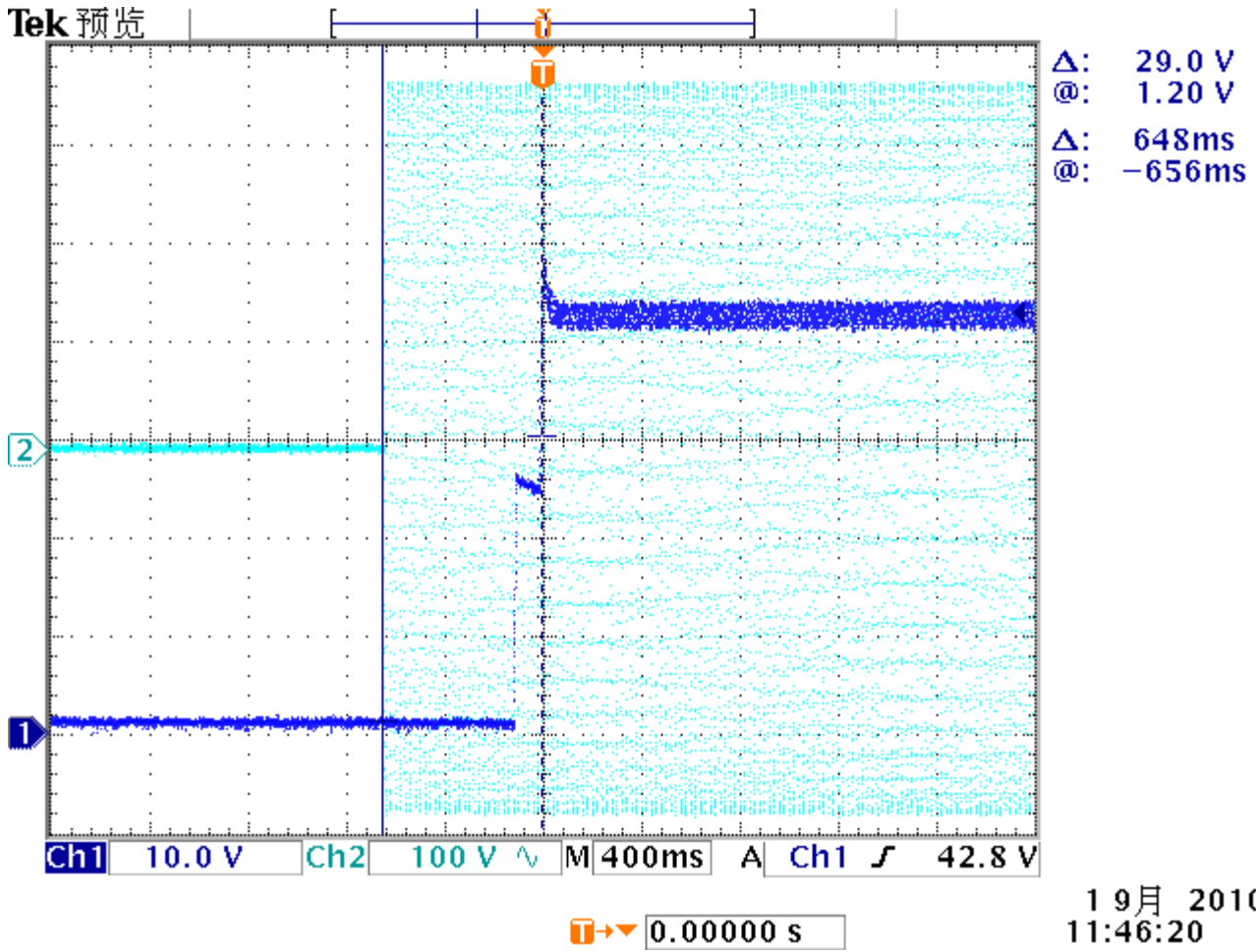




Figure 12 The waveform of Turn on Time at Vin = 264Vac/50Hz & full-load





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	532V	Figure13	800V			
	Startup	776V	Figure14				

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

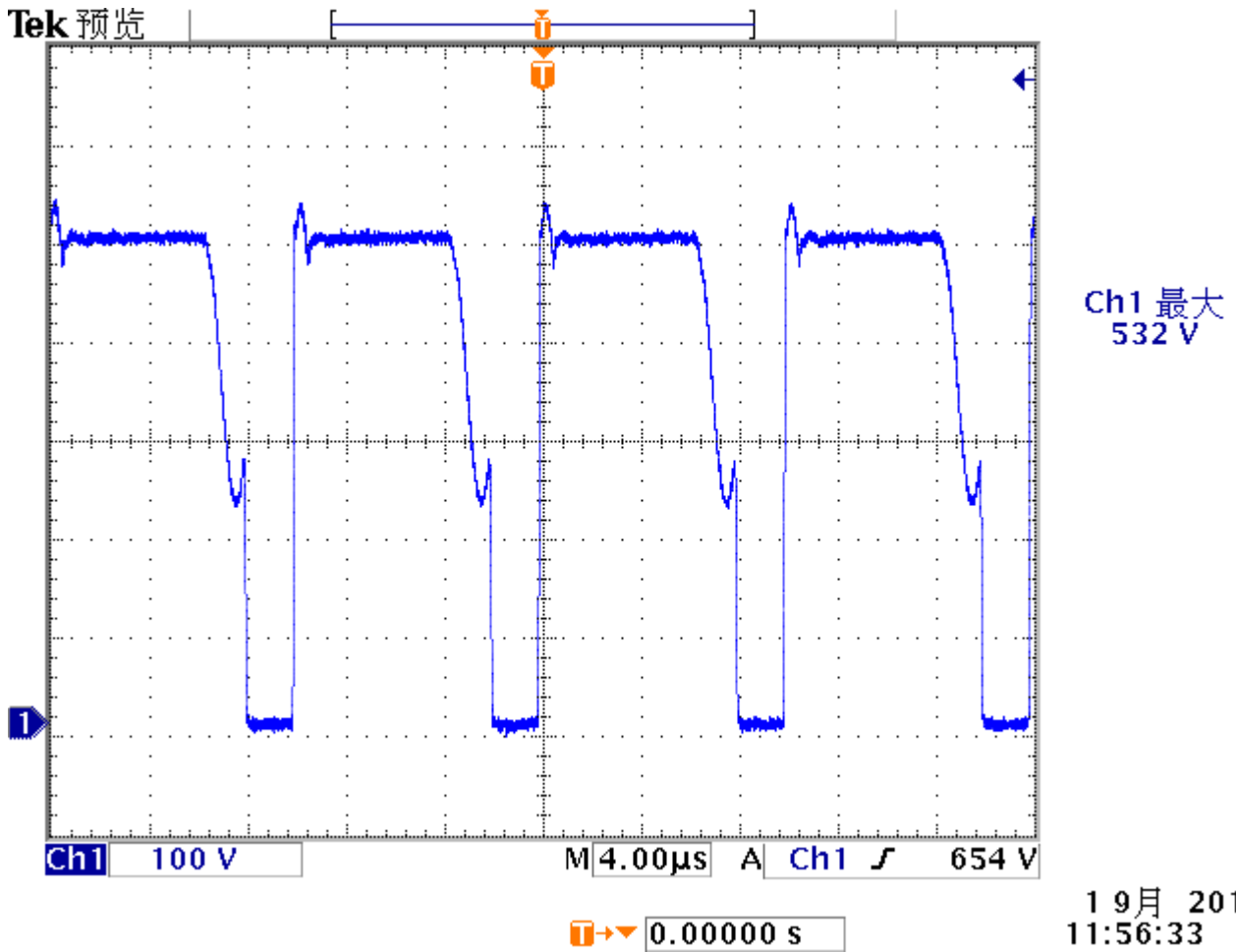
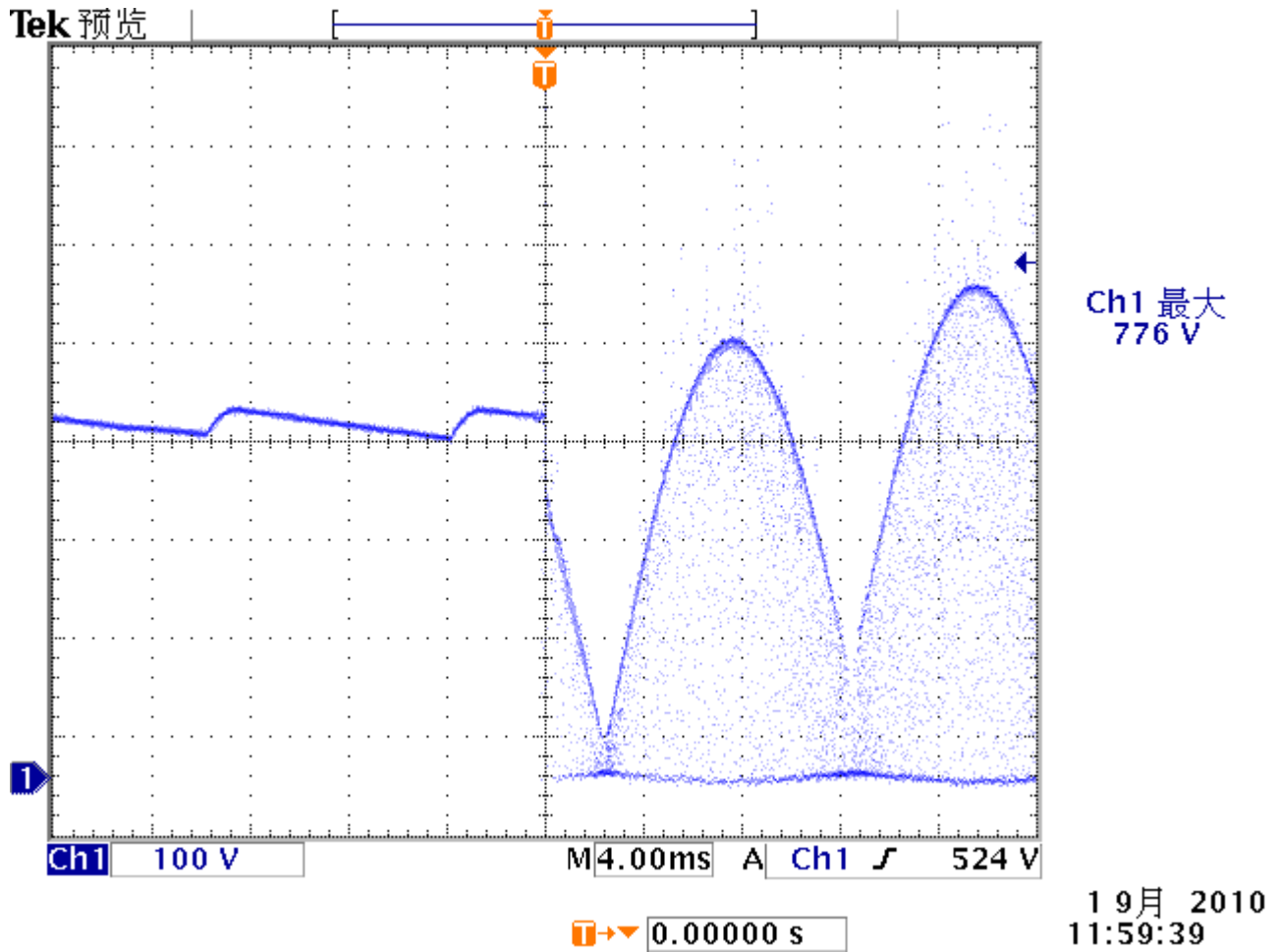




Figure 14 The waveform of Drain at Vin = 264Vac/50Hz & full-load Startup

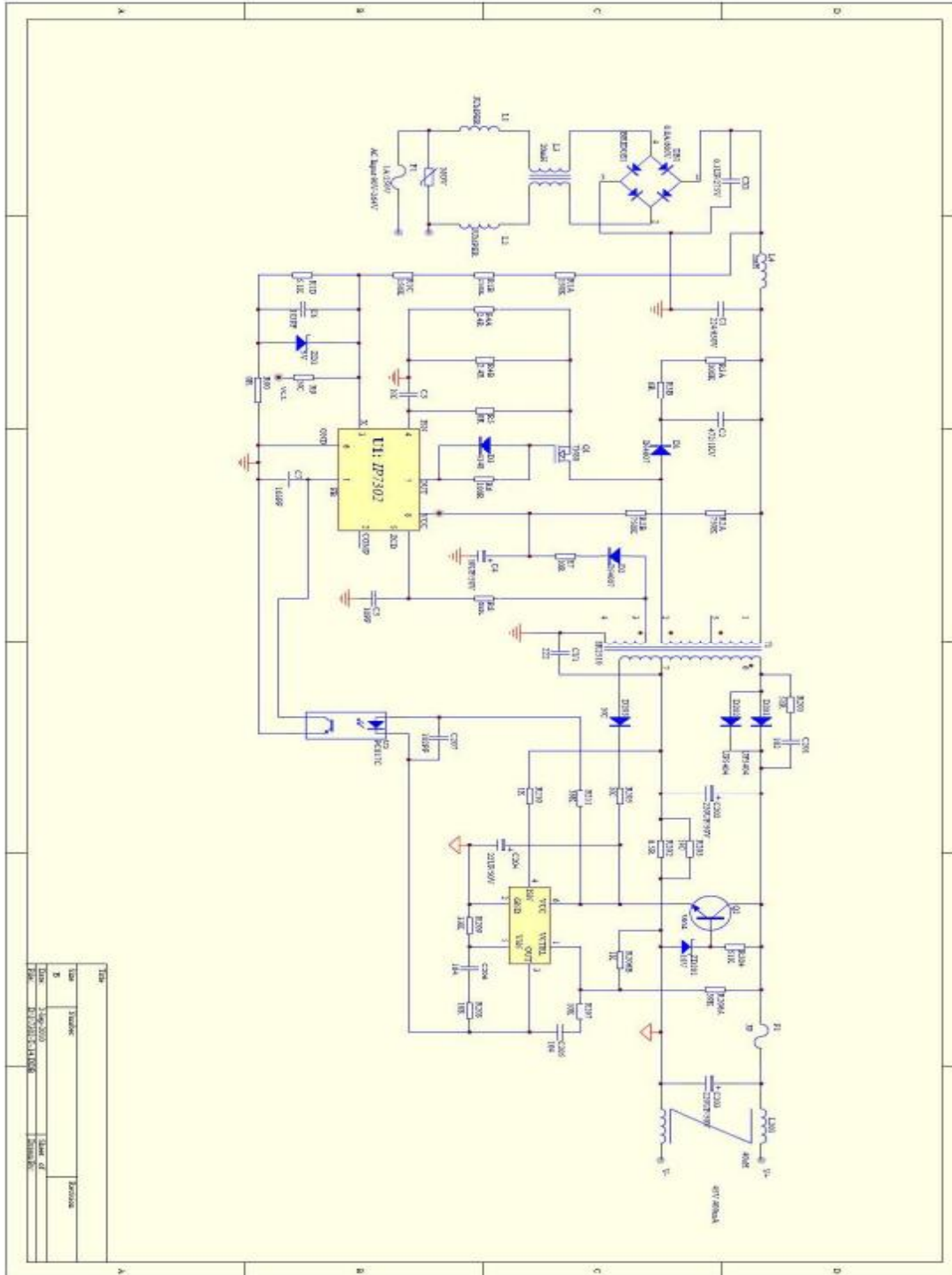


**4.6 Constant Current**

Input Voltage	Current Limit Value(A)	Result
90V /60Hz	0.363	PASS
100V /60Hz	0.3975	
110V /60Hz	0.3979	
220V /50Hz	0.3991	
230V /50Hz	0.4025	
264V /50Hz	0.3976	



5. Schematic





6. BOM List

序號	品名	規格	數量	製程	打件位置
1	晶片電阻	RES SMD 1/4W 150K F 0805	3	SMD	R1A, R1B, R1C
2	晶片電阻	RES SMD 1/2W 750K F 1206	2	SMD	R2A, R2B
3	晶片電阻	RES SMD 1/2W 2.4R F 1206	2	SMD	R4A, R4B
4	晶片電阻	RES SMD 1/2W 100K F 1206	1	SMD	R3A
5	晶片電阻	RES SMD 1/2W 0R F 1206	1	SMD	R3B
6	晶片電阻	RES SMD 1/4W 0R F 0805	1	SMD	R5, R00
7	晶片電阻	RES SMD 1/4W 100R F 0805	1	SMD	R6
8	晶片電阻	RES SMD 1/4W 5.1K F 0805	1	SMD	R1D
9	晶片電阻	RES SMD 1/4W 68K F 0805	1	SMD	R8
10	晶片電阻	RES SMD 1/4W 10R F 0805	1	SMD	R7
11	晶片電阻	RES SMD 1/2W 51R F 1206	1	SMD	R201
12	晶片電阻	RES SMD 1/4W 51K F 0805	1	SMD	R204
13	晶片電阻	RES SMD 1/4W 39K F 0805	1	SMD	R206A
14	晶片電阻	RES SMD 1/4W 1K F 0805	1	SMD	R206B
15	晶片電阻	RES SMD 1/4W 10K F 0805	2	SMD	R207, R208
16	晶片電阻	RES SMD 1/4W 33K F 0805	1	SMD	R209
17	晶片電阻	RES SMD 1/4W 36K F 0805	1	SMD	R211
18	晶片電阻	RES SMD 1/4W 1K F 0805	1	SMD	R210
19	晶片電容	CAP SMD X7R 10 P 50V 0603	1	SMD	C5
20	晶片電容	CAP SMD X7R 103P 50V 0805	2	SMD	C6, C7
21	晶片電容	CAP SMD X7R 104P 50V 0805	2	SMD	C205, C206
22	晶片電容	CAP SMD X7R 102P 50V 0603	1	SMD	C207
23	二極管	LL4148 1/2W	1	SMD	D3
24	二極體	1N4007 SOT-123	1	SMD	D2
25	穩壓二極管	5.1V MLL-34	1	SMD	ZD1
26	穩壓二極管	18V MLL-34	1	SMD	ZD201
27	PWM IC	iP7302 SO8	1	SMD	U1
28	REFERENCE IC	iP7700 SOT-23-6	1	SMD	U3
29	三極管	3904	1	SMD	Q2
30	电阻	0R5 1W	1	DIP	R202
31	FUSE	1A/250V	1	DIP	F1
32	跳线	15mm	3	DIP	L1, L2, F201
33	橋式整流器	DB107G 1A/1000V	1	DIP	DB1
34	X-CAP	0.1uF 275V	1	DIP	CX1

TR-P7302-1



35	电感	20mH	1	DIP	L3
36	电感	2mH	1	DIP	L4
37	电感	40uH	1	DIP	L201
38	金屬皮膜電容	224/630V	1	DIP	C1
39	鋁質電解電容	10uF/50V LONG LIFE 5*11	1	DIP	C4
40	陶瓷电容	102P	1	DIP	C2
41	Y-CAP	222M	1	DIP	CY1
42	二極體	1N4007 SOT-123	1	DIP	D1
43	陶瓷电容	472P/1KV	1	DIP	C201
44	變壓器	0.9 mH ER2510	1	DIP	T2
45	MOSFET	7N80 7A/800V	1	DIP	Q1
46	二極體	UF5404 5A/400V	2	DIP	D201 , D202
47	鋁質電解電容	22uF/50V LONG LIFE 5*11	1	DIP	C204
48	鋁質電解電容	220uF/50V LONG LIFE 10*16	2	DIP	C202 , C203
49	光耦合器	PC817C DIP4	1	DIP	U2

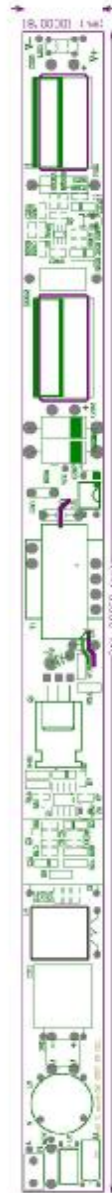
Z

TR-P7302-1



7. PCB Layout

7.1 Top Silkscreen



Z

TR-P7302-1



7.2 Top Layer

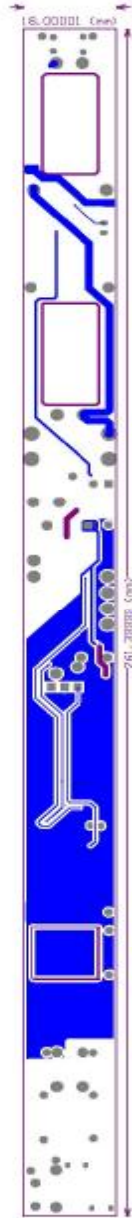


Z

TR-P7302-1

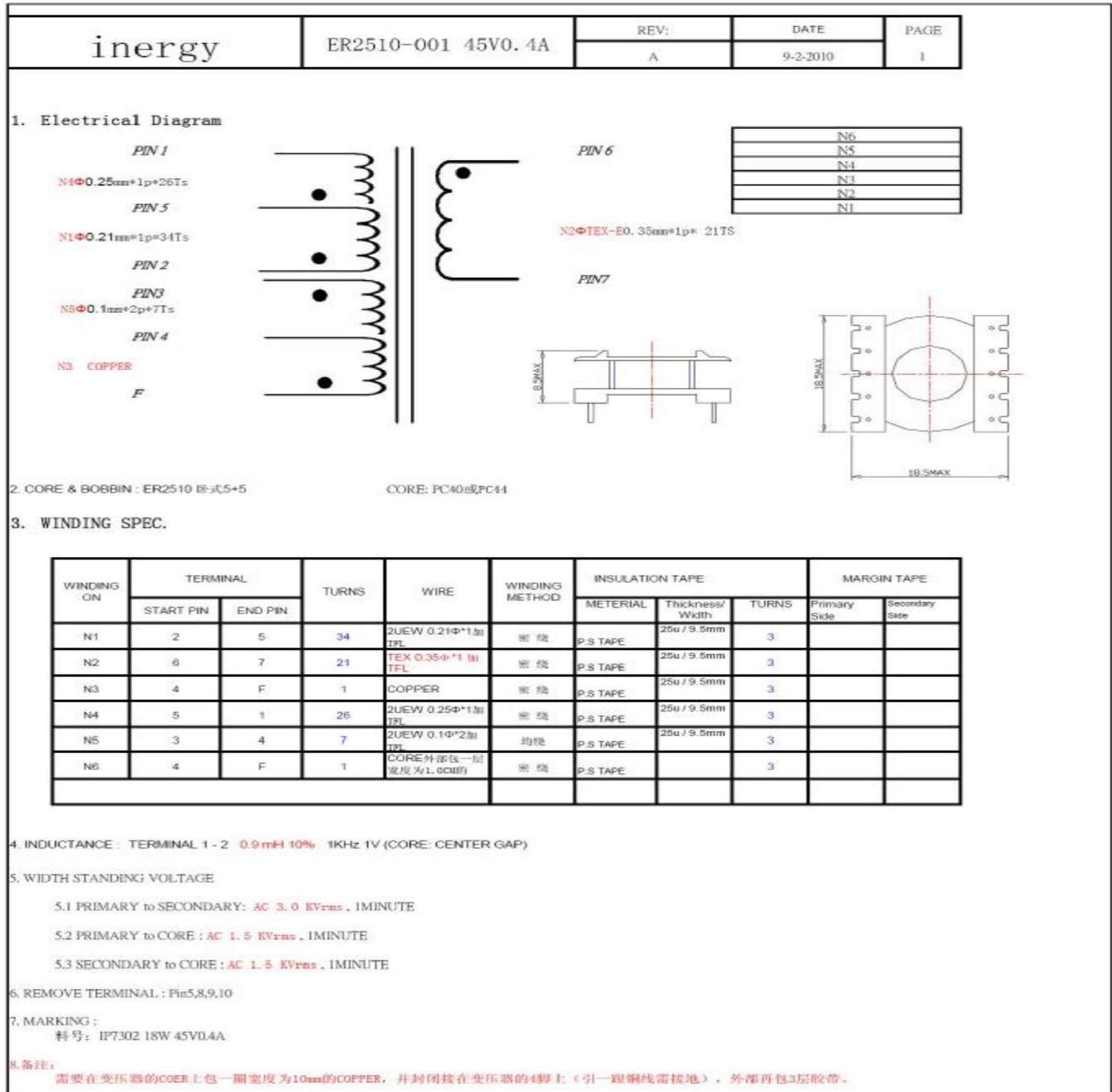


7.3 Bottom Layer



8. Transformer

8.1 Schematic & Winding

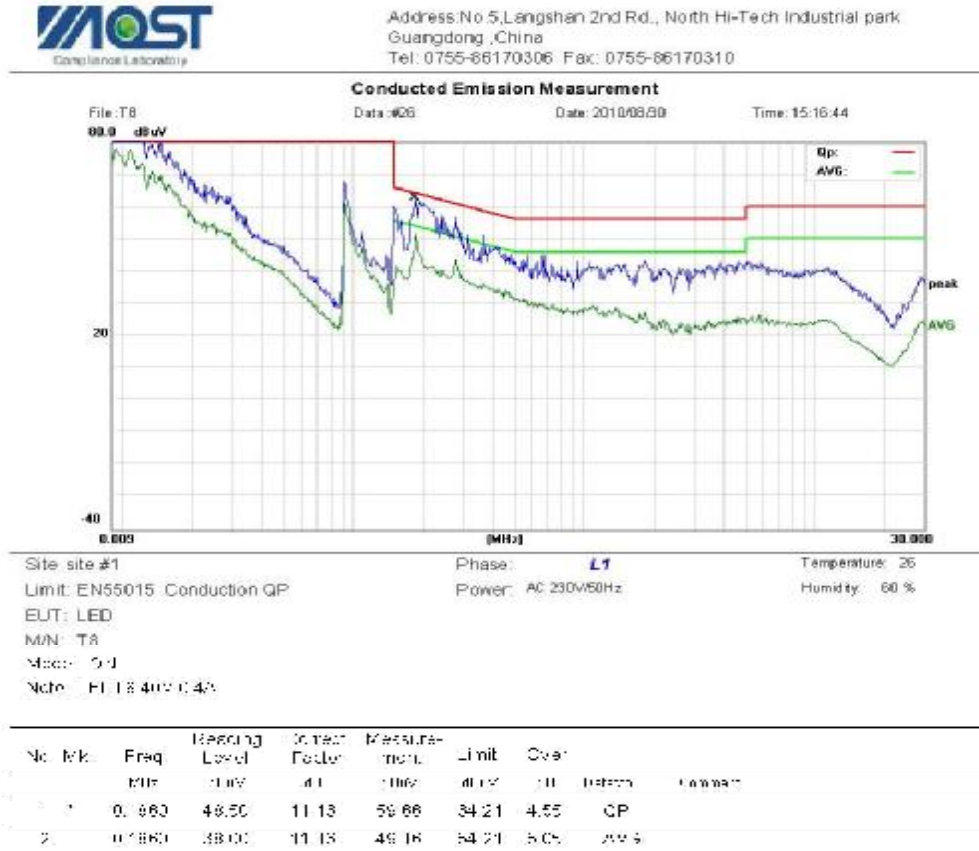




9. EMI Test

9.1 Conduction (EN55015 Class B)

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



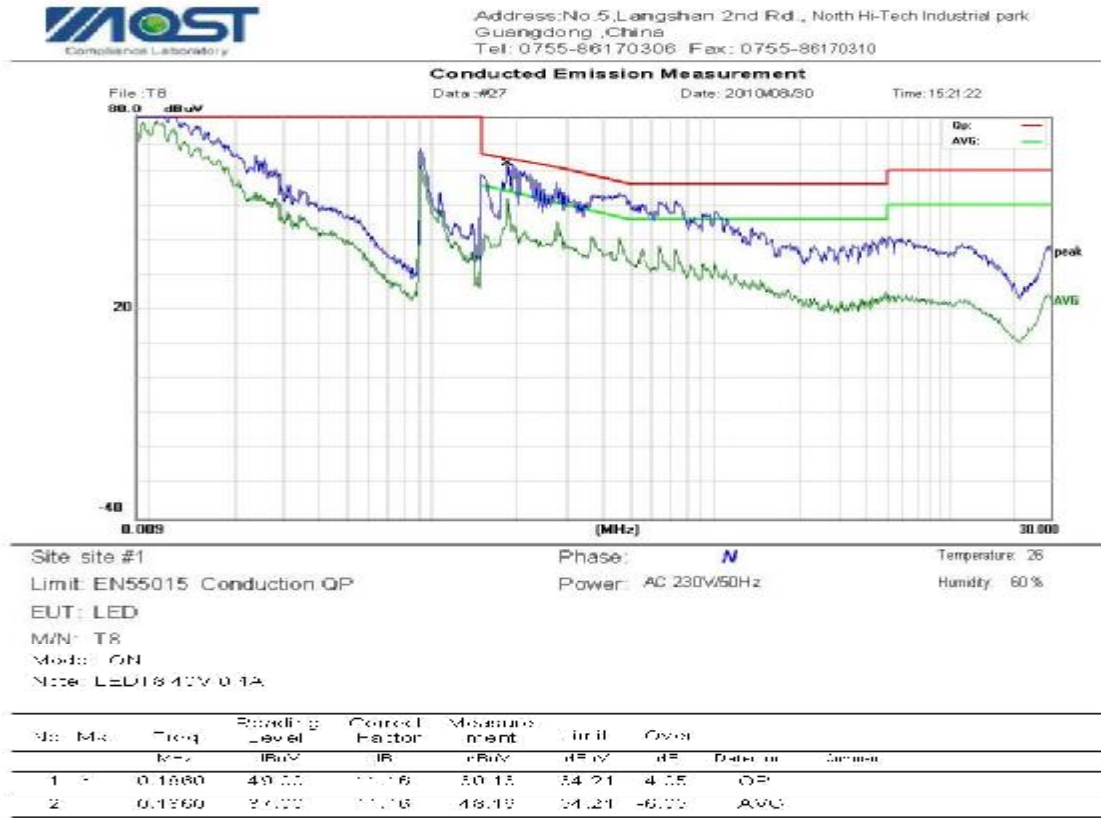
Maximum Pass Over Limit Over Range

Engineer: Syun-wei Date: / /

TR-P7302-1



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



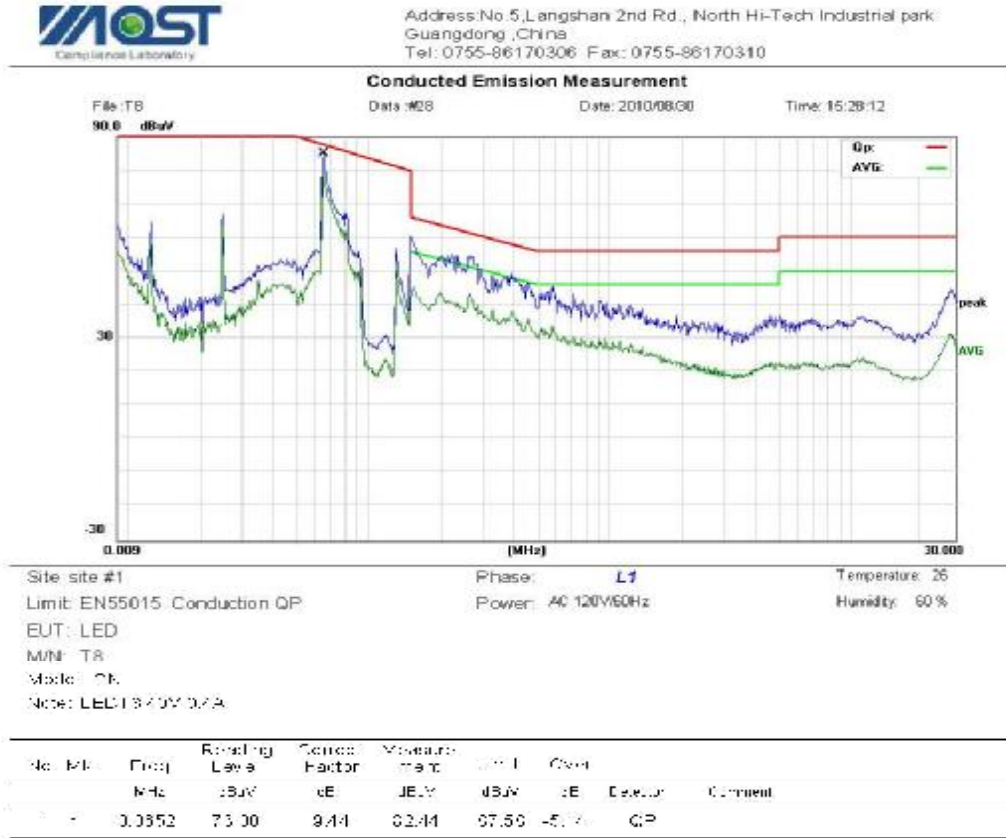
Maximum data Over limit Over margin

Export as image Copy

TR-P7302-1



Figure 17 The waveform of Conduction – L at Vin =120Vac/60Hz & full-load

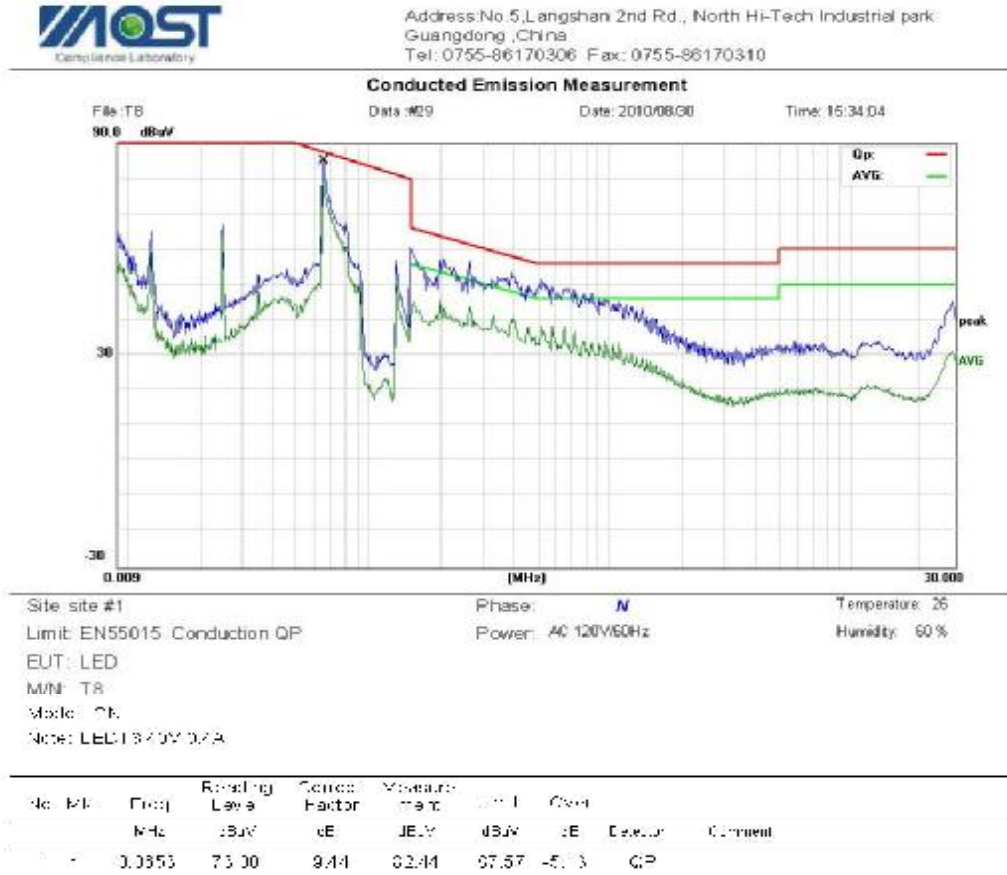


1 Maximum data 0 Over limit 1 Excess margin

Engineer: Shen Risky



Figure 18 The waveform of Conduction – N at Vin =120Vac/60Hz & full-load



Maximum data Over limit Excess margin

Engineer Signature Ricky

**10. Revision History**

Ver.	Date	Change Notice
1.0	2010/09/02	Original

方案提供商：深圳市港晟电子有限公司

电话：13560746382 郭立峰