Leadtrend
通嘉科技

LD5523E2　12V/1.5A 测试数据

By：Sunny

Date：2018/07/10

Design Check List

NO.	Test Item	Spec.	Test Result	Judgment
1	Specification			
2	BOM List			
3	Efficiency Measurement @ 12V	CoC V5 Tier-2	115Vac 86.06% 230Vac 85.81%	Pass
4	Photograph	63mm*35mm	见附件	
5	Schematic		见附件	
6	Transformer Design		详见附件	
7	Output Ripple Voltage & Noise	<120mVp-p	80mVPP	
8	Over Current Protection	1.8<I<2.2A	1.87A~2.03A	Pass
9	Turn On Delay Time	< 3sec/90V	1.58s	Pass
10	Output Rise Time	<40mS	11.56ms	Pass
11	Dynamic Load Response	DC 10.8V<Vo<13.2V	11.2V<Vo<12.3V	Pass
12	Load Regulation	Vo < ±5%	90Vac/ 60Hz Vo ±0.75% 264Vac / 50Hz Vo ±0.58%	Pass
13	Hold up Time	≥10mS/ac 90V	10.8ms	Pass
14	Power Component Stress Voltage	De-rating<95%	DIODE 65.2V/100V 65.2% MOSFET V/650V 89.8%	Pass
15	Transformer Flux Density	<3900Guass	0.33Guass	Pass
16	Conducted EMI	EN55022/CISPR22 class B	详见附件	Pass
17	Thermal Analysis	Mosfet diode<120 Transformer<110 @40度	详见附件	Pass

1. Specification

Description	Symbol	Min	Typ	Max	Units	Comment
Input						
Voltage	Vin	90		264	VAC	2 Wire
Frequency	f	47	50/60	63	Hz	
No-load Input Power				75	mW	Test at 230VAC
Output 12V						
Output Voltage	Vout	11.4	12	12.6	V	
Output Current	Iout	0		1.5	A	
Ripple Voltage	Vripple			120	mVpp	10uF/0.1uF &20MHz/BW
OCP	Iout	1.8		2.2	A	
Conducted EMI		Meets CISPR22B / EN55022B				Test with grounding
Ambient Temperature	Tamp A	0	25	40	˚C	Free convection, sea level

2. BOM List

序号	物料	位置	数量	序号	物料	位置	数量
	DIP 元件列表			17	2MΩ±5%/1206	R5, R9	2
1	10uF/400V/10*16	EC1	1	18	30KΩ±1%/0805	R16	1
2	22uF/400V/13*17	EC2	1	19	430KΩ±1%/0805	R17	1
3	220pF/Y电容	CY1	1	20	1R0Ω±5%/0805	R7	1
4	4.7uF/50V	C5	1	21	150KΩ±1%/1206	R11	1
5	470uF/16V 8*12	C4,C3	2	22	2R0Ω±1%/1206	R14 ，R15	2
6	10D471K	VAR1	1	23	39Ω±5%/0805	R12	1
7	5D-5(5欧姆）热敏	NTC1	1	24	120Ω±5%/0805	R13	1
8	250Vac/T3.15A	F1	1	25	10KΩ±5%/0805	R6，R18	2
9	Cable	22AWG/1.5 m	1	26	390KΩ±5%/1206	R2	1
10	EE16W	T1	1	27	27Ω±5%/1206	R1	1
11	EE8.3 20mH/min	LF1	1	28	75Ω±5%/1206	R4	1
12	T9*5*3 45uH/min	LF2	1	29	1000pF/100V ,1206	C1	1
13	5A/100V /D0-15	D1(平伟）	1	30	100nF/100V,0805	C6	1
	SMD 元件列表			31	A7/ 1206	D4	1
13	ABS210	BD1	1	32	M7/ SMA	D3	1
14	LD5523 E2 /S0T-26	U1	1	33	1000pF/1KV,1206	C2	1
15	390KΩ±5%/0805	R3A	1	34	220pF/50V, 0805	C8A	1
16	CS7N65 /TO-252	Q1	1	35	1nF/50V ,0805	C8	1

3 Efficiency Measurement

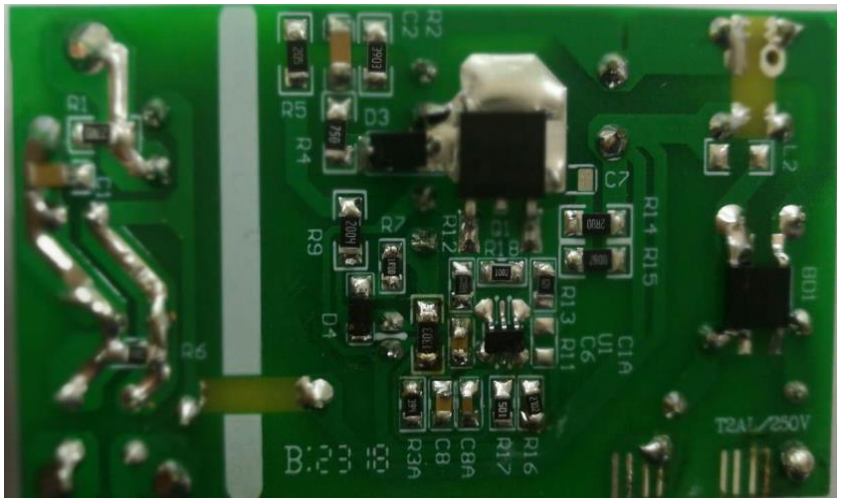
Vac	Io	Pin	Po	Eff	Avg
115 V	0	42mW			
	10%	2.08	1.79	86.06%	
	25%	5.13	4.49	87.52%	86.08%
	50%	10.39	9.03	86.91%	
	75%	15.87	13.62	85.82%	
	100%	21.52	18.09	84.06%	
230V	0	62mW			
	10%	2.16	1.78	82.41%	
	25%	5.17	4.46	86.27%	85.81%
	50%	10.34	8.92	86.27%	
	75%	15.67	13.43	85.71%	
	100%	21.08	17.92	85.01%	

备注： 1.共模电感EE8.3
2.NTC 5歐

- **NOTE : CoC V5 Tier-2 spec: 12V Avg. Eff. >85.45%, 10% Eff. > 75.45%**
- **NOTE : 1.5M / 22AWG, burn-in 30mins**

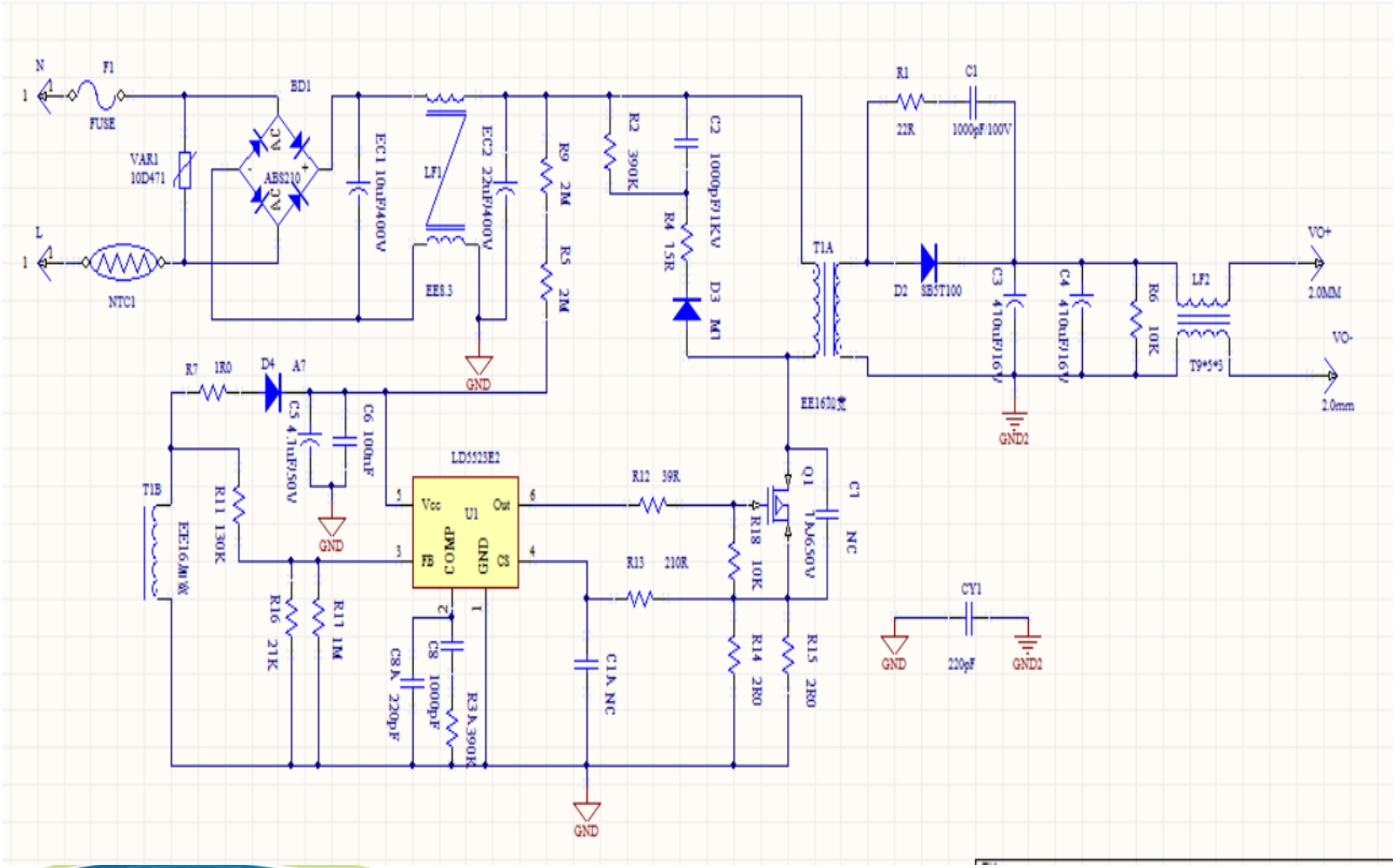
4. Photograph

35mm



63mm

5. SCH


N
F1
FUSE
BD1
VAR1
10D471
AC
AC
AB8210
+
-
L
NTC1
EC1 10uF/400V
LF1
EC2 22uF/400V
EE8.3
GND
R9 2M
R5 2M
R2 390K
C2 1000pF/1KV
R4 1.5R
D3 M1
T1A
R1
22R
C1
1000pF/100V
D2 SB5T100
C3 470uF/16V
C4 470uF/16V
GND2
R6 10K
LF2
T9*5*3
VO+
2.0MM
VO-
2.0mm
EE16加宽
R7 1R0
D4 A7
C5 4.7uF/50V
C6 100nF
GND
LD5523E2
Vcc
U1
Out
FB
COMP
GND
CS
R12 39R
R13 210R
T1B
EE16/M/W
R11 130K
R16 21K
R11 1M
C8A 220pF
C8 1000pF
R3A 390K
C1A NC
Q1
1A/650V
C1
NC
R18 10K
R14 2R0
R15 2R0
CY1
220pF
GND
GND2

Transformer Design

- ✓ Transformer : EE-16 PC44
- ✓ Inductance: 1.4mH @ 40KHz, 1V
- ✓ Np:Ns:Naux: 87:11:10
- ✓ Ae: 40mm^2

Transformer : EE-16
Ae=40mm2

Winding No.	Pin No.		Winding types	Number turns		Remarks
	Start	Finish		Winding	MYLAR tape	
N1	2	3	0.25mm X 1P	60	2	
N2	5	4	0.2mm X 2P	11	2	居中密绕
N3	6	7	TEX-E 0.6mm X 1P	10	2	
N4	4	NC	0.17mm X 2P	10	2	居中密绕
N5	3	1	0.25mm X 1P	27	2	
	Pin 2-1 1.4mH ± 7%					

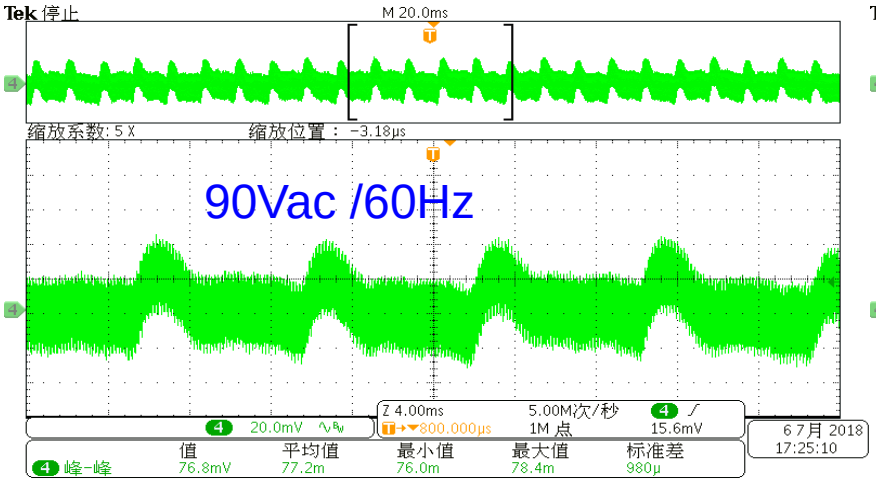
备注：用0.2的铜线上锡，一端紧贴磁芯，另一端焊接于变压器PIN4脚

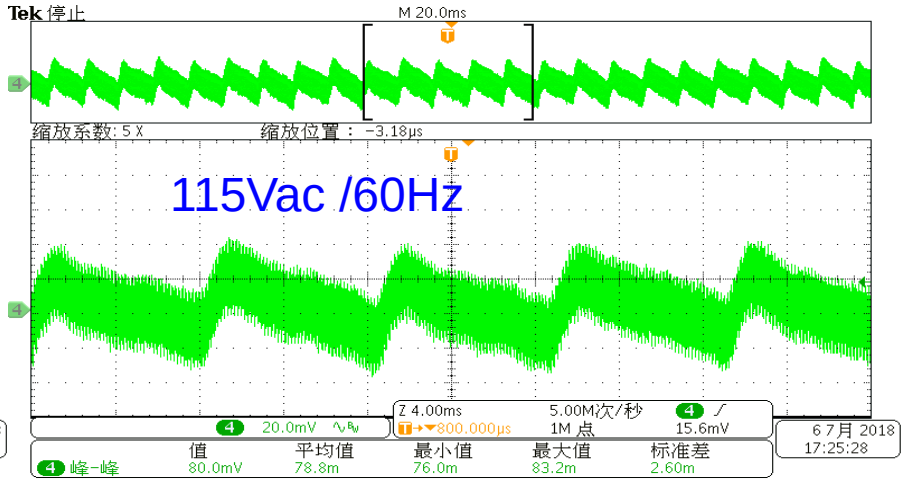
7. Output Ripple Voltage & Noise

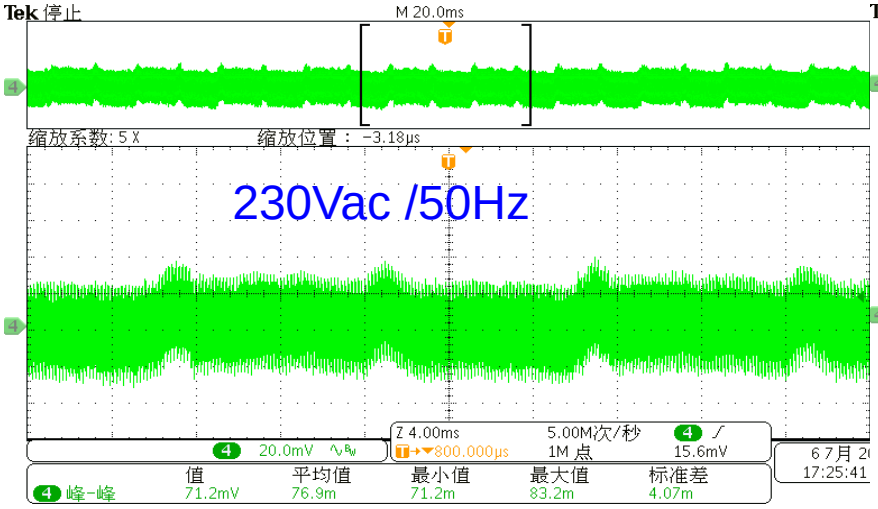
Input	12V/1.5A ripple noise 9174
90VAC / 60Hz	76.8mV
115VAC / 60Hz	80mV
230VAC / 50Hz	71.2mV
264VAC / 50Hz	68.8mV

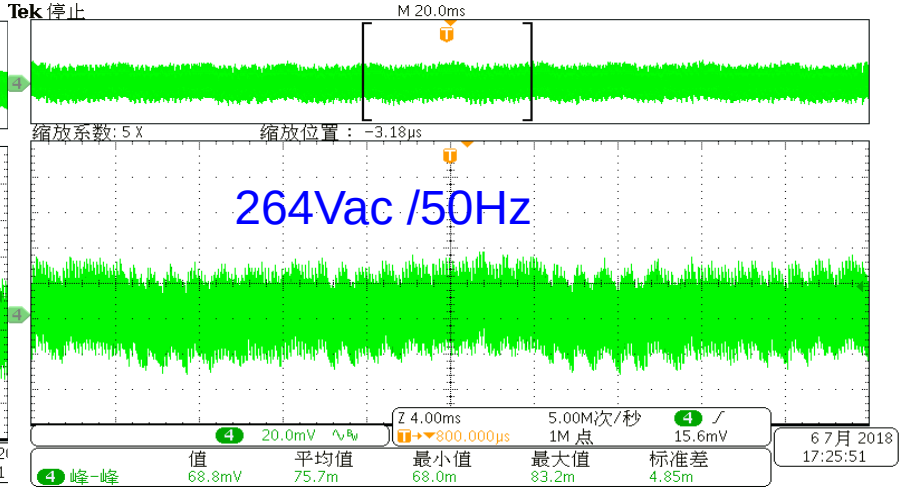
- **NOTE : Output with 0.1uF ceramic // 10uF E-cap & using 20MHz BW**
- **Output Cap: 470uF//470uF, bulk cap 10uF//22uF**

Ripple Test waveform









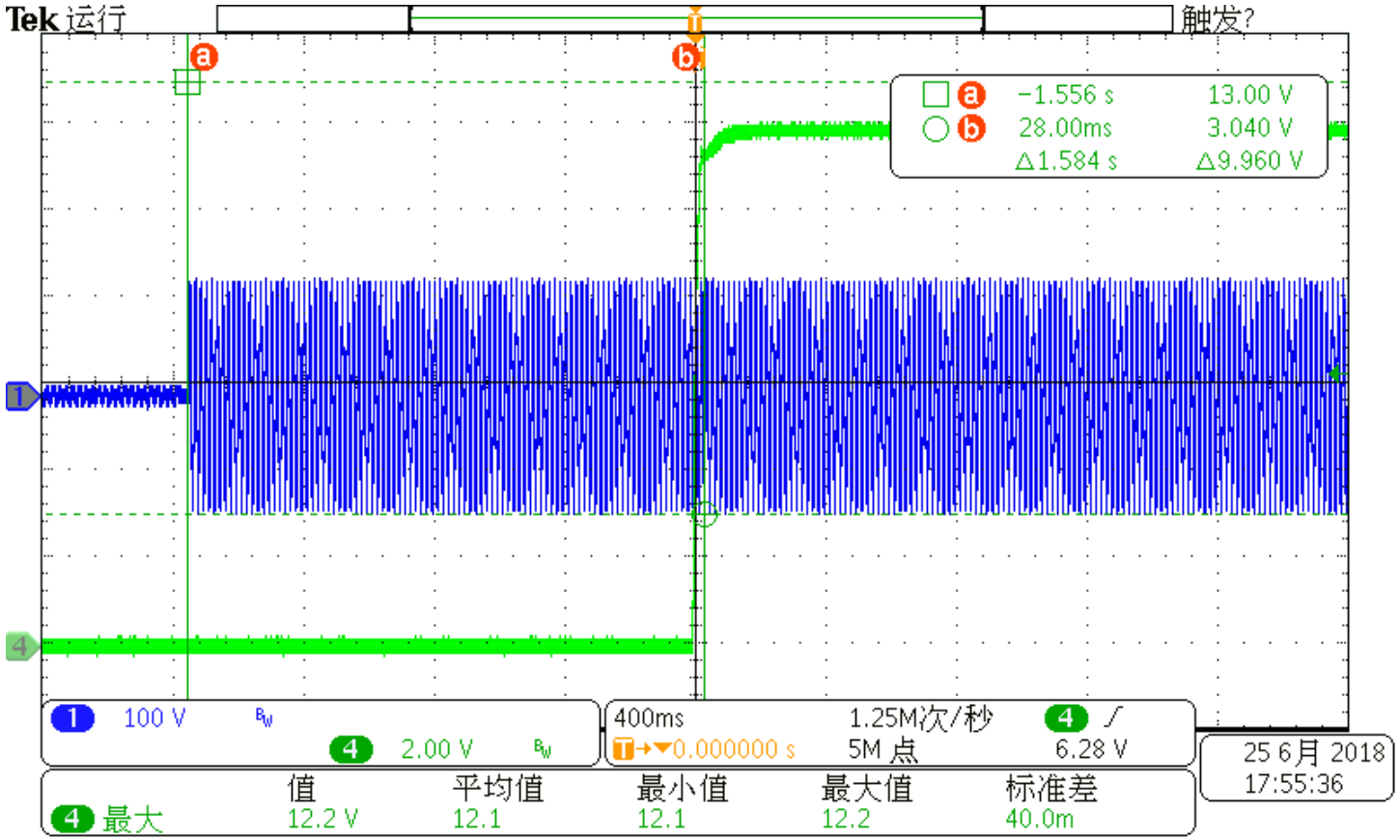
8. Over Current Protection

Input	12V I_o(Max)
90VAC / 60Hz	1.87A
115VAC / 60Hz	1.96A
230VAC / 50Hz	2.01A
264VAC / 50Hz	2.03A

➢**NOTE : Rcs=2R0//2R0**

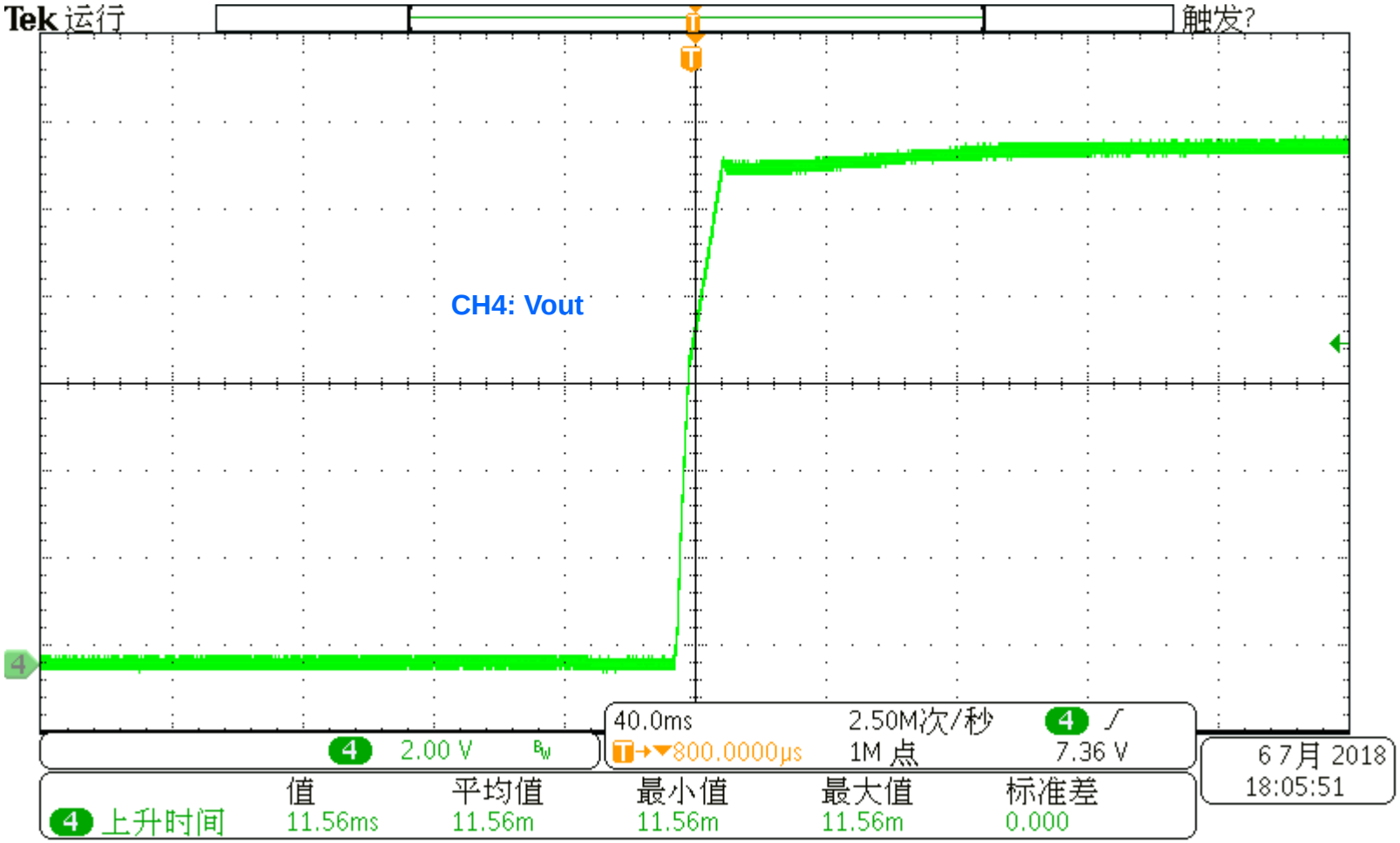
9. Turn On Delay Time

Input	Turn on delay time
90VAC / 60Hz	1.58S



10. Output Rise Time

90VAC, Full load
Trise = 11.56mS

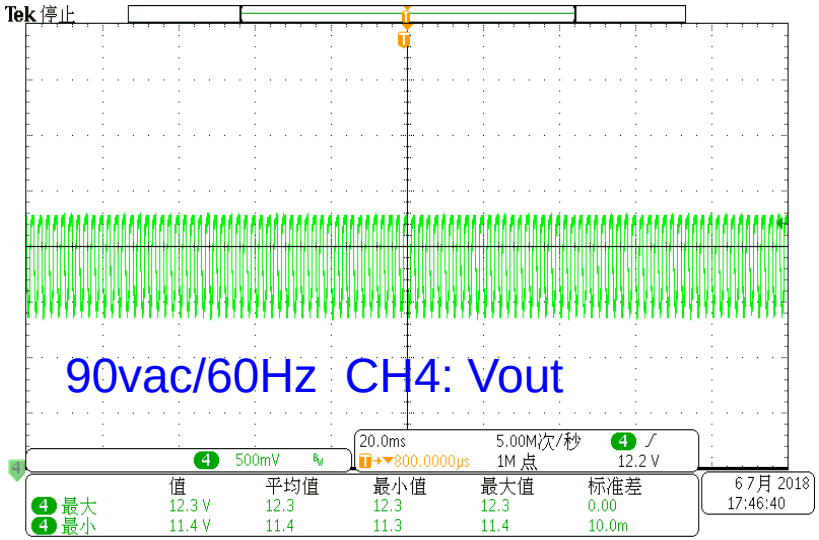


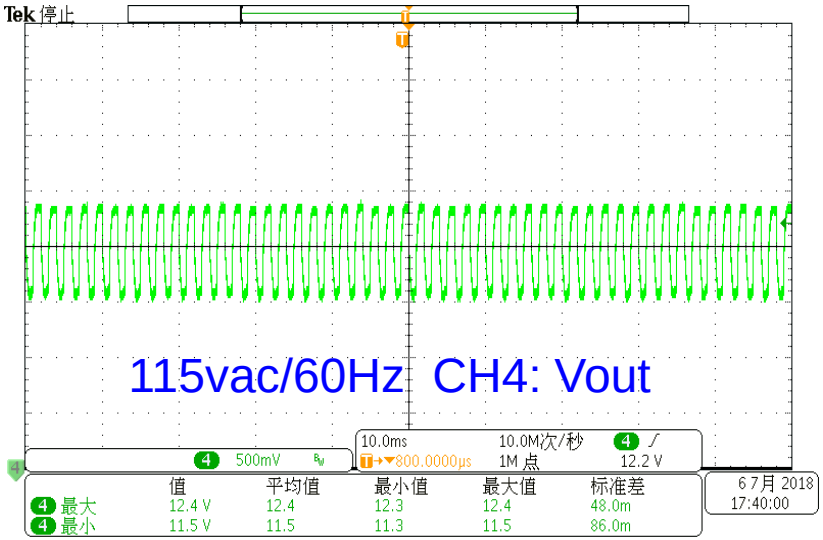
11. Dynamic Load Response

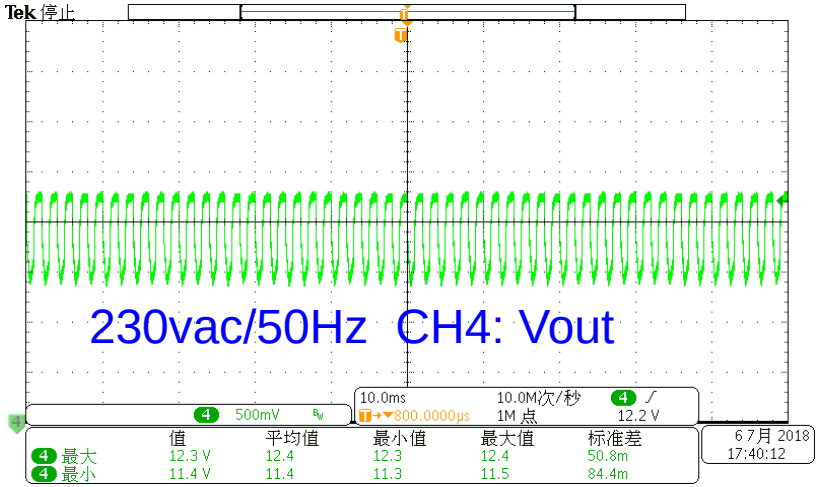
Input	Output Dynamic	Reading	
		Vmax(V)	Vmin(V)
90VAC / 60Hz	0.15A→1.35A	12.3	11.4
115VAC / 60Hz	0.15A→1.35A	12.4	11.5
230VAC / 50Hz	0.15A→1.35A	12.3	11.4
264VAC / 50Hz	0.15A→1.35A	12.3	11.4
SPEC		<13.2V	>10.8V
Result		PASS	

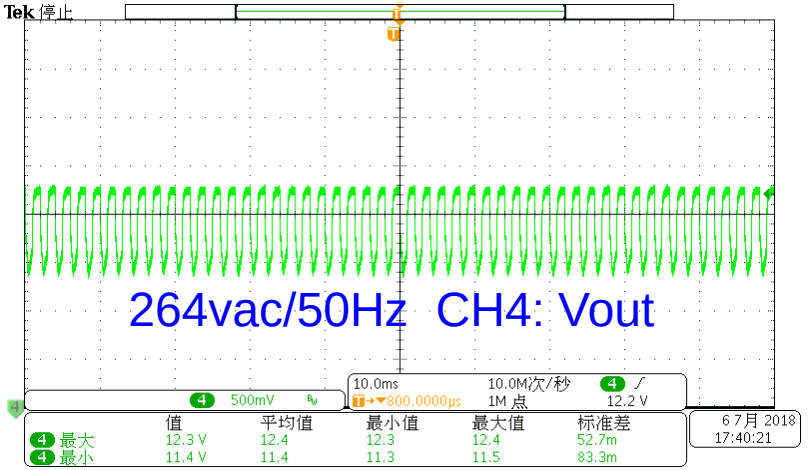
- Output Load : 10%-90%, T1=T2=1ms, Slew Rate: 0.1A/us
- Note : Measured at wire end 22# 1.5M 输出电容: 470uF/16V//470uF/16V

Output Dynamic waveform







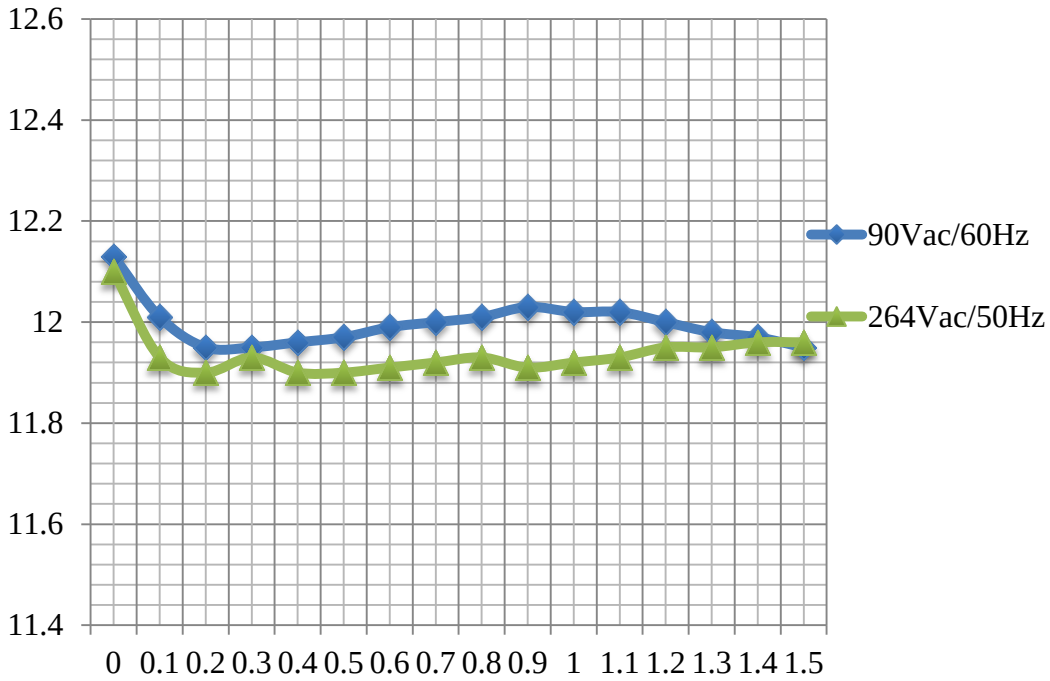


12. Line regulation

Input	Min Load	Max Load	Spec <1%
	Vo	Vo	Results
90Vac/60Hz	12.13V	11.96V	
115Vac/60Hz	12.13V	12.03V	
150Vac/60Hz	12.12V	12.11V	
180Vac/50Hz	12.11V	12.1V	
230Vac/50Hz	12.08V	11.96V	
264Vac/50Hz	12.07V	11.96V	
Tolerance(%)	± 0.37%	±0.62%	Pass

13. Load regulation

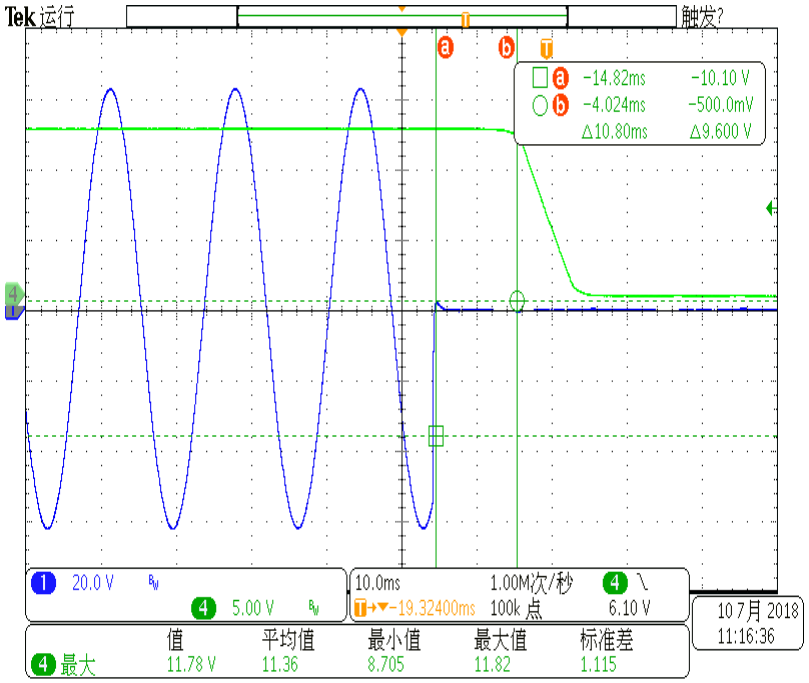
Input	12.6V> Vo > 11.4V	Spec <5%	
	Vo_max / Vo_min	tolerance	Results
90Vac/ 60Hz	12.13V / 11.95V	0.75%	PASS
264Vac / 50Hz	12.10V / 11.96V	0.58%	PASS



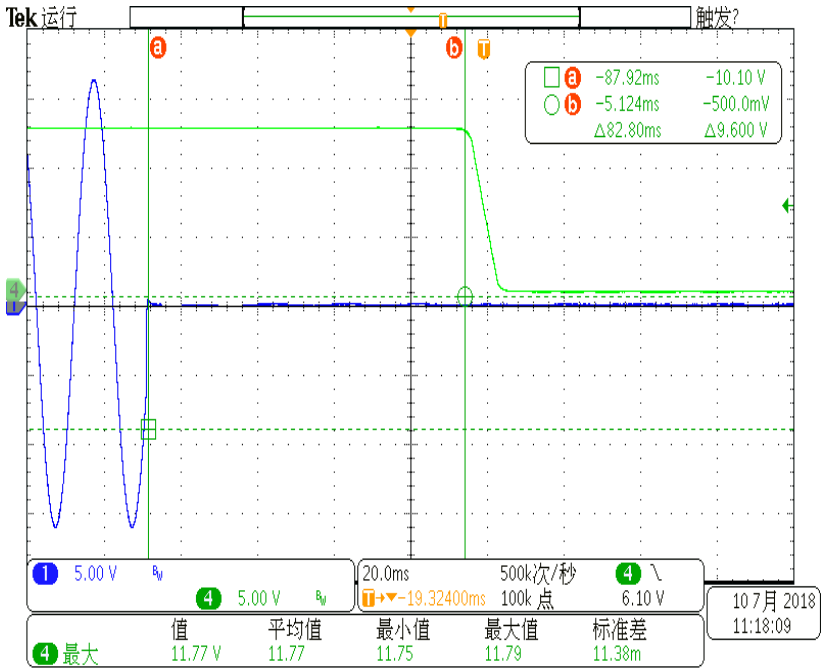
Load	90Vac/60Hz	Load2	264Vac/50Hz
0	12.13	0	12.1
0.1	12.01	0.1	11.93
0.2	11.95	0.2	11.9
0.3	11.95	0.3	11.93
0.4	11.96	0.4	11.9
0.5	11.97	0.5	11.9
0.6	11.99	0.6	11.91
0.7	12	0.7	11.92
0.8	12.01	0.8	11.93
0.9	12.03	0.9	11.91
1	12.02	1	11.92
1.1	12.02	1.1	11.93
1.2	12	1.2	11.95
1.3	11.98	1.3	11.95
1.4	11.97	1.4	11.96
1.5	11.95	1.5	11.96

13. Hold Up Time

Input	Load	SPEC.	Measured (ms)	Results
115VAC / 60Hz	12V/1.5A	≥10mS	10.8	**PASS**
230VAC / 50Hz	12V/1.5A	≥10mS	82.8	**PASS**



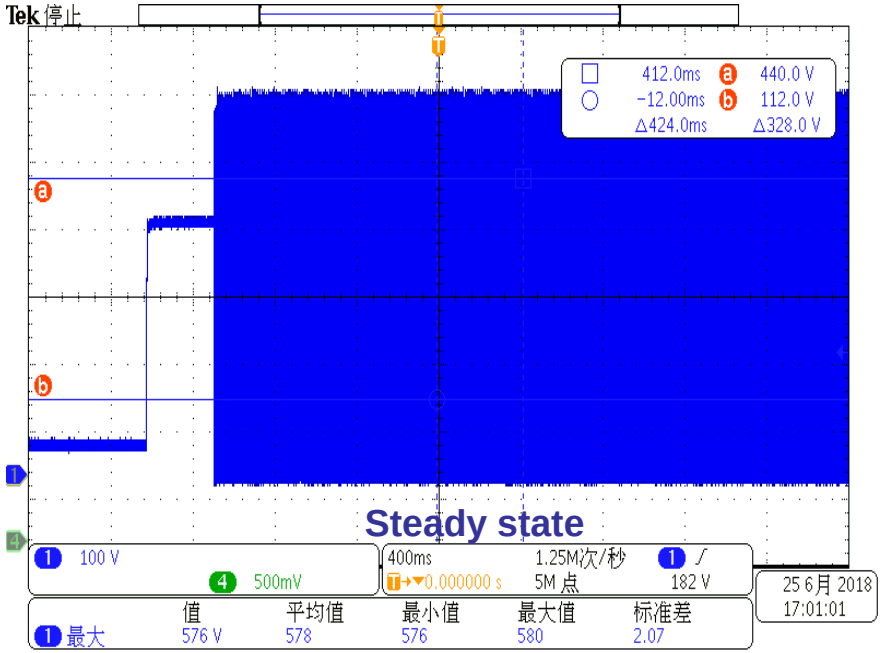
CH4 Vo CH1 AC-in

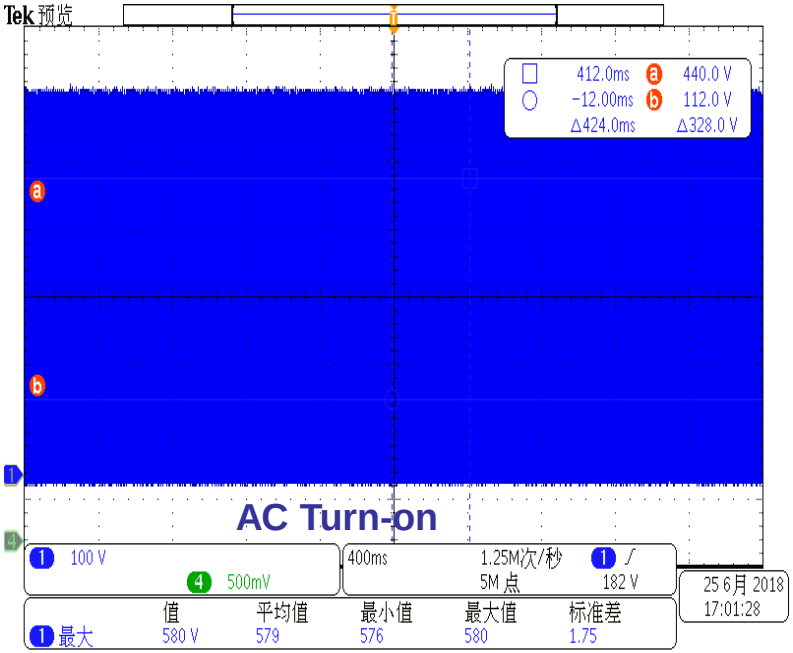


CH4 Vo CH1 AC-in

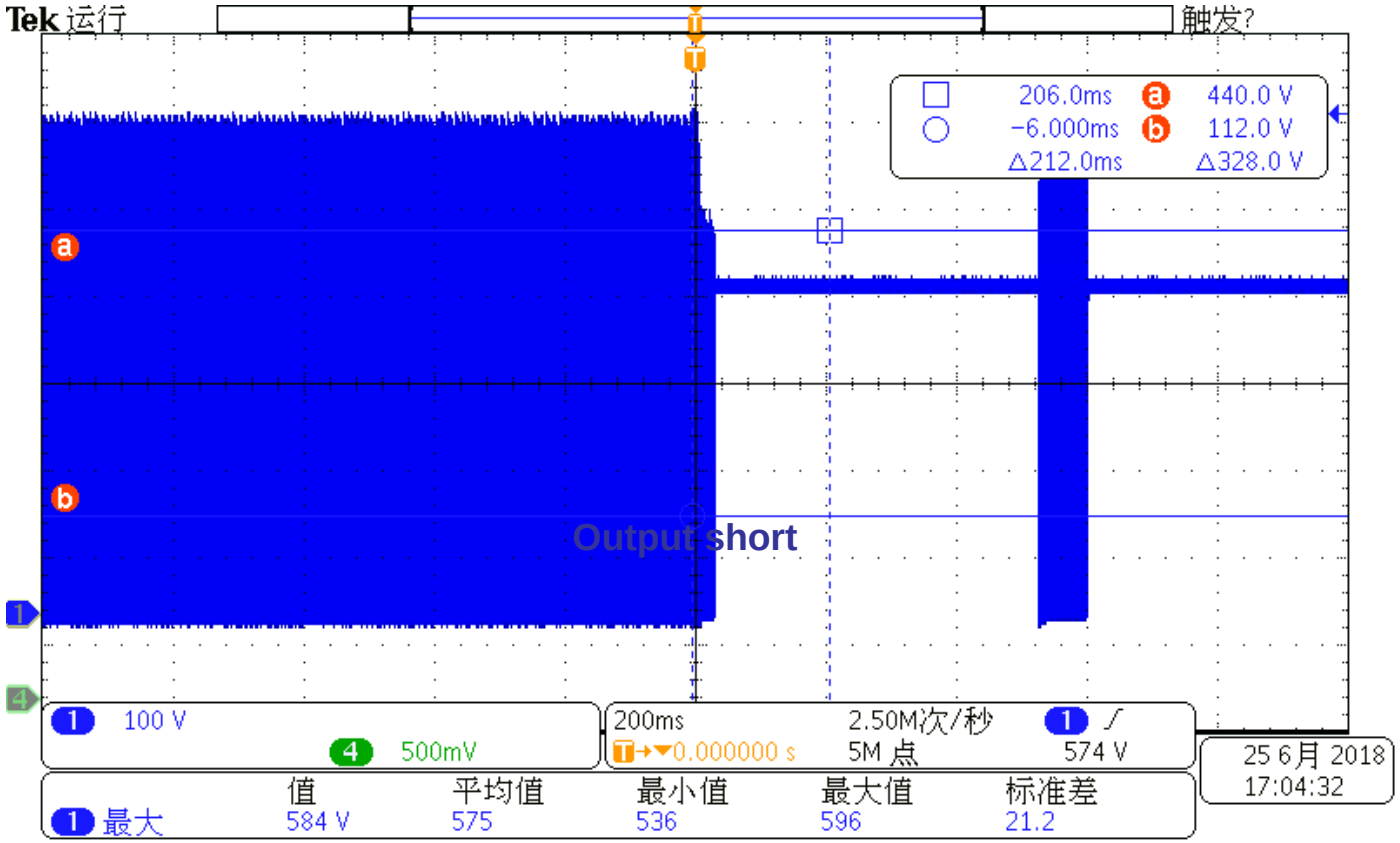
14. Power Component Stress Voltage

Input	Location	Max Rating	Stable	AC Turn-0n	Output short circuit	De-rating <90%
			Measurement @12V & 1.5A load	Measurement @12V & 1.5A load	Measurement @12V & 1.5A load	
264VAC / 50Hz	Q1	650V	576V	580V	584 V	89.8%



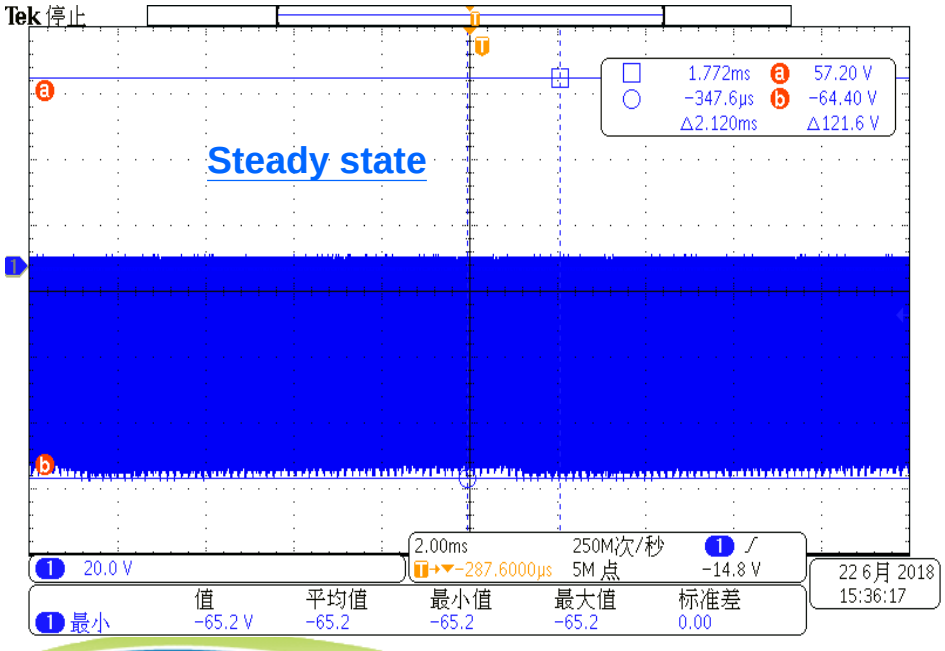


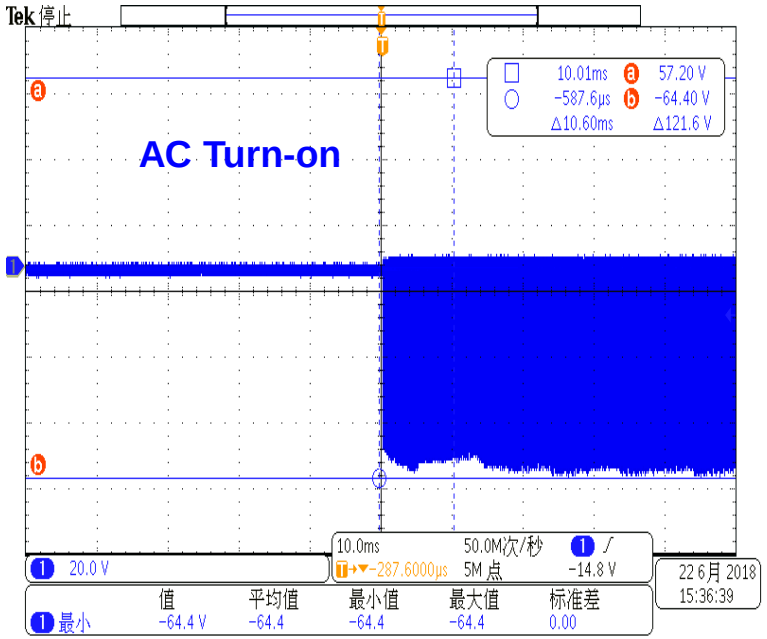
14. Power Component Stress Voltage(Cont.)



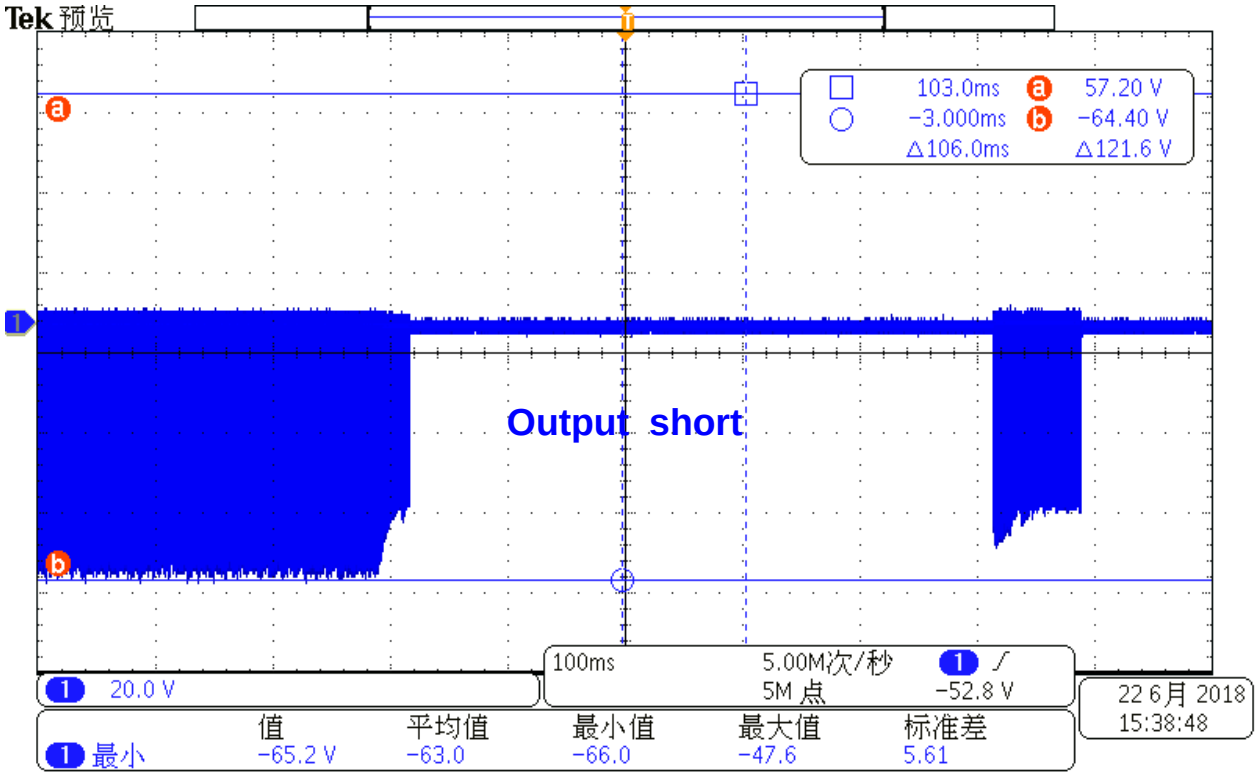
14. Power Component Stress Voltage(Cont.)

Input	Location	Max Rating	Stable	AC Turn-on	Output short circuit	De-rating <90%
			Measurement @12Vo & 1.5A Load	Measurement @12Vo & 1.5A Load	Measurement @12Vo & 1.5A Load	
264VAC / 50Hz	Secondary Schottky	100V	65.2V	64.4V	65.2V	65.2%



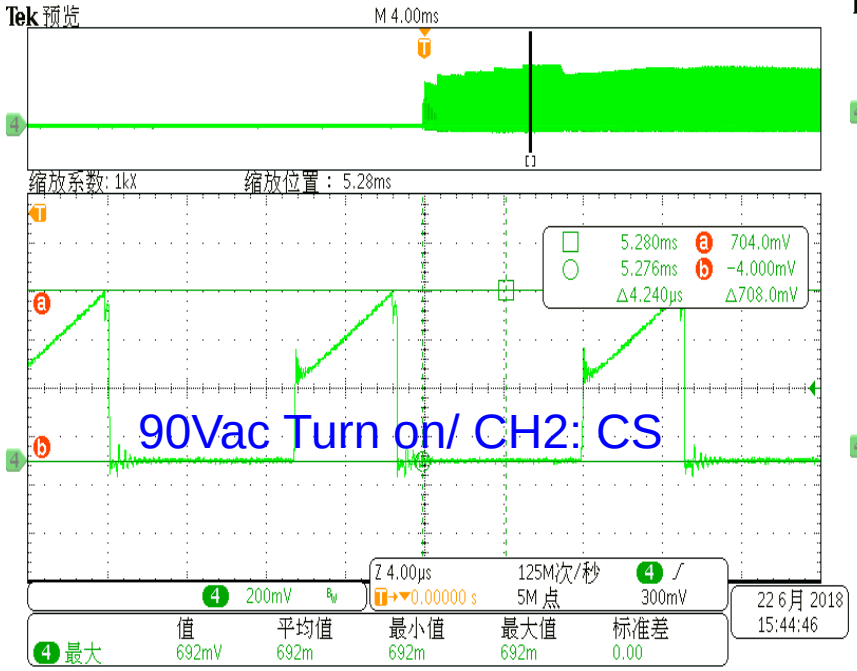


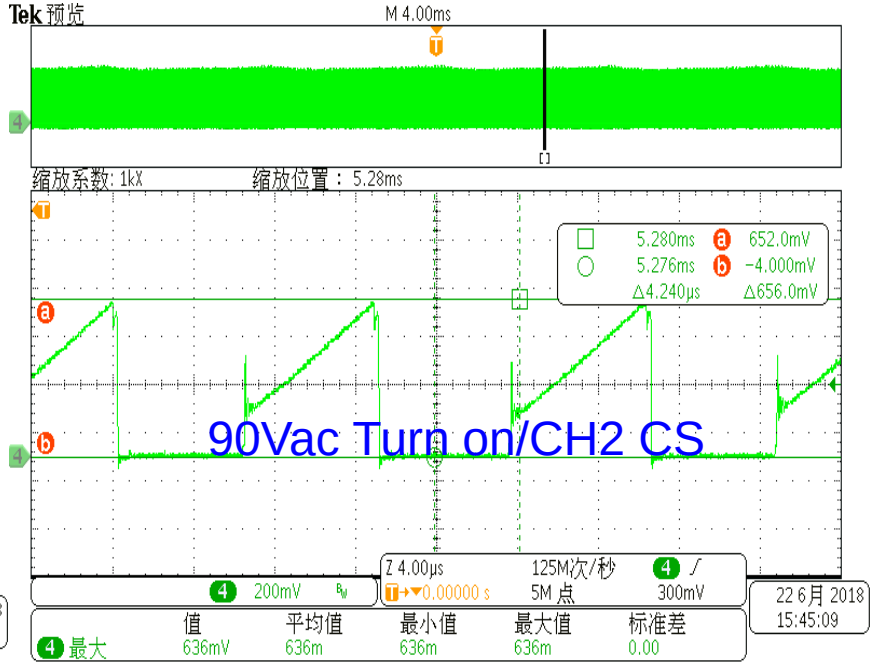
15. Power Component Stress Voltage(Cont.)



15. Transformer Flux Density

Input	+12Vout/1.5A	+12Vout/1.5A	Spec < 0.39T
	Bmax at Start up	B Steady	Results
90VAC / 60Hz	0.33T	0.25T	Pass





△B=(Ip*Lp)/(Np*Ae)

=〔（Vcs/Rcs）*Lp〕/(Np*Ae)

=〔（0.75/0.9）*1.4〕/(87*40)*10^3

=0.33(T)

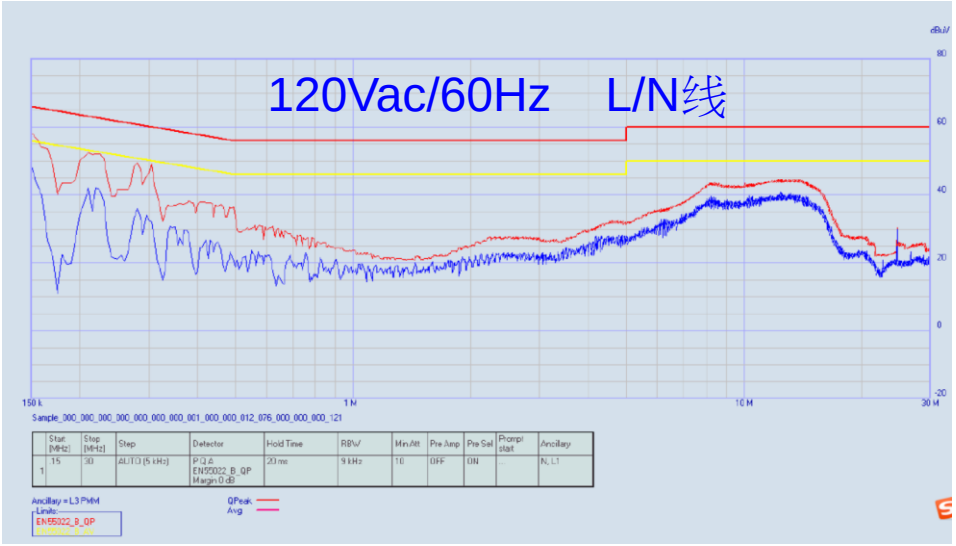
△B=(Ip*Lp)/(Np*Ae)

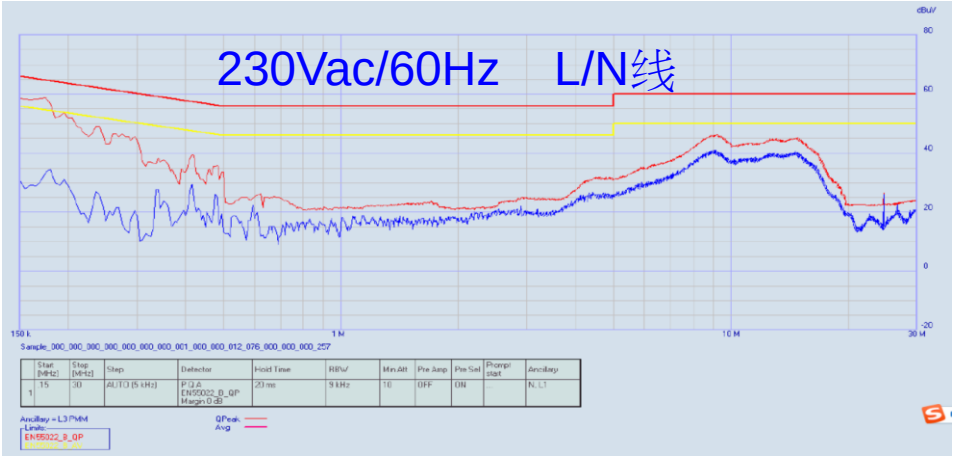
=〔（Vcs/Rcs）*Lp〕/(Np*Ae)

=〔（0.57/0.9）*1.4〕/(87*40)*10^3

=0.25(T)

16. Conducted EMI



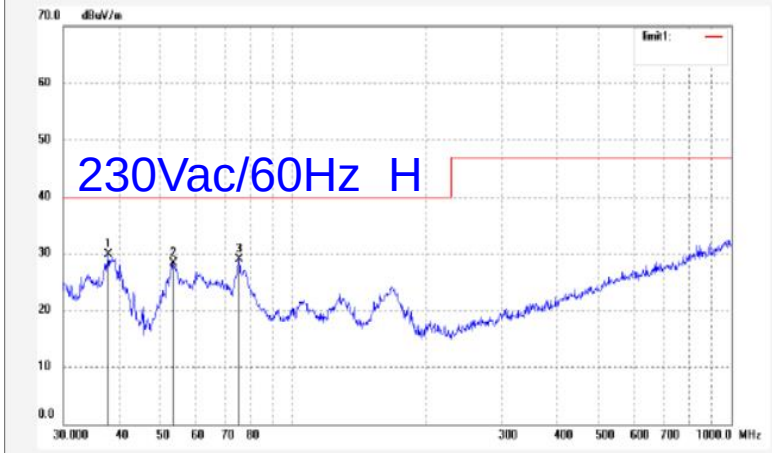


ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg.A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LD #261
Standard: EN55032 CLASS B
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT:
Mode: Full load
Model: LD5523E2DB 1#
Manufacturer:

Polarization: Vertical
Power Source: AC 230V/50Hz
Date: 2018/06/28
Time: 14:02:46
Engineer Signature:
Distance: 3m

Note:



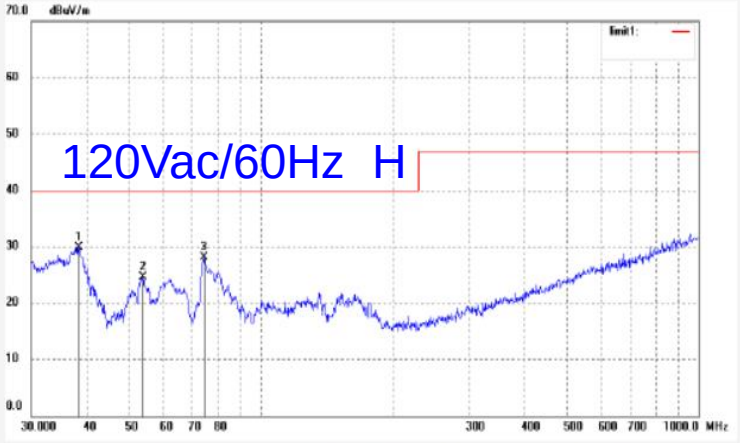
No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	37.9450	40.87	-11.07	29.80	40.00	-10.20	peak			
2	53.3179	41.03	-12.83	28.20	40.00	-11.80	peak			
3	75.4464	45.74	-16.69	29.05	40.00	-10.95	peak			

ACCURATE TECHNOLOGY CO., LTD.
F1,Bldg.A,Changyuan New Material Port Keyuan Rd,
Science & Industry Park,Nanshan Shenzhen,P.R.China
Site: 2# Chamber
Tel:+86-0755-26503290
Fax:+86-0755-26503396

Job No.: LD #264
Standard: EN55032 CLASS B
Test item: Radiation Test
Temp.(C)/Hum.(%) 23 C / 48 %
EUT:
Mode: Full load
Model: LD5523E2DB 1#
Manufacturer:

Polarization: Vertical
Power Source: AC 120V/60Hz
Date: 2018/06/28
Time: 14:09:44
Engineer Signature:
Distance: 3m

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	38.4809	41.07	-11.20	29.87	40.00	-10.13	peak			
2	53.8818	37.49	-12.87	24.62	40.00	-15.38	peak			
3	74.3955	44.73	-16.63	28.10	40.00	-11.90	peak			

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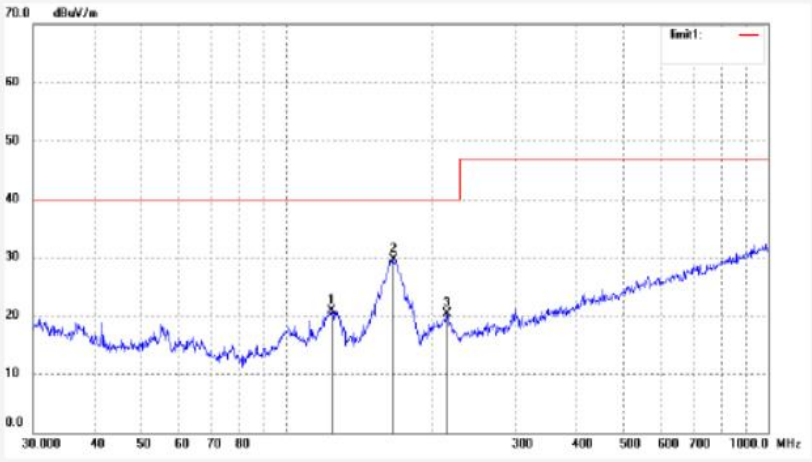
Job No.: LD #262	Polarization: Horizontal
Standard: EN55032 CLASS B	Power Source: AC 230V/50Hz
Test item: Radiation Test	Date: 2018/06/28
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 14:04:42
EUT:	Engineer Signature:
Mode: Full load	Distance: 3m
Model: LD5523E2DB 1#	
Manufacturer:	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	124.5690	34.54	-13.58	20.96	40.00	-19.04	peak			
2	167.2368	43.67	-13.97	29.70	40.00	-10.30	peak			
3	216.0240	31.98	-11.66	20.32	40.00	-19.68	peak			

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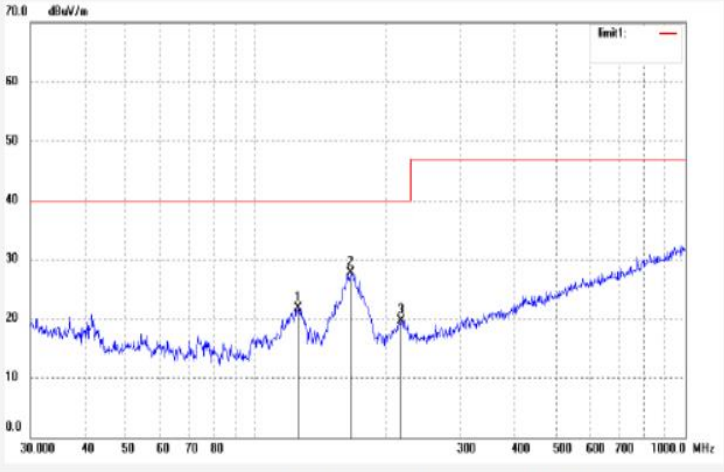
Job No.: LD #263	Polarization: Horizontal
Standard: EN55032 CLASS B	Power Source: AC 120V/60Hz
Test item: Radiation Test	Date: 2018/06/28
Temp.(C)/Hum.(%) 23 C / 48 %	Time: 14:07:44
EUT:	Engineer Signature:
Mode: Full load	Distance: 3m
Model: LD5523E2DB 1#	
Manufacturer:	

Note:



No.	Freq. (MHz)	Reading (dBuV/m)	Factor (dB)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Degree (deg.)	Remark
1	125.4457	35.39	-13.65	21.74	40.00	-18.26	peak			
2	166.6514	41.76	-14.07	27.69	40.00	-12.31	peak			
3	218.3085	31.24	-11.58	19.66	40.00	-20.34	peak			

17 .Thermal Analysis

		L5523 E2(90V)	LD5523 E2 (264V)
测试条件	元件位置	温度(℃)	温度(℃)
Measurement @12Vo & Full load	D2	92.5	93.5
	Q1	81.9	71.6
	T磁芯	82.0	81.2
	T线包	87.7	86.2
	共模电感	74.5	51.9
	输入电容	72.0	58.9
	输出电容	69.3	69.7
	环境温度	29.2	30.0

备注：测试条件 ：@12Vo
& Full load 装外壳密闭环境老化2小时

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