方案名称：	YT8110FES8+YT2273HEE5_40-120V 350mA_External LED Driver

■ 方案特点：

- 低成本升压APFC+降压BUCK两级方案；
- 前后级都集成高压启动和供电电路；满载条件下，启动时间<10ms
- 浮地应用
- 准谐振模式高效率工作，优异的线性和负载调整率
- 前后级都支持无辅助绕组应用
- 过温线性降电流功能
- 保护功能齐全

■ 实物图片：成品电源（带外壳）尺寸 L*W= 208mm* 30mm

■ 版本修订：

版本	创建/修订人	创建/修订日期	审核人	审核日期	描述
A1.00	Sam	2024/7/31			初版

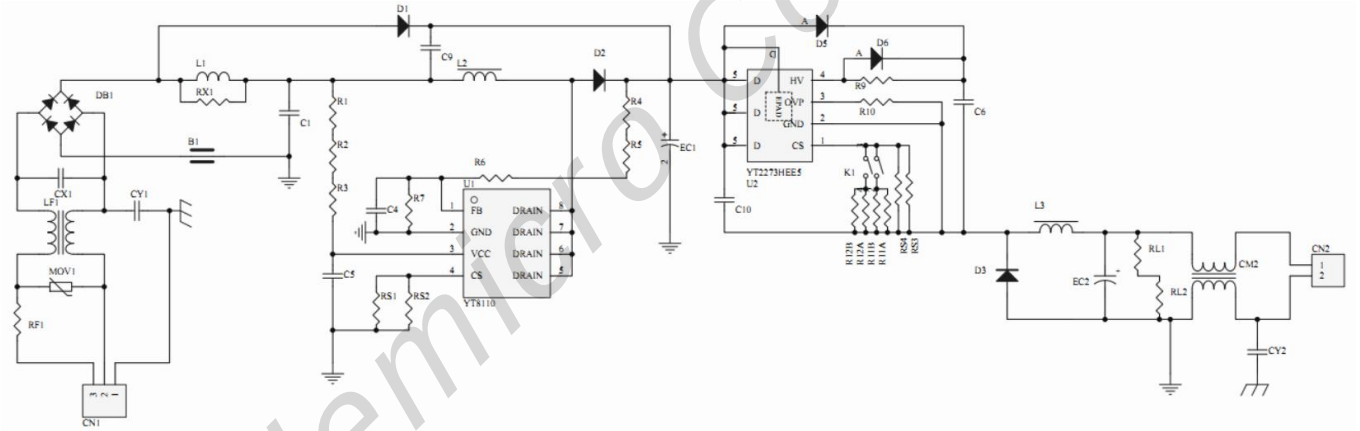
目　　录

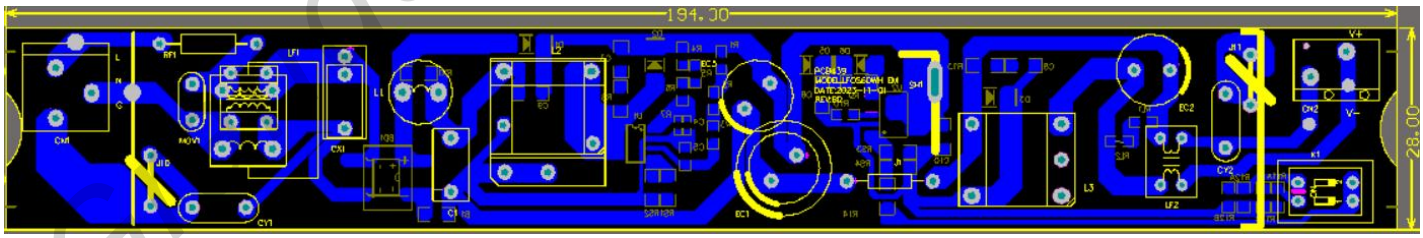
1 设计规格

- 输入电压: 220~240Vac 50/60Hz
- 输出电压: 40~120Vdc
- 输出电流: 200/250/300/350mA
- 电源尺寸: 194mm * 28mm

PIN1	PIN2	I_{rated}[mA]	P_{rated}[W]	U_{rated}[V_{DC}]	U_n / f_n	I_N [A]	t_a [℃]	PF
OFF	OFF	200	24	40-120	220-240V 50/60Hz	0.130	-25...+50	0.7C-0.96
OFF	ON	250	30	40-120		0.154		0.8C-0.96
ON	OFF	300	36	40-120		0.177		0.8C-0.97
ON	ON	350	42	40-120		0.202		0.9C-0.98

2 原理图/PCB





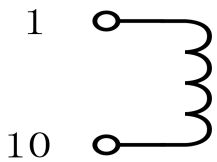
3 材料清单

编号		描述：外置铁壳电源_40W_YT8110FES8+YT2273HEE5_HL_40~120V350mA 输入：220-240Vac 输出：40-120Vdc 200/250/300/350mA	用量	单位	位号
1	壳体		1	PCS	
2	PCB板	PCB_194mm*28mm_FR-4_厚1.2mm_单面板_OSP丝印_绿油白字_铜厚25um_V0_RoHS	1	PCS	
3	贴片桥堆	贴片桥堆_1KV2A_ABS210_RoHS	1	PCS	DB1
4	贴片电阻	贴片电阻_0805_10KR_1%_RoHS	1	PCS	R7
5		贴片电阻_0805_200KR_5%_RoHS	3	PCS	R1, R2, R3
6		贴片电阻_0805_510KR_1%_RoHS	1	PCS	R6
7		贴片电阻_0805_560KR_1%_RoHS	2	PCS	R4, R5
8		贴片电阻_0805_51KR_5%_RoHS	2	PCS	RL1, RL2
9		贴片电阻_0805_2.7R_1%_RoHS	1	PCS	R11A
10		贴片电阻_0805_5.6R_1%_RoHS	1	PCS	R12A
11		贴片电阻_0805_120k_1%_RoHS	1	PCS	R10
12		贴片电阻_1206_5.1K_5%_RoHS	1	PCS	RX1
13		贴片电阻_1206_1.3R_1%_RoHS	1	PCS	RS1
14		贴片电阻_1206_1.6R_1%_RoHS	1	PCS	RS2
15		贴片电阻_1206_4.3R_1%_RoHS	1	PCS	RS3
16		贴片电阻_1206_2.4R_1%_RoHS	1	PCS	RS4
17		贴片电阻_1206_36KR_5%_RoHS	1	PCS	R9
18	贴片电容	贴片电容_0805_1nF/50V_10%_X7R_RoHS	1	PCS	C4
19		贴片电容_0805_1uF/50V_10%_X7R_RoHS	1	PCS	C5
20		贴片电容_1206_2.2nF/1KV_10%_X7R_RoHS	1	PCS	C6
21		贴片电容_1206_2.2nF/1KV_10%_X7R_RoHS	1	PCS	C9
22	贴片电感	贴片电感_1206_3.3uH_RoHS	1	PCS	B1
23	贴片二极管	贴片二极管_600V1A_ES1J_SMA_RoHS	2	PCS	D5,D6
24		贴片二极管_600V2A_ES2J_SMA_RoHS	2	PCS	D2,D3
25		贴片二极管_1KV1A_M7_SMA_RoHS	1	PCS	D1
26	IC	SMD_YT2273HEE5_ESOP5_RoHS	1	PCS	U2
27		SMD_YT8110FES8_SOP8_RoHS	1	PCS	U1
28	跳线	D=0.8mm _P=7mm_RoHS	2	PCS	J10,J11
29	跳线	D=0.8mm _P=12mm_RoHS	1	PCS	J1
30	X电容	X2电容_0.22uF/250V_P=7.5mm_RoHS	1	PCS	CX1
31	Y电容	Y2电容_2.2nF/250V_P=7.5mm_RoHS	1	PCS	CY1
32		Y2电容_1nF/250V_P=7.5mm_RoHS	1	PCS	CY2
33	保险丝	插件保险丝电阻_2.2R_1WS_5%_RoHS	1	PCS	RF1
34	压敏	压敏电阻_7D511_P=5mm_RoHS	1	PCS	MOV1
35	薄膜电容	薄膜电容_150nF/450V_P=7.5mm_RoHS	1	PCS	C1
36	磁性元件	工字电感8*10_0.17mm_2mH_RoHS	1	PCS	L1
37		EE1410_2.7mH_235T_0.21mm_5+5Pin_立式_RoHS	1	PCS	L2
38		EE1410_2mH_170T_0.25mm_5+5Pin_立式_RoHS	1	PCS	L3
39		共模电感_EE8.3_0.16mm_>20mH_RoHS	1	PCS	LF1
40		磁环电感_9*5*3_100uH_0.3mm_RoHS	1	PCS	LF2
41	电解电容	电解电容_RG_10uF/250V_105℃_8*12mm_RoHS	1	PCS	EC2
42		电解电容_CD11GD_10uF/450V_105℃_10*13mm_RoHS	1	PCS	EC1
43	开关	拨码开关_间距2.54mm_2位_RoHS	1	PCS	K1
44	端子	免螺丝压扣式端子_3PIN_P=3.5mm_3.5A250V_灰色_RoHS	1	PCS	CN1
45		免螺丝压扣式端子_2PIN_P=3.5mm_3.5A250V_左黑右红_RoHS	1	PCS	CN2

4 电感参数

***Inductor Specification of L2_EE1410_5+5**

一、电性原理图及结构图：

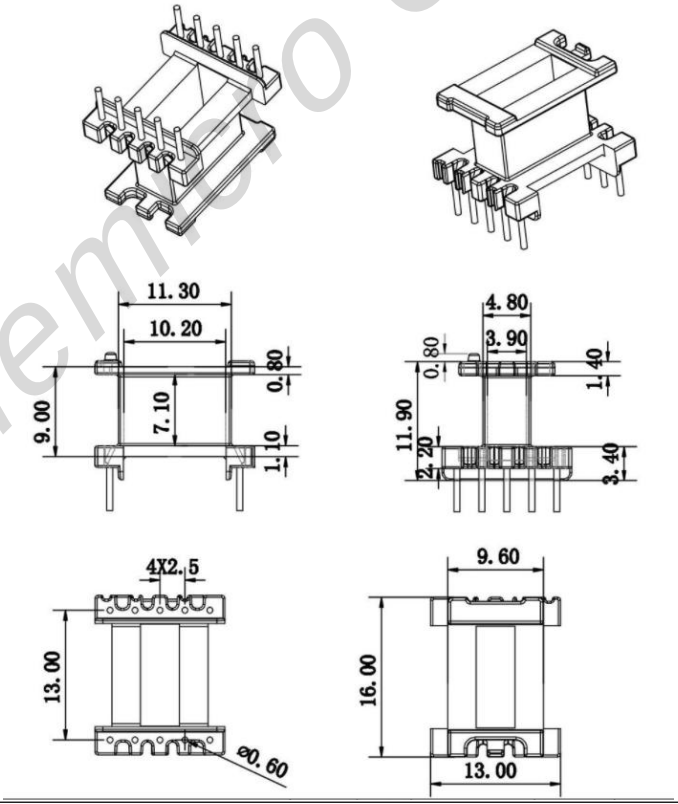


二、绕线方式 WINDING MODE：

Winding 绕组	Start 起端	Finish 尾端	Wire 线规	Turns 圈数	Reamark 绕线方式	Tape Layer 胶带层数
N1	1	10	2UEW Φ0.21mm	235Ts	密绕	2Ts

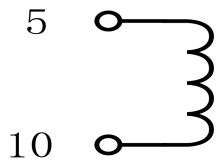
NOTE:(注意事项)

1. PC40 EE1410 加宽磁芯
2. 1-10 脚感量 2.7mH±5%（10K/0.3V）
3. 保留 1、4、6、10 脚，去除其余脚



***Inductor Specification of L3 EE1410 5+5**

一、电性原理图及结构图：

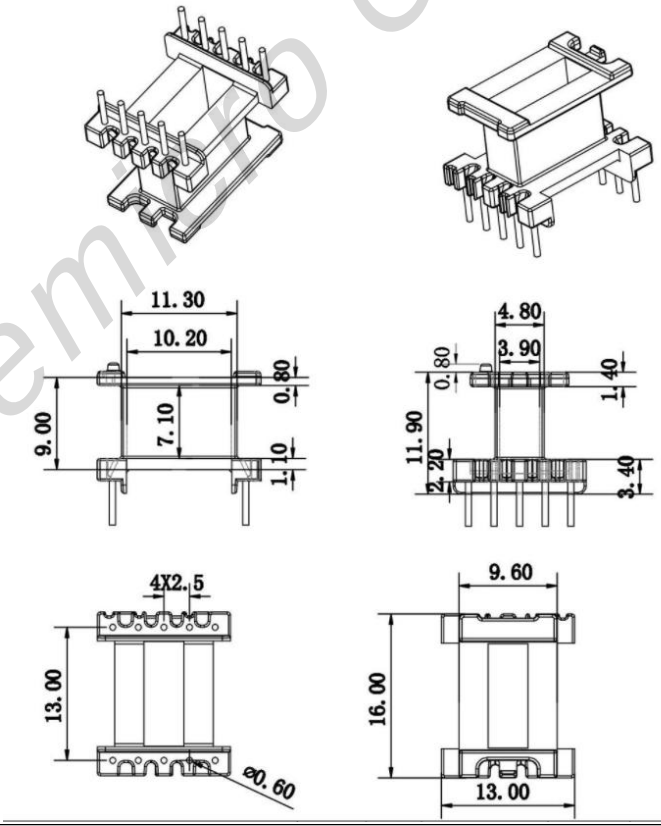


二、绕线方式 WINDING MODE：

Winding 绕组	Start 起端	Finish 尾端	Wire 线规	Turns 圈数	Reamark 绕线方式	Tape Layer 胶带层数
N1	5	10	2UEW Φ0.25mm	170Ts	密绕	2Ts

NOTE:(注意事项)

1. PC40 EE1410 加宽磁芯
2. 5-10 脚感量 2mH±5%（10K/0.3V）
3. 保留 1、5、6、8、10 脚，去除其余脚

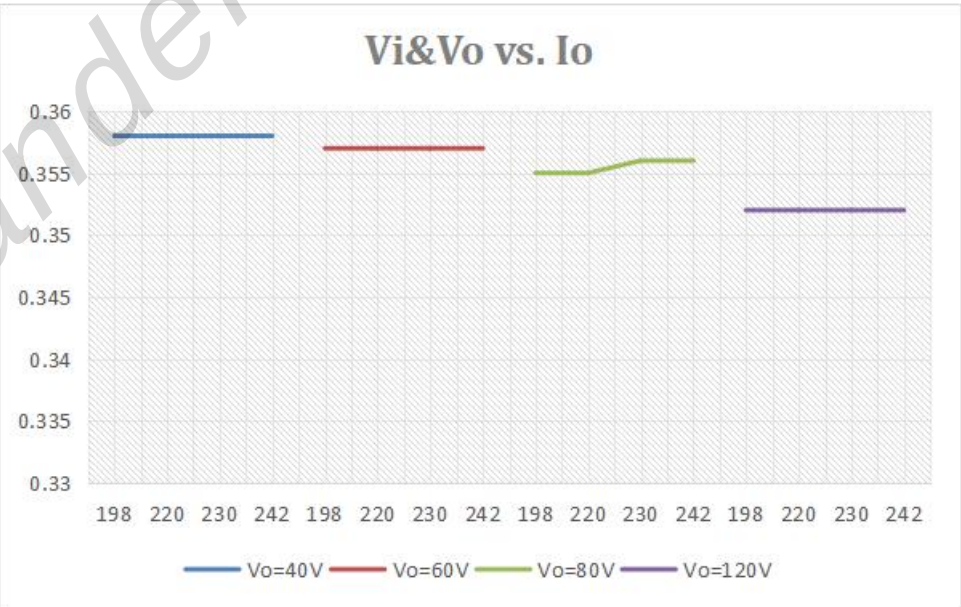


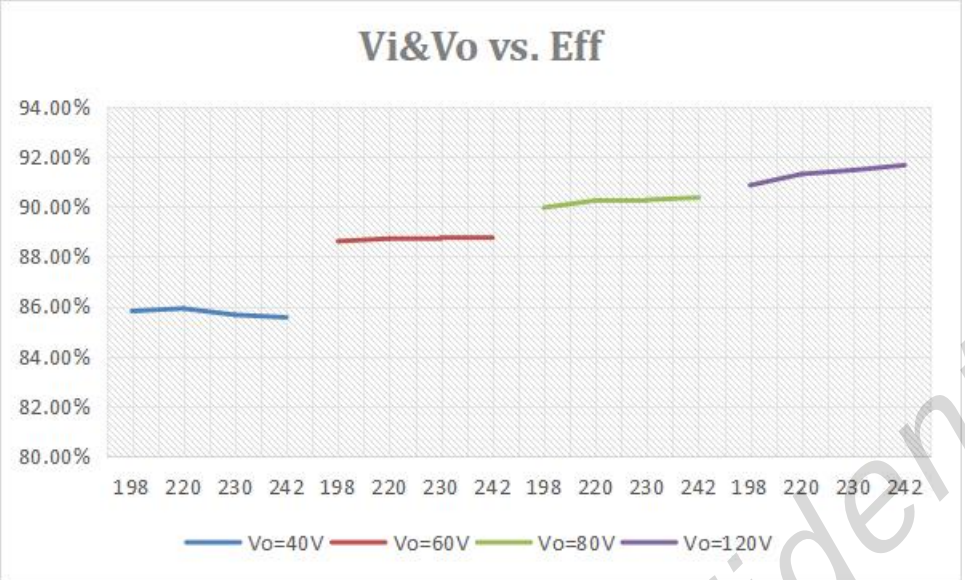
5 静态参数测试

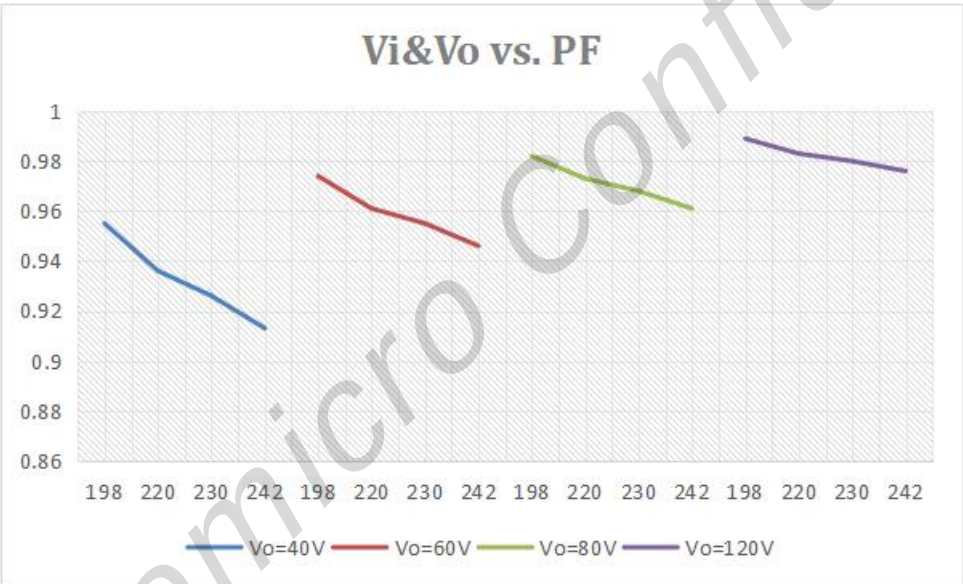
5.1 综合性能测试

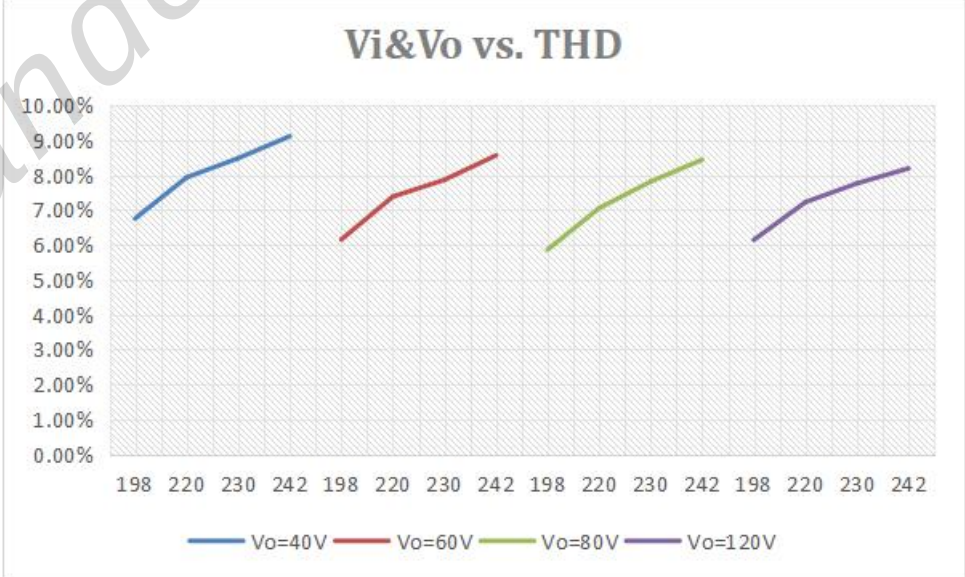
5.1.1 Io=350mA

No.	Vin	Fre	Iin	Pin	Vout	Iout	Wout	Eff	PF	I-THD
	Vac	Hz	mA	Watts	Vdc	A	Watts	%		%(max)
	Vac					0.332-0.367		YT	YT	YT
1	198	50	88.84	16.77	40.026	0.358	14.39	85.81%	0.955	6.75
2	220	50	81.54	16.75	40.026	0.358	14.39	85.91%	0.936	7.93
3	230	50	79.06	16.8	40.026	0.358	14.39	85.65%	0.926	8.48
4	242	50	76.26	16.82	40.026	0.358	14.39	85.55%	0.913	9.11
5	198	50	125.94	24.23	59.995	0.357	21.47	88.61%	0.974	6.15
6	220	50	114.71	24.2	59.995	0.357	21.47	88.72%	0.961	7.38
7	230	50	110.44	24.19	59.995	0.357	21.47	88.76%	0.955	7.86
8	242	50	105.76	24.18	59.995	0.357	21.47	88.79%	0.946	8.56
9	198	50	163.27	31.68	80.026	0.355	28.50	89.96%	0.982	5.86
10	220	50	147.88	31.58	80.026	0.355	28.50	90.25%	0.973	7.05
11	230	50	142.09	31.57	80.026	0.356	28.50	90.28%	0.968	7.81
12	242	50	135.8	31.54	80.026	0.356	28.50	90.36%	0.961	8.44
13	198	50	238.56	46.59	120.01	0.352	42.33	90.86%	0.989	6.14
14	220	50	214.75	46.36	120.01	0.352	42.33	91.31%	0.983	7.22
15	230	50	205.72	46.28	120.01	0.352	42.33	91.46%	0.98	7.76
16	242	50	195.79	46.18	120.01	0.352	42.33	91.66%	0.976	8.19



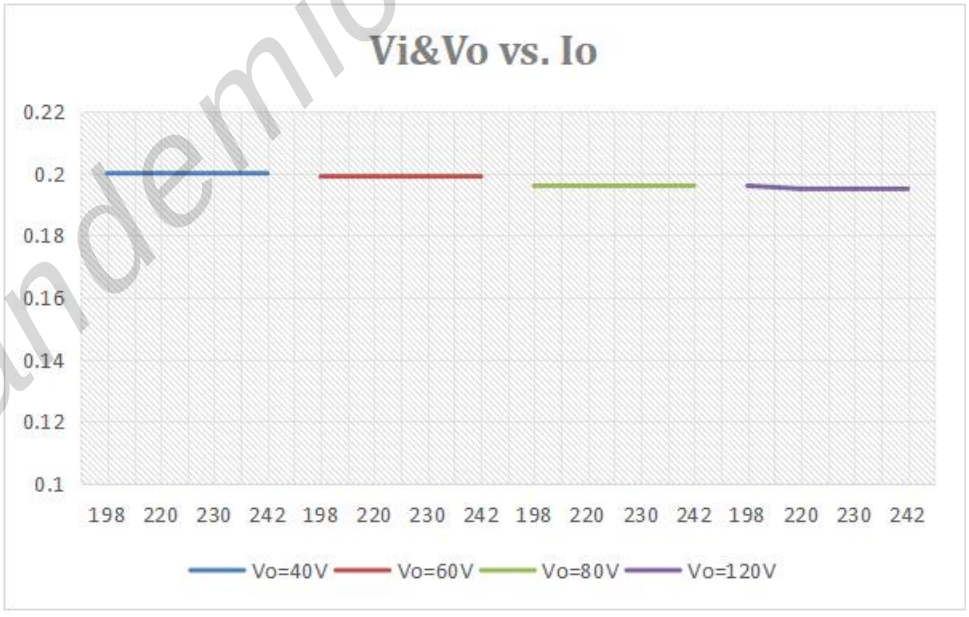


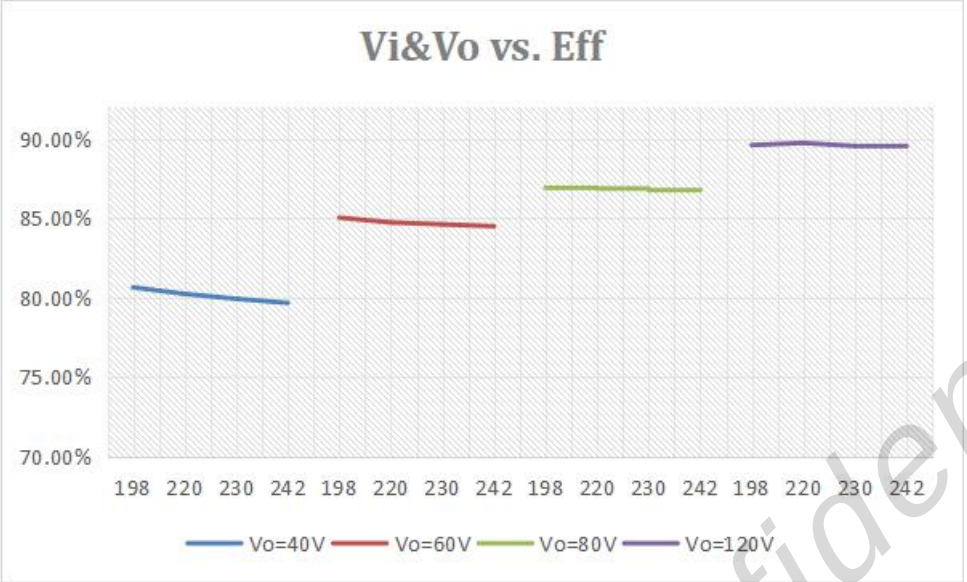


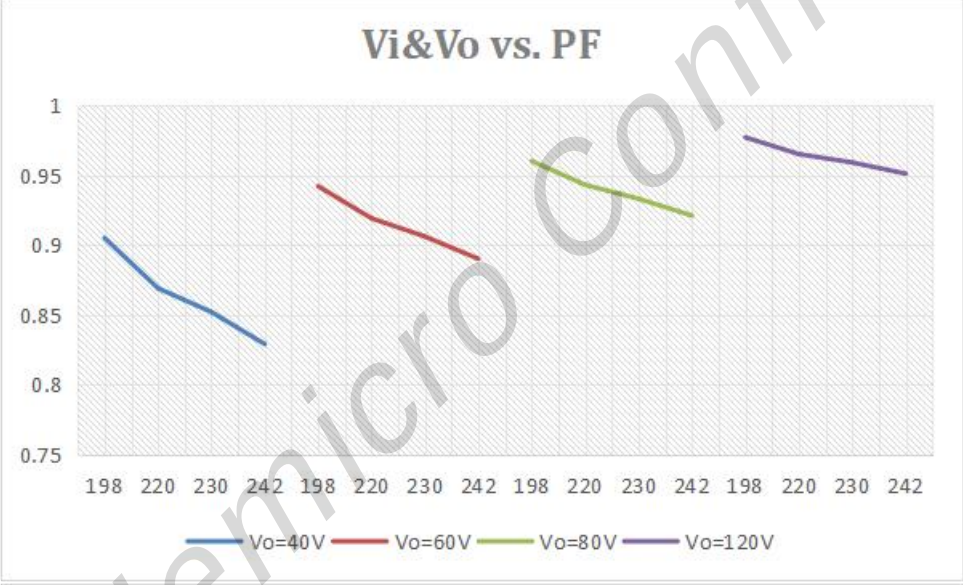


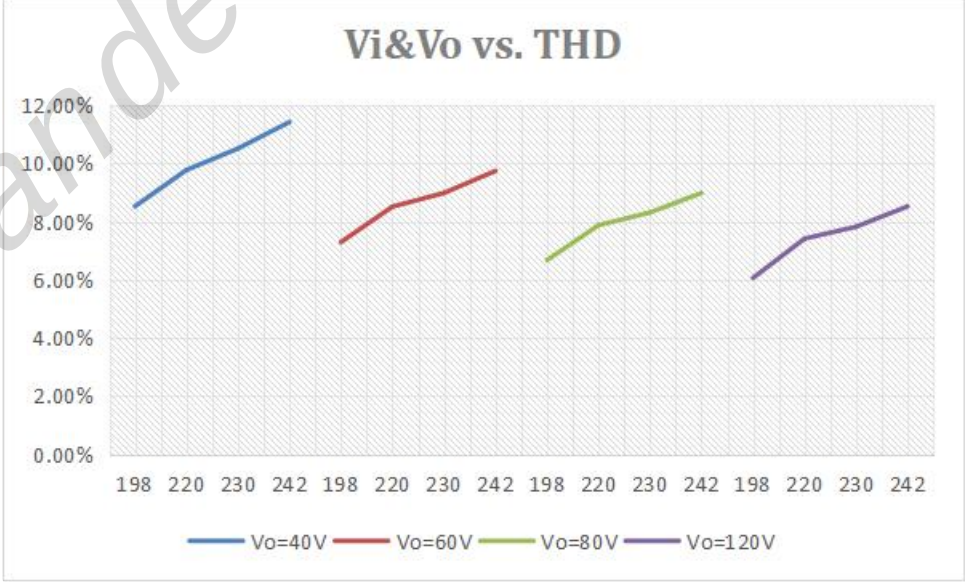
5.1.2 Io=200mA

No.	Vin	Fre	Iin	Pin	Vout	Iout	Wout	Eff	PF	I-THD
	Vac	Hz	mA	Watts	Vdc	A	Watts	%		%(max)
	Vac					0.194-0.206		YT	YT	YT
1	198	50	55.63	9.94	40.026	0.2	8.02	80.65%	0.905	8.52
2	220	50	52.38	9.99	40.026	0.2	8.02	80.24%	0.869	9.77
3	230	50	51.33	10.03	40.026	0.2	8.02	79.93%	0.852	10.51
4	242	50	50.25	10.06	40.026	0.2	8.02	79.67%	0.829	11.42
5	198	50	75.44	14.04	59.996	0.199	11.94	85.04%	0.942	7.29
6	220	50	69.88	14.09	59.996	0.199	11.94	84.74%	0.919	8.51
7	230	50	67.85	14.11	59.995	0.199	11.94	84.62%	0.906	8.98
8	242	50	65.68	14.13	59.995	0.199	11.94	84.50%	0.89	9.74
9	198	50	95.57	18.12	80.026	0.196	15.75	86.92%	0.96	6.67
10	220	50	87.69	18.13	80.026	0.196	15.75	86.87%	0.943	7.87
11	230	50	84.76	18.15	80.026	0.196	15.75	86.78%	0.933	8.31
12	242	50	81.63	18.17	80.026	0.196	15.75	86.68%	0.921	8.98
13	198	50	136.23	26.28	120	0.196	23.55	89.61%	0.977	6.06
14	220	50	123.94	26.24	120	0.195	23.55	89.75%	0.965	7.41
15	230	50	119.18	26.22	120	0.195	23.48	89.55%	0.959	7.82
16	242	50	114.07	26.21	120	0.195	23.48	89.58%	0.951	8.52









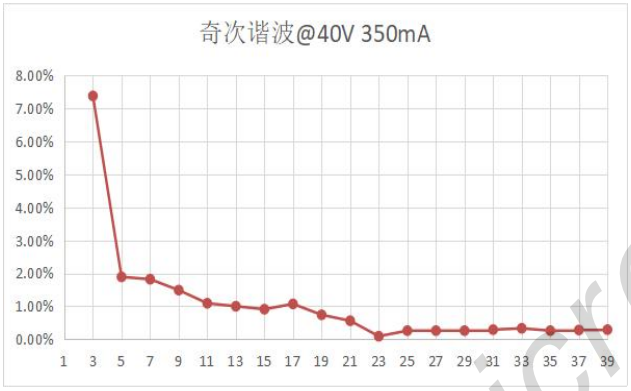
5.2 单次谐波测试

*标准： C 类（照明）设备的谐波电流限值（GB 17625.1 表 2）

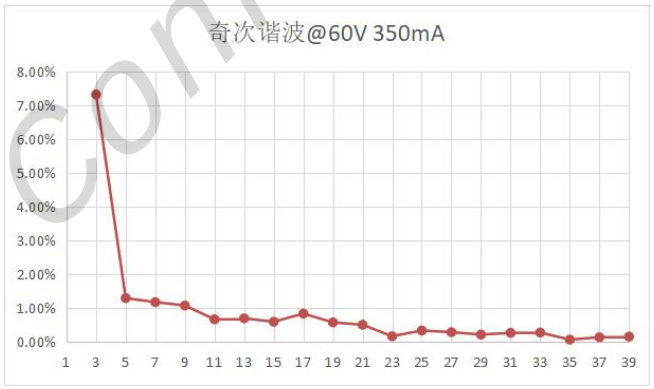
谐波次数 n	基波频率下输入电流百分数表示的最大允许谐波电流 %
2	2
3	$30 \cdot \lambda^a$
5	10
7	7
9	5
$11 \leqslant n \leqslant 39$ （仅有奇次谐波）	3

[a] λ是电路功率因数。

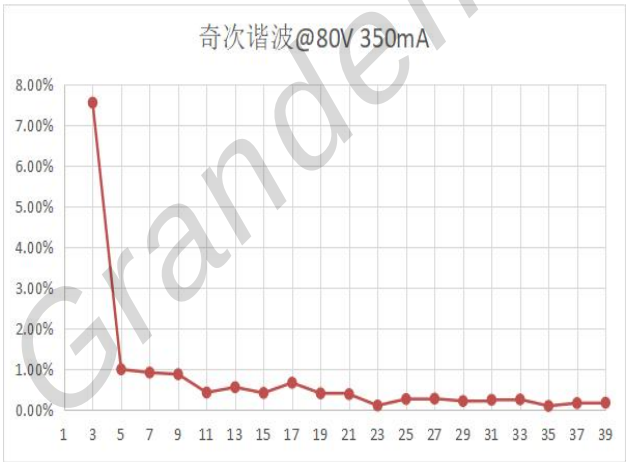
***测试条件：Input=230Vac/50Hz，输出从轻载到满载分四个电压进行测试**



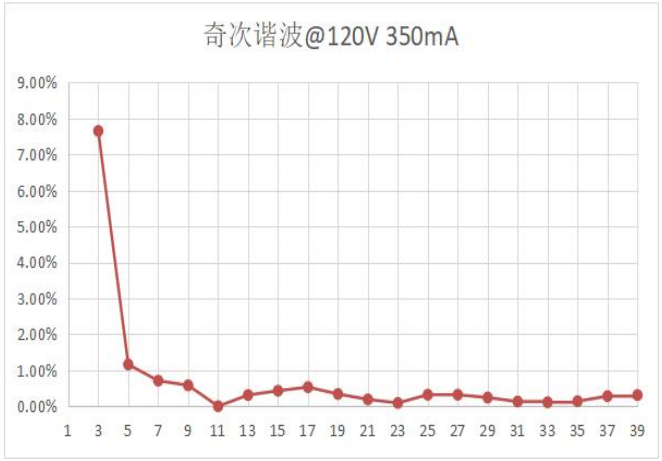
可满足分次谐波要求



可满足分次谐波要求



可满足分次谐波要求

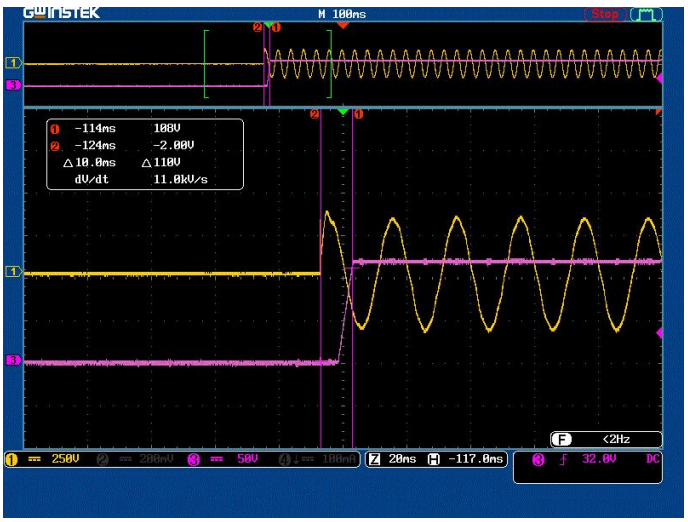


可满足分次谐波要求

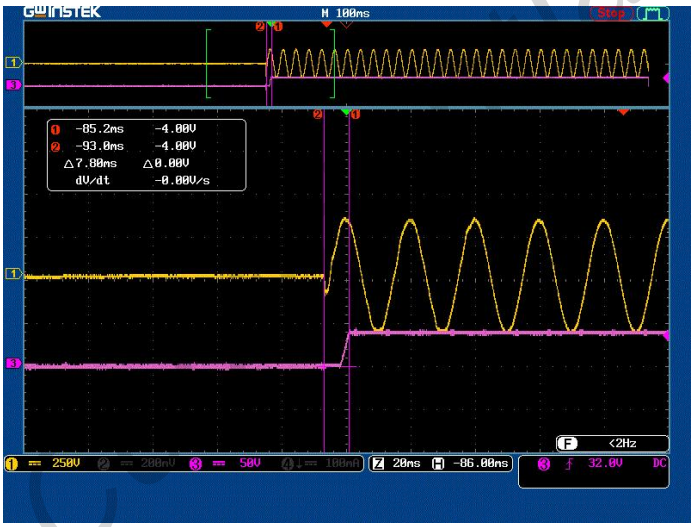
6 关键波形测试

6.1 启动时间

◆ Input=230Vac（黄色 CH1=AC，紫色 CH3=Vout）



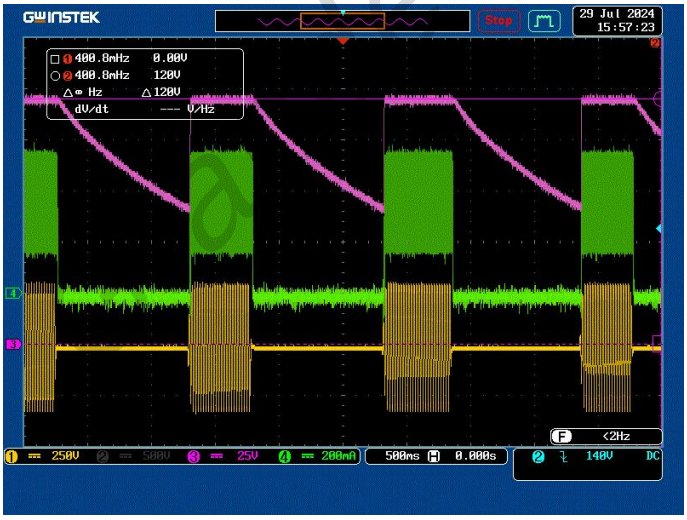
Vout=120V 350mA
Start-up Time=10ms



Vout=40V 200mA
Start-up Time=7.8ms

6.2 连续开关机/拉弧

◆ Input=230Vac（黄色 CH1=AC，紫色 CH3=Vout，绿色 CH4=Iout），Vout=120V 350mA



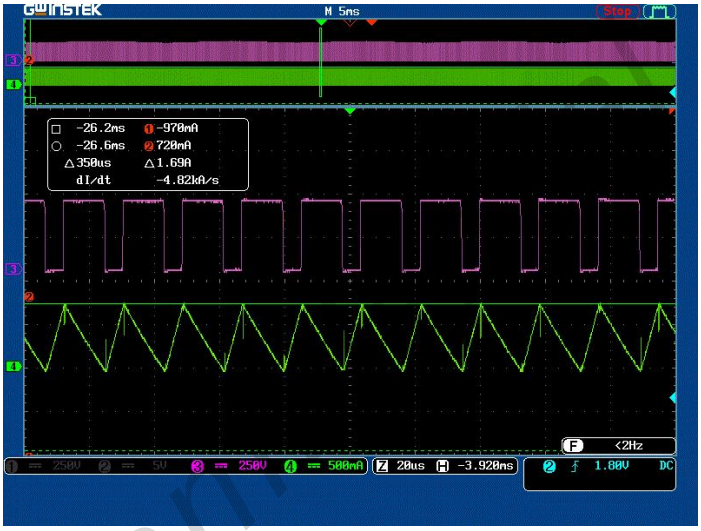
连续开关机
不误触发 OVP

AC 拉弧测试
不误触发 OVP

6.3 MOSFET 应力测试

◆ Input=230Vac（紫色 CH3=VDS，绿色 CH4=IL），Vout=120V 350mA

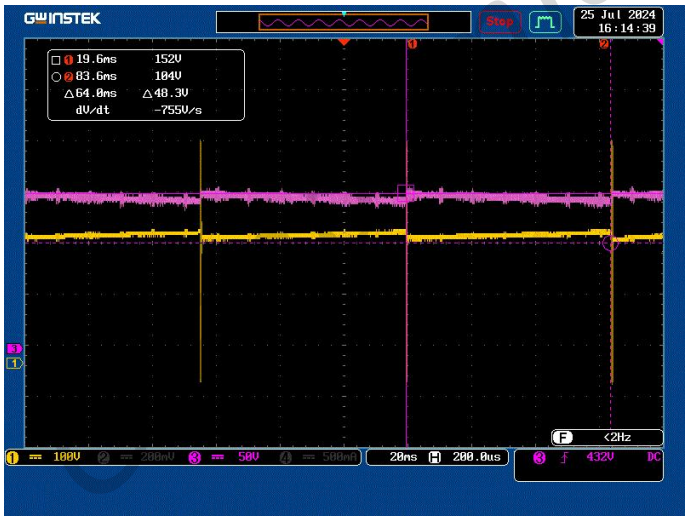
前级 APFC 芯片-U1
VDS_max=420V，IL_max=640mA



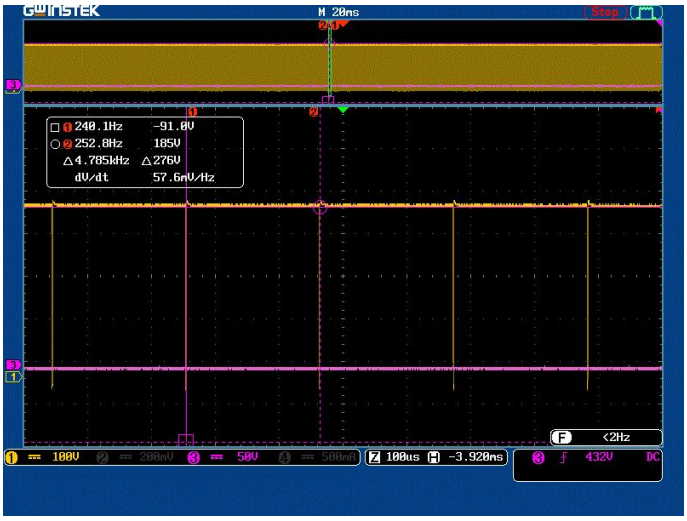
后级 BUCK 芯片-U2
VDS_max=430V，IL=720mA

6.4 开路/短路保护

◆ Input=230Vac（黄色 CH1=VDS，紫色 CH3=Vout）



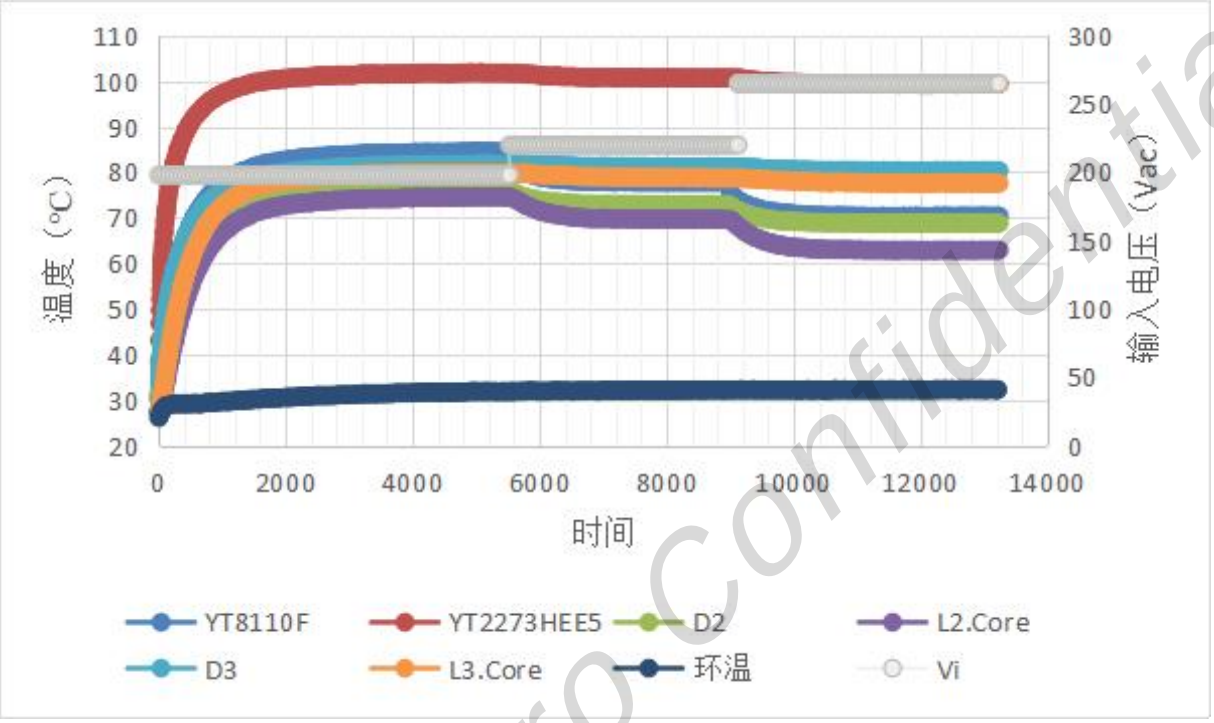
开路保护功能正常
Vovp=152V，打嗝时间=64ms



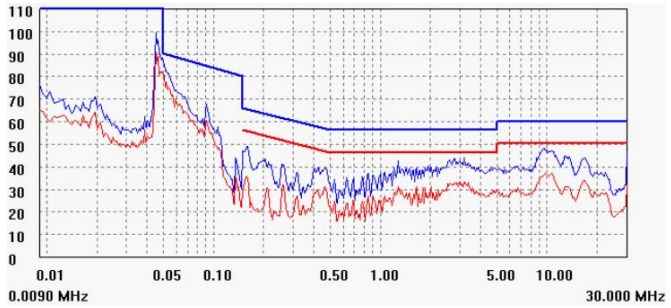
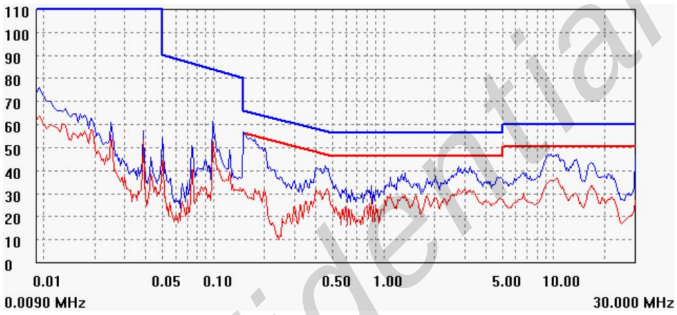
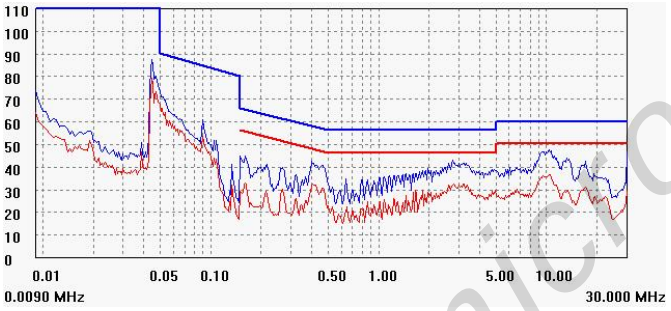
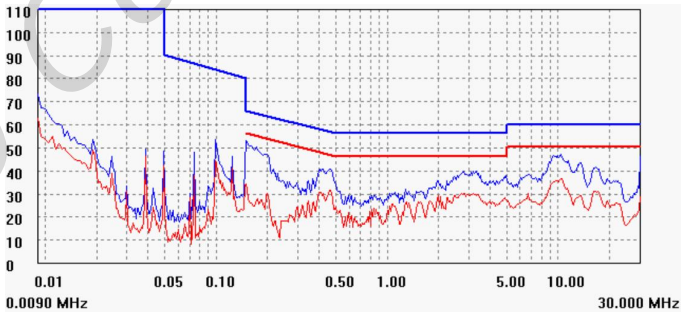
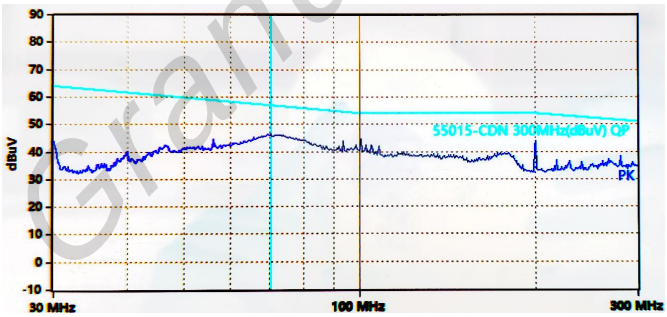
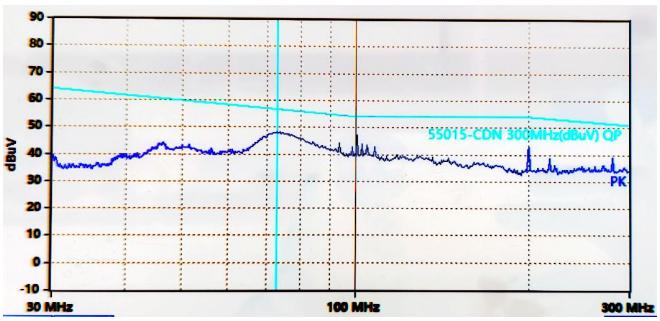
短路保护功能正常
最低工作频率=4.78kHz

7 温升测试

* 测试条件：Input=198/230/265Vac/50Hz，Output=120V 350mA



8 EMI 测试

测试条件：Input=230Vac，Output=120V 350mA	测试条件：Input=230Vac，Output=40V350mA
	
传导-L	传导-L
	
传导-N	传导-N
	
辐射	辐射