

# 产品规格书

描述(Description): FT8238A+PQ2006 12V2A

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客 户(Customer):

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版 本(Version): V3.0(单 Y 单共模)

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发行日期(Iss Date): 2019-4-2

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拟制 PREPARED BY	检查 CHECKED BY	批准 APPROVED BY



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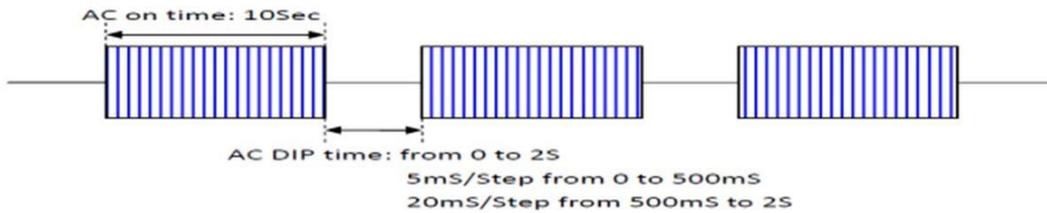
## 1. Power Supply Overview 电性能指标:

### 1.1 Table 1 Input Electrical Characteristics Overview (输入特性)

Input voltage range 输入电压范围	90Vac-264Vac
Normal voltage range 标准输入	100Vac-240Vac
Frequency range 频率范围	50Hz/60Hz
Max input AC current 满载输入电流	0.5A max at full load condition
Inrush current (cold start) 浪涌电流(冷机)	80A <sub>typ</sub> peak, 120Vac; 100A <sub>typ</sub> peak, 220Vac
Efficiency (full load) 效率	86.2% min at 115Vac/230Vac;
Harmonic current 谐波电流	Meet GB17625.1-1998/IEC61000-3-2 class D
No Load Power Loss 待机功耗	≅0.075W 230Vac input
AC Brown-out AC 欠压关机	Not required
AC Brown-in AC 开机电压	Not required
AC DIP Test AC 跌落测试	Not required

Note: 1) At AC Brown-out and Brown-on test, when the input voltage from 0Vac 120Vac for 3min, and from 120Vac to 0Vac for 3min, the PSU function shall be normal and no components damaged. AC 欠压关机、开机测试时，电压从 0V 上升到 120V，从 120Vac 降到 0Vac，过程的时间均为 3 分钟。

2) Power module shall not shutdown and latch off at AC cycling DIP test (from 10ms to 10sec) during specified load. Power modules must auto-restart when AC input voltage has applied again. 电源输出带额定负载情况下，当 AC 输入电压跌落保持时间在 10ms 到 10sec 时，电源不得出现关机或锁死现象。当输入电压恢复正常后，电源应进入正常工作状态。



### 1.2 Output Electrical Characteristics Overview (输出特性)

#### 1.2.1 Table 2 Output Voltage, Current & Regulation. (输出调整率)

Output Voltage 输出电压	Regulation 调整率	Min current 最小电流	Rated current 额定电流	Peak current 峰值电流	Peak Power 峰值功率
+12V	±5%	0A	2		

#### 1.2.2 Turn on delay time. (开机延时)

Upon application of the AC signal the PSU shall begin functioning normally under all operation specifications within 3seconds. AC 上电后，电源必须在 3 秒内达到正常工作状态。



**1.2.3 Table 3 DC Output Ripple & Noise.(输出波纹和噪声)**

Output Voltage 输出电压	Ripple & Noise(PK to PK)纹波与噪声	Test Condition 测试条件
+12V	240mVp-p	Normal Input, 0%,50%,100% Rated Load

Note: 1) Measurements shall be made with an oscilloscope with 20MHz bandwidth 示波器设置在 20MHz 带宽。

2) Output shall be bypassed at the connector with a 0.1uF ceramic capacitor and a 4.7uF electrolytic simulate system loading . 输出并联一个 0.1uF 的陶瓷电容和一个 4.7uF 的电解电容。

**1.2.4 Table 4 Output Transient Response. (输出动态响应)**

Output Voltage 输出电压	Voltage Tolerance Limit 动态调整率	Slew Rate 动态速率	Load Change 负载变化
+12V	±20%	50mA/uS	Min. to 10% load and 90% to Max load

Note: Transient response measurements shall be made with a load changing repetition rate of 100Hz and 500Hz.

输出以 100&500Hz 的频率跳变负载来测试。

**1.2.5 Table 6 DC Output Hold-Up Time. (输出保持时间)**

Output Voltage 输出电压	120Vac input	230Vac input
+12V	≥5 mS	≥10 mS

Note: DC output at full load. 所有输出带满载

**1.2.6 Table 7 DC Output Overshoot At Turn On & Turn Off. (输出超调)**

Output Voltage 输出电压	Output Over shoot voltage(V)超调电压	
	Turn on 开机	Turn off 关机
+12V	±10%	±10%

Note: DC output current at Min and Rated load. 测试时负载为最小和额定负载两种状况。

**1.2.7 Table 8 DC output voltage rise time (输出上升时间)**

Output Voltage 输出电压	120Vac input	220Vac input
+12V	≤100mS	≤100 mS

Note: The output voltages shall rise from 10% to 90% of their output voltage. 输出从 10% 上升到 90% 的时间

**1.2.8 Table 9 Capacitive load. (容性负载能力)**

The PSU should be able to power up and operate normally with the following capacitances simultaneously present on the DC outputs. 当电源输出端并联以下容量的容性负载时，电源应能正常开启并正常工作。

Output Voltage 输出电压	+12V				
Capacitive load 容性负载					

**1.3 Protection:(保护功能)****1.3.1 Table 12 DC Output Over current Protection. (输出过流保护)**

Output Voltage	Over Current	Comments
+12V	≥2.6A	Hiccup 尝试重复启动



### 1.3.3 Table 13 DC Output Short Circuit Protection. (输出短路保护)

Output Voltage	Comments
+12V	Hiccup 尝试重复启动

Note: The Short Circuit protection should be test at other of dc output at min load

短路保护测试是在其它最小负载时测试.

## 2. Safety(ClassII) (安规标准, II类设备)

### 2.1 Standard (标准)

The PSU must meet with the following standard :

电源必须满足以下标准:

IEC60065, 60950-1 and UL60950, 60950-1 and GB8898-2011

### 2.2 Isolation resistance(绝缘阻抗)

Input To Output: 50MΩ Min at DC500V,in room temperature.在室温环境下, DC500 电压测试时不得小于 50MΩ。

### 2.3 Hi-Pot test(耐压测试)

Lab test: 3KVac(or 4242Vdc)/10mA, 1 minute between primary and secondary circuit.

3KVac(or 4242Vdc)/10mA, 1 minute between primary and FG.

实验室测试: 初级与次级 3KVac(or 4242Vdc)/10mA, 1 分钟。

初级与保护地 3KVac(or 4242Vdc)/10mA, 1 分钟。

Product line: 3.6KVac(or 5100Vdc)/5mA, 2 second between primary and secondary circuit.

3.6KVac(or 5100Vdc)/5mA, 2 second between primary and FG.

产线测试: 初级与次级间 3.6KVac(or 5100Vdc)/5mA, 2 秒。

初级与保护地间 3.6KVac(or 5100Vdc)/5mA, 2 秒。

### 2.4 Leakage current(泄漏电流)

0.25mA MAX at 230Vac/50Hz. 输入 230Vac/50Hz 时最大 0.25mA。

### 2.5 Lightning surge(雷击浪涌)

(1). common mode(Line to secondary GND and Neutral to secondary GND)

(L 与次级地之间, N 与次级地之间)

(2). ±1KV/differential mode(Line to Neutral). 差模±1KV (L 与 N 之间)

Note: After the test, no loss function. 测试后产品无功能失效。

Reference standard 参照标准 : GB17626.5-1998/IEC61000-4-5

## 3. EMC (电磁兼容性)

### 3.1 EMI (电磁干扰)

The PSU shall compliance with the following conduction emission and radiate emission standard:

电源电磁干扰满足下列标准:

EN55022 CLASS B for Europe. 欧州标准 EN55022 CLASS B

GB9254 CLASS B for China CCC. 中国标准 GB9254 CLASS B

FCC PART15 CLASS B for America. 美国标准 FCC PART15 CLASS B

### 3.2 EMS (电磁抗干扰)

The PSU shall compliance with the following standard 电源电磁抗干扰满足下标准:

#### 3.2.1 ESD (静电抗扰度)

IEC61000-4-2 ESD level 4, criterion B. 测试标准 IEC61000-4-2 ESD level 4, criterion B

Air discharge test(with system) 空气放电 (带整机): ±2KV, ±4KV, ±8KV, ±12KV

Contact discharge test(with system) 接触放电 (带整机): ±2KV, ±4KV



### 3.2.2 EFT (快速脉冲群)

IEC61000-4-4 EFT level 2, criterion B(with system) 1KV/5KHz on AC power port for 1 minute.

测试标准 IEC61000-4-4 EFT level 2, criterion B (带整机)：电源输入端口 1KV/5KHz 信号 1 分钟。

## 4. Environmental Requirement (工作环境)

### 4.1 Temperature (环境温度)

Operating temperature 工作温度：0°C to +40°C

Note: Only for the temperate climate conditions. 仅适用于温带气候条件下使用。

### 4.2 Humidity (环境湿度)

Operating humidity 工作环境湿度：From 10% to 90% relative humidity (without dewdrop 无结露条件下).

### 4.3 Altitude (海拔高度)

Operating altitude 工作海拔高度：2Km MAX.

Store altitude 贮存海拔高度：6Km MAX.

## 5 MTBF (平均无故障时间)

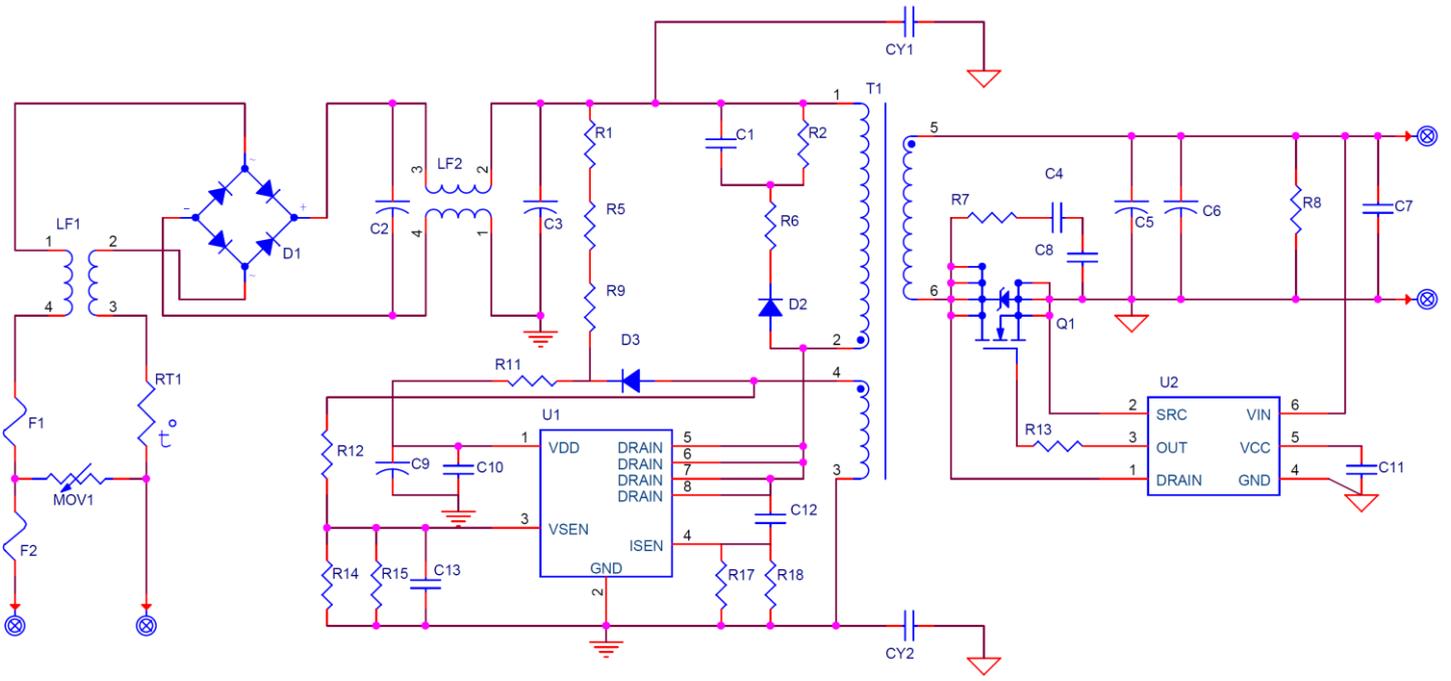
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## 6. Dimension(物理尺寸)

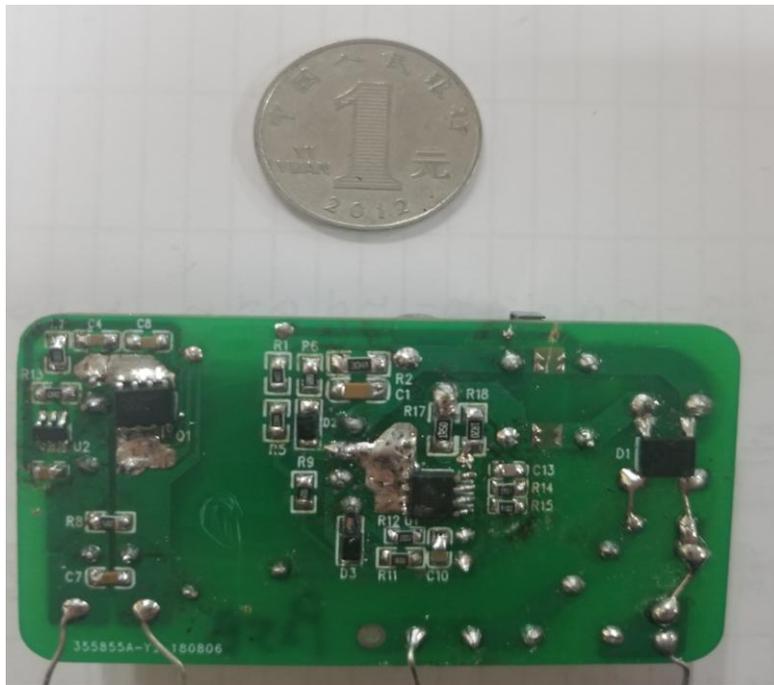
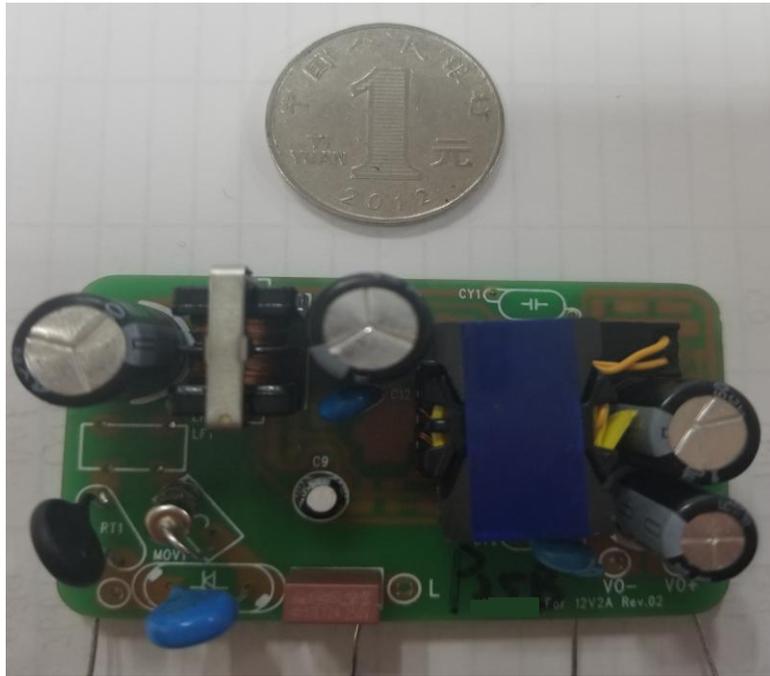
TBD



7. schematic



8. Product photos (产品照片)



## 9.Bill of material (物料清单)

序号	元件标号	元件型号	数量	备注
SMD				
1	R1	SMD-RES, 2.2M $\Omega$ 5% 0805	1	
2	R2	SMD-RES, 300K $\Omega$ 5% 1206	1	
3	R5	SMD-RES, 2.2M $\Omega$ 5% 0805	1	
4	R6	SMD-RES, 68 $\Omega$ 5% 0805	1	
5	R7	SMD-RES, 30 $\Omega$ 5% 0805	1	
6	R8	SMD-RES, 56K $\Omega$ 5% 0805	1	
7	R9	SMD-RES, 1M $\Omega$ 5% 0805	1	
8	R11	SMD-RES, 1 $\Omega$ 5% 0805	1	
9	R12	SMD-RES, 20K $\Omega$ 1% 0603	1	
10	R13	SMD-RES, 10 $\Omega$ 5% 0805	1	
11	R14	SMD-RES, 3.9K $\Omega$ 1% 0603	1	
12	R15	SMD-RES, 91K $\Omega$ 1% 0603	1	
13	R17	SMD-RES, 1.5 $\Omega$ 1% 1206	1	
14	R18	SMD-RES, 1.2 $\Omega$ 1% 1206	1	
15	C1	SMD-CAP, 1nF/250V 1206 X7R	1	
16	C4、C8	SMD-CAP, 2.2nF/50V 0805 X7R	2	
17	C7、C10	SMD-CAP, 0.1uF/50V 0805 X7R	2	
18	C11	SMD-CAP, 220nF/50V 0603 X7R	1	
19	C13	SMD-CAP, 33PF/50V 0805 X7R	1	
20	D1	Bridge Rectifier, ABS210	1	
21	D2	SMD-DIDOE, 1N4007 1A1000V SOD-123	1	
22	D3	SMD-DIDOE, FR107 1A1000V SOD-123	1	
23	U1	SMD-IC, FT8238TA, SOP-8 鑫集微电子	1	
24	U2	SMD-IC, FT8576, SOT23-6 鑫集微电子	1	
25	Q1	NCEP6020AS, SOP-8	1	
DIP				
26	FR1	Fast Break Fuse, 2A/250V	1	
27	FR2	Slow Break Fuse, T2A/250V	1	
28	C2	E-CAP, 22uF/400V 10*16MM	1	
29	C3	E-CAP, 22uF/400V 10*16MM	1	
30	C5	E-CAP, 1000uF/16V 10*12.5MM LOW ESR	1	
31	C6	E-CAP, 1000uF/16V 8*16MM LOW ESR	1	
32	C9	E-CAP, 3.3uF/50V 4*5MM	1	
33	C12	Ceramic Capacitor, 68pF/1000V	1	
34	MOV1	07D471K	1	
35	RT1	NTC 5D-9	1	
36	LF2	Common Inductors, UU9.8 25mH	1	
37	T1	PQ2006	1	
38	CY2	Y-CAP, 471K/250V	1	



10. Test report (测试报告)

MODEL	
SPEC	12V/2A
INPUT	90Vac/60Hz-264Vac/50Hz

DATE	2019.4.2
TESTED BY	
Ta	25°C

10.1 Electrical performance test report (电性能测试报告) 板端效率

NO.1	Load Rate	Pin (W)	Vout (V)	Iout (mA)	Pout (W)	η	OCP (A)	Average	Ripple & Noise(mV)
						(%)		η(%)	≤
Iput:	0	0.038	11.960	0.000	0.000	0.00%	2.36	≥	
90Vac60Hz	10%	2.680	11.900	0.200	2.380	88.81%		90.01%	190
	25%	6.590	11.910	0.500	5.955	90.36%			
	50%	13.170	11.970	1.000	11.970	90.89%			
	75%	20.080	12.050	1.500	18.075	90.01%			
Iput:	0	0.041	11.960	0.000	0.000	0.00%	2.38		
115Vac60Hz	10%	2.690	11.900	0.200	2.380	88.48%		90.96%	167
	25%	6.570	11.910	0.500	5.955	90.64%			
	50%	13.080	11.960	1.000	11.960	91.44%			
	75%	19.820	12.050	1.500	18.075	91.20%			
Iput:	0	<b>0.068</b>	11.960	0.000	0.000	0.00%	2.33		
230Vac50Hz	10%	2.800	11.890	0.200	2.378	84.93%		90.48%	160
	25%	6.690	11.910	0.500	5.955	89.01%			
	50%	13.240	11.970	1.000	11.970	90.41%			
	75%	19.860	12.060	1.500	18.090	91.09%			
Iput:	0	0.079	11.960	0.000	0.000	0.00%	2.33		
264Vac50Hz	10%	2.870	11.900	0.200	2.380	82.93%		89.78%	160
	25%	6.770	11.920	0.500	5.960	88.04%			
	50%	13.370	11.970	1.000	11.970	89.53%			
	75%	19.990	12.070	1.500	18.105	90.57%			
	100%	26.750	12.170	2.000	24.340	90.99%			



10.3、安全电压测试				
功率管安全	动态切换	短路测试	稳态测试	
Vds_max (V)	550V	490V	535V	
VSR_max (V)	56V	70V	55V	
10.4、空满载稳定性测试				
IC 电路安全	空满载切换测试	空载掉电测试	90V60HzVCC 满载电压	90V60HzVCC 空载电压
85~265V	√	√	11.4V	8.68V
10.5、启动测试				
测试项	90V60Hz 满载启动时间	115V60Hz 是否启动	230V50Hz 是否启动	264V50Hz 是否启动
测试结果	2.8S	√	√	√
10.6、待机测试				
测试项	230V50Hz 空载待机	230V50Hz 空载电压	90V60Hz 空载电压	264V50Hz 空载电压
测试结果	68mW	11.95V	11.95V	11.952V
10.7、纹波测试				
测试项	90V60Hz	115V60Hz	230V50Hz	264V50Hz
0~满载, 0.1A/step 扫描 记录最大纹波值	190mV	167mV	160mV	160mV
10.8、OCP 测试				
测试项	90V60Hz	115V60Hz	230V50Hz	264V50Hz
ICV_(Uout-1V)(A)	2.36A	2.38A	2.33A	2.33A

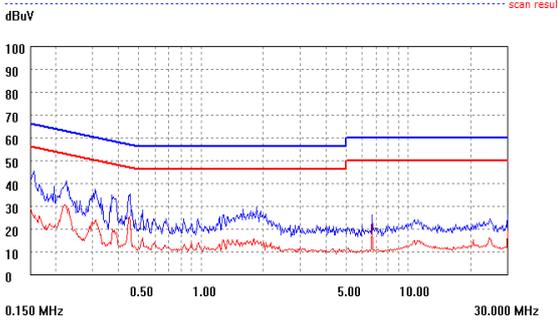


# 10.9 EMC test report (EMC 测试报告)

## EMI TEST REPORT

Organization: \_\_\_\_\_ parameter  
 Place: \_\_\_\_\_ Operator: \_\_\_\_\_ EUT: \_\_\_\_\_  
 Time: 2019/4/2/16:22 Test equipment: KH3962  
 Detector: PK+AV Test-time[ms]: 10 SN: 620620  
 Limit: EN55022B Transducer(PK/AV): PK / AV JZ: 2,14,1230  
 Remark: \_\_\_\_\_

Start(MHz)	End(MHz)	Step(MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

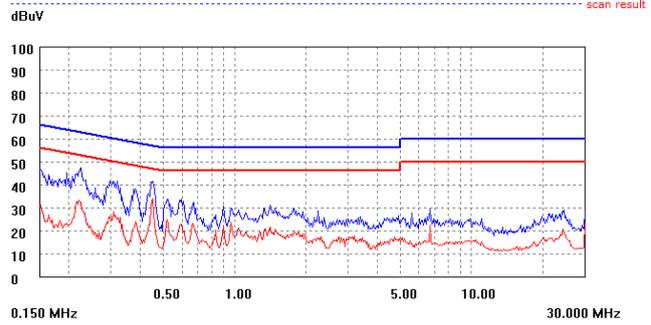


230V CE\_L

## EMI TEST REPORT

Organization: \_\_\_\_\_ parameter  
 Place: \_\_\_\_\_ Operator: \_\_\_\_\_ EUT: \_\_\_\_\_  
 Time: 2019/4/2/16:25 Test equipment: KH3962  
 Detector: PK+AV Test-time[ms]: 10 SN: 620620  
 Limit: EN55022B Transducer(PK/AV): PK / AV JZ: 2,14,1226  
 Remark: \_\_\_\_\_

Start(MHz)	End(MHz)	Step(MHz)
0.150	2.000	0.002
2.000	10.000	0.010
10.000	30.000	0.025

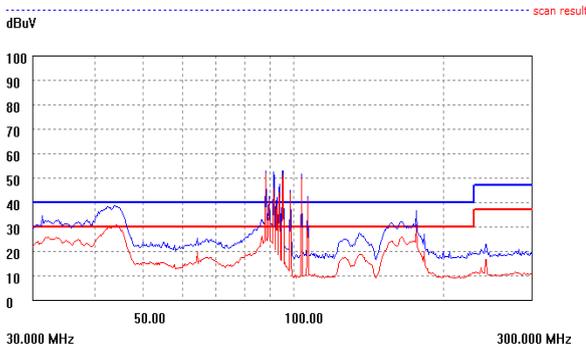


230V CE\_N

## EMI TEST REPORT

Organization: \_\_\_\_\_ parameter  
 Place: \_\_\_\_\_ Operator: \_\_\_\_\_ EUT: \_\_\_\_\_  
 Time: 2019/4/2/16:16 Test equipment: KH3962  
 Detector: PK+AV Test-time[ms]: 10 SN: 620620  
 Limit: EN55022B30-300M-1 Transducer(PK/AV): PK / AV JZ: 2,14,1229  
 Remark: \_\_\_\_\_

Start(MHz)	End(MHz)	Step(MHz)
30.000	100.000	0.050
100.000	230.000	0.100
230.000	300.000	0.200

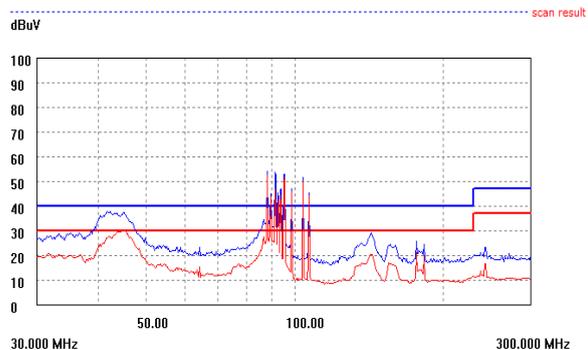


230V RE\_L

## EMI TEST REPORT

Organization: \_\_\_\_\_ parameter  
 Place: \_\_\_\_\_ Operator: \_\_\_\_\_ EUT: \_\_\_\_\_  
 Time: 2019/4/2/16:19 Test equipment: KH3962  
 Detector: PK+AV Test-time[ms]: 10 SN: 620620  
 Limit: EN55022B30-300M-1 Transducer(PK/AV): PK / AV JZ: 2,14,1229  
 Remark: \_\_\_\_\_

Start(MHz)	End(MHz)	Step(MHz)
30.000	100.000	0.050
100.000	230.000	0.100
230.000	300.000	0.200



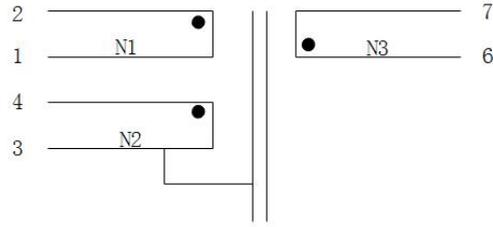
230V RE\_N



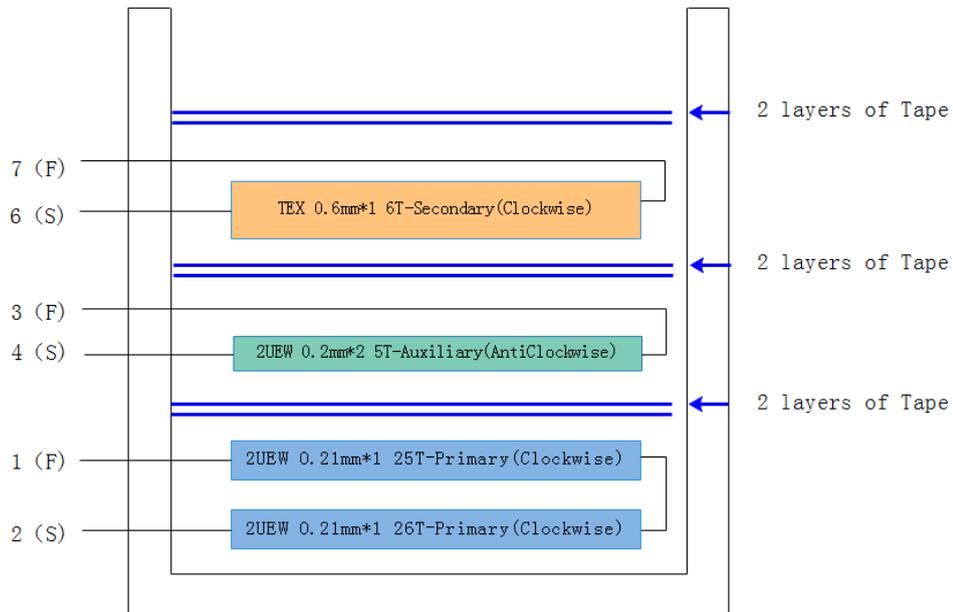
### 11、Transformer specifications (变压器规格书)

Note: 备注

1. Dot (●) denote electrical start.



序号	绕线参数 (mm)	圈数	胶带层数	起始脚	结束脚	备注
N1	2UEW $\Phi$ 0.21*1	50	2	2	1	密绕两层
N2	2UEW $\Phi$ 0.2*2	5	2	4	3	均匀逆绕
N3	TEX $\Phi$ 0.6*1	6	2	6	7	密绕一层



Note:

1. Bobbin: PQ2006
2. Core: TDK PC95 or equivalent,  $A_e$ : 60mm<sup>2</sup>
3. 槽宽 6.20mm。
4. L1-2: 800uH  $\pm$ 5% @10KHz, 0.25V
5. Pin3 用  $\Phi$  0.21\*2 线连接到磁芯上, 并接触良好。
6. PIN-5 剪掉。
7. N1, N3 Pin 脚朝外顺时针绕, N2 Pin 脚朝外逆时针
8. 铁芯研磨放顶部。
9. 产品需真空含浸。

