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变更履历表

Revision History

承认书版本 Spec. Edition	发行日期 Release Date	修 改 内 容 Modified content	产品版本 Product Edition
Rev:A01	2026/09/01	初版 Initial	

1. 导言 Introduction

1.1 电源概况 Power Supply Overview

本产品效率高，可靠性高等特点，具有短路保护，过流保护和过压保护等保护功能。

This product has the feature such as high efficiency and high reliability, and it also has the protection function such as short-circuit protection, over voltage protection and over current protection.

1.2 支持文件 Applicable Documents

本产品验证测试过程中遵循并选用以下标准（但不局限于）：

The products choose the standards as following for design verification test（but no limited）.

- GB/T 2423.1-01 电工电子产品基本环境试验规程 试验 A：低温试验方法
Basic environmental testing procedures for electric and electronic products Tests A: Cold
- GB/T 2423.2-01 电工电子产品基本环境试验规程 试验 B：高温试验方法
Basic environmental testing procedures for electric and electronic products Tests B: Dry heat
- GB/T 2423.3-93 电工电子产品基本环境试验规程 试验 Ca：恒定湿热试验方法
Basic environmental testing procedures for electric and electronic products Test Ca: Damp heat, steady state
- GB/T 2423.4-93 电工电子产品基本环境试验规程 试验 Db：交变湿热试验方法
Basic environmental testing procedures for electric and electronic products Test Db: Damp heat cyclic
- GB/T 2423.5-95 电工电子产品环境试验 第 2 部分：试验方法 试验 Ea 和导则：冲击
Environmental testing for electric and electronic products. Part 2: test methods. Test Ea and guidance: Shock
- GB/T 2423.6-95 电工电子产品环境试验 第 2 部分：试验方法 试验 Eb 和导则：碰撞
Environmental testing for electric and electronic products. Part 2: Test methods. Test Eb and guidance: Bump
- GB/T 2423.8-95 电工电子产品环境试验 第 2 部分：试验方法 试验 Ed 和导则：自由跌落
Environmental testing for electric and electronic products. Part 2: Test methods. Test Ed: Free fall
- GB/T 2423.10-95 电工电子产品环境试验 第 2 部分：试验方法 试验 Fc 和导则：振动（正弦）
Environmental testing for electric and electronic products. Part 2: Test methods. Test Fc and guidance: Vibration(Sinusoidal)
- GB/T 2423.11-97 电工电子产品环境试验 第 2 部分：试验方法 试验 Fd 和导则：宽频带随机震动——一般要求
Environmental testing for electric and electronic products. Part 2: Test methods. Test Fd: Random Vibration wide band_general requirements.
- GB/T 2423.22-87 电工电子产品基本环境试验规程 试验 N：温度变化试验方法
Basic environmental testing procedures for electric and electronic products. Test N: Change of temperature
- GB 4943-2003 信息技术设备的安全
Safety of information technology equipment
- GB 17625.1-1998 低压电气及电子设备发出的谐波电流限值（设备每相输入电流≤16A）
The limits for the harmonic current emissions caused by low-voltage electrical and electronic equipments(equipment input current≤16A per phase)
- GB/T 17626.2-1998 电磁兼容 试验和测量技术 静电放电抗扰度试验
Electromagnetic compatibility-Testing and measurement techniques-Electrostatic discharge immunity test
- GB/T 17626.4-1998 电磁兼容 试验和测量技术 电快速瞬变脉冲群抗扰度试验
Electromagnetic compatibility-Testing and measurement techniques-Electrical fast transient/ burst immunity test
- GB/T 17626.5-1998 电磁兼容 试验和测量技术 浪涌（冲击）抗扰度试验
Electromagnetic compatibility-Testing and measurement techniques-Surge immunity test
- GB/T 17626.11-1998 电磁兼容 试验和测量技术 电压暂降、短时中断和电压变化的抗扰度试验
Electromagnetic compatibility-Testing and measurement techniques-Voltage dips, short interruptions and voltage variations immunity tests

2. 电气规格 Electrical Specification

2.1 AC 输入 AC Input

2.1.1 输入电压 Input Voltage

表格 1：列举 AC 输入电压范围，在此电压范围内，电源应正常工作并符合所有电气性能要求。

Table 1: Lists the AC input operating voltage range. The power shall work normally and meet all electrical requirements throughout this range.

表格 1: AC 输入电压限值 Table 1: AC Input Voltage Limitations

最小值 Minimum	额定值 Nominal	最大值 Maximum
100Vac	220Vac	240Vac

2.1.2 输入频率 Input Frequency

表格 2 : 列举 AC 输入频率范围, 在此频率范围内, 电源应正常工作并符合所有电气性能要求。

Table 2: List the AC input operating frequency range. The power shall work normally and meet all electrical requirements throughout this range.

Table 2: AC Input Frequency Limitations AC 输入频率限值

最小值 Minimum	额定值 Nominal	最大值 Maximum
47Hz	50HZ/60HZ	63Hz

2.1.3 冲击电流 Inrush Current

冲击电流峰值在额定电压输入, 冷启动 (25°C) 时, 不大于 30A; 且在任何负载和输入条件下, 不导致永久性损坏或危险, 输入电压的定义见表格 1.

Peak inrush current shall be limited to 30A of rated input voltage and cold start at 25 degrees C, and shall not result in a permanent damage of the power supply under any conditions of load and input voltage as specified at any input voltage as specified in table 1.

2.1.4 待机功耗 Standby Input Power

在额定电压输入情况下, 待机功耗不大于 0.1W。

The standby input power should no more than 0.1W under the rated input voltage condition.

2.1.5 最大输入电流 Input Current Limiting

在输入电压最小值, 负载为满载条件下, 最大输入电流不大于 0.5A。

The input current should be less than 0.5A, under minimum AC input and full load.

2.1.6 效率 Efficiency

在额定输入电压, 最大负载和额定负载条件下, 电源的效率大于 88%。

The power supply efficiency shall be greater than 88% under rated input voltage. It will be measured at the typical load and maximum load.

2.2 输出规格 Output Specification

2.2.1 电压调整率 DC Voltage Regulation

在输出端子量测的电压需符合表格 3 中标示的调整范围。

电压调整的限值不包括 2.2.4 节中要求的 DC 负载瞬态变化。

The DC output voltages will remain within the regulation ranges shown in Table 5 when measured at the load end of the output connectors.

The voltage regulation limits do not include the transient DC load changes, which are covered in Section 3.2.4.

表格 3: 输出电压调整限值 Table 3: DC Output voltage regulation limits

Parameter 参数	Line Regulation 线性调整	Load regulation 负载调整	Cross regulation 交叉调整
V1:12V	± 5.0%	± 5.0%	N/A

2.2.2 输出电流 DC Output Current

表格 4: 输出电流限值

Table4: DC output current limits

Parameter 参数	Min Current 最小电流	Rate Current 标称电流	Max Current 最大电流	Unit 单位
V1:12V	0.1	2.5	3	A

2.2.3 输出纹波与噪声 Output Ripple and Noise

下面表格 5 是纹波与噪声要求, 以 2.2.2 节中定义的负载范围和 2.1.1 节定义的输入电压为测试条件, 纹波与噪声均应符合要求, 测试时示波器设置为 20MHz 带宽, 输出端并接一 0.1uF 瓷片电容和一 10uF 钽电解电容 (低 ESR 值)。

The following table 5 is output ripple and noise requirements, it will be met throughout the load ranges specified in Section 2.2.2 and under all input voltage conditions as specified Section 2.1.1, Measurements will be made with an oscilloscope set to 20MHz bandwidth limit. The outputs will be bypassed with one 0.1uF multilayer (type X7R) and one 10uF tantalum electrolytic (low ESR) capacitors.

表格 5: 纹波与噪声限值

Table 5: Output ripples and noise limits

参数 Parameter	最大值 Max.
V1:12V	150mVp-p@25 degrees C 300mVp-p@0 degrees C

2.2.4 输出动态负载响应 Output Dynamic Load Response

输出电压在下列表格 6 定义的负载变化时, 符合规格要求, 负载变化率为 0.1Amps/uS, 50Hz~10 KHz 之间。

The output voltages will remain within specified regulation limit of the nominal set voltage for changes in load as specified below under the following load steps defined below table 8. At a slew rate of 0.1Amps/uS between 50Hz to 10 KHz.

表格 6: 输出动态负载响应限值

Table6: Output dynamic load response limits

Dynamic Load 动态负载	DC Voltage Regulation 电压调整率
50%~100%~50%	± 10%

2.2.5 电压过冲 Overshoot at turn-on/ turn-off

开机或关机时, 电压过冲不得超过标称值的 10%.

Any overshoot at turn on or turn off shall be less than 10% of rated output voltage.

2.3 保护功能 Protection Function

2.3.1 过压保护 Over Voltage Protection

电源提供过压保护. The power supply will provide OVP function.

2.3.2 短路保护 Short Circuit Protection

输出的短路定义为其输出阻抗小于 0.1 欧姆，在上述 3.1 节中定义的输入条件下，电源将进行保护，保护过程中，不会出现诸如元器件、连接器等损坏危险。

An output short circuit is defined as any output impedance of less than 0.1 ohms. The power supply will protect without damage to overseers of to the unit (components, connectors, etc) under the input conditions specified in Section 3.1 above.

2.3.3 过流保护 Over Current Protection

电源过流点符合下表限值要求，而且过流保护无任何危险和损坏，在保护去除后，电源自动恢复。

The power supply shall meet the limitation requirement as below table without any damage, the unit shall recover and function automatically after the protection is removed.

表格 7: 过流保护限值

Table 7: Over Current Protection limits

参数 Parameter	最小 Min.	-	最大值 Max	单位 Unit
V1:12V	0.5	-	3	A

2.4 时序特性 Timing

2.4.1 保持时间 Hold up Time

满载条件下，电源在 100Vac/47Hz 输入时，保持时间不小于 5mS；220Vac/50/60Hz 输入时，保持时间不小于 10mS。

Hold-up time no less than 5mS at 100Vac/47Hz input and no less than 10mS at 220Vac/50/60Hz input, the output loading should be set up with full load during the test.

2.4.2 启动时间 Start up Time

满载条件下，电源在 100Vac/47Hz 输入时，启动时间不大于 3 秒；220Vac/50/60Hz 输入时，启动时间不大于 2 秒。

Start up time no more than 3 seconds at 100Vac/47Hz input and no more than 2 seconds at 220Vac/50/60Hz, the output loading should be set up with full load during the test.

3. 环境要求 Environment Requirement

3.1 温度 Temperature

工作环境温度: 0°C~40°C

Operating Ambient: 0°C~40°C

贮存环境温度: -25°C~+55°C

Non-operating Ambient: -25°C~+55°C

3.2 湿度 Humidity

工作时: 25%~90%相对湿度 (非冷凝) Operating: 25%~90% relative humidity (Non- condensing)

贮存时: 10%~90%相对湿度 (非冷凝) Non-operating: 10%~90% relative humidity (Non- condensing)

3.3 海拔高度 Altitude

工作时: 2000 米 Operating: 2000 meters

贮存时: 2000 米 Non-operating: 2000meters

4. 可靠性 Reliability

4.1 平均无故障间隔时间 MTBF (MIL-HDBK-217F)

25°C环境温度，满载条件，额定电压输入条件，平均无故障间隔时间≥25K 小时。



MTBF no less than 25K hours (25 degrees C, Full load and rated voltage input)

4.2 老化寿命测试 Burn-in and Life test

TIANQIN 将与客户评估并确认电源产品室内老化寿命测试过程。

TIANQIN shall discuss with customer to make sure the power in house Burn-In and life test procedures.

5. 产品安规要求 Product Safety Requirement

5.1 标准 Standard

遵循 UL CUL TUV CE ROHS (信息技术及类似电子设备 安全要求) 要求.

Meet UL CUL TUV CE ROHS (information technology and similar electric apparatus -safety requirement) standard requirement.

5.2 接触电流 Leakage Current

接触电流不得超过 0.25mA (220Vac/50Hz).

Leakage current shall not exceed 0.25mA at 220Vac/50Hz.

5.3 绝缘阻抗 Insulation Resistance

初级对次级: $\geq 50M$ 欧姆, 500VDC

-Primary to Secondary: 50 Meg. Ohms min. 500VDC

5.4 绝缘强度 Dielectric Strength Testing

绝缘强度满足下表的要求, 100% 在线产品执行此项测试, 并每一项目至少保持 60S 时间, 无任何故障。

Hi-pot test shall be met the table 8 requirements, an item listing this test as a 100% production test must be performed and be maintained at that level for a minimum of 3 seconds without failure.

表 8: 耐压测试 Table 8: Hi-pot test

项目 Item	规格要求 Specification		备注 Remark
输入-----输出 Primary to Secondary	3.0KVac	<5mA	无飞弧 No arcing
输入-----地 Primary to P.G	N/A	N/A	无击穿 No broken

6. 结构尺寸 Mechanical Dimensions (单位:mm Unit:mm)

6.1 标贴 Label

Switching Power Adapter

MODEL:TQ-2402500u

INPUT:100-240V~0.5A Max

50/60Hz

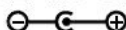
OUTPUT:24V=2.5A



RoHS



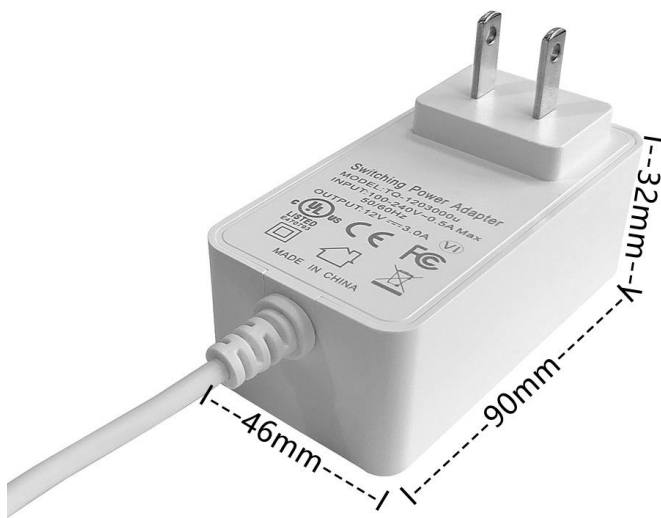
MADE IN CHINA



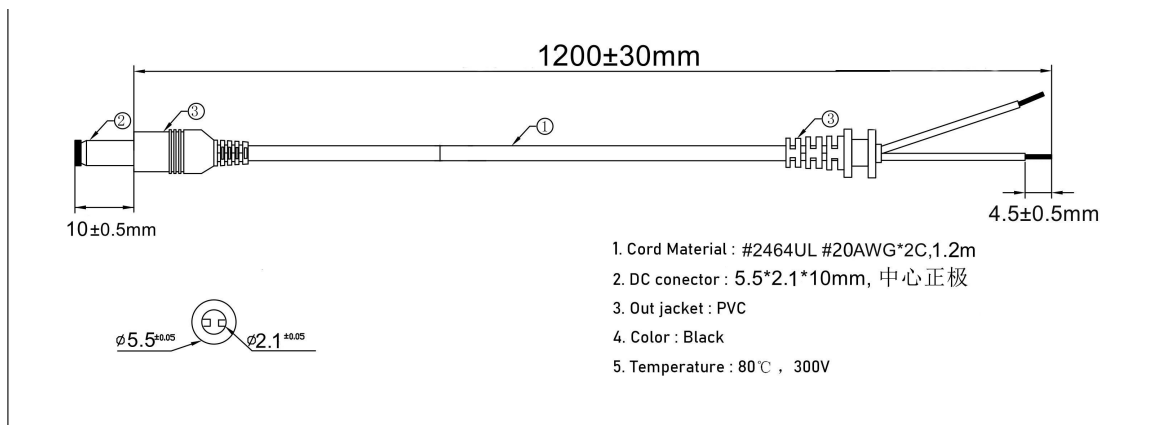
6.2 结构尺寸 Mechanical Dimensions

90mm*46mm*32mm (L*W*H)

6.3 结构图 Mechanical Appendix



输出 DC 线: 1.2m 2468 20AWG dc cable



6.4 包装 Packing



Packaging Mode



PE bag packing or small white box packing, the carton size is 58*37*20CM

24v 2.5a power adapter wall model 120cm DC cable (110pcs/carton)

7 声明 Statement

7.1 本承认书解释权归东莞市瞳祺电源科技有限公司。

All rights reserved by Shenzhen TIANQIN electronics Co., Ltd. for all of this specification for approval.

7.2 本承认书一式两份，客户一份，供应商一份，自双方确认签字之日起生效。

This specification for approval has two copies, one for customer, and the other for provider. It comes into effect after approval this specification by customers.

7.3 如有更新，需由双方协商解决，另行补充。

If specification for approval needs to update, it's made an agreement after discuss between customer and provider.

