服务器电源技术规格书

Server Power Supply

Technical Specification

2000W/超白金

2000W/Platinum

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1. 范围和目的 SCOPE

本文件适用于全球范围内用于电子数据设备最大输出功率为2000W电源模块的功能要求。除特别标注外，其规格均适用于安装在终端使用系统的所有操作环境。
This document defines the functional requirements for a power supply module up to 2000W max output intended for worldwide use in electronic data processing equipment. All specifications are applicable under all operating conditions when installed in the End Use system, unless otherwise stated.

航嘉项目号 HUNTKEY PART NUMBER	HK2000B-S1
	PS,1U,2000W,12V, PLATINUM

2. 一般功能描述 GENERAL FUNCTIONAL DESCRIPTION

本规格书用于说明应用于服务器系统的离线模块化、热插拔、N+1的冗余配置（N最大为3），支持功率因数的校正并且符合CE标准的电源；电源单元应包含用于强制风冷的风扇；电源支持单独使用，也可以冗余配置，最多可支持4个同时使用。

This specification is for an off-line modular, hot pluggable, N+1, (N=3 max.) redundant, power factor corrected, CE Mark compliant switching power supply for use in server systems. The power supply unit shall contain fan(s) for forced air-cooling. The power supply may be used singly or in redundant configurations up to 4 power supplies.

3. 电气特性 ELECTRICAL

3.1 输入 INPUT

3.1.1 电压/电流/频率 Voltage/current/frequency

表 3-1. 输入范围

Table 3-1. Universal input range

参数 Parameter	最小值 Min	额定范围 Rated	最大值 Max	峰值 Peak
电压有效值 220V Voltage220Vrms	90Vrms	200-240V_{rms}	264V_{rms}	300V_{rms}
电压有效值 110V Voltage110Vrms		100-120V_{rms}		
直流电压输入 DC input	180Vdc	240-270Vdc	320Vdc	

电流 Current		≤13.8A@100VAC ≤10A@240VDC				
频率 Frequency	47HZ	50/60			63 Hz	
输入接口 Inlet	1 per module,IEC320C-14，10A/250VAC					
输入谐波电流 I THD	% of Rated Load	5%	10%	20%	40%	50%
	Max.i.THD(%)	⩽20%	⩽15%	⩽10%	⩽8%	⩽5%
	Input conditions	200Vac to 240Vac and 50/60 HZ				

3.1.2 浪涌电流 Inrush current

电源在任何额定交流电压下需满足以下情况的浪涌要求，即交流电压的任意相位接通、单周期的交流电压关断、交流电压的重复上/下电以及在规定的温度范围情况下。浪涌电流不能超过其关键部位（包括输入保险丝、整流器和滤波装置）的额定值，一般不超过 55A。此冷启动浪涌电流规格为 35A。

The power supply must meet inrush requirements for any rated AC voltage;during turn on at any phase of AC voltage, during a single cycle AC dropout condition, during repetitive ON/OFF cycling of AC, and over the specified temperature range (Top). The peak inrush current shall be less than the ratings of its critical components (including input fuse, bulk rectifiers, and surge limiting device), but shall not exceed 55A in general.This cold start inrush current specification is 35A.

在评估浪涌电流时，应排除输入电流波形中持续时间小于 200us 的高频尖峰，这些尖峰由 EMI 滤波电容器造成。

High frequency spikes lasting less than 200 μs in the input current waveform that are the result of EMI filter capacitors shall be excluded when evaluating the inrush current.

3.1.3 保持时间（AC/HVDC）Hold up time (For AC and HVDC)

交流电压掉电指 AC/HVDC 输入在交流线路下的任意相位下降到 0V 并保持一定时间所产生的掉电。在定义的掉电时间内，电源需满足所有 AC/HVDC 输入电压下额定负载的动态电压调节（如表 3-5）。

An AC line loss is the condition when AC/HVDC input drops to 0Vac at any phase of the AC line for defined length of time. During an AC/HVDC loss of defined time or less the power supply shall meet dynamic voltage regulation (*Table 3-5*) in the rated load at all AC/HVDC input voltages.

1）满载情况下 Vout 保持时间≥13mS。(90V~264Vac/180-320Vdc)

2）满载情况下 PWOK 保持时间≥12mS。(90V~264Vac/180-320Vdc)

3）满载情况下+12Vsb≥70mS。(90V~264Vac/180-320Vdc)

1) Hold up time Vout≥13mS for full load. (90V~264Vac/180-320Vdc)

2) Hold up time PWOK≥12mS for full load. . (90V~264Vac/180-320Vdc)

3) Hold up time +12Vsb≥70mS for full load. (90V~264Vac/180-320Vdc)

3.1.4 AC 关断 AC turn off

电源在缓慢降低电压后进入断电状态。在降压状态中，服务器系统应对有效冗余电源系统配置中进行测试。将测试负载配置为额定直流负载，AC/HVDC 线路电压应在 30 分钟内以恒定速率从 90VAC/60Hz 降低到 0VAC(180Vdc 至 0Vdc)。电源开关在交流电压低于 80Vac 时关断，直流电压低于 167Vdc 时电源关断，交流电压关断时输出电压和信号（PWOK 及其他信号）不发生振荡。
Power supply shall go to power off state after a slow brownout condition. The brownout condition shall be tested with all valid redundant power system configurations using the system. While the power system is operating at full rated DC load, the AC/HVDC line voltage shall be reduced from 90VAC/60Hz to 0VAC (180Vdc to 0Vdc) at a constant rate over a period of 30 minutes.
Power supply will shutdown at the AC voltage ≤80Vac
For HVDC Power supply will shutdown at the DC voltage ≤167Vdc
No output voltage and signal (PWOK and other signals) oscillate while AC turn off .

3.1.5 AC 开通 AC turn on

在一定时间缓慢爬升后，电源恢复到正常上电状态。恢复过程应在有效冗余电源系统配置中进行测试。将测试负载配置为电阻模式下最大系统 DC 输出，AC 电压应在 30 分钟内以恒定速率从 0VAC 增加到 90VAC/60Hz (0Vdc 至 180Vdc)。电源在交流电压 85V±5(≤90)Vac 范围内启动，HVDC 电源在直流电压 175V±5(≤180)Vdc 范围内启动。
Power supply shall return to normal power up state after a slow recovery condition. The recovery shall be tested in all valid redundant power system configurations. With the test loads configured for maximum system DC output in resistive mode, the AC line voltage shall be increased from 0VAC to 90VAC/60Hz (0Vdc to 180Vdc) at a constant rate over a period of 30 minutes.
Power supply will turn up at the AC voltage 85V±5(≤90)Vac
For HVDC Power supply will turn up at the DC voltage 175V±5(≤180)Vdc

3.1.6 输入过压保护 Input Over Voltage Protection

电源应能防止因输入电源电压过高而导致的内部部件故障。当电源检测到输入电压超过 305±5Vac 或 340±5Vdc 时，应关闭其输出并报告输入电压过压故障。当输入电压降至 295±5Vac 或 330±5Vdc 以下时，电源应重新使能其输出。
The power supply shall be protected from input over voltage conditions caused by excessive voltage from the input power source which could cause internal part failures.When the power supply observes an input voltage which exceeds 305±5Vac or 340±5Vdc, the power supply shall disable its output and report an input over

voltage fault. The supply shall re-enable its output when the input voltage falls below 295±5Vac or 330±5Vdc.

3.1.7 效率 Efficiency

在指定工作电压运行 15 分钟后，电源需置于环境温度为 20ºC～25ºC，交流电压为 230VAC ±1%（频率 50Hz~60Hz）进行效率测试。测试期间，电源内部风扇应由外部电源供电。

Efficiency shall be measured at 230VAC ±1% (50Hz or 60Hz) at an ambient temperature between 20ºC and 25ºC after the Power Supply has dwelled at the specified set point for 15 minutes. The Power Supply's internal fan shall be powered from an external source during efficiency measurements.

1）80 Plus 钛金或白金标准

1) 80 Plus Pt gold level or Platinum standard.

表 3-2.PSUS 的效率要求

Table 3-2. Efficiency requirements for- PSUS

效率标准 Efficiency Std.	10% load	20% load	50% load	100% load
白金 Platinum	88%	94%	94%	91%

注：1）FAN 功率损耗需要排除且需从输入功率中减去。

2）12VSB 不带负载。

Note: 1)FAN power loss shall be excluded and need to be deducted from power input.

2)12VSB with no load.

3.1.8 功率因数 Power factor

在指定工作电压运行 15 分钟后，电源需置于环境温度为 20ºC～25ºC，交流电压为 220VAC /频率 50Hz 进行功率因数测试。

The power factor is measured after the Power Supply has dwelled at the specified set Point for 15 minutes in a 20-25°C ambient at 220Vac/50HZ.

表 3-3.PSUS 的功率因数要求

Table 3-3. Power factor requirements for PSU

输出功率 Output power	10%负载 10%load	20%负载 20%load	50%负载 50%load	100%负载 100%load
功率因数 Power Factor	＞0.90	＞0.96	＞0.98	＞0.99

3.1.9 掉 电

Dropout (For AC and HVDC)

AC 线路掉电指 AC 或 HVDC 输入在 AC 线路的某一相位上持续下降一段时间至 0VAC。AC 或 HVDC 掉电时长低于或等于 16mS 时，电源需满足所有 AC/HVDC 输入电压下额定负载的动态电压调节（如表 3-5），此情况下控制信号故障和保护电路动作不会发生。AC 或 HVDC 掉电时长高于 16mS 后，电源可以重新启动并恢复运行状态。

An AC line dropout is the condition when AC or HVDC input drops to 0VAC at any phase of the AC line for any length of time. During an AC or HVDC dropout of 16mS or less the power supply will meet dynamic voltage regulation (*Table 3-5*) in the rated load at all AC or HVDC input voltages. An AC or HVDC line dropout of 16mS or less will not cause malfunction of control signals or protection circuit trip. If the AC or HVDC dropout lasts longer than 11mS the power supply will recover and meet all turn on requirements.

在额定 AC 或 HVDC 输入电压、频率以及输出负载条件下，且满足 AC 或 HVDC 的压差要求，电源能够承受 AC 或 HVDC 线路的任意掉电。

The power supply will meet the AC or HVDC dropout requirement over rated AC or HVDC input voltages, frequencies, and output loading conditions. Any dropout of the AC or HVDC line will not cause damage to the power supply.

3.1.10 断电 Brownout

电源包含保护电路，使输入电压低于表 3-1 规定的最小值时，不会对电源单元造成损坏，也不会造成输入保险丝故障和对任意其它部件的过应力。长期降压导致的待机事故中，电源会将 AC/HVDC 限制在规定范围内后自动重新启动。待机和恢复之间的电压电平有最小的滞留电压，使电源不会因电压变化发生振荡开断。电源满足动态电压调节，同时在待机或恢复时满足所有开通和关断要求。

Power supply will contain protection circuitry such that the application of an input voltage below the minimum specified in *Table 3-1* will not cause damage to the power supply unit nor cause failure of the input fuse and overstress to any other component. In the event of shutdown due to extended brownout, the power supply will automatically restart after the AC /HVDC input is within specified limits. The voltage level between shutdown and recovery will have a minimum of VAC/HVDC of voltage hysteresis, so that the power supply will not oscillate on and off due to voltage change condition. The power supply will meet dynamic voltage regulations and all turn on requirements or turn off requirements while shutdown or recovery.

3.2 输出 OUTPUT

3.2.1 功率/额定电流 Power/currents rating

表3-4对功率和额定电流进行定义。所有输出的组合输出功率不会超过额定输出功率，所有输出电压和输出负载组合。电源满足静态和动态电压调节，且满足最小、最大以及交叉负载条件下的定时要求。

The following tables define the power and current ratings. The combined output power of all outputs will not exceed the rated output power. Load ranges are provided for each output level. The power supply will meet both static, dynamic voltage regulation and timing requirements for the minimum/maximum/cross loading conditions.

表3-4 输出功率和额定电流

Table 3-4. Output power and current rating

信号 Signal	最小负载 Minimum load (A)	最大负载 Maximum load(A)	输入条件 Input condition
+12V	1	83A	90VAC~132VAC
	1	164A	180VAC~264VAC
12Vsb	0.1	3	90~264VAC
Total	2000W		

注：

1)对于功率2000W、输出12V的电源在超额负载情况下电流不能超过196.8A，超额负载保持时长11.1s。

Note:
1) Peak load on the combined 12V output will not exceed 196.8A for 2000W. The keep time of peak load will be 11.1S.

3.2.2 电压调整 Voltage regulation

在稳态、动态负载条件下工作时，电源输出电压必须保持在表3-5所示的极值范围内，同时开通条件下的超调量也在极值范围内。所有输出信号的测试均依赖于遥感信号（ReturnS），其中12V和12Vsb输出信号的测试基于电源连接处的遥感信号。在规定极限范围内电源能够承受10%的谐波电流失真。

The power supply output voltages must stay within the following voltage limits shown in *Table 3-5* when operating at steady state, dynamic loading conditions. And the overshoot at turn on conditions will also meet the voltage limits. All outputs are measured with reference to the return remote sense (ReturnS) signal. The 12V and 12Vsb outputs are measured at the power supply connectors referenced to ReturnS. AC line Harmonic distortion of up to 10% THD will not cause the power supply to go out of specified limits.

表3-5 电压调节阈值

Table 3-5. Voltage regulation limits

输出 Outputs	最小值 Min	最大值 Max	单位 Units	偏差 Tolerance
+12VDC（动态） +12VDC(Dynamic)	+11.6V	+12.8V	Vdc	+ 5%-5%

+12VDC（稳态） +12VDC(Static)	+11.8V	+12.6V	Vdc	+ 3.3%-3.3%
12Vsb（动态） 12Vsb(Dynamic)	11.4V	12.6V	Vdc	+ 5%-5%
12Vsb（稳态） 12Vsb(Static)	11.6V	12.4V	Vdc	+ 3.3%-3.3%

3.2.3 纹波噪声 Ripple noise

表 3-6 纹波和噪声

Table 3-6. Ripple and Noise

电压 Voltage	纹波/噪声峰-峰值 Ripple/Noise pk-pk
+12V	120 mV
12Vsb	120mV

注：

1）表中数据测试于 20Hz~20MHz 的带宽，测试需将一个 10μF 电解电容与一个 0.1μF 陶瓷电容并联焊接在测试点。

2）纹波噪声的测试至少须在 5μs/1ms/10ms 的扫描和峰值检测模式下进行。

Notes:

1) This is measured over a bandwidth of 20Hz to 20MHz at the output connector. A 10μF electrolytic capacitor in parallel with a 0.1μF ceramic capacitor are placed at the point of measurement.

2) Ripple noise test must be at least in 5μs/1ms/10ms sweep and peak detect mode.

3.2.4 动态负载 Dynamic loading

负载瞬态重复率测试在频率 50Hz 至 5KHz 之间进行，占空比范围为 10%~90%。负载瞬态重复率仅作为一项测试规格。负载递增过程输出电压保持在表 3-5 指定的阈值范围内，摆幅率、容性负载如表 3-8 所示。

The load transient repetition rate will be tested between 50Hz to 5kHz at duty cycles rang from10%-90%.

The load transient repetition rate is only a test specification.

The output voltages will remain within limits specified in *Table 3-5* for the step loading, Slew rate, and capacitive loading in the *Table 3-8*.

表 3-7 动态负载要求

Table 3-7. Transient Load Requirements

输出 Output	额定电流暂态步长占比 Transient Step (A) XX % of rated current	A/μs	频率 Frequency Hz	电容容量 Cap (μF)	最小负载 Min load

	模块 Module	PDB 或没有冗余 PDB or None redundant				
+12V	60%	60%	2.5		2200	3A
12Vsb	60%	60%	2.5		20	0.1A

3.2.5 容性负载 Capacitive loading

电源需要在满足下列容性负载范围的所有条件下保持稳定工作。
The power supply will be stable and meet all requirements with the following capacitive loading ranges.

表 3-8 输出容性负载

Table 3-8. Output Capacitive loading

输出 outputs	+12V	12Vsb
容性负载（μF） Cap load μF	2200-50000	20-3100

3.2.6 冗余与热插拔 Redundant and hot swap

3.2.6.1 热插拔 Hot swap

在进行热插拔或者插入到模块接口中，电源需满足以下条件：
1）输出电压始终保持在表 3-5 所示的阈值范围内。
2）直流信号，如 PG, PS-ON, present 等不会振荡或变化。
3）均流母线电压不会振荡。
4）指示灯颜色不发生改变。
5）电源不会触发过载和其它保护。
6）通过外部交流电源插入的电源需满足表 3-5 所示的电压要求和表 3-10 所示的时间要求。
7）两个模块在电源接通、关闭、掉电和断电时需保持同步。不允许出现由于异步导致的电压波形任意振荡。
The power supply will meet following requirements while hot remove or insert the module to the cage:
1)The output voltage will stay within the limits shown in *Table 3-5*.
2)DC signal, such as PG, PS-ON, present and other signals will not oscill ate or change.
3)Current Sharing bus will not oscillate.
4)LED color will not change.
5)Power supply will not be overload and other protection.
6)The newly inserted power supply may get turned on by plugging AC into the external and meet the turn on requirements, including the voltage shown in

Table 3-5 and timing shown in *Table 3-10*.
7)The two modules will be synchronous while the power supply turn on, turn off, dropout and brownout. Any oscillation of voltage waveform due to the non-synchronous is not acceptable.

3.2.6.2 强制负载均流 Forced load sharing

在提供总输出负载电流在 0.2~1 倍的最大阈值电流范围内时，任意电源的+12V 输出电流的负载均流度满足-5%~+5%范围。
+12V output current from each power supply will be within (+5%, -5%) of I load / (no. of PS) when supplying total output load current of 0.2I max. < I load < I max.

3.2.6.3 均流母线电压 I share bus voltage

12VLS 是用于平衡多个电源之间主 12V 输出负载均流的模拟输出信号，也可用于表示一个或多个电源上的负载量。
12VLS is an analog output signal used to help equalize the load sharing of the main 12V output between multiple power supplies. It also represents the amount of the loading on the power supply (or supplies).

表 3-9 单模块时输出电流对应的 12VLS 输出电压值

Table 3-9. Voltage level VS output current for single module

输出电流 Output current (A)	电流共享总线上的电压等级 Voltage level of I share bus (VDC)			备注 Description
	最小值 Minimum	标准值 Nominal	最大值 Maximum	
164(100%额定电流) 164(100%rated current)	7.6	8	8.4	
82(50%额定电流) 82(50%rated current)	3.8	4.0	4.2	
32.8(20%额定电流) 32.8(20%rated current)	1.44	1.6	1.76	
16.4(10%额定电流) 16.4(10%rated current)	0.72	0.8	0.88	
0	0	0.125	0.175	

3.2.7 智能开启（根据需要激活，默认未激活）

Smart on (activated as required, default as inactivated)

电源满足智能开启的冗余条件。当系统均流母线电压(12VLS)低于 1.44V 时，从机处于冷备状态，当系统均流母线电压(12VLS)超过 3.2V 时，恢复至正

常冗余状态，确切的电流转移点需进行验证。然而，一旦操作模块预测故障发生，冷备模块应立即开机并输出系统所需全部电源。电源模块需必须满足表 3-5 的输出规律和表 3-10 的时序要求。
Power supply will meet Smart on redundant requirement. The slave module will be in the cold standby state when the system load share voltage(12VLS) is less than 1.44V, and recovery to normal redundant state when the system load share voltage (12VLS) is more than 3.2V. The detailed transfer current point must be verified.
However, the cold standby module should immediately turn up and output all of system power once the operating module predicts failure. The power supply module must meet the output regulation in *Table 3-5* and timing requirement in *Table 3-10*.

3.2.8 遥测 Remote sense

在 12V 带有返回路径下开发遥测功能具有必要性。遥测器应具备调节 12V 线路上最小 300mV 的输出压降并返回的功能。
Remote sense is necessary at 12V and return sense. The remote sense should be able to regulate out voltage drop of 300mV minimum on 12V rail as well as return.

3.3 时序 TIMING & SEQUENCE

3.3.1 通用时序 General timing

以下为单模块和多模块输出电源的时序要求。
These are the timing requirements for power supply operation including alone module outputs and multi model outputs.

表 3-10 打开/关闭时序信号

Table 3-10. Turn On/Turn Off Timing

项目 ITEM	描述 DESCRIPTION	最小值 MIN	最大值 MAX	单位 UNIS
T_{vout_rise}	从任意主输出上升到 12V 输出电压所需时间 Output voltage rise time from each main output.	5	70	msec
$T_{sb_on_delay}$	从输入正常到 12Vsb 上升到输出电压范围内的时间 Delay from AC being applied to 12Vsb being within regulation.		1500	msec
$T_{ac_on_delay}$	从输入正常到 12V 输出上升到输出电压范围内的时间 Delay from AC being applied to all output voltages being within regulation.		3000	msec

T_{vsb_holdup}	从输入掉电到 12Vsb 输出电压不在输出电压范围的时间，满载测试 Time for 12Vsb voltage stays within regulation after loss of AC	70		msec
T_{vout_holdup}	从输入掉电到 12V 输出电压不在输出电压范围的时间，满载测试 Time for 12V voltage stays within regulation after loss of AC, total power 2000W	13		msec
T_{pwok_holdup}	从输入掉电到 PWOK 变成低电平的时间，满载测试 Delay from loss of AC to deassertion of PWOK	12		msec
$T_{pson_on_delay}$	从 PS_ON 发出低电平启机信号，从 12V 输出上升到电压输出范围的时间 Delay from PSON# active to output voltages within regulation limits.	5	400	msec
T_{pson_pwok}	从 PS_ON 变成高电平到 PWOK 变成低电平信号之间的时间 Delay from PSON# deactive to PWOK being deasserted.		5	msec
T_{pwok_on}	从 12V 输出上升到输出电压范围，再到 PWOK 变成高电平信号之间的时间 Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	msec
T_{pwok_off}	输入电压掉电或 PS_ON 待机，PWOK 变成低电平到 12V 输出电压不在输出电压范围的时间 Delay from PWOK deasserted to 12V voltage stays within regulation	1		msec
T_{pwok_low}	在进行 PS_ON 待机或输入掉电待机再重启机过程中，PWOK 保持为低电平时间 Duration of PWOK being in the deasserted state during an off/on cycle using AC or the PSON signal.	100		msec
$T_{SMBAlert}$	输入电压掉电至 0V 模块故障警告（Smbalert）信号响应时间 Smbalert response time when Vin drop to 0V		3	msec

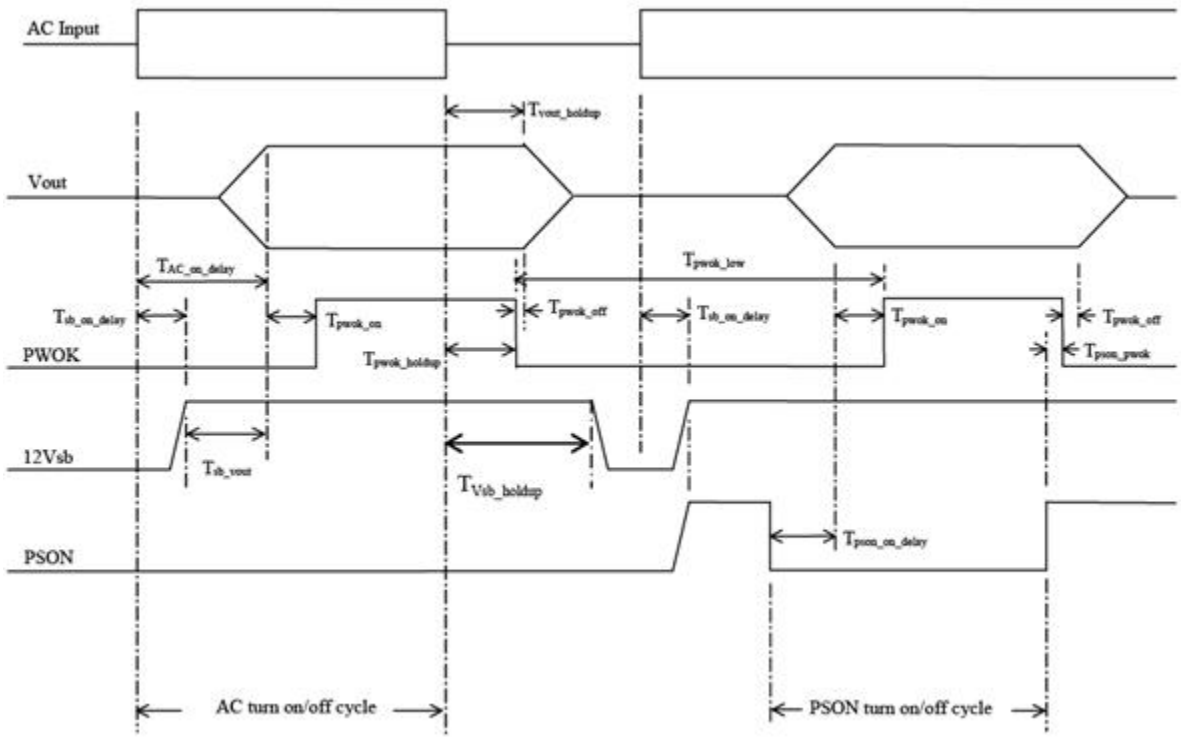


图 3-1 时序图

Figure 3-1. Timing diagram

3.3.2 控制信号 Control signal

下面的表格是 TTL 信号的汇总表，其中列出了所有上拉电阻和上拉端子的位置。

The below table is a TTL signals summary, which presents all the pull-high resistance and pull-up location.

Pin 脚位 Pin No.	Pin 脚名 Pin Name	Pin 脚类型 Pin Type (I/O)	工作电平 Active	上拉电阻阻值 Pull-up Res. Of PSU (Ω)	上拉电压 Pull-up Vol.(V)
A19	SDA	I/O	/	10K	3.3
A20	SCL	I/O	/	10K	3.3
A21	PSON	I	Low	3.48K	3.3
A22	SMBAlert	O	Low	8.2K	3.3
A25	PWOK	O	High	0.02K	3.3
B19	A0	I	/	10K	3.3
B20	A1	I	/	10K	3.3
B24	Present	I	Low	0K	0

B25	Vin_GOOD	O	High	1K	3.3

3.3.2.1 输出正常信号 PG signal (PWOK)

PWOK 是一个电源正常信号，当所有输出均在电源的调节范围内时，该信号将由电源拉高。当输出电压低于调节范围或交流电源断开的时间足够长以致无法保证电源正常运行时，PWOK 将被置为低电平。只要电源的任何输出处于电流限制状态，PWOK 延迟时间的开始应被触发。

PWOK is a power OK signal and will be pulled HIGH by the power supply to indicate that all the outputs are within the regulation limits of the power supply. When output voltage falls below regulation limits or when AC power has been removed for a time sufficiently long so that power supply operation is no longer guaranteed, PWOK will be de-asserted to a LOW state. The start of the PWOK delay time shall inhibited as any power supply output is in current limit.

表 3-11 输出正常信号电平特性

Table 3-11. PWOK TTL Characteristics

Signal type	+3.3VDC, TTL compatible
PWOK = High	Power OK
PWOK = Low	Power Not OK
Logic level low voltage	0.0—0.4V
Logic level high voltage	2.4—3.46V
Sink current,PWOK = low	4mA
Source current,PWOK = High	400uA
Rise & Fall time	0μs---100μs

3.3.2.2 SMBAlert 信号 SMBAlert signal

此信号表面电源出现了问题，用户应进行进一步检查。此信号会在出现关键事件或警告事件时翻转。当关键器件温度达到警告阈值（如 OCW/OTW/OCP/OTP，SMBAlert 触发条件）时，此信号将被激活，请详情参考固件规格说明。此信号还可能表示电源已达到使用寿命终点或正在运行于超出规定限制的环境中。

This signal indicates that the power supply is experiencing a problem that the user should investigate.This shall be asserted due to Critical events or Warning events. The signal shall activate in the case of critical component temperature reached a warning threshold such as OCW / OTW / OCP / OTP, SMBAlert trigger condition please refer FW Spec in detail. This signal may also indicate the power supply is reaching its end of life or is operating in an environment exceeding the specified limits.

表 3-12 SMB 信号电平特性

Table 3-12. SMB TTL Characteristics

Signal type	+3.3VDC, TTL compatible
SMBAlert# = High	Power OK
SMBAlert# = Low	Power Not OK
Logic level low voltage	0.0—0.4V
Logic level high voltage	2.4—3.46V
Sink current,SMBAlert#= low	4mA
Source current,SMBAlert#= High	50uA

3.3.2.3 输入正常信号 VIN_GOOD signal

输入正常信号表示输入电压状态。当输入电压降至 0V 时，必须在 3 毫秒内将输入正常信号驱动至低电平。在并行模式下，如果某个电源没有输入，则该电源上的输入正常信号始终处于低电平状态。

The VIN_GOOD signal indicates input voltage state. When the input voltage drops to 0V the VIN_GOOD must be driven to LOW within 3ms. In parallel mode, the VIN_GOOD signal is always LOW at that power supply which has none input.

表 3-13 输入正常信号电平特性

Table 3-13. VIN_GOOD Signal Characteristics

Signal type	+3.3VDC, TTL compatible
VIN_GOOD# = High	Input voltage OK
VIN_GOOD# = Low	Input voltage failure
Logic level low voltage	0.0—0.4V
Logic level high voltage	2.4—3.46V
Sink current	4mA
Source current	400uA

3.3.2.4 待机信号 PS-ON signal

PS_ON# 信号用于远程开启/关闭电源。PS_ON#是一个低电平有效信号，用于开启 +12 输出。当此信号未被系统拉低或处于开路状态时，输出将关闭。此信号由电源内部的上拉电阻拉至待机电压。

The PS_ON# signal is required to remotely turn on/off the power supply. PS_ON# is an active low signal that turns on the +12V power rail. When this signal is not pulled low by the system, or left open, the outputs turn off. This signal is pulled to a standby voltage by a pull-up resistor internal to the power supply.

表 3-14 PS_ON 信号电平特性

Table 3-14. PS_ON TTL Characteristics

Signal type	+3.3VDC, TTL compatible
PS_ON# = Low	ON
PS_ON#= High or Open	OFF
Logic level low (power supply ON)	0.0—0.4V

Logic level high (power supply OFF)	2.4—3.46V
Sink current	4mA(system)
Source current	100uA
Rise & Fall time	0μs---100μs

3.3.2.5 在位信号 PRESENT# signal

此引脚将通过一个电阻与待机返回端相连。系统侧应有一个上拉电阻，将此信号引脚与电源相连的最大电流限制在 4 毫安以内，下拉电阻应为 0 欧姆或直接将 PRESENT#短接至地。
This pin will be tied to Standby return through a resistor. System side should have a pull-up Resistor which limits the max current 4mA to go through from this signal pin to the power supply, the pull-down resistor shall be 0 ohm or short PRESENT# to ground directly.

3.3.2.6 A0 signal

地址位 0：通过 10 千欧电阻上拉至电源内部的 +3.3 伏。
Address Bit 0: Pull-up to PSU internal +3.3V via 10k-ohm resistor.

3.3.2.7 A1 signal

地址位 1：通过 10 千欧电阻上拉至电源内部的 +3.3 伏。
Address Bit 1: Pull-up to PSU internal +3.3V via 10k-ohm resistor.

3.3.2.8 SDA signal

SMBus 数据：通过 10 千欧电阻上拉至电源内部的 +3.3 伏。
SMBus Data: Pull-up to PSU internal +3.3V via 10k-ohm resistor

3.3.2.9 SCL signal

PMBus 时钟：通过 10k-ohm 电阻上拉到 PSU 内部+3.3V。
PMBus Clock: Pull-up to PSU internal +3.3V via 10k-ohm resistor.

3.4 保护功能 PROTECTION

3.4.1 过流保护/过流警告/过保护警告 OCP/OC warning/OP warning

表 3-16 过流保护的需求

+12V:

Table 3-16. The condition of OCP

输入 Input	规格 Spec	阈值 Thresholds			需求条件 Condition	
		最小值	正常值	最大值	SMB 信号掉	12V 输出掉电

		MIN	NOR	MAX	电延时 SMB Alert delay	时间 +12V shut down
High line	OCW	110%	115%	120%	>60ms	NA
	OCP1	120%	130%	140%	>60ms	>11.1S
	OCP2	140%	145%	150%	>60ms	>100ms
	OPP	160%			>3ms	>5ms
Low line	OCW	105%	107%	110%	>60ms	NA
	OCP1	110%	115%	120%	>60ms	>100ms
	OPP	>120%			>3ms	>5ms

12Vsb:

表 3-17 过流保护的需求

Table 3-17. The condition of OCP

输出 Output	输入电压 Input Voltage	过流范围 OCP range
12Vsb	230VAC/240VDC	110%-150% load

注：
主输出上的过流保护状态将关闭并锁机，并通过切换 PSON 信号或交流输入再循环清除。
Notes:
OCP state on Main outputs will shut down and latch off, and will be cleared by toggling the PSON# signal or by an AC input re-cycle.

3.4.2 过压保护 OVP

表 3-18 过压保护

Table 3-18. Over voltage protection

电压 Voltage	最小值 Min	最大值 Max	单位 Unit
+12V	+13.5	+15	VDC
12Vsb	+13	+15.5	VDC

注：
主输出路的过压保护状态将关闭输出并锁机；
Notes:
OVP state on Main outputs will shut down and latch off.

3.4.3 欠压保护 UVP

表 3-19 欠压保护

Table 3-19. Under voltage protection

电压 Voltage	最小值 Min	最大值 Max	单位 Unit
+12V	+10	+10.9	VDC

注：
主输出路的欠压保护状态将关闭输出并锁机；
Notes:
UVP state on Main outputs will shut down and latch off.

3.4.4 短路保护 Short circuit protection

无论电源处于运行状态还是运行之前，当输出短路（阻抗小于 0.1ohm）时，电源将关闭并锁机。
1）电源在不会产生物理损坏，当+12V,12Vsb 输出短路到其直流返回或其他输出。
The power supply will shut down and latch off when any output is short circuit (impedance less than 0.1ohm) with any other outputs, whatever the outputs is shorten when power supply is running as well as before turn on.
1) The power supply will be no physical damage when +12V, 12Vsb output is shorted to its DC return or other outputs.

3.4.5 空载环境 No load condition

电源在空载状态下工作时，不发生过压保护。
No OVP protection occurs when power supply operates in no load condition.

3.4.6 过温保护 Over temperature protection

OTP 电路将内置滞回（>5°C），使电源不会因温度恢复条件而振荡打开和关闭。
The OTP circuit will incorporate built in hysteretic(>5°C) such that the power supply does not oscillate on and off due to temperature recovering condition.

3.5 电源 LED 指示 POWER SUPPLY LED INDICATOR

电源模块的一个 LED 指示灯位于插孔附近，其状态说明如下：
One indicator LED in power supply module next to the inlet socket.
The LED Status showing on below:

电源状态 Power Supply Condition	LED 状态 LED State
输出正常 Output ON and OK.	绿色 GREEN
主备电源都没有 AC 输入 No AC power to all power supplies.	关闭 OFF

PSU 处于 AC 输入或冷备状态（参考冷冗余和离线直流部分） PSU standby state with AC present or PSU in cold standby state as defined in the Cold Redundancy and DC Offline section.	频率 1Hz 绿色闪烁 1Hz Blinking GREEN
AC 输入线未插紧或多个 AC 并联输入的某一输入掉电 AC cord unplugged or AC power lost with a second power supply in parallel still with AC input power.	黄色 AMBER
导致电源关闭的主要故障：过流保护、短路、过压保护、风扇异常、过温、输入过压保护等 Power supply critical events causing a shutdown: OCP, Short Circuit, OVP, Fan Failure, OTP, Input OVP etc.	黄色 AMBER
电源工作在高温、高压、高电流和风扇转动过慢状态下的警告 Power supply warning events occur when the power supply continues to operate high temp, high power, high current, slow fan etc.	频率 1Hz 的黄色闪烁 1Hz Blinking AMBER
电源 FW 更新 Power supply FW updating.	频率 2Hz 的绿色闪烁 2Hz Blinking GREEN

4. 使用环境 ENVIRONMENT

4.1 温度 TEMPERATURE

4.1.1 运行温度 Operating temperature:

运行温度为+0°C~+55°C
+0°C Min.，+55°C Max for module

4.1.2 储存温度 None operating temperature (storage):

最低-40°C，最高+85°C
-40°C Min, +85°C Max

4.2 噪声和风扇转速控制 ACOUSTIC AND FAN SPEED CONTROL

4.2.1 噪声 Acoustic

环境温度 35° C，12V 半载下声功率低于 51dBA。电源应满足电源发出的声压，但杜绝噪声，如低频噪声等。
≤51dBA, surrounding temperature =35°C, 12V half load.
The power supply shall meet the sound pressure as well as sound power.

Abnormal audible noise from power supply shall be unacceptable, such as low frequency noise and so on.

4.2.2 待机状态 In standby mode

风扇电压由 12V 和 12Vsb 供电。电源导通时，风扇以 12V 电压运行，待机时，以 12Vsb 低速运行。
Fan voltage is powered from 12v and 12Vsb. The fan will run by the 12V voltage while power supply turn on, and it will run in low speed by 12Vsb voltage in standby mode.

4.3 湿度 HUMIDITY

运行湿度（非冷凝状态）Operating (non-condensing): 0% to 95%
务必在 120 小时测试取较高的数据（50°C，湿度 93%）
Make sure to thoroughly test the higher values (50 degrees and 93% humidity) for 120hrs.
待机（非冷凝状态）Non-operating (non-condensing): 5% to 95%

4.4 海拔 ALTITUDE

工作条件 Operating :To 5000m
非工作条件 Non-operating : To 15200m.

4.5 机械冲击和振动 MECHANICAL SHOCK AND VIBRATION

测试 TEST	测试参数 Test Parameter	
工作振动 Operating Vibration	正弦振动 Sinusoidal Vibration	加速度：0.25G 零点至峰值频率 Acceleration:0.25G zero to peak 频率范围：10-500-10Hz Frequency Range:10-500-10Hz 轴：X,Y,Z Axis:X,Y,Z 扫描速度：0.25oct/min Sweep Speed: 0.25oct/min 持续时间：1 次扫描 Duration:1 Sweep
	随机振动 Random Vibration	功率谱密度：0.008G^2/Hz (总计 2.0G) PSD:0.008G^2/Hz (total 2.0G) 频率范围：10-500Hz Frequency Range:10 to 500Hz 持续时间：1 小时/轴 Duration:1 hour/axis 轴：X,Y,Z Axis:X,Y,Z

非工作振动 Non-Operating Vibration	正弦振动 Sinusoidal Vibration	加速度：0.75G 零点至峰值频率 Acceleration:0.75G zero to peak 频率范围：10-500-10Hz Frequency Range:10-500-10Hz 轴：X,Y,Z Axis:X,Y,Z 扫描速度：0.5oct/min Sweep Speed: 0.5oct/min 持续时间：1 次扫描 Duration:1 Sweep
	随机振动 Random Vibration	功率谱密度：0.008G²/Hz (总计 2.0G) PSD:0.008G^2/Hz (total 2.0G) 频率范围：10-500Hz Frequency Range:10 to 500Hz 持续时间：1 小时/轴 Duration:1 hour/axis 轴：X,Y,Z Axis:X,Y,Z
工作半正弦冲击 Operational Half Sine Shock	10g,11ms,半正弦波脉冲 10G,11ms,half-sine wave pulse. 三个相互垂直轴上的两个方向 Both directions on three mutually perpendicular axes.	
非工作半正弦冲击 Non-Operational Half Sine Shock	40g,11ms,半正弦波脉冲 40G,11ms,half-sine wave pulse. 三个相互垂直轴上的两个方向 Both directions on three mutually perpendicular axes.	

4.6 热循环 THERMAL SHOCK (SHIPPING)

非工作状态：-40° C 至 +70° C，50 次循环，升温速率 30° C/分钟，降温速率≥15° C/分钟，每次半循环在极端温度下的暴露时间为 30 分钟。

Non-operating: -40˚C to +70˚C, 50 cycles, 30˚C /min. ≧transition time ≧ 15˚C /min., duration of exposure to temperature extremes for each half cycle shall be 30 minutes.

4.7 包装 PACKAGE

电源模块包装应采用防静电袋，以避免在运输过程中电源模块受损。

Power supply module package will be the Anti-ESD bag to avoid power supply damage in shipment.

5. 可靠性 RELIABILITY

5.1 电源循环开机 Power cycles:

5000个全交流周期，10000个远程开/关周期。

5000 full AC cycles, 10000 cycles remote on/off.

5.2 平均故障间隔时间 Demonstrated mean time between failure (MTBF) :

电源在 100%负载和 55° C 的连续运行条件下，其最小平均故障间隔时间（CMTBF）应达到 200,000 小时，该数值依据 Telcordia SR-332 第 2 版计算得出。

The The power supply shall have a minimum CMTBF at continuous operation of 200,000 hours at 100% load and 55°C, as calculated by Telcordia SR-332 Issues 2.

·输入电压 Input voltage : 230VAC

·输出负载 Output load : full load

·环境温度 Ambient temperature: 55°C ambient temperature to the power supply.

6. 电磁兼容性和安全性 EMC AND SAFETY

6.1 EMC 指标解析 EMC COMPLIANCE

表 6-1 EMC 指标解析

Table 6-1. EMC compliance

序号 Section	测试项目 Test Item	测试环境 Test Condition	
		电路标准 Line	其它标准 Other
1	传导干扰 Conducted Emission	110V/60HZ,220V ac/50Hz	CISPR 32 – Emissions (International) Class A EN55032 - Emissions (Europe) Class A GB9254
2	辐射干扰 Radiated Emission	110V/60HZ,220V ac/50Hz	CISPR 32 – Emissions (International) Class A EN55032 - Emissions (Europe) Class A GB9254
3	谐波 Harmonic	110V/60HZ,220V ac/50Hz	IEC 61000-3-2, classA as well as class D.
4	波动和闪烁 Flicker	110V/60HZ,220V ac/50Hz	EN/IEC 61000-3-3
5	静电 Electrostatic Discharge	110V/60HZ,220V ac/50Hz	IEC 61000-4-2 criteria:B Air discharge: 15kV Contact discharge: 8kV
6	辐射抗干扰 Radiated	110V/60HZ,220V ac/50Hz	IEC 61000-4-3criteria:A 4V/m

	Immunity		
7	快速瞬变脉冲群 EFT	110V/60HZ,220V ac/50Hz	IEC 61000-4-4, L/N/PE/L-N/L-PE/N-PE/L-N-PE 2kV,Criteria:A
8	浪涌 Surge	110V/60HZ,220V ac/50Hz	IEC 61000-4-5,criteria:A Line to Line: 2KV Line to Earth: 2KV
9	传导抗干扰 Conducted Immunity	110V/60HZ,220V ac/50Hz	IEC 61000-4-6criteria:A 4Vrms
10	磁场强度 Magnetic Field	110V/60HZ,220V ac/50Hz	IEC 61000-4-8 1A/m
11	电压跌落/短时中断 Voltage Dips/Interrupts	110V/60HZ,220V ac/50Hz	IEC 61000-4-11 1. >95% reduction in 0.5 period, 2. 30% reduction in 25 period, 3. >95% reduction in 250 period

注：EMC 测试应使用屏蔽直流输出电缆进行。
Note:Test shall be conducted using a shielded DC output cable to a shielded load.

6.2 安全性 SAFETY

将 PSU 产品销往以下国家时必须满足安全性、EMC/EMI 和偏差认证，因此电源必须获得这些国家的一切特定认证。以下是当前最新出版的电源安全认证：
The safety，EMC/EMI and deviations certification must ensure the PSU product can sell to below countries, So the power supply must get any specific certification of these countries.
The power supply will have the following safety approvals with most current editions:

A) UL 60950-1/CSA 60950-1 Edition 2 (USA/Canada)

B) TUV EN60950-1 Edition 2 (Europe)

C) IEC60950-1 Edition 2 (International)

D) CB Certificate & Report, IEC60950-1 Edition 2

E) CE – Low Voltage Directive 2006/95/EC (Europe)

F) GB4943-2011 Certification (China)

6.2.1 高压 Hipot

电源模块必须符合如下所诉的最低高压测试。该测试将在初级（交流电路和不带电的接触点）和地，初级和次级之间进行。
One hundred percent (100%) of the Power Supply Module will comply with the minimum

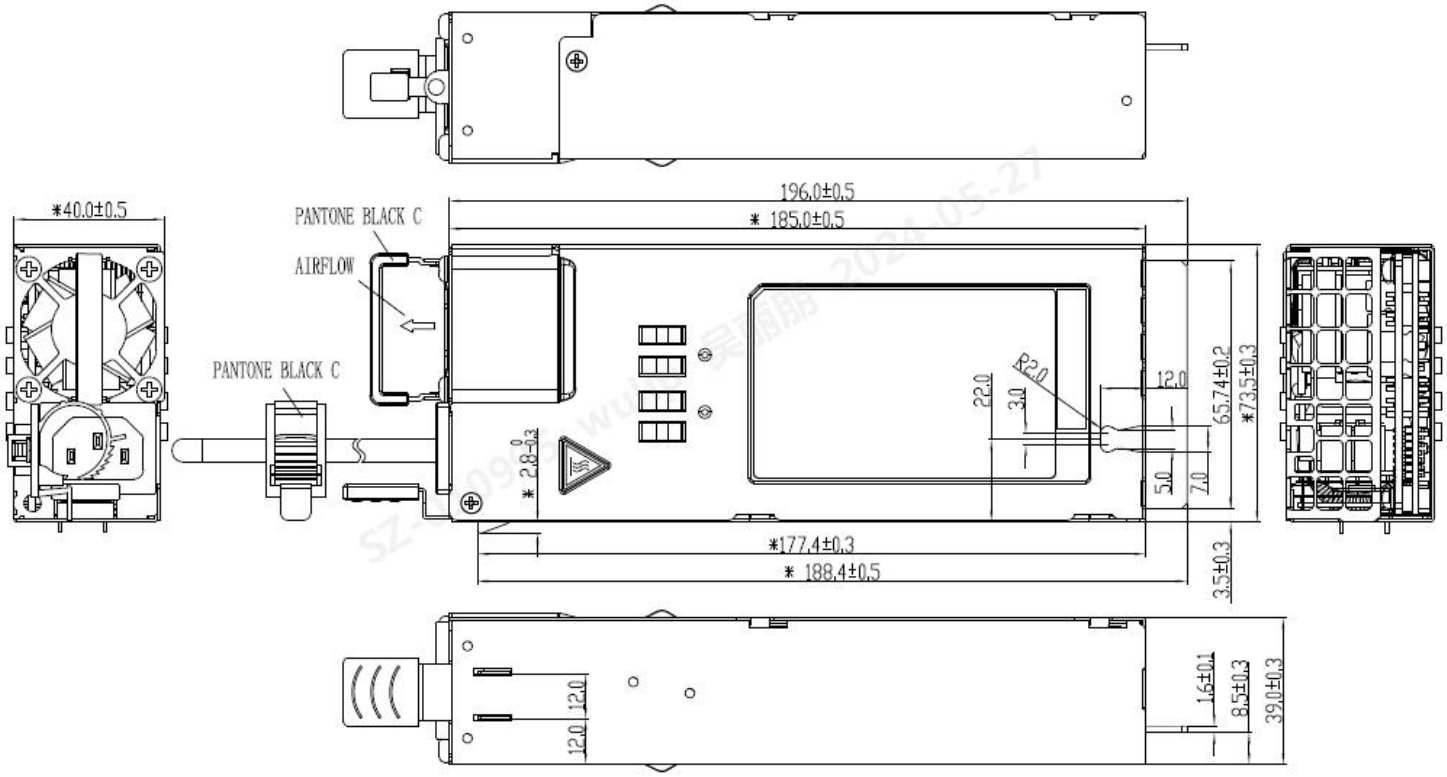
Production Line Hipot (High Potential) Test as noted below. The test will be applied between the primary (AC Line and Neutral) and earth ground, primary and second.
耐压：满足安全性能要求，最低1800VAC或2550VDC。
Withstand voltage: Meet safety requirement, at least 1800VAC or 2550VDC.
停留时间：Dwell time: 3s minimum/1800VAC.

6.2.2 输入漏电流 Input leakage current:

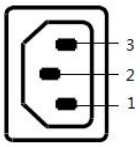
在264V/60HZ条件下低于1.75mA <1.75mA at 264V/60HZ

7. 机械特性 MECHANICAL CHARACTERISTICS

外围尺寸 Outline dimension：
宽度 Width: 73.5mm
厚度 Thickness: 40mm
长度 Length: 185mm
具体尺寸图如下所示 The detailed size diagram is shown as follow:



交流输入接口 AC input connector

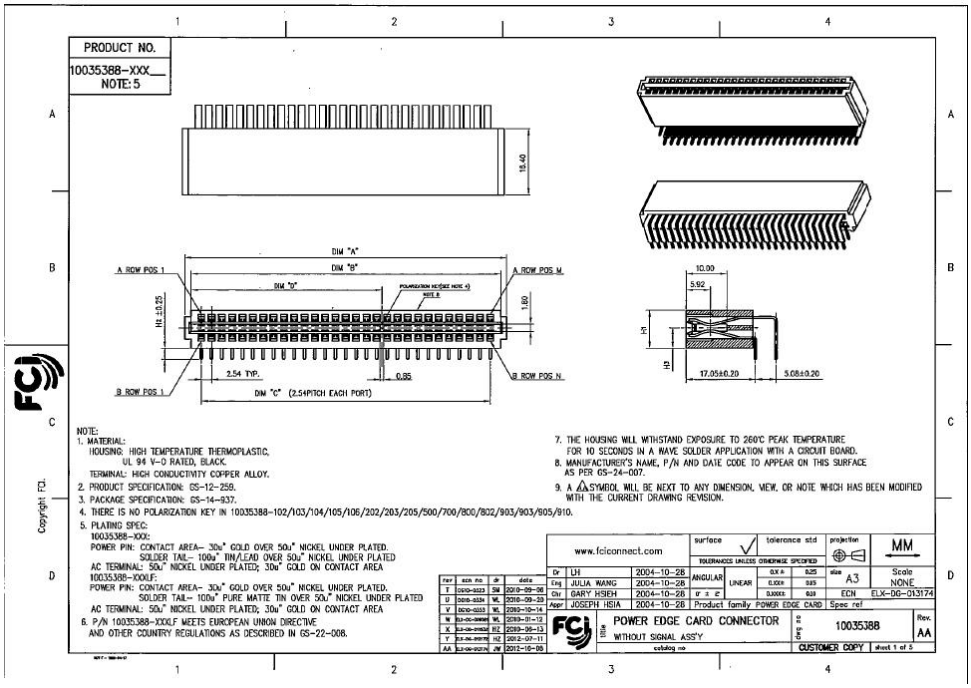
接口 Connector	Pin脚序号 Pin Number	Pin脚名称 Pin Name	Pin脚类型 Pin Type	描述 Description
	1	火线 AC_L	输人 INPUT	高压直流输入，无论 L、N 分别接 DC+还是 DC-，电源都能正常工作。 The PSU will be normal operation whether the AC_L and AC_N connect with DC+ and DC- respectively or on the contrary.
	2	保护地 PE	输入 INPUT	
	3	零线 AC_N	输入 INPUT	

直流输出接口 DC output connector

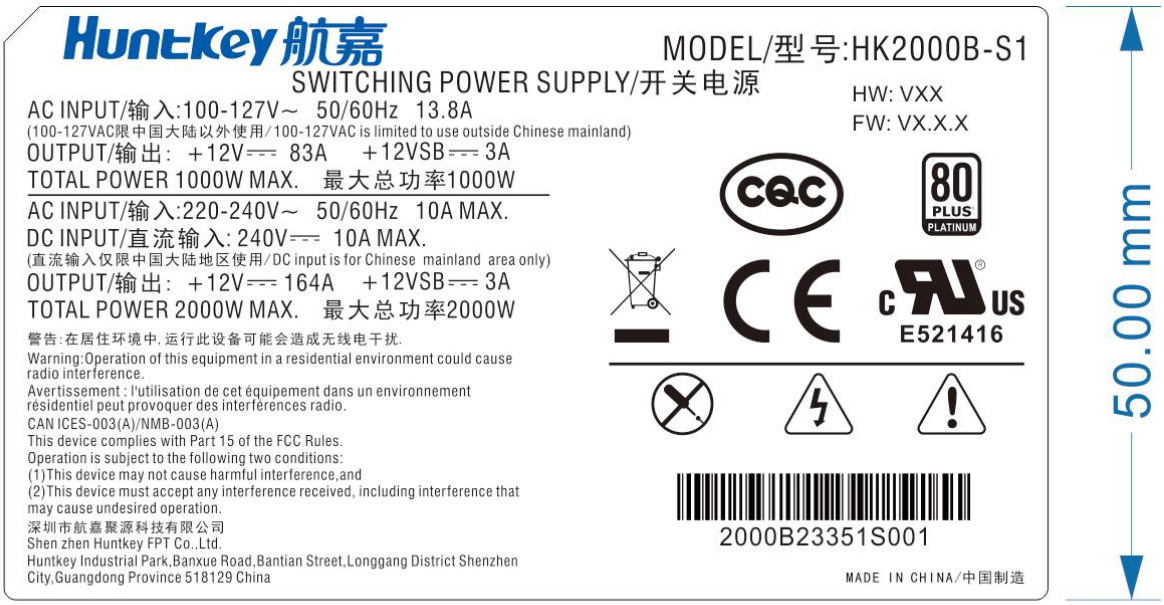
Pin脚序号 Pin Number	Pin脚名称 Pin Name	Pin脚类型 Pin Type	描述 Description
A1 – A9; B1 – B9	GND	隔离接地 ISOLATED GROUND	12V 主电源和 12VSB 备用电源 12V Main and 12VSB Standby Power Return
A10 – A18; B10 – B18	12V	隔离电源 ISOLATED POWER	12V 主输出 12V Main Output
A19	SDA	I/O 信号端口 I/O	SMBus/PMBus 数据传输线；标准 pin 脚长度 SMBus/PMBus Data; standard pin length
A20	SCL	输入信号 INPUT	100KHz SMBus/PMBus 时钟线；标准 pin 脚长度 SMBus/PMBus Clock; 100KHz standard pin length
A21	PSON	输入信号 INPUT	低电平有效；12V 主输出开关控制；断 pin 脚长度 Active Low ; 12V Main output ON/OFF Control; SHORT pin length
A22	SMBus ALERT#	输出信号 OUTPUT	低电平有效；用于跟随主控的设备中断线路；标准 pin 脚长度 Active Low; interrupt line for devices that want to trade their ability to master for a pin; standard pin length
A23	RETRUNS	输入模拟信号 ANALOG INPUT	12V 遥测主输出-；标准 pin 脚长度 12v Main Output Remote Sense -; standard pin length
A24	+12VRS	输入模拟信号 ANALOG INPUT	12V 遥测主输出+；标准 pin 脚长度 12v Main Output Remote Sense +; standard pin length

A25	PWOK	输出信号 OUTPUT	PWOK 高电平有效，表示 12V 主输出正常；标准 pin 脚长度 PWOK Active High, indicates 12V Main is valid; standard pin length
B19	A0	输入信号 INPUT	0 字节 PMBus 信号地址；标准 pin 脚长度 PMBus Address Bit 0; standard pin length
B20	A1	输入信号 INPUT	0 字节 PMBus 信号地址；标准 pin 脚长度 PMBus Address Bit 0; standard pin length
B21	12VSB	隔离电源 ISOLATED POWER	12VSB 输出 12V Standby Output
B22	CR_1	输入模拟信号 ANALOG INPUT	Cold Redundancy Bus 冷备信号
B23	12V LS	I/O 接口模拟信号 ANALOG I/O	12V 主输出负载均流；标准 pin 脚长度 12V Main Output Load Current Sharing; standard pin length
B24	PRESENT_N#	输出信号 OUTPUT	PSU 当前状态 PSU at present
B25	VIN_GOOD	输出信号 OUTPUT	VIN_GOOD 可供选择 VIN_GOOD is optiona

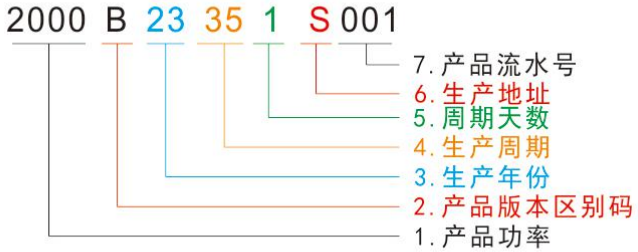
尺寸图如下所示 Dimensions as below:



8. 铭牌标签 LABEL



条形码编码规则(共14位):



1、产品功率：四位,取产品型号中的产品功率，固定不变；
2、产品版本区别码：一位，取产品型号中产品功率后一位字母表示，固定不变；
3、生产年份：两位，取年份的后两位，如2023年此处即为23；
4、生产周期：两位，01-53,按实际周期编写，如2023年第35周即表示2023年8.21-8.27这段时间；
5、周期天数：一位，1-7数字表示，如编写3即表示为周三；
6、生产地址：一位，深圳--S；河源--Y；
7、产品流水号：三位，采用16进制编码，001-FFF(0-9;A-F)。

软硬件版本信息打印规则（所有符号均为半角输入）：

1、HW：VXX 三位,V01-V99,按实际硬件版本打印；
2、FW：VX.X.X 六位（包含小数点）V1.0.0-V9.9.9，按实际软件版本打印。

打印字体:黑体;颜色： 黑色； 字迹清晰易于扫描,不能出现模糊及断笔；
码制&打印等级:1D:Code 128B; 2D:QR Code; 等级要求:B。