ASPOWER

深圳欧陆通电子股份有限公司

深圳欧陆通电子股份有限公司 SHENZHEN HONOR ELECTRONIC CO.,LTD ASPOWER Electrical Specification	Model Name	U1A-C20600-D
	Version	S3
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Electrical Specification

(With ATX output (SGCC))

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REV	Description	Date
S0	Release	2017/12/06
S1	1. 3.5 Dynamic： 3.3V&5V capacitive load modified to 2200uF 2. 6.2 Hi-pot： Modified description fuzzy 3. 15.3 Front Label： Modify company name 4. 7.0 OUTLINE STRUCTURE： Add wire	2018/06/05
S2	3.4 Timing: Modify to increase PF time definition	2018/12/07
S3	Update ： 7.0 OUTLINE STRUCTURE 15.0 PACKAGE Add EMC Description	2020/05/28

Contents

1.0 SCOPE

The specification defines the key characteristics for the power supply. The power supply can be used for Server storage filed, and normal AC input voltage can apply in the power supply. Output connector is for output cable, and output port include +12V, +5V, +3.3V, -12V and +5VSB. The max output power is 600W.

2.0 INPUT PARAMETER

2.1 Input Voltage/Input Current/Frequency

The power supply should operate in input limited voltage range, and follow the specification defined as below table, includes the limited value of input current, input voltage, working frequency. The power supply should be turned on when 90VAC at min load and max load.

Table1.

	Min	Rated	Max	Units
AC input voltage	90	100~127	140	Vrms
AC input voltage	180	200~240	264	Vrms
Frequency	47	50/60	63	Hz
DC input voltage	180	200~360	380	Vdc
Input current	<10A@100-240VAC			

2.2 Inrush Current

Cold start at normal input voltage at 25℃, when input power is applied to the power supply and any initial inrush current surge or spike of 1ms or less shall not exceed 40A@230VAC peak per module. Any additional inrush current surges or spikes in the form of AC cycles or multiple AC cycles greater than 5ms shall not exceed 40A peak per module. Inrush current difference between line and neutral is under 0.1A per half cycle of input current and/or the phase difference between line and neutral is less than +/-20 degrees during each AC input voltage half-cycle.

The inrush shall be less than the ratings of the critical components. Any inrush current of the AC line shall not cause damage to the power supply. Surge current does not contain the current spike due to X-CAP, but the peak current derating time should < 100us.

2.3 Efficiency

Efficiency testing should be in ambient temperature:18degC-27degC, input voltage at 115Vac/60Hz. Efficiency testing delay time should be 15min after running the PSU, and so that the PSU in under steady state.

Table2.

Load	+3.3V	+5V	+12V	-12V	+5Vsb	EFF
20%	2.8A	2.8A	7.6A	0.16A	0.4A	>87%
50%	7A	7A	19A	0.4A	1A	>90%
100%	14A	14A	38A	0.8A	2A	>87%

2.4 Power Factor

Power factor is used to measure the power efficiency of the data used in electrical equipment. It is necessary for meeting the energy star's computer server 2 standard requirements. Input voltage condition: 115V/60Hz, 230Vac/50Hz, power factor meets the requirement as below table.

Table3.

Load	10% Load	20% Load	50% Load	100% Load
PF	> 0.65	> 0.80	> 0.90	> 0.95

2.5 Surge and Sag

The dynamic condition of mains input is defined as sag. Sag is mains drop to below normal voltage, the PSU should meet sag requirement.

Table4. Sag

Duration	Sag	Input Voltage	Frequency	Performance Criteria
=1/2 AC cycle	95%	100~240Vac	50/60Hz	No loss of function or performance
>1/2 AC cycle	>30%	100~240Vac	50/60Hz	Loss of function acceptable, Power supply can turn on automatically

3.0 OUTPUT PARAMETER

3.1 Output Current

The following table defines the current ratings. The combined output power of all outputs shall not exceed the rated output power. The power supply shall meet both static, dynamic voltage regulation and timing requirements for the min/max loading conditions.

Table5.

Output Voltage	Min Current	Max current
+3.3V	0.0A	25.0A
+5V	0.0A	25.0A
+12V	0.5A	48.0A
-12V	0.0A	1.0A
+5VSB	0.0A	3.0A

Note:

1. The continuous total output power is 600W max.
2. The combined power of +3.3V and +5V is 150W max.

3.2 Voltage Regulation

The power supply output voltage must stay within the following voltage limits shown in below table when operating at steady state, dynamic loading conditions. All outputs are measured with reference to the return remote sense (ReturnS) signal.

Table6.

Output Voltage	Min	Rated	Max	Tolerance
+3.3V	+3.135V	+3.3V	+3.465V	+/-5%
+5V	+4.75V	+5.0V	+5.25V	+/-5%
+12V	+11.4V	+12.0V	+12.6V	+/-5%
-12V	-10.8V	-12.0V	-13.2V	+/-10%
+5VSB	+4.75V	+5.0V	+5.25V	+/-5%

Table7. Load Regulation Test

LOAD	+3.3V	+5V	+12V	-12V	+5Vsb
Load1	0.0A	0.0A	0.5A	0.0A	0.0A
Load 2	2.8A	2.8A	7.6A	0.16A	0.4A
Load 3	7A	7A	19A	0.4A	1.0A
Load 4	14A	14A	38A	0.8A	2.0A
Load 5	25.0A	7.5A	33.6A	1.0A	3.0A
Load 6	13.5A	25.0A	33.6A	1.0A	3.0A

Load 7	2.0A	2.0A	40.0A	0.2A	0.2A

3.3 Ripple & Noise

Table8.

Output voltage	Ripple & noise
+3.3V	<50mV
+5V	<50mV
+12V	<120mV
-12V	<120mV
+5VSB	<50mV

Note:

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

3.4 Timing

These are the timing requirements for power supply operation including alone module outputs and multi model outputs. All outputs shall rise and fall monotonically. However, PS timing must meet the requirement of mother board. PS supplier must evaluate and verify the timing characteristics when in design stage and system test stage.

Table9. Turn On/Off Timing

Item	Description	Min	Max	Units
Tvout_rise	Output voltage rise from 10% to 90% time.	1	20	ms
Tsb_on_delay	Delay from AC being applied to 5Vsb being within regulation.		2000	ms
Tac_on_delay	Delay from AC being applied to 12V being within regulation.		2000	ms
Tsb_vout	Delay from 5Vsb being in regulation to 12V being in regulation at AC turn on.	50	1000	ms
Tpson_on_delay	Delay from PSON active to output voltages being within regulation limits.	5	500	ms
Tpwok_on	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	ms

Tvout_holdup	All output stay within regulation after loss of AC.	16		ms
Tpwok_holdup	Delay from loss of AC to de-assertion of PWOK.	14		ms
Tpwok_off	Delay from PWOK de-asserted to output voltages dropping out of regulation limits.	1		msec

Note:

1. Rise Time (Tvout_rise): The all output voltages must rise from 10% to 90% within regulation limits within1 to 20ms.

All outputs must rise monotonically.

2. Tsb-on & Tac-on Delay Time: The Tsb-on delay time for 5Vsb should be ≤ 2s at 115Vac/230Vac when full load.

The Tdc-on delay time for all output voltages should be ≤ 2s at 115Vac/230Vac when full load.

3. Main Output Delay Time (Tsb_vout): The all output voltages being in regulation delay from 5Vsb being in regulation should be 50 to 1000ms when at AC turn on.

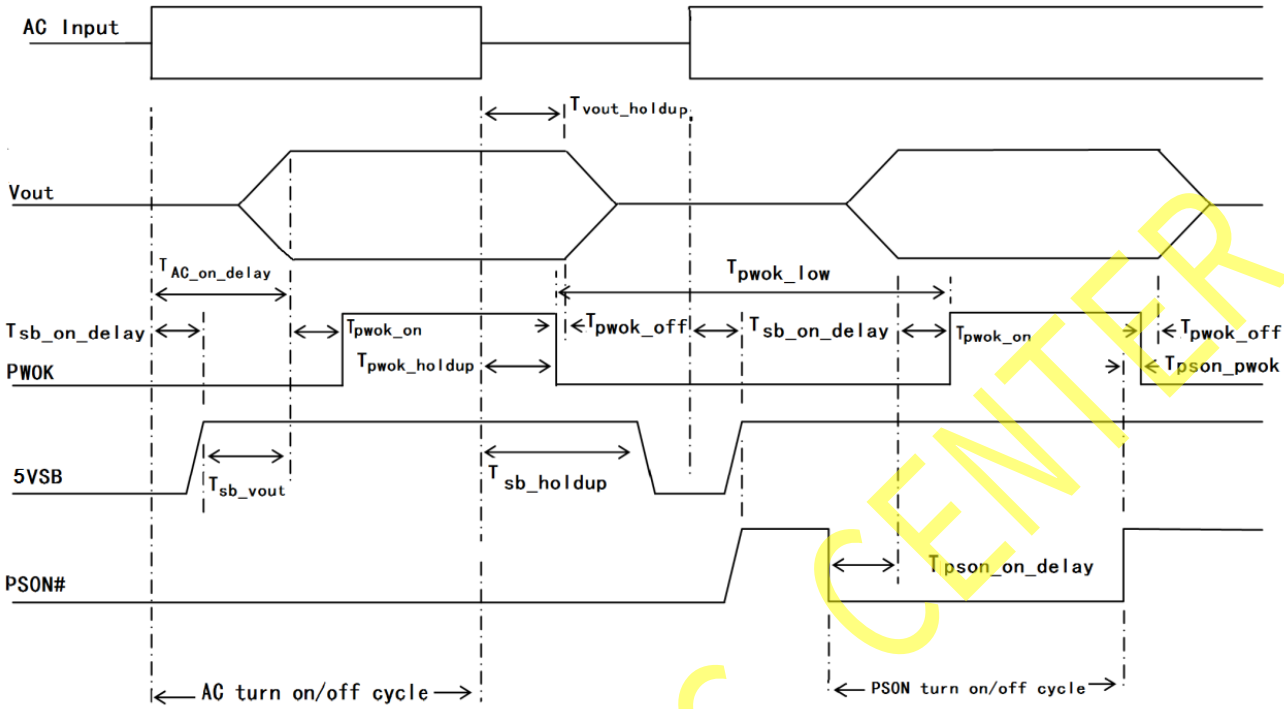
4. Tpson_on_delay: The all output voltages must be within regulation after PSON active for 5 to 500ms.

5. Power Work OK Delay (Tpwok_on): PWOK should delay from all output voltages within regulation for 100 to 500ms.

6. Hold up Time (Tvout_holdup): The hold up time for all output should >16ms at 115Vac/230Vac input when 70% full load.

The hold up time for PWOK should>14ms, at 115Vac/230Vac input when 70% full load.

7. Power Fail Delay Time (Tpwok_off): all output voltages dropping out of regulation delay from PG should≥ 1ms when power off (70% full load).



3.5 Dynamic

The load transient repetition rate shall be tested between 50Hz to 5KHz at 50% duty cycles. The test shall be at least in 50 Hz/1KHz/5KHz condition. The load transient repetition rate is only a test specification.

The output voltage shall remain within limits specified for the step loading, slew rate, and capacitive loading in below table.

Table10.

Output Voltage	Transient Step (A) Percent of Max current	A/us	Frequency (Hz)	Cap (uF)
+3.3V	30%	1.0	50-5K	2200
+5V	30%	1.0	50-5K	2200
+12V	30%	1.0	50-5K	2200
+5VSB	25%	1.0	50-5K	10

3.6 Capacitive Loading

The power supply shall be stable and meet all requirements with the following capacitive loading range. The PSU is not damaged Include normal turn on timing, running under light load and full load.

Table11.

Output Voltage	+3.3V	+5V	+12V	-12V	+5VSB
Capacitive loading (uF)	10000	10000	10000	330	1000

4.0 PROTECTION

When the all output voltages OCP/ OVP/ UVP/ Short is triggered, the power supply will shut down and latched off. The latch can be cleared by toggling the PSON signal or by an AC power interruption. 5Vsb output will auto recovery when the fault condition removed.

4.1 Over Voltage Protection (OVP)

The power supply should have over voltage protection to prevent the outputs from exceeding limits, if the OVP occurred, the power supply should shut down and latch-off and the latch will be cleared by toggling the PSON signal or an AC on/off cycle operation.

Table12.

Voltage	Max(V)
+3.3V	4.5
+5V	7.0
+12V	15.6

4.2 Over Power Protection (OPP)

When the total power supply's power is 120%~160% of full Load, the power supply should shutdown.

4.3 Over Temperature Protection (OTP)

The power supply will be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature. In an OTP condition the PSU will shut down and latch-off.

The ambient over temperature point is 56±5℃.

4.4 Short Circuit Protection (SCP)

The power supply shall be protected from damage due to faults between main output and GND. Short circuit of the power supply outputs shall not result in fire hazard, shock hazard, or damage to the power supply. Components shall not be damaged during the short circuit conditions. If the main output short to GND, the power supply will shut down and latch-off.

4.5 Over Current Protection (OCP)

The power supply should have over current protection to prevent the outputs from exceeding limits, if the OCP occurred, the power supply should shut down and latch-off and the latch will be cleared by toggling the PSON signal or an AC on/off cycle operation.

Table13. OCP Limited Table

Output	Min	Max
+3.3V	30A	40A
+5V	30A	40A
+12V	52A	62A

5.0 OPERATE ENVIRONMENT

5.1 Operate Temperature

Operate temperature: 0℃ to +50℃.

5.2 Storage Temperature

Storage temperature: -40℃ to +70℃.

5.3 Operate Humidity

Operate Humidity (non-condensing): 10% to 90%.

5.4 Storage Humidity

Storage Humidity (non-condensing): 5% to 95%.

5.5 Operate Altitude

Operate Altitude: 0 to 5000m.

5.6 Storage Altitude

Storage Altitude: 0 to 10000m.

6.0 SAFETY

6.1 Safety Certification

The power supply must meet to the safety standard listed following:

1. UL: Recognized to U.S. requirements under the component recognition program of Underwriters Laboratories Inc. The power supply shall be designed to meet UL 60950.

2. TUL: TUV meet TUV EN-60950.

CB meets IEC-60950.

3. CCC: Certificate for China compulsory product certification.

GB4943-2001, GB9254-1998, GB17625.1-2003.

6.2 Hi-pot

Primary to secondary Hi-pot withstand voltage: 3000Vac, 60s, leakage current <10mA or 4242Vdc, 60s, leakage current <0.5mA for PCBA.

Primary to grounding Hi-pot withstand voltage: 1500Vac, 60s, leakage current <10mA or 2121Vdc, 60s, leakage current <0.5mA.

6.3 Grounding Impedance Test

Grounding impedance test using grounding current 32A for 60 seconds and the impedance is less than 100mohm.

6.4 Leakage Current

In order to ensure that the leakage current of the power supply case not cause leakage damage to the human body, after inserting the AC power, the leakage current of the power supply should meet the requirements of safety. Under 264Vac/60Hz conditions to be less than 3.5mA.

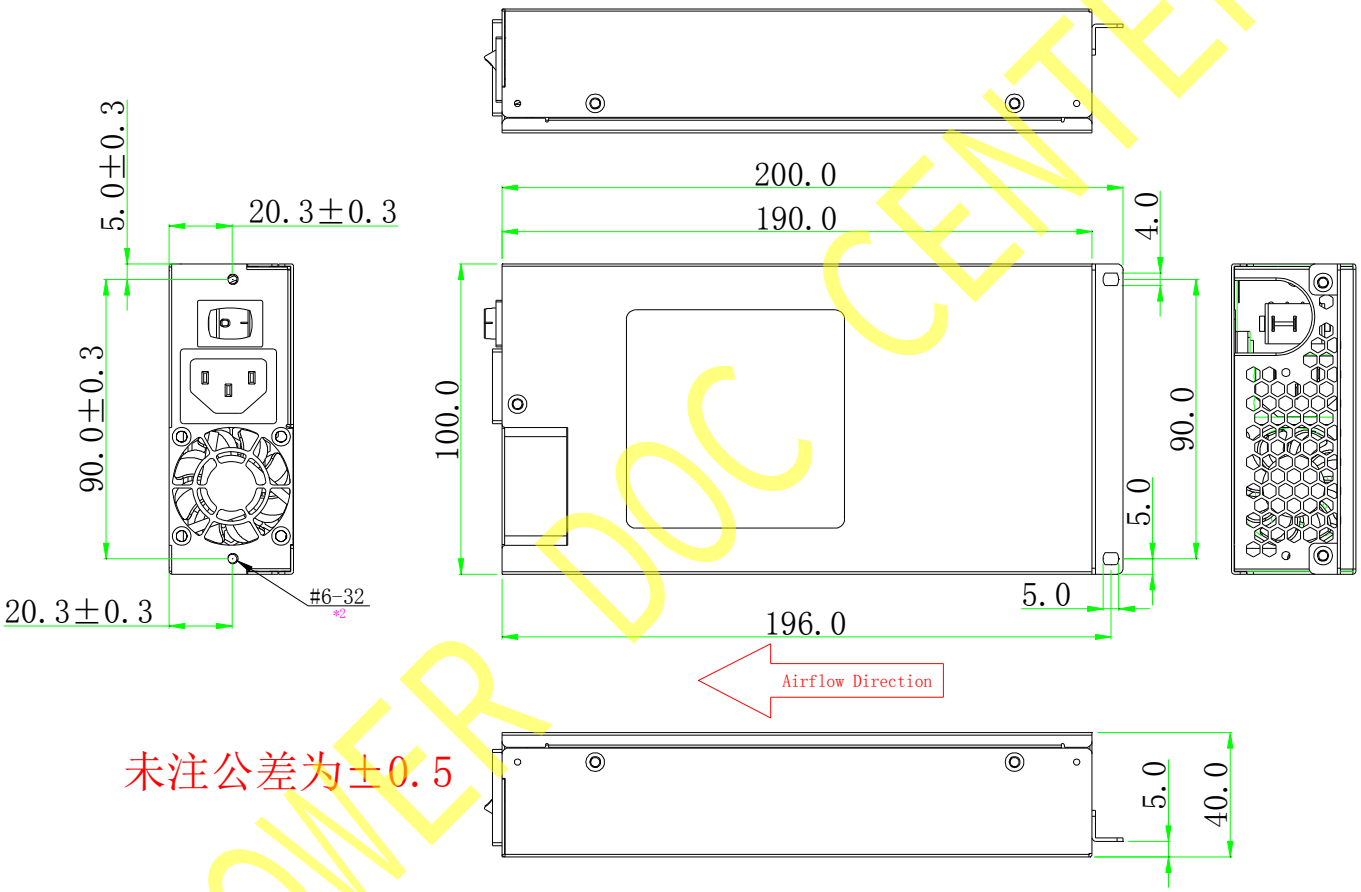
7.0 OUTLINE STRUCTURE

Outline dimension:

Length: 190.0mm

Width: 100.0mm

Thickness: 40.0mm



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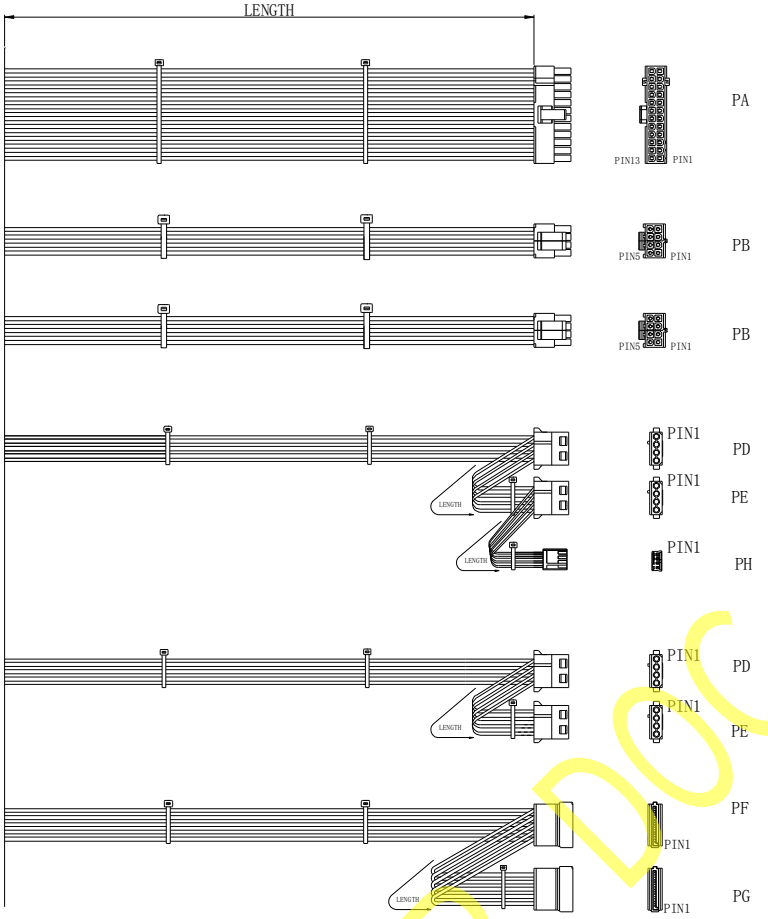


CONN	PIN	WIRE COLOR	OUTPUT	WIRE SPECIFICATION	LENGTH (mm)
PA	1	ORANGE	+3.3VDC	UL/CSA 1007 18AWG 80° C 300V	400±30
		ORANGE	+3.3V REMOTE SENSE	UL/CSA 1007 22AWG 80° C 300V	
	2	ORANGE	+3.3VDC	UL/CSA 1007 18AWG 80° C 300V	
	3	BLACK	GND		
	4	RED	+5VDC		
	5	BLACK	GND		
	6	RED	+5VDC		
	7	BLACK	GND		
	8	GRAY	PG	UL/CSA 1007 20AWG 80° C 300V	
	9	PURPLE	+5 VSB	UL/CSA 1007 18AWG 80° C 300V	
	10	YELLOW	+12VDC		
	11	YELLOW	+12VDC		
	12	ORANGE	+3.3VDC		
	13	ORANGE	+3.3VDC		
	14	BLUE	-12VDC		
	15	BLACK	GND		
	16	GREEN	PS-ON	UL/CSA 1007 20AWG 80° C 300V	
	17	BLACK	GND	UL/CSA 1007 18AWG 80° C 300V	
	18	BLACK	GND		
	19	BLACK	GND		
	20	NC	NC		
	21	RED	+5VDC		
	22	RED	+5VDC		
		RED	+5V REMOTE SENSE	UL/CSA 1007 22AWG 80° C 300V	
	23	RED	+5VDC	UL/CSA 1007 18AWG 80° C 300V	
	24	BLACK	GND		
PB	1	BLACK	GND	UL/CSA 1007 18AWG 80° C 300V	450±30
	2	BLACK	GND		
	3	BLACK	GND		
	4	BLACK	GND		
	5	YELLOW	+12VDC		
	6	YELLOW	+12VDC		
	7	YELLOW	+12VDC		
	8	YELLOW	+12VDC		
PD PE PH	1	YELLOW	+12VDC	PD PE:UL/CSA 1007 18AWG 80° C 300V PH:UL/CSA 1007 18AWG 80° C 300V	PD 400±30 PE PH 150±10
	2	BLACK	GND		
	3	BLACK	GND		
	4	RED	+5VDC		
PF PG	1 2 3	ORANGE	+3.3VDC	UL/CSA 1007 18AWG 80° C 300V	PF 400±30 PG 150±10
	4 5 6	BLACK	GND		
	7 8 9	RED	+5VDC		
	10 11 12	BLACK	GND		
	13 14 15	YELLOW	+12VDC		

NOTE:

PA	HOUSING:	WST P20+4-I42002K2	OR EQU
PB	HOUSING:	WST P4-I42002K3A	OR EQU
PD PE	HOUSING:	WST P4-A10202	OR EQU
PF PG	HOUSING:	WST P5-I12707	OR EQU
PH	HOUSING:	WST P4-I25001	OR EQU

8.0 ROHS

Power supply must meet be Rohs6 compliant including the component, PCB, soldering material, case, wire, and so on.

9.0 EMC

警告

此为 A 级产品，在生活环境中，该产品可能会造成无线电干扰。在这种情况下，可能需要用户对干扰采取切实可行的措施。

IEC61000-4-2 Electrostatic Discharge

IEC61000-4-4 Electrical Fast Transients

IEC61000-4-5 Electrical Surge

Table14

Item	Description and requirements	
Insulation safety rating	Input / Output	Reinforce
	Input / Case	Basic
	Output / Case	Functional
Radiated Emissions EN55032	Class A	
Conducted Emissions EN55032	Class A	
EN61000-3-2 Harmonics (AC Rated Input Current <=16A per phase)	Class A	
EN/IEC61000-4-2 ESD	4kV Contact, 8kV Air	
IEC61000-4-3 Radiated Immunity	3V/m, Performance Criteria A required.	
IEC61000-4-4 EFT (5kHz and 100kHz repetition rates)	1kV, Performance Criteria B required.	
IEC61000-4-5 Surge	±2.0 kV in CM/12ohm, ±1.0 kV DM/2ohm. Performance Criteria A required.	
IEC61000-4-6 Conducted Immunity	3Vrms, Performance Criteria A required.	

10.0 PART CONTROL REQUIREMENTS

1. All current limiting devices shall have UL, TUV or VDE certification and shall be identified as applications in which the device complies with IEC60950.

2. All printed circuit board ratings shall meet UL94V - 0 and those from UL certified PCB manufacturers.

3. All joints shall pass UL certification and UL flame retardant rating UL94V-0.

4. All wiring harness shall be from UL certified wiring harness manufacturer. SELV cable is rated at minimum 80V, 130degC.

5. Product safety labels must be printed with UL certified labels and ribbons. In addition labels can be purchased from UL label manufacturers for approval.

6. The product must have the correct regulatory marks to support the certification specified in this document.

11.0 MECHANICAL PERFORMANCE

Mechanical vibration experiment is mainly to simulate the product vibration experiment in the work and transport process, the purpose is to test whether the product can meet certain specifications of vibration intensity, the main test items include:

1. Work random vibration.
2. Work shock.
3. Packaging random vibration.

Table15.

NO	Experiment Item	Sample	Standard	Parameter	Criterion
1	work random vibration	≥3	IPC9592A-2010 IEC60068-2-64	ASD: 20~1000Hz: 0.04g2/Hz; 1000~2000Hz: 6db/oct; 2000Hz: 0.01g2/Hz. About 8Grms. 3 axial, each axial at least 10min. Test process sample power on, normal input voltage, no load. During the test, each power output and signal output should be monitored continuously. The monitoring period should be less than 1ms.	Power supply voltage is Within the specification limits during the test.
2	work shock	≥3	IPC9592A-2010 IEC60068-2-27	Half sine wave, 16ms, at least 30g. 3 axial, each axial 3 times. During the test, each power output and signal	Power supply voltage is Within the specification limits during the test.

				output should be monitored continuously. The monitoring period should be less than 1ms.	
3	packaging random vibration	≥3	IPC9592A-2010 IEC60068-2-64	ASD: 5~1000Hz: 0.05g2/Hz; 1000~2000Hz: 6db/oct; 2000Hz: 0.0125g2/Hz. About 9Grms. About 9Grms, 3 axial, each axial at least 10min. Each PSU should have independent packaging follow normal delivery.	After the test, product should be inspected. Allows minor damage without affecting appearance, installation, or function. Connector pins are not allowed to bend, switch damage, handle damage. Label readability is poor, metal deformation or bending. All equipment through functional testing. Test shipment packaging damage degree does not make judgment requirements.

12.0 MTBF

Quantitative reliability (Quantitative) performance requirements: MTBF (MTBF Mean Time Between Critical Failure), according to the Bellcore standard SR-332 Issue3, the PSU operates continuously under 25degC condition, 115VAC/60Hz, 230V/50HZ input voltage under max load, and MTBF is more than 100000 hours, the testing process should not be interrupted.

Table16.

Item	Requirement	Notes
CMTBF (Calculated MTBF)	≧100,000 hours, at 25℃ ambient temperature and full load.	By Telcordia SR-332 issue 2

13.0 HALT

Highly accelerated life test, HALT is a kind of process of defect detection, by setting the incremental stricter environmental stress, to expose accelerated test sample defects and weak points, and then have analysis and improvement to defects and faults at design, process and material aspects, so as to improve the purpose of reliability, the biggest feature is setting higher environmental stress of the designed sample running limitation, so that the exposure fault time is much shorter than the normal fault reliability time under the condition of force. Test procedure and test report must meet the "IPC9592B-2012" requirements.

High acceleration life test specific testing includes points as below:

1. Gradually apply stress until the product failure or fault.
2. Take temporary action to correct product failure or fault.
3. Continue to apply stress gradually until the product fails again and correct again.
4. Repeat the above test steps from failure to improve.
5. Find out the basic operating limitation and basic damage limits.

Experimental process:

1. Temperature uniformity test: After the test at room temperature for the test sample, before low temperature step stress test and turn off test sample power, adjust wind tube position, Device surface temperature is at ambient temperature, adjust the temperature to 50degC, the Duration time for 5min, record temperature of the key chip, and the layout of the site after temperature stability, until the temperature difference of all points is less than Plus or minus 3degC, then start experiment.

2. Temperature step stress test: Temperature step stress test, have two stages: low temperature and high temperature. The first implementation of low temperature stress test stage, then high temperature stress test, the specific steps are as follows: the test should start from room temperature (20 DEG to 30 DEG); the maximum temperature step level: -10degC (low step) and +10degC (high temperature step); each temperature dwell times should be enough long (at least 10 minutes), until the thermocouple

measurements value on the sample reached stable. The function of the test sample can be carried out under temperature stable, may also have been carried out in the whole process of the test sample; until find the operating limits or test has reached limit capacity of HALT test box, the test can be stopped; After determining the operating limits of the product, temperature step test should to be continued. The stress range is between the sample operation and destroying limits and the limit of HALT test box.

3. Rapid temperature change cyclic stress test: Rapid temperature cyclic stress tests shall be performed at least 5 cycles, unless the test sample exhibits a non-recoverable failure in the test. Temperature change test rate according to the provisions of test program (not to exceed the maximum temperature change rate of HALT equipment); the lowest temperature test than the lowest temperature limit of 10degC higher (or 80%), the highest temperature is 10 degrees lower than the maximum working temperature limit (or 80%). At least 5 minutes in the temperature extremes, dwell time should be long enough, until the thermocouple measurements on the sample to achieve stability. In the whole process of rapid temperature change cyclic stress test, the samples should be functional monitored to judge whether the test samples will cause failure due to rapid temperature changes.

4. Vibration step stress test: The vibration order of the experiment was 5~10Grms (recommended 10Grms), the frequency was between 2 and 5000Hz, or higher frequency range. At the end of each vibration magnitude and sample dwell function tests, and then test the vibration magnitude increasing with 5~10Grms (recommended 10Grms), the dwell time at each order of magnitude should not be less than 10 minutes about vibration stress, then test the product function, Until find the sample's operation and destroying limits, due to the stress range, the sample may fail, so it is necessary in all vibration stress level test, reduce stress, determine whether the samples can return to normal.

5. Comprehensive stress test: The comprehensive stress test performed at least 5 cycles, unless the sample failure does not be recovered in the experiment; the temperature cycling curve of extreme settings is same as rapid temperature change of cyclic stress, the resident time at the extreme temperature is at least 10 minutes; Vibration level in the comprehensive vibration is the first four cycle, vibration =90%* vibration limit cycle number /4* operation, the fifth cycles of vibration stress reduced to 5Grms. After a certain period of time at vibration level, the test product should be functional detection. Test residence time will be appropriately extended according to the time required for product functional testing.

14.0 THERMAL SHOCK TEST

Thermal shock test is a testing technique to test the resistance of material to extreme high temperature or extremely low temperature. This situation is similar to the case of discontinuous in high temperature or low temperature. It can make various objects complete the test in the shortest time. The changing of chemical or physical damage producing in the TST is caused by Thermal changing or changing of other physical value. The effects of TST include electrochemical changes caused by product crack or fracture and displacement. TEST method:

1. In the temperature controlling room, it change from normal temperature 25degC to low temperature -40degC usually, and bake for 30 minutes under low temperature.

2. Temperature of controlling room changes from low temperature -40degC to high Temperature 70degC usually, changing time is 2min., and high temperature baking for 30 minutes.

3. After 10 cycle changing between the high temperature of 70degC and low temperature -40degC, the temperature returned to normal temperature, and removed the power (at least restore for 4 hours).

4. Confirm the label, case withstand voltage and electrical performance of the tested product before and after test. Note:

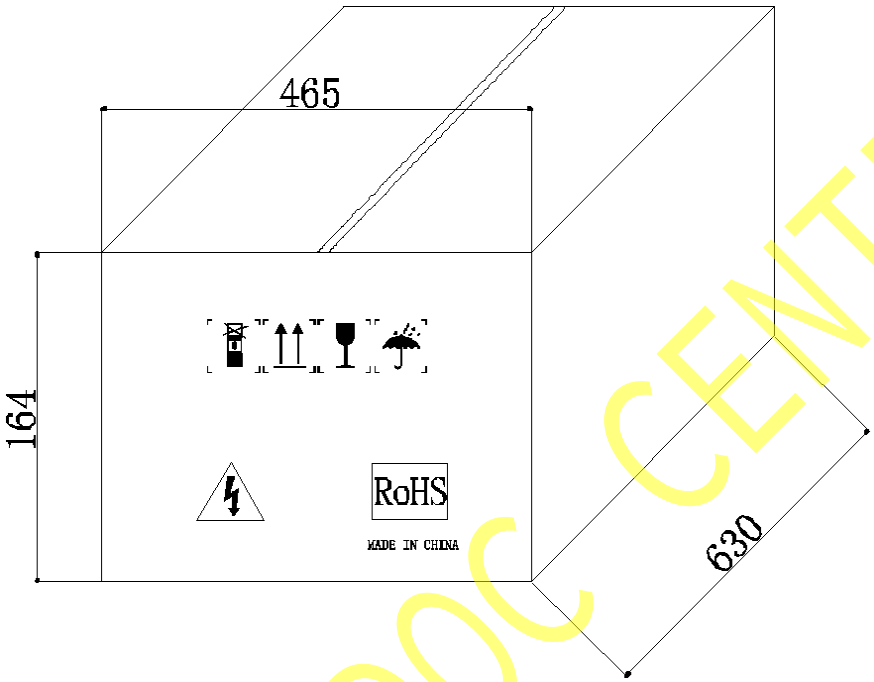
1. After TST test product, performance and appearance of PSU should not appear degradation and degradation phenomenon.

2. The dielectric strength and insulation resistance after thermal shock test products shall meet the requirements of specifications.

3. Products are non-operating condition.

15.0 PACKAGE

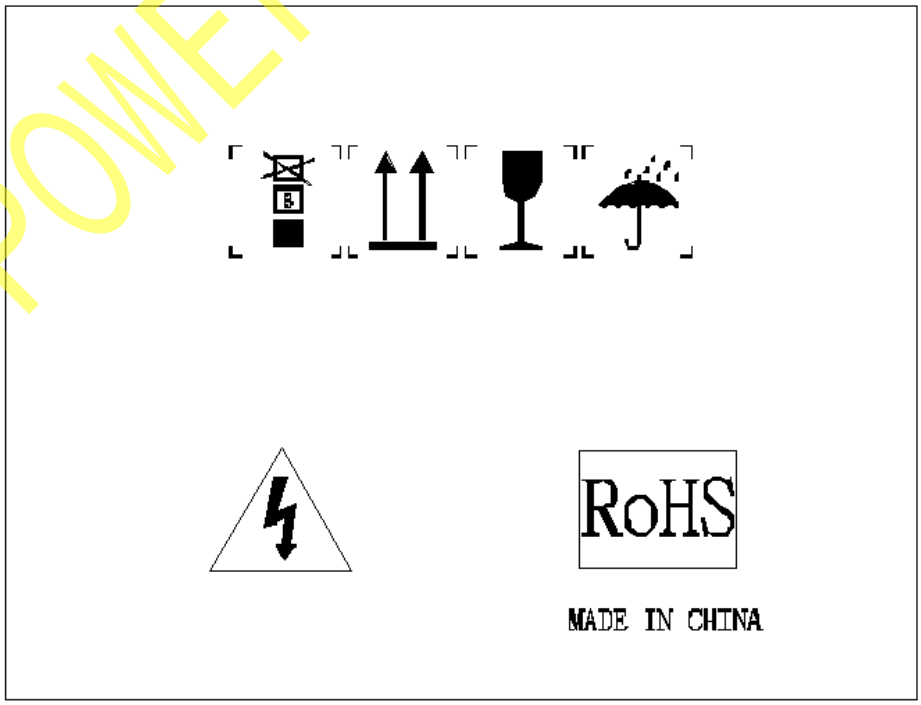
15.1 Outline Diagram of Carton



Note:

Material: K=K, five layers of corrugated paper.

15.2 Side Label



15.3 Front Label