Negorack Limited Electrical Specification	Model Name	NR2-MVR700-N
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Electrical Specification

(With ATX output (SGCC) 1+1 Redundant)

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REV	Description	Date

S0	Release	2012/03/15
S1	Format modified	2014/03/03
S2	Format modified	2016/01/27
S3	1.Modify spec for R3.6 about Dynamic Loading 2.Modify spec for R4.3 about Over Temperature Protection	2017/09/28

Contents

1.0 SCOPE

This specification defines the key characteristics for the +700W power supply (include double modules and one PDB), which is intended for worldwide use in IT equipment such as server application. This unit contains +12V, +5V, +3.3V, -12V and +5Vsb output ports. All the specifications are applicable under all operating conditions when installed in the end used system unless other noted.

2.0 INPUT PARAMETER

2.1 Input Voltage/Input Current/Frequency

The power supply shall operate within input limited voltage range as defined as Table 1, which includes the limited value of input current, input voltage, working frequency. The power supply shall be capable of start up from min load to max load at line input as low as 90VAC.

Table1.

	Min	Rated	Max	Units
AC input voltage	90	100~127	264	VAC
		200~240		VAC
Input current	<10A@100~240VAC @full load			

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 longer than 1ms shall not exceed 120A peak @230Vac. 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 and Y-Cap.

2.3 Efficiency

The power supply achieves the 80 plus level by testing at the 230Vac/50Hz, 18degC-27degC ambient temperature and the loading condition show in Table 2. Efficiency testing delay time should be 30min after running the PSU, and so that the PSU in under steady state. This efficiency test refers

to 80Plus Test Protocol “Generalized Test Protocol for Calculating the Energy Efficiency of Internal Ac-Dc and Dc-Dc Power Supplies Revision 6.7”.

Table2.

Load	+3.3V	+5V	+12V	-12V	+5Vsb	EFF
20%	3.7A	3.7A	8.8 A	0.2A	0.5A	>82%
50%	9.2A	9.2A	22A	0.4A	1.2A	>85%
100%	18.4A	18.4A	44A	0.8A	2.3A	>82%

2.4 Hold up Time

Hold up time is defined length of time from AC input drops to 0V to +12V dropping out of voltage regulation range at any phase of the AC input, the power supply should meet dynamic voltage range.

1. Hold up time +12Vout>=16ms@80% load (90~264VAC)

2.5 AC Line Dropout

AC line dropout is the condition when AC input voltage drops to 0V at any phase of the AC line for any length of time. During an AC dropout of 16ms or less than the power supply’s hold up time shall meet voltage regulation in the rated load and half load at all AC input voltages.

An AC line dropout of 9ms or less at 80% load shall not cause malfunction of control signals or protection circuit trip. If the AC dropout lasts longer than 16ms the power supply shall recover and meet all turn on requirements.

Any dropout of the AC line shall not cause damage to the power supply.

2.6 Power Factor

The power supply must meet the power factor requirements stated in the Energy Star Program Requirement for Computer Servers V2.0. The power factor shall meet the requirement as below table at 230Vac/50Hz and 115Vac/60Hz input voltage condition.

Table3.

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

2.7 Surge and Sag

The dynamic conditions of AC line are defined as sag and surge. Sag is mainly drop to below normal voltage, surge refers to the input voltage rising above the normal range, the PSU shall meet the requirements under the following AC line sag and surge conditions.

Table4. Surge and Sag Test Condition

Duration	Surge/Sag	Input Voltage	Frequency	Performance Criteria
500ms	10%	220/110VAC	50/60Hz	No loss of function or performance
0 to 1/2 AC cycle	30%	220/110VAC	50/60Hz	No loss of function or performance
=1/2 AC cycle	30%	220/110VAC	50/60Hz	No loss of function or performance
>1/2 AC cycle	>30%	220/110VAC	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 output current ratings. The combined output power of all outputs shall not exceed the rated output power (700W). The power supply shall meet both static, dynamic voltage regulation and timing requirements for all loading conditions defined in specification.

Table5.

Output Voltage	Min Current	Max current
+3.3V	0.3A	30A
+5V	0.3A	30A
+12V	0.3A	58A
-12V	0A	1A
+5Vsb	0A	3A

Note:

1. The continuous total output power is 700W max.
2. The combined power of +5V and +3.3V is 200W max.

3.2 Voltage Regulation

The power supply output voltages 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 Table

	+3.3V	+5V	+12V	-12V	+5Vsb
Load1	0.3A	0.3A	0.3A	0.0A	0.0A
Load2	3.7A	3.7A	8.8A	0.2A	0.5A
Load3	9.2A	9.2A	22A	0.4A	1.1A
Load4	18.4A	18.4A	44A	0.8A	2.2A
Load5	30.0A	20.0A	39.5A	1.0A	3.0A
Load6	15.0A	30.0A	39.5A	1.0A	3.0A
Load7	1.0A	1.0A	55.0A	1.0A	3.0A

3.3 Ripple & Noise

Table8.

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

Note:

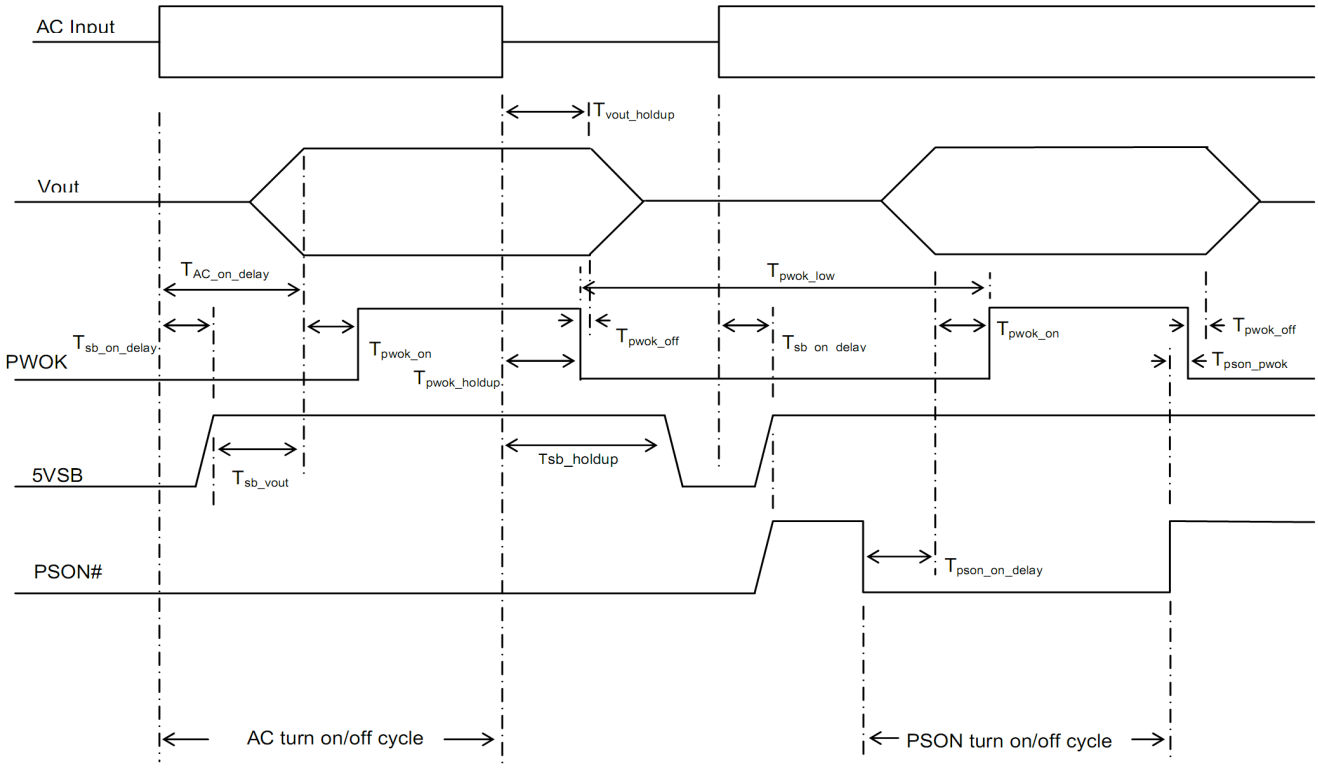
1. The ripple & noise is measured over a bandwidth of 20MHz at the power supply output connectors. A 10μF Electrolytic capacitor in parallel with a 0.1μF ceramic capacitor is placed at the point of measurement.

3.4 Timing

These timing requirements for power supply operation include alone module's output and multi modules' outputs. All outputs shall rise and fall monotonically. In additional, PSU timing must meet the requirement of mother board. The timing characteristics must be evaluated and verified when in design stage and system test stage.

Table9.

Item	Description	Min	Max	Units
Tvout _rise	Output voltage rise from 10% to 90% time.		25	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		ms



Note:

1. Rise Time (Tvout _rise): The output must rise from 10% to 90% within regulation limits should < 25ms.

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 Tac-on delay time for 12V should be ≤ 2s at 115Vac/230Vac when full load.

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

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

5. Power Work OK Delay (Tpwok_on): PWOK should delay from all output 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 80% full load.

The hold up time for PWOK should>14ms, at 115Vac/230Vac input when 80% full load.

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

3.5 Overshoot

Output voltage overshoot is less than 10% with 30% load step and any input voltage, the output rising up waveform should be kept flat and smoothly.

Table10.

Output Voltage	Overshoot (Max)
+3.3V	3.63V
+5V	5.5V
+12V	13.2V

3.6 Dynamic

The output voltage shall remain within 10% specified for the step loading, slew rate, and capacitive loading in below table.

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 output current transient repetition rate is only a test specification.

Table11.

Output Voltage	Transient Step (A) Percent of Rated Current	Slew rate (A/us)	Frequency (Hz)	Cap (uF)
+3.3V	30%	0.5	50-5K	10000
+5V	30%	0.5	50-5K	10000
+12V	30%	0.5	50-5K	10000
-12V	30%	0.5	50-5K	330
+5Vsb	25%	0.5	50-5K	1000

3.7 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 all loading conditions.

Table12.

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

3.8 Current Sharing and Hot Plug

As this power supply has redundant function, the output current sharing should within ±10% when half, full load and within ±20% at light load. The supplies must be able to load share in parallel and operate in a hot-swap/redundant configuration.

Table13. Load Regulation Test Table

	+3.3V	+5V	+12V	-12V	+5Vsb	Spec
Load1	0.3A	0.3A	0.3A	0.0A	0.0A	REF
Load2	0.0A	0.0A	11.6A	0.0A	0.0A	±20%
Load3	0.0A	0.0A	29.0A	0.0A	0.0A	±10%
Load4	0.0A	0.0A	58.0A	0.0A	0.0A	±10%
Load5	6.0A	0.0A	0.0A	0.0A	0.0A	±20%
Load6	15.0A	0.0A	0.0A	0.0A	0.0A	±10%
Load7	30.0A	0.0A	0.0A	0.0A	0.0A	±10%
Load8	0.0A	6.0A	0.0A	0.0A	0.0A	±20%
Load9	0.0A	15.0A	0.0A	0.0A	0.0A	±10%
Load10	0.0A	30.0A	0.0A	0.0A	0.0A	±10%
Load11	18.4A	18.4A	44.0A	0.0A	0.0A	±10%

3.9 PWOK Signal

PWOK is a power OK signal and it will be pulled high, when the power supply indicates all outputs are within the regulation. When +12V, +5V, +3.3V, or -12V output have a fault, the PWOK will be de-asserted to a low state.

4.0 PROTECTION

To operation safely and reliably, inside circuit in the power supply should have necessary protection function for various abnormal situations, include OCP, OVP, OTP, OPP and short. The main output shall shut down and latch off under protection mode. The main outputs can be reset by cycling the remote on/off or input interrupt restart. +5Vsb output is auto recovery when fault condition removed.

4.1 Over Voltage Protection (OVP)

The OVP range is shown in below table.

Table14.

Voltage	Min(V)	Max(V)
+3.3V	3.7	4.5
+5V	5.7	7.0
+12V	13.2	15.6

4.2 Over Power Protection (OPP)

110%~160% of full load

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 OTP is 58+/-7℃.

4.4 Short Circuit Protection (SCP)

The power supply shall shut down and output is under skip mode, when main output is under shorten mode (impedance less than 0.1ohm). The power supply should be under protection mode to keep component safe, whatever the output is shorten before turn on or shorten after turn on. The main output voltage shall shut down and latch off, and power supply must be able to turn on by cycling the remote on/off or input interrupt restart.

4.5 Over Current Protection (OCP)

Table15. OCP Limited Table

Output	Min	Max
+3.3V	35A	45A
+5V	35A	45A
+12V	62A	72A

4.6 Warning Type

Table16.

Status	Module LED	Backplane LED	Buzzle	TTL Level
Normal	green	green	quiet	high

Fault	Only +5Vsb	yellow	flash	alarm	low
	No +5Vsb	off	flash	alarm	low
Reset		Yellow/off	flash	quiet	low

Note:

1. Audio alarm is buzzer sounds and it can be eliminated by the reset button.
2. Unplug the abnormal modules and all signals will be back to normal.

4.7 No Load Operating

No damage or hazardous condition should occur with all the DC output connectors disconnected from the load. The power supply may latch into the shutdown state.

5.0 OPERATE ENVIRONMENT

5.1 Operate Temperature

Operate temperature: 0℃ to +50℃.

5.2 Storage Temperature

Storage temperature: -20℃ 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

FCC

CCC

CE

6.2 Hi-pot

Primary to secondary, HI-POT Withstand voltage: 3000Vac, 60s, leakage current <10mA; 4242Vdc, 60s, leakage current <0.5mA.

Primary to GND, HI-POT Withstand voltage: 1500Vac, 60s, leakage current <10mA; 2121Vdc, 60s, leakage current <0.5mA.

6.3 Grounding Impedance Test

Grounding impedance test using grounding current 32A for 60s 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 test with customer system.

6.5 Smokeless

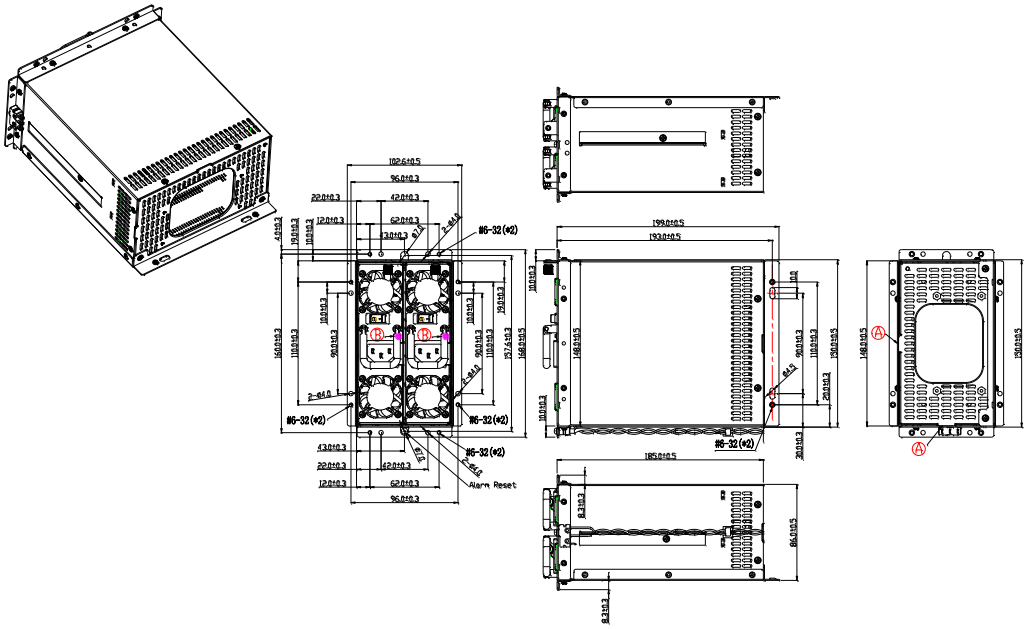
Parts failure in the power supply shall not have smoke and flame. And it is necessary to put a fuse in the front of DC-DC conversion circuit or equivalent circuit to prevent smoke and diffusion. Parts failure will trigger the fuse open. All power components are not limited in safety components, but it should be required to verify in the smoke-less testing.

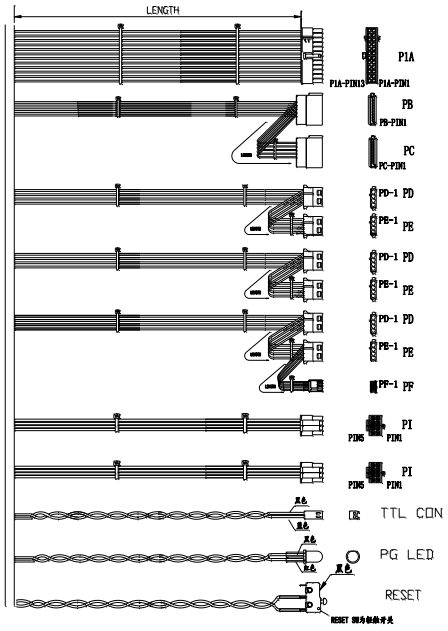
6.6 Warning

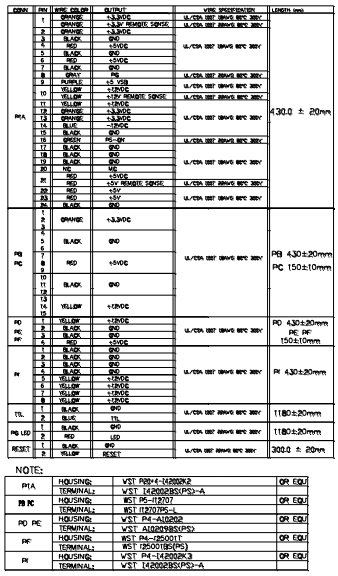
1. The PSU must have insulation protection.
2. To avoid electric shock and injury, the PSU must not be energized before finishing installation.
3. This PSU only allows professional maintenance.

7.0 OUTLINE STRUCTURE

Outline dimension: 185mm (L)*150mm (W)* 86mm (T)







8.0 RESTRICTED SUBSTANCE

8.1 ROHS

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

8.2 Restricted Substance

Recycled Plastics: Post-consumer recycled content plastics to constitute have a minimum of 4% of total supplier plastic purchases.

Packaging: Minimum 50% total recycled content, including 30% post-consumer recycled content for corrugated materials. Corrugated – min. 50% total recycled content, min. 30% post-consumer content.

Minimum 50% of total recycled content by weight is across all new systems for cushions.

9.0 EMC

9.1 Lighting

Lightning test meet the IEC61000-4-4 electric fast transient standard, withstand voltage: +/- 1KV. Performance criterion: B.

Table17.

Lighting	Withstand requirement
EFT	±1KV

Surge defined in IEC61000-4-5 standard, including the upper limit of the standard including phase angle: 0 degree, 90 degree, 180 degree, 270 degree. It is suitable for input AC/DC power supply of four combinations (L1-L2, L1-PE, L1&L2-PE, and L2-PE). Performance criterion: B.

The requirement for surge is listed in the table as below.

Table18.

Lighting	Common	Different
Surge	±2KV	±1KV
Resistance	12ohm	2ohm

A. Equipment can work in the specified conditions.

B. Test equipment temporary performance decline, loss of function or reset phenomenon, but it can be recovery itself.

C. Equipment has temporary performance decline or loss of function, and it is restored by operator intervention or system.

D. Equipment has non recoverable performance degradation or loss of function due to component damage, software affected or data loss.

9.2 EMI

Electromagnetic interference (EMI) project basic requirements: radiation interference (RE) and conduction interference (CE), and it shall meet the standard requirements of CLASS A.

Table19. Conduction Performance Requirement

Item	Frequency Segment	Reference Standard	Note
Conduction interference	150KHz~30MHz	EN 55022	115V/60Hz, 230Vac/50Hz

Table20. Conduction CLASS A Standard Limitation

Frequency (MHz)	Limitation (dBuV/m)	
	QP	AVG
0.15-0.50	79	66
0.50-30	73	60

Table21. Radiation Index Requirements

Item	Frequency Segment	Reference Standard	Note
Radiation interference	30MHz~1GHz	EN 55022	115V/60Hz, 230Vac/50Hz

Table22. Radiation CLASS A Standard Limitation

FREQ	Limitation (dBuV/m)
30-230MHz	50
230-1000MHz	57

9.3 ESD

Power supply should be able to meet the IEC61000-4-2 ESD standard, the need to meet the level 3 requirements of contact 4KV, isolation 8KV standard. It should not have power product shutdown, signal drop, product burning and other undesirable phenomena. Performance criterion: B

Performance criterion:

A. Equipment can work in the specified conditions.

B. Test equipment temporary performance decline, loss of function or reset phenomenon, but it can be recovery itself.

C. Equipment has temporary performance decline or loss of function, and it is restored by operator intervention or system.

D. Equipment has non recoverable performance degradation or loss of function due to component damage, software affected or data loss.

Electrostatic discharge experiment is mainly simulating the condition as below

Table23. ESD Degree of Severity

ESD Grade	Contact	Air
3	4KV	8KV

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 (Safety Extra Low Voltage) 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.

Table24.

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 output should be monitored continuously. The monitoring period should be less than 1ms.	Power supply voltage is within the specification limits during the test.

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, 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 : Telcordia Technologies SR-332 (Method I Case 3), the PSU operates continuously under 25degC condition, 230V/50HZ under max load, and MTBF is more than 100000 hours, the testing process should not be interrupted.

Life time≧5 years at 25℃ ambient @100% load under 230Vac/50Hz.

Table25.

Input Voltage	Load	MTBF
230VAC/50Hz	+3.3V/18.4A,+5V/18.4A,+12V/44.0A,-12V/0.8A,+5VSB/2.3A	100000hours

13.0 HALT

Highly accelerated life test, HALT is a kind 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 (20degC to 30 degC); the maximum temperature step level: -10degC (low temperature 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, 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. The situation is similar to the case of discontinuous in high or low temperature, and it can enable various objects to finish the test in the shortest time.

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.

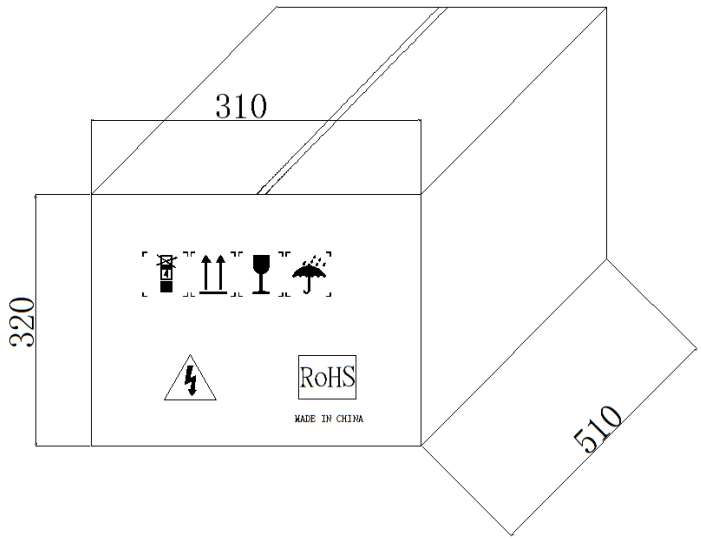
2. The dielectric strength and insulation resistance after thermal shock test products shall meet the requirements of specifications.

3. Products are non-operating condition.

15.0 PACKAGE

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

15.1 Outline Diagram of Carton



Note:

1. Material: outside the box: K=K, five layers of corrugated paper, the thickness: 6.0mm min, Naipoli: 11KG min.

2. Outline: bright and clean, no stain, yellow white and no color difference, no gap junction.

3. Dimension: above dimensions for carton size, tolerance +/-3mm.

16.0 STRESS/COMPONENT DE-RATING

The following component de-rating requirements shall be followed:

1. The semiconductor junction temperature at all loads condition, all input voltage range, and ambient of 50°C shall not exceed 90% rated specification.

2. Capacitor: ripple current: 90% of rated specification at frequency and temperature.

Voltage: 90% of the rated specification. Bulk cap voltage de-rating <=90% of the rated specification, if not meet this limited, Manufacturers need to provide guarantee letter.

3. Resistor: The power of resistor's de-rating<=65% of the rated specification whatever is ambient or high 50°C condition and all of input voltage range.

4. Static voltage/power/current de-rating of all components <=90% of the rated specification. The OCP current must be considered the output component de-rating. Vr/Ipeak/If of diode shall meet 90% of spec rating. The voltage and current rating for Dynamic/output short/input on off of all component<=100% of the rated specification. Main switch MOSFET voltage de-rating <=90% of the rated specification at steady status, and <=100% of the rated specification at transient status.

5. Transformer and Inductor:

Transformer and Inductor core and coil temperature shall not exceed 110°C and 80% of rated temperature ambient of 50°C.

The core/junction temperature of all other components at all load condition, all input voltage range, and ambient of 55°C shall not exceed 110°C(130°C max) and 150°C(175°C max) , and the thermal rating must be less than 80% rated specification.

The component thermal shall not reach its max specification rating while the power supply OTP/OCP trips due to the excessive heat in the all load/input voltage condition.

6. Component select requirements:

For PFC booster: Vds>=600V.

For main switching MOSFET Vds>=600V; (full/half bridge or double forward topology).

For auxiliary switching MOSFET Vds>=800V for single forward or Flyback topology, and the MOSFET must be separated from switching controller, so the TOP switch or Tiny switch shall be prohibited.

Bulk cap: The max voltage of >=450V. Temperature is 105°C.

To meet 5 years life time, the Basic life Lo of bulk capacitor must be higher than 3000Hrs. And it is acceptable that the supplier must provide the evidence to ensure the life time meet 5 years by the calculating formula if the Basic life Lo is less than 3000Hrs.

7. MOV / Spark gap:

MOV/spark gap voltage must be up to 300Vrms if the MOV or spark gap is used. The voltage of other primary side components must also suffer up to 300Vrms.

8. The board material (PWB) shall be rated 130°C minimum. And the surface temperature shall not exceed 100°C.