Electrical Specification

(With +12V&+5VSB output for QD-Dist01 (SGCC) Optimize)

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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 or HVDC input voltage can apply in the power supply. Output connector t he gold finger, and output ports is include +ype is t12V and +5VSB. The power supply has a fan for air- cooling. The max output power is 300W.

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 or 135VDC at min load and max load.

Table1.

	Min	Rated	Max	Units
AC input voltage	90	100~127	264	Vrms
		200~240		Vrms
Frequency	47	50/60	63	Hz
HVDC input voltage	135	145~350	380	Vdc
Input current	<5A@90-264VAC <4A@135-350VDC			

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 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 60A 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.

For Vdc input HVDC, input current shall be less 40A.

2.3 Efficiency

Efficiency testing should be in ambient temperature:18degC-27degC, input voltage at 230Vac/50Hz. Efficiency testing delay time should be 15min after running the PSU, and so that the PSU in under steady state. Negligible fan loss and the power of the fan should be supplied by an external DC source.

Table2.

Load	+12V	+5Vsb	EFF
20%	5A	0.4A	>86%
50%	12.5A	1A	>89%
100%	25A	2A	>87%

2.4 Hold up Time (AC & HVDC)

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

1. Hold up time +12Vout>=16ms with 80% load (90V~264VAC/135V-380Vdc)
2. Hold up time PG>=14ms with 80% load (90V~264VAC/135V-380Vdc)

2.5 AC/HVDC Line Dropout

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 13ms or less the power supply shall meet dynamic voltage regulation in the 80% load and half load at all AC or HVDC input voltages

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

2.6 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 and 230Vac/50Hz, power factor meets the requirement as below table.

Table3.

Vin	Load	PF
115Vac	100% Load	> 0.95
230Vac	100% Load	> 0.93

2.7 Brownout

Power supply shall run normally when the application of an input voltage is below the minimum input voltage but not reach shutdown point, and do not cause damage to the power supply unit nor cause failure of the input fuse and overstress to any other component. After the event of shutdown due to brownout, the power supply shall automatically restart after the AC /HVDC input is within specified limits.

2.8 AC/HVDC Turn On Requirement

Power supply shall return to normal power up state after a slow recovery condition. The AC line voltage shall be increased from 0VAC to 90VAC/60Hz (HVDC: 0Vdc to 135Vdc) at a constant rate over a period of 30 minutes.

Power supply shall turn on at the AC voltage 80V±5V.

For HVDC, power supply shall turn on at the DC voltage 130V±10Vdc.

2.9 AC/HVDC Turn Off Requirement

Power supply shall go to power off state after a slow brownout condition. While the power supply is operating at full load, the AC/HVDC line voltage shall be reduced from 90VAC/60Hz to 0VAC (135Vdc to 0Vdc) at a constant rate over a period of 30 minutes.

Power supply shall shutdown at the AC voltage 75±5V.

For HVDC, power supply shall shutdown at the DC voltage 115V±10Vdc.

2.10 Surge and Sag

The dynamic conditions of mains input are defined as sag and surge. Sag is mains drop to below normal voltage, surge refers to the input voltage rises above the normal range, the PSU should meet sag and surge requirement.

Table4. Surge and Sag

Duration	Surge/Sag	Input Voltage	Frequency	Performance Criteria
500ms	10%	220/110VAC 240VDC	50/60Hz	No loss of function or performance
0 to 1/2 AC cycle	30%	220/110VAC 240VDC	50/60Hz	No loss of function or performance
=1/2 AC cycle	30%	220/110VAC 240VDC	50/60Hz	No loss of function or performance
>1/2 AC cycle	>30%	220/110VAC	50/60Hz	Loss of function acceptable,

		240VDC		power supply can turn on automatically

3.0 OUTPUT PARAMETER

3.1 Output Current

The following table defines the current rating. 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
+12V	0.5A	25A
+5VSB	0A	3A

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.

Table6.

Output Voltage	Min	Rated	Max	Tolerance
+12V	11.4V	12.0V	12.6V	+/-5%
+5VSB	4.5V	5.0V	5.5V	+/-10%

3.3 Ripple & Noise

Table7.

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

Note:

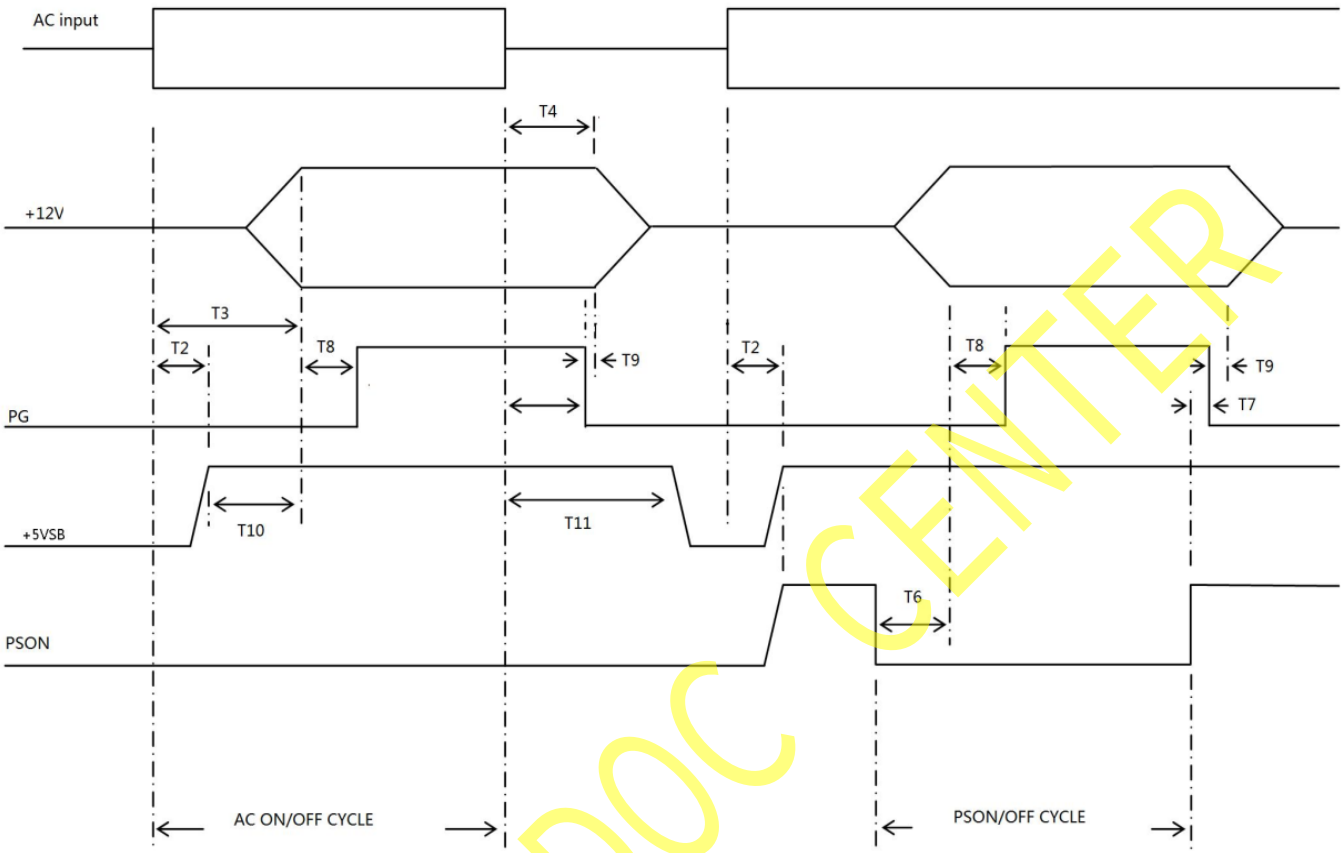
1. This is measured over a bandwidth of 20Hz to 20MHz at the output connector. A 10μF Electrolytic capacitor in parallel with a 0.1μF ceramic capacitor are placed at the point of measurement.

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.

Table8. Turn On/Off Timing

Item	Description	Min	Max	Units
T1	For Output +12V voltage rise time from 10% to 90%. For +5VSB rise time from 10% to 90%.	1 1	70 40	ms
T2	Delay from AC being applied to +5VSB being within regulation.		1500	ms
T3	Delay from AC being applied to all output voltages being within regulation.		3000	ms
T4	Time +12V voltages stay within regulation after loss of AC.	16		ms
T5	Delay from loss of AC to de-assertion of PG.	14		ms
T6	Delay from PSON active to output voltages within regulation limits.	5	400	ms
T7	Delay from PSON de-active to PG being de-asserted.		5	ms
T8	Delay from output voltages within regulation limits to PG asserted at turn on.	100	500	ms
T9	Delay from PG de-asserted to output voltages dropping out of regulation limits at 80% Load.	1		ms
T10	Delay from 5Vsb being applied to +12V voltages within regulation limits.	100		ms
T11	Time +5VSB voltages stay within regulation after loss of AC.	70		ms



3.5 Overshoot

Output voltage overshoot is less than 12.6V at any load and any input voltage, the output rising up waveform should be kept flat and smooth.

Table9.

Output Voltage	Overshoot (Max)
+12V	12.6V
5Vsb	5.5V

3.6 Dynamic

The load transient repetition rate shall be tested between 50Hz to 10 KHz at duty cycles rang from10%-90%. The test shall be at least in 50 Hz/1KHz/10KHz condition. The load transient repetition rate is only a test specification. 12V Min Load is 1A at Dynamic Load

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 Rated current	A/us	Frequency (Hz)	Cap (uF)
+12V	60%	1.0	50Hz-10KHz	3300uF
+5VSB	1	1.0	50Hz-10KHz	560uF

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 light load and full load.

Table11.

Output Voltage	+12V	+5VSB
Capacitive loading (uF)	31000	2000

3.8 No Load

The power supply turn on in no load condition shall not cause damage to the power supply. The power supply shall be able to turn up in no load condition.

3.9 Redundancy and Hot Swap

Hot swapping a power supply is the process of inserting and extracting a power supply module from an operating power system both stead and dynamic conditions with power cord as well as without power cord. In general, a failed (off by internal latch or external control) supply module may be removed, and replaced with a good power supply module. However, hot swap needs to work with operational as well as failed power supply module.

The power supply shall meet following requirements while hot remove or insert the module to the cage:

1. The output voltage shall stay within the limits.
2. Output signal, such as PG, PS-ON shall not oscillate or change.
3. Current Sharing bus shall not oscillate.
4. Power supply shall not be overload and other protection.
5. The newly inserted power supply may get turned on by plugging AC into the external and meet the turn on requirements.

3.10 Return

All DC Returns (GND) are internally connected to frame ground.

3.11 Control Signal

3.11.1 PSON Signal

PSON signal is required to remotely turn on/off the power supply module/PDB. PSON is an active low signal that turns on +12V output. When this signal is not pulled low by the system, or left open, all the outputs (except for +5VSB) shall be turned off. This signal is pulled to a 5.0V voltage by a pull-up resistor internal to the system.

Table12. PSON Signal

Signal Level	Status	Logical Level (Min)	Logical Level (Max)
PSON high level	Turn off power	2.0V	5.2V
PSON low level	Turn on power	0.0V	1.0V
PSON rise and fall time		≦500us	
High-state output impedance		Pull up a resistor between PSON and 5V	

3.11.2 PG Signal

PG signal is the logical signal for PSU under normal status: high level is power normal, low level is power abnormal.

Table13. PG Signal Characteristic

Signal Status	Status	Logical Level (Min)	Logical Level (Max)
PG high level	Power normal	2.4V	5.2V
PG low level	Power abnormal	0.0V	0.7V
Source current (PG high level)		≦2mA	
Sink current (PG low level)		≦4mA	
PG rise and fall time		≦100us	
High-state output impedance		Pull up a resistor between PSON and 5.0V	

3.12 LED Status

There are indicators of LED in power supply module next to the inlet socket. This LED shall have several kind of status as below.

Table14.

PSU Status	LED Status		LED Wavelength Reference Value
Normal work	GREEN	ON	573nm
1.Module fault/protection 2.Power cord unplugged, another redundancy module normally operate. 3.Fan speed slow down, or Fan fault. 4. Input voltage lower than 90Vac (not warning above 90V condition, must be warning state below 85V condition).	YELLOW	ON	602nm
Standby /CR state or PDB fault/ protection	GREEN	1HZ Frequency flicker	573nm
No AC or HVDC input.	OFF		/
1. PSU can operate normally but high temperature without protection. 2. Output power is bigger than max power, but not reaches OPP point. 3. Output current is bigger than max current, but not reaches OCP point. 4. Output voltage is over limited.	YELLOW	1HZ Frequency flicker	602nm

3.13 Immunity Voltage

The Power supply shall be immune to any residual voltage placed on its outputs up to 2V. There shall be no additional heat generated, and stress of any internal components, nor protection circuit trip during turn on with this voltage applied to +12V output, and all outputs simultaneously.

First add 2V voltage at +5Vsb output before AC is applied, then applying AC to PSU, PSU shall be able to turn up, and meet all turn on timing requirements.

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, UVP, OTP, and input UVP, SHORT. Power supply shall shut down and latch-off by fault or protection. When this fault or protection is removed, power supply must be able to turn on through toggling PS ON/OFF or AC ON/OFF re-cycles. The toggling time is <=1s by PSON turn on, and <=15s by AC turn on. The +5VSB protection mode is auto restart once the fault or protection is removed.

4.1 Over Voltage Protection (OVP)

When one module +12V occurs OVP, +12V should latch off, power supply must be able to turn on through toggling PS ON/OFF or AC ON/OFF re-cycle after remove the protection.

For redundant PS, once one power supply module (not PDB) is in OVP state due to the internal OVP trip point detected, another one will continue to work unless another one also occur internal OVP. Power supply must be able to turn on through toggling PS ON/OFF or AC ON/OFF re-cycle after remove the protection.

Table15.

Voltage	Min(V)	Max(V)
+12V	+13.2	+15.6
5VSB	+5.8	+6.5

4.2 Under Voltage Protection (UVP)

When single module +12V occurs UVP, +12V shall shut down and latch off. The +12V can be recovery after removing UVP by AC on/off or PSON/OFF .+12V UVP range is 9.0V~10.8V.

4.3 Over Temperature Protection (OTP)

The power supply shall be protected against over temperature conditions caused by loss of fan cooling or excessive ambient temperature, which could cause internal parts failure. When the PSU shutdown in an oven temperature condition. The +5VSB shall not shutdown during an OTP condition. When the temperature drops to within safe operating range for internal parts, the power supply shall restart power automatically.

The OTP circuit shall incorporate built in hysteretic (>5°C) such that the power supply does not oscillate on and off due to temperature recovery.

Ambient protection is set at 55-65degC, and recovery point is 47-57degC.

4.4 Short Circuit Protection (SCP)

The power supply shall shut down and latch off when +12V output is short circuit (impedance less than 0.1ohm), and 5VSB shall be auto restart. The power should be under protection to keep component safe, whatever the outputs is shorten before turn on or shorten after turn on. The +12V can be recovery after removing short by AC on/off or PSON/OFF, but +5VSB can be auto restart after short is removed.

4.5 Over Current Protection (OCP)

Table16. OCP Limited Table

Output	Min	Max
+12V	28A	34A
+5VSB	3.5A	6A

Note:

1. After OCP, the +12V output is turned off and latch off, and by AC ON/OFF or PSON/OFF unlock; the +5VSB output can restart automatically. When the OCP fault is removed, +5VSB should return to normal.

5.0 HOT SWAP AND CURRENT SHARE

5.1 Load Current

Two PSU working in parallel, when the load is under 20% to 100%, the current of redundancy PSU are not exceed the scope of below table accuracy, sharing degree is calculated as follows sharing degree =(I1-I2)/(I1+12). I1, I2 is PSU1, PSU2 output current.

Table17.

<20%	20%≦I<50%	50%≦I≦100%
NC	≤15%	≤10%

5.2 I-Share Voltage

If the power supply allows single and double operate, when a single power supply running, current bus voltage represent the load of this power supply itself, and meet linear condition under certain loading. When double modules work, the current bus voltage will be half base on the voltage of a single power supply. The current bus logic output signal is used to help balance +12V load for multiple power supply. The system can use this signal to monitor the PSU load with a general way.

Table18. I-Share Voltage Level VS Output Current

I-Share Voltage (1 Power Supply)	
Percent of Power Supply Max Current Capacity	Voltage Level (±10%)
100%	4000mv

6.0 OPERATE ENVIRONMENT

6.1 Operate Temperature

Operate temperature: 0℃ to +50℃.

6.2 Storage Temperature

Storage temperature: -40℃ to +70℃.

6.3 Operate Humidity

Operate Humidity (non-condensing): 5% to 90%.

6.4 Storage Humidity

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

6.5 Operate Altitude

Operate Altitude: 0 to 5000m.

6.6 Storage Altitude

Storage Altitude: 0 to 10000m.

6.7 Cold Start

The power supply shall be able to turn on at 0degC.

7.0 SAFETY

7.1 Safety Certification

Meet FCC Part15 subpartB 15.107,15.109 (USA).

Meet EN60950-1(Europe).

Meet GB4943.1-2011(CCC-CNCA Certification) (CHINA).

7.2 Hi-pot

Primary to secondary Hi-pot withstand voltage: 3000Vac, 10s, leakage current <10mA.

Primary to grounding Hi-pot withstand voltage: 1800Vac, 10s, leakage current <10mA.

7.3 Grounding Impedance Test

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

7.4 Leakage Current

Leakage current 264Vac/50Hz 3.5mA max.

7.5 Insulation Resistance

Primary to Secondary: 500Vdc for 60S, the isolation resistance shall not be less than 100Mohm.

7.6 Smokeless

If one part failure in the power supply, do not have smoke and flames. So it is necessary to put a fuse in the front of DC-DC conversion circuit or equivalent circuit to prevent failure brought smoke and failure parts diffusion. If part failure will trigger the fuse open. All power components are not limited in safety components, should be required to verify smoke-less test.

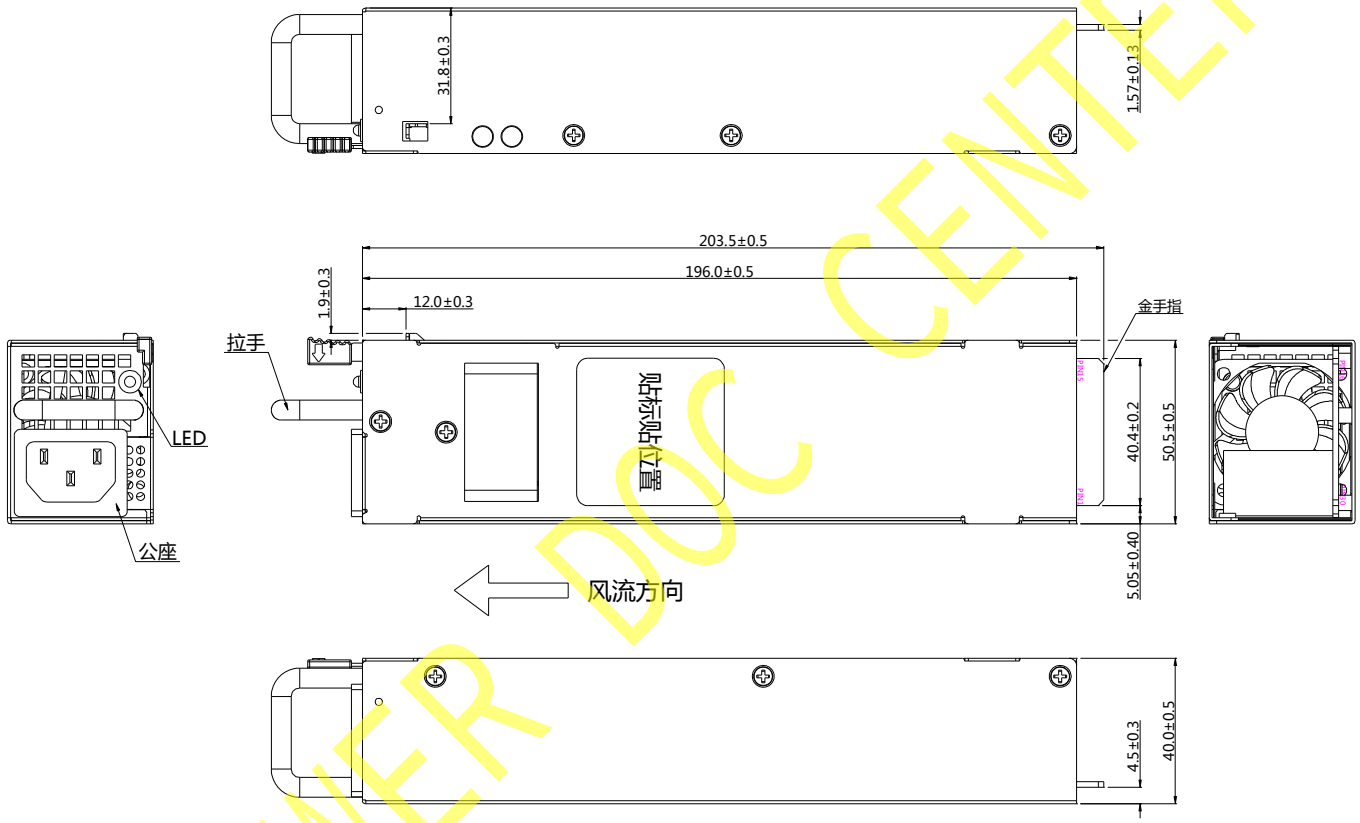
8.0 OUTLINE STRUCTURE

Outline dimension:

Length: 203.5mm include gold finger length

Width: 50.5mm

Thickness: 40mm



9.0 GOLD FINGER DEFINE

Gold finger using C21001-13001-Y 90°(ALLTOP) (2*15PIN) connector, the specific definition of PSU gold finger is as follows:

Table19.

Pin	Name	Description	Pin	Name	Description
Pin 6	GND	Ground	Pin 20	GND	Ground
Pin 7	GND		Pin 21	GND	
Pin 8	GND		Pin 22	GND	
Pin 9	GND		Pin 23	GND	
Pin 10	GND		Pin 24	GND	
			Pin 25	GND	
Pin 1	+12V	12V	Pin 26	+12V	12V
Pin 2	+12V		Pin 27	+12V	
Pin 3	+12V		Pin 28	+12V	
Pin 4	+12V		Pin 29	+12V	
Pin 5	+12V		Pin 30	+12V	
Pin 11	PS/ON	Remote ON/OFF control signal	Pin 12	+5VSB	+5V Standby Output
Pin 19	+5VSB	+5V Standby Output	Pin 18	+12VBUS	+12V Current Share Line
Pin 13	A0	I2C Adress line	Pin 17	SCL	PMBUS Clock Line
Pin 14	PG	Power Good Output	Pin 16	SDA	PMBUS Data Line
Pin 15	OCP	+3.3V and+5VOCP signal			

10.0 EMC

Table20. EMI (Electromagnetic Interference) Requirements Table

Item	Frequency Segment	Level	Reference Standard	Note
Conduction interference	150KHz~30MHz satisfy 3dB margin	A	EN 55022	115V/60Hz 230Vac/50Hz
Radiation interference	30MHz~1GHz	A	EN 55022	115V/60Hz 230Vac/50Hz
Voltage Fluctuation	Relative voltage variation characteristics Dt	500ms	IEC61000-3-3	230Vac/50Hz
	Maximum relative voltage change Dmax	4%		
	Relative steady state voltage change	≦3.3%		
Voltage Flicker	Short term flicker Pst	1.0	IEC61000-3-3	230Vac/50Hz
	Long term flicker Plt	0.65		

Table21.EMS (Electromagnetic Susceptibility) Requirements Table

Item	Description and Requirement		Level	Criterion
EFT	±2KV		A	IEC61000-4-4
surge	Common:±2KV 12ohm Different:±1KV 2ohm		A	61000-4-5
ESD	Touch: ±6KV Air: ±8KV		A	IEC61000-4-2 ESD
Conducted Susceptibility	150KHz~80MHz 3V/M		A	IEC 61000-4-6
Radiated Susceptibility	80M Hz~1000MHz 10V/M		A	IEC 61000-4-3
Voltage Dips	0%Ut	10ms	B	IEC 61000-4-11

	70%Ut	500ms	B	
	0%Ut	5000ms	C	
Power frequency magnetic field	experimental grade: 1		A	IEC61000-4-8

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.

11.0 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.

12.0 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.

Table22.

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	Power supply voltage is Within the specification limits during the test.

				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.

13.0 MTBF

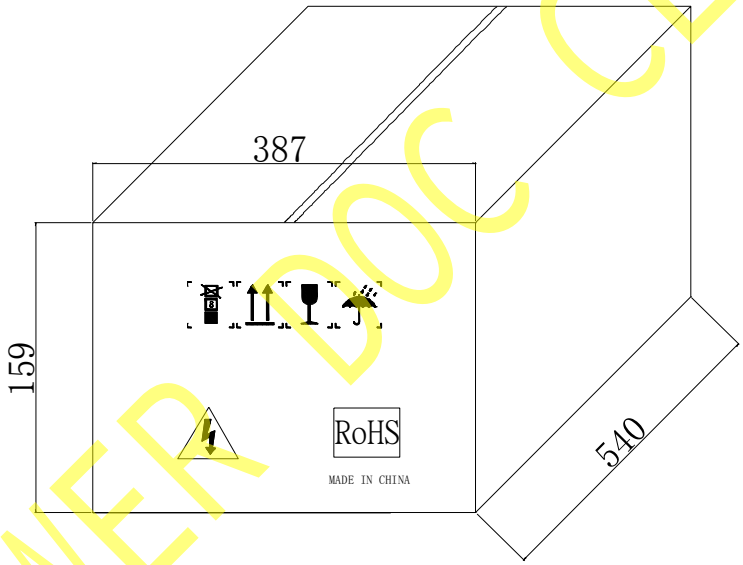
Quantitative reliability (Quantitative) performance requirements: MTBF (MTBF Mean Time Between Critical Failure), according to the Bell core standard SR-332 Issue3, the PSU operates continuously under 35degC condition, 115VAC/60Hz 230V/50HZ, and 240VDC input voltage under max load, and MTBF is more than 100000 hours, the testing process should not be interrupted.

Table23.

Input Voltage	Load	MTBF
115VAC/60Hz	12V/25A	100000hours
230VAC/50Hz	12V/25A	100000hours
240VDC	12V/25A	100000hours

14.0 PACKAGE

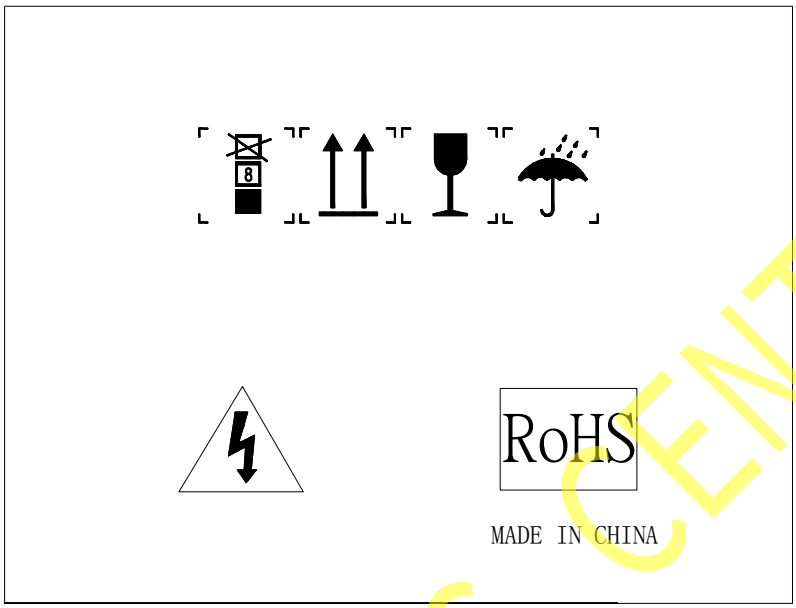
14.1 Outline Diagram of Carton



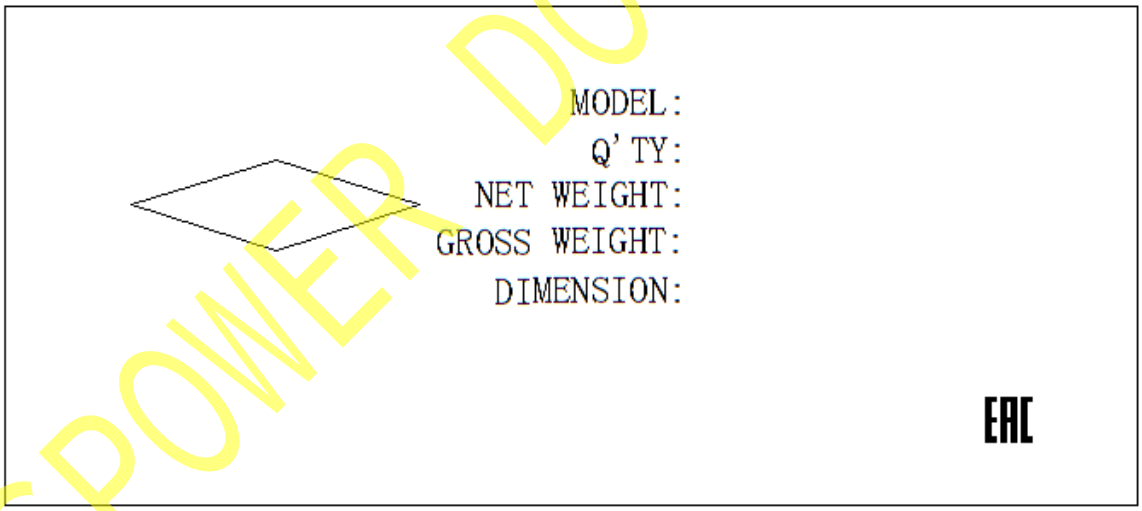
Note:

1. Material: outside the box: K=K, five layers of corrugated paper, the thickness: 5.0mm min, Bursting strength: 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.

14.2 Side Label



14.3 Front Label



15.0 SOFTWARE

15.1 Address

PSU address line corresponding address bit A0, address PSU high four bits for 0xB0, defined as follows:

1	0	1	1	0	0	A0	R/W bit 1:read, 0:write

15.2 Software Read Accuracy

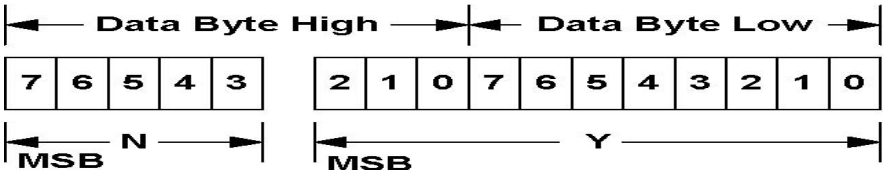
Table24.

Read Content	Instruction	Input Voltage Range	Load Condition		
			<10%	10%~20%	20%~100%
Input voltage	Read_VIN(88h)	100Vac~127Vac or 200Vac~240Vac	5%	5%	5%
Input power	Read_PIN(97h)		NA	15%	10%
Output voltage	Read_Vout(8Bh)		5%	5%	5%
Output current	Read_Iout(8Ch)		NA	10%	5%
Output power	Read_Pout(96h)		NA	10%	5%
Amb temperature	READ_TEMPERATURE_1		+/-5℃	+/-5℃	+/-5℃
Input voltage	Read_VIN(88h)	135Vdc~380Vdc	5%	5%	5%
Input power	Read_PIN(97h)		NA	15%	10%
Output voltage	Read_Vout(8Bh)		5%	5%	5%
Output current	Read_Iout(8Ch)		NA	10%	5%
Output power	Read_Pout(96h)		NA	10%	5%
Amb temperature	READ_TEMPERATURE_1		+/-5℃	+/-5℃	+/-5℃

15.3 Software Data Format

Linear Data Formats:

The Linear Data Format is a two byte value with: An 11 bit, two's complement mantissa and A 5 bit, two's complement exponent (scaling factor). The format of the two data bytes is illustrated in below Figure.



The relation between Y, N and the "real world" value is: $X = Y \cdot 2^{N}$.

Where, as described below:

X is the "real world" value being communicated.

Y is an 11 bit, two's complement integer.

N is a 5 bit, two's complement integer.

Devices that use the linear format must accept and be able to process any value of N.

15.4 Status Command

Table25. STATUS_WORD Command

Byte	Bit	Status Bit Name	Meaning	Support
Low	7	BUSY	A fault was declared because the device was busy and unable to respond.	No
	6	OFF	This bit is asserted if the unit is not providing power to the output, regardless of the reason, including simply not being enabled.	Yes
	5	VOUT_OV	An output over voltage fault has occurred	Yes
	4	IOUT_OC	An output over current fault has occurred	Yes
	3	VIN_UV	An input under voltage fault has occurred	Yes
	2	TEMPER-ATURE	A temperature fault or warning has occurred	Yes
	1	CML	A communications, memory or logic fault has occurred	No
	0	NONE OF THE ABOVE	A fault or warning not listed in bits [7:1] of this byte has occurred	No
High	7	VOUT	An output voltage fault or warning has occurred	Yes
	6	IOUT/POUT	An output current or output power fault or warning has occurred	Yes
	5	INPUT	An input voltage, input current, or input power fault or warning has occurred	Yes

	4	MFR	A manufacturer specific fault or warning has occurred	No
	3	POWER_ GOOD#	The POWER_GOOD signal, if present, is negated	Yes
	2	FANS	A fan or airflow fault or warning has occurred	Yes
	1	OTHER	A bit in STATUS_OTHER is set	No
	0	UNKNOWN	A fault type not given in bits [15:1] of the SATUS_WORD has been detected	No

Table26. STATUS_VOUT Command

Bit	Meaning	Support
7	VOUT Over voltage Fault	Yes
6	VOUT Over voltage Warning	No
5	VOUT Under voltage Warning	No
4	VOUT Under voltage Fault	Yes
3	VOUT_MAX Warning (An attempt has been made to set the output voltage to value higher than allowed by the VOUT_MAX command)	No
2	TON_MAX_FAULT	No
1	TOFF_MAX Warning	No
0	VOUT Tracking Error	No

Table27. STATUS_IOUT Command

Bit	Meaning	Support
7	IOUT Over current Fault	Yes
6	IOUT Over current And Low Voltage Shutdown Fault	No
5	IOUT Over current Warning	Yes
4	IOUT Undercurrent Fault	No
3	Current Share Fault	No
2	Power Limiting	No
1	POUT Overpower Fault	Yes
0	POUT Overpower Warning	No

Table28. STATUS_INPUT Command

Bit	Meaning	Support
7	VIN Over voltage Fault	No
6	VIN Over voltage Warning	No
5	VIN Under voltage Warning	No
4	VIN Under voltage Fault	Yes
3	Unit Off For Insufficient Input Voltage	No
2	IIN Over current Fault	No
1	IIN Over current Warning	No
0	PIN Overpower Warning	No

Table29. STATUS_TEMPERATURE Command

Bit	Meaning	Support
7	Over temperature Fault	Yes
6	Over temperature Warning	Yes
5	Under temperature Warnings	No
4	Under temperature Fault	No
3	Reserved	No
2	Reserved	No
1	Reserved	No
0	Reserved	No

Table30. STATUS_FAN_1_2 Command

Bit	Meaning	Support
7	Fan 1 Fault	Yes
6	Fan 2 Fault	No
5	Fan 1 Warning	Yes
4	Fan 2 Warning	No
3	Fan 1 Speed Overridden	No
2	Fan 2 Speed Overridden	No
1	Airflow Fault	No
0	Airflow Warning	No

Table31. STATUS _OTHER Command

Bit	Meaning	Support
7	Transformer primary and secondary communication failures(Mfr. Defined)	No
6	Reserved	No
5	Input A Fuse Or Circuit Breaker Fault	No
4	Input B Fuse Or Circuit Breaker Fault	No
3	Input A Or-ing Device Fault	No
2	Input B Or-ing Device Fault	No
1	Output Or-ing Device Fault	No
0	Reserved	No

15.5 Supported Command

Table32.

CMD Code	Name	Type	Bytes	Comment
03h	CLEAR_FAULTS	Send Byte	0	
19h	CAPABILITY	Read Byte	1	Support PEC check out, maximum communication speed: 100KHz
1Ah	QUERY	Block Read	1	
78h	STATUS_BYTE	Read Byte	1	
79h	STATUS_WORD	Read Word	2	
7Ah	STATUS_VOUT	Read Byte	1	
7Bh	STATUS_IOUT	Read Byte	1	
7Ch	STATUS _INPUT	Read Byte	1	
7Dh	STATUS_TEMPERATURE	Read Byte	1	
7Fh	STATUS _OTHER	Read Byte	1	
81h	STATUS_FANS_1_2	Read Byte	1	
86h	READ_EIN	Block Read	6	
87h	READ_EOUT	Block Read	6	
88h	READ_VIN	Read Word	2	

89h	READ_IIN	Read Word	2	
8Bh	READ_VOUT	Read Word	2	
8Ch	READ_IOUT	Read Word	2	
8Dh	READ_TEMPERATURE_1	Read Word	2	Ambient temperature
8Eh	READ_TEMPERATURE_2	Read Word	2	Secondary hotspot temperature
8Fh	READ_TEMPERATURE_3	Read Word	2	Primary hotspot temperature
90h	READ_FAN_SPEED_1	Read Word	2	Rpm value
96h	READ_POUT	Read Word	2	
97h	READ_PIN	Read Word	2	
98h	PMBUS_REVISION	Read Byte	1	0x22(V1.2)
99h	MFR_ID	Read Block	14	ASPOWER
9Ah	MFR_MODEL	Read Block	14	U1A-K10300-DRB
9Bh	MFR_REVISION	Read Block	6	1.1SA1
A0h	MFR_VIN_MIN	Read Word	2	90(V)
A1h	MFR_VIN_MAX	Read Word	2	264(V)
A4h	MFR_VOUT_MIN	Read Word	2	11.4(V)
A5h	MFR_VOUT_MAX	Read Word	2	12.6(V)
A6h	MFR_IOUT_MAX	Read Word	2	25(A)
A8h	MFR_TAMBIENT_MAX	Read Word	2	50(℃)
A9h	MFR_TAMBIENT_MIN	Read Word	2	0(℃)

16.0 Label