



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-D11300-DRB-Z

Version

S7

Release Date

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Electrical Specification

(with +12V&+12Vsb output (SGCC) HVDC CRPS Module)

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1.0 SCOPE

This specification defines the key characteristics for the 1300W power supply, which is intended for worldwide use in IT equipment such as server application. This unit contains +12V and +12Vsb 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 below table, 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	100~240	264	VAC
Frequency	47	50-60	63	Hz
DC input voltage	160	160~400	400	VDC
Input current	<15A@100-127Vac @full load, <10A@200-240Vac/160-400Vdc @full load			

Note: Any long period of time for 265Vac~300Vac input at rated frequency range shall not cause damage to or shut down the power supply.

2.2 Inrush Current

The input inrush current shall not exceed 25A@220Vac and 35A@400Vdc, after which, the input current should be no more than the specified maximum input current. Ignore the instantaneous charge current for X, Y caps, but the peak current during time should <0.2ms. The power supply must meet the inrush requirement during cold start and under 25°C ambient temperature.

2.3 AC Line Fuse

The power supply has a fuse in the live line wire of the input. The input fuse shall be a fast blow type. The input inrush current shall not cause the AC line fuse to blow under any conditions. All protection circuits in the power supply shall not cause the AC fuse to blow unless a component in the power supply has failed.

2.4 Efficiency

The power supply achieves the 80 plus platinum level by testing at the 230Vac//50-60Hz or 336Vdc, 25°C ambient temperature and the loading condition show in below table.

Table2.

Load	+12V	+12Vsb	Efficiency requirement
10%	10.5A	0.3A	>85%
20%	21.1A	0.6A	>91%
50%	52.75A	1.5A	>94%
100%	105.5A	3.0A	>91%

Note: Add external +12V power for fan and the fan power is not included in efficiency calculation.

2.5 AC Line Dropout

An AC line dropout is defined to be when the AC input drops to 0VAC at any phase of the AC line for any length of time. During an AC dropout the power supply must meet dynamic voltage regulation requirements. An AC line dropout of any duration shall not cause tripping of control signals or protection circuits. If the AC dropout lasts longer than the holdup time, the power supply should recover and meet all turn on requirements. The power supply shall meet the AC dropout requirement over rated AC voltages and frequencies. A dropout of the AC line for any duration shall not cause damage to the power supply.

2.6 Power Factor and iTHD

The power supply must meet the power factor requirements stated in the Energy Star Program Requirement for Computer Servers V2.0.

The power factor and iTHD shall meet the requirements shown as below table at 230Vac/50Hz input condition.

Table3.

Load	10% Load	20% Load	50% Load	100% Load
PF	>0.90	>0.96	>0.98	> 0.99
Load	>10% Load	20% Load	40% Load	50-100% Load
Current THD	15%	<10%	<8%	<5%

2.7 Surge and Sag

AC line transient conditions are defined as “sag” and “surge”. “Sag” is defined as the AC line voltage drops below nominal voltage. “Surge” is defined as the AC line voltage rises above nominal voltage. The power supply should meet below AC line sag and surge conditions.

Table4. AC Line Sag Transient Performance

Duration	Sag	Input Voltage	Frequency	Performance Criteria
=1/2 AC cycle	95%	100~127VAC 200~240VAC	50/60Hz	Full load and no loss of function or performance
>1.0 AC cycle	>30%	100~127VAC 200~240VAC	50/60Hz	Loss of function acceptable, self-recoverable

Table5. AC Line Surge Transient Performance

Duration	Surge	Input Voltage	Frequency	Performance Criteria
Continuous	10%	100~127VAC 200~240VAC	50/60Hz	No loss of function or performance
0 to 1/2 AC cycle	30%	115VAC/230VAC	50/60Hz	No loss of function or performance

2.8 Input Power Loss

The input power should be lower than 5W when no load at PS off mode and lower than 12W PS ON at no load or at cold standby mode when 230Vac/50Hz input.

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 (1000W/1300W). The power supply shall meet both static, dynamic voltage regulation and timing requirements for all loading conditions defined in specification.

Table6.

Input	Output Voltage	Min Current	Max current
90~140Vac	+12V	1.0A	80.5A
	+12Vsb	0.1A	3.0A
180~264Vac	+12V	1.0A	105.5A
160~400Vdc	+12Vsb	0.1A	3.0A

Note: 1. The total max continuous output power is 1000W for 90~140Vac low input and 1300W for 180~264Vac /160~400Vdc high input.

2. The power supply can support no load working.

3. The +12Vsb's max load should derating to 2.0A when at standby state.

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.

Table7.

Output Voltage	Min	Rated	Max	Tolerance
+12V (at static state)	11.8V	12.2V	12.6V	/
+12V (at dynamic state)	11.6V	12.2V	12.8V	±5%
+12Vsb	11.4V	12.0V	12.6V	/

3.3 Ripple & Noise

Table8.

Output voltage	Ripple & noise
+12V	<120mV
+12Vsb	<120mV

Note:

1. The ripple & noise is measured over a bandwidth of 20MHz at the power supply output connectors. A 10μF & 2200uF low ESR electrolytic capacitor in parallel with a 0.1μF ceramic capacitor are 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. Turn On/Off Timing

Item	Description	Min	Max	Units
Tsb_on_delay	Delay from AC being applied to +12Vsb within regulation.		1500	ms
Tac_on_delay	Delay from AC being applied to +12V within regulation.		2500	ms
Tvout_rise	Output voltage rise from 10% to 90% time for +12V.	5	70	ms
Tvout_rise	Output voltage rise from 10% to 95% time for +12Vsb.	1	25	ms
Tsb_vout	Delay from +12Vsb being in regulation to +12V being in regulation at AC turn on.		1500	ms
Tpson_on_delay	Delay from PSON active to output voltages being within regulation limits.	5	400	ms
Tpwok_on	Delay from output voltages within regulation limits to PWOK asserted at turn on.	100	500	ms
Tvout_holdup	Time 12V output voltage dropping to 11.4V after loss of AC.	13		ms
Tpwok_holdup	Delay from loss of AC to de-assertion of PWOK.	12		ms
T12Vsb_holdup	Time the +12Vsb output voltage stays within regulation after loss of AC.	70		ms
Tpwok_off	Delay from PWOK de-asserted to output voltages dropping out of regulation limits.	1		ms
Tpwok_low	Duration of PWOK being in the de-asserted state during an OFF/ON cycle using AC or the PSON signal.	100		ms
Tpson_pwok	PWOK being de-asserted delay from PSON deactivate.		5	ms

Note:

1. Tsb-on & Tac-on Delay Time: The Tsb-on delay time for +12Vsb should be $\leq 1500\text{ms}$ at rated input when full load. The Tac-on delay time for +12V should be $\leq 2500\text{ms}$ at rated input when full load.



2. Rise Time (T_{vout_rise}): The +12V must rise from 10% to 95% within regulation limits within 5 to 70ms. For +12Vsb, it is allowed to rise within 1.0 to 25ms. All outputs must rise monotonically.

3. Main Output Delay Time (T_{sb_vout}): The +12V main output being in regulation delay from +12Vsb being in regulation should be $\leq 1500\text{ms}$ when at AC turn on.

4. $T_{pson_on_delay}$: The +12V output must be within regulation after PSON active for 5 to 400ms.

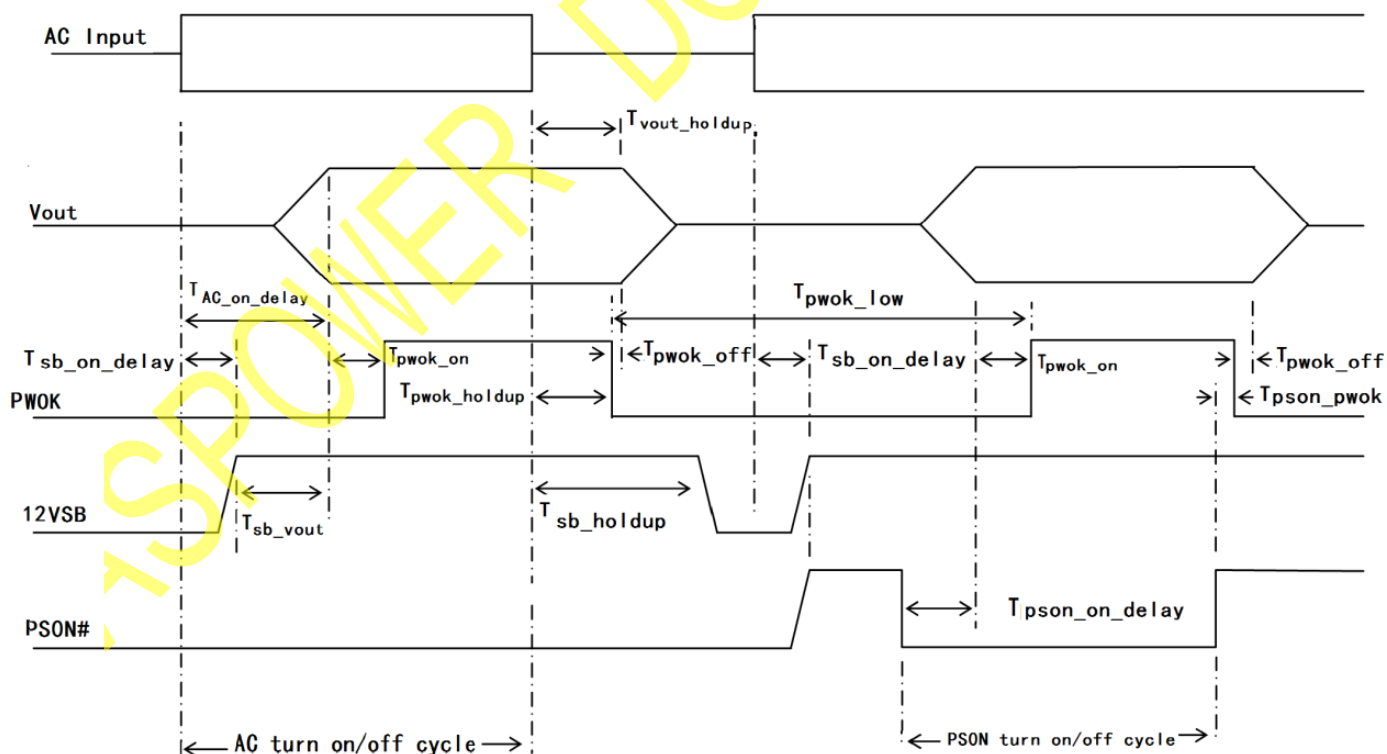
5. Power Work OK Delay (T_{pwok_on}): PWOK should delay from +12V output within regulation for 100 to 500ms.

6. Hold Up Time(T_{vout_holdup}): The hold up time for +12V $\geq 13\text{ms}$ & PWOK $\geq 12\text{ms}$ at any phase of rated voltage input when full load. The hold up time for +12Vsb should $\geq 70\text{ms}$.

7. Power Fail Delay Time (T_{pwok_off}): +12V dropping out of regulation delay from PWOK should $\geq 1\text{ms}$ when power off at full load.

8. Duration Time for PWOK (T_{pwok_low}): The duration time of PWOK when OFF/ON cycle using AC or the PSON signal should $\geq 100\text{ms}$.

9. PWOK Delay PSON Deactivate (T_{pson_pwok}): PWOK being de-asserted should delay from PSON deactivate $\leq 5\text{ms}$.



3.5 Overshoot

The turn-on overshoot due to application of AC input or remote enable shall be $< 5\%$ of the nominal output voltage for any application of input voltage within the specified range.

Overshoot/undershoot on turn on or restart must meet under all loading conditions, including minimum output capacitance on all output voltages.

3.6 Dynamic

The output voltage shall remain within limits 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. And +12V's, +12Vsb's min load is 1.0A, 0.1A when do dynamic loading test. The test shall be at least in 50 Hz/1KHz/5KHz condition. The output current transient repetition rate is only a test specification.

Table10.

Output Voltage	Transient Step (A) Percent of Rated Current	Slew rate (A/us)	Frequency (Hz)	Cap (uF)
+12V	60% of max load	0.5	50-5K	1000uF
+12Vsb	1.0	0.5	50-5K	1000uF

3.7 Capacitive Loading

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

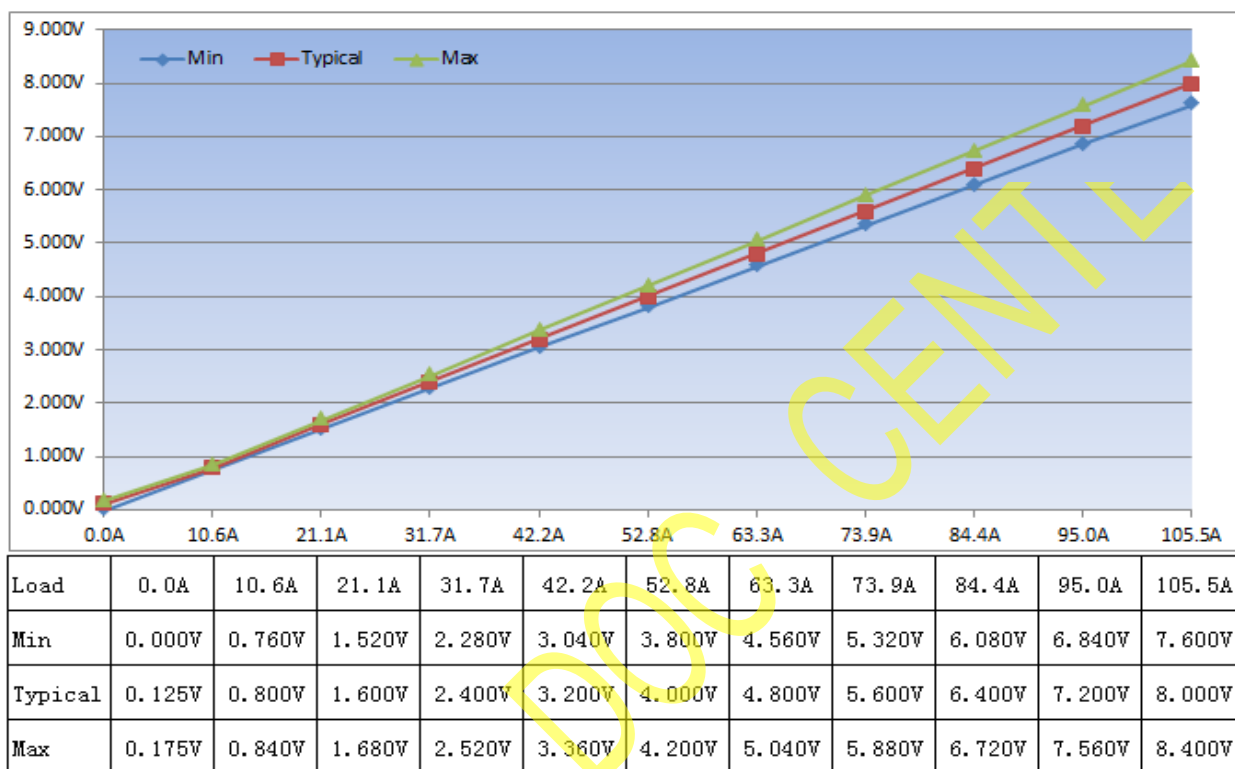
Table11.

Output Voltage	+12V	+12Vsb
Capacitive loading (uF)	2000~50000	10~3100

3.8 Current Sharing

All outputs shall be capable of operating in a redundant current share mode. A maximum (eight) of power supplies may be operated in parallel. All outputs shall incorporate an isolation diode or mosfet for fault isolation. The +12Vsb current sharing shall be a drop type. The +12V current sharing shall be an active type. Connecting the load share bus pins of each power supply together shall enable the current share feature. With the current share pins tied together, the +12V output load current shall be balanced to within 5% when 12V output at $\geq 30\%$ full load and no load for +12Vsb.

Shorting or opening of a current share pin shall not cause the output voltage to go out of steady state regulation. For 105.5A load the +12Vbus voltage shall be 8 V for a single power supply. The +12Vbus pin's voltage VS load requirements are as below table and curve when single power supply.



Note:

1. The voltage at +12Vbus should meet the V-I curve requirement when $\geq 50\%$ full load.

3.9 Hot Swap Requirement

Hot swapping is the process of inserting and extracting a power supply from an operating power system. During this process the output voltage shall remain within the limits. The hot swap test must be conducted when the system is operating under static, dynamic and no loading conditions. The power supply shall use a latching mechanism to prevent insertion and extraction of the power supply when the AC power cord is inserted into the power supply. The power supplies must be able to operate in a hot-swap/redundant configuration.

3.10 No Load Condition

The power supply shall not be damaged nor cause abnormal operation at any load conditions including no load. The power supply shall be able to turn on and off under no load condition. The on and off waveforms shall be monotonic.

3.11 Output Regulation

All outputs shall remain within the tolerances in section 3.2's table under all allowable load and temperature conditions during load variations on the other output voltage, any combination of the following conditions. The outputs will be measured at the output terminals.

1. Input operating rated range.
2. Specified load range.
3. Cross regulation on dual or multiple outputs.
4. Specified environmental conditions.

3.12 Grounding

The output ground of the pins of the power supply provides the output power return path. The output connector ground pins shall be connected to the safety ground (power supply enclosure). This grounding should be well designed to ensure passing the max allowed common mode noise levels. The power supply shall be provided with a reliable protective earth ground. All secondary return circuits shall be connected to protective earth ground.

3.13 Control Signal

3.13.1 Control and Status Signals

All control signals shall be TTL compatible with respect to the output return and shall be isolated from the primary circuit and be SELV (safety extra-low voltage circuit) rated.

3.13.2 Vin_Good Signal

Vin_Good signal is an input voltage OK signal and will be asserted high to indicate the power supply's input voltage are within range. If the input voltage is out of range, the Vin_Good signal will be pulled to a low state. This signal accepts an open collector/drain input from the system and a 5.1K ohm resistor pull up to +3.3Vs located in power supply.

Table12. Vin_Good Signal Characteristic

Signal Type	Power State	Logic Level (Min)	Logic Level (Max)
Vin_Good Signal=Low	Input Out Of Range	0V	0.4V
Vin_Good Signal=High	Input Normally	2.4V	3.46V

3.13.3 PSON Input Signal

The PSON signal is required to remotely turn on/off the power supply. PSON is an active low signal that turn on the +12V power rail. When this signal is not pulled low by the system, or left open, the outputs (except the +12Vsb) turn off. This signal is pulled to a standby voltage by a pull-up resistor internal to the power supply. Refer to section 3.4 for the timing diagram. This signal accepts an open collector/drain input from the system and a 5.1K ohm resistor pull up to +3.3Vs located in power supply.

Table13. PSON Signal Characteristic

Signal Type	Power State	Logic Level (Min)	Logic Level (Max)
PSON=Low	ON	0V	1.0V
PSON=High or Open	OFF	2.0V	3.46V
Source Current (Low)	ON		4mA

3.13.4 PWOK (Power OK) Output Signal

PWOK is a power OK signal and will be pulled high when the power supply to indicate that all the outputs are within the regulation limits of the power supply. When any output voltage falls out of 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 long as any power supply output is in current limit. This signal is open collector/drain output and a 0.27K ohm resistor pull-up to +3.3Vs in power supply.

Table14. PWOK Signal Characteristic

Signal Type	Power State	Logic Level (Min)	Logic Level (Max)
PWOK=Low	Power Not OK	0V	0.4V
PWOK=High	Power OK	2.4V	3.46V
Sink Current (Low)			0.4mA
Source Current (High)			2mA
PWOK Rise and Fall Time			0.1ms

3.13.5 Alert Signal

This signal is low active indicating that the power supply is experiencing a problem, warning or fault that the user should investigate. The signal shall activate in the case of critical component temperature reached a over temperature protection, over current protection,

This signal is open collector output and a 2K ohm resistor pull-up to +3.3Vs in power supply.

Table15. Alert Signal Characteristic

Signal Type	Power State	Logic Level (Min)	Logic Level (Max)
Alert=Low	Alert to system	0V	0.4V
Alert=High	Power OK	2.4V	3.46V
Sink Current, Alert=Low			4mA
Alert Rise and Fall Time			0.1ms

3.13.6 SDA and SCL Signal

SDA and SCL pins (for I2C bus) is designed to operate at +3.3V volts. The pull-up resistors are 20K ohm to +3.3Vs in power supply.

3.13.7 A0, A1 Signal

PSU module address line 0 and line 1. This signal line is provided for determining the address for the specific PSU FRU and SMBus address. A 10K ohm resistor pull-up to +3.3Vs located in the PSU for each. The address line should be either float or pull low with equal to or less than 100ohm in the motherboard design.

3.13.8 Power Cold Redundancy Requirement

3.13.8.1 Power MCU Address Settings

Power should support N+1 cold redundant ($N \leq 3$). Power address settings is refers to the below table.

Table16. Power MCU address settings

A1 (B20 PIN)	A0 (B19 PIN)	Power Internal MCU Address	Power slot position
0	0	B0	1
0	1	B2	2
1	0	B4	3
1	1	B6	4

3.13.8.2 Cold Redundancy Configuration

There is a Cold_Redundancy_CONFIG (FCh) command in power supply, the system can read or write access. The format of the command for example: the command S B0 w FC 55 PEC P is to set the register of power supply B0 to 55h. According to the requirements, the value of the register can be set to

00h / 55h / 0Eh . The different value represents the different meaning that can refer to the descriptions from the below table.

Table17. Cold Redundant Configuration Description

Cold Redundant Configuration (FCh)		
Value	State	Description
00h	Standard Redundancy	Power loading in average cold redundant.
55h	Cold Redundant Active	Normal operating output power from cold redundant.
0Eh	Cold Redundant Standby	Standby power without output power from cold redundant.
Remarks: The power supply which is in cold standby mode will not involve the output loading by slightly decreases its output voltage.		

The default factory setting state is standard redundant, its value is 00h.

When power supply occurs any abnormal conditions (including AC cord plugging in/out, power off reset, over-temperature warning, ambient temperature out of range; 12V short protection, UVP, OVP, OCP, Fan alert and abnormal internal circuit) will make the register value reset to default 00h, and also set the CRB (B22 PIN) to low level, force the other paralleled operating power supplies into standard redundancy state.

3.13.8.3 Cold Standby Signal Require

The essential condition for power supply access into cold standby state: PSON is low level, the register value should be 0Eh. At the same time the requirements for the power supply which is access into cold standby state as below:

When CRB is low level, the power of cold redundant active and cold standby should be awaked immediately and the FCh value recover to 00h, moving into standard redundancy state.

Keep PWOK (A25 PIN) as high level.

Every power status should keep normal, could not report any fault or abnormal condition, unless it is indeed existed.

Indicator light should flicker as the specification requirements.

3.13.8.4 Access Cold Redundancy Status

For example (at most 4 units power), the cold redundancy operating mode of power supply should follow the below descriptions.

Cold Redundancy BUS (B22 PIN) abbreviate CRB, power Supply Unite abbreviate PSU.

Table18. Power Access Cold Redundancy example sheet

PSU	FCh Register Value (hex)		
	Step1	Step2	Step3
1#	00	55	55
2#	00	55	0E
CRB	Low Level	High Level	High Level

3.13.8.5 Exit Cold Redundancy State

PSU could exit cold redundant mode by system command or load over threshold.

1. Exit Cold Redundancy command by system command

When PSU is working in cold redundant mode, system can send command to order the PSU in cold standby mode. By setting the FCh to 55h or 00h to exit cold redundant standby mode and move into cold redundant active or standard redundancy mode.

When setting the cold standby PSU to 00h, to let PSU move into standard redundancy state, at the same time pull low the CRB from high level to low level. Then drive all the paralleled PSU to move in standard redundancy state.

2. Exiting Cold Redundancy by Output Load Over Threshold

When output loading over the threshold, CR Standby PSU will exit cold standby automatically and move into standard redundancy state.

3.13.9 EEPROM

The power supply shall have an ID EEPROM which contains power supply specific information:

Specially assemble part number, serial number, assembly deviation, special configurations, test history, field test history, and field trace-ability data. This data is stored in an EEPROM device located inside of the power supply. A 256bytes serial EEPROM is used in power supply. This device will be programmed by the unit vendor with detailed information on the unit. This device shall have its highest order address bit (A2 internally wired to ground). The A0 & A1 address bit are wired to the output connector and includes an internal 10K ohm resistor pull up to the +3.3Vs.



Table19. Address Signals

A1	A0	EEPROM Address	MCU Address	PSU
0	0	A0	B0	1
0	1	A2	B2	2
1	0	A4	B4	3
1	1	A6	B6	4

3.13.10 LED Indicators

There will be a dual color LED lamp on the case's front panel, the color is green and amber to indicate the power supply status. There will be a (slow) blinking green to indicate that AC is applied to the PSU and the standby voltage is available. It shall go steady to indicate that all the power outputs are available. This same LED will (slowly) blinking or be solid ON amber to indicate that the power supply reached a warning status or has failed and therefore a replacement of the unit is/maybe necessary. The LED operation is defined as below table.

The LED shall be visible on the power supply's exterior face. The LED locations shall meet ESD requirements. The LED shall be securely mounted in such a way that incidental pressure on the LED won't cause it to become displaced.

Table20. LED State Requirement

Power Supply Status	LED Status
+12V Output ON and OK.	Green ON
No AC power to all power supplies.	OFF
AC present/Only 12Vsb on (PS off).	1Hz Blinking Green
When the power in cold redundancy.	2Hz Blinking Green
AC cord unplugged or DC power lost; with a second power supply in parallels still with AC input power.	Amber ON
Power supply warning events where the power supply continues to operate: High temperature warning, Fan warning, Over current warning.	2Hz Blinking Amber
Power supply critical event causing a shutdown: UVP, OVP, OCP, OTP.	Amber ON



3.13.11 Signal Ripple & Noise Requirement

Some significant signals should have a ripple and noise requirement as below table. The test condition should under no external capacitor but mating with customer's system.

Table21.

Signal	SCL High	SDA High	PSON Low or High	Alert Low or High	PWOK Low or High	Vin_Good Low or High	Present Low
Test @ 20MHz	300mV						

4.0 PROTECTION

When the input UVP/OVP, +12Vsb output's OVP/UVP/SCP, unit's OTP or high ambient temperature protection is triggered, the power supply will shut down and self-recovery when the fault condition removed. If +12V output's OVP/UVP/SCP/OCP is triggered, the power supply will shut down and latched off the +12V output. The latch state can be cleared by toggling the PSON signal or by an AC power interruption of 5 seconds nominal. If the auxiliary converter's OTP is triggered, the power supply will shut down and auto-restart immediately.

4.1 Input Under and Over Voltage Protection (Input UVP/OVP)

The input UVP and OVP should meet below table.

Table22.

Input voltage	Under voltage protection	Self-recovery voltage
HVDC	145V \pm 5V	155V \pm 5V
AC	74V \pm 5V	84V \pm 5V
Input voltage	Over voltage protection	Self-recovery voltage
HVDC	418V \pm 8V	408V \pm 8V
AC	316V \pm 6V	310V \pm 6V

4.2 Output Under and Over Voltage Protection (Output UVP/OVP)

The power supply should have over and under voltage protection to prevent the outputs from exceeding limits or abnormal operation. If the +12Vsb's UVP/OVP occurred, the power supply should shut down and self-recovery after the fault condition removed. If the +12V's OVP/UVP occurred, the power supply will shut down and latched off. The latch state can be cleared by toggling the PSON signal or by an AC power interruption of 5 seconds nominal.

+12Vsb & +12V UVP range: 9.0~10.5Vdc; +12Vsb & +12V OVP range: 13.3~14.5Vdc.

There is a slow OVP range for +12V as the output has a more than 100ms during time: 12.8~13.2Vdc.

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 over temperature protection (OTP) condition the PSU will shut down. When the power supply temperature drops to within specified limits, the power supply shall restore power automatically, while the +12Vsb remains always on.

There are four temp sensors in the power supply, The first is on the main board to sense the PFC MOSFET copper temperature, it will trigger primary OTP and self-recovery when the PFC MOSFET temperature return to a safe point. The second is on the main board to sense the auxiliary converter MOSFET's temperature, it will trigger auxiliary converter +12Vsb output's OTP and auto-restart immediately for single module. The third is on the transformer PCB board to sense the synchronous MOSFET's copper temperature. It will trigger secondary OTP when the sensor resistor's temperature reached limit and self-recovery. The last one is a temperature sense resistor on the main board and located at the air intake to sense the ambient temperature. The power supply will shut down if the ambient temperature reached the limit and self-recovery when the ambient temperature returns to normally. Before the fourth OTP triggered, there is warning first, and the trigger points are as below table.

Table23.

The temp sensors	Over temperature warning	Over temperature protection	Self-recovery temperature
Fourth ambient	62±5℃	64±5℃	60±5℃

4.4 Short Circuit Protection (SCP)

The power supply shall be protected from damage due to faults between output (+12V or +12Vsb) 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 +12V shorted to GND, the power supply will shut down and latched off the +12V output. All outputs shut down upon a short circuit of the +12Vsb and when the short is removed, the power supply shall self-recovery.

4.5 Over Current Protection (OCP)

The power supply should have over current protection to prevent the outputs from exceeding limits. If the +12V's OCP occurred, the power supply will shut down and latched off the +12V output. If the +12Vsb's OCP occurred, the power supply should shut down and self-recovery after the over current condition removed.

It also has 150% peak load function when start up for 10s.

+12Vsb OCP range: 3.5~7.0A; +12V OCP range: 90~100A for 90~140Vac low input and 120~135A for 180~264Vac or 160~400Vdc high input

The +12V main output can endure a peak load of 150% full load for 50ms min, after the occurrence of peak current Maximum 8ms, the Alert signal will be low.

Table24. OCP Limited Specification

+12V Main Output	Low Input	High Input	LED
Over current warning	$90 \pm 5A$	$120 \pm 5A$	2Hz Blinking Amber
Over current protection	90~100A	120~135A	Amber
Over current recovery	83~90A	110~120A	Green
Peak load (50ms)	110~125A	140~160A	Amber
+12Vsb	Total Range Input		LED
Over current warning (PS OFF)	$3.8 \pm 0.3A$		1Hz Blinking Green
Over current warning (PS ON)	$3.8 \pm 0.3A$		2Hz Blinking Amber
Over current protection (PS ON)	$6.2 \pm 0.3A$		Blinking Amber
Over current protection (PS OFF)	$4.2 \pm 0.3A$		Blinking Amber

4.6 Fan Warning and Fault

If the fan speed control duty cycle was set greater than 10%, but the fan speed is between 500 and 1000 RPM, the PSU should send out fan alarm signal, when it less than 500RPM, the PSU should send out fan failure signal.

5.0 OPERATE ENVIRONMENT

Table25. Environment Limits

Item	Unit	Min	Nominal	Max	Notes
Operating Temperature	℃	0	35	55	The power supply should start up at -25℃, But no electrical property requirement.
Storage Temperature	℃	-40	25	70	Non-operating, maximum rate of change of 20℃/hour.
Relative Humidity	%	10		90	Operating, non-condensing.
		5		95	Non-operating, non-condensing.
Operating Altitude	m	0		5000	The power supply max operating ambient temperature is defined at sea level. The max operating ambient temperature should drops at a slew of 0.33℃/100m altitude raised.
Storage Altitude	m	0		15000	
Mechanical Shock	50G trapezoidal wave, velocity change =170in./sec				Non-operating. Three drops in each of six directions are applied to each of the samples.

6.0 SAFETY

6.1 Safety Certification

1、CCC

6.2 Hi-Pot

Primary to secondary, HI-POT Withstand voltage: 10mA max 3000Vac, 50/60Hz or 0.5mA max 4242Vdc for 60 seconds for power supply unit;

Primary to Earth, HI-POT Withstand voltage: 10mA max 1500Vac, 50/60Hz or 0.5mA max 2121Vdc for 60 seconds.

Secondary to Earth,, HI-POT Withstand voltage: 10mA max 500Vac, 50/60Hz or 0.5mA max 707Vdc for 60 seconds.

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 1.75mA test with customer system.

6.5 Insulation Resistance

Primary to Secondary: 500Vdc for 60S, the insulation resistance shall not be less than 10Mohm.

Secondary to Earth: 500Vdc for 60S, the insulation resistance shall not be less than 2Mohm.

7.0 RESTRICTED SUBSTANCE

7.1 ROHS

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

7.2 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.

8.0 EMI AND EMS REQUIREMENT

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。

Table26. EMI (Electromagnetic Interference) Requirements Table

Item	Description and Requirement	Criterion	Notes
Radiated Emissions	Frequency: 30MHz~1GHz Class A with 6dB Margin	EN 55032	230V/50Hz input
		FCC Part 15	120V/60Hz input
Conducted Emissions	Frequency: 150KHz~30MHz Class A with 6dB Margin	EN 55032	230V/50Hz input
		FCC Part 15	120V/60Hz input

Harmonic	EN 61000-3-2 Class A	EN 61000-3-2	230V/50Hz input
Voltage Flicker	$P_{st} \leq 1.0$ and $P_{lt} \leq 0.65$, Voltage change $\leq 3.3\%$, Relative Voltage change $\leq 4\%$, The voltage changed over 3.3% duration time should $\leq 500ms$	EN 61000-3-3	230V/50Hz input

Table27. EMS (Electromagnetic Susceptibility) Requirements Table

Item	Description and Requirement	Level	Criterion
Surge	Different Mode: $\pm 1KV$ Common Mode: $\pm 2KV$	B	EN61000-4-5 EN 55035 GR-1089-CORE
Electrical Fast Transient Group (EFT)	$\pm 2KV$	B	EN61000-4-4 EN 55035 YD/T 1082
Electrical Static Discharge (ESD)	Touch: $\pm 6KV$ Air: $\pm 8KV$	B	EN61000-4-2 EN 55035
Radiated Susceptibility (RS)	3V/m	A	EN 61000-4-3 EN 55035
Conducted Susceptibility (CS)	150KHz~80MHz 3V 80% AM	A	EN 61000-4-6 EN 55035
Voltage Dips and Interruptions	0% U_t : 10ms 70% U_t : 500ms 0% U_t : 5000ms	B C C	EN 61000-4-11 EN 61000-4-29 EN 55035 / 60601 GB 19286

Performance criterion of the voltage fluctuation immunity test:

A: The power supply should have no loss of function or degradation of performance according to its specification during the test.

B: Temporary loss of function or degradation of performance is acceptable, but all the outputs should be in an acceptable range and should recover to normal after the test. The power supply shouldn't loss any of outputs, reset or any abnormal warning when doing the test with system.

C: Temporary loss of function or shut down is acceptable, but the power supply should restart with an operator intervention or auto-restart normally after the test.

9.0 MECHANICAL PERFORMANCE

Non-operating:

Sine sweep: 5~500Hz @0.5gRMS at 0.5 octave/min; dwell 15 min at each of 3 resonant points;

Random profile: 5Hz @0.01g²/Hz (slope up); 20~500Hz @0.02g²/Hz (flat);

Input acceleration = 3.13gRMS; 10min.per axis for 3 axis on all samples.

10.0 MTBF

The power supply shall have a reliability requirement as below table when under full load and 230Vac/50Hz input.

Table28.

Item	Requirement	Notes
Life Time	≥ 5 years at 30℃ ambient	Should ≥ 7 years at 25℃ ambient when mating with customer system.
CMTBF (Calculated MTBF)	$\geq 250,000$ hours, at 30℃ ambient temperature and full load.	Telcordia Technologies SR-332 (Method I Case 3).
Electrolytic capacitor calculated life	≥ 5 years	30℃ ambient and full load using capacitors supplier equation.
Fan L10 Life	≥ 5 years	30℃ ambient and full load.
Fan Noise	60dBA (220Vac input)	30℃ ambient and full load.
Annual Return Rate	$\leq 0.1\%$	
Warranty	≥ 3 years	



11.0 SOFTWARE

11.1 Data Precision Requirement

Some data read from power supply should have a precision requirement as below table:

Table29. Required Accuracy (110Vac or 220Vac or 270Vdc)

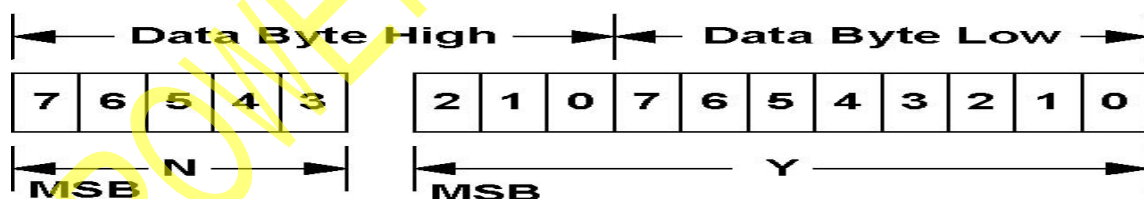
Output Load Condition	10%~20%	20%-50%	50%-100%
Read_VIN(88h)	±2%	±2%	±2%
Read_IIN(89h)	±2% or ±0.2A		
Read_PIN(97h)/Read_Ein(86h)	±10W	±2%	±2%
Read_Vout(8Bh)	±2%		
Read_Iout(8Ch)	±1A	±2%	±2%
Read_Pout(96h)/Read_Eout(87h)	±10W	±2%	±2%
Read_Ambient Temperature(0-70℃) (8Dh)	±5℃		

Note: 1. There is no accuracy requirement when PSU is in PS-OFF mode.

11.2 PMBus Specification

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 above:

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.



11.3 PMBUS Command Supported

Table30. STATUS_WORD Command

Byte	Bit No.	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	TEMPERATURE	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 STATUS_WORD has been detected.	No

Table31. STATUS_VOUT Command

Bit	Meaning	Support
7	VOUT Over voltage Fault	Yes

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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

Table32. 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	No
0	POUT Overpower Warning	No

Table33. STATUS_INPUT Command

Bit	Meaning	Support
7	VIN Over voltage Fault	Yes
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

Table34. 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

Table35. 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

Table36. STATUS_OTHER Command

Bit	Meaning	Support
7	Reserved	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

Table37. Supported Command Summary

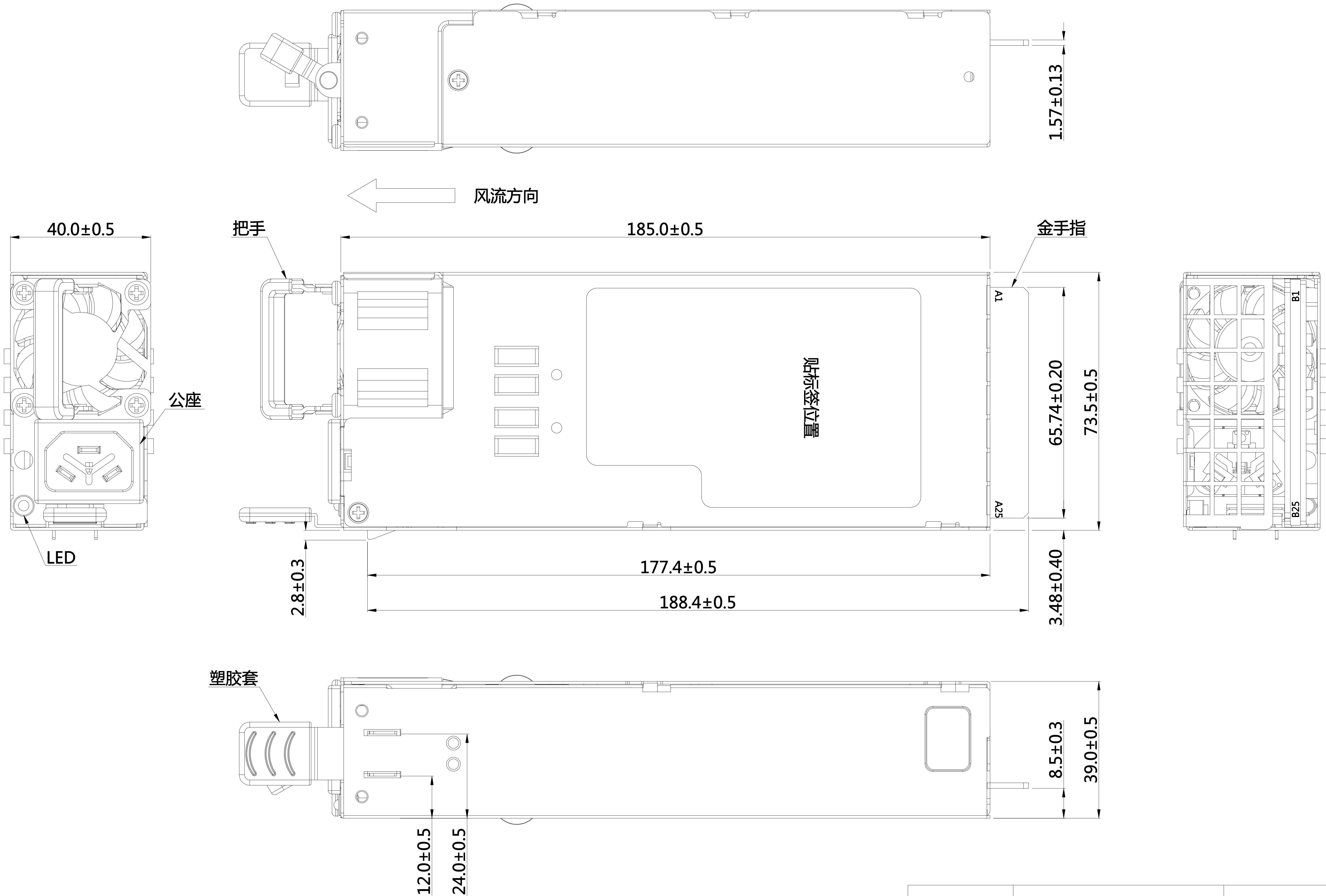
CMD Code	Name	Type	Bytes	Conditions
03h	CLEAR_FAULTS	Send Byte	0	
19h	CAPABILITY	Read Byte	1	
1Ah	QUERY	Block Read	1	
20h	VOUT_MODE	Read Byte	1	
40h	VOUT_OV_FAULT_LIMIT	Read Word	2	
44h	VOUT_UV_FAULT_LIMIT	Read Word	2	
46h	IOUT_OC_FAULT_LIMIT	Read Word	2	
4Ah	IOUT_OC_WARN_LIMIT	Read Word	2	
4Fh	OT_FAULT_LIMIT	Read Word	2	
51h	OT_WARN_LIMIT	Read Word	2	
55h	VIN_OV_FAULT_LIMIT	Read Word	2	
57h	VIN_OV_WARN_LIMIT	Read Word	2	
58h	VIN_UV_WARN_LIMIT	Read Word	2	
59h	VIN_UV_FAULT_LIMIT	Read Word	2	
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	
80h	READ_VIN_TYPE	Read Byte	1	00:NO AC; 01:AC; 02:HVDC
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	
8Eh	READ_TEMPERATURE_2	Read Word	2	
8Fh	READ_TEMPERATURE_3	Read Word	2	
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	V1.2
99h	MFR_ID	Read Block	14	See MFR Data table
9Ah	MFR_MODEL	Read Block	14	See MFR Data table
9Bh	MFR_REVISION	Read Block	6	Updata
9Eh	MFR_SERIAL	Read Block	14	
A0h	MFR_VIN_MIN	Read Word	2	See MFR Data table
A1h	MFR_VIN_MAX	Read Word	2	See MFR Data table
A4h	MFR_VOUT_MIN	Read Word	2	See MFR Data table
A5h	MFR_VOUT_MAX	Read Word	2	See MFR Data table
A6h	MFR_IOUT_MAX	Read Word	2	See MFR Data table
A7h	MFR_POUT_MAX	Read Word	2	See MFR Data table
A8h	MFR_TAMBIENT_MAX	Read Word	2	See MFR Data table
A9h	MFR_TAMBIENT_MIN	Read Word	2	See MFR Data table
FCh	SMART_ON_CONFIG	Write Byte Read Byte	1	00h Standard Redundancy 55h Smart On Active 0Eh Smart Standby

Table38. MFR Data

CMD Code	Name	Content
99h	MFR_ID	ASPOWER#####
9Ah	MFR_MODEL	U1A-D1300-M###
A0h	MFR_VIN_MIN	90
A1h	MFR_VIN_MAX	264
A4h	MFR_VOUT_MIN	11.6
A5h	MFR_VOUT_MAX	12.8
A6h	MFR_IOUT_MAX	105.5
A7h	MFR_POUT_MAX	1300
A8h	MFR_TAMBIENT_MAX	55
A9h	MFR_TAMBIENT_MIN	0

版本	变更内容	修改人	日期
1.0	首次发行	黄奕崇	2021.01.28



Pin	Name	Pin	Name
A1	GND	B1	GND
A2	GND	B2	GND
A3	GND	B3	GND
A4	GND	B4	GND
A5	GND	B5	GND
A6	GND	B6	GND
A7	GND	B7	GND
A8	GND	B8	GND
A9	GND	B9	GND
A10	+12V	B10	+12V
A11	+12V	B11	+12V
A12	+12V	B12	+12V
A13	+12V	B13	+12V
A14	+12V	B14	+12V
A15	+12V	B15	+12V
A16	+12V	B16	+12V
A17	+12V	B17	+12V
A18	+12V	B18	+12V
A19	SDA	B19	A0
A20	SCL	B20	A1
A21	PS0N	B21	+12V SB
A22	Alert	B22	SM-Bus
A23	GND Sense	B23	LS
A24	+12V Sense	B24	Present
A25	PWOK	B25	Input OK

机型	U1A-D1XXXX-DRB-Z	未注尺寸公差		<div><div> 深圳欧陆通电子股份有限公司.</div><div>ASPOWER</div></div>						
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		*** :								
料号		**** :		确认	审核	单位	mm	页码	1/1	
		角度 :								
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