# AC/DC 550W CRPS SERVER POWER SUPPLY

LMS550-P12BG

MORNSUN®

RoHS

## FEATURES

- AC & HVDC wide input voltage range: 90 - 264VAC/180 - 320VDC
- Strong adaptability to AC power grids, with EMS level 4 protection
- Wide operating temperature range: -25℃ to +55℃ without derating
- Supports 1.5 times transient power for 100ms, meeting thede mands of sudden computing power scenarios
- Supports N+M ⩽ 4 intelligent redundancy, cold backup efficiency optimization and active current sharing
- Supports PMBus/I2C communication protocols Equipped with fault early warning and black box functions
- Multiple protection mechanisms including overcurrent, short circuit, overvoltage, undervoltage, overtemperature and fan failure
- Full stack domesticization, safe and controllable
- Complies with CRPS 2.2 standard, 80 PLUS Platinum energy efficiency
- Safety according to UL/EN/IEC62368, IEC62368
- 5 years warranty

*LMS550-P12BG is a server power supply provided for customers. It supports a wide input voltage range of AC and HVDC, meets the requirements for parallel operation, and supports hot-swapping. It features high efficiency, intelligent backup function, anti-backflow, and remote compensation. It has PMBus/I2C communication function, which can support online monitoring of input/output voltage/current/power, and has functions such as fault warning and black box. The power supply is equipped with a fan for heat dissipation and adopts the exhaust heat dissipation method. The fan is designed with automatic speed regulation. The EMC and safety specifications meet the standards of UL/EN/IEC62368 and GB4943.*

## Selection Guide*

| Certification | Part No. | Fan Operation Type | Output Power (W) | Nominal Output Voltage | | Main Load | | Auxiliary Load | Max. Capacitive Load (μF) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | Main Circuit | Auxiliary Circuit | Min. | Max. | Typ. | Main Circuit | Auxiliary Circuit |
| -- | LMS550-P12BG | Forward airflow, from DC to AC | 550W | 12.2VDC | 12.0VDC | 1A | 45A | 3.0A | 25000 | 3100 |

Note: 1.*The product picture is for reference only. For details, please refer to the actual product.

## Input Specifications

| Item | Operating Conditions | | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Input Voltage Range | AC input | | | 90 | -- | 264 | VAC |
| | DC input | | | 180 | -- | 320 | VDC |
| Input Voltage Frequency | AC input | | | 47 | -- | 63 | Hz |
| AC input overvoltage | Protection voltage | | | 300 | -- | 320 | VAC |
| | Recovery voltage | | | 290 | -- | 315 | |
| DC input overvoltage | Protection voltage | | | 336 | -- | 350 | VDC |
| | Recovery voltage | | | 320 | -- | 335 | |
| Efficiency | TA=25℃, without Fan | Vin: 230VAC/50Hz | 10% load | -- | 89 | -- | % |
| | | | 20% load | -- | 93 | -- | |
| | | | 50% load | -- | 94 | -- | |
| | | | 100% load | -- | 91 | -- | |
| Input Current | Vin=100Vac/60Hz Pout=550W | | | -- | -- | 7 | A |
| | Vin=200Vac/50Hz Pout=550W | | | -- | -- | 3.5 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Contact Inrush Current | Vin=264Vac/50Hz Pout=550W | Cold start | -- | 24 | -- | |
| Earth Leakage Current | Vin=264Vac fin=50Hz | | -- | -- | 1.75 | mA |
| Power Factor | 10%Imax≤Io≤20%Imax @ Vin=230Vac/50Hz | | 0.92 | -- | -- | -- |
| | 20%Imax<Io≤50%Imax @Vin=230Vac/50Hz | | 0.96 | -- | -- | |
| | 50%Imax<o≤100%Imax @Vin=230Vac/50Hz | | 0.98 | -- | -- | |
| | Io=100%Imax @ Vin=230Vac/50Hz | | 0.99 | -- | -- | |
| ITHD | 5%Imax<Io≤10%Imax @Vin=230Vac/50Hz | | -- | -- | 20 | % |
| | 10%Imax<Io<20%Imax @Vin=230Vac/50Hz | | -- | -- | 15 | |
| | 20%Imax≤Io<40%Imax @Vin=230Vac/50Hz | | -- | -- | 10 | |
| | 40%Imax≤Io<50%Imax @Vin=230Vac/50Hz | | -- | -- | 8 | |
| | 50%Imax≤Io≤100%Imax @Vin=230Vac/50Hz | | -- | -- | 5 | |

## Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Rated Output Voltage | +12.2V | -- | 12.2 | -- | V |
| Steady State Output Voltage Range | | 11.8 | 12.2 | 12.6 | |
| Output Ripple & Noise* | | -- | -- | 120 | mV |
| Output Current | | 1 | -- | 45 | A |
| Current Sharing Accuracy (@110W≤Pout<275W) | | -- | -- | 10 | % |
| Current Sharing Accuracy (@275W≤Pout≤550W) | | -- | -- | 5 | |
| Hold-up Time@90% load | | 13 | -- | -- | ms |
| Dynamic Load(60% load step; 1 A/us; 2200 uF capacitor connected in parallel with the main output; minimum load 1 A) | | 11.6 | -- | 12.8 | V |
| Rated Output Voltage | +12VSB | 11.4 | 12 | 12.6 | V |
| Steady State Output Voltage Range | | 11.4 | 12 | 12.6 | |
| Output Ripple & Noise* | | -- | -- | 120 | mV |
| Output Current | | 0 | -- | 3 | A |
| Hold-up Time | | 70 | -- | -- | ms |
| Dynamic Load(50% Load Step; 0.5 A/us; 1000uF CapacitorConnected in Parallel with the Auxiliary Output; Minimum Load 0.05 A) | | 11.4 | -- | 12.8 | V |

Note: 1.*The "Tip and barrel method" is used for ripple and noise test, +12.2V output adds 2200uF capacitive load, and the coaxial cable is connected to the 10uF capacitor and 0.1uF ceramic capacitor in parallel;+12VSB output adds 270uF capacitive load, and the coaxial cable is connected to the 10uF capacitor and 0.1uF ceramic capacitor in parallel.For specific operation methods,please refer to the Server Power Test Specification.

## Protective Characteristics

| | Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| +12.2V Output | Over-current Alarm | 47 | -- | 55 | A | Alarm after 20s,the main output will be turned off after 2s |
| | Over-current Protection 1 | 55 | -- | 65 | | The main output is turned off after 100ms |
| | Over-current Protection 2 | 90 | -- | -- | | The main output is turned off after 100us |
| | Short-circuit Protection | +12.2V output short-circuit protection mode is latching, reset by PSON#, AC power off and restart for recovery,12VSB output is normal. | | | | |
| | Over-voltage Protection | 13.5 | -- | 15.0 | V | Latching, reset by PSON#, AC power off and restart for recovery,12VSB output is normal |
| | Under-voltage Protection | 9.5 | -- | 11 | | Self-recover,12VSB output is normal |
| | Over-temperature Alarm Point | 56 | -- | -- | ℃ | Over-temperature protection hysteresis ≥ 5℃ Protection point is ≥ 4℃ higher than alarm point |
| | Over-temperature Protection Point | 60 | -- | 70 | | |
| | Over-temperature Protection Release | 55 | -- | -- | | |
| | Fan-fault Protection | When the fan malfunctions, the output is shut off. Once the fault is cleared, the output will be automatically restored. | | | | |

| | Item | Min. | Typ. | Max. | Unit | Note |
|---|---|---|---|---|---|---|
| +12VSB Output | Over-current Protection | 4 | 4.5 | 5 | A | Self-recover(The main output will be protected/self-recover together) |
| | Short-circuit Protection | Self-recover(The main output will be protected/self-recover together) | | | | |
| | Over-voltage Protection | 13.5 | -- | 15 | V | Self-recover(The main output will be protected/self-recover together) |

## LED Indicator Light

| Power Status | Light Status |
|---|---|
| Power output normal | Green |
| All power supplies no AC input | Light off |
| AC input normal, only with +12VSB output or the product in cold redundant mode that is in sleep state. | The green light flashes at a frequency of 1Hz |
| One product no AC input, the other one with AC input | Orange |
| Product failure lead to output off, such as OVP, OCP, Fan Fault | Orange |
| Product in alarm status but with output on | The orange light flashes at a frequency of 1Hz |
| The module enters the firmware upgrade mode. | The green light flashes at a frequency of 2Hz |

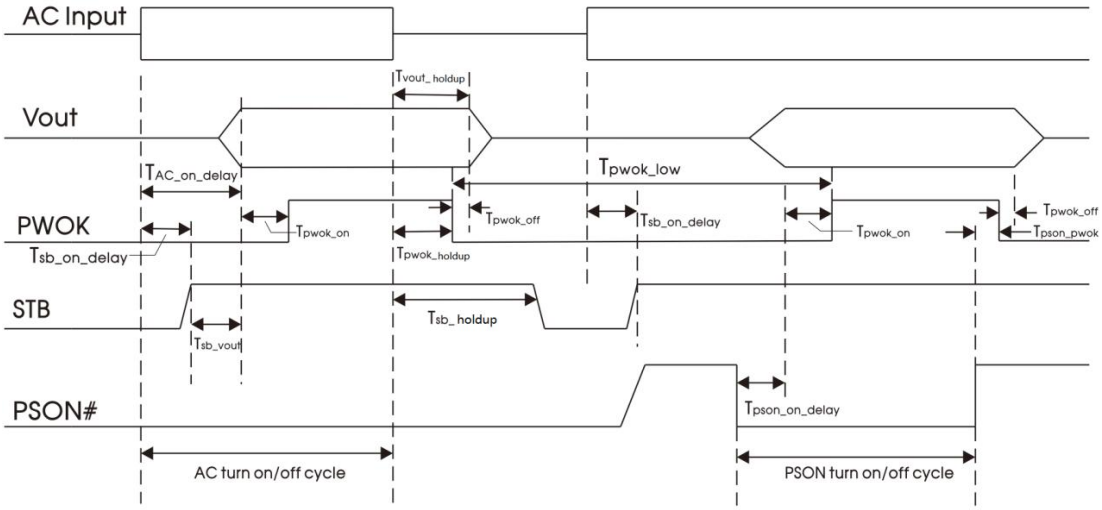
## Data Online Reading and Monitoring

| Item | Accuracy Range | | |
|---|---|---|---|
| Output Load | <10% | 10%-30% | 30%-100% |
| Input Voltage | ±3% | ±3% | ±3% |
| Input Current | NA | ±5% or ±0.5A | ±5% or ±0.5A |
| Input Power | NA | ±5% or 12W | ±3% |
| Output Voltage | ±5% | ±3% | ±3% |
| Output Current | NA | ±5% | ±5% |
| Output Power | NA | ±5% | ±5% |

## Timing Definition

| Item | Description | Min. | Max. | Unit |
|---|---|---|---|---|
| Tvout_rise | Time for +12.2V output to rise from 0 to 10.8V | 5 | 70 | ms |
| | Time for +12VSB output to rise from 0 to 10.8V | 1 | 25 | |
| Tsb_on_delay | Time from AC power on to +12VSB output reaching at 10.8V | -- | 1500 | |
| Tac_on_delay | Time from AC power on to +12.2V output reaching at 10.8V | -- | 3000 | |
| Tvout_holdup | Time from AC power off to +12.2V output reaching at 10.8V @90%Load | 13 | -- | |
| Tpwok_holdup | Time from AC power off to PWOK signal decreasing @90%Load | 12 | -- | |
| Tpson_on_delay | Time from high to low of PSON# signal to +12.2V output reaching at 10.8V | 5 | 400 | |
| Tpson_off_delay | Time from low to high of PSON# signal to +12.2V output turning off | -- | 10 | |
| Tpson_pwok | Time from low to high of PSON# signal to PWOK signal becoming low-level | -- | 5 | |
| Tpwok_on | Time from +12.2V output reaching at 10.8V to PWOK signal becoming high-level | 100 | 500 | |
| Tpwok_off | Time from PWOK signal becoming low-level to +12.2V output dropping to 10.8V @90%Load | 1 | -- | |
| Tpwok_low | Time from PWOK signal becoming low-level to when the PWOK signal increases through the PSON# switch or AC restart | 100 | -- | |
| Tsb_vout | Time from +12VSB output reaching at 10.8V to +12.2V output reaching at 10.8V | 50 | 1000 | |
| T12VSB_holdup | Time from AC power off to +12VSB output voltage dropping to 10.8V | 70 | -- | |
| Tvingood_de-asserted | Delay from the Vin drop being 0V to VIN_GOOD de-assertion. | -- | 4 | |

## Timing Definition




## General Specifications

| Item | | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|---|
| Isolation Test | Input - ⏚ | Electric strength test for 1min., leakage current <5mA | | 1500 | -- | -- | VAC |
| | Input - Output* | Electric strength test for 1min., leakage current <10mA | | 3000 | -- | -- | |
| Insulation Resistance | Input - ⏚* | Ambient temperature: 25 ± 5℃<br>Relative humidity: < 95%RH, no condensation<br>Test voltage: 500VDC | | 50 | -- | -- | MΩ |
| | Input - Output | | | | | | |
| Operating Temperature | | | | -25 | -- | 55 | ℃ |
| Storage Temperature | | | | -40 | -- | 70 | |
| Operating Humidity | | Non-condensing | | -- | -- | 90 | %RH |
| Storage Humidity | | | | -- | -- | 95 | |
| Operating Altitude | | ⩾2000m,the working temperature is reduced by 1℃/300m | | -- | -- | 5000 | m |
| Storage Ambient Height | | | | -- | -- | 15200 | |
| Hot-plug | | 1. 0.5m/s⩽speed⩽1m/s, the backplane voltage cannot exceed the dynamic specification of the power module during hot-plug process.<br>2. The main output adds 2200uF capacitive load,and the auxiliary output adds 1000uF capacitive load. | +12.2V | 11.6 | -- | 12.8 | V |
| | | | +12VSB | 11.4 | -- | 12.8 | |
| Safety Standards | | | Design refer to UL/EN/IEC62368-1, GB4943.1 | | | | |
| MTBF | | Rated input, 100% load @ 25℃ Evaluated by Telcordia SR-332 | >500,000 h | | | | |
| Communication Method | | PMBus / I2C | | | | | |
| Warranty | | 5 years | | | | | |

Note: 1.*Input-Output isolation voltage refer to PCBA only;
2.*The output ground is connected to ⏚.

## Mechanical Specifications

| | |
|---|---|
| Case Material | Metal (SGCC) |
| Dimensions* | 73.50mm x 185.00mm x 40.00/39.00mm ( W x D x H ) |
| Weight | 670g (Typ.) |
| Cooling Method | Forced-air cooling |
| Fan Noise | 25℃, the overall noise ⩽ 61dB @80%Load (measure at 1m) |

Note: 1.*Product shell height 39mm, fan height 40mm.

## Electromagnetic Compatibility (EMC)

| | | | |
|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 CLASS A | |
| | RE | CISPR32/EN55032 CLASS A | |
| | Harmonic current | IEC/EN61000-3-2 CLASS A | |
| Immunity | ESD | IEC/EN61000-4-2 Contact ±8KV/Air ±15KV | perf. Criteria A |
| | RS | IEC/EN61000-4-3 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 Input port: ±2KV | perf. Criteria A |
| | Surge | IEC/EN61000-4-5 line to line ±2KV 2Ω/line to ground ±4KV 12Ω | perf. Criteria A |
| | CS | IEC/EN61000-4-6 3Vrms | perf. Criteria A |
| | Voltage dips, interruption | IEC/EN61000-4-11 1 cycle @ nominal voltage input | perf. Criteria A |

## Functional requirements of black box

| | | | | | |
|---|---|---|---|---|---|
| General requirements of black box | 1. Record the alarm when the output is turned off and the input power is down, the alarm status and the time of the fault occur are stored, and the important physical quantities at the fault site are saved and queried, including not limited to input voltage, output voltage, output current, temperature, fan speed, etc. Use the circular storage method (the black box information is written on the current index number +1 in case of failure, and when the index number is "record 4", the next line is written to "record 0").<br>2. Support the host to query fault records one by one.<br>3. Support host timing. The host needs to send the system time (time according to the Unix standard) to the power module, and the send it again every 10 minutes for the time synchronization of the power module. | | | | |
| Storage and reading mechanism of black box records | Described from the time dimension, it is divided into the following stages:<br>1. Power-up initialization stage<br>After powering on, read the historical fault of the EEPROM record into the cache.<br>2. Fault site storage stage<br>The upper computer timings the power time (10min/time), when the output is turned off, the enabling fault record mark writes all the fault scene data to the EEPROM to generate a fault record.<br>3. Fault data reporting stage<br>When the upper computer queries the alarm log, each time a single query is made, the lower computer takes the corresponding data from the EEPROM storage area and uploads it all to the upper computer. | | | | |
| Black box reading protocol | Command | Name of the command | Data reading type | Data bytes | Description of the order |
| | DCh | MFR_READ_BLACK_BOX | Block Read | 237 | Power supply black box query, Reading: multi-byte (fault record information, you need to write the fault index before reading, 0-4, 0 is the latest record. 4 is the earliest record) |
| | DFh | MFR_BLACKBOX_CONFIG | Read/Write Byte | 1 | Reading/Writing:single-byte(0:disable black box function;1:enable black box function) |
| System timing mechanism in the black box | The power module needs to be time synchronized through host:<br>1.Product: -- Synchronization<br>-- Time to send the power module every 10 minutes<br>-- The time to send is in seconds<br>2.Power supply: -- Time synchronization of accepting products<br>-- Interrupt timing, every 1second, the counter is increased by 1, and the time unit is seconds<br>The timing time (time according to the Unix standard) is the number of seconds relative to the base time. The delivery time under the host will be sent to the power supply from the number of seconds from the base time to the current time. The time read in the alarm log is the number of seconds from the base time of the alarm. If the host is not given time, the running time of the power supply will increase by seconds, and the power drop needs to be saved. | | | | |
| Black box data content | The black box records the real-time physical quantity and state data of the scene. The storage content is divided into two parts: the head and the data department. Each record contains 38 bytes of data. | | | | |

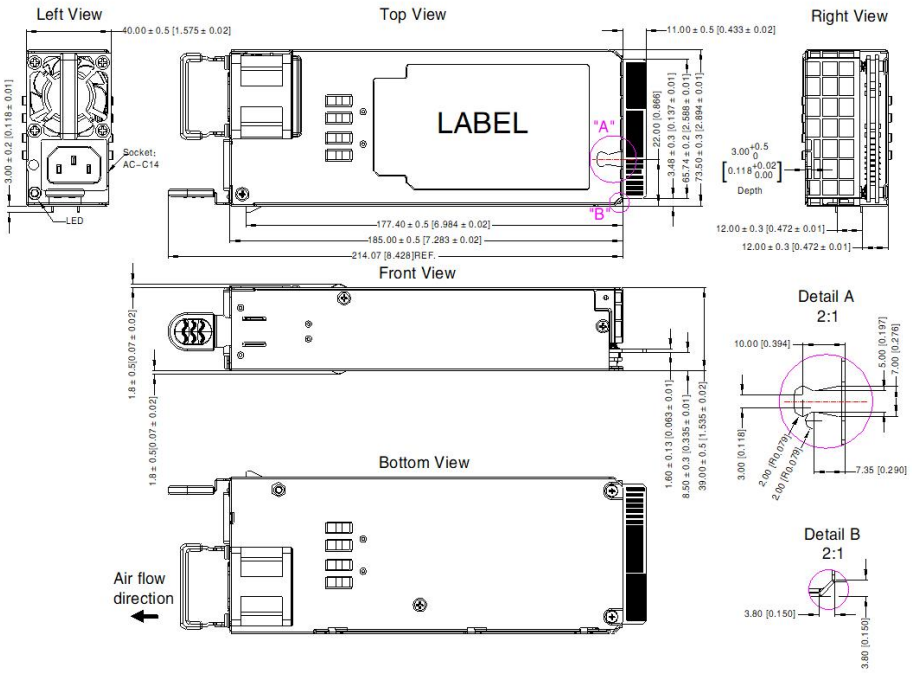
## Gold-finger Definition

| Output Terminal | Definition | Output Terminal | Definition |
|---|---|---|---|
| A1-A9 | SGND | B1-B9 | SGND |
| A10-A18 | +12.2V | B10-B18 | +12.2V |
| A19 | PMBus_SDA | B19 | A0 |
| A20 | PMBus_SCL | B20 | A1 |
| A21 | PSON# | B21 | +12VSB |
| A22 | SMBAlert# | B22 | SMART_ON |
| A23 | +12V Return sense | B23 | +12V_Sharebus# |
| A24 | +12V Remote sense | B24 | PRESENT# |
| A25 | PWOK | B25 | VIN_GOOD |

Note: The product is equipped with a built-in cooling fan, Keep the air intake clear of Debris, If the environment cannot meet this requirement, a fanless model is recommended.

## Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



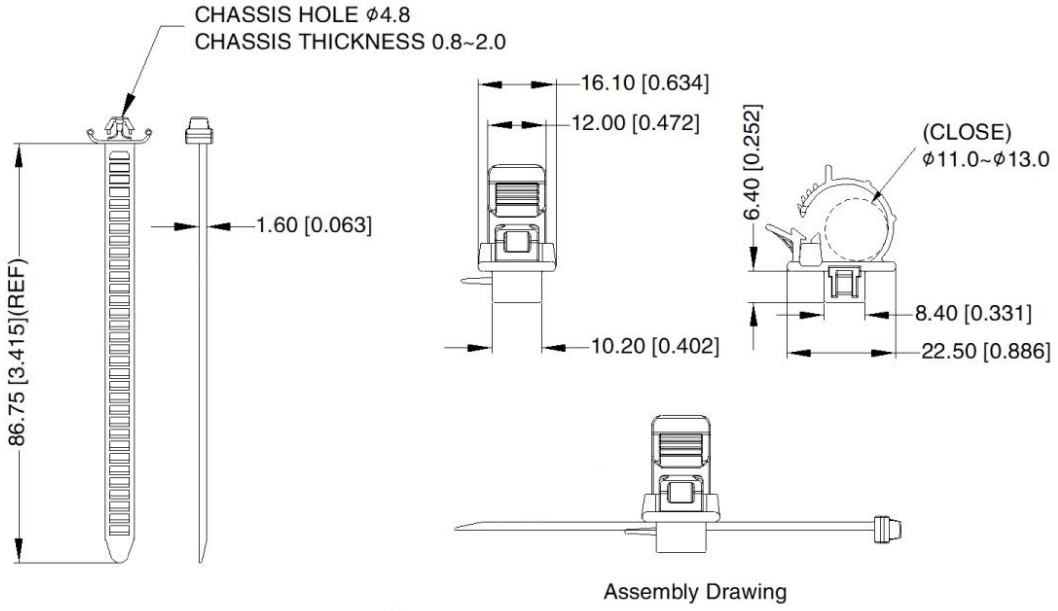

| AC-C14 Pin-Out | | Picture |
|---|---|---|
| Pin | Mark | |
| 1 | AC(L) | |
| 2 | ⏚ | |
| 3 | AC(N) | |

| Goldfinger Pin-Out(Top) | | Picture |
|---|---|---|
| Pin | Mark | |
| A1~9 | SGND | A1~9 |
| A10~18 | +12.2V | A10~18 |
| A19 | PMBus_SDA | A19 |
| A20 | PMBus_SCL | |
| A21 | PSON | |
| A22 | SMBAlert# | |
| A23 | +12V_Return sense | |
| A24 | +12V_Remote sense | |
| A25 | PWOK | A25 |

| Goldfinger Pin-Out(Bottom) | | Picture |
|---|---|---|
| Pin | Mark | |
| B1~9 | SGND | B25 |
| B10~18 | +12.2V | B19 |
| B19 | A0 | B10~18 |
| B20 | A1 | |
| B21 | +12VSB | |
| B22 | SMART_ON | |
| B23 | +12V_Sharebus# | |
| B24 | PRESENT# | B1~9 |
| B25 | VIN_GOOD | |

Note:
Unit: mm[inch]
General tolerances: ± 2[ ± 0.078]

## Recommended Tie Type




Assembly Drawing

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220607;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity <75%RH with nominal input voltage and rated output load;
3. The room temperature derating of 1℃/300m is needed for operating altitude greater than 2000m;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. In order to improve the efficiency at high input voltage, there will be audible noise generated, but it does not affect product performance and reliability;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. The out case needs to be connected to PE (⏚)of system when the terminal equipment in operating;
9. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
10. The power supply is considered a component which will be installed into a terminal equipment. All EMC tests should be confirmed with the final equipment. Please consult our FAE for EMC test operation instructions.

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