AC/DC 350W CRPS SERVER POWER SUPPLY

LMS350-G12B

MORNSUN®

EN62368-1 GB4943.1 BS EN62368-1

FEATURES

- Input voltage range: 90 - 264VAC and accepts AC & HVDC wide voltage range input
- Operating ambient temperature range: -5℃ to +55℃
- 80 PLUS Gold efficiency
- N+M Intelligent redundancy N+M≤4 (N=3 max, M=2 max)
- Active current sharing function
- PMBus/I²C communication function
- Support online upgrade
- Black box function
- Over-current alarm, over-current / short-circuit / over-voltage / under-voltage protection, over-temperature protection, fan-fault protection
- Design refer to UL/EN/IEC62368, GB4943
- 5 years warranty

LMS350-G12B is the server power supply provided by Mornsun for customers. It supports AC & HVDC wide voltage range input, hot-plug available and parallel using requirements. It features high efficiency, intelligent backup function, anti-backflow, remote compensation. With PMBus / I²C communication function, it can support online monitoring of input / output voltage / current / power, with fault warning, black box and other functions. 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
CE/CCC	LMS350-G12B	Forward airflow, from DC to AC	350W	12.2VDC	12.0VDC	1A	29A	3A	25000	3000

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
Efficiency	TA=25℃, without Fan	Vin: 230VAC/50Hz	10% load	85	--	--	%
			20% load	89	--	--	
			50% load	92	--	--	
			100% load	89	--	--	
Input Current	V_{in}=100Vac/60Hz P_{out}=350W			--	--	5	A
	V_{in}=200Vac/50Hz P_{out}=350W			--	--	2.5	
Inrush Current	V_{in}=264Vac/50Hz P_{out}=350W		Cold start	--	55	--	
Leakage Current	V_{in}=240Vac f_{in}=50Hz			--	--	0.875	mA
Power Factor	10%I_{max} @ V_{in}=230Vac/50Hz			0.80	--	--	--
	20%I_{max} @ V_{in}=230Vac/50Hz			0.90	--	--	
	50%I_{max} @ V_{in}=230Vac/50Hz			0.95			
	100%I_{max} @ V_{in}=230Vac/50Hz			0.98	--	--	
ITHD	5%I_{max}≤I_o≤10%I_{max} @ V_{in}=230Vac/50Hz			--	--	30	%
	10%I_{max}<I_o≤20%I_{max} @ V_{in}=230Vac/50Hz			--	--	20	
	20%I_{max}<I_o≤50%I_{max} @ V_{in}=230Vac/50Hz			--	--	10	
	50%I_{max}<I_o≤70%I_{max} @ V_{in}=230Vac/50Hz			--	--	7	
	70%I_{max}<I_o≤100%I_{max} @ V_{in}=230Vac/50Hz			--	--	5	

Output Specifications

Item	+12V			+12VSB			Unit
	Min.	Typ.	Max.	Min.	Typ.	Max.	
Rated Output Voltage	12.1	12.2	12.3	11.6	12	12.3	V
Steady State Output Voltage Range	11.8	12.2	12.6	11.4	12	12.6	
Dynamic Output Voltage Range	11.6	--	12.8	11.4	--	12.6	
Output Ripple & Noise*	--	--	120	--	--	120	mV
Output Current	1	--	29	0	--	3	A
Current Sharing Accuracy (@70W<Pout<350W)	--	--	10	--	NA	--	%
Hold-up Time	13	--	--	70	--	--	ms

Note: *The "Tip and barrel method" is used for ripple and noise test, 20MHz bandwidth (peak-to-peak value), 25℃, output parallel 10uF electrolytic capacitor and 0.1uF ceramic capacitor, please refer to Server Power Test Specifications for specific information.

Protective Characteristics (+12V Output)

Item	Min.	Typ.	Max.	Unit	Note
Over-current Alarm	30	--	32	A	Alarm
Over-current Protection	32	--	40		Latching, Vsb remains normal
Short-circuit Protection	The short-circuit protection mode is latching, after the short-circuit state is released, reset by PSON, AC power off and restart for recovery				
Over-voltage Protection	13.5	--	15.0	V	Latching, Vsb remains normal
Under-voltage Protection	9.5	--	11		Self-recover
Over-temperature Alarm Point	60	--	65	℃	Over-temperature protection hysteresis greater than 4℃
Over-temperature Protection Point	--	--	70		
Over-temperature Protection Release	55	--	--		
Fan-fault Protection	When the fan fails, the main output off				

Protective Characteristics (+12VSB Output)

Item	Min.	Typ.	Max.	Unit	Note
Over-current Alarm	3.2	--	4	A	Alarm
Over-current Protection	4	--	5		Self-recovery
Short-circuit Protection	Self-recovery (+12V output will be protected/self-recovery together)				
Over-voltage Protection	13.5	--	15	V	Self-recovery

LED Indicator Light

Power Status	Light Status
Power output normal	Green
All power supplies no AC input	Light off
AC input normal, only with +12VCS output or product in backup status	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
Product enters Active-Standby mode	The green light flashes at a frequency of 2Hz

Data Online Reading and Monitoring

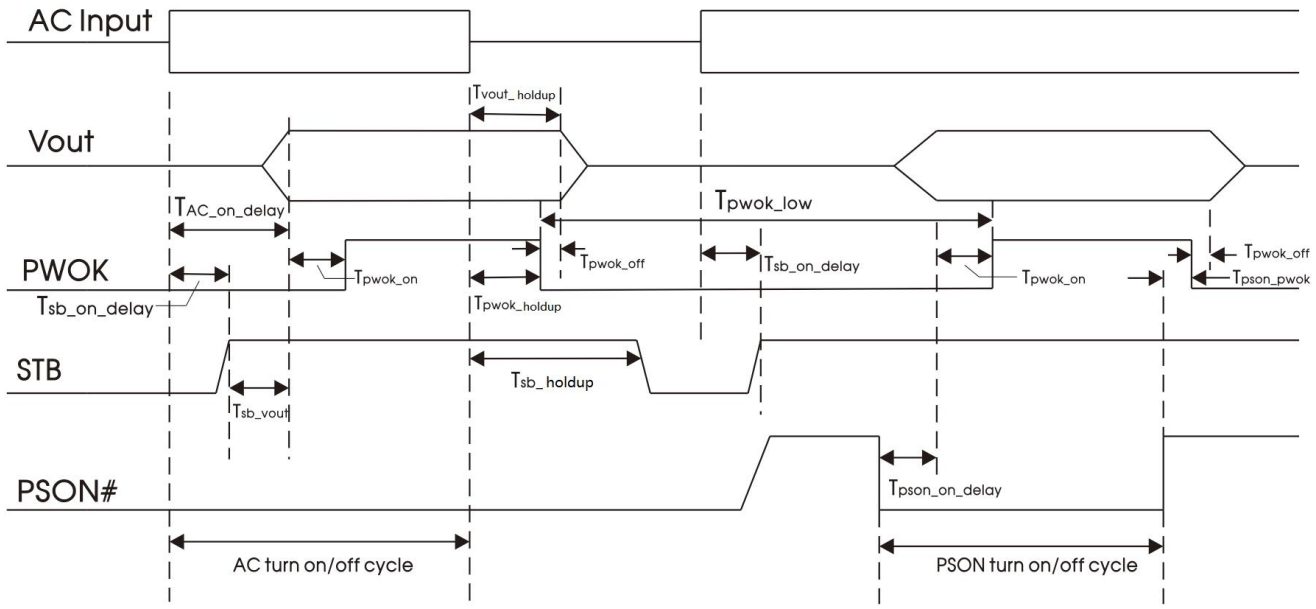
Item	Accuracy Range		
Output Load	<10%	10%-30%	30%-100%
Input Voltage	±3%	±3%	±3%
Input Current	NA	±10 or ±0.5A	±10% or ±0.5A
Input Power	NA	±5% or ±10W	±5%

Output Voltage	±5%	±3%	±3%
Output Current	NA	±10%	±5%
Output Power	NA	±10%	±5%

Timing Definition

Item	Description	Min.	Max.	Unit
Tvout_rise	Time for +12V output to rise from 0 to 10.8V	5.0	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 +12V output reaching at 10.8V	--	2500	
Tvout_holdup	Time from AC power off to +12V output reaching at 10.8V	11	--	
Tpwok_holdup	Time from AC power off to PWOK signal decreasing	12	--	
Tpson_on_delay	Time from high to low of PSON# signal to +12V output reaching at 10.8V	5	400	
Tpson_pwok	Time from low to high of PSON# signal to PWOK signal becoming low-level	--	5	
Tpwok_on	Time from +12V output reaching at 10.8V to PWOK signal becoming high-level	100	500	
Tpwok_off	Time from PWOK signal becoming low-level to +12V output dropping to 10.8V	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 +12V output reaching at 10.8V	50	1000	
T12VSB_holdup	Time from AC power off to +12VSB output voltage dropping to 10.8V	70	--	

Timing Diagram



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 - Output	Ambient temperature: 25 ± 5℃ Relative humidity: < 95%RH, no condensation Test voltage: 500VDC	50	--	--	MΩ
Operating Temperature			-5	--	55	℃
Storage Temperature			-40	--	70	
Operating Humidity		Non-condensing	--	--	90	%RH

Storage Humidity			--	--	95	
Operating Altitude			--	--	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. 2. Add 2200uF capacitive load to the main circuit and 1000uF capacitive load to the auxiliary circuit on the output side.	Vo	11.6	--	12.8	V
		VSB	11.4	--	12.8	
Safety Standards			GB4943.1 safety approved & EN62368-1, BS EN62368-1; Design refer to UL/IEC62368-1			
MTBF	Rated Input, 100% Load@25℃ Evaluate According to Telcordia SR-332		>500,000 h			
Communication Method	PMBus / I²C					
Warranty			5 years			
Note: *Input-Output isolation voltage refer to PCBA only.						

General Specifications

Case Material	Metal (SGCC)
Dimensions*	73.50mm x 185.00mm x 40.00/39.00mm (W x D x H)
Weight	680g (Typ.)
Cooling Method	Forced-air cooling
Fan Noise	25℃, the overall noise ≤ 60dB (measure at 0.5m)
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	perf. Criteria A
Immunity	ESD	IEC/EN 61000-4-2 Contact ±8KV/Air ±15KV	perf. Criteria A
	RS	IEC/EN 61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4 Input port: ±2KV	perf. Criteria A
	Surge	IEC/EN 61000-4-5 line to line ±1KV/line to ground ±2KV	perf. Criteria A
	CS	IEC/EN61000-4-6 3Vrms	perf. Criteria A
	Voltage dips, interruption	IEC/EN61000-4-11 0%, 70%	perf. Criteria B

Functional requirements of black box

General requirements of black box	1. It is necessary to 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 9", the next line is written to "record 0"). 2. Support the host to query fault records one by one, Support the host to query the latest input power failure time. 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. If the host is not timed, the time in the power supply is equivalent to the entire cumulative time of power supply work.
Storage and reading mechanism of black box records	Described from the time dimension, it is divided into the following stages: 1. Power-up initialization stage After powering on, read the historical fault of the EEPROM record into the cache, and the time is initialized to the last fault record plus 3 seconds. 2. Fault site storage stage The upper computer timings the power time (10min/time), when the output is turned off, the enabling fault record

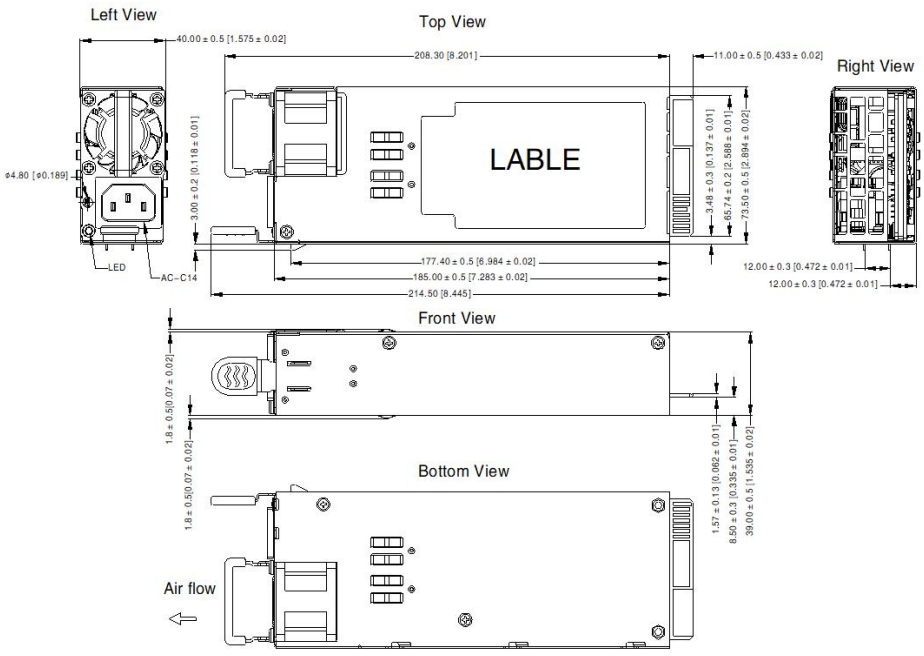
<table>
<tr><td></td><td colspan="5">mark writes all the fault scene data to the EEPROM to generate a fault record.
3. Fault data reporting stage
When the upper computer queries the alarm log, each time a single query is made, the lower computer takes the corresponding data from the EEPROM storage area and uploads it all to the upper computer.</td></tr>
<tr><td rowspan="3">Black box reading protocol</td><td>Command</td><td>Name of the command</td><td>Data reading type</td><td>Data bytes</td><td>Description of the order</td></tr>
<tr><td>D2h</td><td>MFR_READ_BLACK_BOX</td><td>Block Read</td><td>100</td><td>Power supply black box query,
Reading: multi-byte (fault record information, you need to write the fault index before reading, 0-9, 0 is the latest record. 9 is the earliest record)</td></tr>
<tr><td>D3h</td><td>MFR_READ_BLACK_BOX_INDEX</td><td>Write Byte</td><td>1</td><td>Write: single byte (request to read the index of the fault record)</td></tr>
<tr><td>System timing mechanism in the black box</td><td colspan="5">The power module needs to be time synchronized through host:
1) Product: -- Synchronization
-- Time to send the power module every 10 minutes
-- The time to send is in seconds
2) Power supply: -- The initialization time of one power on is equal to the last failure time +3 seconds
-- Time synchronization of accepting products
-- Interrupt timing, every 1second, the counter is increased by 1, and the time unit is seconds
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.</td></tr>
<tr><td>Black box data content</td><td colspan="5">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 100 bytes of data.</td></tr>
</table>

Gold-finger Definition

Output Terminal	Definition	Output Terminal	Definition
A1-A9	SGND	B1-B9	SGND
A10-A18	+12V	B10-B18	+12V
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

Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



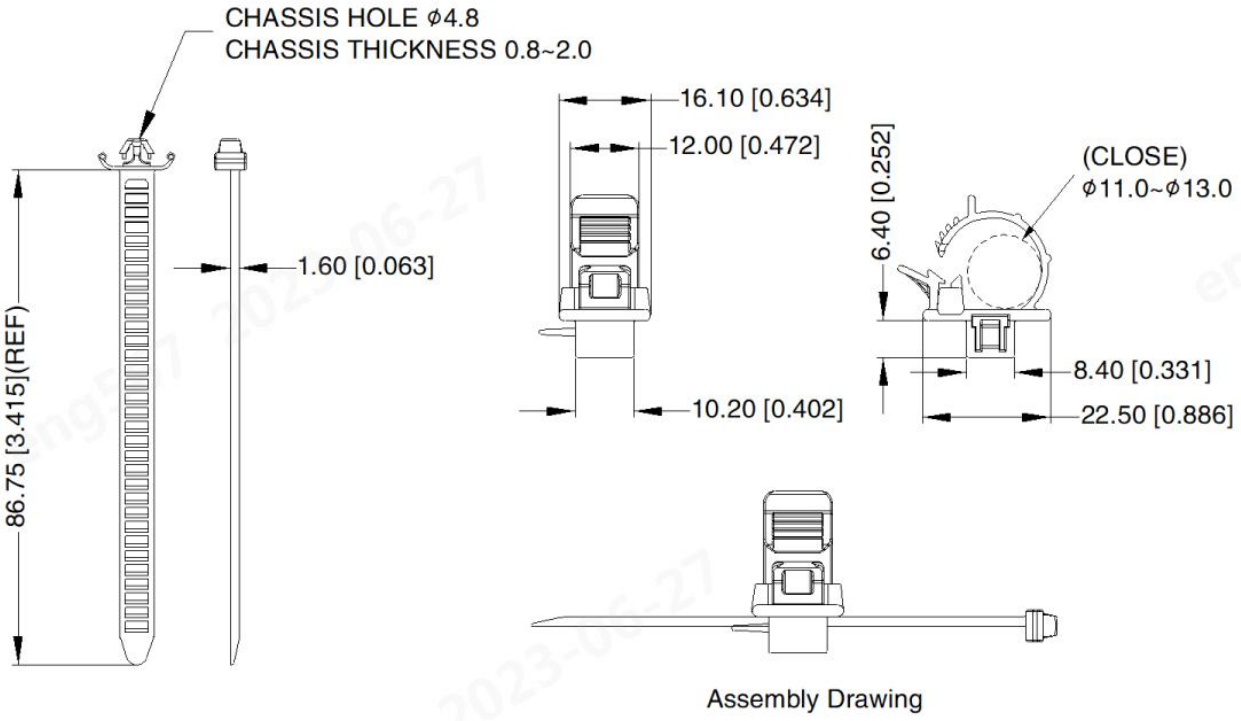
AC-C14 Pin-Out		Picture
Pin	Mark	
1	AC(L)	
2	⏚	
3	AC(N)	

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

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