AC/DC 450W Enclosed Switching Power Supply

LM450-12Dxx Series

MORNSUN®

RoHS

FEATURES

- Universal 176 - 285VAC or 240 - 400VDC Input voltage
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range: -40℃ to +85℃
- High efficiency, low ripple & noise
- AC_OK, DC_OK function
- High I/O isolation test voltage up to 3000VAC
- Output short circuit/over-current/over-voltage protection, input under-voltage/over-voltage protection, over-temperature protection
- Operating altitude up to 3000m
- Safety according to EN62368, GB4943
- 3 years warranty

LM450-12Dxx series is one of Mornsun's enclosed AC-DC switching power supply. The converts feature universal AC input and at the same time accepts DC input voltage, cost-effective, low no load power consumption, high efficiency, high reliability and double or reinforced insulation. The converters offer excellent EMC performance and meet IEC/EN61000-4, CISPR32/EN55032, EN62368, GB4943 standards.

Selection Guide

Part No.*	Cooling Method	Output Power (W)	Nominal Output Voltage and Current		Efficiency at 230VAC (%) Typ.	Max. Capacitive Load (uF)	
			Vo1/Io1	Vo2/Io2		Vo1	Vo2
LM450-12D2809-50	Add heat sink	451	28V/14.5A	9V/5A	92	2200	3500
LM450-12D3209-50		451.4	32V/12.7A	9V/5A	92	1800	3500
LM450-12D4809-50		453	48V/8.5A	9V/5A	92	1100	3500

Note: 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	Rated input (Certified voltage)		200	--	240	VAC
	AC input		176	--	285	
	DC input		240	--	400	VDC
Input Voltage Frequency	Rated input (Certified voltage)		50	--	60	Hz
			47	--	63	
Input Current	Rated input (Certified voltage)		--	--	6	A
	230VAC		--	--	6	
Inrush Current	230VAC	Cold start	--	30	35	
Start-up Delay Time	230VAC, rated load		--	--	1.5	s
Input Fuse	Built-in fuse		--	12.5	--	A
Input Under-voltage Protection	Under-voltage protection start(Input voltage drops from high to low), each output with 50% Io		145	--	165	VAC
	Under-voltage protection release(Input voltage rises from low to high), each output with 50% Io		160	--	175	
Input Over-voltage Protection	Under-voltage protection start (Input voltage rises from low to high), each output with 50% Io		286	--	305	
	Under-voltage protection release (Input voltage drops from high to low), each output with 50% Io		275	--	295	
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions			Min.	Typ.	Max.	Unit
Output Voltage Accuracy	Full load range	28V/32V/48V		--	±1	±2	%
		9V		--	±2	±3	
Line Regulation	Rated load	28V/32V/48V		--	--	±1	
		9V		--	--	±2	
Load Regulation	0% - 100% load	28V/32V/48V		--	--	±1.5	
		9V		--	--	±2	
Minimum Load				0	--	--	
Ripple & Noise*	20MHz bandwidth (peak-peak value)	28V	200-285VAC	--	--	200	mV
		32V		--	--	230	
		48V		--	--	250	
		9V		--	--	150	
Temperature Coefficient				--	±0.02	--	%/℃
Hold-up Time	230VAC, rated load			--	15	--	ms
Short Circuit Protection	Recovery time <3s after the short circuit disappear.			Hiccup or turn-off, continuous, self-recover			
Over-current Protection	＜200VAC			⩾110% Io, hiccup, self-recover			
	⩾200VAC			⩾130% Io, hiccup, self-recover			
Over-voltage Protection	28V			⩽40VDC (Hiccup, self-recover)			
	32V			⩽50VDC (Hiccup, self-recover)			
	48V			⩽60VDC (Hiccup, self-recover)			
Over-temperature Protection				hiccup, self-recover after over-temperature fault elimination			

Note: *The "parallel cable" method is used for ripple and noise test, output parallel 47uF electrolytic capacitor and 0.1uF ceramic capacitor, please refer to Enclosed Switching Power Supply Application Notes for specific information.

General Specifications

Item		Operating Conditions		Min.	Typ.	Max.	Unit
Isolation*	Input - ⏚	Electric strength test for 1min., leakage current <5mA (Before testing the isolation and insulation resistance, remove the ϕ4 screw ①)		1500	--	--	VAC
	Input - output			3000	--	--	
	Output - ⏚			500	--	--	
Insulation Resistance*	Input - ⏚	Ambient temperature: 25 ± 5℃ Relative humidity: < 95%RH, no condensation Test voltage: 500VDC		100	--	--	MΩ
	Input - output			100	--	--	
	Output - ⏚			100	--	--	
Operating Temperature				-40	--	+85	℃
Storage Temperature				-45	--	+85	
Operating Humidity		Non-condensing		--	--	95	%RH
Storage Humidity				--	--	95	
Power Derating		Operating temperature derating (Without aluminum plate)	-40℃ to -25℃	2.67	--	--	%/℃
			+55℃ to +70℃	3.33	--	--	
			+70℃ to +85℃	1.33	--	--	
Leakage Current		240VAC, 60Hz	Input - ⏚	⩽3.5mA			
			Input - output	⩽0.25mA			
Safety Standards				Design refer to EN62368-1, GB4943.1			
Safety Class				CLASS I			
MTBF		MIL-HDBK-217F@25℃		⩾300,000 h			
Warranty		Ambient temperature: <85℃		3 years			

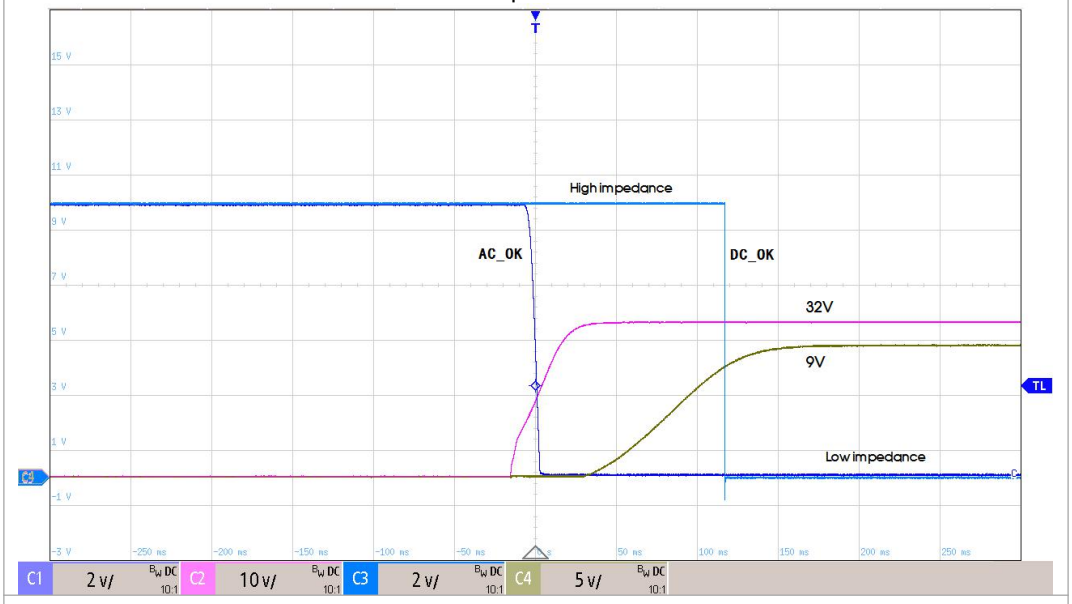
Note:
1. The power derating curve is the test installed with 450mm x 450mm x 3mm aluminum heat sink. The specific derating specifications need to be adjusted based on actual conditions after customer tests.
2. "The built-in gas discharge tube in the device can effectively protect the power supply and prevent damage from asymmetric interference variables (e.g.

EN61000-4-5). Each continuous voltage test of the power supply will cause a very high load on the power supply. Therefore, cause test 1 should be avoided the test voltage is too high and causes unnecessary load or damage to the power supply. Disconnect the device's built-in gas discharge tube if necessary to use a higher test voltage. Reconnect the gas discharge tube after successful completion of the test.

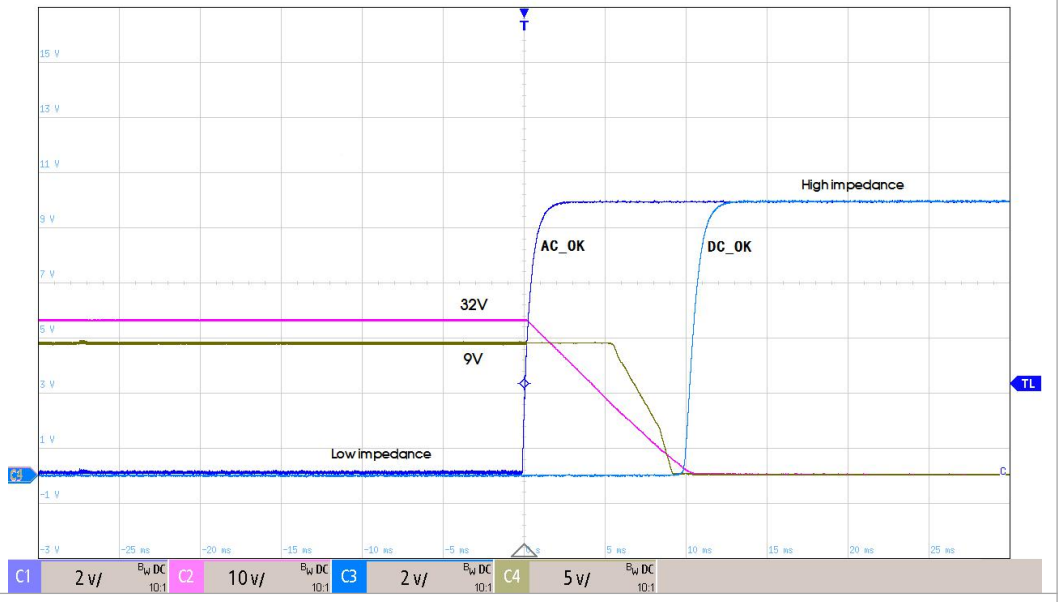
Functional Specifications

Item	Operating Conditions		Standard			
LED Signal	Output status indication	Normal output	Green on			
		Abnormal output, protected	Light off			
		Power off (AC without Input)				
DC_OK Signal	Input abnormal alarm signal delay (AC normal input Low impedance, AC abnormal input high impedance)		--	--	500	ms
AC_OK Signal	9V abnormal alarm signal delay (DC normal output Low impedance, DC abnormal output high impedance)		--	--	500	ms
AC_OK and DC_OK sequence diagram using LM450-12D3209-50 as an example	Test conditions: Tc=25C, Vin-230VAC, rated load, AC_OK/DC_OK signal terminal is connected to 10VDC voltage source through 4.3KΩ resistor, and the test point is AC_OK/DC_OK signal terminal.					

Power-on sequence waveform:



Power-off sequence waveform:



Note: The AC_OK, DC_OK signal end allows the external voltage <40V and the inflow current <10mA.

Environmental Characteristics

Item	Operating Conditions	Standard
Low Temperature Working	-40℃	GB2423.1, IEC60068-2-1
High Temperature Working	+85℃	GB2423.2, IEC60068-2-2
High Temperature Aging	+55℃, full load	GB2423.2, IEC60068-2-2
Normal Temperature Aging	+25℃, full load	GB2423.1, IEC60068-2-1
Sinusoidal Vibration	10-500Hz, 5g, three direction of X, Y, Z axis	GB2423.10, IEC60068-2-6
Temperature Cycle	-25℃ to +55℃	GB2423.22, IEC60068-2-14
Hot And Humid	+85℃, 85%RH	GB2423.50, IEC60068-2-67
Low Temperature/Low-pressure Synthetical Test	-25℃, 54KPa	GB2423.25, IEC60068-2-40
High Temperature/Low-pressure Synthetical Test	+55℃, 54KPa	GB2423.26, IEC60068-2-41

General Specifications

Case Material	Metal (AL5052, SGCC)
Dimensions	240.00mm x 81.00mm x 40.00mm
Weight	730g (Typ.)
Cooling Method	Windless environment, add surface heat sink (refer to the installation diagram)

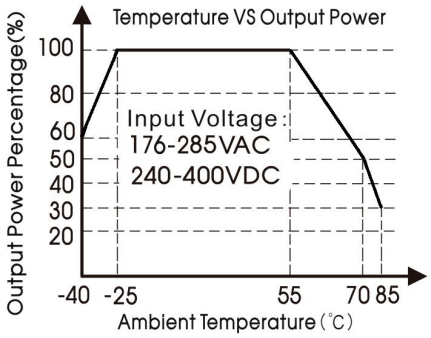
Electromagnetic Compatibility (EMC)

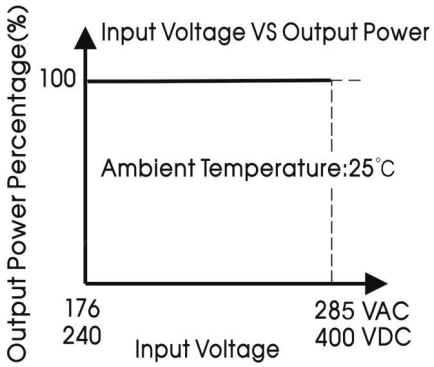
Emissions	CE (Input port)	CISPR32/EN55032 150K - 30MHz		CLASS A
	RE	CISPR32/EN55032 30MHz - 1GHz		CLASS A
	Voltage flicker	EN61000-3-3		--
Immunity	ESD	IEC/EN61000-4-2 Contact ±8KV/Air ±8KV		perf. Criteria A
	RS	IEC/EN61000-4-3 3V/m		perf. Criteria A
	EFT (Input port)	IEC/EN61000-4-4 ±2KV		perf. Criteria A
	Surge (Input port)	IEC/EN61000-4-5 line to line ±2KV/line to PE ±4KV		perf. Criteria A
		IEC/EN61000-4-5 line to line/line to PE 5KA (5 times)		perf. Criteria A
	CS	IEC/EN61000-4-6 0.15 - 80MHz, 3Vr.m.s		perf. Criteria A
	Voltage variation*	IEC61000-6-2/IEC61000-4-11	70% Un, 25/30 cycle(50/60Hz) 40% Un, 10/12 cycle(50/60Hz) 0% Un, 1 cycle	perf. Criteria B
	Voltage interruption*	IEC61000-6-2/IEC61000-4-11	0% Un, 250/300 cycle(50/60Hz)	perf. Criteria C

Note:

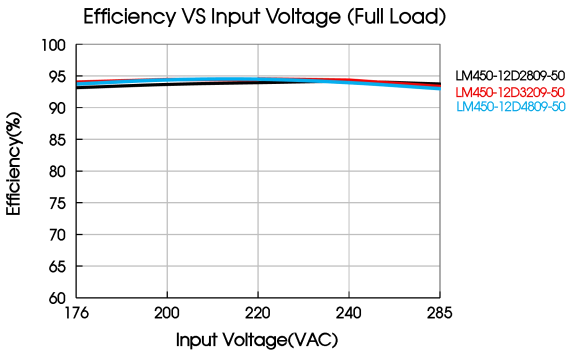
1. perf. Criteria:
   A: The equipment shall continue to operate as intended without operator intervention;
   B: After the test, the equipment shall continue to operate as intended without operator intervention;
2. This power supply does not meet the harmonic current requirements specified in EN61000-3-2.
   Please do not use this power supply under the following conditions:
   (1) The terminal equipment is used in the European Union.
   (2) Supporting terminals are connected to a public power grid with 220VAC or a higher voltage that comply with the requirements of EN61000-3-2.
   (3) The power supply is installed in terminal equipment with average or continuous input power greater than 75W.
   (4) The power supply belong to a part of lighting system.
   Exception: The power supply used in the following terminal equipment does not need to meet EN61000-3-2.
   (1) Professional equipment with a total rated input power greater than 1000W.
   (2) Symmetrically controlled heating element with a rated power less than or equal to 200W.
3. If no harmonic current is required or customers can solve harmonic current problems by themselves, this product can be used.
4. *Un is the maximum input nominal voltage.

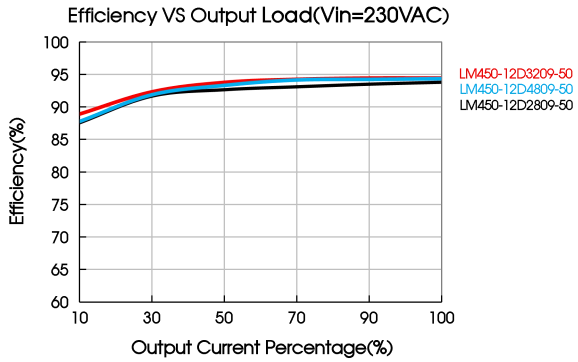
Product Characteristic Curve



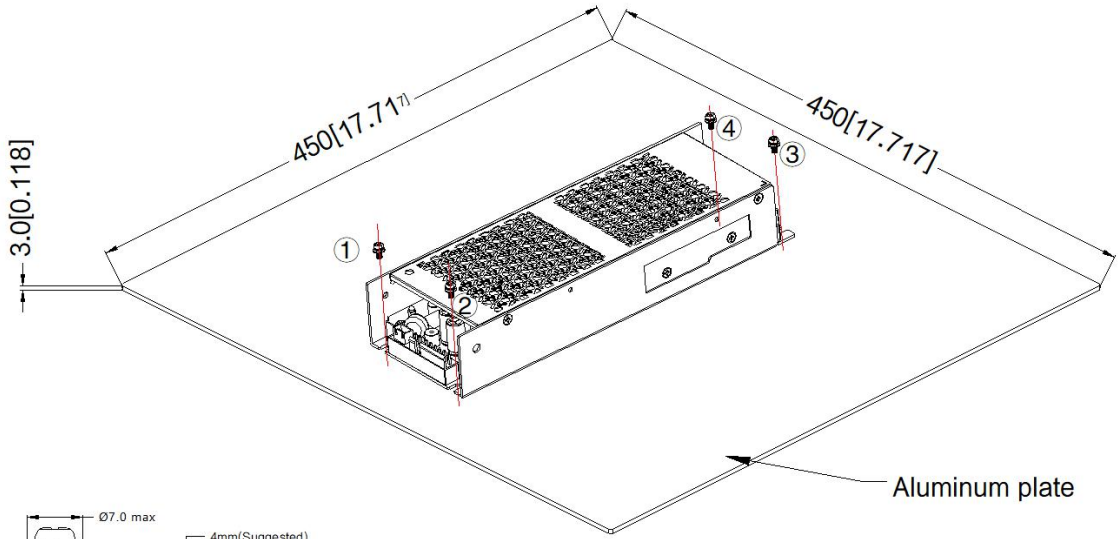


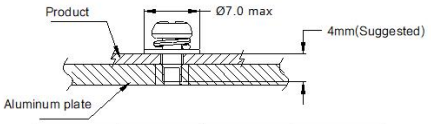
Note: This product is suitable for applications using natural air cooling; The surface must be attached to the aluminum plate of the chassis for heat dissipation, for applications in closed environment please consult Mornsun FAE.





Installation Diagram

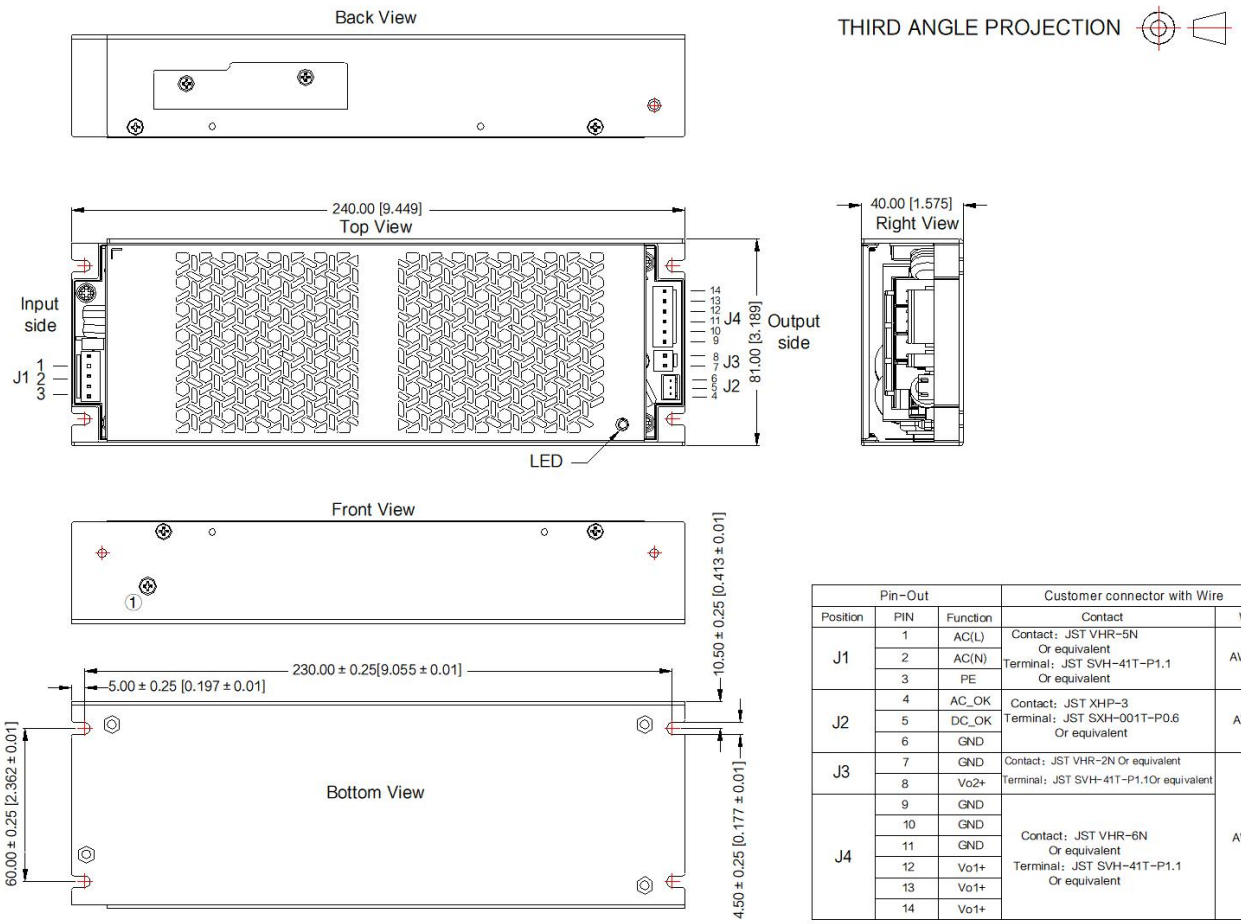




Position	Screw Spec.	L(Suggested)	Torque(max)
① – ④	M3	5MM	0.4N • m

Note: 1. In order to meet the "Derating Curve", the product testing must be installed onto an aluminum plate. The size of the suggested aluminum plate is shown as above. And for optimizing thermal performance, it is necessary to apply thermal grease on the bottom of the product.
2. It is suggested to install the product with M3 x 5 combination screws, and the product must be firmly installed at the center of the aluminum plate.

Dimensions and Recommended Layout



Pin-Out			Customer connector with Wire	
Position	PIN	Function	Contact	Wire spec
J1	1	AC(L)	Contact: JST VHR-5N Or equivalent Terminal: JST SVH-41T-P1.1 Or equivalent	AWG#18~16
	2	AC(N)		
	3	PE		
J2	4	AC_OK	Contact: JST XHP-3 Terminal: JST SXH-001T-P0.6 Or equivalent	AWG#28~22
	5	DC_OK		
	6	GND		
J3	7	GND	Contact: JST VHR-2N Or equivalent Terminal: JST SVH-41T-P1.1Or equivalent	AWG#18~16
	8	Vo2+		
J4	9	GND	Contact: JST VHR-6N Or equivalent Terminal: JST SVH-41T-P1.1 Or equivalent	
	10	GND		
	11	GND		
	12	Vo1+		
	13	Vo1+		
	14	Vo1+		

Note:
Unit: mm[inch]
LED: Output status indicator LED
General tolerances: ± 1.00[± 0.039]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220660;
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 5℃/1000m 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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