DESCRIPTIONS 10W, AC/DC Converter



RoHS

CE Report UKCA Report

EN62368-1 BS EN62368-1

FEATURES

- Ultra-wide 85 - 528VAC and 100 - 745VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Working available with any two phases
- Operating ambient temperature range: -40℃ to +85℃
- High I/O isolation test voltage up to 4000VAC
- Multi application, flexible layout
- Output short circuit, over-current protection

APPLICATIONS

- Industrial control
- Electric power
- Instrumentation

Selection Guide

Certification	Part No*	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN/BS EN	APSW10-03	6.6W	3.3V/2000mA	70	1500
	APSW10-05	10W	5V/2000mA	77	1500
	APSW10-09		9V/1100mA	80	1000
	APSW10-12		12V/830mA	82	680
	APSW10-15		15V/670mA	82	470
	APSW10-24		24V/420mA	83	330

Note: 1. *The nominal output voltage refers to the voltage applied to the load terminal after adding external circuits.
2. *If the product is used in a severe vibration application, it needs to be glued and fixed.
3. The product picture is for reference only. For details, please refer to the actual product.

Specifications

Product Specifications	Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Specifications	Input Voltage Range	AC input	85	--	528	VAC
		DC input	100	--	745	VDC
	Input Certified Voltage Range	AC input	100	--	480	VAC
	Input Frequency		47	--	63	Hz

Input Specifications	Input Current		115VAC	--	--	0.30	A
			230VAC	--	--	0.15	
			380VAC	--	--	0.10	
	Inrush Current		115VAC	--	15	--	
			230VAC	--	30	--	
			380VAC	--	50	--	
	Leakage Current		480VAC/50Hz	0.5mA RMS Max.			
	Recommended External Input Fuse			2A, slow-blow, required (The actual use needs to be selected according to the application environment)			
	Hot Plug			Unavailable			
Output Specifications	Output Voltage Accuracy		3.3V	--	±6	--	%
		5V	0% - 10% load	--	±5	--	
			10% - 100% load	--	±4	--	
			9V/12V/15V/24V	--	±5	--	
	Line Regulation	Rated load	3.3V	--	±2	--	
			5V/9V/12V/15V/24V	--	±1.5	--	
	Load Regulation		10% - 100% load	--	±3	--	
	Ripple & Noise*		20MHz bandwidth (peak-to-peak value), 10% - 100% load	--	100	180	mV
	Temperature Coefficient			--	±0.2	--	%/℃
	Stand-by Power Consumption		230VAC input	--	--	0.30	W
			380VAC input	--	--	0.50	
	Short Circuit Protection			Hiccup, continuous, self-recover			
	Over-current Protection			≥110% Io, self-recover			
	Minimum Load*			10	--	--	%
	Hold-up Time		115VAC input	--	8	--	ms
			230VAC input	--	35	--	
			380VAC input	--	80	--	
General Specifications	Isolation	Input-output	Electric Strength Test for 1min., leakage current <5mA	4000	--	--	VAC
	Insulation Resistance	Input - output	At 500VDC	50	--	--	MΩ
	Operating Temperature			-40	--	+85	℃
	Storage Temperature			-40	--	+105	
	Storage Humidity			--	--	95	%RH
	Soldering Temperature		Wave-soldering	260 ± 5℃; time: 5 - 10s			
			Manual-welding	360 ± 10℃; time: 3 - 5s			
	Power Derating		+50℃ to +85℃	1.72	--	--	%/℃
			-40℃ to -25℃	1.33	--	--	
			85VAC - 100VAC	1.33	--	--	%/VAC
			480AVC - 528VAC	0.42	--	--	
	Safety Class			CLASS II			

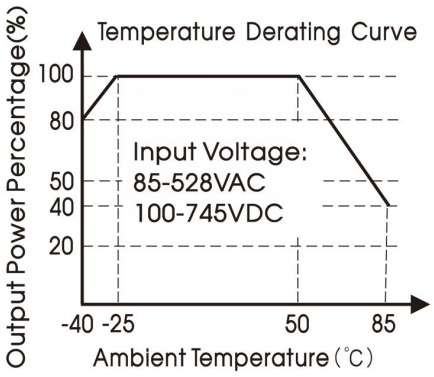
	MTBF	MIL-HDBK-217F@25℃	>500,000 h
Mechanical Specifications	Dimension	38.00 x 20.00 x 15.25 mm	
	Weight	10.0g (Typ.)	
	Cooling method	Free air convection	

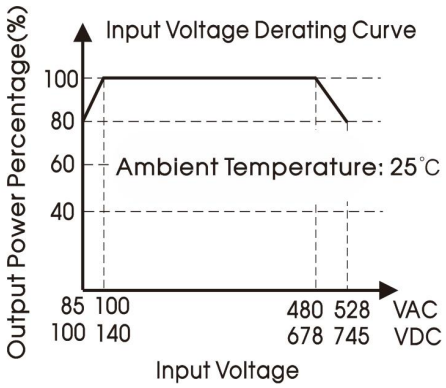
Note: 1. * The "parallel cable" method is used for ripple and noise test.
2. *The product is able to work with 0%-10% load and with stable output.

Electromagnetic Compatibility (EMC)

Electromagnetic Compatibility (EMC)	Emissions	CE	CISPR32/EN55032 CLASS A (Application circuit 1, 4, 5, 6)	
			CISPR32/EN55032 CLASS B (Application circuit 2, 3)	
		RE	CISPR32/EN55032 CLASS A (Application circuit 1, 4, 5, 6)	
			CISPR32/EN55032 CLASS B (Application circuit 2, 3)	
	Immunity	ESD	IEC/EN61000-4-2 Contact ±6KV/Air ±8KV	perf. Criteria B
		RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
		EFT	IEC/EN61000-4-4 ±2KV (Application circuit 1, 4, 6)	perf. Criteria B
			IEC/EN61000-4-4 ±4KV (Application circuit 2, 3, 5)	perf. Criteria B
		Surge	IEC/EN61000-4-5 line to line ±1KV (Application circuit 1, 2)	perf. Criteria B
			IEC/EN61000-4-5 line to line ±2KV (Application circuit 3, 4)	perf. Criteria B
			IEC/EN61000-4-5 line to line ±2KV/line to PE ±4KV (Application circuit 5)	perf. Criteria B
			IEC/EN61000-4-5 line to line ±4KV (Application circuit 6)	perf. Criteria B
		CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A
		Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11 0%, 70%	perf. Criteria B

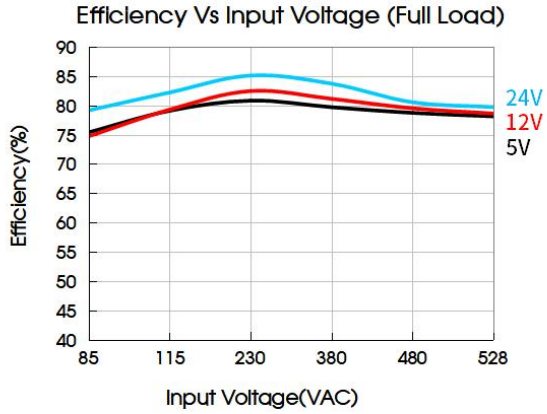
Characteristic Curve

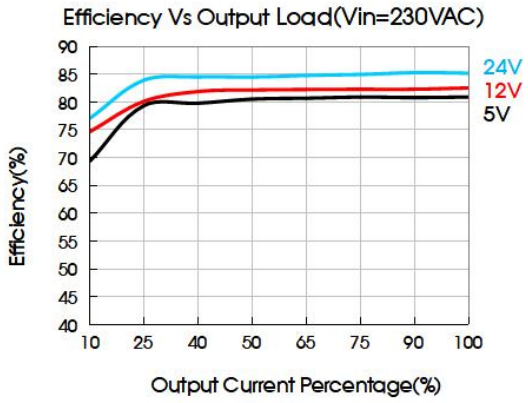




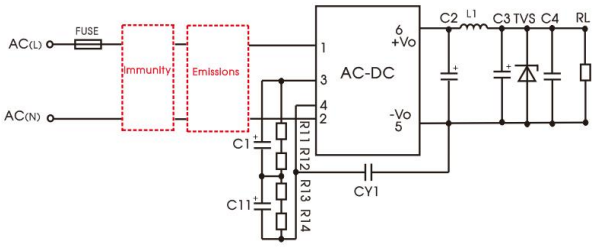
Note: ① With an AC input between 85 -100V/480-528VAC and a DC input between 100 - 140V/678-745VDC, the output power must be derated as per temperature derating curves;

② This product is suitable for applications using natural air cooling.





Additional Circuits Design Reference



APSW series additional circuits design reference

APSW10 series additional components selection guide (No EMC devices)								
Part No.	C1/C11 (required)	R11/R12/R13/R14 (SMD resistor, required)	C2 (required)	L1(required)	C3 (required)	C4	CY1 (required)	TVS
APSW10-03	47uF/400V	1MΩ/1206/(1/4W)	1500uF/6.3V (solid-state capacitor)	2.2uH/15mΩ Max/6.5A	680uF/25V	0.1uF/50V	1nF/400VAC	SMBJ7.0A
APSW10-05			820uF/16V (solid-state capacitor)		330uF/25V			
APSW10-09			470uF/16V (solid-state capacitor)		1000uF/16V			SMBJ12A
APSW10-12					330uF/25V			SMBJ20A
APSW10-15			470uF/25V (solid-state capacitor)		100uF/35V			
APSW10-24			470uF/35V					SMBJ30A

Note:

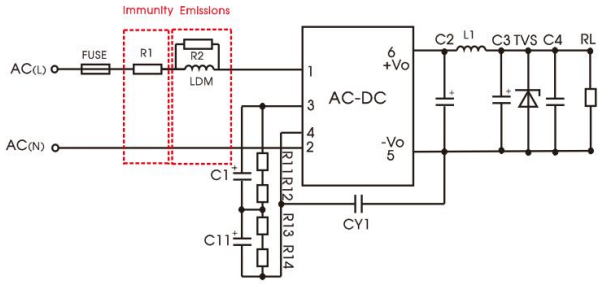
1. C1/C11 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current >200mA@100KHz. It is recommended to use electrolytic capacitor C1/C11 with ESR≤100Ω at low temperature.
2. R11, R12, R13, R14 are the voltage equalizing resistors of C1, C11 electrolytic capacitors (must be connected), and SMD anodes can be used;
3. We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of -40℃≤1.1Ω) rating for C3 (refer to manufacture's datasheet), electrolytic capacitor can be used for C2 when applied in normal and high temperature environments. Combined with C2, L1, they form a pi-type filter circuit. Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C4 is a ceramic capacitor, used for filtering high frequency noise.
4. A suppressor diode (TVS) is recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.

Environmental Application EMC Solution

APSW series environmental application EMC solution selection table						
Recommended circuit	Application environmental	Typical industry	Input voltage range	Environment temperature	Emissions	Immunity
1	Basic application	None	85 - 528VAC	-40℃ to +85℃	Class A	Level 3
2	Indoor general environment	Intelligent building/Intelligent agriculture		-25℃ to +55℃	Class B	Level 3
3	Indoor industrial environment	Manufacturing workshop		-25℃ to +55℃	Class B	Level 4
4	Outdoor general environment	ITS/Video monitoring/Charging point/Communication/Security and protection		-40℃ to +85℃	Class A	Level 4
5	Outdoor industrial environment	Electricity/Grid		-40℃ to +85℃	Class A	Level 4
6	Strong lightning surge	Electricity dedicated		-40℃ to +85℃	Class A	Level 4

Electromagnetic Compatibility Solution--Recommended Circuit

1. Application circuit 1——Basic application

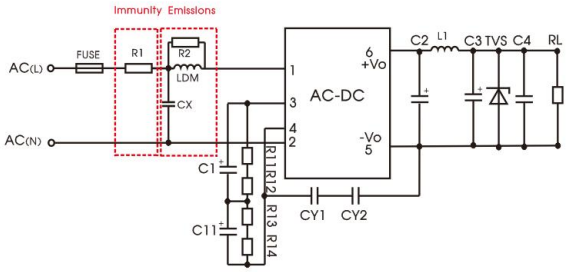


Recommended circuit 1

Application environmental	Ambient temperature range	Immunity level	Emissions class
Basic application	-40℃ to +85℃	Level 3	Class A

Component		Recommended value
FUSE		2A/500V, slow-blow, required
R1		6.8Ω/3W (wire-wound resistor, required)
R2	APSW10-03/05/12	10K/1206/(1/4W) (SMD resistor)
	APSW10-09/15/24	4.7K/1206/(1/4W) (SMD resistor)
LDM		2.2mH/Max: 4.81Ω/Min: 0.31A
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.		

2. Application circuit 2——Universal system recommended circuits for indoor general environment

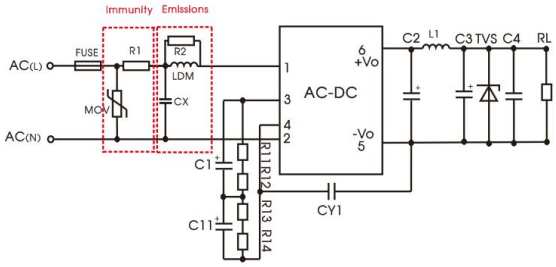


Recommended circuit 2

Application environmental	Ambient temperature range	Immunity level	Emissions class
Indoor civil /general	-25℃ to +55℃	Level 3	Class B

Component		Recommended value
R1		6.8Ω/3W (wire-wound resistor, required)
R2	APSW10-03/05/12	10K/1206/(1/4W) (SMD resistor)
	APSW10-09/15/24	4.7K/1206/(1/4W) (SMD resistor)
LDM		2.2mH/Max: 4.81Ω/Min: 0.31A
CX		0.1uF/480VAC
FUSE		2A/500V, slow-blow, required
Note 1: In the home appliance application environment, the two Y capacitors of the primary and secondary need to be externally connected (CY1/CY2, value at 2.2nF/250VAC), which can meet the EN60335 certification; Note 2: According to the certification requirements, the CX capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard; Note 3: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.		

3. Application circuit 3——Universal system recommended circuits for indoor industrial environment



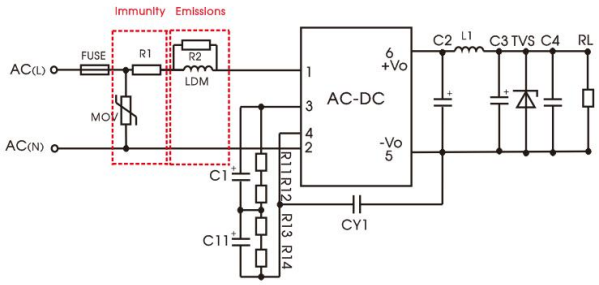
Recommended circuit 3

Application environmental	Ambient temperature range	Immunity level	Emissions class
Indoor industrial	-25℃ to +55℃	Level 4	Class B

Component		Recommended value
MOV		S14K550
CX		0.1uF/480VAC
R2	APSW10-03/05/12	10K/1206/(1/4W) (SMD resistor)
	APSW10-09/15/24	4.7K/1206/(1/4W) (SMD resistor)
LDM		2.2mH/Max: 4.81Ω/Min: 0.31A
R1		6.8Ω/3W (wire-wound resistor, required)
FUSE		2A/500V, slow-blow, required

Note 1: According to the certification requirements, the CX capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard;
Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.

4. Application circuit 4——Universal system recommended circuits for outdoor general environment

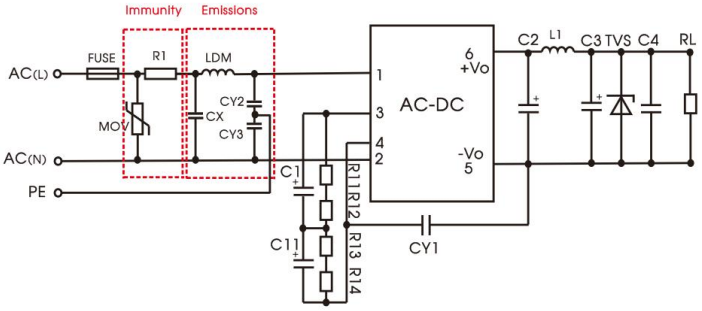


Recommended circuit 4

Application environmental	Ambient temperature range	Immunity level	Emissions class
Outdoor general environment	-40℃ to +85℃	Level 4	Class A

Component		Recommended value
MOV		S14K550
R2	APSW10-03/05/12	10K/1206/(1/4W) (SMD resistor)
	APSW10-09/15/24	4.7K/1206/(1/4W) (SMD resistor)
LDM		2.2mH/Max: 4.81Ω/Min: 0.31A
R1		6.8Ω/3W (wire-wound resistor, required)
FUSE		2A/500V, slow-blow, required
Note: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.		

5. Application circuit 5——Universal system recommended circuits for outdoor industrial environment



Recommended circuit 5

Application environmental	Ambient temperature range	Immunity level	Emissions class
Outdoor industrial environment	-40℃ to +85℃	Level 4	Class A

Component	Recommended value
MOV	S14K550
LDM	2.2mH/Max: 4.81Ω/Min: 0.31A
R1	6.8Ω/3W (wire-wound resistor, required)
CX	0.1uF/480VAC
FUSE	2A/500V, slow-blow, required
CY2/CY3	1nF/400VAC
Note 1: According to the certification requirements, the CX capacitor needs to be connected in parallel with the bleeder resistance, the recommended resistance value is less than 3.8MΩ, and the actual need to be selected according to the certification standard; Note 2: R1 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.	

6. Application circuit 6——Universal system recommended circuits for strong lightning surge environment

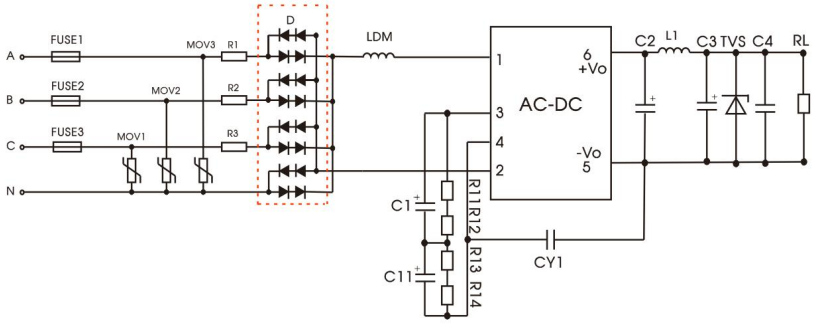


Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

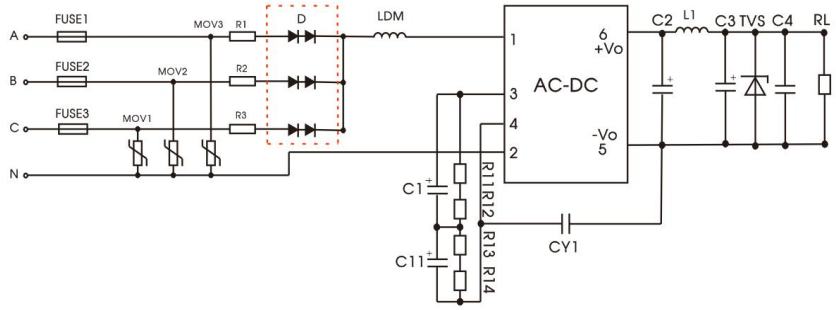
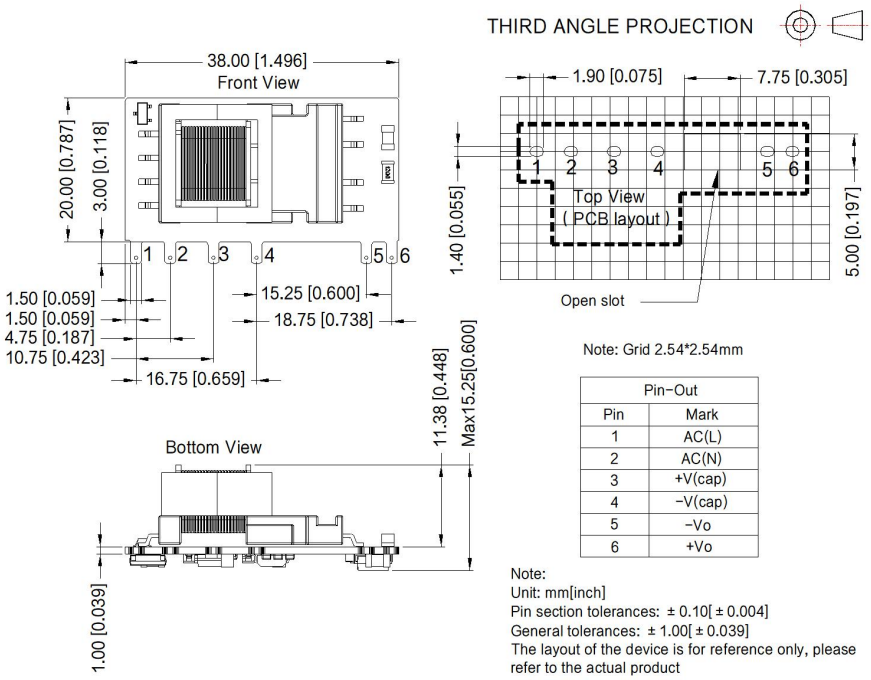


Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

Application environmental	Ambient temperature range	Immunity level	Emissions class
Strong lightning surge environment	-40℃ to +85℃	Level 4	Class A

Component	Recommended value
FUSE1/FUSE2/FUSE3	6.3A/500V, slow-blow, required
MOV1/MOV2/MOV3	S14K550
R1/R2/R3	12Ω/5W (wire-wound resistor, required)
D	2A/1000V
LDM	2.2mH/Max: 4.81Ω/Min: 0.31A
Note: R1/R2/R3 is the input plug-in resistor, this resistor needs to be a wire-wound resistor (required), please do not select SMD resistor or carbon film resistor.	

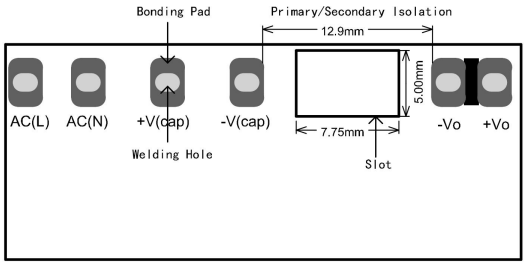
Dimensions and Recommended Layout



Pin-Out	
Pin	Mark
1	AC(L)
2	AC(N)
3	+V(cap)
4	-V(cap)
5	-Vo
6	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 1.00[± 0.039]
The layout of the device is for reference only, please refer to the actual product

Recommended pad



Note: There is a slot(non-metallic hole) between pin 4/5; For details, please refer to the recommended dimensions or pad.

Note:

1. External electrolytic capacitors are required to modules, more details refer to typical applications;
2. This part is open frame, at least 8.4 mm creepage distance between the primary and secondary external components of the module is needed to meet the safety requirement, refer to the recommended welding hole design in the external dimension drawing;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%, nominal input voltage (115V, 230V and 380V) and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.
8. The image certification marks are for reference only; please refer to the selection table for actual specifications. Certification is based on the physical mark or packaging label.