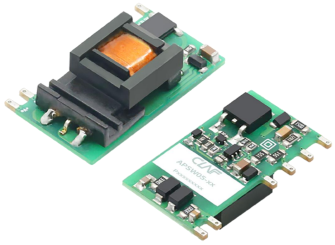
DESCRIPTIONS 5W, AC-DC Converter



RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

FEATURES

- Ultra-wide 90 - 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 (W)	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
EN/BS EN	APSW05-03	3.3W	3.3V/1000mA	70	2200
	APSW05-05	5W	5V/1000mA	72	1500
	APSW05-09		9V/560mA	72	680
	APSW05-12		12V/420mA	78	470
	APSW05-15		15V/340mA	78	330
	APSW05-24		24V/210mA	78	100

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	90	--	528	VAC
		DC input	100	--	745	VDC
	Input Frequency		47	--	63	Hz
	Input Current	115VAC	--	--	0.20	A
		230VAC	--	--	0.10	
		480VAC	--	--	0.07	
	Inrush Current	115VAC	--	10	--	
		230VAC	--	17	--	
		480VAC	--	28	--	
	Leakage Current	480VAC/50Hz	0.6mA RMS Max.			
	Recommended External Input Fuse		1A, 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	--	±3	±6	%
		5V/9V/12V/15V/24V	--	±2.5	±5	
	Line Regulation	Rated load	--	±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-recovery			
	Over-current Protection		≥120% Io, self-recovery			
	Minimum Load*		10	--	--	%
	Hold-up Time	115VAC input	--	8	--	ms
		230VAC input	--	35	--	
		380VAC input	--	100	--	
General Specifications	Isolation Input-output	Electric Strength Test for 1min., leakage current < 5mA	4000	--	--	VAC
	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	+55℃ to +85℃	2.0	--	--	%/℃
		90VAC - 110VAC	2.0	--	--	%/VAC

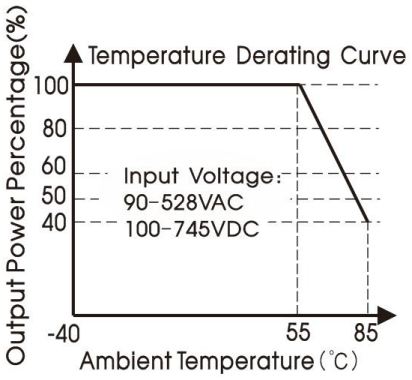
		480AVC - 528VAC	0.42	--	--	
	Safety Class		CLASS II			
	MTBF	MIL-HDBK-217F@25℃	≥500,000 h			
Mechanical Specifications	Dimension	33.50 x 17.20 x 13.00 mm				
	Weight	6.2g (Typ.)				
	Cooling method	Free air convection				

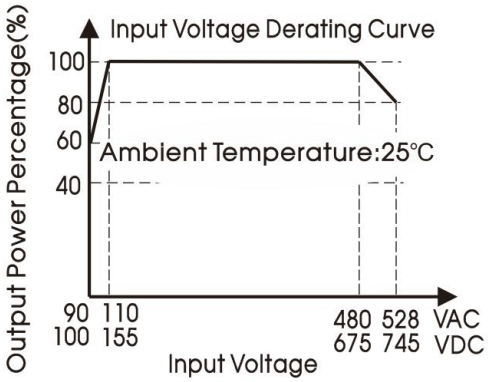
Note: 1.* The "parallel cable" method is used for ripple and noise test,
2. The product is able to work with 0% - 10% load and with stable output.

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	perf. Criteria B
		RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
		EFT	IEC/EN61000-4-4 ±2KV (Application circuit 1, 2)	perf. Criteria B
			IEC/EN61000-4-4 ±4KV (Application circuit 3, 4, 5, 6)	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

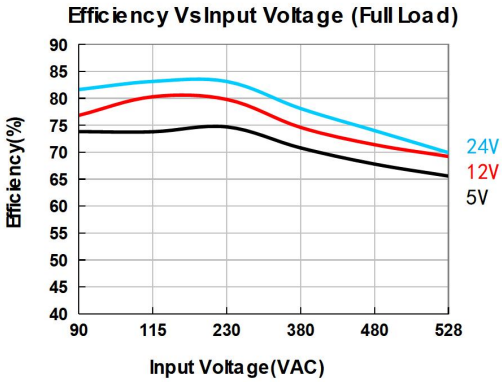
Characteristic Curve

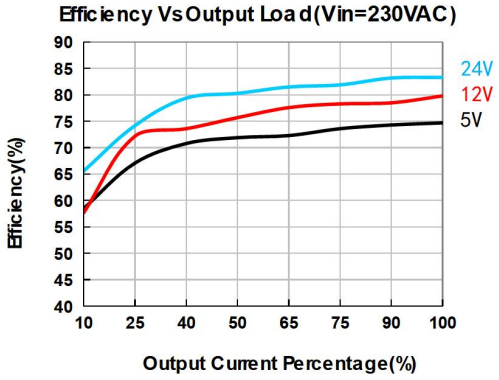




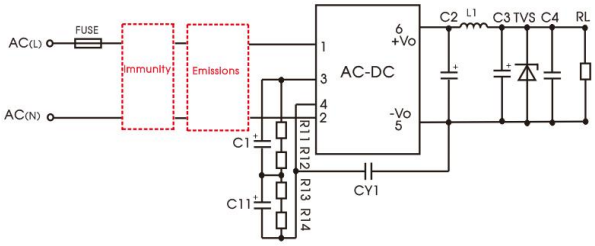
Note: ① With an AC input between 90 -110V/480-528VAC and a DC input between 100 - 155V/675-745VDC, the output power must be derated as per temperature derating curves;

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





Additional Circuits Design Reference



APSW series additional circuits design reference

APWS05 series additional components selection guide (No EMC devices)						
Part No.	C2(required)	L1(required)	C3(required)	C4	CY1(required)	TVS
APSW05-03	470uF/16V(solid-state capacitor)	2.2uH/15mΩ Max/6.5A	150uF/35V	0.1uF/50V	1.0nF/400VAC	SMBJ7.0A
APSW05-05						
APSW05-09	270uF/16V(solid-state capacitor)		100uF/35V			SMBJ12A
APSW05-12			47uF/35V			SMBJ20A
APSW05-15	220uF/35V					
APSW05-24	150uF/35V					SMBJ30A

C1/C11(required)			R11/R12/R13/R14
	-25℃ to +85℃	-40℃ to +85℃	1MΩ/1206/(1/4W) (required)
90VAC - 528VAC	33uF/400V	47uF/400V	
165VAC - 528VAC	22uF/400V	33uF/400V	
90VAC - 305VAC	C1: 10uF/450V C11: wire	C1: 22uF/450V C11: wire	--

Note:

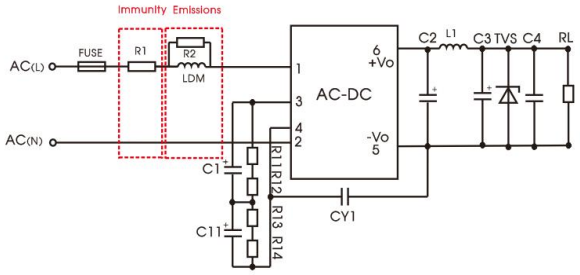
1. C1/C11 is used as filter capacitor with AC input (must be connected externally) and as EMC filter capacitor with DC input (must be connected), and it is recommended to use the capacitor with ripple current > 200mA@100KHz. It is recommended to use electrolytic capacitor C1/C11 with ESR≤100Ω at low 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	90-528VAC	-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



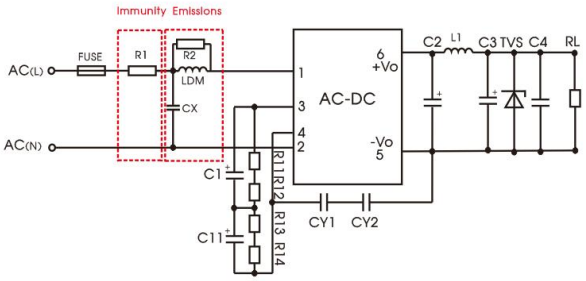
recommended circuit 1

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

FUSE (required)		1A/500V, slow-blow
R1 (wire-wound resistor, required)		12Ω/3W
R2 (SMD resistor)	APSW05-05/09	20K/1206/(1/4W)
	APSW05-03/12	2K/1206/(1/4W)
	APSW05-15/24	15K/1206/(1/4W)
LDM	APSW05-05	1.2mH/Max: 2.5Ω/Min: 0.2A
	APSW05-09	2.2mH/Max: 15Ω/Min: 0.2A

	APSW05-03/12/15/24	4.7mH/Max: 15Ω/Min: 0.2A
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

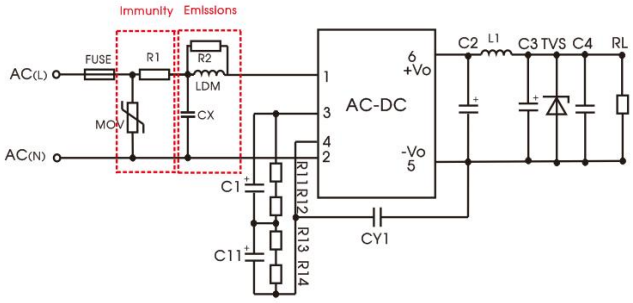


Recommended circuit 2

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

Component		Recommended value
R1 (wire-wound resistor, required)		12Ω/3W
R2 (SMD resistor)	APSW05-05/09	20K/1206/(1/4W)
	APSW05-03/12	2K/1206/(1/4W)
	APSW05-15/24	15K/1206/(1/4W)
LDM	APSW05-05	1.2mH/Max: 2.5Ω/Min: 0.2A
	APSW05-09	2.2mH/Max: 15Ω/Min: 0.2A
	APSW05-03/12/15/24	4.7mH/Max: 15Ω/Min: 0.2A
CX		0.1uF/480VAC
FUSE (required)		1A/500V, slow-blow
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); Note 2: According to the certification requirements, the X 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

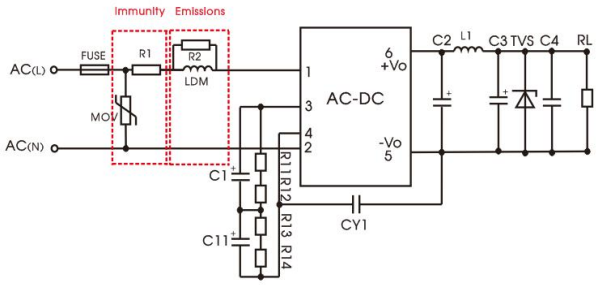


Recommended circuit 3

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 (SMD resistor)	APSW05-05/09	20K/1206/(1/4W)
	APSW05-03/12	2K/1206/(1/4W)
	APSW05-15/24	15K/1206/(1/4W)
LDM	APSW05-05	1.2mH/Max: 2.5Ω/Min: 0.2A
	APSW05-09	2.2mH/Max: 15Ω/Min: 0.2A
	APSW05-03/12/15/24	4.7mH/Max: 15Ω/Min: 0.2A
R1 (wire-wound resistor, required)		12Ω/3W
FUSE (required)		2A/500V, slow-blow
Note 1: According to the certification requirements, the X 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

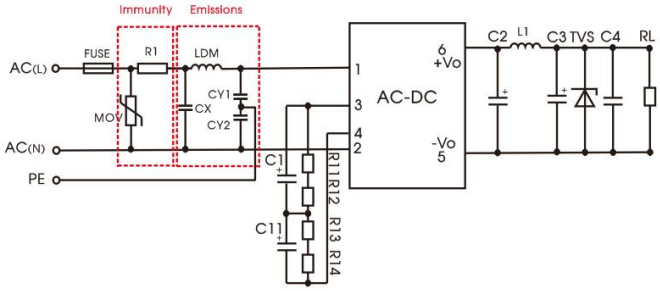


Recommended circuit 4

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 (SMD resistor)	APSW05-05/09	20K/1206/(1/4W)
	APSW05-03/12	2K/1206/(1/4W)
	APSW05-15/24	15K/1206/(1/4W)
LDM	APSW05-05	1.2mH/Max: 2.5Ω/Min: 0.2A
	APSW05-09	2.2mH/Max: 15Ω/Min: 0.2A
	APSW05-03/12/15/24	4.7mH/Max: 15Ω/Min: 0.2A
R1 (wire-wound resistor, required)		12Ω/3W
FUSE (required)		2A/500V, slow-blow
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	APSW05-05	1.2mH/Max: 2.5Ω/Min: 0.2A
	APSW05-09	2.2mH/Max: 15Ω/Min: 0.2A
	APSW05-03/12/15/24	4.7mH/Max: 15Ω/Min: 0.2A
R1 (wire-wound resistor, required)		12Ω/3W
CX		0.1uF/480VAC
FUSE (required)		2A/500V, slow-blow
CY1/CY2		1.0nF/400VAC
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.		

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

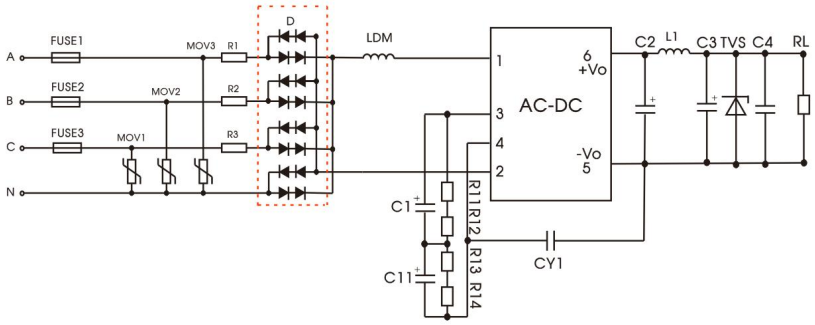


Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

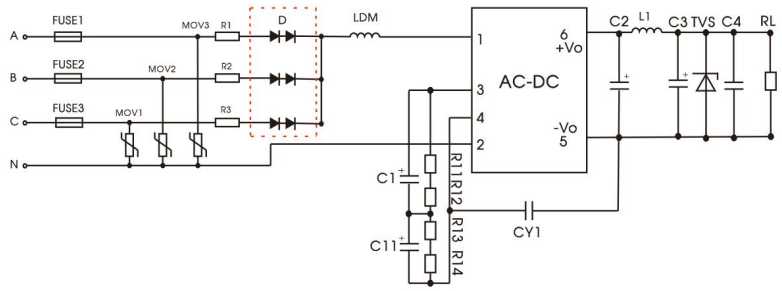
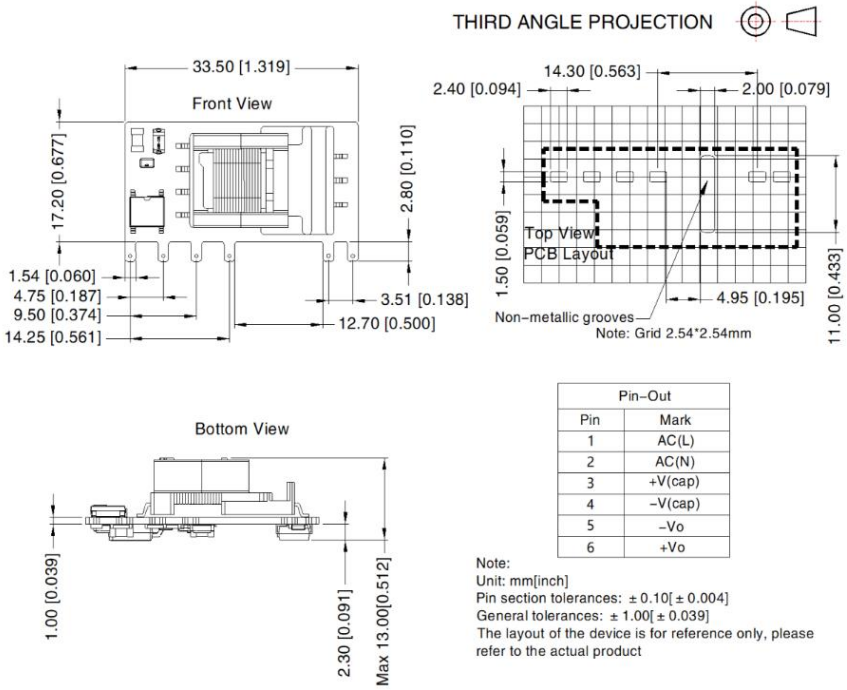


Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

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 (required)		3.15A/500V
MOV1/MOV2/MOV3		S14K550
R1/R2/R3 (wire-wound resistor, required)		12Ω/5W
D		2A/1000V
LDM	APSW05-05	1.2mH/Max: 2.5Ω/Min: 0.2A
	APSW05-09	2.2mH/Max: 15Ω/Min: 0.2A
	APSW05-03/12/15/24	4.7mH/Max: 15Ω/Min: 0.2A
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.		

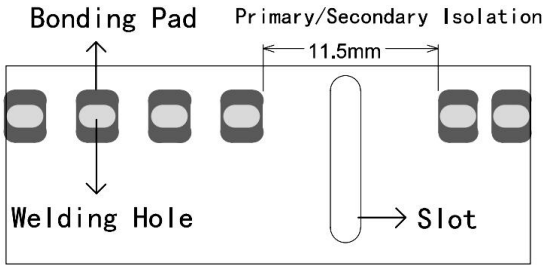
Dimensions and Recommended Layout



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 8.4mm 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.