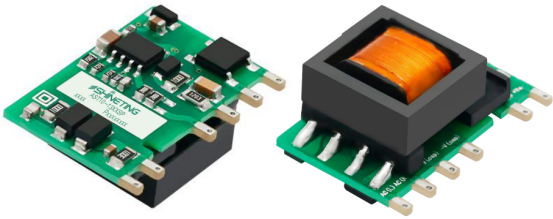


- Ultra-wide 85 - 305VAC and 90 - 430VDC input voltage range
- Accepts AC or DC input (dual-use of same terminal)
- Operating ambient temperature range: -40°C to +85°C
- Multi application, flexible layout
- Compact size, high power density, green power
- No-load power consumption as low as 0.1W
- Output short circuit, over-current protection
- Designed to meet IEC/EN61558-1, IEC/EN60335-1 standards

AST10-13XXSP



RoHS 3-Year Warranty

Description

AST10-13XXSP series feature wide input range accepting either AC or DC voltage, high reliability, low power consumption and reinforced isolation. All models are particularly suitable for industrial control, electric power, instrumentation and smart home applications which have high requirement for dimension and don't have high requirement on EMC. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
/	AST10-1303SP	6.6W	3.3V/2000mA	70	1500
	AST10-1305SP	10W	5V/2000mA	77	1500
	AST10-1309SP		9V/1100mA	80	1000
	AST10-1312SP		12V/830mA	83	680
	AST10-1315SP		15V/670mA	83	470
	AST10-1324SP		24V/420mA	84	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.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Input Voltage Range	AC input	85	--	305	VAC	
	DC input	90	--	430	VDC	
Input Frequency		47	--	63	Hz	
Input Current	115VAC	--	--	0.30	A	
	230VAC	--	--	0.15		
Inrush Current	115VAC	--	15	--		
	230VAC	--	30	--		
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

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	10% - 100% load	--	±2.5	±5	%
Line Regulation	Rated load	--	±0.75	±1.5	
Load Regulation	10% - 100% load	--	±1.5	±3	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	80	150	mV
Temperature Coefficient		--	--	±0.2	%/℃
Stand-by Power Consumption	230VAC	--	0.1	0.15	W
Short Circuit Protection		Hiccup, continuous, self-recovery			
Over-current Protection		≥110% Io, self-recovery			
Minimum Load*		10	--	--	%

Note: 1. *The “parallel cable” method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information;
2. *The product is able to work stably at load of 0% - 10%.

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output	Electric Strength Test for 1min., leakage current <5mA	3600	--	--	VAC
			5000	--	--	VDC
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		-40℃ to -25℃	1.33	--	--	% /℃
		+55℃ to +85℃	1.67	--	--	
		85VAC - 100VAC	1.33	--	--	% /VAC
		277AVC - 305VAC	1	--	--	
Safety Standard			IEC/UL62368-1 safety approved & BS EN62368-1, EN62368-1 (Report); Designed to meet IEC/EN60335-1, IEC/EN61558-1 standards			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25℃ >1,000,000 h			

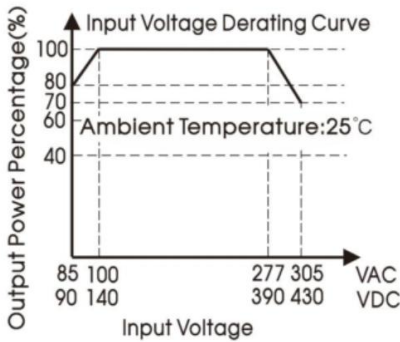
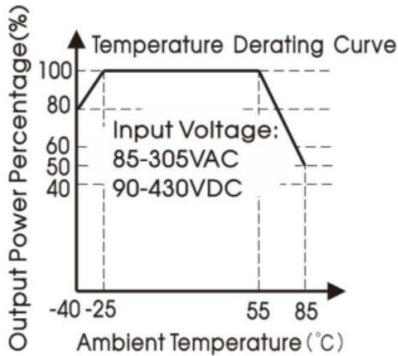
Mechanical Specifications

Dimension	28.84 x 17.20 x 14.05 mm
Weight	8.2g (Typ.)
Cooling method	Free air convection

Mechanical Specifications

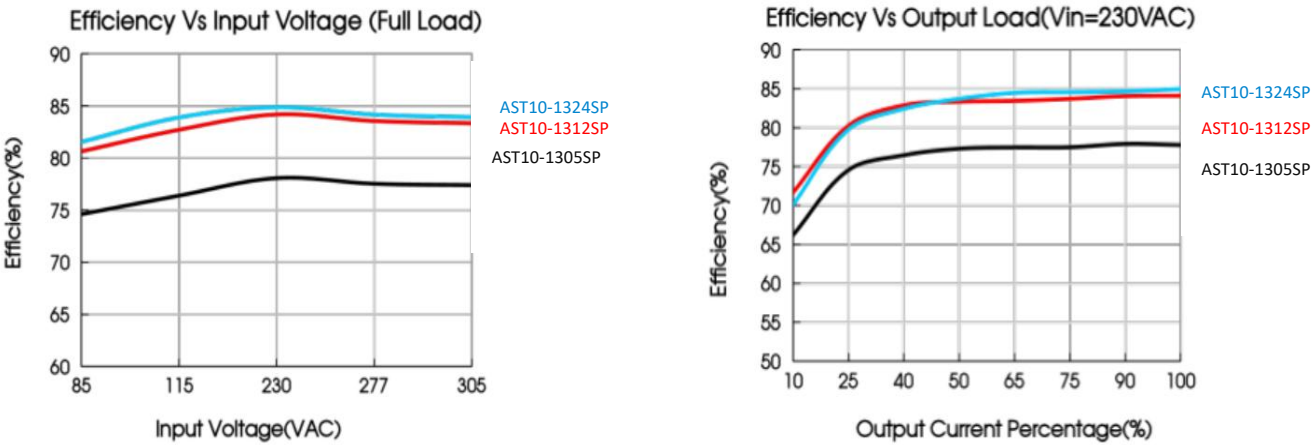
Emissions	CE	CISPR32/EN55032 CLASS A (Application circuit 1, 4)
		CISPR32/EN55032 CLASS B (Application circuit 2, 3)
	RE	CISPR32/EN55032 CLASS A (Application circuit 1, 4)
		CISPR32/EN55032 CLASS B (Application circuit 2, 3)
Immunity	ESD	IEC/EN61000-4-2 Contact ±6KV perf. Criteria B
	RS	IEC/EN61000-4-3 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) 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
	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

Product Characteristic Curves

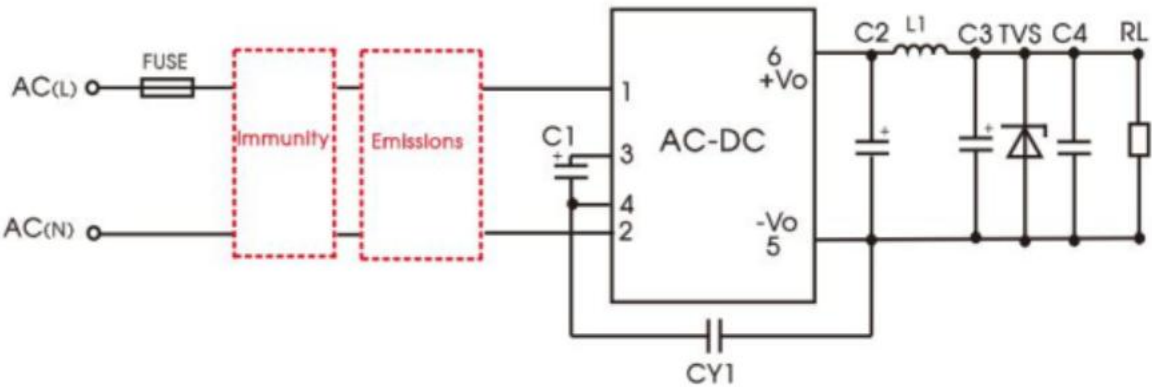


Note:
① With an AC input between 85 - 100VAC/277 - 305VAC and a DC input between 90 - 140VDC/390 - 430VDC, the output power must be derated as per temperature derating curves;

Product Characteristic Curves



Additional Circuits Design Reference



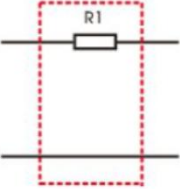
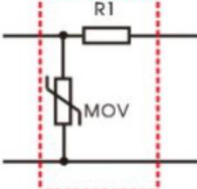
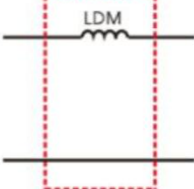
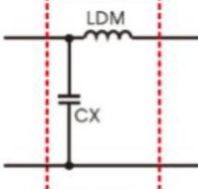
AST series additional circuits design reference

AST10 series additional components selection guide (No EMC devices)							
Part No.	C1(required)	C2 (required)	L1 (required)	C3 (required)	C4	CY1(required)	TVS
AST10-1303SP	22uF/450V	1500uF/6.3V (solid-state capacitor)	2.2uH/15m Ω Max/6.5A	330uF/25V	0.1uF/50V	1nF/400VAC	SMBJ7.0A
AST10-1305SP		820uF/16V (solid-state capacitor)					SMBJ12A
AST10-1309SP		470uF/16V (solid-state capacitor)		150uF/35V			SMBJ20A
AST10-1312SP		470uF/35V		220uF/35V			SMBJ30A
AST10-1315SP				47uF/50V			
AST10-1324SP							

- Note:
- 1. C1 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 >300mA@100KHz.
 - 2. We recommend using an electrolytic capacitor with high frequency and low ESR (ESR of C3 at low temperature of $-40^{\circ}\text{C}\leq 1.1\Omega$) 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.
 - 3. 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.

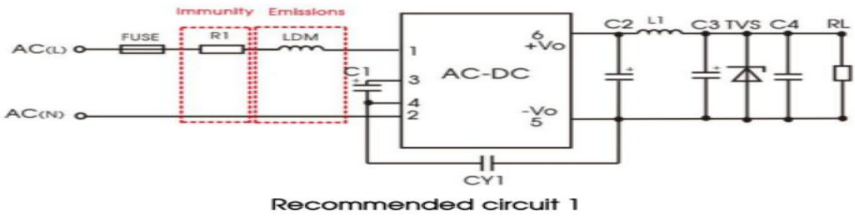
Environmental Application EMC Solution

AST 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 - 305VAC	-40℃ to +85℃	Class A	Level 3
2	Indoor civil environment	Smart home/Home appliances (2Y)		-25℃ to +55℃	Class B	Level 3
	Indoor general environment	Intelligent building/Intelligent agriculture		-25℃ to +55℃	Class B	Level 4
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

Immunity design circuits for reference		Emissions design circuits for reference	
Level 3	Level 4	Class A	Class B
			

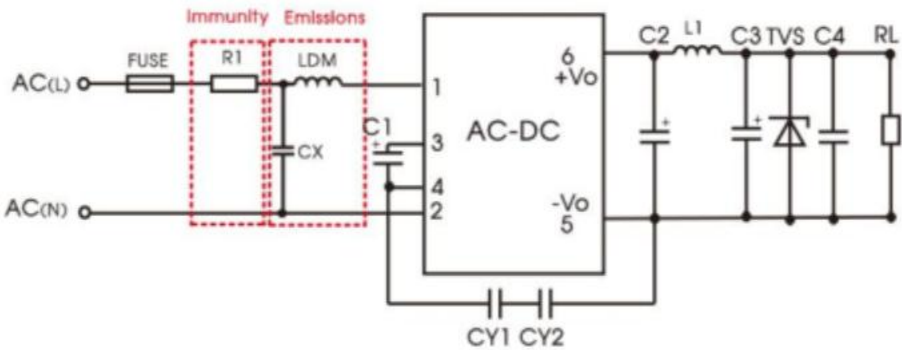
Electromagnetic Compatibility Solution--Recommended Circuit

1.Application circuit 1——Basic application



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

2. Application circuit 2——Indoor civil /Universal system recommended circuits for general environment



Recommended circuit 2

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

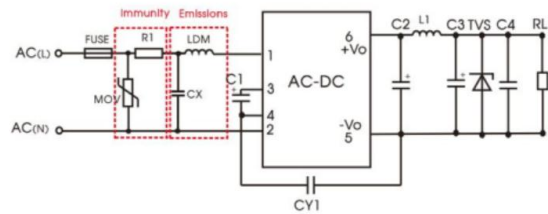
Component	Recommended value
FUSE (required)	1A/300V, slow-blow
R1 (wire-wound resistor, required)	6.8 Ω/3W
CY1(CY2)	1nF/400VAC
LDM	1.2mH/Max: 2.5 Ω/Min: 0.35A
CX	0.1uF/310VAC

Note 1: To meet the IEC/EN60335 certification, 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

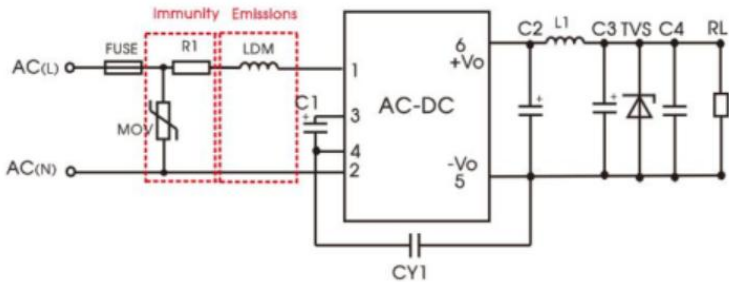
Application environmental	Ambient temperature range	Immunity Level	Emissions Class
Indoor industrial	-25℃ to +55℃	Level 4	Class B

Component	Recommended value
FUSE (required)	2A/300V, slow-blow
MOV	S14K350
CY1	1nF/400VAC
CX	0.1uF/310VAC
LDM	1.2mH/Max: 2.5Ω/Min: 0.35A
R1 (wire-wound resistor, required)	6.8Ω/3W

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/harsh environment



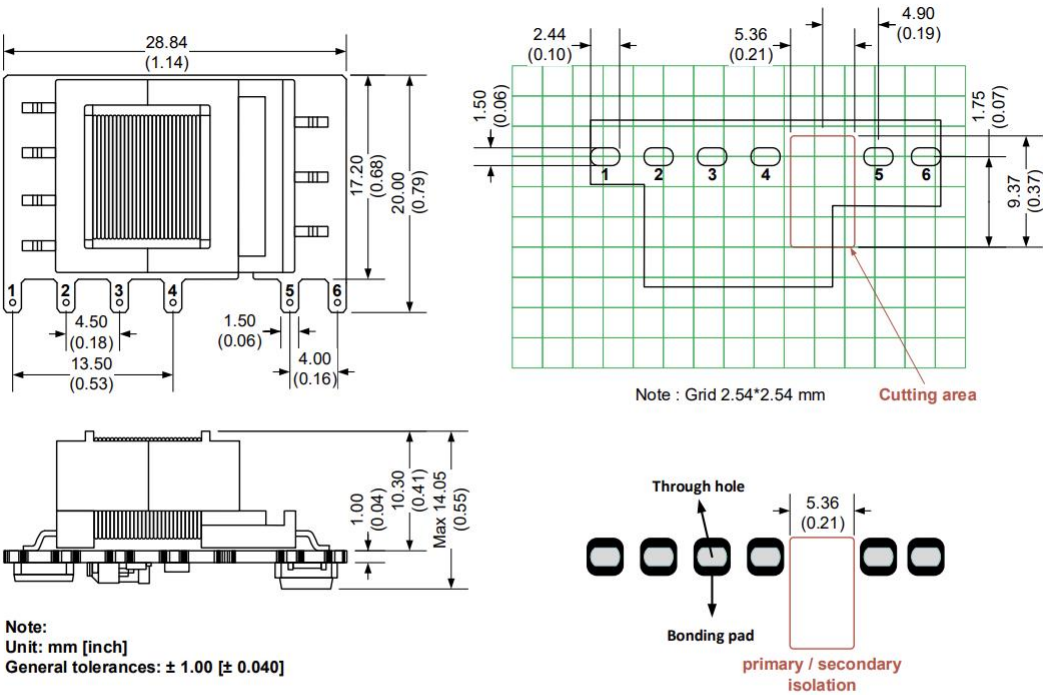
Recommended circuit 4

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

Component	Recommended value
FUSE (required)	2A/300V, slow-blow
MOV	S14K350
LDM	1.2mH/Max: 2.5Ω/Min: 0.35A
R1 (wire-wound resistor, required)	6.8Ω/3W

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.

Dimensions and Recommended Layout



Pin Output Specifications	
Pin	Function
1	+V Input (L)
2	-V Input (N)
3	+V_Cap
4	-V_Cap
5	-V Output
6	+V Output

1. It is necessary to add C1 between pin3 to pin4
2. It is necessary to add circuit to the output as shown in recommended circuit
3. The layout of the device is for reference only, please refer to the actual product
4. The slots between pin 4 and pin 5 are required for creepage distance consideration.
5. For primary and secondary side external components, >6.4mm creepage is required.

Note

1. External electrolytic capacitors are required to modules, more details refer to typical applications;
2. This part is open frame, at least 6.4mm creepage distance between the primary and secondary external components of the module is needed to meet the safety requirement;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25°C, humidity<75%, recommended circuit, nominal input voltage (115V and 230V) 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. If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer;