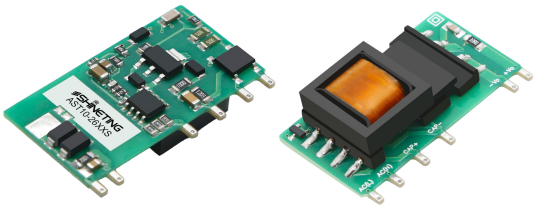
AC/DC Converter

- 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

AST10-26XXS



RoHS

3 YEAR WARRANTY

3-Year Warranty

Description

AST10-26XXS 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 applications which have high requirement for dimension. 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 230 VAC (%) Typ.	Capacitive Load (uF) Max.
/	AST10-2603S	6.6W	3.3V/2000mA	70	1500
	AST10-2605S	10W	5V/2000mA	77	1500
	AST10-2609S		9V/1100mA	80	1000
	AST10-2612S		12V/830mA	82	680
	AST10-2615S		15V/670mA	82	470
	AST10-2624S		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.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
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 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

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	3.3V	--	±6	--	%
	5V 0% - 10% load	--	±5	--	
	5V 10% - 100% load	--	±4	--	
	9V/12V/15V/24V	--	±5	--	

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Line Regulation	Rated load 3.3V	--	±2	--	%
	Rated load 5V/9V/12V/15V/24V	--	±1.5	--	
Load Regulation	10% - 100% load	--	±3	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value),	--	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		≥110% Io, self-recovery			
Minimum Load*		10	--	--	%
Hold-up Time	115VAC input	--	8	--	ms
	230VAC input	--	35	--	
	380VAC input	--	80	--	

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 with 0%-10% load and with stable output.

General Specifications

Item		Operating Conditions	Min.	Typ.	Max.	Unit
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 Standard			BS EN/EN62368-1 (Report) Safety Approval; Design refer to IEC/UL62368-1, IEC/EN62477-1, EN61010-1			
Safety Class			CLASS II			
MTBF			MIL-HDBK-217F@25℃ >500,000 h			

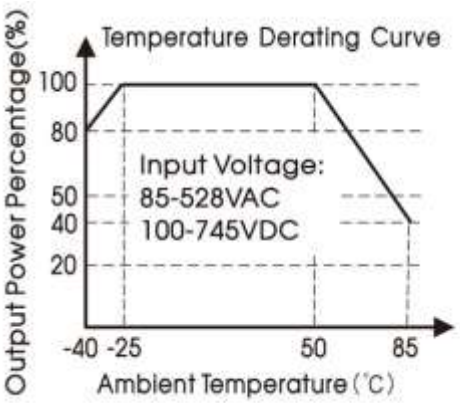
Mechanical Specifications

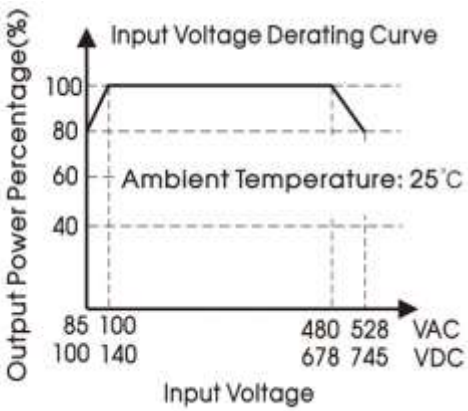
Dimension	38.00 x 20.00 x 15.25 mm
Weight	10.0g (Typ.)
Cooling method	Free air convection

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%

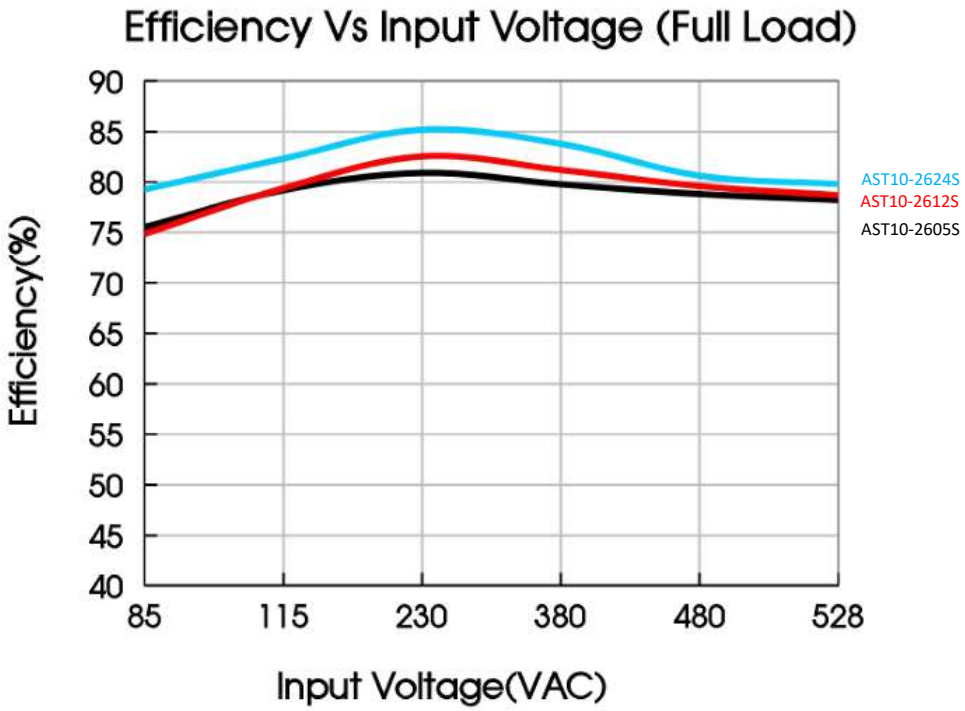
Product Characteristic Curves

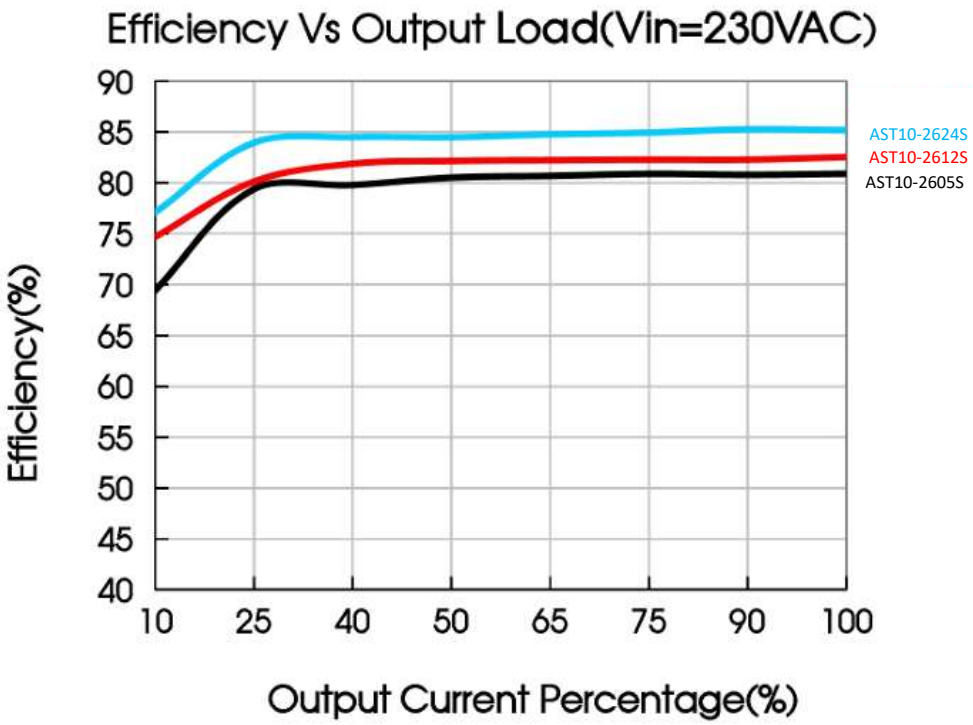




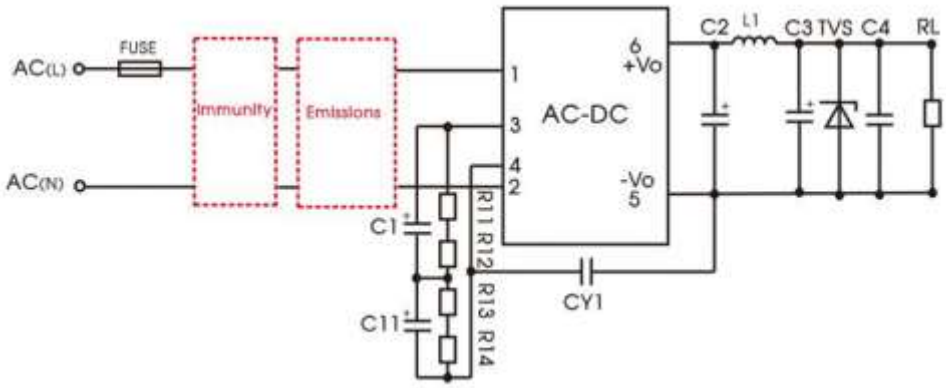
Note: ① With an AC input between 85 -100V/480-528VAC and a DC input between 100 - 140V/678-745VDC, the output power must be derated as per temperature derating curves;

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/C11 (required)	R11/R12/R13/R14 (SMD resistor, required)	C2 (required)	L1(required)	C3 (required)	C4	CY1 (required)	TVS
AST10-2603S	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
AST10-2605S			820uF/16V (solid-state capacitor)		330uF/25V			
AST10-2609S			470uF/16V (solid-state capacitor)		1000uF/16V			SMBJ12A
AST10-2612S					330uF/25V			SMBJ20A
AST10-2615S			470uF/25V (solid-state capacitor)		100uF/35V			
AST10-2624S			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.

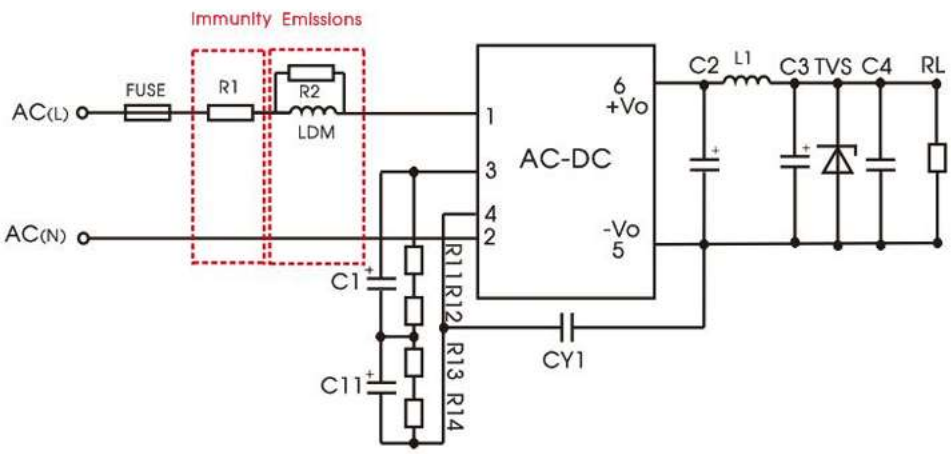
4. A suppressor diode (TVS) is recommended to protect the application in case of converter failure and specification should be 1.2 times of the output voltage.

Environmental Application EMC Solution

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 - 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



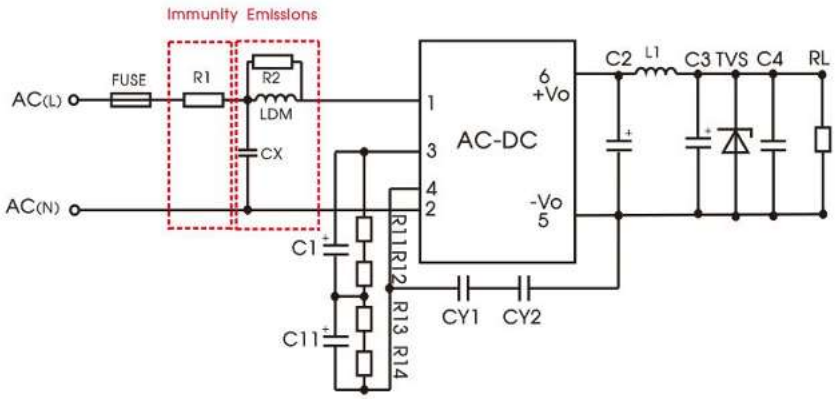
Recommended circuit 1

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	**AST10-2603/05/12S**	**10K/1206/(1/4W) (SMD resistor)**
	AST10-2609/15/24S	**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.		

Electromagnetic Compatibility Solution--Recommended Circuit

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



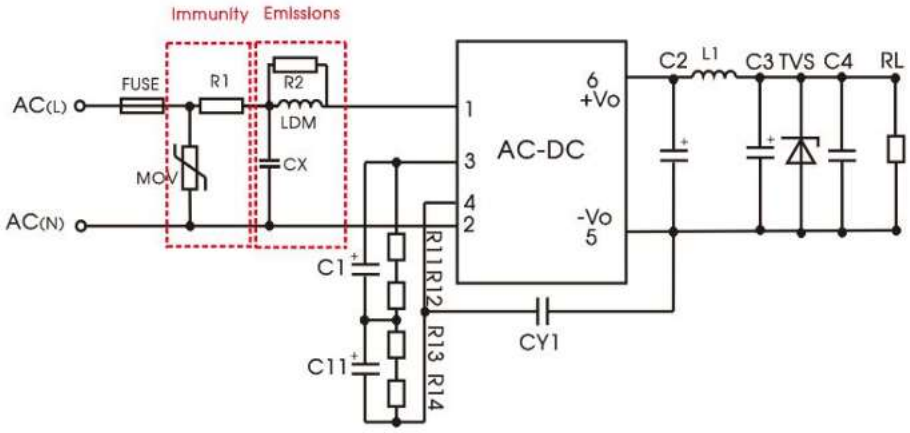
Recommended circuit 2

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	AST10-2603/05/12S	10K/1206/(1/4W) (SMD resistor)
	AST10-2609/15/24S	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



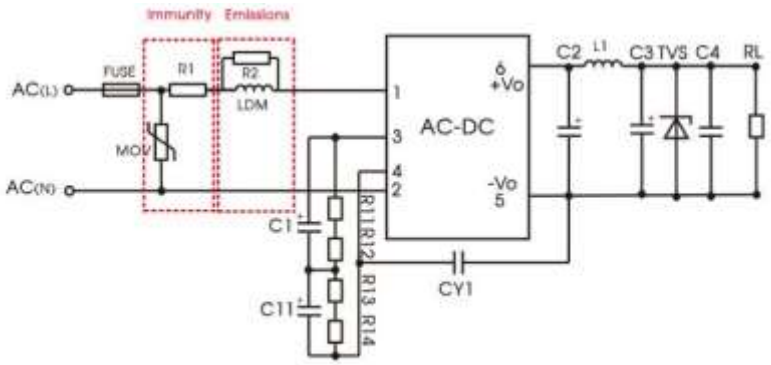
Recommended circuit 3

Electromagnetic Compatibility Solution--Recommended Circuit

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	AST10-2603/05/12S	10K/1206/(1/4W) (SMD resistor)
	AST10-2609/15/24S	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



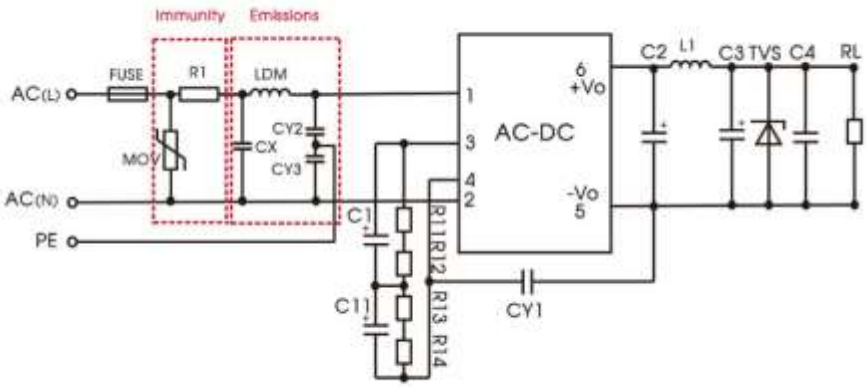
Recommended circuit 4

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	AST10-2603/05/12S	10K/1206/(1/4W) (SMD resistor)
	AST10-2609/15/24S	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.		

Electromagnetic Compatibility Solution--Recommended Circuit

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

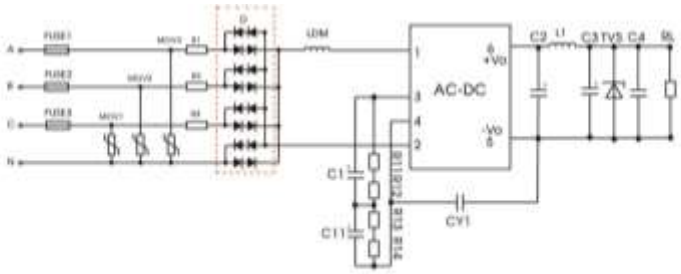


Fig. (1): Recommended circuit for applications which require 4KV differential-mode surge standard (full-wave rectification)

Electromagnetic Compatibility Solution--Recommended Circuit

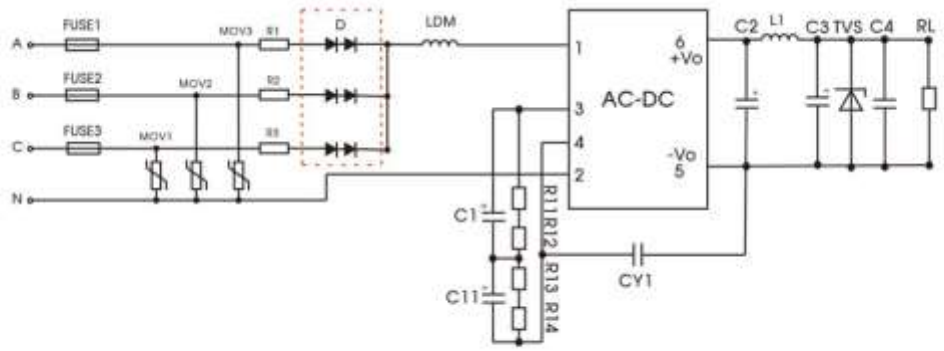


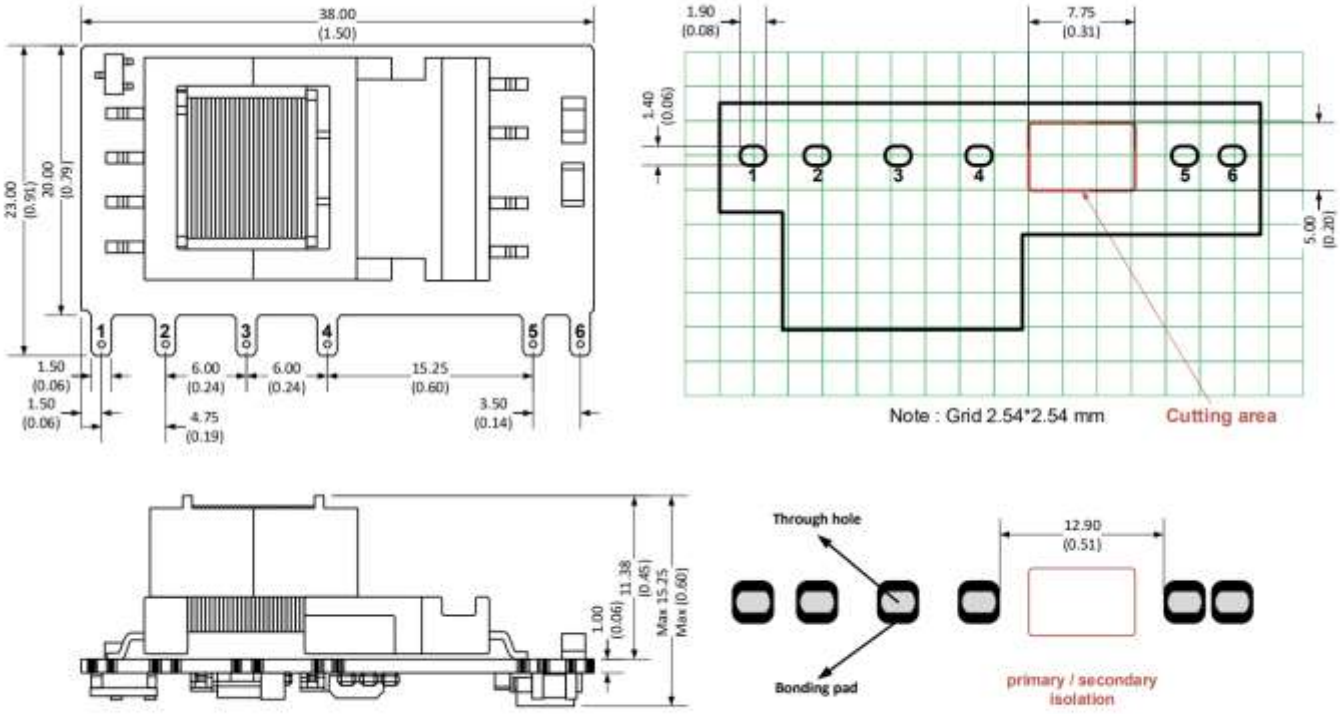
Fig. (2): Recommended circuit for applications which require 4KV differential-mode surge standard (half-wave rectification)

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

AST10-xxyyS series dimensions



Note:
Unit: mm [inch]
General tolerances: ± 1.00 [± 0.040]

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

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. If product involves multi-brand materials and there are differences in color etc, please refer to the standards of each manufacturer.