Typical Features

- ◆ Wide input voltage range 85-528VAC/100-745VDC
- ◆ No load power consumption ≤0.65W@230VAC
- ◆ Efficiency 78%(Typ.) @230VAC
- ◆ Operating temperature from -40°C to +85°C
- ◆ Switching Frequency 65KHz (Typ.)
- ◆ Short circuit & over-current protections
- ◆ Isolation voltage 4000VAC
- ◆ Altitude during operation 4000m Max
- ◆ PCB SIP mounting

Application Field

DA5-380SXXGA9N4 series *--- Mini size open frame AC-DC power supplies with ultra-wide input voltage (both AC and DC available), low ripple, low temperature rise, low standby power consumption, high efficiency, high reliability & safety isolated. This series of products can be widely used in the fields of industry, office devices, electric power and household devices, etc. The additional EMC circuit diagram is recommended in this data sheet for the application with higher EMC requirement.*

Typical Product List

Certificate	Part No.	Output Specifications			Capacitive Load @230VAC	Ripple & Noise 20MHz	Efficiency @ Full Load/230VAC
		Power	Voltage	Current			
		(W)	Vo(V)	Io(mA)	u F (Max)	mVp-p (Max)	% (Typ.)
-	*DA5-380S3V3GA9N4	3.3	3.3	1000	1000	100	68
	DA5-380S05GA9N4	5	5	1000	1000	100	71
	DA5-380S12GA9N4	5	12	416	500	100	78
	DA5-380S15GA9N4	5	15	333	500	100	78
	DA5-380S24GA9N4	5	24	208	300	150	80

Note 1 - The typical value of efficiency is based on the product tested after half an hour burn-in at full load, the minimum efficiency could be -2% of the typical value.

Note 2 - The ripple and noise should be tested by the twisted pair method with the external circuit. Please refer to the following Ripple & Noise Test Instruction.

Note 3 - Please contact Aipu sales for other output voltage requirement in this series but not listed in this table.

Note 4 - The * marked part has been developed in process.

Input Specifications

Item	Operating Condition	Min	Typ.	Max	Unit
Input Voltage Range	AC input	85	230	528	VAC
	DC input	100	325	745	VDC
Input Frequency Range	-	47	50	63	Hz

Input Current	115VAC	-	-	0.30	A
	230VAC	-	-	0.20	
Surge Current	115VAC	-	-	15	
	230VAC	-	-	20	
No-load power consumption	Input 230VAC	-	-	0.65	W
	Input 380VAC	-	-	0.80	
External fuse		1.0A/500VAC, Time-delay fuse (necessary)			
Leakage current	-	0.25mA TYP / 230VAC/50HZ			
Hot-plug	-	NA			
Remote Control	-	NA			

Output Specifications

Item		Operating Condition		Min.	Typ.	Max.	Unit
Voltage Accuracy		Full input voltage range,10-100% load (Stable output @0-10% load)	5V	-	±2.0	±8.0	%
			Others	-	±2.0	±5.0	%
Line Regulation		Rated Load		-	-	±1.5	%
Load Regulation		Nominal input voltage, 10%~100% load		-	-	±6.0	%
Minimum Load		Single Output		10	-	-	%
Turn-on Delay Time		Input 230VAC（full load）		-	500	-	mS
Power-off Hold up Time		Input 230VAC（full load）		-	200	-	mS
Dynamic Response	Overshoot range	25%~50%~25% 50%~75%~50%		-5.0	-	+5.0	%
	Recovery time			-	-	5.0	mS
Output Over-shoot		Full input voltage range		≤10%Vo			%
Short circuit protection				Continuous, self-recovery			Hiccup
Drift Coefficient		-		-	±0.03%	-	%/℃
Over Current Protection		Input 230VAC		≥110% Io, self-recovery			Hiccup
Ripple & Noise		-		-	-	150	mV

General Specifications

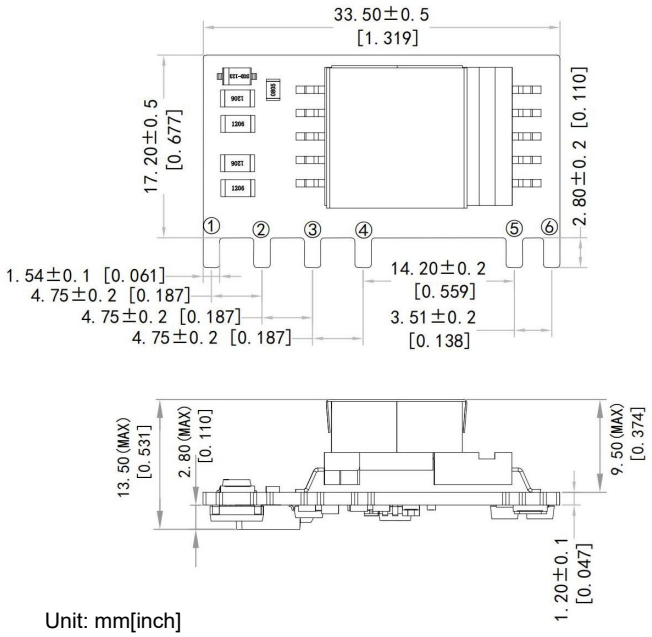
Item	Operating Condition	Min.	Typ.	Max.	Unit
Switching Frequency	-	60	65	70	KHz
Operating Temperature	Refer to the Temperature Derating Graph	-40	-	+85	℃
Storage Temperature	-	-40	-	+105	
Soldering Temperature	Wave-soldering	260±4℃，Time 5-10S			
	Manual-soldering	360±8℃，Time 4-7S			

Relative Humidity	-	10	-	90	%RH
Isolation Voltage	Input-Output, Test 1min, leakage current ≤5mA	4000	-	-	VAC
Insulation Resistance	Input-Output, @ DC500V	100	-	-	MΩ
Vibration	-	10-55Hz,10G, 30 Min, along X,Y,Z			
MTBF	-	MIL-HDBK-217F 25℃＞300,000H			
Unit weight	-	7g (Typ.)			

EMC Performance

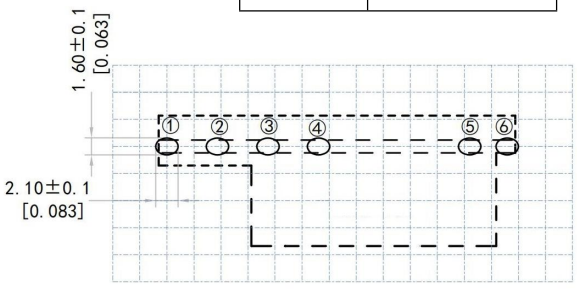
Total Item		Sub Item	Test Standard	Performance/Class
EMC	EMI	CE	CISPR22/EN55022	CLASS B (with the Recommend Circuit 2,3)
		RE	CISPR22/EN55022	CLASS B (with the Recommend Circuit 2,3)
	EMS	ESD	IEC/EN 61000-4-2	Contact ±6KV / Air ±8KV Perf. Criteria B (with the Recommend Circuit 3, 4, 5, 6)
		RS	IEC/EN 61000-4-3	10V/m Perf. Criteria B (with the Recommend Circuit 3, 4, 5, 6)
		EFT	IEC/EN 61000-4-4	±2KV Perf. Criteria B (with the Recommend Circuit 3, 4, 5, 6)
			IEC/EN 61000-4-4	±4KV Perf. Criteria B (with the Recommend Circuit 3, 4, 5, 6)
		Surge	IEC/EN 61000-4-5	Line to line ±2KV / line to ground ±4KV Perf. Criteria B (with Recommend Circuit 3, 4, 5, 6)
		CS	IEC/EN61000-4-6	10 Vr.m.s Perf. Criteria B (with the Recommend Circuit 3, 4, 5, 6)

Mechanical Dimensions



Unit: mm[inch]
The components layout is only for reference, any deviation from the actual unit should be accepted.

Pin No.	Function
1	AC(L)
2	AC(N)
3	+V(CAP)
4	-V(CAP)
5	-Vout
6	+Vout



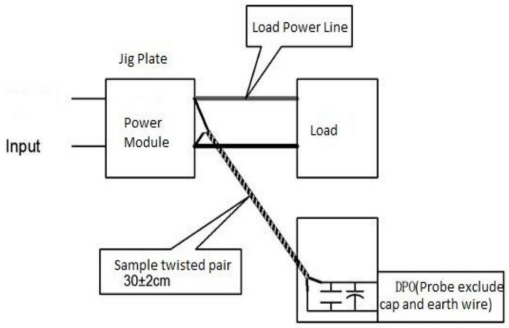
PCB layout vertical view

Grid 2.54x2.54[0.10x0.10]

Package Code	Dimensions (L x W x H)	
-	33.50 X 20.00 X 13.50 mm	1.319 X 0.787 X 0.531 inch

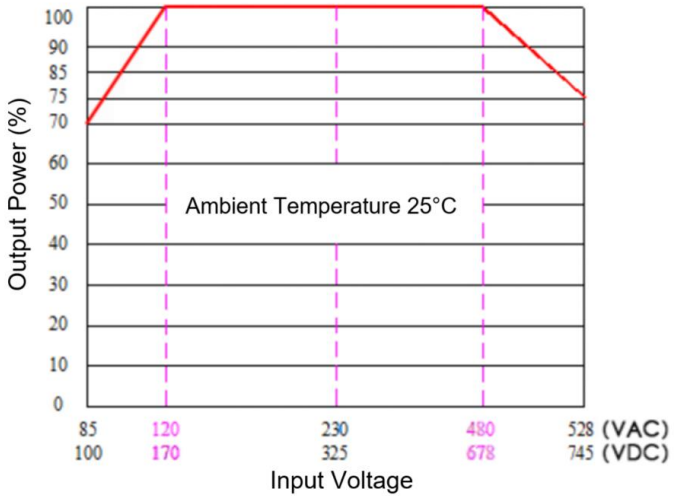
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHz Bandwidth)

1) The Ripple & noise test need 12# twisted pair cables, an oscilloscope which bandwidth should be set to 20MHz, 0.1uF polypropylene capacitor and 10uF high-frequency low-resistance electrolytic capacitors are connected in parallel with the probes (100M bandwidth). The oscilloscope should be set at the Sample Mode.
2) The test diagram is shown on the right. The converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the location is as close as possible to the output pins or terminals. The test can be start after input power on.

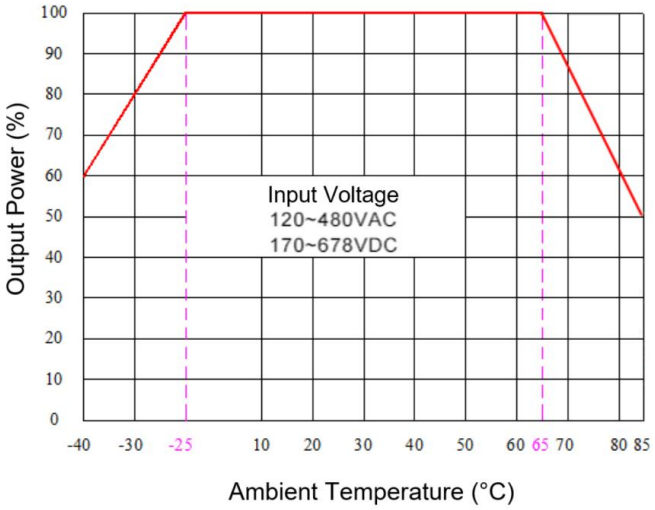


Product Characteristics Graphs

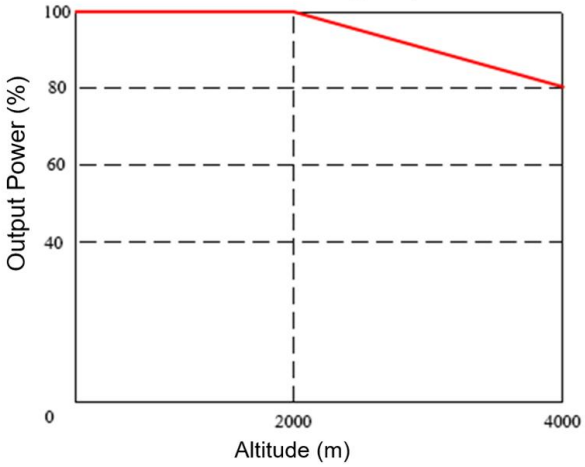
Input Voltage Derating Graph



Temperature Derating Graph



Altitude Derating Graph



Note 1 - The output power should be derated based on the input voltage derating graph at 85~120VAC/480~528VAC & 100~170VDC/678~745VDC.

Note 2 - This product should operate at natural air condition, please contact us if it need be used at a closed space.

Recommended Circuits Diagrams for Application

1. Typical Application Circuit Diagram

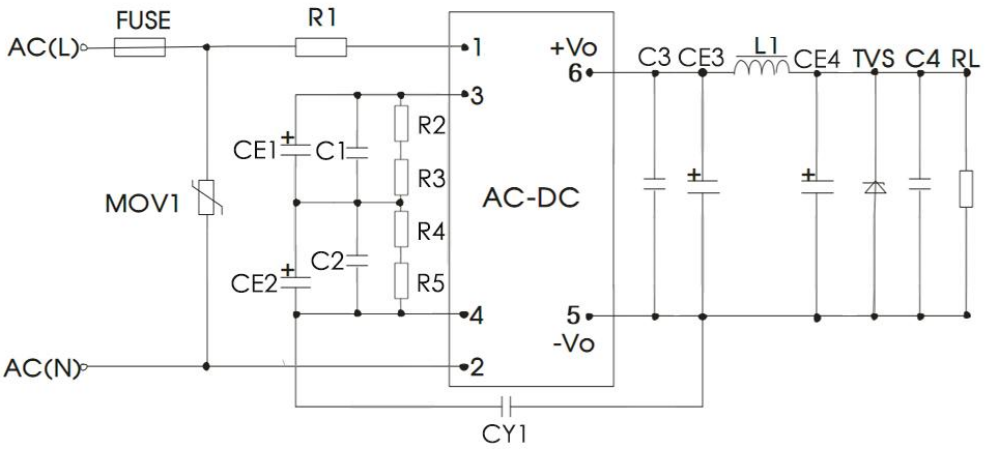


Figure - Circuit 1

Recommended parameters

Part No	CE3 (*Solid state capacitor)	L1 (*)	CE4(* Electrolytic capacitor)	C1, C2	CY1 (*)	C3, C4	TVS1
DA5-380S3V3GA9N4	680uF/10V	2.2uH/2A	330uF/10V	0.1uF/630V	Y1/102K/ 400VAC	0.1uF/50V	SMBJ7.0A
DA5-380S05GA9N4	680uF/10V		330uF/10V				SMBJ7.0A
DA5-380S12GA9N4	470uF/16V		100uF/25V				SMBJ20A
DA5-380S15GA9N4	470uF/25V		100uF/25V				SMBJ20A
DA5-380S24GA9N4	100uF/35V		47uF/35V				SMBJ30A

Input Voltage	CE1, CE2 (*)		R2, R3, R4, R5 (*)
/	-25℃ - +85℃	-40℃ - +85℃	1206/1MΩ
85-528VAC	33uF/400V	47uF/400V	
165-528VAC	22uF/400V	33uF/400V	
85-305VAC	CE1：10uF/450V； CE2：Wire-jumper	CE1：22uF/450V； CE2：Wire-jumper	/

Note:

1. The * marked component is necessary for the application, not optional.
2. 1A/500Vac time-delay fuse is recommended, necessary not optional.
3. 14D911K/4500A is recommended for MOV1, necessary not optional.
4. 12Ω/3W wire-wound resistor is recommended for R1, necessary not optional.
5. CE1 & CE2 are filtering capacitors at AC input and EMC filters at DC input. The electrolytic capacitors are recommended with ripple current >200mA@100KHz, and ESR≤100Ω at low temperature.
6. R2, R3, R4 & R5 are the voltage-balance resistors for CE1 and CE2, all necessary not optional.
7. Ceramic SMD capacitors are recommended for C3 & C4 to suppress the high-frequency noise.
8. CE3 & CE4 are output filtering capacitors which can set up a Pi-type circuit together with L1. It is recommended to use high-frequency, low-resistance electrolytic capacitors (ESR≤1.1Ω at low temperature -40°C) or solid-state capacitors. Please refer to the capacitances and the rated ripple currents defined in the manufacturers' specifications. The capacitors withstand voltage should be derated by at least 80%.

2. Recommended EMC circuits diagrams

1) Recommended circuit for the application at normal indoor environment

Application Environment	Temperature Range	EMS Level	EMI Class
Indoor Normal	From -25℃ to +55℃	Level 3	CLASS B

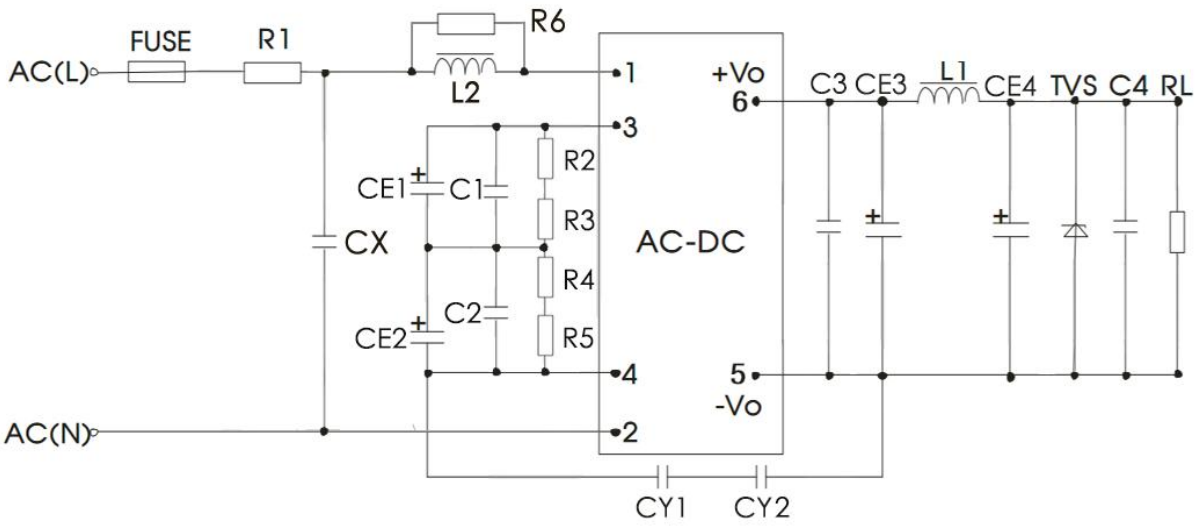


Figure - Circuit 2

Recommended parameters:

Component No.		Recommended Value
R1 (wire-wound resistor, necessary)		12Ω/3W
R2（SMD resistor）	Vout：3.3V & 5V	1206/20K
	Vout：12V	1206/2K
	Vout：15V	1206/2K
	Vout：24V	1206/15K
L2	Vout：3.3V & 5V	1.2mH/1.2A
	Vout：12V, 15V & 24V	4.7mH/0.5A
CX		X2/104K/480VAC
FUSE（Necessary）		1A/500V，Time-delay fuse

Note:

1. 2x Y capacitors (CY1 & CY2, Y1/222K/400VAC) are needed together for household application which is compliant with IEC60335.
2. One <3.8MΩ bleeder resistor is recommended to connect in parallel with X capacitor to meet certificate requirement, the resistance value can be defined according to the actual test situation.
3. Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.

2) Recommended circuit for the application at indoor industrial environment

Application Environment	Temperature Range	EMS Level	EMI Class
Indoor industry	From -25℃ to +55℃	Level 4	CLASS B

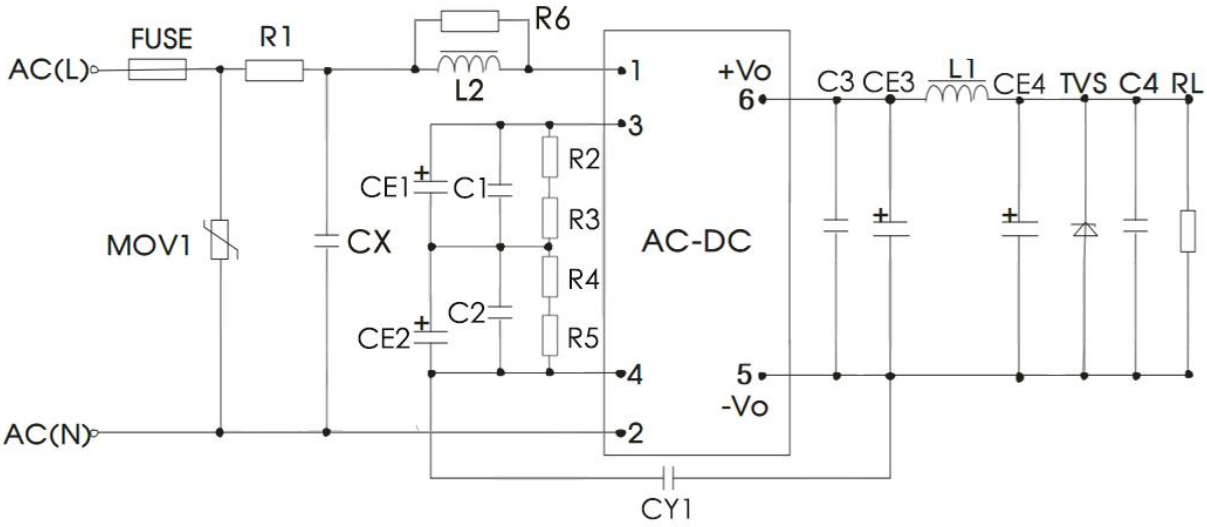


Figure - Circuit 3

Recommended parameters:

Component No.		Recommended Value
MOV1		14D911K/4500A
R1（wire-wound resistor, necessary）		12Ω/3W
R2（SMD resistor）	Vout：3.3V & 5V	1206/20K
	Vout：12V	1206/2K
	Vout：15V	1206/2K
	Vout：24V	1206/15K
L2	Vout：3.3V & 5V	1.2mH/1.2A
	Vout：12V, 15V & 24V	4.7mH/0.5A
CX		X2/104K/480VAC
FUSE（necessary）		2A/500V，Time-delay fuse

Note:
1. One <3.8MΩ bleeder resistor is recommended to connect in parallel with X capacitor to meet certificate requirement, the resistor value can be defined according to the actual test situation.
2. Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.

3) Recommended circuit for the application at normal outdoor environment

Application Environment	Temperature Range	EMS Level	EMI Class
Outdoor normal	From -40℃ to +85℃	Level 4	CLASS A

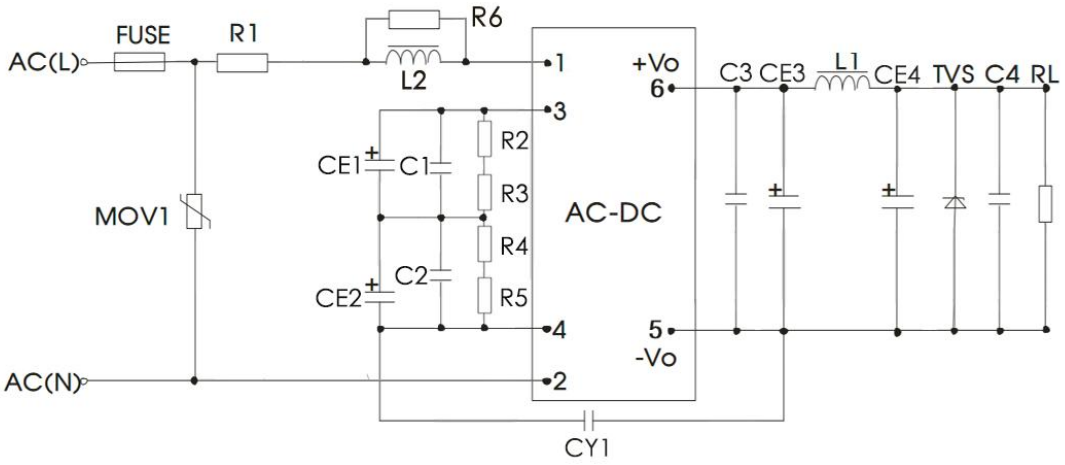


Figure - Circuit 4

Recommended parameters:

Component No.		Recommended Value
MOV1		14D911K/4500A
R1（wire-wound resistor, necessary）		12Ω/3W
R2（Chip resistor）	Vout：3.3V & 5V	1206/20K
	Vout：12V & 15V	1206/2K
	Vout：24V	1206/15K
L2	Vout：3.3V & 5V	1.2mH/1.2A
	Vout：12V,24V	4.7mH/0.5A
FUSE（necessary）		2A/500V，Time-delay fuse
Note: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.		

4) Recommended circuit for the application at outdoor industrial environment

Application Environment	Temperature Range	EMS Level	EMI Class
Outdoor industrial	From -40℃ to +85℃	Level 4	CLASS A

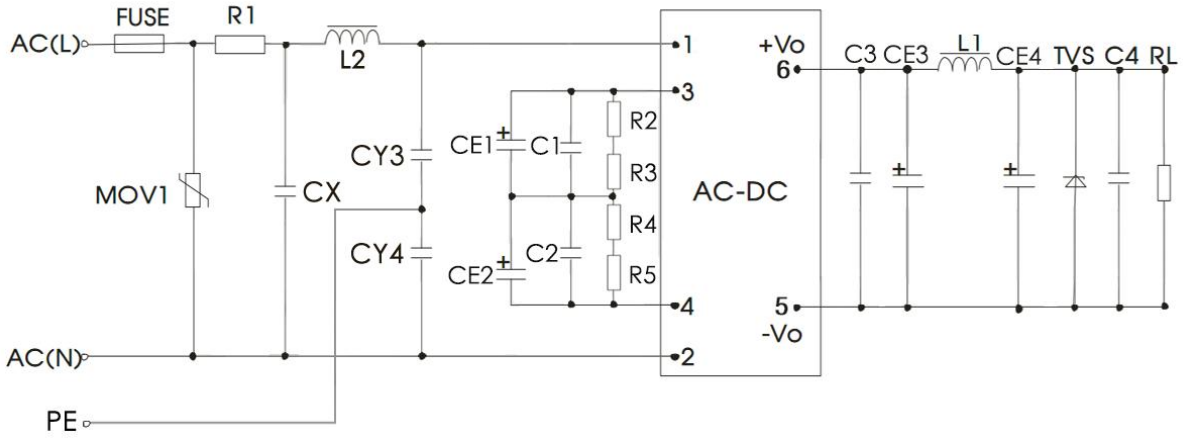


Figure - Circuit 5

Recommended parameters:

Component No.		Recommended Value
MOV1		14D911K/4500A
R1（wire-wound resistor, necessary）		12Ω/3W
L2	Vout：3.3V & 5V	1.2mH/1.2A
	Vout：12V, 15V & 24V	4.7mH/0.5A
CX		X2/104K/480VAC
FUSE（necessary）		2A/500V, time-delay fuse
CY3, CY4		Y1/102K/400VAC
Note: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.		

5) Recommended circuits for the application at hard lightning surge environment

Application Environment	Temperature Range	EMS Level	EMI Class
Hard lightning surge	From -40℃ to +85℃	Level 4	CLASS A

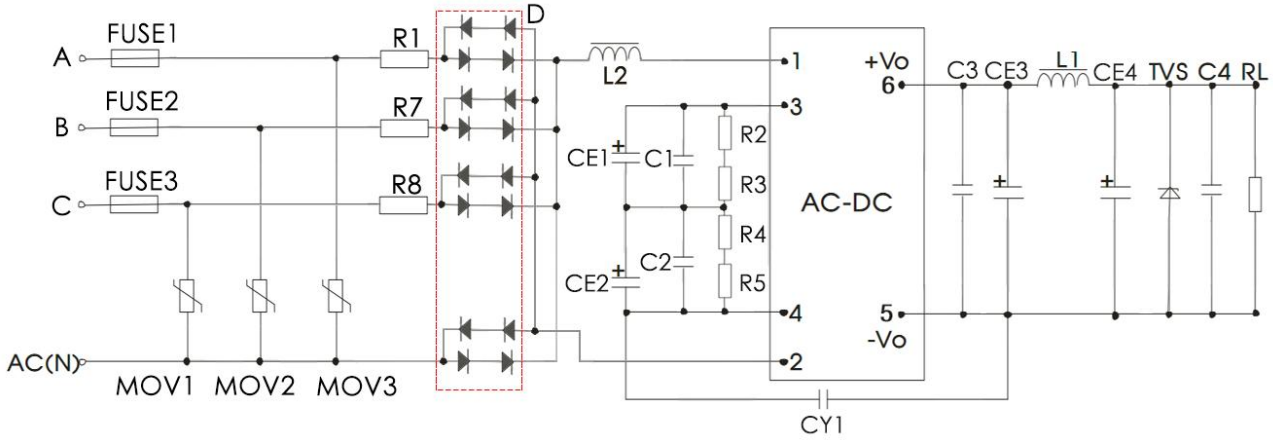


Figure - Circuit 6.1 (4KV Surge - differential mode full wave rectification)

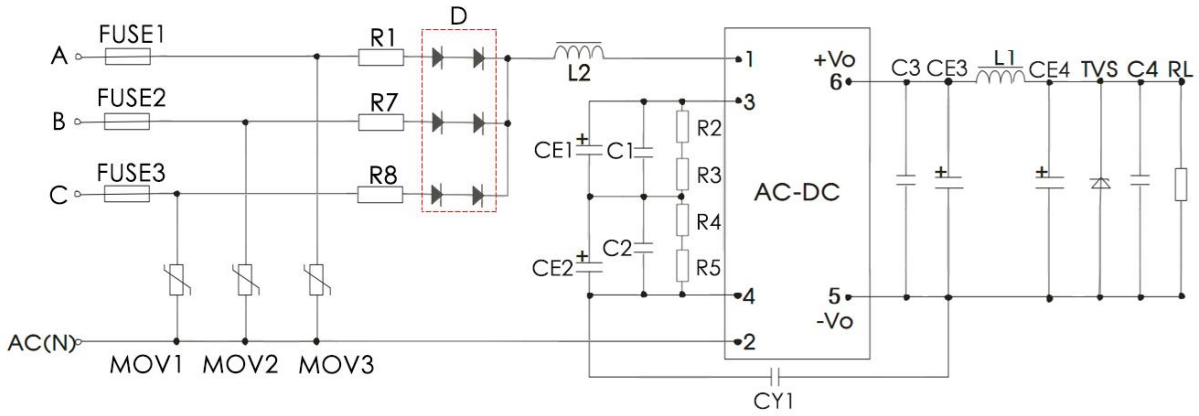


Figure - Circuit 6.2 (4KV Surge - differential mode half-wave rectification)

Recommended parameters:

Component No.		Recommended Value
MOV1, MOV2, MOV3		14D911K/4500A
R1, R7, R8（wire-wound resistors, Necessary）		12Ω/5W
L2	Vout：3.3V & 5V	1.2mH/1.2A
	Vout：12V, 15V & 24V	4.7mH/0.5A
CX		X2/104K/480VAC
D		2A/1000V
FUSE1, FUSE2, FUSE3（Necessary）		2A/500V, time-delay fuse
Note: Wire-wound resistors are recommended for R1, R7 & R8 as the input plug-in resistors, SMD resistors or carbon film resistors are not available for the application.		

Application Notice

1.The products should be used according to the specifications in this datasheet, otherwise it could be permanently damaged.

2. A fuse should be connected at input.

3. The product performance in this datasheet cannot be guaranteed if it works at a lower load than the minimum load defined.

4. The product performance in this datasheet cannot be guaranteed if it works at over-load condition.

5. Unless otherwise specified, all values or indicators in this datasheet are tested at Ta=25℃, humidity<75%RH, nominal input voltage and rated load

6. All values or indicators in this datasheet had been tested based on Aipupower test specifications.

7.The specifications are specially for the parts listed in this data sheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.

8. Aipupower can provide customization service.

Guangzhou Aipu Electron Technology Co., Ltd

Address: Building 4, HEDY Park, No.63, Punan Road, Huangpu Dist, Guangzhou, China.

Tel: 86-20-84206763 Fax: 86-20-84206762 HOTLINE: 400-889-8821

E-mail: sales@aipu-elec.com Website: https://www.aipupower.com

