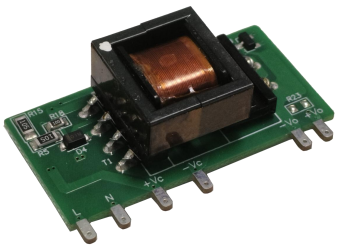
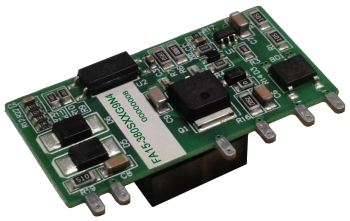
AC/DC Converter
FA15-380SXXG9N4 Series

Typical Features

- Wide input voltage range 176-528VAC/248-745VDC
- No load power consumption ≤0.30W@220VAC
- Efficiency up to 84%(Typ.)
- Operating temperature from -40°C to +85°C
- Switching frequency 65KHz
- Short circuit protection & over current protection
- Isolation voltage 3600VAC
- Compliant with IEC/EN62368/UL62368
- Altitude during operation 4000m Max
- Mini size open-frame, industrial level design
- PCB SIP mounting





Application Field

FA15-380SXXG9N4 Series ----- *Mini size & open-frame AC-DC power supplies with global adapted input voltage range both AC & DC available, low ripple, low temperature rise, low standby power consumption, high efficiency, high reliability, safety isolated and good EMC performance. This series of products can be widely used in the fields of Electric power, Industry, Instrument and Smart home devices, etc. The additional circuit diagram for EMC is recommended for the application with higher EMC requirement.*

Typical Product List

Certificate	Part No.	Output Specifications			Capacitive Load (Max) @220VAC	Ripple & Noise @20MHz (Max)	Efficiency @Full load 220VAC
		Power	Voltage	Current			
		(W)	Vo(V)	Io(mA)	uF	mVp-p	% (Typ.)
-	FA15-380S05G9N4	12.5	5	2500	4000	120	77
-	FA15-380S12G9N4	15	12	1250	2000	120	82
-	FA15-380S15G9N4	15	15	1000	2000	120	83
-	FA15-380S24G9N4	15	24	625	800	150	84

Note 1: The typical value of efficiency is based on the product tested after half an hour burn-in at full load.

Note 2: The full load efficiency should be in ±2% of the typical value in this table. The efficiency is calculated by the way that the full output power is divided by the input power.

Note 3: The Ripple and Noise is tested by the twisted pair method, please refer to the following Ripple & Noise test instruction.

Note 4: Please contact Aipu sales for other output voltages requirement in this series but not listed in this table.

Input Specifications

Item	Operating Condition	Min	Typ.	Max	Unit
Input Voltage Range	AC input	176	220	528	VAC
	DC input	248	310	745	VDC
Input Frequency range	-	47	50	63	Hz

Input Current	Input 176VAC	-	-	0.25	A
	Input 220VAC	-	-	0.20	
Surge Current	Input 176VAC	-	-	10	
	Input 220VAC	-	-	20	
No-load power consumption	Input 176VAC	-	-	0.30	W
	Input 220VAC	-	-		
Leakage Current	-	0.25mA TYP/230VAC/50Hz			
Recommended External Fuse	-	2A/600VAC Time-delay fuse			
Hot Plug	-	Unavailable			
ON/OFF Control	-	Unavailable			

Output Specifications

Item		Operating Condition	Min	Typ.	Max	Unit
Voltage Accuracy		Full input voltage range, any load	-	±2.0	±3.0	%
Line Regulation		Rated load	-	-	±0.5	%
Load Regulation		Nominal input voltage, 20%~100% load	-	-	±1.0	%
Minimum Load		Single Output	0	-	-	%
Turn-on Delay Time		Nominal input voltage (full load)	-	1000	-	mS
Power-off Hold up Time		Input 176VAC (full load)	-	50	-	mS
		Input 220VAC (full load)	-	80	-	
Dynamic Response	Overshoot range	25%~50%~25% 50%~75%~50%	-5.0	-	+5.0	%
	Recovery time		-	5.0	-	mS
Output Overshoot		Full input voltage range	≤10%Vo			%
Short circuit Protection			Continuous, self-recovery			Hiccup
Over Current Protection		Input 220VAC	≥110% Io, self-recovery			Hiccup
Temperature Drift		-	-	±0.03%	-	%/℃
Ripple & Noise		-	-	50	150	mV

General Specifications

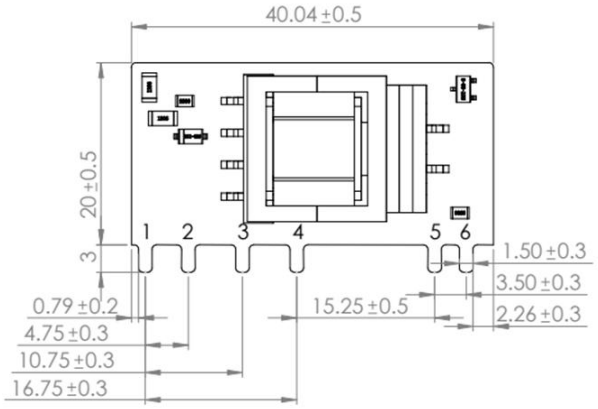
Item		Operating Condition	Min	Typ.	Max	Unit
Switching Frequency		-	-	65	-	KHz
Operating Temperature		Refer to the Temperature Derating Graph	-40	-	+85	℃
Storage Temperature		-	-40	-	+110	
Soldering Temperature		Wave soldering	260±4℃, time 5-10S			
		Manual soldering	360±8℃, time 4-7S			
Relative Humidity		-	10	-	90	%RH
Isolation Voltage	I/P-O/P	Dielectric test 1min, leakage current ≤5mA	3600	-	-	VAC
Insulation Resistance	I/P-O/P	@ DC500V	100	-	-	MΩ

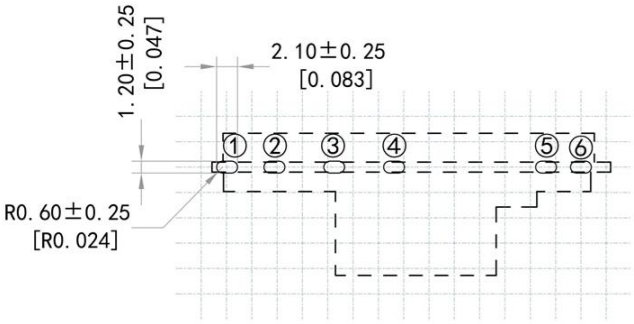
Safety Standard	-	IEC/EN62368
Vibration	-	10-55Hz,10G, 30 Min, along X,Y,Z
Safety Class	-	CLASS Ⅱ
MTBF	MIL-HDBK-217F @25℃	＞300,000H
Unit Weight	-	8g (Typ.)

EMC Performances

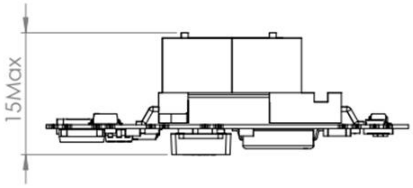
Total Item		Sub Item	Test Standard	Performance/Class
EMC	EMI	CE	CISPR32/EN55032	CLASS B (with the Recommended EMC Circuit)
		RE	CISPR32/EN55032	CLASS B (with the Recommended EMC Circuit)
	EMS	RS	IEC/EN61000-4-3	10V/m Perf.Criteria A (with the Recommended EMC Circuit)
		CS	IEC/EN61000-4-6	10Vr.m.s Perf.Criteria A (with the Recommended EMC Circuit)
		ESD	IEC/EN61000-4-2	Contact ±6KV / Air ±8KV Perf.Criteria B
		Surge	IEC/EN61000-4-5	±2KV Perf.Criteria B (with the Recommended EMC Circuit)
		EFT	IEC/EN61000-4-4	±2KV Perf.Criteria B ±4KV Perf.Criteria B (with the Recommended EMC Circuit)
		Voltage dips & interruptions	IEC/EN61000-4-11	0%~70% Perf.Criteria B

Mechanical Dimensions





PCB layout vertical view
Grid 2.54x2.54[0.10x0.10]



Terminal No.	Function
1	AC(L)
2	AC(N)
3	+Vcap
4	-Vcap
5	-Vout
6	+Vout

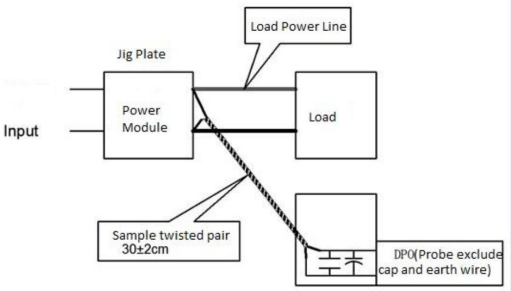
Unit: mm[inch]
General tolerance: ±1.00[±0.039]
Terminal section tolerance: ±0.25[±0.010]
The components layout is only for reference, any deviation from the actual unit should be accepted.

Package Code	Dimensions L x W x H	
-	40.04 x 20.00 x 15.00 mm	1.576 × 0.787 × 0.591 inch

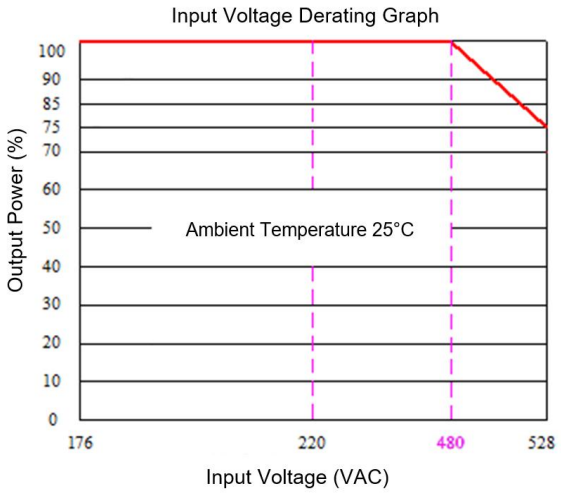
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHZ bandwidth)

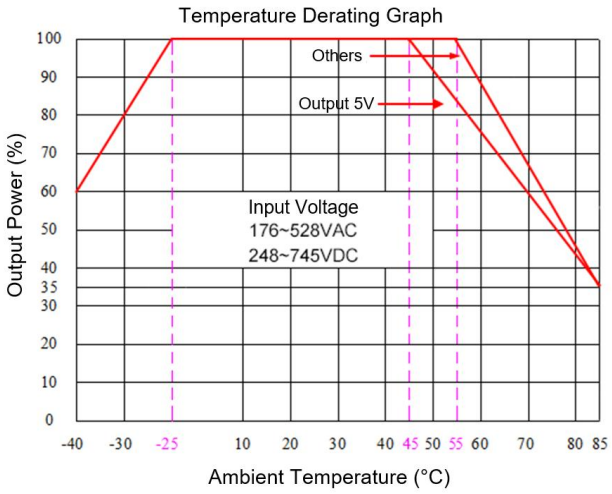
1) The Ripple & noise test needs 12# twisted pair cables, an oscilloscope which bandwidth should be set to 20MHz, 0.1uF polypropylene capacitor and 10uF high-frequency low-resistance electrolytic capacitors are connected in parallel with the probes (100M bandwidth). The oscilloscope should be set at the Sample Mode.

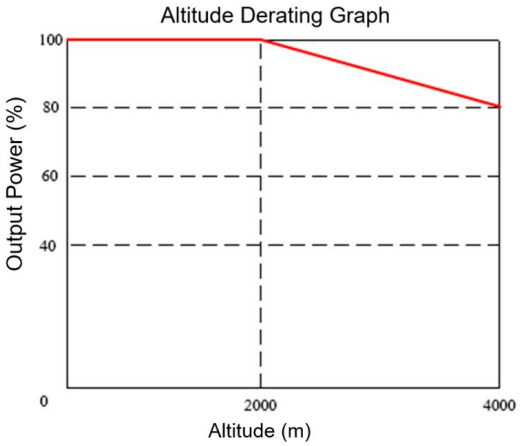
2) The test diagram is shown on the right. The converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the location is as close as possible to the output pins or terminals. The test can be start after input power on.



Product Characteristics Graphs







Note 1: The output power should be derated based on the input voltage derating graph at 480~528VAC/678~745VDC. FA15-380S05G9N4 should refer to the curve of output 5V.

Note 2: This product should operate at a 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

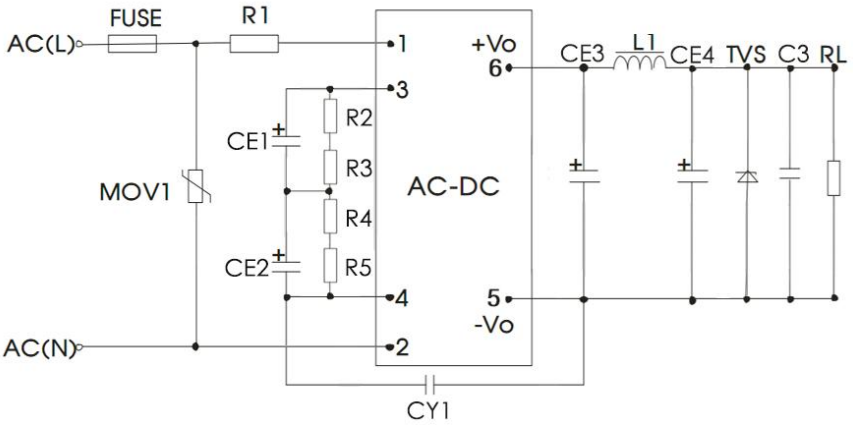


Figure - Circuit 1

Part No.	CE1 CE2 (*)	CE3 Solid-state Capacitor (*)	L1 (*)	CE4 (*)	FUSE (*)	MOV1	R2 R3 R4 R5 (*)	CY1	C3	TVS
FA15-380S05G9N4	47uF/ 400V	1000uF/16V	2.0uH /3A	330uF/16V	T2A/ 600VAC	14D91 1K 4500A	1206/ 1MΩ	Y1/ 102M/ 400VAC	0.1uF/ 50V	SMBJ7.0A
FA15-380S12G9N4		470uF/16V		330uF/16V						SMBJ20A
FA15-380S15G9N4		475uF/25V		100uF/35V						SMBJ20A
FA15-380S24G9N4		470uF/35V		100uF/35V						SMBJ30A

Note:

1) The * marked components are necessary for the application, not optional.
2) The electrolytic capacitors (Ripple current >200mA@100KHz, ESR≤100Ω at low temperature) are recommended for CE1 & CE2 which work as the input filter capacitors at AC input and the EMC filter capacitors at DC input.
3) R2, R3, R4, R5 are voltage equalizing resistors for CE1 & CE2, SMD resistors are recommended.
4) 3W/6.8Ω wire-wound resistor is recommended for R1

2. EMC solutions and the recommended circuit diagrams

Basic application

Application Environment	Ambient Temperature	EMS Level	EMI Class
Basic Application	-40℃ ~ +85℃	3	Class A

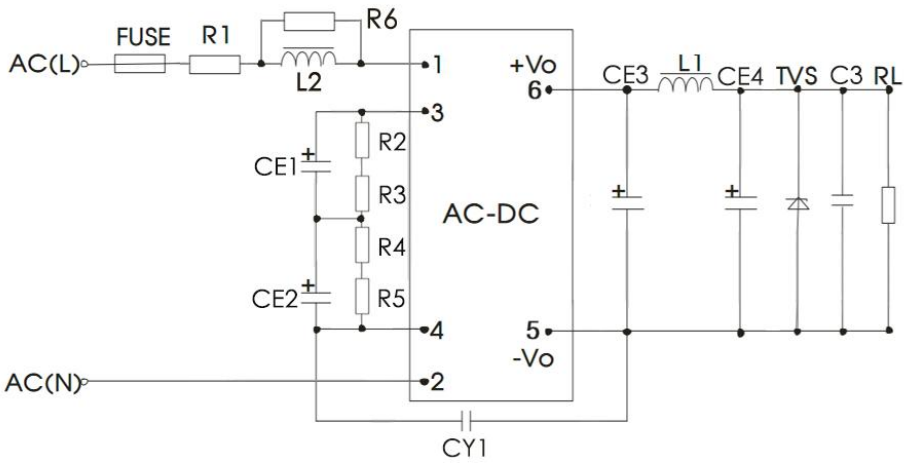


Figure - Circuit 2-1

Components	Recommend Value
R1 (Wire-wound resistor, necessary)	6.8Ω/3W
R6 (SMD resistor)	1206/4.7KΩ
L2	2.2mH/0.30A
FUSE(Necessary)	2A/600VAC, Time-delay fuse
Note: R1 works as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.	

Recommended circuit diagram for Indoor Normal environment

Application Environment	Ambient Temperature	EMS Level	EMI Class
Indoor Normal	-25℃ ~ +55℃	3	Class B

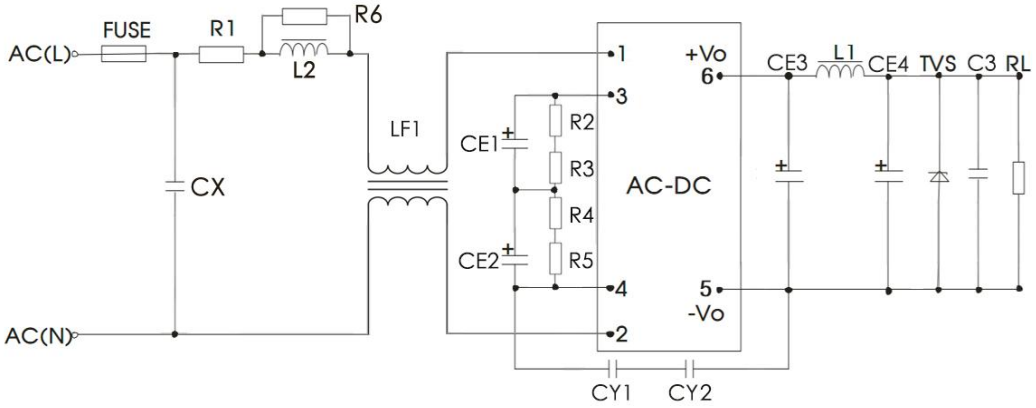


Figure - Circuit 2-2

Components	Recommended Value
R1 (Wire-wound resistor, necessary)	6.8Ω/3W
R6 (SMD resistor)	1206/4.7KΩ
L2	2.2mH/0.30A
FUSE(Necessary)	2A/600VAC, Time-delay fuse
LF1	10mH/1A
CX	X2/104K/480VAC
Note 1: 2x Y capacitors (CY1 & CY2, Y1/222M/400VAC) are recommended for household application which is compliant with IEC/EN60335. Note 2: A bleeder resistor(<3.8MΩ) 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. Note 3: R1 works as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.	

Recommended circuit diagram for Indoor Industrial environment

Application Environment	Ambient Temperature	EMS Level	EMI Class
Indoor Industry	-25℃ ~ +50℃	4	Class B

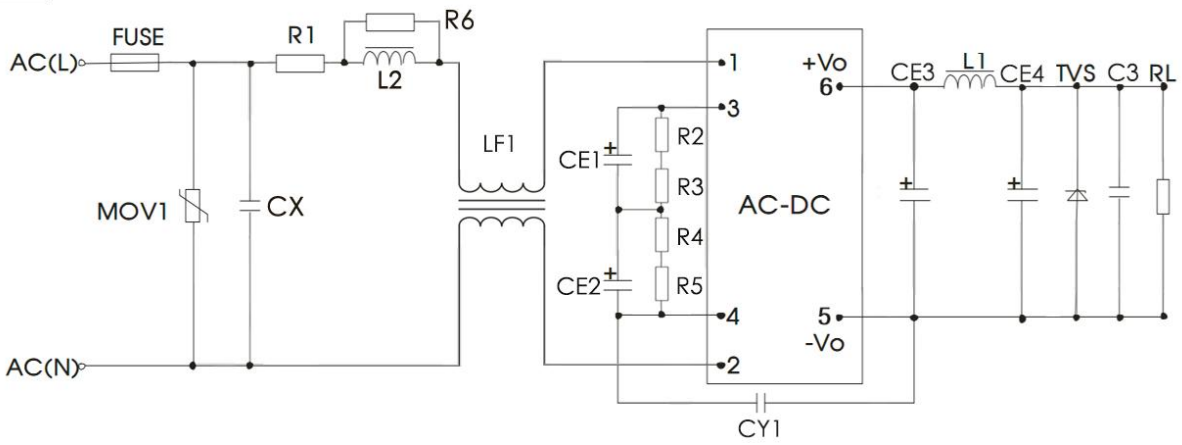


Figure - Circuit 2-3

Components	Recommended Value
MOV1	14D911K/4500A
R1 (Wire-wound resistor, necessary)	6.8Ω/3W
R6 (SMD resistor)	1206/4.7KΩ
L2	2.2mH/0.30A
FUSE(Necessary)	2A/600VAC, Time-delay fuse
LF1	10mH/1A
CX	X2/104K/480VAC
Note 1: A bleeder resistor(<3.8MΩ) 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. Note 2: R1 works as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.	

Recommended circuit diagram for Outdoor Normal environment

Application Environment	Ambient Temperature	EMS Level	EMI Class
Outdoor Normal	-40℃ ~ +85℃	4	Class A

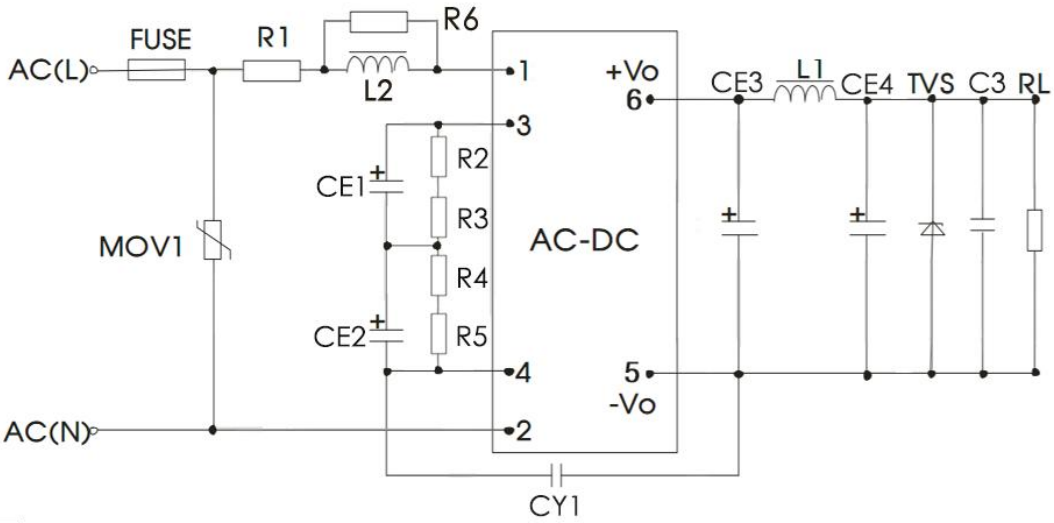


Figure - Circuit 2-4

Components	Recommended Value
MOV1	14D911K/4500A
R1 (Wire-wound resistor, necessary)	6.8Ω/3W
R6 (SMD resistor)	1206/4.7KΩ
L2	2.2mH/0.30A
FUSE(Necessary)	2A/600VAC, Time-delay fuse
Note: R1 works as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.	

Recommended circuit diagram for Outdoor Industry environment

Application Environment	Ambient Temperature	EMS Level	EMI Class
Outdoor Industry	-40℃ ~ +85℃	4	Class A

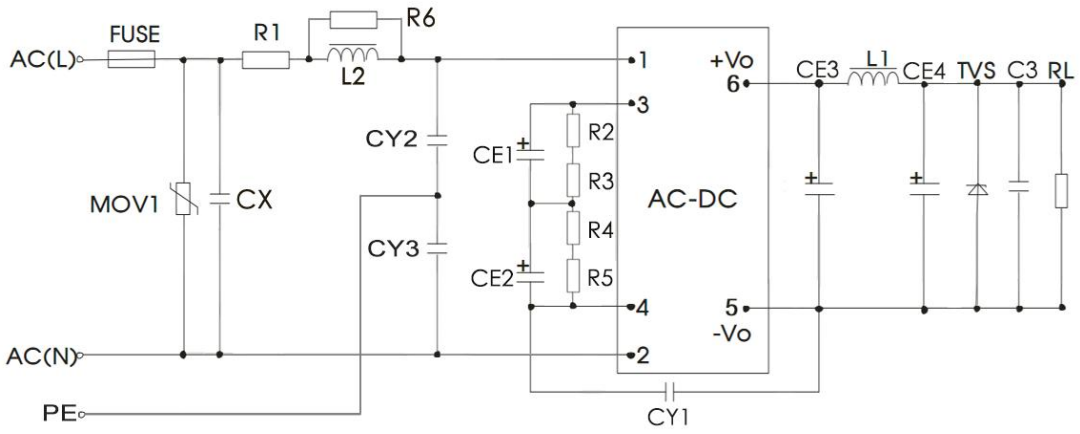


Figure - Circuit 2-5

Components	Recommended Value
MOV1	14D911K/4500A
R1 (Wire-wound resistor, necessary)	6.8Ω/3W
R6 (SMD resistor)	1206/4.7KΩ
L2	2.2mH/0.30A
FUSE(Necessary)	2A/600VAC, Time-delay fuse
CY2, CY3	Y1/102M/400VAC
CX	X2/104K/480VAC
Note 1: A bleeder resistor(<3.8MΩ) 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. Note 2: R1 works as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.	

Recommended circuit diagram for Strong Surges environment

Application Environment	Ambient Temperature	EMS Level	EMI Class
Strong Surges	-40℃ ~ +85℃	4	Class A

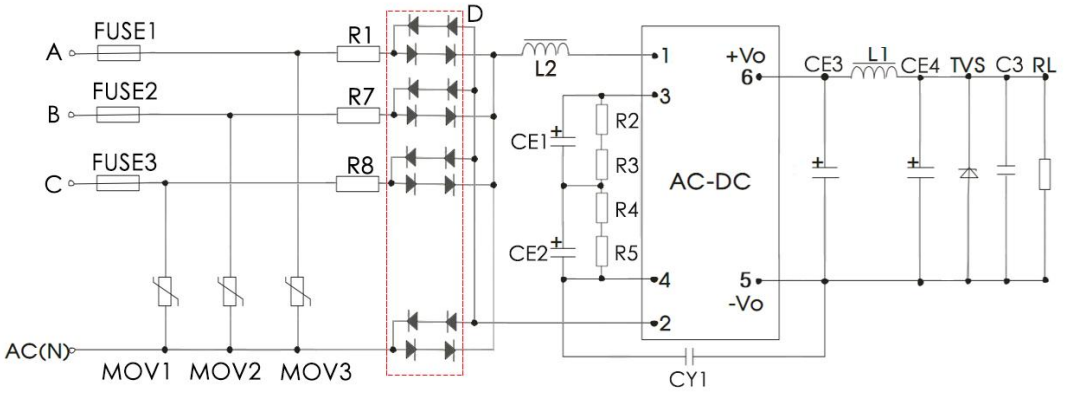


Figure - Circuit 3-1(4KV Surge - differential mode wave rectification)

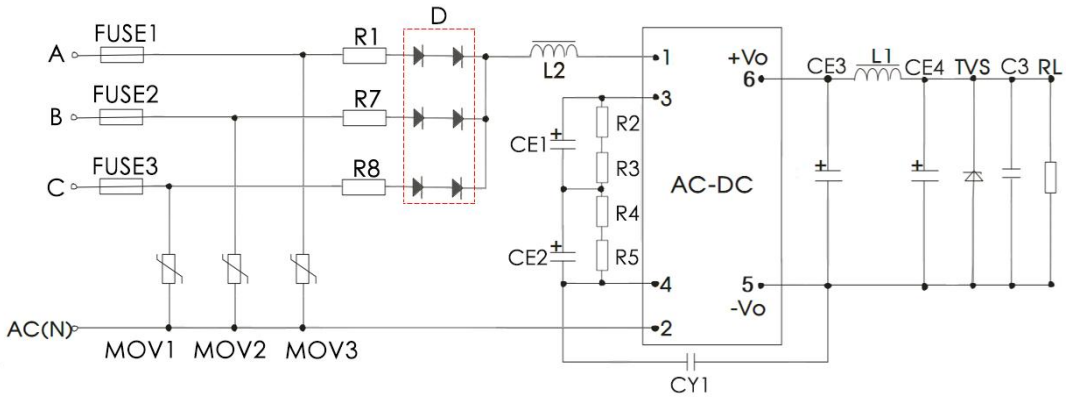


Figure - Circuit 3-2 (4KV Surge - differential mode half-wave rectification)

Components	Recommended Value
FUSE1, FUSE2, FUSE3 (Necessary)	6.3A/600VAC, Time-delay fuse
MOV1, MOV2, MOV3	14D911K/4500A
R1, R7, R8 (Wire-wound resistors, necessary)	12Ω/5W
D	2A/1000V
L2	2.2mH/0.30A
Note: R1, R7 & R8 work as the input plug-in resistors, SMD resistor or a carbon film resistor is 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 (pure resistance 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 datasheet, 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.

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