

Typical Features

- ◆ Wide input voltage range 85-305VAC/70-430VDC
- ◆ Standby power consumption $\leq 0.3W@220VAC$
- ◆ Efficiency up to 78%(Typ.)
- ◆ Operating temperature from $-40^{\circ}C$ to $+85^{\circ}C$
- ◆ Switching frequency 65KHz
- ◆ Output short circuit & over current protections
- ◆ Isolation voltage 3600VAC
- ◆ Compliant with IEC/EN62368/UL62368
- ◆ With UL, CB & CE certificates
- ◆ Altitude during operation 5000m Max
- ◆ Mini size open-frame, industrial level design
- ◆ PCB SIP mounting



Application Field

FG03-C4SXX 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. Additional circuit diagram for EMC is recommended for the application with higher EMC requirement.

Typical Product List

Certificate	Part No.	Input Voltage Range		Output Specifications			Max Capacitive Load @220VAC uF	Ripple & Noise @20MHz (Max) mVp-p	Efficiency @full Load 220VAC (Typ.) %
		Nominal	Range	Power	Voltage	Current			
		(VAC)	(VAC)	P(W)	Vo(VDC)	Io(mA)			
CE/CB/UL	FG03-C4S03	220	85-305	2	3.3	600	3000	100	69
CE/CB/UL	FG03-C4S05			3	5	600	3000	100	73
-	FG03-C4S07				7.8	385	2000	100	75
CE/CB/UL	FG03-C4S09				9	333	330	100	75
CE/CB/UL	FG03-C4S12				12	250	330	100	75
CE/CB/UL	FG03-C4S15				15	200	330	100	75
CE/CB/UL	FG03-C4S24				24	125	330	100	78

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 $\pm 2\%$ 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 & Noise is tested by the Parallel-line method (please refer to the following test instruction).

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

Input Specifications					
Item	Test Condition	Min	Typ.	Max	Unit
Input voltage range	AC input	85	220	305	VAC
	DC input	70	310	430	VDC
Input frequency range	-	47	50	63	Hz
Input current	Input 115VAC	-	-	0.10	A
	Input 220VAC	-	-	0.07	
Surge current	Input 115VAC	-	-	22	
	Input 220VAC	-	-	24	
Standby power consumption	Input 115VAC	-	-	0.30	W
	Input 220VAC	-	-		
Leakage current	-	0.5mA TYP/230VAC/50Hz			
Recommended external fuse	-	1A/300VAC Time-delay fuse			
Hot-plug	-	NA			
ON/OFF Control	-	NA			

Output Specifications						
Item	Test Condition	Min	Typ.	Max	Unit	
Voltage accuracy	Full input voltage range, 10-100% load (the unit can work stably at <10% load)	-	±2.0	±6.0	%	
Line regulation	Rated load	-	±1.0	±2.0	%	
Load regulation	Nominal input voltage, 20%~100% load	-	±1.0	±3.0	%	
Minimum load	Single Output	10	-	-	%	
Temperature drift coefficient	-	-	-	±0.03	%/°C	
Turn-on delay time	Input 115VAC (full load)	-	-	1000	mS	
	Input 220VAC (full load)	-	-			
Power-off hold up time	Input 115VAC (full load)	50	-	-	mS	
	Input 220VAC (full load)	80	-	-		
Dynamic Response	Overshoot range	25%~50%~25%	-5.0	-	+5.0	%
	Recovery time	50%~75%~50%	-	-	+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	-	200%Io	Hiccup	
Ripple & Noise	Full input voltage range	-	50	100	mVp-p	

Note: The Ripple & Noise is tested by the Parallel-line method (please refer to the following test instruction).

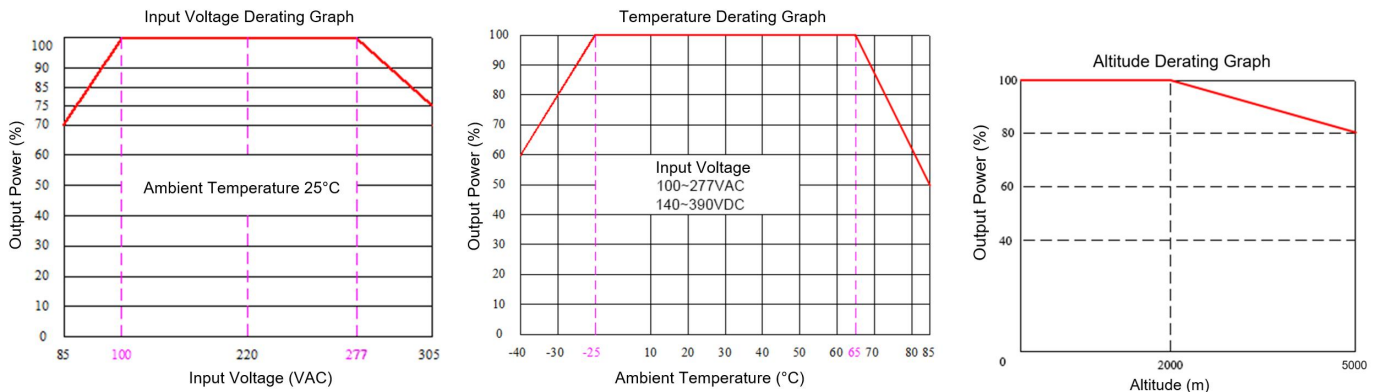
General Specifications					
Item	Test Condition	Min	Typ.	Max	Unit
Switching frequency	-	-	65	-	KHz
Operating temperature	Refer to the Temperature Derating Graph	-40	-	+85	°C

Storage temperature	-		-40	-	+110	°C
Soldering temperature	Wave soldering		260±4°C, time 5-10S			
	Manual soldering		360±8°C, time 4-7S			
Relative humidity	-		10	-	90	%RH
Isolation voltage	I/P-O/P	Test 1min, leakage current <5mA	3600	-	-	VAC
Insulation resistance	I/P-O/P	@ 500VDC	100	-	-	MΩ
MTBF	MIL-HDBK-217F @25°C		1000	-	-	K Hours
Safety standard	-		IEC/EN62368/UL62368			
Vibration	-		10-55Hz, 10G, 30 Min, along X, Y, Z			
Safety class	-		CLASS II			
Weight & Dimensions	Part No.	Weight (Typ.)	Dimensions L x W x H			
	FG03-C4SXX	4g	26.40 x 15.40 x 11.00 mm	1.039 x 0.606 x 0.433 inch		

EMC Performances

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

Product Characteristics Graphs



Note 1: The output power should be derated based on the input voltage derating graph at 85~100VAC/70~140VDC & 277~305VAC/390~430VDC.

Note 2: This product should operate under the condition of natural air, please contact us if it could be used at a closed space.

Recommended Circuits for Application

1. Typical application circuit diagram

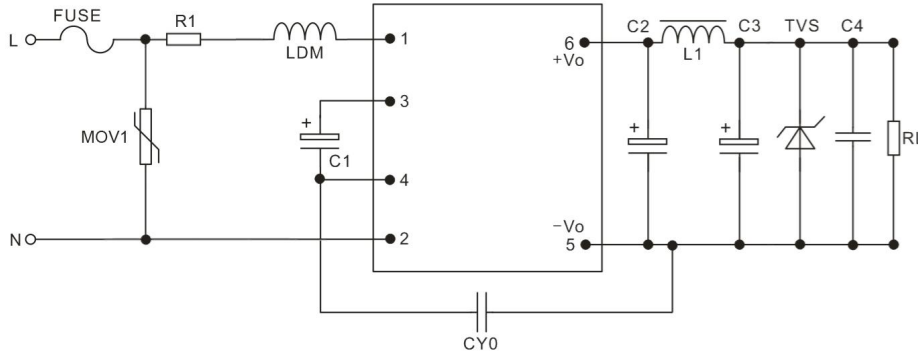


Figure - Circuit 1

Part No.	C2(*) Solid-state capacitor	L1 (*)	C3(*) Solid-state capacitor	C4	LDM	R1(*)	CY0	FUSE (*)	TVS
FG03-C4S03	220uF/10V	2.0uH/ 1A	220uF/10V	0.1uF/ 50V	1.2mH/ 0.2A	12Ω/3W Wire-wound resistor	Y1 102M/ 400VAC	1A/ 300VAC Time delay fuse	SMBJ7.0A
FG03-C4S05	220uF/10V		220uF/10V						SMBJ7.0A
FG03-C4S07	220uF/16V		68uF/16V						SMBJ12A
FG03-C4S09	220uF/16V		68uF/16V						SMBJ12A
FG03-C4S12	220uF/16V		68uF/16V						SMBJ20A
FG03-C4S15	220uF/35V		68uF/35V						SMBJ20A
FG03-C4S24	68uF/35V		47uF/35V						SMBJ30A

C1(*)	Operation Conditions
10uF/450V	Input 85-305VAC, -25°C ~ +85°C Input 165-305VAC, -40°C ~ +85°C
22uF/450V	Input 85-305VAC, -40°C ~ +85°C

Note:

- 1) All the * marked components are required for the application, not optional.
- 2) The Ripple current > 200mA@100KHz electrolytic capacitor is recommended for C1 which works as the input filter capacitor at AC input and the EMC filter capacitor at DC input.
- 3) 14D561K/4500A is recommended for MOV1.

2. Recommended circuit diagrams for higher EMC requirements

Basic application

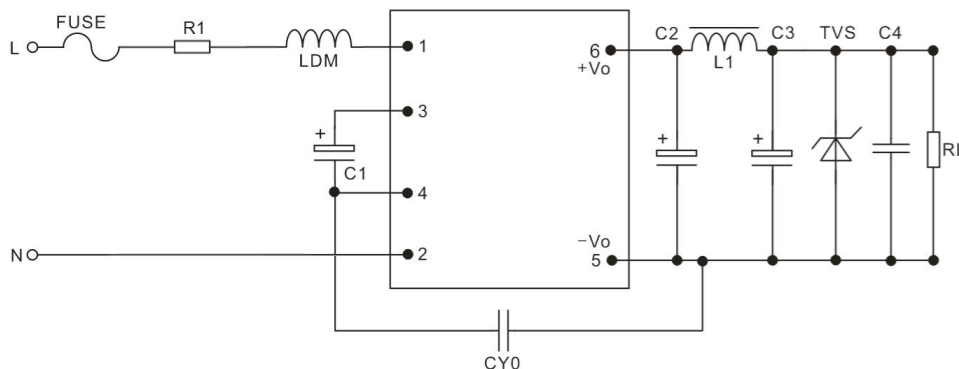


Figure - Circuit 2-1

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

Component	Recommend Value
FUSE (Required)	1A/300VAC, Time-delay fuse
R1 (Wire-wound resistor, required)	12Ω/3W
LDM	1.2mH/0.2A

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.

Recommended circuit diagram for indoor household normal environment

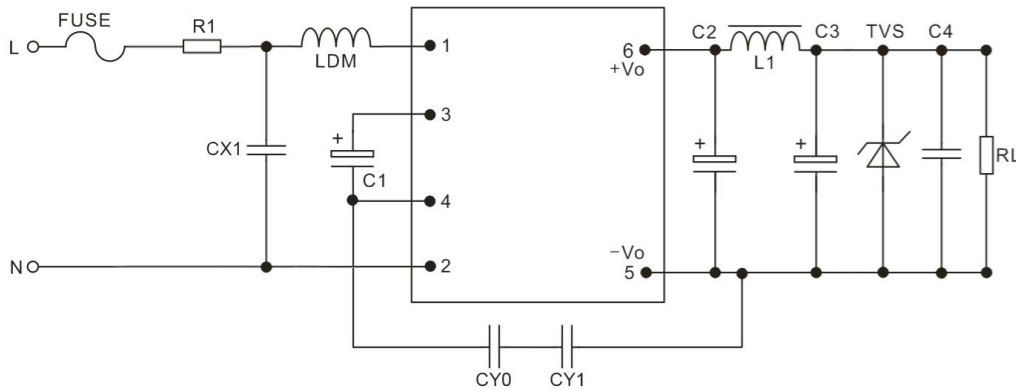


Figure - Circuit 2-2

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

Component	Recommended Value
FUSE (Required)	1A/300VAC, Time-delay fuse
R1 (Wire-wound resistor, required)	12Ω/3W
CX1	X2/104K/310VAC
LDM	1.2mH/0.2A

Note 1: Two Y capacitors (CY0 & CY1, 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: 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.

Recommended circuit diagram for indoor industrial environment

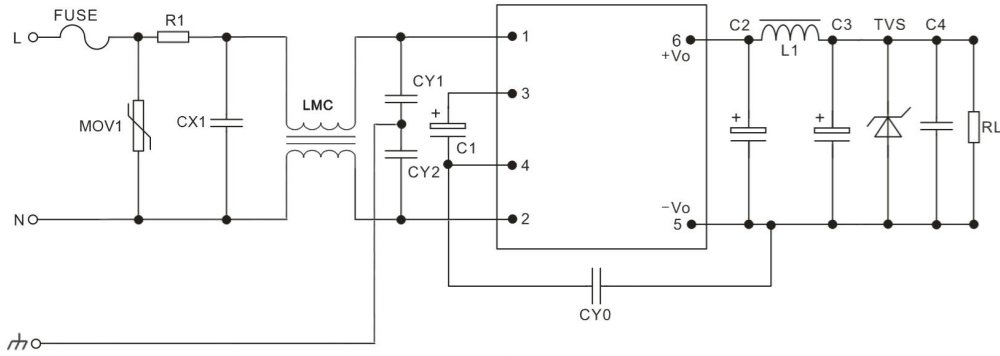


Figure - Circuit 2-3

Application Environment	Ambient Temperature	EMS Level	EMI Class
Indoor Industry	-25°C ~ +55°C	4	Class B

Component	Recommended Value
FUSE (Required)	1A/300VAC, Time-delay fuse
MOV1	14D561K/4500A
R1 (Wire-wound resistor, required)	12Ω/3W
CX1	X2/104K/310VAC
LMC	30mH/0.3A
CY1, CY2	Y1/102M/400VAC

Note 1: A bleeder resistor(<math><3.8M\Omega</math>) 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: 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.

Recommended circuit diagram for outdoor normal environment

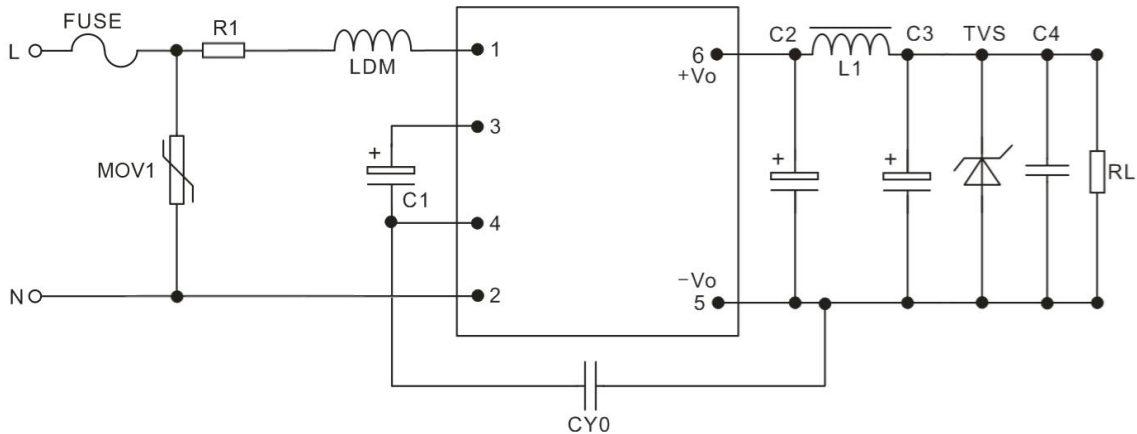


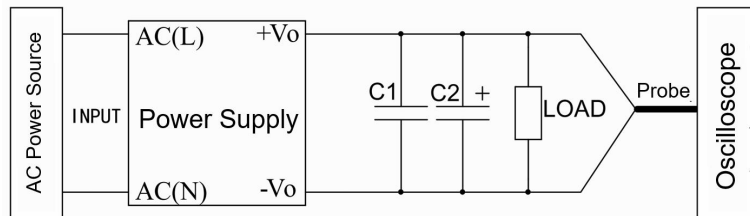
Figure - Circuit 2-4

Application Environment	Ambient Temperature	EMS Level	EMI Class
Outdoor normal	-40°C ~ +85°C	4	Class A

Component	Recommended Value
FUSE (Required)	1A/300VAC, Time-delay fuse
MOV1	14D561K/4500A
R1 (Wire-wound resistor, required)	12Ω/3W
LDM	1.2mH/0.2A

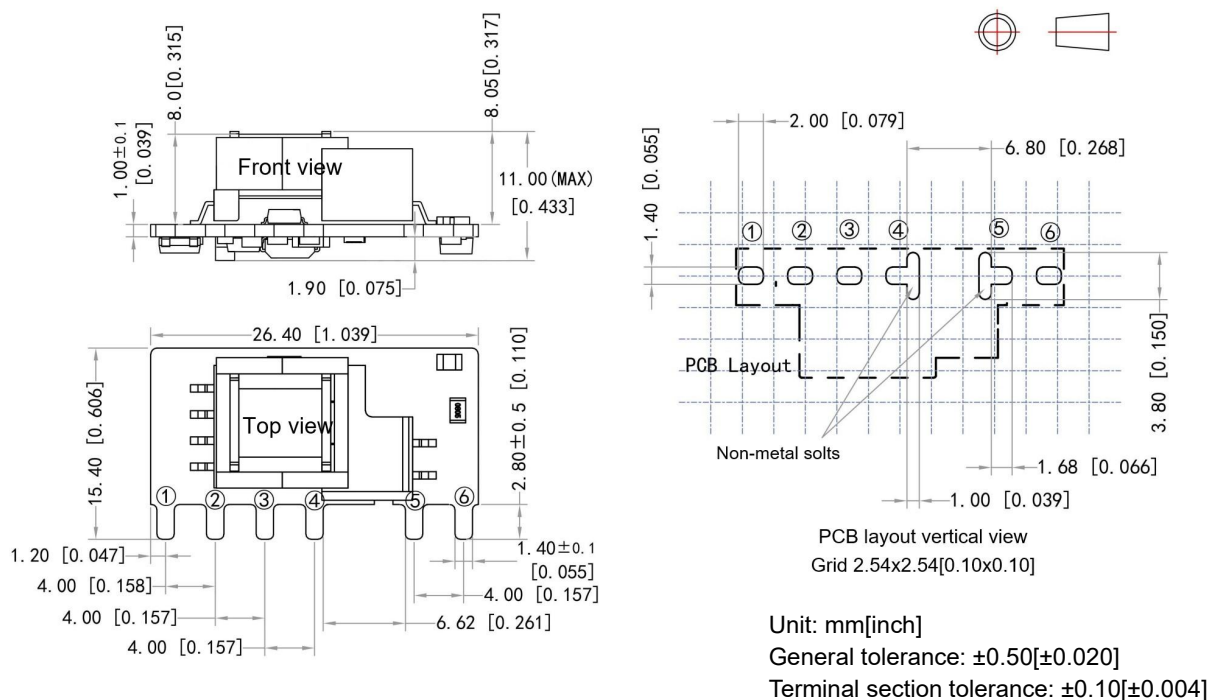
Note: Wire-wound resistor is recommended for R1 as the input plug-in resistor, SMD resistor or a carbon film resistor is not available for the application.

Ripple & Noise Test Instruction (Parallel-line Method, 20MHZ bandwidth)



1. The Ripple & Noise test needs the cables in parallel, an oscilloscope that should be set at the Sample Mode, bandwidth 20MHZ. 100M bandwidth probe with cap and ground removed. One polypropylene capacitor C1(0.1uF) and one high frequency & low impedance electrolytic capacitor C2(10uF) are connected in parallel with the probe.
2. Refer to the test diagram, 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 test can start at the converter output terminals after the input power on.

Mechanical Dimensions



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

Application Notice

- 1.The product should be used according to the specifications, otherwise it could be permanently damaged.
2. The product performance cannot be guaranteed if it works at a lower load than the minimum load defined.
3. The product performance cannot be guaranteed if it works under over-load condition.
4. Unless otherwise specified, all values or indicators on this datasheet are tested at Ta=25°C, humidity<75%RH, nominal input voltage and rated load (pure resistance load).
5. All values or indicators on this datasheet have been tested based on Aipupower test specifications.
- 6.The specifications are specially for the parts listed on this datasheet, any other non-standard model performances could be out of the specifications. Please contact our technician for specific requirements.
7. Aipupower can provide customization service.

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