AC/DC Converter
FG03-C4SXX Series

Typical Features

- Wide input voltage range 85-305VAC/70-430VDC
- No load power consumption 0.3W(Typ.)@220VAC
- Efficiency up to 78%(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
- With UL (E518940) 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. 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.)
UL/CE/CB	FG03-C4S03	2	3.3	600	3000	100	69
	FG03-C4S05	3	5	600	3000	100	73
	FG03-C4S09	3	9	333	330	100	75
	FG03-C4S12	3	12	250	330	100	75
	FG03-C4S15	3	15	200	330	100	75
	FG03-C4S24	3	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 ±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 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	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	
No-load power consumption	Input 115VAC	-	0.3	-	W
	Input 220VAC	-		-	
Leakage Current	-	0.25mA TYP/230VAC/50Hz			
Recommended External Fuse	-	1A-3A/300VAC 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, 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	-	-	%
Turn-on Delay Time		Input 115VAC (full load)	-	600	-	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% 50%~75%~50%	-5.0	-	+5.0	%
	Recovery time		-5.0	-	+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	100	mV

General Specifications

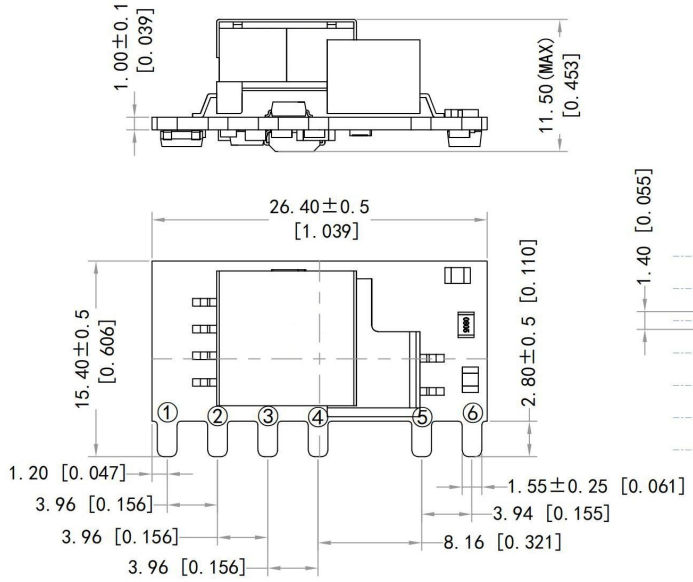
Item	Operating Condition	Min	Typ.	Max	Unit
Switching Frequency	-	-	65	-	KHz
Operating Temperature	Refer to the Temperature Derating Graph	-40	-	+85	℃
Storage Temperature	-	-40	-	+110	
Soldering Temperature	Wave soldering	260±4℃, time 5-10S			
	Manual soldering	360±8℃, time 4-7S			
Relative Humidity	-	10	-	90	%RH

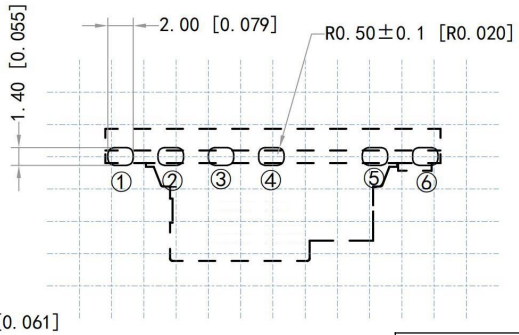
Isolation Voltage	I/P-O/P	Dielectric test 1min, leakage current ≤5mA	3600	-	-	VAC
Insulation Resistance	I/P-O/P	@ DC500V	100	-	-	MΩ
Safety Standard		-	IEC/EN62368/UL62368			
Vibration		-	10-55Hz,10G, 30 Min, along X,Y,Z			
Safety Class		-	CLASS Ⅱ			
MTBF		MIL-HDBK-217F @25℃	＞1000,000H			
Unit Weight		-	4g (Typ.)			

EMC Performances

Total Item		Sub Item	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

Mechanical Dimensions





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

Unit: mm[inch]
General tolerance: ±0.50[±0.020]
Terminal section tolerance: ±0.25[±0.010]

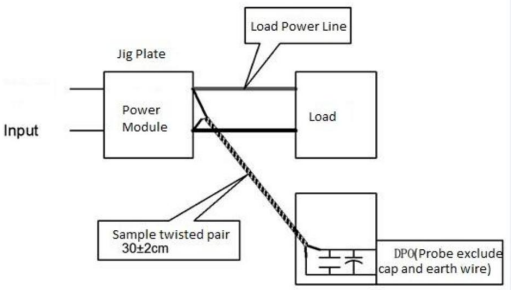
Terminal No.	Function
1	AC(L)
2	AC(N)
3	+Vcap
4	-Vcap
5	-Vo
6	+Vo

Package Code	Dimensions L x W x H	
-	26.40 x 15.40 x 11.50 mm	1.039 × 0.606 × 0.453 inch

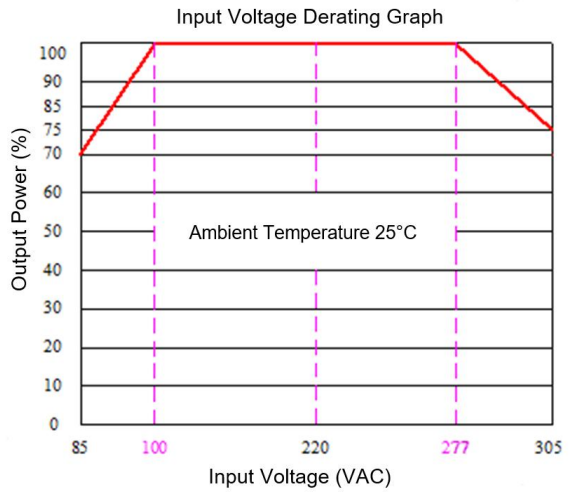
Ripple & Noise Test Instruction (Twisted Pair Method, 20MHZ bandwidth)

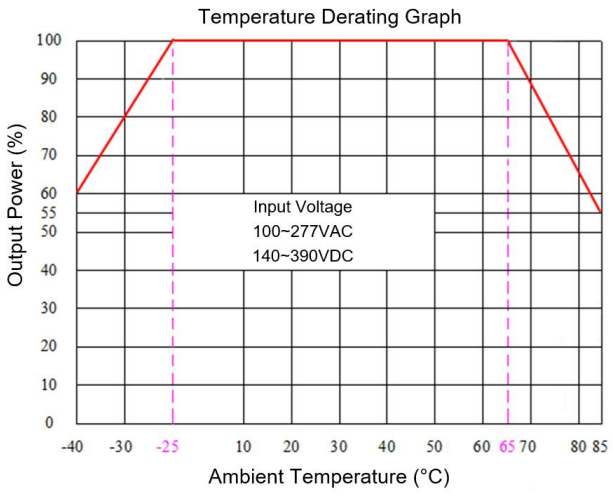
1) The Ripple & noise test need 12# twisted pair cables, an oscilloscope which bandwidth should be set to 20MHz, 0.1uF polypropylene capacitor and 10uF high-frequency low-resistance electrolytic capacitors are connected in parallel with the probes (100M bandwidth). The oscilloscope should be set at the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

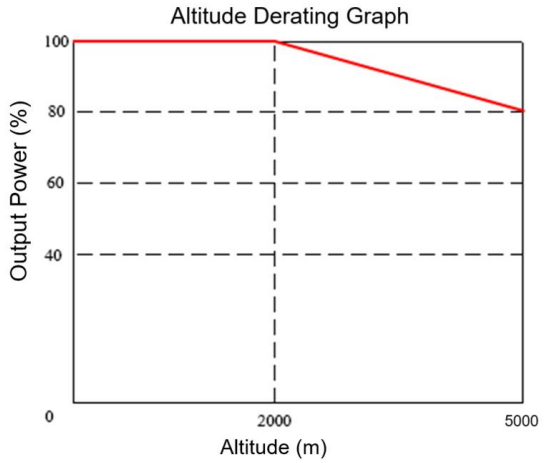
2) The test diagram is shown on the right. The converter output connects to the electronic load by the jig with cables which size should be defined according to the output current value. The twisted pair (length 30cm±2 cm) should be connected in parallel with the load, the location is as close as possible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



Product Characteristics Graphs







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

Note 2: This product should operate at the 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

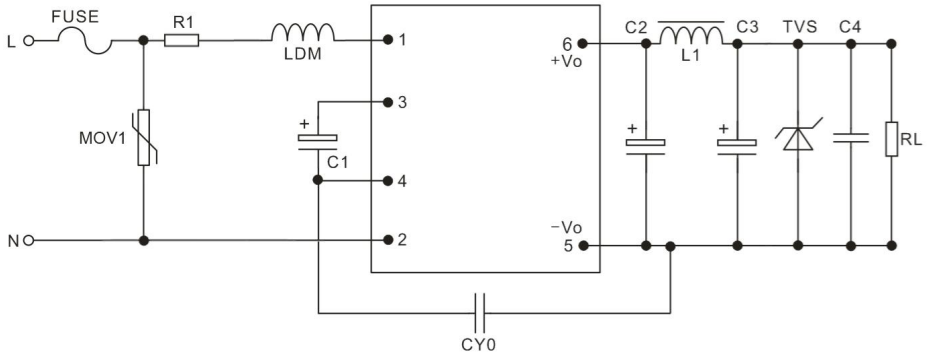


Figure - Circuit 1

Part No.	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 /400V AC	1A/ 300VAC Time delay fuse	SMBJ7.0A
FG03-C4S05	220uF/10V		220uF/10V						SMBJ7.0A
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(*)	Conditions
10uF/450V	Input 85-305VAC, -25℃ ~ +85℃ Input 165-305VAC, -40℃ ~ +85℃
22uF/450V	Input 85-305VAC, -40℃ ~ +85℃

Note:

1) The * marked components are necessary 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

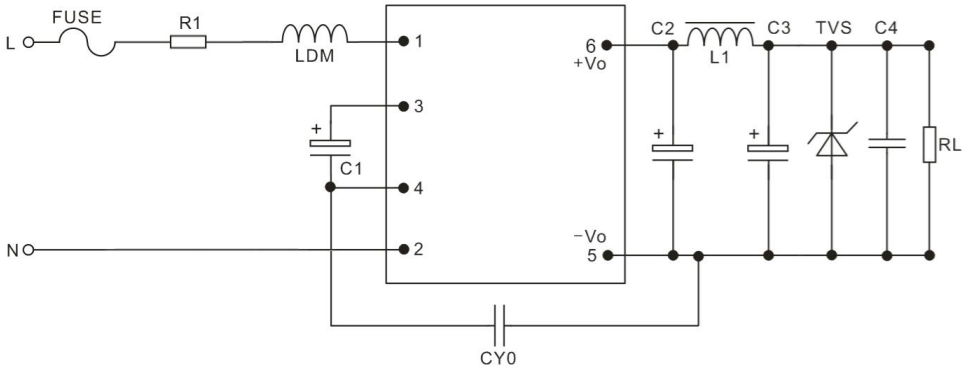


Figure - Circuit 2-1

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

Component	Recommend Value
FUSE(Necessary)	1A/300VAC, Time-delay fuse
R1 (Wire-wound resistor, necessary)	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

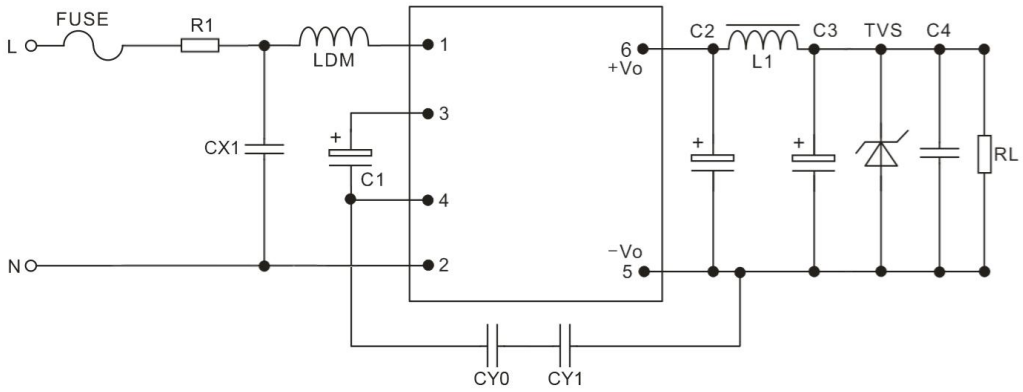


Figure - Circuit 2-2

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

Component	Recommended Value
FUSE (Necessary)	1A/300VAC, Time-delay fuse
R1 (Wire-wound resistor, necessary)	12Ω/3W
CX1	X2/104K/310VAC
LDM	1.2mH/0.2A
Note 1: 2x 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

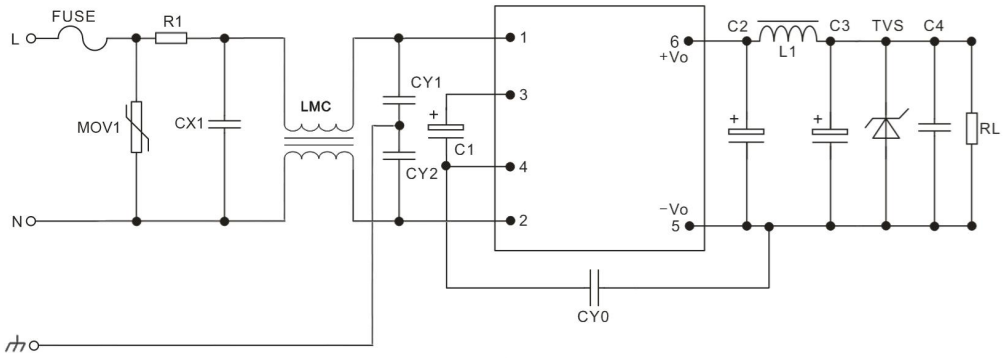


Figure - Circuit 2-3

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

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

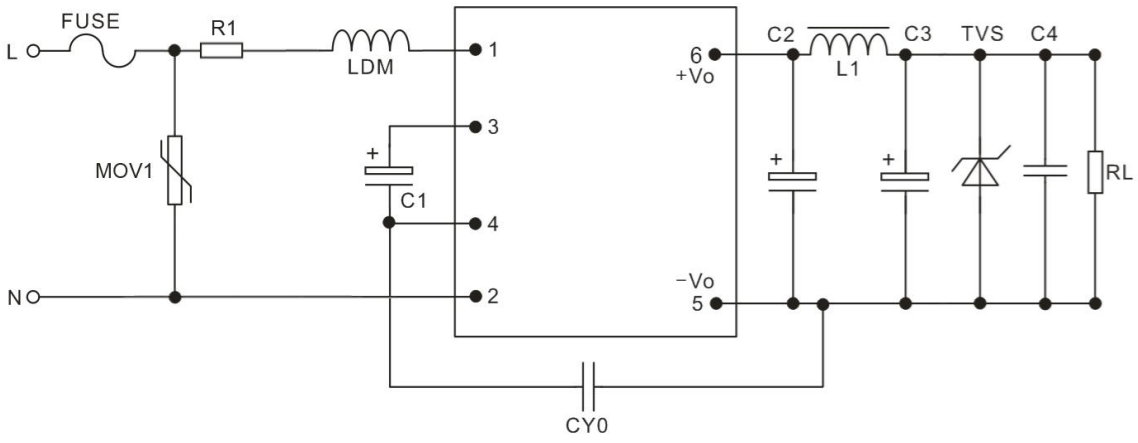


Figure - Circuit 2-4

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

Component	Recommended Value
FUSE (Necessary)	1A/300VAC, Time-delay fuse
MOV1	14D561K/4500A
R1 (Wire-wound resistor, necessary)	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.	

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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