Typical Features

- ◆ Wide input voltage range 80-305VAC/110-430VDC
- ◆ No load power consumption 0.21W (Typ.)
- ◆ Efficiency 93% (Typ.)
- ◆ Switching frequency 65KHz
- ◆ Short-circuit, over-current, over-voltage protections
- ◆ Isolation Voltage 4200Vac
- ◆ Compliant with IEC/EN62368/UL62368
- ◆ Altitude during operation 4000m Max
- ◆ Overvoltage Category III (OVC III):Compliant with EN 62368-1 & EN 61558-1 at 2000m altitude

Application Field

*The **FA90-220SXXG2N5** series is a compact, high-efficiency power module designed by Aipu. This series features an ultra-wide input voltage range, AC/DC dual-use capability, low ripple, minimal temperature rise, low power consumption, high reliability, and reinforced safety isolation. It delivers excellent EMC performance, with EMC and safety specifications complying with international EN55032 and IEC/EN61000 standards. These modules are widely used in electric power, industrial control, instrumentation, and smart home applications. For harsh electromagnetic environments, please refer to our recommended EMC application circuits.*

Selection Guide

Certificate	Part No.	Input Voltage Range		Output Specification			Capacitive Load @220VAC(Max) μF	Ripple & Noise 20MHz (Max) mVp-p	Efficiency @full load, 220Vac (Typ.) %
		Nominal Value (VAC)	Range (VAC)	Power (W)	Voltage Vo (VDC)	Current Io(mA)			
-	FA90-220S12G2N5	220	80-305	80.4	12	6700	6800	120	92
	FA90-220S15G2N5	220	80-305	85.05	15	5670	4500	120	92.5
	FA90-220S24G2N5	220	80-305	90	24	3750	3000	200	93
	FA90-220S48G2N5	220	80-305	90	48	1875	470	240	93

Note 1 - Typical efficiency values are measured after the product has been aged at full load for 30 minutes.

Note 2 - Full-load efficiency (%, Typ.) may fluctuate by ±2%. It is calculated as total output power divided by input power.

Note 3 - Ripple and noise are measured using the twisted pair method. For detailed testing procedures and setup, please refer to the "Ripple & Noise Test" section.

Note 4 - This list is for reference only. For products or specifications not listed, please contact our Sales Department.

Input Specifications

Items	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	80	-	305	VAC
	DC input	110	-	430	VDC

Input Frequency Range	-	47	-	63	Hz
Input Current	115VAC	-	-	0.21	W
	220VAC	-	-	1.1	A
Surge Current	115VAC	-	35	40	
	220VAC	-	65	70	
Leakage Current	-	0.5mA TYP/230VAC/50Hz			
Hot Plug		N/A			
Recommended External Fuse	-	3.15A/300VAC, Time-blow fuse			
Remote Control (Ctrl)		N/A			

Output Specifications

Test Item		Test Conditions		Minimum	Typical	Max	Unit
Output Voltage Accuracy		Across the full Input Voltage Range with any load	Vo	-	±2.0	-	%
Linearity		Rated load	Vo	-	±0.5	-	
Load regulation		0%–100% of rated load	Vo	-	±1.0	-	
Ripple & Noise		20 MHz bandwidth	12V	-	-	120	mVp-p
			15V	-	-	120	mVp-p
			24V	-	-	200	mVp-p
			48V	-	-	240	mVp-p
Dynamic response	Overshoot	25%–50%–25%		-5.0	-	+5.0	%
	Recovery time	50%–75%–50%		-	5.0	-	ms
Minimum load				0	-	-	%
Temperature Coefficient		-		-	±0.02	-	%/°C
Start-up delay time		Nominal Input Voltage (full load)		-	50	-	ms
Power-off hold time		Input 115 VAC		-	10	-	
		Input 220 VAC		-	30	-	
Output startup overshoot voltage		Input Voltage Range		≤10			%Vo
Short-circuit protection				Can withstand prolonged short circuits with Self-recovery			Isolated
Output Over-current Protection (OCP)		Input 220 VAC		≥125% Io, Self-recovery			Isolated
Overvoltage protection		12 VDC output		≤16 VDC (hiccup or clamp)			
		15 VDC output		≤25 VDC (hiccup or clamp)			
		24 VDC Output		≤35 VDC (stutter or clamp)			
		48 VDC output		≤60 VDC (stutter or clamp)			

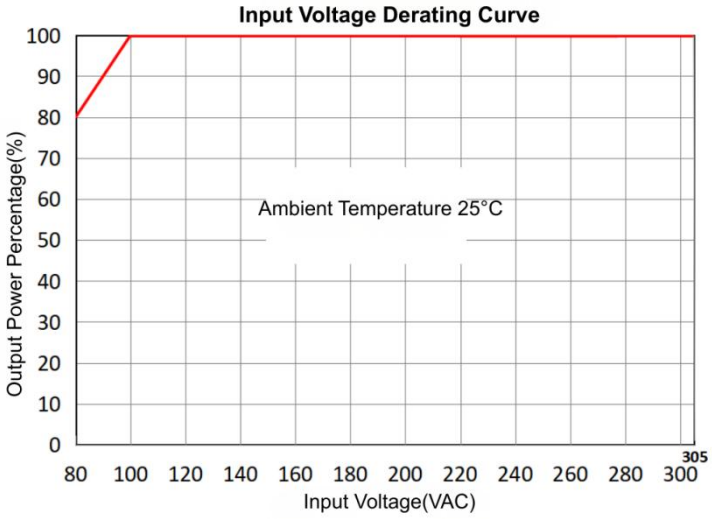
General Specifications

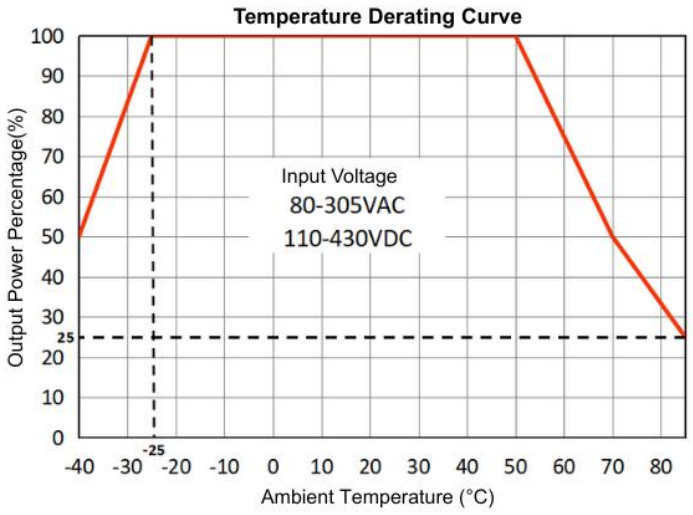
Test Item		Test Conditions	Minimum	Typical	Max	Unit
Switching Frequency		-	-	75	-	kHz
Operating Temperature		Derate the device according to the reference Derating Curve	-40	-	+85	°C
Storage temperature		-	-40	-	+85	
Soldering Temperature		Wave soldering	260±4°C, duration 5–10 s			
		Manual soldering	360±8°C, duration 4–7 s			
Relative Humidity		-	-	-	95	%RH
Isolation Voltage	Input-Output	Tested for 1 min; leakage current less than 5 mA	4200	-	-	VAC
Insulation Resistance	Input-Output	Apply 500 VDC	100	-	-	MΩ
MTBF		MIL-HDBK-217F at 25°C	500	-	-	K hours
Safety Standards		-	EN 62368, IEC 62368			
Vibration		10–500 Hz, 2G for 10 minutes per cycle, 60 minutes each on the X, Y, and Z axes				
Safety Rating		-	CLASS II			
Enclosure Rating			UL 94 V-0			
Weight/Dimensions		Package Type / Weight(Typ)	Dimensions L x W x H			
		FA90-220SXXG2N5 / 245 g	87.00 x 52.00 x 29.50 mm		3.425 x 2.047 x 1.161 in	
Power Derating		-40°C to -25°C	3.33	-	-	%/°C
		+50°C to +70°C	2.5	-	-	
		+70°C to +80°C	1.66	-	-	
		80 VAC – 100 VAC	1.0	-	-	%/VAC
		2000 m–4000 m	10	-	-	%/km
Cooling Method			natural convection cooling			

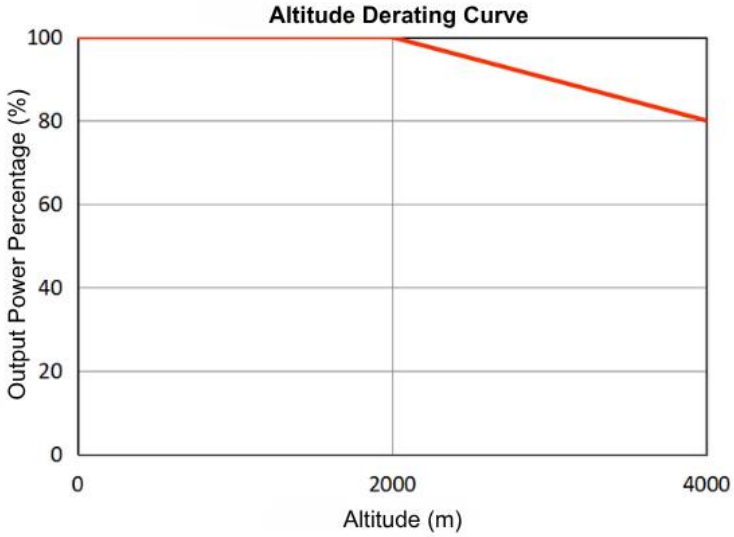
EMC Performance

Component		Sub-item	Technical Standard	Performance Criteria
EMC	EMI	CE	CISPR 32/EN 55032	CLASS B
		RE	CISPR 32/EN 55032	CLASS B
		Harmonic current	IEC/EN 61000-3-2	Class A
	EMS	Radiated immunity	IEC/EN 61000-4-3	10 V/m Performance Criteria A
		CS	IEC/EN 61000-4-6	10 V r.m.s. Performance Criteria A
		ESD	IEC/EN 61000-4-2	Contact ±6 kV / Air ±8 kV Performance Criteria A
		Surge Immunity	IEC/EN 61000-4-5	Line-to-line ±2 kV Performance Criteria A
			IEC/EN 61000-4-5	Line-to-line ±2 kV / Line-to-ground ±4 kV Performance Criteria B (recommended circuit shown in Figure 2)
		EFT	IEC/EN 61000-4-4	±2 kV Performance Criteria A
		Power frequency magnetic field immunity	IEC/EN 61000-4-8	30 A/m Performance Criteria A
		Immunity to Voltage Dips and Interruptions	IEC/EN 61000-4-11	0%, 70% Performance Criteria B

Product Characteristics Curves







Note 1: The input voltage is 80–100 VAC/110–140 VDC; voltage derating must be performed based on the input voltage Derating Curve.

Note 2: This product is suitable for use in environments with natural convection cooling; please contact us if using in enclosed environments.

Design Reference

1. Typical Application Circuit

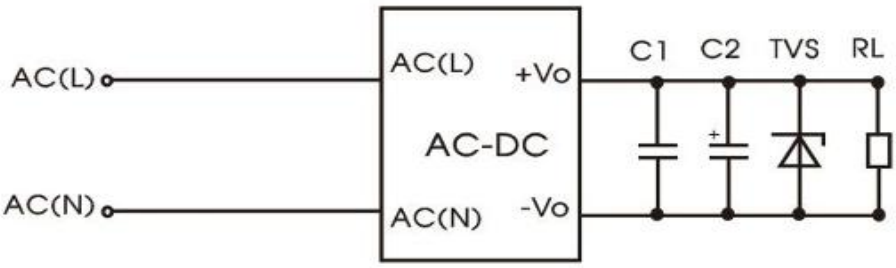


Figure 1

Model	C1	C2	TVS
FA90-220S12G2N5	1uF/100V	330uF/35V	SMBJ20A
FA90-220S15G2N5		330 μF/35 V	SMBJ20A
FA90-220S24G2N5		220uF/35V	SMBJ30A
FA90-220S48G2N5		100uF/63V	SMBJ60A

Notes:

- C2 is an electrolytic capacitor; high-frequency, low-impedance types are recommended. Refer to the manufacturer's specifications for capacity and ripple current ratings. The voltage rating should be derated to at least 80%.
- C1 is a ceramic capacitor used to filter high-frequency noise.
- A TVS diode is recommended to protect the downstream circuit in case of module abnormality.

2. EMC Solutions and Recommended Parameters

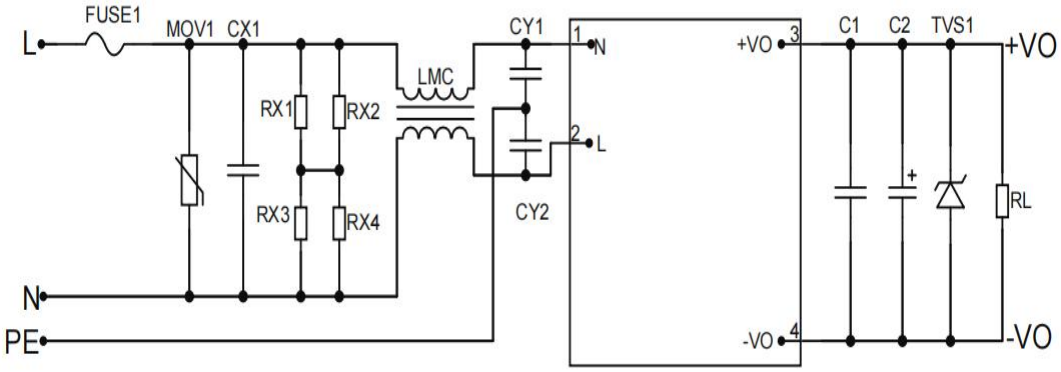
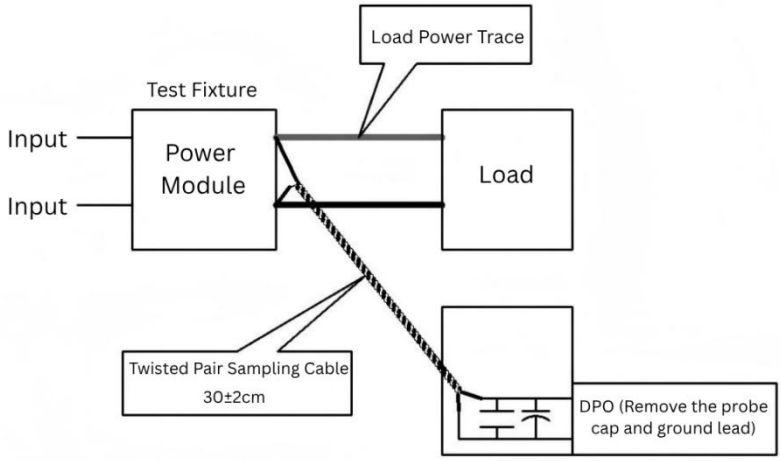


Figure 2

Model	FUSE1 (Mandatory)	MOV1	CX1	RX1、RX2、RX3、RX4	LMC	CY1、CY2	C1	C2	TVS1
FA90-220S12G2N5	3.15A/300V (slow-blow)	14D561K	334/305VAC	1206,1.5M	20mH	1nF/400VAC	1uF/100V	330uF/35V	SMBJ20A
FA90-220S15G2N5								330uF/35V	SMBJ20A
FA90-220S24G2N5								220uF/35V	SMBJ30A
FA90-220S48G2N5								100uF/63V	SMBJ60A

Ripple & Noise Test Specifications (Twisted-pair Method, 20 MHz Bandwidth)



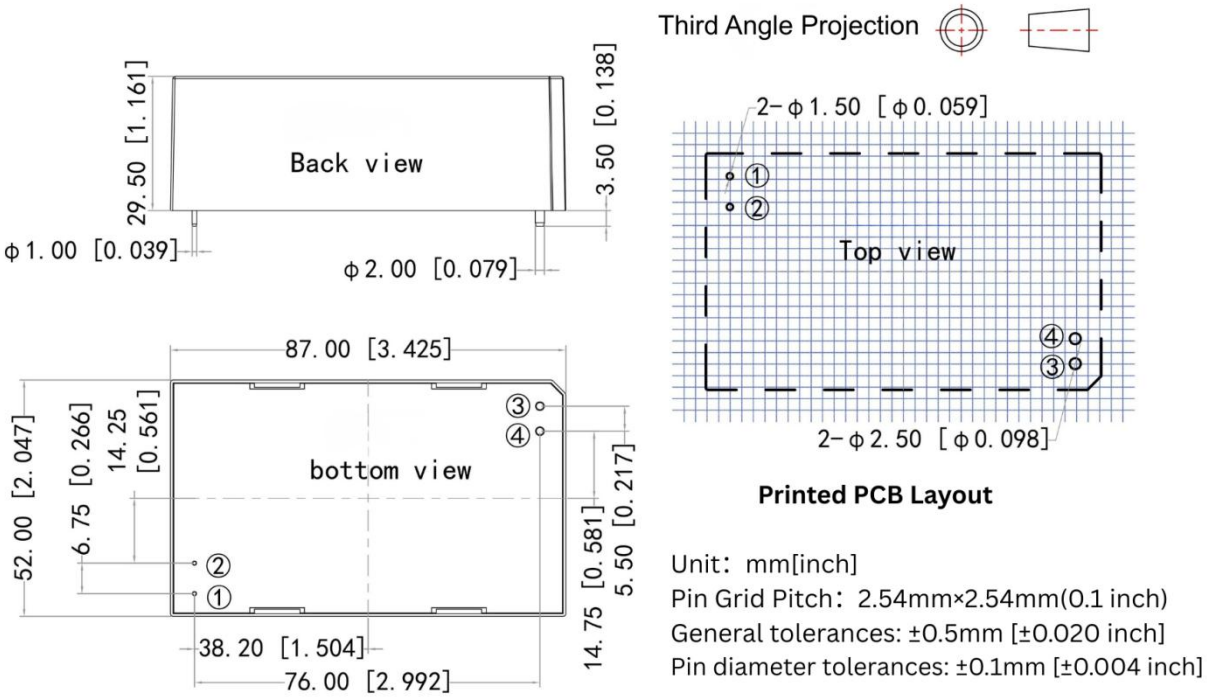
Testing Methods:

1. Ripple & Noise: Measured using the 12# twisted pair method with oscilloscope bandwidth set to 20MHz (or 100MHz). A 0.1 μ F polypropylene capacitor and a 10 μ F high-frequency low-impedance electrolytic capacitor are connected in parallel at the probe tip. The oscilloscope is set to Sample mode.

2. Ripple & Noise Test Setup:

Connect the module input to the power source and the output to the electronic load via a test fixture. Sampling is performed directly at the output ports using a 30cm ± 2cm [11.81 ± 0.79 inch] sampling wire. Power cables with appropriate gauges and insulation should be selected based on the output current.

Mechanical Dimensions



Pin Definitions

Pin Description	1	2	3	4
Function	AC(N)	AC(L)	+Vo	-Vo
	AC Neutral	AC Line	Positive Output	Negative Output

Notes:

1. The product must be used within its specified operating range; otherwise, it may be permanently damaged;
2. An external fuse must be connected at the 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 data above was measured at Ta = 25°C, humidity < 75%, Nominal Input Voltage, and rated output load (resistive load);
6. All test methods for the above specifications are based on our company's standards;
7. The performance specifications listed above apply to the product models specified in this manual. Certain specifications for non-standard models may exceed the requirements stated above; please contact our technical staff directly for specific details;
8. Aipupower can provide customization service.

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