

FEATURES

1. Ultra-wide 85 - 305VAC and 100 - 430VDC input voltage range
2. 1 × 1 inch compact size
3. Operating ambient temperature range: -40°C to +85°C
4. Up to 81.5% efficiency
5. No-load power consumption 0.1W
6. 5000m altitude application
7. Plastic case meets UL94V-0 flammability
8. EMI performance meets CISPR32/EN55032 CLASS B, EN55014



3 years
Warranty

Selection Guide

Part No.*	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 230VAC (%) Typ.	Capacitive Load (uF) Max.
RAD05-23B03R2	5W	3.3V/1515mA	71.5	4000
RAD05-23B05R2		5V/1000mA	77.5	3000
RAD05-23B09R2		9V/555mA	80.5	1200
RAD05-23B12R2		12V/416mA	80.5	1200
RAD05-23B15R2		15V/333mA	81.5	680
RAD05-23B24R2		24V/208mA	81.5	220

Note: *① Use suffix "A2S" for chassis and suffix "A4S" for DIN-Rail mounting;

② The product picture is for reference only. For details, please refer to the actual product.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Voltage Range	AC input	85	–	305	VAC
	DC input	100	–	430	VDC
Input Frequency		47	–	63	Hz
Input Current	115VAC	–	–	0.13	A
	230VAC	–	–	0.07	
Inrush Current	115VAC	–	15	–	
	230VAC	–	25	–	
Leakage Current	277VAC/50Hz	0.25mA RMS Max.			
Recommended External Input Fuse		1A, slow-blow, required (The actual use needs to be selected according to the application environment)			
Hot Plug		Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	3.3V output	–	±3	–	%
	others	–	±2	–	
Line Regulation	Full load	–	±0.5	–	
Load Regulation	0%-100% load	–	±1	–	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	–	50	100	mV

Stand-by Power Consumption	230VAC	-	0.10	-	W
Temperature Coefficient		-	±0.02	-	%/°C
Short Circuit Protection		Hiccup, continuous, self-recover			
Over-current Protection		≥130%Io, self-recover			
Over-voltage Protection	3.3/5VDC output	≤7.5VDC			
	9VDC output	≤15VDC			
	12VDC output	≤16VDC			
	15VDC output	≤20VDC			
	24VDC output	≤30VDC			
Minimum Load		0	-	-	%
Hold-up Time	115VAC input	-	5	-	ms
	230VAC input	-	50	-	
Note: * The "Tip and barrel method" is used for ripple and noise test, output parallel 10uF electrolytic capacitor and 1uF ceramic capacitor, please refer to AC-DC Converter Application Notes for specific information.					

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-Output	Electric Strength Test for 1min, leakage current <5mA			VAC
Operating Temperature		-40	-	+85	°C
Storage Temperature		-40	-	+105	
Storage Humidity		-	-	+95	%RH
Soldering Temperature	Wave-soldering	260 ± 5°C; time: 5 - 10s			
	Manual-welding	360 ± 10°C; time: 3 - 5s			
Switching Frequency		-	65	-	kHz
Power Derating	-40°Cto -25°C	3.0	-	-	% / °C
	+50°Cto +70°C	3.3V	1.75	-	
	+55°Cto +70°C	5V/9V/12V	2.33	-	
	+60°Cto +70°C	15V/24V	3.5	-	
	+70°Cto +85°C	3.3V	1.67	-	
		Others	1.0	-	-
	85VAC - 100VAC	1.0	-	-	%/VAC
	277VAC - 305VAC	0.54	-	-	
2000m - 5000m	6.7	-	-	%/Km	
Safety Standard		meet IEC/EN/BS EN62368-1, EN61558-1, EN60335-1 safety and design refer to UL62368-1			
Safety Class		CLASS II			
MTBF	MIL-HDBK-217F@25°C	≥2,602,000 h			
Designed Life	230VAC	Ta: 25°C100% load	>130x10 ³ h		
		Ta: 55°C100% load	>41x10 ³ h		

Mechanical Specifications

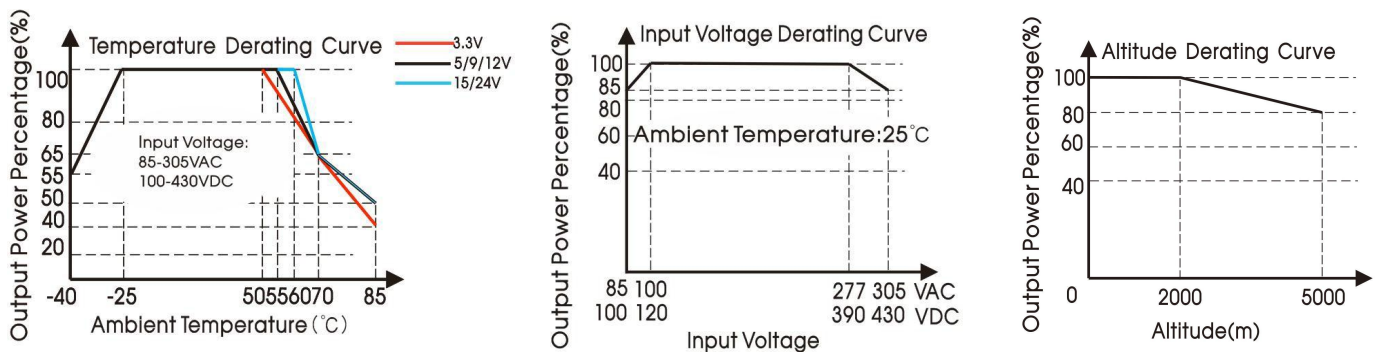
Case Material	Black plastic, flame-retardant and heat-resistant (UL94V-0)	
Dimension	Horizontal package	25.40 x 25.40 x 17.60 mm
	A2S mounting	76.00 x 31.50 x 26.40 mm
	A4S mounting	76.00 x 31.50 x 31.00 mm
Weight	Horizontal package	17.5g (Typ.)
	A2S mounting	38.0g (Typ.)
	A4S mounting	58.0g (Typ.)
Cooling method	Free air convection	

Electromagnetic Compatibility (EMC)

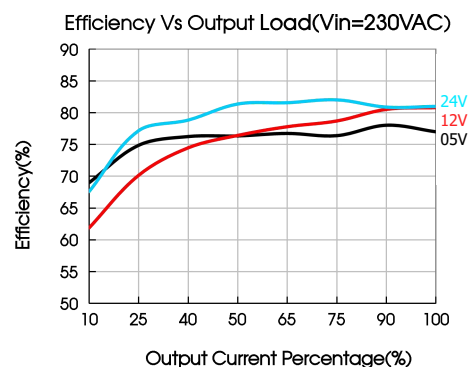
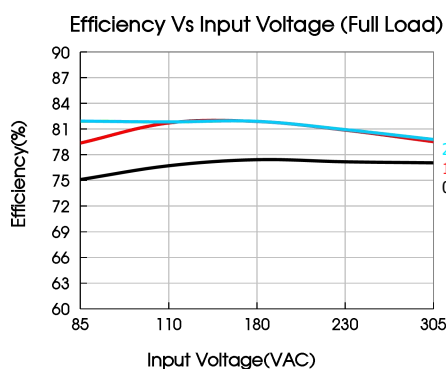
Emissions	CE	CISPR32/EN55032 CLASS B	
		EN55014-1	
Emissions	RE	CISPR32/EN55032 CLASS B	
		EN55014-1	
Immunity	ESD	IEC/EN61000-4-2 Contact $\pm 6\text{KV}$ /Air $\pm 8\text{KV}$	perf. Criteria B
		EN55014-2	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
		EN55014-2	perf. Criteria A
	EFT	IEC/EN61000-4-4 $\pm 2\text{KV}$	perf. Criteria B
		IEC/EN61000-4-4 $\pm 4\text{KV}$ (See Fig. 2 for recommended circuit)	perf. Criteria B
		IEC/EN61000-4-4 $\pm 4\text{KV}$ (See Fig. 3 for recommended circuit)	perf. Criteria A
		EN55014-2	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line $\pm 1\text{KV}$	perf. Criteria B
		IEC/EN61000-4-5 line to line $\pm 2\text{KV}$ (See Fig. 2 for recommended circuit)	perf. Criteria B
		IEC/EN61000-4-5 line to line $\pm 2\text{KV}$ /line to PE $\pm 4\text{KV}$ (See Fig. 3 for recommended circuit)	perf. Criteria A
		EN55014-2	perf. Criteria B
CS	IEC/EN61000-4-6 10Vr.m.s	perf. Criteria A	
	EN55014-2	perf. Criteria A	
	Voltage dip, short interruption and voltage variation	IEC/EN61000-4-11 0%, 70%	perf. Criteria B
		EN55014-2	perf. Criteria B

Note: ① When the output terminal of the product needs to be connected to PE through a Y capacitor, or close to the metal frame, please refer to the Fig. 3 for recommended circuit.
 ② Unless otherwise specified, EMC performance indicators are tested according to typical application circuits (Fig. 1).

Typical Characteristic Curves



Note: ① With an AC input between 85-100V/277-305VAC and a DC input between 100-120V/390-430VDC, the output power must be derated as per temperature derating curves;
 ② This product is suitable for applications using natural air cooling;



Design Reference

1. Typical application

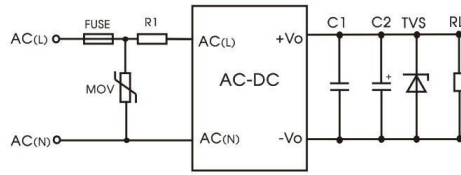


Fig. 1: Typical circuit diagram

Part No.	C1(uF)	C2(uF)	FUSE	R1	TVS	MOV
RAD05-23B03R2	1	150	1A/300V, slow-blow, required	12Ω/3W (wire-wound resistor, required)	SMBJ7.0A	S10K350
RAD05-23B05R2		150			SMBJ7.0A	
RAD05-23B09R2		120			SMBJ12A	
RAD05-23B12R2		120			SMBJ20A	
RAD05-23B15R2		120			SMBJ20A	
RAD05-23B24R2		68			SMBJ30A	

Output Filter Components:

We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacturer's datasheet). Choose a Capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise and TVS is a recommended suppressor diode to protect the application in case of a converter failure.

2. EMC compliance recommended circuit

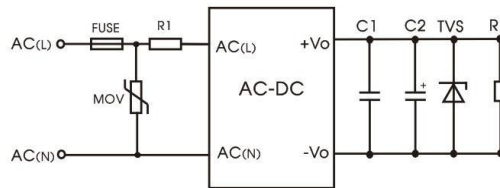


Fig. 2: EMC application circuit with higher requirements

Component	Recommended value
MOV	S14K350
R1	33Ω/3W (wire-wound resistor, required)
FUSE	2A/300V, slow-blow, required

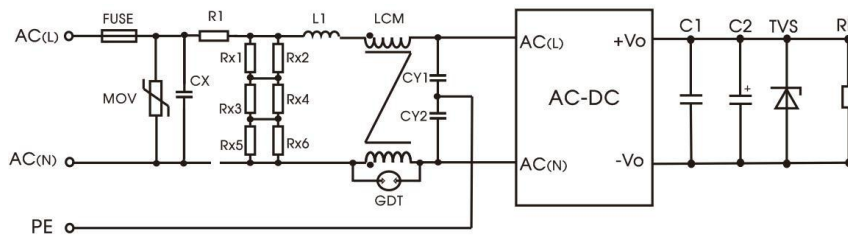


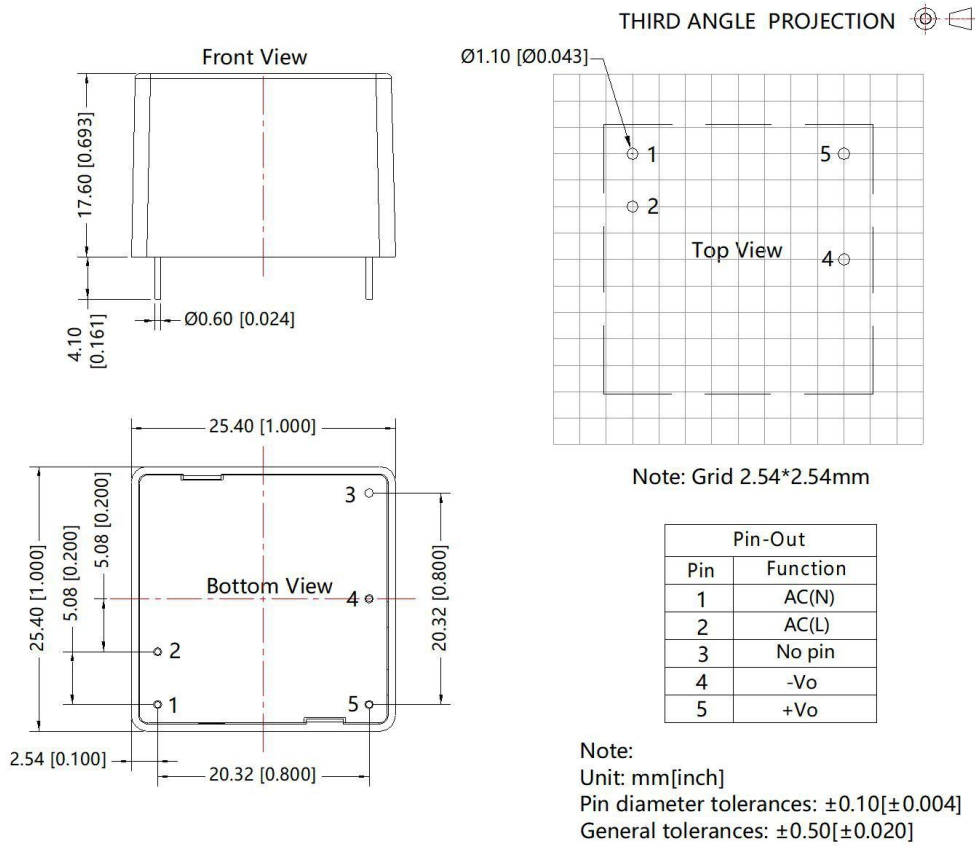
Fig. 3: Recommended circuit for class I equipment

(Recommended when the output terminal of the product needs to be connected to PE or connected to PE through a Y capacitor)

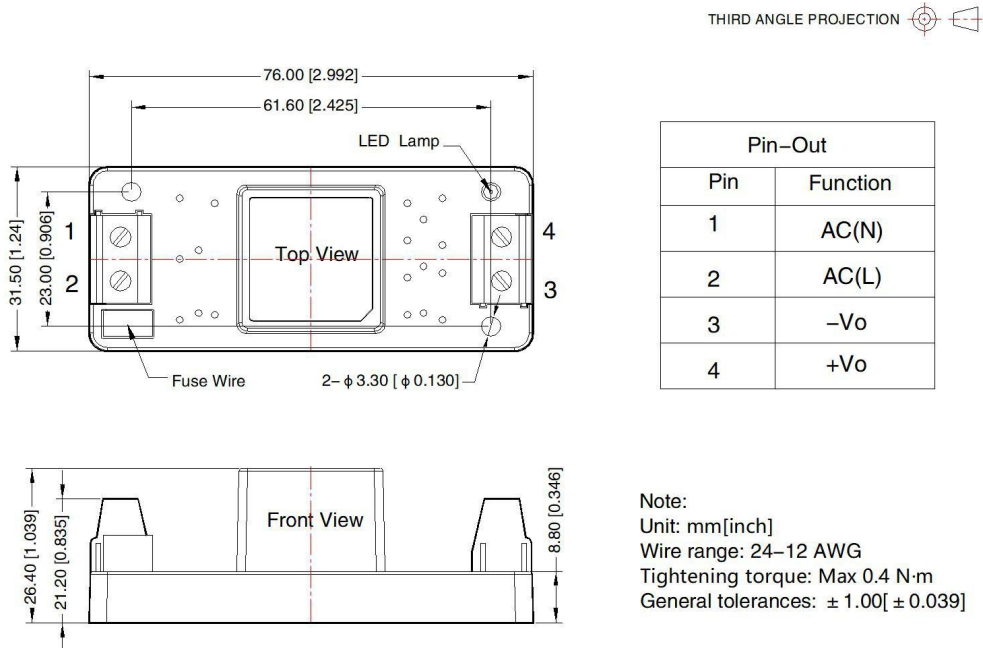
Component	Recommended value
FUSE	2A/300V, slow-blow, required
CX	334K/305VAC
R1	33Ω/3W (wire-wound resistor, required)
L1	1.2mH/0.3A
CY1/CY2	1nF/400VAC
GDT	300V/1KA
LCM	20mH, 20000*2μH 1A Max is recommended

Note: Rx1/Rx2/Rx3/Rx4/Rx5/Rx6 is the bleeder resistance of CX, and the recommended resistance value is 1.5MΩ/150VDC.

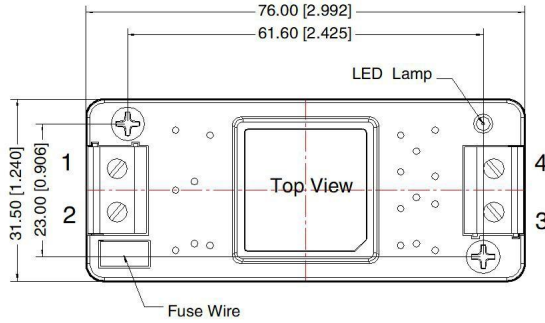
Dimensions and Recommended Layout



A2S Dimensions

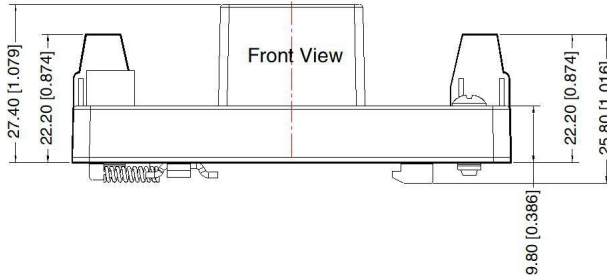


A4S Dimensions



THIRD ANGLE PROJECTION

Pin-Out	
Pin	Function
1	AC(N)
2	AC(L)
3	-Vo
4	+Vo



Note:
 Unit: mm[inch]
 Wire range: 24–12 AWG
 Tightening torque: Max 0.4 N·m
 Mounting rail: TS35, rail needs to connect safety ground
 General tolerances: $\pm 1.00[\pm 0.039]$

Notes & Instructions

1. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at $T_a=25^\circ\text{C}$, humidity $<75\%RH$, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff;

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Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at www.norpas-power.com

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