

10-40W isolated DC-DC converter with ultra-wide, ultra-high 200 - 1500V DC input for renewable energy



FEATURES

- Ultra wide input voltage range: 200 - 1500VDC
- Industrial grade operating temperature: -40°C to +70°C
- 4000VAC high isolation voltage
- High efficiency, low ripple & noise
- Input under-voltage protection, reverse input voltage protection, output short circuit, over-current, over-voltage protection
- UL1741, CSA-C22.2 No.107.1, EN62109 safety approved
- Mounting: PCB mounting, DIN-Rail mounting available
- Reinforced insulation

SPVxx-29BxxR2 series is regulated DC-DC converters with an ultra-wide DC input of 200-1500VDC. The products feature high efficiency, high reliability, high insulation and high level of safety. This type of power supply is widely used in renewable energy industries such as photovoltaic, power generation, energy storage, inverters and high-voltage DC conversions. The converters provide multiple protection features and guarantee stable and safe operating environments even under abnormal working conditions. For extremely harsh EMC environment, we recommend using the application circuit show in Design Reference of this datasheet.

Selection Guide

Certification	Part No.*	Output Power	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 800VDC (%) Typ.	Capacitive Load (µF) Max. (Normal temperature full load)
CSA/CE	SPV15-29B05R2	10W	5V/2000mA	64	6000
	SPV15-29B12R2		12V/1250mA	71	2000
	SPV15-29B15R2	15W	15V/1000mA	72	1200
	SPV15-29B24R2		24V/625mA	74	470
UL/CSA/CE	SPV40-29B12R2	40W	12V/3330mA	78	3000
	SPV40-29B15R2		15V/2670mA	82	1500
	SPV40-29B24R2		24V/1670mA	83	680

Note: * Use suffix "A8" and "A10" for DIN-Rail mounting;
A8 versions include built-in high-voltage fuse and EMC filter module, A10 only for DIN-rail;
SPV40 ("A8" and "A10") versions with UL/CSA/CE approved, SPV15 ("A8" and "A10") versions with CSA/CE approved.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range			200	--	1500	VDC
Input Current	200VDC	SPV15	--	--	120	mA
		SPV40	--	--	320	
	800VDC	SPV15	--	--	30	
		SPV40	--	--	80	
1500VDC	SPV15	--	--	16		
	SPV40	--	--	42		
Inrush Current	200VDC		--	50	--	A
	1500VDC		--	150	--	
Under-voltage Protection			Lockout activation range: 170 - 185V Lockout deactivation range: 180 - 195V			
External Input Fuse Required (A8 suffix versions with fuse included)			4A/1500VDC, required			
Hot Plug			Unavailable			

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Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±2	--	%
Line Regulation	Full load	--	±1	--	
Load Regulation	0% - 100% load	--	±1	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	150	300	mV
Temperature Coefficient		--	±0.02	±0.15	%/°C
Short Circuit Protection		Continuous, self-recovery			
Over-current Protection		≥ 120%Io, self-recovery			
Over-voltage Protection	SPV15-29B05R2	≤ 8VDC			
	SPV15-29B12R2	≤ 20VDC			
	SPV15-29B15R2	≤ 20VDC			
	SPV15-29B24R2	≤ 30VDC			
	SPV40-29B12R2	≤ 20VDC			
	SPV40-29B15R2	≤ 20VDC			
	SPV40-29B24R2	≤ 30VDC			
Minimum Load		0	--	--	%
Start-up Delay Time**	200 - 1500VDC	--	--	3	s

Note: * The "parallel cable" method is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information.
 ** Start-up delay time Test conditions: full voltage input range, full output load range(The cooling-time between input power-off and power-on again is greater than 15s.)

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit	
Isolation	Input-output	4000	--	--	VAC	
Operating Temperature		-40	--	+70	°C	
Storage Temperature		-40	--	+85		
Storage Humidity		--	--	95	%RH	
Soldering Temperature	Wave-soldering	260 ± 5°C; time: 5 - 10s				
	Manual-welding	360 ± 10°C; time: 3 - 5s				
Power Derating	-40°C to 0°C	SPV15-29B05R2/12/15	0.75	--	--	%/°C
	(200 - 300VDC)	SPV15-29B24R2/SPV40-29BxxR2	1.5	--	--	
	-40°C to -15°C	SPV15-29BxxR2	1.2	--	--	
		SPV40-29BxxR2	0	--	--	
	+50°C to +70°C	SPV15-29BxxR2	1.5	--	--	
		SPV40-29BxxR2	2.5	--	--	
	1200VDC-1500VDC	SPV40-29BxxR2	0.07	--	--	%/VDC
	2000m - 5000m		6.7	--	--	%/Km
Switching Frequency		--	65	--	kHz	
Safety Standard		UL1741, CSA-C22.2 No.107.1, EN62109				
Safety Certification		UL1741, CSA-C22.2 No.107.1, EN62109				
Altitude		--	--	5000	m	
MTBF		MIL-HDBK-217F@25°C ≥ 300,000 h				

Mechanical Specifications

Case Material	Black flame-retardant and heat-resistant plastic (UL94 V-0)				
Dimensions	Horizontal package		125.0 x 75.0 x 40.0 mm		
	A8 Din-Rail mounting		146.0 x 138.0 x 55.0 mm		
	A10 Din-Rail mounting		129.0 x 102.0 x 49.0 mm		
Weight	Horizontal package	SPV15	400g (Typ.)		
		SPV40	434g (Typ.)		
	A8 Din-Rail mounting	SPV15	710g (Typ.)		
		SPV40	744g (Typ.)		
	A10 Din-Rail mounting	SPV15	460g (Typ.)		
		SPV40	494g (Typ.)		
Cooling method	Free air convection				

Note: Washing of out-case must be avoided. We recommend using alcohol to brush clean it instead.

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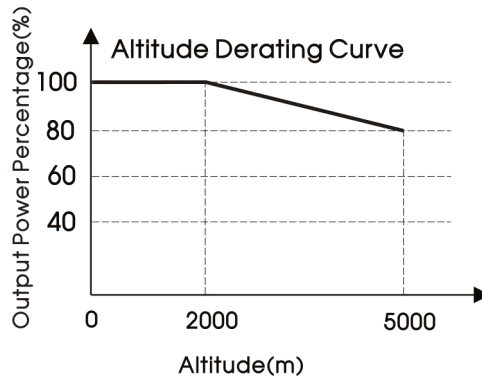
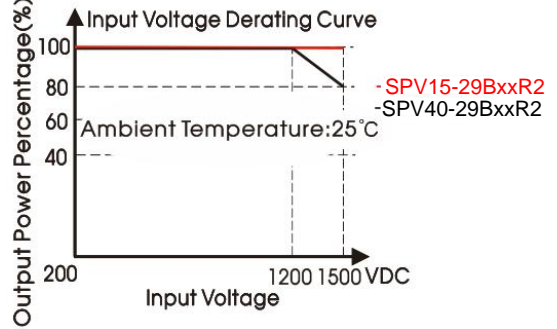
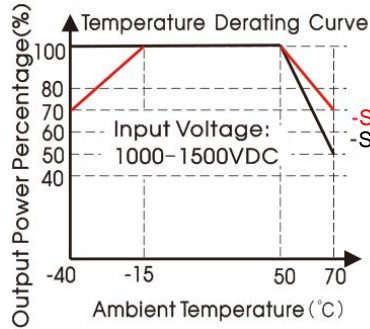
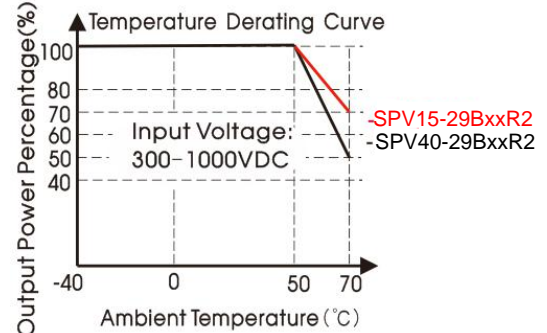
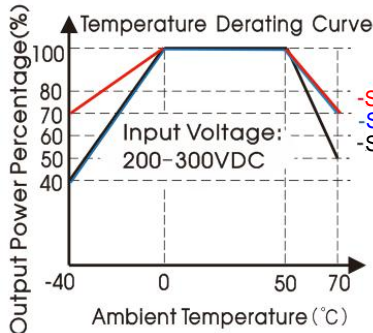
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Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A(See Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A(See Fig. 2 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ± 6 KV/Air ± 8 KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	± 2 KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ± 1 KV (See Fig. 2 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	10Vr.m.s	perf. Criteria A
	PFM	IEC/EN61000-4-8	10A/m	perf. Criteria A

Note: A8 suffix versions meet the above EMC performance without external circuits.

Product Characteristic Curve



- Note:
- ① With an input between 1200 - 1500VDC, the output power of SPV40-29BXXR2 parts must be derated as per temperature derating curves;
 - ② For operation of this converter series in an altitude between 2000 - 5000m above sea level, the output power must be derated as per the altitude derating curve;
 - ③ This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.

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Design Reference

1. Typical application

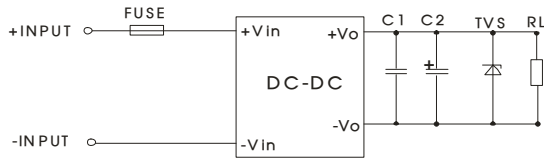


Fig. 1: Typical application circuit

Model	FUSE	C1(μF)	C2(μF)	TVS
SPV15-29B05R2	4A/1500VDC, required	1	120	SMBJ7.0A
SPV15-29B12R2			120	SMBJ20A
SPV15-29B15R2			120	SMBJ20A
SPV15-29B24R2			68	SMBJ30A
SPV40-29B12R2			120	SMBJ20A
SPV40-29B15R2			120	SMBJ20A
SPV40-29B24R2			68	SMBJ30A

Note on filter components:

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

2. EMC compliance recommended circuit

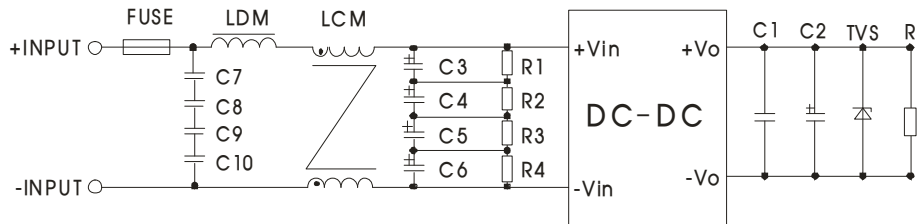
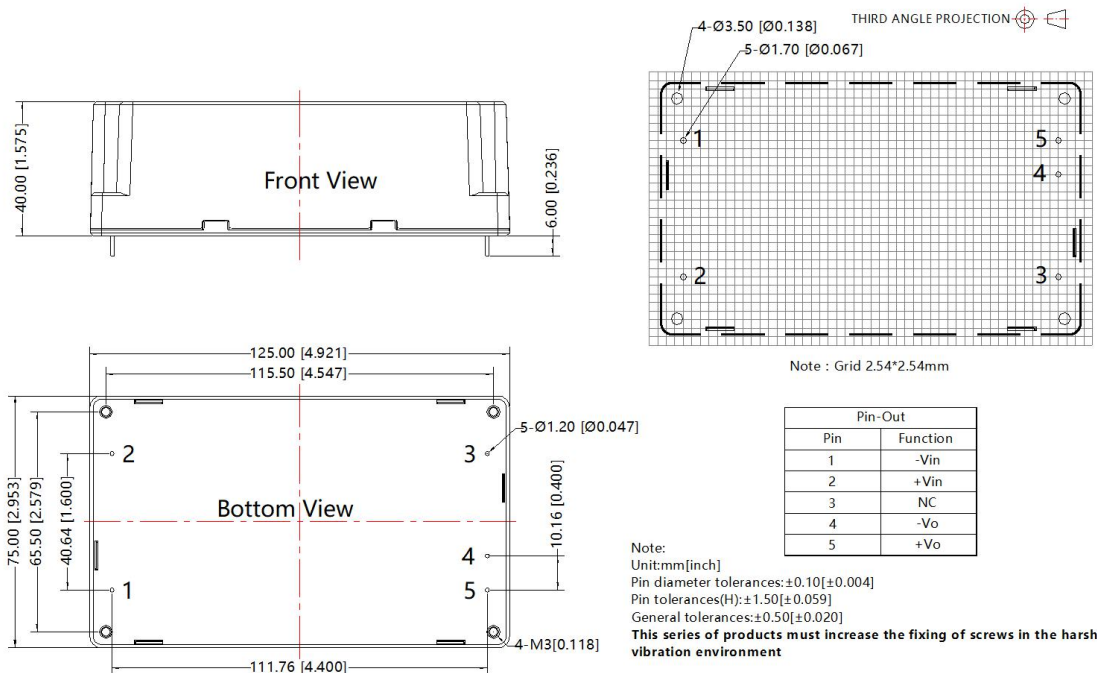


Fig 2: EMC application for higher compliance requirements (output parameters are show in Figure 1)

Component	Recommended value
C7/C8/C9/C10	Safety capacitor 104K/275VAC
C3/C4/C5/C6	47uF/450VDC
R1/R2/R3/R4	1MΩ /2W
LDM	330uH/1A
LCM	7mH/1A
FUSE	4A/1500VDC, required

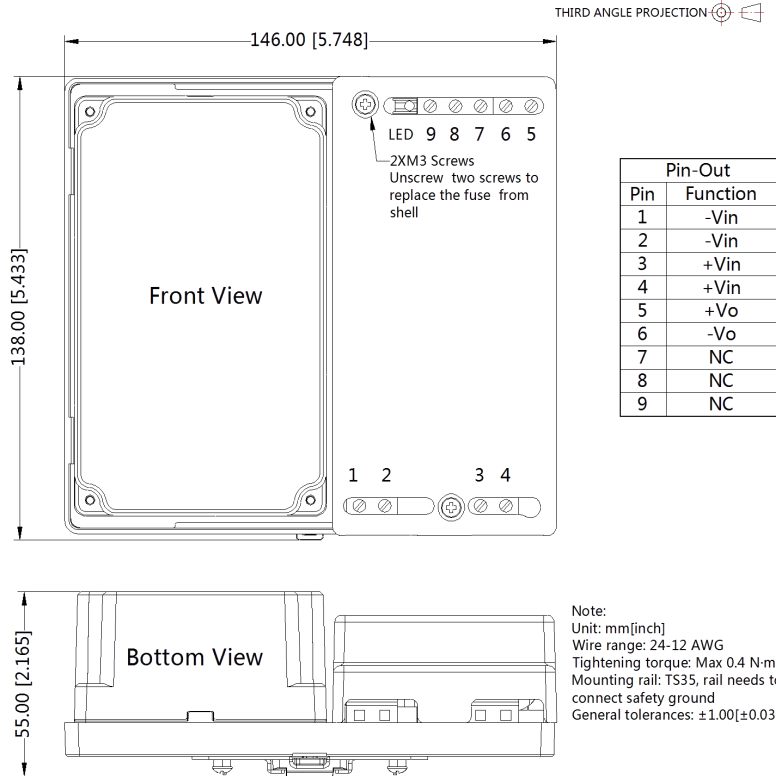
Dimensions and Recommended Layout



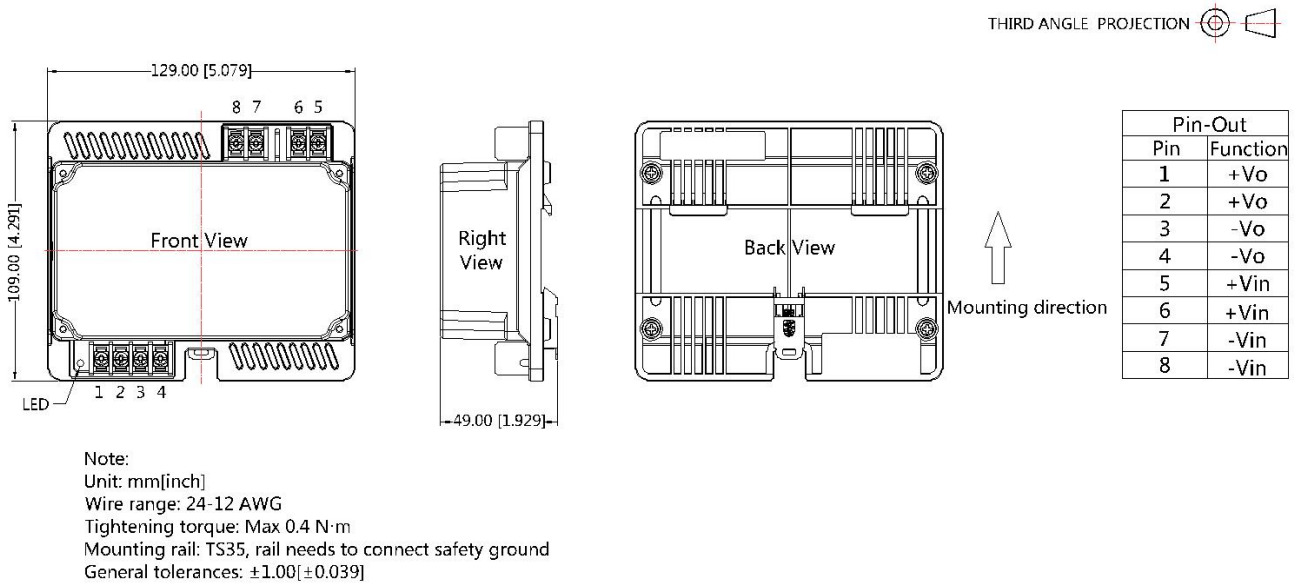
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A8 Dimensions



A10 Dimensions



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Note:

1. Unless otherwise specified, A8/A10 products performance are consistent with Horizontal package products;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75% with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. In order to improve the efficiency, there will be audible noise generated when working at input voltage higher than 1000 VDC, but it does not affect product performance and reliability;
5. It is recommended that the product be locked screw before welding;
6. If the customer needs to replace the fuse of the A8 version product, please do not put excessive mechanical stress on the bottom of PCB;
7. The above are the performance indicators of the product models listed in this datasheet. Some indicators of non-standard models will exceed the above requirements. For details, please contact our technical staff;
8. We can provide product customization service;
9. Products are related to laws and regulations: see "Features" and "EMC";
10. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.