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



FEATURES

- Ultra-wide 200 - 1500VDC input voltage range
- Industrial grade operating temperature: -40℃ to +70℃
- 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
- Mounting: PCB mounting, DIN-Rail mounting available
- Reinforced insulation

UL1741 CSA-C22.2 No.107.1-16 EN62109-1

PVxx-29Bxx 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/EN	PV15-29B05	10W	5V/2000mA	64	6000
	PV15-29B12	15W	12V/1250mA	71	2000
	PV15-29B15		15V/1000mA	72	1200
	PV15-29B24		24V/625mA	74	470
UL/CSA/EN	PV40-29B12	40W	12V/3330mA	78	3000
	PV40-29B15		15V/2670mA	82	1500
	PV40-29B24		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;
PV40 ("A8" and "A10") versions with UL/CSA/EN approved, PV15 ("A8" and "A10") versions with CSA/EN approved.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range			200	--	1500	VDC
Input Current	200VDC	PV15	--	--	120	mA
		PV40	--	--	320	
	800VDC	PV15	--	--	30	
		PV40	--	--	80	
	1500VDC	PV15	--	--	16	
		PV40	--	--	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)			15A/1500VDC, required			
Hot Plug			Unavailable			

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	%/℃
Short Circuit Protection		Continuous, self-recovery			
Over-current Protection		≥120%Io, self-recovery			
Over-voltage Protection	PV15-29B05	≤8VDC			
	PV15-29B12	≤ 20VDC			
	PV15-29B15	≤20VDC			
	PV15-29B24	≤30VDC			
	PV40-29B12	≤20VDC			
	PV40-29B15	≤ 20VDC			
	PV40-29B24	≤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 PV 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	Electric Strength Test for 1min.		4000	--	--	VAC
Operating Temperature				-40	--	+70	℃
Storage Temperature				-40	--	+85	
Storage Humidity				--	--	95	%RH
Soldering Temperature		Wave-soldering		260 ± 5℃; time: 5 - 10s			
		Manual-welding		360 ± 10℃; time: 3 - 5s			
Power Derating		-40℃ to 0℃ (200 - 300VDC)	PV15-29B05/12/15	0.75	--	--	%/℃
			PV15-29B24/ PV40-29Bxx	1.5	--	--	
		-40℃ to -15℃ (1000 - 1500VDC)	PV15-29Bxx	1.2	--	--	
			PV40-29Bxx	0	--	--	
		+50℃ to +70℃	PV15-29Bxx	1.5	--	--	
			PV40-29Bxx	2.5	--	--	
		1200VDC-1500VDC	PV40-29Bxx	0.07	--	--	%/VDC
		2000m - 5000m		6.7	--	--	%/Km
Switching Frequency				--	65	--	kHz
Safety Standard				UL1741, CSA-C22.2 No.107.1-16, EN62109-1 safety standards			
Altitude				--	--	5000	m
MTBF				MIL-HDBK-217F@25℃ ≥ 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	PV15	400g (Typ.)
		PV40	434g (Typ.)
	A8 Din-Rail mounting	PV15	710g (Typ.)
		PV40	744g (Typ.)
	A10 Din-Rail mounting	PV15	460g (Typ.)
		PV40	494g (Typ.)
Cooling method			Free air convection

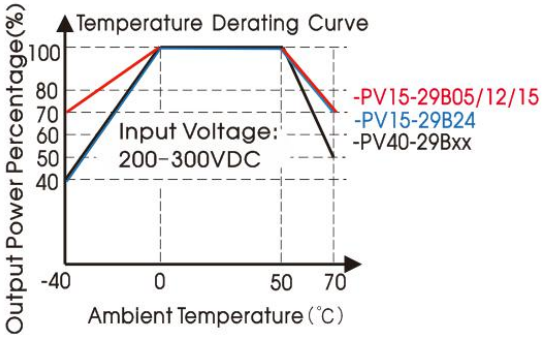
Note: Avoid washing the shell with the PCB water directly, it is recommended to use alcohol to clean or wipe it.

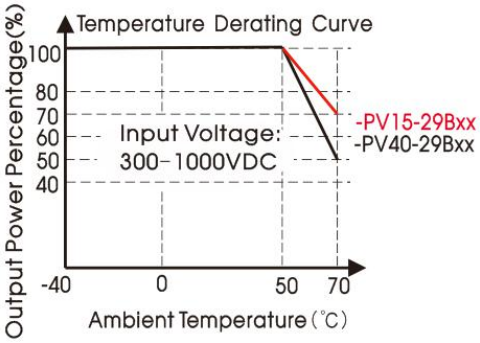
Electromagnetic Compatibility (EMC)

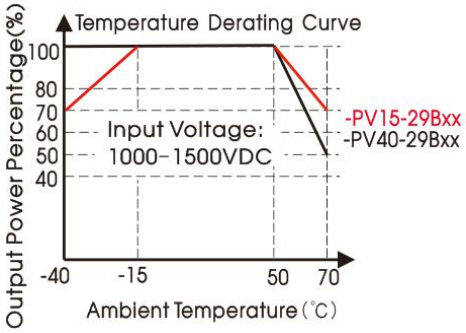
Emissions	CE	CISPR32/EN55032	CLASS A (See Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (See Fig. 2 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	Perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (See Fig. 2 for recommended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

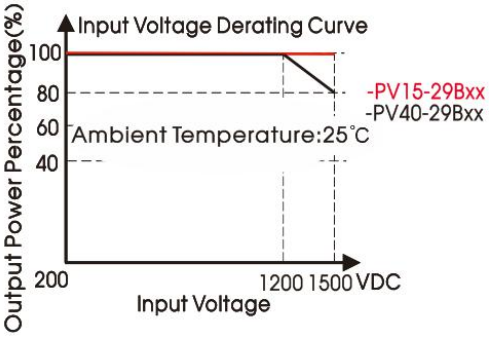
Note: A8 suffix versions meet the above EMC performance without external circuits.

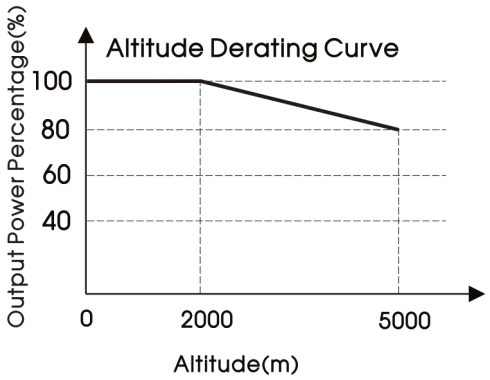
Product Characteristic Curve











Note:
① With an input between 1200 - 1500VDC, the output power of PV40-29Bxx 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.

Design Reference

1. Typical application

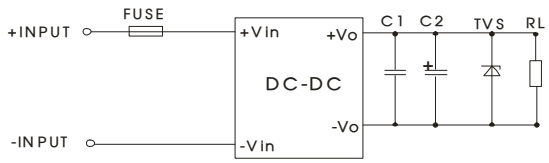


Fig. 1: Typical application circuit

Model	FUSE	C1(μF)	C2(μF)	TVS
PV15-29B05	15A/1500VDC , required	1	120	SMBJ7.0A
PV15-29B12			120	SMBJ20A
PV15-29B15			120	SMBJ20A
PV15-29B24			68	SMBJ30A
PV40-29B12			120	SMBJ20A
PV40-29B15			120	SMBJ20A
PV40-29B24			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

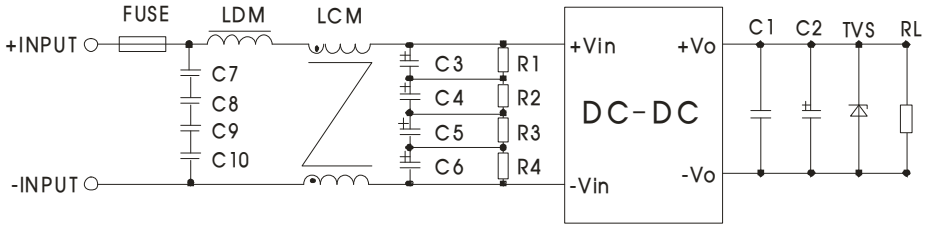
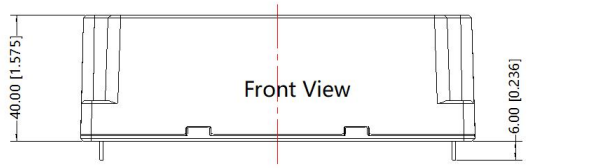


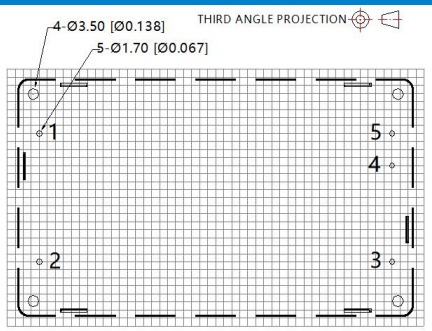
Fig 2: EMC application for higher compliance requirements (output parameters are show in Figure 1)

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	15A/1500VDC, required

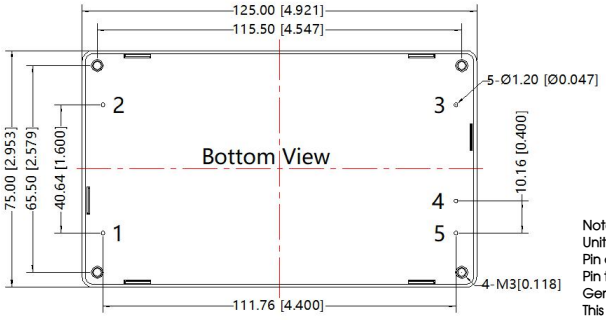
3. For additional information please refer to application notes on www.mornsun-power.com.

Dimensions and Recommended Layout





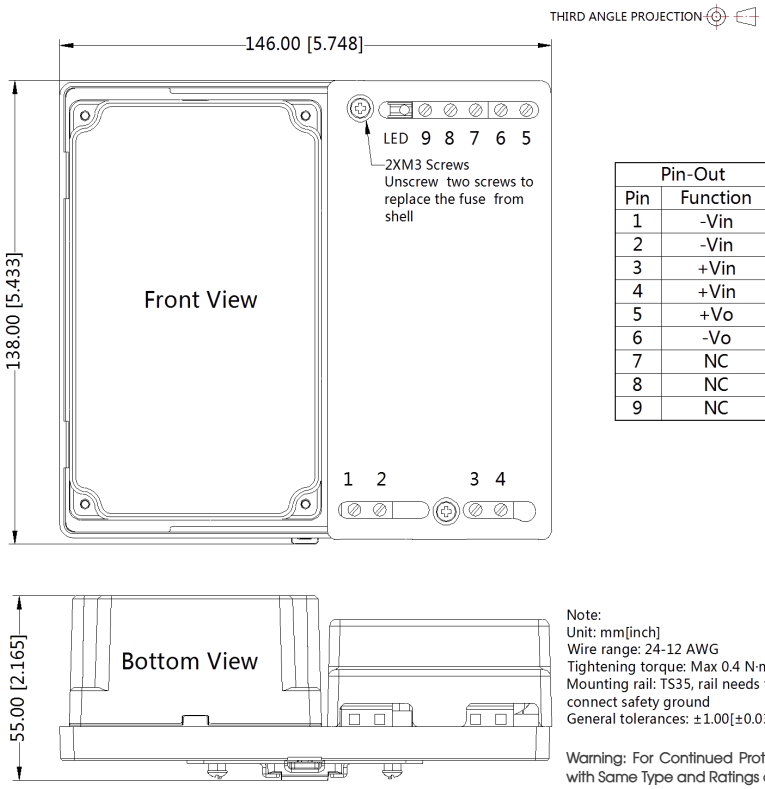
Note : Grid 2.54*2.54mm



Pin-Out	
Pin	Function
1	-Vin
2	+Vin
3	NC
4	-Vo
5	+Vo

Note:
Unit: mm (inch)
Pin diameter tolerances: ±0.10 (±0.004)
Pin tolerances (H): ±1.50 (±0.059)
General tolerances: ±0.50(±0.020)
This series of products must increase the fixing of screws in the harsh vibration environment.
Fuse: 15A/1500VDC
Warning: For Continued Protection against Risk of Fire, Replace Only with Same Type and Ratings of Fuse.
Fuse: 15A/1500VDC
Avertissement: Afin de continuer à éviter les risques d'incendie, veuillez utiliser uniquement des fusibles du même type et de même calibre à la place.

A8 Dimensions



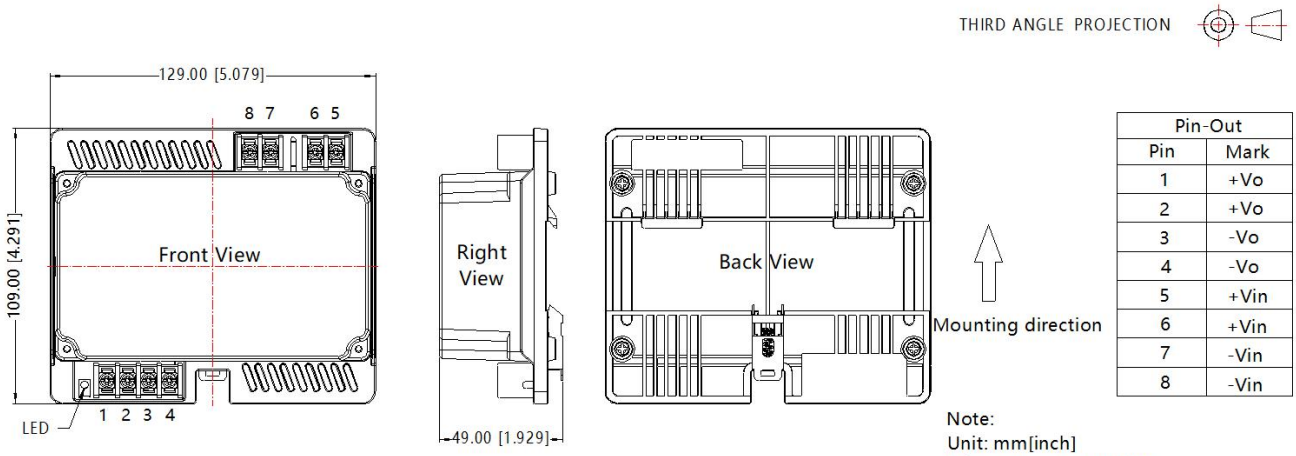
Pin-Out	
Pin	Function
1	-Vin
2	-Vin
3	+Vin
4	+Vin
5	+Vo
6	-Vo
7	NC
8	NC
9	NC

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: ±1.00[±0.039]

Warning: For Continued Protection against Risk of Fire, Replace Only with Same Type and Ratings of Fuse.

Avertissement: Afin de continuer à éviter les risques d'incendie, veuillez utiliser uniquement des fusibles du même type et de même calibre à la place.

A10 Dimensions



Pin-Out	
Pin	Mark
1	+Vo
2	+Vo
3	-Vo
4	-Vo
5	+Vin
6	+Vin
7	-Vin
8	-Vin

Note:
Unit: mm[inch]
Wire range: 22-14 AWG
Connector tightening torque: M3, 0.5N·m
Mounting rail: TS35, rail needs to connect safety ground
General tolerances: ±1.00[±0.039]
Fuse: 15A/1500VDC
Warning: For Continued Protection against Risk of Fire, Replace Only with Same Type and Ratings of Fuse.
Fuse: 15A/1500VDC
Avertissement: Afin de continuer à éviter les risques d'incendie, veuillez utiliser uniquement des fusibles du même type et de même calibre à la place.

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number of Horizontal package: 58020023; the packaging bag number of A8 package: 58220034; the packaging bag number of A10 package: 58220040;
2. Unless otherwise specified, A8/A10 products performance are consistent with Horizontal package products;
3. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. 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;
6. It is recommended that the product be locked screw before welding;
7. 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;
8. 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;
9. We can provide product customization service;
10. Products are related to laws and regulations: see "Features" and "EMC";
11. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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