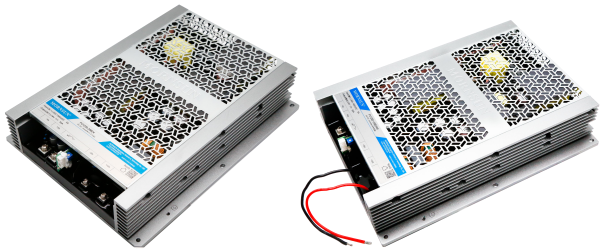
DC/DC Converter

PV1200-29Bxx Series

MORNSUN®

1200W isolated DC-DC converter with ultra-wide, ultra-high 300 -1500VDC input for Renewable Energy



RoHS

FEATURES

- Ultra-wide input voltage range of 300 - 1500VDC (Transient 1600VDC last for 10s)
- Industrial grade operating temperature -40℃ to +85℃
- High I/O isolation voltage up to 4000VAC
- High efficiency, low ripple & noise
- High reliability, long lifespan
- Input under-voltage protection, input reverse polarity protection, over-temperature protection, output short circuit, over-current, over-voltage protection
- Support 3+1 parallel redundancy, current sharing
- Operating up to 5000m altitude
- Meets Class I (terminal), Class II (lead type)
- EFT immunity meets Level 4
- Design refer to CSA-C22.2 No.107.1, UL1741, EN/IEC/BS EN62109

PV1200-29Bxx is a regulated DC-DC series converter with an ultra-wide and ultra-high DC input of 300-1500VDC, which design based on standard of CSA-C22.2 No.107.1, UL1741, EN/IEC/BS EN62109. The products feature high efficiency, high reliability, high insulation and a high level of safety protection. It is widely used in renewable energy industries, such as photovoltaic inverter, energy storage systems, industrial control. 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 (W)	Nominal Output Voltage and Current (Vo/Io)	Efficiency at 1100VDC (%) Typ.	Capacitive Load (μF) Max.
/	PV1200-29B12	900	12V/75A	91	10000
	PV1200-29B24	1200	24V/50A	93	8800
	PV1200-29B36		36V/33.34A	94	6600
	PV1200-29B48		48V/25A	95	4400

Note: *Use suffix "W" for lead type version.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range			300	--	1500	VDC
	Transient (10s)		--	--	1600	
Input Current	300VDC		--	--	5	A
	800VDC		--	--	2	
Inrush Current	1500VDC	Cold start	--	150	--	
Input Under-voltage Protection			Lockout activation range: 285 - 295V Lockout deactivation range: 290 - 300V Hysteresis voltage typical value: 5V			
Input Reverse Polarity Protection			Available			
External Input Fuse			8A/1500VDC, required			
Hot Plug			Unavailable			

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	All load range	--	±1	--	%
Line Regulation	Rated load	--	±1	--	
Load Regulation	800VDC	--	±2	--	
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)	--	--	150	mV

Stand-by Power Consumption	300VDC		--	3	5	W
	800VDC		--	4	6	
	1500VDC		--	5	8	
Temperature Coefficient			--	±0.02	--	%/℃
Short Circuit Protection			Hiccup, continuous, self-recovery			
Over-voltage Protection	12V		⩽20V	Output voltage hiccup		
	24V		⩽35V			
	36V		⩽50V			
	48V		⩽60V			
Over-current Protection	Full input voltage range		110% - 200% Io, hiccup, self-recovery			
Over-temperature Protection**	Full voltage, full load, self-recover	Over-temperature protection start	60	--	80	℃
		Over-temperature protection release	45	--	65	
Minimum Load			0	--	--	%
Hold-up Time	Full load	800VDC input	--	5	--	ms
Start-up Delay Time***			--	1	3	s
Output Voltage Adjustable Range ADJ	12V		10.8 - 13.2			V
	24V		21.6 - 26.4			
	36V		32.4 - 39.6			
	48V		43.2 - 52.8			
	12V	Output voltage adjustable range ＞12.3V	Output power ⩽900W			
	24V	Output voltage adjustable range ＞24.3V	Output power ⩽1000W			
	36V	Output voltage adjustable range ＞36.5V				
	48V	Output voltage adjustable range ＞48.5V				

Note: *The " Tip and barrel method" is used for ripple and noise test, please refer to PV Converter Application Notes for specific information;
**Output voltage turn off, self-recovery after fault conditions is removed, the over-temperature point is the ambient temperature of the product;
***Full input voltage / 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., leakage current ＜5mA		4000	--	--	VAC
	Input - PE	Electric Strength Test for 1min., leakage current ＜6mA					
	Output - PE	Electric Strength Test for 1min., leakage current ＜5mA					
Insulation Type				Primary and secondary meet reinforced insulation			
Insulation Resistance	Input - output	Testing voltage: 500VDC		100	--	--	MΩ
	Input - PE						
	Output - PE						
Operating Temperature				-40	--	+85	℃
Storage Temperature				-40	--	+85	
Storage Humidity		Non-condensing		--	--	95	%RH
Output Power Derating		Operating temperature derating	+45℃ to +55℃	1.7	--	--	%/℃
			+55℃ to +70℃	2.2	--	--	
			+70℃ to +85℃	2.66	--	--	
		Altitude derating	3000- 5000m	10	--	--	%/Km
Safety Standard				Design refer to CSA-C22.2 No.107.1-16, UL1741, EN/IEC/BS EN62109-1			
Safety Class				Class I (terminal), Class II (lead type)			
MTBF		MIL-HDBK-217F@25℃		⩾ 300,000 h			

Mechanical Specifications

Case Material	Metal
Dimensions	292.00 x 225.00 x 58.00mm
Weight	4000g (Typ.)
Cooling Method	Free air convection

Electromagnetic Compatibility (EMC)

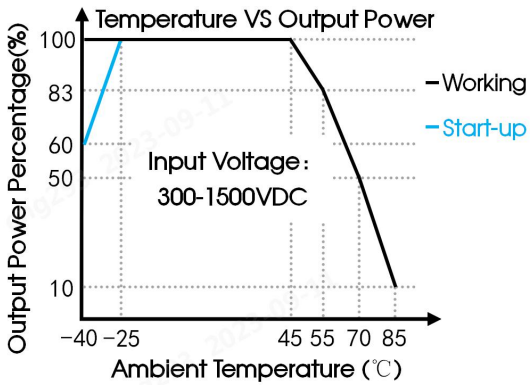
Emissions	CE	CISPR32/EN55032	CLASS A	
	RE	CISPR32/EN55032	CLASS A	
Immunity	ESD	IEC/EN61000-4-2	Contact ±6KV/Air ±8KV	Perf. Criteria A
	RS	IEC/EN61000-4-3	10V/m	Perf. Criteria A
	EFT	IEC/EN61000-4-4	±4KV	Perf. Criteria A
	Surge	IEC/EN61000-4-5	Line to line ±1KV/line to PE ±2KV	Perf. Criteria A
		IEC/EN61000-4-5	Line to line ±2KV/line to PE ±4KV (See Fig. 2 for recommended circuit)	Perf. Criteria A
	CS	IEC/EN61000-4-6	10Vr.m.s	Perf. Criteria A
	PFMF	IEC/EN61000-4-8	30A/m	Perf. Criteria A

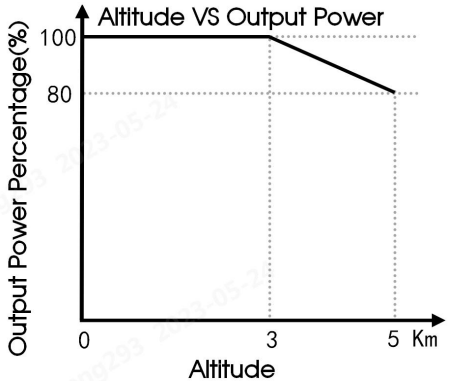
Note: PE connection is required for CLASS I (terminal) application; no PE connection is required for CLASS II (lead type) application.

Functional Specifications

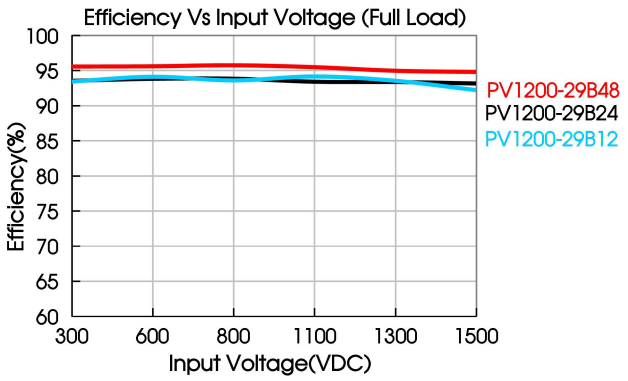
Item	Operating Conditions		Min.	Typ.	Max.	Unit
Current Sharing Accuracy (parallel)	Full input voltage range, when units in parallel, each power supply needs to carry a rated load of more than 50%		-5	--	+5	%
Backflow Prevention	Applied voltage, product without damaging	12V	--	--	14	V
		24V	--	--	28	
		36V	--	--	41	
		48V	--	--	54	
External Enable Pin	External signal to EN pin		1. Pulled high (5-15V) product no output 2. Disconnection or pulled low (＜0.3V) product normal output			/
LED Signal	Main output status indication	Normal output	Green on			
		Power off	Light off			

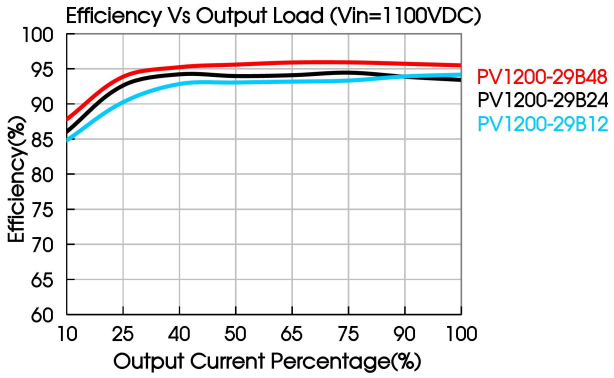
Product Characteristic Curve





Note: This product is suitable for applications using natural air cooling; For applications in closed environment please consult Mornsun FAE.





Design Reference

1. Typical application

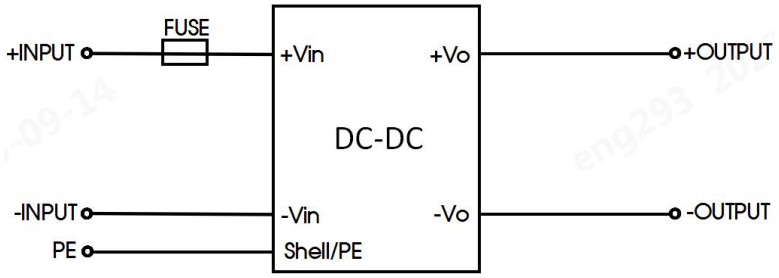


Fig. 1

Part No.	FUSE
PV1200-29Bxx	8A/1500VDC, required
Note: No PE connection is required for CLASS II application.	

2. EMC compliance recommended circuit

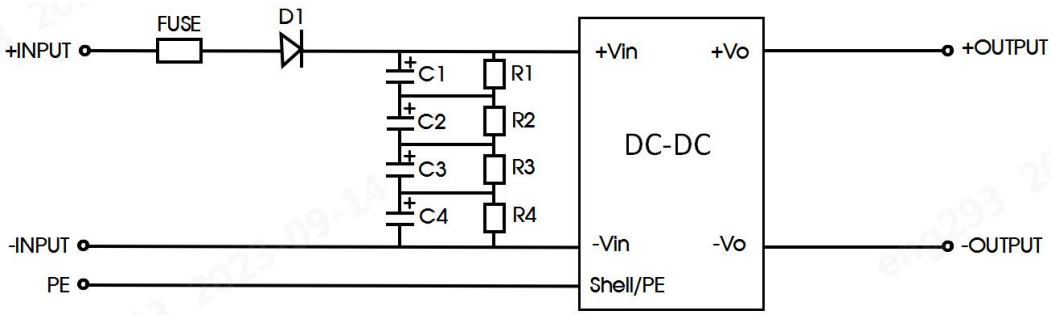


Fig. 2

Model	Recommended value
FUSE	8A/1500VDC, required
D1	4000V/50A (two 1000V/50A rectifier bridges in series)
C1/C2/C3/C4	100μF/450VDC
R1/R2/R3/R4	1MΩ/2W
Note: No PE connection is required for CLASS II application.	

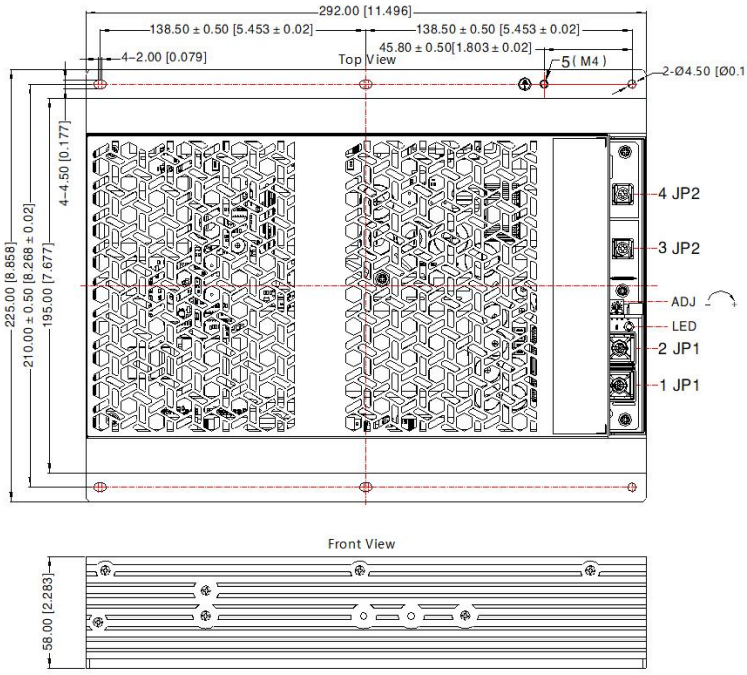
3. IMPORTANT SAFETY INSTRUCTIONS

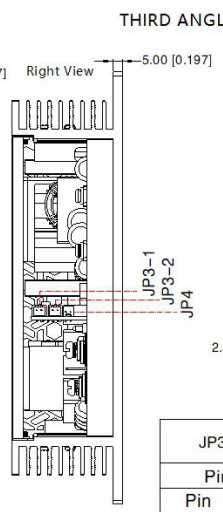
Additional protective devices, such as lightning protector need to be added if there is an transient pulse voltage greater than 6KV at the input of PV products in system applications.

4. For more information Please find the application notes on www.mornsun-power.com.

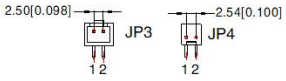
Dimensions and Recommended Layout

PV1200-29B12





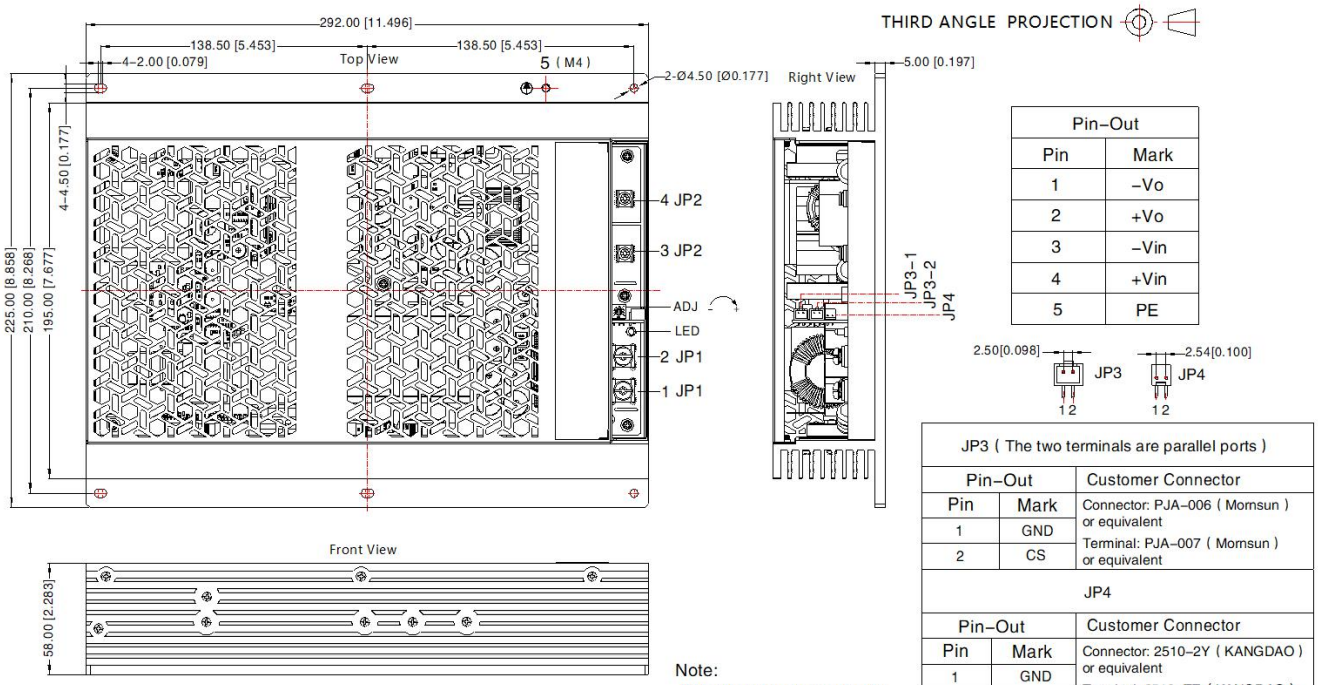
Pin-Out	
Pin	Mark
1	-Vo
2	+Vo
3	-Vin
4	+Vin
5	PE



JP3 (The two terminals are parallel ports)		
Pin-Out		Customer Connector
Pin	Mark	Connector: PJA-006 (Mornsun) or equivalent Terminal: PJA-007 (Mornsun) or equivalent
1	GND	
2	CS	
JP4		
Pin-Out		Customer Connector
Pin	Mark	Connector: 2510-2Y (KANGDAO) or equivalent Terminal: 2510-TE (KANGDAO) or equivalent
1	GND	
2	EN	

Note:
JP1 connector wire range: 6-2AWG
Recommend Torque: M5, 2.4N · m ± 10%
JP2 connector wire range: 20-14AWG
Recommend Torque: M4, 1.2N · m ± 10%
JP3 spec.: XHS2.5-2A
JP4 spec.: A2542-02AW
Unit: mm[inch]
General tolerances: ± 1.00[± 0.039]

PV1200-29B24/36/48



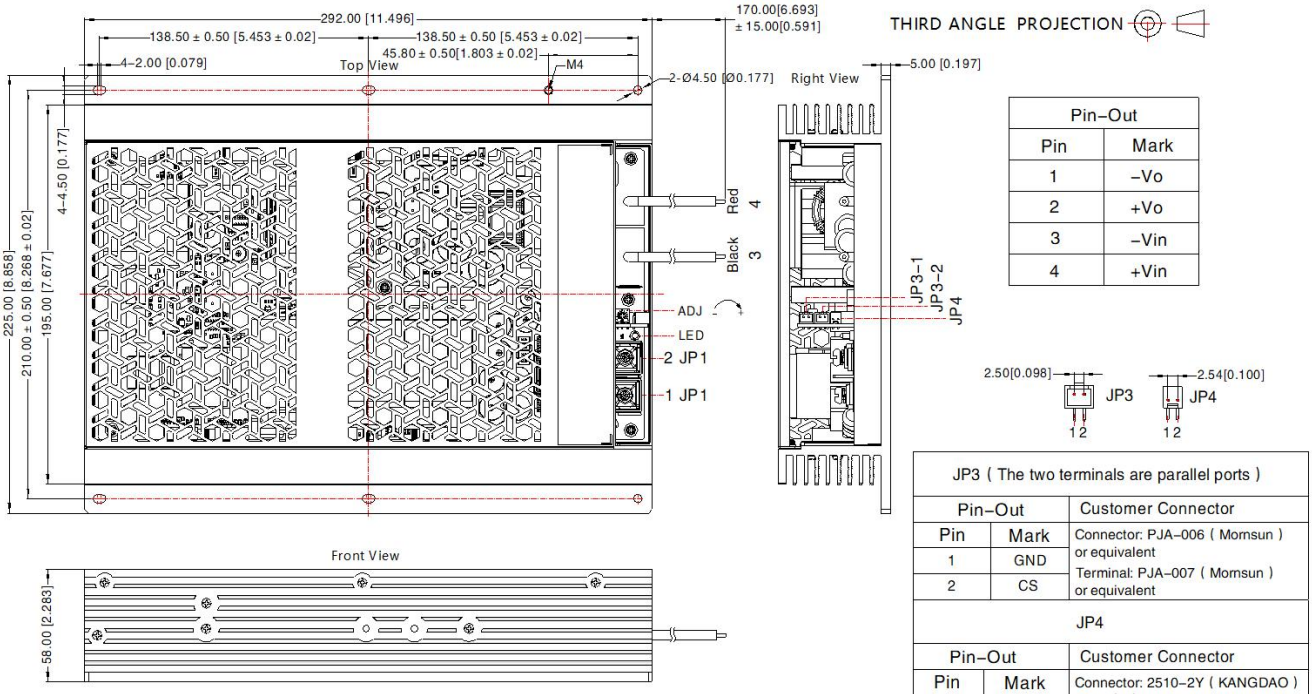
Pin-Out	
Pin	Mark
1	-Vo
2	+Vo
3	-Vin
4	+Vin
5	PE

JP3 (The two terminals are parallel ports)		
Pin-Out		Customer Connector
Pin	Mark	Connector: PJA-006 (Mornsun) or equivalent
1	GND	Terminal: PJA-007 (Mornsun) or equivalent
2	CS	

JP4		
Pin-Out		Customer Connector
Pin	Mark	Connector: 2510-2Y (KANGDAO) or equivalent
1	GND	Terminal: 2510-TE (KANGDAO) or equivalent
2	EN	

Note:
JP1 connector wire range:
24V: 8-2AWG
36V: 10-2AWG
48V: 14-2AWG
Recommend Torque: M5, 2.4N · m ± 10%
JP2 connector wire range: 20-14AWG
Recommend Torque: M4, 1.2N · m ± 10%
JP3 spec.: XHS2.5-2A
JP4 spec.: A2542-02AW
Unit: mm[inch]
General tolerances: ± 1.00[± 0.039]

PV1200-29B12W

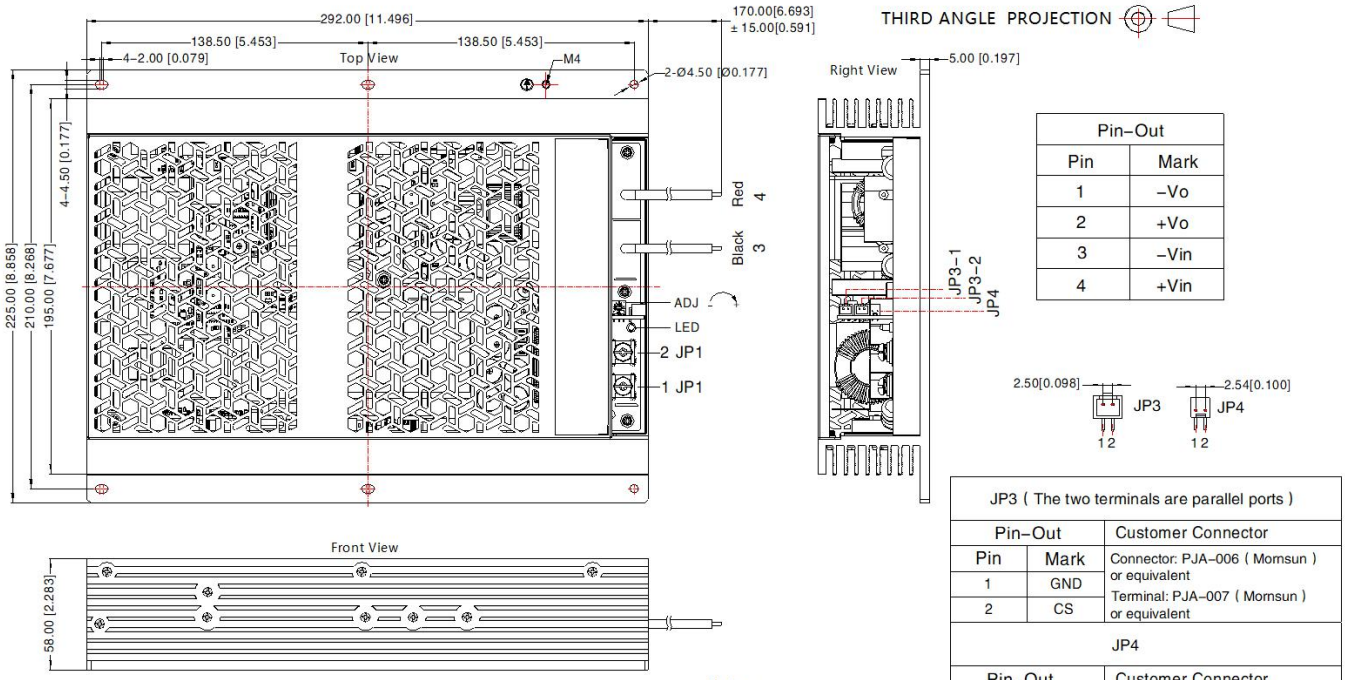


Pin-Out	
Pin	Mark
1	-Vo
2	+Vo
3	-Vin
4	+Vin

JP3 (The two terminals are parallel ports)		
Pin-Out		Customer Connector
Pin	Mark	Connector: PJA-006 (Mornsun) or equivalent
1	GND	Terminal: PJA-007 (Mornsun) or equivalent
2	CS	
JP4		
Pin-Out		Customer Connector
Pin	Mark	Connector: 2510-2Y (KANGDAO) or equivalent
1	GND	Terminal: 2510-TE (KANGDAO) or equivalent
2	EN	

Note:
JP1 connector wire range: 6-2AWG
Recommend Torque: M5, 2.4N · m ± 10%
Input wire spec.: UL3239 14AWG
JP3 spec.: XHS2.5-2A
JP4 spec.: A2542-02AW
Unit: mm[inch]
General tolerances: ± 1.00[± 0.039]

PV1200-29B24/36/48W



Pin-Out	
Pin	Mark
1	-Vo
2	+Vo
3	-Vin
4	+Vin

JP3 (The two terminals are parallel ports)		
Pin-Out		Customer Connector
Pin	Mark	Connector: PJA-006 (Mornsun) or equivalent Terminal: PJA-007 (Mornsun) or equivalent
1	GND	
2	CS	
JP4		
Pin-Out		Customer Connector
Pin	Mark	Connector: 2510-2Y (KANGDAO) or equivalent Terminal: 2510-TE (KANGDAO) or equivalent
1	GND	
2	EN	

Note:
JP1 connector wire range:
24V: 8-2AWG
36V: 10-2AWG
48V: 14-2AWG
Recommend Torque: M5, 2.4N · m ± 10%
Input wire spec.: UL3239 14AWG
JP3 spec.: XHS2.5-2A
JP4 spec.: A2542-02AW
Unit: mm[inch]
General tolerances: ± 1.00[± 0.039]

⚠WARNING:
1. CAUTION: "To reduce the risk of fire, connect only to a circuit provided with 8 amperes maximum branch-circuit over-current protection in accordance with the National Electrical Code, ANSI/NFPA70."
2. WARNING: REPLACE ONLY WITH THE SAME RATINGS AND TYPE OF FUSE.
3. DANGER — HIGH VOLTAGE.

AVERTISSEMENT:
1. Avertissement: Pour réduire le risque d'incendie, veuillez connecter uniquement à des circuits de dérivation avec protection contre les surintensités conformes au code électrique national ANSI/ NFPA 70.
2. AVERTISSEMENT : N'UTILISER QUE DES FUSIBLES DE MÊMECALIBRE ET DE MÊME TYPE QUE LE FUSIBLE DORIGINE.
3. DANGER : HAUTE TENSION.

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220274;
2. 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;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. The output voltage can be adjusted by the ADJ, clockwise to increase;
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.
8. If the final product application is connected to a photovoltaic array, the array needs to be grounded and the voltage between the positive and negative poles of the product shall not be greater than 1500VDC.

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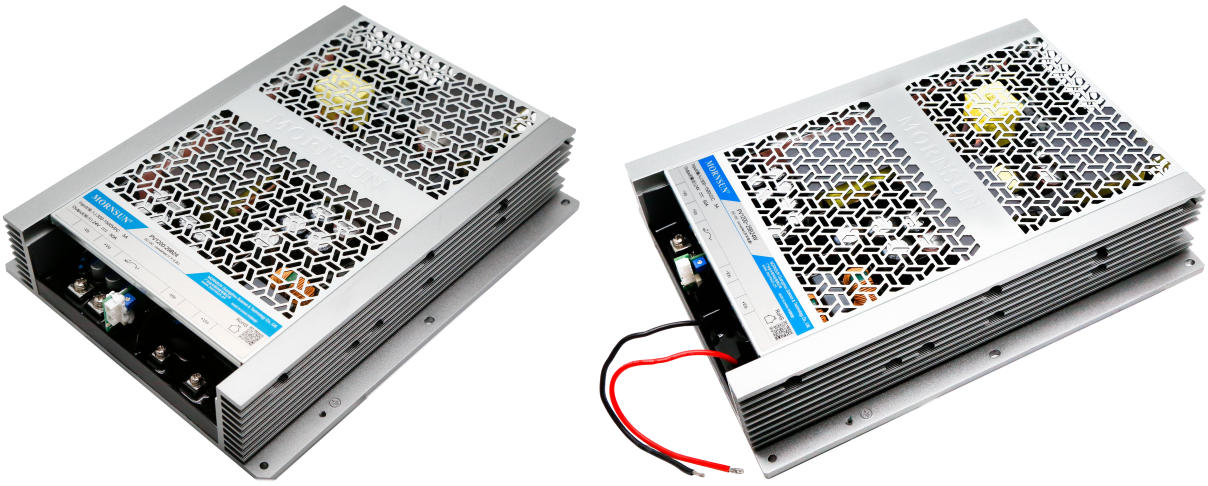


PV1200-29Bxx Series Parallel Redundancy and Current Sharing Application Notes

Parallel Operating

1. Redundancy

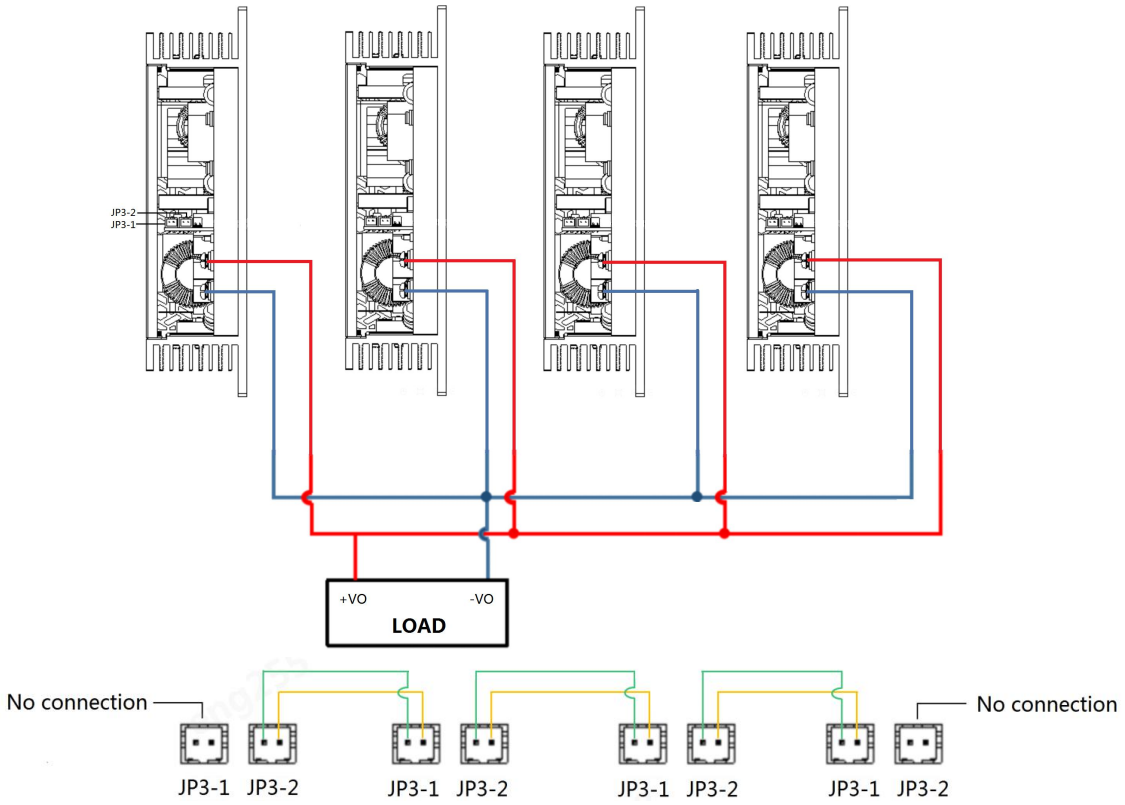
The output of the power module can be connected in parallel to achieve redundancy, thereby improving system reliability. The maximum power of the redundant system needs to be derated to ensure that the redundant system can still meet the rated load requirements when a power module fails. At present, the common practice is to build a redundant system using the N+1 method, that is, N+1 power supplies are connected in parallel. It supports the maximum load current N*Iomax, where Iomax is the rated output current of each power supply, for example, the rated output current of each power supply is 50A, and 3+1 are only connected in parallel to build a 3*50A=150A redundant system.

The power modules support 3+1 parallel redundant operation. When any power module in the parallel connection fails, other power modules can continue to work.

Note: When used in parallel, the maximum load current cannot exceed the maximum output current of a single power module at startup, otherwise the entire parallel power supply system will not be able to start and work normally. When any power supply in the parallel connection fails, its current-sharing connection terminal needs to be removed to prevent other power modules from being affected by it, resulting in a decrease in output voltage.

2. Current Sharing

The each power module has a current sharing connection terminal (JP3). If the current sharing function is required, the current sharing terminals of all power modules must be connected together when working in parallel. The wiring method of the current sharing function is shown in the figure below:



Note: The JP3 ports of each power module have the same function, and there is no sequence.

The output voltage of each power module will affect the accuracy of current sharing. It is recommended that the output voltage of the power module be the rated voltage ±50mV. In practical applications, if the output voltage value needs to be adjusted, the output voltages of all parallel-connected power modules need to be adjusted to the same voltage. The recommended voltage range is: target voltage value ±50mV.

After the output load of each power module is greater than 50% of the rated load, the current sharing accuracy is required to be ±5%. The formula for calculating the average current is:

$$\text{Current Sharing Accuracy} = \frac{Io\ max - Io\ min}{Io*total} * 100\%$$

Iomax: The maximum output current value of the power modules connected in parallel
Iomin: The minimum output current value of the power modules connected in parallel
Io*total= Iomax + Iomin