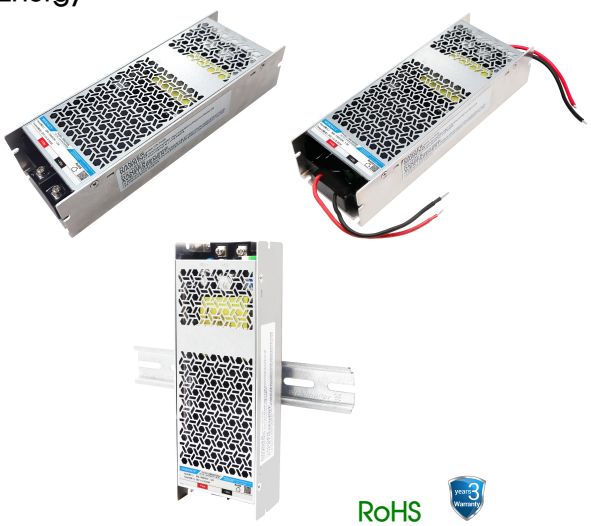
DC/DC Converter

PV350-29BxxR3S Series

MORNSUN®

200W isolation DC-DC converter with ultra-wide, ultra-high 300 - 1500VDC input for Renewable Energy



RoHS

FEATURES

- Ultra-wide 300 - 1500VDC input voltage range (Transient 1700VDC last for 10s)
- Transient power 350W last for 3min
- Operating ambient temperature range: -40℃ to +85℃
- High I/O isolation voltage up to 4000VAC
- High reliability, efficiency up to 93%
- Input under-voltage protection, input reverse polarity protection, output short circuit, over-current, over-voltage protection
- Support 1+1 parallel redundancy, current sharing
- Operating altitude up to 5000m
- Meets Class I (terminal/lead type), Class II (lead type)
- EFT immunity meets Level 4
- Design refer to UL1741, EN/IEC/BS EN62109

PV350-29BxxR3S 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 EN/IEC/BS EN62109, UL1741. 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.

Selection Guide

Certification	Part No.*	Output Power (W)		Nominal Output Voltage and Current (Vo/Io)	Efficiency at 850VDC (%) Typ.	Capacitive Load (μF) Max.
		Steady	Transient (duration 3min)			
/	PV350-29B12R3S	150	260	12V/12.5A	88	5000
	PV350-29B24R3S	200	350	24V/8.333A	91	5000
	PV350-29B28R3S			28V/7.143A	91	3500
	PV350-29B48R3S			48V/4.167A	93	1250

Note: *Use suffix "WR3S" for lead type version and suffix "R3SA6" for terminal DIN-Rail mounting, suffix "WR3SA6" for lead type version DIN-Rail mounting.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Voltage Range			300	--	1500	VDC
Input Current	300VDC		--	--	1.2	A
	1100VDC		--	--	0.4	
	1500VDC		--	--	0.3	
Inrush Current	1500VDC	Cold start	--	300	--	
Input Under-voltage Protection	Under-voltage protection start		120	150	240	VDC
	Under-voltage protection release		130	200	250	
Input Reverse Polarity Protection			Available			
Start-up Delay Time*			--	1	2	s
External Input Fuse			6A/1500VDC, required			
Hot Plug			Unavailable			

Note: *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 10s.)

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	All load range		--	±1.0	±2.0	%
Line Regulation	Rated load		--	±0.5	--	
Load Regulation	850VDC		--	±1.0	--	
Stand-by Power Consumption	1500VDC		--	1	3	W
Ripple & Noise*	20MHz bandwidth (peak-to-peak value)		--	150	300	mV
Temperature Coefficient			--	±0.02	--	%/℃
Short Circuit Protection			Hiccup, continuous, self-recovery			
Over-current Protection			110%-400%Io, hiccup, self-recovery			
Over-voltage Protection	12V		≤20V	Output voltage clamp or hiccup		
	24V		≤32V			
	28V		≤35V			
	48V		≤58V			
Minimum Load			0	--	--	%
Hold-up Time	Room temperature, full load	650VDC input	--	10	--	ms

Note: *The "Tip and barrel method" is used for ripple and noise test, please refer to PV 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 <10mA		4000	--	--	VAC
	Input - PE			4000	--	--	
	Output - PE	Electric strength test for 1min., leakage current <5mA		2000	--	--	
Insulation Resistance	Input - output	Test 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	-40℃ to -25℃	2.67	--	--	%/℃
			+55℃ to +70℃	2.67	--	--	
			+70℃ to +85℃	3.67	--	--	
		Input voltage derating	300 - 400VDC	0.2	--	--	%/VDC
		Altitude derating	2000 - 5000m	6.67	--	--	%/Km
Switching Frequency				--	65	--	kHz
Safety Standard				Design refer to UL1741, EN/IEC/BS EN62109-1			
Safety Class				Class I (terminal/lead type), Class II (lead type)			
MTBF		MIL-HDBK-217F@25℃		≥300,000 h			

Mechanical Specifications

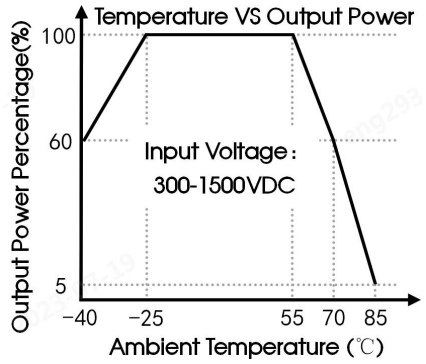
Case Material		Metal
Dimensions	Hrizontal package	201.00 x 70.00 x 42.00mm
	Din-Rail mounting	210.00 x 70.00 x 55.00mm
Weight	Hrizontal package	620g (Typ.)
	Din-Rail mounting	815g (Typ.)
Cooling Method		Free air convection

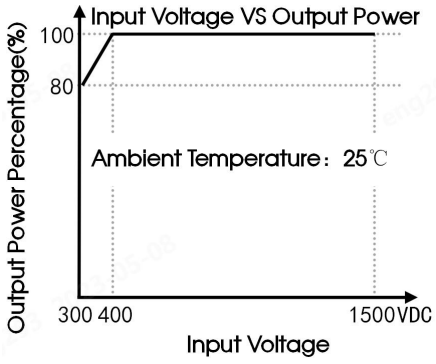
Electromagnetic Compatibility (EMC)

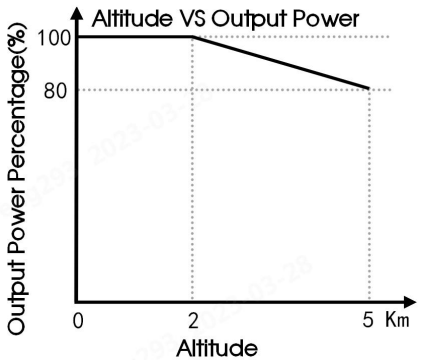
Emissions	CE	CISPR32/EN55032	CLASS A	
	RE	CISPR32/EN55032	CLASS A	
Immunity	ESD	IEC/EN 61000-4-2	Contact ±6KV/Air ±8KV	Perf. Criteria A
	RS	IEC/EN 61000-4-3	10V/m	Perf. Criteria A
	EFT	IEC/EN 61000-4-4	±4KV	Perf. Criteria A
	Surge	IEC/EN 61000-4-5	Line to line ±1KV/ line to PE ±2KV	Perf. Criteria B
	CS	IEC/EN 61000-4-6	10Vr.m.s	Perf. Criteria A
	PFMF	IEC/EN 61000-4-8	30A/m	Perf. Criteria A

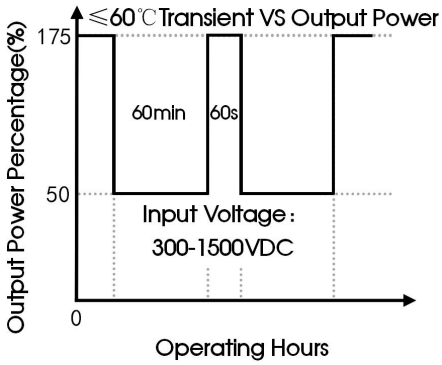
Note: For harsh EMC application environments, please consult FAE to add application circuits.

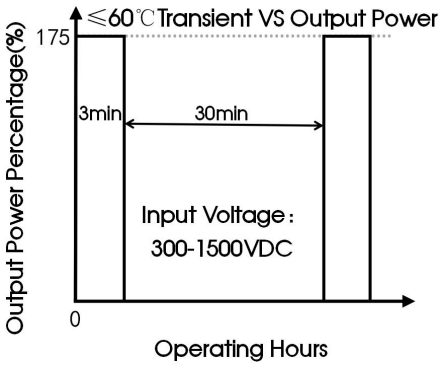
Product Characteristic Curve

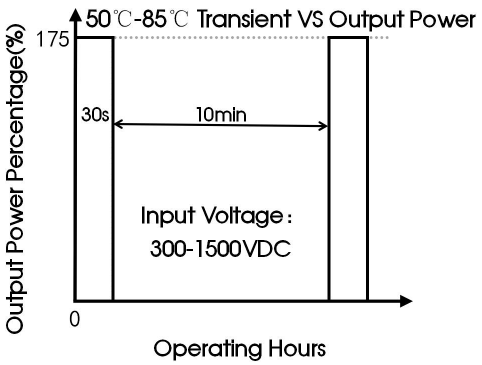




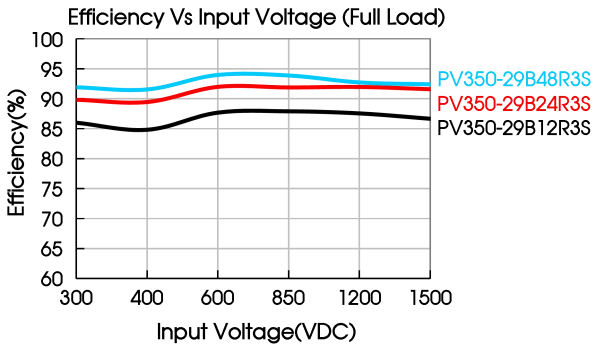


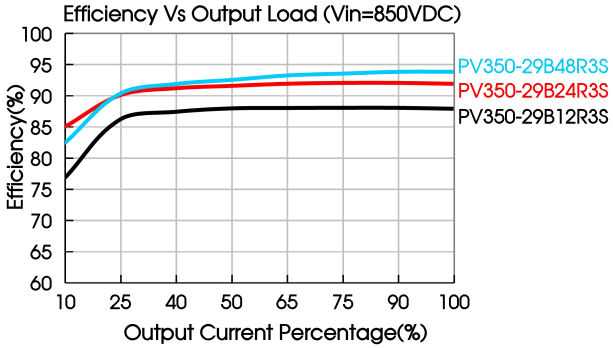






Note: 1.With an DC input between 300-400VDC, the output power must be derated as per temperature derating curves;
2.This product is suitable for applications using natural free air cooling; for applications in closed environment please consult Mornsun FAE;
3.In transient working mode, input voltage derating must be performed on the basis of transient derating.





Design Reference

1. Typical application circuit

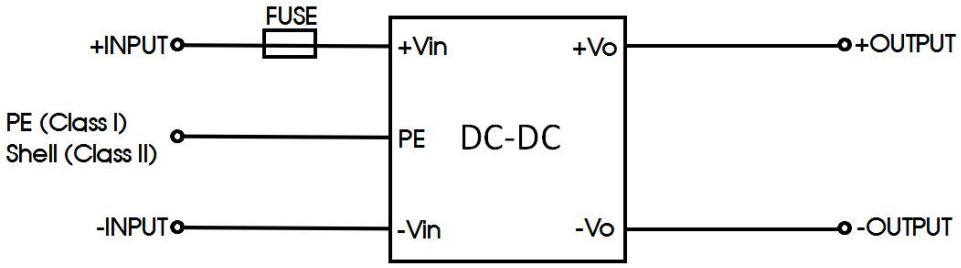


Fig. 1

Model	Recommended value
FUSE	6A/1500VDC, required

2. IMPORTANT SAFETY INSTRUCTIONS

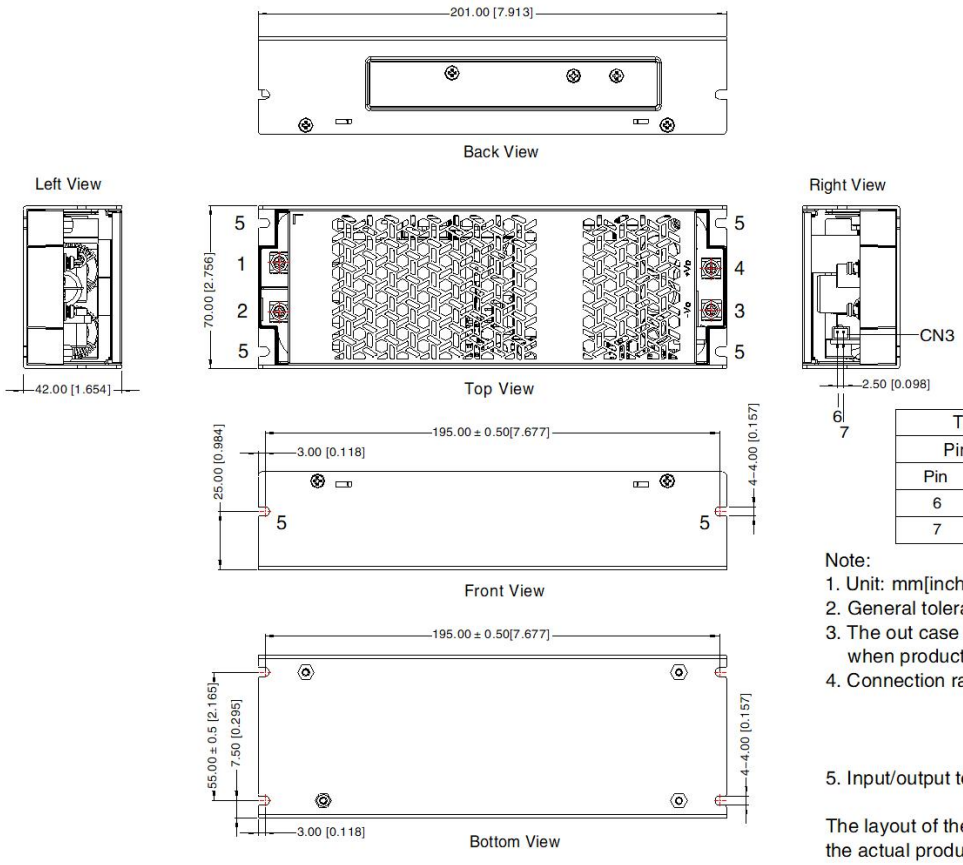
Additional protective devices, such as lightning protector need to be added if there is an transient pulse voltage greater than 6KV at the input of PV products in system applications.

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

Dimensions and Recommended Layout

PV350-29BxxR3S Series

THIRD ANGLE PROJECTION



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

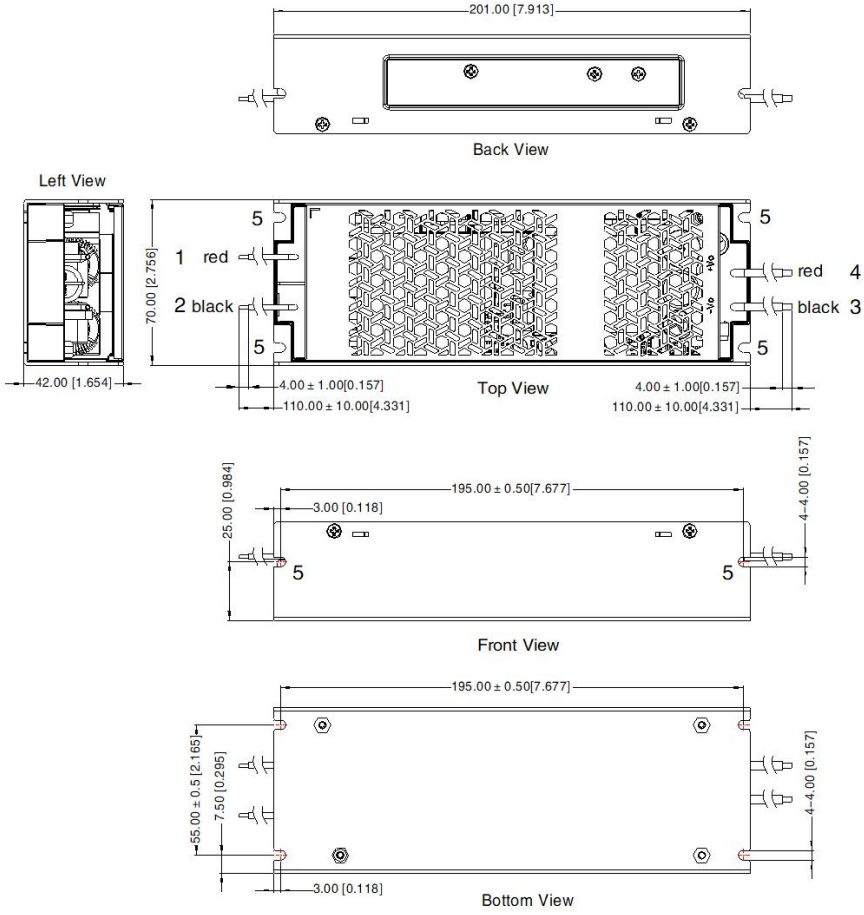
The CN3 terminal is a parallel port		
Pin-Out		Customer Connector
Pin	Mark	Connector: KANGDAO 2.5XHS-2Y or equivalent
6	CS	Terminal: KANGDAO 2.5XH-TE or equivalent
7	GND	

Note:
1. Unit: mm[inch]
2. General tolerances: ± 1.00[± 0.040]
3. The out case needs to be connected to the system earth when products in application
4. Connection range: Input (1-2): 22-8AWG
   Output (3-4): 12V 14-8AWG
   24/28V 16-8AWG
   48V 18-8AWG
5. Input/output terminal torque: M4, 0.9N · m(Max)

The layout of the device is for reference only, please refer to the actual product

PV350-29BxxWR3S Series

THIRD ANGLE PROJECTION



Pin–Out	
Pin	Mark
1	+Vin
2	–Vin
3	–Vo
4	+Vo
5	PE (Shell)

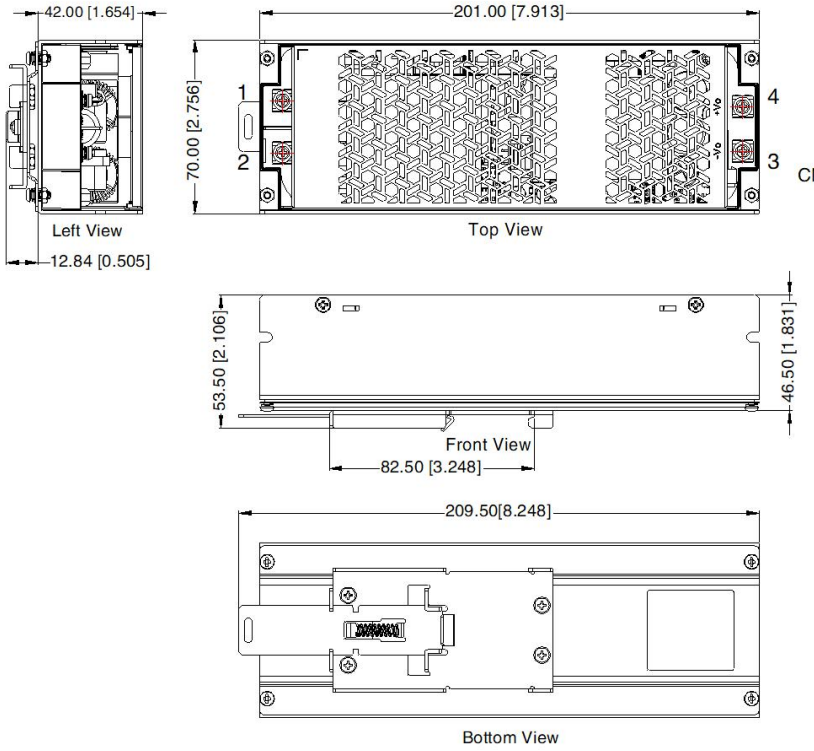
The CN3 terminal is a parallel port		
Pin–Out		Customer Connector
Pin	Mark	Connector: KANGDAO 2.5XHS–2Y or equivalent Terminal: KANGDAO 2.5XH–TE or equivalent
6	CS	
7	GND	

Note:
1. Unit: mm[inch]
2. General tolerances: ± 1.00[± 0.040]
3. The out case needs to be connected to the system earth when products in application
4. 1~2 wire spec.: UL3239 18AWG
   3~4 wire spec.: UL1015 14AWG

The layout of the device is for reference only, please refer to the actual product

PV350-29BxxR3SA6 Series

THIRD ANGLE PROJECTION

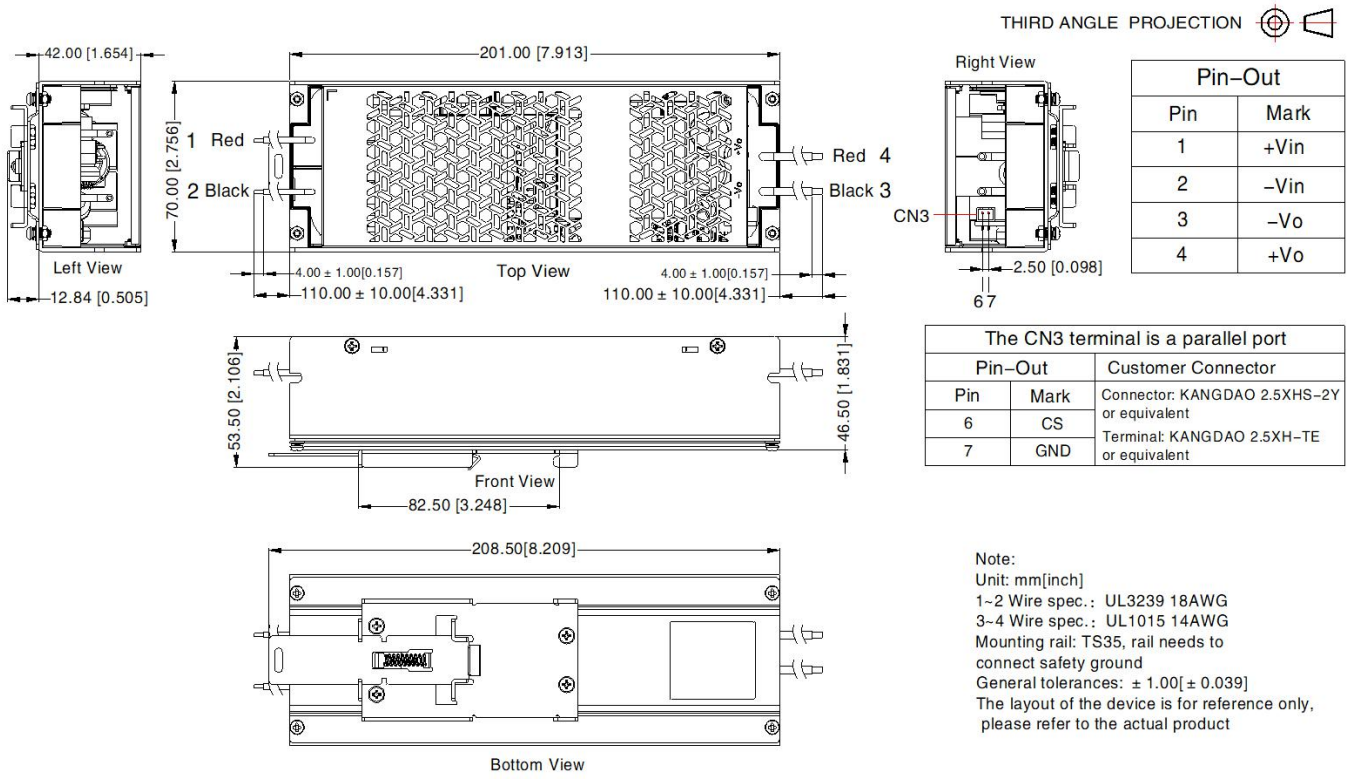


Pin–Out	
Pin	Mark
1	+Vin
2	–Vin
3	–Vo
4	+Vo

The CN3 terminal is a parallel port		
Pin–Out		Customer Connector
Pin	Mark	Connector: KANGDAO 2.5XHS–2Y or equivalent Terminal: KANGDAO 2.5XH–TE or equivalent
6	CS	
7	GND	

Note:
Unit: mm[inch]
Wire range:
Input: 22–8AWG
Output: 12V 14–8AWG
24/28V 16–8AWG
48V 18–8AWG
Terminal torque:
Input: M4, Max0.9N・m
Output: M3, Max0.4N・m
Mounting rail: TS35, rail needs to connect safety ground
General tolerances: ± 1.00[± 0.039]
The layout of the device is for reference only, please refer to the actual product

PV350-29BxxWR3SA6 Series



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

The CN3 terminal is a parallel port		
Pin-Out		Customer Connector
Pin	Mark	Connector: KANGDAO 2.5XHS-2Y or equivalent
6	CS	Terminal: KANGDAO 2.5XH-TE or equivalent
7	GND	

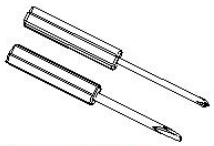
Note:
Unit: mm[inch]
1~2 Wire spec.: UL3239 18AWG
3~4 Wire spec.: UL1015 14AWG
Mounting rail: TS35, rail needs to connect safety ground
General tolerances: ± 1.00[± 0.039]
The layout of the device is for reference only, please refer to the actual product

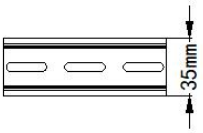
Installation Diagram

Bill Of Material		
1	Product	1 PCS
2	Phillips screwdriver Slotted screwdriver	1 PCS
3	TS35/7.5 or TS35/15	1 PCS

All above is only for reference, the actual connecting wire and locking torque refer to the appearance size diagram

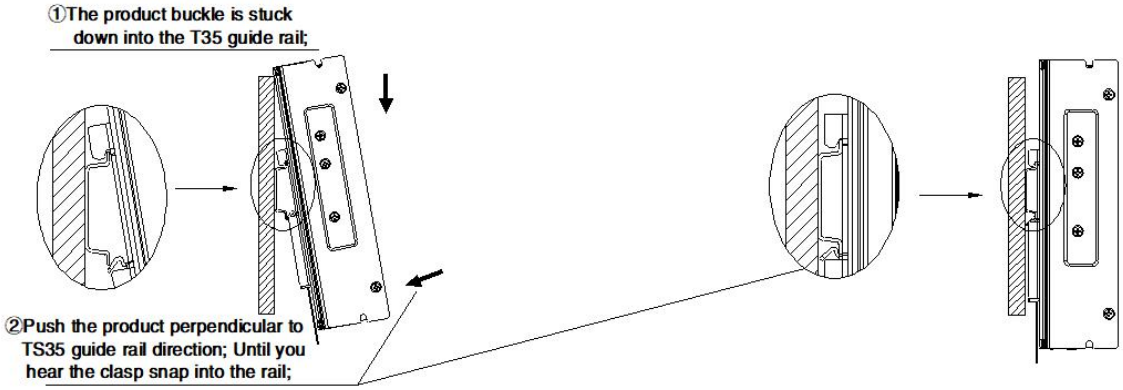

Product


Phillips screwdriver
Slotted screwdriver
Diameter of the cutting tools: 3mm

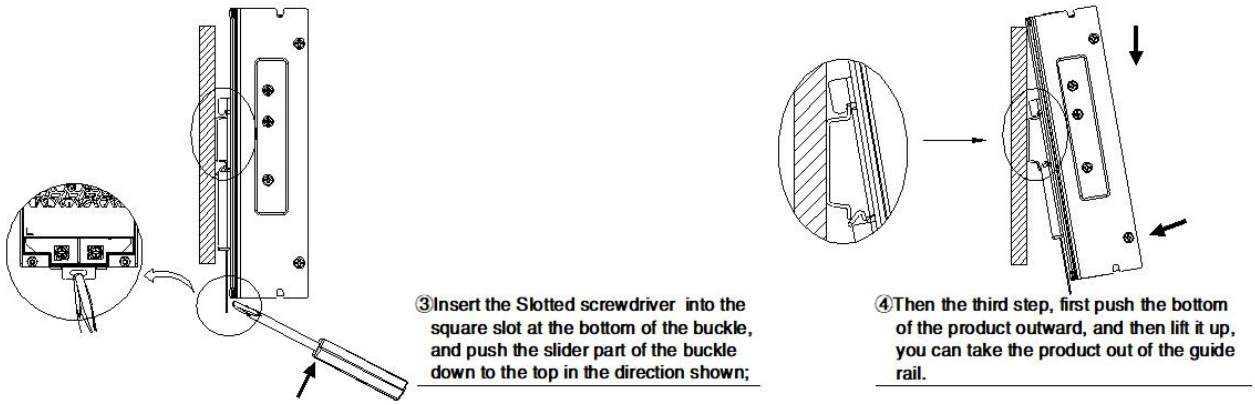


TS35/7.5 or TS35/15

Installation procedure ①-②



Remove the step ③–④



③Insert the Slotted screwdriver into the square slot at the bottom of the buckle, and push the slider part of the buckle down to the top in the direction shown;

④Then the third step, first push the bottom of the product outward, and then lift it up, you can take the product out of the guide rail.

Note: Keep the following installation clearances: 20mm on top, 20mm on the bottom, 5mm on the left and right sides are recommended when the device is loaded permanently with more than 50% of the rated power. Increase this clearance to 15mm in case the adjacent device is a heat source (e.g. another power supply).

⚠WARNING:

1. CAUTION: "To reduce the risk of fire, connect only to a circuit provided with 6 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: 58220211(horizontal package), 58220752(din-Rail mounting);
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. In order to improve the efficiency, there will be audible noise generated when working at input voltage higher than 1000VDC, but it does not affect product performance and reliability;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
8. If UL certification is required, an external lightning protection device (SVR=6000V) should be connected to the input.

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PV350-29BxxR3S 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 Iomax, where Iomax is the rated output current of each power supply.

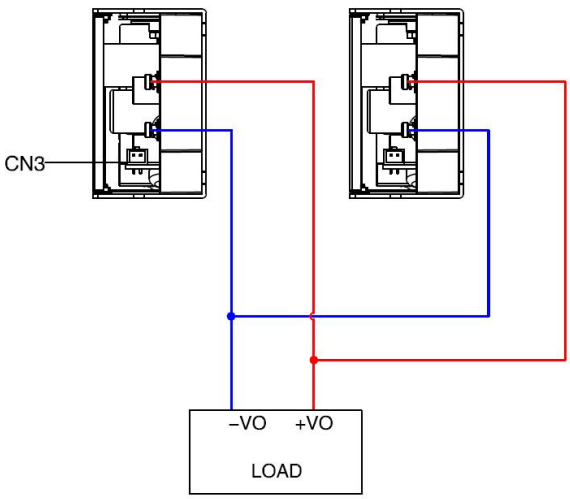
The power modules support 1+1 parallel redundant operation. When any power module in the parallel connection fails, other power modules can continue to work.

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 (CN3). 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:

PV350-29BxxR3S(A6)



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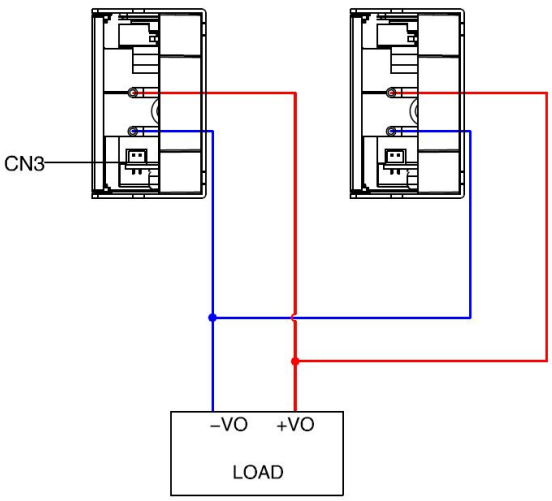

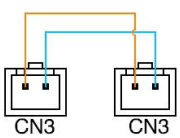

Note: The CN3 ports of each power module have the same function, and there is no sequence.

The output voltage of each power module will affect the accuracy of current sharing. In practical applications, if the current sharing accuracy data is not within the 10% accuracy range of the product, please replace new product to match it.

1+1 parallel redundant operation, the current sharing accuracy is required to be ±10%. The formula for calculating the average current is:

$$\text{Power supply 1's average accuracy} = \frac{Io_1 - (Io_1 + Io_2)/2}{(Io_1 + Io_2)/2} * 100\%$$

$$\text{Power supply 2's average accuracy} = \frac{Io_2 - (Io_1 + Io_2)/2}{(Io_1 + Io_2)/2} * 100\%$$

Io_1: The output current value of the power supply 1 in the parallel power module;

Io_2: The output current value of the power supply 2 in the parallel power module.