# DC/DC Switching Power Supply

PV45-29D1515-15

MORNSUN®

45W isolation DC-DC converter with ultra-wide, ultra-high 150 -1500VDC input for Renewable Energy

RoHS

## FEATURES

- 10:1 ultra-wide input voltage range 150 - 1500VDC
- High I/O isolation test voltage of 4000VAC
- Industrial grade operating temperature -40℃ to +85℃
- High efficiency, low ripple & noise
- Input under-voltage protection, reverse input voltage protection, output short circuit, over-current, over-voltage protection
- High reliability, long lifespan
- Operating up to 5000m altitude

*PV45-29D1515-15 is regulated DC-DC converters with an ultra-wide and ultra-high DC input of 150-1500VDC. The products feature high efficiency, high reliability, high insulation and a high level of safety protection. This type of power supply is widely used in renewable energy industries such as SVG, 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

| Part No. | Output Power | Nominal Output Voltage and Current (Vo/Io) | | Efficiency(%) Typ. | | | Capacitive Load (μF) Max. | |
|---|---|---|---|---|---|---|---|---|
| | | Vo1/Io1 | Vo2/Io2 | 200VDC | 850VDC | 1400VDC | Vo1 | Vo2 |
| PV45-29D1515-15 | 45W | 15V/1.53A | 15V/1.53A | 78 | 78 | 76 | 1500 | 470 |

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Voltage Range | | 150 | -- | 1500 | VDC |
| Input Current | 200VDC | -- | 350 | -- | mA |
| | 300VDC | -- | 230 | -- | |
| | 850VDC | -- | 90 | -- | |
| | 1500VDC | -- | 50 | -- | |
| Inrush Current | 200VDC | -- | 30 | -- | A |
| | 300VDC | -- | 40 | -- | |
| | 850VDC | -- | 100 | -- | |
| | 1500VDC | -- | 180 | -- | |
| Under-voltage Protection | | Lockout activation range: 120 - 140VDC<br>Lockout deactivation range: 130 - 150VDC | | | |
| Maximum Transients Input Voltage | 1600VDC | Duration time: 1s, normal output | | | |
| External Input Fuse | | 4A/1500VDC, slow-blow, required | | | |
| Hot Plug | | Unavailable | | | |

## Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Output Voltage Accuracy | All load range | Vo1 | -- | -- | ±2 | % |
| | | Vo2 | -- | -- | ±2 | |
| Line Regulation | Full load | Vo1 | -- | -- | ±1 | |
| | | Vo2 | -- | -- | ±1 | |
| Load Regulation | 10% - 100% load | Vo1 | -- | -- | ±2 | |
| | | Vo2 | -- | -- | ±2 | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value) | Vo1 | -- | -- | 150 | mV |
| | | Vo2 | -- | -- | 150 | |
| Temperature Coefficient | | | -- | ±0.02 | -- | %/℃ |
| Short Circuit Protection | | | Hiccup, continuous, self-recovery | | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Over-current Protection | | ⩾110% Io, hiccup, self-recovery | | | | |
| Over-voltage Protection | Vo1 | ⩽25VDC (Output voltage clamp) | | | | |
| | Vo2 | ⩽25VDC (Output voltage clamp) | | | | |
| Minimum Load | Vo1 | 0 | -- | -- | % | |
| | Vo2 | 0 | -- | -- | | |
| Start-up Delay Time ** | 150 - 1500VDC | -- | 2 | 3 | s | |

Note: * The"Tip and barrel method" is used for ripple and noise test, output parallel 47uF electrolytic capacitor, please refer to PV Converter Application Notes for specific information;
** Start-up Delay Time test condition: Full input voltage range, full output load range (The cooling-time between input power-off and power-on again is greater than 2s).

## General Specifications

| Item | | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Isolation Test | Input-output | Electric Strength Test for 1min., leakage current ⩽10mA | 4000 | -- | -- | VAC |
| | Input-⏚ | | 2500 | -- | -- | |
| | Vo1-Vo2 | | 4000 | -- | -- | |
| | Output-⏚ | | 2500 | -- | -- | |
| Operating Temperature | | | -40 | -- | +85 | ℃ |
| Storage Temperature | | | -40 | -- | +85 | |
| Storage Humidity | | | -- | -- | 95 | %RH |
| Power Derating | | -40℃ to 0℃ (Input Voltage: 150VDC - 200VDC) | 1.5 | -- | -- | %/℃ |
| | | -40℃ to 0℃ (Input Voltage: 200VDC - 1500VDC) | 1.0 | -- | -- | |
| | | +60℃ to +70℃ | 4.0 | -- | -- | |
| | | +70℃ to +85℃ | 2.0 | -- | -- | |
| | | 150 - 200VDC | 0.4 | -- | -- | %/VDC |
| | | 1400 - 1500VDC | 0.2 | -- | -- | |
| Switching Frequency | | | -- | 65 | -- | kHz |
| Altitude | | | -- | -- | 5000 | m |
| MTBF | | | MIL-HDBK-217F@25℃⩾ 300,000 h | | | |

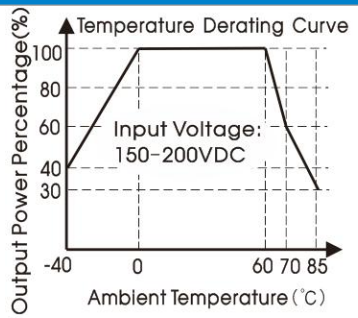
## Mechanical Specifications

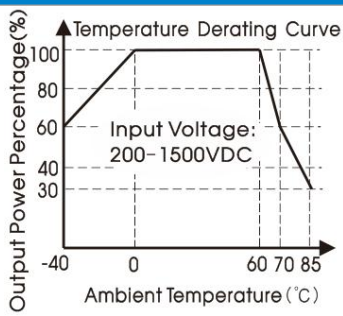
| | |
|---|---|
| Case Material | Metal |
| Dimensions | 144.50 x 105.00 x 40.00 mm |
| Weight | 420g (Typ.) |
| Cooling method | Free air convection |

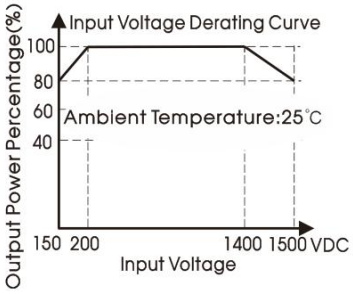
## Electromagnetic Compatibility (EMC)

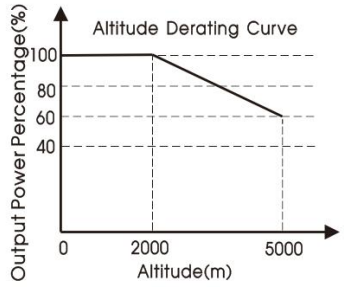
| | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 | CLASS A (See Fig. 2 for recommended circuit) | |
| | RE | CISPR32/EN55032 | CLASS A | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±6KV/Air ±8KV | Perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±4KV | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±2KV/ line to ground ±4KV | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 10Vr.m.s (See Fig. 2 for recommended circuit) | perf. Criteria A |
| | Voltage dips, short and interruptions immunity | IEC/EN61000-4-29 | 0%, 70% | perf. Criteria B |

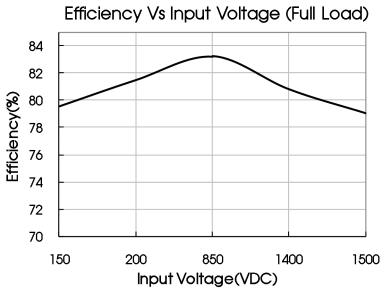
## Product Characteristic Curve

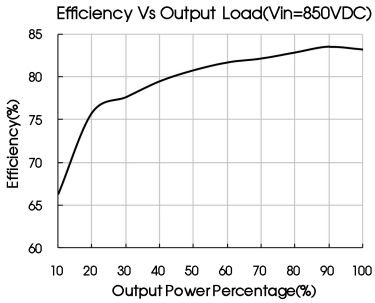



Note: ① With an input between 150 - 200VDC/1400 -1500VDC, the output power of PV45-29D1515-15 parts must be derated as per temperature derating curves;
② For operation of this converter series in an altitude between 2000 - 5000m above sea level, the output power must be derated as per the altitude derating curve;
③ Electrolytic capacitor having a constant period of use, its life depends on the actual ambient temperature, in the harsh operating environment will affect the life of the product and shorten the life of the product, the product is not recommended for long-term work in high temperature environment of more than 70℃;
④ 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

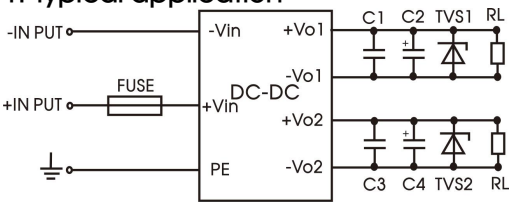



Fig.1: Typical circuit diagram

| Model | C1、C3(μF) | C2、C4(μF) | TVS1、TVS2 | FUSE |
|---|---|---|---|---|
| PV45-29D1515-15 | 1 | 100 | SMBJ20A | 4A/1500VDC, slow-blow, required |

Note on filter components:
We recommend using an electrolytic capacitor with high frequency and low ESR rating for C2, C4 (refer to manufacture's datasheet). Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1, C3 are ceramic capacitors, 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

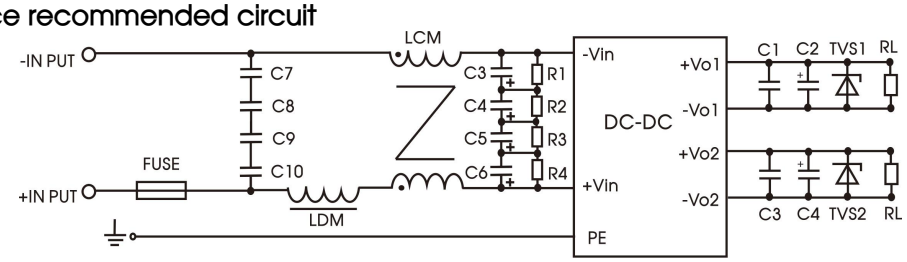


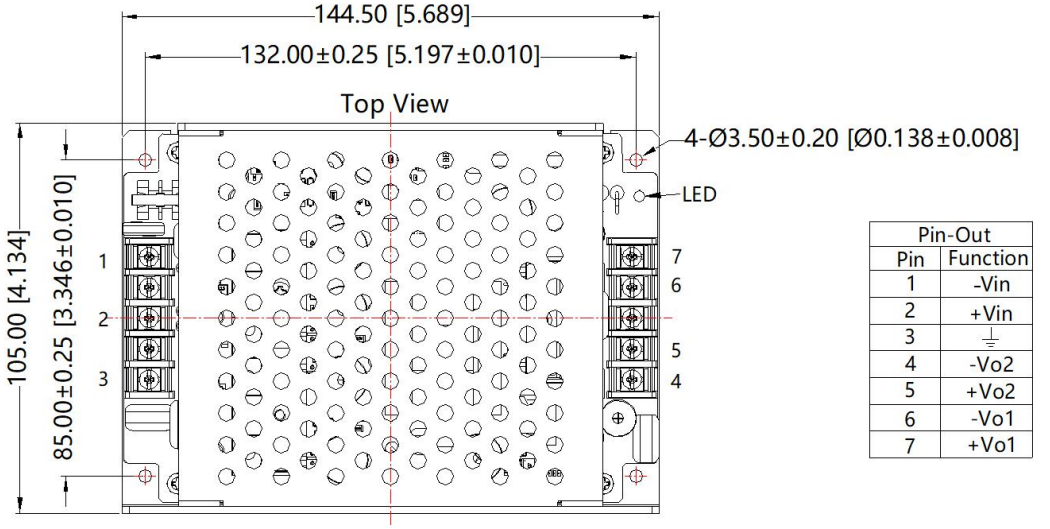

Fig. 2: EMC Recommended circuit (for output components also refer to typical application)

| Component | Recommended value |
|---|---|
| C7、C8、C9、C10 | 104K/275VAC |
| C3、C4、C5、C6 | 47μF/450VDC |
| R1、R2、R3、R4 | 1MΩ/2W |
| LDM | 330uH/0.38A |
| LCM | 7mH/1A |
| FUSE | 4A/1500VDC, slow-blow, required |

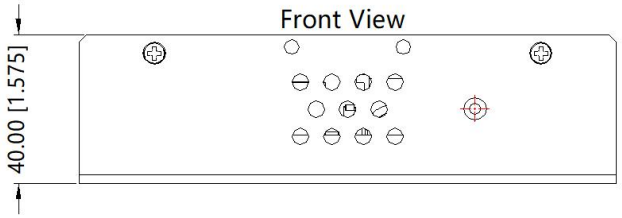
3. For additional information please refer to application notes on www.mornsun-power.com.

## Dimensions and Recommended Layout

THIRD ANGLE PROJECTION




| Pin-Out | |
|---|---|
| Pin | Function |
| 1 | -Vin |
| 2 | +Vin |
| 3 | ⏚ |
| 4 | -Vo2 |
| 5 | +Vo2 |
| 6 | -Vo1 |
| 7 | +Vo1 |




Note:
Unit : mm[inch]
Wire range : 24~12AWG
Tightening torque : Max 0.4N·m
General tolerances : ±1.00[±0.039]

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220039;
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 conversion efficiency, when the product is working high voltage, the module may have certain audio noise, but does not affect the reliability of the product;
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.

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