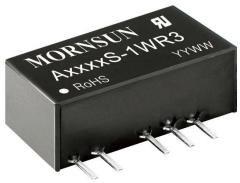
# DC/DC Converter

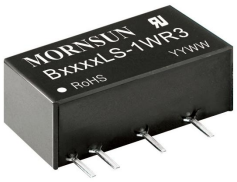
## A05_S-1WR3 & B05_LS-1WR3 Series

MORNSUN®

1W isolated DC-DC converter

Fixed input voltage and unregulated dual/single output





Continuous Short Circuit Protection

c UL us CE Patent Protection RoHS


## FEATURES

- Continuous short-circuit protection
- No-load input current as low as 5mA
- Operating temperature range: -40℃ ~ +105℃
- High efficiency up to 85%
- I/O isolation test voltage 1.5k VDC
- Industry standard pin-out
- SIP package
- UL62368, EN62368 approved

*A05_S-1WR3 & B05_LS-1WR3 series are specially designed for applications where an isolated (two isolated) voltage is required in a distributed power supply system. They are suitable for: pure digital circuits, low frequency analog circuits, relay-driven circuits and data switching circuits.*

## Selection Guide

| Certification | Part No. | Input Voltage(VDC) | Output | | Full Load Efficiency(%) Min./Typ. | Capacitive Load(μF)* Max. |
|---|---|---|---|---|---|---|
| | | Nominal (Range) | Voltage (VDC) | Current(mA) Max./Min. | | |
| CE | A0503S-1WR3 | 5 (4.5-5.5) | ±3.3 | ±152/±15 | 70/74 | 1200 |
| UL/CE | A0505S-1WR3 | | ±5 | ±100/±10 | 78/82 | 1200 |
| | A0509S-1WR3 | | ±9 | ±56/±6 | 79/83 | 470 |
| | A0512S-1WR3 | | ±12 | ±42/±5 | 79/83 | 220 |
| | A0515S-1WR3 | | ±15 | ±34/±4 | 79/83 | 220 |
| | A0524S-1WR3 | | ±24 | ±21/±3 | 81/85 | 100 |
| | B0503LS-1WR3 | | 3.3 | 303/30 | 70/74 | 2400 |
| | B0505LS-1WR3 | | 5 | 200/20 | 78/82 | 2400 |
| | B0509LS-1WR3 | | 9 | 111/12 | 79/83 | 1000 |
| | B0512LS-1WR3 | | 12 | 84/9 | 79/83 | 560 |
| | B0515LS-1WR3 | | 15 | 67/7 | 79/83 | 560 |
| | B0524LS-1WR3 | | 24 | 42/4 | 81/85 | 220 |

Note: *The specified maximum capacitive load for positive and negative output is identical.

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Current (full load / no-load) | 3.3VDC/5VDC output | -- | 270/5 | 286/10 | mA |
| | 9VDC/12VDC output | -- | 241/12 | 254/20 | |
| | 15VDC/24VDC output | -- | 241/18 | 254/30 | |
| Reflected Ripple Current* | | -- | 15 | -- | |
| Surge Voltage (1sec. max.) | 5VDC input | -0.7 | -- | 9 | VDC |
| Input Filter | | Capacitance filter | | | |
| Hot Plug | | Unavailable | | | |

Note: * Refer to DC-DC Converter Application Notes for detailed description of reflected ripple current test method.

## Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Voltage Accuracy | | | See output regulation curve(Fig. 1) | | | |
| Linear Regulation | Input voltage change: ±1% | 3.3VDC output | -- | -- | 1.5 | % |
| | | Others | -- | -- | 1.2 | |

| | | | | | | |
|---|---|---|---|---|---|---|
| Load Regulation | 10%-100% load | 3.3VDC output | -- | 15 | 20 | % |
| | | 5VDC output | -- | 10 | 15 | |
| | | 9VDC output | -- | 8 | 10 | |
| | | 12VDC output | -- | 7 | 10 | |
| | | 15VDC output | -- | 6 | 10 | |
| | | 24VDC output | -- | 5 | 10 | |
| Ripple & Noise* | 20MHz bandwidth | Others | -- | 30 | 75 | mVp-p |
| | | 24VDC output | -- | 50 | 100 | |
| Temperature Coefficient | 100% load | | -- | ±0.02 | -- | %/℃ |
| Short-circuit Protection | | | Continuous, self-recovery | | | |
| Note: * The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information. | | | | | | |

## General Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Isolation | Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max. | | 1500 | -- | -- | VDC |
| Insulation Resistance | Input-output resistance at 500VDC | | 1000 | -- | -- | MΩ |
| Isolation Capacitance | Input-output capacitance at 100kHz/0.1V | | -- | 20 | -- | pF |
| Operating Temperature | Derating when operating temperature≥85℃, (see Fig. 2) | | -40 | -- | 105 | ℃ |
| Storage Temperature | | | -55 | -- | 125 | |
| Case Temperature Rise | Ta=25℃ | 3.3VDC output | -- | 25 | -- | |
| | | Others | -- | 15 | -- | |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds | | -- | -- | 300 | |
| Storage Humidity | Non-condensing | | -- | -- | 95 | %RH |
| Switching Frequency | 100% load, nominal input voltage | | -- | 270 | -- | KHz |
| MTBF | MIL-HDBK-217F@25℃ | | 3500 | -- | -- | K hours |

## Mechanical Specifications

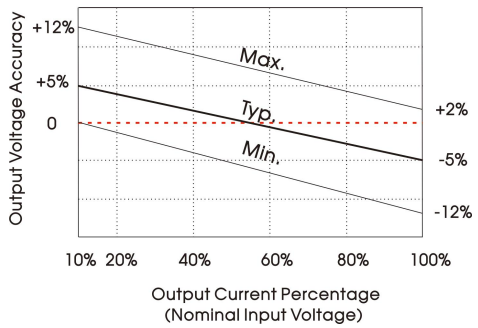
| | |
|---|---|
| Case Material | Black plastic; flame-retardant and heat-resistant (UL94 V-0) |
| Dimensions | 19.65 x 6.00 x 10.16mm |
| Weight | 2.1g(Typ.) |
| Cooling Method | Free air convection |

## Electromagnetic Compatibility (EMC)

| | | |
|---|---|---|
| Emissions | CE | CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit) |
| | RE | CISPR32/EN55032 CLASS B (see Fig. 4 for recommended circuit) |
| Immunity | ESD | IEC/EN61000-4-2 Air ±8kV , Contact ±4kV perf. Criteria B |

## Typical Characteristic Curves

3.3VDC output
Output Regulation Curve




Others
Output Regulation Curve

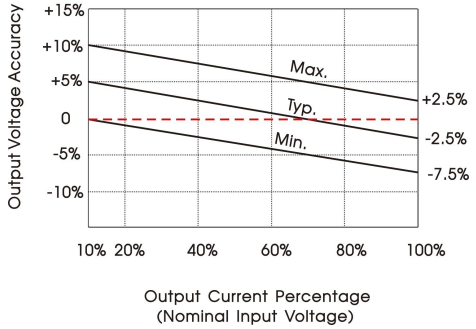



Fig. 1

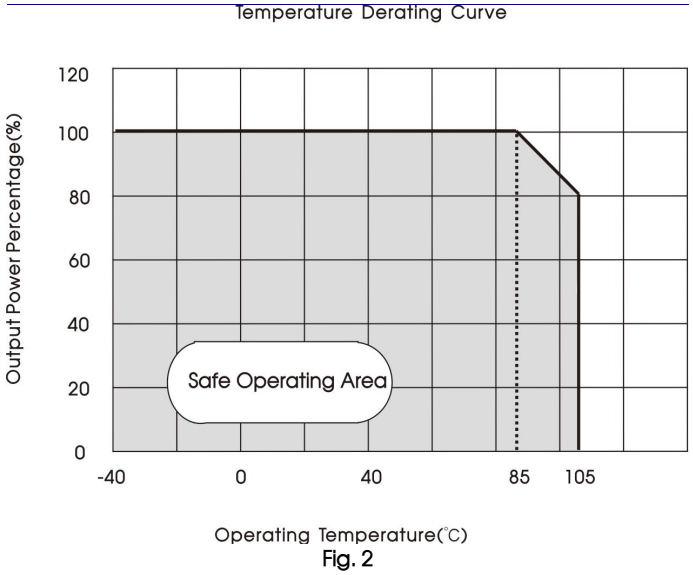
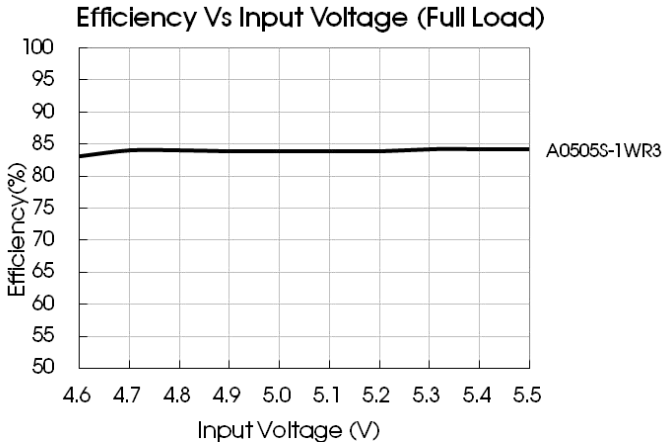
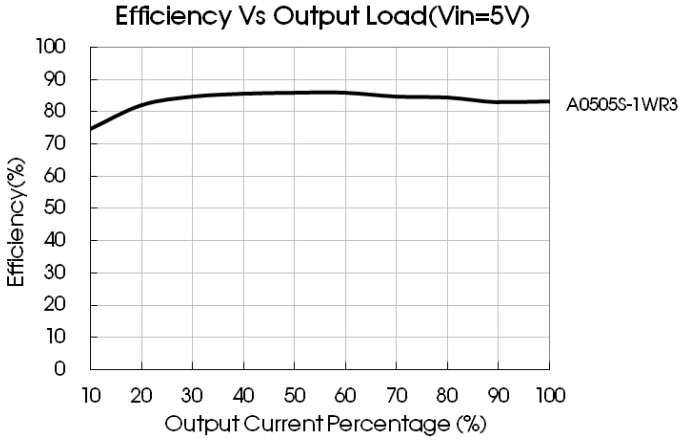
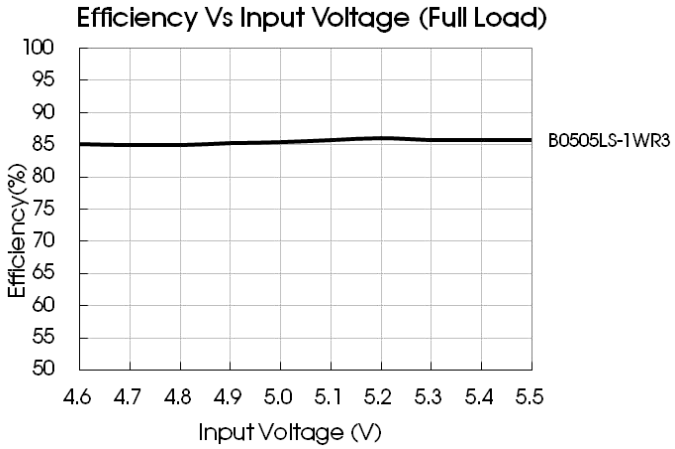
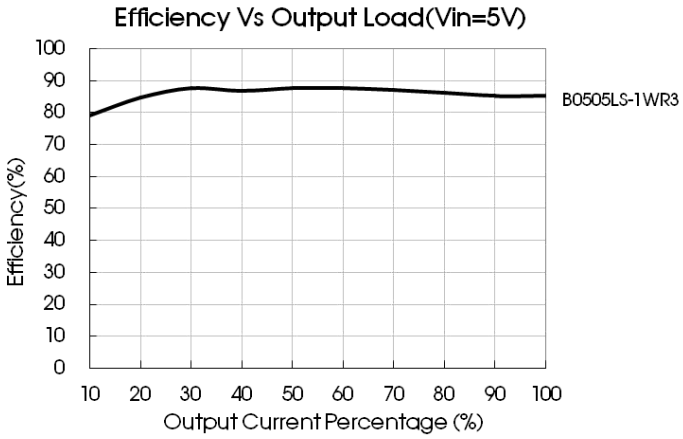


Fig. 2



## Design Reference

### 1. Typical application circuit

Choosing suitable filter capacitor values is very important for a smooth operation of the modules, particularly to avoid start-up problems caused by capacitor values that are too high. For recommended input and output capacitor values refer to Table 1.

The simplest device for output voltage regulation, over-voltage and over-current protection is a linear voltage regulator with overheat protection that is connected to the input or output end in series (see Fig. 3).

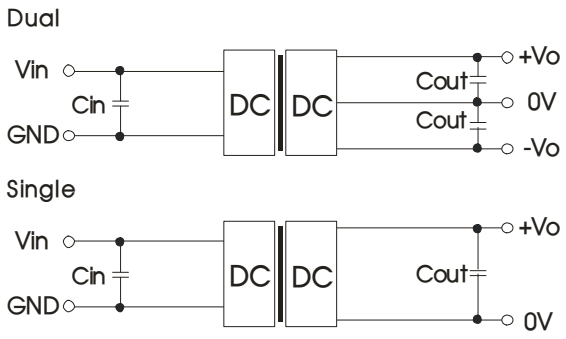



Fig.3

Recommended capacitive load value table (Table 1)

| Vin (VDC) | Cin (μF) | Single Vout (VDC) | Cout (μF) | Dual Vout (VDC) | Cout (μF) |
|---|---|---|---|---|---|
| 5 | 4.7 | 3.3/5 | 10 | ±5 | 4.7 |
| -- | -- | 9/12 | 2.2 | ±9/±12 | 1 |
| -- | -- | 15/24 | 1 | ±15/±24 | 0.47 |

### 2. EMC (CLASS B) compliance circuit

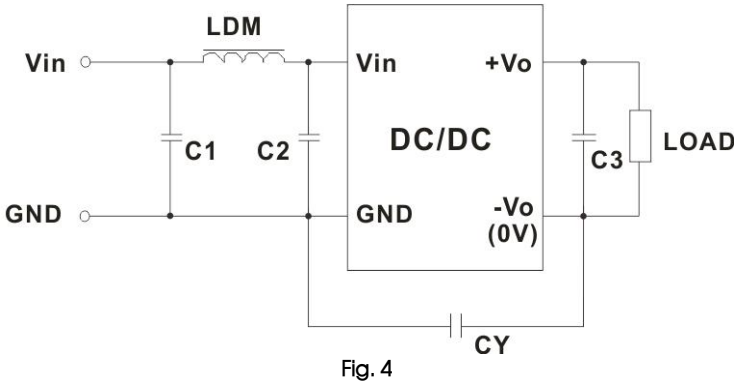



Fig. 4

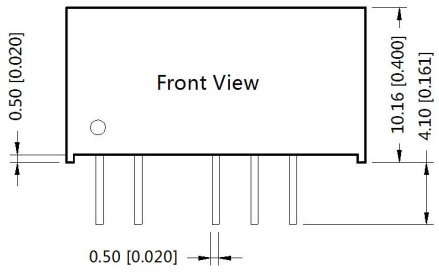
EMC recommended circuit value table (Table 2)

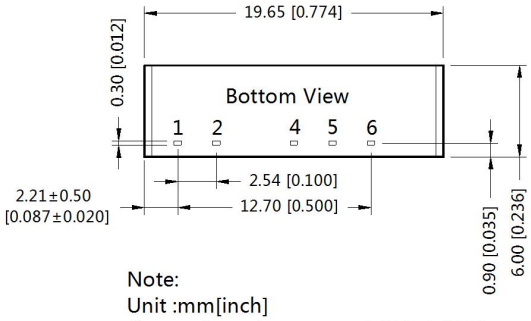
| | | | | |
|---|---|---|---|---|
| Input voltage 5VDC | Output voltage (VDC) | | 3.3/5/9 | 12/15/24 |
| | EMI | C1/C2 | 4.7μF /25V | 4.7μF /25V |
| | | CY | -- | 1nF/4KVDC<br>VISHAY HGZ102MBP<br>TDK CD45-E2GA102M-GKA |
| | | C3 | Refer to the Cout in table 1 | |
| | | LDM | 6.8μH | 6.8μH |

Note: In the case of actual use, the requirements for EMI are high, it is subject to CY .

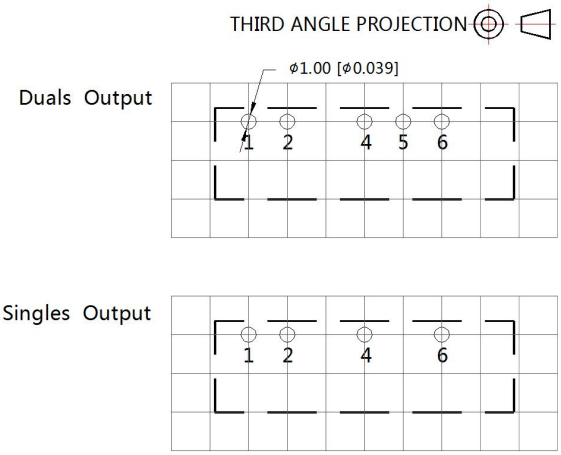
### 3. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

## Dimensions and Recommended Layout




Note:
Unit :mm[inch]
Pin section tolerances :±0.10[±0.004]
General tolerances:±0.25[±0.010]




Note : Grid 2.54*2.54mm

| Pin-Out | | |
|---|---|---|
| Pin | Singles | Duals |
| 1 | Vin | Vin |
| 2 | GND | GND |
| 4 | 0V | -Vo |
| 5 | No Pin | 0V |
| 6 | +Vo | +Vo |

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200001;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on our company corporate standards;
6. We can provide product customization service, please contact our technicians directly for specific information;
7. Products are related to laws and regulations: see "Features" and "EMC";
8. 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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