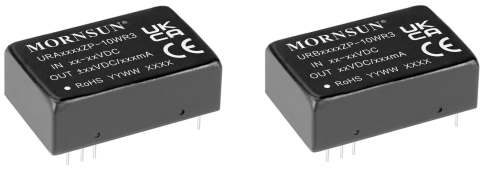
# DC/DC Converter

## URA_ZP-10WR3 & URB_ZP-10WR3 Series

MORNSUN®

10W isolated DC-DC converter in DIP package
Ultra-wide input and regulated dual/single output



Patent Protection

EN62368-1 BS EN62368-1 RoHS

## FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 88%
- No-load power consumption as low as 0.12W
- I/O isolation test voltage: 1.5k VDC
- Operating ambient temperature range: -40℃ to +85℃
- Input under-voltage protection, output short-circuit, over-current and over-voltage protection
- Meet CISPR32/EN55032 CLASS A, without extra components
- Industry standard pin-out
- Meets EN50155 standards

*URA_ZP-10WR3 & URB_ZP-10WR3 series are isolated 10W DC-DC converter products with an extremely wide voltage input range of 9-36VDC or 18-75VDC, input to output isolation voltage of 1500VDC, Input under-voltage protection, output short-circuit, over-current and over-voltage protection. They meet CLASS A of CISPR32/EN55032 EMI standards without external components and they are widely used in applications such as industrial controls, electric power, instrumentation, communications and railway.*

## Selection Guide

| Certification | Part No. | Input Voltage (VDC) | | Output | | Full Load Efficiency② (%) Min./Typ. | Capacitive Load③ (μF)Max. |
|---|---|---|---|---|---|---|---|
| | | Nominal (Range) | Max.① | Voltage(VDC) | Current (mA) Max./Min. | | |
| EN/BS EN | URA2405ZP-10WR3 | 24 (9-36) | 40 | ±5 | ±1000/0 | 81/83 | 1000 |
| | URA2412ZP-10WR3 | | | ±12 | ±416/0 | 85/87 | 470 |
| | URA2415ZP-10WR3 | | | ±15 | ±333/0 | 85/87 | 330 |
| | URB2403ZP-10WR3 | | | 3.3 | 2400/0 | 84/86 | 1200 |
| | URB2405ZP-10WR3 | | | 5 | 2000/0 | 85/87 | 1000 |
| | URB2412ZP-10WR3 | | | 12 | 833/0 | 85/87 | 470 |
| | URB2415ZP-10WR3 | | | 15 | 667/0 | 85/87 | 330 |
| | URB2424ZP-10WR3 | | | 24 | 416/0 | 86/88 | 100 |
| | URA4805ZP-10WR3 | 48 (18-75) | 80 | ±5 | ±1000/0 | 81/83 | 1000 |
| | URA4812ZP-10WR3 | | | ±12 | ±416/0 | 85/87 | 470 |
| | URA4815ZP-10WR3 | | | ±15 | ±333/0 | 85/87 | 330 |
| | URB4803ZP-10WR3 | | | 3.3 | 2400/0 | 83/85 | 1200 |
| | URB4805ZP-10WR3 | | | 5 | 2000/0 | 84/86 | 1000 |
| | URB4812ZP-10WR3 | | | 12 | 833/0 | 85/87 | 470 |
| | URB4815ZP-10WR3 | | | 15 | 667/0 | 85/87 | 330 |
| | URB4824ZP-10WR3 | | | 24 | 416/0 | 86/88 | 100 |

Notes: ①Exceeding the maximum input voltage may cause permanent damage;
②Efficiency is measured at nominal input voltage and rated output load;
③The specified maximum capacitive load value for Vo1 and Vo2 output is identical;
④We suggest to connect an external electrolytic capacitor if there is a spike voltage at the input, details please refer to application circuit.

## Input Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Input Current (full load / no-load) | 24VDC nominal input series, nominal input voltage | 3.3VDC single output | -- | 380/12 | 389/25 | mA |
| | | 5VDC single output | -- | 474/6 | 485/15 | |
| | | others | -- | 502/5 | 515/12 | |
| | 48VDC nominal input series, nominal input voltage | 3.3VDC single output | -- | 192/5 | 197/20 | |
| | | 5VDC single output | -- | 240/6 | 245/15 | |
| | | others | -- | 251/4 | 258/8 | |
| Reflected Ripple Current | 24VDC nominal input series, nominal input voltage | | -- | 40 | -- | |
| | 48VDC nominal input series, nominal input voltage | | -- | 30 | -- | |

| | | | | | |
|---|---|---|---|---|---|
| Surge Voltage (1sec. max.) | 24VDC nominal input series | -0.7 | -- | 50 | VDC |
| | 48VDC nominal input series | -0.7 | -- | 100 | |
| Start-up Voltage | 24VDC nominal input series | -- | -- | 9 | |
| | 48VDC nominal input series | -- | -- | 18 | |
| Under-voltage Protection | 24VDC nominal input series | 5.5 | 6.5 | -- | |
| | 48VDC nominal input series | 12 | 15.5 | -- | |
| Input Filter | | Pi filter | | | |
| Hot Plug | | Unavailable | | | |
| Ctrl * | Module on | Ctrl pin open or pulled high (3.5-12VDC) | | | |
| | Module off | Ctrl pin pulled low to GND (0-1.2VDC) | | | |
| | Input current when off | -- | 6 | 10 | mA |

Note: *The Ctrl pin voltage is referenced to input pin GND.

## Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Voltage Accuracy① | 0%-100% load | 3.3VDC/5VDC single output | -- | ± 0.5 | ± 2 | % |
| | | Others | -- | ±1 | ±3 | |
| Linear Regulation | Input voltage variation from low to high at full load | Vo1 | -- | ±0.2 | ±0.5 | |
| | | Vo2 | -- | ±0.5 | ±1 | |
| Load Regulation② | 5%-100% load | Vo1 | -- | ±0.5 | ±1 | |
| | | Vo2 | -- | ±0.5 | ±1.5 | |
| Cross Regulation | Dual output, Vo1 load at 50%, Vo2 load at range of 25%-100% | | -- | -- | ±5 | |
| Transient Recovery Time | 25% load step change, nominal input voltage | | -- | 300 | 500 | μs |
| Transient Response Deviation | | 3.3VDC/5VDC single output | -- | ±5 | ±8 | % |
| | | Others | -- | ±3 | ±5 | |
| Temperature Coefficient | Full load | | -- | -- | ±0.03 | %/℃ |
| Ripple & Noise③ | 20MHz bandwidth | | -- | 40 | 80 | mVp-p |
| Over-voltage Protection | Input voltage range | | 110 | -- | 160 | %Vo |
| Over-current Protection | Input voltage range | 3.3VDC/5VDC single output | 110 | 160 | 230 | %Io |
| | | Others | 110 | 140 | 190 | |
| Short-circuit Protection | Input voltage range | | Continuous, self-recovery | | | |

Note: ①At 0% - 5% load, the Max. output voltage accuracy of ±5VDC output converter is ±5%, the Max. output voltage accuracy of 3.3VDC/5VDC output converter is ±3%;
②Load regulation for 0% - 100% load increases to ±5%;
③Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. 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 | -- | 2000 | -- | pF |
| Operating Temperature | See Fig. 1 | -40 | -- | +85 | ℃ |
| Storage Temperature | | -55 | -- | +125 | |
| Storage Humidity | Non-condensing | 5 | -- | 95 | %RH |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds | -- | -- | +300 | ℃ |
| Vibration(EN62368) | | 10-150Hz, 5G, 0.75mm. along X, Y and Z | | | |
| Vibration(EN50155) | | IEC/EN61373 - Category 1, Grade B | | | |
| Switching Frequency * | PWM mode | -- | 350 | -- | kHz |
| MTBF | MIL-HDBK-217F@25℃ | 1000 | -- | -- | k hours |

Note: *Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

## Mechanical Specifications

| | |
|---|---|
| Case Material | Aluminum alloy |
| Dimensions | 32.00 x 20.00 x 10.80mm |
| Weight | 12.0g(Typ.) |
| Cooling Method | Free air convection |

## Electromagnetic Compatibility (EMC)

| | | | | |
|---|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 | CLASS A (without extra components)/<br>CLASS B (see Fig.3-② for recommended circuit) | |
| | RE | CISPR32/EN55032 | CLASS A (without extra components)/<br>CLASS B (see Fig.3-② for recommended circuit) | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±4kV | perf. Criteria B |
| | RS | IEC/EN61000-4-3 | 10V/m | perf. Criteria A |
| | EFT | IEC/EN61000-4-4 | ±2kV (see Fig.3-① for recommended circuit) | perf. Criteria B |
| | Surge | IEC/EN61000-4-5 | line to line ±2kV (see Fig.3-①for recommended circuit) | perf. Criteria B |
| | CS | IEC/EN61000-4-6 | 10 Vr.m.s | perf. Criteria A |
| | Immunities of voltage dip, drop and short interruption | IEC/EN61000-4-29 | 0%, 70% | perf. Criteria B |

## Electromagnetic Compatibility (EMC)（EN50155）

| | | | | |
|---|---|---|---|---|
| EMI | CE | EN50121-3-2<br>EN55016-2-1 | 150kHz-500kHz 99dBuV(see Fig.3-② for recommended circuit)<br>500kHz-30MHz 93dBuV(see Fig.3-② for recommended circuit) | |
| | RE | EN50121-3-2<br>EN55016-2-1 | 30MHz-230MHz 40dBuV/m at 10m(see Fig.3-② for recommended circuit)<br>230MHz-1GHz 47dBuV/m at 10m(see Fig.3-② for recommended circuit) | |
| EMS | ESD | EN50121-3-2 | Contact ±6kV/Air ±8kV | perf. Criteria B |
| | RS | EN50121-3-2 | 20V/m | perf. Criteria A |
| | EFT | EN50121-3-2 | ±2kV 5/50ns 5kHz(see Fig.3-① for recommended circuit) | perf. Criteria A |
| | Surge | EN50121-3-2 | line to line ± 1kV（42Ω，0.5μF）(see Fig.3-① for recommended circuit) | perf. Criteria A |
| | CS | EN50121-3-2 | 0.15MHz-80MHz 10 Vr.m.s | perf. Criteria A |

## Typical Characteristic Curves

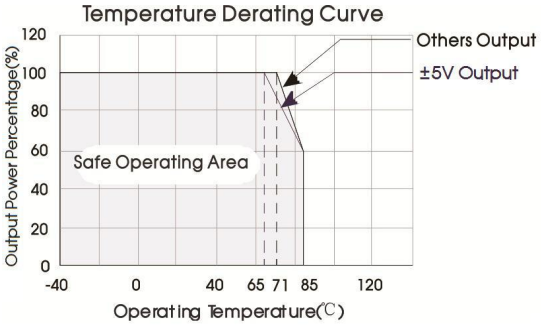
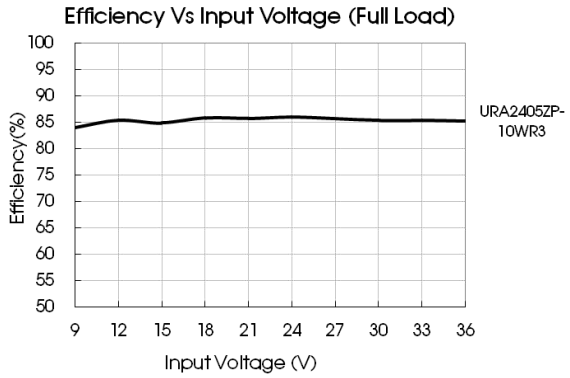
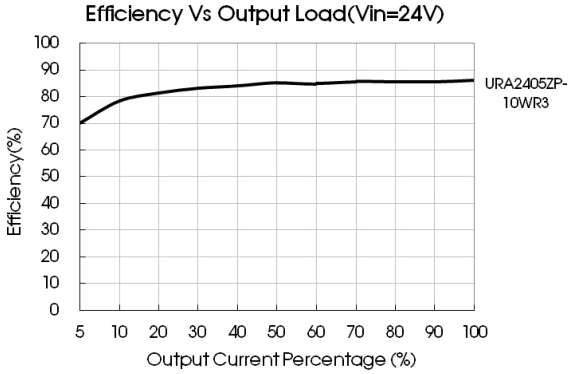
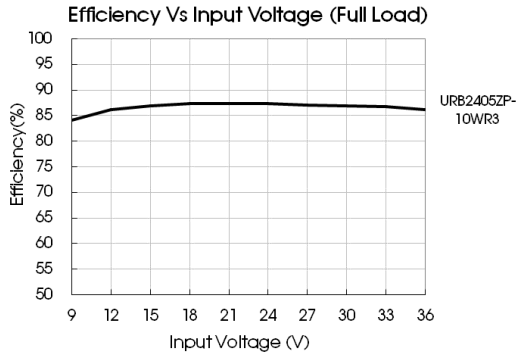
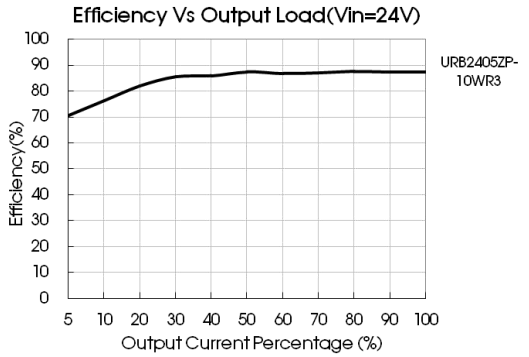


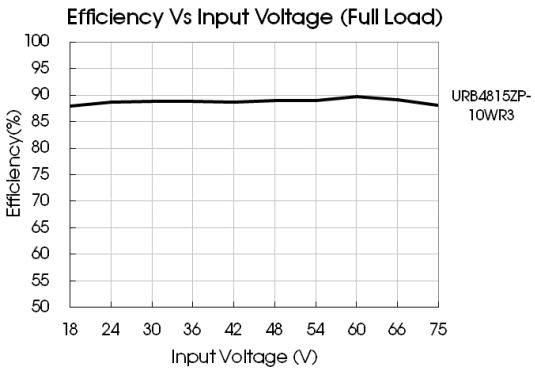

Fig. 1

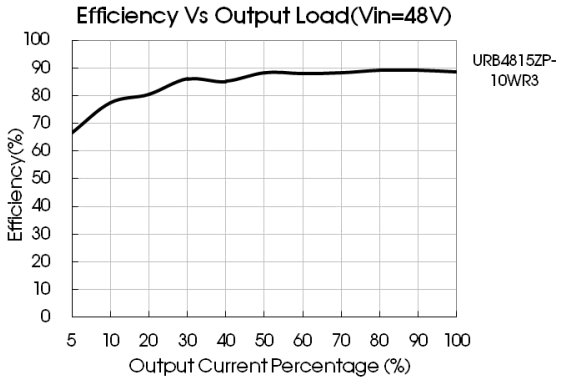



## Design Reference

### 1. Typical application

All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.
Input and/or output ripple can be further reduced by appropriately increasing the input & output capacitor values Cin and Cout and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the max. capacitive load value of the product.

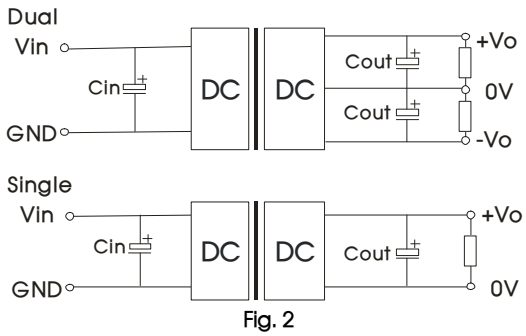
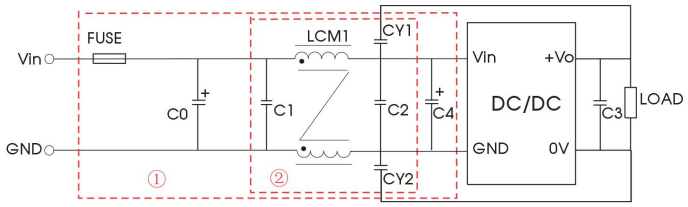



Fig. 2

| Vin(VDC) | Vout(VDC) | Cin | Cout |
|---|---|---|---|
| 24 | 3/5/±5 | 100μF/50V | 10μF/16V |
| | 12/15/±12/±15 | | 10μF/25V |
| | 24 | | 10μF/50V |
| 48 | 3/5/±5 | 10μF - 47μF/100V | 10μF/16V |
| | 12/15/±12/±15 | | 10μF/25V |
| | 24 | | 10μF/50V |

### 2. EMC compliance circuit

3.3VDC/5VDC single output:




Parameter description:

| Model | Vin: 24VDC | Vin: 48VDC |
|---|---|---|
| FUSE | Select FUSE value according to actual input current | |
| C0, C4 | 330μF/50V | 330μF/100V |
| C1, C2 | 10μF/50V | 10μF/100V |
| LDM1 | 10μH | |
| LCM1 | 1.4-1.7mH（TN150P-RH12.7*12.7*7.9） | |
| C3 | Refer to the Cout in Fig.2 | |
| CY1, CY2 | 1nF/2kV | |

Others:

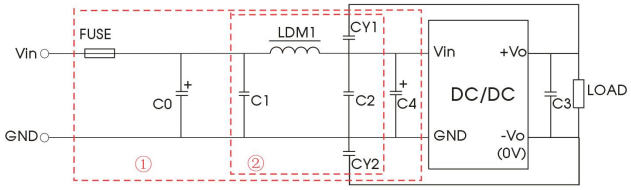
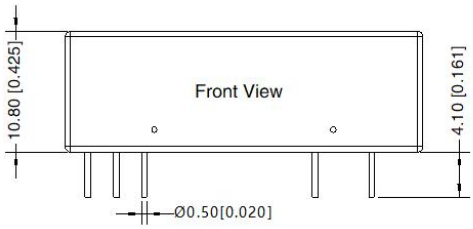


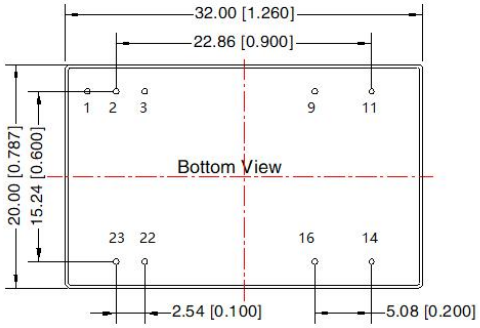

Fig. 3

Notes: For EMC tests we use Part ① in Fig. 3 for immunity and part ② for emissions test. Selecting based on needs.

3. The products do not support parallel connection of their output
4. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

## Dimensions and Recommended Layout

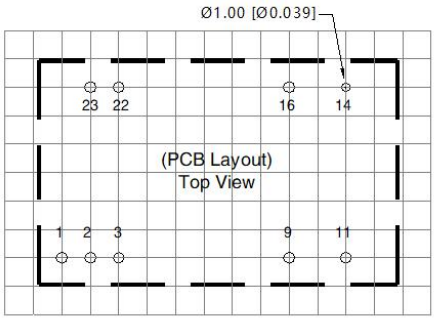


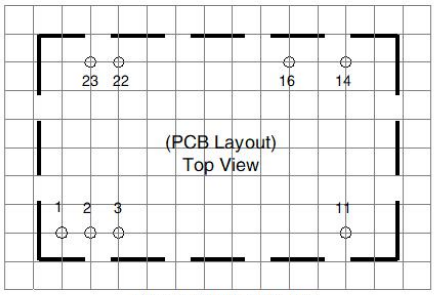

Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[ ± 0.004]
General tolerances: ± 0.50[ ± 0.020]

THIRD ANGLE PROJECTION

Dual




Single




Note: Grid 2.54*2.54mm

| Pin-Out | | |
|---|---|---|
| Pin | Single | Dual |
| 1 | Ctrl | Ctrl |
| 2,3 | GND | GND |
| 9 | No Pin | 0V |
| 11 | NC | -Vo |
| 14 | +Vo | +Vo |
| 16 | 0V | 0V |
| 22,23 | Vin | Vin |

NC: Pin to be isolated from circuit