# DC/DC Converter
## URA2412YMD-20WR3G

MORNSUN®

20W isolated DC-DC converter in DIP package
Ultra-wide input and regulated dual output

Patent Protection RoHS

## FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 90%
- No-load power consumption as low as 0.24W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard pin-out

*URA2412YMD-20WR3G of isolated 20W DC-DC converter products have an ultra-wide 4:1 input voltage and feature efficiencies of up to 90%, input to output isolation is tested with 1500VDC and the converters safely operate in an ambient temperature of -40℃ to +105℃, input under-voltage protection, output short-circuit, over-current, over-voltage protection, they are widely used in applications such as industrial control, electric power, instruments, communication and railway applications.*

## 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. | | |
| -- | URA2412YMD-20WR3G | 24 (9-36) | 40 | ±12 | ±833/0 | 88/90 | 800 |

Notes:
① Exceeding the maximum input voltage may cause permanent damage;
② Efficiency is measured at nominal input voltage and rated output load;
③ The specified maximum capacitive load value for positive and negative output is identical.

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Current (full load / no-load) | nominal input voltage | -- | 926/10 | 947/20 | mA |
| Maximum input current | nominal input voltage | -- | -- | 1100 | |
| Reflected Ripple Current | | -- | 30 | -- | |
| Surge Voltage (1sec. max.) | | -0.7 | -- | 50 | VDC |
| Start-up Voltage | | -- | -- | 9 | |
| Under-voltage Protection | | 5.5 | 6.5 | -- | |
| Start-up Time | Nominal input voltage & constant resistance load | -- | 10 | -- | ms |
| 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 | -- | 2 | 7 | mA |

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

## Output Specifications

| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Voltage Accuracy① | 5%-100% load | | -- | ±1 | ±3 | % |
| Linear Regulation | Input voltage variation from low to high at full load | Vo1 | -- | ±0.2 | ±0.5 | |
| | | Vo2 | -- | ±0.4 | ±1 | |
| Load Regulation② | 5%-100% load | | -- | ±0.5 | ±1 | |
| Cross Regulation | Dual output, Vo1 load at 50%, Vo2 load at range of 10%-100% | | -- | -- | ±5 | |
| Transient Recovery Time | 25% load step change, nominal input voltage | | -- | 300 | 500 | μs |
| Transient Response Deviation | | | -- | ±3 | ±5 | % |

| | | | | | |
|---|---|---|---|---|---|
| Temperature Coefficient | Full load | -- | -- | ±0.03 | %/℃ |
| Ripple & Noise③ | 20MHz bandwidth, 5%-100% load | -- | 100 | 200 | mVp-p |
| Over-voltage Protection | Input voltage range | 110 | -- | 160 | %Vo |
| Over-current Protection | | 110 | 150 | 200 | %Io |
| Short-circuit Protection | | Continuous, self-recovery | | | |

Note:
①Output voltage accuracy for 0%-5% load is ±4% max;
②Load regulation for 0%-100% load is ±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 |
| | Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max. | 1000 | -- | -- | |
| 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 | -- | +105 | ℃ |
| 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 | | IEC/EN61373 - Category 1, Grade B | | | |
| Switching Frequency * | PWM mode | -- | 270 | -- | 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 | 25.40 x 25.40 x 11.70 mm |
| Weight | 15.0g(Typ.) |
| Cooling method | Free air convection |

## Electromagnetic Compatibility (EMC)

| | | | |
|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 CLASS B (see Fig.3-② for recommended circuit) | |
| | RE | CISPR32/EN55032 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（Without extra component） | 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.3-① for recommended circuit) | perf. Criteria B |
| | CS | IEC/EN61000-4-6 3 Vr.m.s（Without extra component） | perf. Criteria A |

## Electromagnetic Compatibility (EMC) (EN50155)

| | | | |
|---|---|---|---|
| Emissions | CE | EN50121-3-2 150kHz-500kHz 99dBuV (see Fig.3-② for recommended circuit)<br>EN55016-2-1 500kHz-30MHz 93dBuV (see Fig.3-② for recommended circuit) | |
| | RE | EN50121-3-2 30MHz-230MHz 40dBuV/m at 10m (see Fig.3-② for recommended circuit)<br>EN55016-2-1 230MHz-1GHz 47dBuV/m at 10m (see Fig.3-② for recommended circuit) | |
| Immunity | ESD | EN50121-3-2 Contact ±6kV/Air ±8kV | perf. Criteria A |
| | RS | EN50121-3-2 20V/m（Without extra component） | perf. Criteria A |
| | EFT | EN50121-3-2 ±2kV 5/50ns 5kHz (see Fig.3-① for recommended circuit) | perf. Criteria A |
| Immunity | 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（Without extra component） | perf. Criteria A |

## Typical Characteristic Curves

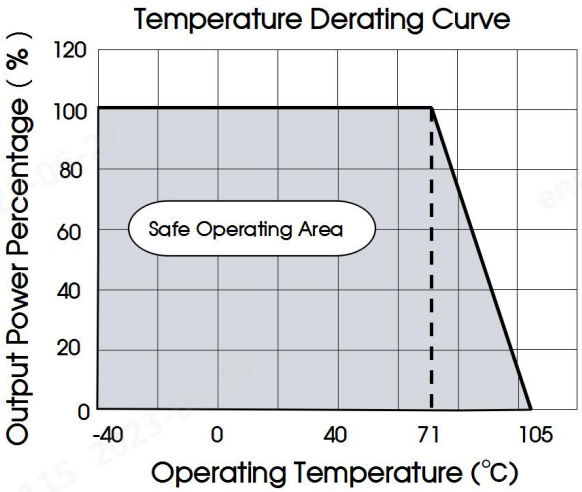



Fig. 1

## Design Reference

### 1. Typical application

All the 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 | ±12 | 100μF/50V | 10μF/25V |

### 2. EMC compliance circuit

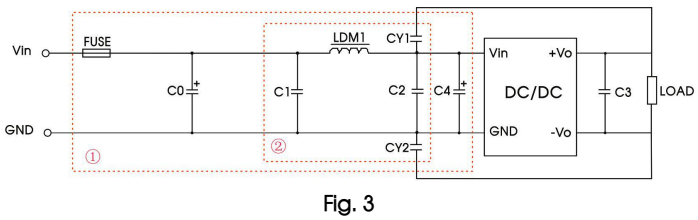



Fig. 3

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

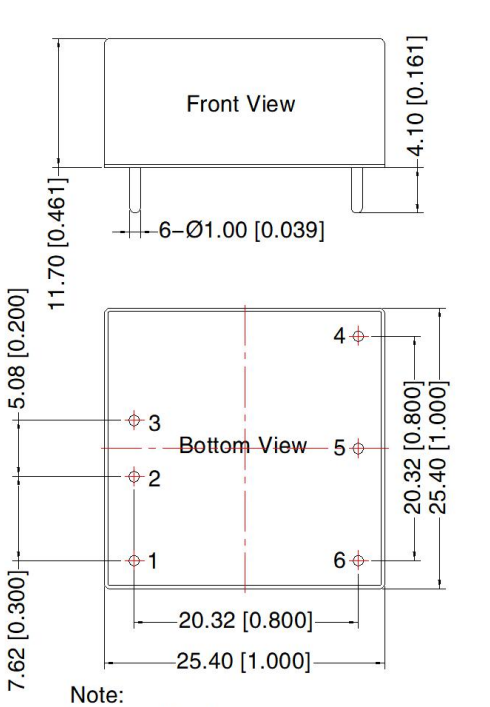
List of components:

| Model | Vin: 24VDC |
|---|---|
| FUSE | Choose according to actual input current |
| C0, C4 | 330μF/50V |
| C1, C2 | 4.7μF/50V |
| C3 | Refer to the Cout in Fig.2 |
| LDM1 | 4.7μH |
| CY1, CY2 | 1nF/2kV |

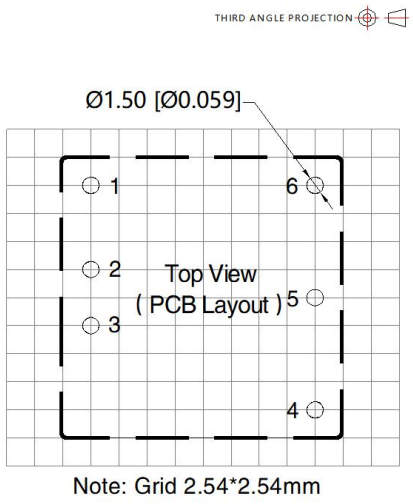
### 3. The products do not support parallel connection of their output

### 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]
PIN1/2/3/4/5/6: ϕ 1.0mm
Pin diameter tolerances: ± 0.10[ ± 0.004]
General tolerances: ± 0.50[ ± 0.020]




Note: Grid 2.54*2.54mm

| Pin-Out | |
|---|---|
| Pin | Mark |
| 1 | Ctrl |
| 2 | GND |
| 3 | Vin |
| 4 | +Vo |
| 5 | 0V |
| 6 | –Vo |

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210003;
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. 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;
4. All index testing methods in this datasheet are based on company corporate standards;
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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