

6W isolated DC-DC converter
Ultra-wide input voltage and regulated dual/single output



CE RoHS Patent Protection

URA1D_YMD-6WR3 & URB1D_YMD-6WR3 series of isolated 6W DC-DC converter with 40-160VDC input voltage with efficiencies of up to 86%, 2250VDC input to output isolation and the converter safely operate ambient temperature of -40°C to +85°C, input under-voltage protection, output over-voltage, over-current, short circuit protection. They are widely used in railway vehicle applications using 72V, 96V and 110V battery voltages.

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 86%
- I/O test isolation voltage: 2.25k VDC
- Operating ambient temperature range: -40°C to +85°C
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Low output ripple & noise
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting (A4S) version
- EN62368 approved (URA1D_YMD-6WR3)
- EN60950 approved (URB1D_YMD-6WR3)
- Meets EN50155 railway standard
- Industry standard pin-out

Selection Guide

| certification | Part No. ① | Input Voltage (VDC) | | Output | | Full Load Efficiency ^③ (%) Min./Typ. | Max. Capacitive Load(μF) |
|---------------|-----------------|---------------------|-------------------|---------------|---------------------------|--|--------------------------|
| | | Nominal (Range) | Max. ^② | Voltage (VDC) | Current (mA) Max./Min. | | |
| CE | URA1D05YMD-6WR3 | 110 (40-160) | 170 | ±5 | ±600/0 | 78/80 | 470 |
| | URA1D12YMD-6WR3 | | | ±12 | ±250/0 | 82/84 | 100 |
| | URA1D15YMD-6WR3 | | | ±15 | ±200/0 | 83/85 | 100 |
| CE | URB1D05YMD-6WR3 | | | 5 | 1200/0 | 78/80 | 1000 |
| | URB1D12YMD-6WR3 | | | 12 | 500/0 | 82/84 | 470 |
| | URB1D15YMD-6WR3 | | | 15 | 400/0 | 83/85 | 220 |
| | URB1D24YMD-6WR3 | | | 24 | 250/0 | 84/86 | 100 |

Note:

- ① Use "H" suffix for heat sink mounting, "A2S" suffix for chassis mounting and "A4S" suffix for Din-Rail mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
- ② Exceeding the maximum input voltage may cause permanent damage;
- ③ Efficiency is measured at nominal input voltage and rated output load; efficiencies for A2S and A4S Model's is decreased by 2% due to the input reverse polarity protection circuit.

Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|-------------------------------------|--|--|------|------|------|
| Input Current (full load / no-load) | Nominal input voltage | -- | 68/3 | 70/8 | mA |
| Reflected Ripple Current | Nominal input voltage | -- | 25 | -- | |
| Surge Voltage (1sec. max.) | | -0.7 | -- | 180 | VDC |
| Start-up Voltage | | -- | -- | 40 | |
| Shutdown Voltage | | 28 | 33 | -- | |
| 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 | -- | 3 | 8 | mA |

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

Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------------|--|---------------------------|-------|-------|--------|---|
| Voltage Accuracy ^① | 0%-100% load | -- | ±1 | ±3 | % | |
| Linear Regulation | Input voltage variation from low to high at full load | Vo1 | ±0.2 | ±0.5 | | |
| | | Vo2 | ±0.5 | ±1 | | |
| Load Regulation ^② | 0%-100% load | URB1D_YMD-6WR3 | ±0.5 | ±1 | | |
| | 5%-100% load | Vo1 of URA1D_YMD-6WR3 | ±0.5 | ±1 | | |
| | | Vo2 of URA1D_YMD-6WR3 | ±0.5 | ±1.5 | | |
| Cross Regulation | Dual outputs, Vo1 load at 50%, Vo2 load at range of 25%-100% | -- | -- | ±10 | | |
| Transient Recovery Time | 25% load step change, nominal input voltage | -- | 300 | 500 | μs | |
| Transient Response Deviation | | 5V, ±5V output | -- | ±3 | ±8 | % |
| | | Others | -- | ±3 | ±5 | |
| Temperature Coefficient | Full load | -- | ±0.02 | ±0.03 | %/°C | |
| Ripple & Noise ^③ | 20MHz bandwidth, 5%-100% load | -- | 50 | 100 | mV p-p | |
| Over-voltage Protection | Input voltage range | 110 | -- | 160 | %Vo | |
| Over-current Protection | | 120 | -- | 210 | %Io | |
| Short-circuit Protection | | Continuous, self-recovery | | | | |

Note: ①Vo2 output voltage accuracy of ±5VDC output converter for 0%-5% load is ±5% max;
 ②URA1D_YMD-6WR3 load regulation for 0%-100% load is ±5%;
 ③Ripple & Noise at ≤ 5% load is 5%Vo Max. 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, with the test time of 1 minute and the leak current lower than 1mA. | 2250 | -- | -- | VDC |
| | Input/output-case Electric Strength Test for 1 minute with a leakage current of 1mA max. | 1600 | -- | -- | |
| Insulation Resistance | Input-output resistance at 500VDC | 1000 | -- | -- | MΩ |
| Isolation Capacitance | Input-output capacitance at 100KHz/0.1V | -- | 1000 | -- | pF |
| Operating Temperature | See Fig.1 | -40 | -- | +85 | °C |
| Storage Temperature | | -55 | -- | +125 | |
| Pin Soldering Resistance Temperature | Soldering spot is 1.5mm away from case for 10 seconds | -- | -- | +300 | |
| Storage Humidity | Non-condensing | 5 | -- | 95 | %RH |
| Vibration | | IEC61373 - Category 1, Grade B | | | |
| Switching Frequency * | PWM Mode | -- | 300 | -- | KHz |
| MTBF | MIL-HDBK-217F@25°C | 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 | Horizontal package(without heat sink) | | | 25.40 x 25.40 x 11.70 mm | |
| | Horizontal package(with heat sink) | | | 25.40 x 25.40 x 16.20 mm | |
| | A2S wiring package (without heat sink) | | | 76.00 x 31.50 x 21.20 mm | |
| | A2S wiring package(with heat sink) | | | 76.00 x 31.50 x 25.20 mm | |
| | A4S rail package(without heat sink) | | | 76.00 x 31.50 x 25.80 mm | |
| | A4S rail package(with heat sink) | | | 76.00 x 31.50 x 29.80 mm | |
| Weight | without heat sink | Horizontal package/A2S wiring package/A4S rail package | | 12.5g/36.0g/56.0g(Typ.) | |
| | with heat sink | Horizontal package/A2S wiring package/A4S rail package | | 17.0g/40.0g/59.0g(Typ.) | |
| Cooling Methods | Free air convection | | | | |

Electromagnetic Compatibility (EMC)

| | | | | |
|-----------|-----------------|-----------------|---|--|
| Emissions | CE | CISPR32/EN55032 | CLASS B (see Fig.3 or Fig.4-② for recommended circuit) | |
| | RE | CISPR32/EN55032 | CLASS B (see Fig.3 or Fig.4-② for recommended circuit) | |
| Immunity | ESD | IEC/EN61000-4-2 | Contact ±6KV/Air ±8KV | |
| | RS | IEC/EN61000-4-3 | 20V/m | |
| | EFT | IEC/EN61000-4-4 | ±4KV(see Fig.3 or Fig.4-① for recommended circuit) | |
| | Surge | IEC/EN61000-4-5 | line to line ±2KV (2Ω 18uF see Fig.3 for recommended circuit) | |
| | | | line to ground ±4KV (12Ω 9uF see Fig.3 for recommended circuit) | |
| CS | IEC/EN61000-4-6 | 10 Vr.m.s | | |

Electromagnetic Compatibility (EMC) (EN50155)

| | | | | |
|-----------|-------------|------------------------|---|--|
| Emissions | CE | EN50121-3-2 | 150kHz-500kHz 99dBuV 500kHz-30MHz 93dBuV | |
| | RE | EN50121-3-2 | 30MHz-230MHz 40dBuV/m at 10m 230MHz-1GHz 47dBuV/m at 10m | |
| Immunity | ESD | EN50121-3-2 | Contact ±6KV/Air ±8KV | |
| | RS | EN50121-3-2 | 20V/m | |
| | EFT | EN50121-3-2 | ±2kV 5/50ns 5kHz | |
| | Surge | EN50121-3-2 | line to line ±1KV (42Ω, 0.5 μ F) | |
| | | | line to ground ±2KV (42Ω, 0.5 μ F) | |
| CS | EN50121-3-2 | 0.15MHz-80MHz 10Vr.m.s | | |

Note: All the tests are measured under the conditions of input capacitor 100uF/200V or FC-C01D.

Product Characteristic Curves

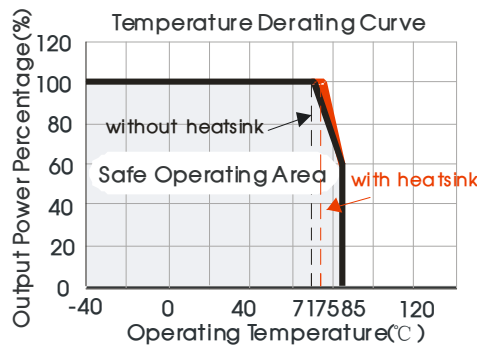
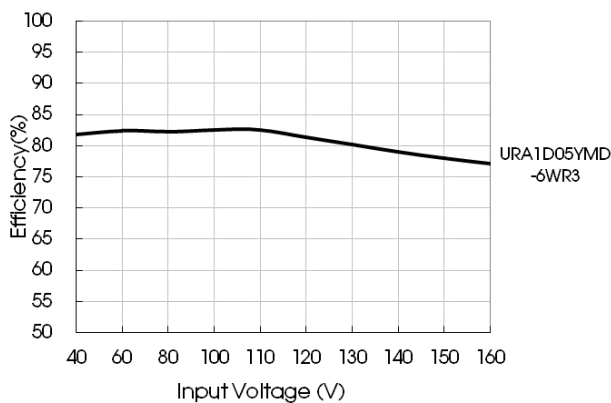
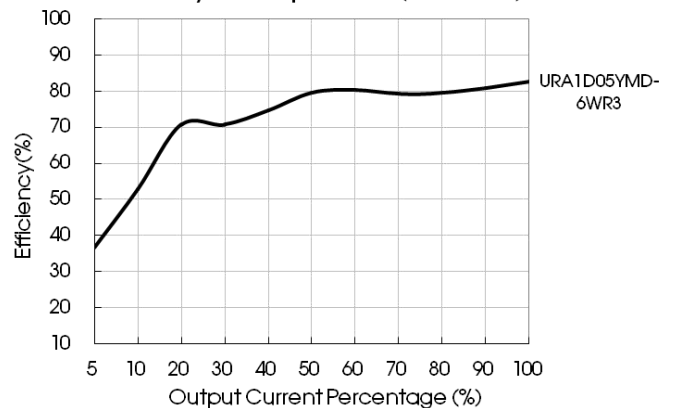


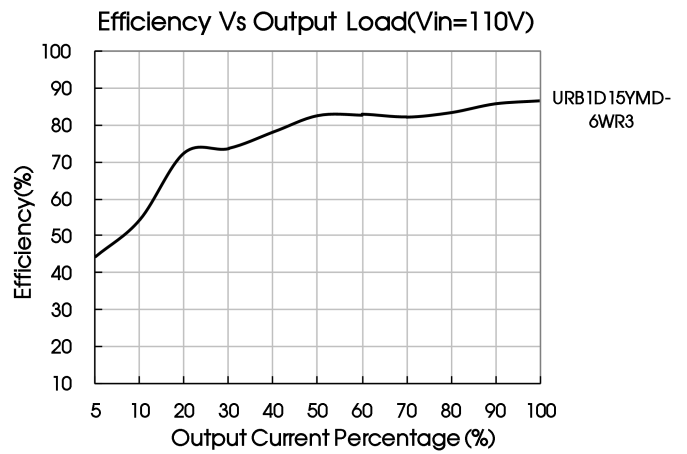
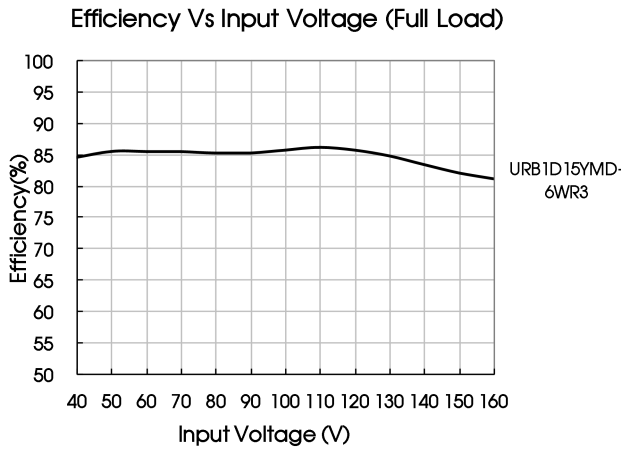
Fig. 1

Efficiency Vs Input Voltage (Full Load)



Efficiency Vs Output Load (Vin=110V)





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 C_{in} and C_{out} and/or by selecting capacitors with a low ESR (equivalent series resistance). Also make sure that the capacitance is not exceeding the specified max. capacitive load value of the product.

Dual Output



Single Output



Fig. 2

| C_{in} | C_{out} |
|------------------------|------------|
| 10 μ F -47 μ F | 10 μ F |

2. EMC compliance circuit

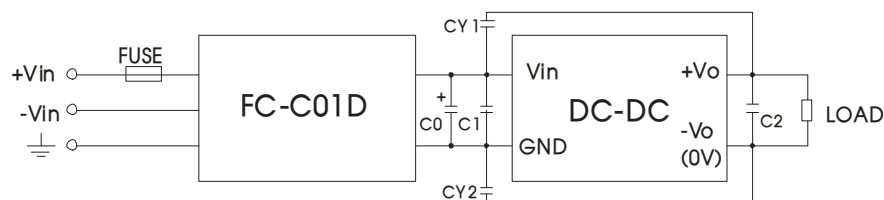


Fig. 3

Fig.3 Parameter description:

| | |
|----------|--|
| FUSE | Choose according to actual input current |
| FC-C01D | FC-CX1D is the EMC auxiliary component of our company. Input voltage range: 40V-160V |
| C0 | 100 μ F/200V |
| C1 | Refer to the C_{in} in Fig.2 |
| C2 | Refer to the C_{out} in Fig.2 |
| CY1, CY2 | 1nF /3KV |

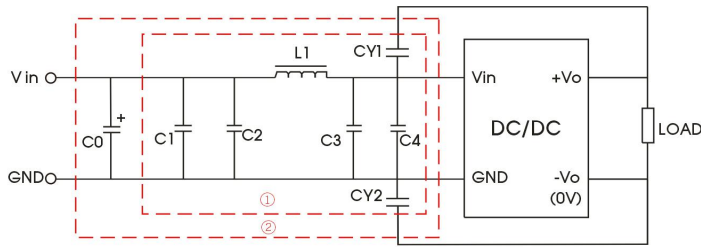


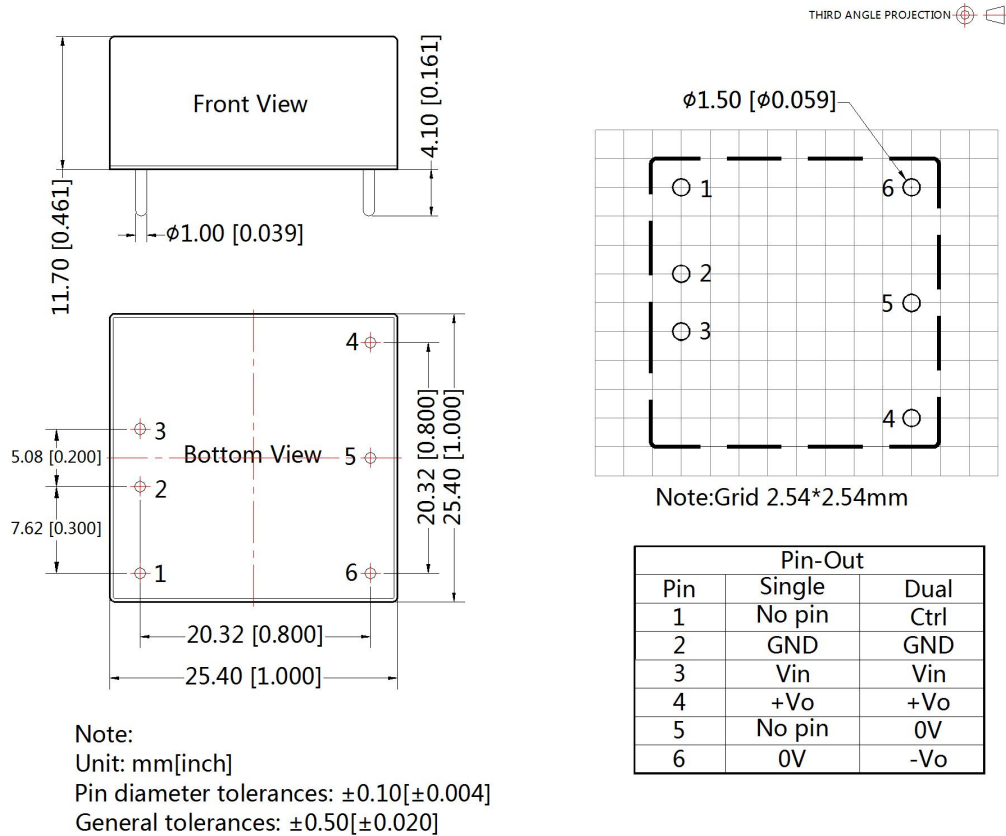
Fig. 4

Fig. 4 Parameter description:

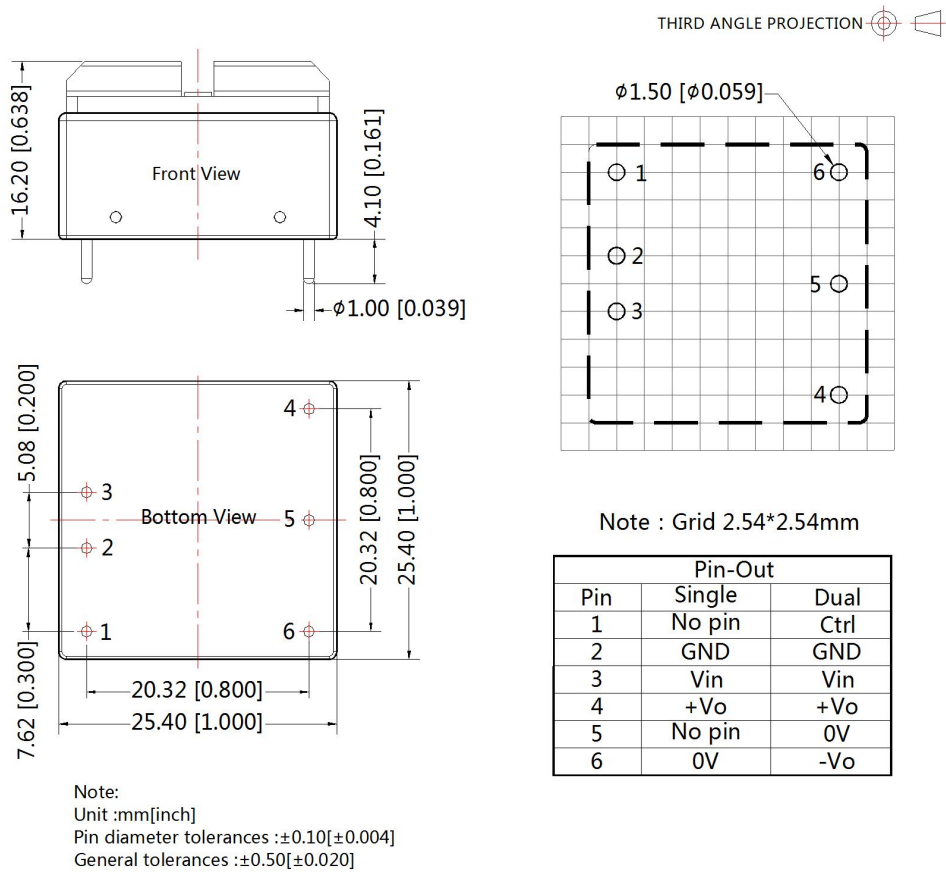
| | |
|----------------|-------------|
| C0 | 100uF/200V |
| C1, C2, C3, C4 | 0.22uF/250V |
| L1 | 68 μ H |
| CY1, CY2 | 1nF/3KV |

- The products do not support parallel connection of their output
- For additional information about Mornsun EMC Filter products please refer to www.mornsun-power.com to download the Selection Guide of EMC Filter

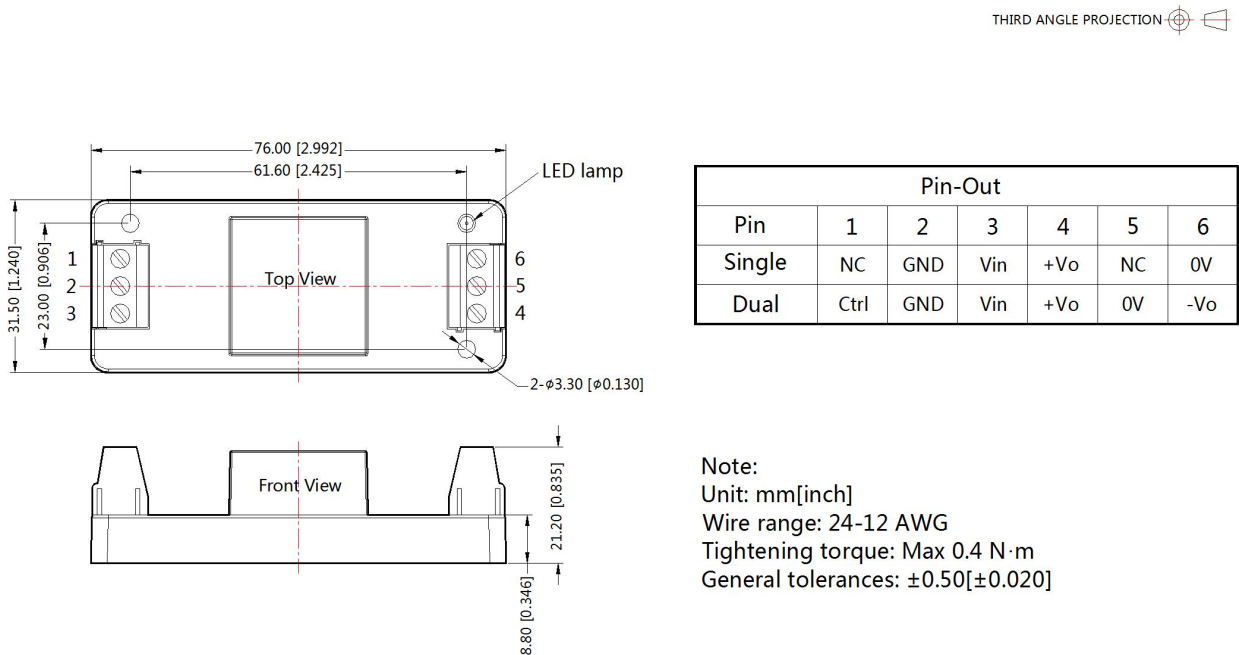
Horizontal Package (without heat sink) Dimensions and Recommended Layout



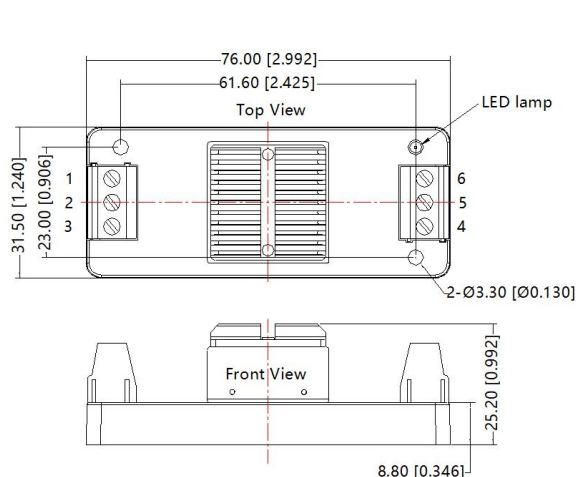
Horizontal Package (with heat sink) Dimensions



URA1D_YMD-6WR3A2S & URB1D_YMD-6WR3A2S (without heat sink) Dimensions



URA1D_YMD-6WHR3A2S & URB1D_YMD-6WHR3A2S (with heat sink) Dimensions

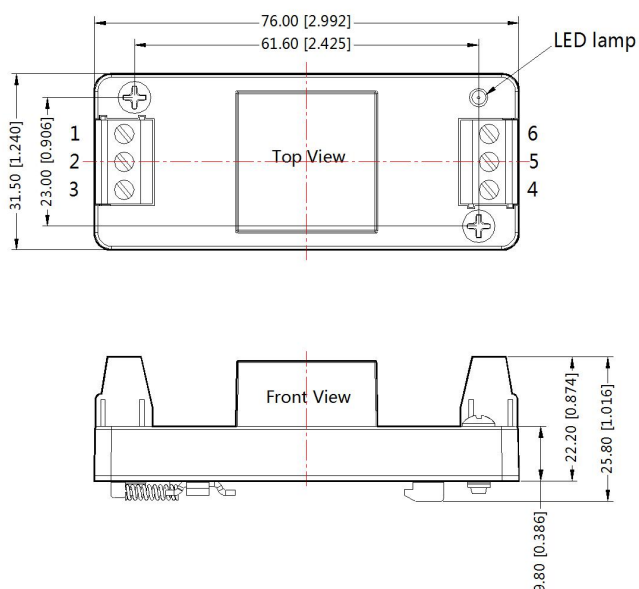


THIRD ANGLE PROJECTION

| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|----|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | NC | GND | Vin | +Vo | NC | 0V |
| Dual | Ctrl | GND | Vin | +Vo | 0V | -Vo |

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

URA1D_YMD-6WR3A4S & URB1D_YMD-6WR3A4S (without heat sink) Dimensions



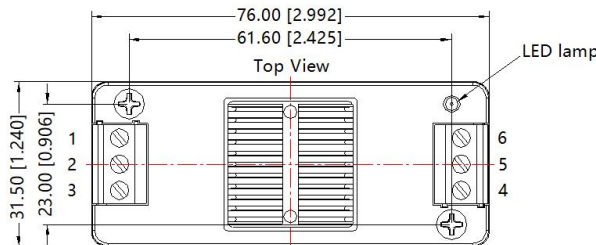
THIRD ANGLE PROJECTION

| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|----|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | NC | GND | Vin | +Vo | NC | 0V |
| Dual | Ctrl | GND | Vin | +Vo | 0V | -Vo |

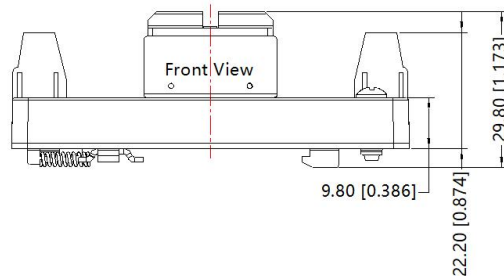
Note:
 Unit: mm[inch]
 Mounting rail: TS35
 Wire range: 24-12 AWG
 Tightening torque: Max 0.4 N·m
 General tolerances: ±1.00[±0.039]

URA1D_YMD-6WHR3A4S & URB1D_YMD-6WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|----|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | NC | GND | Vin | +Vo | NC | 0V |
| Dual | Ctrl | GND | Vin | +Vo | 0V | -Vo |



Note:
 Unit: mm[inch]
 Mounting rail: TS35
 Wire range: 24-12 AWG
 Tightening torque: Max 0.4 N·m
 General tolerances: ±1.00[±0.039]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number of Horizontal package: 58210003(without heat sink), 58200048(with heat sink), A2S/ A4S package number: 58220022;
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 $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated output load;
4. Other product application information, please see DC-DC (railway power supply) Converter Application Notes for specific operation methods--2016 Edition.
5. All index testing methods in this datasheet are based on 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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