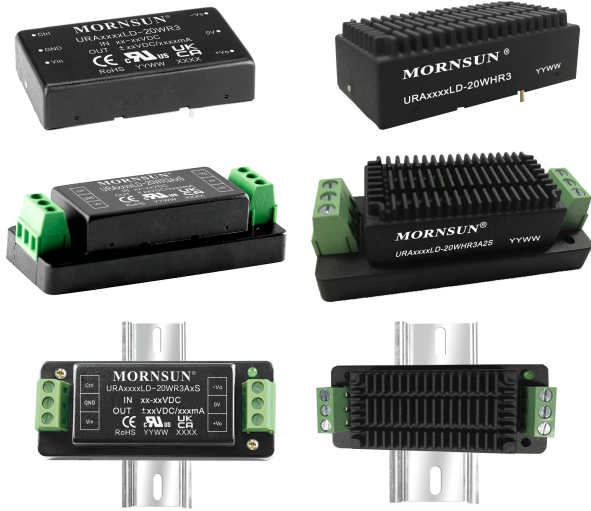


20W isolated DC-DC converter
Ultra-wide input and regulated dual/single output



UL US CE Report UK Report CB Patent Protection RoHS 3

UL60950-1 EN62368-1 BS EN62368-1 IEC60950-1

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 90%
- No-load power consumption as low as 0.15W
- I/O isolation test voltage 1.5k VDC
- Input under-voltage protection, output short-circuit, over-voltage, over-current protection
- Operating ambient temperature range: -40°C to +85°C
- Meets CISPR32/EN55032 CLASS A, without extra components
- Six-sided metal shielding package
- Input reverse polarity protection available with chassis(A2S) or Din-Rail mounting (A4S) version
- Meets EN50155 railway standard

URA_LD-20WR3 & URB_LD-20WR3 series of isolated 20W DC-DC products with an ultra 4:1 input voltage range. They feature efficiencies up to 90%, input to output isolation is tested with 1500VDC, operating ambient temperature range of -40 °C to +85 °C, input under-voltage protection, output short-circuit, over-voltage, over-current protection. They meet CLASS A of CISPR32/EN55032 standards without extra components, optional packages are offered for chassis or DIN-rail mounting (A2S, A4S), adding additional input reverse polarity protection and they are widely used in applications such as data transmission device, battery power supplies, telecommunication device, distributed power supply system, hybrid module system, remote control system, industrial robot system and railway fields.

Selection Guide

| Certification | Part No. ① | Input Voltage (VDC) | | Output | | Full Load Efficiency ^② (%) Min./Typ. | Capacitive Load ^③ (μF)Max. |
|-----------------|-----------------|---------------------------------|--------|---------------|---------------------------|--|--|
| | | Nominal ^② (Range) | Max. ③ | Voltage (VDC) | Current (mA) Max./Min. | | |
| UL/EN/BS EN/IEC | URA2405LD-20WR3 | 24 (9-36) | 40 | ±5 | ±2000/0 | 84/86 | 4800 |
| | URA2409LD-20WR3 | | | ±9 | ±1111/0 | 86/88 | 1000 |
| | URA2412LD-20WR3 | | | ±12 | ±834/0 | 86/88 | 800 |
| | URA2415LD-20WR3 | | | ±15 | ±667/0 | 86/88 | 625 |
| | URB2403LD-20WR3 | | | 3.3 | 5000/0 | 84/86 | 10000 |
| | URB2405LD-20WR3 | | | 5 | 4000/0 | 86/88 | 10000 |
| | URB2409LD-20WR3 | | | 9 | 2222/0 | 86/88 | 4700 |
| | URB2412LD-20WR3 | | | 12 | 1667/0 | 87/89 | 1600 |
| | URB2415LD-20WR3 | | | 15 | 1333/0 | 88/90 | 1000 |
| | URB2424LD-20WR3 | | | 24 | 834/0 | 88/90 | 500 |
| | URA4805LD-20WR3 | 48 (18-75) | 80 | ±5 | ±2000/0 | 84/86 | 4800 |
| | URA4812LD-20WR3 | | | ±12 | ±834/0 | 86/88 | 800 |
| | URA4815LD-20WR3 | | | ±15 | ±667/0 | 87/89 | 625 |
| | URB4803LD-20WR3 | | | 3.3 | 5000/0 | 84/86 | 10000 |
| | URB4805LD-20WR3 | | | 5 | 4000/0 | 84/86 | 10000 |
| | URB4809LD-20WR3 | | | 9 | 2222/0 | 87/89 | 4700 |
| | URB4812LD-20WR3 | | | 12 | 1667/0 | 85/87 | 1600 |
| | URB4815LD-20WR3 | | | 15 | 1333/0 | 88/90 | 1000 |
| | URB4824LD-20WR3 | | | 24 | 834/0 | 86/88 | 500 |

Notes:
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 The minimum input voltage and starting voltage of A2S and A4S Model are 1VDC higher than those of DIP package due to input reverse polarity protection

function;
 ③ Exceeding the maximum input voltage may cause permanent damage;
 ④ 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;
 ⑤ The specified maximum capacitive load for positive and negative output is identical.

Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit | |
|-------------------------------------|--|--|------|--------|--------|----|
| Input Current (full load / no-load) | 24VDC input | 3.3V output | -- | 799/40 | 818/45 | mA |
| | | 5V output | -- | 969/40 | 993/80 | |
| | | Others | -- | 947/6 | 969/10 | |
| | 48VDC input | 3.3V output | -- | 400/20 | 409/25 | |
| | | 5V output | -- | 485/20 | 497/60 | |
| | | Others | -- | 474/5 | 485/9 | |
| Reflected Ripple Current | 24VDC input | -- | 30 | -- | | |
| | 48VDC input | -- | 30 | -- | | |
| Surge Voltage (1sec. max.) | 24VDC input | -0.7 | -- | 50 | VDC | |
| | 48VDC input | -0.7 | -- | 100 | | |
| Start-up Voltage | 24VDC input | -- | -- | 9 | VDC | |
| | 48VDC input | -- | -- | 18 | | |
| Input Under-voltage Protection | 24VDC input | 5.5 | 6.5 | -- | | |
| | 48VDC input | 12 | 15.5 | -- | | |
| Start-up Time | Nominal input & constant resistance load | -- | 10 | -- | ms | |
| Input Filter | | PI filter | | | | |
| 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 | -- | 4 | 7 | mA | |
| Hot Plug | | Unavailable | | | | |

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 | Positive Output | -- | ±0.2 | | ±0.5 |
| | | Negative Output | -- | ±0.5 | | ±1 |
| Load Regulation ^② | 5%-100% load | Positive Output | -- | ±0.5 | | ±1 |
| | | Negative Output | -- | ±0.5 | | ±1.5 |
| Cross Regulation | Dual output with Positive output at 50% load and Negative output from 10%-100% load | -- | -- | ±5 | | |
| Transient Recovery Time | | -- | 300 | 500 | μs | |
| Transient Response Deviation | 25% load step change, nominal input voltage | 3.3V/5V/±5V output | -- | ±5 | ±8 | % |
| | | Others | -- | ±3 | ±5 | |
| Temperature Coefficient | Full load | -- | -- | ±0.03 | %/°C | |
| Ripple & Noise ^③ | 20MHz bandwidth, 5%-100% load | -- | 50 | 100 | mVp-p | |
| Trim | Input voltage range | -- | ±10 | -- | %Vo | |
| Over-voltage Protection | | 110 | -- | 160 | | |
| Over-current Protection | | 110 | -- | 190 | %Io | |
| Short-circuit Protection | | Hiccup, continuous, self-recovery | | | | |

Note:
 ① Output voltage accuracy of ±5VDC/±9VDC output converter for 0%-5% load is ±5% max;
 ② Load regulation for 0%-100% load is ±5%;
 ③ Under 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 | URB2424LD-20WR3 | -- | 2050 | -- | pF |
| | | Others | -- | 1050 | -- | |
| Operating Temperature | See Fig. 1 | -40 | -- | +85 | °C | |
| 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 | °C | |
| Vibration | | IEC/EN61373 - Category 1, Grade B | | | | |
| Switching Frequency * | PWM mode | -- | 270 | -- | 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) | | | 50.80 x 25.40 x 11.80 mm | |
| | Horizontal package (with heat sink) | | | 51.40 x 26.20 x 16.50mm | |
| | A2S chassis mounting (without heat sink) | | | 76.00 x 31.50 x 21.20 mm | |
| | A2S chassis mounting (with heat sink) | | | 76.00 x 31.50 x 25.30 mm | |
| | A4S Din-rail mounting (without heat sink) | | | 76.00 x 31.50 x 25.80 mm | |
| | A4S Din-rail mounting (with heat sink) | | | 76.00 x 31.50 x 29.90 mm | |
| Weight | Without heat sink | Horizontal package/A2S chassis mounting/A4S Din-rail mounting | | 25.0g/48.0g/68.0g(Typ.) | |
| | With heat sink | Horizontal package/A2S chassis mounting/A4S Din-rail mounting | | 34.0g/56.0g/76.0g(Typ.) | |
| Cooling Method | Free air convection | | | | |

Electromagnetic Compatibility (EMC)

| | | | | | |
|-----------|---|------------------|---|--|------------------|
| Emissions | CE | CISPR32/EN55032 | CLASS A (without extra components)/ CLASS B (see Fig.3-② for recommended circuit) | | |
| | RE | CISPR32/EN55032 | CLASS A (without extra components)/ 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 components) | | 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 components) | | perf. Criteria A |
| | Voltage dips, short interruptions and voltage variations immunity | IEC/EN61000-4-29 | 0%, 70% | | perf. Criteria B |

Electromagnetic Compatibility (EMC) (EN50155)

| | | | | | |
|-----------|-------|-------------|--|---|------------------|
| Emissions | CE | EN50121-3-2 | 150kHz-500kHz | 99dBμV (see Fig.3-② for recommended circuit) | |
| | | EN55016-2-1 | 500kHz-30MHz | 93dBμV (see Fig.3-② for recommended circuit) | |
| | RE | EN50121-3-2 | 30MHz-230MHz | 40dBμV/m at 10m (see Fig.3-② for recommended circuit) | |
| | | EN55016-2-1 | 230MHz-1GHz | 47dBμV/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 components) | | 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 | 10V r.m.s (without extra components) | perf. Criteria A |
|----|-------------|---------------|--------------------------------------|------------------|

Typical Characteristic Curves

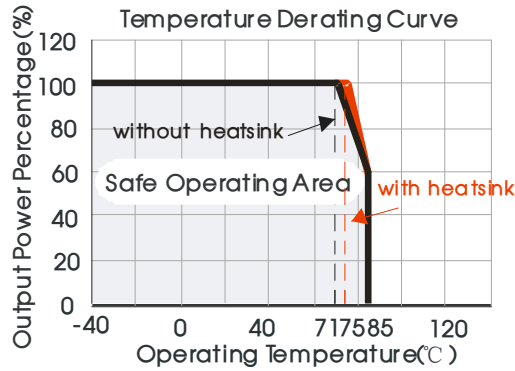
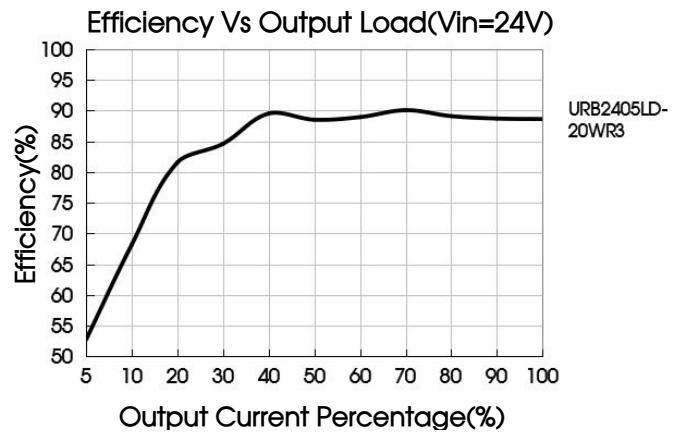
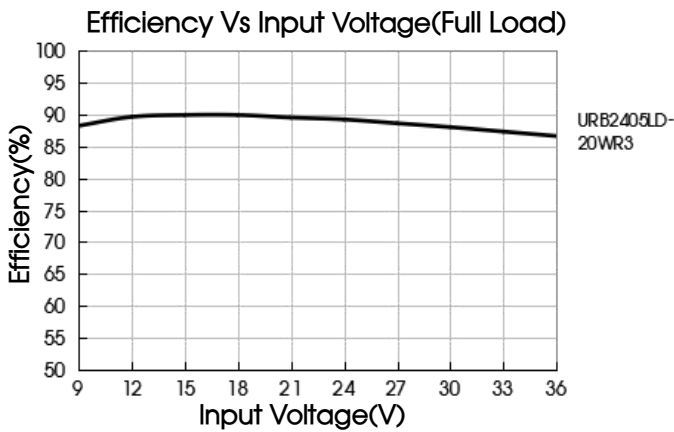
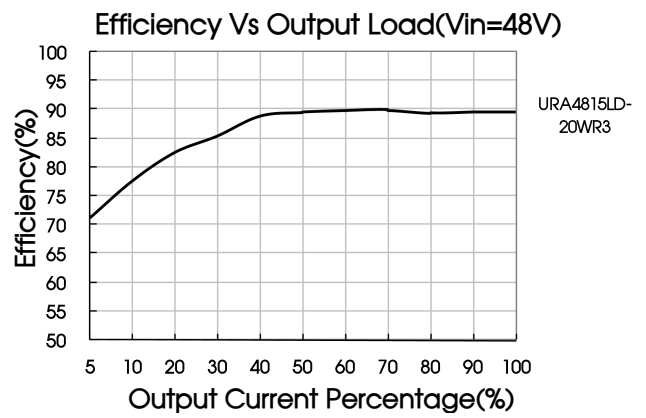
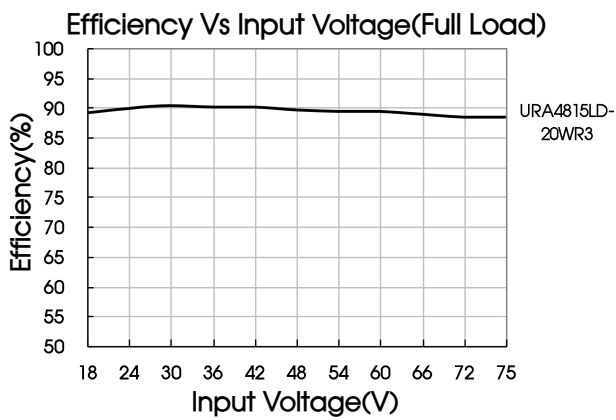


Fig. 1



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 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.

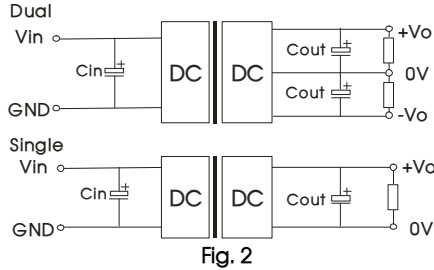
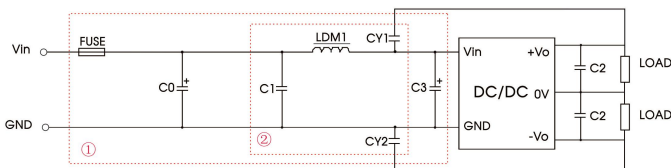


Fig. 2

| Cin | | Single Vo (VDC) | Cout | Dual Vo (VDC) | Cout |
|------------|------------|-----------------|-----------|---------------|-----------|
| Vin: 24VDC | Vin: 48VDC | | | | |
| 100µF/50V | 100µF/100V | 3.3/5 | 470µF/16V | ±5 | 220µF/16V |
| | | 9 | 220µF/16V | ±9 | 100µF/16V |
| | | 12/15 | 220µF/25V | ±12/±15 | 100µF/25V |
| | | 24 | 100µF/50V | -- | -- |

2. EMC compliance circuit

Dual



Single

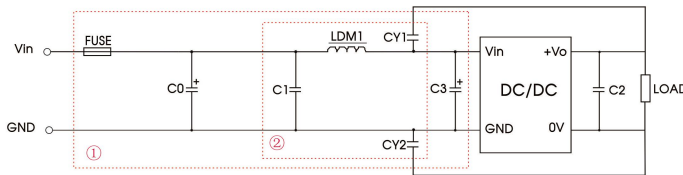


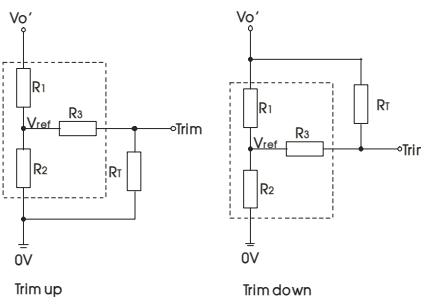
Fig. 3

Notes: We use Part ① in Fig. 3 for Immunity tests and Part ② for Emissions test. Selecting based on needs.

Parameter description:

| Model | Vin: 24VDC | Vin: 48VDC |
|---------|--|------------|
| FUSE | Choose according to actual input current | |
| C0/C3 | 330µF/50V | 330µF/100V |
| C1 | 1µF/50V | 1µF/100V |
| C2 | Refer to the Cout in Fig.2 | |
| LDM1 | 4.7µH/3.1A | |
| CY1/CY2 | 1nF/2kV | |

3. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

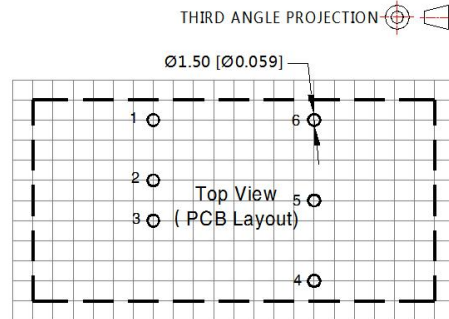
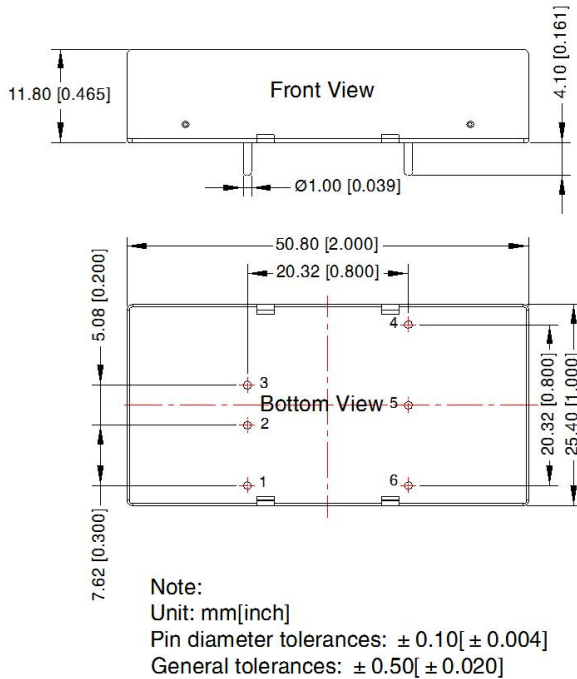
$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} - R_3 & \alpha &= \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} - R_3 & \alpha &= \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

R_T = Trim Resistor value
 α = self-defined parameter

| Vout(V) | R1(kΩ) | R2(kΩ) | R3(kΩ) | Vref(V) |
|---------|--------|--------|--------|---------|
| 3.3 | 4.772 | 2.87 | 12.4 | 1.25 |
| 5 | 2.883 | 2.87 | 10 | 2.5 |
| 9 | 7.500 | 2.87 | 15 | 2.5 |
| 12 | 11.000 | 2.87 | 15 | 2.5 |
| 15 | 14.494 | 2.87 | 15 | 2.5 |
| 24 | 24.872 | 2.87 | 17.8 | 2.5 |

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

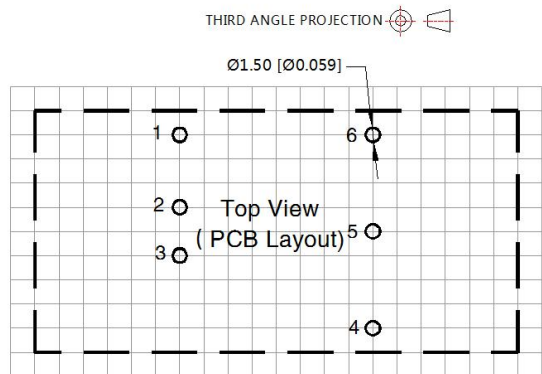
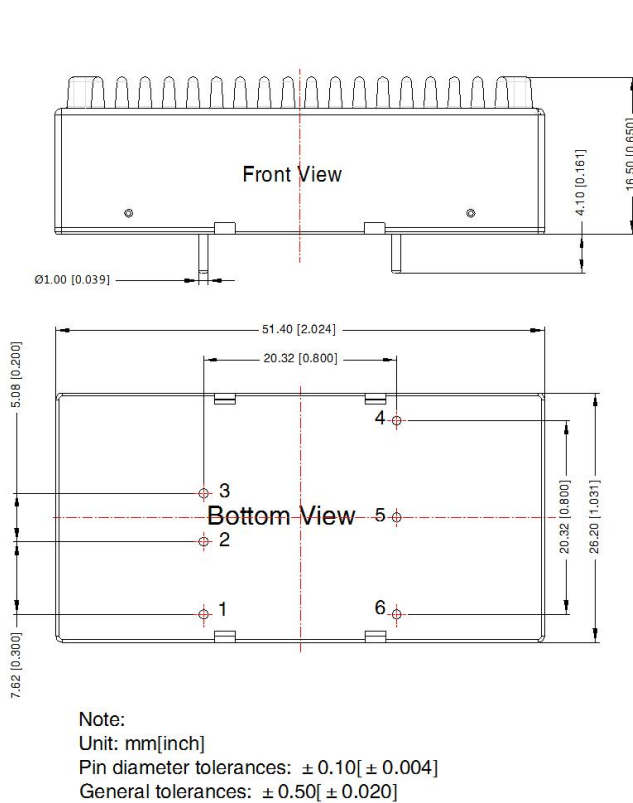
Horizontal Package (without heat sink) Dimensions and Recommended Layout



Note: Grid 2.54*2.54mm

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

Horizontal Package (with heat sink) Dimensions

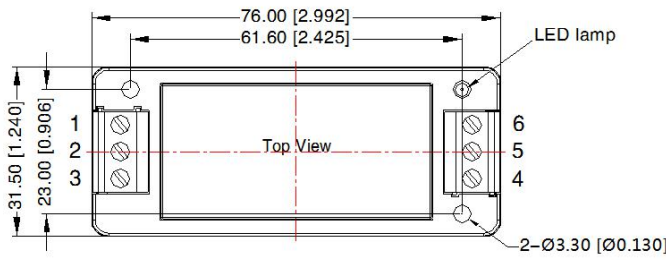


Note: Grid 2.54*2.54mm

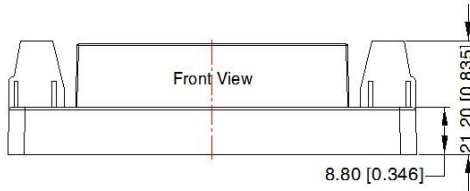
| Pin | Pin-Out | |
|-----|---------|------|
| | Single | Dual |
| 1 | Ctrl | Ctrl |
| 2 | GND | GND |
| 3 | Vin | Vin |
| 4 | +Vo | +Vo |
| 5 | Trim | 0V |
| 6 | 0V | -Vo |

URA_LD-20WR3A2S & URB_LD-20WR3A2S(without heat sink) Dimensions

THIRD ANGLE PROJECTION 



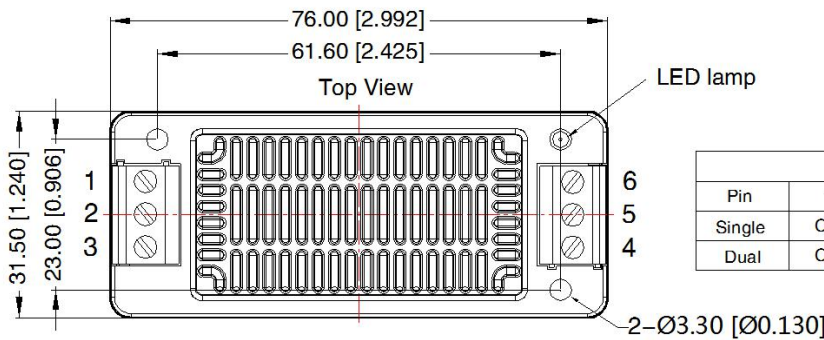
| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|------|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Dual | Ctrl | GND | Vin | +Vo | 0V | -Vo |
| Single | Ctrl | GND | Vin | +Vo | Trim | 0V |



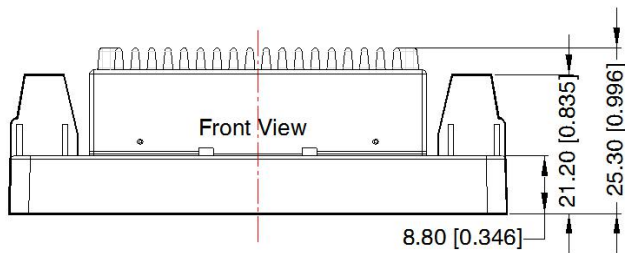
Note:
 Unit: mm[inch]
 Wire range: 24-12 AWG
 Tightening torque: Max 0.4 N · m
 General tolerances: ± 1.0[± 0.039]

URA_LD-20WHR3A2S & URB_LD-20WHR3A2S(with heat sink) Dimensions

THIRD ANGLE PROJECTION 



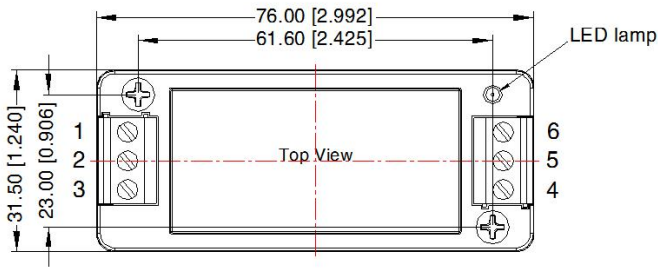
| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|------|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | Ctrl | GND | Vin | +Vo | Trim | 0V |
| Dual | Ctrl | GND | Vin | +Vo | 0V | -Vo |



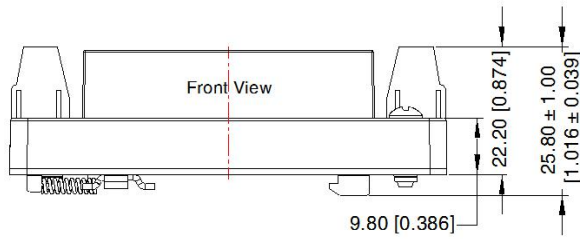
Note:
 Unit: mm[inch]
 Wire range: 24-12 AWG
 Tightening torque: Max 0.4 N · m
 General tolerances: ± 1.0[± 0.039]

URA_LD-20WR3A4S & URB_LD-20WR3A4S(without heat sink) Dimensions

THIRD ANGLE PROJECTION 



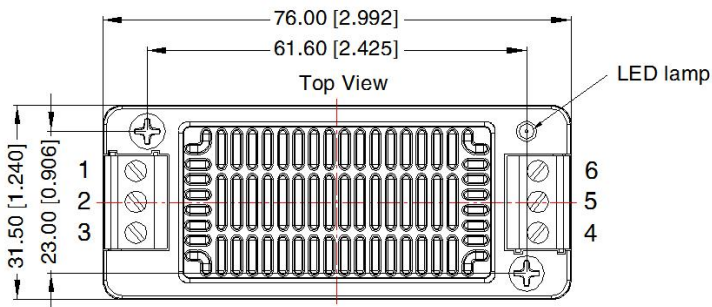
| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|------|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Dual | Ctrl | GND | Vin | +Vo | 0V | -Vo |
| Single | Ctrl | GND | Vin | +Vo | Trim | 0V |



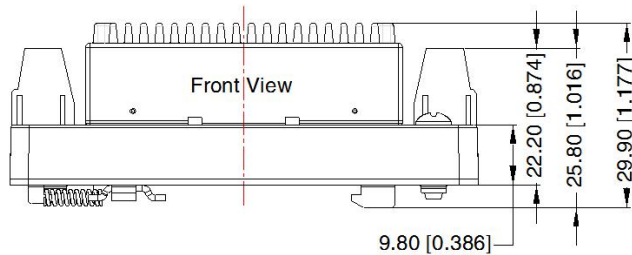
Note:
 Unit: mm[inch]
 Mounting rail: TS35
 Wire range: 24-12 AWG
 Tightening torque: Max 0.4 N · m
 General tolerances: ± 1.00 [± 0.039]

URA_LD-20WHR3A4S & URB_LD-20WHR3A4S(with heat sink) Dimensions

THIRD ANGLE PROJECTION 



| Pin-Out | | | | | | |
|---------|------|-----|-----|-----|------|-----|
| Pin | 1 | 2 | 3 | 4 | 5 | 6 |
| Single | Ctrl | GND | Vin | +Vo | Trim | 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]

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number of Horizontal packaging: 58200035(without heat sink), 58200051(with heat sink), A2S/A4S packaging 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. 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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