

100W isolated DC-DC converter
Ultra-wide input and regulated single output



FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 94%
- I/O isolation test voltage: 2250VDC
- Operating ambient temperature range: -40°C to +85°C
- Input under-voltage protection, output over-voltage, over-current, short circuit, over-temperature protection
- Five-sided metal shielding package
- Industry standard 1/4-Brick package and pin-out



EN62368-1 BS EN62368-1

URF48_QB -100W(F/H)R3 series are isolated 100W DC-DC products with 4:1 input voltage. They feature efficiency up to 94%, 2250VDC input to output isolation, operating temperature of -40°C to +85°C, input under-voltage, output over-voltage, over-current, short circuit, over-temperature protection. EN62368 approved and they are widely used in applications such as battery powered systems, industrial controls, electricity, instrumentation, railway, communication and intelligent robotics.

Selection Guide

| Certification | Part No. ^① | Input Voltage ^③ (VDC) | | Output | | Full Load Efficiency(%) Min./Typ. | | Max. Capacitive Load (μF) |
|---------------|-----------------------------|----------------------------------|-------------------|--------------|--------------------|--------------------------------------|----------------------|---------------------------|
| | | Nominal (Range) | Max. ^② | Voltage(VDC) | Current (A) (Max.) | V _{in} =24V | V _{in} =48V | |
| -- | URF4803QB-100W(F/H) R3 | 48 (18-75) | 80 | 3.3 | 22.7 | 87/89 | 86/88 | 10000 |
| EN/BS EN | URF4805QB-100W(F/H) R3 | | | 5 | 20 | 91/93 | 89/91 | 6000 |
| | URF4812QB-100W(F/H) R3 | | | 12 | 8.3 | 91/93 | 90/92 | 2000 |
| | URF4815QB-100W(F/H) R3 | | | 15 | 6.7 | 92/94 | 91/93 | 2000 |
| | URF4824QB-100W(F/H) R3 | | | 24 | 4.2 | 91/93 | 90/92 | 1000 |
| | URF4848QB-100W(F/H) R3 | | | 48 | 2.1 | 91/93 | 90/92 | 470 |
| -- | URF4803QB-100W(F/H) R3A5/A6 | 48 (19-75) | 80 | 3.3 | 22.7 | 85/87 | 84/86 | 10000 |
| EN/BS EN | URF4805QB-100W(F/H) R3A5/A6 | | | 5 | 20 | 89/91 | 87/89 | 6000 |
| | URF4812QB-100W(F/H) R3A5/A6 | | | 12 | 8.3 | 89/91 | 88/90 | 2000 |
| | URF4815QB-100W(F/H) R3A5/A6 | | | 15 | 6.7 | 90/92 | 89/91 | 2000 |
| | URF4824QB-100W(F/H) R3A5/A6 | | | 24 | 4.2 | 89/91 | 88/90 | 1000 |
| | URF4848QB-100W(F/H) R3A5/A6 | | | 48 | 2.1 | 89/91 | 88/90 | 470 |

Note:
 ① Use "F" suffix is for added aluminum baseplate and "H" suffix for heat sink mounting, Use "A5" suffix for chassis mounting and "A6" 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 The minimum input voltage range and start-up voltage of the A5/A6 product model are 1V_{DV} higher than the horizontal package model;
 ④ A5/A6 package products are 2% less efficient than standard products.

Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|-----------------------------------|-----------------------|-------------|------|---------|---------|
| Input Current (full load/no-load) | Nominal input voltage | 3.3V output | -- | 1776/50 | 1812/80 |
| | | Others | -- | 2265/50 | 2341/80 |

| | | | | | |
|--------------------------------|---|--|------|----|-----|
| Reflected Ripple Current | Nominal input voltage | -- | 30 | -- | |
| Surge Voltage (1sec. max.) | | -0.7 | -- | 90 | VDC |
| Start-up Voltage | | -- | -- | 18 | |
| Input Under-voltage Protection | URF4805QB-100W(F/H)R3, URF4815QB-100W(F/H) R3 | 16 | 16.5 | -- | |
| | Others | 15 | 15.5 | -- | |
| Input Filter | | Pi filter | | | |
| Ctrl ^① | Module on | Ctrl pin open or pulled high TTL (3.5-12VDC) | | | |
| | Module off | Ctrl pin pulled low to GND(0-1.2VDC) | | | |
| | Input current when off | -- | 2 | 10 | mA |
| Hot Plug | | Unavailable | | | |

Note: ①The Ctrl pin voltage is referenced to input GND.

Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------------|---|-----------------------------------|------|-------|------|-------|
| Output Voltage Accuracy | | -- | ±1 | ±3 | | |
| Linear Regulation | Input voltage variation from low to high at full load | -- | ±0.2 | ±0.5 | % | |
| Load Regulation | 5%-100% load | -- | ±0.5 | ±0.75 | | |
| Transient Recovery Time | 25% load step change | -- | 200 | 500 | μs | |
| Transient Response Deviation | 25% load step change | 3.3V, 5V output | -- | ±3 | ±7.5 | % |
| | | Others | -- | ±3 | ±5 | |
| Temperature Coefficient | Full load | -- | -- | ±0.03 | %/°C | |
| Ripple & Noise ^① | 20MHz bandwidth | 12V, 15V output | -- | 100 | 200 | mVp-p |
| | | Others | -- | 130 | 250 | |
| Output Over-voltage Protection | | 110 | 125 | 160 | %Vo | |
| Output Over-current Protection | Input voltage range | 110 | 125 | 190 | %Io | |
| Short-circuit Protection | | Hiccup, continuous, self-recovery | | | | |

Note: ①The "parallel cable" method is used for ripple and noise test, please see DC-DC Converter Application Notes for specific information.

General Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit | |
|--------------------------------------|--|-------------------------------|------|------|---------|-----|
| Insulation Voltage | Electric Strength Test for 1 minute with a leakage current of 5mA max. | Input-output | 2250 | -- | -- | VDC |
| | | Input-case | 1500 | -- | -- | |
| | | Output-case | 500 | -- | -- | |
| Insulation Resistance | Input-output, insulation voltage 500VDC | 1000 | -- | -- | MΩ | |
| Isolation Capacitance | Input-output, capacitance at 100kHz/0.1V | -- | 2200 | -- | pF | |
| Trim ^① | | 95 | -- | 110 | %Vo | |
| Sense | | -- | -- | 105 | | |
| Operating Temperature | | -40 | -- | +85 | °C | |
| Storage Temperature | | -55 | -- | +125 | | |
| Over-temperature Protection | Max. Casing Temperature | +95 | +105 | +115 | | |
| Pin Soldering Resistance Temperature | Wave-soldering, 10 seconds | -- | -- | +260 | | |
| | Soldering spot is 1.5mm away from case for 10 seconds | -- | -- | +300 | | |
| Storage Humidity | Non-condensing | 5 | -- | 95 | %RH | |
| Vibration | | IEC/EN61373 train 1B category | | | | |
| Switching Frequency | PFM mode | -- | 250 | -- | KHz | |
| MTBF | MIL-HDBK-217F@25°C | 500 | -- | -- | K hours | |

Note: ①For URF4803QB-100W (F/H)R3, URF4805QB-100W (F/H)R3 and URF4815QB-100W (F/H)R3, when the Trim function satisfies the output up to 10% or the Sense function satisfies the output up to 5%, Vin needs to be higher than 20VDC.

Mechanical Specifications

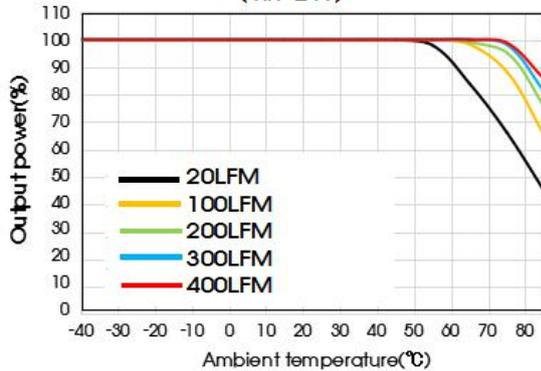
| | | |
|----------------|--|--------------------------|
| Case Material | Aluminum alloy case; Black plastic bottom, flame-retardant and heat-resistant (UL94 V-0) | |
| Dimensions | URF48xxQB-100WR3 | 61.8 x 40.2 x 12.7 mm |
| | URF48xxQB-100WFR3 | 62.0 x 56.0 x 14.6 mm |
| | URF48xxQB-100WHR3 | 61.8 x 40.2 x 27.7 mm |
| | URF48xxQB-100WR3A5 | 135.00 x 70.00 x 22.60mm |
| | URF48xxQB-100WR3A6 | 137.00 x 70.00 x 28.10mm |
| | URF48xxQB-100WHR3A5 | 135.00 x 70.00 x 27.70mm |
| | URF48xxQB-100WHR3A6 | 137.00 x 70.00 x 37.2mm |
| Weight | URF48xxQB-100WR3 | 89g(Typ.) |
| | URF48xxQB-100WFR3 | 109g(Typ.) |
| | URF48xxQB-100WHR3 | 120g(Typ.) |
| | URF48xxQB-100WR3A5 | 166(Typ.) |
| | URF48xxQB-100WR3A6 | 239(Typ.) |
| | URF48xxQB-100WHR3A5 | 197(Typ.) |
| | URF48xxQB-100WHR3A6 | 270(Typ.) |
| Cooling Method | Free air convection or forced convection | |

Electromagnetic Compatibility (EMC)

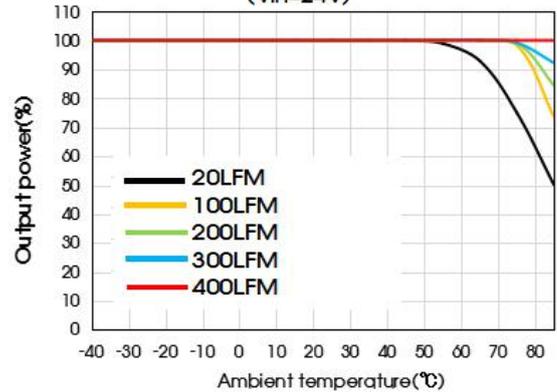
| | | | |
|-----------|-------|------------------------------|--|
| Emissions | CE | CISPR32/EN55032, EN50121-3-2 | CLASS A and CLASS B (see Fig. 2 for recommended circuit) |
| | RE | | |
| Immunity | ESD | IEC/EN61000-4-2, EN50121-3-2 | Contact ±6KV Air ±8KV perf.Criteria B |
| | RS | IEC/EN61000-4-3, EN50121-3-2 | 10V/m perf.Criteria A |
| | EFT | IEC/EN61000-4-4, EN50121-3-2 | ±2KV(see Fig. 2 for recommended circuit) perf.Criteria A |
| | Surge | EN50121-3-2 | differential mode ±1KV, 1.2/50us, source impedance 42Ω (see Fig.2 for recommended circuit) perf.Criteria B |
| | CS | IEC/EN61000-4-6, EN50121-3-2 | 10 Vr.m.s perf.Criteria A |

Typical Performance Curves

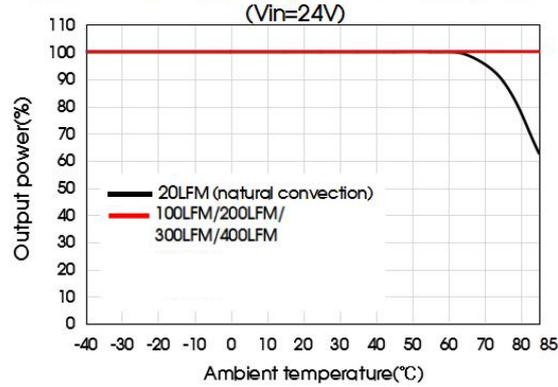
URF4824QB-100WR3 Temperature Derating Curves (Vin=24V)



URF4824QB-100WFR3 Temperature Derating Curves (Vin=24V)



URF4824QB-100WHR3 Temperature Derating Curves

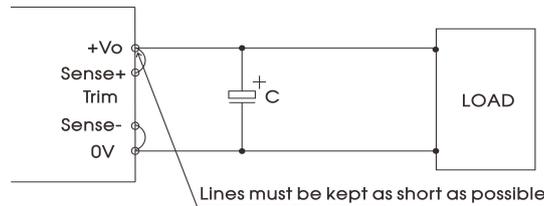


Notes:

1. Product application thermal design should be referred to the recommended PCB layout and recommended heat dissipation structure, please see DC-DC Converter Application Notes for specific information.

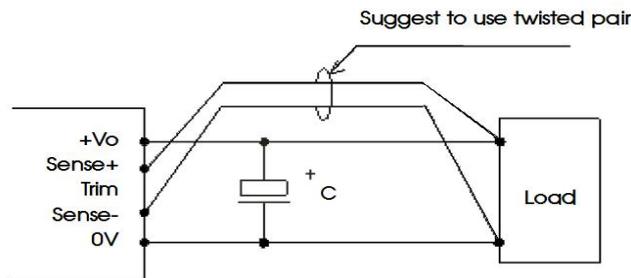
Remote Sense Application

1. Remote Sense Connection if not used



- (1) If the sense function is not used for remote regulation the user must connect the +Sense to +Vo and -Sense to 0V.
- (2) The connections between Sense lines and their respective power lines must be kept as short as possible, otherwise they may be picking up noise, interference and/or causing unstable operation of the power module.

2. Remote Sense Connection used for Compensation



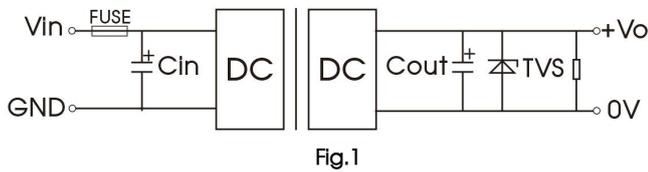
Notes:

- (1) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used.
- (2) PCB-tracks or cables/wires for Remote Sense must be kept as short as possible. Twisted pair or shielded wires are suggested for remote compensation and must be kept as short as possible.
- (3) We recommend using adequate cross section for PCB-track layout and/or cables to connect the power supply module to the load in order to keep the voltage drop below 0.3V and to make sure the power supply's output voltage remains within the specified range.
- (4) Note that large wire impedance may cause oscillation of the output voltage and/or increased ripple. Consult technical support or factory for further advice of sense operation.

Design Reference

1. Typical application

- (1) We recommended using the recommended circuit shown in Fig.1 during product testing and application, otherwise please ensure that at least a 220μF electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression and protection.
- (2) We recommended increasing the value of Cin and pay attention to the unstable input voltage if the product input side is paralleled with motor drive circuit and/or larger energy transient circuits, to ensure the stability of input terminal and avoid repeatedly start-up problems due to input voltage lower than under-voltage protection point.
- (3) We recommended increasing the output capacitance with limited to the capacitive load specification and/or increasing the voltage clamping circuit(such as TVS) if the output terminal is inductive device such as relay or a motor, to ensure adequate voltage surge suppression and protection.
- (4) 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 specified max. capacitive load value of the product.



| Vout(VDC) | Fuse | Cin ^① | Cout | TVS |
|-----------|-------------------|------------------|-------|----------|
| 3.3 | 10A, slow blow | 220μF | 680μF | SMDJ6.0A |
| 5 | | | 470μF | SMDJ6.0A |
| 12 | | | 220μF | SMDJ14A |
| 15 | | | | SMDJ17A |
| 24 | | | 100μF | SMDJ28A |
| 48 | | | | SMDJ54A |

Note:

①Please pay attention to the ambient temperature of the product when using an external capacitor, increase the electrolytic capacitor values to at least 1.5 times the original parameter if the ambient temperature is low(such as -25°C).

2. EMC solution-recommended circuit

We recommended using the recommended circuit shown in Fig.2 during product EMC testing and application.

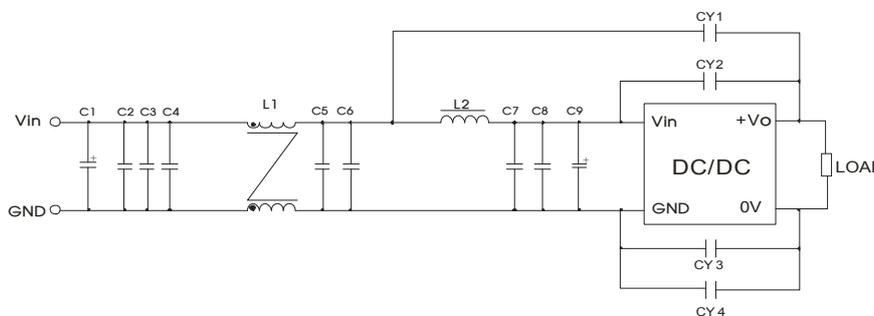
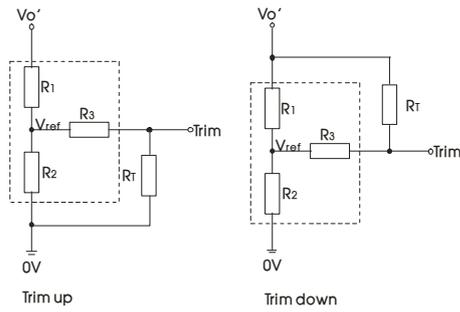


Fig. 2

| CLASS A Components | CLASS B Components | Recommended Component value of 3.3V | Recommended Component value of 05-48V | Function |
|----------------------------|----------------------------|---|---|---|
| C1 | C1 | 150μF electrolytic capacitor | 150μF electrolytic capacitor | Meet EFT and surge |
| C9 | C9 | 470μF electrolytic capacitor | 47μF electrolytic capacitor | |
| C1 | C1 | 150μF electrolytic capacitor | 150μF electrolytic capacitor | Meet conducted emission and radiated emission |
| C9 | C9 | 470μF electrolytic capacitor | 47μF electrolytic capacitor | |
| C2, C3, C4, C5, C6, C7, C8 | C2, C3, C4, C5, C6, C7, C8 | 4.7μF ceramic capacitor | 2.2μF ceramic capacitor | |
| L1 | L1 | 2mH, recommended to use MORNSUN P/N: FL2D-A2-202(C) | 2mH, recommended to use MORNSUN P/N: FL2D-A2-202(C) | |
| L2 | L2 | 1.5μH inductance | 1.5μH inductance | |
| CY1, CY2 | CY1, CY2 | 1nF Y1 safety capacitor | 1nF Y1 safety capacitor | |
| CY3 | CY3, CY4 | 2.2nF Y1 safety capacitor | 1nF Y1 safety capacitor | |

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



TRIM resistor connection (dashed line shows internal resistor network)

Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{\alpha R_2}{R_2 - \alpha} - R_3 \quad \alpha = \frac{V_{ref}}{V_o' - V_{ref}} \cdot R_1$$

$$\text{down: } R_T = \frac{\alpha R_1}{R_1 - \alpha} - R_3 \quad \alpha = \frac{V_o' - V_{ref}}{V_{ref}} \cdot R_2$$

Note:

Value for R1, R2, R3, and Vref refer to the above table 1

R_T = Trim Resistor value

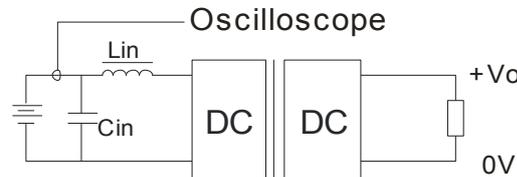
α = User-defined parameter, no actual meanings

V_o' = desired output voltage (±10% max.)

| Vout(VDC) | R1(KΩ) | R2(KΩ) | R3(KΩ) | Vref(V) |
|-----------|--------|--------|--------|---------|
| 3.3 | 5 | 3 | 10 | 1.24 |
| 5 | 3.036 | 3 | 10 | 2.5 |
| 12 | 11.00 | 2.87 | 15 | 2.5 |
| 15 | 14.03 | 2.8 | 15 | 2.5 |
| 24 | 24.872 | 2.87 | 15 | 2.5 |
| 48 | 53.017 | 2.913 | 15 | 2.5 |

Note: When using the Trim down function, if R_T resistor value is too low, or the Trim pin is shorted with +V_o, then the output voltage V_o' would be lower than 0.9V_o, which may cause permanent damage to the product.

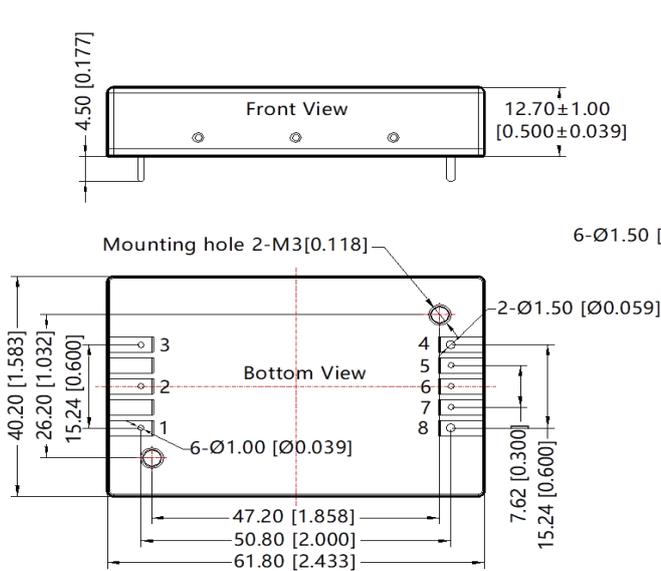
4. Reflected ripple current--test circuit



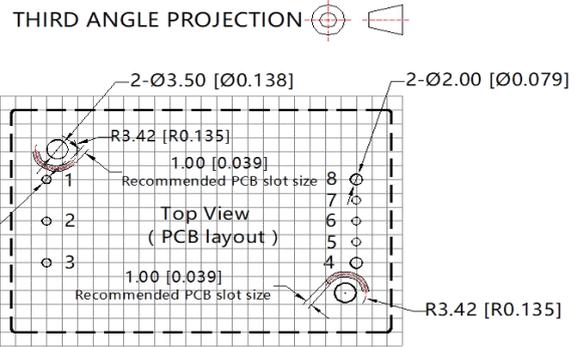
Note: Lin(4.7μH), Cin(220μF, ESR < 1.0Ω at 100 KHz)

- The products do not support parallel connection of their output.
- The product test process shall ensure that the current of the input terminal meets the requirements of the starting current to ensure that the power supply of the product does not suffer from under-power.
- For additional information please refer to application notes on www.mornsun-power.com

Dimensions and Recommended Layout (URF48xxQB-100WR3)



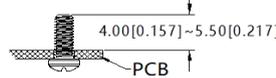
Note:
Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
Pin4, 8's diameter: 1.50[0.059]
Pin diameter tolerances: $\pm 0.10[\pm 0.004]$
General tolerances: $\pm 0.50[\pm 0.020]$
Mounting hole screwing torque: Max 0.4 N · m



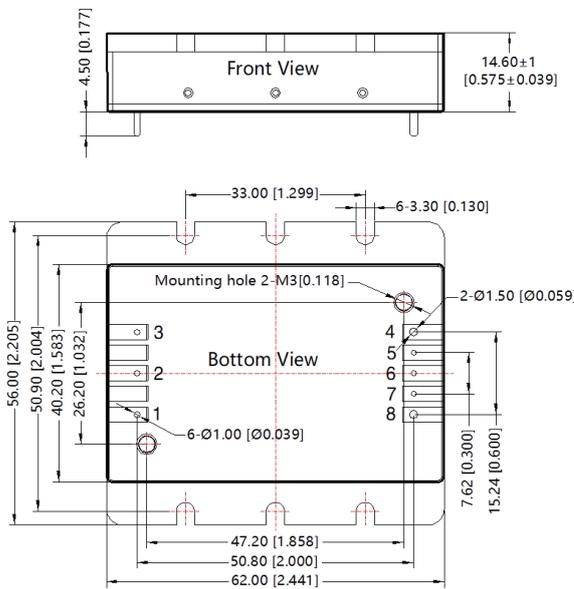
Note: Grid 2.54*2.54mm

| Pin | Mark | Pin | Mark |
|-----|------|-----|--------|
| 1 | +Vin | 5 | Sense- |
| 2 | Ctrl | 6 | Trim |
| 3 | -Vin | 7 | Sense+ |
| 4 | 0V | 8 | +Vo |

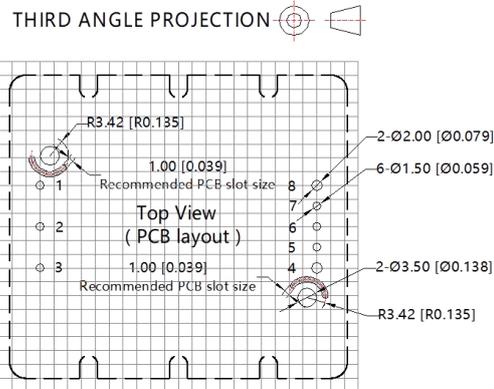
Recommended screw length



Dimensions and Recommended Layout(URF48xxQB-100WFR3)



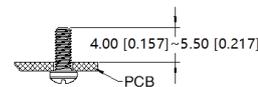
Note:
Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
Pin4, 8's diameter: 1.50[0.059]
Pin diameter tolerances: $\pm 0.10[\pm 0.004]$
General tolerances: $\pm 0.50[\pm 0.020]$
Mounting hole screwing torque: Max 0.4 N · m



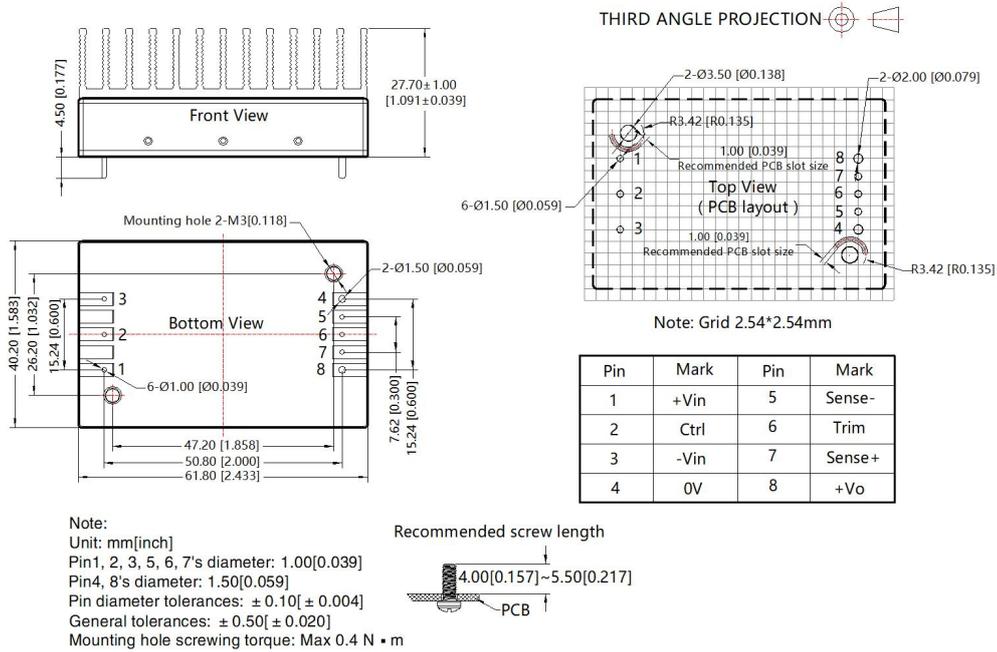
Note: Grid 2.54*2.54mm

| Pin | Mark | Pin | Mark |
|-----|------|-----|--------|
| 1 | +Vin | 5 | Sense- |
| 2 | Ctrl | 6 | Trim |
| 3 | -Vin | 7 | Sense+ |
| 4 | 0V | 8 | +Vo |

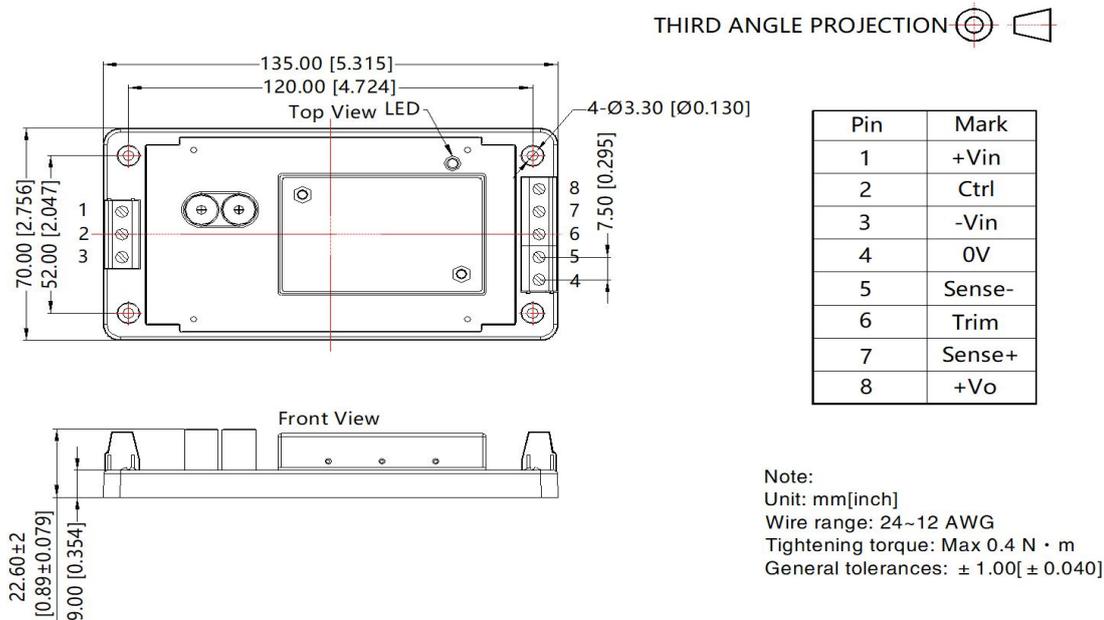
Recommended screw length



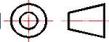
Dimensions and Recommended Layout(URF48xxQB-100WHR3)

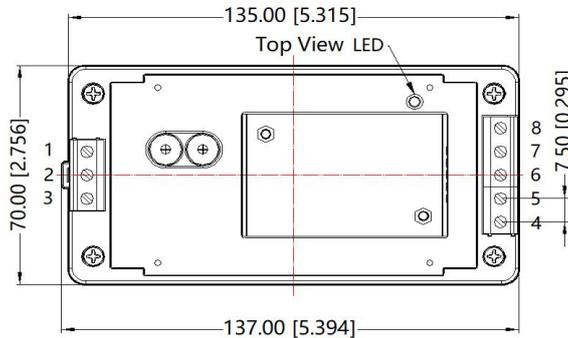


Dimensions and Recommended Layout(URF4812QB-100WR3A5)

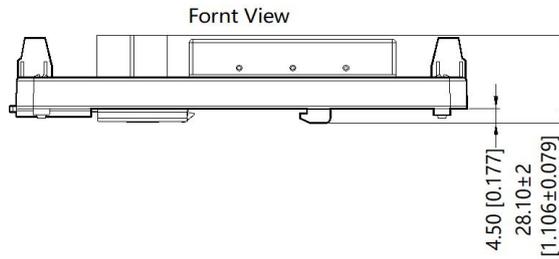


Dimensions and Recommended Layout(URF48xxQB-100WR3A6)

THIRD ANGLE PROJECTION 



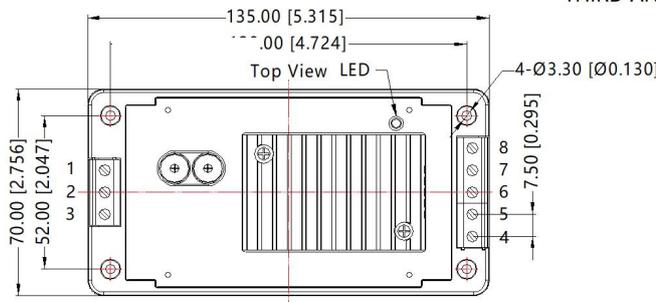
| Pin | Mark |
|-----|--------|
| 1 | +Vin |
| 2 | Ctrl |
| 3 | -Vin |
| 4 | 0V |
| 5 | Sense- |
| 6 | Trim |
| 7 | Sense+ |
| 8 | +Vo |



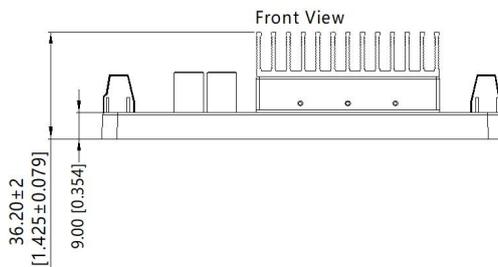
Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N · m
Installed on DIN RAIL TS35
General tolerances: ± 1.00 [± 0.040]

Dimensions and Recommended Layout(URF4812QB-100WHR3A5)

THIRD ANGLE PROJECTION 



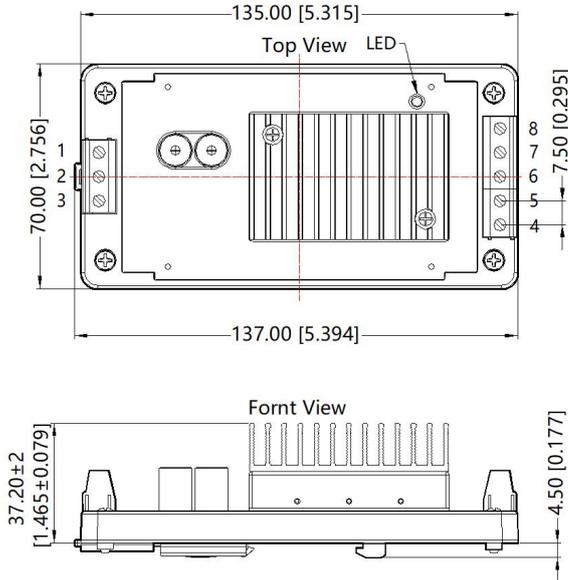
| Pin | Mark |
|-----|--------|
| 1 | +Vin |
| 2 | Ctrl |
| 3 | -Vin |
| 4 | 0V |
| 5 | Sense- |
| 6 | Trim |
| 7 | Sense+ |
| 8 | +Vo |



Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N · m
General tolerances: ± 1.00 [± 0.040]

Dimensions and Recommended Layout(URF48xxQB-100WHR3A6)

THIRD ANGLE PROJECTION 



| Pin | Mark |
|-----|--------|
| 1 | +Vin |
| 2 | Ctrl |
| 3 | -Vin |
| 4 | 0V |
| 5 | Sense- |
| 6 | Trim |
| 7 | Sense+ |
| 8 | +Vo |

Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N · m
Installed on DIN RAIL TS35
General tolerances: ± 1.00[± 0.040]

- Note:
- For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58010113(URF48xxQB-200WR3), 58200069(URF48xxQB-200WFR3), 58220017(URF48xxQB-200WHR3), 58220031(URF48xxQB-200W(H)R3(A5/A6));
 - The maximum capacitive load offered were tested at input voltage range and full load;
 - Unless otherwise specified, data in this datasheet should be tested under the conditions of $T_a=25^{\circ}\text{C}$, humidity<75%RH with nominal input voltage and rated load;
 - All index testing methods in this datasheet are based on our company corporate standards;
 - We can provide product customization service and match filter module;
 - Products are related to laws and regulations: see "Features" and "EMC";
 - Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.

Address: No. 5, Kehui St. 1, Kehui Development Center, Science Ave., Guangzhou Science City, Huangpu District, Guangzhou, P. R. China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com