200W isolated DC-DC converter
Ultra-wide input and regulated single output

Patent Protection RoHS

EN62368-1 BS EN62368-1

FEATURES

- Ultra-wide 4:1 input voltage range
- High efficiency up to 91%
- I/O isolation test voltage 2.25k VDC
- Operating ambient temperature range -40℃ to +85℃
- Input under-voltage protection, output short-circuit, over-current, over–voltage, over-temperature protection
- Five-sided metal shielded package
- Industry standard ¼-Brick package and pin-out

URF48_QB-200W(F/H)R3(A5/A6) series are isolated 200W DC-DC products with 4:1 input voltage. They feature efficiency up to 91%, 2250VDC input to output isolation, operating ambient temperature of -40℃ to +85℃, input under-voltage, output short circuit, over-current, over–voltage, over-temperature protection. The products meet CLASS A of CISPR32/EN55032 EMI standards by adding the recommended external components and they are widely used in applications such as battery powered systems, industrial controls, electricity, instrumentation, railway, communication and intelligent robotic.

Selection Guide

Certification	Part No.①	Input Voltage (VDC)		Output		Full Load Efficiency(%) Min./Typ.	Max. Capacitive Load(μF)
		Nominal (Range)	Max.③	Voltage (VDC)	Current (A) (Max.)		
EN/BS EN	URF4805QB-200W(F/H)R3	48 (18-75)	80	5	40	86/88	6000
	URF4812QB-200W(F/H)R3			12	16.7	89/91	2000
	URF4815QB-200W(F/H)R3			15	13.3	87/89	2000
	URF4824QB-200W(F/H)R3			24	8.4	89/91	1000
--	URF4836QB-200W(F/H)R3			36	5.56	86/88	1000
	URF4842QB-200W(F/H)R3			42.5	5	88/90	2000
EN/BS EN	URF4848QB-200W(F/H)R3			48	4.2	89/91	450
	URF4805QB-200W(H)R3A5/A6			5	40	84/86	6000
	URF4812QB-200W(H)R3A5/A6			12	16.7	87/89	2000
	URF4815QB-200W(H)R3A5/A6			15	13.3	85/87	2000
	URF4824QB-200W(H)R3A5/A6			24	8.4	87/89	1000
--	URF4836QB-200W(H)R3A5/A6			36	5.56	84/86	1000
	URF4842QB-200W(H)R3A5/A6			42.5	5	86/88	2000
EN/BS EN	URF4848QB-200W(H)R3A5/A6			48	4.2	87/89	450

Note:
①Use "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;
②Exceeding the maximum input voltage may cause permanent damage;
③The minimum input voltage range and start -up voltage of the A5 /A6 product model are 1VDC higher than the horizontal package model;
④A5/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	--	4735/100	4845/200	mA
Reflected Ripple Current		--	100	--	
Surge Voltage (1sec. max.)		-0.7	--	90	VDC
Start-up Voltage		--	--	18	
Input Under-voltage Protection		14	16	--	
Input Filter		Pi filter			
Hot Plug		Unavailable			
Ctrl①	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

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Output Voltage Accuracy	0%-100% load		--	±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		--	300	500	μs
Transient Response Deviation	25% load step change	5V output	--	±3	±7.5	%
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise①	20MHz bandwidth	36V, 42.5V output	--	150	300	mVp-p
		Others	--	150	250	
Trim	36V output		100	--	110	%Vo
	Others		90	--	110	
Sense			--	--	105	
Over-temperature Protection	Max. Case Temperature	36V, 42.5V output	95	105	115	℃
		Others	--	115	120	
Output Over-voltage Protection	Input voltage range		110	130	160	%Vo
Output Over-current Protection			110	130	150	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery			

Note: ①The "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 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		100	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2200	--	pF
Operating Temperature			-40	--	+85	℃
Storage Temperature			-55	--	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Pin Soldering Resistance Temperature	Wave-soldering, 10 seconds		--	--	260	℃
	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	
Thermal resistance	Free air convection	URF48xxQB-200WR3	--	--	7.5	℃/W

	(20LFM)	URF48xxQB-200WFR3	--	--	6.3	
		URF48xxQB-200WHR3	--	--	5.2	
Shock And Vibration			IEC/EN61373 - Category 1, Grade B			
Switching Frequency	PWM mode		--	250	--	KHz
MTBF	MIL-HDBK-217F@25℃		500	--	--	K hours

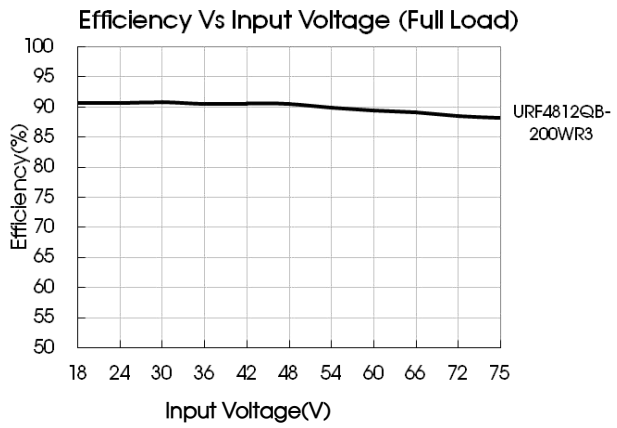
Mechanical Specifications

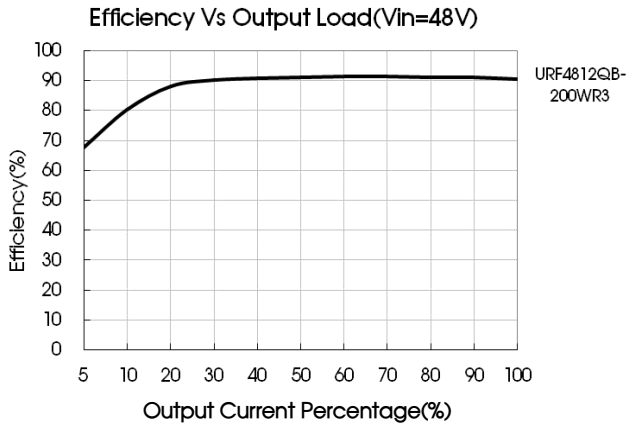
Case Material	Aluminum alloy case, black plastic bottom, flame-retardant and heat-resistant (UL94 V-0)	
Dimension	URF48xxQB-200WR3	61.8 x 40.2 x 12.7 mm
	URF48xxQB-200WFR3	62.0 x 56.0 x 14.6 mm
	URF48xxQB-200WHR3	61.8 x 40.2 x 27.7 mm
	URF48xxQB-200WR3A5	135.00 x 70.00 x 22.6mm
	URF48xxQB-200WR3A6	137.00 x 70.00 x 28.10mm
	URF48xxQB-200WHR3A5	135.00 x 70.00 x 36.20mm
	URF48xxQB-200WHR3A6	137.00 x 70.00 x 37.20mm
Weight	URF48xxQB-200WR3	89.0g(Typ.)
	URF48xxQB-200WFR3	109.0g(Typ.)
	URF48xxQB-200WHR3	120.0g(Typ.)
	URF48xxQB-200WR3A5	165.0g(Typ.)
	URF48xxQB-200WR3A6	235.0g (Typ.)
	URF48xxQB-200WHR3A5	196.0g(Typ.)
	URF48xxQB-200WHR3A6	266.0g (Typ.)
Cooling Method	Free air convection (20LFM)	

Electromagnetic Compatibility (EMC)

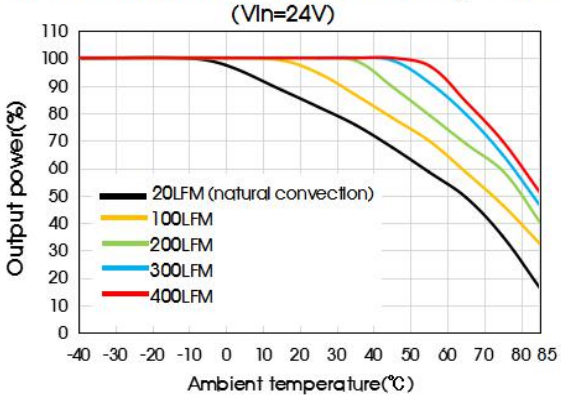
Emissions	CE	CISPR32/EN55032	CLASS A (see Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032	CLASS A (see Fig. 2 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2, EN50121-3-2	Contact ±6KV Air ±8KV	perf.Criteria B
	RS	IEC/EN61000-4-3, EN50121-3-2	10V/m	perf.Criteria A
	EFT	IEC/EN61000-4-4, EN50121-3-2	±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 Characteristic Curves

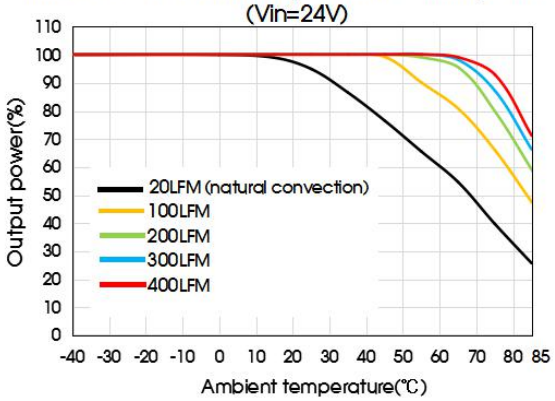




URF4824QB-200WFR3 Temperature Derating Curves
(Vin=24V)



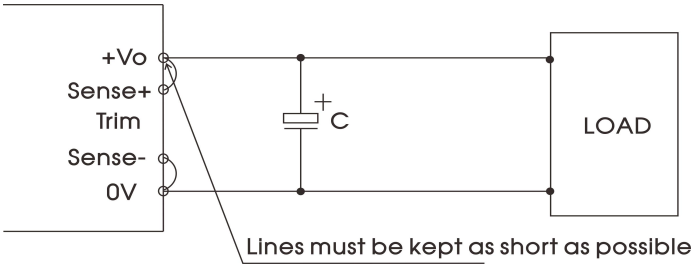
URF4824QB-200WHR3 Temperature Derating Curves
(Vin=24V)



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

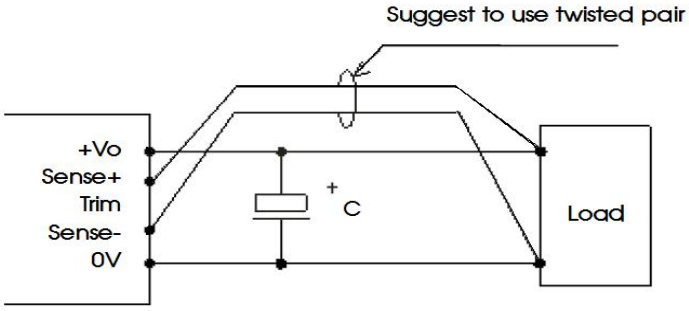
Remote Sense Application

1. Remote Sense Connection if not used



Notes:
(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 capactive 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.

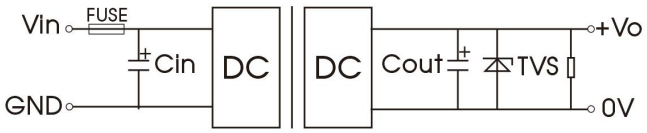


Fig.1

Vout(VDC)	Fuse	Cin①	Cout	TVS
5	20A, slow blow	220μF	470μF	SMDJ6.0A
12			220μF	SMDJ14A
15				SMDJ17A
24			100μF	SMDJ28A
36				SMDJ47A
42.5				SMDJ54A
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℃）.

2. EMC compliance circuit

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

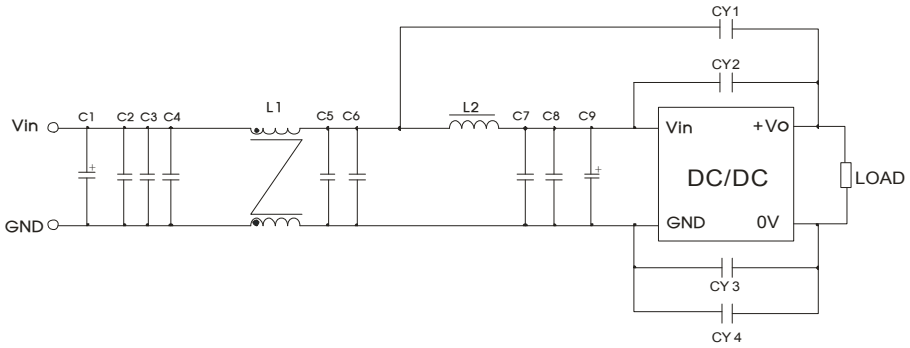
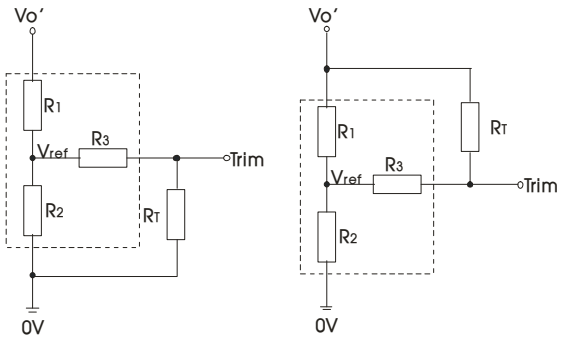


Fig. 2

Components	Recommended Component Value
C1	150μF/100V electrolytic capacitor
C9	47μF/100V electrolytic capacitor
C2, C3, C4, C5, C6, C7, C8	2.2μF/100V ceramic capacitor
L1	2.0mH, recommended to use MORNSUN P/N: FL2D-A2-202(C)
L2	1.5μH/15A inductance
CY1, CY2, CY3, CY4	1nF Y1 safety capacitor

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



Trim up　　Trim down

TRIM resistor connection (dashed line shows internal resistor network)

Calculation formula of Trim resistance:

$$up:\ R_T=\frac{aR_2}{R_2-a}-R_3 \qquad a=\frac{Vref}{Vo'-Vref}\cdot R_1$$

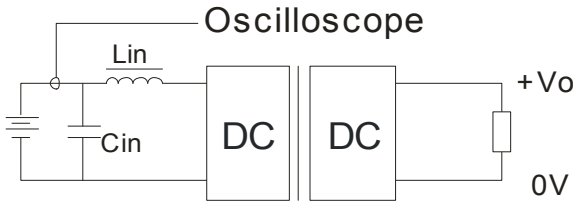
$$down:\ R_T=\frac{aR_1}{R_1-a}-R_3 \qquad a=\frac{Vo'-Vref}{Vref}\cdot R_2$$

R_T = Trim Resistor value;
a = User-defined parameter,no actual meanings
Vo'= desired output voltage (±10% max.)

Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
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
36	38.73	2.85	15	2.5
42.5	46.789	2.913	15	2.5
48	53.017	2.913	15	2.5

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

4. Reflected ripple current--test circuit



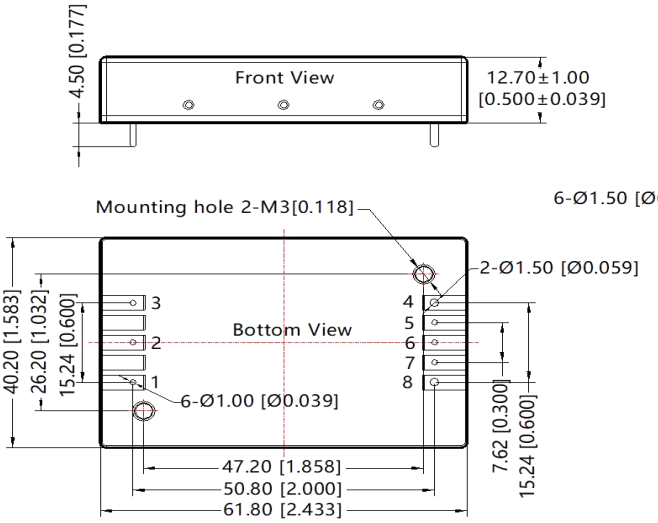
Note:Lin(4.7μH) , Cin(220μF, ESR < 1.0Ω at 100 KHz)

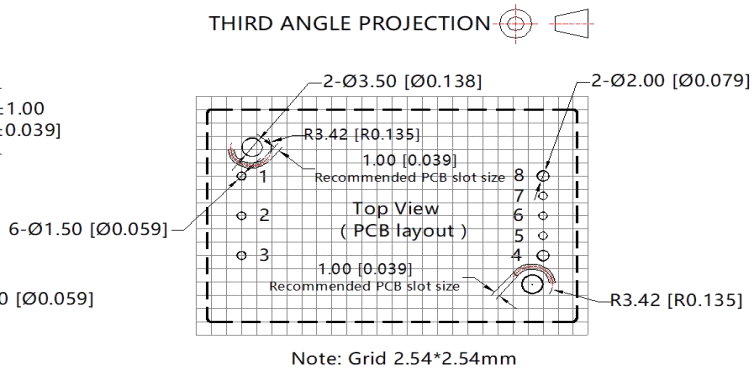
5. The products do not support parallel connection of their output.

6. 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.

7. For additional information please refer to application notes on www.mornsun-power.com

URF48xxQB-200WR3 Dimensions and Recommended Layout

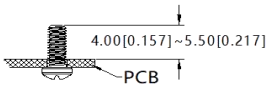




Note: Grid 2.54*2.54mm

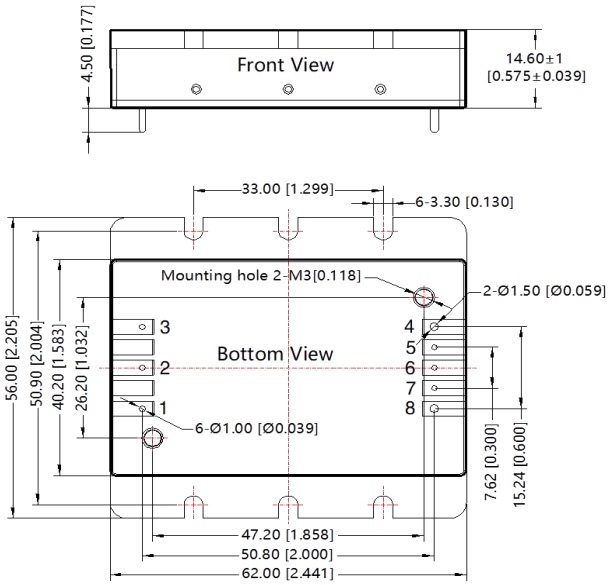
Pin	Mark	Pin	Mark
1	+Vin	5	Sense-
2	Ctrl	6	Trim
3	-Vin	7	Sense+
4	0V	8	+Vo

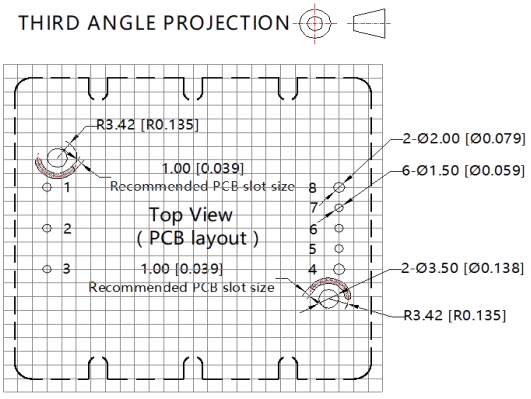
Recommended screw length



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: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole screwing torque: Max 0.4 N・m

URF48xxQB-200WFR3 Dimensions and Recommended Layout

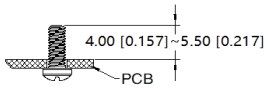




Note: Grid 2.54*2.54mm

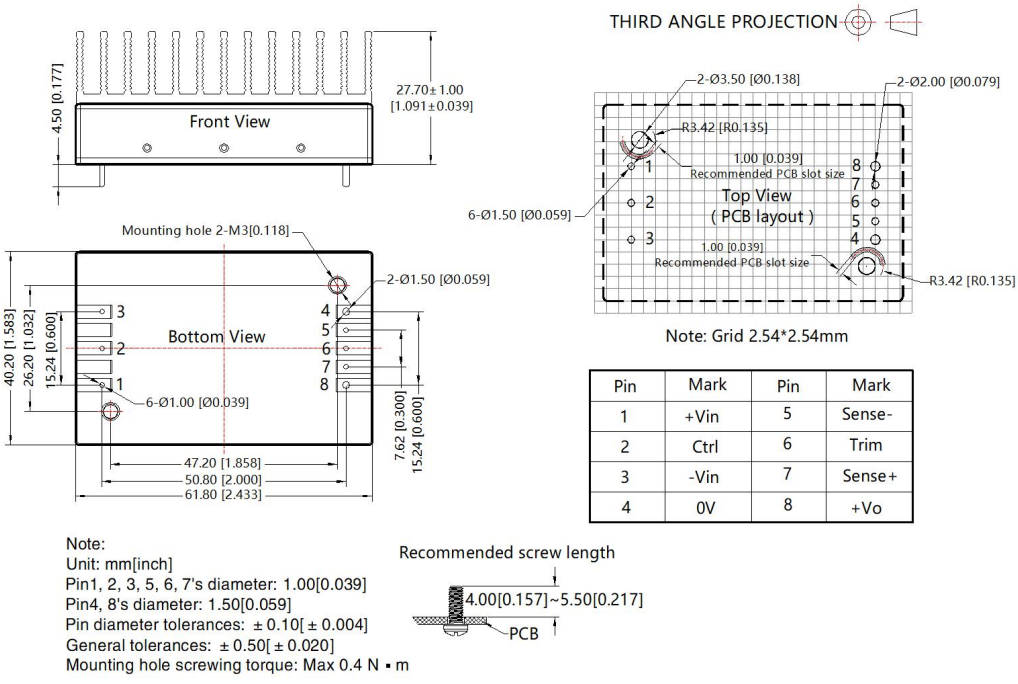
Pin	Mark	Pin	Mark
1	+Vin	5	Sense-
2	Ctrl	6	Trim
3	-Vin	7	Sense+
4	0V	8	+Vo

Recommended screw length



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: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole screwing torque: Max 0.4 N・m

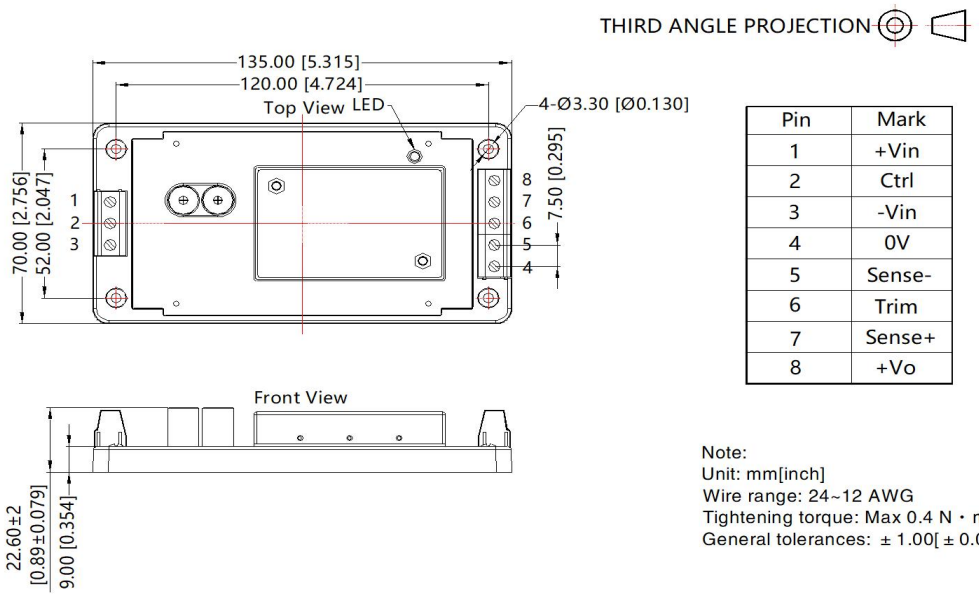
URF48xxQB-200WHR3 Dimensions and Recommended Layout



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

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: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
Mounting hole screwing torque: Max 0.4 N ▪ m

URF48xxQB-200WR3A5 Dimensions and Recommended Layout

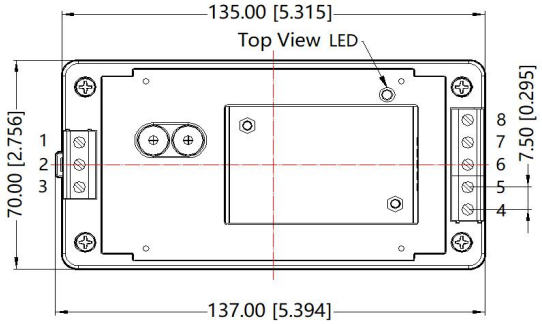


Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

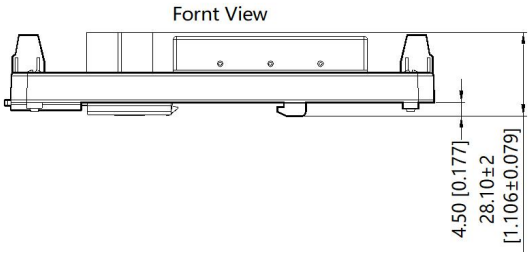
Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N・m
General tolerances: ± 1.00[± 0.040]

URF48xxQB-200WR3A6 Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



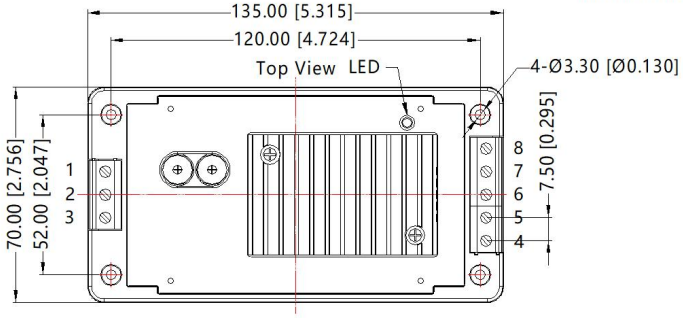
Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo



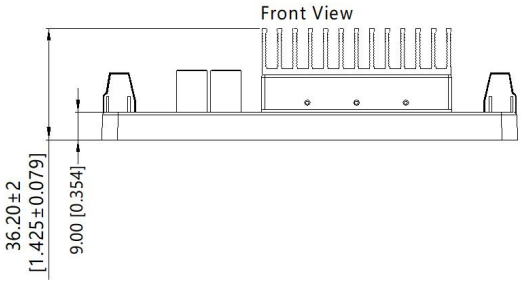
Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N・m
Installed on DIN RAIL TS35
General tolerances: ± 1.00[± 0.040]

URF48xxQB-200WHR3A5 Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



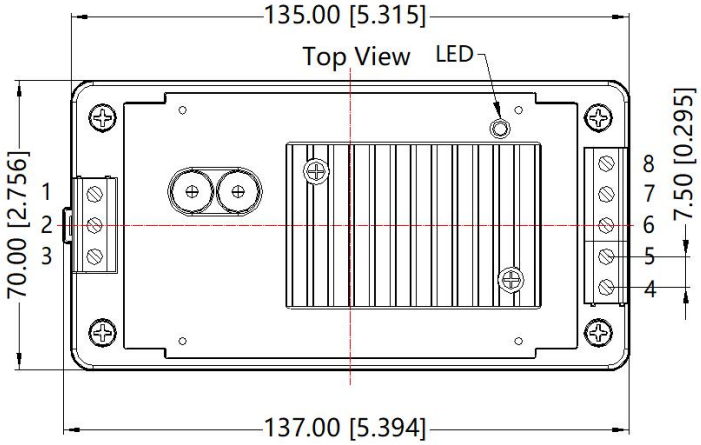
Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo



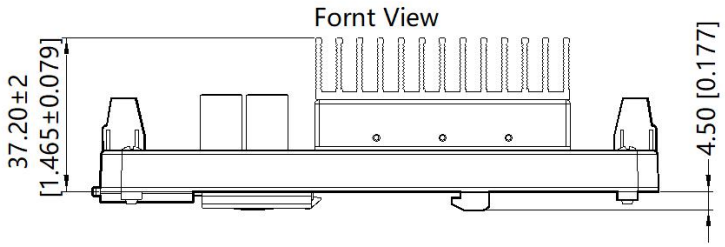
Note:
Unit: mm[inch]
Wire range: 24~12 AWG
Tightening torque: Max 0.4 N・m
General tolerances: ± 1.00[± 0.040]

URF48xxQB-200WHR3A6 Dimensions and Recommended Layout

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:
1. 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));
2. The maximum capacitive load offered were tested at input voltage range and full load;
3. Unless otherwise specified, data in this datasheet should be tested under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated load;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service and match filter module;
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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