200W, wide input voltage, isolated & regulated single output DC-DC converter

FEATURES

- Ultra wide input voltage range (4:1)
- High efficiency up to 91%
- Isolation voltage: 2.25K VDC
- Input under-voltage protection, Output short circuit, over-current, over–voltage, over-temperature protection
- Operating temperature range: -40℃ to +85℃
- Five-sided metal shielding package
- International standard pin-out: 1/4 brick

Patent Protection RoHS

URF48_QB-200W(F/H)R3 series are isolated 200W DC-DC products with 4:1 input voltage. They feature efficiency up to 91%, 2250VDC isolation, operating temperature of -40℃ to +85℃, Input under-voltage protection, output short circuit protection, over-current protection, over–voltage protection, over-temperature protection and EMI meets CISPR22/EN55022 CLASS A, which make them widely applied in battery power supplies, industrial control, electricity, instruments, railway, communication fields.

Selection Guide

Part No.	Input Voltage (VDC)		Output		Efficiency (%,Min./Typ.) @ Full Load	Max. Capacitive Load(μF)
	Nominal (Range)	Max.①	Output Voltage(VDC)	Output Current (A)(Max.)		
URF4812QB-200W(F/H)R3	48 (18-75)	80	12	16.7	89/91	2000
URF4824QB-200W(F/H)R3			24	8.4	89/91	1000
URF4848QB-200W(F/H)R3			48	4.2	89/91	450

Note:
①Exceeding the maximum input voltage may cause permanent damage.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	Nominal input voltage	--	4579/100	4682/200	mA
Reflected Ripple Current	Nominal input voltage	--	100	--	
Surge Voltage (1sec. max.)		-0.7	--	90	VDC
Start-up Threshold Voltage		--	--	18	
Input Under-voltage Protection		14	16	--	
Input Filter		Pi filter			
Ctrl*	Module switch on	Ctrl open circuit or connected to TTL high level (3.5-12VDC)			
	Module switch off	Ctrl pin connected to GND or low level (0-1.2VDC)			
	Input current when switched off	--	2	10	mA
Hot Plug		Unavailable			

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

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy		--	±1	±3	%
Line Regulation	Full load, the input voltage is from low to high	--	±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	--	±3	±5	%
Temperature Coefficient	Full load	--	--	±0.03	%/℃
Ripple & Noise*	20MHz bandwidth	--	150	250	mVp-p
Output Over-voltage Protection	Input voltage range	110	130	160	%Vo
Output Over-current Protection	Input voltage range	110	130	150	%Io
Short-circuit Protection		Hiccup, Continuous, self-recovery			

Note: *Ripple and noise are measured by "parallel cable" method, please see DC-DC Converter Application Notes for specific operation.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Insulation Voltage	Input-output	With the test time of 1 minute and the leak current less than 5mA	2250	--	--	VDC
	Input-case		1500	--	--	
	Output-case		500	--	--	
Insulation Resistance	Input-output, insulation voltage 500VDC		100	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V		--	2200	--	pF
Trim			90	--	110	%Vo
Sense			--	--	105	
Operating Temperature			-40	--	85	℃
Storage Temperature			-55	--	125	
Over-temperature Protection			95	105	115	
Pin Welding Resistance Temperature	Wave-soldering, 10 seconds		--	--	260	
	Welding spot is 1.5mm away from the casing, 10 seconds		--	--	300	
Storage Humidity	Non-condensing		5	--	95	%RH
Vibration			IEC/EN61373 car body 1 B mold			
Switching Frequency	PWM mode		--	250	--	KHz
MTBF	MIL-HDBK-217F@25℃		500	--	--	K hours

Physical Specifications
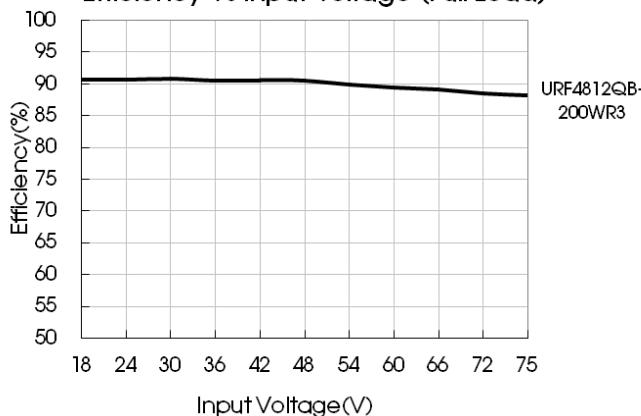
Casing Material	Aluminum alloy case, Black flame-retardant and heat-resistant plastic bottom case (UL94 V-0)	
Dimension	URF48xxQB-200WR3	61.8*40.2*12.7 mm
	URF48xxQB-200WFR3	62.0*56.0*14.6 mm
	URF48xxQB-200WHR3	61.8*40.2*27.7 mm
Weight	URF48xxQB-200WR3	83g(Typ.)
	URF48xxQB-200WFR3	103g(Typ.)
	URF48xxQB-200WHR3	114g(Typ.)
Cooling method	Natural convection (20FLM) or Forced convection	

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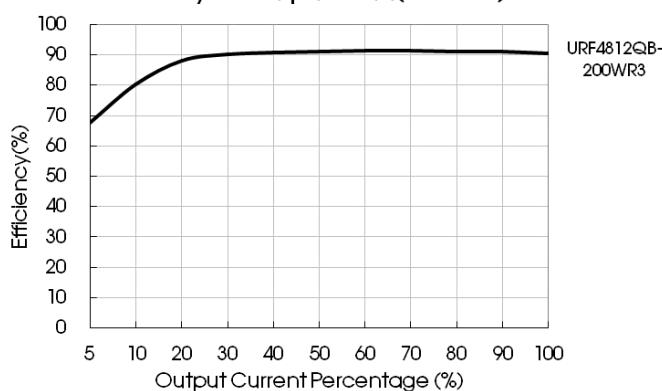
| EMI	CE	CISPR32/EN55032, EN50121-3-2	CLASS A (see Fig. 2 for recommended circuit)	
	RE	CISPR32/EN55032, EN50121-3-2	CLASS A (see Fig. 2 for recommended circuit)	
EMS	ESD	IEC/EN61000-4-2, EN50121-3-2	Contact ±6KV Air ±8KV	perf.Criteria B
	RS	IEC/EN61000-4-3, EN50121-3-2	10V/m	perf.Criteria A
	EFT	IEC/EN61000-4-4,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

Product Characteristic Curve
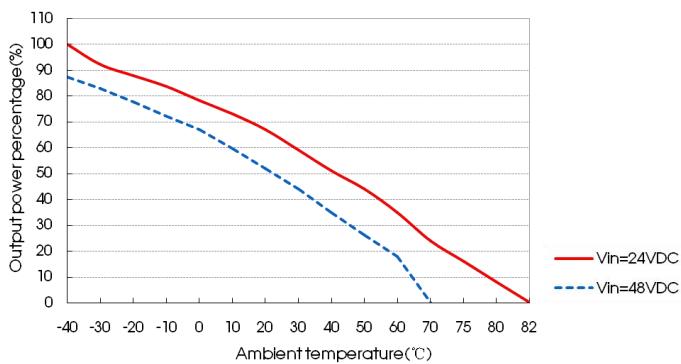
Efficiency Vs Input Voltage (Full Load)
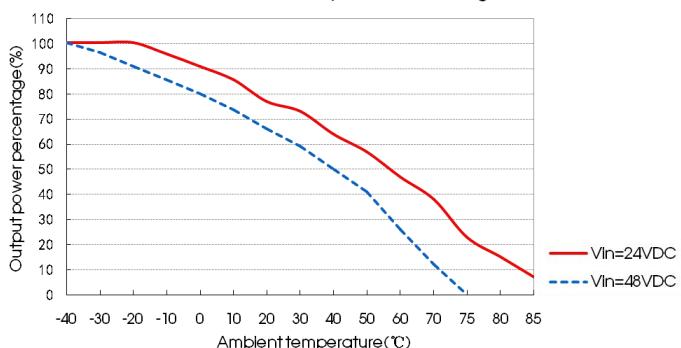
URF4812QB-200WR3

Efficiency Vs Output Load(Vin=48V)
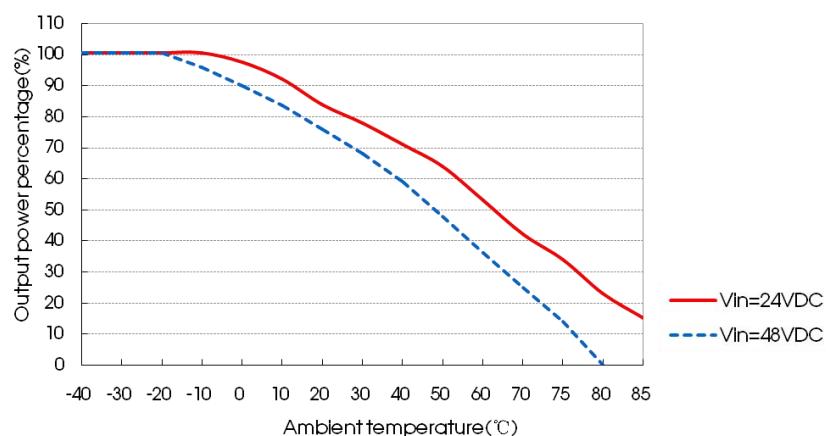
URF4812QB-200WR3

URF4812/24/48QB-200WR3 Temperature Derating Curves

Vin=24VDC
Vin=48VDC

URF4812/24/48QB-200WFR3 Temperature Derating Curves

Vin=24VDC
Vin=48VDC
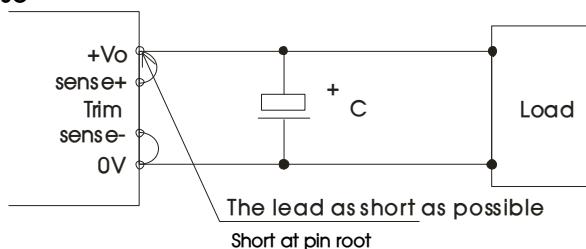
URF4812/24/48QB-200WHR3 Temperature Derating Curves

Vin=24VDC
Vin=48VDC

Sense of application and precautions

1. When not using remote sense
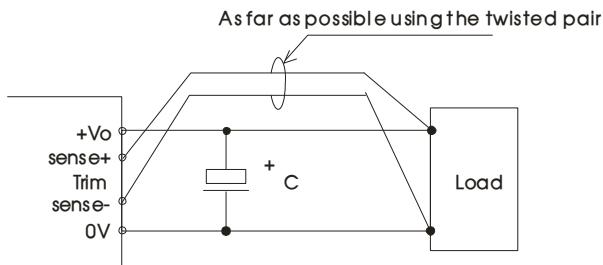
The lead as short as possible
Short at pin root

Notes：

1) When not using remote sense, make sure + Vo and Sense + are shorted, and that 0V and Sense- are shorted as well;
2) Keep the tracks between + Vo and Sense +, 0V and Sense- as short as possible. and close to the terminal. Avoid a looping track. If noise interferes the loop, the operation of the power module will become unstable.

2. When Remote Sense is used

As far as possible using the twisted pair

Notes:

1. Using remote sense with long wires may cause output voltage to become unstable. Consult us if long sensing wiring is necessary.
2. Sense tracks or wires should be as short as possible. If using wires, it should not use twisted-pair or shielded wires.
3. Please use wide PCB tracks or a thick wires between the power supply module and the load, the line voltage drop should be kept less than 0.3V. Make sure the power supply module's output voltage remains within the specified range.
4. The impedance of wires may cause the output voltage oscillation or a greater ripple, please take adequate assessments before using.
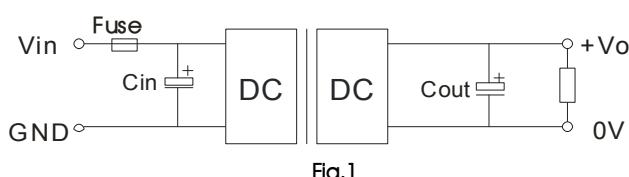
Design Reference

1. Typical application

If not using Momsun's recommended cicuit, please ensure an 220μF electrolytic capacitors in parallel with the input, which used to suppress the surge voltage come from the iuput terminal.
All the DC/DC converters of this series are tested according to the recommended circuit (see Fig. 1) before delivery.
If it is required to further reduce input&output ripple, properly increase the input & output of additional capacitors Cin and Cout or select capacitors of low equivalent impedance,provided that the capacitance is no larger than the max. capacitive load of the product.

Fig.1

| Vout(VDC)	Fuse	Cin	Cout
12	20A, slow blow	220μF	220μF
24			100μF
48			100μF

2. EMC solution-module recommended circuit
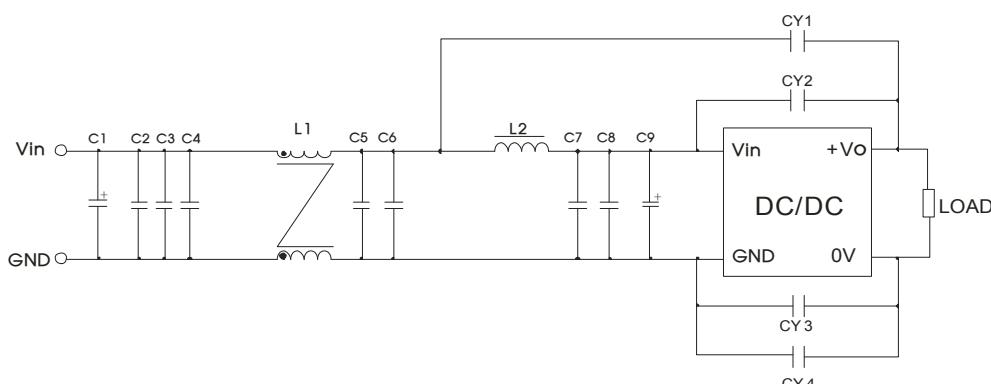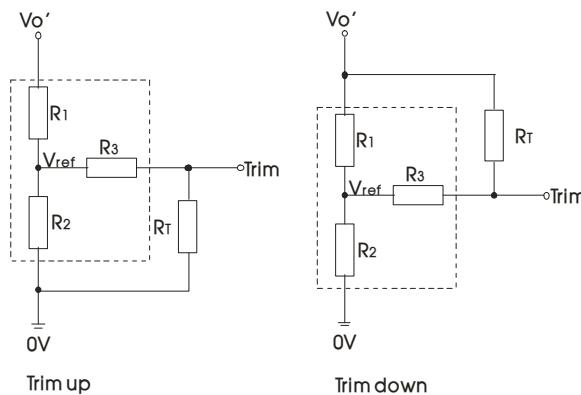
Fig. 2

device number	Device parameter	Device function
C1	150μF electrolytic caoacitor	Meet puise group and surge
C9	47μF electrolytic caoacitor	
C1	150μF electrolytic caoacitor	Meet conducted emission and radiated emission
C9	47μF electrolytic caoacitor	
C2、C3、C4、C5、C6、C7、C8	2.2μF ceramic caoacitor	
L1	1.0mH common mode inductor	
L2	1.5μH inductance	
CY1、CY2、CY3、CY4	1nF Y1safety caoacitor	

3. Application of Trim and calculation of Trim resistance

Calculation formula of Trim resistance:

$$\text{up: } R_T = \frac{aR_2}{R_2-a} - R_3 \qquad a = \frac{Vref}{Vo'-Vref} \cdot R_1$$
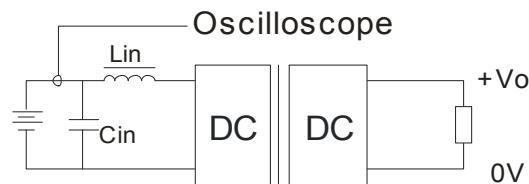
$$\text{down: } R_T = \frac{aR_1}{R_1-a} - R_3 \qquad a = \frac{Vo'-Vref}{Vref} \cdot R_2$$

R_T is Trim resistance ,a is a self-defined parameter, with no real meaning. Vo' for the actual needs of the up or down regulated voltage

Trim up   Trim down

Applied circuits of Trim (Part in broken line is the interior of models)

Vout(VDC)	R1(KΩ)	R2(KΩ)	R3(KΩ)	Vref(V)
12	11.00	2.87	15	2.5
24	24.872	2.87	15	2.5
48	53.017	2.913	15	2.5

## 4. Reflected ripple current--test circuit
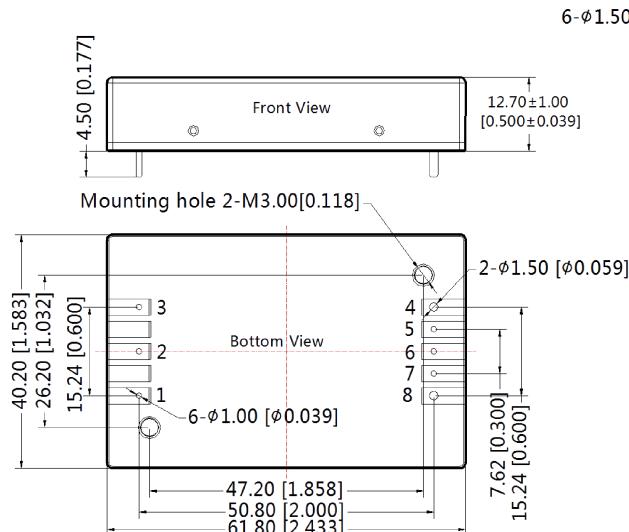
Note:Lin(4.7μH)，Cin(220μF, ESR < 1.0Ω at 100 KHz)

5. It is not allowed to connect modules output in parallel to enlarge the power

6. For more information please find the application notes on www.mornsun-power.com

## URF48xxQB-200WR3 Dimensions and Recommended Layout
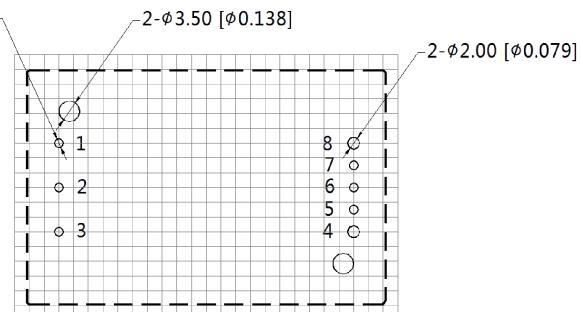
THIRD ANGLE PROJECTION

Front View

4.50 [0.177]

12.70±1.00 [0.500±0.039]

Mounting hole 2-M3.00[0.118]

2-φ1.50 [φ0.059]

Bottom View

40.20 [1.583]
26.20 [1.032]
15.24 [0.600]

6-φ1.00 [φ0.039]

47.20 [1.858]
50.80 [2.000]
61.80 [2.433]

7.62 [0.300]
15.24 [0.600]

6-φ1.50 [φ0.059]
2-φ3.50 [φ0.138]
2-φ2.00 [φ0.079]

Note:Grid 2.54*2.54mm

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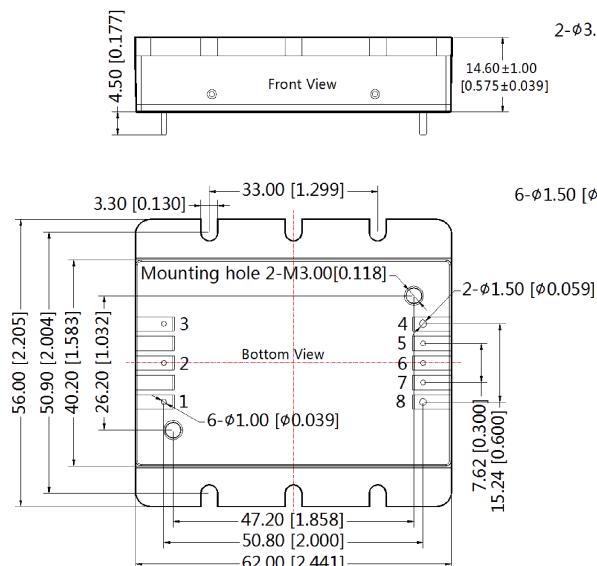
Pin-Out			
Pin	Function	Pin	Function
1	+Vin	5	Sense-
2	Ctrl	6	Trim
3	-Vin	7	Sense+
4	0V	8	+Vo

URF48xxQB-200WFR3 Dimensions and Recommended Layout

THIRD ANGLE PROJECTION

Front View

4.50 [0.177]

14.60±1.00 [0.575±0.039]

33.00 [1.299]

3.30 [0.130]

Mounting hole 2-M3.00[0.118]

2-φ1.50 [φ0.059]

Bottom View

56.00 [2.205]
50.90 [2.004]
40.20 [1.583]
26.20 [1.032]

6-φ1.00 [φ0.039]

47.20 [1.858]
50.80 [2.000]
62.00 [2.441]

7.62 [0.300]
15.24 [0.600]

2-φ3.50 [φ0.138]
2-φ2.00 [φ0.079]
6-φ1.50 [φ0.059]

Note:Grid 2.54*2.54mm

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Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
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General tolerances: ±0.50[±0.020]
Mounting hole screwing torque: Max 0.4 N·m

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

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URF48xxQB-200WHR3 Dimensions and Recommended Layout

THIRD ANGLE PROJECTION

Note:Grid 2.54*2.54mm

Note:
Unit: mm[inch]
Pin1, 2, 3, 5, 6, 7's diameter: 1.00[0.039]
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Pin-Out			
Pin	Function	Pin	Function
1	+Vin	5	Sense-
2	Ctrl	6	Trim
3	-Vin	7	Sense+
4	0V	8	+Vo

Note:

1. Packing Information please refer to 'Product Packing Information'. Packing bag number: 58010113；

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 when inputting nominal voltage and outputting rated load;

4. All index testing methods in this datasheet are based on our Company's corporate standards;

5. We can provide product customization service and match filter module;

6. Specifications of this product are subject to chang es without prior notice.

Mornsun Guangzhou Science & Technology Co., Ltd.

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