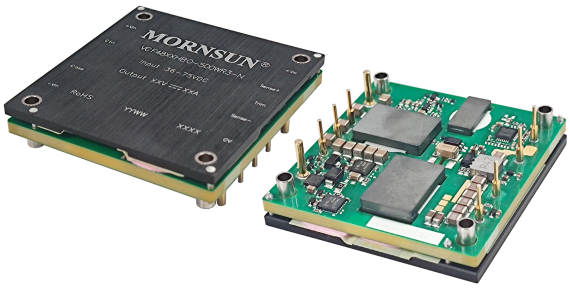
DC/DC Converter

VCF48_HBO-500WR3(-N) Series

MORNSUN®

500W isolated DC-DC converter
Wide input and regulated single output



Patent Protection RoHS

FEATURES

- Wide input voltage range (2:1)
- High efficiency up to 94%
- I/O isolation test voltage: 2.25k VDC
- Output over-voltage, short-circuit, over-current protection, over-temperature protection
- Operating ambient temperature range: -40℃ to +85℃
- Trim Adjustable output voltage 14Vdc~32Vdc(28V output)
- Trim Adjustable output voltage 38Vdc~52.8Vdc(48V output)
- Industry standard 1/2 brick
- Meet EN62368 standards

VCF48_HBO-500WR3(-N) series of isolated 500W DC-DC products with a 2:1 input voltage range. They feature efficiencies of up to 94%, 2250VDC input to output isolation, operating ambient temperature range of -40℃ to +85℃. The products also provide output over-voltage, short-circuit, over-current protection. Additional functions include remote On/Off control, they are widely used in the field of communication, such as switches, Repeaters, intelligent communication gateways, GPS clock synchronization and 4G/5G base station related DC power supply equipment.

Selection Guide

Certification	Part No.	Input Voltage (VDC)		Output		Full Load Efficiency ② (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal	Max.①	Voltage (VDC)	Current (mA) Max./Min.		
--	VCF4828HBO-500WR3(-N)	48 (36-75)	80	28	17850/0	92/94	3300
	VCF4848HBO-500WR3(-N)			48	10400/0	92/94	2200

Note: ① Exceeding the maximum input voltage may cause permanent damage;
② Efficiency is measured in nominal input voltage and rated output load.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load/no-load)	Nominal input voltage	28V output	--	11081/--	11322/200	mA
		48V output	--	11081/--	11322/250	
Reflected Ripple Current	Nominal input voltage, 100% load		--	200	--	
Surge Voltage (1sec. max.)			-0.7	--	100	VDC
Start-up Voltage			--	--	36	
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl*	VCF48XXHBO-500WR3-N	Module on	Ctrl pin GND or pulled low (0-0.8VDC)			
		Module off	Ctrl pin open or pulled high TTL (2-12VDC)			
	VCF48XXHBO-500WR3	Module on	Ctrl pin open or pulled high TTL (2-12VDC)			
		Module off	Ctrl pin GND or pulled low (0-0.8VDC)			
	Input current when off		--	13	40	mA

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

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
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, nominal input voltage	--	300	500	μs

Transient Response Deviation			--	±3	±5	%
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise*	20MHz bandwidth, 5%-100% load, nominal input voltage	28V Output	--	80	200	mVp-p
		48V Output	--	100	300	
Trim	28V Output		14	--	32	V
	48V Output		38	--	52.8	
Sense			--	--	105	%Vo
Over-voltage Protection	Input voltage range		110	120	130	
Over-current Protection			110	140	170	%Io
Short-circuit Protection			Hiccup, continuous, self-recovery, self-recovery time must not exceed 3s			

Note: *Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. Ripple and noise are measured using parallel line base, and the test results are subject to the measurement method.

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.	2250	--	--	VDC
	Input-case		1500	--	--	
	Output-case		500	--	--	
Insulation Resistance	Input-output resistance at 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	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	℃
Vibration			10-150Hz, 5G, 0.75mm. along X, Y and Z, duration/axial 90min			
Switching Frequency	PWM mode		--	250	--	kHz
MTBF	MIL-HDBK-217F@25℃		280	--	--	k hours

Mechanical Specifications

Case Material	Black plastic; flame-retardant and heat-resistant (UL94 V-0) & Aluminum alloy case
Dimensions	61.00 x 57.90 x 12.70mm
Weight	96.0g(Typ.)
Cooling Method	Free air convection or forced air cooling

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 Class A (see Fig. 3 for recommended circuit)	
	RE	CISPR32/EN55032 Class A (see Fig. 3 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6kV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2kV (see Fig. 3 for recommended circuit)	perf. Criteria A
	Surge	IEC/EN61000-4-5 line to line ±2kV (see Fig. 3 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6 10 Vr.m.s	perf. Criteria A

Typical Characteristic Curves

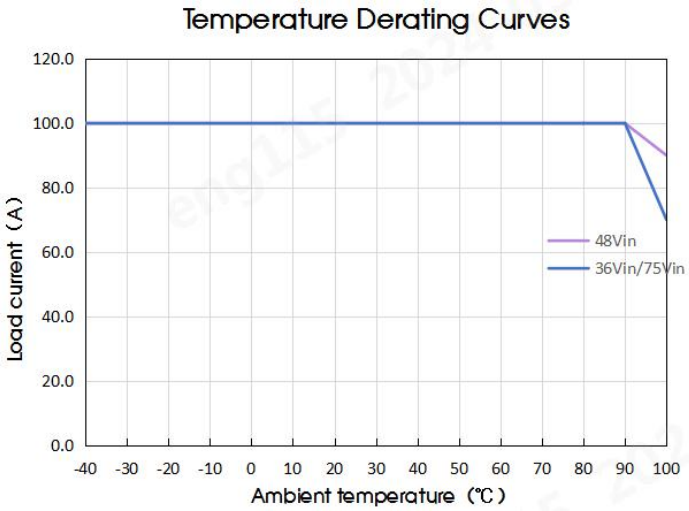
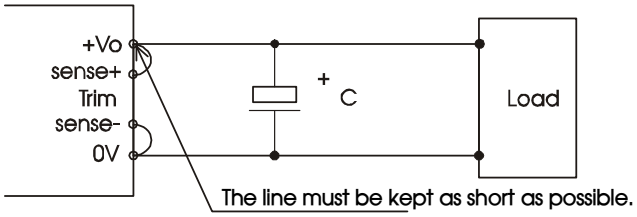


Fig.1

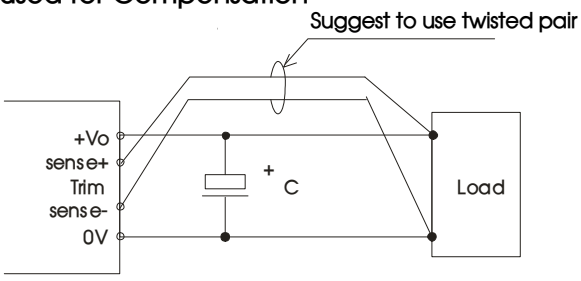
Remote Sense Application

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 at the DC-DC converter pins and will compensate for voltage drop across pins only.
(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 wairs 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

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 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.

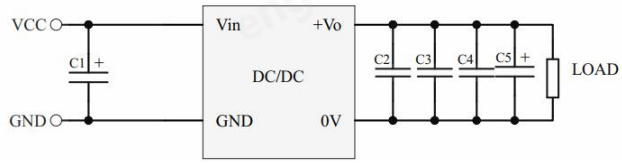


Fig. 2

Capacitor values / Output voltage (VDC)	C1	C2/C3/C4	C5
28/48	220μF/100V	4.7μF/100V	470uF/100V

2. EMC compliance circuit

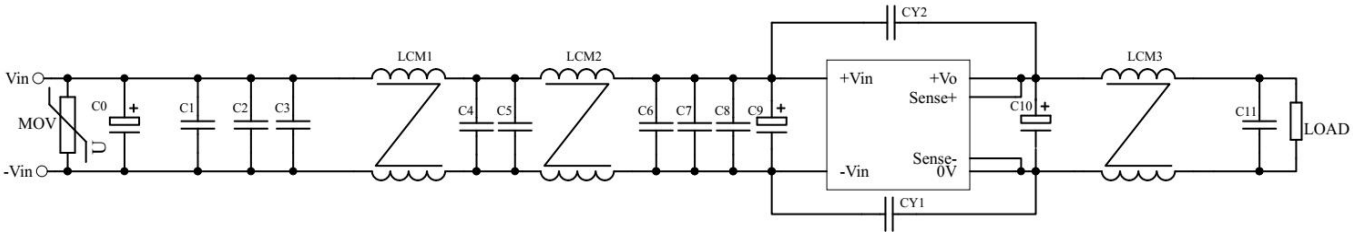
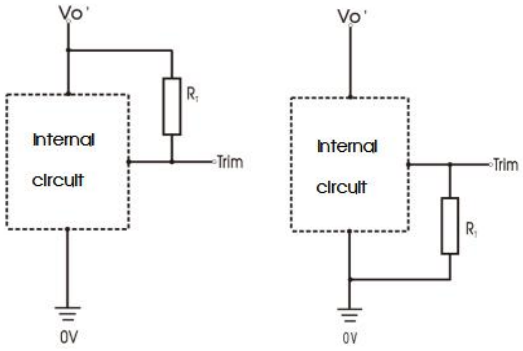


Fig. 3

Parameter description:

Components	Value
MOV	S14K60 Varistor
C0	680μF/100V electrolytic capacitor
C9	470μF/100V electrolytic capacitor
C10	470uF/50V electrolytic capacitor
C1, C2, C3, C4, C5,C6,C7,C8,C11	4.7μF/100V ceramic capacitor
LCM1	4mH/20A, Recommend our company FL2D-A5-472
LCM2	Recommend our company FL2D-D0-040
LCM3	Recommend our company FL2D-A0-900
CY1, CY2	2.2nF/400VAC safety capacitor

3. Trim function for output voltage adjustment (open if unused)



Trim up Trim down

Fig. 4 TRIM resistor connection
(dashed line shows internal resistor network)

Calculation formula of Trim resistance:

Trim up

$$R_T = \left(\frac{5.11 V_{nom}(100+\Delta\%)}{1.225\Delta\%} - \frac{511}{\Delta\%} - 10.22 \right)(k\Omega)$$

Trim down

$$R_T = \left(\frac{511}{\Delta\%} \right) - 10.22(k\Omega)$$

Note:

R_T: Resistance of Trim.

$$\Delta\% = \left| \frac{V_{nom} - V_{out}}{V_{nom}} \right| \times 100$$

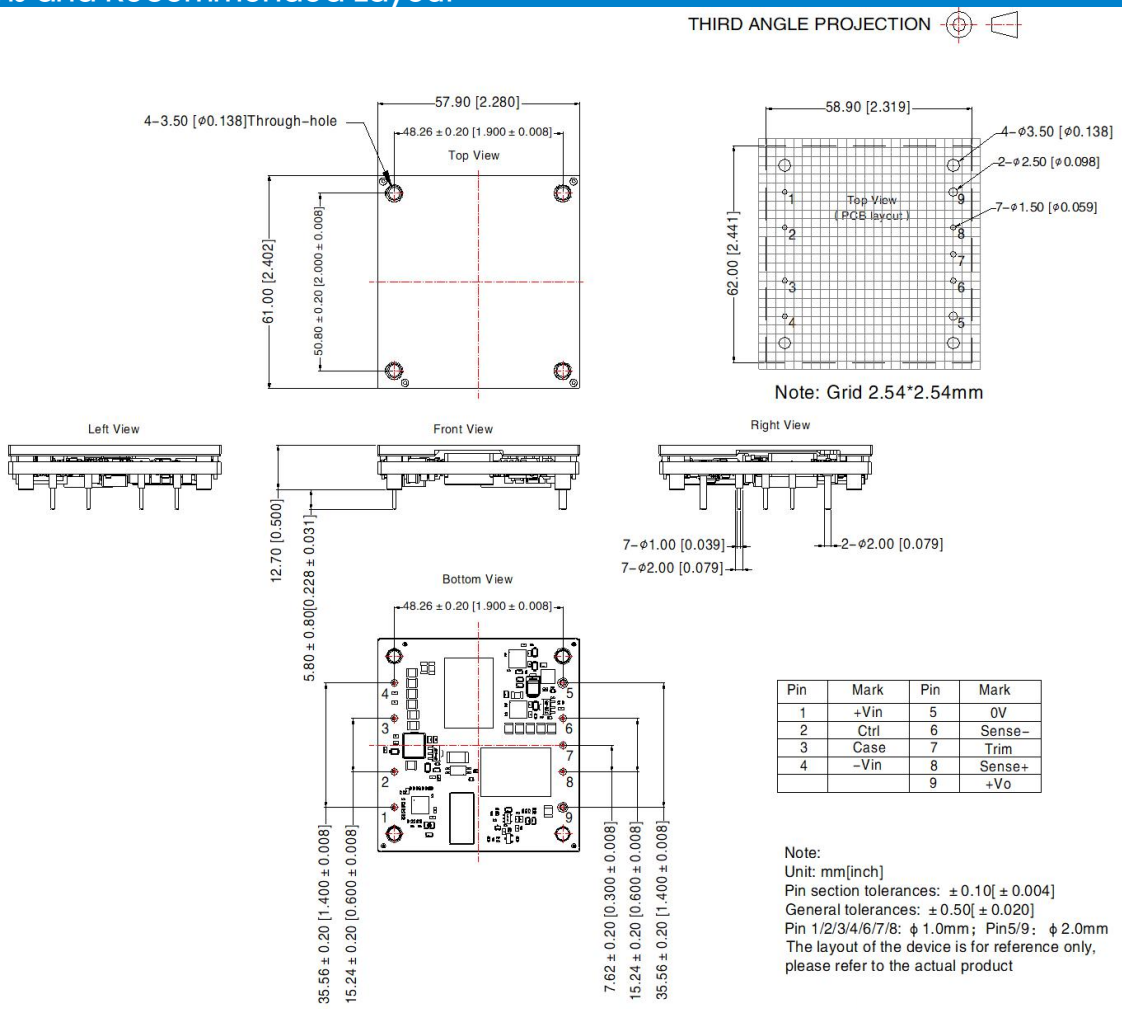
V_{nom} : Nominal Input Voltage.

V_{out} : The trim up/down voltage.

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

5. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

Dimensions and Recommended Layout



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

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
Pin 1/2/3/4/6/7/8: ϕ1.0mm; Pin5/9: ϕ2.0mm
The layout of the device is for reference only, please refer to the actual product

Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. The Packaging bag number: 58200069;
2. Recommend to use module with more than 5% load, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
3. The maximum capacitive load offered were tested at input voltage range and full load;
4. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
5. All index testing methods in this datasheet are based on company corporate standards;
6. We can provide customized and matched filter modules. For details, please contact our technical staff;
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.

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