DC/DC Converter

VCB48_SBO-50WR3(-N) Series

MORNSUN®

50W isolated DC-DC converter
Wide input and regulated single output

Patent Protection RoHS

EN62368-1 BS EN62368-1

FEATURES

- Wide input voltage range: 36V-75V
- High efficiency up to 90%
- I/O isolation test voltage 1500 VDC
- Input under-voltage protection, output short circuit, over-current, over–voltage protection
- Operating ambient temperature range: -40℃ to +85℃
- Industry standard package: 1/16 brick, meet DOSA standard

VCB48_SBO-50WR3(-N) series of isolated 50W DC-DC converter products with an wide 2:1 input voltage range. They feature efficiencies up to 90%, input to output isolation is tested with 1500VDC and the converter safety operate ambient temperature of -40℃ to +85℃, input under-voltage protection, output over-voltage, over-current, short-circuit protection. They are widely used in communication field, such as switches, repeaters, intelligent communication gateways, GPS synchronous clock and 4G/5G base station etc.

Selection Guide

Certification	Part No.	Ctrl Logic②	Input Voltage (VDC)		Output		Full Load Efficiency② (%) Typ.	Capacitive Load (μF)Max.
			Nominal (Range)	Max.①	Voltage (VDC)	Current(mA) Max./Min.		
EN/BS EN	VCB4805SBO-50WR3	P	48 (36-75)	80	5	10000/0	88	7200
	VCB4812SBO-50WR3	P			12	4170/0	90	2000
	VCB4805SBO-50WR3-N	N			5	10000/0	88	7200
	VCB4812SBO-50WR3-N	N			12	4170/0	90	2000

Notes:
① Exceeding the maximum input voltage may cause permanent damage;
② Efficiency is measured in nominal input voltage and rated output load;
③ "P" means positive logic, "N" means negative logic.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage		--	1185/6	1220/20	mA
Reflected Ripple Current			--	50	--	
Surge Voltage (1sec. max.)			-0.7	--	100	VDC
Start-up Voltage			--	--	36	
Input Under-voltage Protection			26	29	--	
Start-up Time	Nominal input voltage & constant resistance load		--	--	100	ms
Input Filter			Cfilter			
Hot Plug			Unavailable			
Ctrl①	Module on	VCB4805SBO-50WR3 VCB4812SBO-50WR3	Ctrl pin open or pulled high (TTL 4.5-12VDC)			
		VCB4805SBO-50WR3-N VCB4812SBO-50WR3-N	Ctrl pin pulled low to GND (0-1.2VDC)			
	Module off	VCB4805SBO-50WR3 VCB4812SBO-50WR3	Ctrl pin pulled low to GND (0-1.2VDC)			
		VCB4805SBO-50WR3-N VCB4812SBO-50WR3-N	Ctrl pin open or pulled high (TTL 4.5-12VDC)			
	Input current when off		--	6	10	mA

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	5%-100% load		--	±1	±3	%Vo
Linear Regulation	Input voltage variation from low to high at full load		--	±0.2	±0.5	
Load Regulation	5%-100% load		--	±0.5	±1	
Transient Recovery Time	25% load step change		--	300	500	μs
Transient Response Deviation	25% load step change	5V output	--	±5	±10	%Vo
		Others	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise①	20MHz bandwidth, nominal input voltage, 5%-100% load		--	100	200	mVp-p
Trim	Input voltage range		90	--	110	%Vo
Sense			--	--	105	
Over-voltage Protection			110	130	160	
Over-current Protection			110	150	190	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①Linear Regulation at 0%-100% load is ±3% max.
②The "Tip and barrel" method is used for ripple and noise test, please refer to DC-DC Converter Application Notes for specific information. Ripple & Noise at <5% load is 5%Vo max.

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation Voltage	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	--	1000	--	pF
Operating Temperature	See Fig1	-40	--	+85	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Shock and Vibration Test		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency①	PWM mode	--	230	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	K hours

Note: ①Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Mechanical Specifications

Dimensions	33.02 x 22.86 x 9.70mm
Weight	12.0g（Typ.）
Cooling method	Natural convection or forced air convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032	CLASS A (see Fig.3 for recommended circuit)/ CLASS B (see Fig.4-① for recommended circuit)
	RE	CISPR32/EN55032	CLASS A (see Fig.3 for recommended circuit)/ CLASS B (see Fig.4-① for recommended circuit)
Immunity	ESD	IEC/EN61000-4-2	Contact ±4KV perf. Criteria B
	RS	IEC/EN61000-4-3	10V/m perf. Criteria A
	EFT	IEC/EN61000-4-4	±2KV (see Fig.4-② for recommended circuit) perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2KV (see Fig.4-② for recommended circuit) perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s perf. Criteria A

Temperature Derating Curve

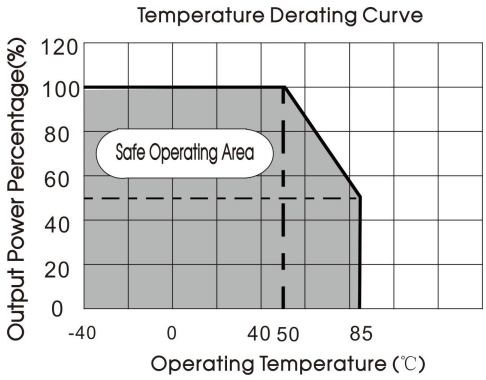
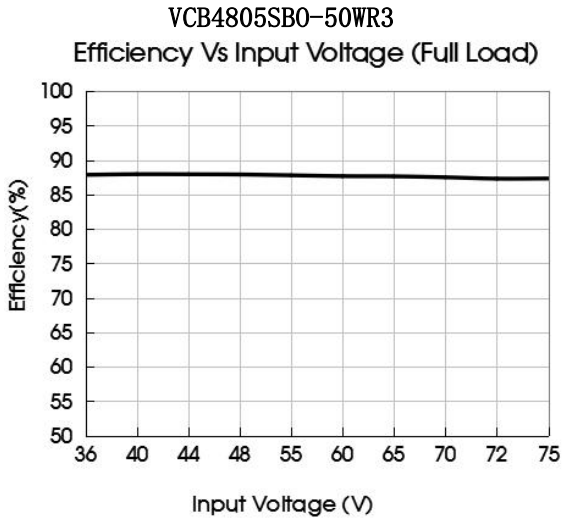
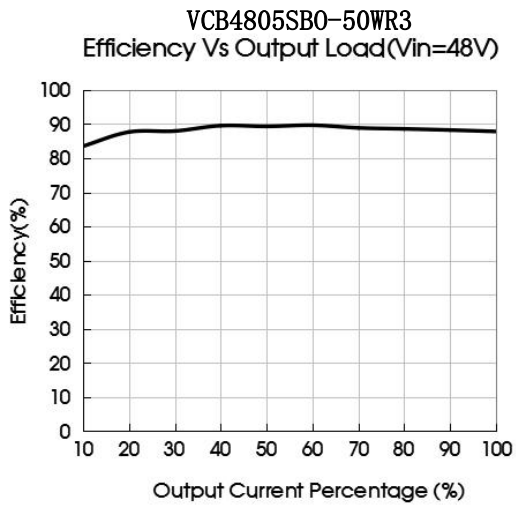


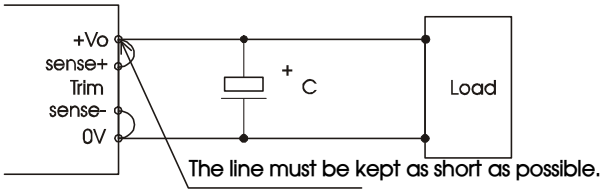
Fig.1





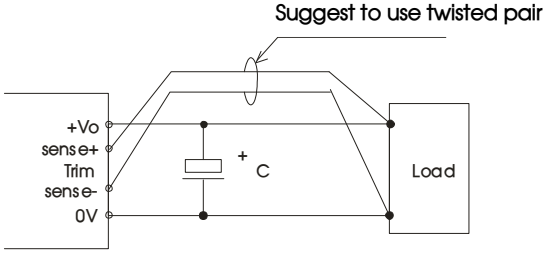
Remote Sense Application

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 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

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.

Vin	48V
Cin	100μF/100V
Cout	330μF/63V

Fig. 2

2. EMC compliance recommended circuit

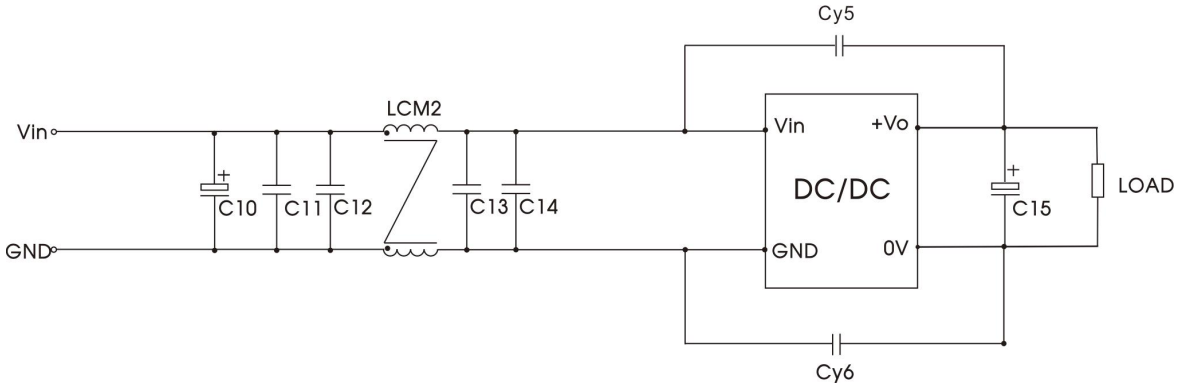


Fig.3

Parameter explaination:

Model	Vo: 5V/12V
C10	680uF/100V
C11、C12 C13、C14	4.7uF/100V
C15	Refer to Fig.2 of Cout
LCM2	2.2mH
Cy5、Cy6	2.2nF/400VAC

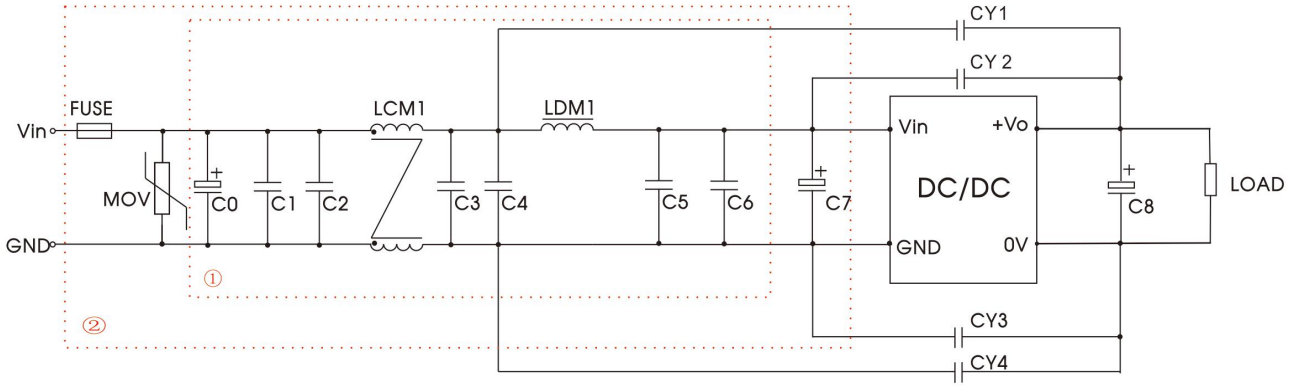
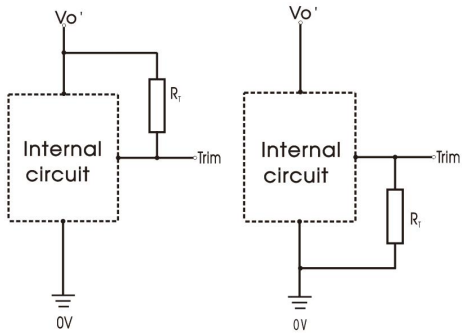


Fig.4

Parameter explaination:

Model	Vo: 5V/12V
FUSE	According to the customer's actual input current selection
MOV	14D101K
C0	680uF/100V
C1、C2、C3 C4、C5、C6	4.7uF/100V
C7	330μF/100V
C8	Refer to Fig.2 of Cout
LCM1	2.2 mH
LDM1	2.2 uH
CY1、CY2 CY3、CY4	2.2nF/400VAC

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



Trim up　　Trim down

TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

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:

RT = Trim Resistor value

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

V_{nom} = nominal output voltage

V_{out} = desired output voltage

4. Thermal est point

The thermal element is installed on the top surface of the product and dissipates heat to the surrounding environment through conduction, convection and radiation. Sufficient heat dissipation conditions should be provided to ensure the reliable operation of the product.

By measuring the temperature of the thermal test point ① in Fig. 5, it can be verified whether the heat dissipation conditions are met.

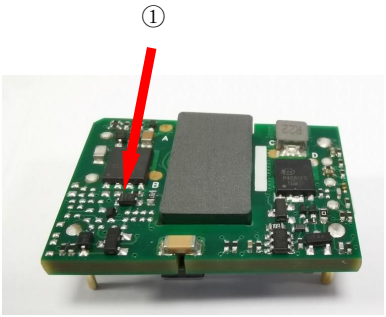


Fig. 5

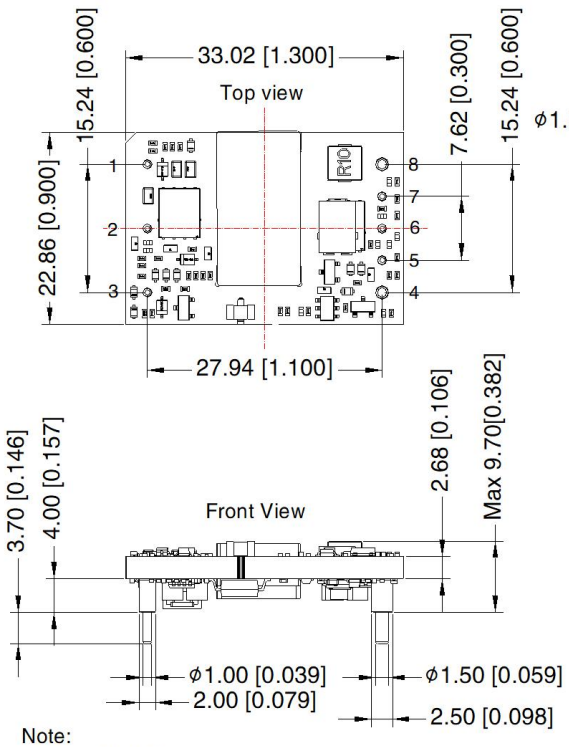
Note:

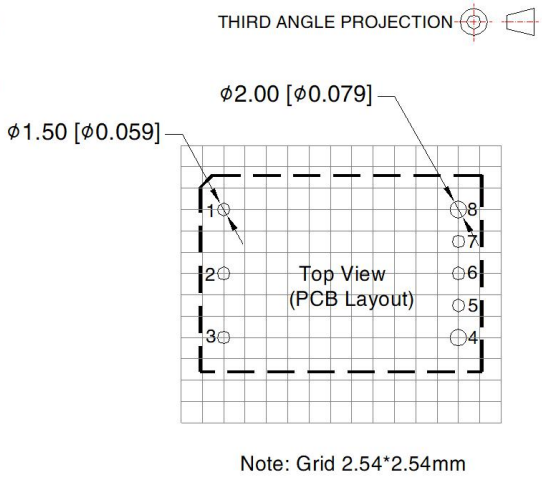
The temperature of the hot test point ① cannot exceed 130℃, otherwise the product will trigger protection.

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

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

Dimensions and Recommended Layout





Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Function
1	Vin
2	Ctrl
3	GND
4	0V
5	Sense–
6	Trim
7	Sense+
8	+V0

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
PIN 1/2/3/5/6/7: ϕ1.0mm; PIN 4/8: ϕ1.5mm
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. Packaging bag number: 58210102;
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 Ta=25℃, 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.

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