

# DC/DC Converter

## VCB48\_SBO-100W(F)R3S(-N) Series

# MORNSUN®

100W isolated DC-DC converter  
Wide input and regulated single output



Patent Protection RoHS

### FEATURES

- Wide input voltage range: 36V-75V
- High efficiency up to 92%
- I/O isolation test voltage 1500 VDC
- Input under-voltage protection, output short circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40°C to +85°C
- Industry standard package: 1/16 brick, meet DOSA standard

VCB48\_SBO-100W(F)R3S(-N) series of isolated 100W DC-DC converter products with an wide 2:1 input voltage range. They feature efficiencies up to 92%, input to output isolation is tested with 1500VDC and the converter safely operate ambient temperature of -40°C to +85°C, 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. ①	Ctrl Logic®	Input Voltage (VDC)		Output		Full Load Efficiency® (%) Min./Typ.	Capacitive Load (uF)Max.
			Nominal (Range)	Max. ③	Voltage (VDC)	Current(mA) Max./Min.		
—	VCB4812SBO-100W(F)R3S	P	48 (36-75)	80	12	8333/0	90/92	3300
	VCB4815SBO-100W(F)R3S				15	6667/0	90/92	2680
	VCB4812SBO-100W(F)R3S-N	N			12	8333/0	90/92	3300
	VCB4815SBO-100W(F)R3S-N				15	6667/0	90/92	2680

Note:

- ① Product model suffix plus "F" for the heat sink package;  
② "P" means positive logic, "N" means negative logic;  
③ Exceeding the maximum input voltage may cause permanent damage;  
④ 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	5/12/15V output	--	2264/10	2315/30	mA
			28V output	--	30	--	
Reflected Ripple Current				--	30	--	
Surge Voltage (1sec. max.)				-0.7	--	80	VDC
Start-up Voltage				--	--	36	
Input Under-voltage Protection				26	29	--	
Start-up Time		Nominal input voltage & constant resistance load		--	--	100	ms
Input Filter				PI filter			
Hot Plug				Unavailable			
Ctrl ①	VCB48_SBO-100W(F)R3S	Module on		Ctrl pin open or pulled high (TTL 4.5-12VDC)			
		Module off		Ctrl pin pulled low to -Vin (0-1.2VDC)			
		Input current when off		--	3	10	mA
	VCB48_SBO-100W(F)R3S-N	Module on		Ctrl pin pulled low to -Vin (0-1.2VDC)			
		Module off		Ctrl pin open or pulled high (TTL 4.5-12VDC)			
		Input current when off		--	3	10	mA

Note: \*The Ctrl pin voltage is referenced to input -Vin.

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## 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	±0.75	
Transient Recovery Time	25% load step change	--	200	500	μs
Transient Response Deviation	25% load step change	--	±3	±5	%Vo
Temperature Coefficient	Full load	--	--	±0.03	%/°C
Ripple & Noise <sup>①</sup>	20MHz bandwidth, nominal input voltage, 5%-100% load	--	100	150	mVp-p
Trim	Input voltage range	90	--	110	%Vo
Sense		--	--	105	
Over-voltage Protection		110	125	140	
Over-current Protection		110	130	170	%Io
Short-circuit Protection		Continuous, self-recovery			

Note:  
<sup>①</sup>Linear Regulation at 0%-100% load is ±3% max.  
<sup>②</sup>The "parallel cable" 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 3%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	°C
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Shock and Vibration Test		10-55Hz, 10G, 30Min. along X, Y and Z			
Switching Frequency <sup>①</sup>	PWM mode	--	300	--	kHz
MTBF	MIL-HDBK-217F@25°C	500	--	--	k hours

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

## Mechanical Specifications

Dimensions	VCB48_SBO-100WR3S(-N)	33.02 x 22.86 x 9.75 mm
	VCB48_SBO-100WFR3S(-N)	33.02 x 22.86 x 12.70 mm
Weight	VCB48_SBO-100WR3S(-N)	14.60g (Typ.)
	VCB48_SBO-100WFR3S(-N)	21.40g (Typ.)
Cooling method	Natural convection	

## Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (see Fig.4 for recommended circuit)/CLASS B (see Fig.5 for recommended circuit)			
	RE	CISPR32/EN55032 CLASS A (see Fig.4 for recommended circuit)/CLASS B (see Fig.5 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	100kHz ±2kV (see Fig.4 for recommended circuit)	perf. Criteria B	
	Surge	IEC/EN61000-4-5	line to line ±2kV (see Fig.4 for recommended circuit)	perf. Criteria B	
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A	

## Temperature Derating Curve

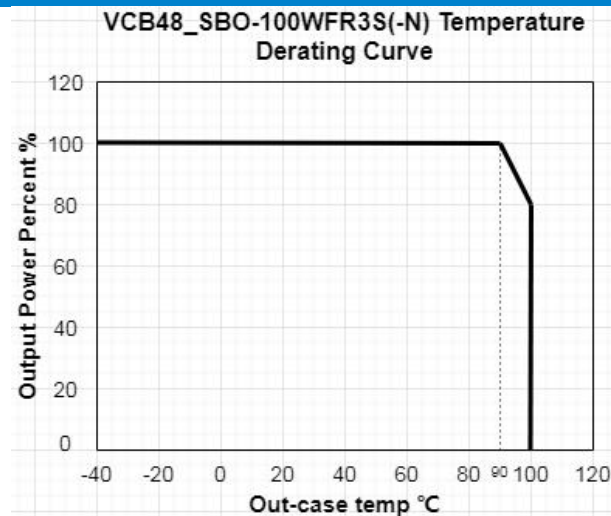
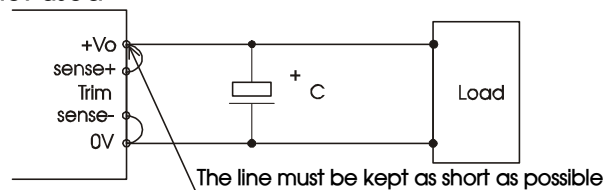


Fig.1

- Note:
1. For reference only;
  2. Test conditions: Normal input voltage, The allowable load of the product under the corresponding conditions is evaluated by the maximum temperature rise of the shell, and the maximum temperature of the shell should be controlled below the corresponding abscission temperature at the corresponding load point;
  3. Products without radiator: it is recommended to add heat dissipation measures by yourself. You can refer to the hot spot in the recommended thermal test program to control the hot spot temperature.

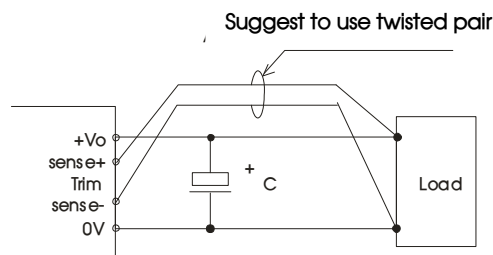
## Remote Sense Application

### 1. Remote Sense Connection if not used



- Note:
- (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



- Note:
- (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. Ripple & Noise

All the DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

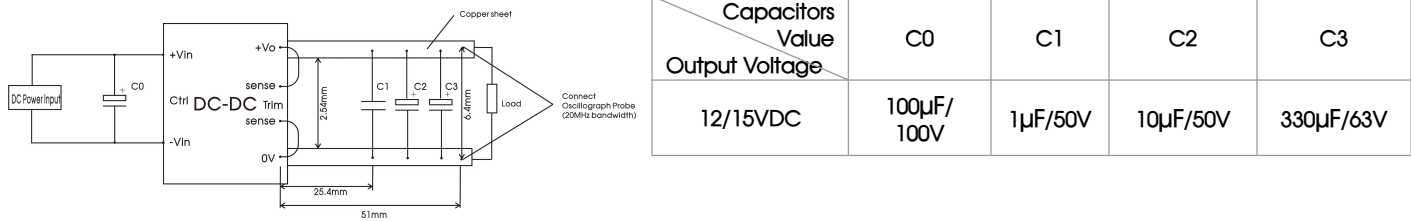


Fig. 2

2. Typical application

We recommended using Mornsun's EMC circuit, otherwise please ensure that at least a 100 μ F electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression and protection.

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.

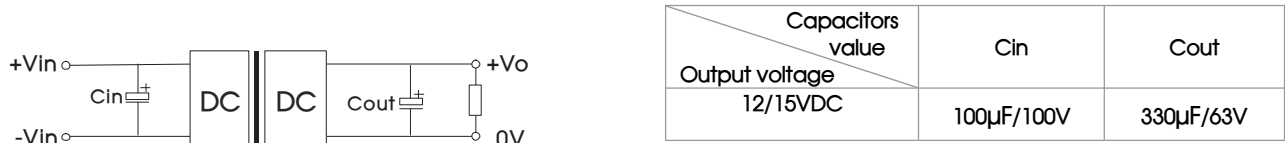
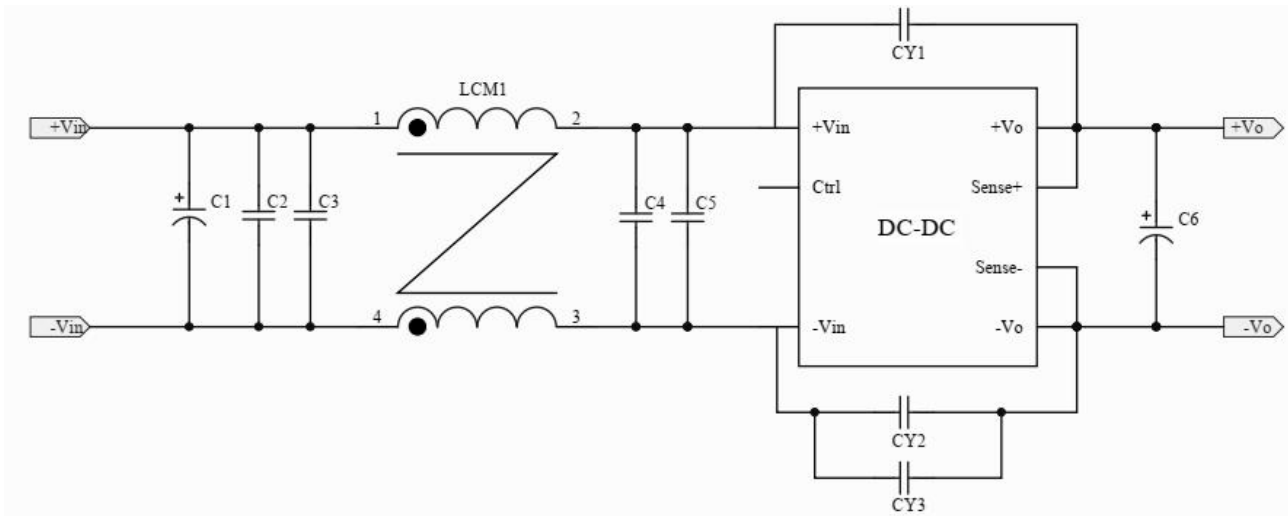


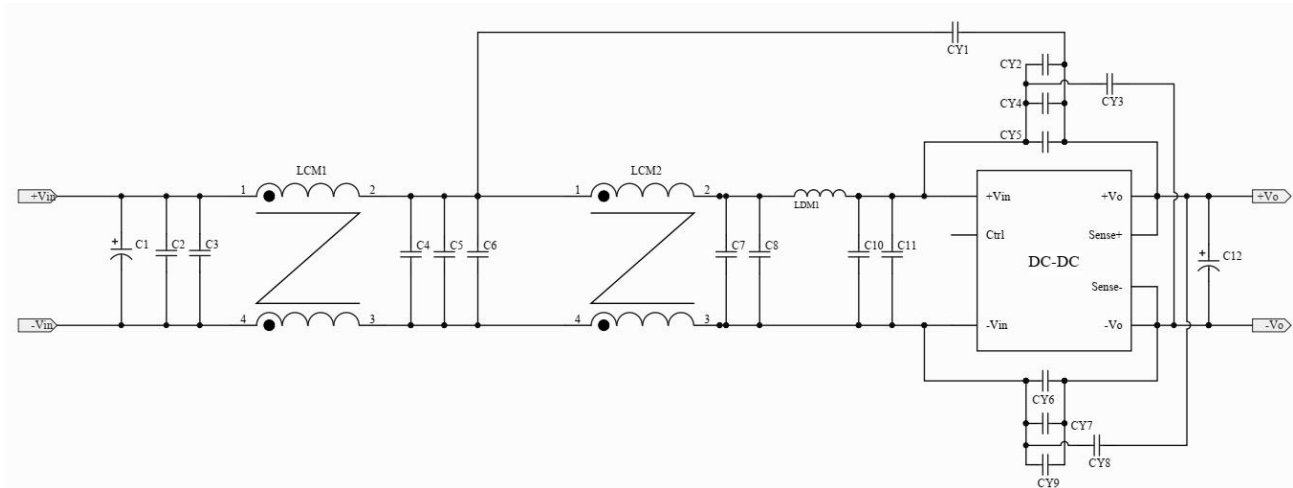
Fig. 3

3. EMC compliance recommended circuit



Device	Parameter description	
	12V	15V
C1	2000uF/100V Electrolytic capacitance	
C2、C3、C4、C5	225K/100V	
C6	330uF/63V	
CY1、CY2、CY3	2.2nF/400VAC Safety Y capacitor	
LCM1	2.0mH, recommended to use MORNSUN P/N: FL2D-A2-202(C)	

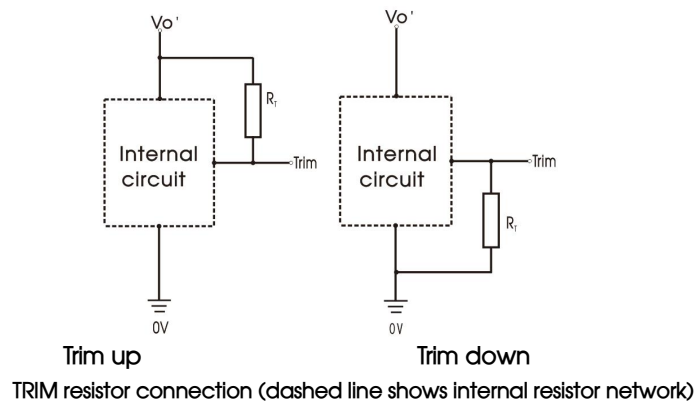
Fig. 4



Device	Parameter description	
	12V	15V
C1	2000uF/100V Electrolytic capacitance	
C2、C3、C4、C5、C7、C8、C10、C11	225K/100V	
C12	330uF/63V	
CY1	/	
CY2、CY6	0.1nF/400VAC Safety Y capacitor	
CY4、CY7	2.2nF/400VAC Safety Y capacitor	
CY5、CY9	3.3nF/400VAC Safety Y capacitor	
CY3、CY8	0.22nF/400VAC Safety Y capacitor	
LCM1	7.0mH, recommended to use MORNSUN P/N: FL2D-60-702	
LCM2	2.0mH, recommended to use MORNSUN P/N: FL2D-A2-202(C)	
LDM1	0.47uH	

Fig.5

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



Calculating Trim resistor values:

Trim up

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

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



## 5. Thermal test point

The thermal element is installed on the top surface of the product and dissipates heat to the surrounding environment by conduction, convection and radiation, sufficient cooling conditions shall be provided to ensure reliable operation of the product. It can be verified that cooling conditions are met by measuring the temperature of thermal test point ①, thermal test point ② in Fig.6.

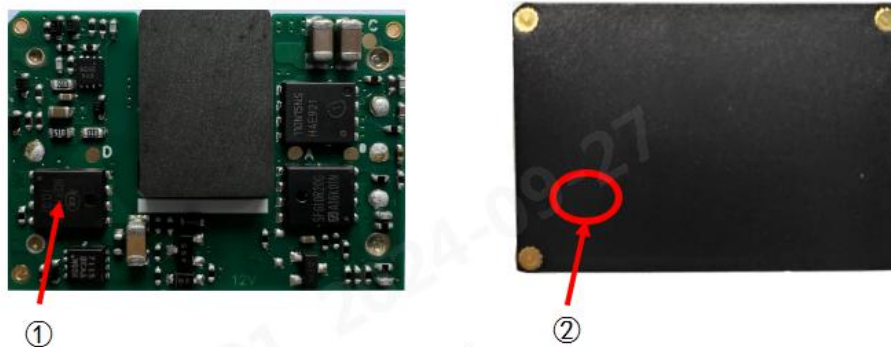


Fig. 6

Note:

1、the temperature of the heat test point (1) without heat sink cannot exceed 130 ° C, and the temperature of the heat test point (2) with heat sink cannot exceed 110 ° C. Otherwise, the product will trigger protection due to high temperature, and the product has no output.

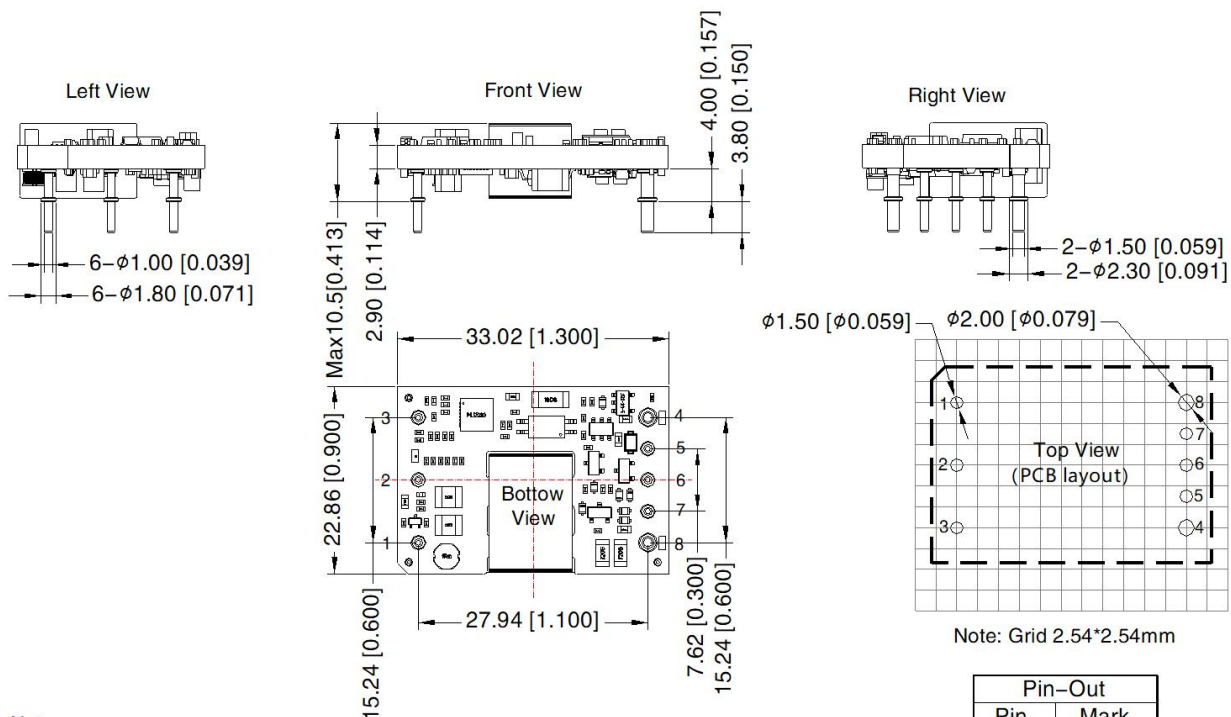
6. The products do not support parallel connection of their output

7. For additional information please refer to DC-DC converter application notes on

[www.mornsun-power.com](http://www.mornsun-power.com)

## VCB4812/15SBO-100WR3S(-N) Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note:

Unit: mm[inch]

Pin section tolerances:  $\pm 0.10 [\pm 0.004]$

General tolerances:  $\pm 0.50 [\pm 0.020]$

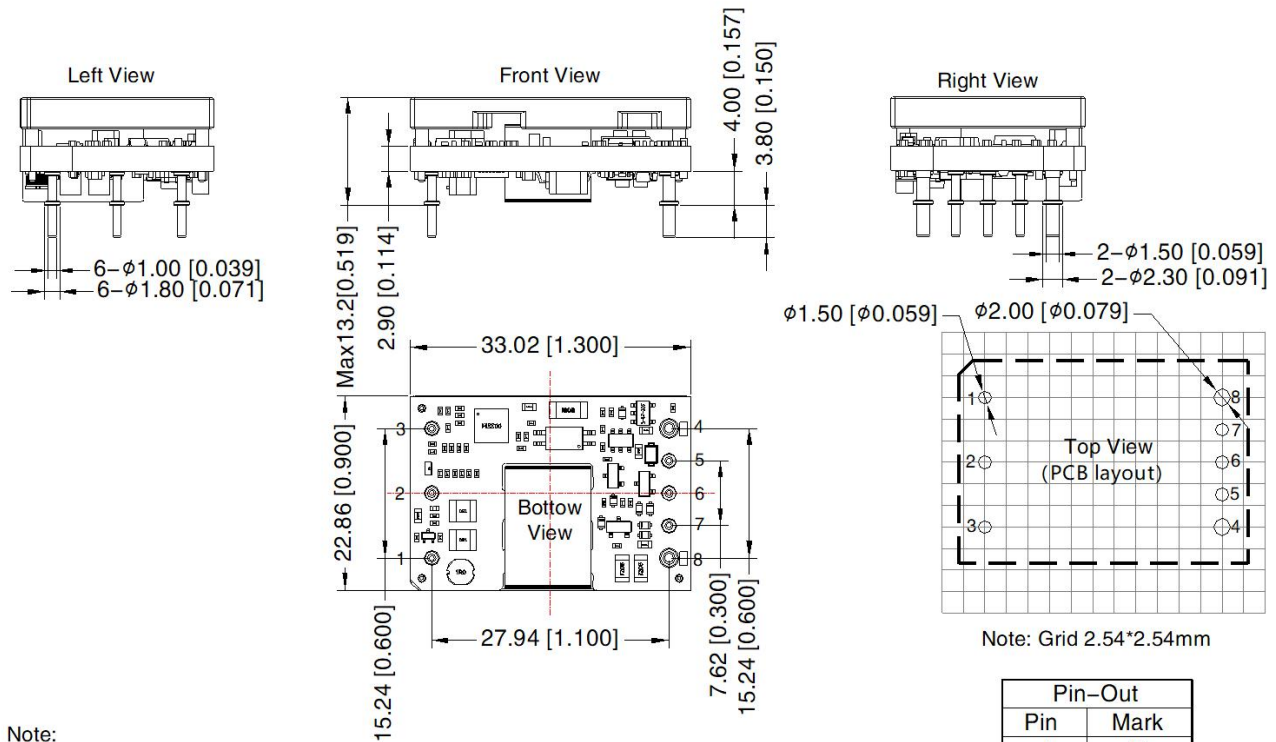
PIN1/2/3/5/6/7:  $\phi 1.0\text{mm}$ ; PIN4/8:  $\phi 1.5\text{mm}$

The layout of the device is for reference only, please refer to the actual product

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

VCB4812/15SBO-100WFR3S(-N) Dimensions and Recommended Layout

THIRD ANGLE PROJECTION



Note:  
Unit: mm[inch]  
Pin section tolerances:  $\pm 0.10 [\pm 0.004]$   
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PIN1/2/3/5/6/7:  $\phi 1.0\text{mm}$ ; PIN4/8:  $\phi 1.5\text{mm}$   
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Pin-Out	
Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	Sense-
6	Trim
7	Sense+
8	+Vo

Note:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58200055;
- It is recommended to use at more than 10% load. If the load is lower than 10%, the ripple of the product may exceed the specifications, but the reliability of the product is not affected.
- If the product operates under the minimum required load, the product performance cannot be guaranteed to meet all performance indicators in this manual.
- The maximum capacitive load offered were tested at input voltage range and full load;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a=25^\circ\text{C}$ , humidity<75%RH with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- 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.

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