DC/DC Converter

VCF48_SBO-150W(F)R3S(-N) Series

MORNSUN®

150W, isolated DC-DC converter
Wide input and regulated single output

Patent Protection RoHS

FEATURES

- Wide input voltage range: 36-75VDC
- High efficiency up to 92%
- I/O isolation test voltage 2250VDC, meet basic insulation
- Input under-voltage protection, output over-current, short circuit, over–voltage protection, over–temperature protection
- Operating ambient temperature range:-40℃ to +85℃
- Industry standard package: 1/16 brick, meet DOSA standard

VCF48_SBO-150W(F)R3S(-N)eries products output power of 150W, 2:1 wide voltage input range, efficiency up to 92%, 2250VDC conventional isolation voltage, allowed operating temperature -40℃ to +85℃, with input under-voltage protection, output over-current, short circuit, over–voltage protection, over–temperature protection functions. It is widely used in the field of communication, such as switch, repeater, intelligent communication gateway, GPS clock synchronization and 4G/5G base station related DC power supply equipment.

Selection Guide

Certification	Part No.①	CTRL logic②	Input Voltage (VDC)		Output		Efficiency(%)④ 100%Io/50%Io	Max. Capacitive Load(μF)
			Nominal (Range)	Max.③	Voltage (VDC)	Current (mA) Max./Min.		
--	VCF4812SBO-150W(F)R3S	P	48 (36-75)	80	12	12500/0	92/90	5000
	VCF4812SBO-150W(F)R3S-N	N						
	VCF4815SBO-150W(F)R3S	P			15	10000/0	91/90	4000
	VCF4815SBO-150W(F)R3S-N	N						

Notes:
① Use suffix "F" for heat sink;
② "P" indicates that Ctrl is positive logic, "N" indicates that Ctrl is negative logic;
③ The input voltage cannot exceed this value, otherwise, permanent damage may be caused;
④ The above efficiency values are measured at the input nominal voltage and output rated load, full load efficiency Min(%)=Typ.(%)-2%, half load efficiency Min(%)=Typ.(%)-3%.

Input Specifications

Item		Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)		Room temperature, nominal input voltage(12V)		--	3400/30	3473/50	mA
		Room temperature, nominal input voltage(15V)		--	3434/30	3515/50	
Reflected Ripple Current		Room temperature, nominal input voltage, full load		--	200	--	
Surge Voltage (1sec. max.)				-0.7	--	100	VDC
Start-up Voltage				--	--	36	
Input Under-voltage Protection		Vin=48V	Module under-voltage turn-on	--	--	36	
			Module under-voltage turn-off	26	30	--	
Start-up time		Nominal input voltage & constant resistance load		--	--	100	ms
Input Filter				Pi filter			
Hot Plug				Unavailable			
Ctrl①	VCF48_SBO-150W(F)R3S	Module turn-on		Ctrl pin open or pulled high (TTL 4.5-12VDC)			
		Module turn-off		Ctrl pin pulled low to -Vin (0-1.2VDC)			
		Input current during shutdown		--	13	25	mA
	VCF48_SBO-150W(F)R3S-N	Module turn-on		Ctrl pin pulled low to -Vin (0-1.2VDC)			
		Module turn-off		Ctrl pin open or pulled high (TTL 4.5-12VDC)			
		Input current during shutdown		--	13	25	mA

Note: *Ctrl control pin voltage is relative to input pin -Vin.

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy	Room temperature, input voltage range, 0%Io-100%Io	--	±2	±3	%Vo
Linear Regulation	Room temperature	--	±0.2	±0.5	
Load Regulation①	Room temperature, input voltage range, 5%-100% load	--	±0.5	±0.75	
Transient Recovery Time	25% load step change, nominal input voltage	--	--	450	μs
Transient response deviation		--	±3	±5	%Vo
Temperature Coefficient	Full load	--	--	±0.03	%/℃
Ripple & Noise②	Room temperature, 20MHz,, 5%-100% load	--	150	200	mVp-p
Trim	Input voltage range	90	--	110	%Vo
Over-voltage Protection		110	125	160	%Vo
Over-current Protection③		110	140	170	%Io
Short-circuit Protection		Hiccup, continuous, self-recovery			

Note:
① According to the load working conditions of 0%-100% test, the load adjustment rate index is ±3%;
② 0% - 5% load ripple & noise is less than or equal to 3%Vo. Ripple and noise are measured by the measurement method. For details, see the DC-DC (Wide Voltage) Module Power Application Guide;
③ Under high and low temperature conditions, it meets the over-current protection function, and does not control the over-flow point.

General Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Isolation	Electric Strength Test for 1 minute with a leakage current of 1mA max.	Input-output	2250	--	--	VDC
		Input-case	1500	--	--	
		Output-case	750	--	--	
Insulation Resistance	Input-output resistance at 500VDC		1000	--	--	MΩ
Isolation Capacitance	Input-output, 100KHz/0.1V		--	4700	--	pF
Operating Temperature			-40	--	+85	℃
Storage Temperature			-55	--	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Shock and Vibration Test			10-500Hz, 0.07g2/Hz, 10 Min. along X, Y and Z			
Switching Frequency	PWM mode		--	333	--	KHz
MTBF	Telcordia SR-332@25℃		1000	--	--	K hours

Mechanical Specifications

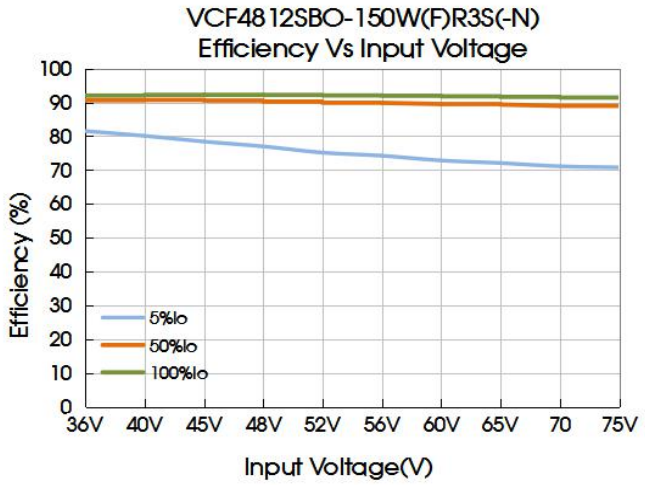
Dimensions	VCF48_SBO-150WR3S(-N)	33.02 x 22.86 x 12.5 mm
	VCF48_SBO-150WFR3S(-N)	33.02 x 22.86 x 13.2 mm
Weight	VCF48_SBO-150WR3S(-N)	16.6 g(typ)
	VCF48_SBO-150WFR3S(-N)	26.6 g(typ)
Cooling Method	Natural air cooling or forced air cooling	

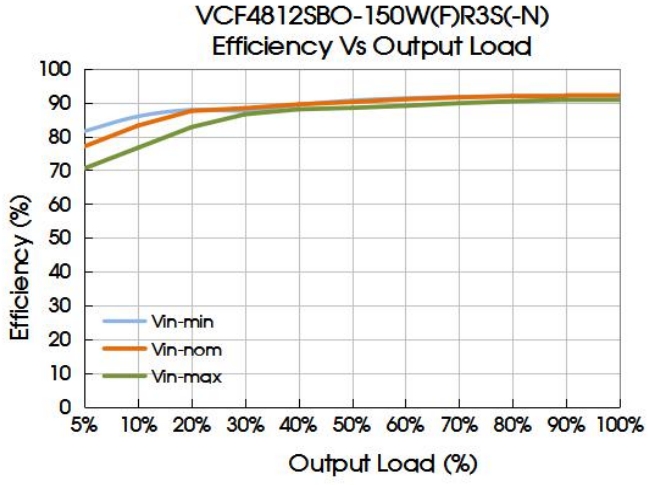
Electromagnetic Compatibility (EMC)

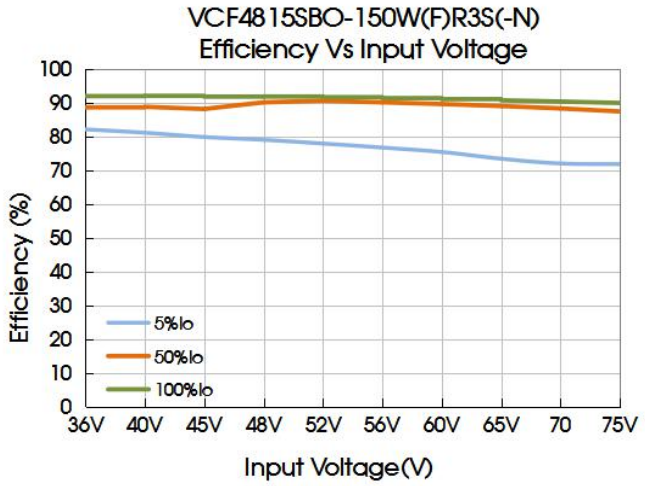
EMI	CE	CISPR32/EN55032 CLASS A (See Fig. 4 for recommended circuits)/ CLASS B (See Fig. 5 for recommended circuits)	
	RE	CISPR32/EN55032 CLASS A (See Fig. 4 for recommended circuits)/ CLASS B (See Fig. 5 for recommended circuits)	
EMS	ESD	IEC/EN61000-4-2 Contact ±6KV, Air ±8KV	perf.Criteria B
	RS	IEC/EN61000-4-3 10V/m (See Fig.5 for recommended circuits)	perf.Criteria B

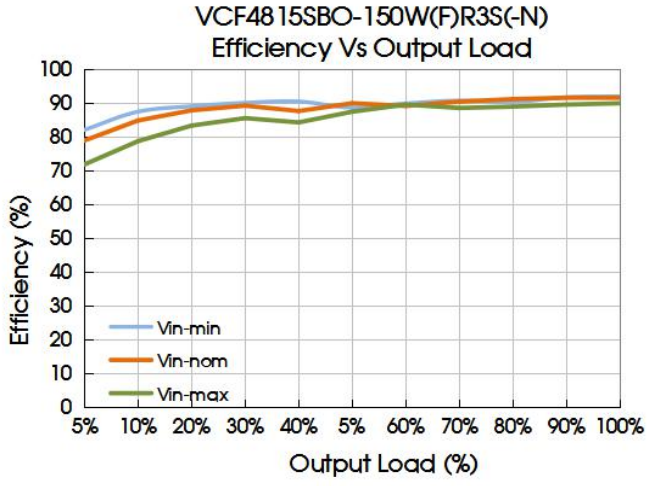
	EFT	IEC/EN61000-4-4 100kHz ±2KV (See Fig. 5 for recommended circuits)	perf.Criteria B
	Surge	IEC/EN61000-4-5 line to line ±2KV (See Fig. 5 for recommended circuits)	perf.Criteria B
	CS	IEC/EN61000-4-6 3Vr.m.s (See Fig. 5 for recommended circuits)	perf.Criteria B

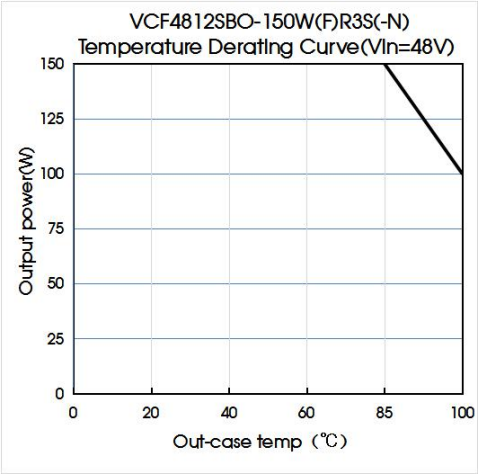
Typical Characteristic Curve











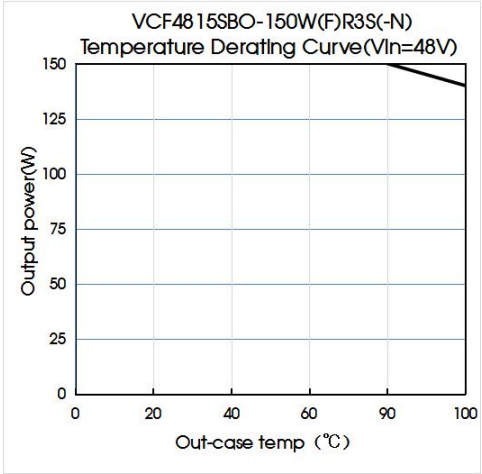


Fig.1

Note:
1. For reference only;
2. Test conditions: 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.

Design Reference

1. Ripple & Noise

All DC/DC converters of this series are tested according to the test circuit recommended in Figure 2 before leaving the factory.

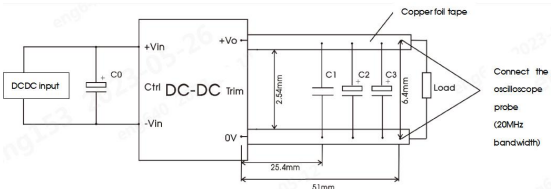


Fig.2

Output Voltage \ Capacitance Values	C0	C1	C2	C3
12V/15VDC	220μF/250V	1μF/50V	10μF/35V	680μF/35V (Solid state)

2. Typical circuit

If the customer does not use our recommended circuit, the input must be connected with an electrolytic capacitor of at least 220μF to suppress the potential surge voltage generated by the input.

If it is required to further reduce the input/output ripple, the external input/output capacitors Cin and Cout can be increased or a capacitor with small series equivalent impedance value can be selected, but the capacitance value should not be greater than the maximum capacitive load of the product.

Fig.3

Output Voltage \ Capacitance Values	Cin	C1	C2	Cout
12V/15VDC	220μF	1μF	10μF	680μF (Solid state)

3. EMC compliance recommended circuit

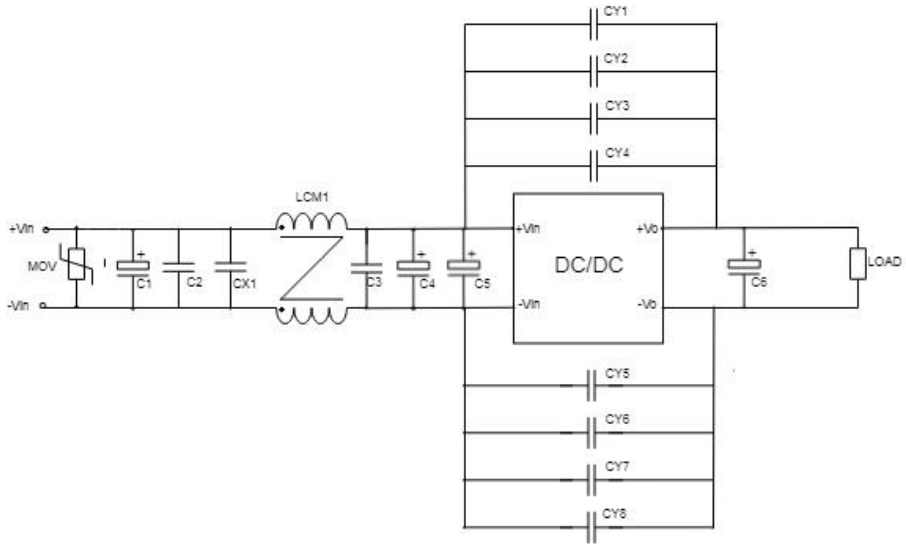
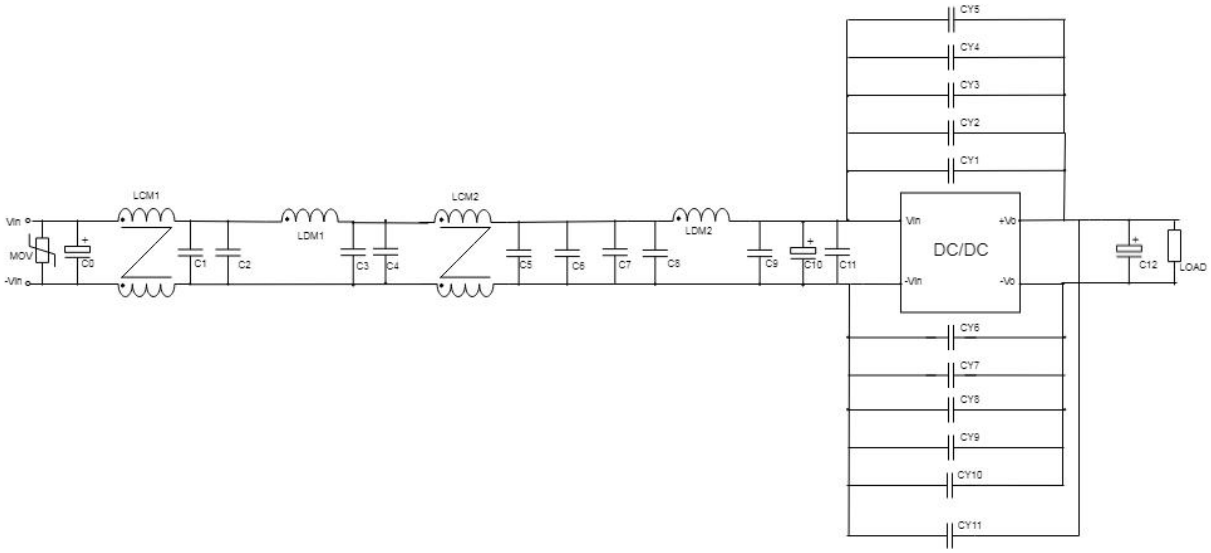


Fig.4

Device	Value	Parameter Description
MOV1	10D821K	Voltage sensitive resistor
C1	470uF	Electrolytic capacitor, withstand pressure≥100V
C2/C3	2.2nF	Ceramic capacitor, withstand pressure≥250V
CX1	2.2uF	X capacitor, withstand pressure≥450V
C4/C5	330uF	Electrolytic capacitor, withstand pressure≥200V
C6	680uF	Solid state capacitor, withstand pressure≥35V
CY4	2.2nF	Ycapacitor
CY1/CY2/CY3/CY5/CY6/CY7	4.7nF	Ycapacitor

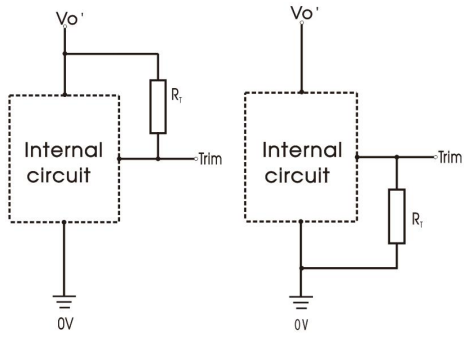
LCM1	10mH, recommended to use MORNSUNP/N:FL2D-A2-103	CM inductoror
CY8	0.22nF	Ycapacitor



Device	Value	Parameter Description
MOV1	14D561K	Voltage sensitive resistor
C0	470uF	Electrolytic capacitor,Withstand pressure≥100V
LCM1/LCM2	10mH, Recommended to use MORNSUN P/N:FL2D-A2-103	CM inductoror
C1/C2/C3/C4/C5/C6/C7/C8/C9/C11	2.2nF	Ceramic capacitor，Withstand pressure≥250V
C10	330uF	Electrolytic capacitor,Withstand pressure≥200V
LDM1	5uH	DM inductor
LDM2	10uH	DM inductor
CY1/CY2/CY3/CY4/CY6/CY7/CY8/CY9/CY10	4.7nF	Ycapacitor
CY5/CY11	10nF	Ycapacitor
C12	680uF	Solid state capacitor，Withstand pressure≥35V

Fig.5

4. 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

5. Recommended solution for thermal test

During the application process, the thermal design of the product can be evaluated in combination with the product temperature derating curve, or the stable working range of the product can be determined by testing the temperature at point AB in Figure 6 (model with radiator, test at the same point). The temperature of point A is belowe120℃, which is the stable working range of VCF48_SBO-150W(F)R3S(-N); The temperature of point B is belowe125℃, which is the stable working range of VCF48_SBO-150W(F)R3S(-N).

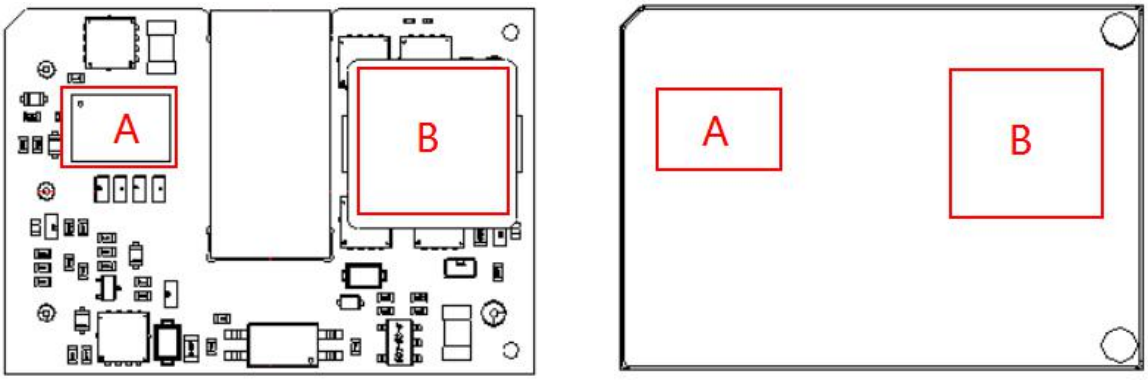
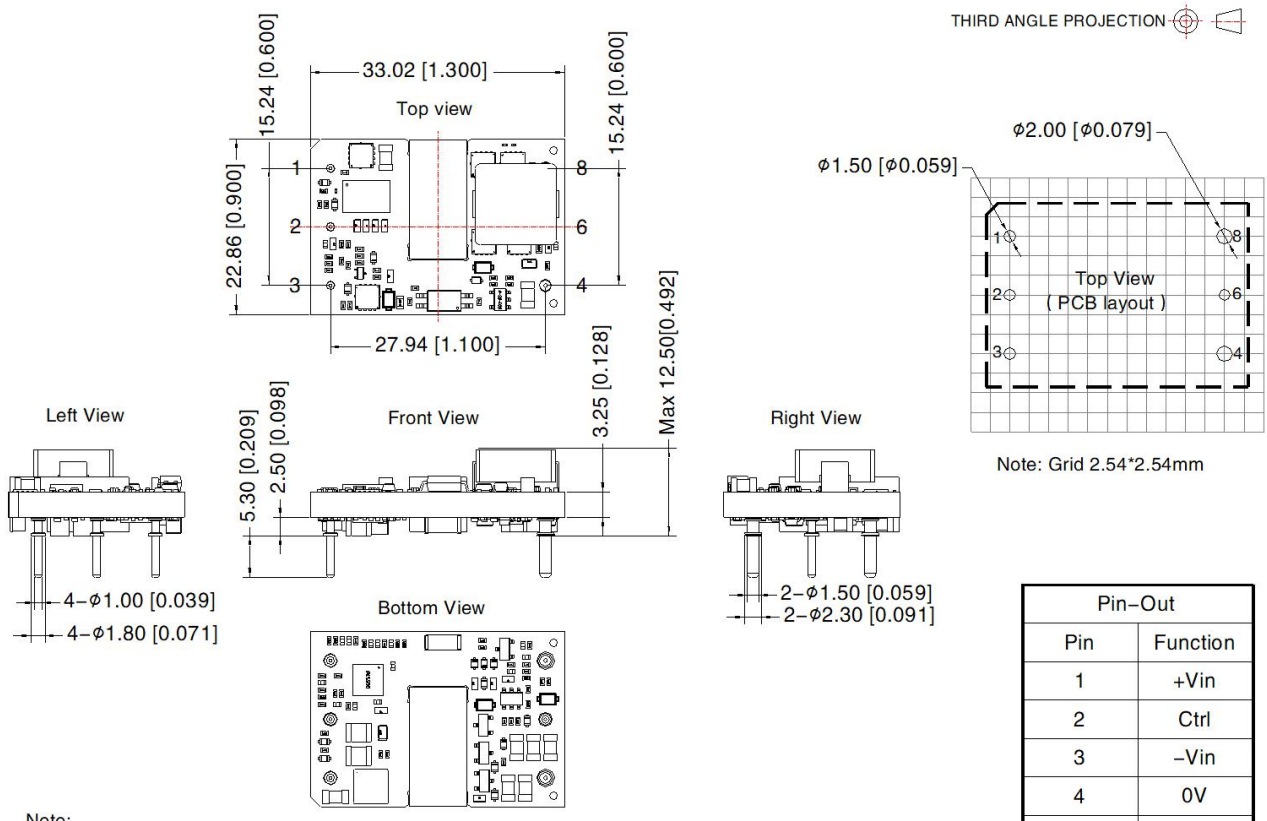


Fig.6

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.cn

VCF48_SBO-150WR3S(-N) Dimensions and Recommended Layout

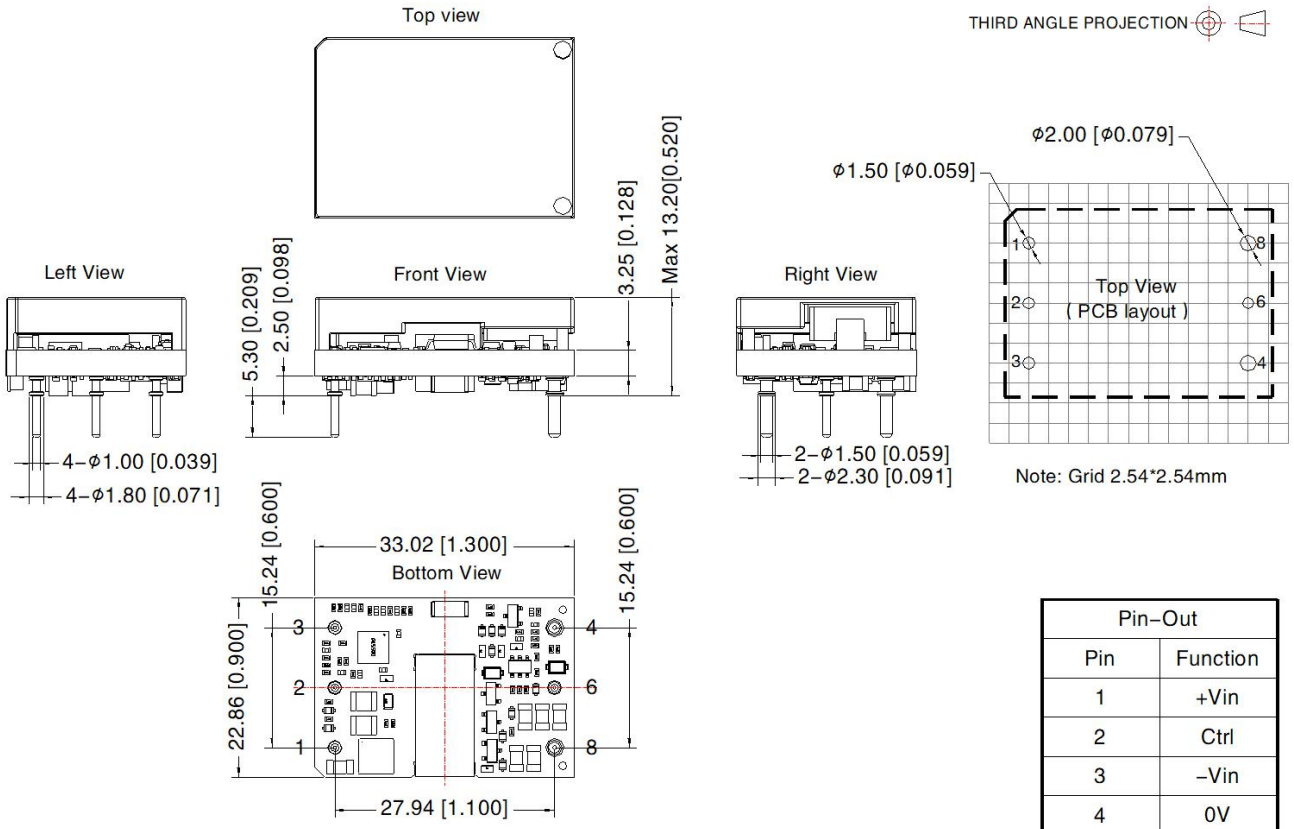


Note: Grid 2.54*2.54mm

Pin–Out	
Pin	Function
1	+Vin
2	Ctrl
3	–Vin
4	0V
6	Trim
8	+Vo

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
PIN 1/2/3/6: φ1.0mm; PIN 4/8: φ1.5mm
The layout of the device is for reference only, please refer to the actual product

VCF48_SBO-150WFR3S(-N)Dimensions and Recommended Layout



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PIN 1/2/3/6: φ1.0mm; PIN 4/8: φ1.5mm
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Note:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58210102;
2. It is recommended to use more than 5% load. If less than 5% load, the ripple index of the product may exceed the specification, but it will not affect the reliability of the product;
3. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the data sheet;
4. The maximum capacitive load offered were tested at nominal input voltage and full load;
5. Unless otherwise specified, parameters in this data sheet were measured under the conditions of Ta=25℃, humidity<75%RH with nominal input voltage and rated output load;
6. All index test methods in this manual are based on the enterprise standards of the company;
7. We can provide product customization, specific needs can directly contact our technical staff;
8. The product involves laws and regulations: see "Product Features" and "EMC Features";
9. After scrapping, our products shall be classified and stored in accordance with ISO14001 and relevant environmental laws and regulations, and handed over to qualified units.

Mornsun Guangzhou Science & Technology Co., Ltd.
Address: No. 8 Nanyun 4th Road, Huangpu District, Guangzhou, China
Tel: 86-20-38601850 Fax: 86-20-38601272 E-mail: info@mornsun.cn www.mornsun-power.com