300W isolated DC-DC converter
Wide input and regulated single output

Patent Protection RoHS

FEATURES

- Wide input voltage range: 36-75 VDC
- High efficiency up to 93%
- I/O isolation test voltage 2250 VDC
- Operating ambient temperature range: -40℃ to +100℃
- Input under-voltage protection, output over–voltage, over-current, short circuit, over-temperature protection
- Industry standard package: 1/8 brick
- Meet EN62368 standards

VCF48_EBO-300W(F/H)R3S-N series is a high-performance product designed for the field of communication power supply, output power up to 300W, no minimum load requirements, with 36-75VDC wide voltage input, allowing operating temperature up to 85℃, With input undervoltage protection, output overvoltage protection, output overcurrent protection, output short circuit protection, over temperature protection, remote control and compensation, output voltage regulation and other functions, through the periphery to meet CISPR32/EN55032 CLASS B, widely used in battery power supply equipment, industrial control, electric power, instrumentation, communication, intelligent robot and other fields.

Selection Guide

Certification	Part No.①	Input Voltage (VDC)		Output		Full Load Efficiency (%)Min./Typ.	Half Load Efficiency (%) Min./Typ.	Max. Capacitive Load(μF)	Min. Capacitive Load③(μF)
		Nominal (Range)	Max.②	Voltage (VDC)	Current (mA) Max./Min.				
--	VCF4812EBO-300W(F/H)R3S-N	48 (36-75)	80	12	25000/0	91/93	91/93	10000	680
	VCF4815EBO-300W(F/H)R3S-N			15	20000/0			7400	
	VCF4824EBO-300W(F/H)R3S-N			24	12500/0			4300	
	VCF4828EBO-300W(F/H)R3S-N			28	10700/0			3800	
	VCF4848EBO-300W(F/H)R3S-N			48	62500/0	90/91.5	90/91.5	2200	

Note:
① Suffix "F" means the product with aluminum base, "H" for the heat sink package;
② The input voltage should not exceed this value, otherwise permanent and unrecoverable damage may be caused;
③ In order to ensure the stability of output voltage, the output side of the product must be externally connected with a minimum capacitive load.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	Nominal input voltage	12/15/24/28V Output	--	6720/60	6868/80	mA
		48V Output	--	6830/60	6944/80	
Reflected Ripple Current	Nominal input voltage		--	100	--	
Surge Voltage (1sec. max.)			-0.7	--	100	VDC
Start-up Voltage			--	--	36	
Input Under-voltage Protection			31	--	36	
Start-up Time	Nominal input voltage & constant resistance load		--	--	100	ms
Input Filter			Pi filter			
Hot Plug			Unavailable			
Ctrl ①	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)			
	Ctrl Start-up Delay Time		--	30	50	ms

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy	5%-100% load		--	--	±2	%
Linear Regulation	Full load, input voltage from low voltage to high voltage		--	±0.2	±0.5	
Load Regulation	5%-100% load		--	±0.5	±0.75	
Transient Recovery Time	25% load step change, nominal input voltage, di/dt=2.5A/us		--	--	400	μs
Transient Response Deviation			--	±2	±5	%
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise①	20MHz bandwidth, nominal input voltage, 10%-100% load	12/15/48V Output	--	100	240	mVp-p
		24/28V Output	--	100	300	
Trim	40-75V input		90	--	110	%
Sense	40-75V input		--	--	105	
Over-temperature Protection②	Product surface max. temperature		--	130	--	℃
Over-voltage Protection	Input voltage range		110	125	130	%Vo
Over-current Protection			110	140	170	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①The "parallel cable" method is used for Ripple and Noise test, please refer to DC-DC Converter Application Notes for specific information.

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
Insulation Resistance	Input-output resistance at 500VDC	1000	--	--	MΩ
Operating Temperature	See Fig. 1	-40	--	+85	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Wave soldering,10 seconds	--	--	260	℃
	Soldering spot is 1.5mm away from case for 10 seconds	--	--	300	
Shock and Vibration Test		10-150Hz, 5G, 0.75mm. along X, Y and Z			
Switching Frequency①	PWM mode	--	330	--	KHz
MTBF	MIL-HDBK-217F@25℃	--	2000	--	K hours

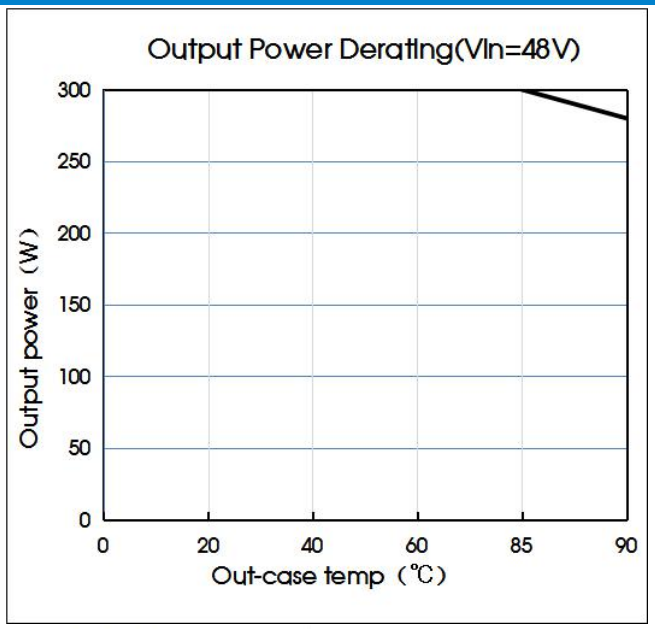
Mechanical Specifications

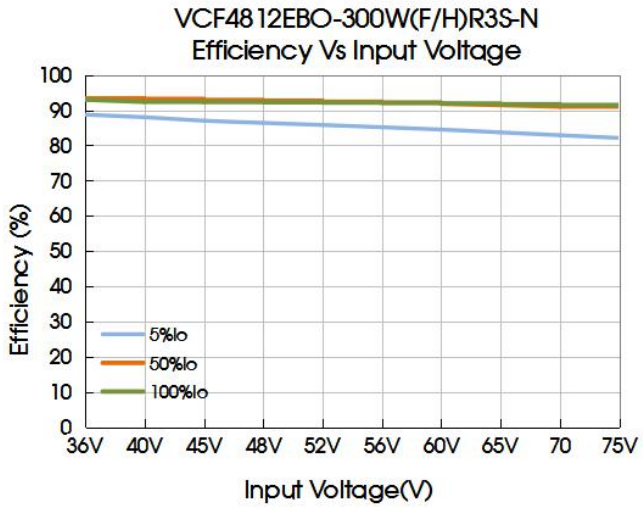
Shell Material	Aluminium alloy shell	
Dimensions	VCF48_EBO300WR3S-N	58.42 x 22.86 x10.7 mm
	VCF48_EBO300WFR3S-N	58.42 x 22.86 x 13.2 mm
	VCF48_EBO300WHR3S-N	58.42 x 22.86 x 25.9 mm
Weight	VCF48_EBO300WR3S-N	30.5g(Typ.)
	VCF48_EBO300WFR3S-N	42g(Typ.)
	VCF48_EBO300WHR3S-N	61g(Typ.)
Cooling Method	Natural convection or forced air convection	

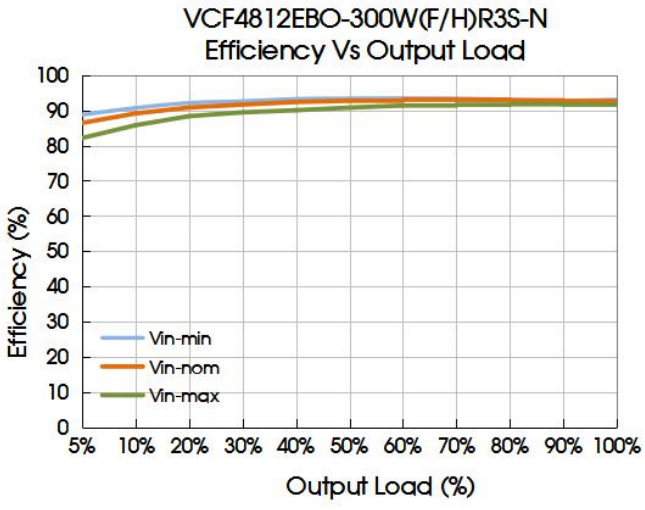
Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS B (see Fig. 6 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS B (see Fig. 6 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6KV/Air ±8KV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m (see Fig. 6 for recommended circuit)	perf. Criteria B
	EFT	IEC/EN61000-4-4 100KHz ±2KV (see Fig. 6 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5 line to line ±2KV (see Fig. 6 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6 3 Vr.m.s (see Fig. 6 for recommended circuit)	perf. Criteria B

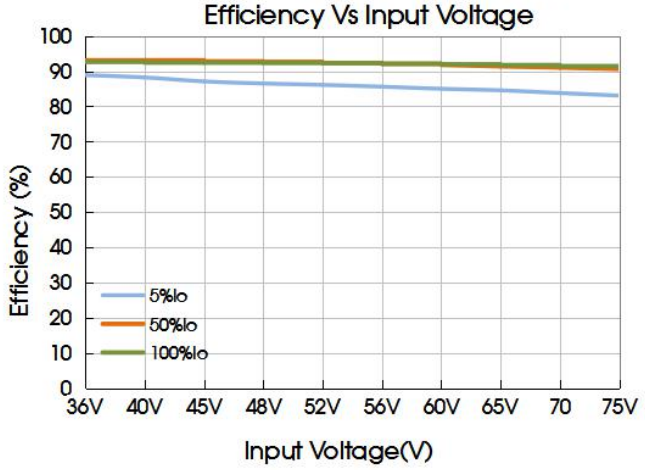
Typical Characteristic Curve



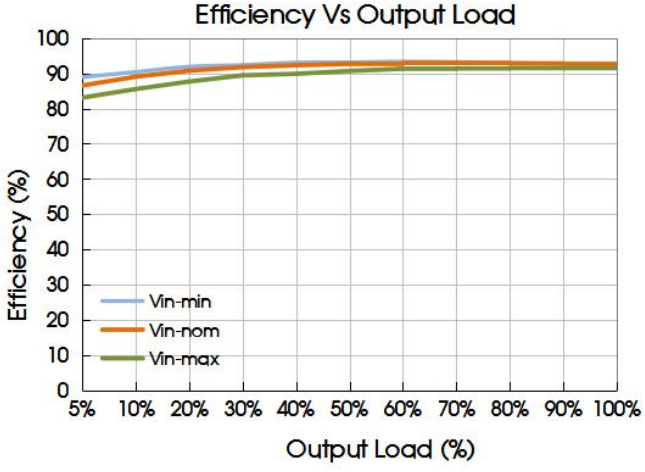




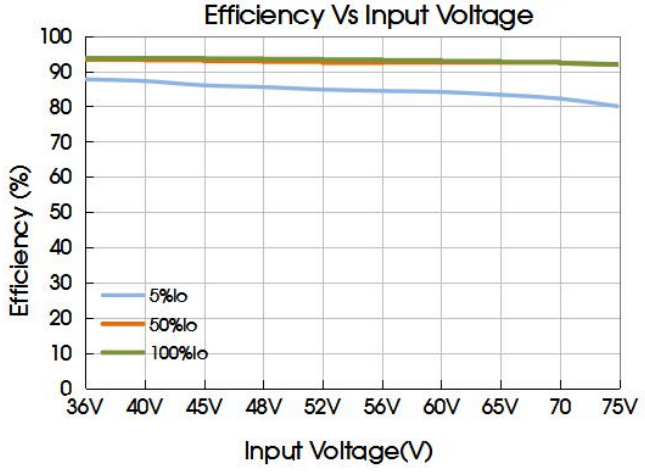
VCF4815EBO-300W(F/H)R3S-N
Efficiency Vs Input Voltage



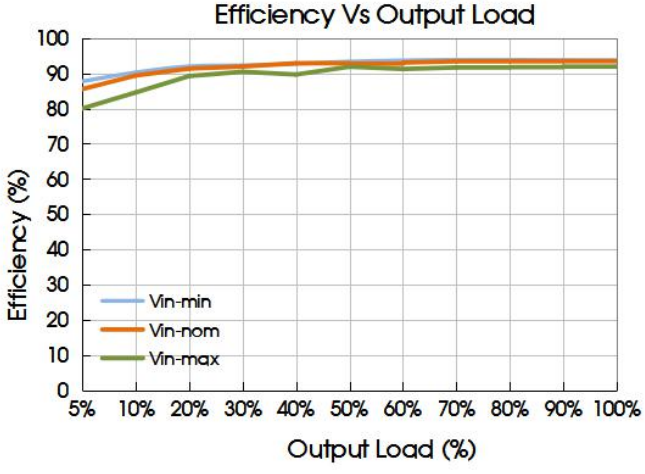
VCF4815EBO-300W(F/H)R3S-N
Efficiency Vs Output Load



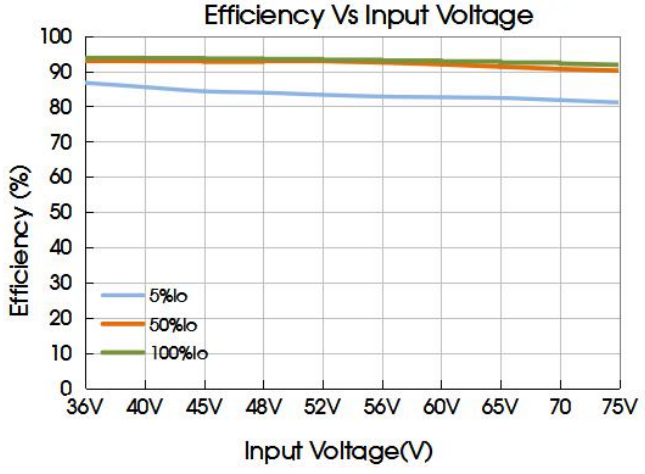
VCF4824EBO-300W(F/H)R3S-N
Efficiency Vs Input Voltage



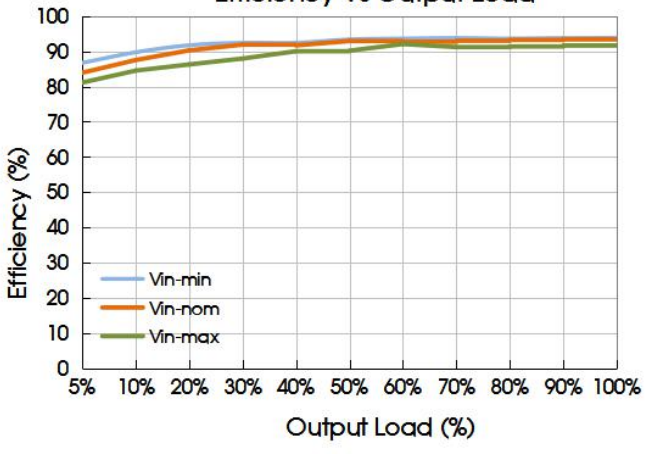
VCF4824EBO-300W(F/H)R3S-N
Efficiency Vs Output Load



VCF4828EBO-300W(F/H)R3S-N
Efficiency Vs Input Voltage



VCF4828EBO-300W(F/H)R3S-N
Efficiency Vs Output Load



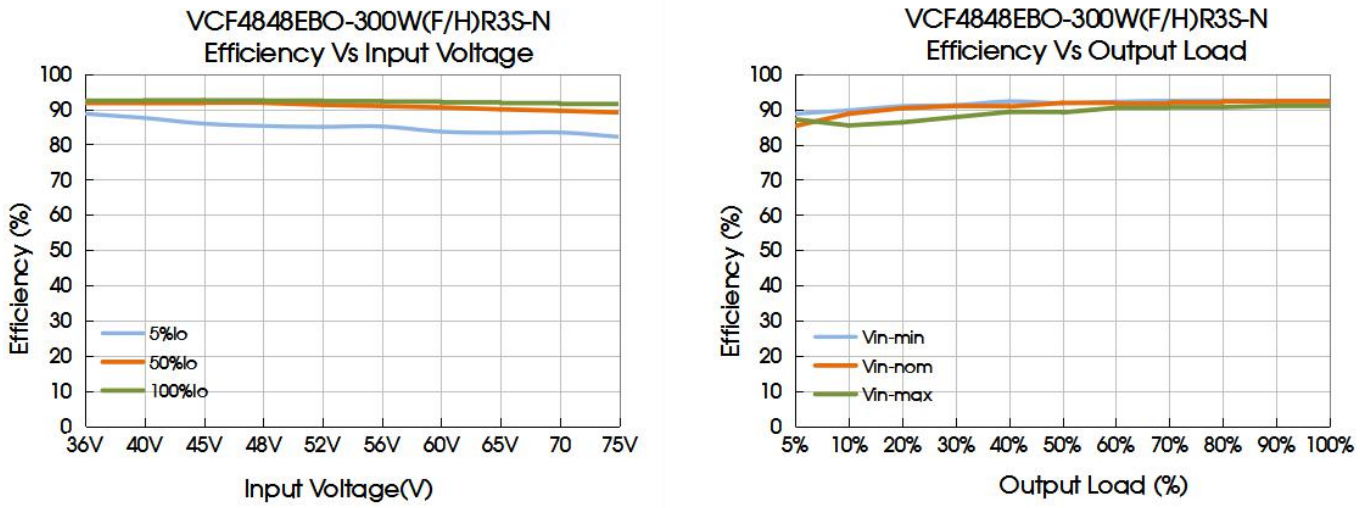


Fig. 1

Remote Sense Application

1. Remote Sense Connection if not used

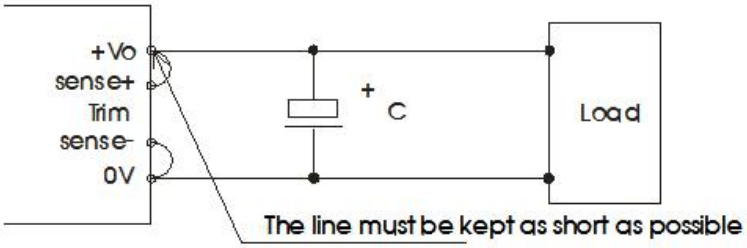


Fig. 2

Note：
(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

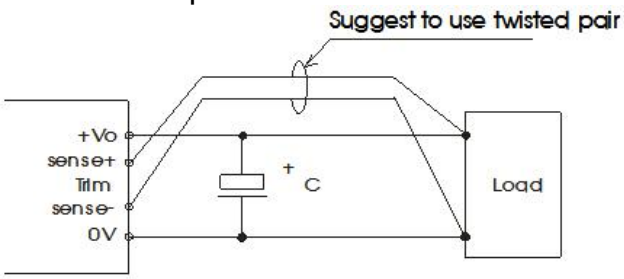


Fig. 3

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. 4.

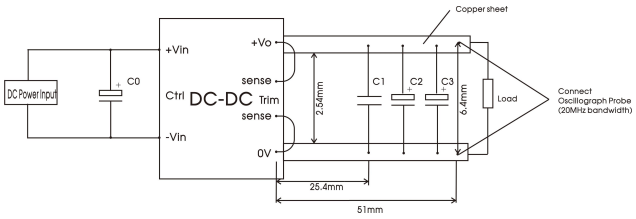


Fig. 4

Capacitors value / Output voltage	C0	C1	C2	C3
12V/15V//24V/ 28V/48VDC	100μF/ 100V	1μF/50V	10μF/50V	680μF/63V

2. Typical application

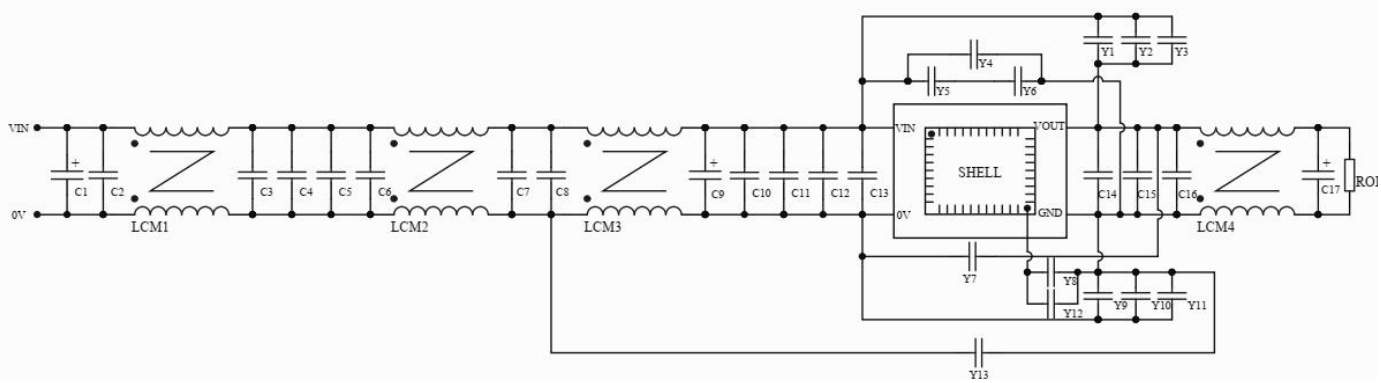
All DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 5.
We recommended using Mornsun's EMC circuit, otherwise please ensure that at least a 100μF electrolytic capacitors is connected at the input in order to ensure adequate voltage surge suppression 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. 5

Capacitors value / Output voltage	Cout(min.)	Cin
12V/15V//24V/ 28V/48VDC	680μF	100μF

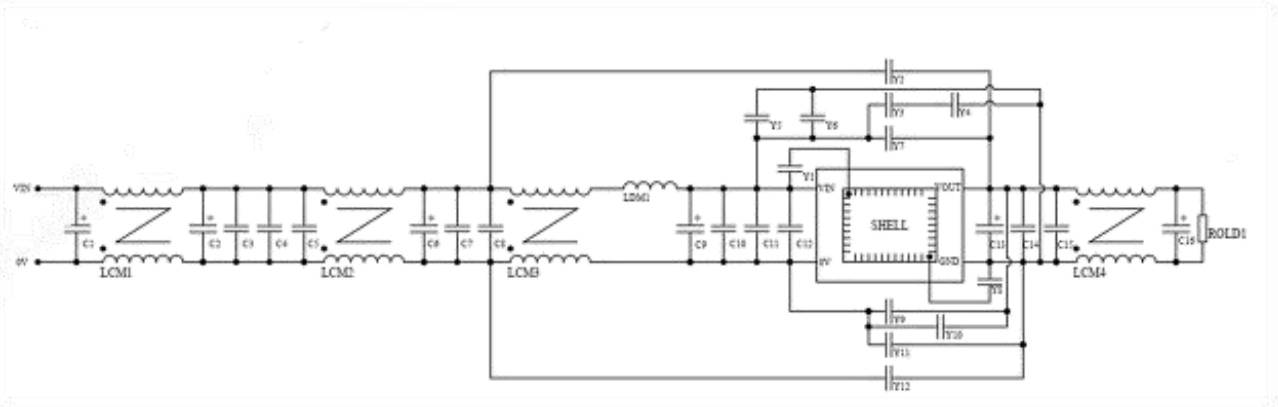
3. EMC compliance recommended circuit

VCF4812/15EBO-300W(F/H)R3S-N



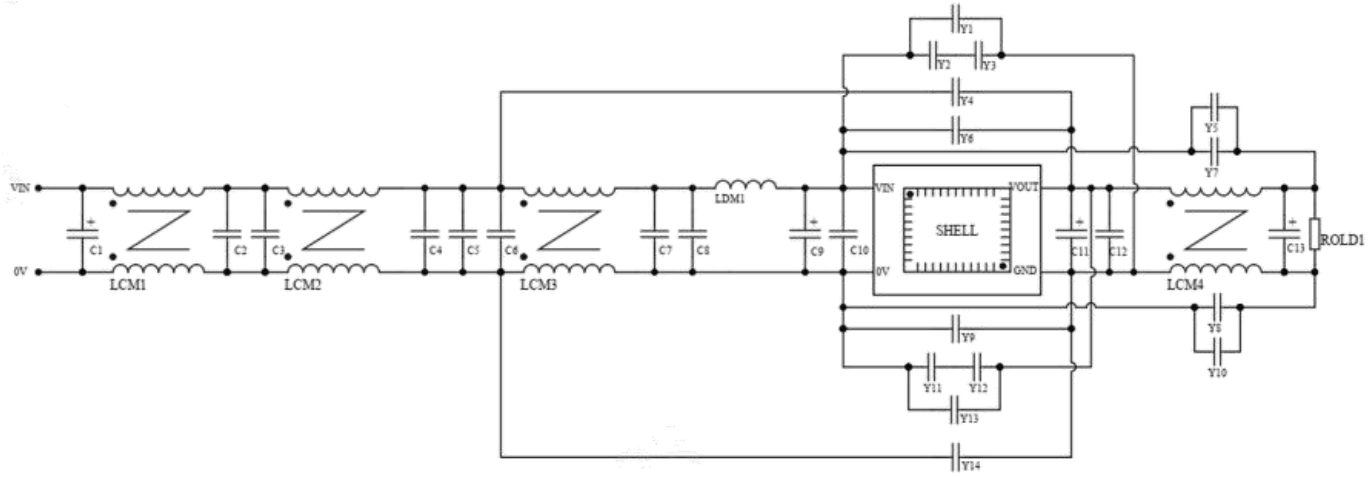
Device	Parameters
C1	100uF/200V
C2/C3/C7/C10	225K/250V
C4/C5/C11/C12/C13/C14/C15/C16	105K/100V
C6/C8	225K/450V,Film capacitor
C9	470uF/100V
C17	330uF/63V
Y1/Y4/Y8/Y11	100pF/400VAC
Y2/Y3/Y9/Y10	4.7nF/400VAC
Y5/Y6	1nF/400VAC
Y7	2.2nF/400VAC
Y12/Y13	220pF/400VAC
LCM1	90uH, recommended to use MORNSUN P/N: FL2D-A0-900
LCM2	200uH, recommended to use MORNSUN P/N: FL2D-B0-201
LCM3	10mH, recommended to use MORNSUN P/N: FL2D-A2-103
LCM4	1mH, recommended to use MORNSUN P/N: FL2D-A5-102

VCF4824/28EBO-300W(F/H)R3S-N



Device	Parameters
C1	100uF/200V
C2/C9	1000uF/63V
C3/C10/C14	225k/250V
C4/C8/C11/C15	101/100V
C5/C12	225K/450V, Film capacitor
C6	82uF/63V
C7	225k/250V
C13/C16	330uF/63V
Y1/Y6/Y7/Y8/Y9/Y11	100pF/400VAC
Y2/Y12	2.2nF/400VAC
Y3/Y4	1nF/400VAC
Y5/Y10	3.3nF/400VAC
LDM1	0.47uH, Differential inductance
LCM1	90uH, recommended to use MORNSUN P/N: FL2D-A0-900
LCM2	4.7mH, recommended to use MORNSUN P/N:FL2D-A5-472
LCM3	200uH, recommended to use MORNSUN P/N: FL2D-D0-201
LCM4	1.4mH, recommended to use MORNSUN P/N: FL2D-C5-142

VCF4848EBO-300W(F/H)R3S-N

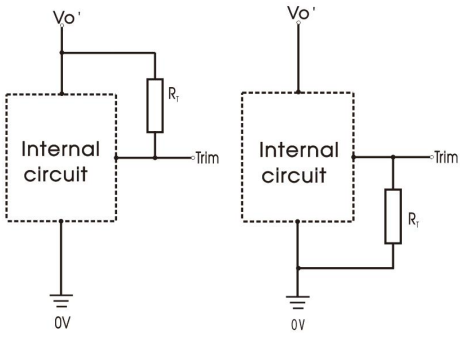


Device	Parameters
C1/C9	1000uF/100V
C2/C6/C7	225K/100V
C3/C8/C4	103K/100V

C5	222k/100V
C10	101/100V
C11	330uF/63V
C12	225K/250V
C13	220uF/63V
Y1/Y4/Y5/Y8/Y13/Y14	1nF/400VAC
Y2/Y7	2.2nF/400VAC
Y3/Y6/Y9/Y10/Y12	100pF/400VAC
Y11	220pF/400VAC
LCM1	10mH, recommended to use MORNSUN P/N: FL2D-A2-103
LCM2	1.0mH, recommended to use MORNSUN P/N: FL2D-A5-102
LCM3	4.7mH, recommended to use MORNSUN P/N: FL2D-A5-472
LDM1	0.15uH, Differential inductance

Fig. 6

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



Trim up Trim down

Fig. 7
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 testing

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 in Figure 8-1/Figure 8-2 (model with radiator, test at the same point). The temperature of point ABC in Figure 8-1 is belowe125℃, which is the stable working range of VCF4812/15/24/28EBO-300W(F/H)R3S(-N); The temperature of point ABCD in Figure 8-2 is belowe125℃, which is the stable working range of VCF4848EBO-300W(F/H)R3S(-N).

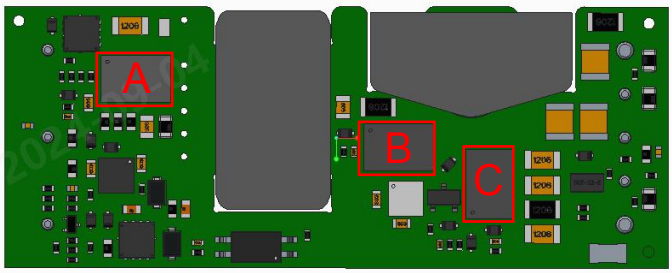


Fig. 8-1

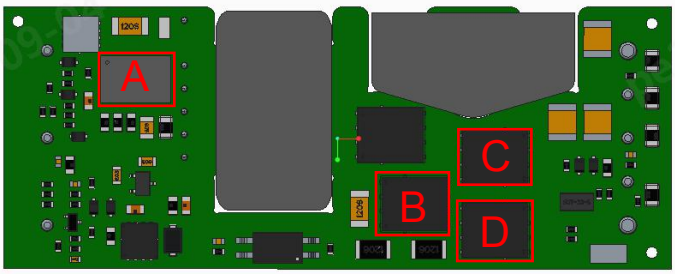


Fig. 8-2

6. Reflection ripple current test

The input reflected ripple current should be tested according to the peripheral circuit in Fig. 9

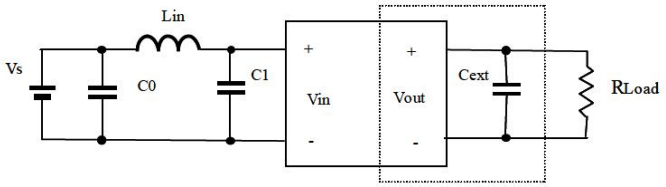


Fig. 9

Device	Parameter
C0	220μF/100V
Lin	10uH
C1	470μF/100V
Cext	680μF/63V

7. Safety Specification

The input is considered as safety extra low voltage (ES1/SELV) if one of the following conditions is met.

①The input source provides double or reinforced insulation from the AC mains according to IEC/EN/UL 62368-1;

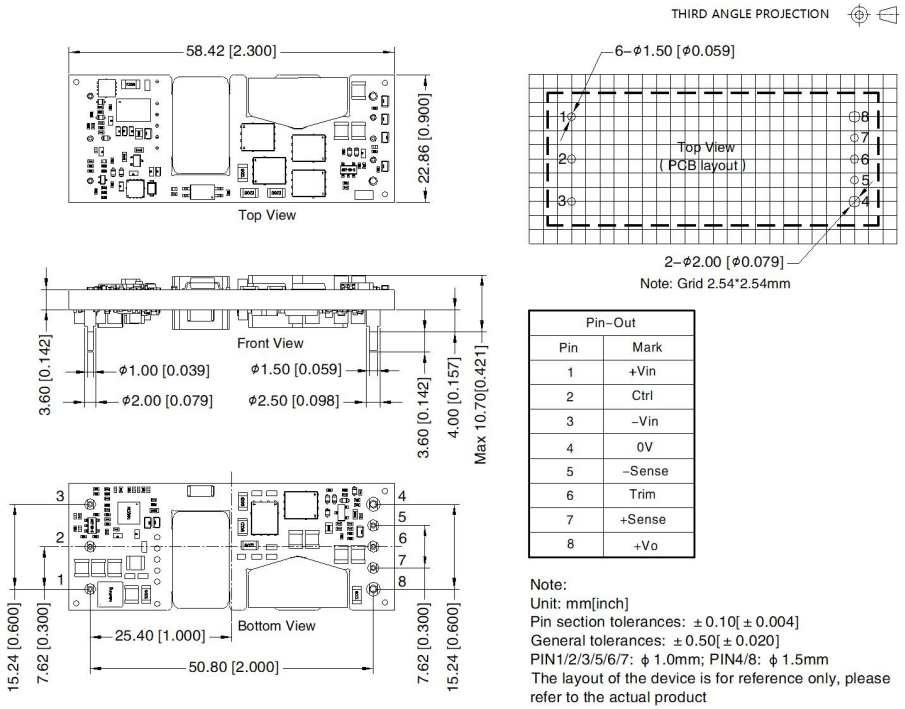
②The input source provides basic or supplementary insulation from the AC mains and product's output is reliably connected to protective earth according to IEC/EN/UL 62368-1;

③The input source is reliably connected to protective earth and provides basic or supplementary insulation according to IEC/EN/UL 62368-1 and the maximum input source voltage is 60Vdc.

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

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

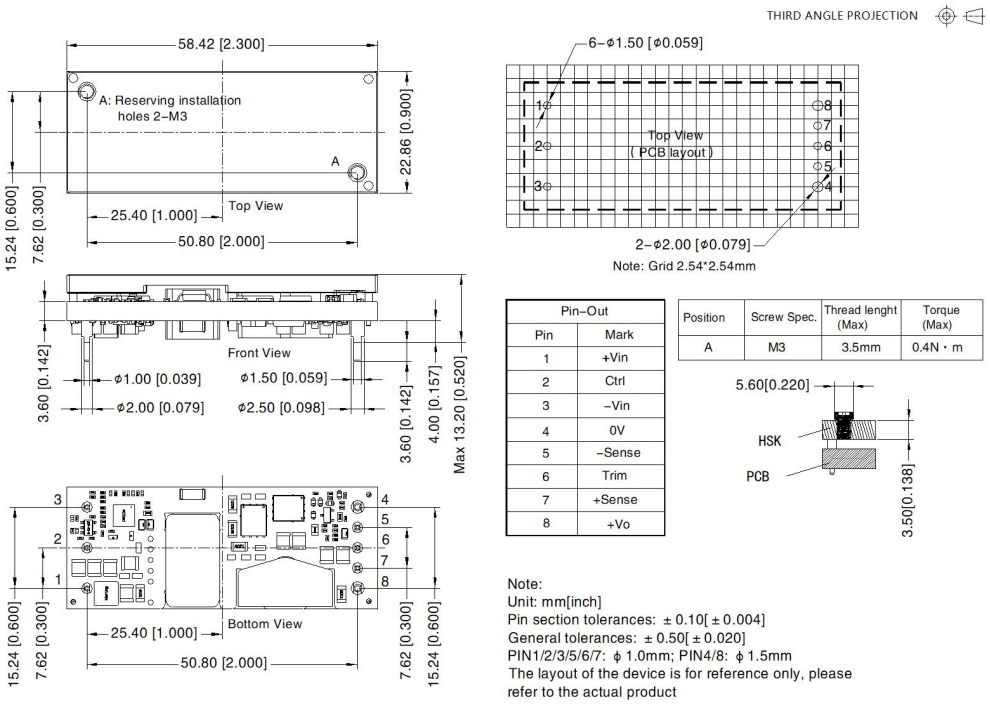
VCF48_EBO-300WR3S-N Dimensions and Recommended Layout



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

Note:
Unit: mm[inch]
Pin section tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
PIN1/2/3/5/6/7: ϕ1.0mm; PIN4/8: ϕ1.5mm
The layout of the device is for reference only, please refer to the actual product

VCF48_EBO-300WFR3S-N Dimensions and Recommended Layout

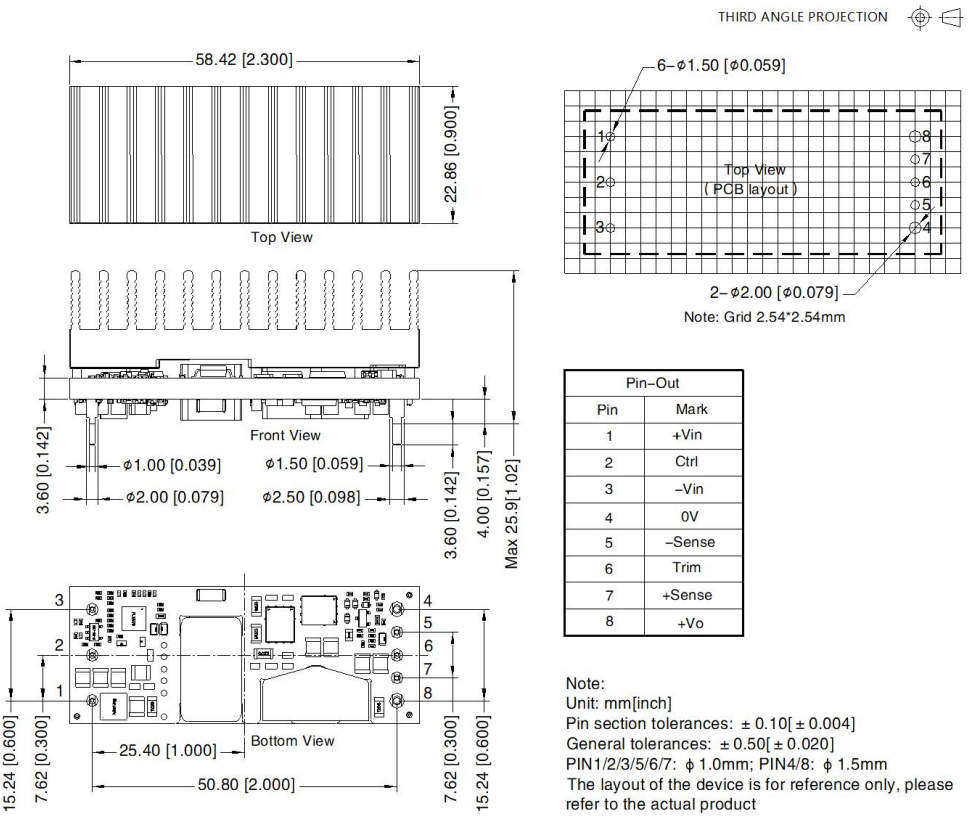


Pin-Out	
Pin	Mark
1	+Vin
2	Ctrl
3	-Vin
4	0V
5	-Sense
6	Trim
7	+Sense
8	+Vo

Position	Screw Spec.	Thread lenght (Max)	Torque (Max)
A	M3	3.5mm	0.4N・m

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
PIN1/2/3/5/6/7: ϕ 1.0mm; PIN4/8: ϕ 1.5mm
The layout of the device is for reference only, please refer to the actual product

VCF48_EBO-300WHR3S-N Dimensions and Recommended Layout



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

Note:
Unit: mm[inch]
Pin section tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
PIN1/2/3/5/6/7: ϕ 1.0mm; PIN4/8: ϕ 1.5mm
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：VCF48_EBO-300W(F)R3S-N：58210192、VCF48_EBO-300WHR3S-N：58210190；
2. We suggest to use module at load of over 10%, if not, the ripple of the product may exceeds the specification, but does not affect the reliability of the product;
3. If the product works below the minimum required load, it is not guaranteed that the product performance meets all performance indicators in this manual
4. The maximum capacitive load offered were tested at input voltage range and full load;
5. 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;
6. All index testing methods in this datasheet are based on company corporate standards;
7. We can provide product customization service, please contact our technicians directly for specific information;
8. Products are related to laws and regulations: see "Features" and "EMC";
9. 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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