DC/DC Converter

VCF48_TBO-60W(F)R3S-N Series

MORNSUN®

60W isolated DC-DC converter
Wide input and regulated single output

Patent Protection RoHS

FEATURES

- Wide input voltage range: 36V-75V
- I/O isolation test voltage 2250 VDC
- Input under-voltage protection, output over-current, short- circuit, over–voltage, over–temperatur protection
- Operating ambient temperature range: -40℃ to +85℃
- Industry standard package: 1/32 brick, meet DOSA standard

VCF48_TBO-60W(F)R3S-N series of isolated 60W DC-DC converter products with an wide 2:1 input voltage range. Input to output isolation is tested with 2250VDC and the converter safety operate ambient temperature of -40℃ to +85℃, input under-voltage protection, output over-current, short-circuit over-voltage protection. They are widely used in communication field, such as switches, repeaters, intelligent communication gateways, GPS synchronous clock and 4G/5G base station related DC power supply and other equipment.

Selection Guide

Certification	Part No.①	Ctrl Logic②	Input Voltage (VDC)		Output		Full Load Efficiency④ (%) Min./Typ.	Capacitive Load (uF)Max.
			Nominal (Range)	Max.③	Voltage (VDC)	Current(mA) Max./Min.		
--	VCF4803TBO-60W(F)R3S-N	N	48 (36-75)	80	3.3	15150/0	87/89	6060
	VCF4805TBO-60W(F)R3S-N				05	12000/0	89/91.5	4800
	VCF4812TBO-60W(F)R3S-N				12	5000/0	89/91.5	2000

Notes:
① Use suffix"F"for the heat sink package;
② "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, 3.3V output	--	1170/20	1198/30	mA
	Nominal input voltage, 5/12V output	--	1366/20	1404/30	
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		LC filter			
Hot Plug		Unavailable			
Ctrl①	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	--	10	20	mA

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

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, Nominal input voltage		--	200	500	us
Transient Response Deviation	25% load step change, Nominal input voltage	3.3V output	--	±5	±8	%Vo
		5V output	--	±4	±5	
		12Voutput	--	±3	±5	
Temperature Coefficient	Full load		--	--	±0.03	%/℃
Ripple & Noise①	20MHz bandwidth, nominal input voltage, 5%-100% load	3.3V/5V	--	100	120	mVp-p
		12V	--	120	150	
Trim	Input voltage range		90	--	110	%Vo
Sense			--	--	105	
Over-voltage Protection			110	130	160	%Vo
Over-current Protection			110	140	190	%Io
Short-circuit Protection			Continuous, self-recovery			

Note:
①Linear Regulation at 0%-100% load is ±3% max.
②0% -5% load Ripple & Noise less than or equal to 5%Vo. Ripple & Noise are tested according to the recommended circuit Figure 2, and the method by test shall prevail.
③ If the low-voltage input is 36-40VDC, the protection function may enter burp protection mode.

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.	2250	--	--	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		10-500Hz, 0.07g²/Hz, 10 Min. along X, Y and Z			
Switching Frequency *	PWM mode	--	400	--	kHz
MTBF	MIL-HDBK-217F@25℃	500	--	--	k hours

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

Mechanical Specifications

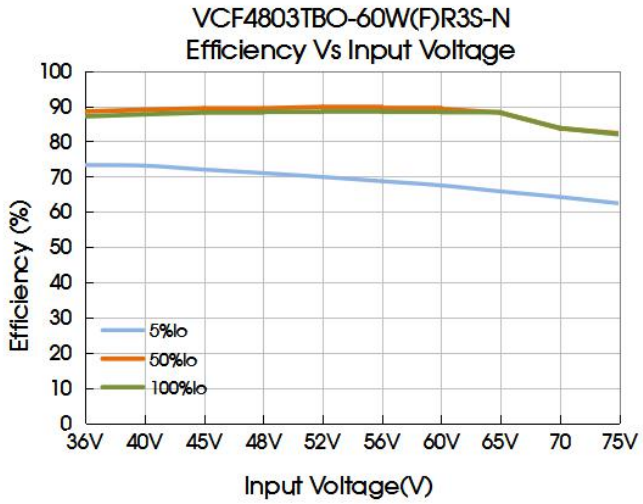
Dimensions	VCF4803/05/12TBO-60WR3S-N	23.36 x 19.05 x 12.7mm
	VCF4803/05/12TBO-60WFR3S-N	23.36 x 19.05 x 15.0mm
Weight	VCF4803/05/12TBO-60WR3S-N	12.0g(typ.)
	VCF4803/05/12TBO-60WFR3S-N	16.6g(typ.)
Cooling method	Natural convection or forced air convection	

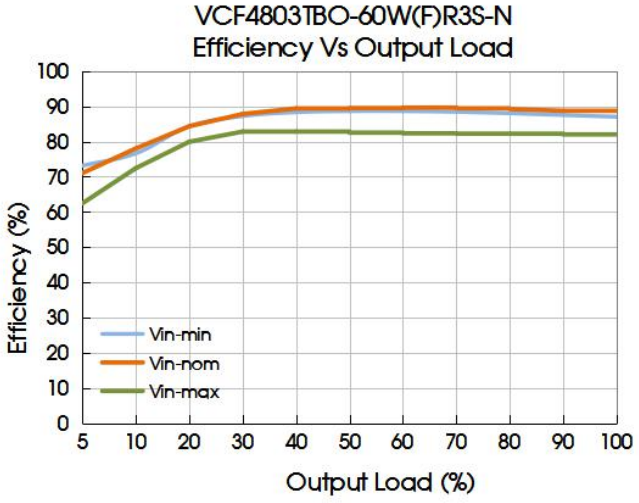
Electromagnetic Compatibility (EMC)

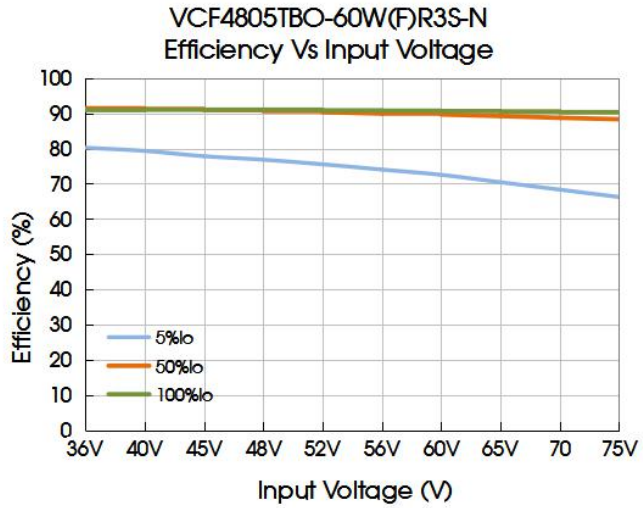
Emissions	CE	CISPR32/EN55032 CLASS A (see Fig.4 for recommended circuit) /CLASS B (see Fig.5 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (see Fig.4 for recommended circuit) /CLASS B (see Fig.5 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6kV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A

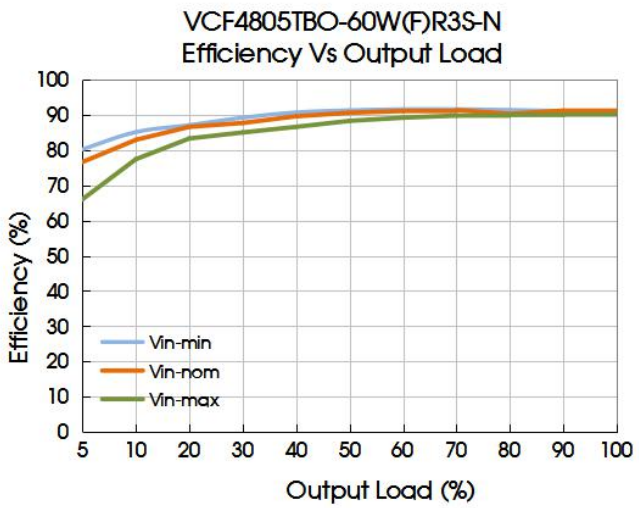
	EFT	IEC/EN61000-4-4	100kHz ±2kV (see Fig.4 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN61000-4-5	line to line ±2kV (see Fig.4 for recommended circuit)	perf. Criteria B
	CS	IEC/EN61000-4-6	3 Vr.m.s	perf. Criteria A
Note: *Out-case is not support static protection.				

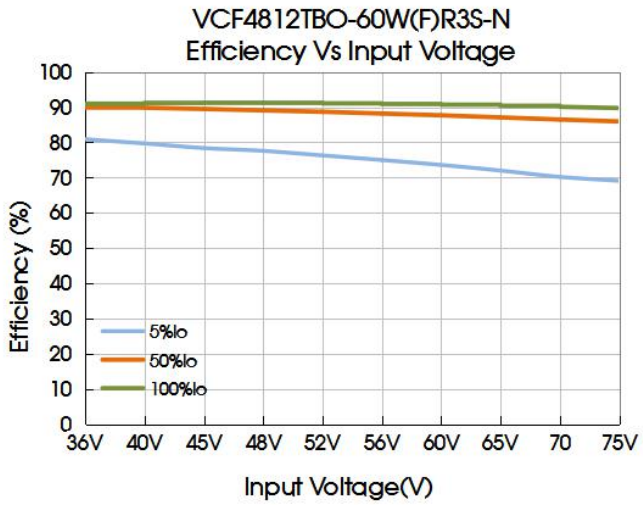
Temperature Derating Curve

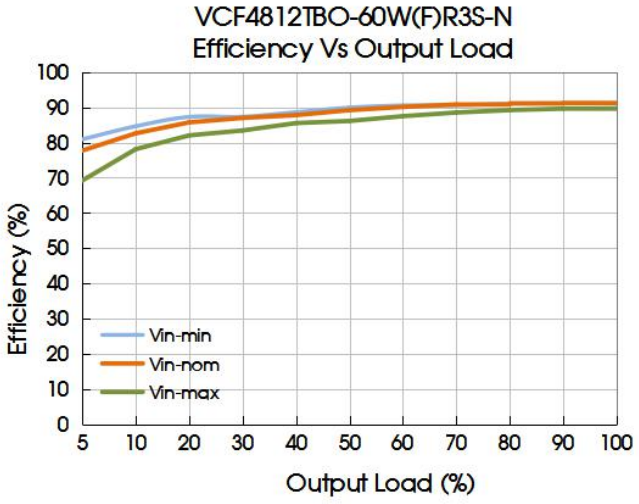












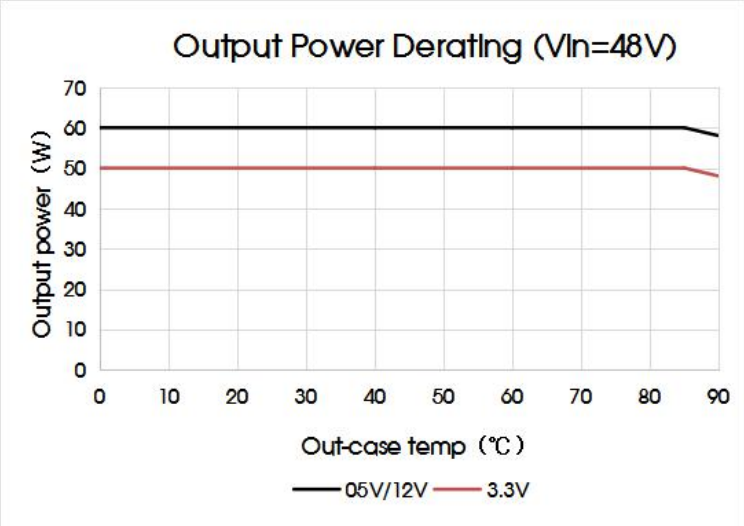
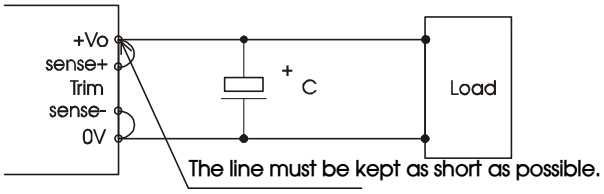


Fig.1

Note:
1.For preliminary evaluation only.
2. Test conditions: The maximum temperature rise of the shell evaluates the allowable load of the product under the corresponding conditions, and the maximum temperature of the shell at the corresponding load point should be controlled below the corresponding horizontal coordinate temperature.

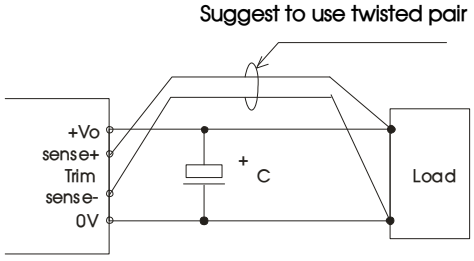
Remote Sense Application

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. Ripple & Noise

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

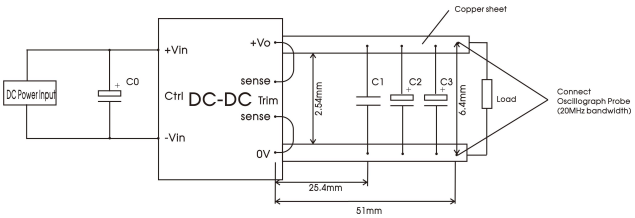


Fig. 2

Parameter explaination:

Capacitors value / Output voltage	C0	C1	C2	C3
3.3/5/12VDC	100uF/100V	1uF/50V	10uF/35V	330uF/ 63V(solid)

2. Typical application

We recommended using Mornsun's EMC circuit, otherwise please ensure that at least a 100uF 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

Parameter explaination:

Capacitors value / Output voltage	Cin	Cout
3.3/5/12VDC	100uF/100V	330uF/63V (solid)

3. EMC compliance recommended circuit

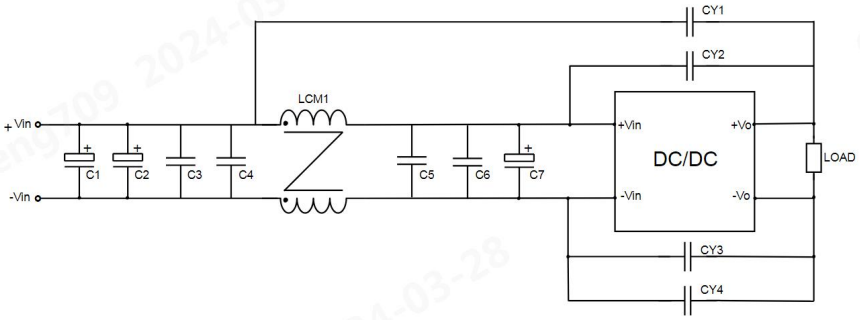
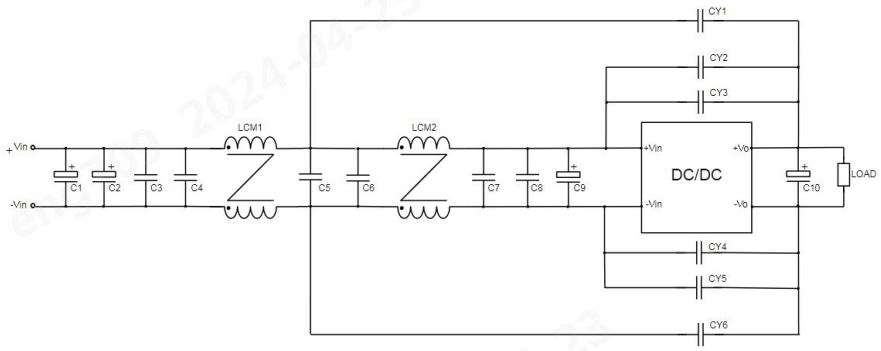


Fig. 4

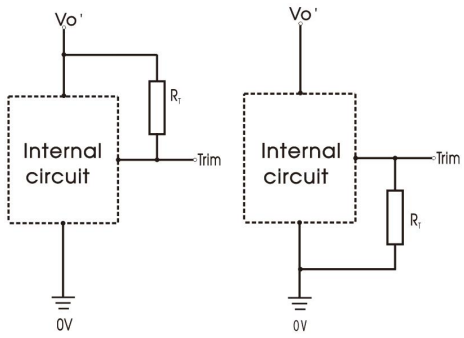
Model	Vo:3.3/5/12V
C1/C2	1000uF/100V
C3/C4/C5/C6	4.7uF/100V
C7	100uF/100V
LCM1	18mH, Φ0.2*1.5mm Wire diameter
CY1/CY2/CY3/CY4	2.2nF/400VAC



Model	Vo: 3.3/5/12V
C1/C2	1000uF/100V
C3/C4/C5/C6/C7/C8	4.7uF/100V
C9	100uF/100V
C10	330uF/63V
LCM1/LCM2	18mH, Φ0.2*1.5mm Wire diameter
CY2/CY3/CY4/CY5	1nF/400VAC
CY1/CY6	4.7nF/400VAC

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 ABCD in Figure 6. When the temperature at point ABCD is lower than 125° C, it is the stable working range of the product.

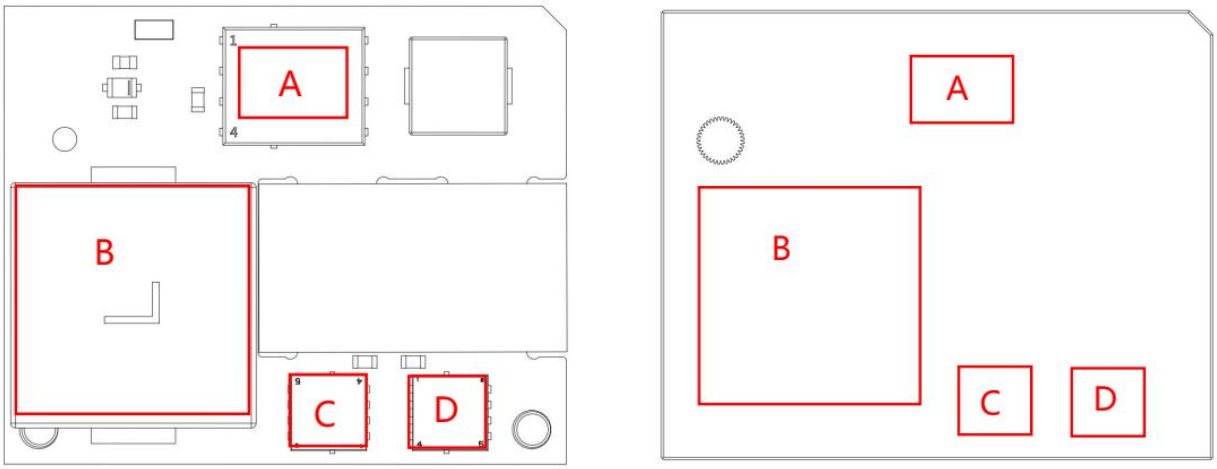
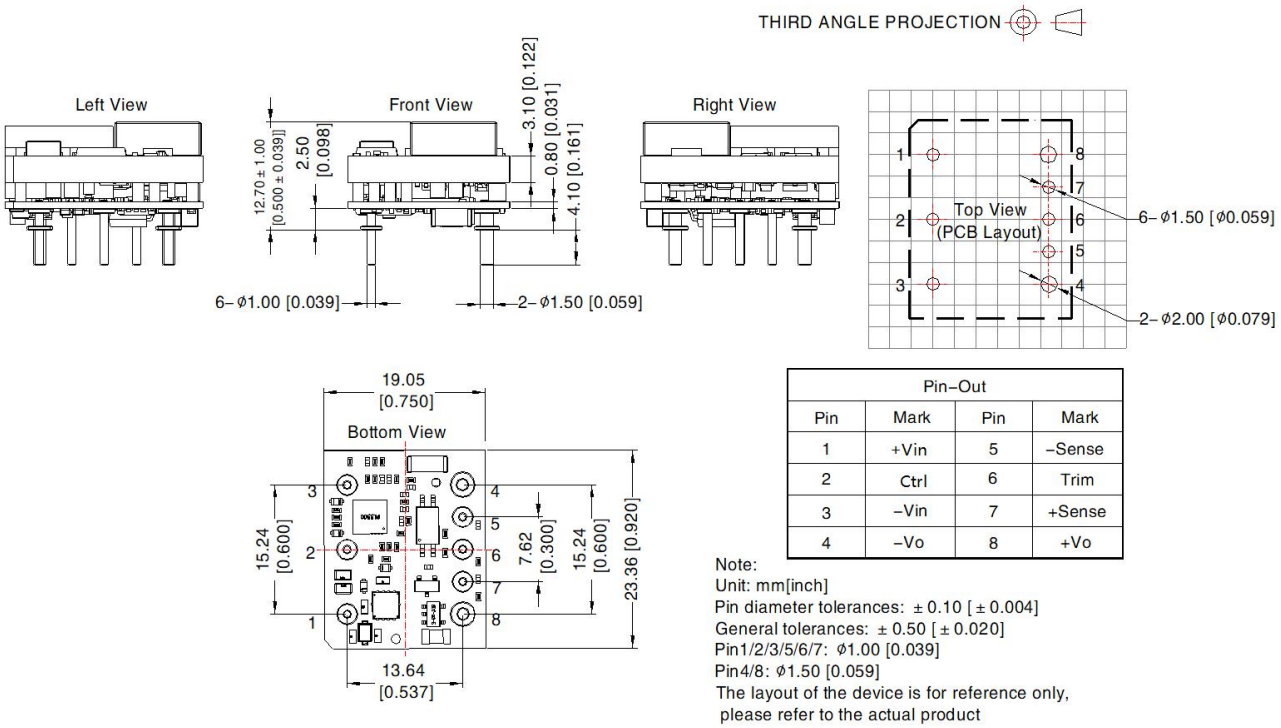


Fig. 6

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

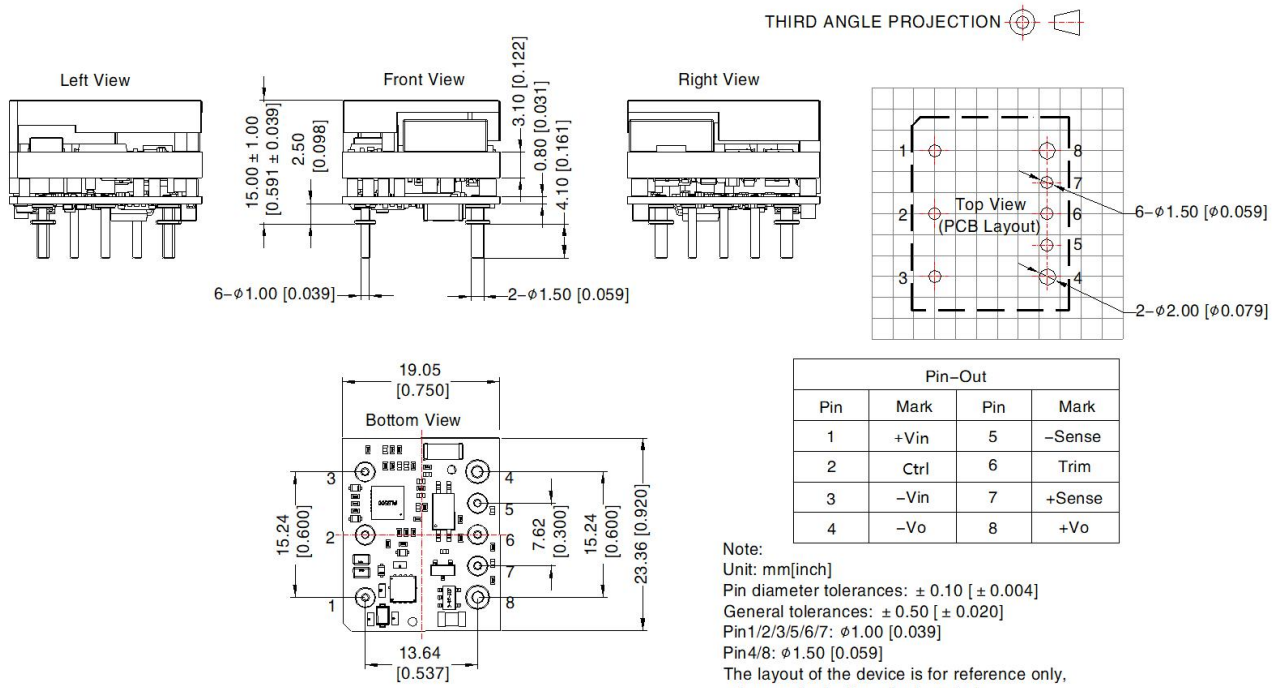
VCF4803/05/12TBO-60WR3S-N Dimensions and Recommended Layout



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

Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10 [± 0.004]
General tolerances: ± 0.50 [± 0.020]
Pin1/2/3/5/6/7: ϕ1.00 [0.039]
Pin4/8: ϕ1.50 [0.059]
The layout of the device is for reference only, please refer to the actual product

VCF4803/05/12TBO-60WFR3S-N Dimensions and Recommended Layout



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Pin	Mark	Pin	Mark
1	+Vin	5	–Sense
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Note:
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Pin1/2/3/5/6/7: φ1.00 [0.039]
Pin4/8: φ1.50 [0.059]
The layout of the device is for reference only, please refer to the actual product

Notes:
1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number：58210416；
2. If the product works below the minimum required load, it cannot be guaranteed that the product performance meets all performance indicators in this manual;
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 product customization service, please contact our technicians directly for specific information;
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.

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