

FEATURES:

- ◆ Ultra-wide 9-75V_{DC} input voltage range
- ◆ High efficiency up to 92%
- ◆ I/O isolation test voltage 3000V_{DC}
- ◆ Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- ◆ Operating ambient temperature range: -40℃ to +70℃
- ◆ Industry standard pin-out
- ◆ Warranty period of three years

60W isolated DC-DC converter in DIP package
Ultra-wide input and regulated single output



CFDMU60-48GC series of isolated 60W DC-DC converter products with an ultra-wide 9-75V_{DC} input voltage range. They feature efficiencies up to 92%, input to output isolation is tested with 3000V_{DC} and the converter safely operate ambient temperature of -40℃ to +70℃, input under-voltage protection, output short-circuit, over-current, over-voltage protection. They are ideally and widely used in applications such as industrial control, electric power, instruments and communications fields.

Selection Guide

Certification	Part No. ①	Input Voltage(V _{DC})		Output		Full Load Efficiency ③ (%)Min./Typ.	Capacitive Load (μF)Max.
		No minal (Range)	Max. ②	Voltage(V _{DC})	Current(mA) Max./Min.		
	CFDMU60-48S05	48 (9-75)	80	5	12000/0	88/90	20000
	CFDMU60-48S12			12	5000/0	88/90	6000
	CFDMU60-48S15			15	4000/0	88/90	4000
	CFDMU60-48S24			24	2500/0	89/91	2000
	CFDMU60-48S28			28	2143/0	90/92	2000

Note:

- ① Use "S" suffix for heat sink mounting. We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;
 ② Exceeding the maximum input voltage may cause permanent damage;
 ③ Efficiency is measured at nominal input voltage and rated output load.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current(full load/no-load)	48Vdc input voltage	--	1389/15	1420/25	mA
Surge Voltage(1sec.max.)		-0.7	--	100	V _{DC}
Start-up Voltage		--	--	9	
Input Filter		Capacitance filter			
Hot Plug		Unavailable			
CNT ^①	Module on	CNT pin open or pulled high TTL (3-12V _{DC})			
	Module off	CNT pin pulled low to GND (0-1.2V _{DC})			
	Input current when off, 48Vdc input voltage	--	6	12	mA

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

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Output Voltage Accuracy	5%-100% load	--	±1	±2	%
	0%-5% load	--	±2	±5	
Linear Regulation	Input voltage variation from low to high at full load	--	±0.2	±0.5	
Load Regulation ①	5%-100% load	--	±0.5	±1	

Transient Response Deviation	25%load step change, input voltage range	5V output	--	±3	±10	%
		Other output	--	±3	±5	
Transient Recovery Time	25%load step change, nominal input voltage		--	250	500	μs
Ripple/Noise ^②	20MHz bandwidth, nominal input voltage 5%-100%load		--	130	200	mVp-p
Trim	Input voltage range		90	--	110	%Vo
Over-voltage Protection			110	140	160	
Over-current Protection			110	--	250	%Io
Short-circuit Protection			Continuous,self-recovery			
Note: ① Load regulation for 0% -100%load inc reases to ±3%; ② Under 0%-5%load conditions, ripple & noise doesnot exceed 5%Vo. The "Tip and barrel method" is used for ripple and noise test, please refer to Fig. 2. for recommended circuit.						

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input-output Elec tric Strength Test for 1 minute with a leakage current of 1mA max.	3000	--	--	V _{DC}
	Input/ output-Case Elec tric Strength Test for 1 minute with a leakage current of 1mA max.	1600	--	--	
Insulation Resistance	Input-output resistance at 500V _{DC}	100	--	--	MΩ
Isolation Capacitance	Input-output capac itance at 100kHz/0.1V	--	1000	--	pF
Operating Temperature	See Fig.1	-40	--	+70	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature *	Soldering spot is 1.5mm away from case for 10 seconds	--	--	<u>300</u>	℃
	Wave soldering,10 seconds	<u>255</u>	<u>260</u>	<u>265</u>	
Vibration		10-150Hz,5G,0.75mm.along X,Y and Z			
Switching Frequency ^①	PWM mode	--	255	--	kHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours

Note: *The pin resistance temperature is not the actual set temperature of the soldering iron, but the temperature required for a good solder joint. The ac tual set temperature by the customer needs to be comprehensively set based on the thic kness of the PCB, the size of the copper cladding, the power of the soldering iron, and the selection of the soldering iron tip.

①Switching frequenc y is measured at full load. The module reduces the switching frequenc y for light load (below 50%) effic ienc y improvement.

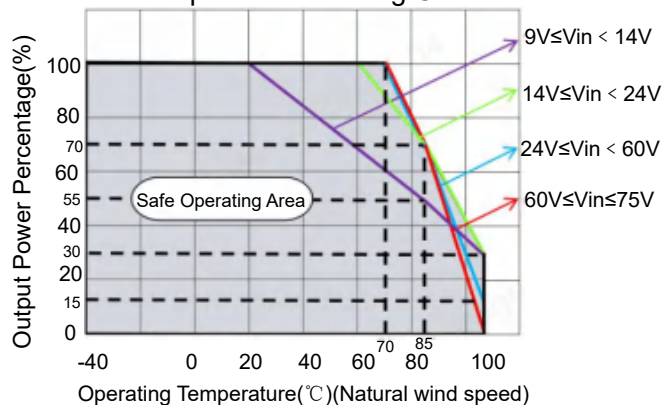
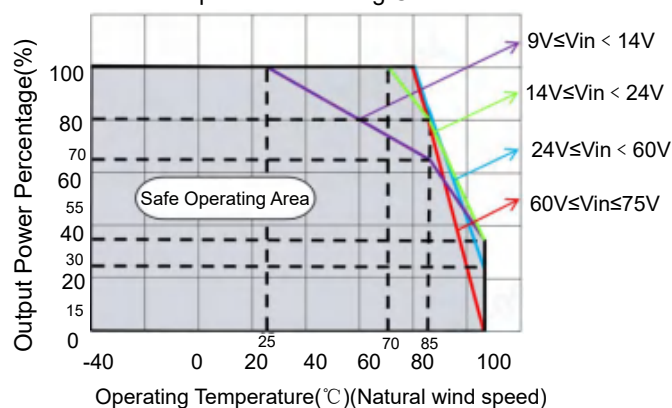
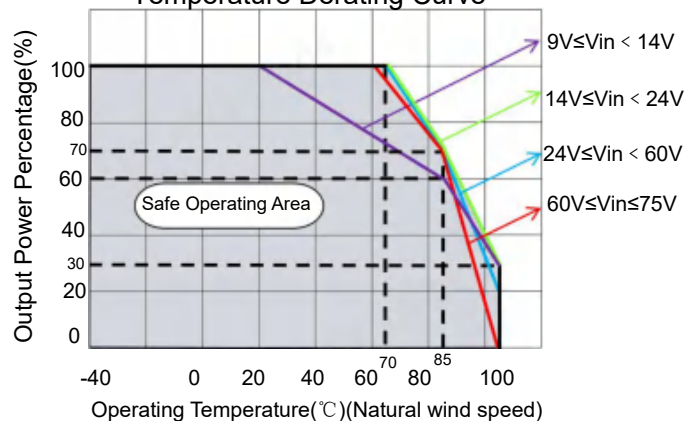
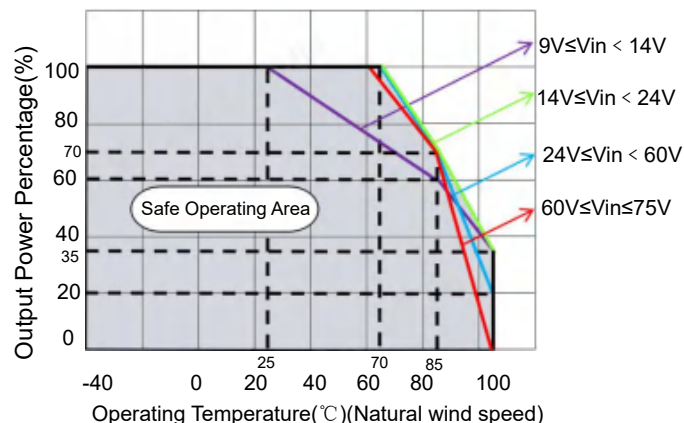
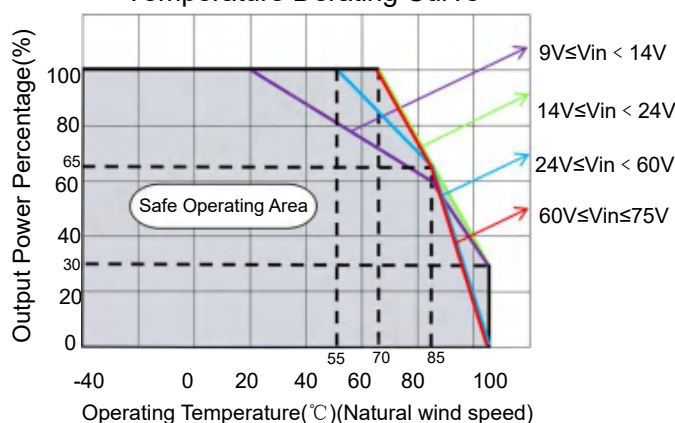
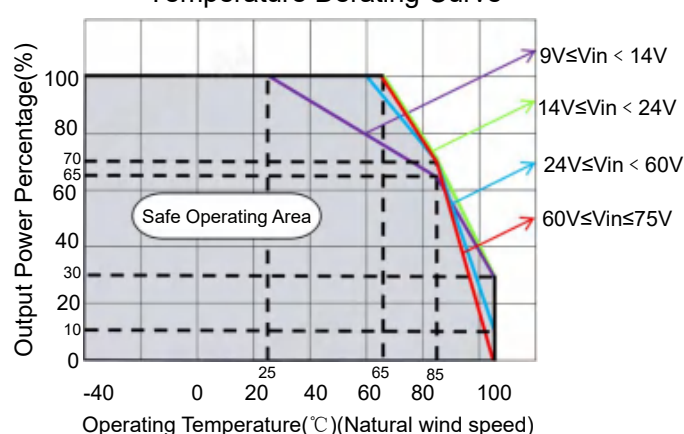
Mechanical Specifications

Case Material	Aluminum alloy	
Dimensions	Without heat sink	50.8×25.4×11.8mm
	Heat sink	51.4x26.2x16.5mm
Weight	Without heat sink	37.3g(Typ.)
	Heat sink	47.1g(Typ.)
Cooling Method	Free air convection	

Electromagnetic Compatibility(EMC)

Emissions	CE	CISPR32/EN55032 CLASS A(see Fig.3-①for recommended circuit) /CLASS B(see Fig.3-②for recommended circuit)			
	RE	CISPR32/EN55032 CLASS A(see Fig.3-①for recommended circuit) /CLASS B(see Fig.3-②for recommended circuit)			
Immunity	ESD	IEC/EN61000-4-2	Contact ±6kV/Air ±8kV	perf.Criteria B	
	RS	IEC/EN61000-4-3	10V/m	perf.Criteria A	
	EFT	IEC/EN61000-4-4	100kHz ±2kV (see Fig. 3-② for recommended circuit)	perf.Criteria A	
	Surge	IEC/EN61000-4-5	line to line ±2kV (see Fig. 3-② for recommended circuit)	perf.Criteria A	
	CS	IEC/EN61000-4-6	10Vr.m.s	perf.Criteria A	

Typical Characteristic Curves

CFDMU60-48S05
Temperature Derating CurveCFDMU60-48S05S
Temperature Derating CurveCFDMU60-48S12
Temperature Derating CurveCFDMU60-48S12S
Temperature Derating CurveCFDMU60-48S15
Temperature Derating CurveCFDMU60-48S15S
Temperature Derating Curve

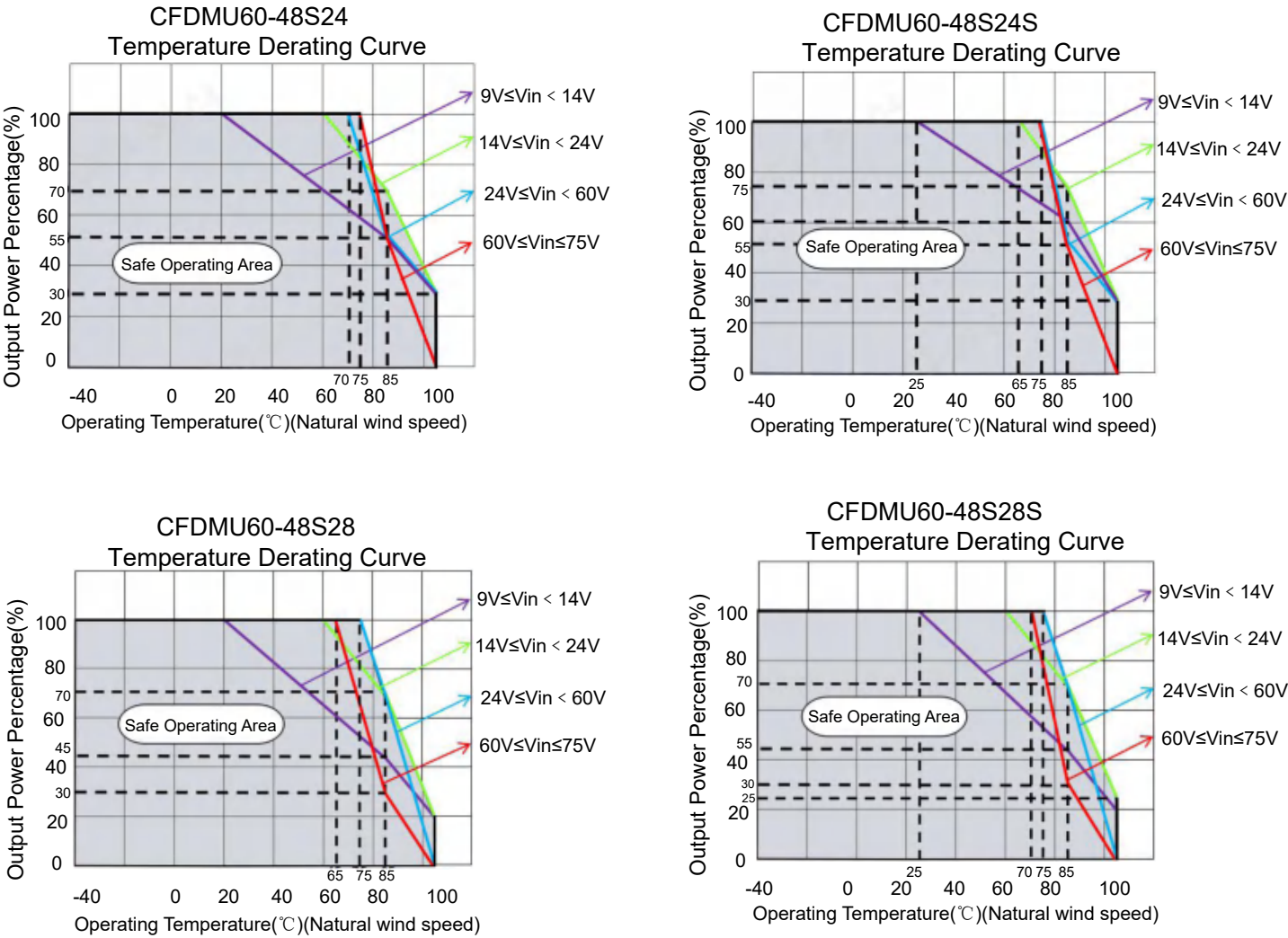


Fig.1

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 C_{in} and C_{out} 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.

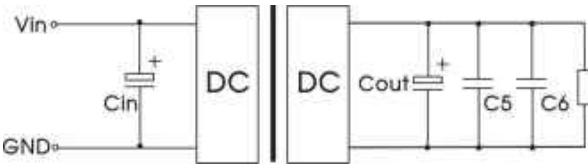


Fig.2

Vout (Vdc)	Cin	Cout	C5	C6
5	100μF/ 100V	220μF/ 50V	1μF/16V	10μF/16V
12/15			1μF/25V	10μF/25V
24/28			1μF/50V	10μF/50V

2.EMC compliance circuit

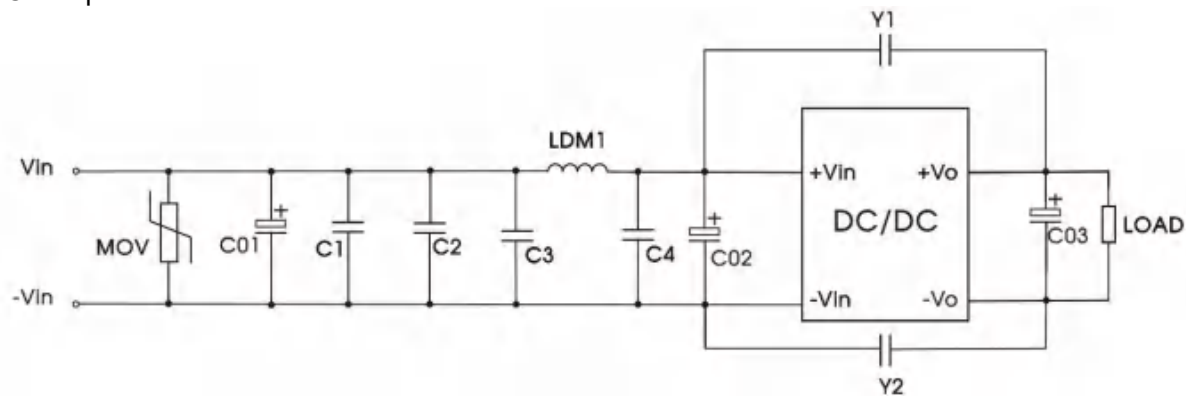


Fig.3-①

Table 1: recommended component parameters

Model	Parameter	Parameter description
C1/C2	4.7μF	100V
C3/C4	20μF	100V
C01	1000μF	100V
C02	470μF	100V
C03	330μF	50V
Y1/Y2	2.2nF	3000Vdc
LDM1	2.2μH	/
MOV	/	/

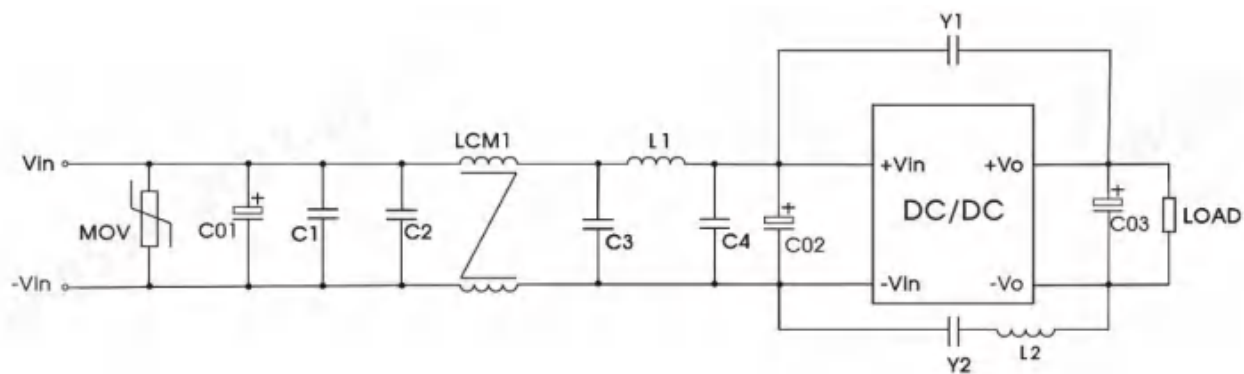
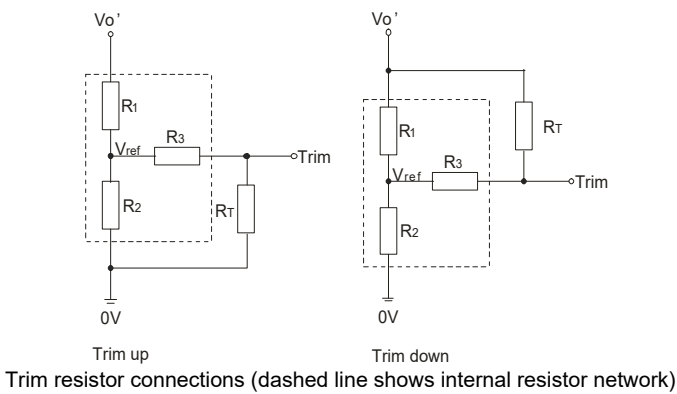


Fig.3-②

Table 2: recommended component parameters

Model	Parameter	Parameter description
C1/C2	4.7uF	100V
C3/C4	20uF	100V
C01	1000uF	100V
C02	470uF	100V
C03	330uF	50V
Y1/Y2	4.7nF	3000Vdc
LCM1	80uH	
L1	2.2uH	/
L2	0.3uH	/
MOV	/	/

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



Calculating Trim resistor values:

$$\text{up: } R_T = \frac{a R_2}{R_2 - a} - R_3$$

$$\text{down: } R_T = \frac{a R_1}{R_1 - a} - R_3$$

$$a = \frac{V_{ref}}{V_{o'} - V_{ref}} \cdot R_1$$

$$a = \frac{V_{o'} - V_{ref}}{V_{ref}} \cdot R_2$$

$$R_T = \text{Trim Resistor value}$$

$$a = \text{self-defined parameter}$$

$$V_{o'} = \text{desired output voltage}$$

Vout(VDC)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
05	2.97	2.87	8.1	2.5
12	10.91	2.87	15	2.5
15	14.35	2.87	12.1	2.5
24	24.77	2.87	6.1	2.5

4. Recommended solution for thermal testing

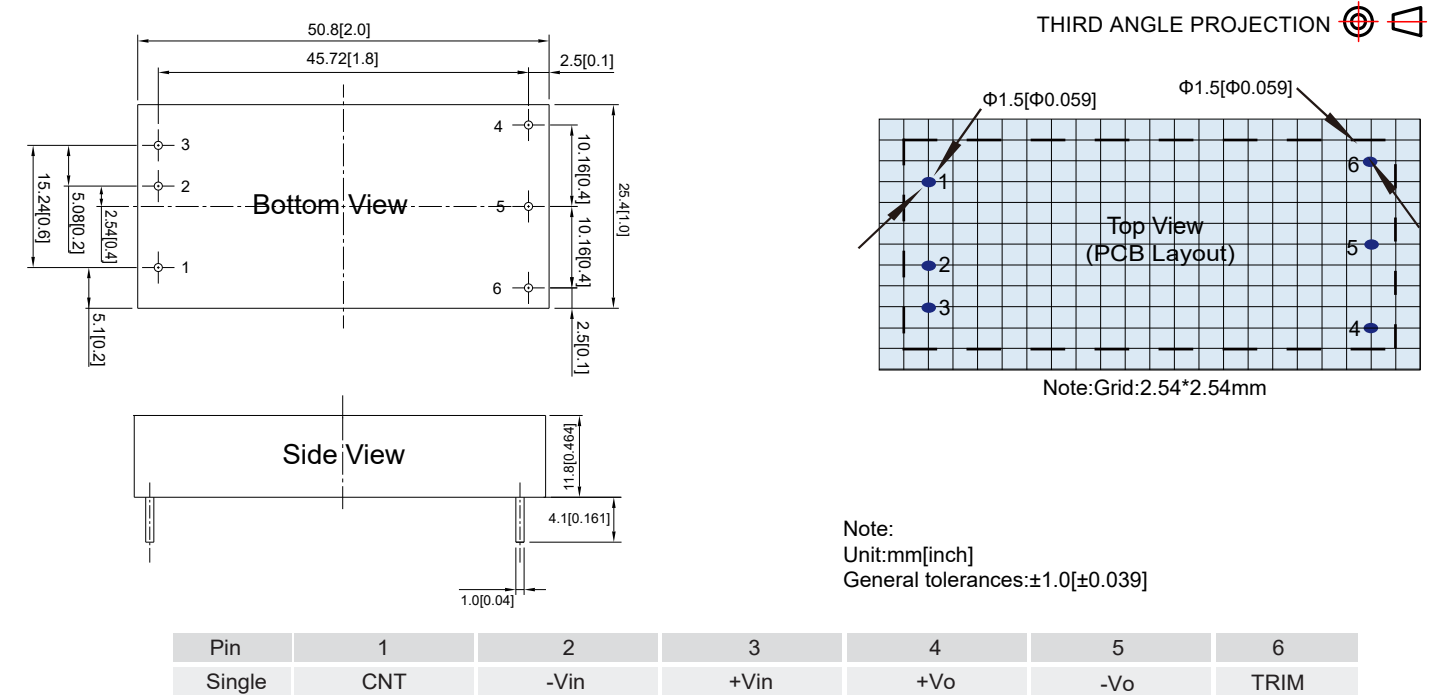
During the application process, the thermal design of the product can be evaluated in combination with the temperature derating curve of the product, or it can be determined by testing the temperature at point A, it is an safe operating area if the temperature lower than 100℃.



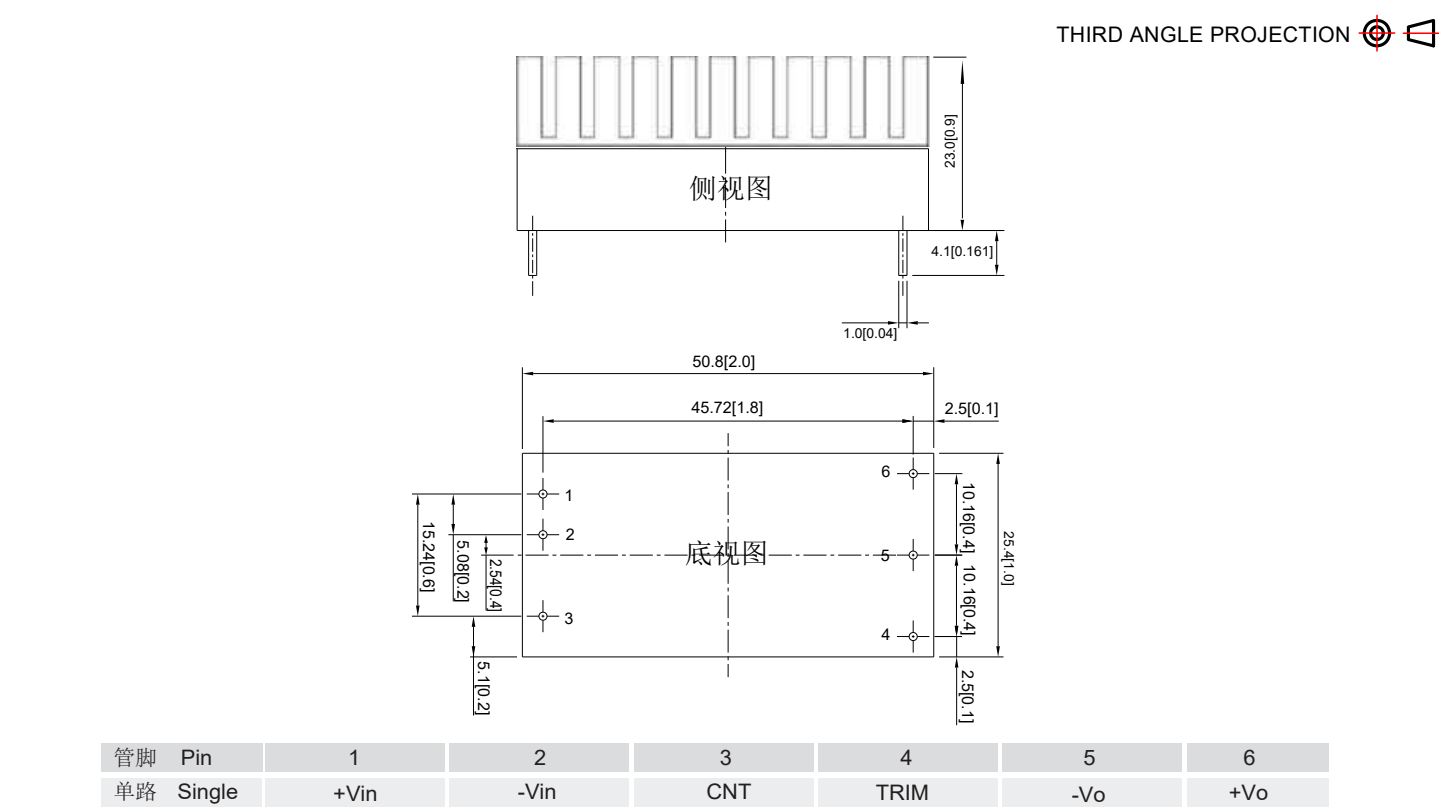
Fig.4

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

Horizontal Package(without heat sink)Dimensions and Recommended Layout



Horizontal Package(with heat sink)Dimensions





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