

FEATURES

- ◆ Wide input voltage range:36-75V_{DC}
- ◆ High efficiency up to 95%
- ◆ Basic insulation, I/O isolation test voltage 2250V_{DC}
- ◆ Operating ambient temperature range -40℃ to +100℃
- ◆ Input under-voltage protection, output over-voltage, over-current, short-circuit, over-temperature protection
- ◆ Industry standard 1/4-Brick package and pin-out
- ◆ Meet EN62368 standards
- ◆ 3 Years warranty

400W isolated DC-DC converter

Wide input and regulated single output



Selection Guide

Certification	PartNo. ①	Ctrl Logic ②	Input Voltage (Vdc)		Output		Full Load Efficiency(%) Min./Typ.	Max. Capacitive Load(μF)	Min. Capacitive Load ④(μF)
			Nominal (Range)	Max. ③	Voltage (Vdc)	Current(mA) (Max./Min.)			
-	CFDQ400-48S12		48 (36-75)	80	12	33000/0	93/95	10000	470
	CFDQ400-48S15				15	26500/0		6800	
	CFDQ400-48S24				24	16500/0		3300	
	CFDQ400-48S28				28	14200/0		3300	
	CFDQ400-48S12N	N			12	33000/0		10000	
	CFDQ400-48S15N				15	26500/0		6800	
	CFDQ400-48S24N				24	16500/0		3300	
	CFDQ400-48S28N				28	14200/0		3300	

Note:

① Use "F" suffix is for added aluminum baseplate and "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 "N" means negative logic;

③ Exceeding the maximum input voltage may cause permanent damage;

④ In order to ensure the output stability, a minimum capacitive load must be connected to the output side of the product.

Input Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Input Current(Full load/no load)	Nominal input voltage	CFDQ400-48S12(N)	--	--	8961/120	mA
		CFDQ400-48S15(N)	--	--	8961/150	
		CFDQ400-48S24(N)	--	--	8961/120	
		CFDQ400-48S28(N)	--	--	8961/150	
Reflected Ripple Current	Nominal input voltage		--	200	--	V _{DC}
Surge Voltage(1sec.max.)			-0.7	--	90	
Start-up Voltage			--	--	36	

Input Under-voltage Protection			30	32	--	
Start-up Time		Nominal input voltage, constant resistance load	--	--	100	ms
Input Filter			LC filter			
Hot Plug			Unavailable			
CNT ^①	CFDQ400-48S	Module on	CNT open circuit or connected to TTL high level (3.3-12V _{DC})			
		Module off	CNT pin connected to -Vin or low level (0-1.2V _{DC})			
		Input current when off	--	13	--	mA
		Respond Time	--	--	50	ms
	CFDQ400-48S_N	Module on	CNT pin pulled low to GND (0-1.2V _{DC})			
		Module off	CNT pin open or pulled high (TTL 4.5-12V _{DC})			
		Input current when off	--	13	--	mA
		Respond Time	--	--	50	ms

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

Output Specifications

Item	Operating Conditions		Min.	Typ.	Max.	Unit
Voltage Accuracy			--	±1	±3	%
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		--	300	500	μs
Transient Response Deviation			--	±3	±5	%
Temperature Coefficient	Full load		--	--	±0.03	%/°C
Ripple/Noise ^①	Nominal input voltage, 100% Io	CFDQ400-48S12(N)(S/F) CFDQ400-48S15(N)(S/F)	--	--	150	mVp-p
		CFDQ400-48S24(N)(S/F) CFDQ400-48S28(N)(S/F)	--	--	220	
Trim			90	--	110	%V _O
Sense			--	--	105	
Over-temperature Protection	Max. Case Temperature		--	110	120	°C
Over-voltage Protection	Input voltage range		110	130	160	%V _O
Over-current Protection			110	140	170	%I _O
Short-circuit Protection			Hiccup, continuous, self-recovery			

Notes: ① The "Tip and barrel" method is used for ripple and noise test;

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	--	--	V _{DC}
		Input-case	1500	--	--	
		Output-case	500	--	--	
Insulation Resistance	Input-output resistance at 500V _{DC}		100	--	--	MΩ
Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2200	--	pF
Operating Temperature	See temperature derating curves		-40	--	+85	°C
Storage Temperature			-55	--	+125	
Storage Humidity	Non-condensing		5	--	95	%RH
Pin Soldering Resistance Temperature	Wave-soldering, 10 seconds		--	--	260	°C
	Soldering spot is 1.5mm away from case for 10 seconds		--	--	300	

ShockAnd Vibration		10-150Hz,5G,0.75mm.along X,Y and Z			
Switching Frequency	PWM mode	--	280	--	KHz
MTBF	MIL-HDBK-217F@25℃	1000	--	--	Khours

Mechanical Specifications

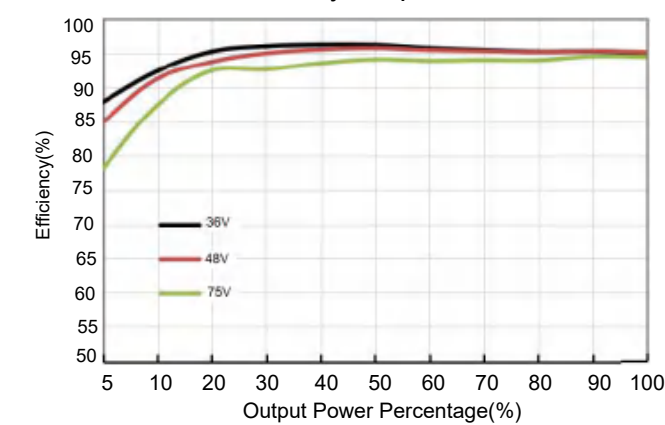
Case Material	Aluminum alloy case	
Dimension	CFDQ400-48_(N)	57.9x36.8x12.9mm
	CFDQ400-48_(N/S)	57.9x36.8x25.6mm
	CFDQ400-48_(N/S/F)	62.0x56.0x14.7mm
Weight	CFDQ400-48_(N)	71.4g(Typ.)
	CFDQ400-48_(N/S)	102.8g(Typ.)
	CFDQ400-48_(N/S/F)	91.4g(Typ.)
Cooling Method	Free air convection or forced air convection	

Electromagnetic Compatibility(EMC)

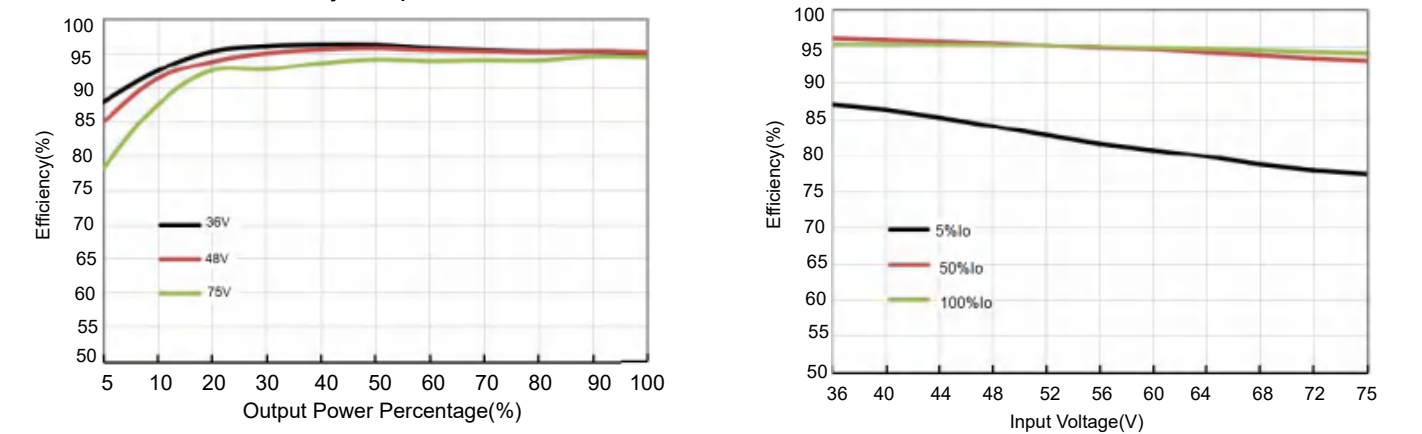
Emissions	CE	CISPR32/EN55032 CLASS A(see Fig.6-1 for recommended circuit)			
		CISPR32/EN55032 CLASS B(see Fig.6-2 for recommended circuit)			
	RE	CISPR32/EN55032 CLASS A(see Fig.6-1 for recommended circuit)			
		CISPR32/EN55032 CLASS B(see Fig.6-2 for recommended circuit)			
Immunity	ESD	IEC61000-4-2 Contact ±6KV,Air ±8KV			perf.Criteria B
	RS	IEC61000-4-3 10V/m(see Fig.6-2 for recommended circuit)			perf.Criteria A
	EFT	IEC61000-4-4 ±2KV(see Fig.6-1 or Fig.6-2 for recommended circuit)			perf.Criteria A
	Surge	IEC/EN61000-4-5 line to line ±2KV(see Fig.6-1 or Fig.6-2 for recommended circuit)			perf.Criteria B
	CS	IEC61000-4-6 10Vr.m.s (see Fig.6-2 for recommended circuit)			perf.Criteria A

Typical Performance Curves

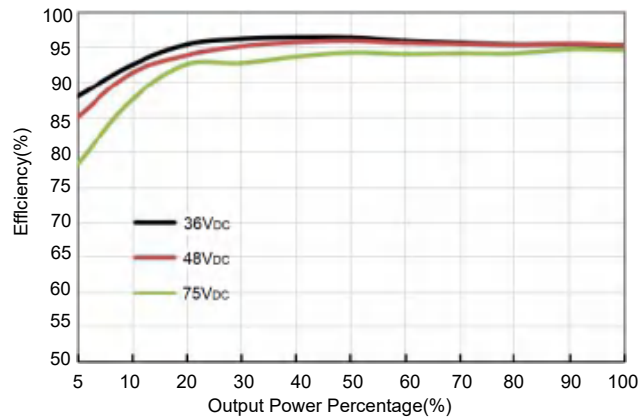
CFDQ400-48S12(N)(F/S)
Efficiency/Output Load



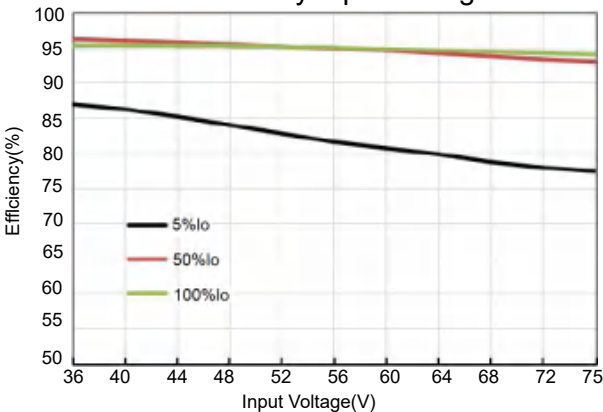
CFDQ400-48S12(N)(F/S)
Efficiency/Input Voltage



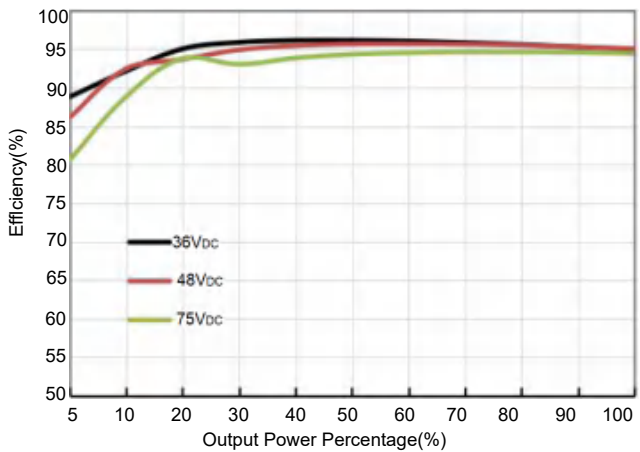
CFDQ400-48S15(N)(F/S)
Efficiency/Output Load



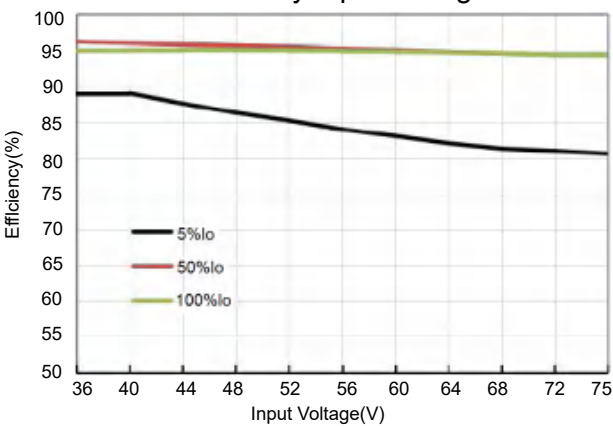
CFDQ400-48S15(N)(F/S)
Efficiency/Input Voltage



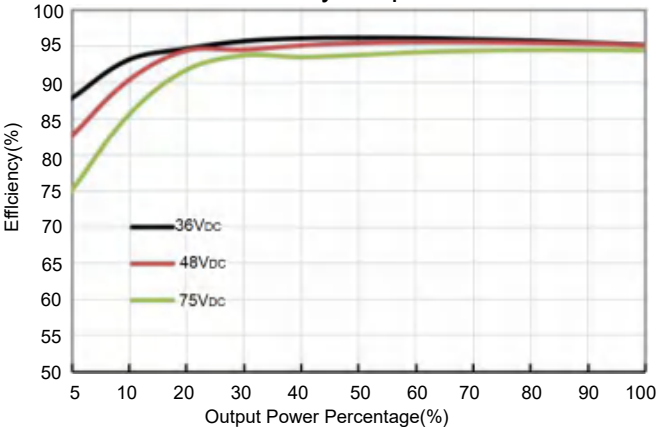
CFDQ400-48S24(N)(F/S)
Efficiency/Output Load



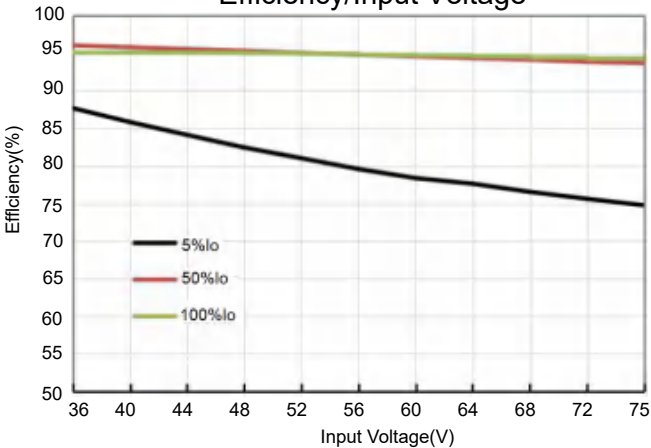
CFDQ400-48S15(N)(F/S)
Efficiency/Input Voltage



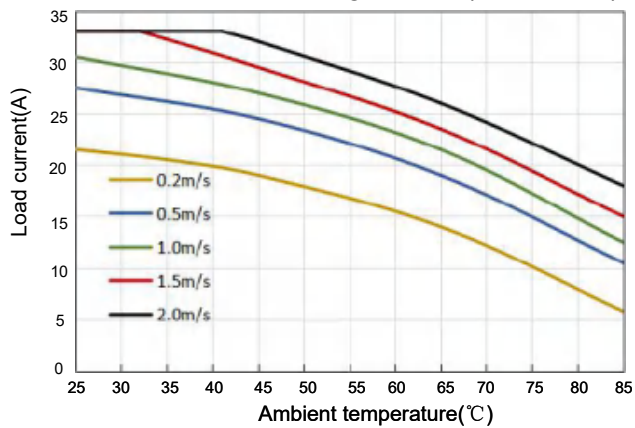
CFDQ400-48S28(N)(F/S)
Efficiency/Output Load



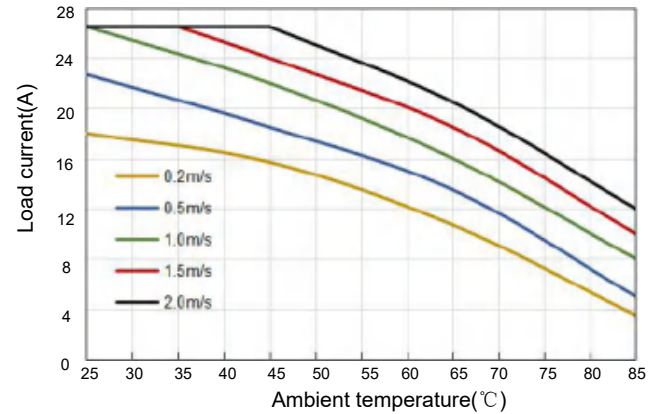
CFDQ400-48S28(N)(F/S)
Efficiency/Input Voltage



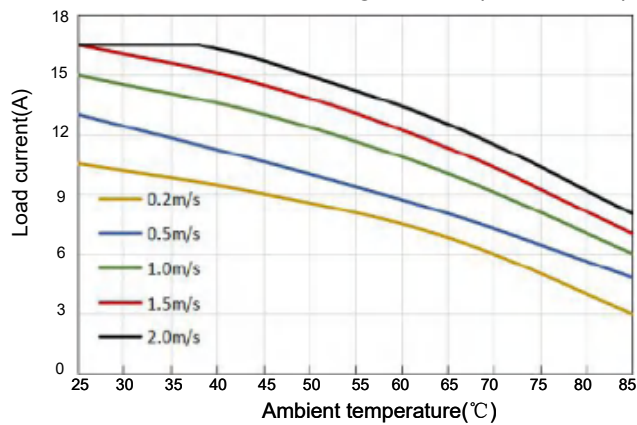
CFDQ400-48S12(-N)
Temperature Derating Curves($V_{in}=48V_{DC}$)



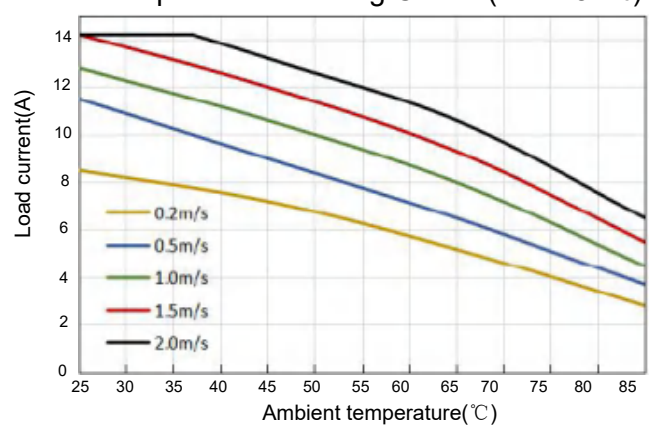
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Temperature Derating Curves($V_{in}=48V_{DC}$)



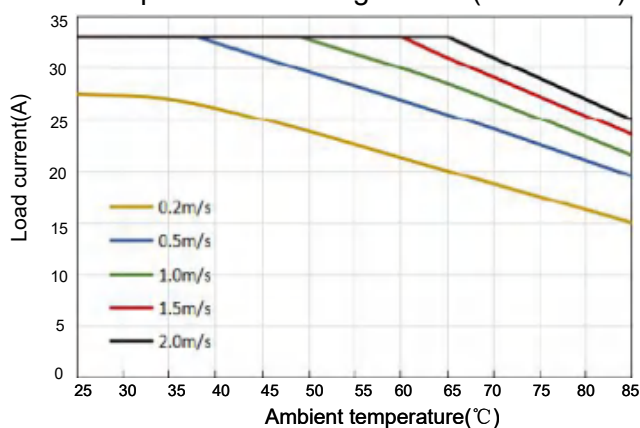
CFDQ400-48S24(-N)
Temperature Derating Curves($V_{in}=48V_{DC}$)



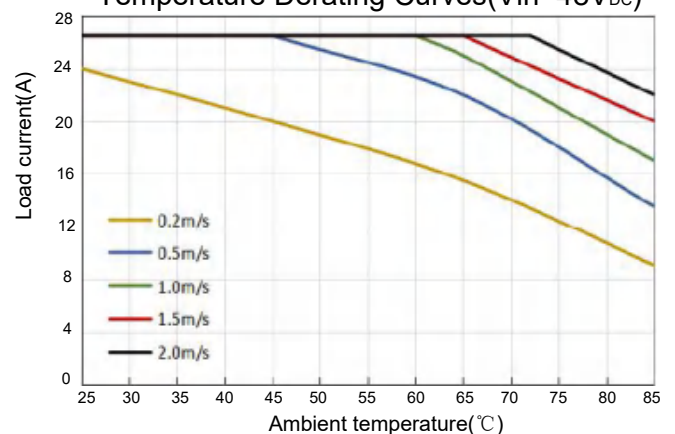
CFDQ400-48S28(-N)
Temperature Derating Curves($V_{in}=48V_{DC}$)



CFDQ400-48S12S(-N)
Temperature Derating Curves($V_{in}=48V_{DC}$)



CFDQ400-48S15S(-N)
Temperature Derating Curves($V_{in}=48V_{DC}$)



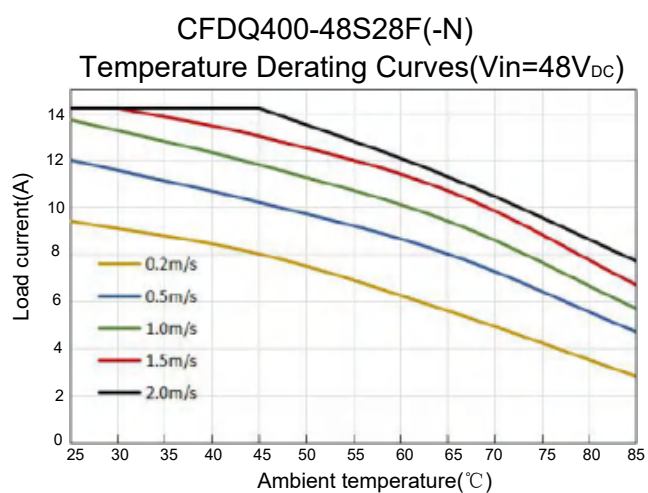
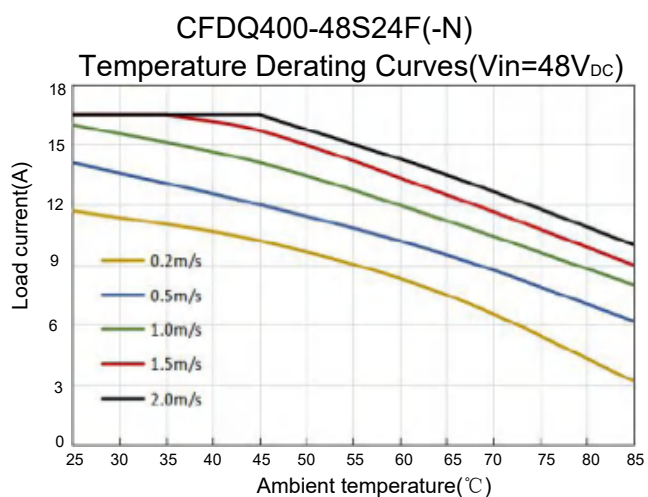
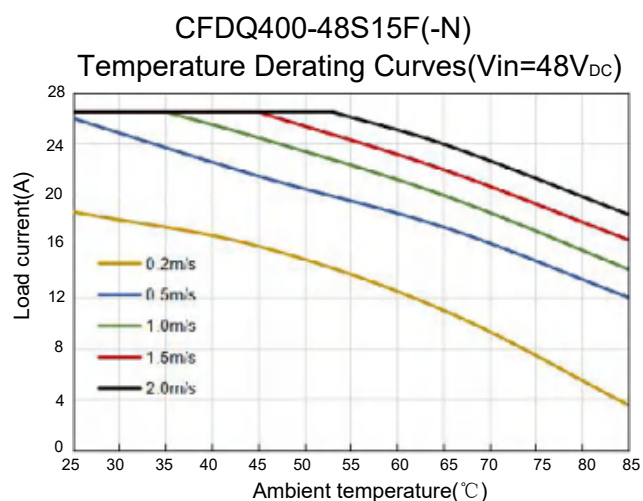
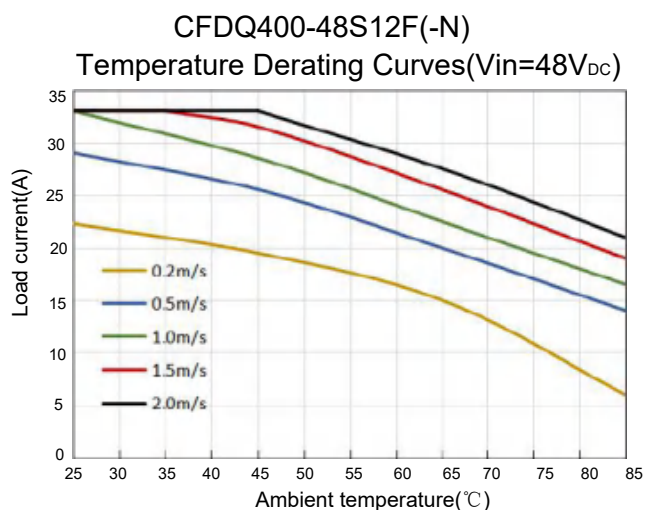
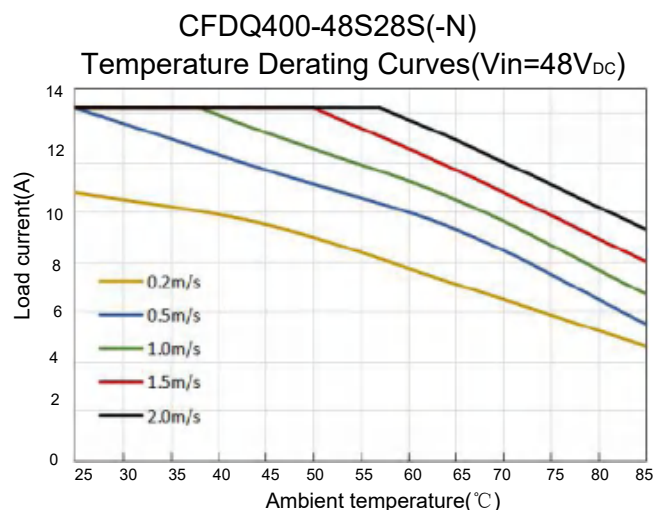
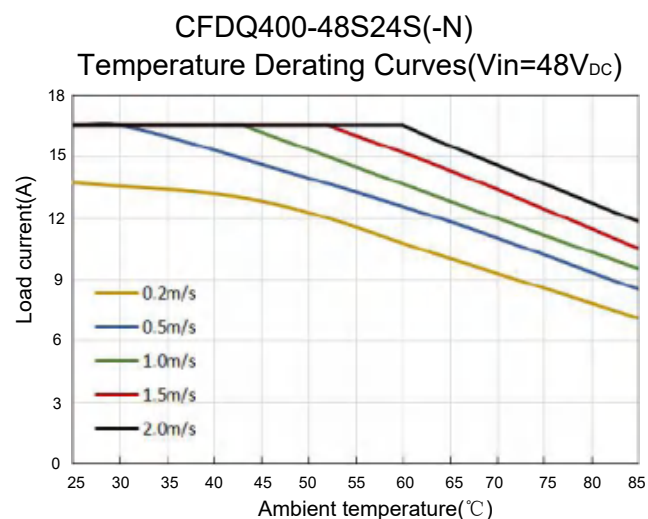


Fig.1

Remote Sense Application

1.Remote Sense Connection if not used

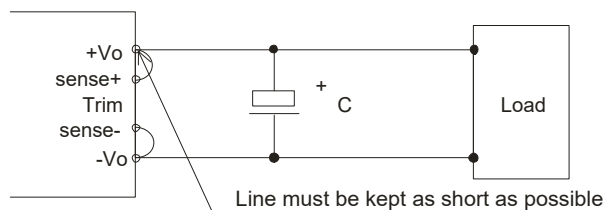


Fig.2

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

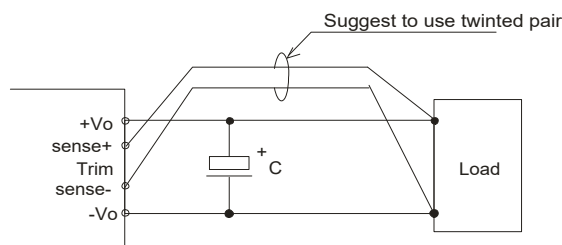


Fig.3

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 wires 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. Typical application

We recommend using the recommended circuit shown in Fig.6-1 or Fig.6-2 during product testing and application, otherwise please ensure that at least a 220μF electrolytic capacitor is connected at the input in order to ensure adequate voltage surge suppression, and a minimum capacitive load must be connected at the output in order to ensure the output stability.

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.5

Capacitor Value		
Output Voltage	C_{out}	C_{in}
12V/15V/24V/28V	470μF	220μF

2.EMC complian cecircuit

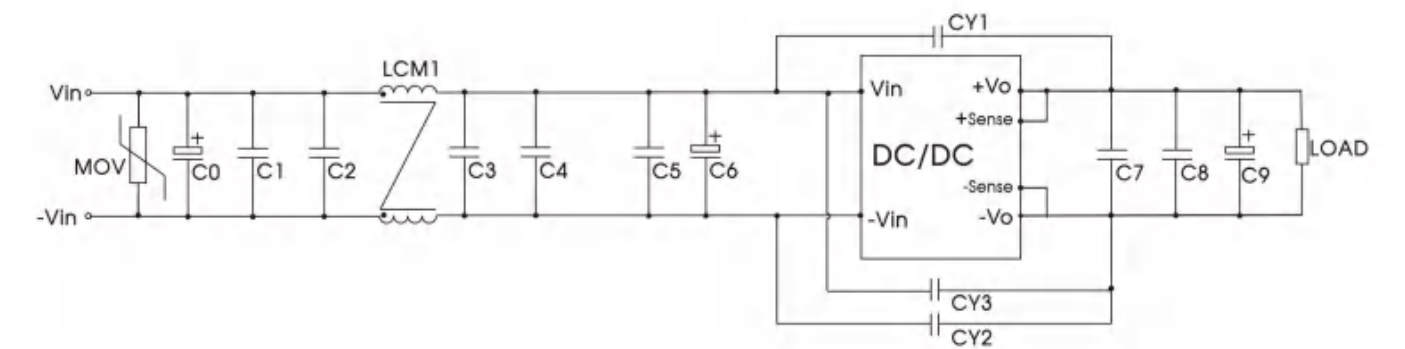


Fig.6-1

Components	Recommended Component Value
MOV	S14K60 Varistor
C0	680μF/100V electrolytic capacitor
C6	470μF/100V electrolytic capacitor
C9	470μF/63V electrolytic capacitor
C1,C2,C3,C4,C5,C7,C8	4.7μF/100V ceramic capacitor
LCM1	T24x23.5x19/4mH/35mΩ max
CY1,CY2,CY3	1nF/400VAcY1 safety capacitor

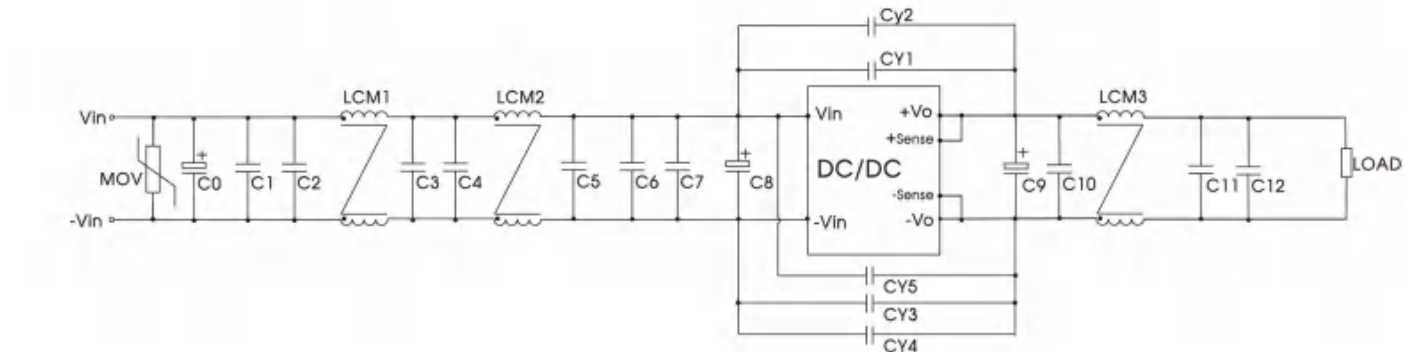
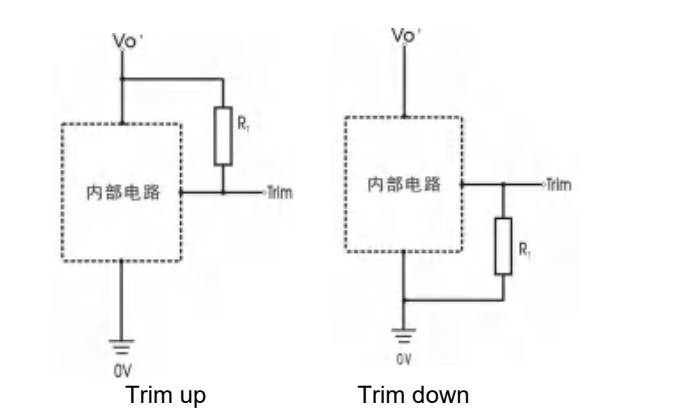


Fig.6-2

Components	Recommended Component Value
MOV	S14K60 Varistor
C0	680μF/100V electrolytic capacitor
C8	470μF/100V electrolytic capacitor
C9	470μF/63V electrolytic capacitor
C1,C2,C3,C4,C5,C6,C7,C10,C11,C12	4.7μF/100V ceramic capacitor
LCM1,LCM2	T24x23.5x19/4mH/35mΩ max
LCM3	T28x27.5x12/100uH/5mΩ max
CY1,CY2,CY3,CY4,CY5	1nF/400VAc Y1 safety capacitor

3. Trim func tion for output voltage adjustment (open if unused)



TRIM resistor connec tion (dashed line shows internal resistor network)
Fig.7

Calculation formula of Trim resistance:

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:
 R_T:Resistance of Trim.

$$\Delta\% = \left| \frac{V_{nom} - V_{out}}{V_{nom}} \right| \times 100$$

 V_{nom}:Nominal Input Voltage.
 V_{ut}:The trim up/down voltage.

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 125℃ .

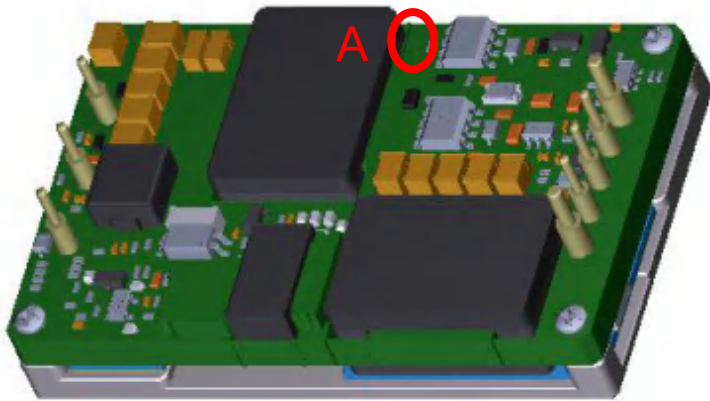


Fig.8

5. Reflec ted ripple current test circuit

All DC-DC converters of this series are tested using the recommended circuit shown in Fig.9

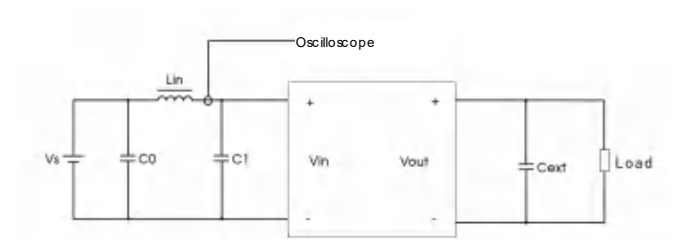
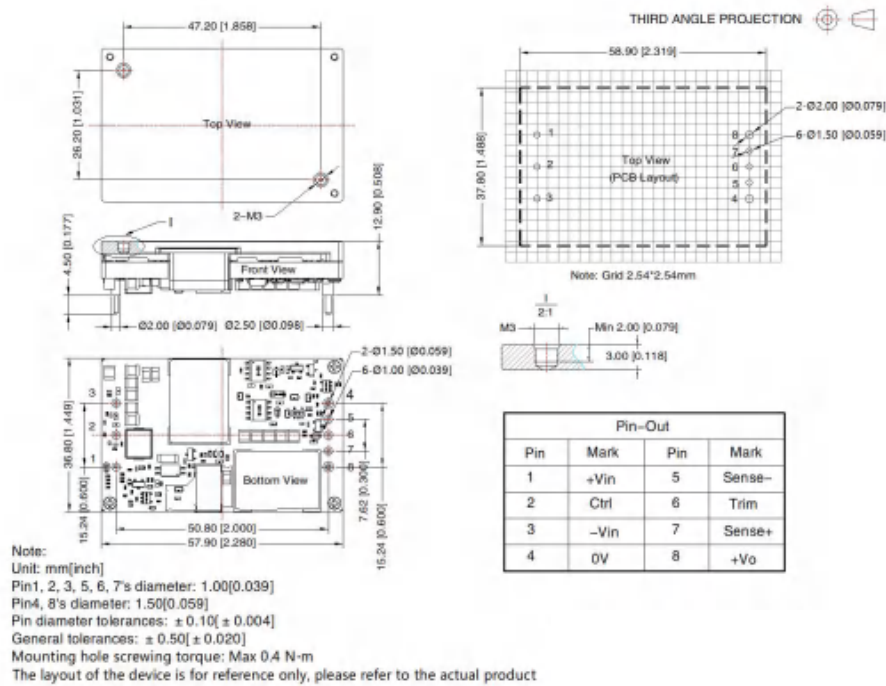


Fig.9

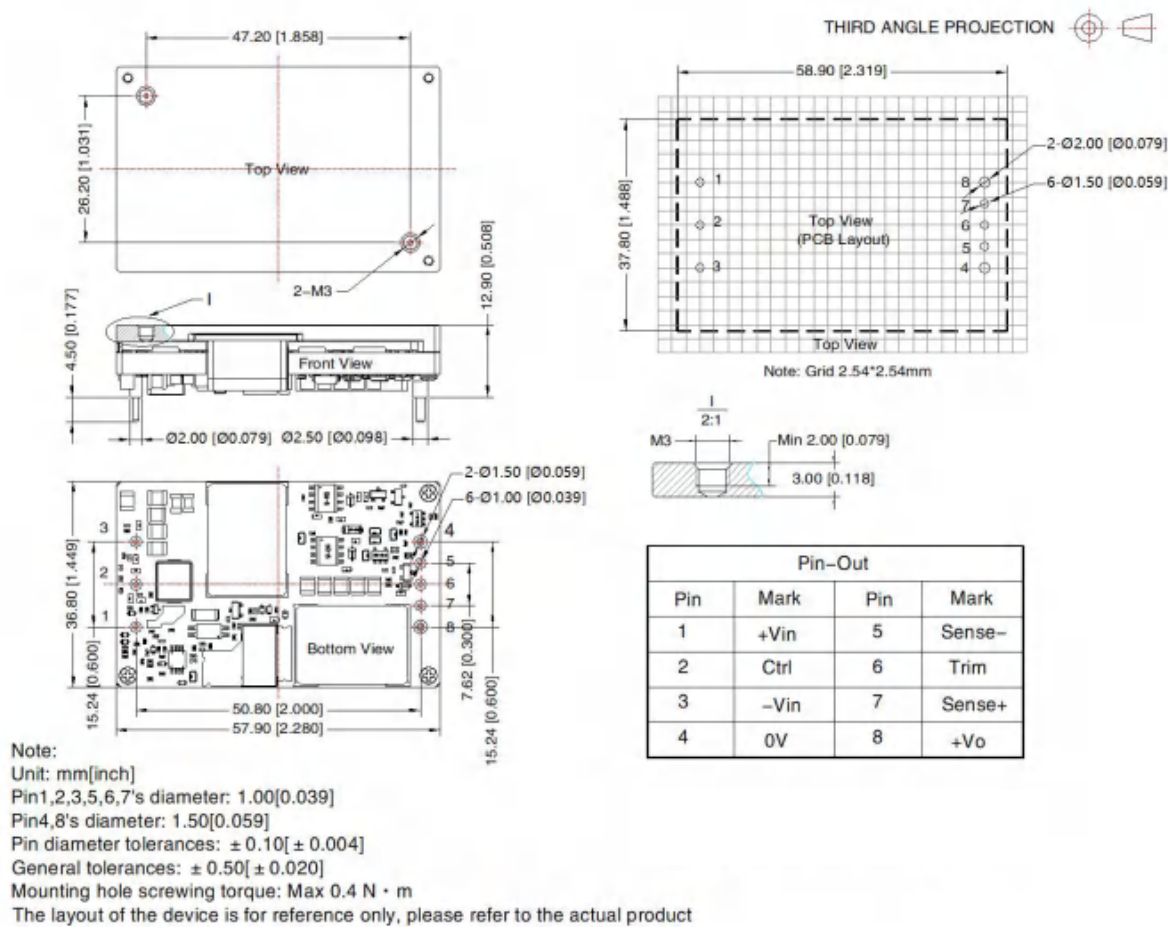
Components	Recommended Component Value
C0	220μF/100V
Lin	10uH/15A
C1	470μF/100V
Cext	470μF/63V

6. The produc ts do not support parallel connec tion of their output

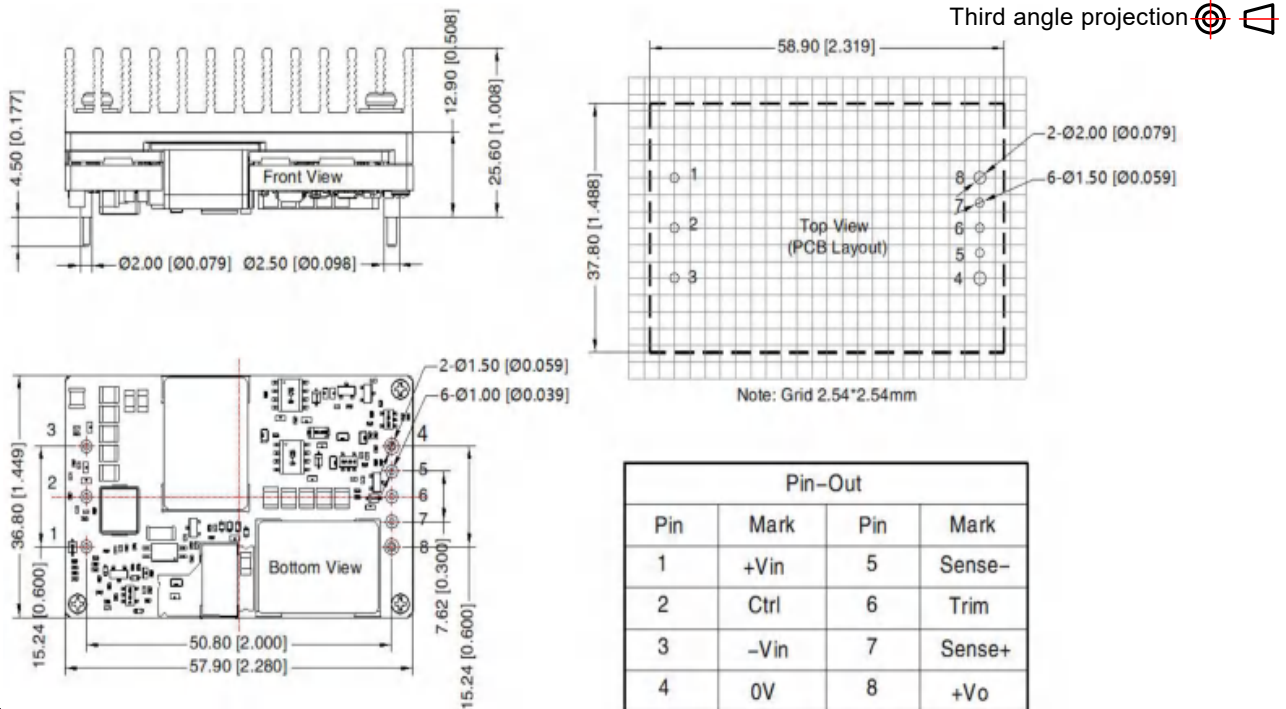
CFDQ400-48 Dimensions and Recommended Layout



CFDQ400-48_N Dimensions and Recommended Layout



CFDQ400-48_S Dimensions and Recommended Layout



Note:

Unit:mm[inch]

Pin1,2,3,5,6,7's diameter:1.0[0.039]

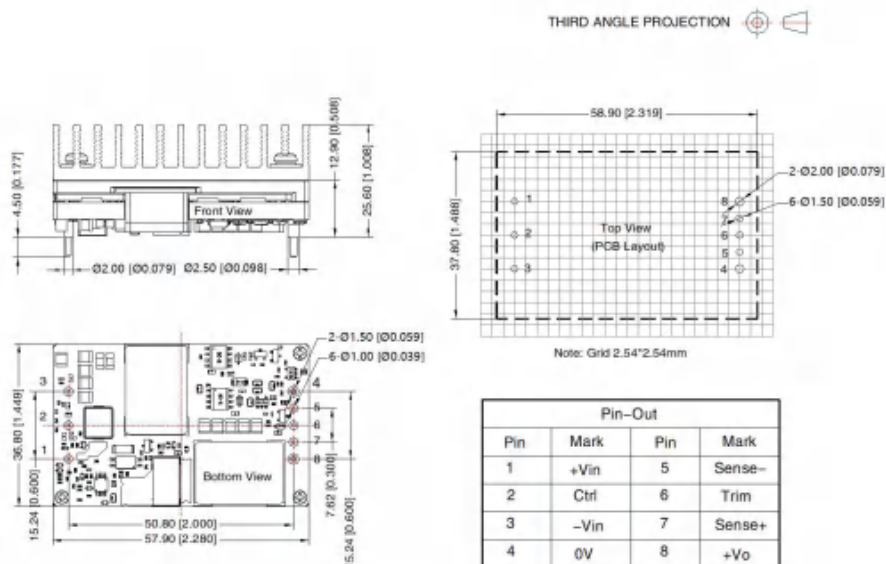
Pin4,8's diameter:1.5[0.059]

Pin diameter tolerances:±0.1[±0.004]

General tolerances:±0.5[±0.02]

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

CFDQ400-48_NS Dimensions and Recommended Layout



Note:

Unit: mm[inch]

Pin1,2,3,5,6,7's diameter: 1.00[0.039]

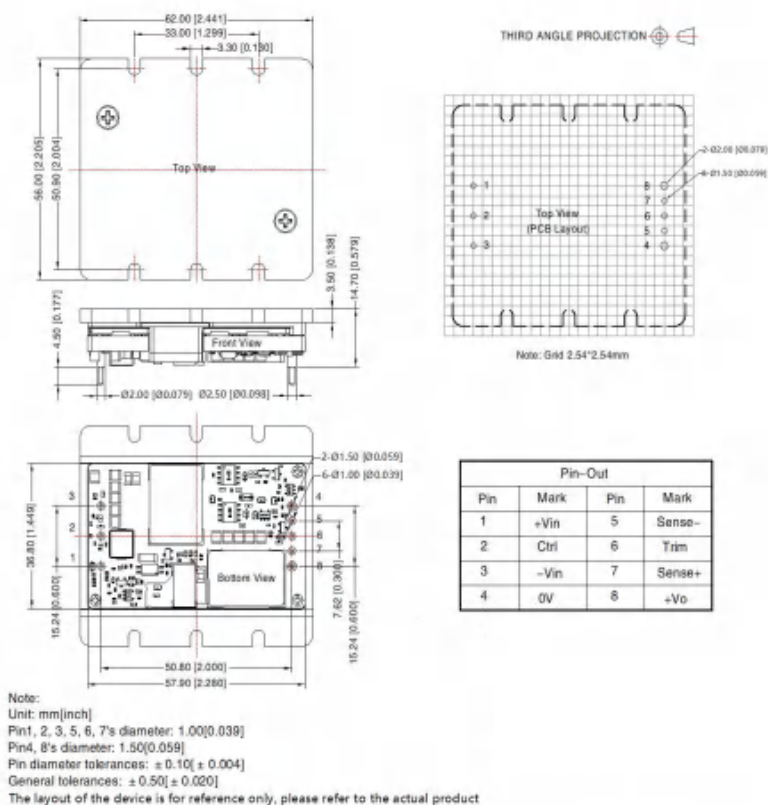
Pin4,8's diameter: 1.50[0.059]

Pin diameter tolerances: ± 0.10[± 0.004]

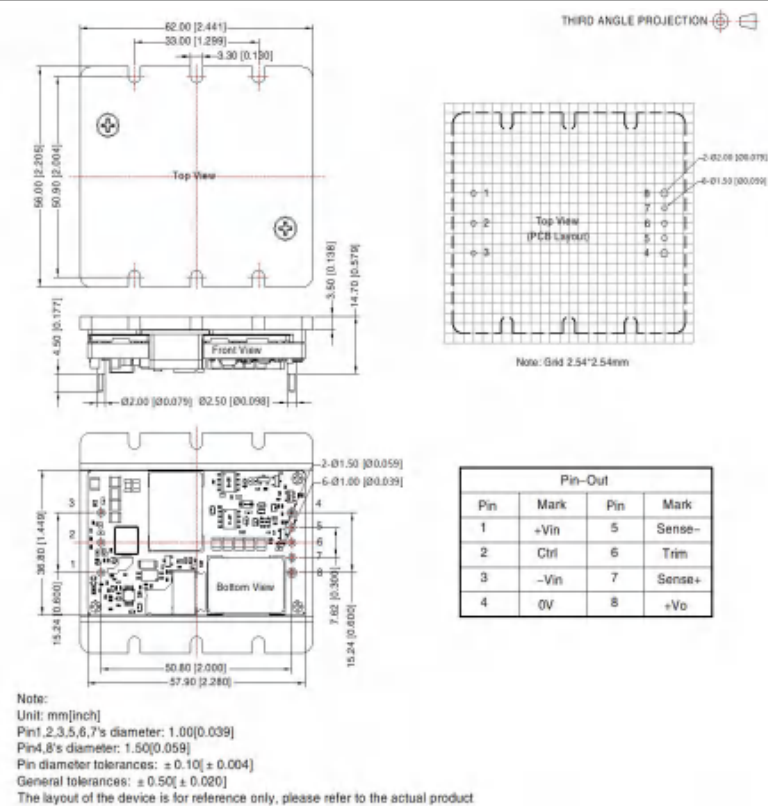
General tolerances: ± 0.50[± 0.020]

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

CFDQ400-48_F Dimensions and Recommended Layout



CFDQ400-48S_NF Dimensions and Recommended Layout



NOTE:

1. The maximum capacitive load offered were tested at input voltage range and full load;
2. 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;
3. All index testing methods in this datasheet are based on company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. 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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