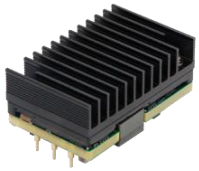
Descriptions

400W isolated，DC/DC Converter






RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Wide input voltage range: 36-75VDC
- High efficiency up to 95%
- Basic insulation, I/O isolation test voltage 2250VDC
- Operating ambient temperature range -40℃ to +85℃
- 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

Applications

- Battery power supplies
- Industrial control
- Electricity
- Instruments
- Communication
- Intelligent robotic

Selection Guide

Certification	Part No.①	Ctrl Logic②	Input Voltage (VDC)		Output		Full Load Efficiency (%) Min./Typ.	Max. Capacitive Load(μF)	Min. Capacitive Load④(μF)
			Nominal (Range)	Max.③	Voltage (VDC)	Current (mA) (Max./Min.)			
EN/BS EN	DOQB400-F4812(H/F)	P	48 (36-75)	80	12	33000/0	93/95	10000	470
	DOQB400-F4815(H/F)				15	26500/0		6800	
	DOQB400-F4824(H/F)				24	16500/0		3300	
	DOQB400-F4828(H/F)				28	14200/0		3300	
	DOQB400-F4812(H/F)N	N	48 (36-75)	80	12	33000/0	93/95	10000	
	DOQB400-F4815(H/F)N				15	26500/0		6800	
	DOQB400-F4824(H/F)N				24	16500/0		3300	
	DOQB400-F4828(H/F)N				28	14200/0		3300	

Note:
①Use "F" suffix is for added aluminum baseplate and "H" 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" P" represents positive logic, "N" represents negative logic, and the corresponding positive logic model is: DOQB400-F48xx(H/F),The negative logic model is:DOQB400-F48xx(H/F)N;
③Exceeding the maximum input voltage may cause permanent damage;
④In order to ensure the output stability, a minimum capacitive load must be connected to the output side of the product;
⑤Product images are for reference only; the actual product shall prevail.

Specifications

Product Specifications	Item		Operating Conditions		Min.	Typ.	Max.	Unit
Input Specifications	Input Current (Full load/no load)		Nominal input voltage	12VDC output	--	--	8961/120	mA
				15VDC output	--	--	8961/150	
				24VDC output	--	--	8961/120	
				28VDC output	--	--	8961/150	
	Reflected Ripple Current		Nominal input voltage		--	200	--	
	Surge Voltage (1sec. max.)				-0.7	--	90	VDC
	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			
	Ctrl①	Positive logic	Module on		Ctrl open circuit or connected to TTL high level (3.3-12VDC)			
			Module off		Ctrl pin connected to -Vin or low level (0-1.2VDC)			
			Input current when off		--	13	--	mA
			Respond Time		--	--	50	ms
		Negative logic	Module on		Ctrl pin pulled low to GND (0-1.2VDC)			
			Module off		Ctrl pin open or pulled high (TTL 4.5-12VDC)			
			Input current when off		--	13	--	mA
			Respond Time		--	--	50	ms
Output Specifications	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	%/℃
	Ripple & Noise②		Nominal input voltage, 100%Io	12VDC output 15VDC output	--	--	150	mVp-p
				24VDC output 28VDC output	--	--	220	
	Trim				90	--	110	%Vo
	Sense				--	--	105	
	Over-temperature Protection		Max. Case Temperature		--	110	120	℃
	Over-voltage Protection		Input voltage range		110	130	160	%Vo
	Over-current Protection				110	140	170	%Io
	Short-circuit Protection				Hiccup, continuous, self-recovery			

General Specifications	Isolation	Electric Strength Test for 1 minute with a leakage current of 1mA max	Input-output	2250	--	--	VDC
			Input-case	1500	--	--	
			Output-case	500	--	--	
	Insulation Resistance	Input-output resistance at 500VDC		100	--	--	MΩ
	Isolation Capacitance	Input-output capacitance at 100KHz/0.1V		--	2200	--	pF
	Operating Temperature	See temperature derating curves		-40	--	+85	℃
	Storage Temperature			-55	--	+125	
	Storage Humidity	Non-condensing		5	--	95	%RH
	Pin Soldering Resistance Temperature③	Soldering spot is 1.5mm away from the case, 10 seconds max.		--	--	+300	℃
		Wave soldering, maximum 10 seconds		255	260	265	
	Shock And Vibration			10-150Hz, 5G, 0.75mm. along X, Y and Z			
	Switching Frequency	PWM mode		--	280	--	kHz
	MTBF	MIL-HDBK-217F@25℃		1000	--	--	k hours

Mechanical Specifications	Case Material	Aluminum alloy case	
	Dimension	DOQB400-F48xx(N)	57.9 x 36.8 x 12.9 mm
		DOQB400-F48xxH(N)	57.9 x 36.8 x 25.6 mm
		DOQB400-F48xxF(N)	62.0 x 56.0 x 14.7 mm
	Weight	DOQB400-F48xx(N)	71.4g(Typ.)
		DOQB400-F48xxH(N)	102.8g(Typ.)
		DOQB400-F48xxF(N)	91.4g(Typ.)
	Cooling Method	Free air convection or forced air convection	

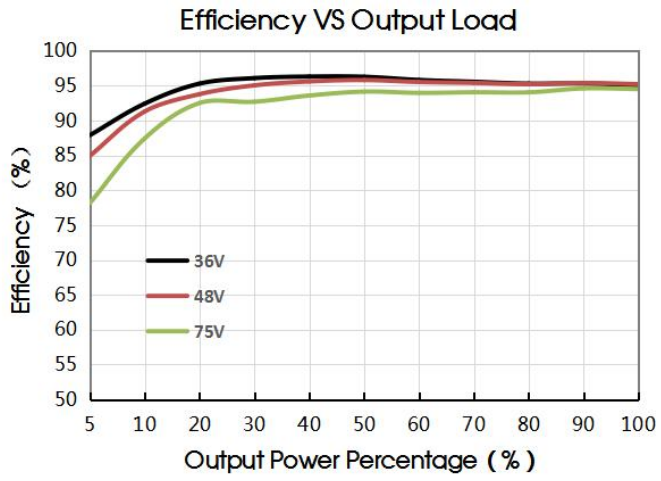
Note:
①The Ctrl pin voltage is referenced to input -Vin;
②The "Tip and barrel" method is used for ripple and noise test;
③The pin soldering temperature tolerance is not the actual temperature set by the soldering iron but the temperature required for proper solder joints. The actual temperature set by the customer should be determined comprehensively based on factors such as PCB thickness, copper coverage, soldering iron power, and soldering iron tip selection.

Electromagnetic Compatibility (EMC)

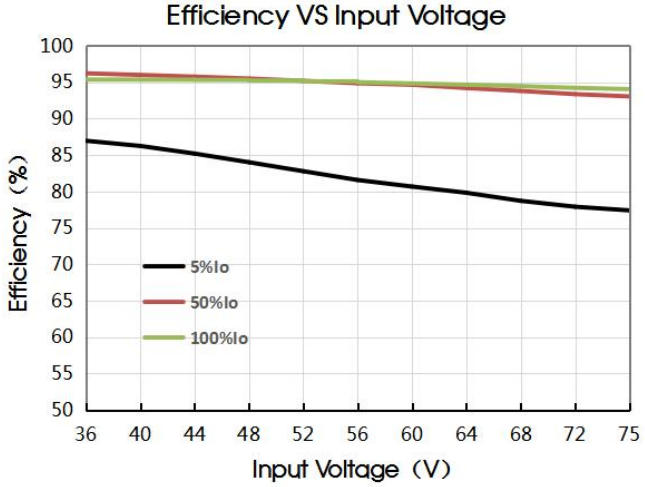
Emissions	CE	CISPR32/EN55032 CLASS A (see Fig.6-1 for recommended circuit)	
		CISPR32/EN55032 CLASS B (see Fig.6-2 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (see Fig.6-1 for recommended circuit)	
		CISPR32/EN55032 CLASS B (see Fig.6-2 for recommended circuit)	
Immunity	ESD	IEC61000-4-2 Contact ±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

Characteristic Curve

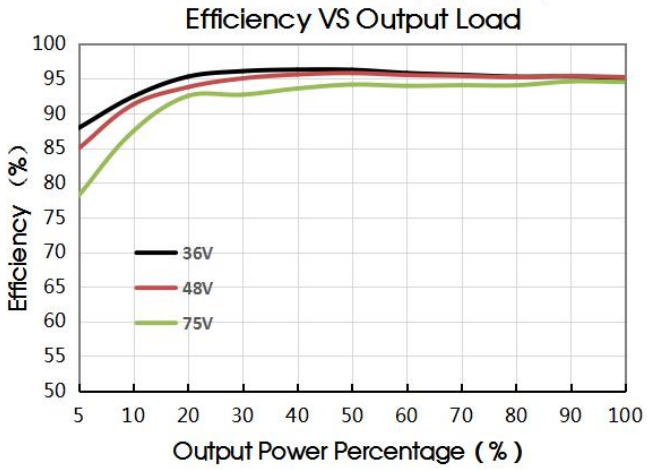
12VDC output



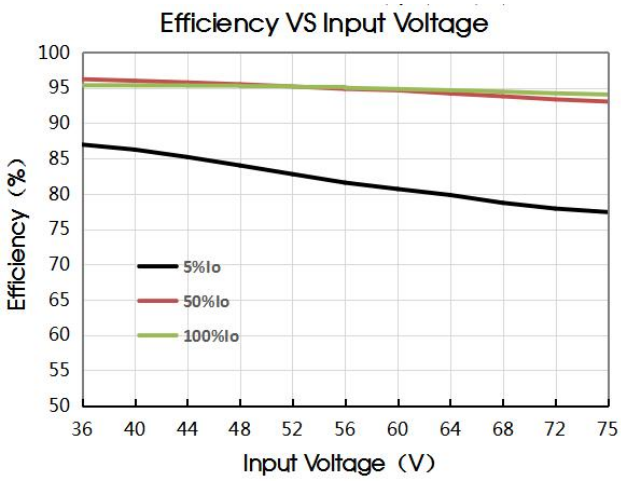
12VDC output



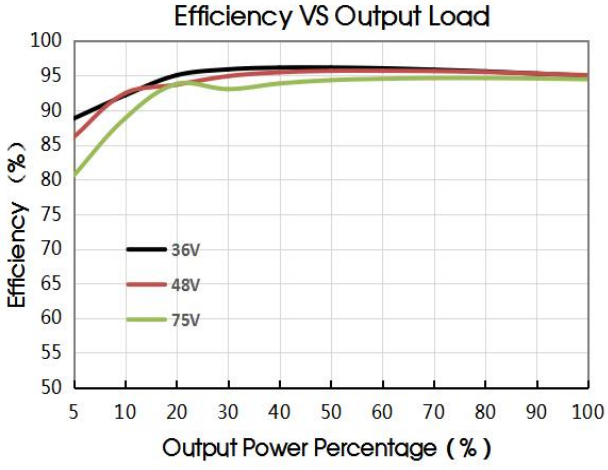
15VDC output



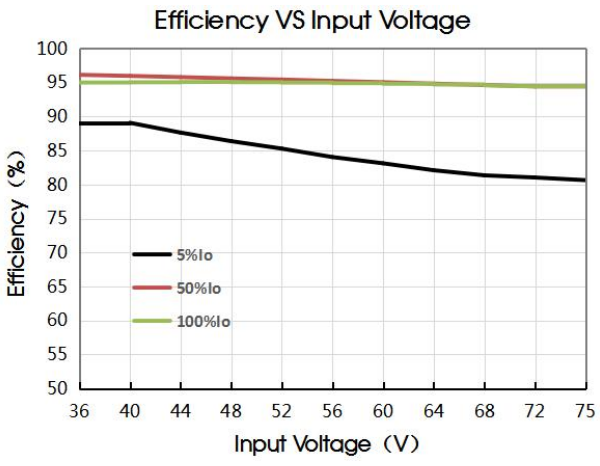
15VDC output



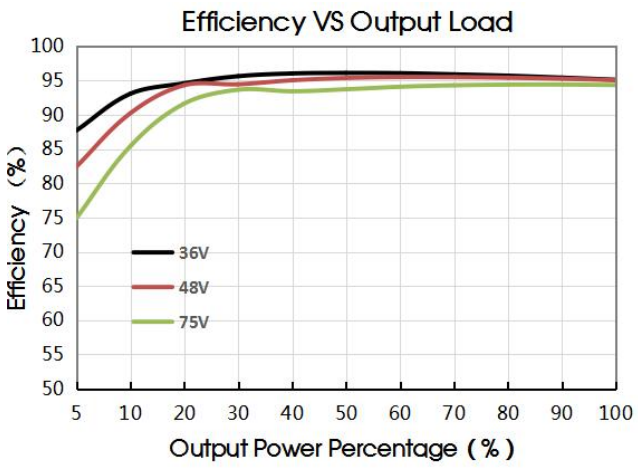
24VDC output



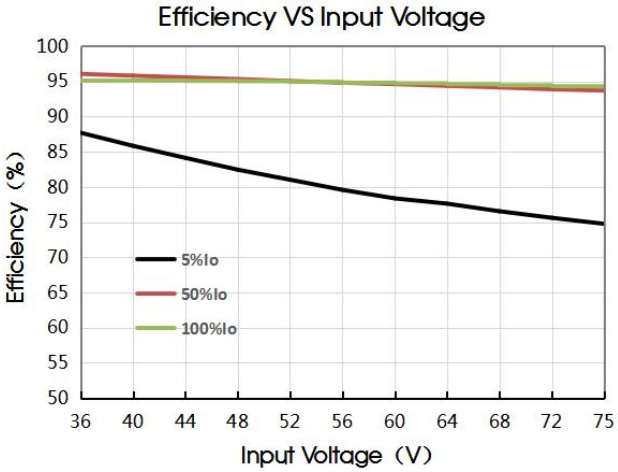
24VDC output



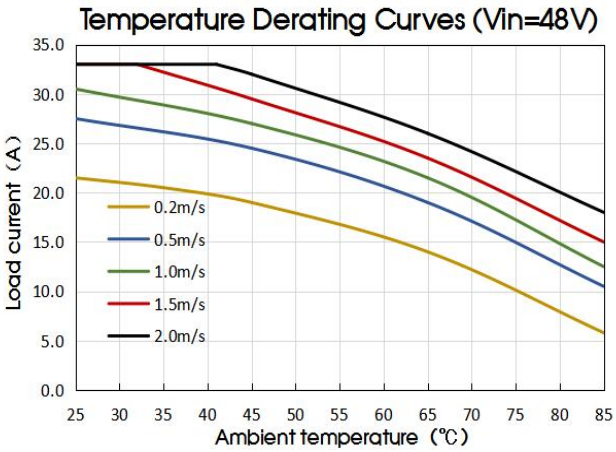
28VDC output



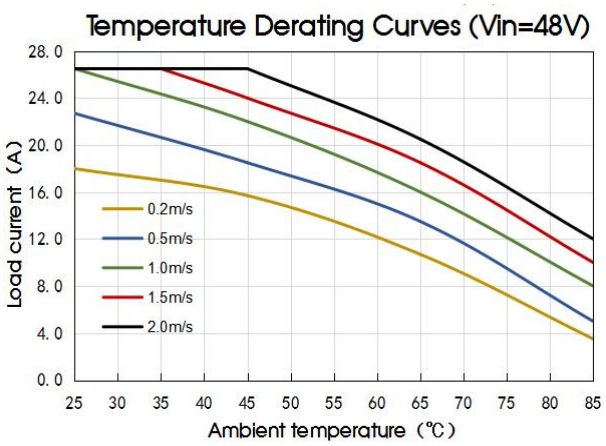
28VDC output



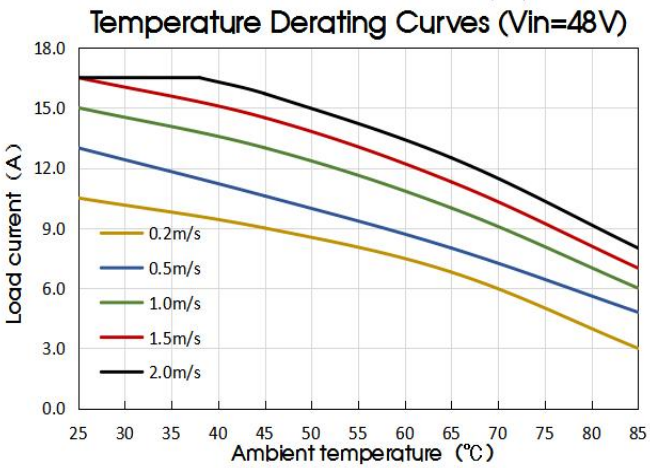
12VDC output (without heat sink)



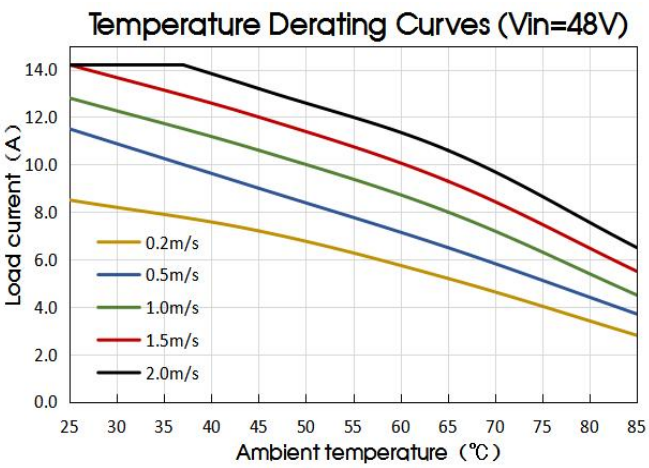
15VDC output (without heat sink)



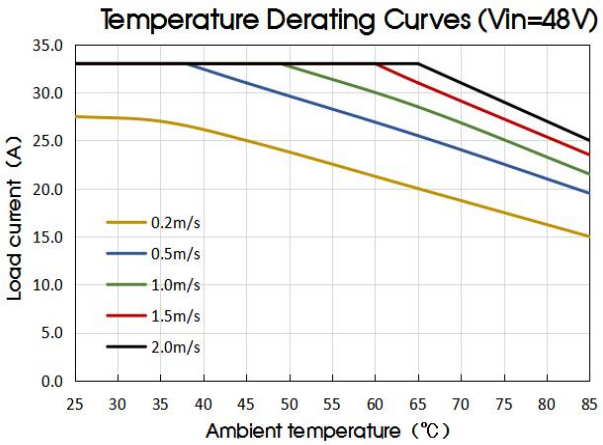
24VDC output (without heat sink)



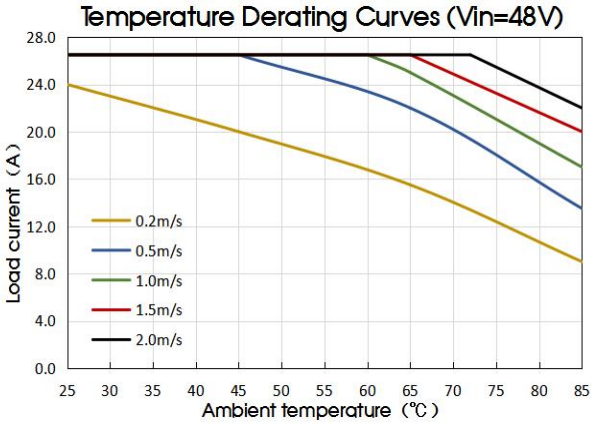
28VDC output (without heat sink)



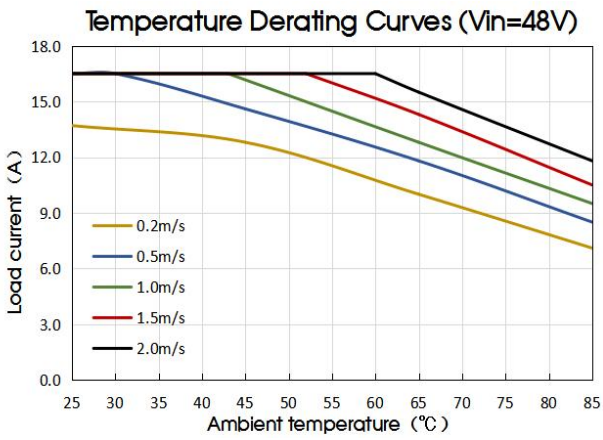
12VDC output (with heat sink)



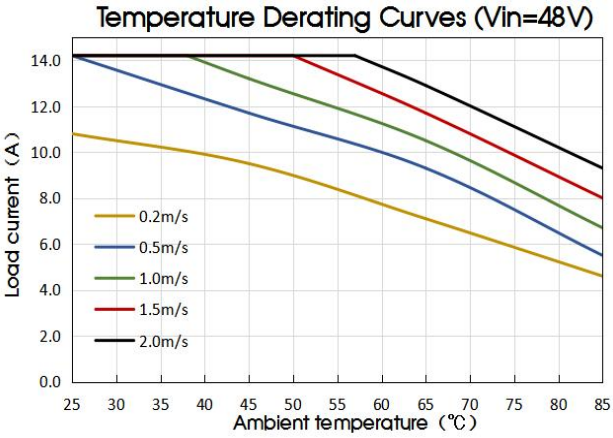
15VDC output (with heat sink)



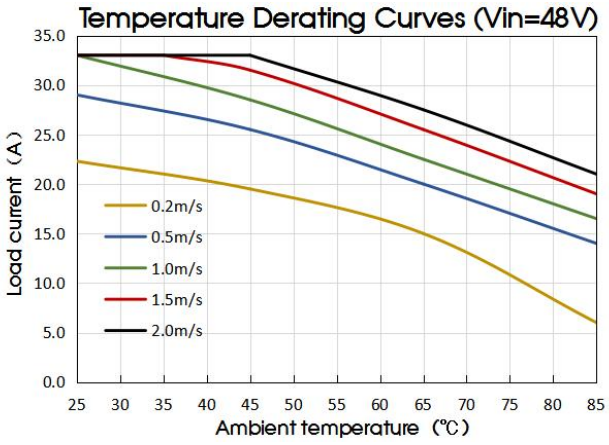
24VDC output (with heat sink)



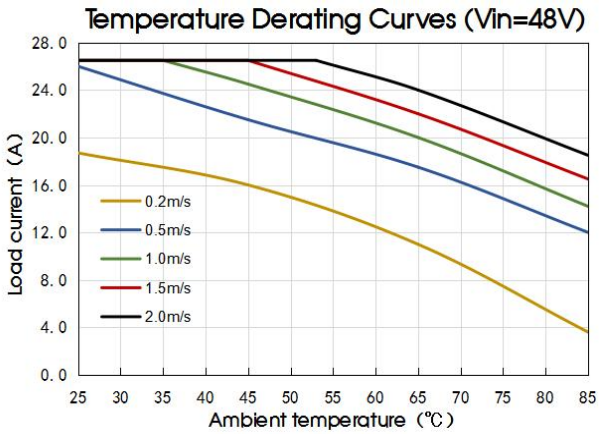
28VDC output (with heat sink)



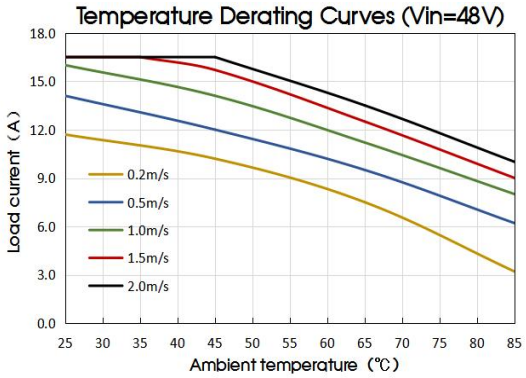
12VDC output (with aluminum baseplate)



15VDC output (with aluminum baseplate)



24VDC output (with aluminum baseplate)



28VDC output (with aluminum baseplate)

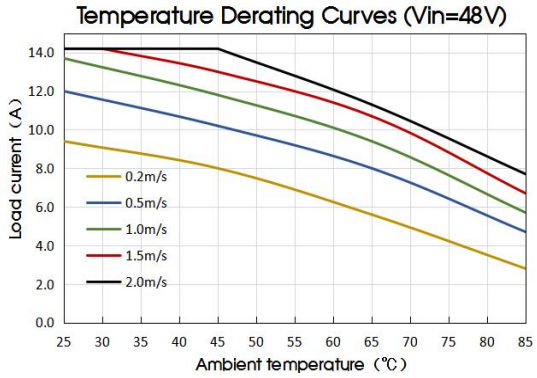


Fig.1

Remote Sense Application

1. Remote Sense Connection if not used

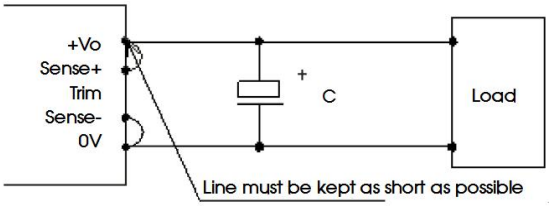


Fig.2

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

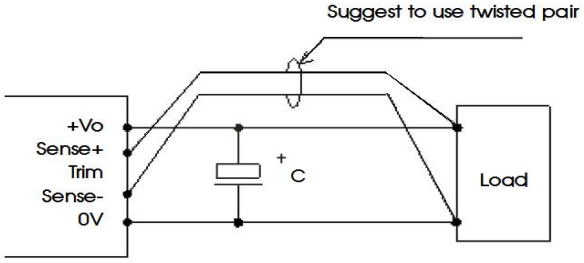


Fig.3

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

①We recommended 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.

②Input 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

Capacitor Value / Output Voltage	Cout	Cin
12V/15V/24V/28V	470μF	220 μF

2. EMC compliance circuit

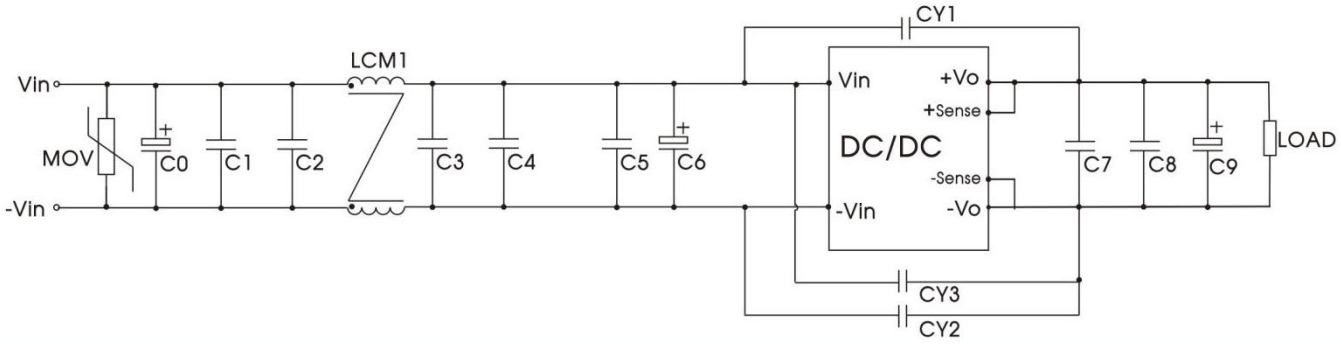


Fig. 6-1

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	T24 x 23.5 x 19/4mH/35mΩmax
CY1, CY2, CY3	1nF/400VAC Y1 safety capacitor

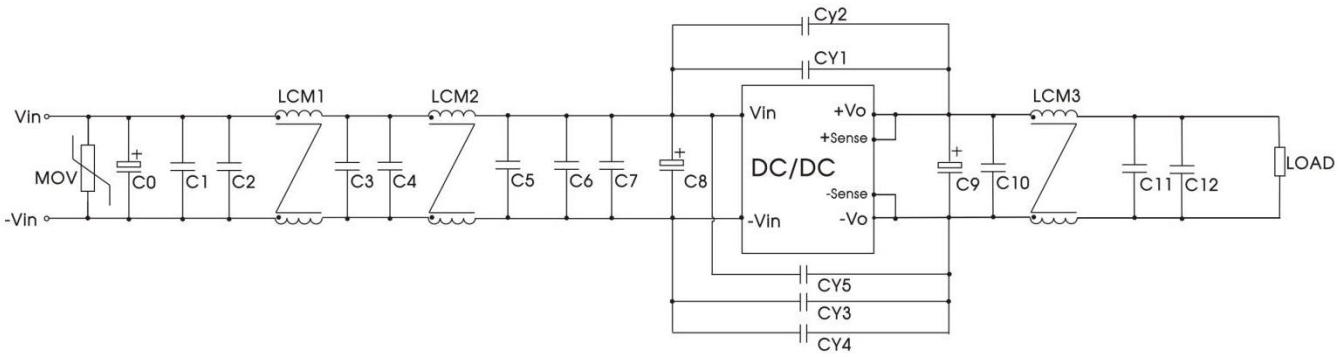
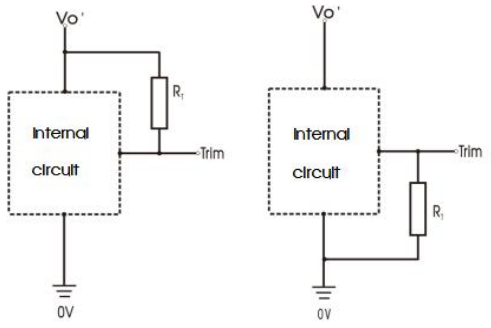


Fig. 6-2

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	T24 x 23.5 x 19/4mH/35mΩmax
LCM3	T28 x 27.5 x 12/100uH/5mΩmax
CY1, CY2, CY3, CY4, CY5	1nF/400VAC Y1 safety capacitor

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



Trim up Trim down

TRIM resistor connection (dashed line shows internal resistor network)

Fig. 7

Calculation formula of Trim resistance:

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:

R_T: Resistance of Trim.

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

V_{nom} : Nominal Input Voltage.

V_{out} : 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℃.

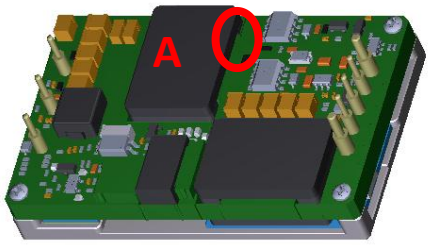


Fig. 8

5. Reflected ripple current test circuit

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

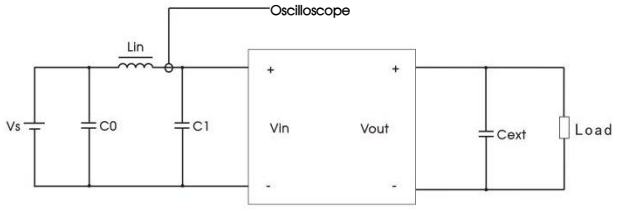
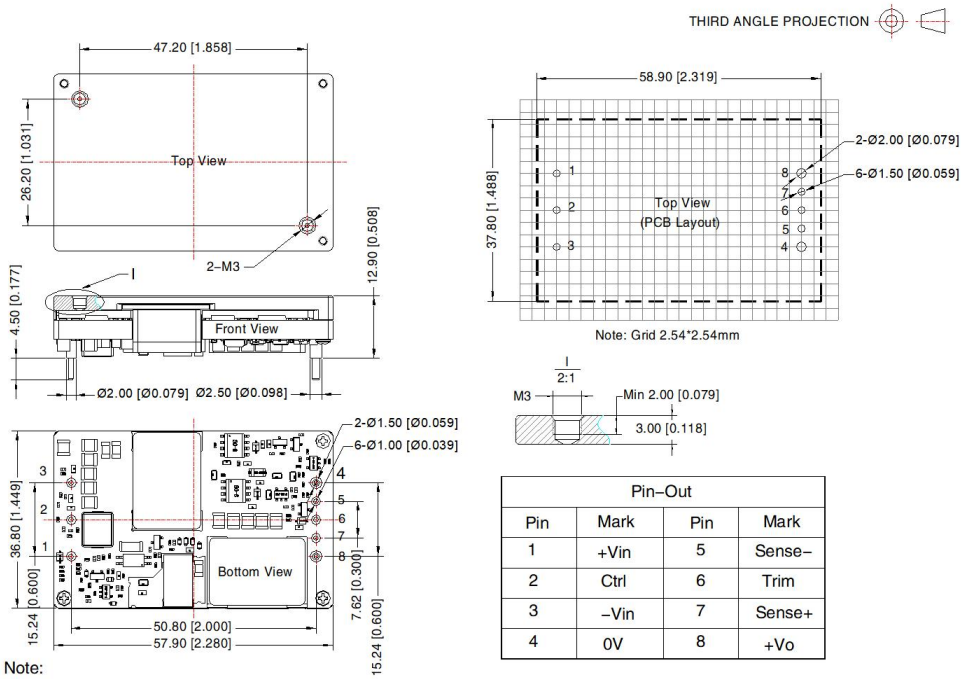


Fig. 9

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

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

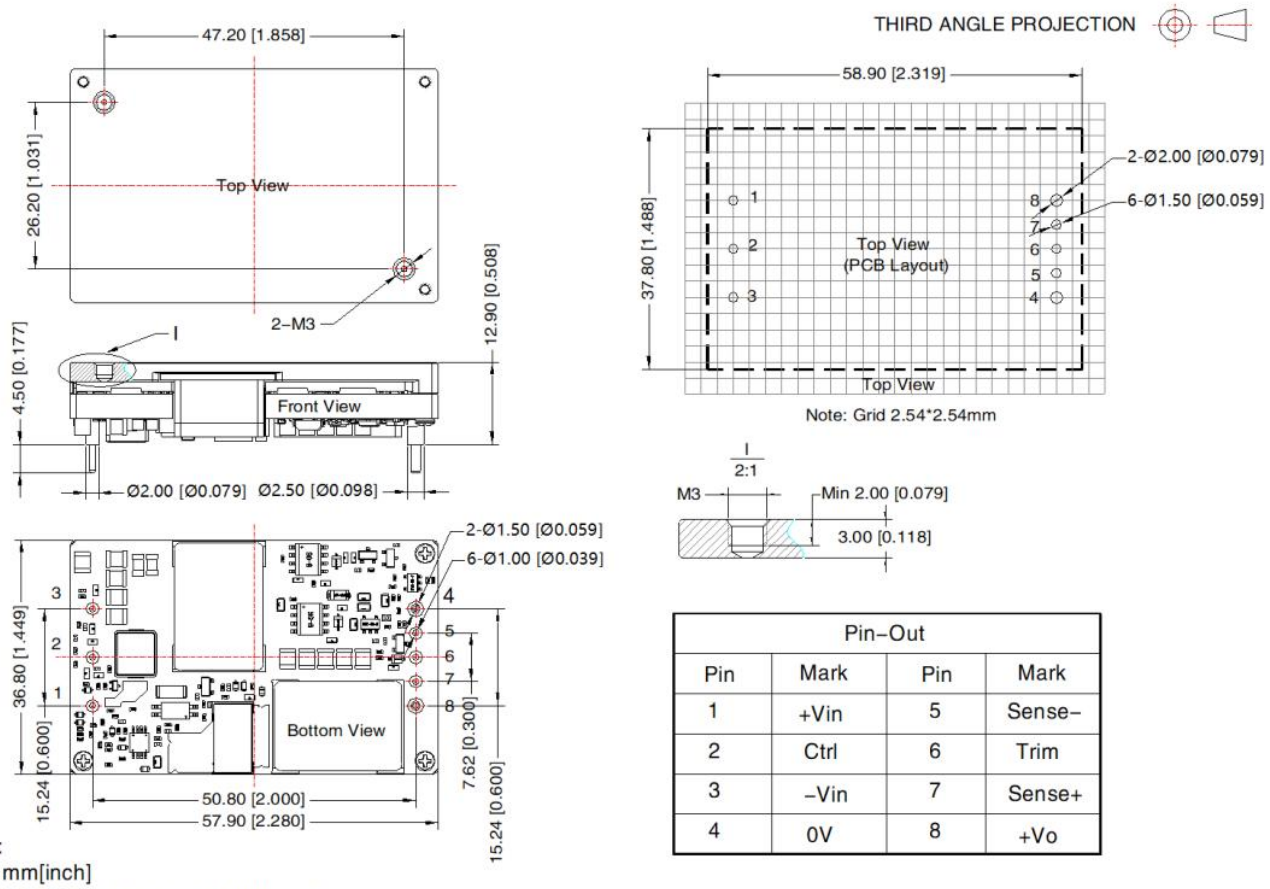
DOQB400-F48xx Dimensions and Recommended Layout



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

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]
Mounting hole screwing torque: Max 0.4 N・m
The layout of the device is for reference only，please refer to the actual product

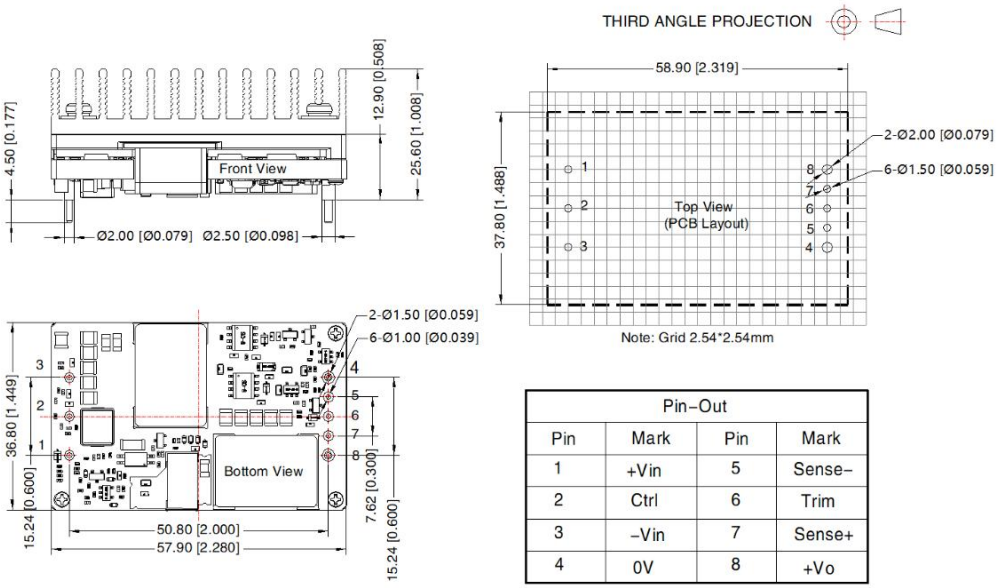
DOQB400-F48xxN Dimensions and Recommended Layout



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

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]
Mounting hole screwing torque: Max 0.4 N・m
The layout of the device is for reference only, please refer to the actual product

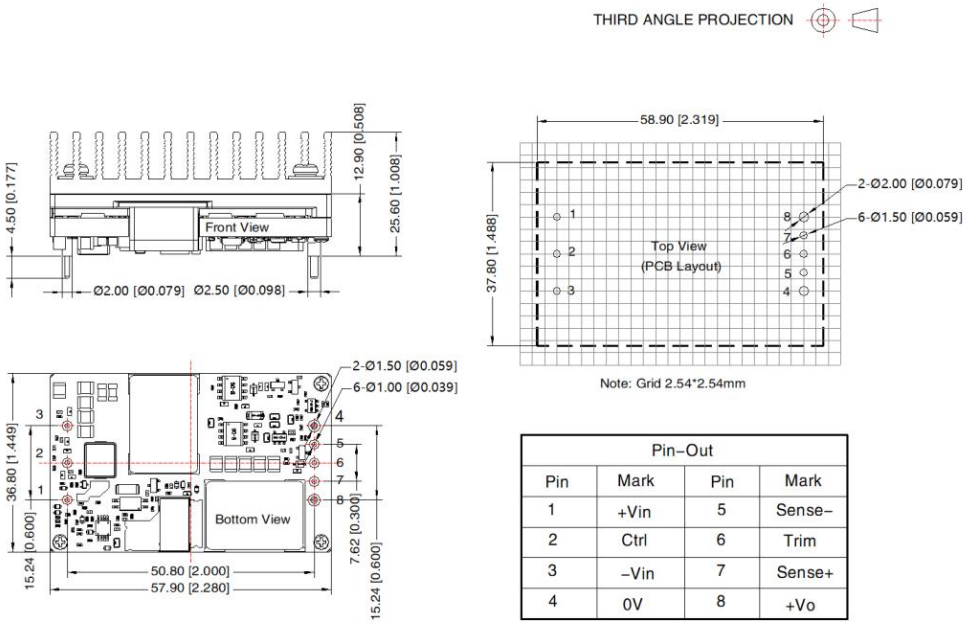
DOQB400-F48xxH Dimensions and Recommended Layout



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

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

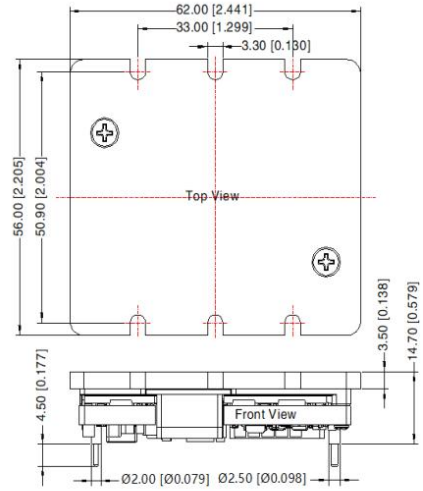
DOQB400-F48xxHN Dimensions and Recommended Layout

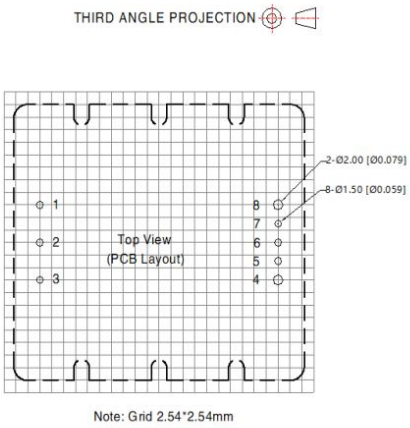


Pin-Out			
Pin	Mark	Pin	Mark
1	+Vin	5	Sense-
2	Ctrl	6	Trim
3	-Vin	7	Sense+
4	0V	8	+Vo

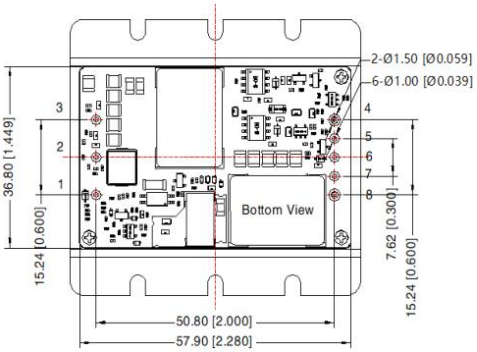
Note:
Unit: mm[inch]
Pin1,2,3,5,6,7's diameter: 1.00[0.039]
Pin4,8's diameter: 1.50[0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]
The layout of the device is for reference only, please refer to the actual product

DOQB400-F48xxF Dimensions and Recommended Layout





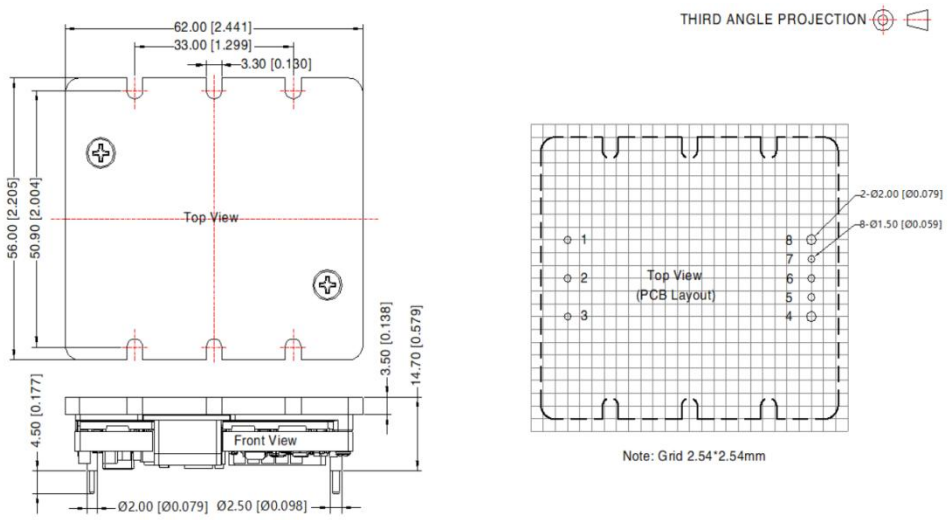
Note: Grid 2.54*2.54mm



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

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

DOQB400-F48xxFN Dimensions and Recommended Layout



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

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

Notes:

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 Ta=25℃, 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.
7. The image certification marks are for reference only; please refer to the selection table for actual specifications. Certification is based on the physical mark or packaging label.