Descriptions

60W isolated，DC-DC Converter



RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Ultra-wide 9-75VDC input voltage range
- High efficiency up to 92%
- I/O isolation test voltage 3k VDC
- Input under-voltage protection, output short-circuit, over-current, over-voltage protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard pin-out

Applications

- Industrial control
- Power
- Instrumentation
- Communication

Selection Guide

Certification	Part No.①	Input Voltage (VDC)		Output		Full Load Efficiency③ (%) Min./Typ.	Capacitive Load (μF)Max.
		Nominal (Range)	Max.②	Voltage (VDC)	Current (mA) Max./Min.		
EN/BS EN	DULD60-F4805	48 (9-75)	80	5	12000/0	88/90	20000
	DULD60-F4812			12	5000/0	88/90	6000
	DULD60-F4815			15	4000/0	88/90	4000
	DULD60-F4824			24	2500/0	89/91	2000
	DULD60-F4828			28	2143/0	90/92	2000

Note:

①Use "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;

②Exceeding the maximum input voltage may cause permanent damage;

③Efficiency is measured at nominal input voltage and rated output load;

④Product 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)			--	1389/15	1420/25	mA
	Surge Voltage (1sec. max.)			-0.7	--	100	VDC
	Start-up Voltage			--	--	9	
	Input Filter			Capacitance filter			
	Hot Plug			Unavailable			
	Ctrl①	Module on		Ctrl pin open or pulled high TTL (3-12VDC)			
		Module off		Ctrl pin pulled low to GND (0-1.2VDC)			
		Input current when off, 48VDC input voltage		--	6	12	mA
Output Specifications	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 Regulation②	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 & Noise③	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			
General Specifications	Isolation	Input-output Electric Strength Test for 1 minute with a leakage current of 1mA max.		3000	--	--	VDC
		Input/output-Case Electric Strength Test for 1 minute with a leakage current of 1mA max.		1600	--	--	
	Insulation Resistance	Input-output resistance at 500VDC		100	--	--	MΩ
	Isolation Capacitance	Input-output capacitance at 100kHz/0.1V		--	1000	--	pF
	Operating Temperature	See Fig. 1		-40	--	+105	℃
	Storage Temperature			-55	--	+125	
	Storage Humidity	Non-condensing		5	--	95	%RH
	Pin Soldering Resistance Temperature④	Soldering spot is 1.5mm away from the case, 10 seconds max.		--	--	+300	℃
		Wave soldering, maximum 10 seconds		255	260	265	

	Vibration		10-150Hz, 5G, 0.75mm. along X, Y and Z			
	Switching Frequency⑤	PWM mode	--	255	--	kHz
	MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy				
	Dimensions	Without heat sink	50.80 *25.40*11.80 mm			
		Heat sink	51.40 * 26.20 * 16.50 mm			
	Weight	Without heat sink	37.3g (Typ.)			
		Heat sink	47.1g (Typ.)			
	Cooling Method	Free air convection				

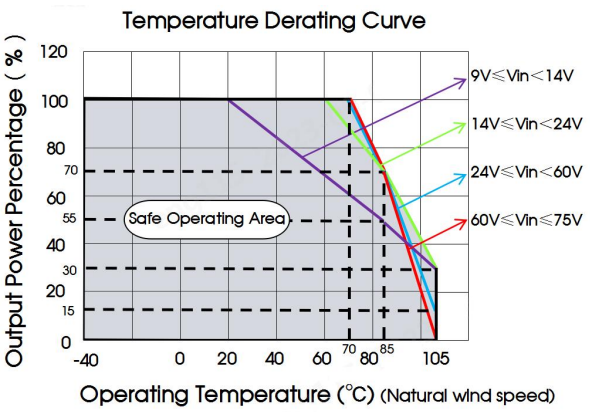
Note:
①The Ctrl pin voltage is referenced to input GND;
②Load regulation for 0% -100% load increases to ±3%;
③Under 0% -5% load conditions, ripple & noise does not exceed 5%Vo. The " Tip and barrel method" is used for ripple and noise test, please refer to Fig. 2. for recommended circuit;
④The pin soldering 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;
⑤Switching frequency is measured at full load. The module reduces the switching frequency for light load (below 50%) efficiency improvement.

Electromagnetic Compatibility (EMC)

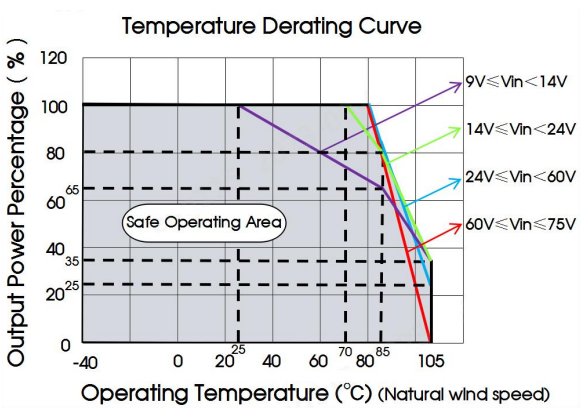
Emissions	CE	CISPR32/EN55032 CLASS A (see Fig. 3-① for recommended circuit) /CLASS B (see Fig. 3-② for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (see Fig. 3-① for recommended circuit) / CLASS B (see Fig. 3-② for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6kV/Air ±8kV	perf. Criteria 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 10 Vr.m.s	perf. Criteria A

Typical Characteristic Curves

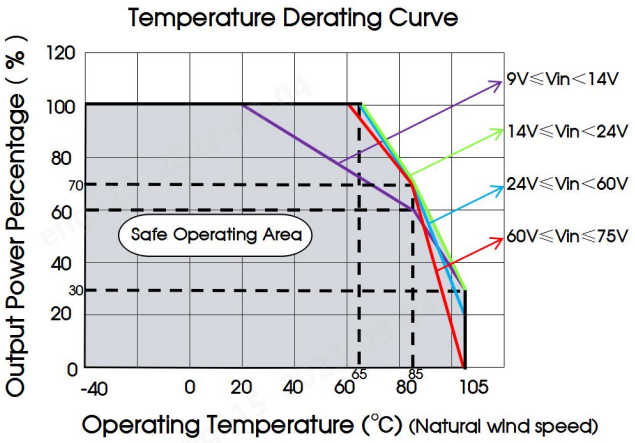
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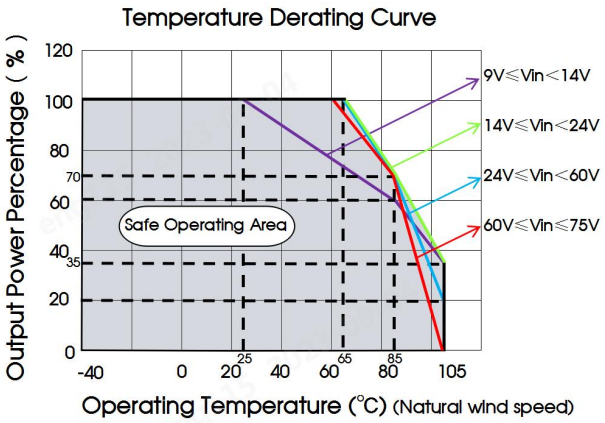
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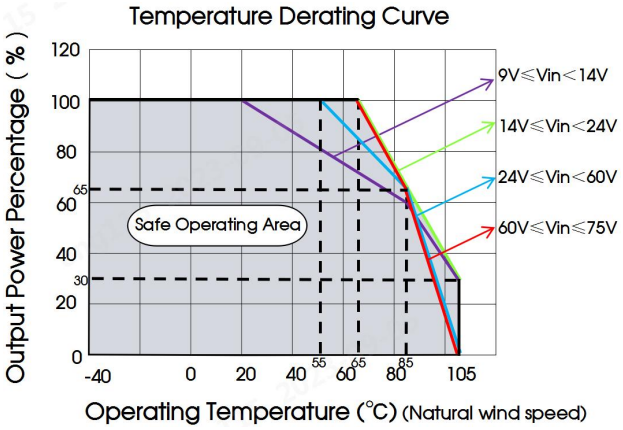
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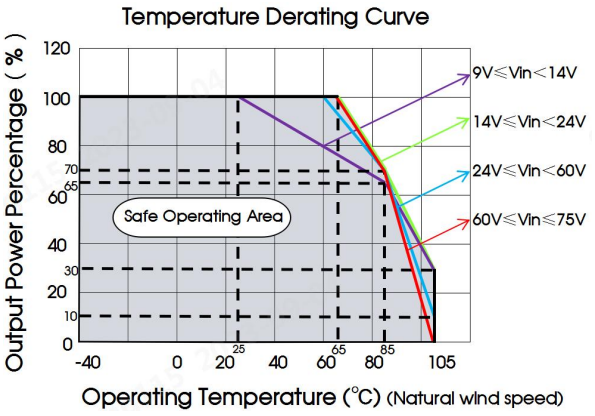
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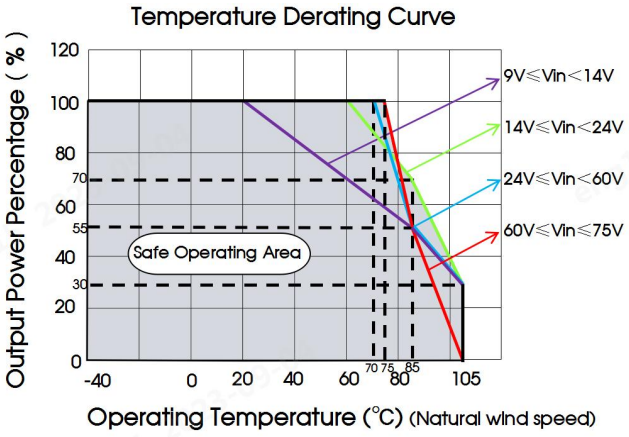
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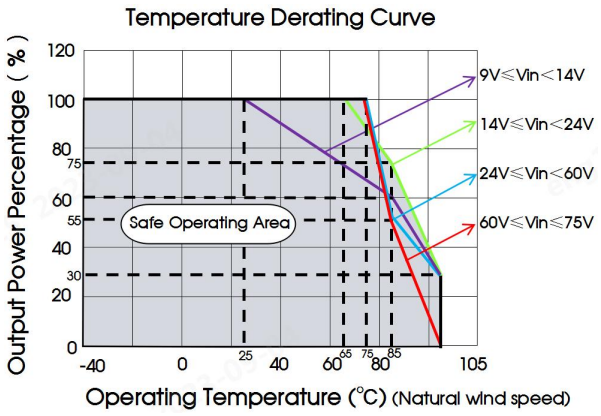
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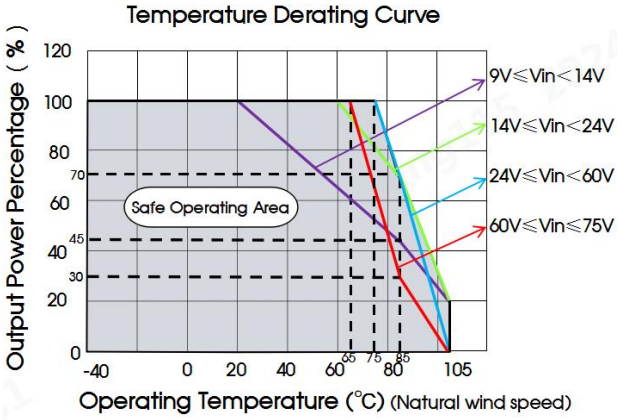
DULD60-F4824



DULD60-F4824H



DULD60-F4828



DULD60-F4828H

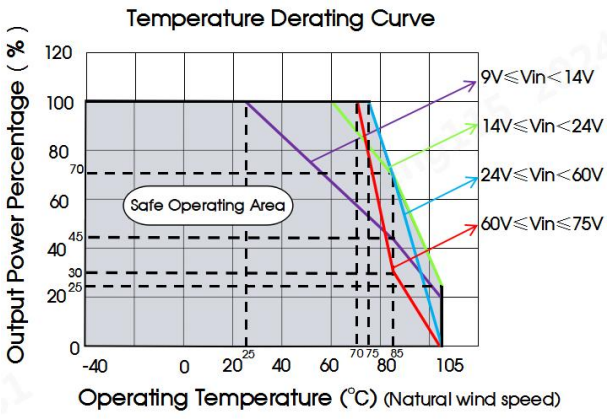


Fig. 1

Design Reference

1. Typical application

①All the DC-DC converters of this series are tested before delivery using the recommended circuit shown in Fig. 2.

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.

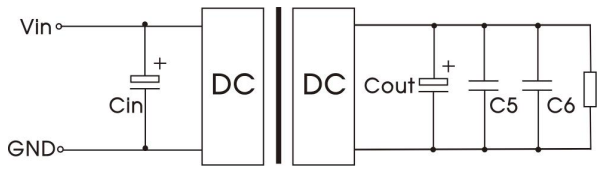


Fig. 2

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

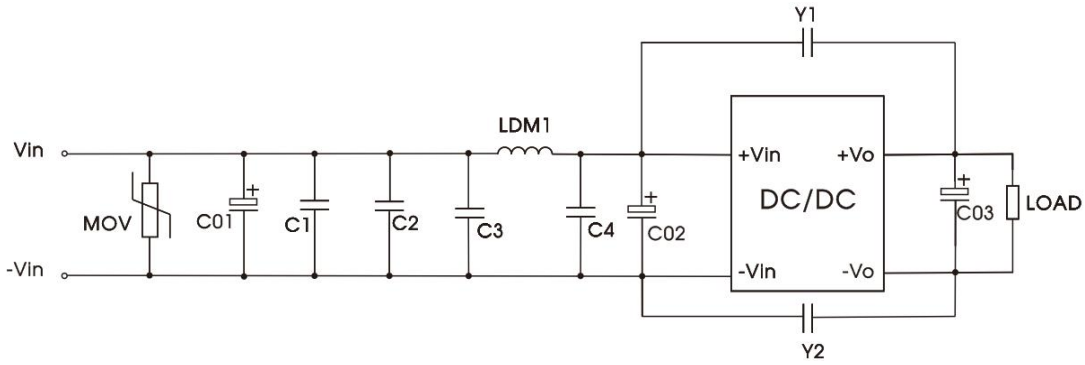


Fig. 3-①

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	/	/

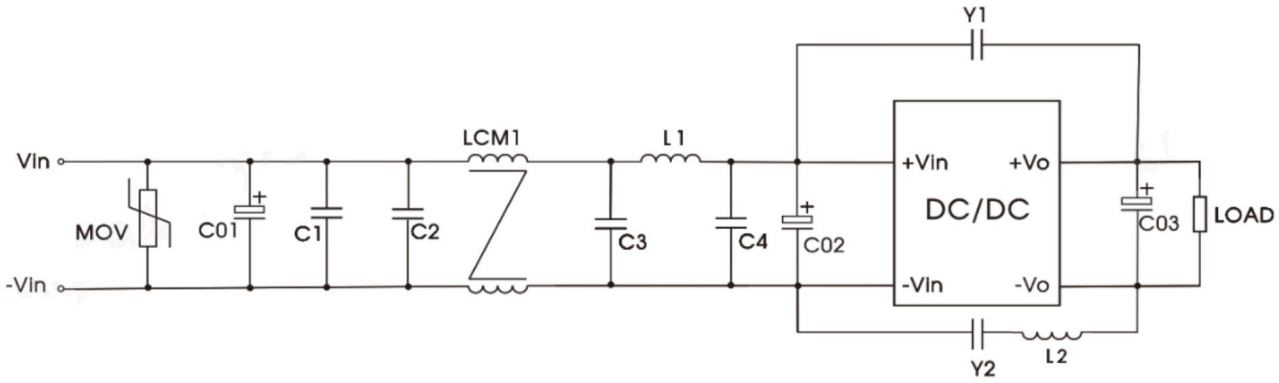
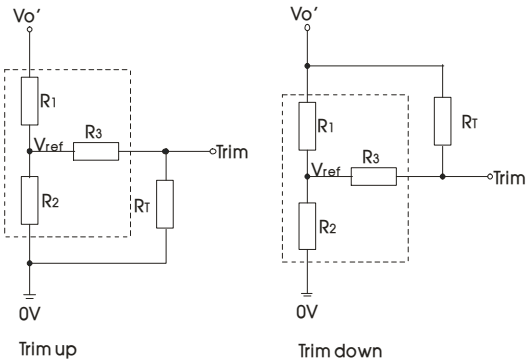


Fig. 3-②

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)



Trim resistor connections (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\text{up: } R_T = \frac{aR_2}{R_2-a} - R_3 \qquad a = \frac{Vref}{Vo'-Vref} \cdot R_1$$

$$\text{down: } R_T = \frac{aR_1}{R_1-a} - R_3 \qquad a = \frac{Vo'-Vref}{Vref} \cdot R_2$$

RT = Trim Resistor value
a = self-defined parameter
Vo' = desired output voltage

Vout(VDC)	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
5	2.93	2.87	10	2.5
12	10.91	2.87	12	2.5
15	14.35	2.87	12	2.5
24	24.77	2.87	15	2.5
28	29.41	2.87	15	2.5

4. Recommended solution for thermal testing

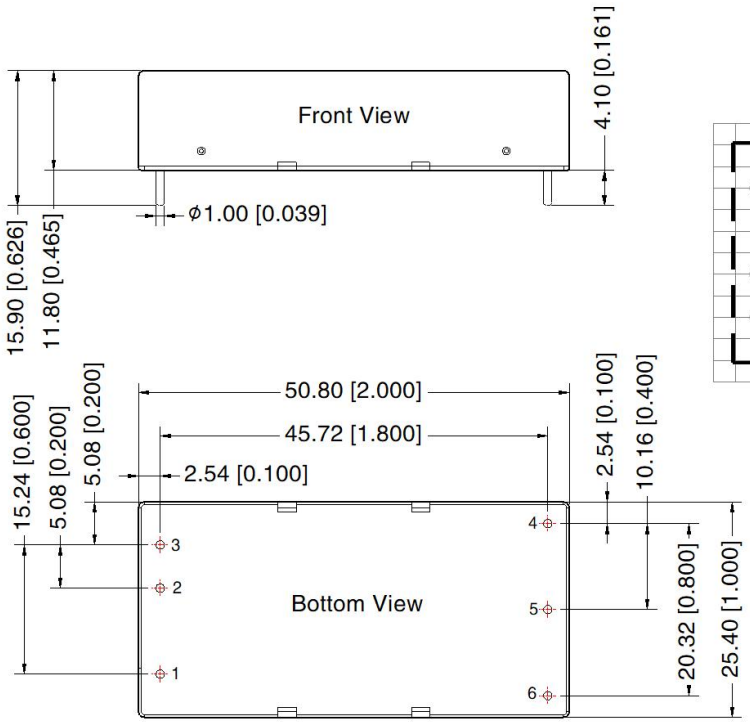
During the application process, the thermal design of the product can be evaluated in combination with the temperature derating curve of the product, or it can be determined by testing the temperature at point A, it is an safe operating area if the temperature lower than 100℃.

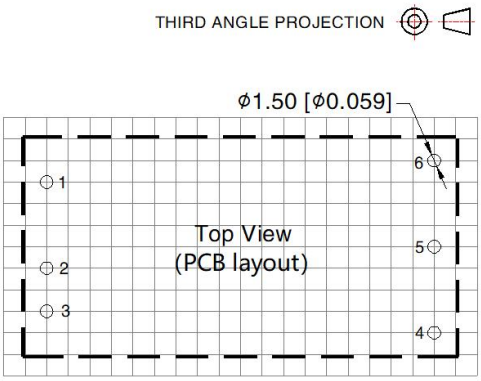


Fig.4

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

DULD60-F48xx Dimensions and Recommended Layout





Note: Grid 2.54*2.54mm

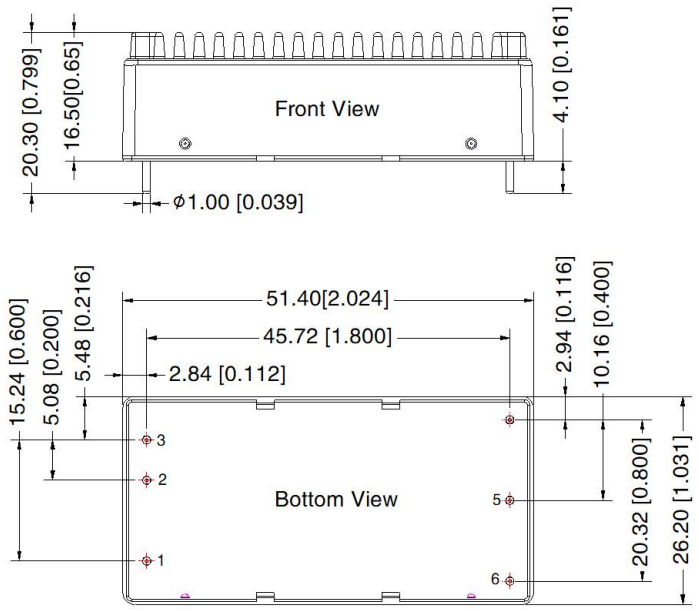
Pin–Out	
Pin	Mark
1	Ctrl
2	GND
3	Vin
4	+Vo
5	0V
6	Trim

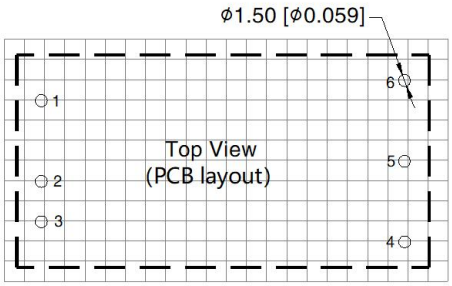
Note:
Unit: mm[inch]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

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

DULD60-F48xxH Dimensions and Recommended Layout

THIRD ANGLE PROJECTION





Note: Grid 2.54*2.54mm

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

Note:
Unit: mm[inch]
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

Note:

1. Recommended used in more than 5% load, if the load is lower than 5%, then the ripple index of the product may exceed the specification, but does not affect the reliability of the product;
2. If the product is not operated within the required load range, the product performance cannot be guaranteed to comply with all parameters in the datasheet;
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;
9. 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.