Descriptions

20A non-isolated ultra-wide input and buck single output DC-DC converter



RoHS

CE Report EN62368-1

UKCA Report BS EN62368-1

Features

- Ultra-wide input voltage range: 14.5 - 85VDC
- High efficiency up to 98%
- Input under-voltage protection, output short-circuit, over-current protection, over-temperature protection
- Operating ambient temperature range: -40℃ to +105℃
- Industry standard 1/8-Brick package and pin-out
- Maximum 540W output power

Applications

- Industrial control
- Electricity
- Instrumentation

Selection Guide

Certification	Part No①	Input Voltage (VDC)		Output		Full Load Efficiency④(%) Min./Typ.	Capacitive Load(μF) Max.
		Nominal② (Range)	Max.③ (VDC)	Voltage(VDC)	Current (A) Max.		
EN /BS EN	DNJEB20-B4805(F)	48 (14.5-85)	90	5	20	90/92	8500
	DNJEB20-B4812(F)	48 (18-85)		12	20	93/95	5500
	DNJEB20-B4815(F)	48 (21-85)		15	20	93/95	4400
	DNJEB20-B4824(F)	48 (30-85)		24	20	94/96	2200
--	DNJEB15-B4836(F)	48 (43-85)		36	15	96/98	680

Notes:

① "F" means heat sink package; We recommend to choose modules with a heat sink for enhanced heat dissipation and applications with extreme temperature requirements;

② After DNJEB20-B4805(F) is started with 16VDC input voltage, it can drop to 14.5VDC input voltage to work, but the 14.5-16VDC input voltage range is not guaranteed to meet the specifications in this manual. This manual specifications based on 16-85VDC input voltage range; When the input voltage exceeds 48VDC, a 330μF/100V electrolytic capacitor needs to be connected to the input to prevent module damage caused by voltage spikes;

③The input voltage should not exceed this value, otherwise permanent and unrecoverable damage may be caused;

④The above efficiency values are measured at nominal 48VDC input voltage;

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 48VDC input	DNJEB20-B4805(F)	--	2265/2	2315/--	mA
			DNJEB20-B4812(F)	--	5264/2	5377/--	
			DNJEB20-B4815(F)	--	6579/2	6721/--	
			DNJEB20-B4824(F)	--	10417/2	10639/--	
			DNJEB15-B4836(F)	--	11480/2	11719/--	
	Reverse Polarity at Input	Nominal 48VDC input		--	300	--	
	Surge Voltage (1sec. max.)			--	--	90	VDC
	Start-up Voltage	DNJEB20-B4805(F)		--	--	16	
		DNJEB20-B4812(F)		--	--	18	
		DNJEB20-B4815(F)		--	--	21	VDC
		DNJEB20-B4824(F)		--	--	30	
		DNJEB15-B4836(F)		--	--	43	
	Under-voltage Protection	DNJEB20-B4805(F)		10	--	--	
		DNJEB20-B4812(F)		13	--	--	
		DNJEB20-B4815(F)		16	--	--	
		DNJEB20-B4824(F)		24	--	--	
		DNJEB15-B4836(F)		36	--	--	
	Input Filter			Capacitance filter			
	Hot Plug			Unavailable			
	Input Reverse Polarity Protection			Unavailable			
	Ctrl①	Module on		Ctrl pin open or pulled high TTL(3 - 20VDC)			
		Module off		Ctrl pin pulled low to -Vin (0 - 1VDC)			
		Input current when off		--	1	5	mA
Output Specifications	Voltage Accuracy	Input voltage range, 10% - 100%Io		--	±2	±3	%
	Linear Regulation	Full load, input voltage range		--	±0.3	±1	
	Load Regulation	Nominal 48VDC input, 10% - 100%Io		--	±0.5	±2	
	Transient Recovery Time	Nominal 48VDC input, 25% load step change		--	300	500	us
	Transient Response Deviation	Nominal 48VDC input, 25% load step change	5VDC output	--	--	±8	%
			Others	--	--	±5	
	Temperature Coefficient	Operating temperature -40℃ to +105℃, full load		--	±0.02	--	%/℃
	Ripple & Noise②	20MHz bandwidth, nominal 48VDC input, full load		--	250	350	mVp-p
	Over-temperature Protection③	Maximum surface temperature of the product		--	125	--	℃
	Over-current Protection	Normal temperature, input voltage range		110	130	230	%Io
	Short-circuit Protection	Input voltage range		Hiccup, continuous, self-recovery			
General Specifications	Trim④			90	--	110	%Vo
	Sense	See part of Remote Sense Application		--	--	105	
	Operating Temperature			-40	--	+105	℃
	Storage Temperature			-55	--	+125	
	Pin Soldering Resistance Temperature⑤	Soldering spot is 1.5mm away from the case, 10 seconds max.		--	--	+300	

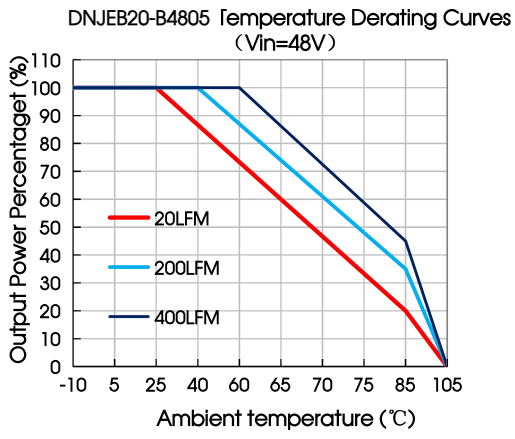
		Wave soldering, maximum 10 seconds	255	260	265	
	Storage Humidity	Non-condensing	5	--	95	%RH
	Vibration		10-150Hz, 5G, 0.75mm, 90 Min. along X, Y and Z			
	Switching Frequency⑥		--	350	--	kHz
	MTBF	MIL-HDBK-217F@25℃	1000	--	--	k hours
Mechanical Specifications	Case Material	Aluminum alloy				
	Dimensions	DNJEB20-B48xx, DNJEB15-B4836	60.80 × 25.00 × 12.70 mm			
		DNJEB20-B48xxF, DNJEB15-B4836F	60.80 × 36.83 × 12.70 mm			
	Weight	DNJEB20-B48xx, DNJEB15-B4836	53.0g(Typ.)			
		DNJEB20-B48xxF, DNJEB15-B4836F	58.2g(Typ.)			
	Cooling Method	Free air convection or forced convection				

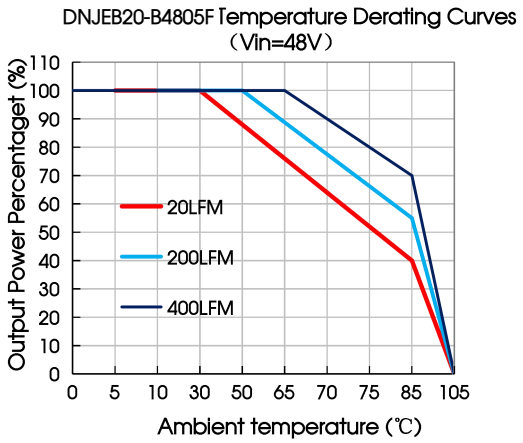
Note:
①The ctrl pin voltage is referenced to input -Vin;
②The method is used for ripple and noise test, please refer to Fig.3;
③Over-temperature protection for product is output off;
④When using Trim and Sense, the 24VDC output needs to meet Vin≥34VDC, the 36VDC output needs to meet Vin≥48VDC;
⑤The pin 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;
⑥Switching frequency varies with input voltage and load, ranging from 110-750 kHz.

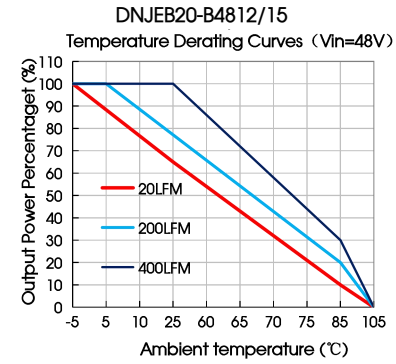
Electromagnetic Compatibility (EMC)

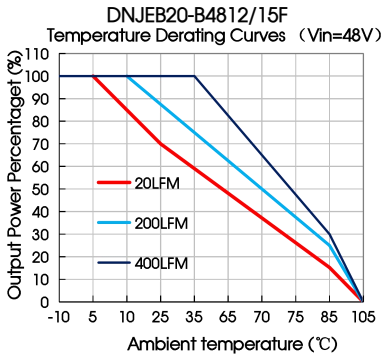
Emissions	CE	CISPR32/EN55032 CLASS A (see Fig. 4 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (see Fig. 4 for recommended circuit)	
Immunity	ESD	IEC/EN61000-4-2 Contact ±6kV	perf. Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN61000-4-4 ±2kV (see Fig. 4 for recommended circuit)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

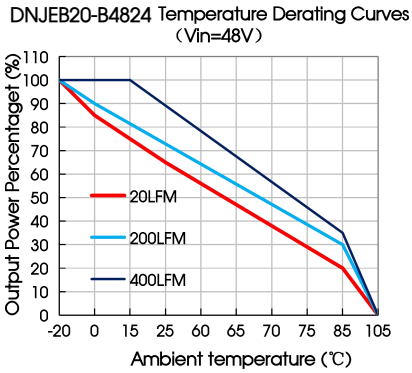
Characteristic Curve

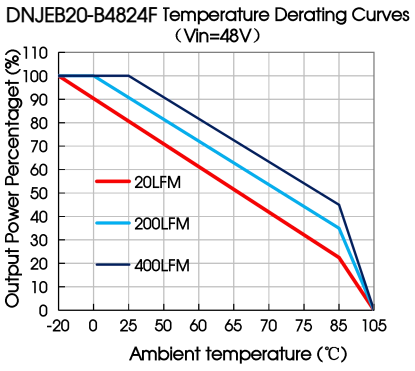


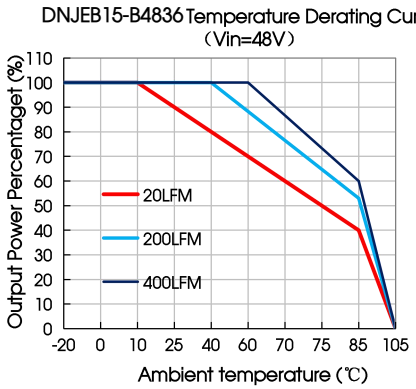



DNJEB20-B4812/15
Temperature Derating Curves（Vin=48V）
Output Power Percentaget (%)
20LFM
200LFM
400LFM
Ambient temperature (℃)


DNJEB20-B4812/15F
Temperature Derating Curves（Vin=48V）
Output Power Percentaget (%)
20LFM
200LFM
400LFM
Ambient temperature (℃)


DNJEB20-B4824 Temperature Derating Curves
（Vin=48V）
Output Power Percentaget (%)
20LFM
200LFM
400LFM
Ambient temperature (℃)


DNJEB20-B4824F Temperature Derating Curves
（Vin=48V）
Output Power Percentaget (%)
20LFM
200LFM
400LFM
Ambient temperature (℃)


DNJEB15-B4836 Temperature Derating Curves
（Vin=48V）
Output Power Percentaget (%)
20LFM
200LFM
400LFM
Ambient temperature (℃)

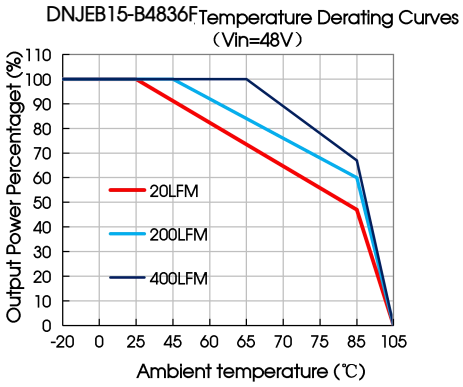

DNJEB15-B4836F Temperature Derating Curves
（Vin=48V）
Output Power Percentaget (%)
20LFM
200LFM
400LFM
Ambient temperature (℃)

Fig. 1

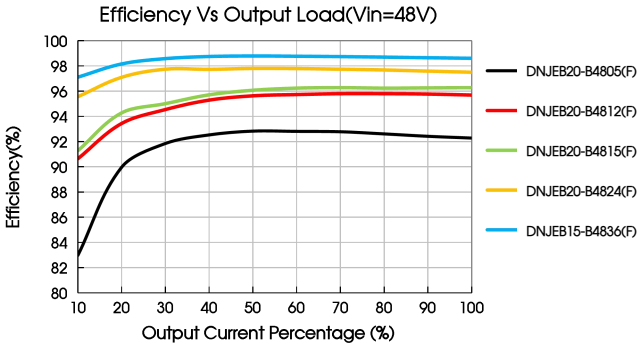
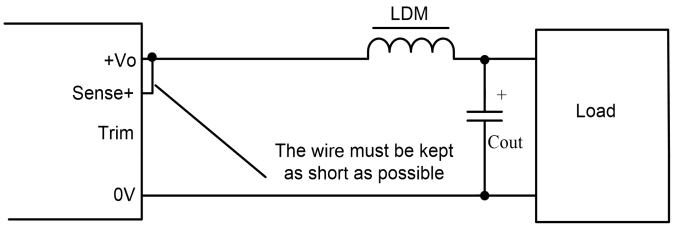

Efficiency Vs Output Load(Vin=48V)
Efficiency(%)
DNJEB20-B4805(F)
DNJEB20-B4812(F)
DNJEB20-B4815(F)
DNJEB20-B4824(F)
DNJEB15-B4836(F)
Output Current Percentage (%)

Fig. 2

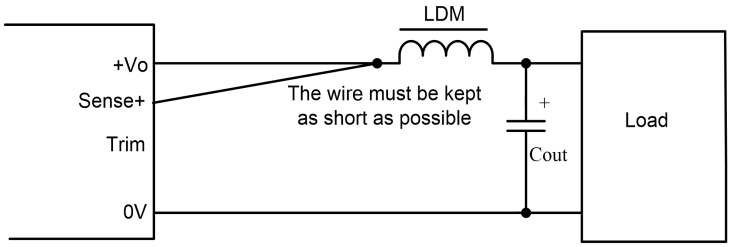
Remote Sense Application

1. Remote Sense Application:



Notes:
①If the sense function is not used for remote regulation the user must connect the Sense+ to +Vo at the DC-DC converter pins and will compensate for voltage drop across pins only.
②The 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:
①Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used;
②We 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;
③Note 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. Application circuit

① During product testing and application, please follow the recommended test circuit (Fig. 3); At least one electrolytic capacitor Cin is guaranteed to be connected externally to suppress the possible input surge voltage; An external inductor and electrolytic capacitor are connected to output for output filtering;
②If the input terminal of the product is connected in parallel with a circuit with large transient energy (such as a parallel motor drive circuit), the input voltage of the product may be pulled down. At this time, pay attention to the fluctuation of the input voltage of the product, and it is recommended to appropriately increase the capacitance of the electrolytic capacitor Cin at the input terminal to ensure the stability of the input terminal voltage and avoid the situation where the input voltage is lower than the under-voltage protection point and cause the product to restart repeatedly;
③If the input and output ripple needs to be further reduced, Cin and Cout capacity of external capacitors can be appropriately increased or external capacitors with small series equivalent impedance can be selected.

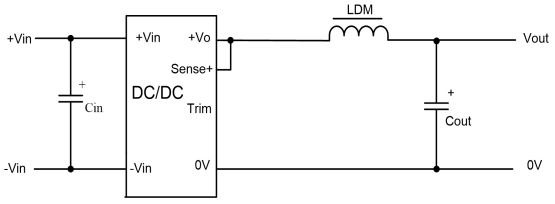


Fig. 3

Cin	LDM	Cout
330μF/100V(ESR<45mΩ)	1μH/27A	330μF/50V

2. EMC compliance circuit

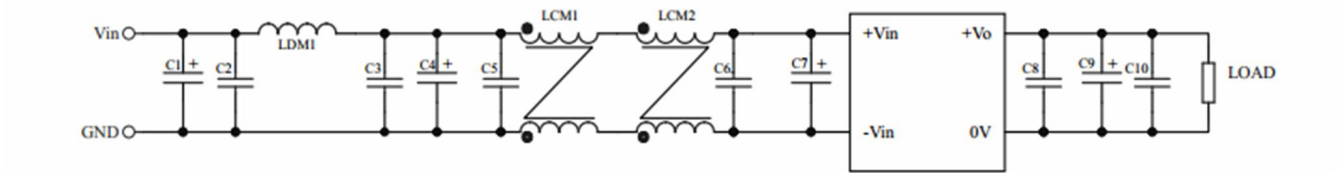
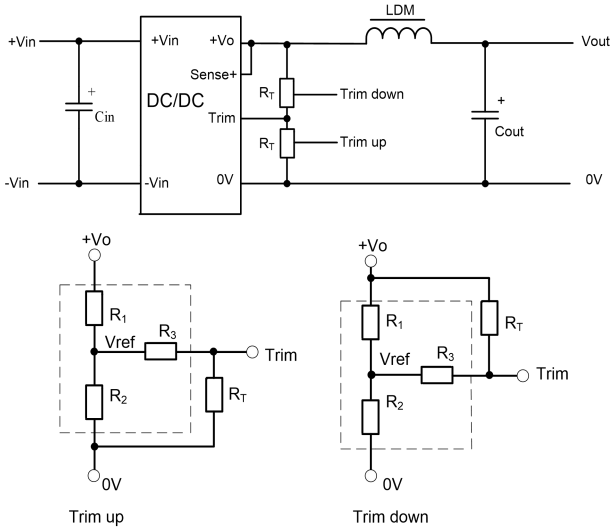


Fig. 4

Components	Recommended Component Value	Components Function
C1	2000μF/100V electrolytic capacitor	Meet EFT and Surge
C7	330μF/100V electrolytic capacitor	
C1、C4、C7	330μF/100V electrolytic capacitor	Meet CE and RE
C2、C3、C5、C6	4.7μF/100V ceramic capacitor	
C8、C10	4.7 μF/50V ceramic capacitor	
C9	330μF/50V electrolytic capacitor	
LDM1	8.2uH/15A	
LCM1、LCM2	EFL2D-4-040	

3. Trim Function for Output Voltage Adjustment



Trim resistance calculation formula:

$$\text{up: } R_T = \frac{\alpha R_2}{R_2-\alpha} - R_3 \qquad \alpha = \frac{Vref}{+Vo-Vref} - R_1$$

$$\text{down: } R_T = \frac{\alpha R_1}{R_1-\alpha} - R_3 \qquad \alpha = \frac{+Vo-Vref}{Vref} - R_2$$

R_T: the Trim resistor

α : user-defined parameter and has no actual meaning

+Vo: the actual up or down voltage required

Trim resistor connection (dashed line shows internal resistor network)

Part No.	R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
DNJEB20-B4805(F)	6.65	2.87	12.4	1.5
DNJEB20-B4812(F)	20	2.87	14.7	1.5
DNJEB20-B4815(F)	25.8	2.87	17.5	1.5
DNJEB20-B4824(F)	43.13	2.87	17	1.5
DNJEB15-B4836(F)	83.08	3.6	20.8	1.5

When trimming is used, if the RT resistor is too small or the Trim and +Vo pins are directly short-circuited, resulting in the output voltage after trimming, the product may be irreparably damaged.

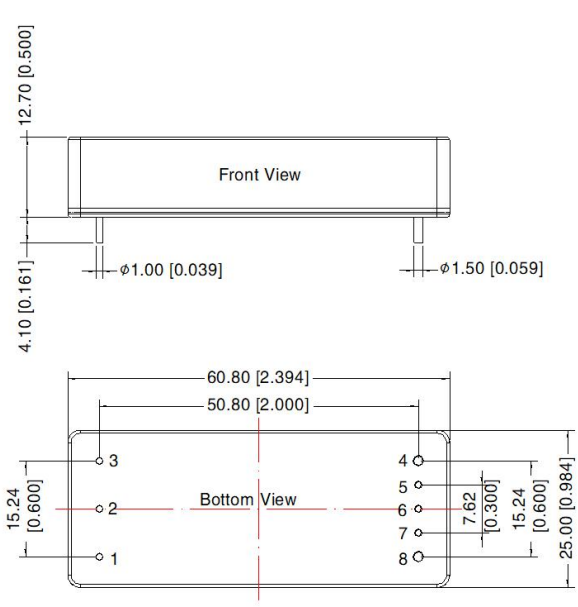
4. The products do not support parallel connection of their output

5. Recommended solution for thermal test

In the application process, the product temperature derating curve can be combined to evaluate the product thermal design; The temperature of point A is used to determine the stable operating range of the product, when it is lower than 110℃, it is the stable operating range.

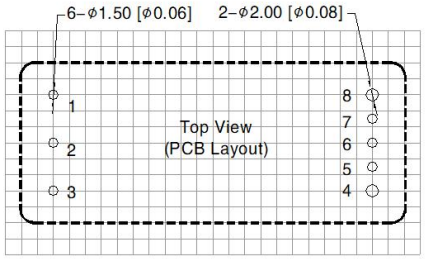


DNJEB15/20-B48xx Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin1,2,3,6,7 diameter: 1.00[0.039]
Pin4,8 diameter: 1.50[0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

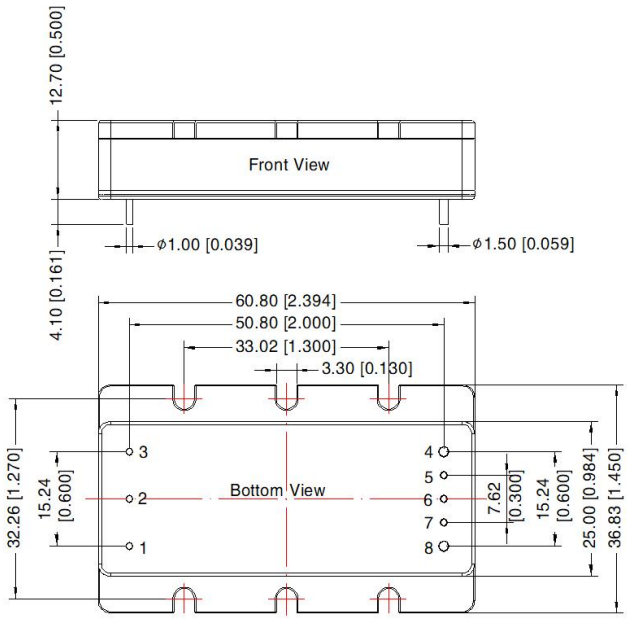
THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

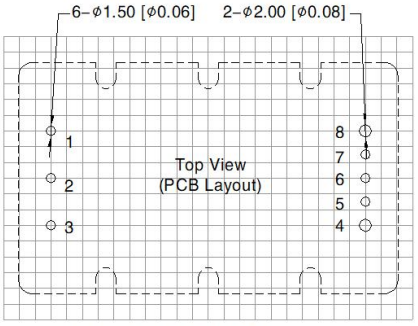
Pin–Out			
Pin	Mark	Pin	Mark
1	+Vin	5	No pin
2	Ctrl	6	Trim
3	–Vin	7	Sense+
4	0V	8	+Vo

DNJEBF15/20-B48xxF Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin1,2,3,6,7 diameter: 1.00[0.039]
Pin4,8 diameter: 1.50[0.059]
Pin diameter tolerances: ± 0.10[± 0.004]
General tolerances: ± 0.50[± 0.020]

THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

Pin–Out			
Pin	Mark	Pin	Mark
1	+Vin	5	No pin
2	Ctrl	6	Trim
3	–Vin	7	Sense+
4	0V	8	+Vo

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. Products are related to laws and regulations: see "Features" and "EMC";
4. Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units;
5. 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.