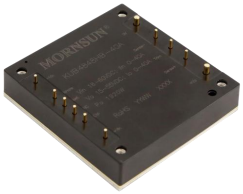
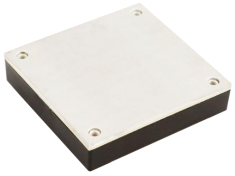
DC/DC Converter
KUB4848HB-40A

MORNSUN®

1920W ultra-wide input, non-isolated, buck-boost single output





Patent Protection RoHS

FEATURES

- Ultra-wide input voltage range: 14.5 - 60VDC
- Output voltage range: 15 - 55VDC
- High efficiency up to 96%
- No-load input current as low as 10 mA
- Protections: input under-voltage, input over-voltage,output over-voltage, short-circuit, output over-current, over-temperature
- Parallel support
- Operating ambient temperature range: -40℃ to 100℃
- Industry standard half-Brick package and pin-out

KUB4848HB-40A is high efficiency switching regulators. It features ultra-wide input range of 14.5-60VDC, adjustable output voltage range of 15-55VDC, efficiency up to 96%, operating temperature of -40℃ to +100℃, input over-voltage and under-voltage protection, output short-circuit and output over-voltage, over-current, over-temperature protection, remote control, output voltage regulation and remote compensation, current monitor, parallet support and other functions. It is widely used in robotics, communications, battery management, DC-DC distributed power supply and other occasions.

Selection Guide

Certification	Part No.	Input			Output			Full Load Efficiency (%)① Min./Typ.	Capacitive Load (μF) Max.
		Nominal (Range) (VDC)	Max.② (VDC)	Current (A) Max.	Voltage (Range) (VDC)	Current (A) Max.	Power(W) Max.		
--	KUB4848HB-40A	48 (14.5-60)③	60	40	48 (15-55)	40	1920	95/96	1000

Note:
① The above efficiency values are measured at nominal input voltage, nominal output voltage and output maximum load;
② The input voltage should not exceed this value, otherwise permanent and unrecoverable damage may be caused;
③ After the product is started at 18VDC input voltage, it can be reduced to 14.5VDC input voltage to work, but it is not guaranteed to meet the specifications of this datasheet in the 14.5-18VDC input voltage range. This datasheet is for 18-60VDC;
④ KUB4848HB-40A products in the nominal input voltage range(14.5-60VDC) and output voltage range (15-55VDC) can work properly, but the input and output currents cannot exceed 40A and the output power cannot exceed 1920W. For details, see the product characteristic curve.

Typical input-output Efficiency

Input	Output			Efficiency (%) Typ.
Voltage(VDC)	Voltage(VDC)	Current(A)	Power(W) Max.	
24	24	40	960	94
	48	20	960	93
48	24	40	960	92
	48	40	1920	96

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (full load / no-load)	48Vin, 48Vo	--	--/10	40000/--	mA
Reflected Ripple Current	Nominal input voltage	--	150	1000	
Surge Voltage (1sec. max.)		--	--	70	VDC
Start-up Voltage		--	17	18	
Under-voltage Protection		12	14.5	--	
Over-voltage Protection		--	73	80	
Input Filter		Capacitance filter			
Hot Plug		Unavailable			

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Input Reverse Polarity Protection		Unavailable			
Input Current Limit		--	--	40	A
Ctrl	Module on	Ctrl pin open or pulled GND or pulled low (0-0.6 VDC)			
	Module off	Ctrl pin pulled TTL to high(2.5-5 VDC)			
	Input current when off	--	2	8	mA

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy	Input voltage range 0% -100% load	--	±1	±3	%
Linear Regulation	Full load, input voltage range	--	±0.02	±1	
Load Regulation	Nominal input voltage, 0% -100% load	--	±0.5	±1	
Transient Response Deviation	Nominal input voltage, 24Vo, 25% load step change，0.1A/uS	--	300	500	mV
	Nominal input voltage, 48Vo, 25% load step change，0.1A/uS	--	800	1200	
Transient Recovery Time	Nominal input voltage, 24Vo, 25% load step change，0.1A/uS	--	200	400	uS
	Nominal input voltage, 48Vo, 25% load step change，0.1A/uS	--	200	400	
Temperature Coefficient	Operating temperature -40℃ to +105℃	--	±0.02	--	%/℃
Ripple & Noise①	20MHz bandwidth, nominal input voltage, full load	--	200	--	mVp-p
Over-temperature Protection	Maximum surface temperature of the product	--	100	115	℃
Over-voltage Protection	Input voltage range, output power range	--	--	60	VDC
Output Current Limit		--	--	40	A
Short-circuit Protection	Input voltage range	Hiccup, continuous, self-recovery			
Iset	Input to set maximum output current	See Iset function for output current adjustment			
	Pin Voltage	--	2.1	--	VDC
Trim	Input to set output voltage	See Trim function for output voltage adjustment			
	Adjustable range of output voltage	15	--	55	VDC
Sense	See part of Remote Sense Application	See Sense function adjustment			
		--	--	105	%Vo
Ishare	Current monitor：Pin Voltage at Full Load	--	2.0	--	VDC
	Number in Parallel	--	--	4	PCS

Note:
①The "parallel cable" method is used for ripple and noise test and parallel 220uF/100V capacitor, please refer to DC-DC Converter Application Notes for specific information;
②test condition：Ta = 25℃, airflow rate = 400 LFM, the product surface temperature is less than 100℃

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation	Input/Output - Shell, Electric Strength Test for 1 minute with a leakage current of 1mA max.	1500	--	--	VDC
Operating Temperature	Surface temperature	-40	--	+100	℃
Storage Temperature		-55	--	+125	
Storage Humidity	Non-condensing	5	--	95	%RH
Pin Soldering Resistance Temperature	Wave-soldering, 10 second	--	--	+260	℃
	Soldering spot is 1.5mm away from case for 10 seconds	--	--	+300	
Pollution Degree		PD 3			
Vibration		10-150Hz, 5g, 0.75mm, 90 Min. along X, Y and Z			
Switching Frequency	Full load, nominal input voltage	--	800	--	kHz

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Operating altitude		Altitude: ≤2000m, Atmospheric pressure: 80-110KPa			
MTBF	MIL-HDBK-217F@25℃	500	--	--	k hours

Note:
①Operating temperature refers to the surface temperature of the product.

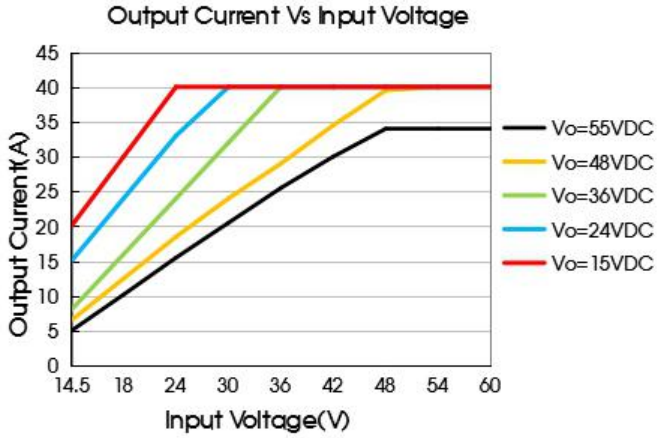
Mechanical Specifications

Case Material	Aluminum alloy
Dimensions	61.00 x 57.90 x 12.70 mm
Weight	133 g(Typ.)
Cooling Method	Free air convection or forced convection

Electromagnetic Compatibility (EMC)

Emissions	CE	CISPR32/EN55032 CLASS A (see Fig. 3 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A (see Fig. 3 for recommended circuit)	
Immunity	ESD	IEC/EN 61000-4-2 Contact ±6kV	perf. Criteria B
	RS	IEC/EN 61000-4-3 10V/m	perf. Criteria A
	EFT	IEC/EN 61000-4-4 ±2kV (see Fig. 3 for recommended circuit)	perf. Criteria B
	Surge	IEC/EN 61000-4-5 line to line ±2kV (see Fig. 3 for recommended circuit)	perf. Criteria B
	CS	IEC/EN 61000-4-6 10Vr.m.s	perf. Criteria A

Typical Characteristic Curves



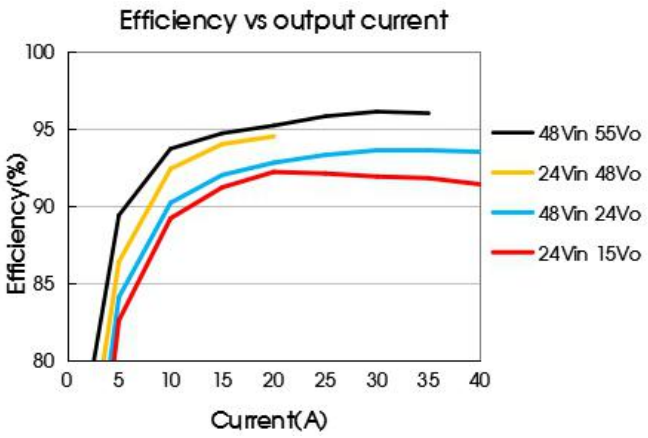
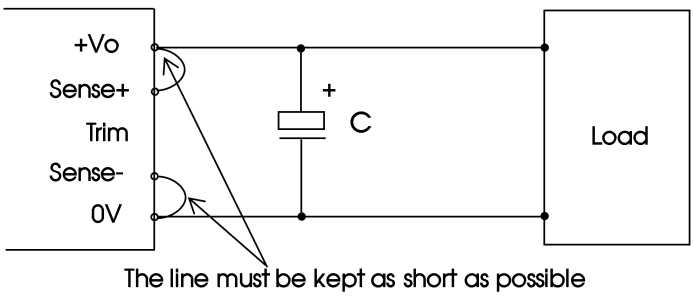


Fig.1

Remote Sense Application

1. Remote Sense Connection if not used



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.

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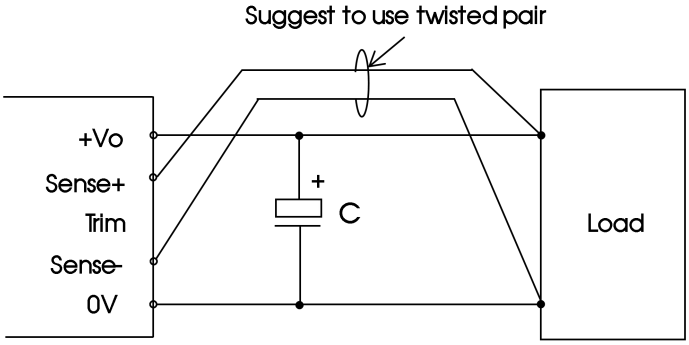
2. Remote Sense Connection used for Compensation



Notes:

(1) The compensation voltage should not exceed 2V. Do not exceed the output voltage range when using remote compensation;

(2) Using remote sense with long wires may cause unstable output, please contact technical support if long wires must be used;

(3) 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;

(4) 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;

(5) 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. Application circuit

(1) During product testing and application, please follow the recommended test circuit (Figure 2); At least one electrolytic capacitor Cin (≥100μF) is guaranteed to be connected externally to suppress the possible input surge voltage;

(2) If 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;

(3) If the output end of the product is inductive load (such as relay and motor), it is recommended to increase the output capacitance Cout capacitance within the capacitive load specification and add TVS tubes to filter out voltage spikes;

(4) If 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. Cout capacity of external capacitors cannot be greater than the maximum capacitive load of products.

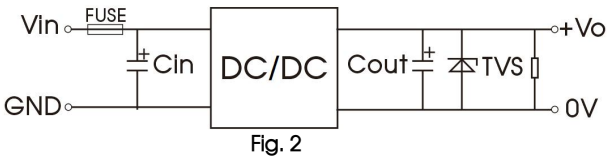


Fig. 2

Fuse	Cin*	Cout	TVS
50A, Slow fuse	220μF/100V	220μF/100V	Based on the output voltage

Note: *During the use of external capacitor, attention should be paid to the external environment temperature of the product. Under low temperature, the electrolytic capacitor capacity value should be increased to 1.5 times of the original parameter at least.

2. EMC compliance circuit

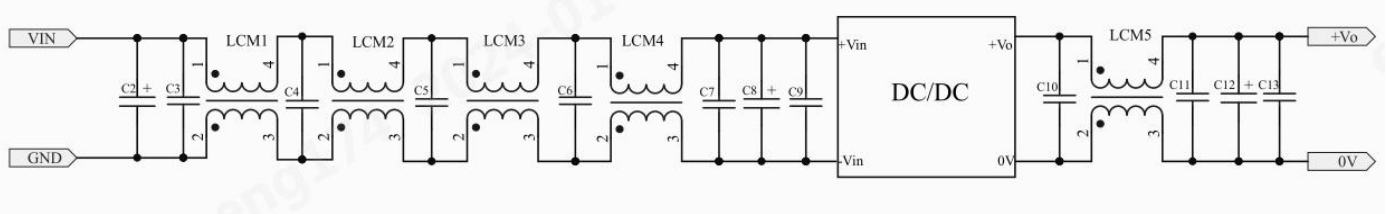


Fig.3 Recommended compliance circuit

C2, C8, C12	C3, C4, C5, C6, C7, C9, C10, C11, C13	LCM1, LCM3	LCM2, LCM4, CM5
1000μF/100V	10μF/100V	FL2D-D0-152 (MORNSUN)	FL2D-D0-040 (MORNSUN)

3. Trim Function for Output Voltage Adjustment

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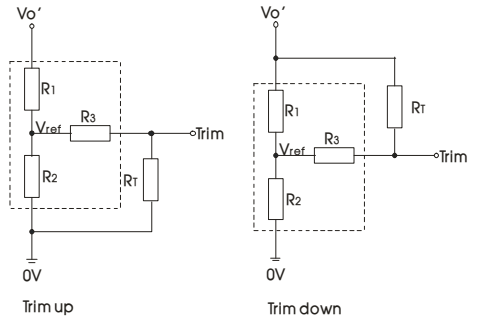


Trim resistor connection (dashed line shows internal resistor network)

Trim resistance calculation formula:

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

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

RT: the Trim resistor
A: a user-defined parameter and has no actual meaning
Vo ': the actual up or down voltage required

R1(kΩ)	R2(kΩ)	R3(kΩ)	Vref(V)
150	7.5	35.7	2.28

Recommended Trim resistors for typical output voltages

Vo'(V)	15	20	24	36	48	55
RT (kΩ)	22.4	58.7	100	396.8	/	12.4
Trim	down	down	down	down	/	up

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

4. Output Current Setpoint (Iset)

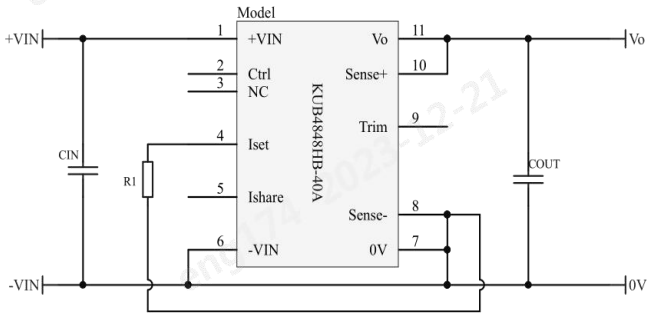
The maximum output current (effectively the current limit) can be reduced to any value between 0 and Imax by connecting one resistor between the Iset pin(4) and Sense- pin (8); see Figure. The value of the resistor should be:

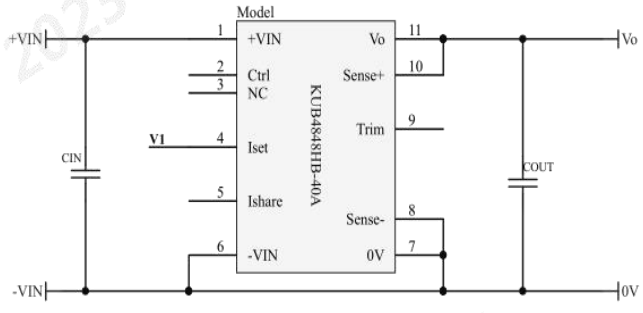
$$R1(Iset)=\frac{1.034Io_{\max}}{1.452-0.027Io_{\max}}\ \mathrm{K\Omega}$$

Iomax(A)	5	10	15	20	25	30	35	40
R1(KΩ)	3.92	8.74	14.8	22.6	33.2	48.3	71.3	110.0

Alternatively, the Iset pin can be driven from an external voltage source:

$$V1(Iset)=(0.05*Io_{\max}+0.1)V$$





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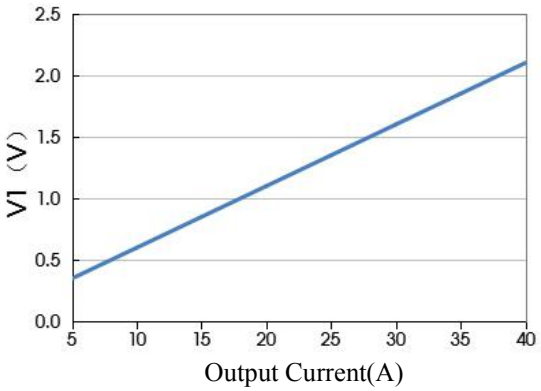
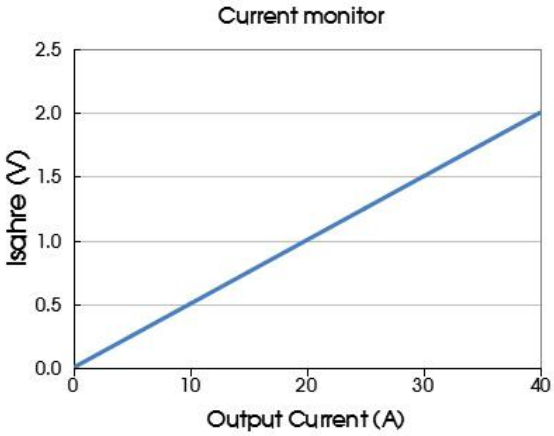
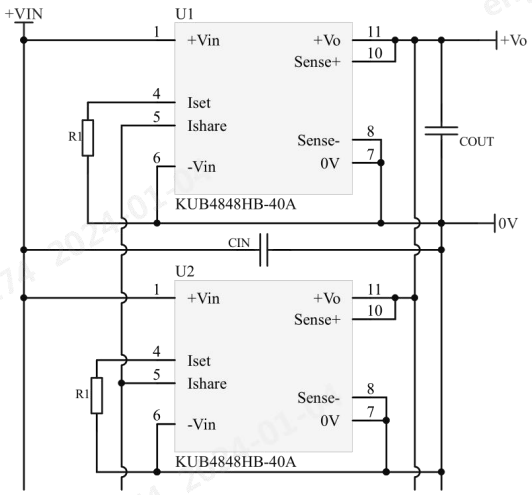


5. Current monitor or Share

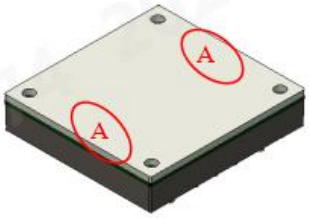
The units should all be set at the same output voltage setpoint by using identical Rvset resistors and using Iset pin set the same output current limit. In this arrangement, the level of the Ishare bus is that of the average current delivered by each converter.





6. 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 100℃, it is the stable operating range.



7. For additional information please refer to DC-DC converter application notes on www.mornsun-power.com

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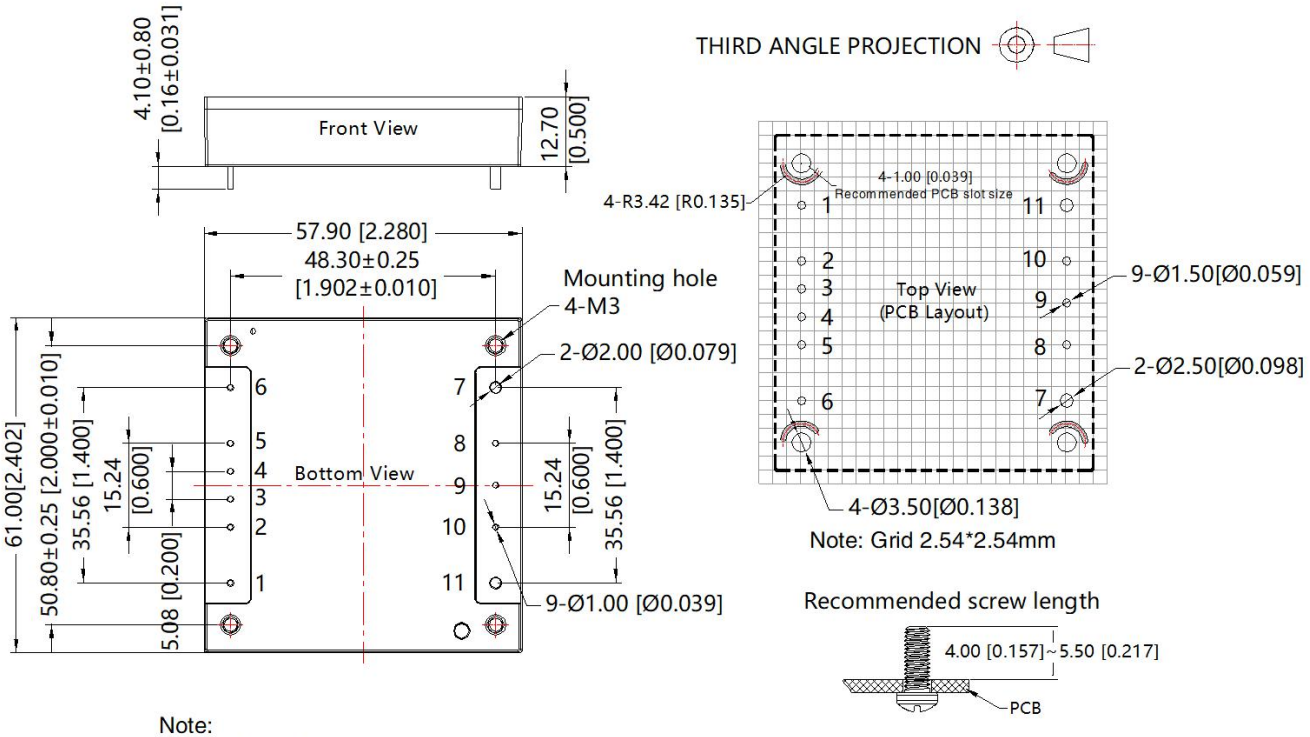
KUB4848HB-40A Dimensions and Recommended Layout



Note:
Unit: mm[inch]
Pin1, 2, 3, 4, 5, 6, 8, 9, 10diameter: 1.00[0.039]
Pin7, 11diameter: 2.00[0.079]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]
Mounting hole screwing torque: Max 0.4 N・m

Pin-Out			
Pin	Mark	Pin	Mark
1	+Vin	7	0V
2	Ctrl	8	Sense-
3	NC	9	Trim
4	Iset	10	Sense+
5	Ishare	11	+Vo
6	-Vin		

Notes:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58200069;
2. The maximum capacitive load offered were tested at nominal input voltage and full load;
3. 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;
4. All index testing methods in this datasheet are based on our company corporate standards;
5. We can provide product customization service, please contact our technicians directly for specific information;
6. Products are related to laws and regulations: see "Features" and "EMC";
7. 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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