FEATURES

1. Wide input voltage range: 9-60VDC
2. Output voltage range: 0-60VDC
3. Efficiency up to 98%
4. Built-in output reverse current protection Oring-fet
5. Input under-voltage protection, input over-voltage protection, output over-voltage protection, output over-current & short-circuit protection, over-temperature protection
6. Operating temperature range: -40°C to +100°C (case temperature)
7. 1/8 brick international standard pin configuration
8. Application: Communication, battery management, DC-DC distributed power supply, robot

RoHS CE 3 years Warranty

Selection Guide

Part No.	Input			Output	
	Nominal (Range) (VDC)	Max. (VDC)	Current Limit (A) max.	Nominal (Range) (VDC)	Current (A) max.
QAB4836EB-20A-S(F)G	9-60	60	23	0-60	20
QAB4836EB-20A-C(F)G	9-60	60	23	0-60	20

Note:
① The input voltage must not exceed this value; otherwise, it may cause permanent and irrecoverable damage.
② When Vin > Vo, the maximum output current cannot exceed 20A; when Vin ≤ Vo, the maximum input current cannot exceed 23A.
③ The 5 and 7 output terminals of QAB4836EB-20A-SG are for the Senso- and Sonso+ versions; the 5 and 7 output terminals of QAB4836EB-20A-CG are for the Iset and Imon versions.
④ (F) are packaged with heat sinks.

Typical operating condition efficiency

Input	Output			Efficiency(%) Typ.
Voltage(VDC)	Voltage(VDC)	Current(A)	Output Power(W)Max.	
12	48	5	240	92.5
	48	2.5	120	93.5
	24	10	240	94.5
	24	5	120	96.0
	12	20	240	94.0
	12	10	120	96.0
24	48	10	480	96.5
	48	5	240	96.5
	24	20	480	97.0
	24	10	240	97.5
	12	20	240	94
	12	10	120	95
48	48	20	960	98.0
	48	10	480	98.0
	24	20	480	95.5
	24	10	240	95.5
	12	20	240	93.5
	12	10	120	93.5
60	60	20	1200	98.0
	60	10	600	98.0

Note: The corresponding 100% Io values for each operating condition are shown in the power reduction curve in Figure 1.

Input Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Input Current (no-load)	Vin=12/24/36/48V,Vout=12V,Io=0A	--	65	--	mA
	Vin=12/24/36/48V,Vout=24V,Io=0A	--	75	--	
	Vin=12/24/36/48V,Vout=48V,Io=0A	--	135	--	
Reflected ripple current	Vin=48V,Vout=24V,Io=20A	--	150	--	
Surge Voltage (1sec. max.)	1sec.max.	--	--	80	VDC
Start-up Voltage		--	--	9	
Input Under-voltage Protection		6	--	--	
Input overvoltage protection	self-recovery	--	70	--	
Input Filter		Pi filter			
Hot Plug		Unavailable			
Input Reverse Polarity Protection					
Input current limit	input voltage range	--	--	23	A
Ctrl	Module on	Ctrl pin connected to -Vin or low level (0-0.8VDC)			
	Module off	Ctrl open circuit or connected to TTL high level (1.8-5.5VDC)			
	Input current during shutdown		2		mA

Output Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Voltage Accuracy①	3.3V - 60V output, 5% to 100% max	±100mV±2%*Vout-2%*Vout*Iout/Iomax			
	3.3V - 60V output, 0% to 5% max	±100mV±3%*Vout -2%*Vout*Iout/Iomax			
Output load regulation rate	Nominal input voltage, 5% to 100% max	±2%*Vout*Iout/Iomax			
Transient response deviation	Vin = 28V, Vout = 12V, 25% load step change, 0.1A/us	--	600	--	mV
Transient recovery time	Vin = 28V, Vout = 12V, 25% load step change, 0.1A/us	--	400	--	uS
Temperature Coefficient	Operating temperature: -40°C to 100°C	--	±0.02	--	%/°C
Ripple & Noise②	20MHz bandwidth, Vin = 36V, Vout = 12V, Io = 20A	--	50	--	mVp-p
	20MHz bandwidth, Vin = 36V, Vout = 24V, Io = 20A	--	300	--	
	20MHz bandwidth, Vin = 36V, Vout = 48V, Io = 15A	--	200	--	
Over-temperature protection	The maximum temperature on the product surface	--	105	--	°C
Output overvoltage protection	Input voltage range, output power range, lockout	--	65	--	VDC
Output current limit	Input voltage range, output voltage range	--	22	--	A
Output overcurrent & short circuit protection	Input voltage range	Constant current			
Current regulation(Iset)	Iset pin setting	For details on the design and precautions for adjusting the output current Iset, please refer to the manual.			
	Iset pin floating	--	2.5	--	VDC
	Output current adjustment range	0	--	20	A
Voltage regulation(Vset)	Vset pin setting	Please refer to the output voltage Vset adjustment design and precautions for details.			
	Vset pin floating	--	2.5	--	VDC
	Output voltage adjustment range	0	--	60	
Remote Compensation(Sense)	Sense pin setting	Please refer to the adjustment design and precautions of Sense for details.			
	Sense compensation voltage range	--	--	105	%Vo

General Specifications

Item	Operating Conditions	Min.	Typ.	Max.	Unit
Isolation voltage	Input/Output - Housing, test duration 1 minute, leakage current less than 1mA	1500	--	--	VDC
Operating temperature ④		-40	--	+100	℃
Storage temperature		-55	--	+125	
Storage humidity	No condensation	5	--	95	%RH
Pin soldering temperature resistance	Wave soldering: maximum 10 seconds	--	--	+260	℃
	Manual soldering: solder points 1.5mm away from the casing, 10 seconds	--	--	+300	
Pollution level		Level 3			
Vibration	10-150Hz,5g,0.75mm,90 Min.along X,Y and Z				
Switching frequency	Rated input voltage, full load	--	270	--	kHz
Altitude	Altitude: ≤ 2000m, Atmospheric pressure: 80 - 110 KPa				
Mean Time Between Failures	MIL-HDBK-217F@25℃	500	--	--	k hours

Mechanical Specifications

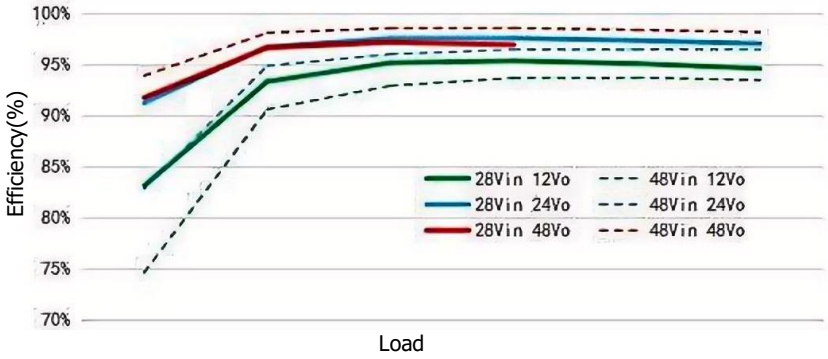
Case Material	Aluminum alloy
Dimension	60.80×25.00×12.70 mm
Weight	53g(Typ.)
Cooling Method	Natural air cooling, forced air cooling, water cooling

Electromagnetic Compatibility (EMC)

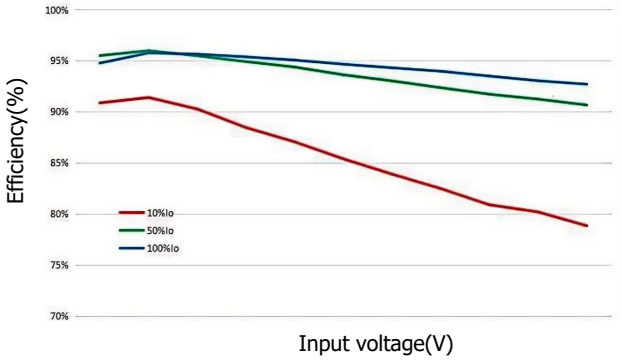
EMI	CE	CISPR32/EN55032 CLASS A(see Fig. 9 for recommended circuit)	
	RE	CISPR32/EN55032 CLASS A(see Fig. 9 for recommended circuit)	
EMS	ESD	IEC/EN61000-4-2 Contact±6kV	perf.Criteria B
	RS	IEC/EN61000-4-3 10V/m	perf.Criteria A
	EFT	IEC/EN61000-4-4 ±2kV(see Fig. 9 for recommended circuit)	perf.Criteria B
	Surge	IEC/EN61000-4-5 line to line±2kV(see Fig. 9 for recommended circuit)	perf.Criteria B
	CS	IEC/EN61000-4-6 10Vr.m.s	perf.Criteria A

Typical Characteristic Curve

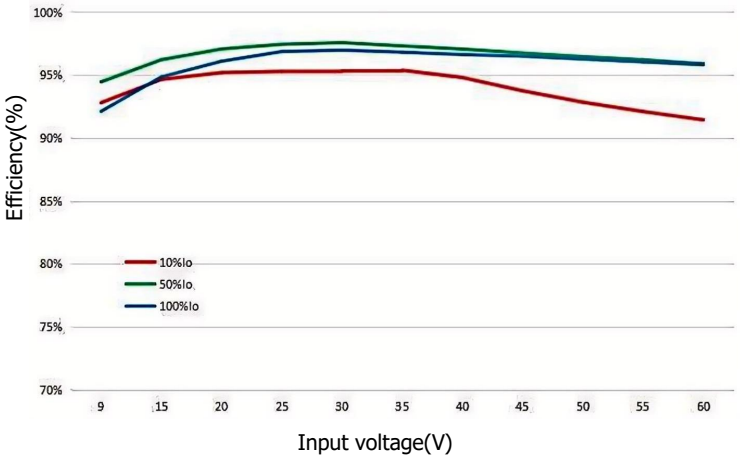
QAB4836EB-20A series efficiency curve



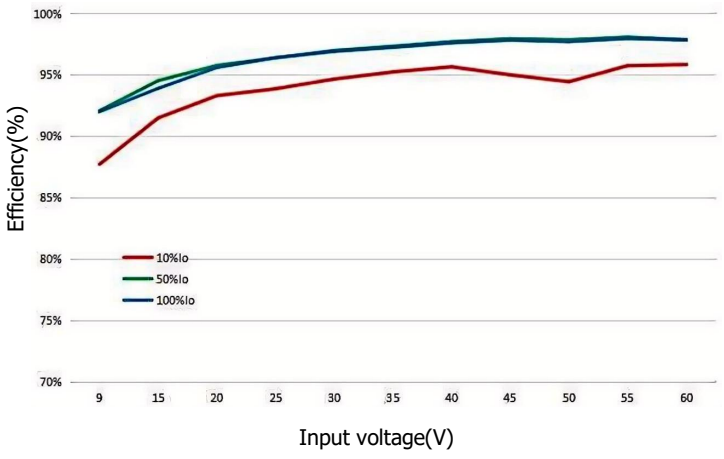
Input Voltage & Efficiency Curve - 12Vout



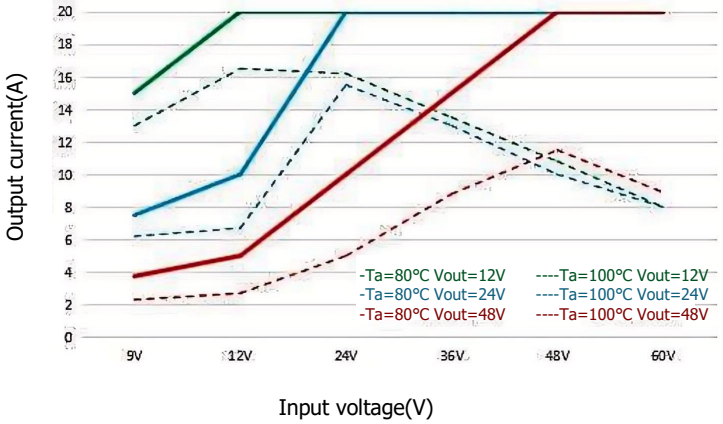
Input Voltage & Efficiency Curve - 24Vout



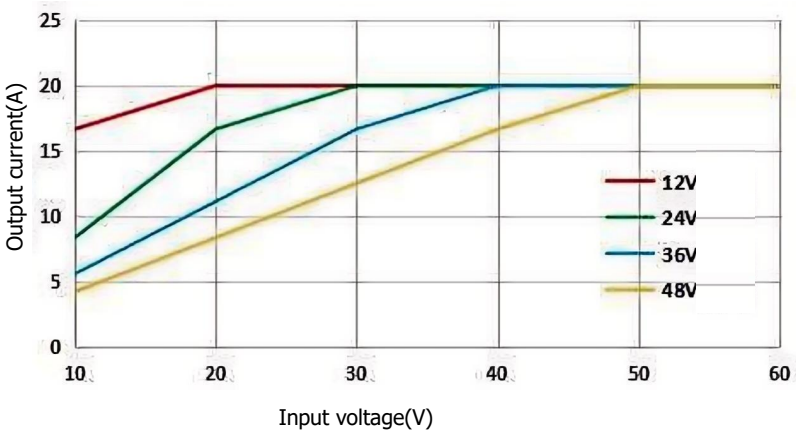
Input Voltage & Efficiency Curve - 48Vout



QAB4836EB-20A Series Temperature Reduction Curve - Case Temperature



QAB4836EB-20A series full-load power curve



Remote Sense Application

1. Remote Sense Connection if not used

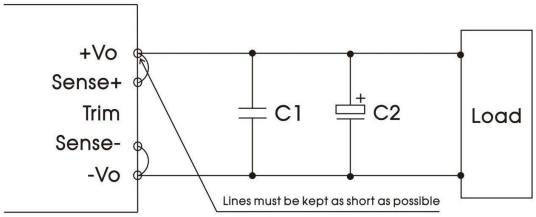
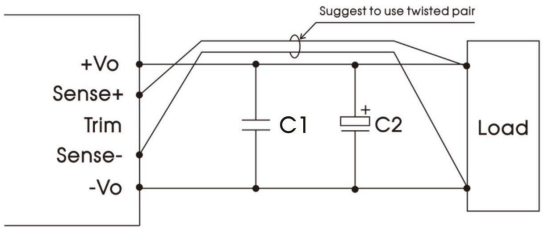


Fig.1

Notes:
① When no remote compensation is used, ensure that +Vo is short-circuited to Sense+, and 0V is short-circuited to Sense-.
② The connection lines between +Vo and Sense+, and between 0V and Sense- should be as short as possible and placed as close to the terminals as possible. Avoid forming a large loop area. When noise enters this loop, it may cause instability of the cross-block.

2. Remote Sense Connection used for Compensation



Notes:

① When using remote compensation, the output voltage range of 0-60VDC must not be exceeded;

② If the lead for remote compensation is too long, it may cause unstable output voltage. If a longer remote compensation lead must be used, please contact our technical staff;

③ If using remote compensation, use twisted pair or shielded wire, and keep the lead as short as possible;

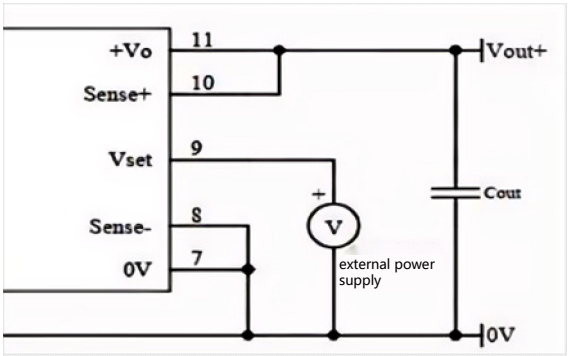
④ Between the power module and the load, use wide PCB leads or thick wires, and ensure that the voltage drop of the line is less than 0.3V to maintain the output voltage within the specified range of the power module;

⑤ The impedance of the lead may cause output voltage oscillation or large ripple. Please make sufficient assessment before using.

Design for adjusting output voltage Vo using the Vset pin and precautions

The impedance between the control pin Vset and the Sense- pin enables the output voltage to be adjusted within the range of 0-60Vdc. The output voltage can be adjusted either by using a regulating resistor or an external power supply driver.

1. When adjusting using the Vset pin with an external power supply:

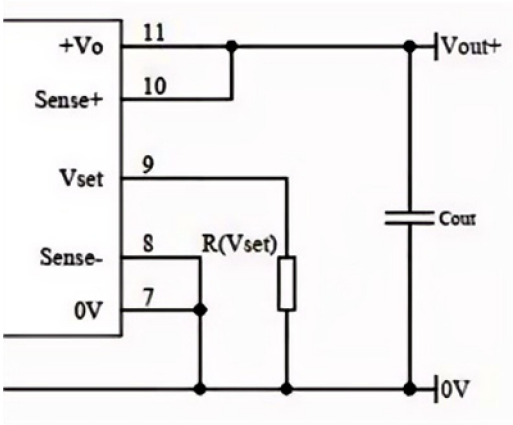


External power supply driven, wiring method as shown in the left figure 2, Vset voltage calculation formula:

$$Vvset(Vset) = 2.366 - 2.316 \left(\frac{Vset}{Vmax} \right) V$$

Notes:
1. Vset is the expected output voltage, adjustable range: 0 - 60V;
2. Vmax is 60V
3. External power supply value range: 0V - 2.5V
4. Vset pin must not be left floating.

2. When the Vset pin is connected to an external resistor for adjustment:



External adjustment resistor R(Vse), wiring method as shown in the left figure 3, calculation formula for R(Vset) resistor:

$$Rvset(Vset) = \left[\left(\frac{11830 \times Vmax}{Vset + 0.058 \times Vmax}\right) - 10912\right] (\Omega)$$

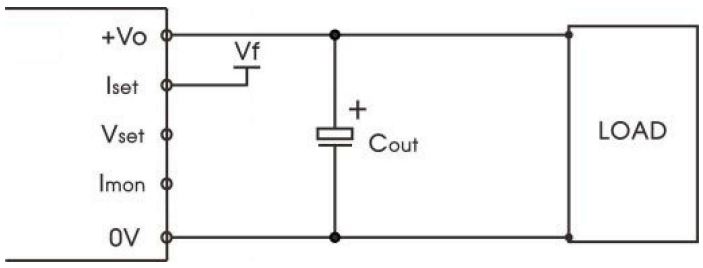
Note:
1. Vo represents the expected output voltage, with an adjustable range of 0 - 60V;
2. R(Vsef) is measured in KΩ;
3. Vmax is 60V.

Vo/V	3.3	5	12	15	20	24	36	48	60
Rvse+/KQ	93.78	72.79	34.94	27.50	19.32	14.92	7.07	2.88	0.27

Design for output voltage Io regulation using the Iset pin and precautions

The module contains an output overcurrent protection circuit. The impedance between the control pin Iset and 0V allows the output current to be adjusted within the range of 0-20A. The output current can be adjusted using either a regulating resistor or an external power supply driver. When the Iset pin is left floating, its voltage is 2.5V. At this point, the default overcurrent point is 110% * 20A.

1. When the Iset pin is connected to the external voltage V+ for adjustment:

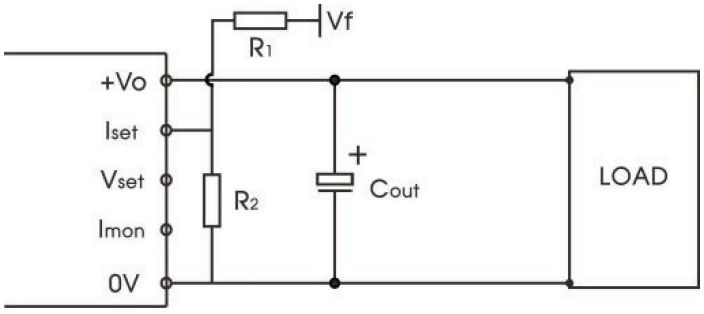


Output current regulation calculation formula:

$$Viset(Iset) = \left(0.0953+2.085 * Iset/Imax\right) V$$

1. The output current range of Iset is 0 - 20A;
2. Imax is 20A.
3. The external voltage range is 0V - 2.5V. The Vf voltage is relative to the output pin 0V.

2. When adjusting the Iset pin by connecting an external resistor:



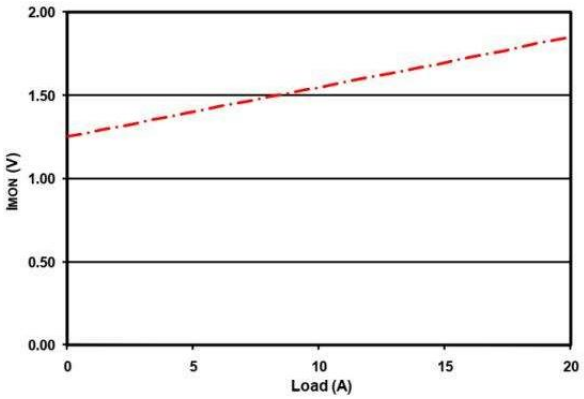
Output current adjustment calculation formula:

$$RIset(Iset) = \left[\left(\frac{0.0469\ Imax + Iset}{1.153\ Imax - Iset}\right) *10200 -10\right] (\Omega)$$

Notes:
1. The output current range of LSET is from 0 to 20A;
2. Imax is 20A.

Io/A	1	2	5	10	15	20
Rvset/KΩ	0.89	1.41	3.34	8.53	20.16	69.78

The Output Current Detection Imon



Calculation formula of the Imon pin voltage and output current:

$$V_{Imon} = 0.03Io + 1.25$$

Notes:

1. VImon is the Imon pin voltage, in V. The VImon voltage is referenced to output 0V.
2. Io is the output current, in A.

Design Reference

1. Typical application

(1) During testing and application, please follow the recommended test circuit (Figure 8); Be sure to connect an electrolytic capacitor Cin (≥1000μF) at the input to suppress the surge voltage that may be generated at the input terminal.

(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), it may cause the input voltage of the product to be pulled down. Please pay attention to the fluctuation of the input voltage of the product, and it is recommended to increase the electrolytic capacitor at the input terminal appropriately. The capacitance value of Cin is to ensure the stability of the input terminal voltage and avoid the situation that the input voltage is lower than the undervoltage protection point and the product restarts repeatedly.

(3) If the output terminal of the product is an inductive load (such as a relay, a motor), it is recommended to increase the value of the output capacitor Cout and add a TVS to filter out the voltage spikes.

(4) Input 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).

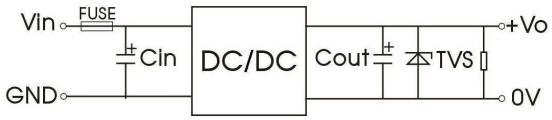
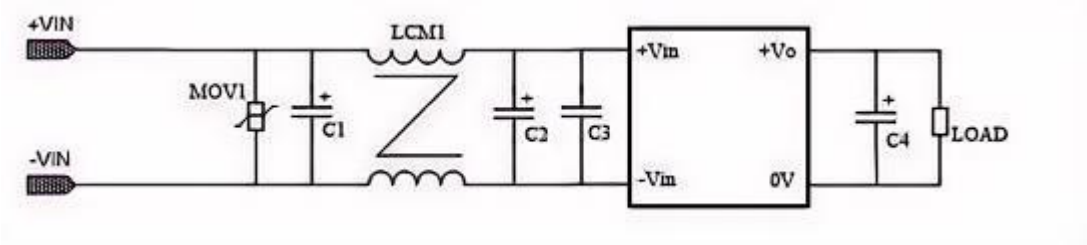


Fig. 6

FUSE	Cin	Cout	TVS
30A, slow	1000μF/100V	100μF/100V	Select according to the output voltage

Note:
①Please pay attention to the ambient temperature of the product when using an external capacitor, increase the electrolytic capacitor values to at least 2 times the original parameter if the ambient temperature is low.

2. EMC solution-recommended circuit

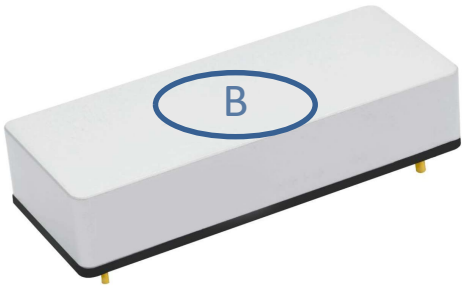


Components	Recommended Component Value
MOV	101K
C1、C2	1000μF/100V electrolytic capacitor
C4	100μF/63V electrolytic capacitor
C3	4.7uF/100V
LCM1	90uH

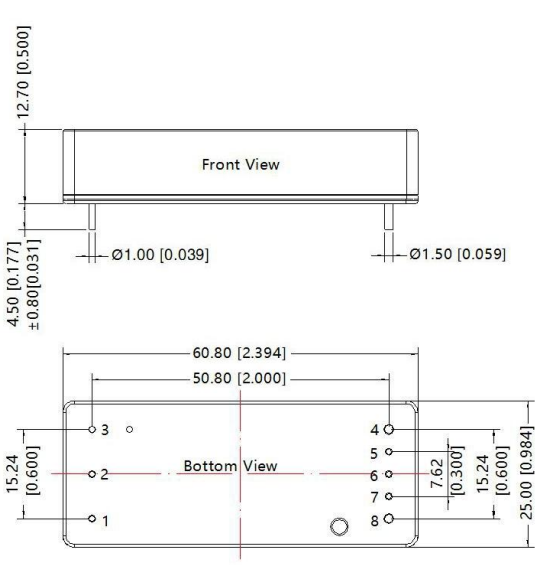
3. The products do not support parallel connection of their output

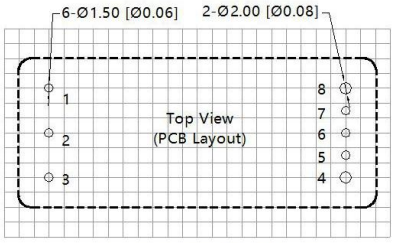
4. Thermal Testing Recommendation Scheme

During the application process, the thermal design of the product can be evaluated by combining the temperature reduction curve of the product; or the stable working range of the product can be determined by the temperature at point B in the following test diagram. When the temperature at point B is lower than 100°C, it is the stable working range of the product.



QAB4836EB-20A-CG Dimensions and Recommended Layout



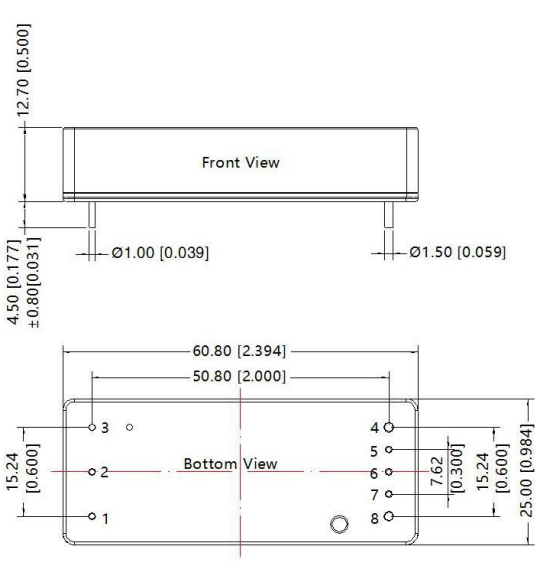


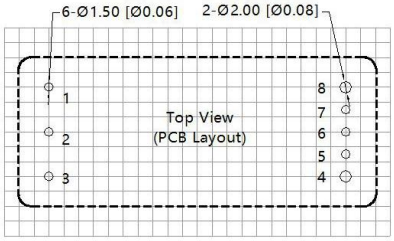
Note: Grid 2.54*2.54mm

Note:
Unit: mm[inch]
Pin1,2,3,5,6,7 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]

Pin-Out			
Pin	**Mark**	**Pin**	**Mark**
1	+Vin	5	Iset
2	Ctrl	6	Vset
3	-Vin	7	Imon
4	0V	8	+Vo

QAB4836EB-20A-SG Dimensions and Recommended Layout





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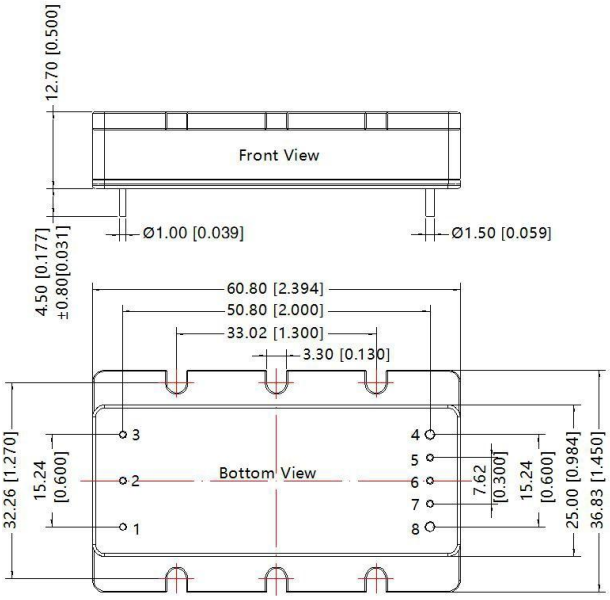
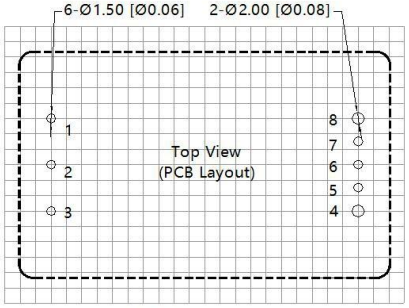
Pin4,8 diameter: 1.50[0.059]
Pin diameter tolerances: ±0.10[±0.004]
General tolerances: ±0.50[±0.020]

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

QAB4836EB-20A-SFG Dimensions and Recommended Layout



THIRD ANGLE PROJECTION

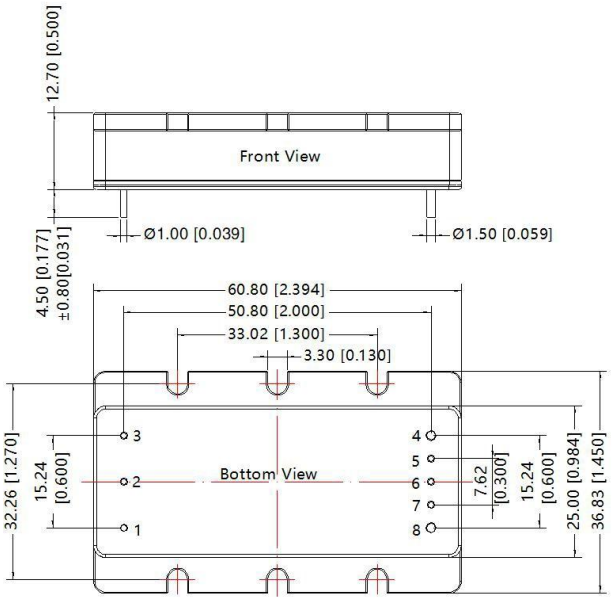


Note: Grid 2.54*2.54mm

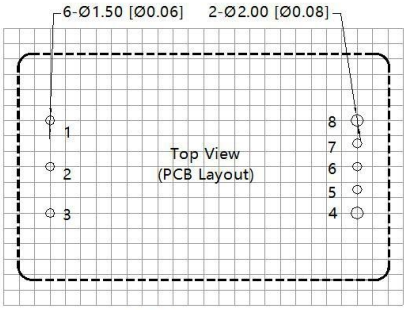
Pin-Out			
Pin	**Mark**	**Pin**	**Mark**
1	+Vin	5	Sense-
2	Ctrl	6	Vset
3	-Vin	7	Sense+
4	0V	8	+Vo

Note:
Unit: mm[inch]
Pin1,2,3,5,6,7 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]

QAB4836EB-20A-CFG Dimensions and Recommended Layout



THIRD ANGLE PROJECTION



Note: Grid 2.54*2.54mm

Pin-Out			
Pin	**Mark**	**Pin**	**Mark**
1	+Vin	5	Iset
2	Ctrl	6	Vset
3	-Vin	7	Imon
4	0V	8	+Vo

Note:
Unit: mm[inch]
Pin1,2,3,5,6,7 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]

Note:

1. If the product works under the minimum required load, it cannot guarantee that the performance of the product complies with all the performance indicators in this manual;
2. The maximum capacitive load is tested under the input voltage range and full load condition;
3. Unless otherwise stated, all indexes in this manual are measured at Ta=25℃, humidity <75%RH, nominal input voltage and rated output load;
4. All index testing methods in this manual are based on the enterprise standards of the company;
5. Our company can provide product customization, specific needs can directly contact our technical staff;