Industry standard 1/8 brick： 48 Vin 5Vout 15A

Options：

- Negative/Positive Remote on/off logic
- Conformal coating
- Aluminum board

Features

- Industry standard 1/8 brick package and footprint:
  2.28″×0.41″×0.90″
  2.28″×0.50″×0.90″
- Operating temperature:-40~85°C
- Wide input voltage range: 2:1
- Output voltage trim range:－10％~＋10％
- Isolation voltage: 1500Vdc (input-output)
- High efficiency: at least 90%
- High power density
- Low output ripple and noise
- Remote On/Off
- Input under-voltage protection
- Output over-current protection
- Output over voltage protection
- Thermal shutdown protection
- RoHS (2002/95/EC) recognized
- EN60950-1 Certified

Numbering Convention

ESR 15 – 48 S 5 – L B–C G5
1 2 3 4 5 6 7 8 9

No	Features	Descriptions
1	Product Series	ESR-1/8brick
2	Output current	15 - Typical output current: 15A
3	Typical Input Voltage	48 - Input Voltage: 48V
4	Number of Outputs	S - Single Output
		D - Dual Output
5	Output Voltage	5 – Output Voltage: 5V
6	Remote on/off Logic	L – Negative Logic
		H or Default – Positive Logic
7	Aluminum board	B - with aluminum board
		Default - No heat sink
8	Sprayed Conformal Coating	C – Sprayed conformal coating
		Default: no sprayed conformal coating
9	RoHS feature	G5 – RoHS5
		G – lead-free, RoHS6
		Default – lead

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1 Description

The ESR15-48S5 series products are open-frame DC-DC converters in an industry 1/8 brick packaging and footprint, and can provide up to 5.0V output voltage and 15A output current. All components of the converter are surface mounted. The converters feature high power density, remote on/off, thermal shutdown protection and current limit, etc.

2 Specifications (All specifications are typical at nominal input, full load at 25°C and airflow of 1m/S unless otherwise stated.)

Parameter		Test Condition	Min	Typ	Max	Unit
2.1 Absolute Maximum Ratings						
Input Voltage（Vi）		Non-operating, continuous	0	—	80	Vdc
		Transient（100ms）	—	—	100	Vdc
Max Output Power (Pomax)		allowable operating conditions	—	—	75	W
2.2 Input Specifications						
Typical Input Voltage (Vinom)		—	—	48	—	Vdc
Input Voltage Range		—	36	—	75	Vdc
Input Under-voltage Protection		Ionom	30	—	34	Vdc
Input Under-voltage Recovery Point		Ionom	31	—	36	Vdc
Maximum Input current（Iimax）		Vimin, Vonom,Ionom	—	—	2.4	A
No-load Input Current（Iio）		Vinom, Io＝0A	—	—	100	mA
Quiescent Input Current（Iiof）		Vinom, remote output shutdown	—	—	10	mA
No-load loss		Vinom, Io=0A	—	2	4.8	W
Inrush Transient current		Io=Ionom	—	—	1	A^2S
Input Reflected Ripple Current		Vinom,Ionom	—	20	50	mAp-p
Input Filtering Capacitance		V_{INMIN}~V_{INMAX}	—	220	—	μF
Remote (Positive)	On	High level（2.4V~48V or open circuit, reference to -Vin）				
	Off	Low level (-0.7～0.8V, reference to -Vin) or connect to -Vin				
Remote (Negative)	Off	High level（2.4V~48V or open circuit, reference to -Vin）				
	On	Low level (-0.7～0.8V, reference to -Vin) or connect to -Vin				
2.3 Output Specifications						
Output Voltage (Vonom)		Vinom,Ionom	4.95	5.0	5.05	Vdc
Typical Load (Ionom)		—	—	—	15	A
Output Current Range (Io)		Po≤ 100W	0	—	15	A
Line Regulation (Vov)		Vimin-Vimax,Ionom	—	±0.1	±0.2	%Vo
Load Regulation (Vol)		0-100%Ionom,Vinom	—	±0.2	±0.5	%Vo
Output Voltage Trim Range (Voadj)		Io≤Ionom,Po≤75W	-20	—	+10	%Vo

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Parameter	Test Condition		Min	Typ	Max	Unit
Over-voltage Protection	Protection Mode	——	Automatic recovery			—
	Threshold	Po<Pomax	5.75	—	7.0	Vdc
Over-current Protection	Protection Mode	——	lockout, Automatic recovery			—
	Threshold	Vinmin~Vinmax, Tc（baseplate temp）= -40~100°C	105	—	150	%Ionom
Short-circuit Protection	Protection Mode	——	lockout, Automatic recovery			—
Dynamic Load Response	Peak Deviation	25%-50%-25%Ionom 50%-75%-50%Ionom	—	100	250	mV
	Settling Time	ΔIo/Δt=0.1A/μS,Vinom	—	100	200	μs
	Peak Deviation	0%-100%-0%Ionom ΔIo/Δt=0.1A/μS,Vinom	—	—	±50	%Vo
	Settling Time		—	—	800	μs
Output Ripple & Noise ①	RMS（20MHz）	Vinom, 20MHz, externally add a 1μF ceramic capacitor and a 10μF tantalum capacitor to the output	—	—	40	mV
	Peak-to-Peak (20MHz)		—	—	100	mV
	Peak-to-Peak (100MHz)		—	—	200	mV
External Output Capacitance (Co)		V_{INMIN}~V_{INMAX},0~100%I_O	0	—	10000	μF
Turn-on/off Peak Deviation		Vinom,Ionom	—	—	±5	%Vo
Turn-on Delay Time		10%Vinnom-- 90%Vonom	—	—	30	mS
Output rise time ②		10%Vonom---90%Vonom	—	—	15	mS
Remote Sense Voltage Sampling		——	Avaliable			
2.4 Safety Specifications						
Isolation Voltage	Input to output	Leak Current≤1mA, 1min	1500	—	—	Vdc
Isolation Resistance (RISO)		500V_{DC}	10	—	—	MΩ
Safety Certificate		EN 60950-1:2006 Recognized				
2.5 Reliability						
Vibration Test(sine)		Frequency: 10~55Hz Amplitude: 0.35mm Acceleration: 50m/s^2 Cycle: X,Y,Z 30min each axis	After being tested, no damage to the converter and its components, the appearance, output voltage and output ripple and noise (p-p) meet the data sheet requirements.			
Impact Test (half-sine)		Peak Acceleration: 300m/s^2 Duration: 6ms 6 times for three perpendicular directions	After being tested, no damage to the converter and its components, the appearance, output voltage and output ripple and noise (p-p) meet the data sheet requirements.			
MTBF		≥2×10^{6}h Bellcore TR-332（Ta=25°C） ≥1×10^{6}h Bellcore TR-332（Ta=55°C）				

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Parameter		Test Condition		Min	Typ	Max	Unit
2.6 Environmental Specifications							
Relative Humidity		（40±2）℃, No dew		—	—	90	%RH
Cooling		——		Forced-air Cooling			
Thermal Shutdown Protection	Protection Mode	——		105℃~125℃(Auto-recovery)			
	Hysteresis	——		5	8	12	℃
Operating Ambient Temperature				-40	—	+85	℃
Storage Temperature (Tst)				-55	—	+125	℃
2.7 General Specifications							
Switching Frequency		——		—	300	—	KHz
Temperature Coefficient (Tcoeff)		——		—	—	±0.02	%Vo/℃
Efficiency (η)		Vinom	100%Ionom	90	91	—	%
			20%Ionom	—	81	—	%
			50%Ionom	—	90	—	%
			80%Ionom	—	91	—	%
Weight		——		—	30	—	g
RoHS		RoHS(2002/95/EC)					
Anti-sulfuration feature		Sprayed conformal coating					

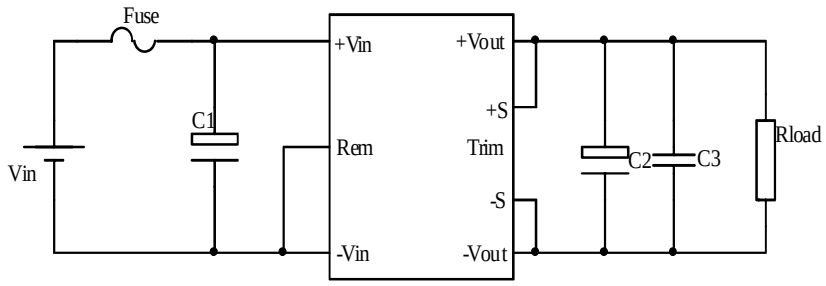
Note: At high/low temperature,

① Output Ripple & Noise (P-to-P): Vrp<100mV (test condition: Vinom,20MHz , externally add a 1μF ceramic capacitor and a 220μF tantalum capacitor to the output.)

② Output rise time (T): 5mS<T<20mS (test condition: 10%Vonom--90%Vonom)

3. Basic Application Circuit and Considerations

3.1 Typical Application (Negative Logic)



Fuse: 5A C1≥220μF/100V (capacitor) C2: 220μF/25V (High-frequency, low ESR capacitor)

C3: 1μF/16V (monolithic capacitor)

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3.2 Input Voltage up to 80Vdc for long time or reverse input polarity would cause the module damaged.

3.3 Output will be on when the Rem is at low level or the Rem is connected to -Vin;

Output will be off when the Rem is at high level or when the Rem keeps open circuit referenced to –Vin.

3.4 Output short-circuit protection model is hiccup, automatic recovery.

3.5 Output Trim: Exceed the maximum output power (trim up) or the maximum output current (trim down) may cause the converter operates abnormally. The output voltage shall not exceed 5.5V (trim up) or be lower than 4V (trim down), or the converter may operate abnormally. See "4. Output Voltage Adjustment (Trim)" for details.

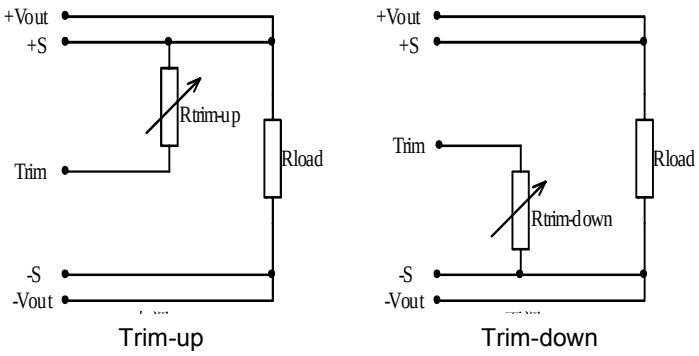
3.6 Add a 220μF/100V electrolytic capacitor to the input when a capacitor is connected to the output.

4 Use Instructions (Forced-air cooling is required)

4.1 Input voltage is up to 80Vdc for long time or reserve the polarities may cause the module permanently damaged. Input voltage mutation may cause output voltage transient process. The module is not internally fuse, and an external fuse of 5A/250V shall be used.

4.2 Output voltage Adjustment (Trim):

4.2.1 Output Voltage Trim Circuit:



4.2.2 Output Trim Equations

(1) To increase the output voltage, the value of the external resistor should be

$$R_{Trim-up} = \left(\frac{5.11 \times Vo(100(\%) + \Delta(\%))}{1.225 \times \Delta(\%)} - \frac{5.11 \times 100(\%)}{\Delta(\%)} - 10.22 \right) (k\Omega)$$

(2) To decrease the output voltage, the value of the external resistor should be

$$R_{Trim-down} = \left(\frac{5.11 \times 100(\%)}{\Delta(\%)} - 10.22 \right) (k\Omega)$$

Where V_O is rated output voltage;

$R_{Trim-up}$、$R_{Trim-down}$ are external adjusting resistors;

$\Delta(\%)$: Ratio of output voltage changes to nominal output voltage

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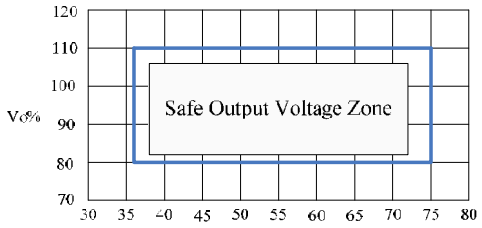
4.2.3 Output Voltage Trim Curve



Unit: V

Output Voltage Changes vs Input Voltage

4.3 Over-current Protection:

Operating at over-current conditions for long time may cause damage to the module; if the output is in short-circuit, the module is in hiccup mode, and the output current varies from a few mA to hundreds of mA.

4.4 Output over-voltage protection:

When the module is at over-voltage conditions, the module is locked; after eliminating the over-voltage conditions, the module needs to be reset to recover the output voltage.

4.5 Over-temperature protection:

When the baseplate temperature is higher than the threshold (100℃ to 125℃), the over-temperature protection functions, and the output is off; when the baseplate temperature is 5℃ to 15℃ less than the threshold, the module is automatically recovered.

4.6 Remote Sense (+S, -S terminals):

When using remote sense, use twisted-pair to connect +S and –S respectively to + LOAD and –LOAD. The twisted-pair shall be as short as possible. The remote sense terminals shall not be used to provide load current, or the module may be damaged.

4.7 Remote On/Off (Rem):

(1) For negative logic,

On: Rem is at low level or connected to -Vin;

Off: Rem is at high level or keeps open circuit (referenced to-Vin);

(2) For positive logic,

Off: Rem is at low level or connected to -Vin;

On: Rem is at high level or keeps open circuit referenced to-Vin;

4.8 Isolation Voltage Test:

Short the input terminals (+ Vin,-Vin, Rem) and the output terminals (+ Vout,-Vout, Trim, + S,-S).

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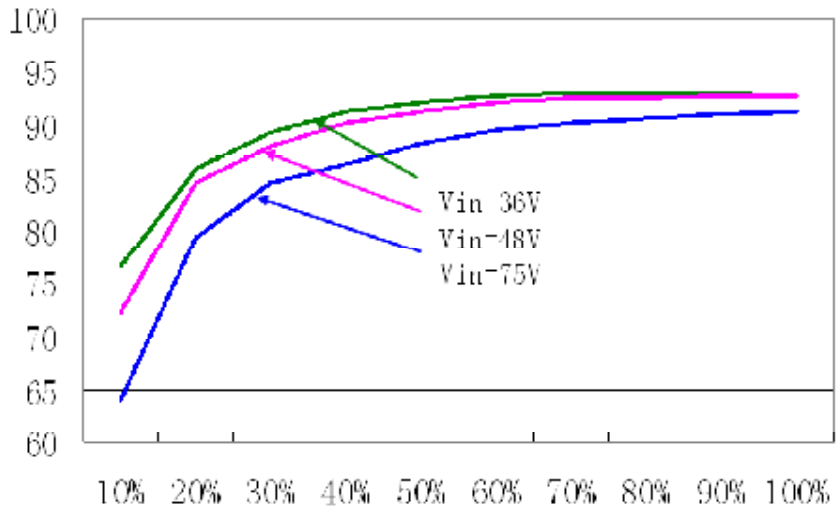
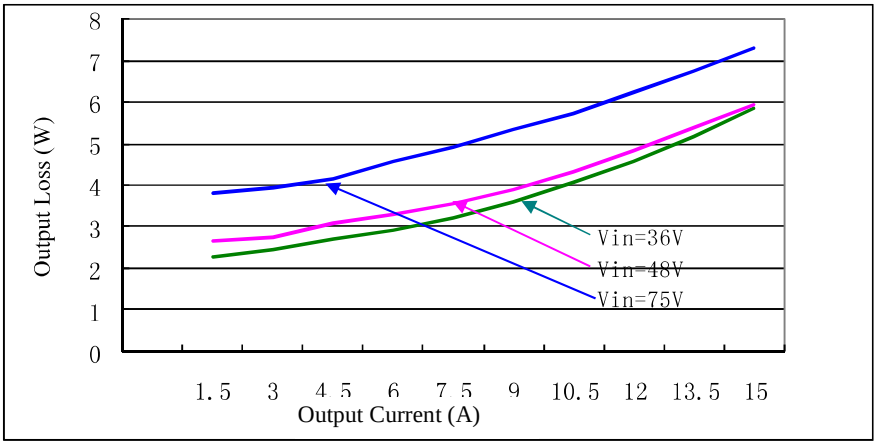
5 Characteristic Curves (Ta＝＋25℃, Airflow = 1m/S):

5.1 Efficiency Curve



Efficiency vs Input Current(Tc＝＋25℃)

5.2 Power Loss Curve



Power Loss vs Output Current

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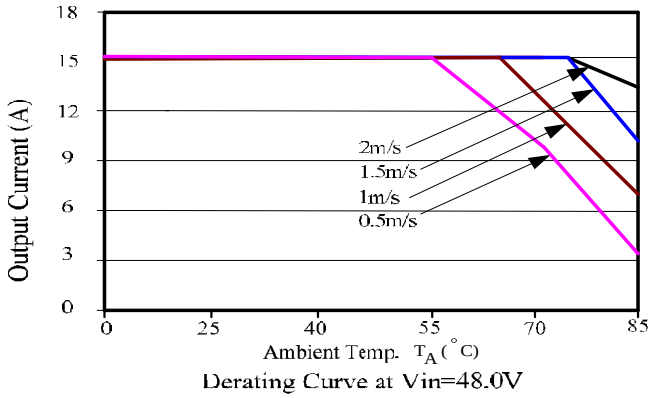
5.3 Thermal Derating Curve



Temperature-derating curve (no heat sink)

Test conditions:

① The module shall be soldered on a 2.0mm standard 4-layer test board, of which the middle two layers are two-ounce copper foils.

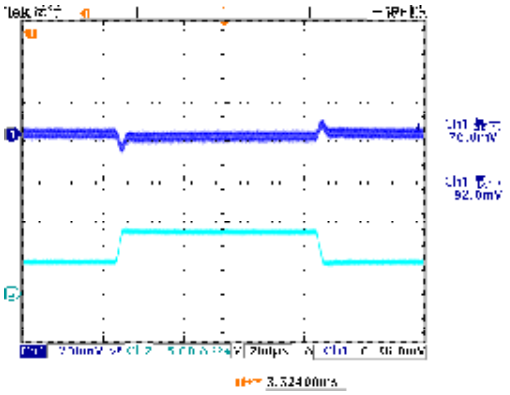
② A certain gap is required between the module and test board. Keep the test board perpendicular to the horizontal direction and the long edge parallel with the horizontal plane.

③ Put the module into a thermal test box, and test the module using infrared thermal imaging equipment and thermocouple test equipment. See the diagram below for airflow directions.

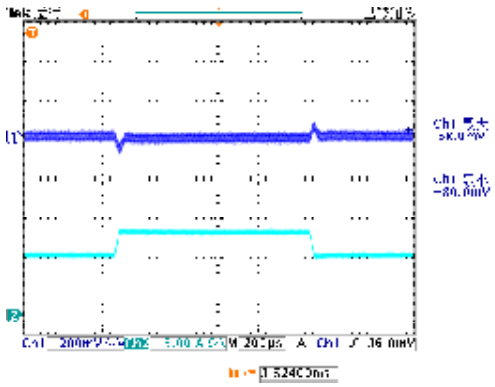
④ When the module reaches thermal equilibrium state, the components on the module can meet thermal derating requirements.

5.4 Dynamic Response:

Test conditions: Tc=25℃,Vin=48V, 20MHz,externally add a 10μF tantalum capacitor and a 1μF Ceramic Capacitor to output, add an 220μF/100V electrolytic capacitor to input



25%-50%-25%Io Dynamic Load



50%-75%-50%Io Dynamic Load

5.5 Output Ripple and Power-on Wave:

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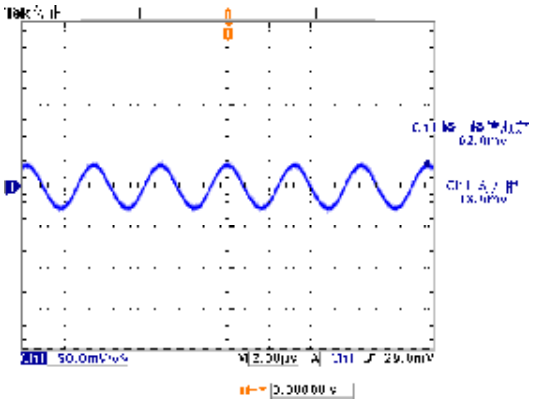
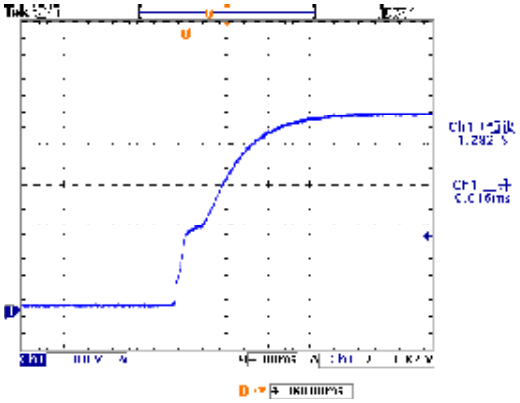
Test Condition: Ta=25℃, Vin=48V, Io=15A, 20MHz, externally add a 10μF tantalum capacitor and a 1μF ceramic capacitor to output, add a 220μF/100V electrolytic capacitor to input

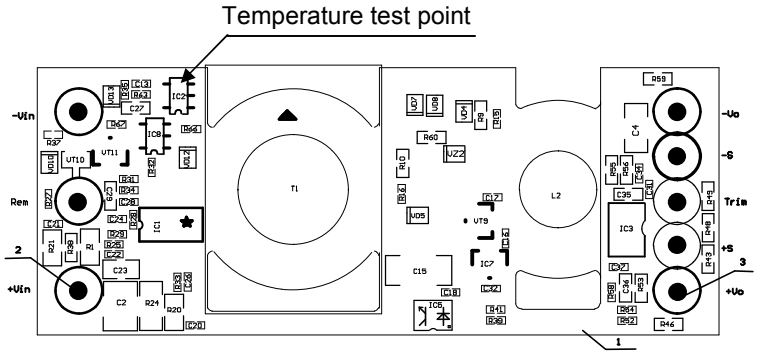


Output Ripple



Output Rise Time

5.6 Temperature test point and airflow direction



Pin Side
Airflow

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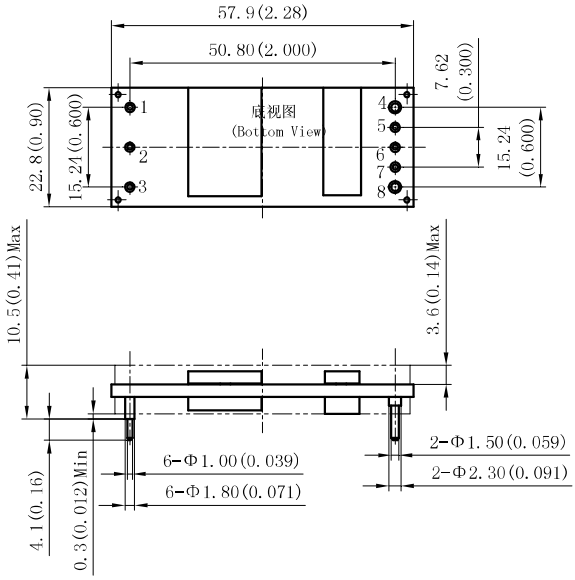
6 Mechanical Diagrams and Pin definition

6.1 Mechanical Diagrams

The product is equipped with an option of Aluminum board, which includes through-threaded mounting holes allowing for attachment of heat sinks. There are two designs: open-frame and aluminum board.

1) Open-frame (applicable to products without suffix "B" in model no.)



Note (1) Unit: mm(inch)

(2) Tolerances: .X±0.5(.XX±0.02); . XX±0.13(.XXX±0.005) .

(3) The maximum height of the highest components at non-pin side is 4.1 (0.16); and the minimum space between the highest components at pin side and the mounting surface of pin side is 0.3 (0.012).

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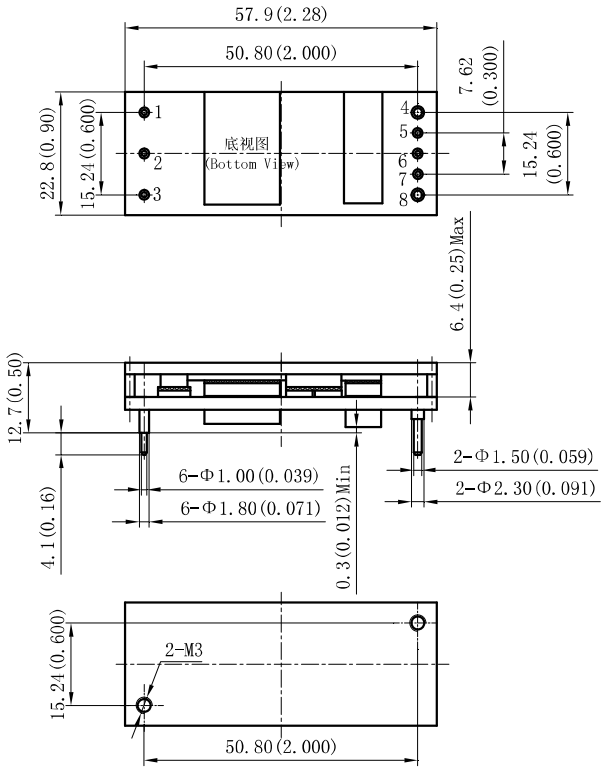
2）Aluminum board (applicable to products with a suffix "B" in model no.)



Note (1) Unit: mm(inch)

(2) Tolerances: .X±0.5(.XX±0.02) ; .XX±0.13(.XXX±0.005) .

(3) The maximum height of the highest components at non-pin side is 6.4 (0.25); and the minimum space between the highest components at pin side and the mounting surface of pin side is 0.3 (0.012).

(4) 2-M3 is the through-threaded mounting hole allowing for attachment of heat sinks. The length of M3 screw screwed into the aluminum board shall be less than 3.0mm.

6.2 Pin definition

No	1	2	3	4	5	6	7	8
Symbol	-Vin	Rem	+Vin	-Vout	-S	Trim	+S	+Vout
Definition	Negative input	Remote	Positive input	Negative output	Negative Remote Sense	Trim	Positive Remote Sense	Positive output

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