Industry Standard 1/4 brick: 48 Vin, 3.3V/8A 1.2V/13V

Options:

- Positive/Negative and Remote on/off
- Sprayed Conformal coating

Features:

- Industry standard 1/4brick package & footprint
  57.9mm×36.8mm×10.5mm
  (2.28"×1.449"×0.413")
- High power density: 31.8W/in^3
- High efficiency
- 2:1 Input voltage range
- Low output noise & ripple
- Remote sense
- Constant frequency
- Over-temperature protection: Auto-recovery
- Output over-voltage: locked
- Double outputs (adjustable output voltage): +10%/-20%
- Output over-current/voltage protection
- EN60950-1: 2006 Certified
- RoHS (2002/95/EC) complaint

Numbering Convention

QSR 20–48 D 3V3 1V2–L B - C G5
① ② ③ ④ ⑤ ⑥ ⑦ ⑧ ⑨ ⑩

NO	Features	Descriptions
①	Product Series	Industry standard 1/4brick
②	Output current	Double outputs; total output current: up to 20A
③	Typical Input Voltage	Typical Input Voltage: 48V
④	Number of Outputs	S - Single Output
		D - Double Output
⑤	Typical Output Voltage	Voltage Output 1: 3.3V
⑥	Typical Output Voltage	Voltage Output 2: 1.2V
⑦	Remote on/off Logic	L - Negative Logic
		H or Default - Positive Logic
⑧	Aluminum HeatSink	Default - No HeatSink
		B - HeatSink
⑨	Sprayed conformal coating	C - Sprayed Conformal coating
		Default - No Sprayed Conformal coating
⑩	ROHS	G5 - ROHS5
		G - lead-free, ROHS6
		Default - lead

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1 Description

The power modules are open-frame DC-DC converters in an industry 1/4 brick packaging & footprint equipped with an option of Aluminum board. The converters is wide input voltage range feature, high efficiency, high power density, high isolation voltage of input to output, and are well suited for telecommunication, industrial automation and testing equipments, etc.

2 Technical Specifications (Unless otherwise stated, all specifications are typical at nominal input, full load and 25°C. Externally add a 100μF/100V electrolytic capacitors to the input, and a 220μF/10V tantalum capacitors to the output of the testing tool)

Parameter		Test Condition	Min	Typ	Max	Unit
2.1 Absolute Maximum Ratings						
Input Voltage (Vi)		no operating, continuous	0	—	80	Vdc
		transient (100ms)	—	—	100	Vdc
Max Output Power (Pomax)		allowable operating conditions	—	—	42	W
2.2 Input Specifications						
Typical Input Voltage (Vinom)		—	—	48	—	Vdc
Input Voltage Range		—	36	—	75	Vdc
Input Under-voltage Protection		Ionom	30	—	32	Vdc
Input Under-voltage Recovery Point		Ionom	31	—	36	Vdc
Maximum Input current (Iimax)		Vimin, Vonom,Ionom	—	—	1.6	A
No-load Input Current (Iio)		Vinom, Io＝0A	—	90	110	mA
Quiescent Input Current (Iiof)		Vinom, remote output shutdown	—	—	40	mA
No-load Loss		Vinom, Io=0A	—	—	5.28	W
Inrush Transient current		Io=Ionom	—	—	1	A^2S
Input Filtering Capacitance		Vimin-Vimax	—	—	100	μF
Input Reflected Ripple		5Hz~20MHz, 12μH Absorption Inductor, 0.1μF Ceramics Capacitor, 100μF Electrolytic Capacitor	—	10	20	mA (p-p)
Remote	On	Connected to -Vin or connected to -0.7V-1.8V, Current: 0.5~2mA				
	Off	3.5V~12V (reference to -Vin) or open circuit				
2.3 Output Specifications						
Output voltage Set-point (Vonom)		Vinom,Ionom, Vo1	3.30	3.33	3.36	Vdc
		Vinom,Ionom, Vo2	1.20	1.24	1.26	Vdc
Typical Output Current (Ionom)		Io1	—	8.0	—	A
		Io2	—	13.0	—	A
Output Current Range (Io)		Io1	0	—	8.0	A
		Io2	0	—	13.0	A
Line Regulation (Vov)		Vimin-Vimax,Ionom,Vo1	—	±0.2	±0.5	%Vo1
		Vimin-Vimax,Ionom,Vo2	—	±0.2	±0.5	%Vo2

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Parameter		Test Condition	Min	Typ	Max	Unit
Load Regulation (Vol)		0-100%Ionom,Vinom,Vo1, Vo2	—	±0.5	±1.5	%Vo1, 2
Interactive Regulation		One output: full load; Another output: 0-100%Ionom; Vinom,Vo1, Vo2	—	±0.5	±1.5	%Vo1, 2
Output Voltage Trim Range (Voadj)		Io2≤Io2nom (Output I: adjustable; Output II: not adjustable)	-20	—	+10	%Vo2
Steady Voltage Precision		Vinom, 0-100%Ionom	—	—	2	%Vo1, 2
Output Over-voltage Protection	Protection Mode	——	locked, power-on recovery			—
	Threshold	Po<Pomax, Vo1	3.9	—	5.0	Vdc
		Po<Pomax , Vo2	1.45	—	1.80	Vdc
Output Over-current Protection	Protection Mode	——	Hiccup, Auto-Recovery			—
	Threshold	Vo1: over-current(Vo2: full load), Vinom	9.0	—	13.0	A
		Vo2I: over-current(Vo1: full load), Vinom	15.0	—	22.0	A
Output Short-circuit Protection	Protection Mode	——	Hiccup, Auto-recovery			—
	Input Current	Vimin-Vimax,Ionom	—	—	0.2	A
Dynamic Load Response (25%Ionom)	Peak Deviation	25%-50%-25%Ionom, 50%-75%-50%Ionom, ΔIo/Δt=1.0A/μS, Vinnom	—	—	5%	Vo1/2
	Settling Time		—	—	100	μs
Dynamic Load Response (50%Ionom)	Peak Deviation	25%-75%-25%Ionom, 25%-100%-25%Ionom, ΔIo/Δt=1.0A/μS Vinnom	—	—	5%	Vo1
			—	—	6%	Vo2
	Settling Time		—	—	400	μs
Dynamic Load Response (100%Ionom)	Peak Deviation	0%-100%-0%Ionom, ΔIo/Δt=1.0A/μS, Vinnom	—	—	50%	Vo1/2
	Settling Time		—	—	1000	μs
Output Ripple & Noise (Peak-to-Peak) ①	RMS	20MHz, add a 10μF/10V tantalum capacitor to the ripple test tooling for Vo1, and a 1μF ceramic capacitor for Vo2	—	—	30	mV
	P-to-P (20MHz)		—	—	50	mV
	P-to-P (100MHz)		—	—	200	mV
External Output Capacitance (Co)		V_{inmin}~V_{inmax},0~100%I_O , Vo1	220	—	5000	μF
		V_{inmin}~V_{inmax},0~100%I_O , Vo2	220	—	10000	μF
Turn-on/off Peak Deviation		Vinom,Ionom, Vo1	—	—	±5	%Vo1
		Vinom,Ionom, Vo2	—	—	±6	%Vo2
Turn-on Delay Time		△V=	Vo2-Vo1 | 0%Vo2---90%Vo2 0%Vonom -- 90%Vonom	—	—	0.5	Vdc
Turn-on Rise Time		10%Vonom---90%Vonom	—	5	20	mS

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Parameter		Test Condition	Min	Typ	Max	Unit
2.4 Safety Specifications						
Isolation voltage	Input to output	Leak Current≤1mA, 1min	1500	—	—	Vdc
Isolation Resistance (R_{ISO})		test voltage: 500Vdc, normal temperature	10	—	—	MΩ
Safety Certificate		EN60950-1 Recognized				
2.5 Reliability						
Vibration Test(sine)		ΔIo/Δt=: 10~55Hz Amplitude: 0.35mm Acceleration: 10m/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-to-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-to-p) meet the data sheet requirements.			
MTBF		≥2×10^{6}h Bellcore TR-332 (Vinom,Ionom, Ta=25°C)				
		≥1×10^{6}h Bellcore TR-332 (Vinom,Ionom, Ta=55°C)				
2.6 Environmental Specifications						
Relative Humidity		(40±2) ℃, No dew	5	—	95	%RH
Cooling			Forced-air cooling or heat sink			
Over-temperature protection		——	100℃~115℃			
Operating Ambient Temperature		＜55℃ Natural Convection	-40	—	+70	℃
Storage Temperature (Tst)		——	-40	—	+100	℃
2.7 General Specifications						
Switching Frequency		——	—	300	—	k Hz
Temperature Coefficient (Tcoeff)		——	—	—	±0.02	%/℃
Efficiency (η)		Vinom,100%Ionom	85	87.5	—	%
		Vinom,80%Ionom	—	87	—	%
		Vinom,50%Ionom	—	84.5	—	%
		Vinom,20%Ionom	—	71.5	—	%
Weight		——	—	35	—	g
Anti-sulfuration feature		Sprayed conformal coating				
RoHS		2002/95/EC Directive (RoHS5)				

Note: ① 20MHz, besides the 220μF capacitors on the test tooling (one for each output), add a 10μF/10V tantalum capacitor to the ripple test tooling for Vo1, and a 1μF ceramic capacitor for Vo2.

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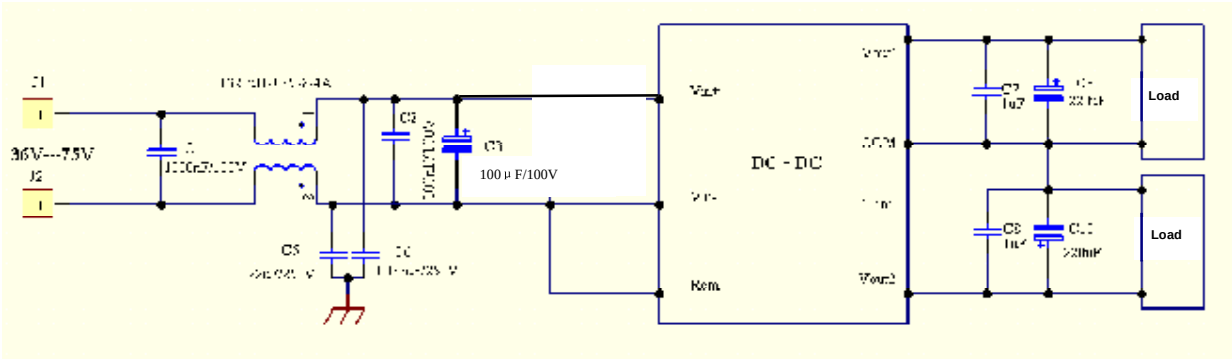
3 Basic Application Circuit and Considerations

3.1 Typical Application



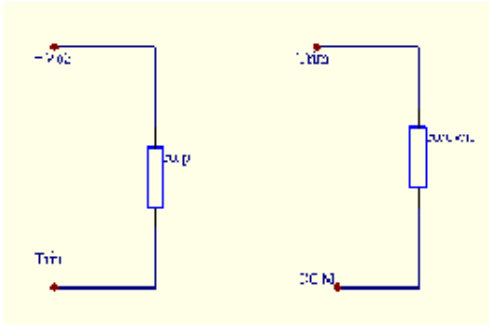
3.2 Input Voltage up to 80Vdc for long time or reverse input polarity would cause the module damaged.

3.3 Output will turn 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: Vo1 is not adjustable, but Vo2 is adjustable. Exceed the maximum output power (trim up) of Vo2 or the maximum output current (trim down) of Vo2 may cause the converter operates abnormally.

3.6 **Output Voltage Trim**



Trim-up Trim-down

Trim-down:
$$R_{down} = \frac{2.82V_{o2}}{V_{o2nom} - V_{o2}} - 2.4$$

Trim-up:
$$R_{up} = \frac{(4.75V_{o2nom} - 2.82)V_{o2}}{V_{o2} - V_{o2nom}} - 2.4$$

Where V_{o2nom} is nominal output voltage of Vo2, V_{o2} is the adjusted output voltage of Vo2, and Rdown and Rup are external resistors. Units: kΩ.

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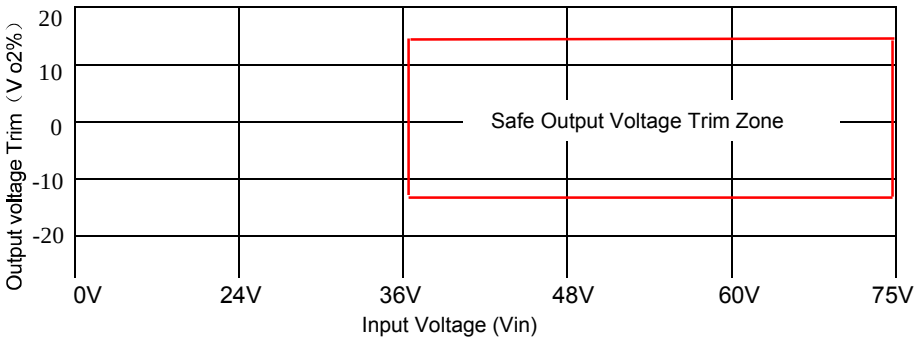
3.7 **Output Voltage Trim Curve**

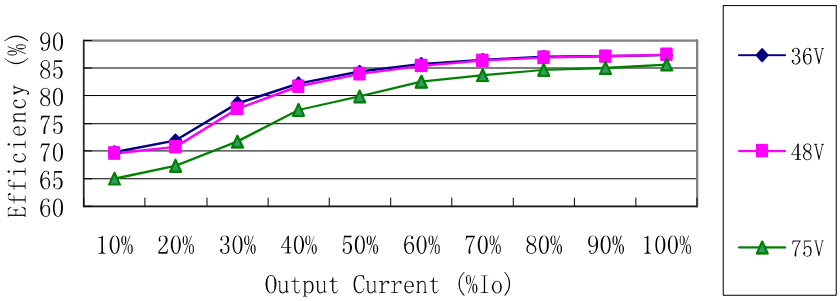


3.8 Note: Vo1 is not adjustable, but Vo2 is adjustable. If the out voltage is trimmed up higher than the over-voltage threshold, the over-voltage protection functions turn on.

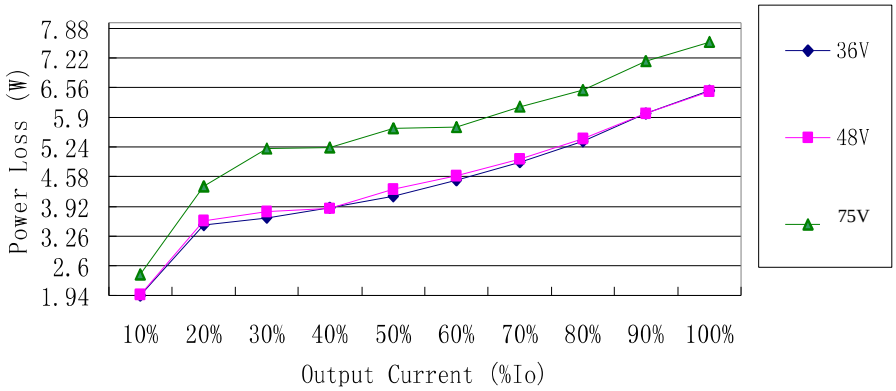
3.9 Ripple & noise: 20MHz, add 10μF/10V Tantalum capacitor and 1μF ceramic capacitor to the test tooling for Vo1 and Vo2.

4 Characteristic Curves (Ta=25℃)

4.1 Efficiency Curve



4.2 Dissipation Efficiency Curve



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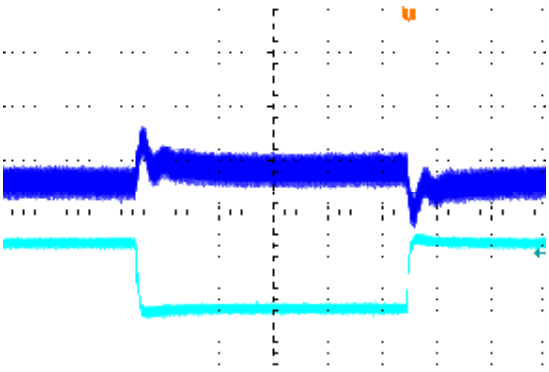
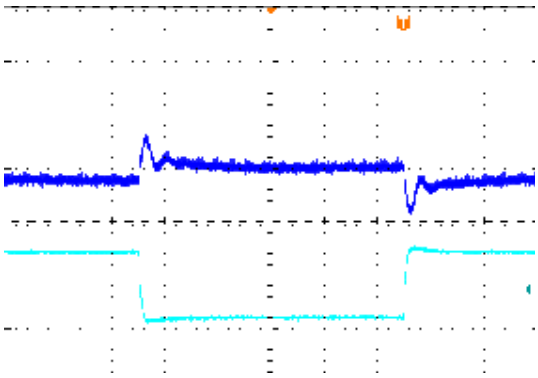
4.3 Dynamic Response

Test Condition: Ta=25℃, Vin=48V, slope 1.0A/μS, add a 220uF capacitor for each output



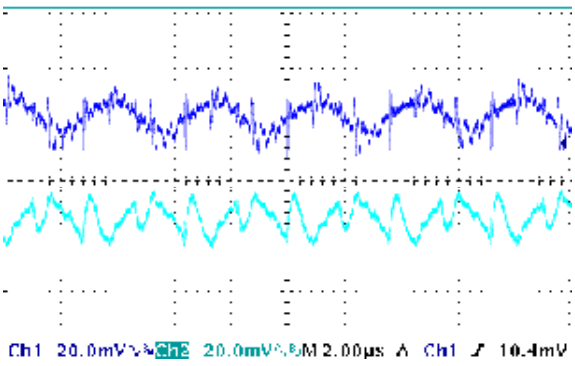
25%-50%-25%Ionom



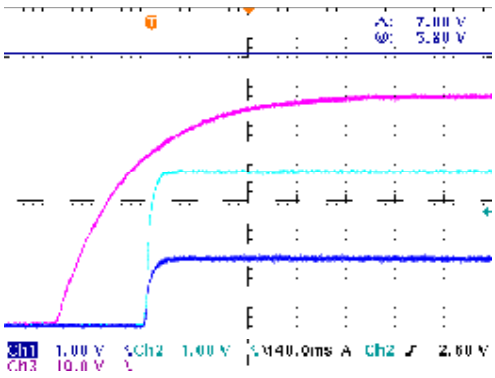
25%-75%-25%Ionom

4.4 Output Ripple and Power-on Wave

Test Condition: Ta=25℃, Vin=48V, 20MHz, add 10μF/10V Tantalum capacitor and 1μF ceramic capacitor to the test tooling for Vo1 and Vo2.



Output Ripple
CH1: 3.3V Output Ripple Voltage
CH2: 1.2V Output Ripple Voltage



Power-on output Wave
CH1: 3.3V Output Voltage Wave
CH2: 1.2V Output Voltage Wave
CH3: Input Voltage Wave

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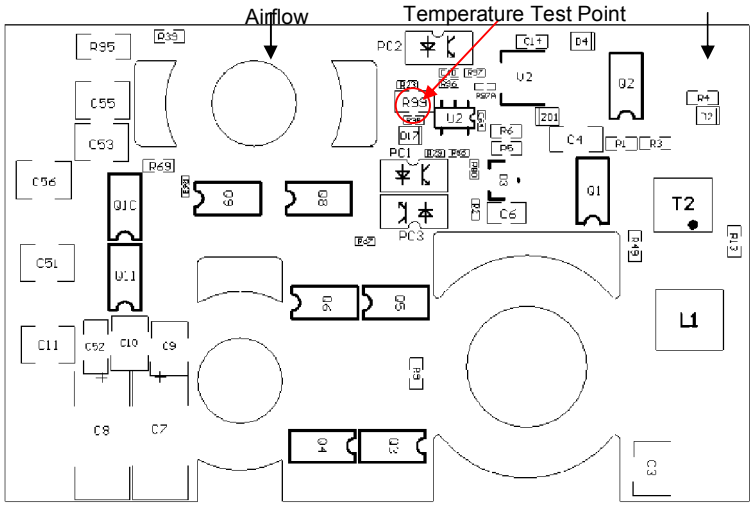
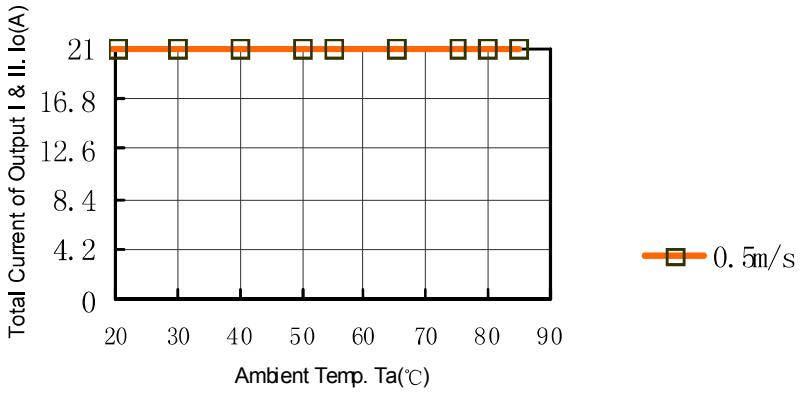
4.5 Temperature Test Point

The diagram below shows the location of thermistor.



5 Thermal Derating Curve



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 diagram 4.5 for the airflow direction.

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

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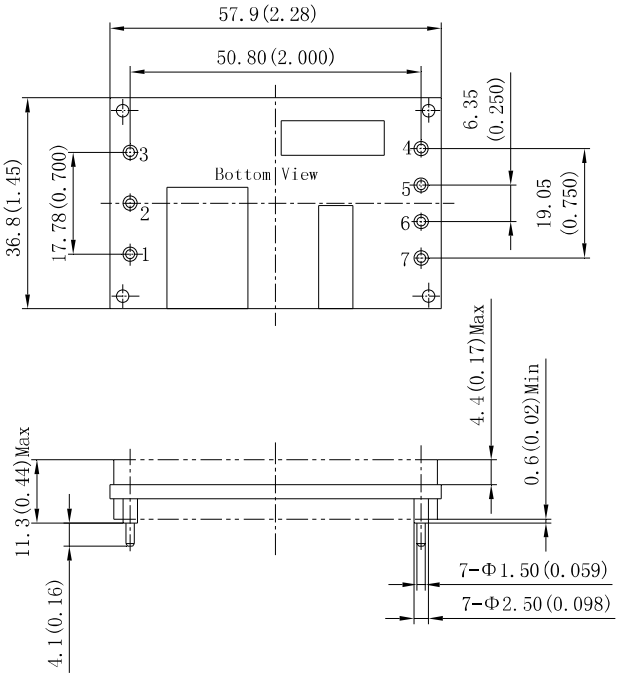
6. Dimensions and Pin definition

6.1 Dimensions

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 outline designs: open-frame and aluminum board.

1) Outline Diagram - Open-frame:



(1) Unit: mm (inch)

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

(3) The maximum height of the highest component at non-pin side is 4.4mm (0.17''); and the minimum space between the highest component at pin side and the mounting surface of pin side is 0.6mm(0.012'').

2) Outline Diagram - Aluminum Baseplate (with a suffix "B" in model number):

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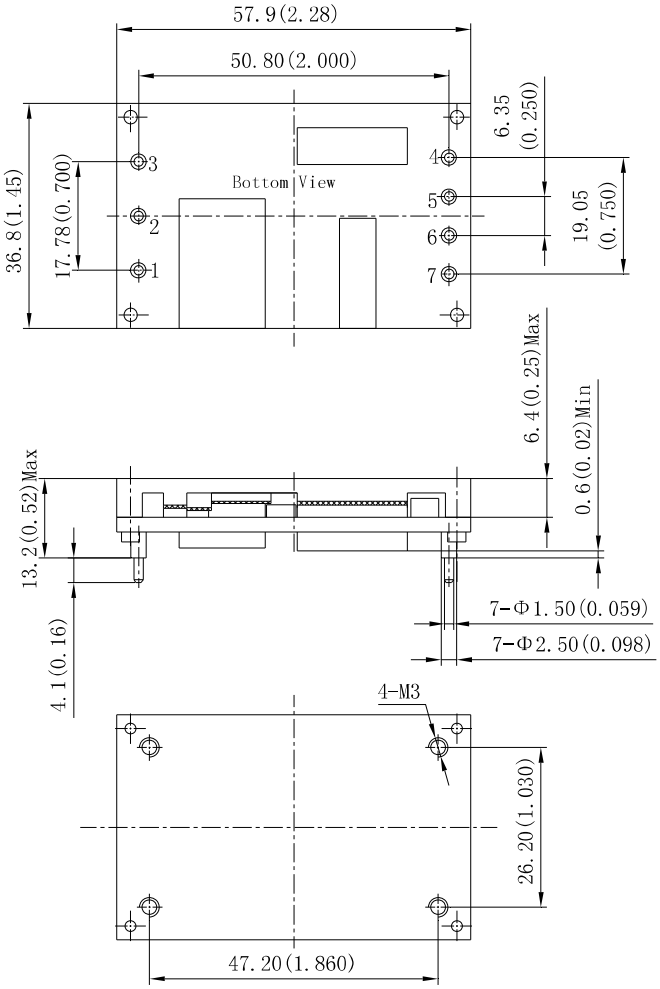

(1) Unit: mm (inch)

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

(3) The maximum height of the highest device at non-pin side is 6.4 (0.25); and the minimum space between the highest device at pin side and the mounting surface of pin side is 0.6 (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 baseplate shall be less than 3mm.

6.2 Pin Definition

No	1	2	3	4	5	6	7
Symbol	+Vin	Rem	-Vin	+Vo2	COM	Trim	+Vo1
Definition	Positive Input	Remote	Negative Input	Positive Output II	Common Terminal (Output grounding)	Trim (Output II)	Positive Output I

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