Features：

Dimensions：

33 ×13.46 ×8.28 mm

- Operating temperature range:-40～85°C
- Input Voltage Range:3.0～5.5Vdc
- Output voltage Precision:＋2％
- Remote sense
- Low output noise & ripple
- Output over-current protection
- RoHS (2002/95/EC) complaint
- EN60950-1 Certified

Numbering Convention:

BSM 16A – 3 S X– G
1 2 3 4 5 6

NO	Features	Descriptions
1	Product Series	BSM Series
2	Typical Output Current	16 -Typical Output current16A
3	Typical Input Voltage	5 -Typical Input Voltage: 5V
4	Number of Outputs	S - Single Output
		D - Dual Output
5	Typical Output Voltage	X-Output Voltage adjustable wide-range of arbitrary
6	RoHS	G - lead-free,ROHS6

1 Description

The BSM16A-3SXG power modules are open frame DC-DC converters using non-isolated buck-boost technologies and synchronous rectifier technologies, and feature remote on/off, over-current protection and over-temperature protection. All devices are surface mounted. The converts operate at an input voltage of 3.3Vdc or 5Vdc, and provide an adjustable output voltage of 0.75Vdc to 3.63Vdc.

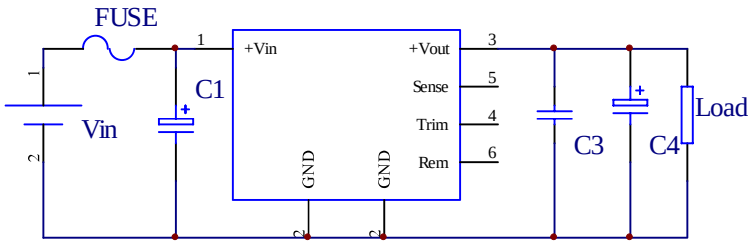
2 Specifications (unless otherwise stated, all specifications are typical at nominal input, full load, 25℃ and wind speed of 1m/s (200ft./min))

Parameter		Test Condition	Min	Typ	Max	Unit
2.1 Absolute Maximum Ratings						
Input Voltage (Vi)		Non-operating, continuous	0	—	5.8	Vdc
Max Output Power (Pomax)		Allowable operating conditions	—	—	53	W
2.2 Input Specifications						
Typical Input Voltage (Vinom)		—	—	5.0	—	Vdc
Input Voltage Range		Vo≤Vin–0.5	3	—	5.5	Vdc
Input Under-voltage Protection			—	2.2	—	Vdc
			—	2.0	—	Vdc
Remote	On	Open Circuit or High Level (-0.4Vdc <Vin <5.5Vdc)				
	Off	Shorted to GND or Low Level (< 0.3Vdc)				
2.3 Output Specifications						
Output voltage Set-point (Vonom)		Vinom,Ionom	—	—	±2	%Vo
Typical Output Current (Ionom)			—	—	16	A
Output Current Range (Io)			0	—	16	A
Output Voltage Trim (Voadj)		Add external adjust resistor	0.7525	—	3.63	V
Line Regulation (Vov)		Vimin～Vimax,Ionom	—	—	±1	%Vo
Load Regulation (Vol)		0～Ionom,Vinom	—	—	±1	%Vo
Output Over-current Protection		Vinom	—	28	—	A
Dynamic Load Response	Peak Deviation	50%～100%～50%Ionom ΔIo/Δt=2.5A/μS, Vinom	—	300	—	mV
	Settling Time	Add a 220μF low-ESR capacitor to input, and add a 1μF ceramic capacitor and a 10μF tantalum capacitor to output	—	35	—	μs
Output Ripple & Noise		Vinom, 20MHz, add a 1μF ceramic capacitor and a 10μF tantalum capacitor to output	—	—	50	mV
External Output Capacitance (Co)			—	—	10000	μF
2.4 Safety Specifications						

Parameter	Test Condition	Min	Typ	Max	Unit
Safety Certificate	EN 60950-1				
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-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.			
2.6 Environmental Specifications					
Relative Humidity	(40±2) ℃, No dew	—	—	95	%RH
Cooling	——	Forced-air Cooling			
Operating Ambient Temperature	See the derating curve	-40	—	+85	℃
Over-temperature Protection	——	+110℃			
Storage Temperature (Tst)	no operating	-55	—	+125	℃
2.7 General Specifications					
Switching Frequency	——	—	300	—	k Hz
Weight	——	—	5.5	—	g
Temperature Coefficient (Tcoeff)	——	—	—	±0.02	%/℃
Efficiency (η)	Vin=5.0V, Ionom, Vo=0.75V	—	81.0	—	%
	Vin=5.0V, Ionom, Vo=1.2V	—	86.0	—	%
	Vin=5.0V, Ionom, Vo=1.5V	—	88.0	—	%
	Vin=5.0V, Ionom, Vo=1.8V	—	89.0	—	%
	Vin=5.0V, Ionom, Vo=2.5V	—	91.5	—	%
	Vin=5.0V, Ionom, Vo=3.3V	—	94.0	—	%
RoHS	2002/95/EC Directive				

3 Basic Application Circuit and Considerations

3.1 Basic Application Circuit



C1: 220μF, ESR<0.1Ω; C3: 1μF ceramic capacitor; C4: 10μF Tantalum capacitor; FUSE: 20A

3.2 Input Voltage up to 5.8Vdc or reverse input polarity would cause the module damaged.

3.3 To improve load regulation, make the resistance of wires to load as small as possible.

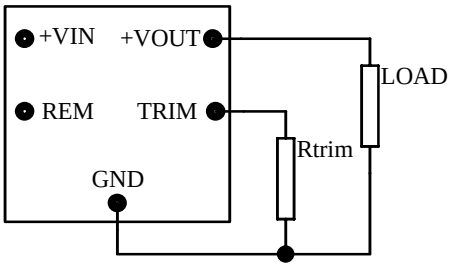
3.4 To improve the stability of power modules, it is recommended to add 220μF low-ESR tantalum capacitor (AVX p/n: TPSD227K010R) to the input; to improve the output ripple and noise, it is recommended to add a 10μF tantalum capacitor and 1μF ceramic capacitor.

3.5 The key to improve the input reflected ripple and noise is using low ESR capacitors, or adding three 150μF polymer capacitors (Panasonic p/n: EEFUE0J151R, Sanyo p/n: 6TPE150M) and two 47μF ceramic capacitor (Panasonic p/n: ECJ-5YB0J476M, Taiyo Yuden p/n: CEJMK432BJ476MMT) to the input to further improve the ripple and noise. A high inductive reactance at input may reduce the stability of power modules, so using a power source with low inductive reactance. Put the external capacitor to input as close as possible to the input terminal to ensure the stability of power modules and reduce the input reflected ripple.

3.6 Attention: the module is not internally fused, so add an external fuse to the input.

4 Output Voltage Adjustment (Trim)

4.1 Output Voltage Trim



Output Voltage Trim Circuit

Vo (V)	Rtrim (KΩ)
0.7525	Open
1.2	41.973
1.5	23.077
1.8	15.004
2.5	6.947
3.3	3.160

Table 1: Rtrim vs. Output Voltage

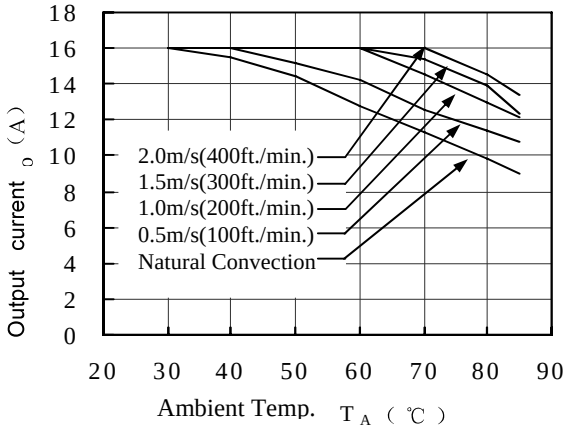
Add a suitable Rtrim between TRIM and GND to trim the output voltage from 0.7525Vdc to 3.3Vdc. See table 1 for reference. With no Rtrim, the module provides an output voltage of 0.7525Vdc.

$$Rtrim = \left[\frac{21070}{V_O - 0.7525} - 5110 \right] \Omega$$

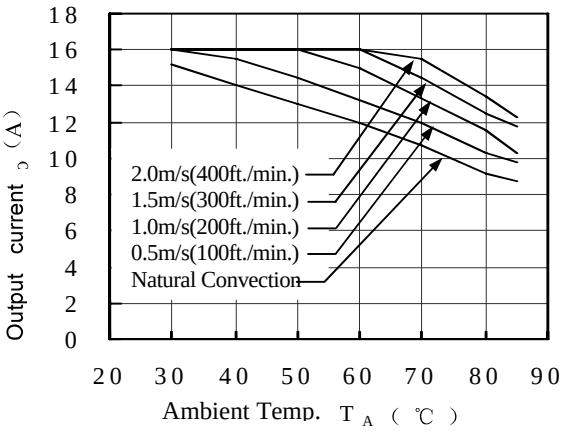
Where V_O: the adjusted output voltage.

5 Thermal Derating Curve

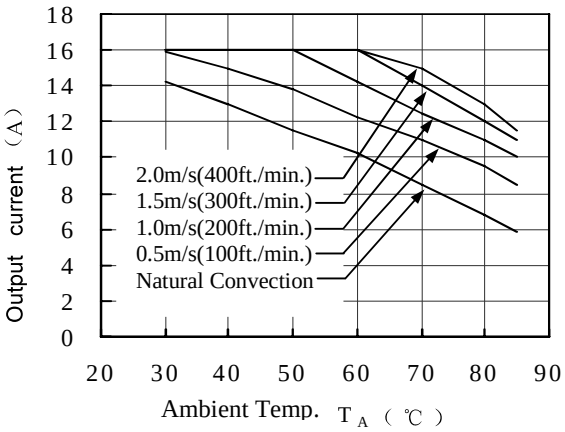
When the module operates at high temperature, use the derating curves as below:



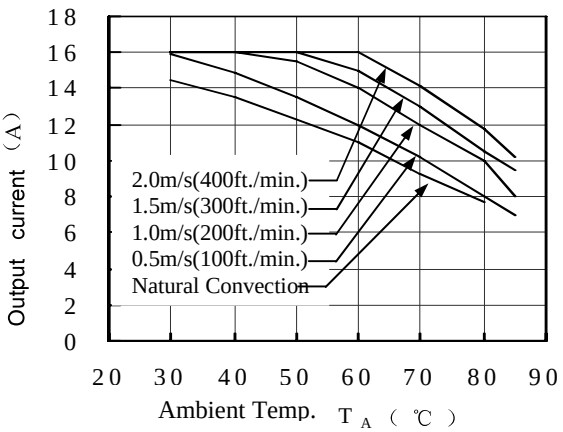
Derating Curve at Vin=3.3V, Vo=2.5 V



Derating Curve at Vin=3.3V, Vo=0.75V

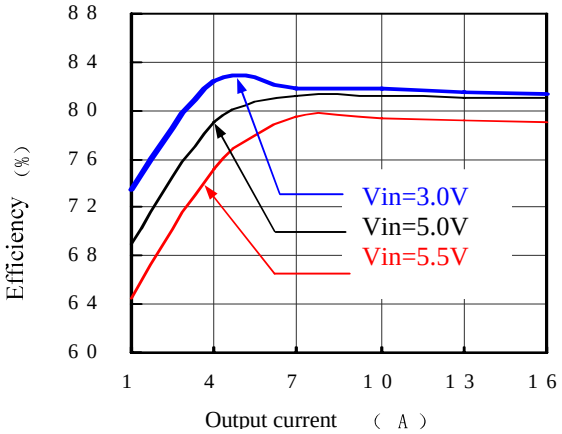


Derating Curve at Vin=5.0V, Vo=3.3V

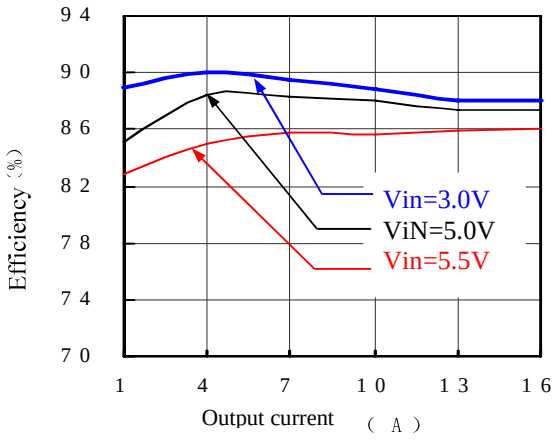


Derating Curve at Vin=5.0V, Vo=0.75V

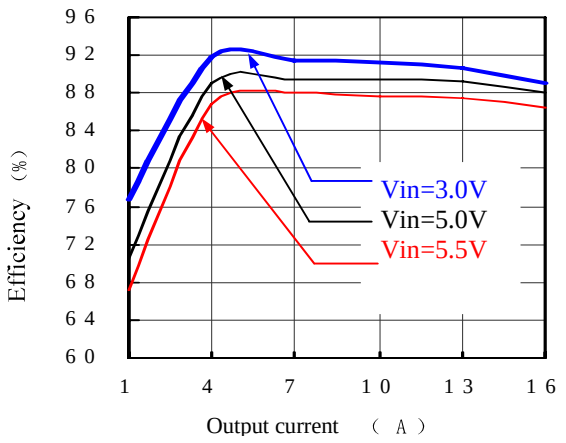
6 Efficiency Curve



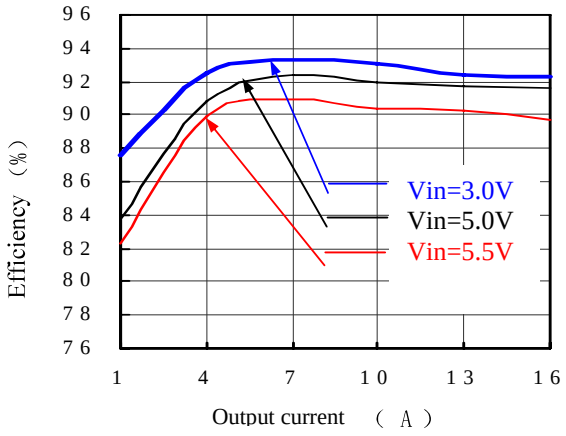
Efficiency Curve at Vo=0.75V



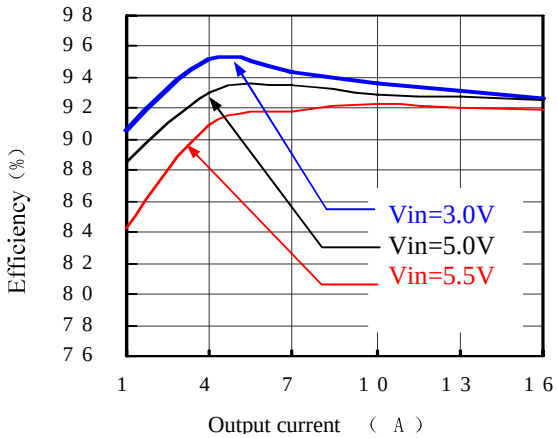
Efficiency Curve at Vo=1.2V



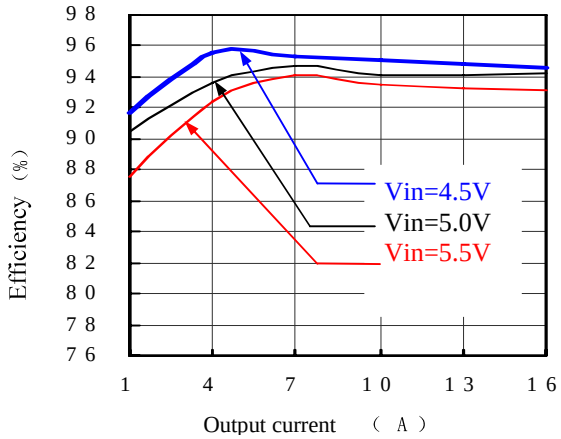
Efficiency Curve at Vo=1.5V



Efficiency Curve at Vo=1.8V



Efficiency Curve at Vo=2.5V

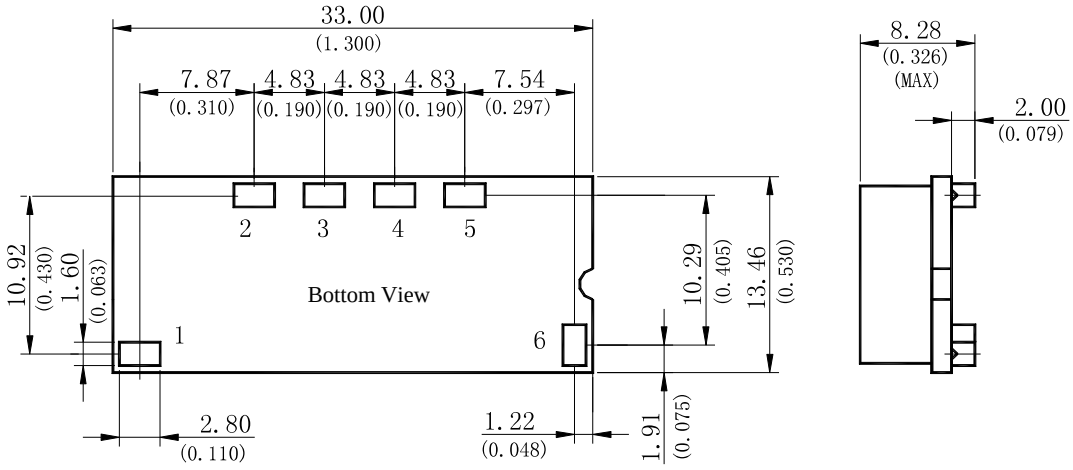


Efficiency Curve at Vo=3.3V

7 Dimensions and Pin Definition

7.1 Dimensions

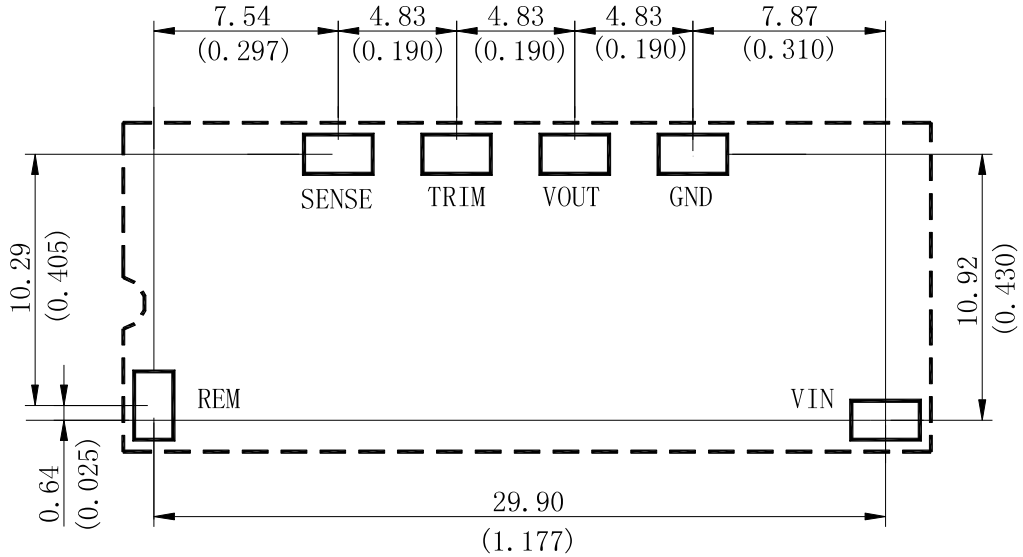
Unit: mm (inch) Tolerances: .XX ±0.25 (0.010.)



7.2 Pin Definition

No.	1	2	3	4	5	6
Symbol	+Vin	GND	+Vout	TRIM	SENSE	REM
Definition	Positive Input	Ground	Positive Output	TRIM	Remote Sense	Remote on/off

7.3 Recommended Land Patterns



Dimensions

Min: 3.556×2.413 (0.140×0.095)
Max: 4.19×2.79 (0.165×0.110)