**Features:****Dimensions:**

22.86 × 10.16 × 6.63 mm

- Operating temperature range: -40 ~ 85°C
- Input Voltage Range: 2.4 ~ 5.5Vdc
- Output voltage Precision: -3% ~ +3%
- Remote sense
- Low output noise & ripple
- Output short-circuit protection
- Output over-current protection
- RoHS (2002/95/EC) complaint
- EN60950-1 Certified

**Numbering Convention:****BBN 6A - 3 S X - L - G**

1      2      3 4 5      6      7

| NO | Features               | Descriptions                                          |
|----|------------------------|-------------------------------------------------------|
| 1  | Product Series         | BBN Series                                            |
| 2  | Typical Output Current | 6 - Typical Output current: 6A                        |
| 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  | Remote on/off Logic    | L - Negative Logic                                    |
|    |                        | H or Default - Positive Logic                         |
| 7  | RoHS                   | G - lead-free, ROHS6                                  |

## 1. Description

The BBN6A-3SX-LG series power modules are open frame DC-DC converters using non-isolated buck-boost technologies and synchronous rectifier technologies, and feature high reliability, high stability, remote on/off, and short-circuit protection. All devices are surface mounted. The converts operate at an input voltage of 2.4Vdc or 5.5Vdc, and provide an adjustable output voltage of 0.75Vdc to 3.63Vdc and a 6A output current. The output voltage is initially set as 0.75Vdc, and can be trimmed by adding an external resistor between Trim and GND.

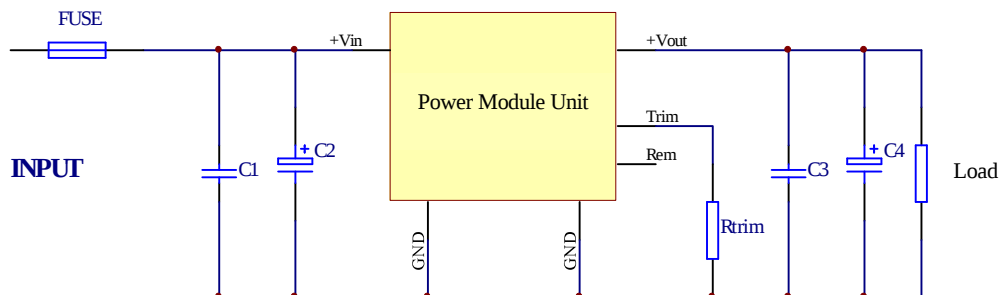
## 2 Specifications

Unless otherwise stated, all specifications are typical at nominal input, full load and 25°C. Add filter capacitors to the input and output of test tooling; C1: 1000μF/10V Aluminum capacitor, C2: 220μF tantalum electrolytic capacitor (TPSD227M010R0100), C3: 22μF ceramic capacitor (C3225X5R1A226KT), C4: 100μF tantalum electrolytic capacitor (TPSD107K010R0100). All the capacitors shall have a low ESR.

| 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                                        | —      | —    | 21.78 | W         |
| 2.2 Input Specifications               |                |                                                                       |        |      |       |           |
| Typical Input Voltage (Vinom)          |                | —                                                                     | —      | 5.0  | —     | Vdc       |
| Input Voltage Range                    |                | Vo≤1.5Vdc                                                             | 2.4    | —    | 5.5   | Vdc       |
|                                        |                | Vo=1.8Vdc                                                             | 3.0    | —    | 5.5   | Vdc       |
|                                        |                | 2.5≤Vo≤3.3Vdc                                                         | 4.5    | —    | 5.5   | Vdc       |
| Input Under-voltage Protection         | Threshold      | Ionom                                                                 | 1.8    | 2.0  | —     | Vdc       |
|                                        | Recovery       | Ionom                                                                 | —      | 2.05 | 2.4   | Vdc       |
| Remote                                 | On             | Open Circuit or Low Level (0~0.4V <sub>DC</sub> ) or connected to GND |        |      |       |           |
|                                        | Off            | High Level (1.5~5.5V <sub>DC</sub> )                                  |        |      |       |           |
| 2.3 Output Specifications              |                |                                                                       |        |      |       |           |
| Typical Output Current (Ionom)         |                | —                                                                     |        | 6    |       | A         |
| Output Voltage Set-point Precision (%) |                | Vinom, 50%Ionom                                                       | -2     | —    | +2    | %         |
| Output Voltage Trim(Voadj)             |                | Add external adjusting resistor                                       | 0.7525 | —    | 3.63  | Vdc       |
| Output voltage Precision (%)           |                | Vimin~Vimax, Iomin~Iomax                                              | -3     | —    | +3    | %         |
| Line Regulation(ΔV <sub>OV</sub> )     |                | Vimin~Vimax, Ionom                                                    | —      | ±0.4 | —     | %         |
| Load Regulation(ΔV <sub>OL</sub> )     |                | 0~50%~100%Ionom, Vinom                                                | —      | ±0.4 | —     | %         |
| Output Over-current Protection (A)     |                | Vinom,Ionom                                                           | —      | 13.2 | —     | A         |
| Output Short-circuit Protection        |                | Continuous, Auto-recovery                                             |        |      |       |           |
| Dynamic Load Response                  | Peak Deviation | 50%~100%~50% Ionom<br>di/dt=2.5A/μS                                   | —      | 250  | —     | mV        |
|                                        | Settling Time  |                                                                       | —      | 50   | —     | μS        |
| Output Ripple & Noise (Peak-to-Peak)   |                | 20MHz                                                                 | —      | —    | 50    | mV(pk-pk) |

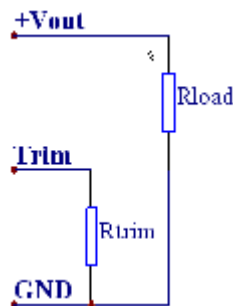
| Parameter                           |               | Test Condition                                                                                            | Min                                                                                                                                                                   | Typ  | Max  | Unit |
|-------------------------------------|---------------|-----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|------|------|
| External Output Capacitance (Conom) |               | ESR≥1mΩ                                                                                                   | —                                                                                                                                                                     | —    | 1000 | μF   |
|                                     |               | ESR≥10mΩ                                                                                                  | —                                                                                                                                                                     | —    | 3000 | μF   |
| Turn-on Time (Ts)                   |               | Vinom, Ionom                                                                                              | —                                                                                                                                                                     | —    | 10   | mS   |
| 2.4 Safety Specifications           |               |                                                                                                           |                                                                                                                                                                       |      |      |      |
| Safety Certificate                  |               | EN 60950-1                                                                                                |                                                                                                                                                                       |      |      |      |
| 2.5 Reliability                     |               |                                                                                                           |                                                                                                                                                                       |      |      |      |
| Vibration Test(sine)                |               | ΔIo/Δt=: 10~55Hz<br>Amplitude: 0.35mm<br>Acceleration: 50m/s <sup>2</sup><br>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 <sup>2</sup><br>Duration: 6ms<br>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                                |               | Bellcore TR-332 Ta=40℃                                                                                    | 3×10 <sup>6</sup>                                                                                                                                                     |      |      | h    |
| 2.6 Environmental Specifications    |               |                                                                                                           |                                                                                                                                                                       |      |      |      |
| Relative Humidity                   |               | (40±2) °C, No dew                                                                                         | —                                                                                                                                                                     | —    | 90   | %RH  |
| Cooling                             |               | —                                                                                                         | Natural Convention or Forced-air Cooling                                                                                                                              |      |      |      |
| Storage Temperature (Tst)           |               | Non-operating                                                                                             | -55                                                                                                                                                                   | —    | +125 | ℃    |
| Ambient Temperature (Ta)            |               | —                                                                                                         | -40                                                                                                                                                                   | —    | +85  | ℃    |
| 2.7 General Specifications          |               |                                                                                                           |                                                                                                                                                                       |      |      |      |
| Over-temperature Protection         |               | Auto-recovery                                                                                             | ±10℃                                                                                                                                                                  | 135  | —    | ℃    |
| Switching Frequency                 |               | —                                                                                                         | —                                                                                                                                                                     | 300  | —    | kHz  |
| Temperature Regulation              |               | Tamin ~ Tamax                                                                                             | —                                                                                                                                                                     | ±0.4 | —    | %Vo  |
| Efficiency (η)                      | Vonom=0.75Vdc | Vinom,Ionom                                                                                               | —                                                                                                                                                                     | 78.0 | —    | %    |
|                                     | Vonom=1.2Vdc  |                                                                                                           | —                                                                                                                                                                     | 84.0 | —    | %    |
|                                     | Vonom=1.5Vdc  |                                                                                                           | —                                                                                                                                                                     | 87.0 | —    | %    |
|                                     | Vonom=1.8Vdc  |                                                                                                           | —                                                                                                                                                                     | 88.0 | —    | %    |
|                                     | Vonom=2.5Vdc  |                                                                                                           | —                                                                                                                                                                     | 91.0 | —    | %    |
|                                     | Vonom=3.3Vdc  |                                                                                                           | —                                                                                                                                                                     | 93.0 | —    | %    |
| Weight                              |               | —                                                                                                         | —                                                                                                                                                                     | 2.8  | —    | g    |
| RoHS                                |               | RoHS (2002/95/EC)                                                                                         |                                                                                                                                                                       |      |      |      |

### 3 Basic Application Circuit and Considerations



**Recommended:** C1: 1000μF/10V Aluminum capacitor, C2: 220μF tantalum electrolytic capacitor (TPSD227M010R0100), C3: 22μF ceramic capacitor (C3225X5R1A226KT), C4: 100μF tantalum electrolytic capacitor (TPSD107K010R0100), Fuse: 10A/32V. All the capacitors shall have a low ESR, and the external capacitors shall be put as close as to input/output.

### 4 Output Voltage Adjustment (Trim)

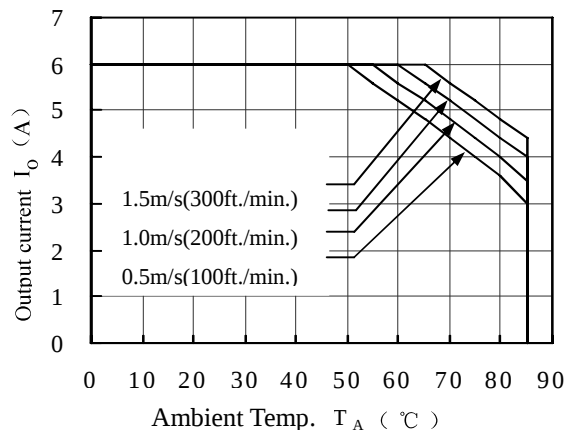


Output Voltage Trim Equation: 
$$R_{trim} = \frac{21.070}{V_o - 0.7525} - 5.110(k\Omega)$$

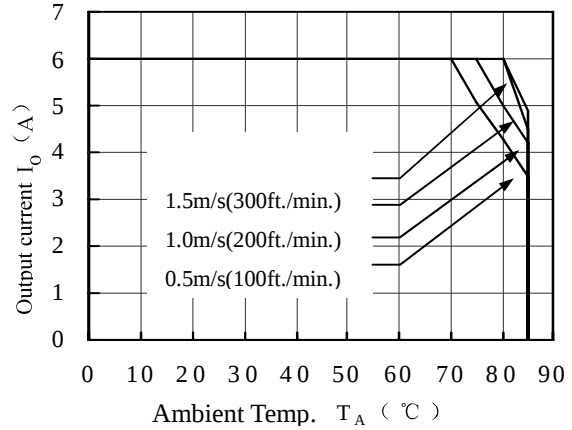
| Vo (Vdc) | Rtrim (kΩ) |
|----------|------------|
| 0.75     | Open       |
| 1.2      | 41.973     |
| 1.5      | 23.077     |
| 1.8      | 15.004     |
| 2.5      | 6.947      |
| 3.3      | 3.160      |

Rtrim Vs. Output Voltage

### 5 Thermal Derating Curve



Derating Curve at  $V_{in}=5.0V$ ,  $V_o=3.3V$



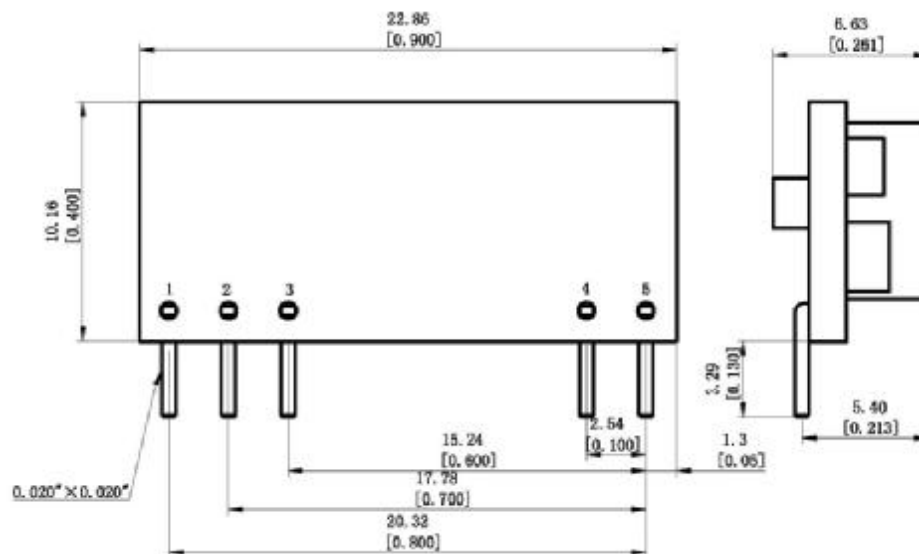
Derating Curve at  $V_{in}=3.3V$ ,  $V_o=0.75V$

### 6 Dimensions and Pin Definition

#### 6.1 Dimensions

Tolerances:  $x.x \pm 0.05mm$  ( $x.xx \pm 0.02inch$ )

$x.xx \pm 0.25mm$  ( $x.xxx \pm 0.010inch$ )



#### 6.2 Pin Definition

| No.        | 1               | 2    | 3      | 4              | 5             |
|------------|-----------------|------|--------|----------------|---------------|
| Symbol     | +Vout           | Trim | GND    | +Vin           | Rem           |
| Definition | Positive Output | TRIM | Ground | Positive Input | Remote on/off |