## Features

- Industrial standard 1/8 brick package and footprint：
  57.9×22.8×9.8mm(2.28*0.90*0.38inch)
- 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 91%
- High power density
- Low output voltage ripple and noise
- Remote On/Off
- Under-voltage protection
- Over-current protection
- Over-voltage protection

## Options：

- Sprayed Conformal coating
- RoHS

## Numbering Convention

**ESR 15 – 48 S 3V3 – L –C G5**
① ② ③ ④ ⑤ ⑥ ⑦ ⑧

| No | Features | Descriptions |
|---|---|---|
| ① | Product Series | ESR-1/8brick |
| ② | Output current | 15-Max. output current 15A |
| ③ | Typical input voltage | Typical input voltage is 48V |
| ④ | Number of Outputs | S-single Output |
| | | D-double Outputs |
| ⑤ | Output voltage | 3V3-output voltage is 3.3V |
| ⑥ | Remote on/off Logic | L- Negative Logic |
| | | H or Default – Positive Logic |
| ⑦ | Sprayed Conformal coating | C – Sprayed Conformal coating |
| | | Default: no Sprayed Conformal coating |
| ⑧ | RoHS feature | G5 – RoHS5 |
| | | G – lead-free products, RoHS6 |





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## 1 Description

The converters are in an industry 1/8 brick packaging & footprint and open-frame design, and provide up to 3.3V output voltage and 15A output current. All devices of the converter are surface mounted. The converters feature high power density, remote on/off, over-temperature protection and current limit, etc.

## 2 Specifications (All specifications are typical at nominal input, full load at 25°C and 200LFM unless otherwise stated.)

| Parameter | | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **2.1 Absolute Maximum Ratings** | | | | | | |
| Input Voltage (Vi) | | at no operating, continuous | 0 | — | 80 | Vdc |
| Transient input voltage (Vit) | | 100ms | — | — | 100 | Vdc |
| Max Output Power (Pomax) | | allowable operating conditions | — | — | 49.5 | W |
| **2.2 Input Specifications** | | | | | | |
| Typical Input Voltage (Vinom) | | — | — | 48 | — | Vdc |
| Input Voltage Range | | — | 36 | — | 75 | Vdc |
| Input Under-voltage Protection (Vishl) | | Ionom | 30 | — | 34 | Vdc |
| Input Under-voltage Recovery Point | | Ionom | 31 | — | 36 | Vdc |
| Maximum Input Current (Iimax) | | Vimin, Vonom, Ionom | — | — | 1.53 | A |
| No-load Input Current (Iio) | | Vinom, Io＝0A | — | — | 60 | mA |
| Static Input Current (Iiof) | | Vinom, Remote Shutdown Output | — | — | 10 | mA |
| Remote | On | Low level( 0~0.8Vdc, reference to –Vin) or connect to –Vin | | | | |
| | Off | High level( 2.4~48Vdc , reference to –Vin) or open circuit | | | | |
| **2.3 Output Specifications** | | | | | | |
| Output voltage Set-point (Vonom) | | Vinom, Ionom | 3.27 | 3.3 | 3.33 | Vdc |
| Typical Load (Ionom) | | — | — | — | 15 | A |
| Output Current Range (Io) | | Po≤49.5W | 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≤49.5W | -20 | — | +10 | %Vo |
| Output Over-voltage Protection ① | | Po<Pomax | 3.8 | | 4.62 | Vdc |
| Output Over-current Protection | Protection Mode | —— | Hiccup, Automatic recovery | | | — |
| | Protection Range | Vinmin~Vinmax, Tc (PCB temp) = -40~100°C | 105 | | 150 | %Ionom |
| Output Short-circuit Protection | Protection Mode | —— | Hiccup, Automatic recovery | | | — |





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| Parameter | | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| Dynamic Load Response | Overshoot Amplitude | 25%-50%-25%Ionom<br>50%-75%-50%Ionom<br>Slope :0.1A/μS,Vinom | — | 100 | 165 | mV |
| | Recovery Time | | — | 100 | 200 | μs |
| Output Ripple and Noise② | | Vinom, 20MHz, externally add a 22μF tantalum capacitor to output, test the 10μF tantalum capacitor and the 1μF ceramic capacitor on the ripple & noise test tooling | — | 40 | 50 | mV |
| External Output Capacitance (Co) | | Externally add a 100μF/100V capacitor to input | 0 | — | 10000 | μF |
| Turn-on/off Peak Deviation | | Vinom,Ionom | — | ±2 | ±5 | %Vo |
| Turn-on Delay Time | | 90%Vinnom-- 10%Vonom | 10 | 30 | 50 | mS |
| Output Rise Time ③ | | 10%Vonom---90%Vonom | 5 | 10 | 15 | mS |
| **2.4 Safety Specifications** | | | | | | |
| Isolation voltage | Input to output | Leak Current ≤1mA, 1min | 1500 | — | — | Vdc |
| Isolation Resistance ($R_{ISO}$) | | Test voltage: 500Vdc, normal temperature | 50 | — | — | MΩ |
| Safety Certificate | | EN 60950-1:2006 Recognized | | | | |
| **2.5 Reliability** | | | | | | |
| Vibration Test (sine) | | Frequency: 10~55Hz<br>Amplitude: 0.35mm<br>Acceleration: 50m/s$^2$<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$^2$<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 | | ≥2×10$^6$h Bellcore TR-332 (Ta=25℃) | | | | |
| **2.6 Environmental Specifications** | | | | | | |
| Relative Humidity | | (40±2) ℃, No dew | — | — | 90 | %RH |
| Cooling | | —— | Forced Air Cooling | | | |
| Operating Ambient Temperature Range (Ta) | | See the derating curves | -40 | — | +85 | ℃ |
| Over-temperature protection (Auto-recovery) | Temperature Range | —— | 105 | 115 | 125 | ℃ |
| | Recovery Hysteresis Range | —— | 5 | 8 | 12 | ℃ |
| Storage Temperature (Tst) | | Non-operating | -55 | — | +125 | ℃ |
| **2.7 General Specifications** | | | | | | |
| Switching Frequency | | —— | — | 300 | — | k Hz |
| Temperature Coefficient (Tcoeff) | | —— | — | — | ±0.02 | %/℃ |





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| Parameter | Test Condition | Min | Typ | Max | Unit |
|---|---|---|---|---|---|
| Efficiency (η) | Vinom,Ionom | 89 | 91 | — | % |
| Weight (g) | — | | 30 | | g |
| RoHS | According to 2002/95/EC directive | | | | |
| Anti-sulfuration feature | Sprayed conformal coating | | | | |

**Notes:** At high/low temperature, the three indicators shall:

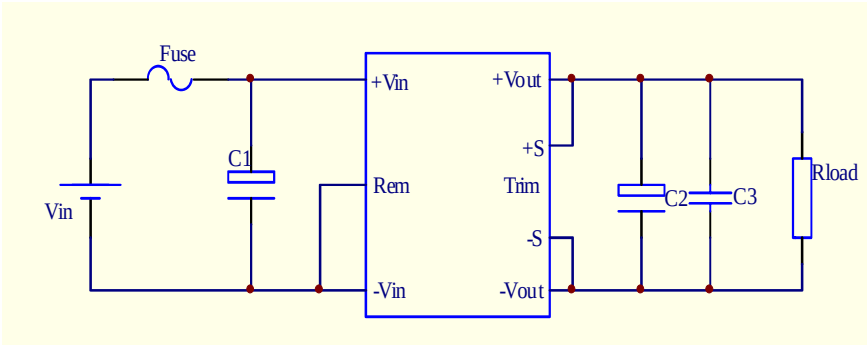
① Output over-voltage protection: 3.8V<V<4.95V (Test condition: Po<Pomax).

② Output ripple & noise (peak-to-peak): Vrp<75mV (Test condition: Vinom, 20MHz, externally add a 22μF tantalum capacitor to output, test the 10μF tantalum capacitor and the 1μF ceramic capacitor on the ripple & noise test tooling).

③ Output rise time: 5mS<T<20mS (Test condition: 10%Vonom--90%Vonom).

## 3. Basic Application Circuit and Considerations

3.1 Typical Application




Fuse: 5A C1 ≥100μF/100V (capacitor) C2: 22μF/10V (Tantalum capacitor)
C3: 1μF /10V (Monolithic capacitor)

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: 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 3.63V (trim up) or be lower than 2.64V (trim down), or the converter can't work well. See "4. Output Voltage Adjustment (Trim)" for details.

3.6 Connect a 100μF/100V electrolytic capacitor to the input terminal when a capacitor connected to the output terminal.





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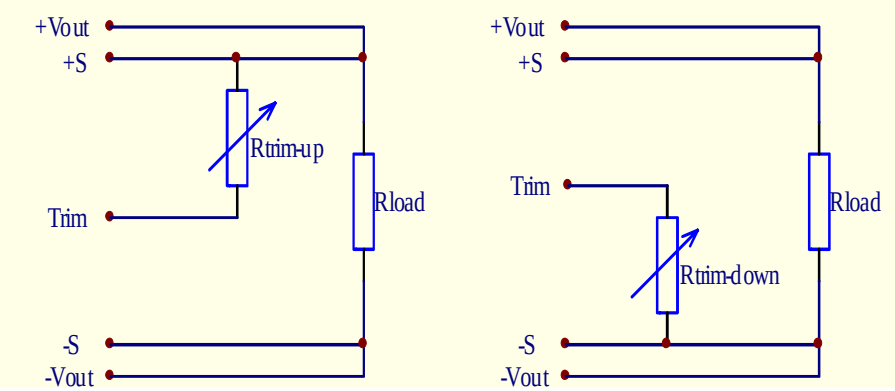
## 4 Output Voltage Adjustment (Trim)

4.1 Output Voltage Trim Circuit




Trim up　　Trim down

4.2 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

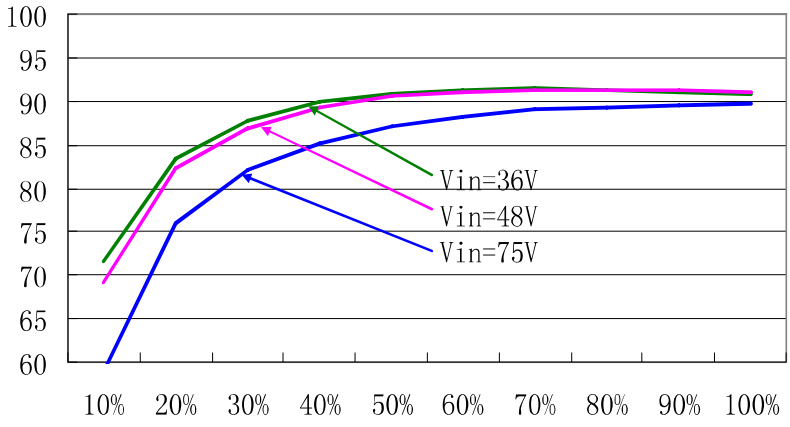
$$R_{Trim-down} = \left( \frac{5.11 \times 100(\%)}{\Delta(\%)} - 10.22 \right) (k\Omega)$$

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

## 5 Efficiency Curves: Ta=+25℃, air speed: 1m/S (200ft./min.)





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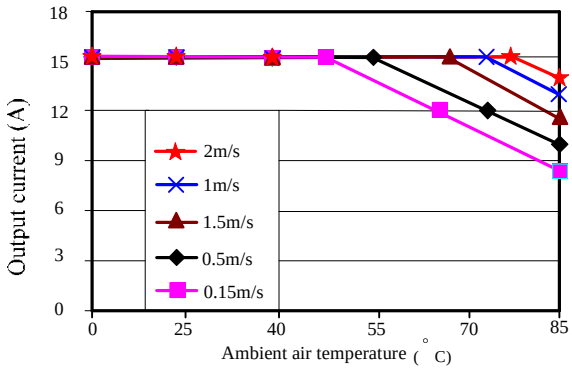
## 6 Thermal Derating Curves

When the converter operating at high temperature, the following derating curves shall be used:




Vin=48.0V

Test conditions：

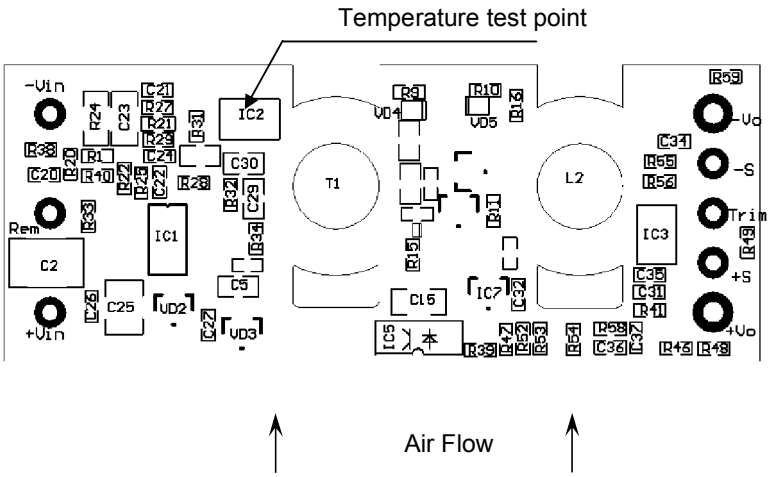
① The module shall be soldered on a 2.0mm standard 4-layer test board, of which the middle two layers are two-ounce copper foils.

② A certain clearance 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 devices on the module can meet thermal derating requirements.

## 7 Temperature test point and airflow direction





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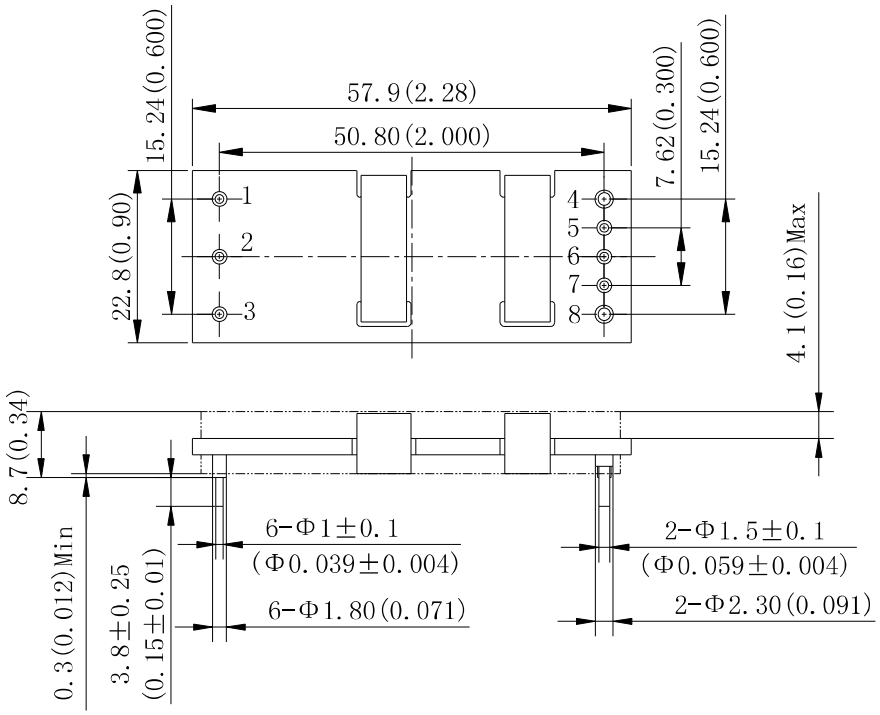
## 8 Dimensions and Pin definition

### 8.1 Dimensions




（1）Unit: mm(inch)　　Tolerances: .X±0.5(.XX±0.02); .XX±0.25(.XXX ±0.010)

（2）4.1 (0.16) for non-top device has a maximum pin-surface height, 0.3 (0.012) for the pin face a maximum installation of the device and the pins were the smallest spacing

### 8.2 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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