DC/DC Converter

- Continuous short circuit protection
- I/O isolation: 1’060 VAC
- Operating temperature range -40 to +80 °C without derating
- Input voltage ranges (±10%): 5, 12, 24 VDC
- High efficiency up to 84%
- SIP-7 package
- Unregulated outputs
- 3-year product warranty

The TBA 2 is a 2 Watt DC/DC SIP converter series which is specifically designed to offer a low-cost solution with no concession on quality and lifetime. The new design improves on the industry standard features and offers an integrated continuous short circuit protection circuit, an operating temperature range from -40°C to 80°C without derating and I/O-isolation of 1'500 VDC. It offers a broad application range in any space and cost critical application.

### Models

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
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<tr>
<td>TBA 2-0511</td>
<td>4.5 - 5.5 VDC (5 VDC nom.)</td>
<td>5 VDC</td>
<td>400 mA</td>
<td>–5 VDC</td>
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<tr>
<td>TBA 2-0512</td>
<td>5 VDC</td>
<td>165 mA</td>
<td>–5 VDC</td>
<td>200 mA</td>
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<tr>
<td>TBA 2-0513</td>
<td>12 VDC</td>
<td>130 mA</td>
<td>–12 VDC</td>
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<tr>
<td>TBA 2-0521</td>
<td>15 VDC</td>
<td>80 mA</td>
<td>–15 VDC</td>
<td>65 mA</td>
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<tr>
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<td>+5 VDC</td>
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<td>TBA 2-0523</td>
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<tr>
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</tr>
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<tr>
<td>TBA 2-1223</td>
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<td>–15 VDC</td>
<td>65 mA</td>
</tr>
<tr>
<td>TBA 2-2411</td>
<td>21.6 - 26.4 VDC (24 VDC nom.)</td>
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<tr>
<td>TBA 2-2412</td>
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<td>200 mA</td>
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<td>TBA 2-2413</td>
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</table>
Input Specifications

**Input Current**
- At no load: 5 Vin models: 35 mA typ.
- 12 Vin models: 18 mA typ.
- 24 Vin models: 10 mA typ.

**Surge Voltage**
- 5 Vin models: 9 VDC max. (1 s max.)
- 12 Vin models: 18 VDC max. (1 s max.)
- 24 Vin models: 30 VDC max. (1 s max.)

**Recommended Input Fuse**
- 5 Vin models: 1'000 mA (slow blow)
- 12 Vin models: 400 mA (slow blow)
- 24 Vin models: 200 mA (slow blow)

(IEEE need of an external fuse has to be assessed in the final application)

**Input Filter**
Internal Capacitor (add. external 22 µF, ESR <0.1Ω, recommended)

Output Specifications

**Voltage Set Accuracy**
±3% max. (at 60% for 5VDC models)
±3% max. (at 80% for other models)

**Regulation**
- Input Variation (1% Vin step) single output models: 1.5% max.
- Load Variation dual output models: 1.5% max.
- Voltage Balance (see application note: www.tracopower.com/overview/tba2) dual output models: 1% max.

**Ripple and Noise**
- 20 MHz Bandwidth
  - 120 mVP-p typ.
  - 250 mVP-p max.

**Capacitive Load**
- single output
  - 5 Vout models: 470 µF max.
  - 12 Vout models: 470 µF max.
  - 15 Vout models: 470 µF max.

- dual output
  - 5 / -5 Vout models: 220 / 220 µF max.
  - 12 / -12 Vout models: 220 / 220 µF max.
  - 15 / -15 Vout models: 220 / 220 µF max.

**Minimum Load**
10 % of Iout max.

**Temperature Coefficient**
±0.02 %/K max.

**Start-up Time**
10 ms max.

**Short Circuit Protection**
Continuous, Automatic recovery

Safety Specifications

**Safety Standards**
- IT / Multimedia Equipment

- Designed for EN 62368-1 (no certification)

General Specifications

**Relative Humidity**
95% max. (non-condensing)

**Temperature Ranges**
- Operating Temperature
  - -40°C to +90°C
- Case Temperature
  - +95°C max.
- Storage Temperature
  - -55°C to +125°C

**Power Derating**
- High Temperature
  - 6.67 %/K above 80°C

**Cooling System**
Natural convection (20 LFM)

**Switching Frequency**
30 - 200 kHz (PWM)

**Insulation System**
Functional Insulation

**Isolation Test Voltage**
- Input to Output, 60 s: 1'500 VDC

**Isolation Resistance**
- Input to Output, 500 VDC: 1'000 MΩ min.

**Isolation Capacitance**
- Input to Output, 100 kHz, 1 V: 20 pF max.

**Reliability**
- Calculated MTBF:
  - 2'000'000 h (MIL-HDBK-217F, ground benign)

**Housing Material**
Plastic (UL 94 V-0 rated)

**Potting Material**
Epoxy (UL 94 V-0 rated)

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
**Pin Material**  
Nickel-Iron (Alloy 42)

**Pin Foundation Plating**  
Nickel (1.5 µm min.)

**Pin Surface Plating**  
Tin (3 µm min.), bright

**Connection Type**  
THD (Through-Hole Device)

**Weight**  
2.8 g

**Environmental Compliance**  
- REACH Declaration  
  [www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)
- RoHS Declaration  
  Exemptions: '7a, '7c-I

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**Outline Dimensions**

[Diagram of dimensions]

**Pinout**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>4</td>
<td>–Vout</td>
<td>–Vout</td>
</tr>
<tr>
<td>5</td>
<td>No pin</td>
<td>Common</td>
</tr>
<tr>
<td>6</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

Dimensions in mm (inch)  
Tolerances: ±0.35 (±0.01)