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.

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
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<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 400 mA</td>
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<tr>
<td>TBA 2-0512</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>TBA 2-0521</td>
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<td>+5 VDC 200 mA</td>
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<tr>
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<td>+12 VDC 80 mA</td>
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<tr>
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<td>+15 VDC 65 mA</td>
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<td>82 %</td>
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<tr>
<td>TBA 2-1211</td>
<td>5 VDC 400 mA</td>
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<td></td>
<td>79 %</td>
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<tr>
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<td>82 %</td>
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<tr>
<td>TBA 2-1213</td>
<td>15 VDC 130 mA</td>
<td>+5 VDC 200 mA</td>
<td></td>
<td>84 %</td>
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<tr>
<td>TBA 2-1221</td>
<td>+12 VDC 80 mA</td>
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<td>79 %</td>
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<tr>
<td>TBA 2-1222</td>
<td>+15 VDC 65 mA</td>
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<td></td>
<td>83 %</td>
</tr>
<tr>
<td>TBA 2-1223</td>
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<td>5 VDC 400 mA</td>
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<td></td>
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<tr>
<td>TBA 2-2411</td>
<td>12 VDC 165 mA</td>
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<tr>
<td>TBA 2-2412</td>
<td>15 VDC 130 mA</td>
<td>+5 VDC 200 mA</td>
<td></td>
<td>84 %</td>
</tr>
<tr>
<td>TBA 2-2413</td>
<td>+12 VDC 80 mA</td>
<td></td>
<td></td>
<td>84 %</td>
</tr>
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<td>TBA 2-2421</td>
<td>+15 VDC 65 mA</td>
<td></td>
<td></td>
<td>84 %</td>
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<tr>
<td>TBA 2-2422</td>
<td>21.6 - 26.4 VDC (24 VDC nom.)</td>
<td>5 VDC 400 mA</td>
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<td>80 %</td>
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<tr>
<td>TBA 2-2423</td>
<td>12 VDC 165 mA</td>
<td></td>
<td></td>
<td>84 %</td>
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<tr>
<td>TBA 2-2424</td>
<td>15 VDC 130 mA</td>
<td>+5 VDC 200 mA</td>
<td></td>
<td>84 %</td>
</tr>
<tr>
<td>TBA 2-2425</td>
<td>+12 VDC 80 mA</td>
<td></td>
<td></td>
<td>84 %</td>
</tr>
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<td>TBA 2-2426</td>
<td>+15 VDC 65 mA</td>
<td></td>
<td></td>
<td>84 %</td>
</tr>
</tbody>
</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)
  (The 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.
  - dual output models: 1.5% max.
- Load Variation
- Voltage Balance (symmetrical load)
  See application note:
  www.tracopower.com/overview/tba2
- Voltage Balance (asymmetrical load)
  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)

**Washing Process**
Not allowed

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

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

All specifications valid at nominal voltage, resistive 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
Housing Type: Plastic Case
Mounting Type: PCB Mount
Connection Type: THD (Through-Hole Device)
Footprint Type: SIP7
Weight: 2.8 g

Environmental Compliance:
- REACH Declaration
  www.tracopower.com/info/reach-declaration.pdf
- RoHS Declaration
  www.tracopower.com/info/rohs-declaration.pdf

Exemptions:
7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

Supporting Documents
Overview Link (for additional Documents)
www.tracopower.com/overview/tba2

Outline Dimensions

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single/Single Terminal Block</th>
<th>Dual/Dual Terminal Block</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)