**DC/DC Converter**

- Continuous short circuit protection
- I/O isolation: 1'060 VAC
- Operating temperature range -40 to +85 °C without derating
- Input voltage ranges (±10%): 5, 12, 24 VDC
- High efficiency up to 82%
- SIP-7 package
- Unregulated outputs
- 3-year product warranty

The TBA 1E is a 1 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 85°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>
</tr>
<tr>
<td>TBA 1-0511E</td>
<td>4.5 - 5.5 VDC (5 VDC nom)</td>
<td>5 VDC</td>
<td>200 mA</td>
<td></td>
</tr>
<tr>
<td>TBA 1-0512E</td>
<td>12 VDC</td>
<td>84 mA</td>
<td></td>
<td>82 %</td>
</tr>
<tr>
<td>TBA 1-0513E</td>
<td>15 VDC</td>
<td>66 mA</td>
<td></td>
<td>82 %</td>
</tr>
<tr>
<td>TBA 1-0521E</td>
<td>+5 VDC</td>
<td>100 mA</td>
<td>−5 VDC</td>
<td>100 mA</td>
</tr>
<tr>
<td>TBA 1-0522E</td>
<td>+12 VDC</td>
<td>41 mA</td>
<td>−12 VDC</td>
<td>41 mA</td>
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<tr>
<td>TBA 1-0523E</td>
<td>+15 VDC</td>
<td>33 mA</td>
<td>−15 VDC</td>
<td>33 mA</td>
</tr>
<tr>
<td>TBA 1-1211E</td>
<td>10.8 - 13.2 VDC (12 VDC nom)</td>
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<td>200 mA</td>
<td></td>
</tr>
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<td>TBA 1-1212E</td>
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<td>84 mA</td>
<td></td>
<td>80 %</td>
</tr>
<tr>
<td>TBA 1-1213E</td>
<td>15 VDC</td>
<td>66 mA</td>
<td></td>
<td>80 %</td>
</tr>
<tr>
<td>TBA 1-1221E</td>
<td>+5 VDC</td>
<td>100 mA</td>
<td>−5 VDC</td>
<td>100 mA</td>
</tr>
<tr>
<td>TBA 1-1222E</td>
<td>+12 VDC</td>
<td>41 mA</td>
<td>−12 VDC</td>
<td>41 mA</td>
</tr>
<tr>
<td>TBA 1-1223E</td>
<td>+15 VDC</td>
<td>33 mA</td>
<td>−15 VDC</td>
<td>33 mA</td>
</tr>
<tr>
<td>TBA 1-2411E</td>
<td>21.6 - 26.4 VDC (24 VDC nom)</td>
<td>5 VDC</td>
<td>200 mA</td>
<td></td>
</tr>
<tr>
<td>TBA 1-2412E</td>
<td>12 VDC</td>
<td>84 mA</td>
<td></td>
<td>82 %</td>
</tr>
<tr>
<td>TBA 1-2413E</td>
<td>15 VDC</td>
<td>66 mA</td>
<td></td>
<td>82 %</td>
</tr>
<tr>
<td>TBA 1-2421E</td>
<td>+5 VDC</td>
<td>100 mA</td>
<td>−5 VDC</td>
<td>100 mA</td>
</tr>
<tr>
<td>TBA 1-2422E</td>
<td>+12 VDC</td>
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</tr>
<tr>
<td>TBA 1-2423E</td>
<td>+15 VDC</td>
<td>33 mA</td>
<td>−15 VDC</td>
<td>33 mA</td>
</tr>
</tbody>
</table>
## Input Specifications

**Input Current**
- At no load
  - 5 Vin models: 25 mA typ.
  - 12 Vin models: 15 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: 500 mA (slow blow)
- 12 Vin models: 200 mA (slow blow)
- 24 Vin models: 100 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.
- Load Variation dual output models: 1.5% max.
- Voltage Balance See application note: www.tracopower.com/overview/tba1e
- (symmetrical load) dual output models: 1% max.

**Ripple and Noise**
- 20 MHz Bandwidth 100 mVp-p typ.
- 150 mVp-p max.

**Capacitive Load**
- single output 5 Vout models: 2’200 µF max.
  - 12 Vout models: 470 µF max.
  - 15 Vout models: 470 µF max.
- dual output 5 / -5 Vout models: 2’200 / 2’200 µF max.
  - 12 / -12 Vout models: 470 / 470 µF max.
  - 15 / -15 Vout models: 220 / 220 µF max.

**Minimum Load**
- 0% 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 +95°C
- Case Temperature +105°C max.
- Storage Temperature -55°C to +125°C

**Power Derating**
- High Temperature 5 %/K above 85°C

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

**Switching Frequency**
- 40 - 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 10 pF max.

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

**Washing Process**
- Not allowed

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

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

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
TBA 1E Series, 1 Watt

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  2.3 g

Environmental Compliance  - REACH Declaration
  www.tracopower.com/info/reach-declaration.pdf
  REACH SVHC list compliant
  REACH Annex XVII compliant
  www.tracopower.com/info/rohs-declaration.pdf
  Exemptions: 7a, 7c-1
  (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/tba1e

Outline 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)

Front view

Bottom view

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Specifications can be changed without notice.
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