**DC/DC Converters**

**TEM 2 Series, 2 Watt**

**Features**
- DIL-24 plastic package
- Tightly regulated output
- Very low output noise
- Short circuit protection
- Operating temperature range -25°C to +70°C
- I/O isolation 1’000 VDC
- Internal filter
- Industry standard pinout
- 3-year product warranty

The TEM 2 series is a family of isolated dc/dc converters in a DIP-24 package. They offer tight line/load regulation and 1000 VDC I/O isolation. Standard features include an internal filter to reduce reflected input ripple current and to guarantee low output noise. This product series provides a cost effective solution by many industrial or consumer electronics applications.

<table>
<thead>
<tr>
<th>Models</th>
<th>Input voltage range</th>
<th>Output voltage (±10%)</th>
<th>Output current max.</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEM 2-0511</td>
<td>5 VDC ±10%</td>
<td>5 VDC</td>
<td>400 mA</td>
<td>50 %</td>
</tr>
<tr>
<td>TEM 2-0512</td>
<td>5 VDC ±10%</td>
<td>12 VDC</td>
<td>165 mA</td>
<td>54 %</td>
</tr>
<tr>
<td>TEM 2-0521</td>
<td>12 VDC ±10%</td>
<td>±12 VDC</td>
<td>±80 mA</td>
<td>53 %</td>
</tr>
<tr>
<td>TEM 2-0522</td>
<td>12 VDC ±10%</td>
<td>±15 VDC</td>
<td>±65 mA</td>
<td>51 %</td>
</tr>
<tr>
<td>TEM 2-1211</td>
<td>12 VDC ±10%</td>
<td>5 VDC</td>
<td>400 mA</td>
<td>50 %</td>
</tr>
<tr>
<td>TEM 2-1212</td>
<td>12 VDC ±10%</td>
<td>12 VDC</td>
<td>165 mA</td>
<td>56 %</td>
</tr>
<tr>
<td>TEM 2-1221</td>
<td>12 VDC ±10%</td>
<td>±12 VDC</td>
<td>±80 mA</td>
<td>59 %</td>
</tr>
<tr>
<td>TEM 2-1222</td>
<td>12 VDC ±10%</td>
<td>±15 VDC</td>
<td>±65 mA</td>
<td>59 %</td>
</tr>
<tr>
<td>TEM 2-2411</td>
<td>24 VDC ±10%</td>
<td>5 VDC</td>
<td>400 mA</td>
<td>51 %</td>
</tr>
<tr>
<td>TEM 2-2412</td>
<td>24 VDC ±10%</td>
<td>12 VDC</td>
<td>165 mA</td>
<td>61 %</td>
</tr>
<tr>
<td>TEM 2-2421</td>
<td>24 VDC ±10%</td>
<td>±12 VDC</td>
<td>±80 mA</td>
<td>61 %</td>
</tr>
<tr>
<td>TEM 2-2422</td>
<td>24 VDC ±10%</td>
<td>±15 VDC</td>
<td>±65 mA</td>
<td>61 %</td>
</tr>
</tbody>
</table>
### Input Specifications

**Input current no load**
- 5 Vin models: 80 mA typ.
- 12 Vin models: 40 mA typ.
- 24 Vin models: 20 mA typ.

**Surge voltage (1 sec. max.)**
- 5 Vin models: 7.5 V max.
- 12 Vin models: 15 V max.
- 24 Vin models: 30 V max.

**Input filter**
- Pi-Filter

### Output Specifications

**Voltage set accuracy**
- ±3 %

**Regulation**
- Input variation: Vin min. to Vin max.
  - ±0.3 % max.
- Load variation: 10 – 100 %
  - Single output models: ±0.5 % max.
  - Dual output models balanced load: ±1.0 % max.
  - Dual output models unbalanced load: ±3.0 % max.

**Ripple and noise (20 MHz Bandwidth)**
- 50 mVpk-pk max

**Temperature coefficient**
- ±0.02 %/K

**Current limitation**
- >120 % of Iout max., constant current

**Short circuit protection**
- Indefinite

**Capacitive load**
- Single output models: 470 µF max.
- Dual output models: 220 µF max.

### General Specifications

**Temperature ranges**
- Operating: −25°C to +70°C
- 5 VDC output models: −25°C to +60°C
- Case temperature: +95°C max.
- Storage: −40°C to +125°C

**Derating**
- 3 %/K above +70°C

**Humidity (non condensing)**
- 95 % rel H max.

**Reliability, calculated MTBF** (MIL-HDBK-217F, at +25°C, ground benign)
- >800’000 Mio. h

**Isolation voltage (60 sec.)**
- Input/Output: 1,000 VDC

**Isolation capacitance**
- Input/Output: 100 pF typ.

**Isolation resistance**
- Input/Output (500 VDC): >1,000 M Ohm

**Switching frequency**
- 80 kHz typ. (Pulse frequency modulation PFM)

**Safety standards**
- cUL/UL 60950-1, IEC/EN 60950-1

**Environmental compliance**
- Reach
- RoHS
  - www.tracopower.com/info/reach-declaration.pdf
  - Directive 2011/65/EU

All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.
Physical Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing material</td>
<td>non conductive plastic (UL94V-0 rated)</td>
</tr>
<tr>
<td>Weight</td>
<td>12 g (0.42 oz)</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>max. 260°C / 10 sec.</td>
</tr>
</tbody>
</table>

Outline Dimensions mm (inches)

Pin-Out

<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>NC</td>
<td>–Vout</td>
</tr>
<tr>
<td>3</td>
<td>NC</td>
<td>Common</td>
</tr>
<tr>
<td>10</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>11</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>12</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>13</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>14</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>15</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>22</td>
<td>NC</td>
<td>Common</td>
</tr>
<tr>
<td>23</td>
<td>NC</td>
<td>–Vout</td>
</tr>
<tr>
<td>24</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
</tbody>
</table>

NC = not connected

Pin diameter ø 0.5 ±0.05 (0.02) ±0.002
Tolerances ±0.5 (±0.02)

Specifications can be changed any time without notice.