DC/DC Converter

• Cost optimized design in DIP-24 package
• Fully regulated output
• Output ripple & noise 30 mVp-p typ.
• Short circuit protection
• Operating temperature range –40°C to +75°C at full load
• I/O isolation 1'500 VDC
• Input filter meet EN 55022, class A
• No minimum load required
• Industry standard pinout
• 3-year product warranty

The TEM 3N series is a range of isolated DC/DC converters in a DIP-24 package. They offer tight output regulation and very low output noise. Operating temperature range is –40°C to +85°C. This product series provides a cost effective solution for many industrial or consumer electronics applications.

Models

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
</tr>
<tr>
<td>TEM 3-0511N</td>
<td>4.5 - 5.5 VDC</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-0512N</td>
<td>4.5 - 5.5 VDC</td>
<td>12 VDC</td>
<td>250 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-0513N</td>
<td>4.5 - 5.5 VDC</td>
<td>15 VDC</td>
<td>200 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-0522N</td>
<td>+12 VDC</td>
<td>125 mA</td>
<td>125 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-0523N</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td>100 mA</td>
<td>–15 VDC</td>
</tr>
<tr>
<td>TEM 3-1211N</td>
<td>10.8 - 13.2 VDC</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
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<td>10.8 - 13.2 VDC</td>
<td>12 VDC</td>
<td>250 mA</td>
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</tr>
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<td>10.8 - 13.2 VDC</td>
<td>15 VDC</td>
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<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-1222N</td>
<td>+12 VDC</td>
<td>125 mA</td>
<td>125 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-1223N</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td>100 mA</td>
<td>–15 VDC</td>
</tr>
<tr>
<td>TEM 3-2411N</td>
<td>21.6 - 28.4 VDC</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-2412N</td>
<td>21.6 - 28.4 VDC</td>
<td>12 VDC</td>
<td>250 mA</td>
<td>–12 VDC</td>
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<tr>
<td>TEM 3-2413N</td>
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<td>15 VDC</td>
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<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-2422N</td>
<td>+12 VDC</td>
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<td>125 mA</td>
<td>–12 VDC</td>
</tr>
<tr>
<td>TEM 3-2423N</td>
<td>+15 VDC</td>
<td>100 mA</td>
<td>100 mA</td>
<td>–15 VDC</td>
</tr>
</tbody>
</table>
### Input Specifications

**Input Current**
- At no load
  - 5 Vin models: 90 mA typ.
  - 12 Vin models: 45 mA typ.
  - 24 Vin models: 22 mA typ.
- At full load
  - 5 Vin models: 800 mA typ.
  - 12 Vin models: 320 mA typ.
  - 24 Vin models: 160 mA typ.

**Surge Voltage**
- 5 Vin models: 7.5 VDC max. (1 s max.)
- 12 Vin models: 15 VDC max. (1 s max.)
- 24 Vin models: 30 VDC max. (1 s max.)

**Recommended Input Fuse**
(The need of an external fuse has to be assessed in the final application)

### Output Specifications

**Voltage Set Accuracy**
±2% max.

**Regulation**
- Input Variation (Vmin - Vmax) single output models: 0.5% max.
  dual output models: 0.5% max.
- Load Variation (10 - 100%) single output models: 0.5% max.
  dual output models: 0.5% max. (Output 1)
  0.5% max. (Output 2)
- Voltage Balance (symmetrical load) dual output models: 3% max.

**Ripple and Noise**
- 20 MHz Bandwidth
  - 30 mVp-p typ.
  - 60 mVp-p max.

**Capacitive Load**
- single output
  - 5 Vout models: 470 µF max.
  - 12 Vout models: 100 µF max.
  - 15 Vout models: 100 µF max.
- dual output
  - 12 / -12 Vout models: 100 / 100 µF max.
  - 15 / -15 Vout models: 100 / 100 µF max.

**Minimum Load**
Not required

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

**Short Circuit Protection**
Continuous, Automatic recovery

**Output Current Limitation**
120% max. of Iout max.

### Safety Specifications

**Safety Standards**
- IT / Multimedia Equipment
  - CSA-C22.2, No. 60950-1
  - EN 60950-1
  - EN 62368-1
  - IEC 60950-1
  - IEC 62368-1
  - UL 60950-1
  - UL 62368-1

- Certification Documents
  - www.tracopower.com/overview/tem3n

**Pollution Degree**
PD 2

### EMC Specifications

**EMI Emissions**
- Conducted Emissions
  - EN 55032 class A (internal filter)
  - FCC Part 15 class A (internal filter)

### General Specifications

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

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
**Temperature Ranges**
- Operating Temperature: –40°C to +85°C
- Case Temperature: +95°C max.
- Storage Temperature: –50°C to +125°C

**Power Derating**
- High Temperature: 5 %/K above 75°C

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

**Altitude During Operation**
6'000 m max.

**Switching Frequency**
300 kHz typ. (PFM)

**Insulation System**
Functional Insulation

**Isolation Test Voltage**
- Input to Output, 60 s: 1'500 VDC
- Input to Output, 1 s: 1'800 VDC

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

**Isolation Capacitance**
- Input to Output, 100 kHz, 1 V: 300 pF typ.

**Reliability**
- Calculated MTBF: 700'000 h (MIL-HDBK-217F, ground benign)

**Washing Process**
Allowed (hermetrical product)

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

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

**Pin Material**
Phosphor Bronze (C5191)

**Pin Foundation Plating**
Nickel (2 – 4 µm)

**Pin Surface Plating**
Gold (75 – 125 nm), glossy

**Housing Type**
Plastic Case

**Mounting Type**
PCB Mount

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

**Footprint Type**
DIP24

**Soldering Profile**
Wave Soldering
260°C / 10 s max.

**Weight**
12.4 g

**Environmental Compliance**
- REACH Declaration: [www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)

Exemptions: 7a
(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/tem3n](http://www.tracopower.com/overview/tem3n)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Outline Dimensions

Dimensions in mm (inch)
Tolerances: x.x ±0.5 (x.xx ±0.02)
           x.xx ±0.25 (x.xxx ±0.01)
Pin diameter Ø0.5 ±0.05 (Ø0.02 ±0.002)

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>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