DC/DC Converter

- Chassis mount with screw terminal block
- Wide 2:1 input voltage range
- Full load operation up to 60°C with convection cooling
- Soft start
- Under voltage lock-out circuit
- Reverse input voltage protection
- Input protection filter
- Optional DIN-rail mounting kit
- 3-year product warranty

The TEP-100 Series is a family of isolated high performance DC/DC converter modules with ultra-wide 2:1 input voltage ranges which come in a rugged, sealed metal case. These converters are suitable for a wide range of applications, but the product is designed particularly also for industrial applications where often no PCB mounting is possible but the module has to be mounted on a chassis. Four threaded M3 inserts in the module makes chassis mount or attachment of a heatsink for optimal thermal management very simple. For easy connection there is also an unique adaptor available with screw terminals. A very high efficiency allows an operating temperature up to +60°C with natural convection cooling without power derating. Further features include output voltage trimming, Remote On/Off and under voltage lockout. The very wide input voltage range make these converters also an interesting solution for battery operated systems.

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>TEP 100-1210-CMF</td>
<td>TEP 100-1211-CMF</td>
<td>9 - 18 VDC (12 VDC nom.)</td>
<td>3.3 VDC (2.64 - 3.63 VDC)</td>
<td>25'000 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEP 100-1212-CMF</td>
<td>TEP 100-1213-CMF</td>
<td>12 VDC (9.6 - 13.2 VDC)</td>
<td>5 VDC (4.0 - 5.5 VDC)</td>
<td>20'000 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEP 100-1215-CMF</td>
<td>TEP 100-1216-CMF</td>
<td>15 VDC (12.0 - 16.5 VDC)</td>
<td>12 VDC (9.6 - 13.2 VDC)</td>
<td>8'400 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEP 100-1218-CMF</td>
<td>TEP 100-2410-CMF</td>
<td>18 - 36 VDC (24 VDC nom.)</td>
<td>24 VDC (19.2 - 26.4 VDC)</td>
<td>6'700 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEP 100-2411-CMF</td>
<td>TEP 100-2412-CMF</td>
<td>28 VDC (22.4 - 30.8 VDC)</td>
<td>5 VDC (4.0 - 5.5 VDC)</td>
<td>4'200 mA</td>
<td>92 %</td>
</tr>
<tr>
<td>TEP 100-2413-CMF</td>
<td>TEP 100-2415-CMF</td>
<td>48 VDC (38.4 - 52.8 VDC)</td>
<td>12 VDC (9.6 - 13.2 VDC)</td>
<td>3'600 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEP 100-2416-CMF</td>
<td>TEP 100-2418-CMF</td>
<td>48 VDC (38.4 - 52.8 VDC)</td>
<td>15 VDC (12.0 - 16.5 VDC)</td>
<td>2'100 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TEP 100-4810-CMF</td>
<td>TEP 100-4811-CMF</td>
<td>36 - 75 VDC (48 VDC nom.)</td>
<td>3.3 VDC (2.64 - 3.63 VDC)</td>
<td>25'000 mA</td>
<td>91 %</td>
</tr>
<tr>
<td>TEP 100-4812-CMF</td>
<td>TEP 100-4813-CMF</td>
<td>5 VDC (4.0 - 5.5 VDC)</td>
<td>12 VDC (9.6 - 13.2 VDC)</td>
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<td>92 %</td>
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### Options

**TEP-MK1**

**on demand (backorder with MOQ non stocking item)**
- Optional models with inverse Remote On/Off function (passive = off)

### Input Specifications

**Input Current**
- At no load
  - 12 Vin models: 130 mA typ.
  - 24 Vin models: 120 mA typ.
  - 48 Vin models: 70 mA typ.
- At full load
  - 12 Vin models: 9'400 mA max.
  - 24 Vin models: 4'600 mA max.
  - 48 Vin models: 2'300 mA max.

**Surge Voltage**
- 12 Vin models: 36 VDC max. (1 s max.)
- 24 Vin models: 50 VDC max. (1 s max.)
- 48 Vin models: 100 VDC max. (1 s max.)

**Under Voltage Lockout**
- 12 Vin models: 7.5 VDC typ.
- 24 Vin models: 16 VDC typ.
- 48 Vin models: 34 VDC typ.

**Recommended Input Fuse**
- 12 Vin models: 20'000 mA (fast acting)
- 24 Vin models: 10'000 mA (fast acting)
- 48 Vin models: 5'000 mA (slow blow)

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

**Reverse Voltage Protection**
- Parallel diode (external input fuse required)

**Input Filter**
- Internal Pi-Type

### Output Specifications

**Output Voltage Adjustment**
- Min. 20% to +10% (By external trim resistor)

See application note: [www.tracopower.com/overview/tep100cmf](http://www.tracopower.com/overview/tep100cmf)

**Voltage Set Accuracy**
- ±1% max.

**Regulation**
- Input Variation (Vmin - Vmax)
  - 0.1% max.
- Load Variation (0 – 100%)
  - 0.1% max.

**Ripple and Noise**

20 MHz Bandwidth

- 3.3 Vout models: 75 mVp-p max. (w/ 4.7 μF X7R)
- 5 Vout models: 75 mVp-p max. (w/ 4.7 μF X7R)
- 12 Vout models: 100 mVp-p max. (w/ 4.7 μF X7R)
- 15 Vout models: 100 mVp-p max. (w/ 4.7 μF X7R)
- 24 Vout models: 200 mVp-p max. (w/ 4.7 μF X7R)
- 28 Vout models: 200 mVp-p max. (w/ 4.7 μF X7R)
- 48 Vout models: 300 mVp-p max. (w/ 2.2 μF X7R)

**Capacitive Load**
- 3.3 Vout models: 7'500 μF max.
- 5 Vout models: 40’000 μF max.
- 12 Vout models: 7'000 μF max.
- 15 Vout models: 4'460 μF max.
- 24 Vout models: 1'750 μF max.
- 28 Vout models: 1'280 μF max.
- 48 Vout models: 430 μF max.

**Minimum Load**
- Not required

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

**Start-up Time**
- 25 ms typ.

**Short Circuit Protection**
- Continuous, Automatic recovery

**Output Current Limitation**
- 110 - 140% of Iout max.

**Overvoltage Protection**
- 115 - 130% of Vout nom.

**Transient Response**
- Response Time
  - 200 μs typ. / 250 μs max. (25% Load Step)

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

**Standards**
- IT / Multimedia Equipment  
  - EN 60950-1  
  - IEC 60950-1  
  - UL 60950-1  
- Certification Documents  
  - www.tracopower.com/overview/tep100cmf

### EMC Specifications

**EMI Emissions**
- Conducted Emissions
  - EN 55011 class A (internal filter)  
  - EN 55032 class A (internal filter)
- Radiated Emissions
  - EN 55011 class A (internal filter)  
  - EN 55032 Class A (internal filter)

**EMS Immunity**
- Electrostatic Discharge
  - Air: EN 61000-4-2, ±8 kV, perf. criteria A  
  - Contact: EN 61000-4-2, ±6 kV, perf. criteria A  
- RF Electromagnetic Field
  - EN 61000-4-3, 10 V/m, perf. criteria A  
- EFT (Burst) / Surge
  - EN 61000-4-4, ±2 kV, perf. criteria A  
  - EN 61000-4-5, ±2 kV, perf. criteria A  
- Conducted RF Disturbances
  - EN 61000-4-6, 10 Vrms, perf. criteria A
- PF Magnetic Field
  - Continuous: EN 61000-4-8, 100 A/m, perf. criteria A  
  - 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

### General Specifications

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

**Temperature Ranges**
- Operating Temperature: -40°C to +75°C  
- Case Temperature: +105°C max.  
- Storage Temperature: -40°C to +105°C

**Power Derating**
- High Temperature
  - See application note: [www.tracopower.com/overview/tep100cmf](http://www.tracopower.com/overview/tep100cmf)
  - Depending on model

**Over Temperature Protection Switch Off**
- Protection Mode
  - See application note: [www.tracopower.com/overview/tep100cmf](http://www.tracopower.com/overview/tep100cmf)
  - 115°C typ. (Automatic recovery at 105°C typ.)

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

**Sense Function**
- 10% max. of Vout nom.

**Remote Control**
- Voltage Controlled Remote
  - (passive = on)
  - On: 3.0 to 12 VDC or open circuit
  - Off: 0 to 1.2 VDC or short circuit
- Off Idle Input Current
  - 3 mA typ.
- Remote Pin Input Current
  - -0.5 to 1.0 mA
  - (Optional models with inverse Remote On/Off function (passive = off))

**Altitude During Operation**
- 2'000 m max. (for basic insulation)
- 5'000 m max. (for functional insulation)

**Switching Frequency**
- 270 - 330 kHz (PWM)
- 300 kHz typ. (PWM)

**Insulation System**
- Basic Insulation

**Isolation Test Voltage**
- Input to Output: 60 s
  - 3'000 VDC
- Input to Case: 60 s
  - 1'600 VDC
- Output to Case: 60 s
  - 1'600 VDC

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

**Isolation Capacitance**
- Input to Output: 100 kHz, 1 V
  - 2'500 pF max.

**Reliability**
- Calculated MTBF
  - 331'000 h (MIL-HDBK-217F, ground benign)

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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
Environment
- Vibration MIL-STD-810F
- Thermal Shock MIL-STD-810F

Housing Material
Metal

Base Material
Non-conductive FR4 (UL 94 V-0 rated)

Potting Material
Silicone (UL 94 V-0 rated)

Housing Type
Metal Case

Mounting Type
Chassis Mount

Connection Type
Screw Terminal

Weight
287 g

Thermal Impedance
- Case to Ambient 6.7 K/W typ.

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)).

- SCIP Reference Number
e70cd9df-2d35-4446-bc31-bc0d2cd31b12

Supporting Documents
Overview Link (for additional Documents)
www.tracopower.com/overview/tep100cmf

Outline Dimensions

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
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<tbody>
<tr>
<td>1</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>2</td>
<td>Case</td>
</tr>
<tr>
<td>3</td>
<td>Remote On/Off</td>
</tr>
<tr>
<td>4</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>5</td>
<td>–Vout</td>
</tr>
<tr>
<td>6</td>
<td>–Sense</td>
</tr>
<tr>
<td>7</td>
<td>Trim</td>
</tr>
<tr>
<td>8</td>
<td>+Sense</td>
</tr>
<tr>
<td>9</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

Pinout

Dimensions in mm (inch)
- Screw 1: Type M4
- Screw 2: Head diameter 6.88 (0.271)

Dimensions: Rated current: 15 A

Mounting screw locked torque: max. 11.2 kgfcm / 1.10 Nm

Wire gauge range:
AWG 14 - 26