**Features**

- Wide 2:1 input range
- High efficiency up to 88%
- Extended operating temperature range –40°C to +85°C
- Indefinite short circuit protection
- I/O isolation 1500 VDC
- Input filter to meet EN 55022, Class A and FCC, level A without external components
- Industry standard footprint
- Shielded metal case with insulated baseplate
- 3-year product warranty

The TEN 15 series is a family of high performance 15W DC/DC converters in a compact 2” x 1” low profile package with industry standard footprint. A high efficiency allows a wide operating temperature range of –40°C to +85°C. A built-in EMI filter is built in to meet EN 55022, class A without any external components. Further standard features include over voltage protection and short-circuit protection. Typical applications for these converters are battery operated equipment, instrumentation, distributed power architectures in communication and industrial electronics, everywhere where isolated, tightly regulated voltages are required.

### Models

<table>
<thead>
<tr>
<th>Order code</th>
<th>Input voltage range</th>
<th>Output voltage</th>
<th>Output current max.</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEN 15-1210</td>
<td>9 – 18 VDC (12 VDC nominal)</td>
<td>3.3 VDC</td>
<td>4'000 mA</td>
<td>79 %</td>
</tr>
<tr>
<td>TEN 15-1211</td>
<td>5 VDC</td>
<td>3'000 mA</td>
<td>82 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-1212</td>
<td>12 VDC</td>
<td>1'250 mA</td>
<td>86 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-1213</td>
<td>15 VDC</td>
<td>1'000 mA</td>
<td>86 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-1221</td>
<td>±5 VDC</td>
<td>±1'500 mA</td>
<td>83 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-1222</td>
<td>±12 VDC</td>
<td>±625 mA</td>
<td>86 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-1223</td>
<td>±15 VDC</td>
<td>±500 mA</td>
<td>84 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-2410</td>
<td>18 – 36 VDC (24 VDC nominal)</td>
<td>3.3 VDC</td>
<td>4'000 mA</td>
<td>80 %</td>
</tr>
<tr>
<td>TEN 15-2411</td>
<td>5 VDC</td>
<td>3'000 mA</td>
<td>84 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-2412</td>
<td>12 VDC</td>
<td>1'250 mA</td>
<td>85 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-2413</td>
<td>15 VDC</td>
<td>1'000 mA</td>
<td>85 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-2421</td>
<td>±5 VDC</td>
<td>±1'500 mA</td>
<td>84 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-2422</td>
<td>±12 VDC</td>
<td>±625 mA</td>
<td>86 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-2423</td>
<td>±15 VDC</td>
<td>±500 mA</td>
<td>86 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-4810</td>
<td>36 – 75 VDC (48 VDC nominal)</td>
<td>3.3 VDC</td>
<td>4'000 mA</td>
<td>81 %</td>
</tr>
<tr>
<td>TEN 15-4811</td>
<td>5 VDC</td>
<td>3'000 mA</td>
<td>83 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-4812</td>
<td>12 VDC</td>
<td>1'250 mA</td>
<td>87 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-4813</td>
<td>15 VDC</td>
<td>1'000 mA</td>
<td>86 %</td>
<td></td>
</tr>
<tr>
<td>TEN 15-4821</td>
<td>±5 VDC</td>
<td>±1'500 mA</td>
<td>85 %</td>
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<tr>
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<td>±12 VDC</td>
<td>±625 mA</td>
<td>88 %</td>
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<td>±15 VDC</td>
<td>±500 mA</td>
<td>87 %</td>
<td></td>
</tr>
</tbody>
</table>
### Input Specifications

| Input current at no load | 12 Vin models: 30 mA typ.  
|                        | 24 Vin models: 20 mA typ.  
|                        | 48 Vin models: 15 mA typ.  |
| Input current at full load | 12 Vin, 3.3 VDC models: 1470 mA typ.  
|                            | 12 Vin, other models: 1550 mA typ.  
|                            | 24 Vin, 3.3 VDC models: 730 mA typ.  
|                            | 24 Vin, other models: 780 mA typ.  
|                            | 48 Vin, 3.3 VDC models: 360 mA typ.  
|                            | 48 Vin, other models: 380 mA typ.  |
| Surge voltage (100 msec. max.) | 12 Vin models: 36 V max.  
|                                | 24 Vin models: 50 V max.  
|                                | 48 Vin models: 100 V max.  |

### Conducted noise (input)

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

### Output Specifications

<table>
<thead>
<tr>
<th>Voltage set accuracy</th>
<th>±1 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation</td>
<td></td>
</tr>
</tbody>
</table>
| - Input variation Vin min. to Vin max. | 0.5 % max.  
| - Load variation 2 % – 100 % | single output models: 1 % max. (balanced load)  
|                        | dual output models: 5 % max. (load cross variation 25 % / 100 %)  |
| Minimum load         | 2 % of rated max. output current.  
| (Operation at lower load is safe but major deviations to specified data may occur)  |
| Ripple and noise (20 MHz Bandwidth) | single output models: 50 mVpk-pk max.  
|                                | dual output models: 75 mVpk-pk max.  |
| Temperature coefficient | ±0.02 %/K  |
| Start up time (nominal Vin and constant resistive load) | 20 ms typ.  |
| Transient response (25 % load step change) | 250 µs typ.  |
| Short circuit protection | continuous (automatic recovery)  |
| Over load protection | 150 % of load max typ. foldback  |
| Over voltage protection |  
| - 3.3 VDC models: 3.9 V  
| - 5.0 VDC models: 6.2 V  
| - 12 VDC models: 15 V  
| - 15 VDC models: 18 V  |
| Capacitive load |  
| - 3.3 VDC models: 10'200 µF max.  
| - 5 VDC models: 7'050 µF max.  
| - 12 VDC models: 1'035 µF max.  
| - 15 VDC models: 750 µF max.  
| ±5 VDC models: ±1'020 µF max.  
| ±12 VDC models: ±495 µF max.  
| ±15 VDC models: ±165 µF max.  |
### General Specifications

**Temperature ranges**
- Operating: -40°C to +85°C
- Casing temperature: +100°C max.
- Storage: -55°C to +105°C

**Derating**
- 3.3 / 5.0 VDC models: 2.5 %/K above 60°C
- other models: 3.3 %/K above 70°C

**Thermal impedance**
- Natural convection: 12°C/W
- Natural convection with heatsink: 10°C/W

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

**Reliability, calculated MTBF** (MIL-HDBK-217F, at +25°C, ground benign)
- >2.3 Mio h

**Isolation Test Voltage** (Input/Output, 60s)
- 1'600 VDC

**Insulation System**
- Functional

**Isolation Capacitance** (Input/Output)
- 300 pF max.

**Isolation Resistance** (Input/Output)
- >1 G Ohm

**Switching frequency**
- single output models: 500 kHz typ. (pulse width modulation)
- dual output models: 300 kHz typ. (pulse width modulation)

**EMC immunity**
- Electrostatic discharge ESD: EN 61000-4-2 8 kV / 6 kV, criteria B
- RF field susceptibility: EN 61000-4-3 10 V/m, criteria A
- Electrical fast transient / burst immunity input: EN 61000-4-4 ±2 kV, criteria B
- Surge immunity: EN 61000-4-5 ±1 kV, criteria B
- Immunity to conducted RF disturbances: EN 61000-4-6 ±10 Vrms, criteria A

**Vibration**
- acc. MIL-STD-810F

**Thermal shock**
- acc. MIL-STD-810F

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

**Safety approvals**
- UL/cUL: www.ul.com -> certifications -> File e188913

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

### Physical Specifications

**Casing material**
- copper, nickel plated

**Baseplate material**
- non conductive FR4

**Potting material**
- epoxy (UL 94V-0 rated)

**Weight**
- 27 g (0.95oz)

**Soldering temperature**
- max. +265°C / 10 sec.

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

Supporting documents: [www.tracopower.com/overview/ten15](http://www.tracopower.com/overview/ten15)
DC/DC Converters
TEN 15 Series  15 Watt

Outline Dimensions

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>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>4</td>
<td>No pin</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>–Vout</td>
<td>–Vout</td>
</tr>
</tbody>
</table>

Dimensions in [mm], () = Inch
Pin diameter: 1.0 ±0.05 (0.02 ±0.002)
Pin pitch tolerances: ±0.25 (±0.01)
Casing tolerances: ±0.5 (±0.02)

Heat-Sink (Option)

Order code: TEN-HS1
(cont.: heat-sink, thermal pad, 2 clamps)

Material: Aluminum
Finish: Anodic treatment (black)
Weight: 17g [0.60oz] without converter
Thermal impedance after assembling: 10 K/W

Note:
The product label on converter has to be removed before mounting the heat-sink.
For volume orders converters will be supplied with heat-sinks already mounted. Please contact factory for quotation.
Separate heat-sinks are only available for prototypes and small quantity orders.

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at www.tracopower.com

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www.tracopower.com