

#### 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

| Order code  | Input voltage range                    | Output voltage | Output current max. | Efficiency typ. |
|-------------|----------------------------------------|----------------|---------------------|-----------------|
| TEN 15-1210 | <b>9 – 18 VDC</b><br>(12 VDC nominal)  | 3.3 VDC        | 4'000 mA            | 79 %            |
| TEN 15-1211 |                                        | 5 VDC          | 3'000 mA            | 82 %            |
| TEN 15-1212 |                                        | 12 VDC         | 1'250 mA            | 86 %            |
| TEN 15-1213 |                                        | 15 VDC         | 1'000 mA            | 86 %            |
| TEN 15-1221 |                                        | ±5 VDC         | ±1'500 mA           | 83 %            |
| TEN 15-1222 |                                        | ±12 VDC        | ±625 mA             | 86 %            |
| TEN 15-1223 |                                        | ±15 VDC        | ±500 mA             | 84 %            |
| TEN 15-2410 | <b>18 – 36 VDC</b><br>(24 VDC nominal) | 3.3 VDC        | 4'000 mA            | 80 %            |
| TEN 15-2411 |                                        | 5 VDC          | 3'000 mA            | 84 %            |
| TEN 15-2412 |                                        | 12 VDC         | 1'250 mA            | 85 %            |
| TEN 15-2413 |                                        | 15 VDC         | 1'000 mA            | 85 %            |
| TEN 15-2421 |                                        | ±5 VDC         | ±1'500 mA           | 84 %            |
| TEN 15-2422 |                                        | ±12 VDC        | ±625 mA             | 86 %            |
| TEN 15-2423 |                                        | ±15 VDC        | ±500 mA             | 86 %            |
| TEN 15-4810 | <b>36 – 75 VDC</b><br>(48 VDC nominal) | 3.3 VDC        | 4'000 mA            | 81 %            |
| TEN 15-4811 |                                        | 5 VDC          | 3'000 mA            | 83 %            |
| TEN 15-4812 |                                        | 12 VDC         | 1'250 mA            | 87 %            |
| TEN 15-4813 |                                        | 15 VDC         | 1'000 mA            | 86 %            |
| TEN 15-4821 |                                        | ±5 VDC         | ±1'500 mA           | 85 %            |
| TEN 15-4822 |                                        | ±12 VDC        | ±625 mA             | 88 %            |
| TEN 15-4823 |                                        | ±15 VDC        | ±500 mA             | 87 %            |

## 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<br>(100 msec. max.) | 12 Vin models:                         | 36 V max.    |
|                                   | 24 Vin models:                         | 50 V max.    |
|                                   | 48 Vin models:                         | 100 V max.   |
| Conducted noise (input)           | EN 55022 level A, FCC part 15, level A |              |

## Output Specifications

|                                                         |                                                                                                                         |                                                                                              |
|---------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Voltage set accuracy                                    | ±1 %                                                                                                                    |                                                                                              |
| Regulation                                              | – Input variation Vin min. to Vin max.                                                                                  |                                                                                              |
|                                                         | 0.5 % max.                                                                                                              |                                                                                              |
|                                                         | – Load variation 2 % – 100 %                                                                                            | single output models: 0.5 % max.                                                             |
|                                                         |                                                                                                                         | dual output models: 1 % max. (balanced load)<br>5 % max. (load cross variation 25 % / 100 %) |
| Minimum load                                            | 2 % of rated max. output current.<br>(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                                | indefinite (automatic recovery)                                                                                         |                                                                                              |
| Over load protection                                    | 150 % of lout max typ. foldback                                                                                         |                                                                                              |
| Over voltage protection                                 | 3.3 / 5.0 VDC models:                                                                                                   | 3.9 / 6.2 V                                                                                  |
|                                                         | 12 / 15 VDC models:                                                                                                     | 15 / 18 V                                                                                    |
| Capacitive load                                         | 3.3 VDC models:                                                                                                         | 10'200 µF max.                                                                               |
|                                                         | 5 VDC / ±5 VDC models:                                                                                                  | 7'050 µF max. / ±1'020 µF max.                                                               |
|                                                         | 12 VDC / ±12 VDC models:                                                                                                | 1'035 µF max. / ±495 µF max.                                                                 |
|                                                         | 15 VDC / ±15 VDC models:                                                                                                | 750 µF max. / ±165 µF max.                                                                   |

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

## General Specifications

|                                                                       |                                                                                                                                                                                                                                                           |                                                                                                                                                                                 |
|-----------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Temperature ranges                                                    | <ul style="list-style-type: none"> <li>– Operating</li> <li>– Casing temperature</li> <li>– Storage</li> </ul>                                                                                                                                            | – 40°C to +85°C<br>+100°C max.<br>–55°C to +105°C                                                                                                                               |
| Derating                                                              | 3.3 / 5.0 VDC models:<br>other models:                                                                                                                                                                                                                    | 2.5 %/K above 60°C<br>3.3 %/K above 70°C                                                                                                                                        |
| Thermal impedance                                                     | <ul style="list-style-type: none"> <li>– Natural convection</li> <li>– Natural convection with heatsink</li> </ul>                                                                                                                                        | 12°C/W<br>10°C/W                                                                                                                                                                |
| Humidity (non condensing)                                             |                                                                                                                                                                                                                                                           | 95 % rel H max.                                                                                                                                                                 |
| Reliability, calculated MTBF (MIL-HDBK-217F, at 25 °C, ground benign) |                                                                                                                                                                                                                                                           | >1 Mio h                                                                                                                                                                        |
| Isolation (Input/Output)                                              | <ul style="list-style-type: none"> <li>– Voltage</li> <li>– Capacity</li> <li>– Resistance</li> </ul>                                                                                                                                                     | 1'500 VDC<br>300 pF max.<br>>1'000 M Ohm                                                                                                                                        |
| Switching frequency                                                   | single output models:<br>dual output models:                                                                                                                                                                                                              | 500 kHz typ. (pulse width modulation)<br>300 kHz typ. (pulse width modulation)                                                                                                  |
| EMC immunity                                                          | <ul style="list-style-type: none"> <li>– Electrostatic discharge ESD</li> <li>– RF field susceptibility</li> <li>– Electrical fast transient / burst immunity input</li> <li>– Surge immunity</li> <li>– Immunity to conducted RF disturbances</li> </ul> | EN 61000-4-2 8 kV / 6 kV, criteria B<br>EN 61000-4-3 10 V/m, criteria A<br>EN 61000-4-4 ±2 kV, criteria B<br>EN 61000-4-5 ±1 kV, criteria B<br>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                                                                                                                                                                                                                                                  | <a href="http://www.ul.com">www.ul.com</a> -> certifications -> File E188913                                                                                                    |

## Physical Specifications

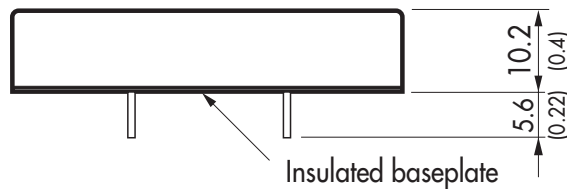
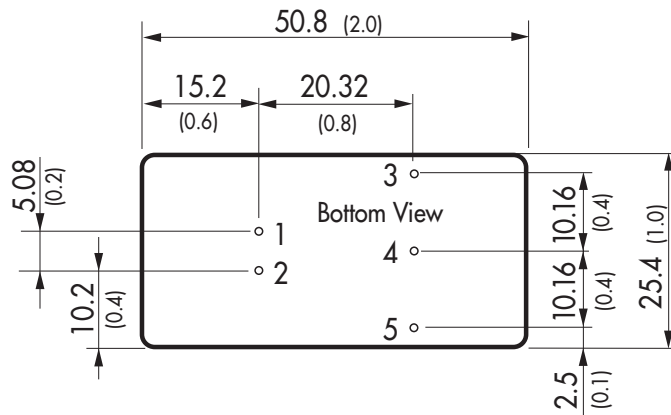
|                       |                        |
|-----------------------|------------------------|
| Casing material       | copper, nickel plated  |
| Baseplate material    | non conductive FR4     |
| Potting material      | epoxy (UL 94V-0 rated) |
| Weight                | 27 g (09.5 oz)         |
| Soldering temperature | max. 265°C / 10 sec.   |

## Application note

Download: [www.tracopower.com/products/ten15-application.pdf](http://www.tracopower.com/products/ten15-application.pdf)

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

## Outline Dimensions



| Pin-Out |            |            |
|---------|------------|------------|
| Pin     | Single     | Dual       |
| 1       | +Vin (Vcc) | +Vin (Vcc) |
| 2       | -Vin (GND) | -Vin (GND) |
| 3       | +Vout      | +Vout      |
| 4       | No pin     | Common     |
| 5       | -Vout      | -Vout      |

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

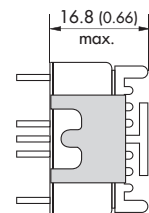
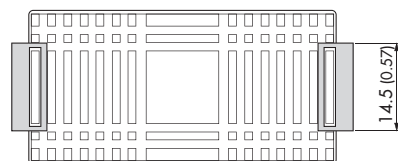
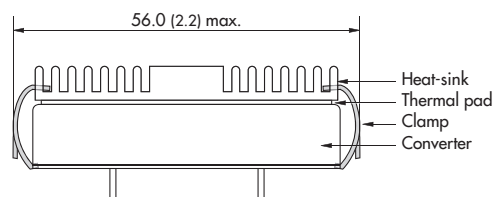


### Note:

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 any time without notice.