

#### Features

- ◆ Wide 2:1 input range
- ◆ High power density
- ◆ 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 pinout
- ◆ Shielded metal case with insulated  
baseplate
- ◆ High reliability, MTBF >1 Mio. h
- ◆ 3-year product warranty

*not recommended for new design in*



The TEN 10 series is a family of high performance 10W 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 10-1210 | <b>9 – 18 VDC</b><br>(12 VDC nominal)  | 3.3 VDC        | 2'400 mA            | 72 %            |
| TEN 10-1211 |                                        | 5 VDC          | 2'000 mA            | 77 %            |
| TEN 10-1212 |                                        | 12 VDC         | 830 mA              | 80 %            |
| TEN 10-1213 |                                        | 15 VDC         | 670 mA              | 80 %            |
| TEN 10-1215 |                                        | 24 VDC         | 415 mA              | 81 %            |
| TEN 10-1221 |                                        | ±5 VDC         | ±1'000 mA           | 78 %            |
| TEN 10-1222 |                                        | ±12 VDC        | ±415 mA             | 81 %            |
| TEN 10-1223 |                                        | ±15 VDC        | ±330 mA             | 80 %            |
| TEN 10-2410 | <b>18 – 36 VDC</b><br>(24 VDC nominal) | 3.3 VDC        | 2'400 mA            | 76 %            |
| TEN 10-2411 |                                        | 5 VDC          | 2'000 mA            | 78 %            |
| TEN 10-2412 |                                        | 12 VDC         | 830 mA              | 82 %            |
| TEN 10-2413 |                                        | 15 VDC         | 670 mA              | 82 %            |
| TEN 10-2415 |                                        | 24 VDC         | 415 mA              | 83 %            |
| TEN 10-2421 |                                        | ±5 VDC         | ±1'000 mA           | 80 %            |
| TEN 10-2422 |                                        | ±12 VDC        | ±415 mA             | 82 %            |
| TEN 10-2423 |                                        | ±15 VDC        | ±330 mA             | 82 %            |
| TEN 10-4810 | <b>36 – 75 VDC</b><br>(48 VDC nominal) | 3.3 VDC        | 2'400 mA            | 76 %            |
| TEN 10-4811 |                                        | 5 VDC          | 2'000 mA            | 80 %            |
| TEN 10-4812 |                                        | 12 VDC         | 830 mA              | 82 %            |
| TEN 10-4813 |                                        | 15 VDC         | 670 mA              | 83 %            |
| TEN 10-4815 |                                        | 24 VDC         | 415 mA              | 83 %            |
| TEN 10-4821 |                                        | ±5 VDC         | ±1'000 mA           | 81 %            |
| TEN 10-4822 |                                        | ±12 VDC        | ±415 mA             | 83 %            |
| TEN 10-4823 |                                        | ±15 VDC        | ±330 mA             | 83 %            |

## Input Specifications

|                                               |                                 |                                        |
|-----------------------------------------------|---------------------------------|----------------------------------------|
| Input current at no load                      | 12 Vin models:                  | 30 mA typ.                             |
|                                               | 24 Vin models:                  | 20 mA typ.                             |
|                                               | 48 Vin models:                  | 10 mA typ.                             |
| Input current at full load                    | 12 Vin; 3.3 VDC models:         | 915 mA typ.                            |
|                                               | 12 Vin; 5 & $\pm 5$ VDC models: | 1080 mA typ.                           |
|                                               | 12 Vin; other output models:    | 1045 mA typ.                           |
|                                               | 24 Vin; 3.3 VDC models:         | 435 mA typ.                            |
|                                               | 24 Vin; 5 & $\pm 5$ VDC models: | 530 mA typ.                            |
|                                               | 24 Vin; other output models:    | 510 mA typ.                            |
|                                               | 48 Vin; 3.3 VDC models:         | 215 mA typ.                            |
|                                               | 48 Vin; 5 & $\pm 5$ VDC models: | 260 mA typ.                            |
| Start-up voltage /<br>under voltage shut down | 12 Vin models:                  | 8.5 VDC / 8 VDC                        |
|                                               | 24 Vin models:                  | 16.5 VDC / 16 VDC                      |
|                                               | 48 Vin models:                  | 32.5 VDC / 32 VDC                      |
| Surge voltage<br>(1 sec. max.)                | 12 Vin models:                  | 25 V max.                              |
|                                               | 24 Vin models:                  | 50 V max.                              |
|                                               | 48 Vin models:                  | 100 V max.                             |
| Reserve voltage protection                    |                                 | 1.0 A max.                             |
| Conducted noise (input)                       |                                 | EN 55022 level A, FCC part 15, level A |

## Output Specifications

|                                     |                                        |                                                |
|-------------------------------------|----------------------------------------|------------------------------------------------|
| Voltage set accuracy                |                                        | $\pm 1$ %                                      |
| Regulation                          | – Input variation Vin min. to Vin max. | 0.3 % max.                                     |
|                                     | – Load variation 10 % – 90 %           | single output models: 0.5 % max.               |
|                                     |                                        | dual output models: 1 % max. (balanced load)   |
|                                     |                                        | dual output models: 3 % max. (unbalanced load) |
| Ripple and noise (20 MHz Bandwidth) | single output models:                  | 50 mVpk-pk max.                                |
|                                     | dual output models:                    | 75 mVpk-pk max.                                |
| Temperature coefficient             |                                        | $\pm 0.02$ %/K                                 |
| Output current limitation           |                                        | >110 % of Iout max., constant current          |
| Short circuit protection            |                                        | continuous (automatic recovery)                |
| Capacitive load                     | single output models:                  | 2200 $\mu$ F max.                              |
|                                     | dual output models:                    | 470 $\mu$ F max.                               |

## General Specifications

|                                                                       |                       |                                       |
|-----------------------------------------------------------------------|-----------------------|---------------------------------------|
| Temperature ranges                                                    | – Operating           | –40°C to +85°C                        |
|                                                                       | – Case temperature    | +100°C max.                           |
|                                                                       | – Storage             | –40°C to +125°C                       |
| Derating (convection cooling)                                         |                       | 3.3 %/K above 70°C                    |
| Humidity (non condensing)                                             |                       | 95 % rel H max.                       |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) |                       | >1 Mio h                              |
| Isolation (Input/Output)                                              | – Voltage             | 1'500 VDC                             |
|                                                                       | – Capacitance         | 120 pF max.                           |
|                                                                       | – Resistance          | >1'000 M Ohm                          |
| Switching frequency                                                   | single output models: | 500 kHz typ. (pulse width modulation) |
|                                                                       | dual output models:   | 300 kHz typ. (pulse width modulation) |

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

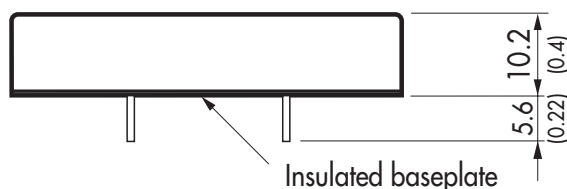
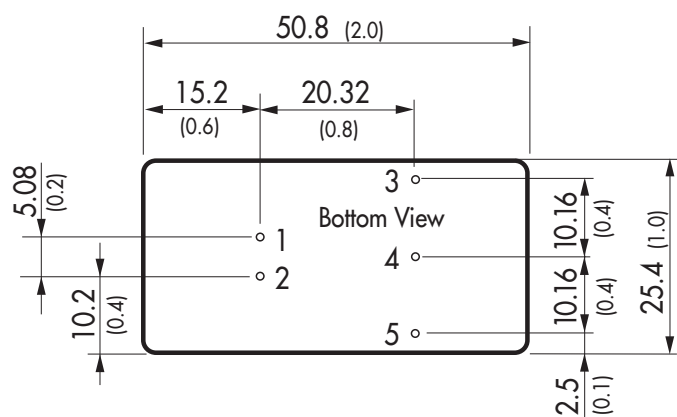
## General Specifications

|                                             |                                                                                                                                                                                                                                                           |                                                                                                                                                                                           |
|---------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 $\pm 2$ kV, criteria B<br>EN 61000-4-5 $\pm 1$ kV, criteria B<br>EN 61000-4-6 10 Vrms, criteria A |
| Thermal shock, mechanical shock & vibration | – Test conditions                                                                                                                                                                                                                                         | EN 61373, MIL-STD-810F<br><a href="http://www.tracopower.com/products/mil810.pdf">www.tracopower.com/products/mil810.pdf</a>                                                              |
| Safety standards                            |                                                                                                                                                                                                                                                           | UL 60950-1, IEC / EN 60950-1                                                                                                                                                              |
| Safety approvals                            | – UL/cUL                                                                                                                                                                                                                                                  | <a href="http://www.ul.com">www.ul.com</a> -> certifications -> File e188913                                                                                                              |
| Environmental compliance                    | <ul style="list-style-type: none"> <li>– Reach</li> <li>– RoHS</li> </ul>                                                                                                                                                                                 | <a href="http://www.tracopower.com/products/ten10-reach.pdf">www.tracopower.com/products/ten10-reach.pdf</a><br>directive 2011/65/EU                                                      |

## Physical Specifications

|                       |                                     |
|-----------------------|-------------------------------------|
| Casing material       | Steel chrome-nickel plated          |
| Baseplate material    | Epoxy                               |
| Potting material      | Silicon rubber TES (UL 94V-0 rated) |
| Weight                | 30 g (1.2 oz)                       |
| Soldering temperature | max. 265°C / 10 sec.                |

## Outline Dimensions



### Pin-Out

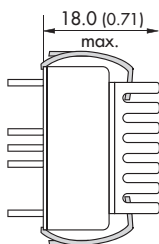
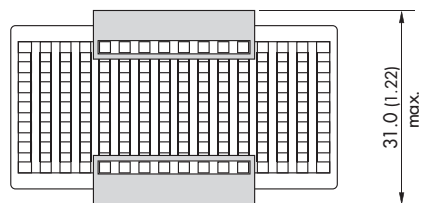
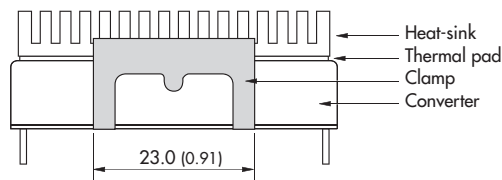
| Pin | Single     | Dual       |
|-----|------------|------------|
| 1   | +Vin (Vcc) | +Vin (Vcc) |
| 2   | -Vin (GND) | -Vin (GND) |
| 3   | +Vout      | +Vout      |
| 4   | No pin     | Common     |
| 5   | -Vout      | -Vout      |

Dimensions in [mm], ( ) = Inch  
 Pin diameter: 1.0  $\pm$  0.05 (0.039  $\pm$  0.0019)  
 Pin pitch tolerances:  $\pm$  0.25 ( $\pm$  0.01)  
 Casing tolerances:  $\pm$  0.5 ( $\pm$  0.02)

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

## Heat-Sink (Option)

### Heat-sink TEN-HS4 (optional)



**Order code:** TEN-HS4

(cont.: heat-sink, thermal pad, 2 clamps)

**Material:** Aluminum

**Finish:** Anodic treatment (black)

**Weight:** 17 g (0.60oz) without converter

Thermal impedance after assembling: 10 K/W

**Note:**

Before attaching the heatsink, the product label on converter has to be removed for optimal performance.

For volume orders we can supply the converters with heatsink already mounted. Please contact us for a relative quotation.

Specifications can be changed any time without notice.