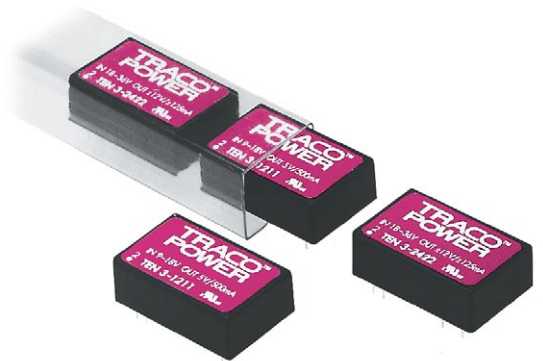


#### Features

- ◆ Wide 2 : 1 Input Range
- ◆ High Efficiency up to 84%
- ◆ Full SMD-Design
- ◆ Short-Circuit Protection
- ◆ Extended Operating Temperature Range -40°C to 85°C
- ◆ I/O-Isolation 1'500 VDC
- ◆ Input Filter to meet EN 55022, Class A and FCC, Level A without external Components
- ◆ 24-pin DIP with Industry Standard Pinout
- ◆ High Reliability, MTBF >1.1 Mio. h
- ◆ 3 Year Product Warranty



The TEN 3 series of DC/DC converters, comprising 28 models, has been designed for a wide range of applications in industrial and communication systems. High efficiency allows an operating temperature range of - 40°C to +85°C. Other features of these converters are internal filtering according to EN 55022-A and FCC, level A. Full SMD-design guarantees a high reliability of this product.

#### Models

| Ordercode  | Input voltage range | Output voltage | Output current max. | Efficiency typ. |
|------------|---------------------|----------------|---------------------|-----------------|
| TEN 3-0510 | 4.5 – 9.0 VDC       | 3.3 VDC        | 600 mA              | 70 %            |
| TEN 3-0511 |                     | 5 VDC          | 500 mA              | 73 %            |
| TEN 3-0512 |                     | 12 VDC         | 250 mA              | 77 %            |
| TEN 3-0513 |                     | 15 VDC         | 200 mA              | 77 %            |
| TEN 3-0521 |                     | ± 5 VDC        | ± 250 mA            | 72 %            |
| TEN 3-0522 |                     | ± 12 VDC       | ± 125 mA            | 75 %            |
| TEN 3-0523 |                     | ± 15 VDC       | ± 100 mA            | 75 %            |
| TEN 3-1210 | 9 – 18 VDC          | 3.3 VDC        | 600 mA              | 74 %            |
| TEN 3-1211 |                     | 5 VDC          | 500 mA              | 78 %            |
| TEN 3-1212 |                     | 12 VDC         | 250 mA              | 82 %            |
| TEN 3-1213 |                     | 15 VDC         | 200 mA              | 82 %            |
| TEN 3-1221 |                     | ± 5 VDC        | ± 250 mA            | 77 %            |
| TEN 3-1222 |                     | ± 12 VDC       | ± 125 mA            | 80 %            |
| TEN 3-1223 |                     | ± 15 VDC       | ± 100 mA            | 80 %            |
| TEN 3-2410 | 18 – 36 VDC         | 3.3 VDC        | 600 mA              | 76 %            |
| TEN 3-2411 |                     | 5 VDC          | 500 mA              | 79 %            |
| TEN 3-2412 |                     | 12 VDC         | 250 mA              | 84 %            |
| TEN 3-2413 |                     | 15 VDC         | 200 mA              | 84 %            |
| TEN 3-2421 |                     | ± 5 VDC        | ± 250 mA            | 79 %            |
| TEN 3-2422 |                     | ± 12 VDC       | ± 125 mA            | 82 %            |
| TEN 3-2423 |                     | ± 15 VDC       | ± 100 mA            | 82 %            |
| TEN 3-4810 | 36 – 72 VDC         | 3.3 VDC        | 600 mA              | 76 %            |
| TEN 3-4811 |                     | 5 VDC          | 500 mA              | 79 %            |
| TEN 3-4812 |                     | 12 VDC         | 250 mA              | 84 %            |
| TEN 3-4813 |                     | 15 VDC         | 200 mA              | 84 %            |
| TEN 3-4821 |                     | ± 5 VDC        | ± 250 mA            | 80 %            |
| TEN 3-4822 |                     | ± 12 VDC       | ± 125 mA            | 84 %            |
| TEN 3-4823 |                     | ± 15 VDC       | ± 100 mA            | 84 %            |

## Input Specifications

|                                               |                             |                                        |
|-----------------------------------------------|-----------------------------|----------------------------------------|
| Input current no load /full load              | 5 Vin models                | 40 mA / 800 mA typ.                    |
|                                               | 12 Vin models               | 20 mA / 300 mA typ.                    |
|                                               | 24 Vin models               | 5 mA / 150 mA typ.                     |
|                                               | 48 Vin models               | 3 mA / 75 mA typ.                      |
| Start-up voltage /<br>under voltage shut down | 5 Vin models                | 4 VDC / 3.5 VDC typ.                   |
|                                               | 12 Vin models               | 7 VDC / 6.5 VDC typ.                   |
|                                               | 24 Vin models               | 12 VDC / 11 VDC typ.                   |
|                                               | 48 Vin models               | 24 VDC / 22 VDC typ.                   |
| Surge voltage (1 sec. max.)                   | 5 Vin models                | 11 V max.                              |
|                                               | 12 Vin models               | 25 V max.                              |
|                                               | 24 Vin models               | 50 V max.                              |
|                                               | 48 Vin models               | 100 V max.                             |
| Reverse voltage protection                    |                             | 1.0 A max.                             |
| Conducted noise (input)                       | (5 V input models excluded) | 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 10 – 100 %            |                                       |
|                                     | – single output models                 | ± 0.5 % max.                          |
|                                     | – dual output models balanced load     | ± 1.0 % max.                          |
|                                     | – dual output models unbalanced load   | ± 2.0 % max.                          |
| Ripple and noise (20 MHz Bandwidth) |                                        | 50 mVpk-pk max                        |
| Temperature coefficient             |                                        | ± 0.02 % /K                           |
| Current limitation                  |                                        | > 110% of Iout max., constant current |
| Short circuit protection            |                                        | indefinite, automatic recovery        |
| Capacitive load                     | – single output models                 | 4000 µF max.                          |
|                                     | – dual output models                   | 1000 µF max.                          |

## General Specifications

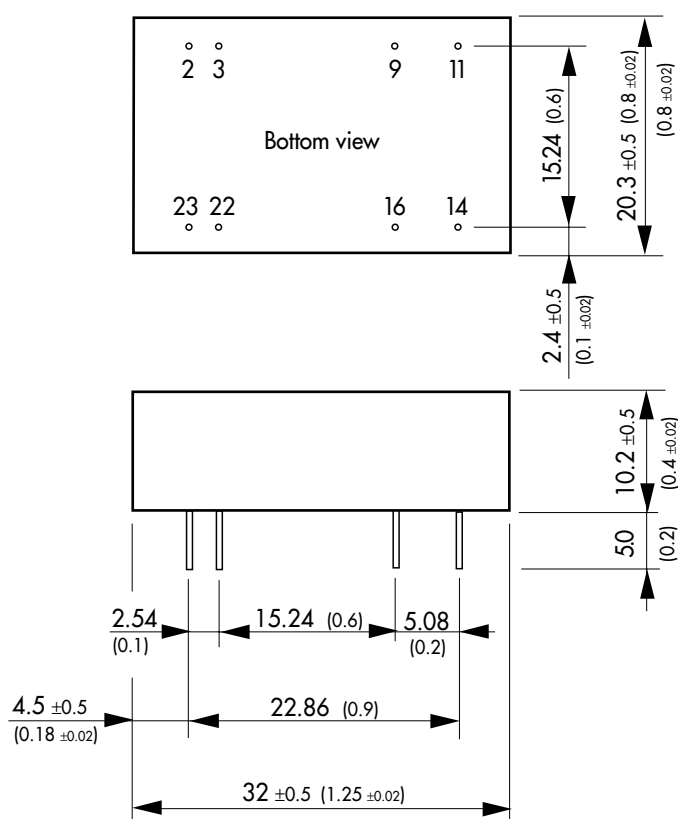
|                                               |                        |                                                                                        |
|-----------------------------------------------|------------------------|----------------------------------------------------------------------------------------|
| Temperature ranges                            | – Operating            | – 40 °C ... + 85 °C                                                                    |
|                                               | – Case temperature     | + 100 °C max.                                                                          |
|                                               | – Storage              | – 55 °C ... +125°C                                                                     |
| Derating                                      |                        | 3% /K above 70°C                                                                       |
| Humidity (non condensing)                     |                        | 95 % rel H max.                                                                        |
| Reliability, calculated MTBF (MIL-HDBK-217 E) |                        | >1.1 Mio. h @ + 25 °C                                                                  |
| Isolation voltage                             | Input/Output           | 1'500 VDC                                                                              |
| Isolation capacity                            | Input/Output           | 65 pF typ                                                                              |
| Isolation resistance                          | Input/Output (500 VDC) | > 1'000 M Ohm                                                                          |
| Switching frequency                           |                        | 300 kHz typ. (Pulse frequency modulation PFM)                                          |
| Safety standards                              |                        | UL 60950, IEC 60950, EN 60950<br>Compliance up to 60 VDC input<br>voltage (SELV limit) |
| Safety approval                               |                        | cUL / UL (File no. E188913)                                                            |

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

## Physical Specifications

|                       |                        |
|-----------------------|------------------------|
| Case material         | non conductive FR4     |
| Potting material      | epoxy (UL 94V-0 rated) |
| Weight                | 12 g (0.42 oz)         |
| Soldering temperature | max. 260 °C / 10 sec.  |

## Outline Dimensions mm (inches)



Pin diameter  $\varnothing 0.5 \pm 0.05$  (0.02)  $\pm 0.002$   
Tolerances  $\pm 0.5$  (0.02)

## Pin-Out

| Pin | Single     | Dual       |
|-----|------------|------------|
| 2   | -Vin (GND) | -Vin (GND) |
| 3   | -Vin (GND) | -Vin (GND) |
| 9   | No pin     | Common     |
| 11  | No con.    | -Vout      |
| 14  | +Vout      | +Vout      |
| 16  | -Vout      | Common     |
| 22  | +Vin (Vcc) | +Vin (Vcc) |
| 23  | +Vin (Vcc) | +Vin (Vcc) |

Specifications can be changed without notice