

#### Features

- Wide 2 : 1 Input Range
- High Efficiency up to 84%
- Full SMD-Design
- Indefinite Short-Circuit Protection
- 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
- 2 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 +75°C without derating. 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<br>TEN 3-0511<br>TEN 3-0512<br>TEN 3-0513<br>TEN 3-0521<br>TEN 3-0522<br>TEN 3-0523 | 4.5 – 9.0 VDC       | 3.3 VDC<br>5 VDC<br>12 VDC<br>15 VDC<br>± 5 VDC<br>± 12 VDC<br>± 15 VDC | 600 mA<br>500 mA<br>250 mA<br>200 mA<br>± 250 mA<br>± 125 mA<br>± 100 mA | 70 %<br>73 %<br>77 %<br>77 %<br>72 %<br>75 %<br>75 % |
| TEN 3-1210<br>TEN 3-1211<br>TEN 3-1212<br>TEN 3-1213<br>TEN 3-1221<br>TEN 3-1222<br>TEN 3-1223 | 9 – 18 VDC          | 3.3 VDC<br>5 VDC<br>12 VDC<br>15 VDC<br>± 5 VDC<br>± 12 VDC<br>± 15 VDC | 600 mA<br>500 mA<br>250 mA<br>200 mA<br>± 250 mA<br>± 125 mA<br>± 100 mA | 74 %<br>78 %<br>82 %<br>82 %<br>77 %<br>80 %<br>80 % |
| TEN 3-2410<br>TEN 3-2411<br>TEN 3-2412<br>TEN 3-2413<br>TEN 3-2421<br>TEN 3-2422<br>TEN 3-2423 | 18 – 36 VDC         | 3.3 VDC<br>5 VDC<br>12 VDC<br>15 VDC<br>± 5 VDC<br>± 12 VDC<br>± 15 VDC | 600 mA<br>500 mA<br>250 mA<br>200 mA<br>± 250 mA<br>± 125 mA<br>± 100 mA | 76 %<br>79 %<br>84 %<br>84 %<br>79 %<br>82 %<br>82 % |
| TEN 3-4810<br>TEN 3-4811<br>TEN 3-4812<br>TEN 3-4813<br>TEN 3-2421<br>TEN 3-4822<br>TEN 3-4823 | 36 – 72 VDC         | 3.3 VDC<br>5 VDC<br>12 VDC<br>15 VDC<br>± 5 VDC<br>± 12 VDC<br>± 15 VDC | 600 mA<br>500 mA<br>250 mA<br>200 mA<br>± 250 mA<br>± 125 mA<br>± 100 mA | 76 %<br>79 %<br>84 %<br>84 %<br>80 %<br>84 %<br>84 % |

### Input Specifications

|                                               |                                                                 |                                                                                              |
|-----------------------------------------------|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| Input current no load /full load              | 5 Vin models<br>12 Vin models<br>24 Vin models<br>48 Vin models | 40 mA / 800 mA typ.<br>20 mA / 300 mA typ.<br>5 mA / 150 mA typ.<br>3 mA / 75 mA typ.        |
| Start-up voltage /<br>under voltage shut down | 5 Vin models<br>12 Vin models<br>24 Vin models<br>48 Vin models | 4 VDC / 3.5 VDC typ.<br>7 VDC / 6.5 VDC typ.<br>12 VDC / 11 VDC typ.<br>24 VDC / 22 VDC typ. |
| Surge voltage (1 sec. max.)                   | 5 Vin models<br>12 Vin models<br>24 Vin models<br>48 Vin models | 11 V max.<br>25 V max.<br>50 V max.<br>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.<br>– Load variation 10 – 100 %<br>– single output models<br>– dual output models balanced load<br>– dual output models unbalanced load | ± 0.5 % max.<br><br>± 0.5 % max.<br>± 1.0 % max.<br>± 2.0 % max. |
| Ripple and noise (20 MHz Bandwidth) |                                                                                                                                                                               | 50 mVpk-pk max                                                   |
| Temperature coefficient             |                                                                                                                                                                               | ± 0.02 % / °C                                                    |
| Current limitation                  |                                                                                                                                                                               | > 110% of Iout max., constant current                            |
| Short circuit protection            |                                                                                                                                                                               | Hiccup mode, indefinite<br>(no automatic recovery)               |
| Capacitive load                     | – single output models<br>– dual output models                                                                                                                                | 400 µF max.<br>100 µF max.                                       |

### General Specifications

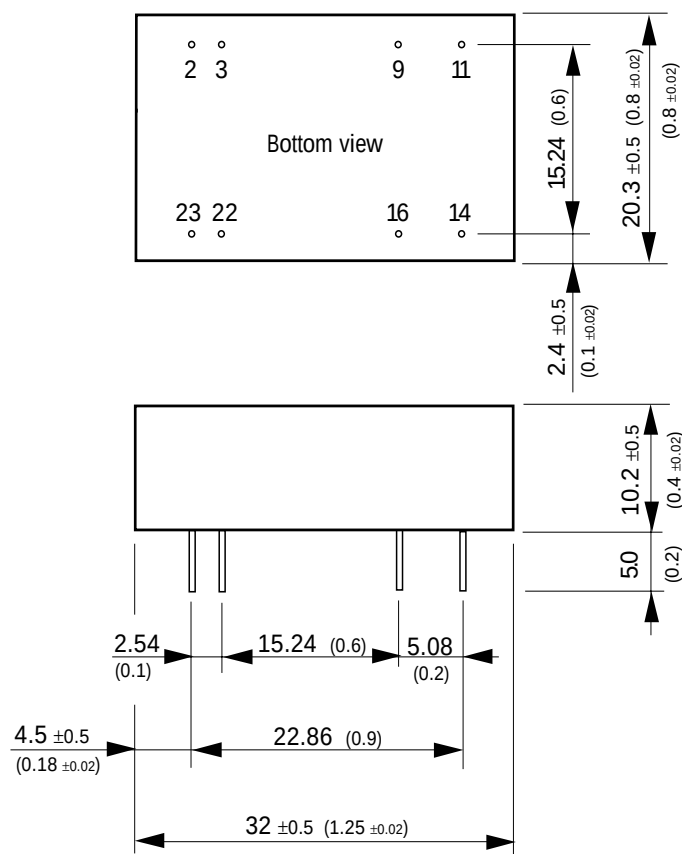
|                                               |                                                |                                                                                        |
|-----------------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------|
| Temperature ranges                            | – Operating<br>– Case temperature<br>– Storage | – 40 °C ... + 75 °C (no derating)<br>+ 95 °C max.<br>– 40 °C ... + 125 °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 1950 , 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 black plastic<br>(flammability to UL 94V-0) |
| 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) ±0.002  
Tolerances ±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 function | -Vout      |
| 14  | +Vout       | +Vout      |
| 16  | -Vout       | Common     |
| 22  | +Vin (Vcc)  | +Vin (Vcc) |
| 23  | +Vin (Vcc)  | +Vin (Vcc) |

Specifications can be changed without notice