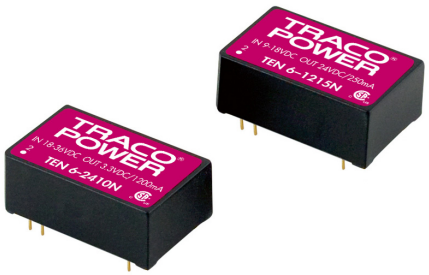
# DC/DC Converters

## TEN 6N Series, 6 Watt

IEC 60950-1 UL 60950-1

### Features

- 2:1 input voltage range
- High efficiency
- Operating temperature range -40°C to +85°C
- No minimum load required
- Input filter meets EN 55022, class A
- Overload protection
- I/O-isolation 1'500 VDC
- DIP-24 plastic package
- Industry standard pinout
- 3-year product warranty




The TEN-6N series is designed for an optimized cost/performance ratio of DC/DC converters with output power of 6 Watt.
General features like no minimum load requirement, overload protection, internal filter for EN55022 class A and high efficiency make these converters easy to design in. With the popular DIP-24 standard package they are also a drop in replacement for many cost critical applications.

### Models

| Order code | Input voltage range | Output voltage | Output current max. | Efficiency typ. |
|---|---|---|---|---|
| TEN 6-1210N | | 3.3 VDC | 1200 mA | 75 % |
| TEN 6-1211N | | 5 VDC | 1200 mA | 78 % |
| TEN 6-1212N | | 12 VDC | 500 mA | 82 % |
| TEN 6-1213N | **9 – 18 VDC** | 15 VDC | 400 mA | 82 % |
| TEN 6-1215N | (12 VDC nominal) | 24 VDC | 250 mA | 84 % |
| TEN 6-1221N | | ±5 VDC | ±500 mA | 78 % |
| TEN 6-1222N | | ±12 VDC | ±250 mA | 82 % |
| TEN 6-1223N | | ±15 VDC | ±200 mA | 82 % |
| TEN 6-2410N | | 3.3 VDC | 1200 mA | 77 % |
| TEN 6-2411N | | 5 VDC | 1200 mA | 80 % |
| TEN 6-2412N | | 12 VDC | 500 mA | 84 % |
| TEN 6-2413N | **18 – 36 VDC** | 15 VDC | 400 mA | 84 % |
| TEN 6-2415N | (24 VDC nominal) | 24 VDC | 250 mA | 84 % |
| TEN 6-2421N | | ±5 VDC | ±500 mA | 80 % |
| TEN 6-2422N | | ±12 VDC | ±250 mA | 84 % |
| TEN 6-2423N | | ±15 VDC | ±200 mA | 84 % |
| TEN 6-4810N | | 3.3 VDC | 1200 mA | 77 % |
| TEN 6-4811N | | 5 VDC | 1200 mA | 80 % |
| TEN 6-4812N | | 12 VDC | 500 mA | 84 % |
| TEN 6-4813N | **36 – 75 VDC** | 15 VDC | 400 mA | 84 % |
| TEN 6-4815N | (48 VDC nominal) | 24 VDC | 250 mA | 84 % |
| TEN 6-4821N | | ±5 VDC | ±500 mA | 80 % |
| TEN 6-4822N | | ±12 VDC | ±250 mA | 84 % |
| TEN 6-4823N | | ±15 VDC | ±200 mA | 84 % |

## Input Specifications

| | | |
|---|---|---|
| Input current at no load | 12 Vin models: | 40 mA typ. |
| | 24 Vin models: | 20 mA typ. |
| | 48 Vin models: | 10 mA typ. |
| Input current at full load | 12 Vin, 3.3VDC models: | 440 mA typ. |
| | 12 Vin other models: | 610 mA typ. |
| | 24 Vin, 3.3VDC models: | 220 mA typ. |
| | 24 Vin other models: | 300 mA typ. |
| | 48 Vin, 3.3VDC models: | 110 mA typ. |
| | 48 Vin other models: | 150 mA typ. |
| Recommended input fuse (slow blow) | 12 Vin models: | 1500 mA |
| | 24 Vin models: | 700 mA |
| | 48 Vin models: | 350 mA |
| Start-up voltage / under voltage shut down | 12 Vin models: | 9.0 VDC / 8.5 VDC (or lower) |
| | 24 Vin models: | 18 VDC / 16 VDC (or lower) |
| | 48 Vin models: | 36 VDC / 35 VDC (or lower) |
| Surge voltage (1 sec. max.) | 12 Vin models: | 25 V max. |
| | 24 Vin models: | 50 V max. |
| | 48 Vin models: | 100 V max. |
| Conducted noise | | internal filter to meet EN 55022 class A |

## Output Specifications

| | | |
|---|---|---|
| Voltage set accuracy | | ±2 % |
| Regulation | – Input variation Vin min. to Vin max. | 0.5 % max. |
| | – Load variation 0 – 100 % single output models: | 1.2 % max. |
| | dual output models balanced load: | 1.2 % max. |
| | dual output models 50%/100% unbalanced load: | 3.0 % max. |
| Minimum load | | not required |
| Temperature coefficient | | ±0.02 %/K |
| Ripple and noise (20 MHz Bandwidth) | | 80 mVp-p max. |
| Dynamic load response (change from 75 % to 100 % load) | | ±3 % peak variation typ.<br>300 µS response time typ. |
| Current limitation | | 145 % of Iout max. typ., constant power |
| Short circuit protection | | continuous, automatic recovery |
| Capacitive load | 3.3 & 5.0 VDC models: | 470 µF max. |
| | 12 & 15 VDC models: | 100 µF max. |
| | 24 VDC models: | 47 µF max. |
| | dual output models: | 100 µF max. (each output) |

## General Specifications

| | | |
|---|---|---|
| Temperature ranges | – Operating | –40°C to +85°C |
| | – Case temperature | +100°C max. |
| | – Storage | –50°C to +125°C |
| Derating | 3.3 & 5.0 VDC models: | 2.5 %/K above +60°C |
| | other models: | 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 voltage (60 sec.) | – Input/Output | 1'500 VDC (functional insulation) |
| Isolation capacitance | – Input/Output (100 KHz, 1 V) | 1000 pF typ. |
| Isolation resistance | – Input/Output (500 VDC) | >1'000 M Ohm |
| Switching frequency | | 330 kHz typ. |

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

## General Specifications

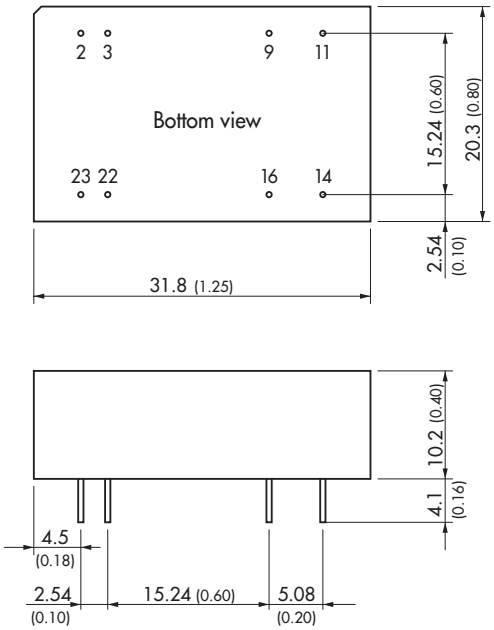
| | | |
|---|---|---|
| Safety standards | | UL/cUL 60950-1, IEC/EN 60950-1 |
| Safety approvals | – CSA certificate according UL 60950-1<br>– CB test certificate according IEC 60950-1 | www.tracopower.com/products/ten6n-csa.pdf<br>www.tracopower.com/products/ten6n-cb.pdf pending |
| Environmental compliance | – Reach<br>– RoHS | www.tracopower.com/products/ten6n-reach.pdf<br>RoHS directive 2011/65/EU |

## Physical Specifications

| | |
|---|---|
| Casing material | non conductive plastic (UL 94V-0-rated) |
| Potting material | epoxy (XM-2109 & XY-2110, UL 94V-0-rated) |
| Weight | 13.0 g (0.46 oz) |
| Soldering temperature (1.5mm from case for 10 sec.) | max. 260°C |

**Application note:** www.tracopower.com/products/ten6n-application.pdf

## Outline Dimensions




| 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) |

Dimensions in [mm], () = Inch
Pin diameter ⌀ 0.5 ±0.05 (0.02 ±0.002)
Tolerances ±0.25 (±0.01)
Pin pich tolerances ±0.13 (±0.0005)