

## DC/DC Converter

## TEN 40N Series, 40 Watt

- Highest power density:  
40 W in 1" x 2" x 0.4" package
- Excellent efficiency up to 92 %
- Output voltage adjustable
- Remote On/Off
- Short circuit protection
- Over voltage protection
- I/O isolation 1500 VDC
- Operating temperature range  
-40°C to +80°C
- Fully RoHS compliant
- 3-year product warranty



UL 62368-1 IEC 62368-1

The TEN 40N Series is a new range of isolated high performance DC/DC converter modules. Due to the very high efficiency of up to 92% these 40 W converters come with a footprint of only 1.0" x 2.0". The 15 models have a wide 2:1 input voltage range and a tight output voltage regulation. The output voltage is adjustable by external resistor. Remote On/Off and protection against overpower and overvoltage are standard features of these converters. Typical applications are in mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is critical.

### Models

| Order Code   | Input Voltage Range          | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|--------------|------------------------------|----------|------------------|----------|------------------|-----------------|
|              |                              | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TEN 40-1210N | 9 - 18 VDC<br>(12 VDC nom.)  | 3.3 VDC  | 8'000 mA         |          |                  | 89 %            |
| TEN 40-1211N |                              | 5 VDC    | 8'000 mA         |          |                  | 89 %            |
| TEN 40-1212N |                              | 12 VDC   | 3'330 mA         |          |                  | 89 %            |
| TEN 40-1213N |                              | 15 VDC   | 2'670 mA         |          |                  | 90 %            |
| TEN 40-1215N |                              | 24 VDC   | 1'670 mA         |          |                  | 91 %            |
| TEN 40-1222N |                              | +12 VDC  | 1'670 mA         | -12 VDC  | 1'670 mA         | 88 %            |
| TEN 40-1223N |                              | +15 VDC  | 1'330 mA         | -15 VDC  | 1'330 mA         | 88 %            |
| TEN 40-2410N | 18 - 36 VDC<br>(24 VDC nom.) | 3.3 VDC  | 8'000 mA         |          |                  | 90 %            |
| TEN 40-2411N |                              | 5 VDC    | 8'000 mA         |          |                  | 91 %            |
| TEN 40-2412N |                              | 12 VDC   | 3'330 mA         |          |                  | 91 %            |
| TEN 40-2413N |                              | 15 VDC   | 2'670 mA         |          |                  | 91 %            |
| TEN 40-2415N |                              | 24 VDC   | 1'670 mA         |          |                  | 91 %            |
| TEN 40-2422N |                              | +12 VDC  | 1'670 mA         | -12 VDC  | 1'670 mA         | 89 %            |
| TEN 40-2423N |                              | +15 VDC  | 1'330 mA         | -15 VDC  | 1'330 mA         | 89 %            |
| TEN 40-4810N | 36 - 75 VDC<br>(48 VDC nom.) | 3.3 VDC  | 8'000 mA         |          |                  | 90 %            |
| TEN 40-4811N |                              | 5 VDC    | 8'000 mA         |          |                  | 91 %            |
| TEN 40-4812N |                              | 12 VDC   | 3'330 mA         |          |                  | 92 %            |
| TEN 40-4813N |                              | 15 VDC   | 2'670 mA         |          |                  | 92 %            |
| TEN 40-4815N |                              | 24 VDC   | 1'670 mA         |          |                  | 91 %            |
| TEN 40-4822N |                              | +12 VDC  | 1'670 mA         | -12 VDC  | 1'670 mA         | 89 %            |
| TEN 40-4823N |                              | +15 VDC  | 1'330 mA         | -15 VDC  | 1'330 mA         | 89 %            |

### Options

|         |                                                                                                                    |
|---------|--------------------------------------------------------------------------------------------------------------------|
| TEN-HS4 | - Optional Heat Sink: <a href="http://www.tracopower.com/overview/ten-hs4">www.tracopower.com/overview/ten-hs4</a> |
| TEN-HS6 | - Optional Heat Sink: <a href="http://www.tracopower.com/overview/ten-hs6">www.tracopower.com/overview/ten-hs6</a> |

## Input Specifications

|                          |                |                                                                                                                                                                                                                                                                |
|--------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current            | - At no load   | 12 Vin models: 120 mA typ. (3.3 Vout model)<br>160 mA typ. (5 Vout model)<br>160 mA typ. (12 Vout model)<br>150 mA typ. (15 Vout model)<br>160 mA typ. (24 Vout model)<br>70 mA typ. (12 / -12 Vout model)<br>60 mA typ. (15 / -15 Vout model)                 |
|                          |                | 24 Vin models: 75 mA typ. (3.3 Vout model)<br>80 mA typ. (5 Vout model)<br>85 mA typ. (12 Vout model)<br>75 mA typ. (15 Vout model)<br>85 mA typ. (24 Vout model)<br>50 mA typ. (12 / -12 Vout model)<br>45 mA typ. (15 / -15 Vout model)                      |
|                          |                | 48 Vin models: 40 mA typ. (3.3 Vout model)<br>50 mA typ. (5 Vout model)<br>50 mA typ. (12 Vout model)<br>50 mA typ. (15 Vout model)<br>50 mA typ. (24 Vout model)<br>65 mA typ. (12 / -12 Vout model)<br>65 mA typ. (15 / -15 Vout model)                      |
|                          | - At full load | 12 Vin models: 2'470 mA max. (3.3 Vout model)<br>3'750 mA max. (5 Vout model)<br>3'750 mA max. (12 Vout model)<br>3'700 mA max. (15 Vout model)<br>3'670 mA max. (24 Vout model)<br>3'790 mA max. (12 / -12 Vout model)<br>3'790 mA max. (15 / -15 Vout model) |
|                          |                | 24 Vin models: 1'220 mA max. (3.3 Vout model)<br>1'830 mA max. (5 Vout model)<br>1'830 mA max. (12 Vout model)<br>1'830 mA max. (15 Vout model)<br>1'835 mA max. (24 Vout model)<br>1'870 mA max. (12 / -12 Vout model)<br>1'870 mA max. (15 / -15 Vout model) |
|                          |                | 48 Vin models: 610 mA max. (3.3 Vout model)<br>920 mA max. (5 Vout model)<br>910 mA max. (12 Vout model)<br>910 mA max. (15 Vout model)<br>918 mA max. (24 Vout model)<br>940 mA max. (12 / -12 Vout model)<br>940 mA max. (15 / -15 Vout model)               |
| Surge Voltage            |                | 12 Vin models: 25 VDC max. (100 ms max.)<br>24 Vin models: 50 VDC max. (100 ms max.)<br>48 Vin models: 100 VDC max. (100 ms max.)                                                                                                                              |
| Under Voltage Lockout    |                | 12 Vin models: 8.3 VDC typ.<br>24 Vin models: 16.5 VDC typ.<br>48 Vin models: 33 VDC typ.                                                                                                                                                                      |
| Reflected Ripple Current |                | 12 Vin models: 50 mAp-p typ.<br>24 Vin models: 30 mAp-p typ.<br>48 Vin models: 20 mAp-p typ.                                                                                                                                                                   |

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

## Output Specifications

### Output Voltage Adjustment

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

## Safety Specifications

|                       |                             |                                                                                                              |
|-----------------------|-----------------------------|--------------------------------------------------------------------------------------------------------------|
| Standards             | - IT / Multimedia Equipment | CSA-C22.2, No. 60950-1<br>EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1 |
|                       | - Certification Documents   | <a href="http://www.tracopower.com/overview/ten40n">www.tracopower.com/overview/ten40n</a>                   |
| Pollution Degree      |                             | PD 3                                                                                                         |
| Over Voltage Category |                             | Not mains connected                                                                                          |

## EMC Specifications

|                 |                             |                                                                                            |
|-----------------|-----------------------------|--------------------------------------------------------------------------------------------|
| EMI (Emissions) | - Conducted Emissions       | EN 55032 class A (with external filter)                                                    |
|                 | External filter proposal:   | <a href="http://www.tracopower.com/overview/ten40n">www.tracopower.com/overview/ten40n</a> |
| EMS (Immunity)  |                             | EN 55024 (IT Equipment)<br>EN 55035 (Multimedia)                                           |
|                 | - Electrostatic Discharge   | Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria B                                            |
|                 | - RF Electromagnetic Field  | Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria B                                        |
|                 | - EFT (Burst) / Surge       | EN 61000-4-3, 10 V/m, perf. criteria A                                                     |
|                 |                             | EN 61000-4-4, $\pm 2$ kV, perf. criteria A                                                 |
|                 |                             | EN 61000-4-5, $\pm 1$ kV, perf. criteria B                                                 |
|                 | Ext. input component:       | KXG 330 $\mu$ F, 200 V                                                                     |
|                 | - Conducted RF Disturbances | EN 61000-4-6, 10 Vrms, perf. criteria A                                                    |

## General Specifications

|                                        |                                                                                                          |                                                                                                                                               |
|----------------------------------------|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Relative Humidity                      |                                                                                                          | 95% max. (non condensing)                                                                                                                     |
| Temperature Ranges                     | - Operating Temperature<br>- Case Temperature<br>- Storage Temperature                                   | -40°C to +80°C<br>+105°C max.<br>-50°C to +125°C                                                                                              |
| Power Derating                         | - High Temperature                                                                                       | Depending on model                                                                                                                            |
|                                        | See application note:                                                                                    | <a href="http://www.tracopower.com/overview/ten40n">www.tracopower.com/overview/ten40n</a>                                                    |
| Over Temperature Protection Switch Off | - Protection Mode                                                                                        | 110°C typ.                                                                                                                                    |
| Cooling System                         |                                                                                                          | Natural convection (20 LFM)                                                                                                                   |
| Remote Control                         | - Voltage Controlled Remote (passive = on)<br><br>- Off Idle Input Current<br>- Remote Pin Input Current | On: 3.5 to 12 VDC or open circuit<br>Off: 0 to 1.2 VDC or short circuit<br>Refers to 'Remote' and '-Vin' Pin<br>2.5 mA typ.<br>-0.5 to 0.5 mA |
| Altitude During Operation              |                                                                                                          | 6'000 m max.                                                                                                                                  |
| Switching Frequency                    |                                                                                                          | 285 kHz typ. (PWM) (24 Vout models)<br>320 kHz typ. (PWM) (other models)                                                                      |
| Insulation System                      |                                                                                                          | Functional Insulation                                                                                                                         |
| Isolation Test Voltage                 | - Input to Output, 60 s<br>- Input to Output, 1 s                                                        | 1'500 VDC<br>1'800 VDC                                                                                                                        |
| Isolation Resistance                   | - Input to Output, 500 VDC                                                                               | 1'000 M $\Omega$ min.                                                                                                                         |
| Isolation Capacitance                  | - Input to Output, 100 kHz, 1 V                                                                          | 1'500 pF max.                                                                                                                                 |
| Reliability                            | - Calculated MTBF                                                                                        | 328'000 h (MIL-HDBK-217F, ground benign)                                                                                                      |
| Washing Process                        |                                                                                                          | According to Cleaning Guideline<br><a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>             |
| Housing Material                       |                                                                                                          | Alu alloy, black anodized coating                                                                                                             |
| Base Material                          |                                                                                                          | Non-conductive FR4 (UL 94 V-0 rated)                                                                                                          |
| Potting Material                       |                                                                                                          | Epoxy (UL 94 V-0 rated)                                                                                                                       |
| Pin Material                           |                                                                                                          | Copper Alloy (C6801)                                                                                                                          |
| Pin Foundation Plating                 |                                                                                                          | Nickel (2.5 $\mu$ m min.)                                                                                                                     |

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

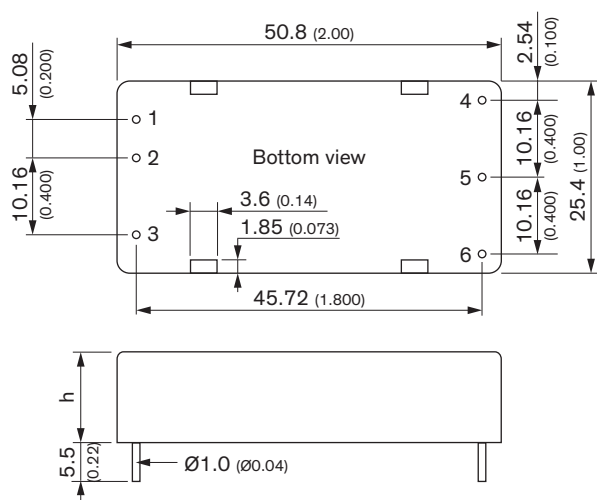
|                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Pin Surface Plating      | Gold (75 - 125 nm), glossy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Housing Type             | Metal Case                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Mounting Type            | PCB Mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Connection Type          | THD (Through-Hole Device)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| Footprint Type           | 2" x 1"                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Soldering Profile        | Lead-Free Wave Soldering<br>260°C / 10 s max.                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Weight                   | 30 g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Thermal Impedance        | - Case to Ambient<br>12 K/W typ.<br>10 K/W typ. (with Heat Sink)                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Environmental Compliance | - REACH Declaration<br><a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a><br>REACH SVHC list compliant<br>REACH Annex XVII compliant<br><a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)<br>9975c105-3aca-40b8-82cc-db9489b95dde |
|                          | - RoHS Declaration                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|                          | - SCIP Reference Number                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/ten40n](http://www.tracopower.com/overview/ten40n)

### Outline Dimensions



h=11.0 (0.43) for 24 VDC output models

h=10.2 (0.40) for other models

Dimensions in mm (inch)

Tolerances: x.x ±0.25 (x.xx ±0.01)

x.xx ±0.13 (x.xxx ±0.005)

Pin diameter tolerances: x.x ±0.05 (x.xx ±0.002)

### Pinout

| Pin | Single        | Dual          |
|-----|---------------|---------------|
| 1   | +Vin (Vcc)    | +Vin (Vcc)    |
| 2   | -Vin (GND)    | -Vin (GND)    |
| 3   | Remote On/Off | Remote On/Off |
| 4   | +Vout         | +Vout         |
| 5   | -Vout         | Common        |
| 6   | Trim          | -Vout         |