

- Compact 1" x 1" metal package
- EN 50155 and EN 61373 approval for railway applications
- Qualification for fire behavior according to EN 45545-2
- Wide 4:1 input voltage: 9-36, 18-75, 36-160 VDC
- Operating temperature range -40 to +80 °C without derating
- High efficiency up to 90%
- 3000 VDC I/O-isolation
- Protection against overload, overvoltage and short circuit
- Remote On/Off and Trim function
- 3-year product warranty



The THN 10WIR series is a family of ruggedized 10 Watt DC/DC converters for highest reliability in harsh environments. The converters have a wide 4:1 input range and increased resistance against electromagnetic interference, shock/vibration and thermal shock and come in a six-side shielded 1" x 1" metal package. The innovative design provides high efficiencies up to 90% and thus enable an operating temperature range from -40 to +80°C without derating. The approvals according to standards EN 50155 and EN 61373 qualify them for railway and transportation systems. Additional qualification for the fire behavior of components according to EN 45545-2 and the safety approval according IEC/EN 62368-1, UL62368-1 support a potential compliance test of the application. Built-in features like an internal EN 55032 class A filter, input under-voltage-lockout, short circuit protection, remote On/Off and output voltage trim make this series suitable for almost any application demands and thus facilitate the design-in process.

| Models         |                                |          |                  |          |                  |                 |
|----------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
| Order Code     | Input Voltage Range            | Output 1 |                  | Output 2 |                  | Efficiency typ. |
|                |                                | Vnom     | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| THN 10-2410WIR | 9 - 36 VDC<br>(24 VDC nom.)    | 3.3 VDC  | 3'000 mA         |          |                  | 87 %            |
| THN 10-2411WIR |                                | 5 VDC    | 2'000 mA         |          |                  | 89 %            |
| THN 10-2412WIR |                                | 12 VDC   | 830 mA           |          |                  | 89 %            |
| THN 10-2413WIR |                                | 15 VDC   | 670 mA           |          |                  | 90 %            |
| THN 10-2415WIR |                                | 24 VDC   | 420 mA           |          |                  | 90 %            |
| THN 10-2421WIR |                                | +5 VDC   | 1'000 mA         | -5 VDC   | 1'000 mA         | 86 %            |
| THN 10-2422WIR |                                | +12 VDC  | 416 mA           | -12 VDC  | 416 mA           | 89 %            |
| THN 10-2423WIR |                                | +15 VDC  | 333 mA           | -15 VDC  | 333 mA           | 89 %            |
| THN 10-2425WIR |                                | +24 VDC  | 210 mA           | -24 VDC  | 210 mA           | 90 %            |
| THN 10-4810WIR | 18 - 75 VDC<br>(48 VDC nom.)   | 3.3 VDC  | 3'000 mA         |          |                  | 87 %            |
| THN 10-4811WIR |                                | 5 VDC    | 2'000 mA         |          |                  | 89 %            |
| THN 10-4812WIR |                                | 12 VDC   | 830 mA           |          |                  | 89 %            |
| THN 10-4813WIR |                                | 15 VDC   | 670 mA           |          |                  | 90 %            |
| THN 10-4815WIR |                                | 24 VDC   | 420 mA           |          |                  | 90 %            |
| THN 10-4821WIR |                                | +5 VDC   | 1'000 mA         | -5 VDC   | 1'000 mA         | 86 %            |
| THN 10-4822WIR |                                | +12 VDC  | 416 mA           | -12 VDC  | 416 mA           | 89 %            |
| THN 10-4823WIR |                                | +15 VDC  | 333 mA           | -15 VDC  | 333 mA           | 89 %            |
| THN 10-4825WIR |                                | +24 VDC  | 210 mA           | -24 VDC  | 210 mA           | 90 %            |
| THN 10-7210WIR | 36 - 160 VDC<br>(110 VDC nom.) | 3.3 VDC  | 3'000 mA         |          |                  | 87 %            |
| THN 10-7211WIR |                                | 5 VDC    | 2'000 mA         |          |                  | 88 %            |
| THN 10-7212WIR |                                | 12 VDC   | 830 mA           |          |                  | 89 %            |
| THN 10-7213WIR |                                | 15 VDC   | 670 mA           |          |                  | 89 %            |
| THN 10-7215WIR |                                | 24 VDC   | 420 mA           |          |                  | 89 %            |
| THN 10-7221WIR |                                | +5 VDC   | 1'000 mA         | -5 VDC   | 1'000 mA         | 85 %            |
| THN 10-7222WIR |                                | +12 VDC  | 416 mA           | -12 VDC  | 416 mA           | 89 %            |
| THN 10-7223WIR |                                | +15 VDC  | 333 mA           | -15 VDC  | 333 mA           | 89 %            |
| THN 10-7225WIR |                                | +24 VDC  | 210 mA           | -24 VDC  | 210 mA           | 89 %            |

### Options

|  |  |
|--|--|
| <b>THN-HS2</b>   | - Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs2.pdf">www.tracopower.com/products/thn-hs2.pdf</a>   |
| <b>on demand</b><br>(backorder with MOQ non stocking item) | - Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs3.pdf">www.tracopower.com/products/thn-hs3.pdf</a><br>- Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs4.pdf">www.tracopower.com/products/thn-hs4.pdf</a> |

### Input Specifications

|                        |              |  |
|------------------------|--------------|--|
| Input Current          | - At no load | 24 Vin models: <b>10 mA typ.</b><br>48 Vin models: <b>8 mA typ.</b><br>110 Vin models: <b>6 mA typ.</b>  |
| Surge Voltage          |              | 24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)<br>110 Vin models: <b>200 VDC max.</b> (1 s max.)  |
| Under Voltage Lockout  |              | 24 Vin models: <b>7.5 VDC min. / 8 VDC typ. / 8.8 VDC max.</b><br>48 Vin models: <b>15.5 VDC min. / 16 VDC typ. / 17.5 VDC max.</b><br>110 Vin models: <b>32 VDC min. / 34 VDC typ. / 35.5 VDC max.</b>              |
| Recommended Input Fuse |              | 24 Vin models: <b>2'000 mA</b> (slow blow)<br>48 Vin models: <b>1'250 mA</b> (slow blow)<br>110 Vin models: <b>630 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.) |
| Input Filter           |              | <b>Internal Pi-Type</b>  |

### Output Specifications

|  |  |  |
|--|--|--|
| Output Voltage Adjustment              |  | <b>±10%</b> (3.3 & 12 Vout models)<br><b>-10% to +20%</b> (other models)<br>(only single output)<br>(By external trim resistor)<br>See application note: <a href="http://www.tracopower.com/overview/thn10wir">www.tracopower.com/overview/thn10wir</a><br>Output power must not exceed rated power!   |
| Voltage Set Accuracy                   |  | <b>±1% max.</b>  |
| Regulation                             | - Input Variation (Vmin - Vmax)<br>- Load Variation (0 - 100%)<br>- Cross Regulation (25% / 100% asym. load) | single output models: <b>0.2% max.</b><br>dual output models: <b>0.5% max.</b><br>single output models: <b>0.2% max.</b><br>dual output models: <b>1% max.</b> (Output 1)<br><b>1% max.</b> (Output 2)<br>dual output models: <b>5% max.</b>   |
| Ripple and Noise<br>(20 MHz Bandwidth) | - single output<br>- dual output   | 3.3 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R)<br>5 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R)<br>12 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R)<br>15 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R)<br>24 Vout models: <b>100 mVp-p typ.</b> (w/ 2.2 µF X7R)<br>5 / -5 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R)<br>12 / -12 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R)<br>15 / -15 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R)<br>24 / -24 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 2.2 µF X7R) |
| Capacitive Load                        | - single output<br>- dual output   | 3.3 Vout models: <b>3'500 µF max.</b><br>5 Vout models: <b>2'500 µF max.</b><br>12 Vout models: <b>430 µF max.</b><br>15 Vout models: <b>350 µF max.</b><br>24 Vout models: <b>125 µF max.</b><br>5 / -5 Vout models: <b>1'440 / 1'440 µF max.</b><br>12 / -12 Vout models: <b>250 / 250 µF max.</b><br>15 / -15 Vout models: <b>180 / 180 µF max.</b><br>24 / -24 Vout models: <b>56 / 56 µF max.</b>   |

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

|                           |  |
|---------------------------|--|
| Minimum Load              | Not required   |
| Temperature Coefficient   | ±0.02 %/K max.   |
| Start-up Time             | 30 ms typ. / 50 ms max.  |
| Short Circuit Protection  | Continuous, Automatic recovery   |
| Output Current Limitation | 170% typ. of I <sub>out</sub> max.   |
| Overvoltage Protection    | 112 - 164% of V <sub>out</sub> nom.<br>(depending on model)<br>3.7 - 5.4 VDC (3.3 VDC model)<br>6.3 - 7.4 VDC (±5 VDC model)<br>13.5 - 19.6 VDC (±12 VDC model)<br>18.3 - 22 VDC (±15 VDC model)<br>29.1 - 32.5 VDC (±24 VDC model)) |
| Transient Response        | - Response Time<br>250 µs typ. (25% Load Step)   |

### Safety Specifications

|                  |  |   |
|------------------|--|---|
| Safety Standards | - IT / Multimedia Equipment<br><br>- Railway Applications<br>- Certification Documents | EN 62368-1<br>IEC 62368-1<br>UL 62368-1<br>EN 50155<br><a href="http://www.tracopower.com/overview/thn10wir">www.tracopower.com/overview/thn10wir</a> |
| Pollution Degree |  | PD 2  |

### EMC Specifications

|               |  |  |
|---------------|--|--|
| EMI Emissions | - Conducted Emissions<br><br>- Radiated Emissions  | EN 50121-3-2 (EMC for Rolling Stock)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)   |
|               |  | External filter proposal: <a href="http://www.tracopower.com/overview/thn10wir">www.tracopower.com/overview/thn10wir</a>   |
| EMS Immunity  | - Electrostatic Discharge<br><br>- RF Electromagnetic Field<br>- EFT (Burst) / Surge<br><br>- Conducted RF Disturbances<br>- PF Magnetic Field | EN 50155 (Railway Applications)<br>Air: EN 61000-4-2, ±8 kV, perf. criteria A<br>Contact: EN 61000-4-2, ±6 kV, perf. criteria A<br>EN 61000-4-3, 20 V/m, perf. criteria A<br>EN 61000-4-4, ±2 kV, perf. criteria A<br>EN 61000-4-5, ±2 kV, perf. criteria A<br>Ext. input component: 24 Vin models: KY 470 µF // TVS SMDJ58A<br>48 Vin models: KY 330 µF // TVS SMDJ120A<br>110 Vin models: KXJ 220 µF // TVS SMDJ300A<br>EN 61000-4-6, 10 V <sub>rms</sub> , perf. criteria A<br>Continuous: EN 61000-4-8, 100 A/m, perf. criteria A<br>1 s: EN 61000-4-8, 1000 A/m, perf. criteria A |

### General Specifications

|                    |   |   |
|--------------------|---|---|
| Relative Humidity  |   | 95% max. (non condensing)   |
| Temperature Ranges | - Operating Temperature<br>- Case Temperature<br>- Storage Temperature                    | -40°C to +95°C<br>+105°C max.<br>-55°C to +125°C  |
| Power Derating     | - High Temperature  | Depending on model<br>Depending on model (with Heat Sink)<br>See application note: <a href="http://www.tracopower.com/overview/thn10wir">www.tracopower.com/overview/thn10wir</a> |
| Cooling System     |   | Natural convection (20 LFM)   |
| Remote Control     | - Voltage Controlled Remote<br><br>- Off Idle Input Current<br>- Remote Pin Input Current | On: 3.0 to 15 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 1.0 mA                                     |

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

|                           |                                 |  |
|---------------------------|---------------------------------|--|
| Altitude During Operation |                                 | 5'000 m max.   |
| Switching Frequency       |                                 | 260 - 320 kHz (PWM) (3.3 & 5 Vout models)<br>325 - 395 kHz (PWM) (other models)  |
| Insulation System         |                                 | Functional Insulation  |
| Isolation Test Voltage    | - Input to Output, 60 s         | 3'000 VDC  |
|                           | - Input to Case, 60 s           | 2'250 VDC  |
|                           | - Output to Case, 60 s          | 2'250 VDC  |
| Isolation Resistance      | - Input to Output, 500 VDC      | 1'000 MΩ min.  |
| Isolation Capacitance     | - Input to Output, 100 kHz, 1 V | 1'000 pF max.  |
| Reliability               | - Calculated MTBF               | 2'334'000 h (MIL-HDBK-217F, ground benign)   |
| Washing Process           |                                 | Allowed (hermetical product)   |
|                           | See Cleaning Guideline:         | <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>   |
| Environment               | - Vibration                     | MIL-STD-810F<br>EN 61373   |
|                           | - Mechanical Shock              | MIL-STD-810F<br>EN 61373   |
|                           | - Thermal Shock                 | MIL-STD-810F<br>EN 50155   |
| Housing Material          |                                 | Copper   |
| Base Material             |                                 | Non-conductive FR4 (UL 94 V-0 rated)   |
| Potting Material          |                                 | Epoxy (UL 94 V-0 rated)  |
| Pin Material              |                                 | Copper   |
| Pin Foundation Plating    |                                 | Nickel (2 - 3 μm)  |
| Pin Surface Plating       |                                 | Tin (3 - 5 μm), matte  |
| Housing Type              |                                 | Metal Case   |
| Mounting Type             |                                 | PCB Mount  |
| Connection Type           |                                 | THD (Through-Hole Device)  |
| Footprint Type            |                                 | 1" x 1"  |
| Soldering Profile         |                                 | Wave Soldering   |
| Weight                    |                                 | 16.5 g   |
| Thermal Impedance         | - Case to Ambient               | 16.8 K/W typ. (without heatsink)<br>13.2 K/W typ. (with heatsink THN-HS2)<br>11.0 K/W typ. (with heatsink THN-HS3)<br>9.4 K/W typ. (with heatsink THN-HS4)   |
| Environmental Compliance  | - REACH Declaration             | <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  |
|                           | - RoHS Declaration              | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.) |
|                           | - Flammability (EN 45545-2)     | <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>   |

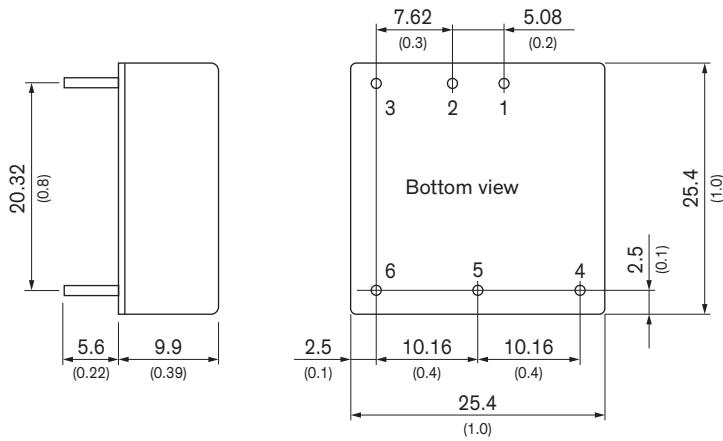
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/thn10wir](http://www.tracopower.com/overview/thn10wir)

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

**Outline Dimensions**



Dimensions in mm (inch)  
 Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin pitch tolerances  $\pm 0.25$  ( $\pm 0.01$ )  
 Pin diameter  $\varnothing 1.0$  (0.04)

| 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      | Trim          | Common        |
| 6      | -Vout         | -Vout         |