



**THE DATASHEET OF  
THN 20-1213**



- **Smallest encapsulated 20 W Converter!**  
Ultra compact size: 1.0" x 1.0" x 0.4"
- **Shielded metal case with isolated baseplate**
- **Wide 2:1 input voltage ranges**
- **Very high efficiency up to 90%**
- **Output voltage adjustable**
- **Remote On/Off control**
- **Operating temp. range -40°C to +75°C and up to 85 °C with heat-sink**
- **I/O isolation voltage 1500 VDC**
- **Input filter meets EN 55022 class A without external components**
- **3-year product warranty**



The THN 20 series is the latest generation of high performance DC/DC converter modules with highest power density. The product achieves 20 W output power while it comes in a metal case with dimensions of only 1.0" x 1.0" x 0.4". All models have a wide 2:1 input voltage range and precisely regulated output voltages, even under no load conditions. Highest efficiency of up to 90% makes this product very reliable and applicable in temperature ranges of up to 75°C or 85°C with optional mounted heat sink. Together with low input current characteristics at minimal load and remote On/Off control these converters are the ideal solution for battery-operated systems. 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> |                 |
| THN 20-1210 | 9 - 18 VDC<br>(12 VDC nom.)  | 3.3 VDC  | 4'500 mA         |          |                  | 89 %            |
| THN 20-1211 |                              | 5 VDC    | 4'000 mA         |          |                  | 89 %            |
| THN 20-1212 |                              | 12 VDC   | 1'670 mA         |          |                  | 89 %            |
| THN 20-1213 |                              | 15 VDC   | 1'330 mA         |          |                  | 89 %            |
| THN 20-1222 |                              | +12 VDC  | 833 mA           | -12 VDC  | 833 mA           | 89 %            |
| THN 20-1223 |                              | +15 VDC  | 667 mA           | -15 VDC  | 667 mA           | 90 %            |
| THN 20-2410 | 18 - 36 VDC<br>(24 VDC nom.) | 3.3 VDC  | 4'500 mA         |          |                  | 90 %            |
| THN 20-2411 |                              | 5 VDC    | 4'000 mA         |          |                  | 91 %            |
| THN 20-2412 |                              | 12 VDC   | 1'670 mA         |          |                  | 90 %            |
| THN 20-2413 |                              | 15 VDC   | 1'330 mA         |          |                  | 91 %            |
| THN 20-2422 |                              | +12 VDC  | 833 mA           | -12 VDC  | 833 mA           | 90 %            |
| THN 20-2423 |                              | +15 VDC  | 667 mA           | -15 VDC  | 667 mA           | 90 %            |
| THN 20-4810 | 36 - 75 VDC<br>(48 VDC nom.) | 3.3 VDC  | 4'500 mA         |          |                  | 90 %            |
| THN 20-4811 |                              | 5 VDC    | 4'000 mA         |          |                  | 90 %            |
| THN 20-4812 |                              | 12 VDC   | 1'670 mA         |          |                  | 90 %            |
| THN 20-4813 |                              | 15 VDC   | 1'330 mA         |          |                  | 90 %            |
| THN 20-4822 |                              | +12 VDC  | 833 mA           | -12 VDC  | 833 mA           | 89 %            |
| THN 20-4823 |                              | +15 VDC  | 667 mA           | -15 VDC  | 667 mA           | 90 %            |

### Options

|         |  |
|---------|--|
| THN-HS1 | - Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs1.pdf">www.tracopower.com/products/thn-hs1.pdf</a> |
|---------|--|

## Input Specifications

|                          |                |   |
|--------------------------|----------------|---|
| Input Current            | - At no load   | 12 Vin models: <b>10 mA typ.</b><br>24 Vin models: <b>6 mA typ.</b><br>48 Vin models: <b>4 mA typ.</b>  |
|                          | - At full load | 12 Vin models: <b>1'510 mA typ.</b> (3.3 Vout model)<br><b>1'960 mA typ.</b> (5 Vout model)<br><b>1'960 mA typ.</b> (12 Vout model)<br><b>1'960 mA typ.</b> (15 Vout model)<br><b>1'960 mA typ.</b> (12 / -12 Vout model)<br><b>1'960 mA typ.</b> (15 / -15 Vout model)<br>24 Vin models: <b>755 mA typ.</b> (3.3 Vout model)<br><b>970 mA typ.</b> (5 Vout model)<br><b>970 mA typ.</b> (12 Vout model)<br><b>970 mA typ.</b> (15 Vout model)<br><b>970 mA typ.</b> (12 / -12 Vout model)<br><b>970 mA typ.</b> (15 / -15 Vout model)<br>48 Vin models: <b>375 mA typ.</b> (3.3 Vout model)<br><b>485 mA typ.</b> (5 Vout model)<br><b>485 mA typ.</b> (12 Vout model)<br><b>485 mA typ.</b> (15 Vout model)<br><b>485 mA typ.</b> (12 / -12 Vout model)<br><b>485 mA typ.</b> (15 / -15 Vout model) |
| Surge Voltage            |                | 12 Vin models: <b>25 VDC max.</b> (1 s max.)<br>24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)   |
| Under Voltage Lockout    |                | 12 Vin models: <b>7.5 VDC min. / 8 VDC typ. / 8.8 VDC max.</b><br>24 Vin models: <b>15.5 VDC min. / 16 VDC typ. / 17.5 VDC max.</b><br>48 Vin models: <b>32.5 VDC min. / 33 VDC typ. / 35.5 VDC max.</b>  |
| Reflected Ripple Current |                | <b>30 mA<sub>p-p</sub> typ.</b>   |
| Recommended Input Fuse   |                | 12 Vin models: <b>4'000 mA</b> (slow blow)<br>24 Vin models: <b>2'000 mA</b> (slow blow)<br>48 Vin models: <b>1'250 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           |  | -10% to +20% (24 Vout models)<br><b>±10%</b> (other models)<br>(single output models only)<br>(By external trim resistor)<br>See application note: <a href="http://www.tracopower.com/overview/thn20">www.tracopower.com/overview/thn20</a><br>Output power must not exceed rated power!                         |
| Voltage Set Accuracy                |  | <b>±1% max.</b>  |
| Regulation                          | - Input Variation (Vmin - Vmax)            | single output models: <b>0.2% max.</b><br>dual output models: <b>0.5% max.</b>   |
|                                     | - Load Variation (0 - 100%)                | 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)   |
|                                     | - Cross Regulation (25% / 100% asym. load) | dual output models: <b>5% max.</b>   |
| Ripple and Noise (20 MHz Bandwidth) | - single output                            | 3.3 Vout models: <b>75 mV<sub>p-p</sub> typ.</b> (w/ 1 µF X7R    10 µF TC)<br>5 Vout models: <b>75 mV<sub>p-p</sub> typ.</b> (w/ 1 µF X7R    10 µF TC)<br>12 Vout models: <b>75 mV<sub>p-p</sub> typ.</b> (w/ 1 µF X7R    10 µF TC)<br>15 Vout models: <b>75 mV<sub>p-p</sub> typ.</b> (w/ 1 µF X7R    10 µF TC) |
|                                     | - dual output                              | 12 / -12 Vout models: <b>100 / 100 mV<sub>p-p</sub> typ.</b> (w/ 1 µF X7R    10 µF TC)<br>15 / -15 Vout models: <b>100 / 100 mV<sub>p-p</sub> typ.</b> (w/ 1 µF X7R    10 µF TC)   |

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

|                           |                 |  |
|---------------------------|-----------------|--|
| Capacitive Load           | - single output | 3.3 Vout models: 7'000 µF max.<br>5 Vout models: 5'000 µF max.<br>12 Vout models: 850 µF max.<br>15 Vout models: 700 µF max. |
|                           | - dual output   | 12 / -12 Vout models: 500 / 500 µF max.<br>15 / -15 Vout models: 350 / 350 µF max.   |
| Minimum Load              |                 | Not required   |
| Temperature Coefficient   |                 | ±0.02 %/K max.   |
| Start-up Time             |                 | 30 ms max.   |
| Short Circuit Protection  |                 | Continuous, Automatic recovery   |
| Output Current Limitation |                 | 110 - 190% of Iout max.  |
|                           |                 | 150% typ. of Iout max.   |
| Overvoltage Protection    |                 | 112 - 164% of Vout nom.  |
| Transient Response        | - Response Time | 250 µs typ. (25% Load Step)  |

### Safety Specifications

|                       |                             |  |
|-----------------------|-----------------------------|--|
| Standards             | - IT / Multimedia Equipment | 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/thn20">www.tracopower.com/overview/thn20</a> |
| Pollution Degree      |                             | PD 2   |
| Over Voltage Category |                             | OVC I  |

### EMC Specifications

|               |                             |  |
|---------------|-----------------------------|--|
| EMI Emissions | - Conducted Emissions       | EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)                        |
|               | - Radiated Emissions        | EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)                        |
|               | External filter proposal:   | <a href="http://www.tracopower.com/overview/thn20">www.tracopower.com/overview/thn20</a>             |
| EMS Immunity  | - Electrostatic Discharge   | Air: EN 61000-4-2, ±8 kV, perf. criteria A<br>Contact: EN 61000-4-2, ±6 kV, perf. criteria A         |
|               | - RF Electromagnetic Field  | EN 61000-4-3, 10 V/m, perf. criteria A   |
|               | - EFT (Burst) / Surge       | EN 61000-4-4, ±2 kV, perf. criteria A<br>EN 61000-4-5, ±2 kV, perf. criteria A                       |
|               | - Conducted RF Disturbances | Ext. input component: 220 µF, 100 V<br>EN 61000-4-6, 10 Vrms, perf. criteria A                       |
|               | - PF Magnetic Field         | 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                    | -40°C to +75°C<br>-40°C to +85°C (with Heat Sink)  |
|                    | - Case Temperature                         | +105°C max.  |
|                    | - Storage Temperature                      | -55°C to +125°C  |
| Power Derating     | - High Temperature                         | Depending on model<br>See application note: <a href="http://www.tracopower.com/overview/thn20">www.tracopower.com/overview/thn20</a> |
| Cooling System     |  | Natural convection (20 LFM)  |
| Remote Control     | - Voltage Controlled Remote (passive = on) | 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                         |
|                    | - Off Idle Input Current                   | 2 mA typ.  |
|                    | - Remote Pin Input Current                 | -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.  |
| Regulator Topology        |                                 | Flyback Converter   |
| Switching Frequency       |                                 | 275 kHz typ. (PWM) ( $\pm 10\%$ , 3.3 & 5 Vout model)<br>330 kHz typ. (PWM) ( $\pm 10\%$ , other models)  |
| Insulation System         |                                 | Functional Insulation   |
| Isolation Test Voltage    | - Input to Output, 60 s         | 1'600 VDC   |
|                           | - Input to Case, 60 s           | 1'000 VDC   |
|                           | - Output to Case, 60 s          | 1'000 VDC   |
| Isolation Resistance      | - Input to Output, 500 VDC      | 1'000 M $\Omega$ min.   |
| Isolation Capacitance     | - Input to Output, 100 kHz, 1 V | 1'000 pF max.   |
| Reliability               | - Calculated MTBF               | 1'400'000 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>   |
| Environment               | - Vibration                     | MIL-STD-810F  |
|                           | - Thermal Shock                 | MIL-STD-810F  |
| Housing Material          |                                 | Copper, Nickel plated   |
| Base Material             |                                 | Non-conductive FR4 (UL 94 V-0 rated)  |
| Potting Material          |                                 | Silicone (UL 94 V-0 rated)  |
| Pin Material              |                                 | Copper  |
| Pin Foundation Plating    |                                 | Nickel (2 - 3 $\mu\text{m}$ )   |
| Pin Surface Plating       |                                 | Tin (3 - 5 $\mu\text{m}$ ), matte   |
| Housing Type              |                                 | Metal Case  |
| Mounting Type             |                                 | PCB Mount   |
| Connection Type           |                                 | THD (Through-Hole Device)   |
| Footprint Type            |                                 | 1" x 1"   |
| Soldering Profile         |                                 | Lead-Free Wave Soldering<br>265°C / 10 s max.   |
| Weight                    |                                 | 15 g  |
| Thermal Impedance         | - Case to Ambient               | 17.6 K/W typ.<br>14.8 K/W typ. (with Heat Sink)   |
| 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)) |
|                           | - SCIP Reference Number         | 47872c3c-f3a0-4ad5-ab75-2fa773c171c1  |

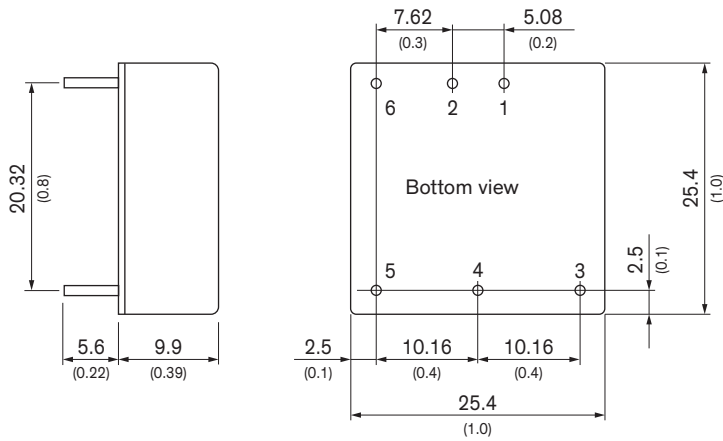
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/thn20](http://www.tracopower.com/overview/thn20)

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      | +Vout         | +Vout         |
| 4      | Trim          | Common        |
| 5      | -Vout         | -Vout         |
| 6      | Remote On/Off | Remote On/Off |

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