



# THE DATASHEET OF THN 20-2423

- **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<br>(25% / 100% asym. load) | dual output models: <b>5% max.</b>                                                                                                                                                                                                                                                       |
|                                        |                                               |                                                                                                                                                                                                                                                                                          |
| Ripple and Noise<br>(20 MHz Bandwidth) | - single output                               | 3.3 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R    10 µF TC)<br>5 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R    10 µF TC)<br>12 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R    10 µF TC)<br>15 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R    10 µF TC)                     |
|                                        | - dual output                                 | 12 / -12 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 1 µF X7R    10 µF TC)<br>15 / -15 Vout models: <b>100 / 100 mVp-p 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.

## Safety Specifications

## EMC Specifications

## General Specifications

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<br>- Input to Case, 60 s<br>- Output to Case, 60 s                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
|                           | 1'600 VDC<br>1'000 VDC<br>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<br>- Thermal Shock                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|                           | MIL-STD-810F<br>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 $\mu$ m)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Pin Surface Plating       | Tin (3 - 5 $\mu$ 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<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>- RoHS Declaration<br><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).)<br>- SCIP Reference Number<br>47872c3c-f3a0-4ad5-ab75-2fa773c171c1 |

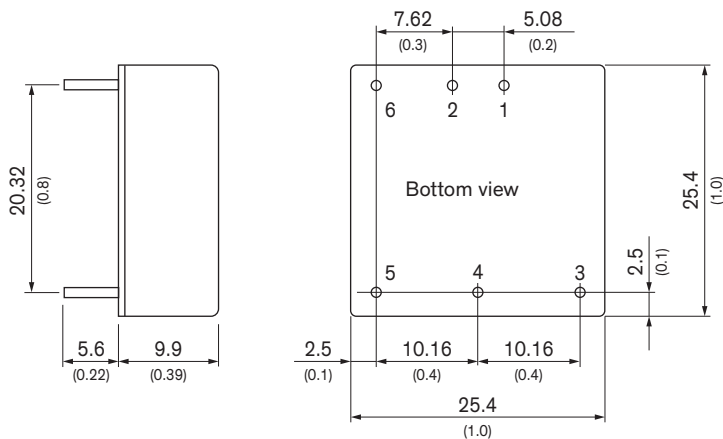
## Supporting Documents

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



| 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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