

## DC/DC Converter

## THN 15 Series, 15 Watt

- **Smallest encapsulated 15 W Converter!**  
Ultra compact size: 1.0" x 1.0" x 0.4"
- **Shielded metal case with isolated baseplate**
- **Wide 2:1 input ranges:**  
9-18, 18-36 or 36-75 VDC
- **Output voltage Trim**
- **I/O isolation voltage 1600 VDC**
- **Very high efficiency up to 88%**
- **Operating temp. range:**  
-40°C to +85°C
- **Remote On/Off control**
- **Industry standard pinout**
- **3-year product warranty**



The THN 15 series is the latest generation of high performance DC/DC converter modules setting new standards concerning power density. This product with 15 W comes in a encapsulated, shielded metal package with dimensions of only 1.0" x 1.0" x 0.4" and occupies 50% (!) less board space. All models have wide 2:1 input voltage range and precisely regulated, isolated output voltages. Advanced circuit design provides high efficiency up to 88% which allows an operating temperature range of -40°C to +85°C (with derating). Further features include remote On/Off and trimmable output. Typical applications for these converters are mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on 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 15-1210 | 9 - 18 VDC<br>(12 VDC nom.)  | 3.3 VDC  | 4'000 mA         |          |                  | 84 %            |
| THN 15-1211 |                              | 5 VDC    | 3'000 mA         |          |                  | 88 %            |
| THN 15-1212 |                              | 12 VDC   | 1'300 mA         |          |                  | 86 %            |
| THN 15-1213 |                              | 15 VDC   | 1'000 mA         |          |                  | 88 %            |
| THN 15-1215 |                              | 24 VDC   | 625 mA           |          |                  | 90 %            |
| THN 15-1221 |                              | +5 VDC   | 1'500 mA         | -5 VDC   | 1'500 mA         | 85 %            |
| THN 15-1222 |                              | +12 VDC  | 625 mA           | -12 VDC  | 625 mA           | 87 %            |
| THN 15-1223 |                              | +15 VDC  | 500 mA           | -15 VDC  | 500 mA           | 88 %            |
| THN 15-1225 |                              | +24 VDC  | 315 mA           | -24 VDC  | 315 mA           | 90 %            |
| THN 15-2410 | 18 - 36 VDC<br>(24 VDC nom.) | 3.3 VDC  | 4'000 mA         |          |                  | 86 %            |
| THN 15-2411 |                              | 5 VDC    | 3'000 mA         |          |                  | 88 %            |
| THN 15-2412 |                              | 12 VDC   | 1'300 mA         |          |                  | 87 %            |
| THN 15-2413 |                              | 15 VDC   | 1'000 mA         |          |                  | 88 %            |
| THN 15-2415 |                              | 24 VDC   | 625 mA           |          |                  | 90 %            |
| THN 15-2421 |                              | +5 VDC   | 1'500 mA         | -5 VDC   | 1'500 mA         | 85 %            |
| THN 15-2422 |                              | +12 VDC  | 625 mA           | -12 VDC  | 625 mA           | 88 %            |
| THN 15-2423 |                              | +15 VDC  | 500 mA           | -15 VDC  | 500 mA           | 88 %            |
| THN 15-2425 |                              | +24 VDC  | 315 mA           | -24 VDC  | 315 mA           | 90 %            |
| THN 15-4810 | 36 - 75 VDC<br>(48 VDC nom.) | 3.3 VDC  | 4'000 mA         |          |                  | 86 %            |
| THN 15-4811 |                              | 5 VDC    | 3'000 mA         |          |                  | 88 %            |
| THN 15-4812 |                              | 12 VDC   | 1'300 mA         |          |                  | 88 %            |
| THN 15-4813 |                              | 15 VDC   | 1'000 mA         |          |                  | 88 %            |
| THN 15-4815 |                              | 24 VDC   | 625 mA           |          |                  | 91 %            |
| THN 15-4821 |                              | +5 VDC   | 1'500 mA         | -5 VDC   | 1'500 mA         | 85 %            |
| THN 15-4822 |                              | +12 VDC  | 625 mA           | -12 VDC  | 625 mA           | 89 %            |
| THN 15-4823 |                              | +15 VDC  | 500 mA           | -15 VDC  | 500 mA           | 88 %            |
| THN 15-4825 |                              | +24 VDC  | 315 mA           | -24 VDC  | 315 mA           | 91 %            |

## Options

|                                                            |                                                                                                                              |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| <b>THN-HS1</b>                                             | - Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs1.pdf">www.tracopower.com/products/thn-hs1.pdf</a>   |
| <b>on demand</b><br>(backorder with MOQ non stocking item) | - Optional models without remote and trim pins<br>- Optional models without remote pin<br>- Optional models without trim pin |

## Input Specifications

|                        |              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
|------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input Current          | - At no load | 12 Vin models: <b>120 mA typ.</b> (3.3 Vout model)<br><b>90 mA typ.</b> (5 Vout model)<br><b>30 mA typ.</b> (12 Vout model)<br><b>30 mA typ.</b> (15 Vout model)<br><b>12 mA typ.</b> (24 Vout model)<br><b>30 mA typ.</b> (5 / -5 Vout model)<br><b>30 mA typ.</b> (12 / -12 Vout model)<br><b>30 mA typ.</b> (15 / -15 Vout model)<br><b>17 mA typ.</b> (24 / -24 Vout model)<br>24 Vin models: <b>50 mA typ.</b> (3.3 Vout model)<br><b>65 mA typ.</b> (5 Vout model)<br><b>20 mA typ.</b> (12 Vout model)<br><b>20 mA typ.</b> (15 Vout model)<br><b>10 mA typ.</b> (24 Vout model)<br><b>15 mA typ.</b> (5 / -5 Vout model)<br><b>15 mA typ.</b> (12 / -12 Vout model)<br><b>25 mA typ.</b> (15 / -15 Vout model)<br><b>12 mA typ.</b> (24 / -24 Vout model)<br>48 Vin models: <b>25 mA typ.</b> (3.3 Vout model)<br><b>35 mA typ.</b> (5 Vout model)<br><b>12 mA typ.</b> (12 Vout model)<br><b>12 mA typ.</b> (15 Vout model)<br><b>10 mA typ.</b> (24 Vout model)<br><b>12 mA typ.</b> (5 / -5 Vout model)<br><b>15 mA typ.</b> (12 / -12 Vout model)<br><b>20 mA typ.</b> (15 / -15 Vout model)<br><b>10 mA typ.</b> (24 / -24 Vout model) |
| Surge Voltage          |              | 12 Vin models: <b>36 VDC max.</b> (100 ms max.)<br>24 Vin models: <b>50 VDC max.</b> (100 ms max.)<br>48 Vin models: <b>100 VDC max.</b> (100 ms max.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Under Voltage Lockout  |              | 12 Vin models: <b>7 VDC min. / 8 VDC typ. / 8.8 VDC max.</b><br>24 Vin models: <b>14.5 VDC min. / 15.5 VDC typ. / 17.5 VDC max.</b><br>48 Vin models: <b>32 VDC min. / 33.5 VDC typ. / 35 VDC max.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Recommended Input Fuse |              | 12 Vin models: <b>3'150 mA</b> (slow blow)<br>24 Vin models: <b>1'600 mA</b> (slow blow)<br>48 Vin models: <b>1'000 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 single models)<br>±10% (other single models)<br>(By external trim resistor)<br>See application note: <a href="http://www.tracopower.com/overview/thn15">www.tracopower.com/overview/thn15</a><br>Output power must not exceed rated power! |
| Voltage Set Accuracy      | <b>±1% max.</b>                                                                                                                                                                                                                                                  |

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

|                                        |                                            |                       |                                                                |
|----------------------------------------|--------------------------------------------|-----------------------|----------------------------------------------------------------|
| Regulation                             | - Input Variation (Vmin - Vmax)            | single output models: | <b>0.2% max.</b>                                               |
|                                        |                                            | dual output models:   | <b>0.5% max.</b>                                               |
|                                        | - Load Variation (0 - 100%)                | single output models: | <b>0.2% max.</b>                                               |
|                                        |                                            | dual output models:   | <b>1% max. (Output 1)</b><br><b>1% max. (Output 2)</b>         |
|                                        | - Cross Regulation (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 $\mu$ F MC // 10 $\mu$ F TC)        |
|                                        |                                            | 5 Vout models:        | <b>75 mVp-p typ.</b> (w/ 1 $\mu$ F MC // 10 $\mu$ F TC)        |
|                                        |                                            | 12 Vout models:       | <b>100 mVp-p typ.</b> (w/ 1 $\mu$ F MC // 10 $\mu$ F TC)       |
|                                        |                                            | 15 Vout models:       | <b>100 mVp-p typ.</b> (w/ 1 $\mu$ F MC // 10 $\mu$ F TC)       |
|                                        |                                            | 24 Vout models:       | <b>100 mVp-p typ.</b> (w/ 6.8 $\mu$ F MC)                      |
|                                        | - dual output                              | 5 / -5 Vout models:   | <b>100 / 100 mVp-p typ.</b> (w/ 1 $\mu$ F MC // 10 $\mu$ F TC) |
|                                        |                                            | 12 / -12 Vout models: | <b>100 / 100 mVp-p typ.</b> (w/ 1 $\mu$ F MC // 10 $\mu$ F TC) |
|                                        |                                            | 15 / -15 Vout models: | <b>100 / 100 mVp-p typ.</b> (w/ 1 $\mu$ F MC // 10 $\mu$ F TC) |
|                                        |                                            | 24 / -24 Vout models: | <b>100 / 100 mVp-p typ.</b> (w/ 4.7 $\mu$ F MC)                |
|                                        |                                            |                       |                                                                |
| Capacitive Load                        | - single output                            | 3.3 Vout models:      | <b>12'000 <math>\mu</math>F max.</b>                           |
|                                        |                                            | 5 Vout models:        | <b>6'000 <math>\mu</math>F max.</b>                            |
|                                        |                                            | 12 Vout models:       | <b>1'000 <math>\mu</math>F max.</b>                            |
|                                        |                                            | 15 Vout models:       | <b>660 <math>\mu</math>F max.</b>                              |
|                                        |                                            | 24 Vout models:       | <b>200 <math>\mu</math>F max.</b>                              |
|                                        | - dual output                              | 5 / -5 Vout models:   | <b>3'000 / 3'000 <math>\mu</math>F max.</b>                    |
|                                        |                                            | 12 / -12 Vout models: | <b>520 / 520 <math>\mu</math>F max.</b>                        |
|                                        |                                            | 15 / -15 Vout models: | <b>330 / 330 <math>\mu</math>F max.</b>                        |
|                                        |                                            | 24 / -24 Vout models: | <b>100 / 100 <math>\mu</math>F max.</b>                        |
|                                        |                                            |                       |                                                                |
| Minimum Load                           |                                            |                       | <b>Not required</b>                                            |
| Temperature Coefficient                |                                            |                       | <b><math>\pm 0.02</math> %/K max.</b>                          |
| Start-up Time                          |                                            |                       | <b>30 ms max.</b>                                              |
| Short Circuit Protection               |                                            |                       | <b>Continuous, Automatic recovery</b>                          |
| Output Current Limitation              |                                            |                       | <b>120 - 175% of Iout max.</b>                                 |
|                                        |                                            |                       | <b>150% typ. of Iout max.</b>                                  |
| Overvoltage Protection                 |                                            |                       | <b>112 - 164% of Vout nom.</b>                                 |
| Transient Response                     | - Response Time                            |                       | <b>250 <math>\mu</math>s typ.</b> (25% Load Step)              |

## Safety Specifications

|                       |                             |                                                                                          |
|-----------------------|-----------------------------|------------------------------------------------------------------------------------------|
| Safety 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/thn15">www.tracopower.com/overview/thn15</a> |
| Pollution Degree      |                             | <b>PD 2</b>                                                                              |
| Over Voltage Category |                             | <b>OVC I</b>                                                                             |

## EMC Specifications

|                           |                       |                                                                                          |
|---------------------------|-----------------------|------------------------------------------------------------------------------------------|
| EMI Emissions             | - Conducted Emissions | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)       |
|                           | - Radiated Emissions  | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)       |
| External filter proposal: |                       | <a href="http://www.tracopower.com/overview/thn15">www.tracopower.com/overview/thn15</a> |

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

|              |                             |                       |                                            |
|--------------|-----------------------------|-----------------------|--------------------------------------------|
| EMS Immunity | - Electrostatic Discharge   | Air:                  | EN 61000-4-2, $\pm 8$ kV, perf. criteria A |
|              |                             | Contact:              | EN 61000-4-2, $\pm 6$ kV, perf. criteria A |
|              | - RF Electromagnetic Field  |                       | EN 61000-4-3, 10 V/m, perf. criteria A     |
|              | - EFT (Burst) / Surge       |                       | EN 61000-4-4, $\pm 2$ kV, perf. criteria A |
|              |                             |                       | EN 61000-4-5, $\pm 1$ kV, perf. criteria A |
|              |                             | Ext. input component: | 220 $\mu$ F, 100 V                         |
|              | - Conducted RF Disturbances |                       | EN 61000-4-6, 3 Vrms, perf. criteria A     |
|              | - PF Magnetic Field         | Continuous:           | EN 61000-4-8, 100 A/m, perf. criteria A    |
|              |                             | 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 +85°C                                                                                 |
|                           |                                 | -40°C to +90°C (with Heat Sink)                                                                |
|                           | - Case Temperature              | +105°C max.                                                                                    |
|                           | - Storage Temperature           | -55°C to +125°C                                                                                |
| Power Derating            | - High Temperature              | 2.86 %/K above 70°C                                                                            |
|                           |                                 | 3.3 %/K above 75°C (with Heat Sink)                                                            |
| Cooling System            |                                 | Natural convection (20 LFM)                                                                    |
| Remote Control            | - Voltage Controlled Remote     | On: 3.0 to 15 VDC or open circuit                                                              |
|                           |                                 | Off: 0 to 1.2 VDC or short circuit                                                             |
|                           |                                 | Refers to 'Remote' and '-Vin' Pin                                                              |
|                           | - Off Idle Input Current        | 2.5 mA typ.                                                                                    |
|                           | - Remote Pin Input Current      | -0.5 to 1.0 mA                                                                                 |
| Altitude During Operation |                                 | 5'000 m max.                                                                                   |
| Switching Frequency       |                                 | 360 - 440 kHz (PWM)                                                                            |
|                           |                                 | 400 kHz typ. (PWM)                                                                             |
| 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               | 1'600'000 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                                                                                   |
|                           |                                 | EN 61373                                                                                       |
|                           | - Thermal Shock                 | MIL-STD-810F                                                                                   |
| Housing Material          |                                 | Copper, Nickel plated                                                                          |
| 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 $\mu$ 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         |                                 | 265°C / 10 s max.                                                                              |
| Weight                    |                                 | 15 g                                                                                           |
|                           |                                 |                                                                                                |
| Thermal Impedance         |                                 | 18.2 K/W                                                                                       |
|                           |                                 | 15.8 K/W (with Heat Sink)                                                                      |

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

Environmental Compliance - REACH Declaration

[www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)

REACH SVHC list compliant

REACH Annex XVII compliant

[www.tracopower.com/info/rohs-declaration.pdf](http://www.tracopower.com/info/rohs-declaration.pdf)

Exemptions: 7a, 7c-I

(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.)

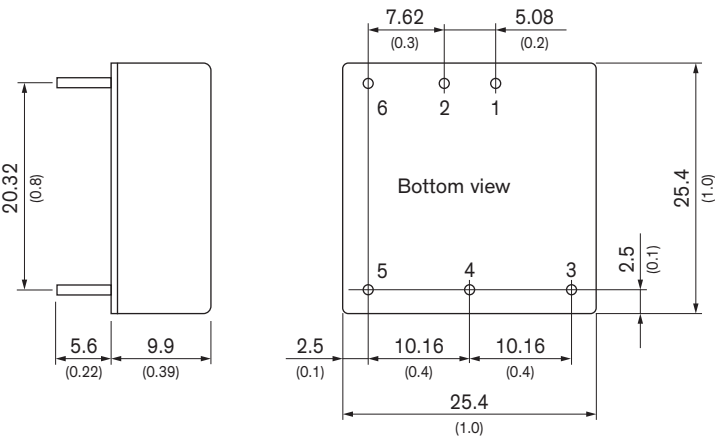
- RoHS Declaration

## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/thn15](http://www.tracopower.com/overview/thn15)

## 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 |