DC/DC Converter

- 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

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>THN 20-1210</td>
<td>3.3 VDC</td>
<td>4'500 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-1211</td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-1212</td>
<td>9 - 18 VDC (12 VDC nom.)</td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
</tr>
<tr>
<td>THN 20-1213</td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-1222</td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>-12 VDC</td>
<td>833 mA</td>
</tr>
<tr>
<td>THN 20-1223</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>-15 VDC</td>
<td>667 mA</td>
</tr>
<tr>
<td>THN 20-2410</td>
<td>3.3 VDC</td>
<td>4'500 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-2411</td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-2412</td>
<td>18 - 36 VDC (24 VDC nom.)</td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
</tr>
<tr>
<td>THN 20-2413</td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-2422</td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>-12 VDC</td>
<td>833 mA</td>
</tr>
<tr>
<td>THN 20-2423</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>-15 VDC</td>
<td>667 mA</td>
</tr>
<tr>
<td>THN 20-4810</td>
<td>3.3 VDC</td>
<td>4'500 mA</td>
<td></td>
<td></td>
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<tr>
<td>THN 20-4811</td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-4812</td>
<td>36 - 75 VDC (48 VDC nom.)</td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
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<tr>
<td>THN 20-4813</td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-4822</td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>-12 VDC</td>
<td>833 mA</td>
</tr>
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<td>THN 20-4823</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>-15 VDC</td>
<td>667 mA</td>
</tr>
</tbody>
</table>

### Options

### Input Specifications

<table>
<thead>
<tr>
<th>Input Current</th>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>At no load</strong></td>
<td>10 mA typ.</td>
<td>6 mA typ.</td>
<td>4 mA typ.</td>
</tr>
<tr>
<td><strong>At full load</strong></td>
<td>1'510 mA typ. (3.3 Vout model)</td>
<td>1'960 mA typ. (5 Vout model)</td>
<td>1'960 mA typ. (12 Vout model)</td>
</tr>
<tr>
<td></td>
<td>1'960 mA typ. (12 Vout model)</td>
<td>1'960 mA typ. (15 Vout model)</td>
<td>1'960 mA typ. (15 Vout model)</td>
</tr>
</tbody>
</table>

#### Surge Voltage

<table>
<thead>
<tr>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>25 VDC max.</td>
<td>50 VDC max.</td>
<td>100 VDC max.</td>
</tr>
</tbody>
</table>

#### Under Voltage Lockout

<table>
<thead>
<tr>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.5 VDC min.</td>
<td>15.5 VDC min.</td>
<td>32.5 VDC min.</td>
</tr>
<tr>
<td>/ 8 VDC typ.</td>
<td>/ 16 VDC typ.</td>
<td>/ 33 VDC typ.</td>
</tr>
<tr>
<td>/ 8.8 VDC max.</td>
<td>/ 17.5 VDC max.</td>
<td>/ 35.5 VDC max.</td>
</tr>
</tbody>
</table>

#### Reflected Ripple Current

<table>
<thead>
<tr>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
</table>

#### Recommended Input Fuse

<table>
<thead>
<tr>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>4'000 mA (slow blow)</td>
<td>2'000 mA (slow blow)</td>
<td>1'250 mA (slow blow)</td>
</tr>
</tbody>
</table>

(The need of an external fuse has to be assessed in the final application.)

**Input Filter**

Internal Pi-Type

### Output Specifications

**Output Voltage Adjustment**

-10% to +20% (24 Vout models)

±10% (other models)

(By external trim resistor)

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

Output power must not exceed rated power!

**Voltage Set Accuracy**

±1% max.

**Regulation**

- Input Variation (Vmin - Vmax)
  - Single output models: 0.2% max.
  - Dual output models: 0.5% max.

- Load Variation (0 - 100%)
  - Single output models: 0.2% max.
  - Dual output models: 1% max. (Output 1)
  - 1% max. (Output 2)

- Cross Regulation (25% / 100% asym. load)
  - Single output models: 5% max.

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
Ripple and Noise (20 MHz Bandwidth)  
- single output: 3.3 Vout models: 75 mVp-p typ. (w/ 1 µF X7R // 10 µF TC)  
- 5 Vout models: 75 mVp-p typ. (w/ 1 µF X7R // 10 µF TC)  
- 12 Vout models: 75 mVp-p typ. (w/ 1 µF X7R // 10 µF TC)  
- 15 Vout models: 75 mVp-p typ. (w/ 1 µF X7R // 10 µF TC)  
- dual output  
12 / -12 Vout models: 100 / 100 mVp-p typ. (w/ 1 µF X7R // 10 µF TC)  
15 / -15 Vout models: 100 / 100 mVp-p typ. (w/ 1 µF X7R // 10 µF TC)  

Capacitive Load  
- single output: 3.3 Vout models: 7'000 µF max.  
- 5 Vout models: 5'000 µF max.  
- 12 Vout models: 850 µF max.  
- 15 Vout models: 700 µF max.  
- dual output: 12 / -12 Vout models: 500 / 500 µF max.  
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 lout max.  
150% typ. of lout max.  

Overvoltage Protection  
112 - 164% of Vout nom.  

Transient Response  
- Response Time  
250 µs typ. (25% Load Step)  

Safety Specifications  
Safety Standards  
- IT / Multimedia Equipment  
EN 60950-1  
IEC 60950-1  
UL 60950-1  
- Certification Documents  
www.tracopower.com/overview/thn20  
Pollution Degree  
PD 2  
Over Voltage Degree  
OVC I  

EMC Specifications  
EMI Emissions  
- Conducted Emissions  
EN 55032 class A (internal filter)  
EN 55032 class B (with external filter)  
- Radiated Emissions  
EN 55032 class A (internal filter)  
EN 55032 class B (with external filter)  
External filter proposal: www.tracopower.com/overview/thn20  
EMS Immunity  
- Electrostatic Discharge  
Air: EN 61000-4-2, ±8 kV, perf. criteria A  
Contact: EN 61000-4-2, ±6 kV, perf. criteria A  
EN 61000-4-3, 10 V/m, perf. criteria A  
EN 61000-4-4, ±2 kV, perf. criteria A  
EN 61000-4-5, ±2 kV, perf. criteria A  
Ext input component: 220 µF, 100 V  
- Conducted RF Disturbances  
Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A  
1 s: EN 61000-4-8, 100 A/m, perf. criteria A  
- PF Magnetic Field  

General Specifications  
Relative Humidity  
95% max. (non condensing)  

Temperature Ranges  
- Operating Temperature  
-40°C to +75°C  
-40°C to +85°C (with Heat Sink)  
+105°C max.  
-55°C to +125°C  

Power Derating  
- High Temperature  
2 %/K above 60°C  
2 %/K above 70°C (with Heat Sink)  

Cooling System  
Natural convection (20 LFM)  

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

- Voltage Controlled Remote
  - Off Idle Input Current
  - Remote Pin Input Current

On: 3.0 to 15 VDC or open circuit
Off: 0 to 1.2 VDC or short circuit
Refers to 'Remote' and '-Vin' Pin

2 mA typ.
-0.5 to 1.0 mA

Altitude During Operation
2'000 m max.

Switching Frequency
275 kHz typ. (PWM) (+10%, 3.3 & 5 Vout model)
330 kHz typ. (PWM) (+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 MΩ min.
- Input to Output, 100 kHz, 1 V: 1'000 pF max.

Reliability
- Calculated MTBF
1'400'000 h (MIL-HDBK-217F, ground benign)

Environment
- Vibration
MIL-STD-810F
- Thermal Shock
MIL-STD-810F

Housing Material
Nickel coated Copper

Base Material
Non-conductive FR4 (UL94 V-0 rated)

Potting Material
Silicone (UL 94 V-0 rated)

Pin Material
Copper

Pin Foundation Plating
Nickel (2 - 3 µm)

Pin Surface Plating
Tin (3 - 5 µm), matte

Soldering Profile
265°C / 10 s max.

Connection Type
THD (Through-Hole Device)

Weight
15 g

Thermal Impedance
17.6 K/W
14.8 K/W (with Heat Sink)

Environmental Compliance
- Reach
www.tracopower.com/info/reach-declaration.pdf
- RoHS
www.tracopower.com/info/rohs-declaration.pdf

Supporting Documents
Overview Link (for additional Documents)
www.tracopower.com/overview/thn20

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

Dimensions in mm (inch)

- Tolerances: ±0.5 (±0.02)
- Pin pitch tolerances ±0.25 (±0.01)
- Pin diameter Ø 1.0 (0.04)

**Pinout**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>4</td>
<td>Trim</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>–Vout</td>
<td>–Vout</td>
</tr>
<tr>
<td>6</td>
<td>Remote On/Off</td>
<td>Remote On/Off</td>
</tr>
</tbody>
</table>