DC/DC Converter

THN 20WI Series, 20 Watt

- Ultra compact size: 1.0" x 1.0" x 0.4"
- Shielded metal casing with isolated baseplate
- Ultrawide 4:1 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 1600 VDC
- Input filter meets EN 55032 class A without external components
- 3-year product warranty

The THN 20WI series models are high performance DC/DC converters. They achieve 20 W output power and come in a small size metal casing (1.0" x 1.0" x 0.4"). The models feature an ultra-wide 4:1 input voltage range while the output voltages are precisely regulated even under no load conditions. Highest efficiency of up to 90% makes this product very reliable and applicable in temperature ranges of up to 85°C. The low no-load input current characteristics and the remote On/Off control make these converters an 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></th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>THN 20-2410WI</td>
<td>9 - 36 VDC</td>
<td>3.3 VDC</td>
<td>4'500 mA</td>
<td>24 VDC</td>
<td>833 mA</td>
</tr>
<tr>
<td>THN 20-2411WI</td>
<td></td>
<td>5 VDC</td>
<td>4'000 mA</td>
<td></td>
<td></td>
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<tr>
<td>THN 20-2411WI-A1</td>
<td></td>
<td>5 VDC</td>
<td>4'000 mA</td>
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<tr>
<td>THN 20-2412WI</td>
<td></td>
<td>12 VDC</td>
<td>1'670 mA</td>
<td></td>
<td></td>
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<tr>
<td>THN 20-2413WI</td>
<td></td>
<td>15 VDC</td>
<td>1'330 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THN 20-2415WI</td>
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<td>24 VDC</td>
<td>833 mA</td>
<td></td>
<td></td>
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<tr>
<td>THN 20-2422WI</td>
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<td>+12 VDC</td>
<td>833 mA</td>
<td>-12 VDC</td>
<td>833 mA</td>
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<tr>
<td>THN 20-2423WI</td>
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<td>+15 VDC</td>
<td>667 mA</td>
<td>-15 VDC</td>
<td>667 mA</td>
</tr>
<tr>
<td>THN 20-2425WI</td>
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<td>+24 VDC</td>
<td>417 mA</td>
<td>-24 VDC</td>
<td>417 mA</td>
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<tr>
<td>THN 20-4810WI</td>
<td>18 - 75 VDC</td>
<td>3.3 VDC</td>
<td>4'500 mA</td>
<td>24 VDC</td>
<td>833 mA</td>
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<tr>
<td>THN 20-4811WI</td>
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<td>5 VDC</td>
<td>4'000 mA</td>
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<td>THN 20-4811WI-A1</td>
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<td>5 VDC</td>
<td>4'000 mA</td>
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</tr>
</tbody>
</table>

Options

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
</table>

Note:
- Suffix -A1: Adjustable output up to 6 VDC, suitable for low ripple & noise applications in conjunction with an LDO regulator.
- ±24 Vout models: The output can also be used in serial circuit for single 48 VDC operation.

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### Input Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Current</td>
<td>– At no load</td>
<td>8 mA typ.</td>
</tr>
<tr>
<td>Surge Voltage</td>
<td>50 VDC max. (1 s max)</td>
<td>100 VDC max. (1 s max)</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>7.5 VDC min. / 8 VDC typ. / 8.8 VDC max.</td>
<td>15.5 VDC min. / 16 VDC typ. / 17.5 VDC max.</td>
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<tr>
<td>Reflected Ripple Current</td>
<td>30 mA/p-p typ.</td>
<td>30 mA/p-p typ.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>4'000 mA (Slow blow)</td>
<td>2'000 mA (Slow blow)</td>
</tr>
<tr>
<td>(The need of an external fuse has to be assessed in the final application.)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Filter</td>
<td>Internal Pi-Type</td>
<td></td>
</tr>
</tbody>
</table>

### Output Specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Voltage Adjustment</td>
<td>–10% to +20% (A1 &amp; 24 Vout models)</td>
<td>±10% (other single models)</td>
</tr>
<tr>
<td>Voltage Set Accuracy</td>
<td>±1% max.</td>
<td></td>
</tr>
<tr>
<td>Regulation</td>
<td>single output models: 0.2% max.</td>
<td>dual output models: 0.5% max.</td>
</tr>
<tr>
<td>- Input Variation (Vmin - Vmax)</td>
<td>single output models: 0.2% max.</td>
<td>dual output models: 1% max. (Output 1)</td>
</tr>
<tr>
<td>- Load Variation (0 - 100%)</td>
<td>dual output models: 1% max. (Output 2)</td>
<td></td>
</tr>
<tr>
<td>- Cross Regulation</td>
<td>dual output models: 5% max.</td>
<td></td>
</tr>
<tr>
<td>Capacitive Load</td>
<td>3.3 Vout models: 75 mVp-p typ. (w/ 1µF X7R // 10µF TC)</td>
<td>12 / -12 Vout models: 100 / 100 mVp-p typ. (w/ 1µF X7R // 10µF TC)</td>
</tr>
<tr>
<td>(20 MHz Bandwidth)</td>
<td>5 Vout models: 75 mVp-p typ. (w/ 1µF X7R // 10µF TC)</td>
<td>15 / -15 Vout models: 100 / 100 mVp-p typ. (w/ 1µF X7R // 10µF TC)</td>
</tr>
<tr>
<td></td>
<td>12 Vout models: 75 mVp-p typ. (w/ 1µF X7R // 10µF TC)</td>
<td>24 / -24 Vout models: 100 / 100 mVp-p typ. (w/ 4.7µF X7R)</td>
</tr>
<tr>
<td></td>
<td>15 Vout models: 75 mVp-p typ. (w/ 1µF X7R // 10µF TC)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 Vout models: 75 mVp-p typ. (w/ 6.8µF X7R)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5 Vout models: 5’000 µF max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 Vout models: 850 µF max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 Vout models: 700 µF max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 Vout models: 220 µF max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>12 / -12 Vout models: 500 / 500 µF max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>15 / -15 Vout models: 350 / 350 µF max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>24 / -24 Vout models: 100 / 100 µF max.</td>
<td></td>
</tr>
<tr>
<td>Minimum Load</td>
<td>Not required</td>
<td></td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td>±0.02 %/K max.</td>
<td></td>
</tr>
<tr>
<td>Start-up Time</td>
<td>30 ms max.</td>
<td></td>
</tr>
<tr>
<td>Short Circuit Protection</td>
<td>Continuous, Automatic recovery</td>
<td></td>
</tr>
<tr>
<td>Output Current Limitation</td>
<td>125 - 190% of Iout max.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>150% typ. of Iout max.</td>
<td></td>
</tr>
<tr>
<td>Overvoltage Protection</td>
<td>112 - 164% of Vout nom.</td>
<td></td>
</tr>
<tr>
<td>Transient Response</td>
<td>- Response Time</td>
<td>250 µs typ. (25% Load Step)</td>
</tr>
</tbody>
</table>

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

| Safety Standards | EN 60950-1
|                 | EN 62368-1
|                 | IEC 60950-1
|                 | IEC 62368-1
|                 | UL 60950-1
|                 | UL 62368-1
| Certification Documents | www.tracopower.com/overview/thn20wi

| Pollution Degree | PD 2
| Over Voltage Category | OVC

## EMC Specifications

| EMI Emissions | Conducted Emissions | EN 55032 class A (internal filter)
|               | Radiated Emissions  | EN 55032 class B (with external filter)
|               |                     | EN 55032 class A (internal filter)
|               |                     | EN 55032 class B (with external filter)

| EMS Immunity | Electrostatic Discharge | Air: EN 61000-4-2, ±8 kV, perf. criteria A
|              | 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
|              | Continuous: EN 61000-4-5, ±2 kV, perf. criteria A

| Conducted RF Disturbances | Ext. input component: 220 μF, 100 V
| PF Magnetic Field | Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A

| General Specifications |

| Relative Humidity | 95% max. (non condensing)
| Temperature Ranges | Operating Temperature: −40°C to +75°C
|                   | Case Temperature: −40°C to +85°C (with Heat Sink)
|                   | Storage Temperature: +105°C max.
|                   | −55°C to +125°C
| Power Derating | See application note: www.tracopower.com/overview/thn20wi

| Cooling System | Natural convection (20 LFM)
| 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 | 5'000 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
|                      | Input to Case, 60 s
|                      | Output to Case, 60 s
|                      | 1'600 VDC
|                      | 1'000 VDC
|                      | 1'000 VDC

| Isolation Resistance | Input to Output, 500 VDC
|                      | 1'000 MΩ min.
| Isolation Capacitance | Input to Output, 100 kHz, 1 V
|                      | 1'500 pF max.

| Reliability | Calculated MTBF
|             | 1'400'000 h (MIL-HDBK-217F, ground benign)
| Environment | Vibration
|             | Thermal Shock
|             | MIL-STD-810F
|             | MIL-STD-810F

| Housing Material | Copper, Nickel plated
| Base Material | Non-conductive FR4 (UL94 V-0 rated)
| Potting Material | Silicone (UL 94 V-0 rated)
| Pin Material | Copper

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
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 (with Heat Sink)

Environmental Compliance
- REACH Declaration
  - www.tracopower.com/info/reach-declaration.pdf
  - REACH SVHC list compliant
  - REACH Annex XVII compliant
- RoHS Declaration
  - 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.)

Supporting Documents
Overview Link (for additional Documents) | www.tracopower.com/overview/thn20wi

Outline Dimensions

<table>
<thead>
<tr>
<th>Pinout</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>

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