DC/DC Converters
THL 20WI Series, 20 Watt

Features

• Smallest encapsulated 20W converter!
  Ultra compact size: 1.0” x 1.0” x 0.4”
• Shielded metal case 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 1500 VDC
• Lead free design, RoHS compliant
• 3-year product warranty

The THL 20WI series is the latest generation of dc-dc converter modules with highest power density. The product achieves 20 Watt output power while it comes in a metal case with dimensions of only 1.0”x1.0”x0.4”.

All models have an ultra wide 4:1 input voltage range and precisely regulated output voltages. 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. Typical applications are in mobile equipments, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is critical.

<table>
<thead>
<tr>
<th>Models</th>
<th>Order code</th>
<th>Input voltage range</th>
<th>Output voltage</th>
<th>Output current max.</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>THL 20-2410WI</td>
<td>3.3 VDC (24 VDC nominal)</td>
<td>4500 mA</td>
<td>87 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-2411WI</td>
<td>5.0 VDC (24 VDC nominal)</td>
<td>4000 mA</td>
<td>89 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-2412WI</td>
<td>12 VDC (24 VDC nominal)</td>
<td>1670 mA</td>
<td>89 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-2413WI</td>
<td>15 VDC (24 VDC nominal)</td>
<td>1340 mA</td>
<td>89 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-2415WI</td>
<td>24 VDC (24 VDC nominal)</td>
<td>835 mA</td>
<td>88 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-2422WI</td>
<td>±12 VDC (24 VDC nominal)</td>
<td>±835 mA</td>
<td>89 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-2423WI</td>
<td>±15 VDC (24 VDC nominal)</td>
<td>±670 mA</td>
<td>89 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-4810WI</td>
<td>3.3 VDC (48 VDC nominal)</td>
<td>4500 mA</td>
<td>88 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>THL 20-4811WI</td>
<td>5.0 VDC (48 VDC nominal)</td>
<td>4000 mA</td>
<td>89 %</td>
<td></td>
</tr>
<tr>
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<td>THL 20-4812WI</td>
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<tr>
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<tr>
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<tr>
<td></td>
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</table>

http://www.tracopower.com
### Input Specifications

<table>
<thead>
<tr>
<th>Input current at no load</th>
<th>24 Vin</th>
<th>3.3 VDC models: 80 mA typ.</th>
<th>5.0 VDC models: 90 mA Typ.</th>
<th>all other models: 40 mA typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(at nominal input voltage)</td>
<td>48 Vin</td>
<td>3.3 VDC models: 40 mA typ.</td>
<td>5.0 VDC models: 45 mA typ.</td>
<td>all other models: 25 mA typ.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input current at full load</th>
<th>24 Vin</th>
<th>3.3 VDC models: 700 mA typ.</th>
<th>other models: 940 mA typ..</th>
</tr>
</thead>
<tbody>
<tr>
<td>(at nominal input voltage)</td>
<td>48 Vin</td>
<td>3.3 VDC models: 350 mA typ.</td>
<td>other models: 470 mA typ.</td>
</tr>
</tbody>
</table>

**Start-up voltage**
- 24 V models: 9 VDC (or lower)
- 48 V models: 18 VDC (or lower)

**Surge voltage (1 s max.)**
- 24 Vin models: 50 V max.
- 48 Vin models: 100 V max.

**Reflected input ripple current**
- 48 Vin models: 30 mAp-p typ.

**Conducted noise (input)**
- EN 55032 class A, FCC part 15, level A with ext. components (see application note)

**ESD (electrostatic discharge)**
- EN 61000-4-2, air ±8 kV, contact ±4 kV, perf. criteria B

**Radiated immunity**
- EN 61000-4-3, 10 V/m, perf. criteria A

**Recommended input fuse** (slow blow)
- 24 Vin models: 5000 mA
- 48 Vin models: 2500 mA

### Output Specifications

<table>
<thead>
<tr>
<th>Voltage set accuracy</th>
<th>±1 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output voltage adj. range</td>
<td>±10 % for single output models only. For further information see application note <a href="http://www.tracopower.com/overview/thl20wi">www.tracopower.com/overview/thl20wi</a></td>
</tr>
</tbody>
</table>

**Regulation**
- Input variation (Vmin – Vmax)
  - single output models: 0.2 % max.
  - dual output models: 0.5 % max.
- Load variation
  - single output models: 0.5 % max. (0 – 100 % load)
  - dual output models: 1.0 % max. (8 – 100 % balanced load)

**Minimum load**
- single output models: not required
- dual output models: 8 % of rated max current (operation at lower load condition will not damage the converters. However, they may not meet all listed specifications)

**Ripple and noise** (20 MHz bandwidth)
- 3.3 & 5.0 VDC models: 75 mVp-p typ.
- 12 & 15 VDC models: 100 mVp-p typ.
- 24 VDC models: 150 mVp-p typ.
  - Measured with a 1µF M/C and a 10µF T/C

**Temperature coefficient**
- ±0.02 %/K

**Output current limitation**
- at 150 % of Iout max., foldback

**Short circuit protection**
- indefinite, automatic recovery

**Transient response setting time**
- 300 µs typ. (25% load step change)

**Max. capacitive load**
- 3.3 VDC models: 10'300 µF
- 5 VDC models: 6'800 µF
- 12 VDC models: 1'200 µF
- 15 VDC models: 750 µF
- 24 VDC models: 300 µF
- ±12 VDC models: 680 µF (each output)
- ±15 VDC models: 380 µF (each output)
## General Specifications

### Temperature ranges
- Operating (convection cooling 50 LFM, 0.25 m/s) -40°C to +75°C (with derating)
- Operating with heat sink (natural convection 20 LFM) -40°C to +85°C (with derating)
- Case temperature +105°C max.
- Storage -50°C to +125°C

### Load derating (convection cooling 50 LFM, 0.25 m/s)
- 24 V, 3.3 VDC models: 2.5 %/K above +64°C
- 48 V, 3.3 VDC models: 2.7 %/K above +68°C
- 5, 12 & 15 VDC single output models: 2.2 %/K above +60°C
- 24 VDC output models: 2.0 %/K above +55°C
- dual output models: 2.2 %/K above +60°C
- with heat sink
- 24 V, 3.3 VDC models: 3.3 %/K above +70°C
- 48 V, 3.3 VDC models: 3.2 %/K above +74°C
- 5, 12 & 15 VDC output models: 3.1 %/K above +67°C
- 24 VDC output models: 2.7 %/K above +63°C
- dual output models: 3.1 %/K above +67°C

### Thermal impedance
- Natural convection 18.2°C/W
- Natural convection with heat sink 15.3°C/W

### Humidity (non condensing)
95 % rel H max.

### Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)
>451,600 h

### Isolation voltage (60 s)
- Input/Output 1500 VDC
- Input/Case 1500 VDC
- Output/Case 1000 VDC

### Isolation capacitance
- Input/Output (100 kHz, 1 V) 1500 pF max.
- Input/Case 1000 VDC
- Output/Case 1000 VDC

### Isolation resistance
- Input/Output (500 VDC) >1000 MOhm

### Remote On/Off
- On: 3.5 ... 12 VDC or open circuit
- Off: 0 ... 1.2 VDC or short circuit pin 6 and pin 2
- Off idle current: 10 mA

### Switching frequency (fixed)
330 kHz typ. (pulse width modulation PWM)

### Altitude during operation
5'000 m max. [16400 ft] approved

### Safety standards (designed to meet)
UL/cUL 60950-1, IEC/EN 60950-1

### Safety approvals
- CSA certificate of compliance CAN/CSA-C22.2 No 60950-1-07, Am 1:2011
- Certification documents www.tracopower.com/overview/thl20wi

### Environmental compliance
- Reach www.tracopower.com/info/reach-declaration.pdf
- RoHS directive 2011/65/EU

## Physical Specifications

<table>
<thead>
<tr>
<th>Spec</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing material</td>
<td>aluminium alloy</td>
</tr>
<tr>
<td>Pin material</td>
<td>copper alloy with gold platet nickel subplate</td>
</tr>
<tr>
<td>Baseplate</td>
<td>non conductive FR4</td>
</tr>
<tr>
<td>Potting material</td>
<td>epoxy [UL 94V-0 rated]</td>
</tr>
<tr>
<td>Weight</td>
<td>15 g (0.53 oz)</td>
</tr>
<tr>
<td>Soldering temperature</td>
<td>260°C / 10 s max.</td>
</tr>
</tbody>
</table>

Application note: www.tracopower.com/overview/thl20wi

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

http://www.tracopower.com
**Outline Dimensions**

![Diagram of the THL 20WI Series DC/DC Converter dimensions](image)

<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></td>
</tr>
</tbody>
</table>

Dimensions in [mm], ( ) = Inch  
Pin diameter ø 1.0 (0.04)  
Pin pitch tolerances: ±0.25 (±0.01)  
Tolerances: ±0.5 (±0.02)

**Heat-Sink (Option)**

*Order code: THL-HS1  
(cont.: heat-sink, thermal pad, 2 clamps)*

*Material: Aluminum*  
*Finish: Anodic treatment (black)*  
*Weight: 4 g (0.14 oz) without converter*  
*Thermal impedance after assembling: 15.8 K/W*

*Note:*  
The product label on converter has to be removed before mounting the heat-sink.  
For volume orders converters will be supplied with heat-sink already mounted. Please contact factory for quotation.  
Separate heat-sinks are only available for prototypes and small quantity orders.