

- Ultra wide 4:1 input voltage 20 W DC/DC converter in a 1.6 x 1 " plastic case
- I/O isolation 5000 VAC rated for 250 VAC working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Low leakage current <2.5  $\mu$ A
- Operating temperature  $-40^{\circ}\text{C}$  to  $80^{\circ}\text{C}$
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- Operating up to 5000m altitude
- 5-year product warranty



ES 60601-1 IEC 60601-1  
UL 62368-1 IEC 62368-1

The THM 20WI series is a range of medical 20 Watt DC/DC converters in 1.6" x 1.0" plastic package and with ultra wide 4:1 input voltage range. They provide a reinforced isolation system for 5000 VAC isolation and a very low leakage current of less than 2.5  $\mu$ A. The units are approved to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. With a high efficiency of up to 89% and highest grade components the converters can reliably operate in an ambient temperature range of  $-40^{\circ}\text{C}$  up to  $+80^{\circ}\text{C}$ . They constitute a reliable solution not only for medical equipment but also for demanding ranges of application such as transportation, control & measurement or IGBT drivers.

### Models

| Order Code    | Input Voltage Range         | Output 1                     |                  | Output 2 |                  | Efficiency typ. |
|---------------|-----------------------------|------------------------------|------------------|----------|------------------|-----------------|
|               |                             | Vnom                         | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| THM 20-2411WI | 9 - 36 VDC<br>(24 VDC nom.) | 5 VDC                        | 4'000 mA         |          |                  | 89 %            |
| THM 20-2412WI |                             | 12 VDC                       | 1'670 mA         |          |                  | 89 %            |
| THM 20-2413WI |                             | 15 VDC                       | 1'330 mA         |          |                  | 89 %            |
| THM 20-2415WI |                             | 24 VDC                       | 833 mA           |          |                  | 89 %            |
| THM 20-2421WI |                             | +5 VDC                       | 2'000 mA         | -5 VDC   | 2'000 mA         | 86 %            |
| THM 20-2422WI |                             | +12 VDC                      | 833 mA           | -12 VDC  | 833 mA           | 89 %            |
| THM 20-2423WI |                             | +15 VDC                      | 667 mA           | -15 VDC  | 667 mA           | 89 %            |
| THM 20-4811WI |                             | 18 - 75 VDC<br>(48 VDC nom.) | 5 VDC            | 4'000 mA |                  |                 |
| THM 20-4812WI | 12 VDC                      |                              | 1'670 mA         |          |                  | 89 %            |
| THM 20-4813WI | 15 VDC                      |                              | 1'330 mA         |          |                  | 89 %            |
| THM 20-4815WI | 24 VDC                      |                              | 833 mA           |          |                  | 89 %            |
| THM 20-4821WI | +5 VDC                      |                              | 2'000 mA         | -5 VDC   | 2'000 mA         | 86 %            |
| THM 20-4822WI | +12 VDC                     |                              | 833 mA           | -12 VDC  | 833 mA           | 89 %            |
| THM 20-4823WI | +15 VDC                     |                              | 667 mA           | -15 VDC  | 667 mA           | 89 %            |

### Options

|  |   |
|--|---|
| on demand<br>(backorder with MOQ<br>non stocking item) | - Optional models with remote-control function                    |
|  | - Optional models with remote-control function with inverse logic |

## Input Specifications

|                        |              |   |
|------------------------|--------------|---|
| Input Current          | - At no load | 24 Vin models: <b>10 mA typ.</b><br>48 Vin models: <b>9 mA typ.</b>   |
| Surge Voltage          |              | 24 Vin models: <b>50 VDC max.</b> (3 s max.)<br>48 Vin models: <b>100 VDC max.</b> (3 s max.)   |
| Under Voltage Lockout  |              | 24 Vin models: <b>7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.</b><br>48 Vin models: <b>15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.</b>                                     |
| Recommended Input Fuse |              | 24 Vin models: <b>4'000 mA</b> (slow blow)<br>48 Vin models: <b>2'000 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% (15 & 24 Vout single models)<br><b>±10%</b> (other single output models)<br>(By external trim resistor)<br>See application note: <a href="http://www.tracopower.com/overview/thm20wi">www.tracopower.com/overview/thm20wi</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 (25% / 100% asym. load) | dual output models: <b>5% max.</b>  |
| Ripple and Noise (20 MHz Bandwidth) | - single output                            | 5 Vout models: <b>50 mVp-p typ.</b> (w/ 10 µF X7R)<br>12 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R)<br>15 Vout models: <b>75 mVp-p typ.</b> (w/ 10 µF X7R)<br>24 Vout models: <b>100 mVp-p typ.</b> (w/ 4.7 µF X7R)   |
|                                     | - dual output                              | 5 / -5 Vout models: <b>50 / 50 mVp-p typ.</b> (w/ 10 µF X7R)<br>12 / -12 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R)<br>15 / -15 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 10 µF X7R)  |
| Capacitive Load                     | - single output                            | 5 Vout models: <b>5'000 µF max.</b><br>12 Vout models: <b>850 µF max.</b><br>15 Vout models: <b>700 µF max.</b><br>24 Vout models: <b>220 µF max.</b>   |
|                                     | - dual output                              | 12 / -12 Vout models: <b>500 / 500 µF max.</b><br>15 / -15 Vout models: <b>350 / 350 µF max.</b>  |
|                                     | - 24 Vin input                             | 5 / -5 Vout models: <b>2'500 / 2'500 µF max.</b>  |
|                                     | - 48 Vin input                             | 5 / -5 Vout models: <b>500 / 500 µF max.</b>  |
| Minimum Load                        |  | <b>Not required</b>   |
| Temperature Coefficient             |  | <b>±0.02 %/K max.</b>   |
| Start-up Time                       |  | <b>30 ms typ. / 60 ms max.</b>  |
| Short Circuit Protection            |  | <b>Continuous, Automatic recovery</b>   |
| Output Current Limitation           |  | <b>185% max. of Iout max.</b><br><b>150% typ. of Iout max.</b>  |

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

|                        |                 |   |
|------------------------|-----------------|---|
| Overvoltage Protection |                 | 125% typ. of Vout nom.<br>(depending on model)<br>6.2 VDC typ. (5 VDC model)<br>15 VDC typ. (12 VDC model)<br>20 VDC typ. (15 VDC model)<br>30 VDC typ. (24 VDC model)<br>6.2 VDC typ. (±5 VDC model)<br>15 VDC typ. (±12 VDC model)<br>20 VDC typ. (±15 VDC model) |
| Transient Response     | - Response Time | 250 µs typ. (25% Load Step)   |

### Safety Specifications

|                       |                             |  |
|-----------------------|-----------------------------|--|
| Safety Standards      | - IT / Multimedia Equipment | EN 62368-1<br>IEC 62368-1<br>UL 62368-1  |
|                       | - Medical Equipment         | EN 60601-1<br>IEC 60601-1<br>ANSI/AAMI ES 60601-1<br>2 x MOPP (Means Of Patient Protection)  |
|                       | - Certification Documents   | <a href="http://www.tracopower.com/overview/thm20wi">www.tracopower.com/overview/thm20wi</a> |
| Pollution Degree      |                             | PD 2   |
| Over Voltage Category |                             | OVC II   |

### EMC Specifications

|               |                             |   |
|---------------|-----------------------------|---|
| EMI Emissions | - Conducted Emissions       | EN 60601-1-2 edition 4 (Medical Devices)<br>EN 55011 class A (internal filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)<br>FCC Part 18 class A (internal filter)<br>FCC Part 18 class B (with external filter) |
|               | - Radiated Emissions        | EN 55011 class A (internal filter)<br>EN 55011 class B (with external filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (with external filter)<br>FCC Part 18 class A (internal filter)<br>FCC Part 18 class B (with external filter)   |
|               |                             | External filter proposal: <a href="http://www.tracopower.com/overview/thm20wi">www.tracopower.com/overview/thm20wi</a>  |
| EMS Immunity  | - Electrostatic Discharge   | EN 60601-1-2 edition 4 (Medical Devices)<br>Air: EN 61000-4-2, ±15 kV, perf. criteria A<br>Contact: EN 61000-4-2, ±8 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<br>EN 61000-4-5, ±2 kV, perf. criteria A  |
|               | - Conducted RF Disturbances | Ext. input component: 24 Vin models: 2 x KY 220 µF // TVS SMDJ58A<br>48 Vin models: 2 x KY 220 µF // TVS SMDJ120A<br>EN 61000-4-6, 10 Vrms, perf. criteria A  |
|               | - PF Magnetic Field         | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A<br>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 +80°C   |
|                    | - Case Temperature      | +105°C max.  |
|                    | - Storage Temperature   | -55°C to +125°C  |
| Power Derating     | - High Temperature      | 2 %/K above 55°C   |
|                    |                         | See application note: <a href="http://www.tracopower.com/overview/thm20wi">www.tracopower.com/overview/thm20wi</a> |

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

|  |   |   |
|--|---|---|
| Over Temperature Protection Switch Off | - Protection Mode<br>- Measurement Point  | 115°C typ. (Automatic recovery)<br>Case   |
| Cooling System                         |   | Natural convection (20 LFM)   |
| Remote Control                         | - Voltage Controlled Remote<br><br>- Off Idle Input Current<br>- Remote Pin Input Current | On: 3.5 to 12 VDC or open circuit<br>Off: 0 to 1.2 VDC or short circuit<br>Refers to 'Remote' and '-Vin' Pin<br>2.5 mA typ.<br>-0.5 to 1.0 mA<br>(Only for optional models with remote-control. Inverse models available.)  |
| Altitude During Operation              |   | 5'000 m max.  |
| Switching Frequency                    |   | 225 - 285 kHz (PWM)<br>250 kHz typ. (PWM)   |
| Insulation System                      |   | Reinforced Insulation   |
| Working Voltage (rated)                |   | 250 VAC   |
| Isolation Test Voltage                 | - Input to Output, 60 s   | 5'000 VAC   |
| Creepage                               | - Input to Output   | 8 mm min.   |
| Clearance                              | - Input to Output   | 8 mm min.   |
| Isolation Capacitance                  | - Input to Output, 100 kHz, 1 V   | 20 pF typ.  |
| Leakage Current                        | - Touch Current   | 2.5 µA max. (240 VAC, 60 Hz)  |
| Reliability                            | - Calculated MTBF   | 1'712'000 h (MIL-HDBK-217F, ground benign)  |
| Washing Process                        |   | Allowed (hermetical product)<br>See Cleaning Guideline: <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                       |   | Non-conductive Plastic (UL 94 V-0 rated)  |
| Base Material                          |   | Non-conductive Plastic (UL 94 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   |
| Housing Type                           |   | Plastic Case  |
| Mounting Type                          |   | PCB Mount   |
| Connection Type                        |   | THD (Through-Hole Device)   |
| Footprint Type                         |   | 1.6" x 1"   |
| Soldering Profile                      |   | 265°C / 10 s max.   |
| Weight                                 |   | 24 g  |
| Thermal Impedance                      | - Case to Ambient   | 14.4 K/W typ.   |
| Environmental Compliance               | - REACH Declaration<br><br>- RoHS Declaration   | <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><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). The SCIP number is provided on request.) |

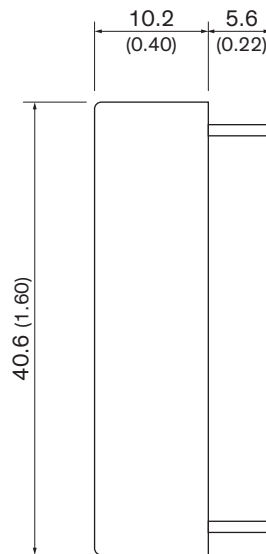
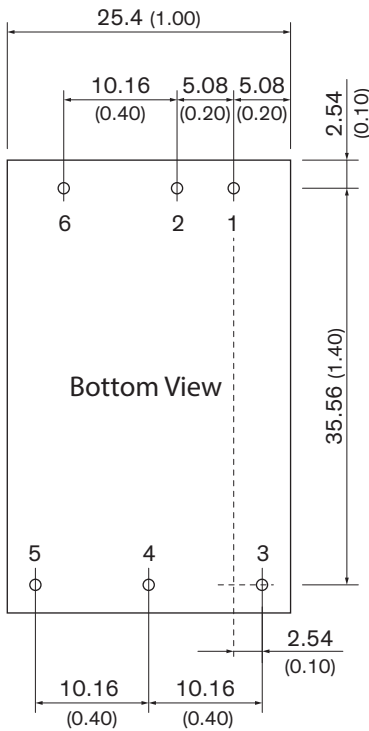
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/thm20wi](http://www.tracopower.com/overview/thm20wi)

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

### Outline Dimensions



Dimensions in mm (inch)  
 Tolerances  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin  $\varnothing$   $1.0 \pm 0.1$  ( $0.039 \pm 0.004$ )  
 Pin pitch tolerances  $\pm 0.25$  ( $\pm 0.01$ )

### Pinout

| Pin | Single Output  | Dual Output    |
|-----|----------------|----------------|
| 1   | +Vin (Vcc)     | +Vin (Vcc)     |
| 2   | -Vin (GND)     | -Vin (GND)     |
| 3   | +Vout          | +Vout          |
| 4   | -Vout          | Common         |
| 5   | Trim           | -Vout          |
| 6   | No pin*/Remote | No pin*/Remote |

\*If remote is not selected there will be no pin.