

## DC/DC Medical Converter

## THM 20WI Series, 20 Watt

- 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 edition 3.2 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°C to 80°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 edition 3.2 for 2 x MOPP and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 134-85. With a high efficiency of up to 89% and highest grade components the converters can reliably operate in an ambient temperature range of -40°C up to +80°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

|  |  |
|--|--|
| <b>on demand</b><br>(backorder with MOQ non stocking item) | - Optional models with Remote On/Off function<br>- Optional models with inverse Remote On/Off function (passive = off) |
|--|--|

## 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 models)<br><b>±10%</b> (other models)<br>(single output models only)<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)<br><br>- Load Variation (0 - 100%)<br><br>- Cross Regulation<br>(25% / 100% asym. load) | single output models: <b>0.2% max.</b><br>dual output models: <b>0.5% max.</b><br>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)<br>dual output models: <b>5% max.</b>  |
| Ripple and Noise<br>(20 MHz Bandwidth) | - single output<br><br>- dual 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)<br>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<br><br>- dual output<br><br>- 24 Vin input<br>- 48 Vin input  | 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><br>12 / -12 Vout models: <b>500 / 500 µF max.</b><br>15 / -15 Vout models: <b>350 / 350 µF max.</b><br>5 / -5 Vout models: <b>2'500 / 2'500 µF max.</b><br>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. (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

|                       |                             |  |
|-----------------------|-----------------------------|--|
| 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 47 Part 18 class A (internal filter)<br>FCC 47 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 47 Part 18 class A (internal filter)<br>FCC 47 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   |
|                     | - RF Electromagnetic Field  | Contact: EN 61000-4-2, ±8 kV, perf. criteria A  |
|                     | - EFT (Burst) / Surge       | EN 61000-4-3, 10 V/m, perf. criteria A<br>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   |
|                     | - PF Magnetic Field         | EN 61000-4-6, 10 Vrms, perf. criteria A<br>Continuous: EN 61000-4-8, 100 A/m, perf. criteria A<br>1 s: EN 61000-4-8, 1000 A/m, perf. criteria A   |
| EMC / Environmental | - Certification Documents   | <a href="http://www.tracopower.com/overview/thm20wi">www.tracopower.com/overview/thm20wi</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 (passive = on)<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>(Optional models with inverse Remote On/Off function (passive = off))  |
| 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<br>- Input to Output, 1 s  | 5'000 VAC<br>10'000 VDC   |
| 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                        |  | According to Cleaning Guideline<br><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                      |  | Lead-Free Wave Soldering<br>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<br><br>- SCIP Reference Number                             | <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-l<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)<br>f59e6a9c-dffc-47cf-b04a-7210d54cc4d6 |

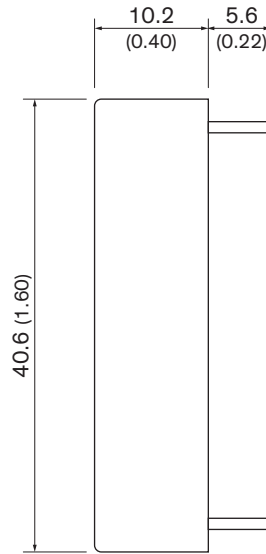
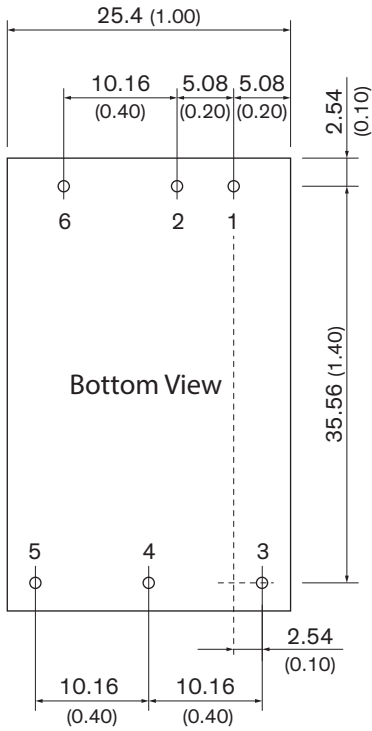
## Supporting Documents

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.