DC/DC Medical Converter

- Ultra wide 4:1 input voltage 10 W DC/DC converter in a compact DIP-24 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 µA
- Operating temperature –40°C to 90°C
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- Operating up to 5000m altitude
- 5-year product warranty

The THM 10Wi series is a range of medical 10 Watt DC/DC converters in DIP-24 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 µA. The units are approved to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP (Means Of Patient Protection) 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 87% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +90°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

<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>THM 10-0510WI</td>
<td>3.3 VDC</td>
<td>2'500 mA</td>
<td></td>
<td>80 %</td>
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<tr>
<td>THM 10-0511WI</td>
<td>5 VDC</td>
<td>2'000 mA</td>
<td></td>
<td>84 %</td>
</tr>
<tr>
<td>THM 10-0512WI</td>
<td>12 VDC</td>
<td>830 mA</td>
<td></td>
<td>87 %</td>
</tr>
<tr>
<td>THM 10-0513WI</td>
<td>15 VDC</td>
<td>670 mA</td>
<td></td>
<td>87 %</td>
</tr>
<tr>
<td>THM 10-0515WI</td>
<td>24 VDC</td>
<td>416 mA</td>
<td></td>
<td>86 %</td>
</tr>
<tr>
<td>THM 10-0521WI</td>
<td>+5 VDC</td>
<td>1'000 mA</td>
<td>–5 VDC</td>
<td>1'000 mA</td>
</tr>
<tr>
<td>THM 10-0522WI</td>
<td>+12 VDC</td>
<td>416 mA</td>
<td>–12 VDC</td>
<td>416 mA</td>
</tr>
<tr>
<td>THM 10-0523WI</td>
<td>+15 VDC</td>
<td>333 mA</td>
<td>–15 VDC</td>
<td>333 mA</td>
</tr>
<tr>
<td>THM 10-2410WI</td>
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<td>2'500 mA</td>
<td></td>
<td>83 %</td>
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<td>333 mA</td>
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</tr>
<tr>
<td>THM 10-4810WI</td>
<td>3.3 VDC</td>
<td>2'500 mA</td>
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<td>83 %</td>
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### Options

| on demand (backorder with MOQ non stocking item) | - Optional models with alternative pinning  
| - Optional models with adjustable output  
| - Optional models with remote-control function  
| - Optional models with adjustable output and remote-control function |

### Input Specifications

| Input Current | - At no load  
| - 5 Vin models: 20 mA typ.  
| - 24 Vin models: 6 mA typ.  
| - 48 Vin models: 4 mA typ. |

| Surge Voltage | - 5 Vin models: 16 VDC max. (3 s max.)  
| - 24 Vin models: 50 VDC max. (3 s max.)  
| - 48 Vin models: 100 VDC max. (3 s max.) |

| Under Voltage Lockout | - 5 Vin models: 3 VDC min. / 4 VDC typ. / 4.4 VDC max.  
| - 24 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max.  
| - 48 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max. |

| Recommended Input Fuse | - 5 Vin models: 5'000 mA (slow blow)  
| - 24 Vin models: 2'000 mA (slow blow)  
| - 48 Vin models: 1'000 mA (slow blow) (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% (15 & 24 Vout single models)  
- ±10% (other models)  
(Only for optional models with adjustable output)  
(By external trim resistor)

See application note: [www.tracopower.com/overview/thm10wi](http://www.tracopower.com/overview/thm10wi)

**Output power must not exceed rated power!**

<table>
<thead>
<tr>
<th>Voltage Set Accuracy</th>
<th>±1% max.</th>
</tr>
</thead>
</table>
| Regulation | - Input Variation (Vmin - Vmax)  
| - Load Variation (0 - 100%)  
| - Cross Regulation (25% / 100% asym. load)  
| single output models: 0.2% max.  
| dual output models: 0.5% max.  
| dual output models: 1% max. (Output 1)  
| dual output models: 1% max. (Output 2)  
| dual output models: 5% max. |

**Ripple and Noise (20 MHz Bandwidth)**
- single output  
| 3.3 Vout models: 30 mVp-p typ. (w/ 10 µF X7R)  
| 5 Vout models: 30 mVp-p typ. (w/ 10 µF X7R)  
| 12 Vout models: 40 mVp-p typ. (w/ 10 µF X7R)  
| 15 Vout models: 40 mVp-p typ. (w/ 10 µF X7R)  
| 24 Vout models: 50 mVp-p typ. (w/ 4.7 µF X7R) |

- dual output  
| 5 / -5 Vout models: 30 / 30 mVp-p typ. (w/ 10 µF X7R)  
| 12 / -12 Vout models: 40 / 40 mVp-p typ. (w/ 10 µF X7R)  
| 15 / -15 Vout models: 40 / 40 mVp-p typ. (w/ 10 µF X7R) |

**Capacitive Load**
- single output  
| 3.3 Vout models: 3'000 µF max.  
| 5 Vout models: 2'500 µF max.  
| 12 Vout models: 430 µF max.  
| 15 Vout models: 350 µF max.  
| 24 Vout models: 125 µF max. |

- dual output  
| 5 / -5 Vout models: 1'440 / 1'440 µF max.  
| 12 / -12 Vout models: 550 / 550 µF max.  
| 15 / -15 Vout models: 180 / 180 µF max. |

**Minimum Load**
- Not required

**Temperature Coefficient**
- ±0.02 %/K max.

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
### Start-up Time
30 ms typ.

### Short Circuit Protection
Continuous, Automatic recovery

### Output Current Limitation
150% typ. of Iout max.

### Overvoltage Protection
- 112 - 152% of Vout nom. (depending on model)
- 3.7 - 5 VDC (3.3 VDC model)
- 5.6 - 7 VDC (5 VDC model)
- 13.5 - 18 VDC (12 VDC model)
- 18.3 - 22 VDC (15 VDC model)
- 29.1 - 34.5 VDC (24 VDC model)
- 5.6 - 7 VDC (±5 VDC model)
- 13.5 - 18.2 VDC (±12 VDC model)
- 17 - 22 VDC (±15 VDC model)

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

## Safety Specifications

### Safety Standards
- Medical Equipment
  - EN 60601-1
  - IEC 60601-1
  - ANSI/AAMI ES 60601-1
- Certification Documents
  - 2 x MOPP (Means Of Patient Protection)
  - www.tracopower.com/overview/thm10wi

### Pollution Degree
PD 2

### Over Voltage Category
OVC II

## EMC Specifications

### EMI Emissions
- Conducted Emissions
  - EN 60601-1-2 edition 4 (Medical Devices)
  - EN 55011 class A (internal filter)
  - EN 55011 class B (with external filter)
  - EN 55032 class A (internal filter)
  - EN 55032 class B (with external filter)
  - FCC Part 18 class A (internal filter)
  - FCC Part 18 class B (with external filter)
- Radiated Emissions
  - EN 55011 class A (internal filter)
  - EN 55011 class B (with external filter)
  - EN 55032 class A (internal filter)
  - EN 55032 class B (with external filter)
  - FCC Part 18 class A (internal filter)
  - FCC Part 18 class B (with external filter)

### EMS Immunity
- Electrostatic Discharge
  - Air: EN 61000-4-2, ±15 kV, perf. criteria A
  - 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
  - EN 61000-4-5, ±2 kV, perf. criteria A
- Conducted RF Disturbances
  - 5 Vin models: KY 1000 µF // Vishay V10P45
  - 24 Vin models: KY 470 µF
  - 48 Vin models: KY 330 µF
- PF Magnetic Field
  - Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A
  - 1 s: EN 61000-4-8, 100 A/m, perf. criteria A

### General Specifications

### Relative Humidity
95% max. (non condensing)

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

www.tracopower.com
**Temperature Ranges**

- Operating Temperature
  -40°C to +90°C
- Approved Ambient Temp.
  +50°C max. (to comply with EN 60601-1)
- Case Temperature
  +105°C max.
- Storage Temperature
  -55°C to +125°C

**Power Derating**

- High Temperature
  3.33 %/K above 75°C

**Cooling System**

Natural convection (20 LFM)

**Remote Control**

- Voltage Controlled Remote
  On: 0 to 1.2 VDC or open circuit
  Off: 2.2 to 12 VDC
  Refers to 'Remote' and '-Vin' Pin
  2.5 mA typ.
  -0.5 to 1.0 mA
  (Only for optional models with remote-control)

**Altitude During Operation**

5'000 m max.

**Switching Frequency**

270 - 330 kHz (PWM)
300 kHz typ. (PWM)

**Insulation System**

Reinforced Insulation

**Insulation 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
  12 pF typ.
  17 pF max.

**Leakage Current**

- Touch Current
  2 µA max. (240 VAC, 60 Hz)

**Reliability**

- Calculated MTBF
  3,850,000 h (MIL-HDBK-217F, ground benign)

**Environmental Compliance**

- Reach
  [www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)
- RoHS

**Supporting Documents**

**Overview Link** (for additional Documents)
[www.tracopower.com/overview/thm10wi](http://www.tracopower.com/overview/thm10wi)
Outline Dimensions

Standard pinning with options: With adjustable output and/or remote-control function

Optional pinning

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No pin*/Remote</td>
<td>No pin*/Remote</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>10</td>
<td>No pin*/Trim</td>
<td>No pin*/Trim</td>
</tr>
<tr>
<td>11</td>
<td>NC</td>
<td>–Vout</td>
</tr>
<tr>
<td>14</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>16</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>22</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>23</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
</tbody>
</table>

NC: No connection
*If Remote or Trim is not selected there is no pin on corresponding number.

Dimensions in mm (inch)
Tolerances ±0.5 (±0.02)
Pin Ø 0.6 ±0.1 (0.024 ±0.004)
Pin pitch tolerances ±0.25 (±0.01)

Remark:
No optional pinning for 5 Vin models. Corresponding parts are with THM 10 series by default.
see www.tracopower.com/overview/thm10