DC/DC Medical Converter

THM 10WI Series, 10 Watt

- 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.

<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>
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<td>Imax</td>
</tr>
<tr>
<td>THM 10-0510WI</td>
<td>3.3 VDC</td>
<td>2'500 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 10-0511WI</td>
<td>5 VDC</td>
<td>2'000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 10-0512WI</td>
<td>12 VDC</td>
<td>830 mA</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>15 VDC</td>
<td>670 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 10-0515WI</td>
<td>24 VDC</td>
<td>416 mA</td>
<td></td>
<td></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>
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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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<tr>
<td>THM 10-4811WI</td>
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## Options

<table>
<thead>
<tr>
<th>Options</th>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>on demand</strong> (backorder with MOQ non stocking item)</td>
<td>- Optional models with alternative pinning</td>
</tr>
<tr>
<td></td>
<td>- Optional models with adjustable output</td>
</tr>
<tr>
<td></td>
<td>- Optional models with remote-control function</td>
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<tr>
<td></td>
<td>- Optional models with adjustable output and remote-control function</td>
</tr>
</tbody>
</table>

## 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: 5000 mA (slow blow)
- 24 Vin models: 2000 mA (slow blow)
- 48 Vin models: 1000 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!

### Voltage Set Accuracy
- ±1% max.

### Regulation
- Input Variation (Vmin - Vmax)
  - single output models: 0.2% max.
  - dual output models: 0.5% max.
- Load Variation (0 - 100%)
  - single output models: 0.2% max.
  - dual output models: 1% max. (Output 1)
    - 1% max. (Output 2)
- Cross Regulation (25% / 100% asym. load)
  - 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.
<table>
<thead>
<tr>
<th>Start-up Time</th>
<th>30 ms typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short Circuit Protection</td>
<td>Continuous, Automatic recovery</td>
</tr>
<tr>
<td>Output Current Limitation</td>
<td>150% typ. of Iout max.</td>
</tr>
<tr>
<td>Overvoltage Protection</td>
<td>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 - 16 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)</td>
</tr>
<tr>
<td>Transient Response</td>
<td>- Response Time 250 µs typ. (25% Load Step)</td>
</tr>
</tbody>
</table>

### Safety Specifications

**Safety Standards**

- Medical Equipment: EN 60601-1
- IEC 60601-1
- ANSI/AAMI ES 60601-1
  
- Certification Documents
  
**Pollution Degree**

PD 2

**Over Voltage Category**

OVC II

### EMC Specifications

**EMI Emissions**

- Conducted Emissions
  
- Radiated Emissions
  
- External filter proposal: [www.tracopower.com/overview/thm10wi](http://www.tracopower.com/overview/thm10wi)

**EMS Immunity**

- Electrostatic Discharge
  
- RF Electromagnetic Field
  
- EFT (Burst) / Surge
  
- Conducted RF Disturbances
  
- PF Magnetic Field

Ext. input component:

- 5 Vin models: KY 1000 µF // Vishay V10P45
- 24 Vin models: KY 470 µF
- 48 Vin models: KY 330 µF

Continuous:

- 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.
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
- Off Idle Input Current: 2.5 mA typ.
- Remote Pin Input Current: -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

Isolation Test Voltage
- Input to Output: 60 s
  5'000 VAC
- Creepage: 8 mm min.
- Clearance: 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)

Environment
- Vibration: MIL-STD-810F
- Thermal Shock: MIL-STD-810F

Housing Material
Non-conductive Plastic (UL94 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
Soldering Profile
265°C / 10 s max.
Connection Type
THD (Through-Hole Device)
Weight
14 g
Thermal Impedance
18 K/W

Environmental Compliance
- Reach
  www.tracopower.com/info/reach-declaration.pdf
- RoHS
  www.tracopower.com/info/rohs-declaration.pdf

Supporting Documents
Overview Link (for additional Documents)
www.tracopower.com/overview/thm10wi

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

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

Optional pinning

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)

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.

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