DC/DC Medical Converter

THM 6WI Series, 6 Watt

- Ultra wide 4:1 input voltage 6 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 6WI series is a range of medical 6 Watt DC/DC converters in DIP-24 plastic package and with ultra-wide 4:1 input voltage range. They provide a re-inforced 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 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 6-0510WI</td>
<td>3.3 VDC</td>
<td>1'800 mA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>THM 6-0511WI</td>
<td>5 VDC</td>
<td>1'200 mA</td>
<td>-</td>
<td>-</td>
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<tr>
<td>THM 6-0512WI</td>
<td>12 VDC</td>
<td>500 mA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>THM 6-0513WI</td>
<td>15 VDC</td>
<td>400 mA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>THM 6-0515WI</td>
<td>24 VDC</td>
<td>250 mA</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>THM 6-0521WI</td>
<td>+5 VDC</td>
<td>600 mA</td>
<td>-5 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-0522WI</td>
<td>+12 VDC</td>
<td>250 mA</td>
<td>-12 VDC</td>
<td>250 mA</td>
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<tr>
<td>THM 6-0523WI</td>
<td>+15 VDC</td>
<td>200 mA</td>
<td>-15 VDC</td>
<td>200 mA</td>
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<tr>
<td>THM 6-4810WI</td>
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### Options

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

### Input Specifications

<table>
<thead>
<tr>
<th>Input Current</th>
<th>- At no load 5 Vin models: 20 mA typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge Voltage</td>
<td>5 Vin models: 16 VDC max. (3 s max.)</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>5 Vin models: 3 VDC min. / 4 VDC typ. / 4.4 VDC max.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>5 Vin models: 2'500 mA (slow blow)</td>
</tr>
<tr>
<td>Input Filter</td>
<td>Internal Pi-Type</td>
</tr>
</tbody>
</table>

### Output Specifications

| Output Voltage Adjustment | -10% to +20% (15 & 24 Vout single models) |
| 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) |
|             | dual output models: 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) |
| Capacitive Load | - single output 3.3 Vout models: 2'100 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.

See application note: [www.tracopower.com/overview/thm6wi](http://www.tracopower.com/overview/thm6wi)

Output power must not exceed rated power!
### 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

<table>
<thead>
<tr>
<th>Safety Standards</th>
<th>EN 62368-1</th>
<th>IEC 62368-1</th>
<th>UL 62368-1</th>
<th>EN 60601-1</th>
<th>IEC 60601-1</th>
<th>ANSI/AAMI ES 60601-1</th>
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<tbody>
<tr>
<td>- IT / Multimedia Equipment</td>
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<td>- Medical Equipment</td>
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<tr>
<td>- Certification Documents</td>
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<td></td>
</tr>
</tbody>
</table>

## EMC Specifications

### EMI Emissions
- Conducted 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)
- 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)
  - FCC Part 18 class B (with external filter)

External filter proposal: [www.tracopower.com/overview/thm6wi](http://www.tracopower.com/overview/thm6wi)

### 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
  - EN 61000-4-4, ±2 kV, perf. criteria A
  - EN 61000-4-5, ±2 kV, perf. criteria A
- 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

### 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 +95°C
- **Approved Ambient Temp.**: +70°C max. (to comply with EN 60601-1)
- **Case Temperature**: +105°C max.
- **Storage Temperature**: -55°C to +125°C

### Power Derating

- **High Temperature**: 5.26 %/K above 86°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

- **Off Idle Input Current**: (-0.5 to 1.0 mA)

### Altitude During Operation

- 5'000 m max.

### Switching Frequency

- 225 - 275 kHz (PWM)
- 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
  - 12 pF typ.
  - 17 pF max.

### Leakage Current

- **Earth Leakage Current**: 2 µA max. (240 VAC, 60 Hz)

### Reliability

- **Calculated MTBF**: 4'700'000 h (MIL-HDBK-217F, ground benign)

### Environment

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

### Soldering Profile

- 265°C / 10 s max.

### Connection Type

- **THD (Through-Hole Device)**

### Weight

- 14 g

### Thermal Impedance

- 18 K/W

### Environmental Compliance

- **REACH Declaration**: www.tracopower.com/info/reach-declaration.pdf
- **REACH SVHC list compliant**
- **REACH Annex XVII compliant**
- **Exemptions**: 7a

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**Supporting Documents**

**Overview Link** (for additional Documents)  
www.tracopower.com/overview/thm6wi

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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

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>No pin/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.

** If Trim is selected there is no pin on the corresponding pin 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 6 series by default.

see www.tracopower.com/overview/thm6

Specifications can be changed without notice.

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