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 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 60601-1-2 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>5 VDC</td>
<td>1’200 mA</td>
</tr>
<tr>
<td>THM 6-0511WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-0512WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>250 mA</td>
</tr>
<tr>
<td>THM 6-0513WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>12 VDC</td>
</tr>
<tr>
<td>THM 6-0515WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>2 VDC</td>
</tr>
<tr>
<td>THM 6-0521WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>1 VDC</td>
</tr>
<tr>
<td>THM 6-0522WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>1/2 VDC</td>
</tr>
<tr>
<td>THM 6-0523WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>1/4 VDC</td>
</tr>
<tr>
<td>THM 6-2410WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>1’200 mA</td>
</tr>
<tr>
<td>THM 6-2411WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>500 mA</td>
</tr>
<tr>
<td>THM 6-2412WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>400 mA</td>
</tr>
<tr>
<td>THM 6-2413WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>250 mA</td>
</tr>
<tr>
<td>THM 6-2415WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>250 mA</td>
</tr>
<tr>
<td>THM 6-2421WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>250 mA</td>
</tr>
<tr>
<td>THM 6-2422WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>250 mA</td>
</tr>
<tr>
<td>THM 6-2423WI</td>
<td>3.3 VDC</td>
<td>1’800 mA</td>
<td>5 VDC</td>
<td>250 mA</td>
</tr>
<tr>
<td>THM 6-4810WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>1’200 mA</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4811WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>600 mA</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4812WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>12 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4813WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>12 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4815WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>12 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4821WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>12 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4822WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>12 VDC</td>
<td>600 mA</td>
</tr>
<tr>
<td>THM 6-4823WI</td>
<td>9 - 48 VDC</td>
<td>5 VDC</td>
<td>12 VDC</td>
<td>600 mA</td>
</tr>
</tbody>
</table>
### Options

- Optional models with alternative pinning
- Optional models with adjustable output voltage
- Optional models with Remote On/Off 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: 2500 mA (slow blow)
- 24 Vin models: 1250 mA (slow blow)
- 48 Vin models: 630 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 single and dual output models)
(only for optional models with adjustable output)
(By external trim resistor)

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

**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

**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: 2100 µF max.
  - 5 Vout models: 1500 µF max.
  - 12 Vout models: 260 µF max.
  - 15 Vout models: 210 µF max.
  - 24 Vout models: 75 µF max.
- dual output
  - 5 / -5 Vout models: 860 / 860 µF max.
  - 12 / -12 Vout models: 150 / 150 µF max.
  - 15 / -15 Vout models: 110 / 110 µF max.

#### Minimum Load
- Not required

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

---

All specifications valid at nominal voltage, resistive 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 - 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)

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

### Safety Specifications

<table>
<thead>
<tr>
<th>Standards</th>
<th>EN 62368-1</th>
</tr>
</thead>
<tbody>
<tr>
<td>IT / Multimedia Equipment</td>
<td>IEC 62368-1</td>
</tr>
<tr>
<td>Medical Equipment</td>
<td>EN 60601-1</td>
</tr>
<tr>
<td>Certification Documents</td>
<td>ANSI/AAMI ES 60601-1</td>
</tr>
<tr>
<td></td>
<td>2 x MOPP (Means Of Patient Protection)</td>
</tr>
<tr>
<td>PD 2</td>
<td>OVC II</td>
</tr>
</tbody>
</table>

### Over Voltage Category

### EMC Specifications

<table>
<thead>
<tr>
<th>EMI Emissions</th>
<th>EN 60601-1-2 edition 4 (Medical Devices)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conducted Emissions</td>
<td>EN 55011 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55011 class B (with external filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class B (with external filter)</td>
</tr>
<tr>
<td>Radiated Emissions</td>
<td>FCC Part 18 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (with external filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (with external filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (with external filter)</td>
</tr>
<tr>
<td>External filter proposal</td>
<td><a href="http://www.tracopower.com/overview/thm6wi">www.tracopower.com/overview/thm6wi</a></td>
</tr>
</tbody>
</table>

### EMS Immunity

<table>
<thead>
<tr>
<th>Discharge Type</th>
<th>EN 61000-4-2, ±15 kV, perf. criteria A</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air</td>
<td>EN 61000-4-2, ±8 kV, perf. criteria A</td>
</tr>
<tr>
<td>Contact</td>
<td>EN 61000-4-3, 10 V/m, perf. criteria A</td>
</tr>
<tr>
<td>EFT (Burst) / Surge</td>
<td>EN 61000-4-4, ±2 kV, perf. criteria A</td>
</tr>
<tr>
<td>Ext. input component</td>
<td>EN 61000-4-5, ±2 kV, perf. criteria A</td>
</tr>
<tr>
<td>5Vin models: KY 1000 µF</td>
<td></td>
</tr>
<tr>
<td>24Vin models: KY 470 µF</td>
<td></td>
</tr>
<tr>
<td>48Vin models: KY 330 µF</td>
<td></td>
</tr>
<tr>
<td>Conducted RF Disturbances</td>
<td>EN 61000-4-6, 10 Vrms, perf. criteria A</td>
</tr>
<tr>
<td>PF Magnetic Field</td>
<td>Continuous: EN 61000-4-8, 100 A/m, perf. criteria A</td>
</tr>
<tr>
<td>1s:</td>
<td>EN 61000-4-8, 1000 A/m, perf. criteria A</td>
</tr>
</tbody>
</table>

### General Specifications

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

All specifications valid at nominal voltage, resistive 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

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

### Cooling System
- Natural convection (20 LFM)

### Remote Control
- Voltage Controlled Remote (passive = on)
  - 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
- 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
- Input to Output, 1 s: 10'000 VDC

### Clearance
- Input to Output: 8 mm min.

### Creepage
- 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)

### Washing Process

### Environment
- Vibration
- Thermal Shock

### 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 (2.5 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
- DIP24

### Soldering Profile
- Lead-Free Wave Soldering
  - 265°C / 10 s max.

### Weight
- 14 g

### Thermal Impedance
- Case to Ambient: 18 K/W typ.

### Environmental Compliance
- REACH Declaration: [www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)
- SCIP Reference Number: ffbb141a-1df3-4321-ae20-4e79ad5ce0af

### Supporting Documents

**Overview Link** ([for additional Documents](http://www.tracopower.com/overview/thm6wi))

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

[www.tracopower.com](http://www.tracopower.com)  January 22, 2024  Page 4 / 5
Outline Dimensions

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

Optional models with alternative 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>

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 alternative pinning for 5 Vin models.
Corresponding parts are with THM 6 series by default.
see [www.tracopower.com/overview/thm6](http://www.tracopower.com/overview/thm6)