DC/DC Medical Converter

THM 15 Series, 15 Watt

- Wide 2:1 input voltage 15 W DC/DC converter in a 1.6 \( \times \) 1 " 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 <2.5 \( \mu \)A
- Operating temperature –40°C to 85°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 15 series is a range of medical 15 Watt DC/DC converters in 1.6" x 1.0" plastic package and with wide 2:1 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 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 90% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +85°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</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
</tr>
<tr>
<td>THM 15-1211</td>
<td>5 VDC</td>
<td>3’000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-1212</td>
<td>12 VDC</td>
<td>1’250 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-1213</td>
<td>15 VDC</td>
<td>1’000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-1215</td>
<td>24 VDC</td>
<td>625 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-1221</td>
<td>+5 VDC</td>
<td>1’500 mA</td>
<td>–5 VDC</td>
<td>1’500 mA</td>
</tr>
<tr>
<td>THM 15-1222</td>
<td>+12 VDC</td>
<td>625 mA</td>
<td>–12 VDC</td>
<td>625 mA</td>
</tr>
<tr>
<td>THM 15-1223</td>
<td>+15 VDC</td>
<td>500 mA</td>
<td>–15 VDC</td>
<td>500 mA</td>
</tr>
<tr>
<td>THM 15-2411</td>
<td>5 VDC</td>
<td>3’000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-2412</td>
<td>12 VDC</td>
<td>1’250 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-2413</td>
<td>15 VDC</td>
<td>1’000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-2415</td>
<td>24 VDC</td>
<td>625 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-2421</td>
<td>+5 VDC</td>
<td>1’500 mA</td>
<td>–5 VDC</td>
<td>1’500 mA</td>
</tr>
<tr>
<td>THM 15-2422</td>
<td>+12 VDC</td>
<td>625 mA</td>
<td>–12 VDC</td>
<td>625 mA</td>
</tr>
<tr>
<td>THM 15-2423</td>
<td>+15 VDC</td>
<td>500 mA</td>
<td>–15 VDC</td>
<td>500 mA</td>
</tr>
<tr>
<td>THM 15-4811</td>
<td>5 VDC</td>
<td>3’000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-4812</td>
<td>12 VDC</td>
<td>1’250 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-4813</td>
<td>15 VDC</td>
<td>1’000 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-4815</td>
<td>24 VDC</td>
<td>625 mA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THM 15-4821</td>
<td>+5 VDC</td>
<td>1’500 mA</td>
<td>–5 VDC</td>
<td>1’500 mA</td>
</tr>
<tr>
<td>THM 15-4822</td>
<td>+12 VDC</td>
<td>625 mA</td>
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</tr>
<tr>
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<td>+15 VDC</td>
<td>500 mA</td>
<td>–15 VDC</td>
<td>500 mA</td>
</tr>
</tbody>
</table>

### Options

<table>
<thead>
<tr>
<th>on demand (backorder with MOQ non stocking item)</th>
<th>- Optional models with Remote On/Off function</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>- Optional models with inverse Remote On/Off function (passive = off)</td>
</tr>
</tbody>
</table>

www.tracopower.com  January 22, 2024  Page 1 / 5
### Input Specifications

<table>
<thead>
<tr>
<th>Input Current</th>
<th>12 Vin models: 12 mA typ.</th>
<th>24 Vin models: 10 mA typ.</th>
<th>48 Vin models: 9 mA typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surge Voltage</td>
<td>12 Vin models: 25 VDC max. (3 s max)</td>
<td>24 Vin models: 50 VDC max. (3 s max)</td>
<td>48 Vin models: 100 VDC max. (3 s max)</td>
</tr>
<tr>
<td>Under Voltage Lockout</td>
<td>12 Vin models: 7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.</td>
<td>24 Vin models: 15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.</td>
<td>48 Vin models: 32 VDC min. / 33 VDC typ. / 34 VDC max.</td>
</tr>
<tr>
<td>Recommended Input Fuse</td>
<td>12 Vin models: 3'150 mA (slow blow)</td>
<td>24 Vin models: 1'600 mA (slow blow)</td>
<td>48 Vin models: 800 mA (slow blow)</td>
</tr>
<tr>
<td></td>
<td>(The need of an external fuse has to be assessed in the final application)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Filter</td>
<td>Internal Pi-Type</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Output Specifications

#### Output Voltage Adjustment

-10% to +20% (15 & 24 Vout models)
±10% (other models)
(surplus output models only)
(By external trim resistor)

See application note: [www.tracopower.com/overview/thm15](http://www.tracopower.com/overview/thm15)

Output power must not exceed rated power!

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

#### Ripple and Noise

(20 MHz Bandwidth)

- single output
  - 5 Vout models: 50 mVp-p typ. (w/ 10 µF X7R)
  - 12 Vout models: 75 mVp-p typ. (w/ 10 µF X7R)
  - 15 Vout models: 75 mVp-p typ. (w/ 10 µF X7R)
  - 24 Vout models: 100 mVp-p typ. (w/ 4.7 µF X7R)
- dual output
  - 5 / -5 Vout models: 50 / 50 mVp-p typ. (w/ 10 µF X7R)
  - 12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R)
  - 15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R)

#### Capacitive Load

- single output
  - 5 Vout models: 3'800 µF max.
  - 12 Vout models: 650 µF max.
  - 15 Vout models: 530 µF max.
  - 24 Vout models: 190 µF max.
- dual output
  - 5 / -5 Vout models: 1'900 / 1'900 µF max.
  - 12 / -12 Vout models: 380 / 380 µF max.
  - 15 / -15 Vout models: 270 / 270 µF max.

<table>
<thead>
<tr>
<th>Minimum Load</th>
<th>Not required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Coefficient</td>
<td>±0.02 %/K max.</td>
</tr>
<tr>
<td>Start-up Time</td>
<td>30 ms typ. / 60 ms max.</td>
</tr>
<tr>
<td>Short Circuit Protection</td>
<td>Continuous, Automatic recovery</td>
</tr>
<tr>
<td>Output Current Limitation</td>
<td>185% max. of lout max.</td>
</tr>
<tr>
<td></td>
<td>150% typ. of lout max.</td>
</tr>
</tbody>
</table>

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)
6.2 VDC typ. (5 VDC model)
15 VDC typ. (12 VDC model)
20 VDC typ. (15 VDC model)
30 VDC typ. (24 VDC model)
6.2 VDC typ. (±5 VDC model)
15 VDC typ. (±12 VDC model)
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
  IEC 62368-1
  UL 62368-1
- Medical Equipment
  EN 60601-1
  IEC 60601-1
  ANSI/AAMI ES 60601-1
- Certification Documents
  www.tracopower.com/overview/thm15

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)

External filter proposal: www.tracopower.com/overview/thm15

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
  10 V/m, perf. criteria A

- EFT (Burst) / Surge
  240 Vrms, 200 µF, TVS SMJ120A

Ext. input component:
- Conducted RF Disturbances
  12 Vin models: 2 x KY 220 µF TVS SMJ36A
  24 Vin models: 2 x KY 220 µF TVS SMJ58A

- PF Magnetic Field
  Continuous: EN 61200-4-6, 10 Vrms, perf. criteria A
  Continuous: EN 61200-4-8, 1000 A/m, perf. criteria A

General Specifications

Relative Humidity 95% max. (non condensing)

Temperature Ranges - Operating Temperature
- Case Temperature
- Storage Temperature
  -40°C to +85°C
  +105°C max.
  -55°C to +125°C

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

www.tracopower.com January 22, 2024
### Power Derating
- High Temperature
  - 2.5 %/K above 65°C
  - See application note: www.tracopower.com/overview/thm15

### Over Temperature Protection Switch Off
- Protection Mode
- Measurement Point
- 115°C typ. (Automatic recovery)
- Case

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

### Remote Control
- Voltage Controlled Remote
  (passive = on)
- Off Idle Input Current
- Remote Pin Input Current
  - On: 3.5 to 12 VDC or open circuit
  - Off: 0 to 1.2 VDC or short circuit
  - Refers to 'Remote' and 'Vin' Pin
  - 2.5 mA typ.
  - -0.5 to 1.0 mA
  (Optional models with inverse Remote On/Off function (passive = off))

### Altitude During Operation
- 5'000 m max.

### Switching Frequency
- 225 - 285 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

### 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
  - 2'080'000 h (MIL-HDBK-217F, ground benign)

### Washing Process
- According to Cleaning Guideline
  - www.tracopower.com/info/cleaning.pdf

### 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

### 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
  - 265°C / 10 s max.

### Weight
- 24 g

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

### Environmental Compliance
- REACH Declaration
  - www.tracopower.com/info/reach-declaration.pdf
- REACH SVHC list compliant
- REACH Annex XVII compliant
  - www.tracopower.com/info/rohs-declaration.pdf
- RoHS Declaration
  - Exemptions: 7a, 7c-l
  (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))
  - www.tracopower.com/info/reach-declaration.pdf
- SCIP Reference Number
  - cd949d48-3380-4ccc9-a15d-0cd2ecd88e54

### Supporting Documents

**Overview Link** (for additional Documents)

- www.tracopower.com/overview/thm15

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 ±0.5 (±0.02)
Pin Ø 1.0 ±0.1 (0.039 ±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>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>2</td>
<td>–Vin (GND)</td>
<td>–Vin (GND)</td>
</tr>
<tr>
<td>3</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>4</td>
<td>–Vout</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>Trim</td>
<td>–Vout</td>
</tr>
<tr>
<td>6</td>
<td>No pin*/Remote</td>
<td>No pin*/Remote</td>
</tr>
</tbody>
</table>

*If remote is not selected there will be no pin.