The THM 20 series is a range of medical 20 Watt DC/DC converters in 1.6” x 1” 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 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 89% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +80°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 20-1211</td>
<td>9 - 18 VDC (12 VDC nom.)</td>
<td>5 VDC</td>
<td>4,000 mA</td>
<td>-5 VDC</td>
</tr>
<tr>
<td>THM 20-1212</td>
<td>12 VDC</td>
<td>1,670 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-1213</td>
<td>15 VDC</td>
<td>1,330 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-1215</td>
<td>24 VDC</td>
<td>833 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-1221</td>
<td>+5 VDC</td>
<td>2,000 mA</td>
<td>86 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-1222</td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-1223</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-2411</td>
<td>18 - 36 VDC (24 VDC nom.)</td>
<td>5 VDC</td>
<td>4,000 mA</td>
<td>-5 VDC</td>
</tr>
<tr>
<td>THM 20-2412</td>
<td>12 VDC</td>
<td>1,670 mA</td>
<td>90 %</td>
<td>90 %</td>
</tr>
<tr>
<td>THM 20-2413</td>
<td>15 VDC</td>
<td>1,330 mA</td>
<td>90 %</td>
<td>90 %</td>
</tr>
<tr>
<td>THM 20-2415</td>
<td>24 VDC</td>
<td>833 mA</td>
<td>90 %</td>
<td>90 %</td>
</tr>
<tr>
<td>THM 20-2421</td>
<td>+5 VDC</td>
<td>2,000 mA</td>
<td>86 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-2422</td>
<td>+12 VDC</td>
<td>833 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-2423</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-4811</td>
<td>36 - 75 VDC (48 VDC nom.)</td>
<td>5 VDC</td>
<td>4,000 mA</td>
<td>-5 VDC</td>
</tr>
<tr>
<td>THM 20-4812</td>
<td>12 VDC</td>
<td>1,670 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-4813</td>
<td>15 VDC</td>
<td>1,330 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
<tr>
<td>THM 20-4815</td>
<td>24 VDC</td>
<td>833 mA</td>
<td>89 %</td>
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<td>833 mA</td>
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</tr>
<tr>
<td>THM 20-4823</td>
<td>+15 VDC</td>
<td>667 mA</td>
<td>89 %</td>
<td>89 %</td>
</tr>
</tbody>
</table>

## Options

- Optional models with remote-control function
- Optional models with remote-control function with inverse logic
## Input Specifications

<table>
<thead>
<tr>
<th>Input Current</th>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>- At no load</td>
<td>11 mA typ.</td>
<td>9 mA typ.</td>
<td>9 mA typ.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Surge Voltage</th>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 25 VDC max. (3 s max.)</td>
<td>50 VDC max. (3 s max.)</td>
<td>100 VDC max. (3 s max.)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Under Voltage Lockout</th>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 7.8 VDC min. / 8 VDC typ. / 8.6 VDC max.</td>
<td>15.8 VDC min. / 16 VDC typ. / 17.4 VDC max.</td>
<td>32 VDC min. / 33 VDC typ. / 34 VDC max.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Recommended Input Fuse</th>
<th>12 Vin models</th>
<th>24 Vin models</th>
<th>48 Vin models</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 4'000 mA (Slow blow)</td>
<td>2'000 mA (Slow blow)</td>
<td>1'000 mA (Slow blow)</td>
<td></td>
</tr>
</tbody>
</table>

(The need of an external fuse has to be assessed in the final application.)

## Output Specifications

### Output Voltage Adjustment

<table>
<thead>
<tr>
<th>Voltage Set Accuracy</th>
<th>±1% max.</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>Ripple and Noise (20 MHz Bandwidth)</th>
<th>5 Vout models: 50 mVp-p typ. (w/ 10 µF X7R)</th>
<th>12 Vout models: 75 mVp-p typ. (w/ 10 µF X7R)</th>
<th>15 Vout models: 75 mVp-p typ. (w/ 10 µF X7R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- single output</td>
<td>24 Vout models: 100 mVp-p typ. (w/ 4.7 µF X7R)</td>
<td>5 / -5 Vout models: 50 / 50 mVp-p typ. (w/ 10 µF X7R)</td>
<td>12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R)</td>
</tr>
<tr>
<td>- dual output</td>
<td>15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacitive Load</th>
<th>5 Vout models: 5'000 µF max.</th>
<th>12 Vout models: 850 µF max.</th>
<th>15 Vout models: 700 µF max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>- single output</td>
<td>24 Vout models: 220 µF max.</td>
<td>5 / -5 Vout models: 2'500 / 2'500 µF max.</td>
<td>12 / -12 Vout models: 500 / 500 µF max.</td>
</tr>
<tr>
<td>- dual output</td>
<td>15 / -15 Vout models: 350 / 350 µF max.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<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 Iout max.</td>
</tr>
<tr>
<td></td>
<td>150% typ. of Iout max.</td>
</tr>
</tbody>
</table>

All specifications valid at nominal voltage, 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. (6 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

Safety 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
  - 2 x MOPP (Means Of Patient Protection)

Pollution Degree
PD 2

Over Voltage Category
OVC II

EMC Specifications

EMI Emissions
- Conducted Emissions
  - EN 55011 class A (with internal filter)
  - EN 55032 class A (with internal filter)
  - FCC Part 18 class A (with internal filter)
- Radiated Emissions
  - EN 55011 class A (with internal filter)
  - EN 55032 class A (with internal filter)
  - FCC Part 18 class A (with internal 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

Ext. input component: 12 Vin models: 2 x KY 220 µF // TVS SMDJ36A
24 Vin models: 2 x KY 220 µF // TVS SMDJ58A
48 Vin models: 2 x KY 220 µF // TVS SMDJ1120A
- Conducted RF Disturbances
  - EN 61000-4-6, 10 Vrms, perf. criteria A
- PF Magnetic Field
  - Continuous: EN 61000-4-8, 100 A/m, perf. criteria A
  - 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

General Specifications

Relative Humidity
95% max. (non condensing)

Temperature Ranges
- Operating Temperature
  - -40°C to +80°C
- Case Temperature
  - +105°C max.
- Storage Temperature
  - -55°C to +125°C

Power Derating
- High Temperature
  - 2 %/K above 55°C

All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.
### Over Temperature Protection Switch Off
- Protection Mode
- Measurement Point

### Cooling System
Natural convection (20 LFM)

### Remote Control
- Voltage Controlled Remote
  - Off Idle Input Current
  - Remote Pin Input Current

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

### Switching Frequency
225 - 285 kHz (PWM)
250 kHz typ. (PWM)

### Insulation System
Reinforced Insulation

### 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
  20 pF typ.

### Leakage Current
- Touch Current
  2.5 µA max. (240 VAC, 60 Hz)

### Reliability
- Calculated MTBF
  1'712'000 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
24 g

### Thermal Impedance
14.4 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/thm20
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)

Bottom View

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.