AC/DC Medical Power Supply

TPP 300-M Series, 300 Watt

- High power-density: 300 Watt in 4.6"x2.44" package (encased)
- I/O isolation 3000 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
- Peak power operation up to 360 Watt for 5s
- Operating temperature –40°C to 80°C
- Active power factor correction >0.9
- Operating up to 5000m altitude
- 5-year product warranty

The TPP 300-M series is a set of encapsulated AC/DC power supplies in an encased package style. They feature a reinforced double I/O isolation (3000 VAC) system according to latest medical safety standards. The TPP 300-M series also has a low leakage current of <100 μA which makes the units suitable for BF (body floating) applications. The excellent efficiency of up to 93% allows a high power-density and compact design (4.6” x 2.44”). The operating temperature range is –40°C to +80°C with derating above 50°C. In natural convection operation these power supplies deliver 180 Watt going up to 300 Watt with forced air cooling. Additionally, they can deliver 360 Watt peak power for 5s. The EMC characteristic is dedicated for applications in industrial and medical fields. High reliability is provided by using high quality components and an excellent thermal management making the TPP 300-M an ideal solution for industrial and medical devices and for demanding safety and space critical applications.

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>TPP 300-112-M</td>
<td>12 VDC (10.8 - 13.2 VDC)</td>
<td>25'000 mA</td>
<td>30'000 mA</td>
<td>91 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPP 300-115-M</td>
<td>15 VDC (13.5 - 16.5 VDC)</td>
<td>20'000 mA</td>
<td>24'000 mA</td>
<td>92 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPP 300-124-M</td>
<td>24 VDC (21.6 - 26.4 VDC)</td>
<td>12'500 mA</td>
<td>15'000 mA</td>
<td>93 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPP 300-136-M</td>
<td>36 VDC (32.4 - 39.6 VDC)</td>
<td>8'330 mA</td>
<td>10'000 mA</td>
<td>93 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPP 300-148-M</td>
<td>48 VDC (43.2 - 52.8 VDC)</td>
<td>6'250 mA</td>
<td>7'500 mA</td>
<td>93 %</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TPP 300-153-M</td>
<td>53 VDC (47.7 - 58.3 VDC)</td>
<td>5'670 mA</td>
<td>6'790 mA</td>
<td>93 %</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Options**

- Optional model with 18 VDC / 16’667 mA
- Optional model with 28 VDC / 10’710 mA
### Input Specifications

<table>
<thead>
<tr>
<th>Input Voltage</th>
<th>AC Range</th>
<th>Operational Range: 85 - 264 VAC (Full Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>DC Range</td>
<td>Rated Range: 100 - 240 VAC (Full Range)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operational Range: 120 - 370 VDC (Designed for, no certification)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Polarity: +DC: L / –DC: N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Current</th>
<th>Full Load &amp; Vin = 230 VAC</th>
<th>1'600 mA max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 115 VAC</td>
<td>3'900 mA max.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Consumption</th>
<th>At no load</th>
<th>3'000 mW typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 230 VAC</td>
<td>0.9 A max.</td>
</tr>
<tr>
<td></td>
<td>At 115 VAC</td>
<td>40 A max.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power Factor</th>
<th>At 230 VAC</th>
<th>0.9 min. (Active Power Factor Correction)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 115 VAC</td>
<td>0.9 min. (Active Power Factor Correction)</td>
</tr>
</tbody>
</table>

| Input Protection    | 5 A / 250 VAC (Internal Fuse in L & N) |

<table>
<thead>
<tr>
<th>Recommended Input Fuse</th>
<th>5'000 mA (slow blow)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(The need of an external fuse has to be assessed in the final application.)</td>
</tr>
</tbody>
</table>

### Output Specifications

<table>
<thead>
<tr>
<th>Output Voltage Adjustment</th>
<th>±10% (by trim potentiometer)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output power must not exceed rated power!</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Voltage Set Accuracy</th>
<th>±1% max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation</td>
<td>- Input Variation (Vmin - Vmax)</td>
</tr>
<tr>
<td></td>
<td>- Load Variation (0 - 100%)</td>
</tr>
<tr>
<td></td>
<td>0.2% max.</td>
</tr>
<tr>
<td></td>
<td>0.5% max.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Boost Power</th>
<th>Output Current peak: See model table</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak power time: 5 s max.</td>
</tr>
<tr>
<td></td>
<td>Peak power duty cycle: 20% max.</td>
</tr>
<tr>
<td></td>
<td>Average operation power: 50% of full load</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ripple and Noise</th>
<th>12 VDC model: 150 mVp-p max. (w/ 1 µF X7R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(20 MHz Bandwidth)</td>
<td>15 VDC model: 180 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
<tr>
<td></td>
<td>18 VDC model: 210 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
<tr>
<td></td>
<td>24 VDC model: 270 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
<tr>
<td></td>
<td>28 VDC model: 310 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
<tr>
<td></td>
<td>36 VDC model: 390 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
<tr>
<td></td>
<td>48 VDC model: 510 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
<tr>
<td></td>
<td>53 VDC model: 540 mVp-p max. (w/ 1 µF X7R)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacitive Load</th>
<th>12 VDC model: 20'000 µF max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 VDC model: 12'000 µF max.</td>
</tr>
<tr>
<td></td>
<td>18 VDC model: 9'000 µF max.</td>
</tr>
<tr>
<td></td>
<td>24 VDC model: 2'400 µF max.</td>
</tr>
<tr>
<td></td>
<td>28 VDC model: 2'000 µF max.</td>
</tr>
<tr>
<td></td>
<td>36 VDC model: 1'000 µF max.</td>
</tr>
<tr>
<td></td>
<td>48 VDC model: 650 µF max.</td>
</tr>
<tr>
<td></td>
<td>53 VDC model: 470 µF max.</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>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hold-up Time</th>
<th>At 230 VAC: 5 ms min.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 115 VAC: 5 ms min.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Start-up Time</th>
<th>At 230 VAC: 2'000 ms max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>At 115 VAC: 2'000 ms max.</td>
</tr>
</tbody>
</table>

| Short Circuit Protection | Continuous, Automatic recovery |

<table>
<thead>
<tr>
<th>Output Current Limitation</th>
<th>135 - 165% of Iout max.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>150% typ. of Iout max.</td>
</tr>
</tbody>
</table>

| Overvoltage Protection   | 115 - 135% of Vout nom. (Latch off) |

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
### Transient Response
- Response Deviation: 3% typ. / 10% max. (50% to 75% Load Step)
- Response Time: 600 µs typ. (50% to 75% Load Step)

### Safety Specifications

<table>
<thead>
<tr>
<th>Safety 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>UL 62368-1</td>
</tr>
<tr>
<td></td>
<td>EN 60601-1</td>
</tr>
<tr>
<td></td>
<td>IEC 60601-1</td>
</tr>
<tr>
<td></td>
<td>ANSI/AAMI ES 60601-1</td>
</tr>
</tbody>
</table>

- Certification Documents: 2 x MOPP (Means Of Patient Protection)

### Protection Class
- Class I & II (Prepared: Reinforced Insulation)

### Pollution Degree
- PD 2

### Over Voltage Category
- OVC II

### 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 B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 15 class B (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class B (internal filter)</td>
</tr>
<tr>
<td>- Radiated Emissions</td>
<td>EN 55011 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>EN 55032 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 15 class A (internal filter)</td>
</tr>
<tr>
<td></td>
<td>FCC Part 18 class A (internal filter)</td>
</tr>
</tbody>
</table>

| Harmonic Current Emissions | EN 61000-3-2, class A |
| Voltage Fluctuations & Flicker | EN 61000-3-3 |

### EMS Immunity

| Electrostatic Discharge | EN 61000-4-2, ±15 kV, perf. criteria A |
| Contact: Air: | EN 61000-4-2, ±8 kV, perf. criteria A |
| Contact: L to L: | EN 61000-4-3, 20 V/m, perf. criteria A |
| Contact: L to PE: | EN 61000-4-4, ±2 kV, perf. criteria A |
| Conducted RF Disturbances | EN 61000-4-5, ±1 kV, perf. criteria A |
| Continuous: | EN 61000-4-6, 20 Vrms, perf. criteria A |
| Voltage Dips & Interruptions | EN 61000-4-8, 30 A/m, perf. criteria A |

| 230 VAC / 50 Hz: 30% | EN 61000-4-11 |
| 25 periods, perf. criteria A | >95%, 0.5 periods, perf. criteria A |
| >95%, 250 periods, perf. criteria B |

| 115 VAC / 60 Hz: 30% | EN 61000-4-11 |
| 25 periods, perf. criteria A | >95%, 0.5 periods, perf. criteria A |
| >95%, 250 periods, perf. criteria B |

### General Specifications

| Relative Humidity | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature: -40°C to +80°C |
| | - Storage Temperature: -40°C to +80°C |
| Power Derating | - High Temperature: See application note: www.tracopower.com/overview/tpp300-m |
| | - Low Input Voltage: 2 %/V below 100 VAC |
| Over Temperature Protection Switch Off | - Protection Mode: 118°C min. / 125°C typ. / 132°C max. (Automatic recovery at 112°C typ.) |
| | - Measurement Point: See application note: www.tracopower.com/overview/tpp300-m (Internal Thermistor) |

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
<table>
<thead>
<tr>
<th>Cooling System</th>
<th>Forced air cooling (with internal fan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fan Power Source</td>
<td>Variable fan speed (temperature regulated)</td>
</tr>
<tr>
<td>- Characteristic</td>
<td>12 VDC</td>
</tr>
<tr>
<td>- Output Voltage</td>
<td>500 mA max.</td>
</tr>
<tr>
<td>- Output Current</td>
<td></td>
</tr>
<tr>
<td>Standby Power Source</td>
<td>5 VDC</td>
</tr>
<tr>
<td>- Output Voltage</td>
<td>1000 mA max.</td>
</tr>
<tr>
<td>- Output Current</td>
<td>(Fan Power Source and Standby Power Source total power must not exceed 8 W.)</td>
</tr>
<tr>
<td>Remote Control</td>
<td>On: 3.0 to 12 VDC or open circuit</td>
</tr>
<tr>
<td>- Voltage Controlled Remote</td>
<td>Off: 0 to 1.2 VDC or short circuit</td>
</tr>
<tr>
<td>- Off Idle Input Current</td>
<td>Refers to ‘+Remote’ and ‘-Remote’ Pin</td>
</tr>
<tr>
<td>- Remote Pin Input Current</td>
<td>16 mA typ. / 25 mA max. (except Standby power source and Fan power source)</td>
</tr>
<tr>
<td>-0.5 to 1.0 mA</td>
<td>(Standby power source and Fan power source are always present)</td>
</tr>
<tr>
<td>Altitude During Operation</td>
<td>5'000 m max.</td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>100 - 180 kHz (PWM)</td>
</tr>
<tr>
<td>- Characteristic</td>
<td>140 kHz typ. (PWM)</td>
</tr>
<tr>
<td>Insulation System</td>
<td>Reinforced Insulation</td>
</tr>
<tr>
<td>Working Voltage (rated)</td>
<td>250 VAC</td>
</tr>
<tr>
<td>Isolation Test Voltage</td>
<td>4'000 VAC</td>
</tr>
<tr>
<td>- Input to Output, 60 s</td>
<td>2'500 VAC</td>
</tr>
<tr>
<td>- Input to Case or PE, 60 s</td>
<td></td>
</tr>
<tr>
<td>- Output to Case or PE, 60 s</td>
<td>2'500 VAC</td>
</tr>
<tr>
<td>Creepage</td>
<td>13.6 mm min.</td>
</tr>
<tr>
<td>- Input to Output</td>
<td>5 mm min.</td>
</tr>
<tr>
<td>- Input to Case or PE</td>
<td>4.2 mm min.</td>
</tr>
<tr>
<td>Clearance</td>
<td>9.7 mm min.</td>
</tr>
<tr>
<td>- Input to Output</td>
<td>5 mm min.</td>
</tr>
<tr>
<td>- Input to Case or PE</td>
<td>4.2 mm min.</td>
</tr>
<tr>
<td>Isolation Resistance</td>
<td>100 MΩ min.</td>
</tr>
<tr>
<td>- Input to Output, 500 VDC</td>
<td></td>
</tr>
<tr>
<td>Isolation Capacitance</td>
<td>1'250 pF typ. / 1'500 pF max.</td>
</tr>
<tr>
<td>- Input to Output, 100 kHz, 1 V</td>
<td></td>
</tr>
<tr>
<td>Leakage Current (254 VAC / 60 Hz)</td>
<td>100 µA max.</td>
</tr>
<tr>
<td>- Touch Current</td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td>1'056'000 h (MIL-HDBK-217F, ground benign)</td>
</tr>
<tr>
<td>- Characteristic</td>
<td></td>
</tr>
<tr>
<td>Environment</td>
<td></td>
</tr>
<tr>
<td>- Vibration</td>
<td>IEC 60068-2-6</td>
</tr>
<tr>
<td>- Mechanical Shock</td>
<td>5 g, 3 axis, sine sweep, 3x30 min, 5-500 Hz</td>
</tr>
<tr>
<td>- Thermal Shock</td>
<td>IEC 60068-2-27</td>
</tr>
<tr>
<td>- 50 g, 3 axis, half sine, 11 ms</td>
<td></td>
</tr>
<tr>
<td>MIL-STD-810F</td>
<td></td>
</tr>
<tr>
<td>Housing Material</td>
<td>Aluminium</td>
</tr>
<tr>
<td>Housing Type</td>
<td>Metal Case</td>
</tr>
<tr>
<td>Mounting Type</td>
<td>Chassis Mount</td>
</tr>
<tr>
<td>Connection Type</td>
<td>Pin Connector</td>
</tr>
<tr>
<td>Weight</td>
<td>318 g</td>
</tr>
</tbody>
</table>

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
### TPP 300-M Series, 300 Watt

<table>
<thead>
<tr>
<th>Power OK Signal</th>
<th>Open collector output</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Trigger Threshold</td>
<td>12 VDC model: 10 - 10.8 VDC</td>
</tr>
<tr>
<td></td>
<td>15 VDC model: 12.5 - 13.5 VDC</td>
</tr>
<tr>
<td></td>
<td>18 VDC model: 15.3 - 16.2 VDC</td>
</tr>
<tr>
<td></td>
<td>24 VDC model: 20 - 21.6 VDC</td>
</tr>
<tr>
<td></td>
<td>28 VDC model: 24 - 25.2 VDC</td>
</tr>
<tr>
<td></td>
<td>36 VDC model: 31 - 32.4 VDC</td>
</tr>
<tr>
<td></td>
<td>48 VDC model: 41.5 - 43.2 VDC</td>
</tr>
<tr>
<td></td>
<td>53 VDC model: 46 - 47.7 VDC</td>
</tr>
<tr>
<td>- Power OK</td>
<td>Low level</td>
</tr>
<tr>
<td>- Power Off</td>
<td>High resistance</td>
</tr>
<tr>
<td></td>
<td>(Refers to ‘PG’ and ‘-Vout’ Pin)</td>
</tr>
<tr>
<td>- Pin Specifications</td>
<td>50 VDC / 50 mA max.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sense Function</th>
<th>10% max. of Vout nom.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(If sense function is not used, sense pins should be connected to output pins)</td>
</tr>
</tbody>
</table>

### Environmental Compliance

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

- **RoHS Declaration**
  - www.tracopower.com/info/rohs-declaration.pdf
  - Exemptions: 7c-I
  - (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (OE5A rule). The SCIP number is provided on request.)

### Supporting Documents

- **Overview Link** (for additional Documents)
  - www.tracopower.com/overview/tpp300-m

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

**Input**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>AC (L) / DC (+)</td>
<td>1</td>
<td>+ Vout</td>
</tr>
<tr>
<td>2</td>
<td>– Vout</td>
<td>2</td>
<td>– Standby</td>
</tr>
<tr>
<td>3</td>
<td>AC (N) / DC (–)</td>
<td>3</td>
<td>+ Standby</td>
</tr>
<tr>
<td>3</td>
<td>PG</td>
<td>4</td>
<td>– Remote</td>
</tr>
<tr>
<td>4</td>
<td>– Sense</td>
<td>5</td>
<td>+ Remote</td>
</tr>
</tbody>
</table>

** Auxiliary**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+ Fan</td>
</tr>
<tr>
<td>2</td>
<td>– Fan</td>
</tr>
<tr>
<td>3</td>
<td>+ Sense</td>
</tr>
<tr>
<td>4</td>
<td>– Sense</td>
</tr>
</tbody>
</table>

** CON1:** Molex Housing 09-50-8031

** CON2:** KST Ring Terminal RVS2-3.7

** CON3:** Molex Housing 90143-0004

** CON4:** Molex Housing 51021-0500

Specifications can be changed without notice.

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