AC/DC Medical Power Supply

TPP 65E-J Series, 65 Watt

- Compact encapsulated 65 Watt Chassis mount module (4.3"x2.2")
- I/O isolation 4000 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 <100 µA rated for BF applications
- Operating temperature –40°C to 80°C
- EMC compliance according to IEC 60601-1-2 4th edition and EN55032 class B
- Operating up to 5000m altitude
- 5-year product warranty

The TPP65E-J is a 65 Watt encapsulated AC/DC modules in a Chassis mount package. It features a reinforced double I/O isolation system according to latest medical safety standards (60601-1 3rd edition, 2 x MOPP). The leakage current is below 100 µA and makes the module suitable for BF (body floating) applications. The excellent efficiency of up to 93% allows a high power density and compact design (4.3" x 2.2"). The operating temperature range is –40°C to +80°C with derating above 60°C. The EMC characteristic is dedicated for applications in industrial and medical fields. High reliability is provided by use of high quality components and an excellent thermal management making the TPP 65E-J an ideal solution for medical devices and for demanding safety and space critical applications.

Models

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>TPP 65-105E-J</td>
<td>50 W</td>
<td>5 VDC (4.5 - 5.5 VDC)</td>
<td>10'000 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TPP 65-112E-J</td>
<td>65 W</td>
<td>12 VDC (10.8 - 13.2 VDC)</td>
<td>5'420 mA</td>
<td>93 %</td>
</tr>
<tr>
<td>TPP 65-115E-J</td>
<td>65 W</td>
<td>15 VDC (13.5 - 16.5 VDC)</td>
<td>4'340 mA</td>
<td>94 %</td>
</tr>
<tr>
<td>TPP 65-124E-J</td>
<td>65 W</td>
<td>24 VDC (21.6 - 26.4 VDC)</td>
<td>2'710 mA</td>
<td>94 %</td>
</tr>
<tr>
<td>TPP 65-136E-J</td>
<td>65 W</td>
<td>36 VDC (32.4 - 39.6 VDC)</td>
<td>1'810 mA</td>
<td>93 %</td>
</tr>
<tr>
<td>TPP 65-148E-J</td>
<td>65 W</td>
<td>48 VDC (43.2 - 52.8 VDC)</td>
<td>1'360 mA</td>
<td>93 %</td>
</tr>
</tbody>
</table>
## Input Specifications

| Input Voltage          | - AC Range | Operational Range: 85 - 264 VAC (Full Range)  
|                       | - DC Range | Rated Range: 100 - 240 VAC (Full Range)  
|                       |           | Operational Range: 120 - 370 VDC (Designed for, no certification)  
| Polarity              | +DC: L / −DC: N |  
| Input Frequency       |           | 47 - 63 Hz |  
| Input Current         | - Full Load & Vin = 230 VAC | 900 mA max.  
|                       | - Full Load & Vin = 115 VAC | 1'500 mA max.  
| Power Consumption     | - At no load | 110 mW typ. (Ready to meet ErP directive)  
| Input Inrush Current  | - At 230 VAC | 80 A max.  
|                       | - At 115 VAC | 30 A max.  
| Recommended Input Fuse|           | T 3.15 A / 250 VAC [Internal Fuse L & N]  
| 3150 mA (Slow blow)  |           | (The need of an external fuse has to be assessed in the final application)  

## Output Specifications

### Output Voltage Adjustment

| Voltage Set Accuracy | ±10% (by external trim resistor)  
| Regulation           | ±1% max.  
| - Input Variation (Vmin - Vmax) | 0.2% max.  
| - Load Variation (0 - 100%) | 0.5% max.  

### Ripple and Noise

| 5 VDC model | 100 mVp-p max. (w/ 10uF)  
| 12 VDC model | 100 mVp-p max. (w/ 10uF)  
| 15 VDC model | 100 mVp-p max. (w/ 10uF)  
| 24 VDC model | 120 mVp-p max. (w/ 1uF)  
| 36 VDC model | 120 mVp-p max. (w/ 1uF)  
| 48 VDC model | 200 mVp-p max. (w/ 0.1uF)  
| 5 VDC model | 75 mVp-p typ. (w/ 10uF)  
| 12 VDC model | 75 mVp-p typ. (w/ 10uF)  
| 15 VDC model | 75 mVp-p typ. (w/ 10uF)  
| 24 VDC model | 75 mVp-p typ. (w/ 1uF)  
| 36 VDC model | 75 mVp-p typ. (w/ 1uF)  
| 48 VDC model | 150 mVp-p typ. (w/ 0.1uF)  

### Capacitive Load

| 5 VDC model | 20'000 µF max.  
| 12 VDC model | 4'520 µF max.  
| 15 VDC model | 2'900 µF max.  
| 24 VDC model | 1'130 µF max.  
| 36 VDC model | 520 µF max.  
| 48 VDC model | 285 µF max.  

### Minimum Load

Not required

### Temperature Coefficient

±0.02 %/K max.

### Hold-up Time

| - At 230 VAC | 75 ms min.  
| - At 115 VAC | 16 ms min.  

### Start-up Time

| - At 230 VAC | 1'000 ms max.  
| - At 115 VAC | 1'000 ms max.  

### Short Circuit Protection

Continuous, Automatic recovery

### Output Current Limitation

120 - 180% of Iout max.  
145% typ. of Iout max.

### Overvoltage Protection

130% typ. of Vout nom.  
125 - 140% of Vout nom.

### Transient Response

- Response Deviation | 3% max. (50% to 75% Load Step at 2.5 A/µs)  
| Response Time | 600 µs typ. (50% to 75% Load Step at 2.5 A/µs)

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

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### Safety Specifications

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<th>EN 62368-1</th>
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<tr>
<td></td>
<td>IEC 62368-1</td>
</tr>
<tr>
<td></td>
<td>UL 62368-1</td>
</tr>
<tr>
<td>- Medical Equipment</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>
<tr>
<td></td>
<td>2 x MOPP (Means Of Patient Protection)</td>
</tr>
</tbody>
</table>

#### Protection Class
- Class I & II [Prepared]: Reinforced Insulation

#### Pollution Degree
- PD 2

#### EMC Specifications

<table>
<thead>
<tr>
<th>EMI Emissions</th>
<th>EN 55011 class B (internal filter)</th>
</tr>
</thead>
<tbody>
<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 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>- Harmonic Current Emissions</td>
<td>EN 61000-3-2, class A</td>
</tr>
<tr>
<td>- Voltage Fluctuations &amp; Flicker</td>
<td>EN 61000-3-3</td>
</tr>
</tbody>
</table>

#### 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
- EFT (Burst) / Surge
- L to L: EN 61000-4-5, ±1 kV, PERF. CRITERIA A
- Continuous: EN 61000-4-6, 20 Vrms, PERF. CRITERIA A

- Conducted RF Disturbances
- PF Magnetic Field
- Voltage Dips & Interruptions
- 230 VAC / 50 Hz: EN 61000-4-11
- 115 VAC / 60 Hz: EN 61000-4-11
- 30%, 25 periods, PERF. CRITERIA A
- >95%, 0.5 periods, PERF. CRITERIA A
- >95%, 1 period, PERF. CRITERIA A
- >95%, 250 periods, PERF. CRITERIA B

#### General Specifications

<table>
<thead>
<tr>
<th>Relative Humidity</th>
<th>95% max. (non condensing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Ranges</td>
<td>- Operating Temperature: -40°C to +85°C</td>
</tr>
<tr>
<td></td>
<td>- Storage Temperature: -40°C to +85°C</td>
</tr>
<tr>
<td>Power Derating</td>
<td>High Temperature: See application note: <a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a></td>
</tr>
<tr>
<td></td>
<td>Low Input Voltage: See application note: <a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a></td>
</tr>
<tr>
<td>Cooling System</td>
<td>Natural convection (20 LFM)</td>
</tr>
<tr>
<td>Altitude During Operation</td>
<td>5'000 m max.</td>
</tr>
<tr>
<td>Switching Frequency</td>
<td>50 - 130 kHz (PWM QR)</td>
</tr>
<tr>
<td>Insulation System</td>
<td>Reinforced Insulation</td>
</tr>
<tr>
<td>Working Voltage (rated)</td>
<td>250 VAC</td>
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<tr>
<td>Isolation Test Voltage</td>
<td>- Input to Output, 60 s: 4'000 VAC</td>
</tr>
<tr>
<td></td>
<td>- Input to Case or PE, 60 s: 2'500 VAC</td>
</tr>
<tr>
<td></td>
<td>- Output to Case or PE, 60 s: 2'500 VAC</td>
</tr>
</tbody>
</table>

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

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### Creepage
- Input to Output 8 mm min.
- Input to Case or PE 4 mm min.
- Output to Case or PE 4 mm min.

### Clearance
- Input to Output 4 mm min.
- Input to Case or PE 4 mm min.
- Output to Case or PE 4 mm min.

### Isolation Resistance
- Input to Output, 500 VDC 100 MΩ min.

### Isolation Capacitance
- Input to Output, 100 kHz, 1 V 1'250 pF typ. / 1'500 pF max.

### Leakage Current
- Touch Current 100 µA max.

### Reliability
- Calculated MTBF 1'494'000 h (MIL-HDBK-217F, ground benign)

### Environment
- Vibration IEC 60068-2-6
  - 5 g, 3 axis, sine sweep, 3x30 min, 5-500 Hz
- Mechanical Shock IEC 60068-2-27
  - 50 g, 3 axis, 11 ms
- Thermal Shock MIL-STD-810F
  - -40 to +85°C, 72 cycles, 30 min each

### Housing Material
- Plastic (UL 94 V-0 rated)

### Potting Material
- Silicone (UL 94 V-0 rated)

### Housing Type
- Plastic Case

### Mounting Type
- Chassis Mount

### Connection Type
- Pin Connector

### Weight
- 295 g

### 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-l (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).
    The SCIP number is provided on request.)

### Supporting Documents
**Overview Link** (for additional Documents)
- www.tracopower.com/overview/tpp65e-j

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Outline Dimensions

Dimensions in mm (inch)
Tolerances: x.x ±0.5 (x.xx ±0.02)
 x.xx ±0.25 (x.xxx ±0.010)

Pin connectors

<table>
<thead>
<tr>
<th>Pin</th>
<th>Function</th>
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<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Line</td>
<td>1, 2</td>
<td>–Vout</td>
</tr>
<tr>
<td>2</td>
<td>Neutral</td>
<td>3, 4</td>
<td>+Vout</td>
</tr>
</tbody>
</table>

NC: Not connected

Input: JST series
mates with JST crimp terminal: SVH-21T-P1.1
and terminal housing: VHR-3N

Output: JST series
mates with JST crimp terminal: SVH-21T-P1.1
and terminal housing: VHR-4N

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