

- 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 edition 3.2 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 TPP 65E-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 edition 3.2, 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        |                      |                                     |                        |                    |
|---------------|----------------------|-------------------------------------|------------------------|--------------------|
| Order Code    | Output Power<br>max. | Output Voltage<br>nom. (adjustable) | Output Current<br>max. | Efficiency<br>typ. |
| TPP 65-105E-J | 50 W                 | 5 VDC (4.5 - 5.5 VDC)               | 10'000 mA              | 90 %               |
| TPP 65-112E-J | 65 W                 | 12 VDC (10.8 - 13.2 VDC)            | 5'420 mA               | 93 %               |
| TPP 65-115E-J |                      | 15 VDC (13.5 - 16.5 VDC)            | 4'340 mA               | 94 %               |
| TPP 65-124E-J |                      | 24 VDC (21.6 - 26.4 VDC)            | 2'710 mA               | 94 %               |
| TPP 65-136E-J |                      | 36 VDC (32.4 - 39.6 VDC)            | 1'810 mA               | 93 %               |
| TPP 65-148E-J |                      | 48 VDC (43.2 - 52.8 VDC)            | 1'360 mA               | 93 %               |

### Input Specifications

|                        |  |  |
|------------------------|--|--|
| Input Voltage          | - AC Range   | Operational Range: <b>85 - 264 VAC</b> (Full Range)<br>Rated Range: <b>100 - 240 VAC</b> (Full Range)        |
|                        | - DC Range   | Operational Range: <b>120 - 370 VDC</b> (Designed for, no certification)<br>Polarity: <b>+DC: L / -DC: N</b> |
| Input Frequency        |  | Operational Range: <b>47 - 440 Hz</b><br>Certified: <b>50/60 Hz</b>  |
| Power Consumption      | - No load & Vin = 230 VAC<br>- No load & Vin = 115 VAC     | <b>210 mW max.</b> (Ready to meet ErP directive)<br><b>210 mW max.</b>                                       |
| Input Current          | - Full load & Vin = 230 VAC<br>- Full load & Vin = 115 VAC | <b>900 mA max.</b><br><b>1'500 mA max.</b>   |
| Input Inrush Current   | - At 230 VAC<br>- At 115 VAC                               | <b>80 A max.</b><br><b>30 A max.</b>   |
| Input Protection       |  | <b>T 3.15 A / 250 VAC</b> (Internal Fuse L & N)  |
| Recommended Input Fuse |  | <b>3'150 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.)   |

### Output Specifications

|  |  |   |
|--|--|---|
| Output Voltage Adjustment              |  | <b>±10%</b> (By trim potentiometer)<br>Output power must not exceed rated power!  |
| Voltage Set Accuracy                   |  | <b>±1% max.</b>   |
| Regulation                             | - Input Variation (Vmin - Vmax)<br>- Load Variation (0 - 100%) | <b>0.2% max.</b><br><b>0.5% max.</b>  |
| Ripple and Noise<br>(20 MHz Bandwidth) |  | 5 VDC model: <b>100 mVp-p max.</b> (w/ 10 µF)<br>12 VDC model: <b>100 mVp-p max.</b> (w/ 10 µF)<br>15 VDC model: <b>100 mVp-p max.</b> (w/ 10 µF)<br>24 VDC model: <b>120 mVp-p max.</b> (w/ 1 µF)<br>36 VDC model: <b>120 mVp-p max.</b> (w/ 1 µF)<br>48 VDC model: <b>200 mVp-p max.</b> (w/ 0.1 µF)<br>5 VDC model: <b>75 mVp-p typ.</b> (w/ 10 µF)<br>12 VDC model: <b>75 mVp-p typ.</b> (w/ 10 µF)<br>15 VDC model: <b>75 mVp-p typ.</b> (w/ 10 µF)<br>24 VDC model: <b>75 mVp-p typ.</b> (w/ 1 µF)<br>36 VDC model: <b>75 mVp-p typ.</b> (w/ 1 µF)<br>48 VDC model: <b>150 mVp-p typ.</b> (w/ 0.1 µF) |
| Capacitive Load                        |  | 5 VDC model: <b>20'000 µF max.</b><br>12 VDC model: <b>4'520 µF max.</b><br>15 VDC model: <b>2'900 µF max.</b><br>24 VDC model: <b>1'130 µF max.</b><br>36 VDC model: <b>520 µF max.</b><br>48 VDC model: <b>285 µF max.</b>  |
| Minimum Load                           |  | <b>Not required</b>   |
| Temperature Coefficient                |  | <b>±0.02 %/K max.</b>   |
| Hold-up Time                           | - At 230 VAC<br>- At 115 VAC                                   | <b>75 ms min.</b><br><b>16 ms min.</b>  |
| Start-up Time                          | - At 230 VAC<br>- At 115 VAC                                   | <b>1'000 ms max.</b><br><b>1'000 ms max.</b>  |
| Short Circuit Protection               |  | <b>Continuous, Automatic recovery</b>   |
| Output Current Limitation              |  | <b>120 - 180% of Iout max.</b><br><b>145% typ. of Iout max.</b>   |
| Overvoltage Protection                 |  | <b>125 - 140% of Vout nom.</b><br><b>130% typ. of Vout nom.</b>   |
| Transient Response                     | - Response Deviation<br>- Response Time                        | <b>3% max.</b> (50% to 75% Load Step at 2.5 A/µs)<br><b>600 µs typ.</b> (50% to 75% Load Step at 2.5 A/µs)  |

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

## Safety Specifications

|                       |                             |   |
|-----------------------|-----------------------------|---|
| Standards             | - IT / Multimedia Equipment | EN 62368-1<br>IEC 62368-1<br>UL 62368-1   |
|                       | - Medical Equipment         | EN 60601-1<br>IEC 60601-1<br>ANSI/AAMI ES 60601-1<br>2 x MOPP (Means Of Patient Protection)<br><a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a> |
|                       | - Certification Documents   | <a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a>  |
| Protection Class      | See application note:       | Class I & II (Prepared): Reinforced Insulation<br><a href="http://www.tracopower.com/info/protection-class.pdf">www.tracopower.com/info/protection-class.pdf</a>                              |
| Pollution Degree      |                             | PD 2  |
| Over Voltage Category |                             | OVC II  |

## EMC Specifications

|                 |                                  |  |  |
|-----------------|----------------------------------|--|--|
| EMI (Emissions) | - Conducted Emissions            | EN 60601-1-2 edition 4 (Medical Devices)<br>EN 55011 class A (internal filter)<br>EN 55011 class B (internal filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (internal filter)<br>FCC 47 Part 15 class A (internal filter)<br>FCC 47 Part 15 class B (internal filter)<br>FCC 47 Part 18 class A (internal filter)<br>FCC 47 Part 18 class B (internal filter) |  |
|                 | - Radiated Emissions             | EN 55011 class A (internal filter)<br>EN 55011 class B (internal filter)<br>EN 55032 class A (internal filter)<br>EN 55032 class B (internal filter)<br>FCC 47 Part 15 class A (internal filter)<br>FCC 47 Part 15 class B (internal filter)<br>FCC 47 Part 18 class A (internal filter)<br>FCC 47 Part 18 class B (internal filter)   |  |
|                 | - Harmonic Current Emissions     | EN 61000-3-2, class A  |  |
|                 | - Voltage Fluctuations & Flicker | EN 61000-3-3   |  |
| EMS (Immunity)  | - Electrostatic Discharge        | EN 60601-1-2 edition 4 (Medical Devices)<br>Air: EN 61000-4-2, $\pm 15$ kV, perf. criteria A<br>Contact: EN 61000-4-2, $\pm 8$ kV, perf. criteria A<br>EN 61000-4-3, 20 V/m, perf. criteria A<br>EN 61000-4-4, $\pm 2$ kV, perf. criteria A  |  |
|                 | - RF Electromagnetic Field       | L to L: EN 61000-4-5, $\pm 1$ kV, perf. criteria A<br>EN 61000-4-6, 20 Vrms, perf. criteria A  |  |
|                 | - EFT (Burst) / Surge            | Continuous: EN 61000-4-8, 30 A/m, perf. criteria A<br>230 VAC / 50 Hz: EN 61000-4-11<br>30%, 25 periods, perf. criteria A<br>>95%, 0.5 periods, perf. criteria A<br>>95%, 1 period, perf. criteria A<br>>95%, 250 periods, perf. criteria B  |  |
|                 | - Conducted RF Disturbances      | 115 VAC / 60 Hz: EN 61000-4-11<br>30%, 25 periods, perf. criteria A<br>>95%, 0.5 periods, perf. criteria A<br>>95%, 1 period, perf. criteria A<br>>95%, 250 periods, perf. criteria B  |  |
|                 | - PF Magnetic Field              |  |  |
|                 | - Voltage Dips & Interruptions   |  |  |
|                 | EMC / Environmental              | - Certification Documents  | <a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a> |

## General Specifications

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

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

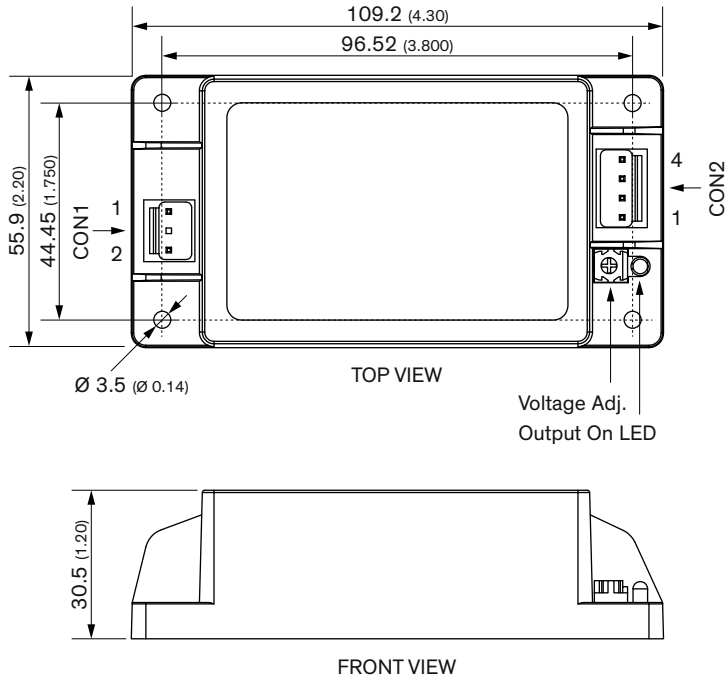
|                           |  |   |
|---------------------------|--|---|
| Temperature Ranges        | - Operating Temperature<br>- Storage Temperature                                       | -40°C to +85°C<br>-40°C to +85°C  |
| Power Derating            | - High Temperature<br>- Low Input Voltage  | Depending on model<br>Depending on model<br>See application note: <a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a>  |
| Cooling System            |  | Natural convection (20 LFM)   |
| Altitude During Operation |  | 5'000 m max.  |
| Regulator Topology        |  | Flyback Converter   |
| Switching Frequency       |  | 50 - 130 kHz (PWM QR)   |
| Insulation System         |  | Reinforced Insulation   |
| Working Voltage (rated)   |  | 250 VAC   |
| Isolation Test Voltage    | - Input to Output, 60 s<br>- Input to Case or PE, 60 s<br>- Output to Case or PE, 60 s | 4'000 VAC<br>2'500 VAC<br>2'500 VAC   |
| Creepage                  | - Input to Output<br>- Input to Case or PE<br>- Output to Case or PE                   | 8 mm min.<br>4 mm min.<br>4 mm min.   |
| Clearance                 | - Input to Output<br>- Input to Case or PE<br>- Output to Case or PE                   | 4 mm min.<br>4 mm min.<br>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<br><br>- Mechanical Shock<br><br>- Thermal Shock                           | IEC 60068-2-6<br>5 g, 3 axis, sine sweep, 3x30 min, 5-500 Hz<br>IEC 60068-2-27<br>50 g, 3 axis, 11 ms<br>MIL-STD-810F<br>-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<br><br>- RoHS Declaration<br><br>- SCIP Reference Number           | <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a><br>REACH SVHC list compliant<br>REACH Annex XVII compliant<br><a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7(a), 7(c)-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)<br>4d9386ca-0766-4eaf-91f2-fb72674e1c24 |

## Additional Information

|                            |  |
|----------------------------|--|
| Supporting Documents       | <a href="http://www.tracopower.com/overview/tpp65e-j">www.tracopower.com/overview/tpp65e-j</a> |
| Frequently Asked Questions | <a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>           |
| Glossary                   | <a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a> |

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**Outline Dimensions**



| Pin connectors |          |               |          |
|----------------|----------|---------------|----------|
| Input (CON1)   |          | Output (CON2) |          |
| Pin            | Function | Pin           | Function |
| 1              | Line     | 1, 2          | -Vout    |
| 2              | Neutral  | 3, 4          | +Vout    |

**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

Mounting screw locked torque: Max. 0.33 Nm (3.4 kgfcm)

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

