

- Compact encapsulated 40 Watt PCB module (3.2"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



ES 60601-1 IEC 60601-1  
UL 62368-1 IEC 62368-1

The TPP40E-D is a 40 Watt encapsulated AC/DC modules in a PCB 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 (3.2" 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 40E-D an ideal solution for medical devices and for demanding safety and space critical applications.

### Models

| Order Code    | Output Power max. | Output Voltage nom. (adjustable) | Output Current max. | Efficiency typ. |
|---------------|-------------------|----------------------------------|---------------------|-----------------|
| TPP 40-105E-D | 40 W              | 5 VDC (4.5 - 5.5 VDC)            | 8'000 mA            | 90 %            |
| TPP 40-112E-D |                   | 12 VDC (10.8 - 13.2 VDC)         | 3'340 mA            | 92 %            |
| TPP 40-115E-D |                   | 15 VDC (13.5 - 16.5 VDC)         | 2'670 mA            | 92 %            |
| TPP 40-124E-D |                   | 24 VDC (21.6 - 26.4 VDC)         | 1'670 mA            | 92 %            |
| TPP 40-136E-D |                   | 36 VDC (32.4 - 39.6 VDC)         | 1'120 mA            | 92 %            |
| TPP 40-148E-D |                   | 48 VDC (43.2 - 52.8 VDC)         | 840 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        |                             | <b>47 - 63 Hz</b>                                                                                            |
| Input Current          | - Full Load & Vin = 230 VAC | <b>500 mA max.</b>                                                                                           |
|                        | - Full Load & Vin = 115 VAC | <b>980 mA max.</b>                                                                                           |
| Power Consumption      | - At no load                | <b>210 mW max.</b> (Ready to meet ErP directive)                                                             |
| Input Inrush Current   | - At 230 VAC                | <b>80 A max.</b>                                                                                             |
|                        | - At 115 VAC                | <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 external trim resistor)<br>See application note: <a href="http://www.tracopower.com/overview/tp40e-d">www.tracopower.com/overview/tp40e-d</a><br>Output power must not exceed rated power! |
| Voltage Set Accuracy                   |                                 | <b>±1% max.</b>                                                                                                                                                                                            |
| Regulation                             | - Input Variation (Vmin - Vmax) | <b>0.2% max.</b>                                                                                                                                                                                           |
|                                        | - Load Variation (0 - 100%)     | <b>0.5% max.</b>                                                                                                                                                                                           |
| Ripple and Noise<br>(20 MHz Bandwidth) | 5 VDC model:                    | <b>100 mVp-p max.</b> (w/ 10uF)                                                                                                                                                                            |
|                                        | 12 VDC model:                   | <b>100 mVp-p max.</b> (w/ 10uF)                                                                                                                                                                            |
|                                        | 15 VDC model:                   | <b>100 mVp-p max.</b> (w/ 10uF)                                                                                                                                                                            |
|                                        | 24 VDC model:                   | <b>120 mVp-p max.</b> (w/ 1uF)                                                                                                                                                                             |
|                                        | 36 VDC model:                   | <b>120 mVp-p max.</b> (w/ 1uF)                                                                                                                                                                             |
|                                        | 48 VDC model:                   | <b>200 mVp-p max.</b> (w/ 0.1uF)                                                                                                                                                                           |
|                                        | 5 VDC model:                    | <b>75 mVp-p typ.</b> (w/ 10uF)                                                                                                                                                                             |
|                                        | 12 VDC model:                   | <b>75 mVp-p typ.</b> (w/ 10uF)                                                                                                                                                                             |
|                                        | 15 VDC model:                   | <b>75 mVp-p typ.</b> (w/ 10uF)                                                                                                                                                                             |
|                                        | 24 VDC model:                   | <b>75 mVp-p typ.</b> (w/ 1uF)                                                                                                                                                                              |
|                                        | 36 VDC model:                   | <b>75 mVp-p typ.</b> (w/ 1uF)                                                                                                                                                                              |
|                                        | 48 VDC model:                   | <b>150 mVp-p typ.</b> (w/ 0.1uF)                                                                                                                                                                           |
| Capacitive Load                        | 5 VDC model:                    | <b>16'000 µF max.</b>                                                                                                                                                                                      |
|                                        | 12 VDC model:                   | <b>2'785 µF max.</b>                                                                                                                                                                                       |
|                                        | 15 VDC model:                   | <b>1'780 µF max.</b>                                                                                                                                                                                       |
|                                        | 24 VDC model:                   | <b>700 µF max.</b>                                                                                                                                                                                         |
|                                        | 36 VDC model:                   | <b>310 µF max.</b>                                                                                                                                                                                         |
|                                        | 48 VDC model:                   | <b>175 µF max.</b>                                                                                                                                                                                         |
| Minimum Load                           |                                 | <b>Not required</b>                                                                                                                                                                                        |
| Temperature Coefficient                |                                 | <b>±0.02 %/K max.</b>                                                                                                                                                                                      |
| Hold-up Time                           | - At 230 VAC                    | <b>120 ms min.</b>                                                                                                                                                                                         |
|                                        | - At 115 VAC                    | <b>25 ms min.</b>                                                                                                                                                                                          |
| Start-up Time                          | - At 230 VAC                    | <b>1'000 ms max.</b>                                                                                                                                                                                       |
|                                        | - At 115 VAC                    | <b>1'000 ms max.</b>                                                                                                                                                                                       |
| Short Circuit Protection               |                                 | <b>Continuous, Automatic recovery</b>                                                                                                                                                                      |
| Output Current Limitation              |                                 | <b>120 - 180% of Iout max.</b>                                                                                                                                                                             |
|                                        |                                 | <b>145% typ. of Iout max.</b>                                                                                                                                                                              |
| Overvoltage Protection                 |                                 | <b>130% typ. of Vout nom.</b>                                                                                                                                                                              |
|                                        |                                 | <b>125 - 140% of Vout nom.</b>                                                                                                                                                                             |
| Transient Response                     | - Response Deviation            | <b>3% max.</b> (50% to 75% Load Step at 2.5 A/µs)                                                                                                                                                          |
|                                        | - Response Time                 | <b>600 µs typ.</b> (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.

## Safety Specifications

|                       |                             |                                                                                                |
|-----------------------|-----------------------------|------------------------------------------------------------------------------------------------|
| Safety 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)    |
|                       | - Certification Documents   | <a href="http://www.tracopower.com/overview/tpp40e-d">www.tracopower.com/overview/tpp40e-d</a> |
| Protection Class      |                             | Class I & II (Prepared): Reinforced Insulation                                                 |
| Pollution Degree      |                             | PD 2                                                                                           |
| Over Voltage Category |                             | OVC II                                                                                         |

## EMC Specifications

|               |                                  |                                                                                                                                                                                       |
|---------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| EMI Emissions | - Conducted Emissions            | EN 55011 class B (internal filter)<br>EN 55032 class B (internal filter)<br>FCC Part 15 class B (internal filter)<br>FCC Part 18 class B (internal filter)                            |
|               | - Radiated Emissions             | EN 55011 class B (internal filter)<br>EN 55032 class B (internal filter)<br>FCC Part 15 class B (internal filter)<br>FCC 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 B                                   |
|               | - RF Electromagnetic Field       | EN 61000-4-3, 20 V/m, perf. criteria A                                                                                                                                                |
|               | - EFT (Burst) / Surge            | EN 61000-4-4, $\pm 2$ kV, perf. criteria A                                                                                                                                            |
|               |                                  | L to L: EN 61000-4-5, $\pm 1$ kV, perf. criteria A                                                                                                                                    |
|               | - Conducted RF Disturbances      | EN 61000-4-6, 20 Vrms, perf. criteria A                                                                                                                                               |
|               | - PF Magnetic Field              | Continuous: EN 61000-4-8, 30 A/m, perf. criteria A                                                                                                                                    |
|               | - Voltage Dips & Interruptions   | 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 |
|               |                                  | 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 |

## General Specifications

|                           |                              |                                                                                                                      |
|---------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Relative Humidity         |                              | 95% max. (non condensing)                                                                                            |
| Temperature Ranges        | - Operating Temperature      | -40°C to +85°C                                                                                                       |
|                           | - Storage Temperature        | -40°C to +85°C                                                                                                       |
| Power Derating            | - High Temperature           | See application note: <a href="http://www.tracopower.com/overview/tpp40e-d">www.tracopower.com/overview/tpp40e-d</a> |
| Cooling System            |                              | Natural convection (20 LFM)                                                                                          |
| Altitude During Operation |                              | 5'000 m max.                                                                                                         |
| Switching Frequency       |                              | 50 - 130 kHz (PWM QR)                                                                                                |
| Insulation System         |                              | Reinforced Insulation                                                                                                |
| Working Voltage (rated)   |                              | 250 VAC                                                                                                              |
| Isolation Test Voltage    | - Input to Output, 60 s      | 4'000 VAC                                                                                                            |
|                           | - Input to Case or PE, 60 s  | 2'500 VAC                                                                                                            |
|                           | - Output to Case or PE, 60 s | 2'500 VAC                                                                                                            |

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

|                          |                                 |                                                                                                                                                                                                                                                                                                               |
|--------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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               | 3'010'000 h (MIL-HDBK-217F, ground benign)                                                                                                                                                                                                                                                                    |
| Environment              | - Vibration                     | IEC 60068-2-6<br>5 g, 3 axis, sine sweep, 3x30 min, 5-500 Hz                                                                                                                                                                                                                                                  |
|                          | - Mechanical Shock              | IEC 60068-2-27<br>50 g, 3 axis, 11 ms                                                                                                                                                                                                                                                                         |
|                          | - Thermal Shock                 | 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)                                                                                                                                                                                                                                                                                    |
| Pin Material             |                                 | Tinned 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)                                                                                                                                                                                                                                                                                     |
| Soldering Profile        |                                 | Wave Soldering<br>260°C / 6 s                                                                                                                                                                                                                                                                                 |
| Weight                   |                                 | 265 g                                                                                                                                                                                                                                                                                                         |
| Environmental Compliance | - REACH Declaration             | <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                                                                                                                                   |
|                          | - RoHS Declaration              | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br><b>Exemptions: 7c-I</b><br>(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.) |

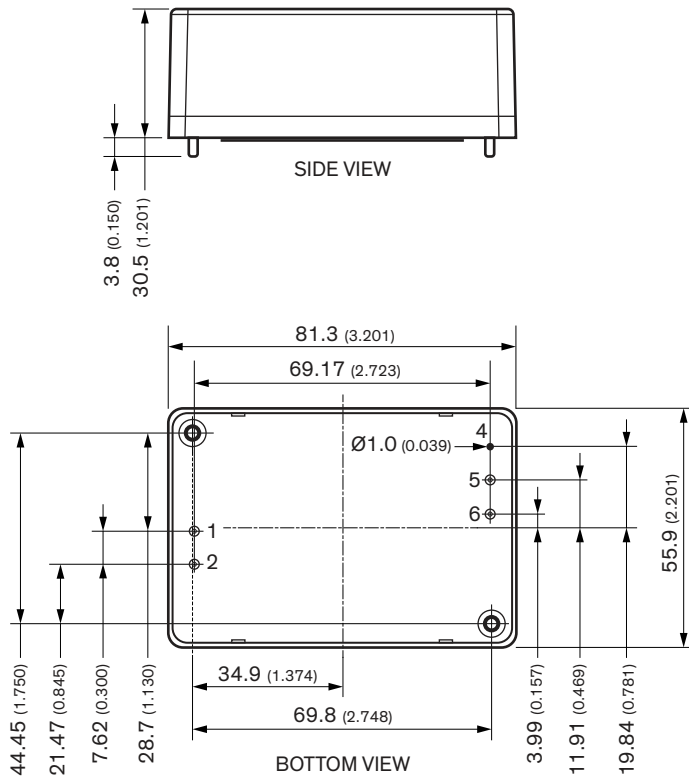
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tpp40e-d](http://www.tracopower.com/overview/tpp40e-d)

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

**Outline Dimensions**



| Pinout |          |
|--------|----------|
| Pin    | Function |
| 1      | AC (N)   |
| 2      | AC (L)   |
| 4      | Trim     |
| 5      | -Vout    |
| 6      | +Vout    |

All dimensions in mm (inch)  
 Tolerance: X.X  $\pm 0.5$  (X.XX  $\pm 0.02$ )  
 X.XX  $\pm 0.25$  (X.XXX  $\pm 0.010$ )