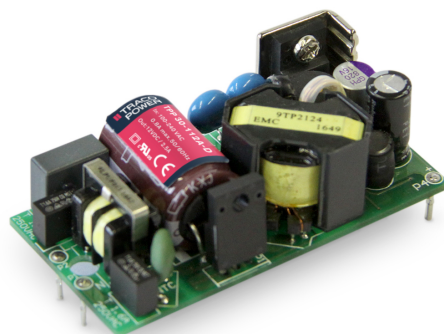


- High power density power supply (open frame)
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP
- Low leakage current <75 µA rated for BF applications
- EMC compliance to IEC 60601-1-2 4th edition
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Protection class II
- Operating up to 5000 m altitude
- Ready to meet ErP directive, no load power consumption <60 mW
- 5-year product warranty



ES 60601-1 IEC 60601-1  
UL 62368-1 IEC 60335-1  
IEC 62368-1

The TPP 30A-D AC/DC power supplies feature a reinforced double I/O isolation system according to medical safety standards IEC/EN/ES 60601-1 3rd edition for 2 x MOPP approved for an operating altitude of 5000 m. The earth leakage current is below 75 µA what makes the units suitable for BF (body floating) applications. The excellent efficiency of up to 92% offers a high power density in the packaging format 1.36" x 2.74". The full load operating temperature range covers -40°C to +60°C while it goes up to 85°C with 50% load derating. The units operate in compliance to the medical EMC emission and immunity levels according to latest standard IEC 60601-1-2 4th edition.

| Models        |                      |                                     |                        |                    |
|---------------|----------------------|-------------------------------------|------------------------|--------------------|
| Order Code    | Output Power<br>max. | Output Voltage<br>nom. (adjustable) | Output Current<br>max. | Efficiency<br>typ. |
| TPP 30-103A-D | 20 W                 | 3.3 VDC (2.97 - 3.63 VDC)           | 6'000 mA               | 84 %               |
| TPP 30-105A-D | 30 W                 | 5 VDC (4.5 - 5.5 VDC)               | 6'000 mA               | 87 %               |
| TPP 30-109A-D |                      | 9 VDC (8.1 - 9.9 VDC)               | 3'340 mA               | 88 %               |
| TPP 30-112A-D |                      | 12 VDC (10.8 - 13.2 VDC)            | 2'500 mA               | 91 %               |
| TPP 30-115A-D |                      | 15 VDC (13.5 - 16.5 VDC)            | 2'000 mA               | 91 %               |
| TPP 30-124A-D |                      | 24 VDC (21.6 - 26.4 VDC)            | 1'250 mA               | 90 %               |
| TPP 30-136A-D |                      | 36 VDC (32.4 - 39.6 VDC)            | 840 mA                 | 90 %               |
| TPP 30-148A-D |                      | 48 VDC (43.2 - 52.8 VDC)            | 630 mA                 | 92 %               |

## 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   | <b>60 mW max.</b> (Ready to meet ErP directive)                                                              |
|                        | - No load & Vin = 115 VAC   | <b>60 mW max.</b>                                                                                            |
| Input Current          | - Full load & Vin = 230 VAC | <b>400 mA max.</b>                                                                                           |
|                        | - Full load & Vin = 115 VAC | <b>800 mA max.</b>                                                                                           |
| Input Inrush Current   | - At 230 VAC                | <b>40 A max.</b>                                                                                             |
|                        | - At 115 VAC                | <b>25 A max.</b>                                                                                             |
| Input Protection       |                             | <b>T 1.6 A / 250 VAC</b> (Internal Fuse in L & N)                                                            |
| Recommended Input Fuse |                             | (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)                                                                                                     |
|                                        | See application note:           | <a href="http://www.tracopower.com/overview/tpp30a-d">www.tracopower.com/overview/tpp30a-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>0.7% max.</b> (3.3 and 5 VDC model)                                                                                                      |
|                                        |                                 | <b>0.5% max.</b> (other output models)                                                                                                      |
| Ripple and Noise<br>(20 MHz Bandwidth) | 3.3 VDC model:                  | <b>50 mVp-p typ.</b> (w/ 10 µF X7R)                                                                                                         |
|                                        | 5 VDC model:                    | <b>50 mVp-p typ.</b> (w/ 10 µF X7R)                                                                                                         |
|                                        | 9 VDC model:                    | <b>50 mVp-p typ.</b> (w/ 10 µF X7R)                                                                                                         |
|                                        | 12 VDC model:                   | <b>50 mVp-p typ.</b> (w/ 1 µF X7R)                                                                                                          |
|                                        | 15 VDC model:                   | <b>50 mVp-p typ.</b> (w/ 1 µF X7R)                                                                                                          |
|                                        | 24 VDC model:                   | <b>50 mVp-p typ.</b> (w/ 1 µF X7R)                                                                                                          |
|                                        | 36 VDC model:                   | <b>50 mVp-p typ.</b> (w/ 1 µF X7R)                                                                                                          |
|                                        | 48 VDC model:                   | <b>50 mVp-p typ.</b> (w/ 0.1 µF X7R)                                                                                                        |
| Capacitive Load                        | 3.3 VDC model:                  | <b>10'000 µF max.</b>                                                                                                                       |
|                                        | 5 VDC model:                    | <b>12'000 µF max.</b>                                                                                                                       |
|                                        | 9 VDC model:                    | <b>3'720 µF max.</b>                                                                                                                        |
|                                        | 12 VDC model:                   | <b>2'085 µF max.</b>                                                                                                                        |
|                                        | 15 VDC model:                   | <b>1'350 µF max.</b>                                                                                                                        |
|                                        | 24 VDC model:                   | <b>520 µF max.</b>                                                                                                                          |
|                                        | 36 VDC model:                   | <b>235 µF max.</b>                                                                                                                          |
| Minimum Load                           |                                 | <b>Not required</b>                                                                                                                         |
|                                        |                                 |                                                                                                                                             |
| Temperature Coefficient                |                                 | <b>±0.02 %/K max.</b>                                                                                                                       |
| Hold-up Time                           | - At 115 VAC                    | <b>16 ms min.</b>                                                                                                                           |
| Start-up Time                          | - At 230 VAC                    | <b>1'500 ms max.</b>                                                                                                                        |
| Short Circuit Protection               |                                 | <b>Continuous, Automatic recovery</b>                                                                                                       |
| Output Current Limitation              |                                 | <b>110 - 170% of Iout max.</b>                                                                                                              |
|                                        |                                 | <b>140% typ. of Iout max.</b>                                                                                                               |
| Overvoltage Protection                 |                                 | <b>125 - 140% of Vout nom.</b>                                                                                                              |
| Transient Response                     | - Response Deviation            | <b>3% max.</b> (50% to 75% Load Step)                                                                                                       |
|                                        | - Response Time                 | <b>500 µs typ.</b> (50% to 75% Load Step)                                                                                                   |

All specifications valid at nominal voltage, 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                                                        |
|                       | - Household                 | EN 60335-1<br>IEC 60335-1                                                                      |
|                       | - Medical Equipment         | EN 60601-1<br>IEC 60601-1<br>ANSI/AAMI ES 60601-1<br>2 x MOPP (Means Of Patient Protection)    |
|                       | - Power Transformers        | IEC 61558-1<br>IEC 61558-2-16                                                                  |
|                       | - Certification Documents   | <a href="http://www.tracopower.com/overview/tpp30a-d">www.tracopower.com/overview/tpp30a-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 60601-1-2 edition 4 (Medical Devices)<br>EN 55011 class B (internal filter)<br>EN 55014-1 (internal filter)<br>EN 55032 class B (internal filter)<br>FCC 47 Part 15 class B (internal filter)<br>FCC 47 Part 18 class B (internal filter) |
|                     | - Radiated Emissions             | EN 55011 class B (internal filter)<br>EN 55014-1 (internal filter)<br>EN 55032 class B (internal filter)<br>FCC 47 Part 15 class B (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)      |                                  | EN 60601-1-2 edition 4 (Medical Devices)<br>EN 55024 (IT Equipment)<br>EN 55035 (Multimedia)<br>EN 55014-2 (Household Appliances Tools)                                                                                                      |
|                     | - Electrostatic Discharge        | 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                                                                                                                                                                                           |
|                     | - EFT (Burst) / Surge            | EN 61000-4-6, 20 Vrms, perf. criteria A                                                                                                                                                                                                      |
|                     | - Conducted RF Disturbances      | Continuous: EN 61000-4-8, 30 A/m, perf. criteria A                                                                                                                                                                                           |
|                     | - PF Magnetic Field              | 230 VAC / 50 Hz: EN 61000-4-11<br>30%, 25 periods, perf. criteria A<br>60%, 1 period, perf. criteria A<br>>95%, 1 period, perf. criteria A<br>>95%, 250 periods, perf. criteria A                                                            |
|                     | - Voltage Dips & Interruptions   | 115 VAC / 60 Hz: EN 61000-4-11<br>30%, 25 periods, perf. criteria A<br>60%, 1 period, perf. criteria A<br>>95%, 1 period, perf. criteria A<br>>95%, 250 periods, perf. criteria A                                                            |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
|                     |                                  |                                                                                                                                                                                                                                              |
| EMC / Environmental |                                  | - Certification Documents<br><a href="http://www.tracopower.com/overview/tpp30a-d">www.tracopower.com/overview/tpp30a-d</a>                                                                                                                  |

## General Specifications

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

All specifications valid at nominal voltage, 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>4 %/V below 90 VAC                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| See application note: <a href="http://www.tracopower.com/overview/tpp30a-d">www.tracopower.com/overview/tpp30a-d</a> |                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Cooling System                                                                                                       |                                                                                        | Natural convection (20 LFM)                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Altitude During Operation                                                                                            |                                                                                        | 5'000 m max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Regulator Topology                                                                                                   |                                                                                        | Flyback Converter                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Switching Frequency                                                                                                  |                                                                                        | 30 - 60 kHz (PWM)                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Insulation System                                                                                                    |                                                                                        | Reinforced Insulation                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Working Voltage (rated)                                                                                              |                                                                                        | 272 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>1'500 VAC<br>1'500 VAC                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Creepage                                                                                                             | - Input to Output                                                                      | 8 mm min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Clearance                                                                                                            | - Input to Output                                                                      | 8 mm min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Isolation Resistance                                                                                                 | - Input to Output, 500 VDC                                                             | 100 MΩ min.                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Leakage Current<br>(at 264 VAC)                                                                                      | - Touch Current                                                                        | 75 µA max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Reliability                                                                                                          | - Calculated MTBF                                                                      | 3'300'000 h (MIL-HDBK-217F, ground benign)                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Washing Process                                                                                                      |                                                                                        | Not allowed                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Environment                                                                                                          | - Vibration<br>- Mechanical Shock                                                      | IEC 60068-2-6<br>IEC 60068-2-27                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Pin Material                                                                                                         |                                                                                        | Copper                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Pin Foundation Plating                                                                                               |                                                                                        | Nickel (2 - 3 µm)                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Pin Surface Plating                                                                                                  |                                                                                        | Tin (3 - 5 µm), matte                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Housing Type                                                                                                         |                                                                                        | Open Frame                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Mounting Type                                                                                                        |                                                                                        | PCB Mount                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Connection Type                                                                                                      |                                                                                        | THD (Through-Hole Device)                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Soldering Profile                                                                                                    |                                                                                        | Lead-Free Wave Soldering<br>260°C / 6 s max.                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Weight                                                                                                               |                                                                                        | 58 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: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)<br>ea46c584-bfb7-47ad-bebf-79fd02614da1 |

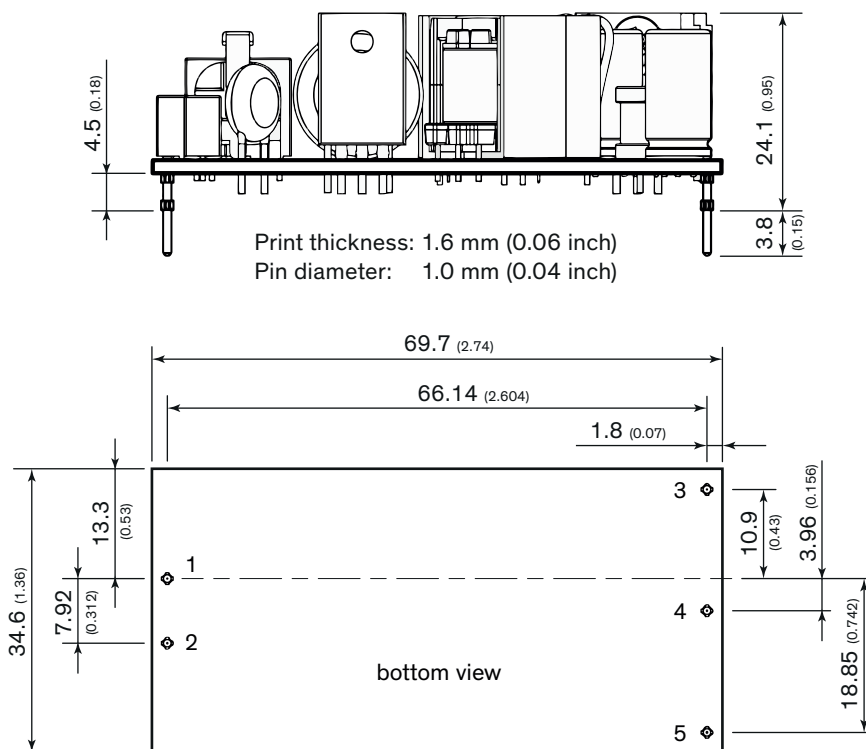
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tpp30a-d](http://www.tracopower.com/overview/tpp30a-d)

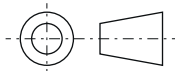
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

## Outline Dimensions



| PCB Pinout |          |
|------------|----------|
| Pin        | Function |
| 1          | Neutral  |
| 2          | Line     |
| 3          | +Vout    |
| 4          | -Vout    |
| 5          | Trim     |

Dimension in mm (inch)  
Tolerances: x.x  $\pm 0.5$  (x.xx  $\pm 0.02$ )  
x.xx  $\pm 0.25$  (x.xxx  $\pm 0.010$ )  
Pin pitch tolerance:  $\pm 0.25$  ( $\pm 0.010$ )  
Pin dimension tolerance:  $\pm 0.10$  ( $\pm 0.004$ )



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