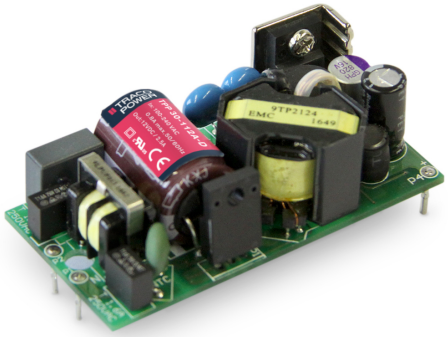
# TRACO POWER

## AC/DC Medical Power Supply

## TPP 30A-D Series, 30 Watt

- **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 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 max. | Output Voltage nom. (adjustable) | Output Current max. | Efficiency 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 | 85 - 264 VAC (Full Range) |
| | - DC Range | 120 - 370 VDC (Designed for, no certification) |
| Input Frequency | | 47 - 63 Hz |
| Input Current | - Full Load & Vin = 230 VAC | 400 mA max. |
| | - Full Load & Vin = 115 VAC | 800 mA max. |
| Power Consumption | - at no Load | 60 mW max. (Ready to meet ErP directive) |
| Input Inrush Current | - at 230 VAC | 40 A max. |
| Input Protection | | T 1.6 A / 250 VAC (Internal Fuse in L & N) |

## Output Specifications

| | | | |
|---|---|---|---|
| Output Voltage Adjustment | | | ±10% (By external trim resistor) |
| | | Refer to Application Note: | www.tracopower.com/overview/tpp30a-d |
| | | | Output power must not exceed rated power! |
| Voltage Set Accuracy | | | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax) | | 0.2% max. |
| | - Load Variation (0 - 100%) | | 0.7% max. (3.3 and 5 VDC model) |
| | | | 0.5% max. (other output models) |
| Ripple and Noise (20 MHz Bandwidth) | | 3.3 VDC model: | 50 mVp-p typ. (with 10 µF X7R) |
| | | 5 VDC model: | 50 mVp-p typ. (with 10 µF X7R) |
| | | 9 VDC model: | 50 mVp-p typ. (with 10 µF X7R) |
| | | 12 VDC model: | 50 mVp-p typ. (with 1 µF X7R) |
| | | 15 VDC model: | 50 mVp-p typ. (with 1 µF X7R) |
| | | 24 VDC model: | 50 mVp-p typ. (with 1 µF X7R) |
| | | 36 VDC model: | 50 mVp-p typ. (with 1 µF X7R) |
| | | 48 VDC model: | 50 mVp-p typ. (with 0.1 µF X7R) |
| Capacitive Load | | 3.3 VDC model: | 10'000 µF max. |
| | | 5 VDC model: | 12'000 µF max. |
| | | 9 VDC model: | 3'720 µF max. |
| | | 12 VDC model: | 2'085 µF max. |
| | | 15 VDC model: | 1'350 µF max. |
| | | 24 VDC model: | 520 µF max. |
| | | 36 VDC model: | 235 µF max. |
| | | 48 VDC model: | 130 µF max. |
| Minimum Load | | | Not required |
| Temperature Coefficient | | | ±0.02 %/K max. |
| Hold-up Time | - at 115 VAC | | 16 ms min. |
| Start-up Time | - at 230 VAC | | 1'500 ms max. |
| Short Circuit Protection | | | Continuous, Automatic recovery |
| Output Current Limitation | | | 110 - 170% of Iout max. |
| | | | 140% typ. of Iout max. |
| Overvoltage Protection | | | 125 - 140% of Vout nom. |
| Transient Response | - Response Deviation | | 3% max. (50% to 75% Load Step) |
| | - Response Time | | 500 µs typ. (50% to 75% Load Step) |

All specifications valid at nominal input voltage, 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 |
| | - Household | 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 | www.tracopower.com/overview/tpp30a-d |
| Protection Class | | Class II Prepared: Reinforced Insulation |
| Pollution Degree | | PD 2 |
| Over Voltage Category | | OVC II |

## EMC Specifications

| | | | |
|---|---|---|---|
| EMC Emissions | | | EN 60601-1-2 edition 4 (Medical Devices) |
| | - Conducted Emissions | | EN 55011 class B (internal filter)<br>EN 55014-1<br>EN 55032 class B (internal filter)<br>FCC Part 15, class B<br>FCC Part 18, class B |
| | - Radiated Emissions | | EN 55011 class B (internal filter)<br>EN 55014-1<br>EN 55032 class B (internal filter)<br>FCC Part 15, class B<br>FCC Part 18, class B |
| | - Harmonic Current Emissions | | EN 61000-3-2, class A |
| | - Voltage Fluctuations & Flicker | | EN 61000-3-3 |
| EMC Immunity | | | EN 55024 (IT Equipment)<br>EN 60601-1-2 edition 4 (Medical Devices)<br>EN 55014-2 (Household Appliances Tools) |
| | - Electrostatic Discharge | Air:<br>Contact: | EN 61000-4-2, ±15 kV, perf. criteria A<br>EN 61000-4-2, ±8 kV, perf. criteria A |
| | - RF Electromagnetic Field | | EN 61000-4-3, 20 V/m, perf. criteria A |
| | - EFT (Burst) | | EN 61000-4-4, ±2 kV, perf. criteria A |
| | - Surge | L to L: | EN 61000-4-5, ±1 kV, perf. criteria A |
| | - Conducted RF Disturbances | | EN 61000-4-6, 20 Vrms, perf. criteria A |
| | - PF Magnetic Field | | 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>60%, 1 period, perf. criteria A<br>>95%, 1 period, perf. criteria A<br>>95%, 250 periods, perf. criteria A |
| | | 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 |

## General Specifications

| | | |
|---|---|---|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | –40°C to +85°C |
| | - Storage Temperature | –40°C to +85°C |

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

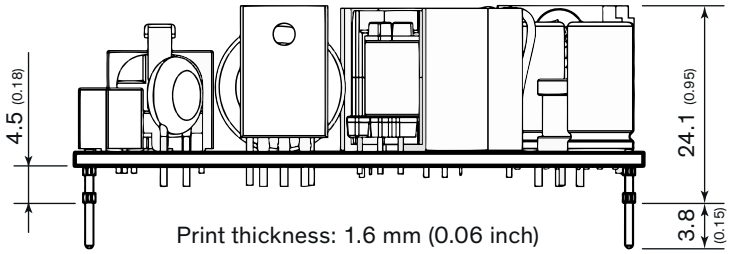
| | | |
|---|---|---|
| Power Derating | - High Temperature | see application note<br>www.tracopower.com/overview/tpp30a-d |
| | - Low Input Voltage | 4 %/V below 90 VAC |
| Cooling System | | Natural convection (20 LFM) |
| Altitude During Operation | | 5'000 m max. |
| Switching Frequency | | 30 - 60 kHz (PWM) |
| Insulation System | | Reinforced Insulation |
| Working Voltage (rated) | | 272 VAC |
| Isolation Test Voltage | - Input to Output, 60 s | 5'657 VDC |
| | - Input to Case or PE, 60 s | 2'121 VDC |
| | - Output to Case or PE, 60 s | 2'121 VDC |
| Creepage | - Input to Output | 8 mm min. |
| Clearance | - Input to Output | 8 mm min. |
| Isolation Resistance | - Input to Output, 500 VDC | 100 MOhm min. |
| Leakage Current (at 264 VAC) | - Touch Current | 75 µA max. |
| Reliability | - Calculated MTBF | 3'300'000 h (MIL-HDBK-217F, ground benign) |
| Environment | - Vibration | IEC 60068-2-6 |
| | - Mechanical Shock | IEC 60068-2-27 |
| Connection Type | | THD (Through-Hole Device) |
| Weight | | 58 g |
| Environmental Compliance | - Reach | www.tracopower.com/info/reach-declaration.pdf |
| | - RoHS | www.tracopower.com/info/rohs-declaration.pdf |

## Supporting Documents

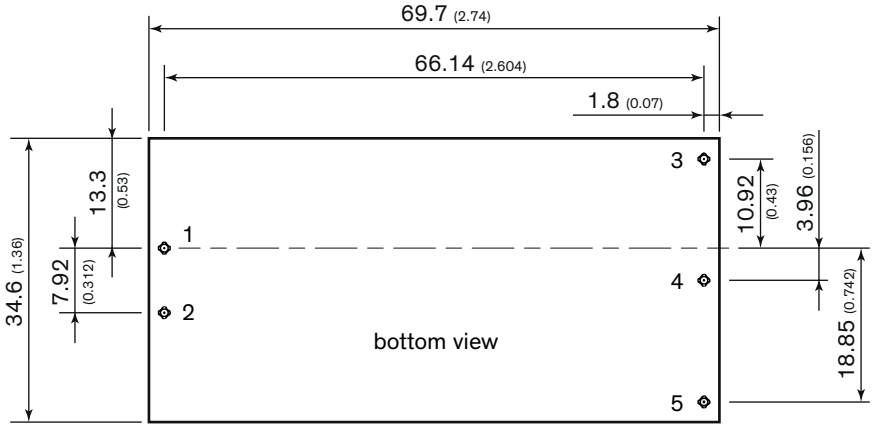
| | |
|---|---|
| Overview Link (for additional Documents) | www.tracopower.com/overview/tpp30a-d |

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

## Outline Dimensions




Print thickness: 1.6 mm (0.06 inch)
Pin diameter: 1.0 mm (0.04 inch)




Dimension in mm, () = inch
Tolerances: x.x ±0.50 (±0.02)
x.xx ±0.25 (±0.01)
Pin pitch tolerance: ±0.25 (±0.010)
Pin dimension tolerance: ±0.10 (±0.004)

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

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