

- High power density power supply (encapsulated)
- 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 <75 mW
- 5-year product warranty



The TPP 15-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 88.5% offers a high power density in the packaging format 1.1" x 1.65". The full load operating temperature range covers -40°C to +70°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 15-103-D	13.2 W	3.3 VDC (2.97 - 3.63 VDC)	4'000 mA	84 %
TPP 15-105-D		5 VDC (4.5 - 5.5 VDC)	3'000 mA	86 %
TPP 15-109-D		9 VDC (8.1 - 9.9 VDC)	1'670 mA	86 %
TPP 15-112-D		12 VDC (10.8 - 13.2 VDC)	1'250 mA	87 %
TPP 15-115-D		15 VDC (13.5 - 16.5 VDC)	1'000 mA	87 %
TPP 15-124-D		24 VDC (21.6 - 26.4 VDC)	625 mA	88 %
TPP 15-136-D		36 VDC (32.4 - 39.6 VDC)	417 mA	88 %
TPP 15-148-D		48 VDC (43.2 - 52.8 VDC)	313 mA	89 %

### Input Specifications

Input Voltage	- AC Range - DC Range	85 - 264 VAC (Full Range) 120 - 370 VDC (Designed for, no certification)
Input Frequency		47 - 63 Hz
Input Current	- Full Load & Vin = 230 VAC - Full Load & Vin = 115 VAC	300 mA max. 450 mA max.
Power Consumption	- At no load	75 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)
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)

### Output Specifications

Output Voltage Adjustment		±10% (By external trim resistor)
	See application note:	<a href="http://www.tracopower.com/overview/tpp15-d">www.tracopower.com/overview/tpp15-d</a> Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.2% max. 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: 40 mVp-p typ. (w/ 10 µF X5R) 5 VDC model: 40 mVp-p typ. (w/ 10 µF X5R) 9 VDC model: 70 mVp-p typ. (w/ 10 µF X5R) 12 VDC model: 70 mVp-p typ. (w/ 10 µF X5R) 15 VDC model: 70 mVp-p typ. (w/ 10 µF X5R) 24 VDC model: 100 mVp-p typ. (w/ 10 µF X5R) 36 VDC model: 100 mVp-p typ. (w/ 10 µF X5R) 48 VDC model: 140 mVp-p typ. (w/ 1 µF X7R)
Capacitive Load		3.3 VDC model: 6'000 µF max. 5 VDC model: 4'000 µF max. 9 VDC model: 1'860 µF max. 12 VDC model: 1'200 µF max. 15 VDC model: 820 µF max. 24 VDC model: 470 µF max. 36 VDC model: 220 µF max. 48 VDC model: 150 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Hold-up Time	- At 115 VAC	8 ms min.
Start-up Time	- At 230 VAC	500 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		120 - 200% of Iout max. 145% typ. of Iout max.
Overvoltage Protection		125 - 140% of Vout nom.
Transient Response	- Response Deviation - Response Time	8% max. (75% to 100% Load Step) 500 µs typ. (75% to 100% Load Step)

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

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Household	EN 60335-1 IEC 60335-1
	- Medical Equipment	EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1
	- Power Transformers	2 x MOPP (Means Of Patient Protection) IEC 61558-1 IEC 61558-2-16
	- Certification Documents	<a href="http://www.tracopower.com/overview/tpp15-d">www.tracopower.com/overview/tpp15-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) EN 55011 class B (internal filter) EN 55014-1 (internal filter) EN 55032 class B (internal filter) FCC Part 15 class B (internal filter) FCC Part 18 class B (internal filter)
	- Radiated Emissions	EN 55011 class B (internal filter) EN 55014-1 (internal filter) EN 55032 class B (internal filter) FCC Part 15 class B (internal filter) 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 55024 (IT Equipment) EN 60601-1-2 edition 4 (Medical Devices) EN 55014-2 (Household Appliances Tools) Air: EN 61000-4-2, ±15 kV, perf. criteria A Contact: EN 61000-4-2, ±8 kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, ±2 kV, perf. criteria A 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	Continuous: EN 61000-4-8, 30 A/m, perf. criteria A
	- Voltage Dips & Interruptions	230 VAC / 50 Hz: EN 61000-4-11 30%, 25 periods, perf. criteria A 60%, 1 period, perf. criteria A >95%, 1 period, perf. criteria A >95%, 250 periods, perf. criteria A
		115 VAC / 60 Hz: EN 61000-4-11 30%, 25 periods, perf. criteria A 60%, 1 period, perf. criteria A >95%, 1 period, perf. criteria A >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 voltage, full load and +25°C after warm-up time unless otherwise stated.

Power Derating	- High Temperature - Low Input Voltage	See application note: <a href="http://www.tracopower.com/overview/tpp15-d">www.tracopower.com/overview/tpp15-d</a> 4 %/V below 90 VAC
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		75 - 95 kHz (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		250 VAC
Isolation Test Voltage	- Input to Output, 60 s - Input to Case or PE, 60 s - Output to Case or PE, 60 s	4'000 VAC 1'500 VAC 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 (at 264 VAC)	- Touch Current	75 μA max.
Reliability	- Calculated MTBF	3'100'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration  - Mechanical Shock	IEC 60068-2-6 5 g, 3 axis, sine sweep, 3x30 min, 5-500 Hz IEC 60068-2-27 50 g, 3 axis, 11 ms
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 μm)
Pin Surface Plating		Tin (3 - 5 μm), matte
Connection Type		THD (Through-Hole Device)
Weight		43 g
Environmental Compliance	- Reach - RoHS	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a>

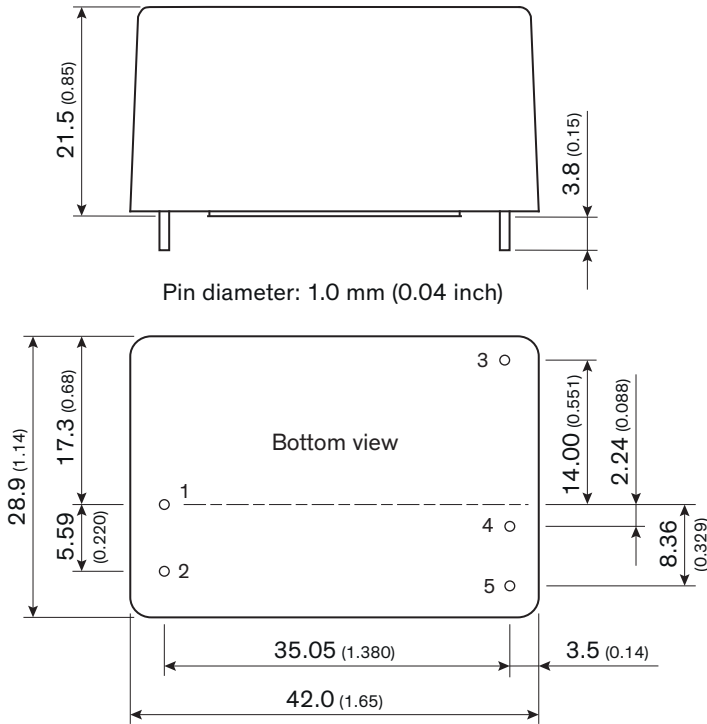
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tpp15-d](http://www.tracopower.com/overview/tpp15-d)

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

**Outline Dimensions**



Pin diameter: 1.0 mm (0.04 inch)

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

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)

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