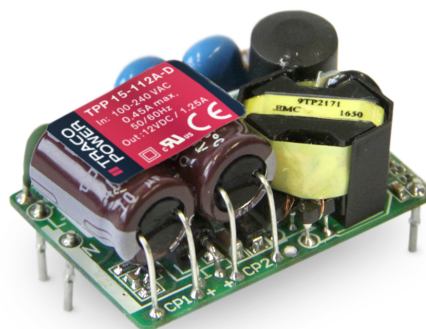


- High power density power supply (open frame)
- Certification according to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP
- Low leakage current <100 µA rated for BF applications
- EMC compliance to IEC 60601-1-2 4th edition
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance 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 <100 mW
- 5-year product warranty



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

The TPP 15A-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 100 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 1.0" x 1.5". 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 15-103A-D	13.2 W	3.3 VDC (2.97 - 3.63 VDC)	4'000 mA	84 %
TPP 15-105A-D	15 W	5 VDC (4.5 - 5.5 VDC)	3'000 mA	86 %
TPP 15-109A-D		9 VDC (8.1 - 9.9 VDC)	1'670 mA	86 %
TPP 15-112A-D		12 VDC (10.8 - 13.2 VDC)	1'250 mA	87 %
TPP 15-115A-D		15 VDC (13.5 - 16.5 VDC)	1'000 mA	87 %
TPP 15-124A-D		24 VDC (21.6 - 26.4 VDC)	625 mA	88 %
TPP 15-136A-D		36 VDC (32.4 - 39.6 VDC)	417 mA	88 %
TPP 15-148A-D		48 VDC (43.2 - 52.8 VDC)	313 mA	89 %

Note - Other output models are available on request.

## Input Specifications

Input Voltage	- AC Range	Operational Range: <b>85 - 264 VAC</b> (Full Range) Rated Range: <b>100 - 240 VAC</b> (Full Range)
	- DC Range	Operational Range: <b>120 - 370 VDC</b> Certified Range: <b>120 - 370 VDC</b> Polarity: <b>irrelevant</b> (When operating with DC input voltage an external fuse T 1.0 A / 400 VDC is needed. Allowed types: Littlefuse 477 series, Cooper Bussmann type S505H-1-R, Bel Fuse type OADK)
Input Frequency		Operational Range: <b>47 - 440 Hz</b> Certified: <b>50/60 Hz</b>
Power Consumption	- No load & $V_{in} = 230$ VAC - No load & $V_{in} = 115$ VAC	<b>100 mW max.</b> (Ready to meet ErP directive) <b>100 mW max.</b>
Input Current	- Full load & $V_{in} = 230$ VAC - Full load & $V_{in} = 115$ VAC	<b>300 mA max.</b> <b>450 mA max.</b>
Input Inrush Current	- At 230 VAC - At 115 VAC	<b>40 A max.</b> <b>25 A max.</b>
Input Protection		<b>T 1.6 A / 250 VAC</b> (Internal Fuse in L)
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/tp15a-d">www.tracopower.com/overview/tp15a-d</a> Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation ( $V_{min} - V_{max}$ ) - Load Variation (0 - 100%)	<b>0.2% max.</b> <b>0.7% max.</b> (3.3 and 5 VDC model) <b>0.5% max.</b> (other output models)
Ripple and Noise (20 MHz Bandwidth)		3.3 VDC model: <b>40 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 5 VDC model: <b>40 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 9 VDC model: <b>70 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 12 VDC model: <b>70 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 15 VDC model: <b>70 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 24 VDC model: <b>100 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 36 VDC model: <b>100 mVp-p typ.</b> (w/ 10 $\mu$ F X5R) 48 VDC model: <b>140 mVp-p typ.</b> (w/ 1 $\mu$ F X7R)
Capacitive Load		3.3 VDC model: <b>6'000 <math>\mu</math>F max.</b> 5 VDC model: <b>4'000 <math>\mu</math>F max.</b> 9 VDC model: <b>1'860 <math>\mu</math>F max.</b> 12 VDC model: <b>1'200 <math>\mu</math>F max.</b> 15 VDC model: <b>820 <math>\mu</math>F max.</b> 24 VDC model: <b>470 <math>\mu</math>F max.</b> 36 VDC model: <b>220 <math>\mu</math>F max.</b> 48 VDC model: <b>150 <math>\mu</math>F max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Hold-up Time	- At 115 VAC	<b>8 ms min.</b>
Start-up Time	- At 230 VAC	<b>850 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>120 - 200% of <math>I_{out}</math> max.</b> <b>145% typ. of <math>I_{out}</math> max.</b>
Overvoltage Protection		<b>115 - 140% of <math>V_{out}</math> nom.</b>

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

Transient Response	- Response Deviation	8% max. (75% to 100% Load Step)
	- Response Time	500 $\mu$ s typ. (75% to 100% Load Step)

## Safety Specifications

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 2 x MOPP (Means Of Patient Protection)
	- Power Transformers	IEC 61558-1 IEC 61558-2-16
	- Certification Documents	<a href="http://www.tracopower.com/overview/tpp15a-d">www.tracopower.com/overview/tpp15a-d</a>
	Protection Class	Class I & II (Prepared): Reinforced Insulation
Pollution Degree		PD 2
Over Voltage Category		OVC II

## EMC Specifications

EMI (Emissions)	<ul style="list-style-type: none"><li>- Conducted Emissions</li><li>- Radiated Emissions</li><li>- Harmonic Current Emissions</li><li>- Voltage Fluctuations &amp; Flicker</li></ul>	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 47 Part 15 class B (internal filter)			
		FCC 47 Part 18 class B (internal filter)			
		EN 55011 class B (internal filter)			
EMS (Immunity)	<ul style="list-style-type: none"><li>- Electrostatic Discharge</li><li>- RF Electromagnetic Field</li><li>- EFT (Burst) / Surge</li><li>- Conducted RF Disturbances</li><li>- PF Magnetic Field</li><li>- Voltage Dips &amp; Interruptions</li></ul>	Air: Contact:	EN 55014-1 (internal filter)		
			EN 55032 class B (internal filter)		
			FCC 47 Part 15 class B (internal filter)		
		L to L:	FCC 47 Part 18 class B (internal filter)		
			EN 61000-3-2, class A		
			EN 61000-3-3		
		EMC / Environmental	- Certification Documents	EN 60601-1-2 edition 4 (Medical Devices)	
				EN 55024 (IT Equipment)	
				EN 55035 (Multimedia)	
				EN 55014-2 (Household Appliances Tools)	
				Continuous:	EN 61000-4-2, ±15 kV, perf. criteria A
					EN 61000-4-2, ±8 kV, perf. criteria A
EN 61000-4-3, 20 V/m, perf. criteria A					
230 VAC / 50 Hz:	EN 61000-4-4, ±2 kV, perf. criteria A				
	EN 61000-4-5, ±1 kV, perf. criteria A				
	EN 61000-4-6, 20 Vrms, perf. criteria A				
115 VAC / 60 Hz:	EN 61000-4-8, 30 A/m, perf. criteria A				
	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				
	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				
<a href="http://www.tracopower.com/overview/tpp15a-d">www.tracopower.com/overview/tpp15a-d</a>					

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

## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Storage Temperature	-40°C to +85°C -40°C to +85°C
Power Derating	- High Temperature - Low Input Voltage	Depending on model 4 %/V below 90 VAC
	See application note: <a href="http://www.tracopower.com/overview/tpp15a-d">www.tracopower.com/overview/tpp15a-d</a>	
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		90 - 110 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	100 µA max.
Reliability	- Calculated MTBF	3'100'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Not allowed
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, half sine, 11 ms
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 260°C / 6 s max.
Weight		16.5 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) 31b494fa-2a36-415b-947b-0f32804b2076

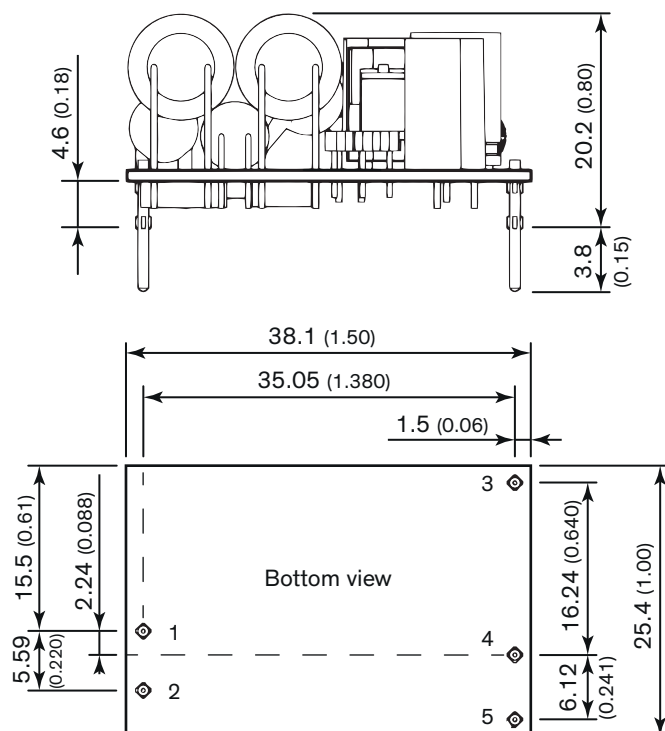
## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tpp15a-d">www.tracopower.com/overview/tpp15a-d</a>
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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

## Outline Dimensions

12, 15, 24, 36, and 48 VDC models - without heatsink



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

Print thickness: 1.0 mm (0.04)

Pin diameter: 1.0 mm (0.04)

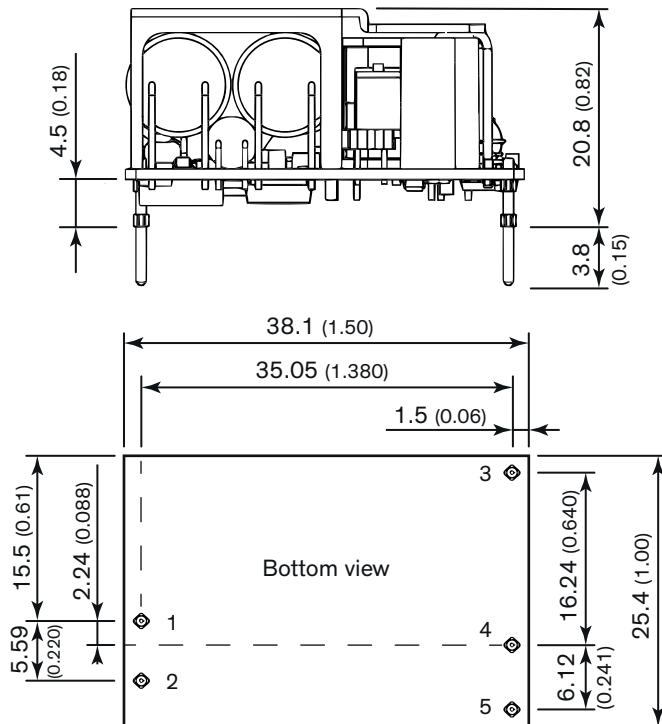
Dimension in mm (inch)

Tolerance: x.x  $\pm 0.50$  (x.xx  $\pm 0.02$ )

x.xx  $\pm 0.25$  (x.xxx  $\pm 0.010$ )

Pin dimension tolerance:  $\pm 0.10$  ( $\pm 0.004$ )

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

**3.3, 5, and 9 VDC models - with heatsink**


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

Print thickness: 1.0 mm (0.04)

Pin diameter: 1.0 mm (0.04)

Dimensions in mm (inch)

Tolerance:  $x.x \pm 0.50$  ( $x.xx \pm 0.02$ )

$x.xx \pm 0.25$  ( $x.xxx \pm 0.010$ )

Pin dimension tolerance:  $\pm 0.10$  ( $\pm 0.004$ )