

- Compact encapsulated 65 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 edition 3.2 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 EN 55032 class B
- Operating up to 5000 m altitude
- 5-year product warranty



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

The TPP 65E-D is a 65 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 edition 3.2, 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 94% 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 65E-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 65-105E-D	50 W	5 VDC (4.5 - 5.5 VDC)	10'000 mA	90 %
TPP 65-112E-D	65 W	12 VDC (10.8 - 13.2 VDC)	5'420 mA	93 %
TPP 65-115E-D		15 VDC (13.5 - 16.5 VDC)	4'340 mA	94 %
TPP 65-124E-D		24 VDC (21.6 - 26.4 VDC)	2'710 mA	94 %
TPP 65-136E-D		36 VDC (32.4 - 39.6 VDC)	1'810 mA	93 %
TPP 65-148E-D		48 VDC (43.2 - 52.8 VDC)	1'360 mA	93 %

Input Specifications

Input Voltage	- AC Range	Operational Range: 85 - 264 VAC (Full Range) Rated Range: 100 - 240 VAC (Full Range)
	- DC Range	Operational Range: 120 - 370 VDC (Designed for, no certification) Polarity: +DC: L / -DC: N
Input Frequency		Operational Range: 47 - 440 Hz Certified: 50/60 Hz
Power Consumption	- No load & Vin = 230 VAC	210 mW max. (Ready to meet ErP directive)
	- No load & Vin = 115 VAC	210 mW max.
Input Current	- Full load & Vin = 230 VAC	900 mA max.
	- Full load & Vin = 115 VAC	1'500 mA max.
Input Inrush Current	- At 230 VAC	80 A max.
	- At 115 VAC	30 A max.
Input Protection		T 3.15 A / 250 VAC (Internal Fuse L & N)
Recommended Input Fuse		3'150 mA (slow blow) (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: www.tracopower.com/overview/tpp65e-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%)	0.5% max.
Ripple and Noise (20 MHz Bandwidth)	5 VDC model:	100 mVp-p max. (w/ 10 µF)
	12 VDC model:	100 mVp-p max. (w/ 10 µF)
	15 VDC model:	100 mVp-p max. (w/ 10 µF)
	24 VDC model:	120 mVp-p max. (w/ 1 µF)
	36 VDC model:	120 mVp-p max. (w/ 1 µF)
	48 VDC model:	200 mVp-p max. (w/ 0.1 µF)
	5 VDC model:	75 mVp-p typ. (w/ 10 µF)
	12 VDC model:	75 mVp-p typ. (w/ 10 µF)
	15 VDC model:	75 mVp-p typ. (w/ 10 µF)
	24 VDC model:	75 mVp-p typ. (w/ 1 µF)
	36 VDC model:	75 mVp-p typ. (w/ 1 µF)
	48 VDC model:	150 mVp-p typ. (w/ 0.1 µF)
Capacitive Load	5 VDC model:	20'000 µF max.
	12 VDC model:	4'520 µF max.
	15 VDC model:	2'900 µF max.
	24 VDC model:	1'130 µF max.
	36 VDC model:	520 µF max.
	48 VDC model:	285 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Hold-up Time	- At 230 VAC	75 ms min.
	- At 115 VAC	16 ms min.
Start-up Time	- At 230 VAC	1'000 ms max.
	- At 115 VAC	1'000 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		120 - 180% of Iout max.
		145% typ. of Iout max.
Overvoltage Protection		125 - 140% of Vout nom.
		130% typ. of Vout nom.

All specifications valid at 230 VAC, resistive full load and +25°C after warm-up time, unless otherwise stated.

Transient Response	- Response Deviation	3% max. (50% to 75% Load Step at 2.5 A/μs)
	- Response Time	600 μs typ. (50% to 75% Load Step at 2.5 A/μs)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Medical Equipment	EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 2 x MOPP (Means Of Patient Protection)
	- Certification Documents	www.tracopower.com/overview/tpp65e-d
	Protection Class	Class I & II (Prepared): Reinforced Insulation
	See application note: www.tracopower.com/info/protection-class.pdf	
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 A (internal filter)
			EN 55011 class B (internal filter)
			EN 55032 class A (internal filter)
			EN 55032 class B (internal filter)
			FCC 47 Part 15 class A (internal filter)
			FCC 47 Part 15 class B (internal filter)
			FCC 47 Part 18 class A (internal filter)
			FCC 47 Part 18 class B (internal filter)
	- Radiated Emissions		EN 55011 class A (internal filter)
		EN 55011 class B (internal filter)	
		EN 55032 class A (internal filter)	
		EN 55032 class B (internal filter)	
		FCC 47 Part 15 class A (internal filter)	
		FCC 47 Part 15 class B (internal filter)	
		FCC 47 Part 18 class A (internal filter)	
		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)
	- Electrostatic Discharge	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
			EN 61000-4-4, ±2 kV, perf. criteria A
	- EFT (Burst) / Surge	L to L:	EN 61000-4-5, ±1 kV, perf. criteria A
			EN 61000-4-6, 20 Vrms, perf. criteria A
	- Conducted RF Disturbances	Continuous:	EN 61000-4-8, 30 A/m, perf. criteria A
		230 VAC / 50 Hz:	EN 61000-4-11
	- PF Magnetic Field		30%, 25 periods, perf. criteria A
			>95%, 0.5 periods, perf. criteria A
			>95%, 1 period, perf. criteria A
			>95%, 250 periods, perf. criteria B
			EN 61000-4-11
	- Voltage Dips & Interruptions	115 VAC / 60 Hz:	EN 61000-4-11
			30%, 25 periods, perf. criteria A
			>95%, 0.5 periods, perf. criteria A
			>95%, 1 period, perf. criteria A
			>95%, 250 periods, perf. criteria B
	EMC / Environmental	- Certification Documents	

All specifications valid at 230 VAC, 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 Depending on model
	See application note: www.tracopower.com/overview/tpp65e-d	
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		50 - 130 kHz (PWM QR)
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 2'500 VAC 2'500 VAC
Creepage	- Input to Output - Input to Case or PE - Output to Case or PE	8 mm min. 4 mm min. 4 mm min.
Clearance	- Input to Output - Input to Case or PE - Output to Case or PE	4 mm min. 4 mm min. 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	1'494'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration - Mechanical Shock - Thermal 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 MIL-STD-810F -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		Lead-Free Wave Soldering 260°C / 6 s max.
Weight		265 g
Environmental Compliance	- REACH Declaration - RoHS Declaration - SCIP Reference Number	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) dd509643-121a-4ee3-a36d-571d3743f609

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Additional Information

Supporting Documents

www.tracopower.com/overview/tpp65e-d

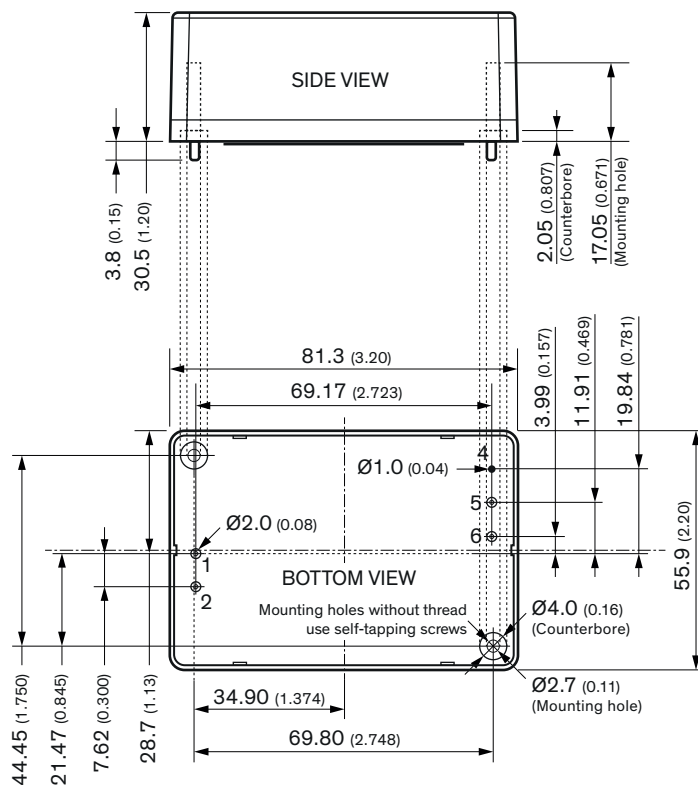
Frequently Asked Questions

www.tracopower.com/glossary-faq

Glossary

www.tracopower.com/info/glossary.pdf

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 ±0.5 (x.xx ±0.02)

x.xx ±0.25 (x.xxx ±0.010)

Suggested screw: ST2.9 X 6.5

Mounting screw locked torque: Max. 0.33 Nm (3.4 kgfcm)

