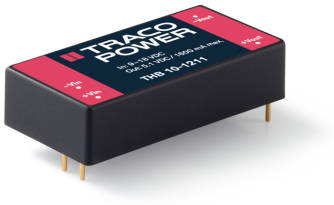
TRACO POWER

DC/DC Converter

THB 10 Series, 10 Watt

- **Supplementary and reinforced insulation**
- **I/O isolation 4000 VACrms rated for 300 Vrms working voltage**
- **2 x MOOP Medical safety according to AAMI/ANSI ES 60601-1:2005(R) and IEC/EN 60601-1 3rd edition**
- **Industrial safety to UL/IEC/EN 62368-1**
- **Wide 2:1 input voltage ranges**
- **Extended operating temperature range –40°C to 75°C max.**
- **Input filter meets EN55022, class A**
- **Continuous short-circuit protection**
- **High reliability**
- **3-year product warranty**



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

The THB 10 series is a range of high performance DC/DC converter modules with double reinforced insulation system. It complies to latest medical safety standard IEC 60950-1 3rd edition for MOOP (Means of Operator Protection). The product comes in a 2"x1" industry standard package. All 12 models features wide 2:1 input voltage range and fully regulated output voltage. The converters offer an economical solution for demanding applications in industrial and medical instrumentation.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
THB 10-1211	9 - 18 VDC (12 VDC nom.)	5.1 VDC	1'600 mA			75 %
THB 10-1212		12 VDC	835 mA			80 %
THB 10-1222		+12 VDC	417 mA	–12 VDC	417 mA	80 %
THB 10-1223		+15 VDC	333 mA	–15 VDC	333 mA	81 %
THB 10-2411	18 - 36 VDC (24 VDC nom.)	5.1 VDC	2'000 mA			76 %
THB 10-2412		12 VDC	835 mA			81 %
THB 10-2422		+12 VDC	417 mA	–12 VDC	417 mA	81 %
THB 10-2423		+15 VDC	333 mA	–15 VDC	333 mA	82 %
THB 10-4811	36 - 75 VDC (48 VDC nom.)	5.1 VDC	2'000 mA			76 %
THB 10-4812		12 VDC	835 mA			81 %
THB 10-4822		+12 VDC	417 mA	–12 VDC	417 mA	81 %
THB 10-4823		+15 VDC	333 mA	–15 VDC	333 mA	82 %

Input Specifications

Input Current	- At no load	12 Vin models:	30 mA typ.
		24 Vin models:	20 mA typ.
		48 Vin models:	10 mA typ.
	- At full load	12 Vin models:	905 mA typ. (5.1 Vout model)
			1'040 mA typ. (12 Vout model)
			1'040 mA typ. (12 / -12 Vout model)
			1'040 mA typ. (15 / -15 Vout model)
		24 Vin models:	560 mA typ. (5.1 Vout model)
			515 mA typ. (12 Vout model)
			515 mA typ. (12 / -12 Vout model)
			515 mA typ. (15 / -15 Vout model)
		48 Vin models:	280 mA typ. (5.1 Vout model)
			255 mA typ. (12 Vout model)
			255 mA typ. (12 / -12 Vout model)
			255 mA typ. (15 / -15 Vout model)
Surge Voltage		12 Vin models:	25 VDC max. (1 s max.)
		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
Start-up Voltage		12 Vin models:	7 VDC min. / 8 VDC typ. / 9 VDC max.
		24 Vin models:	13 VDC min. / 15 VDC typ. / 18 VDC max.
		48 Vin models:	30 VDC min. / 33 VDC typ. / 36 VDC max.
Under Voltage Lockout		12 Vin models:	8.5 VDC max.
		24 Vin models:	16 VDC max.
		48 Vin models:	34 VDC max.
Reflected Ripple Current		12 Vin models:	100 mA typ.
		24 Vin models:	50 mA typ.
		48 Vin models:	25 mA typ.
Recommended Input Fuse		12 Vin models:	3'000 mA (slow blow)
		24 Vin models:	1'500 mA (slow blow)
		48 Vin models:	750 mA (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type
Short Circuit Input Power			3 W max.

Output Specifications

Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.5% max.
		dual output models:	0.5% max.
	- Load Variation (15 - 100%)	single output models:	1% max.
		dual output models:	1% max. (Output 1)
			1% max. (Output 2)
Ripple and Noise (20 MHz Bandwidth)	- single output	5.1 Vout models:	100 mVp-p max.
		12 Vout models:	150 mVp-p max.
	- dual output	12 / -12 Vout models:	150 / 150 mVp-p max.
		15 / -15 Vout models:	150 / 150 mVp-p max.
Capacitive Load	- single output	5.1 Vout models:	1'000 µF max.
		12 Vout models:	470 µF max.
	- dual output	12 / -12 Vout models:	220 / 220 µF max.
		15 / -15 Vout models:	220 / 220 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.05 %/K max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			120% min. of Iout max.
			150% typ. of Iout max.

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

Transient Response	- Response Deviation	3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time	300 µs typ. / 600 µs max. (75% to 100% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	CSA-C22.2, No. 60950-1 EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Medical Equipment	EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 CSA-C22.2, No 60601-1 2 x MOOP (Means Of Operator Protection) MOPP (Means Of Patient Protection)
	- Certification Documents	www.tracopower.com/overview/thb10
Pollution Degree		PD 3
Over Voltage Category		Not mains connected

EMC Specifications

EMI Emissions			EN 60601-1-2 edition 4 (Medical Devices)
	- Conducted Emissions		EN 55011 class A (with external filter)
	- Radiated Emissions		EN 55011 class A (with external filter)
		External filter proposal:	www.tracopower.com/overview/thb10
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, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge		EN 61000-4-4, ±2 kV, perf. criteria A
			EN 61000-4-5, ±1 kV, perf. criteria A
		Ext. input component:	330 µF / 35 V (12 Vin models) 330 µF / 50 V (24 Vin models) 330 µF / 100 V (48 Vin models)
	- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous:	EN 61000-4-8, 30 A/m, perf. criteria A

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +75°C
	- Case Temperature		+95°C max.
	- Storage Temperature		–50°C to +125°C
Power Derating	- High Temperature		2.85 %/K above 60°C
		See application note:	www.tracopower.com/overview/thb10
Cooling System			Natural convection (20 LFM)
Altitude During Operation			5'000 m max.
Switching Frequency			120 - 180 kHz (PWM) 150 kHz typ. (PWM)
Insulation System			Reinforced Insulation
Working Voltage (rated)			300 VAC (acc. to IEC/EN 60601-1) 1000 VAC (acc. to IEC/EN 62368-1, 60950-1)
Isolation Test Voltage	- Input to Output, 60 s		4'200 VAC
Isolation Resistance	- Input to Output, 500 VDC		10'000 MΩ min.

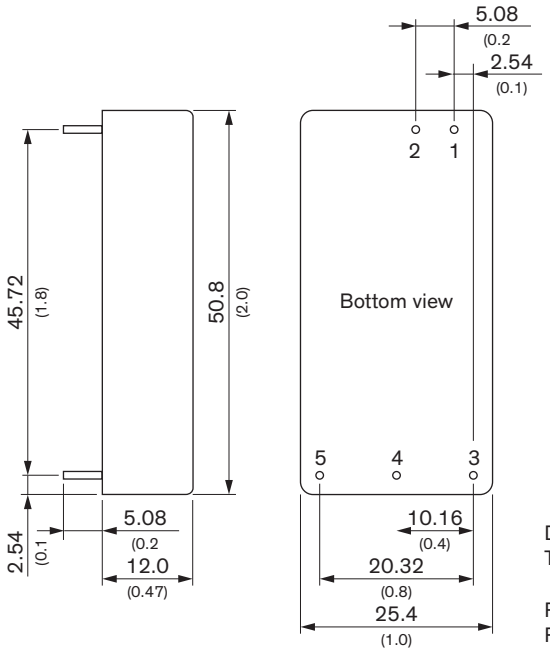
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Isolation Capacitance	- Input to Output, 100 kHz, 1 V	60 pF typ. 80 pF max.
Leakage Current	- Earth Leakage Current	10 µA max.
Reliability	- Calculated MTBF	1'000'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Allowed (hermetical product)
	See Cleaning Guideline:	www.tracopower.com/info/cleaning.pdf
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper Alloy (C6801)
Pin Foundation Plating		Nickel (2.5 µm min.)
Pin Surface Plating		Gold (75 - 125 nm), glossy
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		2" x 1"
Soldering Profile		Wave Soldering 260°C / 10 s max.
Weight		24.5 g
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/thb10

Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (±0.02)
x.xx ±0.25 (±0.01)
Pin Ø 1.0 ±0.05 (0.04 ±0.002)
Pin pich tolerances ±0.13 (±0.005)

Pinout		
Pin	**Single**	**Dual**
1	+Vin (Vcc)	+Vin (Vcc)
2	–Vin (GND)	–Vin (GND)
3	+Vout	+Vout
4	No pin	Common
5	–Vout	–Vout