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.

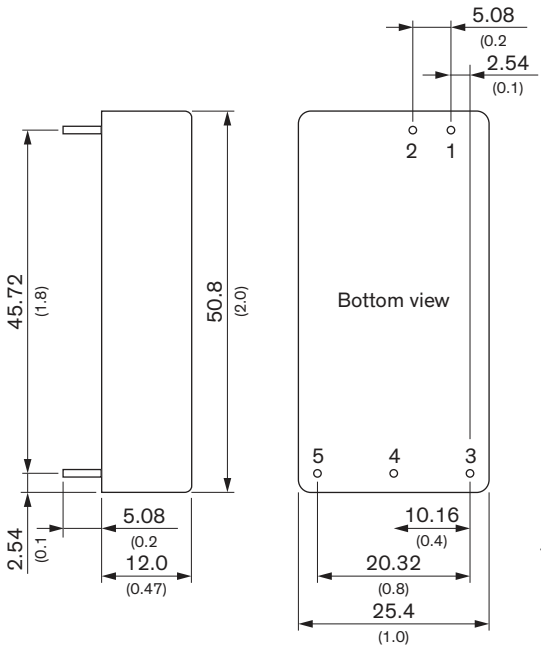
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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		According to 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).)
	- SCIP Reference Number	6643ce60-44b4-4d3b-b3d0-21abce17c45b

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 pitch 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