

- 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



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 60601-1 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 typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
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: <b>30 mA typ.</b> 24 Vin models: <b>20 mA typ.</b> 48 Vin models: <b>10 mA typ.</b>
	- At full load	12 Vin models: <b>905 mA typ.</b> (5.1 Vout model) <b>1'040 mA typ.</b> (12 Vout model) <b>1'040 mA typ.</b> (12 / -12 Vout model) <b>1'040 mA typ.</b> (15 / -15 Vout model) 24 Vin models: <b>560 mA typ.</b> (5.1 Vout model) <b>515 mA typ.</b> (12 Vout model) <b>515 mA typ.</b> (12 / -12 Vout model) <b>515 mA typ.</b> (15 / -15 Vout model) 48 Vin models: <b>280 mA typ.</b> (5.1 Vout model) <b>255 mA typ.</b> (12 Vout model) <b>255 mA typ.</b> (12 / -12 Vout model) <b>255 mA typ.</b> (15 / -15 Vout model)
Surge Voltage		12 Vin models: <b>25 VDC max.</b> (1 s max.) 24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Start-up Voltage		12 Vin models: <b>7 VDC min. / 8 VDC typ. / 9 VDC max.</b> 24 Vin models: <b>13 VDC min. / 15 VDC typ. / 18 VDC max.</b> 48 Vin models: <b>30 VDC min. / 33 VDC typ. / 36 VDC max.</b>
Under Voltage Lockout		12 Vin models: <b>8.5 VDC max.</b> 24 Vin models: <b>16 VDC max.</b> 48 Vin models: <b>34 VDC max.</b>
Reflected Ripple Current		12 Vin models: <b>100 mA typ.</b> 24 Vin models: <b>50 mA typ.</b> 48 Vin models: <b>25 mA typ.</b>
Recommended Input Fuse		12 Vin models: <b>3'000 mA</b> (slow blow) 24 Vin models: <b>1'500 mA</b> (slow blow) 48 Vin models: <b>750 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Pi-Type</b>
Short Circuit Input Power		<b>3 W max.</b>

## Output Specifications

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

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

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	<a href="http://www.tracopower.com/overview/thb10">www.tracopower.com/overview/thb10</a>
Pollution Degree		PD 3
Over Voltage Category		Not mains connected

### EMC Specifications

EMI Emissions	- Conducted Emissions	EN 60601-1-2 edition 4 (Medical Devices)	
	- Radiated Emissions	EN 55011 class A (with external filter) EN 55011 class A (with external filter)	
	External filter proposal:	<a href="http://www.tracopower.com/overview/thb10">www.tracopower.com/overview/thb10</a>	
EMS Immunity	- Electrostatic Discharge	Air: EN 60601-1-2 edition 4 (Medical Devices) EN 61000-4-2, ±15 kV, perf. criteria A	
	- RF Electromagnetic Field	Contact: EN 61000-4-2, ±8 kV, perf. criteria A 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:	<a href="http://www.tracopower.com/overview/thb10">www.tracopower.com/overview/thb10</a>
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.

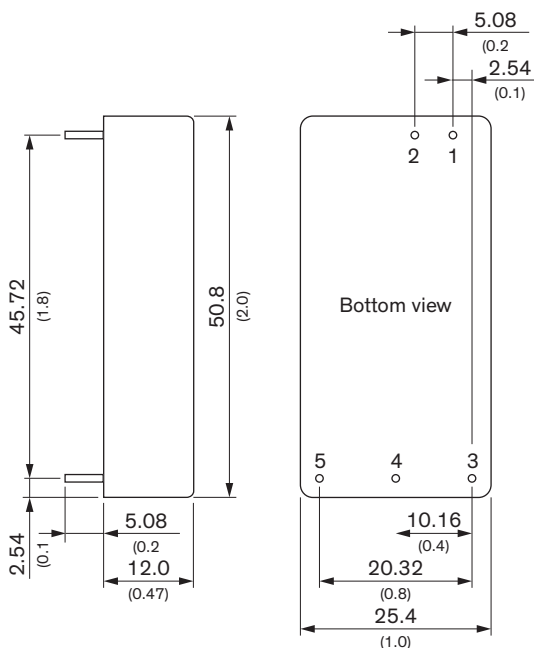
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	60 pF typ. 80 pF max.
Leakage Current	- Earth Leakage Current	10 µA max.
Reliability	- Calculated MTBF	1'000'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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		Lead-Free Wave Soldering 260°C / 10 s max.
Weight		24.5 g
Environmental Compliance	- REACH Declaration	<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
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> 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](http://www.tracopower.com/overview/thb10)

### Outline Dimensions



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