

- Supplementary and reinforced insulation
- I/O isolation 4800 VACrms rated for 1000 Vrms (1410 Vpk) working voltage
- Medical safety to ES 60601-1 and IEC/EN 60601-1 3rd edition, 2 x MOOP
- Isolation test voltage 6000 Vpk
- Wide 2:1 input voltage ranges
- Extended operating temperature range  $-40^{\circ}\text{C}$  to  $85^{\circ}\text{C}$  max.
- Input filter meets EN55032, class A
- Continuous short-circuit protection
- High reliability
- 3-year product warranty



The THB 3 series is a range of high performance, regulated DC/DC converters in a DIP-24 plastic package. A reinforced I/O-isolation system and a wide 2:1 input voltage range make this product the best choice for many demanding applications like transportation systems, industrial controls, medical equipments, instrumentations, everywhere where high basic-, supplementary- or reinforced insulation is required to meet requested safety standards. A high efficiency allows safe operation in a temperature range of  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$ . Other features of this product are over voltage protection and internal EMI-input filter to meet EN 55032, class A without additional components. Full SMD-design with exclusive use of ceramic capacitors ensure a very high reliability and a long product lifetime.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
THB 3-0511	4.5 - 9 VDC (5 VDC nom.)	5 VDC	600 mA			70 %
THB 3-0512		12 VDC	250 mA			75 %
THB 3-0515		24 VDC	125 mA			76 %
THB 3-0522		+12 VDC	125 mA	-12 VDC	125 mA	75 %
THB 3-0523		+15 VDC	100 mA	-15 VDC	100 mA	75 %
THB 3-1211	9 - 18 VDC (12 VDC nom.)	5 VDC	600 mA			74 %
THB 3-1212		12 VDC	250 mA			80 %
THB 3-1215		24 VDC	125 mA			81 %
THB 3-1222		+12 VDC	125 mA	-12 VDC	125 mA	80 %
THB 3-1223		+15 VDC	100 mA	-15 VDC	100 mA	80 %
THB 3-2411	18 - 36 VDC (24 VDC nom.)	5 VDC	600 mA			78 %
THB 3-2412		12 VDC	250 mA			83 %
THB 3-2415		24 VDC	125 mA			84 %
THB 3-2422		+12 VDC	125 mA	-12 VDC	125 mA	83 %
THB 3-2423		+15 VDC	100 mA	-15 VDC	100 mA	83 %
THB 3-4811	36 - 75 VDC (48 VDC nom.)	5 VDC	600 mA			78 %
THB 3-4812		12 VDC	250 mA			83 %
THB 3-4815		24 VDC	125 mA			84 %
THB 3-4822		+12 VDC	125 mA	-12 VDC	125 mA	83 %
THB 3-4823		+15 VDC	100 mA	-15 VDC	100 mA	83 %

### Input Specifications

Input Current	- At no load	5 Vin models: <b>40 mA typ.</b> 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	5 Vin models: <b>825 mA typ.</b> 12 Vin models: <b>325 mA typ.</b> 24 Vin models: <b>150 mA typ.</b> 48 Vin models: <b>75 mA typ.</b>
Surge Voltage		5 Vin models: <b>11 VDC max.</b> (1 s max.) 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		5 Vin models: <b>3.7 VDC min. / 4 VDC typ. / 4.5 VDC max.</b> 12 Vin models: <b>8 VDC min. / 8.5 VDC typ. / 9 VDC max.</b> 24 Vin models: <b>15 VDC min. / 17 VDC typ. / 18 VDC max.</b> 48 Vin models: <b>30 VDC min. / 33 VDC typ. / 36 VDC max.</b>
Under Voltage Lockout		5 Vin models: <b>4 VDC max.</b> 12 Vin models: <b>8.5 VDC max.</b> 24 Vin models: <b>17 VDC max.</b> 48 Vin models: <b>34 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>60 mA typ.</b> 12 Vin models: <b>30 mA typ.</b> 24 Vin models: <b>15 mA typ.</b> 48 Vin models: <b>10 mA typ.</b>
Recommended Input Fuse		5 Vin models: <b>2'000 mA</b> (slow blow) 12 Vin models: <b>1'000 mA</b> (slow blow) 24 Vin models: <b>500 mA</b> (slow blow) 48 Vin models: <b>250 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>2 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 (25 - 100%)	single output models: <b>1% max.</b> dual output models: <b>2% max.</b> (Output 1) <b>2% max.</b> (Output 2)
Ripple and Noise (20 MHz Bandwidth)	- single output	5 Vout models: <b>100 mVp-p max.</b> 12 Vout models: <b>150 mVp-p max.</b> 24 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>
	- single output	5 Vout models: <b>75 mVp-p typ.</b> 12 Vout models: <b>100 mVp-p typ.</b> 24 Vout models: <b>100 mVp-p typ.</b>
	- dual output	12 / -12 Vout models: <b>100 / 100 mVp-p typ.</b> 15 / -15 Vout models: <b>100 / 100 mVp-p typ.</b>
Capacitive Load	- single output	5 Vout models: <b>1'000 µF max.</b> 12 Vout models: <b>470 µF max.</b> 24 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>

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

Minimum Load		15 % of lout max. (Operation at lower load will not damage the converter, but it may not meet all specifications)
Temperature Coefficient		±0.05 %/K max.
Short Circuit Protection		Continuous, Automatic recovery
Overload Protection		Foldback Mode
Output Current Limitation		120% min. of lout max. 150% typ. of lout max.
Transient Response	- Response Deviation - Response Time	3% typ. / 6% max. (75% to 100% Load Step) 150 µs typ. / 500 µs max. (75% to 100% Load Step)

### Safety Specifications

Standards	- IT / Multimedia Equipment  - Medical Equipment  - Certification Documents	CSA-C22.2, No. 60950-1 Designed for IEC/EN/UL 62368-1 (not certified) EN 60950-1 IEC 60950-1 UL 60950-1 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) <a href="http://www.tracopower.com/overview/thb3">www.tracopower.com/overview/thb3</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

### EMC Specifications

EMI (Emissions)	- Conducted Emissions - Radiated Emissions	EN 60601-1-2 edition 4 (Medical Devices) EN 55032 class A (internal filter) EN 55032 class A (internal filter)
EMS (Immunity)		EN 60601-1-2 edition 4 (Medical Devices)

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +100°C max. -50°C to +125°C
Power Derating	- High Temperature	3.3 %/K above 70°C See application note: <a href="http://www.tracopower.com/overview/thb3">www.tracopower.com/overview/thb3</a>
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		150 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		1'000 VAC
Isolation Test Voltage	- Input to Output, 60 s	4'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	7 pF typ. 13 pF 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)

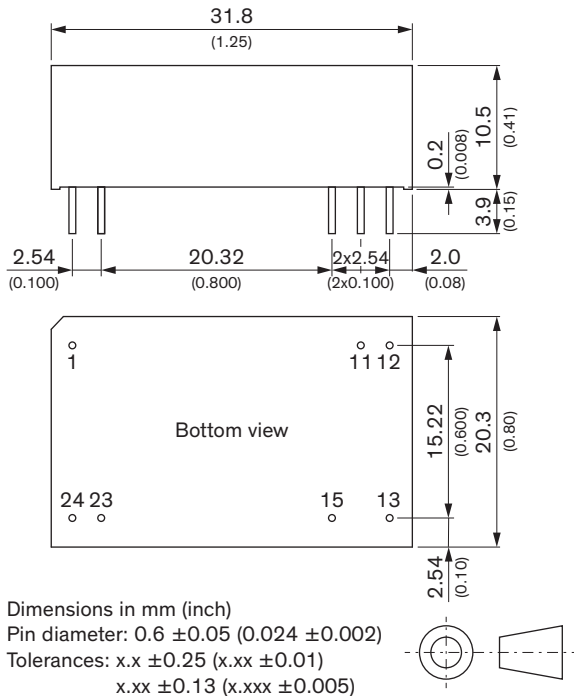
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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	DIP24
Soldering Profile	Lead-Free Wave Soldering 260°C / 6 s max.
Weight	13 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: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))
	- SCIP Reference Number bfebbf7-4ff9-4d1b-bd08-c85cccdcb535

### Additional Information

Supporting Documents	<a href="http://www.tracopower.com/overview/thb3">www.tracopower.com/overview/thb3</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

### Outline Dimensions



Pinout		
Pin	Single	Dual
1	+Vin (Vcc)	
11	No pin	Common
12	-Vout	No pin
13	+Vout	-Vout
15	No pin	+Vout
23	-Vin (GND)	
24	-Vin (GND)	