TRACO POWER

DC/DC Converter

THB 6 Series, 6 Watt

- **I/O isolation 3000 VACrms rated for 1000 Vrms (1410 Vpk) working voltage**
- **Medical safety to UL 60601-1 and IEC/EN 60601-1 3rd edition, 2 x MOOP**
- **Ultra compact DIP-24 package**
- **Wide 2:1 input voltage ranges**
- **Operating temperature range –40°C to +75°C**
- **Low leakage current**
- **Short circuit protection**
- **Input filter to meet EN 55022, Class A**
- **3-year product warranty**

ES 60601-1 IEC 60601-1
UL 60950-1 IEC 60950-1

The THB 6 series is a new 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 equipment, instrumentation, 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°C to +71°C. Other features of this product are over voltage protection and internal EMI-input filter to meet EN 55022 class A without additional components. Full SMD-design with exclusive use of ceramic capacitors ensures a very high reliability and a long product lifetime.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
THB 6-1211	9 - 18 VDC (12 VDC nom.)	5 VDC	1'000 mA			75 %
THB 6-1212		12 VDC	500 mA			78 %
THB 6-1222		+12 VDC	250 mA	–12 VDC	250 mA	78 %
THB 6-1223		+15 VDC	200 mA	–15 VDC	200 mA	78 %
THB 6-2411	18 - 36 VDC (24 VDC nom.)	5 VDC	1'000 mA			77 %
THB 6-2412		12 VDC	500 mA			80 %
THB 6-2422		+12 VDC	250 mA	–12 VDC	250 mA	80 %
THB 6-2423		+15 VDC	200 mA	–15 VDC	200 mA	80 %
THB 6-4811	36 - 75 VDC (48 VDC nom.)	5 VDC	1'000 mA			77 %
THB 6-4812		12 VDC	500 mA			80 %
THB 6-4822		+12 VDC	250 mA	–12 VDC	250 mA	80 %
THB 6-4823		+15 VDC	200 mA	–15 VDC	200 mA	80 %

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:	570 mA typ. (5 Vout model)
			640 mA typ. (12 Vout model)
			640 mA typ. (12 / -12 Vout model)
			640 mA typ. (15 / -15 Vout model)
		24 Vin models:	280 mA typ. (5 Vout model)
			315 mA typ. (12 Vout model)
			315 mA typ. (12 / -12 Vout model)
			315 mA typ. (15 / -15 Vout model)
		48 Vin models:	140 mA typ. (5 Vout model)
			155 mA typ. (12 Vout model)
			155 mA typ. (12 / -12 Vout model)
			155 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:	60 mA typ.
		24 Vin models:	30 mA typ.
		48 Vin models:	15 mA typ.
Recommended Input Fuse		12 Vin models:	1'200 mA (slow blow)
		24 Vin models:	600 mA (slow blow)
		48 Vin models:	300 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 (25 - 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 Vout models:	75 mVp-p typ.
		12 Vout models:	100 mVp-p typ.
	- dual output	12 / -12 Vout models:	100 / 100 mVp-p typ.
		15 / -15 Vout models:	100 / 100 mVp-p typ.
	- single output	5 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 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.

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

Minimum Load		20 % of Iout 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 Iout max. 150% typ. of Iout max.
Transient Response	- Response Deviation	3% typ. / 6% max. (75% to 100% Load Step)
	- Response Time	300 µs typ. / 500 µs max. (75% to 100% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	CSA-C22.2, No. 60950-1 Designed for EN 62368-1 (no certification) EN 60950-1 IEC 60950-1 UL 60950-1
	- 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/thb6
Pollution Degree		PD 2
Over Voltage Category		OVC II

EMC Specifications

EMI Emissions		EN 60601-1-2 edition 4 (Medical Devices)
	- Conducted Emissions	EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC Part 15 class A (internal filter) FCC Part 15 class B (with external filter)
	- Radiated Emissions	EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC Part 15 class A (internal filter) FCC Part 15 class B (with external filter)
	External filter proposal:	www.tracopower.com/overview/thb6
EMS Immunity		EN 60601-1-2 edition 4 (Medical Devices)

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	2.5 %/K above 55°C
	See application note:	www.tracopower.com/overview/thb6
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.

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Isolation Capacitance	- Input to Output, 100 kHz, 1 V	7 pF typ. 13 pF max.
Leakage Current	- Earth Leakage Current	2 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		DIP24
Soldering Profile		Lead-Free Wave Soldering 260°C / 10 s max.
Weight		18 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, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	b96497e2-5138-4c12-9ba3-0f6e5882b328

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/thb6

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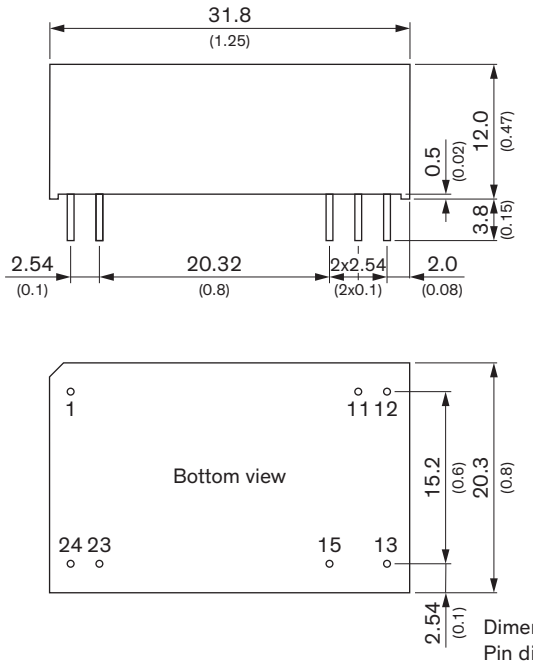
Outline Dimensions



Dimensions in mm (inch)
Pin diameter Ø 0.6 ±0.05 (0.024 ±0.002)
Tolerances ±0.25 (±0.01)
Pin pitch tolerances ±0.13 (±0.005)

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