TRACO POWER

DC/DC Converter

THM 6 Series, 6 Watt

- **Wide 2:1 input voltage 6 W DC/DC converter in a compact DIP-24 plastic case**
- **I/O isolation 5000 VACrms rated for 250 VACrms working voltage**
- **Certification according to IEC/EN/ES 60601-1 3rd edition for 2×MOPP**
- **Risk management process according to ISO 14971 including risk management file**
- **Acceptance criteria for electronic assemblies according to IPC-A-610 Level 3**
- **Low leakage current < 2µA**
- **Extended operating temperature range –40°C to 90°C.**
- **EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A**
- **Operating up to 5000m altitude**
- **5 year product warranty A**

CB Scheme IEC 606010-1 cULus ES 60601-1

The THM-6 series is a range of medical 6 Watt DC/DC converters in DIP-24 plastic package and with wide 2:1 input voltage range. They provide a reinforced isolation system for 5000 VACrms isolation and a very low leakage current of less than 2 µA. The units are approved to IEC/EN/ES 60601-1 3rd edition for 2 x MOPP (Means Of Patient Protection) and come along with an ISO 14971 risk management file. Design and production conform to the quality management system ISO 13485. With a high efficiency of up to 89% and highest grade components the converters can reliably operate in an ambient temperature range of –40°C up to +90°C. They constitute a reliable solution not only for medical equipment but also for demanding ranges of application such as transportation, control & measurement or IGBT drivers.

Models

Order code	Input voltage range	Output voltage	Output current max.	Efficiency typ.
THM 6-0510	4.5 – 9 VDC (5 VDC nominal)	3.3 VDC	1800 mA	81.5 %
THM 6-0511		5.0 VDC	1200 mA	86.0 %
THM 6-0512		12 VDC	500 mA	86.0 %
THM 6-0513		15 VDC	400 mA	87.5 %
THM 6-0515		24 VDC	250 mA	87.0 %
THM 6-0521		±5.0 VDC	±600 mA	84.0 %
THM 6-0522		±12 VDC	±250 mA	86.5 %
THM 6-0523		±15 VDC	±200 mA	87.5 %
THM 6-1210	9.0 – 18 VDC (12 VDC nominal)	3.3 VDC	1800 mA	83.5 %
THM 6-1211		5.0 VDC	1200 mA	86.0 %
THM 6-1212		12 VDC	500 mA	89.0 %
THM 6-1213		15 VDC	400 mA	88.5 %
THM 6-1215		24 VDC	250 mA	88.5 %
THM 6-1221		±5.0 VDC	±600 mA	85.0 %
THM 6-1222		±12 VDC	±250 mA	89.0 %
THM 6-1223		±15 VDC	±200 mA	88.0 %
THM 6-2410	18 – 36 VDC (24 VDC nominal)	3.3 VDC	1800 mA	83.0 %
THM 6-2411		5.0 VDC	1200 mA	86.0 %
THM 6-2412		12 VDC	500 mA	89.0 %
THM 6-2413		15 VDC	400 mA	89.0 %
THM 6-2415		24 VDC	250 mA	88.5 %
THM 6-2421		±5.0 VDC	±600 mA	85.0 %
THM 6-2422		±12 VDC	±250 mA	88.5 %
THM 6-2423		±15 VDC	±200 mA	88.5 %
THM 6-4810	36 – 75 VDC (48 VDC nominal)	3.3 VDC	1800 mA	82.5 %
THM 6-4811		5.0 VDC	1200 mA	86.5 %
THM 6-4812		12 VDC	500 mA	88.0 %
THM 6-4813		15 VDC	400 mA	88.5 %
THM 6-4815		24 VDC	250 mA	88.0 %
THM 6-4821		±5.0 VDC	±600 mA	85.0 %
THM 6-4822		±12 VDC	±250 mA	88.0 %
THM 6-4823		±15 VDC	±200 mA	87.0 %

Input Specifications

Input current no load		5 Vin models:	20 mA typ.
		12 Vin models:	10 mA typ.
		24 Vin models:	6 mA typ.
		48 Vin models:	4 mA typ.
Surge voltage (3 sec. max.)		5 Vin models:	16 V max.
		12 Vin models:	25 V max.
		24 Vin models:	50 V max.
		48 Vin models:	100 V max.
Start-up voltage		5 Vin models:	4.5 VDC (or lower)
		12 Vin models:	9 VDC (or lower)
		24 Vin models:	18 VDC (or lower)
		48 Vin models:	36 VDC (or lower)
Startup time			30 ms
Under voltage shut down		5 Vin models:	4 VDC typ.
		12 Vin models:	8 VDC typ.
		24 Vin models:	16 VDC typ.
		48 Vin models:	33 VDC typ.
Conducted noise	– Conducted & Radiated input surpression		EN 55011 limits to IEC 60601-1-2 4th editon EN 55032 class A (internal filter)
EMC immunity	– Generic for Medical equipment		IEC/EN 60601-1-2 4th edition
	– ESD (electrostatic discharge)		EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A
	– Radiated immunity		EN 61000-4-3, 10 V/m, perf. criteria A
	– Fast transient / surge		EN 61000-4-4, ±2 kV, perf. criteria A
	(with external input capacitor / diode)		EN 61000-4-5, ±2 kV perf. criteria A
		5 Vin models:	Nippon chemi-con KY 1000 µF/ 25 V and reverse diode (Vishay V10P45) in parallel
		12 & 24 Vin models:	Nippon chemi-con KY 470 µF/ 50 V
		48 Vin models:	Nippon chemi-con KY 330 µF/ 100 V
	– Conducted immunity		EN 61000-4-6, 10 Vrms, perf. criteria A
	– Magnetic field immunity		EN 61000-4-8 100 A/m, continuous, perf. criteria A 1000 A/m, 1 sec., perf. criteria A

Output Specifications

Voltage set accuracy			±1 % max.
Regulation	– Input variation	single output:	0.2 % max.
		dual output:	0.5 % max.
	– Load variation 0 – 100 %	single output:	0.2 % max.
		dual output:	1.0 % max.
	– Cross regulation	dual output:	5.0 % max. (asymmetrical load 25/100 %)
Minimum load			not required
Ripple and noise (20 MHz Bandwidth)		3.3 & 5.0 VDC models:	30 mVp-p typ. with cap. 10 µF/25 V X7R MLCC
		12 & 15 VDC models:	40 mVp-p typ. with cap. 10 µF/25 V X7R MLCC
		24 VDC models:	50 mVp-p typ. with cap. 4.7 µF/50 V X7R MLCC
Transient response	– Recovery time (25% load step change)		250 µs typ.
Over load protection			at 150 % typ. of Iout rated (hiccup mode)
Short circuit protection			Continuous, automatic recovery
Over voltage protection	–Single output	3.3 VDC models:	3.7 – 5.0 VDC
		5.0 VDC models:	5.6 – 7.0 VDC
		12 VDC models:	13.5 – 16.0 VDC
		15 VDC models:	18.3 – 22.0 VDC
		24 VDC models:	29.1 – 34.5 VDC
	–Dual output	±5 VDC models:	5.6 – 7.0 VDC
		±12 VDC models:	13.5 – 18.2 VDC
		±15 VDC models:	17.0 – 22.0 VDC

General Specifications

Capacitive load	–Single output	3.3 VDC models:	2‘100 µF max.
		5.0 VDC models:	1‘500 µF max.
		12 VDC models:	260 µF max.
		15 VDC models:	210 µF max.
		24 VDC models:	75 µF max.
	–Dual output	±5 VDC models:	860 µF max. (each output)
		±12 VDC models:	150 µF max. (each output)
		±15 VDC models:	110 µF max. (each output)
Temperature ranges	– Operating (designed for)		–40°C to +88°C (without derating)
	– Rated according to IEC/EN 60601-1		–40°C to +70°C (without derating)
	– Case temperature		+105°C max.
	– Storage temperature		–55°C to +125°C
Thermal impedance			18 K/W
Humidity (non condensing)			5 % to 95 % rel H max.
Isolation voltage (50Hz, 60sec)	– to meet ES/IEC/EN 60601-1		5000 VACrms, rated for 250 VACrms working voltage, 2 × MOPP
Clearance/creepage			8 mm min.
Leakage current (at 240 VAC, 60 Hz)			2 µA max.
Isolation capacitance (input/output)			17 pF max.
Altitude during operation			5000 m
Temperature coefficient			±0.02 %/K typ.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)			4‘700‘000 h
Switching frequency			250 kHz ±25 kHz (pulse width modulation)
Vibration and thermal shock resistance			according to MIL-STD-810F
Safety standards/approvals	– Medical equipment		ANSI/AAMI ES60601-1:2005/(R)2012, IEC/EN60601-1 3rd edition
	– Certification documents		www.tracopower.com/products/overview/thm6
Environmental compliance	– Reach		www.tracopower.com/products/reach-declaration.pdf
	– RoHS		RoHS directive 2011/65/EU

Physical Specifications

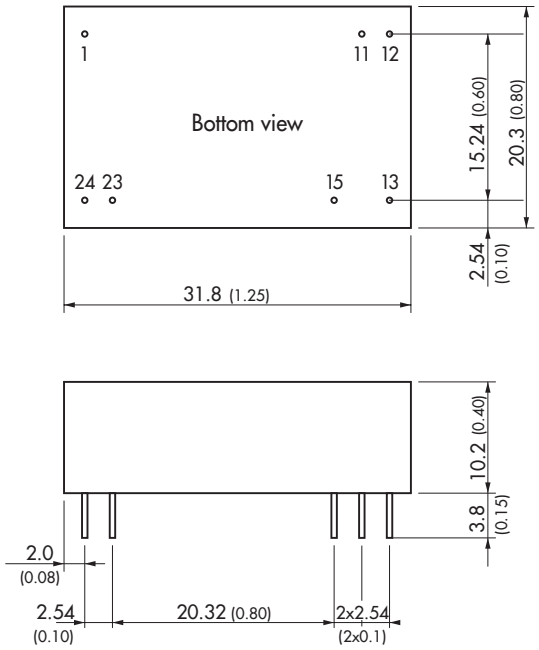
Casing material	non-conductive black plastic
Base material	non-conductive black plastic
Potting material	silicone (UL94 V-0 rated)
Package weight	14 g (0.48oz)
Soldering temperature	max. 265°C / 10 sec

- The component is not be used in an oxygen rich environment.
- The component is not to be used in conjunction with flammable anaesthetics and agents.
- The component has to be disposed appropriately. Please refer to local regulations (Waste Electrical and Electronic Equipment).
- A modification of the component is not allowed.

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

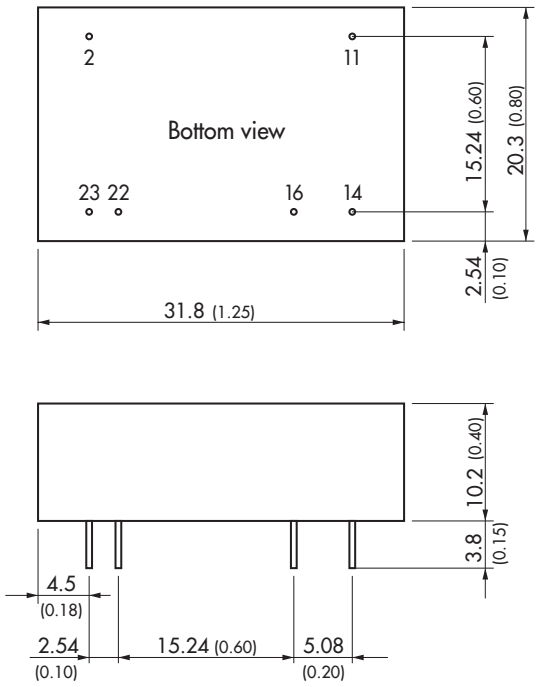
Outline Dimensions

Standard pinning



Standard 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)

Optional pinning: suffix **-B1**



Optional Pinout		
Pin	**Single**	**Dual**
2	–Vin (GND)	–Vin (GND)
11	No con.	–Vout
14	+Vout	+Vout
16	–Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

Remark: No suffix **-B1** for 5 Vin models. Corresponding parts are with THM 6WI series by default. see www.tracopower.com/overview/thm6wi

Dimensions in [mm], () = Inch
Tolerances ±0.5 (±0.02)
Pin ø 0.6 ±0.1 (0.024 ±0.004)
Pin pich tolerances ±0.25 (±0.01)