

- Compact DIP-24 plastic case
- I/O isolation 5000 VAC rated for 250 VAC working voltage
- IEC 60601-1 certification for 2 x MOPP
- Risk management process according to ISO 14971 incl. risk management file
- Acceptance criteria for electronic assemblies acc. to IPC-A-610 Level 3
- Low leakage current <2 μ A
- Operating temperature -40°C to 90°C
- EMC compliance to IEC 60601-1-2 4th edition and EN55032 class A
- 5-year product warranty



ES 60601-1 IEC 60601-1
UL 62368-1 IEC 62368-1

The THM 10 series is a range of medical 10 Watt DC/DC converters in DIP-24 plastic package with wide 2:1 input voltage range. They provide a reinforced isolation system for 5000 VAC and a very low leakage current of less than 2 μ A. The units are approved to IEC/EN/ES 60601-1 3rd ed. for 2 x MOPP 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 $+90^{\circ}\text{C}$. 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 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
THM 10-0510	4.5 - 9 VDC (5 VDC nom.)	3.3 VDC	2'500 mA			80 %
THM 10-0511		5 VDC	2'000 mA			84 %
THM 10-0512		12 VDC	830 mA			87 %
THM 10-0513		15 VDC	670 mA			87 %
THM 10-0515		24 VDC	416 mA			86 %
THM 10-0521		+5 VDC	1'000 mA	-5 VDC	1'000 mA	83 %
THM 10-0522		+12 VDC	416 mA	-12 VDC	416 mA	86 %
THM 10-0523		+15 VDC	333 mA	-15 VDC	333 mA	87 %
THM 10-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	2'500 mA			83 %
THM 10-1211		5 VDC	2'000 mA			86 %
THM 10-1212		12 VDC	830 mA			88 %
THM 10-1213		15 VDC	670 mA			89 %
THM 10-1215		24 VDC	416 mA			89 %
THM 10-1221		+5 VDC	1'000 mA	-5 VDC	1'000 mA	84 %
THM 10-1222		+12 VDC	416 mA	-12 VDC	416 mA	89 %
THM 10-1223		+15 VDC	333 mA	-15 VDC	333 mA	88 %
THM 10-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	2'500 mA			83 %
THM 10-2411		5 VDC	2'000 mA			87 %
THM 10-2412		12 VDC	830 mA			89 %
THM 10-2413		15 VDC	670 mA			89 %
THM 10-2415		24 VDC	416 mA			89 %
THM 10-2421		+5 VDC	1'000 mA	-5 VDC	1'000 mA	85 %
THM 10-2422		+12 VDC	416 mA	-12 VDC	416 mA	89 %
THM 10-2423		+15 VDC	333 mA	-15 VDC	333 mA	88 %
THM 10-4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC	2'500 mA			83 %
THM 10-4811		5 VDC	2'000 mA			87 %
THM 10-4812		12 VDC	830 mA			89 %
THM 10-4813		15 VDC	670 mA			89 %
THM 10-4815		24 VDC	416 mA			89 %
THM 10-4821		+5 VDC	1'000 mA	-5 VDC	1'000 mA	85 %
THM 10-4822		+12 VDC	416 mA	-12 VDC	416 mA	88 %
THM 10-4823		+15 VDC	333 mA	-15 VDC	333 mA	88 %

Options

on demand (backorder with MOQ non stocking item)	<ul style="list-style-type: none"> - Optional models with alternative pinning - Optional models with adjustable output - Optional models with remote-control function - Optional models with adjustable output and remote-control function
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Input Specifications

Input Current	- At 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		5 Vin models: 16 VDC max. (3 s max.) 12 Vin models: 25 VDC max. (3 s max.) 24 Vin models: 50 VDC max. (3 s max.) 48 Vin models: 100 VDC max. (3 s max.)
Under Voltage Lockout		5 Vin models: 3 VDC min. / 4 VDC typ. / 4.4 VDC max. 12 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max. 24 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max. 48 Vin models: 31.5 VDC min. / 33 VDC typ. / 34.5 VDC max.
Recommended Input Fuse		5 Vin models: 5'000 mA (slow blow) 12 Vin models: 2'000 mA (slow blow) 24 Vin models: 1'000 mA (slow blow) 48 Vin models: 500 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Pi-Type

Output Specifications

Output Voltage Adjustment		-10% to +20% (15 & 24 Vout single models) ±10% (other models) (Only for optional models with adjustable output) (By external trim resistor) See application note: www.tracopower.com/overview/thm10 Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%) - Cross Regulation (25% / 100% asym. load)	single output models: 0.2% max. dual output models: 0.5% max. single output models: 0.2% max. dual output models: 1% max. (Output 1) 1% max. (Output 2) dual output models: 5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output - dual output	3.3 Vout models: 30 mVp-p typ. (w/ 10 µF X7R) 5 Vout models: 30 mVp-p typ. (w/ 10 µF X7R) 12 Vout models: 40 mVp-p typ. (w/ 10 µF X7R) 15 Vout models: 40 mVp-p typ. (w/ 10 µF X7R) 24 Vout models: 50 mVp-p typ. (w/ 4.7 µF X7R) 5 / -5 Vout models: 30 / 30 mVp-p typ. (w/ 10 µF X7R) 12 / -12 Vout models: 40 / 40 mVp-p typ. (w/ 10 µF X7R) 15 / -15 Vout models: 40 / 40 mVp-p typ. (w/ 10 µF X7R)

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

Capacitive Load	- single output	3.3 Vout models: 3'000 µF max. 5 Vout models: 2'500 µF max. 12 Vout models: 430 µF max. 15 Vout models: 350 µF max. 24 Vout models: 125 µF max.
	- dual output	5 / -5 Vout models: 1'440 / 1'440 µF max. 12 / -12 Vout models: 250 / 250 µF max. 15 / -15 Vout models: 180 / 180 µF max.
Minimum Load	Not required	
Temperature Coefficient	±0.02 %/K max.	
Start-up Time	30 ms typ.	
Short Circuit Protection	Continuous, Automatic recovery	
Output Current Limitation	150% typ. of Iout max.	
Overvoltage Protection	112 - 151% of Vout nom. (depending on model) 3.7 - 5 VDC (3.3 VDC model) 5.6 - 7 VDC (5 VDC model) 13.5 - 16 VDC (12 VDC model) 18.3 - 22 VDC (15 VDC model) 29.1 - 34.5 VDC (24 VDC model) 5.6 - 7 VDC (±5 VDC model) 13.5 - 18.2 VDC (±12 VDC model) 17 - 22 VDC (±15 VDC model)	
Transient Response	- Response Time	250 µs typ. (25% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	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
	- Certification Documents	2 x MOPP (Means Of Patient Protection) www.tracopower.com/overview/thm10
Pollution Degree	PD 2	
Over Voltage Category	OVC II	

EMC Specifications

EMI Emissions	- Conducted Emissions	EN 60601-1-2 edition 4 (Medical Devices) EN 55011 class A (internal filter) EN 55011 class B (with external filter) EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC Part 18 class A (internal filter) FCC Part 18 class B (with external filter)
	- Radiated Emissions	EN 55011 class A (internal filter) EN 55011 class B (with external filter) EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC Part 18 class A (internal filter) FCC Part 18 class B (with external filter)
		External filter proposal: www.tracopower.com/overview/thm10

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

EMS Immunity	<ul style="list-style-type: none"> - Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge 	EN 60601-1-2 edition 4 (Medical Devices) Air: EN 61000-4-2, ± 15 kV, perf. criteria A Contact: EN 61000-4-2, ± 8 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 2 kV, perf. criteria A
	<ul style="list-style-type: none"> - Conducted RF Disturbances - PF Magnetic Field 	Ext. input component: 5 Vin models: KY 1000 μ F // Vishay V10P45 12 Vin models: KY 470 μ F 24 Vin models: KY 470 μ F 48 Vin models: KY 330 μ F EN 61000-4-6, 10 Vrms, perf. criteria A Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	<ul style="list-style-type: none"> - Operating Temperature - Approved Ambient Temp. - Case Temperature - Storage Temperature 	-40°C to +90°C +50°C max. (to comply with EN 60601-1) +105°C max. -55°C to +125°C
Power Derating	- High Temperature	3.33 %/K above 75°C
Cooling System		Natural convection (20 LFM)
Remote Control	<ul style="list-style-type: none"> - Voltage Controlled Remote - Off Idle Input Current - Remote Pin Input Current 	On: 0 to 1.2 VDC or open circuit Off: 2.2 to 12 VDC Refers to 'Remote' and '-Vin' Pin 2.5 mA typ. -0.5 to 1.0 mA (Only for optional models with remote-control)
Altitude During Operation		5'000 m max.
Switching Frequency		270 - 330 kHz (PWM) 300 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		250 VAC
Isolation Test Voltage	- Input to Output, 60 s	5'000 VAC
Creepage	- Input to Output	8 mm min.
Clearance	- Input to Output	8 mm min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	12 pF typ. 17 pF max.
Leakage Current	- Touch Current	2 μ A max. (240 VAC, 60 Hz)
Reliability	- Calculated MTBF	3'850'000 h (MIL-HDBK-217F, ground benign)
Washing Process	See Cleaning Guideline:	Allowed (hermetical product) www.tracopower.com/info/cleaning.pdf
Environment	<ul style="list-style-type: none"> - Vibration - Thermal Shock 	MIL-STD-810F MIL-STD-810F
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 μ m)
Pin Surface Plating		Tin (3 - 5 μ m), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		DIP24
Soldering Profile		265°C / 10 s max.
Weight		14 g

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

Thermal Impedance	18 K/W
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). The SCIP number is provided on request.)

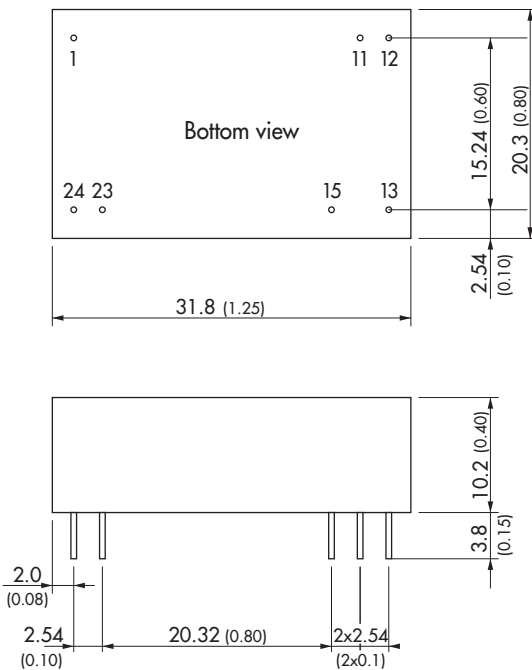
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/thm10

Outline Dimensions

Standard pinning

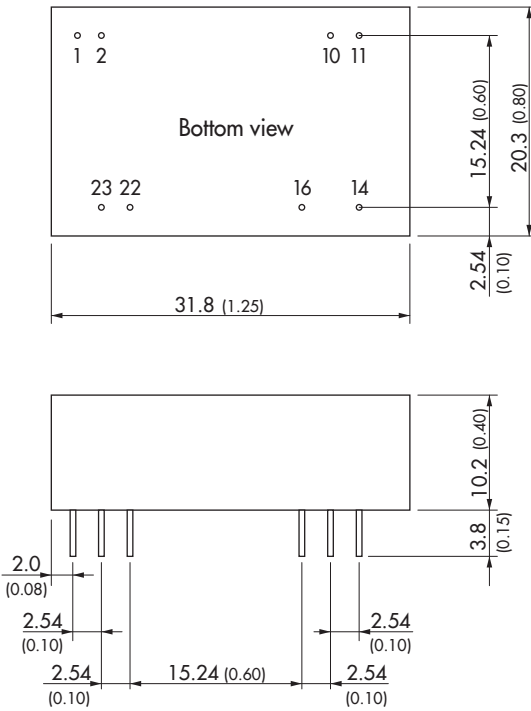


Dimensions in mm (inch)
Tolerances ± 0.5 (± 0.02)
Pin $\varnothing 0.6 \pm 0.1$ (0.024 ± 0.004)
Pin pitch tolerances ± 0.25 (± 0.01)

Pinout		
Pin	Single Output	Dual Output
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)

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

Optional models with alternative pinning, adjustable output and/or remote-control function



Dimensions in mm (inch)
 Tolerances ± 0.5 (± 0.02)
 Pin \varnothing 0.6 ± 0.1 (0.024 ± 0.004)
 Pin pitch tolerances ± 0.25 (± 0.01)

Pinout		
Pin	Single Output	Dual Output
1	No pin*/Remote	No pin*/Remote
2	-Vin (GND)	-Vin (GND)
10	No pin*/Trim	No pin*/Trim
11	NC	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

NC: No connection

*If Remote or Trim is not selected there is no pin on corresponding number.

Remark:

No optional pinning for 5 Vin models. Corresponding parts are with THM 10WI series by default.

see www.tracopower.com/overview/thm10wi