

- DIP-16 Package
- Unregulated device
- I/O isolation 3000 VACrms rated for 300 Vrms working voltage
- Medical safety to UL 60601-1 and IEC/EN 60601-1 3rd edition, 2 x MOOP
- Industrial safety to IEC/EN/UL 62368-1
- Operating temp. range -25°C to $+80^{\circ}\text{C}$
- 3-years product warranty



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

The THI 2M series is a new range of ultra-compact 2W DC/DC-converters providing a high I/O-isolation voltage of 3000 VAC. With a reinforced I/O-isolation system this product is an economical solution for many applications in instrumentation, industrial controls, medical equipment and everywhere where supplementary- or reinforced insulation is required to meet requested safety standards. 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 _{max}	Vnom	I _{max}	
THI 2-0511M	4.5 - 5.5 VDC (5 VDC nom.)	5 VDC	400 mA			66 %
THI 2-0512M		12 VDC	165 mA			66 %
THI 2-0513M		15 VDC	133 mA			66 %
THI 2-0522M		+12 VDC	83 mA	-12 VDC	83 mA	72 %
THI 2-0523M		+15 VDC	66 mA	-15 VDC	66 mA	73 %
THI 2-1211M	10.8 - 13.2 VDC (12 VDC nom.)	5 VDC	400 mA			66 %
THI 2-1212M		12 VDC	165 mA			66 %
THI 2-1213M		15 VDC	133 mA			66 %
THI 2-1222M		+12 VDC	83 mA	-12 VDC	83 mA	74 %
THI 2-1223M		+15 VDC	66 mA	-15 VDC	66 mA	75 %
THI 2-2411M	21.6 - 26.4 VDC (24 VDC nom.)	5 VDC	400 mA			66 %
THI 2-2412M		12 VDC	165 mA			66 %
THI 2-2413M		15 VDC	133 mA			66 %
THI 2-2422M		+12 VDC	83 mA	-12 VDC	83 mA	74 %
THI 2-2423M		+15 VDC	66 mA	-15 VDC	66 mA	75 %

Input Specifications

Input Current	- At no load	5 Vin models: 60 mA typ. 12 Vin models: 30 mA typ. 24 Vin models: 15 mA typ.
	- At full load	5 Vin models: 580 mA typ. 12 Vin models: 240 mA typ. 24 Vin models: 120 mA typ.
Surge Voltage		5 Vin models: 9 VDC max. (1 s max.) 12 Vin models: 18 VDC max. (1 s max.) 24 Vin models: 30 VDC max. (1 s max.)
Recommended Input Fuse		5 Vin models: 1'000 mA (slow blow) 12 Vin models: 500 mA (slow blow) 24 Vin models: 200 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor

Output Specifications

Voltage Set Accuracy		±4% max.
Regulation	- Input Variation (1% Vin step)	single output models: 1.5% max. dual output models: 1.5% max.
	- Load Variation - Voltage Balance (symmetrical load)	See application note: www.tracopower.com/overview/thi2m dual output models: 1% max.
Ripple and Noise	- 20 MHz Bandwidth	100 mVp-p typ. 150 mVp-p max.
Capacitive Load	- single output	5 Vout models: 330 µF max. 12 Vout models: 330 µF max. 15 Vout models: 330 µF max.
	- dual output	12 / -12 Vout models: 100 / 100 µF max. 15 / -15 Vout models: 100 / 100 µF max.
Minimum Load		2 % of Iout max. (Operation at lower load will not damage the converter, but it may not meet all specifications)
Temperature Coefficient		±0.02 %/K max.
Short Circuit Protection		Limited 0.5 s max., Automatic recovery

Safety Specifications

Safety 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	www.tracopower.com/overview/thi2m
Pollution Degree		PD 2
Over Voltage Category		OVC II

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

General Specifications

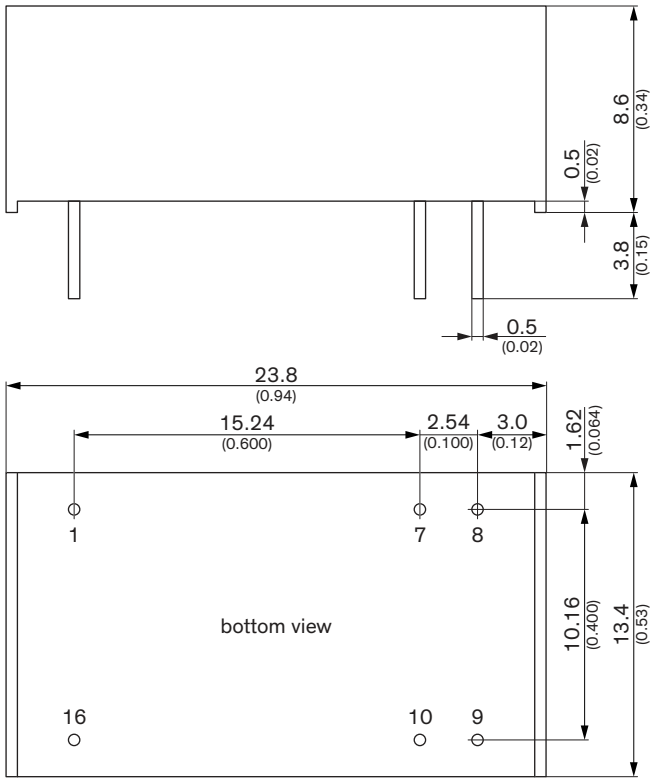
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-25°C to +80°C +105°C max. -50°C to +125°C
Power Derating	- High Temperature	2.5 %/K above 60°C
	See application note:	www.tracopower.com/overview/thi2m
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		50 - 100 kHz (PFM) 80 kHz typ. (PFM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		300 VAC
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s	3'000 VAC (acc. to 60601-1) 4'800 VAC (acc. to 62368-1) 6'000 VAC
Isolation Resistance	- Input to Output, 500 VDC	10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	15 pF typ. 20 pF max.
Leakage Current	- Touch Current	2 μA max.
Reliability	- Calculated MTBF	2'000'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Allowed (hermetical product)
	See Cleaning Guideline:	www.tracopower.com/info/cleaning.pdf
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Nickel (2 - 4 μm)
Pin Surface Plating		Gold (75 - 125 nm), glossy
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		DIP16
Soldering Profile		Wave Soldering 265°C / 10 s max.
Weight		5.1 g
Thermal Impedance	- Case to Ambient	22.5 K/W typ.
Environmental Compliance	- REACH Declaration - RoHS Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a (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/thi2m
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Outline Dimensions



Dimensions in mm (inch)
 Tolerances: x.x ±0.25 (x.xx ±0.01)
 x.xx ±0.13 (x.xxx ±0.005)
 Pin tolerances: x.x ±0.05 (x.xx ±0.002)

Pinout		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin (Vcc)	+Vin (Vcc)

NC: Not connected