TRACO POWER

Unregulated DC/DC Converter

TMH Series, 2 Watt

- **Industry standard pinout**
- **Unregulated outputs**
- **Operating temperature range –40 °C to +85 °C**
- **I/O isolation voltage 1000 VDC**
- **Efficiency up to 83 %**
- **3-year product warranty**



The TMH series are ultra miniature, isolated 2 Watt DC/DC-converters in a Single-in-Line package (SIP). Requiring only 1.5 cm2 board space they offer the ideal solution in many space critical applications for board level power distribution. The use of SMD-technology makes it possible to offer a product with high performance at low cost.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TMH 0505S	4.5 - 5.5 VDC (5 VDC nom.)	5 VDC	400 mA			76 %
TMH 0512S		12 VDC	165 mA			80 %
TMH 0515S		15 VDC	133 mA			80 %
TMH 0505D		+5 VDC	200 mA	–5 VDC	200 mA	77 %
TMH 0512D		+12 VDC	83 mA	–12 VDC	83 mA	79 %
TMH 0515D		+15 VDC	66 mA	–15 VDC	66 mA	79 %
TMH 1205S	10.8 - 13.2 VDC (12 VDC nom.)	5 VDC	400 mA			78 %
TMH 1212S		12 VDC	165 mA			82 %
TMH 1215S		15 VDC	133 mA			83 %
TMH 1205D		+5 VDC	200 mA	–5 VDC	200 mA	79 %
TMH 1212D		+12 VDC	83 mA	–12 VDC	83 mA	82 %
TMH 1215D		+15 VDC	66 mA	–15 VDC	66 mA	82 %
TMH 2405S	21.6 - 26.4 VDC (24 VDC nom.)	5 VDC	400 mA			77 %
TMH 2412S		12 VDC	165 mA			81 %
TMH 2415S		15 VDC	133 mA			82 %
TMH 2405D		+5 VDC	200 mA	–5 VDC	200 mA	79 %
TMH 2412D		+12 VDC	83 mA	–12 VDC	83 mA	81 %
TMH 2415D		+15 VDC	66 mA	–15 VDC	66 mA	82 %

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:	**526 mA typ.** (5 Vout model)
			495 mA typ. (12 Vout model)
			499 mA typ. (15 Vout model)
			519 mA typ. (5 / -5 Vout model)
			504 mA typ. (12 / -12 Vout model)
			501 mA typ. (15 / -15 Vout model)
		12 Vin models:	**212 mA typ.** (5 Vout model)
			200 mA typ. (12 Vout model)
			200 mA typ. (15 Vout model)
			210 mA typ. (5 / -5 Vout model)
			201 mA typ. (12 / -12 Vout model)
			200 mA typ. (15 / -15 Vout model)
		24 Vin models:	**108 mA typ.** (5 Vout model)
			101 mA typ. (12 Vout model)
			101 mA typ. (15 Vout model)
			105 mA typ. (5 / -5 Vout model)
			102 mA typ. (12 / -12 Vout model)
			100 mA typ. (15 / -15 Vout model)
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 Pi-Type

Output Specifications

Voltage Set Accuracy			±3% max.
Regulation (Unregulated)	- Input Variation (1% Vin step)	single output models:	**1.5% max.**
		dual output models:	**1.5% max.**
	- Load Variation	See application note:	www.tracopower.com/tmh-cc
	- Voltage Balance (symmetrical load)	dual output models:	**1% max.**
Ripple and Noise	- 20 MHz Bandwidth		**150 mVp-p max.**
			100 mVp-p typ.
			(To further reduce Ripple and Noise, a capacitor with 1.5 µF X7R is recommended.)
Capacitive Load	- single output	5 Vout models:	**470 µF max.**
		12 Vout models:	**470 µF max.**
		15 Vout models:	**470 µF max.**
	- dual output	5 / -5 Vout models:	**390 / 390 µF max.**
		12 / -12 Vout models:	**390 / 390 µF max.**
		15 / -15 Vout models:	**390 / 390 µF max.**
Minimum Load		See application note:	www.tracopower.com/tmh-cc
			(Operation at lower load will not damage the converter, but it may not meet all specifications)
Temperature Coefficient			±0.02 %/K max.
Start-up Time			260 ms max.
Short Circuit Protection			Limited 0.5 s max., Automatic recovery

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

Safety Specifications

Over Voltage Category		Not mains connected

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (with external filter)
	- Radiated Emissions	EN 55032 class A (internal filter)
	External filter proposal:	www.tracopower.com/tmh-emc-filter

General Specifications

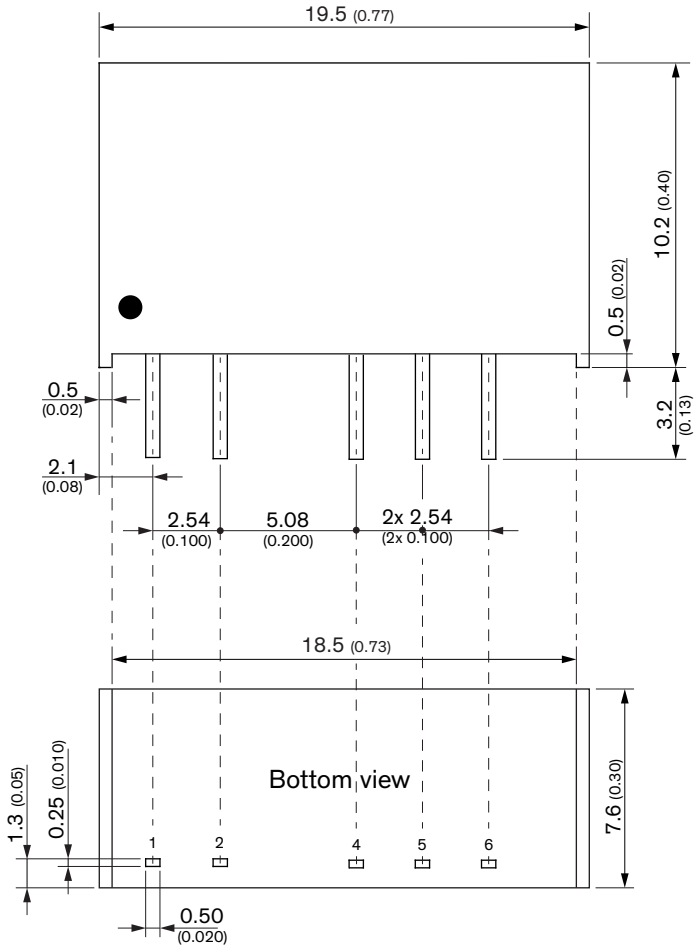
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Case Temperature	+105°C max.
	- Storage Temperature	–50°C to +125°C
Power Derating	- High Temperature	2.86 %/K above 70°C
	See application note:	www.tracopower.com/tmh-cc
Cooling System		Natural convection (20 LFM)
Regulator Topology		Push-Pull Converter
Switching Frequency		50 - 100 kHz (PFM)
		80 kHz typ. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'000 VDC
	- Input to Output, 1 s	1'200 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	80 pF typ.
		120 pF max.
Reliability	- Calculated MTBF	2'000'000 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)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Nickel-Iron (Alloy 42)
Pin Foundation Plating		Nickel (1 µm min.)
Pin Surface Plating		Tin (3 - 5 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP7
Soldering Profile		Lead-Free Wave Soldering
		260°C / 10 s max.
Weight		2.7 g
Thermal Impedance	- Case to Ambient	52.5 K/W typ.
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: 7(a)
		(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	13224883-cead-4b7f-b9ea-fc07cfac2927

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

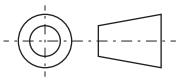
Additional Information

Supporting Documents	www.tracopower.com/overview/tmh
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

Outline Dimensions



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



Pinout		
Pin	**Single**	**Dual**
1	+Vin (Vcc)	
2	–Vin (GND)	
4	–Vout	
5	No pin	Common
6	+Vout	

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