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/overview/tmh
	- 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			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.
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.

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/overview/tmh

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/overview/tmh
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: 7a
		(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

Supporting Documents

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

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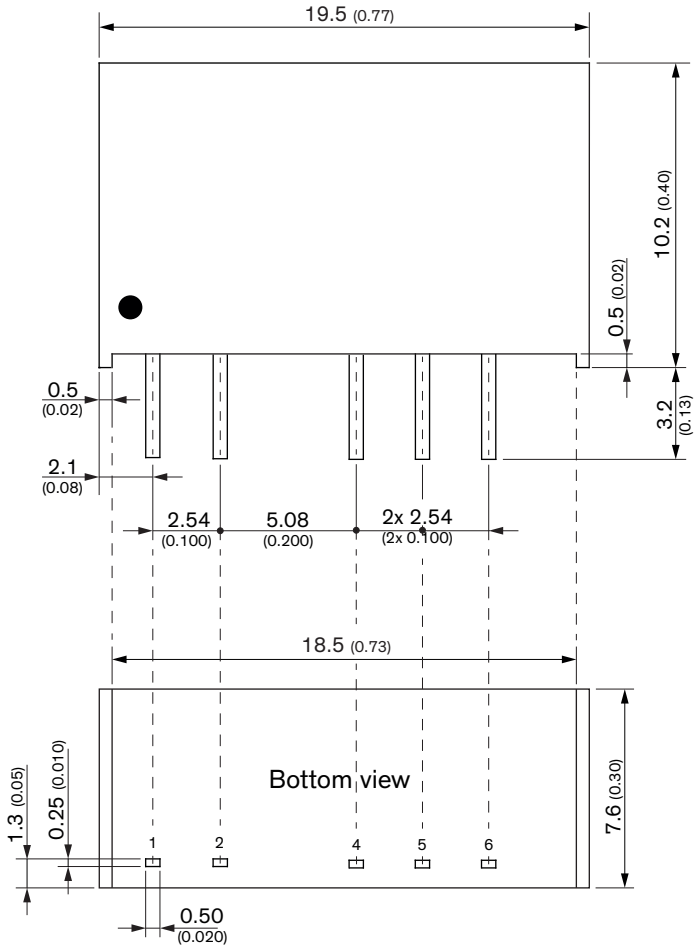
Outline Dimensions



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

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)

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TRACO Power:

TMH 0512S TMH 0515D TMH 0512D TMH 0515S TMH 1205S TMH 0505D TMH 2405S TMH 1215D TMH 0505S TMH 2405D TMH 2412S TMH 2415D TMH 2412D TMH 2415S TMH 1212S TMH 1215S TMH 1212D TMH 1205D