

DC/DC Medical Converter

THM 3WI Series, 3 Watt

- Ultra wide 4:1 input voltage 3 W DC/DC converter in a compact DIP-24 plastic case
- I/O isolation 5000 VAC rated for 250 VAC working voltage
- Certification according to IEC/EN/ES 60601-1 3rd edition 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 $<2 \mu\text{A}$
- Operating temperature -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



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

The THM 3WI series is a range of medical 3 Watt DC/DC converters in DIP-24 plastic package and with ultra-wide 4:1 input voltage range. They provide a reinforced isolation system for 5000 VAC isolation and a very low leakage current of less than $2 \mu\text{A}$. The units are approved to IEC/EN/ES 60601-1 3rd edition 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 87% 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 3-0510WI	4.5 - 9 VDC (5 VDC nom.)	3.3 VDC	1'000 mA			81 %
THM 3-0511WI		5 VDC	600 mA			85 %
THM 3-0512WI		12 VDC	250 mA			86 %
THM 3-0513WI		15 VDC	200 mA			88 %
THM 3-0515WI		24 VDC	125 mA			86 %
THM 3-0521WI		+5 VDC	300 mA	-5 VDC	300 mA	83 %
THM 3-0522WI		+12 VDC	125 mA	-12 VDC	125 mA	86 %
THM 3-0523WI		+15 VDC	100 mA	-15 VDC	100 mA	86 %
THM 3-2410WI	9 - 36 VDC (24 VDC nom.)	3.3 VDC	1'000 mA			82 %
THM 3-2411WI		5 VDC	600 mA			85 %
THM 3-2412WI		12 VDC	250 mA			87 %
THM 3-2413WI		15 VDC	200 mA			87 %
THM 3-2415WI		24 VDC	125 mA			87 %
THM 3-2421WI		+5 VDC	300 mA	-5 VDC	300 mA	83 %
THM 3-2422WI		+12 VDC	125 mA	-12 VDC	125 mA	87 %
THM 3-2423WI		+15 VDC	100 mA	-15 VDC	100 mA	86 %
THM 3-4810WI	18 - 75 VDC (48 VDC nom.)	3.3 VDC	1'000 mA			81 %
THM 3-4811WI		5 VDC	600 mA			84 %
THM 3-4812WI		12 VDC	250 mA			87 %
THM 3-4813WI		15 VDC	200 mA			87 %
THM 3-4815WI		24 VDC	125 mA			87 %
THM 3-4821WI		+5 VDC	300 mA	-5 VDC	300 mA	83 %
THM 3-4822WI		+12 VDC	125 mA	-12 VDC	125 mA	86 %
THM 3-4823WI		+15 VDC	100 mA	-15 VDC	100 mA	86 %

Options

on demand (backorder with MOQ non stocking item)	- 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. 24 Vin models: 6 mA typ. 48 Vin models: 4 mA typ.
Surge Voltage		5 Vin models: 16 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. 24 Vin models: 7 VDC min. / 8 VDC typ. / 8.8 VDC max. 48 Vin models: 15 VDC min. / 16 VDC typ. / 17.5 VDC max.
Recommended Input Fuse		5 Vin models: 1'600 mA (slow blow) 24 Vin models: 800 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/thm3wi 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)
Capacitive Load	- single output - dual output	3.3 Vout models: 1'050 µF max. 5 Vout models: 750 µF max. 12 Vout models: 130 µF max. 15 Vout models: 100 µF max. 24 Vout models: 39 µF max. 5 / -5 Vout models: 430 / 430 µF max. 12 / -12 Vout models: 75 / 75 µF max. 15 / -15 Vout models: 56 / 56 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.

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

Start-up Time	30 ms typ.
Short Circuit Protection	Continuous, Automatic recovery
Output Current Limitation	150% typ. of I _{out} max.
Overvoltage Protection	112 - 152% of V _{out} 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 62368-1 IEC 62368-1 UL 62368-1
	- Medical Equipment	EN 60601-1 IEC 60601-1 ANSI/AAMI ES 60601-1 2 x MOPP (Means Of Patient Protection)
	- Certification Documents	www.tracopower.com/overview/thm3wi
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/thm3wi
EMS Immunity	- Electrostatic Discharge	EN 60601-1-2 edition 4 (Medical Devices) Air: EN 61000-4-2, ±15 kV, perf. criteria A
	- RF Electromagnetic Field	Contact: EN 61000-4-2, ±8 kV, perf. criteria A
	- EFT (Burst) / Surge	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
		Ext. input component: 5 Vin models: KY 1000 µF // Vishay V10P45 24 Vin models: KY 470 µF 48 Vin models: KY 330 µF
	- Conducted RF Disturbances	EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	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)
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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Temperature Ranges	- Operating Temperature - Approved Ambient Temp. - Storage Temperature	-40°C to +100°C +80°C max. (to comply with EN60601-1) -55°C to +125°C
Power Derating	- High Temperature	10 %/K above 95°C
Cooling System		Natural convection (20 LFM)
Remote Control	- 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		135 - 165 kHz (PWM) 150 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	- Earth Leakage Current	2 µA max. (240 VAC, 60 Hz)
Reliability	- Calculated MTBF	6'400'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Allowed (hermetical product)
	See Cleaning Guideline:	www.tracopower.com/info/cleaning.pdf
Environment	- 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 µm)
Pin Surface Plating		Tin (3 - 5 µm), 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
Thermal Impedance		18 K/W
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, 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

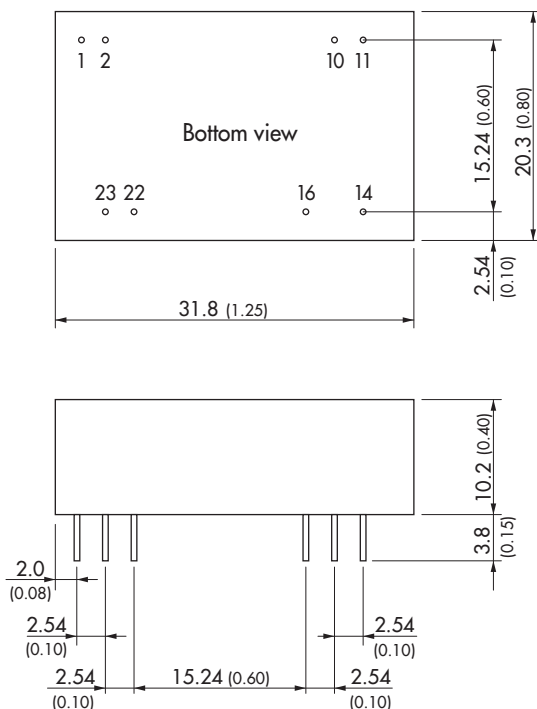
Overview Link (for additional Documents)

www.tracopower.com/overview/thm3wi

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

Outline Dimensions

Standard pinning with options: With adjustable output and/or remote-control function



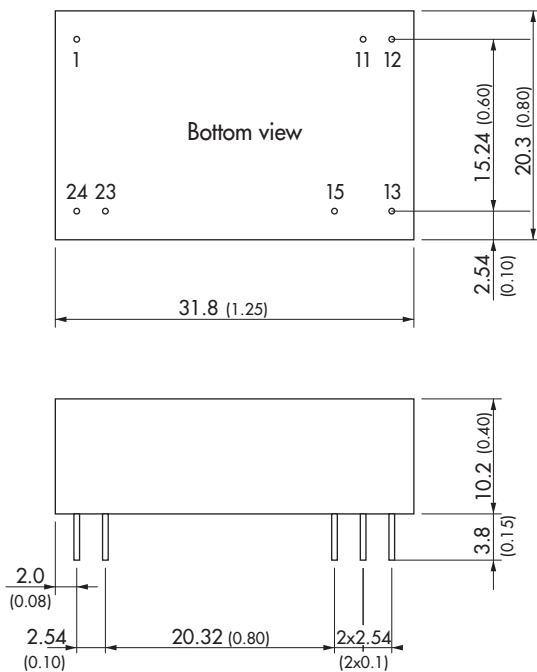
Pinout		
Pin	Single Output	Dual Output
1	No pin*/Remote	No pin*/Remote
2	-Vin (GND)	-Vin (GND)
10	No pin*/Trim	No pin*/Trim
11	No pin/NC **	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

NC: No connection

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

** If Trim is selected there is no pin on the corresponding pin number.

Optional pinning



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)

Remark:

No optional pinning for 5 Vin models. Corresponding parts are with THM 3 series by default.

see www.tracopower.com/overview/thm3