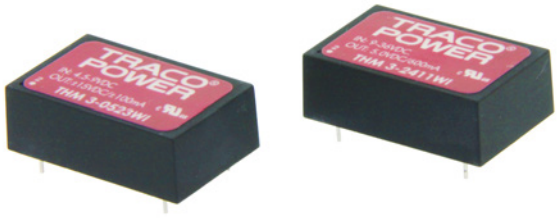
# DC/DC Converters

## THM 3WI Series, 3 Watt

ES 60601-1

## Features

- Ultra wide 4:1 input voltage
- I/O isolation 5000 VACrms rated for 250 working voltage
- 2 x MOPP Medical safety according to AAMI/ANSI ES 60601-1:2005(R) and IEC/EN 60601-1 3rd edition
- Low leakage current <2 µA
- Very high efficiency up to 87%
- Extended operating temperature range –40°C to 94°C at full load.
- Input filter to meet EN55022 class A
- 3-year product warranty



The THM-3WI series is a range of high performance, regulated 3 Watt DC/DC converters in a DIP-24 plastic package. The reinforced I/O-isolation system complies with the medical safety requirements for MOPP (Means Of Patient Protection). Together with a wide 4:1 input voltage range, and an internal EMI filter to meet EN55022 class A the converters constitute also a reliable solution for many demanding applications such as transportation systems, industrial control equipments, measurement equipments, and some IGBT driver applications. With A high efficiency of up to 87% and highest grade components the converters can reliably operate in an ambient temperature range of –40 up to +94°C at full load.

## Models

| Order code | Input voltage range | Output voltage | Output current max. | Efficiency typ. |
|---|---|---|---|---|
| THM 3-0510WI | 4.5 – 9 VDC (5 VDC nominal) | 3.3 VDC | 1000 mA | 81.0 % |
| THM 3-0511WI | | 5.0 VDC | 600 mA | 84.5 % |
| THM 3-0512WI | | 12 VDC | 250 mA | 85.0 % |
| THM 3-0513WI | | 15 VDC | 200 mA | 85.0 % |
| THM 3-0515WI | | 24 VDC | 125 mA | 85.5 % |
| THM 3-0521WI | | ±5.0 VDC | ±300 mA | 83.0 % |
| THM 3-0522WI | | ±12 VDC | ±125 mA | 86.0 % |
| THM 3-0523WI | | ±15 VDC | ±100 mA | 86.0 % |
| THM 3-2410WI | 9 – 36 VDC (12 VDC nominal) | 3.3 VDC | 1000 mA | 82.0 % |
| THM 3-2411WI | | 5.0 VDC | 600 mA | 84.5 % |
| THM 3-2412WI | | 12 VDC | 250 mA | 87.0 % |
| THM 3-2413WI | | 15 VDC | 200 mA | 87.0 % |
| THM 3-2415WI | | 24 VDC | 125 mA | 87.0 % |
| THM 3-2421WI | | ±5.0 VDC | ±300 mA | 83.0 % |
| THM 3-2422WI | | ±12 VDC | ±125 mA | 86.5 % |
| THM 3-2423WI | | ±15 VDC | ±100 mA | 86.0 % |
| THM 3-4810WI | 18 – 75 VDC (48 VDC nominal) | 3.3 VDC | 1000 mA | 81.0 % |
| THM 3-4811WI | | 5.0 VDC | 600 mA | 83.0 % |
| THM 3-4812WI | | 12 VDC | 250 mA | 86.5 % |
| THM 3-4813WI | | 15 VDC | 200 mA | 87.0 % |
| THM 3-4815WI | | 24 VDC | 125 mA | 86.0 % |
| THM 3-4821WI | | ±5.0 VDC | ±300 mA | 83.0 % |
| THM 3-4822WI | | ±12 VDC | ±125 mA | 86.0 % |
| THM 3-4823WI | | ±15 VDC | ±100 mA | 86.0 % |

## 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. |
| Start-up voltage / under voltage shut down | 5 Vin models: | 4.5 VDC / 4.0 VDC typ. |
| | 24 Vin models: | 9.0 VDC / 8.0 VDC typ. |
| | 48 Vin models: | 18 VDC / 16 VDC typ. |
| Surge voltage (1 sec. max.) | 5 Vin models: | 16 VDC max. |
| | 24 Vin models: | 50 VDC max. |
| | 48 Vin models: | 100 VDC max. |
| Conducted noise | | EN 55022 class A, without external components |
| ESD (electrostatic discharge) | | EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A |
| Radiated immunity | | EN 61000-4-3, 10 V/m, perf. criteria A |
| Fast transient / surge (with external input capacitor / diode) | | EN 61000-4-4, ±2 kV, perf. criteria A<br>EN 61000-4-5, ±2 kV perf. criteria A |
| – external input capacitor: | 5 Vin models: | Nippon chemi-con KY 1000 µF/ 25 V and reverse diode (Vishay V10P45) in parallel |
| | 24 Vin models: | Nippon chemi-con KY 470 µF/ 50 V |
| | 48 Vin models: | Nippon chemi-con KY 330 µF/ 100 V |
| Conducted immunity | | EN 61000-4-6, 10 V, perf. criteria A |
| External input fuse required (recommended values, slow blow type) | 5 Vin models: | 2.5 A |
| | 24 Vin models: | 1.5 A |
| | 48 Vin models: | 1 A |

## Output Specifications

| | | | |
|---|---|---|---|
| Voltage set accuracy | | | ±1.0 % max. |
| Regulation | – Input variation | single output models | 0.2 % max. |
| | | dual output models | 0.5 % max. |
| | – Load variation 0 – 100 %: | single output models: | 0.2 % max.. |
| | | dual output models balanced load: | 1.0 % max. |
| | | dual output models unbalanced load: | 5.0 % max. |
| Minimum load | | | not required |
| Start up time | | | 30 mS |
| Ripple and noise (20 MHz Bandwidth) | | 3.3 & 5.0 VDC models: | 30 mVp-p typ. with cap. 10µF/25V X7R MLCC |
| | | 12 & 15 VDC models: | 40 mVp-p typ. with cap. 10µF/25V X7R MLCC |
| | | 24 VDC models: | 50 mVp-p typ. with cap. 4.7µF/50V X7R MLCC |
| Transient response (25% load step change) | | | 250 µs typ. |
| Current limitation | | | 150 % Iout nominal typ. (hiccup mode) |
| Short circuit protection | | | continuous (automatic recovery) |
| Over voltage protection | | 3.3 VDC output models: | 3.7 – 5.4 VDC |
| | | 5 VDC output models: | 5.6 – 7.0 VDC |
| | | 12 VDC output models: | 13.5 – 19.6 VDC |
| | | 15 VDC output models: | 18.3 – 22.0 VDC |
| | | 24 VDC output models: | 29.1 – 32.5 VDC |
| Capacitive load | | 3.3 VDC output models: | 1050 µF max. |
| | | 5 VDC output models: | 750 µF max. |
| | | 12 VDC output models: | 130 µF max. |
| | | 15 VDC output models: | 100 µF max. |
| | | 24 VDC output models: | 39 µF max. |
| | | ±5 VDC output models: | 430 µF max. (each output) |
| | | ±12 VDC output models: | 75 µF max. (each output) |
| | | ±15 VDC output models: | 56 µF max. (each output) |

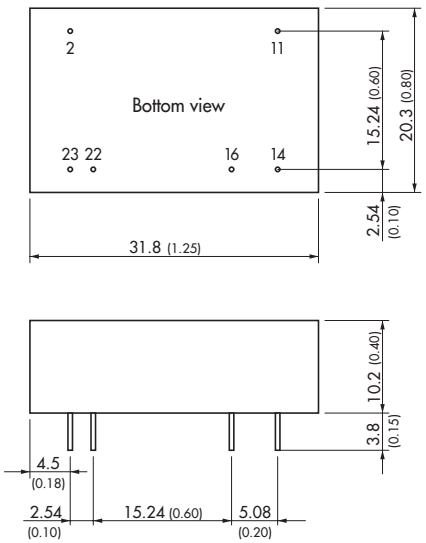
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## General Specifications

| | | |
|---|---|---|
| Temperature ranges | – Operating<br>– Casing<br>– Storage | –40°C to +94°C (withou derating)<br>+105°C max.<br>–55°C to +125°C |
| Humidity (non condensing) | | 95 % rel H max. |
| Temperature coefficient | | ±0.02 %/K typ. |
| Switching frequency | | 150 kHz ±15 kHz (puls width modulation) |
| I/O isolation voltage (50Hz, 60sec.) | – to meet UL/IEC/EN 60601-1 | 5000 VACrms, rated for 250 Vrms working voltage, 2 x MOPP |
| Clearance/creepage | | 8 mm min. |
| Leakage current | | 2 µA max. (at 240 VAC, 60 Hz) |
| Isolation capacitance | – Input/Output | 17 pF max. (at 100 KHz, 1 V) |
| Safety standards | | ANSI/AAMI ES 60601-1:2005/(R)2012, IEC/EN 60601-1 3rd edition |
| Safety approvals | – UL online certification UL 60601-1 | www.ul.com File E188913, copy: e188913qqhm2.pdf |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) | | >1.3 Mio. h |
| Casing material | | non conductive plastic (UL 94V-0-rated) |
| Potting material | | silicone (UL 94V-0-rated) |
| Vibration and thermal shock resistance | | according to MIL-STD-810F |
| Weight | | 14.0 g (0.48 oz) |
| Soldering temperature | | max. 265°C / 10 sec. |
| Environmental compliance | – Reach<br>– RoHS | www.tracopower.com/products/reach-declaration.pdf<br>according RoHS directive 2011/65/EU |

- The component is not be used in an oxygen rich environment.
- The component is not to be used in conjunction with flammable anaesthetics and agents.
- The component has to be disposed appropriately. Please refer to local regulations (Waste Electrical and Electronic Equipment).
- A modification of the component is not allowed.

## Outline Dimensions




| Pin-Out | | |
|---|---|---|
| **Pin** | **Single** | **Dual** |
| **2** | –Vin (GND) | –Vin (GND) |
| **11** | No con. | –Vout |
| **14** | +Vout | +Vout |
| **16** | –Vout | Common |
| **22** | +Vin (Vcc) | +Vin (Vcc) |
| **23** | +Vin (Vcc) | +Vin (Vcc) |

Dimensions in [mm], () = Inch
Pin diameter ø 0.6 ±0.1 (0.024 ±0.004)
Tolerances ±0.5 (±0.02)
Pin pich tolerances ±0.25 (±0.01)