# THE DATASHEET OF

# TES 2-0523H

# TRACO POWER

## Unregulated DC/DC Converter

## TES 2H Series, 2 Watt

- **I/O isolation voltage 1'500 VDC**
- **Unregulated outputs**
- **Single and dual output models**
- **Input voltage 5, 12 and 24 VDC**
- **High efficiency up to 80%**
- **Operating Temperature range -40 to +90°C**
- **High accuracy of pin co-planarity**
- **Qualified for leadfree reflow solder process according IPC/JEDEC J-STD-020E**
- **Available in tape and reel package**
- **3-year product warranty**

With their small footprint these 2 Watt DC/DC converters are an ideal and economical solution for many applications where an isolated voltage is required. Typical applications are ground loop elimination, noise reduction, voltage isolation in digital interfaces and voltage conversion in distributed power systems. With a new package design these converters are qualified for the higher temperatures requested by lead-free reflow solder processes. For automated SMD production lines the devices can be supplied in standard tape and reel package.

## Models

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency |
|---|---|---|---|---|---|---|
| | | Vnom | Imax | Vnom | Imax | typ. |
| **TES 2-0510H** | 4.5 - 5.5 VDC (5 VDC nom.) | 3.3 VDC | 500 mA | | | 70 % |
| **TES 2-0511H** | | 5 VDC | 400 mA | | | 73 % |
| **TES 2-0512H** | | 12 VDC | 165 mA | | | 77 % |
| **TES 2-0521H** | | +5 VDC | 200 mA | –5 VDC | 200 mA | 74 % |
| **TES 2-0522H** | | +12 VDC | 83 mA | –12 VDC | 83 mA | 76 % |
| **TES 2-0523H** | | +15 VDC | 66 mA | –15 VDC | 66 mA | 76 % |
| **TES 2-1210H** | 10.8 - 13.2 VDC (12 VDC nom.) | 3.3 VDC | 500 mA | | | 72 % |
| **TES 2-1211H** | | 5 VDC | 400 mA | | | 75 % |
| **TES 2-1212H** | | 12 VDC | 165 mA | | | 79 % |
| **TES 2-1222H** | | +12 VDC | 83 mA | –12 VDC | 83 mA | 80 % |
| **TES 2-1223H** | | +15 VDC | 66 mA | –15 VDC | 66 mA | 80 % |
| **TES 2-2410H** | 21.6 - 26.4 VDC (24 VDC nom.) | 3.3 VDC | 500 mA | | | 72 % |
| **TES 2-2411H** | | 5 VDC | 400 mA | | | 75 % |
| **TES 2-2412H** | | 12 VDC | 165 mA | | | 79 % |
| **TES 2-2422H** | | +12 VDC | 83 mA | –12 VDC | 83 mA | 79 % |
| **TES 2-2423H** | | +15 VDC | 66 mA | –15 VDC | 66 mA | 79 % |

## 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: | 500 mA typ. |
| | | 12 Vin models: | 200 mA typ. |
| | | 24 Vin models: | 100 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 | | | (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | | Internal Capacitor |

## Output Specifications

| | | | |
|---|---|---|---|
| Voltage Set Accuracy | | | ±3% max. (at 60% load, 3.3 & 5 Vout models) |
| | | | ±3% max. (at 100% load, other output models) |
| 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/tes2h |
| | - Voltage Balance (symmetrical load) | dual output models: | 1% max. |
| Ripple and Noise | - 20 MHz Bandwidth | | 120 mVp-p max. |
| Capacitive Load | - single output | 3.3 Vout models: | 47 µF max. |
| | | 5 Vout models: | 47 µF max. |
| | | 12 Vout models: | 10 µF max. |
| | - dual output | 5 / -5 Vout models: | 10 / 10 µF max. |
| | | 12 / -12 Vout models: | 4.7 / 4.7 µF max. |
| | | 15 / -15 Vout models: | 4.7 / 4.7 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 | | | 50 ms max. |
| Short Circuit Protection | | | Limited 0.5 s max., Automatic recovery |

## EMC Specifications

| | | | |
|---|---|---|---|
| EMI Emissions | - Conducted Emissions | | EN 55032 class A (with external filter) |
| | - Radiated Emissions | | EN 55032 class A (with external filter) |
| | | External filter proposal: | www.tracopower.com/overview/tes2h |

## General Specifications

| | | | |
|---|---|---|---|
| Relative Humidity | | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature | | –40°C to +90°C |
| | - Case Temperature | | +105°C max. |
| | - Storage Temperature | | –50°C to +125°C |
| Power Derating | - High Temperature | | 4 %/K above 80°C |
| | | See application note: | www.tracopower.com/overview/tes2h |
| Cooling System | | | Natural convection (20 LFM) |
| Regulator Topology | | | Push-Pull Converter |
| Switching Frequency | | | 50 - 120 kHz (PFM) |
| | | | 100 kHz typ. (PFM) |
| Insulation System | | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | | 1'500 VDC |
| | - Input to Output, 1 s | | 1'800 VDC |

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

| | | |
|---|---|---|
| Isolation Resistance | - Input to Output, 500 VDC | 10'000 MΩ min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 60 pF typ.<br>100 pF max. |
| Reliability | - Calculated MTBF | 2'000'000 h (MIL-HDBK-217F, ground benign) |
| Moisture Sensitivity (MSL) | | Level 2 (J-STD-033C) |
| Washing Process | | Not allowed |
| Housing Material | | Plastic resin (UL 94 V-0 rated) |
| Pin Material | | Phosphor Bronze (C5191) |
| Pin Foundation Plating | | Copper (1 - 3 µm) |
| Pin Surface Plating | | Tin (7.5 µm min.), matte |
| Housing Type | | Plastic Case |
| Mounting Type | | PCB Mount |
| Connection Type | | SMD (Surface-Mount Device) |
| Footprint Type | | SMD8 (single output models)<br>SMD10 (dual output models) |
| Soldering Profile | | Lead-Free Reflow Soldering (acc. J-STD-020E) |
| | See application note: | www.tracopower.com/info/reflow-soldering.pdf |
| Weight | - single output<br>- dual output | 1.5 g<br>2.2 g |
| Environmental Compliance | - REACH Declaration | www.tracopower.com/info/reach-declaration.pdf<br>REACH SVHC list compliant<br>REACH Annex XVII compliant |
| | - RoHS Declaration | www.tracopower.com/info/rohs-declaration.pdf<br>Exemptions: 7a<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) |
| | - SCIP Reference Number | 2c701e25-1552-4135-96f1-51ba816788e8 |

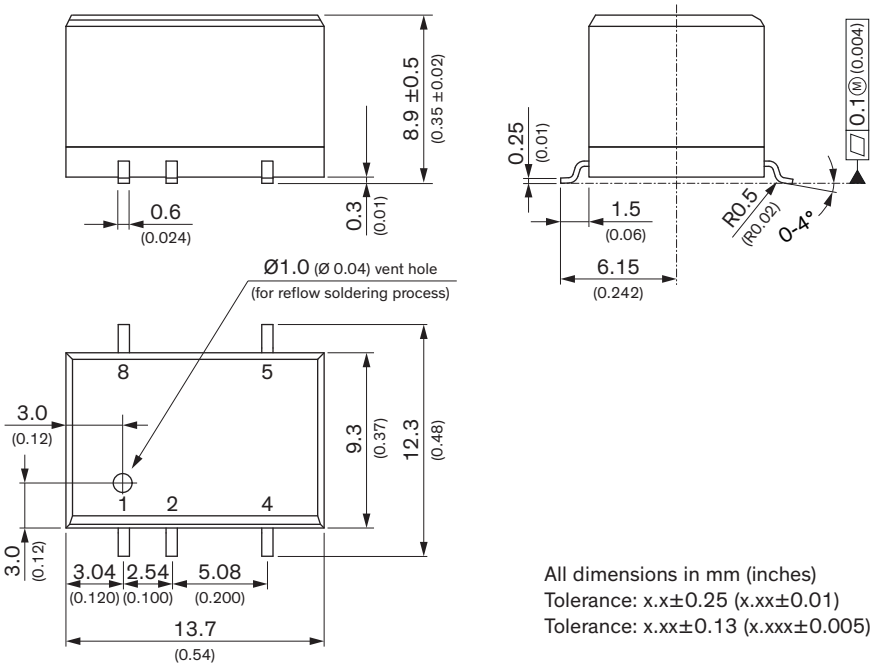
## Supporting Documents

| | |
|---|---|
| Overview Link (for additional Documents) | www.tracopower.com/overview/tes2h |

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

## Outline Dimensions

### Single Output Models

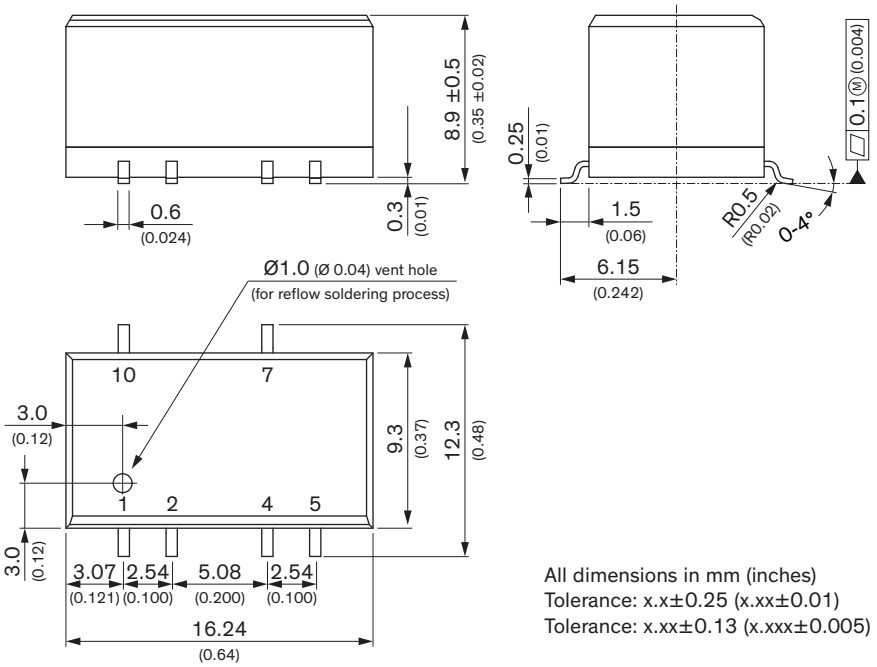



All dimensions in mm (inches)
Tolerance: x.x±0.25 (x.xx±0.01)
Tolerance: x.xx±0.13 (x.xxx±0.005)

| Pinout | |
|---|---|
| **Pin** | **Single** |
| 1 | –Vin (GND) |
| 2 | +Vin (Vcc) |
| 4 | –Vout |
| 5 | +Vout |
| 8 | NTC |

NTC: Not to connect

### Dual Output Models




All dimensions in mm (inches)
Tolerance: x.x±0.25 (x.xx±0.01)
Tolerance: x.xx±0.13 (x.xxx±0.005)

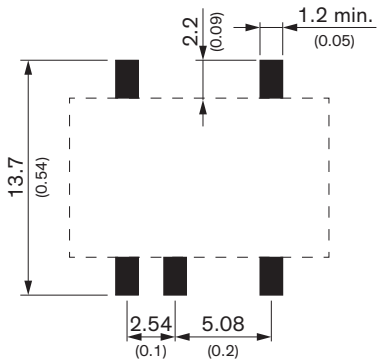
| Pinout | |
|---|---|
| **Pin** | **Dual** |
| 1 | –Vin (GND) |
| 2 | +Vin (Vcc) |
| 4 | Common |
| 5 | –Vout |
| 7 | +Vout |
| 10 | NTC |

NTC: Not to connect

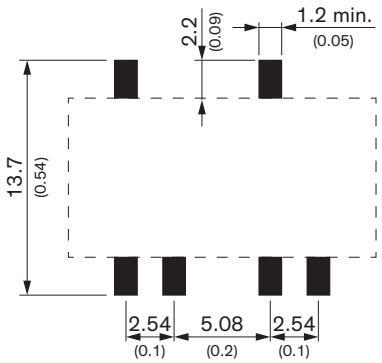
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

**Recommended Solder Pad Layout**

Single Output Models




Dual Output Models




Dimensions in mm (inch)

© Copyright 2024 Traco Electronic AG

## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- View TES 2-0523H on WIN SOURCE
- Traco Power Information

## Optimize Your Supply Chain with WIN SOURCE Solutions

- Global Sourcing Solution
- Obsolete Management
- Cost Control Management
- Shortage Management
- Alternative Solution
- Excess Inventory Management