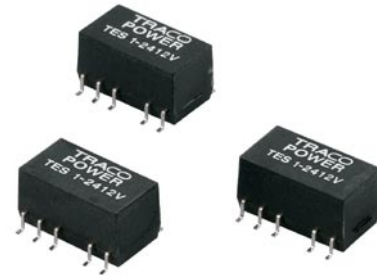


### Features

- ◆ Small SMD package with standard footprint
- ◆ I/O isolation voltage 3000 VDC
- ◆ Single- and dual output models
- ◆ High efficiency up to 80%
- ◆ Operating temperature range -40°C to +85°C
- ◆ High accuracy of pin co-planarity
- ◆ Qualified for leadfree reflow solder process according IPC/JEDEC J-STD-020D
- ◆ Available in tape and reel package
- ◆ 3-year product warranty



The TES-IV series are miniature, 1W DC/DC-converters with high isolation in a SMD package. With a new package design these converters are qualified for the higher temperatures requested by lead-free reflow solder processes. With the small footprint, these converters are the ideal solution for board level power distribution, mainly for applications in the industrial- and telecom field. For automated SMD production lines the devices can be supplied in standard tape and reel package.

### Models

| Order code  | Input voltage                   | Output voltage | Output current max. | Efficiency typ. |
|-------------|---------------------------------|----------------|---------------------|-----------------|
| TES 1-0510V | 5 VDC ±10%<br>(nominal 5 VDC)   | 3.3 VDC        | 260 mA              | 72 %            |
| TES 1-0511V |                                 | 5.0 VDC        | 200 mA              | 75 %            |
| TES 1-0512V |                                 | 12 VDC         | 84 mA               | 79 %            |
| TES 1-0513V |                                 | 15 VDC         | 67 mA               | 80 %            |
| TES 1-0521V |                                 | ±5 VDC         | ±100 mA             | 75 %            |
| TES 1-0522V |                                 | ±12 VDC        | ±42 mA              | 79 %            |
| TES 1-0523V |                                 | ±15 VDC        | ±34 mA              | 80 %            |
| TES 1-1210V | 12 VDC ±10%<br>(nominal 12 VDC) | 3.3 VDC        | 260 mA              | 73 %            |
| TES 1-1211V |                                 | 5.0 VDC        | 200 mA              | 76 %            |
| TES 1-1212V |                                 | 12 VDC         | 84 mA               | 80 %            |
| TES 1-1213V |                                 | 15 VDC         | 67 mA               | 81 %            |
| TES 1-1221V |                                 | ±5 VDC         | ±100 mA             | 76 %            |
| TES 1-1222V |                                 | ±12 VDC        | ±42 mA              | 80 %            |
| TES 1-1223V |                                 | ±15 VDC        | ±34 mA              | 80 %            |
| TES 1-2410V | 24 VDC ±10%<br>(nominal 24 VDC) | 3.3 VDC        | 260 mA              | 70 %            |
| TES 1-2411V |                                 | 5.0 VDC        | 200 mA              | 73 %            |
| TES 1-2412V |                                 | 12 VDC         | 84 mA               | 79 %            |
| TES 1-2413V |                                 | 15 VDC         | 67 mA               | 79 %            |
| TES 1-2421V |                                 | ±5 VDC         | ±100 mA             | 73 %            |
| TES 1-2422V |                                 | ±12 VDC        | ±42 mA              | 79 %            |
| TES 1-2423V |                                 | ±15 VDC        | ±34 mA              | 79 %            |

**Input Specifications**

|                                   |   |
|-----------------------------------|---|
| Input current no load / full load | 5 Vin models: 30 mA / 260 mA typ.<br>12 Vin models: 15 mA / 110 mA typ.<br>24 Vin models: 8 mA / 55 mA typ. |
| Surge voltage (1 sec. max.)       | 5 Vin models: 9 V max.<br>12 Vin models: 18 V max.<br>24 Vin models: 30 V max.                              |
| Reverse voltage protection        | 0.3 A max.  |
| Input filter                      | internal capacitor  |

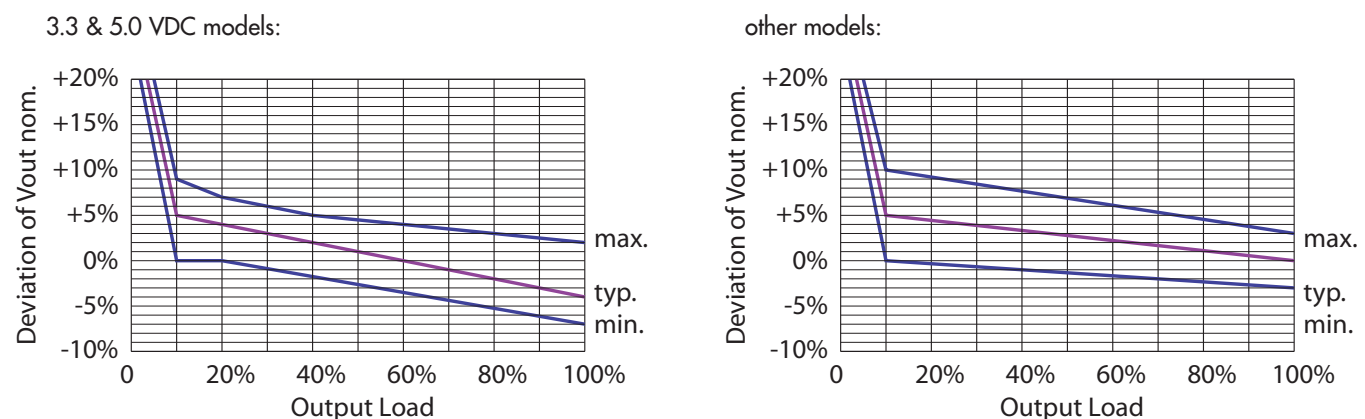
**Output Specifications**

|   |   |
|---|---|
| Voltage set accuracy                                | see graphs below  |
| Voltage balance (dual output models, balanced load) | ±1.0 % max.   |
| Regulation<br>– Input variation<br>– Load variation | 1.2 % / 1 % change Vin<br>see graphs below  |
| Ripple and noise (20 MHz Bandwidth)                 | 100 mVpp max.   |
| Temperature coefficient                             | ±0.02 %/K max.  |
| Short circuit protection                            | limited 0.5 sec. max.   |
| Capacitive load                                     | 3.3 & 5.0 VDC models: 33 µF max.<br>12 & 15 VDC models: 4.7 µF max.<br>±5.0 VDC models: 10 µF max.<br>±12 & ±15 VDC models: 2.2 µF max. |

**General Specifications**

|  |  |
|--|--|
| Temperature ranges<br>– Operating<br>– Storage<br>– Case             | –40°C to +85°C<br>–40°C to +125°C<br>95°C max. |
| Derating (convection cooling)  | 4 %/K above 75°C                               |
| Humidity (non condensing)  | 95 % rel. H max.                               |
| Reliability, calculated MTTF (MIL-HDBK-217F, @ +25°C, ground benign) | >2 Mio h                                       |
| I/O isolation voltage (60 sec)                                       | 3000 VDC                                       |
| I/O isolation capacity (100 kHz, 1 V)                                | 60 pF typ.                                     |
| I/O isolation resistance (500 VDC)                                   | >10 Gohm                                       |
| Switching frequency  | 50 to 150 kHz (depending on load)              |

**Output voltage variation dependent on load (at nominal input voltage)**

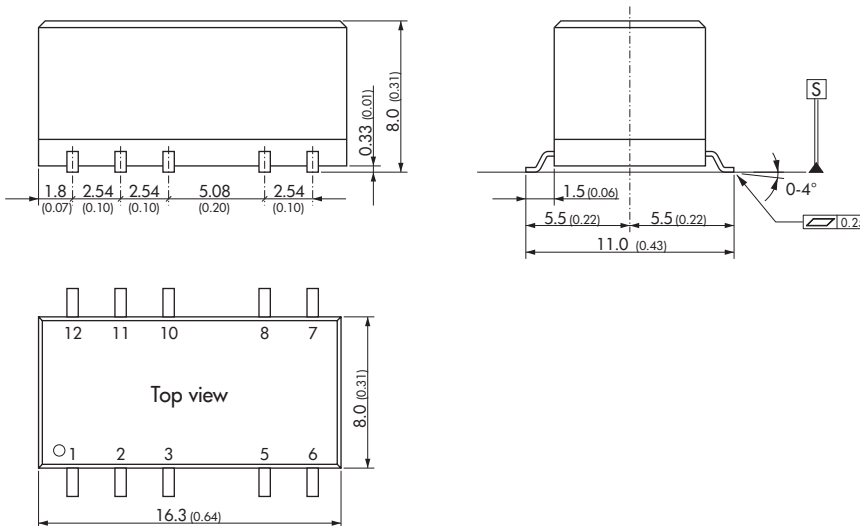


All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**Physical Specifications**

|                                 |   |
|---------------------------------|---|
| Casing material                 | non-conductive plastic<br>(flammability to UL 94V-0 rated)  |
| Package weight                  | 2.0 g (0.07oz)  |
| Lead-free reflow solder process | as per J-STD-020D.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required)         |
| Moisture sensivity level (MSL)  | level 2 as per J-STD-033B.01 (to find at:<br><a href="http://www.jedec.org">www.jedec.org</a> - free registration required) |
| Washing process                 | <a href="http://www.tracopower.com/products/smd-wash.pdf">www.tracopower.com/products/smd-wash.pdf</a>                      |
| Packaging                       | <a href="http://www.tracopower.com/products/tes1v-pack.pdf">www.tracopower.com/products/tes1v-pack.pdf</a>                  |

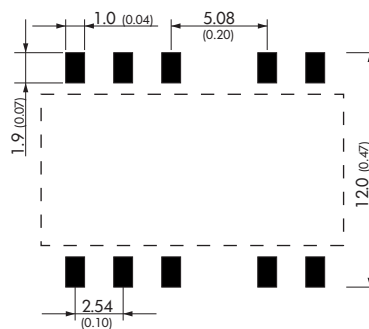
**Outline Dimensions**



| Pin-Out |            |            |
|---------|------------|------------|
| Pin     | Single     | Dual       |
| 1       | -Vin (GND) | -Vin (GND) |
| 2       | +Vin       | +Vin       |
| 3       | No con.    | No con.    |
| 5       | -Vout      | Common     |
| 6       | No con.    | -Vout      |
| 7       | No con.    | No con.    |
| 8       | +Vout      | +Vout      |
| 10      | No con.    | No con.    |
| 11      | No con.    | No con.    |
| 12      | No con.    | No con.    |

No con. = Pin to be isolated from circuitry

Solder Pad Dimension



Dimensions in [mm], ( ) = Inch  
Pin pitch tolerances: ±0.13 (±0.005)  
Other tolerances: ±0.25 (±0.01)

Specifications can be changed any time without notice.