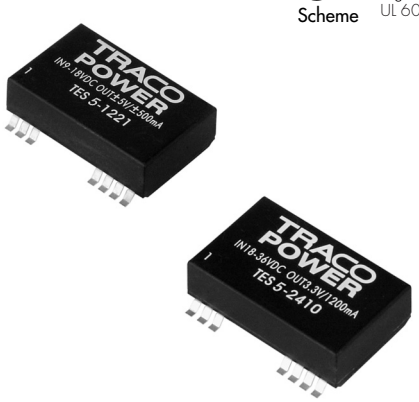
# DC/DC Converters

## TES 5 Series, 5 Watt

CB Scheme  c UL us UL 60950-1

### Features

- Compact low profile SMD package
- Wide 2:1 input voltage range
- I/O isolation 1500VDC
- Operating temp. range –40°C to +85°C max.
- Short circuit protection
- Remote On/Off
- High accuracy of pin co-planarity
- Lead free design – RoHS compliant
- 3-years product warranty




The TES-5 series is a new range of high performance 5W dc-dc converter modules in low profile SMD package with compact dimensions of only 33.4 x 20.6 x 10.2 mm. The 18 available models feature wide 2:1 input voltage range and tightly regulated output voltage. High efficiency allows operating temperatures up to 71°C at full load.

Further features are built-in EMI-filter to meet EN 55022,class A and FCC, level A without additional components and remote On/Off control. The products are qualified for soldering in a high temperature lead-free reflow solder process. Typical applications for these converters are battery powered equipment, instrumentation, communication systems and industrial controls.

### Models

| Ordercode | Input voltage range | Output voltage | Output current max. | Efficiency typ. |
|---|---|---|---|---|
| **TES 5-1210** | **9 – 18 VDC** (12 VDC nominal) | 3.3 VDC | 1200 mA | 76 % |
| **TES 5-1211** | | 5 VDC | 1000 mA | 80 % |
| **TES 5-1212** | | 12 VDC | 420 mA | 83 % |
| **TES 5-1213** | | 15 VDC | 335 mA | 83 % |
| **TES 5-1221** | | ±5 VDC | ±500 mA | 80 % |
| **TES 5-1222** | | ±12 VDC | ±210 mA | 83 % |
| **TES 5-1223** | | ±15 VDC | ±165 mA | 83 % |
| **TES 5-2410** | **18 – 36 VDC** (24 VDC nominal) | 3.3 VDC | 1200 mA | 78 % |
| **TES 5-2411** | | 5 VDC | 1000 mA | 82 % |
| **TES 5-2412** | | 12 VDC | 420 mA | 85 % |
| **TES 5-2413** | | 15 VDC | 335 mA | 85 % |
| **TES 5-2421** | | ±5 VDC | ±500 mA | 82 % |
| **TES 5-2422** | | ±12 VDC | ±210 mA | 85 % |
| **TES 5-2423** | | ±15 VDC | ±165 mA | 85 % |
| **TES 5-4810** | **36 – 75 VDC** (48 VDC nominal) | 3.3 VDC | 1200 mA | 78 % |
| **TES 5-4811** | | 5 VDC | 1000 mA | 82 % |
| **TES 5-4812** | | 12 VDC | 420 mA | 85 % |
| **TES 5-4813** | | 15 VDC | 335 mA | 85 % |
| **TES 5-4821** | | ±5 VDC | ±500 mA | 82 % |
| **TES 5-4822** | | ±12 VDC | ±210 mA | 85 % |
| **TES 5-4823** | | ±15 VDC | ±165 mA | 85 % |

## Input Specifications

| | | |
|---|---|---|
| Input current no load | 12 Vin models | 20 mA |
| | 24 Vin models | 5 mA |
| | 48 Vin models | 3 mA |
| Input current full load | 12 Vin models | 500 mA typ. |
| | 24 Vin models | 250 mA typ. |
| | 48 Vin models | 125 mA typ. |
| Start-up voltage / under voltage shut down | 12 Vin models | 8 VDC / 7 VDC typ. |
| | 24 Vin models | 16 VDC / 15 VDC typ. |
| | 48 Vin models | 33 VDC / 31 VDC typ. |
| Surge voltage (1 sec. max.) | 12 Vin models | 25 V max. |
| | 24 Vin models | 50 V max. |
| | 48 Vin models | 100 V max. |
| Reverse voltage protection | | 1.0 A max. |
| Conducted noise (input) | | EN 55022 level A, FCC part 15, class A |

## Output Specifications

| | | |
|---|---|---|
| Voltage set accuracy | | ±1 % |
| Regulation | – Input variation Vin min. to Vin max. | 0.3 % max. |
| | – Load variation 20 – 100 % single output models | 1 % max. |
| | dual output models balanced load | 2 % max. |
| Ripple and noise (20 MHz Bandwidth) | | 85 mVpk-pk max. |
| Temperature coefficient | | ±0.02 %/°C |
| Output current limitation | | >115 % of Iout max., constant current |
| Short circuit protection | | indefinite, automatic recovery |
| Capacitive load | single output models | 680 µF max. |
| | dual output models | 100 µF max. (each output) |

## General Specifications

| | | |
|---|---|---|
| Temperature ranges | – Operating | –40°C to +85°C |
| | – Case temperature | +100°C max. |
| | – Storage | –40°C to +125°C |
| Derating | | 3.5 %/K above 70°C |
| Humidity (non condensing) | | 95 % rel H max. |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) | | >1 Mio. h |
| Isolation voltage (60sec.) | – Input/Output | 1'500 VDC |
| Isolation capacitance | – Input/Output | 650 pF typ. |
| Isolation resistance | – Input/Output (500 VDC) | >1'000 MOhm |
| Switching frequency | | 260 kHz typ. |
| Safety standards | | UL 60950-1 , IEC/EN 60950-1 |
| Environmental compliance | – Reach | www.tracopower.com/info/reach-declaration.pdf |
| | – RoHS | RoHS directive 2011/65/EU |
| Remote On/Off | – On: | 2.5 ... 5.5 VDC or open circuit |
| | – Off: | -0.7 ... 0.8 VDC or short circuit pin 1 and 2(/3) |
| | – Off idle current: | 10 mA |

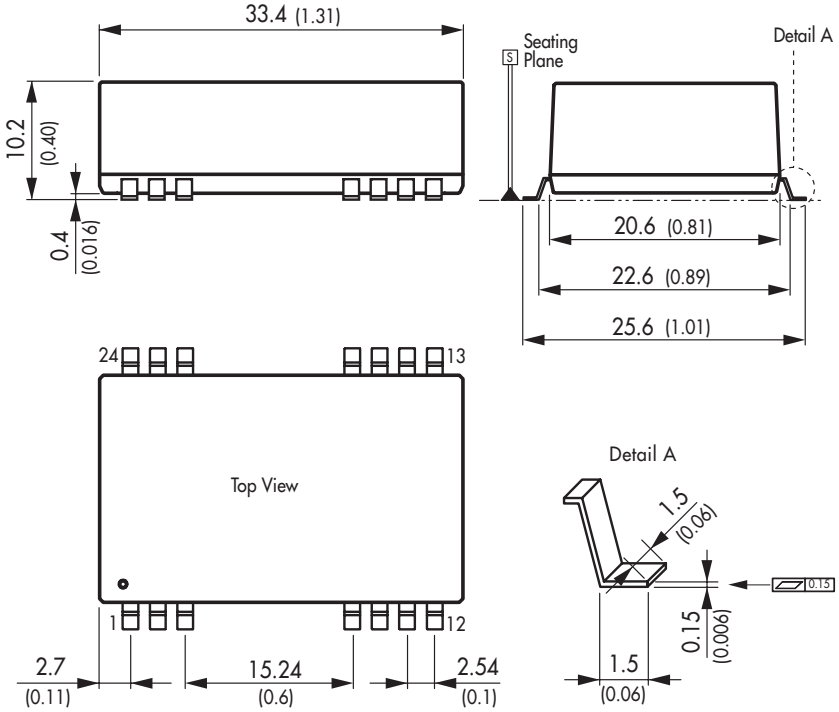
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

## Physical Specifications

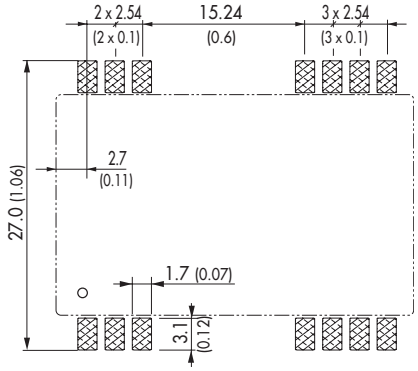
| | |
|---|---|
| Casing material | non conductive plastic |
| Weight | 14 g (0.55oz) |
| Moisture sensivity level (MSL) | level 2 as per J-STD-020D.1 (to find at: www.jedec.org - free registration required) |

## Supporting documents: www.tracopower.com/overview/tes5

## Outline Dimensions




Pin Patterns:




| Pin-Out | | |
|---|---|---|
| **Pin** | **Single** | **Dual** |
| **1** | Remote On/Off | Remote On/Off |
| **2** | –Vin (GND) | –Vin (GND) |
| **3** | –Vin (GND) | –Vin (GND) |
| **9** | No con. | Common |
| **10** | No con. | No con. |
| **11** | No con. | –Vout |
| **12** | No con. | No con. |
| **13** | No con. | No con. |
| **14** | +Vout | +Vout |
| **15** | No con. | No con. |
| **16** | –Vout | Common |
| **22** | +Vin (Vcc) | +Vin (Vcc) |
| **23** | +Vin (Vcc) | +Vin (Vcc) |
| **24** | No con. | No con. |

Dimensions in [mm], () = Inch
Tolerances ±0.25 (±0.02)
Pin pich tolerances ±0.13 (±0.005)