

### 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% (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% (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% (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. 12 Vin models: 15 mA / 110 mA typ. 24 Vin models: 8 mA / 55 mA typ.
Surge voltage (1 sec. max.)	5 Vin models: 9 V max. 12 Vin models: 18 V max. 24 Vin models: 30 V max.
Reverse voltage protection	0.3 A max.
Input filter	internal capacitor

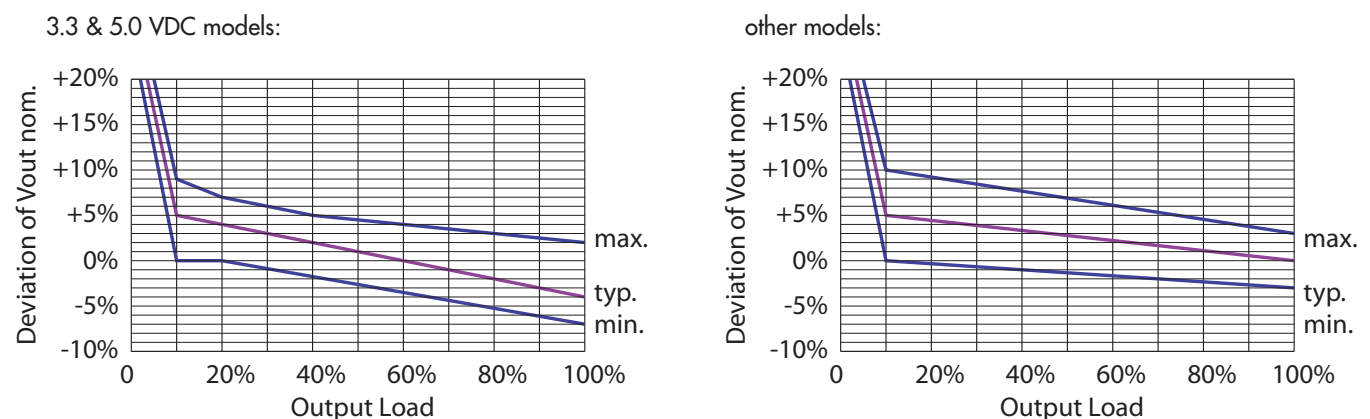
**Output Specifications**

Voltage set accuracy	see graphs below
Voltage balance (dual output models, balanced load)	±1.0 % max.
Regulation – Input variation – Load variation	1.2 % / 1 % change Vin 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. 12 & 15 VDC models: 4.7 µF max. ±5.0 VDC models: 10 µF max. ±12 & ±15 VDC models: 2.2 µF max.

**General Specifications**

Temperature ranges – Operating – Storage – Case	–40°C to +85°C –40°C to +125°C +95°C max.
Derating (convection cooling)	4 %/K above +75°C
Humidity (non condensing)	95 % rel. H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)	>2 Mio h
I/O isolation voltage (60 sec.)	3000 VDC
I/O isolation capacitance (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)**



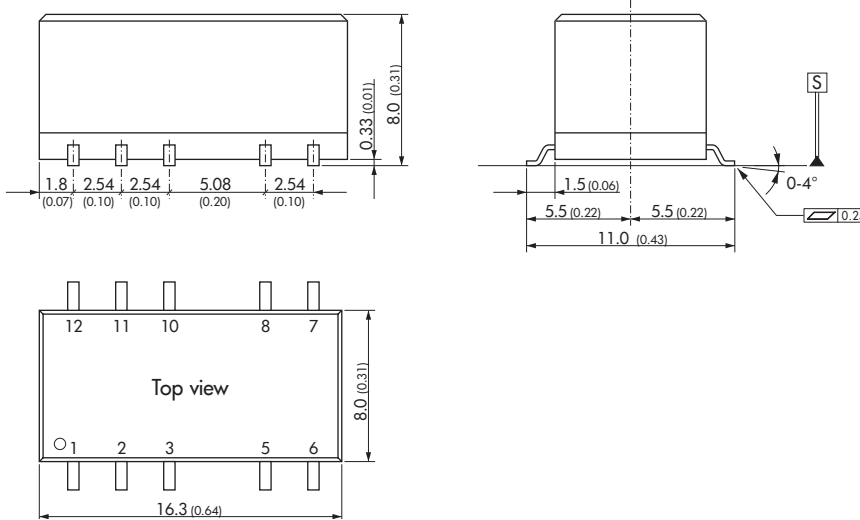
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

**Physical Specifications**

Casing material	non-conductive plastic (UL 94V-0 rated)
Weight	2.0 g (0.07oz)
Lead-free reflow solder process	as per J-STD-020D.01 (to find at: <a href="http://www.jedec.org">www.jedec.org</a> - free registration rquired)
Moisture sensitivity level (MSL)	level 2 as per J-STD-033B.01 (to find at: <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>
Environmental compliance	- Reach - RoHS <a href="http://www.tracopower.com/products/tes1v-reach.pdf">www.tracopower.com/products/tes1v-reach.pdf</a> RoHS directive 2002/95/EC

**Application note:** [www.tracopower.com/products/tes1v-application.pdf](http://www.tracopower.com/products/tes1v-application.pdf)

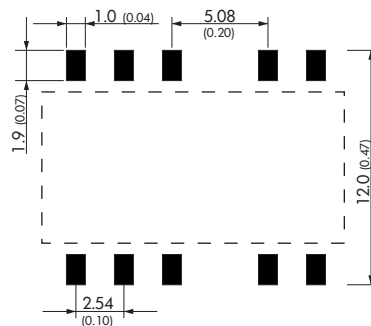
**Outline Dimensions**



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.