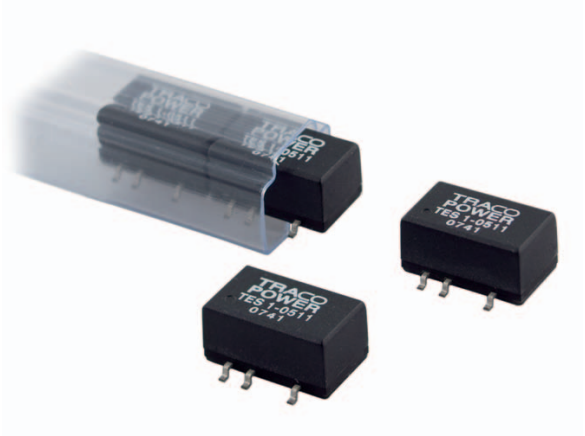
DC/DC Converters

TES 1 Series, 1 Watt

Features

- Small SMD package with standard footprint
- I/O isolation 1500 VDC
- Single and dual output models
- Input voltage 5, 12 and 24 VDC
- 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-020C
- Available in tape and reel package
- 3-year product warranty



With their small footprint these 1Watt 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	Output voltage	Output current max.	Efficiency typ.
TES 1-0510	**5 VDC ±10%** (nominal 5 VDC)	3.3 VDC	300 mA	73 %
TES 1-0511		5 VDC	200 mA	78 %
TES 1-0519		9 VDC	110 mA	78 %
TES 1-0512		12 VDC	85 mA	78 %
TES 1-0513		15 VDC	65 mA	79 %
TES 1-0521		±5 VDC	±100 mA	74 %
TES 1-0522		±12 VDC	±40 mA	78 %
TES 1-0523		±15 VDC	±35 mA	78 %
TES 1-1211	**12 VDC ±10%** (nominal 12 VDC)	5 VDC	200 mA	76 %
TES 1-1219		9 VDC	110 mA	78 %
TES 1-1212		12 VDC	85 mA	79 %
TES 1-1213		15 VDC	65 mA	80 %
TES 1-1221		±5 VDC	±100 mA	74 %
TES 1-1222		±12 VDC	±40 mA	78 %
TES 1-1223		±15 VDC	±35 mA	79 %
TES 1-2411	**24 VDC ±10%** (nominal 24 VDC)	5 VDC	200 mA	78 %
TES 1-2419		9 VDC	110 mA	77 %
TES 1-2412		12 VDC	85 mA	77 %
TES 1-2413		15 VDC	65 mA	79 %
TES 1-2421		±5 VDC	±100 mA	73 %
TES 1-2422		±12 VDC	±40 mA	78 %
TES 1-2423		±15 VDC	±35 mA	78 %

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 capacitors

Output Specifications

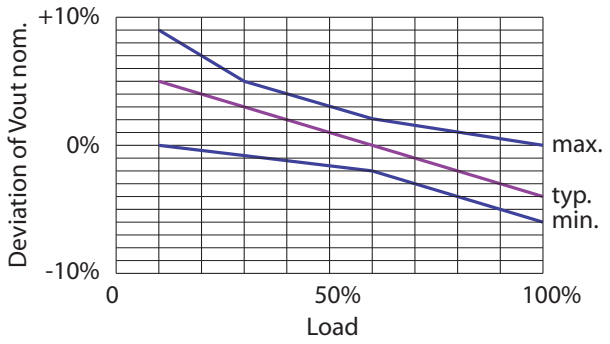
Voltage set accuracy	– 5 VDC models:	±2 % at 60 % load
	– other models:	±2 % at 100 % load
Voltage balance (dual output models, balanced load)		±1 % max.
Regulation	– Input variation	1.2 % / 1 % change Vin
	– Load variation	see graphs below
Ripple and noise (20 MHz Bandwidth)		120 mVpp max.
Temperature coefficient		±0.02 %/K
Short circuit protection		limited 0.5 sec. max.
Capacitive load		33 µF max.

General Specifications

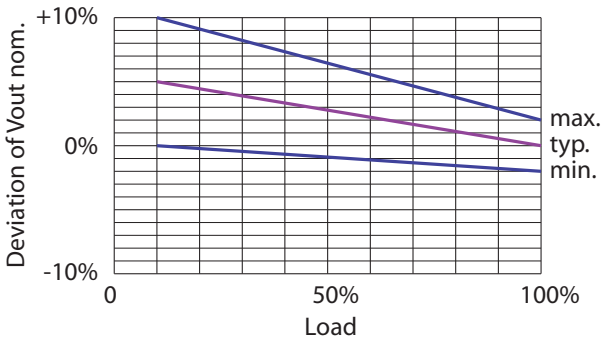
Temperature ranges	– Operating	–40°C to +85°C
	– Storage	–55°C to +125°C
	– Case	–105°C max.
Derating (convection cooling)		4 %/K above +75°C
Humidity (non condensing)		95 % rel. H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)		>2'000'000 h
Isolation voltage (60sec.)	– Input/Output	1'500 VDC
Isolation capacitance	– Input/Output	40 pF typ.
Isolation resistance	– Input/Output	>1'000 Mohm
Switching frequency		100 kHz typ. (frequency modulation)
Frequency change over line and load		±30 %
Environmental compliance	– Reach	www.tracopower.com/products/tes1-reach.pdf
	– RoHS	RoHS directive 2002/95/EC

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

5 VDC models:



other models:



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

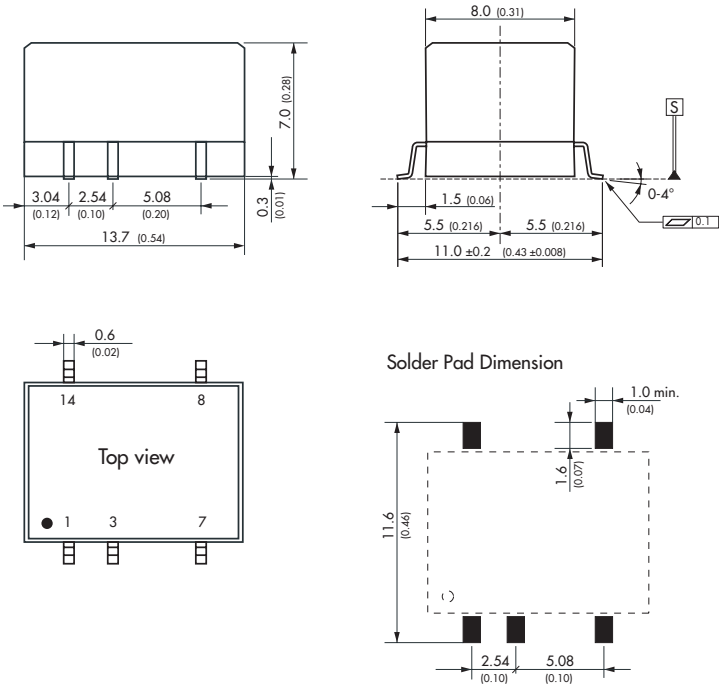
Physical Specifications

Casing material		epoxy molding compound (94V-0 rated)
Weight	single output models: dual output models:	1.7 g (0.04 oz) 2.0 g (0.05 oz)
Lead-free reflow solder process		as per J-STD-020D.01 (to find at: www.jedec.org - free registration equired)
Moisture sensivity level (MSL)		level 2 as per J-STD-033B.01 (to find at: www.jedec.org - free registration required)
Washing process		www.tracopower.com/products/smd-wash.pdf
Packaging		www.tracopower.com/products/tes1-pack.pdf

Application note: www.tracopower.com/products/tes1-application.pdf

Outline and Solder Pad Dimensions

TES 1 Single Output Models



Pin-Out	
Pin	**Single**
1	–Vin (GND)
3	+Vin (Vcc)
7	–Vout
8	+Vout
14	*NC

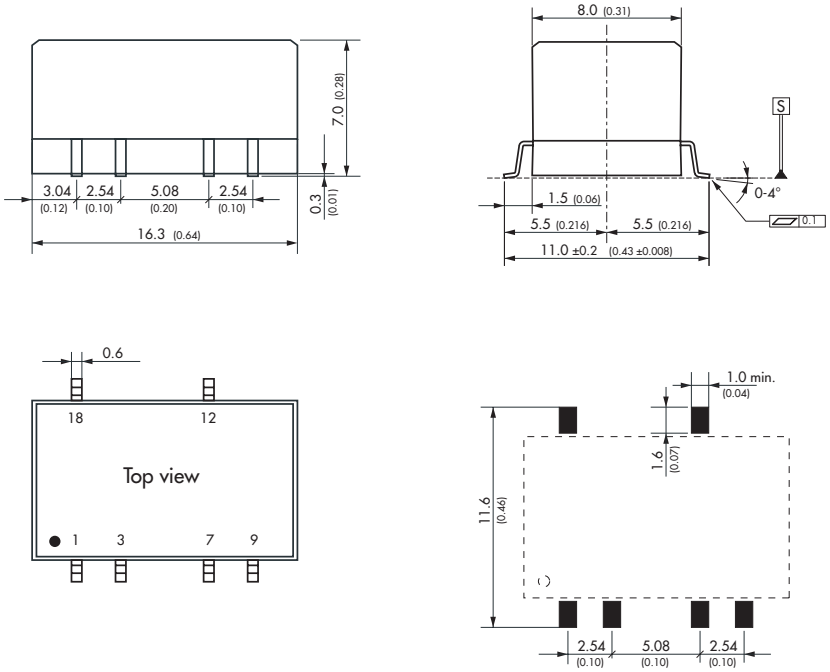
* Pin to be isolated from circuitry

Dimensions in [mm], () = Inch
Pin pitch tolerances: ±0.10 (±0.004)
Other tolerances: ±0.25 (±0.01)

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

Outline and Solder Pad Dimensions

TES 1 Dual Output Models



Pin-Out	
Pin	**Dual**
1	–Vin (GND)
3	+Vin (Vcc)
7	Common
9	–Vout
12	+Vout
18	*NC

* Pin to be isolated from circuitry

Dimensions in [mm], () = Inch
Pin pitch tolerances: ±0.10 (±0.004)
Other tolerances: ±0.25 (±0.01)

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