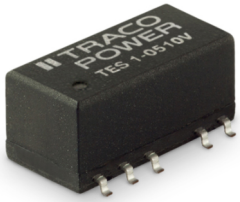
TRACO POWER

Unregulated DC/DC Converter

TES 1V Series, 1 Watt

- **Small SMD package with standard footprint**
- **I/O isolation voltage 3000 VDC**
- **Unregulated outputs**
- **Single- and dual output models**
- **High efficiency up to 80%**
- **Operating temperature range −40°C 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**



The TES 1V 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 Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TES 1-0510V	4.5 - 5.5 VDC (5 VDC nom.)	3.3 VDC	260 mA			72 %
TES 1-0511V		5 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	−5 VDC	100 mA	75 %
TES 1-0522V		+12 VDC	42 mA	−12 VDC	42 mA	79 %
TES 1-0523V		+15 VDC	34 mA	−15 VDC	34 mA	80 %
TES 1-1210V	10.8 - 13.2 VDC (12 VDC nom.)	3.3 VDC	260 mA			73 %
TES 1-1211V		5 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	−5 VDC	100 mA	76 %
TES 1-1222V		+12 VDC	42 mA	−12 VDC	42 mA	80 %
TES 1-1223V		+15 VDC	34 mA	−15 VDC	34 mA	80 %
TES 1-2410V	21.6 - 26.4 VDC (24 VDC nom.)	3.3 VDC	260 mA			70 %
TES 1-2411V		5 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	−5 VDC	100 mA	73 %
TES 1-2422V		+12 VDC	42 mA	−12 VDC	42 mA	79 %
TES 1-2423V		+15 VDC	34 mA	−15 VDC	34 mA	79 %

Input Specifications

Input Current	- At no load	5 Vin models:	30 mA typ.
		12 Vin models:	15 mA typ.
		24 Vin models:	8 mA typ.
	- At full load	5 Vin models:	260 mA max.
		12 Vin models:	110 mA max.
		24 Vin models:	55 mA max.
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/tes1v-cc
	- Voltage Balance (symmetrical load)	dual output models:	1% max.
Ripple and Noise	- 20 MHz Bandwidth		100 mVp-p max.
Capacitive Load	- single output	3.3 Vout models:	33 µF max.
		5 Vout models:	33 µF max.
		12 Vout models:	4.7 µF max.
		15 Vout models:	4.7 µF max.
	- dual output	5 / -5 Vout models:	10 / 10 µF max.
		12 / -12 Vout models:	2.2 / 2.2 µF max.
		15 / -15 Vout models:	2.2 / 2.2 µF max.
Minimum Load		See application note:	www.tracopower.com/tes1v-cc (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			400 ms max.
Short Circuit Protection			Limited 0.5 s max., Automatic recovery

Safety Specifications

Over Voltage Category			Not mains connected

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/tes1v-emc-filter

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		3.3 %/K above 75°C
		See application note:	www.tracopower.com/tes1v-cc
Cooling System			Natural convection (20 LFM)
Regulator Topology			Push-Pull Converter

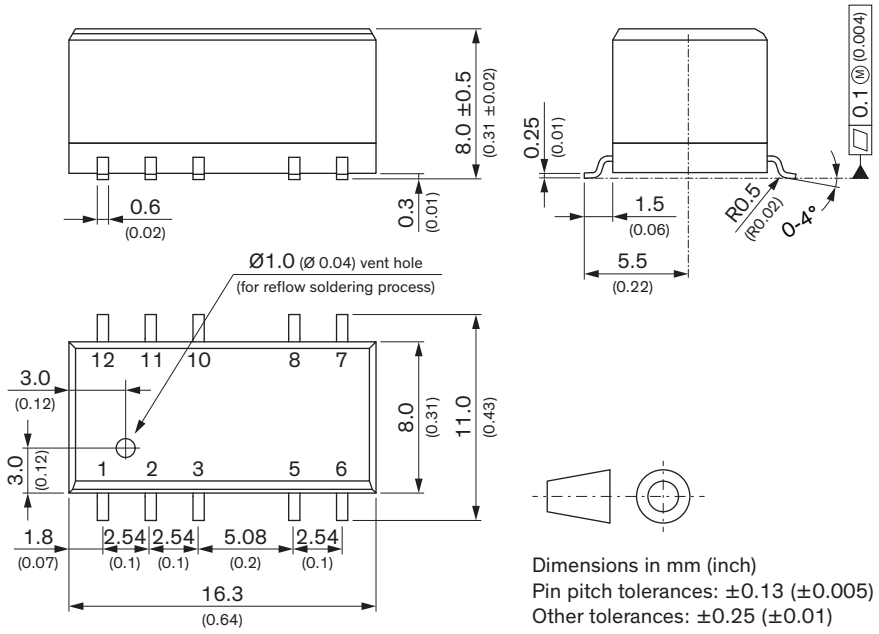
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Switching Frequency		50 - 150 kHz (PFM) 100 kHz typ. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	3'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	60 pF typ. 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		Non-conductive Plastic (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		SMD12
Soldering Profile		Lead-Free Reflow Soldering (acc. J-STD-020E) See application note: www.tracopower.com/info/reflow-soldering.pdf
Weight		2 g
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: No Exemptions

Additional Information

Supporting Documents	www.tracopower.com/overview/tes1v
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

Outline Dimensions



Dimensions in mm (inch)
Pin pitch tolerances: ±0.13 (±0.005)
Other tolerances: ±0.25 (±0.01)

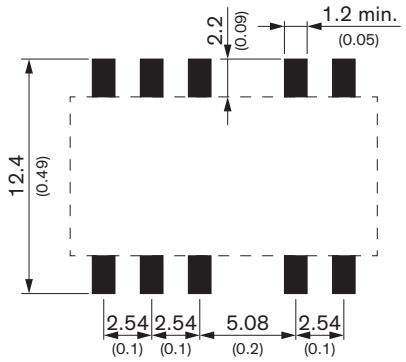
Pinout

Pin	Single	Dual
1	–Vin (GND)	–Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
3	NTC	NTC
5	–Vout	Common
6	NTC	–Vout
7	NTC	NTC
8	+Vout	+Vout
10	NTC	NTC
11	NTC	NTC
12	NTC	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



Dimensions in mm (inch)