

Features

- ◆ Ultracompact SMD-package
- ◆ I/O isolation 4000 VACrms
- ◆ Reinforced insulation rated for working voltages up to 300 VAC
- ◆ Industrial & medical safety approval
- ◆ Operating temp. range -40°C to $+71^{\circ}\text{C}$
- ◆ Qualified for leadfree reflow solder process
- ◆ Available in tape & reel package



The TES 2M series is a new range of ultra-compact 2W DC/DC-converters providing a high I/O-isolation voltage of 4000 VAC. With a reinforced I/O-isolation system this product is an economical solution for many applications in instrumentation, industrial controls, medical equipment and everywhere where supplementary- or reinforced insulation is required to meet requested safety standards.

With a new package design these converters are qualified for the higher solder temperature profiles in leadfree solder processes. For automated SMD production lines the devices can be supplied in tape & reel package. Full SMD-design with exclusive use of ceramic capacitors ensure a very high reliability and a long product lifetime.

Models

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TES 2-0511M	5.0 VDC $\pm 10\%$ (nominal 0.5 VDC)	5 VDC	400 mA	66 %
TES 2-0512M		12 VDC	165 mA	66 %
TES 2-0513M		15 VDC	133 mA	66 %
TES 2-0522M		± 12 VDC	± 83 mA	72 %
TES 2-0523M		± 15 VDC	± 66 mA	73 %
TES 2-1211M	12.0 VDC $\pm 10\%$ (nominal 1.2 VDC)	5 VDC	400 mA	66 %
TES 2-1212M		12 VDC	165 mA	66 %
TES 2-1213M		15 VDC	133 mA	66 %
TES 2-1222M		± 12 VDC	± 83 mA	74 %
TES 2-1223M		± 15 VDC	± 66 mA	75 %
TES 2-2411M	24 VDC $\pm 10\%$ (nominal 2.4 VDC)	5 VDC	400 mA	66 %
TES 2-2412M		12 VDC	165 mA	66 %
TES 2-2413M		15 VDC	133 mA	66 %
TES 2-2422M		± 12 VDC	± 83 mA	74 %
TES 2-2423M		± 15 VDC	± 66 mA	75 %

Input Specifications

Input current no load / full load	5 Vin models: 60 mA / 600 mA typ. 12 Vin models: 30 mA / 250 mA typ. 24 Vin models: 15 mA / 125 mA typ.
Reverse voltage protection	0.3 A max.
Recommended input fuse (slow blow)	5 Vin models: 1.0 A 12 Vin models: 0.5 A 24 Vin models: 0.2 A
Surge voltage (1 sec. max.)	5 Vin models: 9 V max. 12 Vin models: 18 V max. 24 Vin models: 30 V max.
Input filter	internal capacitors

Output Specifications

Voltage set accuracy	±4 %
Voltage balance (dual output models)	1 % max.
Regulation	– Input variation 1.2 % / 1 % change of Vin – Load variation 20 – 100 % 10 % max. 12 % max. for 5 Vout models.
Ripple and noise (20 MHz Bandwidth)	150 mVpk-pk max.
Temperature coefficient	±0.02 %/K
Short circuit protection	0.5 sec. max.
Minimum load	2 % of rated max current.
Capacitive load	single output models: 330 µF max. dual output models: 100 µF max. (each output)

General Specifications

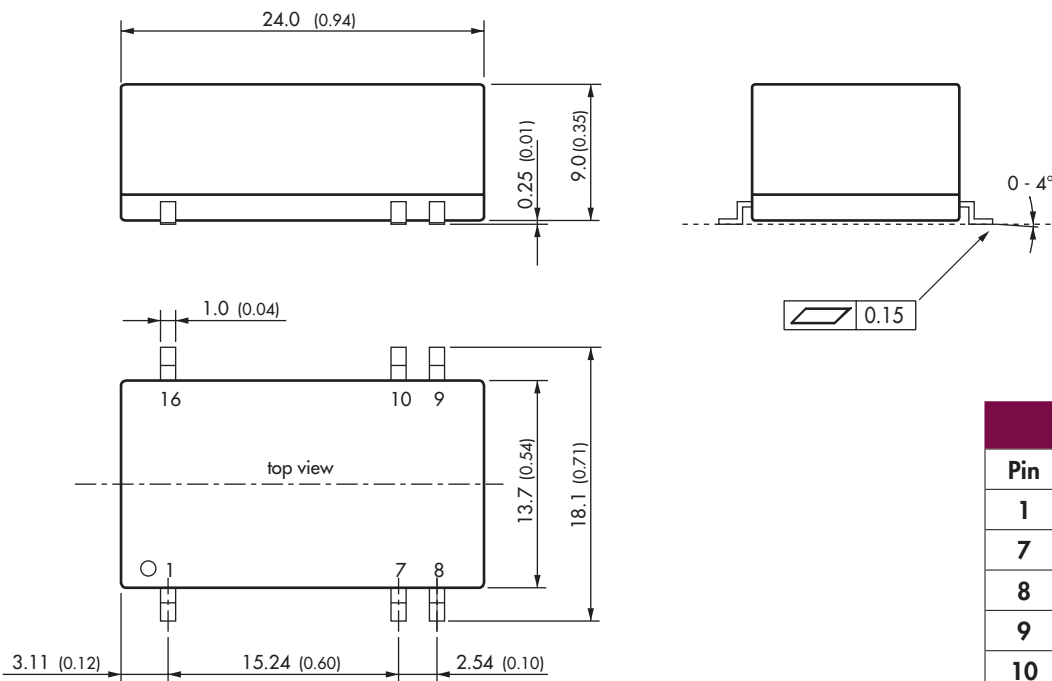
Temperature ranges	– Operating –40°C to +71°C – Storage –55°C to +125°C – Casing +90°C max.
Derating	2.5 %/K above 60°C
Humidity (non condensing)	95 % rel. H max.
Reliability, calculated MTTF (MIL-HDBK-217F @ +25°C, ground benign)	>2.0 Mio h
Isolation voltage (50Hz, 60sec) – Input/Output	4000 VACrms
Isolation test voltage (1 sec.)	6000 Vpk
Leakage current (at 240VAC, 60Hz)	2 µA max.
Isolation capacity – Input/Output	20 pF max. (at 100KHz, 1V)
Isolation resistance – Input/Output	>10 Gohm (at 500VDC)
Switching frequency	50 – 100 kHz (PFM)
Safety standards	IEC/EN 60950-1, UL 60950-1 CSA C22.2 No. 60950-1-03 IEC/EN 60601-1, UL 60601-1, CSA C22.2 No. 601-1
Safety approvals	– CSA certificate for medical electrical equipment www.tracopower.com/products/thi2m-csa60601.pdf for information technology equipment www.tracopower.com/products/thi2m-csa60950.pdf – CB test report for medical electrical equipment www.tracopower.com/products/thi2m-cb60601.pdf for information technology equipment www.tracopower.com/products/thi2m-cb60950.pdf

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

Physical Specifications

Casing material	plastic
Weight	3.8 g (0.13oz)
Lead-free reflow solder process	as per J-STD-020D.01 (to find at: www.jedec.org - free registration required)
Moisture sensitivity 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/tes2m-pack.pdf

Outline Dimensions



Pin-Out		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
7	No con.	No con.
8	No con.	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

Dimensions in [mm], () = Inch
Tolerances ± 0.25 (± 0.01)
Pin pitch tolerances ± 0.05 (± 0.002)

Specifications can be changed any time without notice.