

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

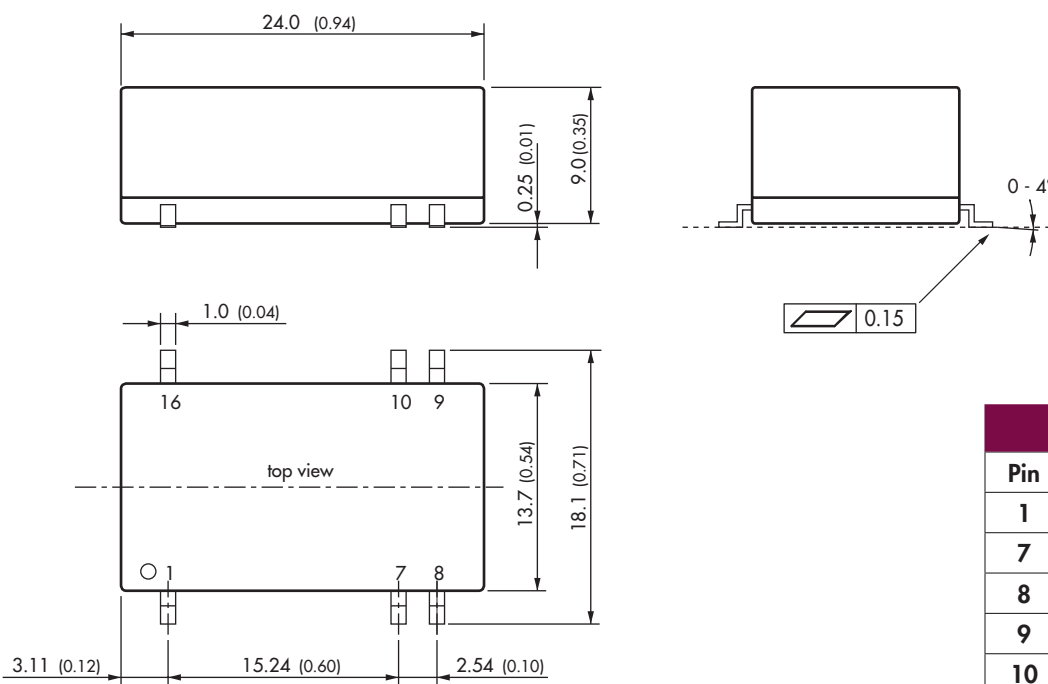
Temperature ranges	– Operating –40°C to +71°C – Storage –55°C to +125°C – Casing +90°C max.
Derating	2.5 %/K above 60°C
Humidity (non condensing)	95 % rel. H max.
Reliability, calculated MTTF (MIL-HDBK-217F @ +25°C, ground benign)	>2.0 Mio h
Isolation voltage (50Hz, 60sec) – Input/Output	4000 VACrms
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

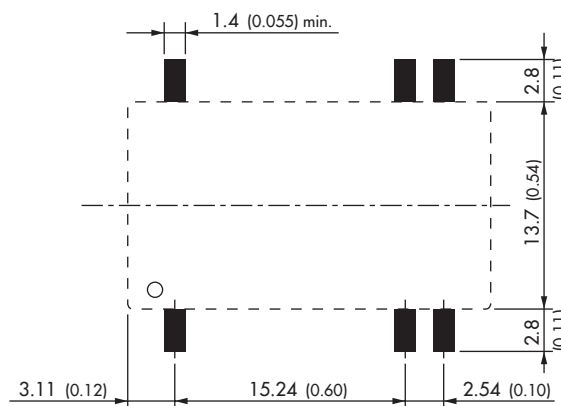
Casing material	plastic
Weight	3.8 g (0.13oz)
Lead-free reflow solder process	as per J-STD-020D.01 (to find at: www.jedec.org - free registration required)
Moisture sensitivity level (MSL)	level 2 as per J-STD-033B.01 (to find at: www.jedec.org - free registration required)
Washing process	www.tracopower.com/products/smd-wash.pdf
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

Solder Pad Dimension



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

Specifications can be changed any time without notice.