

- I/O isolation voltage 1'500 VDC
- Unregulated outputs
- Single and dual output models
- Input voltage 5, 12 and 24 VDC
- High efficiency up to 80%
- Operating Temperature range -40 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



With their small footprint these 2 Watt 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 Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
TES 2-0510H	4.5 - 5.5 VDC (5 VDC nom.)	3.3 VDC	500 mA			70 %
TES 2-0511H		5 VDC	400 mA			73 %
TES 2-0512H		12 VDC	165 mA			77 %
TES 2-0521H		+5 VDC	200 mA	-5 VDC	200 mA	74 %
TES 2-0522H		+12 VDC	83 mA	-12 VDC	83 mA	76 %
TES 2-0523H		+15 VDC	66 mA	-15 VDC	66 mA	76 %
TES 2-1210H	10.8 - 13.2 VDC (12 VDC nom.)	3.3 VDC	500 mA			72 %
TES 2-1211H		5 VDC	400 mA			75 %
TES 2-1212H		12 VDC	165 mA			79 %
TES 2-1222H		+12 VDC	83 mA	-12 VDC	83 mA	80 %
TES 2-1223H		+15 VDC	66 mA	-15 VDC	66 mA	80 %
TES 2-2410H	21.6 - 26.4 VDC (24 VDC nom.)	3.3 VDC	500 mA			72 %
TES 2-2411H		5 VDC	400 mA			75 %
TES 2-2412H		12 VDC	165 mA			79 %
TES 2-2422H		+12 VDC	83 mA	-12 VDC	83 mA	79 %
TES 2-2423H		+15 VDC	66 mA	-15 VDC	66 mA	79 %

Input Specifications

Input Current	- At no load	5 Vin models: 60 mA typ. 12 Vin models: 30 mA typ. 24 Vin models: 15 mA typ.
	- At full load	5 Vin models: 500 mA typ. 12 Vin models: 200 mA typ. 24 Vin models: 100 mA typ.
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 - Voltage Balance (symmetrical load)	See application note: www.tracopower.com/tes2h-cc/ dual output models: 1% max.
Ripple and Noise	- 20 MHz Bandwidth	120 mVp-p max.
Capacitive Load	- single output	3.3 Vout models: 47 µF max. 5 Vout models: 47 µF max. 12 Vout models: 10 µF max.
	- dual output	5 / -5 Vout models: 10 / 10 µF max. 12 / -12 Vout models: 4.7 / 4.7 µF max. 15 / -15 Vout models: 4.7 / 4.7 µF max.
Minimum Load		See application note: www.tracopower.com/tes2h-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		50 ms max.
Short Circuit Protection		Limited 0.5 s max., Automatic recovery

Safety Specifications

Over Voltage Category	Not mains connected
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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/tes2h-emc-filter/
EMC / Environmental	- Certification Documents	www.tracopower.com/tes2h-emc-cert/

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	4.0 %/K above 80°C
	See application note:	www.tracopower.com/tes2h-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.

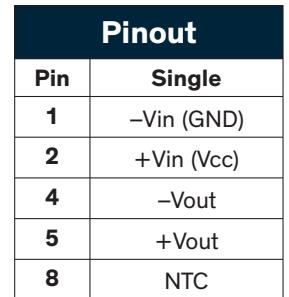
Switching Frequency	50 - 120 kHz (PFM) 100 kHz typ. (PFM)
Insulation System	Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s 1'500 VDC 1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC 10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 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	Plastic resin (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	SMD8 (single output models) SMD10 (dual output models)
Soldering Profile	Lead-Free Reflow Soldering (acc. J-STD-020E) See application note: www.tracopower.com/info/reflow-soldering.pdf
Weight	- single output - dual output 1.5 g 2.2 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: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) - SCIP Reference Number 2c701e25-1552-4135-96f1-51ba816788e8

Additional Information

Supporting Documents	www.tracopower.com/overview/tes2h
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf
Service Portal	www.tracoserviceportal.com

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Single Output Models



Avoid routing PCB traces under the converter.

Technical drawing of a 16-pin DIP package showing top, side, and detail views with dimensions in mm and inches.

Top View Dimensions:

- Pin 1 location: 3.0 (0.12) from left edge, 10 from left edge.
- Pin 2 location: 3.07 (0.121) from Pin 1, 2.54 (0.100) from Pin 1.
- Pin 4 location: 5.08 (0.200) from Pin 2, 2.54 (0.100) from Pin 5.
- Pin 5 location: 16.24 (0.64) from left edge.
- Pin 7 location: 7 from Pin 1.
- Pin 10 location: 10 from Pin 1.
- Pin 12 location: 12.3 (0.48) from left edge.
- Pin 14 location: 14.3 (0.56) from left edge.
- Pin 16 location: 16.24 (0.64) from left edge.

Side View Dimensions:

- Package height: 8.9 ± 0.5 (0.35 ± 0.02).
- Pin height: 0.3 (0.01).
- Pin width: 0.6 (0.024).
- Pin pitch: 1.5 (0.06).
- Pin spacing: 6.15 (0.242).
- Pin radius: R0.5 (R0.02).
- Pin angle: 0-4°.
- Pin diameter: Ø1.0 (Ø0.04) vent hole (for reflow soldering process).

Detail View:

- Pin diameter: Ø1.0 (Ø0.04) vent hole (for reflow soldering process).
- Pin radius: R0.5 (R0.02).
- Pin angle: 0-4°.
- Pin diameter: Ø1.0 (Ø0.04) vent hole (for reflow soldering process).

Notes:

- All dimensions in mm (inches).
- Tolerance: x.xx ± 0.25 (x.xx ± 0.01).
- Tolerance: x.xxx ± 0.13 (x.xxx ± 0.005).

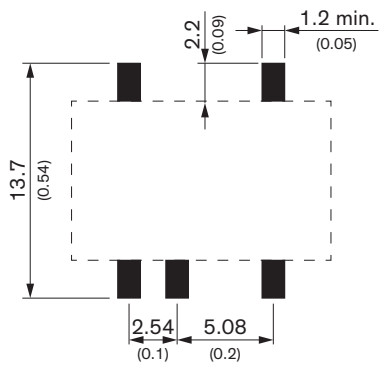
Pinout	
Pin	Dual
1	−Vin (GND)
2	+Vin (Vcc)
4	Common
5	−Vout
7	+Vout
10	NTC

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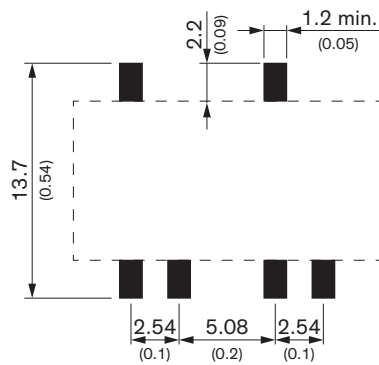
Downloaded from [Arrow.com](https://www.arrow.com).

Recommended Solder Pad Layout

Single Output Models



Dual Output Models



Dimensions in mm (inch)