

- Compact SMD package
- 33.4 x 25.6 mm footprint
- Ultra-wide 4:1 input voltage range
- I/O isolation 1500 VDC
- Operating temp. range -40°C to +70°C
- Short circuit protection
- Input filter to meet EN 55032, conducted class A
- Remote On/Off
- High accuracy of pin co-planarity
- 3-year product warranty



The TES 5WI series is a family of high performance 5W DC/DC converter modules in a low profile SMD package with compact dimensions. The 14 modules feature ultrawide 4:1 input ranges with tightly regulated output voltage. High efficiency allows an operating temperature range of -40 to +70°C at full load. Further features are built-in EMI-filter to meet EN 55032 conducted class A without external components and remote On/Off control. The products comply with IPC J-STD-020D and are qualified for high temperature lead-free reflow solder process

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TES 5-2410WI	9 - 36 VDC (24 VDC nom.)	3.3 VDC	1'200 mA			76 %
TES 5-2411WI		5 VDC	1'000 mA			80 %
TES 5-2412WI		12 VDC	420 mA			83 %
TES 5-2413WI		15 VDC	335 mA			83 %
TES 5-2421WI		+5 VDC	500 mA	-5 VDC	500 mA	80 %
TES 5-2422WI		+12 VDC	210 mA	-12 VDC	210 mA	83 %
TES 5-2423WI		+15 VDC	165 mA	-15 VDC	165 mA	83 %
TES 5-4810WI	18 - 75 VDC (48 VDC nom.)	3.3 VDC	1'200 mA			76 %
TES 5-4811WI		5 VDC	1'000 mA			80 %
TES 5-4812WI		12 VDC	420 mA			83 %
TES 5-4813WI		15 VDC	335 mA			83 %
TES 5-4821WI		+5 VDC	500 mA	-5 VDC	500 mA	80 %
TES 5-4822WI		+12 VDC	210 mA	-12 VDC	210 mA	83 %
TES 5-4823WI		+15 VDC	165 mA	-15 VDC	165 mA	83 %

## Input Specifications

Input Current	- At no load	24 Vin models: <b>20 mA typ.</b> 48 Vin models: <b>10 mA typ.</b>
	- At full load	24 Vin models: <b>250 mA typ.</b> 48 Vin models: <b>125 mA typ.</b>
Surge Voltage		24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Start-up Voltage		24 Vin models: <b>7 VDC min. / 8 VDC typ. / 9 VDC max.</b> 48 Vin models: <b>14 VDC min. / 16 VDC typ. / 18 VDC max.</b>
Under Voltage Lockout		24 Vin models: <b>6 VDC min. / 7 VDC typ. / 8 VDC max.</b> 48 Vin models: <b>13 VDC min. / 15 VDC typ. / 17 VDC max.</b>
Reflected Ripple Current		24 Vin models: <b>10 mA<sub>p-p</sub> typ.</b> 48 Vin models: <b>5 mA<sub>p-p</sub> typ.</b>
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Short Circuit Input Power		<b>3000 W max.</b>

## Output Specifications

Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (V <sub>min</sub> - V <sub>max</sub> )	single output models: <b>1% max.</b> dual output models: <b>1% max.</b>
	- Load Variation (10 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max. (Output 1)</b> <b>1% max. (Output 2)</b>
	- Voltage Balance (symmetrical load)	dual output models: <b>3% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>85 mV<sub>p-p</sub> max.</b>
Capacitive Load	- single output	3.3 V <sub>out</sub> models: <b>2'000 µF max.</b>
		5 V <sub>out</sub> models: <b>2'000 µF max.</b>
		12 V <sub>out</sub> models: <b>470 µF max.</b>
		15 V <sub>out</sub> models: <b>330 µF max.</b>
		5 / -5 V <sub>out</sub> models: <b>680 / 680 µF max.</b>
- dual output	12 / -12 V <sub>out</sub> models: <b>330 / 330 µF max.</b>	
	15 / -15 V <sub>out</sub> models: <b>220 / 220 µF max.</b>	
Minimum Load		<b>10 % of I<sub>out</sub> max.</b> (Operation at lower load will not damage the converter, but it may not meet all specifications)
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>10 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Overload Protection		<b>Foldback Mode</b>
Output Current Limitation		<b>115% min. of I<sub>out</sub> max.</b>
Transient Response	- Response Deviation	<b>2% typ. / 6% max. (25% Load Step)</b>
	- Response Time	<b>250 µs typ. / 500 µs max. (25% Load Step)</b>

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>Designed for EN 62368-1 (no certification)</b>
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## EMC Specifications

EMI Emissions	- Conducted Emissions	<b>EN 55032 class A (internal filter)</b> <b>FCC Part 15 class A (internal filter)</b>
	- Radiated Emissions	<b>EN 55032 class A (internal filter)</b> <b>FCC Part 15 class A (internal filter)</b>

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

## General Specifications

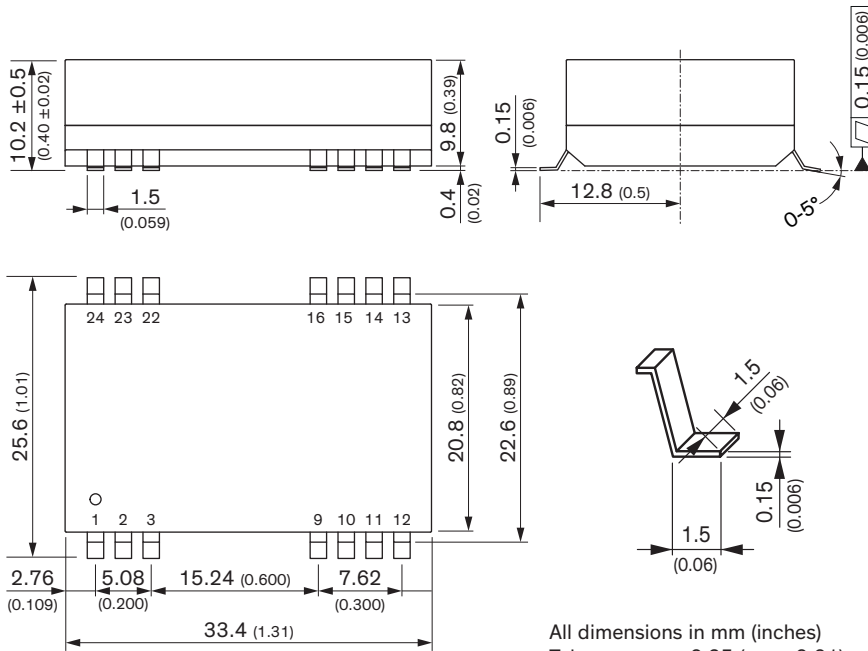
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +70°C (without derating) +100°C max. -50°C to +125°C
Power Derating	- High Temperature	3.3 %/K above 70°C
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current - Remote Pin Input Current	On: 2.5 to 5.5 VDC or open circuit Off: -0.7 to +0.8 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 10 mA max. -0.7 mA max.
Switching Frequency		210 - 350 kHz (PFM) 340 kHz typ. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'500 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	650 pF typ. 750 pF max.
Reliability	- Calculated MTBF	1'000'000 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		SMD24
Soldering Profile		Lead-Free Reflow Soldering (acc. J-STD-020E)
Weight		14 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) c77aae5d-5033-4d0d-826b-295f60f75778

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tes5wi">www.tracopower.com/overview/tes5wi</a>
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### Outline Dimensions



All dimensions in mm (inches)  
 Tolerance: x.x±0.25 (x.xx±0.01)  
 Tolerance: x.xx±0.13 (x.xxx±0.005)  
 Pin tolerance: ±0.05 (±0.002)

Pinout		
Pin	Single	Dual
1	Remote On/Off	Remote On/Off
2	-Vin (GND)	-Vin (GND)
3	-Vin (GND)	-Vin (GND)
9	NC	Common
10	NC	NC
11	NC	-Vout
12	NC	NC
13	NC	NC
14	+Vout	+Vout
15	NC	NC
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)
24	NC	NC

NC: Not connected

### Recommended Solder Pad Layout

