

- Ultra-wide 4:1 input voltage range
- I/O isolation 1500 VDC
- Operating temp. range  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$
- Short circuit protection
- Input filter to meet EN 55032, conducted class A
- Remote On/Off
- High accuracy of pin co-planarity
- Qualified for leadfree reflow solder process according IPC/JEDEC J-STD-020E
- Available in tape & reel package
- 3-year product warranty



The TES 3WI series is a family of high performance 3W 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  $-40^{\circ}\text{C}$  to  $+70^{\circ}\text{C}$  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-020E 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 3-2410WI	9 - 36 VDC (24 VDC nom.)	3.3 VDC	750 mA			75 %
TES 3-2411WI		5 VDC	600 mA			79 %
TES 3-2412WI		12 VDC	250 mA			81 %
TES 3-2413WI		15 VDC	200 mA			81 %
TES 3-2421WI		+5 VDC	300 mA	-5 VDC	300 mA	78 %
TES 3-2422WI		+12 VDC	125 mA	-12 VDC	125 mA	81 %
TES 3-2423WI		+15 VDC	100 mA	-15 VDC	100 mA	81 %
TES 3-4810WI	18 - 75 VDC (48 VDC nom.)	3.3 VDC	750 mA			76 %
TES 3-4811WI		5 VDC	600 mA			80 %
TES 3-4812WI		12 VDC	250 mA			83 %
TES 3-4813WI		15 VDC	200 mA			83 %
TES 3-4821WI		+5 VDC	300 mA	-5 VDC	300 mA	80 %
TES 3-4822WI		+12 VDC	125 mA	-12 VDC	125 mA	83 %
TES 3-4823WI		+15 VDC	100 mA	-15 VDC	100 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>155 mA typ.</b> 48 Vin models: <b>75 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>4.5 VDC min. / 6 VDC typ. / 8.5 VDC max.</b> 48 Vin models: <b>8.5 VDC min. / 12 VDC typ. / 17 VDC max.</b>
Under Voltage Lockout		24 Vin models: <b>8 VDC max.</b> 48 Vin models: <b>16 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>2 W max.</b>

### Output Specifications

Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (V <sub>min</sub> - V <sub>max</sub> )	single output models: <b>0.5% max.</b> dual output models: <b>0.5% max.</b>
	- Load Variation (10 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: <b>2% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>75 mV<sub>p-p</sub> max.</b>
Capacitive Load	- single output	3.3 V <sub>out</sub> models: <b>3'000 µF max.</b>
		5 V <sub>out</sub> models: <b>3'000 µF max.</b>
		12 V <sub>out</sub> models: <b>3'000 µF max.</b>
		15 V <sub>out</sub> models: <b>3'000 µF max.</b>
		- dual output
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>16 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Overload Protection		<b>Foldback Mode</b>
Output Current Limitation		<b>120% min. of I<sub>out</sub> max.</b>
Transient Response	- Response Deviation	<b>2% typ. / 6% max.</b> (75% to 100% Load Step)
	- Response Time	<b>150 µs typ. / 500 µs max.</b> (75% to 100% Load Step)

### EMC Specifications

EMI (Emissions)	- Conducted Emissions	<b>EN 55032 class A</b> (internal filter) <b>FCC 47 Part 15 class A</b> (internal filter)
	- Radiated Emissions	<b>EN 55032 class A</b> (internal filter) <b>FCC 47 Part 15 class A</b> (internal filter)

### General Specifications

Relative Humidity	<b>95% max.</b> (non condensing)
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All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

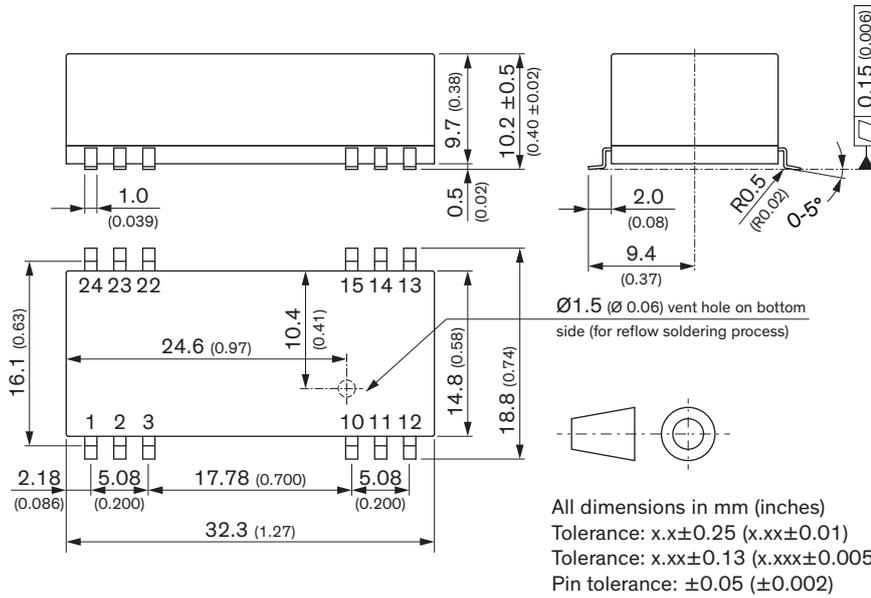
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +70°C (without derating) +100°C max. -50°C to +125°C
Power Derating	- High Temperature	3.3 %/K above 70°C
	See application note:	<a href="http://www.tracopower.com/overview/tes3wi">www.tracopower.com/overview/tes3wi</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)  - 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 5 mA max. -0.4 mA max.
Regulator Topology		Push-Pull Converter
Switching Frequency		180 - 580 kHz (PFM) 300 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	350 pF typ. 500 pF max.
Reliability	- Calculated MTBF	1'000'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2 (J-STD-033C)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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)
	See application note:	<a href="http://www.tracopower.com/info/reflow-soldering.pdf">www.tracopower.com/info/reflow-soldering.pdf</a>
Weight		8.8 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: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) e33565be-1414-415c-805c-ff0333727756

## Additional Information

Supporting Documents	<a href="http://www.tracopower.com/overview/tes3wi">www.tracopower.com/overview/tes3wi</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

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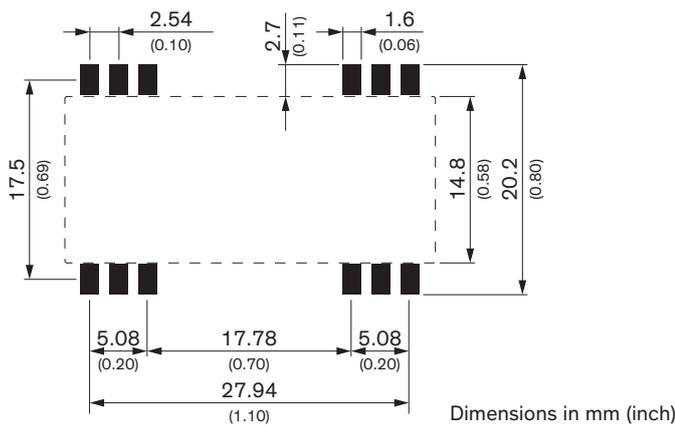
**Outline Dimensions**



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

NC: Not connected

**Recommended Solder Pad Layout**



# Mouser Electronics

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