

- Ultra-wide 4:1 input range
- SIP-9 package
- Temperature range  $-40$  to  $+85^{\circ}\text{C}$
- High efficiency
- Excellent load and line regulation
- Indefinite short-circuit protection
- I/O isolation 1500 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



The TMR 2WI series is a new family of isolated 2W DC/DC converter modules with regulated output, featuring ultra-wide 4:1 input voltage ranges of 9-36 VDC or 18-75 VDC. The product comes in a ultra-compact SIP-9 plastic package.

An excellent efficiency up to 84% allows  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  operation temperatures at full load. Further features include remote On/Off control and continuous short circuit protection. Typical applications for these ultra-compact converters are battery operated equipment and distributed power architectures in communication, instrumentation and industrial electronics, everywhere where space on the PCB is critical.

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TMR 2-2410WI	9 - 36 VDC (24 VDC nom.)	3.3 VDC	500 mA			71 %
TMR 2-2411WI		5 VDC	400 mA			76 %
TMR 2-2412WI		12 VDC	167 mA			79 %
TMR 2-2413WI		15 VDC	134 mA			80 %
TMR 2-2421WI		+5 VDC	200 mA	-5 VDC	200 mA	73 %
TMR 2-2422WI		+12 VDC	83 mA	-12 VDC	83 mA	77 %
TMR 2-2423WI		+15 VDC	67 mA	-15 VDC	67 mA	79 %
TMR 2-4810WI	18 - 75 VDC (48 VDC nom.)	3.3 VDC	500 mA			70 %
TMR 2-4811WI		5 VDC	400 mA			72 %
TMR 2-4812WI		12 VDC	167 mA			78 %
TMR 2-4813WI		15 VDC	134 mA			78 %
TMR 2-4821WI		+5 VDC	200 mA	-5 VDC	200 mA	70 %
TMR 2-4822WI		+12 VDC	83 mA	-12 VDC	83 mA	76 %
TMR 2-4823WI		+15 VDC	67 mA	-15 VDC	67 mA	76 %

### Input Specifications

Input Current	- At no load	24 Vin models: <b>20 mA typ.</b> 48 Vin models: <b>15 mA typ.</b>
	- At full load	24 Vin models: <b>110 mA typ.</b> 48 Vin models: <b>55 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>300 mA<sub>p-p</sub> typ.</b> 48 Vin models: <b>600 mA<sub>p-p</sub> typ.</b>
Recommended Input Fuse		24 Vin models: <b>350 mA</b> (slow blow) 48 Vin models: <b>135 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>
Short Circuit Input Power		<b>1.5 W max.</b>

### Output Specifications

Voltage Set Accuracy		<b>±2% max.</b>	
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.5% max.</b> dual output models: <b>0.5% max.</b>	
	- Load Variation (25 - 100%)	single output models: <b>0.75% max.</b> dual output models: <b>0.75% max.</b> (Output 1) <b>0.75% max.</b> (Output 2)	
	- Voltage Balance (symmetrical load)	dual output models: <b>2% max.</b>	
Ripple and Noise	- 20 MHz Bandwidth	<b>30 mV<sub>p-p</sub> typ.</b> <b>50 mV<sub>p-p</sub> max.</b>	
Capacitive Load	- single output	3.3 Vout models: <b>2'200 µF max.</b> 5 Vout models: <b>1'000 µF max.</b> 12 Vout models: <b>170 µF max.</b> 15 Vout models: <b>110 µF max.</b>	
		- dual output	5 / -5 Vout models: <b>470 / 470 µF max.</b> 12 / -12 Vout models: <b>100 / 100 µF max.</b> 15 / -15 Vout models: <b>47 / 47 µF max.</b>
	Minimum Load		<b>25 % of Iout 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>1 ms max.</b>	
Short Circuit Protection		<b>Continuous, Automatic recovery</b>	
Transient Response	- Response Deviation	<b>5% max.</b> (75% to 100% Load Step)	
	- Response Time	<b>100 µs typ. / 300 µs max.</b> (75% to 100% Load Step)	

### Safety Specifications

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

EMI Emissions	- Conducted Emissions	<b>EN 55032 class A</b> (with external filter)
	- Radiated Emissions	<b>EN 55032 class A</b> (with external filter)
	External filter proposal:	<a href="http://www.tracopower.com/overview/tmr2wi">www.tracopower.com/overview/tmr2wi</a>

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

## General Specifications

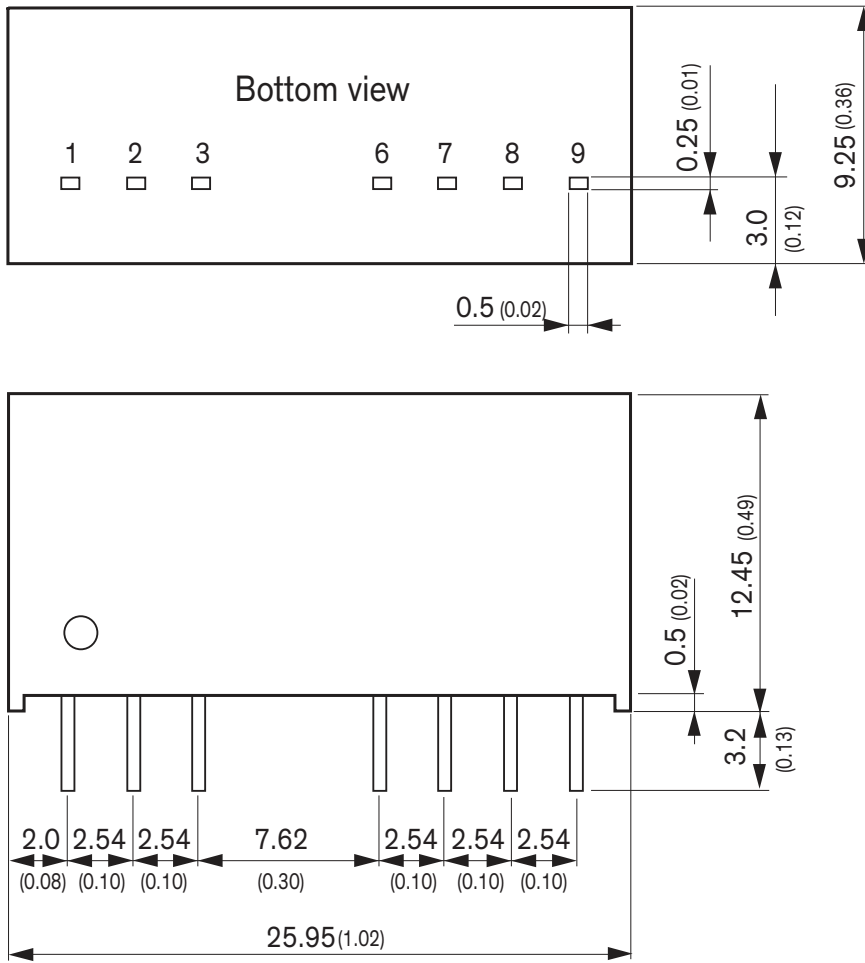
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +90°C max. -55°C to +105°C
Power Derating	- High Temperature	2.86 %/K above 65°C See application note: <a href="http://www.tracopower.com/overview/tmr2wi">www.tracopower.com/overview/tmr2wi</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current - Remote Pin Input Current	On: < 0.6 VDC or open circuit Off: 2.9 to 15 VDC Refers to 'Remote' and '-Vin' Pin 3 mA max. -1.0 to 1.0 mA
Switching Frequency		100 - 650 kHz (PFM) 300 kHz typ. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'500 VAC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	250 pF typ. 500 pF max.
Reliability	- Calculated MTBF	1'200'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Nickel-Iron (Alloy 42)
Pin Foundation Plating		Nickel (1 μm min.)
Pin Surface Plating		Tin (3 - 5 μm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP9
Soldering Profile		Wave Soldering 260°C / 10 s max.
Weight		6.5 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, 7c-1 (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) d40a088b-a8a0-486b-86d0-09471abcbbb4

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tmr2wi">www.tracopower.com/overview/tmr2wi</a>
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### Outline Dimensions



Pinout		
Pin	Single Output	Dual Output
1	-Vin (GND)	-Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
3	Remote	Remote
6	+Vout	+Vout
7	NC	Common
8	NC	NC
9	-Vout	-Vout

NC: Not connected

Dimensions in mm (inch)  
 Pin diameter  $\varnothing 0.5 \pm 0.05$  (0.02  $\pm 0.002$ )  
 Tolerances  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin pitch tolerance  $\pm 0.2$  ( $\pm 0.008$ )