



**THE DATASHEET OF  
TMR 9-4822WI**



- Highest power density in SIP-8 metal package (optional plastic package)
- Ultra wide 4:1 input voltage range
- Temperature range  $-40^{\circ}$  to  $+85^{\circ}\text{C}$
- High efficiency up to 89%
- Indefinite short-circuit protection
- I/O isolation 1'600 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



The TMR 9WI series is a new family of isolated 9W DC/DC converter modules with regulated output, featuring ultra wide 4:1 input voltage ranges. The product comes in a ultra-compact SIP-8 metal package with a small footprint occupying only 2.0 cm<sup>2</sup> (0.3 square inch) of board space. An excellent efficiency allows  $-40^{\circ}$  to  $+60^{\circ}\text{C}$  operation temperatures without derating. Further features include remote On/Off control and continuous short circuit protection. The very compact dimensions of these converters make them an ideal solution for many space critical applications in communication equipment, instrumentation and industrial electronics.

### Models

| Order Code   | Input Voltage Range         | Output 1                     |                  | Output 2 |                  | Efficiency typ. |
|--------------|-----------------------------|------------------------------|------------------|----------|------------------|-----------------|
|              |                             | Vnom                         | I <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TMR 9-2410WI | 9 - 36 VDC<br>(24 VDC nom.) | 3.3 VDC                      | 2'000 mA         |          |                  | 82 %            |
| TMR 9-2411WI |                             | 5 VDC                        | 1'600 mA         |          |                  | 85 %            |
| TMR 9-2419WI |                             | 9 VDC                        | 1'000 mA         |          |                  | 88 %            |
| TMR 9-2412WI |                             | 12 VDC                       | 750 mA           |          |                  | 88 %            |
| TMR 9-2413WI |                             | 15 VDC                       | 600 mA           |          |                  | 89 %            |
| TMR 9-2415WI |                             | 24 VDC                       | 375 mA           |          |                  | 89 %            |
| TMR 9-2421WI |                             | +5 VDC                       | 800 mA           | -5 VDC   | 800 mA           | 86 %            |
| TMR 9-2422WI |                             | +12 VDC                      | 375 mA           | -12 VDC  | 375 mA           | 88 %            |
| TMR 9-2423WI |                             | +15 VDC                      | 300 mA           | -15 VDC  | 300 mA           | 88 %            |
| TMR 9-4810WI |                             | 18 - 75 VDC<br>(48 VDC nom.) | 3.3 VDC          | 2'000 mA |                  |                 |
| TMR 9-4811WI | 5 VDC                       |                              | 1'600 mA         |          |                  | 85 %            |
| TMR 9-4819WI | 9 VDC                       |                              | 1'000 mA         |          |                  | 89 %            |
| TMR 9-4812WI | 12 VDC                      |                              | 750 mA           |          |                  | 89 %            |
| TMR 9-4813WI | 15 VDC                      |                              | 600 mA           |          |                  | 89 %            |
| TMR 9-4815WI | 24 VDC                      |                              | 375 mA           |          |                  | 89 %            |
| TMR 9-4821WI | +5 VDC                      |                              | 800 mA           | -5 VDC   | 800 mA           | 85 %            |
| TMR 9-4822WI | +12 VDC                     |                              | 375 mA           | -12 VDC  | 375 mA           | 88 %            |
| TMR 9-4823WI | +15 VDC                     |                              | 300 mA           | -15 VDC  | 300 mA           | 87 %            |

### Options

|  |                                     |
|--|-------------------------------------|
| <b>on demand</b><br>(backorder with MOQ non stocking item) | - Optional models with plastic case |
|--|-------------------------------------|

## Input Specifications

|                        |                |  |
|------------------------|----------------|--|
| Input Current          | - At no load   | 24 Vin models: <b>7 mA typ.</b><br>48 Vin models: <b>3 mA typ.</b>   |
|                        | - At full load | 24 Vin models: <b>350 mA max.</b> (3.3 Vout model)<br><b>407 mA max.</b> (5 Vout model)<br><b>434 mA max.</b> (9 Vout model)<br><b>439 mA max.</b> (12 Vout model)<br><b>440 mA max.</b> (15 Vout model)<br><b>431 mA max.</b> (24 Vout model)<br><b>399 mA max.</b> (5 / -5 Vout model)<br><b>434 mA max.</b> (12 / -12 Vout model)<br><b>434 mA max.</b> (15 / -15 Vout model)<br>48 Vin models: <b>173 mA max.</b> (3.3 Vout model)<br><b>203 mA max.</b> (5 Vout model)<br><b>217 mA max.</b> (9 Vout model)<br><b>219 mA max.</b> (12 Vout model)<br><b>218 mA max.</b> (15 Vout model)<br><b>215 mA max.</b> (24 Vout model)<br><b>201 mA max.</b> (5 / -5 Vout model)<br><b>218 mA max.</b> (12 / -12 Vout model)<br><b>222 mA max.</b> (15 / -15 Vout model) |
| Surge Voltage          |                | 24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)  |
| Recommended Input Fuse |                | 24 Vin models: <b>3'150 mA</b> (slow blow)<br>48 Vin models: <b>1'250 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.)  |
| Input Filter           |                | <b>Internal Capacitor</b>  |

## Output Specifications

|  |  |   |   |   |
|--|--|---|---|---|
| Voltage Set Accuracy                   |  | <b>±1% max.</b>   |   |   |
| Regulation                             | - Input Variation (Vmin - Vmax)            | single output models: <b>0.2% max.</b><br>dual output models: <b>0.2% max.</b>  |   |   |
|  | - Load Variation (0 - 100%)                | single output models: <b>1% max.</b><br>dual output models: <b>1% max.</b> (Output 1)<br><b>1% max.</b> (Output 2)  |   |   |
|  | - Cross Regulation (25% / 100% asym. load) | dual output models: <b>5% max.</b>  |   |   |
|  |  |   |   |   |
| Ripple and Noise<br>(20 MHz Bandwidth) | - single output                            | 3.3 Vout models: <b>50 mVp-p typ.</b> (w/ 1 µF X7R)<br>5 Vout models: <b>50 mVp-p typ.</b> (w/ 1 µF X7R)<br>9 Vout models: <b>50 mVp-p typ.</b> (w/ 1 µF X7R)<br>12 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R)<br>15 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R)<br>24 Vout models: <b>75 mVp-p typ.</b> (w/ 1 µF X7R) |   |   |
|  |  | - dual output   | 5 / -5 Vout models: <b>50 / 50 mVp-p typ.</b> (w/ 1 µF X7R)<br>12 / -12 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 1 µF X7R)<br>15 / -15 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 1 µF X7R) |   |
|  |  |   |   |   |
|  |  |   |   |   |
|  |  | Capacitive Load   | - single output   | 3.3 Vout models: <b>2'600 µF max.</b><br>5 Vout models: <b>1'300 µF max.</b><br>9 Vout models: <b>800 µF max.</b><br>12 Vout models: <b>560 µF max.</b><br>15 Vout models: <b>560 µF max.</b><br>24 Vout models: <b>200 µF max.</b> |
|  |  |   |   | - dual output   |
|  |  |   |   |   |
|  |  |   |   |   |
| Minimum Load                           |  |   |   | <b>Not required</b>   |

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

|                           |                 |                                    |
|---------------------------|-----------------|------------------------------------|
| Temperature Coefficient   |                 | ±0.02 %/K max.                     |
| Start-up Time             |                 | 50 ms typ.                         |
| Short Circuit Protection  |                 | Continuous, Automatic recovery     |
| Output Current Limitation |                 | 180% typ. of I <sub>out</sub> max. |
| Transient Response        | - Response Time | 250 µs typ. (25% Load Step)        |

### Safety Specifications

|                  |                             |  |
|------------------|-----------------------------|--|
| Standards        | - IT / Multimedia Equipment | EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1         |
|                  | - Certification Documents   | <a href="http://www.tracopower.com/overview/tmr9wi">www.tracopower.com/overview/tmr9wi</a> |
| Pollution Degree |                             | PD 2   |

### EMC Specifications

|               |                             |   |
|---------------|-----------------------------|---|
| EMI Emissions | - Conducted Emissions       | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)  |
|               | - Radiated Emissions        | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter)  |
|               |                             | External filter proposal: <a href="http://www.tracopower.com/overview/tmr9wi">www.tracopower.com/overview/tmr9wi</a>  |
| EMS Immunity  | - Electrostatic Discharge   | Air: EN 61000-4-2, ±8 kV, perf. criteria A<br>Contact: EN 61000-4-2, ±6 kV, perf. criteria A  |
|               | - RF Electromagnetic Field  | EN 61000-4-3, 20 V/m, perf. criteria A  |
|               | - EFT (Burst) / Surge       | EN 61000-4-4, ±2 kV, perf. criteria A<br>EN 61000-4-5, ±2 kV, perf. criteria A  |
|               | - Conducted RF Disturbances | Ext. input component: 24 V <sub>in</sub> models: KY 220 µF    SMDJ70A<br>48 V <sub>in</sub> models: KY 220 µF    SMDJ120A<br>EN 61000-4-6, 10 V <sub>rms</sub> , perf. criteria A |
|               | - PF Magnetic Field         | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A   |

### General Specifications

|                           |  |  |
|---------------------------|--|--|
| Relative Humidity         |  | 95% max. (non condensing)  |
| Temperature Ranges        | - Operating Temperature                    | -40°C to +85°C   |
|                           | - Case Temperature                         | +100°C max.  |
|                           | - Storage Temperature                      | -55°C to +125°C  |
| Power Derating            | - High Temperature                         | Depending on model   |
|                           |  | See application note: <a href="http://www.tracopower.com/overview/tmr9wi">www.tracopower.com/overview/tmr9wi</a> |
| Cooling System            |  | Natural convection (20 LFM)  |
| Remote Control            | - Voltage Controlled Remote (passive = on) | On: 0 to 0.5 VDC or open circuit<br>Off: 3 to 12 VDC   |
|                           | - Off Idle Input Current                   | Refers to 'Remote' and '-Vin' Pin<br>2.5 mA max.   |
| Altitude During Operation |  | 5'000 m max.   |
| Regulator Topology        |  | Flyback Converter  |
| Switching Frequency       |  | 400 kHz typ. (PWM) (single output models)  |
|                           |  | 500 kHz typ. (PWM) (dual output models)  |
| Insulation System         |  | Functional Insulation  |
| Isolation Test Voltage    | - Input to Output, 60 s                    | 1'600 VDC  |
|                           | - Input to Case, 60 s                      | 1'000 VDC  |
|                           | - Output to Case, 60 s                     | 1'000 VDC  |
| Isolation Resistance      | - Input to Output, 500 VDC                 | 1'000 MΩ min.  |
| Isolation Capacitance     | - Input to Output, 100 kHz, 1 V            | 50 pF max.   |

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

|                          |  |  |
|--------------------------|--|--|
| Reliability              | - Calculated MTBF  | 2'940'000 h (for standard version)<br>2'640'000 h (for plastic version)<br>(MIL-HDBK-217F, ground benign)  |
| Washing Process          |  | According to Cleaning Guideline<br><a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>  |
| Environment              | - Vibration<br>- Thermal Shock   | MIL-STD-810F<br>MIL-STD-810F   |
| Housing Material         |  | Copper (for standard version)<br>non-conductive plastic (for plastic version)  |
| Potting Material         |  | Silicone (UL 94 V-0 rated)   |
| Pin Material             |  | Copper   |
| Pin Foundation Plating   |  | Nickel (2 - 3 µm)  |
| Pin Surface Plating      |  | Tin (3 - 5 µm), matte  |
| Housing Type             |  | Metal Case   |
| Mounting Type            |  | PCB Mount  |
| Connection Type          |  | THD (Through-Hole Device)  |
| Footprint Type           |  | SIP8   |
| Soldering Profile        |  | Lead-Free Wave Soldering<br>260°C / 6 s max.   |
| Weight                   |  | 5.9 g (for standard version)<br>4.8 g (for plastic version)  |
| Environmental Compliance | - REACH Declaration<br><br>- RoHS Declaration<br><br>- SCIP Reference Number | <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a><br>REACH SVHC list compliant<br>REACH Annex XVII compliant<br><a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a><br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))<br>d8371d3a-5c43-4990-a9e2-1a156c2ee4ba |

## Supporting Documents

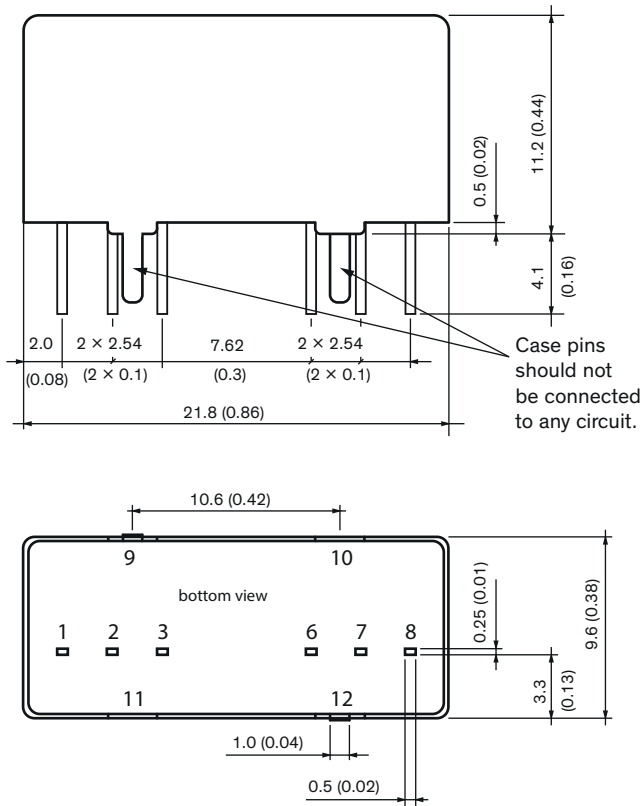
Overview Link (for additional Documents)

[www.tracopower.com/overview/tmr9wi](http://www.tracopower.com/overview/tmr9wi)

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

### Outline Dimensions

#### Metal package (standard)



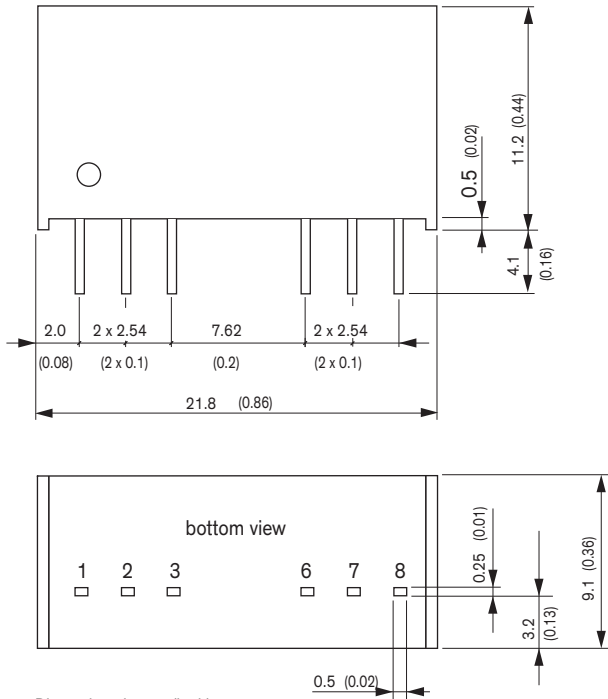
Dimensions in mm (inch)  
 Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin pitch Tolerance  $\pm 0.25$  ( $\pm 0.01$ )

Case pins should not be connected to any circuit.

| Pinout |               |             |
|--------|---------------|-------------|
| Pin    | Single Output | Dual Output |
| 1      | -Vin (GND)    | -Vin (GND)  |
| 2      | +Vin (Vcc)    | +Vin (Vcc)  |
| 3      | Remote        | Remote      |
| 6      | +Vout         | +Vout       |
| 7      | -Vout         | Common      |
| 8      | NC            | -Vout       |
| 9      | Case          | Case        |
| 10     | Stand Off     | Stand Off   |
| 11     | Stand Off     | Stand Off   |
| 12     | Case          | Case        |

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

### Plastic package (option)





Dimensions in mm (inch)  
 Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin pitch Tolerance  $\pm 0.25$  ( $\pm 0.01$ )

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

## Looking for pricing, stock, or lifecycle information?

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