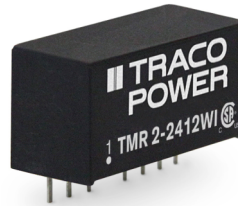


- Ultra-wide 4:1 input range
- SIP-9 package
- Temperature range  $-40$  to  $+85^{\circ}\text{C}$
- High efficiency
- Excellent load and line regulation
- Indefinite short-circuit protection
- I/O isolation 1500 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



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<br>(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<br>(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: 20 mA typ.<br>48 Vin models: 15 mA typ.                                                                                                |
|                           | - At full load | 24 Vin models: 110 mA typ.<br>48 Vin models: 55 mA typ.                                                                                               |
| Surge Voltage             |                | 24 Vin models: 50 VDC max. (1 s max.)<br>48 Vin models: 100 VDC max. (1 s max.)                                                                       |
| Start-up Voltage          |                | 24 Vin models: 4.5 VDC min. / 6 VDC typ. / 8.5 VDC max.<br>48 Vin models: 8.5 VDC min. / 12 VDC typ. / 17 VDC max.                                    |
| Under Voltage Lockout     |                | 24 Vin models: 8 VDC max.<br>48 Vin models: 16 VDC max.                                                                                               |
| Reflected Ripple Current  |                | 24 Vin models: 300 mAp-p typ.<br>48 Vin models: 600 mAp-p typ.                                                                                        |
| Recommended Input Fuse    |                | 24 Vin models: 350 mA (slow blow)<br>48 Vin models: 135 mA (slow blow)<br>(The need of an external fuse has to be assessed in the final application.) |
| Input Filter              |                | Internal Capacitor                                                                                                                                    |
| Short Circuit Input Power |                | 1.5 W max.                                                                                                                                            |

## Output Specifications

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

## Safety Specifications

|           |                             |                                                |
|-----------|-----------------------------|------------------------------------------------|
| Standards | - IT / Multimedia Equipment | Designed for IEC/EN/UL 62368-1 (not certified) |
|-----------|-----------------------------|------------------------------------------------|

## 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: |                       | <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

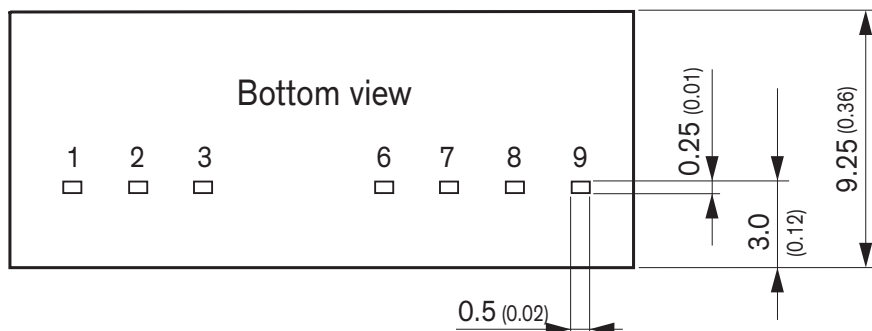
|                          |                                                                                                                                                                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Relative Humidity        |                                                                                                                                                                    | 95% max. (non condensing)                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| Temperature Ranges       | <ul style="list-style-type: none"> <li>- Operating Temperature</li> <li>- Case Temperature</li> <li>- Storage Temperature</li> </ul>                               | -40°C to +85°C<br>+90°C max.<br>-55°C to +105°C                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Power Derating           | <ul style="list-style-type: none"> <li>- High Temperature</li> </ul>                                                                                               | 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           | <ul style="list-style-type: none"> <li>- Voltage Controlled Remote (passive = on)</li> <li>- Off Idle Input Current</li> <li>- Remote Pin Input Current</li> </ul> | On: < 0.6 VDC or open circuit<br>Off: 2.9 to 15 VDC<br>Refers to 'Remote' and '-Vin' Pin<br>3 mA max.<br>-1.0 to 1.0 mA                                                                                                                                                                                                                                                                                                                                                                   |
| Regulator Topology       |                                                                                                                                                                    | RCC Converter                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Switching Frequency      |                                                                                                                                                                    | 100 - 650 kHz (PFM)<br>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.<br>500 pF max.                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Reliability              | - Calculated MTBF                                                                                                                                                  | 1'200'000 h (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>                                                                                                                                                                                                                                                                                                                                                         |
| 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        |                                                                                                                                                                    | Lead-Free Wave Soldering<br>260°C / 10 s max.                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Weight                   |                                                                                                                                                                    | 6.5 g                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Environmental Compliance | <ul style="list-style-type: none"> <li>- REACH Declaration</li> <li>- RoHS Declaration</li> <li>- SCIP Reference Number</li> </ul>                                 | <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>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> |
|------------------------------------------|--------------------------------------------------------------------------------------------|

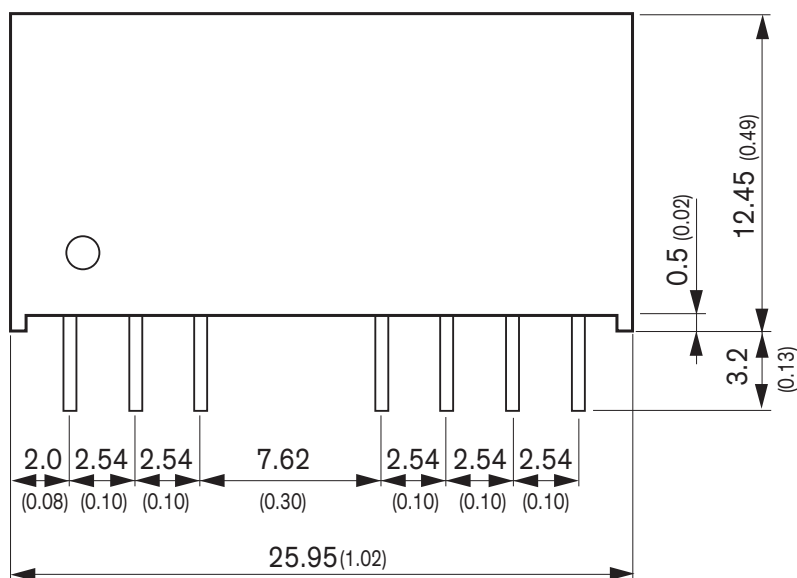
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

## 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  $\pm 0.2$  ( $\pm 0.008$ )

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