The TMR 9 series is a new family of isolated 9W DC/DC converter modules with regulated output, featuring wide 2:1 input voltage ranges. The product comes in a ultra-compact SIP-8 metal package with a small footprint occupying only 2.0 cm² (0.3 square inch) of board space.

An excellent efficiency allows –40° to +60°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

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMR 9-1210</td>
<td>9 - 18 VDC (12 VDC nom.)</td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
</tr>
<tr>
<td>TMR 9-1211</td>
<td>9 VDC</td>
<td>3.3 VDC</td>
<td>2’000 mA</td>
<td>85 %</td>
</tr>
<tr>
<td>TMR 9-1212</td>
<td>12 VDC</td>
<td>5 VDC</td>
<td>1’600 mA</td>
<td>85 %</td>
</tr>
<tr>
<td>TMR 9-1213</td>
<td>15 VDC</td>
<td>9 VDC</td>
<td>1’000 mA</td>
<td>87 %</td>
</tr>
<tr>
<td>TMR 9-1215</td>
<td>24 VDC</td>
<td>12 VDC</td>
<td>750 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TMR 9-1221</td>
<td>18 VDC</td>
<td>+5 VDC</td>
<td>600 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TMR 9-1222</td>
<td>15 VDC</td>
<td>+12 VDC</td>
<td>375 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TMR 9-1223</td>
<td>12 VDC</td>
<td>+15 VDC</td>
<td>300 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TMR 9-2410</td>
<td>18 - 36 VDC (24 VDC nom.)</td>
<td>3.3 VDC</td>
<td>2’000 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TMR 9-2411</td>
<td>12 VDC</td>
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<td>12 VDC</td>
<td>750 mA</td>
<td>89 %</td>
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<tr>
<td>TMR 9-2415</td>
<td>24 VDC</td>
<td>15 VDC</td>
<td>600 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TMR 9-2421</td>
<td>36 VDC</td>
<td>+5 VDC</td>
<td>375 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TMR 9-2422</td>
<td>24 VDC</td>
<td>+12 VDC</td>
<td>300 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TMR 9-2423</td>
<td>18 VDC</td>
<td>+15 VDC</td>
<td>800 mA</td>
<td>90 %</td>
</tr>
<tr>
<td>TMR 9-4810</td>
<td>36 - 75 VDC (48 VDC nom.)</td>
<td>3.3 VDC</td>
<td>2’000 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TMR 9-4811</td>
<td>12 VDC</td>
<td>5 VDC</td>
<td>1’600 mA</td>
<td>85 %</td>
</tr>
<tr>
<td>TMR 9-4812</td>
<td>15 VDC</td>
<td>9 VDC</td>
<td>1’000 mA</td>
<td>88 %</td>
</tr>
<tr>
<td>TMR 9-4813</td>
<td>24 VDC</td>
<td>12 VDC</td>
<td>750 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TMR 9-4815</td>
<td>24 VDC</td>
<td>15 VDC</td>
<td>600 mA</td>
<td>89 %</td>
</tr>
<tr>
<td>TMR 9-4821</td>
<td>75 VDC</td>
<td>+5 VDC</td>
<td>375 mA</td>
<td>89 %</td>
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<tr>
<td>TMR 9-4822</td>
<td>24 VDC</td>
<td>+12 VDC</td>
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<td>18 VDC</td>
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<td>800 mA</td>
<td>89 %</td>
</tr>
</tbody>
</table>

### Options

- on demand (backorder with MOQ, non stocking item)
- models with plastic case

www.tracopower.com  January 7, 2022
### Input Specifications

| Input Current | - At no load       | 12 Vin models: 11 mA typ. |
|              | 24 Vin models: 7 mA typ. |
|              | 48 Vin models: 3 mA typ. |

| Surge Voltage | 12 Vin models: 36 VDC max. (1 s max) |
|              | 24 Vin models: 50 VDC max. (1 s max) |
|              | 48 Vin models: 100 VDC max. (1 s max) |

| Recommended Input Fuse | 12 Vin models: 3'150 mA (slow blow) |
|                        | 24 Vin models: 2'500 mA (slow blow) |
|                        | 48 Vin models: 1'250 mA (slow blow) |

(The need of an external fuse has to be assessed in the final application.)

### Output Specifications

<table>
<thead>
<tr>
<th>Voltage Set Accuracy</th>
<th>±1% max.</th>
</tr>
</thead>
</table>

#### Regulation

- Input Variation (Vmin - Vmax)
  - single output models: 0.2% max.
  - dual output models: 0.2% max.
- Load Variation (0 - 100%)
  - single output models: 1% max.
    - dual output models: 1% max. (Output 1)
    - 1% max. (Output 2)
- Cross Regulation (25% / 100% asym. load)
  - dual output models: 5% max.

#### Ripple and Noise

(20 MHz Bandwidth)

- single output
  - 3.3 Vout models: 50 mVp-p typ. (w/ 1 μF X7R)
  - 5 Vout models: 50 mVp-p typ. (w/ 1 μF X7R)
  - 9 Vout models: 50 mVp-p typ. (w/ 1 μF X7R)
  - 12 Vout models: 75 mVp-p typ. (w/ 1 μF X7R)
  - 15 Vout models: 75 mVp-p typ. (w/ 1 μF X7R)
  - 24 Vout models: 75 mVp-p typ. (w/ 1 μF X7R)
- dual output
  - 5 / -5 Vout models: 50 / 50 mVp-p typ. (w/ 1 μF X7R)
  - 12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 1 μF X7R)
  - 15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 1 μF X7R)

#### Capacitive Load

- single output
  - 3.3 Vout models: 2'600 μF max.
  - 5 Vout models: 1'300 μF max.
  - 9 Vout models: 800 μF max.
  - 12 Vout models: 560 μF max.
  - 15 Vout models: 560 μF max.
  - 24 Vout models: 200 μF max.
- dual output
  - 5 / -5 Vout models: 800 / 800 μF max.
  - 12 / -12 Vout models: 390 / 390 μF max.
  - 15 / -15 Vout models: 200 / 200 μF max.

#### Minimum Load

Not required

#### Temperature Coefficient

±0.02 %/K max.

#### Start-up Time

50 ms typ.

#### Short Circuit Protection

Continuous, Automatic recovery

#### Output Current Limitation

180% typ. of Iout max.

#### Transient Response

- Response Time
  - 250 μs typ. (25% Load Step)

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

| Safety Standards | EN 60950-1  
|                 | EN 62368-1  
|                 | IEC 60950-1  
|                 | IEC 62368-1  
|                 | UL 60950-1  
|                 | UL 62368-1  
| Certification Documents | [www.tracopower.com/overview/tmr9](http://www.tracopower.com/overview/tmr9)  

## EMC Specifications

| EMI Emissions | - Conducted Emissions  
|               | EN 55032 class A (with external filter)  
|               | EN 55032 class B (with external filter)  
|               | - Conducted RF Disturbances  
|               | Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A  
|               | Ext. input component: 24 Vin models: KY 220 µF // SMDJ70A  
|               | 48 Vin models: KY 220 µF // SMDJ120A  
| Radiated Emissions | EN 55032 class A (with external filter)  
| 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  
| EMS Immunity | External filter proposal: [www.tracopower.com/overview/tmr9](http://www.tracopower.com/overview/tmr9)  
| Electrostatic Discharge | Air: EN 61000-4-2, ±8 kV, perf. criteria A  
| 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  
| Ext. input component | 24 Vin models: KY 220 µF // SMDJ70A  
| Conducted RF Disturbances | Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A  
| PF Magnetic Field | Contact: [www.tracopower.com/overview/tmr9](http://www.tracopower.com/overview/tmr9)  

## 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  
| Remote Control | - Voltage Controlled Remote  
|                | On: 0 to 0.5 VDC or open circuit  
|                | Off: 3 to 12 VDC  
|                | 2.5 mA max.  
| Altitude During Operation | 2'000 m max. (for basic insulation)  
| | 5'000 m max. (for functional insulation)  
| 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  
|                       | 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.  
| Reliability | - Calculated MTBF  
|            | 2'940'000 h (for standard version)  
|            | 2'700'000 h (for plastic version) (MIL-HDBK-217F, ground benign)  
| Environment | - Vibration  
|             | - Thermal Shock  
|             | MIL-STD-810F  
|             | MIL-STD-810F  
| Housing Material | Copper (for standard version)  
|                | Non-conductive plastic (for plastic version)  
| Potting Material | Silicone (UL 94 V-0 rated)  
| Pin Material | Copper  

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

Weight  
5.9 g (for standard version)
4.8 g (for plastic version)

Environmental Compliance  
- REACH Declaration
  www.tracopower.com/info/reach-declaration.pdf
  REACH SVHC list compliant
  REACH Annex XVII compliant

- RoHS Declaration
  www.tracopower.com/info/rohs-declaration.pdf
  Exemptions: 7a, 7c-I
  (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (OE5A rule).
  The SCIP number is provided on request.)

Supporting Documents
Overview Link (for additional Documents)  
www.tracopower.com/overview/tmr9

Outline Dimensions

Metal package (standard)

Pinout

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single Output</th>
<th>Dual Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>−Vin (GND)</td>
<td>−Vin (GND)</td>
</tr>
<tr>
<td>2</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>3</td>
<td>Remote</td>
<td>Remote</td>
</tr>
<tr>
<td>6</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>7</td>
<td>−Vout</td>
<td>Common</td>
</tr>
<tr>
<td>8</td>
<td>NC</td>
<td>−Vout</td>
</tr>
<tr>
<td>9</td>
<td>Case</td>
<td>Case</td>
</tr>
<tr>
<td>10</td>
<td>Stand Off</td>
<td>Stand Off</td>
</tr>
<tr>
<td>11</td>
<td>Stand Off</td>
<td>Stand Off</td>
</tr>
<tr>
<td>12</td>
<td>Case</td>
<td>Case</td>
</tr>
</tbody>
</table>

Dimensions in mm (inch)

Tolerances: ±0.5 (±0.02)
Pin pitch Tolerance ±0.25 (±0.01)

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:

Pin pitch Tolerance ±0.25 (±0.01)

Pinout

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<tr>
<th>Pin</th>
<th>Single Output</th>
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</tr>
</thead>
<tbody>
<tr>
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<tr>
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<td>+Vin (Vcc)</td>
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</tr>
<tr>
<td>3</td>
<td>Remote</td>
<td>Remote</td>
</tr>
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<td>+Vout</td>
</tr>
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