DC/DC Converter TMR 12WI Series, 12 Watt

- Ultra compact 12 Watt converter in SIP-8 metal casing
- Highest power density of 4.73W/cm³
- Wide 4:1 input voltage ranges
- I/O-isolation 1600 VDC
- High efficiency (up to 90%) for low thermal loss
- Operating temperature range -40°C to +85°C
- Fully regulated outputs
- Remote On/Off control
- Indefinite short circuit protection
- 3-year product warranty

The TMR 12WI series is a family of isolated 12W DC/DC converter modules with regulated output, featuring wide 4:1 input voltage ranges. The product offers a very high power density of 4.73W/cm³ in an ultra-compact SIP-8 metal package occupying only 2.0 cm² (0.3 square inch) of board space. An excellent efficiency of up to 90% allows for an extended operating temperature range of -40°C to +85°C without derating under natural convection conditions (see recommended PCB layout). Further features include remote On/Off control, continuous short circuit protection and an I/O isolation voltage of 1600 VDC. 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 (VDC)</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vnom</td>
<td>Imax</td>
<td>Vnom</td>
<td>Imax</td>
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<tr>
<td>TMR 12-1210WI</td>
<td>3.3 VDC</td>
<td>3'000 mA</td>
<td>87 %</td>
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<tr>
<td>TMR 12-1211WI</td>
<td>5.1 VDC</td>
<td>2'400 mA</td>
<td>89 %</td>
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<td>TMR 12-1212WI</td>
<td>12 VDC</td>
<td>1'000 mA</td>
<td>89 %</td>
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<td>TMR 12-1213WI</td>
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<td>800 mA</td>
<td>89 %</td>
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<tr>
<td>TMR 12-1215WI</td>
<td>24 VDC</td>
<td>500 mA</td>
<td>90 %</td>
<td></td>
</tr>
<tr>
<td>TMR 12-1221WI</td>
<td>+5 VDC</td>
<td>1'200 mA</td>
<td>-5 VDC</td>
<td>86 %</td>
</tr>
<tr>
<td>TMR 12-1222WI</td>
<td>+12 VDC</td>
<td>500 mA</td>
<td>-12 VDC</td>
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<tr>
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<td>87 %</td>
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<td>2'400 mA</td>
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<td></td>
</tr>
<tr>
<td>TMR 12-2413WI</td>
<td>15 VDC</td>
<td>800 mA</td>
<td>89 %</td>
<td></td>
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<td>TMR 12-2415WI</td>
<td>24 VDC</td>
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</tr>
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</tr>
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<td>+12 VDC</td>
<td>500 mA</td>
<td>-12 VDC</td>
<td>500 mA</td>
</tr>
<tr>
<td>TMR 12-2423WI</td>
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<td>400 mA</td>
<td>-15 VDC</td>
<td>400 mA</td>
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<tr>
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<td>15 VDC</td>
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<td>89 %</td>
<td></td>
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<tr>
<td>TMR 12-4815WI</td>
<td>24 VDC</td>
<td>500 mA</td>
<td>90 %</td>
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<td>+5 VDC</td>
<td>1'200 mA</td>
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<td>86 %</td>
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<tr>
<td>TMR 12-4822WI</td>
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<td>500 mA</td>
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<tr>
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<td>+15 VDC</td>
<td>400 mA</td>
<td>-15 VDC</td>
<td>400 mA</td>
</tr>
</tbody>
</table>
### Options

**on demand (backorder with MOQ non stocking item)**
- Optional model with 9 VDC / 1'333 mA Output and 4.5 - 18 VDC Input
- Optional model with 9 VDC / 1'333 mA Output and 9 - 36 VDC Input
- Optional model with 9 VDC / 1'333 mA Output and 18 - 75 VDC Input
- Optional models with 3'000 VDC I/O-isolation

### Input Specifications

**Input Current**
- At no load
  - 12 Vin models: 25 mA typ. (3.3 Vout model)
  - 25 mA typ. (5.1 Vout model)
  - 12 mA typ. (9 Vout model)
  - 12 mA typ. (12 Vout model)
  - 12 mA typ. (15 Vout model)
  - 12 mA typ. (24 Vout model)
  - 12 mA typ. (5 / -5 Vout model)
  - 12 mA typ. (12 / -12 Vout model)
  - 12 mA typ. (15 / -15 Vout model)
  - 24 Vin models: 6 mA typ. (3.3 Vout model)
  - 7 mA typ. (5.1 Vout model)
  - 6 mA typ. (9 Vout model)
  - 6 mA typ. (12 Vout model)
  - 6 mA typ. (15 Vout model)
  - 6 mA typ. (24 Vout model)
  - 6 mA typ. (5 / -5 Vout model)
  - 6 mA typ. (12 / -12 Vout model)
  - 6 mA typ. (15 / -15 Vout model)
  - 48 Vin models: 3 mA typ. (3.3 Vout model)
  - 4 mA typ. (5.1 Vout model)
  - 3 mA typ. (9 Vout model)
  - 3 mA typ. (12 Vout model)
  - 3 mA typ. (15 Vout model)
  - 3 mA typ. (24 Vout model)
  - 3 mA typ. (5 / -5 Vout model)
  - 3 mA typ. (12 / -12 Vout model)
  - 3 mA typ. (15 / -15 Vout model)

**Surge Voltage**
- 12 Vin models: 25 VDC max. (1 s max)
- 24 Vin models: 50 VDC max. (1 s max)
- 48 Vin models: 100 VDC max. (1 s max)

**Input Inrush Current**
- 50 A typ

**Under Voltage Lockout**
- 12 Vin models: 2.5 VDC min. / 3.5 VDC typ. / 4.4 VDC max.
- 24 Vin models: 6.2 VDC min. / 7.2 VDC typ. / 8.2 VDC max.
- 48 Vin models: 12.5 VDC min. / 14.5 VDC typ. / 16.4 VDC max.

**Recommended Input Fuse**
- 12 Vin models: 5'000 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)*

**Input Filter**
- Internal Capacitor

### Output Specifications

**Voltage Set Accuracy**
- ±1% max.
<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
<th>Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulation</td>
<td>Input Variation (Vmin - Vmax) single output models</td>
<td>0.2% max.</td>
</tr>
<tr>
<td></td>
<td>Load Variation (0 - 100%) single output models</td>
<td>0.5% max.</td>
</tr>
<tr>
<td></td>
<td>Voltage Balance (symmetrical load) single output models</td>
<td>1% max. (Output 1)</td>
</tr>
<tr>
<td></td>
<td>Cross Regulation (25% / 100% asym. load) dual output models</td>
<td>5% max.</td>
</tr>
<tr>
<td></td>
<td>Load Variation (0 - 100%) dual output models</td>
<td>0.5% max.</td>
</tr>
<tr>
<td></td>
<td>(Output 1)</td>
<td>1% max.</td>
</tr>
<tr>
<td></td>
<td>(Output 2)</td>
<td>5% max.</td>
</tr>
<tr>
<td></td>
<td>Ripple and Noise (20 MHz Bandwidth)</td>
<td>3.3 Vout models: 50 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.1 Vout models: 50 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 Vout models: 75 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 Vout models: 75 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 Vout models: 75 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>24 Vout models: 75 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5 / -5 Vout models: 50 / 50 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 1 µF)</td>
</tr>
<tr>
<td></td>
<td>Capacitive Load</td>
<td>3.3 Vout models: 3'500 µF max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5.1 Vout models: 1'800 µF max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>9 Vout models: 1'100 µF max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 Vout models: 680 µF max.</td>
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<tr>
<td></td>
<td></td>
<td>15 Vout models: 680 µF max.</td>
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<tr>
<td></td>
<td></td>
<td>24 Vout models: 300 µF max.</td>
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<tr>
<td></td>
<td></td>
<td>5 / -5 Vout models: 1'100 / 1'100 µF max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12 / -12 Vout models: 560 / 560 µF max.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15 / -15 Vout models: 300 / 300 µF max.</td>
</tr>
<tr>
<td>Minimum Load</td>
<td></td>
<td>Not required</td>
</tr>
<tr>
<td>Temperature Coefficient</td>
<td></td>
<td>±0.02 %/K max.</td>
</tr>
<tr>
<td>Hold-up Time</td>
<td></td>
<td>30 µs min.</td>
</tr>
<tr>
<td>Start-up Time</td>
<td></td>
<td>50 ms typ. / 75 ms max.</td>
</tr>
<tr>
<td>Short Circuit Protection</td>
<td></td>
<td>Continuous, Automatic recovery</td>
</tr>
<tr>
<td>Output Current Limitation</td>
<td></td>
<td>160% typ. of Iout max.</td>
</tr>
<tr>
<td>Transient Response</td>
<td>Response Deviation</td>
<td>5% typ. / 7% max. (25% Load Step)</td>
</tr>
<tr>
<td></td>
<td>Response Time</td>
<td>250 µs typ. / 400 µs max. (25% Load Step)</td>
</tr>
</tbody>
</table>

**Safety Specifications**

- **Safety Standards**
  - IT / Multimedia Equipment: EN 62368-1
  - IEC 62368-1
  - UL 62368-1

- **Certification Documents**
  - www.tracopower.com/overview/tmr12wi

- **Pollution Degree**
  - PD 2

- **Over Voltage Category**
  - OVC II

**EMC Specifications**

- **EMI Emissions**
  - Conducted Emissions: EN 55032 class A (with external filter)
  - Radiated Emissions: EN 55032 class B (with external filter)

- **Radiated Emissions**
  - EN 55032 class B (with external filter)

- **External filter proposal**
  - www.tracopower.com/overview/tmr12wi

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
TMR 12WI Series, 12 Watt

EMS Immunity
- 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, 10 V/m, perf. criteria A
  - EN 61000-4-4, ±2 kV, perf. criteria A
- EFT (Burst) / Surge
  - EN 61000-4-5, ±2 kV, perf. criteria A
  - Ext. input component: 12 Vin models: KZN 3300 μF // TVS SMDJ30A
    24 Vin models: KZN 1200 μF // TVS SMDJ70A
    48 Vin models: KZN 390 μF // TVS SMDJ120A
- Conducted RF Disturbances
  - Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A
  - 1 s: 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
  +105°C max.
- Storage Temperature
  -55°C to +125°C

Power Derating
- High Temperature

See application note: www.tracopower.com/overview/tmr12wi
(1 layer PCB layout: ca. up to 55°C w/o derating
2 layer PCB layout: ca. up to 65°C w/o derating
--> For ideal temperature behaviour, use suggested PCB layout from application note.)

Cooling System
Natural convection (20 LFM)

Remote Control
- Voltage Controlled Remote
  On: 0 to 1.2 VDC or open circuit
  Off: 3 to 12 VDC
- Off Idle Input Current
  2.5 mA typ.
- Remote Pin Input Current
  0.5 to 1.0 mA

Altitude During Operation
5'000 m max.

Switching Frequency
290 - 460 kHz (PWM) (all models)
290 kHz typ. (PWM) (3.3 Vout)
390 kHz typ. (PWM) (5.1 Vout)
460 kHz typ. (PWM) (12, 15, 24 Vout)
460 kHz typ. (PWM) (dual models)

Insulation System
Functional Insulation

Isolation Test Voltage
- Input to Output, 60 s
  1'600 VDC
- Input to Output, 1 s
  1'920 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, 1 kHz, 1 V
  600 pF max.

Reliability
- Calculated MTBF
  906'000 h (MIL-HDBK-217F, ground benign)

Washing Process

Environment
- Vibration
- Mechanical Shock
- Thermal Shock

MIL-STD-810F
MIL-STD-810F
MIL-STD-810F

Housing Material
Copper

Potting Material
Silicone (UL 94 V-0 rated)

Pin Material
Tinned Copper

Pin Foundation Plating
Nickel (1 - 2 μm)

Pin Surface Plating
Tin (3 - 5 μm), matte

Housing Type
Metal Case

Mounting Type
PCB Mount

Connection Type
THD (Through-Hole Device)

All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.
**Footprint Type**  SIP8

**Soldering Profile**  Wave Soldering

**Weight**  7.2 g

**Thermal Impedance**  24 K/W

**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 (O5A rule). The SCIP number is provided on request.)

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**Supporting Documents**

**Overview Link** (for additional Documents)  www.tracopower.com/overview/tmr12wi

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**Outline Dimensions**

**Pinout**

<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-Vin</td>
<td>-Vin</td>
</tr>
<tr>
<td>2</td>
<td>+Vin</td>
<td>+Vin</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>

NC = not connected

**Dimensions in mm (inch)**

**TOP VIEW**

- Pin dimension tolerances: ±0.1 (±0.004)

**BOTTOM VIEW**

- Tolerances: x.x ±0.5 (x.xx ±0.02)
- Tolerances: x.xx ±0.25 (x.xxx ±0.01)

Specifications can be changed without notice.