

- Wide 2:1 input voltage range
- Compact SIP-6 package
- Fully regulated outputs
- Cost optimised design
- No minimum load required
- Continuous short circuit protection
- Temperature range -40°C to $+95^{\circ}\text{C}$
- I/O isolation 1500 VDC
- 3-year product warranty



The TMR 1 series is a family of isolated 1 W DC/DC converter modules with regulated output, featuring wide 2:1 input voltage ranges. These products come in a compact SIP-6 package with small footprint.

An excellent efficiency allows -40°C to $+95^{\circ}\text{C}$ operation temperature. Further features continuous short circuit protection. The compact dimensions and cost optimised design make this converters an ideal solution for applications in communication equipment, instrumentation and industrial electronics.

Models

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
|------------|------------------------------|----------|------------------|----------|------------------|-----------------|
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TMR 1-0511 | 4.5 - 9 VDC (5 VDC nom.) | 5 VDC | 200 mA | | | 76 % |
| TMR 1-0512 | | 12 VDC | 83 mA | | | 77 % |
| TMR 1-0513 | | 15 VDC | 67 mA | | | 79 % |
| TMR 1-0515 | | 24 VDC | 42 mA | | | 76 % |
| TMR 1-0522 | | +12 VDC | 42 mA | -12 VDC | 42 mA | 77 % |
| TMR 1-0523 | | +15 VDC | 33 mA | -15 VDC | 33 mA | 78 % |
| TMR 1-1211 | 9 - 18 VDC (12 VDC nom.) | 5 VDC | 200 mA | | | 77 % |
| TMR 1-1212 | | 12 VDC | 83 mA | | | 77 % |
| TMR 1-1213 | | 15 VDC | 67 mA | | | 80 % |
| TMR 1-1215 | | 24 VDC | 42 mA | | | 77 % |
| TMR 1-1222 | | +12 VDC | 42 mA | -12 VDC | 42 mA | 79 % |
| TMR 1-1223 | | +15 VDC | 33 mA | -15 VDC | 33 mA | 78 % |
| TMR 1-2411 | 18 - 36 VDC (24 VDC nom.) | 5 VDC | 200 mA | | | 77 % |
| TMR 1-2412 | | 12 VDC | 83 mA | | | 80 % |
| TMR 1-2413 | | 15 VDC | 67 mA | | | 80 % |
| TMR 1-2415 | | 24 VDC | 42 mA | | | 77 % |
| TMR 1-2422 | | +12 VDC | 42 mA | -12 VDC | 42 mA | 80 % |
| TMR 1-2423 | | +15 VDC | 33 mA | -15 VDC | 33 mA | 80 % |
| TMR 1-4811 | 36 - 75 VDC (48 VDC nom.) | 5 VDC | 200 mA | | | 77 % |
| TMR 1-4812 | | 12 VDC | 83 mA | | | 78 % |
| TMR 1-4813 | | 15 VDC | 67 mA | | | 78 % |
| TMR 1-4815 | | 24 VDC | 42 mA | | | 76 % |
| TMR 1-4822 | | +12 VDC | 42 mA | -12 VDC | 42 mA | 79 % |
| TMR 1-4823 | | +15 VDC | 33 mA | -15 VDC | 33 mA | 79 % |

Input Specifications

| | | |
|--------------------------|--------------|---|
| Input Current | - At no load | 5 Vin models: 40 mA typ. 12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 7 mA typ. |
| Surge Voltage | | 5 Vin models: 15 VDC max. (1 s max.) 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.) |
| Under Voltage Lockout | | 5 Vin models: 4 VDC max. 12 Vin models: 8.5 VDC max. 24 Vin models: 17.5 VDC max. 48 Vin models: 35.5 VDC max. (Long term operation at undervoltage will damage the converter) |
| Reflected Ripple Current | | 5 Vin models: 80 mAp-p typ. 12 Vin models: 40 mAp-p typ. 24 Vin models: 30 mAp-p typ. 48 Vin models: 20 mAp-p typ. |
| Recommended Input Fuse | | 5 Vin models: 500 mA (slow blow) 12 Vin models: 250 mA (slow blow) 24 Vin models: 120 mA (slow blow) 48 Vin models: 60 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |

Output Specifications

| | | |
|---------------------------|---------------------------------|---|
| Voltage Set Accuracy | | ±1% max. |
| Regulation | - Input Variation (Vmin - Vmax) | single output models: 0.2% max. dual output models: 0.2% max. |
| | - Load Variation (10 - 90%) | single output models: 0.5% max. dual output models: 0.8% max. (Output 1) 0.8% max. (Output 2) |
| Ripple and Noise | - 20 MHz Bandwidth | 110 mVp-p max. |
| Capacitive Load | - single output | 5 Vout models: 1'680 µF max. 12 Vout models: 820 µF max. 15 Vout models: 680 µF max. 24 Vout models: 470 µF max. |
| | - dual output | 12 / -12 Vout models: 470 / 470 µF max. 15 / -15 Vout models: 330 / 330 µF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Short Circuit Protection | | Automatic recovery |
| Overload Protection | | Foldback Mode |
| Output Current Limitation | | 120% min. of Iout max. 130% typ. of Iout max. |
| Transient Response | - Response Deviation | 5% max. (25% Load Step) |
| | - Response Time | 250 µs typ. (25% Load Step) |

Safety Specifications

| | | |
|------------------|-----------------------------|--|
| Safety Standards | - IT / Multimedia Equipment | CSA-C22.2, No 60950-1 EN 60950-1 IEC 60950-1 UL 60950-1 |
| | - Certification Documents | www.tracopower.com/overview/tmr1 |
| Pollution Degree | | PD 2 |

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

EMC Specifications

| | | |
|---------------|-----------------------|--|
| EMI Emissions | - Conducted Emissions | EN 55032 class A (with external filter) FCC Part 15 class A (with external filter) |
| | | External filter proposal: www.tracopower.com/overview/tmr1 |

General Specifications

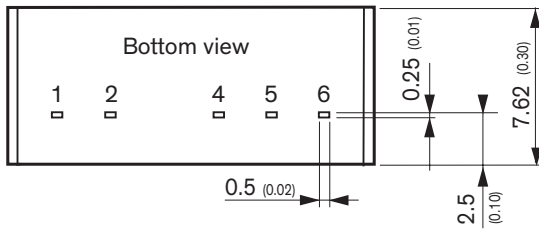
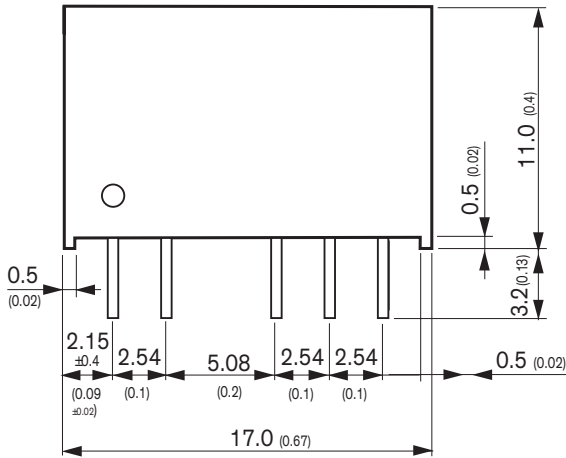
| | | |
|---------------------------|--|--|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | - Operating Temperature - Case Temperature - Storage Temperature | -40°C to +95°C +105°C max. -55°C to +125°C |
| Power Derating | - High Temperature | 5 %/K above 95°C |
| Cooling System | | Natural convection (20 LFM) |
| Altitude During Operation | | 4'000 m max. |
| Switching Frequency | | 220 kHz typ. (PFM) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | 1'500 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 | 2'800'000 h (MIL-HDBK-217F, ground benign) |
| Housing Material | | Non-conductive Plastic (UL94 V-0 rated) |
| Potting Material | | Epoxy (UL 94 V-0 rated) |
| Pin Material | | Nickel-Iron (Alloy 42) |
| Pin Foundation Plating | | Nickel (1.5 μm min.) Copper (1 - 1.5 μm) |
| Pin Surface Plating | | Tin (3 - 5 μm), matte |
| Soldering Profile | | Wave Soldering 260°C / 10 s max. |
| Connection Type | | THD (Through-Hole Device) |
| Weight | | 3.1 g |
| Environmental Compliance | - Reach - RoHS | www.tracopower.com/info/reach-declaration.pdf www.tracopower.com/info/rohs-declaration.pdf |

Supporting Documents

| | |
|--|--|
| Overview Link (for additional Documents) | www.tracopower.com/overview/tmr1 |
|--|--|

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

Outline Dimensions



Dimensions in [mm], () = Inch
 Tolerances: ±0.5 (±0.02)
 Pin pitch tolerances: ±0.25 (±0.01)

| Pinout | | |
|--------|---------------|-------------|
| Pin | Single Output | Dual Output |
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | +Vin (Vcc) | +Vin (Vcc) |
| 4 | +Vout | +Vout |
| 5 | No pin | Common |
| 6 | -Vout | -Vout |