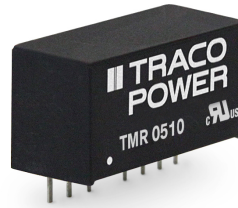




THE DATASHEET OF TMR 2412



- Wide 2:1 input voltage range
- Compact SIP-8 package
- Small footprint
- Remote On/Off control
- Temperature range -40° to $+85^{\circ}\text{C}$
- High efficiency
- Excellent load and line regulation
- Indefinite short-circuit protection
- I/O isolation 1600 VDC
- 3-year product warranty



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

An excellent efficiency allows -40° to $+85^{\circ}\text{C}$ operation temperatures. Further features include remote On/Off control and continuous short circuit protection. The ultra-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 _{max} | Vnom | I _{max} | |
| TMR 0510 | 4.5 - 9 VDC (5 VDC nom.) | 3.3 VDC | 500 mA | | | 76 % |
| TMR 0511 | | 5 VDC | 400 mA | | | 80 % |
| TMR 0512 | | 12 VDC | 167 mA | | | 81 % |
| TMR 0521 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 79 % |
| TMR 0522 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 82 % |
| TMR 0523 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 81 % |
| TMR 1210 | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 500 mA | | | 77 % |
| TMR 1211 | | 5 VDC | 400 mA | | | 81 % |
| TMR 1212 | | 12 VDC | 167 mA | | | 83 % |
| TMR 1221 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 81 % |
| TMR 1222 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 83 % |
| TMR 1223 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 84 % |
| TMR 2410 | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 500 mA | | | 78 % |
| TMR 2411 | | 5 VDC | 400 mA | | | 81 % |
| TMR 2412 | | 12 VDC | 167 mA | | | 83 % |
| TMR 2421 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 80 % |
| TMR 2422 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 83 % |
| TMR 2423 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 82 % |
| TMR 4810 | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 500 mA | | | 76 % |
| TMR 4811 | | 5 VDC | 400 mA | | | 78 % |
| TMR 4812 | | 12 VDC | 167 mA | | | 83 % |
| TMR 4821 | | +5 VDC | 200 mA | -5 VDC | 200 mA | 80 % |
| TMR 4822 | | +12 VDC | 83 mA | -12 VDC | 83 mA | 81 % |
| TMR 4823 | | +15 VDC | 67 mA | -15 VDC | 67 mA | 81 % |

Input Specifications

| | | |
|------------------------|----------------|---|
| Input Current | - At no load | 24 Vin models: 15 mA typ. 48 Vin models: 8 mA typ. 5 Vin models: 35 mA typ. (3.3 Vout model) 35 mA typ. (5 Vout model) 40 mA typ. (12 Vout model) 40 mA typ. (5 / -5 Vout model) 40 mA typ. (12 / -12 Vout model) 40 mA typ. (15 / -15 Vout model) |
| | - At full load | 12 Vin models: 20 mA typ. (3.3 Vout model) 20 mA typ. (5 Vout model) 20 mA typ. (12 Vout model) 30 mA typ. (5 / -5 Vout model) 30 mA typ. (12 / -12 Vout model) 30 mA typ. (15 / -15 Vout model) 5 Vin models: 645 mA max. 12 Vin models: 242 mA max. 24 Vin models: 117 mA max. 48 Vin models: 62 mA max. |
| Surge Voltage | | 5 Vin models: 15 VDC max. (100 ms max.) 12 Vin models: 36 VDC max. (100 ms max.) 24 Vin models: 50 VDC max. (100 ms max.) 48 Vin models: 100 VDC max. (100 ms max.) |
| Recommended Input Fuse | | 5 Vin models: 1'600 mA (slow blow) 12 Vin models: 1'000 mA (slow blow) 24 Vin models: 1'000 mA (slow blow) 48 Vin models: 1'000 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. |
| 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) |
| | - Cross Regulation (25% / 100% asym. load) | dual output models: 5% max. |
| Ripple and Noise | - 20 MHz Bandwidth | 50 mVp-p typ. |
| Capacitive Load | - single output | 3.3 Vout models: 2'200 µF max. 5 Vout models: 1'000 µF max. 12 Vout models: 170 µF max. |
| | - dual output | 5 / -5 Vout models: 470 / 470 µF max. 12 / -12 Vout models: 100 / 100 µF max. 15 / -15 Vout models: 47 / 47 µF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 5 ms typ. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Transient Response | - Response Time | 500 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

| | | |
|------------------|-----------------------------|--|
| Standards | - IT / Multimedia Equipment | EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1 |
| | - Certification Documents | www.tracopower.com/overview/tmr2 |
| Pollution Degree | | PD 2 |

EMC Specifications

| | | |
|---------------|-----------------------------|--|
| EMI Emissions | - Conducted Emissions | EN 55032 class A (with external filter) EN 55032 class B (with external filter) |
| | - Radiated Emissions | EN 55032 class A (with external filter) EN 55032 class B (with external filter) |
| | External filter proposal: | www.tracopower.com/overview/tmr2 |
| 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 |
| | - EFT (Burst) / Surge | EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 1 kV, perf. criteria A |
| | - Conducted RF Disturbances | Ext. input component: Nippon KY 220 μ F, 48 mOhm EN 61000-4-6, 10 Vrms, 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 +92°C |
| | - Case Temperature | +100°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | Depending on model |
| | | See application note: www.tracopower.com/overview/tmr2 |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Current Controlled Remote (passive = on) | On: open circuit Off: 2 to 4 mA current (internal 1 k Ω resistor) Refers to 'Remote' and '-Vin' Pin |
| | | External circuit proposal: www.tracopower.com/info/current-remote.pdf |
| | - Off Idle Input Current | 2.5 mA max. |
| Altitude During Operation | | 5'000 m max. (see altitude test report) |
| Switching Frequency | | 100 - 650 kHz (RCC) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | 1'600 VDC |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 M Ω min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 200 pF max. |
| Reliability | - Calculated MTBF | 4'900'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration | MIL-STD-810F |
| | - Mechanical Shock | MIL-STD-810F |
| | - Thermal Shock | MIL-STD-810F |
| Housing Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Potting Material | | Silicone (UL 94 V-0 rated) |
| Pin Material | | Copper |
| Pin Foundation Plating | | Nickel (2 - 3 μ m) |
| Pin Surface Plating | | Tin (3 - 5 μ m), matte |
| Housing Type | | Plastic Case |

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

| | |
|--------------------------|---|
| Mounting Type | PCB Mount |
| Connection Type | THD (Through-Hole Device) |
| Footprint Type | SIP8 |
| Soldering Profile | Lead-Free Wave Soldering 260°C / 6 s max. |
| Weight | 4.8 g |
| Environmental Compliance | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant 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).) 25cf7004-2c3a-4f03-8855-1f1b93359928 |
| - REACH Declaration | |
| - RoHS Declaration | |
| - SCIP Reference Number | |

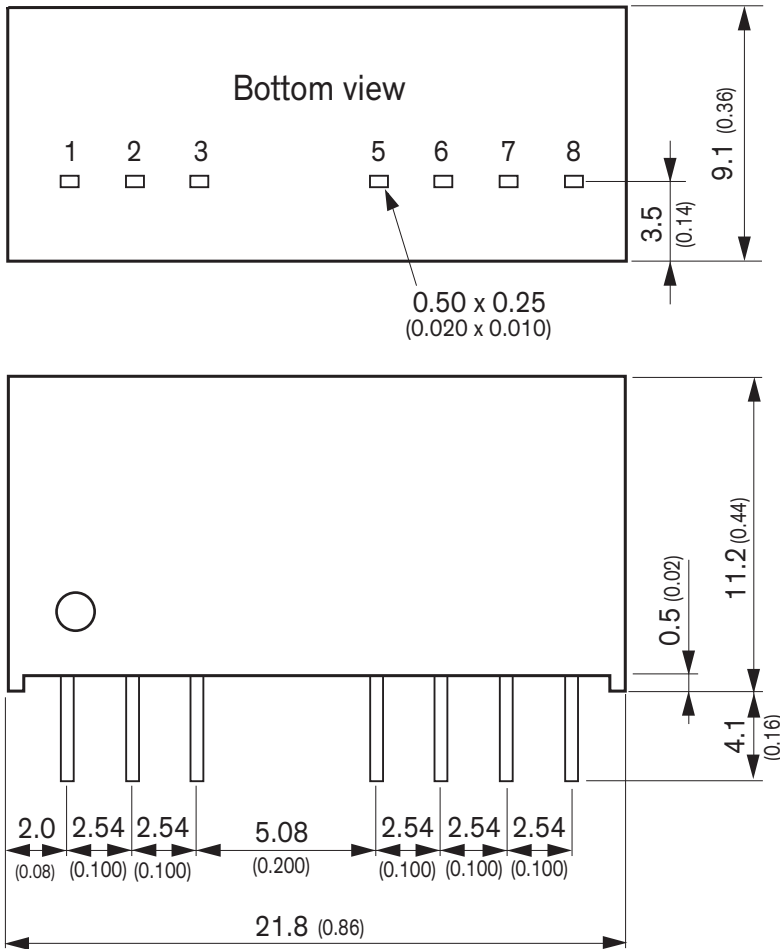
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tmr2

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 |
| 5 | NC | NC |
| 6 | +Vout | +Vout |
| 7 | -Vout | Common |
| 8 | NC | -Vout |

NC: Not connected

Dimensions in mm (inch)
 Tolerances: x.x ±0.5 (x.xx ±0.02)
 x.xx ±0.25 (x.xxx ±0.01)
 Pin dimension tolerance: ±0.1 (±0.004)

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