# THE DATASHEET OF

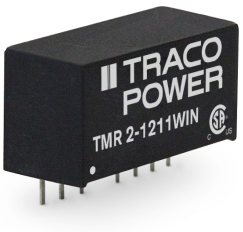
# TMR 2-2412WIN

# TRACO POWER

## DC/DC Converter

## TMR 2WIN Series, 2 Watt

- **Ultra-wide 4:1 input range**
- **Compact SIP-8 package**
- **Temperature range –40 to +90°C (up to +75°C at full load)**
- **High efficiency of 82%**
- **Excellent load and line regulation**
- **Continuouse short-circuit protection**
- **Overload protection**
- **I/O isolation 1500 VDC**
- **Remote On/Off control**
- **3-year product warranty**




UL 62368-1 IEC 62368-1

The TMR 2WIN series is a family of isolated 2 W DC/DC converter modules with accurately regulated output voltages and ultra-wide 4:1 input voltage ranges. They require no minimum load and are protected against overload and short circuit.
An excellent efficiency along with the use of high grade components allows a compact construction in SIP-8 package; even the converters can reliably operate in an ambient temperature of –40°C to +75°C at full load and up to 90°C with 50% power derating. Typical applications for these converters are 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 |
|---|---|---|---|---|---|---|
| | | Vnom | Imax | Vnom | Imax | typ. |
| **TMR 2-1210WIN** | 4.5 - 18 VDC (12 VDC nom.) | 3.3 VDC | 500 mA | | | 75 % |
| **TMR 2-1211WIN** | | 5 VDC | 400 mA | | | 80 % |
| **TMR 2-1212WIN** | | 12 VDC | 167 mA | | | 82 % |
| **TMR 2-1213WIN** | | 15 VDC | 134 mA | | | 82 % |
| **TMR 2-1221WIN** | | +5 VDC | 200 mA | –5 VDC | 200 mA | 80 % |
| **TMR 2-1222WIN** | | +12 VDC | 83 mA | –12 VDC | 83 mA | 82 % |
| **TMR 2-1223WIN** | | +15 VDC | 67 mA | –15 VDC | 67 mA | 82 % |
| **TMR 2-2410WIN** | 9 - 36 VDC (24 VDC nom.) | 3.3 VDC | 500 mA | | | 75 % |
| **TMR 2-2411WIN** | | 5 VDC | 400 mA | | | 80 % |
| **TMR 2-2412WIN** | | 12 VDC | 167 mA | | | 82 % |
| **TMR 2-2413WIN** | | 15 VDC | 134 mA | | | 82 % |
| **TMR 2-2421WIN** | | +5 VDC | 200 mA | –5 VDC | 200 mA | 80 % |
| **TMR 2-2422WIN** | | +12 VDC | 83 mA | –12 VDC | 83 mA | 82 % |
| **TMR 2-2423WIN** | | +15 VDC | 67 mA | –15 VDC | 67 mA | 82 % |
| **TMR 2-4810WIN** | 18 - 75 VDC (48 VDC nom.) | 3.3 VDC | 500 mA | | | 74 % |
| **TMR 2-4811WIN** | | 5 VDC | 400 mA | | | 80 % |
| **TMR 2-4812WIN** | | 12 VDC | 167 mA | | | 82 % |
| **TMR 2-4813WIN** | | 15 VDC | 134 mA | | | 82 % |
| **TMR 2-4821WIN** | | +5 VDC | 200 mA | –5 VDC | 200 mA | 80 % |
| **TMR 2-4822WIN** | | +12 VDC | 83 mA | –12 VDC | 83 mA | 82 % |
| **TMR 2-4823WIN** | | +15 VDC | 67 mA | –15 VDC | 67 mA | 82 % |

## Input Specifications

| | | | |
|---|---|---|---|
| Input Current | - At no load | 12 Vin models: | 60 mA typ. |
| | | 24 Vin models: | 30 mA typ. |
| | | 48 Vin models: | 20 mA typ. |
| | - At full load | 12 Vin models: | 200 mA typ. |
| | | 24 Vin models: | 100 mA typ. |
| | | 48 Vin models: | 50 mA typ. |
| 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.) |
| Start-up Voltage | | 12 Vin models: | 3 VDC min. / 4 VDC typ. / 4.5 VDC max. |
| | | 24 Vin models: | 4.5 VDC min. / 6 VDC typ. / 9 VDC max. |
| | | 48 Vin models: | 8.5 VDC min. / 12 VDC typ. / 18 VDC max. |
| Under Voltage Lockout | | 12 Vin models: | 4 VDC max. |
| | | 24 Vin models: | 8 VDC max. |
| | | 48 Vin models: | 16 VDC max. |
| Recommended Input Fuse | | 12 Vin models: | 1'000 mA (slow blow) |
| | | 24 Vin models: | 500 mA (slow blow) |
| | | 48 Vin models: | 250 mA (slow blow) |
| | | | (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. |
| | | dual output models: | 0.5% max. |
| | - Load Variation (0 - 100%) | single output models: | 1% max. |
| | | dual output models: | 1% max. (Output 1) |
| | | | 1% max. (Output 2) |
| | - Voltage Balance (symmetrical load) | dual output models: | 2% max. |
| Ripple and Noise | - 20 MHz Bandwidth | | 100 mVp-p max. |
| Capacitive Load | - single output | 3.3 Vout models: | 1'000 µF max. |
| | | 5 Vout models: | 1'000 µF max. |
| | | 12 Vout models: | 170 µF max. |
| | | 15 Vout models: | 110 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. |
| Short Circuit Protection | | | Automatic recovery |
| Overload Protection | | | Foldback Mode |
| Output Current Limitation | | | 110% min. of Iout max. |
| | | | 140% typ. of Iout max. |
| Transient Response | - Response Deviation | | 5% max. (75% to 100% Load Step) |
| | - Response Time | | 300 µs typ. / 500 µs max. (75% to 100% 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 | | CSA-C22.2, No. 60950-1<br>EN 60950-1<br>EN 62368-1<br>IEC 60950-1<br>IEC 62368-1<br>UL 60950-1<br>UL 62368-1 |
| | - Certification Documents | | www.tracopower.com/overview/tmr2win |
| Pollution Degree | | | PD 2 |

## EMC Specifications

| | | | |
|---|---|---|---|
| EMI Emissions | | | EN 61000-6-3 (Generic Residential) |
| | - Conducted Emissions | | EN 55032 class A (with external filter) |
| | - Radiated Emissions | | EN 55032 class A (with external filter) |
| | | External filter proposal: | www.tracopower.com/overview/tmr2win |
| EMS Immunity | | | EN 61000-6-1 (Generic Residential)<br>EN 55035 (Multimedia) |
| | - Electrostatic Discharge | Air: | EN 61000-4-2, ±8 kV, perf. criteria A |
| | | Contact: | EN 61000-4-2, ±4 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<br>EN 61000-4-5, ±1 kV, perf. criteria A |
| | | Ext. input component: | 220 µF / 100 V / KYA series |
| | - Conducted RF Disturbances | | 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 +90°C |
| | - Case Temperature | | +105°C max. |
| | - Storage Temperature | | –55°C to +125°C |
| Power Derating | - High Temperature | | 3.33 %/K above 75°C |
| | | See application note: | www.tracopower.com/overview/tmr2win |
| Cooling System | | | Natural convection (20 LFM) |
| Remote Control | - Voltage Controlled Remote (passive = on) | | On: open circuit<br>Off: 6 to 9 VDC (via 1 kOhm resistor)<br>Refers to 'Remote' and '-Vin' Pin |
| | - Current Controlled Remote (passive = on) | | On: open circuit<br>Off: 2 to 4 mA current |
| | - Off Idle Input Current | | 3 mA max. |
| Altitude During Operation | | | 6'000 m max. |
| Regulator Topology | | | RCC Converter |
| Switching Frequency | | | 300 kHz typ. (PFM) |
| Insulation System | | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 60 s | | 1'500 VDC |
| | - Input to Output, 1 s | | 1'800 VDC |
| 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 | | 3'430'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | | According to Cleaning Guideline<br>www.tracopower.com/info/cleaning.pdf |
| Housing Material | | | Non-conductive Plastic (UL 94 V-0 rated) |
| Potting Material | | | Epoxy (UL 94 V-0 rated) |
| Pin Material | | | Nickel-Iron (Alloy 42) |

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

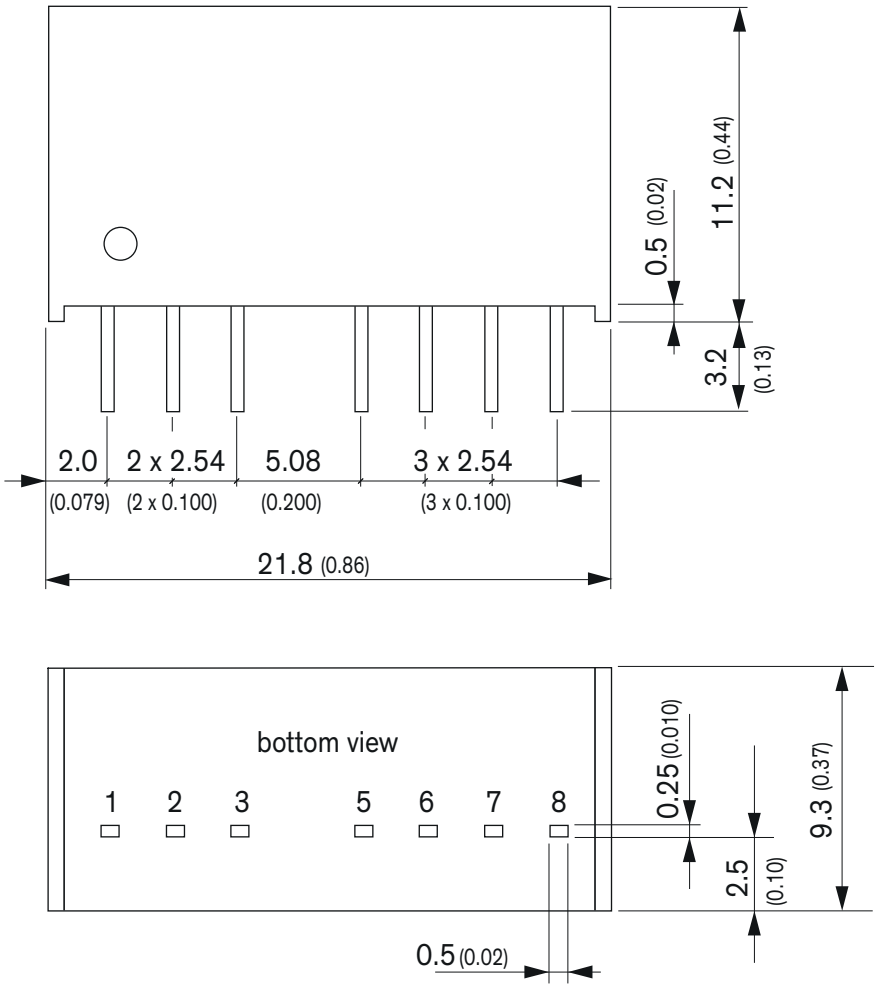
| | | |
|---|---|---|
| Pin Foundation Plating | | Nickel (1 µm min.) |
| Pin Surface Plating | | Tin (3 - 5 µm), matte |
| Housing Type | | Plastic Case |
| Mounting Type | | PCB Mount |
| Connection Type | | THD (Through-Hole Device) |
| Footprint Type | | SIP8 |
| Soldering Profile | | Lead-Free Wave Soldering<br>260°C / 10 s max. |
| Weight | | 4.66 g |
| Environmental Compliance | - REACH Declaration | www.tracopower.com/info/reach-declaration.pdf<br>REACH SVHC list compliant<br>REACH Annex XVII compliant |
| | - RoHS Declaration | www.tracopower.com/info/rohs-declaration.pdf<br>Exemptions: 7a<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) |
| | - SCIP Reference Number | d03e2461-f0b1-480d-9580-ce42a4dc9914 |

## Supporting Documents

| | |
|---|---|
| Overview Link (for additional Documents) | www.tracopower.com/overview/tmr2win |

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

## Outline Dimensions




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

| 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

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