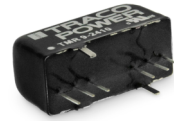


- Highest power density in SIP-8 metal package (optional plastic package)
- Wide 2:1 input voltage range
- Temperature range -40° to $+85^{\circ}\text{C}$
- High efficiency up to 89%
- Indefinite short-circuit protection
- I/O isolation 1600 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



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 $+60^{\circ}\text{C}$ 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

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
|------------|------------------------------|----------|------------------|----------|------------------|-----------------|
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TMR 9-1210 | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 2'000 mA | | | 81 % |
| TMR 9-1211 | | 5 VDC | 1'600 mA | | | 85 % |
| TMR 9-1219 | | 9 VDC | 1'000 mA | | | 87 % |
| TMR 9-1212 | | 12 VDC | 750 mA | | | 88 % |
| TMR 9-1213 | | 15 VDC | 600 mA | | | 89 % |
| TMR 9-1215 | | 24 VDC | 375 mA | | | 89 % |
| TMR 9-1221 | | +5 VDC | 800 mA | -5 VDC | 800 mA | 85 % |
| TMR 9-1222 | | +12 VDC | 375 mA | -12 VDC | 375 mA | 88 % |
| TMR 9-1223 | | +15 VDC | 300 mA | -15 VDC | 300 mA | 89 % |
| TMR 9-2410 | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 2'000 mA | | | 82 % |
| TMR 9-2411 | | 5 VDC | 1'600 mA | | | 85 % |
| TMR 9-2419 | | 9 VDC | 1'000 mA | | | 88 % |
| TMR 9-2412 | | 12 VDC | 750 mA | | | 89 % |
| TMR 9-2413 | | 15 VDC | 600 mA | | | 90 % |
| TMR 9-2415 | | 24 VDC | 375 mA | | | 90 % |
| TMR 9-2421 | | +5 VDC | 800 mA | -5 VDC | 800 mA | 86 % |
| TMR 9-2422 | | +12 VDC | 375 mA | -12 VDC | 375 mA | 89 % |
| TMR 9-2423 | | +15 VDC | 300 mA | -15 VDC | 300 mA | 87 % |
| TMR 9-4810 | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 2'000 mA | | | 82 % |
| TMR 9-4811 | | 5 VDC | 1'600 mA | | | 85 % |
| TMR 9-4819 | | 9 VDC | 1'000 mA | | | 88 % |
| TMR 9-4812 | | 12 VDC | 750 mA | | | 89 % |
| TMR 9-4813 | | 15 VDC | 600 mA | | | 89 % |
| TMR 9-4815 | | 24 VDC | 375 mA | | | 89 % |
| TMR 9-4821 | | +5 VDC | 800 mA | -5 VDC | 800 mA | 86 % |
| TMR 9-4822 | | +12 VDC | 375 mA | -12 VDC | 375 mA | 87 % |
| TMR 9-4823 | | +15 VDC | 300 mA | -15 VDC | 300 mA | 87 % |

Options

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

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.) |
| 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 (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 μ F X7R) 5 Vout models: 50 mVp-p typ. (w/ 1 μ F X7R) 9 Vout models: 50 mVp-p typ. (w/ 1 μ F X7R) 12 Vout models: 75 mVp-p typ. (w/ 1 μ F X7R) 15 Vout models: 75 mVp-p typ. (w/ 1 μ F X7R) 24 Vout models: 75 mVp-p typ. (w/ 1 μ F X7R) |
| | - dual output | 5 / -5 Vout models: 50 / 50 mVp-p typ. (w/ 1 μ F X7R) 12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 1 μ F X7R) 15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 1 μ F 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

| | | |
|------------------|-----------------------------|--|
| 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/tmr9 |
| 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/tmr9 |
| 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, 20 V/m, perf. criteria A |
| | - EFT (Burst) / Surge | EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 2 kV, perf. criteria A |
| | - Conducted RF Disturbances | Ext. input component: 24 Vin models: KY 220 μ F SMDJ70A 48 Vin models: KY 220 μ F SMDJ120A 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 +85°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/tmr9 |
| Cooling System | | Natural convection (20 LFM) |
| Remote Control | - Voltage Controlled Remote (passive = on) | On: 0 to 0.5 VDC or open circuit Off: 3 to 12 VDC |
| | - Off Idle Input Current | Refers to 'Remote' and '-Vin' Pin 2.5 mA typ. |
| | - Remote Pin Input Current | 0.5 to 2.5 mA |
| Altitude During Operation | | 5'000 m max. |
| Regulator Topology | | Flyback Converter |
| 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 |
| | - Input to Case, 60 s | 1'000 VDC |
| Isolation Resistance | - Input to Output, 500 VDC | 1'000 M Ω 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) |
| | | According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf |
| Washing Process | | |
| Environment | - Vibration | MIL-STD-810F |
| | - Thermal Shock | MIL-STD-810F |

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

| | |
|--------------------------|---|
| Housing Material | Copper (for standard version) Non-conductive plastic (for plastic version) |
| Potting Material | Silicone (UL 94 V-0 rated) |
| Pin Material | Copper |
| 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 |
| Soldering Profile | Lead-Free Wave Soldering 260°C / 6 s max. |
| Weight | 5.9 g (for standard version) 4.8 g (for plastic version) |
| Environmental Compliance | <p>- REACH Declaration www.tracopower.com/info/reach-declaration.pdf</p> <p>- RoHS Declaration REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-1 (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)</p> <p>- SCIP Reference Number a0c3442b-7838-4ff2-befa-e4362c1436dc</p> |

Supporting Documents

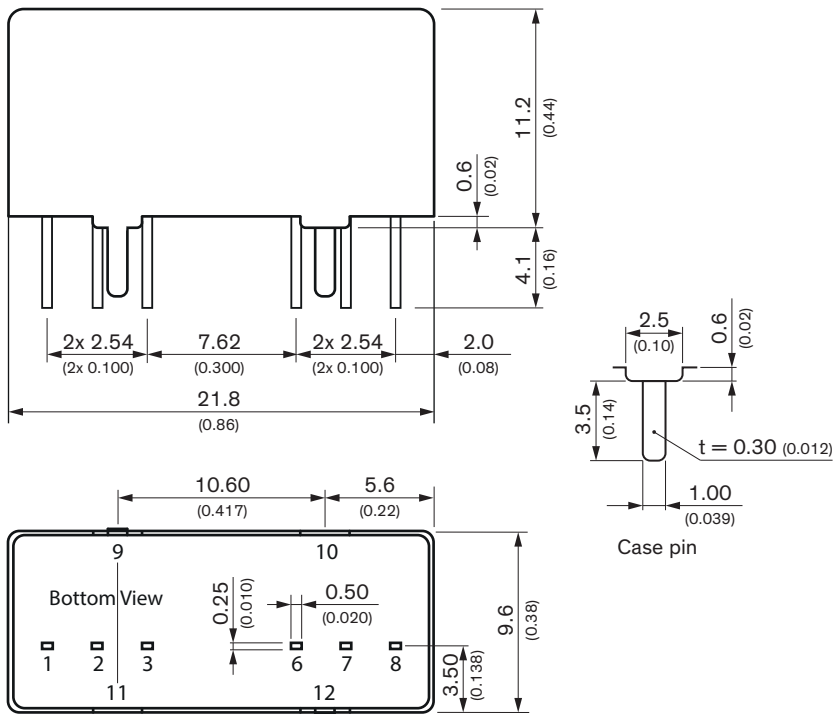
Overview Link (for additional Documents)

www.tracopower.com/overview/tmr9

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

Outline Dimensions

Metal package (standard)



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)

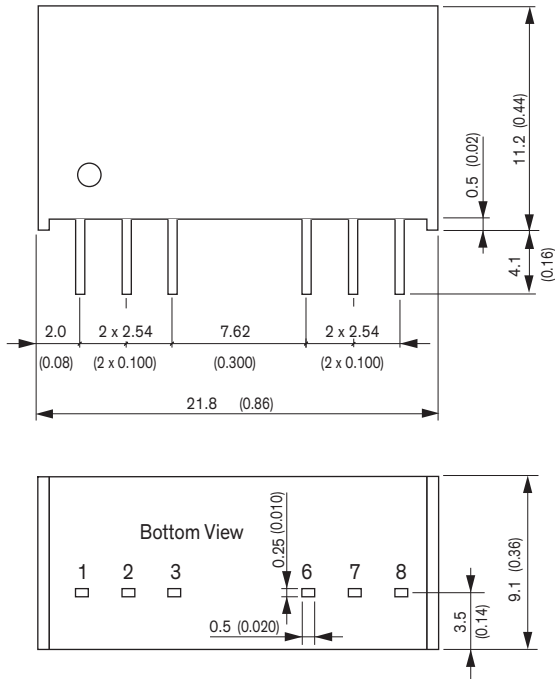
Pinout

| Pin | Single Output | Dual Output |
|-----|---------------|---------------|
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | +Vin (Vcc) | +Vin (Vcc) |
| 3 | Remote On/Off | Remote On/Off |
| 6 | +Vout | +Vout |
| 7 | -Vout | Common |
| 8 | NC | -Vout |
| 9 | Case* | Case* |
| 10 | Stand off | Stand off |
| 11 | Stand off | Stand off |
| 12 | Case* | Case* |

NC: Not connected

*Case pins must not be connected to any circuit.

Plastic package (option)



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)

| Pinout | | |
|--------|---------------|---------------|
| Pin | Single Output | Dual Output |
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | +Vin (Vcc) | +Vin (Vcc) |
| 3 | Remote On/Off | Remote On/Off |
| 6 | +Vout | +Vout |
| 7 | -Vout | Common |
| 8 | NC | -Vout |

NC: Not connected