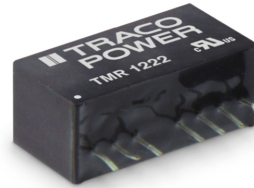


- Wide 2:1 input voltage range
- Compact SIP-8 package
- Small footprint
- Remote On/Off control
- Temperature range  $-40^{\circ}$  to  $+85^{\circ}\text{C}$
- High efficiency
- Excellent load and line regulation
- Indefinite short-circuit protection
- I/O isolation 1500VDC
- 3-year product warranty



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 cm<sup>2</sup> (0.3 square in.) of board space.

An excellent efficiency allows  $-40^{\circ}$  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 <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TMR 0510   | 4.5 - 9 VDC<br>(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<br>(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<br>(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<br>(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   | 5 Vin models: <b>35 mA typ.</b><br>12 Vin models: <b>20 mA typ.</b><br>24 Vin models: <b>15 mA typ.</b><br>48 Vin models: <b>8 mA typ.</b>                                                               |
|                        | - at full load | 5 Vin models: <b>645 mA max.</b><br>12 Vin models: <b>242 mA max.</b><br>24 Vin models: <b>117 mA max.</b><br>48 Vin models: <b>62 mA max.</b>                                                           |
| Surge Voltage          |                | 5 Vin models: <b>15 VDC max.</b> (100 ms max.)<br>12 Vin models: <b>36 VDC max.</b> (100 ms max.)<br>24 Vin models: <b>50 VDC max.</b> (100 ms max.)<br>48 Vin models: <b>100 VDC max.</b> (100 ms max.) |
| Recommended Input Fuse |                | 5 Vin models: <b>1600 mA</b> (slow blow)<br>12 Vin models: <b>1000 mA</b> (slow blow)<br>24 Vin models: <b>1000 mA</b> (slow blow)<br>48 Vin models: <b>1000 mA</b> (slow blow)                          |
| Input Filter           |                | Internal Capacitor                                                                                                                                                                                       |

### Output Specifications

|                          |                                               |                                                                                                                                                |
|--------------------------|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Voltage Set Accuracy     |                                               | <b>±1% max.</b>                                                                                                                                |
| Regulation               | - Input Variation (Vmin - Vmax)               | single output models: <b>0.2% max.</b><br>dual output models: <b>0.2% max.</b>                                                                 |
|                          | - Load Variation (10 - 90%)                   | single output models: <b>0.5% max.</b><br>dual output models: <b>0.8% max.</b> (Output 1)<br><b>0.8% max.</b> (Output 2)                       |
|                          | - Cross Regulation<br>(25% / 100% asym. load) | dual output models: <b>5% max.</b>                                                                                                             |
| Ripple and Noise         | - 20 MHz Bandwidth                            | <b>50 mVp-p typ.</b>                                                                                                                           |
| Capacitive Load          | - single output                               | 3.3 Vout models: <b>2'200 µF max.</b><br>5 Vout models: <b>1'000 µF max.</b><br>12 Vout models: <b>170 µF max.</b>                             |
|                          | - dual output                                 | 5 / -5 Vout models: <b>470 / 470 µF max.</b><br>12 / -12 Vout models: <b>100 / 100 µF max.</b><br>15 / -15 Vout models: <b>47 / 47 µF max.</b> |
| Minimum Load             |                                               | Not required                                                                                                                                   |
| Temperature Coefficient  |                                               | <b>±0.02 %/K max.</b>                                                                                                                          |
| Start-up Time            |                                               | <b>5 ms typ.</b>                                                                                                                               |
| Short Circuit Protection |                                               | Continuous, Automatic recovery                                                                                                                 |
| Transient Response       | - Response Time                               | <b>500 µs typ.</b> (25% Load Step)                                                                                                             |

### Safety Specifications

|                  |                             |                                                                                        |
|------------------|-----------------------------|----------------------------------------------------------------------------------------|
| Safety Standards | - IT / Multimedia Equipment | IEC 60950-1<br>EN 60950-1<br>UL 60950-1                                                |
|                  | - Certification Documents   | <a href="http://www.tracopower.com/overview/tmr2">www.tracopower.com/overview/tmr2</a> |
| Pollution Degree |                             | PD 2: Office or Laboratory Environments                                                |

### EMC Specifications

|               |                       |                                                                                    |
|---------------|-----------------------|------------------------------------------------------------------------------------|
| EMC Emissions | - Conducted Emissions | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
|               | - Radiated Emissions  | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |

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

|              |                             |                                                      |
|--------------|-----------------------------|------------------------------------------------------|
| EMC Immunity | - Electrostatic Discharge   | Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A      |
|              | - RF Electromagnetic Field  | Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A  |
|              | - EFT (Burst)               | EN 61000-4-3, 10 V/m, perf. criteria A               |
|              | - Surge                     | EN 61000-4-4, $\pm 2$ kV, perf. criteria A           |
|              |                             | EN 61000-4-5, $\pm 1$ kV, perf. criteria A           |
|              |                             | Ext. Input Component: Nippon KY 220 $\mu$ F, 48 mOhm |
|              | - Conducted RF Disturbances | EN 61000-4-6, 10 Vrms, perf. criteria A              |
|              | - PF Magnetic Field         | EN 61000-4-8, 100 A/m, perf. criteria A              |

## General Specifications

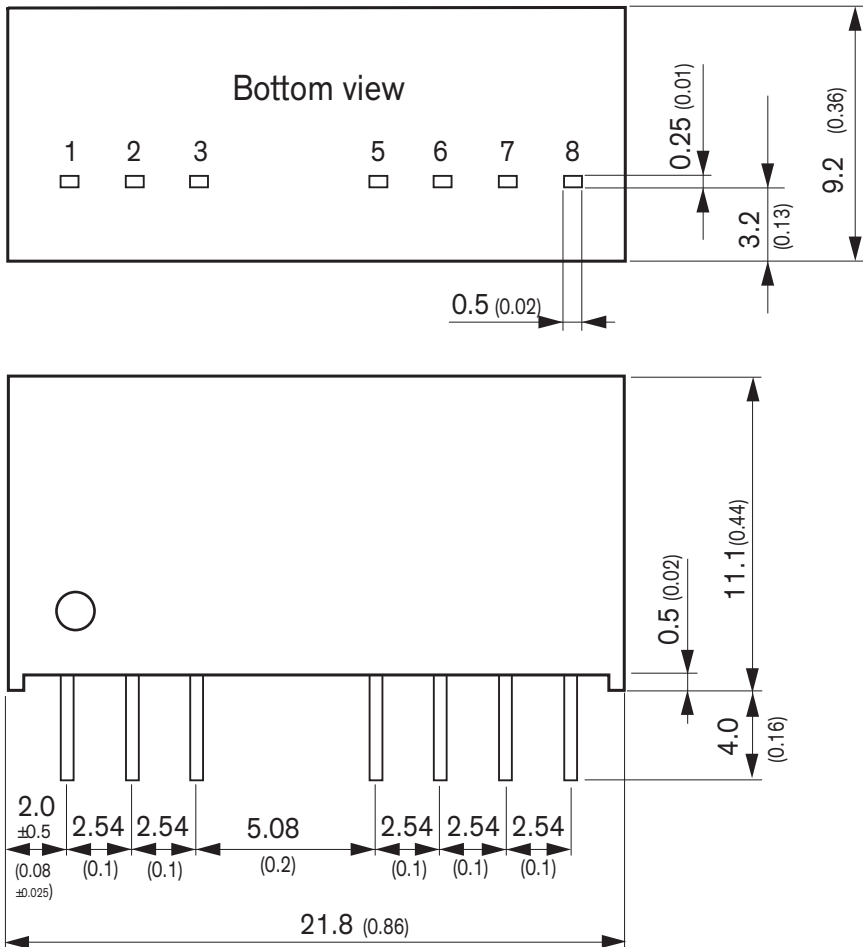
|                           |                                 |                                                                                                                  |
|---------------------------|---------------------------------|------------------------------------------------------------------------------------------------------------------|
| 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              | 6.67 %/K above 85°C                                                                                              |
| Cooling System            |                                 | Natural convection (20 LFM)                                                                                      |
| Altitude During Operation |                                 | 12'000 m max.                                                                                                    |
| 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 MOhm 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)                                                                       |
| Environment               | - Vibration                     | MIL-STD-810F                                                                                                     |
|                           | - Mechanical Shock              | MIL-STD-810F                                                                                                     |
|                           | - Thermal Shock                 | MIL-STD-810F                                                                                                     |
| Housing Material          |                                 | Non-conductive Plastic (UL94 V-0 rated)                                                                          |
| Potting Material          |                                 | Silicone (UL94 V-0 rated)                                                                                        |
| Connection Type           |                                 | THD (Through-Hole Device)                                                                                        |
| Weight                    |                                 | 4.8 g                                                                                                            |
| Remote Control            | - Current Controlled Remote     | On: open circuit                                                                                                 |
|                           |                                 | Off: 2 to 4 mA current (internal 1 kOhm resistor)                                                                |
|                           | - External Circuit Proposal     | <a href="http://www.tracopower.com/info/current-remote.pdf">www.tracopower.com/info/current-remote.pdf</a>       |
|                           | - Off Idle Input Current        | 2.5 mA max.                                                                                                      |
| Environmental Compliance  | - Reach                         | <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> |
|                           | - RoHS                          | <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a>   |

## Supporting Documents

|                                          |                                                                                        |
|------------------------------------------|----------------------------------------------------------------------------------------|
| Overview Link (for additional Documents) | <a href="http://www.tracopower.com/overview/tmr2">www.tracopower.com/overview/tmr2</a> |
|------------------------------------------|----------------------------------------------------------------------------------------|

All specifications valid at nominal input voltage, 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: No Connection

Dimensions in mm (inch)  
 Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin pitch Tolerance  $\pm 0.25$  ( $\pm 0.01$ )

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