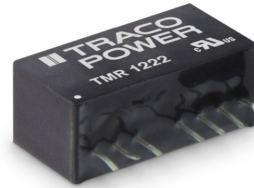


- Wide 2:1 input voltage range
- Compact SIP-8 package
- Small footprint
- Remote On/Off control
- Temperature range  $-40^{\circ}$  to  $+85^{\circ}\text{C}$
- High efficiency
- Excellent load and line regulation
- Indefinite short-circuit protection
- I/O isolation 1600 VDC
- 3-year product warranty



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 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 (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	5 Vin models: <b>35 mA typ.</b> 12 Vin models: <b>20 mA typ.</b> 24 Vin models: <b>15 mA typ.</b> 48 Vin models: <b>8 mA typ.</b>
	- At full load	5 Vin models: <b>645 mA max.</b> 12 Vin models: <b>242 mA max.</b> 24 Vin models: <b>117 mA max.</b> 48 Vin models: <b>62 mA max.</b>
Surge Voltage		5 Vin models: <b>15 VDC max.</b> (100 ms max.) 12 Vin models: <b>36 VDC max.</b> (100 ms max.) 24 Vin models: <b>50 VDC max.</b> (100 ms max.) 48 Vin models: <b>100 VDC max.</b> (100 ms max.)
Recommended Input Fuse		5 Vin models: <b>1'600 mA</b> (slow blow) 12 Vin models: <b>1'000 mA</b> (slow blow) 24 Vin models: <b>1'000 mA</b> (slow blow) 48 Vin models: <b>1'000 mA</b> (slow blow)  (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>

### Output Specifications

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

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>EN 60950-1</b> <b>EN 62368-1</b> <b>IEC 60950-1</b> <b>IEC 62368-1</b> <b>UL 60950-1</b> <b>UL 62368-1</b>
	- Certification Documents	<a href="http://www.tracopower.com/overview/tmr2">www.tracopower.com/overview/tmr2</a>
Pollution Degree		<b>PD 2</b>

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) 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: <a href="http://www.tracopower.com/overview/tmr2">www.tracopower.com/overview/tmr2</a>
EMS Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 1$ kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: Nippon KY 220 $\mu$ 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

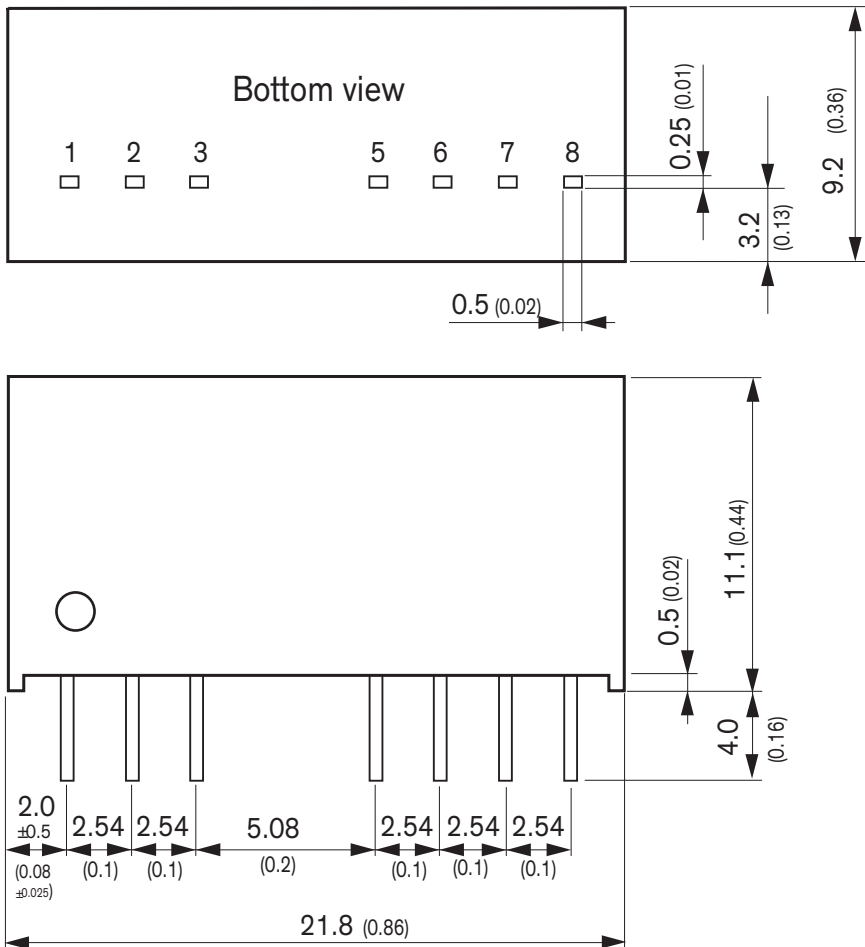
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +92°C
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	6.67 %/K above 85°C
Cooling System		Natural convection (20 LFM)
Remote Control	- Current Controlled Remote	On: open circuit Off: 2 to 4 mA current (internal 1 k $\Omega$ resistor)
	- Off Idle Input Current	External circuit proposal: <a href="http://www.tracopower.com/info/current-remote.pdf">www.tracopower.com/info/current-remote.pdf</a> 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 $\Omega$ 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 (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 $\mu$ m)
Pin Surface Plating		Tin (3 - 5 $\mu$ m), matte
Connection Type		THD (Through-Hole Device)
Weight		4.8 g
Environmental Compliance	- REACH Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tmr2">www.tracopower.com/overview/tmr2</a>
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All specifications valid at nominal 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  $\pm 0.25$  ( $\pm 0.01$ )