

- Wide 2:1 input voltage range
- Compact SIP-6 package
- Fully regulated outputs
- Cost optimised design
- No minimum load required
- Continuous short circuit protection
- Temperature range  $-40^{\circ}\text{C}$  to  $+95^{\circ}\text{C}$
- I/O isolation 1500 VDC
- 3-year product warranty



The TMR 1 series is a family of isolated 1 W DC/DC converter modules with regulated output, featuring wide 2:1 input voltage ranges. These products come in a compact SIP-6 package with small footprint.

An excellent efficiency allows  $-40^{\circ}\text{C}$  to  $+95^{\circ}\text{C}$  operation temperature. Further features continuous short circuit protection. The compact dimensions and cost optimised design make this converters an ideal solution for 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 1-0511	4.5 - 9 VDC (5 VDC nom.)	5 VDC	200 mA			76 %
TMR 1-0512		12 VDC	83 mA			77 %
TMR 1-0513		15 VDC	67 mA			79 %
TMR 1-0515		24 VDC	42 mA			76 %
TMR 1-0522		+12 VDC	42 mA	-12 VDC	42 mA	77 %
TMR 1-0523		+15 VDC	33 mA	-15 VDC	33 mA	78 %
TMR 1-1211	9 - 18 VDC (12 VDC nom.)	5 VDC	200 mA			77 %
TMR 1-1212		12 VDC	83 mA			77 %
TMR 1-1213		15 VDC	67 mA			80 %
TMR 1-1215		24 VDC	42 mA			77 %
TMR 1-1222		+12 VDC	42 mA	-12 VDC	42 mA	79 %
TMR 1-1223		+15 VDC	33 mA	-15 VDC	33 mA	78 %
TMR 1-2411	18 - 36 VDC (24 VDC nom.)	5 VDC	200 mA			77 %
TMR 1-2412		12 VDC	83 mA			80 %
TMR 1-2413		15 VDC	67 mA			80 %
TMR 1-2415		24 VDC	42 mA			77 %
TMR 1-2422		+12 VDC	42 mA	-12 VDC	42 mA	80 %
TMR 1-2423		+15 VDC	33 mA	-15 VDC	33 mA	80 %
TMR 1-4811	36 - 75 VDC (48 VDC nom.)	5 VDC	200 mA			77 %
TMR 1-4812		12 VDC	83 mA			78 %
TMR 1-4813		15 VDC	67 mA			78 %
TMR 1-4815		24 VDC	42 mA			76 %
TMR 1-4822		+12 VDC	42 mA	-12 VDC	42 mA	79 %
TMR 1-4823		+15 VDC	33 mA	-15 VDC	33 mA	79 %

## Input Specifications

Input Current	- At no load	5 Vin models: <b>40 mA typ.</b> 12 Vin models: <b>20 mA typ.</b> 24 Vin models: <b>10 mA typ.</b> 48 Vin models: <b>7 mA typ.</b>
Surge Voltage		5 Vin models: <b>15 VDC max.</b> (1 s max.) 12 Vin models: <b>25 VDC max.</b> (1 s max.) 24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Under Voltage Lockout		5 Vin models: <b>4 VDC max.</b> 12 Vin models: <b>8.5 VDC max.</b> 24 Vin models: <b>17.5 VDC max.</b> 48 Vin models: <b>35.5 VDC max.</b> (Long term operation at undervoltage will damage the converter)
Reflected Ripple Current		5 Vin models: <b>80 mAp-p typ.</b> 12 Vin models: <b>40 mAp-p typ.</b> 24 Vin models: <b>30 mAp-p typ.</b> 48 Vin models: <b>20 mAp-p typ.</b>
Recommended Input Fuse		5 Vin models: <b>500 mA</b> (slow blow) 12 Vin models: <b>250 mA</b> (slow blow) 24 Vin models: <b>120 mA</b> (slow blow) 48 Vin models: <b>60 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)

## 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)
Ripple and Noise	- 20 MHz Bandwidth	<b>110 mVp-p max.</b>
Capacitive Load	- single output	5 Vout models: <b>1'680 µF max.</b> 12 Vout models: <b>820 µF max.</b> 15 Vout models: <b>680 µF max.</b> 24 Vout models: <b>470 µF max.</b>
	- dual output	12 / -12 Vout models: <b>470 / 470 µF max.</b> 15 / -15 Vout models: <b>330 / 330 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Short Circuit Protection		<b>Automatic recovery</b>
Overload Protection		<b>Foldback Mode</b>
Output Current Limitation		<b>120% min. of Iout max.</b> <b>130% typ. of Iout max.</b>
Transient Response	- Response Deviation	<b>5% max.</b> (25% Load Step)
	- Response Time	<b>250 µs typ.</b> (25% Load Step)

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

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	CSA-C22.2, No 60950-1 EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/tmr1">www.tracopower.com/overview/tmr1</a>
Pollution Degree		PD 2

## EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (with external filter) FCC Part 15 class A (with external filter)
	External filter proposal:	<a href="http://www.tracopower.com/overview/tmr1">www.tracopower.com/overview/tmr1</a>

## General Specifications

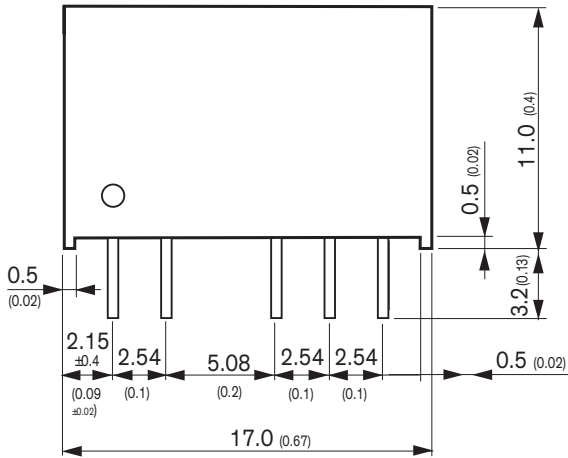
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +95°C (without derating) +105°C max. -55°C to +125°C
Power Derating	- High Temperature	5 %/K above 95°C
Cooling System		Natural convection (20 LFM)
Altitude During Operation		6'000 m max.
Switching Frequency		220 kHz typ. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'500 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	50 pF max.
Reliability	- Calculated MTBF	2'800'000 h (MIL-HDBK-217F, ground benign)
Housing Material		Non-conductive Plastic (UL94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Nickel-Iron (Alloy 42)
Pin Foundation Plating		Nickel (1 μm min.)
Pin Surface Plating		Tin (3 - 5 μm), matte
Soldering Profile		Wave Soldering 260°C / 10 s max.
Connection Type		THD (Through-Hole Device)
Weight		3.1 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

## Supporting Documents

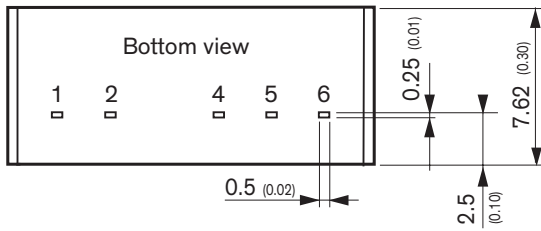
Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tmr1">www.tracopower.com/overview/tmr1</a>
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**Outline Dimensions**



Pinout		
Pin	Single Output	Dual Output
1	-Vin (GND)	-Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
4	+Vout	+Vout
5	No pin	Common
6	-Vout	-Vout



Dimensions in [mm], ( ) = Inch  
 Tolerances: ±0.5 (±0.02)  
 Pin pitch tolerances: ±0.25 (±0.01)