TRACO POWER

DC/DC Converter

TMR 1 Series, 1 Watt

- **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°C to +95°C**
- **I/O isolation 1500 VDC**
- **3-year product warranty**

UL 62368-1 IEC 62368-1

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°C to +95°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
		Vnom	Imax	Vnom	Imax	typ.
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:	40 mA typ.
		12 Vin models:	20 mA typ.
		24 Vin models:	10 mA typ.
		48 Vin models:	7 mA typ.
Surge Voltage		5 Vin models:	15 VDC max. (1 s max.)
		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.)
Under Voltage Lockout		5 Vin models:	4 VDC max.
		12 Vin models:	8.5 VDC max.
		24 Vin models:	17.5 VDC max.
		48 Vin models:	35.5 VDC max.
			(Long term operation at undervoltage will damage the converter)
Reflected Ripple Current		5 Vin models:	80 mAp-p typ.
		12 Vin models:	40 mAp-p typ.
		24 Vin models:	30 mAp-p typ.
		48 Vin models:	20 mAp-p typ.
Recommended Input Fuse		5 Vin models:	500 mA (slow blow)
		12 Vin models:	250 mA (slow blow)
		24 Vin models:	120 mA (slow blow)
		48 Vin models:	60 mA (slow blow)
			(The need of an external fuse has to be assessed in the final application.)

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 (10 - 90%)	single output models:	0.5% max.
		dual output models:	0.8% max. (Output 1)
			0.8% max. (Output 2)
Ripple and Noise	- 20 MHz Bandwidth		110 mVp-p max.
Capacitive Load	- single output	5 Vout models:	1'680 µF max.
		12 Vout models:	820 µF max.
		15 Vout models:	680 µF max.
		24 Vout models:	470 µF max.
	- dual output	12 / -12 Vout models:	470 / 470 µF max.
		15 / -15 Vout models:	330 / 330 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Short Circuit Protection			Automatic recovery
Overload Protection			Foldback Mode
Output Current Limitation			120% min. of Iout max.
			130% typ. of Iout max.
Transient Response	- Response Deviation		5% max. (25% Load Step)
	- Response Time		250 µs typ. (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	www.tracopower.com/overview/tmr1
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:	www.tracopower.com/overview/tmr1

General Specifications

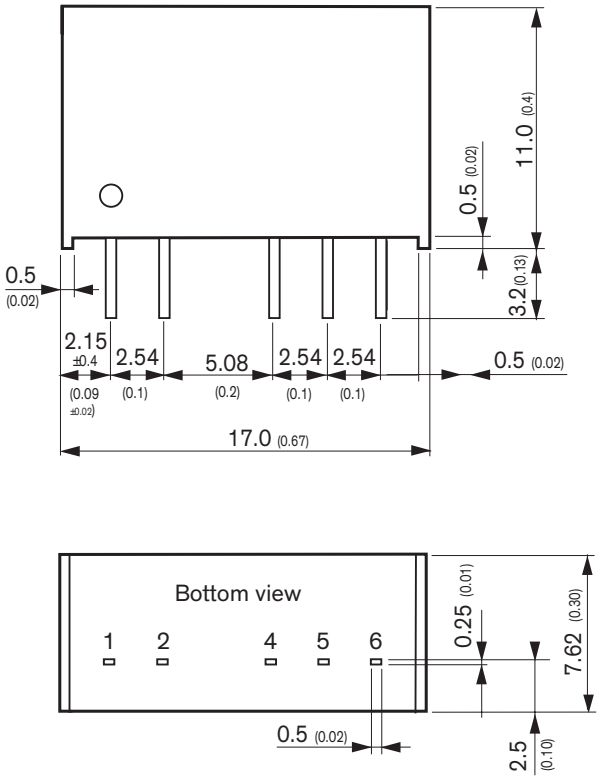
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +95°C (without derating)
	- Case Temperature	+105°C max.
	- Storage Temperature	–55°C to +125°C
Power Derating	- High Temperature	5 %/K above 95°C
Cooling System		Natural convection (20 LFM)
Altitude During 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	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a (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)	www.tracopower.com/overview/tmr1

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

Outline Dimensions



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

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