

- Wide 2:1 input voltage range
- Compact SMD package
- Fully regulated outputs
- Cost optimised design
- No minimum load required
- Continuous short circuit protection
- Temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- I/O isolation 1500 VDC
- Remote On/Off control
- 3-year product warranty



UL 62368-1 IEC 62368-1

The TMR 1SM 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 SMD package with small footprint.

An excellent efficiency allows  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  operation temperature. Further features include remote On/Off control and 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 1-0511SM	4.5 - 9 VDC (5 VDC nom.)	5 VDC	200 mA			78 %
TMR 1-0512SM		12 VDC	83 mA			79 %
TMR 1-0513SM		15 VDC	67 mA			81 %
TMR 1-0522SM		+12 VDC	42 mA	-12 VDC	42 mA	79 %
TMR 1-0523SM		+15 VDC	33 mA	-15 VDC	33 mA	80 %
TMR 1-1211SM	9 - 18 VDC (12 VDC nom.)	5 VDC	200 mA			79 %
TMR 1-1212SM		12 VDC	83 mA			79 %
TMR 1-1213SM		15 VDC	67 mA			82 %
TMR 1-1222SM		+12 VDC	42 mA	-12 VDC	42 mA	81 %
TMR 1-1223SM		+15 VDC	33 mA	-15 VDC	33 mA	80 %
TMR 1-2411SM	18 - 36 VDC (24 VDC nom.)	5 VDC	200 mA			79 %
TMR 1-2412SM		12 VDC	83 mA			82 %
TMR 1-2413SM		15 VDC	67 mA			82 %
TMR 1-2422SM		+12 VDC	42 mA	-12 VDC	42 mA	82 %
TMR 1-2423SM		+15 VDC	33 mA	-15 VDC	33 mA	82 %
TMR 1-4811SM	36 - 75 VDC (48 VDC nom.)	5 VDC	200 mA			79 %
TMR 1-4812SM		12 VDC	83 mA			80 %
TMR 1-4813SM		15 VDC	67 mA			80 %
TMR 1-4822SM		+12 VDC	42 mA	-12 VDC	42 mA	81 %
TMR 1-4823SM		+15 VDC	33 mA	-15 VDC	33 mA	81 %

### 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.)
Reflected Ripple Current		5 Vin models: <b>80 mA<sub>p-p</sub> typ.</b> 12 Vin models: <b>40 mA<sub>p-p</sub> typ.</b> 24 Vin models: <b>30 mA<sub>p-p</sub> typ.</b> 48 Vin models: <b>20 mA<sub>p-p</sub> 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 (V <sub>min</sub> - V <sub>max</sub> )	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>75 mV<sub>p-p</sub> max.</b>
Capacitive Load	- single output	5 V <sub>out</sub> models: <b>1'680 µF max.</b> 12 V <sub>out</sub> models: <b>820 µF max.</b> 15 V <sub>out</sub> models: <b>680 µF max.</b>
	- dual output	12 / -12 V <sub>out</sub> models: <b>470 / 470 µF max.</b> 15 / -15 V <sub>out</sub> 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 I<sub>out</sub> max.</b> <b>130% typ. of I<sub>out</sub> max.</b>
Transient Response	- Response Deviation	<b>5% max.</b> (25% Load Step)
	- Response Time	<b>250 µs typ.</b> (25% Load Step)

### Safety Specifications

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/tmr1sm-safety-cert">www.tracopower.com/tmr1sm-safety-cert</a>
Energy Source	- Output, acc. to 62368-1	ES1
Power Source	- Output, acc. to 62368-1	PS3
Pollution Degree		PD 2
Over Voltage Category		Not mains connected

All specifications valid at nominal voltage, resistive 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) FCC 47 Part 15 class A (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/tmr1sm-emc-filter">www.tracopower.com/tmr1sm-emc-filter</a>

## General Specifications

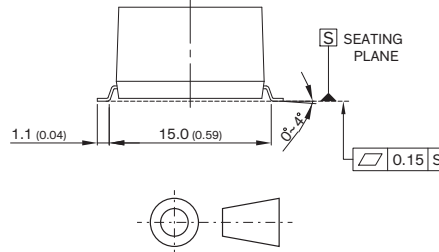
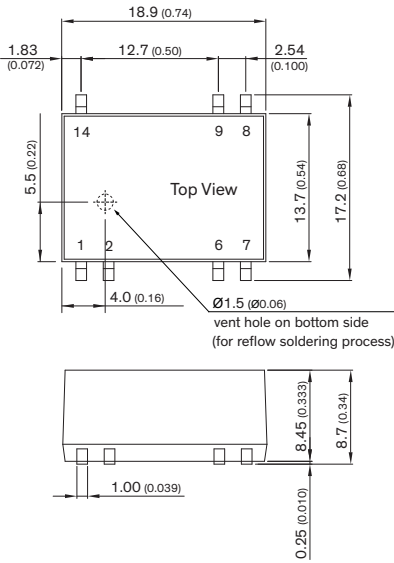
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +95°C max. -55°C to +125°C
Power Derating	- High Temperature	5.0 %/K above 75°C
		See application note: <a href="http://www.tracopower.com/tmr1sm-cc">www.tracopower.com/tmr1sm-cc</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)  - Current Controlled Remote (passive = on) - Off Idle Input Current	On: < 0.6 VDC or open circuit Off: 3 to 15 VDC Refers to 'Remote' and '-Vin' Pin On: open circuit Off: 2 to 4 mA current 3 mA max.
Altitude During Operation		6'000 m max.
Regulator Topology		RCC Converter
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)
Moisture Sensitivity (MSL)		Level 2 (J-STD-033C)
Washing Process		Not allowed
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Copper (1 - 3 μm)
Pin Surface Plating		Tin (7.5 μm min.), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Footprint Type		SMD14
Soldering Profile		Lead-Free Reflow Soldering (acc. J-STD-020E)
		See application note: <a href="http://www.tracopower.com/info/reflow-soldering.pdf">www.tracopower.com/info/reflow-soldering.pdf</a>
Weight		2.9 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<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 <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule)) bdd04b85-62c3-4e4e-abcc-acf49c9007d6

## Additional Information

Supporting Documents	<a href="http://www.tracopower.com/overview/tmr1sm">www.tracopower.com/overview/tmr1sm</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

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

### Outline Dimensions

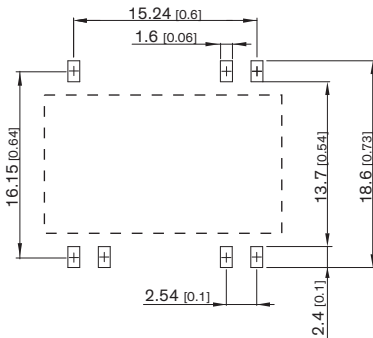


Dimensions in mm (inch)  
 Tolerances: x.x±0.5 (x.xx±0.02)  
 x.xx±0.25 (x.xxx±0.01)  
 Pin tolerances: x.x±0.05 (±0.002)

Pinout		
Pin	Single Output	Dual Output
1	-Vin (GND)	-Vin (GND)
2	Remote	Remote
6	NC	Common
7	NC	-Vout
8	+Vout	+Vout
9	-Vout	Common
14	+Vin (Vcc)	+Vin (Vcc)

NC: Not connected

### Recommended Solder Pad Layout



Dimensions in mm [inch]