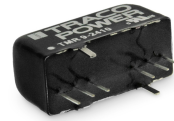


- Highest power density in SIP-8 metal package (optional plastic package)
- Wide 2:1 input voltage range
- Temperature range  $-40^{\circ}$  to  $+85^{\circ}\text{C}$
- High efficiency up to 89%
- Indefinite short-circuit protection
- I/O isolation 1600 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year product warranty



The TMR 9 series is a new family of isolated 9W DC/DC converter modules with regulated output, featuring wide 2:1 input voltage ranges. The product comes in a ultra-compact SIP-8 metal package with a small footprint occupying only 2.0 cm<sup>2</sup> (0.3 square inch) of board space.

An excellent efficiency allows  $-40^{\circ}$  to  $+60^{\circ}\text{C}$  operation temperatures without derating. Further features include remote On/Off control and continuous short circuit protection. The very 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 9-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	2'000 mA			81 %
TMR 9-1211		5 VDC	1'600 mA			85 %
TMR 9-1219		9 VDC	1'000 mA			87 %
TMR 9-1212		12 VDC	750 mA			88 %
TMR 9-1213		15 VDC	600 mA			89 %
TMR 9-1215		24 VDC	375 mA			89 %
TMR 9-1221		+5 VDC	800 mA	-5 VDC	800 mA	85 %
TMR 9-1222		+12 VDC	375 mA	-12 VDC	375 mA	88 %
TMR 9-1223		+15 VDC	300 mA	-15 VDC	300 mA	89 %
TMR 9-2410		18 - 36 VDC (24 VDC nom.)	3.3 VDC	2'000 mA		
TMR 9-2411	5 VDC		1'600 mA			85 %
TMR 9-2419	9 VDC		1'000 mA			88 %
TMR 9-2412	12 VDC		750 mA			89 %
TMR 9-2413	15 VDC		600 mA			90 %
TMR 9-2415	24 VDC		375 mA			90 %
TMR 9-2421	+5 VDC		800 mA	-5 VDC	800 mA	86 %
TMR 9-2422	+12 VDC		375 mA	-12 VDC	375 mA	89 %
TMR 9-2423	+15 VDC		300 mA	-15 VDC	300 mA	87 %
TMR 9-4810	36 - 75 VDC (48 VDC nom.)		3.3 VDC	2'000 mA		
TMR 9-4811		5 VDC	1'600 mA			85 %
TMR 9-4819		9 VDC	1'000 mA			88 %
TMR 9-4812		12 VDC	750 mA			89 %
TMR 9-4813		15 VDC	600 mA			89 %
TMR 9-4815		24 VDC	375 mA			89 %
TMR 9-4821		+5 VDC	800 mA	-5 VDC	800 mA	86 %
TMR 9-4822		+12 VDC	375 mA	-12 VDC	375 mA	87 %
TMR 9-4823		+15 VDC	300 mA	-15 VDC	300 mA	87 %

### Options

on demand (backorder with MOQ non stocking item)	- Optional models with plastic case
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## Input Specifications

Input Current	- At no load	12 Vin models: <b>11 mA typ.</b> 24 Vin models: <b>7 mA typ.</b> 48 Vin models: <b>3 mA typ.</b>
Surge Voltage		12 Vin models: <b>36 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.)
Recommended Input Fuse		12 Vin models: <b>3'150 mA</b> (slow blow) 24 Vin models: <b>2'500 mA</b> (slow blow) 48 Vin models: <b>1'250 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 (0 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: <b>5% max.</b>
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models: <b>50 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 5 Vout models: <b>50 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 9 Vout models: <b>50 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 12 Vout models: <b>75 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 15 Vout models: <b>75 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 24 Vout models: <b>75 mVp-p typ.</b> (w/ 1 $\mu$ F X7R)
	- dual output	5 / -5 Vout models: <b>50 / 50 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 12 / -12 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 1 $\mu$ F X7R) 15 / -15 Vout models: <b>75 / 75 mVp-p typ.</b> (w/ 1 $\mu$ F X7R)
Capacitive Load	- single output	3.3 Vout models: <b>2'600 <math>\mu</math>F max.</b> 5 Vout models: <b>1'300 <math>\mu</math>F max.</b> 9 Vout models: <b>800 <math>\mu</math>F max.</b> 12 Vout models: <b>560 <math>\mu</math>F max.</b> 15 Vout models: <b>560 <math>\mu</math>F max.</b> 24 Vout models: <b>200 <math>\mu</math>F max.</b>
	- dual output	5 / -5 Vout models: <b>800 / 800 <math>\mu</math>F max.</b> 12 / -12 Vout models: <b>390 / 390 <math>\mu</math>F max.</b> 15 / -15 Vout models: <b>200 / 200 <math>\mu</math>F max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>50 ms typ.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>180% typ. of Iout max.</b>
Transient Response	- Response Time	<b>250 <math>\mu</math>s typ.</b> (25% Load Step)

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

## Safety Specifications

Standards	- IT / Multimedia Equipment	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/tmr9">www.tracopower.com/overview/tmr9</a>
Pollution Degree		PD 2

## 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/tmr9">www.tracopower.com/overview/tmr9</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, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: 24 Vin models: KY 220 $\mu$ F    SMDJ70A 48 Vin models: KY 220 $\mu$ F    SMDJ120A 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 +85°C
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	Depending on model
		See application note: <a href="http://www.tracopower.com/overview/tmr9">www.tracopower.com/overview/tmr9</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote	On: 0 to 0.5 VDC or open circuit Off: 3 to 12 VDC Refers to 'Remote' and '-Vin' Pin 2.5 mA typ.
	- Off Idle Input Current	
Altitude During Operation		5'000 m max.
Switching Frequency		400 kHz typ. (PWM) (single output models) 500 kHz typ. (PWM) (dual output models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'600 VDC
	- Input to Case, 60 s	1'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	50 pF max.
Reliability	- Calculated MTBF	2'940'000 h (for standard version) 2'700'000 h (for plastic version) (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Copper (for standard version) Non-conductive plastic (for plastic version)
Potting Material		Silicone (UL 94 V-0 rated)

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

Pin Material	Copper
Pin Foundation Plating	Nickel (2 - 3 $\mu\text{m}$ )
Pin Surface Plating	Tin (3 - 5 $\mu\text{m}$ ), matte
Housing Type	Metal Case
Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Footprint Type	SIP8
Soldering Profile	Lead-Free Wave Soldering
Weight	5.9 g (for standard version) 4.8 g (for plastic version)
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.))
	- SCIP Reference Number a0c3442b-7838-4ff2-befa-e4362c1436dc

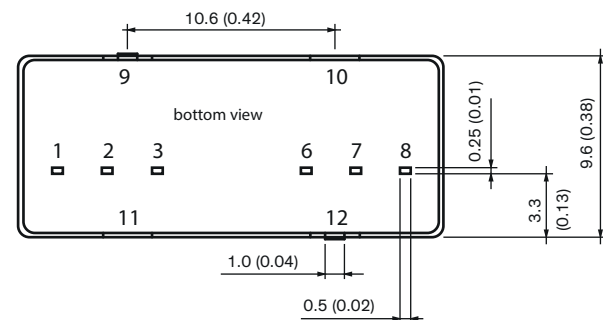
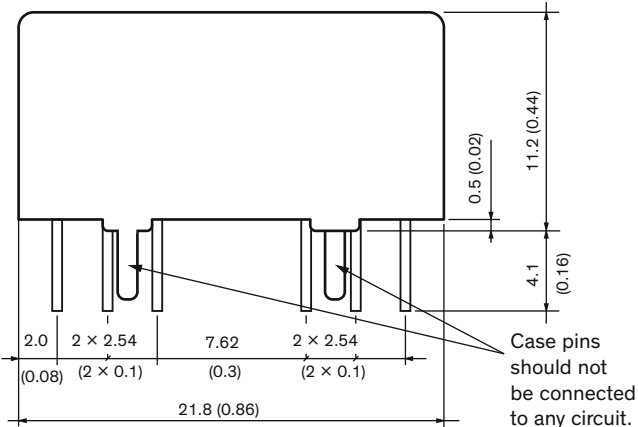
### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tmr9](http://www.tracopower.com/overview/tmr9)

### Outline Dimensions

#### Metal package (standard)

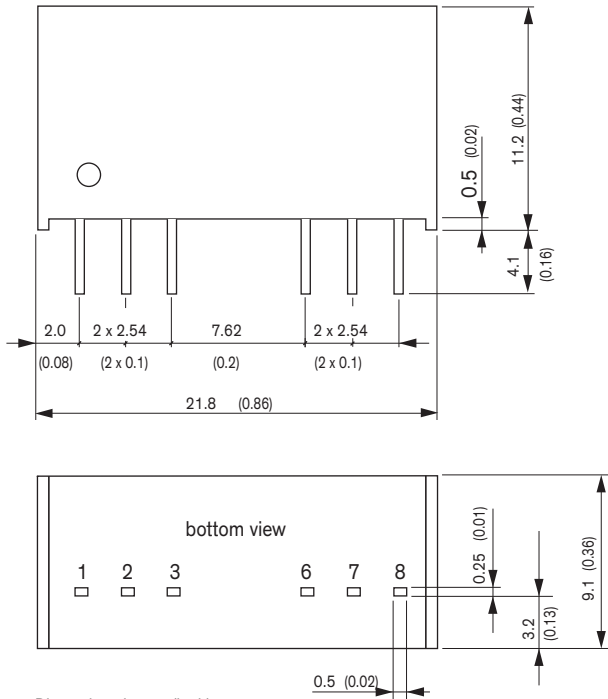


Dimensions in mm (inch)  
Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
Pin pitch Tolerance  $\pm 0.25$  ( $\pm 0.01$ )

Pinout		
Pin	Single Output	Dual Output
1	-Vin (GND)	-Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
3	Remote	Remote
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout
9	Case	Case
10	Stand Off	Stand Off
11	Stand Off	Stand Off
12	Case	Case

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

### Plastic package (option)



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

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