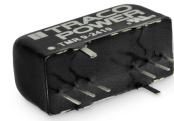


- Highest power density in SIP-8 metal package (optional plastic package)
- Wide 2:1 input voltage range
- Temperature range -40° to $+85^{\circ}\text{C}$
- High efficiency up to 89%
- Indefinite short-circuit protection
- I/O isolation 1600 VDC
- Remote On/Off control
- Fully RoHS compliant
- 3-year 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 cm² (0.3 square inch) of board space.

An excellent efficiency allows -40° 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 _{max}	Vnom	I _{max}	
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

Suffix -P	- models with plastic case
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Input Specifications

Input Current	- at no load	12 Vin models: 11 mA typ. 24 Vin models: 7 mA typ. 48 Vin models: 3 mA typ.
Surge Voltage		12 Vin models: 36 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.)
Recommended Input Fuse		12 Vin models: 3150 mA (slow blow) 24 Vin models: 2500 mA (slow blow) 48 Vin models: 1250 mA (slow blow)
Input Filter		Internal Capacitor

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	single output models: 1% max. dual output models: 1% max. (Output 1) 1% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: 5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models: 50 mVp-p typ. (with 1 µF X7R) 5 Vout models: 50 mVp-p typ. (with 1 µF X7R) 9 Vout models: 50 mVp-p typ. (with 1 µF X7R) 12 Vout models: 75 mVp-p typ. (with 1 µF X7R) 15 Vout models: 75 mVp-p typ. (with 1 µF X7R) 24 Vout models: 75 mVp-p typ. (with 1 µF X7R)
	- dual output	5 / -5 Vout models: 50 / 50 mVp-p typ. (with 1 µF X7R) 12 / -12 Vout models: 75 / 75 mVp-p typ. (with 1 µF X7R) 15 / -15 Vout models: 75 / 75 mVp-p typ. (with 1 µF X7R)
Capacitive Load	- single output	3.3 Vout models: 2'600 µF max. 5 Vout models: 1'300 µF max. 9 Vout models: 800 µF max. 12 Vout models: 560 µF max. 15 Vout models: 560 µF max. 24 Vout models: 200 µF max.
	- dual output	5 / -5 Vout models: 800 / 800 µF max. 12 / -12 Vout models: 390 / 390 µF max. 15 / -15 Vout models: 200 / 200 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		50 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		180% typ. of Iout max.
Transient Response	- Response Time	250 µs typ. (25% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	IEC 60950-1 EN 60950-1 UL 60950-1
	- Certification Documents	www.tracopower.com/overview/tmr9
Pollution Degree		PD 2

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

EMC Specifications

EMC 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	www.tracopower.com/overview/tmr9
EMC Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, ± 8 kV, perf. criteria A Contact: EN 61000-4-2, ± 6 kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst)	EN 61000-4-4, ± 2 kV, perf. criteria A
	- Surge	EN 61000-4-5, ± 2 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. Input Component: 24 Vin models: KY 220 μ F // SMDJ70A 48 Vin models: KY 220 μ F // SMDJ120A
- PF Magnetic Field	EN 61000-4-6, 10 Vrms, perf. criteria A 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	see application note www.tracopower.com/overview/tmr9
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
	- Off Idle Input Current	2.5 mA max.
Altitude During Operation		2'000 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 or PE, 60 s	1'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MOhm 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 option -P) (MIL-HDBK-217F, ground benign)
Environment	- Vibration	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Copper (for standard version) Non-conductive plastic (for option -P)
Potting Material		Silicone (UL94 V-0 rated)
Connection Type		THD (Through-Hole Device)
Weight		5.9 g (for standard version)
		4.8 g (for option -P)
Environmental Compliance	- Reach	www.tracopower.com/info/reach-declaration.pdf
	- RoHS	www.tracopower.com/info/rohs-declaration.pdf

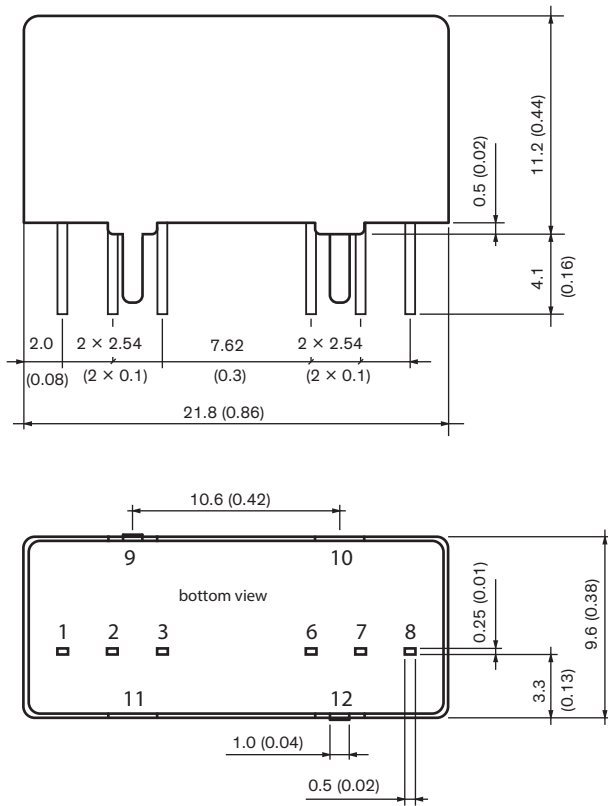
Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tmr9
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All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Outline Dimensions

Metal package (standard)

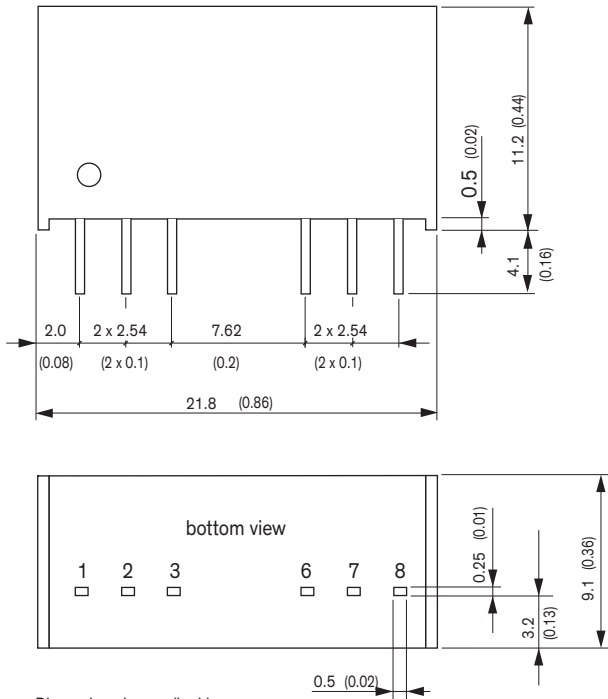


Dimensions in mm (inch)
 Tolerances: ± 0.5 (± 0.02)
 Pin pitch Tolerance ± 0.25 (± 0.01)

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 input voltage, full load and +25°C after warm-up time unless otherwise stated.

Plastic package (option)



Dimensions in mm (inch)
 Tolerances: ± 0.5 (± 0.02)
 Pin pitch Tolerance ± 0.25 (± 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

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