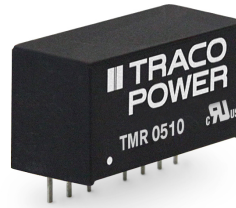




THE DATASHEET OF TMR 1212



- Wide 2:1 input voltage range
- Compact SIP-8 package
- Small footprint
- Remote On/Off control
- Temperature range -40° to $+85^{\circ}\text{C}$
- High efficiency
- Excellent load and line regulation
- Indefinite short-circuit protection
- I/O isolation 1600 VDC
- 3-year product warranty



The TMR 2 series is a family of isolated 2W DC/DC converter modules with regulated output, featuring wide 2:1 input voltage ranges. The product comes in a compact SIP-8 plastic package with small footprint occupying only 2.0 cm² (0.3 square in.) of board space.

An excellent efficiency allows -40° to $+85^{\circ}\text{C}$ operation temperatures. Further features include remote On/Off control and continuous short circuit protection. The ultra-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 0510	4.5 - 9 VDC (5 VDC nom.)	3.3 VDC	500 mA			76 %
TMR 0511		5 VDC	400 mA			80 %
TMR 0512		12 VDC	167 mA			81 %
TMR 0521		+5 VDC	200 mA	-5 VDC	200 mA	79 %
TMR 0522		+12 VDC	83 mA	-12 VDC	83 mA	82 %
TMR 0523		+15 VDC	67 mA	-15 VDC	67 mA	81 %
TMR 1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	500 mA			77 %
TMR 1211		5 VDC	400 mA			81 %
TMR 1212		12 VDC	167 mA			83 %
TMR 1221		+5 VDC	200 mA	-5 VDC	200 mA	81 %
TMR 1222		+12 VDC	83 mA	-12 VDC	83 mA	83 %
TMR 1223		+15 VDC	67 mA	-15 VDC	67 mA	84 %
TMR 2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	500 mA			78 %
TMR 2411		5 VDC	400 mA			81 %
TMR 2412		12 VDC	167 mA			83 %
TMR 2421		+5 VDC	200 mA	-5 VDC	200 mA	80 %
TMR 2422		+12 VDC	83 mA	-12 VDC	83 mA	83 %
TMR 2423		+15 VDC	67 mA	-15 VDC	67 mA	82 %
TMR 4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC	500 mA			76 %
TMR 4811		5 VDC	400 mA			78 %
TMR 4812		12 VDC	167 mA			83 %
TMR 4821		+5 VDC	200 mA	-5 VDC	200 mA	80 %
TMR 4822		+12 VDC	83 mA	-12 VDC	83 mA	81 %
TMR 4823		+15 VDC	67 mA	-15 VDC	67 mA	81 %

Input Specifications

Input Current	- At no load	24 Vin models: 15 mA typ. 48 Vin models: 8 mA typ. 5 Vin models: 35 mA typ. (3.3 Vout model) 35 mA typ. (5 Vout model) 40 mA typ. (12 Vout model) 40 mA typ. (5 / -5 Vout model) 40 mA typ. (12 / -12 Vout model) 40 mA typ. (15 / -15 Vout model)
	- At full load	12 Vin models: 20 mA typ. (3.3 Vout model) 20 mA typ. (5 Vout model) 20 mA typ. (12 Vout model) 30 mA typ. (5 / -5 Vout model) 30 mA typ. (12 / -12 Vout model) 30 mA typ. (15 / -15 Vout model) 5 Vin models: 645 mA max. 12 Vin models: 242 mA max. 24 Vin models: 117 mA max. 48 Vin models: 62 mA max.
Surge Voltage		5 Vin models: 15 VDC max. (100 ms max.) 12 Vin models: 36 VDC max. (100 ms max.) 24 Vin models: 50 VDC max. (100 ms max.) 48 Vin models: 100 VDC max. (100 ms max.)
Recommended Input Fuse		5 Vin models: 1'600 mA (slow blow) 12 Vin models: 1'000 mA (slow blow) 24 Vin models: 1'000 mA (slow blow) 48 Vin models: 1'000 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
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 (10 - 90%)	single output models: 0.5% max. dual output models: 0.8% max. (Output 1) 0.8% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: 5% max.
Ripple and Noise	- 20 MHz Bandwidth	50 mVp-p typ.
Capacitive Load	- single output	3.3 Vout models: 2'200 µF max. 5 Vout models: 1'000 µF max. 12 Vout models: 170 µF max.
	- dual output	5 / -5 Vout models: 470 / 470 µF max. 12 / -12 Vout models: 100 / 100 µF max. 15 / -15 Vout models: 47 / 47 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		5 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Transient Response	- Response Time	500 µs typ. (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	www.tracopower.com/overview/tmr2
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:	www.tracopower.com/overview/tmr2
EMS 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, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 1 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: Nippon KY 220 μ F, 48 mOhm 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 +92°C
	- Case Temperature	+100°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	Depending on model
		See application note: www.tracopower.com/overview/tmr2
Cooling System		Natural convection (20 LFM)
Remote Control	- Current Controlled Remote (passive = on)	On: open circuit Off: 2 to 4 mA current (internal 1 k Ω resistor) Refers to 'Remote' and '-Vin' Pin
		External circuit proposal: www.tracopower.com/info/current-remote.pdf
	- Off Idle Input Current	2.5 mA max.
Altitude During Operation		5'000 m max. (see altitude test report)
Switching Frequency		100 - 650 kHz (RCC)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	200 pF max.
Reliability	- Calculated MTBF	4'900'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F
	- Mechanical Shock	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 μ m)
Pin Surface Plating		Tin (3 - 5 μ m), matte
Housing Type		Plastic Case

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

Mounting Type	PCB Mount
Connection Type	THD (Through-Hole Device)
Footprint Type	SIP8
Soldering Profile	Lead-Free Wave Soldering 260°C / 6 s max.
Weight	4.8 g
Environmental Compliance	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
- REACH Declaration	
- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf 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	25cf7004-2c3a-4f03-8855-1f1b93359928

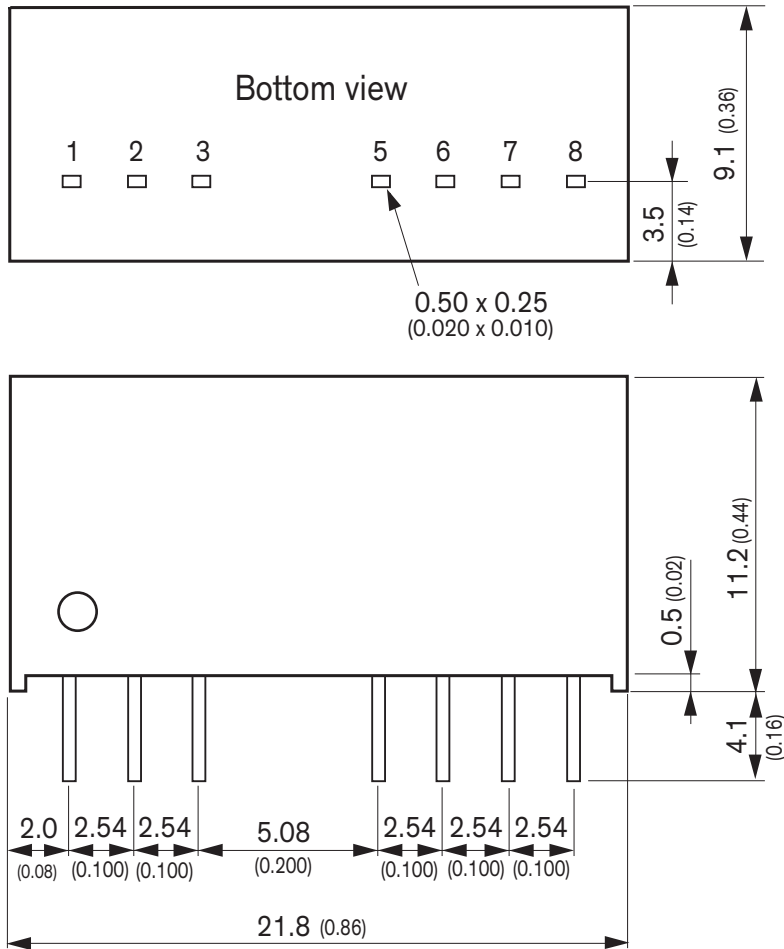
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tmr2

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

Outline Dimensions





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

NC: Not connected

Dimensions in mm (inch)
 Tolerances: x.x ±0.5 (x.xx ±0.02)
 x.xx ±0.25 (x.xxx ±0.01)
 Pin dimension tolerance: ±0.1 (±0.004)

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