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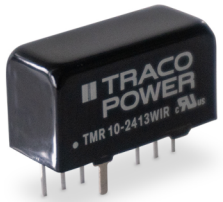
TRACO POWER

DC/DC Railway Converter

TMR 10WIR Series, 10 Watt

- **Compact SIP-8 metal case**
- **EN 50155 and EN 61373 approval for railway applications**
- **Qualification for fire behavior according to EN 45545-2**
- **Wide 4:1 input voltage: 9-36, 18-75, 36-160 VDC**
- **Operating temperature range -40 to +75 °C without derating**
- **High efficiency up to 89%**
- **3000 VDC I/O-isolation**
- **Protection against overload, and short circuit**
- **Remote On/Off function**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TMR 10WIR series is a family of ruggedized 10 Watt DC/DC converters for highest reliability in harsh environments. The converters have a wide 4:1 input range and increased resistance against electromagnetic interference, shock/vibration and thermal shock and come in a SIP-8 metal package. The innovative design provides high efficiencies up to 89% and thus enable an operating temperature range from -40 up to +75°C without derating. The approvals according to standards EN 50155 and EN 61373 qualify them for railway and transportation systems. Additional qualification for the fire behavior of components according to EN 45545-2 and the safety approval according IEC/- EN62368-1, UL62368-1 support a potential compliance test of the application. Built-in features like input under-voltage-lockout, short circuit protection and remote On/Off make this series suitable for almost any application demands and thus facilitate the design-in process.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TMR 10-2410WIR	9 - 36 VDC (24 VDC nom.)	3.3 VDC	2'500 mA			87 %
TMR 10-2411WIR		5 VDC	2'000 mA			88 %
TMR 10-2412WIR		12 VDC	840 mA			89 %
TMR 10-2413WIR		15 VDC	670 mA			89 %
TMR 10-2415WIR		24 VDC	420 mA			89 %
TMR 10-2421WIR		+5 VDC	1'000 mA	−5 VDC	1'000 mA	86 %
TMR 10-2422WIR		+12 VDC	420 mA	−12 VDC	420 mA	89 %
TMR 10-2423WIR		+15 VDC	336 mA	−15 VDC	336 mA	89 %
TMR 10-4810WIR	18 - 75 VDC (48 VDC nom.)	3.3 VDC	2'500 mA			87 %
TMR 10-4811WIR		5 VDC	2'000 mA			88 %
TMR 10-4812WIR		12 VDC	840 mA			89 %
TMR 10-4813WIR		15 VDC	670 mA			89 %
TMR 10-4815WIR		24 VDC	420 mA			89 %
TMR 10-4821WIR		+5 VDC	1'000 mA	−5 VDC	1'000 mA	86 %
TMR 10-4822WIR		+12 VDC	420 mA	−12 VDC	420 mA	89 %
TMR 10-4823WIR		+15 VDC	336 mA	−15 VDC	336 mA	89 %
TMR 10-7210WIR	40 - 160 VDC (110 VDC nom.)	3.3 VDC	2'500 mA			86 %
TMR 10-7211WIR		5 VDC	2'000 mA			87 %
TMR 10-7212WIR		12 VDC	840 mA			88 %
TMR 10-7213WIR		15 VDC	670 mA			88 %
TMR 10-7215WIR		24 VDC	420 mA			88 %
TMR 10-7221WIR		+5 VDC	1'000 mA	−5 VDC	1'000 mA	85 %
TMR 10-7222WIR		+12 VDC	420 mA	−12 VDC	420 mA	88 %
TMR 10-7223WIR		+15 VDC	336 mA	−15 VDC	336 mA	88 %

Input Specifications

Input Current	- At no load	24 Vin models:	**8 mA typ.**
		48 Vin models:	**4 mA typ.**
		110 Vin models:	**4 mA typ.** (3.3 Vout model)
			3 mA typ. (5 Vout model)
			3 mA typ. (12 Vout model)
			3 mA typ. (15 Vout model)
			3 mA typ. (24 Vout model)
			3 mA typ. (5 / -5 Vout model)
			3 mA typ. (12 / -12 Vout model)
			3 mA typ. (15 / -15 Vout model)
Surge Voltage		24 Vin models:	**50 VDC max.** (1 s max.)
		48 Vin models:	**100 VDC max.** (1 s max.)
		110 Vin models:	**200 VDC max.** (1 s max.)
Under Voltage Lockout		24 Vin models:	**6.2 VDC min. / 7.2 VDC typ. / 8.2 VDC max.**
		48 Vin models:	**12.5 VDC min. / 14.5 VDC typ. / 16.4 VDC max.**
		110 Vin models:	**31.8 VDC min. / 33.8 VDC typ. / 35.6 VDC max.**
Recommended Input Fuse		24 Vin models:	**2'000 mA** (slow blow)
		48 Vin models:	**1'250 mA** (slow blow)
		110 Vin models:	**630 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:	**0.5% max.**
	- Load Variation (0 - 100%)	single output models:	**0.5% max.**
		dual output models:	**1% max.** (Output 1)
			1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	**5% max.**
	- Cross Regulation (25% / 100% asym. load)	dual output models:	**5% max.**
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models:	**75 mVp-p max.** (w/ 1 µF)
		5 Vout models:	**75 mVp-p max.** (w/ 1 µF)
		12 Vout models:	**100 mVp-p max.** (w/ 1 µF)
		15 Vout models:	**100 mVp-p max.** (w/ 1 µF)
		24 Vout models:	**100 mVp-p max.** (w/ 1 µF)
	- dual output	5 / -5 Vout models:	**75 / 75 mVp-p max.** (w/ 1 µF)
		12 / -12 Vout models:	**100 / 100 mVp-p max.** (w/ 1 µF)
		15 / -15 Vout models:	**100 / 100 mVp-p max.** (w/ 1 µF)
	- single output	3.3 Vout models:	**45 mVp-p typ.** (w/ 1 µF)
		5 Vout models:	**45 mVp-p typ.** (w/ 1 µF)
		12 Vout models:	**70 mVp-p typ.** (w/ 1 µF)
		15 Vout models:	**70 mVp-p typ.** (w/ 1 µF)
		24 Vout models:	**70 mVp-p typ.** (w/ 1 µF)
	- dual output	5 / -5 Vout models:	**45 / 45 mVp-p typ.** (w/ 1 µF)
		12 / -12 Vout models:	**70 / 70 mVp-p typ.** (w/ 1 µF)
		15 / -15 Vout models:	**70 / 70 mVp-p typ.** (w/ 1 µF)

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

Capacitive Load	- single output	3.3 Vout models:	3'700 µF max.
		5 Vout models:	1'800 µF max.
		12 Vout models:	700 µF max.
		15 Vout models:	680 µF max.
		24 Vout models:	330 µF max.
	- dual output	5 / -5 Vout models:	1'100 / 1'100 µF max.
		12 / -12 Vout models:	580 / 580 µF max.
		15 / -15 Vout models:	300 / 300 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Hold-up Time			10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: www.tracopower.com/info/holdup_en50155.pdf)
Start-up Time			45 ms typ. / 75 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			160% typ. of Iout max.
Transient Response	- Response Time		250 µs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment		EN 62368-1 IEC 62368-1 UL 62368-1
	- Railway Applications		EN 50155
	- Certification Documents		www.tracopower.com/overview/tmr10wir
Pollution Degree			PD 2
Over Voltage Category			Not mains connected

EMC Specifications

EMI (Emissions)			EN 50121-3-2 (EMC for Rolling Stock)
	- 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/tmr10wir
EMS (Immunity)			EN 50121-3-2 (EMC for Rolling Stock) EN 55035 (Multimedia)
	- 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) / Surge		EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±2 kV, perf. criteria A
		External filter proposal:	www.tracopower.com/overview/tmr10wir
	- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A
		1 s:	EN 61000-4-8, 1000 A/m, perf. criteria A
EMC / Environmental	- Certification Documents		www.tracopower.com/overview/tmr10wir

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +75°C
	- Case Temperature		+105°C max.
	- Storage Temperature		–55°C to +125°C
Power Derating	- High Temperature		Depending on model (For ideal temperature behaviour, use suggested PCB layout from application note.)
		See application note:	www.tracopower.com/overview/tmr10wir

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Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	Off: 3 to 12 VDC Refers to 'Remote' and '-Vin' Pin On: 0 to 0.8 VDC or open circuit
	- Off Idle Input Current	2.5 mA typ.
	- Remote Pin Input Current	0.5 to 2.5 mA
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		250 - 520 kHz (PWM) 365 kHz typ. (PWM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	3'000 VDC (110 Vin models) 2'250 VDC (other models)
	- Input to Case, 60 s	1'500 VDC
	- Output to Case, 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	600 pF max.
Reliability	- Calculated MTBF	2'605'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Not allowed
Environment	- Vibration	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	MIL-STD-810F
	- Flammability	EN 45545-2 www.tracopower.com/info/en45545-declaration.pdf
Housing Material		Copper
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Brass (C2680-H)
Pin Foundation PlatingPin Foundation Plating		Nickel (1 - 2 µm) Nickel (2.5 - 3 µm)
Pin Surface Plating		Tin (3 - 5 µm), matte
Housing Type		Metal Case
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		7.7 g
Thermal Impedance	- Case to Ambient	25 K/W typ.
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: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	ded6012d-3761-48fe-9631-a4fd4bfaafea

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tmr10wir

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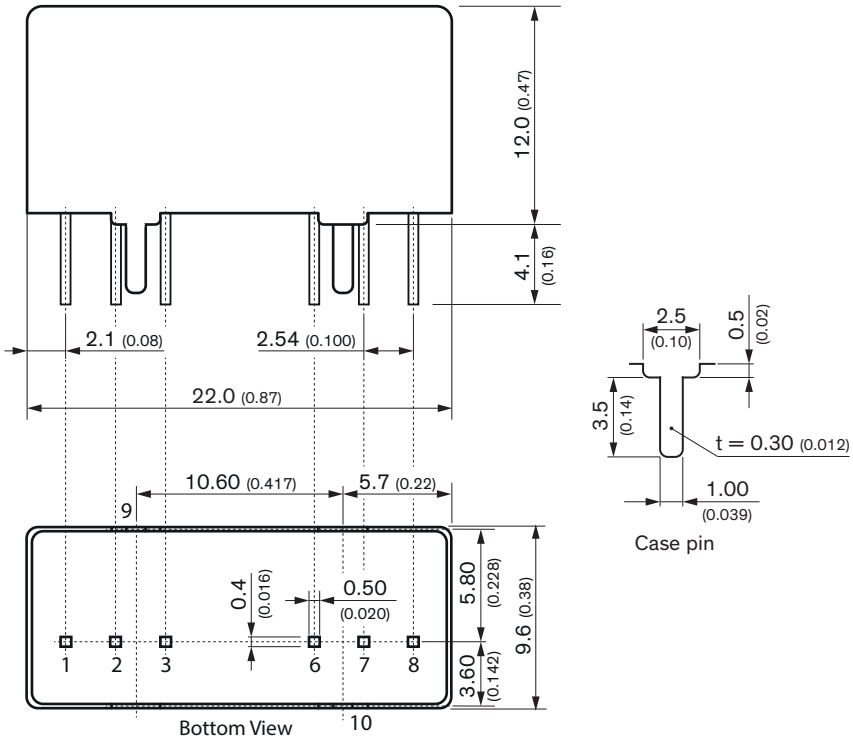
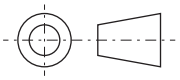
Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (x.xx ±0.02)
x.xx ±0.25 (x.xxx ±0.01)
Pin dimension tolerance: ±0.10 (±0.004)



Pinout		
Pin	**Single Output**	**Dual Output**
1	–Vin	
2	+Vin	
3	Remote On/Off	
6	+Vout	
7	–Vout	Common
8	NC	–Vout
9	Case*	
10	Case*	

NC: Not connected

*Case pins must not be connected to any circuit.