TRACO POWER

DC/DC Converter

TMR 10WI Series, 10 Watt

- **Ultra compact 10 Watt converter in SIP-8 casing**
- **High power density of 3,89W/cm³**
- **Wide 4:1 input voltage ranges**
- **I/O-isolation 1500 VDC**
- **High efficiency (up to 89%) for low thermal loss**
- **Operating temperature range -40°C to +70°C (without derating)**
- **Fully regulated outputs**
- **Remote On/Off control**
- **Indefinite short circuit protection**
- **3-year product warranty**

UL 62368-1 IEC 62368-1

The TMR 10WI series is a family of isolated 10W DC/DC converter modules with regulated output, featuring wide 4:1 input voltage ranges. The product offers a very high power density of 3.89W/cm³ in an ultra-compact SIP-8 package occupying only 2.0 cm² (0.3 square inch) of board space. An excellent efficiency of up to 89% allows for an extended operating temperature range of −40° to +70°C without derating under natural convection conditions. Further features include remote On/Off control, continuous short circuit protection and an I/O isolation voltage of 1500 VDC. 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
		Vnom	Imax	Vnom	Imax	typ.
TMR 10-1211WI	4.5 - 18 VDC (12 VDC nom.)	5.1 VDC	2'000 mA			89 %
TMR 10-1212WI		12 VDC	833 mA			89 %
TMR 10-1213WI		15 VDC	666 mA			89 %
TMR 10-1215WI		24 VDC	416 mA			89 %
TMR 10-1222WI		+12 VDC	416 mA	−12 VDC	416 mA	88 %
TMR 10-1223WI		+15 VDC	333 mA	−15 VDC	333 mA	89 %
TMR 10-2411WI	9 - 36 VDC (24 VDC nom.)	5.1 VDC	2'000 mA			88 %
TMR 10-2412WI		12 VDC	833 mA			89 %
TMR 10-2413WI		15 VDC	666 mA			89 %
TMR 10-2415WI		24 VDC	416 mA			88 %
TMR 10-2422WI		+12 VDC	416 mA	−12 VDC	416 mA	88 %
TMR 10-2423WI		+15 VDC	333 mA	−15 VDC	333 mA	88 %
TMR 10-4811WI	18 - 75 VDC (48 VDC nom.)	5.1 VDC	2'000 mA			88 %
TMR 10-4812WI		12 VDC	833 mA			89 %
TMR 10-4813WI		15 VDC	666 mA			89 %
TMR 10-4815WI		24 VDC	416 mA			89 %
TMR 10-4822WI		+12 VDC	416 mA	−12 VDC	416 mA	89 %
TMR 10-4823WI		+15 VDC	333 mA	−15 VDC	333 mA	89 %

Note - If the input will be switched electromechanically, use an external 68 µF / 100 V / KZE capacitor to reduce voltage transient.

Input Specifications

Input Current	- At no load	12 Vin models:	16 mA typ. / 24 mA max.
		24 Vin models:	8 mA typ. / 13 mA max.
		48 Vin models:	5 mA typ. / 10 mA max.
	- At full load	12 Vin models:	936 mA typ. / 967 mA max.
		24 Vin models:	473 mA typ. / 494 mA max.
		48 Vin models:	234 mA typ. / 247 mA max.
Surge Voltage		12 Vin models:	25 VDC max. (1 s max.)
		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
Start-up Voltage		12 Vin models:	4.1 VDC - 4.5 VDC
		24 Vin models:	8 VDC - 9 VDC
		48 Vin models:	17 VDC - 18 VDC
Under Voltage Lockout		12 Vin models:	3.7 - 4.3 VDC max.
		24 Vin models:	7.5 - 8.5 VDC max.
		48 Vin models:	15.5 - 16.5 VDC max.
Recommended Input Fuse		12 Vin models:	5'000 mA (slow blow)
		24 Vin models:	2'500 mA (slow blow)
		48 Vin models:	1'500 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:	0.8% max.
		dual output models:	0.8% max.
	- Load Variation (0 - 100%)	single output models:	1% max.
		dual output models:	1% max. (Output 1)
			1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	2% max.
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	5.1 Vout models:	100 mVp-p max. (w/ 1uF)
		12 Vout models:	140 mVp-p max. (w/ 1uF)
		15 Vout models:	140 mVp-p max. (w/ 1uF)
		24 Vout models:	140 mVp-p max. (w/ 1uF)
	- dual output	12 / -12 Vout models:	140 / 140 mVp-p max. (w/ 1uF)
		15 / -15 Vout models:	140 / 140 mVp-p max. (w/ 1uF)
	- single output	5.1 Vout models:	80 mVp-p typ. (w/ 1uF)
		12 Vout models:	100 mVp-p typ. (w/ 1uF)
		15 Vout models:	100 mVp-p typ. (w/ 1uF)
		24 Vout models:	100 mVp-p typ. (w/ 1uF)
	- dual output	12 / -12 Vout models:	100 / 100 mVp-p typ. (w/ 1uF)
		15 / -15 Vout models:	100 / 100 mVp-p typ. (w/ 1uF)
Capacitive Load	- single output	5.1 Vout models:	3'900 µF max.
		12 Vout models:	680 µF max.
		15 Vout models:	470 µF max.
		24 Vout models:	180 µF max.
	- dual output	12 / -12 Vout models:	390 / 390 µF max.
		15 / -15 Vout models:	220 / 220 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Hold-up Time			1 ms min. (12 Vin models)
			1.2 ms min. (24 Vin models)
			5.5 ms min. (48 Vin models)

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

Start-up Time			30 ms typ. / 50 ms max.
Start-up Overshoot Voltage			5% max.
Short Circuit Protection			Continuous, Automatic recovery
Overload Protection			Switch off after 4 s delay, automatic restart
Output Current Limitation			110 - 180% of Iout max.
Overvoltage Protection			140% typ. of Vout nom.
Transient Response	- Response Deviation		5% max. (75% to 100% Load Step)
	- Response Time		500 µs max. (75% to 100% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment		EN 62368-1 IEC 62368-1 UL 62368-1
	- Certification Documents		www.tracopower.com/overview/tmr10wi
Pollution Degree			PD 3
Over Voltage Category			Not mains connected

EMC Specifications

EMI (Emissions)			EN 61000-6-4 (Generic Industrial)
	- Conducted Emissions		EN 55032 class A (with external filter)
	- Radiated Emissions		EN 55032 class A (with external filter)
		External filter proposal:	www.tracopower.com/overview/tmr10wi
EMS (Immunity)			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, 10 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/tmr10wi
	- 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/tmr10wi

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +85°C
	- Approved Ambient Temp.		+65°C max. (5.1 Vout models) +70°C max. (other models) (for compliance to 62368-1)
	- Case Temperature		+105°C max.
	- Storage Temperature		–50°C to +125°C
Power Derating	- High Temperature		Depending on model
		See application note:	www.tracopower.com/overview/tmr10wi
Cooling System			Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)		On: 3.5 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current		0.5 mA max.
	- Remote Pin Input Current		-0.5 to 0.5 mA
Altitude During Operation			6'000 m max.
Regulator Topology			Flyback Converter
Switching Frequency			390 - 450 kHz (PWM) 420 kHz typ. (PWM)
Insulation System			Functional Insulation

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

Isolation Test Voltage	- Input to Output, 60 s	1'500 VDC
	- Input to Output, 1 s	1'800 VDC
	- Input to Case, 60 s	1'500 VDC
	- Output to Case, 60 s	1'500 VDC
Creepage	- Input to Output	0.7 mm min.
Clearance	- Input to Output	1.5 mm min.
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'000 pF typ. 1'500 pF max.
Distance Through Isolation		1.5 mm
Reliability	- Calculated MTBF	1'590'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	IPC-9592B 2.4 g, 3 axis, random waveform, 30 min
	- Mechanical Shock	IPC-9592B 30 g, 3 axis, half sine, 11 ms
	- Thermal Shock	IPC-9592B -40 to +125°C, 100 cycles, 30 min each
Housing Material		Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Nickel (1 - 3 µm)
Pin Surface Plating		Tin (3 - 5 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP8
Soldering Profile		Lead-Free Reflow Soldering (acc. J-STD-020E) 245°C max. (Tp) 10 s max. (tp, at Tp - 5°C) See application note: www.tracopower.com/info/reflow-soldering.pdf
Weight		7 g
Thermal Impedance	- Case to Ambient	26.39 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) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	be5cadb1-00ed-482a-9818-2ba04826a37f

Additional Information

Supporting Documents	www.tracopower.com/overview/tmr10wi
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

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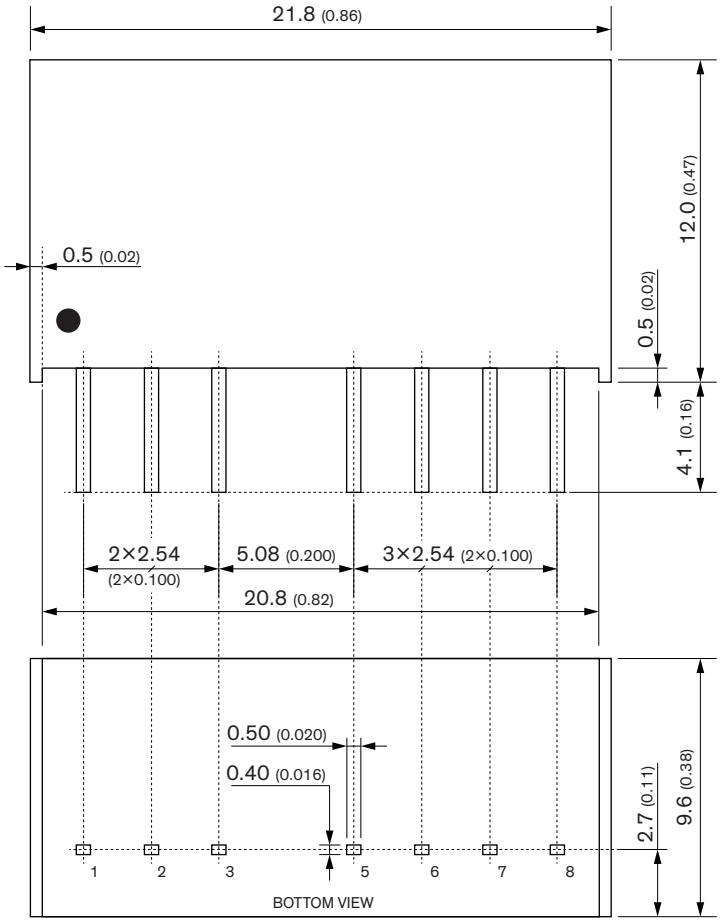
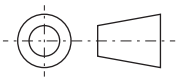
Outline Dimensions



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



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

NC: Not connected