

Non-Isolated DC/DC Converter (POL)

TSR 1WI Series, 1 A

- **Ultra wide 8:1 input voltage range: 9-72 VDC**
- **Covers a majority of standard bus- and battery voltages**
- **Up to 93% efficiency - No heatsink required**
- **Pin compatible with LMxx linear regulators (SIP-3)**
- **Operating temperature range -40 to +80°C**
- **Low standby current**
- **Excellent line/load regulation**
- **Protection against short circuit, overvoltage and overtemperature**
- **3-year product warranty**



The TSR 1WI is a non-isolated POL converter series with an ultra wide 8:1 input voltage range which comes in a standard SIP-3 package. Covering the majority of standard bus- and battery voltages this POL converter is a versatile solution for many applications in distributed power systems where different input voltages have to be handled. Being able to use the same converter in many different situations effectively reduces the bill of material (BOM) of a given application. A high efficiency of up to 93% allows for an operating temperature range of -40 to +80°C (up to 50°C without derating) and makes them excellent drop-in replacements for less efficient LMxx linear regulators. With 1.0 A max. output current and standard features such as low standby current, precise regulation and protection against short circuit, overvoltage and overload the TSR 1WI is suitable for many battery and distributed power applications.

Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom.	Efficiency typ.
TSR 1-4833WI	1'000 mA	9 - 72 VDC (48 VDC nom.)	3.3 VDC	83 % (at 24 Vin)
TSR 1-4850WI			5 VDC	87 % (at 24 Vin)
TSR 1-4865WI			6.5 VDC	88 % (at 24 Vin)
TSR 1-4890WI			9 VDC	90 % (at 24 Vin)
TSR 1-48120WI			12 VDC	93 % (at 24 Vin)
TSR 1-48150WI	700 mA	21 - 72 VDC (48 VDC nom.)	15 VDC	93 % (at 24 Vin)
TSR 1-48240WI		33 - 72 VDC (48 VDC nom.)	24 VDC	92 % (at 48 Vin)

Options

on demand (backorder with MOQ non stocking item)	- Optional models with angular pins (see outline dimensions)
--	--

Input Specifications

Input Current	- At no load	12 mA typ.
Recommended Input Fuse		1'000 mA (slow blow) (3.3 Vout model) 1'250 mA (slow blow) (5 and 24 Vout models) 1'600 mA (slow blow) (other models) (The need of an external fuse has to be assessed in the final application.)
Input Filter	See application note:	www.tracopower.com/overview/tsr1wi (Recommended external input filter proposal)

Output Specifications

Voltage Set Accuracy		±2% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.5% max. 0.6% max.
Ripple and Noise	- 20 MHz Bandwidth	75 mVp-p typ. (24 Vout model) (w/ 4.7 µF X7R) 50 mVp-p typ. (other models) (w/ 10 µF X7R)
Capacitive Load	3.3 Vout models: 5 Vout models: 6.5 Vout models: 9 Vout models: 12 Vout models: 15 Vout models: 24 Vout models:	2'400 µF max. 1'580 µF max. 1'200 µF max. 880 µF max. 660 µF max. 530 µF max. 330 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		25 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		180% typ. of Iout max.
Transient Response	- Peak Variation	125 mV typ. / 250 mV max. (50% Load Step) (24 Vout model, with external 4.7 µF X7R) 90 mV typ. / 180 mV max. (50% Load Step) (other models, with external 10 µF X7R)
	- Response Time	150 µs typ. / 250 µs max. (50% Load Step)

Safety Specifications

Over Voltage Category	Not mains connected
-----------------------	---------------------

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/tsr1wi-emc-filter/

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +80°C +105°C max. -55°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/tsr1wi-cc/
Over Temperature	- Protection Mode	165°C typ. (Automatic recovery)
Protection Switch Off	- Measurement Point	Internal IC temperature
Cooling System		Natural convection (20 LFM)

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

Regulator Topology	Buck Converter
Switching Frequency	143 - 238 kHz (PWM) (3.3 Vout model) 150 - 250 kHz (PWM) (5 Vout model) 188 - 313 kHz (PWM) (6.5 Vout model) 225 - 375 kHz (PWM) (9 Vout model) 263 - 438 kHz (PWM) (12 Vout model) 300 - 500 kHz (PWM) (15 Vout model) 413 - 688 kHz (PWM) (24 Vout model)
Insulation System	Non-isolated
Reliability	- Calculated MTBF 8'215'000 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	Metal
Potting Material	Epoxy (UL 94 V-0 rated)
Pin Material	Brass
Pin Foundation Plating	Nickel (1 - 2 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	SIP3
Soldering Profile	Lead-Free Wave Soldering 260°C / 6 s max.
Weight	5.5 g
Thermal Impedance	- Case to Ambient 35.0 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 c99571d7-5cd4-40ad-b21e-7f68ac374873

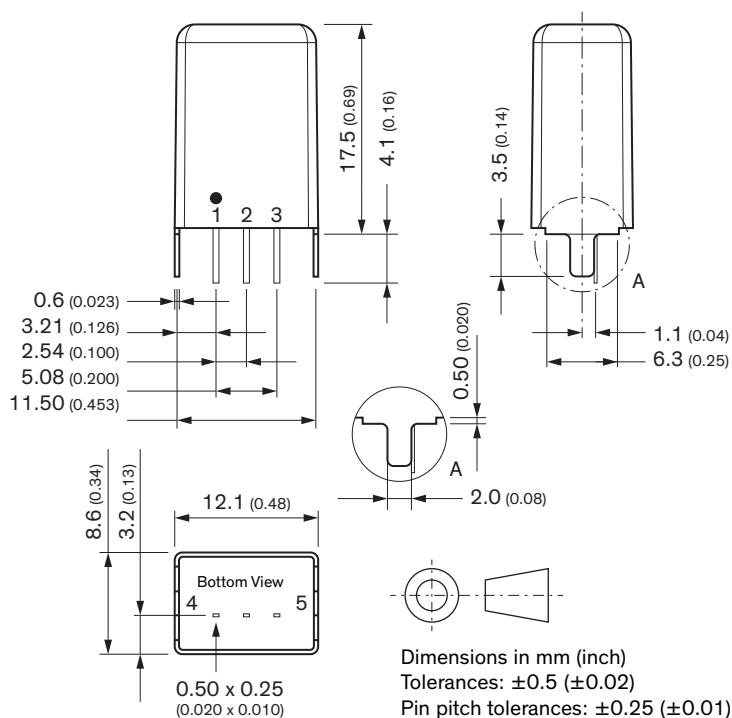
Additional Information

Supporting Documents	www.tracopower.com/overview/tsr1wi
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf
Service Portal	www.tracoserviceportal.com

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

Outline Dimensions

Straight pin version

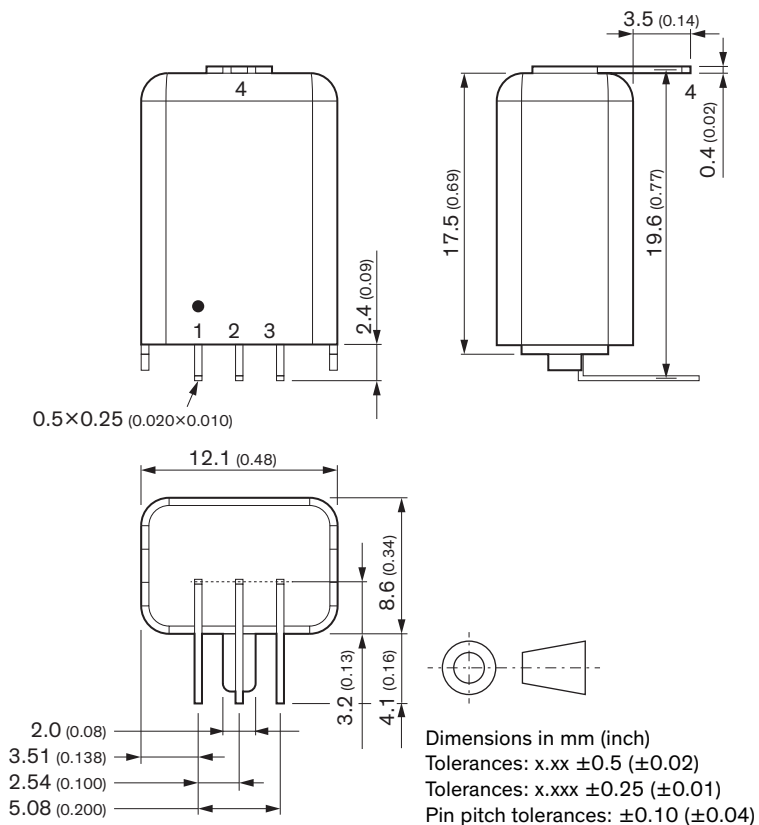


Pinout

1	+Vin
2	GND
3	+Vout
4	Case pin
5	Case pin

Avoid routing PCB traces under the converter.

Angular pin version



Pinout

1	+Vin
2	GND
3	+Vout
4	Case pin

Avoid routing PCB traces under the converter.