

## Non-Isolated DC/DC Converter (POL)

## TSR 1WI Series

- **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.

<b>on demand</b> (on demand (backorder with MOQ, non stocking item) non stocking item)	- Optional models with angular pins (see outline dimensions)
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### Input Specifications

(It is recommended to use an external input filter, please refer to application note: <a href="http://www.tracopower.com/overview/tsr1wi">www.tracopower.com/overview/tsr1wi</a> )	
Recommended Input Fuse	VDC model: 1'000 mA (slow blow) 1'250 mA (slow blow) 1'600 mA (slow blow) 1'250 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)

### Output Specifications

Voltage Set Accuracy	±2% max.
Regulation	- Input Variation (Vmin - Vmax) 0.5% max. - Load Variation (0 - 100%) 0.6% max.

Ripple and Noise (20 MHz Bandwidth)	3.3 VDC model:	50 mVp-p typ. (w/ 10 $\mu$ F X7R)
	5 VDC model:	50 mVp-p typ. (w/ 10 $\mu$ F X7R)
	6.5 VDC model:	50 mVp-p typ. (w/ 10 $\mu$ F X7R)
	9 VDC model:	50 mVp-p typ. (w/ 10 $\mu$ F X7R)
	12 VDC model:	50 mVp-p typ. (w/ 10 $\mu$ F X7R)
	15 VDC model:	50 mVp-p typ. (w/ 10 $\mu$ F X7R)
	24 VDC model:	75 mVp-p typ. (w/ 4.7 $\mu$ F X7R)
Capacitive Load	3.3 VDC model:	2'400 $\mu$ F max.
	5 VDC model:	1'580 $\mu$ F max.
	6.5 VDC model:	1'200 $\mu$ F max.
	9 VDC model:	880 $\mu$ F max.
	12 VDC model:	660 $\mu$ F max.
	15 VDC model:	530 $\mu$ F max.
	24 VDC model:	330 $\mu$ F max.
Minimum Load		
Temperature Coefficient		$\pm 0.02$ %/K max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		180% typ. of I <sub>out</sub> max.
Transient Response	- Peak Variation	125 mV typ. / 250 mV max. (50% Load Step) (24 V <sub>out</sub> model, with external 4.7 $\mu$ F X7R)
	- Response Time	90 mV typ. / 180 mV max. (50% Load Step) (other models, with external 10 $\mu$ F X7R) 150 $\mu$ s typ. / 250 $\mu$ s max. (50% Load Step)

## Safety Specifications

Safety Standards	- Certification Documents	<a href="http://www.tracopower.com/overview/tsr1wi">www.tracopower.com/overview/tsr1wi</a>
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## EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (with external filter)
	- Radiated Emissions	EN 55032 class B (with external filter)
		EN 55032 class A (with external filter)
		EN 55032 class B (with external filter)
External filter proposal:		<a href="http://www.tracopower.com/overview/tsr1wi">www.tracopower.com/overview/tsr1wi</a>

## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +80°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	See application note: <a href="#">See application note</a>
Over Temperature Protection Switch Off	- Protection Mode	165°C typ. (Automatic recovery)
	- Measurement Point	Internal IC temperature
Cooling System		Natural convection (20 LFM)
Switching Frequency		143 - 238 kHz (PWM) (3.3 V <sub>out</sub> model)
		150 - 250 kHz (PWM) (5 V <sub>out</sub> model)
		188 - 313 kHz (PWM) (6.5 V <sub>out</sub> model)
		225 - 375 kHz (PWM) (9 V <sub>out</sub> model)
		263 - 438 kHz (PWM) (12 V <sub>out</sub> model)
		300 - 500 kHz (PWM) (15 V <sub>out</sub> model)
Insulation System		413 - 688 kHz (PWM) (24 V <sub>out</sub> model)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	8'215'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>

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

Environment	- Vibration - Mechanical Shock - Thermal Shock	MIL-STD-810F MIL-STD-810F MIL-STD-810F
Housing Material		Metal
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Brass
Pin Foundation Plating		Nickel (1 - 2 $\mu$ m)
Pin Surface Plating		Tin (3 - 5 $\mu$ m), matte
Housing Type		Metal Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP3
Soldering Profile		Lead-Free Wave Soldering
Weight		5.5 g
Thermal Impedance	- Case to Ambient	35 K/W typ.
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) c99571d7-5cd4-40ad-b21e-7f68ac374873

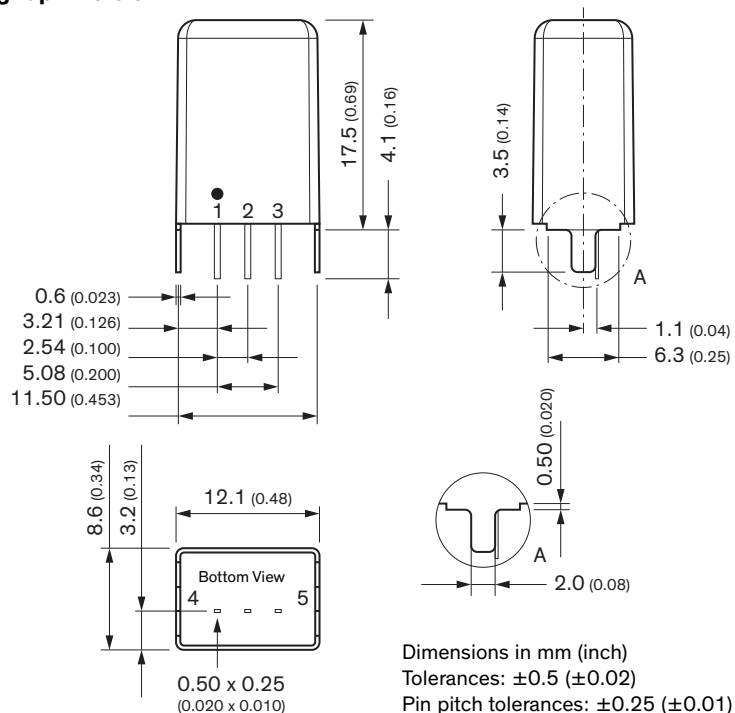
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tsr1wi](http://www.tracopower.com/overview/tsr1wi)

## Outline Dimensions

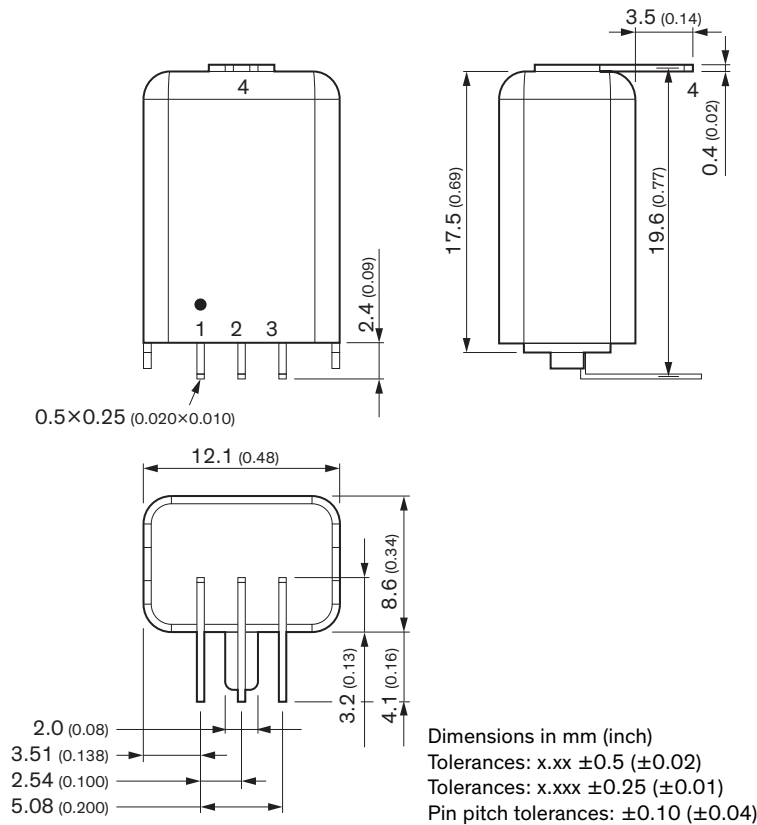
### Straight pin version



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

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

**Angular pin version**



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