

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

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

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|------------------------|-----------------------|--|
| 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) |

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/tsr1wi |

General Specifications

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|-----------------------|--|--|
| 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/overview/tsr1wi |
| Over Temperature | - Protection Mode | 165°C typ. (Automatic recovery) |
| Protection Switch Off | - Measurement Point | Internal IC temperature |
| Cooling System | | Natural convection (20 LFM) |
| Regulator Topology | | Buck Converter |

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

| | | |
|--------------------------|--|---|
| 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 - 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 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 K/W typ. |
| Environmental Compliance | - REACH Declaration - RoHS Declaration - SCIP Reference Number | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant 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).) c99571d7-5cd4-40ad-b21e-7f68ac374873 |

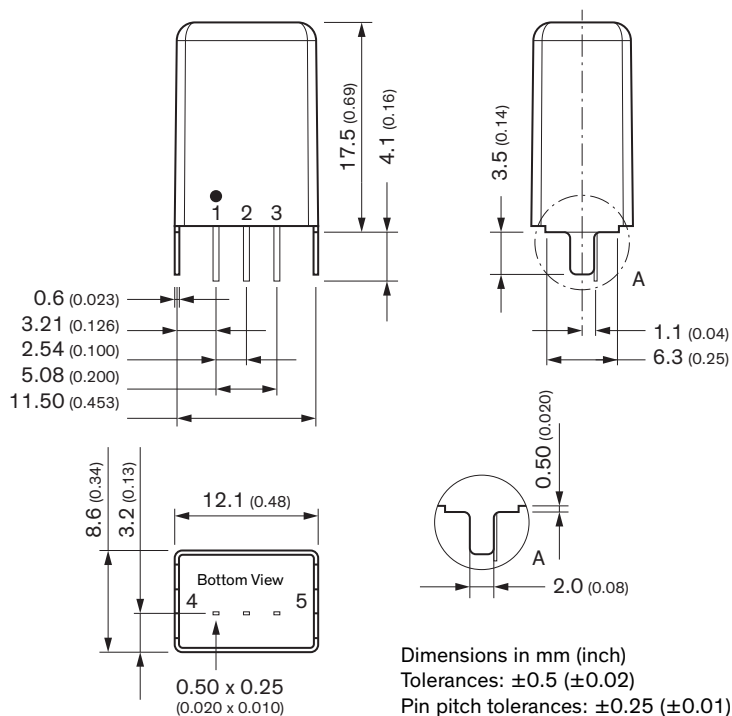
Supporting Documents

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|--|--|
| Overview Link (for additional Documents) | www.tracopower.com/overview/tsr1wi |
|--|--|

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

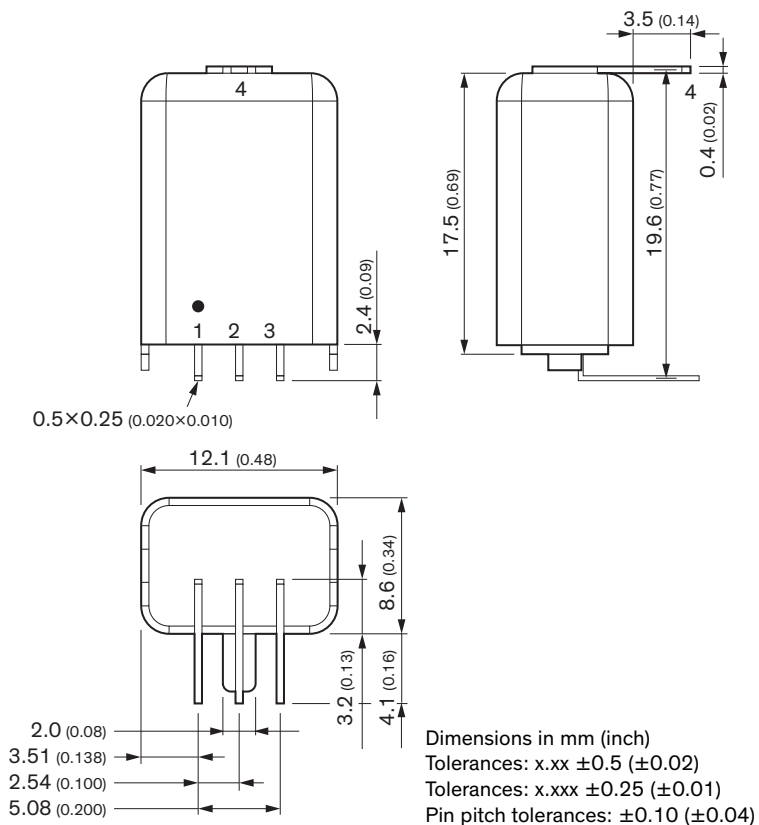
Outline Dimensions

Straight pin version



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

Angular pin version



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

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