TRACO POWER

Non-Isolated DC/DC Converter (POL) — TSR 1E Series, 1 A

- **Highly cost efficient design**
- **Pin compatible with LMxx linear regulators**
- **Operation temperature. range –40°C to +85°C**
- **Efficiency up to 92%**
- **Wide input operating range 6-36 VDC**
- **Short circuit protection**
- **Excellent line / load regulation**
- **3-year product warranty**

The TSR 1E is a 1 Ampere step-down switching regulator series and a drop-in replacement for inefficient 78xx linear regulators. This series comes in a standard plastic SIP-3 case and complements our existing POL portfolio with a series focusing strongly on a cost efficient design while maintaining our quality standards. The effective design allows full load operation up to +60°C ambient temperature without the need of any heat sink or forced cooling. The TSR 1E switching regulators provide other significant features over linear regulators, i.e. better output accuracy, lower standby current and no requirement of external capacitors. The TSR 1E series offers a broad application range in many environments and is especially suited for high volume projects where the series will help to reduce production cost by delivering not only a highly cost efficient but also reliable solution.

Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom.	Efficiency typ.
TSR 1-2433E	1'000 mA	6 - 36 VDC (24 VDC nom.)	3.3 VDC	88 %
TSR 1-2450E		7 - 36 VDC (24 VDC nom.)	5 VDC	92 %

Input Specifications

Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor

Output Specifications

Voltage Set Accuracy		±4% max.
Regulation	- Input Variation (Vmin - Vmax)	0.75% max.
	- Load Variation (10 - 100%)	1.5% max.
Ripple and Noise	- 20 MHz Bandwidth	80 mVp-p typ.
Capacitive Load		1'000 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.03 %/K max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		350% max. of Iout max.
Transient Response	- Peak Variation	80 mV max. (50% to 100% Load Step) (3.3 Vout model) 100 mV max. (50% to 100% Load Step) (5 Vout model)
	- Response Time	200 µs max. (50% to 100% Load Step)

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class B (with external filter)
	- Radiated Emissions	EN 55032 class B (with external filter)
	External filter proposal:	www.tracopower.com/overview/tsr1e

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Case Temperature	+105°C max.
	- Storage Temperature	–50°C to +125°C
Power Derating	- High Temperature	4.17 %/K above 61°C
	See application note:	www.tracopower.com/overview/tsr1e
Over Temperature Protection Switch Off	- Protection Mode	150°C typ. (Latch off)
Cooling System		Natural convection (20 LFM)
Switching Frequency		520 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	7'000'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Not allowed
Housing Material		Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Nickel (1 µm min.)
Pin Surface Plating		Tin (3 µm min.), bright
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP3
Soldering Profile		Lead-Free Wave Soldering 265 °C / 5 s max.
Weight		1.6 g

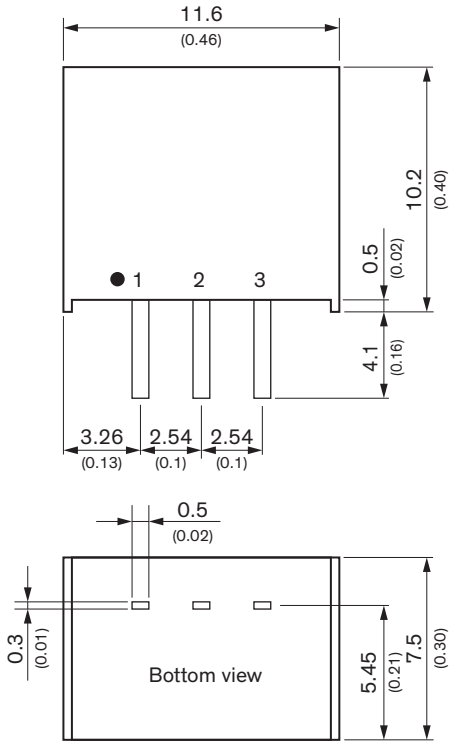
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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: 7a, 7c-I
		(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	3880b865-22ea-4c73-9bb3-931a3f09253d

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tsr1e

Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (±0.02)
x.xx ±0.25 (±0.01)
Pin dimension tolerance: ±0.1 (±0.04)

Pinout	
Pin	**Function**
1	+Vin
2	GND
3	+Vout