TRACO POWER®

DC/DC Converters
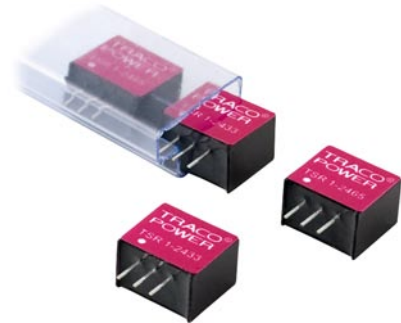
TSR-1 Series, 1 A

Features

◆ **Up to 96 % efficiency**
   –> No heat-sink required

◆ **Pin compatible with LMxx linear regulators**

◆ **SIP-package fitsexisting TO-220 footprint**

◆ **Built in filter capacitors**

◆ **Operation temp. range –40 to +85 °C**

◆ **Short circuit protection**

◆ **Wide input operating range**

◆ **Excellent line / load regulation**

◆ **Low standby current**

◆ **3-year product warranty**

The new TSR-1 series step-down switching regulators are drop-in replacement for inefficient 78xx linear regulators. A high efficiency up to 96 % allows full load operation up to +60 °C ambient temperature without the need of any heat-sink or forced cooling.

The TSR-1 switching regulators provide other significant features over linear regulators, i.e. better output accuracy (± 2 %), lower standby current of 2 mA and no requirement of external capacitors. The high efficiency and low standby power consumption makes these regulators an ideal solution for many battery powered applications.

Models

Order code	Input voltage		Output voltage	Output current	Efficiency typ.	
	range	nominal		max.	@ Vin min.	@ Vin max.
TSR 1-2415	4.75 – 32 VDC		1.5 VDC		78 %	65 %
TSR 1-2418	4.75 – 32 VDC	9 VDC	1.8 VDC		81 %	68 %
TSR 1-2425	4.75 – 32 VDC		2.5 VDC		87 %	75 %
TSR 1-2433	5.5 – 32 VDC		3.3 VDC		90 %	79 %
TSR 1-2450	6.5 – 32 VDC	12 VDC	5.0 VDC	1.0 A	93 %	84 %
TSR 1-2465	9.0 – 32 VDC		6.5 VDC		94 %	87 %
TSR 1-2490	12 – 32 VDC		9.0 VDC		95 %	89 %
TSR 1-24120	15 – 32 VDC	24 VDC	12 VDC		95 %	91 %
TSR 1-24150	18 – 32 VDC		15 VDC		96 %	94 %

Input Specifications

Maximum input current (@ Vin min. and 1 A output current)		1 A
No load input current	24 V models:	1 mA max.
	other models:	2 mA max.
Reflected ripple current		150 mA
Input filter		internal capacitors

Output Specifications

Voltage set accuracy		±2 % (at full load)
Regulation	– Input variation	0.2 %
	– Load variation (10 – 100 %)	0.4 %
Overshoot startup voltage		1.0 % max.
Minimum load		not required
Ripple and noise (20 MHz Bandwidth)	1.5 – 6.5 VDC models:	50 mVpk-pk max.
	9 – 15 VDC models:	75 mVpk-pk max.
Temperature coefficient		± 0.015 % / °C max.
Dynamic load response 50% load change (upper half)		150 mV max. peak variation
		250 μS max. response time
Startup rise time 10 % to 90 % Vout		2 mS
Short circuit protection		continuous, automatic recovery
Current limitation		@ 2.5 A typ.
Capacitive load		470 μF max.

General Specifications

Temperature ranges	– Operating	−40 °C to +85 °C
	– Storage	−55 °C to +125 °C
Derating		2.4 %/K above 60 °C
Thermal shock		acc. MIL-STD-810F
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, ground benign)		>5'350'000 h @ 25 °C
Isolation voltage		none
Isolation capacity	– Input/Output	40 pF typ.
Isolation resistance	– Input/Output	>1'000 Mohm
Switching frequency		500 kHz typ.

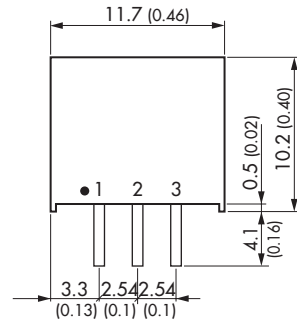## Physical Specifications

Case material	non-conductive plastic
Potting material	epoxy (flammability to UL 94V-0 rated)
Package weight	1.9 g (0.07 oz)
Soldering profile	max. 265 °C / 10 sec. (wave soldering)

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

Outline Dimensions

0.5(0.02)

0.3 (0.01)

Bottom view

2.0 (0.08)

7.6 (0.30)

11.7 (0.46)

0.5 (0.02)

10.2 (0.40)

4.1 (0.16)

● 1   2   3

3.3 (0.13)   2.54 (0.1)   2.54 (0.1)
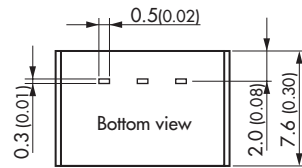
Pin-Out	
1	+Vin
2	GND
3	+Vout

Dimensions in [mm], () = Inch
Pin pitch tolerances: ±0.25 (±0.01)
Pin profile tolerance: ±0.1 (±0.004)
Other tolerances: ±0.5 (±0.02)

Rev. 09/08