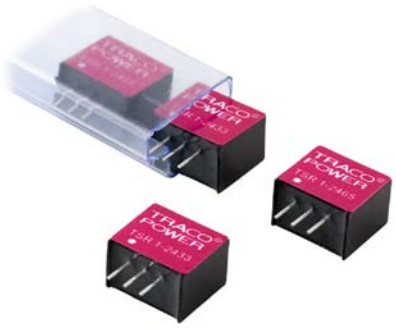
TRACO POWER

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 fits existing TO-220 footprint
- Built in filter capacitors
- Operation temp. range –40°C 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 range	Output voltage	Output current max.	Efficiency typ. @ Vin min.	Efficiency typ. @ Vin max.
TSR 1-2412	**4.6 – 36 VDC***	1.2 VDC		74 %	62 %
TSR 1-2415	**4.6 – 36 VDC***	1.5 VDC		78 %	65 %
TSR 1-2418	**4.6 – 36 VDC***	1.8 VDC		82 %	69 %
TSR 1-2425	**4.6 – 36 VDC***	2.5 VDC		87 %	75 %
TSR 1-2433	**4.75 – 36 VDC***	3.3 VDC	**1.0 A**	91 %	78 %
TSR 1-2450	**6.5 – 36 VDC***	5.0 VDC		94 %	84 %
TSR 1-2465	**9.0 – 36 VDC***	6.5 VDC		93 %	87 %
TSR 1-2490	**12 – 36 VDC***	9.0 VDC		95 %	90 %
TSR 1-24120	**15 – 36 VDC***	12 VDC		95 %	92 %
TSR 1-24150	**18 – 36 VDC***	15 VDC		96 %	94 %

* For input voltage higher than 32 VDC an input capcitor 22 µF / 50 V is required. See application notes (page 3)

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Input Specifications

Maximum input current (@ Vin min. and 1 A output current)		1 A
No load input current		1 mA typ.
Reflected ripple current		150 mA see application notes (page 3) for to meet EN55022 class A
Input filter		internal capacitors

Output Specifications

Voltage set accuracy		±2 % (at full load)
Regulation	– Input variation	0.2 %
	– Load variation (10 – 100 %) 1.2 & 1.5 VDC models:	0.6 %
	other models:	0.4 %
Overshoot startup voltage		1.0 % max.
Minimum load		not required
Ripple and noise (20 MHz Bandwidth)	1.2 – 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 (–40°F to +185°F)
	– Storage	–55°C to +125°C (–67°F to +257°F)
Derating		2.4 %/K above 60°C
Thermal shock		acc. MIL-STD-810F
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTTF (MIL-HDBK-217F, @ +25°C, ground benign)		>5'350'000 h
Isolation voltage		none
Isolation capacity	– Input/Output	40 pF typ.
Isolation resistance	– Input/Output	>1'000 Mohm
Switching frequency		500 kHz typ.

Physical Specifications

Casing material	non-conductive plastic
Potting material	silicon (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.

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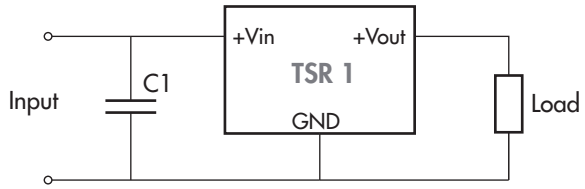
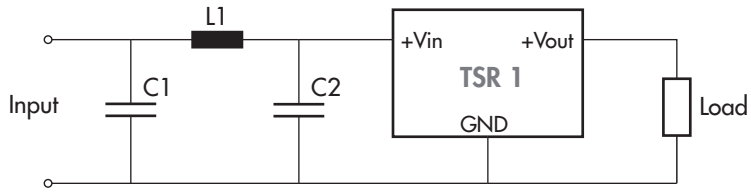
Applications notes

For input voltage higher than 32 VDC (max. 36 VDC)



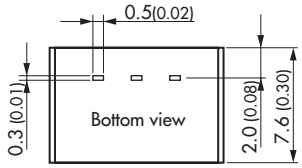
C1 = 22 µF / 50 V

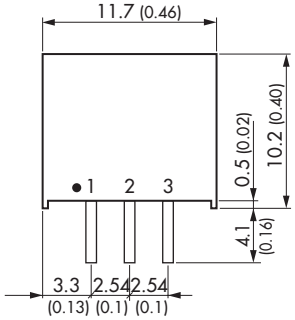
Input filter to meet EN 55022 class A



C1 = 4.7 µF / 50 V
C2 = 4.7 µF / 50 V
L1 = 8.2 µH / 1.5 A / 0.08 Ohm

Outline Dimensions





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)

Specifications can be changed any time without notice.

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