

- ◆ Ultra compact SIP package  
0.55 × 0.30 × 0.40 inch
- ◆ Up to 96 % efficiency  
– No heat-sink required
- ◆ Pin compatible with LMxx  
linear regulators
- ◆ Built in filter capacitors
- ◆ Operating temperature range  
-40°C to +85°C
- ◆ Excellent line / load regulation
- ◆ Short circuit protection
- ◆ 3-year product warranty



The new TSR 2 series step-down switching regulators are drop-in replacement for inefficient LMxx linear regulators. A high efficiency up to 96 % allows full load operation up to +67°C ambient temperature without the need of any heat-sink or forced cooling.

The TSR 2 switching regulators provide other significant features over linear regulators, i.e. better output accuracy ( $\pm 2$  %), 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.		Capacitive Load max.
				@ Vin min.	@ Vin max.	
TSR 2-0512	3.0 - 5.5 VDC	1.2 VDC	2.0 A	90 %	86 %	2500 $\mu$ F
TSR 2-0515	3.0 - 5.5 VDC	1.5 VDC		91 %	88 %	2000 $\mu$ F
TSR 2-0518	3.0 - 5.5 VDC	1.8 VDC		92 %	90 %	1600 $\mu$ F
TSR 2-0525	3.8 - 5.5 VDC	2.5 VDC		95 %	92 %	1200 $\mu$ F
TSR 2-2412	4.6 - 36 VDC*	1.2 VDC		84 %	75 %	2500 $\mu$ F
TSR 2-2415	4.6 - 36 VDC*	1.5 VDC		86 %	77 %	2000 $\mu$ F
TSR 2-2418	4.6 - 36 VDC*	1.8 VDC		87 %	79 %	1600 $\mu$ F
TSR 2-2425	4.6 - 36 VDC*	2.5 VDC		89 %	83 %	1200 $\mu$ F
TSR 2-2433	4.75 - 36 VDC*	3.3 VDC		91 %	86 %	900 $\mu$ F
TSR 2-2450	6.5 - 36 VDC*	5 VDC		94 %	89 %	600 $\mu$ F
TSR 2-2465	9.0 - 36 VDC*	6.5 VDC		94 %	91 %	470 $\mu$ F
TSR 2-2490	12 - 36 VDC*	9 VDC		95 %	92 %	330 $\mu$ F
TSR 2-24120	15 - 36 VDC*	12 VDC		95 %	93 %	270 $\mu$ F
TSR 2-24150	18 - 36 VDC*	15 VDC		96 %	94 %	200 $\mu$ F

\* For input voltage higher than 20 VDC an input capacitor 22  $\mu$ F / 50 V is recommend, to prevent damage due to power-on voltage peaks.

### Input Specifications

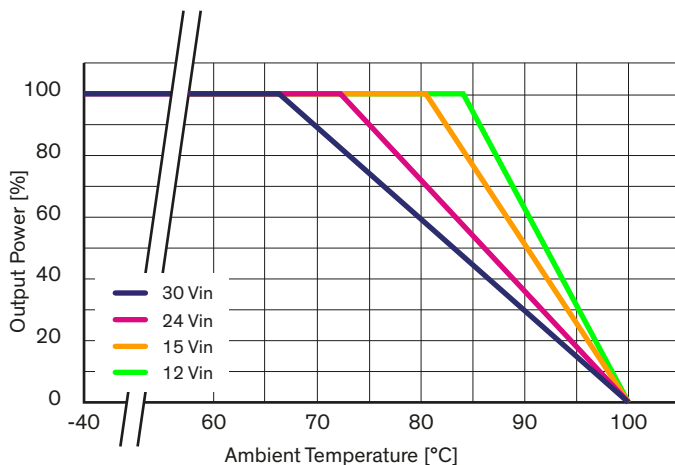
Input current no load	1 mA typ.
Input filter	internal capacitor

### Output Specifications

Voltage set accuracy	±2 % max.
Regulation	– Input variation: 0.5 % max. – Load variation 0 – 100 %: 1 % max.
Ripple and noise (20 MHz Bandwidth)	50 mVp-p typ. for $V_{out} \leq 6.5$ VDC 75 mVp-p typ. for $V_{out} \geq 9.0$ VDC
Start up time (constant resistive load)	5 ms typ.
Dynamic load response (50% load step change)	150 $\mu$ s typ. response time 9, 12 & 15 VDC models: 300 mV typ. peak deviation other models: 150 mV typ. peak deviation
Short circuit protection	continuous, automatic recovery
Overload protection (hiccup mode)	5 Vin models: 8.0 A other models: 3.6 A

### General Specifications

Temperature ranges	– Operating (convection cooling 20LFM, 0,1m/s) – Case temperature – Storage temperature	–40°C to +85°C +105°C max. –55°C to +125°C
Derating		see graph below
Humidity (non condensing)		5 - 95 % rel H max.
Shock and vibration		acc MIL-STD-810F
Temperature coefficient		±0.02 %/K typ.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)		13'520'000 h
Switching frequency (Pulse frequency modulation)	5 Vin models: other models:	1200 kHz typ. 410 kHz typ.
Environmental compliance	– Reach – RoHS	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> RoHS directive 2011/65/EU



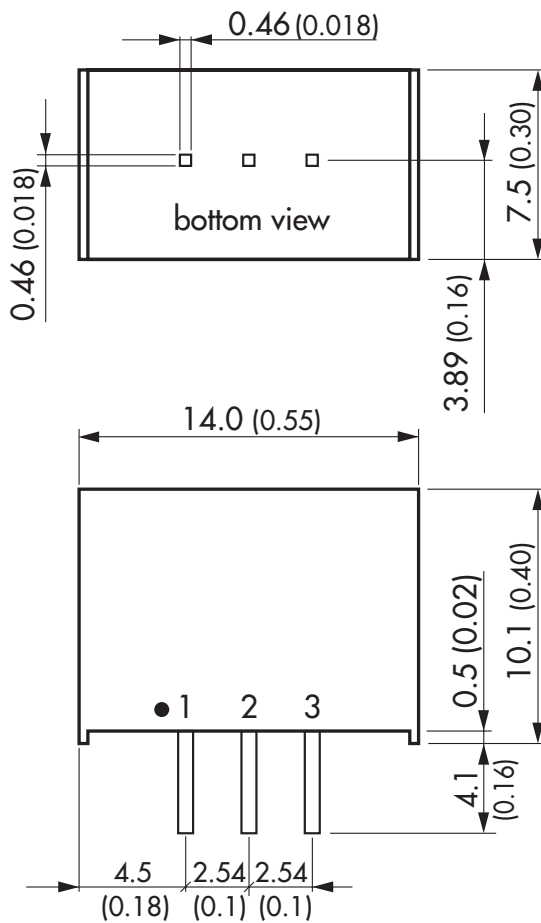
**Supporting Documents:** [www.tracopower.com/overview/tsr2](http://www.tracopower.com/overview/tsr2)

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

**Physical Specifications**

Casing material	plastic, non-conducting
Potting material	Silicone (UL 94V-0 rated)
Package weight	2.6g (0.092oz)
Soldering temperature	max. 260°C / 10 sec.

**Outline Dimensions**



Pin-Out	
Pin	Single
1	+Vin
2	GND
3	+Vout

Dimensions in [mm], ( ) = Inch

Tolerances: x.xx ±0.5 (±0.02)

x.xxx ±0.25 (±0.01)

Pin pitch tolerances ±0.25 (±0.01)

pin dimension tolerance ±0.1 (±0.004)