

Features

- ◆ SMD-package
- ◆ Up to 96 % efficiency
- ◆ No thermal layer required
- ◆ 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-1SM series models of step-down switching regulators have a high efficiency up to 96 % which allows full load operation up to +65°C ambient temperature without the need of any heat transmission layer.

Excellent output voltage accuracy ($\pm 2\%$) and low standby current ($\sim 1 \mu\text{A}$) are features that distinguish these switching regulators from linear regulators.

Models

Order code	Input voltage range	Output voltage	Output current max.	Efficiency typ.	
				@ Vin min.	@ Vin max.
TSR 1-0512SM	3.0 – 5.5 VDC*	1.2 VDC	1 A	90.5 %	90.0 %
TSR 1-0515SM	3.0 – 5.5 VDC*	1.5 VDC		92.0 %	91.5 %
TSR 1-0518SM	3.0 – 5.5 VDC*	1.8 VDC		92.5 %	92.0 %
TSR 1-0525SM	3.8 – 5.5 VDC*	2.5 VDC		94.5 %	94.0 %
TSR 1-2412SM	4.6 – 36 VDC*	1.2 VDC		74 %	62 %
TSR 1-2415SM	4.6 – 36 VDC*	1.5 VDC		79 %	67 %
TSR 1-2418SM	4.6 – 36 VDC*	1.8 VDC		82 %	70 %
TSR 1-2425SM	4.6 – 36 VDC*	2.5 VDC		87 %	75 %
TSR 1-2433SM	4.75 – 36 VDC*	3.3 VDC		91 %	80 %
TSR 1-2450SM	6.5 – 36 VDC*	5.0 VDC		94 %	84 %
TSR 1-2465SM	9.0 – 36 VDC*	6.5 VDC		94 %	89 %
TSR 1-2490SM	12 – 36 VDC*	9.0 VDC		95 %	90 %
TSR 1-24120SM	15 – 36 VDC*	12 VDC		95 %	92 %
TSR 1-24150SM	18 – 36 VDC*	15 VDC		96 %	94 %

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

Input Specifications

Maximum input current (at V_{in} min. and 1 A output current)	1 A
No load input current	1 mA typ.
Reflected ripple current	150 mA
Input filter	internal capacitor

Output Specifications

Voltage set accuracy	$\pm 2\%$
Regulation	– Input variation: 0.2 % – Load variation (0 – 100 %): 0.6 % – Load variation (10 – 90 %): 0.3 %
Minimum load	not required
Ripple and noise (20 MHz Bandwidth)	$V_{out} < 8$ VDC: 50 mV max. $V_{out} > 8$ VDC: 75 mV max.
Temperature coefficient	$\pm 0.015\%$ / °C max.
Dynamic load response 50% load change (upper half)	200 mV max. peak variation 250 μ S max. response time
Startup rise time 10 % to 90 % V_{out}	5 mS
Short circuit protection	continuous, automatic recovery
Current limitation	TSR 1-05xxSM models: at 4.8 A typ. other models: at 2.5 A typ.
Capacitive load	470 μ F max.

General Specifications

Temperature ranges	– Operating: -40°C to $+85^{\circ}\text{C}$ – Max. casing temperature: 105°C – Storage: -55°C to $+125^{\circ}\text{C}$
Derating	2.5 %/K above 65°C
Thermal shock	acc. MIL-STD-810F
Humidity (non condensing)	95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at $+25^{\circ}\text{C}$, ground benign)	>12 Mio. h
Isolation voltage	none
Switching frequency (pulse width modulation)	TSR 1-05xxSM models: 1200 kHz other models: 500 kHz
Environmental compliance	– Reach: www.tracopower.com/overview/tsr1sm – RoHS: RoHS directive 2011/65/EU

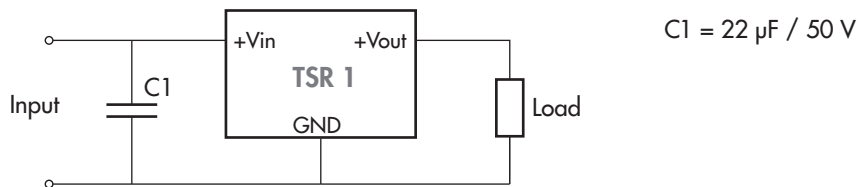
Physical Specifications

Casing material	non-conductive plastic
Package weight	1.7 g (0.07 oz)
Lead-free reflow solder process	as per J-STD-020D.01 (to find at: www.jedec.org - free registration required)
	– max. peak body temperature: 245°C
Moisture sensitivity level (MSL)	level 1 as per IPC J-STD-033B.1 (to find at: www.jedec.org - free registration required)
Washing	baking after washing: 100°C for 30 min.

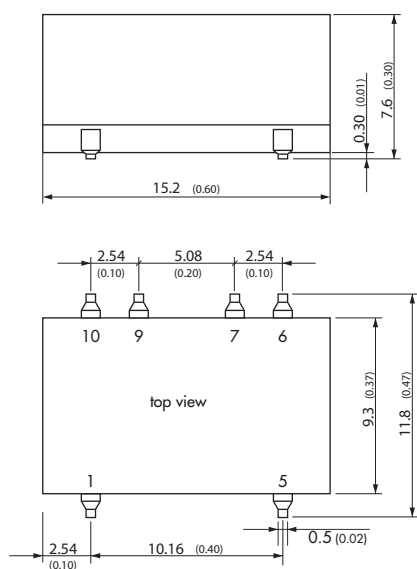
All specifications valid at nominal input voltage, full load and $+25^{\circ}\text{C}$ after warm-up time unless otherwise stated.

Applications notes

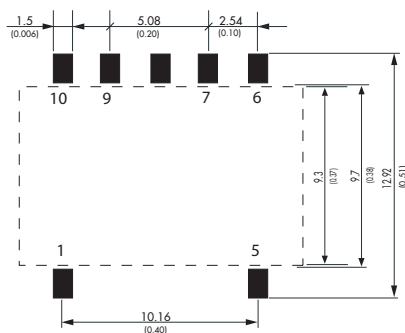
For input voltage higher than 32 VDC (max. 36 VDC)



Outline Dimensions



Solder Pad Dimension



Pin-Out

1	-Vin
5	+Vout
6	nc
7	GND
9	GND
10	nc

nc = no internal connection

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