DC/DC Converters

TSR-1SM Series, 1 A

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 (±2%) and low standby current (~1 µA) 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.	Efficiency typ. @ Vin max.
TSR 1-0512SM	3.0 – 5.5 VDC*	1.2 VDC		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	1 A	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 capcitor 22 µF / 50 V is required. See application notes (page 3)

Input Specifications

Maximum input current (at Vin 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			±2 %
Regulation	– Input variation – Load variation (0 – 100 %) – Load variation (10 – 90 %)		0.2 % 0.6 % 0.3 %
Minimum load			not required
Ripple and noise (20 MHz Bandwidth)		Vout < 8 VDC: Vout > 8 VDC:	50 mV max. 75 mV max.
Temperature coefficient			±0.015 % / °C max.
Dynamic load response 50% load change (upper half)			200 mV max. peak variation 250 µS max. response time
Startup rise time 10 % to 90 % Vout			5 mS
Short circuit protection			continuous, automatic recovery
Current limitation		TSR 1-05xxSM models: other models:	at 4.8 A typ. at 2.5 A typ.
Capacitive load			470 µF max.

General Specifications

Temperature ranges	– Operating – Max. casing temperature – Storage		–40°C to +85°C 105°C –55°C to +125°C
Derating			2.5 %/K above 65°C
Thermal shock			acc. MIL-STD-810F
Safety standards			UL/cUL 60950-1, IEC/EN 60950-1
Humidity (non condensing)			95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)			>12 Mio. h
Isolation voltage			none
Switching frequency (pulse width modulation)		TSR 1-05xxSM models: other models:	1200 kHz 500 kHz
Environmental compliance	– Reach – RoHS		www.tracopower.com/overview/tsr1sm RoHS directive 2011/65/EU

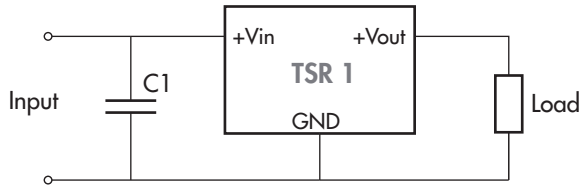
Physical Specifications

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 rqueired)
	– 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°C after warm-up time unless otherwise stated.

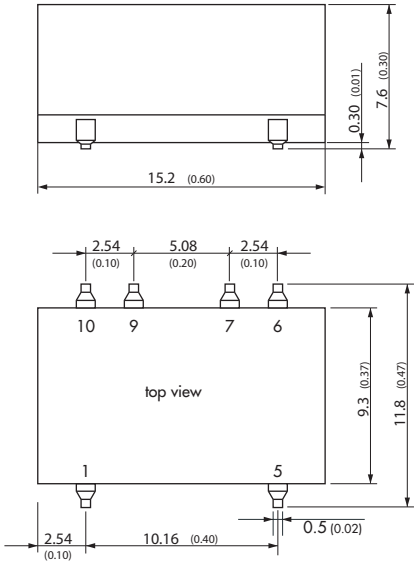
Applications notes

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

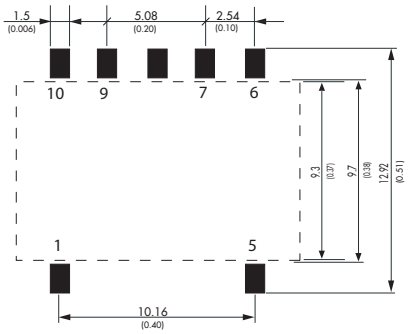


C1 = 22 µF / 50 V

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)