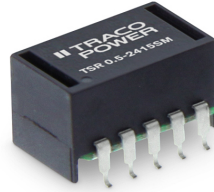




**THE DATASHEET OF  
TSR 0.5-24150SM**



- Compact SMD package
- Very high efficiency up to 97%
- Excellent line / load regulation
- Low standby current
- Operating temperature range  $-40$  to  $90^{\circ}\text{C}$
- Over-temperature and short circuit protection
- Remote On/Off input
- Adjustable output voltage
- Moisture sensitivity level 2 as per IPC J-STD-033C
- 3-year product warranty



TSR 0.5SM is a series of step-down non-isolated switching regulators in compact SIP package. These converters are an ideal alternative to LM78 linear regulators when energy efficiency is a parameter of the design. The high efficiency up to 97% allows full load operation up to  $+80^{\circ}\text{C}$  ( $+90^{\circ}\text{C}$  with 50% load) ambient temperature without the need of forced air cooling. Excellent output voltage accuracy and low standby current are other features that distinguish switching regulators from linear regulators.

### Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TSR 0.5-2415SM	500 mA	4.75 - 32 VDC (24 VDC nom.)	1.5 VDC (1.4 - 2.5 VDC)	73 % (at $V_{in}$ min.)
TSR 0.5-2418SM			1.8 VDC (1.5 - 3.0 VDC)	82 % (at $V_{in}$ min.)
TSR 0.5-2425SM			2.5 VDC (1.5 - 3.0 VDC)	87 % (at $V_{in}$ min.)
TSR 0.5-2433SM			3.3 VDC (3.0 - 5.5 VDC)	91 % (at $V_{in}$ min.)
TSR 0.5-2450SM			5 VDC (3.0 - 8.0 VDC)	94 % (at $V_{in}$ min.)
TSR 0.5-2465SM			6.5 VDC (3.3 - 11.0 VDC)	95 % (at $V_{in}$ min.)
TSR 0.5-2490SM			9 VDC (4.5 - 12.6 VDC)	96 % (at $V_{in}$ min.)
TSR 0.5-24120SM			12 VDC (4.5 - 13.5 VDC)	97 % (at $V_{in}$ min.)
TSR 0.5-24150SM			15 VDC (4.5 - 15.5 VDC)	97 % (at $V_{in}$ min.)

Note - For input voltage higher 28 VDC an input capacitor of 22  $\mu\text{F}$  is required

### Input Specifications

Input Current	- At no load	5 mA typ.
Surge Voltage		34 VDC max. (1 s max.)
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor
Short Circuit Input Power		1.5 W max.

### Output Specifications

Output Voltage Adjustment		1.5 Vout models: 1.4 - 2.5 VDC 1.8 Vout models: 1.5 - 3.0 VDC 2.5 Vout models: 1.5 - 3.0 VDC 3.3 Vout models: 3.0 - 5.5 VDC 5 Vout models: 3.0 - 8.0 VDC 6.5 Vout models: 3.3 - 11.0 VDC 9 Vout models: 4.5 - 12.6 VDC 12 Vout models: 4.5 - 13.5 VDC 15 Vout models: 4.5 - 15.5 VDC (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/tsr0-5sm">www.tracopower.com/overview/tsr0-5sm</a>
Voltage Set Accuracy		±3% max.
Regulation	- Input Variation (Vmin - Vmax)	0.2% max. (9, 12 & 15 Vout models) 0.4% max. (other models)
	- Load Variation (10 - 100%)	0.4% max. (9, 12 & 15 Vout models) 0.6% max. (other models)
Ripple and Noise (20 MHz Bandwidth)		1.5 Vout models: 30 mVp-p max. 1.8 Vout models: 30 mVp-p max. 2.5 Vout models: 30 mVp-p max. 3.3 Vout models: 30 mVp-p max. 5 Vout models: 30 mVp-p max. 6.5 Vout models: 30 mVp-p max. 9 Vout models: 40 mVp-p max. 12 Vout models: 40 mVp-p max. 15 Vout models: 40 mVp-p max.
Capacitive Load		220 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.015 %/K max.
Short Circuit Protection		Continuous, Automatic recovery
Transient Response	- Response Deviation	2% max. (50% Load Step)
	- Response Time	100 µs max. (50% Load Step)

### EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class B (with external filter) FCC Part 15 class B (with external filter)
	- Radiated Emissions	EN 55032 class B (internal filter) FCC Part 15 class B (internal filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/tsr0-5sm">www.tracopower.com/overview/tsr0-5sm</a>
EMS Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, ±8 kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 3 V/m, perf. criteria A
	- EFT (Burst)	EN 61000-4-4, ±0.5 kV, perf. criteria A
		Ext. input component: Nippon chemi-con KY 330 µF, 100 V
	- Conducted RF Disturbances	EN 61000-4-6, 3 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous: EN 61000-4-8, 3 A/m, perf. criteria A

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

## General Specifications

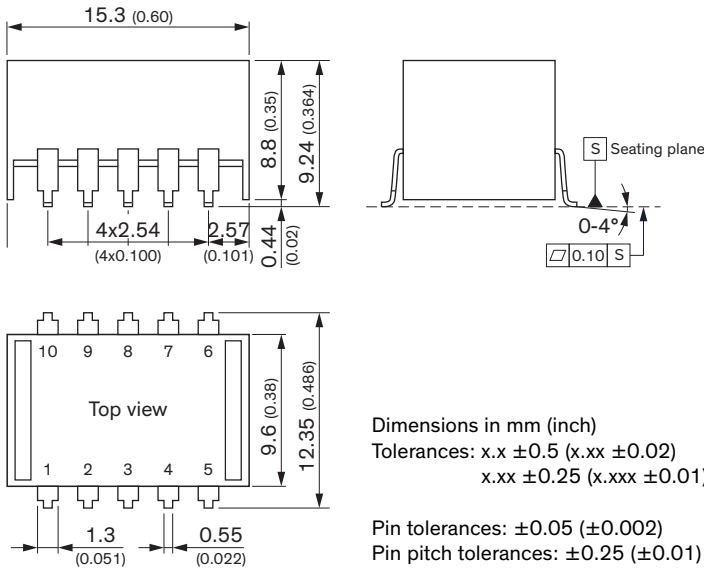
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +90°C +100°C max. -55°C to +125°C
Power Derating	- High Temperature	5 %/K above 80°C See application note: <a href="http://www.tracopower.com/overview/tsr0-5sm">www.tracopower.com/overview/tsr0-5sm</a>
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	160°C typ. (Automatic recovery) Internal IC temperature
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)  - Off Idle Input Current	On: 2.4 to 5.0 VDC or open circuit Off: 0 to 1.6 VDC or short circuit Refers to 'Remote' and 'GND' Pin 0.035 mA max.
Switching Frequency		280 - 380 kHz (PWM) 330 kHz typ. (PWM)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	2'000'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2 (J-STD-033C)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Copper (1 - 3 µm)
Pin Surface Plating		Tin (7.5 µm min.), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Footprint Type		SMD10
Soldering Profile		Lead-Free Reflow Soldering (acc. J-STD-020E) See application note: <a href="http://www.tracopower.com/info/reflow-soldering.pdf">www.tracopower.com/info/reflow-soldering.pdf</a>
Weight		1.7 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.)) e0a18ff4-ad10-4a4c-9291-ed6dcd37c4d5

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tsr0-5sm">www.tracopower.com/overview/tsr0-5sm</a>
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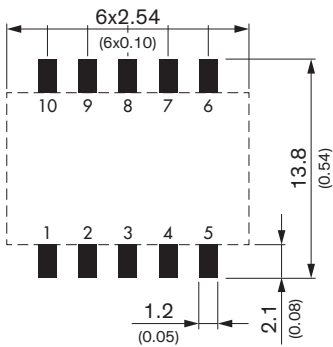
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

### Outline Dimensions





Pinout	
Pin	Function
1	+Vin
2	+Vin
3	GND
4	+Vout
5	+Vout
6	Trim
7	GND
8	GND
9	GND
10	Remote On/Off

### Recommended Solder Pad Layout



## Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

-  [View TSR 0.5-24150SM on WIN SOURCE](#)
-  [Traco Power Information](#)

## Optimize Your Supply Chain with WIN SOURCE Solutions

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-  Shortage Management
-  Alternative Solution
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