

- Compact SMD package
- Suitable for positive & negative output circuit
- Adjustable output voltage
- Wide input up to 42 VDC
- Remote On/Off input
- Built in filter capacitors
- Operation temp. range -40°C to $+85^{\circ}\text{C}$
- Excellent line/load regulation
- Low standby current
- 3-year product warranty



The new TSRN 1SM series are step-down non-isolated switching regulators in compact SMD package. They are an ideal solution to replace inefficient linear regulators. The high efficiency up to 95% allows full load operation up to $+55^{\circ}\text{C}$ ($+85^{\circ}\text{C}$ with derating) ambient temperature without the need of forced air cooling.

The TSRN-1SM switching regulators provide other significant features over linear regulators, i.e. better output accuracy ($\pm 2\%$), lower standby current of ~ 4 mA and no requirement of external capacitors. They are suitable for positive or negative output circuits and offer a trim input for output voltage adjustment. The high efficiency, low standby power consumption and remote On/Off function make these regulators an ideal solution for energy sensitive applications.

Models				
Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TSRN 1-0525SM	1'000 mA	3 - 5.5 VDC (5 VDC nom.)	2.5 VDC (1.2 - 3.63 VDC)	96 %
TSRN 1-2433SM		4.6 - 42 VDC (12 VDC nom.)	3.3 VDC (1.5 - 5.5 VDC)	88 %
TSRN 1-2450SM		6.5 - 42 VDC (12 VDC nom.)	5 VDC (2.5 - 8.0 VDC)	92 %
TSRN 1-2490SM		10.5 - 42 VDC (12 VDC nom.)	9 VDC (4.5 - 12.6 VDC)	95 %
TSRN 1-24120SM		13.5 - 42 VDC (24 VDC nom.)	12 VDC (4.5 - 13.5 VDC)	95 %
TSRN 1-24150SM		16.5 - 42 VDC (24 VDC nom.)	15 VDC (4.5 - 15.5 VDC)	96 %

Note - For external circuit proposal for negative output voltage, refer to application note: www.tracopower.com/overview/tsrn1sm

Input Specifications

Input Current	- At no load	5 Vin models: 6 mA typ. 12 Vin models: 3 mA typ. 24 Vin models: 4 mA typ.
Reflected Ripple Current		5 Vin models: 100 mAp-p typ. 12 Vin models: 100 mAp-p typ. 24 Vin models: 100 mAp-p typ.
Recommended Input Fuse		5 Vin models: 2'000 mA (slow blow) 12 Vin models: 2'500 mA (slow blow) 24 Vin models: 1'600 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Capacitor

Output Specifications

Output Voltage Adjustment		2.5 Vout models: 1.2 - 3.63 VDC 3.3 Vout models: 1.5 - 5.5 VDC 5 Vout models: 2.5 - 8.0 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: www.tracopower.com/overview/tsrn1sm
Voltage Set Accuracy		±2% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.2% max. 0.6% max.
Ripple and Noise (20 MHz Bandwidth)	5 Vin models: 24 Vin models: 3.3 Vout models: 5 Vout models: 9 Vout models:	50 mVp-p max. 75 mVp-p max. 50 mVp-p max. 50 mVp-p max. 75 mVp-p max.
Capacitive Load		470 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.015 %/K max.
Start-up Time		5 ms typ.
Short Circuit Protection		Continuous, Automatic recovery
Transient Response	- Peak Variation - Response Time	150 mV typ. / 250 mV max. (50% Load Step) 250 µs typ. / 350 µs max. (50% Load Step)

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +105°C max. -55°C to +125°C
Power Derating	- High Temperature	See application note: www.tracopower.com/overview/tsrn1sm
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	170°C typ. (Automatic recovery) Internal IC temperature
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote - Off Idle Input Current	On: 2.0 to 5.0 VDC or open circuit Off: 0 to 0.8 VDC or short circuit Refers to 'Remote' and 'GND' Pin 1.2 mA typ.
Switching Frequency		410 kHz typ. (PWM) (2.5 Vout models) 300 kHz typ. (PWM) (3.3 Vout models) 580 kHz typ. (PWM) (other models)

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

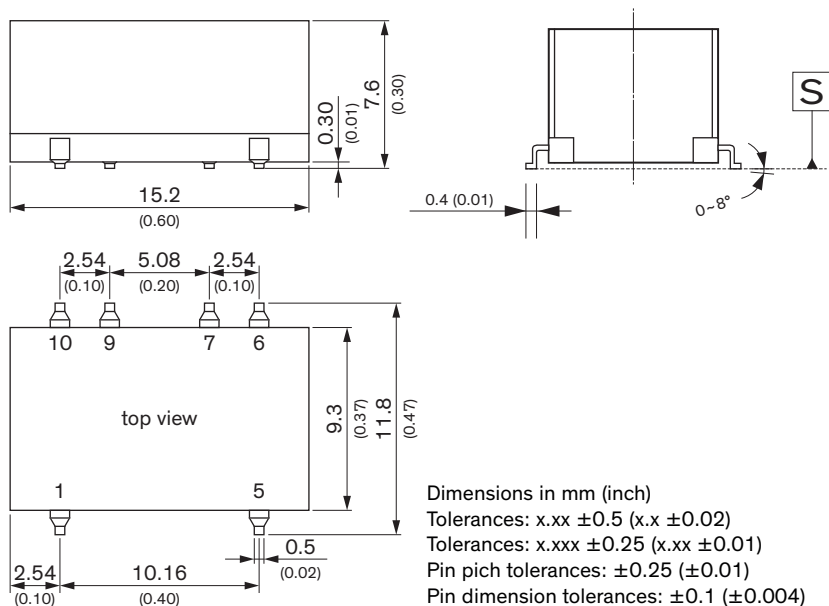
Insulation System	Non-isolated
Reliability	- Calculated MTBF 14'000'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)	Level 1 (J-STD-033C)
Washing Process	Allowed (open product) Baking after washing: 100°C for 30 min See Cleaning Guideline: www.tracopower.com/info/cleaning.pdf
Environment	- Vibration MIL-STD-810F EN 61373 - Thermal Shock MIL-STD-810F
Housing Material	Non-conductive Plastic (UL 94 V-0 rated)
Base Material	Non-conductive Plastic (UL 94 V-0 rated)
Pin Material	Copper
Pin Foundation Plating	Nickel (2 - 3 µm)
Pin Surface Plating	Tin (3 - 5 µm), matte
Soldering Profile	Reflow Soldering (J-STD-020E) 245°C max.
Connection Type	SMD (Surface-Mount Device)
Weight	1.7 g
Environmental Compliance	- REACH Declaration www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tsrn1sm

Outline Dimensions



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

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Recommended Solder Pad Layout

