

- 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 $\sim 4\text{ mA}$ 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 %

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)		2.5 Vout models: 50 mVp-p max. 3.3 Vout models: 50 mVp-p max. 5 Vout models: 50 mVp-p max. 9 Vout models: 75 mVp-p max. 12 Vout models: 75 mVp-p max. 15 Vout models: 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	2.38 %/K above 58°C
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.

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

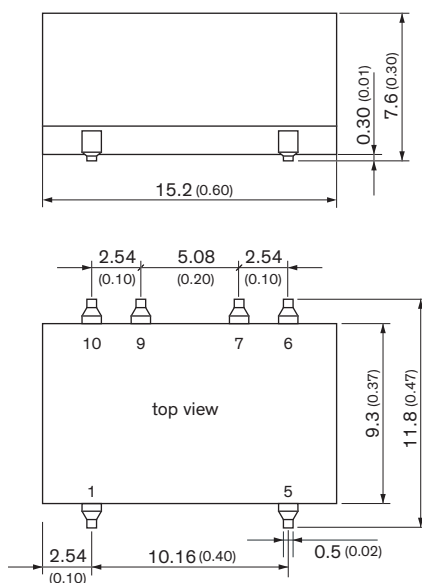
Switching Frequency	410 kHz typ. (PWM) (2.5 Vout models) 300 kHz typ. (PWM) (3.3 Vout models) 580 kHz typ. (PWM) (other models)
Insulation System	Non-isolated
Reliability	- Calculated MTBF 14'000'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)	Level 1 (J-STD-033C)
Washing Process	Baking after washing: 100°C for 30 min
Environment	- Vibration MIL-STD-810F EN 61373 - Thermal Shock MIL-STD-810F EN 61373
Housing Material	Non-conductive Plastic (UL94 V-0 rated)
Base Material	Non-conductive Plastic (UL 94 V-0 rated)
Potting Material	Epoxy (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 www.tracopower.com/info/reach-declaration.pdf - RoHS www.tracopower.com/info/rohs-declaration.pdf

Supporting Documents

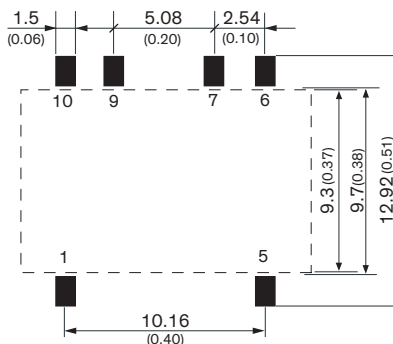
Overview Link (for additional Documents)

www.tracopower.com/overview/tsrn1sm

Outline Dimensions



Solder Pad Dimension



Dimensions in mm (inch)
Tolerances: x.xx ± 0.5 (x.x ± 0.02)
Tolerances: x.xxx ± 0.25 (x.xx ± 0.01)
Pin pitch tolerances: ± 0.25 (± 0.01)
Pin dimension tolerances: ± 0.1 (± 0.004)

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