

- 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		100 mA _{p-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 V _{out} models: 1.2 - 3.63 VDC 3.3 V _{out} models: 1.5 - 5.5 VDC 5 V _{out} models: 2.5 - 8.0 VDC 9 V _{out} models: 4.5 - 12.6 VDC 12 V _{out} models: 4.5 - 13.5 VDC 15 V _{out} 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 (V _{min} - V _{max}) - Load Variation (0 - 100%)	0.2% max. 0.6% max.
Ripple and Noise (20 MHz Bandwidth)		5 Vin models: 50 mV _{p-p} max. 24 Vin models: 75 mV _{p-p} max. 3.3 V _{out} models: 50 mV _{p-p} max. 5 V _{out} models: 50 mV _{p-p} max. 9 V _{out} models: 75 mV _{p-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	Depending on model 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 V _{out} models) 300 kHz typ. (PWM) (3.3 V _{out} models) 580 kHz typ. (PWM) (other models))
Insulation System		Non-isolated

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

Reliability	- Calculated MTBF	14'000'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 1 (J-STD-033C)
Washing Process		According to 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)
Potting Material		Epoxy (UL 94 V-0 rated) (Converter halfway potted on top of the PCB, not visible through vent hole)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 µm)
Pin Surface Plating		Tin (3 - 5 µm), 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) 245°C max. (Tp) 10 s max. (tp, at Tp - 5°C)
	See application note:	www.tracopower.com/info/reflow-soldering.pdf
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))
	- SCIP Reference Number	c414b2ac-dba5-47f6-8505-84a60254272a

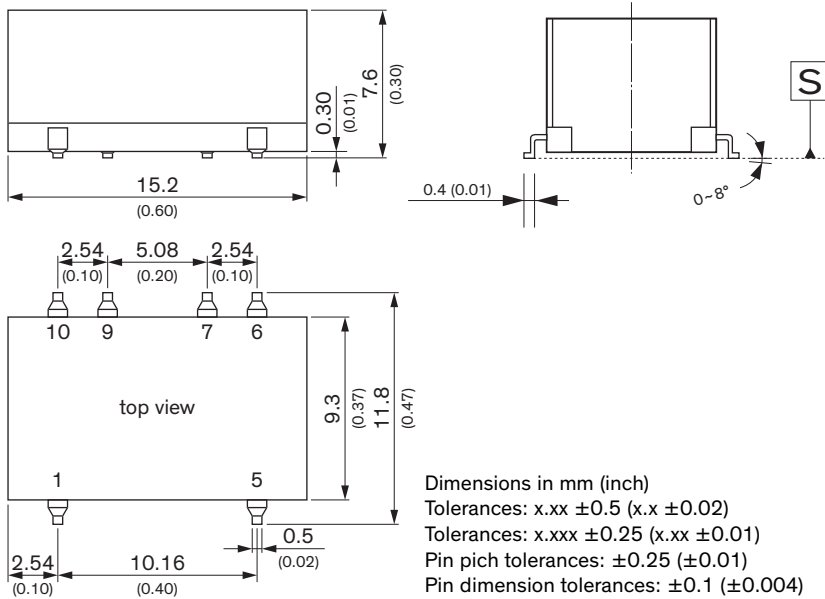
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tsrn1sm

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Outline Dimensions



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

Recommended Solder Pad Layout

