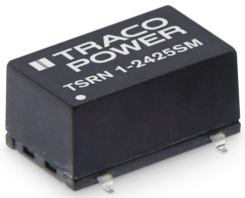
TRACO POWER

Non-Isolated DC/DC Converter (POL) — TSRN 1SM Series, 1 A

- **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°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°C (+85°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 (±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 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)		0.2% max.
	- Load Variation (0 - 100%)		0.6% max.
Ripple and Noise (20 MHz Bandwidth)		5 Vin models:	50 mVp-p max.
		24 Vin models:	75 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.
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		150 mV typ. / 250 mV max. (50% Load Step)
	- Response Time		250 µs typ. / 350 µs max. (50% Load Step)

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +85°C
	- Case Temperature		+105°C max.
	- Storage Temperature		–55°C to +125°C
Power Derating	- High Temperature	See application note:	www.tracopower.com/overview/tsrn1sm
Over Temperature Protection Switch Off	- Protection Mode		170°C typ. (Automatic recovery)
	- Measurement Point		Internal IC temperature
Cooling System			Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote		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
	- Off Idle Input Current		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))
Insulation System			Non-isolated
Reliability	- Calculated MTBF		14'000'000 h (MIL-HDBK-217F, ground benign)

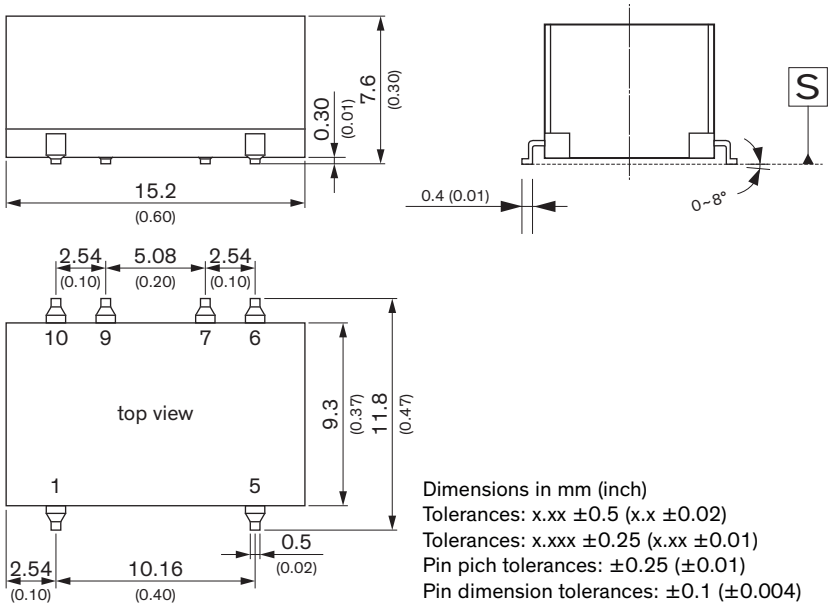
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Moisture Sensitivity (MSL)		Level 1 (J-STD-033C)
Washing Process		Allowed (open product)
	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)
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		SMD 10 Pin
Soldering Profile		Reflow Soldering (J-STD-020E) 245°C max.
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



Dimensions in mm (inch)
Tolerances: x.xx ±0.5 (x.x ±0.02)
Tolerances: x.xxx ±0.25 (x.xx ±0.01)
Pin pich 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

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

Recommended Solder Pad Layout