

Features

- ◆ 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 $+85^{\circ}\text{C}$
- ◆ No heat-sink required
- ◆ Over-temperature protection
- ◆ Short circuit protection
- ◆ Excellent line / load regulation
- ◆ Low standby current
- ◆ Moisture sensitivity level (MSL) 1
- ◆ Qualified for leadfree reflow solder process
- ◆ 3-year product warranty



The new TSRN-ISM 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 aircooling.

The TSRN-ISM 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 ¹⁾ | Input voltage range ²⁾ / (nominal) | Output voltage | | Output current max. | Efficiency typ. | |
|--------------------------|---|----------------|--------------------------|---------------------|-----------------|------------|
| | | nominal | trim range ³⁾ | | @ Vin min. | @ Vin max. |
| Positive output circuit | | | | | | |
| TSRN 1-0525SM | 3.0 – 5.5 VDC (5 VDC) | 2.5 VDC | 1.2 – 3.6 VDC | 1.0 A | 95.5 % | 95 % |
| TSRN 1-2433SM | 4.6 – 42 VDC (12 VDC) | 3.3 VDC | 1.5 – 5.5 VDC | | 87.5 % | 80 % |
| TSRN 1-2450SM | 6.5 – 42 VDC (12 VDC) | 5.0 VDC | 2.5 – 8.0 VDC | | 91.5 % | 83.5 % |
| TSRN 1-2490SM | 10.5 – 42 VDC (12 VDC) | 9.0 VDC | 4.5 – 12.6 VDC | | 94.5 % | 89 % |
| TSRN 1-24120SM | 13.5 – 42 VDC (24 VDC) | 12 VDC | 4.5 – 13.5 VDC | | 95.0 % | 91 % |
| TSRN 1-24150SM | 16.5 – 42 VDC (24 VDC) | 15 VDC | 4.5 – 15.5 VDC | | 95.5 % | 92.5 % |
| Negative output circuit | | | | | | |
| TSRN 1-2433SM | 4.6 – 32 VDC (12 VDC) | -3.3 VDC | -1.5 – -5.5 VDC | 0.6 A | 74 % | 77 % |
| TSRN 1-2450SM | 4.6 – 31 VDC (12 VDC) | -5.0 VDC | -2.5 – -8.0 VDC | 0.4 A | 80 % | 78 % |
| TSRN 1-2490SM | 7 – 27 VDC (12 VDC) | -9.0 VDC | -4.5 – -12.6 VDC | 0.3 A | 85 % | 82 % |
| TSRN 1-24120SM | 7 – 24 VDC (12 VDC) | -12 VDC | -4.5 – -13.5 VDC | 0.3 A | 84 % | 86 % |
| TSRN 1-24150SM | 7 – 21 VDC (12 VDC) | -15 VDC | -4.5 – -15.5 VDC | 0.2 A | 85 % | 84 % |

1) Same order code for positive and negative output operation, see page 3 for circuits.

2) For input voltage higher 36 VDC an input capacitor 22 μF / 50 V is required.

3) For positive output circuit, input voltage must be higher than output voltage set: $>0.5\text{ V}$ for TSRN1-0525SM and $>1.5\text{ V}$ for other models. For negative output circuit, input voltage plus absolute output voltage set must not exceed 36 VDC ($V_{in} + |V_{out}| < 36\text{ VDC}$)

Input Specifications

| | | |
|--------------------------|---------------------------|--|
| No load input current | – positive output circuit | TSRN 1-0525SM: 6 mA typ. TSRN 1-2433SM: 1.5 mA typ. |
| | – negative output circuit | other models: 4 mA typ. -3.3 / -5.5 Vout models: 3 mA typ. -9.0 / -12 Vout models: 7 mA typ. TSRN 1-24150SM: 10 mA typ. |
| Reflected ripple current | | 100 mA typ. |
| Input filter | | internal capacitors |

Output Specifications

| | | |
|--|---|---|
| Voltage set accuracy | | ±2 % (at full load) |
| Regulation | – Input variation | 0.2 % |
| | – Load variation 0 – 100 % | 0.6 % |
| | – Load variation 10 – 90 % | 0.3 % |
| Startup voltage overshoot | | 1.0 % max. |
| Minimum load | | not required |
| Ripple and noise (20 MHz Bandwidth) | – Vout = 1.2V – 8V | 50 mVpk-pk max. |
| | – Vout = 8.1V – 15V | 75 mVpk-pk max. |
| Temperature coefficient | | ±0.015 % / °C max. |
| Dynamic load response (change of 50% to 100% load) | | 150 mV max. peak variation 250 µS max. response time |
| Startup time | – start up time at nominal Vin, constant resistive load | 5 mS typ. |
| Short circuit protection | | continuous, automatic recovery |
| Current limitation | | TSRN 1-0525SM: at 4.0 A typ. other models: at 2.0 A typ. |
| Capacitive load | | 470 µF max. |

General Specifications

| | | |
|---|---|---|
| Temperature ranges | – Operating | –40°C to +85°C |
| | – case temperature | +130°C. max. |
| | – Storage | –55°C to +125°C |
| Derating | – positive output circuit | 1.7 %/K above +55°C |
| | – negative output circuit | 2.5 %/K above +65°C |
| Thermal shock, mechanical shock & vibration | – Test conditions | EN 61373, MIL-STD-810F www.tracopower.com/products/mil810.pdf |
| Overtemperature protection | | at +170°C (on internal IC) |
| Humidity (non condensing) | | 90 % rel H max. |
| Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign) | | >4'500'000 h |
| Isolation voltage | | none |
| Switching frequency | | TSRN 1-0525SM: 410 kHz typ. |
| | | TSRN 1-2433SM: 300 kHz typ. |
| | | other models: 580 kHz typ. |
| Safety standards (designed to meet) | | UL/cUL 60950-1, IEC/EN 60950-1 |
| Remote On/Off | – Control pin reference for positive output circuit | GND |
| | – Control pin reference for negative output circuit | -Vout |
| | – On: | 2 – 5 VDC or open circuit. |
| | – Off: | 0 – 0.8 VDC or short circuit |
| | – Off idle current: | 1.2 mA typ. |
| Environmental compliance | – Reach – RoHS | www.tracopower.com/products/tsrn1sm-reach.pdf RoHS directive 2011/65/EU |

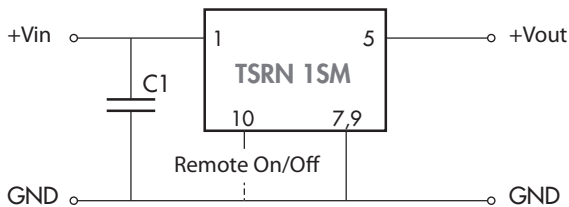
All specifications valid at nominal input voltage, full load and +25°C after warm-up time unless otherwise stated.

Physical Specifications

| | |
|----------------------------------|--|
| Casing material | non-conductive plastic (UL94V-0 rated) |
| Potting material | epoxy, (UL 94V-0 rated) |
| Weight | 1.7 g (0.06 oz) |
| Lead-free reflow solder process | as per J-STD-020D.01 (to find at: www.jedec.org - free registration required) 245°C – max. peak body temperature |
| Moisture sensitivity level (MSL) | level 1 as per IPC J-STD-033B.1 (to find at: www.jedec.org - free registration required) |
| Washing | baking after washing: 100°C for 30 min. |
| Packaging | www.tracopower.com/products/tsrn1sm-pack.pdf |

Applications notes

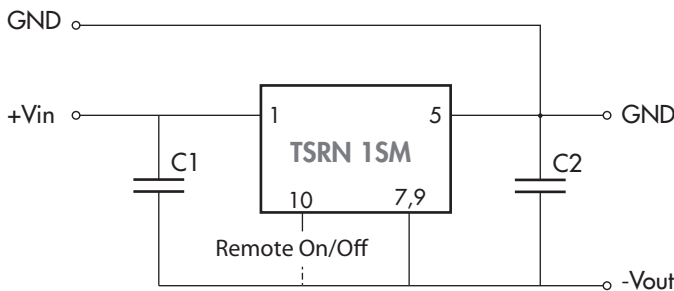
Positive output operation:



C1 = 22 µF / 50 V (required only if input voltage is higher than 36 V)

(Open Remote On/Off input = On)

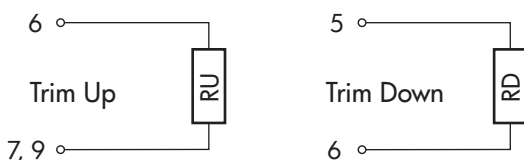
Negative output operation (not for model TSRN 1-0525SM):



C1 = 10 µF / 50 V, 1210 X5R MLCC
C2 = 10 µF / 25 V, 1206 X5R MLCC

(Open Remote On/Off input = On)

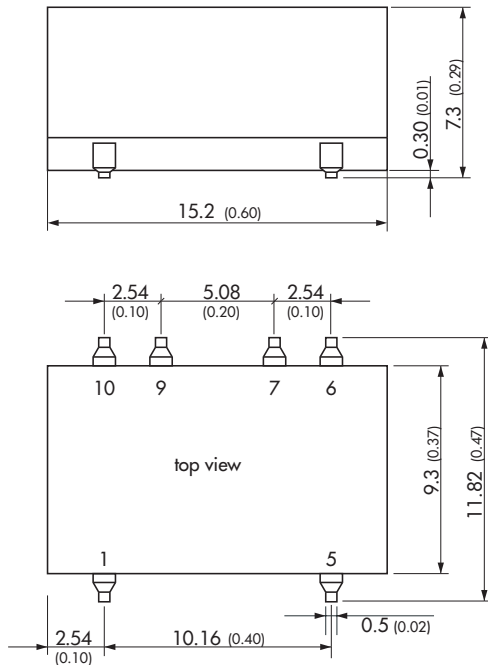
Output voltage adjustment:



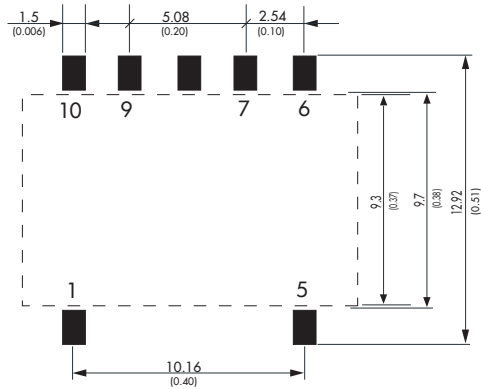
| Model | RU [KOhm] | RD [KOhm] |
|----------------|--------------------|-----------------------------------|
| TSRN 1-0525SM | 40.75 / (Vo - 2.5) | (Vo · 50.75 - 40.75) / (2.5 - Vo) |
| TSRN 1-2433SM | 26.4 / (Vo - 3.3) | (Vo · 33 - 26.4) / (3.3 - Vo) |
| TSRN 1-2450SM | 160 / (Vo - 5) | (Vo · 200 - 160) / (5 - Vo) |
| TSRN 1-2490SM | 80 / (Vo - 9) | (Vo · 100 - 80) / (9 - Vo) |
| TSRN 1-24120SM | 240 / (Vo - 12) | (Vo · 300 - 240) / (12 - Vo) |
| TSRN 1-24150SM | 240 / (Vo - 15) | (Vo · 300 - 240) / (15 - Vo) |

Vo = output voltage to be adjusted.
Calculate with absolute values for negative output circuit
Open Trim = nominal output voltage

Outline Dimensions



Solder Pad Dimension



| Pin-Out | | |
|---------|---------------|-------|
| Pin | pos. | neg. |
| 1 | +Vin | +Vin |
| 5 | +Vout | GND |
| 6 | Trim | |
| 7 | GND | -Vout |
| 9 | GND | -Vout |
| 10 | Remote On/Off | |

Dimensions in [mm], () = Inch
 Pin pitch tolerances: ± 0.25 (± 0.01)
 Pin profile tolerance: ± 0.1 (± 0.004)
 Other tolerances: ± 0.5 (± 0.02)

Specifications can be changed any time without notice.

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В нашем ассортименте представлены ведущие мировые производители активных и пассивных электронных компонентов.

Нашей специализацией является поставка электронной компонентной базы двойного назначения, продукции таких производителей как XILINX, Intel (ex.ALTERA), Vicor, Microchip, Texas Instruments, Analog Devices, Mini-Circuits, Amphenol, Glenair.

Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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