

Features

- ◆ SIP-package fits existing TO-220 footprint
- ◆ Suitable for positive & negative output circuit
- ◆ Pin compatible with LMxx linear regulators
- ◆ Built in filter capacitors
- ◆ Operation temp. range -40°C to $+85^{\circ}\text{C}$
- ◆ No heat-sink required
- ◆ Over-temperature protection
- ◆ Short circuit protection
- ◆ Wide input range up to 42 VDC
- ◆ Excellent line / load regulation
- ◆ Low standby current
- ◆ 3-year product warranty



The new TSRN-1 series step-down switching regulators are drop-in replacement for inefficient 78xx linear regulators. A high efficiency up to 95 % allows full load operation up to $+70^{\circ}\text{C}$ ($+85^{\circ}\text{C}$ with derating) ambient temperature without the need of any heat-sink or forced air cooling.

The TSRN-1 switching regulators provide other significant features over linear regulators, i.e. better output accuracy ($\pm 2\%$), lower standby current of $\sim 2\text{ mA}$ and no requirement of external capacitors. They are suitable for positive or negative output circuits. The high efficiency and low standby power consumption 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. | |
|--------------------------|---------------|--|----------------|------------------------|-----------------|------------|
| straight pins | angular pins | | | | @ Vin min. | @ Vin max. |
| Positive output circuit | | | | | | |
| TSRN 1-2415 | TSRN 1-2415A | 4.6 – 42 VDC (12 VDC) | 1.5 VDC | 1.0 A | 77 % | 66 % |
| TSRN 1-2418 | TSRN 1-2418A | 4.6 – 42 VDC (12 VDC) | 1.8 VDC | | 80 % | 70 % |
| TSRN 1-2425 | TSRN 1-2425A | 4.6 – 42 VDC (12 VDC) | 2.5 VDC | | 83 % | 75 % |
| TSRN 1-2433 | TSRN 1-2433A | 4.6 – 42 VDC (12 VDC) | 3.3 VDC | | 87 % | 79 % |
| TSRN 1-2450 | TSRN 1-2450A | 6.5 – 42 VDC (12 VDC) | 5.0 VDC | | 91 % | 83 % |
| TSRN 1-2465 | TSRN 1-2465A | 8.0 – 42 VDC (12 VDC) | 6.5 VDC | | 93 % | 86 % |
| TSRN 1-2490 | TSRN 1-2490A | 10.5 – 42 VDC (12 VDC) | 9.0 VDC | | 94 % | 88 % |
| TSRN 1-24120 | TSRN 1-24120A | 13.5 – 42 VDC (24 VDC) | 12 VDC | | 95 % | 91 % |
| TSRN 1-24150 | TSRN 1-24150A | 16.5 – 42 VDC (24 VDC) | 15 VDC | | 95 % | 92 % |
| Negative output circuit | | | | | | |
| TSRN 1-2415 | TSRN 1-2415A | 4.6 – 32 VDC (12 VDC) | -1.5 VDC | 0.6 A | 69 % | 64 % |
| TSRN 1-2418 | TSRN 1-2418A | 4.6 – 32 VDC (12 VDC) | -1.8 VDC | 0.6 A | 72 % | 67 % |
| TSRN 1-2425 | TSRN 1-2425A | 4.6 – 32 VDC (12 VDC) | -2.5 VDC | 0.6 A | 72 % | 74 % |
| TSRN 1-2433 | TSRN 1-2433A | 4.6 – 32 VDC (12 VDC) | -3.3 VDC | 0.6 A | 74 % | 77 % |
| TSRN 1-2450 | TSRN 1-2450A | 6.5 – 31 VDC (12 VDC) | -5.0 VDC | 0.4 A | 79 % | 78 % |
| TSRN 1-2465 | TSRN 1-2465A | 8.0 – 29 VDC (12 VDC) | -6.5 VDC | 0.3 A | 84 % | 80 % |
| TSRN 1-2490 | TSRN 1-2490A | 10.5 – 27 VDC (12 VDC) | -9.0 VDC | 0.3 A | 85 % | 82 % |
| TSRN 1-24120 | TSRN 1-24120A | 13.5 – 24 VDC (12 VDC) | -12 VDC | 0.3 A | 85 % | 85 % |
| TSRN 1-24150 | TSRN 1-24150A | 16.5 – 21 VDC (12 VDC) | -15 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

Input Specifications

| | |
|--------------------------|---|
| No load input current | <= 3.3 VDC output models: 1 mA typ. >= 5.0 VDC Output models: 3 mA typ |
| Reflected ripple current | 100 mA typ. |
| Input filter | internal capacitors |

Output Specifications

| | |
|--|---|
| Voltage set accuracy | ±2 % (at full load) |
| Regulation | <ul style="list-style-type: none"> - Input variation 0.2 % - Load variation (10 – 100 %) 1.5 VDC models: 0.6 % straight pin vers., 1.2 % angular pin vers. 1.8 VDC models: 0.4 % straight pin vers., 1.2 % angular pin vers. other models: 0.4 % (all versions) |
| Startup voltage overshoot | 1.0 % max. |
| Minimum load | not required |
| Ripple and noise (20 MHz Bandwidth) | 1.5 – 6.5 VDC models: 50 mVpk-pk max. 9 – 15 VDC models: 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 | <ul style="list-style-type: none"> - start up time at nominal Vin, constant resistive load 5 mS typ. - rise time for 10 % to 90 % Vout 3.5 mS typ. |
| Short circuit protection | continuous, automatic recovery |
| Current limitation (for positive output circuit) | at 2.0 A typ. |
| Capacitive load | 470 µF max. |

General Specifications

| | |
|---|---|
| Temperature ranges | <ul style="list-style-type: none"> - Operating -40°C to +85°C - Max. casing temperature +100°C - Storage -55°C to +125°C |
| Derating | 2.7 %/K above +70°C |
| Thermal shock, mechanical shock & vibration | EN 61373, MIL-STD-810F |
| | - Test conditions 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) | >6'000'000 h |
| Isolation voltage | none |
| Switching frequency | 1.5 – 3.3 VDC models: 300 kHz typ. 5.0 – 15 VDC models: 580 kHz typ. |

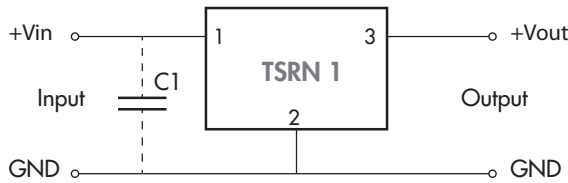
Physical Specifications

| | |
|--------------------------|--|
| Casing material | non-conductive plastic |
| Potting material | silicon (flammability to UL 94V-0 rated) |
| Weight | 1.9 g (0.07 oz) |
| Soldering profile | max. +265°C / 10 sec. (wave soldering) |
| Environmental compliance | <ul style="list-style-type: none"> - Reach www.tracopower.com/products/tsrn1-reach.pdf - RoHS RoHS directive 2011/65/EU |

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

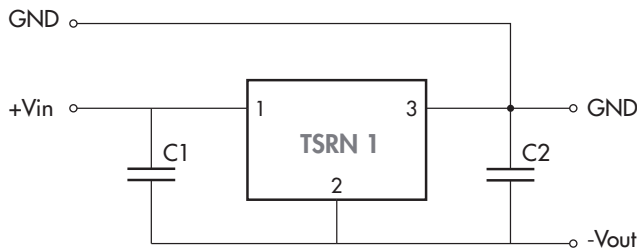
Applications notes

Positive output operation:



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

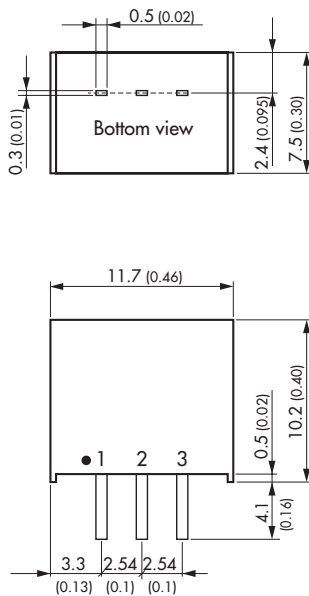
Negative output operation:



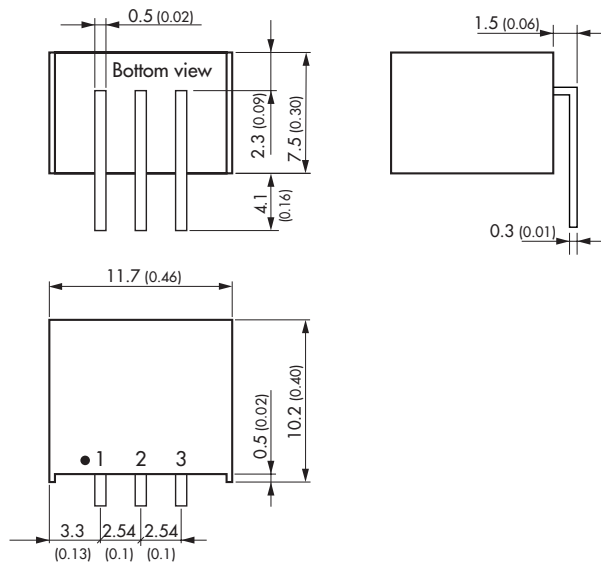
C1 = 10 μ F / 50 V, 1210 X5R MLCC
C2 = 10 μ F / 25 V, 1206 X5R MLCC

Outline Dimensions

Straight pin version



Angular pin version (suffix A)



| Pin-Out | | |
|---------|-------|-------|
| Pin | pos. | neg. |
| 1 | +Vin | +Vin |
| 2 | GND | -Vout |
| 3 | +Vout | GND |

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

Solder Pad Layout: www.tracopower.com/products/tsrn1-solderpadlayout.pdf

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

Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

Skype отдела продаж:

moschip.ru

moschip.ru_4

moschip.ru_6

moschip.ru_9