EN: This Datasheet/Document is presented by the manufacturer.

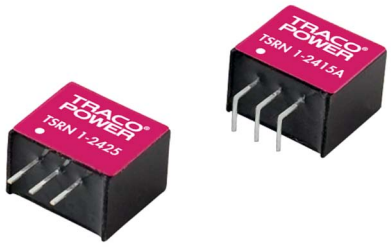
Please visit our website for pricing and availability at www.hestore.hu.

DC/DC Converters

TSRN-1 Series, 1 A Switching Regulator

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°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°C (+85°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 (±2 %), lower standby current of ~2 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	Output voltage	Output current	Efficiency typ.	
straight pins	angular pins	range [2]/ (nominal)		max.	@ Vin min.	@ Vin max.
		Positive output circuit				
TSRN 1-2415	TSRN 1-2415A	4.6 – 42 VDC (12 VDC)	1.5 VDC		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	1.0 A	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: >= 5.0 VDC Output models:	1 mA typ. 3 mA typ
Reflected ripple current			100 mA typ.
Input filter			internal capacitors

Output Specifications

Voltage set accuracy			±2 % (at full load)
Regulation	– Input variation – Load variation (10 – 100 %)	 1.5 VDC models: 1.8 VDC models: other models:	0.2 % 0.6 % straight pin vers., 1.2 % angular pin vers. 0.4 % straight pin vers., 1.2 % angular pin vers. 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: 9 – 15 VDC models:	50 mVpk-pk max. 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 – rise time for 10 % to 90 % Vout		5 mS typ. 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	– Operating – Max. casing temperature – Storage		–40°C to +85°C tba. –55°C to +125°C
Derating			2.7 %/K above +70°C
Thermal shock			acc. MIL-STD-810F
Vibration			acc. MIL-STD-810F
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: 5.0 – 15 VDC models:	300 kHz typ. 580 kHz typ.

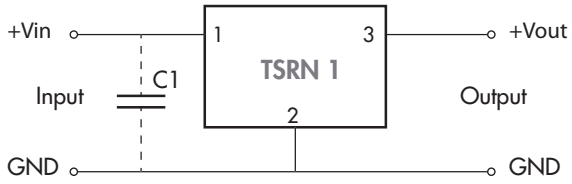
Physical Specifications

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)

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

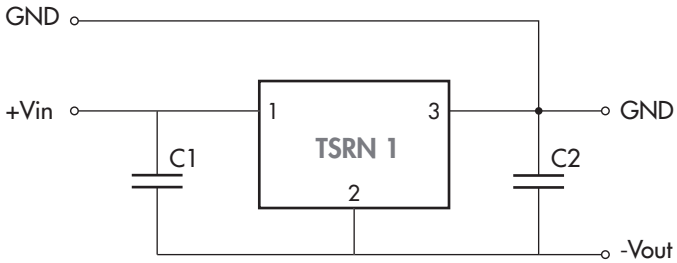
Applications notes

Positive output operation:



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

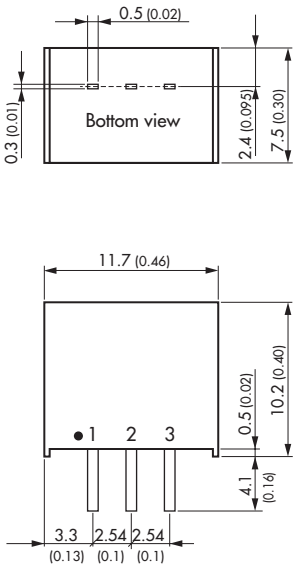
Negative output operation:



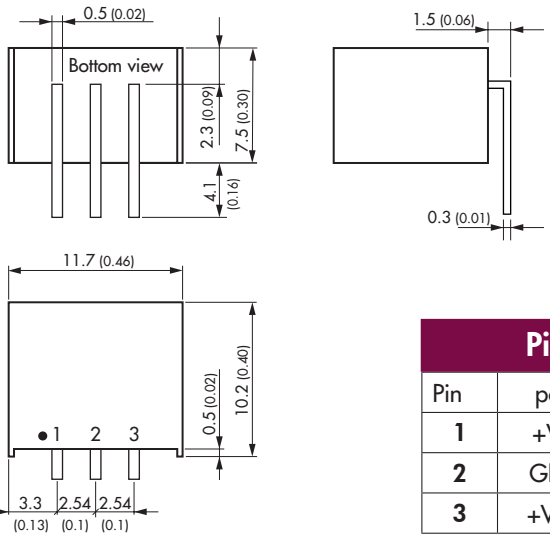
C1 = 10 µF / 50 V, 1210 X5R MLCC
C2 = 10 µF / 25 V, 1206 X5R MLCC

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)

Specifications can be changed any time without notice.

Jenatschstrasse 1 · CH-8002 Zurich · Switzerland
Tel. +41 43 311 45 11 · Fax +41 43 311 45 45 · info@traco.ch · www.tracopower.com