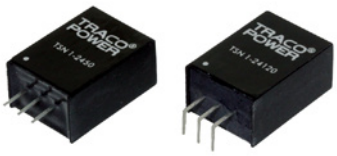
DC/DC Converters

TSN-1 Series, -1 A Switching Regulator

Features

- Non-isolated converter for negative output
- Small size and low profile
- Pin compatible with LM79xx linear regulators
- No heatsink required
- High efficiency up to 96%
- Operation temp. range –40°C to +85°C
- Protection against overload, short circuit and over-temperature
- Fixed switching frequency
- Wide input range up to -32 VDC
- Excellent line / load regulation
- Low standby current
- 3-year product warranty



The new TSN-1 series step-down switching regulators are drop-in replacement for inefficient 79xx linear regulators. A high efficiency up to 96 % 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 TSN-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 negative output circuits. The high efficiency and low standby power consumption make these regulators an ideal solution for energy sensitive applications.

Models

Order code		Input voltage	Output voltage	Output current	Efficiency typ.	
straight pins	angular pins	range / (nominal)		max.	@ Vin min.	@ Vin max.
		Negative output circuit				
TSN 1-2450	TSN 1-2450A	-7.0 – -32 VDC (12 VDC)	-5.0 VDC		91.5 %	84.5 %
TSN 1-2452	TSN 1-2452A	-7.0 – -32 VDC (12 VDC)	-5.2 VDC		92.0 %	85.0 %
TSN 1-2460	TSN 1-2460A	-8.0 – -32 VDC (12 VDC)	-6.0 VDC		92.5 %	86.5 %
TSN 1-2480	TSN 1-2480A	-10.5 – -32 VDC (12 VDC)	-8.0 VDC	-1.0 A	94.0 %	89.0 %
TSN 1-2490	TSN 1-2490A	-11.5 – -32 VDC (24 VDC)	-9.0 VDC		94.5 %	90.5 %
TSN 1-24120	TSN 1-24120A	-15 – -32 VDC (24 VDC)	-12.0 VDC		96.0 %	92.0 %
TSN 1-24150	TSN 1-24150A	-18 – -32 VDC (24 VDC)	-15.0 VDC		96.0 %	93.5 %

Input Specifications

No load input current			-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 %)		1.0 % max. 0.6 % max.
Startup voltage overshoot			1.0 % max.
Minimum load			not required
Ripple and noise (20 MHz Bandwidth)		5.0 – 5.2 VDC models: 6 – 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)			5% of Vout mV 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		15 mS typ. 10 mS typ.
Short circuit protection			continuous, automatic recovery
Capacitive load		5.0 – 5.2 VDC models: 6.0 – 9.0 VDC models: 12 – 15 VDC models:	1600 µF max. 1000 µF max. 470 µF max.

General Specifications

Temperature ranges	– Operating – Storage		–40°C to +85°C –55°C to +125°C
Derating			3.3 %/K above +70°C
Thermal shock, mechanical shock & vibration	– Test conditions		MIL-STD-810F www.tracopower.com/products/mil810.pdf
Overtemperature protection			at +165°C (on internal IC)
Humidity (non condensing)			95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)			>2'000'000 h
Isolation voltage			none
Switching frequency		5.0 – 5.2 VDC models: 6.0 – 15 VDC models:	380 kHz typ. 500 kHz typ.

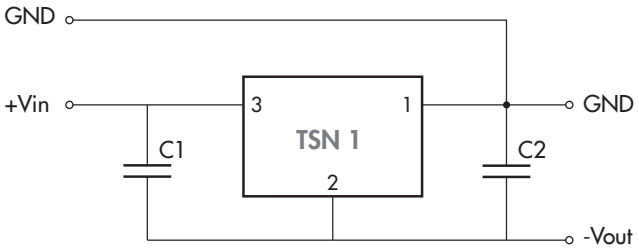
Physical Specifications

Casing material			non-conductive plastic
Potting material			silicon (flammability to UL 94V-0 rated)
Weight			3.1 g (0.11 oz)
Soldering profile			max. +265°C / 10 sec. (wave soldering)
Environmental compliance	– Reach – RoHS		www.tracopower.com/products/reach-declaration.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.

Application note

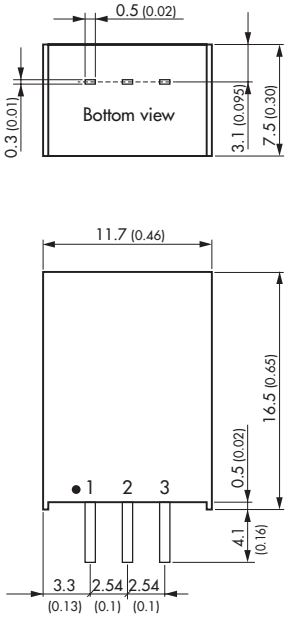
Negative output operation:



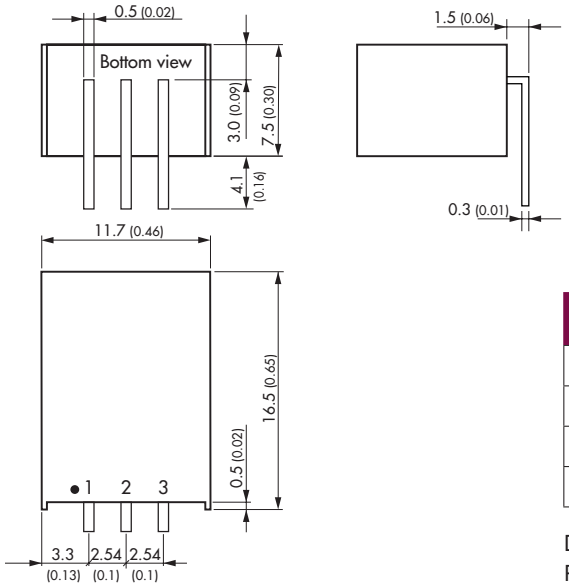
C1 = 10 µF / 50 V, 1210 X5R MLCC
C2 = 10 µF / 25 V, 1206 X5R MLCC

Outline Dimensions

Straight pin version



Angular pin version (suffix A)



Pin-Out	
Pin	**Single**
1	GND
2	-Vin
3	+Vout

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