

- Compact SIP package  
11,9 × 7,7 × 11,0 mm
- Fully regulated outputs
- Input Voltage range  
4.5-13.2, 9-18, 18-36, 36-75 VDC
- I/O-isolation 1'600 VDC
- Operating temperature range  
-40°C to +90°C without derating
- Short circuit protection
- 3-year product warranty



The TRN 1 Series comprises 1 Watt fully regulated, high performance DC/DC converters. They come in a compact cubical package of only 1.00 cm<sup>3</sup>. Full load operation is reliable up to 90°C environment temperature. With 1'600 VDC I/O-isolation voltage, and short current protection they cover a wide range of application when space is limited. The input of the converters is designed for a wide voltage range (2:1) and minimum load is not required.

Models				
Order code	Input voltage	Output voltage	Output current max.	Efficiency typ.
TRN 1-0510	4.5 – 13.2 VDC (9 VDC nominal)	3.3 VDC	300 mA	77 %
TRN 1-0511		5.0 VDC	200 mA	79 %
TRN 1-0512		12 VDC	90 mA	81 %
TRN 1-0513		15 VDC	70 mA	82 %
TRN 1-0515		24 VDC	45 mA	83 %
TRN 1-0521		± 5.0 VDC	±100 mA	79 %
TRN 1-0522		±12 VDC	±45 mA	83 %
TRN 1-0523		±15 VDC	±35 mA	80 %
TRN 1-1210	9 – 18 VDC (12 VDC nominal)	3.3 VDC	300 mA	77 %
TRN 1-1211		5.0 VDC	200 mA	80 %
TRN 1-1212		12 VDC	90 mA	81 %
TRN 1-1213		15 VDC	70 mA	83 %
TRN 1-1215		24 VDC	45 mA	83 %
TRN 1-1221		± 5.0 VDC	±100 mA	79 %
TRN 1-1222		±12 VDC	±45 mA	83 %
TRN 1-1223		±15 VDC	±35 mA	80 %
TRN 1-2410	18 – 36 VDC (24 VDC nominal)	3.3 VDC	300 mA	77 %
TRN 1-2411		5.0 VDC	200 mA	81 %
TRN 1-2412		12 VDC	90 mA	82 %
TRN 1-2413		15 VDC	70 mA	83 %
TRN 1-2415		24 VDC	45 mA	82 %
TRN 1-2421		± 5.0 VDC	±100 mA	79 %
TRN 1-2422		±12 VDC	±45 mA	82 %
TRN 1-2423		±15 VDC	±35 mA	80 %
TRN 1-4810	36 – 75 VDC (48 VDC nominal)	3.3 VDC	300 mA	77 %
TRN 1-4811		5.0 VDC	200 mA	78 %
TRN 1-4812		12 VDC	90 mA	80 %
TRN 1-4813		15 VDC	70 mA	81 %
TRN 1-4815		24 VDC	45 mA	81 %
TRN 1-4821		± 5.0 VDC	±100 mA	78 %
TRN 1-4822		±12 VDC	±45 mA	81 %
TRN 1-4823		±15 VDC	±35 mA	79 %

## Input Specifications

Input current no load		9 Vin models: 35 mA typ 12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 5 mA typ.
Surge voltage (1 sec. max.)		9 Vin models: 15 V max. 12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max.
Reflected ripple current		30 mA <sub>p-p</sub> typ.
Conducted noise	– conducted input emission	EN 55032 class A or B with external components
EMC immunity	– ESD (electrostatic discharge) – Radiated immunity – Fast transient / surge (with external input capacitor) – Conducted immunity – Magnetic field immunity	EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV perf. criteria A Nippon chemi-con KY 220 µF/ 100 V EN 61000-4-6, 10 V <sub>rms</sub> , perf. criteria A EN 61000-4-8 100 A/m, continuous, perf. criteria A 1000 A/m, 1 sec., perf. criteria A
Input filter		capacitor type

## Output Specifications

Voltage set accuracy		±1 % max.
Regulation	– Input variation – Load variation 0 – 100 % – cross regulation - dual output:	0.2 % max. 1 % max. 5 % max. (asymmetrical load 25 % / 100 %)
Temperature coefficient		±0.02 %/K typ.
Ripple and noise (20 MHz Bandwidth)		50 mV <sub>p-p</sub> typ.
Start-up time		15 ms max. (5 ms typ.)
Transient response (25% load step change)		500 µs typ.
Short circuit protection		continuous, automatic recovery
Capacitive load	–Single output  –Dual output	3.3 VDC models: 1680 µF max. 5.0 VDC models: 820 µF max. 12 VDC models: 470 µF max. 15 VDC models: 330 µF max. 24 VDC models: 160 µF max. ±5.0 VDC models: 470 µF max. (each output) ±12 VDC models: 330 µF max. (each output) +15 VDC models: 220 µF max. (each output)

## General Specifications

Temperature ranges	– Operating (convection cooling 20LFM, 0,1m/s) – Case temperature – Storage temperature	–40°C to +90°C (without derating) +95°C max. –55°C to +125°C
Derating		6.7%/K above 90°C
Humidity (non condensing)		5 – 95 % rel H max.
Isolation voltage	– I/O isolation voltage (60 sec.)	1'600 VDC
Isolation capacitance		75 pF max.
Isolation resistance (@ 500 VDC)		>1 Gohm

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

### General Specifications

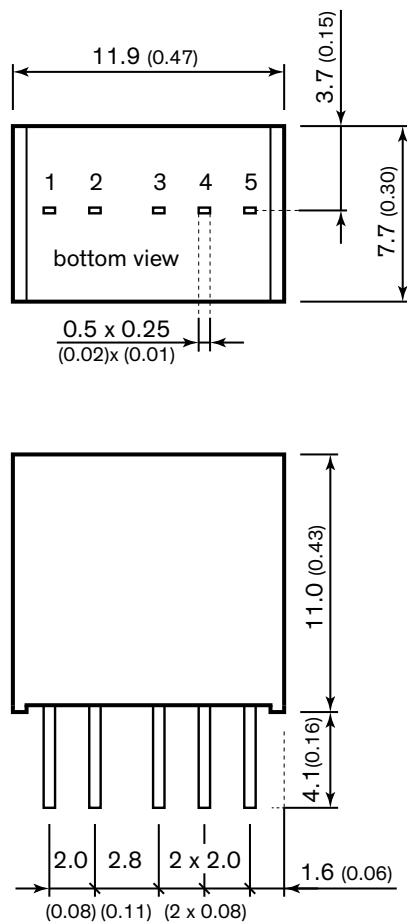
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)	7'400'000 h
Switching frequency	100 kHz min. Pulse frequency modulation.
Thermal shock & vibration	MIL-STD-810F
Safety standards	– Information technology IEC/EN 60950-1, UL 60950-1
Environmental compliance	– Reach – RoHS <a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a> RoHS directive 2011/65/EU

### Physical Specifications

Casing material	non-conductive black plastic
Potting material	silicone (UL 94V-0 rated)
Package weight	2.1g (0.07oz)
Soldering temperature	max. 260°C / 6 sec

**Supporting Documents:** [www.tracopower.com/overview/trn1](http://www.tracopower.com/overview/trn1)

### Outline Dimensions



Pin-Out		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
3	+Vout	+Vout
4	no pin	common
5	-Vout	-Vout

Dimensions in [mm], () = Inch

Tolerances: x.x	±0.5 (±0.02)
x.xx	±0.25 (±0.01)
Pin pitch tolerances	±0.25 (±0.01)
Pin dimension tolerance	±0.1 (±0.004)