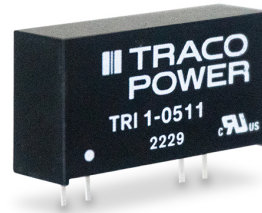


## DC/DC Converter

## TRI 1 Series, 1 Watt

- Reinforced I/O-isolation 3000 VAC rated for 480 VAC working voltage
- Ultra-high isolation peak voltage 8000 VDC (1s)
- Operating temperature range -40 to +85°C without derating
- High efficiency up to 81%
- Input voltage range ( $\pm 10\%$ ): 5, 12, 24 VDC
- Protection against overvoltage and short circuit
- 3-year product warranty



The new TRI 1 is a high isolation, regulated DC/DC converter series which comes in a compact SIP-8 package. The core characteristic of the TRI 1 series is a sophisticated reinforced isolation system which is able to withstand high test voltages (8000 VDC for 1s and 3000 VAC for 60s) and working voltages (480 VACrms). Efficiencies up to 81% allow safe operation from  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  without derating. All models have a  $\pm 10\%$  input voltage range and precisely regulated, isolated output voltages. With the latest IT safety certifications (IEC/EN/UL 62368-1) the TRI 1 series is the perfect choice for many demanding low power applications in the industrial, transportation and instrumentation sectors.

### Models

Order Code	Input Voltage Range	Output Voltage nom.	Output Current max.	Efficiency typ.
TRI 1-0511	4.5 - 5.5 VDC (5 VDC nom.)	5 VDC	200 mA	79 %
TRI 1-0512		12 VDC	84 mA	80 %
TRI 1-0513		15 VDC	68 mA	81 %
TRI 1-1211	10.8 - 13.2 VDC (12 VDC nom.)	5 VDC	200 mA	79 %
TRI 1-1212		12 VDC	84 mA	81 %
TRI 1-1213		15 VDC	68 mA	79 %
TRI 1-2411	21.6 - 26.4 VDC (24 VDC nom.)	5 VDC	200 mA	76 %
TRI 1-2412		12 VDC	84 mA	79 %
TRI 1-2413		15 VDC	68 mA	79 %

### Input Specifications

Input Current	- At no load	5 Vin models: <b>50 mA typ. / 75 mA max.</b> 12 Vin models: <b>35 mA typ. / 53 mA max.</b> 24 Vin models: <b>20 mA typ. / 30 mA max.</b>
	- At full load	5 Vin models: <b>258 mA max.</b> (5 Vout model) <b>255 mA max.</b> (12 Vout model) <b>255 mA max.</b> (15 Vout model) 12 Vin models: <b>107 mA max.</b> (5 Vout model) <b>106 mA max.</b> (12 Vout model) <b>109 mA max.</b> (15 Vout model) 24 Vin models: <b>56 mA max.</b> (5 Vout model) <b>54 mA max.</b> (12 Vout model) <b>55 mA max.</b> (15 Vout model)
Surge Voltage		5 Vin models: <b>9 VDC max.</b> (1 s max.) 12 Vin models: <b>18 VDC max.</b> (1 s max.) 24 Vin models: <b>30 VDC max.</b> (1 s max.)
Recommended Input Fuse		5 Vin models: <b>500 mA</b> (slow blow) 12 Vin models: <b>200 mA</b> (slow blow) 24 Vin models: <b>100 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>

### Output Specifications

Voltage Set Accuracy		<b>±3% max.</b>
Regulation	- Input Variation (1% Vin step) - Load Variation	<b>1.5% max.</b> See application note: <a href="http://www.tracopower.com/overview/tri1">www.tracopower.com/overview/tri1</a>
Ripple and Noise	- 20 MHz Bandwidth	<b>75 mVp-p max.</b>
Capacitive Load		<b>220 µF max.</b>
Minimum Load		<b>Not required</b> (Higher regulation tolerance below 2% load.)
Temperature Coefficient		<b>±0.02 %/K max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>EN 62368-1</b> <b>IEC 62368-1</b> <b>UL 62368-1</b>
	- Certification Documents	<a href="http://www.tracopower.com/overview/tri1">www.tracopower.com/overview/tri1</a>
Pollution Degree		<b>PD 2</b>
Over Voltage Category		<b>OVC II (not mains connected)</b>

### EMC Specifications

EMI Emissions	- Conducted Emissions	<b>EN 55032 class A</b> (with external filter) <b>EN 55032 class B</b> (with external filter)
	- Radiated Emissions	<b>EN 55032 class A</b> (internal filter) <b>EN 55032 class B</b> (internal filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/tri1">www.tracopower.com/overview/tri1</a>

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

EMS Immunity		EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 15$ kV, perf. criteria A
	- RF Electromagnetic Field	Contact: EN 61000-4-2, $\pm 8$ kV, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-3, 10 V/m, perf. criteria A
		EN 61000-4-4, $\pm 2$ kV, perf. criteria A
		EN 61000-4-5, $\pm 1$ kV, perf. criteria A
	- PF Magnetic Field	External filter proposal: <a href="http://www.tracopower.com/overview/tri1">www.tracopower.com/overview/tri1</a>
		Continuous: EN 61000-4-8, 100 A/m, perf. criteria A
		1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +95°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-50°C to +125°C
Power Derating	- High Temperature	5 %/K above 85°C
		See application note: <a href="http://www.tracopower.com/overview/tri1">www.tracopower.com/overview/tri1</a>
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		30 - 100 kHz (Royer)
		60 kHz typ. (Royer)
Insulation System		Reinforced Insulation
Working Voltage (rated)		480 VAC (679 VDC)
Isolation Test Voltage	- Input to Output, 60 s	3'000 VAC (4242 VDC)
	- Input to Output, 1 s	8'000 VDC
Creepage	- Input to Output	5.5 mm min.
Clearance	- Input to Output	5.5 mm min.
Isolation Resistance	- Input to Output, 500 VDC	10'000 M $\Omega$ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	20 pF typ.
Reliability	- Calculated MTBF	4'300'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration	IPC-9592B
	- Mechanical Shock	IPC-9592B
	- Thermal Shock	IPC-9592B
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Nickel-Iron (Alloy 42)
Pin Foundation Plating		Nickel (1 $\mu$ m min.)
Pin Surface Plating		Tin (3 - 5 $\mu$ m), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP7
Soldering Profile		Wave Soldering 260°C / 4 s max.
Weight		4.1 g

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

Environmental Compliance - REACH Declaration

[www.tracopower.com/info/reach-declaration.pdf](http://www.tracopower.com/info/reach-declaration.pdf)

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

[www.tracopower.com/info/rohs-declaration.pdf](http://www.tracopower.com/info/rohs-declaration.pdf)

Exemptions: 7a

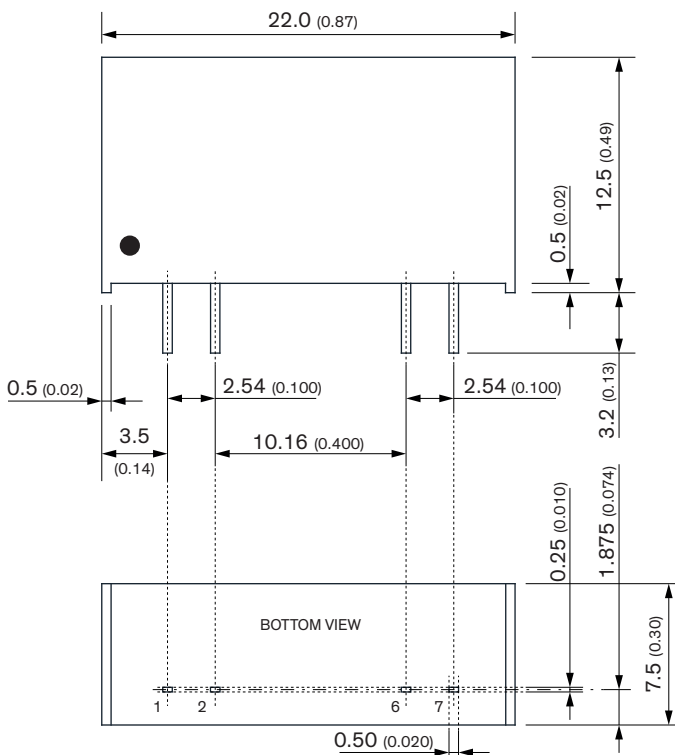
(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).  
The SCIP number is provided on request.)

### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/tri1](http://www.tracopower.com/overview/tri1)

### Outline Dimensions



Pinout	
Pin	Function
1	+Vin
2	-Vin
6	-Vout
7	+Vout

Dimensions in mm (inch)  
Tolerances: x.x ±0.5 (±0.02)  
              x.xx ±0.25 (±0.01)  
Pin tolerances: ±0.05 (±0.002)