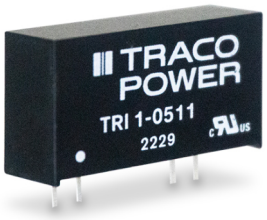
TRACO POWER

Unregulated 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 (±10%): 5, 12, 24 VDC**
- **Protection against overvoltage and short circuit**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The new TRI 1 is a high isolation, unregulated 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°C to +85°C without derating. All models have a ±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:	**50 mA typ. / 75 mA max.**
		12 Vin models:	**35 mA typ. / 53 mA max.**
		24 Vin models:	**20 mA typ. / 30 mA max.**
	- At full load	5 Vin models:	**258 mA max.** (5 Vout model)
			255 mA max. (12 Vout model)
			255 mA max. (15 Vout model)
		12 Vin models:	**107 mA max.** (5 Vout model)
			106 mA max. (12 Vout model)
			109 mA max. (15 Vout model)
		24 Vin models:	**56 mA max.** (5 Vout model)
			54 mA max. (12 Vout model)
			55 mA max. (15 Vout model)
Surge Voltage		5 Vin models:	**9 VDC max.** (1 s max.)
		12 Vin models:	**18 VDC max.** (1 s max.)
		24 Vin models:	**30 VDC max.** (1 s max.)
Recommended Input Fuse		5 Vin models:	**500 mA** (slow blow)
		12 Vin models:	**200 mA** (slow blow)
		24 Vin models:	**100 mA** (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Capacitor

Output Specifications

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

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 62368-1
		IEC 62368-1
		UL 62368-1
	- Certification Documents	www.tracopower.com/overview/tri1
Pollution Degree		PD 2
Over Voltage Category		OVC II (not mains connected)

EMC Specifications

EMI (Emissions)	- Conducted Emissions		EN 55032 class A (with external filter)
			EN 55032 class B (with external filter)
	- Radiated Emissions		EN 55032 class A (internal filter)
			EN 55032 class B (internal filter)
		External filter proposal:	www.tracopower.com/overview/tri1

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, ±15 kV, perf. criteria A
		Contact:	EN 61000-4-2, ±8 kV, perf. criteria A
	- RF Electromagnetic Field		EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge		EN 61000-4-4, ±2 kV, perf. criteria A
			EN 61000-4-5, ±1 kV, perf. criteria A
		External filter proposal:	www.tracopower.com/overview/tri1
	- PF Magnetic Field	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A
		1 s:	EN 61000-4-8, 1000 A/m, perf. criteria A
EMC / Environmental	- Certification Documents		www.tracopower.com/overview/tri1

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:	www.tracopower.com/overview/tri1
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Regulator Topology		Push-Pull Converter
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 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	20 pF typ.
Distance Through Isolation		0.4 mm
Reliability	- Calculated MTBF	4'300'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline
		www.tracopower.com/info/cleaning.pdf
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 µm min.)
Pin Surface Plating		Tin (3 - 5 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP7
Soldering Profile		Lead-Free Wave Soldering
		260°C / 4 s max.
Weight		4.1 g

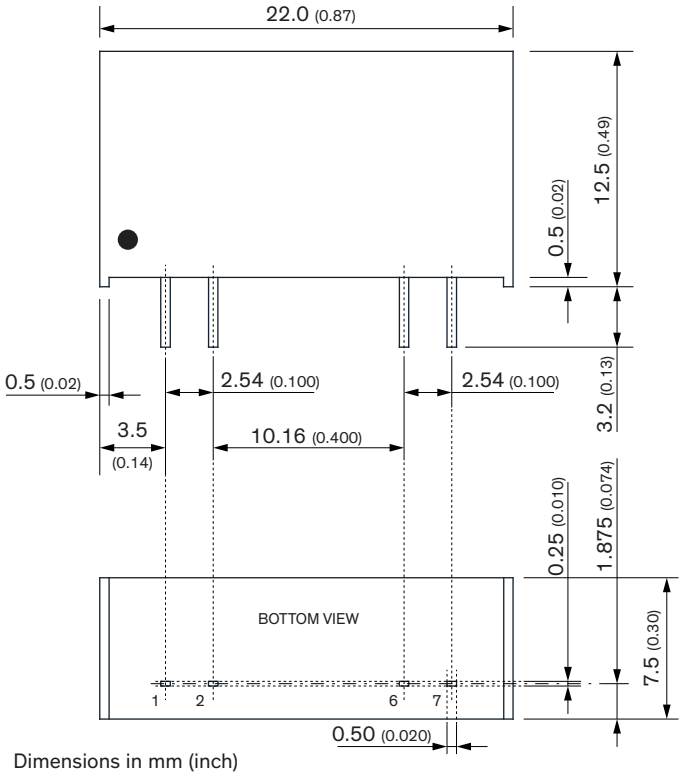
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	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).)
	- SCIP Reference Number	ce6961a9-da47-456e-912d-ee6c21b4fca4

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tri1

Outline Dimensions



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

Pinout	
Pin	**Function**
1	+Vin (Vcc)
2	–Vin (GND)
6	–Vout
7	+Vout