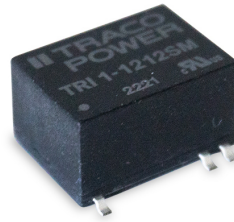


- Reinforced I/O-isolation 3000 VAC rated for 480 VAC working voltage
- Ultra-high isolation peak voltage 8000 VDC (1s)
- Operating temperature range -40 to +85°C without derating
- High efficiency up to 84%
- Input voltage range ($\pm 10\%$): 5, 12, 24 VDC
- Protection against overvoltage and short circuit
- 3-year product warranty



The new TRI 1SM is a high isolation, regulated DC/DC converter series which comes in a compact SMD-14 package. The core characteristic of the TRI 1SM 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 84% allow safe operation from -40°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 1SM 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 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
TRI 1-0511SM	4.5 - 5.5 VDC (5 VDC nom.)	5 VDC	200 mA			76 %
TRI 1-0512SM		12 VDC	84 mA			80 %
TRI 1-0513SM		15 VDC	68 mA			83 %
TRI 1-0522SM		+12 VDC	42 mA	-12 VDC	42 mA	80 %
TRI 1-0523SM		+15 VDC	33 mA	-15 VDC	33 mA	84 %
TRI 1-1211SM	10.8 - 13.2 VDC (12 VDC nom.)	5 VDC	200 mA			76 %
TRI 1-1212SM		12 VDC	84 mA			79 %
TRI 1-1213SM		15 VDC	68 mA			80 %
TRI 1-1222SM		+12 VDC	42 mA	-12 VDC	42 mA	79 %
TRI 1-1223SM		+15 VDC	33 mA	-15 VDC	33 mA	80 %
TRI 1-2411SM	21.6 - 26.4 VDC (24 VDC nom.)	5 VDC	200 mA			76 %
TRI 1-2412SM		12 VDC	84 mA			80 %
TRI 1-2413SM		15 VDC	68 mA			80 %
TRI 1-2422SM		+12 VDC	42 mA	-12 VDC	42 mA	80 %
TRI 1-2423SM		+15 VDC	33 mA	-15 VDC	33 mA	80 %

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: 267 mA max. (5 Vout model) 249 mA max. (12 Vout model) 246 mA max. (15 Vout model) 249 mA max. (12 / -12 Vout model) 239 mA max. (15 / -15 Vout model) 12 Vin models: 111 mA max. (5 Vout model) 108 mA max. (12 Vout model) 106 mA max. (15 Vout model) 108 mA max. (12 / -12 Vout model) 102 mA max. (15 / -15 Vout model) 24 Vin models: 56 mA max. (5 Vout model) 53 mA max. (12 Vout model) 54 mA max. (15 Vout model) 53 mA max. (12 / -12 Vout model) 52 mA max. (15 / -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) - Load Variation - Voltage Balance (symmetrical load)	single output models: 1.5% max. See application note: www.tracopower.com/overview/tri1sm dual output models: 1% max.
Ripple and Noise	- 20 MHz Bandwidth	100 mVp-p max.
Capacitive Load	- single output - dual output	5 Vout models: 220 µF max. 12 Vout models: 220 µF max. 15 Vout models: 220 µF max. 12 / -12 Vout models: 100 / 100 µF max. 15 / -15 Vout models: 100 / 100 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 - Certification Documents	EN 62368-1 IEC 62368-1 UL 62368-1 www.tracopower.com/overview/tri1sm
Pollution Degree		PD 2
Over Voltage Category		Not mains connected

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

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/tri1sm
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
	- PF Magnetic Field	External filter proposal: www.tracopower.com/overview/tri1sm 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: www.tracopower.com/overview/tri1sm
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Regulator Topology		Push-Pull Converter
Switching Frequency		30 - 100 kHz (Royer)
		55 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	8 mm min.
Clearance	- Input to Output	8 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.
Reliability	- Calculated MTBF	4'700'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2 (J-STD-033C)
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		Plastic resin (UL 94 V-0 rated)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Copper (1 - 3 μm)
Pin Surface Plating		Tin (7.5 μm min.), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Footprint Type		SMD14

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

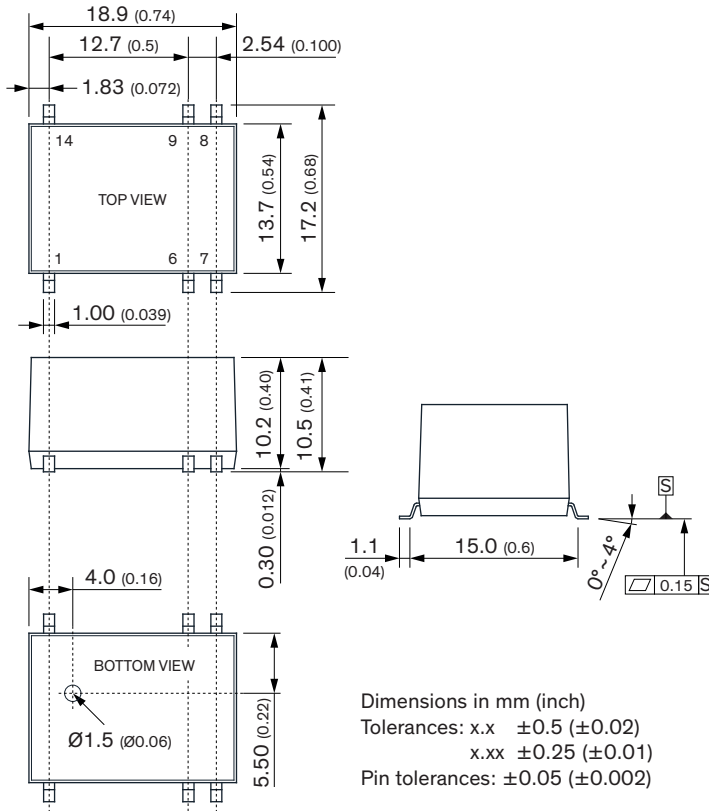
Soldering Profile	Lead-Free Reflow Soldering (acc. J-STD-020E) 245°C max. (Tp) 10 s max. (tp, at Tp - 5°C)
Weight	4.1 g
Environmental Compliance	- REACH Declaration www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration www.tracopower.com/info/rohs-declaration.pdf Exemptions: No Exemptions

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tri1sm

Outline Dimensions



Pinout		
Pin	Single	Dual
1		-Vin
6	NC	Common
7	NC	-Vout
8	+Vout	+Vout
9	-Vout	Common
14	+Vin	+Vin

NC: Not connected

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

Recommended Solder Pad Layout

