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TRACO POWER

DC/DC Converter

TRI 10 Series, 10 Watt

- **Reinforced I/O-isolation 5000 VAC rated for 1000 VAC working voltage**
- **Ultra-high isolation peak voltage 9000 VDC (1s)**
- **Common Mode Transient Immunity (dv/dt) 15 kV/µs**
- **Operating temperature range -40 to +85°C**
- **Low no-load power consumption 144 – 288 mW**
- **Internal EN 55032 class A filter**
- **High efficiency up to 88%**
- **2:1 input voltage range: 9-18, 18-36, 36-75 VDC**
- **Protection against overload, overvoltage and short circuit**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The new TRI 10 is a high isolation, regulated 10 Watt DC/DC converter series which comes in a compact DIP-24 package. The core characteristic of the TRI 10 series is a sophisticated reinforced isolation system which is able to withstand high test voltages (9000 VDC for 1s and 5000 VAC for 60s) and working voltages (1000 VACrms). Complementing this isolation characteristic is a high Common Mode Transient Immunity of 15 kV/µs. The new design allows to fully integrate an EN 55032 class A filter and greatly reduces the no-load power consumption. High efficiencies up to 88% allow safe operation from –40°C to +65°C without derating and up to +85°C with derating. All models have a wide 2:1 input voltage range and precisely regulated, isolated output voltages. With the latest IT safety certifications (IEC/EN/UL 62368-1) the TRI 10 series is the perfect choice for many demanding applications in the industrial, transportation and instrumentation sectors.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TRI 10-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	2'700 mA			81 %
TRI 10-1211		5.1 VDC	2'000 mA			83 %
TRI 10-1212		12 VDC	833 mA			86 %
TRI 10-1213		15 VDC	666 mA			88 %
TRI 10-1215		24 VDC	416 mA			88 %
TRI 10-1222		+12 VDC	416 mA	–12 VDC	416 mA	88 %
TRI 10-1223		+15 VDC	333 mA	–15 VDC	333 mA	87 %
TRI 10-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	2'700 mA			81 %
TRI 10-2411		5.1 VDC	2'000 mA			84 %
TRI 10-2412		12 VDC	833 mA			87 %
TRI 10-2413		15 VDC	666 mA			88 %
TRI 10-2415		24 VDC	416 mA			88 %
TRI 10-2422		+12 VDC	416 mA	–12 VDC	416 mA	88 %
TRI 10-2423		+15 VDC	333 mA	–15 VDC	333 mA	87 %
TRI 10-4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC	2'700 mA			81 %
TRI 10-4811		5.1 VDC	2'000 mA			84 %
TRI 10-4812		12 VDC	833 mA			87 %
TRI 10-4813		15 VDC	666 mA			88 %
TRI 10-4815		24 VDC	416 mA			87 %
TRI 10-4822		+12 VDC	416 mA	–12 VDC	416 mA	87 %
TRI 10-4823		+15 VDC	333 mA	–15 VDC	333 mA	87 %

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Input Specifications

Input Current	- At no load	12 Vin models:	12 mA typ.
		24 Vin models:	8 mA typ.
		48 Vin models:	6 mA typ.
	- At full load	12 Vin models:	960 mA typ.
		24 Vin models:	480 mA typ.
		48 Vin models:	240 mA typ.
Surge Voltage		12 Vin models:	25 VDC max. (1 s max.)
		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
Under Voltage Lockout		12 Vin models:	7 VDC min. / 8 VDC typ.
		24 Vin models:	15 VDC min. / 16 VDC typ.
		48 Vin models:	31 VDC min. / 33 VDC typ.
Recommended Input Fuse			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

Output Specifications

Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.5% max.
		dual output models:	0.5% max.
	- Load Variation (0 - 100%)	single output models:	0.5% max.
		dual output models:	1% max. (Output 1)
			1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	2% max.
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise	- 20 MHz Bandwidth		70 mVp-p max. (w/ 10 µF MLCC)
			50 mVp-p typ. (w/ 10 µF MLCC)
Capacitive Load	- single output	3.3 Vout models:	4'700 µF max.
		5.1 Vout models:	3'300 µF max.
		12 Vout models:	560 µF max.
		15 Vout models:	360 µF max.
		24 Vout models:	140 µF max.
	- dual output	12 / -12 Vout models:	280 / 280 µF max.
		15 / -15 Vout models:	180 / 180 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Start-up Time			30 ms typ. / 60 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			190% max. of Iout max.
			150% typ. of Iout max.
Overvoltage Protection			125% typ. of Vout nom.
Transient Response	- Response Deviation		5% max. (75% to 100% Load Step)
	- Response Time		300 µs typ. (75% to 100% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 62368-1
		IEC 62368-1
		UL 62368-1
	- Certification Documents	www.tracopower.com/tri10-safety-cert/
Energy Source	- Output, acc. to 62368-1	ES1
Power Source	- Output, acc. to 62368-1	PS2

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

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Pollution Degree		PD 2
Over Voltage Category		Not mains connected

EMC Specifications

EMI (Emissions)	- Conducted Emissions		EN 55032 class A (internal filter)
			EN 55032 class B (with external filter)
			FCC 47 Part 15 class A (internal filter)
	- Radiated Emissions		EN 55032 class A (internal filter)
			FCC 47 Part 15 class A (internal filter)
		External filter proposal:	www.tracopower.com/tri10-emc-filter/
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, ±2 kV, perf. criteria A
		Ext. input component:	KY 470 µF / 100 V
	- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous:	EN 61000-4-8, 100 A/m, perf. criteria A
EMC / Environmental	- Certification Documents		www.tracopower.com/tri10-emc-cert/

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Case Temperature	+105°C max.
	- Storage Temperature	–50°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/tri10-cc/
Cooling System		Natural convection (20 LFM)
Altitude During Operation		5'000 m max.
Switching Frequency		200 - 280 kHz (PWM)
		240 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		1'000 VAC
Isolation Test Voltage	- Input to Output, 60 s	5'000 VAC
	- Input to Output, 1 s	9'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	20 pF max.
Common Mode Transient Immunity		15 kV/µs min.
Reliability	- Calculated MTBF	3'817'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Housing Material		Plastic resin (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper Alloy (C6801)
Pin Foundation Plating		Nickel (2 - 4 µm)
Pin Surface Plating		Tin (3 - 5 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		DIP24
Soldering Profile		Lead-Free Wave Soldering 260°C / 10 s max.
Weight		16 g

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

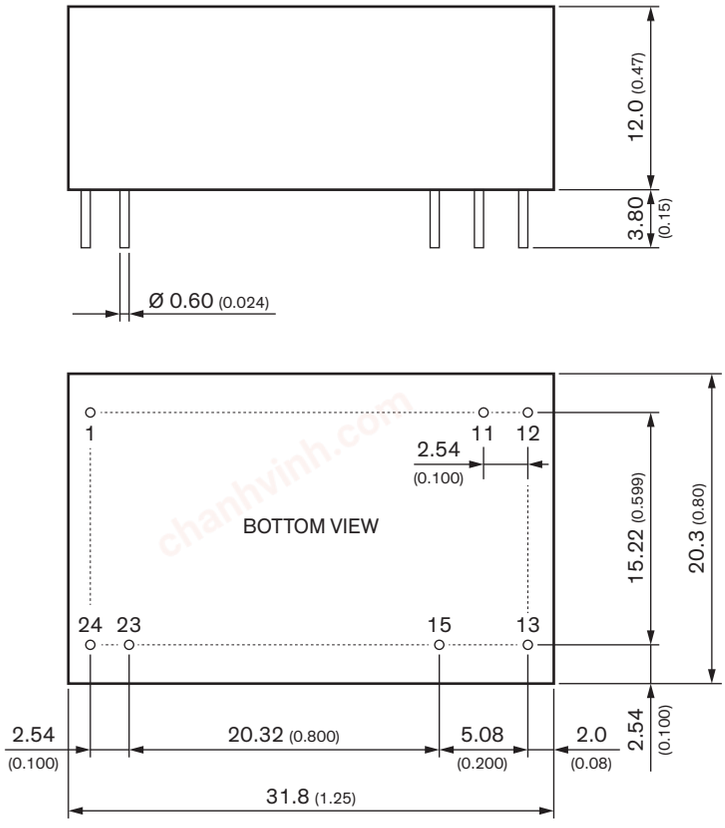
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Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf
		REACH SVHC list compliant
		REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf
		Exemptions: 7(a)
		(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	9b91c601-6307-4a85-aec7-1c0d10760441

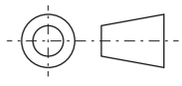
Additional Information

Supporting Documents	www.tracopower.com/overview/tri10
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf
Service Portal	www.tracoserviceportal.com

Outline Dimensions



Dimensions in mm (inch)
Tolerances: X.X ±0.5 (X.XX ±0.02)
X.XX ±0.25 (X.XXX ±0.010)
Pin Ø 0.6 ±0.05 (0.02 ±0.002)



Pinout

Pin	Single Output	Dual Output
1	+Vin (Vcc)	+Vin (Vcc)
11	No pin	Common
12	–Vout	No pin
13	+Vout	–Vout
15	No pin	+Vout
23	–Vin (GND)	–Vin (GND)
24	–Vin (GND)	–Vin (GND)

Avoid routing PCB traces under the converter.

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