

- 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



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 typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
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 %

### Input Specifications

Input Current	- At no load	12 Vin models: <b>12 mA typ.</b> 24 Vin models: <b>8 mA typ.</b> 48 Vin models: <b>6 mA typ.</b>
	- At full load	12 Vin models: <b>960 mA typ.</b> 24 Vin models: <b>480 mA typ.</b> 48 Vin models: <b>240 mA typ.</b>
Surge Voltage		12 Vin models: <b>25 VDC max.</b> (1 s max.) 24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Under Voltage Lockout		12 Vin models: <b>7 VDC min. / 8 VDC typ.</b> 24 Vin models: <b>15 VDC min. / 16 VDC typ.</b> 48 Vin models: <b>31 VDC min. / 33 VDC typ.</b>
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		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.5% max.</b> dual output models: <b>0.5% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>0.5% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: <b>2% max.</b>
	- Cross Regulation (25% / 100% asym. load)	dual output models: <b>5% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>50 mVp-p typ.</b> (w/ 10 µF MLCC) <b>70 mVp-p max.</b> (w/ 10 µF MLCC)
Capacitive Load	- single output	3.3 Vout models: <b>4'700 µF max.</b> 5.1 Vout models: <b>3'300 µF max.</b> 12 Vout models: <b>560 µF max.</b> 15 Vout models: <b>360 µF max.</b> 24 Vout models: <b>140 µF max.</b>
	- dual output	12 / -12 Vout models: <b>280 / 280 µF max.</b> 15 / -15 Vout models: <b>180 / 180 µF max.</b>
Minimum Load		Not required
Start-up Time		<b>30 ms typ. / 60 ms max.</b>
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		<b>190% max.</b> of Iout max. <b>150% typ.</b> of Iout max.
Overvoltage Protection		<b>125% typ.</b> of Vout nom.
Transient Response	- Response Deviation	<b>5% max.</b> (75% to 100% Load Step)
	- Response Time	<b>300 µs typ.</b> (75% to 100% Load Step)

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/tri10">www.tracopower.com/overview/tri10</a>
Pollution Degree		PD 2
Over Voltage Category		OVC II

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

## EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC Part 15 class A (internal filter)
	- Radiated Emissions	EN 55032 class A (internal filter) FCC Part 15 class A (internal filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/tri10">www.tracopower.com/overview/tri10</a>
EMS Immunity	- 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
	- Conducted RF Disturbances	Ext. input component: KY 1 µF / 100 V EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	Continuous: EN 61000-4-8, 100 A/m, perf. criteria A

## General Specifications

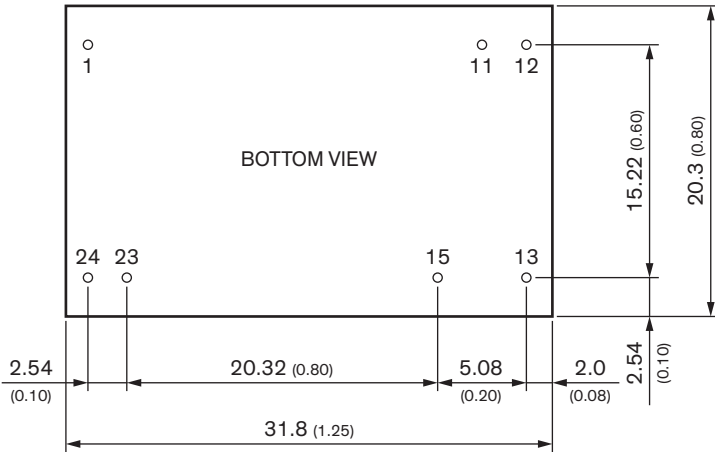
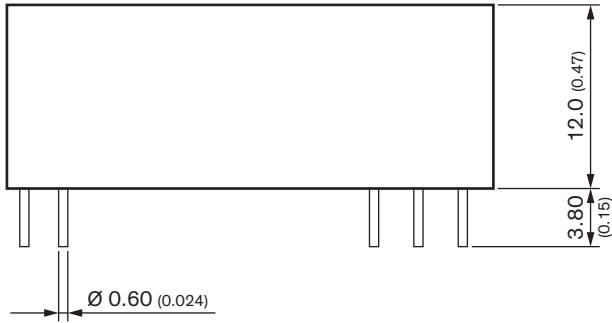
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +85°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-50°C to +125°C
Power Derating	- High Temperature	See application note: <a href="http://www.tracopower.com/overview/tri10">www.tracopower.com/overview/tri10</a>
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)
Housing Material		Plastic (UL 94 V-0 rated)
Pin Material		Copper (C6804)
Pin Foundation Plating		Nickel (2 - 4 µm)
Pin Surface Plating		Tin (3 - 5 µm), matte
Soldering Profile		Wave Soldering
		260°C / 10 s max.
Connection Type		THD (Through-Hole Device)
Weight		16 g
Environmental Compliance	- Reach	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a>
	- RoHS	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a>

## Supporting Documents

Overview Link (for additional Documents)	<a href="http://www.tracopower.com/overview/tri10">www.tracopower.com/overview/tri10</a>
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**Outline Dimensions**



Dimensions in mm (inch)  
 Tolerances  $\pm 0.5$  ( $\pm 0.02$ )  
 Pin  $\varnothing 0.5 \pm 0.05$  ( $0.02 \pm 0.002$ )

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)