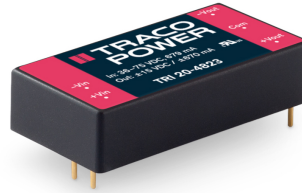


- Reinforced I/O-isolation 4200 VAC rated for 1000 VAC working voltage
- Ultra-high isolation peak voltage 8000 VDC (1s)
- Common Mode Transient Immunity (dv/dt) 15 kV/μs
- Operating temperature range -40 to +76°C
- Low no-load power consumption 240 – 480 mW
- Internal EN 55032 class A filter
- High efficiency up to 90%
- 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 20 is a high isolation, regulated 20 Watt DC/DC converter series which comes in a compact 2"x1" package. The core characteristic of the TRI 20 series is a sophisticated reinforced isolation system which is able to withstand high test voltages (8000 VDC for 1s and 4200 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 90% allow safe operation from -40°C to +55°C without derating and up to +76°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 20 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 20-1211	9 - 18 VDC (12 VDC nom.)	5.1 VDC	4'000 mA			85 %
TRI 20-1212		12 VDC	1'670 mA			88 %
TRI 20-1213		15 VDC	1'333 mA			88 %
TRI 20-1215		24 VDC	840 mA			89 %
TRI 20-1222		+12 VDC	840 mA	-12 VDC	840 mA	89 %
TRI 20-1223		+15 VDC	670 mA	-15 VDC	670 mA	89 %
TRI 20-2411	18 - 36 VDC (24 VDC nom.)	5.1 VDC	4'000 mA			87 %
TRI 20-2412		12 VDC	1'670 mA			88 %
TRI 20-2413		15 VDC	1'333 mA			89 %
TRI 20-2415		24 VDC	840 mA			90 %
TRI 20-2422		+12 VDC	840 mA	-12 VDC	840 mA	90 %
TRI 20-2423		+15 VDC	670 mA	-15 VDC	670 mA	90 %
TRI 20-4811	36 - 75 VDC (48 VDC nom.)	5.1 VDC	4'000 mA			87 %
TRI 20-4812		12 VDC	1'670 mA			88 %
TRI 20-4813		15 VDC	1'333 mA			90 %
TRI 20-4815		24 VDC	840 mA			89 %
TRI 20-4822		+12 VDC	840 mA	-12 VDC	840 mA	89 %
TRI 20-4823		+15 VDC	670 mA	-15 VDC	670 mA	90 %

### Input Specifications

Input Current	- At no load	12 Vin models: <b>20 mA typ.</b> 24 Vin models: <b>15 mA typ.</b> 48 Vin models: <b>10 mA typ.</b>
	- At full load	12 Vin models: <b>1'910 mA typ.</b> 24 Vin models: <b>945 mA typ.</b> 48 Vin models: <b>475 mA typ.</b>
Surge Voltage		12 Vin models: <b>25 VDC max.</b> (100 ms max.) 24 Vin models: <b>50 VDC max.</b> (100 ms max.) 48 Vin models: <b>100 VDC max.</b> (100 ms max.)
Under Voltage Lockout		12 Vin models: <b>7.5 VDC typ.</b> 24 Vin models: <b>15 VDC typ.</b> 48 Vin models: <b>33 VDC typ.</b>
Reflected Ripple Current		12 Vin models: <b>100 mA<sub>p-p</sub> typ.</b> 24 Vin models: <b>50 mA<sub>p-p</sub> typ.</b> 48 Vin models: <b>30 mA<sub>p-p</sub> typ.</b>
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Pi-Type</b>

### Output Specifications

Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (V <sub>min</sub> - V <sub>max</sub> )	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>
Ripple and Noise (20 MHz Bandwidth)	- single output	5.1 V <sub>out</sub> models: <b>50 mV<sub>p-p</sub> typ.</b> (w/ 4.7 µF MLCC) 12 V <sub>out</sub> models: <b>100 mV<sub>p-p</sub> typ.</b> (w/ 4.7 µF MLCC) 15 V <sub>out</sub> models: <b>100 mV<sub>p-p</sub> typ.</b> (w/ 4.7 µF MLCC) 24 V <sub>out</sub> models: <b>150 mV<sub>p-p</sub> typ.</b> (w/ 4.7 µF MLCC)
	- dual output	12 / -12 V <sub>out</sub> models: <b>100 / 100 mV<sub>p-p</sub> typ.</b> (w/ 4.7 µF MLCC) 15 / -15 V <sub>out</sub> models: <b>100 / 100 mV<sub>p-p</sub> typ.</b> (w/ 4.7 µF MLCC)
Capacitive Load	- single output	5.1 V <sub>out</sub> models: <b>6'800 µF max.</b> 12 V <sub>out</sub> models: <b>1'160 µF max.</b> 15 V <sub>out</sub> models: <b>750 µF max.</b> 24 V <sub>out</sub> models: <b>295 µF max.</b>
	- dual output	12 / -12 V <sub>out</sub> models: <b>590 / 590 µF max.</b> 15 / -15 V <sub>out</sub> models: <b>380 / 380 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>30 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>150% typ. of I<sub>out</sub> max.</b>
Overvoltage Protection		<b>120% typ. of V<sub>out</sub> nom.</b>
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	<b>EN 62368-1</b> <b>IEC 62368-1</b> <b>UL 62368-1</b>
	- Certification Documents	<a href="http://www.tracopower.com/overview/tri20">www.tracopower.com/overview/tri20</a>

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

Pollution Degree	PD 2
Over Voltage Category	OVC II

### 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/tri20">www.tracopower.com/overview/tri20</a>
EMS Immunity	- Electrostatic Discharge	Air: EN 55024 (IT Equipment) EN 61000-4-2, ±15 kV, perf. criteria A
	- RF Electromagnetic Field	Contact: EN 61000-4-2, ±8 kV, perf. criteria A 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
	- Conducted RF Disturbances	Ext. input component: 12 & 24 Vin models: KY 560 µF // V15P8-M3 48 Vin models: KY 560 µF // V15P10
	- PF Magnetic Field	Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A 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 +76°C
	- Case Temperature	+95°C max.
	- Storage Temperature	-50°C to +125°C
Power Derating	- High Temperature	Depending on model
		See application note: <a href="http://www.tracopower.com/overview/tri20">www.tracopower.com/overview/tri20</a>
Cooling System		Natural convection (20 LFM)
Altitude During Operation		4'000 m max.
Switching Frequency		285 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		1'000 VAC
Isolation Test Voltage	- Input to Output, 60 s	4'200 VAC
	- Input to Output, 1 s	8'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	10'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	80 pF max.
Common Mode Transient Immunity		15 kV/µs min.
Reliability	- Calculated MTBF	1'087'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Allowed (hermetical product)
		See Cleaning Guideline: <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Housing Material		Non-conductive Plastic (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 (5 - 7 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		2" x 1"
Soldering Profile		Wave Soldering
		260°C / 10 s max.
Weight		30 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

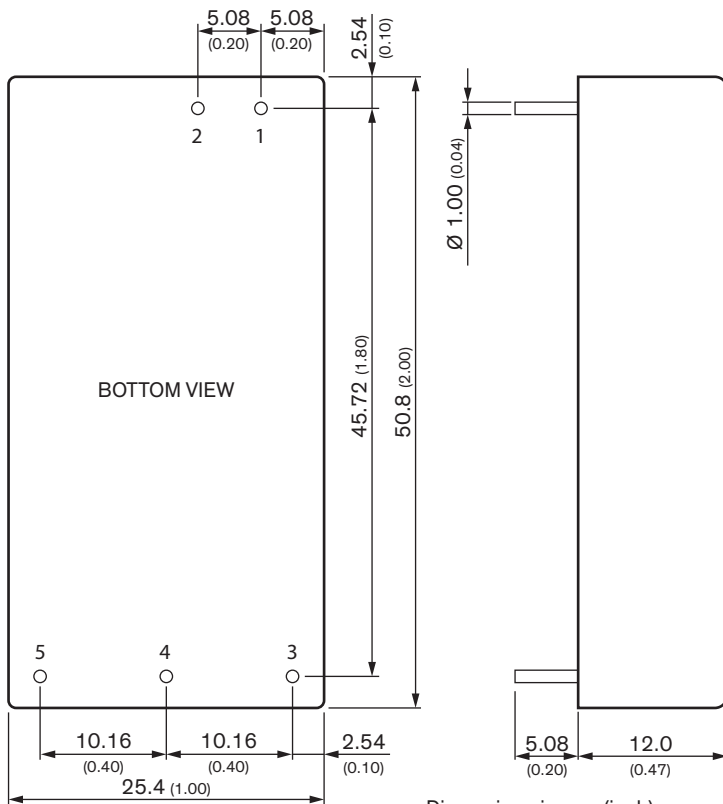
(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).  
The SCIP number is provided on request.)

### Supporting Documents

[Overview Link](#) (for additional Documents)

[www.tracopower.com/overview/tri20](http://www.tracopower.com/overview/tri20)

### 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)
2	-Vin (GND)	-Vin (GND)
3	+Vout	+Vout
4	No pin	Common
5	-Vout	-Vout