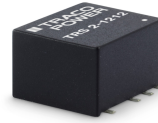


- **Most compact 2 Watt SMD DC/DC converter: 11.9 mm x 11.3 mm x 8 mm (0.47 x 0.44 x 0.31 inch)**
- **1600 VDC I/O isolation (functional)**
- **High efficiency for low thermal loss**
- **Operating temp. range -40°C to +90°C**
- **Designed to meet UL 62368-1**
- **Protection against short circuit**
- **3-year product warranty**



TRS 2 Series is a new series with the design purpose to improve the prevalent 2 Watt SMD DC/DC converters in terms of size, cost, efficiency and performance. The main intended uses for the TRS 2 Series are IT applications, industrial control systems and measurement equipment. With the reduction of thermal loss, the operating temperature range can be expanded from -40°C to +90°C. The converters are fully regulated over 0 - 100% load (no minimum load). The low input range is extended from 4.5 to 13.2 VDC (to include 12V battery applications) while models are also available with the standard 2:1 input ranges of 9-18, 18-36 and 36-75 VDC. The functional I/O-isolation system is designed to meet IEC/EN 62368-1 with a test voltage (60 s) of 1600 VDC.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
TRS 2-0910	4.5 - 13.2 VDC (9 VDC nom.)	3.3 VDC	500 mA			77 %
TRS 2-0911		5 VDC	400 mA			80 %
TRS 2-0919		9 VDC	222 mA			80 %
TRS 2-0912		12 VDC	167 mA			83 %
TRS 2-0913		15 VDC	134 mA			82 %
TRS 2-0915		24 VDC	83 mA			82 %
TRS 2-0921		+5 VDC	200 mA	-5 VDC	200 mA	78 %
TRS 2-0922		+12 VDC	83 mA	-12 VDC	83 mA	82 %
TRS 2-0923		+15 VDC	67 mA	-15 VDC	67 mA	80 %
TRS 2-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	500 mA			77 %
TRS 2-1211		5 VDC	400 mA			80 %
TRS 2-1219		9 VDC	222 mA			80 %
TRS 2-1212		12 VDC	167 mA			84 %
TRS 2-1213		15 VDC	134 mA			83 %
TRS 2-1215		24 VDC	83 mA			83 %
TRS 2-1221		+5 VDC	200 mA	-5 VDC	200 mA	79 %
TRS 2-1222		+12 VDC	83 mA	-12 VDC	83 mA	83 %
TRS 2-1223		+15 VDC	67 mA	-15 VDC	67 mA	81 %
TRS 2-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	500 mA			77 %
TRS 2-2411		5 VDC	400 mA			78 %
TRS 2-2419		9 VDC	222 mA			80 %
TRS 2-2412		12 VDC	167 mA			84 %
TRS 2-2413		15 VDC	134 mA			84 %
TRS 2-2415		24 VDC	83 mA			82 %
TRS 2-2421		+5 VDC	200 mA	-5 VDC	200 mA	80 %
TRS 2-2422		+12 VDC	83 mA	-12 VDC	83 mA	83 %
TRS 2-2423		+15 VDC	67 mA	-15 VDC	67 mA	82 %
TRS 2-4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC	500 mA			76 %
TRS 2-4811		5 VDC	400 mA			79 %
TRS 2-4819		9 VDC	222 mA			80 %
TRS 2-4812		12 VDC	167 mA			83 %
TRS 2-4813		15 VDC	134 mA			83 %
TRS 2-4815		24 VDC	83 mA			82 %
TRS 2-4821		+5 VDC	200 mA	-5 VDC	200 mA	78 %
TRS 2-4822		+12 VDC	83 mA	-12 VDC	83 mA	82 %
TRS 2-4823		+15 VDC	67 mA	-15 VDC	67 mA	80 %

### Input Specifications

Input Current	- At no load	9 Vin models: <b>60 mA typ.</b> 12 Vin models: <b>30 mA typ.</b> 24 Vin models: <b>15 mA typ.</b> 48 Vin models: <b>8 mA typ.</b>
Surge Voltage		9 Vin models: <b>15 VDC max.</b> (1 s max.) 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.)
Recommended Input Fuse		9 Vin models: <b>1'000 mA</b> (slow blow) 12 Vin models: <b>500 mA</b> (slow blow) 24 Vin models: <b>315 mA</b> (slow blow) 48 Vin models: <b>160 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>

### Output Specifications

Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.2% max.</b> dual output models: <b>0.2% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- 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>
Capacitive Load	- single output	3.3 Vout models: <b>3'300 µF max.</b> 5 Vout models: <b>1'680 µF max.</b> 9 Vout models: <b>1'000 µF max.</b> 12 Vout models: <b>820 µF max.</b> 15 Vout models: <b>680 µF max.</b> 24 Vout models: <b>220 µF max.</b>
	- dual output	5 / -5 Vout models: <b>1'000 / 1'000 µF max.</b> 12 / -12 Vout models: <b>470 / 470 µF max.</b> 15 / -15 Vout models: <b>330 / 330 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>5 ms typ. / 15 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>190% typ. of Iout max.</b>
Transient Response	- Response Deviation	<b>3% typ.</b> (25% Load Step)
	- Response Time	<b>500 µs typ.</b> (25% Load Step)

### Safety Specifications

Safety Standards	- IT / Multimedia Equipment	<b>Designed for EN 62368-1 (no certification)</b>
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### EMC Specifications

EMI Emissions	- Conducted Emissions	<b>EN 55032 class A</b> (with external filter) <b>EN 55032 class B</b> (with external filter)
	- Radiated Emissions	<b>EN 55032 class A</b> (with external filter) <b>EN 55032 class B</b> (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/trs2">www.tracopower.com/overview/trs2</a>

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

EMS Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, ±8 kV, perf. criteria A
	- RF Electromagnetic Field	Contact: EN 61000-4-2, ±6 kV, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-3, 10 V/m, perf. criteria A
		EN 61000-4-4, ±2 kV, perf. criteria A
		EN 61000-4-5, ±1 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: 220 µF, 100 V
	- PF Magnetic Field	EN 61000-4-6, 10 Vrms, perf. criteria A
		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

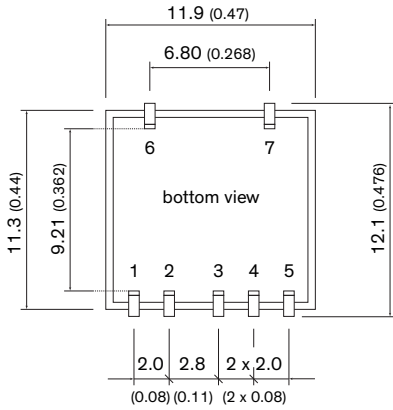
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +90°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	3.33 %/K above 75°C
		See application note: <a href="http://www.tracopower.com/overview/trs2">www.tracopower.com/overview/trs2</a>
Cooling System		Natural convection (20 LFM)
Switching Frequency		100 kHz min. (PFM)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	1'600 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	75 pF max.
Reliability	- Calculated MTBF	5'735'000 h (MIL-HDBK-217F, ground benign)
Moisture Sensitivity (MSL)		Level 2 (J-STD-033C)
Washing Process		Allowed (hermetical product)
	See Cleaning Guideline:	<a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
Environment	- Vibration	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (0.3 - 0.9 µm)
Pin Surface Plating		Tin (5 - 6 µm), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Footprint Type		SMD10
Soldering Profile		Reflow Soldering (J-STD-020E)
Weight		2.1 g
Environmental Compliance	- REACH Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a, 7c-I (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)	<a href="http://www.tracopower.com/overview/trs2">www.tracopower.com/overview/trs2</a>
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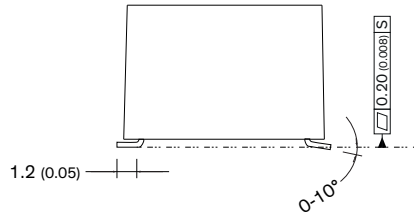
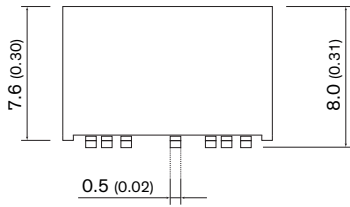
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

### Outline Dimensions

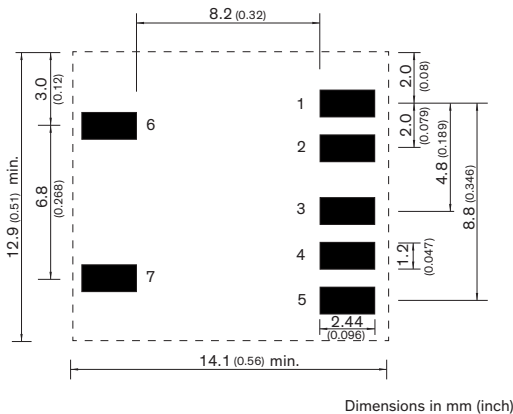


Pinout		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	+Vin (VCC)	+Vin (VCC)
3	+Vout	+Vout
4	No Pin	Common
5	-Vout	-Vout
6	NC	NC
7	NC	NC

NC: No connection



### Recommended Solder Pad Layout



Dimensions in mm (inch)