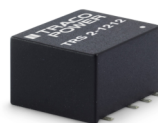


DC/DC Converter

TRS 2 Series, 2 Watt

- **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 IEC/EN/UL 62368-1 (not certified)**
- **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/UL 62368-1 (not certified) with a test voltage (60 s) of 1600 VDC.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
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: 60 mA typ. 12 Vin models: 30 mA typ. 24 Vin models: 15 mA typ. 48 Vin models: 8 mA typ.
Surge Voltage		9 Vin models: 15 VDC max. (1 s max.) 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.)
Recommended Input Fuse		9 Vin models: 1'000 mA (slow blow) 12 Vin models: 500 mA (slow blow) 24 Vin models: 315 mA (slow blow) 48 Vin models: 160 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		±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models: 0.2% max. dual output models: 0.2% max.
	- Load Variation (0 - 100%)	single output models: 1% max. dual output models: 1% max. (Output 1) 1% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: 5% max.
Ripple and Noise	- 20 MHz Bandwidth	50 mVp-p typ.
Capacitive Load	- single output	3.3 Vout models: 3'300 µF max. 5 Vout models: 1'680 µF max. 9 Vout models: 1'000 µF max. 12 Vout models: 820 µF max. 15 Vout models: 680 µF max. 24 Vout models: 220 µF max.
	- dual output	5 / -5 Vout models: 1'000 / 1'000 µF max. 12 / -12 Vout models: 470 / 470 µF max. 15 / -15 Vout models: 330 / 330 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		5 ms typ. / 15 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		190% typ. of Iout max.
Transient Response	- Response Deviation	3% typ. (25% Load Step)
	- Response Time	500 µs typ. (25% Load Step)

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

Safety Specifications

Standards	- IT / Multimedia Equipment	Designed for IEC/EN/UL 62368-1 (not certified)
-----------	-----------------------------	--

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55032 class A (with external filter)
	- Radiated Emissions	EN 55032 class B (with external filter)
External filter proposal:		www.tracopower.com/overview/trs2
EMS (Immunity)	- Electrostatic Discharge	Air: EN 61000-4-2, ± 8 kV, perf. criteria A
		Contact: EN 61000-4-2, ± 6 kV, perf. criteria A
		EN 61000-4-3, 10 V/m, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-4, ± 2 kV, perf. criteria A
		EN 61000-4-5, ± 1 kV, perf. criteria A
		Ext. input component: 220 μ F, 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
		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: www.tracopower.com/overview/trs2
Cooling System		Natural convection (20 LFM)
Regulator Topology		RCC Converter
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 M Ω 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		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
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 μ m)
Pin Surface Plating		Tin (5 - 6 μ m), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		SMD (Surface-Mount Device)
Footprint Type		SMD10
Soldering Profile		Lead-Free Reflow Soldering (acc. J-STD-020E)
		245°C max. (Tp)
		30 s max. (tp, at Tp - 5°C)
		90 s max. (tL, time above 217°C)
		See application note: www.tracopower.com/info/reflow-soldering.pdf
Weight		2.1 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

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

www.tracopower.com/info/rohs-declaration.pdf

Exemptions: 7(a), 7(c)-I

(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)

- SCIP Reference Number

2a541389-cea9-409c-a48d-a5fd8729b4da

Additional Information

Supporting Documents

www.tracopower.com/overview/trs2

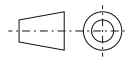
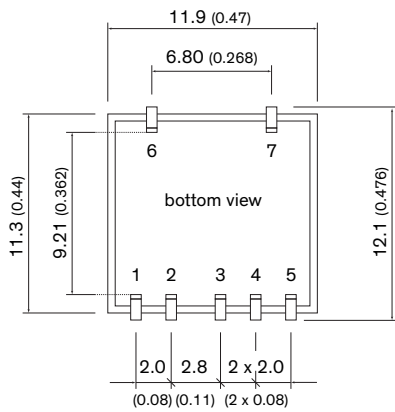
Frequently Asked Questions

www.tracopower.com/glossary-faq

Glossary

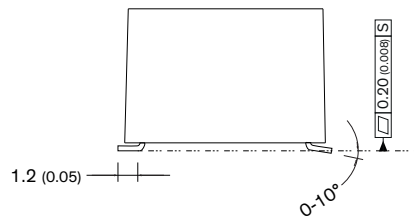
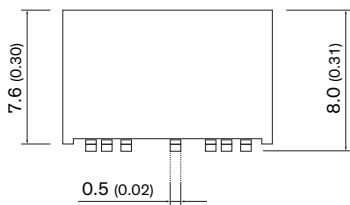
www.tracopower.com/info/glossary.pdf

Outline Dimensions

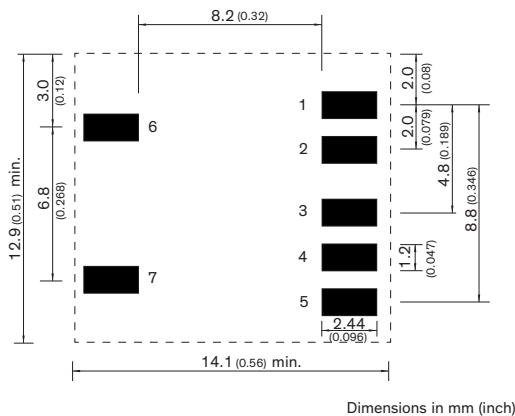


Pinout		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	+Vin (VCC)	+Vin (VCC)
3	+Vout	+Vout
4	No pin	Common
5	-Vout	-Vout
6	NC	NC
7	NC	NC

NC: Not connected



Recommended Solder Pad Layout



Dimensions in mm (inch)