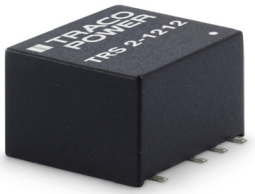
DC/DC Converter

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 × 0.44 × 0.31 inch)**
- **Cost-efficient design**
- **1600 VDC I/O isolation (functional)**
- **High efficiency for low thermal loss**
- **Operating temperature range -40°C to +90°C**
- **Designed to met UL 62368-1**
- **No minimum load required**
- **Protection against short circuit**
- **3 years 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 also 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 is required). The low input range is extended from 4.5 to 13.2 VDC (to include 12V battery powered 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	Output voltage	Output current max.	Efficiency typ.
TRS 2-0910	**4.5 – 13.2 VDC** (9 VDC nominal)	3.3 VDC	500 mA	77 %
TRS 2-0911		5.0 VDC	400 mA	80 %
TRS 2-0919		9.0 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		±5.0 VDC	±200 mA	78 %
TRS 2-0922		±12 VDC	±83 mA	82 %
TRS 2-0923		±15 VDC	±67 mA	80 %
TRS 2-1210	**9 – 18 VDC** (12 VDC nominal)	3.3 VDC	500 mA	77 %
TRS 2-1211		5.0 VDC	400 mA	80 %
TRS 2-1219		9.0 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		±5.0 VDC	±200 mA	79 %
TRS 2-1222		±12 VDC	±83 mA	83 %
TRS 2-1223		±15 VDC	±67 mA	81 %
TRS 2-2410	**18 – 36 VDC** (24 VDC nominal)	3.3 VDC	500 mA	77 %
TRS 2-2411		5.0 VDC	400 mA	78 %
TRS 2-2419		9.0 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		±5.0 VDC	±200 mA	80 %
TRS 2-2422		±12 VDC	±83 mA	83 %
TRS 2-2423		±15 VDC	±67 mA	82 %
TRS 2-4810	**36 – 75 VDC** (48 VDC nominal)	3.3 VDC	500 mA	76 %
TRS 2-4811		5.0 VDC	400 mA	79 %
TRS 2-4819		9.0 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		±5.0 VDC	±200 mA	78 %
TRS 2-4822		±12 VDC	±83 mA	82 %
TRS 2-4823		±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 (1 s max.)		9 Vin models:	15 V max.
		12 Vin models:	25 V max.
		24 Vin models:	50 V max.
		48 Vin models:	100 V max.
Input filter			internal capacitor
Recommended input fuse		9 Vin models:	1.0 A (slow blow type)
		12 Vin models:	0.5 A (slow blow type)
		24 Vin models:	0.315 A (slow blow type)
		48 Vin models:	0.16 A (slow blow type)
EMC emissions			EN 55032 class A or B with external components
EMC immunity	– ESD (electrostatic discharge)		EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A
	– Radiated immunity		EN 61000-4-3, 10 V/m, perf. criteria A
	– Fast transient / surge		EN 61000-4-4, ±2 kV, perf. criteria A
	(with external input capacitor)		EN 61000-4-5, ±1 kV perf. criteria A
		all models:	Nippon chemi-con KY 220µF/100V
	– Conducted immunity		EN 61000-4-6, 10 Vrms, perf. criteria A
	– Magnetic field immunity		EN 61000-4-8
			100 A/m, continuous, perf. criteria A
			1000 A/m, 1 sec., perf. criteria A

Output Specifications

Voltage set accuracy			±1 % max.
Regulation	– Input variation (Vin min. to Vin max.)		0.2 % max.
	– Load variation (0 to 100 %)	single output:	1 % max.
		dual output:	1 % max. (balanced load)
	– Load variation (10 to 90 %)	single output:	0.5 % max.
		dual output:	0.8 % max. (balanced load)
	– Cross regulation	dual output:	5 % max. (asymmetrical load 25 % / 100 %)
Temperature coefficient			±0.02 %/K max.
Ripple and noise (20 MHz Bandwidth)			50 mVp-p typ.
Short circuit protection			continuous, automatic recovery
Start up time	– Constant resistive load		5 ms typ. / 15 ms max.
Transient response time (25% load step change)			500 µs typ.
Capacitive load	– Single output	3.3 Vout models:	3300 µF max.
		5.0 Vout models:	1680 µF max.
		9.0 Vout models:	1000 µF max.
		12 Vout models:	820 µF max.
		15 Vout models:	680 µF max.
		24 Vout models:	220 µF max.
	– Dual output	±5.0 Vout models:	1000 µF max. (each output)
		±12 Vout models:	470 µF max. (each output)
		±15 Vout models:	330 µF max. (each output)

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

General Specifications

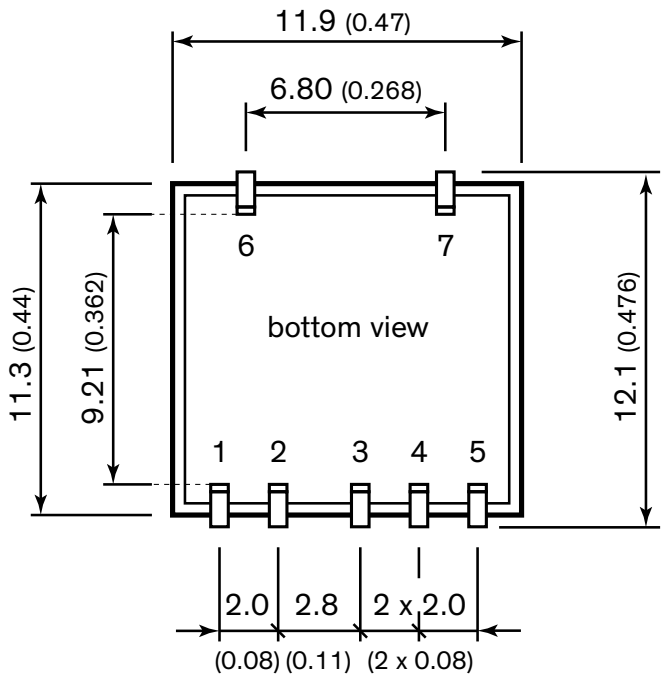
Temperature ranges	– Operating (natural convection: 20 LFM, 0.1 m/s) – Case temperature – Storage temperature	–40°C to +90°C +105°C max. –55°C to +125°C
Derating		3.3 %/K above 75°C
Humidity (non condensing)		5 – 95 % rel H.
Moisture sensitivity level (MSL)		IPC J-STD-033C Level 2
Isolation voltage	– I/O isolation voltage (60 s)	1‘600 VDC
Isolation resistance (input/output)		1 GOhm min.
Isolation capacitance (input/output)		75 pF max.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)		5‘735‘000 h
Switching frequency		100 kHz min. (pulse frequency modulation)
Shock, vibration and thermal shock		MIL-STD-810F
Safety standards	– Designed to meet (no certification)	IEC/EN/UL 62368-1, UL 60950-1
Environmental compliance	– Reach – RoHS	RoHS directive 2011/65/EU

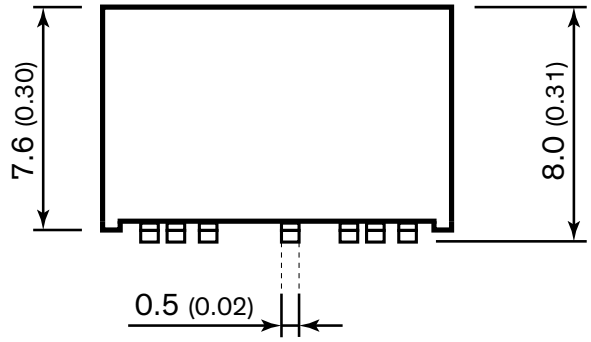
Physical Specifications

Casing material	non-conducting black plastic
Potting material	Silicone (UL 94V-0 rated)
Pin material	Phosphor bronze
Package weight	2.1 g (0.07 oz)
Lead-free reflow solder process	IPC J-STD-020E

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

Outline Dimensions





Pin-Out		
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

Dimensions in [mm], () = Inch

Tolerances: x.xx	±0.5 (±0.02)
Pin pitch tolerances	±0.25 (±0.01)
Pin dimension tolerance	±0.1 (±0.004)