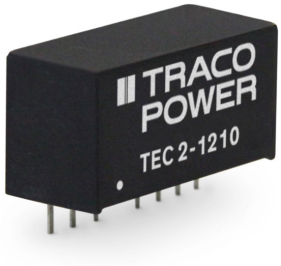
TRACO POWER

DC/DC Converter

TEC 2 Series, 2 Watt

- **Compact SIP-8 package**
- **I/O-isolation voltage 1‘600 VDC**
- **Fully regulated outputs**
- **Operating temperature range −40°C to +95°C**
- **Short circuit protection**
- **Remote On/Off**
- **3-year product warranty**
- **Designed to meet UL 62368-1 (UL 60950-1)**



TEC 2 is a new series with the design purpose to improve the prevalent 2 Watt SIP-8 DC/DC converters in terms of cost, efficiency and performance. The latest technology and components enable an increase in efficiency by more than 20%. With the reduction of thermal loss, the operating temperature range can be expanded from -40°C to +95°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 while models are also available with the standard 2:1 input ranges of 9-18, 18-36 and 36-75 VDC (see TEC 2WI series for 4:1 input ranges). 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.
TEC 2-0910	**4.5 – 13.2 VDC** (9 VDC nominal)	3.3 VDC	500 mA	78 %
TEC 2-0911		5.0 VDC	400 mA	81 %
TEC 2-0919		9.0 VDC	222 mA	84 %
TEC 2-0912		12 VDC	167 mA	84 %
TEC 2-0913		15 VDC	134 mA	84 %
TEC 2-0915		24 VDC	83 mA	85 %
TEC 2-0921		±5.0 VDC	±200 mA	81 %
TEC 2-0922		±12 VDC	±83 mA	85 %
TEC 2-0923		±15 VDC	±67 mA	84 %
TEC 2-1210	**9 – 18 VDC** (12 VDC nominal)	3.3 VDC	500 mA	78 %
TEC 2-1211		5.0 VDC	400 mA	82 %
TEC 2-1219		9.0 VDC	222 mA	84 %
TEC 2-1212		12 VDC	167 mA	85 %
TEC 2-1213		15 VDC	134 mA	85 %
TEC 2-1215		24 VDC	83 mA	85 %
TEC 2-1221		±5.0 VDC	±200 mA	82 %
TEC 2-1222		±12 VDC	±83 mA	85 %
TEC 2-1223		±15 VDC	±67 mA	84 %
TEC 2-2410	**18 – 36 VDC** (24 VDC nominal)	3.3 VDC	500 mA	78 %
TEC 2-2411		5.0 VDC	400 mA	83 %
TEC 2-2419		9.0 VDC	222 mA	85 %
TEC 2-2412		12 VDC	167 mA	86 %
TEC 2-2413		15 VDC	134 mA	85 %
TEC 2-2415		24 VDC	83 mA	85 %
TEC 2-2421		±5.0 VDC	±200 mA	83 %
TEC 2-2422		±12 VDC	±83 mA	85 %
TEC 2-2423		±15 VDC	±67 mA	86 %
TEC 2-4810	**36 – 75 VDC** (48 VDC nominal)	3.3 VDC	500 mA	76 %
TEC 2-4811		5.0 VDC	400 mA	80 %
TEC 2-4819		9.0 VDC	222 mA	82 %
TEC 2-4812		12 VDC	167 mA	84 %
TEC 2-4813		15 VDC	134 mA	85 %
TEC 2-4815		24 VDC	83 mA	85 %
TEC 2-4821		±5.0 VDC	±200 mA	80 %
TEC 2-4822		±12 VDC	±83 mA	85 %
TEC 2-4823		±15 VDC	±67 mA	83 %

Input Specifications

Input current at no load		9 Vin models:	45 mA typ.
		12 Vin models:	25 mA typ.
		24 Vin models:	10 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.
Start up voltage		9 Vin models:	4.5 V (or lower)
		12 Vin models:	9 V (or lower)
		24 Vin models:	18 V (or lower)
		48 Vin models:	36 V (or lower)
Under voltage shut down		9 Vin models:	2 - 4 V
		12 Vin models:	6 - 8 V
		24 Vin models:	13 - 17 V
		48 Vin models:	29 - 35 V
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)
Conducted noise			EN 55032 class A or B with external components
	– Application note for filter class A/B proposal		www.tracopower.com/overview/tec2
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 – 100 %)	single output:	1 % max.
		dual output:	1 % max. (balanced load)
	– Load variation (10 – 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)			75 mVp-p typ.
Current limitation			140 - 240 % of Iout max.
Short circuit protection			continuous, automatic recovery
Start up time	– Power ON		10 ms typ. / 20 ms max.
(constant resistive load)	– Remote ON		10 ms typ. / 20 ms max.
Transient response time (25% load step change)			500 µs typ.

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

Output Specifications (continued)

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)

General Specifications

Temperature ranges	– Operating (natural convection: 20 LFM, 0.1 m/s)	–40°C to +95°C
	– Case temperature	+105°C max.
	– Storage temperature	–55°C to +125°C
Derating		5.9 %/K above 88°C
Humidity (non condensing)		5 – 95 % rel H max.
Isolation voltage	– I/O isolation voltage (60 s)	1‘600 VDC
Isolation resistance (input/output)		1 GOhm min.
Isolation capacitance (input/output)		50 pF max.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)		6‘621‘000 h
Switching frequency		100 kHz min. (pulse frequency modulation)
Shock, vibration and thermal shock		MIL-STD-810F
Remote On/Off	– On:	open circuit or high impedance
	– Off:	2 – 4 mA current applied via 1kOhm resistor
	– Off idle current:	2.5 mA typ.
Safety standards	– Desinged to meet (no certification)	IEC/EN/UL 62368-1, UL 60950-1
Environmental compliance	– Reach	www.tracopower.com/products/reach-declaration.pdf
	– RoHS	RoHS directive 2011/65/EU

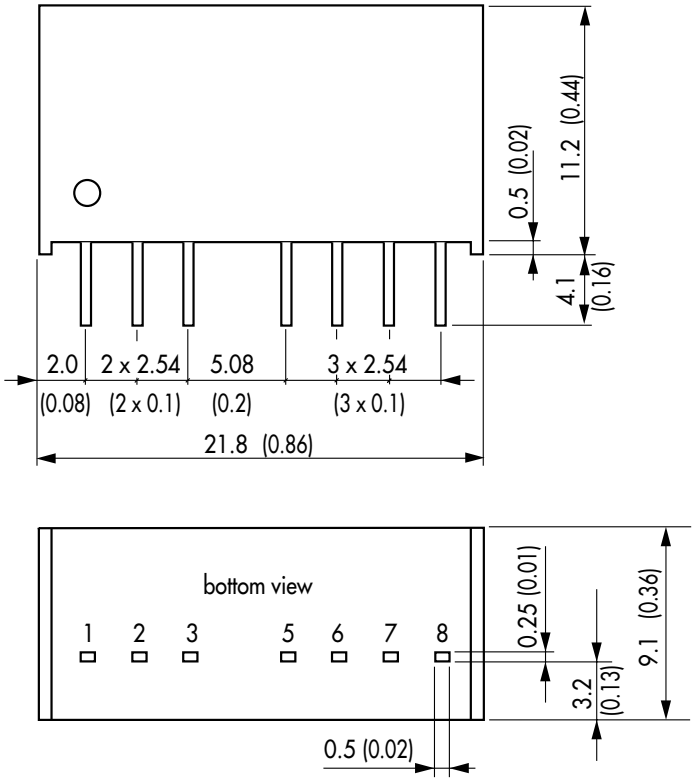
Physical Specifications

Casing material	non-conducting black plastic
Potting material	Silicone (UL 94V-0 rated)
Pin material	tinned copper
Package weight	4.5 g (0.16 oz)
Soldering profile	260°C / 10 s max. (wave soldering)

Supporting Documents: www.tracopower.com/overview/tec2

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	On/Off	On/Off
5	NC	NC
6	+Vout	+Vout
7	–Vout	Common
8	NC	–Vout

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)

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