



- 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

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 approved to IEC/EN 60950-1 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	82 %
TEC 2-0912		12 VDC	167 mA	83 %
TEC 2-0913		15 VDC	134 mA	83 %
TEC 2-0915		24 VDC	83 mA	85 %
TEC 2-0921		±5.0 VDC	±200 mA	80 %
TEC 2-0922		±12 VDC	±83 mA	85 %
TEC 2-0923		±15 VDC	±67 mA	82 %
TEC 2-1210	9 – 18 VDC (12 VDC nominal)	3.3 VDC	500 mA	78 %
TEC 2-1211		5.0 VDC	400 mA	81 %
TEC 2-1219		9.0 VDC	222 mA	82 %
TEC 2-1212		12 VDC	167 mA	86 %
TEC 2-1213		15 VDC	134 mA	84 %
TEC 2-1215		24 VDC	83 mA	84 %
TEC 2-1221		±5.0 VDC	±200 mA	81 %
TEC 2-1222		±12 VDC	±83 mA	84 %
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	82 %
TEC 2-2412		12 VDC	167 mA	86 %
TEC 2-2413		15 VDC	134 mA	84 %
TEC 2-2415		24 VDC	83 mA	84 %
TEC 2-2421		±5.0 VDC	±200 mA	81 %
TEC 2-2422		±12 VDC	±83 mA	84 %
TEC 2-2423		±15 VDC	±67 mA	85 %
TEC 2-4810	36 – 75 VDC (48 VDC nominal)	3.3 VDC	500 mA	77 %
TEC 2-4811		5.0 VDC	400 mA	80 %
TEC 2-4819		9.0 VDC	222 mA	83 %
TEC 2-4812		12 VDC	167 mA	83 %
TEC 2-4813		15 VDC	134 mA	83 %
TEC 2-4815		24 VDC	83 mA	85 %
TEC 2-4821		±5.0 VDC	±200 mA	81 %
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: 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.
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 <a href="http://www.tracopower.com/overview/tec2">www.tracopower.com/overview/tec2</a> – Application note for filter class A/B proposal
EMC immunity	EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A 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 all models: Nippon chemi-con KY 220µF/100V EN 61000-4-6, 10 Vrms, perf. criteria A EN 61000-4-8 100 A/m, continuous, perf. criteria A 1000 A/m, 1 sec., perf. criteria A – ESD (electrostatic discharge) – Radiated immunity – Fast transient / surge (with external input capacitor) – Conducted immunity – Magnetic field immunity

## 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 (constant resistive load)	– Power ON 10 ms typ. / 20 ms max. – 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: <b>3300 µF max.</b> 5.0 Vout models: <b>1680 µF max.</b> 9.0 Vout models: <b>1000 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	±5.0 Vout models: <b>1000 µF max. (each output)</b> ±12 Vout models: <b>470 µF max. (each output)</b> ±15 Vout models: <b>330 µF max. (each output)</b>

### General Specifications

Temperature ranges	– Operating (natural convection: 20 LFM, 0.1 m/s) – Case temperature – Storage temperature	–40°C to +95°C +105°C max. –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: – Off: – Off idle current:	open circuit or high impedance 2 – 4 mA current applied via 1kOhm resistor 2.5 mA typ.
Safety standards /approvals	– Certification documents	IEC/EN/UL 60950-1 <a href="http://www.tracopower.com/overview/tec2">www.tracopower.com/overview/tec2</a>
Environmental compliance	– Reach – RoHS	<a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a> RoHS directive 2011/65/EU

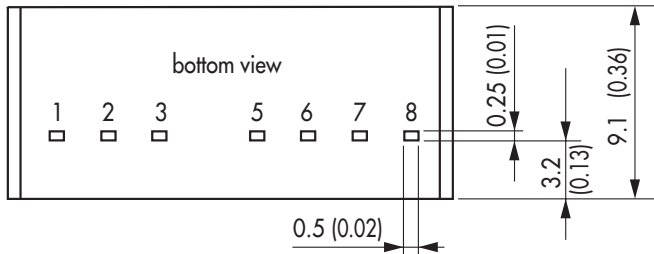
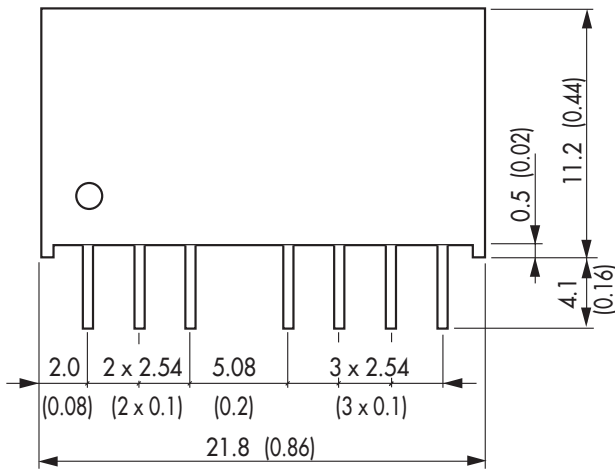
### Physical Specifications

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](http://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)