

- Compact SIP-8 package
- I/O-isolation voltage 1'600 VDC
- Fully regulated outputs
- Operating temp range -40°C to $+95^{\circ}\text{C}$
- Continuous short circuit protection
- Remote On/Off
- 3-year product warranty
- Designed to meet UL 62368-1



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 $+95^{\circ}\text{C}$. 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 (see TEC 2WI series for 4:1 input ranges). The functional isolation system is designed to meet EN 62368-1 with 1600 VDC test voltage.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
TEC 2-0910	4.5 - 13.2 VDC (9 VDC nom.)	3.3 VDC	500 mA			78 %
TEC 2-0911		5 VDC	400 mA			81 %
TEC 2-0919		9 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 VDC	200 mA	-5 VDC	200 mA	81 %
TEC 2-0922		+12 VDC	83 mA	-12 VDC	83 mA	85 %
TEC 2-0923		+15 VDC	67 mA	-15 VDC	67 mA	84 %
TEC 2-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	500 mA			78 %
TEC 2-1211		5 VDC	400 mA			82 %
TEC 2-1219		9 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 VDC	200 mA	-5 VDC	200 mA	82 %
TEC 2-1222		+12 VDC	83 mA	-12 VDC	83 mA	85 %
TEC 2-1223		+15 VDC	67 mA	-15 VDC	67 mA	84 %
TEC 2-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	500 mA			78 %
TEC 2-2411		5 VDC	400 mA			83 %
TEC 2-2419		9 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 VDC	200 mA	-5 VDC	200 mA	83 %
TEC 2-2422		+12 VDC	83 mA	-12 VDC	83 mA	85 %
TEC 2-2423		+15 VDC	67 mA	-15 VDC	67 mA	86 %
TEC 2-4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC	500 mA			76 %
TEC 2-4811		5 VDC	400 mA			80 %
TEC 2-4819		9 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 VDC	200 mA	-5 VDC	200 mA	80 %
TEC 2-4822		+12 VDC	83 mA	-12 VDC	83 mA	85 %
TEC 2-4823		+15 VDC	67 mA	-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		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.)
Under Voltage Lockout		9 Vin models: 2 VDC min. / 3 VDC typ. / 4 VDC max. 12 Vin models: 6 VDC min. / 7 VDC typ. / 8 VDC max. 24 Vin models: 13 VDC min. / 15 VDC typ. / 17 VDC max. 48 Vin models: 29 VDC min. / 32 VDC typ. / 35 VDC 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	75 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		10 ms typ. / 20 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		140 - 240% of Iout max. 180% typ. of Iout max.
Transient Response	- Response Time	500 µs typ. (25% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	Designed for EN 62368-1 (no certification)
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All specifications valid at nominal voltage, full load and +25°C after warm-up time unless otherwise stated.

EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	- Radiated Emissions	EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal: www.tracopower.com/overview/tec2
EMS Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, ±8 kV, perf. criteria A Contact: EN 61000-4-2, ±6 kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: KY 220 µF / 100 V 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

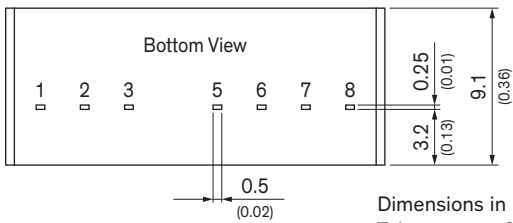
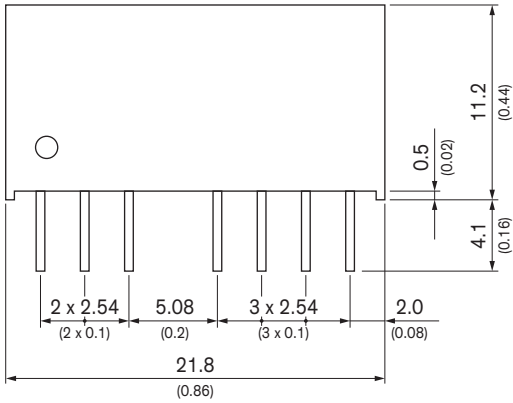
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +95°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	5.9 %/K above 88°C
Cooling System		Natural convection (20 LFM)
Remote Control	- Current Controlled Remote	On: open circuit Off: 2 to 4 mA current (internal 1 kΩ resistor)
	- Off Idle Input Current	External circuit proposal: www.tracopower.com/info/current-remote.pdf 2.5 mA typ.
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	50 pF max.
Reliability	- Calculated MTBF	6'620'000 h (MIL-HDBK-217F, ground benign)
Environment	- Vibration	MIL-STD-810F
	- Mechanical Shock	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Non-conductive Plastic (UL94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (1 - 2 µm)
Pin Surface Plating		Tin (3 - 5 µm), matte
Soldering Profile		Wave Soldering 260°C / 10 s max.
Connection Type		THD (Through-Hole Device)
Weight		4.5 g
Environmental Compliance	- Reach	www.tracopower.com/info/reach-declaration.pdf
	- RoHS	www.tracopower.com/info/rohs-declaration.pdf

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tec2
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Outline Dimensions



Dimensions in mm (inch)
 Tolerances: ± 0.5 (± 0.02)
 Pin pitch tolerances ± 0.25 (± 0.01)
 Pin dimension tolerance ± 0.1 (0.004)

Pinout		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
2	+Vin (Vcc)	+Vin (Vcc)
3	Remote On/Off	Remote On/Off
5	NC	NC
6	+Vout	+Vout
7	-Vout	Common
8	NC	-Vout

NC: Not connected

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