



**THE DATASHEET OF
TEC 3-0912**



- Compact SIP-8 package
- I/O-isolation voltage 1'600 VDC
- Fully regulated outputs
- Operating temperature range -40°C to $+90^{\circ}\text{C}$
- Continuous short circuit protection
- Remote On/Off
- Designed to meet IEC/EN/UL 62368-1 (not certified)
- 3-year product warranty



TEC 3 is a new series with the design purpose to improve the prevalent 3 Watt SIP-8 DC/DC converters in terms of cost, efficiency and performance. The latest technology and components effectuate a high efficiency for a low thermal loss. This enables an operating temperature range from -40°C up to $+90^{\circ}\text{C}$. The converters are fully regulated over 0 - 100% load. The low input range input 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 3WI series for 4:1 input ranges). 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}	
TEC 3-0910	4.5 - 13.2 VDC (9 VDC nom.)	3.3 VDC	700 mA			75 %
TEC 3-0911		5 VDC	600 mA			78 %
TEC 3-0919		9 VDC	333 mA			81 %
TEC 3-0912		12 VDC	250 mA			83 %
TEC 3-0913		15 VDC	200 mA			84 %
TEC 3-0915		24 VDC	125 mA			82 %
TEC 3-0921		+5 VDC	300 mA	-5 VDC	300 mA	79 %
TEC 3-0922		+12 VDC	125 mA	-12 VDC	125 mA	82 %
TEC 3-0923		+15 VDC	100 mA	-15 VDC	100 mA	82 %
TEC 3-1210		9 - 18 VDC (12 VDC nom.)	3.3 VDC	700 mA		
TEC 3-1211	5 VDC		600 mA			81 %
TEC 3-1219	9 VDC		333 mA			82 %
TEC 3-1212	12 VDC		250 mA			84 %
TEC 3-1213	15 VDC		200 mA			85 %
TEC 3-1215	24 VDC		125 mA			85 %
TEC 3-1221	+5 VDC		300 mA	-5 VDC	300 mA	81 %
TEC 3-1222	+12 VDC		125 mA	-12 VDC	125 mA	85 %
TEC 3-1223	+15 VDC		100 mA	-15 VDC	100 mA	83 %
TEC 3-2410	18 - 36 VDC (24 VDC nom.)		3.3 VDC	700 mA		
TEC 3-2411		5 VDC	600 mA			82 %
TEC 3-2419		9 VDC	333 mA			83 %
TEC 3-2412		12 VDC	250 mA			85 %
TEC 3-2413		15 VDC	200 mA			86 %
TEC 3-2415		24 VDC	125 mA			84 %
TEC 3-2421		+5 VDC	300 mA	-5 VDC	300 mA	82 %
TEC 3-2422		+12 VDC	125 mA	-12 VDC	125 mA	84 %
TEC 3-2423		+15 VDC	100 mA	-15 VDC	100 mA	85 %
TEC 3-4810		36 - 75 VDC (48 VDC nom.)	3.3 VDC	700 mA		
TEC 3-4811	5 VDC		600 mA			80 %
TEC 3-4819	9 VDC		333 mA			82 %
TEC 3-4812	12 VDC		250 mA			84 %
TEC 3-4813	15 VDC		200 mA			85 %
TEC 3-4815	24 VDC		125 mA			86 %
TEC 3-4821	+5 VDC		300 mA	-5 VDC	300 mA	80 %
TEC 3-4822	+12 VDC		125 mA	-12 VDC	125 mA	86 %
TEC 3-4823	+15 VDC		100 mA	-15 VDC	100 mA	83 %

Input Specifications

Input Current	- At no load	9 Vin models: 55 mA typ. 12 Vin models: 30 mA typ. 48 Vin models: 8 mA typ. 24 Vin models: 12 mA typ. (3.3 Vout model) 12 mA typ. (5 Vout model) 12 mA typ. (9 Vout model) 12 mA typ. (12 Vout model) 12 mA typ. (15 Vout model) 12 mA typ. (24 Vout model) 12 mA typ. (5 / -5 Vout model) 12 mA typ. (12 / -12 Vout model) 15 mA typ. (15 / -15 Vout model)
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: 1'600 mA (slow blow) 12 Vin models: 800 mA (slow blow) 24 Vin models: 500 mA (slow blow) 48 Vin models: 315 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	55 mVp-p max.
Capacitive Load	- single output	3.3 Vout models: 4'400 µF max. 5 Vout models: 2'200 µF max. 9 Vout models: 1'300 µF max. 12 Vout models: 1'000 µF max. 15 Vout models: 820 µF max. 24 Vout models: 470 µF max.
	- dual output	5 / -5 Vout models: 1'200 / 1'200 µF max. 12 / -12 Vout models: 520 / 520 µF max. 15 / -15 Vout models: 440 / 440 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)

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)
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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/tec3
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 μ F / 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 +90°C
	- Case Temperature	+105°C max.
	- Storage Temperature	-55°C to +125°C
Power Derating	- High Temperature	3.4 %/K above 75°C
		See application note: www.tracopower.com/overview/tec3
Cooling System		Natural convection (20 LFM)
Remote Control	- Current Controlled Remote (passive = on)	On: open circuit Off: 2 to 4 mA current (internal 1 k Ω resistor) Refers to 'Remote' and '-Vin' Pin
		External circuit proposal: www.tracopower.com/info/current-remote.pdf
	- Off Idle Input Current	2.5 mA typ.
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	50 pF max.
Reliability	- Calculated MTBF	5'124'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F
	- Mechanical Shock	MIL-STD-810F
	- Thermal Shock	MIL-STD-810F
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (1 - 2 μ m)
Pin Surface Plating		Tin (3 - 5 μ m), matte
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP8
Soldering Profile		Lead-Free Wave Soldering 260°C / 10 s max.

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

Weight	4.5 g
Environmental Compliance - REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-l (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))
- SCIP Reference Number	e0986e5b-0522-4adb-9f26-096d17c4d764

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/tec3

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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