



**THE DATASHEET OF  
TEC 3-2412**



- Compact SIP-8 package
- I/O-isolation voltage 1'600 VDC
- Fully regulated outputs
- Operating temperature range  $-40^{\circ}\text{C}$  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  $-40^{\circ}\text{C}$  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 <sub>max</sub>	Vnom	I <sub>max</sub>	
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: <b>55 mA typ.</b> 12 Vin models: <b>30 mA typ.</b> 48 Vin models: <b>8 mA typ.</b> 24 Vin models: <b>12 mA typ.</b> (3.3 Vout model) <b>12 mA typ.</b> (5 Vout model) <b>12 mA typ.</b> (9 Vout model) <b>12 mA typ.</b> (12 Vout model) <b>12 mA typ.</b> (15 Vout model) <b>12 mA typ.</b> (24 Vout model) <b>12 mA typ.</b> (5 / -5 Vout model) <b>12 mA typ.</b> (12 / -12 Vout model) <b>15 mA typ.</b> (15 / -15 Vout model)
Surge Voltage		9 Vin models: <b>15 VDC max.</b> (1 s max.) 12 Vin models: <b>25 VDC max.</b> (1 s max.) 24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Under Voltage Lockout		9 Vin models: <b>2 VDC min. / 3 VDC typ. / 4 VDC max.</b> 12 Vin models: <b>6 VDC min. / 7 VDC typ. / 8 VDC max.</b> 24 Vin models: <b>13 VDC min. / 15 VDC typ. / 17 VDC max.</b> 48 Vin models: <b>29 VDC min. / 32 VDC typ. / 35 VDC max.</b>
Recommended Input Fuse		9 Vin models: <b>1'600 mA</b> (slow blow) 12 Vin models: <b>800 mA</b> (slow blow) 24 Vin models: <b>500 mA</b> (slow blow) 48 Vin models: <b>315 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>

## Output Specifications

Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.2% max.</b> dual output models: <b>0.2% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: <b>5% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>55 mVp-p max.</b>
Capacitive Load	- single output	3.3 Vout models: <b>4'400 µF max.</b> 5 Vout models: <b>2'200 µF max.</b> 9 Vout models: <b>1'300 µF max.</b> 12 Vout models: <b>1'000 µF max.</b> 15 Vout models: <b>820 µF max.</b> 24 Vout models: <b>470 µF max.</b>
	- dual output	5 / -5 Vout models: <b>1'200 / 1'200 µF max.</b> 12 / -12 Vout models: <b>520 / 520 µF max.</b> 15 / -15 Vout models: <b>440 / 440 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>10 ms typ. / 20 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>140 - 240% of Iout max.</b> <b>180% typ. of Iout max.</b>
Transient Response	- Response Time	<b>500 µs typ.</b> (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: <a href="http://www.tracopower.com/overview/tec3">www.tracopower.com/overview/tec3</a>
EMS Immunity	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 1$ kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: KY 220 $\mu$ 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: <a href="http://www.tracopower.com/overview/tec3">www.tracopower.com/overview/tec3</a>
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 $\Omega$ resistor) Refers to 'Remote' and '-Vin' Pin
		External circuit proposal: <a href="http://www.tracopower.com/info/current-remote.pdf">www.tracopower.com/info/current-remote.pdf</a>
	- 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 $\Omega$ 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 <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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 $\mu$ m)
Pin Surface Plating		Tin (3 - 5 $\mu$ 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	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant
- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> 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](http://www.tracopower.com/overview/tec3)

### Outline Dimensions



Dimensions in mm (inch)  
Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
Pin pitch tolerances  $\pm 0.25$  ( $\pm 0.01$ )  
Pin dimension tolerance  $\pm 0.1$  (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

## Looking for pricing, stock, or lifecycle information?

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- ⊖ [Traco Power Information](#)

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