THE DATASHEET OF

TEL 5-1210

TRACO POWER

DC/DC Converter

TEL 5 Series, 5 Watt

- **Wide 2:1 input range**
- **Cost efficient design**
- **High power density**
- **High efficiency up to 86%**
- **Built-in EN 55032 class A filter**
- **I/O isolation 1'500 VDC**
- **Regulated outputs**
- **Continuous short-circuit protection**
- **High reliability, MTBF >1 Mio. h**
- **3-year product warranty**

UL 60950-1 IEC 60950-1

The TEL 5 Series is a range of DC/DC-converter modules with wide input range of 2:1. State of the art SMD-technology guarantees a product with very high reliability and excellent cost / performance ratio. High efficiency allows an operating temperature range of –40°C to +85°C at full load. This product series provides an economical solution for many cost critical applications in industrial and consumer electronics.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEL 5-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC	1'200 mA			77 %
TEL 5-1211		5 VDC	1'000 mA			81 %
TEL 5-1212		12 VDC	500 mA			84 %
TEL 5-1222		+12 VDC	250 mA	–12 VDC	250 mA	84 %
TEL 5-1223		+15 VDC	200 mA	–15 VDC	200 mA	84 %
TEL 5-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC	1'200 mA			79 %
TEL 5-2411		5 VDC	1'000 mA			83 %
TEL 5-2412		12 VDC	500 mA			86 %
TEL 5-2422		+12 VDC	250 mA	–12 VDC	250 mA	86 %
TEL 5-2423		+15 VDC	200 mA	–15 VDC	200 mA	86 %

Input Specifications

Input Current	- At no load	12 Vin models:	20 mA typ.
		24 Vin models:	5 mA typ.
	- At full load	12 Vin models:	429 mA typ. (3.3 Vout model)
			514 mA typ. (5 Vout model)
			595 mA typ. (12 Vout model)
			595 mA typ. (12 / -12 Vout model)
			595 mA typ. (15 / -15 Vout model)
		24 Vin models:	209 mA typ. (3.3 Vout model)
			251 mA typ. (5 Vout model)
			291 mA typ. (12 Vout model)
			291 mA typ. (12 / -12 Vout model)
			291 mA typ. (15 / -15 Vout model)
Surge Voltage		12 Vin models:	25 VDC max. (1 s max.)
		24 Vin models:	50 VDC max. (1 s max.)
Start-up Voltage		12 Vin models:	4.5 VDC min. / 6 VDC typ. / 8 VDC max.
		24 Vin models:	8 VDC min. / 12 VDC typ. / 16 VDC max.
Under Voltage Lockout		12 Vin models:	8 VDC max.
		24 Vin models:	16 VDC max.
Reflected Ripple Current		12 Vin models:	25 mA typ.
		24 Vin models:	15 mA typ.
Recommended Input Fuse		12 Vin models:	1'250 mA (slow blow)
		24 Vin models:	1'250 mA (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type
Short Circuit Input Power			3 W max.

Output Specifications

Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.3% max.
		dual output models:	0.3% max.
	- Load Variation (20 - 100%)	single output models:	1% max.
		dual output models:	1% max. (Output 1)
			1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	2% max.
Ripple and Noise	- 20 MHz Bandwidth		75 mVp-p max.
			50 mVp-p typ.
			(To further reduce Ripple and Noise, a capacitor with 3.3 µF X7R is recommended.)
Capacitive Load	- single output	3.3 Vout models:	6'800 µF max.
		5 Vout models:	6'800 µF max.
		12 Vout models:	6'800 µF max.
	- dual output	12 / -12 Vout models:	1'000 / 1'000 µF max.
		15 / -15 Vout models:	1'000 / 1'000 µF max.
Minimum Load			5 % of Iout max.
			(Operation at lower load will not damage the converter, but it may not meet all specifications)
Temperature Coefficient			±0.02 %/K max.
Start-up Time			37 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Overload Protection			Foldback Mode
Output Current Limitation			120% min. of Iout max.
			150% typ. of Iout max.

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

Transient Response	- Response Deviation	6% max. (25% Load Step)
	- Response Time	150 µs typ. / 300 µs max. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	CSA-C22.2, No. 60950-1 Designed for IEC/EN/UL 62368-1 (not certified) EN 60950-1 IEC 60950-1 UL 60950-1
	- Certification Documents	www.tracopower.com/overview/tel5
Pollution Degree		PD 2

EMC Specifications

EMI Emissions	- Conducted Emissions	EN 55032 class A (internal filter)
	- Radiated Emissions	EN 55032 class A (internal filter)

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Case Temperature	+90°C max.
	- Storage Temperature	–50°C to +125°C
Power Derating	- High Temperature	3.33 %/K above 70°C
	See application note:	www.tracopower.com/overview/tel5
Cooling System		Natural convection (20 LFM)
Regulator Topology		RCC Converter
Switching Frequency		200 kHz min. (PFM) 300 kHz typ. (PFM)
Insulation System		Functional Insulation
Working Voltage (rated)		120 VAC
Isolation Test Voltage	- Input to Output, 60 s	1'500 VDC
	- Input to Output, 1 s	1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	380 pF typ. 500 pF max.
Reliability	- Calculated MTBF	1'000'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Housing Material		Non-conductive Plastic (UL 94 V-0 rated)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Phosphor Bronze (C5191)
Pin Foundation Plating		Nickel (2 - 4 µm)
Pin Surface Plating		Gold (75 - 125 nm), glossy
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		DIP24
Soldering Profile		Lead-Free Wave Soldering 260°C / 10 s max.
Weight		16.9 g
Thermal Impedance	- Case to Ambient	15.34 K/W typ.

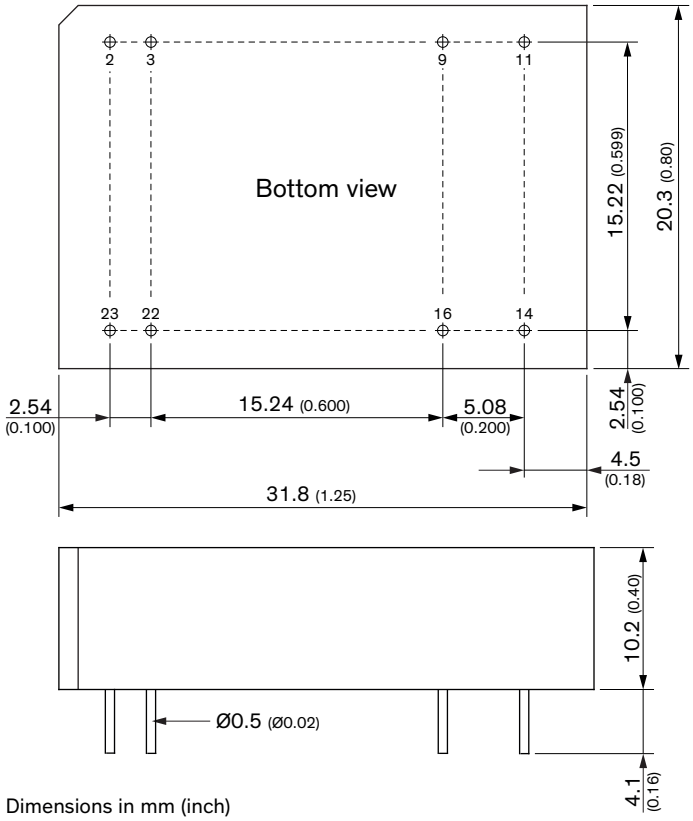
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	e533bdba-1560-450b-b30c-74fbf8df5fbc

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/tel5

Outline Dimensions



Dimensions in mm (inch)
Tolerance: x.x ±0.25 (x.xx ±0.01)
x.xx ±0.13 (x.xxx ±0.005)
Pin diameter tolerance: x.x ±0.05 (x.xx ±0.002)

Pinout		
Pin	**Single**	**Dual**
2	–Vin (GND)	
3	–Vin (GND)	
9	No pin	Common
11	NC	–Vout
14	+Vout	
16	–Vout	Common
22	+Vin (VCC)	
23	+Vin (VCC)	

NC: Not connected

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