

#### Features

- ◆ Wide 2:1 input range
- ◆ Cost efficient SMD-design
- ◆ High power density
- ◆ High efficiency up to 86%
- ◆ Regulated outputs
- ◆ I/O isolation 1'500 VDC
- ◆ Input filter to meet EN 55022, Class A and FCC, level A without external components
- ◆ Indefinite short-circuit protection
- ◆ 24-pin DIP with industry standard pinout
- ◆ High reliability, MTBF >1 Mio. h
- ◆ Lead free design, RoHS compliant
- ◆ 3-year product warranty



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  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$  at full load. This product series provides an economical solution for many cost critical applications in industrial and consumer electronics.

#### Models

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEL 5-1210	9 – 18 VDC (nominal 12 VDC)	3.3 VDC	1200 mA	77 %
TEL 5-1211		5 VDC	1000 mA	81 %
TEL 5-1212		12 VDC	500 mA	84 %
TEL 5-1222		$\pm 12$ VDC	$\pm 250$ mA	84 %
TEL 5-1223		$\pm 15$ VDC	$\pm 200$ mA	84 %
TEL 5-2410	18 – 36 VDC (nominal 24 VDC)	3.3 VDC	1200 mA	79 %
TEL 5-2411		5 VDC	1000 mA	83 %
TEL 5-2412		12 VDC	500 mA	86 %
TEL 5-2422		$\pm 12$ VDC	$\pm 250$ mA	86 %
TEL 5-2423		$\pm 15$ VDC	$\pm 200$ mA	86 %

### Input Specifications

Input current no load /full load	12 Vin models: 20 mA / 590 mA typ. 24 Vin models: 5 mA / 290 mA typ.
Start-up voltage / under voltage shut down	12 Vin models: 8.0 VDC / 8.0 VDC 24 Vin models: 16.0 VDC / 16.0 VDC
Surge voltage (1 sec. max.)	12 Vin models: 25 V max. 24 Vin models: 50 V max.
Reverse voltage protection	1.0 A max.
Conducted noise (input)	EN 55022 class A, FCC part 15 level A

### Output Specifications

Voltage set accuracy	±1 %
Regulation	– Input variation Vin min. to Vin max. – Load variation 20 – 100 % single output models 1 % max dual output models balanced load 2 % max.
Minimum load	5 % of rated max current (operating at lower load condition is safe but the modules may not meet all specifications listed)
Ripple and noise (20 MHz Bandwidth)	75 mVpk-pk max.
Temperature coefficient	±0.02 %/K
Output current limitation	>120 % of Iout max., constant current
Short circuit protection	continuous (automatic recovery)
Capacitive load	single output models: 6800 µF max. dual output models: 1000 µF max. (each output)

### General Specifications

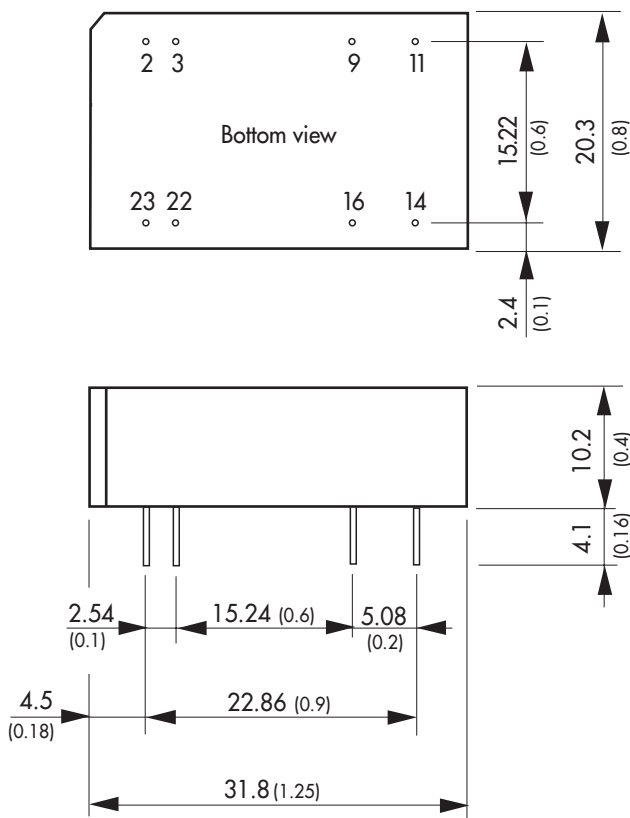
Temperature ranges	– Operating – Case temperature – Storage	–40°C to +85°C +90°C –40°C to +125°C
Derating (convection cooling)		3.3 %/K above 70°C
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)		>1 Mio. h
Isolation voltage (60 sec.)	– Input/Output	1'500 VDC
Isolation capacitance	– Input/Output	380 pF typ.
Isolation resistance	– Input/Output (500 VDC)	>1'000 M Ohm
Switching frequency		300 kHz typ.
Environmental compliance	– Reach – RoHs	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> RoHS directive 2011/65/EU

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

**Physical Specifications**

Casing material	non conductive plastic (UL 94V-0 rated)
Weight	17 g (0.60 oz)
Soldering temperature	max. 265°C / 10 sec.

**Outline Dimensions**



Pin-Out		
Pin	Single	Dual
2	-Vin (GND)	-Vin (GND)
3	-Vin (GND)	-Vin (GND)
9	No pin	Common
11	No con.	-Vout
14	+Vout	+Vout
16	-Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

Dimensions in [mm], ( ) = Inch  
 Pin diameter  $\varnothing 0.5 \pm 0.05$  (0.02  $\pm$  0.002)  
 Tolerances  $\pm 0.25$  ( $\pm 0.01$ )  
 Pin pitch tolerances  $\pm 0.13$  ( $\pm 0.005$ )

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at [www.tracopower.com](http://www.tracopower.com)

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