

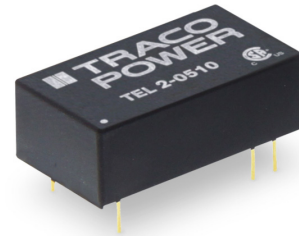


**THE DATASHEET OF  
TEL 2-0513**



#### Features

- ◆ Ultracompact DIP-16 plastic package
- ◆ Wide 2:1 input range
- ◆ Regulated output
- ◆ I/O isolation 1500V
- ◆ Input filter meets EN55032, class A without ext. components
- ◆ Low ripple and noise
- ◆ Indefinite shortcircuit protection
- ◆ Operating temperature range -40°C to +80°C
- ◆ Lead free design, RoHS compliant
- ◆ 3-year product warranty



The TEL-2 series, comprising 28 models, is a range of isolated 2 Watt converters in a low profile DIP-16 package. Requiring only 3.25 cm<sup>2</sup> of space on the PCB they provide a complete DC/DC converter without need of any external components. Wide input range and tightly regulated output voltage qualifies these converters for many cost critical applications in industrial and consumer electronics.

#### Models

Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEL 2-0510	4.5 – 9 VDC (nominal 5 VDC)	3.3 VDC	500 mA	70 %
TEL 2-0511		5 VDC	400 mA	73 %
TEL 2-0512		12 VDC	165 mA	75 %
TEL 2-0513		15 VDC	135 mA	73 %
TEL 2-0521		±5 VDC	±200 mA	64 %
TEL 2-0522		±12 VDC	±85 mA	69 %
TEL 2-0523		±15 VDC	±65 mA	71 %
TEL 2-1210	9 – 18 VDC (nominal 12 VDC)	3.3 VDC	500 mA	73 %
TEL 2-1211		5 VDC	400 mA	77 %
TEL 2-1212		12 VDC	165 mA	80 %
TEL 2-1213		15 VDC	135 mA	80 %
TEL 2-1221		±5 VDC	±200 mA	73 %
TEL 2-1222		±12 VDC	±85 mA	78 %
TEL 2-1223		±15 VDC	±65 mA	78 %
TEL 2-2410	18 – 36 VDC (nominal 24 VDC)	3.3 VDC	500 mA	72 %
TEL 2-2411		5 VDC	400 mA	77 %
TEL 2-2412		12 VDC	165 mA	80 %
TEL 2-2413		15 VDC	135 mA	81 %
TEL 2-2421		±5 VDC	±200 mA	74 %
TEL 2-2422		±12 VDC	±85 mA	78 %
TEL 2-2423		±15 VDC	±65 mA	80 %
TEL 2-4810	36 – 75 VDC (nominal 48 VDC)	3.3 VDC	500 mA	71 %
TEL 2-4811		5 VDC	400 mA	73 %
TEL 2-4812		12 VDC	165 mA	79 %
TEL 2-4813		15 VDC	135 mA	79 %
TEL 2-4821		±5 VDC	±200 mA	71 %
TEL 2-4822		±12 VDC	±85 mA	77 %
TEL 2-4823		±15 VDC	±65 mA	77 %

### Input Specifications

Input current at full load / no load (nominal input)	5 Vin models:	600 mA / 40 mA typ.
	12 Vin models:	220 mA / 20 mA typ.
	24 Vin models:	110 mA / 10 mA typ.
	48 Vin models:	55 mA / 8 mA typ.
Start-up voltage / under voltage shut down	5 Vin models:	4 VDC / 3.5 VDC typ.
	12 Vin models:	7 VDC / 6.5 VDC typ.
	24 Vin models:	12 VDC / 11 VDC typ.
	48 Vin models:	24 VDC / 22 VDC typ.
Surge voltage (100 ms max.)	5 Vin models:	11 V max.
	12 Vin models:	25 V max.
	24 Vin models:	50 V max.
	48 Vin models:	100 V max.
Conducted noise (input)	EN 55032 class A, FCC part 15, level A	

### Output Specifications

Voltage set accuracy	±2 % max.	
Regulation	– Input variation Vin min. to Vin max.	0.5 % max.
	– Load variation 25 – 100 %	single output models: 0.75 % max.
		dual output models: 2.0 % (balanced load)
Ripple and noise (20 MHz Bandwidth)	50 mVpk-pk max	
Temperature coefficient	±0.02 %/K	
Short circuit protection	indefinite, automatic recovery	
Minimum load	25 % of rated max current (operation at lower load condition is safe but a higher output ripple will be experienced)	
Capacitive load	3.3 VDC output models:	2'200 µF max.
	5 VDC output models:	1'000 µF max.
	12 VDC output models:	170 µF max.
	15 VDC output models:	110 µF max.
	±5 VDC output models:	470 µF max.
	±12 VDC output models:	100 µF max.
	±15 VDC output models:	47 µF max.

### General Specifications

Temperature ranges	– Operating	–40°C to +80°C
	– Case	+100°C max.
	– Storage	–55°C to +105°C
Derating	2.9 %/K above 65°C	
Humidity (non condensing)	95 % rel. H max.	
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)	>1.2 Mio h	
Isolation voltage	Input/Output (60 s)	1'500 VDC
Isolation capacitance	Input/Output	250 pF max.
Isolation resistance	Input/Output (500 VDC)	>1'000 MOhm
Switching frequency	150 - 550 kHz (PFM)	
	300 kHz typ. (PFM)	
Safety standards	UL/cUL 60950-1, IEC/EN 60950-1	
Safety approval	CB 60950-1	
	– Certification documents	<a href="http://www.tracopower.com/overview/tel2">www.tracopower.com/overview/tel2</a>
Environmental compliance	– Reach	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a>
	– RoHS	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 FR4
Potting material	epoxy, UL94V-0 - rated
Weight	5.1 g (0.17oz)
Soldering temperature	265°C / 10 s max.

**Outline Dimensions mm (inches)**





Pin-Out		
Pin	Single	Dual
1	-Vin (GND)	-Vin (GND)
7	NC	NC
8	NC	Common
9	+Vout	+Vout
10	-Vout	-Vout
16	+Vin	+Vin

NC = Not connected

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