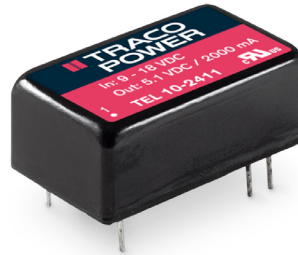


- Most compact 10 Watt converter in DIP-16 metal casing
- Highest power density of 3.83 W/cm<sup>3</sup>
- 6-side shielded metal case with insulated base plate
- Wide 2:1 input voltage range
- High efficiency for low thermal loss
- Operating temperature range of -40°C to +85°C
- Built-in EN 55032 class A filter
- Current limitation and protection against short circuit
- 3 years product warranty



The TEL 10 series is a range of isolated 10 Watt DC/DC converters which come in a ultra compact DIP-16 metal package. The design purpose of these series was to miniaturized low power DC/DC converters to the maximum without sacrificing high efficiency. The TEL 10 series sets the new standart for power density with 3.83 W/cm<sup>3</sup>.

The TEL 10 series offers a wide 2:1 input voltage range and features a high efficiency of up to 88% which enables an operation temperature of up to +70°C at full load and up to 85°C with 50% load.

The converters have an internal input filter to comply with conducted emission EN 55032 class A. The TEL 10 Series models feature an overall economical solution for space critical and cost sensitive applications in instrumentation, IT and industrial electronics.

Models				
Order code	Input voltage	Output voltage	Output current max.	Efficiency typ.
TEL 10-1210	9 - 18 VDC (nominal 12 VDC)	3.3 VDC	2700 mA	79 %
TEL 10-1211		5.1 VDC	2000 mA	82 %
TEL 10-1212		12 VDC	833 mA	86 %
TEL 10-1213		15 VDC	666 mA	87 %
TEL 10-1215		24 VDC	416 mA	87 %
TEL 10-1222		±12 VDC	±416 mA	86 %
TEL 10-1223		±15 VDC	±333 mA	86 %
TEL 10-2410	18 - 36 VDC (nominal 24 VDC)	3.3 VDC	2700 mA	80 %
TEL 10-2411		5.1 VDC	2000 mA	83 %
TEL 10-2412		12 VDC	833 mA	87 %
TEL 10-2413		15 VDC	666 mA	88 %
TEL 10-2415		24 VDC	416 mA	88 %
TEL 10-2422		±12 VDC	±416 mA	87 %
TEL 10-2423		±15 VDC	±333 mA	87 %
TEL 10-4810	36 - 75 VDC (nominal 48 VDC)	3.3 VDC	2700 mA	80 %
TEL 10-4811		5.1 VDC	2000 mA	83 %
TEL 10-4812		12 VDC	833 mA	87 %
TEL 10-4813		15 VDC	666 mA	88 %
TEL 10-4815		24 VDC	416 mA	88 %
TEL 10-4822		±12 VDC	±416 mA	87 %
TEL 10-4823		±15 VDC	±333 mA	87 %

## Input Specifications

Input current at no load	12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 8 mA typ.
Surge voltage (1 s max.)	12 Vin models: 25 V max. 24 Vin models: 50 V max. 48 Vin models: 100 V max.
Start up voltage	12 Vin models: 9 V (or lower) 24 Vin models: 18 V (or lower) 48 Vin models: 36 V (or lower)
Under voltage shut down	12 Vin models: 8 V typ. / 7 V min. 24 Vin models: 16 V typ. / 15 V min. 48 Vin models: 34 V typ. / 31 V min.
Input filter	internal Pi type
Conducted noise	EN 55032, FCC part 15 class A without external components class B with external components <a href="http://www.tracopower.com/overview/tel10">www.tracopower.com/overview/tel10</a>
EMC immunity	EN 55024 EN 61000-4-2, air $\pm 8$ kV, contact $\pm 6$ kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV perf. criteria A 12 & 24 Vin models: Pi-type: 2 pcs. 470uF/50V CHEMI-CON KY Series & 1 pcs. 10uH/2.2A/0.1Ohm inductor: 732774100 48 Vin models: 1 pcs. 470uF/100V CHEMI-CON KY Series EN 61000-4-6, 10 Vrms, perf. criteria A EN 61000-4-8, 100 A/m, perf. criteria A
	<ul style="list-style-type: none"> <li>- Conducted emissions</li> <li>- Conducted and radiated emissions</li> <li>- Application note for external filter proposal</li> </ul>
	<ul style="list-style-type: none"> <li>- ESD (electrostatic discharge)</li> <li>- Radiated immunity</li> <li>- Fast transient / surge (with external components)</li> <li>- Conducted immunity</li> <li>- Magnetic field immunity</li> </ul>

## Output Specifications

Voltage set accuracy	$\pm 1$ % max.
Regulation	<ul style="list-style-type: none"> <li>- Input variation (Vin min. to Vin max.)</li> <li>- Load variation (0 – 100 %)</li> <li>- Output voltage balance</li> <li>- Cross regulation</li> </ul>
Temperature coefficient	$\pm 0.01$ %/K typ. / $\pm 0.02$ %/K max.
Ripple and noise (20 MHz Bandwidth)	3.3 & 5.1 Vout models: 60 mVp-p typ. / 72 mVp-p max. other output models: 80 mVp-p typ. / 96 mVp-p max.
Start up time (constant resistive load)	30 ms typ. / 60 ms max.
Transient response (25% load step change)	<ul style="list-style-type: none"> <li>- Response time</li> <li>- Response deviation</li> </ul>
Over current limitation	160 % typ. / 192 % max. of Iout max.
Short circuit protection	hiccup (0.3 Hz typ.), automatic recovery
Capacitive load	<ul style="list-style-type: none"> <li>- Single output</li> <li>- Dual output</li> </ul>
	3.3 Vout models: 2600 $\mu$ F max. 5.1 Vout models: 1300 $\mu$ F max. 12 Vout models: 560 $\mu$ F max. 15 Vout models: 560 $\mu$ F max. 24 Vout models: 200 $\mu$ F max. $\pm 12$ Vout models: 390 $\mu$ F max. (each output) $\pm 15$ Vout models: 200 $\mu$ F max. (each output)

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

## General Specifications

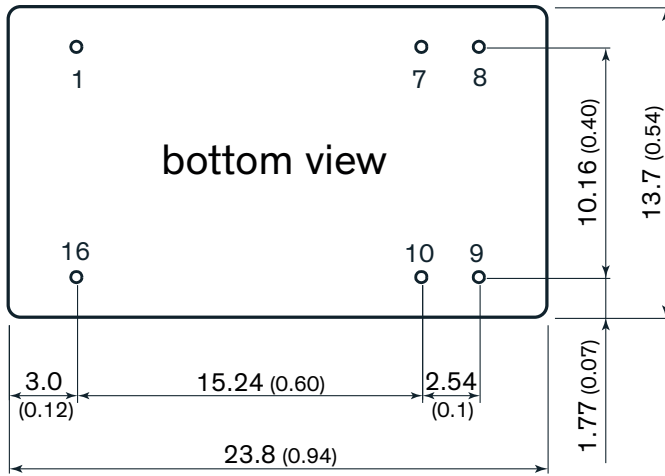
Temperature ranges	<ul style="list-style-type: none"> <li>– Ambient temperature</li> <li>– Case temperature</li> <li>– Storage temperature</li> </ul>	3.3 & 5.1 Vout models: –40°C to +78°C other output models: –40°C to +85°C +105°C max. –55°C to +125°C
Derating		see application note <a href="http://www.tracopower.com/overview/tel10">www.tracopower.com/overview/tel10</a>
Humidity (non condensing)		95 % rel H max.
Isolation voltage	<ul style="list-style-type: none"> <li>– Input to output (60 s)</li> <li>– Input to output (1 s)</li> <li>– Input/output to case</li> </ul>	1'500 VDC 1'800 VDC 1'000 VDC
Isolation resistance (input to output, at 500 VDC)		1 GOhm min.
Isolation capacitance (input to output, at 1 VAC / 100 kHz)		1500 pF max.
Reliability, calculated MTBF (MIL-HDBK-217F at +25°C, ground benign)		TBD
Switching frequency		357 – 483 kHz. / 420 kHz typ. (PWM)
Safety standards /approvals	<ul style="list-style-type: none"> <li>– Certification documents</li> </ul>	IEC/EN/UL 62368-1 (Pending) <a href="http://www.tracopower.com/overview/tel10">www.tracopower.com/overview/tel10</a>
Environmental compliance	<ul style="list-style-type: none"> <li>– Reach</li> <li>– RoHS</li> </ul>	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> RoHS directive 2011/65/EU

## Physical Specifications

Casing material	Aluminium alloy, black anodized coating
Potting material	Epoxy (UL 94V-0 rated)
Pin material	Tinned copper
Package weight	6.5 g (0.23oz)
Soldering profile	260°C / 10 s max.

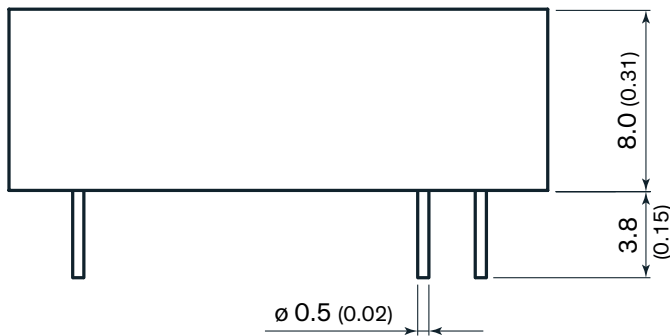
**Supporting Documents:** [www.tracopower.com/overview/tel10](http://www.tracopower.com/overview/tel10)

**Outline Dimensions**



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

NC: not connected



Dimensions in mm, ( ) = Inch

Tolerances: x.x  $\pm 0.5 (\pm 0.02)$

x.xx  $\pm 0.25 (\pm 0.01)$

Pin diameter 0.5  $\pm 0.05 (0.02 \pm 0.002)$

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