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TRACO POWER

DC/DC Converter

TEL 12 Series, 12 Watt

- **Ultra compact 12 Watt converter in DIP-16 metal casing**
- **Highest power density of 3,61W/cm3**
- **6-side shielded metal case with insulated baseplate**
- **Wide 2:1 input voltage range**
- **High efficiency (up to 88%) for low thermal loss**
- **Operating temperature range -40°C to +88°C**
- **Built-In EN 55032 class A filter**
- **Protection against short circuit**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEL 12 is a 12 Watt DC/DC converter series which comes in an ultra compact DIP-16 metal package. The design purpose was to miniaturized low power DC/DC converters to the maximum without sacrificing high efficiency. They solidify the new standard for power density with 3,61 W/cm3 and effectively double the power density compared to 12 Watt converters in DIP-24 package. The TEL 12 and 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 +65°C at full load and up to 85°C with 50% load. The converters also have an internal input filter to comply with conducted emission standard EN 55032 class A. Overall they feature an economical solution for space critical and cost sensitive applications in instrumentation, IT and industrial electronics.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEL 12-1211	9 - 18 VDC (12 VDC nom.)	5.1 VDC	2'400 mA			83 %
TEL 12-1212		12 VDC	1'000 mA			87 %
TEL 12-1213		15 VDC	800 mA			88 %
TEL 12-1215		24 VDC	500 mA			88 %
TEL 12-1222		+12 VDC	500 mA	–12 VDC	500 mA	87 %
TEL 12-1223		+15 VDC	400 mA	–15 VDC	400 mA	87 %
TEL 12-2411	18 - 36 VDC (24 VDC nom.)	5.1 VDC	2'400 mA			83 %
TEL 12-2412		12 VDC	1'000 mA			87 %
TEL 12-2413		15 VDC	800 mA			88 %
TEL 12-2415		24 VDC	500 mA			88 %
TEL 12-2422		+12 VDC	500 mA	–12 VDC	500 mA	87 %
TEL 12-2423		+15 VDC	400 mA	–15 VDC	400 mA	87 %
TEL 12-4811	36 - 75 VDC (48 VDC nom.)	5.1 VDC	2'400 mA			83 %
TEL 12-4812		12 VDC	1'000 mA			87 %
TEL 12-4813		15 VDC	800 mA			88 %
TEL 12-4815		24 VDC	500 mA			88 %
TEL 12-4822		+12 VDC	500 mA	–12 VDC	500 mA	87 %
TEL 12-4823		+15 VDC	400 mA	–15 VDC	400 mA	87 %

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Input Specifications

Input Current	- At no load	12 Vin models:	20 mA typ.
		24 Vin models:	10 mA typ.
		48 Vin models:	7 mA typ.
	- At full load	12 Vin models:	1'160 mA max.
		24 Vin models:	580 mA max.
		48 Vin models:	290 mA max.
Surge Voltage		12 Vin models:	25 VDC max. (1 s max.)
		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
Under Voltage Lockout		12 Vin models:	8 VDC typ.
		24 Vin models:	16 VDC typ.
		48 Vin models:	34 VDC typ.
Recommended Input Fuse			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type

Output Specifications

Voltage Set Accuracy			±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.8% max.
		dual output models:	0.8% max.
	- Load Variation (0 - 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.
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise	- 20 MHz Bandwidth		70 mVp-p typ. (w/ 2.2 µF, 50 V MLCC)
Capacitive Load	- single output	5.1 Vout models:	1'500 µF max.
		12 Vout models:	680 µF max.
		15 Vout models:	680 µF max.
		24 Vout models:	220 µF max.
	- dual output	12 / -12 Vout models:	470 / 470 µF max.
		15 / -15 Vout models:	220 / 220 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Start-up Time			30 ms typ.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			160% typ. of Iout max.
Transient Response	- Response Deviation		5% max. (75% to 100% Load Step)
	- Response Time		500 µs typ. (75% to 100% Load Step)

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Certification Documents	www.tracopower.com/overview/tel12
Pollution Degree		PD 3

EMC Specifications

EMI Emissions	- Conducted Emissions		EN 55032 class A (internal filter) FCC Part 15 class A (internal filter)
	- Radiated Emissions		EN 55032 class A (with external filter) FCC Part 15 class A (with external filter)
		External filter proposal:	www.tracopower.com/overview/tel12

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

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EMS Immunity			EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air:	EN 61000-4-2, ±8 kV, perf. criteria A
		Contact:	EN 61000-4-2, ±6 kV, perf. criteria A
	- RF Electromagnetic Field		EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge		EN 61000-4-4, ±2 kV, perf. criteria A
			EN 61000-4-5, ±2 kV, perf. criteria A
		External filter proposal:	www.tracopower.com/overview/tel12
	- Conducted RF Disturbances		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 +85°C
	- Case Temperature		+105°C max.
	- Storage Temperature		–50°C to +125°C
Power Derating	- High Temperature		1.82 %/K above 50°C (5 Vout models) 2.5 %/K above 65°C (other models)
		See application note:	www.tracopower.com/overview/tel12
Cooling System			Natural convection (20 LFM)
Altitude During Operation			6'000 m max.
Switching Frequency			480 kHz typ. (PWM)
Insulation System			Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s		1'500 VDC
	- Input to Output, 1 s		1'800 VDC
	- Input to Case, 60 s		1'000 VDC
	- Output to Case, 60 s		1'000 VDC
Isolation Resistance	- Input to Output, 500 VDC		1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V		2'200 pF max.
Reliability	- Calculated MTBF		2'537'000 h (MIL-HDBK-217F, ground benign)
Washing Process			Allowed (hermetical product)
		See Cleaning Guideline:	www.tracopower.com/info/cleaning.pdf
Housing Material			Plastic base-plate w. metal case
Potting Material			Silicone (UL 94 V-0 rated)
Pin Material			Copper Alloy (C6801)
Pin Foundation Plating			Nickel (2 - 4 µm)
Pin Surface Plating			Tin (3 - 5 µm), matte
Housing Type			Metal Case
Mounting Type			PCB Mount
Connection Type			THD (Through-Hole Device)
Footprint Type			DIP16
Soldering Profile			Wave Soldering 260°C / 10 s max.
Weight			8.6 g
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 (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.)

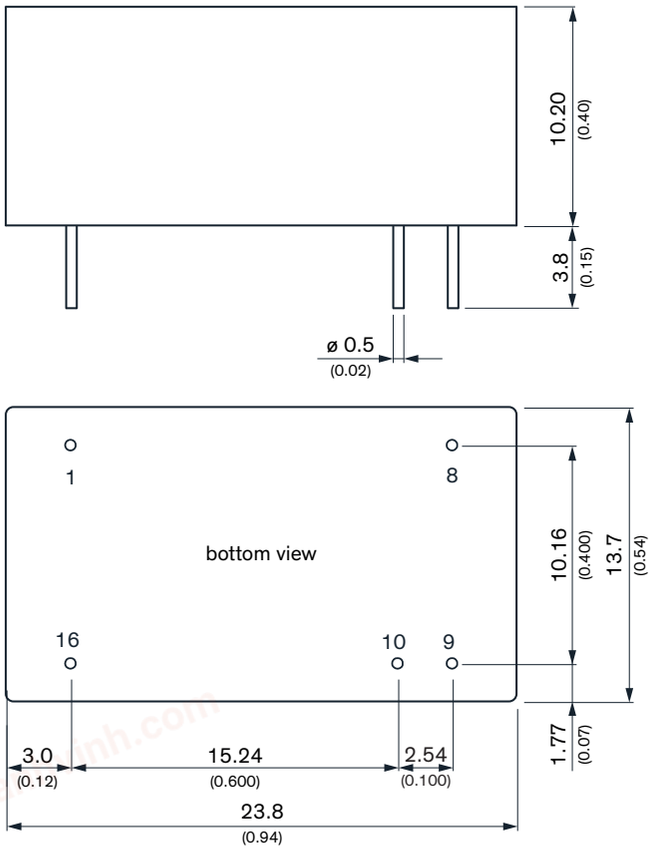
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Supporting Documents

Overview Link (for additional Documents) www.tracopower.com/overview/tel12

Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (±0.02)
x.xx ±0.25 (±0.01)
Pin diameter tolerance: x.x ±0.05 (x.xx ±0.002)

Pinout		
Pin	**Single**	**Dual**
1	–Vin (GND)	–Vin (GND)
8	NC	Common
9	+Vout	+Vout
10	–Vout	–Vout
16	+Vin (Vcc)	+Vin (Vcc)

NC: Not connected

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