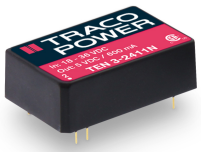
TRACO POWER

DC/DC Converter

TEN 3N Series, 3 Watt

- **Wide 2:1 input range**
- **Input filter to meet EN 55032, class A and FCC, level A without external components**
- **Extended operating temperature range –40°C to +85°C**
- **Models with 1'500 VDC and 3'000 VDC I/O isolation (functional insulation)**
- **High reliability, MTBF >1.0 Mio. h**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 3N Series is a drop in replacement of the prevalent TEN 3 Series. The up-to date design enables a cost reduction without any compromise to reliability and function. They come with an internal filter to meet EN55032 class A without external components. Increased EMC immunity and extended operating temperature range of –40°C to +85°C make these converters an ideal solution for cost critical but demanding applications. With the standard pinning it is a drop in replacement for common 3 Watt converters in DIP24 package.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
TEN 3-0510N	4.5 - 9 VDC (5 VDC nom.)	3.3 VDC	750 mA			77 %
TEN 3-0511N		5 VDC	600 mA			80 %
TEN 3-0512N		12 VDC	250 mA			82 %
TEN 3-0513N		15 VDC	200 mA			82 %
TEN 3-0515N		24 VDC	125 mA			81 %
TEN 3-0521N		+5 VDC	250 mA	–5 VDC	250 mA	80 %
TEN 3-0522N		+12 VDC	125 mA	–12 VDC	125 mA	82 %
TEN 3-0523N		+15 VDC	100 mA	–15 VDC	100 mA	82 %
TEN 3-1210N	9 - 18 VDC (12 VDC nom.)	3.3 VDC	750 mA			79 %
TEN 3-1211N		5 VDC	600 mA			81 %
TEN 3-1212N		12 VDC	250 mA			85 %
TEN 3-1213N		15 VDC	200 mA			85 %
TEN 3-1215N		24 VDC	125 mA			84 %
TEN 3-1221N		+5 VDC	250 mA	–5 VDC	250 mA	80 %
TEN 3-1222N		+12 VDC	125 mA	–12 VDC	125 mA	84 %
TEN 3-1223N		+15 VDC	100 mA	–15 VDC	100 mA	84 %
TEN 3-2410N	18 - 36 VDC (24 VDC nom.)	3.3 VDC	750 mA			79 %
TEN 3-2411N		5 VDC	600 mA			81 %
TEN 3-2412N		12 VDC	250 mA			85 %
TEN 3-2413N		15 VDC	200 mA			85 %
TEN 3-2415N		24 VDC	125 mA			84 %
TEN 3-2421N		+5 VDC	250 mA	–5 VDC	250 mA	80 %
TEN 3-2422N		+12 VDC	125 mA	–12 VDC	125 mA	84 %
TEN 3-2423N		+15 VDC	100 mA	–15 VDC	100 mA	84 %
TEN 3-4810N	36 - 75 VDC (48 VDC nom.)	3.3 VDC	750 mA			79 %
TEN 3-4811N		5 VDC	600 mA			81 %
TEN 3-4812N		12 VDC	250 mA			85 %
TEN 3-4813N		15 VDC	200 mA			85 %
TEN 3-4815N		24 VDC	125 mA			84 %
TEN 3-4821N		+5 VDC	250 mA	–5 VDC	250 mA	80 %
TEN 3-4822N		+12 VDC	125 mA	–12 VDC	125 mA	84 %
TEN 3-4823N		+15 VDC	100 mA	–15 VDC	100 mA	84 %

Options

Suffix -HI	- 5 Vin models (except 3.3 Vout) with high iso. (3000 VDC), other Vin: www.tracopower.com/overview/ten3win

Input Specifications

Input Current	- At no load	5 Vin models:	65 mA typ.
		12 Vin models:	35 mA typ.
		24 Vin models:	20 mA typ.
		48 Vin models:	15 mA typ.
	- At full load	5 Vin models:	700 mA typ.
		12 Vin models:	300 mA typ.
		24 Vin models:	150 mA typ.
		48 Vin models:	75 mA typ.
Surge Voltage		5 Vin models:	11 VDC max. (1 s max.)
		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		5 Vin models:	4 VDC max.
		12 Vin models:	8.5 VDC max.
		24 Vin models:	17.5 VDC max.
		48 Vin models:	35.5 VDC max.
Reflected Ripple Current		5 Vin models:	100 mAp-p typ.
		12 Vin models:	30 mAp-p typ.
		24 Vin models:	15 mAp-p typ.
		48 Vin models:	10 mAp-p typ.
Recommended Input Fuse			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type
Short Circuit Input Power			2 W max.

Output Specifications

Voltage Set Accuracy			±2% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	1% max.
		dual output models:	1% 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.
Ripple and Noise	- 20 MHz Bandwidth		70 mVp-p max.
Capacitive Load	- single output	3.3 Vout models:	680 µF max.
		5 Vout models:	470 µF max.
		12 Vout models:	330 µF max.
		15 Vout models:	220 µF max.
		24 Vout models:	100 µF max.
	- dual output	5 / -5 Vout models:	220 / 220 µF max.
		12 / -12 Vout models:	150 / 150 µF max.
		15 / -15 Vout models:	100 / 100 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Short Circuit Protection			Continuous, Automatic recovery
Overload Protection			Foldback Mode
Output Current Limitation			120% min. of Iout max.
			150% typ. of Iout max.
Transient Response	- Response Deviation		3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time		300 µs typ. / 500 µs max. (75% to 100% Load Step)

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

Safety Specifications

Safety Standards	- IT / Multimedia Equipment	CSA-C22.2, No. 60950-1 EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	www.tracopower.com/overview/ten3n
Pollution Degree		PD 3
Over Voltage Category		Not mains connected

EMC Specifications

EMI Emissions	- Conducted Emissions		EN 55032 class A (internal filter)
	- Radiated Emissions		EN 55032 class A (internal filter)
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, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge		EN 61000-4-4, ±2 kV, perf. criteria A
			EN 61000-4-5, ±1 kV, perf. criteria A
		Ext. input component:	200 µF, 100 V, ESR 48 mΩ
	- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +85°C
	- Case Temperature		+100°C max.
	- Storage Temperature		–55°C to +125°C
Power Derating	- High Temperature		3.3 %/K above 70°C
		See application note:	www.tracopower.com/overview/ten3n
Cooling System			Natural convection (20 LFM)
Altitude During Operation			6'000 m max.
Switching Frequency			80 kHz min. (PFM)
Insulation System			Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s		1'500 VDC (Standard models) 3'000 VDC (Suffix -HI)
	- 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		300 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)
Potting Material			Epoxy (UL 94 V-0 rated)
Pin Material			Copper Alloy (C6801)
Pin Foundation Plating			Nickel (2.5 µm min.)
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			Wave Soldering 260°C / 10 s max.
Weight			12.8 g

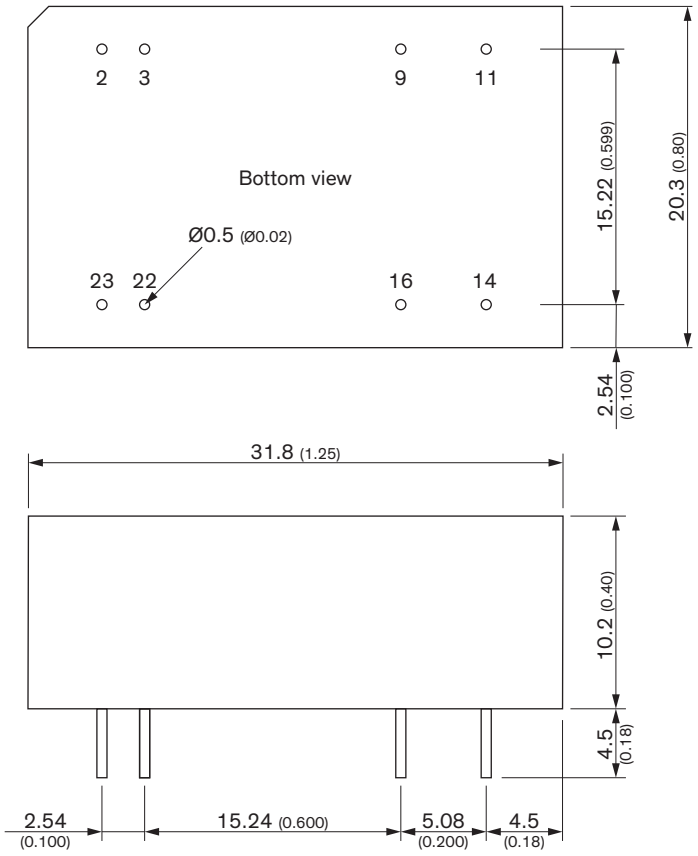
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

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 (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.)

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/ten3n

Outline Dimensions



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

NC: Not connected

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

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