

- 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 $+85^{\circ}\text{C}$
- 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



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 $+85^{\circ}\text{C}$ 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 typ.
		Vnom	I _{max}	Vnom	I _{max}	
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
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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 mA_{p-p} typ. 12 Vin models: 30 mA_{p-p} typ. 24 Vin models: 15 mA_{p-p} typ. 48 Vin models: 10 mA_{p-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 (V _{min} - V _{max})	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 mV_{p-p} max.
Capacitive Load	- single output	3.3 V _{out} models: 680 μF max. 5 V _{out} models: 470 μF max. 12 V _{out} models: 330 μF max. 15 V _{out} models: 220 μF max. 24 V _{out} models: 100 μF max.
	- dual output	5 / -5 V _{out} models: 220 / 220 μF max. 12 / -12 V _{out} models: 150 / 150 μF max. 15 / -15 V _{out} 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 I_{out} max.
		150% typ. of I_{out} 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 - Radiated Emissions	EN 55032 class A (internal filter) EN 55032 class A (internal filter)
EMS Immunity	- Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances	EN 55024 (IT Equipment) Air: EN 61000-4-2, ± 8 kV, perf. criteria A Contact: EN 61000-4-2, ± 6 kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, ± 2 kV, perf. criteria A EN 61000-4-5, ± 1 kV, perf. criteria A Ext. input component: 200 μ F, 100 V, ESR 48 m Ω EN 61000-4-6, 10 V _{rms} , perf. criteria A

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C +100°C max. -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 - Input to Output, 1 s	1'500 VDC (Standard models) 3'000 VDC (Suffix -HI) 1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω 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		Allowed (hermetical product) See 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 μ m 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

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

www.tracopower.com/info/rohs-declaration.pdf

Exemptions: 7a

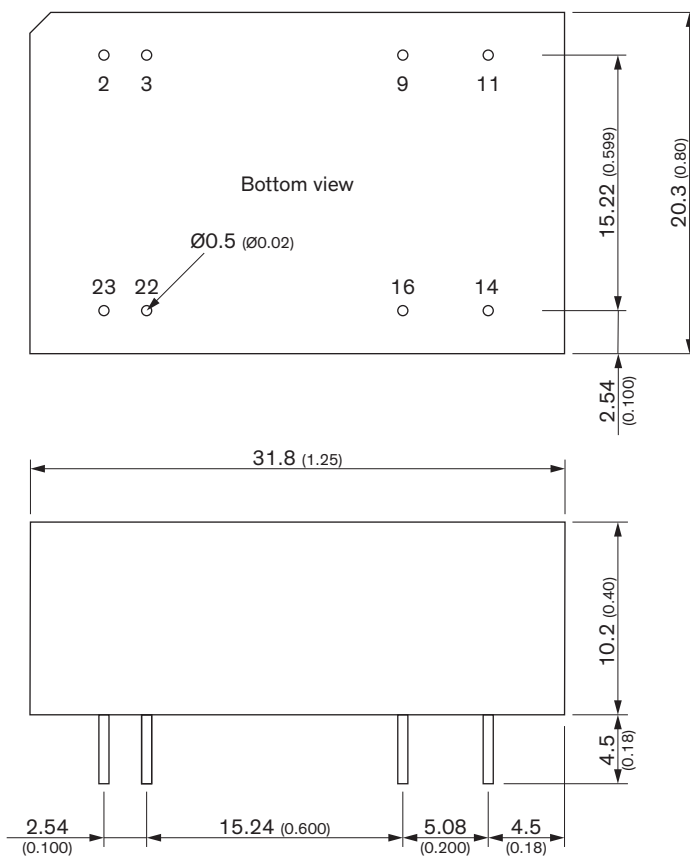
(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).
The SCIP number is provided on request.)

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)