

- 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 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

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

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 μ F, 100 V, ESR 48 m Ω
	- 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 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		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 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		Lead-Free Wave Soldering 260°C / 10 s max.

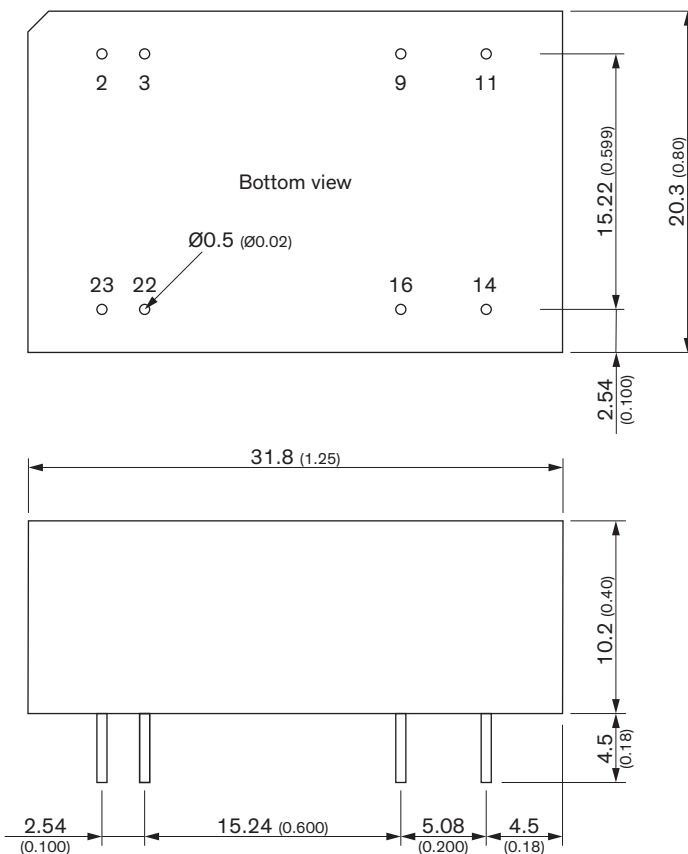
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Weight	12.8 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: 7(a) (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) - SCIP Reference Number dabea3dc-e870-4d0b-8ad2-5c658ef22c35

Additional Information

Supporting Documents	www.tracopower.com/overview/ten3n
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

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 $x.x \pm 0.5$ ($x.xx \pm 0.02$)

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

Pin tolerances: $x.x \pm 0.05$ ($x.xx \pm 0.002$)