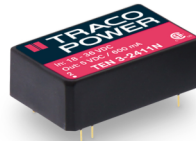


- Wide 2:1 input range
- Input filter to meet EN 55032, class A and FCC, level A without external components
- Extended operating temperature range  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Models with 1'500 VDC and 3'000 VDC I/O isolation (functional insulation)
- High reliability, MTBF >1.0 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  $-40^{\circ}\text{C}$  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 <sub>max</sub>	Vnom	I <sub>max</sub>	
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](http://www.tracopower.com/overview/ten3win)

## Input Specifications

Input Current	- At no load	5 Vin models: <b>65 mA typ.</b> 12 Vin models: <b>35 mA typ.</b> 24 Vin models: <b>20 mA typ.</b> 48 Vin models: <b>15 mA typ.</b>
	- At full load	5 Vin models: <b>700 mA typ.</b> 12 Vin models: <b>300 mA typ.</b> 24 Vin models: <b>150 mA typ.</b> 48 Vin models: <b>75 mA typ.</b>
Surge Voltage		5 Vin models: <b>11 VDC max.</b> (1 s max.) 12 Vin models: <b>25 VDC max.</b> (1 s max.) 24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.)
Under Voltage Lockout		5 Vin models: <b>4 VDC max.</b> 12 Vin models: <b>8.5 VDC max.</b> 24 Vin models: <b>17.5 VDC max.</b> 48 Vin models: <b>35.5 VDC max.</b>
Reflected Ripple Current		5 Vin models: <b>100 mAp-p typ.</b> 12 Vin models: <b>30 mAp-p typ.</b> 24 Vin models: <b>15 mAp-p typ.</b> 48 Vin models: <b>10 mAp-p typ.</b>
Recommended Input Fuse		(The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Pi-Type</b>
Short Circuit Input Power		<b>2 W max.</b>

## Output Specifications

Voltage Set Accuracy		<b>±2% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>1% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: <b>2% max.</b>
Ripple and Noise	- 20 MHz Bandwidth	<b>70 mVp-p max.</b>
Capacitive Load	- single output	3.3 Vout models: <b>680 µF max.</b> 5 Vout models: <b>470 µF max.</b> 12 Vout models: <b>330 µF max.</b> 15 Vout models: <b>220 µF max.</b> 24 Vout models: <b>100 µF max.</b>
	- dual output	5 / -5 Vout models: <b>220 / 220 µF max.</b> 12 / -12 Vout models: <b>150 / 150 µF max.</b> 15 / -15 Vout models: <b>100 / 100 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Overload Protection		<b>Foldback Mode</b>
Output Current Limitation		<b>120% min. of Iout max.</b> <b>150% typ. of Iout max.</b>
Transient Response	- Response Deviation	<b>3% typ. / 5% max.</b> (75% to 100% Load Step)
	- Response Time	<b>300 µs typ. / 500 µs max.</b> (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	<a href="http://www.tracopower.com/ten3n-safety-cert">www.tracopower.com/ten3n-safety-cert</a>
Energy Source	- Output, acc. to 62368-1	ES1
Power Source	- Output, acc. to 62368-1	PS3
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, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 1$ kV, perf. criteria A
		Ext. input component: 200 $\mu$ F, 100 V, ESR 48 m $\Omega$
	- 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: <a href="http://www.tracopower.com/ten3n-cc">www.tracopower.com/ten3n-cc</a>
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 $\Omega$ 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 <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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 $\mu$ 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

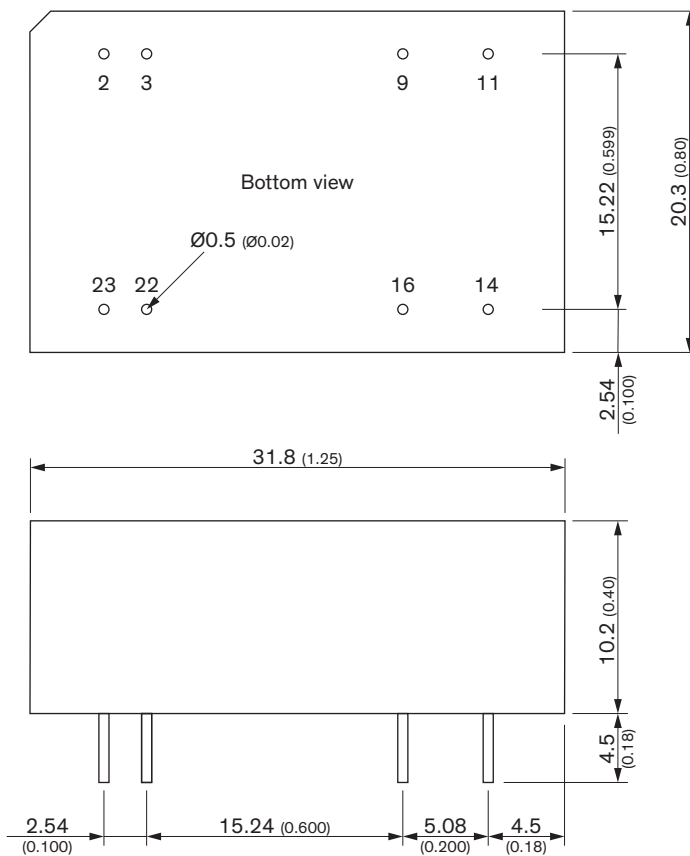
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Soldering Profile	Lead-Free Wave Soldering 260°C / 10 s max.
Weight	12.8 g
Environmental Compliance	- REACH Declaration <a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant - RoHS Declaration <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> 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	<a href="http://www.tracopower.com/overview/ten3n">www.tracopower.com/overview/ten3n</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

### 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)

