DC/DC Converters

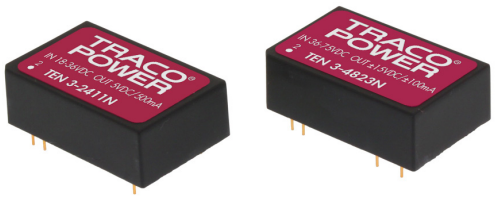
TEN 3N Series, 3 Watt

Features

- Wide 2 : 1 input range
- Input filter to meet EN 55022, 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)
- DIP-24 package
- High reliability, MTBF >1.0 Mio. h
- 3-year product warranty

CB Scheme c SA us

UL 60950-1



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 EN55022 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

1500 VDC Ordercode	3000 VDC Ordercode	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEN 3-0510N	TEN 3-0510NHI	4.5 – 9.0 VDC (nominal 5 VDC)	3.3 VDC	750 mA	77 %
TEN 3-0511N	TEN 3-0511NHI		5.0 VDC	600 mA	80 %
TEN 3-0512N	TEN 3-0512NHI		12 VDC	250 mA	82 %
TEN 3-0513N	TEN 3-0513NHI		15 VDC	200 mA	82 %
TEN 3-0515N	TEN 3-0515NHI		24 VDC	125 mA	81 %
TEN 3-0521N	TEN 3-0521NHI		±5.0 VDC	±250 mA	80 %
TEN 3-0522N	TEN 3-0522NHI		±12 VDC	±125 mA	82 %
TEN 3-0523N	TEN 3-0523NHI		±15 VDC	±100 mA	82 %
TEN 3-1210N	TEN 3-1210NHI	9 – 18 VDC (nominal 12 VDC)	3.3 VDC	750 mA	79 %
TEN 3-1211N	TEN 3-1211NHI		5.0 VDC	600 mA	81 %
TEN 3-1212N	TEN 3-1212NHI		12 VDC	250 mA	85 %
TEN 3-1213N	TEN 3-1213NHI		15 VDC	200 mA	85 %
TEN 3-1215N	TEN 3-1215NHI		24 VDC	125 mA	84 %
TEN 3-1221N	TEN 3-1221NHI		±5.0 VDC	±250 mA	80 %
TEN 3-1222N	TEN 3-1222NHI		±12 VDC	±125 mA	84 %
TEN 3-1223N	TEN 3-1223NHI		±15 VDC	±100 mA	84 %
TEN 3-2410N	TEN 3-2410NHI	18 – 36 VDC (nominal 24 VDC)	3.3 VDC	750 mA	79 %
TEN 3-2411N	TEN 3-2411NHI		5.0 VDC	600 mA	81 %
TEN 3-2412N	TEN 3-2412NHI		12 VDC	250 mA	85 %
TEN 3-2413N	TEN 3-2413NHI		15 VDC	200 mA	85 %
TEN 3-2415N	TEN 3-2415NHI		24 VDC	125 mA	84 %
TEN 3-2421N	TEN 3-2421NHI		±5.0 VDC	±250 mA	80 %
TEN 3-2422N	TEN 3-2422NHI		±12 VDC	±125 mA	84 %
TEN 3-2423N	TEN 3-2423NHI		±15 VDC	±100 mA	84 %
TEN 3-4810N	TEN 3-4810NHI	36 – 75 VDC (nominal 48 VDC)	3.3 VDC	750 mA	79 %
TEN 3-4811N	TEN 3-4811NHI		5.0 VDC	600 mA	81 %
TEN 3-4812N	TEN 3-4812NHI		12 VDC	250 mA	85 %
TEN 3-4813N	TEN 3-4813NHI		15 VDC	200 mA	85 %
TEN 3-4815N	TEN 3-4815NHI		24 VDC	125 mA	84 %
TEN 3-4821N	TEN 3-4821NHI		±5.0 VDC	±250 mA	80 %
TEN 3-4822N	TEN 3-4822NHI		±12 VDC	±125 mA	84 %
TEN 3-4823N	TEN 3-4823NHI		±15 VDC	±100 mA	84 %

Input Specifications

Input current 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.
Start-up voltage	5 Vin models:	4.5 VDC (or lower)
	12 Vin models:	9 VDC (or lower)
	24 Vin models:	18 VDC (or lower)
	48 Vin models:	36 VDC (or lower)
Under voltage shut down (lock-out circuit)	5 Vin models:	4.0 VDC max.
	12 Vin models:	8.5 VDC max.
	24 Vin models:	17.5 VDC max.
	48 Vin models:	35.5 VDC max.
Surge voltage (1 sec. max.)	5 Vin models	11 V max.
	12 Vin models	25 V max.
	24 Vin models	50 V max.
	48 Vin models	100 V max.
Reflected ripple current	5 Vin models	100 mA typ
	12 Vin models	30 mA typ.
	24 Vin models	15 mA typ.
	48 Vin models	10 mA typ.
Conducted noise		EN 55022 class A without external components
ESD (electrostatic discharge)		EN 61000-4-2, air ±8 kV, contact ±6 kV, perf. criteria A
Radiated immunity		EN 61000-4-3, 10 V/m, perf. criteria A
Fast transient / surge (with external input capacitor)		EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV perf. criteria A
– external input capacitor		Nippon chemi-con KY 220 µF, 100 V, ESR 48 mOhm
Conducted immunity		EN 61000-4-6, 10 Vrms, perf. criteria A
Short circuit input power		2000 mW max.
Internal power dissipation		1200 mW max.

Output Specifications

Voltage set accuracy		±2 % max.
Regulation	– Input variation Vin min. to Vin max.	1.0 % max.
	– Load variation 0 – 100 %	
	single output models	1.0 % max.
	dual output models balanced load	2.0 % max.
Minimum load		not required
Ripple and noise (20 MHz bandwidth)		70 mVpk-pk max
Transient response time (25% load step change)		500 µs max.
Transient response deviation (25% load step change)		±5 % max.
Temperature coefficient		±0.02 %/K
Current limitation		>120 % of Iout max., constant current
Short circuit protection		continuous

Output Specifications (continued)

Capacitive load	3.3 VDC models:	680 µF max.
	5.0 VDC models:	470 µF max.
	12 VDC models:	330 µF max.
	15 VDC models:	220 µF max.
	24 VDC models:	100 µF max.
	±5.0 VDC models:	220 µF max (each output)
	±12 VDC models:	150 µF max. (each output)
	±15 VDC models:	100 µF max. (each output)

General Specifications

Temperature ranges	– Operating (natural convection cooling 20 LFM)	–40°C to +85°C
	– Case temperature	+100°C max.
	– Storage	–55°C to +125°C
Derating		3.3 %/K above 70°C
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217 F, at +25°C, ground benign)		>1 Mio. h
Isolation voltage (60 sec.)	– Input/Output	1'500 VDC or 3'000 VDC
Isolation capacitance	– Input/Output	300 pF max.
Isolation resistance	– Input/Output (500 VDC)	>1'000 M Ohm
Switching frequency		90 kHz min. (pulse frequency modulation PFM)
Safety standards		cUL/UL 60950-1, IEC/EN 60950-1
Safety approval		CSA file no. 226037 http://directories.csa-international.org
Environmental compliance	– Reach	www.tracopower.com/products/reach-declaration.pdf
	– RoHS	RoHS directive 2011/65/EU

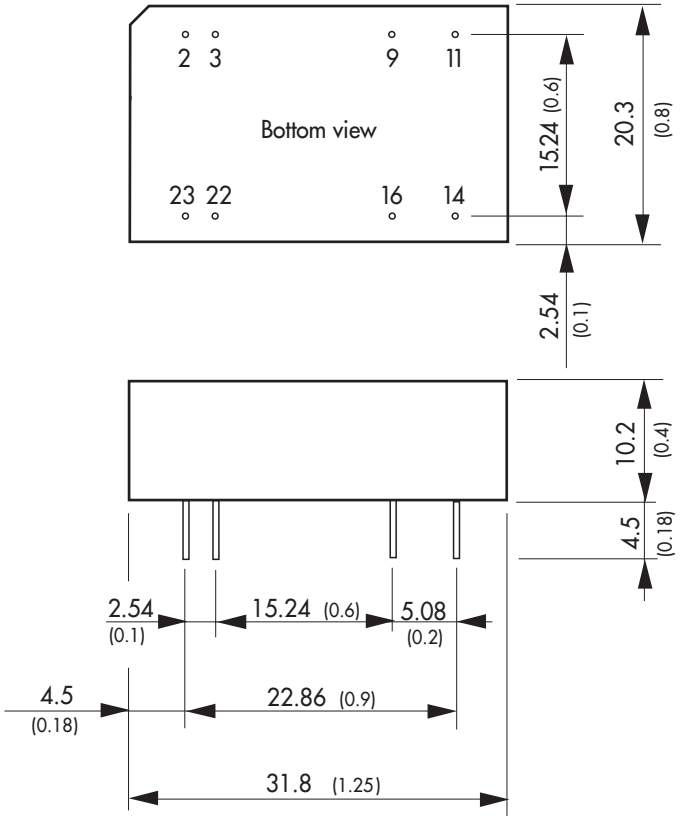
Application note: www.tracopower.com/products/ten3n-application.pdf

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

Physical Specifications

Casing material	non conductive FR4
Potting material	epoxy (UL 94V-0 rated)
Pin material	copper alloy with gold plated subplate
Weight	12.8 g (0.45oz)
Soldering temperature	max. 260°C / 10 sec.

Outline Dimensions



Dimensions in [mm], () = Inch
Pin diameter ⌀ 0.5 ±0.05 (0.02 ±0.002)
Tolerances ±0.5 (±0.02)
Pin pich tolerances ±0.25 (±0.01)

Pin-Out

Pin	Single	Dual
2	–Vin (GND)	–Vin (GND)
3	–Vin (GND)	–Vin (GND)
9	No pin	Common
11	ntc	–Vout
14	+Vout	+Vout
16	–Vout	Common
22	+Vin (Vcc)	+Vin (Vcc)
23	+Vin (Vcc)	+Vin (Vcc)

ntc = not to connect