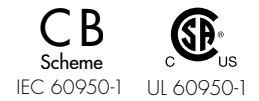
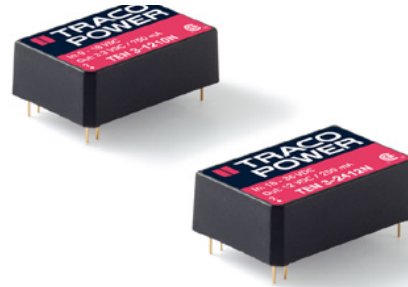


Features

- ◆ 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 $+85^{\circ}\text{C}$
- ◆ 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 EN55022 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 DIP-24 package.

Models						
1500 VDC	Ordercode	3000 VDC	Input voltage range	Output voltage	Output current max.	Efficiency typ.
TEN 3-0510N			4.5 – 9.0 VDC (nominal 5 VDC)	3.3 VDC	750 mA	77 %
TEN 3-0511N	TEN 3-0511N-HI			5.0 VDC	600 mA	80 %
TEN 3-0512N	TEN 3-0512N-HI			12 VDC	250 mA	82 %
TEN 3-0513N	TEN 3-0513N-HI			15 VDC	200 mA	82 %
TEN 3-0515N	TEN 3-0515N-HI			24 VDC	125 mA	81 %
TEN 3-0521N	TEN 3-0521N-HI			± 5.0 VDC	± 250 mA	80 %
TEN 3-0522N	TEN 3-0522N-HI			± 12 VDC	± 125 mA	82 %
TEN 3-0523N	TEN 3-0523N-HI			± 15 VDC	± 100 mA	82 %
TEN 3-1210N				9 – 18 VDC (nominal 12 VDC)	3.3 VDC	750 mA
TEN 3-1211N			5.0 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			± 5.0 VDC		± 250 mA	80 %
TEN 3-1222N			± 12 VDC		± 125 mA	84 %
TEN 3-1223N			± 15 VDC		± 100 mA	84 %
TEN 3-2410N	Models with high isolation available from TEN 3WIN series:		18 – 36 VDC (nominal 24 VDC)	3.3 VDC	750 mA	79 %
TEN 3-2411N				5.0 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				± 5.0 VDC	± 250 mA	80 %
TEN 3-2422N				± 12 VDC	± 125 mA	84 %
TEN 3-2423N				± 15 VDC	± 100 mA	84 %
TEN 3-4810N			36 – 75 VDC (nominal 48 VDC)	3.3 VDC	750 mA	79 %
TEN 3-4811N		5.0 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		± 5.0 VDC		± 250 mA	80 %	
TEN 3-4822N		± 12 VDC		± 125 mA	84 %	
TEN 3-4823N		± 15 VDC		± 100 mA	84 %	

Input Specifications

Input current no load	5 Vin models 12 Vin models 24 Vin models 48 Vin models	65 mA typ. 35 mA typ. 20 mA typ. 15 mA typ.
Start-up voltage	5 Vin models: 12 Vin models: 24 Vin models: 48 Vin models:	4.5 VDC (or lower) 9 VDC (or lower) 18 VDC (or lower) 36 VDC (or lower)
Under voltage shut down (lock-out circuit)	5 Vin models: 12 Vin models: 24 Vin models: 48 Vin models:	4.0 VDC max. 8.5 VDC max. 17.5 VDC max. 35.5 VDC max.
Surge voltage (1 sec. max.)	5 Vin models 12 Vin models 24 Vin models 48 Vin models	11 V max. 25 V max. 50 V max. 100 V max.
Reflected ripple current	5 Vin models 12 Vin models 24 Vin models 48 Vin models	100 mA typ. 30 mA typ. 15 mA typ. 10 mA typ.
Conducted noise		EN 55022 class A without external components
EMC immunity	<ul style="list-style-type: none"> - ESD (electrostatic discharge) - Radiated immunity - Fast transient / surge - Conducted immunity 	EN 55024 EN 61000-4-2, air ± 8 kV, contact ± 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 200 μ F, 100 V, ESR 48 m Ω 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	<ul style="list-style-type: none"> - Input variation Vin min. to Vin max. - Load variation 0 – 100 % 	1.0 % max. 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 μ s 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, automatic recovery

Output Specifications (continued)

Capacitive load	3.3 VDC models:	680 μ F max.
	5.0 VDC models:	470 μ F max.
	12 VDC models:	330 μ F max.
	15 VDC models:	220 μ F max.
	24 VDC models:	100 μ F max.
	\pm 5.0 VDC models:	220 μ F max (each output)
	\pm 12 VDC models:	150 μ F max. (each output)
	\pm 15 VDC models:	100 μ F max. (each output)

General Specifications

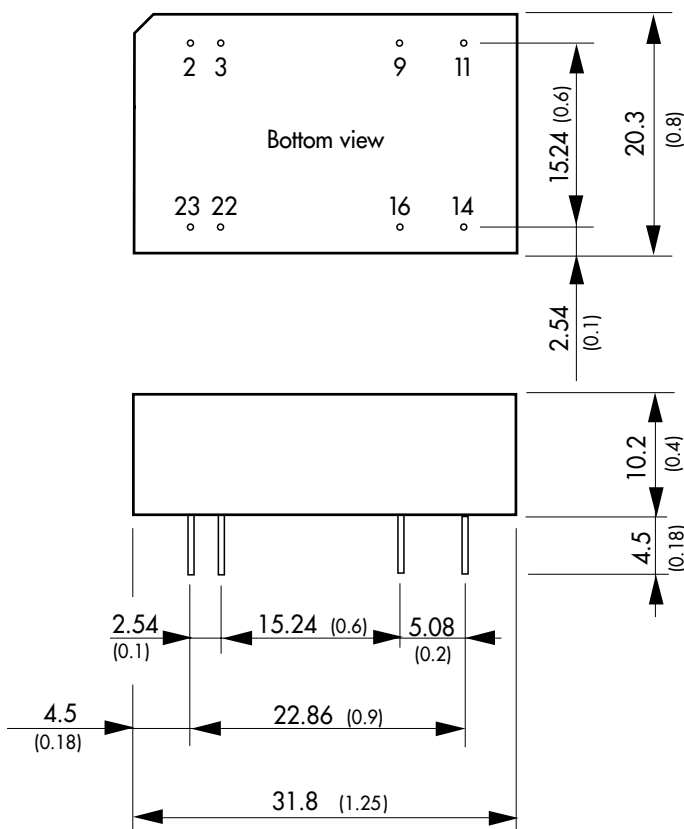
Temperature ranges	– Operating (natural convection cooling 20 LFM)	–40°C to +85°C
	– Case temperature	+100°C max.
	– Storage	–55°C to +125°C
Derating		3.3 %/K above 70°C
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217 F, at +25°C, ground benign)		>1 Mio. h
Isolation 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 approvals	– CSA certificate of compliance	CAN/CSA-C22.2 No 60950-1-07, Am 1:2011
	– CB test certificate	ANSI/UL Std No 60950-1, 2nd Ed, AM 1:2011
	– Certification documents	IEC 60950-1:2005 2nd Ed, Am 1:2009
Environmental compliance	– Reach	
	– RoHS	RoHS directive 2011/65/EU

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 $\varnothing 0.5 \pm 0.05$ (0.02 \pm 0.002)
 Tolerances ± 0.5 (± 0.02)
 Pin pitch 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