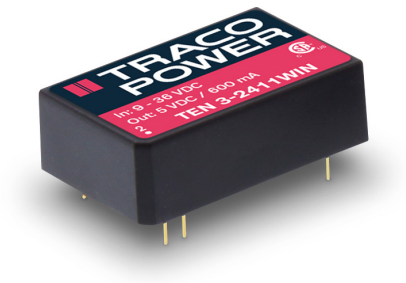
DC/DC Converters

TEN 3WIN Series, 3 Watt

CB Scheme
IEC 60950-1 UL 60950-1
IEC 62368-1 UL 62368-1

Features

- Ultra wide 4 : 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)
- DIP-24 package
- High reliability, MTBF >1.0 Mio. h
- 3-year product warranty



The TEN 3WIN Series is a drop in replacement of the prevalent TEN 3WI 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

Ordercode		Input voltage range	Output voltage	Output current max.	Efficiency max.
1500 VDC isolation	3000 VDC isolation				
TEN 3-2410WIN	-	9.0 – 36 VDC (nominal 24 VDC)	3.3 VDC	750 mA	77 %
TEN 3-2411WIN	TEN 3-2411WIN-HI		5.0 VDC	600 mA	79 %
TEN 3-2412WIN	TEN 3-2412WIN-HI		12 VDC	250 mA	82 %
TEN 3-2413WIN	TEN 3-2413WIN-HI		15 VDC	200 mA	83 %
TEN 3-2415WIN	TEN 3-2415WIN-HI		24 VDC	125 mA	81 %
TEN 3-2421WIN	TEN 3-2421WIN-HI		±5.0 VDC	±250 mA	80 %
TEN 3-2422WIN	TEN 3-2422WIN-HI		±12 VDC	±125 mA	82 %
TEN 3-2423WIN	TEN 3-2423WIN-HI		±15 VDC	±100 mA	82 %
TEN 3-4810WIN	-	18 – 75 VDC (nominal 48 VDC)	3.3 VDC	750 mA	77 %
TEN 3-4811WIN	TEN 3-4811WIN-HI		5 VDC	600 mA	80 %
TEN 3-4812WIN	TEN 3-4812WIN-HI		12 VDC	250 mA	83 %
TEN 3-4813WIN	TEN 3-4813WIN-HI		15 VDC	200 mA	84 %
TEN 3-4815WIN	TEN 3-4815WIN-HI		24 VDC	125 mA	82 %
TEN 3-4821WIN	TEN 3-4821WIN-HI		±5.0 VDC	±250 mA	80 %
TEN 3-4822WIN	TEN 3-4822WIN-HI		±12 VDC	±125 mA	82 %
TEN 3-4823WIN	TEN 3-4823WIN-HI		±15 VDC	±100 mA	82 %

Input Specifications

Input current no load	24 Vin models 48 Vin models	30 mA typ. 20 mA typ.
Start-up voltage	24 Vin models: 48 Vin models:	9.0 VDC (or lower) 18 VDC (or lower)
Under voltage shut down (lock-out circuit)	24 Vin models: 48 Vin models:	8.5 VDC max. 17.5 VDC max.
Surge voltage (1 s max.)	24 Vin models 48 Vin models	50 V max. 100 V max.
Reflected ripple current	24 Vin models 48 Vin models	15 mA typ 10 mA typ.
EMC emissions		EN 55032 class A (without external components)
EMC immunity		EN 55024
– 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		EN 61000-4-4, ±2 kV, perf. criteria A
		EN 61000-4-5, ±1 kV, perf. criteria A
	– External input capacitor	200 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	2.0 % max. (balanced load)
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, automatic recovery

Output Specifications (continued)

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

General Specifications

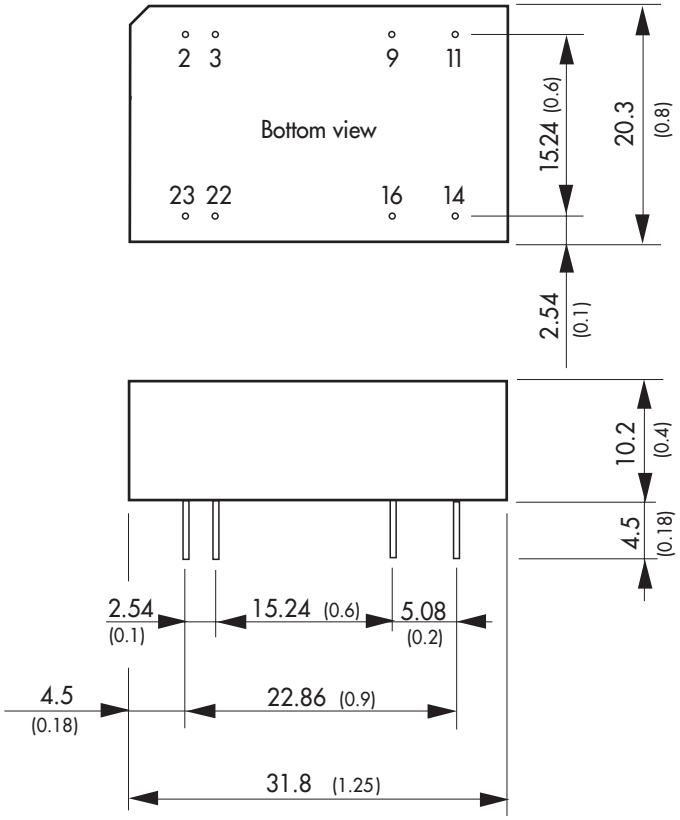
Temperature ranges	– Operating (natural convection cooling 20 LFM)	–40°C to +85°C
	– Case temperature	+100°C max.
	– Storage	–55°C to +125°C
Derating		3.3 %/K above 70°C
Humidity (non condensing)		95 % rel H max.
Reliability, calculated MTBF (MIL-HDBK-217 F, at +25°C, ground benign)		>1 Mio. h
Isolation voltage (60 s)	– 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
Altitude during operation		6'000 m max.
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 ANSI/UL Std No 60950-1, 2nd Ed, AM 1:2011
	– CB test certificate	IEC 60950-1:2005 2nd Ed, Am 1:2009 IEC/EN 62368-1, UL 62368-1
	– Certification documents	www.tracopower.com/overview/ten3win
Environmental compliance	– Reach	www.tracopower.com/info/reach-declaration.pdf
	– 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-conducting Plastic (UL 94V-0 rated)
Potting material	epoxy (UL 94V-0 rated)
Pin material	copper alloy with gold plated subplate
Weight	12.8 g (0.45 oz)
Soldering temperature	260°C / 10 s max.

Outline Dimensions



Dimensions in [mm], () = Inch
Pin diameter ø 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