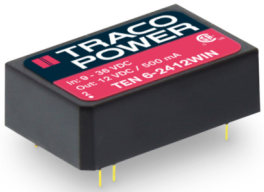
TRACO POWER

DC/DC Converter

TEN 6WIN Series, 6 Watt

- **Wide 4:1 input voltage range**
- **High efficiency**
- **Operating temperature range –40°C to +85°C**
- **Models with 1'500 VDC and 3'000 VDC I/O isolation (functional insulation)**
- **Input filter meets EN 55022, class A**
- **Overload protection**
- **DIP-24 plastic package**
- **Industry standard pinout**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 6WIN series is designed for an optimized cost/performance ratio of DC/DC converters with output power of 6 Watt.
General features like no minimum load requirement, overload protection, internal filter for EN55022 class A and high efficiency make these converters easy to design in. With the popular DIP-24 standard package they are also a drop in replacement for many cost critical applications.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	Imax	Vnom	Imax	
TEN 6-2410WIN	9 - 36 VDC (24 VDC nom.)	3.3 VDC	1'200 mA			77 %
TEN 6-2411WIN		5 VDC	1'200 mA			80 %
TEN 6-2412WIN		12 VDC	500 mA			84 %
TEN 6-2413WIN		15 VDC	400 mA			84 %
TEN 6-2415WIN		24 VDC	250 mA			84 %
TEN 6-2421WIN		+5 VDC	500 mA	–5 VDC	500 mA	80 %
TEN 6-2422WIN		+12 VDC	250 mA	–12 VDC	250 mA	84 %
TEN 6-2423WIN		+15 VDC	200 mA	–15 VDC	200 mA	84 %
TEN 6-4810WIN	18 - 75 VDC (48 VDC nom.)	3.3 VDC	1'200 mA			77 %
TEN 6-4811WIN		5 VDC	1'200 mA			80 %
TEN 6-4812WIN		12 VDC	500 mA			84 %
TEN 6-4813WIN		15 VDC	400 mA			84 %
TEN 6-4815WIN		24 VDC	250 mA			84 %
TEN 6-4821WIN		+5 VDC	500 mA	–5 VDC	500 mA	80 %
TEN 6-4822WIN		+12 VDC	250 mA	–12 VDC	250 mA	84 %
TEN 6-4823WIN		+15 VDC	200 mA	–15 VDC	200 mA	84 %

Options

Suffix -HI	- Optional models with high isolation (3000 VDC)

Input Specifications

Input Current	- At no load	24 Vin models:	20 mA typ.
		48 Vin models:	10 mA typ.
	- At full load	24 Vin models:	215 mA max. (3.3 Vout model)
			300 mA max. (5 Vout model)
			300 mA max. (12 Vout model)
			300 mA max. (15 Vout model)
			300 mA max. (24 Vout model)
			260 mA max. (5 / -5 Vout model)
			300 mA max. (12 / -12 Vout model)
			300 mA max. (15 / -15 Vout model)
		48 Vin models:	110 mA max. (3.3 Vout model)
			150 mA max. (5 Vout model)
			150 mA max. (12 Vout model)
			150 mA max. (15 Vout model)
			150 mA max. (24 Vout model)
			130 mA max. (5 / -5 Vout model)
			150 mA max. (12 / -12 Vout model)
			150 mA max. (15 / -15 Vout model)
Surge Voltage		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
Start-up Voltage		24 Vin models:	7 VDC min. / 8 VDC typ. / 9 VDC max.
		48 Vin models:	14 VDC min. / 16 VDC typ. / 18 VDC max.
Under Voltage Lockout		24 Vin models:	8.5 VDC max.
		48 Vin models:	16 VDC max.
Reflected Ripple Current		24 Vin models:	20 mA typ.
		48 Vin models:	15 mA typ.
Recommended Input Fuse		24 Vin models:	1'500 mA (slow blow)
		48 Vin models:	800 mA (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Pi-Type
Short Circuit Input Power			3 W max.

Output Specifications

Voltage Set Accuracy			±2% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models:	0.5% max.
		dual output models:	0.5% max.
	- Load Variation (0 - 100%)	single output models:	1.2% max.
		dual output models:	1.2% max. (Output 1)
			1.2% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	2% max.
Ripple and Noise	- 20 MHz Bandwidth		80 mVp-p max.
Capacitive Load	- single output	3.3 Vout models:	470 µF max.
		5 Vout models:	470 µF max.
		12 Vout models:	100 µF max.
		15 Vout models:	100 µF max.
		24 Vout models:	47 µF max.
	- dual output	5 / -5 Vout models:	100 / 100 µF max.
		12 / -12 Vout models:	100 / 100 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

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

Output Current Limitation		110% min. of Iout max. 145% typ. of Iout max.
Transient Response	- Response Deviation	3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time	300 µs typ. / 600 µs max. (75% to 100% Load Step)

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/ten6win
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 (with external filter)
	External filter proposal:	www.tracopower.com/overview/ten6win

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Case Temperature	+100°C max.
	- Storage Temperature	–50°C to +125°C
Power Derating	- High Temperature	2.5 %/K above 60°C (3.3 & 5.0 Vout models) 3.3 %/K above 70°C (other models)
	See application note:	www.tracopower.com/overview/ten6win
Cooling System		Natural convection (20 LFM)
Altitude During Operation		6'000 m max.
Switching Frequency		290 - 370 kHz (PWM) 330 kHz typ. (PWM)
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 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'000 pF typ.
Reliability	- Calculated MTBF	800'000 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 µm 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.

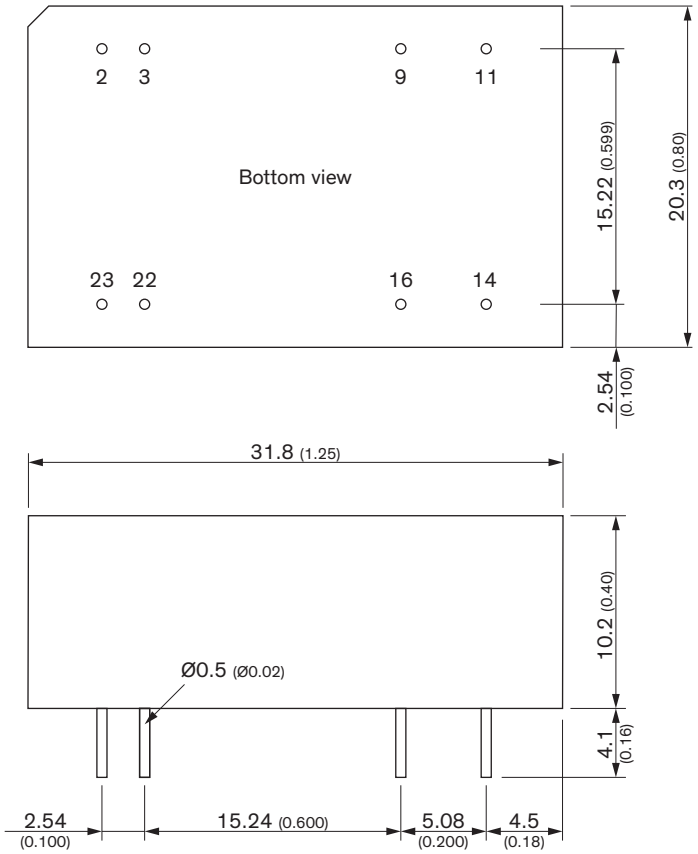
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Weight		12.7 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: 7a
		(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	77b7bf46-53a4-4eaf-b810-bc9e8a874f69

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/ten6win

Outline Dimensions



Dimensions in mm (inch)
Tolerances x.x ±0.25 (x.xx ±0.01)
x.xx ±0.13 (x.xxx ±0.005)
Pin diameter tolerance: x.x ±0.05 (x.xx ±0.002)

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

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