DC/DC Converter

TEN 50WI Series, 50 Watt

- **Very high power density: 50 W in 1” x 2” x 0.4” package**
- **Wide 4:1 input range**
- **Excellent efficiency up to 92 %**
- **Operating temperature range −40°C to +80°C**
- **Protection against over-temperature**
- **Output voltage adjustable**
- **Remote On/Off**
- **I/O isolation 1500 VDC**
- **3-year product warranty**

UL 62368-1 IEC 62368-1

The TEN 50WI Series is a range of isolated high performance DC/DC converter modules. With a very high efficiency of up to 92% and the use of highest reliable components these 50 W converters can be packed into the standard 1.0” x 2.0” casing. The 10 models have a wide 4:1 input voltage range and a tight output voltage regulation. They do not need a minimum load and offer a high efficiency also at low load conditions. The output voltage is adjustable by external resistor. Remote On/Off and protection against overload and short circuit are standard features of these converters. Typical applications are in mobile equipment, instrumentation, distributed power architectures in communication and industrial electronics and everywhere where space on the PCB is critical.

Models

Order Code	Input Voltage Range	Output Voltage nom. (adjustable)	Output Current max.	Efficiency typ.
TEN 50-2410WI	9 - 36 VDC (24 VDC nom.)	3.3 VDC (2.97 - 3.63 VDC)	10'000 mA	90 %
TEN 50-2411WI		5 VDC (4.5 - 5.5 VDC)	10'000 mA	91 %
TEN 50-2412WI		12 VDC (10.8 - 13.2 VDC)	4'170 mA	92 %
TEN 50-2413WI		15 VDC (13.5 - 16.5 VDC)	3'330 mA	92 %
TEN 50-2415WI		24 VDC (21.6 - 28.8 VDC)	2'080 mA	91 %
TEN 50-4810WI	18 - 75 VDC (48 VDC nom.)	3.3 VDC (2.97 - 3.63 VDC)	10'000 mA	90 %
TEN 50-4811WI		5 VDC (4.5 - 5.5 VDC)	10'000 mA	91 %
TEN 50-4812WI		12 VDC (10.8 - 13.2 VDC)	4'170 mA	92 %
TEN 50-4813WI		15 VDC (13.5 - 16.5 VDC)	3'330 mA	92 %
TEN 50-4815WI		24 VDC (21.6 - 28.8 VDC)	2'080 mA	91 %

Options

TEN-HS6	- Optional Heat Sink: www.tracopower.com/overview/ten-hs6

Input Specifications

Input Current	- At no load	24 Vin models:	**80 mA typ.** (3.3 Vout model)
			60 mA typ. (5 Vout model)
			80 mA typ. (12 Vout model)
			80 mA typ. (15 Vout model)
			80 mA typ. (24 Vout model)
		48 Vin models:	**40 mA typ.** (3.3 Vout model)
			30 mA typ. (5 Vout model)
			60 mA typ. (12 Vout model)
			60 mA typ. (15 Vout model)
			50 mA typ. (24 Vout model)
	- At full load	24 Vin models:	**1'528 mA typ.** (3.3 Vout model)
			2'290 mA typ. (5 Vout model)
			2'267 mA typ. (12 Vout model)
			2'263 mA typ. (15 Vout model)
			2'286 mA typ. (24 Vout model)
		48 Vin models:	**764 mA typ.** (3.3 Vout model)
			1'145 mA typ. (5 Vout model)
			1'134 mA typ. (12 Vout model)
			1'134 mA typ. (15 Vout model)
			1'143 mA typ. (24 Vout model)
Surge Voltage		24 Vin models:	**50 VDC max.** (100 ms max.)
		48 Vin models:	**100 VDC max.** (100 ms max.)
Under Voltage Lockout		24 Vin models:	**7.5 VDC typ.**
		48 Vin models:	**16 VDC typ.**
Reflected Ripple Current		24 Vin models:	**40 mAp-p typ.**
		48 Vin models:	**30 mAp-p typ.**
Recommended Input Fuse		24 Vin models:	**10'000 mA** (slow blow)
		48 Vin models:	**5'000 mA** (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal LC-Type

Output Specifications

Output Voltage Adjustment			**−10% to +20%** (24 Vout models)
			±10% (other single models)
			(By external trim resistor)
		See application note:	www.tracopower.com/overview/ten50wi
			Output power must not exceed rated power!
Voltage Set Accuracy			**±1% max.**
Regulation	- Input Variation (Vmin - Vmax)		**0.5% max.**
	- Load Variation (0 - 100%)		**0.5% max.**
Ripple and Noise		3.3 Vout models:	**100 mVp-p max.** (w/ 1 µF MLCC || 10 µF TC)
(20 MHz Bandwidth)		5 Vout models:	**100 mVp-p max.** (w/ 1 µF MLCC || 10 µF TC)
		12 Vout models:	**150 mVp-p max.** (w/ 1 µF MLCC || 10 µF TC)
		15 Vout models:	**150 mVp-p max.** (w/ 1 µF MLCC || 10 µF TC)
		24 Vout models:	**150 mVp-p max.** (w/ 1 µF MLCC || 10 µF TC)
Capacitive Load		3.3 Vout models:	**26'000 µF max.**
		5 Vout models:	**17'000 µF max.**
		12 Vout models:	**3'000 µF max.**
		15 Vout models:	**2'000 µF max.**
		24 Vout models:	**750 µF max.**
Minimum Load			Not required
Temperature Coefficient			**±0.02 %/K max.**
Start-up Time			**30 ms max.** (Power On)
			30 ms max. (Remote On)

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

Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		150% typ. of Iout max.
Transient Response	- Response Deviation	3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time	250 µs typ. (75% to 100% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Certification Documents	www.tracopower.com/overview/ten50wi
Pollution Degree		PD 3
Over Voltage Category		Not mains connected

EMC Specifications

EMI (Emissions)	- Conducted Emissions		EN 55032 class A (with external filter) EN 55032 class B (with external filter) FCC 47 Part 15 class A (with external filter)
	- Radiated Emissions		EN 55032 class A (with external filter) FCC 47 Part 15 class A (with external filter)
		External filter proposal:	www.tracopower.com/overview/ten50wi
EMS (Immunity)			EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air:	EN 61000-4-2, ±8 kV, perf. criteria A
		Contact:	EN 61000-4-2, ±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, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV, perf. criteria A
		External filter proposal:	www.tracopower.com/overview/ten50wi
	- Conducted RF Disturbances		EN 61000-4-6, 10 Vrms, perf. criteria A
EMC / Environmental	- Certification Documents		www.tracopower.com/overview/ten50wi

General Specifications

Relative Humidity			95% max. (non condensing)
Temperature Ranges	- Operating Temperature		–40°C to +80°C –40°C to +85°C (with Heat Sink)
	- Case Temperature		+105°C max.
	- Storage Temperature		–50°C to +125°C
Power Derating	- High Temperature		Depending on model
		See application note:	www.tracopower.com/overview/ten50wi
Over Temperature Protection Switch Off	- Protection Mode		110°C typ.
Cooling System			Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)		On: 3.5 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current		2.5 mA typ.
	- Remote Pin Input Current		-0.5 to 0.5 mA
Altitude During Operation			6'000 m max.
Switching Frequency			285 kHz typ. (PWM)
Insulation System			Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s		1'500 VDC
	- Input to Output, 1 s		1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC		1'000 MΩ min.

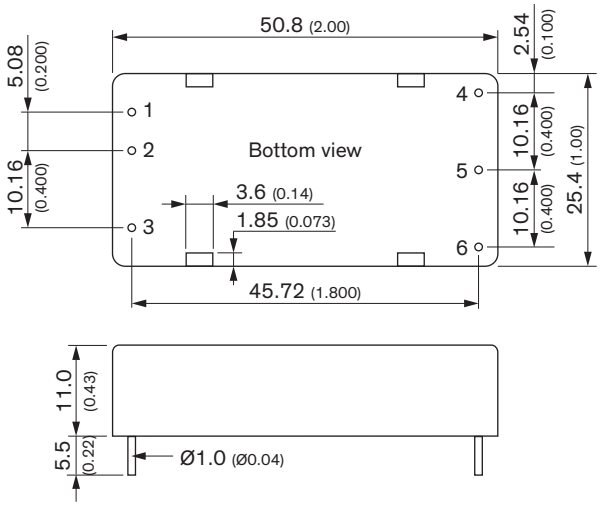
All specifications valid at nominal voltage, resistive full load and +25°C after warm-up time, unless otherwise stated.

Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'200 pF max.
Reliability	- Calculated MTBF	230'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Housing Material		Alu alloy, black anodized coating
Base Material		Non-conductive FR4 (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		Metal Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		2" x 1"
Soldering Profile		Lead-Free Wave Soldering 260°C / 10 s max.
Weight		34 g
Thermal Impedance	- Case to Ambient	12 K/W typ. 10 K/W typ. (with Heat Sink)
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	cb619863-d838-4b4f-a2ec-b819f3151448

Supporting Documents

Overview Link (for additional Documents)	www.tracopower.com/overview/ten50wi

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 tolerances: x.x ±0.05 (x.xx ±0.002)

Pinout	
Pin	**Single**
1	+Vin (Vcc)
2	–Vin (GND)
3	Remote On/Off
4	+Vout
5	–Vout
6	Trim

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