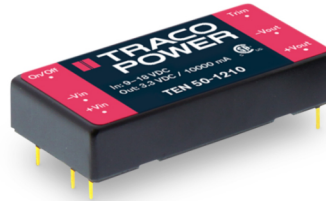


- **Highest power density:**  
50 W in 1" x 2" x 0.4" package
- **Excellent efficiency up to 92 %**
- **Operating temperature range**  
-40°C to +85°C
- **Output voltage adjustable**
- **Remote On/Off**
- **I/O isolation 1500 VDC**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The TEN 50 Series is a range of isolated high performance DC/DC converter modules. Due to the very high efficiency of up to 92% and the use of highest reliable components these 50 W converters come with a footprint of only 1.0" x 2.0". The 12 models have a wide 2:1 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 50-1210	9 - 18 VDC (12 VDC nom.)	3.3 VDC (2.97 - 3.63 VDC)	10'000 mA	89 %
TEN 50-1211		5 VDC (4.5 - 5.5 VDC)	10'000 mA	90 %
TEN 50-1212		12 VDC (10.8 - 13.2 VDC)	4'170 mA	91 %
TEN 50-1213		15 VDC (13.5 - 16.5 VDC)	3'330 mA	91 %
TEN 50-1215		24 VDC (21.6 - 28.8 VDC)	2'080 mA	91 %
TEN 50-2410	18 - 36 VDC (24 VDC nom.)	3.3 VDC (2.97 - 3.63 VDC)	10'000 mA	89 %
TEN 50-2411		5 VDC (4.5 - 5.5 VDC)	10'000 mA	92 %
TEN 50-2412		12 VDC (10.8 - 13.2 VDC)	4'170 mA	92 %
TEN 50-2413		15 VDC (13.5 - 16.5 VDC)	3'330 mA	92 %
TEN 50-2415		24 VDC (21.6 - 28.8 VDC)	2'080 mA	91 %
TEN 50-4810	36 - 75 VDC (48 VDC nom.)	3.3 VDC (2.97 - 3.63 VDC)	10'000 mA	89 %
TEN 50-4811		5 VDC (4.5 - 5.5 VDC)	10'000 mA	92 %
TEN 50-4812		12 VDC (10.8 - 13.2 VDC)	4'170 mA	92 %
TEN 50-4813		15 VDC (13.5 - 16.5 VDC)	3'330 mA	92 %
TEN 50-4815		24 VDC (21.6 - 28.8 VDC)	2'080 mA	91 %

Options	
TEN-HS6	- Optional Heat Sink: <a href="http://www.tracopower.com/overview/ten-hs6">www.tracopower.com/overview/ten-hs6</a>

## Input Specifications

Input Current	- At no load	12 Vin models: <b>85 mA typ.</b> (3.3 Vout model) <b>110 mA typ.</b> (5 Vout model) <b>160 mA typ.</b> (12 Vout model) <b>160 mA typ.</b> (15 Vout model) <b>250 mA typ.</b> (24 Vout model)
		24 Vin models: <b>50 mA typ.</b> (3.3 Vout model) <b>70 mA typ.</b> (5 Vout model) <b>85 mA typ.</b> (12 Vout model) <b>85 mA typ.</b> (15 Vout model) <b>110 mA typ.</b> (24 Vout model)
		48 Vin models: <b>35 mA typ.</b> (3.3 Vout model) <b>45 mA typ.</b> (5 Vout model) <b>50 mA typ.</b> (12 Vout model) <b>50 mA typ.</b> (15 Vout model) <b>60 mA typ.</b> (24 Vout model)
	- At full load	12 Vin models: <b>3'090 mA typ.</b> (3.3 Vout model) <b>4'630 mA typ.</b> (5 Vout model) <b>4'580 mA typ.</b> (12 Vout model) <b>4'580 mA typ.</b> (15 Vout model) <b>4'570 mA typ.</b> (24 Vout model)
		24 Vin models: <b>1'550 mA typ.</b> (3.3 Vout model) <b>2'260 mA typ.</b> (5 Vout model) <b>2'260 mA typ.</b> (12 Vout model) <b>2'260 mA typ.</b> (15 Vout model) <b>2'290 mA typ.</b> (24 Vout model)
		48 Vin models: <b>770 mA typ.</b> (3.3 Vout model) <b>1'130 mA typ.</b> (5 Vout model) <b>1'130 mA typ.</b> (12 Vout model) <b>1'130 mA typ.</b> (15 Vout model) <b>1'150 mA typ.</b> (24 Vout model)
Surge Voltage		12 Vin models: <b>25 VDC max.</b> (100 ms max.) 24 Vin models: <b>50 VDC max.</b> (100 ms max.) 48 Vin models: <b>100 VDC max.</b> (100 ms max.)
Under Voltage Lockout		12 Vin models: <b>8.3 VDC typ.</b> 24 Vin models: <b>16.5 VDC typ.</b> 48 Vin models: <b>33 VDC typ.</b>
Reflected Ripple Current		12 Vin models: <b>50 mA<sub>p-p</sub> typ.</b> 24 Vin models: <b>40 mA<sub>p-p</sub> typ.</b> 48 Vin models: <b>30 mA<sub>p-p</sub> typ.</b>
Recommended Input Fuse		12 Vin models: <b>10'000 mA</b> (slow blow) 24 Vin models: <b>5'000 mA</b> (slow blow) 48 Vin models: <b>2'500 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal LC-Type</b>

## Output Specifications

Output Voltage Adjustment		-10% to +20% (24 Vout models) ±10% (other single models) (By external trim resistor) See application note: <a href="http://www.tracopower.com/ten50-adj">www.tracopower.com/ten50-adj</a> Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%)	0.5% max. 0.5% max.

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

Ripple and Noise (20 MHz Bandwidth)	3.3 Vout models: <b>100 mVp-p max.</b> (w/ 1 $\mu$ F MLCC    10 $\mu$ F TC) 5 Vout models: <b>100 mVp-p max.</b> (w/ 1 $\mu$ F MLCC    10 $\mu$ F TC) 12 Vout models: <b>150 mVp-p max.</b> (w/ 1 $\mu$ F MLCC    10 $\mu$ F TC) 15 Vout models: <b>150 mVp-p max.</b> (w/ 1 $\mu$ F MLCC    10 $\mu$ F TC) 24 Vout models: <b>150 mVp-p max.</b> (w/ 1 $\mu$ F MLCC    10 $\mu$ F TC)
Capacitive Load	3.3 Vout models: <b>25'800 <math>\mu</math>F max.</b> 5 Vout models: <b>17'000 <math>\mu</math>F max.</b> 12 Vout models: <b>2'900 <math>\mu</math>F max.</b> 15 Vout models: <b>1'900 <math>\mu</math>F max.</b> 24 Vout models: <b>750 <math>\mu</math>F max.</b>
Minimum Load	<b>Not required</b>
Temperature Coefficient	<b><math>\pm 0.02</math> %/K max.</b>
Start-up Time	<b>30 ms max.</b> (Power On) <b>30 ms max.</b> (Remote On)
Short Circuit Protection	<b>Continuous, Automatic recovery</b>
Output Current Limitation	<b>150% typ. of Iout max.</b>
Transient Response	- Response Deviation <b>3% typ. / 5% max.</b> (75% to 100% Load Step) - Response Time <b>250 <math>\mu</math>s typ.</b> (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 <a href="http://www.tracopower.com/ten50-safety-cert">www.tracopower.com/ten50-safety-cert</a>
	- Certification Documents	
Energy Source	- Output, acc. to 62368-1	ES1
Power Source	- Output, acc. to 62368-1	PS3
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: <a href="http://www.tracopower.com/ten50-emc-filter">www.tracopower.com/ten50-emc-filter</a>
EMS (Immunity)		EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 10 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 1$ kV, perf. criteria A
		External filter proposal: <a href="http://www.tracopower.com/ten50-emc-filter">www.tracopower.com/ten50-emc-filter</a>
	- Conducted RF Disturbances	EN 61000-4-6, 10 Vrms, perf. criteria A
EMC / Environmental	- Certification Documents	<a href="http://www.tracopower.com/ten50-emc-cert">www.tracopower.com/ten50-emc-cert</a>

### General Specifications

Relative Humidity		<b>95% max.</b> (non condensing)
Temperature Ranges	- Operating Temperature	<b>-40°C to +85°C</b>
	- Case Temperature	<b>+105°C max.</b>
	- Storage Temperature	<b>-50°C to +125°C</b>

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

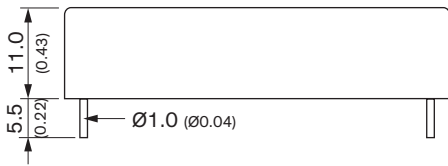
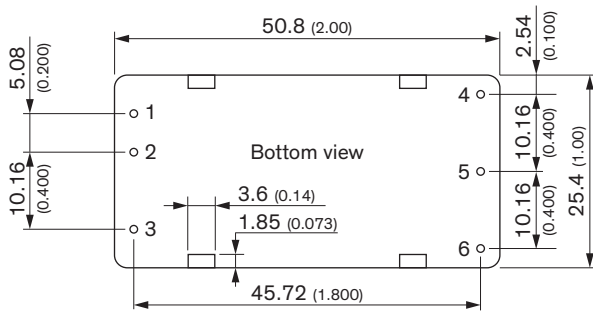
Power Derating	- High Temperature	Depending on model See application note: <a href="http://www.tracopower.com/ten50-cc">www.tracopower.com/ten50-cc</a>
Over Temperature Protection Switch Off	- Protection Mode	110°C typ.
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)  - Off Idle Input Current - Remote Pin Input Current	On: 3.5 to 12 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin 2.5 mA typ. -0.5 to 0.5 mA
Altitude During Operation		6'000 m max.
Switching Frequency		285 kHz typ. (PWM) (24 Vout models) 320 kHz typ. (PWM) (other models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Output, 1 s	1'500 VDC 1'800 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'200 pF max.
Reliability	- Calculated MTBF	220'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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		30 g
Thermal Impedance	- Case to Ambient	12.0 K/W typ. 10.0 K/W typ. (with heatsink TEN-HS6)
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - SCIP Reference Number	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) 5a2a420b-ee13-4969-bf97-1218c3094530

## Additional Information

Supporting Documents	<a href="http://www.tracopower.com/overview/ten50">www.tracopower.com/overview/ten50</a>
Frequently Asked Questions	<a href="http://www.tracopower.com/glossary-faq">www.tracopower.com/glossary-faq</a>
Glossary	<a href="http://www.tracopower.com/info/glossary.pdf">www.tracopower.com/info/glossary.pdf</a>

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

### 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