

- Reinforced I/O-isolation 3000 VAC
- Shock and vibration resistance according to EN 61373
- Wide 4:1 input voltage range: 9-36, 18-75, 40-160 VDC
- Operating temperature range -40 to +90°C
- Internal EN 55032 class A filter
- High efficiency up to 89%
- Protection against overload, overvoltage and short circuit
- 3-year product warranty



The THR 10WI is 10 Watt DC/DC converters series with reinforced isolation (3-000 VAC). These regulated DC/DC converters come in either a 2"x1" package and also feature increased resistance against shock and vibration according to EN 61373. The THR 3WI offers an internal input filter to comply with EN 550-32 class A. High efficiencies up to 89% allow safe operation from -40°C to +90°C (with derating). All models have a wide 4:1 input voltage range and precisely regulated, isolated output voltages. With the latest IT safety certifications (IEC/EN/UL 62368-1) the THR 10WI series is the perfect choice for many demanding applications in the industrial, transportation and instrumentation sectors.

### Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
THR 10-2411WI	9 - 36 VDC (24 VDC nom.)	5 VDC	2'000 mA			84 %
THR 10-2412WI		12 VDC	835 mA			86 %
THR 10-2413WI		15 VDC	670 mA			87 %
THR 10-2415WI		24 VDC	417 mA			88 %
THR 10-2422WI		+12 VDC	417 mA	-12 VDC	417 mA	86 %
THR 10-2423WI		+15 VDC	335 mA	-15 VDC	335 mA	87 %
THR 10-4811WI	18 - 75 VDC (48 VDC nom.)	5 VDC	2'000 mA			85 %
THR 10-4812WI		12 VDC	835 mA			87 %
THR 10-4813WI		15 VDC	670 mA			87 %
THR 10-4815WI		24 VDC	417 mA			86 %
THR 10-4822WI		+12 VDC	417 mA	-12 VDC	417 mA	89 %
THR 10-4823WI		+15 VDC	335 mA	-15 VDC	335 mA	88 %
THR 10-7211WI	40 - 160 VDC (110 VDC nom.)	5 VDC	2'000 mA			82 %
THR 10-7212WI		12 VDC	835 mA			85 %
THR 10-7213WI		15 VDC	670 mA			85 %
THR 10-7215WI		24 VDC	417 mA			85 %
THR 10-7222WI		+12 VDC	417 mA	-12 VDC	417 mA	86 %
THR 10-7223WI		+15 VDC	335 mA	-15 VDC	335 mA	86 %

### Options

THR-HS1	- Optional Heat Sink with Height = 0.25": <a href="http://www.tracopower.com/overview/thr-hs1">www.tracopower.com/overview/thr-hs1</a>
on demand (backorder with MOQ non stocking item)	- Optional Heat Sink with Height = 0.5": <a href="http://www.tracopower.com/overview/thr-hs2">www.tracopower.com/overview/thr-hs2</a>
	- Optional Heat Sink with Height = 1.0": <a href="http://www.tracopower.com/overview/thr-hs3">www.tracopower.com/overview/thr-hs3</a>
	- Optional models with alternative pinning
	- Optional models with pre-assembled heatsink

## Input Specifications

Input Current	- At no load	24 Vin models: <b>25 mA typ.</b> 48 Vin models: <b>15 mA typ.</b> 110 Vin models: <b>10 mA typ.</b>
	- At full load	24 Vin models: <b>484 mA typ.</b> 48 Vin models: <b>240 mA typ.</b> 110 Vin models: <b>107 mA typ.</b>
Surge Voltage		24 Vin models: <b>50 VDC max.</b> (100 ms max.) 48 Vin models: <b>100 VDC max.</b> (100 ms max.) 110 Vin models: <b>170 VDC max.</b> (100 ms max.)
Under Voltage Lockout		24 Vin models: <b>7.5 VDC typ.</b> 48 Vin models: <b>16 VDC typ.</b> 110 Vin models: <b>37 VDC typ.</b>
Recommended Input Fuse		24 Vin models: <b>2'500 mA</b> (slow blow) 48 Vin models: <b>1'250 mA</b> (slow blow) 110 Vin models: <b>625 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Pi-Type</b>

## Output Specifications

Output Voltage Adjustment		<b>±10%</b> (single output models only) (By external trim resistor) See application note: <a href="http://www.tracopower.com/overview/thr10wi">www.tracopower.com/overview/thr10wi</a> Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.2% max.</b> dual output models: <b>0.2% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>0.5% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: <b>2% max.</b>
Ripple and Noise (20 MHz Bandwidth)	- single output	5 Vout models: <b>50 mVp-p typ.</b> (w/ 10 µF, 25 V MLCC) 12 Vout models: <b>100 mVp-p typ.</b> (w/ 10 µF, 25 V MLCC) 15 Vout models: <b>100 mVp-p typ.</b> (w/ 10 µF, 25 V MLCC) 24 Vout models: <b>150 mVp-p typ.</b> (w/ 4.7 µF, 50 V MLCC)
	- dual output	12 / -12 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 10 µF, 25 V MLCC) 15 / -15 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 10 µF, 25 V MLCC)
Capacitive Load	- single output	5 Vout models: <b>2'200 µF max.</b> 12 Vout models: <b>330 µF max.</b> 15 Vout models: <b>220 µF max.</b> 24 Vout models: <b>100 µF max.</b>
	- dual output	12 / -12 Vout models: <b>150 / 150 µF max.</b> 15 / -15 Vout models: <b>100 / 100 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>30 ms typ. / 50 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>150% typ. of Iout max.</b>
Oversvoltage Protection		<b>125% typ. of Vout nom.</b>
Transient Response	- Response Deviation	<b>3% typ. / 5% max.</b> (75% to 100% Load Step)
	- Response Time	<b>300 µs max.</b> (75% to 100% Load Step)

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

### Safety Specifications

Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Certification Documents	<a href="http://www.tracopower.com/overview/thr10wi">www.tracopower.com/overview/thr10wi</a>
Pollution Degree		PD 2

### EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55011 class A (internal filter) EN 55011 class B (with external filter) EN 55032 class A (internal filter) EN 55032 class B (with external filter) FCC 47 Part 15 class A (internal filter) FCC 47 Part 15 class B (with external filter)
	- Radiated Emissions	EN 55011 class A (with external filter) EN 55011 class B (with external filter) EN 55032 class A (with external filter) EN 55032 class B (with external filter) FCC 47 Part 15 class A (with external filter) FCC 47 Part 15 class B (with external filter)
		External filter proposal: <a href="http://www.tracopower.com/overview/thr10wi">www.tracopower.com/overview/thr10wi</a>
EMS (Immunity)	- Electrostatic Discharge	EN 55024 (IT Equipment) EN 55035 (Multimedia)
	- RF Electromagnetic Field - EFT (Burst) / Surge	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A EN 61000-4-3, 10 V/m, perf. criteria A EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV, perf. criteria A
	- Conducted RF Disturbances - PF Magnetic Field	Ext. input component: 24 Vin models: 390 $\mu$ F chemi-con KY 48 Vin models: 330 $\mu$ F chemi-con KY 110 Vin models: 220 $\mu$ F chemi-con KXG EN 61000-4-6, 10 Vrms, perf. criteria A Continuous: EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A
EMC / Environmental	- Certification Documents	<a href="http://www.tracopower.com/overview/thr10wi">www.tracopower.com/overview/thr10wi</a>

### General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +90°C -40°C to +95°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: <a href="http://www.tracopower.com/overview/thr10wi">www.tracopower.com/overview/thr10wi</a>
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
Regulator Topology		Flyback Converter
Switching Frequency		260 - 310 kHz (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		250 VAC
Isolation Test Voltage	- Input to Output, 60 s	3'000 VAC
	- Input to Case, 60 s	1'500 VAC
	- Output to Case, 60 s	1'500 VAC

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

Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'500 pF typ.
Reliability	- Calculated MTBF	2'850'000 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>
Environment	- Vibration	EN 61373
	- Mechanical Shock	EN 61373
Housing Material		Red Copper, Powder Coating
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Isolation Frame Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper Alloy (C6801)
Pin Foundation Plating		Nickel (2 - 4 $\mu$ m)
Pin Surface Plating		Tin (3 - 5 $\mu$ m), matte
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		40.5 g
Thermal Impedance	- Case to Ambient	12.1 K/W typ. (without Heatsink) 9.2 K/W typ. (with Heatsink THR-HS1) 8.5 K/W typ. (with Heatsink THR-HS2) 7.8 K/W typ. (with Heatsink THR-HS3)
Environmental Compliance	- REACH Declaration	<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
	- RoHS Declaration	<a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> Exemptions: 7a (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule.))
	- SCIP Reference Number	2e5509f5-6399-41ee-8aa4-5a6b4dd19e98

## Supporting Documents

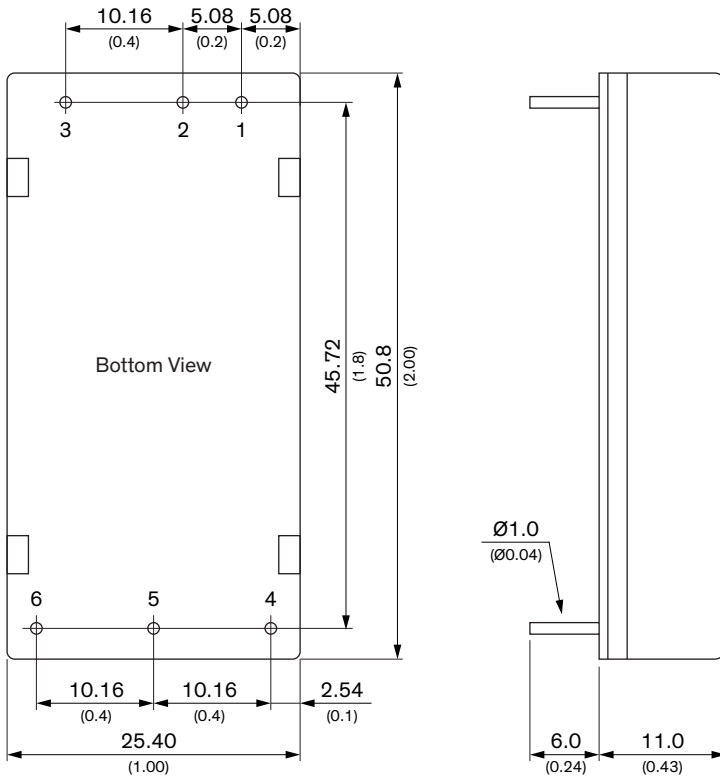
Overview Link (for additional Documents)

[www.tracopower.com/overview/thr10wi](http://www.tracopower.com/overview/thr10wi)

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

**Outline Dimensions**

**Standard version**

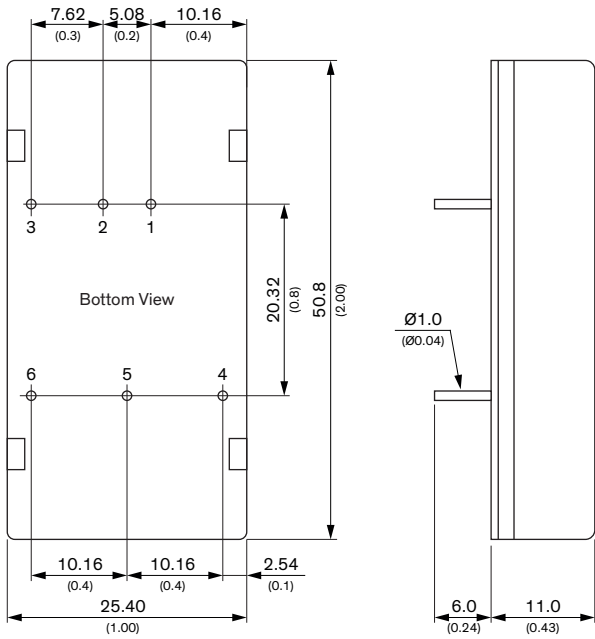


Pinout		
Pin	Single	Dual
1	+Vin (Vcc)	+Vin (Vcc)
2	-Vin (GND)	-Vin (GND)
3	Remote On/Off	Remote On/Off
4	+Vout	+Vout
5	-Vout	Common
6	Trim	-Vout

Dimensions in mm (inch)  
 Tolerances: x.x ±0.75 (±0.03)  
 x.xx ±0.25 (±0.01)  
 Pin diameter ±0.05 (±0.002)

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

### Alternative Pinning version



Dimensions in mm (inch)  
 Tolerances: x.x ±0.75 (±0.03)  
 x.xx ±0.25 (±0.01)  
 Pin diameter ±0.05 (±0.002)

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