

DC/DC Converter

THR 20WI Series, 20 Watt

- 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 +85°C
- Internal EN 55032 class A filter
- High efficiency up to 88%
- Protection against overload, overvoltage and short circuit
- 3-year product warranty



The THR 20WI is 20 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 20WI offers an internal input filter to comply with EN 550-32 class A. High efficiencies up to 88% allow safe operation from -40°C to +80°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 20WI 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 _{max}	Vnom	I _{max}	
THR 20-2411WI	9 - 36 VDC (24 VDC nom.)	5 VDC	4'000 mA			87 %
THR 20-2412WI		12 VDC	1'670 mA			87 %
THR 20-2413WI		15 VDC	1'330 mA			87 %
THR 20-2415WI		24 VDC	833 mA			87 %
THR 20-2422WI		+12 VDC	833 mA	-12 VDC	833 mA	86 %
THR 20-2423WI		+15 VDC	667 mA	-15 VDC	667 mA	86 %
THR 20-4811WI	18 - 75 VDC (48 VDC nom.)	5 VDC	4'000 mA			87 %
THR 20-4812WI		12 VDC	1'670 mA			88 %
THR 20-4813WI		15 VDC	1'330 mA			88 %
THR 20-4815WI		24 VDC	833 mA			88 %
THR 20-4822WI		+12 VDC	833 mA	-12 VDC	833 mA	87 %
THR 20-4823WI		+15 VDC	667 mA	-15 VDC	667 mA	87 %
THR 20-7211WI	40 - 160 VDC (110 VDC nom.)	5 VDC	4'000 mA			84 %
THR 20-7212WI		12 VDC	1'670 mA			86 %
THR 20-7213WI		15 VDC	1'330 mA			86 %
THR 20-7215WI		24 VDC	833 mA			86 %
THR 20-7222WI		+12 VDC	833 mA	-12 VDC	833 mA	86 %
THR 20-7223WI		+15 VDC	667 mA	-15 VDC	667 mA	86 %

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

Input Specifications

Input Current	- At no load	24 Vin models: 25 mA typ. 48 Vin models: 15 mA typ. 110 Vin models: 10 mA typ.
	- At full load	24 Vin models: 961 mA typ. 48 Vin models: 476 mA typ. 110 Vin models: 212 mA typ.
Surge Voltage		24 Vin models: 50 VDC max. (100 ms max.) 48 Vin models: 100 VDC max. (100 ms max.) 110 Vin models: 170 VDC max. (100 ms max.)
Under Voltage Lockout		24 Vin models: 7.5 VDC typ. 48 Vin models: 16 VDC typ. 110 Vin models: 37 VDC typ.
Recommended Input Fuse		24 Vin models: 5'000 mA (slow blow) 48 Vin models: 2'500 mA (slow blow) 110 Vin models: 1'250 mA (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		Internal Pi-Type

Output Specifications

Output Voltage Adjustment		±10% (single output models only) (By external trim resistor) See application note: www.tracopower.com/overview/thr20wi Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax)	single output models: 0.2% max. dual output models: 0.2% max.
	- Load Variation (0 - 100%)	single output models: 0.5% max. dual output models: 1% max. (Output 1) 1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models: 2% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	5 Vout models: 50 mVp-p typ. (w/ 10 µF, 25 V MLCC) 12 Vout models: 100 mVp-p typ. (w/ 10 µF, 25 V MLCC) 15 Vout models: 100 mVp-p typ. (w/ 10 µF, 25 V MLCC) 24 Vout models: 150 mVp-p typ. (w/ 4.7 µF, 50 V MLCC)
	- dual output	12 / -12 Vout models: 100 / 100 mVp-p typ. (w/ 10 µF, 25 V MLCC) 15 / -15 Vout models: 100 / 100 mVp-p typ. (w/ 10 µF, 25 V MLCC)
Capacitive Load	- single output	5 Vout models: 6'800 µF max. 12 Vout models: 1'200 µF max. 15 Vout models: 750 µF max. 24 Vout models: 300 µF max.
	- dual output	12 / -12 Vout models: 600 / 600 µF max. 15 / -15 Vout models: 380 / 380 µF max.
Minimum Load		Not required
Temperature Coefficient		±0.02 %/K max.
Start-up Time		30 ms typ. / 50 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		150% typ. of Iout max.
Overvoltage Protection		125% typ. of Vout nom.
Transient Response	- Response Deviation	3% typ. / 5% max. (75% to 100% Load Step)
	- Response Time	300 µs max. (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	www.tracopower.com/overview/thr20wi
Pollution Degree		PD 2

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 55011 class A (internal filter) EN 55032 class A (internal filter) FCC 47 Part 15 class A (internal filter)
	- Radiated Emissions	EN 55011 class A (with external filter) EN 55032 class A (with external filter) FCC 47 Part 15 class A (with external filter)
	External filter proposal:	www.tracopower.com/overview/thr20wi
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, ± 2 kV, perf. criteria A
	Ext. input component:	24 Vin models: 390 μ F chemi-con KY 48 Vin models: 330 μ F chemi-con KY 110 Vin models: 390 μ F chemi-con KXJ
	- Conducted RF Disturbances	EN 61000-4-6, 10 Vrms, perf. criteria A
	- PF Magnetic Field	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	www.tracopower.com/overview/thr20wi

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +80°C -40°C to +90°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/thr20wi
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	115°C typ. (Automatic recovery at 100°C typ.) Case
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) 280 kHz typ. (PWM)
Insulation System		Reinforced Insulation
Working Voltage (rated)		250 VAC
Isolation Test Voltage	- Input to Output, 60 s - Input to Case, 60 s - Output to Case, 60 s	3'000 VAC 1'500 VAC 1'500 VAC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M Ω min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'500 pF typ.

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Reliability	- Calculated MTBF	665'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration - Mechanical Shock	EN 61373 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 µm)
Pin Surface Plating		Tin (3 - 5 µm), 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	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	2af2841c-3288-4e4f-8a7c-759da8c670cf

Supporting Documents

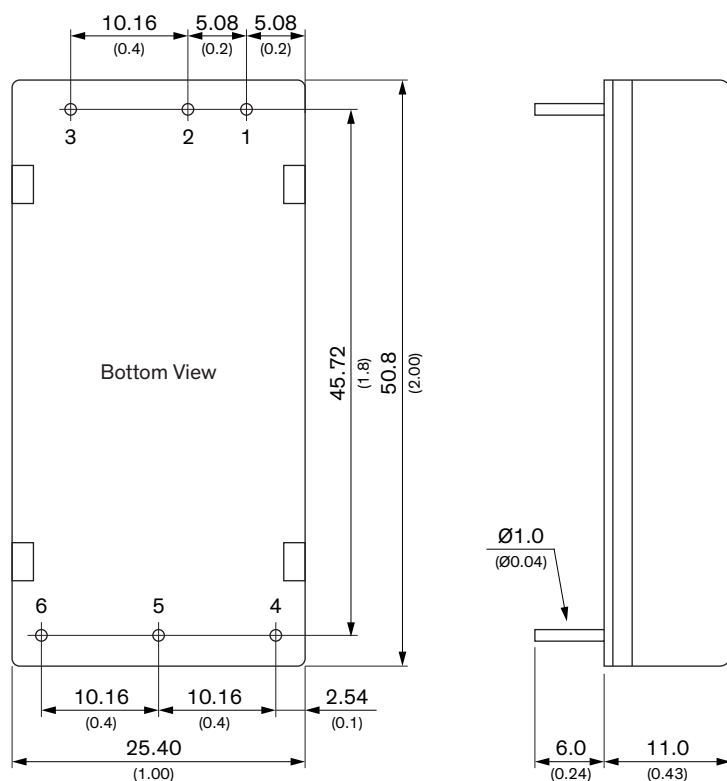
Overview Link (for additional Documents)

www.tracopower.com/overview/thr20wi

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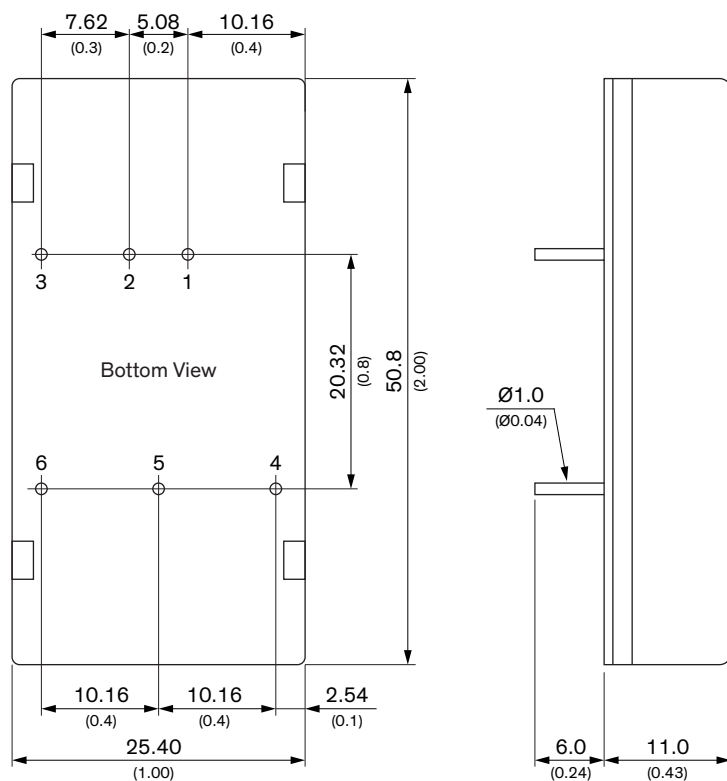
Outline Dimensions

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

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