TRACO POWER

DC/DC Railway Converter

THN 20WIR Series, 20 Watt

- **Compact 1” x 1” metal package**
- **EN 50155 and EN 61373 approval for railway applications**
- **Qualification for fire behavior according to EN 45545-2**
- **Wide 4:1 input voltage: 9-36, 18-75, 36-160 VDC**
- **Operating temperature range -40 to +65 °C without derating**
- **High efficiency up to 91%**
- **3000 VDC I/O-isolation**
- **Protection against overload, overvoltage and short circuit**
- **Remote On/Off and Trim function**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The THN 20WIR series is a family of ruggedized 20 Watt DC/DC converters for highest reliability in harsh environments. The converters have a wide 4:1 input range and increased resistance against electromagnetic interference, shock/vibration and thermal shock and come in a six-side shielded 1” x 1” metal package. The innovative design provides high efficiencies up to 91% and thus enable an operating temperature range from -40 to +65°C without derating. The approvals according to standards EN 50155 and EN 61373 qualify them for railway and transportation systems. Additional qualification for the fire behavior of components according to EN 45545-2 and the safety approval according IEC/EN 62368-1, UL62368-1 support a potential compliance test of the application. Built-in features like an internal EN 55032 class A filter, input under- voltage-lockout, short circuit protection, remote On/Off and output voltage trim make this series suitable for almost any application demands and thus facilitate the design-in process.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
THN 20-2410WIR	9 - 36 VDC (24 VDC nom.)	3.3 VDC	5'500 mA			88 %
THN 20-2411WIR		5.1 VDC	4'000 mA			89 %
THN 20-2412WIR		12 VDC	1'670 mA			89 %
THN 20-2413WIR		15 VDC	1'330 mA			89 %
THN 20-2415WIR		24 VDC	833 mA			91 %
THN 20-2422WIR		+12 VDC	833 mA	−12 VDC	833 mA	89 %
THN 20-2423WIR		+15 VDC	667 mA	−15 VDC	667 mA	90 %
THN 20-2425WIR		+24 VDC	417 mA	−24 VDC	417 mA	91 %
THN 20-4810WIR	18 - 75 VDC (48 VDC nom.)	3.3 VDC	5'500 mA			89 %
THN 20-4811WIR		5.1 VDC	4'000 mA			90 %
THN 20-4812WIR		12 VDC	1'670 mA			89 %
THN 20-4813WIR		15 VDC	1'330 mA			90 %
THN 20-4815WIR		24 VDC	833 mA			91 %
THN 20-4822WIR		+12 VDC	833 mA	−12 VDC	833 mA	89 %
THN 20-4823WIR		+15 VDC	667 mA	−15 VDC	667 mA	90 %
THN 20-4825WIR		+24 VDC	417 mA	−24 VDC	417 mA	91 %
THN 20-7210WIR	36 - 160 VDC (110 VDC nom.)	3.3 VDC	5'500 mA			88 %
THN 20-7211WIR		5.1 VDC	4'000 mA			90 %
THN 20-7212WIR		12 VDC	1'670 mA			90 %
THN 20-7213WIR		15 VDC	1'330 mA			90 %
THN 20-7215WIR		24 VDC	833 mA			91 %
THN 20-7222WIR		+12 VDC	833 mA	−12 VDC	833 mA	90 %
THN 20-7223WIR		+15 VDC	667 mA	−15 VDC	667 mA	90 %
THN 20-7225WIR		+24 VDC	417 mA	−24 VDC	417 mA	91 %

Options

THN-HS2	- Optional Heat Sink: www.tracopower.com/overview/thn-hs2
on demand (backorder with MOQ non stocking item)	- Optional Heat Sink: www.tracopower.com/overview/thn-hs3 - Optional Heat Sink: www.tracopower.com/overview/thn-hs4

Input Specifications

Input Current	- At no load	24 Vin models:	9 mA typ.
		48 Vin models:	7 mA typ.
		110 Vin models:	6 mA typ.
Surge Voltage		24 Vin models:	50 VDC max. (1 s max.)
		48 Vin models:	100 VDC max. (1 s max.)
		110 Vin models:	185 VDC max. (1 s max.)
Under Voltage Lockout		24 Vin models:	7.5 VDC min. / 8 VDC typ. / 8.8 VDC max.
		48 Vin models:	15.5 VDC min. / 16 VDC typ. / 17.5 VDC max.
		110 Vin models:	32 VDC min. / 34 VDC typ. / 35.5 VDC max.
Recommended Input Fuse		24 Vin models:	4'000 mA (slow blow)
		48 Vin models:	2'000 mA (slow blow)
		110 Vin models:	1'000 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% to +20% (24 Vout models) ±10% (other models) (single output models only) (By external trim resistor)
		See application note:	www.tracopower.com/thn20wir-adj/
			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:	0.5% max.
	- Load Variation (10 - 90%)	single output models:	0.1% max.
		dual output models:	0.8% max. (Output 1)
			0.8% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models:	5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models:	75 mVp-p typ. (w/ 22 µF, 25 V X7R)
		5.1 Vout models:	75 mVp-p typ. (w/ 22 µF, 25 V X7R)
		12 Vout models:	100 mVp-p typ. (w/ 22 µF, 25 V X7R)
		15 Vout models:	100 mVp-p typ. (w/ 22 µF, 25 V X7R)
		24 Vout models:	125 mVp-p typ. (w/ 4.7 µF, 50 V X7R)
	- dual output	12 / -12 Vout models:	100 / 100 mVp-p typ. (w/ 10 µF, 25 V X7R)
		15 / -15 Vout models:	100 / 100 mVp-p typ. (w/ 10 µF, 25 V X7R)
		24 / -24 Vout models:	125 / 125 mVp-p typ. (w/ 4.7 µF, 50 V X7R)
Capacitive Load	- single output	3.3 Vout models:	8'000 µF max.
		5.1 Vout models:	5'000 µF max.
		12 Vout models:	850 µF max.
		15 Vout models:	700 µF max.
		24 Vout models:	220 µF max.
	- dual output	12 / -12 Vout models:	500 / 500 µF max.
		15 / -15 Vout models:	350 / 350 µF max.
		24 / -24 Vout models:	100 / 100 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.

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

Hold-up Time		10 ms min. (acc. to EN 50155 Class S2, see application note for ext. capacitor calculation: www.tracopower.com/info/holdup_en50155.pdf)
Start-up Time		30 ms typ. / 40 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		170% typ. of Iout max.
Overvoltage Protection		110 - 164% of Vout nom.
Transient Response	- Response Time	250 µs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 62368-1 IEC 62368-1 UL 62368-1
	- Railway Applications	EN 50155
	- Certification Documents	www.tracopower.com/thn20wir-safety-cert/
Energy Source	- Output, acc. to 62368-1	ES1
Power Source	- Output, acc. to 62368-1	PS3
Pollution Degree		PD 2
Over Voltage Category		Not mains connected

EMC Specifications

EMI (Emissions)			EN 50121-3-2 (EMC for Rolling Stock)
	- Conducted Emissions		EN 55032 class A (internal filter) EN 55032 class B (with external filter)
	- Radiated Emissions		EN 55032 class A (internal filter) EN 55032 class B (with external filter)
		External filter proposal:	www.tracopower.com/thn20wir-emc-filter/ (for 110 Vin models a 47 µF / 200 V Nippon chemi-con KXJ capacitor is required to comply with EN 55032 classA)
EMS (Immunity)			EN 50121-3-2 (EMC for Rolling Stock)
	- 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, 20 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: 220 µF, 100 V, KY || TVS SMDJ58A 48 Vin models: 220 µF, 100 V, KY 110 Vin models: 150 µF, 200 V, KXJ || TVS SMBJ300A
	- 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/thn20wir-emc-cert/

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +82°C –40°C to +84°C (with heatsink THN-HS2) –40°C to +91°C (with heatsink THN-HS3) –40°C to +93°C (with heatsink THN-HS4)
	- Case Temperature	+105°C max.
	- Storage Temperature	–55°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/thn20wir-cc/

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

Over Temperature Protection Switch Off	- Protection Mode	105°C min. / 115°C typ. / 130°C max. (Automatic recovery at 100°C typ.)
	- Measurement Point	Case
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 3.0 to 15 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 1.0 mA
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		230 - 310 kHz (PWM) (24 & 48 Vin, 3.3 & 5.1 Vout models) 290 - 370 kHz (PWM) (24 & 48 Vin, other models) 210 - 270 kHz (PWM) (110 Vin, 3.3 & 5.1 Vout models) 260 - 340 kHz (PWM) (110 Vin, other models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	3'000 VDC (110 Vin models) 2'250 VDC (other models)
	- Input to Case, 60 s	2'250 VDC (110 Vin models) 1'600 VDC (other models)
	- Output to Case, 60 s	2'250 VDC (110 Vin models) 1'600 VDC (other models)
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	2'000 pF max.
Reliability	- Calculated MTBF	1'200'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	MIL-STD-810F
	- Flammability	EN 45545-2 www.tracopower.com/info/en45545-declaration.pdf
Housing Material		Copper
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 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		1" x 1"
Soldering Profile		Lead-Free Wave Soldering 260°C / 6 s max.
Weight		16 g
Thermal Impedance	- Case to Ambient	15.5 K/W typ. 12.3 K/W typ. (with heatsink THN-HS2) 10.7 K/W typ. (with heatsink THN-HS3) 9.1 K/W typ. (with heatsink THN-HS4)

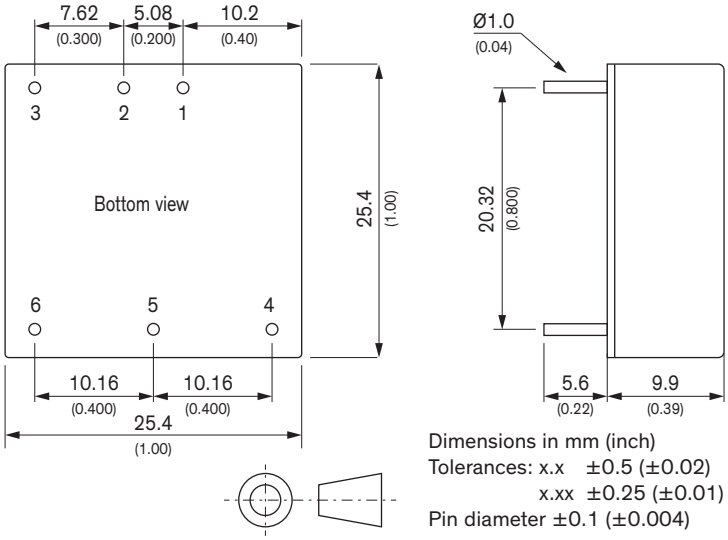
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Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf
		REACH SVHC list compliant
		REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf
		Exemptions: 7(a), 7(c)-I
		(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	3ab574be-5dc2-42ab-a0ef-a6eed2e2be7e

Additional Information

Supporting Documents	www.tracopower.com/overview/thn20wir
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf
Service Portal	www.tracoserviceportal.com

Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (±0.02)
x.xx ±0.25 (±0.01)
Pin diameter ±0.1 (±0.004)

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

Avoid routing PCB traces under the converter.

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