

- 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



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 typ.
		Vnom	I <sub>max</sub>	Vnom	I <sub>max</sub>	
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

<b>THN-HS1</b>	- Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs1.pdf">www.tracopower.com/products/thn-hs1.pdf</a>
<b>THN-HS2</b>	- Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs2.pdf">www.tracopower.com/products/thn-hs2.pdf</a>
<b>on demand</b> (backorder with MOQ non stocking item)	- Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs3.pdf">www.tracopower.com/products/thn-hs3.pdf</a>
	- Optional Heat Sink: <a href="http://www.tracopower.com/products/thn-hs4.pdf">www.tracopower.com/products/thn-hs4.pdf</a>

## Input Specifications

Input Current	- At no load	24 Vin models: <b>9 mA typ.</b> 48 Vin models: <b>7 mA typ.</b> 110 Vin models: <b>6 mA typ.</b>
Surge Voltage		24 Vin models: <b>50 VDC max.</b> (1 s max.) 48 Vin models: <b>100 VDC max.</b> (1 s max.) 110 Vin models: <b>185 VDC max.</b> (1 s max.)
Under Voltage Lockout		24 Vin models: <b>7.5 VDC min. / 8 VDC typ. / 8.8 VDC max.</b> 48 Vin models: <b>15.5 VDC min. / 16 VDC typ. / 17.5 VDC max.</b> 110 Vin models: <b>32 VDC min. / 34 VDC typ. / 35.5 VDC max.</b>
Recommended Input Fuse		24 Vin models: <b>4'000 mA</b> (slow blow) 48 Vin models: <b>2'000 mA</b> (slow blow) 110 Vin models: <b>1'000 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		-10% to +20% (24 Vout models) ±10% (other single models) (By external trim resistor)  See application note: <a href="http://www.tracopower.com/overview/thn20wir">www.tracopower.com/overview/thn20wir</a> Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax)  - Load Variation (10 - 90%)  - Cross Regulation (25% / 100% asym. load)	single output models: <b>0.2% max.</b> dual output models: <b>0.5% max.</b> single output models: <b>0.1% max.</b> dual output models: <b>0.8% max.</b> (Output 1) <b>0.8% max.</b> (Output 2) dual output models: <b>5% max.</b>
Ripple and Noise (20 MHz Bandwidth)	- single output  - dual output	3.3 Vout models: <b>75 mVp-p typ.</b> (w/ 22 µF, 25 V X7R) 5.1 Vout models: <b>75 mVp-p typ.</b> (w/ 22 µF, 25 V X7R) 12 Vout models: <b>100 mVp-p typ.</b> (w/ 22 µF, 25 V X7R) 15 Vout models: <b>100 mVp-p typ.</b> (w/ 22 µF, 25 V X7R) 24 Vout models: <b>125 mVp-p typ.</b> (w/ 4.7 µF, 50 V X7R) 12 / -12 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 10 µF, 25 V X7R) 15 / -15 Vout models: <b>100 / 100 mVp-p typ.</b> (w/ 10 µF, 25 V X7R) 24 / -24 Vout models: <b>125 / 125 mVp-p typ.</b> (w/ 4.7 µF, 50 V X7R)
Capacitive Load	- single output  - dual output	3.3 Vout models: <b>8'000 µF max.</b> 5.1 Vout models: <b>5'000 µF max.</b> 12 Vout models: <b>850 µF max.</b> 15 Vout models: <b>700 µF max.</b> 24 Vout models: <b>220 µF max.</b> 12 / -12 Vout models: <b>500 / 500 µF max.</b> 15 / -15 Vout models: <b>350 / 350 µF max.</b> 24 / -24 Vout models: <b>100 / 100 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>

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

Start-up Time	30 ms typ. / 40 ms max.
Short Circuit Protection	Continuous, Automatic recovery
Output Current Limitation	170% typ. of I <sub>out</sub> max.
Overvoltage Protection	110 - 164% of V <sub>out</sub> nom.
Transient Response	- Response Time 250 μs typ. (25% Load Step)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment - Railway Applications - Certification Documents	EN 62368-1 IEC 62368-1 UL 62368-1 EN 50155 <a href="http://www.tracopower.com/overview/thn20wir">www.tracopower.com/overview/thn20wir</a>
Pollution Degree		PD 2

## EMC Specifications

EMI Emissions	- Conducted Emissions - Radiated Emissions	EN 50121-3-2 (EMC for Rolling Stock) EN 55032 class A (internal filter) EN 55032 class B (with external filter) EN 55032 class A (internal filter) EN 55032 class B (with external filter) External filter proposal: <a href="http://www.tracopower.com/overview/thn20wir">www.tracopower.com/overview/thn20wir</a> (for 110 V <sub>in</sub> models a 4.7 μF / 200 V Nippon chemi-con KXJ capacitor is required to comply with EN 55032 classA)
EMS Immunity	- Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge  - Conducted RF Disturbances - PF Magnetic Field	EN 50155 (Railway Applications) Air: EN 61000-4-2, ±8 kV, perf. criteria A Contact: EN 61000-4-2, ±6 kV, perf. criteria A EN 61000-4-3, 20 V/m, perf. criteria A EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±2 kV, perf. criteria A Ext. input component: 24 V <sub>in</sub> models: 220 μF, 100 V, KY // TVS SMDJ58A 48 V <sub>in</sub> models: 220 μF, 100 V, KY 110 V <sub>in</sub> models: 150 μF, 200 V, KXJ // TVS SMBJ300A Continuous: EN 61000-4-6, 10 V <sub>rms</sub> , perf. criteria A EN 61000-4-8, 100 A/m, perf. criteria A 1 s: EN 61000-4-8, 1000 A/m, perf. criteria A

## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +85°C -40°C to +90°C (with Heat Sink) +105°C max. -55°C to +125°C
Power Derating	- High Temperature	2.5 %/K above 65°C 3.33 %/K above 75°C (with Heat Sink)
Over Temperature Protection Switch Off	- Protection Mode - Measurement Point	105°C min. / 115°C typ. / 130°C max. (Automatic recovery at 100°C typ.) Case
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current - Remote Pin Input Current	On: 3.0 to 15 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 1.0 mA

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

Altitude During Operation		2'000 m max.
Switching Frequency		270 kHz typ. (PWM) ( $\pm 40$ kHz, 24 Vin, 3.3 & 5.1 Vout models) 330 kHz typ. (PWM) ( $\pm 40$ kHz, 24 Vin, other models) 270 kHz typ. (PWM) ( $\pm 40$ kHz, 48 Vin, 3.3 & 5.1 Vout models) 330 kHz typ. (PWM) ( $\pm 40$ kHz, 48 Vin, other models) 240 kHz typ. (PWM) ( $\pm 30$ kHz, 110 Vin, 3.3 & 5.1 Vout models) 300 kHz typ. (PWM) ( $\pm 40$ kHz, 110 Vin, other models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s - Input to Case, 60 s - Output to Case, 60 s	3'000 VDC (110 Vin models) 2'250 VDC (other models) 2'250 VDC (110 Vin models) 1'600 VDC (other models) 2'250 VDC (110 Vin models) 1'600 VDC (other models)
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ 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)
Environment	- Vibration  - Mechanical Shock  - Thermal Shock	MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F EN 50155
Housing Material		Copper
Base Material		Non-conductive FR4 (UL94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 $\mu$ m)
Pin Surface Plating		Tin (3 - 5 $\mu$ m), matte
Connection Type		THD (Through-Hole Device)
Weight		16 g
Thermal Impedance		15.5 K/W 12.3 K/W (with Heat Sink)
Environmental Compliance	- REACH Declaration  - RoHS Declaration  - Flammability (EN 45545-2)	<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: 7a, 7c-I <a href="http://www.tracopower.com/info/en45545-declaration.pdf">www.tracopower.com/info/en45545-declaration.pdf</a>

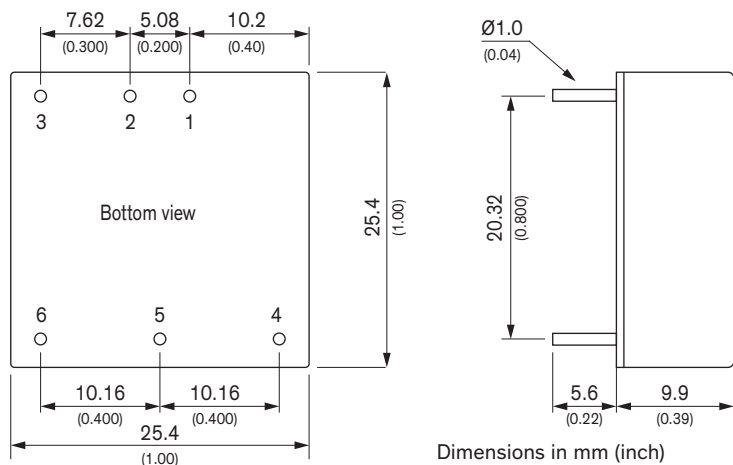
## Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/thn20wir](http://www.tracopower.com/overview/thn20wir)

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## 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