

DC/DC Railway Converter

THN 10WIR Series, 10 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 +80 °C without derating
- High efficiency up to 90%
- 3000 VDC I/O-isolation
- Protection against overload, overvoltage and short circuit
- Remote On/Off and Trim function
- 3-year product warranty



The THN 10WIR series is a family of ruggedized 10 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 90% and thus enable an operating temperature range from -40 to +80°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 _{max}	Vnom	I _{max}	
THN 10-2410WIR	9 - 36 VDC (24 VDC nom.)	3.3 VDC	3'000 mA			87 %
THN 10-2411WIR		5 VDC	2'000 mA			89 %
THN 10-2412WIR		12 VDC	830 mA			89 %
THN 10-2413WIR		15 VDC	670 mA			90 %
THN 10-2415WIR		24 VDC	420 mA			90 %
THN 10-2421WIR		+5 VDC	1'000 mA	-5 VDC	1'000 mA	86 %
THN 10-2422WIR		+12 VDC	416 mA	-12 VDC	416 mA	89 %
THN 10-2423WIR		+15 VDC	333 mA	-15 VDC	333 mA	89 %
THN 10-2425WIR		+24 VDC	210 mA	-24 VDC	210 mA	90 %
THN 10-4810WIR	18 - 75 VDC (48 VDC nom.)	3.3 VDC	3'000 mA			87 %
THN 10-4811WIR		5 VDC	2'000 mA			89 %
THN 10-4812WIR		12 VDC	830 mA			89 %
THN 10-4813WIR		15 VDC	670 mA			90 %
THN 10-4815WIR		24 VDC	420 mA			90 %
THN 10-4821WIR		+5 VDC	1'000 mA	-5 VDC	1'000 mA	86 %
THN 10-4822WIR		+12 VDC	416 mA	-12 VDC	416 mA	89 %
THN 10-4823WIR		+15 VDC	333 mA	-15 VDC	333 mA	89 %
THN 10-4825WIR		+24 VDC	210 mA	-24 VDC	210 mA	90 %
THN 10-7210WIR	36 - 160 VDC (110 VDC nom.)	3.3 VDC	3'000 mA			87 %
THN 10-7211WIR		5 VDC	2'000 mA			88 %
THN 10-7212WIR		12 VDC	830 mA			89 %
THN 10-7213WIR		15 VDC	670 mA			89 %
THN 10-7215WIR		24 VDC	420 mA			89 %
THN 10-7221WIR		+5 VDC	1'000 mA	-5 VDC	1'000 mA	85 %
THN 10-7222WIR		+12 VDC	416 mA	-12 VDC	416 mA	89 %
THN 10-7223WIR		+15 VDC	333 mA	-15 VDC	333 mA	89 %
THN 10-7225WIR		+24 VDC	210 mA	-24 VDC	210 mA	89 %

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: 10 mA typ. 48 Vin models: 8 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: 200 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: 2'000 mA (slow blow) 48 Vin models: 1'250 mA (slow blow) 110 Vin models: 630 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% (3.3 & 12 Vout models) -10% to +20% (other models) (single output models only) (By external trim resistor) See application note: www.tracopower.com/overview/thn10wir Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (Vmin - Vmax) - Load Variation (0 - 100%) - Cross Regulation (25% / 100% asym. load)	single output models: 0.2% max. dual output models: 0.5% max. single output models: 0.2% max. dual output models: 1% max. (Output 1) 1% max. (Output 2) dual output models: 5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output - dual output	3.3 Vout models: 75 mVp-p typ. (w/ 10 µF X7R) 5 Vout models: 75 mVp-p typ. (w/ 10 µF X7R) 12 Vout models: 75 mVp-p typ. (w/ 10 µF X7R) 15 Vout models: 75 mVp-p typ. (w/ 10 µF X7R) 24 Vout models: 100 mVp-p typ. (w/ 2.2 µF X7R) 5 / -5 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R) 12 / -12 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R) 15 / -15 Vout models: 75 / 75 mVp-p typ. (w/ 10 µF X7R) 24 / -24 Vout models: 100 / 100 mVp-p typ. (w/ 2.2 µF X7R)
Capacitive Load	- single output - dual output	3.3 Vout models: 3'500 µF max. 5 Vout models: 2'500 µF max. 12 Vout models: 430 µF max. 15 Vout models: 350 µF max. 24 Vout models: 125 µF max. 5 / -5 Vout models: 1'440 / 1'440 µF max. 12 / -12 Vout models: 250 / 250 µF max. 15 / -15 Vout models: 180 / 180 µF max. 24 / -24 Vout models: 56 / 56 µF max.

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

Minimum Load	Not required
Temperature Coefficient	±0.02 %/K max.
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. / 50 ms max.
Short Circuit Protection	Continuous, Automatic recovery
Output Current Limitation	170% typ. of I _{out} max.
Overvoltage Protection	112 - 164% of V _{out} nom. (depending on model) 3.7 - 5.4 VDC (3.3 VDC model) 6.3 - 7.4 VDC (±5 VDC model) 13.5 - 19.6 VDC (±12 VDC model) 18.3 - 22 VDC (±15 VDC model) 29.1 - 32.5 VDC (±24 VDC model))
Transient Response	- Response Time 250 µs typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment - Railway Applications - Certification Documents	EN 62368-1 IEC 62368-1 UL 62368-1 EN 50155 www.tracopower.com/overview/thn10wir
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: www.tracopower.com/overview/thn10wir
EMS (Immunity)	- Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances - PF Magnetic Field	EN 50121-3-2 (EMC for Rolling Stock) 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 Vin models: KY 470 µF TVS SMDJ58A 48 Vin models: KY 330 µF TVS SMDJ120A 110 Vin models: KXJ 220 µF TVS SMDJ300A Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A 1 s: EN 61000-4-8, 100 A/m, perf. criteria A EN 61000-4-8, 1000 A/m, perf. criteria A
EMC / Environmental	- Certification Documents	www.tracopower.com/overview/thn10wir

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +95°C +105°C max. -55°C to +125°C
Power Derating	- High Temperature	Depending on model See application note: www.tracopower.com/overview/thn10wir
Cooling System		Natural convection (20 LFM)

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Remote Control	- Voltage Controlled Remote (passive = on) - 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
Altitude During Operation		5'000 m max.
Switching Frequency		260 - 320 kHz (PWM) (3.3 & 5 Vout models) 325 - 395 kHz (PWM) (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 2'250 VDC 2'250 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	1'000 pF max.
Reliability	- Calculated MTBF	2'334'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Vibration - Mechanical Shock - Thermal Shock - Flammability	MIL-STD-810F EN 61373 MIL-STD-810F EN 61373 MIL-STD-810F 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		Epoxy (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		16.5 g
Thermal Impedance	- Case to Ambient	16.8 K/W typ. (without heatsink) 13.2 K/W typ. (with heatsink THN-HS2) 11.0 K/W typ. (with heatsink THN-HS3) 9.4 K/W typ. (with heatsink THN-HS4)
Environmental Compliance	- REACH Declaration - RoHS Declaration - SCIP Reference Number	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) 260e4b3e-8f35-4a50-8695-d871680978aa

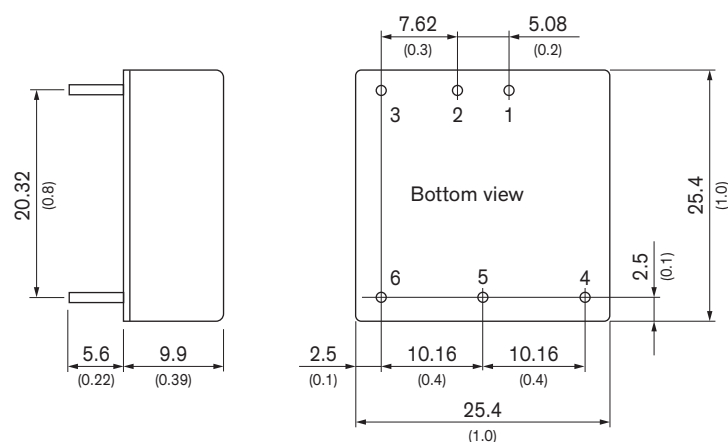
Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/thn10wir

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Outline Dimensions



Dimensions in mm (inch)
 Tolerances: ± 0.5 (± 0.02)
 Pin pitch tolerances ± 0.25 (± 0.01)
 Pin diameter $\varnothing 1.0$ (0.04)

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