

DC/DC Railway Converter

THN 15WIR Series, 15 Watt

- Compact 1.0" x 1.0" x 0.4" standard package
- Ultra-wide 4:1 input voltage range 9–36, 18–75, 36–160 VDC
- EN 50155 and EN 61373 approval for railway applications
- Qualification for fire behaviour according to EN 45545-2
- 3000 VDC I/O-isolation
- High efficiency up to 91%
- Operating temperature range –40°C to +90°C
- Under-voltage lock out circuit
- Adjustable output voltage & Remote On/Off
- 3-year product warranty



The THN 15WIR series is a family of ruggedized 15 W DC/DC converters for highest reliability in harsh environments. The converters have an increased resistance against electromagnetic interference, shock/vibration and thermal shock. The approvals according to standards EN 50155 and EN 61373 qualify them for railway and transportation systems. The qualification for the fire behaviour of components according to EN 45545-2 and the safety approval according IEC/EN 60950-1, UL60950-1 support a potential compliance test of the application. Built-in EMI 55022 class A filter, input under-voltage-lockout, short circuit protection, remote On/Off and output voltage trim are further features which facilitate the design in.

Models						
Order Code	Input Voltage Range	Output 1		Output 2		Efficiency typ.
		Vnom	I _{max}	Vnom	I _{max}	
THN 15-2410WIR	9 - 36 VDC (24 VDC nom.)	3.3 VDC	4'500 mA			88 %
THN 15-2411WIR		5 VDC	3'000 mA			90 %
THN 15-2412WIR		12 VDC	1'300 mA			89 %
THN 15-2413WIR		15 VDC	1'000 mA			90 %
THN 15-2415WIR		24 VDC	625 mA			91 %
THN 15-2421WIR		+5 VDC	1'500 mA	–5 VDC	1'500 mA	87 %
THN 15-2422WIR		+12 VDC	625 mA	–12 VDC	625 mA	90 %
THN 15-2423WIR		+15 VDC	500 mA	–15 VDC	500 mA	90 %
THN 15-2425WIR		+24 VDC	315 mA	–24 VDC	315 mA	91 %
THN 15-4810WIR	18 - 75 VDC (48 VDC nom.)	3.3 VDC	4'500 mA			88 %
THN 15-4811WIR		5 VDC	3'000 mA			90 %
THN 15-4812WIR		12 VDC	1'300 mA			89 %
THN 15-4813WIR		15 VDC	1'000 mA			90 %
THN 15-4815WIR		24 VDC	625 mA			91 %
THN 15-4821WIR		+5 VDC	1'500 mA	–5 VDC	1'500 mA	87 %
THN 15-4822WIR		+12 VDC	625 mA	–12 VDC	625 mA	90 %
THN 15-4823WIR		+15 VDC	500 mA	–15 VDC	500 mA	90 %
THN 15-4825WIR		+24 VDC	315 mA	–24 VDC	315 mA	90 %
THN 15-7210WIR	36 - 160 VDC (110 VDC nom.)	3.3 VDC	4'500 mA			88 %
THN 15-7211WIR		5 VDC	3'000 mA			89 %
THN 15-7212WIR		12 VDC	1'300 mA			89 %
THN 15-7213WIR		15 VDC	1'000 mA			89 %
THN 15-7215WIR		24 VDC	625 mA			90 %
THN 15-7221WIR		+5 VDC	1'500 mA	–5 VDC	1'500 mA	86 %
THN 15-7222WIR		+12 VDC	625 mA	–12 VDC	625 mA	89 %
THN 15-7223WIR		+15 VDC	500 mA	–15 VDC	500 mA	89 %
THN 15-7225WIR		+24 VDC	315 mA	–24 VDC	315 mA	90 %

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: 12 mA typ. 48 Vin models: 10 mA typ. 110 Vin models: 8 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.
Reflected Ripple Current		30 mA_{p-p} typ.
Recommended Input Fuse		24 Vin models: 3'150 mA (slow blow) 48 Vin models: 1'600 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% (15 & 24 VDC models) ±10% (other models) (single output models only) (By external trim resistor) See application note: www.tracopower.com/overview/thn15wir Output power must not exceed rated power!
Voltage Set Accuracy		±1% max.
Regulation	- Input Variation (V _{min} - V _{max})	single output models: 0.2% max. dual output models: 0.5% max.
	- Load Variation (0 - 100%)	single output models: 0.2% max. dual output models: 1% max. (Output 1) 1% max. (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: 5% max.
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 V _{out} models: 75 mV_{p-p} typ. (w/ 10 µF, 6.3 V X7R) 5 V _{out} models: 75 mV_{p-p} typ. (w/ 10 µF, 6.3 V X7R) 12 V _{out} models: 100 mV_{p-p} typ. (w/ 1 µF, 25 V X7R) 15 V _{out} models: 100 mV_{p-p} typ. (w/ 1 µF, 25 V X7R) 24 V _{out} models: 125 mV_{p-p} typ. (w/ 2.2 µF, 50 V X7R)
	- dual output	5 / -5 V _{out} models: 75 / 75 mV_{p-p} typ. (w/ 10 µF, 6.3 V X7R) 12 / -12 V _{out} models: 100 / 100 mV_{p-p} typ. (w/ 1 µF, 25 V X7R) 15 / -15 V _{out} models: 100 / 100 mV_{p-p} typ. (w/ 1 µF, 25 V X7R) 24 / -24 V _{out} models: 125 / 125 mV_{p-p} typ. (w/ 2.2 µF, 50 V X7R)

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

Capacitive Load	- single output	3.3 Vout models: 5'200 μ F max. 5 Vout models: 3'600 μ F max. 12 Vout models: 600 μ F max. 15 Vout models: 500 μ F max. 24 Vout models: 200 μ F max.
	- dual output	5 / -5 Vout models: 1'500 / 1'500 μ F max. 12 / -12 Vout models: 360 / 360 μ F max. 15 / -15 Vout models: 250 / 250 μ F max. 24 / -24 Vout models: 100 / 100 μ F max.
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. / 40 ms max.
Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		145 - 212% of Iout max. 170% typ. of Iout max.
Overvoltage Protection		112 - 164% of Vout nom.
Transient Response	- Response Time	250 μ s typ. (25% Load Step)

Safety Specifications

Standards	- IT / Multimedia Equipment	EN 60950-1 EN 62368-1 IEC 60950-1 IEC 62368-1 UL 60950-1 UL 62368-1
	- Railway Applications - Certification Documents	EN 50155 www.tracopower.com/overview/thn15wir
Pollution Degree		PD 2

EMC Specifications

EMI (Emissions)	- Conducted Emissions	EN 50121-3-2 (EMC for Rolling Stock) 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)
	- Radiated 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)
		External filter proposal: www.tracopower.com/overview/thn15wir
EMS (Immunity)	- Electrostatic Discharge	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
	- RF Electromagnetic Field - EFT (Burst) / Surge	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: 220 μ F, 100 V TVS SMDJ58A 48 Vin models: 220 μ F, 100 V 110 Vin models: 150 μ F, 200 V TVS SMDJ300A
	- Conducted RF Disturbances - PF Magnetic Field	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/thn15wir

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General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	-40°C to +90°C
	- Case Temperature	-40°C to +93°C (with Heat Sink)
	- Storage Temperature	+105°C max.
	- High Temperature	-55°C to +125°C
Power Derating		3.3 %/K above 75°C
		4 %/K above 80°C (with Heat Sink)
	See application note: www.tracopower.com/overview/thn15wir	
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 3.0 to 15 VDC or open circuit
	- Off Idle Input Current	Off: 0 to 1.2 VDC or short circuit
	- Remote Pin Input Current	Refers to 'Remote' and '-Vin' Pin
		2.5 mA typ.
		-0.5 to 1.0 mA
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		245 kHz typ. (PWM) (±10%, 3.3 & 5 Vout model)
		300 kHz typ. (PWM) (±10%, other models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	3'000 VDC
	- Input to Case, 60 s	1'600 VDC
	- Output to Case, 60 s	1'600 VDC
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	1'600'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline
		www.tracopower.com/info/cleaning.pdf
Environment	- Vibration	MIL-STD-810F
	- Mechanical Shock	EN 61373
	- Thermal Shock	MIL-STD-810F
	- Flammability	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		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 / 10 s max.
Weight		16.5 g
Thermal Impedance	- Case to Ambient	17 K/W typ. (without heatsink)
		12.9 K/W typ. (with heatsink THN-HS2)
		10.9 K/W typ. (with heatsink THN-HS3)
		9.3 K/W typ. (with heatsink THN-HS4)

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Environmental Compliance - REACH Declaration

www.tracopower.com/info/reach-declaration.pdf

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

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

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Additional Information

Supporting Documents

www.tracopower.com/overview/thn15wir

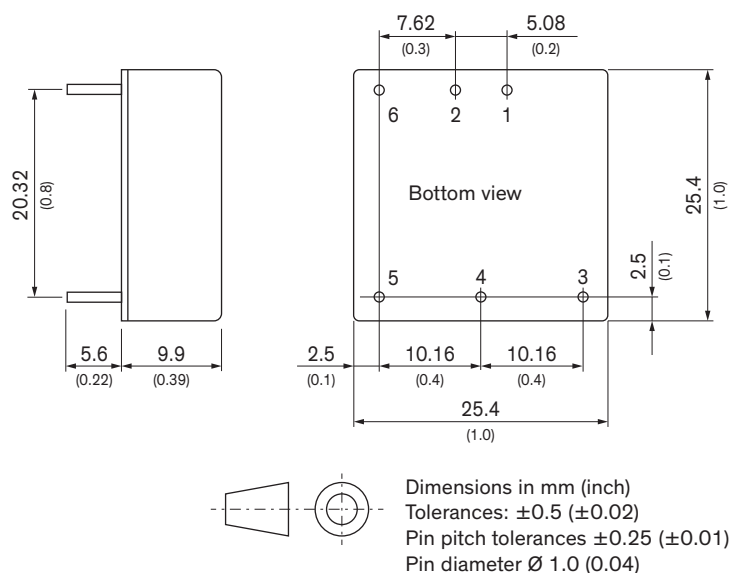
Frequently Asked Questions

www.tracopower.com/glossary-faq

Glossary

www.tracopower.com/info/glossary.pdf

Outline Dimensions



Pinout

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