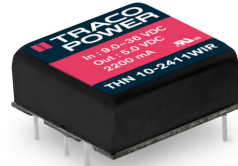


- Compact 1" x 1" metal package
- EN 50155 and EN 61373 approval for railway applications
- Qualification for fire behavior according to EN 45545-2
- Wide 4:1 input voltage: 9-36, 18-75, 36-160 VDC
- Operating temperature range -40 to +80 °C without derating
- High efficiency up to 90%
- 3000 VDC I/O-isolation
- 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 <sub>max</sub>	Vnom	I <sub>max</sub>	
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		
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		
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 %

## Input Specifications

Input Current	- At no load	24 Vin models: <b>10 mA typ.</b> 48 Vin models: <b>8 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>2'000 mA</b> (slow blow) 48 Vin models: <b>1'250 mA</b> (slow blow) 110 Vin models: <b>630 mA</b> (slow blow)
Input Filter		<b>Internal Pi-Type</b>

## Output Specifications

Output Voltage Adjustment		<b>±10%</b> (By external trim resistor) (3.3 & 12 Vout models) <b>-10% to +20%</b> (By external trim resistor) (other models) (only single output)  Output power must not exceed rated power!
Voltage Set Accuracy		<b>±1% max.</b>
Regulation	- Input Variation (Vmin - Vmax)	single output models: <b>0.2% max.</b> dual output models: <b>0.5% max.</b>
	- Load Variation (0 - 100%)	single output models: <b>0.2% max.</b> dual output models: <b>1% max.</b> (Output 1) <b>1% max.</b> (Output 2)
	- Cross Regulation (25% / 100% asym. load)	dual output models: <b>5% max.</b>
Ripple and Noise (20 MHz Bandwidth)	- single output	3.3 Vout models: <b>75 mVp-p typ.</b> (with 10 µF X7R) 5 Vout models: <b>75 mVp-p typ.</b> (with 10 µF X7R) 12 Vout models: <b>75 mVp-p typ.</b> (with 10 µF X7R) 15 Vout models: <b>75 mVp-p typ.</b> (with 10 µF X7R) 24 Vout models: <b>100 mVp-p typ.</b> (with 2.2 µF X7R)
	- dual output	5 / -5 Vout models: <b>75 / 75 mVp-p typ.</b> (with 10 µF X7R) 12 / -12 Vout models: <b>75 / 75 mVp-p typ.</b> (with 10 µF X7R) 15 / -15 Vout models: <b>75 / 75 mVp-p typ.</b> (with 10 µF X7R) 24 / -24 Vout models: <b>100 / 100 mVp-p typ.</b> (with 2.2 µF X7R)
Capacitive Load	- single output	3.3 Vout models: <b>3'500 µF max.</b> 5 Vout models: <b>2'500 µF max.</b> 12 Vout models: <b>430 µF max.</b> 15 Vout models: <b>350 µF max.</b> 24 Vout models: <b>125 µF max.</b>
	- dual output	5 / -5 Vout models: <b>1'440 / 1'440 µF max.</b> 12 / -12 Vout models: <b>250 / 250 µF max.</b> 15 / -15 Vout models: <b>180 / 180 µF max.</b> 24 / -24 Vout models: <b>56 / 56 µF max.</b>
Minimum Load		<b>Not required</b>
Temperature Coefficient		<b>±0.02 %/K max.</b>
Start-up Time		<b>30 ms typ. / 50 ms max.</b>
Short Circuit Protection		<b>Continuous, Automatic recovery</b>
Output Current Limitation		<b>170% typ. of lout max.</b>

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

Overvoltage Protection		112 - 164% of Vout nom. (depending on model) 3.7 - 5.4 VDC (3.3 VDC model) 6.3 - 7.4 VDC ( $\pm 5$ VDC model) 13.5 - 19.6 VDC ( $\pm 12$ VDC model) 18.3 - 22 VDC ( $\pm 15$ VDC model) 29.1 - 32.5 VDC ( $\pm 24$ VDC model))
Transient Response	- Response Time	250 $\mu$ s typ. (25% Load Step)

## Safety Specifications

Safety Standards	- IT / Multimedia Equipment	IEC 62368-1 UL 62368-1
	- Railway Applications	EN 50155
	- Certification Documents	

## 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)
EMS Immunity		EN 50155 (Railway Applications)
	- Electrostatic Discharge	Air: EN 61000-4-2, $\pm 8$ kV, perf. criteria A Contact: EN 61000-4-2, $\pm 6$ kV, perf. criteria A
	- RF Electromagnetic Field	EN 61000-4-3, 20 V/m, perf. criteria A
	- EFT (Burst) / Surge	EN 61000-4-4, $\pm 2$ kV, perf. criteria A EN 61000-4-5, $\pm 2$ kV, perf. criteria A
	- Conducted RF Disturbances	Ext. input component: 24 Vin models: KY 470 $\mu$ F // TVS SMDJ58A 48 Vin models: KY 330 $\mu$ F // TVS SMDJ120A 110 Vin models: KXJ 220 $\mu$ F // TVS SMDJ300A 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

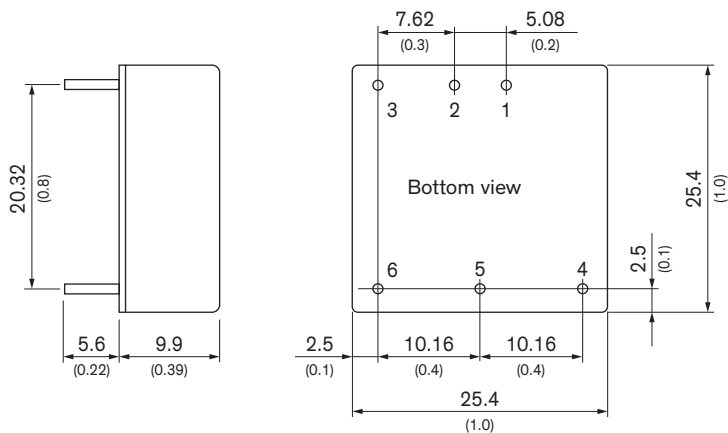
## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Case Temperature - Storage Temperature	-40°C to +105°C +105°C max. -55°C to +125°C Meet the railway TX temperature requirement with derating to 7 W output power (3.3, 5 & $\pm 5$ Vout models) resp. 10 W output power (other models)
Power Derating	- High Temperature	4 %/K above 80°C
Remote Control	- Voltage Controlled Remote	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
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	3'000 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 M $\Omega$ 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)

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

Environment	- Vibration	MIL-STD-810F EN 61373
	- Mechanical Shock	MIL-STD-810F EN 61373
	- Thermal Shock	MIL-STD-810F
Housing Material		Copper
Base Material		Non-conductive FR4 (UL94 V-0 rated)
Potting Material		Epoxy (UL 94 V-0 rated)
Pin Material		Copper
Pin Foundation Plating		Nickel (2 - 3 $\mu\text{m}$ )
Pin Surface Plating		Tin (3 - 5 $\mu\text{m}$ ), matte
Connection Type		THD (Through-Hole Device)
Weight		16.5 g
Thermal Impedance		16.8 K/W
	- with Heat Sink	15.3 K/W
Environmental Compliance	- Reach	
	- RoHS	
	- Flammability (EN 45545-2)	

## Outline Dimensions



Dimensions in mm (inch)  
Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
Pin pitch tolerances  $\pm 0.25$  ( $\pm 0.01$ )  
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

Specifications can be changed without notice.

Rev. December 16, 2019

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