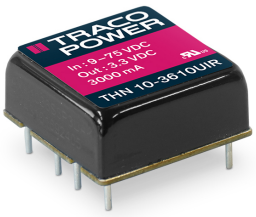
TRACO POWER

DC/DC Railway Converter

THN 10UIR Series, 10 Watt

- **Compact 1”x1” housing**
- **Ultra-wide 12:1 input range: 9-75, 14-160 VDC**
- **-40°C up to 80°C natural convection cooling without derating**
- **EN 50155, EN 45545-2 and EN 61373 certified**
- **Dedicated holdup capacitor connection**
- **Fully encapsulated**
- **3000 VDC I/O isolation**
- **Remote on/off and trim function**
- **Protection against short-circuit, overvoltage and overtemperature**
- **3-year product warranty**



UL 62368-1 IEC 62368-1

The THN 10UIR is a series of high-performance DC/DC converters with an ultra-wide 12:1 input voltage range and a power output of 10 watt. The THN 10UIR comes in a compact, fully encapsulated 1”x1” housing for highest reliability and effective cooling. Thanks to its dedicated holdup capacitor connection, the THN 10UIR meets extended holdup-time requirements without the need for bulky input capacitors. The THN 10UIR is EN 50155 certified for rolling stock applications, EN 61373 certified for resistance against mechanical shock and vibration and EN 45545-2 certified for fire behavior. The THN 10UIR also comes with IEC/EN/UL 62368-1 safety approvals for use in a wide range of demanding industrial applications.

Models

Order Code	Input Voltage Range	Output 1		Output 2		Efficiency
		Vnom	Imax	Vnom	Imax	typ.
THN 10-3610UIR	9 - 75 VDC (36 VDC nom.)	3.3 VDC	3'000 mA			85 %
THN 10-3611UIR		5.1 VDC	2'000 mA			86 %
THN 10-3612UIR		12 VDC	830 mA			88 %
THN 10-3613UIR		15 VDC	670 mA			88 %
THN 10-3615UIR		24 VDC	420 mA			88 %
THN 10-3621UIR		+5 VDC	1'000 mA	−5 VDC	1'000 mA	83 %
THN 10-3622UIR		+12 VDC	416 mA	−12 VDC	416 mA	87 %
THN 10-3623UIR		+15 VDC	333 mA	−15 VDC	333 mA	87 %
THN 10-7210UIR	14 - 160 VDC (72 VDC nom.)	3.3 VDC	3'000 mA			86 %
THN 10-7211UIR		5.1 VDC	2'000 mA			88 %
THN 10-7212UIR		12 VDC	830 mA			88 %
THN 10-7213UIR		15 VDC	670 mA			89 %
THN 10-7215UIR		24 VDC	420 mA			87 %
THN 10-7221UIR		+5 VDC	1'000 mA	−5 VDC	1'000 mA	84 %
THN 10-7222UIR		+12 VDC	416 mA	−12 VDC	416 mA	87 %
THN 10-7223UIR		+15 VDC	333 mA	−15 VDC	333 mA	88 %

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 - Optional models with inverse Remote On/Off function (passive = off) - Optional models without adjustable UVLO and without BUS pin - Optional models with adjustable UVLO but without BUS pin

Note - 72 Vin models: If the input voltage exceeds 110 VDC, use an external 100 µF / 200 V capacitor between +Vin and -Vin to reduce voltage transient.

Input Specifications

Input Current	- At no load		8 mA typ.
Surge Voltage		36 Vin models:	100 VDC max. (1 s max.)
		72 Vin models:	200 VDC max. (1 s max.)
Under Voltage Lockout		36 Vin models:	7.3 VDC min. / 7.7 VDC typ. / 8.1 VDC max.
		72 Vin models:	10 VDC min. / 11 VDC typ. / 12 VDC max.
Recommended Input Fuse		36 Vin models:	2'000 mA (slow blow)
		72 Vin models:	1'600 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 single output models)
			−10% to +20% (other single output models)
			(By external trim resistor)
		See application note:	www.tracopower.com/overview/thn10uir
			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 (0 - 100%)	single output models:	0.2% max.
		dual output models:	1% max. (Output 1)
			1% max. (Output 2)
	- Voltage Balance (symmetrical load)	dual output models:	2% max.
	- 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/ 10 uF)
		5.1 Vout models:	75 mVp-p typ. (w/ 10 uF)
		12 Vout models:	100 mVp-p typ. (w/ 10 uF)
		15 Vout models:	100 mVp-p typ. (w/ 10 uF)
		24 Vout models:	100 mVp-p typ. (w/ 4.7 uF)
	- dual output	5 / -5 Vout models:	75 / 75 mVp-p typ. (w/ 10 uF)
		12 / -12 Vout models:	100 / 100 mVp-p typ. (w/ 10 uF)
		15 / -15 Vout models:	100 / 100 mVp-p typ. (w/ 10 uF)
Capacitive Load	- single output	3.3 Vout models:	3'500 µF max.
		5.1 Vout models:	2'500 µF max.
		12 Vout models:	430 µF max.
		15 Vout models:	350 µF max.
		24 Vout models:	125 µF max.
	- dual output	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.
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 BUS connection: www.tracopower.com/overview/thn10uir)
Start-up Time			30 ms typ. / 40 ms max.
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			160% typ. of Iout max.

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

Overvoltage Protection		(depending on model) **3.7 - 5.4 VDC** (3.3 Vout model) **6.3 - 7.4 VDC** (5.1 Vout model) **13.5 - 19.6 VDC** (12 Vout model) **18.3 - 22 VDC** (15 Vout model) **29.1 - 32.5 VDC** (24 Vout model)
Transient Response	- Response Deviation	**4% typ.** (75% to 100% Load Step)
	- Response Time	**250 µs typ.** (75% to 100% 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/overview/thn10uir (A BUS capacitor must be connected to meet EN 50155 requirements. See application note.)
Pollution Degree		PD 2
Over Voltage Category		OVC II (not mains connected)

EMC Specifications

EMI (Emissions)			EN 50121-3-2 (EMC for Rolling Stock)
	- Conducted Emissions		EN 55032 class A (with external filter) EN 55032 class B (with external filter)
	- Radiated Emissions		EN 55032 class A (with external filter) EN 55032 class B (with external filter)
		External filter proposal:	www.tracopower.com/overview/thn10uir
EMS (Immunity)			EN 50121-3-2 (EMC for Rolling Stock) EN 55035 (Multimedia)
	- 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:	36 Vin models: 220 µF, 100 V, KXJ || SMDJ120A 72 Vin models: 150 µF, 200 V, KXJ || SMDJ170A
	- 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/overview/thn10uir

General Specifications

Relative Humidity			**95% max.** (non condensing)
Temperature Ranges	- Operating Temperature		**–40°C to +95°C**
	- Approved Ambient Temp.		**+75°C max.** (for compliance to 62368-1)
	- 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/overview/thn10uir
Over Temperature Protection Switch Off	- Protection Mode		**115°C typ.** (Automatic recovery at 103°C typ.)
	- Measurement Point		Case
Cooling System			Natural convection (20 LFM)

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

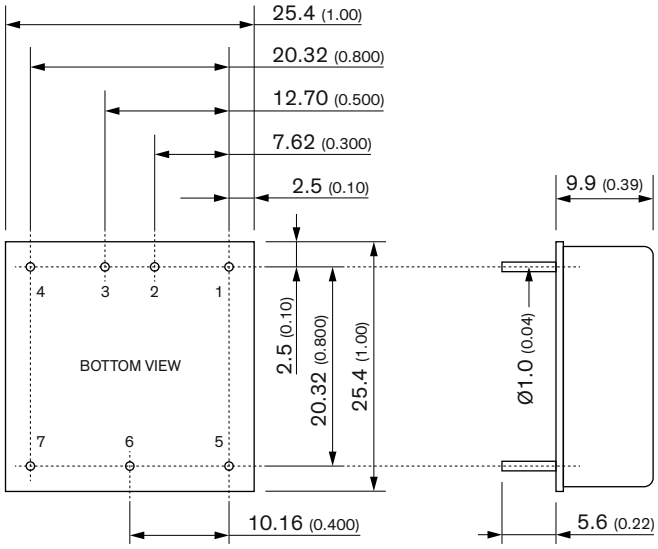
Remote Control	- Voltage Controlled Remote (passive = on)	On: 3.0 to 15 VDC or open circuit Off: 0 to 1.2 VDC or short circuit Refers to 'Remote' and '-Vin' Pin
	- Off Idle Input Current	1.5 mA typ.
	- Remote Pin Input Current	-0.5 to 1.0 mA (Optional models with inverse Remote On/Off function (passive = off))
Altitude During Operation		5'000 m max.
Regulator Topology		Flyback Converter
Switching Frequency		220 - 280 kHz (PWM) (250 kHz typ.) (3.3 & 5.1 Vout models) 200 - 260 kHz (PWM) (230 kHz typ.) (other Vout models)
Insulation System		Functional Insulation
Isolation Test Voltage	- Input to Output, 60 s	3'000 VDC
	- Input to Case, 60 s	2'250 VDC
	- Output to Case, 60 s	2'250 VDC
Isolation Resistance	- Input to Output, 500 VDC	1'000 MΩ min.
Isolation Capacitance	- Input to Output, 100 kHz, 1 V	400 pF typ. 600 pF max.
Reliability	- Calculated MTBF	1'928'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Not allowed
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, Nickel plated
Base Material		Non-conductive FR4 (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Tinned 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		16.1 g
Thermal Impedance	- Case to Ambient	13.7 K/W typ. (without Heatsink) 12.9 K/W typ. (with Heatsink THN-HS2) 10.8 K/W typ. (with Heatsink THN-HS3) 9.3 K/W typ. (with Heatsink THN-HS4)
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: No Exemptions

Supporting Documents

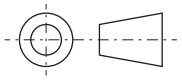
Overview Link (for additional Documents)	www.tracopower.com/overview/thn10uir

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

Outline Dimensions



Dimensions in mm (inch)
Tolerances: x.x ±0.5 (x.xx ±0.02)
x.xx ±0.25 (x.xxx ±0.01)
Pin diameter tolerance: ±0.10 (±0.004)



Pinout		
Pin	**Single**	**Dual**
1	No pin* / BUS / UVLO**	
2	+Vin	
3	–Vin	
4	Remote On/Off	
5	+Vout	
6	Trim	Common
7	–Vout	

* If neither BUS nor UVLO is present

** UVLO function is optional

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