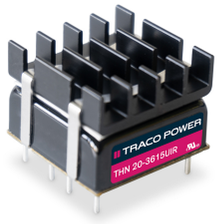
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# TRACO POWER

## DC/DC Railway Converter

## THN 20UIR Series, 20 Watt

- **Compact 1”x1” housing**
- **Ultra-wide 12:1 input voltage range: 9–75, 14–160 VDC**
- **–40°C up to +70°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 (SCP), overvoltage (OVP) and overtemperature (OTP)**
- **3-year product warranty**




UL 62368-1 IEC 62368-1

The THN 20UIR is a series of high-performance DC/DC converters with an ultra-wide 12:1 input voltage range and a power output of 20 watt. The THN 20UIR comes in a compact, fully encapsulated 1”x1” housing for highest reliability. The default variant features a pre-mounted heatsink for convection cooling up to +70°C without derating. Thanks to its dedicated holdup capacitor connection, the THN 20UIR meets extended holdup-time requirements without the need for bulky input capacitors. The THN 20UIR 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 20UIR 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 20-3611UIR** | 9 - 75 VDC (36 VDC nom.) | 5.1 VDC | 4'000 mA | | | 87 % |
| **THN 20-3612UIR** | | 12 VDC | 1'670 mA | | | 88 % |
| **THN 20-3613UIR** | | 15 VDC | 1'330 mA | | | 88 % |
| **THN 20-3615UIR** | | 24 VDC | 835 mA | | | 88 % |
| **THN 20-3622UIR** | | +12 VDC | 833 mA | –12 VDC | 833 mA | 88 % |
| **THN 20-3623UIR** | | +15 VDC | 667 mA | –15 VDC | 667 mA | 88 % |
| **THN 20-7211UIR** | 14 - 160 VDC (72 VDC nom.) | 5.1 VDC | 4'000 mA | | | 87 % |
| **THN 20-7212UIR** | | 12 VDC | 1'670 mA | | | 88 % |
| **THN 20-7213UIR** | | 15 VDC | 1'330 mA | | | 88 % |
| **THN 20-7215UIR** | | 24 VDC | 835 mA | | | 88 % |
| **THN 20-7222UIR** | | +12 VDC | 833 mA | –12 VDC | 833 mA | 88 % |
| **THN 20-7223UIR** | | +15 VDC | 667 mA | –15 VDC | 667 mA | 88 % |

## Options

| | |
|---|---|
| **on demand** (backorder with MOQ non stocking item) | - Optional Heat Sink: www.tracopower.com/overview/thn-hs3<br>- Optional Heat Sink: www.tracopower.com/overview/thn-hs4<br>- Optional models with inverse Remote On/Off function (passive = off)<br>- Optional models without adjustable UVLO and without BUS pin<br>- Optional models with adjustable UVLO but without BUS pin<br>- Optional models without heatsink |

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.

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## Input Specifications

| | | | |
|---|---|---|---|
| Input Current | - At no load | 72 Vin models: | 8 mA typ. |
| | | 36 Vin models: | 15 mA typ. (5.1 Vout model) |
| | | | 12 mA typ. (12 Vout model) |
| | | | 12 mA typ. (15 Vout model) |
| | | | 12 mA typ. (24 Vout model) |
| | | | 12 mA typ. (12 / -12 Vout model) |
| | | | 12 mA typ. (15 / -15 Vout model) |
| 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: | 4'000 mA (slow blow) |
| | | 72 Vin models: | 3'150 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% (12 Vout models) |
| | | | −10% to +20% (other models) |
| | | | (single ouput models only) |
| | | | (By external trim resistor) |
| | | See application note: | www.tracopower.com/overview/thn20uir |
| | | | 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 | 5.1 Vout models: | 75 mVp-p typ. (w/ 22 µF) |
| | | 12 Vout models: | 100 mVp-p typ. (w/ 22 µF) |
| | | 15 Vout models: | 100 mVp-p typ. (w/ 22 µF) |
| | | 24 Vout models: | 125 mVp-p typ. (w/ 4.7 µF) |
| | - dual output | 12 / -12 Vout models: | 100 / 100 mVp-p typ. (w/ 10 µF) |
| | | 15 / -15 Vout models: | 100 / 100 mVp-p typ. (w/ 10 µF) |
| Capacitive Load | - single output | 5.1 Vout models: | 5'000 µF max. |
| | | 12 Vout models: | 850 µF max. |
| | | 15 Vout models: | 700 µF max. |
| | | 24 Vout models: | 220 µF max. |
| | - dual output | 12 / -12 Vout models: | 500 / 500 µF max. |
| | | 15 / -15 Vout models: | 350 / 350 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/thn20uir) |
| Start-up Time | | | 30 ms typ. / 40 ms max. |
| Short Circuit Protection | | | Continuous, Automatic recovery |
| Output Current Limitation | | | 155% typ. of Iout max. |

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

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| | | |
|---|---|---|
| Overvoltage Protection | | (depending on model)<br>**6.3 - 7.4 VDC** (5.1 Vout model)<br>**13.5 - 19.6 VDC** (12 Vout model)<br>**18.3 - 22 VDC** (15 Vout model)<br>**29.1 - 32.5 VDC** (24 Vout model) |
| Transient Response | - Response Deviation | **4% typ.** (25% Load Step) |
| | - Response Time | **250 µs typ.** (25% Load Step) |

## Safety Specifications

| | | |
|---|---|---|
| Standards | - IT / Multimedia Equipment | EN 62368-1<br>IEC 62368-1<br>UL 62368-1 |
| | - Railway Applications | EN 50155 |
| | - Certification Documents | www.tracopower.com/overview/thn20uir<br>(A BUS capacitor must be connected to meet EN 50155 requirements. See application note.) |
| Pollution Degree | | PD 2 |
| Over Voltage Category | | OVC II |

## EMC Specifications

| | | | |
|---|---|---|---|
| EMI (Emissions) | | | EN 50121-3-2 (EMC for Rolling Stock) |
| | - Conducted Emissions | | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
| | - Radiated Emissions | | EN 55032 class A (with external filter)<br>EN 55032 class B (with external filter) |
| | | External filter proposal: | www.tracopower.com/overview/thn20uir |
| EMS (Immunity) | | | EN 50121-3-2 (EMC for Rolling Stock)<br>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<br>EN 61000-4-5, ±2 kV, perf. criteria A |
| | | Ext. input component: | 220µF, 100V, KY \|\| TVS SMDJ120A (36 Vin)<br>150µF, 200V, KXJ \|\| TVS SMBJ220A (72 Vin) |
| | - 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/thn20uir |

## General Specifications

| | | | |
|---|---|---|---|
| Relative Humidity | | | **95% max.** (non condensing) |
| Temperature Ranges | - Operating Temperature | | –40°C to +105°C |
| | - 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/thn20uir |
| 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.

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| | | |
|---|---|---|
| Remote Control | - Voltage Controlled Remote (passive = on) | On: 3.0 to 15 VDC or open circuit<br>Off: 0 to 1.2 VDC or short circuit<br>Refers to 'Remote' and '-Vin' Pin |
| | - Off Idle Input Current | 2.5 mA typ. |
| | - Remote Pin Input Current | -0.5 to 1.0 mA<br>(Optional models with inverse Remote On/Off function (passive = off)) |
| Altitude During Operation | | 5'000 m max. |
| Regulator Topology | | Flyback Converter |
| Switching Frequency | | 190 - 250 kHz (PWM)<br>220 kHz typ. (PWM) |
| Insulation System | | Functional Insulation |
| Working Voltage (rated) | | 75 VDC (36 Vin models)<br>113 VDC (72 Vin models) |
| 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 |
| Creepage | - Input to Output | 2 mm min. |
| Clearance | - Input to Output | 2 mm min. |
| 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 | 1'208'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | According to Cleaning Guideline<br>www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration | MIL-STD-810F<br>EN 61373 |
| | - Mechanical Shock | MIL-STD-810F<br>EN 61373 |
| | - Thermal Shock | MIL-STD-810F |
| | - Flammability | EN 45545-2<br>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<br>260°C / 6 s max. |
| Weight | | 17 g |
| Thermal Impedance | - Case to Ambient | 11.5 K/W typ. (with standard Heatsink)<br>15.5 K/W typ. (without Heatsink)<br>10.4 K/W typ. (with Heatsink THN-HS3)<br>8.8 K/W typ. (with Heatsink THN-HS4) |
| Environmental Compliance | - REACH Declaration | www.tracopower.com/info/reach-declaration.pdf<br>REACH SVHC list compliant<br>REACH Annex XVII compliant |
| | - RoHS Declaration | www.tracopower.com/info/rohs-declaration.pdf<br>Exemptions: 7a, 7c-I<br>(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).) |
| | - SCIP Reference Number | 25c603dd-08f8-4fe0-b89b-aa8c8d481ef2 |

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

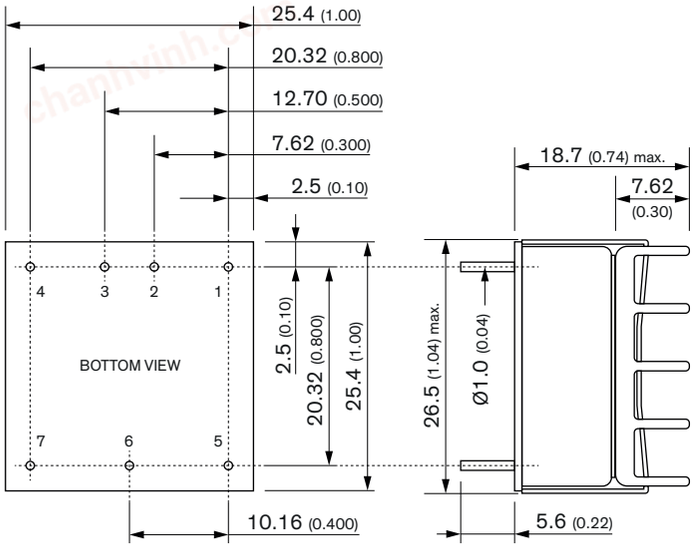
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## Supporting Documents

Overview Link (for additional Documents) www.tracopower.com/overview/thn20uir

## 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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