

- Compact SIP package
11,9 x 7,7 x 11,0 mm
- Fully regulated outputs
- Input Voltage range
4.5-13.2, 9-18, 18-36, 36-75 VDC
- I/O-isolation 1'600 VDC
- Operating temperature range
-40°C to +85°C
- Short circuit protection
- Designed to meet IEC/EN/UL 62368-1
(not certified)
- 3-year product warranty



The TRN 3 Series comprises 3 Watt fully regulated, high performance DC/DC converters. They come in a compact cubical package of only 1.00 cm³. Full load operation is reliable up to 65°C environment temperature. With 1'600 VDC I/O isolation voltage, and short current protection they cover a wide range of application when space is limited. The input of the converters is designed for a wide voltage range (2:1) and minimum load is not required. The functional I/O-isolation system is designed to meet IEC/EN/UL 62368-1 (not certified) with a test voltage (60 s) of 1600 VDC.

Models

| Order Code | Input Voltage Range | Output 1 | | Output 2 | | Efficiency typ. |
|------------|--------------------------------|----------|------------------|----------|------------------|-----------------|
| | | Vnom | I _{max} | Vnom | I _{max} | |
| TRN 3-0510 | 4.5 - 13.2 VDC (9 VDC nom.) | 3.3 VDC | 700 mA | | | 75 % |
| TRN 3-0511 | | 5 VDC | 600 mA | | | 78 % |
| TRN 3-0512 | | 12 VDC | 250 mA | | | 82 % |
| TRN 3-0513 | | 15 VDC | 200 mA | | | 80 % |
| TRN 3-0515 | | 24 VDC | 125 mA | | | 80 % |
| TRN 3-0521 | | +5 VDC | 300 mA | -5 VDC | 300 mA | 77 % |
| TRN 3-0522 | | +12 VDC | 125 mA | -12 VDC | 125 mA | 80 % |
| TRN 3-0523 | | +15 VDC | 100 mA | -15 VDC | 100 mA | 80 % |
| TRN 3-1210 | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 700 mA | | | 76 % |
| TRN 3-1211 | | 5 VDC | 600 mA | | | 79 % |
| TRN 3-1212 | | 12 VDC | 250 mA | | | 84 % |
| TRN 3-1213 | | 15 VDC | 200 mA | | | 83 % |
| TRN 3-1215 | | 24 VDC | 125 mA | | | 82 % |
| TRN 3-1221 | | +5 VDC | 300 mA | -5 VDC | 300 mA | 78 % |
| TRN 3-1222 | | +12 VDC | 125 mA | -12 VDC | 125 mA | 82 % |
| TRN 3-1223 | | +15 VDC | 100 mA | -15 VDC | 100 mA | 81 % |
| TRN 3-2410 | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 700 mA | | | 76 % |
| TRN 3-2411 | | 5 VDC | 600 mA | | | 78 % |
| TRN 3-2412 | | 12 VDC | 250 mA | | | 84 % |
| TRN 3-2413 | | 15 VDC | 200 mA | | | 84 % |
| TRN 3-2415 | | 24 VDC | 125 mA | | | 83 % |
| TRN 3-2421 | | +5 VDC | 300 mA | -5 VDC | 300 mA | 79 % |
| TRN 3-2422 | | +12 VDC | 125 mA | -12 VDC | 125 mA | 83 % |
| TRN 3-2423 | | +15 VDC | 100 mA | -15 VDC | 100 mA | 82 % |
| TRN 3-4810 | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 700 mA | | | 75 % |
| TRN 3-4811 | | 5 VDC | 600 mA | | | 79 % |
| TRN 3-4812 | | 12 VDC | 250 mA | | | 83 % |
| TRN 3-4813 | | 15 VDC | 200 mA | | | 83 % |
| TRN 3-4815 | | 24 VDC | 125 mA | | | 82 % |
| TRN 3-4821 | | +5 VDC | 300 mA | -5 VDC | 300 mA | 77 % |
| TRN 3-4822 | | +12 VDC | 125 mA | -12 VDC | 125 mA | 82 % |
| TRN 3-4823 | | +15 VDC | 100 mA | -15 VDC | 100 mA | 80 % |

Input Specifications

| | | |
|--------------------------|--------------|--|
| Input Current | - At no load | 9 Vin models: 75 mA typ. 12 Vin models: 40 mA typ. 24 Vin models: 20 mA typ. 48 Vin models: 12 mA typ. |
| Surge Voltage | | 9 Vin models: 15 VDC max. (1 s max.) 12 Vin models: 25 VDC max. (1 s max.) 24 Vin models: 50 VDC max. (1 s max.) 48 Vin models: 100 VDC max. (1 s max.) |
| Reflected Ripple Current | | 9 Vin models: 100 mA_{p-p} typ. 12 Vin models: 75 mA_{p-p} typ. 24 Vin models: 75 mA_{p-p} typ. 48 Vin models: 50 mA_{p-p} typ. |
| Recommended Input Fuse | | 9 Vin models: 1'600 mA (slow blow) 12 Vin models: 800 mA (slow blow) 24 Vin models: 500 mA (slow blow) 48 Vin models: 315 mA (slow blow) (The need of an external fuse has to be assessed in the final application.) |
| Input Filter | | Internal Capacitor |

Output Specifications

| | | |
|---------------------------|--|--|
| Voltage Set Accuracy | | ±1% max. |
| Regulation | - Input Variation (V _{min} - V _{max}) | single output models: 0.2% max. dual output models: 0.2% max. |
| | - Load Variation (0 - 100%) | single output models: 1% 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 | 50 mV_{p-p} typ. |
| Capacitive Load | - single output | 3.3 V _{out} models: 4'400 μF max. 5 V _{out} models: 2'200 μF max. 12 V _{out} models: 1'000 μF max. 15 V _{out} models: 820 μF max. 24 V _{out} models: 330 μF max. |
| | - dual output | 5 / -5 V _{out} models: 1'200 / 1'200 μF max. 12 / -12 V _{out} models: 520 / 520 μF max. 15 / -15 V _{out} models: 440 / 440 μF max. |
| Minimum Load | | Not required |
| Temperature Coefficient | | ±0.02 %/K max. |
| Start-up Time | | 5 ms typ. / 15 ms max. |
| Short Circuit Protection | | Continuous, Automatic recovery |
| Output Current Limitation | | 180% typ. of I_{out} max. |
| Transient Response | - Response Deviation | 3% typ. (25% Load Step) |
| | - Response Time | 500 μs typ. (25% Load Step) |

Safety Specifications

| | | |
|-----------|-----------------------------|---|
| Standards | - IT / Multimedia Equipment | Designed for IEC/EN/UL 62368-1 (not certified) |
|-----------|-----------------------------|---|

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

EMC Specifications

| | | |
|-----------------|-----------------------------|--|
| EMI (Emissions) | - 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/trn3 |
| EMS (Immunity) | | EN 55024 (IT Equipment) 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, 10 V/m, perf. criteria A |
| | - EFT (Burst) / Surge | EN 61000-4-4, ±2 kV, perf. criteria A EN 61000-4-5, ±1 kV, perf. criteria A |
| | - Conducted RF Disturbances | Ext. input component: Nippon chemi-con KY 220 µF/ 100 V 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 | -40°C to +85°C |
| | - Case Temperature | +105°C max. |
| | - Storage Temperature | -55°C to +125°C |
| Power Derating | - High Temperature | 2.5 %/K above 65°C |
| | See application note: www.tracopower.com/overview/trn3 | |
| Cooling System | | Natural convection (20 LFM) |
| Regulator Topology | | RCC Converter |
| Switching Frequency | | 100 kHz min. (PFM) |
| Insulation System | | Functional Insulation |
| Isolation Test Voltage | - Input to Output, 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 | 75 pF max. |
| Reliability | - Calculated MTBF | 4'400'000 h (MIL-HDBK-217F, ground benign) |
| Washing Process | | According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf |
| Environment | - Vibration | MIL-STD-810F |
| | - Thermal Shock | MIL-STD-810F |
| Housing Material | | Non-conductive Plastic (UL 94 V-0 rated) |
| Potting Material | | Silicone (UL 94 V-0 rated) |
| Pin Material | | Copper |
| Pin Foundation Plating | | Nickel (0.3 - 0.9 µm) |
| Pin Surface Plating | | Tin (5 - 6 µm), matte |
| Housing Type | | Plastic Case |
| Mounting Type | | PCB Mount |
| Connection Type | | THD (Through-Hole Device) |
| Footprint Type | | SIP5 |
| Soldering Profile | | Lead-Free Wave Soldering |
| | | 260°C / 6 s max. |
| Weight | | 2.1 g |

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

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: 7a, 7c-I

(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule))

- SCIP Reference Number

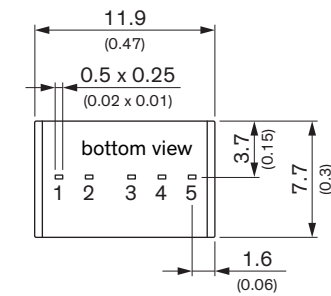
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Supporting Documents

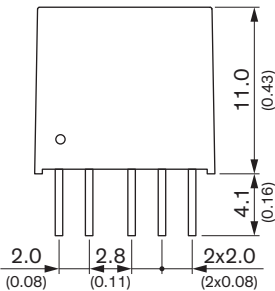
Overview Link (for additional Documents)

www.tracopower.com/overview/trn3

Outline Dimensions



| Pinout | | |
|--------|------------|------------|
| Pin | Single | Dual |
| 1 | -Vin (GND) | -Vin (GND) |
| 2 | +Vin (Vcc) | +Vin (Vcc) |
| 3 | +Vout | +Vout |
| 4 | No pin | Common |
| 5 | -Vout | -Vout |



Dimensions in mm (inch)

Tolerances:

x.x ±0.5 (±0.02)

x.xx ±0.25 (±0.01)

Pin pitch tolerance: ±0.25 (±0.01)

Pin dimension tolerance: ±0.1 (±0.004)

