

- 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 cm<sup>3</sup>. 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 <sub>max</sub> | Vnom     | I <sub>max</sub> |                 |
| TRN 3-0510 | 4.5 - 13.2 VDC<br>(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<br>(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<br>(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<br>(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: <b>75 mA typ.</b><br>12 Vin models: <b>40 mA typ.</b><br>24 Vin models: <b>20 mA typ.</b><br>48 Vin models: <b>12 mA typ.</b>  |
| Surge Voltage            |              | 9 Vin models: <b>15 VDC max.</b> (1 s max.)<br>12 Vin models: <b>25 VDC max.</b> (1 s max.)<br>24 Vin models: <b>50 VDC max.</b> (1 s max.)<br>48 Vin models: <b>100 VDC max.</b> (1 s max.)   |
| Reflected Ripple Current |              | 9 Vin models: <b>100 mA<sub>p-p</sub> typ.</b><br>12 Vin models: <b>75 mA<sub>p-p</sub> typ.</b><br>24 Vin models: <b>75 mA<sub>p-p</sub> typ.</b><br>48 Vin models: <b>50 mA<sub>p-p</sub> typ.</b>   |
| Recommended Input Fuse   |              | 9 Vin models: <b>1'600 mA</b> (slow blow)<br>12 Vin models: <b>800 mA</b> (slow blow)<br>24 Vin models: <b>500 mA</b> (slow blow)<br>48 Vin models: <b>315 mA</b> (slow blow)<br>(The need of an external fuse has to be assessed in the final application.) |
| Input Filter             |              | <b>Internal Capacitor</b>  |

### Output Specifications

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

### Safety Specifications

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

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)<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: <a href="http://www.tracopower.com/overview/trn3">www.tracopower.com/overview/trn3</a> |
| EMS Immunity  |                             | EN 55024 (IT Equipment)<br>EN 55035 (Multimedia)   |
|               | - Electrostatic Discharge   | Air: EN 61000-4-2, ±8 kV, perf. criteria A<br>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<br>EN 61000-4-5, ±1 kV, perf. criteria A                                   |
|               | - Conducted RF Disturbances | Ext. input component: Nippon chemi-con KY 220 µF/ 100 V<br>EN 61000-4-6, 10 Vrms, perf. criteria A               |
|               | - PF Magnetic Field         | Continuous: EN 61000-4-8, 100 A/m, perf. criteria A<br>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: <a href="http://www.tracopower.com/overview/trn3">www.tracopower.com/overview/trn3</a> |   |
| Cooling System         |  | Natural convection (20 LFM)   |
| 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<br><a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a> |
| 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](http://www.tracopower.com/info/reach-declaration.pdf)

- RoHS Declaration

REACH SVHC list compliant

REACH Annex XVII compliant

[www.tracopower.com/info/rohs-declaration.pdf](http://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

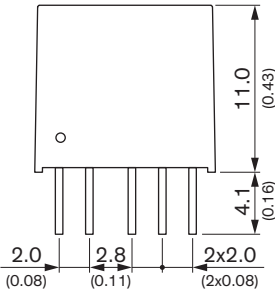
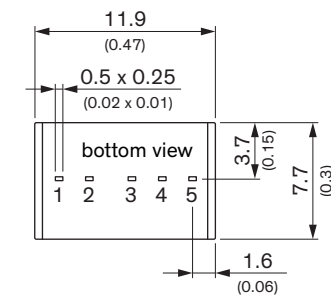
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### Supporting Documents

Overview Link (for additional Documents)

[www.tracopower.com/overview/trn3](http://www.tracopower.com/overview/trn3)

### Outline Dimensions



Dimensions in [mm], () = Inch  
 Tolerances: x.x ±0.5 (±0.02)  
 x.xx ±0.25 (±0.01)  
 Pin pitch tolerances ±0.25 (±0.01)  
 Pin dimension tolerance ±0.1 (±0.004)

### Pinout

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