The TRN 3SM Series comprises 3 Watt fully regulated, high performance DC/DC converters. They come in a compact cubical package of only 1.07 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 1800 VDC.

### Models

<table>
<thead>
<tr>
<th>Order Code</th>
<th>Input Voltage Range</th>
<th>Output 1</th>
<th>Output 2</th>
<th>Efficiency typ.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vnom, Imax</td>
<td>Vnom, Imax</td>
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<td></td>
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<tr>
<td>TRN 3-0510SM</td>
<td>4.5 - 13.2 VDC</td>
<td>3.3 VDC 700 mA</td>
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<td>75 %</td>
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<tr>
<td>TRN 3-0511SM</td>
<td>(9 VDC nom.)</td>
<td>5 VDC 600 mA</td>
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<td>78 %</td>
</tr>
<tr>
<td>TRN 3-0512SM</td>
<td></td>
<td>12 VDC 250 mA</td>
<td></td>
<td>82 %</td>
</tr>
<tr>
<td>TRN 3-0513SM</td>
<td></td>
<td>15 VDC 200 mA</td>
<td></td>
<td>80 %</td>
</tr>
<tr>
<td>TRN 3-0515SM</td>
<td></td>
<td>24 VDC 125 mA</td>
<td></td>
<td>80 %</td>
</tr>
<tr>
<td>TRN 3-0521SM</td>
<td></td>
<td>+5 VDC 300 mA</td>
<td>-5 VDC 300 mA</td>
<td>77 %</td>
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<tr>
<td>TRN 3-0522SM</td>
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<td>+12 VDC 125 mA</td>
<td>-12 VDC 125 mA</td>
<td>80 %</td>
</tr>
<tr>
<td>TRN 3-0523SM</td>
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<td>+15 VDC 100 mA</td>
<td>-15 VDC 100 mA</td>
<td>80 %</td>
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<tr>
<td>TRN 3-1210SM</td>
<td>9 - 18 VDC</td>
<td>3.3 VDC 700 mA</td>
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<td>76 %</td>
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<td>TRN 3-1211SM</td>
<td>(12 VDC nom.)</td>
<td>5 VDC 600 mA</td>
<td></td>
<td>79 %</td>
</tr>
<tr>
<td>TRN 3-1212SM</td>
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<td>12 VDC 250 mA</td>
<td></td>
<td>84 %</td>
</tr>
<tr>
<td>TRN 3-1213SM</td>
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<td>15 VDC 200 mA</td>
<td></td>
<td>83 %</td>
</tr>
<tr>
<td>TRN 3-1215SM</td>
<td></td>
<td>24 VDC 125 mA</td>
<td></td>
<td>82 %</td>
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<tr>
<td>TRN 3-1221SM</td>
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<td>+5 VDC 300 mA</td>
<td>-5 VDC 300 mA</td>
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</tr>
<tr>
<td>TRN 3-1222SM</td>
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<td>+12 VDC 125 mA</td>
<td>-12 VDC 125 mA</td>
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<td>-15 VDC 100 mA</td>
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<tr>
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</tr>
<tr>
<td>TRN 3-2411SM</td>
<td>(24 VDC nom.)</td>
<td>5 VDC 600 mA</td>
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<td>78 %</td>
</tr>
<tr>
<td>TRN 3-2412SM</td>
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<td>12 VDC 250 mA</td>
<td></td>
<td>84 %</td>
</tr>
<tr>
<td>TRN 3-2413SM</td>
<td></td>
<td>15 VDC 200 mA</td>
<td></td>
<td>84 %</td>
</tr>
<tr>
<td>TRN 3-2415SM</td>
<td></td>
<td>24 VDC 125 mA</td>
<td></td>
<td>83 %</td>
</tr>
<tr>
<td>TRN 3-2421SM</td>
<td></td>
<td>+5 VDC 300 mA</td>
<td>-5 VDC 300 mA</td>
<td>79 %</td>
</tr>
<tr>
<td>TRN 3-2422SM</td>
<td></td>
<td>+12 VDC 125 mA</td>
<td>-12 VDC 125 mA</td>
<td>83 %</td>
</tr>
<tr>
<td>TRN 3-2423SM</td>
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<td>+15 VDC 100 mA</td>
<td>-15 VDC 100 mA</td>
<td>82 %</td>
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<td>TRN 3-4810SM</td>
<td>36 - 75 VDC</td>
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<td>75 %</td>
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<td>(48 VDC nom.)</td>
<td>5 VDC 600 mA</td>
<td></td>
<td>79 %</td>
</tr>
<tr>
<td>TRN 3-4812SM</td>
<td></td>
<td>12 VDC 250 mA</td>
<td></td>
<td>83 %</td>
</tr>
<tr>
<td>TRN 3-4813SM</td>
<td></td>
<td>15 VDC 200 mA</td>
<td></td>
<td>83 %</td>
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<td>TRN 3-4815SM</td>
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<td>24 VDC 125 mA</td>
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<td>82 %</td>
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<tr>
<td>TRN 3-4821SM</td>
<td></td>
<td>+5 VDC 300 mA</td>
<td>-5 VDC 300 mA</td>
<td>77 %</td>
</tr>
<tr>
<td>TRN 3-4822SM</td>
<td></td>
<td>+12 VDC 125 mA</td>
<td>-12 VDC 125 mA</td>
<td>82 %</td>
</tr>
<tr>
<td>TRN 3-4823SM</td>
<td></td>
<td>+15 VDC 100 mA</td>
<td>-15 VDC 100 mA</td>
<td>80 %</td>
</tr>
</tbody>
</table>
## 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 mAp-p typ.
- 12 Vin models: 75 mAp-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 (Vmin - Vmax)
  - 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 mVp-p typ.

### Capacitive Load
- Single output
  - 3.3 Vout models: 4'400 µF max.
  - 5 Vout models: 2'200 µF max.
  - 12 Vout models: 1'000 µF max.
  - 15 Vout models: 820 µF max.
  - 24 Vout models: 330 µF max.
- Dual output
  - 5 / -5 Vout models: 1'200 / 1'200 µF max.
  - 12 / -12 Vout models: 520 / 520 µF max.
  - 15 / -15 Vout 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 Iout 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/trn3sm

EMS Immunity
- 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
  - EFT (Burst) / Surge
  - Ext. input component

- Conducted RF Disturbances
- PF Magnetic Field

Electrostatic Discharge
- Air: EN 61000-4-2, ±8 kV, perf. criteria A
- Contact: EN 61000-4-2, ±6 kV, perf. criteria A

Radio Frequency Field
- Continuous
- Air: EN 61000-4-3, 10 V/m, perf. criteria A
- Contact: EN 61000-4-4, ±2 kV, perf. criteria A

- Ext. input component

Environmental 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
2.5 %/K above 65°C

Reliability
Calculated MTBF 4'400'000 h (MIL-HDBK-217F, ground benign)

Moisture Sensitivity (MSL)
Level 2 (J-STD-033C)

Washing Process
According to Cleaning Guideline
www.tracopower.com/info/cleaning.pdf

Environment
- Vibration
- Thermal Shock

MIL-STD-810F

Housing Material
Non-conductive Plastic (UL 94 V-0 rated)

Potting Material
Epoxy (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
SMD (Surface-Mount Device)

Soldering Profile
Lead-Free Reflow Soldering (acc. J-STD-020E)
245°C max. (Tp)
30 s max. (tp, at Tp - 5°C)

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
- RoHS Declaration
- SCIP Reference Number

**Supporting Documents**
Overview Link (for additional Documents)

**Outline Dimensions**

```
+---------+---------+---------+---------+---------+
<table>
<thead>
<tr>
<th>Pin</th>
<th>Single</th>
<th>Dual</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>−Vin (GND)</td>
<td>−Vin (GND)</td>
</tr>
<tr>
<td>2</td>
<td>+Vin (Vcc)</td>
<td>+Vin (Vcc)</td>
</tr>
<tr>
<td>3</td>
<td>+Vout</td>
<td>+Vout</td>
</tr>
<tr>
<td>4</td>
<td>No pin</td>
<td>Common</td>
</tr>
<tr>
<td>5</td>
<td>−Vout</td>
<td>−Vout</td>
</tr>
<tr>
<td>6</td>
<td>NC</td>
<td>NC</td>
</tr>
<tr>
<td>7</td>
<td>NC</td>
<td>NC</td>
</tr>
</tbody>
</table>

NC: Not connected
```

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

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