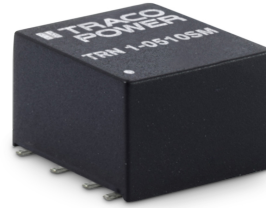


- Compact SMD package
11,9 x 11,3 x 8,0 mm
- Fully regulated outputs
- Input Voltage range
4.5-13.2, 9-18, 18-36, 36-75 VDC
- I/O-isolation 1'600 VDC
- Operating temperature range
-40°C to +90°C without derating
- Short circuit protection
- Designed to meet UL 62368-1 (UL 60950-1)
- 3-year product warranty



The TRN 1SM Series comprises 1 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 90°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 62368-1 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 1-0510SM | 4.5 - 13.2 VDC (9 VDC nom.) | 3.3 VDC | 300 mA | | | 77 % |
| TRN 1-0511SM | | 5 VDC | 200 mA | | | 79 % |
| TRN 1-0512SM | | 12 VDC | 90 mA | | | 81 % |
| TRN 1-0513SM | | 15 VDC | 70 mA | | | 82 % |
| TRN 1-0515SM | | 24 VDC | 45 mA | | | 83 % |
| TRN 1-0521SM | | +5 VDC | 100 mA | -5 VDC | 100 mA | 79 % |
| TRN 1-0522SM | | +12 VDC | 45 mA | -12 VDC | 45 mA | 83 % |
| TRN 1-0523SM | | +15 VDC | 35 mA | -15 VDC | 35 mA | 80 % |
| TRN 1-1210SM | 9 - 18 VDC (12 VDC nom.) | 3.3 VDC | 300 mA | | | 77 % |
| TRN 1-1211SM | | 5 VDC | 200 mA | | | 80 % |
| TRN 1-1212SM | | 12 VDC | 90 mA | | | 81 % |
| TRN 1-1213SM | | 15 VDC | 70 mA | | | 83 % |
| TRN 1-1215SM | | 24 VDC | 45 mA | | | 83 % |
| TRN 1-1221SM | | +5 VDC | 100 mA | -5 VDC | 100 mA | 79 % |
| TRN 1-1222SM | | +12 VDC | 45 mA | -12 VDC | 45 mA | 83 % |
| TRN 1-1223SM | | +15 VDC | 35 mA | -15 VDC | 35 mA | 80 % |
| TRN 1-2410SM | 18 - 36 VDC (24 VDC nom.) | 3.3 VDC | 300 mA | | | 77 % |
| TRN 1-2411SM | | 5 VDC | 200 mA | | | 81 % |
| TRN 1-2412SM | | 12 VDC | 90 mA | | | 82 % |
| TRN 1-2413SM | | 15 VDC | 70 mA | | | 83 % |
| TRN 1-2415SM | | 24 VDC | 45 mA | | | 82 % |
| TRN 1-2421SM | | +5 VDC | 100 mA | -5 VDC | 100 mA | 79 % |
| TRN 1-2422SM | | +12 VDC | 45 mA | -12 VDC | 45 mA | 82 % |
| TRN 1-2423SM | | +15 VDC | 35 mA | -15 VDC | 35 mA | 80 % |
| TRN 1-4810SM | 36 - 75 VDC (48 VDC nom.) | 3.3 VDC | 300 mA | | | 77 % |
| TRN 1-4811SM | | 5 VDC | 200 mA | | | 78 % |
| TRN 1-4812SM | | 12 VDC | 90 mA | | | 80 % |
| TRN 1-4813SM | | 15 VDC | 70 mA | | | 81 % |
| TRN 1-4815SM | | 24 VDC | 45 mA | | | 81 % |
| TRN 1-4821SM | | +5 VDC | 100 mA | -5 VDC | 100 mA | 78 % |
| TRN 1-4822SM | | +12 VDC | 45 mA | -12 VDC | 45 mA | 81 % |
| TRN 1-4823SM | | +15 VDC | 35 mA | -15 VDC | 35 mA | 79 % |

Input Specifications

| | | |
|--------------------------|--------------|--|
| Input Current | - At no load | 9 Vin models: 35 mA typ. 12 Vin models: 20 mA typ. 24 Vin models: 10 mA typ. 48 Vin models: 5 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 | | 30 mA_{p-p} typ. |
| Recommended Input Fuse | | 9 Vin models: 500 mA (slow blow) 12 Vin models: 315 mA (slow blow) 24 Vin models: 160 mA (slow blow) 48 Vin models: 160 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: 1'680 μF max. 5 V _{out} models: 820 μF max. 12 V _{out} models: 470 μF max. 15 V _{out} models: 330 μF max. 24 V _{out} models: 160 μF max. |
| | - dual output | 5 / -5 V _{out} models: 470 / 470 μF max. 12 / -12 V _{out} models: 330 / 330 μF max. 15 / -15 V _{out} models: 220 / 220 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 | | 200% typ. of I_{out} max. |
| Transient Response | - Response Deviation | 3% typ. (25% Load Step) |
| | - Response Time | 500 μs typ. (25% Load Step) |

Safety Specifications

| | | |
|------------------|-----------------------------|---|
| Safety Standards | - IT / Multimedia Equipment | Designed for EN 62368-1 (no certification) |
|------------------|-----------------------------|---|

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/trn1sm |

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

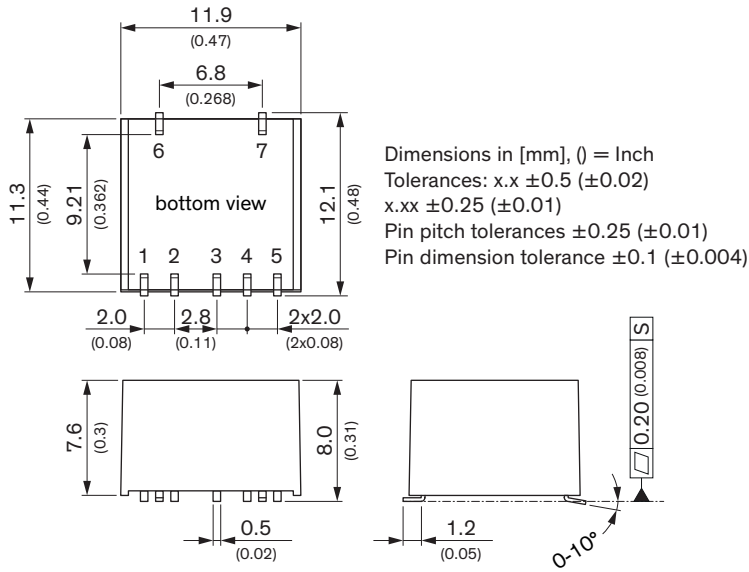
| | | |
|--------------|--|--|
| EMS Immunity | <ul style="list-style-type: none"> - Electrostatic Discharge - RF Electromagnetic Field - EFT (Burst) / Surge - Conducted RF Disturbances - PF Magnetic Field | <p>EN 55024 (IT Equipment)</p> <p>Air: EN 61000-4-2, ± 8 kV, perf. criteria A</p> <p>Contact: EN 61000-4-2, ± 6 kV, perf. criteria A</p> <p>EN 61000-4-3, 10 V/m, perf. criteria A</p> <p>EN 61000-4-4, ± 2 kV, perf. criteria A</p> <p>EN 61000-4-5, ± 1 kV, perf. criteria A</p> <p>Ext. input component: Nippon chemi-con KY 220 μF/100 V</p> <p>Continuous: EN 61000-4-6, 10 Vrms, perf. criteria A</p> <p>EN 61000-4-8, 100 A/m, perf. criteria A</p> <p>1 s: EN 61000-4-8, 1000 A/m, perf. criteria A</p> |
|--------------|--|--|

| General Specifications | | |
|----------------------------|--|---|
| Relative Humidity | | 95% max. (non condensing) |
| Temperature Ranges | <ul style="list-style-type: none"> - Operating Temperature - Case Temperature - Storage Temperature | -40°C to +90°C (without derating) +105°C max. -55°C to +125°C |
| Power Derating | <ul style="list-style-type: none"> - High Temperature | 6.7 %/K above 90°C See application note: www.tracopower.com/overview/trn1sm |
| 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 M Ω min. |
| Isolation Capacitance | - Input to Output, 100 kHz, 1 V | 75 pF max. |
| Reliability | - Calculated MTBF | 7'400'000 h (MIL-HDBK-217F, ground benign) |
| Moisture Sensitivity (MSL) | | Level 2 (J-STD-033C) |
| Washing Process | | Allowed (hermetical product) |
| | See Cleaning Guideline: | www.tracopower.com/info/cleaning.pdf |
| Environment | <ul style="list-style-type: none"> - Vibration - Thermal Shock | MIL-STD-810F 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 μ m) |
| Pin Surface Plating | | Tin (5 - 6 μ m), matte |
| Housing Type | | Plastic Case |
| Mounting Type | | PCB Mount |
| Connection Type | | SMD (Surface-Mount Device) |
| Footprint Type | | SMD10 |
| Soldering Profile | | Reflow Soldering (J-STD-020E) |
| Weight | | 2.1 g |
| Environmental Compliance | <ul style="list-style-type: none"> - REACH Declaration - RoHS Declaration | www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant www.tracopower.com/info/rohs-declaration.pdf Exemptions: 7a, 7c-1 (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule). The SCIP number is provided on request.) |

| Supporting Documents | |
|--|--|
| Overview Link (for additional Documents) | www.tracopower.com/overview/trn1sm |

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

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 |
| 6 | NC | NC |
| 7 | NC | NC |

NC: Not Connected

Recommended Solder Pad Layout

