

- 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 +85°C
- Short circuit protection
- Designed to meet UL 62368-1 (UL 60950-1)
- 3-year product warranty



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 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 3-0510SM	4.5 - 13.2 VDC (9 VDC nom.)	3.3 VDC	700 mA			75 %
TRN 3-0511SM		5 VDC	600 mA			78 %
TRN 3-0512SM		12 VDC	250 mA			82 %
TRN 3-0513SM		15 VDC	200 mA			80 %
TRN 3-0515SM		24 VDC	125 mA			80 %
TRN 3-0521SM		+5 VDC	300 mA	-5 VDC	300 mA	77 %
TRN 3-0522SM		+12 VDC	125 mA	-12 VDC	125 mA	80 %
TRN 3-0523SM		+15 VDC	100 mA	-15 VDC	100 mA	80 %
TRN 3-1210SM	9 - 18 VDC (12 VDC nom.)	3.3 VDC	700 mA			76 %
TRN 3-1211SM		5 VDC	600 mA			79 %
TRN 3-1212SM		12 VDC	250 mA			84 %
TRN 3-1213SM		15 VDC	200 mA			83 %
TRN 3-1215SM		24 VDC	125 mA			82 %
TRN 3-1221SM		+5 VDC	300 mA	-5 VDC	300 mA	78 %
TRN 3-1222SM		+12 VDC	125 mA	-12 VDC	125 mA	82 %
TRN 3-1223SM		+15 VDC	100 mA	-15 VDC	100 mA	81 %
TRN 3-2410SM	18 - 36 VDC (24 VDC nom.)	3.3 VDC	700 mA			76 %
TRN 3-2411SM		5 VDC	600 mA			78 %
TRN 3-2412SM		12 VDC	250 mA			84 %
TRN 3-2413SM		15 VDC	200 mA			84 %
TRN 3-2415SM		24 VDC	125 mA			83 %
TRN 3-2421SM		+5 VDC	300 mA	-5 VDC	300 mA	79 %
TRN 3-2422SM		+12 VDC	125 mA	-12 VDC	125 mA	83 %
TRN 3-2423SM		+15 VDC	100 mA	-15 VDC	100 mA	82 %
TRN 3-4810SM	36 - 75 VDC (48 VDC nom.)	3.3 VDC	700 mA			75 %
TRN 3-4811SM		5 VDC	600 mA			79 %
TRN 3-4812SM		12 VDC	250 mA			83 %
TRN 3-4813SM		15 VDC	200 mA			83 %
TRN 3-4815SM		24 VDC	125 mA			82 %
TRN 3-4821SM		+5 VDC	300 mA	-5 VDC	300 mA	77 %
TRN 3-4822SM		+12 VDC	125 mA	-12 VDC	125 mA	82 %
TRN 3-4823SM		+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

Safety Standards	- IT / Multimedia Equipment	Designed for EN 62368-1 (no certification)
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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		EN 55024 (IT Equipment)
	- 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/trn3sm	
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)
Moisture Sensitivity (MSL)		Level 2 (J-STD-033C)
Washing Process		Allowed (hermetical product)
	See 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		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)
Footprint Type		SMD10
Soldering Profile		Reflow Soldering (J-STD-020E)
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

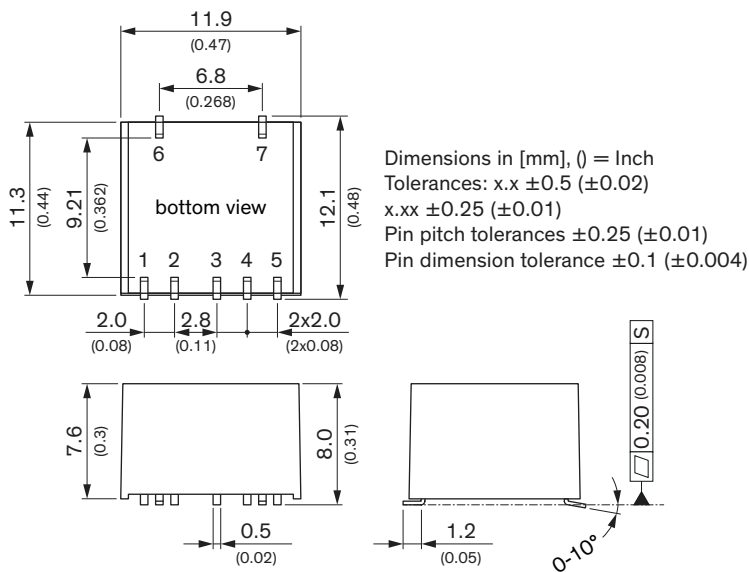
(RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).
The SCIP number is provided on request.)

Supporting Documents

Overview Link (for additional Documents)

www.tracopower.com/overview/trn3sm

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

