TRACO POWER

Non-Isolated DC/DC Converter (POL)

TSR 3N Series, 3 A

- **Highly cost-efficient design**
- **Compact SIP-3 package: 14 x 7.6 x 10.2 mm**
- **Pin compatible with TO-220 package linear regulators**
- **Excellent thermal capabilities**
- **Operation temperature. range –40°C to +95°C**
- **Efficiency up to 95%**
- **Wide input operating range 4.6-36 VDC**
- **Short circuit protection, current limitation and under voltage lockout features**
- **Excellent line / load regulation**
- **3-year product warranty**



The TSR 3N is a 3 Amp step-down switching regulator series and a drop-in replacement for any TO-220 package linear regulators. It comes in a compact SIP-3 plastic package and complements our new generation of POL converters focusing strongly on a cost-efficient design while also improving on critical electrical specifications. The Input ranges from 4.6 to 36 VDC and output voltages are available between 1.2 and 15VDC. Depending on the model, the efficient design allows full load operation up to +90°C ambient temperature (at nominal Vin) without the need of any heat sink or forced cooling. The TSR 3N series provides other significant features like short circuit protection, current limitation and under voltage lockout. Overall, it offers a broad application range in many environments and is especially suited for high volume projects where the series will help to reduce production cost by delivering not only a highly cost efficient but also reliable solution.

Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom.	Efficiency typ.
TSR 3-2412N	3'000 mA	4.6 - 28 VDC (12 VDC nom.)	1.2 VDC	83 %
TSR 3-2415N		4.6 - 32 VDC (12 VDC nom.)	1.5 VDC	85 %
TSR 3-2418N		4.6 - 36 VDC (12 VDC nom.)	1.8 VDC	86 %
TSR 3-2425N			2.5 VDC	89 %
TSR 3-2433N			3.3 VDC	90 %
TSR 3-2450N		6.5 - 36 VDC (12 VDC nom.)	5 VDC	92 %
TSR 3-2465N		9 - 36 VDC (12 VDC nom.)	6.5 VDC	93 %
TSR 3-2490N		11 - 36 VDC (24 VDC nom.)	9 VDC	93 %
TSR 3-24120N		15 - 36 VDC (24 VDC nom.)	12 VDC	94 %
TSR 3-24150N		18 - 36 VDC (24 VDC nom.)	15 VDC	94 %

Input Specifications

Input Current	- At no load	12 Vin models:	1 mA typ.
		24 Vin models:	1 mA typ.
	- At full load	12 Vin models:	370 mA typ. / 954 mA max. (1.2 Vout model)
			449 mA typ. / 1'158 mA max. (1.5 Vout model)
			533 mA typ. / 1'374 mA max. (1.8 Vout model)
			719 mA typ. / 1'855 mA max. (2.5 Vout model)
			939 mA typ. / 2'421 mA max. (3.3 Vout model)
			1'383 mA typ. / 2'527 mA max. (5 Vout model)
			1'789 mA typ. / 2'539 mA max. (6.5 Vout model)
		24 Vin models:	1'232 mA typ. / 2'645 mA max. (9 Vout model)
			1'625 mA typ. / 2'572 mA max. (12 Vout model)
			2'031 mA typ. / 2'679 mA max. (15 Vout model)
Input Inrush Current			60 A typ.
Under Voltage Lockout		12 Vin models:	2.2 VDC min.
		24 Vin models:	2.2 VDC min.
Recommended Input Fuse		24 Vin models:	7'000 mA (fast acting)
	- 12 Vin input	1.2 Vout models:	3'000 mA (fast acting)
		1.5 Vout models:	3'500 mA (fast acting)
		1.8 Vout models:	4'000 mA (fast acting)
		2.5 Vout models:	5'000 mA (fast acting)
		3.3 Vout models:	7'000 mA (fast acting)
		5 Vout models:	7'000 mA (fast acting)
		6.5 Vout models:	7'000 mA (fast acting)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Capacitor

Output Specifications

Voltage Set Accuracy			±2% max.
Regulation	- Input Variation (Vmin - Vmax)		0.5% max.
	- Load Variation (0 - 100%)		2% max.
Ripple and Noise (20 MHz Bandwidth)		24 Vin models:	75 mVp-p typ. (w/ 10 µF)
		1.2 Vout models:	50 mVp-p typ. (w/ 10 µF)
		1.5 Vout models:	50 mVp-p typ. (w/ 10 µF)
		1.8 Vout models:	50 mVp-p typ. (w/ 10 µF)
		2.5 Vout models:	50 mVp-p typ. (w/ 10 µF)
		3.3 Vout models:	50 mVp-p typ. (w/ 10 µF)
		5 Vout models:	50 mVp-p typ. (w/ 10 µF)
		6.5 Vout models:	75 mVp-p typ. (w/ 10 µF)
Capacitive Load		1.2 Vout models:	2'200 µF max.
		1.5 Vout models:	2'200 µF max.
		1.8 Vout models:	1'500 µF max.
		2.5 Vout models:	1'500 µF max.
		3.3 Vout models:	1'200 µF max.
		5 Vout models:	820 µF max.
		6.5 Vout models:	620 µF max.
		9 Vout models:	620 µF max.
		12 Vout models:	470 µF max.
		15 Vout models:	470 µF max.
Minimum Load			Not required
Temperature Coefficient			±0.02 %/K max.
Hold-up Time			20 ms min.

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

Short Circuit Protection		Continuous, Automatic recovery
Output Current Limitation		260% typ. of Iout max. (1.2 - 3.3 Vout models) 240% typ. of Iout max. (other Vout models)

Safety Specifications

Standards	- IT / Multimedia Equipment	Designed for IEC/EN/UL 62368-1 (not certified)
Pollution Degree		PD 2

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/tsr3n

General Specifications

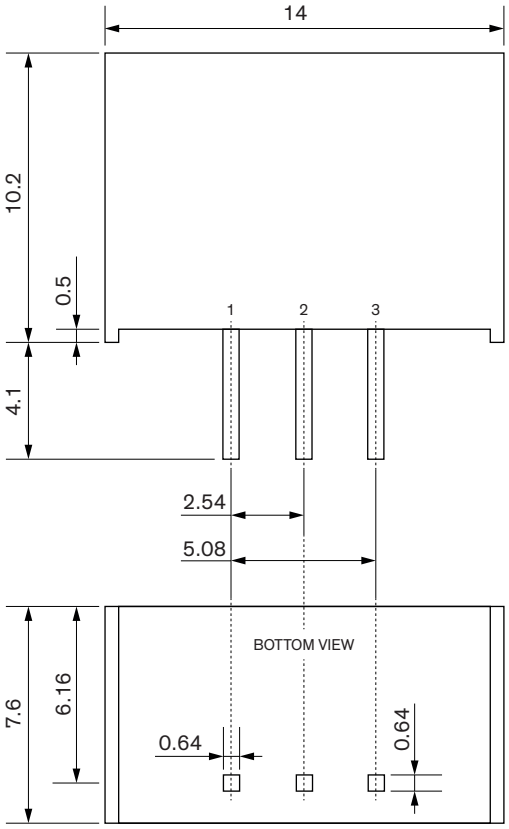
Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +90°C
	- Case Temperature	+110°C max.
	- Storage Temperature	–55°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/overview/tsr3n
Cooling System		Natural convection (20 LFM)
Regulator Topology		Buck Converter
Switching Frequency		380 kHz typ. (PWM) (1.2-2.5 Vout models) 850 kHz typ. (PWM) (3.3-6.5 Vout models) 1000 kHz typ. (PWM) (9-15 Vout models)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	1'600'000 h (MIL-HDBK-217F, ground benign)
Washing Process		Not allowed
Environment	- Vibration	MIL-STD-810F MIL-STD-202
Housing Material		Plastic (UL 94 V-0 rated)
Base Material		Non-conductive Plastic (UL 94 V-0 rated)
Potting Material		Silicone (UL 94 V-0 rated)
Pin Material		Copper Alloy (C2700)
Housing Type		Plastic Case
Mounting Type		PCB Mount
Connection Type		THD (Through-Hole Device)
Footprint Type		SIP3
Soldering Profile		Lead-Free Wave Soldering 260°C / 5 s max.
Weight		2.6 g
Thermal Impedance	- Case to Ambient	41 K/W typ.
Environmental Compliance	- REACH Declaration	www.tracopower.com/info/reach-declaration.pdf REACH SVHC list compliant REACH Annex XVII compliant
	- RoHS Declaration	www.tracopower.com/info/rohs-declaration.pdf Exemptions: No Exemptions

Supporting Documents

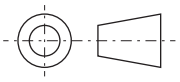
Overview Link (for additional Documents)	www.tracopower.com/overview/tsr3n

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

Outline Dimensions



Dimensions in mm
General tolerances: ±0.5
Pin tolerances: ±0.1



Pinout	
Pin	**Function**
1	+Vin
2	Ground
3	+Vout

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