TRACO POWER

Non-Isolated DC/DC Converter (POL) — TSR 3 Series, 3 A

- **High performance 3 Amp. switching regulator**
- **Suitable for positive & negative output circuit**
- **High efficiency up to 95 %**
- **Adjustable output voltages**
- **Wide input voltage ranges 2.5–5.5, 4.5–14 and 10–30 VDC**
- **Short circuit protection**
- **Remote On/Off input**
- **Low output ripple & noise**
- **3-year product warranty**



The TSR 3 models are non isolated step down switching regulators. Since production May 2013 they can also be operated with negative output voltage.
They come in a very compact open frame package of 15.5 x 9.4 x 6.2mm. The high efficiency of up to 95% admits a full load operation up to 50°C and up to 85°C with 50% current reduction. A low standby current, a very wider input range and no requirement for heatsink give these switching regulators a significant advantage over linear regulators.
Togther with a remote On/Off input and protection against short circuit the TSR 3 Series models are ideal point of load regulators for high reliable and energy critical applications.

Models

Order Code	Output Current max.	Input Voltage Range	Output Voltage nom. (adjustable)	Efficiency typ.
TSR 3-0533	3'000 mA	2.5 - 5.5 VDC (5 VDC nom.)	0.6 VDC (0.6 - 3.3 VDC)	95 % (at 2.5 Vout)
TSR 3-1250		4.5 - 14 VDC (12 VDC nom.)	0.6 VDC (0.6 - 6.0 VDC)	93 % (at 3.3 Vout)
TSR 3-2450		10 - 30 VDC (24 VDC nom.)	3 VDC (3.0 - 6.0 VDC)	91 % (at 5.0 Vout)
TSR 3-24150			5 VDC (5.0 - 15.0 VDC)	95 % (at 12 Vout)

Options

Suffix A	- Optional models with angular pins (see outline dimensions)

Note - TSR 3-1250: max. 9 Vin if Vout <0.9 VDC
- For external circuit proposal for negative output voltage, refer to application note

Input Specifications

Input Current	- At no load	5 Vin models:	**20 mA typ.**
		12 Vin models:	**25 mA typ.**
		24 Vin models:	**25 mA typ.** (3 Vout model)
			30 mA typ. (5 Vout model)
			(at Vin nom.)
	- At full load	5 Vin models:	**3'000 mA max.**
		12 Vin models:	**2'600 mA max.**
		24 Vin models:	**2'200 mA max.** (3 Vout model)
			3'000 mA max. (5 Vout model)
			(at Vin min.)
Reflected Ripple Current			**30 mAp-p typ.**
			(24 Vin models: Ext. filter, see application note)
Recommended Input Fuse		5 Vin models:	**5'000 mA** (slow blow)
		12 Vin models:	**5'000 mA** (slow blow)
		24 Vin models:	**5'000 mA** (slow blow)
			(The need of an external fuse has to be assessed in the final application.)
Input Filter			Internal Capacitor

Output Specifications

Output Voltage Adjustment		0.6 Vout models:	**0.6 - 3.3 VDC**
			0.6 - 6.0 VDC
		3 Vout models:	**3.0 - 6.0 VDC**
		5 Vout models:	**5.0 - 15.0 VDC**
			(By external trim resistor)
		See application note:	www.tracopower.com/tsr3-adj
			(TSR 3-0533: Vin at least 0.5 V higher than Vout TSR 3-1250: Vin at least 2 V higher than Vout TSR 3-24150: Vin at least 3 V higher than Vout)
Voltage Set Accuracy			**±2% max.**
Regulation	- Input Variation (Vmin - Vmax)		**0.2% max.** (Vout >2.5 VDC)
			5 mV typ. (Vout <2.5 VDC)
	- Load Variation (10 - 90%)		**0.8% max.** (Vout >2.5 VDC)
			15 mV typ. (Vout <2.5 VDC)
Ripple and Noise		5 Vin models:	**50 mVp-p typ.**
(20 MHz Bandwidth)		12 Vin models:	**50 mVp-p typ.**
		3 Vout models:	**75 mVp-p typ.**
		5 Vout models:	**150 mVp-p typ.**
Capacitive Load		0.6 Vout models:	**1'000 µF max.**
		3 Vout models:	**1'000 µF max.**
		5 Vout models:	**500 µF max.**
			(ESR >1 mOhm)
Minimum Load			Not required
Temperature Coefficient			**±0.02 %/K max.**
Start-up Overshoot Voltage			**1% max.**
Short Circuit Protection			Continuous, Automatic recovery
Output Current Limitation			**280% typ. of Iout max.** (5 Vin models)
			220% typ. of Iout max. (other models)
Transient Response	- Peak Variation		**250 mV typ. / 500 mV max.** (50% Load Step) (5.0 Vout model)
			150 mV typ. / 250 mV max. (50% Load Step) (other models)
	- Response Time		**120 µs typ. / 220 µs max.** (50% Load Step)

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

Safety Specifications

Over Voltage Category		Not mains connected

General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature	–40°C to +85°C
	- Storage Temperature	–55°C to +125°C
Power Derating	- High Temperature	Depending on model
	See application note:	www.tracopower.com/tsr3-cc
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote (passive = on)	On: 1 to 12 VDC or open circuit Off: 0 to 0.3 VDC or short circuit Refers to 'Remote' and 'GND' Pin
	- Off Idle Input Current	1.5 mA typ. (0.6 Vout models) 6 mA typ. (other models) (5 Vin model: 5.5 V or open circuit for On-state)
Regulator Topology		Buck Converter
Switching Frequency		540 - 660 kHz (PWM) (5 Vin & 12 Vin models) 270 - 330 kHz (PWM) (24 Vin models)
Insulation System		Non-isolated
Reliability	- Calculated MTBF	4'500'000 h (MIL-HDBK-217F, ground benign)
Washing Process		According to Cleaning Guideline www.tracopower.com/info/cleaning.pdf
Environment	- Thermal Shock	MIL-STD-810F
Pin Material		Copper
Pin Foundation Plating		Nickel (3 - 5 µm)
Pin Surface Plating		Gold (50 - 75 nm), matte
Housing Type		Open Frame
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	5 Vin models:	1.7 g
	12 Vin models:	1.7 g
	24 Vin models:	2.1 g
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: 7(a), 7(c)-I (RoHS exemptions refer to the component concentration only, not to the overall concentration in the product (O5A rule).)
	- SCIP Reference Number	614d7af9-8fae-483c-ade9-b5194d2d7ab4

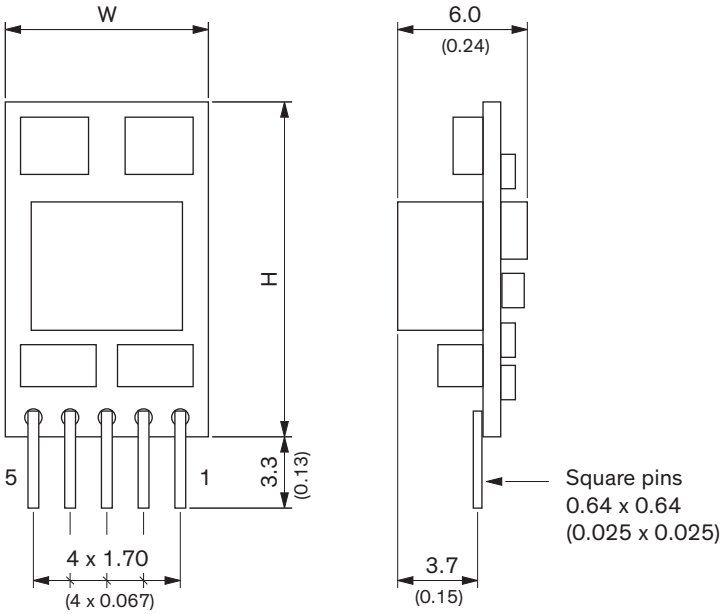
Additional Information

Supporting Documents	www.tracopower.com/overview/tsr3
Frequently Asked Questions	www.tracopower.com/glossary-faq
Glossary	www.tracopower.com/info/glossary.pdf

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Outline Dimensions

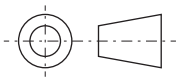
Standard version



Pinout		
Pin	**positive**	**negative**
1	Remote On/Off	
2	+Vin (Vcc)	
3	GND	–Vout
4	+Vout	GND
5	Trim	

TSR 3-0533 & TSR 3-1250: W=9.4 (0.37) H=15.5 (0.61)
TSR 3-2450 & TSR 3-24150: W=10.4 (0.41) H=16.5 (0.65)

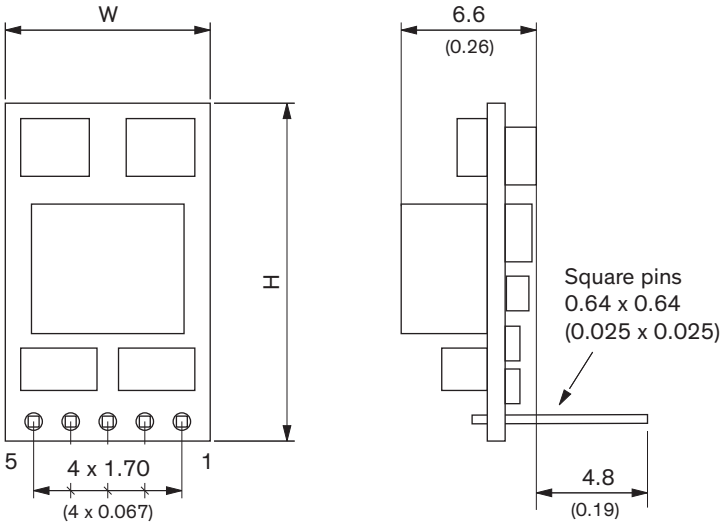
(Component allocation is model specific)



Dimensions in mm (inch)
Tolerances: ±0.5 (±0.02)
Pin pitch Tolerance ±0.25 (±0.01)
Pin profile Tolerance ±0.1 (±0.004)

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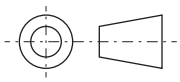
Optional version with angular pins (Suffix A)



Pinout		
Pin	**positive**	**negative**
1	Remote On/Off	
2	+Vin (Vcc)	
3	GND	–Vout
4	+Vout	GND
5	Trim	

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