

- 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. Together 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

<b>Suffix A</b>	- 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: <b>20 mA typ.</b> 12 Vin models: <b>25 mA typ.</b> 24 Vin models: <b>25 mA typ.</b> (3 Vout model) <b>30 mA typ.</b> (5 Vout model) (at Vin nom.)
	- At full load	5 Vin models: <b>3'000 mA max.</b> 12 Vin models: <b>2'600 mA max.</b> 24 Vin models: <b>2'200 mA max.</b> (3 Vout model) <b>3'000 mA max.</b> (5 Vout model) (at Vin min.)
Reflected Ripple Current		<b>30 mA<sub>p-p</sub> typ.</b> (24 Vin models: Ext. filter, see application note)
Recommended Input Fuse		5 Vin models: <b>5'000 mA</b> (slow blow) 12 Vin models: <b>5'000 mA</b> (slow blow) 24 Vin models: <b>5'000 mA</b> (slow blow) (The need of an external fuse has to be assessed in the final application.)
Input Filter		<b>Internal Capacitor</b>

## Output Specifications

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

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

## General Specifications

Relative Humidity		95% max. (non condensing)
Temperature Ranges	- Operating Temperature - Storage Temperature	-40°C to +85°C -55°C to +125°C
Power Derating	- High Temperature	Depending on model See application note: <a href="http://www.tracopower.com/overview/tsr3">www.tracopower.com/overview/tsr3</a>
Cooling System		Natural convection (20 LFM)
Remote Control	- Voltage Controlled Remote  - Off Idle Input Current	On: 1 to 12 VDC or open circuit Off: 0 to 0.3 VDC Refers to 'Remote' and 'GND' Pin 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)
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 <a href="http://www.tracopower.com/info/cleaning.pdf">www.tracopower.com/info/cleaning.pdf</a>
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
Weight	5 Vin models: 12 Vin models: 24 Vin models:	1.7 g 1.7 g 2.1 g
Environmental Compliance	- REACH Declaration  - RoHS Declaration	<a href="http://www.tracopower.com/info/reach-declaration.pdf">www.tracopower.com/info/reach-declaration.pdf</a> REACH SVHC list compliant REACH Annex XVII compliant <a href="http://www.tracopower.com/info/rohs-declaration.pdf">www.tracopower.com/info/rohs-declaration.pdf</a> 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

Weight

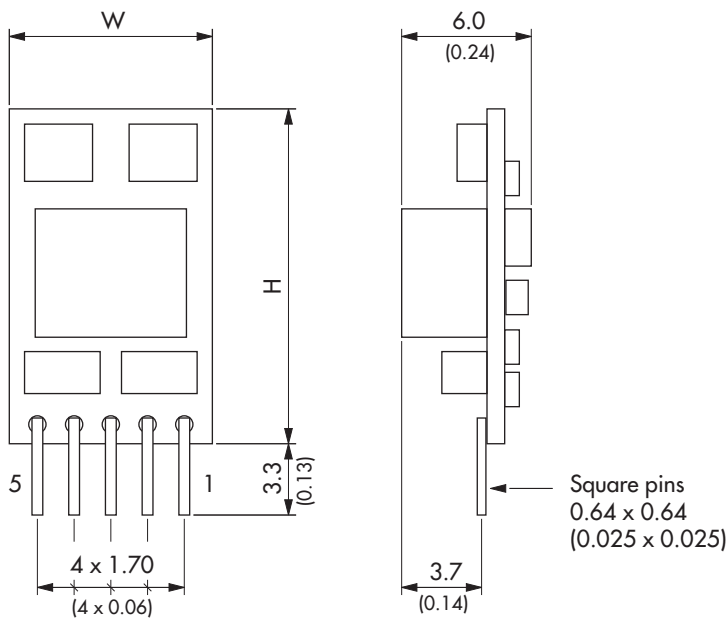
Overview Link (for additional Documents)

[www.tracopower.com/overview/tsr3](http://www.tracopower.com/overview/tsr3)

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

### Outline Dimensions

#### Standard version



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

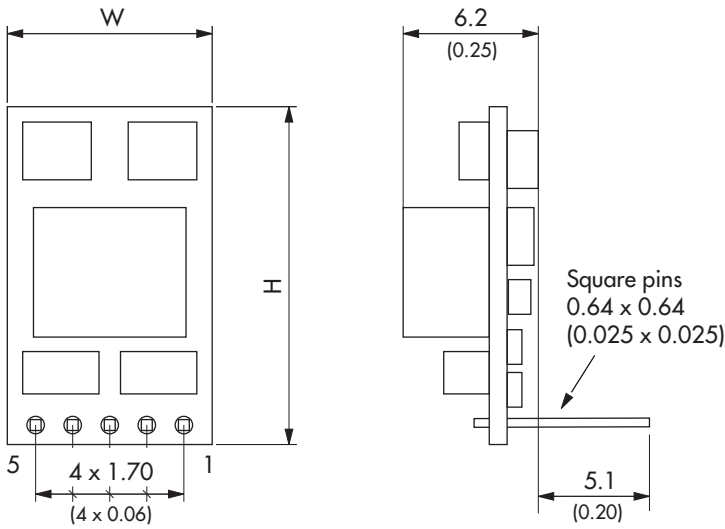
TSR 3-0533 & TSR 3-1250: W=9.4 (0.37) H=15.5 (0.61)  
 TSR 3-2450 & TSR 3-24150: W=10.4 (0.41) H=16.5 (0.65)

(Component allocation is model specific)

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

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

### 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	

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:  $\pm 0.5$  ( $\pm 0.02$ )

Pin pitch Tolerance  $\pm 0.25$  ( $\pm 0.01$ )

Pin profile Tolerance  $\pm 0.1$  ( $\pm 0.004$ )