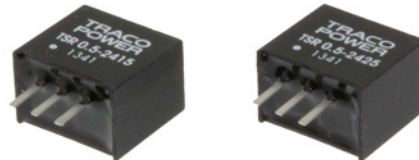


#### Features

- ◆ Compact SIP package
- ◆ Very high efficiency up to 97%
- ◆ Excellent line / load regulation
- ◆ Low standby current
- ◆ Operating temperature range -40 to 90°C
- ◆ Over-temperature protection
- ◆ Short circuit protection
- ◆ 3-year product warranty



TSR-0.5 is a series of step-down non-isolated switching regulators in compact SIP package. These converters are an ideal drop-in replacement to LM78 linear regulators when energy efficiency is a parameter of the design. The high efficiency up to 97 % allows full load operation up to +80°C (+90°C with 50% load) ambient temperature without the need of forced aircooling.

Excellent output voltage accuracy and low standby current are other features that distinguish switching regulators from linear regulators.

#### Models

Order code	Input voltage range <sup>1)</sup>	Output voltage	Output current max.	Efficiency typ.	
				@ Vin min.	@ Vin 32VDC
TSR 0.5-2415	4.75 – 32 VDC	1.5 VDC	0.5 A	73 %	63 %
TSR 0.5-2418		1.8 VDC		82 %	71 %
TSR 0.5-2425		2.5 VDC		87 %	77 %
TSR 0.5-2433		3.3 VDC		91 %	81 %
TSR 0.5-2450	6.5 – 32 VDC	5.0 VDC		94 %	86 %
TSR 0.5-2465	8 – 32 VDC	6.5 VDC		95 %	88 %
TSR 0.5-2490	11 – 32 VDC	9.0 VDC		96 %	92 %
TSR 0.5-24120	15 – 32 VDC	12 VDC		97 %	94 %
TSR 0.5-24150	18 – 32 VDC	15 VDC		97 %	95 %

1) For input voltage higher 24 VDC an input capacitor 22 µF/ 50 V is required

### Input Specifications

No load input current (at 24Vin)	5 mA typ.
Short circuit input power	1.5 W max.
Surge voltage	-0.3 / 34 VDC max.
Input filter	internal capacitor, see filter suggestion page 3 for to meet EN55022 class A, class B
ESD (electrostatic discharge)	EN 61000-4-2, air ±8 kV, perf. criteria A
Radiated immunity	EN 61000-4-3 3 V/m, perf. criteria A
Fast transient	EN 61000-4-4, ±0.5 kV, perf. criteria A with external input capacitor e.g. Nippon chemi-con KY 330 µF, 100 V
Conducted immunity	EN 61000-4-6, 3 Vrms, perf. criteria A
Magnetic field immunity	EN 61000-4-8, 3 A/m, perf. criteria A

### Output Specifications

Voltage set accuracy	±3 % (at full load)												
Regulation	<table border="0"> <tr> <td>- Input variation</td> <td>1.5 to 6.5 Vin models:</td> <td>0.4 %</td> </tr> <tr> <td></td> <td>other models:</td> <td>0.2 %</td> </tr> <tr> <td>- Load variation (10 – 100 %)</td> <td>1.5 to 6.5 Vin models:</td> <td>0.6 %</td> </tr> <tr> <td></td> <td>other models:</td> <td>0.4 %</td> </tr> </table>	- Input variation	1.5 to 6.5 Vin models:	0.4 %		other models:	0.2 %	- Load variation (10 – 100 %)	1.5 to 6.5 Vin models:	0.6 %		other models:	0.4 %
- Input variation	1.5 to 6.5 Vin models:	0.4 %											
	other models:	0.2 %											
- Load variation (10 – 100 %)	1.5 to 6.5 Vin models:	0.6 %											
	other models:	0.4 %											
Minimum load	not required												
Ripple and noise	<table border="0"> <tr> <td>1.5 to 6.5 Vin models:</td> <td>30 mVp-p max.</td> </tr> <tr> <td>other models:</td> <td>40 mVp-p max.</td> </tr> </table>	1.5 to 6.5 Vin models:	30 mVp-p max.	other models:	40 mVp-p max.								
1.5 to 6.5 Vin models:	30 mVp-p max.												
other models:	40 mVp-p max.												
Temperature coefficient	±0.015 %/K max.												
Dynamic load (50% load step change)	<table border="0"> <tr> <td>- Peak variation</td> <td>±2 % max.</td> </tr> <tr> <td>- Response time</td> <td>100 µS max.</td> </tr> </table>	- Peak variation	±2 % max.	- Response time	100 µS max.								
- Peak variation	±2 % max.												
- Response time	100 µS max.												
Short circuit protection	continuous, automatic recovery												
Current limitation	1.0 A max.												
Capacitive load	220 µF max.												

### General Specifications

Temperature ranges	<table border="0"> <tr> <td>- Operating</td> <td>-40°C to +90°C</td> </tr> <tr> <td>- Case temperature</td> <td>+100°C. max.</td> </tr> <tr> <td>- Storage</td> <td>-55°C to +125°C</td> </tr> </table>	- Operating	-40°C to +90°C	- Case temperature	+100°C. max.	- Storage	-55°C to +125°C
- Operating	-40°C to +90°C						
- Case temperature	+100°C. max.						
- Storage	-55°C to +125°C						
Derating	- positive output circuit 5 %/K above +80°C						
Overtemperature protection	at +160°C (on internal IC)						
Humidity (non condensing)	95 % rel H max.						
Reliability, calculated MTBF (MIL-HDBK-217F, at +25°C, ground benign)	>2'000'000 h						
Isolation voltage	none						
Switching frequency	330 kHz ±50 kHz (pulse width modulation)						
Environmental compliance	<table border="0"> <tr> <td>- Reach</td> <td><a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a></td> </tr> <tr> <td>- RoHS</td> <td>RoHS directive 2011/65/EU</td> </tr> </table>	- Reach	<a href="http://www.tracopower.com/products/reach-declaration.pdf">www.tracopower.com/products/reach-declaration.pdf</a>	- RoHS	RoHS directive 2011/65/EU		
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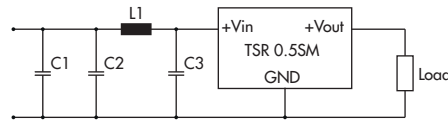
### Physical Specifications

Casing material	non-conductive plastic (UL94V-0 rated)
Pin material	alloy 42
Weight	1.95 g (0.69 oz)
Lead temperature	260°C
Washing	baking after washing: 100°C for 30 min.

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

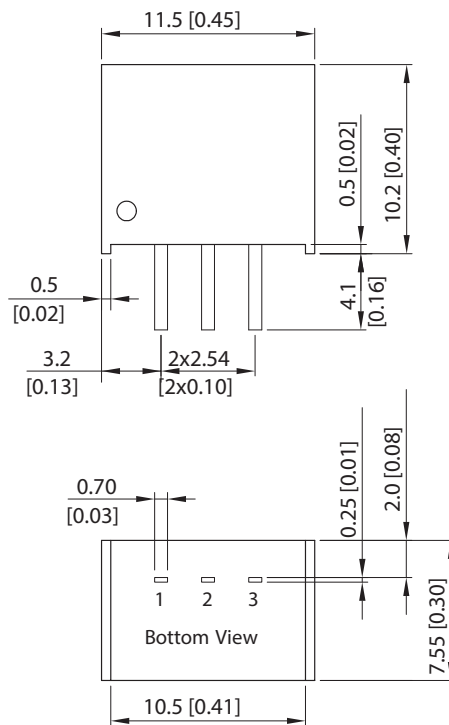
**Applications notes**

EMI filter for EN 55022 class A & B



Class	C1	C2 & C3	L1 value	order code (SMD type)	datasheet:
A	-	4.7 $\mu$ F / 50 V 1206 MLCC	3.3 $\mu$ H	<b>TCK-044</b>	<a href="http://www.tracopower.com/products/tck044.pdf">www.tracopower.com/products/tck044.pdf</a>
B	4.7 $\mu$ F / 50 V 1206 MLCC		10 $\mu$ H	<b>TCK-047</b>	<a href="http://www.tracopower.com/products/tck047.pdf">www.tracopower.com/products/tck047.pdf</a>

**Outline Dimensions**



Pinout	
<b>1</b>	+Vin
<b>2</b>	GND
<b>3</b>	+Vout

Dimensions in [mm], ( ) = Inch  
Tolerances:  $\pm 0.5$  ( $\pm 0.02$ )  
Pin pitch tolerances:  $\pm 0.25$  ( $\pm 0.01$ )

Specifications can be changed without notice! Make sure you are using the latest documentation, downloadable at [www.tracopower.com](http://www.tracopower.com)