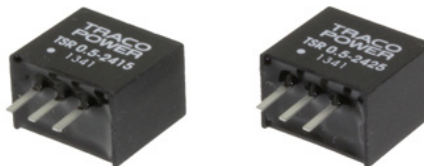


Features

- ◆ 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 ¹⁾	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 24V _{in})	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 V _{rms} , 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 V_{in} 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 V_{in} 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 V _{in} models:	0.4 %		other models:	0.2 %	- Load variation (10 – 100 %)	1.5 to 6.5 V _{in} models:	0.6 %		other models:	0.4 %
- Input variation	1.5 to 6.5 V _{in} models:	0.4 %											
	other models:	0.2 %											
- Load variation (10 – 100 %)	1.5 to 6.5 V _{in} models:	0.6 %											
	other models:	0.4 %											
Minimum load	not required												
Ripple and noise	<table border="0"> <tr> <td>1.5 to 6.5 V_{in} models:</td> <td>30 mV_{p-p} max.</td> </tr> <tr> <td>other models:</td> <td>40 mV_{p-p} max.</td> </tr> </table>	1.5 to 6.5 V _{in} models:	30 mV _{p-p} max.	other models:	40 mV _{p-p} max.								
1.5 to 6.5 V _{in} models:	30 mV _{p-p} max.												
other models:	40 mV _{p-p} max.												
Temperature coefficient	±0.015 %/K max.												
Dynamic load	<table border="0"> <tr> <td>- Peak variation</td> <td>±2 % max.</td> </tr> <tr> <td>(50% load step change)</td> <td>- Response time</td> <td>100 µS max.</td> </tr> </table>	- Peak variation	±2 % max.	(50% load step change)	- Response time	100 µS max.							
- Peak variation	±2 % max.												
(50% load step change)	- 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></td> </tr> <tr> <td>- RoHS</td> <td>RoHS directive 2011/65/EU</td> </tr> </table>	- Reach		- RoHS	RoHS directive 2011/65/EU		
- Reach							
- RoHS	RoHS directive 2011/65/EU						

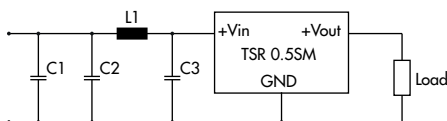
Physical Specifications

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.

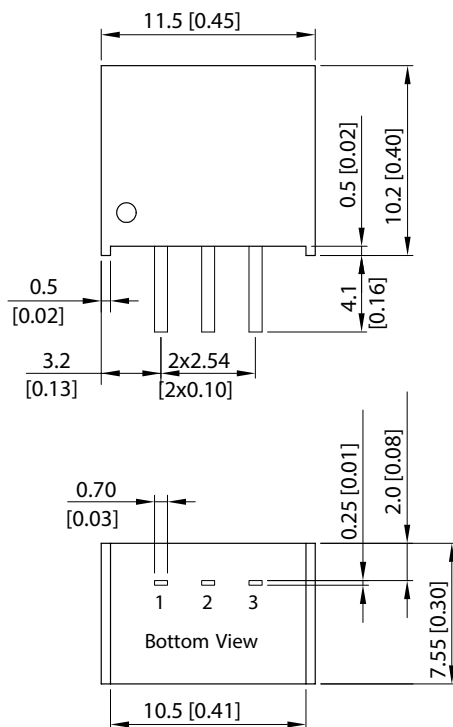
Applications notes

EMI filter for EN 55022 class A & B



Class	C1	C2 & C3	L1 value	order code (SMD type)	datasheet:
A	-	4.7 μ F / 50 V 1206 MLCC	3.3 μ H	TCK-044	www.tracopower.com/products/tck044.pdf
B	4.7 μ F / 50 V 1206 MLCC		10 μ H	TCK-047	www.tracopower.com/products/tck047.pdf

Outline Dimensions



Pinout	
1	+Vin
2	GND
3	+Vout

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