

## Features

### Regulated Converters

- 2:1 and 4:1 Wide Input Voltage Ranges
- 1kVDC, 2kVD or 3kVDC Isolation
- UL94V-O Package Material
- Certified for Medical Applications
- Continuous Short Circuit Protection
- Low Noise
- No External Capacitor needed
- Efficiency to 83 %

#### Description

High-power-density, an industrial temperature range of -40°C to +85°C and extra features like On-Off-control are just some of the characteristics of this converter, ideal for highly sophisticated industrial-designs. The RSO series is available with isolation of 2kV or 3kV by choosing option "/H2" or "/H3" in which case it is also ideal for medical applications which additionally require EN-60601-1 certification. The standard version offers 2:1 input voltage range, while the "Z" version features 4:1 input voltage range, which includes an input voltage range covering both 5V and 12V supplies.

#### Selection Guide

| Part Number  | Input Voltage Range (VDC)     | Rated Output Voltage (VDC) | Output Current (mA) | Efficiency typ. (%) | Max Capacitive Load <sup>(1)</sup> |
|--------------|-------------------------------|----------------------------|---------------------|---------------------|------------------------------------|
| <b>SIP8</b>  |                               |                            |                     |                     |                                    |
| RSO-xx3.3S*  | 4.5-9**, 9-18<br>18-36, 36-72 | 3.3                        | 300                 | 68-72<br>70         | 3300µF                             |
| RSO-xx05S*   | 4.5-9**, 9-18<br>18-36, 36-72 | 5                          | 200                 | 73-75<br>75-78      | 1200µF                             |
| RSO-xx09S*   | 4.5-9**, 9-18<br>18-36, 36-72 | 9                          | 111                 | 74-78<br>78-81      | 680µF                              |
| RSO-xx12S*   | 4.5-9**, 9-18<br>18-36, 36-72 | 12                         | 83                  | 75-80<br>80-83      | 680µF                              |
| RSO-xx15S*   | 4.5-9**, 9-18<br>18-36, 36-72 | 15                         | 67                  | 75-80<br>80-83      | 680µF                              |
| RSO-xx3.3D*  | 4.5-9**, 9-18<br>18-36, 36-72 | ±3.3                       | ±150                | 68-72<br>70         | ±1500µF                            |
| RSO-xx05D*   | 4.5-9**, 9-18<br>18-36, 36-72 | ±5                         | ±100                | 73-75<br>75-76      | ±470µF                             |
| RSO-xx09D*   | 4.5-9**, 9-18<br>18-36, 36-72 | ±9                         | ±56                 | 74-78<br>78         | ±470µF                             |
| RSO-xx12D*   | 4.5-9**, 9-18<br>18-36, 36-72 | ±12                        | ±42                 | 75-79<br>79-80      | ±330µF                             |
| RSO-xx15D*   | 4.5-9**, 9-18<br>18-36, 36-72 | ±15                        | ±34                 | 75-79<br>79-80      | ±330µF                             |
| RSO-xx3.3SZ* | 9-36<br>18-72                 | 3.3                        | 300                 | 68-70<br>70         | 3300µF                             |
| RSO-xx05SZ*  | 4.5-18**, 9-36<br>18-72       | 5                          | 200                 | 73-78<br>75         | 1200µF                             |
| RSO-xx09SZ*  | 4.5-18**, 9-36<br>18-72       | 9                          | 111                 | 75-81<br>78         | 680µF                              |
| RSO-xx12SZ*  | 4.5-18**, 9-36<br>18-72       | 12                         | 83                  | 77-83<br>80         | 680µF                              |
| RSO-xx15SZ*  | 4.5-18**, 9-36<br>18-72       | 15                         | 67                  | 78-83<br>80         | 680µF                              |
| RSO-xx3.3DZ* | 9-36<br>18-72                 | ±3.3                       | ±150                | 70-74<br>70         | ±1500µF                            |
| RSO-xx05DZ*  | 4.5-18**, 9-36<br>18-72       | ±5                         | ±100                | 73-77<br>75         | ±470µF                             |
| RSO-xx09DZ*  | 4.5-18**, 9-36<br>18-72       | ±9                         | ±56                 | 74-78<br>78         | ±470µF                             |
| RSO-xx12DZ*  | 4.5-18**, 9-36<br>18-72       | ±12                        | ±42                 | 75-80<br>80         | ±330µF                             |
| RSO-xx15DZ*  | 4.5-18**, 9-36<br>18-72       | ±15                        | ±34                 | 75-80<br>80         | ±330µF                             |

No suffix is standard isolation (1kVDC) e.g., RSO-0505S

\*add suffix /H2 or /H3 for 2kVDC or 3kVDC isolation, e.g., RSO-0505S/H2, RSO-0505DZ/H3

\*\* derate to 75% if Vin<5V, 12V 4:1 input also requires an external 10µF input capacitor.

## ECONOLINE

### DC/DC-Converter

with 3 year Warranty

RECOM

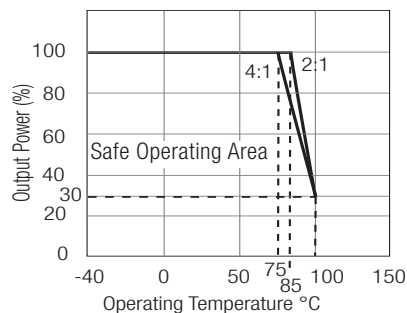
## 1 Watt SIP8 Isolated Single & Dual Output



**EN-60950-1 Certified**  
**EN-60601-1 Certified\***  
(\* /H suffix)

# RSO

## Derating-Graph (Ambient Temperature)



**2:1 Input**  
(RSO-S/D)

xx = 4.5-9Vin = 05  
xx = 9-18Vin = 12  
xx = 18-36Vin = 24  
xx = 36-72Vin = 48

**4:1 Input**  
(RSO-SZ/DZ)

xx = 4.5-18Vin = 12  
xx = 9-36Vin = 24  
xx = 18-72Vin = 48

**Refer to Application Notes**

**Specifications** (Core Operating Area) measured at  $T_A = 25^\circ\text{C}$ , nominal input voltage, full load and after warm-up time unless otherwise specified

|                                                    |                                                              |                           |                                      |
|----------------------------------------------------|--------------------------------------------------------------|---------------------------|--------------------------------------|
| Input Voltage Range                                |                                                              |                           | 2:1 and 4:1                          |
| Output Voltage Accuracy                            |                                                              |                           | ±2% typ.                             |
| Line Voltage Regulation                            | 2:1                                                          | ±0.2% max.                |                                      |
|                                                    | 4:1                                                          | ±0.5% max.                |                                      |
| Load Voltage Regulation<br>(10% to 100% full load) | 2:1                                                          | ±0.4% max.                |                                      |
|                                                    | 4:1                                                          | ±0.5% typ.                |                                      |
| Minimum Load                                       |                                                              |                           | 10% <sup>(2)</sup>                   |
| Output Ripple and Noise (20MHz limited)            |                                                              |                           | 50mVp-p max.                         |
| Operating Frequency                                | 2:1                                                          | 200kHz min. / 500kHz max. |                                      |
|                                                    | 4:1                                                          | 100kHz min. / 800kHz max. |                                      |
| Efficiency at Full Load                            |                                                              |                           | See Selection Guide                  |
| Quiescent Current                                  | RSO-05xxS_D, SZ_DZ                                           |                           | 40mA typ.                            |
| Nominal input Voltage<br>(Standard, /H2 and /H3)   | RSO-12xxS_D, SZ_DZ                                           |                           | 32mA typ.                            |
|                                                    | RSO-24xxS_D, SZ_DZ                                           |                           | 25mA typ.                            |
|                                                    | RSO-48xxS_D, SZ_DZ                                           |                           | 15mA typ.                            |
| CTRL Pin drive current /see Notes)                 |                                                              |                           | 3mA typ, 6mA max.                    |
| Quiescent Input Current when Converter is OFF      |                                                              |                           | 10mA max.                            |
| Isolation Voltage                                  | Standard                                                     | (tested for 1 second)     | 1000VDC                              |
|                                                    |                                                              | (rated for 1 minute**)    | 500VAC / 60Hz                        |
|                                                    | /H2 Version                                                  | (tested for 1 second)     | 2000VDC                              |
|                                                    |                                                              | (rated for 1 minute**)    | 1000VAC / 60Hz                       |
|                                                    | /H3 Version                                                  | (tested for 1 second)     | 3000VDC                              |
|                                                    |                                                              | (rated for 1 minute**)    | 1500VAC / 60Hz                       |
| Isolation Capacitance                              | Standard                                                     | 2:1 Single                | 10pF min. / 40pF typ. / 60pF max.    |
| Isolation Capacitance                              | /H2 and /H3                                                  | 2:1 Single                | 5pF min. / 30pF typ. / 60pF max.     |
| Isolation Capacitance                              | Standard                                                     | 2:1 Dual                  | 120pF min. / 170pF typ. / 250pF max. |
| Isolation Capacitance                              | /H2 and /H3                                                  | 2:1 Dual                  | 5pF min. / 30pF typ. / 60pF max.     |
| Isolation Capacitance                              | Standard                                                     | 4:1 Single/Dual           | 200pF max.                           |
| Isolation Capacitance                              | /H2 and /H3                                                  | 4:1 Single/Dual           | 30pF max.                            |
| Isolation Resistance                               |                                                              |                           | >1GΩ min.                            |
| Short Circuit Protection                           |                                                              |                           | Continuous                           |
| Operating Temperature Range (free air convection)  |                                                              |                           | -40°C to +85°C (see Graph)           |
| Storage Temperature Range                          |                                                              |                           | -55°C to +125°C                      |
| Relative Humidity                                  |                                                              |                           | 95% RH                               |
| Package Weight                                     |                                                              |                           | 4.7g                                 |
| Packing Quantity                                   |                                                              |                           | 22 pcs per Tube                      |
| MTBF (+25°C)<br>(+85°C)                            | Detailed Information see<br>Application Notes chapter "MTBF" | using MIL-HDBK 217F       | 1685 x 10³ hours                     |
|                                                    |                                                              | using MIL-HDBK 217F       | 254 x 10³ hours                      |

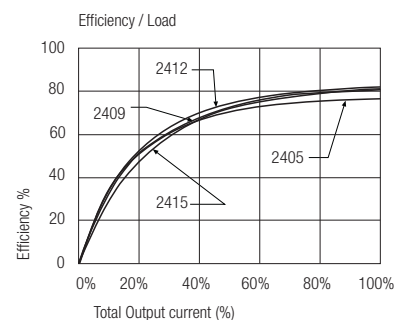
#### Certifications

|                                           |                                    |                                            |
|-------------------------------------------|------------------------------------|--------------------------------------------|
| EN General Safety                         | Report: SPCLVD1212007              | EN60950-1:2006 + A11:2009+A1:2010+A12:2011 |
| EN Medical Safety                         | Report: MDD1205098-3 + RM1205098-3 | IEC/EN 60601-1 3rd Edition                 |
| Medical Report + ISO14971 Risk Assessment |                                    |                                            |

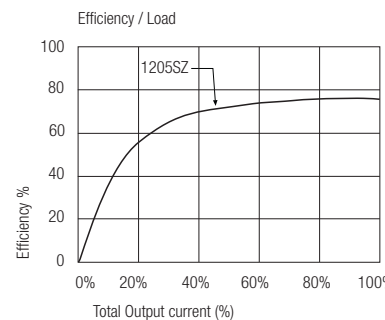
#### Notes

|         |                                                                                                                                                                                                                       |
|---------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Note 1: | Maximum capacitive load is defined as the capacitive load that will allow start up in under 1 second without damage to the converter                                                                                  |
| Note 2: | The RSO series requires a minimum of 10% load on the output to maintain specified regulation. Operating under no-load conditions will not damage these devices; however, they may not meet all listed specifications. |

## RSO-24xxS

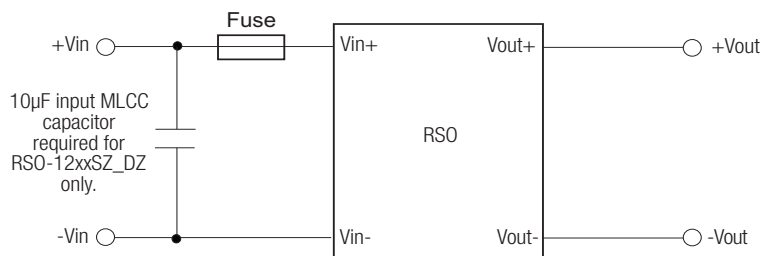


## RSO-1205SZ



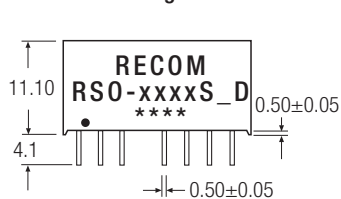
\*\*Any data referred to in this datasheet are of indicative nature and based on our practical experience only. For further details, please refer to our Application Notes.

## Typical Application



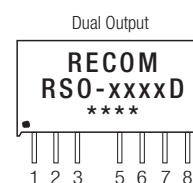
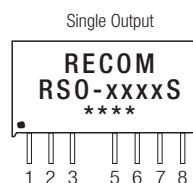
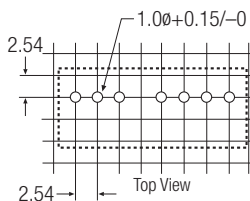
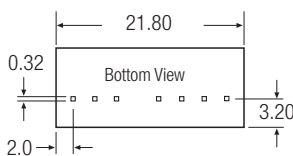
## Package Style and Pinning (mm)

### 8 PIN SIP Package



XX.X ± 0.5 mm  
XX.XX ± 0.25 mm

### Recommended Footprint Details



### Pin Connections

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | -Vin   | -Vin  |
| 2     | +Vin   | +Vin  |
| 3     | CTRL   | CTRL  |
| 5     | NC     | NC    |
| 6     | +Vout  | +Vout |
| 7     | -Vout  | Com   |
| 8     | NC*    | -Vout |

NC = No Connection

NC\* = NC, but no external Connection allowed.

### CTRL Examples:

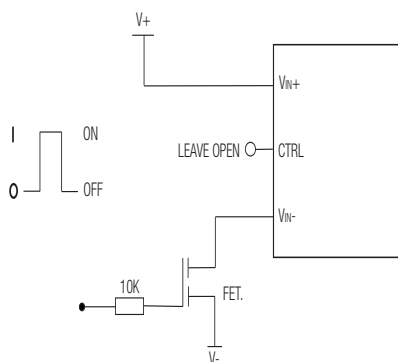
**Pin 8 (NC\*)** This pin is used internally and must have no external connection.

**Pin 5 (NC)** Not connected internally.

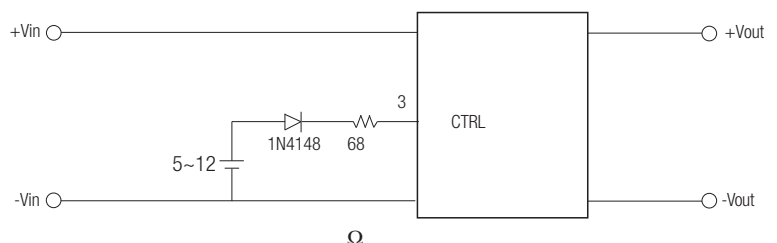
### Pin 3 (CTRL)

This pin provides an Off function which puts the converter into a low power mode. When the pin is 'high' the converter is OFF and when the pin is high 'Z' the converter is ON. There is no allowed low state for this pin.

## ON/OFF CONTROL



I = 3V  
0 = 0.5V or GND



Remote ON/OFF

ON: open or high impedance

OFF: external 5~12 Vdc and 1N4148+ 68Ω resistor