# Features

# Unregulated Converters

- Industry standard pinout
- 1kVDC/1s or 2kVDC/1s isolation
- UL94 V-0 package material
- Fully encapsulated
- Efficiency up to 85%

RECOM
DC/DC Converter

# RO

## 1 Watt SIP4 Single Output

## Description

The RO DC/DC converters are typically used in general purpose power isolation and voltage matching applications, and feature a full industrial operating temperature range of -40°C to +85°C without derating.

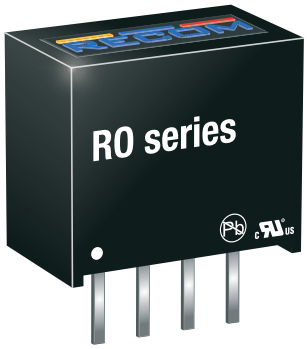
## Selection Guide

| Part Number | nom. Input Voltage [VDC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. (1) [%] | max. Capacitive Load (2) [µF] |
|---|---|---|---|---|---|
| RO-xx3.3S (3,4) | 3.3, 5,12, 15, 24 | 3.3 | 303 | 75 | 2200 |
| RO-xx05S (3,4) | 3.3, 5,12, 15, 24 | 5 | 200 | 78-80 | 1000 |
| RO-xx09S (3,4) | 3.3, 5,12, 15, 24 | 9 | 111 | 78-80 | 1000 |
| RO-xx12S (3,4) | 3.3, 5,12, 15, 24 | 12 | 83 | 80-84 | 470 |
| RO-xx15S (3,4) | 3.3, 5,12, 15, 24 | 15 | 66 | 80-84 | 470 |
| RO-xx24S (3,4) | 3.3, 5,12, 15, 24 | 24 | 42 | 78-85 | 220 |

**Notes:**

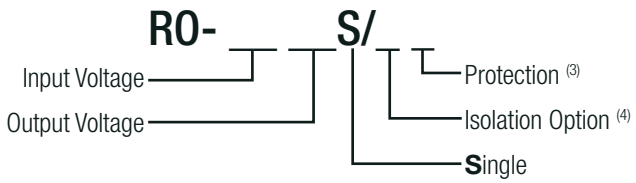
Note1: Efficiency is tested at nominal input and full load at +25°C ambient

Note2: Max Cap Load is tested at nominal input and full resistive load and is defined as the capacitive load that will allow start up in under 1s without damage to the converter




UL60950-1 certified
CAN/CSA-C22.2 No 60950-1 certified
EN60950-1 certified
IEC60950-1 certified
EN55032 compliant
CB report

## Model Numbering




**Notes:**

Note3: standard part is without continuous short circuit protection
add suffix „/P“ for continuous short circuit protection

Note4: add suffix „/H“ for 2kVDC/1s isolation
or add suffix „/HP“ for continuous short circuit protection and 2kVDC/1s isolation

**Ordering Examples:**

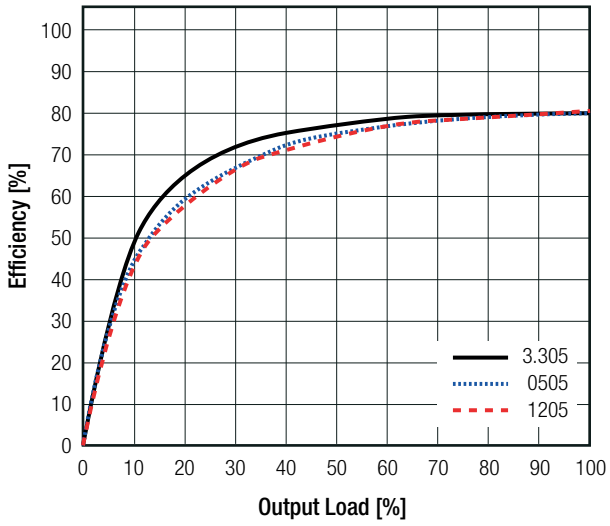
RO-123.3S/P: 12V Input Voltage, 3.3V Output Voltage, Single Output with continuous short circuit protection
RO-0509S/HP: 5V Input Voltage, 9V Output Voltage, Single Output with 2kVDC/1s Isolation and continuous short circuit protection

## Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

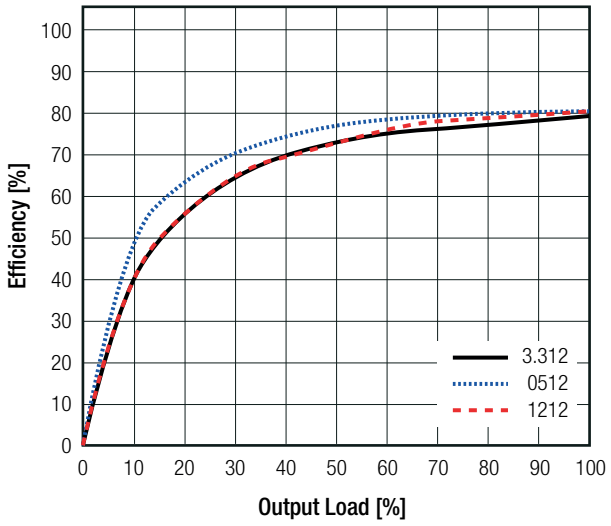
| BASIC CHARACTERISTICS | | | | |
|---|---|---|---|---|
| **Parameter** | **Condition** | **Min.** | **Typ.** | **Max.** |
| Internal Input Filter | | | | capacitor |
| Input Voltage Range | | | ±10% | |
| Minimum Load | | 0% | | |
| Internal Operating Frequency | | 50kHz | 100kHz | 105kHz |
| Output Ripple and Noise | 20MHz BW | | | 100mVp-p |

### Efficiency vs. Load

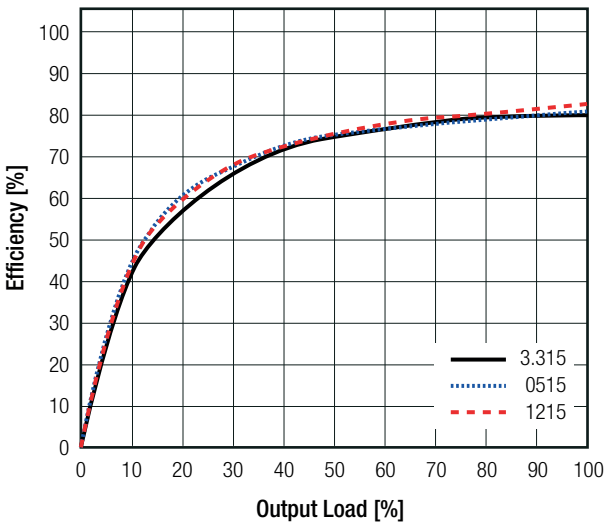
RO-xx05S




RO-xx12S




RO-xx15S




| REGULATIONS | | |
|---|---|---|
| **Parameter** | **Condition** | **Value** |
| Output Accuracy | | -2% typ. / ±5.0% max. |
| Line Regulation | low line to high line | ±1.2% of 1.0% Vin typ. |

continued on next page

## Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

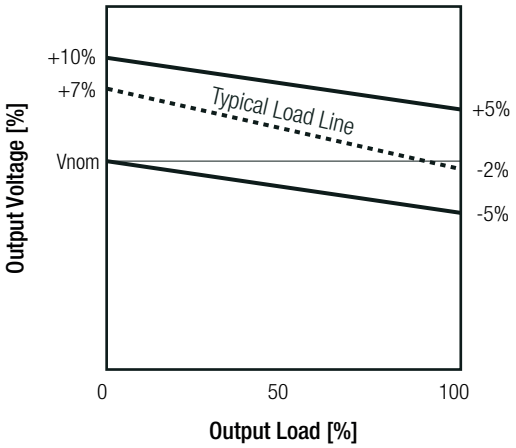
| Parameter | Condition | | Value |
|---|---|---|---|
| Load Regulation [5] | 10% to 100% load | 3.3Vout | 20.0% max. |
| | | 5Vout | 15.0% max. |
| | | 12, 15, 24Vout | 10.0% max. |

**Notes:**

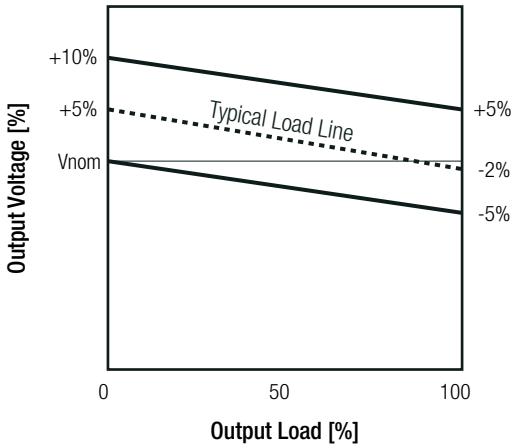
Note5: Operation below 10% load will not harm the converter, but specifications may not be met

### Tolerance Envelope

RO-xx3.3S and RO-xx05S

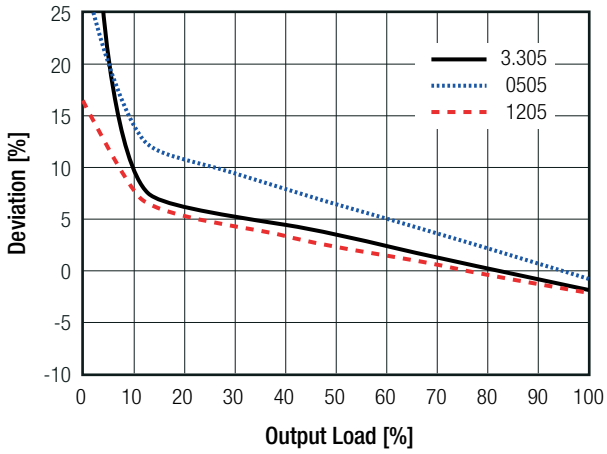



RO-xx12S and RO-xx15S

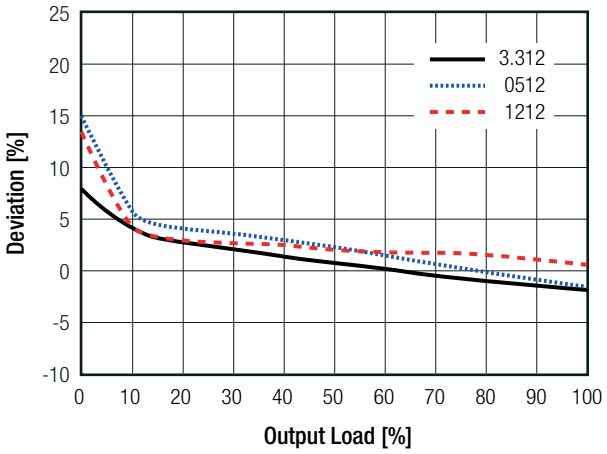



### Deviation vs. Load

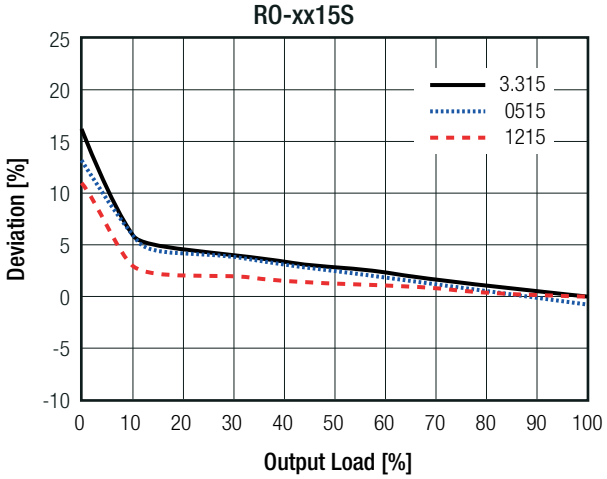
RO-xx05S




RO-xx12S




RO-xx15S



## Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

### PROTECTIONS

| Parameter | Type | | | Value |
|---|---|---|---|---|
| Short Circuit Protection (SCP) | without suffix<br>with suffix "/P" | | | 1 second<br>continuous |
| Isolation Voltage [6] | I/P to O/P | without suffix | tested for 1 second<br>rated for 1 minute | 1kVDC<br>500VAC/60Hz |
| | | with suffix "/H" | tested for 1 second<br>rated for 1 minute | 2kVDC<br>1kVAC/60Hz |
| Isolation Resistance | | | | 10GΩ min. |
| Isolation Capacitance | | | | 20pF min. / 75pF max. |
| Insulation Grade | | | | functional |

**Notes:**

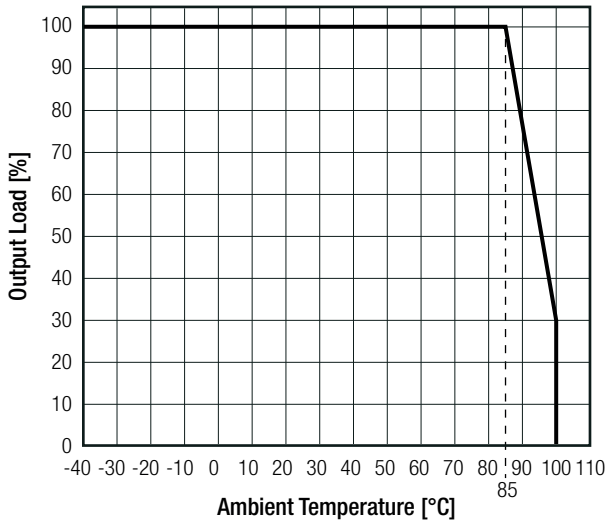
Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note7: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: slow blow type

### ENVIRONMENTAL

| Parameter | Condition | | Value |
|---|---|---|---|
| Operating Temperature Range | full load (see graph) | | -40°C to +85°C |
| Maximum Case Temperature | | | +110°C |
| Temperature Coefficient | | | ±0.03%/K typ. |
| Thermal Impedance | | | 67K/W |
| Operating Altitude | | | 2000m |
| Operating Humidity | non-condensing | | 95% RH max. |
| Pollution Degree | | | PD2 |
| MTBF | according to MIL-HDBK-217F, G.B. | +25°C<br>+85°C | 11800 x $10^3$ hours<br>4800 x $10^3$ hours |

**Derating Graph**



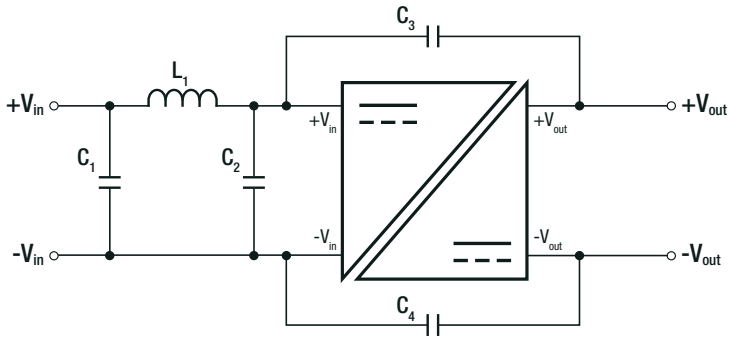
## Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety) | Report / File Number | Standard |
|---|---|---|
| Information Technology Equipment, General Requirements for Safety | SPCLVD1602031 | IEC60950-1:2005, 2nd Edition + A2:2013<br>EN60950-1:2006 + A2:2013 |
| Information Technology Equipment, General Requirements for Safety | E358085-A4-UL | UL60950-1, 2nd Edition:2007<br>CAN/CSA C22.2 No. 60950-1-03, 2nd Edition:2007 |
| Information Technology Equipment, General Requirements for Safety (CB) | E322406-A4-CB-1 | IEC60950-1:2005, 2nd Edition |
| EAC | RU-AT.49.09571 | TP TC 004/2011 |
| RoHS 2+ | | RoHS-2011/65/EU + AM-2015/863 |

| EMC Compliance | Condition | Standard / Criterion |
|---|---|---|
| Electromagnetic compatibility of multimedia equipment - Emission requirements | with external filter (see filter suggestion below) | EN55032, Class B<br>EN55032, Class A |

**EMC Filter Suggestion according to EN55032**




**Component List Class A**

| MODEL | C1 | L1 | C2 | C4 (safety) |
|---|---|---|---|---|
| RO-0505S | 10µF 100V MLCC | N/A | 1nF 50V MLCC | N/A |
| RO-1205S | | | | 2.2nF |
| RO-2405S | | | | N/A |

**Component List Class B**

| MODEL | C1 | L1 | C3 (safety) | C4 (safety) |
|---|---|---|---|---|
| RO-0505S | 10µF 100V MLCC | 22µH choke RLS-226 | 1nF 50V MLCC | 2.2nF |
| RO-1205S | | | | |
| RO-2405S | | | | |

**Notes:**

Note8: Filter suggestions are valid for indicated part numbers only. For other part numbers, please contact RECOM tech support for advice

### DIMENSION AND PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|---|---|---|
| Material | case<br>potting<br>PCB | non-conductive black plastic (UL94V-0)<br>epoxy, (UL94V-0)<br>FR4, (UL94V-0) |
| Dimension (LxWxH) | | 11.5 x 6.0 x 10.0mm |
| Weight | | 1.4g typ. |

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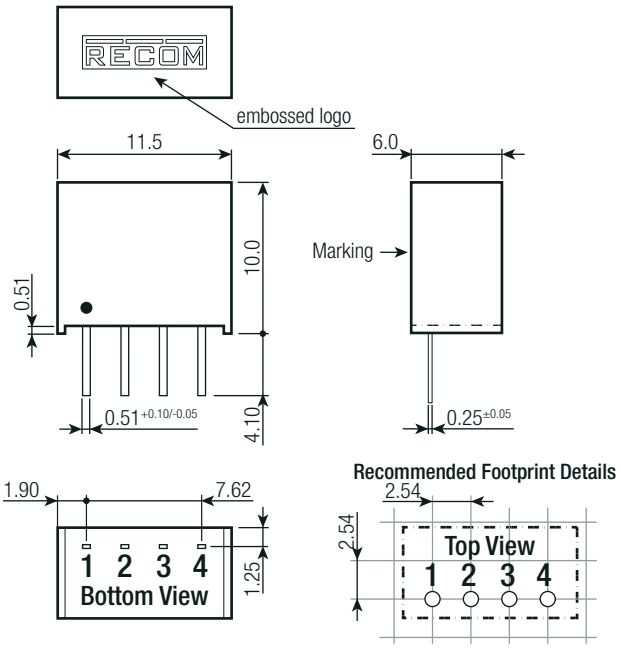
## Specifications (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

### Dimension Drawing (mm)



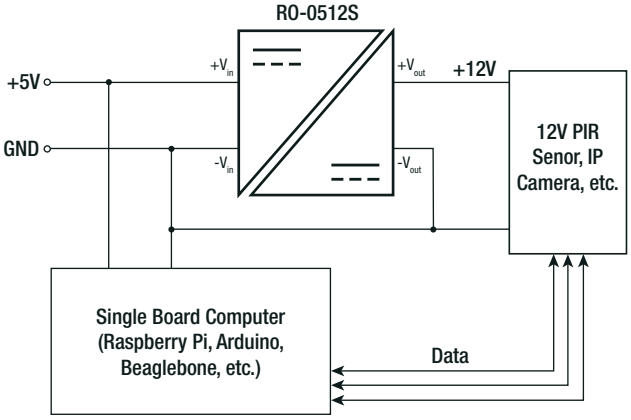

### Pinning information

| Pin # | Single |
|---|---|
| 1 | -Vin |
| 2 | +Vin |
| 3 | -Vout |
| 4 | +Vout |

Tolerance:
xx.x= ±0.5mm
xx.xx= ±0.25mm

## INSTALLATION AND APPLICATION

### Typical Application




## PACKAGING INFORMATION

| Parameter | Type | Value |
|---|---|---|
| Packaging Dimension (LxWxH) | tube | 520.0 x 16.0 x 9.0mm |
| Packaging Quantity | tube | 42pcs |
| Storage Temperature Range | | -55°C to +125°C |
| Storage Humidity | non-condensing | 95% RH max. |

The product information and specifications may be subject to changes even without prior written notice.The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

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- Оперативные сроки поставки под заказ (от 5 рабочих дней);
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- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
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- Поставка специализированных компонентов (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Aeroflex, Peregrine, Syfer, Eurofarad, Texas Instrument, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits,General Dynamics и др.);

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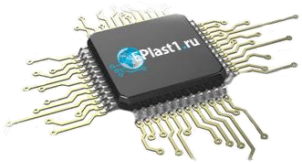
- Подбор аналогов;
- Консультации по применению компонента;
- Поставка образцов и прототипов;
- Техническая поддержка проекта;
- Защита от снятия компонента с производства.




**Как с нами связаться**

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