

# Features

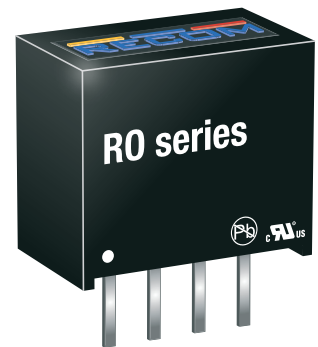
## Unregulated Converters

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



## RO

### 1 Watt SIP4 Single Output



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

## 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. <sup>(1)</sup> [%] | max. Capacitive Load <sup>(2)</sup> [μF] |
|----------------------------|--------------------------|----------------------|---------------------|------------------------------------|------------------------------------------|
| RO-xx3.3S <sup>(3,4)</sup> | 3.3, 5, 12, 15, 24       | 3.3                  | 303                 | 75                                 | 2200                                     |
| RO-xx05S <sup>(3,4)</sup>  | 3.3, 5, 12, 15, 24       | 5                    | 200                 | 78-80                              | 1000                                     |
| RO-xx09S <sup>(3,4)</sup>  | 3.3, 5, 12, 15, 24       | 9                    | 111                 | 78-80                              | 1000                                     |
| RO-xx12S <sup>(3,4)</sup>  | 3.3, 5, 12, 15, 24       | 12                   | 83                  | 80-84                              | 470                                      |
| RO-xx15S <sup>(3,4)</sup>  | 3.3, 5, 12, 15, 24       | 15                   | 66                  | 80-84                              | 470                                      |
| RO-xx24S <sup>(3,4)</sup>  | 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

## 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: 12VDC Input Voltage, 3.3VDC Output Voltage, Single Output with continuous short circuit protection

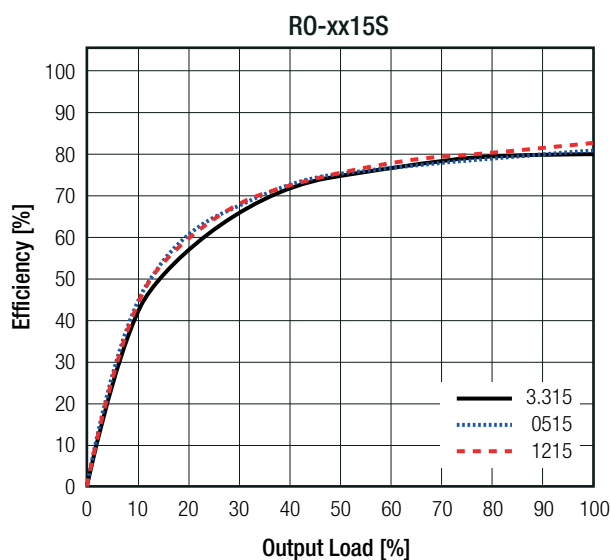
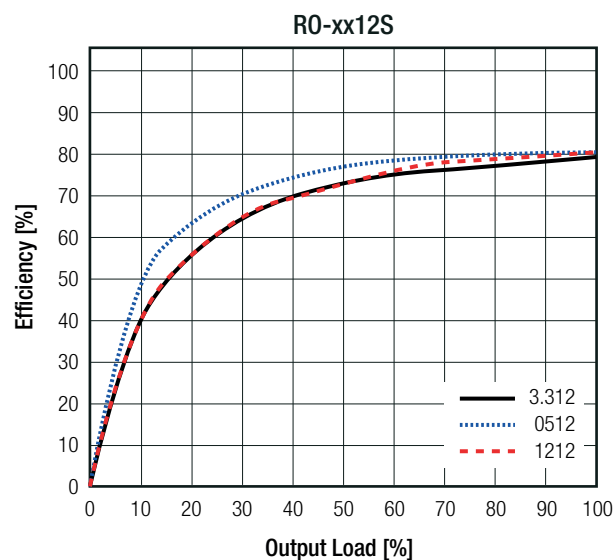
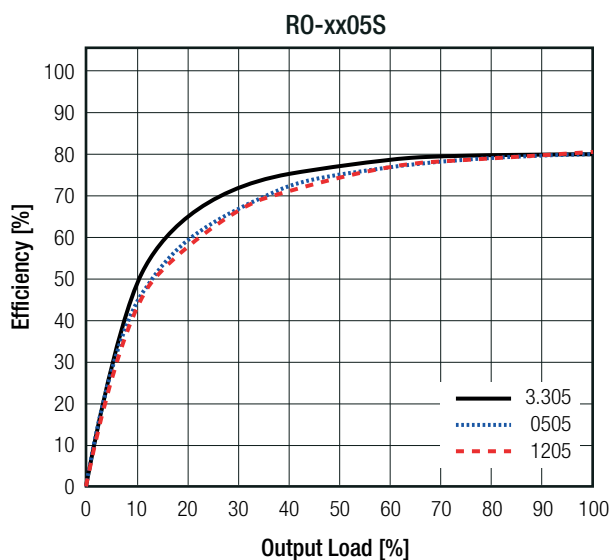
RO-0509S/HP: 5VDC Input Voltage, 9VDC Output Voltage, Single Output with 2kVDC/1s Isolation and continuous short circuit protection

**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



### REGULATIONS

| Parameter       | Condition             | Value                   |
|-----------------|-----------------------|-------------------------|
| Output Accuracy |                       | -2.0% typ. / ±5.0% max. |
| Line Regulation | low line to high line | ±1.2% of 1.0% Vin typ.  |

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### Specifications (measured @ $T_a = 25^\circ\text{C}$ , nom. $V_{in}$ , full load unless otherwise stated)

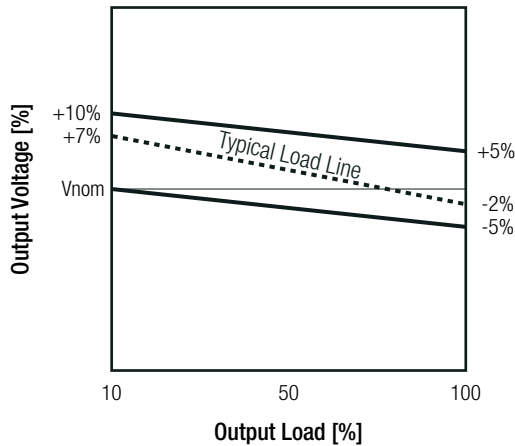
| Parameter                      | Condition        |                | Value      |
|--------------------------------|------------------|----------------|------------|
| Load Regulation <sup>(5)</sup> | 10% to 100% load | 3.3Vout        | 20.0% max. |
|                                |                  | 5Vout          | 15.0% max. |
|                                |                  | 12, 15, 24Vout | 10.0% max. |

#### Notes:

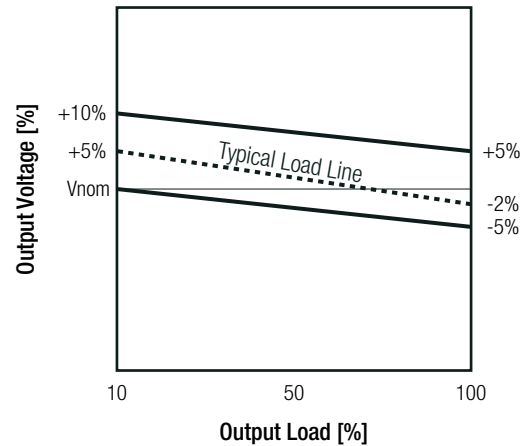
Note5: Operation below 10% load will not harm the converter, but specifications may not be met

#### Tolerance Envelope

R0-xx3.3S and R0-xx05S

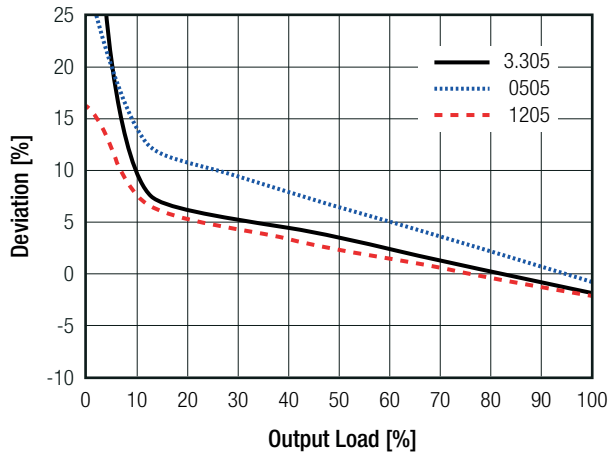


R0-xx12S and R0-xx15S

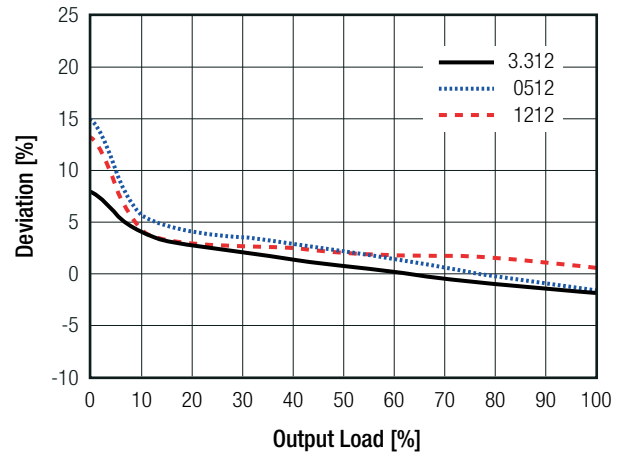


#### Deviation vs. Load

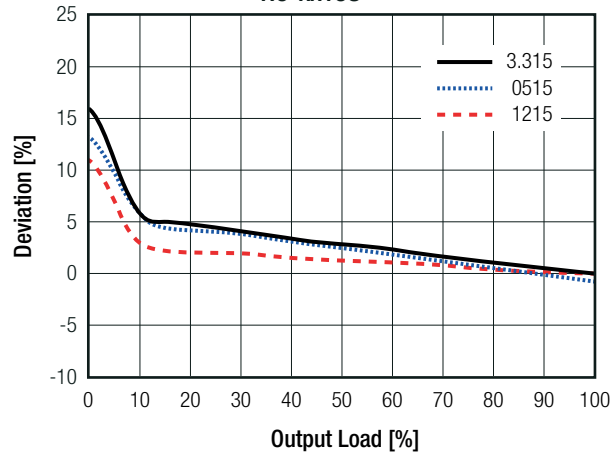
R0-xx05S



R0-xx12S



R0-xx15S

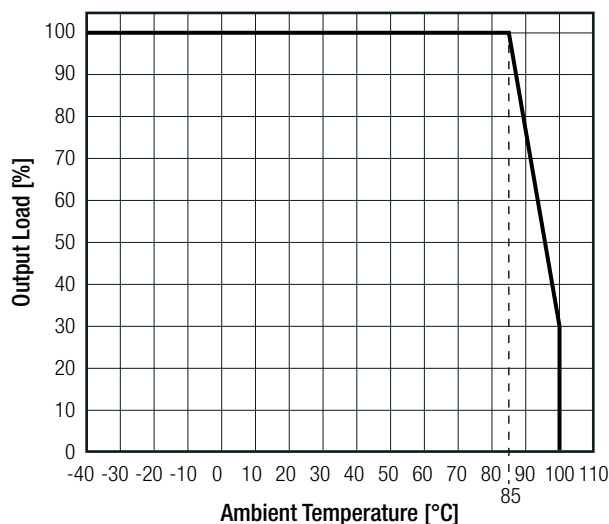


**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

| PROTECTIONS                                                                                                                  |                                    |                     |                                           |                                                     |
|------------------------------------------------------------------------------------------------------------------------------|------------------------------------|---------------------|-------------------------------------------|-----------------------------------------------------|
| Parameter                                                                                                                    | Type                               |                     |                                           | Value                                               |
| Short Circuit Protection (SCP)                                                                                               | without suffix<br>with suffix "/P" |                     |                                           | 1 second<br>continuous                              |
| Isolation Voltage <sup>(6)</sup>                                                                                             | I/P to O/P                         | without suffix      | tested for 1 second<br>rated for 1 minute | 1kVDC<br>500VAC/60Hz                                |
|                                                                                                                              |                                    | with suffix<br>"/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                                                                                                             |                                    |                     |                                           | basic (IEC/EN60950-1)<br>functional (IEC/EN60601-1) |
| <b>Notes:</b>                                                                                                                |                                    |                     |                                           |                                                     |
| 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 (IEC/EN60950-1)<br>3000m (IEC/EN60601-1)                |
| 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 <sup>3</sup> hours<br>4800 x 10 <sup>3</sup> hours |

**Derating Graph**



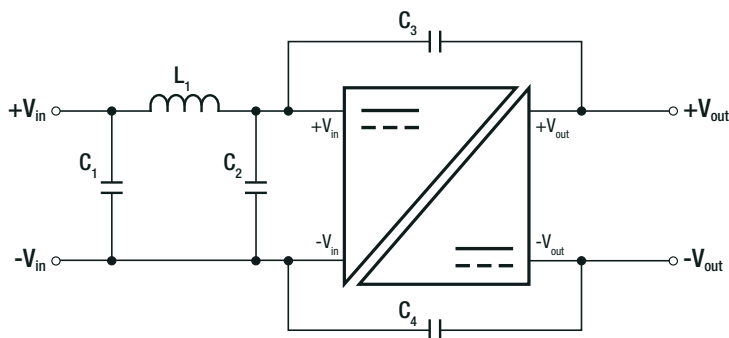
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load unless otherwise stated)

**SAFETY AND CERTIFICATIONS**

| Certificate Type (Safety)                                                                            | Report / File Number | Standard                                                                      |
|------------------------------------------------------------------------------------------------------|----------------------|-------------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety                                    | LVD1602031           | 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                                                  |
| Medical electrical equipment Part 1: General requirements for basic safety and essential performance | WD-SE-R-180677-A0    | EN60601-1:2006 + A12:2014<br>IEC60601-1:2005 + A1:2012, 3rd 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<br>(see filter suggestion below) | EN55032, Class A and B |

**EMC Filter Suggestion according to EN55032**



**Component List Class A**

| MODEL    | C1                | L1  | C2              | C4 (safety) |
|----------|-------------------|-----|-----------------|-------------|
| RO-0505S | 10µF<br>100V MLCC | N/A | 1nF<br>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<br>100V MLCC | <a href="#">22µH choke</a><br><a href="#">RLS-226</a> | 1nF         | 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

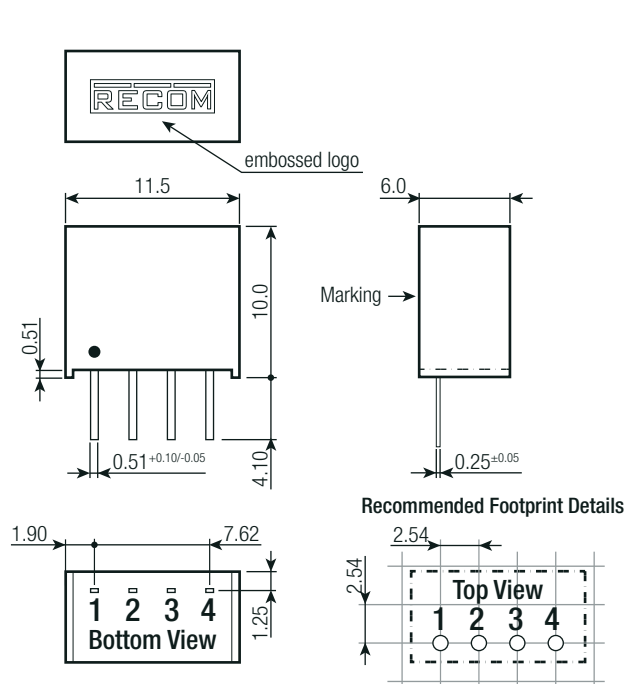
**DIMENSION AND PHYSICAL CHARACTERISTICS**

| 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)



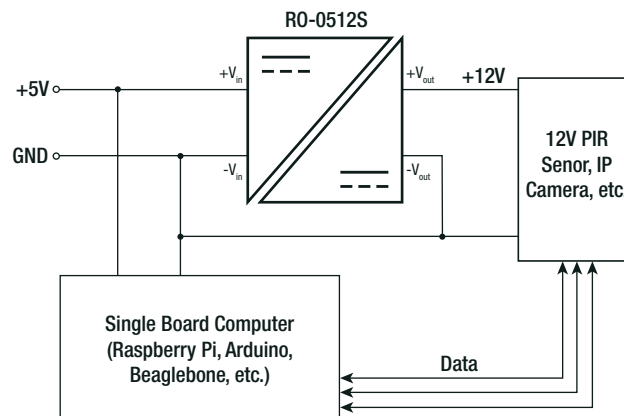
### Pinning Information

| 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.          |

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