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# Features

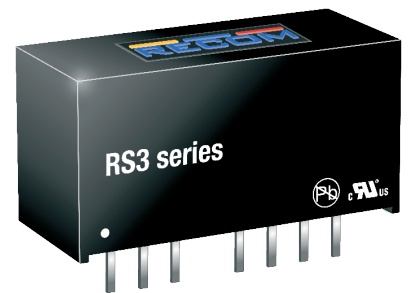
## Regulated Converters

- 2:1 and 3:1 wide input voltage ranges
- 1kVDC, 2kVDC and 3kVDC isolation
- UL94 V-0 package material
- Continuous short circuit protection
- Low ripple and noise
- CTRL On/Off
- Efficiency up to 83%

**RECOM**  
DC/DC Converter

## RS3-S(D)(Z)

**3 Watt**  
**SIP8**  
**Single and Dual**  
**Output**



UL60950-1 certified  
CAN/CSA No. 60950-1-07 certified  
IEC/EN60950-1 certified  
CB Report

### PREFERRED ALTERNATIVES

For new medical applications:

**REM3.5E**



### Description

Very high power density, 2:1 or 3:1 input voltage range and a wide operating temperature range -40°C to +71°C and extra features such as On/Off control are just some of the characteristics of this converter which is ideal for highly sophisticated industrial designs. The RS3 is available with 2kV or 3kV isolation options (1kVDC is standard).

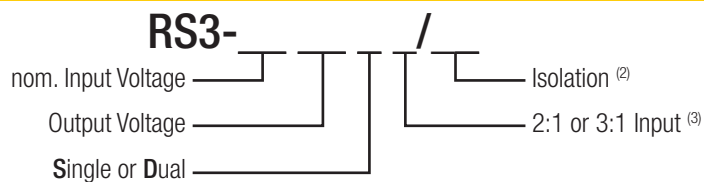
### Selection Guide

| Part Number | nom. Input Voltage [VDC]    | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. [%] | max. Capacitive Load <sup>(1)</sup> [μF] |
|-------------|-----------------------------|----------------------|---------------------|---------------------|------------------------------------------|
| RS3-xx3.3S  | 4.5-9, 9-18<br>18-36, 36-72 | 3.3                  | 600                 | 73-75<br>77-78      | 4700                                     |
| RS3-xx05S   | 4.5-9, 9-18<br>18-36, 36-72 | 5                    | 600                 | 76-79<br>80-81      | 4700                                     |
| RS3-xx09S   | 4.5-9, 9-18<br>18-36, 36-72 | 9                    | 333                 | 77-80<br>81-82      | 3300                                     |
| RS3-xx12S   | 4.5-9, 9-18<br>18-36, 36-72 | 12                   | 250                 | 80-81<br>83         | 2200                                     |
| RS3-xx15S   | 4.5-9, 9-18<br>18-36, 36-72 | 15                   | 200                 | 80-81<br>83         | 2200                                     |
| RS3-xx3.3D  | 4.5-9, 9-18<br>18-36, 36-72 | ±3.3                 | ±300                | 73-75<br>75         | ±2200                                    |
| RS3-xx05D   | 4.5-9, 9-18<br>18-36, 36-72 | ±5                   | ±300                | 76-80<br>80-81      | ±2200                                    |
| RS3-xx09D   | 4.5-9, 9-18<br>18-36, 36-72 | ±9                   | ±167                | 77-81<br>81         | ±2200                                    |
| RS3-xx12D   | 4.5-9, 9-18<br>18-36, 36-72 | ±12                  | ±125                | 78-83<br>83         | ±1000                                    |
| RS3-xx15D   | 4.5-9, 9-18<br>18-36, 36-72 | ±15                  | ±100                | 79-83<br>83         | ±1000                                    |
| RS3-xx3.3SZ | 9-27<br>20-60               | 3.3                  | 600                 | 73<br>74            | 4700                                     |
| RS3-xx05SZ  | 9-27<br>20-60               | 5                    | 600                 | 76-79<br>78         | 4700                                     |
| RS3-xx09SZ  | 9-27<br>20-60               | 9                    | 333                 | 77<br>79            | 3300                                     |
| RS3-xx12SZ  | 9-27<br>20-60               | 12                   | 250                 | 80<br>80            | 2200                                     |
| RS3-xx15SZ  | 9-27<br>20-60               | 15                   | 200                 | 80<br>80            | 2200                                     |
| RS3-xx3.3DZ | 9-27<br>20-60               | ±3.3                 | ±300                | 73<br>74            | ±2200                                    |
| RS3-xx05DZ  | 9-27<br>20-60               | ±5                   | ±300                | 77<br>78            | ±2200                                    |
| RS3-xx09DZ  | 9-27<br>20-60               | ±9                   | ±167                | 79<br>79            | ±2200                                    |
| RS3-xx12DZ  | 9-27<br>20-60               | ±12                  | ±125                | 80<br>80            | ±1000                                    |
| RS3-xx15DZ  | 9-27<br>20-60               | ±15                  | ±100                | 80<br>80            | ±1000                                    |

#### Notes:

Note1: Maximum capacitive load is defined as the capacitive load that will allow start up in under 1 second without damage on the converter

### Model Numbering



#### Notes:

Note2: add „Z“ for 3:1 Input Voltage (24= 9-27VDC or 48= 20-60VDC)

Note3: add suffix „/H2“ for 2kVDC isolation or „/H3“ for 3kVDC isolation, without suffix = standard 1kVDC isolation

#### Ordering Examples:

|               |          |         |        |                   |                 |
|---------------|----------|---------|--------|-------------------|-----------------|
| RS3-053.3S    | 4.5-9Vin | 3.3Vout | Single | 2:1 Input Voltage | 1kVDC Isolation |
| RS3-1212D/H2  | 9-18Vin  | ±12Vout | Dual   | 2:1 Input Voltage | 2kVDC Isolation |
| RS3-2415DZ/H3 | 9-27Vin  | ±15Vout | Dual   | 3:1 Input Voltage | 3kVDC Isolation |

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

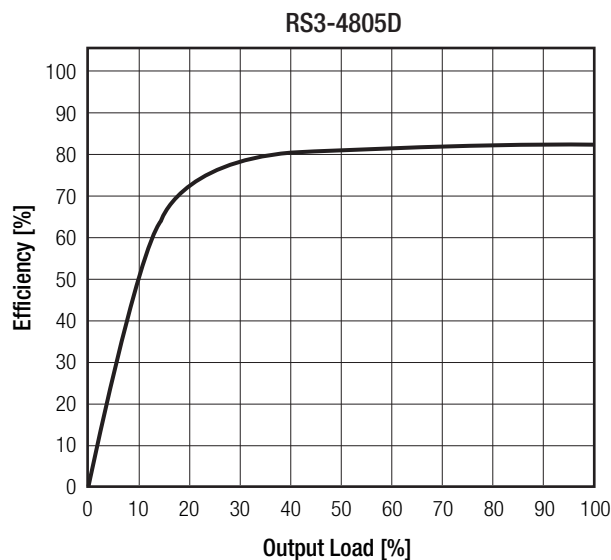
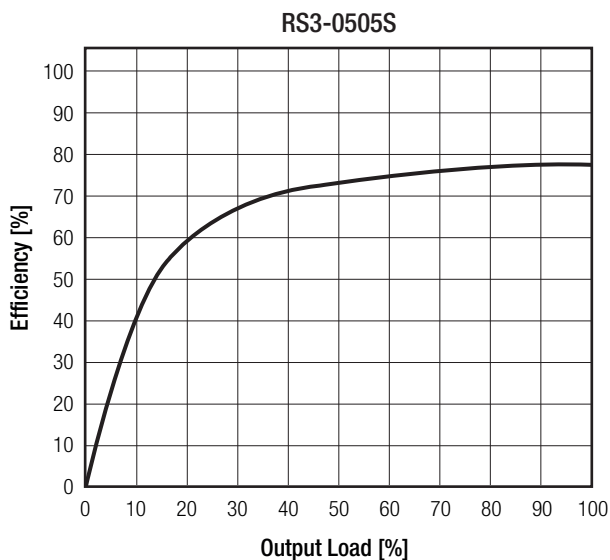
#### BASIC CHARACTERISTICS

| Parameter                    | Condition             |                 | Min.                                                                                     | Typ.   | Max.    |
|------------------------------|-----------------------|-----------------|------------------------------------------------------------------------------------------|--------|---------|
| Input Voltage Range          | 2:1 Input             | 5VDC            | 4.5VDC                                                                                   |        | 9VDC    |
|                              |                       | nom. Vin= 12VDC | 9VDC                                                                                     |        | 18VDC   |
|                              | 3:1 Input             | 24VDC           | 18VDC                                                                                    |        | 36VDC   |
|                              |                       | 48VDC           | 36VDC                                                                                    |        | 72VDC   |
| Quiescent Current            | nom. Vin=             | 24VDC           | 9VDC                                                                                     |        | 27VDC   |
|                              |                       | 48VDC           | 20VDC                                                                                    |        | 60VDC   |
| Quiescent Current            | nom. Vin=             | 5VDC            |                                                                                          | 35mA   |         |
|                              |                       | 12VDC           |                                                                                          | 25mA   |         |
|                              | nom. Vin=             | 24VDC           |                                                                                          | 20mA   |         |
|                              |                       | 48VDC           |                                                                                          | 10mA   |         |
| Minimum Load <sup>(4)</sup>  |                       |                 | 10%                                                                                      |        |         |
| ON/OFF CTRL                  | DC-DC ON<br>DC-DC OFF |                 | open or high impedance<br>external V <sub>CTRL</sub> = 5-12VDC + 1N4148 and 68Ω resistor |        |         |
| Internal Operating Frequency | 20% to 100% full load |                 |                                                                                          | 200kHz |         |
| Output Ripple and Noise      | 20MHz BW              |                 |                                                                                          |        | 50mVp-p |

#### Notes:

Note4: Operation below 10% load won't harm the converter, but specifications may not be met

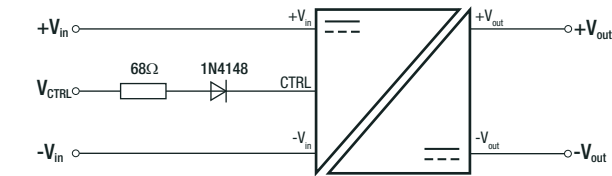
#### Efficiency vs. Load



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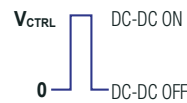
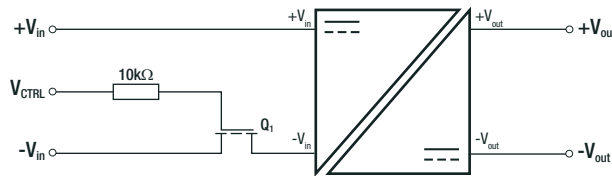
**Specifications** (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

## ON/OFF CTRL



**DC-DC ON:** Open or high impedance

**DC-DC OFF:**  $V_{CTRL} = 5\text{-}12\text{VDC} + 1\text{N}4148$  and  $68\Omega$  resistor



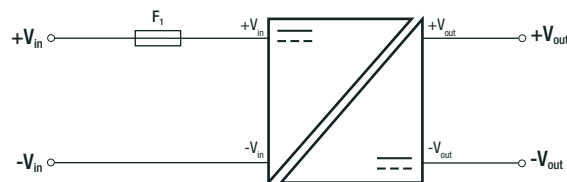
## REGULATIONS

| Parameter       | Condition                        | Value            |
|-----------------|----------------------------------|------------------|
| Output Accuracy |                                  | $\pm 2.0\%$ typ. |
| Line Regulation | low line to high line, full load | $\pm 0.5\%$ max. |
| Load Regulation | 20% to 100% load                 | 0.5% typ.        |

## PROTECTIONS

| Parameter                        | Type                                                   | Value                                                              |
|----------------------------------|--------------------------------------------------------|--------------------------------------------------------------------|
| Short Circuit Protection (SCP)   | below 100mΩ                                            | continuous, auto recovery                                          |
| Isolation Voltage <sup>(5)</sup> | standard without suffix                                | tested for 1 second<br>rated for 1 minute<br>1kVDC<br>500VAC/60Hz  |
|                                  | /H2 version                                            | tested for 1 second<br>rated for 1 minute<br>2kVDC<br>1kVAC/60Hz   |
|                                  | /H3 version                                            | tested for 1 second<br>rated for 1 minute<br>3kVDC<br>1.5kVAC/60Hz |
| Isolation Resistance             |                                                        | 1GΩ min.                                                           |
| Isolation Capacitance            | standard version without suffix<br>/H2 and /H3 version | 200pF max.<br>30pF max.                                            |
| Insulation Grade                 | according to 60950-1                                   | basic                                                              |

### Protection Circuit



#### Notes:

Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note6: To protect the converter under all fault conditions, an input fuse is required. Quick-fuses should be rated at 2x-3x the nominal input current, time -delay fuses at 1.5x the nominal input current

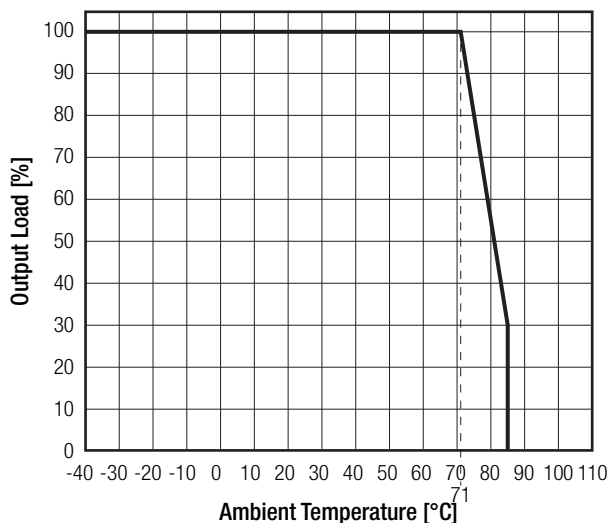
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### ENVIRONMENTAL

| Parameter                   | Condition                                                  |                | Value                                                       |
|-----------------------------|------------------------------------------------------------|----------------|-------------------------------------------------------------|
| Operating Temperature Range | full load @ free air convection, refer to „Derating Graph“ |                | -40°C to +71°C                                              |
| Operating Altitude          | according to 60950-1                                       |                | 5000m                                                       |
| Operating Humidity          | non-condensing                                             |                | 95% RH max.                                                 |
| Pollution Degree            |                                                            |                | PD2                                                         |
| MTBF                        | according to MIL-HDBK-217F, G.B.                           | +25°C<br>+71°C | 3303 x 10 <sup>3</sup> hours<br>745 x 10 <sup>3</sup> hours |

#### Derating Graph

(@ Chamber and free air convection)



### SAFETY AND CERTIFICATIONS

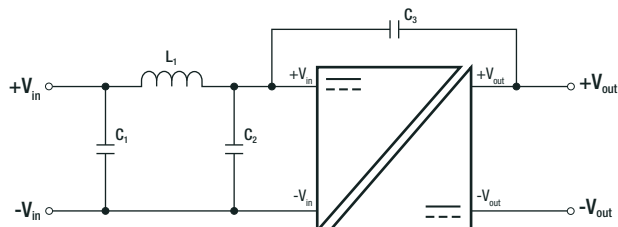
| Certificate Type (Safety)                                                             | Report / File Number | Standard                                                              |
|---------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety (LVD)               | SPCLVD1605077-10     | IEC60950-1, 2nd Edition, AM2: 2013<br>EN60950-1, 2nd Edition, A2:2013 |
| Information Technology Equipment, General Requirements for Safety (CB)                | L0339L49-CB-1-B1     | IEC60950-1:2005, 2nd Edition + A2:2013                                |
| Information Technology Equipment, General Requirements for Safety                     | E224736-A33-UL       | UL60950-1, 2nd Edition, 2014<br>CAN/CSA C22.2 No. 60950-1-07          |
| Medical Electric Equipment, General Requirements for Safety and Essential Performance | SPC1006048           | IEC60601-1:1988 + A2:1995<br>EN60601-1:1990 + A13 :1996               |
| EAC                                                                                   | RU-AT.AB49.B.09571   | TP TC 004/2011                                                        |
| RoHS2                                                                                 |                      | RoHS 2011/65/EU + AM2015/863                                          |

| EMC Compliance                                                                               | Condition                                             | Standard / Criterion                 |
|----------------------------------------------------------------------------------------------|-------------------------------------------------------|--------------------------------------|
| Electromagnetic compatibility of multimedia equipment - Emission requirements <sup>(7)</sup> | with external filter<br>(see filter suggestion below) | EN55032, Class A<br>EN55032, Class B |

continued on next page

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

**EMC Filtering Suggestions according to EN55032**



**Notes:**

Note7: Filter suggestions are valid for indicated part numbers only.  
For other part numbers, please contact RECOM tech support for advice.

**Component List Class A**

| MODEL      | C1   | C2, C3 | L1                                  |
|------------|------|--------|-------------------------------------|
| RS3-0505S  | 10µF | N/A    | <a href="#">3.9µH choke RLS-397</a> |
| RS3-0512S  |      |        |                                     |
| RS3-243.3S |      |        |                                     |
| RS3-4805S  |      |        |                                     |

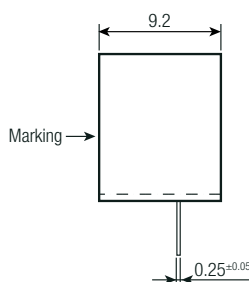
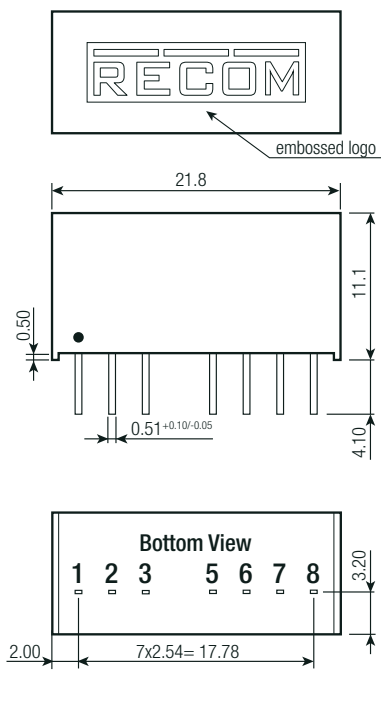
**Component List Class B**

| MODEL      | C1   | C2   | C3    | L1                                     |
|------------|------|------|-------|----------------------------------------|
| RS3-0505S  | 10μF | N/A  | N/A   | 5.6μH choke<br><a href="#">RLS-567</a> |
| RS3-0512S  |      |      |       |                                        |
| RS3-243.3S |      | 10μF | 330pF |                                        |
| RS3-4805S  |      |      |       |                                        |

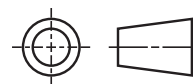
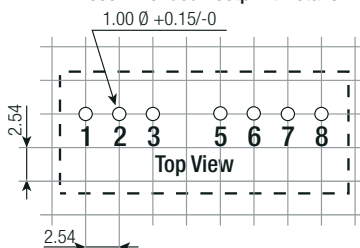
**DIMENSION AND PHYSICAL CHARACTERISTICS**

| Parameter         | Type                   | Value                                                                            |
|-------------------|------------------------|----------------------------------------------------------------------------------|
| Material          | case<br>potting<br>PCB | non-conductive black plastic, (UL94 V-0)<br>epoxy, (UL94 V-0)<br>FR4, (UL94 V-0) |
| Dimension (LxWxH) |                        | 21.8 x 9.2 x 11.1mm                                                              |
| Weight            |                        | 4.7g typ.                                                                        |

**Dimension Drawing (mm)**



**Recommended Footprint Details**



**Pinning information**

| Pin # | Single              | Dual                |
|-------|---------------------|---------------------|
| 1     | -Vin                | -Vin                |
| 2     | +Vin                | +Vin                |
| 3     | CTRL <sup>(8)</sup> | CTRL <sup>(8)</sup> |
| 5     | NC                  | NC                  |
| 6     | +Vout               | +Vout               |
| 7     | -Vout               | Com                 |
| 8     | NC <sup>(9)</sup>   | -Vout               |

NC= No Connection  
Tolerances: xx.x ±0.5mm  
xx.xx ±0.25mm

**Notes:**

- Note8: 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 open the converter is ON. There is no allowed low state for this pin. (refer to „ON/OFF CTRL“)
- Note9: This pin is used internally. No external connection allowed

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

**PACKAGING INFORMATION**

| Parameter                   | Type           | Value                 |
|-----------------------------|----------------|-----------------------|
| Packaging Dimension (LxWxH) | tube           | 520.0 x 17.0 x 10.0mm |
| Packaging Quantity          | tube           | 22pcs                 |
| Storage Temperature Range   |                | -55°C to +125°C       |
| Storage Humidity            | non-condensing | 95% RH max.           |