

# Features

## Regulated Converters

- 2:1 Wide Input Range
- 2kVDC/1 Second Isolation
- -40°C To +75°C Operating Temperature @ Full Load
- Industry Standard Pinout (SIP8)
- EN/UL62368, UL60950, CB Report (pending)
- Low Cost

### Description

The RSE is a low cost isolated, regulated and short-circuit protected DC/DC converter designed for industrial applications. A compact SIP8 case size, 2:1 input, 2kVDC isolation and a wide operating temperature range of -40°C to +75°C without derating makes the RSE series ideal for industrial, transport and general-purpose on-board 5V power supplies. Industrial Class A EMC levels can be met with a simple Pi-filter and the converters come with a three year warranty.

### Selection Guide

| Part Number  | nom. Input Voltage [VDC] | Input Current @ full load [mA] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. <sup>(1)</sup> [%] | max. Capacitive Load <sup>(2)</sup> [μF] |
|--------------|--------------------------|--------------------------------|----------------------|---------------------|------------------------------------|------------------------------------------|
| RSE-0505S/H2 | 4.5 - 9                  | 526                            | 5                    | 400                 | 76                                 | 6800                                     |
| RSE-2405S/H2 | 18 - 36                  | 103                            | 5                    | 400                 | 80                                 | 6800                                     |

#### Notes:

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

Note2: Max. cap load is tested by nominal input and full resistive load

### Specifications (measured @ ta= 25°C, nominal Vin, full load unless otherwise specified)

#### BASIC CHARACTERISTICS

| Parameter                              | Condition              | Min.          | Typ.                               | Max.                           |
|----------------------------------------|------------------------|---------------|------------------------------------|--------------------------------|
| Internal Input Filter                  |                        |               |                                    | capacitor                      |
| Input Voltage Range                    | nom. Vin=              | 5VDC<br>24VDC | 4.5VDC<br>18VDC                    | 5VDC<br>24VDC<br>9VDC<br>36VDC |
| Maximum Reverse Voltage                |                        |               |                                    | 0VDC                           |
| Input Surge Voltage                    | 100ms max nom. Vin=    | 5VDC<br>24VDC |                                    | 15VDC<br>50VDC                 |
| Quiescent Current                      | nom. Vin=              | 5VDC<br>24VDC |                                    | 40mA<br>3mA                    |
| Start-up time                          |                        |               | 500μs                              |                                |
| Rise time                              |                        |               | 450μs                              |                                |
| Hold-up time                           |                        |               | 10μs                               |                                |
| Internal Operating Frequency           |                        | 130kHz        |                                    |                                |
| Minimum Load                           |                        |               | 0%                                 |                                |
| Output Ripple and Noise <sup>(3)</sup> | 20MHz BW, 0-100% load  |               |                                    | 75mVp-p                        |
| ON/OFF CTRL <sup>(4)</sup>             | DC-DC ON<br>DC-DC OFF  |               | Open or 0V<Vr<0.8VDC<br>2V<Vr<6VDC |                                |
| Input Current of CTRL Pin              | 5V VCTRL<br>3.3V VCTRL |               | 15mA<br>10mA                       |                                |
| Standby Current                        |                        |               | 0.75mA                             | 1.5mA                          |

#### Notes:

Note3: Measurements are made with a 0.1μF MLCC across output (low ESR)

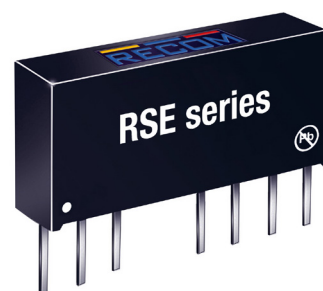
Note4: Please refer to „Application and Installation“ for CTRL pin circuit

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**RECOM**  
DC/DC Converter

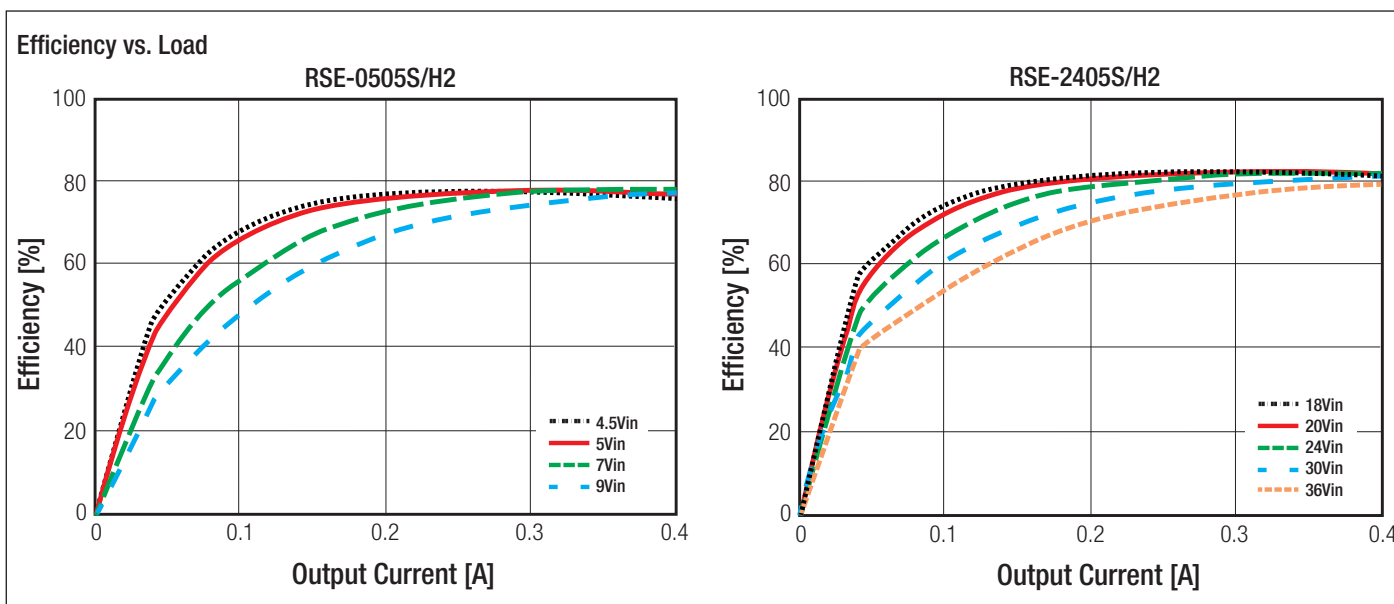
## RSE

**2 Watt  
SIP8  
Single Output**



UL62368-1 (pending)  
C22.2 No. 62368-1-14 (pending)  
UL60950 (pending)  
C22.2 No. 60950-1-07 (pending)  
IEC/EN62368-1 (pending)  
EN55022/55024 compliant  
CB Report

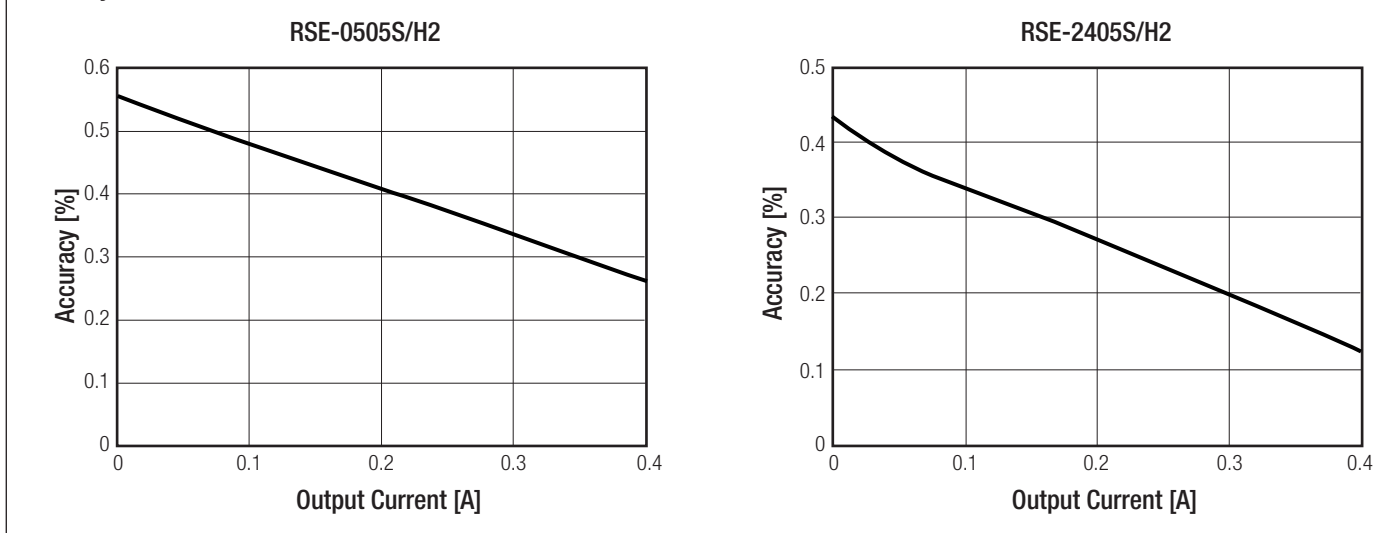
**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal  $V_{in}$ , full load unless otherwise specified)



### REGULATIONS

| Parameter       | Condition                        | Value            |
|-----------------|----------------------------------|------------------|
| Output Accuracy | 0-100% load                      | $\pm 2.0\%$ max. |
| Line Regulation | low line to high line, full load | $\pm 0.2\%$ max. |
| Load Regulation | 0% to 100% load                  | $\pm 0.5\%$ max. |

### Accuracy vs. Load



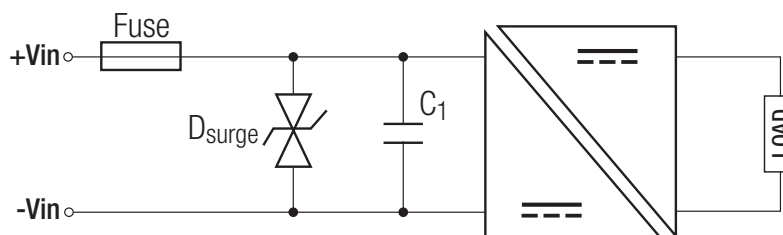
### PROTECTIONS

| Parameter                      | Type                      |                     | Value                     |
|--------------------------------|---------------------------|---------------------|---------------------------|
| Short Circuit Protection (SCP) | below $100\text{m}\Omega$ |                     | continuous, auto recovery |
| Isolation Voltage              | I/P to O/P                | tested for 1 second | 2kVDC                     |
| Isolation Resistance           |                           |                     | $1\text{G}\Omega$ min.    |
| Isolation Capacitance          |                           |                     | 100pF max.                |
| Insulation Grade               |                           |                     | functional                |

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### Specifications (measured @ $t_a = 25^\circ\text{C}$ , nominal $V_{in}$ , full load unless otherwise specified)

#### Surge Protection Circuit according to EN61000-4-5, Criteria A



| nom. $V_{in}$ | TVS       | C1                      |
|---------------|-----------|-------------------------|
| 5VDC          | P4SMAJ11A | N/A                     |
| 24VDC         | P4SMAJ36A | 220 $\mu\text{F}$ /100V |

#### Notes:

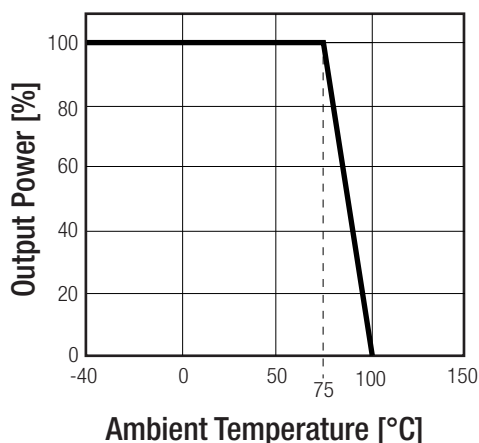
Note5: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: T2A slow blow type

### ENVIRONMENTAL

| Parameter                   | Condition                        | Value                                               |
|-----------------------------|----------------------------------|-----------------------------------------------------|
| Operating Temperature Range | without derating (see graph)     | $-40^\circ\text{C}$ to $+75^\circ\text{C}$          |
| Maximum Case Temperature    |                                  | $105^\circ\text{C}$                                 |
| Temperature Coefficient     |                                  | $\pm 0.05\%/^\circ\text{C}$                         |
| Operating Altitude          |                                  | 2000m                                               |
| Operating Humidity          | non-condensing                   | 5% - 95% RH max.                                    |
| Pollution Degree            |                                  | PD3                                                 |
| MTBF                        | according to MIL-HDBK-217F, G.B. | $2289 \times 10^3$ hours<br>$781 \times 10^3$ hours |
| Vibration                   |                                  | MIL-STD 202G                                        |

#### Derating Graph

(@ Chamber and natural convection 0.1m/s)



### SAFETY AND CERTIFICATIONS

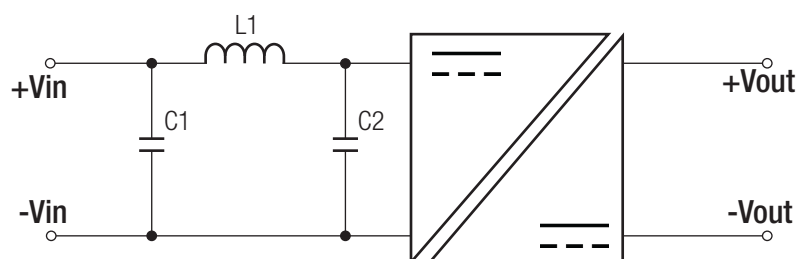
| Certificate Type (Safety)                                                                         | Report / File Number | Standard                                                               |
|---------------------------------------------------------------------------------------------------|----------------------|------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety                                 | pending              | UL60950-1, 2nd Edition, 2014<br>CSA C22.2 No. 60950-1-07, 2nd Ed. 2014 |
| Audio/Video, information and communication technology equipment - Safety requirements             | pending              | UL62368-1, 2nd Edition, 2014<br>CSA C22.2 Nr. 62368-1-14, 2nd Ed. 2014 |
| Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme) | pending              | IEC/EN62368-1, 2nd Edition, 2014                                       |
| RoHS2                                                                                             |                      | RoHS 2011/65/EU + AM2015/863                                           |

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### Specifications (measured @ $t_a = 25^\circ\text{C}$ , nominal $V_{in}$ , full load unless otherwise specified)

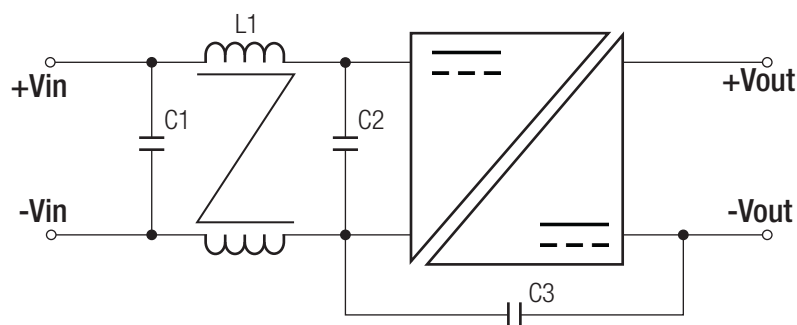
| EMC Compliance                                                                                           | Conditions                                                | Standard / Criterion                 |
|----------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|--------------------------------------|
| Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement | with external components<br>(see filter suggestion below) | EN55022, Class A<br>EN55022, Class B |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement          |                                                           | EN55024, 2015                        |
| ESD Electrostatic discharge immunity test                                                                | $\pm 8\text{kV}$ Air; $\pm 4\text{kV}$ Contact            | IEC6100-4-2, Criteria A              |
| Radiated, radio-frequency, electromagnetic field immunity test                                           | 3V/m                                                      | IEC6100-4-3, Criteria A              |
| Fast Transient and Burst Immunity                                                                        | DC Power Port: $\pm 0.5\text{kV}$                         | IEC6100-4-4, Criteria A              |
| Surge Immunity                                                                                           | DC Power Port: $\pm 0.5\text{kV}$                         | IEC6100-4-5, Criteria A              |
| Immunity to conducted disturbances, induced by radio-frequency fields                                    | DC Power Port: 3V                                         | IEC6100-4-6, Criteria A              |
| Power Magnetic Field                                                                                     | 50Hz, 1A/m                                                | IEC6100-4-8, Criteria A              |

#### EMC Filtering Suggestions for EN55022 Class A



| nom. $V_{in}$ | C1                    | C2                    | L1                    |
|---------------|-----------------------|-----------------------|-----------------------|
| 5VDC          | 22 $\mu\text{F}$ /50V | 22 $\mu\text{F}$ /50V | 3 $\mu\text{H}$ Choke |
| 24VDC         | MLCC                  | MLCC                  |                       |

#### EMC Filtering Suggestions for EN55022 Class B



| nom. $V_{in}$ | C1                    | C2                    | C3         | L1     |
|---------------|-----------------------|-----------------------|------------|--------|
| 5VDC          | 22 $\mu\text{F}$ /50V | 22 $\mu\text{F}$ /50V | 1000pF/3kV | 0.45mH |
| 24VDC         | MLCC                  | MLCC                  |            | CMC    |

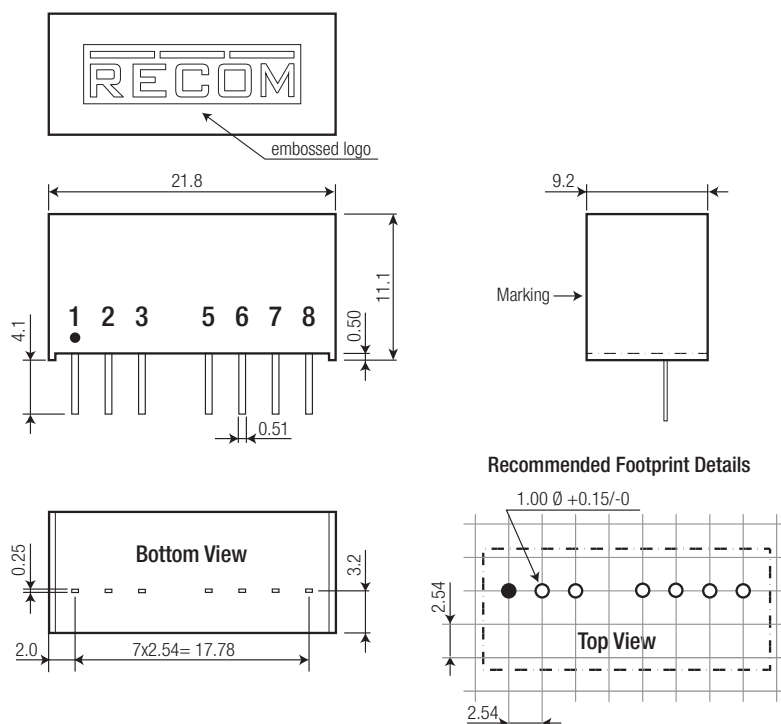
### DIMENSION and PHYSICAL CHARACTERISTICS

| Parameter                 | Type                   | Value                                                                         |
|---------------------------|------------------------|-------------------------------------------------------------------------------|
| Material                  | Case<br>Potting<br>PCB | non-conductive black plastic, (UL94-V0)<br>epoxy, (UL94-V0)<br>FR4, (UL94-V0) |
| Package Dimension (LxWxH) |                        | 21.8 x 9.2 x 11.1mm                                                           |
| Package Weight            |                        | 4.7g                                                                          |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal  $V_{in}$ , full load unless otherwise specified)

### Dimension Drawing (mm)



### Pin Connection

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

NC= no connection

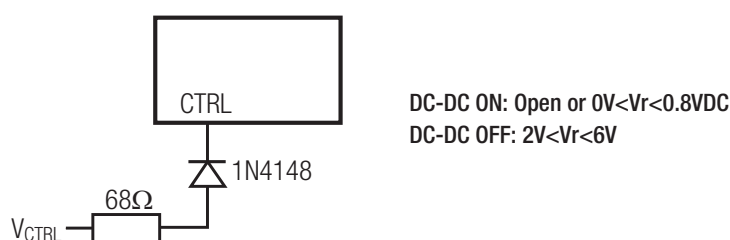
Tolerance: xx.x=  $\pm 0.5\text{mm}$

xx.xx=  $\pm 0.25\text{mm}$

Pin dimension:  $\pm 0.1\text{mm}$

### INSTALLATION and APPLICATION

#### ON/OFF CTRL Circuit



### PACKAGING INFORMATION

|                             |      |                       |
|-----------------------------|------|-----------------------|
| Packaging Dimension (LxWxH) | tube | 520.0 x 11.2 x 18.2mm |
| Packaging Quantity          |      | 22pcs                 |
| Storage Temperature Range   |      | -55°C to +125°C       |
| Storage Humidity            |      | 5% - 95% RH max.      |

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