

## Features

### Unregulated Converters

- Fully RoHS 6/6 Conform
- Full Power at 100°C Ambient Temperature
- 1kVDC and 3kVDC Isolation Options
- /H Version Certified for Medical Applications
- UL/EN/CSA Certified, CB Report
- Suitable for Fully Automated Assembly (including Vapour Phase Soldering)
- Optional Continuous Short Circuit Protection
- Efficiency to 85%

#### Description

The R2S and R2D converters are of the enclosed open frame type, meaning that they are unpotted. The converters are typically used in general purpose and industrial low power isolation and voltage matching applications where an SMD converter is required. The converter series feature an extended ambient temperature operating range of -40°C ~ +100°C without derating and optional continuous short circuit protection. In addition to two isolation options and three different case formats, the converters are also available prepacked as tape and reel for use with automatic insertion machines.

#### Selection Guide

| Part Number<br>SMD | (3kV) | Input Voltage<br>(VDC) | Output Voltage<br>(VDC) | Output Current<br>(mA) | Efficiency<br>(%) |
|--------------------|-------|------------------------|-------------------------|------------------------|-------------------|
| R2S**-xx3.3        | (H)   | 5, 12, 15, 24          | 3.3                     | 606                    | 70-75             |
| R2S**-xx05         | (H)   | 5, 12, 15, 24          | 5                       | 400                    | 76-85             |
| R2S**-xx09         | (H)   | 5, 12, 15, 24          | 9                       | 222                    | 76-85             |
| R2S**-xx12         | (H)   | 5, 12, 15, 24          | 12                      | 167                    | 76-85             |
| R2S**-xx15         | (H)   | 5, 12, 15, 24          | 15                      | 133                    | 76-85             |
| R2S**-xx24         | (H)   | 5, 12, 15, 24          | 24                      | 83                     | 76-85             |
| R2D**-xx05         | (H)   | 5, 12, 15, 24          | ±5                      | ±200                   | 75-80             |
| R2D**-xx09         | (H)   | 5, 12, 15, 24          | ±9                      | ±111                   | 75-80             |
| R2D**-xx12         | (H)   | 5, 12, 15, 24          | ±12                     | ±83                    | 75-83             |
| R2D**-xx15         | (H)   | 5, 12, 15, 24          | ±15                     | ±66                    | 75-85             |
| R2D**-xx24         | (H)   | 5, 12, 15, 24          | ±24                     | ±42                    | 75-85             |

xx = Input Voltage. Other input and output voltage combinations available on request.

\* add Suffix "P" for Continuous Short Circuit Protection, e.g. R2S-0505/P, R2D-0505/HP

\* add suffix -R for tape&reel packing e.g. R2S-0505-R. For more details see Tapes Section.

#### Case and Pinning Options (note restrictions on /H option)

- R2S\*\* : \*\* without marking denotes 5 pins out of 8 fitted (/H option available)  
          \*\* with marking **8** denotes 8 pins out of 8 fitted (/H option not available)  
          \*\* with marking **12** denotes 10 pins out of 12 fitted (/H option available)  
R2D\*\* : \*\* without marking denotes 6 pins out of 10 fitted (/H option available)  
          \*\* with marking **10** denotes with 10 pins out of 10 fitted (/H option not available)  
          \*\* with marking **12** denotes with 10 pins out of 12 fitted (/H option available)

#### Specifications (measured at $T_A = 25^\circ\text{C}$ , nominal input voltage, full load and after warm-up)

|                                                    |                                      |                                      |
|----------------------------------------------------|--------------------------------------|--------------------------------------|
| Input Voltage Range                                | ±10%                                 |                                      |
| Output Voltage Accuracy                            | ±5%                                  |                                      |
| Line Voltage Regulation                            | 1.2%/1% of $V_{in}$ max.             |                                      |
| Load Voltage Regulation<br>(10% to 100% full load) | 3.3V output types                    | 20% max.                             |
|                                                    | 5V output type                       | 15% max.                             |
|                                                    | 9V, 12V, 15V, 24V output types       | 10% max.                             |
| Output Ripple and Noise (20MHz limited)            | 150mVp-p max.                        |                                      |
| Operating Frequency                                | 20kHz min. / 40kHz typ. / 85kHz max. |                                      |
| Efficiency at Full Load                            | 70% min. / 80% typ.                  |                                      |
| No Load Power Consumption                          | RTS typ.                             | 124mW min. / 186mW typ. / 350mW max. |
|                                                    | RTD typ.                             | 159mW min. / 192mW typ. / 350mW max. |

cont.

## ECONOLINE

DC/DC-Converter

RECOM

2 Watt

SMD Single &  
Dual Output



E-224736

UL-60950-1 Certified

EN-60950-1 Certified

EN-60601-1 Certified

(Suffix /H)

## R2S-R2D

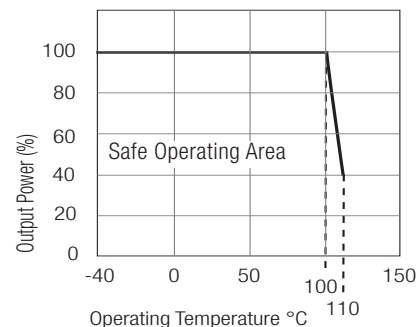
Refer to Application Notes

### Specifications - Continued

|                                                   |                                                             |                                         |
|---------------------------------------------------|-------------------------------------------------------------|-----------------------------------------|
| Isolation Voltage                                 | (tested for 1 second)                                       | 1000VDC min.                            |
| H-Suffix                                          | (tested for 1 second)                                       | 3000VDC min.                            |
| Rated Working Voltage                             | (long term isolation)                                       | see Application Notes                   |
| Isolation Capacitance                             |                                                             | 20pF min. / 115pF max.                  |
| Isolation Resistance                              |                                                             | 10 GΩ min.                              |
| Short Circuit Protection                          |                                                             | 1 Second                                |
| P-Suffix                                          |                                                             | Continuous                              |
| Operating Temperature Range (free air convection) |                                                             | -40°C to +100°C (see Graph)             |
| Storage Temperature Range                         |                                                             | -55°C to +125°C                         |
| Reflow Temperature                                | ROHS compliant                                              | 245°C (30 sec), peak 255°C (5 sec) max. |
| Vapour Phase Process                              | (for more details see Application Notes)                    | 230°C (90 sec) max.                     |
| Relative Humidity                                 |                                                             | 95% RH                                  |
| Package Weight                                    | R2S, R2S8                                                   | 1.4g                                    |
|                                                   | R2D, R2D10                                                  | 1.6g                                    |
|                                                   | R2S12, R2D12                                                | 2.0g                                    |
| Packing Quantity                                  | R2S, R2S8                                                   | 39 pcs per Tube                         |
|                                                   | R2S12, R2D, R2D10, R2D12                                    | 33 pcs per tube                         |
|                                                   | All Types                                                   | 250 pcs per Reel                        |
| MTBF (+25°C)                                      | } Detailed Information see Application Notes chapter "MTBF" | using MIL-HDBK 217F                     |
| (+85°C)                                           |                                                             | using MIL-HDBK 217F                     |
| Certifications                                    |                                                             |                                         |
| CB Test Report                                    | Report: US/14402/UL                                         |                                         |
| UL General Safety                                 | Report: E322406                                             | UL 60950-1 1st Ed.                      |
| CUL General Safety                                |                                                             | C22.2 No. 60950-1-03                    |
| EN General Safety                                 |                                                             | EN-60950-1 2nd Ed.                      |
| EN Medical Safety                                 |                                                             | EN-60601-1                              |

## Derating-Graph (Ambient Temperature)

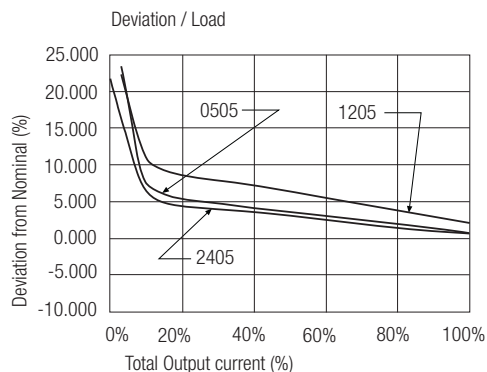
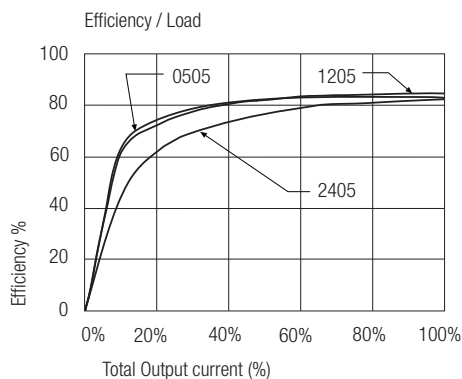
### R2S-0505, R2D-0505



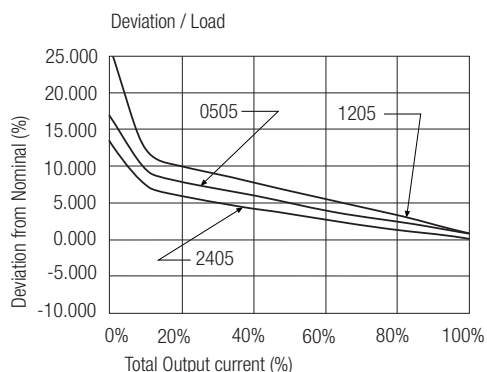
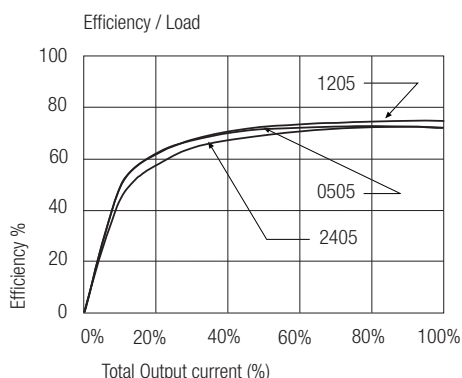
The derating graph is valid only for the shown part numbers. The converters have been tested at full load with 100°C ambient temperature and all internal component temperatures are within limits. However, Recom can only guarantee continuous operation of up to +85°C to maintain the validity of the UL certificates.

### Typical Characteristics

## R2S-xx05

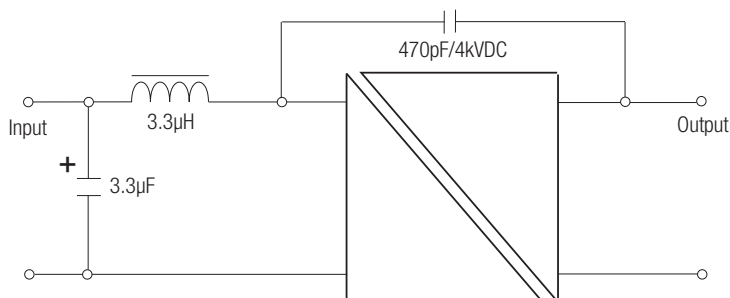


## R2D-xx05

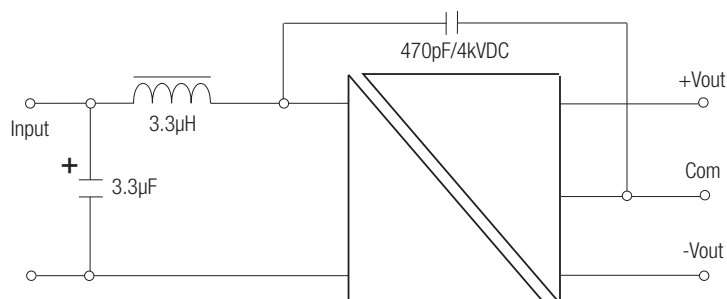


**EMC Filtering - Suggestion for EN55022 Class B (Conducted and Emitted)**

**R2S\*\***



**R2D\*\***

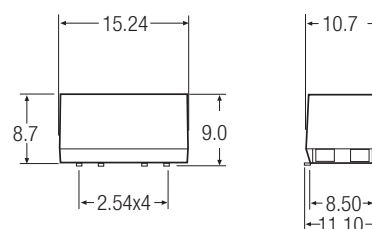
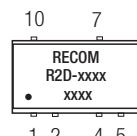
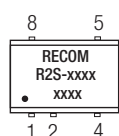
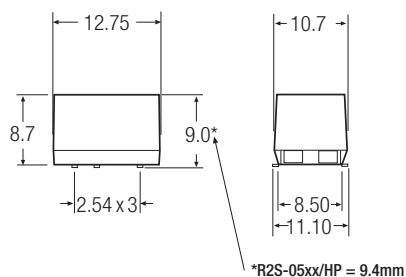


**Package Style and Pinning (mm)**

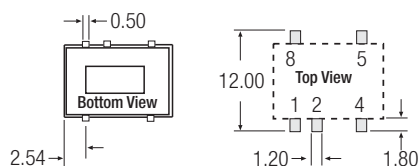
**8 PIN Single SMD Package**

**10 PIN Dual SMD Package**

3rd angle projection



**Recommended Footprint Details**



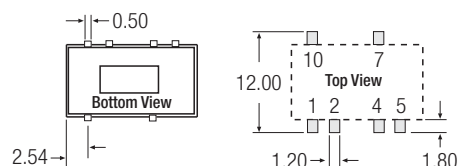
**Pin Connections**

| Pin # | Single | Dual   |
|-------|--------|--------|
| 1     | -Vin   | -Vin   |
| 2     | +Vin   | +Vin   |
| 4     | -Vout  | Com    |
| 5     | +Vout  | -Vout  |
| 7     | No Pin | +Vout  |
| 8     | NC     | No Pin |
| 10    | No Pin | NC     |

NC = No Connection

XX.X ± 0.5 mm  
XX.XX ± 0.25 mm

**Recommended Footprint Details**



R2S\*\* : \*\* without marking denotes 5 pins out of 8 fitted (includes /H option)  
\*\* with marking **8** denotes 8 pins out of 8 fitted (/H option not available)

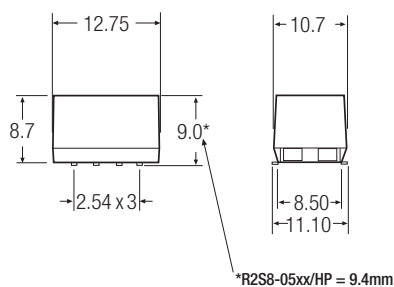
e.g. R2S-0505, R2S-0505/H, R2S-0505/HP  
e.g. R2S8-0505, R2S8-0505/P

R2D\*\* : \*\* without marking denotes 6 pins out of 10 fitted (includes /H option)  
\*\* with marking **10** denotes with 10 pins out of 10 fitted (/H option not available)

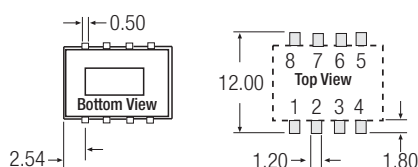
e.g. R2D-0505, R2D-0505/H, R2D-0505/HP  
e.g. R2D10-0505, R2D10-0505/P

## Package Style and Pinning (mm)

### Full 8 PIN Single SMD Package

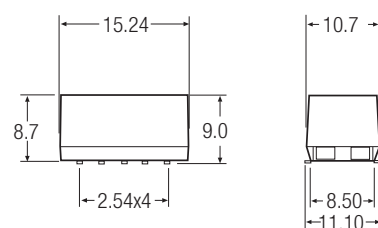


#### Recommended Footprint Details

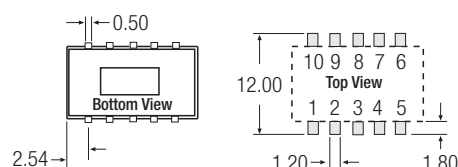


Note: /H option is not available in these pin packages

### Full 10 PIN Dual SMD Package



#### Recommended Footprint Details



#### Pin Connections

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | -Vin   | -Vin  |
| 2     | +Vin   | +Vin  |
| 3     | NC     | NC    |
| 4     | -Vout  | Com   |
| 5     | +Vout  | -Vout |
| 6     | NC     | NC    |
| 7     | NC     | +Vout |
| 8     | NC     | NC    |
| 9     | -      | NC    |
| 10    | -      | NC    |

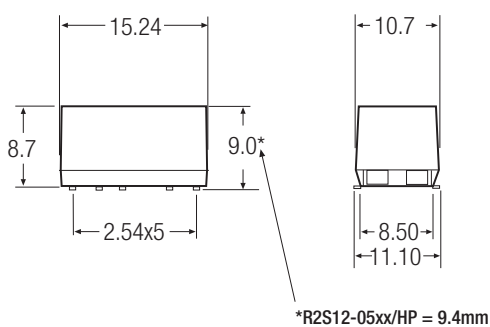
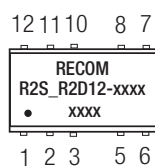
NC = No Connection

XX.X ± 0.5 mm

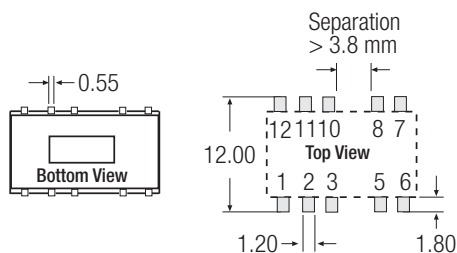
XX.XX ± 0.25 mm

### 12 PIN Single and Dual SMD Package

Note: /H option is available in this pin package



\*R2S12-05xx/HP = 9.4mm



#### Recommended Footprint Details

#### Pin Connections

| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | -Vin   | -Vin  |
| 2     | +Vin   | +Vin  |
| 3     | NC     | NC    |
| 5     | -Vout  | Com   |
| 6     | NC     | -Vout |
| 7     | NC     | NC    |
| 8     | +Vout  | +Vout |
| 10    | NC     | NC    |
| 11    | NC     | NC    |
| 12    | NC     | NC    |

NC = No Connection

XX.X ± 0.5 mm

XX.XX ± 0.25 mm



R2S\*\*: \*\* with marking 12 denotes 10 pins out of 12 fitted (includes /H option)

R2D\*\*: \*\* with marking 12 denotes 10 pins out of 12 fitted (includes /H option)

e.g. R2S12-0505, R2S12-0505/H, R2S12-0505/HP

e.g. R2D12-0505, R2D12-0505/H, R2D12-0505/HP