

## 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 Vapor Phase Soldering)
- Optional Continuous Short Circuit Protection
- Efficiency to 85%
- Built-In EN55022 Class A Filter

#### Description

The R2S and R2D converters are of the enclosed open frame type, meaning that they are un-potted. 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 to +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>(%) | Max Capacitive Load <sup>(1)</sup> |
|--------------------|-------|------------------------|-------------------------|------------------------|-------------------|------------------------------------|
| R2S**-xx3.3        | (H)   | 5, 12, 15, 24          | 3.3                     | 606                    | 70-75             | 3300µF                             |
| R2S**-xx05         | (H)   | 5, 12, 15, 24          | 5                       | 400                    | 76-84             | 1200µF                             |
| R2S**-xx09         | (H)   | 5, 12, 15, 24          | 9                       | 222                    | 76-84             | 1200µF                             |
| R2S**-xx12         | (H)   | 5, 12, 15, 24          | 12                      | 167                    | 76-85             | 680µF                              |
| R2S**-xx15         | (H)   | 5, 12, 15, 24          | 15                      | 133                    | 76-85             | 680µF                              |
| R2S**-xx24         | (H)   | 5, 12, 15, 24          | 24                      | 83                     | 76-85             | 220µF                              |
| R2D**-xx05         | (H)   | 5, 12, 15, 24          | ±5                      | ±200                   | 75-80             | ±470µF                             |
| R2D**-xx09         | (H)   | 5, 12, 15, 24          | ±9                      | ±111                   | 75-80             | ±470µF                             |
| R2D**-xx12         | (H)   | 5, 12, 15, 24          | ±12                     | ±83                    | 75-83             | ±330µF                             |
| R2D**-xx15         | (H)   | 5, 12, 15, 24          | ±15                     | ±66                    | 75-85             | ±330µF                             |
| R2D**-xx24         | (H)   | 5, 12, 15, 24          | ±24                     | ±42                    | 75-85             | ±330µF                             |

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<sub>A</sub> = 25°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 Vin max.                                                                              |
| Load Voltage Regulation                 | 3.3V output types 20% max.<br>5V output type 15% max.<br>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.                                                                              |
| Minimum Load = 0%                       | Specifications valid for 10% minimum load only.                                                  |

continued on next page

## ECONOLINE

### DC/DC-Converter

with 3 year Warranty

RECOM

2 Watt

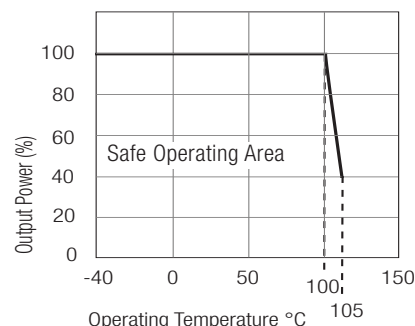
SMD Single &  
Dual Output



UL-60950-1 Certified  
 EN-60950-1 Certified  
 EN-60601-1 Certified\*  
 (\* /H suffix)

**R2S-R2D**

### Derating-Graph (Ambient Temperature)



\*\*\*Any data referred to in this datasheet are of indicative nature and based on our practical experience only. For further details, please refer to our Application Notes.

Refer to Application Notes

## Specifications - Continued

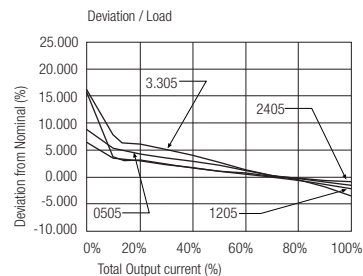
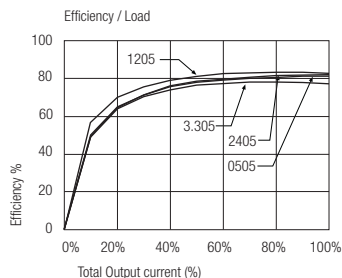
|                                                   |                                                                                 |                                                            |
|---------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------|
| Isolation Voltage                                 | (tested for 1 second)<br>(rated for 1 minute***)                                | 1000VDC<br>500VAC / 60Hz                                   |
| Isolation Voltage                                 | (tested for 1 second)<br>(rated for 1 minute***)                                | 3000VDC<br>1500VAC / 60Hz                                  |
| Isolation Capacitance                             |                                                                                 | 115pF max.                                                 |
| Isolation Resistance                              | (Viso 500V)                                                                     | 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.                    |
| Vapor Phase Process                               | (for more details see Application Notes)                                        | 230°C (90 sec) max.                                        |
| Relative Humidity                                 |                                                                                 | 95% RH                                                     |
| Package Weight                                    | R2S, R2S8<br>R2D, R2D10<br>R2S12, R2D12                                         | 1.4g<br>1.5g<br>1.6g                                       |
| Packing Quantity                                  | R2S, R2S8<br>R2S12, R2D, R2D10, R2D12<br>All Types                              | 39 pcs per Tube<br>33 pcs per tube<br>250 pcs per Reel     |
| MTBF (+25°C)<br>(+85°C)                           | <i>Detailed Information see</i><br><i>Application Notes chapter "MTBF"</i>      | using MIL-HDBK 217F<br>using MIL-HDBK 217F                 |
|                                                   |                                                                                 | 886 x 10 <sup>3</sup> hours<br>128 x 10 <sup>3</sup> hours |
| Certifications                                    |                                                                                 |                                                            |
| CB Test Report                                    | Report: US/14402/UL                                                             |                                                            |
| UL General Safety                                 | Report: E308085                                                                 | UL 60950-1 2nd Ed.                                         |
| CUL General Safety                                |                                                                                 | C22.2 No. 60950-1-03                                       |
| EN Medical Safety                                 | Report: MDD1205098-2 + RM1205098-2<br>Medical Report + ISO14971 Risk Assessment | IEC/EN 60601-1 3rd Ed.                                     |
| EN General Safety                                 | Report: SPCLVD 1211033-3                                                        | EN60950-1: 2006 + A12:2011                                 |
| Conducted / Radiated Emissions                    | EN55022                                                                         | Level A                                                    |

## Notes

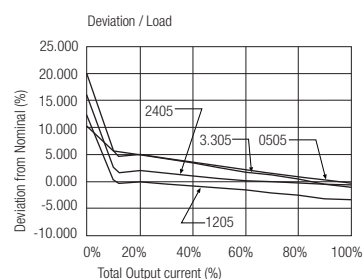
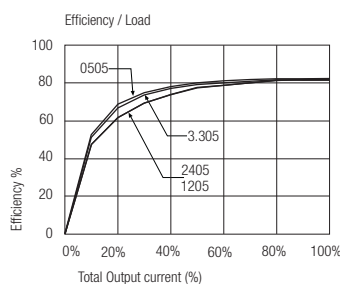
Note 1 Maximum capacitive load is defined as the capacitive load that will allow start up in under 1 second without damage to the converter.

## Typical Characteristics

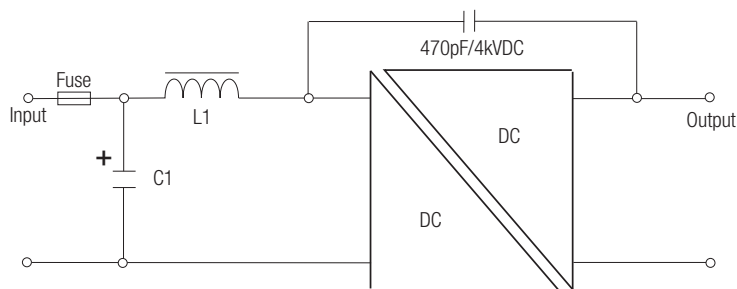
### R2S-xx05



### R2D-xx05

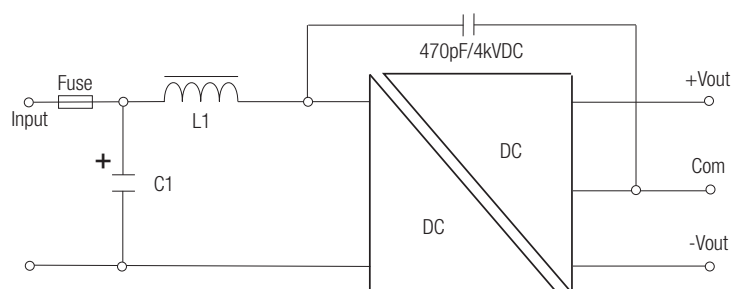


## EMC Filtering - Suggestion for EN55022 Class B (Conducted and Emitted)



Standard and /H versions

| C1    | L1    | Vin |
|-------|-------|-----|
| 2.2µF | 4.7µH | 5V  |
| 2.2µF | 10µH  | 12V |
| 2.2µF | 22µH  | 15V |
| 4.7µF | 22µH  | 24V |



/P and /HP versions

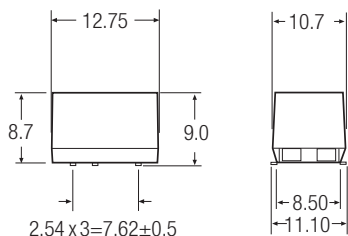
| C1    | L1   | Vin |
|-------|------|-----|
| 10µF  | 10µH | 5V  |
| 4.7µF | 22µH | 12V |
| 4.7µF | 22µH | 15V |
| 10µF  | 47µH | 24V |

C1 = MLCC

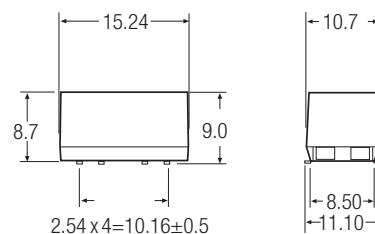
L1 = SMD Inductor

## Package Style and Pinning (mm)

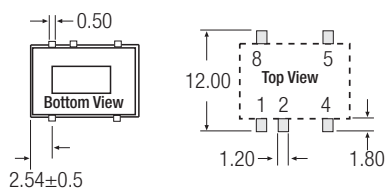
### 8 PIN Single SMD Package



### 10 PIN Dual SMD Package



### Recommended Footprint Details

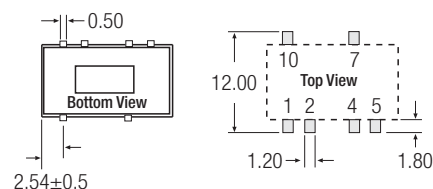


### Pin Connections

| 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)

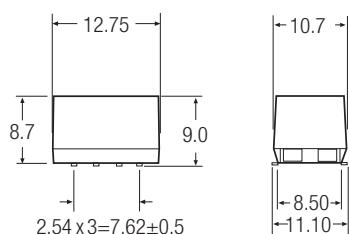
e.g. R2S-0505, R2S-0505/H, R2S-0505/HP  
e.g. R2S8-0505, R2S8-0505/P

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

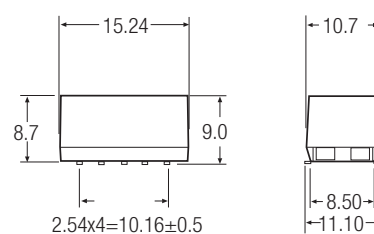
## Package Style and Pinning (mm)

### Full 8 PIN Single SMD Package

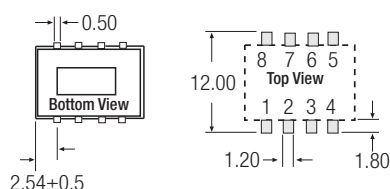


Note: /H option is not available in these pin packages

### Full 10 PIN Dual SMD Package



### Recommended Footprint Details



### Pin Connections

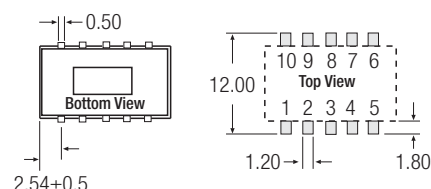
| Pin # | Single | Dual  |
|-------|--------|-------|
| 1     | -Vin   | -Vin  |
| 2     | +Vin   | +Vin  |
| 3     | NC     | NC    |
| 4     | -Vout  | Com   |
| 5     | +Vout  | -Vout |
| 6     | NC     | NC    |
| 7     | NC     | +Vout |
| 8     | NC     | NC    |
| 9     | -      | NC    |
| 10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

NC = No Connection

XX.X ± 0.5 mm

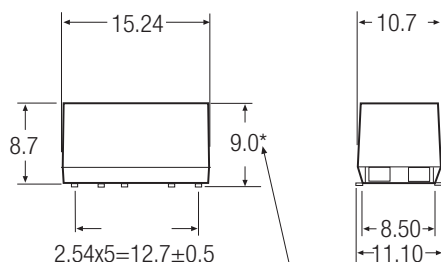
XX.XX ± 0.25 mm

### Recommended Footprint Details

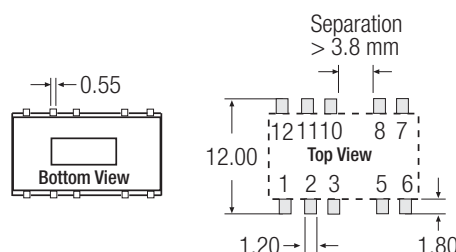


### 12 PIN Single and Dual SMD Package

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

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## RECOM:

[R2S-0505](#) [R2S-1205](#) [R2S-1212](#) [R2D-0505](#) [R2D-0505/H](#) [R2D-0505/HP](#) [R2D-0505/HP-R](#) [R2D-0505/H-R](#) [R2D-0505/P](#) [R2D-0505/P-R](#) [R2D-0505-R](#) [R2D-0509](#) [R2D-0509/H](#) [R2D-0509/HP](#) [R2D-0509/HP-R](#) [R2D-0509/H-R](#) [R2D-0509/P](#) [R2D-0509/P-R](#) [R2D-0509-R](#) [R2D-0512](#) [R2D-0512/H](#) [R2D-0512/HP](#) [R2D-0512/HP-R](#) [R2D-0512/H-R](#) [R2D-0512/P](#) [R2D-0512/P-R](#) [R2D-0512-R](#) [R2D-0515](#) [R2D-0515/H](#) [R2D-0515/HP](#) [R2D-0515/HP-R](#) [R2D-0515/H-R](#) [R2D-0515/P](#) [R2D-0515/P-R](#) [R2D-0515-R](#) [R2D-0524](#) [R2D-0524/H](#) [R2D-0524/HP](#) [R2D-0524/HP-R](#) [R2D-0524/H-R](#) [R2D-0524/P](#) [R2D-0524/P-R](#) [R2D-0524-R](#) [R2D10-0505](#) [R2D10-0505/P](#) [R2D10-0505/P-R](#) [R2D10-0505-R](#) [R2D10-0509](#) [R2D10-0509/P](#) [R2D10-0509/P-R](#) [R2D10-0509-R](#) [R2D10-0512](#) [R2D10-0512/P](#) [R2D10-0512/P-R](#) [R2D10-0512-R](#) [R2D10-0515](#) [R2D10-0515/P](#) [R2D10-0515/P-R](#) [R2D10-0515-R](#) [R2D10-0524](#) [R2D10-0524/P](#) [R2D10-0524/P-R](#) [R2D10-0524-R](#) [R2D10-1205](#) [R2D10-1205/P](#) [R2D10-1205/P-R](#) [R2D10-1205-R](#) [R2D10-1209](#) [R2D10-1209/P](#) [R2D10-1209/P-R](#) [R2D10-1209-R](#) [R2D10-1212](#) [R2D10-1212/P](#) [R2D10-1212/P-R](#) [R2D10-1212-R](#) [R2D10-1215](#) [R2D10-1215/P](#) [R2D10-1215/P-R](#) [R2D10-1215-R](#) [R2D10-1224](#) [R2D10-1224/P](#) [R2D10-1224/P-R](#) [R2D10-1224-R](#) [R2D10-1505](#) [R2D10-1505/P](#) [R2D10-1505/P-R](#) [R2D10-1505-R](#) [R2D10-1509](#) [R2D10-1509/P](#) [R2D10-1509/P-R](#) [R2D10-1509-R](#) [R2D10-1512](#) [R2D10-1512/P](#) [R2D10-1512/P-R](#) [R2D10-1512-R](#) [R2D10-1515](#) [R2D10-1515/P](#) [R2D10-1515/P-R](#) [R2D10-1515-R](#) [R2D10-1524](#)