

# Features

- Qualified with 65kV/ $\mu$ s @ Vcommon mode =1KV
- UL/CSA and IEC/EN safety certified
- High isolation 6.4kVDC/1s
- Optional continuous short circuit protection
- /X2 version with >9mm input/output clearance
- Suitable for IGBT applications

# Unregulated Converters

## RxxPxx

**1 Watt  
SIP7  
Single and Dual  
Output**



### Description

The RxxPxxS\_D Series of DC/DC Converters are certified to UL/CSA60950-1 as well as EN60950-1. This makes them ideal for safety applications where approved isolation is required.

### 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> [ $\mu$ F] |
|----------------------------|--------------------------|----------------------|---------------------|------------------------------------|--|
| RxxP3.3S <sup>(3,4)</sup>  | 5, 12, 15, 24            | 3.3                  | 303                 | 70                                 | 2200   |
| RxxP05S <sup>(3,4)</sup>   | 5, 12, 15, 24            | 5                    | 200                 | 70 - 75                            | 1000   |
| RxxP09S <sup>(3,4)</sup>   | 5, 12, 15, 24            | 9                    | 111                 | 70 - 75                            | 1000   |
| RxxP12S <sup>(3,4)</sup>   | 5, 12, 15, 24            | 12                   | 84                  | 70 - 75                            | 470  |
| RxxP15S <sup>(3,4)</sup>   | 5, 12, 15, 24            | 15                   | 66                  | 75 - 80                            | 470  |
| RxxP3.3D <sup>(3,4)</sup>  | 5, 12, 15, 24            | $\pm$ 3.3            | $\pm$ 151           | 70                                 | $\pm$ 1000                                     |
| RxxP05D <sup>(3,4)</sup>   | 5, 12, 15, 24            | $\pm$ 5              | $\pm$ 100           | 70 - 75                            | $\pm$ 470                                      |
| RxxP09D <sup>(3,4)</sup>   | 5, 12, 15, 24            | $\pm$ 9              | $\pm$ 55            | 70 - 75                            | $\pm$ 470                                      |
| RxxP12D <sup>(3,4)</sup>   | 5, 12, 15, 24            | $\pm$ 12             | $\pm$ 41            | 70 - 75                            | $\pm$ 220                                      |
| RxxP15D <sup>(3,4)</sup>   | 5, 12, 15, 24            | $\pm$ 15             | $\pm$ 33            | 75 - 80                            | $\pm$ 220                                      |
| RxxP1509D <sup>(3,4)</sup> | 12, 24                   | +15/-9               | +33/-56             | 70 - 80                            | $\pm$ 220                                      |
| R05P1509D <sup>(3,4)</sup> | 5                        | +15/-9               | $\pm$ 42            | 70 - 80                            | +68/-220                                       |



#### Notes:

- Note1: Efficiency is tested at nominal input and full load at +25°C ambient  
 Note2: Max. Capacitive Load is defined as the capacitive load that will allow start up in under 1 second without damage to the converter

### Model Numbering



#### Notes:

- Note3: add suffix „/X2“ for single output with alternative pinout  
 Note4: add suffix „P“ for continuous short circuit protection

#### Ordering Examples:

- R05P05S/P = 5V Input, 5V Output, Single Output, Continuous Short Circuit Protection  
 R05P3.3D/P = 5V Input, 3.3V Output, Dual Output, Continuous Short Circuit Protection  
 R05P05S/P/X2 = 5V Input, 5V Output, Single Output, Continuous Short Circuit Protection, Alternative Pinout



[www.recom-power.com/eval-ref-boards](http://www.recom-power.com/eval-ref-boards)

[www.recom-power.com/bier](http://www.recom-power.com/bier)

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

### BASIC CHARACTERISTICS

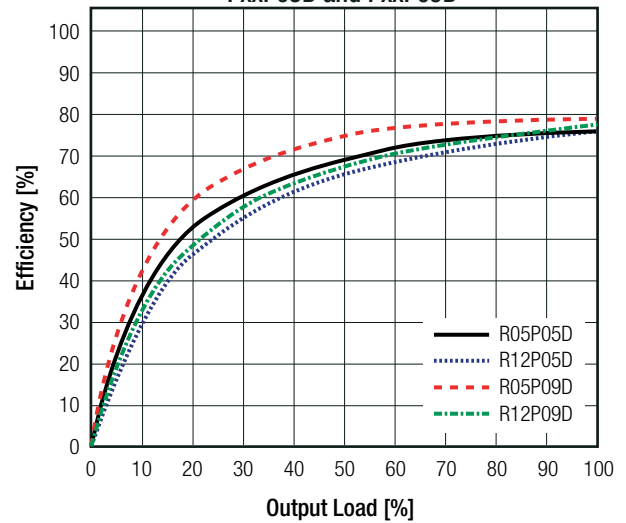
| Parameter                    | Condition              | Min.           | Typ.           | Max.     |
|------------------------------|------------------------|----------------|----------------|----------|
| Input Voltage Range          |                        |                | ±10%           |          |
| Minimum Load                 |                        | 0%             |                |          |
| Internal Operating Frequency | all types<br>PxxP1509D | 20kHz<br>20kHz | 50kHz<br>60kHz | 85kHz    |
| Output Ripple and Noise      | 20MHz BW               |                |                | 200mVp-p |

### Efficiency vs. Load

PxxP05S and PxxP09S



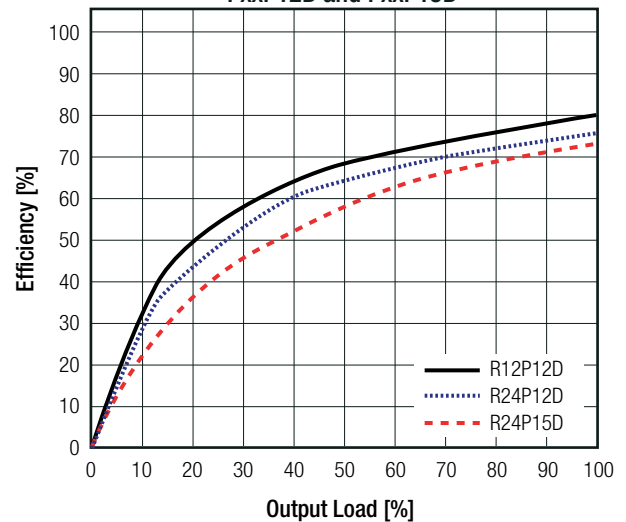
PxxP05D and PxxP09D



PxxP12S and PxxP15S



PxxP12D and PxxP15D



### REGULATIONS

| Parameter                      | Condition                        |                           | Value                  |
|--------------------------------|----------------------------------|---------------------------|------------------------|
| Output Accuracy                |                                  |                           | ±5.0% max.             |
| Line Regulation                | low line to high line, full load |                           | ±1.2% of 1.0% Vin typ. |
| Load Regulation <sup>(5)</sup> | 10% to 100% load                 | 3.3, 5VDC<br>9, 12, 15VDC | 15% typ.<br>10% typ.   |

**Notes:**

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

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

Tolerance Envelope



Deviation vs. Load

PxxP05S and PxxP09S



PxxP05D and PxxP09D



PxxP12S and PxxP15S



PxxP12D and PxxP15D



**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up 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                         | tested for 1 second    | 6.4kVDC      |
|   |                                    | rated for 1 minute     | 3.2kVAC/60Hz |
| Isolation Resistance  |                                    | 15GΩ min.              |              |
| Isolation Capacitance   |                                    | 4.0pF min. / 10pF max. |              |
| Insulation Grade  |                                    | basic                  |              |
| <b>Notes:</b><br>Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage<br>Note7: Refer to local safety regulations if input over-current protection is required. Recommended fuse: slow blow type |                                    |                        |              |

| ENVIRONMENTAL               |   |                |                              |
|-----------------------------|---|----------------|------------------------------|
| Parameter                   | Condition   | Value          |                              |
| Operating Temperature Range | without derating @ free air convection(see graph) | -40°C to +90°C |                              |
| Operating Altitude          |   | 2000m          |                              |
| Operating Humidity          | non-condensing                                    | 95% RH max.    |                              |
| Pollution Degree            |   | PD2            |                              |
| MTBF                        | according to MIL-HDBK-217F, G.B.                  | +25°C          | 2974 x 10 <sup>3</sup> hours |
|                             |   | +85°C          | 728 x 10 <sup>3</sup> hours  |

**Derating Graph**

(@ Chamber and free air convection)



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

### SAFETY AND CERTIFICATIONS

| Certificate Type (Safety)  | Report / File Number | Standard   |
|--|----------------------|--|
| Information Technology Equipment, General Requirements for Safety  | E224736-A56-UL       | UL60950-1, 2nd Edition, 2014<br>CAN/CSA C22.2 No. 60950-1, 2nd Edition, 2014 |
| Information Technology Equipment, General Requirements for Safety  | SPCLVD1602031        | EN60950-1:2006 +AM:2013<br>IEC60950-1:2005, 2nd Edition +AM:2013             |
| Audio/Video, information and communication technology equipment. Safety requirements                     | E224736-A56-UL       | UL62368-1, 2nd Edition, 2014<br>CAN/CSA C22.2 No. 62368-1, 2nd Edition, 2014 |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements (CB Scheme) | ATTCB106076          | IEC62368-1:2014, 2nd Edition   |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements             |                      | EN62368-1: 2014 + A11:2017   |
| EAC  | RU-AT.49.09571       | TP TC 004/2011   |
| RoHS 2+  |                      | RoHS-2011/65/EU + AM2015/863   |

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

### EMC Filter Suggestion according to EN55032



#### Component List Class A

| MODEL   | C1        | L1  | C2       | C3 (safety) |
|---------|-----------|-----|----------|-------------|
| R05P05S | 22µF      | N/A | N/A      | N/A         |
| R05P12S | 50V MLCC  |     | N/A      |             |
| R12P05S | 10µF      |     | 4.7µF    |             |
| R24P05S | 100V MLCC |     | 50V MLCC |             |

#### Component List Class B

| MODEL   | C1                | L1                    | C2  | C3 (safety) |
|---------|-------------------|-----------------------|-----|-------------|
| R05P05S | 10µF<br>100V MLCC | 22µH choke<br>RLS-226 | N/A | 1nF         |
| R05P12S |                   |                       |     |             |
| R12P05S |                   |                       |     |             |
| R24P05S |                   |                       |     |             |

#### 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, (UL94 V-0)<br>silicon rubber compound, (UL94 V-0)<br>FR4, (UL94 V-0) |
| Dimension (LxWxH) |                        | 19.5 x 9.8 x 12.5mm  |
| Weight            |                        | 4.3g typ.  |

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

**Dimension Drawing (mm)**

**Pin Connection**

| Pin # | Single | Dual  | /X2    |
|-------|--------|-------|--------|
| 1     | +Vin   | +Vin  | +Vin   |
| 2     | -Vin   | -Vin  | -Vin   |
| 5     | -Vout  | -Vout | No Pin |
| 6     | No Pin | Com   | -Vout  |
| 7     | +Vout  | +Vout | +Vout  |

Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

**Recommended Footprint Details**

## INSTALLATION AND APPLICATION

### IGBT Application Circuit



## PACKAGING INFORMATION

| Parameter                   | Type | Value                 |
|-----------------------------|------|-----------------------|
| Packaging Dimension (LxWxH) | tube | 520.0 x 22.3 x 12.0mm |
| Packaging Quantity          | tube | 25pcs                 |
| Storage Temperature Range   |      | -55°C to +125°C       |
| Storage Humidity            |      | 95% RH max.           |

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- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

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