



# THE DATASHEET OF RS-2412D



# Features

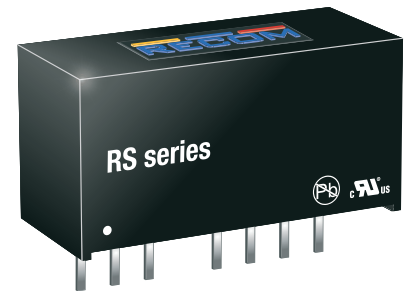
# Regulated Converters

- 2:1 and 4:1 wide input voltage range
- SIP8 package style
- UL94V-0 package material
- Continuous short circuit protected
- Low noise
- No external capacitor needed
- 1kVDC, 2kVDC or 3kVDC isolation



# RS-S(D)(Z)

**2 Watt  
SIP8  
Single & Dual  
Output**



UL60950-1 certified  
CAN/CSA No. 60950-1-07 certified  
IEC/EN60950-1 certified  
IEC/EN60601-1 certified  
CB Report

## Description

High power-density, an industrial temperature range of -40°C to +100°C and extra features like Remote-On-Off- control are just some of the characteristics of this converter, ideal for highly sophisticated industrial designs. The RS series is available with isolation of 2kV or 3kV by choosing option „/H2“ or „/H3“. The standard version offers 2:1 input voltage range, while the “Z” version features 4:1 input voltage range, which includes an input voltage range covering both 5V and 12V supplies.

## Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. [%]	max. Capacitive Load <sup>(2)</sup> [µF]
RS-xx3.3S	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	3.3	500	68-73	4700
RS-xx3.3SZ	9-36, 18-72			75	
RS-xx05S	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	5	400	73-78	1000
RS-xx05SZ	9-36, 18-72			80	
RS-xx09S	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	9	222	74-81	1000
RS-xx09SZ	9-36, 18-72			80	
RS-xx12S	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	12	166	75-83	1000
RS-xx12SZ	9-36, 18-72			83	
RS-xx15S	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	15	134	75-83	1000
RS-xx15SZ	9-36, 18-72			84	
RS-xx3.3D	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	±3.3	±250	68-73	±2200
RS-xx3.3DZ	9-36, 18-72			73	
RS-xx05D	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	±3.3	±200	73-78	±680
RS-xx05DZ	9-36, 18-72			77	
RS-xx09D	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	±9	±111	74-81	±680
RS-xx09DZ	9-36, 18-72			80	
RS-xx12D	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	±12	±83	75-83	±680
RS-xx12DZ	9-36, 18-72			81	
RS-xx15D	4.5-9 <sup>(1)</sup> , 9-18, 18-36, 36-72	±15	±67	75-83	±680
RS-xx15DZ	9-36, 18-72			83	

### Notes:

- Note1: Derate to 85% load if V<sub>IN</sub> is <5VDC (refer to „Line Derating“ on page 2)  
 Note2: Maximum capacitive load is defined as the capacitive load that will allow start up in under 1 second without damage the converter

## Model Numbering



### Notes:

- Note3: add „Z“ for 4:1 Input Voltage (24= 9-36VDC or 48= 18-72VDC)  
 Note4: add suffix „/H2“ for 2kVDC isolation or „/H3“ for 3kVDC isolation, without suffix = standard 1kVDC isolation

### Ordering Examples:

RS-2405S/H2:	18-36Vin	5Vout	Single	4:1 Input Voltage	2kVDC Isolation
RS-0512S:	4.5-9Vin	12Vout	Single	2:1 Input Voltage	1kVDC Isolation
RS-2405DZ/H3	9-36Vin	±5Vout	Dual	4:1 Input Voltage	3kVDC Isolation

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

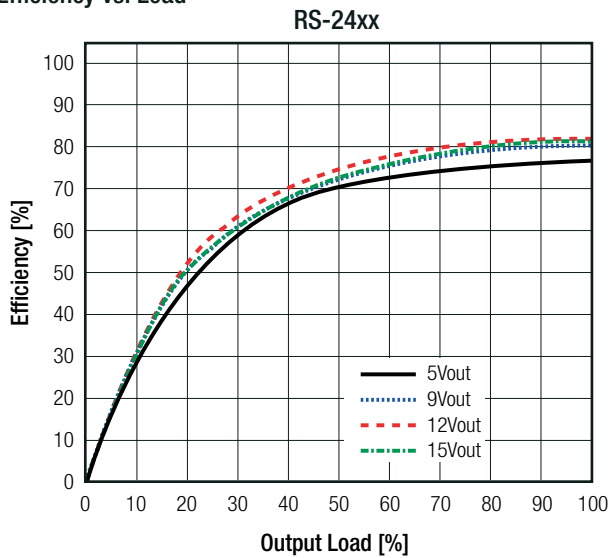
**BASIC CHARACTERISTICS**

Parameter	Condition		Min.	Typ.	Max.
Input Voltage Range	2:1 Input	5VDC	4.5VDC <sup>(1)</sup>		9VDC
		nom $V_{in} =$ 12VDC 24VDC 48VDC	9VDC 18VDC 36VDC		18VDC 36VDC 72VDC
Quiescent Current	4:1 Input	5VDC		40mA	
		nom $V_{in} =$ 12VDC 24VDC 48VDC		32mA 25mA 15mA	
Minimum Load <sup>(5)</sup>			10%		
ON/OFF CTRL	DC-DC ON DC-DC OFF		open or high impedance external $V_{CTRL} = 5-12\text{VDC} + 1\text{N4148}$ and $68\Omega$ resistor		
Internal Operating Frequency			100kHz		300kHz
Output Ripple and Noise	20MHz BW				50mVp-p

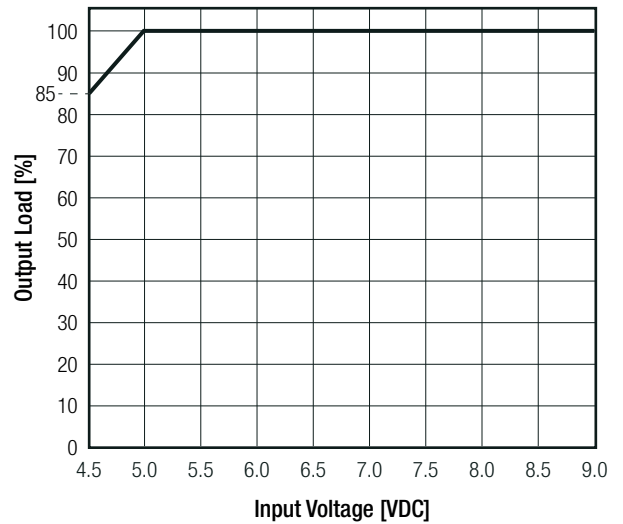
**Notes:**

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

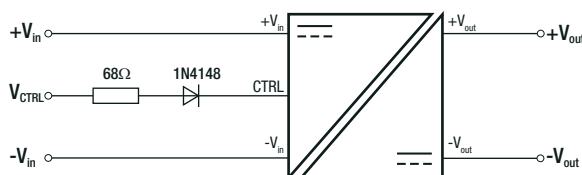
**Efficiency vs. Load**



**Line Derating**



**ON/OFF CTRL**

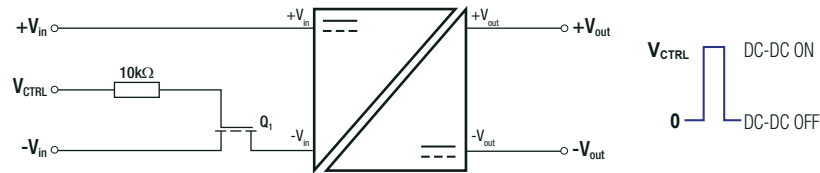


DC-DC ON: Open or high impedance

DC-DC OFF:  $V_{CTRL} = 5-12\text{VDC} + 1\text{N4148}$  and  $68\Omega$  resistor

continued on next page

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



**REGULATIONS**

Parameter	Condition	Value
Output Accuracy		$\pm 2.0\%$ typ.
Line Regulation		$\pm 0.5\%$ max.
Load Regulation	20% to 100% load	0.5% max.

**PROTECTIONS**

Parameter	Type			Value
Short Circuit Protection (SCP)	below 100mΩ			continuous, auto recovery
Isolation Voltage <sup>(6)</sup>	standard without suffix	tested for 1 second		1kVDC
		rated for 1 minute		500VAC/60Hz
	/H2 version	tested for 1 second		2kVDC
		rated for 1 minute		1kVAC/60Hz
/H3 version	tested for 1 second		3kVDC	
	rated for 1 minute		1.5kVAC/60Hz	
Isolation Resistance				1GΩ min.
Isolation Capacitance	standard without suffix	2:1 Input	Single	10pF min. / 40pF typ. / 60pF max.
		2:1 Input	Dual	120pF min. / 170pF typ. / 250pF max.
		4:1 Input	Single	200pF max.
	/H2 and /H3 version	2:1 Input	Single/Dual	5pF min. / 30pF typ. / 60pF max.
		4:1 Input	Single/Dual	30pF max.
Insulation Grade				basic (IEC/EN60950-1) functional (IEC/EN6060-1)

**Notes:**

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note7: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: slow blow type

**ENVIRONMENTAL**

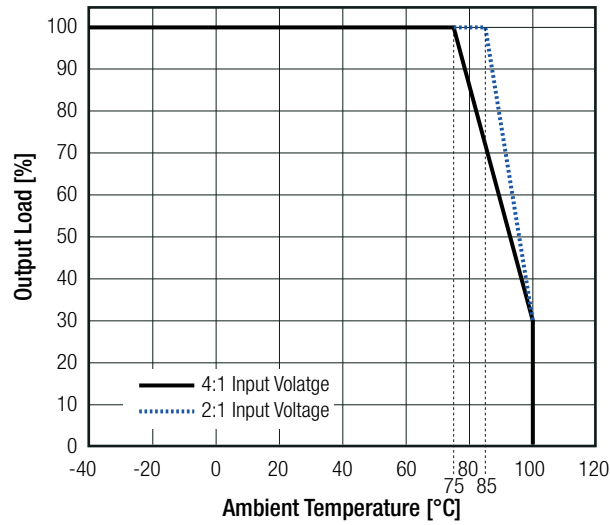
Parameter	Condition		Value
Operating Temperature Range	with derating @ free air convection (see graph)		-40°C to +100°C
Operating Altitude			5000m
Operating Humidity	non-condensing		95% RH max.
Pollution Degree			PD2
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	1398 x 10 <sup>3</sup> hours
		+85°C	210 x 10 <sup>3</sup> hours

continued on next page

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

**Derating Graph**

(@ Chamber and free air convection)

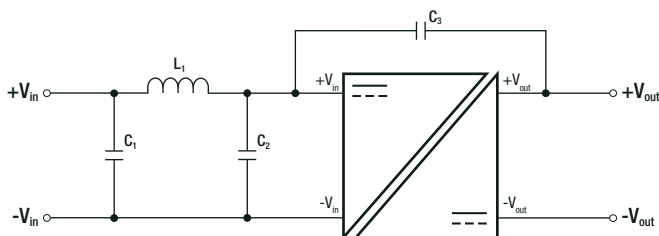


**SAFETY AND CERTIFICATIONS**

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	SPCLVD1605077-10	IEC60950-1, 2nd Edition, AM2: 2013 EN60950-1, 2nd Edition, A2:2013
Information Technology Equipment, General Requirements for Safety (CB)	L0339L48-CB-1-B1	IEC60950-1:2005, 2nd Edition + A2:2013
Information Technology Equipment, General Requirements for Safety	E224736-A35-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA C22.2 No. 60950-1-07
Medical Electric Equipment, General Requirements for Safety and Essential Performance	WD-SE-R-180675-A0	IEC60601-1:2005 + C2:2007 + A1:2012, 3rd Edition EN60601-1:2006 + A1:2013 + A12:2014
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>(8)</sup>	with external filter (see filter suggestion below)	EN55032, Class A EN55032, Class B

**EMC Filtering Suggestions according to EN55032**



**Notes:**

Note8: 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
RS-0505S	10µF/100V MLCC	N/A	3.9µH choke RLS-397
RS-1205S			
RS-2405S		1nF	
RS-4805S			

**Component List Class B**

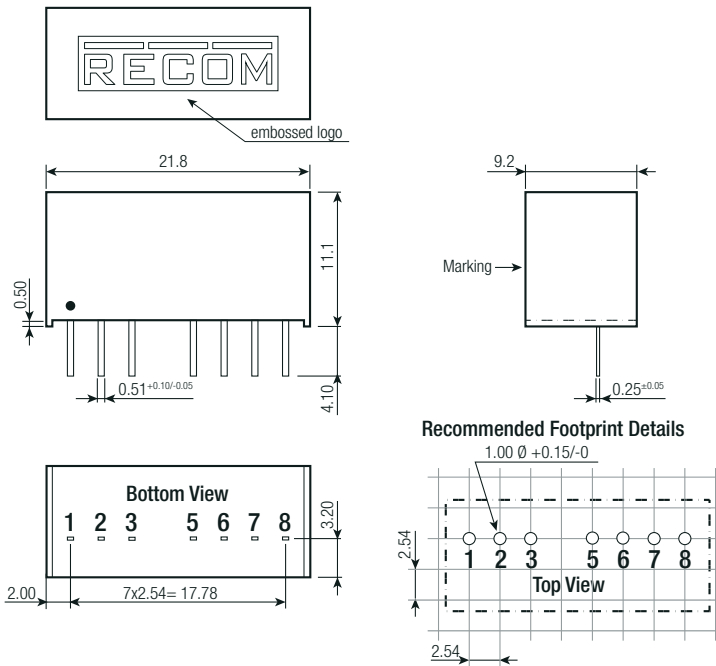
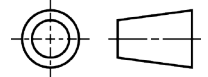
Model	C1, C2	C3	L1
RS-0505S	10µF/100V MLCC	2.2nF	12µH choke RLS-126
RS-1205S			
RS-2405S			
RS-4805S			

Specifications (measured @ ta= 25°C, nom. Vin, full load after warm up unless otherwise specified)

**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case	non-conductive black plastic, (UL94V-0)
	Potting	epoxy, (UL94V-0)
	PCB	FR4, (UL94 V-0)
Package Dimension (LxWxH)		21.8 x 11.1 x 9.2mm
Package Weight		4.7g typ.

Dimension Drawing (mm)



**Pinning information**

Pin #	Single	Dual
1	-Vin	-Vin
2	+Vin	+Vin
3	CTRL <sup>(9)</sup>	CTRL <sup>(9)</sup>
5	NC	NC
6	+Vout	+Vout
7	-Vout	COM
8	NC <sup>(10)</sup>	-Vout

NC= no connection  
Tolerance: xx.x= ±0.5mm  
xx.xx= ±0.25mm

**Notes:**

Note9: 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“ on page 2)

Note10: This pin is used internally. No external connection allowed



**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		95% RH max.

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