

## Features

- Adjustable Output Voltage
- Non-Isolated
- 1-2AMP Adjustable Positive Step Down Integrated Switching Regulator
- Internal Short Circuit Protection
- ON/OFF Control(Ground Off)
- UL94V-0 Package Material
- Wide Input Range
- Efficiency to 96%

**INNOLINE**  
DC/DC-Converter

# R-6xxxP\_D Series

**1-2 AMP  
SIP12  
Vertical &  
Horizontal**



**RECOM**

### Selection Guide

Part Number	Input Range (V)	Nominal Output Voltage (V)	Vout Adjust Range (V)	Output Current (A)	Efficiency (%)	
					Vin min. (%)	Vin max. (%)
SIP12	(V)	(V)	(V)	(A)	(%)	(%)
R-611.8x	9 – 32	1.8	1.5 – 3.6	1	79	67
R-612.5x	9 – 32	2.5	1.5 – 4.5	1	84	74
R-613.3x	9 – 32	3.3	1.8 – 6	1	88	79
R-615.0x	9 – 32	5	1.8 – 9	1	92	84
R-619.0x	11 – 32	9	3.3 – 15	1	96	90
R-6112x	14 – 32	12	3.3 – 15	1	97	92
R-621.8x	9 – 32	1.8	1.5 – 3.6	2	76	68
R-622.5x	9 – 32	2.5	1.5 – 4.5	2	81	74
R-623.3x	9 – 32	3.3	1.8 – 6	2	86	80
R-625.0x	9 – 32	5	1.8 – 9	2	90	85
R-629.0x	11 – 32	9	3.3 – 15	2	95	91
R-6212x	14 – 32	12	3.3 – 15	2	96	93

Note: Vin -Vout ≥ 1.5V if adjust function is used!

Suffix x: (see mechanical drawing for details)

x = P pins vertical through hole

x = D pins bent for horizontal through hole mounting

### Specifications (refer to the standard application circuit, Ta: 25°C)

Characteristics	Conditions	Min.	Typ.	Max.
Input Voltage Range	Vout = 1.8V	9V		32V
	Vout = 2.5V	9V		32V
	Vout = 3.3V	9V		32V
	Vout = 5V	9V		32V
	Vout = 9V	11V		32V
	Vout = 12V	14V		32V
Output Voltage Adjust Range (see table 1)	Vout = 1.8V	1.5V	1.8V	3.6V
	Vout = 2.5V	1.5V	2.5V	4.5V
	Vout = 3.3V	1.8V	3.3V	6V
	Vout = 5V	1.8V	5V	9V
	Vout = 9V	3.3V	9V	15V
	Vout = 12V	3.3V	12V	15V
Output Current	R-61xxP/D	0.1A		1.0A
	R-62xxP/D	0.2A		2.0A
Output Current Limit		4A	4.5A	5A
Short Circuit Input Current	Vin > 12V	20mA		100mA
Short Circuit Protection			Continuous, automatic recovery	
Output Voltage Accuracy	At 100% Load		±1%	±2%
Line Voltage Regulation (Vin = min. to max. at full load)				0.5%

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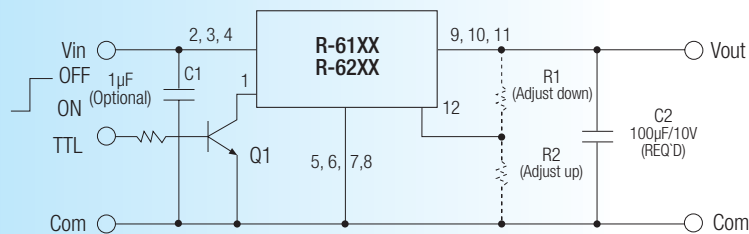
**Specifications (refer to the standard application circuit, Ta: 25°C)**

Characteristics	Conditions	Min.	Typ.	Max.
Load Regulation (10 to 100% full load)	R-61xxP/D			0.5%
	R-62xxP/D			1.0%
Vo Ripple & Noise	R-61xxP/D		40mVpp	100mVpp
	R-62xxP/D		40mVpp	120mVpp
Transient Response (see note 1)	50% Load Change		100us	200us
	Vout Over / Undershoot		5%	
Remote ON / OFF (see note 2) (positive logic)	Open or high (Power ON)	2.0V		10V
	Low (Power OFF)			0.8V
Remote Off Input Current	Remote ON/OFF low level		100µA	
Switching Frequency		200kHz	250kHz	300kHz
Quiescent Current	Vin = min. to max. at 0% load		6mA	10mA
Operating Temperature Range		-40°C		+85°C
Storage Temperature Range		-40°C		+125°C
internal Power Dissipation	$I_o \times V_o \times (1 - \text{Efficiency})$			1.0W
MTBF (Nominal Vout, 100% load)	Tamb. = +25°C			563 x 10 <sup>3</sup> hours
	Tamb. = +71°C			117 x 10 <sup>3</sup> hours

**Notes:**

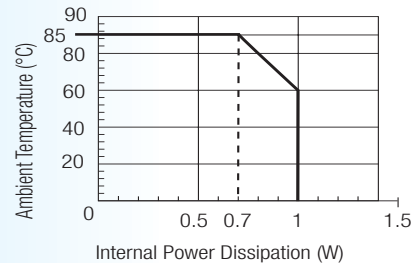
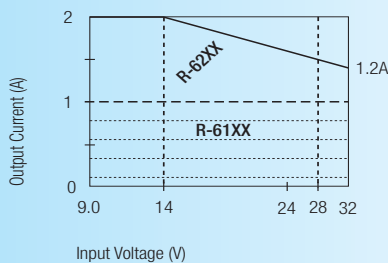
- Requires a 100µF electrolytic or tantalum output capacitor for proper operation in all applications (the capacitor to be placed as close as possible to the output pins).
- ON / OFF pin can be driven by TTL (logic gate), open-collector bipolar transistor or open-drain MOSFET.
- Output Current vs. Input Voltage (see graph below).

**Standard Application Circuit**



Add a blocking diode to Vout if current can flow backwards into the output, as this can damage the converter..

**Output Current vs Input Voltage**



**Max output current calculation:**

Internal power dissipation  
 $(1W) = I_o \times V_o \times (1 - \text{Efficiency})$   
 $I_o = 1(W) / V_o \times (1 - \text{Efficiency})$

**Example : R-6212P**

**at Vin = 28VDC**

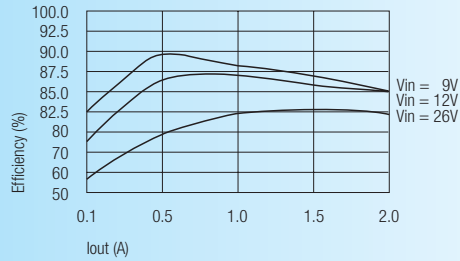
Efficiency = 94% (see "Selection Guide" table)  
 $V_o = 12VDC$   
 $I_o = 1W / 12V \times (1 - 0.94) = 1.388A \approx 1.5A$

**at Vin = 14VDC**

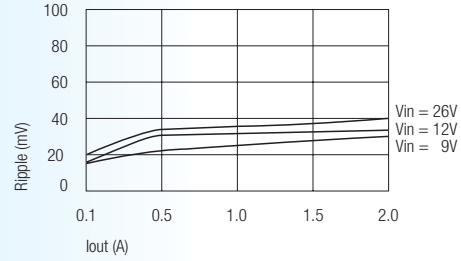
Efficiency = 96% (see "Selection Guide" table)  
 $V_o = 12Vdc$   
 $I_o = 1W / 12V \times (1 - 0.96) = 2.08A$  (spec. = 2A max.)

## Characteristics

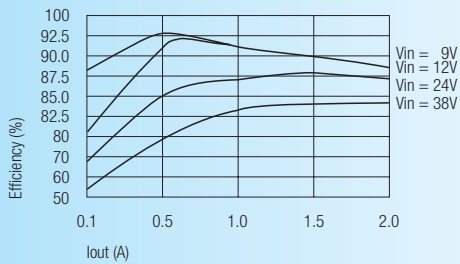
**R-623.3 / R-613.3**  
Efficiency vs Output Current



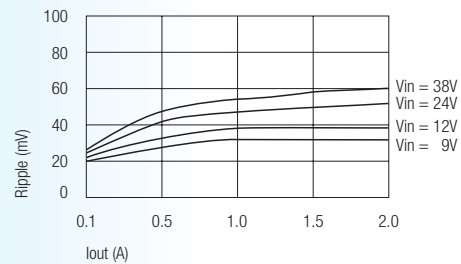
**R-623.3 / R-613.3**  
Ripple vs Output Current



**R-625.0 / R-615.0**  
Efficiency vs Output Current

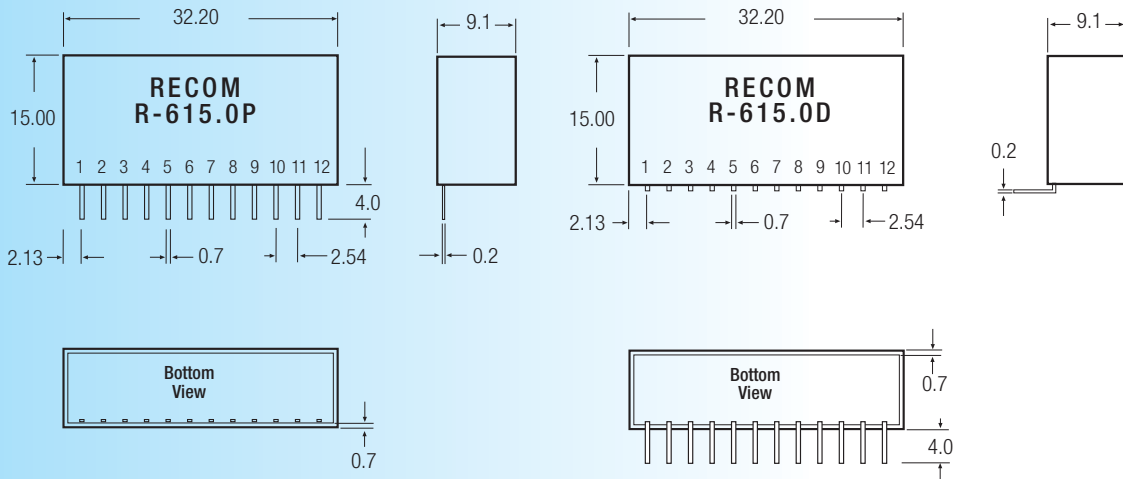


**R-625.0 / R-615.0**  
Ripple vs Output Current



## Package Style and Pinning (mm)

**SIP12 PIN Package**



**Pin Connections**

Pin #	Name	Description
1	ON / OFF	Input pin : Active low (less than 0.8V) to disable the device
2, 3, 4	Vin	Power input
5, 6, 7, 8	GND	Input and output ground (common)
9, 10, 11	Vout	Power output
12	Vout-Adj	With external resistors R1,R2 to selected output voltage

**Tolerance:**  
± 0.25 mm

**Table 1: Adjustment Resistor Values**

1Adc	R-611.8P/D		R-612.5P/D		R-613.3P/D		R-615.0P/D		R-619.0P/D		R-6112P/D	
2Adc	R-621.8P/D		R-622.5P/D		R-623.3P/D		R-625.0P/D		R-629.0P/D		R-6212P/D	
Vout (nominal)	1.8VDC		2.5VDC		3.3VDC		5VDC		9VDC		12VDC	
Vout (adj)	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2	R1	R2
1.5	13.6KΩ		3.3KΩ									
1.8			8.2KΩ		3.1KΩ		820Ω					
2.0	10KΩ		15KΩ		5.1KΩ		1.5KΩ					
2.5	5.1KΩ				13KΩ		3.6KΩ					
3.0	2.5KΩ		10KΩ		51KΩ		7.0KΩ					
3.3	1.7KΩ		5.9KΩ				9.7KΩ		0Ω		0Ω	
3.6	1.2KΩ		3.9KΩ		18KΩ		14KΩ		1.5KΩ		560Ω	
3.9			2.8KΩ		9.1KΩ		20KΩ		3.3KΩ		1.2KΩ	
4.5			1.6KΩ		3.9KΩ		60KΩ		7.5KΩ		2.1KΩ	
5.0					2.4KΩ				11KΩ		4.0KΩ	
5.1					2.2KΩ		60KΩ		12KΩ		4.3KΩ	
5.5					1.6KΩ		15KΩ		17KΩ		5.6KΩ	
6.0					1.1KΩ		7.2KΩ		24KΩ		7.5KΩ	
7.0							2.8KΩ		51KΩ		12KΩ	
8.0							1.5KΩ		130KΩ		19KΩ	
9.0							880Ω				31KΩ	
10							450Ω		36KΩ		55KΩ	
11							180Ω		15KΩ		125KΩ	
12									8.2KΩ			
13									4.7KΩ		11KΩ	
14									2.7KΩ		4.0KΩ	
15									1.3KΩ		1.6KΩ	