

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 %
- See Innoline Application Notes for use as an inverter

Description

The R-6XXX series is a high performance 1.5V to 15V (18V), 1.1Amp to 2.0Amp, 12-Pin SIP (single in-line package) switching regulator. Synchronous rectification yields excellent efficiencies of up to 97%. The devices feature short circuit protection with internal crowbar function to reduce the short circuit input current to under 50mA during fault conditions.

Selection Guide

Part Number SIP12	Input Range (V)	Nominal Output Voltage (V)	Vout Adjust Range (V)	Output Current (A)	Efficiency (%) Vin min. (%)	Vin max. (%)
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
	Vout = 18V	20V		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
	Vout = 18V		18V	

Continued on next page

INNOLINE
DC/DC-Converter
with 3 year Warranty

RECOM

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



EN-60950-1 Certified

R-6xxx

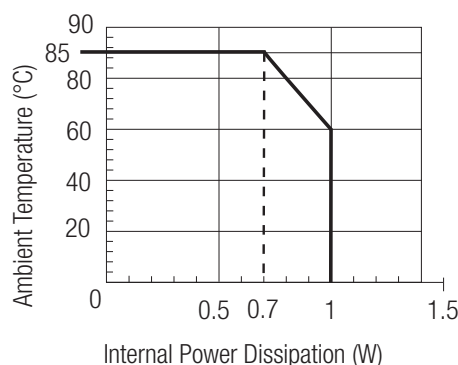
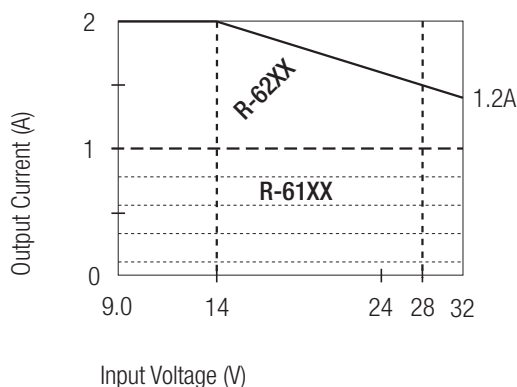
Specifications (refer to the standard application circuit, Ta: 25°C)

Characteristics	Conditions	Min.	Typ.	Max.
Output Current	R-61xxP/D R-62xxP/D	0.1A 0.2A		1.1A 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%	
Load Regulation (10 to 100% full load)	R-61xxP/D R-62xxP/D			0.5% 1.0%
Vo Ripple & Noise	R-61xxP/D R-62xxP/D		40mVpp 40mVpp	100mVpp 120mVpp
Transient Response (see note 1)	50% Load Change Vout Over / Undershoot		100us 5%	200us
Remote ON / OFF (see note 2) (positive logic)	Open or high (Power ON) Low (Power OFF)	2.0V		10V 0.8V
Remote Off Input Current	Remote ON/OFF low level		100μA	
Max capacitance Load	with normal start-up time, no external diodes with <1 second start up time + diode protection circuit			200μF 6800μF
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
Case Material		Non-Conductive Black Plastic		
Potting Material		Epoxy (UL94V-0)		
internal Power Dissipation	Io x Vo x (1-Efficiency)			1.0W
Package Weight				9g
Packing Quantity				15 pcs per Tube
MTBF (Nominal Vout, 100% load)	Tamb. = +25°C Tamb. = +71°C	} Detailed Information see Application Notes chapter "MTBF"		563 x 10 ³ hours 117 x 10 ³ hours
EN General Safety	Report: SPCLVD 1301028-1			EN60950-1:2006 + A12:2011

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).

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)

$V_o = 12VDC$

$I_o = 1W / 12V \times (1 - 0.94) = 1.388A = 1.5A$

at Vin = 14VDC

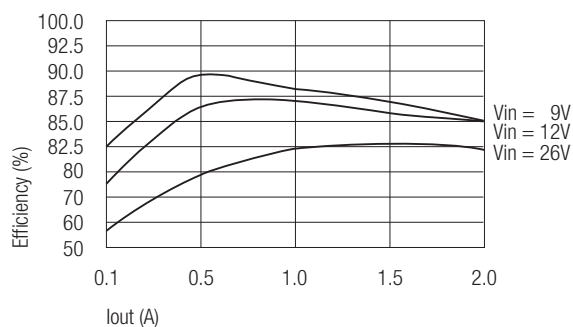
Efficiency = 96% (see "Selection Guide" table)

$V_o = 12Vdc$

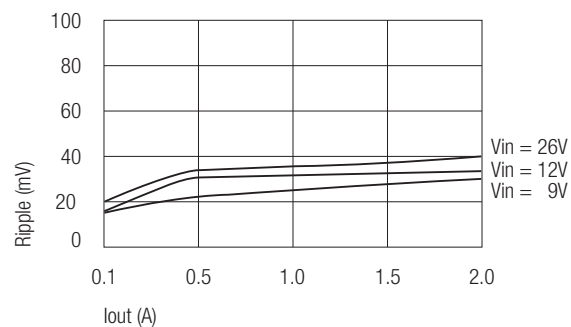
$I_o = 1W / 12V \times (1 - 0.96) = 2.08A$ (spec. = 2A max.)

Characteristics

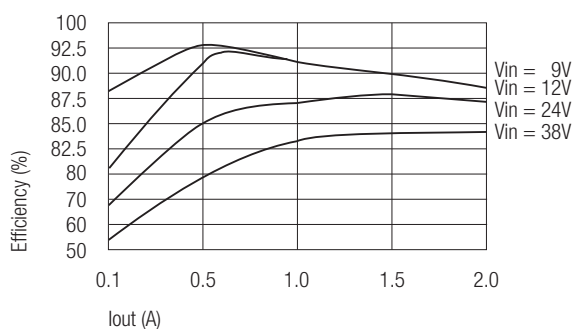
R-623.3 / R-613.3
Efficiency vs Output Current



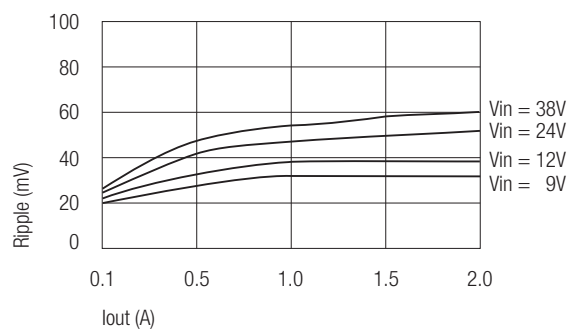
R-623.3 / R-613.3
Ripple vs Output Current



R-625.0 / R-615.0
Efficiency vs Output Current

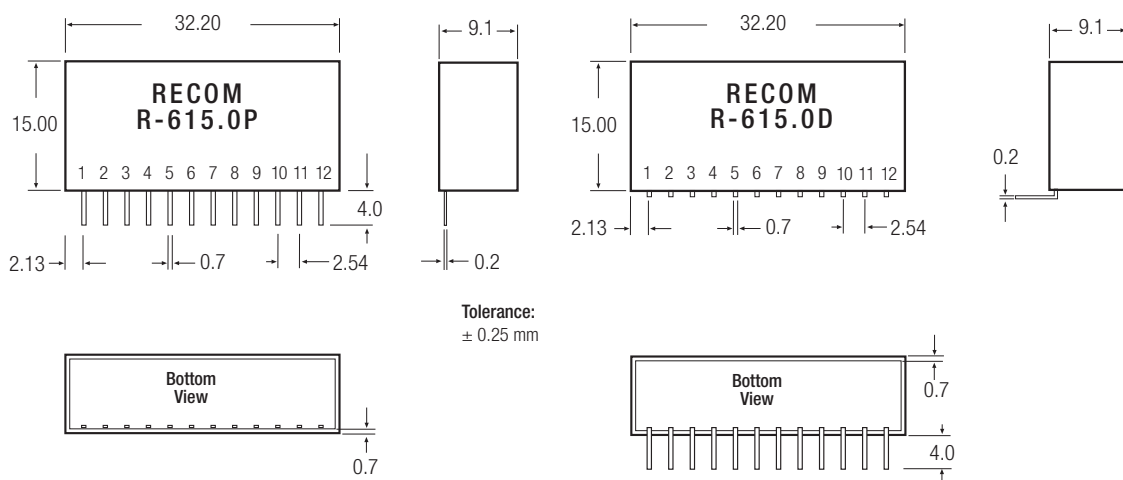


R-625.0 / R-615.0
Ripple vs Output Current



Package Style and Pinning (mm)

SIP12 PIN Package



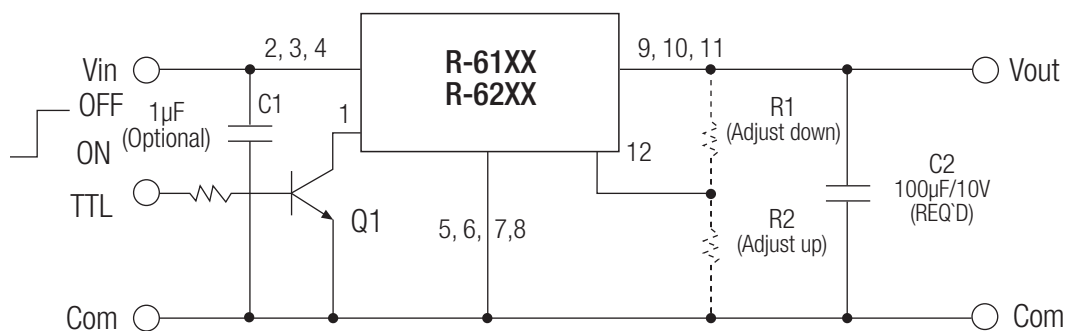
Pin Connections

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

Table 1: Adjustment Resistor Values

1.1Adc	R-611.8P/D		R-621.5P/D		R-613.3P/D		R-615.0P/D		R-619.0P/D		R-6112P/D	
2.0Adc	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	13.6K Ω		3.3K Ω									
1.8			8.2K Ω		3.1K Ω		820 Ω					
2.0		10K Ω	15K Ω		5.1K Ω		1.5K Ω					
2.5		5.1K Ω			13K Ω		3.6K Ω					
3.0		2.5K Ω		10K Ω	51K Ω		7.0K Ω					
3.3		1.7K Ω		5.9K Ω			9.7K Ω		0 Ω		0 Ω	
3.6		1.2K Ω		3.9K Ω		18K Ω	14K Ω		1.5K Ω		560 Ω	
3.9				2.8K Ω		9.1K Ω	20K Ω		3.3K Ω		1.2K Ω	
4.5				1.6K Ω		3.9K Ω	60K Ω		7.5K Ω		2.1K Ω	
5.0						2.4K Ω			11K Ω		4.0K Ω	
5.1						2.2K Ω	60K Ω	12K Ω			4.3K Ω	
5.5						1.6K Ω	15K Ω	17K Ω			5.6K Ω	
6.0						1.1K Ω	7.2 Ω	24K Ω			7.5K Ω	
7.0							2.8K Ω	51K Ω			12K Ω	
8.0							1.5K Ω	130K Ω			19K Ω	
9.0							880 Ω				31K Ω	
10							450 Ω		36K Ω		55K Ω	
11							180 Ω		15K Ω		125K Ω	
12									8.2K Ω			
13									4.7K Ω		11K Ω	
14									2.7K Ω		4.0K Ω	
15									1.3K Ω		1.6K Ω	

Standard Application Circuit



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

Protection diodes are required for high capacitive loads.

Refer to R-5xxxA Datasheet (see Optional Diode Protection Circuit) for circuit suggestions.