

# !NOT RECOMMENDED FOR NEW DESIGNS!

(LAST TIME BUY: 31<sup>TH</sup> DEC 2020)

# RECOM DC/DC Converter

## RP15-OF

### 15 Watt SMD Open Frame Single Output



## Features

- 2:1 input voltage range
- 2.25kVDC isolation
- UL certified
- Efficiency up to 88%
- Ultraminiature open frame SMD
- No minimum load required

## Regulated Converter

### Description

The RP15-SOF series, are SMD open frame ultraminiature power DC/DC converters in a case half the size of industry standard 15W converters. The converters use solder ball pins to enable SMD mounting and can be reflow soldered. Despite their small size, these converters are fully specified devices with output currents up to 3.5 Amps, no minimum load, 2250VDC isolation and low ripple/noise figures. The outputs are also fully protected against short circuits, overcurrent and overvoltage. The RP15-SOF series will find many uses in telecommunications and other demanding applications where cost, board space or board height is at a premium.

### Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input <sup>(1)</sup> Current [mA]	Efficiency <sup>(1)</sup> typ. [%]	Max. Capacitive Load <sup>(2)</sup> [µF]
RP15-243.3SOF <sup>(3)</sup>	18-36	3.3	3500	560	86	10000
RP15-2405SOF <sup>(3)</sup>	18-36	5	3000	718	87	6000
RP15-2412SOF <sup>(3)</sup>	18-36	12	1250	718	87	1000
RP15-2415SOF <sup>(3)</sup>	18-36	15	1000	710	88	660
RP15-483.3SOF <sup>(3)</sup>	36-75	3.3	3500	283	85	10000
RP15-4805SOF <sup>(3)</sup>	36-75	5	3000	359	87	6000
RP15-4812SOF <sup>(3)</sup>	36-75	12	1250	359	87	1000
RP15-4815SOF <sup>(3)</sup>	36-75	15	1000	355	88	660

#### Notes:

Note1: Maximum values at nominal input and full load at +25°C ambient

Note2: Max. Cap Load is tested at nominal input and constant resistive load



UL US  
E196683



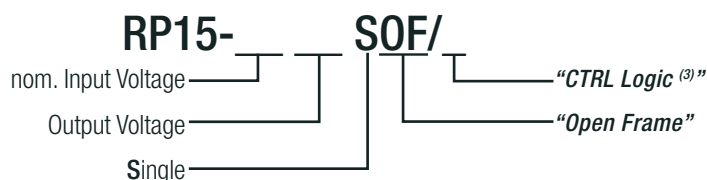
UL60950-1 certified

SEARCHING FOR  
ALTERNATIVES?

Contact RECOM

<https://recom-power.com/contact.html>

### Model Numbering



#### Notes:

Note3: no suffix for standard part without Trim or CTRL pin  
 add suffix "P" for CTRL function with positive logic (1=ON, 0=OFF) and Trim pin  
 add suffix "N" for CTRL function with negative logic (0=ON, 1=OFF) and Trim pin

#### Ordering Examples

RP15-2405SOF = 24V input, 5V output, single, without Trim and CTRL pin

RP15-2412SOF/P = 24V input, 5V output, single, positive logic CTRL pin and Trim pin fitted

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load otherwise stated)

**BASIC CHARACTERISTICS**

Parameter	Condition		Min.	Typ.	Max.
Input Filter			Pi-Type		
Input Voltage Range	nom. Vin = 24VDC nom. Vin = 48VDC		18VDC 36VDC	24VDC 48VDC	36VDC 75VDC
Input Surge Voltage	100ms max.	nom. Vin = 24VDC nom. Vin = 48VDC			50VDC 100VDC
Under Voltage Lockout (UVLO)	nom. Vin = 24VDC	DC-DC ON DC-DC OFF		14.5VDC	18VDC
	nom. Vin = 48VDC	DC-DC ON DC-DC OFF		30.5VDC	36VDC
Output Voltage Trimming	refer to <b>"OUTPUT VOLTAGE TRIMMING"</b>		-10%		+10%
Input Reflected Ripple <sup>(4)</sup>	nominal Vin and full load			30mA <sub>p-p</sub>	
Minimum Load			0%		
Start-up time	Power up				30ms
	Remote ON/OFF				30ms
ON/OFF CTRL <sup>(5)</sup> refer to <b>"ON/OFF CTRL"</b>	Positive Logic	DC-DC ON DC-DC OFF	Open or 3.0VDC < V <sub>CTRL</sub> < 15VDC Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC		
	Negative Logic	DC-DC ON DC-DC OFF	Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC Open or 3.0VDC < V <sub>CTRL</sub> < 15VDC		
Input Current of CTRL pin	drive current	I <sub>CTRL</sub>	-0.5mA		+1.0mA
Standby Current	DC-DC OFF	I <sub>in</sub>			20mA
Internal Operating Frequency	3.3Vout, 5Vout		243kHz	270kHz	297kHz
	Others		423kHz	470kHz	517kHz
Output Ripple and Noise	measured at 20MHz BW with a 1µF M/C X7R and 10µF T/C	3.3Vout, 5Vout 12Vout, 15Vout		75mV <sub>p-p</sub> 100mV <sub>p-p</sub>	

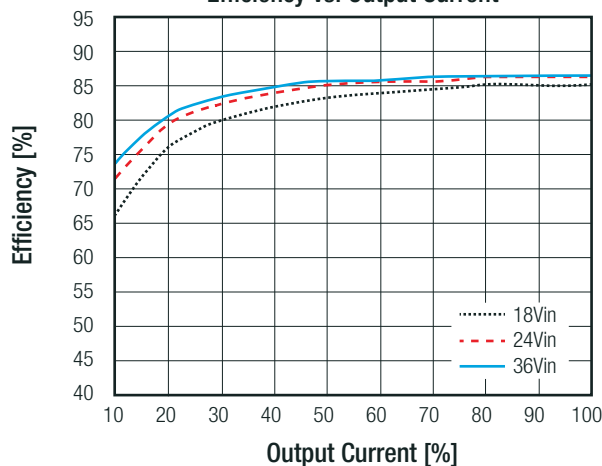
**Notes:**

Note4: Simulated source impedance of 12µH. 12µH inductor in series with +Vin.

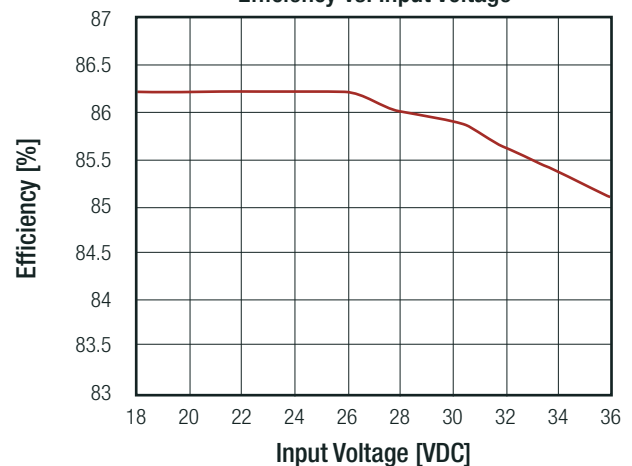
Note5: If no suffix is specified, the control pin will be omitted. If fitted, the ON/OFF control function can be positive or negative logic. The pin voltage is referenced to -Vin

**RP15-2405SOF**

**Efficiency vs. Output Current**



**Efficiency vs. Input Voltage**

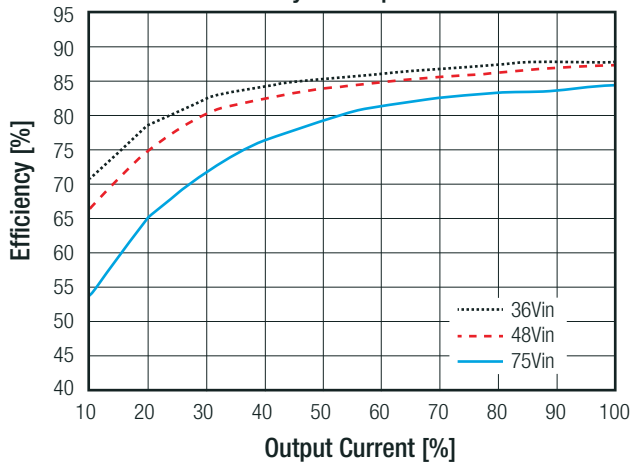


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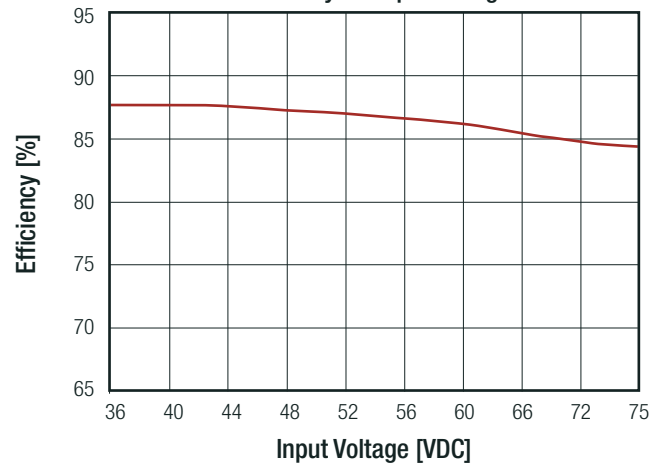
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load otherwise stated)

**RP15-4805SOF**

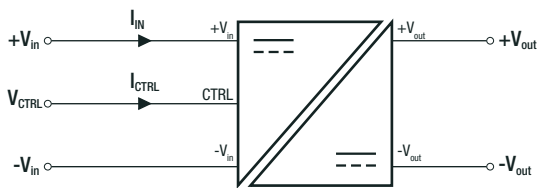
Efficiency vs. Output Current



Efficiency vs. Input Voltage



**ON/OFF CTRL**

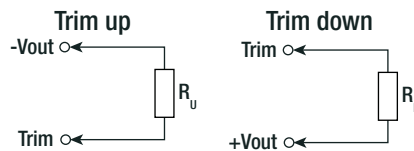


Positive Logic	DC-DC ON	Open or 3.0VDC < V <sub>CTRL</sub> < 15VDC
	DC-DC OFF	Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC
Negativ Logic	DC-DC ON	Short or 0VDC < V <sub>CTRL</sub> < 1.2VDC
	DC-DC OFF	Open or 3.0VDC < V <sub>CTRL</sub> < 15VDC

**OUTPUT VOLTAGE TRIMMING**

**Output Voltage Trimming**

Single output Powerline converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. No general equation can be given for calculating the trim resistors, but the following trimtables give typical values for choosing these trimming resistors. If voltages between the given trim points are required, extrapolate between the two nearest given values to work out the resistor required or use a variable resistor to set the output voltage. Output can be externally trimmed by using the method shown below.



**RP15-xx3.3SOF**

Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	3.333	3.366	3.399	3.432	3.465	3.498	3.531	3.564	3.597	3.63	[VDC]
R <sub>u</sub> =	385.07	191.51	126.99	94.73	75.37	62.47	53.25	46.34	40.96	36.66	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	3.267	3.234	3.201	3.168	3.135	3.102	3.069	3.036	3.003	2.97	[VDC]
R <sub>d</sub> =	116.72	54.78	34.13	23.81	17.62	13.49	10.54	8.32	6.60	5.23	[kΩ]

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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load otherwise stated)

RP15-xx05S0F											
Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	[VDC]
R <sub>v</sub> =	253.45	125.70	83.12	61.82	49.05	40.53	34.45	29.89	26.34	23.50	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	[VDC]
R <sub>v</sub> =	248.34	120.59	78.01	56.71	43.94	35.42	29.34	24.78	21.23	18.39	[kΩ]
RP15-xx12S0F											
Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	[VDC]
R <sub>v</sub> =	203.22	99.06	64.33	46.97	36.56	29.61	24.65	20.93	18.04	15.72	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	[VDC]
R <sub>v</sub> =	776.56	380.72	248.78	182.81	143.22	116.83	97.98	83.85	72.85	64.06	[kΩ]
RP15-xx15S0F											
Trim up	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	[VDC]
R <sub>v</sub> =	161.56	78.22	50.45	36.56	28.22	22.67	18.70	15.72	13.41	11.56	[kΩ]
Trim down	1	2	3	4	5	6	7	8	9	10	[%]
Vout =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	[VDC]
R <sub>v</sub> =	818.22	401.56	262.67	193.22	151.56	123.78	103.94	89.06	77.48	68.22	[kΩ]

REGULATIONS		
Parameter	Condition	Value
Output Accuracy		±1.0%
Line Regulation	low line to high line, full load	±0.2%
Output Overshoot		3.0% typ.
Load Regulation	0% to 100% load	±0.2%
Transient Response Recovery Time	25% load step change	300µs typ.

PROTECTIONS		
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Over Voltage Protection (OVP)	zener diode clamp	3.3Vout 5Vout 12Vout 15Vout 3.7 - 5.4VDC 5.6 - 7.0VDC 13.5 - 19.6VDC 16.8 - 20.5VDC
Over Load Protection (OLP)	% of Iout rated	150% typ., Hiccup mode
Isolation Voltage <sup>(6)</sup>	I/P to O/P	2.25kVDC/1 minute
Isolation Resistance	Viso= 500VDC	10MΩ min.
Isolation Capacitance		1000pF typ.

**Notes:**

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

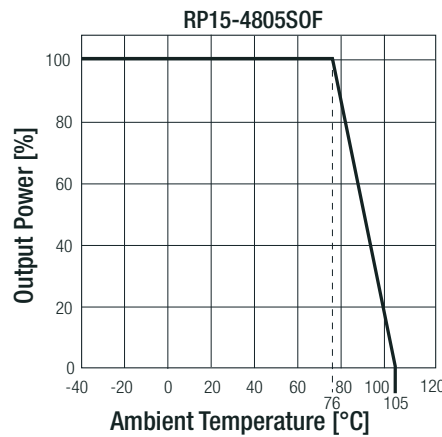
Note7: This power module is not internally fused. An input line fuse must always be used

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load otherwise stated)

**ENVIRONMENTAL**

Parameter	Condition	Value
Lead-free reflow solder process		IPC J-STD-020D
Moisture sensitivity level (MSL)		IPC J-STD-03B level 2a
Operating Temperature Range	without derating	-40°C to 76°C
	with derating	-40°C to +105°C
Temperature Coefficient		±0.02%/K max.
Operating Humidity	non-condensing	5% - 95%, RH
Thermal Shock		according to MIL-STD-810F
Vibration		according to MIL-STD-810F
MTBF	MIL-HDBK-217F, G.B. <sup>(8)</sup>	3438 x 10 <sup>3</sup> hours
	Bellcore TR-NWT-000332 <sup>(9)</sup>	2200 x 10 <sup>3</sup> hours

**Derating Graph <sup>(9)</sup>**



**Notes:**

- Note8: BELLCORE TR-NWT-000332. Case I: 50% Stress, Temperature at 40°C. MIL-HDBK 217F Notice 2. Ta = 25°C, full load, (Ground, Benign, controlled environment).
- Note9: Derating graphs are valid only for the shown part numbers. If you need detailed derating-information about a part-number not shown here please contact RECOM Techsupport for detailed information

**SAFETY AND CERTIFICATIONS**

Certificate Type (Safety)	Condition	Standard
Information Technology Equipment, General Requirements for Safety	E196683	UL60950-1, 1st Edition, 2007 CAN/CSA-C22.2 No. 60950-1-03, 1st Edition, 2006
EAC	RU-AT.49.09571	TP TC 004/2011
RoHS 2		RoHS-2011/65/EU + AM-2015/863

EMC Compliance	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment - Emission requirements	with external filter (see filter suggestion below)	EN55032, Class A and B
Radiated, radio-frequency, electromagnetic field immunity test	10 V/m	EN61000-4-3, Criteria A
Fast Transient and Burst Immunity <sup>(10)</sup>	±2kV	EN61000-4-4, Criteria B
Surge Immunity <sup>(10)</sup>	±1kV	EN61000-4-5, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	10 Vr.m.s	EN61000-4-6, Criteria A
Power Magnetic Field Immunity	100A/m continuous; 1000A/m 1s	EN61000-4-8, Criteria A

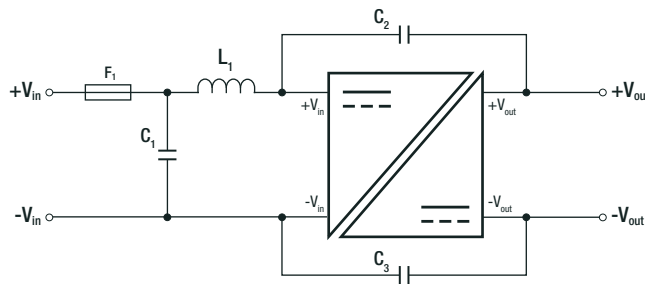
**Notes:**

- Note10: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5  
Recom suggests Nippon chemi-con KY series 220µF/100V

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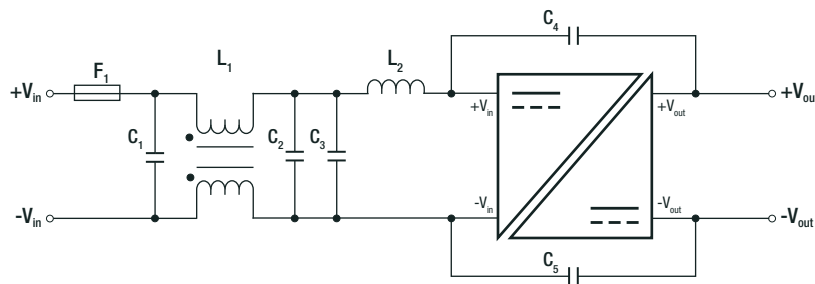
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load otherwise stated)

**EMC Filtering Suggestions according to EN55032**



**Component List Class A**

MODEL	C1	C2/C3	L1
RP15-24xxSOF	6.8µF/50V, 1812 MLCC	470pF/3kV, 1808 MLCC	10iH 1.4A 0.1Ω 0504 SMD Inductor ref.: WE 744787100
RP15-48xxSOF	2.2µF/100V, 1812 MLCC	470pF/3kV, 1808 MLCC	18iH 1.2A 0.15Ω 0504 SMD Inductor ref.: WE 744787180



**Component List Class B**

MODEL	C1	C2	C3	C4/C5	L1	L2
RP15-24xxSOF	6.8µF/50V 1812 MLCC	6.8µF/50V 1812 MLCC	6.8µF/50V 1812 MLCC	470pF/3kV 1808 MLCC	CMC: 145µH ref.: WE 7482210002 ref.: CMC-07	10iH 1.4A 0.1Ω 0504 SMD Inductor ref.: WE 744787100
RP15-48xxSOF	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	2.2µF/100V 1812 MLCC	470pF/3kV 1808 MLCC	CMC: 145µH ref.: WE 7482210002 ref.: CMC-07	18iH 1.2A 0.15Ω 0504 SMD Inductor ref.: WE 744787180

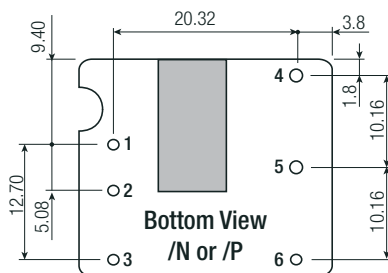
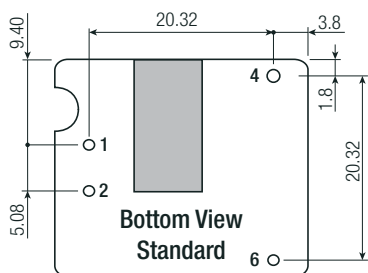
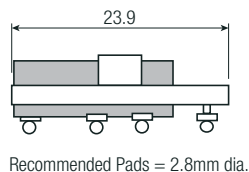
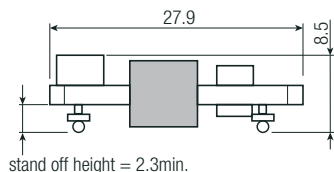
**DIMENSION AND PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	base	FR4 PCB
Dimensions (LxWxH)		27.9 x 23.9 x 8.5mm
Weight		10.5g

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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load otherwise stated)

**Dimension Drawing (mm)**



**Pinning Information**

Pin #	Standard	with Suffix /P or /N
1	+Vin	+Vin
2	-Vin	-Vin
3	no Pin	CTRL
4	+Vout	+Vout
5	no Pin	Trim
6	-Vout	-Vout

PCB Tolerance ±0.5mm  
SMD Pin Pitch Tolerance ±0.25mm

**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	255.0 x 29.0 x 12.0mm
Packaging Quantity		20pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity	non-condensing	5% - 95% RH

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