

Features

- 4:1 Wide Input Voltage Range
- 1.5kVDC Isolation
- UL, IEC/EN60950-1 & EN50155 Pending
- Efficiency up to 93.3%
- OVP, OCP & OTP
- +105°C max Case Temperature

Regulated Converters



RPA60-FW

60 Watt
2"x1"
Single Output



Description

The RPA60-FW series are high power density, wide input voltage range 60W DC/DC converters in an industry standard 2"x1" case size. Despite their small size, the RPA60-FW converters are fully specified devices with output currents up to 12Amps, up to 93% efficiency, no minimum load, 1600VDC isolation, tight regulation and low ripple/noise figures. The trimmable outputs are also fully protected against over-temperature, short circuits, overcurrent and overvoltage. The converters are UL and EN50155 pending and will find many uses in railway and industrial applications where board space is at a premium.

Selection Guide

Part Number	Input Voltage Range [VDC]	Output Voltage [VDC]	Output Current [mA]	Input ⁽¹⁾ Current [mA]	Efficiency ⁽¹⁾ typ. [%]	Max. Capacitive Load [µF]
RPA60-2405SFW ^(2,3)	9-36	05	12000	2700	92.4	20000
RPA60-2412SFW ^(2,3)	9-36	12	5000	2695	92.8	6000
RPA60-2415SFW ^(2,3)	9-36	15	4000	2680	93.3	4000
RPA60-2424SFW ^(2,3)	9-36	24	2500	2688	93	2000

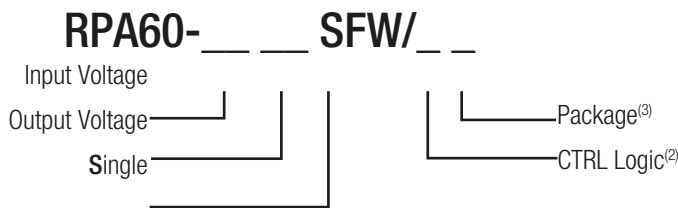
Notes:

Note1: Efficiency is tested by nominal Vin, full load and at 25°C.



UL60950-1 Pending
IEC/EN60950 Pending
EN50155 Pending

Model Numbering



Ordering Examples

- RPA60-2405SFW = 24V Input, 5V Output, Single, no CTRL pin
- RPA60-2405SFW/P = 24V Input, 5V Output, Single, Pos. CTRL function
- RPA60-2415SFW/N-HC = 24V Input, 15V Output, Single, Neg. CTRL function, Heat-sink assembled

Notes:

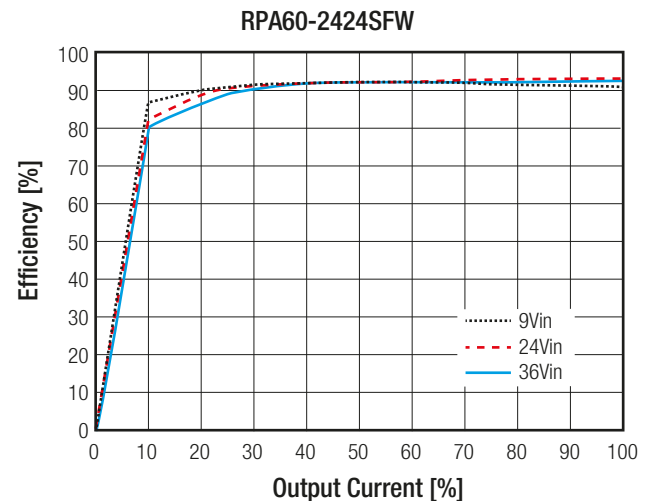
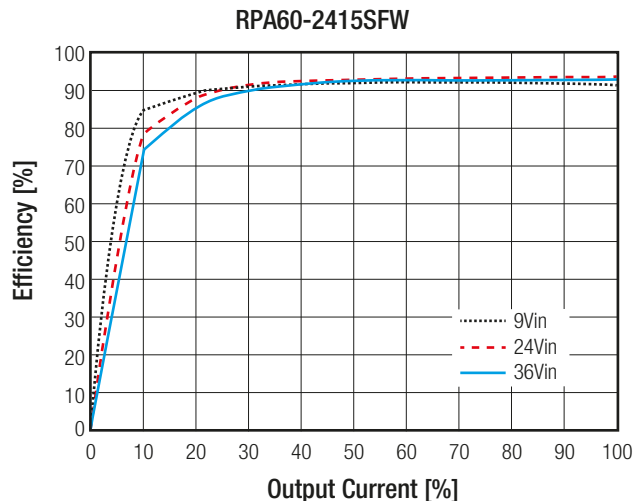
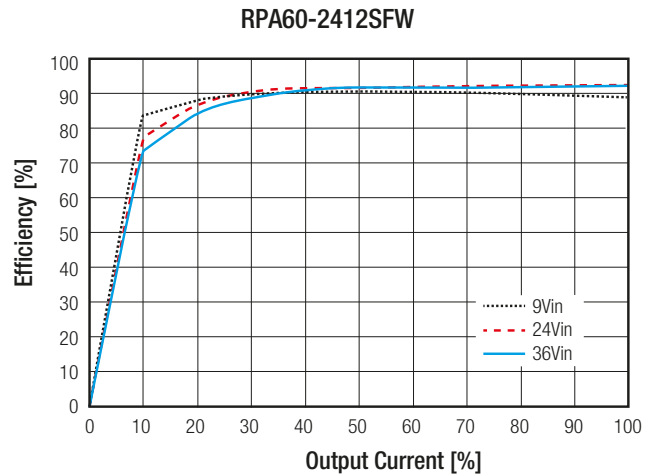
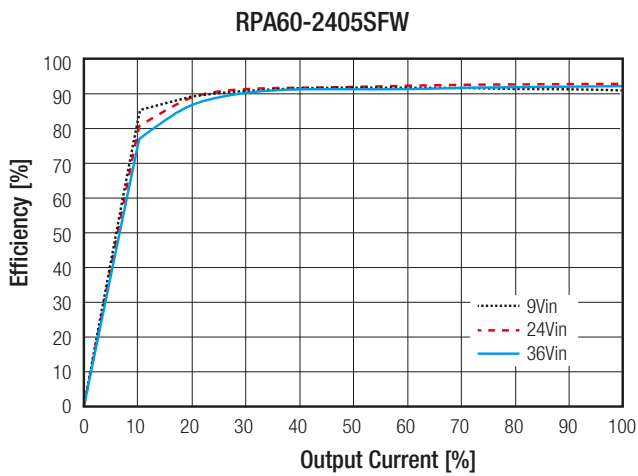
- Note2: part without suffixes is without CTRL pin, trim pin fitted
add suffix "P" for positive CTRL function (1=ON, 0=OFF), trim pin fitted
add suffix "N" for negative CTRL function (0=ON, 1=OFF), trim pin fitted
- Note3: add suffix "-HC" for glued Heat-sink (compatible with all other suffixes)

Specifications measured @ $t_a = 25^\circ\text{C}$, resistive load, nominal V_{in} and rated lout unless otherwise noted

BASIC CHARACTERISTICS

Parameter	Condition	Min.	Typ.	Max.
Internal Input Filter				LC Filter
Input Voltage Range		9VDC	24VDC	36VDC
Input Surge Voltage	100ms			50VDC
Quiescent Current			10mA	
Start-up time	Power up Remote ON/OFF		60ms 60ms	
Internal Operating Frequency			330kHz	
Minimum Load		0%		
Ripple and Noise	20MHz bw, 10 μF tantalum capacitor and 1 μF ceramic capacitor		100mVp-p	
Under Voltage Lockout (UVLO)	DC-DC ON	8VDC	8.5VDC	9VDC
	DC-DC OFF	7VDC	7.5VDC	8VDC
ON/OFF Control	Positive Logic DC-DC ON	2.4VDC		10VDC
	DC-DC OFF	-0.7VDC		0.8VDC
	Negative Logic DC-DC ON	-0.7VDC		0.8VDC
	DC-DC OFF	2.4VDC		10VDC
Input current of CTRL pin	DC-DC OFF		10mA	
Output Voltage Trimming		-10%		+10%

Efficiency vs. Output Current



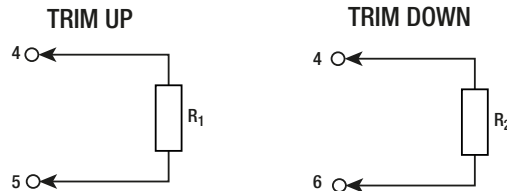
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Specifications measured @ $t_a = 25^\circ\text{C}$, resistive load, nominal V_{in} and rated I_{out} unless otherwise noted

OUTPUT TRIM

Output Voltage Trimming

RPA60-FW converters offer the feature of trimming the output voltage over a certain range around the nominal value by using external trim resistors. The values for trim resistors shown in trim tables below are according to standard E96 values; therefore, the specified voltage may slightly vary.



RPA60-2405SFW

Trim up	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	5.05	5.10	5.15	5.20	5.25	5.30	5.35	5.40	5.45	5.50	Volts
$R_1 =$	604	243	147	95.3	68.1	39.2	34.8	22.1	15	8.06	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	4.95	4.90	4.85	4.80	4.75	4.70	4.65	4.60	4.55	4.50	Volts
$R_2 =$	604	301	169	115	80.6	56.2	40.2	28	15	8.06	KOhms

RPA60-2412SFW

Trim up	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	Volts
$R_1 =$	604	255	154	105	75	49.9	38.3	24.9	18.2	10	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	Volts
$R_2 =$	698	301	187	121	84.5	60.4	45.3	30.1	20	10	KOhms

RPA60-2415SFW

Trim up	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	15.15	15.3	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
$R_1 =$	750	309	191	124	71.5	59	40.2	28	15	8.06	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	Volts
$R_2 =$	698	374	226	150	105	71.5	59	32.4	20	8.06	KOhms

RPA60-2424SFW

Trim up	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	24.24	24.48	24.72	24.96	25.2	25.44	25.68	25.92	26.16	26.4	Volts
$R_1 =$	1000	511	324	221	162	121	90.9	68.1	48.7	34.8	KOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
$V_{out} =$	23.76	23.52	23.38	23.04	22.8	22.56	22.32	22.08	21.84	21.6	Volts
$R_2 =$	1500	909	499	324	232	169	124	93.1	64.9	45.3	KOhms

Specifications measured @ $t_a = 25^\circ\text{C}$, resistive load, nominal V_{in} and rated I_{out} unless otherwise noted

REGULATION		
Parameter	Condition	Value
Output Accuracy		$\pm 1\%$ max.
Line Regulation	low line to high line	$\pm 0.2\%$ max.
Load Regulation		$\pm 0.5\%$
Transient Response	5Vout others	$\pm 5\%$ Vout typ. $\pm 2.5\%$ Vout typ.
	25% load step change	250 μs typ.

PROTECTION		
Parameter	Condition	Value
Short Circuit Protection (SCP)	below 100m Ω	continuous, auto recovery
Over Voltage Protection (OVP)		115%-140% Output Voltage, Hiccup, auto recovery
Over Current Protection (OCP)	Output Voltage 10% low	110%-150% Output Current, Hiccup
Over Temperature Protection (OTP)		115 $^\circ\text{C} \pm 5^\circ\text{C}$
Isolation Voltage	I/P to O/P	1.5kVDC/1 minute
Isolation Resistance		10M Ω min.
Isolation Capacitance		2200pF typ.

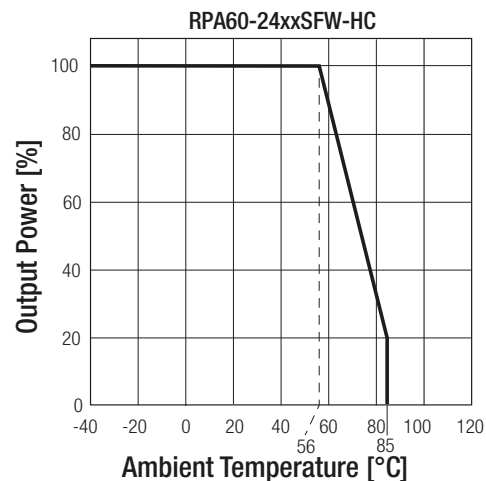
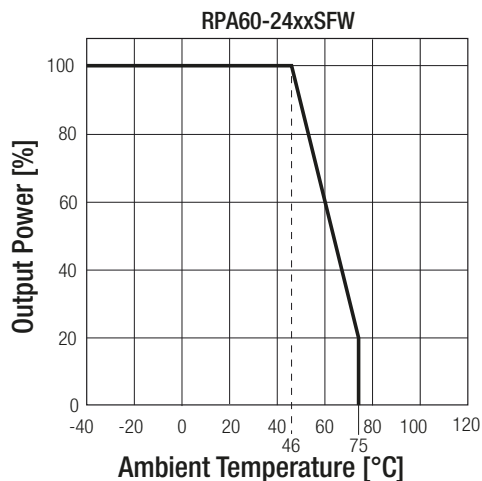
Notes:

Note4: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: 10A slow blow type.

ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range ⁽⁵⁾		refer to derating graph
Maximum Case Temperature		+105 $^\circ\text{C}$
Temperature Coefficient		0.02%/ $^\circ\text{C}$
Thermal Impedance	vertical direction by natural convection (0.1m/s) without Heat-sink	12 $^\circ\text{C}/\text{W}$
	vertical direction by natural convection (0.1m/s) with Heat-sink	10 $^\circ\text{C}/\text{W}$
Operating Altitude		4500m
Operating Humidity		95% RH
MTBF	according to MIL-HDBK-217F standard, 25 $^\circ\text{C}$	5997 x 10 ⁹ h

Derating Graph⁽⁵⁾

(@ Chamber and natural convection 0.1 m/s)



Notes:

Note5: 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 our technical support service team at techsupportAT@recom-power.com

Specifications measured @ $t_a = 25^\circ\text{C}$, resistive load, nominal V_{in} and rated I_{out} unless otherwise noted

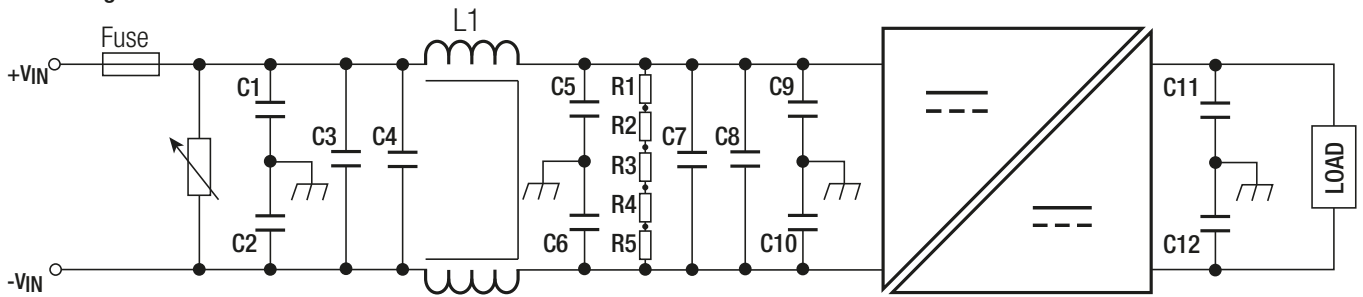
SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	E224736-pending	UL60950-1, 2nd Edition, 2014 CSA C22.2 No. 60950, 2nd Edition, 2014
IEC/EN Information Technology Equipment - General Requirements for Safety (CB Scheme)	E224736-A42+A43 pending	IEC60950-1, 2nd Edition, 2005 EN60950-1, 1st Edition, 2005
EN Information Technology Equipment - General Requirements for Safety (LVD Directive)	pending	EN60950-1, 1st Edition, 2006
Railway Applications - Electrical Equipment used on rolling stock	pending	EN50155, 1st Edition, 2007

EMC Compliance (designed to meet)

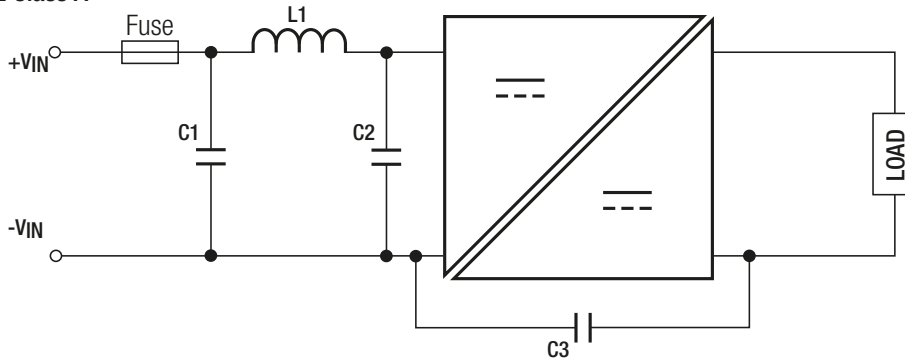
Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics Limits and methods of measurement	with external filter EN55022, Class A, 2010

EMI Filtering EN50155



C1, C2, C5, C6	C9, C10, C11, C12	C3, C4, C8	C7	L1	R1, R2, R3, R4, R5
220pF/275VAC	2200pF/300VAC	0.47 μ F/250V	120 μ F/400V	CMC: 3.4mH	300k Ω /1206

EMI Filtering EN55022 Class A



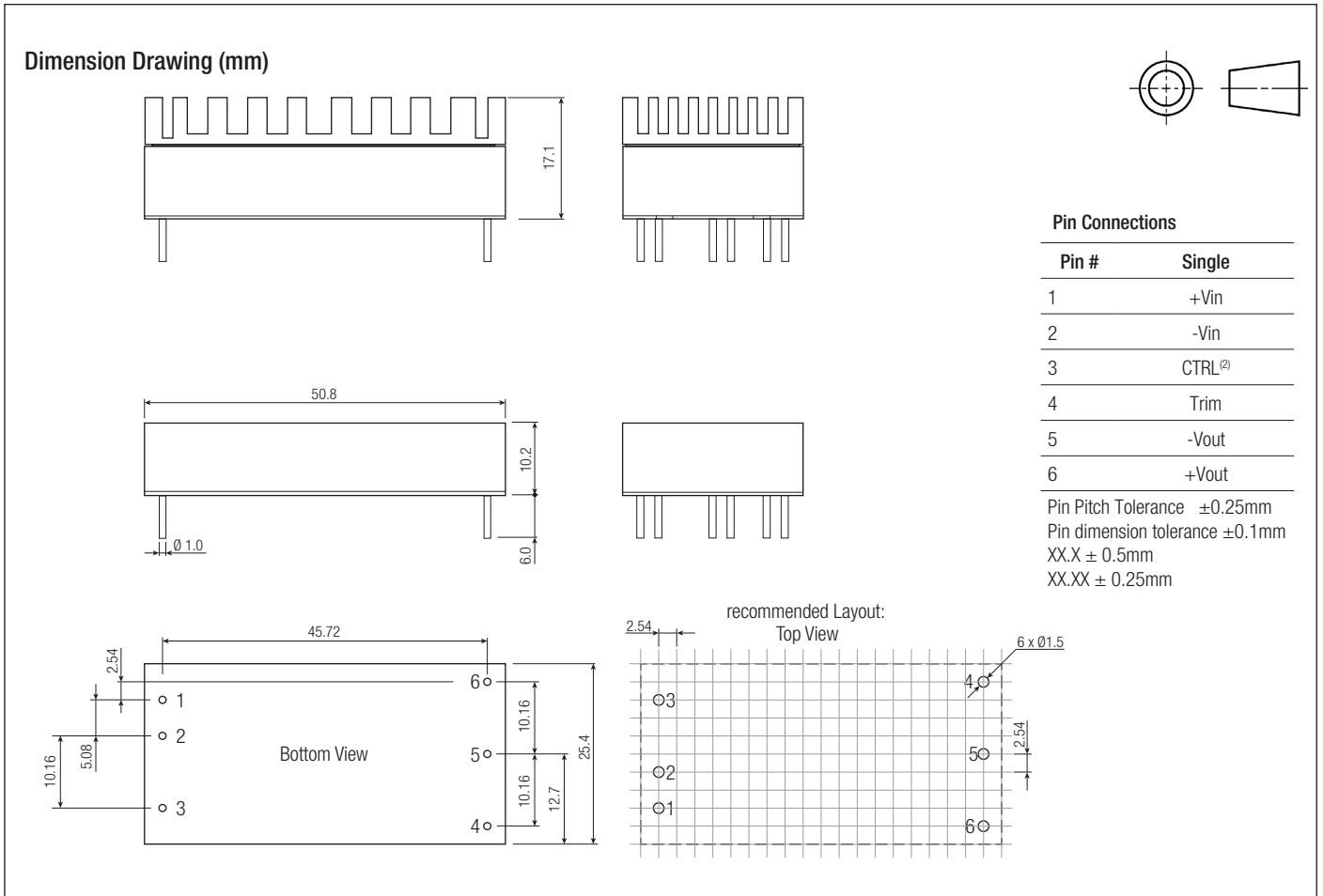
C1	C2	L1	C3
100 μ F/50V	6.8 μ F/50V	4.7 μ H	6.8nF/2kV

DIMENSIONS and PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	Case	Al Alloy, anodize black
	Baseplate	non-conductive FR4
	Potting	Silicone (UL94-0)
Package Dimensions (LxWxH)	without Heat-sink	50.8 x 25.4 x 10.2mm
	with Heat-sink	50.8 x 25.4 x 16.8mm
Package Weight	without Heat-sink	35g
	with Heat-sink	46g

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Specifications measured @ $t_a = 25^\circ\text{C}$, resistive load, nominal V_{in} and rated I_{out} unless otherwise noted



PACKAGING INFORMATION		
Parameter	Type	Value
Packaging Dimensions (LxWxH)	without Heat-sink	285.0 x 27.6 x 19.0mm
	with Heat-sink	285.0 x 27.6 x 25.8mm
Packaging Quantity		5pcs
Storage Temperature Range		-55°C to +125°C
Storage Humidity		5% - 95% RH

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