

Features

Regulated Converters

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

RECOM
DC/DC Converter

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, UVLO, 1500VDC / 1 minute 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/IEC/EN60950 certified and EN50155 compliant 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:

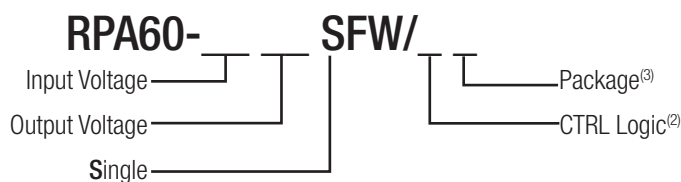
Note1: Efficiency is tested by nominal Vin, full load and at 25°C.



UL[®]
E224736

UL60950-1 Certified
IEC/EN60950 Certified
EN50155 Compliant

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

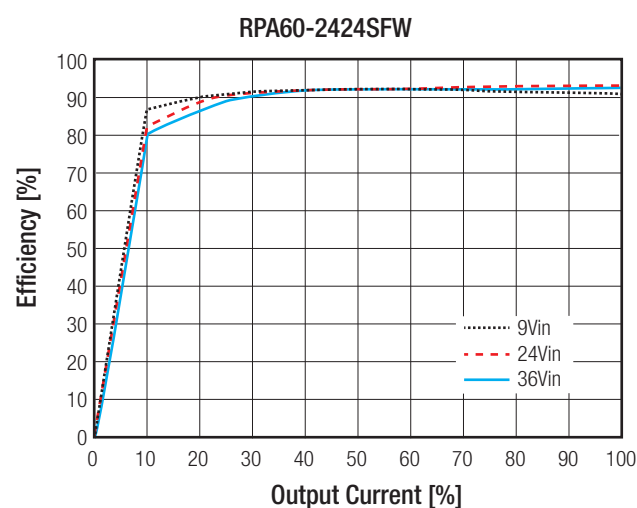
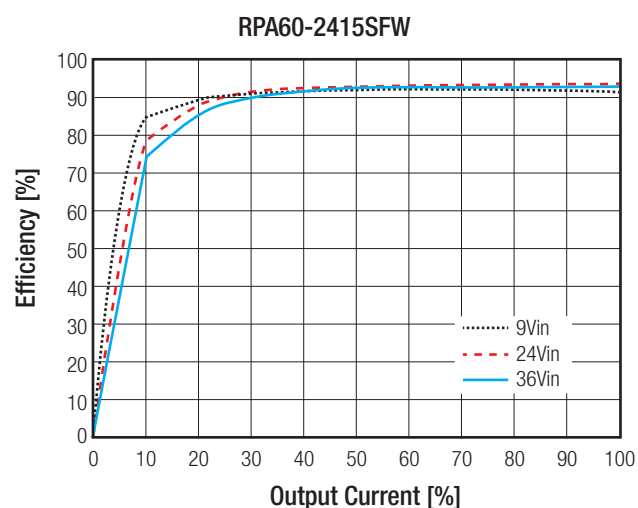
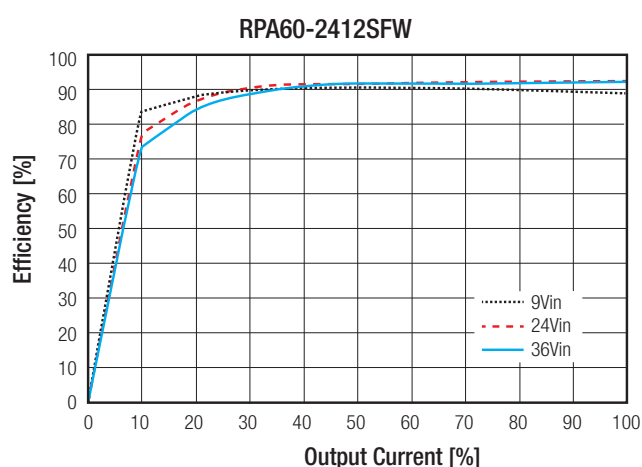
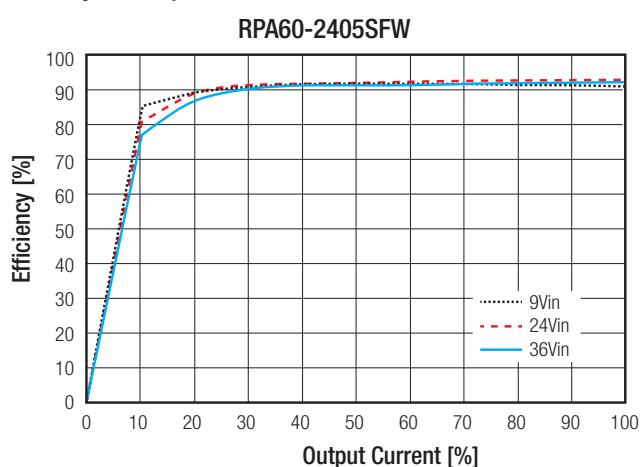
Note3: add suffix "-HC" for glued Heat-sink (compatible with all other suffixes)

Specifications measured @ $t_a = 25^\circ\text{C}$, resistive load, nominal V_{in} and rated I_{out} 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	5Vout 12Vout & 15Vout 24Vout		70mA 60mA 40mA	
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 DC-DC OFF	8VDC 7VDC	8.5VDC 7.5VDC	9VDC 8VDC
ON/OFF Control ⁽²⁾	Positive Logic	DC-DC ON DC-DC OFF	Open or $2.4 < V_r < 10\text{VDC}$ Short or $0 < V_r < 0.8\text{VDC}$	
	Negative Logic	DC-DC ON DC-DC OFF	Short or $0 < V_r < 0.8\text{VDC}$ Open or $2.4 < V_r < 10\text{VDC}$	
Input current of CTRL pin	DC-DC OFF		10mA	
Output Voltage Trimming		-10%		+10%

Efficiency vs. Output Current



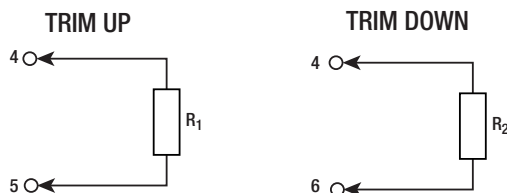
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Specifications measured @ $t_a = 25^{\circ}\text{C}$, resistive load, nominal V_{in} and rated I_{out} unless otherwise noted

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.



RPA60-2405SF

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

RPA60-2412SF

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

RPA60-2415SF

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

RPA60-2424SF

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
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:

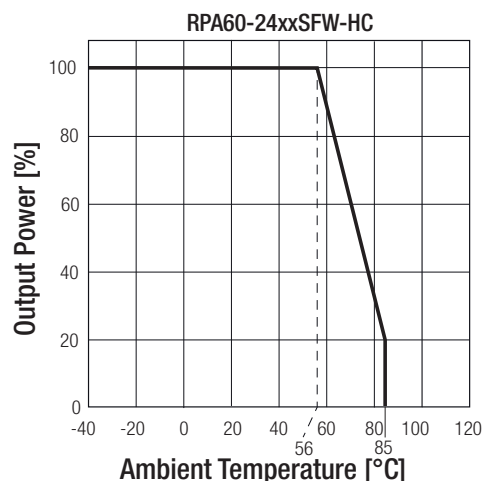
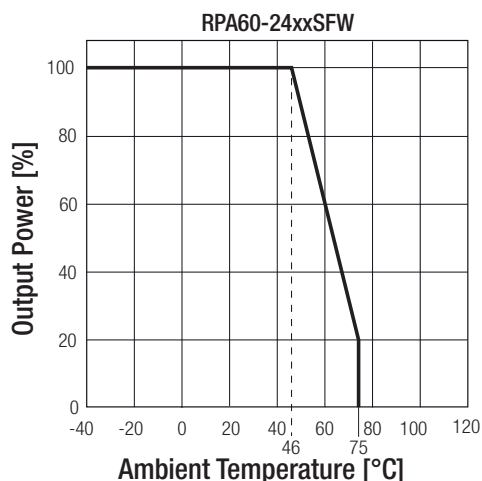
Note4: An input fuse is required if the mains supply is not over-current protected. Recommended fuse: 10A slow blow type.

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 ³ 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

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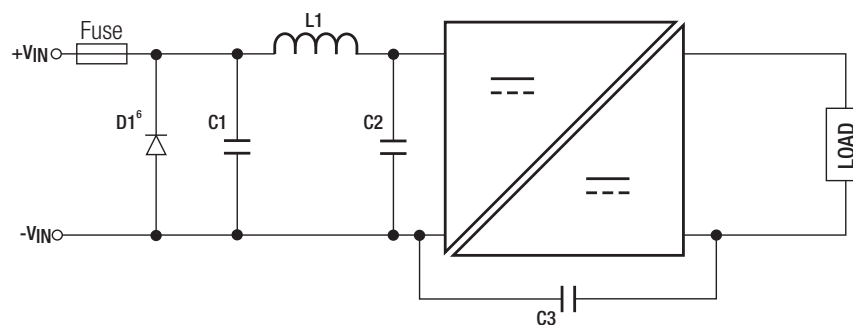
SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	E224736	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	IEC60950-1, 2nd Edition, 2005 + AM2, 2013 EN60950-1, 1st Edition, 2006 + AM2, 2013
Railway Applications - Electrical Equipment used on rolling stock	compliant	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 according to EN50121-3-2 (EN50155) and EN55022 Class A

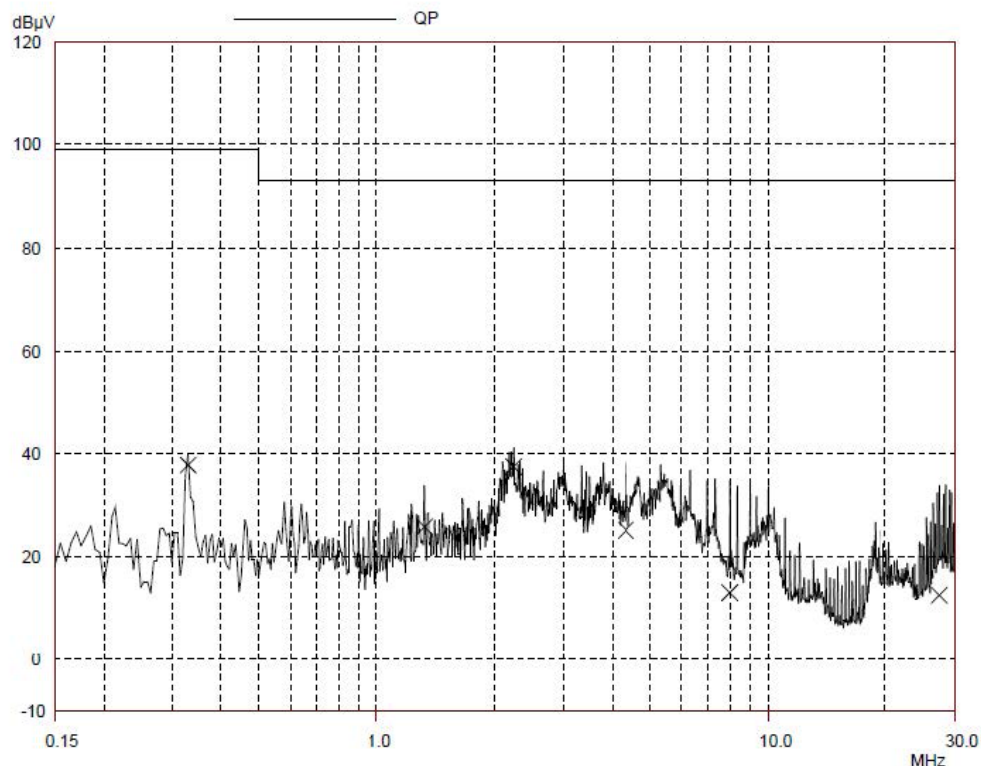


C1	C2	L1	C3
100 μF /50V electrolytic	6.8 μF /50V MLCC	4.7 μH SMD Inductor	6.8nF/2kV MLCC

Notes:

Note6: Diode is only needed for EN50155.

Conducted Emissions according to EN50121-3-2 (EN50155)

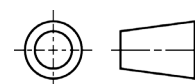
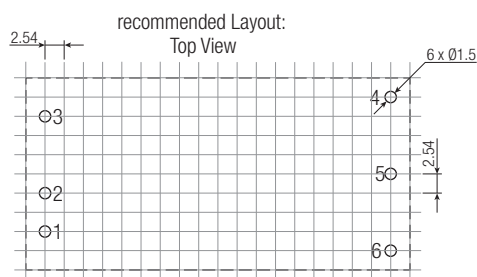
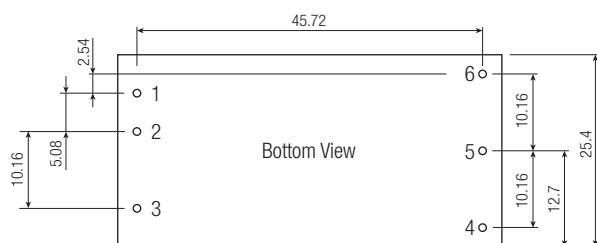
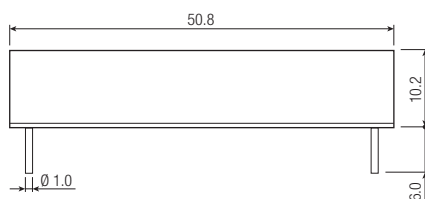
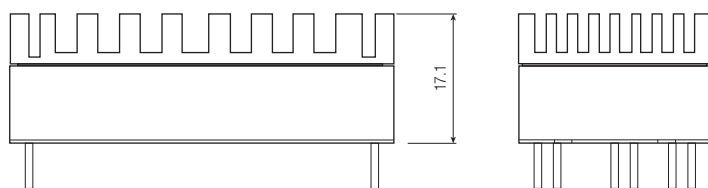


Specifications measured @ $t_a = 25^{\circ}\text{C}$, resistive load, nominal V_{in} and rated I_{out} unless otherwise noted

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

Dimension Drawing (mm)



Pin Connections

Pin #	Single
1	+Vin
2	-Vin
3	CTRL ⁽²⁾
4	Trim
5	-Vout
6	+Vout

Pin Pitch Tolerance $\pm 0.25\text{mm}$
Pin dimension tolerance $\pm 0.1\text{mm}$
XX.X $\pm 0.5\text{mm}$
XX.XX $\pm 0.25\text{mm}$

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 $+125^{\circ}\text{C}$
Storage Humidity		5% - 95% RH

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