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## Features

## Regulated Converters

- 4:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 91%
- Six-Sided Continuous Shield
- No Minimum Load Required

**RECOM**  
DC/DC Converter

## RP10-AW

10 Watt  
1"x1"  
Single & Dual  
Output



### Description

The RP10-AW series are wide input voltage range 1"x1" power DC/DC converters. Despite their small size, the RP10-AW converters are fully specified devices with built-in Class B EMC filters, no minimum load, 1600VDC isolation, under-voltage lockout and low ripple/noise figures. The outputs are fully protected against short circuits, overcurrent and overvoltage and can be trimmed over a +/-10% range. The RP10-AW series will find many uses in applications where board space is at a premium as no external components are required.

### 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 [µF]
RP10-243.3SAW <sup>(2,3)</sup>	9-36	3.3	3000	485	85	3500
RP10-2405SAW <sup>(2,3)</sup>	9-36	5	2000	479	87	2500
RP10-2412SAW <sup>(2,3)</sup>	9-36	12	830	461	90	430
RP10-2415SAW <sup>(2,3)</sup>	9-36	15	670	460	91	350
RP10-2424SAW <sup>(2,3)</sup>	9-36	24	416	462	90	125
RP10-483.3SAW <sup>(2,3)</sup>	18-75	3.3	3000	243	85	3500
RP10-4805SAW <sup>(2,3)</sup>	18-75	5	2000	239	87	2500
RP10-4812SAW <sup>(2,3)</sup>	18-75	12	830	231	90	430
RP10-4815SAW <sup>(2,3)</sup>	18-75	15	670	233	90	350
RP10-4824SAW <sup>(2,3)</sup>	18-75	24	416	231	90	125
RP10-2405DAW <sup>(2,3)</sup>	9-36	±5	±1000	479	87	±1440
RP10-2412DAW <sup>(2,3)</sup>	9-36	±12	±416	467	89	±250
RP10-2415DAW <sup>(2,3)</sup>	9-36	±15	±333	468	89	±180
RP10-4805DAW <sup>(2,3)</sup>	18-75	±5	±1000	239	87	±1440
RP10-4812DAW <sup>(2,3)</sup>	18-75	±12	±416	234	89	±250
RP10-4815DAW <sup>(2,3)</sup>	18-75	±15	±333	234	89	±180

### Notes:

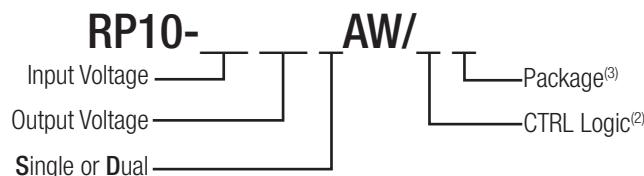
Note1: at nominal input voltage and full load.



UL US  
E196683

UL60950-1 Certified

### Model Numbering



### Ordering Examples

RP10-2405SAW/P = 24V Input, 5V Output, Positive Logic CTRL pin and Trim pin fitted  
 RP10-4805DAW/XC-HC = 48V Input, ±5V Output, without CTRL pin, with fitted Heat-sink  
 RP10-2415SAW/N = 24V Input, 5V Output, Negative Logic CTRL pin and Trim pin fitted

### Notes:

- Note2: standard part is with suffix "P" for positive logic (1=ON, 0=OFF) and trim pin add suffix "N" instead for negative logic (0=ON, 1=OFF) and trim pin or add suffix "XC" instead for no CTRL pin
- Note3: add suffix "-HC" for premounted Heat-sink with clamps

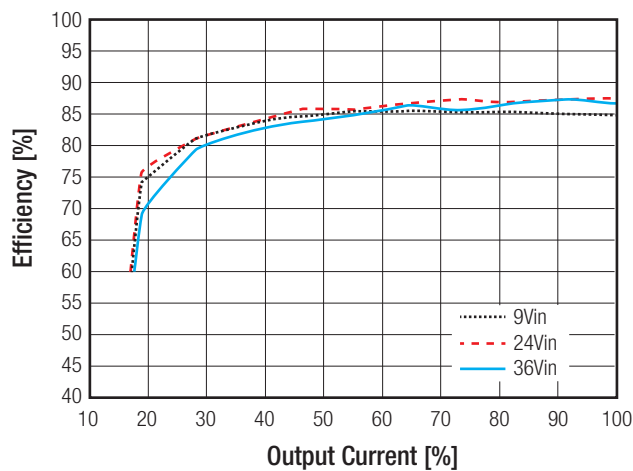
**Specifications** measured at  $T_a = 25^\circ\text{C}$ , nominal input voltage, full load otherwise noted

**BASIC CHARACTERISTICS**

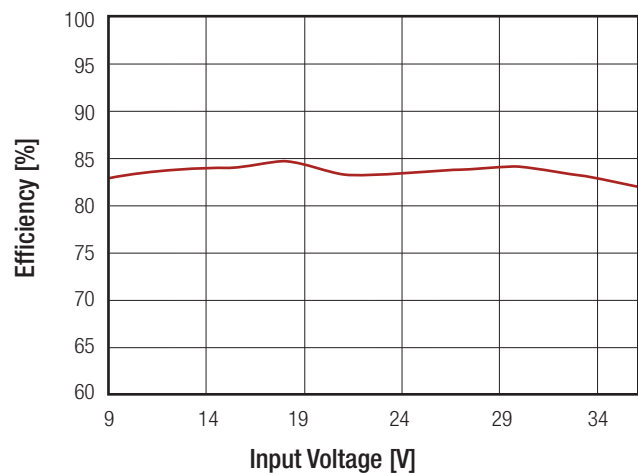
Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range	nom. $V_{in} = 24\text{V}$ nom. $V_{in} = 48\text{V}$	9VDC 18VDC	24VDC 48VDC	36VDC 75VDC
Under Voltage Lockout (UVLO)	$V_{in} = 24\text{V}$ DC-DC ON DC-DC OFF		8VDC	9VDC
	$V_{in} = 48\text{V}$ DC-DC ON DC-DC OFF		16VDC	18VDC
Internal Input Filter				Pi-Type
Input Reflected Ripple Current	nominal $V_{in}$ and full load		30mA <sub>p-p</sub>	
Input Surge Voltage	$V_{in} = 24\text{V}$ , 1s max. $V_{in} = 48\text{V}$ , 1s max.			50VDC 100VDC
Start-up time	Power up Remote ON/OFF			30ms 30ms
Operating Frequency Range		297kHz	330kHz	363kHz
Minimum Load	of full load	0%		
Ripple and Noise	measured by 20MHz bandwidth with a $10\mu\text{F}/25\text{V}$ X7R 1206 MLCC 3.3V <sub>out</sub> , 5V <sub>out</sub> 12V <sub>out</sub> , 15V <sub>out</sub>		40mV <sub>p-p</sub> 60mV <sub>p-p</sub>	
	measured by 20MHz bandwidth with a $1\mu\text{F}/50\text{V}$ X7R 1206 MLCC 24V <sub>out</sub>		60mV <sub>p-p</sub>	
ON/OFF Control	Positive Logic DC-DC ON DC-DC OFF			Open or $3.0 < V_r < 15\text{VDC}$ Short or $0 < V_r < 1.2\text{VDC}$
	Negative Logic DC-DC ON DC-DC OFF			Short or $0 < V_r < 1.2\text{VDC}$ Open or $3.0 < V_r < 15\text{VDC}$
Input Current of CTRL Pin		-0.5 mA		1.0mA

**RP10-2405SAW**

**Efficiency vs. Output Current**



**Efficiency vs. Input Voltage**



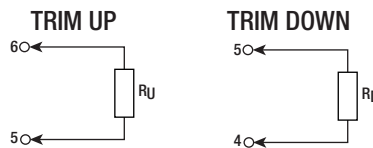
**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

REGULATION			
Parameter	Condition		Value
Output Voltage Accuracy			±1%
Output Trimming	Single	3.3Vout, 12Vout Others	±10% -10% to +20%
Line Voltage Regulation	low line to high line	Single Dual	±0.2% ±0.5%
Load Voltage Regulation	0% to 100% load	Single Dual	±0.2% ±1.0%
	10% to 90% load	Single Dual	±0.1% ±0.8%
Cross Regulation	asymmetrical 25% <-> 100% load		±5%
Transient Response	25% load step change		250µs typ.

### External Output 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.



#### RP10-xx3.3SAW

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	Volts
R <sub>U</sub> =	385.07	191.51	126.99	94.73	75.37	62.47	53.25	46.34	40.96	36.66	kOhms
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	Volts
R <sub>D</sub> =	116.72	54.78	34.13	23.81	17.62	13.49	10.54	8.32	6.60	5.23	kOhms

#### RP10-xx05SAW

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	Volts
R <sub>U</sub> =	253.45	125.70	83.12	61.82	49.05	40.53	34.45	29.89	26.34	23.50	kOhms
Trim up	11	12	13	14	15	16	17	18	19	20	%
Vout =	5.55	5.60	5.65	5.70	5.75	5.80	5.85	5.90	5.95	6.00	Volts
R <sub>U</sub> =	21.18	19.24	17.60	16.20	14.98	13.92	12.98	12.14	11.39	10.73	kOhms
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	Volts
R <sub>D</sub> =	248.34	120.59	78.01	56.71	43.94	35.42	29.34	24.78	21.23	18.39	kOhms

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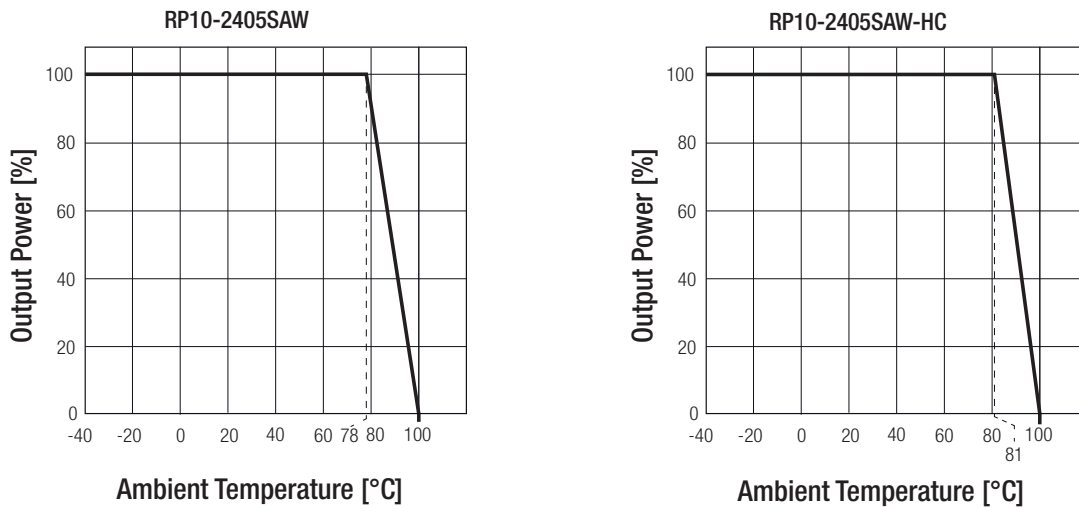
**Specifications** measured at  $T_a = 25^\circ\text{C}$ , nominal input voltage, full load otherwise noted

RP10-xx12SAW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
V <sub>out</sub> =	12.12	12.24	12.36	12.48	12.60	12.72	12.84	12.96	13.08	13.20	Volts
R <sub>v</sub> =	203.22	99.06	64.33	46.97	36.56	29.61	24.65	20.93	18.04	15.72	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V <sub>out</sub> =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	Volts
R <sub>d</sub> =	776.56	380.72	248.78	182.81	143.22	116.83	97.98	83.85	72.85	64.06	kOhms
RP10-xx15SAW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
V <sub>out</sub> =	15.15	15.30	15.45	15.60	15.75	15.90	16.05	16.20	16.35	16.50	Volts
R <sub>v</sub> =	161.56	78.22	50.45	36.56	28.22	22.67	18.70	15.72	13.41	11.56	kOhms
Trim up	11	12	13	14	15	16	17	18	19	20	%
V <sub>out</sub> =	16.65	16.80	16.95	17.10	17.25	17.40	17.55	17.70	17.85	18.00	Volts
R <sub>v</sub> =	10.04	8.78	7.71	6.80	6.00	5.31	4.69	4.15	3.66	3.22	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V <sub>out</sub> =	14.85	14.70	14.55	14.40	14.25	14.10	13.95	13.80	13.65	13.50	Volts
R <sub>d</sub> =	818.22	401.56	262.67	193.22	151.56	123.78	103.94	89.06	77.48	68.22	kOhms
RP10-xx24SAW											
Trim up	1	2	3	4	5	6	7	8	9	10	%
V <sub>out</sub> =	24.24	24.48	24.72	24.96	25.20	25.44	25.68	25.92	26.16	26.40	Volts
R <sub>v</sub> =	570.33	278.67	181.44	132.83	13.67	84.22	70.33	59.92	51.82	45.33	kOhms
Trim up	11	12	13	14	15	16	17	18	19	20	%
V <sub>out</sub> =	26.64	26.88	27.12	27.36	27.60	27.84	28.08	28.32	28.56	28.80	Volts
R <sub>v</sub> =	40.03	35.61	31.87	28.67	25.89	23.46	21.31	19.41	17.70	16.17	kOhms
Trim down	1	2	3	4	5	6	7	8	9	10	%
V <sub>out</sub> =	23.76	23.52	23.28	23.04	22.80	22.56	22.32	22.08	21.84	21.60	Volts
R <sub>d</sub> =	4947.67	2439.33	1603.22	1185.17	934.33	767.11	647.67	558.08	488.41	432.67	kOhms

PROTECTION		
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Over Voltage Protection (OVP)	3.3V <sub>out</sub>	3.7 - 5.4V
	5V <sub>out</sub>	6.3 - 7.4V
	12V <sub>out</sub>	13.5 - 19.6V
	15V <sub>out</sub>	18.3 - 22.0V
	24V <sub>out</sub>	29.1 - 32.5V
Over Load Protection (OLP)	Hiccup Mode	150% typ.
Isolation Voltage	I/P to O/P	1.6kVDC/1 minute
	I/P (O/P) to case	1.0kVDC/1 minute
Isolation Resistance	tested with 500VDC	1GΩ min.
Isolation Capacitance		1500pF max.
<b>Notes:</b>		
Note4: This power module is not internally fused. An input line fuse must always be used.		

**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range	without derating with derating	-40°C to +78°C -40°C to +100°C
Maximum Case Temperature		+105°C
Temperature Coefficient		±0.02%/°C max.
Thermal Impedance	Natural convection (20LFM) without Heat-sink Natural convection (20LFM) with Heat-sink	18.2°C/W 15.8°C/W
Operating Humidity		5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F	3376 x 10 <sup>3</sup> hours

**Derating Graph<sup>(5)</sup>**

**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 at techsupportAT@recom-power.com

**SAFETY AND CERTIFICATIONS**

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	E196683	UL60950-1 1st Ed.: 2003 C22.2 No. 60950 1st. Ed.: 2003

EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement <sup>(6)</sup>	with external filter	EN55022, Class A or B
ESD Electrostatic discharge immunity test	Air ±8kV and Contact ± 6kV	EN61000-4-2, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10 V/m	EN61000-4-3, Criteria A
Fast Transient and Burst Immunity <sup>(7)</sup>	±2kV	EN61000-4-4, Criteria A
Surge Immunity <sup>(7)</sup>	±1kV	EN61000-4-5, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	3 Vr.m.s	EN61000-4-6, Criteria A
Power Magnetic Field Immunity	100A/m continuous, 1000A/m 1s	EN61000-4-8, Criteria A

**Notes:**

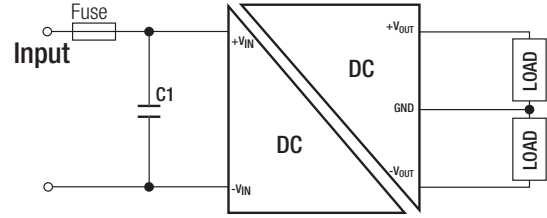
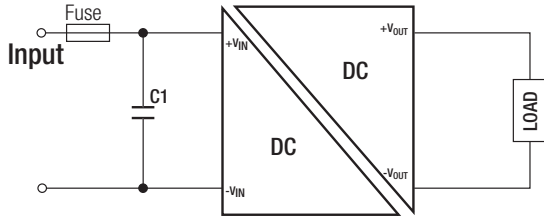
Note6: The standard modules meet EMI Class A without external components and Class B with external components; see filter suggestions below. RP10-2405SAW meets EMI Class B without external components.

Note7: An external input filter capacitor is required if the module has to meet EN61000-4-4, EN61000-4-5. The filter capacitor Recom suggests: Nippon chemi-con KY series, 220µF/100V.

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**Specifications** measured at Ta = 25°C, nominal input voltage, full load otherwise noted

**EMI Filtering Class B**

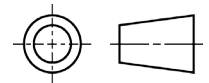
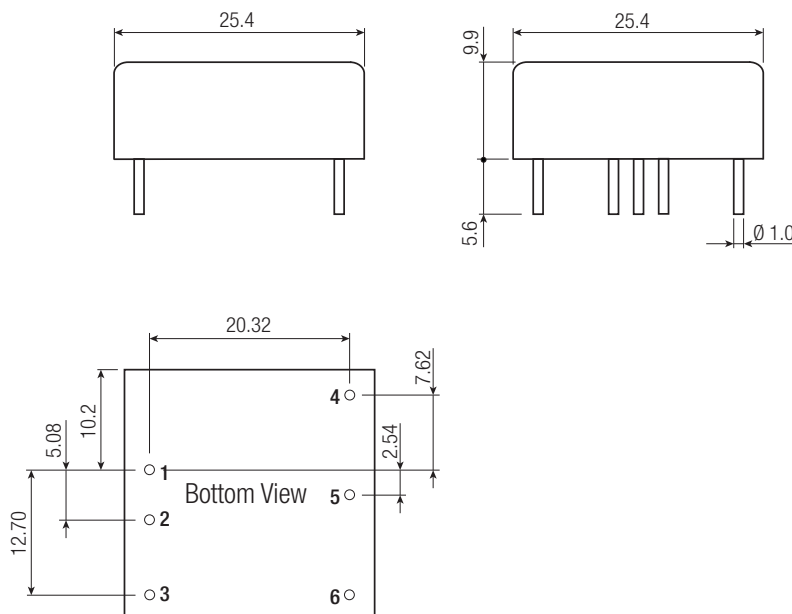


MODEL	C1
RP10-24xxS_DAW	6.8µF/50V 1812 MLCC
RP10-48xxS_DAW	4.7µF/100V 1812 MLCC

**DIMENSIONS and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case	Copper Alloy C2680
	Base	FR4 PCB
	Potting	Epoxy (UL94-V0)
Package Dimensions (LxWxH)	without Heat-sink	25.4 x 25.4 x 9.9mm
	with Heat-sink	31.4 x 25.4 x 16.5mm
Package Weight	without Heat-sink	16.5g
	with Heat-sink	22.94g

**Dimension Drawing (mm)**



**Pin Connections**

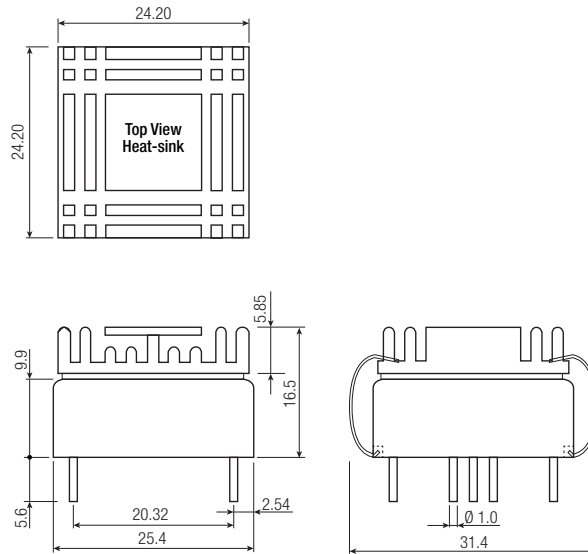
Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL <sup>(2)</sup>	CTRL <sup>(2)</sup>
4	+Vout	+Vout
5	Trim	Com
6	-Vout	-Vout

Pin Pitch Tolerance ±0.25mm  
Pin dimension tolerance ±0.1mm  
XX.X ± 0.5mm  
XX.XX ± 0.25mm

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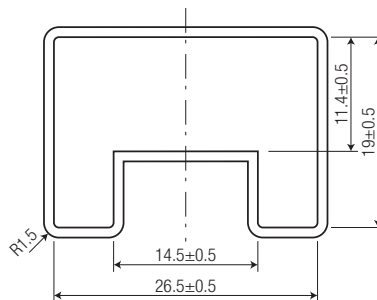
**Specifications** measured at  $T_a = 25^\circ\text{C}$ , nominal input voltage, full load otherwise noted

**Dimension Drawing (mm) with Heat-sink**



PACKAGING INFORMATION		
Parameter	Type	Value
Packaging Dimensions (LxWxH)	Tube	257 x 28.5 x 21mm
	Tray	230 x 180 x 28mm
Packaging Quantity	without Heat-sink	8pcs.
	with Heat-sink	20pcs.
Storage Temperature Range		-55°C to +125°C
Storage Humidity		5% - 95% RH

**Tube Dimension Drawing (mm)**



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