

Features

- 2:1 Wide Input Voltage Range
- 1.6kVDC Isolation
- UL Certified
- Efficiency up to 91%
- Six-Sided Continuous Shield
- No Minimum Load Required

Regulated Converters

RP10-A

10 Watt
1"x1"
Single & Dual
Output



Description

The RP10-A series are wide input voltage range 1"x1" power DC/DC converters. Despite their small size, the RP10-A converters are fully specified devices with built-in Class B EMC filters, no minimum load, 1.6kVDC 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-A series will find many uses in applications where board space is at a premium as no external components are required.

Selection Guide

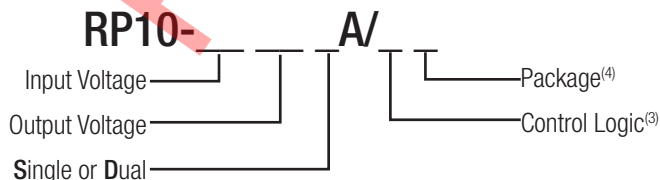
Part Number	Input Voltage Range (VDC)	Output Voltage (VDC)	Output Current (mA)	Input ⁽¹⁾ Current (mA)	Efficiency ⁽¹⁾ typ. (%)	Max. Capacitive Load ⁽²⁾ (µF)
RP10-123.3SA ^(3,4)	9-18	3.3	3000	994	83	3500
RP10-1205SA ^(3,4)	9-18	5	2000	969	86	2500
RP10-1212SA ^(3,4)	9-18	12	830	933	89	430
RP10-1215SA ^(3,4)	9-18	15	670	931	90	350
RP10-1224SA ^(3,4)	9-18	24	416	914	91	125
RP10-243.3SA ^(3,4)	18-36	3.3	3000	485	85	3500
RP10-2405SA ^(3,4)	18-36	5	2000	484	86	2500
RP10-2412SA ^(3,4)	18-36	12	830	456	91	430
RP10-2415SA ^(3,4)	18-36	15	670	465	90	350
RP10-2424SA ^(3,4)	18-36	24	416	457	91	125
RP10-483.3SA ^(3,4)	36-75	3.3	3000	243	85	3500
RP10-4805SA ^(3,4)	36-75	5	2000	239	87	2500
RP10-4812SA ^(3,4)	36-75	12	830	230	90	430
RP10-4815SA ^(3,4)	36-75	15	670	233	90	350
RP10-4824SA ^(3,4)	36-75	24	416	229	91	125
RP10-1205DA ^(3,4)	9-18	±5	±1000	969	86	±1440
RP10-1212DA ^(3,4)	9-18	±12	±416	935	89	±250
RP10-1215DA ^(3,4)	9-18	±15	±333	925	90	±180
RP10-2405DA ^(3,4)	18-36	±5	±1000	484	86	±1440
RP10-2412DA ^(3,4)	18-36	±12	±416	462	90	±250
RP10-2415DA ^(3,4)	18-36	±15	±333	463	90	±180
RP10-4805DA ^(3,4)	36-75	±5	±1000	239	87	±1440
RP10-4812DA ^(3,4)	36-75	±12	±416	229	91	±250
RP10-4815DA ^(3,4)	36-75	±15	±333	231	90	±180



Notes:

- Note1: Values at nominal input voltage and full load.
 Note2: Test by minimum Vin and constant resistor load.

Model Numbering



Ordering Examples

- RP10-2405SA/P = 24V Input, 5V Output, Positive Logic CTRL pin and Trim pin fitted
 RP10-4805DA-HC = 48V nput, ±5V Output, Heat-sink fitted.

Notes:

- Note3: Standard part is without CTRL pin
 add suffix "N" for CTRL function with negative logic (0=ON, 1=OFF) and trim pin
 add suffix "P" for CTRL function with positive logic (1=ON, 0=OFF) and trim pin
 Note4: add suffix -HC for premounted Heat-sink and clips



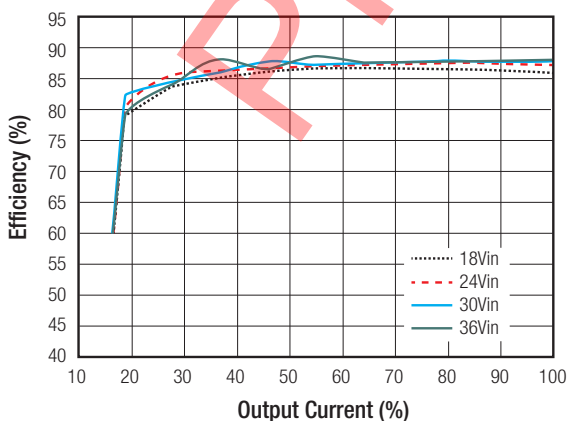
UL60950-1 Certified

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

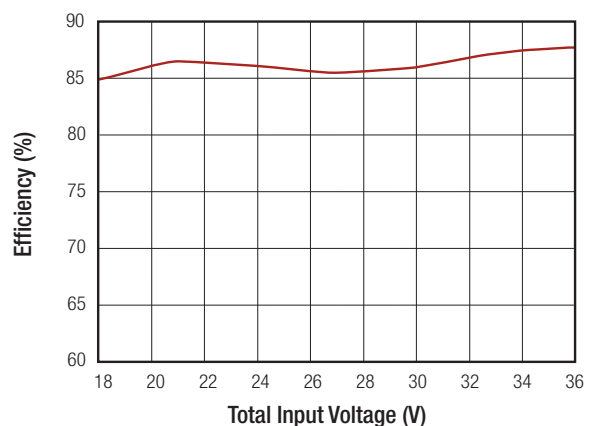
BASIC CHARACTERISTICS					
Parameter	Condition		Min.	Typ.	Max.
Input Voltage Range	nom. $V_{in} = 12\text{V}$ nom. $V_{in} = 24\text{V}$ nom. $V_{in} = 48\text{V}$		9VDC 18VDC 36VDC	12VDC 24VDC 48VDC	18VDC 36VDC 75VDC
Under Voltage Lockout (UVLO)	$V_{in} = 12\text{V}$	DC-DC ON DC-DC OFF		8VDC	9VDC
	$V_{in} = 24\text{V}$	DC-DC ON DC-DC OFF		16VDC	18VDC
	$V_{in} = 48\text{V}$	DC-DC ON DC-DC OFF		33VDC	36VDC
Input Filter					Pi-Type
Input Reflected Ripple Current	nominal V_{in} and full load			30mA _{p-p}	
Input Surge Voltage	$V_{in} = 12\text{V}$, 1s max. $V_{in} = 24\text{V}$, 1s max. $V_{in} = 48\text{V}$, 1s max.				25VDC 50VDC 100VDC
Start-up time	Power up Remote ON/OFF				30ms 30ms
Operating Frequency Range			297kHz	330kHz	363kHz
Minimum Load	of full load		0%		
Optional Power	output voltage trimmed up 10% output voltage trimmed up 20%				11W 12W
Ripple and Noise	measured by 20MHz bandwidth with a 10 μF /25V X7R 1206 MLCC	3.3V _{out} , 5V _{out} 12V _{out} , 15V _{out}		40mV _{p-p} 60mV _{p-p}	
	measured by 20MHz bandwidth with a 1 μF /50V X7R 1206 MLCC	24V _{out}		60mV _{p-p}	
Remote ON/OFF	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 Remote pin (CTRL)	DC-DC OFF			2.5mA	
	DC-DC ON		-0.5 mA		1.0mA

RP10-2405SA

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%
Voltage adjustability ⁽⁶⁾	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 recovery time	25% load step change		250µs typ.

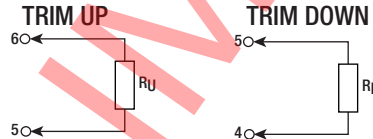
Notes:

Note5: Trimming allows the user to increase or decrease the output voltage set point of the module. This is accomplished by connecting an external resistor between the Trim pin and either +Vout pin or -Vout pin.

External Output Trimming

Output Voltage Trimming

Single output Powerline Plus 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 resis tor required or use a variable resistor to set the output voltage.



RP10-xx3.3SA

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 _u =	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 _d =	116.72	54.78	34.13	23.81	17.62	13.49	10.54	8.32	6.60	5.23	KOhms

RP10-xx05SA

Trim up	1	2	3	4	5	6	7	8	9	10	%
Vout =	5.05	5.01	5.15	5.20	5.25	5.30	5.35	5.4	5.45	5.50	Volts
R _u =	253.45	125.70	83.12	61.82	49.05	40.53	34.45	29.89	26.34	23.50	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 _d =	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 Ta = 25°C, nominal input voltage, full load otherwise noted

RP10-xx12SA											
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	Volts
R _v =	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	%
Vout =	11.88	11.76	11.64	11.52	11.40	11.28	11.16	11.04	10.92	10.8	Volts
R _d =	776.56	380.72	248.78	182.81	143.22	116.83	97.98	83.85	72.85	64.06	KOhms
RP10-xx15SA											
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	Volts
R _v =	161.56	78.22	50.45	36.56	28.22	22.67	18.70	15.72	13.41	11.56	KOhms
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	Volts
R _d =	818.22	401.56	262.67	193.22	151.56	123.78	103.94	89.06	77.48	68.22	KOhms

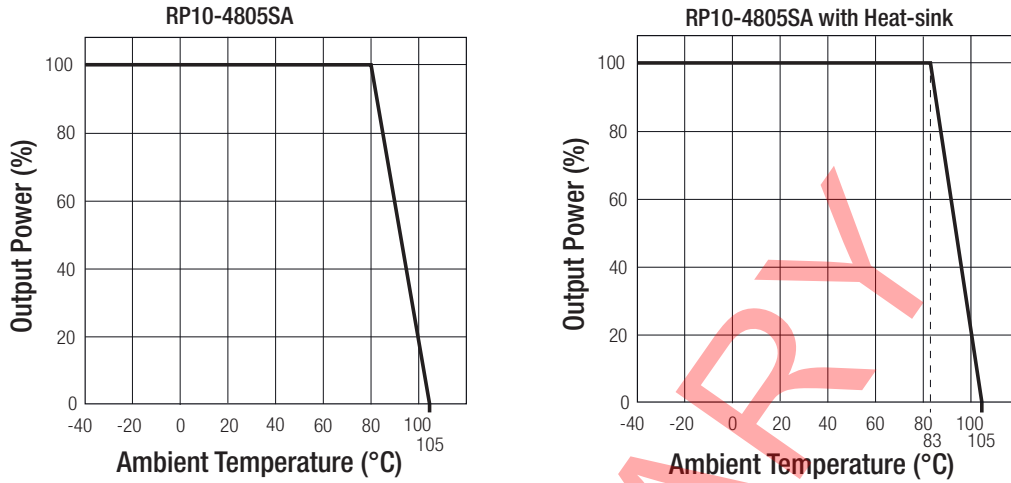
PROTECTION		
Parameter	Condition	Value
Short Circuit Protection (SCP)		continuous, automatic recovery
Over Voltage Protection (OVP)	3.3Vout	3.7 - 5.4V
	5Vout	6.3 - 7.4V
	Zener Diode Clamp 12Vout	13.5 - 19.6V
	15Vout	18.3 - 22.0V
	24Vout	29.1 - 32.5V
Over Load Protection (OLP)	% of Iout rated	150% typ.
Isolation Voltage	I/P to O/P	1.6kVDC/1 minute
	I/P (O/P) to case	1.0kVDC/1 minute
Isolation Resistance	500VDC	1GΩ min.
Isolation Capacitance		1500pF max.
Notes:		
Note6: This power module is not internally fused. An input line fuse must always be used.		

ENVIRONMENTAL		
Parameter	Condition	Value
Operating Temperature Range	without derating	-40°C to +80°C
	with derating	-40°C to +105°C
Maximum Case Temperature		+105°C
Temperature Coefficient		±0.02%/°C max.
Thermal Impedance	Natural convection (20LFM) without Heat-sink	16°C/Watt
	Natural convection (20LFM) with Heat-sink	15°C/Watt
Operating Humidity		5% - 95% RH
Thermal Shock		MIL-STD-810F
Vibration		MIL-STD-810F
MTBF	MIL-HDBK-217F	3308 x 10 ³ hours

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

Derating Graph⁽⁷⁾



Notes:

Note7: 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

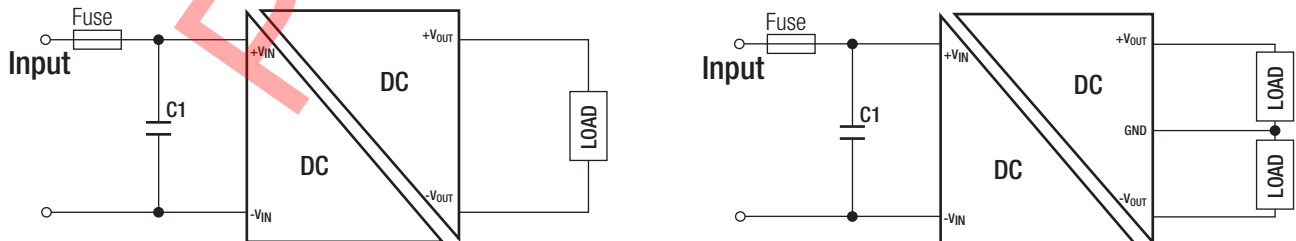
Certificate Type (Safety)	Report / File Number	Standard
UL General Safety	E196683	UL60950-1, 1st Ed.: 2003 C22.2 No. 60950, 1st Ed.: 2003
EMC Compliance	Condition	Standard / Criterion
EMI Standard ⁽⁸⁾	with external filter	EN55022, Class A or B
ESD	Air $\pm 8\text{kV}$ and Contact $\pm 6\text{kV}$	EN61000-4-2, Criteria A
Radiated Immunity	10 V/m	EN61000-4-3, Criteria A
Fast Transient ⁽⁹⁾	$\pm 2\text{kV}$	EN61000-4-4, Criteria A
Surge ⁽⁹⁾	$\pm 1\text{kV}$	EN61000-4-5, Criteria A
Conducted Immunity	3 Vr.m.s	EN61000-4-6, Criteria A
Power frequency magnetic field	100A/m continuous, 1000A/m 1 second	EN61000-4-8, Criteria A

Notes:

Note8: The standard modules meet EMI Class A without external components and Class B with external components; see filter suggestions below. RP10-4805SA meets EMI Class B without external components.

Note9: 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, 220 $\mu\text{F}/100\text{V}$.

EMI Filtering Class B



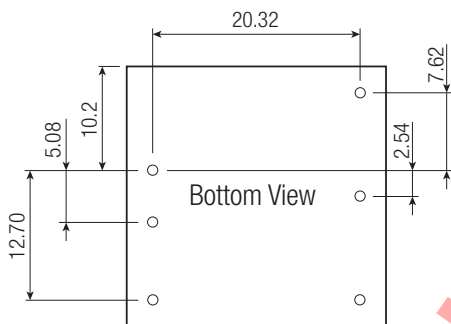
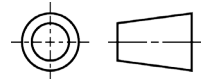
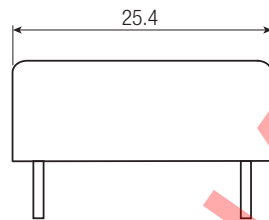
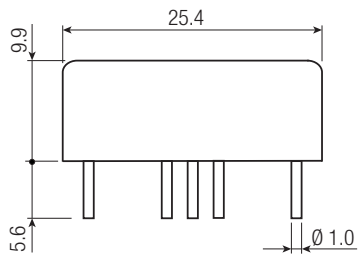
MODEL	C1
RP10-12xxS_DA	10 $\mu\text{F}/25\text{V}$ 1812 MLCC
RP10-24xxS_DA	6.8 $\mu\text{F}/50\text{V}$ 1812 MLCC
RP10-48xxS_DA	4.7 $\mu\text{F}/100\text{V}$ 1812 MLCC

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

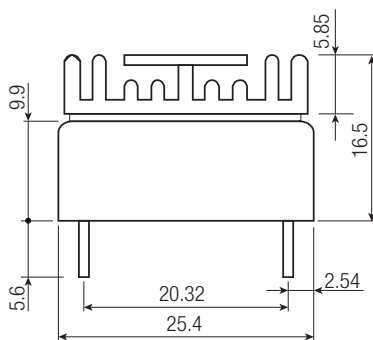
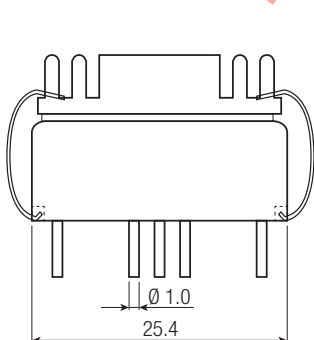
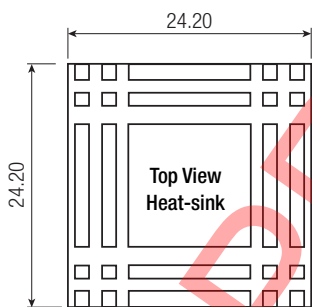
DIMENSIONS and PHYSICAL CHARACTERISTICS

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	25.4 x 25.4 x 16.5mm
Package Weight	without Heat-sink	16.5g
	with Heat-sink	22.94g

Dimension Drawing (mm)



Dimension Drawing (mm) with Heat-sink



Pin Connections

Pin #	Single	Dual
1	+Vin	+Vin
2	-Vin	-Vin
3	CTRL	CTRL
4	+Vout	+Vout
5	Trim	Com
6	-Vout	-Vout

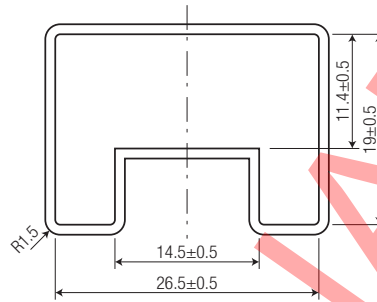
Case Tolerance $\pm 0.5\text{mm}$
 Pin Pitch Tolerance $\pm 0.25\text{mm}$
 XX.X $\pm 0.5\text{ mm}$
 XX.XX $\pm 0.25\text{ mm}$

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

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 Tray	20pcs.
Storage Temperature Range		-55°C to +125°C
Storage Humidity		5% - 95% RH

Tube Dimension Drawing (mm)



PRELIMINARY