

# Features

## Regulated Converters

- Universal Input 85-305VAC
- 4W PCB Mount Package
- <75mW No Load Power Consumption
- Ultra Low Profile, Compact Size
- -40°C to +85°C Operating Temperature
- Continuous SCP, OCP, OVP
- EN60335, EN60950, UL60950 & CE Pending

**RECOM**  
AC/DC Converter

### Description

The RAC04-GA series are low cost AC/DC power supplies, ideal for PCB mounted, compact, board level industrial applications. They feature universal AC input voltage range, regulated and short-circuit -proof isolated DC outputs, low standby power consumption and -40°C to +85°C operating temperature range. The RAC04-GA have a built-in Class A / FCC Part 15 EMC filter, are certified to IEC/EN/UL60950-1 and EN60335 and are pending to IEC/EN/UL62368 and EN61558 safety standards and come with a three year warranty.

### Selection Guide

Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ. <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [μF]
RAC04-05SGA	85-305	5	800	72	1500
RAC04-12SGA	85-305	12	330	78	500
RAC04-24SGA	85-305	24	170	80	150

#### Notes:

Note1: Efficiency is tested at nominal input and full load at +25°C ambient

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

### Model Numbering



#### Ordering Example

RAC04-12SGA = 4W Output Power, 12V Output Voltage, Single Output, EMC Class A

### Specifications (measured @ ta=25°C, nom. Vin, full load unless otherwise noted)

BASIC CHARACTERISTICS				
Parameter	Condition		Min.	Typ.
Internal Input Filter				Pi-Type
Input Voltage Range			85VAC 120VDC	305VAC 430VDC
Input Current	115VAC 230VAC			85mA 55mA
Inrush Current	cold start at 25°C	115VAC 230VAC		10A 20A
No Load Power Consumption				75mW
Input Frequency Range	AC Input		45Hz	65Hz
Minimum Load			0%	
Power Factor	115VAC 230VAC		0.55 0.42	
Start-up Time	115VAC, 230VAC		30ms	1s
Hold-up Time	115VAC 230VAC		5ms 40ms	
Internal Operating Frequency	100% load at nominal Vin		65kHz	

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## RAC04-GA

**4 Watt  
Single  
Output  
EMC Class A**



**FCC** **c** **us** **E196683** **CE**

UL60950-1 Certified  
IEC/EN60950-1 Certified  
UL62368-1 Pending  
IEC/EN62368-1 Pending  
EN61558-1 Pending  
EN61558-2-16 Pending

Specifications (measured @  $ta=25^\circ C$ , nom. Vin, full load unless otherwise noted)

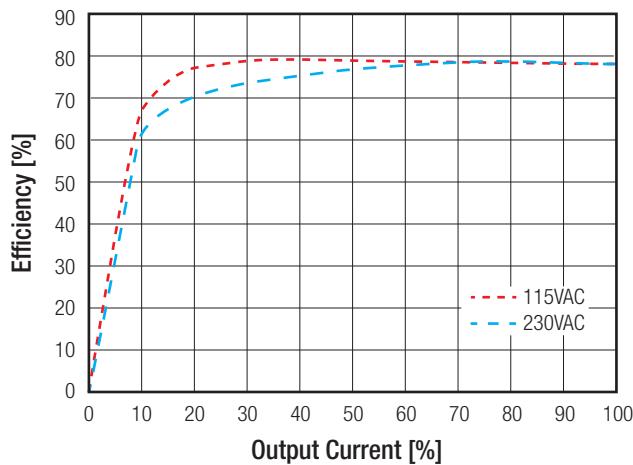
Output Ripple and Noise <sup>(3)</sup>	20MHz BW	0°C to 85°C	5Vout				100mVp-p
			12Vout				150mVp-p
			24Vout				240mVp-p
		-30°C to 0°C	5Vout				200mVp-p
			12Vout				250mVp-p
			24Vout				300mVp-p

## Notes:

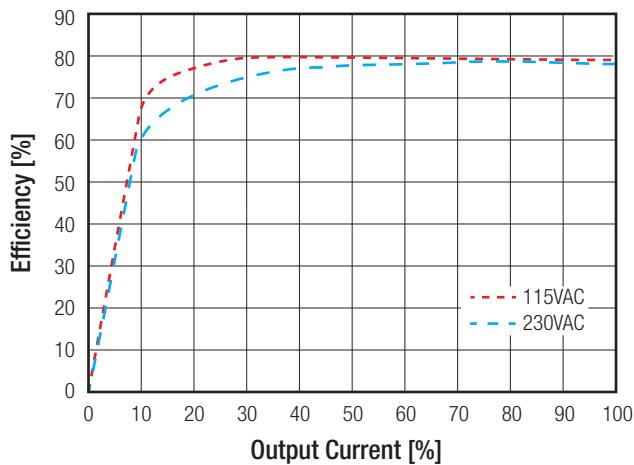
Note3: Measurements are made with a 12" twisted pair-wire with a 0.1 $\mu$ F and 10 $\mu$ F parallel capacitor across output (low ESR).

## Efficiency vs. Load

RAC04-05SGA



RAC04-12SGA

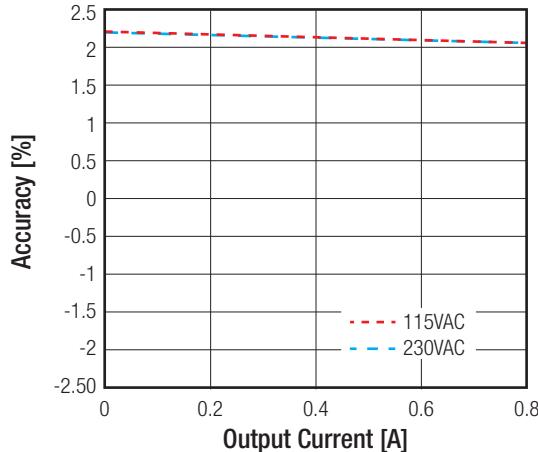


## REGULATIONS

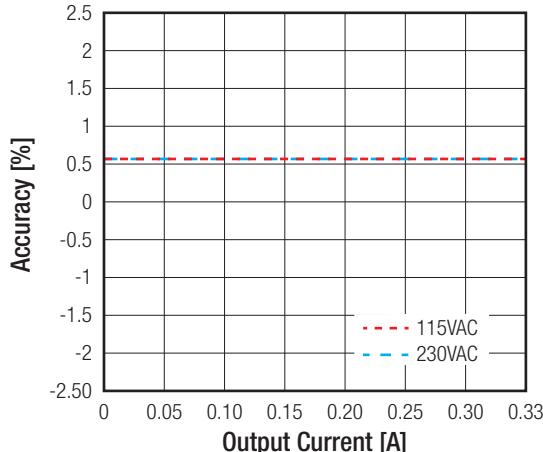
Parameter	Condition	Value
Output Accuracy		$\pm 2.5\%$ max.
Line Regulation	low line to high line	$\pm 0.5\%$ max.
Load Regulation	10% to 100% load	$\pm 0.5\%$ max.

## Accuracy vs. Load

RAC04-05SGA



RAC04-12SGA



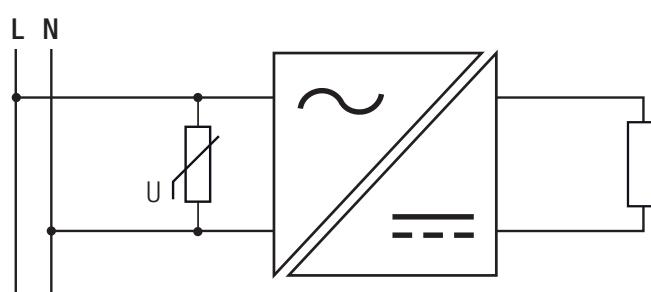
**Specifications** (measured @  $ta=25^\circ\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

<b>PROTECTIONS</b>		
<b>Parameter</b>	<b>Type</b>	<b>Value</b>
Input Fuse	internal	T1A, 300V
Short Circuit Protection (SCP)	below $100\text{m}\Omega$	long-term mode, auto recovery
Over Voltage Protection (OVP)	5Vout 12Vout 24Vout	5.3V - 6.8V, hiccup mode auto recovery 12.6V - 16.2V, hiccup mode auto recovery 25.2V - 32.4V, hiccup mode auto recovery
Over Current Protection (OCP)	5Vout 12Vout 24Vout	0.91A - 2.2A, hiccup mode auto recovery 0.37A - 0.95A, hiccup mode auto recovery 0.19A - 0.45A, hiccup mode auto recovery
Class of Equipment		Class II
Over Voltage Category (OVC)		OVC II
Isolation Voltage <sup>(4)</sup>	I/P to O/P	rated for 1 minute 3kVAC/10mA
Isolation Resistance		$10\text{M}\Omega$ min.
Insulation Grade		Reinforced
Leakage Current	277VAC, 50Hz	0.1mA max.

**Notes:**

Note4: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

Note5: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series.



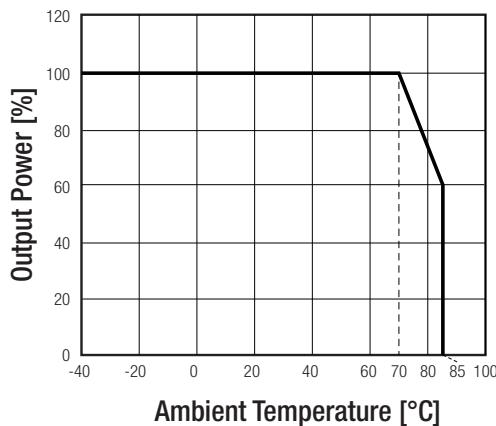
<b>ENVIRONMENTAL</b>		
<b>Parameter</b>	<b>Condition</b>	<b>Value</b>
Operating Temperature Range	without derating (@ natural convection 0.1m/s, see graph)	-40°C to +70°C
Maximum Case Temperature		+100°C
Temperature Coefficient		$\pm 0.03\%/\text{C}$
Operating Altitude		3000m
Operating Humidity	non-condensing	5% - 95% RH
Pollution Degree		PD2
Shock		20G/11ms pulse, 3 times at each x, y, z axes
Vibration		10-150Hz, 2G 10min./1cycle, period 60min. along x,y,z axes for 6 cycles
MTBF	according to MIL-HDBK-217F, G.B.	+25°C +70°C 100 x $10^3$ hours 100 x $10^3$ hours

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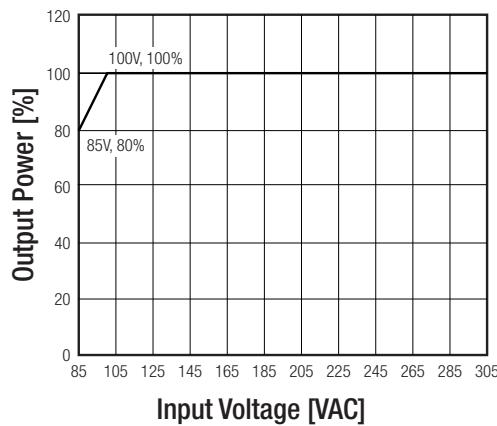
**Specifications** (measured @  $ta=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

**Derating Graph**

(@ Chamber and natural convection 0.1m/s)



**Input Voltage Derating Graph**



**SAFETY AND CERTIFICATION**

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety (LVD)	SA17031845 001	IEC60950-1, 2nd Edition, 2005 + A1, 2009 + A2, 2013 EN60950-1, 2006 + A11, 2009 + A1, 2010 + A12, 2011 + A2, 2013
Information Technology Equipment, General Requirements for Safety	E196683-A3-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014
Audio/video, information and communication technology equipment. Safety requirements	pending	UL62368-1 CAN/CSA C22.2 No 62368-1
Audio/video, information and communication technology equipment. Safety requirements	pending	IEC62368-1 EN62368-1
Household and similar electrical appliances - Safety. General requirements	SA1703184L 01001	EN60335, 2012 + A11, 2014
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	SA1703184L 01001	EN62233, 2008
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements	pending	EN61558-1, 2005 + A1, 2009 EN61558-2-16, 2009 + A1, 2013
RoHs 2+		RoHS 2011/65/EU + AM2015/863
EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement	EA1703184E 01001 with external components	EN55032, 2015, Class A
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices	EA1703184E 01001	47 CFR FCC Part 15 Subpart B: 2016
ESD Electrostatic discharge immunity test	Air $\pm 8\text{kV}$ , Contact $\pm 4\text{kV}$	EN61000-4-2, 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3, 2006 + A1, 2008 + A2, 2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port $\pm 1\text{kV}$	EN61000-4-4, 2012, Criteria A
Surge Immunity	AC Power Port L-N $\pm 1\text{kV}$	EN61000-4-5, 2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	AC Power Port 3V	EN61000-4-6, 2014, Criteria A
Voltage Dips and Interruption	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria A EN61000-4-11, 2004, Criteria C

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**Specifications** (measured @  $ta=25^{\circ}\text{C}$ , nom.  $V_{in}$ , full load unless otherwise noted)

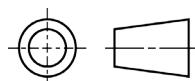
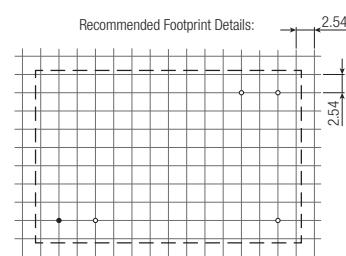
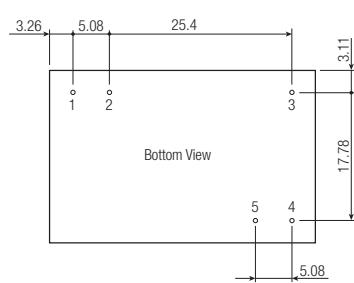
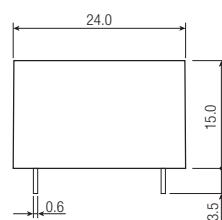
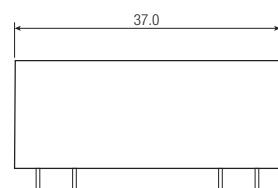
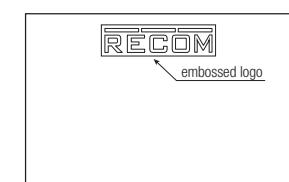
EMI Filtering according to EN60335-1 / EN55032 Class B Compliance

TBD

**DIMENSION and PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	Case	black plastic, (UL94 V-0)
	PCB	FR4, (UL94 V-0)
Package Dimension (LxWxH)		37.0 x 24.0 x 15.0mm
Package Weight		20g typ.

**Dimension Drawing (mm)**



Pin Connections	
Pin #	Single
1	VAC in (L)
2	VAC in (N)
3	NC
4	-Vout
5	+Vout

Tolerance:  $XX.X \pm 0.5\text{mm}$   
Pin Width:  $XX.X \pm 0.05\text{mm}$

**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	505.0 x 39.7 x 23.2mm
Packaging Quantity		20pcs
Storage Temperature Range		-40°C to +100°C
Storage Humidity	non-condensing	5% - 95% RH max.

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