

# Features

## Regulated Converter

- 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
- IEC/EN/UL60950 & CE certified, EN55032 Class B

**RECOM**  
AC/DC Converter

## RAC04-GB

**4 Watt  
Single  
Output  
EMC Class B**



UL60950-1 certified  
IEC/EN60950-1 certified  
UL62368-1 pending  
IEC/EN62368-1 certified  
EN61558-1 certified  
EN61558-2-16 certified  
CB report

## Description

The RAC04-GB 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-GB have a built-in Class B / FCC Part 15 EMC filter, are certified to IEC/EN/UL60950-1 and are pending to IEC/EN/UL62368 and EN61558 safety standards and come with a three year warranty.

## Selection Guide

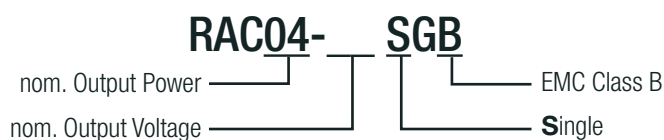
Part Number	Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [μF]
RAC04-3.3SGB	85-305	3.3	1210	70	2000
RAC04-05SGB	85-305	5	800	72	1500
RAC04-09SGB	85-305	9	440	77	1000
RAC04-12SGB	85-305	12	330	78	500
RAC04-15SGB	85-305	15	270	78	200
RAC04-24SGB	85-305	24	170	80	150

### Notes:

Note1: Efficiency is tested at 230VAC and full load at +25°C ambient

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

## Model Numbering



### Ordering Examples:

RAC04-12SGB    12Vout    Single Output    EMC Class B

**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### BASIC CHARACTERISTICS

Parameter	Condition		Min.	Typ.	Max.
Internal Input Filter			Pi-type		
Input Voltage Range <sup>(3,4)</sup>			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			10ms 40ms	
Internal Operating Frequency	100% load at nominal Vin			65kHz	
Output Ripple and Noise <sup>(5)</sup>	20MHz BW	0°C to 85 °C	3.3Vout 5Vout 9Vout 12Vout 15Vout 24Vout		100mVp-p 100mVp-p 120mVp-p 150mVp-p 200mVp-p 240mVp-p
		-30 °C to 0 °C	3.3Vout 5Vout 9Vout 12Vout 15Vout 24Vout		200mVp-p 200mVp-p 250mVp-p 250mVp-p 300mVp-p 300mVp-p

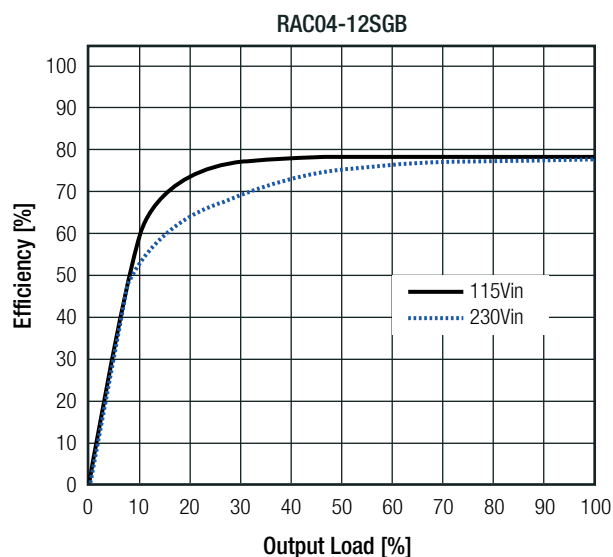
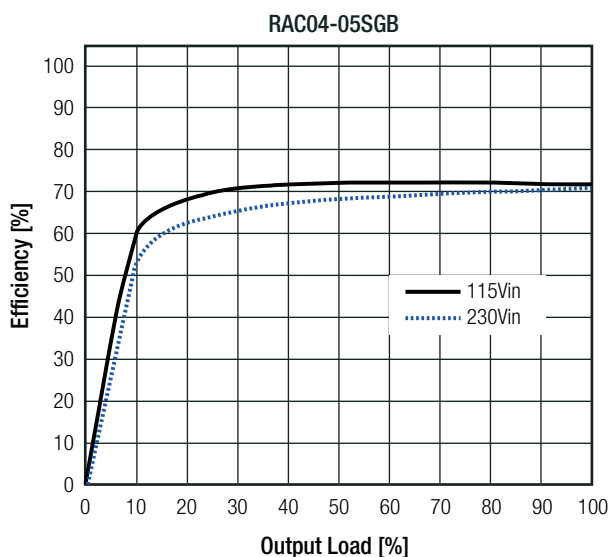
#### Notes:

Note3: The products were submitted for safety files at AC-Input operation

Note4: Refer to line derating graph on page PA-4

Note5: Measurements are made with a 12" twisted pair-wire with a 0.1µF and 10µF parallel capacitor across output (low ESR)

### Efficiency vs. Load



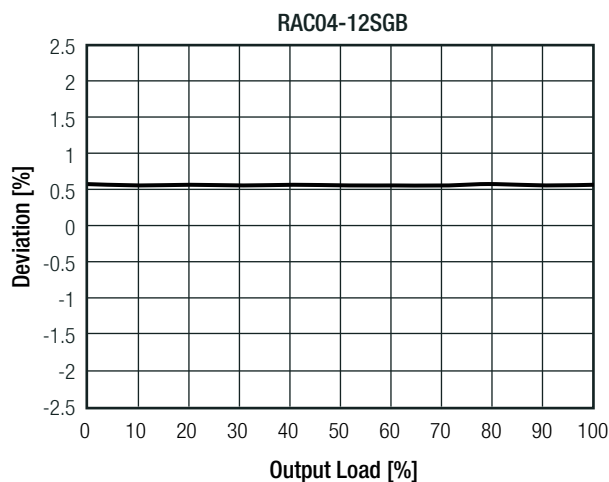
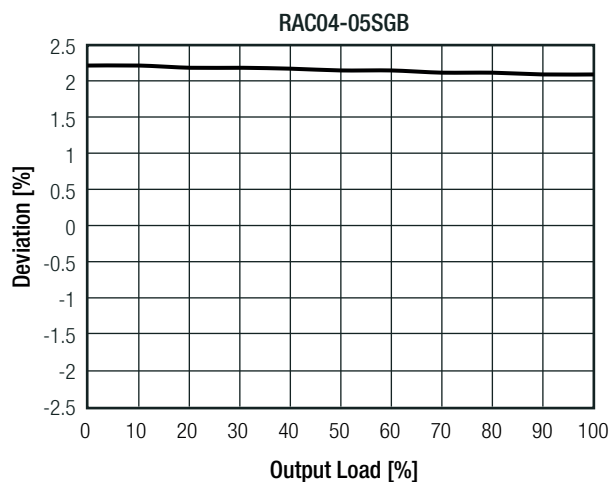
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### REGULATIONS

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

#### Deviation vs. Load

(@ 115VAC, 230VAC)



### PROTECTIONS

Parameter	Type	Value
Input Fuse <sup>(6)</sup>	internal	T1A slow blow type, 300V
Short Circuit Protection (SCP)	below 100mΩ	long-term mode, auto recovery
Over Voltage Protection (OVP)	3.3Vout 5Vout 9Vout 12Vout 15Vout 24Vout	3.8V - 4.9V 5.3V - 6.8V 10.3V - 12.2V 12.6V - 16.2V 15.75V - 20.3V 25.2V - 32.4V hiccup mode, auto recovery
Over Voltage Category		OVCII
Over Current Protection (OCP)	3.3Vout 5Vout 9Vout 12Vout 15Vout 24Vout	1.41A - 3A 0.91A - 2.2A 0.49A - 1.25A 0.37A - 0.95A 0.29A - 0.72A 0.19A - 0.45A hiccup mode, auto recovery
Class of Equipment		Class II
Isolation Voltage <sup>(7)</sup>	I/P to O/P	rated for 1 minute 3kVAC/10mA
Isolation Resistance		10MΩ min.
Isolation Capacitance		800pF min. / 1200pF max.
Insulation Grade		reinforced
Leakage Current	277VAC, 50Hz	0.1mA max.

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**Specifications** (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

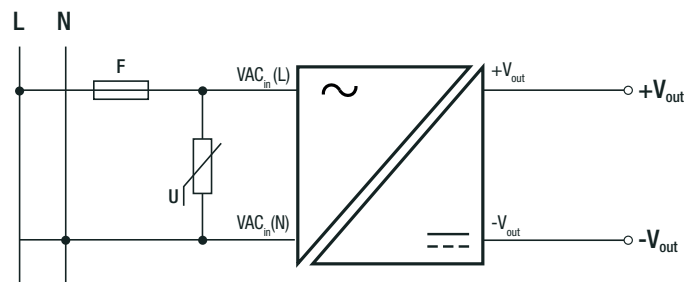
**Notes:**

Note6: Refer to local wiring regulations if input over-current protection is also required

Note7: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note8: For operation  $\geq 230\text{VAC}$ , an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series

**Protection Circuit**

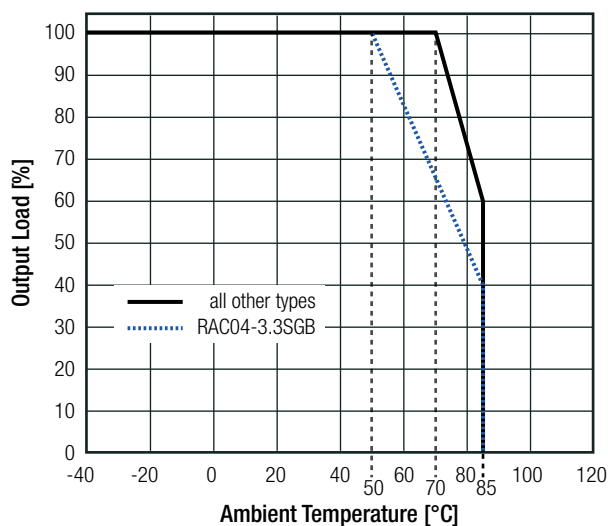


**ENVIRONMENTAL**

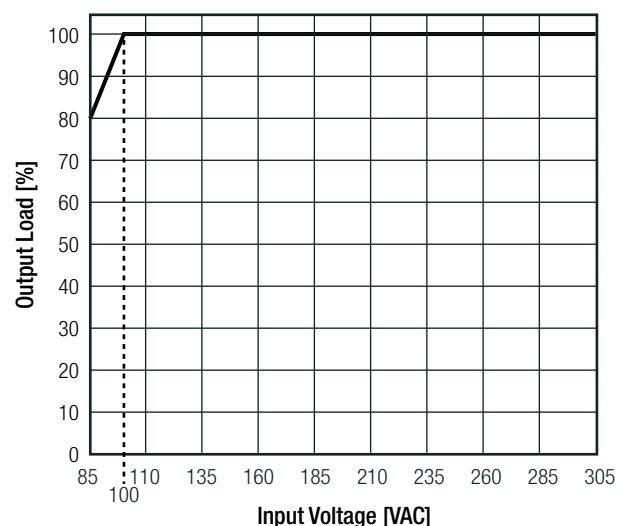
Parameter	Condition		Value
Operating Temperature Range	@ natural convection 0.1m/s	full load	$-40^\circ\text{C}$ to $+70^\circ\text{C}$
		refer to derating graph	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Maximum Case Temperature			$+100^\circ\text{C}$
Temperature Coefficient			0.03%/K
Operating Altitude			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.	$+25^\circ\text{C}$	$100 \times 10^3$ hours
		$+70^\circ\text{C}$	$17 \times 10^3$ hours

**Derating Graph**

(@ Chamber and natural convection 0.1m/s)



**Line Derating Graph**



### Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

#### SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment, General Requirements for Safety	E196683-A4	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		UL62368-1, 2nd Edition CAN/CSA C22.2 No 62368-1-14
Information Technology Equipment, General Requirements for Safety	SA1703184S 001	EN60950-1: 2006 + A2, 2013
Information Technology Equipment, General Requirements for Safety (CB)		IEC60950-1, 2nd Edition: 2005 + AM2, 2013
Audio/video, information and communication technology equipment. Safety requirements	4787985921- 20171025	EN62368-1: 2014
Audio/video, information and communication technology equipment. Safety requirements (CB)		IEC62368-1, 2nd Edition: 2014
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V	SA 1709184L 02001	EN61558-1: 2005 + A1, 2009
Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements		EN61558-2-16: 2009 + A1, 2013
EAC	RU-AT.03.67361	TP TC 004/020, 2011
RoHS 2+		RoHS 2011/65/EU + AM2015/863

EMC Compliance	Condition	Standard / Criterion
Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement <sup>(9)</sup>	EA1703184E 01001	EN55032: 2015, Class B
Limitations on the amount of electromagnetic interference allowed from digital and electronic devices	EA1703184F 01001	47 CFR FCC Part 15 Subpart B: 2016
ESD Electrostatic discharge immunity test	Air ±8kV Contact ±4kV	EN61000-4-2: 2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3: 2006 + A2, 2010, Criteria A
Fast Transient and Burst Immunity	AC Port ±1kV	EN61000-4-4: 2012, Criteria A
Surge Immunity	AC Port L-N ±1kV	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%	EN61000-4-11: 2004, Criteria A
	Voltage Dips 30%	EN61000-4-11: 2004, Criteria A
	Interruptions >95%	EN61000-4-11: 2004, Criteria C

#### Notes:

Note9: If output is connected to GND, please contact RECOM tech support for advice

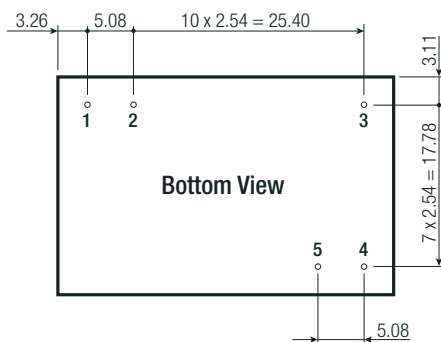
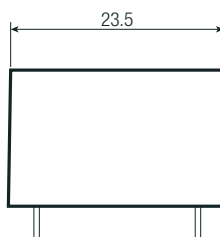
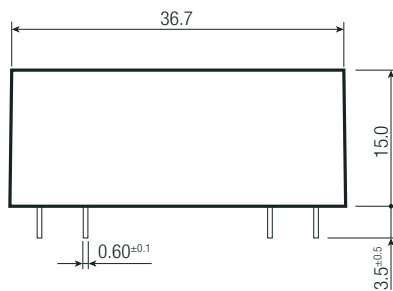
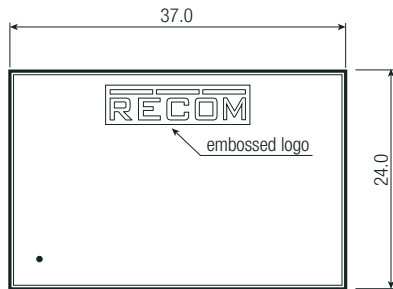
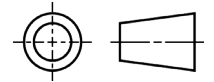
#### DIMENSION AND PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Material	case PCB	black plastic, (UL94V-0) FR4, (UL94V-0)
Dimension (LxWxH)		37.0 x 24.0 x 15.0mm
Weight		20g typ.

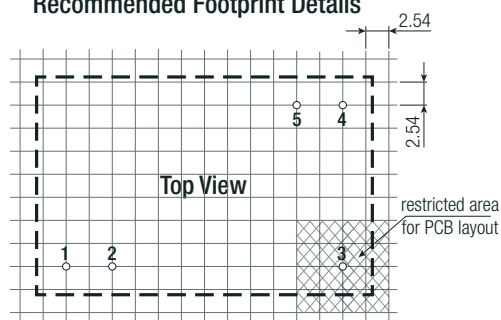
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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

Dimension Drawing (mm)



Recommended Footprint Details



Pin Connections

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

NC: Not Connected

Tolerance: xx.x ±0.5mm

Pin Width: xx.xx ±0.05mm

### 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.

The product information and specifications may be subject to changes even without prior written notice. The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.