

# Features

- 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

# Regulated Converters

## 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                                      |

## On Request

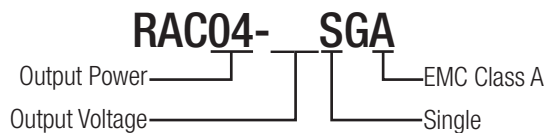
|              |        |     |      |    |      |
|--------------|--------|-----|------|----|------|
| RAC04-3.3SGA | 85-305 | 3.3 | 1210 | 70 | 2000 |
| RAC04-09SGA  | 85-305 | 9   | 440  | 77 | 1000 |
| RAC04-15SGA  | 85-305 | 15  | 270  | 78 | 200  |

### 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.         | Max.             |         |
| Internal Input Filter              |                                      |                  |              |                  | Pi-Type |
| Input Voltage Range <sup>(3)</sup> | refer to line derating graph on PA 4 | 85VAC<br>120VDC  |              | 305VAC<br>430VDC |         |
| Input Current                      | 115VAC<br>230VAC                     |                  | 85mA<br>55mA |                  |         |
| Inrush Current                     | cold start at 25°C                   | 115VAC<br>230VAC |              | 10A<br>20A       |         |
| No Load Power Consumption          |                                      |                  |              | 75mW             |         |
| Input Frequency Range              | AC Input                             | 45Hz             |              | 65Hz             |         |
| Minimum Load                       |                                      | 0%               |              |                  |         |
| Power Factor                       | 115VAC<br>230VAC                     |                  | 0.55<br>0.42 |                  |         |
| Start-up Time                      | 115VAC, 230VAC                       |                  | 30ms         | 1s               |         |
| Hold-up Time                       | 115VAC<br>230VAC                     |                  | 5ms<br>40ms  |                  |         |
| Internal Operating Frequency       | 100% load at nominal Vin             |                  | 65kHz        |                  |         |

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## RAC04-GA

# 4 Watt Single Output EMC Class A



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

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

|  |          |              |                            |  |                                  |
|--|----------|--------------|----------------------------|--|----------------------------------|
| Output Ripple and Noise <sup>(4)</sup> | 20MHz BW | 0°C to 85°C  | 5 Vout<br>12Vout<br>24Vout |  | 100mVp-p<br>150mVp-p<br>240mVp-p |
|  |          | -30°C to 0°C | 5Vout<br>12Vout<br>24Vout  |  | 200mVp-p<br>250mVp-p<br>300mVp-p |

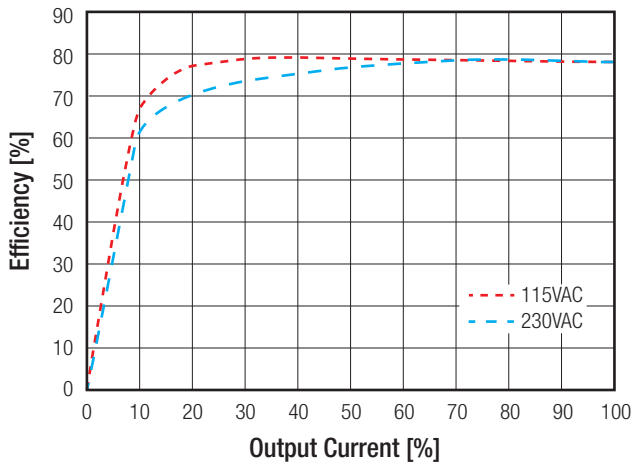
#### Notes:

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

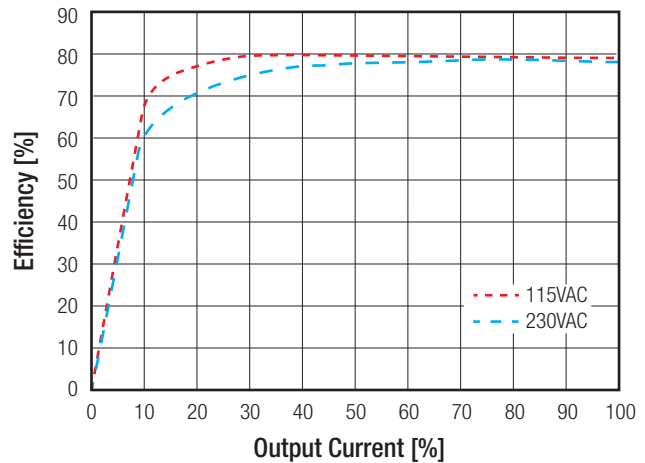
Note4: Measurements are made with a 12" twisted pair-wire with a 0.1 $\mu\text{F}$  and 10 $\mu\text{F}$  parallel capacitor across output (low ESR)

#### Efficiency vs. Load

##### RAC04-05SGA



##### RAC04-12SGA

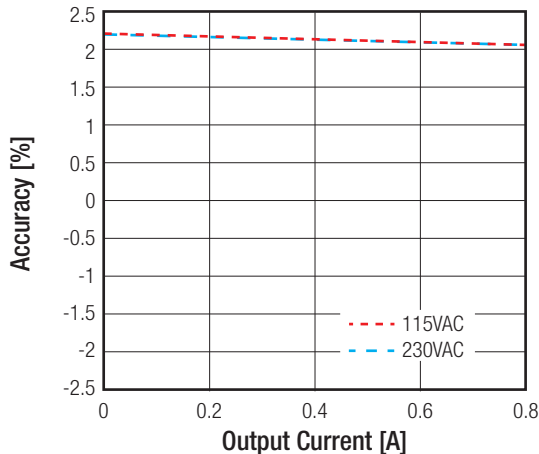


#### REGULATIONS

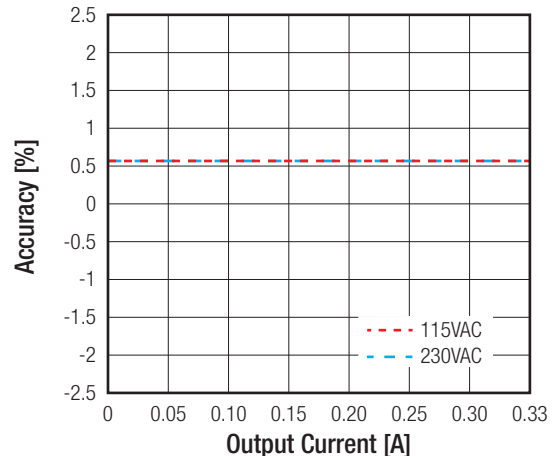
| Parameter       | Condition             | Value            |
|-----------------|-----------------------|------------------|
| Output Accuracy |                       | $\pm 2.5\%$ max. |
| Line Regulation | low line to high line | $\pm 0.5\%$ max. |
| Load Regulation | 10% to 100% load      | $\pm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

#### Accuracy vs. Load

##### RAC04-05SGA



##### RAC04-12SGA



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

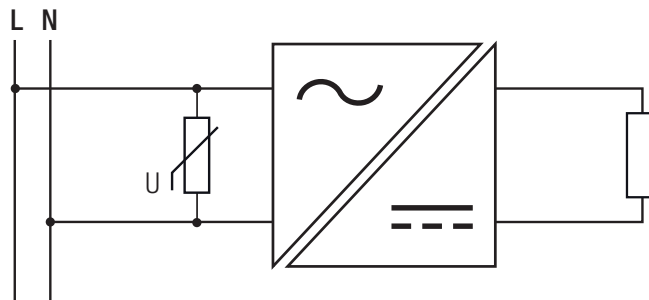
**PROTECTIONS**

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

**Notes:**

Note5: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

Note6: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC61051-2. eg. EPCOS S14 series.

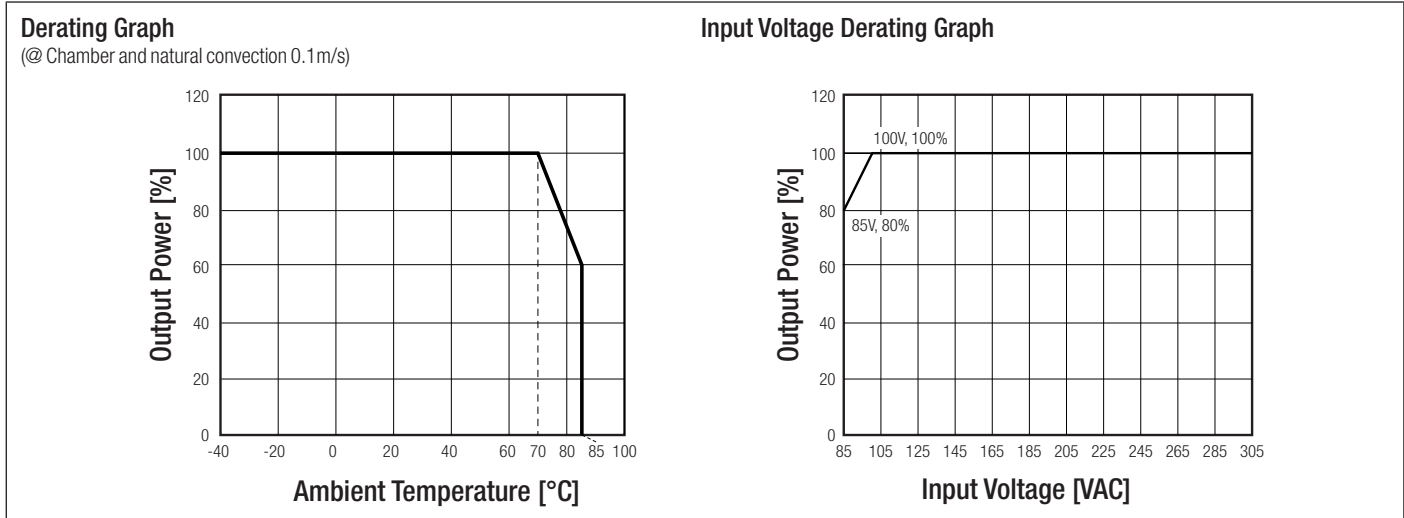


**ENVIRONMENTAL**

| Parameter                   | Condition   |       | Value   |
|-----------------------------|---|-------|---|
| Operating Temperature Range | without derating (@ natural convection 0.1m/s, see graph) |       | -40°C to +70°C  |
| Maximum Case Temperature    |   |       | +100°C  |
| Temperature Coefficient     |   |       | ±0.03%/°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 | 100 x 10 <sup>3</sup> hours   |
|                             |   | +70°C | 100 x 10 <sup>3</sup> hours   |

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



**SAFETY AND CERTIFICATION**

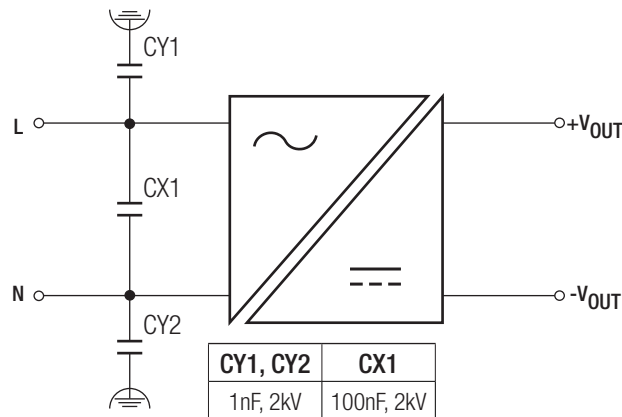
| Certificate Type (Safety)  | Report / File Number | Standard   |
|--|----------------------|--|
| Information Technology Equipment, General Requirements for Safety (LVD)  | SA17031845 001       | IEC60950-1, 2nd Edition, 2005 + A1, 2009 + A2, 2013<br>EN60950-1, 2006 + A11, 2009 + A1, 2010 + A12, 2011 + A2, 2013 |
| Information Technology Equipment, General Requirements for Safety  | E196683-A3-UL        | UL60950-1, 2nd Edition, 2014<br>CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2014                                      |
| Audio/video, information and communication technology equipment. Safety requirements   | pending              | UL62368-1<br>CAN/CSA C22.2 No 62368-1  |
| Audio/video, information and communication technology equipment. Safety requirements   | pending              | IEC62368-1<br>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<br>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%<br>Voltage Dips 30%<br>Voltage Interruptions >95% | EN61000-4-11, 2004, Criteria A<br>EN61000-4-11, 2004, Criteria A<br>EN61000-4-11, 2004, Criteria C |

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

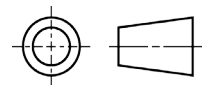
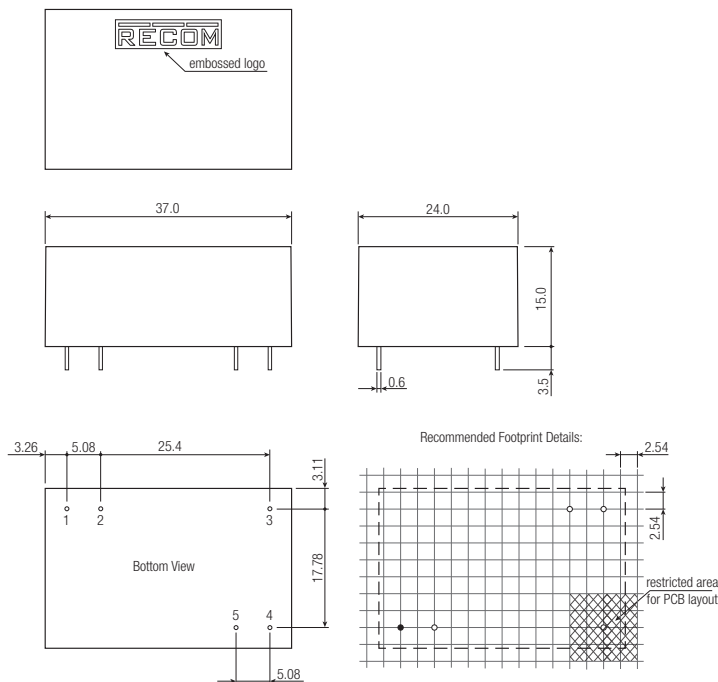
**EMI Filtering according to EN60335-1 / EN55032 Class B Compliance**



**DIMENSION and PHYSICAL CHARACTERISTICS**

| Parameter                 | Type        | Value  |
|---------------------------|-------------|--|
| Material                  | Case<br>PCB | black plastic, (UL94 V-0)<br>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  $\pm 0.5$ mm  
Pin Width: XX.X  $\pm 0.05$ 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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