

# Regulated Converter

- Universal input 85-264VAC
- <150mW No load power consumption
- Class II installations (without FG)
- -25°C to +80°C Operating temperature
- Continuous SCP, OCP
- EN/IEC/UL60950, EN/IEC/UL62368 & EN60335-1 certified



# RAC01-GA

# 1 Watt Single Output EMC Class A



## Description

The RAC01-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 -25°C to +80°C operating temperature range. The RAC01-GA have a built-in Class A / FCC Part 15 EMC filter, are certified to EN60335, EN60950 and EN62368 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] |
|-------------|---------------------------|----------------------|---------------------|-----------------------------------|------------------------------------------|
| RAC01-05SGA | 85-264                    | 5                    | 200                 | 63                                | 500                                      |
| RAC01-12SGA | 85-264                    | 12                   | 83                  | 68                                | 200                                      |

**On Request**

|                            |        |     |     |    |     |
|----------------------------|--------|-----|-----|----|-----|
| RAC01-3.3SGA               | 85-264 | 3.3 | 303 | 63 | 500 |
| RAC01-15SGA                | 85-264 | 15  | 66  | 63 | 200 |
| RAC01-24SGA <sup>(3)</sup> | 85-264 | 24  | 42  | 63 | 200 |



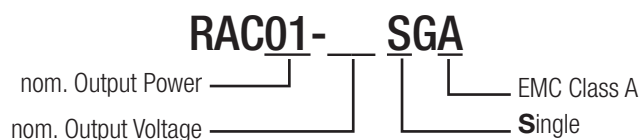
**Notes:**

Note1: Measured with all input voltages at 25°C with constant resistant mode at full load

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

Note3: Minimum order quantity  $\geq 2000$ pcs

## Model Numbering



### Ordering Examples:

|             |        |               |             |
|-------------|--------|---------------|-------------|
| RAC01-12SGA | 12Vout | Single Output | EMC Class A |
|-------------|--------|---------------|-------------|

## PREFERRED ALTERNATIVES

Please consider this alternatives:

RAC02E-K/277

IEC/EN60950-1 certified  
CAN/CSA-C22.2 No. 62368 certified  
UL62368-1 certified  
IEC/EN62368-1 certified  
EN60335-1 certified  
EN55032 compliant  
EN55024 compliant  
CB Report pending

**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>(4,5,6)</sup> | nom. Vin= 230VAC         |                  | 85VAC           | 230VAC       | 264VAC               |
| Input Current                          | 115VAC<br>230VAC         |                  |                 | 25mA<br>18mA | 30mA<br>20mA         |
| Inrush Current                         | cold start at 25°C       | 115VAC<br>230VAC |                 |              | 30A<br>40A           |
| No load Power Consumption              |                          |                  |                 |              | 150mW                |
| Input Frequency Range                  |                          |                  | 47Hz            |              | 63Hz                 |
| Minimum Load                           |                          |                  | 0%              |              |                      |
| Power Factor                           | 115VAC, 230VAC           |                  | 0.4             |              | 0.6                  |
| Start-up Time                          | 115VAC<br>230VAC         |                  |                 |              | 1s<br>2s             |
| Hold-up time                           | 115VAC<br>230VAC         |                  |                 |              | 18ms<br>80ms         |
| Internal Operating Frequency           | 100% load at nominal Vin |                  |                 | 65kHz        |                      |
| Output Ripple and Noise                | 20MHz BW                 | 0°C to 80 °C     | 5Vout<br>12Vout |              | 100mVp-p<br>200mVp-p |
|                                        |                          | -25 °C to 0 °C   | 5Vout<br>12Vout |              | 200mVp-p<br>300mVp-p |

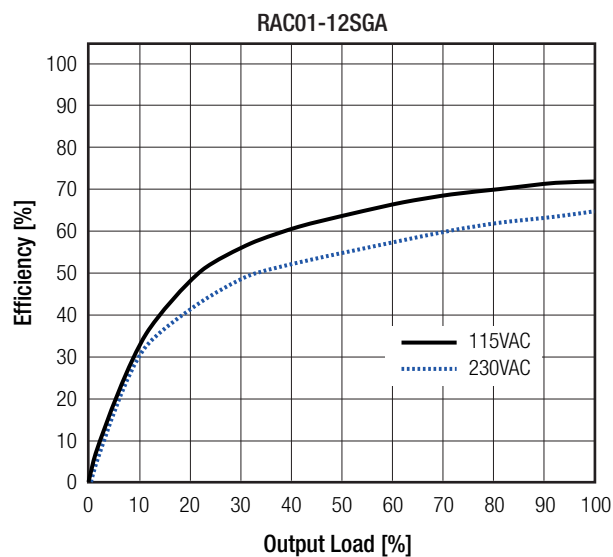
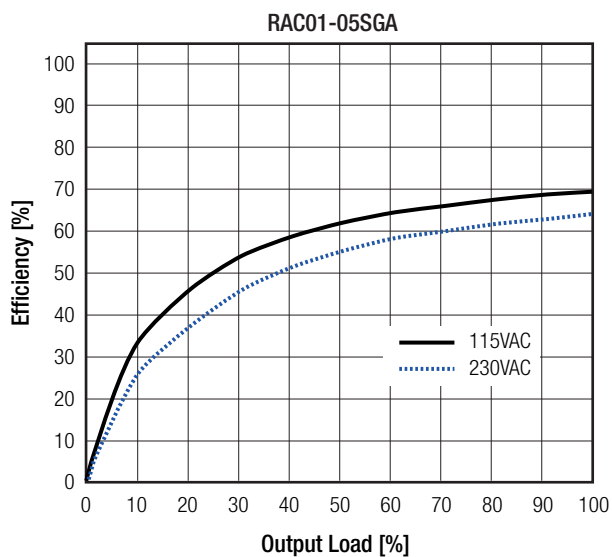
#### Notes:

Note4: No proper operation with DC input voltage

Note5: The products were submitted for safety files at AC-Input operation

Note6: Refer to “**Line Derating**”

### Efficiency vs. Load

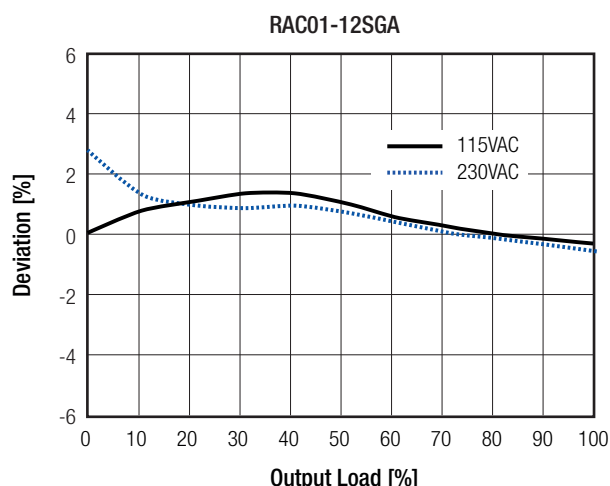
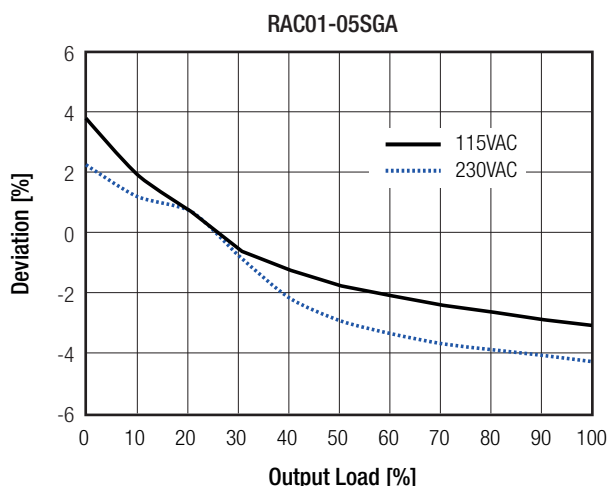


**Specifications** (measured @  $T_a = 25^\circ\text{C}$ , nom.  $V_{in}$ , full load and after warm-up unless otherwise stated)

### REGULATIONS

| Parameter       | Condition                                  | Value            |
|-----------------|--------------------------------------------|------------------|
| Output Accuracy | $-25^\circ\text{C}$ to $+80^\circ\text{C}$ | $\pm 6.0\%$ max. |
| Line Regulation | $-25^\circ\text{C}$ to $+80^\circ\text{C}$ | $\pm 2.0\%$ max. |
| Load Regulation | $-25^\circ\text{C}$ to $+80^\circ\text{C}$ | 6.0% max.        |

### Deviation vs. Load



### PROTECTIONS

| Parameter                        | Type                                    |                    | Value                                                   |
|----------------------------------|-----------------------------------------|--------------------|---------------------------------------------------------|
| Input Fuse <sup>(7)</sup>        | internal                                |                    | fusible resistor, 1Ω/1W                                 |
| Short Circuit Protection (SCP)   | below 100mΩ                             |                    | continuous, auto recovery                               |
| Over Voltage Category            |                                         |                    | OVCII                                                   |
| Over Current Protection (OCP)    | 5V <sub>out</sub><br>12V <sub>out</sub> |                    | 0.22A - 0.5A, hiccup mode<br>0.25A - 0.91A, hiccup mode |
| Class of Equipment               |                                         |                    | Class II                                                |
| Isolation Voltage <sup>(8)</sup> | I/P to O/P                              | rated for 1 minute | 3kVAC                                                   |
| Isolation Resistance             |                                         |                    | 100MΩ min.                                              |
| Insulation Grade                 |                                         |                    | reinforced                                              |
| Leakage Current                  | I/P to O/P                              |                    | 0.25mA max.                                             |

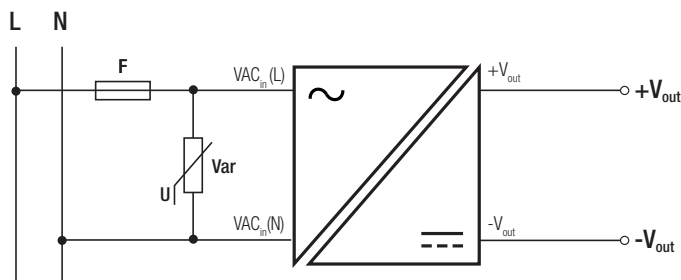
#### Notes:

Note7: Refer to local wiring regulations if input over-current protection is also required

Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage

Note9: For operation at 230VAC, an external MOV is recommended. The Varistor should comply with IEC-61051-2. e.g. EPCOS S14 series

### Protection Circuit



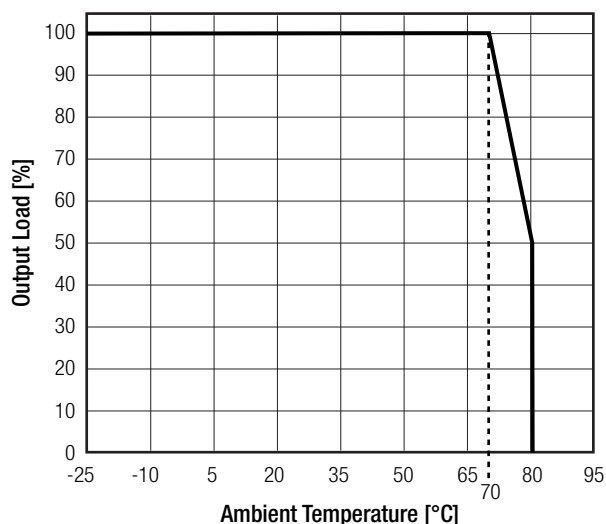
**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### ENVIRONMENTAL

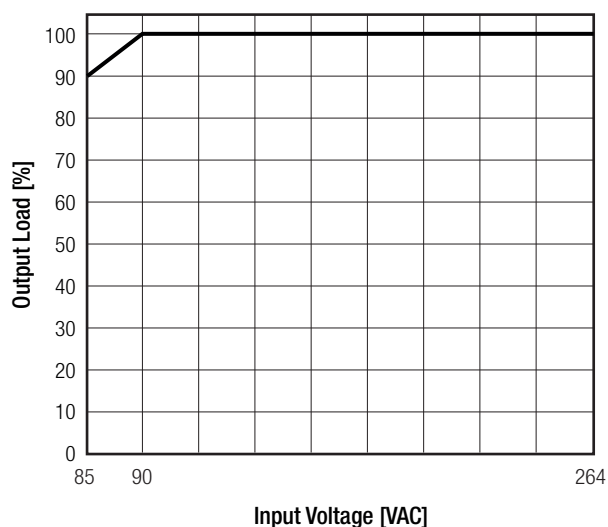
| Parameter                          | Condition                            |                           | Value                                                           |
|------------------------------------|--------------------------------------|---------------------------|-----------------------------------------------------------------|
| Operating Temperature Range        | @ natural convection 0.1m/s          | full load                 | -25°C to +70°C                                                  |
|                                    |                                      | refer to "Derating Graph" | -25°C to +80°C                                                  |
| Maximum Case Temperature           |                                      |                           | +120°C                                                          |
| Temperature Coefficient            |                                      |                           | 0.03%/K                                                         |
| Operating Altitude <sup>(10)</sup> |                                      |                           | 4000m                                                           |
| Operating Humidity                 | non-condensing                       |                           | 5% - 90% RH max.                                                |
| Pollution Degree                   |                                      |                           | PD2                                                             |
| Shock                              |                                      |                           | 10-150Hz, 2G 10min./1cycle, period 60min. each along x,y,z axes |
| Vibration                          | according to MIL-STD-202G            |                           | 20G/11ms pulse, 3 times at each x, y, z axes                    |
| MTBF <sup>(11)</sup>               | according to MIL-HDBK-217F, method 2 | +25°C                     | 1691 x 10 <sup>3</sup> hours                                    |
|                                    |                                      | +70°C                     | 424 x 10 <sup>3</sup> hours                                     |

### Derating Graph

(@ Chamber and natural convection 0.1m/s)



### Line Derating



#### Notes:

- Note10: Recognized by UL for safe operation up to 4000m. High altitude operation may impact the performance and lifetime. Contact TechsupportAT@recom-power.com for advice
- Note11: Based on calculation for 5Vout

### SAFETY AND CERTIFICATIONS

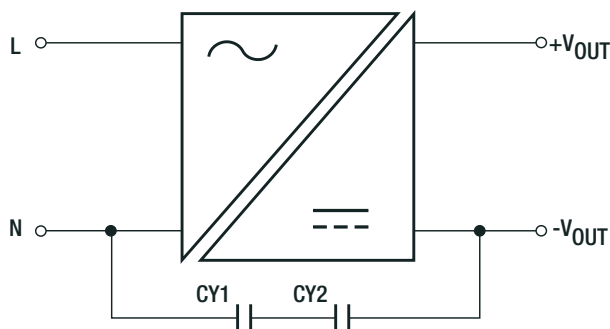
| Certificate Type (Safety)                                                                                | Report / File Number           | Standard                                                                      |
|----------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------|
| Information Technology Equipment, General Requirements for Safety                                        | SA1804152L01001                | IEC60950-1:2005 2nd Edition + Am2:2013<br>EN60950-1:2006 + A12:2011 + A2:2013 |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements             | E196683-A5 and<br>E19668-A6001 | UL62368-1, 2nd Edition<br>CAN/CSA-C22.2 No. 62368-1-14                        |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements (CB Scheme) | SA1804152S 001                 | IEC62368-1:2014 2nd Edition                                                   |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements             |                                | EN62368-1:2014+A11:2017                                                       |
| Household and similar electrical appliances – Safety – Part 1: General requirements                      | SES180313004001E               | EN60335-1:2012+A11:2014                                                       |
| RoHS2                                                                                                    |                                | RoHS 2011/65/EU + AM2015/863                                                  |

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

| EMC Compliance                                                                                  | Condition                                                 | Standard / Criterion                   |
|-------------------------------------------------------------------------------------------------|-----------------------------------------------------------|----------------------------------------|
| Electromagnetic compatibility of multimedia equipment - Emission requirements                   | EA1804152E 01001                                          | EN55032, Class A                       |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement |                                                           | EN55024:2010 + A1:2015                 |
| ESD Electrostatic discharge immunity test                                                       | Air $\pm 2, 4, 8\text{kV}$<br>Contact $\pm 2, 4\text{kV}$ | 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 Power Port: $\pm 1.0\text{kV}$                         | EN61000-4-4:2012, Criteria A           |
| Surge Immunity                                                                                  | AC Power Port: L-N $\pm 1.0\text{kV}$                     | 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           |
| Power Magnetic Field Immunity                                                                   | 50Hz, 1A/m                                                | EN61000-4-8:2009, Criteria A           |
| Voltage Dips and Interruption                                                                   | Voltage Dips >95%                                         | EN61000-4-11:2004, Criteria A          |
|                                                                                                 | Voltage Dips 30%                                          | EN61000-4-11:2004, Criteria B          |
|                                                                                                 | Voltage Interruptions >95%                                | EN61000-4-11:2004, Criteria B          |
| Limits of Voltage Fluctuations & Flicker                                                        |                                                           | EN61000-3-3:2013                       |

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



**CY1,CY2**

Vishay 564R30TSD22, SLCC  
X7R radial, 2.2nF, 3kVDC  $\pm 10\%$

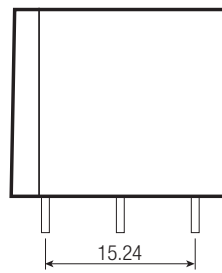
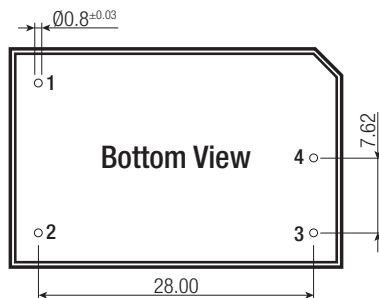
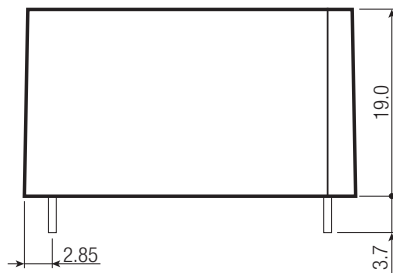
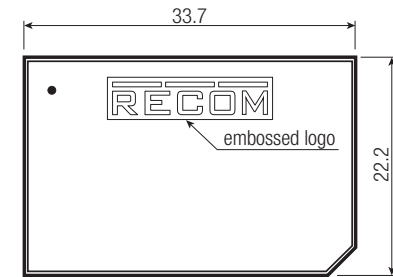
**DIMENSION AND PHYSICAL CHARACTERISTICS**

| Parameter         | Type        | Value                                    |
|-------------------|-------------|------------------------------------------|
| Material          | case<br>PCB | black plastic (UL94V-2)<br>FR4 (UL94V-0) |
| Dimension (LxWxH) |             | 33.7 x 22.2 x 19.0mm                     |
| Weight            |             | 12g typ.                                 |

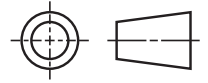
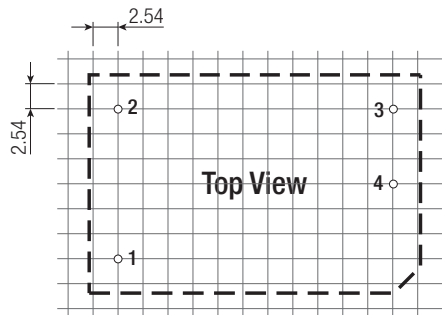
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**Specifications** (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

### Dimension Drawing (mm)



### Recommended Footprint Details



### Pin Connections

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

Tolerance:

Pin length: -0.5/+0.9

xx.x= ±0.5mm

x.xx= ±0.25mm

### PACKAGING INFORMATION

| Parameter                   | Type           | Value                 |
|-----------------------------|----------------|-----------------------|
| Packaging Dimension (LxWxH) | tube           | 470.0 x 36.4 x 26.4mm |
| Packaging Quantity          |                | 20pcs                 |
| Storage Temperature Range   |                | -25°C to +85°C        |
| Storage Humidity            | non-condensing | 5% - 95% RH max.      |

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