

Features

Regulated Converter

- 1 inch² footprint for the tiniest 3 watt module
- Standby mode optimized (Ecodesign Lot 6)
- No load power consumption <150mW
- Operating temperature range: -40°C to +80°C
- Household IEC/EN60335
- EMC compliance without external components

Description

The RAC03-K series are the smallest 3 watt solution on the market. In a compact 1in² footprint, these modules deliver an output power of 3 watts from -40°C to 60°C and 2 watts up to 80°C. Despite such a high power density and small footprint, the RAC03-K series is a complete solution supporting Ecodesign Lot 6 standby mode operation for worldwide applications in automation, industry 4.0, IoT, household, and home automation. With an input voltage range from 85 to 264VAC and international safety certifications for industrial, domestic, ITE, and household applications, these are some of the most versatile power modules on the market. Due to their reinforced class II installation rating and their significantly wide margin to class B emissions compliance without external components, these are the easiest to use modular power solutions in the industry.

RAC03-K

3 Watt Single Output



Selection Guide

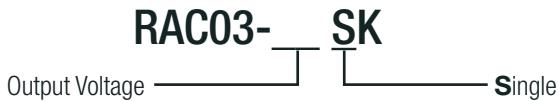
| Part Number | Input Voltage Range [VAC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ ⁽¹⁾ [%] | Max. Capacitive Load [μF] |
|-------------|---------------------------|----------------------|---------------------|-----------------------------------|---------------------------|
| RAC03-3.3SK | 85-264 | 3.3 | 900 | 69 | 10000 |
| RAC03-05SK | 85-264 | 5 | 600 | 74 | 10000 |
| RAC03-12SK | 85-264 | 12 | 250 | 78 | 2200 |
| RAC03-15SK | 85-264 | 15 | 200 | 75 | 1800 |
| RAC03-18SK | 85-264 | 18 | 170 | 78 | 1500 |
| RAC03-24SK | 85-264 | 24 | 125 | 77 | 680 |

Notes:

Note1: Efficiency is tested at 25°C with constant resistive load and 230VAC

UL/IEC/EN62368-1 certified
 CAN/CSA C22.2 No. 62368-1-14 certified
 IEC/EN60335-1 certified
 EN55032/EN55024 compliant
 EN55014-1 /-2 compliant
 IEC/EN61204-3 compliant
 FCC 47 Part 15
 CB Report

Model Numbering



Ordering Examples

| | | | |
|--------------|--------|--------|-----|
| RAC03-05SK = | 5Vout | Single | THT |
| RAC03-12SK = | 12Vout | Single | THT |

Specifications (measured @ $T_a = 25^\circ\text{C}$, 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 ^(2,3) | nom. Vin = 230VAC | | 85VAC 120VDC | 230VAC | 264VAC 370VDC |
| Input Current | 115VAC 230VAC | | | | 80mA 40mA |
| Inrush Current | cold start at $+25^\circ\text{C}$ | 115VAC 230VAC | | | 10A 20A |
| No load Power Consumption | 230VAC | | | 100mW | 150mW |
| ErP Standby Mode Conformity (Output Load Capability) | Input Power= 0.5W 1W | | | | 0.3W 0.7W |
| Input Frequency Range | AC Input | | 47Hz | | 63Hz |
| Minimum Load | | | 0% | | |
| Power Factor | 115VAC 230VAC | | 0.5 0.4 | | |
| Start-up Time | | | | 20ms | |
| Rise Time | | | | 15ms | |
| Hold-up Time | 115VAC 230VAC | | | 15ms 80ms | |
| Internal Operating Frequency | 100% load at nominal Vin | | | | 130kHz |
| Output Ripple and Noise ⁽⁴⁾ | 20MHz BW | 3.3Vout, 5Vout all others | | | 60mVp-p 1% of Vout nom. |

Notes:

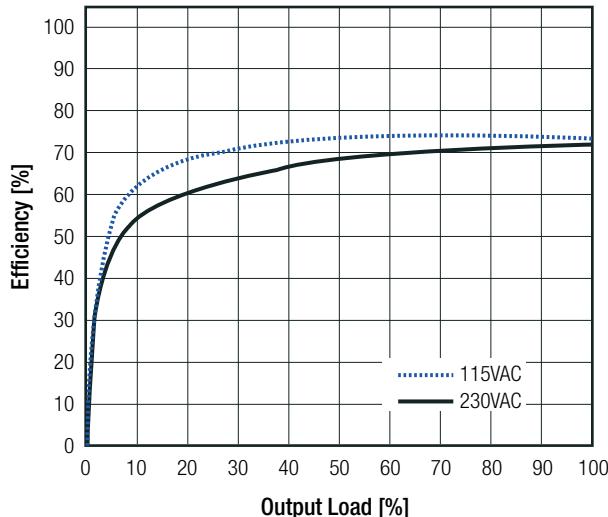
Note2: The products were submitted for safety files at AC-Input operation

Note3: Refer to "**Line Derating**"

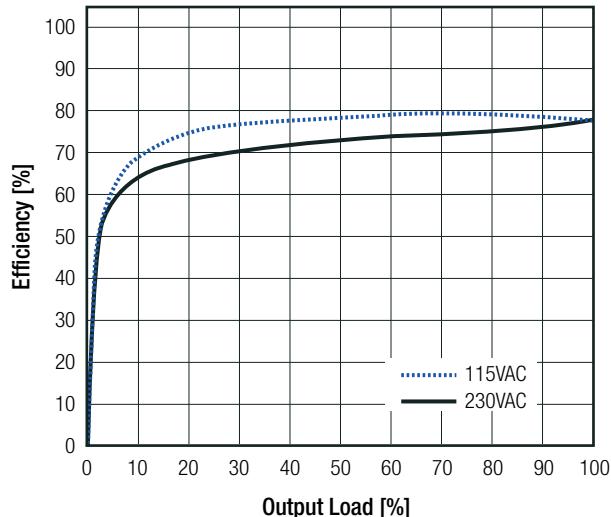
Note4: Measured with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

Efficiency vs. Load

RAC03-05SK

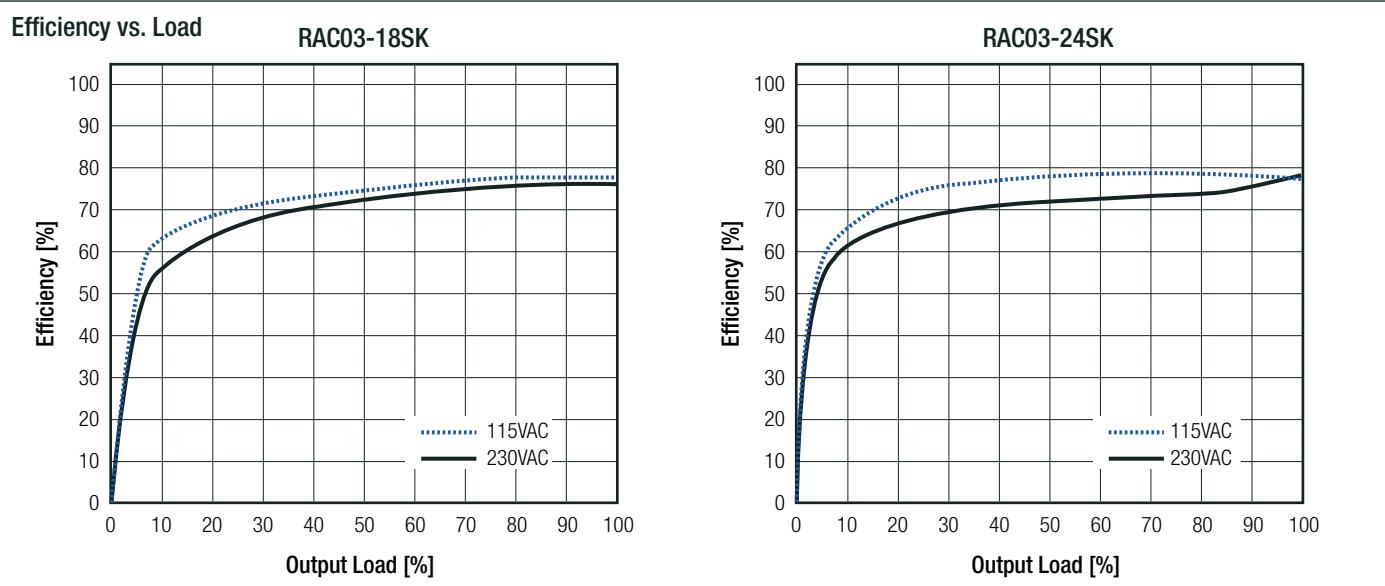


RAC03-12SK



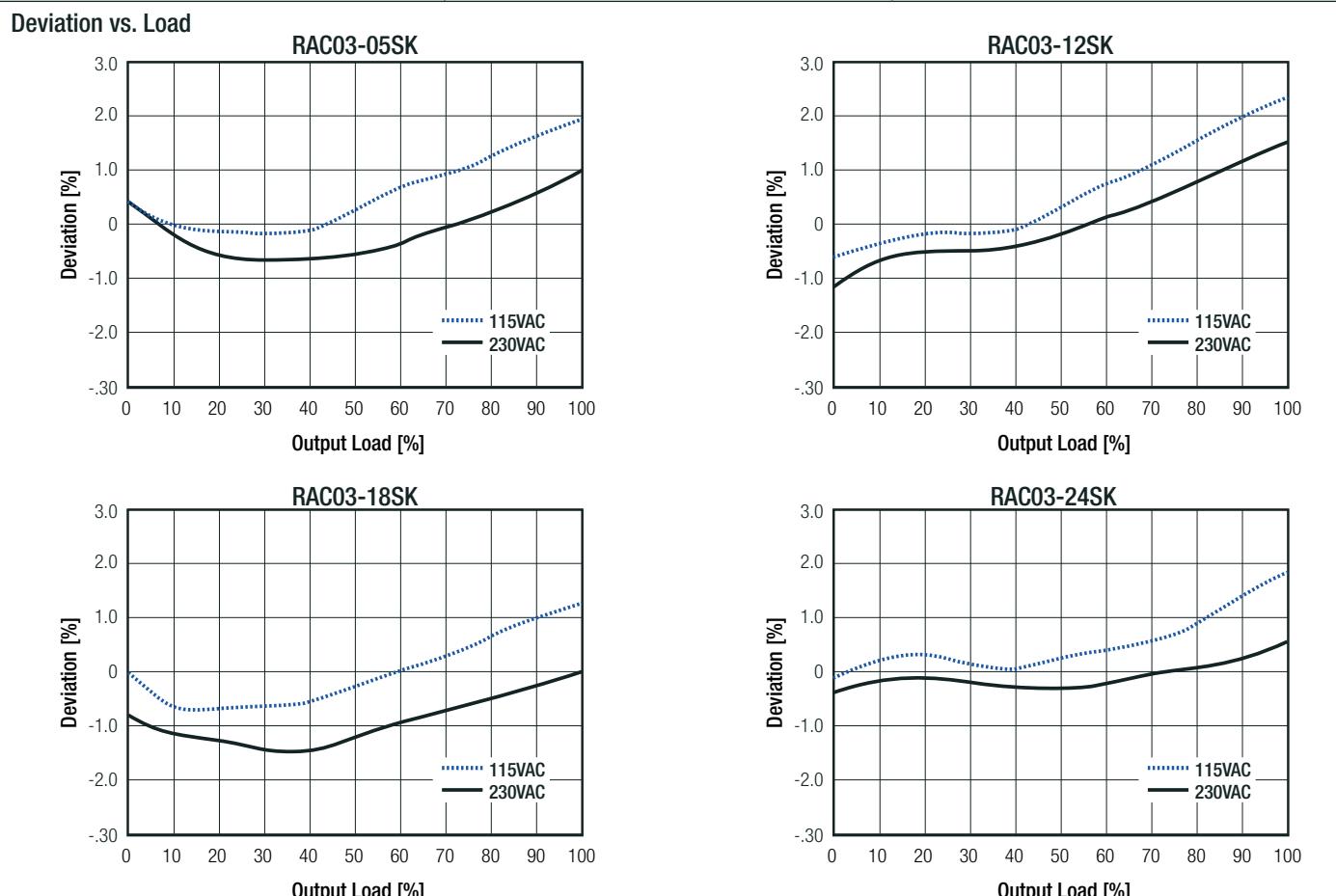
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Specifications (measured @ $T_a = 25^\circ\text{C}$, nom. Vin, full load and after warm-up unless otherwise stated)



REGULATIONS

| Parameter | Condition | Value |
|--------------------|---------------------------------------|-------------------------------------|
| Output Accuracy | | $\pm 3.0\%$ typ. |
| Line Regulation | low line to high line, full load | $\pm 2.5\%$ typ. |
| Load Regulation | 10% to 100% load | 2.5% typ. |
| Transient Response | 25% load step change recovery time | 4.0% max. 500 μs typ. |



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

| PROTECTIONS | | | |
|---|--------------|--------------|----------------------------|
| Parameter | Type | | Value |
| Input Fuse ⁽⁵⁾ | internal | | fusible resistor |
| Short Circuit Protection (SCP) | below 100mΩ | | Hiccup Mode, auto recovery |
| Over Voltage Category (OVC) | | | OVCII |
| Over Current Protection (OCP) | | | Hiccup Mode, auto recovery |
| Class of Equipment | | | Class II |
| Isolation Voltage (safety certified) ⁽⁶⁾ | I/P to O/P | 1 minute | 3kVAC |
| Isolation Resistance | Viso= 500VDC | | 1GΩ min. |
| Isolation Capacitance | I/P to O/P | 100kHz, 0.1V | 100pF max. |
| Insulation Grade | | | reinforced |
| Leakage Current | | | 0.25mA max. |

Notes:

Note5: Refer to local safety regulations if input over-current protection is also required. Recommended fuse: slow blow type

Note6: For repeat Hi-Pot testing, reduce the time and/or the test voltage

| ENVIRONMENTAL | | | |
|-----------------------------|----------------------------------|---|---|
| Parameter | Condition | | Value |
| Operating Temperature Range | @ natural convection 0.1m/s | full load refer to " <i>Derating Graph</i> " | -25°C to +60°C -40°C to +80°C |
| Maximum Case Temperature | 230VAC | | +95°C |
| Temperature Coefficient | | | ±0.05%/K |
| Operating Altitude | according to 62368-1 | | 5000m |
| Operating Humidity | | | 20% to 90% RH max. |
| Pollution Degree | | | PD2 |
| Vibration | according to MIL-STD-202G | | 10-500kHz, 2G 10min./1cycle, period 60 min. each along x, y, z |
| MTBF | according to MIL-HDBK-217F, G.B. | +25°C +30°C +40°C | >1977 x 10 ³ hours >1895 x 10 ³ hours >1794 x 10 ³ hours |
| Design Lifetime | 230VAC/60Hz and full load | +25°C | >40 x 10 ³ hours |

Derating Graph
(@ Chamber and natural convection 0.1m/s)

Line Derating

| Ambient Temperature [°C] | Output Load [%] |
|--------------------------|-----------------|
| -40 | 67 |
| -30 | 75 |
| -25 | 100 |
| 0 | 100 |
| 20 | 100 |
| 60 | 100 |
| 70 | 85 |
| 80 | 67 |

| Input Voltage [VAC] | Output Load [%] |
|---------------------|-----------------|
| 85 | 67 |
| 100 | 100 |
| 264 | 100 |

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

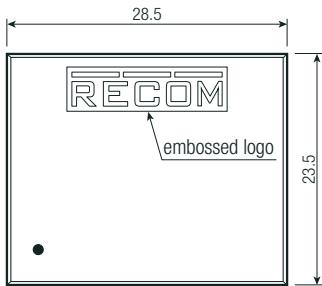
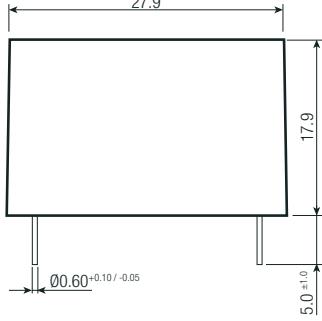
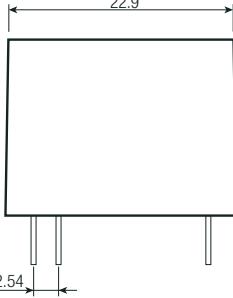
| SAFETY AND CERTIFICATIONS | | |
|---|--|--|
| Certificate Type | Report Number | Standard |
| Audio/video, information and communication technology equipment - Safety requirements | E224736 | UL62368-1:2014, 2nd Edition CAN/CSA C22.2 No. 62368-1-14, 2nd Edition |
| Audio/video, information and communication technology equipment - Safety requirements (CB Scheme) | E491408-A6013 | IEC62368-1:2014, 2nd Edition |
| Audio/video, information and communication technology equipment - Safety requirements | | EN62368-1:2014 + A11:2017 |
| Household and similar electrical appliances - Safety - Part 1: General requirements (LVD) | LCS190408025CS | IEC60335-1:2010 + C1:2016, 5th Edition EN60335-1:2012 + A13:2017 |
| Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure | | EN62233:2008 |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme) | 50237373 001 | IEC61558-1:2005 2nd Edition + A1:2009 |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V | | EN61558-1:2005 + A1:2009 |
| Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units (CB Scheme) | | IEC61558-2-16:2009 1st Edition + A1:2013 |
| Safety of transformers, reactors, power supply units and similar products for supply voltages up to 1100 V Part 2-16: Particular requirements and tests for switch mode power supply units and transformers for switch mode power supply units | | EN61558-2-16:2009 + A1:2013 |
| RoHS2 | | RoHS-2011/65/EU + AM-2015/863 |
| EMC Compliance | | |
| EMC Compliance | Condition | Standard / Criterion |
| Low voltage power supplies, d.c. output - Part 3: Electromagnetic compatibility | LCS190408054BE | IEC/EN61204-3:2008, Class B |
| Electromagnetic compatibility of multimedia equipment - Emission requirements ⁽⁷⁾ | | EN55032:2015, Class B |
| Information technology equipment - Immunity characteristics - Limits and methods of measurement | | EN55024:2010 + A1:2015 |
| Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission ⁽⁷⁾ | | EN55014-1:2006 + A2:2011 |
| Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 2: Immunity | | EN55014-2:2015 |
| ESD Electrostatic discharge immunity test | Air: ±2, 4, 8kV Contact: ±2, 4kV | EN61000-4-2:2009, Criteria B |
| Radiated, radio-frequency, electromagnetic field immunity | 10V/m (80-1000MHz) 3V/M (1.4-2GHz) 1V/m (2-2.7GHz) | EN61000-4-3:2006 + A1:2009, Criteria A |
| Fast Transient and Burst Immunity | AC & DC Port: ±2kV | EN61000-4-4:2012, Criteria B |
| Surge Immunity | AC Port: ±1kV DC Port: ±0.5kV | EN61000-4-5:2014 + A1:2017, Criteria B |
| Immunity to conducted disturbances, induced by radio-frequency fields | AC & DC Port: 10V | EN61000-4-6:2014, Criteria A |
| Power Magnetic Field Immunity | 50Hz, 30A/m | EN61000-4-8:2010, Criteria A |
| Voltage Dips | 100% and 60% | EN61000-4-11:2004 + A1:2017, Criteria B |
| | 30% and 20% | EN61000-4-11:2004 + A1:2017, Criteria C |
| Voltage Interruptions | >95% | EN61000-4-11:2004 + A1:2017, Criteria C |
| Limits of Voltage Fluctuations & Flicker | | EN61000-3-3:2013 |
| Limitations on the amount of electromagnetic interference allowed from digital and electronic devices | | FCC 47 Part 15 Subpart B |
| Notes: Note7: If output is connected to GND, please contact RECOM tech support for further information | | |

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

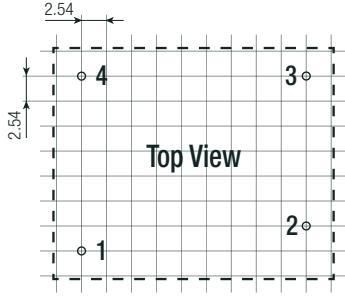
| DIMENSION AND PHYSICAL CHARACTERISTICS | | |
|--|----------------------------------|---|
| Parameter | Type | Value |
| Material | case/baseplate potting PCB | black plastic, (UL94V-0) silicone, (UL94V-0) FR4, (UL94V-0) |
| Dimension (LxWxH) | | 28.5 x 23.5 x 17.9mm |
| Weight | | 20g typ. |

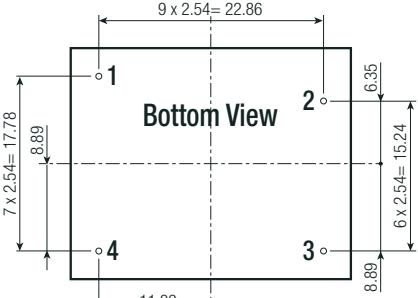
| Dimension Drawing (mm) | | Pinning information |
|------------------------|------------|-------------------------|
| Pin # | Single | |
| 1 | VAC in (L) | NC= no connection |
| 2 | -Vout | Tolerance: xx.x= ±0.5mm |
| 3 | +Vout | xx.xx= ±0.3mm |
| 4 | VAC in (N) | |

NC= no connection
Tolerance: xx.x= ±0.5mm
xx.xx= ±0.3mm

Recommended Footprint Details





| PACKAGING INFORMATION | | |
|-----------------------------|----------------|-----------------------|
| Parameter | Type | Value |
| Packaging Dimension (LxWxH) | tube | 486.8 x 30.5 x 27.6mm |
| Packaging Quantity | | 18pcs |
| Storage Temperature Range | | -40°C to +85°C |
| Storage Humidity | non condensing | 20% to 90% RH max. |

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