Technical Data Sheet

# RAC15-K/WI Series ◊ AC/DC Power Supply

15W ◊ Input: 18V-264VAC and 18V-375VDC

AC/DC Converter

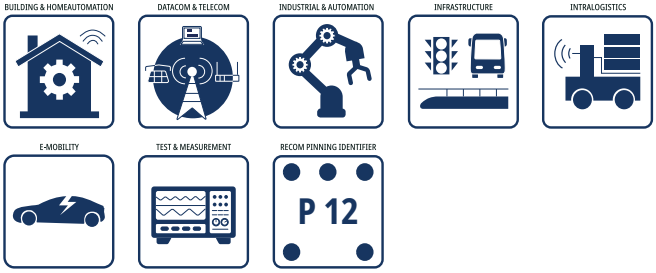
## FEATURES

- Ultra low Input: AC: 18-264V or DC: 18-375V
- 1.5”x2” compact size; standard pinning [P12]
- Print mount or flying wire connections
- OVC III to 3000m or OVC II to 5000m altitude
- Operating temperature ratings from -40° to 85°C
- UL industry and IEC household
- EMI EN55032 “B” filter inside
- No load power consumption typ.: 30mW
- 3 year warranty




52.5 x 40.0 x 25.5mm (2.06 x 1.57 x 1.0 inch)

## APPLICATIONS




## SAFETY & EMC

E224736

HOUSEHOLD CERTIFIED EN-60335-1

RoHS² compliant 10 from 10

Reach compliant

## DESCRIPTION

The RAC15-K/WI power conversion series with extended wide input to ultra-low mains voltages converts inputs ranging from 24 to 240VAC nominal or 18 to 375VDC into regulated outputs from 5 to 54 VDC. The sealed modules in a compact size of 1.5 x 2 inches with the industry standard pinning “P12” enable integration via solder mounting or via flexible cable connections. Certified for operation at altitudes up to 3000m under OVC III or up to 5000m under OVC II requirements, the power supplies meet strict safety standards according to UL and IEC certifications of industrial and household standards. In addition, the integrated EMI EN55032 “B” filter ensures minimal electromagnetic interference for compliant integration in a wide variety of applications. Together with the mechanically identical RAC15-K/480 series RECOM´s range of 1.5”x2” modules opens up an entire accessible conversion range from 24VAC to 480VAC with just two items of the same form factor.

## SELECTION GUIDE

| Part Number | Input Voltage Range [VAC] | Input Voltage Range [VDC] | Output Voltage nom. [VDC] | Output Current rated [mA] | Efficiency (1) typ. [%] | Output Power continuous (2) [W] |
|---|---|---|---|---|---|---|
| RAC15-05SK/WI (2) | 18-264 | 18-375 | 5 | 3000 | 82 | 15 |
| RAC15-12SK/WI (2) | 18-264 | 18-375 | 12 | 1250 | 83 | 15 |
| RAC15-15SK/WI (2) | 18-264 | 18-375 | 15 | 1000 | 83 | 15 |
| RAC15-24SK/WI (2) | 18-264 | 18-375 | 24 | 625 | 84 | 15 |
| RAC15-54SK/WI (2) | 18-264 | 18-375 | 54 | 278 | 80 | 15 |

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

Note2: Refer to **„Derating Graph“**

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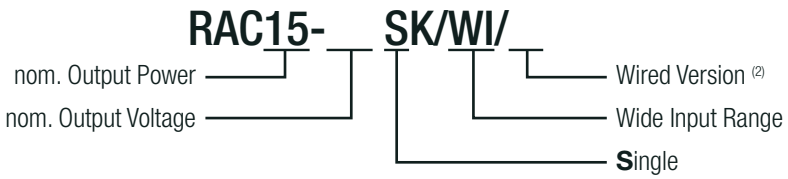

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# RAC15-K/WI Series ◊ AC/DC Power Supply

15W ◊ Input: 18V-264VAC and 18V-375VDC

RECOM AC/DC Converter

## MODEL NUMBERING




Note2: add suffix "/W" for wired version
without suffix standard THT version

## ACCESSIBLE PART (ONLY VALID FOR THT VERSION)

| Part Number | Description | Datasheet Link |
|---|---|---|
| RAC-ADAPT-ST-1 | adapter board with screw terminals for easy connection | RAC-ADAPT-ST-1.pdf |

## BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

| Parameter | Condition | | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Nominal Input Voltage | 50/60Hz | | 24VAC | | 240VAC |
| Operating Range (4) | 47-63Hz | | 18VAC | | 264VAC |
| | DC operation | 5Vout, 12Vout, 15Vout | 18VDC | | 375VDC |
| | | 24Vout | 20VDC | | |
| | | 54Vout | 21.6VDC | | |
| Input Current | 48VAC | | | 600mA | |
| | 115VAC | | | 280mA | 450mA |
| | 230VAC | | | 180mA | 450mA |
| Inrush Current | cold start at 25°C | 100VAC | | | 40A |
| | | 230VAC | | | 65A |
| No Load Power Consumption | | | | 30mW | 100mW |
| Ecodesign Standby Mode Use (Available output power for stated input power) | 100/230VAC | $P_{IN}$= 0.5W | 0.32W | | |
| | | $P_{IN}$= 1.0W | 0.7W | | |
| | | $P_{IN}$= 2.0W | 1.48W | | |
| Input Frequency Range | AC operation | | 47Hz | | 63Hz |
| Minimum Load | | | 0% | | |
| Power Factor | 100VAC | | 0.5 | | |
| | 230VAC | | 0.45 | | |
| Start-up time | 48/100/230VAC | | | | 120ms |
| Rise time | 48/100/230VAC | | | | 25ms |
| Hold-up time | 230VAC | | 120ms | 150ms | |
| Internal Operating Frequency | | | | | 75kHz |
| Output Ripple and Noise (5) | 20MHz BW | | | | 1% of Vout |

Note4: The products were submitted to all safety files at AC (21.6V-264VAC), and DC according to 62368, 61558 (24-375VDC) operation.

Note5: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output (low ESR).
The test setup can have an impact on ripple noise values (placement of scope probe, capacitors, it's specifications, wires, PCB tracks, distances, etc.)

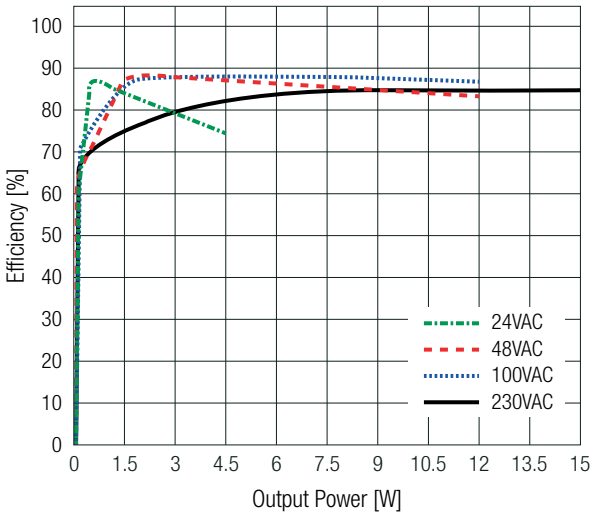
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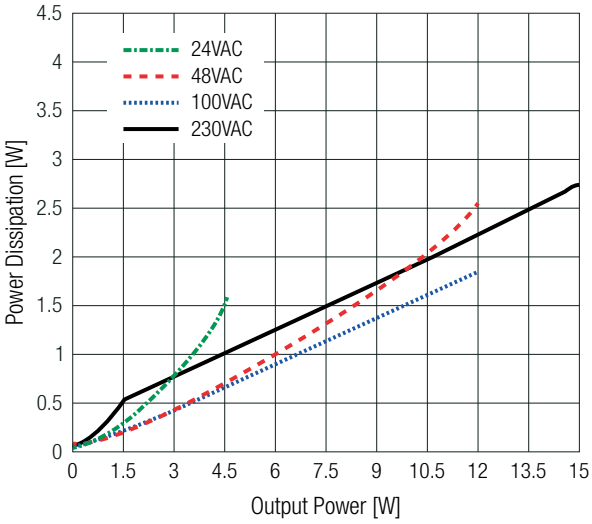
## BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

### RAC15-05SK/WI

Efficiency vs. Output Power

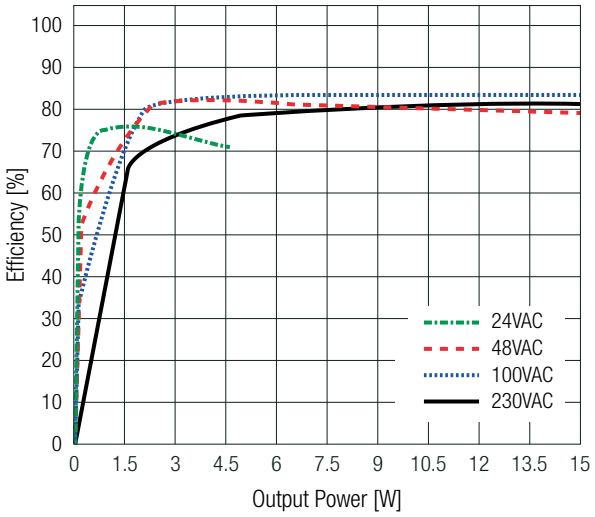



Power Dissipation vs. Output Power

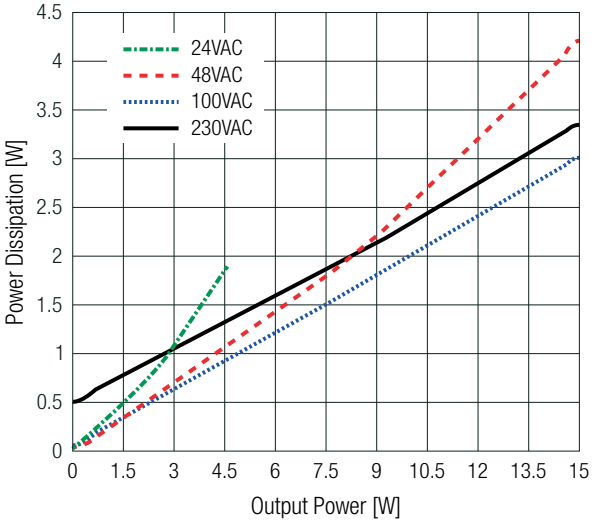



### RAC15-12SK/WI

Efficiency vs. Output Power

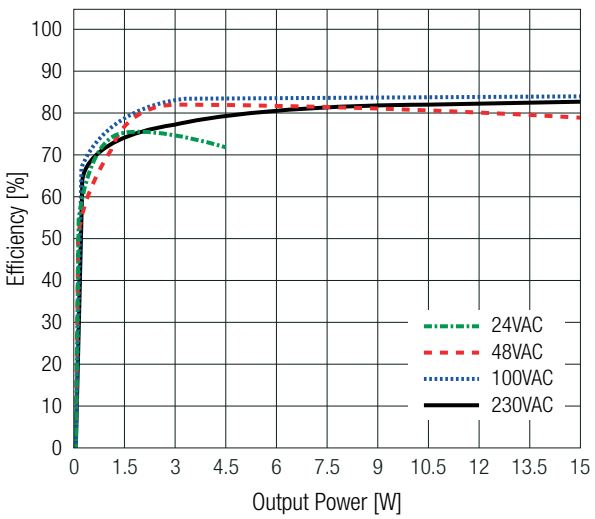



Power Dissipation vs. Output Power

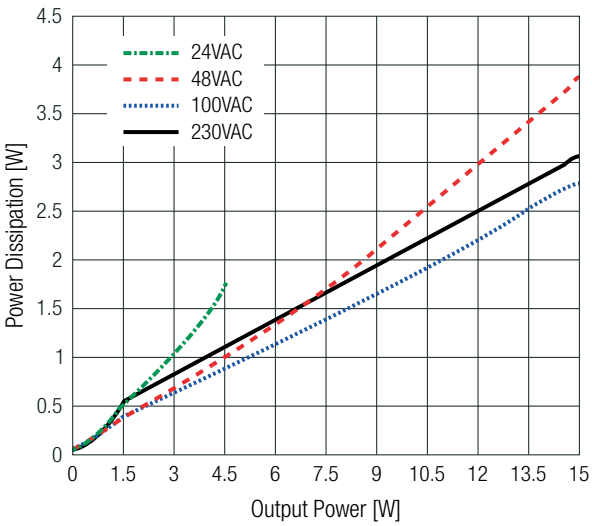



### RAC15-15SK/WI

Efficiency vs. Output Power




Power Dissipation vs. Output Power



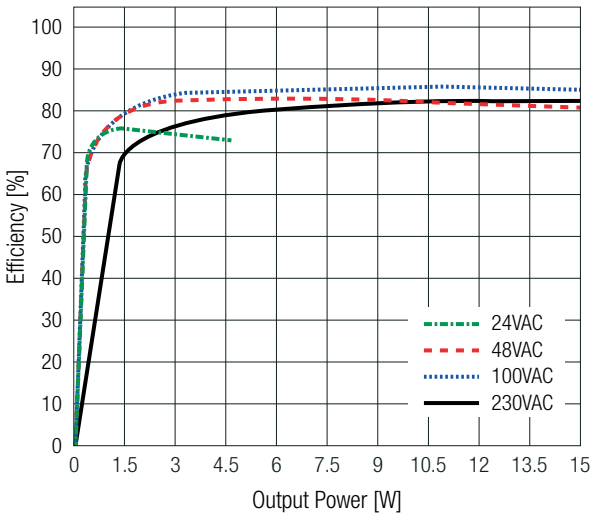

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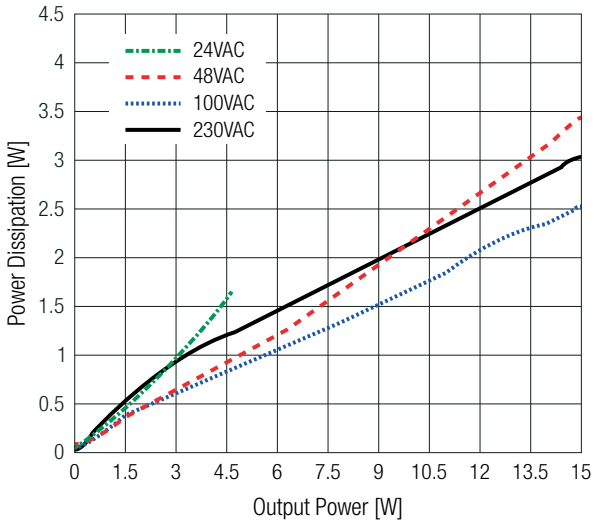
## BASIC CHARACTERISTICS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

### RAC15-24SK/WI

Efficiency vs. Output Power

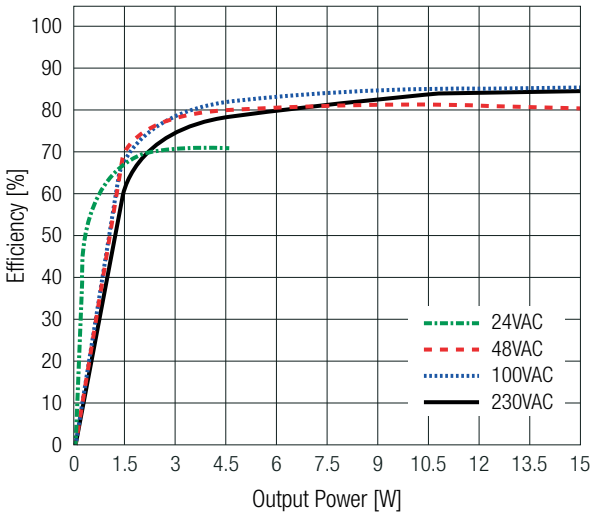



Power Dissipation vs. Output Power

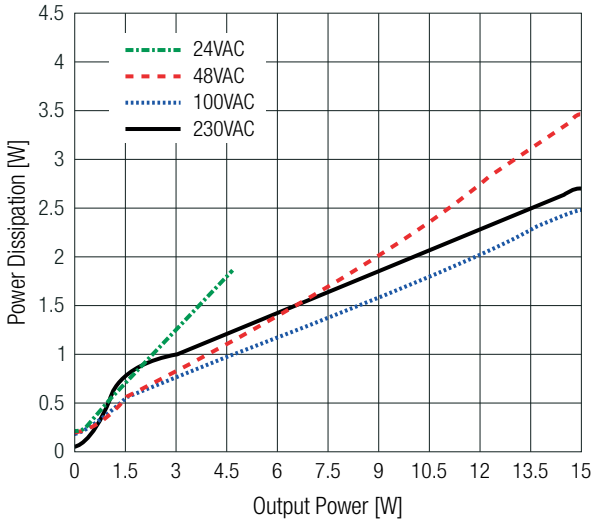



### RAC15-54SK/WI

Efficiency vs. Output Power




Power Dissipation vs. Output Power




## REGULATIONS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

| Parameter | Condition | | Value |
|---|---|---|---|
| Output Accuracy | | | ±2.0% typ. / ±3.0% max. |
| Line Regulation | low line to high line, full load | | ±0.5% typ. / ±1.0% max. |
| Load Regulation [7] | 10% to 100% load | | 1.0% typ. / 2.0% max. |
| Transient Response | 25% load step change | others | 0.5V max. |
| | | 54Vout | 1.5V max. |
| | recovery time | others | 3ms max. |
| | | 54Vout | 6ms max. |

Note7: Operation below 10% load will not harm the converter, but specifications may not be met.

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## PROTECTIONS (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

| Parameter | Type | | Value |
|---|---|---|---|
| Internal Input Fuse [8] | | | T3.15A slow blow type |
| Limited Power Source (LPS) | | | yes (62368-1) |
| Short Circuit Protection (SCP) | below 100mΩ | | hiccup mode |
| Over Voltage Protection (OVP) | | | 110%-150%, hiccup mode |
| Over Voltage Category (OVC) | 62368-1, 60335-1, 61558 with AC only | | OVC III (3000m) |
| | 61558 with DC only | | OVC III (2000m) |
| | 62368-1, 60335-1, 61558 | | OVC II (5000m) |
| Over Current Protection (OCP) | | | <150%, hiccup mode |
| Class of Equipment | | | Class II |
| Isolation Voltage [9] | I/P to O/P | 1 minute | 4kVAC |
| | | | 6kVDC |
| Isolation Resistance | | | 1GΩ min. |
| Isolation Capacitance | | | 100pF max. |
| Insulation Grade | | | reinforced |

Note8: For system integration with DC operation, consider a suitable DC fuse in front of the input.
Note9: For repeat Hi-Pot testing, reduce the time and/or the test voltage.

## ENVIRONMENTAL (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

| Parameter | Condition | | | Value |
|---|---|---|---|---|
| Operating Ambient Temperature Range | @ natural convection (0.1m/s), refer to **„Derating Graph“** | | | -40°C to +85°C |
| Maximum Case Temperature | | | | +110°C |
| Temperature Coefficient | | | | 0.03%/K |
| Operating Altitude [10] | 62368-1, 60335-1, 61558 with AC only | | | 3000m (OVC III) |
| | 61558 with DC only | | | 2000m (OVC III) |
| | 62368-1, 60335-1, 61558 | | | 5000m (OVC II) |
| Operating Humidity | non-condensing | | | 90% RH max. |
| Pollution Degree | | | | PD2 |
| MTBF | others | 100VAC | $T_{AMB}$= +25°C | 660 x 10³ hours |
| | | | $T_{AMB}$= +40°C | 500 x 10³ hours |
| | | 230VAC | $T_{AMB}$= +25°C | 670 x 10³ hours |
| | | | $T_{AMB}$= +40°C | 560 x 10³ hours |
| | 54Vout | 100/230VAC | $T_{AMB}$= +25°C | 330 x 10³ hours |
| | | | $T_{AMB}$= +40°C | 300 x 10³ hours |
| Design Lifetime | 230VAC/50Hz and full load | $T_{AMB}$= +50°C | | 30 x 10³ hours |

Note10: Recognized by safety agency for safe operation up to 5000m. High altitude operation may impact the performance and lifetime. Please contact RECOM tech support for advice.

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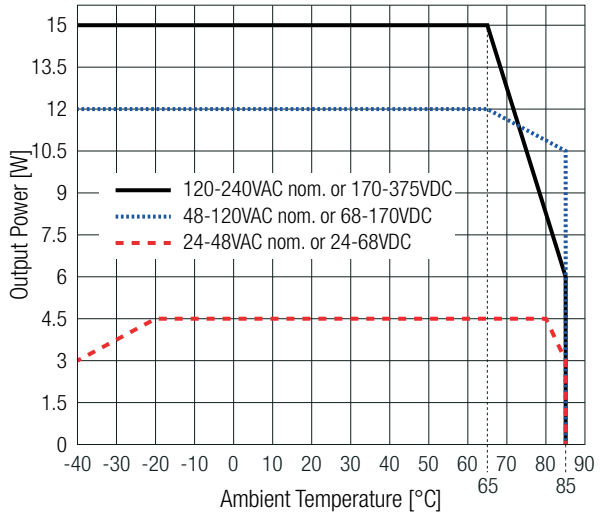
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## ENVIRONMENTAL (measured @ $T_{AMB}$= 25°C, nom. $V_{IN}$, full load and after warm-up unless otherwise stated)

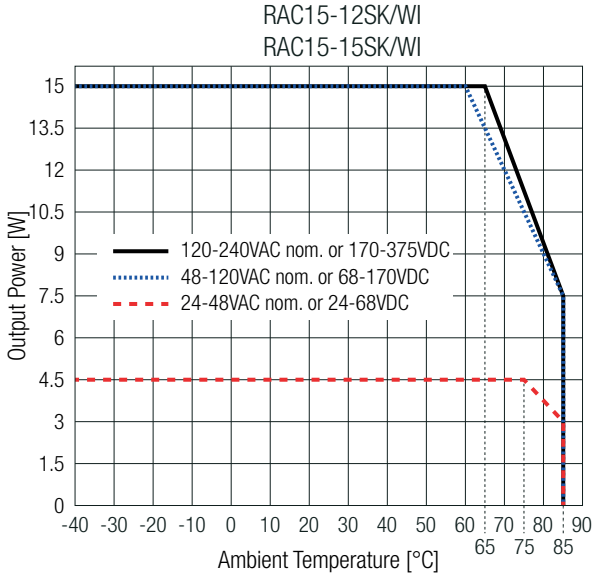
### Derating Graph

(@ Chamber and natural convection 0.1m/s)

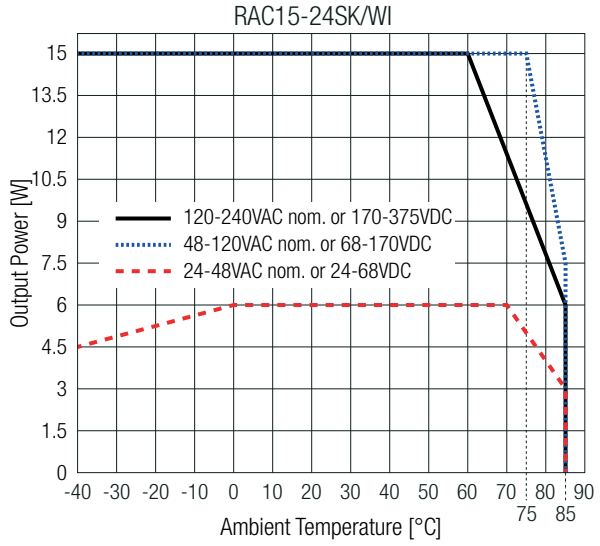
RAC15-05SK/WI



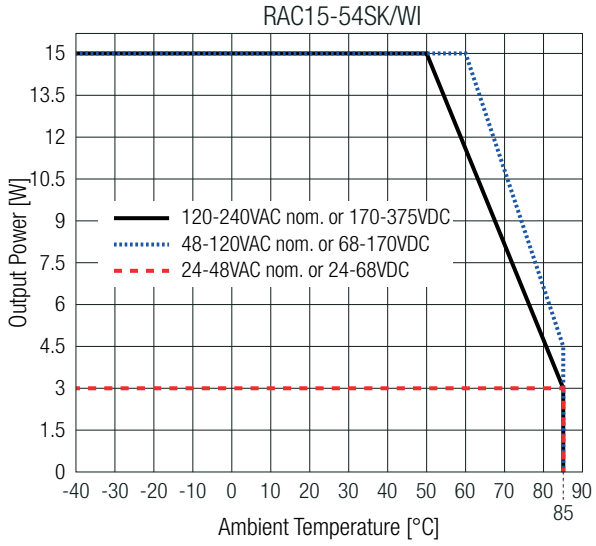

RAC15-12SK/WI
RAC15-15SK/WI




RAC15-24SK/WI




RAC15-54SK/WI




## SAFETY & CERTIFICATIONS

| Certificate Type (Safety) | Report Number | Standard |
|---|---|---|
| Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition | E491408-A6036-UL | UL62368-1:2019 3rd Edition |
| | | CAN/CSA-C22.2 No. 62368-1-19 3rd Edition |
| Audio/Video, information and communication technology equipment - Part1: Safety requirements 3rd Edition | 240619010 | IEC62368-1:2018 3rd Edition |
| | | EN IEC 62368-1:2020+A11:2020 |
| Household and similar electrical appliances – Safety – Part 1: General requirements | 64.110.24.03275.01 | IEC60335-1:2010 5th Edition |
| | | EN 60335-1:2012+A16:2023 |
| 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 3rd Edition | 085-240327401-000 | IEC61558-1:2017 3rd Edition |
| | | EN IEC 61558-1:2019 |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements | | IEC61558-2-16:2009+A1:2013 1st Edition |
| | | EN61558-2-16:2009+A1:2013 |
| RoHS2 | | RoHS-2011/65/EU + AM-2015/863 |

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## SAFETY & CERTIFICATIONS

| EMC Compliance according to EN55032 | Condition | Standard |
|---|---|---|
| Electromagnetic compatibility of multimedia equipment – Emission Requirements | | EN55032:2015+A11:2020 |
| Limitations on the amount of electromagnetic interference allowed from digital and electronic devices | | FCC 47 CFR Part 15 Subpart B, Class B |

| EMC Compliance according to EN61204-3 | Condition | | Standard |
|---|---|---|---|
| Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC) | | | EN IEC 61204-3:2018, Class B |
| ESD Electrostatic discharge immunity test | Air: ±2, 4, 8kV<br>Contact: ±4kV | | IEC61000-4-2:2008, Criteria A<br>EN61000-4-2:2009, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test | 10V/m (80-6000MHz)<br>3V/m (1.4-2GHz)<br>1V/m (2.0-2.7GHz) | | IEC/EN61000-4-3:2006 + A2:2010, Criteria A |
| Fast Transient and Burst Immunity | L, N, L & N: ±2kV | 12/24Vout | IEC/EN61000-4-4:2012, Criteria A |
| | | others | IEC/EN61000-4-4:2012, Criteria B |
| Surge Immunity | AC Port: L-N: ±0.5, 1kV | | IEC/EN61000-4-5:2014 + A1:2017, Criteria A |
| | AC Port: L-PE, N-PE: ±1, 2kV | | IEC/EN61000-4-5:2014 + A1:2017, Criteria A |
| Immunity to conducted disturbances, induced by radio-frequency fields | AC Port: 10V (0.15-80MHz) | | IEC61000-4-6:2013, Criteria A<br>EN61000-4-6:2014, Criteria A |
| Power Magnetic Field Immunity | 30A/m | | IEC61000-4-8:2009, Criteria A<br>EN61000-4-8:2010, Criteria A |
| Voltage Dips | 100% (0.5P, 1P)<br>60%, 30%, 20% | | IEC/EN61000-4-11:2004 + A1:2017, Criteria A |
| Voltage Interruptions | 100% | | IEC/EN61000-4-11:2004 + A1:2017, Criteria B |
| Limits of Voltage Fluctuations & Flicker | | | EN61000-3-3:2013 |

## DIMENSION & PHYSICAL CHARACTERISTICS

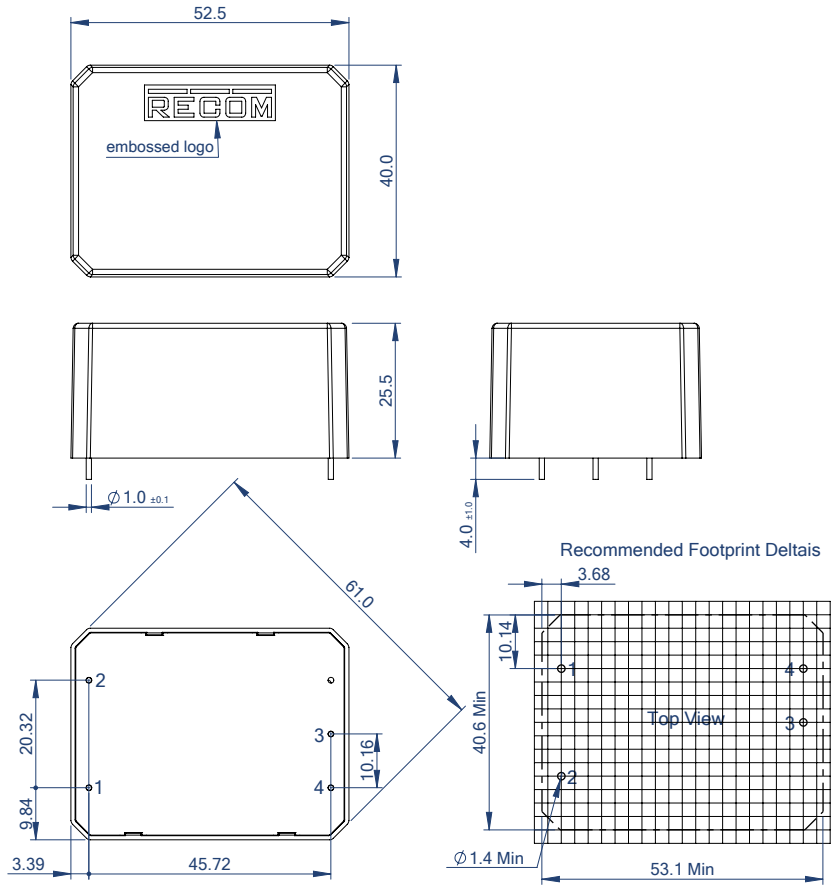
| Parameter | Type | Value |
|---|---|---|
| Materials | case/baseplate | plastic, (UL94 V-0) |
| | potting | silicone, (UL94 V-0) |
| | PCB | FR4, (UL94 V-0) |
| Dimension (LxWxH) | THT Version | 52.5 x 40.0 x 25.5mm<br>2.6 x 1.6 x 1.0 inch |
| | Wired Version | 52.5 x 40.0 x 25.5mm<br>2.6 x 1.6 x 1.0 inch |
| Weight | THT Version | 91g typ.<br>0.20 lbs |
| | Wired Version | 96g typ.<br>0.21 lbs |

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## DIMENSION & PHYSICAL CHARACTERISTICS

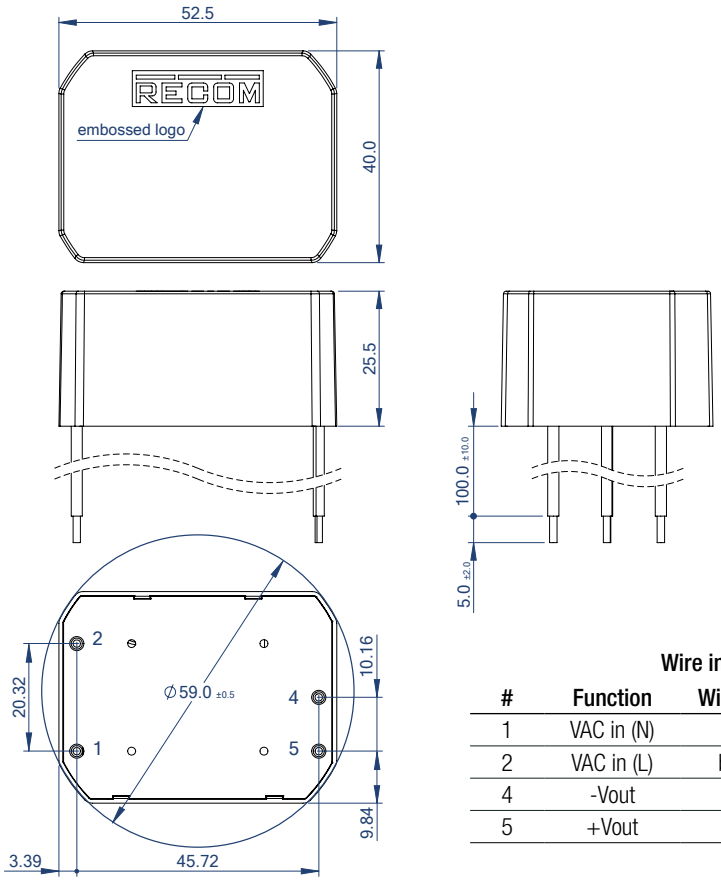
### Dimension Drawing "/THT" version (mm)




**Pinning information [P12]**

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

### Dimension Drawing "/W" version (mm)




**Wire information**

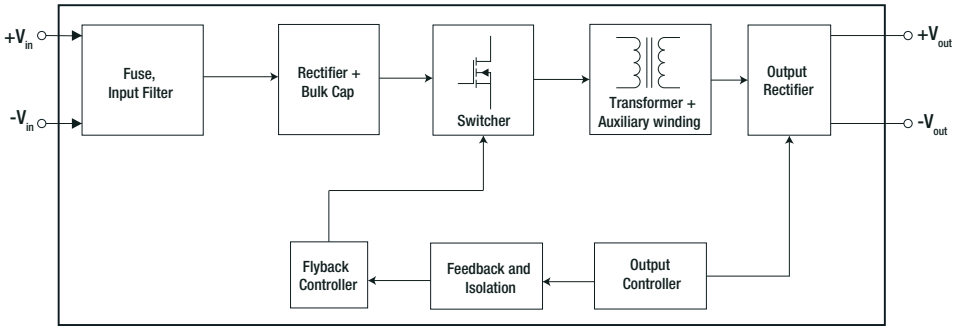
| # | Function | Wire color | Type | AWG |
|---|---|---|---|---|
| 1 | VAC in (N) | blue | UL-3266 | 18 |
| 2 | VAC in (L) | brown | UL-3266 | 18 |
| 4 | -Vout | black | UL-3266 | 18 |
| 5 | +Vout | red | UL-3266 | 18 |

Tolerance: xx.x= ±0.5mm
xx.xx= ±0.25mm

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## BLOCK DIAGRAM




## PACKAGING INFORMATION

| Parameter | Type | | Value |
|---|---|---|---|
| Packaging Dimension (LxWxH) | tube | THT Version | 490.0 x 56.0 x 40.0mm |
| | tray | Wired Version | 435.0 x 370.0 x 64.0mm |
| Packaging Quantity | tube | | 11pcs |
| | tray | | 24pcs |
| Storage Temperature Range | | | -40°C to +90°C |
| Storage Humidity | non-condensing | | 95% RH max. |

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