

Features

Regulated Converter

- Wide input range 85-305VAC
- Standby mode optimized (eco design Lot 6)
- Overvoltage category OVC III (2000m)
- Operating temperature range: -40°C to +90°C
- Overvoltage and overcurrent protected
- EMC compliant without external components
- Encapsulated module with pins or wired



RAC05-K/277

5 Watt Single Output



Description

The RAC05-K/277 series are multipurpose 5 watt AC/DC power supplies for enhanced mains input conditions rated to overvoltage category OVC III from 90VAC up to 305VAC with an extra wide operating temperature range from -40°C to +90°C. These modules are designed to supply worldwide applications in automation, Industry 4.0, IoT, household and smart buildings. For worldwide use they come with international safety certifications for industrial, domestic and ITE as well as household standards. With both PCB-mount and wired packages, fully protected outputs, and EMC class B emissions compliance without any external components, these are the easiest to use modular power solutions in the industry.

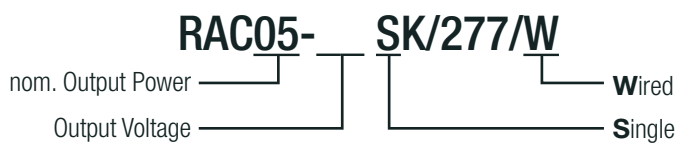
Selection Guide

| Part Number | Input Voltage Range [VAC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ ⁽¹⁾ [%] | Max. Capacitive Load ⁽²⁾ [µF] |
|-----------------|---------------------------|----------------------|---------------------|-----------------------------------|--|
| RAC05-3.3SK/277 | 85-305 | 3.3 | 1510 | 77 | 10000 |
| RAC05-05SK/277 | 85-305 | 5 | 1000 | 80 | 8000 |
| RAC05-12SK/277 | 85-305 | 12 | 416 | 83 | 1500 |
| RAC05-15SK/277 | 85-305 | 15 | 330 | 83 | 1000 |
| RAC05-24SK/277 | 85-305 | 24 | 210 | 84 | 330 |

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



Notes:

- Note3: add suffix „W“ for wired version
 without suffix, standard THT version

Ordering Examples:

| | | | | |
|------------------|--------|--------|---------------|---------------|
| RAC05-05SK/277 | 5 Watt | 5Vout | Single Output | THT version |
| RAC05-24SK/277 | 5 Watt | 24Vout | Single Output | THT version |
| RAC05-05SK/277/W | 5 Watt | 5Vout | Single Output | Wired version |
| RAC05-12SK/277/W | 5 Watt | 12Vout | Single Output | Wired version |



UL62368-1 certified
 EN62368-1 certified
 IEC/EN60335-1 certified
 EN62233 certified
 IEC/EN61558-1 certified
 IEC/EN61558-2-16 certified
 EN55032 compliant
 EN55014-1(-2) compliant
 CB Report

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 ^(4,5) | nom. Vin = 277VAC | | 85VAC 120VDC | 277VAC | 305VAC 430VDC |
| Input Current | 115VAC 230VAC 277VAC | | | | 150mA 100mA 75mA |
| Inrush Current | cold start at +25°C | 115VAC 230VAC 277VAC | | | 15A 30A 35A |
| No Load Power Consumption | | | | | 100mW |
| Input Frequency Range | | | 47Hz | | 63Hz |
| ErP Lot 6 Standby Mode Conformity (Output Load Capability) | Input Power= 0.5W 1.0W | | | | 0.34W 0.70W |
| Minimum Load | | | 0% | | |
| Power Factor | 115VAC 230VAC 277VAC | | 0.60 0.45 0.40 | | |
| Start-up Time | | | | 20ms | |
| Rise Time | | | | 10ms | |
| Hold-up Time | 115VAC 230VAC 277VAC | | | 20ms 60ms 80ms | |
| Internal Operating Frequency | 100% load at nominal Vin | | | 130kHz | |
| Output Ripple and Noise ⁽⁶⁾ | 20MHz BW | 3.3, 5Vout others | | 60mVp-p 1% of Vout | |

Notes:

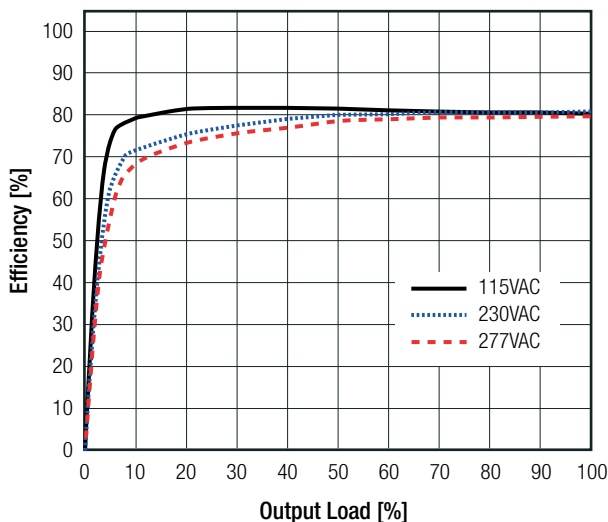
Note4: The products were submitted for safety files at AC-Input operation

Note5: Refer to „Line Derating“

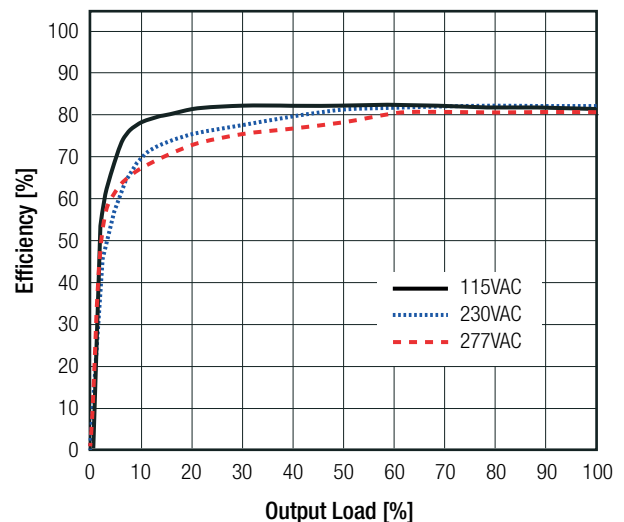
Note6: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

Efficiency vs. Load

RAC05-05SK/277



RAC05-12SK/277



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

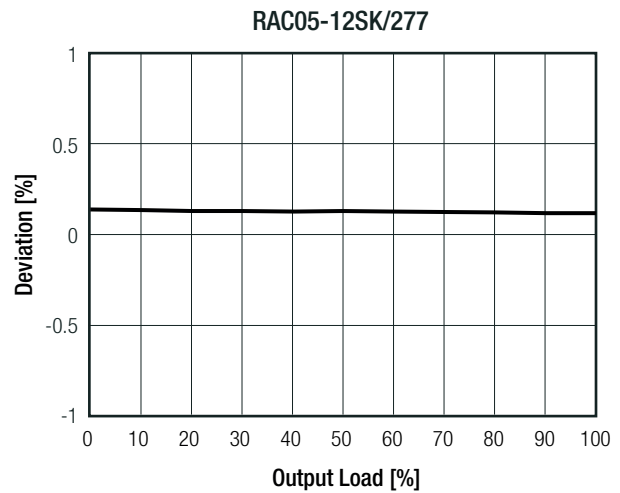
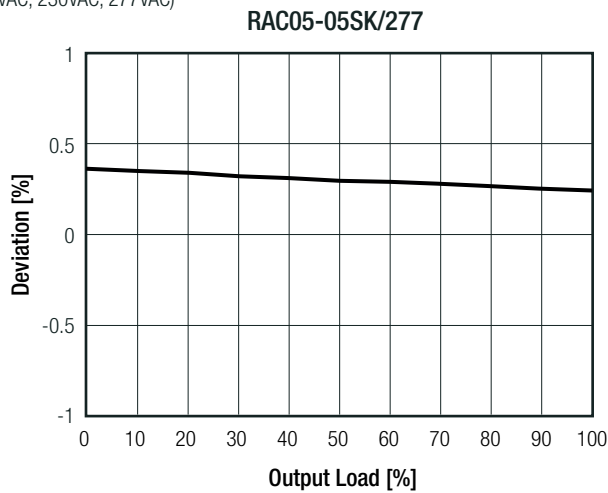
| REGULATIONS | | |
|--------------------------------|----------------------------------|------------|
| Parameter | Condition | Value |
| Output Accuracy | | ±1.0% typ. |
| Line Regulation | low line to high line, full load | ±0.5% typ. |
| Load Regulation ⁽⁷⁾ | 10% to 100% load | 1.0% typ. |
| Transient Response | 25% load step change | 4.0% max. |
| | recovery time | 500µs typ. |

Notes:

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

Deviation vs. Load

(at 115VAC, 230VAC, 277VAC)



| PROTECTIONS | | |
|---|---|---------------------------------|
| Parameter | Type | Value |
| Input Fuse ⁽⁸⁾ | internal | T1A, slow blow |
| Short Circuit Protection (SCP) | below 100mΩ | hiccup, automatic restart |
| Over Voltage Protection (OVP) | | 125% - 195%, latch of mode |
| Over Voltage Category | according to 62368-1; -2-16 according to 61558-1; 2-16 (3rd Edition) | OVCII (5000m) OVCIII (2000m) |
| Over Current Protection (OCP) | | 125% - 195%, hiccup mode |
| Class of Equipment | | Class II |
| Isolation Voltage (safety certified) ⁽⁹⁾ | I/P to O/P | 1 minute |
| Isolation Resistance | | Isolation Voltage 500VDC |
| Isolation Capacitance | | 100pF max. |
| Insulation Grade | | reinforced |
| Leakage Current | | 0.25mA max. |

Notes:

Note8: Refer to local safety regulations if input over-current protection is also required

Note9: For repeat Hi-Pot testing, reduce the time and/or the test voltage

continued on next page

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

Peak Load Capability

P_{nom} = nom. output power [W]
 P_p = peak output power [W]
 P_r = recovery power [W]
 t_1 = peak time [s]
 t_2 = recovery time [s]

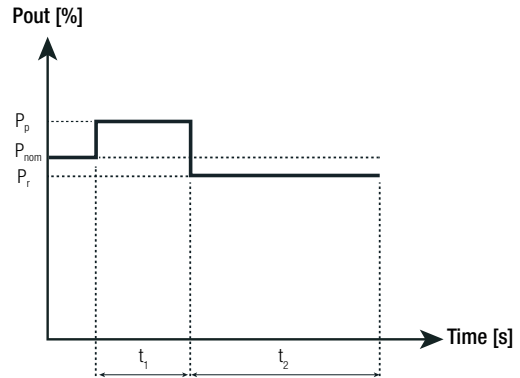
P_{nom} = please refer to derating graph

$$P_p = 1.2 \times P_{nom}$$

$$t_1 \leq 30s$$

$$t_2 \geq 2 \times t_1$$

$$P_r = \frac{P_{nom} \times (t_1 + t_2) - P_p \times t_1}{t_2}$$



Practical Example:

$$P_r = \frac{5W (30s + 60s) - (6W \times 30s)}{60s} = 4.5W$$

ENVIRONMENTAL

| Parameter | Condition | | Value | |
|------------------------------------|----------------------------------|---------------------------|---|----------------|
| Operating Temperature Range | @ natural convection 0.1m/s | full load | 3.3Vout | -40°C to +70°C |
| | | | 5, 12Vout | -40°C to +75°C |
| | | | 15, 24Vout | -40°C to +80°C |
| | | refer to „Derating Graph“ | 3.3Vout | -40°C to +85°C |
| | | all others | -40°C to +90°C | |
| Maximum Case Temperature | | | +95°C | |
| Temperature Coefficient | | | 0.05%/K | |
| Operating Altitude ⁽¹⁰⁾ | | | 5000m (OVCI) 2000m (OVCIII) | |
| Operating Humidity | non-condensing | | 5% - 95% RH max. | |
| Pollution Degree | | | PD2 | |
| Vibration | according to MIL-STD-202G | | 10-500Hz, 2G 10min./1cycle, period 60min. each along x,y,z axis | |
| MTBF | according to MIL-HDBK-217F, G.B. | +25°C | >2252 x 10 ³ hours | |
| | | +40°C | >1806 x 10 ³ hours | |
| Design Lifetime | 230VAC | +25°C | 125 x 10 ³ hours | |
| | | +70°C | 23 x 10 ³ hours | |
| | 277VAC | +25°C | 105 x 10 ³ hours | |
| | | +70°C | 18 x 10 ³ hours | |

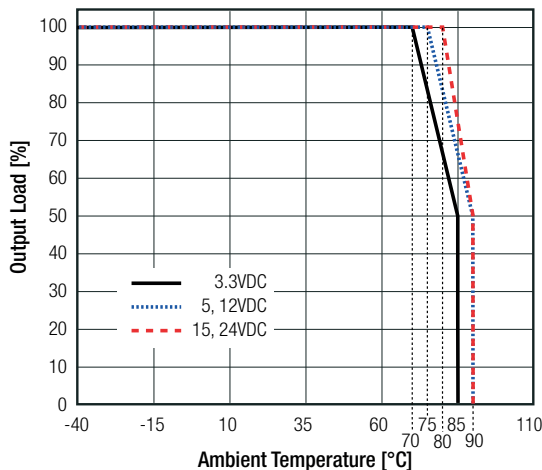
Notes:

Note10: Recognized by UL for safe operation up to 5000m. High altitude operation may impact the performance and lifetime.

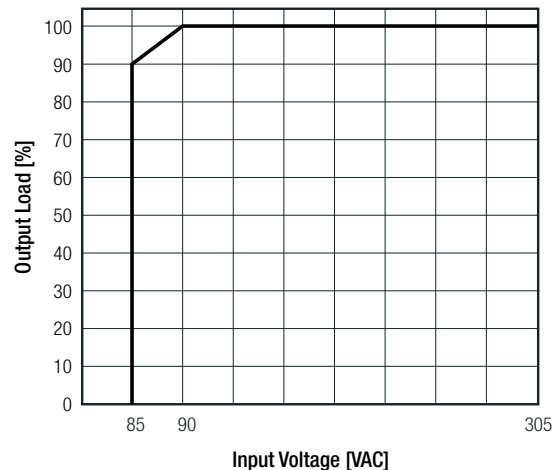
Contact RECOM tech support for advice

Derating Graph

(@ Chamber and natural convection 0.1m/s)



Line Derating



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

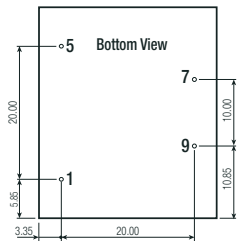
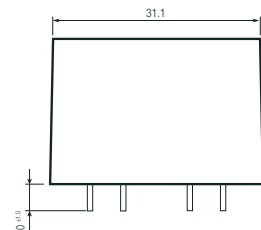
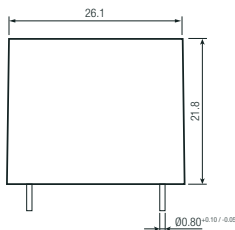
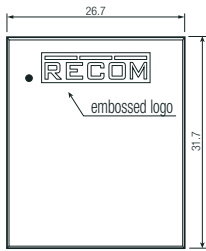
| SAFETY AND CERTIFICATIONS | | |
|--|---|---|
| Certificate Type (Safety) | Report / File Number | Standard |
| Audio/Video, information and communication technology equipment - Part 1: Safety requirements | E491408-A6004-UL | UL62368-1, 2nd Edition, 2014-12-01 CAN/CSA-C22.2 No. 62368-1-14, 2nd Edt., 2014-12 |
| Audio/Video, information and communication technology equipment - Part 1: Safety requirements (CB Scheme) | E491408-A6007-CB-1 | IEC62368-1:2014 2nd Edition |
| Audio/Video, information and communication technology equipment - Part 1: Safety requirements (LVD) | | EN62368-1:2014 + A11:2017 |
| Household and similar electrical appliances - Safety - Part 1: General requirements | LCS190308001CS | IEC60335-1:2010 + A2:2016 + C1:2016, 5th Edt. 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) | 50230493 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 power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme) | CN21A360-001 | IEC61558-1:2017 3rd Edition |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V Part 2: Particular requirements (CB Scheme) | | IEC61558-2-16:2009+A1:2013 1st Edition |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V | CN222ZY2-001 | 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 | | EN61558-2-16:2009+A1:2013 |
| EAC | RU-AT.03.67361 | TP TC 004/2011 |
| RoHS2 | | RoHS-2011/65/EU + AM-2015/863 |
| EMC Compliance | Conditions | Standard / Criterion |
| Low-voltage power supplies DC output - Part 3: Electromagnetic compatibility | | EN61204-3: 2018, Class B |
| Electromagnetic compatibility of multimedia equipment - Emission requirements ⁽¹⁾ | | EN55032:2015, Class B |
| Electromagnetic compatibility - Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission | | EN55014-1:2006 + A2:2011 |
| 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 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 test | 10V/m, 80MHz-1GHz 3V/m, 1.4GHz-2GHz 1V/m, 2GHz-2.7GHz | EN61000-4-3: 2006 + A1, 2009, Criteria A |
| Fast Transient and Burst Immunity | AC and DC Port: ±2kV | EN61000-4-4: 2012, Criteria B |
| Surge Immunity | AC In Port (L-N): ±1kV DC Output Port: ±0.5kV | EN61000-4-5: 2014 +A1:2017, Criteria B |
| Immunity to conducted disturbances, induced by radio-frequency fields | AC and DC Port: 10V | EN61000-4-6: 2014, Criteria A |
| Power Magnetic Field Immunity | 50Hz, 30A/m | EN61000-4-8: 2010, Criteria A |
| Voltage Dips and Interruptions | Voltage Dips: 30% Voltage Dips: 60% Voltage Dips: 100% Interruptions: >95% | EN61000-4-11:2004 + A1:2017, Criteria C EN61000-4-11:2004 + A1:2017, Criteria C EN61000-4-11:2014 + A1:2017, Criteria B EN61000-4-11: 2014 + A1:2017, Criteria C |
| Voltage Fluctuations and Flicker in Public Low-Voltage Systems ≤16A per phase | | EN61000-3-3: 2013 |
| Limitations on the amount of electromagnetic interference allowed from digital and electronic devices | | FCC 47 CFR Part 15 Subpart B, Class B |
| Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz | | ANSI C63.4-2014, Class B |
| Notes: | | |
| Note1: If output is connected to GND, please contact RECOM tech support for advice | | |

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

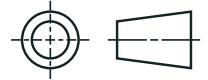
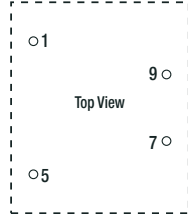
DIMENSION AND PHYSICAL CHARACTERISTICS

| Parameter | Type | Value |
|-------------------|-----------------------------------|--|
| Material | case, baseplate potting PCB | plastic, (UL94 V-0) silicone, (UL94 V-0) FR4, (UL94 V-0) |
| Dimension (LxWxH) | THT/wired | 31.7 x 26.7 x 21.8mm |
| Weight | THT wired | 31.5g typ. 37.0g typ. |

Dimension Drawing THT (mm)



Recommended Footprint Details

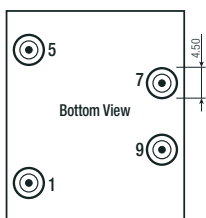
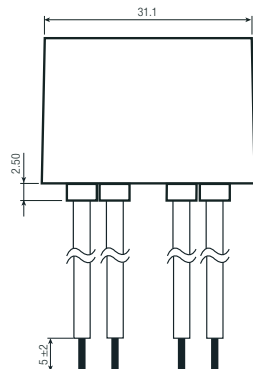
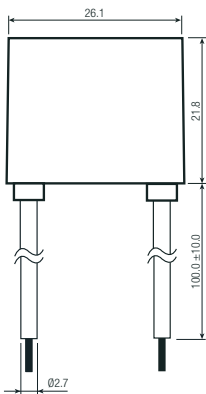


Pin Connections

| Pin # | Single |
|-------|------------|
| 1 | VAC in (N) |
| 5 | VAC in (L) |
| 7 | +Vout |
| 9 | -Vout |

Tolerance: xx.x= ±0.8mm
xx.xx= ±0.25mm

Dimension Drawing Wired (mm)



Wired information

| # | Function | Wire color | Type | AWG |
|---|------------|------------|---------|-----|
| 1 | VAC in (N) | blue | UL-1015 | 18 |
| 5 | VAC in (L) | brown | UL-1015 | 18 |
| 7 | +Vout | red | UL-1015 | 18 |
| 9 | -Vout | black | UL-1015 | 18 |

Tolerance: xx.x= ±0.8mm
xx.xx= ±0.25mm

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

| PACKAGING INFORMATION | | | |
|-----------------------------|----------------|------|------------------------|
| Parameter | Type | | Value |
| Packaging Dimension (LxWxH) | THT | tube | 466.0 x 30.4 x 29.3mm |
| | wired | tray | 468.0 x 198.0 x 46.0mm |
| Packaging Quantity | THT | | 12pcs |
| | wired | | 24pcs |
| Storage Temperature Range | | | -40°C to +85°C |
| Storage Humidity | non-condensing | | 20% to 90% RH max. |

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