Features

Regulated Converter

- Wide input range 85-305VAC
- Standby mode optimized (eco design Lot 6)
- High efficiency over the entire load range
- Operating temperature range: -40°C to +90°C
- Overvoltage and overcurrent protected
- EMC compliant without external components
- Encapsulated module with pins or wired

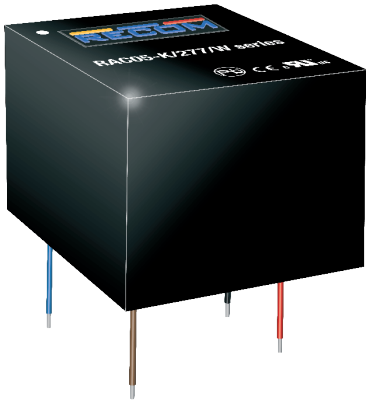
RECOM
AC/DC Converter

RAC05-K/277

5 Watt Single Output

YEAR 3 warranty





Description

The RAC05-K/277 series are multipurpose 5 watt AC/DC power supplies for enhanced mains input conditions 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

RAC05- SK/277/W

- nom. Output Power
- Output Voltage
- **W**ired
- **S**ingle

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

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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:

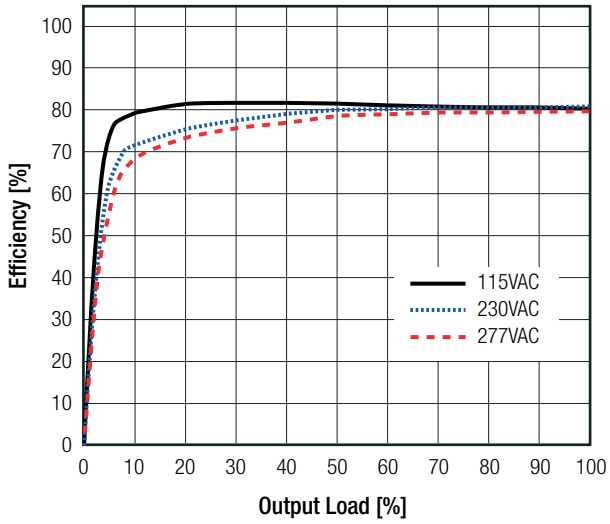
Note4: The products were submitted for safety files at AC-Input operation

Note5: Refer to ***„Line Derating“***

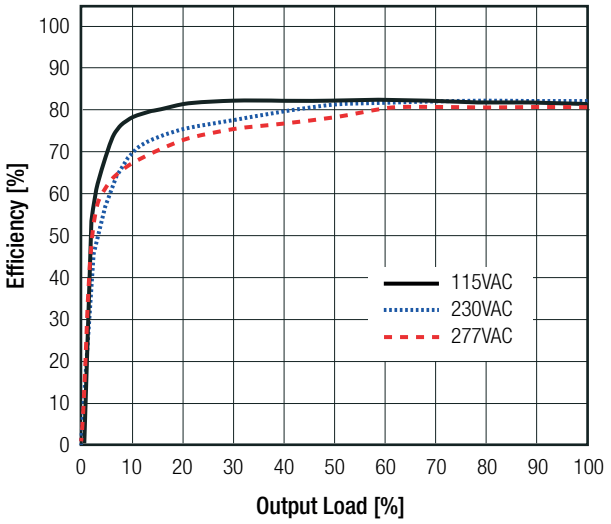
Note6: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

Efficiency vs. Load

RAC05-05SK/277



RAC05-12SK/277



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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.

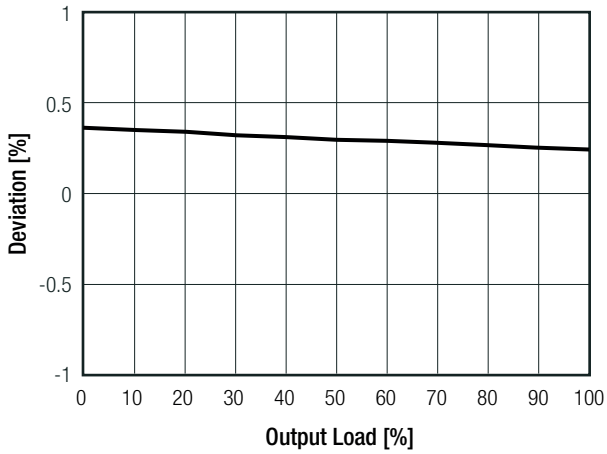
Notes:

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

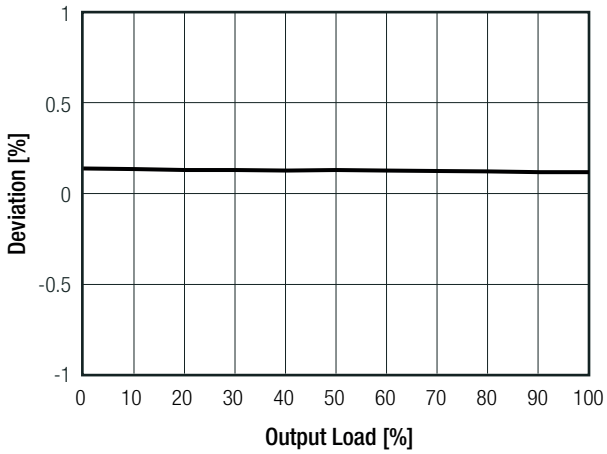
Deviation vs. Load

(at 115VAC, 230VAC, 277VAC)

RAC05-05SK/277



RAC05-12SK/277



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			OVCII
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	4.2kVAC
Isolation Resistance		Isolation Voltage 500VDC	1GΩ min.
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

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

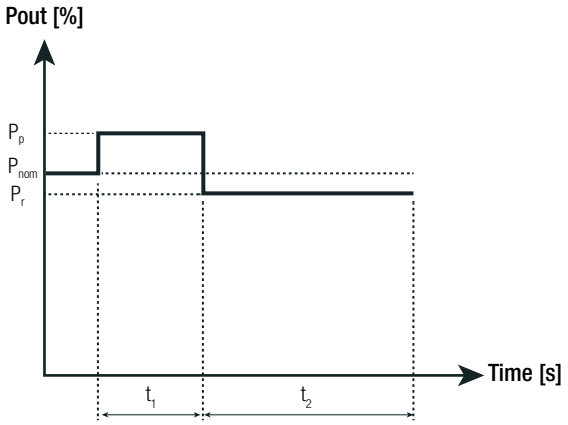
Peak Load Capability

Peak Load Calculation

P_{nom} = please refer to derating graph
P_P = 1.2 x P_{nom}
t_1 ≤ 30s
t_2 ≥ 2 x t_1

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

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]



Practical Example:

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

ENVIRONMENTAL

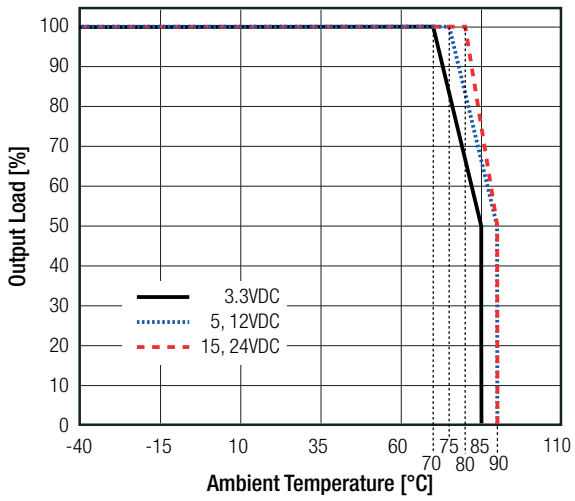
Parameter	Condition		Value	
Operating Temperature Range	@ natural convection 0.1m/s	full load	3.3Vout	-40°C to +70°C
			5, 12Vout	-40°C to +75°C
			15, 24Vout	-40°C to +80°C
		refer to *„Derating Graph“*	3.3Vout	-40°C to +85°C
			all others	-40°C to +90°C
Maximum Case Temperature				+95°C
Temperature Coefficient				0.05%/K
Operating Altitude (10)				5000m
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 +40°C		>2252 x 10^3 hours >1806 x 10^3 hours
Design Lifetime	230VAC	+25°C +70°C		125 x 10^3 hours 23 x 10^3 hours
	277VAC	+25°C +70°C		105 x 10^3 hours 18 x 10^3 hours

Notes:

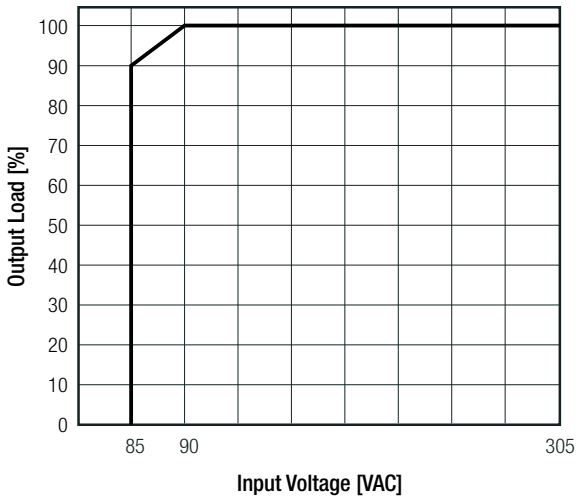
Note10: Recognized by UL for safe operation up to 5000m. High altitude operation may impact the performance and lifetime. Contact RECOM tech support for advice

Derating Graph

(@ Chamber and natural convection 0.1m/s)



Line Derating



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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 Part 2: Particular requirements (CB Scheme)		IEC61558-2-16:2009 1st Edition + A1:2013
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 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 (11)		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 Supbart 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:

Note11: If output is connected to GND, please contact RECOM tech support for advice

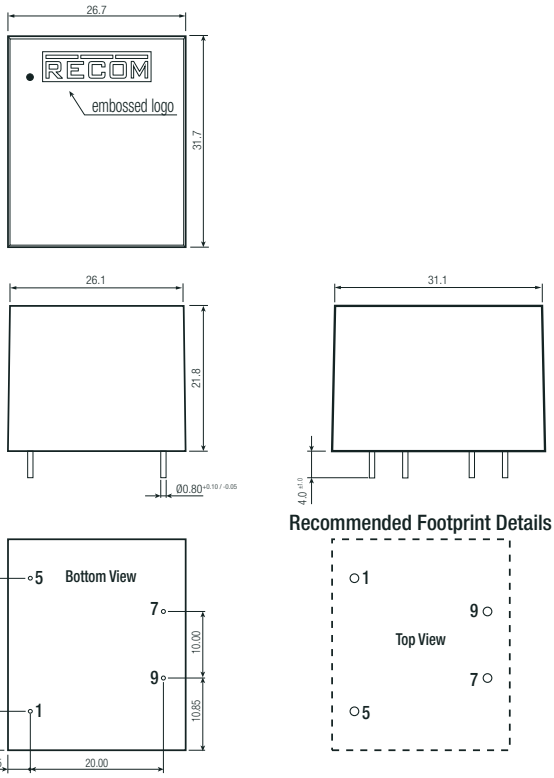
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Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

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)



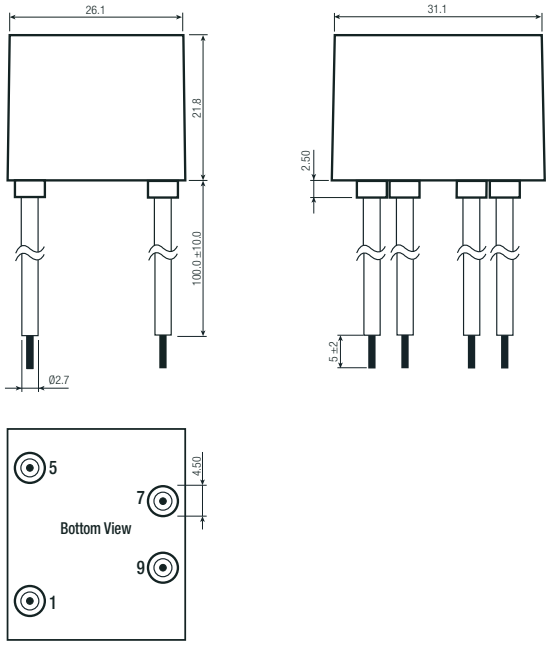
Recommended Footprint Details

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

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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 wired	tube tray	466.0 x 30.4 x 29.3mm 468.0 x 198.0 x 46.0mm
Packaging Quantity	THT wired		12pcs 24pcs
Storage Temperature Range			-40°C to +85°C
Storage Humidity	non-condensing		20% to 90% RH max.

The product information and specifications may be subject to changes even without prior written notice.The product has been designed for various applications; its suitability lies in the responsibility of each customer. The products are not authorized for use in safety-critical applications without RECOM's explicit written consent. A safety-critical application is an application where a failure may reasonably be expected to endanger or cause loss of life, inflict bodily harm or damage property. The applicant shall indemnify and hold harmless RECOM, its affiliated companies and its representatives against any damage claims in connection with the unauthorized use of RECOM products in such safety-critical applications.

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