### **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

### **Description**

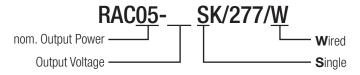
The RAC05-K/277 series are multipurpose 5 watt AC/DC power supplies for enhanced mains input conditions from 90VAC up to 305VAC with an extra wide operating temperature range from -40°C to +90°C. These modules are designed to supply worldwide applications in automation, Industry 4.0, IoT, household and 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 <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [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 resisitive load

### **Model Numbering**



### Notes:

Note3: add suffix "W" for wired version (available from ocotober 2018) 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



### **RAC05-K/277**

## 5 Watt Single Output



















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



### **Series**

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

BASIC CHARACTERISTICS					
Parameter	Condi	tion	Min.	Тур.	Max.
Internal Input Filter					Pi type
Input Voltage Range (4,5)	nom. Vin =	277VAC	85VAC 120VDC	277VAC	305VAC 430VDC
Input Current	115V 230V 277V	AC			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 Confirmity (Output Load Capability)	Innut Power—	0.5W 1.0W			0.34W 0.70W
Minimum Load			0%		
Power Factor	115V 230V 277V	AC	0.60 0.45 0.40		
Start-up Time				20ms	
Rise Time				10ms	
Hold-up Time	230V	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	

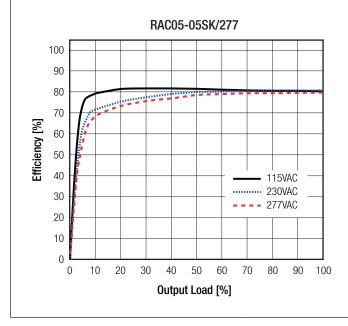
#### Notes:

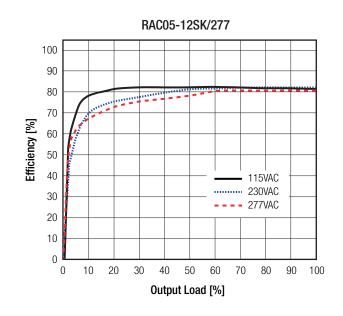
Note4: The products were submitted for safety files at AC-Input operation

Note5: Refer to line derating graph on page 4

Note6: Measurements are made with a 1.0µF MLCC across output (low ESR)

### Efficiency vs. Load







### **Series**

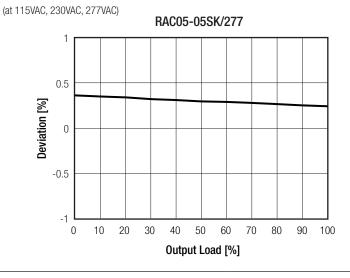
### Specifications (measured @ Ta= 25°C, nom. Vin, full load and after warm-up unless otherwise stated)

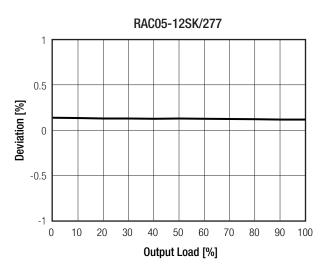
REGULATIONS		
Parameter	Condition	Value
Output Accuracy		±1.0% typ.
Line Regulation	low line to high line, full load	±0.5% typ.
Load Regulation (6)	10% to 100% load	1.0% typ.
Transient Decrease	25% load step change	4.0% max.
Transient Response	recovery time	500µs typ.

#### Notes:

Note6: Operation below 10% load will not harm the converter, but specifications may not be met

### Deviation vs. Load





PROTECTIONS			
Parameter	-	Гуре	Value
Input Fuse (7)	ir	ternal	T1A, slow blow
Short Circuit Protection (SCP)	belov	v 100mΩ	hiccup, automatic restart
Over Voltage Protection (OVP)			125% - 195%, hiccup mode
Over Voltage Category			OVCII
Over Current Protection (OCP)			125% - 195%, hiccup mode
Class of Equipment			Class II
Isolation Voltage (8)	I/P to O/P	tested for 1 minute	3kVAC
Isolation Resistance	1/1/2 (0 0/1/2	Isolation Voltage 500VDC	1G $\Omega$ min.
Isolation Capacitance			100pF max.
Insulation Grade			reinforced
Leakage Current			0.25mA max.

#### Notes:

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

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

continued on next page



### **Series**

### 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

$$P_{_P} \quad = 1.2 \ x \ P_{_{nom}}$$

$$t_1 \leq 30s$$

$$t_2 \ge 2 \times t_1$$

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

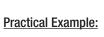
 $P_{nom} = nom.$  output power

P<sub>P</sub> = peak output power [W]

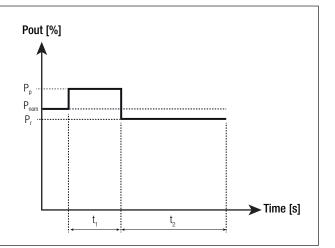
[W] = recovery power

[s] = peak time

= recovery time [S]



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



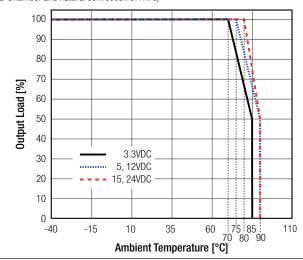
ENVIRONMENTAL					
Parameter	Condition			Value	
		full load	3.3Vout	-40°C to +70°C	
			5, 12Vout	-40°C to +75°C	
Operating Temperature Range	@ natural convection 0.1m/s		15, 24Vout	-40°C to +80°C	
		rafar to darating graph	3.3Vout	-40°C to +85°C	
		refer to derating graph	all others	-40°C to +90°C	
Maximum Case Temperature				+95°C	
Temperature Coefficient				0.05%/K	
Operating Altitude (9)				5000m	
Operating Humidity	non-condensing		5% - 95% RH max.		
Pollution Degree				PD2	
Vibration	according to MIL-ST	TD-202G	10-500Hz, 2G 10min./1cycle, period 60min. each along x,y,z axe		
MTBF	according to MIL-HDBK-217F, G.B.	+25°C		>450 x 10 <sup>3</sup> hours	
	230VAC	+25°C	125 x 10 <sup>3</sup> hours		
Design Lifetime	ZJUVAU	+70°C		23 x 10 <sup>3</sup> hours	
Dough Endumo	277VAC	+25°C		105 x 10 <sup>3</sup> hours	
	2117710	+70°C		18 x 10 <sup>3</sup> hours	

#### Notes:

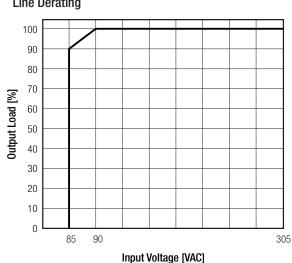
Note9: Recognized by UL for safe operation up to 5000m. High altitude operation may impact the performance and lifetime. Contact RECOM tech support for advice

#### **Derating Graph**

(@ Chamber and natural convection 0.1 m/s)









### **Series**

**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	pending	UL62368-1, 2nd Edition, 2014-12-01		
1: Safety requirements  Audio/Video, information and communication technology equipment -		CAN/CSA-C22.2 No. 62368-1-14, 2nd Edition, 2014-12		
Part 1: Safety requirements (CB Scheme)	pending	IEC62368-1:2014 2nd Edition		
Audio/Video, information and communication technology equipment - Part 1: Safety requirements (LVD)	pending	EN62368-1:2014 + A11:2017		
Household and similar electrical appliances - Safety - Part 1: General requirements	pending	IEC60335-1:2010 + A2:2016 + C1:2016 5th Edition EN60335-1:2012 + A11:2014		
Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure	pending	EN62233:2008		
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		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 intererence 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		

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

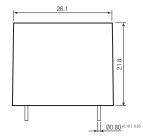


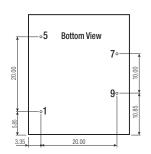
### **Series**

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

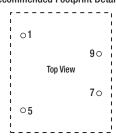
### **Dimension Drawing THT (mm)**











# $\bigcirc$

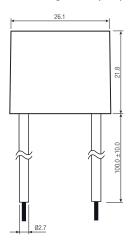


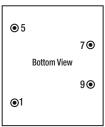
#### **Pin Connections**

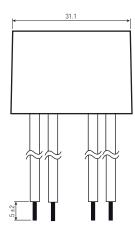
Pin#	Single
1	VAC in (N)
5	VAC in (L)
7	+Vout
9	-Vout
<del> </del>	0.5

Tolerance:  $xx.x = \pm 0.5$ mm  $xx.xx = \pm 0.25$ mm

### Dimension Drawing Wired (mm) available from october 2018







### 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:  $xx.x = \pm 0.5mm$  $xx.xx = \pm 0.25mm$ 



### **Series**

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

PACKAGING INFORMATION			
Parameter	T	уре	Value
Declaring Dimension (LVM/d.)	THT	tube	466.0 x 29.3 x 30.4mm
Packaging Dimension (LxWxH)	wired	tray	468.0 x 46.0 x 198.0mm
Packaging Overtity	7	THT	12pcs
Packaging Quantity	W	ired	24pcs
Storage Temperature Range			-40°C to +85°C
Storage Humidity	non-co	ndensing	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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