## **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
- Class II installations (without FG)
- Overvoltage and overcurrent protected
- EMC compliant without external components

#### **Description**

The RAC3.5-K/277 series are multipurpose 3.5 watt AC/DC power supplies for enhanced mains input conditions from 85VAC 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 fully protected outputs, as well as 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]
RAC3.5-3.3SK/277	85-305	3.3	1060	77	10000
RAC3.5-05SK/277	85-305	5	700	80	8000
RAC3.5-12SK/277	85-305	12	291	83	1500
RAC3.5-15SK/277	85-305	15	233	83	1000
RAC3.5-24SK/277	85-305	24	146	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**



#### **Ordering Examples:**

RAC3.5-05SK/277 3.5 Watt 5Vout Single Output RAC3.5-24SK/277 3.5 Watt 24Vout Single Output



## **RAC3.5-K/277**

# 3.5 Watt Single Output

















UL62368-1 certified EN62368-1 certified 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			Min.	<u> </u>	
Parameter	Cond	Condition		Тур.	Max.
Internal Input Filter					Pi type
Input Voltage Range (3,4)	nom. Vin =	nom. Vin = 277VAC		277VAC	305VAC 430VDC
Input Current	230\	115VAC 230VAC 277VAC		110mA 80mA 60mA	
Inrush Current	cold start at +25°C	115VAC 230VAC 277VAC			15A 30A 35A
No Load Power Consumption					100mW
ErP Lot 6 Standby Mode Confirmity (Output Load Capability)	Innut Power—	Input Power= 0.5W 1.0W			0.34W 0.70W
Input Frequency Range					63Hz
Minimum Load			0%		
Power Factor	230	115VAC 230VAC 277VAC			
Start-up Time				20ms	
Rise Time				10ms	
Hold-up Time	230	115VAC 230VAC 277VAC		20ms 25ms 90ms	
Internal Operating Frequency		100% load at nominal Vin		130kHz	
Output Ripple and Noise (5)	20MHz BW	20MHz BW 3.3, 5Vout others		60mVp-p 1% of Vout	

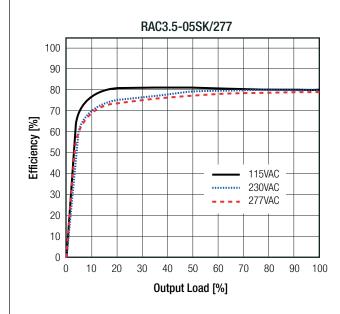
#### Notes:

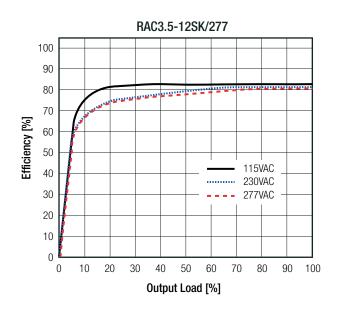
Note3: The products were submitted for safety files at AC-Input operation

Note4: Refer to line derating graph on page PA-4

Note5: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

#### Efficiency vs. Load







## **Series**

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

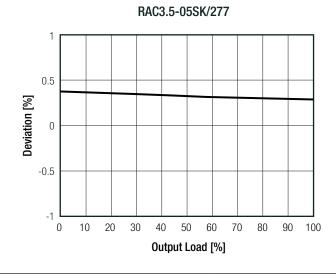
REGULATIONS		
Parameter	Condition	Value
Output Accuracy		±1.0% typ.
Line Regulation	low line to high line, full load	±0.5% typ.
Load Regulation (6)	10% to 100% load	1.0% typ.
Transient Response	25% load step change	4.0% max.
	recovery time	500µs typ.

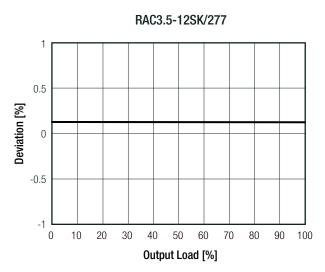
#### Notes:

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

### Deviation vs. Load

(at 115VAC, 230VAC, 277VAC)





PROTECTIONS			
Parameter	Туре		Value
Input Fuse (7)	internal		T1A, slow blow
Short Circuit Protection (SCP)	below 1	$00 \text{m}\Omega$	hiccup, automatic restart
Over Voltage Protection (OVP)			125% - 195%, latch of mode
Over Voltage Category			OVCII
Over Current Protection (OCP)			175% - 275%, hiccup mode
Class of Equipment			Class II
Isolation Voltage (8)	I/P to O/P	rated for 1 minute	3kVAC
Isolation Resistance	1/7 10 0/7	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

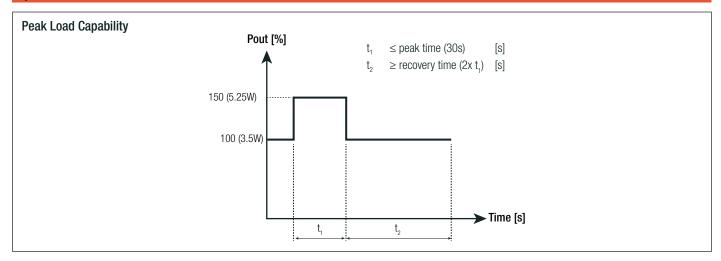
Note8: For repeat Hi-Pot testing, reduce the time and/or the test voltage

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## **Series**

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



ENVIRONMENTAL			
Parameter	Condition		Value
Operating Temperature Dange	@ natural convention 0.1m/a	full load	-40°C to +80°C
Operating Temperature Range	@ natural convection 0.1m/s	refer to derating graph	-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-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	>600 x 10 <sup>3</sup> hours
	230VAC	+25°C	125 x 10 <sup>3</sup> hours
Dogian Lifetime	230VAC	+70°C	34 x 10 <sup>3</sup> hours
Design Lifetime	277VAC	+25°C	105 x 10 <sup>3</sup> hours
	ZIIVAO	+70°C	27 x 10 <sup>3</sup> hours

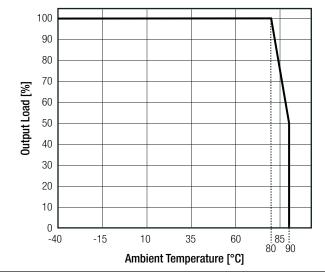
#### Notes:

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

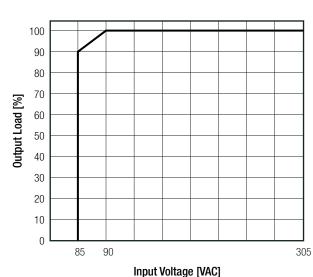
Contact RECOM tech support for advice

#### **Derating Graph**

(@ Chamber and natural convection 0.1m/s)



#### Line Derating





## **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 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)	E491400-A0007-CD-1	EN62368-1:2014 + A11:2017	
Household and similar electrical appliances - Safety - Part 1: General requirements	pending	IEC60335-1:2010 + A2:2016 + C1:2016, 5th Edt. 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 (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 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	
Notes:			
Note11: If output is connected to GND, pleas	e contact RECOM tech supp	ort for advice	

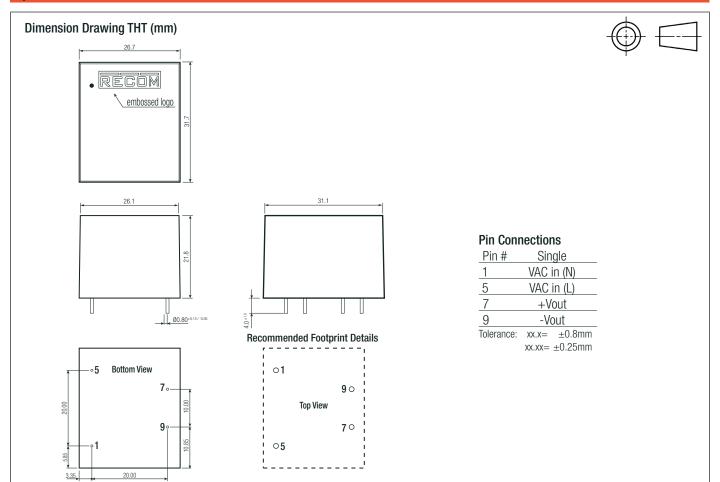
DIMENSION AND PHYSICAL CHARACTERISTICS			
Parameter	Туре	Value	
	case, baseplate	black plastic, (UL94V-0)	
Material	potting	silicone, (UL94V-0)	
	PCB	FR4, (UL94V-0)	
Dimension (LxWxH)		31.7 x 26.7 x 21.8mm	
Weight		31.5g typ.	

continued on next page



## **Series**

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



PACKAGING INFORMATION		
Parameter	Туре	Value
Packaging Dimension (LxWxH)	tube	466.0 x 30.4 x 29.3mm
Packaging Quantity	tube	12pcs
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.