

# Features

- 35mW max. no load power consumption
- Efficiency up to 76%
- Isolated output 3kVAC / 1 min
- SCP, OVP protection
- Wide operating temperature range: -40°C to +85°C
- Universal input 85-305VAC

# Regulated Converter

# RECOM AC/DC Converter

## RAC02-SE/277

2 Watt  
Single  
Output



IEC/EN60950-1 certified  
CAN/CSA-22.2 No. 60950 certified  
UL60950-1 certified  
EN60335-1 certified  
EN55032 certified  
EN55024 certified  
EN55014 certified

## Description

The ultra-compact RAC02-SE/277 modules are available with output voltages of 3.3, 5, 12 and 24V, and the input-to-output isolation is 3kVAC/1min. With a standby consumption of 35mW maximum, the mini power supplies are particularly suitable for energy-saving sleep mode and standby applications. Because of its compact design (height <18mm), it is a versatile solution for home automation and other similar applications. Complete with an integrated input filter, the series has enhanced EMI performance and complies with EN55032, class B. The mini power supplies are also protected against short circuit with fully automatic restart after the error has been solved. The converters are EN/UL60950-1 certified and come complete with a 3 year warranty.

## Selection Guide

Part Number	nom. Input Voltage Range [VAC]	Output Voltage [VDC]	Output Current [mA]	Efficiency typ <sup>(1)</sup> [%]	Max. Capacitive Load <sup>(2)</sup> [µF]
RAC02-3.3SE/277	100-277	3.3	600	67	12000
RAC02-05SE/277	100-277	5	400	70	5500
RAC02-12SE/277	100-277	12	167	73	500
RAC02-24SE/277	100-277	24	83	76	160

### Notes:

Note1: Efficiency is tested at nominal input and full load at +25°C ambient

Note2: Max Cap Load is tested by minimum input and constant resistor load

## Model Numbering



### Ordering Examples:

RAC02-05SE/277    2 Watt    5Vout    Single Output

RAC02-12SE/277    2 Watt    12Vout    Single Output

**Specifications** (measured @ Ta= 25°C, nom. Vin (115/230VAC), full load and after warm-up unless otherwise stated)

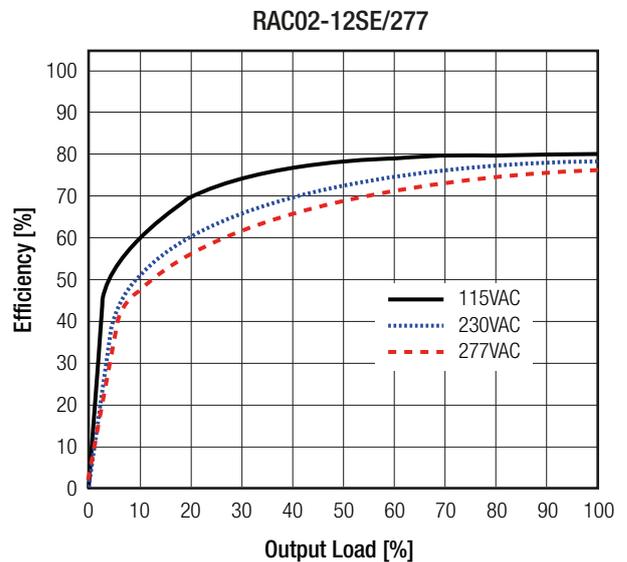
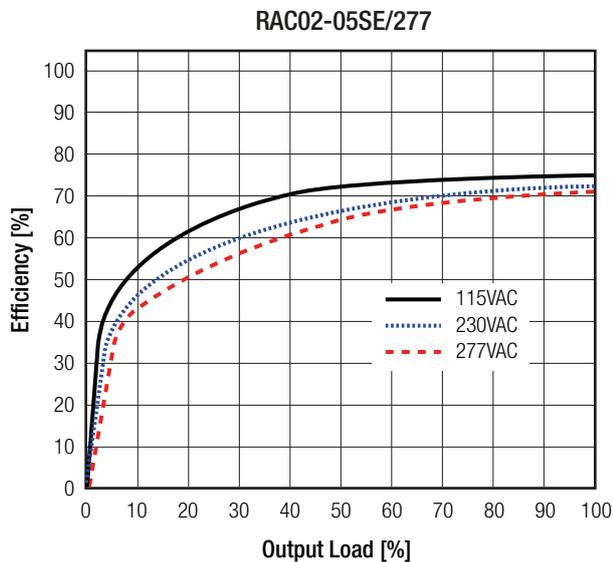
**BASIC CHARACTERISTICS**

Parameter	Condition	Min.	Typ.	Max.
Input Voltage Range <sup>(3,4)</sup>	nom. Vin = 230VAC	85VAC 120VDC	277VAC	305VAC 430VDC
Input Current	115VAC 230VAC		47mA 30mA	
Inrush Current	cold start at +25°C	115VAC 230VAC		15A 30A
No load Power Consumption	85-305VAC, 47-63Hz			35mW
Input Frequency Range	AC Input	47Hz		440Hz
Minimum Load <sup>(5)</sup>			2%	
Hold-up Time	115VAC	18ms		
Internal Operating Frequency	100% load at nominal Vin		55kHz	
Output Ripple and Noise <sup>(6)</sup>	20MHz BW	3.3V all others		300mVp-p 250mVp-p

**Notes:**

- Note3: The products were submitted for safety files at AC-Input operation
- Note4: No line derating required
- Note5: Operation below 2% load will not harm the converter, but specifications may not be met
- Note6: Ripple and Noise is the maximum peak-to-peak voltage value measured at the output with a 20MHz bandwidth, at rated line voltage at full load. And with a 47µF low-ESR electrolytic capacitor in parallel with a 0.1µF ceramic capacitor across output

**Efficiency vs. Load**



**REGULATIONS**

Parameter	Condition	Value
Output Accuracy <sup>(7)</sup>		±6.0% max.
Line Regulation	low line to high line, full load	±1.5% max.
Load Regulation	2% to 100% load	6.0% typ.

**Notes:**

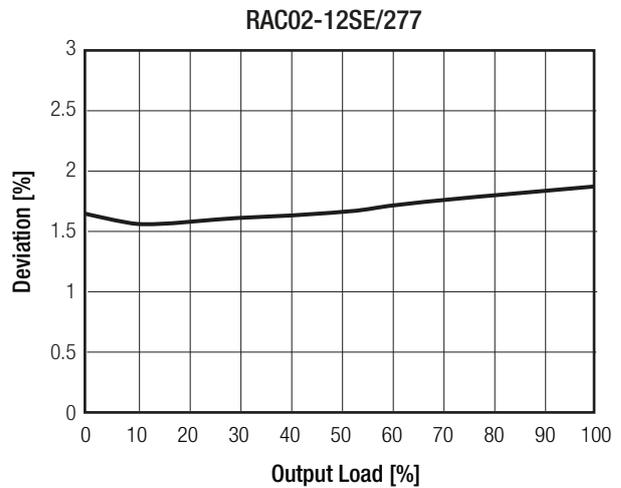
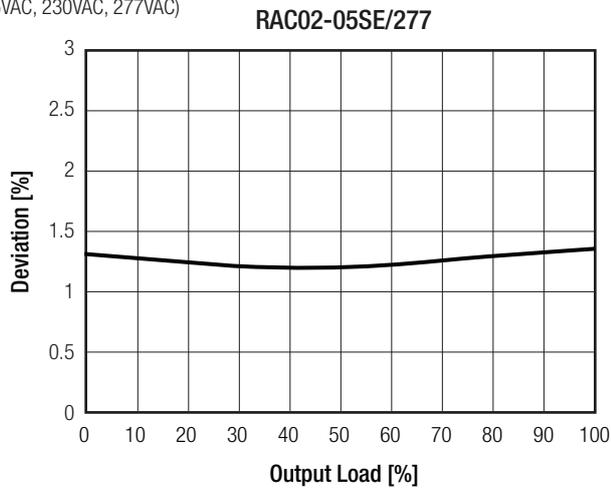
- Note7: Includes initial voltage accuracy, thermal drift, line regulation and load regulation at rated input voltage and load conditions

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

**Deviation vs. Load**

(at 115VAC, 230VAC, 277VAC)



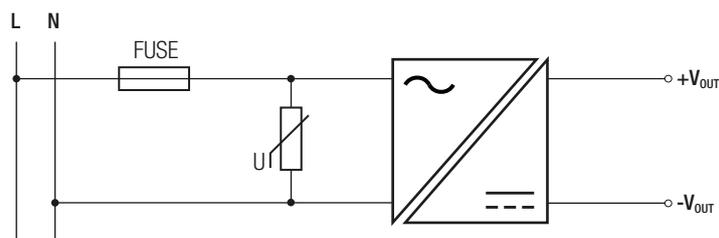
**PROTECTIONS**

Parameter	Type		Value
Short Circuit Protection (SCP)	below 100mΩ		continuous, automatic recovery
Over Voltage Protection (OVP)	zener diode clamp		110% - 140%
Over Voltage Category			OVCII
Over Current Limit			110% - 190%
Isolation Voltage	tested for 1 minute	I/P to O/P	3kVAC
Isolation Resistance			1GΩ min.
Leakage Current	85-305VAC, 47-63Hz		10μA max.

**Notes:**

Note8: Refer to local wiring regulations if input over-current protection is also required. Recommended fuse: T1A slow blow type

Note9: An external MOV is recommended. The Varistor should comply with IEC-61051-2. e.g. EPCOS S 14 Series



**ENVIRONMENTAL**

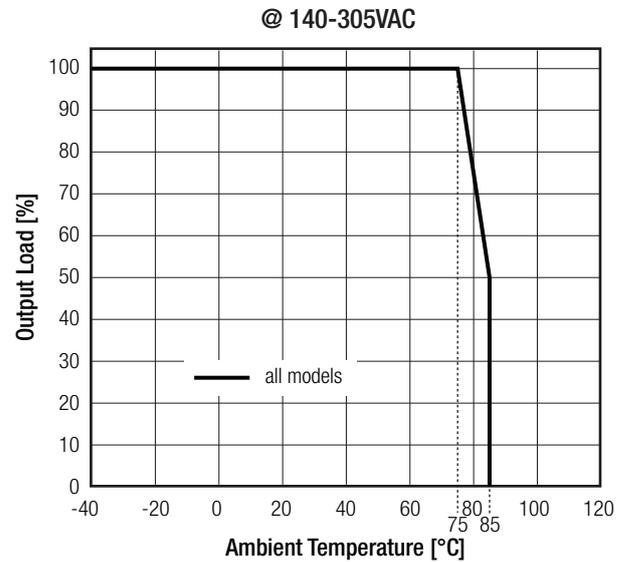
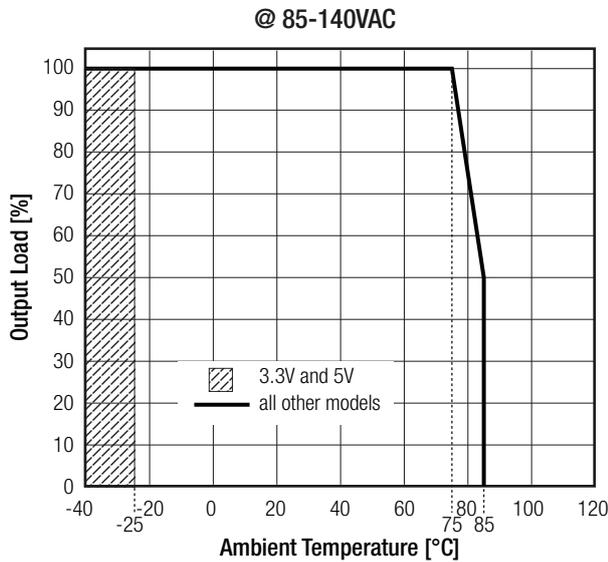
Parameter	Condition			Value
Operating Temperature Range	@ natural convection 0.1m/s, 140-305VAC	full load		-40°C to +75°C
		refer to derating graph		-40°C to +85°C
Maximum Case Temperature				+105°C
Thermal Impedance				8.5°C/W typ.
Operating Humidity	non-condensing			5% - 95% RH max.
Vibration				according to MIL-STD-202G standard
MTBF	according to MIL-HDBK-217F, G.B.	+25°C	115VAC	2238 x 10 <sup>3</sup> hours
			230VAC	1670 x 10 <sup>3</sup> hours

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

#### Derating Graph

(@ Chamber and natural convection 0.1m/s)



#### SAFETY AND CERTIFICATIONS

Certificate Type (Safety)	Report / File Number	Standard
Information Technology Equipment - General Requirements for Safety (CB Scheme)	L0339L26-CB-1-B4	IEC60950-1:2005, 2nd Edition + A2:2013 EN60950-1:2006 + A2:2013
Information Technology Equipment, General Requirements for Safety	E224736-A24-UL	UL60950-1, 2nd Edition, 2014 CAN/CSA-C22.2 60950-1, 2nd Edition, 2014
Household and similar electrical appliances - Safety - Part 1: General requirements	L0339L26-B2-L	EN60335-1:2012 + A11:2014
EAC Safety of Low Voltage Equipment	RU-AT.49.09571	TP TC 004/2011
RoHS2+		RoHS-2011/65/EU + AM-2015/863

#### EMC Compliance (Industrial)

EMC Compliance (Industrial)	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment – Emission Requirements		EN55032:2015, Class B
Information technology equipment - Immunity characteristics - Limits and methods of measurement		EN55024:2010
ESD Electrostatic discharge immunity test	±8kV air, ±4kV contact	EN61000-4-2:2009, Criteria B
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	EN61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port: ±1.0kV	EN61000-4-4:2012, Criteria A
Power Magnetic Field Immunity	50Hz, 1A/m	EN61000-4-8:2010, Criteria A
Voltage Dips and Interruptions	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	EN61000-4-11:2004, Criteria A EN61000-4-11:2004, Criteria A EN61000-4-11:2004, Criteria B
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013

#### EMC Compliance (Household)

EMC Compliance (Household)	Condition	Standard / Criterion
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		EN55014-2:2015
ESD Electrostatic discharge immunity test	±8kV air, ±4kV contact	IEC61000-4-2:2008, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	3V/m	IEC61000-4-3:2006 + A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Power Port: ±1kV DC Output: ±0.5kV	IEC61000-4-4:2012, Criteria A

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

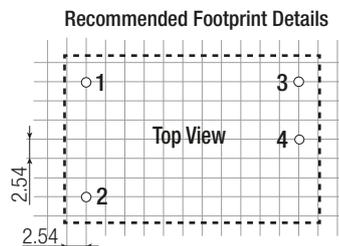
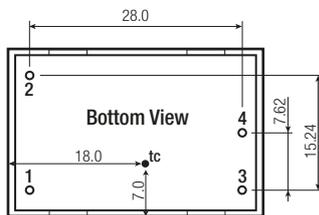
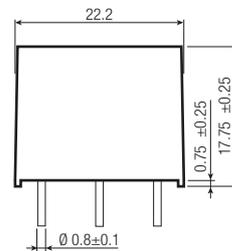
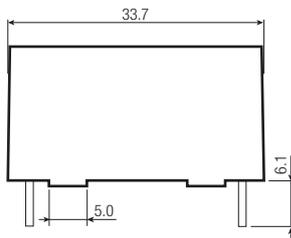
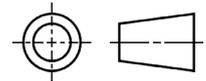
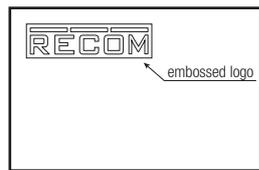
**SAFETY AND CERTIFICATIONS**

EMC Compliance (Household)	Condition	Standard / Criterion
Surge Immunity	AC Power Port:L to N $\pm 2$ kV DC Output: L to N $\pm 1$ kV	IEC61000-4-5:2014, Criteria B
Immunity to conducted disturbances, induced by radio-frequency fields	3 Vr.m.s.	IEC61000-4-6:2013, Criteria A
Voltage Dips and Interruptions	Voltage Dips >95% Voltage Dips 30% Voltage Interruptions >95%	IEC61000-4-11:2004, Criteria B IEC61000-4-11:2004, Criteria C IEC61000-4-11:2004, Criteria C
Limits of Harmonic Current Emissions		EN61000-3-2:2014
Limits of Voltage Fluctuations & Flicker		EN61000-3-3:2013

**DIMENSION AND PHYSICAL CHARACTERISTICS**

Parameter	Type	Value
Material	case potting	black plastic, (UL94V-0) silicone, (UL94V-0)
Dimension (LxWxH)		33.70 x 22.20 x 17.75mm
Weight		24.5g typ.

**Dimension Drawing (mm)**



**Pin Connections**

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

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

xx.xx=  $\pm 0.35$ mm

Pin width:  $\pm 0.05$ mm

**PACKAGING INFORMATION**

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	520.0 x 37.0 x 28.0mm
Packaging Quantity		22pcs
Storage Temperature Range		-40°C to +85°C

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