

# RAC20E-K/277 Series ◊ AC/DC Power Supply

20W ◊ Input: 100-277VAC

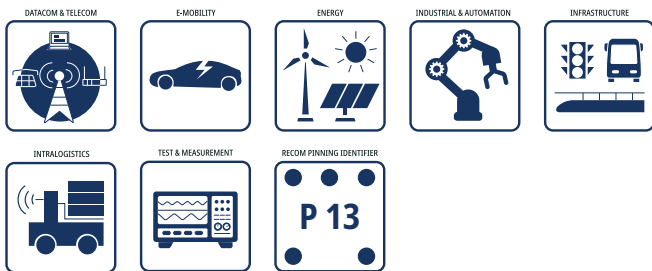
## FEATURES

- Wide input range 85-305VAC
- 5000m operating altitude
- OVC III over voltage category up to 2000m
- Operating temperature ratings: -40°C to +90°C
- 4.2kVAC isolation
- EN55032 class B compliant floating and GND ref.
- No load power consumption <200mW
- Industry standard footprint and pinning [P13]
- 3 year warranty



Dimensions (LxWxH): 52.7 x 27.6 x 23.0mm (2.07 x 1.08 x 0.91 inch)  
60g (0.13 lbs)

## APPLICATIONS



## SAFETY & EMC



## DESCRIPTION

RAC20E-K/277, the economy “E-K” series of compact 20 Watt AC/DC modules, is designed to meet general purpose requirements for a wide variety of equipment for the IoT, ITE and industrial markets. These encapsulated power supplies feature 4.2kVac isolation and over voltage category OVC III, as well as 100-277VAC nominal input voltages. At OVC II usage, the operating altitude is rated for up to 5000m. EMC compatibility to EN55032 class “B” is met in floating and ground referenced installations. The outputs are protected against over current and short circuits and input protection by internal fuse is provided. All these features make the product one of the easiest integrated modular power solutions for lowest total cost of ownership in the industry.

## SELECTION GUIDE

Part Number	Input Voltage Range [VAC]	Output Voltage nom. [VDC]	Output Current max. [mA]	Efficiency typ. <sup>(1)</sup> [%]
RAC20E-05SK/277	85-305	5	4000	80
RAC20E-12SK/277	85-305	12	1667	83
RAC20E-24SK/277	85-305	24	833	84

Note1: Efficiency is tested at nominal input (230VAC) and full load at +25°C ambient

## MODEL NUMBERING



# RAC20E-K/277 Series $\diamond$ AC/DC Power Supply

## 20W $\diamond$ Input: 100-277VAC

### ACCESSIBLE PART

Part Number	Description	Datasheet Link
RAC-ADAPT-ST1	adapter board with screw terminal connection	<a href="#">RAC-ADAPT-ST1.pdf</a>

### BASIC CHARACTERISTICS (measured @ $T_{AMB}= 25^{\circ}\text{C}$ , nom. $V_{IN}$ , full load and after warm-up unless otherwise stated)

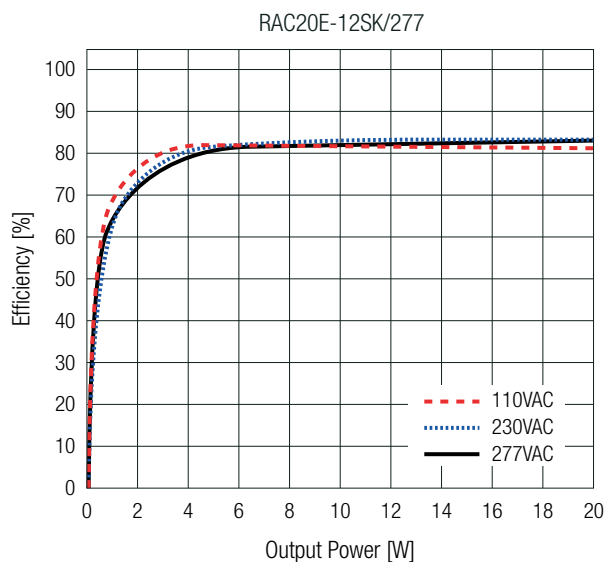
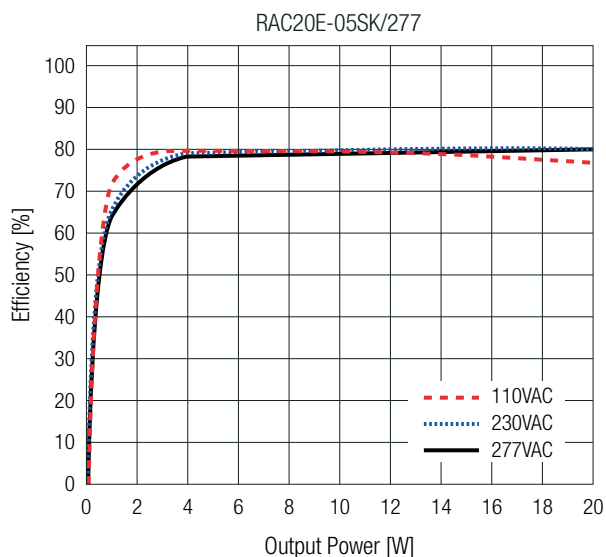
Parameter	Condition	Min.	Typ.	Max.
Nominal Input Voltage	50/60Hz	100VAC		277VAC
Operating Range <sup>(2,3)</sup>	47/63Hz	85VAC	277VAC	305VAC
	DC	120VDC		430VDC
Input Current	$V_{IN}= 115\text{VAC}$			400mA
	$V_{IN}= 230\text{VAC}$			300mA
	$V_{IN}= 277\text{VAC}$			250mA
Inrush Current	cold start at $25^{\circ}\text{C}$	$V_{IN}= 115\text{VAC}$		20A
		$V_{IN}= 230/277\text{VAC}$		40A
No Load Power Consumption				200mW
Ecodesign Standby Mode Use (Available output power for stated input power)	$P_{IN}= 0.5\text{W}$			0.25W
	$P_{IN}= 1.0\text{W}$			0.6W
	$P_{IN}= 2.0\text{W}$			1.4W
Input Frequency Range		47Hz		63Hz
Minimum Load		0%		
Power Factor	$V_{IN}= 115\text{VAC}$		0.6	
	$V_{IN}= 230\text{VAC}$		0.5	
	$V_{IN}= 277\text{VAC}$		0.45	
Start-up time				150ms
Rise time				25ms
Hold-up time	$V_{IN}= 115\text{VAC}$		10ms	
	$V_{IN}= 230\text{VAC}$	25ms	40ms	
	$V_{IN}= 277\text{VAC}$		60ms	
Internal Operating Frequency	100% load at nominal $V_{IN}$		120kHz	
Output Ripple and Noise <sup>(4)</sup>	20MHz BW	5Vout		150mVp-p
		others		1% of nom Vout

Note2: The products were submitted for safety files at AC-Input operation. (90-305VAC)

Note3: Refer to „Derating Graph“

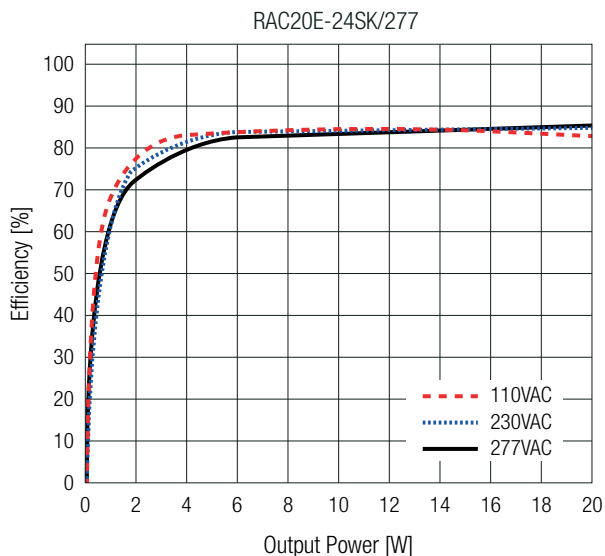
Note4: Measurements are made with a 0.1 $\mu\text{F}$  MLCC & 10 $\mu\text{F}$  E-cap in parallel across output. (low ESR)

### Efficiency vs. Load



**BASIC CHARACTERISTICS** (measured @  $T_{AMB} = 25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

### Efficiency vs. Load

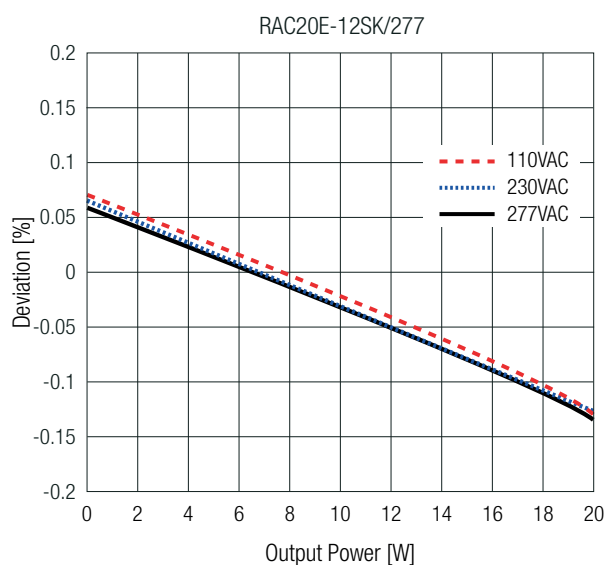
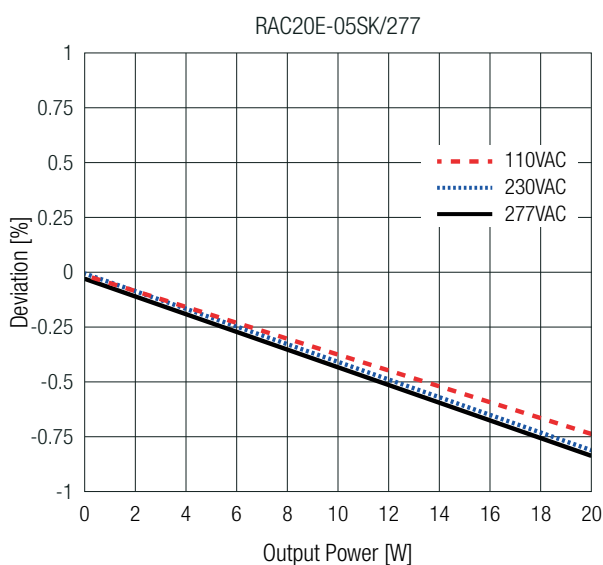


**REGULATIONS** (measured @  $T_{AMB} = 25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

Parameter	Condition	Value
Output Accuracy		$\pm 2.0\%$ typ.
Line Regulation	low line to high line	$\pm 0.5\%$ typ.
Load Regulation <sup>(5)</sup>	10% to 100% load	1.0% typ.
Transient Response	25% load step change	3.0% max.
	recovery time	500 $\mu\text{s}$ max.

Note5: Operation below 10% load will not harm the converter, but specifications may not be met

### Deviation vs. Load

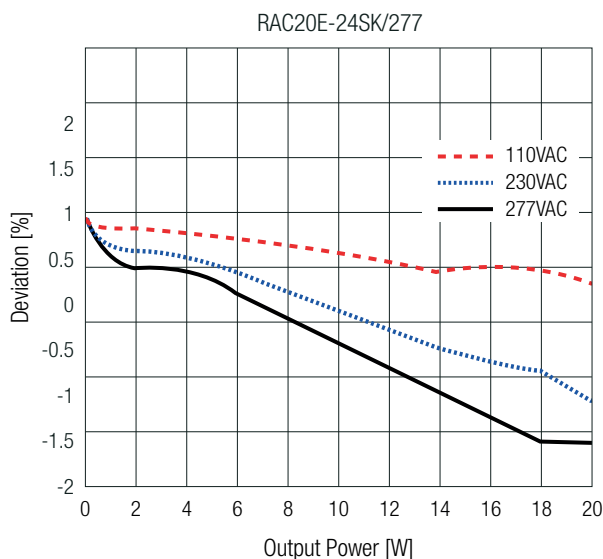


# RAC20E-K/277 Series $\diamond$ AC/DC Power Supply

20W  $\diamond$  Input: 100-277VAC

**REGULATIONS** (measured @  $T_{AMB}=25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

### Deviation vs. Load



### PROTECTIONS

(measured @  $T_{AMB}=25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

Parameter	Type	Value
Input Fuse	internal	slow blow type
Short Circuit Protection (SCP)		hiccup mode, automatic restart
Over Voltage Protection (OVP)		105-120%, clamping, automatic restart
Over Load Protection (OLP)		150-195%, hiccup mode
Over Voltage Category (OVC)	according to 61558	OVC III (2000m)
	according to 62368-1	OVC II (5000m)
Isolation Voltage <sup>(6)</sup>	according to 61558	1 minute
Isolation Resistance	I/P to O/P	$V_{ISO} = 500\text{VDC}$
Isolation Capacitance		I/P to O/P, 100kHz/0.1VDC
Insulation Grade	I/P to O/P	reinforced
Leakage Current	$V_{IN}=277\text{VAC}$	0.25mA max.

Note6: For repeat HI-Pot testing, reduce the time and/or the test voltage

### ENVIRONMENTAL

(measured @  $T_{AMB}=25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

Parameter	Condition	Value
Operating Ambient Temperature Range	@ natural convection (0.1m/s), refer to „Derating Graph“	-40°C to +90°C
Maximum Case Temperature		+95°C
Temperature Coefficient		$\pm 0.02\%/K$
Operating Altitude	according to 62368-1	5000m (OVC II)
	according to 61558	2000m (OVC III)
Operating Humidity	non-condensing	20-90% RH max.
Pollution Degree		PD2
Vibration	according to MIL-STD-202G	10-500Hz, 2G 10min./1cycle, period 60min. each along x,y,z axes
	according to IEC 60068-2-27	3 axis, 40 g half sine, 11 ms shock
	according to IEC 60068-2-65	5-500Hz, 20m/s <sup>2</sup> , 1 Oct/min, 15min
	according to IEC 60068-2-64	10-500Hz; RMS 23,4m/s <sup>2</sup> ; 15min

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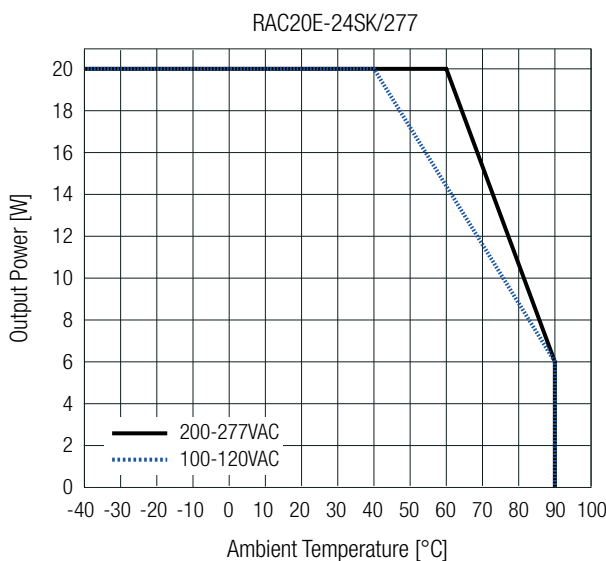
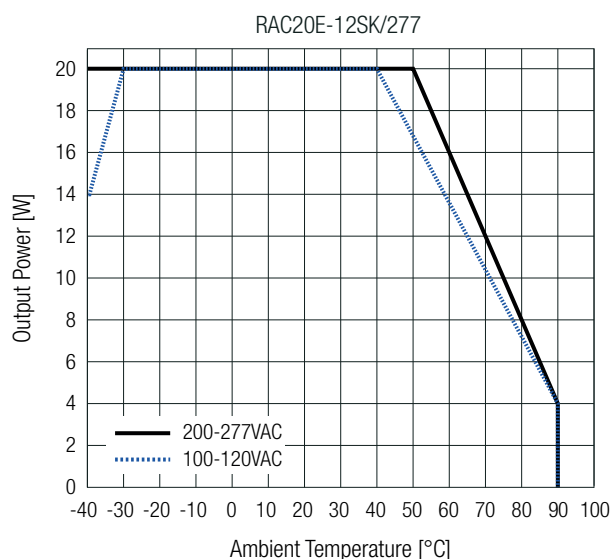
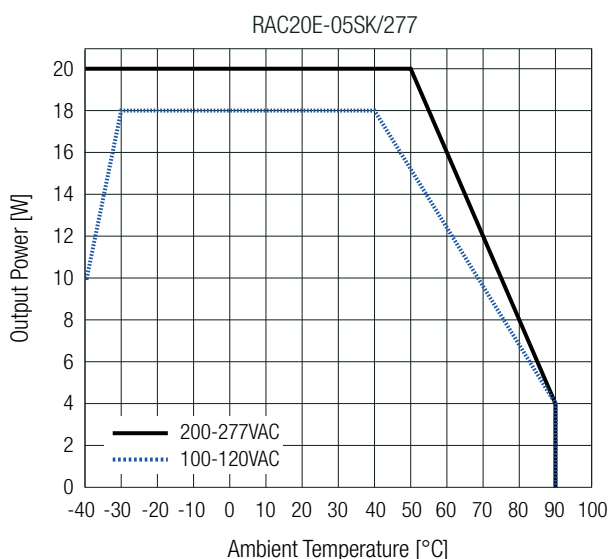
20W  $\diamond$  Input: 100-277VAC

ENVIRONMENTAL (measured @  $T_{AMB} = 25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

Parameter	Condition		Value	
MTBF	according to MIL-HDBK-217F, G.B.		$T_{AMB} = +25^{\circ}\text{C}$	$830 \times 10^3$ hours
			$T_{AMB} = +40^{\circ}\text{C}$	$700 \times 10^3$ hours
Design Lifetime	$V_{IN} = 230\text{VAC}/60\text{Hz}$ and full load	$T_{AMB} = +25^{\circ}\text{C}$	5Vout	$89 \times 10^3$ hours
			12Vout	$115 \times 10^3$ hours
			24Vout	$132 \times 10^3$ hours
		$T_{AMB} = +40^{\circ}\text{C}$	5Vout	$34 \times 10^3$ hours
			12Vout	$44 \times 10^3$ hours
			24Vout	$53 \times 10^3$ hours

## Derating Graph

(@ Chamber and natural convection 0.1m/s)



### SAFETY & CERTIFICATIONS

Certificate Type (Safety)	Report Number	Standard
Audio/Video, information and communication technology equipment - Safety requirements	E491408-A6018 -UL	UL62368-1 3rd Edition CAN/CSA-C22.2 No. 62368-1 3rd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)	210615003	EN62368-1:2014 + A11:2017
Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)		IEC62368-1:2014 2nd Edition
Audio/Video, information and communication technology equipment - Safety requirements (LVD)	210615002	EN IEC 62368-1:2020 + A11:2020
Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)		IEC62368-1:2018 3rd Edition
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V	CN21POAO 001 (OVC II)	EN IEC 61558-1:2019
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V Part 2: Particular requirements		EN61558-2-16:2009 + A1:2013
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V (CB Scheme)	CN21NHMJ 001 (OVC II)	IEC61558-1:2017
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V Part 2: Particular requirements (CB Scheme)		IEC61558-2-16:2009 1st Edition + A1:2013
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V	CN2199UU 001 (OVC III)	EN IEC 61558-1:2019
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V Part 2: Particular requirements		EN61558-2-16:2009 + A1:2013
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V (CB Scheme)	CN21AR9N 001 (OVC III)	IEC61558-1:2017
Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100V Part 2: Particular requirements (CB Scheme)		IEC61558-2-16:2009 1st Edition + A1:2013
RoHS2		RoHS-2011/65/EU + AM-2015/863

EMC Compliance	Condition	Standard / Criterion
Electromagnetic compatibility of multimedia equipment – Emission Requirements	refer to „ <b>Note 7</b> ” for GND ref. use	EN55032:2015+A11:2020, Class B
Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)		EN IEC 61204-3:2018, Class B
ESD Electrostatic discharge immunity test	Air: $\pm 2, 4, 8kV$ Contact $\pm 4kV$	EN61000-4-2:2008, Criteria A IEC61000-4-2:2009, Criteria A
Radiated, radio-frequency, electromagnetic field immunity test	10V/m (80-1000MHz); 3V/m (1400-2000MHz); 1V/m (2000-2700MHz)	IEC/EN61000-4-3:2006+A2:2010, Criteria A
Fast Transient and Burst Immunity	AC Port: $\pm 2kV$	IEC/EN61000-4-4:2012, Criteria A
Surge Immunity	AC Port: $\pm 1kV$	IEC/EN61000-4-5:2014+A1:2017, Criteria A
Immunity to conducted disturbances, induced by radio-frequency fields	AC Port: 10Vrms (0.15-80MHz)	IEC61000-4-6:2013, Criteria A EN61000-4-6:2014, Criteria A
Power Magnetic Field Immunity	30A/m	IEC61000-4-8:2009, Criteria A EN61000-4-8:2010, Criteria A
Voltage Dips	100% (0.5P, 1.0P); 30%; 20%	IEC/EN61000-4-11:2004, Criteria A
Voltage Interruptions	100%	IEC/EN61000-4-11:2004, Criteria B
Limits of Harmonic Current Emissions		EN61000-3-2:2014
Limits of Voltage Fluctuations & Flicker		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

Note7: For 12V model in GND or earth referenced output configuration, an X-cap of 0.15uF parallel connected to the input is recommended

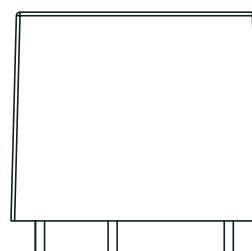
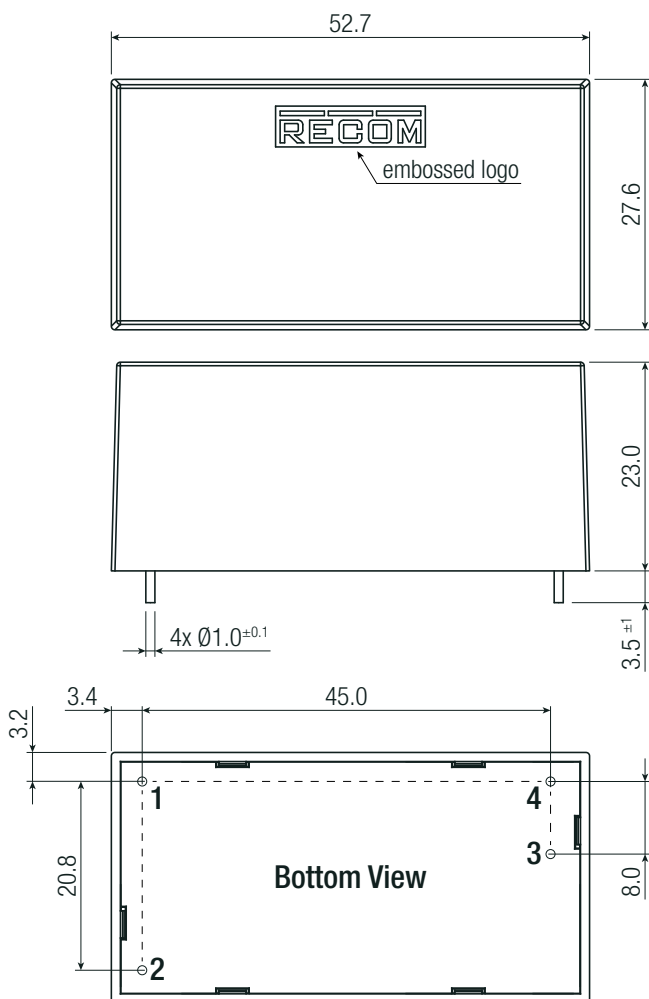
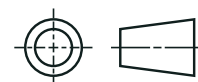
# RAC20E-K/277 Series $\diamond$ AC/DC Power Supply

20W  $\diamond$  Input: 100-277VAC

## DIMENSION & PHYSICAL CHARACTERISTICS

Parameter	Type	Value
Materials	case/baseplate	black plastic, (UL94-V0)
	potting	silicone, (UL94-V0)
	PCB	FR4, (UL94-V0)
Dimension (LxWxH)		52.7 x 27.6 x 23.0mm 2.07 x 1.08 x 0.91 inch
Weight		60g typ. 0.13 lbs

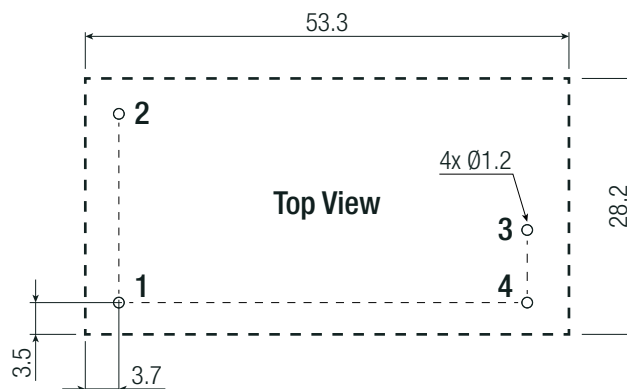
Dimension Drawing (mm)



Pinning Information

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

Recommended Footprint Details



Tolerance: x.x= ±0.5mm  
x.xx= ±0.25mm

## PACKAGING INFORMATION

Parameter	Type	Value
Packaging Dimension (LxWxH)	tube	490.0 x 56.0 x 40.0mm
Packaging Quantity		15pcs
Storage Temperature Range		-40°C to +85°C
Storage Humidity	non-condensing	20-90% 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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- ✓ Shortage Management
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