

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

20W ◊ Input: 100-277VAC

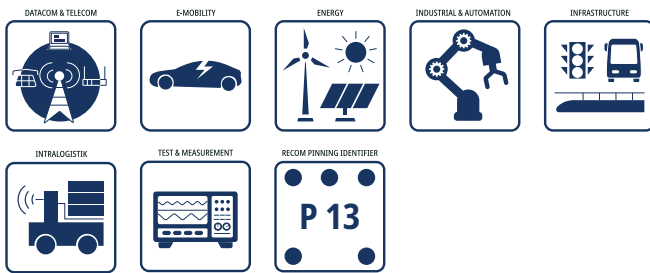
## FEATURES

- 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

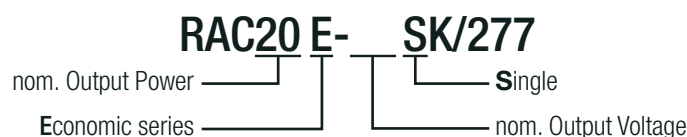
RAC20E-K/277, the economy “E-K” series of compact 20 Watt AC/DC modules, is designed to meet general purpose requirements for a wide variety of equipment for the IoT, ITE and industrial markets. These encapsulated power supplies feature 4.2kVac isolation and over voltage category OVC III, as well as 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)

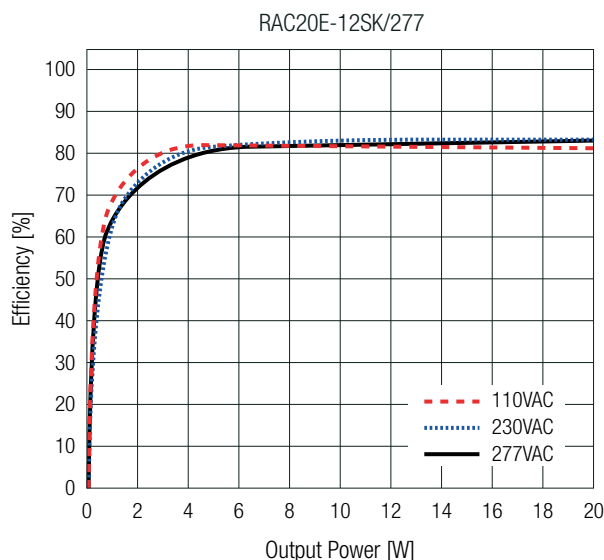
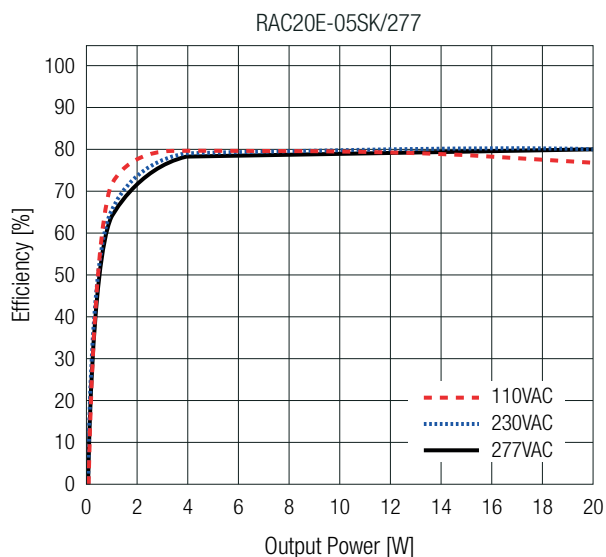
| Parameter   | Condition                          | Min.                        | Typ.   | Max.           |
|---|------------------------------------|-----------------------------|--------|----------------|
| Nominal Input Voltage   | 50/60Hz                            | 100VAC                      |        | 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<br>(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  | $V_{IN}= 115\text{VAC}$            | 25ms                        | 10ms   |                |
|   | $V_{IN}= 230\text{VAC}$            |                             | 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“

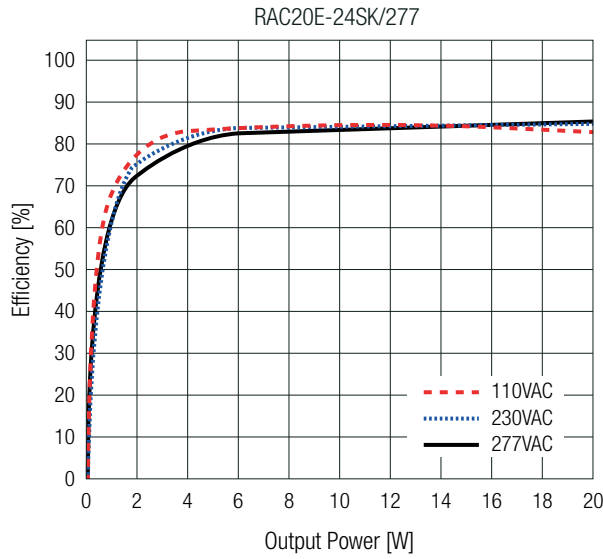
Note4: Measurements are made with a 0.1 $\mu\text{F}$  MLCC & 10 $\mu\text{F}$  E-cap in parallel across output. (low ESR)

### 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**

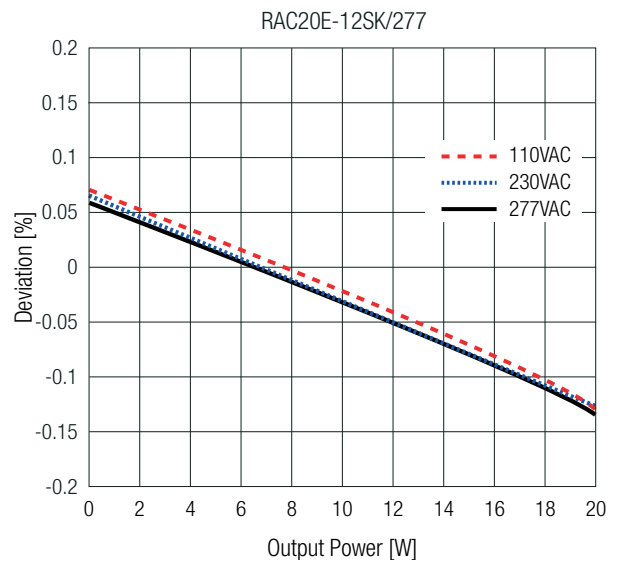
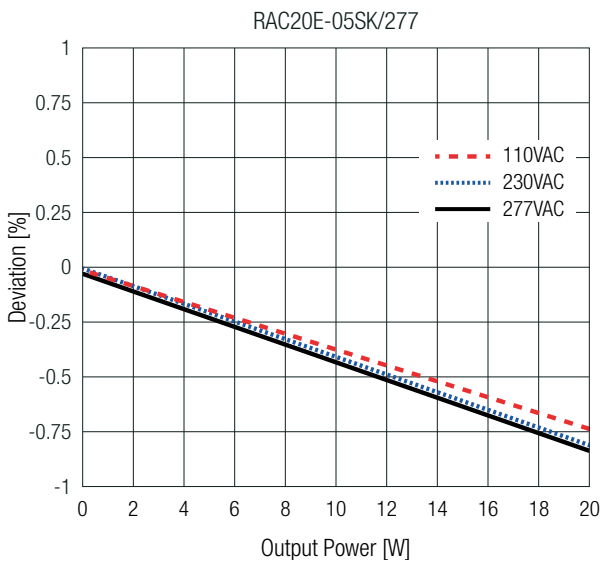


**REGULATIONS** (measured @  $T_{AMB} = 25^{\circ}\text{C}$ , nom.  $V_{IN}$ , full load and after warm-up unless otherwise stated)

| 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. |

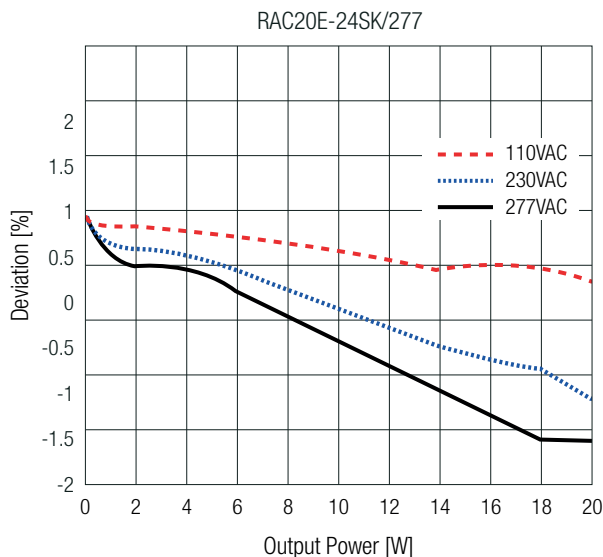
Note5: Operation below 10% load will not harm the converter, but specifications may not be met

**Deviation vs. Load**



**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> | I/P to O/P             | according to 61558        | 1 minute                              |
| Isolation Resistance             |                        | $V_{ISO} = 500\text{VDC}$ |                                       |
| 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                      |

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

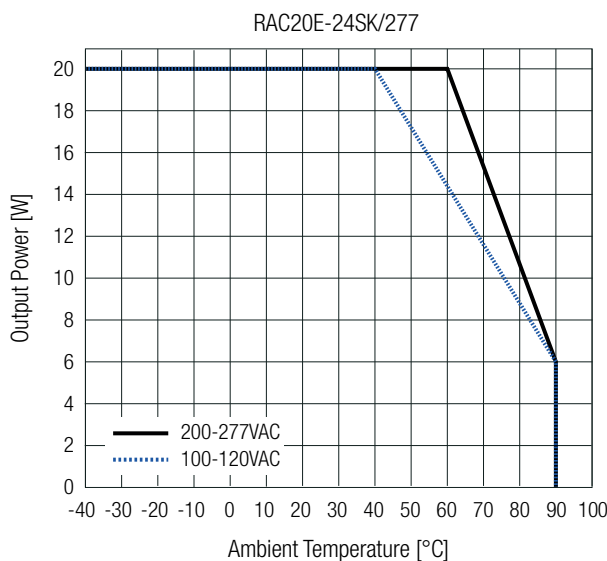
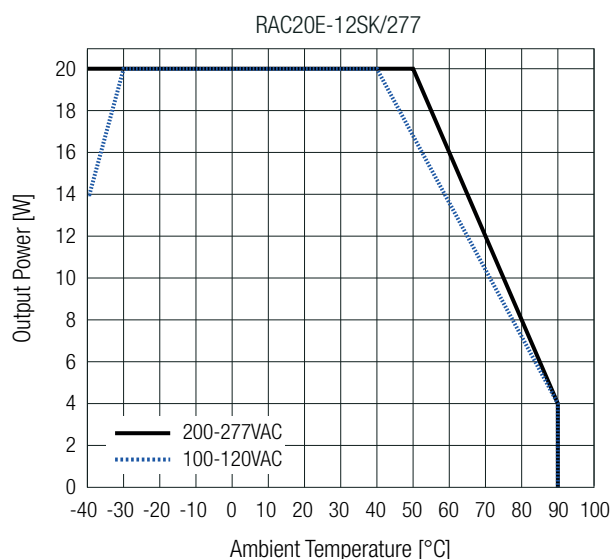
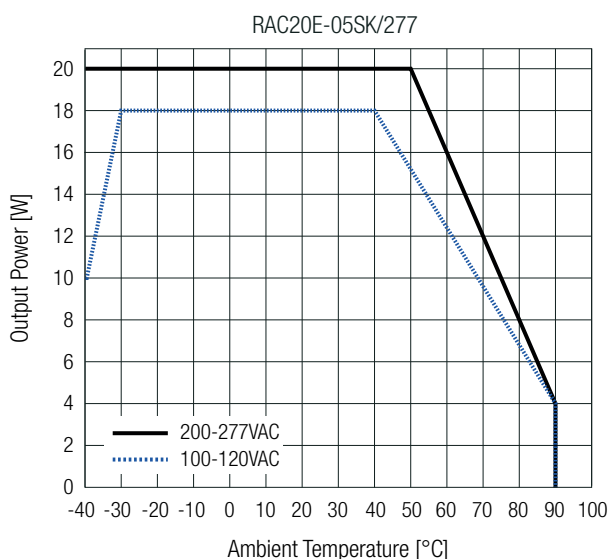
20W  $\diamond$  Input: 100-277VAC

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<br>-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<br>(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<br>(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<br>(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<br>(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: $\pm 2, 4, 8$ kV<br>Contact $\pm 4$ kV                        | EN61000-4-2:2008, Criteria A<br>IEC61000-4-2:2009, Criteria A |
| Radiated, radio-frequency, electromagnetic field immunity test  | 10V/m (80-1000MHz);<br>3V/m (1400-2000MHz);<br>1V/m (2000-2700MHz) | IEC/EN61000-4-3:2006+A2:2010, Criteria A                      |
| Fast Transient and Burst Immunity   | AC Port: $\pm 2$ kV  | IEC/EN61000-4-4:2012, Criteria A                              |
| Surge Immunity  | AC Port: $\pm 1$ kV  | IEC/EN61000-4-5:2014+A1:2017, Criteria A                      |
| Immunity to conducted disturbances, induced by radio-frequency fields                                 | AC Port:<br>10Vrms (0.15-80MHz)                                    | IEC61000-4-6:2013, Criteria A<br>EN61000-4-6:2014, Criteria A |
| Power Magnetic Field Immunity   | 30A/m  | IEC61000-4-8:2009, Criteria A<br>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

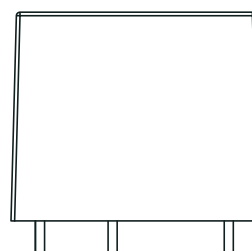
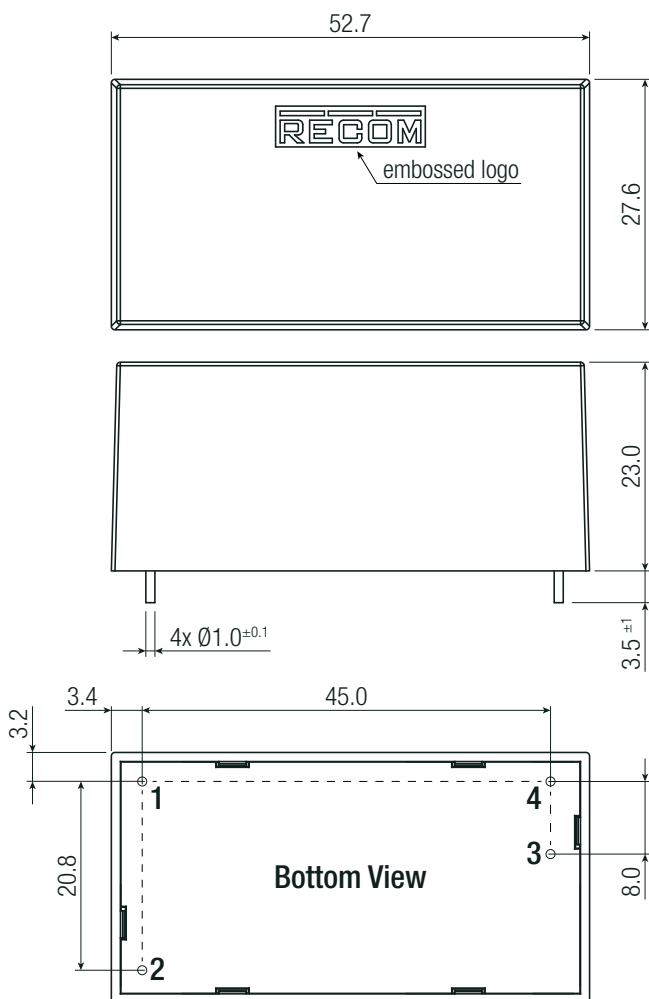
# RAC20E-K/277 Series $\diamond$ AC/DC Power Supply

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<br>2.07 x 10.87 x 0.91 inch |
| Weight            |                | 60g typ.<br>0.13 lbs                             |

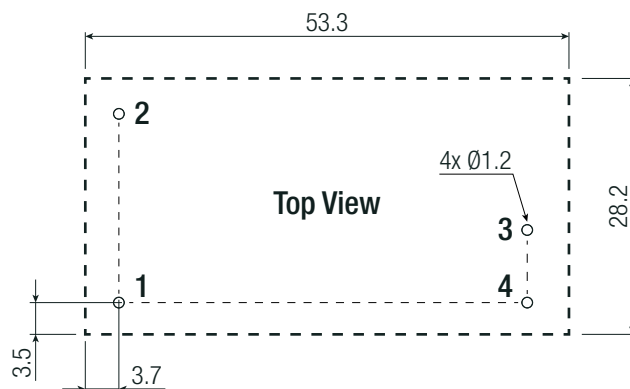
Dimension Drawing (mm)



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.