

## Features

## Regulated Converter

- 100-240VAC Input
- Primary side regulated
- Standard industry pinout
- Full load operation: -25 to 55°C
- No load power consumption <100mW
- Household and ITE certified

**RECOM**  
AC/DC Converter

## RAC05E-K

5 Watt

1.46"x0.95"

Single Output



**UL**  
E224736



UL/IEC/EN62368-1 certified  
CAN/CSA C22.2 No. 62368-1 certified  
IEC/EN60335-1 certified  
EN62233 certified  
IEC/EN61558-1 certified  
IEC/EN61558-2-16 certified  
EN55032/EN55035 compliant  
EN IEC 61204-3 compliant  
CB Report

## Description

The economically priced RAC05E-K series of primary-side regulated AC/DC converters is designed to meet general purpose requirements for ITE and office use as well as household applications or light industrial automation processes, with less than 0.1W no-load power consumption. The footprint is based on the most common industry standard pinning for AC/DC modules from 3W onwards, with just slightly increased height. The AC/DC modules hold UL and CB certifications to the IEC 62368-1 standard and to EN 60335-1 for household applications. Certified for full load operation from -25°C to +55°C and worldwide input voltage ranges of nominal 100-240VAC, the modules feature semi-regulated outputs with permanent short circuit and over voltage protection. With only a few additional components EN55014 and EN55032 class B limits for electromagnetic compatibility are met.

## Selection Guide

| Part Number | Input Voltage Range [VAC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. <sup>(1)</sup> [%] |
|-------------|---------------------------|----------------------|---------------------|------------------------------------|
| RAC05E-05SK | 90-264                    | 5                    | 1000                | 74                                 |
| RAC05E-12SK | 90-264                    | 12                   | 417                 | 78                                 |
| RAC05E-15SK | 90-264                    | 15                   | 333                 | 79                                 |
| RAC05E-24SK | 90-264                    | 24                   | 208                 | 80                                 |

### Notes:

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

## Model Numbering



### Ordering Examples:

RAC05E-05SK      5 Watt      5Vout  
RAC05E-24SK      5 Watt      24Vout

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

### BASIC CHARACTERISTICS

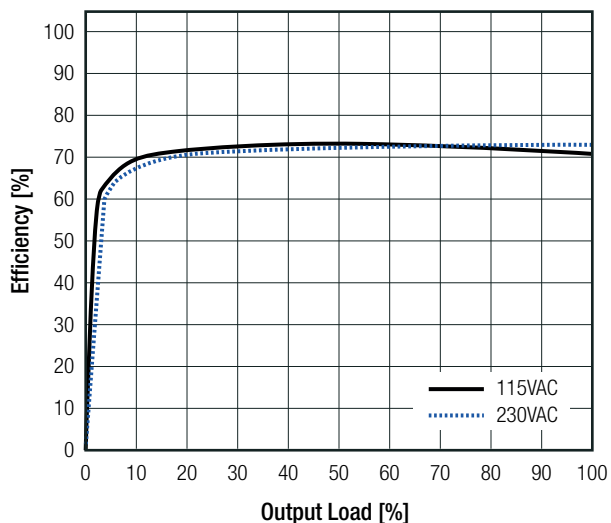
| Parameter                                               | Condition                 |                  | Min.            | Typ.   | Max.                  |
|---------------------------------------------------------|---------------------------|------------------|-----------------|--------|-----------------------|
| Internal Input Filter                                   |                           |                  | Pi type         |        |                       |
| Nominal Input Voltage                                   | 50/60Hz                   |                  | 100VAC          |        | 240VAC                |
| Operating Range <sup>(2, 3)</sup>                       | 47-63Hz<br>DC             |                  | 90VAC<br>130VDC | 230VAC | 264VAC<br>370VDC      |
| Input Current                                           | 115VAC<br>230VAC          |                  |                 |        | 250mA<br>100mA        |
| Inrush Current                                          | cold start at 25°C        | 115VAC<br>230VAC |                 |        | 20A<br>10A            |
| No load Power Consumption                               |                           |                  |                 |        | 100mW                 |
| Input Frequency Range                                   | AC Input                  |                  | 47Hz            |        | 63Hz                  |
| ErP Standby Mode Conformity<br>(Output Load Capability) | Input power= 0.5W<br>1.0W |                  |                 |        | 0.32<br>0.68          |
| Minimum Load                                            |                           |                  | 0%              |        |                       |
| Power Factor                                            | 115VAC<br>230VAC          |                  | 0.55<br>0.45    |        |                       |
| Start-up Time                                           |                           |                  |                 | 20ms   |                       |
| Rise Time                                               |                           |                  |                 | 15ms   |                       |
| Hold-up Time                                            | 115VAC<br>230VAC          |                  | 8ms<br>20ms     |        |                       |
| Internal Operating Frequency                            | 100% load at nominal Vin  |                  |                 |        | 130kHz                |
| Output Ripple and Noise <sup>(4)</sup>                  | 20MHz BW                  | 5Vout<br>others  |                 |        | 70mVp-p<br>1% of Vout |

#### Notes:

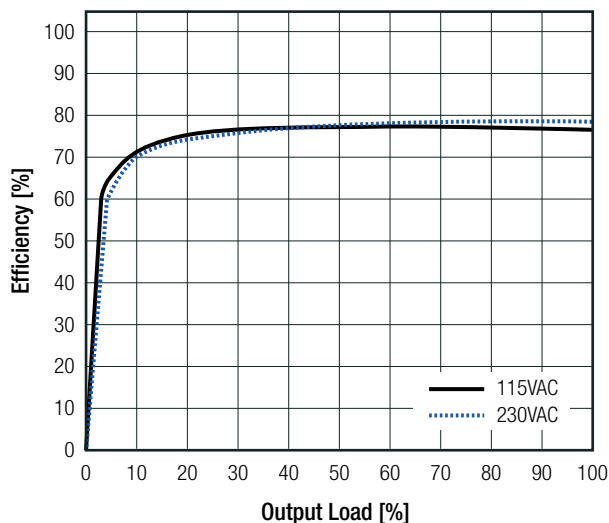
- Note2: The products were submitted for safety files at AC-Input operation  
 Note3: Refer to **"Line Derating"**  
 Note4: Measurements are made with a 0.1µF MLCC & 10µF E-cap in parallel across output. (low ESR)

### Efficiency vs. Load

RAC05E-05SK



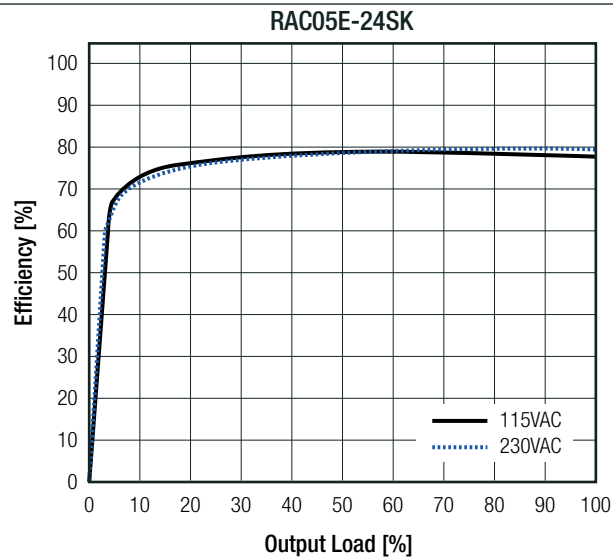
RAC05E-12SK + RAC05E-15SK



continued on next page

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

Efficiency vs. Load



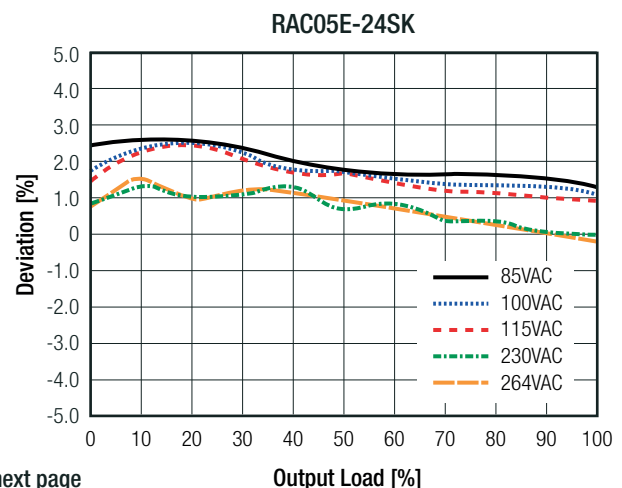
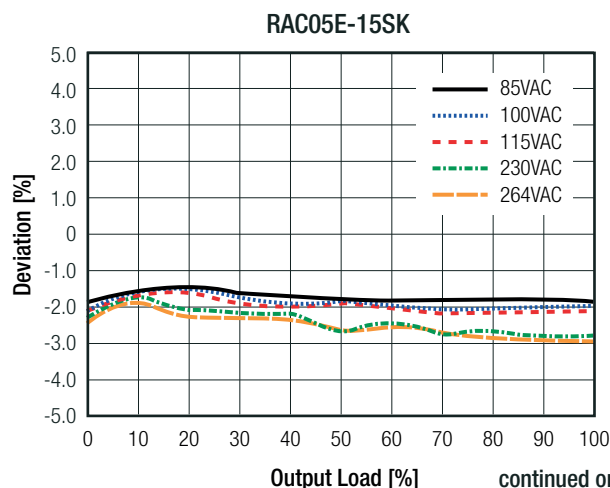
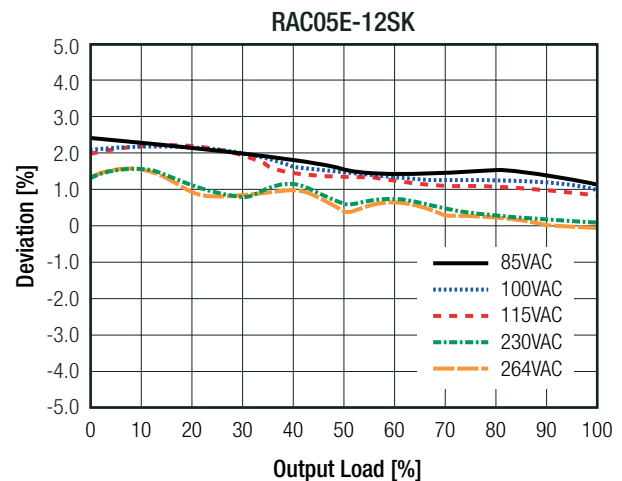
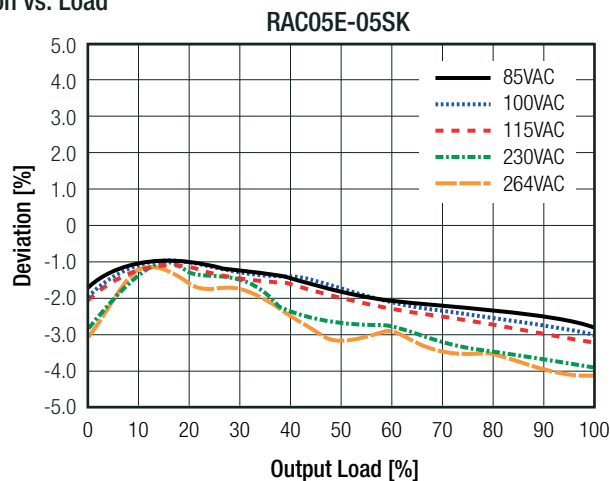
### REGULATIONS

| Parameter                      | Condition | Value      |
|--------------------------------|-----------|------------|
| Output Accuracy                |           | ±5.0% typ. |
| Line Regulation                |           | ±5.0% typ. |
| Load Regulation <sup>(5)</sup> |           | 5.0% typ.  |

**Notes:**

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

Deviation vs. Load



continued on next page

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

### PROTECTIONS

| Parameter                            | Type        |          |                                                                    | Value                      |
|--------------------------------------|-------------|----------|--------------------------------------------------------------------|----------------------------|
| Input Fuse <sup>(6)</sup>            | external    |          |                                                                    | fusible resistor 5.1Ω      |
| Short Circuit Protection (SCP)       | below 100mΩ |          |                                                                    | Hiccup mode, auto recovery |
| Over Voltage Category (OVC)          |             |          |                                                                    | OVCII                      |
| Over Current Protection (OCP)        |             |          |                                                                    | 120% - 180%, hiccup mode   |
| Isolation Voltage (safety certified) | I/P to O/P  | 1 minute | according to 60335-1<br>according to 62368-1<br>according to 61558 | 3kVAC<br>4kVDC<br>4.2kVAC  |
| Insulation Grade                     |             |          |                                                                    | reinforced                 |

**Notes:**

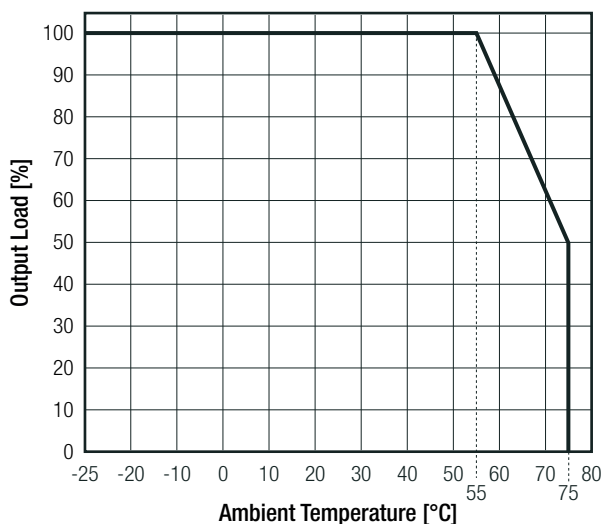
Note6: An external fuse is mandatory in order to protect the device in addition on the AC input side.

### ENVIRONMENTAL

| Parameter                   | Condition                                  |                | Value                                                             |
|-----------------------------|--------------------------------------------|----------------|-------------------------------------------------------------------|
| Operating Temperature Range | full load refer to <i>"Derating Graph"</i> |                | -25°C to +75°C                                                    |
| Maximum Case Temperature    |                                            |                | +90°C                                                             |
| Temperature Coefficient     |                                            |                | ±0.05%/K                                                          |
| Operating Altitude          | according to 60335-1                       |                | 5000m                                                             |
| Operating Humidity          | non-condensing                             |                | 20% - 95% RH max.                                                 |
| Pollution Degree            |                                            |                | PD2                                                               |
| Vibration                   |                                            |                | 10-500Hz, 2G10min./1cycle, period 60min.<br>each along x,y,z axes |
| MTBF                        | according to MIL-HDBK-217F, G.B.           | +25°C<br>+40°C | 1680 x 10 <sup>3</sup> hours<br>1290 x 10 <sup>3</sup> hours      |
| Design Lifetime             | +50°C                                      |                | >40 x 10 <sup>3</sup> hours                                       |

#### Derating Graph

(@ Chamber and natural convection 0.1m/s)



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

| SAFETY AND CERTIFICATIONS                                                                                                                              |                                                           |                                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------------------------|
| Certificate Type (Safety)                                                                                                                              | Report Number                                             | Standard                                                                        |
| Audio/Video, information and communication technology equipment - Part 1: Safety requirements                                                          | E491408-A6016-UL                                          | UL62368-1:2014<br>CAN/CSA-C22.2 No. 62368-1:2014                                |
| Audio/Video, information and communication technology equipment - Safety requirements (CB Scheme)                                                      | E491408-A6017-CB-1                                        | IEC62368-1:2014 2nd Edition                                                     |
| Audio/Video, information and communication technology equipment - Safety requirements (LVD)                                                            | E491408-A6015-IT-1                                        | EN62368-1:2014 + A11:2017                                                       |
| Household and similar electrical appliances – Safety – Part 1: General requirements (CB Scheme)                                                        | LCS200820072AS                                            | IEC60335-1:2010 5th Edition + C1:2016                                           |
| Household and similar electrical appliances – Safety – Part 1: General requirements (LVD)                                                              |                                                           | EN60335-1:2012 + A11:2014+A13:2017+A1:2019+A2:2019+A14:2019                     |
| Measurement methods for electromagnetic fields of household appliances and similar apparatus with regard to human exposure                             |                                                           | EN62233:2008                                                                    |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V (CB Scheme)                               | NN20TGSJ-001                                              | IEC61558-1:2005 2nd Edition + A1:2009                                           |
| Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100 V Part 2: Particular requirements (CB Scheme) |                                                           | IEC61558-2-16:2009 1st Edition + A1:2013                                        |
| Safety of power transformers, power supplies, reactors and similar products for supply voltages up to 1100 V                                           | NN20UK56-001                                              | EN61558-1:2005 + A1:2009                                                        |
| Safety of power transformers, power supplies, reactors & similar products for supply voltages up to 1100 V Part 2: Particular requirements             |                                                           | EN61558-2-16:2009 + A1:2013                                                     |
| RoHS2                                                                                                                                                  |                                                           | RoHS 2011/65/EU + AM2015/863                                                    |
| EMC Compliance (Industrial)                                                                                                                            | Condition                                                 | Standard / Criterion                                                            |
| Electromagnetic compatibility of multimedia equipment - Emission requirements                                                                          |                                                           | EN55032:2015, Class A/B                                                         |
| Electromagnetic compatibility of multimedia equipment – Immunity requirements                                                                          |                                                           | EN55035:2017                                                                    |
| ESD Electrostatic Discharge Immunity Test                                                                                                              | Air: $\pm 2, 4, 8$ kV<br>Contact: $\pm 2, 4$ kV           | IEC61000-4-2:2008, Criteria B<br>EN61000-4-2:2009, Criteria B                   |
| Radiated, Radio-Frequency, Electromagnetic Field Immunity Test                                                                                         | 3V/m: 80-1000MHz<br>1800MHz, 2600MHz<br>3500MHz, 5000MHz  | IEC/EN61000-4-3:2006+A2:2010, Criteria A                                        |
| Fast Transient and Burst Immunity                                                                                                                      | AC Port: $\pm 1$ kV                                       | IEC/EN61000-4-4:2012, Criteria B                                                |
| Surge Immunity                                                                                                                                         | AC Power Port: $\pm 1$ kV                                 | IEC61000-4-5:2014, Criteria B<br>EN61000-4-5:2014+A1:2017, Criteria B           |
| Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields                                                                                  | 3Vrms: 0.15-10MHz<br>3-1Vrms: 10-30MHz<br>1Vrms: 30-80MHz | IEC61000-4-6:2013, Criteria A<br>EN61000-4-6:2014+AC:2015, Criteria A           |
| Power Magnetic Field Immunity                                                                                                                          | 1A/m                                                      | IEC61000-4-8:2009, Criteria A<br>EN61000-4-8:2010, Criteria A                   |
| Voltage Dips and Interruption                                                                                                                          | Voltage Dips:                                             | 100%<br>IEC61000-4-11:2004, Criteria B<br>EN61000-4-11:2004+A1:2017, Criteria B |
|                                                                                                                                                        |                                                           | 30%<br>IEC61000-4-11:2004, Criteria C<br>EN61000-4-11:2004+A1:2017, Criteria C  |
|                                                                                                                                                        | Interruptions:                                            | 100%<br>IEC61000-4-11:2004, Criteria C<br>EN61000-4-11:2004+A1:2017, Criteria C |
| EMC Compliance (Low Voltage PSU)                                                                                                                       | Condition                                                 | Standard / Criterion                                                            |
| Low voltage power supplies, d.c. output Part 3: Electromagnetic compatibility (EMC)                                                                    |                                                           | EN IEC 61204-3:2018, Class A/B                                                  |
| ESD Electrostatic Discharge Immunity Test                                                                                                              | Air: $\pm 2, 4, 8$ kV<br>Contact: $\pm 2, 4$ kV           | IEC61000-4-2:2008, Criteria B<br>EN61000-4-2:2009, Criteria B                   |

continued on next page

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

| EMC Compliance (Low Voltage PSU)                                                                                                                     | Condition                                                     |                      | Standard / Criterion                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------|----------------------|-------------------------------------------------------------------------|
| 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 B                                        |
| Surge Immunity                                                                                                                                       | AC Power Port: $\pm 1$ kV                                     |                      | IEC61000-4-5:2014, Criteria B<br>EN61000-4-5:2014+A1:2017, Criteria B   |
| Immunity to Conducted Disturbances, Induced by Radio-Frequency Fields                                                                                | 10Vrms: 0.15-80MHz                                            |                      | IEC61000-4-6:2013, Criteria A<br>EN61000-4-6:2014+AC:2015, Criteria A   |
| Power Magnetic Field Immunity                                                                                                                        | 30A/m                                                         |                      | IEC61000-4-8:2009, Criteria A<br>EN61000-4-8:2010, Criteria A           |
| Voltage Dips and Interruption                                                                                                                        | Voltage Dips:                                                 | 100%<br>(0.5P; 1.0P) | IEC61000-4-11:2004, Criteria B<br>EN61000-4-11:2004+A1:2017, Criteria B |
|                                                                                                                                                      |                                                               | 20%, 30%,<br>60%     | IEC61000-4-11:2004, Criteria C<br>EN61000-4-11:2004+A1:2017, Criteria C |
|                                                                                                                                                      | Interruptions:                                                | 100%                 | IEC61000-4-11:2004, Criteria C<br>EN61000-4-11:2004+A1:2017, Criteria C |
| Limits of Voltage Fluctuations & Flicker                                                                                                             |                                                               |                      | EN61000-3-3:2013+A1:2019                                                |
| Limitations on the amount of electromagnetic interference allowed from digital and electronic devices                                                |                                                               |                      | FCC 47 CFR Part 15 Subpart B, Class B                                   |
| Limitations on the amount of electromagnetic interference allowed from digital and electronic devices, industrial, scientific, and medical equipment |                                                               |                      | FCC 47 CFR Part 18                                                      |

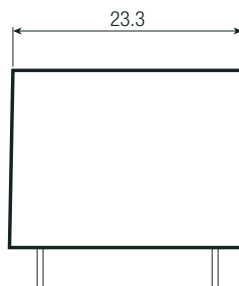
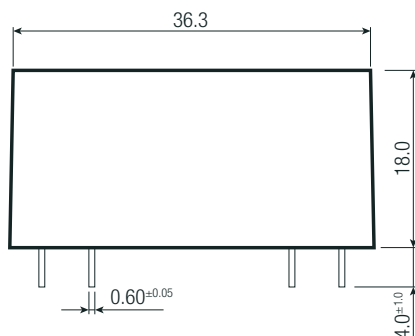
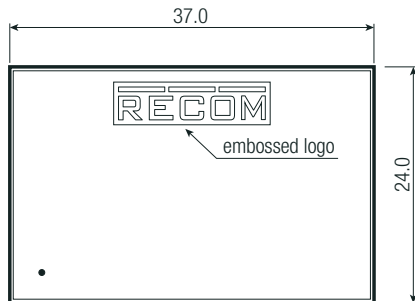
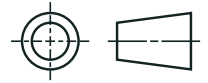
### DIMENSION AND PHYSICAL CHARACTERISTICS

| Parameter         | Type                             | Value                                                          |
|-------------------|----------------------------------|----------------------------------------------------------------|
| Material          | case/baseplate<br>potting<br>PCB | black plastic, (UL94 V-0)<br>PU, (UL94 V-0)<br>FR4, (UL94 V-0) |
| Dimension (LxWxH) |                                  | 37.0 x 24.0 x 18.0mm                                           |
| Weight            |                                  | 26.4g typ.                                                     |

continued on next page

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

Dimension Drawing (mm)

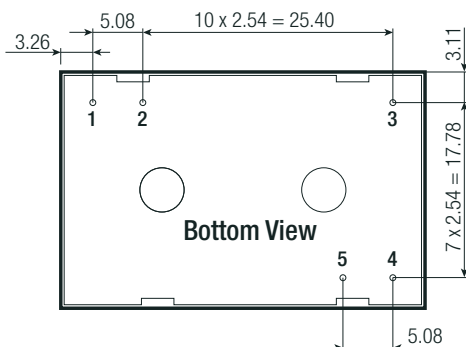


| General tolerances according to ISO 2768-m<br>(table for reference only) |            |
|--------------------------------------------------------------------------|------------|
| Dimension range                                                          | Tolerances |
| 0.5 - 6 mm                                                               | ±0.1 mm    |
| 6 - 30 mm                                                                | ±0.2 mm    |
| 30 - 120 mm                                                              | ±0.3 mm    |
| 120 - 400 mm                                                             | ±0.5 mm    |

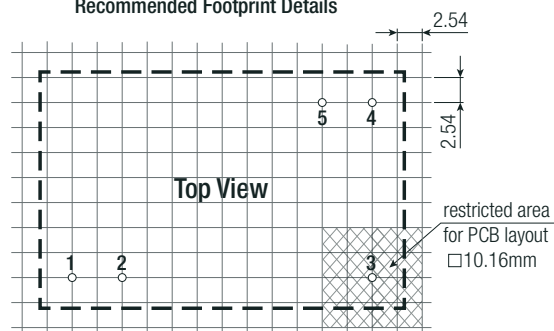
Pinning Information

| Pin # | Single     |
|-------|------------|
| 1     | VAC in (L) |
| 2     | VAC in (N) |
| 3     | NC         |
| 4     | -Vout      |
| 5     | +Vout      |

NC= no connection



Recommended Footprint Details



### PACKAGING INFORMATION

| Parameter                   | Type | Value                 |
|-----------------------------|------|-----------------------|
| Packaging Dimension (LxWxH) | tube | 490.0 x 26.6 x 25.3mm |
| Packaging Quantity          |      | 12pcs                 |

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.