

# Features

# Regulated Converters

- Wide input range 85-305Vac
- Full load temperature range: -40°C to +65°C
- Ultra-high efficiency over entire load range
- No external components necessary
- International EMC compliant
- Lowest total cost of ownership
- 140% Peak Load Capability



## RAC10-K/277

**10 Watt**  
**2" x 1"**  
**Single and Dual Output**



- UL/IEC/EN62368-1 (pending)
- UL/IEC/EN60950-1 (pending)
- IEC/EN60335-1 (pending)
- CSA C22.2 No. 60950-1-07 (pending)
- CSA C22.2 No. 62368-1-14 (pending)
- EN61204-3 (pending)
- EN55022/EN55024 (pending)
- FCC Part 15 (pending)

### Description

The RAC10-K/277 series are highly efficient PCB-Mount power conversion modules with ultra-low energy losses even in light load conditions. Built for worldwide usage, the AC/DC units cover an enhanced mains input range of 85Vac up to 305Vac and come with international safety certifications for both industrial and household standards. These AC/DC modules offer fully protected single or dual outputs as well as EMC class B compliance without the need of any external components. The 150% peak power capability makes the RAC10-K/277 series suitable for inductive, high start-up current or nonlinear loads. With a full load temperature range of -40°C to +65°C, they are ideal for always-on and standby mode operations in process automation, IoT and smart building applications.

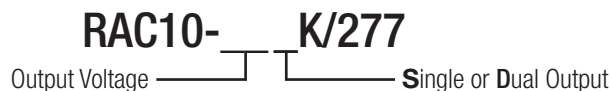
### Selection Guide

| Part Number     | Input Voltage Range [VAC] | Output Voltage [VDC] | Output Current [mA] | Efficiency typ. <sup>(1)</sup> [%] | Max. Capacitive Load [µF] |
|-----------------|---------------------------|----------------------|---------------------|------------------------------------|---------------------------|
| RAC10-3.3SK/277 | 85-305                    | 3.3                  | 2500                | 79                                 | 10000                     |
| RAC10-05SK/277  | 85-305                    | 5                    | 2000                | 82                                 | 8000                      |
| RAC10-12SK/277  | 85-305                    | 12                   | 840                 | 84                                 | 1500                      |
| RAC10-15SK/277  | 85-305                    | 15                   | 670                 | 85                                 | 1000                      |
| RAC10-24SK/277  | 85-305                    | 24                   | 420                 | 84                                 | 330                       |
| RAC10-12DK/277  | 85-305                    | ±12                  | ±420                | 82                                 | ±1200                     |
| RAC10-15DK/277  | 85-305                    | ±15                  | ±340                | 83                                 | ±1000                     |

#### Notes:

Note1: Efficiency is tested at 25°C with constant resistant mode at full load and 230VAC

### Model Numbering



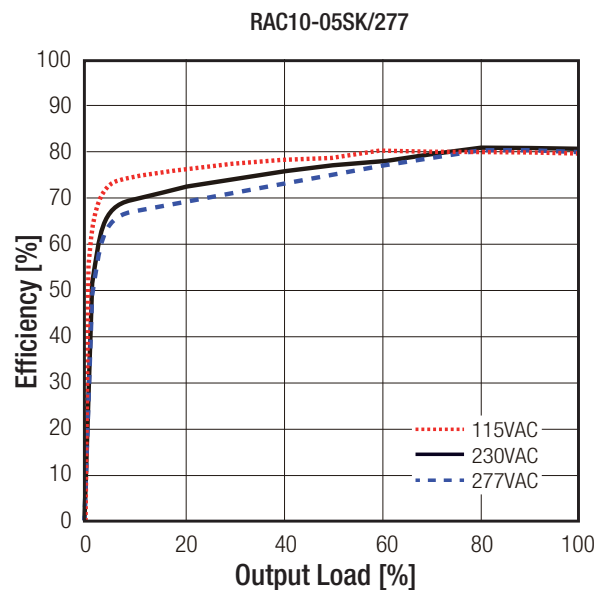
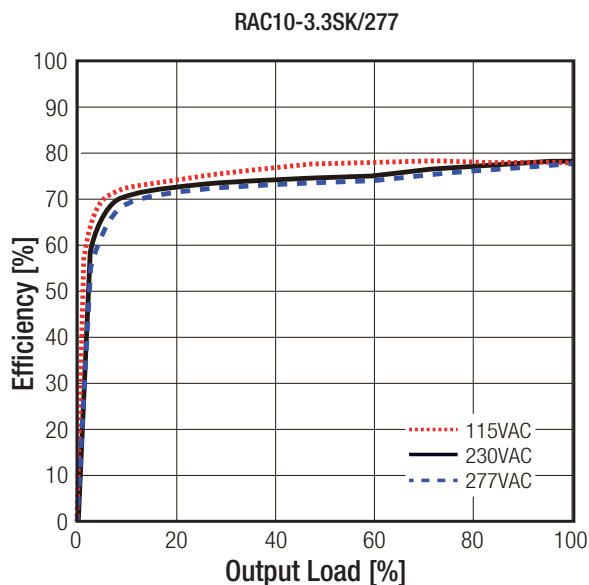
**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage (115/230VAC), full load and after warm-up)

| BASIC CHARACTERISTICS                                |   |   |              |                                   |
|--|---|---|--------------|-----------------------------------|
| Parameter  | Condition   | Min.  | Typ.         | Max.                              |
| Internal Input Filter                                |   |   |              | Pi Type                           |
| Input Voltage Range <sup>(2)</sup>                   | (refer to line derating graph on PA-5)                  | 85VAC<br>120VDC                                   |              | 305VAC<br>430VDC                  |
| Input Current  | 115VAC<br>230VAC  |   |              | 0.25A<br>0.21A                    |
| Inrush Current                                       | 230VAC  |   |              | 0.06A <sup>2</sup> s              |
| No load Power Consumption                            |   |   | 150mW        | 250mW                             |
| ErP Standby Mode Conformity (Output Load Capability) | 0.5W<br>Input Power= 1.0W<br>2.0W                       |   |              | 0.3W<br>0.7W<br>1.4W              |
| Input Frequency Range                                |   | 47Hz  |              | 63Hz                              |
| Overload Capability                                  | peak duty cycle: 10%; $T_{AMB} + 50^\circ\text{C}$ max. |   |              | 140%/10s                          |
| Start-up Time  |   |   | 30ms         |                                   |
| Rise Time  |   |   |              | 25ms                              |
| Hold-up time   | 115VAC<br>230VAC  |   | 15ms<br>90ms |                                   |
| Minimum Load   |   | 0%  |              |                                   |
| Internal Operating Frequency                         |   |   |              | 100kHz                            |
| Output Ripple and Noise                              | 20MHz BW  | 3.3V <sub>out</sub> , 5V <sub>out</sub><br>others |              | 60mVp-p<br>1% of V <sub>out</sub> |
| Power Factor   | 115VAC<br>230VAC  | 0.6<br>0.5  |              |                                   |

**Notes:**

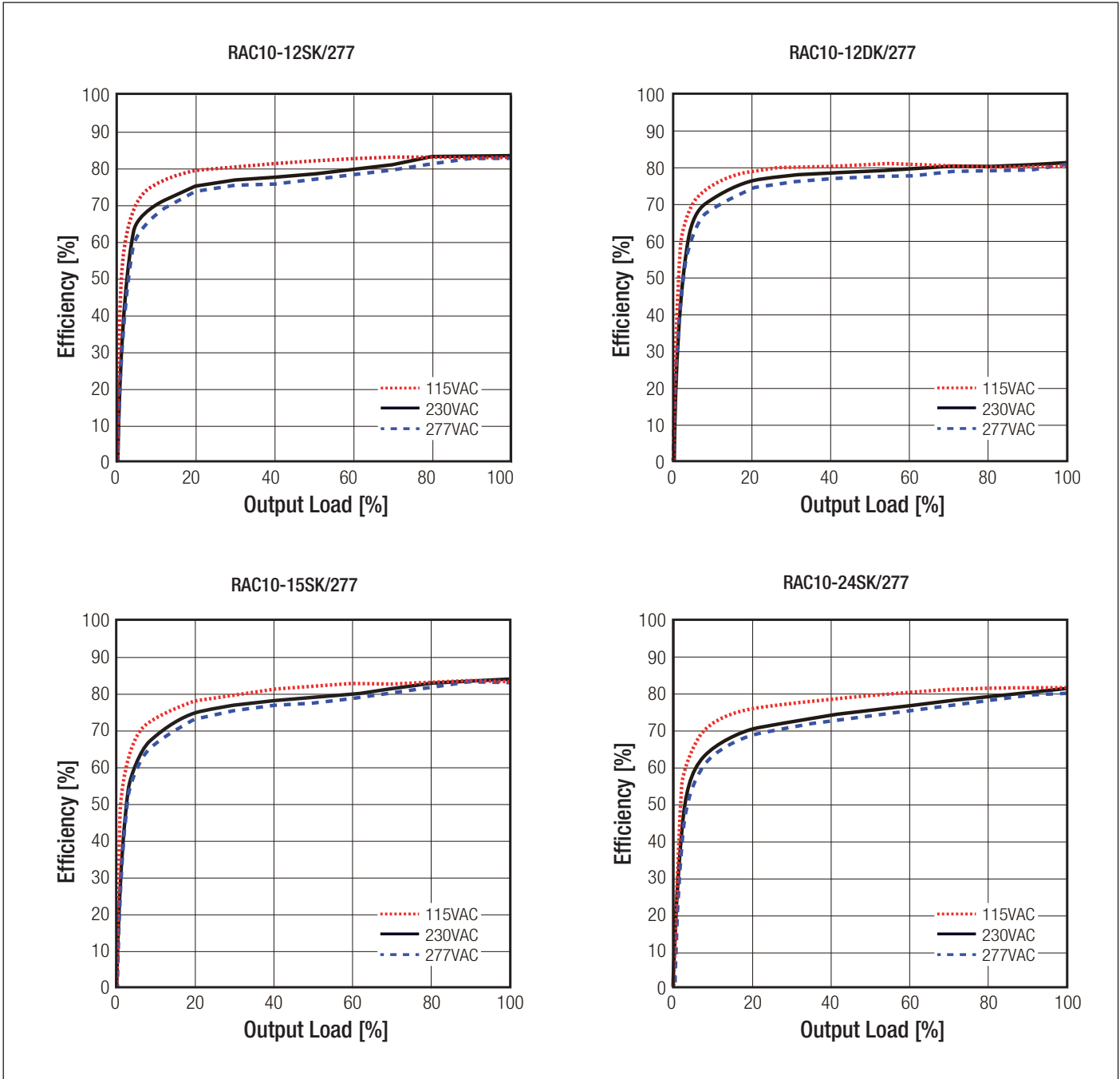
Note2: The products were submitted for safety files at AC-Input operation.

**Efficiency vs. Load**



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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage (115/230VAC), full load and after warm-up)

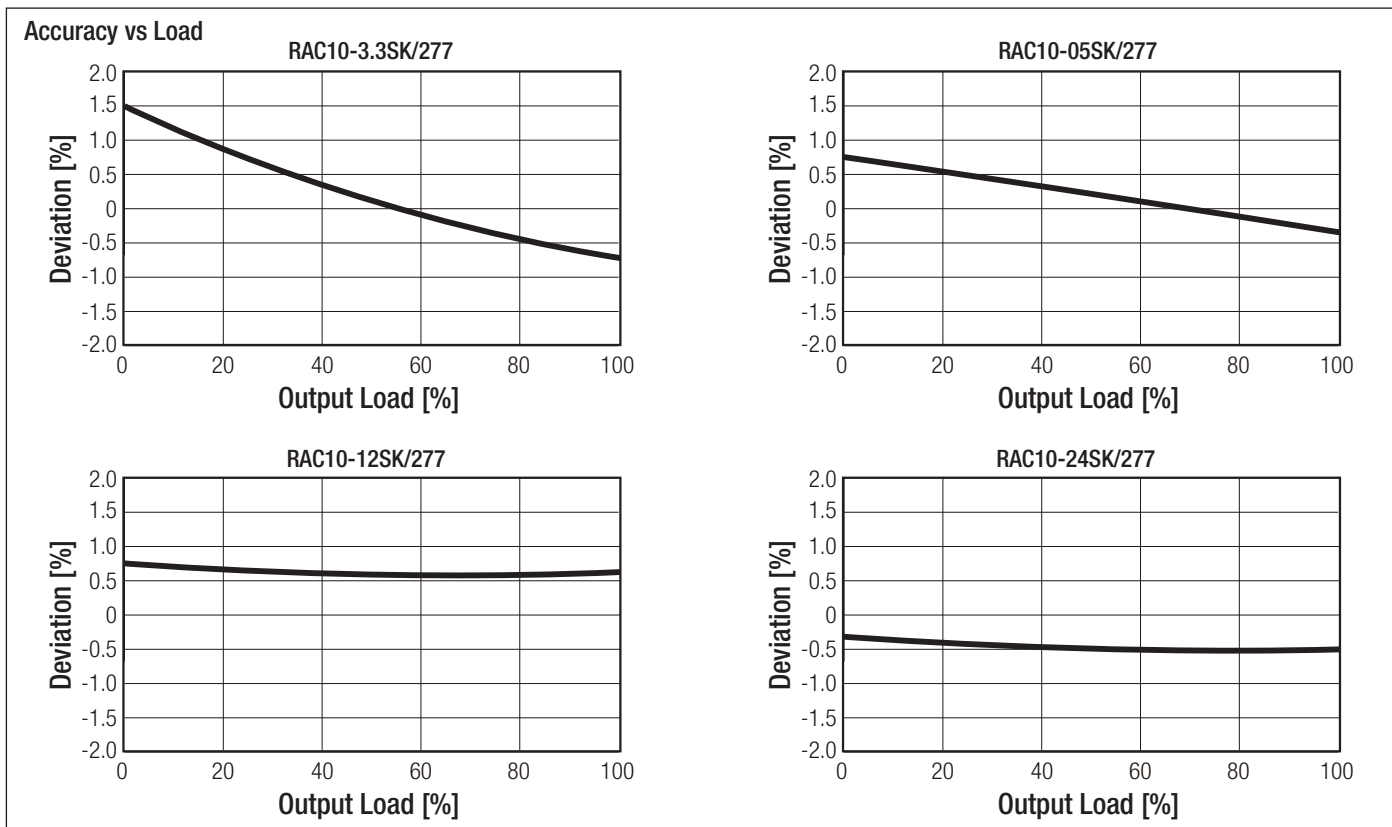


## REGULATIONS

| Parameter          | Condition                             |            | Value              |
|--------------------|---------------------------------------|------------|--------------------|
| Output Accuracy    |                                       |            | ±1.0% typ.         |
| Line Regulation    | low line to high line                 |            | ±0.5% typ.         |
| Load Regulation    | 0-100% load                           | 3.3, 5Vout | ±1.5% typ.         |
|                    |                                       | others     | ±1.0% typ.         |
| Transient Response | 25% load step change<br>Recovery Time |            | 4.0% max.<br>500µs |

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### PROTECTIONS

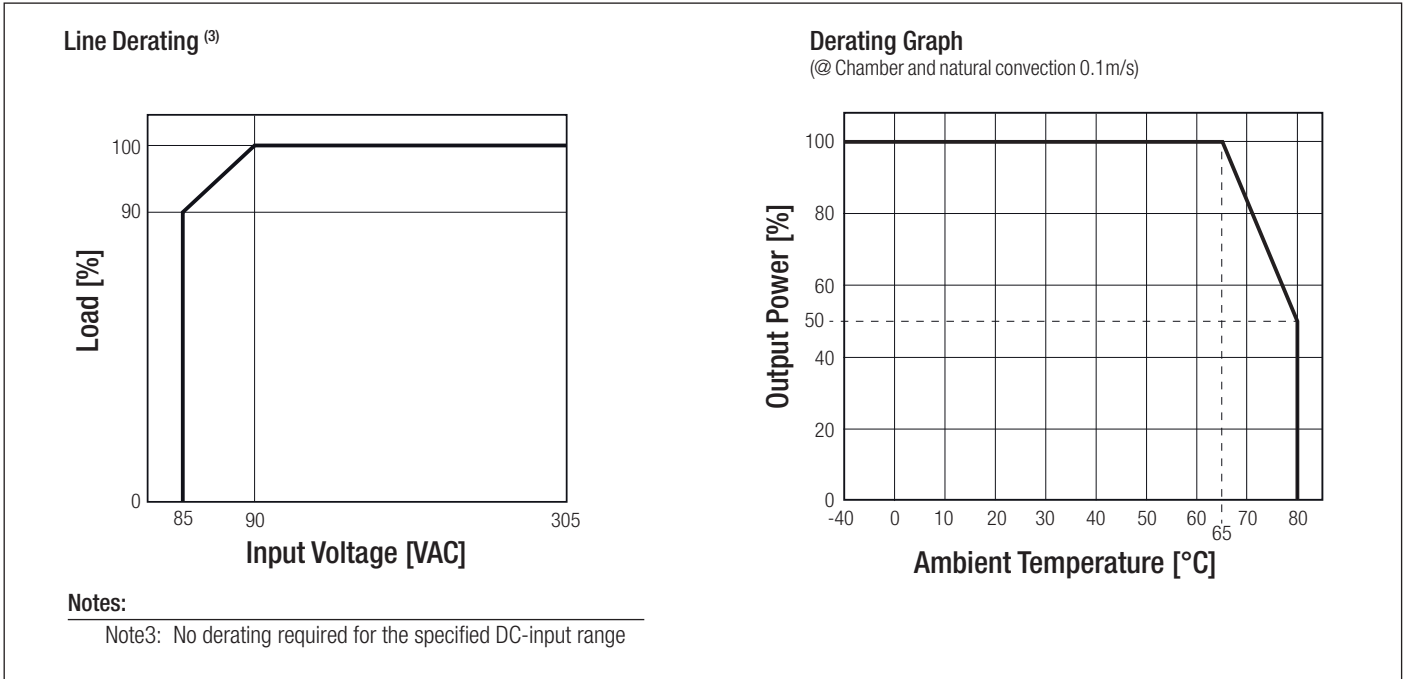
| Parameter                      | Type                                 | Value                     |
|--------------------------------|--------------------------------------|---------------------------|
| Internal Input Fuse            |                                      | T2A, slow blow            |
| Short Circuit Protection (SCP) |                                      | Hiccup, automatic restart |
| Over Voltage Protection (OVP)  |                                      | 150% - 195%, Hiccup Mode  |
| Over Load Protection (OLP)     |                                      | 150% - 195%, Hiccup Mode  |
| Over Voltage Category (OVC)    |                                      | OVC II                    |
| Isolation Voltage              | tested for 1 minute                  | 4KVAC                     |
| Isolation Resistance           | I/P to O/P, Isolation Voltage 500VDC | 1GΩ min.                  |
| Isolation Capacitance          | I/P to O/P, 100kHz/0.1V              | 100pF max.                |
| Insulation Grade               |                                      | reinforced                |
| Leakage Current                |                                      | 0.25mA max.               |

### ENVIRONMENTAL

| Parameter                   | Condition                          | Value   |
|-----------------------------|------------------------------------|---|
| Operating Temperature Range | with derating (see graph)          | -40°C to +80°C  |
| Maximum Case Temperature    |                                    | +100°C  |
| Temperature Coefficient     |                                    | ±0.05%/°C   |
| Operating Altitude          |                                    | 3000m   |
| Operating Humidity          | non-condensing                     | 20% to 90% RH   |
| Design Lifetime             | 115VAC/60Hz and full load at +25°C | >10 x 10 <sup>3</sup> hours                                     |
| MTBF                        | according to MIL-HDBK-217F, G.B.   | +25°C   |
|                             |                                    | +65°C   |
| Pollution Degree            |                                    | PD2   |
| Vibration                   |                                    | 10-500Hz, 2G 10min./1cycle, period 60min. each along x,y,z axes |

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**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage (115/230VAC), full load and after warm-up)



**SAFETY AND CERTIFICATIONS**

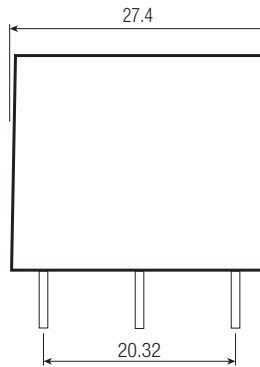
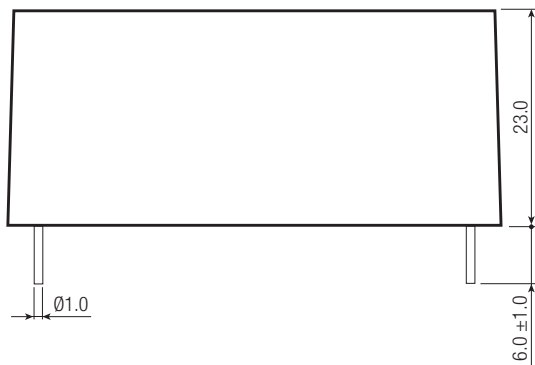
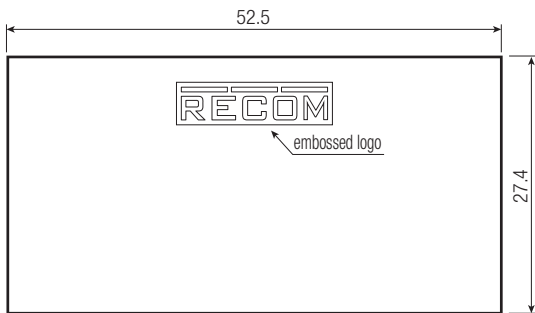
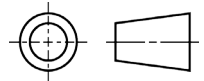
| Certificate Type (Safety)  | Report / File Number | Standard   |
|--|----------------------|--|
| Information Technology Equipment, General Requirements for Safety                          | pending              | UL60950-1, 2nd Edition, 2014<br>CSA C22.2 No. 60950-1-07, 2nd Ed. 2014 |
| Audio/Video, information and communication technology equipment - Safety requirements      | pending              | UL62368-1, 2nd Edition, 2014<br>CSA C22.2 Nr. 62368-1-14, 2nd Ed. 2014 |
| Information Technology Equipment, General Requirements for Safety (CB)                     | pending              | IEC60950-1:2005, 2nd Edition +A2:2013                                  |
| Household and similar electrical appliances - Safety - Part 1: General requirements        | pending              | IEC60335-1,2010+A1,2013<br>EN60335-1,2012+A11,2014                     |
| Information Technology Equipment, General Requirements for Safety (LVD)                    | pending              | IEC60950-1, 2nd Edition + AM2, 2013<br>EN60950-1, 2nd Edition, 2014    |
| Audio/Video, information and communication technology equipment - Safety requirements (CB) | pending              | IEC/EN62368-1, 2nd Edition, 2014                                       |
| Risk-Analysis  |                      | ISO 14121-2  |
| RoHS2  | pending              | RoHS 2011/65/EU + AM2015/863   |

| EMC Compliance   | Conditions                                | Standard / Criterion   |
|--|---|--|
| Low-voltage power supplies DC output - Part 3: Electromagnetic compatibility                             |   | EN61204-3:2000   |
| Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement | pending                                   | AZS/NZS CSPR 22:2009 + A1:2010, Class B                        |
| ESD Electrostatic discharge immunity test  | ±8kV Air; ±4kV Contact                    | EN61000-4-2:2009, Criteria B                                   |
| Radiated, radio-frequency, electromagnetic field immunity test   | 10V/m                                     | EN61000-4-3:2006 + A2:2010, Criteria A                         |
| Fast Transient and Burst Immunity  | AC In Port: ±2kV                          | EN61000-4-4:2012, Criteria B                                   |
| Surge Immunity   | AC In Port: ±1.0kV<br>DC Out Port: ±2.0kV | EN61000-4-5:2014, Criteria B                                   |
| Immunity to conducted disturbances, induced by radio-frequency fields                                    | 10Vrms                                    | EN61000-4-6:2014, Criteria A                                   |
| Power Magnetic Field Immunity  | 50Hz/ 1A/m                                | EN61000-4-8:2010, Criteria A                                   |
| Voltage Dips   | >90%<br>>30%                              | EN61000-4-11:2004, Criteria B<br>EN61000-4-11:2004, Criteria C |
| Voltage Interruptions  | >95%                                      | EN61000-4-11:2004, Criteria C                                  |
| Voltage Fluctuations and Flicker in Public Low-Voltage Systems <=16A per phase                           |   | EN61000-3-3:2013   |

**Specifications** (measured @  $t_a = 25^\circ\text{C}$ , nominal input voltage (115/230VAC), full load and after warm-up)

| DIMENSION and PHYSICAL CHARACTERISTICS |           |                         |
|--|-----------|-------------------------|
| Parameter                              | Type      | Value                   |
| Material                               | Case      | black plastic (UL94V-0) |
|  | Potting   | silicone (UL94V-0)      |
|  | PCB       | FR4 (UL94V-0)           |
|  | Baseplate | plastic (UL94V-0)       |
| Package Dimension (LxWxH)              |           | 52.5 x 27.4 x 23.0mm    |
| Package Weight                         |           | 65g typ.                |

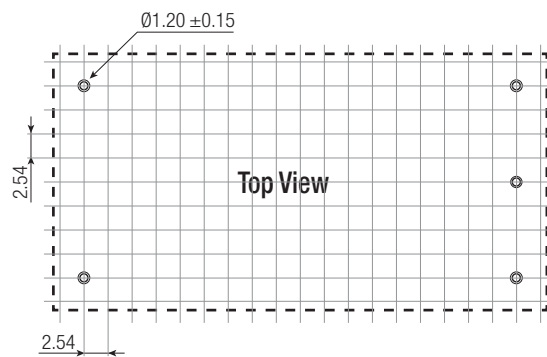
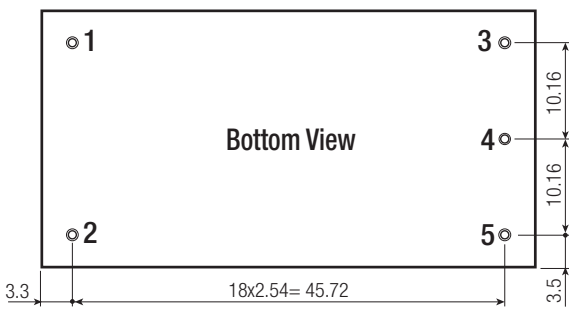
### Dimension Drawing (mm)



### Pin Connections

| Pin # | Single     | Dual       |
|-------|------------|------------|
| 1     | VAC in (N) | VAC in (N) |
| 2     | VAC in (L) | VAC in (L) |
| 3     | No Pin     | -Vout      |
| 4     | -Vout      | COM        |
| 5     | +Vout      | +Vout      |

NC= no connection  
Tolerance: xx.x= ±0.5mm  
xx.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   | non-condensing | -40°C to +85°C        |
| Storage Humidity            |                | 20% to 90% RH         |

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