



### FEATURES

- UL62368-1 recognised
- EN62368-1 certified
- IEC61558-1 & IEC61558-2-16 certified
- ANSI/AAMI ES60601-1, 1 MOPP/2 MOOP recognition pending
- Wide input voltage range 85-264VAC/120-370VDC
- Operating temperature range -40°C to 85°C
- 4.7kVDC isolation 'Hi Pot Test'
- 5V, 12V & 24V single regulated outputs
- Over current protection
- Short circuit protection
- Primary side regulation
- Meets EMC class B with no external components
- No external components required

### PRODUCT OVERVIEW

The BAC3 series delivers an output power of 3 watts from -40°C to 65°C, operating up to 85°C with derating, from AC or DC input voltages. The BAC3 series small footprint is EMC class B compliant without the need of any external components. The BAC3 series is suited to medical applications with 1 MOPP and 2 MOOP.

With high efficiency at low loads and low no load power consumption, the BAC3 supports standby mode operation for applications in industrial, medical, automation, IOT as well as household and home automation.



### SELECTION GUIDE

| Order Code       | Output Power<br>W | Output Voltage<br>V | Output Current<br>A | Ripple & Noise |      |      |      | Efficiency |      |      |      | Isolation Capacitance<br>pF | MTTF <sup>1</sup> |           |
|------------------|-------------------|---------------------|---------------------|----------------|------|------|------|------------|------|------|------|-----------------------------|-------------------|-----------|
|                  |                   |                     |                     | 115V           |      | 230V |      | 115V       |      | 230V |      |                             | MIL 217<br>kHrs   | Telcordia |
|                  |                   |                     |                     | Typ.           | Max. | Typ. | Max. | Min.       | Typ. | Min. | Typ. |                             |                   |           |
|                  |                   |                     |                     | mVp-p          |      |      |      | %          |      |      |      |                             | kHrs              |           |
| <b>BAC3S05DC</b> | 3                 | 5                   | 0.6                 | 45             | 60   | 45   | 60   | 75         | 77   | 72   | 75   | 45                          | 993               | 20443     |
| <b>BAC3S12DC</b> | 3                 | 12                  | 0.25                | 50             | 100  | 60   | 100  | 77         | 80   | 74.5 | 77   | 45                          | 1021              | 22386     |
| <b>BAC3S24DC</b> | 3                 | 24                  | 0.125               | 120            | 200  | 150  | 200  | 78         | 81   | 76   | 78   | 45                          | 1059              | 24680     |

### INPUT CHARACTERISTICS

| Parameter                 | Conditions           | Min.   | Typ.    | Max. | Units |
|---------------------------|----------------------|--------|---------|------|-------|
| Voltage range             | All input types      | 85     | 115/230 | 264  | VAC   |
|                           | All input types      | 120    |         | 370  | VDC   |
| Input frequency           |                      | 47     | 50/60   | 63   | Hz    |
| Switching frequency       |                      |        | 64      |      | kHz   |
| Input current             | Nominal Vin = 115VAC |        | 65      |      | mA    |
|                           | Nominal Vin = 230VAC |        | 40      |      | mA    |
| Inrush current            | Nominal Vin = 115VAC |        | 11      |      | A     |
|                           | Nominal Vin = 230VAC |        | 23      |      |       |
| Input leakage current     | 250VAC               |        | 25      |      | µA    |
| No load power consumption | BAC3S05DC            | 115VAC |         | 67   | mW    |
|                           |                      | 230VAC |         | 150  |       |
|                           | BAC3S12DC            | 115VAC |         | 46   |       |
|                           |                      | 230VAC |         | 129  |       |
| BAC3S24DC                 | 115VAC               |        | 101     |      |       |
|                           | 230VAC               |        | 155     |      |       |

### ISOLATION CHARACTERISTICS

| Parameter              | Conditions                        | Min.       | Typ.                         | Max. | Units |
|------------------------|-----------------------------------|------------|------------------------------|------|-------|
| Isolation test voltage | Production tested for 1 second    | 4700       |                              |      | VDC   |
|                        | Qualification tested for 1 minute | 4700       |                              |      |       |
| Resistance             | Viso = 1000VDC                    | 100        |                              |      | MΩ    |
| Safety standard        | UL62368-1                         | Reinforced | Creepage and clearance 8.4mm | 240  | Vrms  |
|                        | EN62368-1                         |            |                              | 240  |       |
|                        | ANSI/AAMI ES60601-1 <sup>2</sup>  |            |                              | 240  |       |

### TEMPERATURE CHARACTERISTICS

| Parameter                              | Conditions                | Min. | Typ. | Max. | Units |
|--|---------------------------|------|------|------|-------|
| Operation                              | Convection cooling 0.2m/s | -40  |      | 85   | °C    |
| Storage                                |                           | -40  |      | 85   |       |
| Product temperature rise above ambient | BAC3S24DC                 |      | 15   |      |       |
|  | All others                |      | 20   |      |       |

1. Calculated using MIL-HDBK-217F and Telcordia SR-332 calculation model at TA=25°C with nominal input voltage 115VAC at full load.

2. ANSI/AAMI ES60601-1 recognition is currently pending.

All specifications typical at TA=25°C, nominal input voltage and rated output current unless otherwise specified.

| OUTPUT CHARACTERISTICS   |  |            |            |       |       |   |
|--------------------------|--|------------|------------|-------|-------|---|
| Parameter                | Conditions                             | Min.       | Typ.       | Max.  | Units |   |
| Minimum load             |  | 10         |            |       | %     |   |
| Initial voltage accuracy | All output types                       |            |            | ±4    | %     |   |
| Line regulation          | Low line to high line                  | BAC3S24DC  |            | ±0.2  | ±0.5  | % |
|                          |  | All others |            | ±0.05 | ±0.5  |   |
| Load regulation          | 10% total load to 100% total load      | 115VAC     | BAC3S05DC  | ±0.3  | ±1    | % |
|                          |  |            | All others |       | ±0.1  |   |
|                          |  | 230VAC     | BAC3S05DC  | ±0.2  | ±1    |   |
|                          |  |            | All others |       | ±0.1  |   |
| Temperature coefficient  |  |            |            | 0.05  | %/°C  |   |
| Transient response       | Peak deviation - 50-75% & 75-50% swing |            | ±2         |       | %Vout |   |
|                          | Settling time (within 1% Vout Nom.)    |            | 2          |       | ms    |   |
| Current limit inception  | BAC3S05DC                              |            | 160        |       | %     |   |
|                          | BAC3S12DC                              |            | 150        |       |       |   |
|                          | BAC3S24DC                              |            | 130        |       |       |   |
| Hold up time             | 115VAC                                 |            | 25         |       | ms    |   |
|                          | 230VAC                                 |            | 125        |       |       |   |

| ABSOLUTE MAXIMUM RATINGS  |  |
|---|--|
| Short-circuit protection  | Continuous, automatic recovery   |
| Input voltage   | 277VAC   |
| Lead temperature 1.0mm from case for 7 +2/-0 seconds (to JEDEC JESD22-B106) | 270±5°C  |
| Shelf life (1 year)   | Please refer to reconditioning application notes.  |
| Wave Solder   | Wave Solder profile not to exceed the profile recommended in IEC 61760-1 Section 6.1.3. Please refer to <a href="#">application notes</a> for further information. |

**TECHNICAL NOTES****ISOLATION VOLTAGE**

'Hi Pot Test', 'Flash Tested', 'Withstand Voltage', 'Proof Voltage', 'Dielectric Withstand Voltage' & 'Isolation Test Voltage' are all terms that relate to the same thing, a test voltage, applied for a specified time, across a component designed to provide electrical isolation, to verify the integrity of that isolation.

Murata Power Solutions BAC3 series of AC/DC converters are all 100% production tested at their stated isolation voltage. This is 4.7kVDC for 1 second.

The BAC3 has been recognised by Underwriters Laboratory to 240Vrms for Reinforced Insulation.

**REPEATED HIGH-VOLTAGE ISOLATION TESTING**

It is well known that repeated high-voltage isolation testing of a barrier component can actually degrade isolation capability, to a lesser or greater degree depending on materials, construction and environment. We therefore strongly advise against repeated high voltage isolation testing, but if it is absolutely required, that the voltage be reduced by 20% from specified test voltage.

**SAFETY APPROVAL****ANSI/AAMI ES60601-1**

The BAC3 series is pending recognition by Underwriters Laboratory (UL) to ANSI/AAMI ES60601-1 and provides 1 MOPP (Means Of Patient Protection) and 2 MOOP (Means Of Operator Protection) based upon a working voltage of 240Vrms max., between Primary and Secondary. File number E202895 applies.

**EN62368-1**

The BAC3 series has been certified by Demko (D) to EN62368 for reinforced insulation to a working voltage of 240Vrms. File number D-07177 applies.

**UL62368-1**

The BAC3 series has been recognised by Underwriters Laboratory (UL) to UL62368 for reinforced insulation to a working voltage of 240Vrms. File number E151252 applies.

Creepage and clearance 8.4mm

Working altitude OVC II 5000m

**IEC61558-1 & IEC61558-2-16**

The BAC3 series has been certified by TUV SUD to IEC61558-1 & IEC61558-2-16.

**RoHS COMPLIANCE INFORMATION**

This series is compatible with RoHS soldering systems with a peak wave solder temperature of 260°C for 10 seconds based on IEC 61760-1. Please refer to [application notes](#) for further information. The pin termination finish on this product series is Hot Dipped over Matte Tin with Nickel Preplate. The series is backward compatible with Sn/Pb soldering systems. For further information, please visit [www.murata.com/en-global/products/rohs](http://www.murata.com/en-global/products/rohs)

### ENVIRONMENTAL VALIDATION TESTING

The following tests have been conducted on this product series, as part of our design verification process. The datasheet characteristics specify user operating conditions for this series, please contact Murata if further information about the tests is required.

| Test                          | Standard  | Condition  |
|-------------------------------|---|--|
| Temperature cycling           | JEDEC JESD22-A104   | 200 cycles. -40°C to 105°C, 15 minutes hold at each extreme including transitions.   |
| Humidity bias                 | JEDEC JESD22-A101   | 85±2°C, 85±5% R.H. for 1000 (+168/-24) hours   |
| Storage life                  | JEDEC JESD22-A103   | 105°C +10/-0°C for ≥1000 hours   |
| Vibration                     | BS EN 61373 with respect to BS EN 60068-2-64, Test Fh Category 1 Class B. | 5 – 150Hz. Level at each axis – Vertical, Traverse and Longitudinal: 5.72m/s <sup>2</sup> rms. 5 hours in each axis. Crest factor: 3 Sigma. Device is secured via the pins.  |
| Shock                         | BS EN 61373: Category 1 Class B   | Test is 30ms duration, 3 shocks in each sense of 3 mutually perpendicular axes (18 shocks total). Level at each axis as follows: Vertical, Traverse and Longitudinal: 50m/s <sup>2</sup> . Device is secured via pins. |
| Solderability                 | EIA/IPC/JEDEC J-STD-002 Test A1   | Parts are baked for 4 hours at a temperature of 155°C, within 72 hours they are dipped in flux for 10 seconds. Followed by dipping the parts in a solder pot at 255°C ±5°C for 5 seconds (96SC tin/silver/copper)      |
| Solder Heat                   | JEDEC JESD22-B106   | The test sample is subjected to a molten solder bath at 270°C ±5°C for 7 +2/-0 seconds (96SC tin/silver/copper). The leads are dipped in the solder bath to within 1mm of the device body.                             |
| Solder Heat (Hand)            | MIL-STD-202 Method 210, Condition A                                       | The soldering iron is heated to 350°C ± 10°C and applied to the terminations for a duration of 4 to 5 seconds.   |
| Solvent cleaning              | Resistance to cleaning agents   | Solvent – Novec 71IPA & Topklean EL-20A. Pulsed ultrasonic immersion 45°C - 65°C   |
| Solvent Resistance            | MIL-STD-883 Method 2015   | The parts and the bristle portion of the brush are immersed in Isopropanol for a minimum of 1 minute. The parts are brushed 3 times, after the third time the parts are blown dry and inspected.                       |
| Lead Integrity (Adhesion)     | MIL-STD-883 Method 2025   | Leads are bent through 90° until a fracture occurs.  |
| Lead Integrity (Fatigue)      | MIL-STD-883 Method 2004, Condition B <sub>1</sub>                         | The leads are bent to an angle of 15°. Each lead is subjected to 3 cycles.   |
| Lead Integrity (Tension/Pull) | MIL-STD-883 Method 2004, Condition A <sub>1</sub>                         | Pull of 0.227kg applied for 30 seconds. The force is then increased until the pins snap.   |

### EMC/ESD STANDARDS

|   |   |
|---|---|
| Conducted emissions                                       | EN55032/FCC class B   |
| Radiated emissions  | EN55032/FCC class B   |
| ESD immunity  | IEC/EN 61000-4-2, Level 1, criteria A   |
| Radiated, radio-frequency, electromagnetic field immunity | IEC/EN61000-4-3, 10V/m perf criteria A<br>10V/m 80-1000MHz<br>3V/m 1.4-2.0GHz<br>1V/m 2.0-2.7GHz<br>All 80% 1kHz am mod all perf criteria A |
| EFT/burst   | IEC/EN61000-4-4, 2kV, perf criteria A   |
| Surge immunity  | IEC/EN61000-4-5, 1kV perf criteria A  |
| Conducted field immunity                                  | IEC/EN61000-4-6, 10 Vrms 0.15-80MHz 80% 1kHz am mod perf criteria A   |
| Power frequency magnetic field immunity                   | IEC/EN61000-4-8, 50Hz/60Hz 30 A/m perf criteria A   |
| Harmonic current emissions                                | IEC/EN61000-3-2   |
| Voltage changes, voltage fluctuations and flicker         | IEC/EN61000-3-3   |
| Voltage dips, short interruptions and variations          | IEC/EN61000-4-11, 100% for 20ms, 60% for 200ms, 30% for 500ms and 100% for 5s perf criteria A-A-A-C.  |



## APPLICATION NOTES (Continued)

### Minimum Load

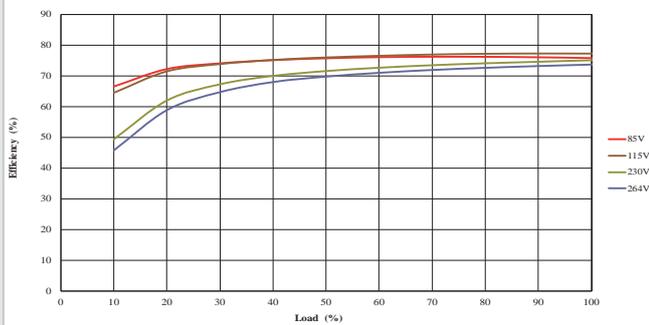
The minimum load to meet full datasheet specification is 10% of the full rated load across the specified input voltage range.

### Reconditioning

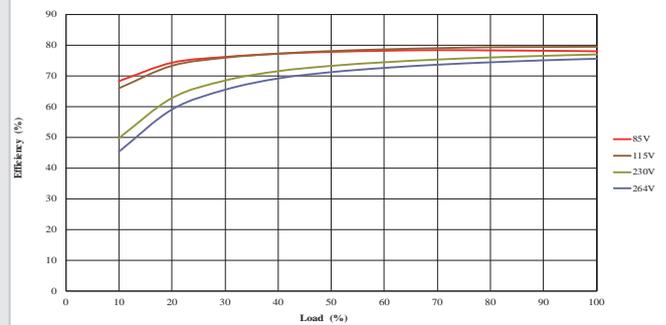
This series contains electrolytic capacitors, which require reconditioning if the product is stored non-powered for more than 2 years from the date of manufacture. To recondition the capacitors, an AC input voltage should be applied with output loading for 10 minutes. For further information please contact Murata.

## EFFICIENCY VS LOAD

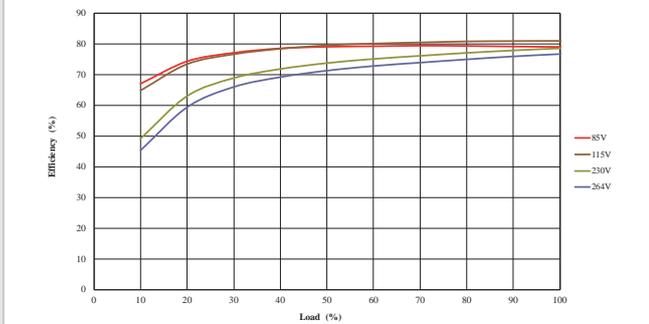
**BAC3S05DC**



**BAC3S12DC**

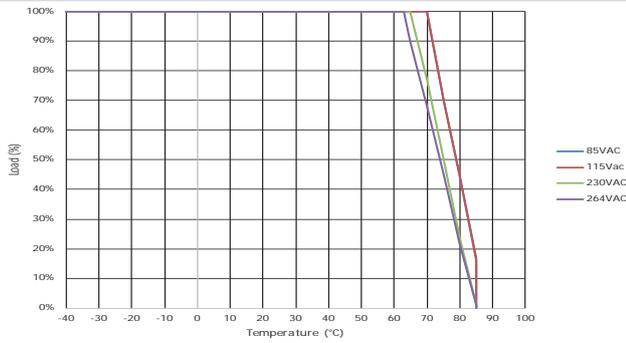


**BAC3S24DC**

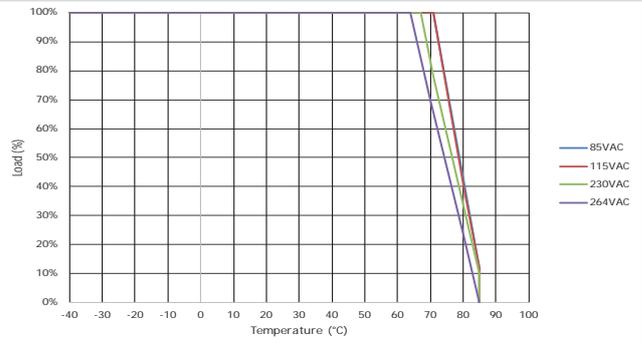


**TEMPERATURE DERATING - PART OPERATIONAL**

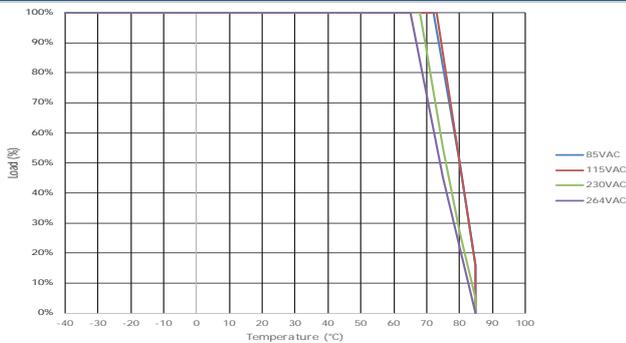
**BAC3S05DC**



**BAC3S12DC**

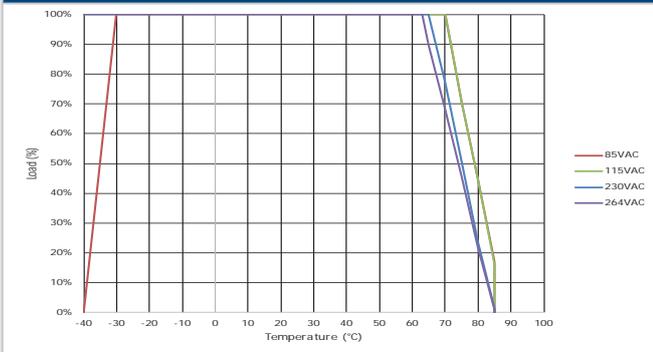


**BAC3S24DC**

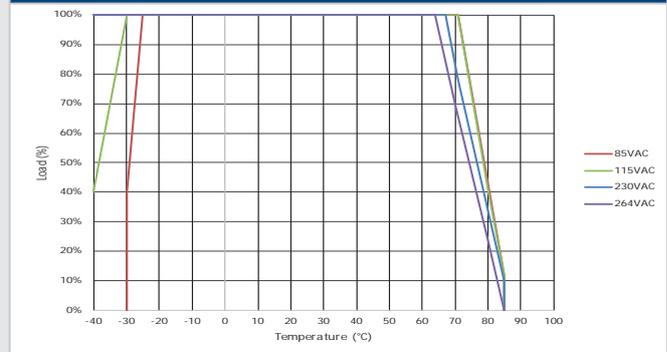


## TEMPERATURE DERATING - COLD STARTUP

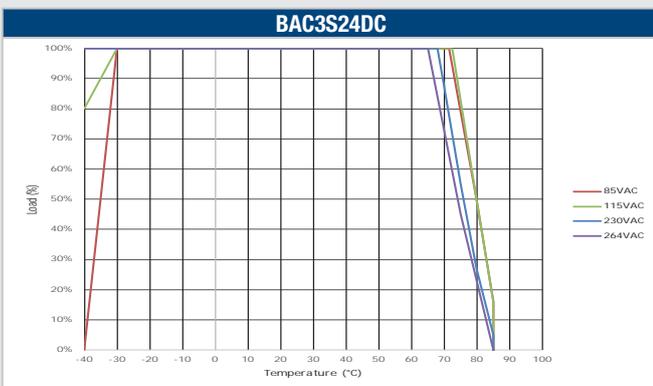
**BAC3S05DC**



**BAC3S12DC**

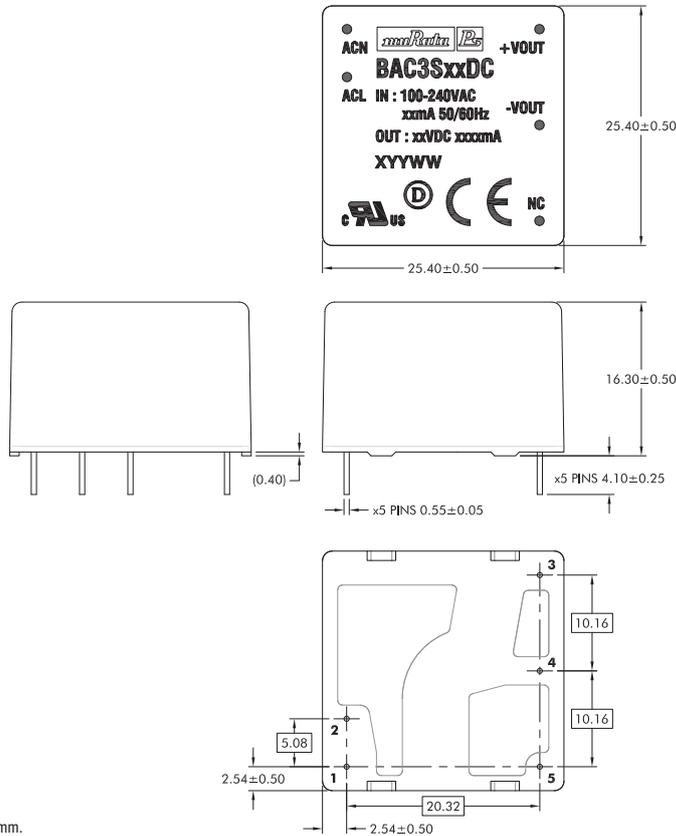


**BAC3S24DC**



**PACKAGE SPECIFICATIONS**

**MECHANICAL DIMENSIONS**



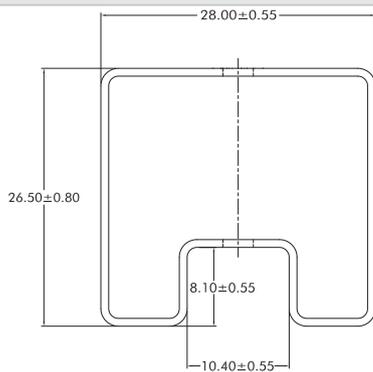
All dimensions in mm.  
Unless otherwise specified all pins within ±0.30 of true position.

Weight: 18g

**PIN CONNECTIONS**

| Pin | Function |
|-----|----------|
| 1   | AC(N)    |
| 2   | AC(L)    |
| 3   | NC       |
| 4   | -Vout    |
| 5   | +Vout    |

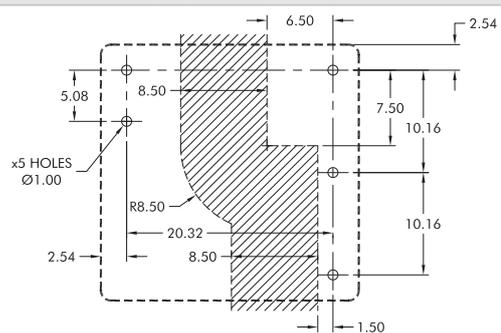
**TUBE OUTLINE DIMENSIONS**



Unless otherwise specified all dimensions in mm.  
Tube Length : 550mm ± 2.0.

Tube Quantity : 20

**RECOMMENDED FOOTPRINT DETAILS**



The isolation barrier shown must not have any copper traces even on internal layers. This is to avoid compromising the creepage and clearance distance. PCB layouts must take into consideration the required clearance and creepage requirements to maintain the clearance and creepage of the isolation barrier. All dimensions in mm.

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