

All dimensions are in mm.

### METALLIZED POLYESTER FILM CAPACITOR HIGH PERFORMANCES - HIGH TEMPERATURE D.C. AND PULSE APPLICATIONS

#### STACKED VERSION

**Typical applications:** blocking, coupling, decoupling for a signal from DC to high frequency; pulse, logic and timing circuit, lamp capacitor for electronic compact lamps, inverter for LCD monitors, automotive DC motor suppression.

PRODUCT CODE: **RSB**

**p = 5mm**

| Pitch<br>(mm) | Box thickness (B)<br>(mm) | Maximum dimensions (mm) |        |        |
|---------------|---------------------------|-------------------------|--------|--------|
|               |                           | B max                   | H max  | L max  |
| 5.0           | <4.5                      | B +0.1                  | H +0.1 | L +0.2 |
| 5.0           | ≥4.5                      | B +0.1                  | H +0.1 | L +0.3 |

### PRODUCT CODE SYSTEM

The part number, comprising 14 digits, is formed as follows:

|   |   |   |   |   |   |   |   |   |    |    |    |    |    |
|---|---|---|---|---|---|---|---|---|----|----|----|----|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
| R | S | B |   | C |   |   |   |   |    |    |    | -  |    |

- Digit 1 to 3 Series code.
- Digit 4 d.c. rated voltage:  
C = 50V D = 63V E = 100V I = 250V  
M = 400V W = 500V P = 630V
- Digit 5 Pitch: C = 5 mm
- Digit 6 to 9 Digits 7 - 8 - 9 indicate the first three digits of Capacitance value and the 6th digit indicates the number of zeros that must be added to obtain the Rated Capacitance in pF.
- Digit 10 to 11 Mechanical version and/or packaging (table 1)
- Digit 12 Identifies the dimensions and electrical characteristics.
- Digit 13 Internal use
- Digit 14 Capacitance tolerance:  
J=5%; K=10%; M=20%.

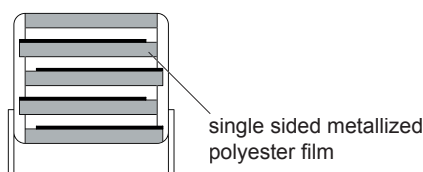
Table 1 (for more detailed information, please refer to page 14).

| Standard packaging style | Lead length<br>(mm) | Ordering code<br>(Digit 10 to 11) |
|--------------------------|---------------------|-----------------------------------|
| AMMO-PACK                |                     | DQ                                |
| Reel Ø 355 mm            |                     | CK                                |
| Loose, short leads       | 4 <sup>+1.5</sup>   | AA                                |
| Loose, long leads        | 17 <sup>+1/-2</sup> | Z3                                |

### GENERAL TECHNICAL DATA

- Dielectric:** polyester film (polyethylene terephthalate).
- Plates:** aluminium layer deposited by evaporation under vacuum.
- Winding:** non-inductive type.
- Leads:** tinned wire.
- Protection:** plastic case, thermosetting resin filled.  
Box material is solvent resistant and flame retardant according to UL94 V0.
- Marking:** Manufacturer's logo, series (RSB) capacitance, tolerance, D.C. rated voltage.
- Climatic category:** 55/125/56 IEC 60068-1
- Operating temperature range:** -55 to +125°C
- Related documents:** IEC 60384-2

### Winding scheme



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**STACKED VERSION**

p = 5 mm

PRODUCT CODE: RSB

| Rated Cap. | 50Vdc/30Vac<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|-------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                             | H    | L   | p   |                     |  |                |
| 2.2µF      | 6.0                           | 11.0 | 7.2 | 5.0 | 200                 | 20 E3                                      | RSBCC4220--1-- |

| Rated Cap. | 63Vdc/40Vac<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|-------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                             | H    | L   | p   |                     |  |                |
| 0.10 µF    | 2.5                           | 6.5  | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC3100--0-- |
| 0.15 µF    | 2.5                           | 6.5  | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC3150--0-- |
| 0.22 µF    | 2.5                           | 6.5  | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC3220--1-- |
| 0.33 µF    | 3.5                           | 7.5  | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC3330--0-- |
| 0.47 µF    | 3.5                           | 7.5  | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC3470--1-- |
| 0.68 µF    | 4.5                           | 9.5  | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC3680--1-- |
| 1.0 µF     | 5.0                           | 10.0 | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC4100--1-- |
| 1.5 µF     | 6.0                           | 11.0 | 7.2 | 5.0 | 250                 | 31.5 E3                                    | RSBDC4150--1-- |

| Rated Cap. | 100Vdc/63Vac<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|--------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                              | H    | L   | p   |                     |  |                |
| 4700 pF    | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC1470--0-- |
| 6800 pF    | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC1680--0-- |
| 0.010 µF   | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC2100--0-- |
| 0.015 µF   | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC2150--0-- |
| 0.022 µF   | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC2220--0-- |
| 0.033 µF   | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC2330--0-- |
| 0.047 µF   | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC2470--0-- |
| 0.068 µF   | 2.5                            | 6.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC2680--1-- |
| 0.10 µF    | 3.5                            | 7.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC3100--0-- |
| 0.15 µF    | 4.5                            | 9.5  | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC3150--0-- |
| 0.22 µF    | 5.0                            | 10.0 | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC3220--0-- |
| 0.33 µF    | 6.0                            | 11.0 | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC3330--0-- |
| 0.47 µF    | 6.0                            | 11.0 | 7.2 | 5.0 | 300                 | 60 E3                                      | RSBEC3470--1-- |

Mechanical version and packaging (Table1) \_\_\_\_\_  
 Internal use \_\_\_\_\_  
 Tolerance: J (±5%); K (±10%); M (±20%) \_\_\_\_\_

| Rated Cap. | 250Vdc/160Vac<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|---------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                               | H    | L   | p   |                     |  |                |
| 1000 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC1100--0-- |
| 1500 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC1150--0-- |
| 2200 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC1220--0-- |
| 3300 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC1330--0-- |
| 4700 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC1470--0-- |
| 6800 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC1680--0-- |
| 0.010 µF   | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC2100--0-- |
| 0.015 µF   | 2.5                             | 6.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC2150--0-- |
| 0.022 µF   | 3.5                             | 7.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC2220--0-- |
| 0.033 µF   | 3.5                             | 7.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC2330--0-- |
| 0.047 µF   | 4.5                             | 9.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC2470--0-- |
| 0.068 µF   | 4.5                             | 9.5  | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC2680--0-- |
| 0.10 µF    | 5.0                             | 10.0 | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC3100--0-- |
| 0.15 µF    | 6.0                             | 11.0 | 7.2 | 5.0 | 400                 | 20 E4                                      | RSBIC3150--0-- |

| Rated Cap. | 400Vdc/200Vac<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|---------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                               | H    | L   | p   |                     |  |                |
| 1000 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC1100--0-- |
| 1500 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC1150--0-- |
| 2200 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC1220--0-- |
| 3300 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC1330--0-- |
| 4700 pF    | 2.5                             | 6.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC1470--0-- |
| 6800 pF    | 3.5                             | 7.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC1680--0-- |
| 0.010 µF   | 3.5                             | 7.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC2100--0-- |
| 0.015 µF   | 3.5                             | 7.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC2150--0-- |
| 0.022 µF   | 4.5                             | 9.5  | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC2220--0-- |
| 0.033 µF   | 5.0                             | 10.0 | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC2330--0-- |
| 0.047 µF   | 6.0                             | 11.0 | 7.2 | 5.0 | 600                 | 48 E4                                      | RSBMC2470--0-- |

| Rated Cap. | 500Vdc/220Vac*<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|----------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                                | H    | L   | p   |                     |  |                |
| 1000 pF    | 2.5                              | 6.5  | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC1100--0-- |
| 1500 pF    | 2.5                              | 6.5  | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC1150--0-- |
| 2200 pF    | 3.5                              | 7.5  | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC1220--0-- |
| 3300 pF    | 3.5                              | 7.5  | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC1330--0-- |
| 4700 pF    | 3.5                              | 7.5  | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC1470--0-- |
| 6800 pF    | 4.5                              | 9.5  | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC1680--0-- |
| 0.010 µF   | 5.0                              | 10.0 | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC2100--0-- |
| 0.015 µF   | 6.0                              | 11.0 | 7.2 | 5.0 | 700                 | 70 E4                                      | RSBWC2150--0-- |

| Rated Cap. | 630Vdc/220Vac*<br>Std dimensions |      |     |     | Max dv/dt<br>(V/µs) | Max K <sub>0</sub><br>(V <sup>2</sup> /µs) | Part Number    |
|------------|----------------------------------|------|-----|-----|---------------------|--|----------------|
|            | B                                | H    | L   | p   |                     |  |                |
| 1000 pF    | 2.5                              | 6.5  | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC1100--0-- |
| 1500 pF    | 3.5                              | 7.5  | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC1150--0-- |
| 2200 pF    | 3.5                              | 7.5  | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC1220--0-- |
| 3300 pF    | 4.5                              | 9.5  | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC1330--0-- |
| 4700 pF    | 4.5                              | 9.5  | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC1470--0-- |
| 6800 pF    | 5.0                              | 10.0 | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC1680--0-- |
| 0.010 µF   | 6.0                              | 11.0 | 7.2 | 5.0 | 800                 | 100 E4                                     | RSBPC2100--0-- |

Mechanical version and packaging (Table1) \_\_\_\_\_  
 Internal use \_\_\_\_\_  
 Tolerance: J (±5%); K (±10%); M (±20%) \_\_\_\_\_

All dimensions are in mm.

Note 1: If the working voltage (V) is lower than the rated voltage (V<sub>R</sub>), the capacitor may work at higher dv/dt. In this case the maximum value allowed is obtained multiplying the above value (see table dv/dt) with the ratio V<sub>R</sub>/V.

The pulse characteristic K<sub>0</sub> depends on the voltage wave-form and in any case it cannot overcome the value given in the above table.

Note 2: The rated voltages from 250Vdc to 630Vdc are for pulse applications (i.e.: lamp capacitors).

\*Not suitable for across-the-line applications. Please refer to Interference Suppression Capacitors (page 167).

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HIGH PERFORMANCES - HIGH TEMPERATURE  
D.C. AND PULSE APPLICATIONS**

**STACKED VERSION**

p = 5 mm

PRODUCT CODE: RSB

**ELECTRICAL CHARACTERISTICS**

**Rated voltage ( $V_R$ ):**

|         |         |         |
|---------|---------|---------|
| 50 Vdc  | 63 Vdc  | 100 Vdc |
| 250 Vdc | 400 Vdc | 500 Vdc |
| 630 Vdc |         |         |

**Rated temperature ( $T_R$ ):** +85°C

**Temperature derated voltage:**

for temperatures between +85°C and +125°C a decreasing factor of 1.25% per degree °C on the rated voltage  $V_R$  (d.c. and a.c.) has to be applied.

**Capacitance range:** 1000pF to 2.2µF

**Capacitance values:** E6 series (IEC 60063 Norm).

**Capacitance tolerances** (measured at 1 kHz):

±5% (J); ±10% (K); ±20% (M).

**Total self-inductance (L):** ≈7nH

max 1 nH per 1 mm lead and capacitor length.

**Dissipation factor (DF):**

tgδ 10<sup>-4</sup> at +25°C ±5°C

| kHz | C ≤ 0.1µF | C > 0.1µF |
|-----|-----------|-----------|
| 1   | ≤ 80      | ≤ 80      |
| 10  | ≤ 120     | ≤ 120     |
| 100 | ≤ 250     |           |

**Insulation resistance:**

**Test conditions**

Temperature: +25°C±5°C

Voltage charge time: 1 min

Voltage charge:

|         |                     |
|---------|---------------------|
| 50 Vdc  | for $V_R < 100$ Vdc |
| 100 Vdc | for $V_R ≥ 100$ Vdc |

**Performance**

**For  $V_R ≤ 100$  Vdc**

≥ 15000 MΩ for C ≤ 0.33µF

≥ 5000 s for C > 0.33µF and ≤ 1µF

≥ 1000 s for C > 1µF

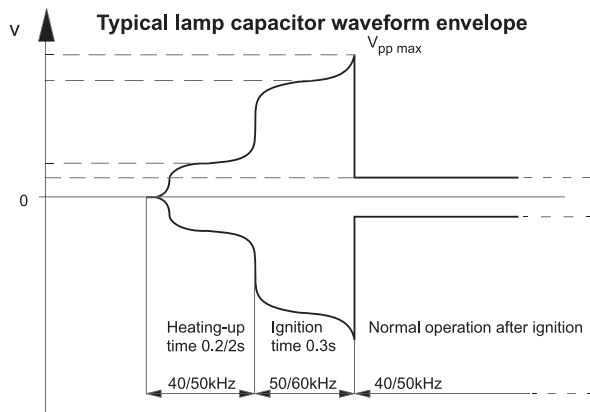
**For  $V_R > 100$  Vdc**

≥ 30000 MΩ

**Test voltage between terminations:**

1.6x $V_R$  applied for 2 s at +25°C±5°C.

**Electrical characteristics for use as lamp capacitors in lighting applications.**



**TEST METHOD AND PERFORMANCE**

**Damp heat, steady state:**

**Test conditions**

Temperature: +40°C±2°C

Relative humidity (RH): 93% ±2%

Test duration: 56 days

**Performance**

Capacitance change |ΔC/C|: ≤ 5%

DF change (Δtgδ): ≤ 50x10<sup>-4</sup> at 1kHz

Insulation resistance: ≥ 50% of initial limit.

**Endurance:**

**Test conditions**

Temperature: +125°C ±2°C

Test duration: 2000 h

Voltage applied: 1.25x $V_C$

**Performance**

Capacitance change |ΔC/C|: ≤ 5%

DF change (Δtgδ): ≤ 30x10<sup>-4</sup> at 10kHz for C ≤ 1µF

≤ 20x10<sup>-4</sup> at 1kHz for C > 1µF

Insulation resistance: ≥ 50% of initial limit.

**Resistance to soldering heat:**

**Test conditions**

Solder bath temperature: +260°C±5°C

Dipping time (with heat screen): 10 s ±1 s

**Performance**

Capacitance change |ΔC/C|: ≤ 2%

DF change (Δtgδ): ≤ 30x10<sup>-4</sup> at 10kHz for C ≤ 1µF

≤ 20x10<sup>-4</sup> at 1kHz for C > 1µF

Insulation resistance: ≥ initial limit.

**Long term stability** (after two years):

**Storage:** standard environmental conditions (see page 12).

**Performance**

Capacitance change |ΔC/C|: ≤ 3% for C ≤ 0.1µF

≤ 2% for C > 0.1µF

**RELIABILITY:**

Reference MIL HDB 217

**Application conditions:**

Temperature: +40°C ±2°C

Voltage: 0.5x $V_R$

Failure rate: ≤ 1 FIT

(1 FIT = 1x10<sup>-9</sup> failures/components x h)

**Failure criteria:**

(according to DIN 44122)

Short or open circuit

Capacitance change |ΔC/C|: > 10%

DF change (Δtgδ): > 2 x initial limit.

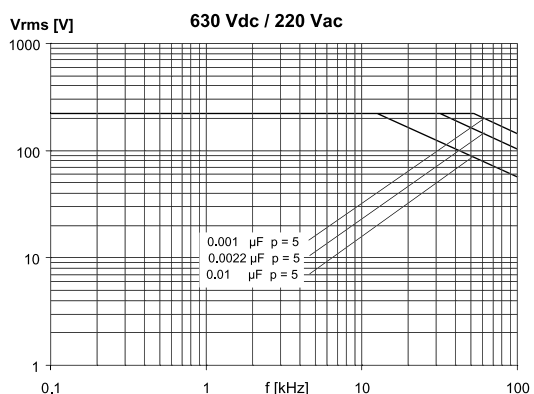
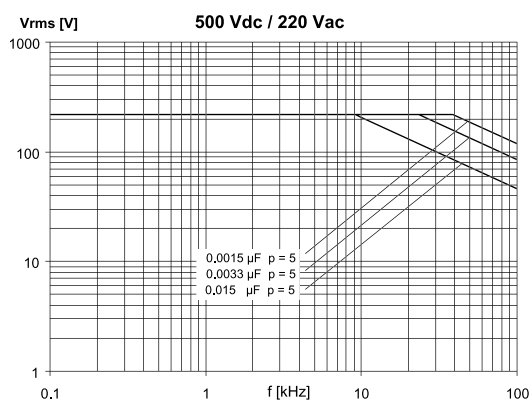
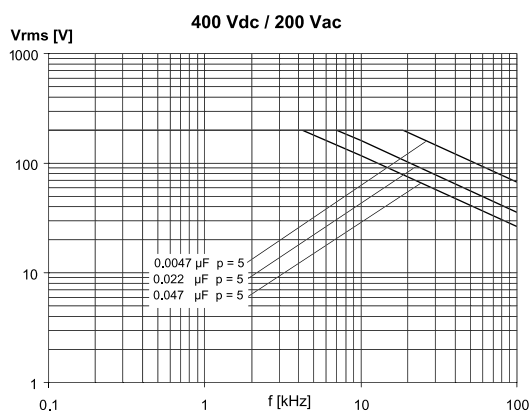
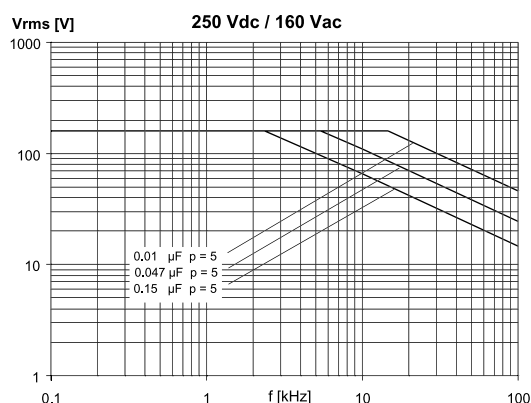
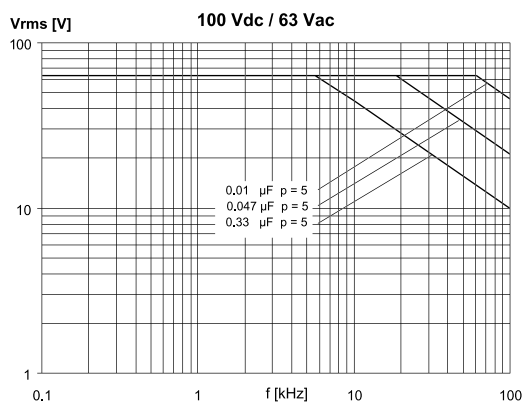
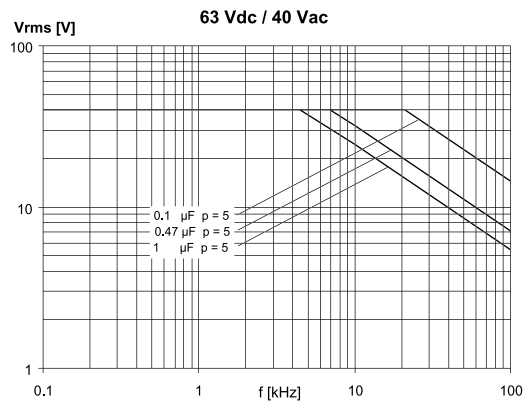
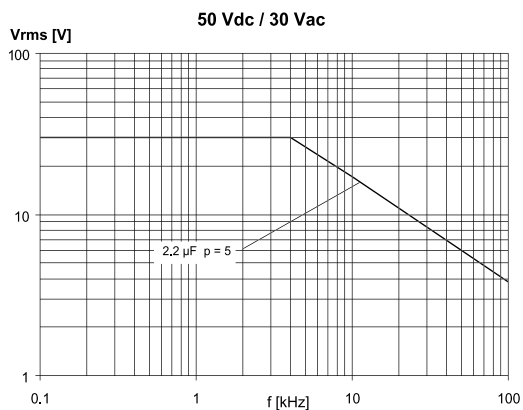
Insulation resistance: < 0.005 x initial limit.

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**MAX. VOLTAGE (Vr.m.s.) VERSUS FREQUENCY (sinusoidal wave-form / Th ≤ 85°C)**

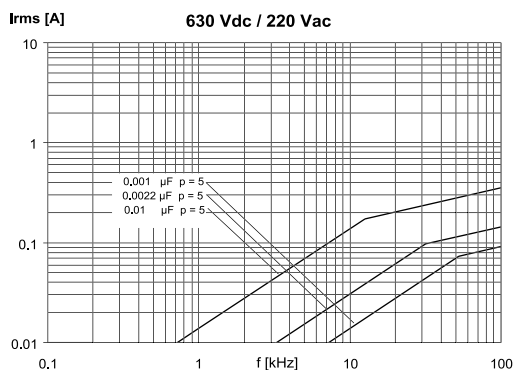
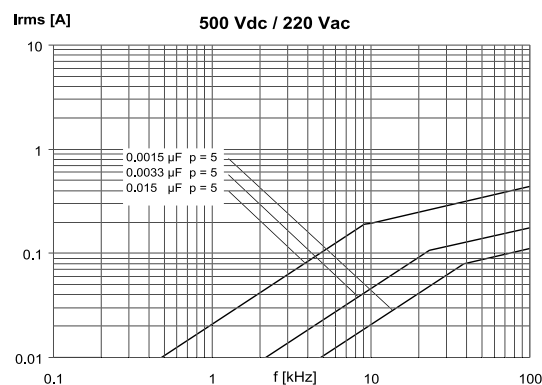
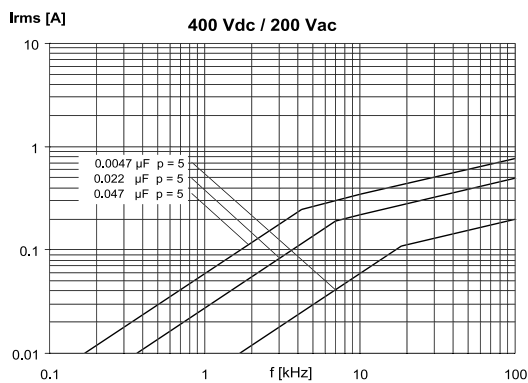
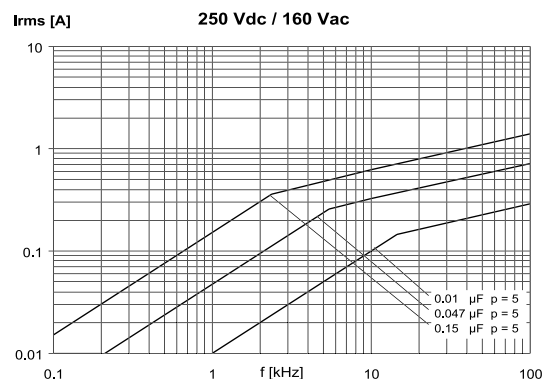
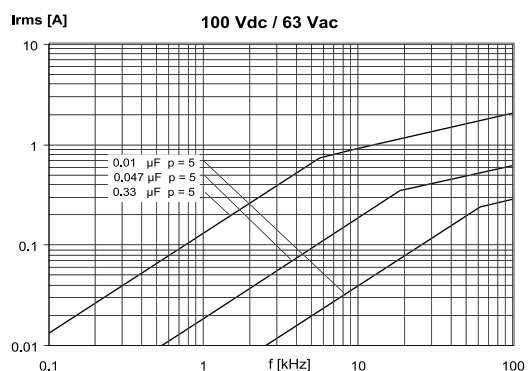
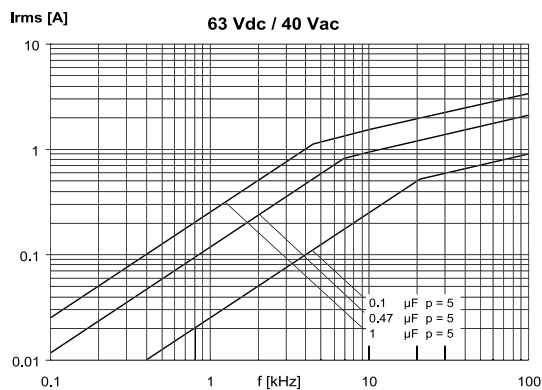
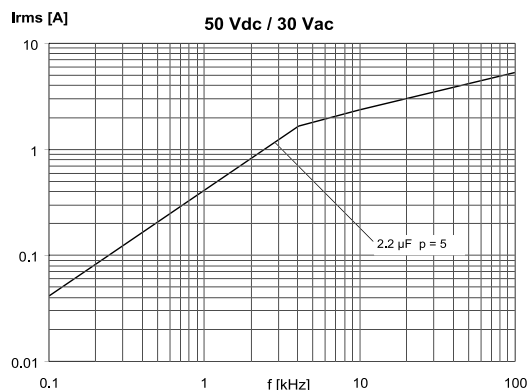


Note: p (pitch) in mm.

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HIGH PERFORMANCES - HIGH TEMPERATURE  
D.C. AND PULSE APPLICATIONS  
STACKED VERSION**

**p = 5 mm**  
PRODUCT CODE: **RSB**

MAX. CURRENT (I<sub>r.m.s.</sub>) VERSUS FREQUENCY (sinusoidal wave-form / Th ≤ 85°C)



Note: p (pitch) in mm.