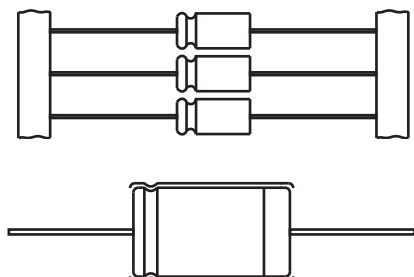




## Aluminum Capacitors Axial Capacitor Style



### FEATURES

- Long useful life: 3000 h at 105 °C
- Polarized aluminum electrolytic capacitors
- High ripple current capability
- Axial leads, insulated cylindrical aluminum case
- Charge/discharge proof
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### APPLICATIONS

- Industrial and automotive electronics, audio/video, telecommunication systems, power supply units
- Coupling, smoothing, filtering, buffering and timing

### QUICK REFERENCE DATA

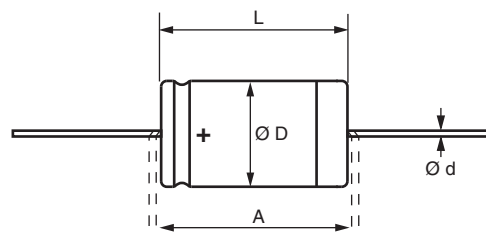
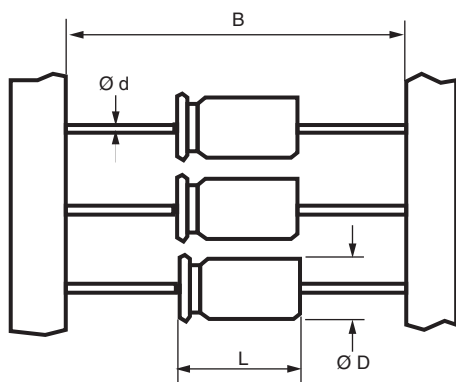
| DESCRIPTION                                      | UNIT                | LOW VOLTAGE                                                                      | HIGH VOLTAGE |
|--------------------------------------------------|---------------------|----------------------------------------------------------------------------------|--------------|
| Nominal case size (Ø D x L)                      | mm                  | 6.5 x 18 to 10 x 25                                                              |              |
| Rated capacitance range C <sub>R</sub>           | µF                  | 4.7 to 470                                                                       | 22           |
| Capacitance tolerance                            | %                   | -10/+50                                                                          |              |
| Rated voltage range                              | V                   | 16 to 100                                                                        | 160          |
| Category temperature range                       | °C                  | -40 to +105                                                                      |              |
| Endurance test at upper category temp.           | h                   | 2000                                                                             |              |
| Useful life at 105 °C and I <sub>R</sub> applied | h                   | 3000                                                                             |              |
| Useful life at 85 °C and I <sub>R</sub> applied  | h                   | 11 000                                                                           |              |
| Useful life at 40 °C and I <sub>R</sub> applied  | h                   | 330 000                                                                          |              |
| Shelf life (0 V, 105 °C)                         | h                   | 100                                                                              |              |
| Failure rate                                     | 10 <sup>-9</sup> /h | ≤ 14                                                                             |              |
| Based on sectional specification                 |                     | IEC 60384-4, EN 130300                                                           |              |
| Based on detailed specifications                 |                     | CECC 30301-003, CECC 30301-801<br>DIN 45910 Part 123, without quality assessment |              |
| Climatic category<br>IEC 60068<br>DIN 40040      |                     | 40/105/56<br>GMF                                                                 |              |

### SELECTION CHART FOR C<sub>R</sub>, U<sub>R</sub>, AND RELEVANT NOMINAL CASE SIZES (Ø D x L in mm)

| C <sub>R</sub><br>(µF) | U <sub>R</sub> (V) |          |          |          |          |         |
|------------------------|--------------------|----------|----------|----------|----------|---------|
|                        | 16                 | 25       | 40       | 63       | 100      | 160     |
| 4.7                    | →                  | →        | →        | 6.5 x 18 | 6.5 x 18 | -       |
| 10                     | →                  | →        | 6.5 x 18 | 8 x 18   | 8 x 18   | -       |
| 22                     | →                  | 6.5 x 18 | 8 x 18   | 8 x 18   | 10 x 18  | 10 x 25 |
| 47                     | 6.5 x 18           | 8 x 18   | 8 x 18   | 10 x 18  | 10 x 25  | -       |
| 100                    | 8 x 18             | 10 x 18  | 10 x 18  | -        | -        | -       |
| 220                    | 10 x 18            | 10 x 25  | -        | -        | -        | -       |
| 470                    | 10 x 25            | -        | -        | -        | -        | -       |



# **DIMENSIONS in millimeters AND AVAILABLE FORMS**



# **DIMENSIONS in millimeters, MASS, PACKAGING, AND ORDERING CODE**

| CASE SIZE<br>Ø D x L | LEAD<br>Ø d | Ø D <sub>max.</sub> | L <sub>max.</sub> | A <sub>min.</sub> | B          | WEIGHT<br>APPROX.<br>(g) | PACKAGING, ENDING OF ORDERING CODE,<br>QUANTITIES |        |            |        |
|----------------------|-------------|---------------------|-------------------|-------------------|------------|--------------------------|---------------------------------------------------|--------|------------|--------|
|                      |             |                     |                   |                   |            |                          | TAPED ON REEL                                     |        | TAPED AMMO |        |
|                      |             |                     |                   |                   |            |                          | CODE                                              | PIECES | CODE       | PIECES |
| 6.5 x 18             | 0.8         | 6.9                 | 18.5              | 25                | 73.0 ± 1.6 | 1.3                      | ..A0W                                             | 1000   | ..B0W      | 1000   |
| 8 x 18               | 0.8         | 8.5                 | 18.5              | 25                | 73.0 ± 1.6 | 1.7                      | ..A0W                                             | 500    | ..B0W      | 500    |
| 10 x 18              | 0.8         | 10.5                | 18.5              | 25                | 73.0 ± 1.6 | 2.5                      | ..A0W                                             | 500    | ..B0W      | 500    |
| 10 x 25              | 0.8         | 10.5                | 25.5              | 30                | 73.0 ± 1.6 | 3.3                      | ..A0W                                             | 500    | ..B0W      | 500    |

## **ELECTRICAL DATA**

| SYMBOL           | DESCRIPTION                                                                                           |
|------------------|-------------------------------------------------------------------------------------------------------|
| C <sub>R</sub>   | Rated capacitance at 100 Hz                                                                           |
| U <sub>R</sub>   | Rated voltage                                                                                         |
| tan δ            | Max. dissipation factor at 100 Hz                                                                     |
| R <sub>ESR</sub> | Equivalent series resistance at 100 Hz<br>(calculated from tan δ <sub>max.</sub> and C <sub>R</sub> ) |
| Z                | Max. impedance at 10 kHz                                                                              |
| I <sub>R</sub>   | Rated alternating current (RMS) at 100 Hz and<br>upper category temperature                           |
| T <sub>a</sub>   | Ambient temperature                                                                                   |
| T <sub>UC</sub>  | Upper category temperature                                                                            |
| RH               | Relative humidity                                                                                     |
| P                | Ambient pressure                                                                                      |

### **Note**

- Unless otherwise specified, all electrical values apply at  
T<sub>a</sub> = 20 °C, P = 80 kPa to 106 kPa, RH = 45 % to 75 %.

## **ORDERING EXAMPLE**

The following table gives the ordering number.

The 16<sup>th</sup> place of ordering code refers to packaging for axial  
lead capacitors:

MALAEBC00FL210J... EBC 1000 µF 63 V 8 x 18

MALAEBC00FL210JA0W A = taped on reel

MALAEBC00FL210JB0W B = taped ammo

Please see Dimensions table for available versions.

**ELECTRICAL DATA AND ORDERING INFORMATION**

| $U_R$<br>(V) | $C_R$<br>100 Hz<br>( $\mu$ F) | NOMINAL<br>CASE SIZE<br>$\varnothing D \times L$<br>(mm) | $\tan \delta$<br>100 Hz<br>MAX. | $R_{ESR}$<br>100 Hz<br>( $\Omega$ ) | $Z$<br>10 kHz<br>MAX.<br>( $\Omega$ ) | $I_R$<br>100 Hz<br>$T_{UC}$<br>(A) | CATALOG<br>NUMBER<br>MALA... |
|--------------|-------------------------------|----------------------------------------------------------|---------------------------------|-------------------------------------|---------------------------------------|------------------------------------|------------------------------|
| 16           | 47                            | 6.5 x 18                                                 | 0.14                            | 4.7                                 | 2.6                                   | 0.095                              | EBC00DL247DB0W               |
|              | 100                           | 8 x 18                                                   | 0.14                            | 2.2                                 | 1.2                                   | 0.15                               | EBC00FL310DB0W               |
|              | 220                           | 10 x 18                                                  | 0.14                            | 1.0                                 | 0.55                                  | 0.25                               | EBC00GL322DB0W               |
|              | 470                           | 10 x 25                                                  | 0.14                            | 0.47                                | 0.26                                  | 0.45                               | EBC00GD347DB0W               |
| 25           | 22                            | 6.5 x 18                                                 | 0.11                            | 8.0                                 | 4.1                                   | 0.060                              | EBC00DL222EB0W               |
|              | 47                            | 8 x 18                                                   | 0.11                            | 3.7                                 | 1.9                                   | 0.11                               | EBC00FL247EB0W               |
|              | 100                           | 10 x 18                                                  | 0.11                            | 1.8                                 | 0.90                                  | 0.18                               | EBC00GL310EB0W               |
|              | 220                           | 10 x 25                                                  | 0.11                            | 0.80                                | 0.40                                  | 0.34                               | EBC00GD322EB0W               |
| 40           | 10                            | 6.5 x 18                                                 | 0.10                            | 16                                  | 7.5                                   | 0.046                              | EBC00DL210GB0W               |
|              | 22                            | 8 x 18                                                   | 0.10                            | 7.2                                 | 3.4                                   | 0.080                              | EBC00FL222GB0W               |
|              | 47                            | 8 x 18                                                   | 0.09                            | 3.0                                 | 1.6                                   | 0.12                               | EBC00FL247GB0W               |
|              | 100                           | 10 x 18                                                  | 0.09                            | 1.4                                 | 0.75                                  | 0.21                               | EBC00GL310GB0W               |
| 63           | 4.7                           | 6.5 x 18                                                 | 0.07                            | 24                                  | 12                                    | 0.038                              | EBC00DL147JB0W               |
|              | 10                            | 8 x 18                                                   | 0.07                            | 11                                  | 5.5                                   | 0.064                              | EBC00FL210JB0W               |
|              | 22                            | 8 x 18                                                   | 0.07                            | 5.1                                 | 2.5                                   | 0.10                               | EBC00FL222JB0W               |
|              | 47                            | 10 x 18                                                  | 0.07                            | 2.4                                 | 1.2                                   | 0.17                               | EBC00GL247JB0W               |
| 100          | 4.7                           | 6.5 x 18                                                 | 0.06                            | 20                                  | 9.6                                   | 0.048                              | EBC00DL147LB0W               |
|              | 10                            | 8 x 18                                                   | 0.06                            | 9.5                                 | 4.5                                   | 0.073                              | EBC00FL210LB0W               |
|              | 22                            | 10 x 18                                                  | 0.06                            | 4.3                                 | 2.0                                   | 0.13                               | EBC00GL222LB0W               |
|              | 47                            | 10 x 25                                                  | 0.06                            | 2.0                                 | 1.0                                   | 0.22                               | EBC00GD247LB0W               |
| 160          | 22                            | 10 x 25                                                  | 0.10                            | 7.2                                 | 5.5                                   | 0.12                               | EBC00GD222MB0W               |

**ADDITIONAL ELECTRICAL DATA**

| PARAMETER       | CONDITIONS                                                       | VALUE                                                                                                                       |
|-----------------|------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| <b>Voltage</b>  |                                                                  |                                                                                                                             |
| Surge voltage   | $U_R \leq 100$ V                                                 | $U_S = 1.15 \times U_R$                                                                                                     |
|                 | $U_R \geq 160$ V                                                 | $U_S = 1.10 \times U_R$                                                                                                     |
| Reverse voltage | -                                                                | $U_{rev} \leq 1$ V                                                                                                          |
| <b>Current</b>  |                                                                  |                                                                                                                             |
| Leakage current | $U_R \leq 100$ V $U_R$ , 300 s<br>$U_R \geq 160$ V $U_R$ , 300 s | $I_{L/\mu A} \leq 0.0015 \times C_R/\mu F \times U_R/V + 3$<br>$I_{L/\mu A} \leq 0.0150 \times C_R/\mu F \times U_R/V + 10$ |



## LOW TEMPERATURE BEHAVIOUR

Table for the calculation of the maximum 10 kHz impedance at low temperatures:

$$Z(10 \text{ kHz})[\Omega] = \frac{\text{Tabular value}}{C_R[\mu\text{F}]}$$

| T <sub>a</sub><br>(°C) | RATED VOLTAGE (V) |      |      |      |      |      |
|------------------------|-------------------|------|------|------|------|------|
|                        | 16                | 25   | 40   | 63   | 100  | 160  |
| -25                    | 2250              | 1500 | 850  | 600  | 450  | 1000 |
| -40                    | 5400              | 3600 | 2040 | 1440 | 1080 | 5000 |

The lower limit of the series resistance and impedance is determined by the ohmic part of the contact points and the foil resistance values. Therefore it will not always be possible to achieve calculated values below 0.05 Ω.

## LIFETIME TABLE U<sub>R</sub> ≤ 100 V

| INTERRELATION BETWEEN ALTERNATING CURRENT, AMBIENT TEMPERATURE, AND LIFETIME |      |      |      |      |        |      |                                                                           |     |     |     |     |     |     |     |     |     |     |     |      |      |
|------------------------------------------------------------------------------|------|------|------|------|--------|------|---------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|------|
| I/I <sub>R</sub> (frequency dependent)                                       |      |      |      |      |        |      | LIFETIME MULTIPLIER L (depending on I/I <sub>R</sub> and T <sub>a</sub> ) |     |     |     |     |     |     |     |     |     |     |     |      |      |
| FREQUENCY [Hz]                                                               |      |      |      |      |        |      | AMBIENT TEMPERATURE T <sub>a</sub> [°C]                                   |     |     |     |     |     |     |     |     |     |     |     |      |      |
| 50                                                                           | 100  | 250  | 500  | 1000 | > 2500 | 10 K | 40                                                                        | 45  | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90  | 95  | 100  | 105  |
| 0                                                                            | 0    | 0    | 0    | 0    | 0      | 0    | 200                                                                       | 127 | 81  | 53  | 35  | 23  | 16  | 11  | 7.4 | 5.1 | 3.6 | 2.6 | 1.84 | 1.33 |
| 0.18                                                                         | 0.20 | 0.22 | 0.23 | 0.24 | 0.25   | 0.26 | 195                                                                       | 123 | 79  | 52  | 34  | 23  | 15  | 10  | 7.2 | 5.0 | 3.5 | 2.5 | 1.81 | 1.31 |
| 0.36                                                                         | 0.40 | 0.44 | 0.46 | 0.48 | 0.50   | 0.52 | 179                                                                       | 115 | 74  | 48  | 32  | 21  | 14  | 9.9 | 6.9 | 4.8 | 3.4 | 2.4 | 1.73 | 1.26 |
| 0.54                                                                         | 0.60 | 0.66 | 0.69 | 0.72 | 0.75   | 0.78 | 158                                                                       | 102 | 66  | 44  | 29  | 20  | 13  | 9.1 | 6.3 | 4.5 | 3.2 | 2.3 | 1.63 | 1.19 |
| 0.72                                                                         | 0.80 | 0.88 | 0.92 | 0.96 | 1.00   | 1.04 | 135                                                                       | 87  | 57  | 38  | 26  | 17  | 12  | 8.3 | 5.8 | 4.1 | 2.9 | 2.1 | 1.51 | 1.10 |
| 0.90                                                                         | 1.00 | 1.10 | 1.15 | 1.20 | 1.25   | 1.30 | 112                                                                       | 73  | 49  | 33  | 22  | 15  | 10  | 7.3 | 5.1 | 3.6 | 2.6 | 1.9 | 1.37 | 1.00 |
| 1.08                                                                         | 1.20 | 1.32 | 1.38 | 1.44 | 1.50   | 1.56 | 90                                                                        | 60  | 40  | 27  | 19  | 13  | 9.0 | 6.3 | 4.5 | 3.2 | 2.3 | 1.7 | 1.21 |      |
| 1.26                                                                         | 1.40 | 1.54 | 1.61 | 1.68 | 1.75   | 1.82 | 70                                                                        | 47  | 32  | 22  | 15  | 11  | 7.5 | 5.3 | 3.8 | 2.7 | 2.0 | 1.4 | 1.06 |      |
| 1.44                                                                         | 1.60 | 1.76 | 1.84 | 1.92 | 2.00   | 2.08 | 54                                                                        | 37  | 25  | 18  | 12  | 8.8 | 6.2 | 4.4 | 3.2 | 2.3 | 1.7 | 1.2 |      |      |
| 1.62                                                                         | 1.80 | 1.98 | 2.07 | 2.16 | 2.25   | 2.34 | 40                                                                        | 28  | 20  | 14  | 9.9 | 7.0 | 5.0 | 3.6 | 2.6 | 1.9 | 1.4 | 1.0 |      |      |
| 1.80                                                                         | 2.00 | 2.20 | 2.30 | 2.40 | 2.50   | 2.60 | 30                                                                        | 21  | 15  | 11  | 7.7 | 5.6 | 4.0 | 2.9 | 2.2 | 1.6 | 1.2 |     |      |      |
| 1.98                                                                         | 2.20 | 2.42 | 2.53 | 2.64 | 2.75   | 2.86 | 22                                                                        | 16  | 11  | 8.2 | 6.0 | 4.3 | 3.2 | 2.3 | 1.7 | 1.3 |     |     |      |      |
| 2.16                                                                         | 2.40 | 2.64 | 2.76 | 2.88 | 3.00   | 3.12 | 16                                                                        | 11  | 8.4 | 6.1 | 4.5 | 3.3 | 2.5 | 1.8 | 1.4 | 1.0 |     |     |      |      |
| 2.34                                                                         | 2.60 | 2.86 | 2.99 | 3.12 | 3.25   | 3.38 | 11                                                                        | 8.3 | 6.1 | 4.6 | 3.4 | 2.5 | 1.9 | 1.4 | 1.1 |     |     |     |      |      |
| 2.52                                                                         | 2.80 | 3.08 | 3.22 | 3.36 | 3.50   | 3.64 | 7.9                                                                       | 5.9 | 4.5 | 3.4 | 2.5 | 1.9 | 1.5 | 1.1 |     |     |     |     |      |      |
| 2.70                                                                         | 3.00 | 3.30 | 3.45 | 3.60 | 3.75   | 3.90 | 5.5                                                                       | 4.2 | 3.2 | 2.5 | 1.9 | 1.4 | 1.1 |     |     |     |     |     |      |      |
| 2.88                                                                         | 3.20 | 3.52 | 3.68 | 3.84 | 4.00   | 4.16 | 3.9                                                                       | 3.0 | 2.3 | 1.8 | 1.4 | 1.1 |     |     |     |     |     |     |      |      |
| 3.06                                                                         | 3.40 | 3.74 | 3.91 | 4.08 | 4.25   | 4.42 | 2.7                                                                       | 2.1 | 1.6 | 1.3 | 1.0 |     |     |     |     |     |     |     |      |      |
| 3.24                                                                         | 3.60 | 3.96 | 4.14 | 4.32 | 4.50   | 4.68 | 1.8                                                                       | 1.5 | 1.2 |     |     |     |     |     |     |     |     |     |      |      |
| 3.42                                                                         | 3.80 | 4.18 | 4.37 | 4.56 | 4.75   | 4.94 | 1.3                                                                       | 1.0 |     |     |     |     |     |     |     |     |     |     |      |      |

### Note

I<sub>R</sub> 100 Hz alternating current [A] at upper category temperature T<sub>UC</sub> taken from datasheet

I User current [A]

T<sub>a</sub> Ambient temperature of capacitor [°C]

L Lifetime multiplier

Regard L as a function of ambient temperature (x-axis) and of current (y-axis); use the current-axis according to the frequency

**LIFETIME TABLE**  $U_R > 100\text{ V}$ 

| <b>INTERRELATION BETWEEN ALTERNATING CURRENT, AMBIENT TEMPERATURE, AND LIFETIME</b> |      |      |      |      |        |      |                                                                               |     |     |     |     |     |     |     |     |     |      |     |      |      |
|-------------------------------------------------------------------------------------|------|------|------|------|--------|------|-------------------------------------------------------------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|------|------|
| <b>I/I<sub>R</sub> (frequency dependent)</b>                                        |      |      |      |      |        |      | <b>LIFETIME MULTIPLIER L (depending on I/I<sub>R</sub> and T<sub>a</sub>)</b> |     |     |     |     |     |     |     |     |     |      |     |      |      |
| <b>FREQUENCY [Hz]</b>                                                               |      |      |      |      |        |      | <b>AMBIENT TEMPERATURE T<sub>a</sub> [°C]</b>                                 |     |     |     |     |     |     |     |     |     |      |     |      |      |
| 50                                                                                  | 100  | 250  | 500  | 1000 | > 2500 | 10 K | 40                                                                            | 45  | 50  | 55  | 60  | 65  | 70  | 75  | 80  | 85  | 90   | 95  | 100  | 105  |
| 0                                                                                   | 0    | 0    | 0    | 0    | 0      | 0    | 200                                                                           | 127 | 81  | 53  | 35  | 23  | 16  | 11  | 7.4 | 5.1 | 3.6  | 2.6 | 1.84 | 1.33 |
| 0.17                                                                                | 0.20 | 0.23 | 0.25 | 0.26 | 0.27   | 0.28 | 194                                                                           | 123 | 79  | 52  | 34  | 23  | 15  | 10  | 7.2 | 5.0 | 3.5  | 2.5 | 1.81 | 1.31 |
| 0.34                                                                                | 0.40 | 0.46 | 0.50 | 0.52 | 0.54   | 0.56 | 178                                                                           | 114 | 74  | 48  | 32  | 21  | 14  | 9.9 | 6.9 | 4.8 | 3.4  | 2.4 | 1.73 | 1.26 |
| 0.51                                                                                | 0.60 | 0.70 | 0.74 | 0.78 | 0.80   | 0.84 | 158                                                                           | 102 | 66  | 44  | 29  | 20  | 13  | 9.1 | 6.3 | 4.5 | 3.2  | 2.3 | 1.63 | 1.19 |
| 0.68                                                                                | 0.80 | 0.93 | 0.99 | 1.04 | 1.07   | 1.12 | 133                                                                           | 87  | 57  | 38  | 26  | 17  | 12  | 8.3 | 5.8 | 4.1 | 2.9  | 2.1 | 1.51 | 1.10 |
| 0.85                                                                                | 1.00 | 1.16 | 1.24 | 1.30 | 1.34   | 1.40 | 110                                                                           | 73  | 49  | 33  | 22  | 15  | 11  | 7.3 | 5.1 | 3.6 | 2.6  | 1.9 | 1.37 | 1.00 |
| 1.02                                                                                | 1.20 | 1.39 | 1.49 | 1.56 | 1.61   | 1.68 | 88                                                                            | 59  | 40  | 27  | 19  | 13  | 9.0 | 6.3 | 4.5 | 3.2 | 2.3  | 1.7 | 1.21 |      |
| 1.19                                                                                | 1.40 | 1.62 | 1.74 | 1.82 | 1.88   | 1.96 | 69                                                                            | 47  | 32  | 22  | 15  | 11  | 7.6 | 5.4 | 3.8 | 2.7 | 2.00 | 1.4 | 1.06 |      |
| 1.36                                                                                | 1.60 | 1.86 | 1.98 | 2.08 | 2.14   | 2.24 | 53                                                                            | 37  | 26  | 18  | 12  | 8.8 | 6.2 | 4.5 | 3.2 | 2.3 | 1.7  | 1.2 |      |      |
| 1.53                                                                                | 1.80 | 2.09 | 2.23 | 2.34 | 2.41   | 2.52 | 40                                                                            | 28  | 20  | 14  | 9.9 | 7.1 | 5.1 | 3.7 | 2.7 | 1.9 | 1.4  | 1.0 |      |      |
| 1.70                                                                                | 2.00 | 2.32 | 2.48 | 2.60 | 2.68   | 2.80 | 30                                                                            | 21  | 15  | 11  | 7.8 | 5.6 | 4.1 | 3   | 2.2 | 1.6 | 1.2  |     |      |      |
| 1.87                                                                                | 2.20 | 2.55 | 2.73 | 2.86 | 2.95   | 3.08 | 22                                                                            | 16  | 11  | 8.3 | 6.0 | 4.4 | 3.2 | 2.4 | 1.7 | 1.3 |      |     |      |      |
| 2.04                                                                                | 2.40 | 2.78 | 2.98 | 3.12 | 3.22   | 3.36 | 16                                                                            | 12  | 8.5 | 6.2 | 4.6 | 3.4 | 2.5 | 1.9 | 1.4 | 1.0 |      |     |      |      |
| 2.21                                                                                | 2.60 | 3.02 | 3.22 | 3.38 | 3.48   | 3.64 | 11                                                                            | 8.4 | 6.2 | 4.6 | 3.5 | 2.6 | 1.9 | 1.4 | 1.1 |     |      |     |      |      |
| 2.38                                                                                | 2.80 | 3.25 | 3.47 | 3.64 | 3.75   | 3.92 | 8.0                                                                           | 6.0 | 4.5 | 3.4 | 2.6 | 1.9 | 1.5 | 1.1 |     |     |      |     |      |      |
| 2.55                                                                                | 3.00 | 3.48 | 3.72 | 3.90 | 4.02   | 4.20 | 5.6                                                                           | 4.3 | 3.3 | 2.5 | 1.9 | 1.4 | 1.1 |     |     |     |      |     |      |      |
| 2.72                                                                                | 3.20 | 3.71 | 3.97 | 4.16 | 4.29   | 4.48 | 3.9                                                                           | 3.0 | 2.3 | 1.8 | 1.4 | 1.1 |     |     |     |     |      |     |      |      |
| 2.89                                                                                | 3.40 | 3.94 | 4.22 | 4.42 | 4.56   | 4.76 | 2.7                                                                           | 2.1 | 1.7 | 1.3 | 1.0 |     |     |     |     |     |      |     |      |      |
| 3.06                                                                                | 3.60 | 4.18 | 4.46 | 4.68 | 4.82   | 5.04 | 1.9                                                                           | 1.5 | 1.2 |     |     |     |     |     |     |     |      |     |      |      |
| 3.23                                                                                | 3.80 | 4.41 | 4.71 | 4.94 | 5.09   | 5.32 | 1.3                                                                           | 1.0 |     |     |     |     |     |     |     |     |      |     |      |      |

**Note**I<sub>R</sub> 100 Hz alternating current [A] at upper category temperature T<sub>UC</sub> taken from datasheet

I User current [A]

T<sub>a</sub> Ambient temperature of capacitor [°C]

L Lifetime multiplier

Regard L as a function of ambient temperature (x-axis) and of current (y-axis); use the current-axis according to the frequency

| <b>TEST PROCEDURES AND REQUIREMENTS</b>        |                                             |                                                                                                                                                                                                       |                                                                                                                                                                              |
|------------------------------------------------|---------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>TEST</b>                                    |                                             | <b>PROCEDURE<br/>(quick reference)</b>                                                                                                                                                                | <b>REQUIREMENTS</b>                                                                                                                                                          |
| <b>NAME OF TEST</b>                            | <b>REFERENCE</b>                            |                                                                                                                                                                                                       |                                                                                                                                                                              |
| Endurance                                      | IEC 60384-4/<br>EN 130300<br>subclause 4.13 | T <sub>A</sub> = 105 °C; U <sub>R</sub> applied<br>2000 h                                                                                                                                             | -15 % ≤ ΔC/C ≤ 15 %<br>tan δ ≤ 1.3 x spec. limit<br>Z ≤ 2 x spec. limit<br>I <sub>L</sub> (300 s) ≤ spec. limit                                                              |
| Useful life                                    | CECC 30301<br>subclause 1.8.1               | T <sub>A</sub> = 105 °C; U <sub>R</sub> and I <sub>R</sub> applied<br>16 V ≤ U <sub>R</sub> ≤ 100 V<br>Cases 6.5 x 8 to 10 x 25: 3000 h<br>160 V ≤ U <sub>R</sub><br>Cases 6.5 x 8 to 10 x 25: 3000 h | -45 % ≤ ΔC/C ≤ 45 %<br>tan δ ≤ 3 x spec. limit<br>Z ≤ 3 x spec. limit<br>I <sub>L</sub> (300 s) ≤ spec. limit<br>No short or open circuit<br>Total failure percentage: ≤ 1 % |
| Shelf life<br>(storage at<br>high temperature) | IEC 60384-4/<br>EN 130300<br>subclause 4.17 | T <sub>A</sub> = 105 °C; no voltage applied<br>100 h<br>After test: U <sub>R</sub> to be applied for 30 min<br>24 h o 48 h before measurement                                                         | -15 % ≤ ΔC/C ≤ 15 %<br>tan δ ≤ 1.3 x spec. limit<br>Z ≤ 2 x spec. limit<br>I <sub>L</sub> (300 s) ≤ 2 x spec. limit                                                          |



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