

## Long-life grade capacitors

### Applications

- Switch-mode power supplies in industrial and entertainment electronics
- Frequency converters

### Features

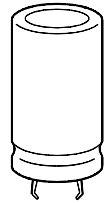
- Long useful life
- High reliability and high ripple current capability
- Low equivalent series resistance *ESR*
- High *CU* product, i.e. compact
- Different case sizes available for each capacitance value

### Construction

- Charge-discharge proof, polar
- Aluminum case, fully insulated
- Snap-in solder pins to hold component in place on PC-board
- Minus pole marking on case surface
- Minus pole not insulated from case
- Overload protection (safety vent)

### Terminals

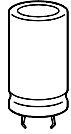
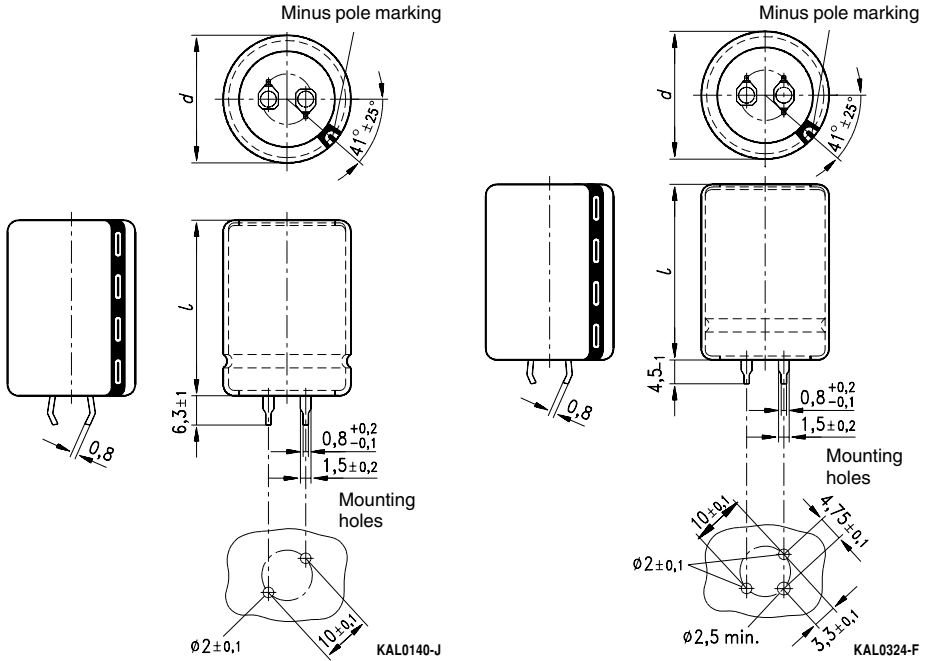
- Standard version with 2 terminals  
2 lengths available: 6,3 and 4,5 mm
- 3 terminals: length 4,5 mm  
(terminal arrangement ensures correct insertion)



KAL0274-A


**Specifications and characteristics in brief**

|   |   |  |
|---|---|--|
| Rated voltage $U_R$   | 160 ... 450 VDC   |  |
| Surge voltage $U_S$   | $1,15 \cdot U_R$ (for $U_R \leq 250$ VDC)<br>$1,10 \cdot U_R$ (for $U_R \geq 385$ VDC)  |  |
| Rated capacitance $C_R$   | 47 ... 2 200 $\mu$ F  |  |
| Capacitance tolerance   | $\pm 20 \% \triangleq M$  |  |
| Leakage current $I_L$<br>(5 min, 20 °C)   | $I_L \leq 0,3 \mu A \cdot \left( \frac{C_R}{\mu F} \cdot \frac{U_R}{V} \right)^{0,7} + 4 \mu A$   |  |
| Self-inductance $L_{ESL}$   | Approx. 20 nH   |  |
| Useful life<br>85 °C; $U_R$ ; $I_{\sim R}$<br>40 °C; $U_R$ ; $1,4 \cdot I_{\sim R}$ | > 10 000 h<br>> 200 000 h   | <b>Requirements:</b><br>$\Delta C/C \leq \pm 30 \%$ of initial value<br>$ESR \leq 3$ times initial specified limit<br>$I_L \leq$ initial specified limit<br>Failure percentage: $\leq 1 \%$<br>Failure rate: $\leq 50$ fit ( $\leq 50 \cdot 10^{-9}/h$ )<br>(for definiton "fit", refer to chapter "Quality", page 62) |
| Voltage endurance test<br>85 °C; $U_R$  | 5 000 h   | <b>Post test requirements:</b><br>$\Delta C/C \leq \pm 10 \%$ of initial value<br>$ESR \leq 1,3$ times initial specified limit<br>$I_L \leq$ initial specified limit   |
| Vibration resistance  | To IEC 60068-2-6, test Fc:<br>displacement amplitude 0,35 mm, frequency range 10 ... 55 Hz,<br>acceleration max. 5 g, duration $3 \times 2$ h                       |  |
| IEC climatic category   | To IEC 60068-1:<br>$U_R \leq 400$ VDC: 40/085/56 (– 40 °C/+ 85 °C/56 days damp heat test)<br>$U_R \geq 420$ VDC: 25/085/56 (– 25 °C/+ 85 °C/56 days damp heat test) |  |
| Detail specification  | Similar to CECC 30301-811   |  |
| Sectional specification   | IEC 60384-4   |  |


**Dimensional drawings**


Snap-in terminals, standard (length  $6,3 \pm 1$  mm). Also available in a shorter version with a length of  $4,5 - 1$  mm. For packing mode and ordering example see next page.

Snap-in capacitors are also available with 3 terminals (length  $4,5 - 1$  mm).

For packing mode and ordering example see next page.

| Dimensions (mm) |           | Approx. weight (g) | Packing units (pieces) |
|-----------------|-----------|--------------------|------------------------|
| $d + 1$         | $l \pm 2$ |                    |                        |
| 22              | 25        | 9                  | 160                    |
| 22              | 30        | 12                 | 160                    |
| 22              | 35        | 15                 | 160                    |
| 22              | 40        | 18                 | 160                    |
| 25              | 25        | 13                 | 130                    |
| 25              | 30        | 17                 | 130                    |
| 25              | 35        | 19                 | 130                    |
| 25              | 40        | 22                 | 130                    |

| Dimensions (mm) |           | Approx. weight (g) | Packing units (pieces) |
|-----------------|-----------|--------------------|------------------------|
| $d + 1$         | $l \pm 2$ |                    |                        |
| 30              | 25        | 17                 | 80                     |
| 30              | 30        | 23                 | 80                     |
| 30              | 35        | 29                 | 80                     |
| 30              | 40        | 36                 | 80                     |
| 30              | 45        | 41                 | 80                     |
| 30              | 50        | 47                 | 80                     |
| 35              | 35        | 36                 | 60                     |
| 35              | 40        | 41                 | 60                     |
| 35              | 45        | 57                 | 60                     |
| 35              | 50        | 72                 | 60                     |



B43501

Long Life – 85 °C

### Packing of snap-in capacitors



For ecological reasons the packing is pure cardboard. Components can be withdrawn (in full or in part) in the correct position for insertion.

### Ordering codes

| Snap-in terminals<br>Version    | Identification in 3rd block of ordering code |
|---------------------------------|--|
| Standard terminals (6,3 ± 1) mm | M000   |
| Short terminals (4,5 – 1) mm    | M007   |
| 3 terminals (4,5 – 1) mm        | M002   |

Ordering example:

B43501A3107M007 } snap-in capacitor with short terminals  
B43501A3107M002 } snap-in capacitor with 3 terminals


**Overview of available types**

| $U_R$ (VDC)      | 160                               | 200                | 250                | 385                | 400                | 420                | 450                           |
|------------------|-----------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------------------------------|
| $C_R$ ( $\mu$ F) | Case dimensions $d \times l$ (mm) |                    |                    |                    |                    |                    |                               |
| 47               |                                   |                    |                    |                    |                    |                    | 22 × 25                       |
| 68               |                                   |                    |                    | 22 × 25            | 22 × 25            |                    | 22 × 30<br>25 × 25            |
| 100              |                                   |                    |                    | 22 × 30<br>25 × 25 | 22 × 30<br>25 × 25 | 22 × 30<br>25 × 25 | 22 × 40<br>25 × 30<br>30 × 25 |
| 120              |                                   |                    |                    |                    | 22 × 35            | 25 × 30            |                               |
| 150              |                                   |                    | 22 × 25            | 22 × 40<br>25 × 30 | 22 × 40<br>30 × 25 | 22 × 40<br>25 × 35 | 25 × 40<br>30 × 30            |
| 180              |                                   |                    |                    |                    | 30 × 30            | 25 × 30<br>30 × 33 | 30 × 35                       |
| 220              | 22 × 25                           | 22 × 25            | 22 × 30<br>25 × 25 | 25 × 40<br>30 × 30 | 25 × 40<br>30 × 35 | 25 × 40<br>30 × 35 | 30 × 40                       |
| 270              |                                   |                    |                    |                    | 30 × 35            | 30 × 35<br>35 × 30 | 30 × 45                       |
| 330              | 22 × 30                           | 22 × 30<br>25 × 25 | 22 × 40<br>25 × 30 | 30 × 40            | 30 × 45            | 30 × 45<br>35 × 35 | 35 × 40                       |
| 390              |                                   |                    |                    |                    | 30 × 50            | 30 × 50            |                               |
| 470              | 22 × 35                           | 22 × 40<br>30 × 25 | 25 × 40<br>30 × 30 | 35 × 40            | 35 × 45            | 35 × 45            | 35 × 50                       |
| 560              |                                   |                    |                    | 35 × 45            | 35 × 50            | 35 × 50            |                               |
| 680              | 25 × 35                           | 25 × 40<br>30 × 30 | 30 × 40            |                    |                    |                    |                               |
| 1 000            | 30 × 35                           | 30 × 40<br>35 × 35 | 35 × 40            |                    |                    |                    |                               |
| 1 500            | 30 × 45                           | 35 × 45            |                    |                    |                    |                    |                               |
| 2 200            | 35 × 50                           |                    |                    |                    |                    |                    |                               |

The capacitance and voltage ratings listed above are available in different cases upon request. Other voltage and capacitance ratings are also available upon request.


**Technical data and ordering codes**

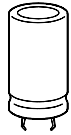
| $U_R$ | $C_R$<br>100 Hz<br>20 °C<br>μF | Case<br>dimensions<br>$d \times l$<br>mm | $ESR_{typ}$<br>100 Hz<br>20 °C<br>mΩ | $ESR_{max}$<br>100 Hz<br>20 °C<br>mΩ | $Z_{max}$<br>10 kHz<br>20 °C<br>mΩ | $I_{~max}$<br>100 Hz<br>40 °C<br>A | $I_{~R}^{(1)}$<br>100 Hz<br>85 °C<br>A | Ordering code <sup>2)</sup> |
|-------|--------------------------------|--|--------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|-----------------------------|
| 160   | 220                            | 22 × 25                                  | 530                                  | 910                                  | 730                                | 2,4                                | 1,1                                    | B43501A1227M000             |
|       | 330                            | 22 × 30                                  | 360                                  | 610                                  | 490                                | 3,2                                | 1,4                                    | B43501A1337M000             |
|       | 470                            | 22 × 35                                  | 250                                  | 430                                  | 350                                | 4,0                                | 1,8                                    | B43501A1477M000             |
|       | 680                            | 25 × 35                                  | 180                                  | 300                                  | 240                                | 5,2                                | 2,4                                    | B43501A1687M000             |
|       | 1 000                          | 30 × 35                                  | 120                                  | 200                                  | 160                                | 6,9                                | 3,1                                    | B43501A1108M000             |
|       | 1 500                          | 30 × 45                                  | 80                                   | 140                                  | 120                                | 9,2                                | 4,2                                    | B43501A1158M000             |
|       | 2 200                          | 35 × 50                                  | 60                                   | 91                                   | 80                                 | 13                                 | 5,8                                    | B43501A1228M000             |
| 200   | 220                            | 22 × 25                                  | 380                                  | 610                                  | 490                                | 2,4                                | 1,1                                    | B43501A2227M000             |
|       | 330                            | 22 × 30                                  | 260                                  | 410                                  | 330                                | 3,2                                | 1,4                                    | B43501A2337M000             |
|       | 330                            | 25 × 25                                  | 260                                  | 410                                  | 330                                | 3,2                                | 1,5                                    | B43501J2337M000             |
|       | 470                            | 22 × 40                                  | 180                                  | 290                                  | 240                                | 4,2                                | 1,9                                    | B43501A2477M000             |
|       | 470                            | 30 × 25                                  | 180                                  | 290                                  | 350                                | 4,2                                | 1,9                                    | B43501J2477M000             |
|       | 680                            | 25 × 40                                  | 130                                  | 200                                  | 160                                | 5,5                                | 2,5                                    | B43501A2687M000             |
|       | 680                            | 30 × 30                                  | 130                                  | 200                                  | 160                                | 5,4                                | 2,4                                    | B43501J2687M000             |
|       | 1 000                          | 30 × 40                                  | 83                                   | 140                                  | 120                                | 7,2                                | 3,3                                    | B43501A2108M000             |
|       | 1 000                          | 35 × 35                                  | 83                                   | 140                                  | 120                                | 7,6                                | 3,5                                    | B43501J2108M000             |
|       | 1 500                          | 35 × 45                                  | 56                                   | 90                                   | 80                                 | 10                                 | 4,6                                    | B43501A2158M000             |
|       | 250                            | 150                                      | 22 × 25                              | 560                                  | 890                                | 800                                | 2,0                                    | 0,91                        |
| 220   |                                | 22 × 30                                  | 380                                  | 610                                  | 500                                | 2,6                                | 1,2                                    | B43501B2227M000             |
| 220   |                                | 25 × 25                                  | 380                                  | 610                                  | 490                                | 2,6                                | 1,2                                    | B43501K2227M000             |
| 330   |                                | 22 × 40                                  | 260                                  | 410                                  | 330                                | 3,5                                | 1,6                                    | B43501B2337M000             |
| 330   |                                | 25 × 30                                  | 260                                  | 410                                  | 330                                | 3,4                                | 1,6                                    | B43501K2337M000             |
| 470   |                                | 25 × 40                                  | 180                                  | 290                                  | 240                                | 4,5                                | 2,1                                    | B43501B2477M000             |
| 470   |                                | 30 × 30                                  | 180                                  | 290                                  | 240                                | 4,5                                | 2,0                                    | B43501K2477M000             |
| 680   |                                | 30 × 40                                  | 130                                  | 200                                  | 160                                | 5,9                                | 2,7                                    | B43501B2687M000             |
| 1 000 |                                | 35 × 40                                  | 83                                   | 140                                  | 120                                | 8,0                                | 3,6                                    | B43501B2108M000             |

Preferred types

1) 120 Hz conversion factor of ripple current:  $I_{~}(120 \text{ Hz}) = 1,03 \cdot I_{~}(100 \text{ Hz})$

2) Ordering code for standard terminals (6,3 mm).

To determine the ordering code for short terminals (4,5 mm) and 3 terminals (4,5 mm) see page 238.



| $U_R$ | $C_R$<br>100 Hz<br>20 °C | Case<br>dimensions<br>$d \times l$<br>mm | $ESR_{typ}$<br>100 Hz<br>20 °C<br>mΩ | $ESR_{max}$<br>100 Hz<br>20 °C<br>mΩ | $Z_{max}$<br>10 kHz<br>20 °C<br>mΩ | $I_{~max}$<br>100 Hz<br>40 °C<br>A | $I_{~R}^{(1)}$<br>100 Hz<br>85 °C<br>A | Ordering code <sup>2)</sup> |
|-------|--------------------------|--|--------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|-----------------------------|
| VDC   | μF                       |  |                                      |                                      |                                    |                                    |  |                             |
| 385   | 68                       | 22 × 25                                  | 980                                  | 1960                                 | 1570                               | 1,3                                | 0,61                                   | B43501A3686M000             |
|       | 100                      | 22 × 30                                  | 670                                  | 1330                                 | 1070                               | 1,7                                | 0,79                                   | B43501A3107M000             |
|       | 100                      | 25 × 25                                  | 670                                  | 1330                                 | 1070                               | 1,8                                | 0,80                                   | B43501B3107M000             |
|       | 150                      | 22 × 40                                  | 450                                  | 890                                  | 720                                | 2,4                                | 1,1                                    | B43501A3157M000             |
|       | 150                      | 25 × 30                                  | 450                                  | 890                                  | 720                                | 2,3                                | 1,0                                    | B43501B3157M000             |
|       | 220                      | 25 × 40                                  | 310                                  | 610                                  | 490                                | 3,1                                | 1,4                                    | B43501A3227M000             |
|       | 220                      | 30 × 30                                  | 310                                  | 610                                  | 490                                | 3,1                                | 1,4                                    | B43501B3227M000             |
|       | 330                      | 30 × 40                                  | 210                                  | 410                                  | 330                                | 4,1                                | 1,9                                    | B43501A3337M000             |
|       | 470                      | 35 × 40                                  | 150                                  | 290                                  | 240                                | 5,5                                | 2,5                                    | B43501A3477M000             |
|       | 560                      | 35 × 45                                  | 120                                  | 240                                  | 200                                | 6,2                                | 2,8                                    | B43501A3567M000             |
| 400   | 68                       | 22 × 25                                  | 980                                  | 1960                                 | 1570                               | 1,3                                | 0,61                                   | B43501A9686M000             |
|       | 100                      | 22 × 30                                  | 670                                  | 1330                                 | 1070                               | 1,7                                | 0,79                                   | B43501A9107M000             |
|       | 100                      | 25 × 25                                  | 670                                  | 1330                                 | 1070                               | 1,8                                | 0,80                                   | B43501B9107M000             |
|       | 120                      | 22 × 35                                  | 560                                  | 1100                                 | 890                                | 2,0                                | 0,92                                   | B43501A9127M000             |
|       | 150                      | 22 × 40                                  | 450                                  | 890                                  | 720                                | 2,4                                | 1,1                                    | B43501A9157M000             |
|       | 150                      | 30 × 25                                  | 450                                  | 890                                  | 720                                | 2,4                                | 1,1                                    | B43501B9157M000             |
|       | 180                      | 30 × 30                                  | 370                                  | 740                                  | 600                                | 2,7                                | 1,2                                    | B43501A9187M000             |
|       | 220                      | 25 × 40                                  | 310                                  | 610                                  | 490                                | 3,1                                | 1,4                                    | B43501A9227M000             |
|       | 220                      | 30 × 35                                  | 310                                  | 610                                  | 490                                | 3,2                                | 1,5                                    | B43501B9227M000             |
|       | 270                      | 30 × 35                                  | 250                                  | 490                                  | 400                                | 3,5                                | 1,6                                    | B43501A9277M000             |
|       | 330                      | 30 × 45                                  | 210                                  | 410                                  | 330                                | 4,3                                | 2,0                                    | B43501A9337M000             |
|       | 390                      | 30 × 50                                  | 180                                  | 340                                  | 280                                | 4,8                                | 2,2                                    | B43501A9397M000             |
|       | 470                      | 35 × 45                                  | 150                                  | 290                                  | 240                                | 5,7                                | 2,6                                    | B43501A9477M000             |
|       | 560                      | 35 × 50                                  | 120                                  | 240                                  | 200                                | 6,4                                | 2,9                                    | B43501A9567M000             |

Preferred types

1) 120 Hz conversion factor of ripple current:  $I_{~}(120 \text{ Hz}) = 1,03 \cdot I_{~}(100 \text{ Hz})$

2) Ordering code for standard terminals (6,3 mm).

To determine the ordering code for short terminals (4,5 mm) and 3 terminals (4,5 mm) see page 238.


**B43501**
**Long Life – 85 °C**

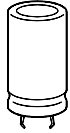
| $U_R$ | $C_R$<br>100 Hz<br>20 °C | Case<br>dimensions<br>$d \times l$<br>mm | $ESR_{typ}$<br>100 Hz<br>20 °C<br>mΩ | $ESR_{max}$<br>100 Hz<br>20 °C<br>mΩ | $Z_{max}$<br>10 kHz<br>20 °C<br>mΩ | $I_{~max}$<br>100 Hz<br>40 °C<br>A | $I_{~R^{(1)}}$<br>100 Hz<br>85 °C<br>A | Ordering code <sup>2)</sup> |                 |
|-------|--------------------------|--|--------------------------------------|--------------------------------------|------------------------------------|------------------------------------|--|-----------------------------|-----------------|
| VDC   | 420                      | 100                                      | 22 × 30                              | 1330                                 | 1990                               | 1600                               | 1,74                                   | 0,79                        | B43501A0107M000 |
|       |                          | 100                                      | 25 × 25                              | 1330                                 | 1990                               | 1600                               | 1,77                                   | 0,80                        | B43501E0107M000 |
|       |                          | 120                                      | 22 × 30                              | 1110                                 | 1660                               | 1330                               | 2,06                                   | 0,94                        | B43501A0127M000 |
|       |                          | 150                                      | 22 × 40                              | 890                                  | 1330                               | 1070                               | 2,37                                   | 1,08                        | B43501A0157M000 |
|       |                          | 150                                      | 25 × 35                              | 890                                  | 1330                               | 1070                               | 2,44                                   | 1,11                        | B43501E0157M000 |
|       |                          | 180                                      | 25 × 35                              | 740                                  | 1110                               | 890                                | 2,67                                   | 1,21                        | B43501A0187M000 |
|       |                          | 180                                      | 30 × 30                              | 740                                  | 1110                               | 890                                | 2,76                                   | 1,26                        | B43501E0187M000 |
|       |                          | 220                                      | 25 × 40                              | 610                                  | 910                                | 730                                | 3,11                                   | 1,41                        | B43501A0227M000 |
|       |                          | 220                                      | 30 × 35                              | 610                                  | 910                                | 730                                | 3,22                                   | 1,46                        | B43501E0227M000 |
|       |                          | 270                                      | 30 × 35                              | 500                                  | 740                                | 590                                | 3,57                                   | 1,62                        | B43501A0277M000 |
|       |                          | 270                                      | 35 × 30                              | 500                                  | 740                                | 590                                | 3,76                                   | 1,71                        | B43501E0277M000 |
|       |                          | 330                                      | 30 × 45                              | 410                                  | 610                                | 490                                | 4,32                                   | 1,96                        | B43501A0337M000 |
|       |                          | 330                                      | 35 × 35                              | 410                                  | 610                                | 490                                | 4,37                                   | 1,98                        | B43501E0337M000 |
|       |                          | 390                                      | 30 × 50                              | 350                                  | 520                                | 410                                | 4,89                                   | 2,22                        | B43501A0397M000 |
|       |                          | 470                                      | 35 × 45                              | 290                                  | 430                                | 340                                | 5,69                                   | 2,58                        | B43501A0477M000 |
|       |                          | 560                                      | 35 × 50                              | 240                                  | 360                                | 290                                | 6,45                                   | 2,93                        | B43501A0567M000 |
| VDC   | 450                      | 47                                       | 22 × 25                              | 2830                                 | 4240                               | 3400                               | 1,1                                    | 0,51                        | B43501A5476M000 |
|       |                          | 68                                       | 22 × 30                              | 1960                                 | 2930                               | 2350                               | 1,4                                    | 0,65                        | B43501A5686M000 |
|       |                          | 68                                       | 25 × 25                              | 1960                                 | 2930                               | 2350                               | 1,5                                    | 0,66                        | B43501B5686M000 |
|       |                          | 100                                      | 22 × 40                              | 1330                                 | 1990                               | 1600                               | 1,9                                    | 0,88                        | B43501A5107M000 |
|       |                          | 100                                      | 25 × 30                              | 1330                                 | 1990                               | 1600                               | 1,9                                    | 0,86                        | B43501B5107M000 |
|       |                          | 100                                      | 30 × 25                              | 1330                                 | 1990                               | 1600                               | 1,9                                    | 0,90                        | B43501C5107M000 |
|       |                          | 150                                      | 25 × 40                              | 890                                  | 1330                               | 1070                               | 2,6                                    | 1,2                         | B43501A5157M000 |
|       |                          | 150                                      | 30 × 30                              | 890                                  | 1330                               | 1070                               | 2,5                                    | 1,1                         | B43501B5157M000 |
|       |                          | 180                                      | 30 × 35                              | 750                                  | 1100                               | 890                                | 2,9                                    | 1,3                         | B43501A5187M000 |
|       |                          | 220                                      | 30 × 40                              | 610                                  | 910                                | 730                                | 3,4                                    | 1,5                         | B43501A5227M000 |
|       |                          | 270                                      | 30 × 45                              | 500                                  | 740                                | 600                                | 3,9                                    | 1,8                         | B43501A5277M000 |
|       |                          | 330                                      | 35 × 40                              | 410                                  | 610                                | 490                                | 4,6                                    | 2,1                         | B43501A5337M000 |
|       |                          | 470                                      | 35 × 50                              | 290                                  | 430                                | 350                                | 5,9                                    | 2,7                         | B43501A5477M000 |

Preferred types

1) 120 Hz conversion factor of ripple current:  $I_{~(120\text{ Hz})} = 1,03 \cdot I_{~(100\text{ Hz})}$

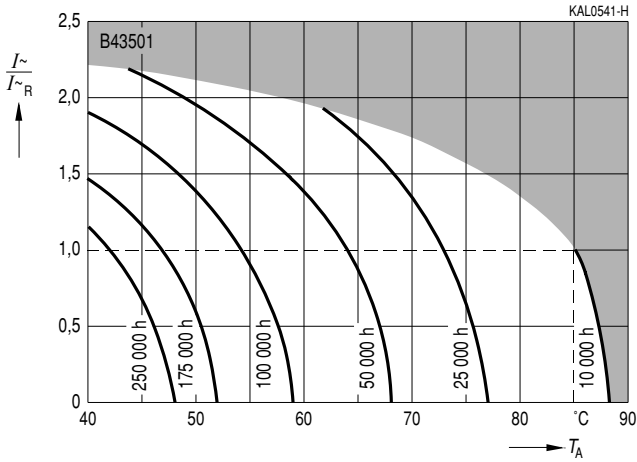
2) Ordering code for standard terminals (6,3 mm).

To determine the ordering code for short terminals (4,5 mm) and 3 terminals (4,5 mm) see page 238.

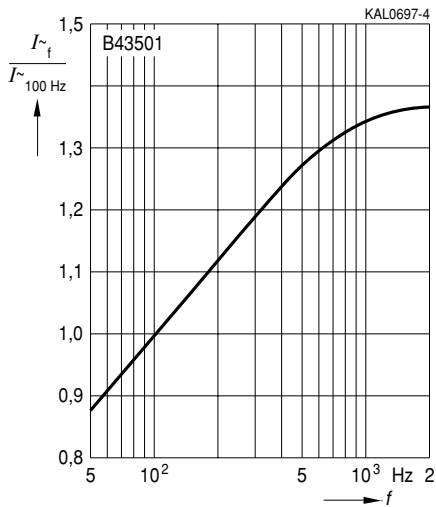


**Useful life**

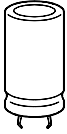
depending on ambient temperature  $T_A$  under ripple current operating conditions<sup>1)</sup>



**Frequency factor of permissible ripple current  $I_{\sim}$  versus frequency  $f$**



1) Refer to page 40 for an explanation on how to interpret the useful life graphs.

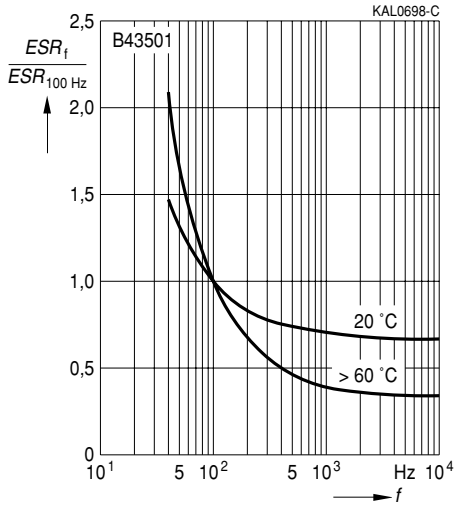


**B43501**

**Long Life – 85 °C**

**Frequency characteristics of ESR**

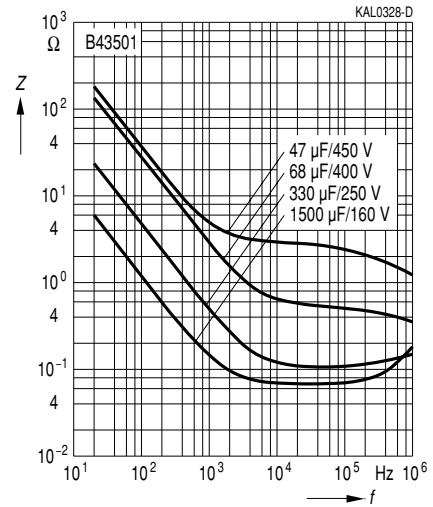
Typical behavior



**Impedance Z**

versus frequency  $f$

Typical behavior at 20 °C



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