

## Aluminum Electrolytic Capacitors

### Axial High Temperature, High Ripple Current

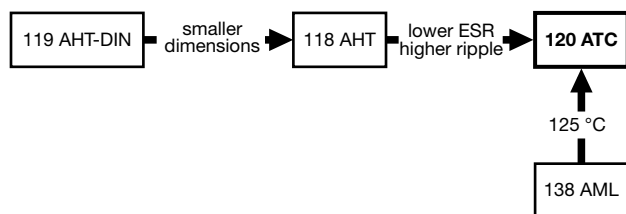


Fig. 1

#### QUICK REFERENCE DATA

| DESCRIPTION                                        | VALUE                    |
|----------------------------------------------------|--------------------------|
| Nominal case sizes (Ø D x L in mm)                 | 10 x 30 to 21 x 38       |
| Rated capacitance range, C <sub>R</sub>            | 47 µF to 6800 µF         |
| Tolerance on C <sub>R</sub>                        | ± 20 %                   |
| Rated voltage range, U <sub>R</sub>                | 16 V to 100 V            |
| Category temperature range                         | -40 °C to +125 °C        |
| Endurance test at 150 °C                           | 1000 h                   |
| Endurance test at 125 °C                           | 4000 h                   |
| Useful life at 125 °C                              | 8000 h                   |
| Useful life at 85 °C, 1.4 x I <sub>R</sub> applied | 40 000 h                 |
| Shelf life at 0 V, 125 °C                          | 1000 h<br>(100 V: 500 h) |
| Shelf life at 0 V, 150 °C                          | ≤ 63 V: 500 h            |
| Based on sectional specification                   | IEC 60384-4 / EN 130300  |
| Climatic category IEC 60068                        | 40/125/56                |

#### FEATURES

- Extra long useful life: up to 8000 h at 125 °C
- Extended temperature range: usable up to 150 °C
- Low ESR levels provide very high ripple current capability
- Miniaturized, high CV-product per unit volume
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Axial leads, cylindrical aluminum case, insulated with a blue sleeve
- Taped versions up to case Ø 15 mm x 30 mm available for automatic insertion
- Lead diameter Ø d = 1.0 mm, available on request
- AEC-Q200 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

#### APPLICATIONS

- Automotive, industrial and telecommunication
- Smoothing, filtering, buffering
- Low mounting height applications, vibration and shock resistant
- SMPS and standard power supplies

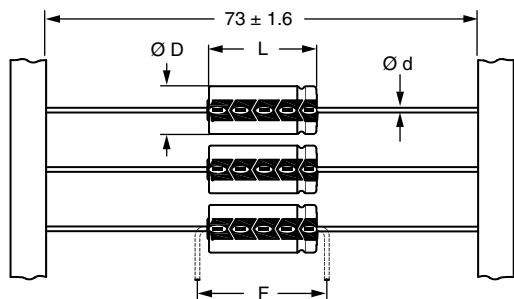
#### MARKING

The capacitors are marked (where possible) with the following information:

- Rated capacitance (in µF)
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (M for ± 20 %)
- Rated voltage (in V)
- Upper category temperature (125 °C)
- Date code in accordance with IEC 60062
- Code for factory of origin
- Name of manufacturer
- Negative terminal identification
- Series number (120)

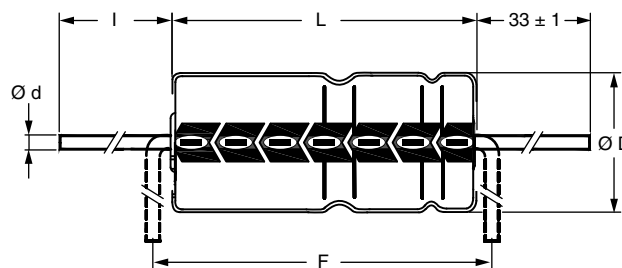
#### SELECTION CHART FOR C<sub>R</sub>, U<sub>R</sub>, AND RELEVANT NOMINAL CASE SIZE (Ø D x L in mm)

| C <sub>R</sub><br>(µF) | U <sub>R</sub> (V) |           |           |           |           |
|------------------------|--------------------|-----------|-----------|-----------|-----------|
|                        | 16                 | 25        | 40        | 63        | 100       |
| 47                     | -                  | -         | -         | -         | 10 x 30   |
| 68                     | -                  | -         | -         | -         | 12.5 x 30 |
| 100                    | -                  | -         | -         | 10 x 30   | 12.5 x 30 |
| 150                    | -                  | -         | -         | 12.5 x 30 | 15 x 30   |
| 220                    | -                  | -         | 10 x 30   | 12.5 x 30 | 18 x 30   |
| 330                    | -                  | -         | 12.5 x 30 | 15 x 30   | 18 x 38   |
| 470                    | -                  | 10 x 30   | 12.5 x 30 | 18 x 30   | 21 x 38   |
| 680                    | 10 x 30            | 12.5 x 30 | 15 x 30   | 18 x 38   | -         |
| 1000                   | 12.5 x 30          | 12.5 x 30 | 18 x 30   | 21 x 38   | -         |
| 1500                   | 12.5 x 30          | 15 x 30   | 18 x 38   | -         | -         |
| 2200                   | 15 x 30            | 18 x 30   | 21 x 38   | -         | -         |
| 3300                   | 18 x 30            | 18 x 38   | -         | -         | -         |
| 4700                   | 18 x 38            | 21 x 38   | -         | -         | -         |
| 6800                   | 21 x 38            | -         | -         | -         | -         |

**DIMENSIONS in millimeters AND AVAILABLE FORMS**


**Form BR:** Taped on reel  
Case Ø D x L = 6.5 mm x 18 mm to 15 mm x 30 mm

Fig. 2 - **Form BR**



**Form AA:** Axial in box  
Case Ø D x L = 10 mm x 30 mm to 21 mm x 38 mm

Fig. 3 - **Form AA**

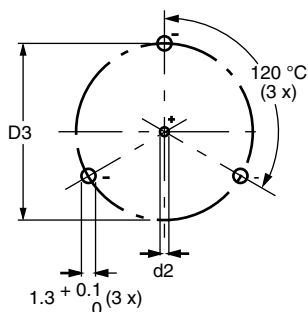
Table 1

| <b>AXIAL; DIMENSIONS in millimeters, MASS, AND PACKAGING QUANTITIES</b> |                       |        |                     |                   |                   |             |                      |            |
|-------------------------------------------------------------------------|-----------------------|--------|---------------------|-------------------|-------------------|-------------|----------------------|------------|
| NOMINAL CASE SIZE<br>Ø D x L<br>(mm)                                    | AXIAL: FORM AA AND BR |        |                     |                   |                   | MASS<br>(g) | PACKAGING QUANTITIES |            |
|                                                                         | Ø d <sup>(1)</sup>    | L      | Ø D <sub>max.</sub> | L <sub>max.</sub> | F <sub>min.</sub> |             | FORM<br>AA           | FORM<br>BR |
| 10 x 30                                                                 | 0.8                   | 55 ± 1 | 10.5                | 30.5              | 35                | ≈ 4.8       | 340                  | 500        |
| 12.5 x 30                                                               | 0.8                   | 55 ± 1 | 13.0                | 30.5              | 35                | ≈ 7.4       | 260                  | 400        |
| 15 x 30                                                                 | 0.8                   | 55 ± 1 | 15.5                | 30.5              | 35                | ≈ 11.7      | 200                  | 250        |
| 18 x 30                                                                 | 0.8                   | 55 ± 1 | 18.5                | 30.5              | 35                | ≈ 12.9      | 120                  | -          |
| 18 x 38                                                                 | 0.8                   | 34 ± 1 | 18.5                | 39.5              | 44                | ≈ 19.0      | 125                  | -          |
| 21 x 38                                                                 | 0.8                   | 34 ± 1 | 21.5                | 39.5              | 44                | ≈ 24.0      | 100                  | -          |

**Notes**

- For detailed tape dimensions, please see [www.vishay.com/doc?28361](http://www.vishay.com/doc?28361).

<sup>(1)</sup> Lead diameter Ø d = 1.0 mm, available on request.



Mounting holes

Case Ø D x L = 15 mm x 30 mm to 21 mm x 38 mm  
Especially for applications with severe shocks and vibrations

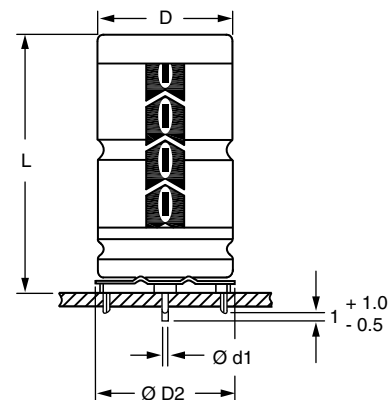
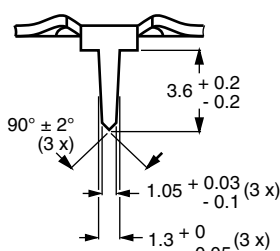


Fig. 4 - Mounting hole diagram and outline; **form MR:** with mounting ring and pins

Table 2

| <b>MOUNTING RING; DIMENSIONS in millimeters, MASS, AND PACKAGING QUANTITIES</b> |              |                        |           |                     |                      |            |                   |             |                         |
|---------------------------------------------------------------------------------|--------------|------------------------|-----------|---------------------|----------------------|------------|-------------------|-------------|-------------------------|
| NOMINAL CASE SIZE<br>Ø D x L                                                    | CASE<br>CODE | MOUNTING RING: FORM MR |           |                     |                      |            |                   | MASS<br>(g) | PACKAGING<br>QUANTITIES |
|                                                                                 |              | Ø d1                   | Ø d2      | Ø D <sub>max.</sub> | Ø D2 <sub>max.</sub> | D3         | L <sub>max.</sub> |             |                         |
| 15 x 30                                                                         | 02           | 0.8                    | 1.0 + 0.4 | 15.5                | 17.5                 | 16.5 ± 0.2 | 33                | ≈ 8.6       | 200                     |
| 18 x 30                                                                         | 03           | 0.8                    | 1.0 + 0.4 | 18.5                | 19.5                 | 18.5 ± 0.2 | 33                | ≈ 11.5      | 240                     |
| 18 x 38                                                                         | 04           | 0.8                    | 1.0 + 0.4 | 18.5                | 19.5                 | 18.5 ± 0.2 | 42                | ≈ 14.0      | 100                     |
| 21 x 38                                                                         | 05           | 0.8                    | 1.0 + 0.4 | 21.5                | 22.5                 | 21.5 ± 0.2 | 42                | ≈ 19.2      | 100                     |

| ELECTRICAL DATA |                                                                                          |
|-----------------|------------------------------------------------------------------------------------------|
| SYMBOL          | DESCRIPTION                                                                              |
| $C_R$           | Rated capacitance at 100 Hz, tolerance $\pm 20\%$                                        |
| $I_R$           | Rated RMS ripple current at 10 kHz, 125 °C                                               |
| $I_{L1}$        | Max. leakage current after 1 min at $U_R$                                                |
| $I_{L5}$        | Max. leakage current after 5 min at $U_R$                                                |
| ESR             | Equivalent series resistance at 100 Hz (calculated from $\tan \delta_{max.}$ and $C_R$ ) |
| Z               | Max. impedance at 10 kHz                                                                 |

**Note**

- Unless otherwise specified, all electrical values in Table 3 apply at  $T_{amb} = 20\text{ °C}$ ,  $P = 86\text{ kPa}$  to  $106\text{ kPa}$ ,  $RH = 45\%$  to  $75\%$ .

**Table 3**

| ELECTRICAL DATA AND ORDERING INFORMATION |                                  |                                         |                                            |                                  |                                  |                               |                               |                               |                               |                             |                            |                             |                             |
|------------------------------------------|----------------------------------|-----------------------------------------|--------------------------------------------|----------------------------------|----------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-----------------------------|----------------------------|-----------------------------|-----------------------------|
| U <sub>R</sub><br>(V)                    | C <sub>R</sub><br>100 Hz<br>(μF) | NOMINAL<br>CASE SIZE<br>Ø D x L<br>(mm) | I <sub>R</sub><br>10 kHz<br>125 °C<br>(mA) | I <sub>L1</sub><br>1 min<br>(μA) | I <sub>L5</sub><br>5 min<br>(μA) | TYP.<br>ESR<br>100 Hz<br>(mΩ) | MAX.<br>ESR<br>100 Hz<br>(mΩ) | TYP.<br>ESR<br>10 kHz<br>(mΩ) | MAX.<br>ESR<br>10 kHz<br>(mΩ) | Z<br>MAX.<br>10 kHz<br>(mΩ) | ORDERING CODE MAL2120..... |                             |                             |
|                                          |                                  |                                         |                                            |                                  |                                  |                               |                               |                               |                               |                             | IN BOX<br>FORM AA          | TAPED<br>ON REEL<br>FORM BR | MOUNTING<br>RING<br>FORM MR |
| 16                                       | 680                              | 10 x 30                                 | 2100                                       | 171                              | 84                               | 106                           | 177                           | 44                            | 74                            | 78                          | 15681E3                    | 25681E3                     | -                           |
|                                          | 1000                             | 12.5 x 30                               | 2550                                       | 232                              | 104                              | 77                            | 128                           | 35                            | 58                            | 61                          | 15102E3                    | 25102E3                     | -                           |
|                                          | 1500                             | 12.5 x 30                               | 2650                                       | 328                              | 136                              | 60                            | 100                           | 32                            | 53                            | 53                          | 15152E3                    | 25152E3                     | -                           |
|                                          | 2200                             | 15 x 30                                 | 2940                                       | 462                              | 181                              | 48                            | 79                            | 28                            | 46                            | 46                          | 15222E3                    | 25222E3                     | 45222E3                     |
|                                          | 3300                             | 18 x 30                                 | 3430                                       | 674                              | 251                              | 41                            | 68                            | 26                            | 43                            | 43                          | 15332E3                    | -                           | 45332E3                     |
|                                          | 4700                             | 18 x 38                                 | 4350                                       | 942                              | 341                              | 27                            | 45                            | 18                            | 29                            | 29                          | 15472E3                    | -                           | 45472E3                     |
|                                          | 6800                             | 21 x 38                                 | 4590                                       | 1346                             | 475                              | 26                            | 43                            | 18                            | 29                            | 29                          | 15682E3                    | -                           | 45682E3                     |
| 25                                       | 470                              | 10 x 30                                 | 2100                                       | 181                              | 87                               | 112                           | 187                           | 45                            | 74                            | 84                          | 16471E3                    | 26471E3                     | -                           |
|                                          | 680                              | 12.5 x 30                               | 2550                                       | 244                              | 108                              | 81                            | 136                           | 35                            | 59                            | 64                          | 16681E3                    | 26681E3                     | -                           |
|                                          | 1000                             | 12.5 x 30                               | 2600                                       | 340                              | 140                              | 64                            | 107                           | 32                            | 53                            | 55                          | 16102E3                    | 26102E3                     | -                           |
|                                          | 1500                             | 15 x 30                                 | 2890                                       | 490                              | 190                              | 49                            | 82                            | 28                            | 46                            | 46                          | 16152E3                    | 26152E3                     | 46152E3                     |
|                                          | 2200                             | 18 x 30                                 | 3310                                       | 700                              | 260                              | 43                            | 71                            | 27                            | 44                            | 44                          | 16222E3                    | -                           | 46222E3                     |
|                                          | 3300                             | 18 x 38                                 | 4350                                       | 1030                             | 370                              | 28                            | 47                            | 18                            | 29                            | 29                          | 16332E3                    | -                           | 46332E3                     |
|                                          | 4700                             | 21 x 38                                 | 4470                                       | 1450                             | 510                              | 27                            | 44                            | 18                            | 29                            | 29                          | 16472E3                    | -                           | 46472E3                     |
| 40                                       | 220                              | 10 x 30                                 | 1990                                       | 146                              | 75                               | 192                           | 320                           | 52                            | 87                            | 124                         | 17221E3                    | 27221E3                     | -                           |
|                                          | 330                              | 12.5 x 30                               | 2430                                       | 198                              | 93                               | 130                           | 216                           | 37                            | 62                            | 83                          | 17331E3                    | 27331E3                     | -                           |
|                                          | 470                              | 12.5 x 30                               | 2550                                       | 266                              | 115                              | 101                           | 169                           | 35                            | 58                            | 70                          | 17471E3                    | 27471E3                     | -                           |
|                                          | 680                              | 15 x 30                                 | 2840                                       | 366                              | 149                              | 75                            | 125                           | 30                            | 50                            | 55                          | 17681E3                    | 27681E3                     | 47681E3                     |
|                                          | 1000                             | 18 x 30                                 | 3150                                       | 520                              | 200                              | 59                            | 99                            | 28                            | 47                            | 49                          | 17102E3                    | -                           | 47102E3                     |
|                                          | 1500                             | 18 x 38                                 | 4130                                       | 760                              | 280                              | 39                            | 65                            | 19                            | 31                            | 32                          | 17152E3                    | -                           | 47152E3                     |
|                                          | 2200                             | 21 x 38                                 | 4170                                       | 1096                             | 392                              | 34                            | 56                            | 19                            | 31                            | 31                          | 17222E3                    | -                           | 47222E3                     |
| 63                                       | 100                              | 10 x 30                                 | 1560                                       | 116                              | 65                               | 297                           | 495                           | 92                            | 154                           | 249                         | 18101E3                    | 28101E3                     | -                           |
|                                          | 150                              | 12.5 x 30                               | 2050                                       | 153                              | 78                               | 195                           | 325                           | 61                            | 102                           | 162                         | 18151E3                    | 28151E3                     | -                           |
|                                          | 220                              | 12.5 x 30                               | 2150                                       | 206                              | 95                               | 149                           | 249                           | 55                            | 92                            | 126                         | 18221E3                    | 28221E3                     | -                           |
|                                          | 330                              | 15 x 30                                 | 2510                                       | 289                              | 123                              | 105                           | 175                           | 44                            | 73                            | 91                          | 18331E3                    | 28331E3                     | 48331E3                     |
|                                          | 470                              | 18 x 30                                 | 2860                                       | 395                              | 158                              | 81                            | 135                           | 38                            | 64                            | 74                          | 18471E3                    | -                           | 48471E3                     |
|                                          | 680                              | 18 x 38                                 | 3720                                       | 554                              | 211                              | 55                            | 92                            | 26                            | 43                            | 49                          | 18681E3                    | -                           | 48681E3                     |
|                                          | 1000                             | 21 x 38                                 | 3780                                       | 796                              | 292                              | 44                            | 74                            | 25                            | 41                            | 43                          | 18102E3                    | -                           | 48102E3                     |
| 100                                      | 47                               | 10 x 30                                 | 760                                        | 96                               | 59                               | 760                           | 1269                          | 349                           | 581                           | 720                         | 19479E3                    | 29479E3                     | -                           |
|                                          | 68                               | 12.5 x 30                               | 1030                                       | 122                              | 67                               | 531                           | 885                           | 246                           | 410                           | 503                         | 19689E3                    | 29689E3                     | -                           |
|                                          | 100                              | 12.5 x 30                               | 1140                                       | 160                              | 80                               | 389                           | 648                           | 196                           | 327                           | 381                         | 19101E3                    | 29101E3                     | -                           |
|                                          | 150                              | 15 x 30                                 | 1480                                       | 220                              | 100                              | 266                           | 443                           | 137                           | 229                           | 262                         | 19151E3                    | 29151E3                     | 49151E3                     |
|                                          | 220                              | 18 x 30                                 | 1960                                       | 304                              | 128                              | 181                           | 302                           | 95                            | 158                           | 179                         | 19221E3                    | -                           | 49221E3                     |
|                                          | 330                              | 18 x 38                                 | 2550                                       | 436                              | 172                              | 120                           | 200                           | 62                            | 104                           | 117                         | 19331E3                    | -                           | 49331E3                     |
|                                          | 470                              | 21 x 38                                 | 2800                                       | 604                              | 228                              | 92                            | 154                           | 52                            | 86                            | 94                          | 19471E3                    | -                           | 49471E3                     |

**ORDERING EXAMPLE**

Electrolytic capacitor 120 series

1000  $\mu F$  / 16 V;  $\pm 20\%$ 

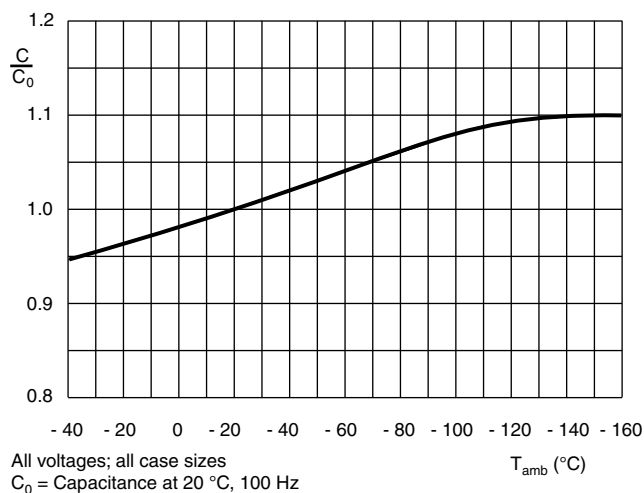
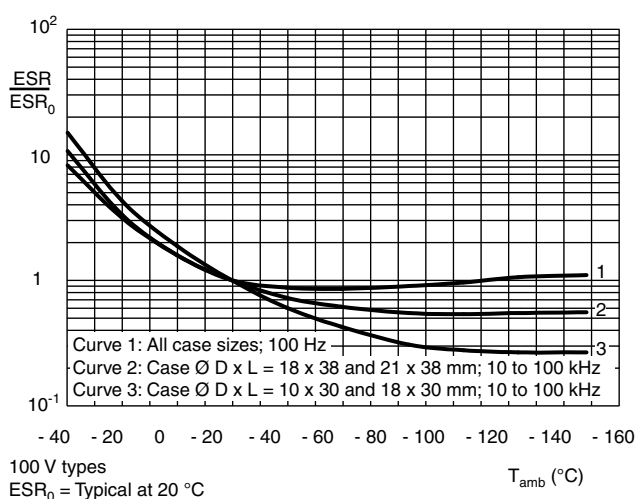
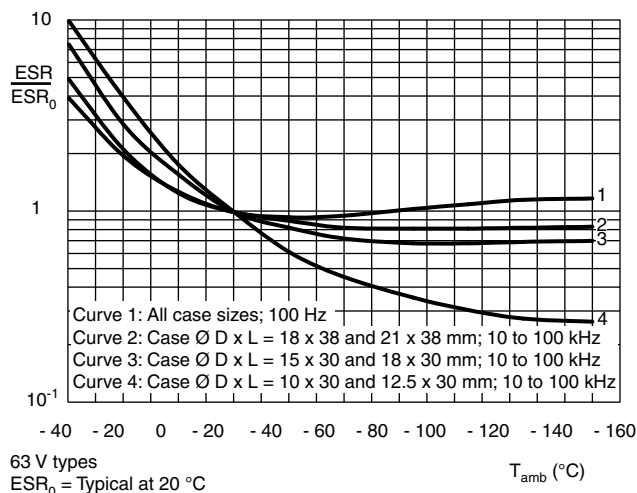
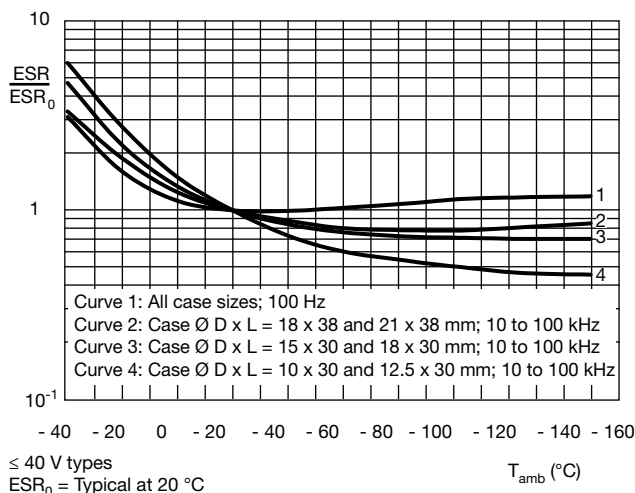
Nominal case size:  $\varnothing 12.5\text{ mm} \times 30\text{ mm}$ ; form BR

Ordering code: MAL212025102E3

Former 12NC: 2222 120 25102



| ADDITIONAL ELECTRICAL DATA         |                      |                                               |               |
|------------------------------------|----------------------|-----------------------------------------------|---------------|
| PARAMETER                          | CONDITIONS           | VALUE                                         |               |
|                                    |                      | AXIAL                                         | MOUNTING RING |
| Voltage                            |                      |                                               |               |
| Surge voltage                      |                      | $U_s \leq 1.15 \times U_R$                    |               |
| Reverse voltage                    |                      | $U_{rev} \leq 1 \text{ V}$                    |               |
| Current                            |                      |                                               |               |
| Leakage current                    | After 1 min at $U_R$ | $I_{L1} \leq 0.012 C_R \times U_R + 40 \mu A$ |               |
|                                    | After 5 min at $U_R$ | $I_{L5} \leq 0.004 C_R \times U_R + 40 \mu A$ |               |
| Inductance                         |                      |                                               |               |
| Equivalent series inductance (ESL) | Case Ø D x L mm:     |                                               |               |
|                                    | 10 x 30              | Typ. 38 nH                                    |               |
|                                    | 12.5 x 30            | Typ. 46 nH                                    |               |
|                                    | 15 x 30              | Typ. 48 nH                                    | Typ. 39 nH    |
|                                    | 18 x 30              | Typ. 50 nH                                    | Typ. 39 nH    |
|                                    | 18 x 38              | Typ. 54 nH                                    | Typ. 39 nH    |
|                                    | 21 x 38              | Typ. 59 nH                                    | Typ. 39 nH    |

**CAPACITANCE (C)****EQUIVALENT SERIES RESISTANCE (ESR)**

**RIPPLE CURRENT AND USEFUL LIFE**

$I_A$  = Actual ripple current at 10 kHz  
 $I_R$  = Rated ripple current at 10 kHz, 125 °C  
<sup>(1)</sup> Useful life at 125 °C and  $I_R$  applied: 8000 h

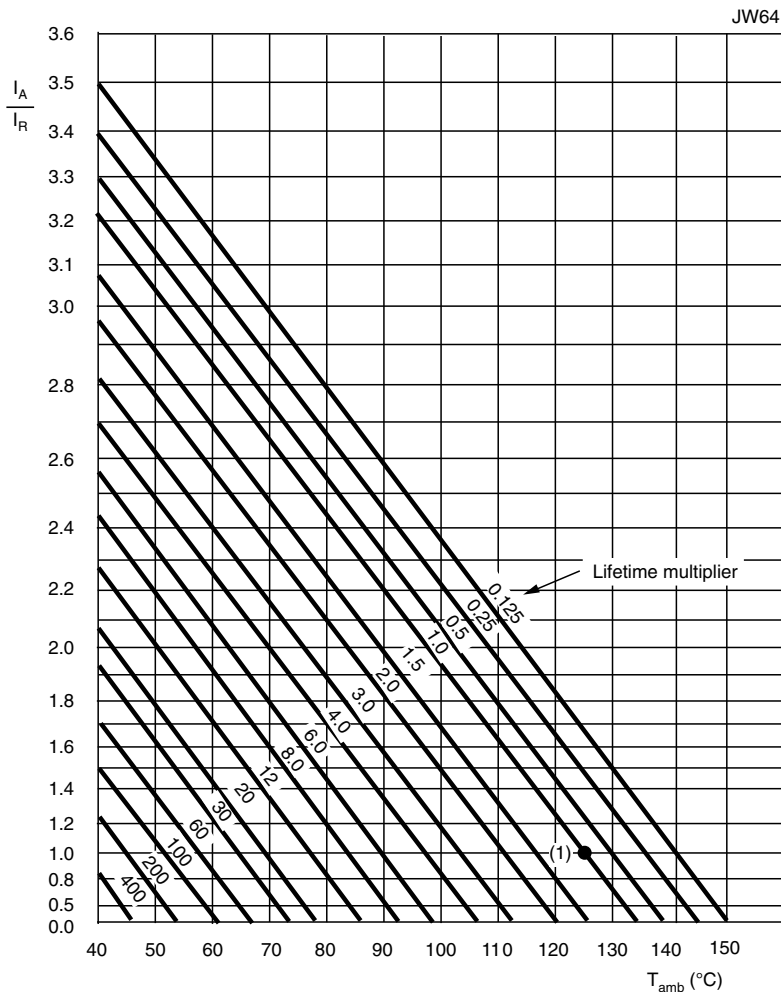


Fig. 9 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 4

| <b>MULTIPLIER OF RIPPLE CURRENT (<math>I_R</math>) AS A FUNCTION OF FREQUENCY</b> |                                                                                                               |                                                                                                               |                                                                                                                 |                                                                                                                 |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| <b>FREQUENCY<br/>(Hz)</b>                                                         | <b><math>I_R</math> MULTIPLIER</b>                                                                            |                                                                                                               |                                                                                                                 |                                                                                                                 |
|                                                                                   | <b><math>U_R = 16\text{ V TO }40\text{ V}</math><br/><b>CASE SIZES</b><br/><b>(10 x 30 to 15 x 30) mm</b></b> | <b><math>U_R = 16\text{ V TO }40\text{ V}</math><br/><b>CASE SIZES</b><br/><b>(18 x 30 to 21 x 38) mm</b></b> | <b><math>U_R = 63\text{ V AND }100\text{ V}</math><br/><b>CASE SIZES</b><br/><b>(10 x 30 to 15 x 30) mm</b></b> | <b><math>U_R = 63\text{ V AND }100\text{ V}</math><br/><b>CASE SIZES</b><br/><b>(18 x 30 to 21 x 38) mm</b></b> |
| 50                                                                                | 0.37                                                                                                          | 0.54                                                                                                          | 0.23                                                                                                            | 0.44                                                                                                            |
| 100                                                                               | 0.48                                                                                                          | 0.63                                                                                                          | 0.32                                                                                                            | 0.56                                                                                                            |
| 300                                                                               | 0.69                                                                                                          | 0.75                                                                                                          | 0.53                                                                                                            | 0.76                                                                                                            |
| 1000                                                                              | 0.86                                                                                                          | 0.81                                                                                                          | 0.77                                                                                                            | 0.88                                                                                                            |
| 3000                                                                              | 0.96                                                                                                          | 0.87                                                                                                          | 0.93                                                                                                            | 0.94                                                                                                            |
| ≥ 10 000                                                                          | 1.00                                                                                                          | 1.00                                                                                                          | 1.00                                                                                                            | 1.00                                                                                                            |

Table 5

| TEST PROCEDURES AND REQUIREMENTS               |                                              |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                             |
|------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TEST                                           |                                              | PROCEDURE<br>(quick reference)                                                                                                                                                                                                                                                              | REQUIREMENTS                                                                                                                                                                                                                |
| NAME OF TEST                                   | REFERENCE                                    |                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                             |
| Endurance                                      | IEC 60384-4 /<br>EN 130300<br>subclause 4.13 | $T_{amb} = 125\text{ }^{\circ}\text{C}$ ; $U_R$ applied;<br>4000 h<br><br>$T_{amb} = 150\text{ }^{\circ}\text{C}$ ; $U_R$ applied;<br>1000 h                                                                                                                                                | $\Delta C/C$ : $\pm 15\%$<br>$\tan \delta \leq 1.3 \times \text{spec. limit}$<br>$Z \leq 2 \times \text{spec. limit}$<br>$I_{L5} \leq \text{spec. limit}$                                                                   |
| Useful life                                    | CECC 30301<br>subclause 1.8.1                | $T_{amb} = 125\text{ }^{\circ}\text{C}$ ; $U_R$ and $I_R$ applied;<br>8000 h                                                                                                                                                                                                                | $\Delta C/C$ : $\pm 45\%$<br>$\tan \delta \leq 3 \times \text{spec. limit}$<br>$Z \leq 3 \times \text{spec. limit}$<br>$I_{L5} \leq \text{spec. limit}$<br>no short or open circuit<br>total failure percentage: $\leq 1\%$ |
| Shelf life<br>(storage at high<br>temperature) | IEC 60384-4 /<br>EN 130300<br>subclause 4.17 | $T_{amb} = 125\text{ }^{\circ}\text{C}$ ; no voltage applied;<br>1000 h (100 V: 500 h)<br><br>$T_{amb} = 150\text{ }^{\circ}\text{C}$ ; no voltage applied;<br>500 h for voltages: $\leq 63\text{ V}$<br><br>After test: $U_R$ to be applied for 30 min,<br>24 h to 48 h before measurement | $\Delta C/C$ , $\tan \delta$ , $Z$ :<br>for requirements<br>see "Endurance test" above<br>$I_{L5} \leq 2 \times \text{spec. limit}$                                                                                         |
| Reverse voltage                                | IEC 60384-4 /<br>EN 130300<br>subclause 4.15 | $T_{amb} = 125\text{ }^{\circ}\text{C}$ :<br>125 h at $U = -1\text{ V}$<br>Followed by 125 h at $U_R$                                                                                                                                                                                       | $\Delta C/C$ : $\pm 20\%$<br>$\tan \delta \leq \text{spec. limit}$<br>$I_{L5} \leq \text{spec. limit}$                                                                                                                      |



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