

## Aluminum Capacitors

### Power Long Life 4-Terminal Snap-In

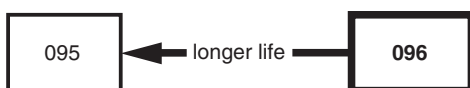


Fig. 1

#### QUICK REFERENCE DATA

| DESCRIPTION                               | VALUE                       |
|-------------------------------------------|-----------------------------|
| Nominal case size (D x L in mm)           | 35 x 50 to 45 x 100         |
| Rated capacitance range $C_R$             | 390 $\mu$ F to 2700 $\mu$ F |
| Tolerance on $C_R$                        | $\pm 20\%$                  |
| Rated voltage range, $U_R$                | 350 V to 500 V              |
| Category temperature range                | - 40 °C to + 85 °C          |
| Endurance test at 85 °C                   | 2000 h                      |
| Useful life at 85 °C                      | 5000 h                      |
| Useful life at 40 °C, 1.4 x $I_R$ applied | 200 000 h                   |
| Shelf life at 0 V, 85 °C                  | 1000 h                      |
| Based on sectional specification          | IEC 60384-4/EN130300        |
| Climatic category IEC 60068               | 40/085/56                   |

#### FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, minimized dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Pressure relief on the side of the aluminum case
- Very long useful life: 5000 h at 85 °C
- Temperature range up to 85 °C
- Keyed polarity
- Low ESR, high ripple current capability
- Compliant to RoHS Directive 2002/95/EC


**RoHS**  
COMPLIANT

#### APPLICATIONS

- Telecommunication and industrial systems
- Smoothing and filtering applications
- Switched mode power supplies
- Renewable energy power converters
- Energy storage in pulse systems
- For excellent mounting stability

#### MARKING

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

- Rated capacitance (in  $\mu$ F)
- Tolerance code on rated capacitance, code letter in accordance with IEC 60062 (M for  $\pm 20\%$ )
- Rated voltage (in V)
- Date code (YYMM)
- Name of manufacturer
- Code for factory of origin
- “-” sign to identify the negative terminal, visible from the top and side of the capacitor
- Code number
- Climatic category in accordance with IEC 60068

#### SELECTION CHART FOR $C_R$ , $U_R$ , AND RELEVANT NOMINAL CASE SIZES ( $\varnothing$ D x L in mm)

| $C_R$<br>( $\mu$ F) | $U_R$ (V)                     |                     |                                |                     |                                |                     |
|---------------------|-------------------------------|---------------------|--------------------------------|---------------------|--------------------------------|---------------------|
|                     | 350                           | 385                 | 400                            | 420                 | 450                            | 500                 |
| 390                 | -                             | -                   | -                              | -                   | -                              | 35 x 60             |
| 470                 | -                             | -                   | -                              | -                   | -                              | 35 x 70             |
| 560                 | -                             | -                   | -                              | -                   | 35 x 60                        | 35 x 70<br>40 x 60  |
| 680                 | -                             | 35 x 50<br>40 x 50  | 35 x 60<br>40 x 50             | 35 x 60<br>40 x 50  | 35 x 70<br>40 x 50             | 35 x 80<br>40 x 70  |
| 820                 | 35 x 50<br>40 x 40            | 35 x 60<br>40 x 50  | 35 x 60<br>40 x 50             | 35 x 70<br>40 x 60  | 35 x 80<br>40 x 60             | 35 x 100<br>40 x 80 |
| 1000                | 35 x 60<br>40 x 50            | 35 x 70<br>40 x 60  | 35 x 70<br>40 x 60<br>45 x 50  | 35 x 80<br>40 x 60  | 35 x 100<br>40 x 70<br>45 x 60 | 40 x 100<br>45 x 70 |
| 1200                | 35 x 70<br>40 x 60            | 35 x 80<br>40 x 70  | 35 x 80<br>40 x 70<br>45 x 60  | 40 x 70             | 40 x 80<br>45 x 70             | 45 x 100            |
| 1500                | 35 x 80<br>40 x 70<br>45 x 60 | 40 x 80<br>45 x 60  | 35 x 100<br>40 x 80<br>45 x 70 | 40 x 100<br>45 x 70 | 40 x 100<br>45 x 80            | 45 x 100            |
| 1800                | 40 x 80<br>45 x 60            | 40 x 100<br>45 x 70 | 40 x 100<br>45 x 80            | 40 x 100<br>45 x 80 | 45 x 100                       | -                   |
| 2200                | 40 x 100<br>45 x 70           | 40 x 100            | 45 x 100                       | 45 x 100            | -                              | -                   |
| 2700                | 45 x 100                      | 45 x 100            | 45 x 100                       | -                   | -                              | -                   |

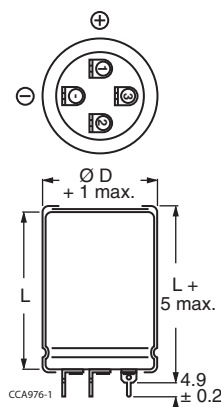
**DIMENSIONS in millimeters AND AVAILABLE FORMS**
**PRINTED WIRING**


Fig. 2 - Printed wiring pin version  
(Case Ø D = 35 mm)

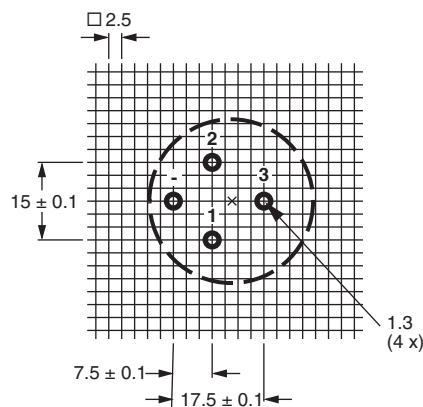


Fig. 3 - Mounting hole diagram viewed from component side  
(Case Ø D = 35 mm)

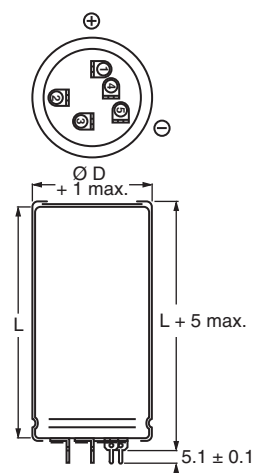


Fig. 4 - Printed wiring pin version  
(Case Ø D = 40 mm)

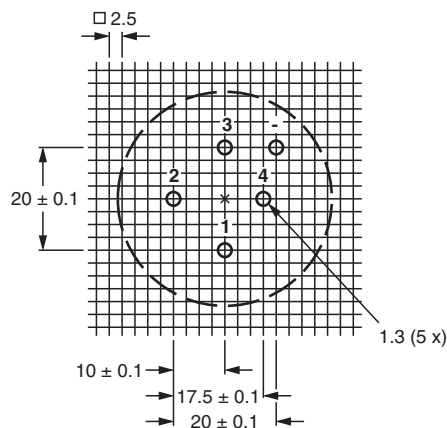
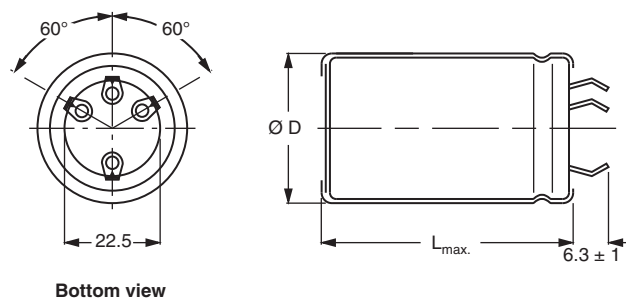
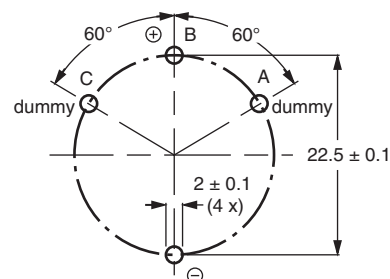


Fig. 5 - Mounting hole diagram viewed from component side  
(Case Ø D = 40 mm)

**FOUR TERMINAL SNAP-IN**


Bottom view

Fig. 6 - 4-Terminal snap-in



Dummy terminals (A and C) must be free from the electrical circuit

Fig. 7 - Mounting hole diagram

**Pin numbers 2, 3 and 4 (if present) should be free from the electrical circuit or connected to the minus terminal.**



Table 1

| DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES |                     |                            |             |             |                                         |                                          |
|----------------------------------------------------------|---------------------|----------------------------|-------------|-------------|-----------------------------------------|------------------------------------------|
| NOMINAL CASE SIZE<br>Ø D x L                             | Ø D <sub>MAX.</sub> | 4T-SI<br>L <sub>max.</sub> | PW<br>L + 5 | MASS<br>(g) | PACKAGING QUANTITIES<br>(units per box) | CARDBOARD BOX<br>DIMENSIONS<br>L x W x H |
| 35 x 50                                                  | 36                  | 52                         | 55          | 72          | 50                                      | 390 x 198 x 60                           |
| 35 x 60                                                  | 36                  | 62                         | 65          | 91          | 50                                      | 390 x 198 x 70                           |
| 35 x 70                                                  | 36                  | 72                         | 75          | 103         | 50                                      | 377 x 375 x 97                           |
| 35 x 80                                                  | 36                  | 82                         | 85          | 115         | 50                                      | 377 x 375 x 107                          |
| 35 x 100                                                 | 36                  | 102                        | 105         | 151         | 50                                      | 377 x 375 x 127                          |
| 40 x 40                                                  | 41                  | 42                         | 45          | 70          | 50                                      | 440 x 223 x 60                           |
| 40 x 50                                                  | 41                  | 52                         | 55          | 94          | 50                                      | 440 x 223 x 70                           |
| 40 x 60                                                  | 41                  | 62                         | 65          | 118         | 25                                      | 230 x 230 x 80                           |
| 40 x 70                                                  | 41                  | 72                         | 75          | 134         | 25                                      | 230 x 230 x 90                           |
| 40 x 80                                                  | 41                  | 82                         | 85          | 150         | 25                                      | 230 x 230 x 100                          |
| 40 x 100                                                 | 41                  | 102                        | 105         | 176         | 25                                      | 230 x 230 x 120                          |
| 45 x 40                                                  | 46                  | 42                         | -           | 88          | 36                                      | TBD                                      |
| 45 x 50                                                  | 46                  | 52                         | -           | 119         | 36                                      | 377 x 375 x 77                           |
| 45 x 60                                                  | 46                  | 62                         | -           | 150         | 36                                      | 377 x 375 x 87                           |
| 45 x 70                                                  | 46                  | 72                         | -           | 170         | 36                                      | 377 x 375 x 97                           |
| 45 x 80                                                  | 46                  | 82                         | -           | 190         | 36                                      | 377 x 375 x 107                          |
| 45 x 100                                                 | 46                  | 102                        | -           | 250         | 36                                      | 377 x 375 x 127                          |

| ELECTRICAL DATA |                                                    |
|-----------------|----------------------------------------------------|
| SYMBOL          | DESCRIPTION                                        |
| C <sub>R</sub>  | Rated capacitance at 100 Hz                        |
| I <sub>R</sub>  | Rated RMS ripple current at 100 Hz and 85 °C       |
| I <sub>L5</sub> | Max. leakage current after 5 min at U <sub>R</sub> |
| ESR             | Max. equivalent series resistance at 100 Hz        |
| Z               | Max. impedance at 10 kHz                           |

**Note**

- Unless otherwise specified, all electrical values in Table 2 apply at T<sub>amb</sub> = 20 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %

**ORDERING EXAMPLE**

Electrolytic capacitor 096 series

820 µF/385 V;

Printed wiring:

Ordering code: MAL2 096 18821 E3

Former 12NC: 2222 096 18821

4-terminal snap-in:

Ordering code: MAL2 096 68821 E3

Former 12NC: 2222 096 68821

Table 2

| ELECTRICAL DATA AND ORDERING INFORMATION |                                  |                                      |                                          |                                  |                       |                                     |                                |         |
|------------------------------------------|----------------------------------|--------------------------------------|------------------------------------------|----------------------------------|-----------------------|-------------------------------------|--------------------------------|---------|
| U <sub>R</sub><br>(V)                    | C <sub>R</sub><br>100 Hz<br>(µF) | NOMINAL CASE SIZE<br>Ø D x L<br>(mm) | I <sub>R</sub><br>100 Hz<br>85 °C<br>(A) | I <sub>L5</sub><br>5 min<br>(µA) | ESR<br>100 Hz<br>(mΩ) | Z <sub>max.</sub><br>10 kHz<br>(mΩ) | CATALOG NUMBER<br>MAL2096..... |         |
|                                          |                                  |                                      |                                          |                                  |                       |                                     | 4T-SI                          | PW      |
| 350                                      | 820                              | 35 x 50                              | 4.0                                      | 578                              | 126                   | 82                                  | 15821E3                        | 65821E3 |
|                                          | 820                              | 40 x 40                              | 3.8                                      | 578                              | 134                   | 90                                  | 25821E3                        | 75821E3 |
|                                          | 1000                             | 35 x 60                              | 4.7                                      | 704                              | 104                   | 67                                  | 15102E3                        | 65102E3 |
|                                          | 1000                             | 40 x 50                              | 4.8                                      | 704                              | 108                   | 72                                  | 25102E3                        | 75102E3 |
|                                          | 1200                             | 35 x 70                              | 5.3                                      | 844                              | 87                    | 57                                  | 15122E3                        | 65122E3 |
|                                          | 1200                             | 40 x 60                              | 5.4                                      | 844                              | 90                    | 59                                  | 25122E3                        | 75122E3 |
|                                          | 1500                             | 35 x 80                              | 6.0                                      | 1054                             | 71                    | 47                                  | 15152E3                        | 65152E3 |
|                                          | 1500                             | 40 x 70                              | 6.2                                      | 1054                             | 73                    | 49                                  | 25152E3                        | 75152E3 |
|                                          | 1500                             | 45 x 60                              | 6.3                                      | 1054                             | 76                    | 52                                  | 35152E3                        | -       |
|                                          | 1800                             | 40 x 80                              | 6.9                                      | 1264                             | 62                    | 41                                  | 25182E3                        | 75182E3 |
|                                          | 1800                             | 45 x 60                              | 6.6                                      | 1264                             | 68                    | 48                                  | 35182E3                        | -       |
|                                          | 2200                             | 40 x 100                             | 8.2                                      | 1544                             | 51                    | 34                                  | 25222E3                        | 75222E3 |
|                                          | 2200                             | 45 x 70                              | 7.4                                      | 1544                             | 57                    | 41                                  | 35222E3                        | -       |
|                                          | 2700                             | 45 x 100                             | 9.2                                      | 1894                             | 44                    | 30                                  | 35272E3                        | -       |



| <b>ELECTRICAL DATA AND ORDERING INFORMATION</b> |                                                      |                                                                     |                                                                     |                                                      |                                            |                                                        |                                              |           |
|-------------------------------------------------|------------------------------------------------------|---------------------------------------------------------------------|---------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------|--------------------------------------------------------|----------------------------------------------|-----------|
| <b>U<sub>R</sub></b><br><b>(V)</b>              | <b>C<sub>R</sub></b><br><b>100 Hz</b><br><b>(μF)</b> | <b>NOMINAL</b><br><b>CASE SIZE</b><br><b>Ø D x L</b><br><b>(mm)</b> | <b>I<sub>R</sub></b><br><b>100 Hz</b><br><b>85 °C</b><br><b>(A)</b> | <b>I<sub>L5</sub></b><br><b>5 min</b><br><b>(μA)</b> | <b>ESR</b><br><b>100 Hz</b><br><b>(mΩ)</b> | <b>Z<sub>max</sub></b><br><b>10 kHz</b><br><b>(mΩ)</b> | <b>CATALOG NUMBER</b><br><b>MAL2096.....</b> |           |
|                                                 |                                                      |                                                                     |                                                                     |                                                      |                                            |                                                        | <b>4T-SI</b>                                 | <b>PW</b> |
| 385                                             | 680                                                  | 35 x 50                                                             | 3.7                                                                 | 528                                                  | 140                                        | 88                                                     | 18681E3                                      | 68681E3   |
|                                                 | 680                                                  | 40 x 50                                                             | 4.2                                                                 | 528                                                  | 140                                        | 87                                                     | 28681E3                                      | 78681E3   |
|                                                 | 820                                                  | 35 x 60                                                             | 4.4                                                                 | 635                                                  | 116                                        | 73                                                     | 18821E3                                      | 68821E3   |
|                                                 | 820                                                  | 40 x 50                                                             | 4.5                                                                 | 635                                                  | 120                                        | 76                                                     | 28821E3                                      | 78821E3   |
|                                                 | 1000                                                 | 35 x 70                                                             | 5.0                                                                 | 774                                                  | 96                                         | 60                                                     | 18102E3                                      | 68102E3   |
|                                                 | 1000                                                 | 40 x 60                                                             | 5.1                                                                 | 774                                                  | 99                                         | 63                                                     | 28102E3                                      | 78102E3   |
|                                                 | 1200                                                 | 35 x 80                                                             | 5.5                                                                 | 928                                                  | 81                                         | 51                                                     | 18122E3                                      | 68122E3   |
|                                                 | 1200                                                 | 40 x 70                                                             | 5.7                                                                 | 928                                                  | 83                                         | 53                                                     | 28122E3                                      | 78122E3   |
|                                                 | 1500                                                 | 40 x 80                                                             | 6.5                                                                 | 1159                                                 | 68                                         | 43                                                     | 28152E3                                      | 78152E3   |
|                                                 | 1500                                                 | 45 x 60                                                             | 6.2                                                                 | 1159                                                 | 74                                         | 50                                                     | 38152E3                                      | -         |
|                                                 | 1800                                                 | 40 x 100                                                            | 7.7                                                                 | 1390                                                 | 56                                         | 36                                                     | 28182E3                                      | 78182E3   |
|                                                 | 1800                                                 | 45 x 70                                                             | 7.0                                                                 | 1390                                                 | 62                                         | 43                                                     | 38182E3                                      | -         |
|                                                 | 2200                                                 | 40 x 100                                                            | 8.2                                                                 | 1698                                                 | 49                                         | 32                                                     | 28222E3                                      | 78222E3   |
|                                                 | 2700                                                 | 45 x 100                                                            | 9.1                                                                 | 2083                                                 | 43                                         | 29                                                     | 38272E3                                      | -         |
| 400                                             | 680                                                  | 35 x 60                                                             | 4.1                                                                 | 548                                                  | 134                                        | 82                                                     | 16681E3                                      | 66681E3   |
|                                                 | 680                                                  | 40 x 50                                                             | 4.2                                                                 | 548                                                  | 138                                        | 85                                                     | 26681E3                                      | 76681E3   |
|                                                 | 820                                                  | 35 x 60                                                             | 4.4                                                                 | 660                                                  | 114                                        | 71                                                     | 16821E3                                      | 66821E3   |
|                                                 | 820                                                  | 40 x 50                                                             | 4.5                                                                 | 660                                                  | 119                                        | 75                                                     | 26821E3                                      | 76821E3   |
|                                                 | 1000                                                 | 35 x 70                                                             | 5.0                                                                 | 804                                                  | 94                                         | 59                                                     | 16102E3                                      | 66102E3   |
|                                                 | 1000                                                 | 40 x 60                                                             | 5.1                                                                 | 804                                                  | 97                                         | 62                                                     | 26102E3                                      | 76102E3   |
|                                                 | 1000                                                 | 45 x 50                                                             | 5.1                                                                 | 804                                                  | 103                                        | 67                                                     | 36102E3                                      | -         |
|                                                 | 1200                                                 | 35 x 80                                                             | 5.5                                                                 | 964                                                  | 80                                         | 50                                                     | 16122E3                                      | 66122E3   |
|                                                 | 1200                                                 | 40 x 70                                                             | 5.7                                                                 | 964                                                  | 82                                         | 52                                                     | 26122E3                                      | 76122E3   |
|                                                 | 1200                                                 | 45 x 60                                                             | 5.9                                                                 | 964                                                  | 85                                         | 55                                                     | 36122E3                                      | -         |
|                                                 | 1500                                                 | 35 x 100                                                            | 7.1                                                                 | 1204                                                 | 64                                         | 40                                                     | 16152E3                                      | 66152E3   |
|                                                 | 1500                                                 | 40 x 80                                                             | 6.5                                                                 | 1204                                                 | 67                                         | 43                                                     | 26152E3                                      | 76152E3   |
|                                                 | 1500                                                 | 45 x 70                                                             | 6.6                                                                 | 1204                                                 | 69                                         | 46                                                     | 36152E3                                      | -         |
|                                                 | 1800                                                 | 40 x 100                                                            | 7.7                                                                 | 1444                                                 | 56                                         | 35                                                     | 26182E3                                      | 76182E3   |
|                                                 | 1800                                                 | 45 x 80                                                             | 7.3                                                                 | 1444                                                 | 59                                         | 39                                                     | 36182E3                                      | -         |
|                                                 | 2200                                                 | 45 x 100                                                            | 8.6                                                                 | 1764                                                 | 48                                         | 32                                                     | 36222E3                                      | -         |
|                                                 | 2700                                                 | 45 x 100                                                            | 9.1                                                                 | 2164                                                 | 42                                         | 29                                                     | 36272E3                                      | -         |
| 420                                             | 680                                                  | 35 x 60                                                             | 4.1                                                                 | 575                                                  | 137                                        | 85                                                     | 14681E3                                      | 64681E3   |
|                                                 | 680                                                  | 40 x 50                                                             | 4.2                                                                 | 575                                                  | 141                                        | 89                                                     | 24681E3                                      | 74681E3   |
|                                                 | 820                                                  | 35 x 70                                                             | 4.6                                                                 | 693                                                  | 114                                        | 71                                                     | 14821E3                                      | 64821E3   |
|                                                 | 820                                                  | 40 x 60                                                             | 4.7                                                                 | 693                                                  | 117                                        | 74                                                     | 24821E3                                      | 74821E3   |
|                                                 | 1000                                                 | 35 x 80                                                             | 5.1                                                                 | 844                                                  | 95                                         | 59                                                     | 14102E3                                      | 64102E3   |
|                                                 | 1000                                                 | 40 x 60                                                             | 5.1                                                                 | 844                                                  | 100                                        | 64                                                     | 24102E3                                      | 74102E3   |
|                                                 | 1200                                                 | 40 x 70                                                             | 5.7                                                                 | 1012                                                 | 84                                         | 54                                                     | 24122E3                                      | 74122E3   |
|                                                 | 1500                                                 | 40 x 100                                                            | 7.2                                                                 | 1264                                                 | 66                                         | 42                                                     | 24152E3                                      | 74152E3   |
|                                                 | 1500                                                 | 45 x 70                                                             | 6.6                                                                 | 1264                                                 | 71                                         | 48                                                     | 34152E3                                      | -         |
|                                                 | 1800                                                 | 40 x 100                                                            | 7.6                                                                 | 1516                                                 | 57                                         | 37                                                     | 24182E3                                      | 74182E3   |
|                                                 | 1800                                                 | 45 x 80                                                             | 7.2                                                                 | 1516                                                 | 60                                         | 40                                                     | 34182E3                                      | -         |
|                                                 | 2200                                                 | 45 x 100                                                            | 8.5                                                                 | 1852                                                 | 49                                         | 33                                                     | 34222E3                                      | -         |

**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>100 Hz<br>85 °C<br>(A) | I <sub>L5</sub><br>5 min<br>(μA) | ESR<br>100 Hz<br>(mΩ) | Z <sub>max.</sub><br>10 kHz<br>(mΩ) | CATALOG NUMBER<br>MAL2096..... |         |
|-----------------------|----------------------------------|-----------------------------------------|------------------------------------------|----------------------------------|-----------------------|-------------------------------------|--------------------------------|---------|
|                       |                                  |                                         |                                          |                                  |                       |                                     | 4T-SI                          | PW      |
| 450                   | 560                              | 35 x 60                                 | 3.8                                      | 508                              | 155                   | 94                                  | 17561E3                        | 67561E3 |
|                       | 680                              | 35 x 70                                 | 4.2                                      | 616                              | 129                   | 78                                  | 17681E3                        | 67681E3 |
|                       | 680                              | 40 x 50                                 | 4.2                                      | 616                              | 136                   | 85                                  | 27681E3                        | 77681E3 |
|                       | 820                              | 35 x 80                                 | 4.8                                      | 742                              | 108                   | 66                                  | 17821E3                        | 67821E3 |
|                       | 820                              | 40 x 60                                 | 4.7                                      | 742                              | 112                   | 70                                  | 27821E3                        | 77821E3 |
|                       | 1000                             | 35 x 100                                | 6.0                                      | 904                              | 89                    | 54                                  | 17102E3                        | 67102E3 |
|                       | 1000                             | 40 x 70                                 | 5.3                                      | 904                              | 93                    | 58                                  | 27102E3                        | 77102E3 |
|                       | 1000                             | 45 x 60                                 | 5.5                                      | 904                              | 97                    | 62                                  | 37102E3                        | -       |
|                       | 1200                             | 40 x 80                                 | 6.0                                      | 1084                             | 78                    | 49                                  | 27122E3                        | 77122E3 |
|                       | 1200                             | 45 x 70                                 | 6.1                                      | 1084                             | 81                    | 52                                  | 37122E3                        | -       |
|                       | 1500                             | 40 x 100                                | 7.2                                      | 1354                             | 63                    | 39                                  | 27152E3                        | 77152E3 |
|                       | 1500                             | 45 x 80                                 | 6.8                                      | 1354                             | 67                    | 43                                  | 37152E3                        | -       |
|                       | 1800                             | 45 x 100                                | 8.0                                      | 1624                             | 55                    | 35                                  | 37182E3                        | -       |
| 500                   | 390                              | 35 x 60                                 | 2.9                                      | 394                              | 475                   | 421                                 | 19391E3                        | 69391E3 |
|                       | 470                              | 35 x 70                                 | 3.3                                      | 474                              | 395                   | 350                                 | 19471E3                        | 69471E3 |
|                       | 560                              | 35 x 70                                 | 3.6                                      | 564                              | 333                   | 296                                 | 19561E3                        | 69561E3 |
|                       | 560                              | 40 x 60                                 | 3.7                                      | 564                              | 336                   | 299                                 | 29561E3                        | 79561E3 |
|                       | 680                              | 35 x 80                                 | 4.1                                      | 684                              | 275                   | 245                                 | 19681E3                        | 69681E3 |
|                       | 680                              | 40 x 70                                 | 4.2                                      | 684                              | 277                   | 247                                 | 29681E3                        | 79681E3 |
|                       | 820                              | 35 x 100                                | 5.1                                      | 824                              | 229                   | 203                                 | 19821E3                        | 69821E3 |
|                       | 820                              | 40 x 80                                 | 4.7                                      | 824                              | 231                   | 206                                 | 29821E3                        | 79821E3 |
|                       | 1000                             | 40 x 100                                | 5.6                                      | 1004                             | 189                   | 169                                 | 29102E3                        | 79102E3 |
|                       | 1000                             | 45 x 70                                 | 5.3                                      | 1004                             | 195                   | 176                                 | 39102E3                        | -       |
|                       | 1200                             | 45 x 100                                | 6.4                                      | 1204                             | 160                   | 144                                 | 39122E3                        | -       |
|                       | 1500                             | 45 x 100                                | 7.0                                      | 1504                             | 131                   | 118                                 | 39152E3                        | -       |

**ADDITIONAL ELECTRICAL DATA**

| PARAMETER                          | CONDITIONS                    | VALUE                                                          |
|------------------------------------|-------------------------------|----------------------------------------------------------------|
| <b>Voltage</b>                     |                               |                                                                |
| Surge voltage                      | ≥ 350 V versions              | U <sub>s</sub> = 1.1 x U <sub>R</sub>                          |
| Reverse voltage                    |                               | U <sub>rev</sub> ≤ 1                                           |
| <b>Current</b>                     |                               |                                                                |
| Leakage current                    | After 1 min at U <sub>R</sub> | I <sub>L1</sub> ≤ 0.006 C <sub>R</sub> x U <sub>R</sub> + 4 μA |
|                                    | After 5 min at U <sub>R</sub> | I <sub>L5</sub> ≤ 0.002 C <sub>R</sub> x U <sub>R</sub> + 4 μA |
| <b>Inductance</b>                  |                               |                                                                |
| Equivalent series inductance (ESL) | All case sizes                | Ca. 20 nH                                                      |

## RIPPLE CURRENT AND USEFUL LIFE

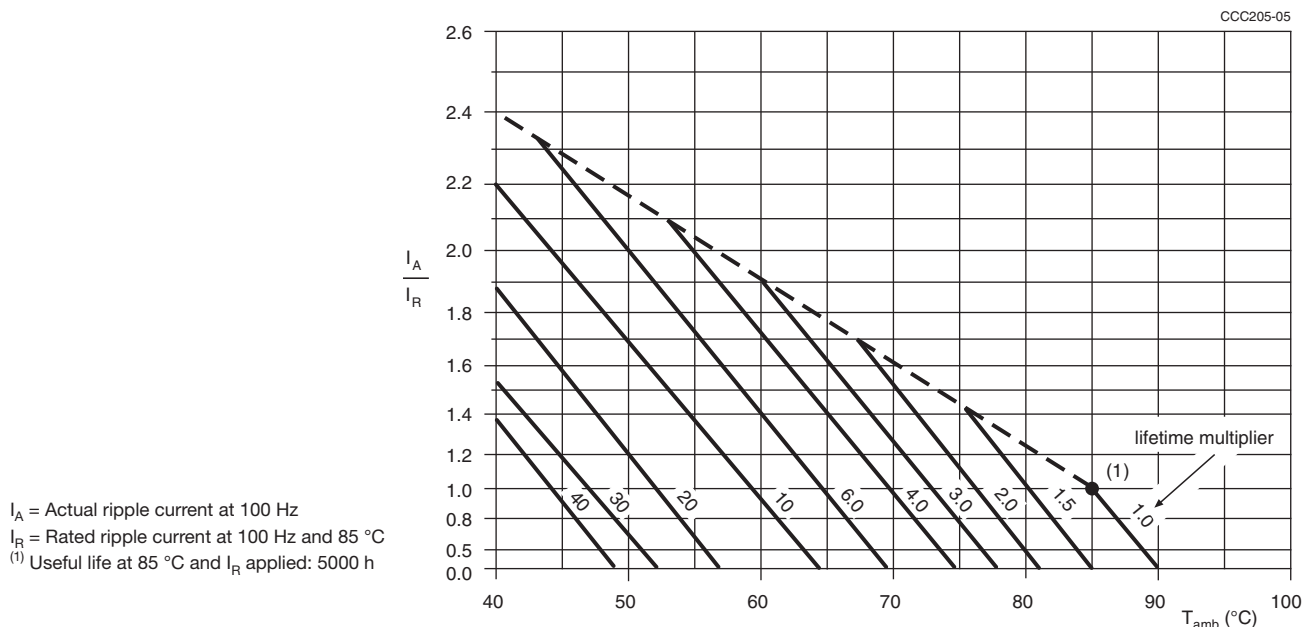


Fig. 8 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 3

| MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY |                  |
|-------------------------------------------------------------------|------------------|
| FREQUENCY (Hz)                                                    | $I_R$ MULTIPLIER |
| 50                                                                | 0.9              |
| 100                                                               | 1.0              |
| 200                                                               | 1.2              |
| 400                                                               | 1.3              |
| 1000                                                              | 1.4              |
| 10 000                                                            | 1.5              |

Table 4

| TEST PROCEDURES AND REQUIREMENTS |                                            |                                                                                                                                               |                                                                                                                                                                                                                                        |
|----------------------------------|--------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TEST                             |                                            | PROCEDURE<br>(quick reference)                                                                                                                | REQUIREMENTS                                                                                                                                                                                                                           |
| NAME OF TEST                     | REFERENCE                                  |                                                                                                                                               |                                                                                                                                                                                                                                        |
| Endurance                        | IEC 60384-4/<br>EN130300<br>subclause 4.13 | $T_{amb} = 85\text{ °C}$ ; $U_R$ applied<br>2000 h                                                                                            | $\Delta C/C: \pm 10\%$<br>$ESR \leq 1.3 \times \text{spec. limit}$<br>$Z \leq 2 \times \text{spec. limit}$<br>$I_{L5} \leq \text{spec. limit}$                                                                                         |
| Useful life                      | CECC 30301<br>subclause 4.13               | $T_{amb} = 85\text{ °C}$ ; $U_R$ and $I_R$ applied;<br>5000 h                                                                                 | $\Delta C/C: \pm 30\%$<br>$ESR \leq 3 \times \text{spec. limit}$<br>$Z \leq 3 \times \text{spec. limit}$<br>$I_{L5} \leq \text{spec. limit}$<br>no short or open circuit,<br>no visible damage<br>total failure percentage: $\leq 3\%$ |
| Shelf life                       | IEC 60384-4/<br>EN130300<br>subclause 4.17 | $T_{amb} = 85\text{ °C}$ ; no voltage applied;<br>1000 h<br><br>After test: $U_R$ to be applied for 30 min<br>24 h to 48 h before measurement | $\Delta C/C: \pm 10\%$<br>$ESR \leq 1.2 \times \text{spec. limit}$<br>$I_{L5} \leq 2 \times \text{spec. limit}$                                                                                                                        |



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