



## Aluminum Capacitors Radial Style



### FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case
- High CV-product per unit volume
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT

### APPLICATIONS

- General purpose, industrial and audio-video
- Coupling, decoupling, timing, smoothing, filtering, buffering in SMPS
- Portable and mobile equipment

### QUICK REFERENCE DATA

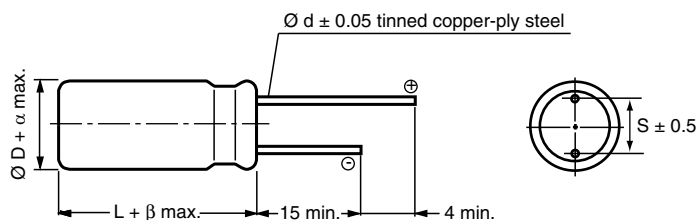
| DESCRIPTION                            | UNIT | VALUE                   |               |
|----------------------------------------|------|-------------------------|---------------|
| Nominal case size (Ø D x L)            | mm   | 5 x 11 to 18 x 40       |               |
| Rated capacitance range C <sub>R</sub> | µF   | 1 to 22 000             |               |
| Capacitance tolerance                  | %    | ± 20                    |               |
| Rated voltage range                    | V    | 6.3 to 350              | 400 to 450    |
| Category temperature range             | °C   | -40 to +85              | -25 to +85    |
| Load life                              | h    | 2000                    |               |
| Based on sectional specification       |      | IEC 60384-4 / EN 130300 |               |
| Climatic category IEC 60068            |      | 40 / 085 / 56           | 25 / 085 / 56 |

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

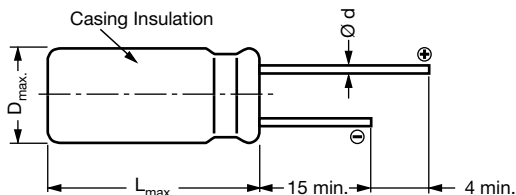
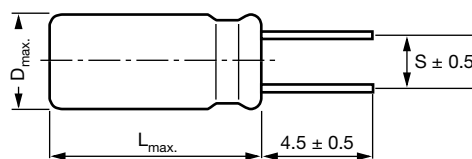
| C <sub>R</sub><br>(µF) | RATED VOLTAGE (V) (> 100 V see next page) |           |           |           |           |           |           |           |
|------------------------|-------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                        | 6.3                                       | 10        | 16        | 25        | 35        | 50        | 63        | 100       |
| 1.0                    | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 1.5                    | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 2.2                    | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 3.3                    | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 4.7                    | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 6.8                    | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 10                     | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 5 x 11    |
| 15                     | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 6.3 x 11  |
| 22                     | →                                         | →         | →         | →         | →         | →         | 5 x 11    | 6.3 x 11  |
| 33                     | →                                         | →         | →         | →         | →         | 5 x 11    | 6.3 x 11  | 8 x 11.5  |
| 47                     | →                                         | →         | →         | →         | 5 x 11    | →         | 6.3 x 11  | 8 x 11.5  |
| 68                     | →                                         | →         | →         | 5 x 11    | →         | 6.3 x 11  | 8 x 11.5  | 10 x 12.5 |
| 100                    | →                                         | →         | →         | 5 x 11    | 6.3 x 11  | →         | 8 x 11.5  | 10 x 16   |
| 150                    | →                                         | →         | 5 x 11    | 6.3 x 11  | 8 x 11.5  | →         | 10 x 12.5 | 10 x 20   |
| 220                    | →                                         | 5 x 11    | →         | 6.3 x 11  | 8 x 11.5  | 10 x 12.5 | 10 x 16   | 12.5 x 20 |
| 330                    | →                                         | →         | 6.3 x 11  | 8 x 11.5  | 10 x 12.5 | 10 x 16   | 10 x 20   | 12.5 x 25 |
| 470                    | →                                         | 6.3 x 11  | 8 x 11.5  | 10 x 12.5 | 10 x 16   | 10 x 20   | 12.5 x 20 | 16 x 25   |
| 680                    | →                                         | →         | 8 x 11.5  | 10 x 16   | 10 x 20   | 12.5 x 20 | 12.5 x 25 | 16 x 31.5 |
| 1000                   | 8 x 11.5                                  | →         | 10 x 12.5 | 10 x 16   | 12.5 x 20 | 12.5 x 25 | 16 x 25   | 18 x 31.5 |
| 2200                   | →                                         | 10 x 16   | 10 x 20   | 12.5 x 20 | 16 x 25   | 16 x 31.5 | 18 x 31.5 | -         |
| 3300                   | 10 x 20                                   | →         | 12.5 x 20 | 16 x 25   | 16 x 31.5 | 18 x 31.5 | 18 x 40   | -         |
| 4700                   | 12.5 x 20                                 | →         | 12.5 x 25 | 16 x 25   | 16 x 35.5 | 18 x 40   | -         | -         |
| 6800                   | 12.5 x 25                                 | →         | 16 x 25   | 18 x 31.5 | 18 x 40   | -         | -         | -         |
| 10 000                 | 16 x 25                                   | →         | 16 x 31.5 | 18 x 40   | -         | -         | -         | -         |
| 15 000                 | →                                         | 16 x 35.5 | 18 x 35.5 | -         | -         | -         | -         | -         |
| 22 000                 | →                                         | 18 x 40   | -         | -         | -         | -         | -         | -         |

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

| $C_R$<br>( $\mu F$ ) | RATED VOLTAGE (V) |           |           |           |           |           |
|----------------------|-------------------|-----------|-----------|-----------|-----------|-----------|
|                      | 160               | 200       | 250       | 350       | 400       | 450       |
| 1.0                  | →                 | →         | →         | →         | →         | 8 x 11.5  |
| 1.5                  | →                 | →         | →         | →         | →         | 8 x 11.5  |
| 2.2                  | →                 | →         | →         | →         | →         | 8 x 11.5  |
| 3.3                  | 6.3 x 11          | →         | 6.3 x 11  | →         | →         | 8 x 11.5  |
| 4.7                  | 6.3 x 11          | →         | 6.3 x 11  | 8 x 11.5  | →         | 10 x 12.5 |
| 6.8                  | 8 x 11.5          | →         | 8 x 11.5  | →         | 10 x 12.5 | 10 x 16   |
| 10                   | →                 | 8 x 11.5  | →         | 10 x 12.5 | 10 x 16   | 10 x 20   |
| 15                   | 10 x 12.5         | →         | 10 x 16   | 10 x 20   | →         | 12.5 x 20 |
| 22                   | 10 x 12.5         | →         | 10 x 16   | →         | 12.5 x 20 | 12.5 x 25 |
| 33                   | 10 x 16           | →         | 10 x 20   | →         | 12.5 x 25 | 16 x 25   |
| 47                   | →                 | 10 x 20   | 12.5 x 20 | 16 x 20   | 16 x 25   | 16 x 31.5 |
| 68                   | 12.5 x 20         | 12.5 x 25 | 16 x 20   | 16 x 25   | 16 x 31.5 | 16 x 35.5 |
| 100                  | 12.5 x 25         | →         | 16 x 25   | 18 x 31.5 | 18 x 35.5 | 18 x 40   |
| 150                  | 16 x 20           | 16 x 25   | 16 x 31.5 | →         | 18 x 40   | -         |
| 220                  | 16 x 25           | 18 x 31.5 | 18 x 35.5 | -         | -         | -         |
| 330                  | 16 x 35.5         | 18 x 35.5 | -         | -         | -         | -         |
| 470                  | 18 x 40           | -         | -         | -         | -         | -         |

**RADIAL STYLE: DIMENSIONS** in millimeters

| $\varnothing D$                   | 5   | 6.3 | 8   | 10  | 12.5 | 16  | 18  | 22   | 25   |
|-----------------------------------|-----|-----|-----|-----|------|-----|-----|------|------|
| <b>S</b>                          | 2.0 | 2.5 | 3.5 | 5.0 | 5.0  | 7.5 | 7.5 | 10.0 | 12.5 |
| <b><math>\varnothing d</math></b> | 0.5 | 0.5 | 0.6 | 0.6 | 0.6  | 0.8 | 0.8 | 1.0  | 1.0  |
| $\beta$                           | 1.5 |     |     | 2.0 |      |     |     |      |      |
| $\alpha$                          | 0.5 |     |     |     |      |     |     | 1.0  |      |

**DIMENSIONS** in millimeters **AND AVAILABLE FORMS** $\varnothing D \leq 18$  long leads MALREKA00... $\varnothing D \leq 18$  shortened leads MALREKA05...  
(S = 2 mm/2.5 mm/3.5 mm/5 mm/7.5 mm)**GENERAL NOTE**

- For Minimum Package Quantity (MPQ) and Minimum Order Quantity (MOQ) please refer to our price list or contact customer service.
- For other packaging forms please refer to Vishay Roederstein General Information.



| ELECTRICAL DATA |                                                                     |
|-----------------|---------------------------------------------------------------------|
| SYMBOL          | DESCRIPTION                                                         |
| $U_R$           | Rated voltage                                                       |
| $C_R$           | Rated capacitance at 120 Hz                                         |
| $\tan \delta$   | Max. dissipation factor at 120 Hz                                   |
| $R_{ESR}$       | Calculated equivalent series resistance at 120 Hz                   |
| $I_R$           | Rated ripple current (rms) at 120 Hz and upper category temperature |

**Note**

- Unless otherwise specified, all electrical values apply at  $T_a = 20^\circ\text{C}$ ,  $P = 80\text{ kPa}$  to  $120\text{ kPa}$ ,  $RH = 45\%$  to  $75\%$ .

**ORDERING EXAMPLE**EKA 3300  $\mu\text{F}$  / 16 V,  $\pm 20\%$ , size: 12.5 mm x 20 mm

Leads: long

Ordering code: MALREKA00FE433D00K

Leads: short

Ordering code: MALREKA05...

| ELECTRICAL DATA AND ORDERING INFORMATION |                                      |                                                          |                         |                                     |                                              |               |                                   |
|------------------------------------------|--------------------------------------|----------------------------------------------------------|-------------------------|-------------------------------------|----------------------------------------------|---------------|-----------------------------------|
| $U_R$<br>(V)                             | $C_R$<br>120 Hz<br>( $\mu\text{F}$ ) | NOMINAL<br>CASE SIZE<br>$\varnothing D \times L$<br>(mm) | $\tan \delta$<br>120 Hz | $R_{ESR}$<br>120 Hz<br>( $\Omega$ ) | $I_R$<br>120 Hz / $85^\circ\text{C}$<br>(mA) | WEIGHT<br>(g) | CATALOG<br>NUMBER<br>(Long Leads) |
| 6.3                                      | 1000                                 | 8 x 11.5                                                 | 0.28                    | 0.37                                | 581                                          | 1.20          | MALREKA00PB410B00K                |
|                                          | 3300                                 | 10 x 20                                                  | 0.34                    | 0.14                                | 1286                                         | 2.80          | MALREKA00DE433B00K                |
|                                          | 4700                                 | 12.5 x 20                                                | 0.36                    | 0.10                                | 1736                                         | 4.10          | MALREKA00FE447B00K                |
|                                          | 6800                                 | 12.5 x 25                                                | 0.40                    | 0.08                                | 2129                                         | 5.60          | MALREKA00FG468B00K                |
|                                          | 10 000                               | 16 x 25                                                  | 0.46                    | 0.06                                | 2629                                         | 7.50          | MALREKA00JG510B00K                |
| 10                                       | 220                                  | 5 x 11                                                   | 0.24                    | 1.45                                | 218                                          | 0.45          | MALREKA00AA322C00K                |
|                                          | 470                                  | 6.3 x 11                                                 | 0.24                    | 0.68                                | 366                                          | 0.48          | MALREKA00BA347C00K                |
|                                          | 2200                                 | 10 x 16                                                  | 0.28                    | 0.17                                | 1051                                         | 2.30          | MALREKA00DD422C00K                |
|                                          | 15 000                               | 16 x 35.5                                                | 0.52                    | 0.05                                | 3284                                         | 10.5          | MALREKA00JL515C00K                |
|                                          | 22 000                               | 18 x 40                                                  | 0.70                    | 0.04                                | 3843                                         | 16.0          | MALREKA00KK522C00K                |
| 16                                       | 150                                  | 5 x 11                                                   | 0.20                    | 1.77                                | 198                                          | 0.45          | MALREKA00AA315D00K                |
|                                          | 330                                  | 6.3 x 11                                                 | 0.20                    | 0.80                                | 359                                          | 0.48          | MALREKA00BA333D00K                |
|                                          | 470                                  | 8 x 11.5                                                 | 0.20                    | 0.56                                | 476                                          | 1.20          | MALREKA00PB347D00K                |
|                                          | 680                                  | 8 x 11.5                                                 | 0.20                    | 0.39                                | 600                                          | 1.20          | MALREKA00PB368D00K                |
|                                          | 1000                                 | 10 x 12.5                                                | 0.20                    | 0.27                                | 796                                          | 1.85          | MALREKA00DC410D00K                |
|                                          | 2200                                 | 10 x 20                                                  | 0.24                    | 0.14                                | 1331                                         | 2.80          | MALREKA00DE422D00K                |
|                                          | 3300                                 | 12.5 x 20                                                | 0.26                    | 0.10                                | 1686                                         | 4.10          | MALREKA00FE433D00K                |
|                                          | 4700                                 | 12.5 x 25                                                | 0.28                    | 0.08                                | 2129                                         | 5.60          | MALREKA00FG447D00K                |
|                                          | 6800                                 | 16 x 25                                                  | 0.32                    | 0.06                                | 2577                                         | 7.50          | MALREKA00JG468D00K                |
|                                          | 10 000                               | 16 x 31.5                                                | 0.38                    | 0.05                                | 3176                                         | 9.50          | MALREKA00JS510D00K                |
|                                          | 15 000                               | 18 x 35.5                                                | 0.48                    | 0.04                                | 3656                                         | 13.0          | MALREKA00KL515D00K                |
| 25                                       | 68                                   | 5 x 11                                                   | 0.16                    | 3.12                                | 144                                          | 0.45          | MALREKA00AA268E00K                |
|                                          | 100                                  | 5 x 11                                                   | 0.16                    | 2.12                                | 181                                          | 0.45          | MALREKA00AA310E00K                |
|                                          | 150                                  | 6.3 x 11                                                 | 0.16                    | 1.42                                | 246                                          | 0.48          | MALREKA00BA315E00K                |
|                                          | 220                                  | 6.3 x 11                                                 | 0.16                    | 0.97                                | 327                                          | 0.48          | MALREKA00BA322E00K                |
|                                          | 330                                  | 8 x 11.5                                                 | 0.16                    | 0.64                                | 431                                          | 1.20          | MALREKA00PB333E00K                |
|                                          | 470                                  | 10 x 12.5                                                | 0.16                    | 0.45                                | 550                                          | 1.85          | MALREKA00DC347E00K                |
|                                          | 680                                  | 10 x 16                                                  | 0.16                    | 0.31                                | 754                                          | 2.30          | MALREKA00DD368E00K                |
|                                          | 1000                                 | 10 x 16                                                  | 0.16                    | 0.21                                | 942                                          | 2.30          | MALREKA00DD410E00K                |
|                                          | 2200                                 | 12.5 x 20                                                | 0.20                    | 0.12                                | 1542                                         | 4.10          | MALREKA00FE422E00K                |
|                                          | 3300                                 | 16 x 25                                                  | 0.22                    | 0.09                                | 2194                                         | 7.50          | MALREKA00JG433E00K                |
|                                          | 4700                                 | 16 x 25                                                  | 0.24                    | 0.07                                | 2448                                         | 7.50          | MALREKA00JG447E00K                |
|                                          | 6800                                 | 18 x 31.5                                                | 0.28                    | 0.05                                | 3114                                         | 12.0          | MALREKA00KS468E00K                |
|                                          | 10 000                               | 18 x 40                                                  | 0.34                    | 0.05                                | 3544                                         | 16.0          | MALREKA00KK510E00K                |

**ELECTRICAL DATA AND ORDERING INFORMATION**

| $U_R$<br>(V) | $C_R$<br>120 Hz<br>( $\mu$ F) | NOMINAL<br>CASE SIZE<br>$\varnothing D \times L$<br>(mm) | $\tan \delta$<br>120 Hz | $R_{ESR}$<br>120 Hz<br>( $\Omega$ ) | $I_R$<br>120 Hz / 85 °C<br>(mA) | WEIGHT<br>(g) | CATALOG<br>NUMBER<br>(Long Leads) |
|--------------|-------------------------------|----------------------------------------------------------|-------------------------|-------------------------------------|---------------------------------|---------------|-----------------------------------|
| 35           | 47                            | 5 x 11                                                   | 0.14                    | 3.95                                | 131                             | 0.45          | MALREKA00AA247F00K                |
|              | 100                           | 6.3 x 11                                                 | 0.14                    | 1.86                                | 220                             | 0.48          | MALREKA00BA310F00K                |
|              | 150                           | 8 x 11.5                                                 | 0.14                    | 1.24                                | 318                             | 1.20          | MALREKA00PB315F00K                |
|              | 220                           | 8 x 11.5                                                 | 0.14                    | 0.84                                | 386                             | 1.20          | MALREKA00PB322F00K                |
|              | 330                           | 10 x 12.5                                                | 0.14                    | 0.56                                | 549                             | 1.85          | MALREKA00DC333F00K                |
|              | 470                           | 10 x 16                                                  | 0.14                    | 0.40                                | 740                             | 2.30          | MALREKA00DD347F00K                |
|              | 680                           | 10 x 20                                                  | 0.14                    | 0.27                                | 947                             | 2.80          | MALREKA00DE368F00K                |
|              | 1000                          | 12.5 x 20                                                | 0.14                    | 0.19                                | 1306                            | 4.10          | MALREKA00FE410F00K                |
|              | 2200                          | 16 x 25                                                  | 0.18                    | 0.11                                | 2032                            | 7.50          | MALREKA00JG422F00K                |
|              | 3300                          | 16 x 31.5                                                | 0.20                    | 0.08                                | 2502                            | 9.50          | MALREKA00JS433F00K                |
|              | 4700                          | 16 x 35.5                                                | 0.22                    | 0.06                                | 2905                            | 10.5          | MALREKA00JL447F00K                |
|              | 6800                          | 18 x 40                                                  | 0.26                    | 0.05                                | 3408                            | 16.0          | MALREKA00KK468F00K                |
|              |                               |                                                          |                         |                                     |                                 |               |                                   |
| 50           | 33                            | 5 x 11                                                   | 0.12                    | 4.83                                | 123                             | 0.45          | MALREKA00AA233H00K                |
|              | 68                            | 6.3 x 11                                                 | 0.12                    | 2.34                                | 203                             | 0.48          | MALREKA00BA268H00K                |
|              | 220                           | 10 x 12.5                                                | 0.12                    | 0.72                                | 501                             | 1.85          | MALREKA00DC322H00K                |
|              | 330                           | 10 x 16                                                  | 0.12                    | 0.48                                | 672                             | 2.30          | MALREKA00DD333H00K                |
|              |                               |                                                          |                         |                                     |                                 |               |                                   |
| 50           | 470                           | 10 x 20                                                  | 0.12                    | 0.34                                | 875                             | 2.80          | MALREKA00DE347H00K                |
|              | 680                           | 12.5 x 20                                                | 0.12                    | 0.23                                | 1235                            | 4.10          | MALREKA00FE368H00K                |
|              | 1000                          | 12.5 x 25                                                | 0.12                    | 0.16                                | 1633                            | 5.60          | MALREKA00FG410H00K                |
|              | 2200                          | 16 x 31.5                                                | 0.16                    | 0.10                                | 2220                            | 9.50          | MALREKA00JS422H00K                |
|              | 3300                          | 18 x 31.5                                                | 0.18                    | 0.07                                | 2765                            | 12.0          | MALREKA00KS433H00K                |
|              | 4700                          | 18 x 40                                                  | 0.20                    | 0.06                                | 3272                            | 16.0          | MALREKA00KK447H00K                |
|              |                               |                                                          |                         |                                     |                                 |               |                                   |
| 63           | 1.0                           | 5 x 11                                                   | 0.10                    | 133                                 | 23                              | 0.45          | MALREKA00AA110J00K                |
|              | 1.5                           | 5 x 11                                                   | 0.10                    | 88.5                                | 28                              | 0.45          | MALREKA00AA115J00K                |
|              | 2.2                           | 5 x 11                                                   | 0.10                    | 60.3                                | 34                              | 0.45          | MALREKA00AA122J00K                |
|              | 3.3                           | 5 x 11                                                   | 0.10                    | 40.2                                | 42                              | 0.45          | MALREKA00AA133J00K                |
|              | 4.7                           | 5 x 11                                                   | 0.10                    | 28.2                                | 50                              | 0.45          | MALREKA00AA147J00K                |
|              | 6.8                           | 5 x 11                                                   | 0.10                    | 19.5                                | 60                              | 0.45          | MALREKA00AA168J00K                |
|              | 10                            | 5 x 11                                                   | 0.10                    | 13.3                                | 72                              | 0.45          | MALREKA00AA210J00K                |
|              | 15                            | 5 x 11                                                   | 0.10                    | 8.85                                | 89                              | 0.45          | MALREKA00AA215J00K                |
|              | 22                            | 5 x 11                                                   | 0.10                    | 6.03                                | 108                             | 0.45          | MALREKA00AA222J00K                |
|              | 33                            | 6.3 x 11                                                 | 0.10                    | 4.02                                | 151                             | 0.48          | MALREKA00BA233J00K                |
|              | 47                            | 6.3 x 11                                                 | 0.10                    | 2.82                                | 181                             | 0.48          | MALREKA00BA247J00K                |
|              | 68                            | 8 x 11.5                                                 | 0.10                    | 1.95                                | 256                             | 1.20          | MALREKA00PB268J00K                |
|              | 100                           | 8 x 11.5                                                 | 0.10                    | 1.33                                | 311                             | 1.20          | MALREKA00PB310J00K                |
|              | 150                           | 10 x 12.5                                                | 0.10                    | 0.88                                | 422                             | 1.85          | MALREKA00DC315J00K                |
|              | 220                           | 10 x 16                                                  | 0.10                    | 0.60                                | 586                             | 2.30          | MALREKA00DD322J00K                |
|              | 330                           | 10 x 20                                                  | 0.10                    | 0.40                                | 784                             | 2.80          | MALREKA00DE333J00K                |
|              | 470                           | 12.5 x 20                                                | 0.10                    | 0.28                                | 1098                            | 4.10          | MALREKA00FE347J00K                |
|              | 680                           | 12.5 x 25                                                | 0.10                    | 0.20                                | 1440                            | 5.60          | MALREKA00FG368J00K                |
|              | 1000                          | 16 x 25                                                  | 0.10                    | 0.13                                | 1937                            | 7.50          | MALREKA00JG410J00K                |
|              | 2200                          | 18 x 31.5                                                | 0.14                    | 0.08                                | 2445                            | 12.0          | MALREKA00KS422J00K                |
|              | 3300                          | 18 x 40                                                  | 0.16                    | 0.06                                | 2987                            | 16.0          | MALREKA00KK433J00K                |
|              |                               |                                                          |                         |                                     |                                 |               |                                   |
|              |                               |                                                          |                         |                                     |                                 |               |                                   |

**ELECTRICAL DATA AND ORDERING INFORMATION**

| $U_R$<br>(V) | $C_R$<br>120 Hz<br>( $\mu$ F) | NOMINAL<br>CASE SIZE<br>$\varnothing$ D x L<br>(mm) | $\tan \delta$<br>120 Hz | $R_{ESR}$<br>120 Hz<br>( $\Omega$ ) | $I_R$<br>120 Hz / 85 °C<br>(mA) | WEIGHT<br>(g) | CATALOG<br>NUMBER<br>(Long Leads) |
|--------------|-------------------------------|-----------------------------------------------------|-------------------------|-------------------------------------|---------------------------------|---------------|-----------------------------------|
| 100          | 1.0                           | 5 x 11                                              | 0.08                    | 106                                 | 23                              | 0.45          | MALREKA00AA110L00K                |
|              | 1.5                           | 5 x 11                                              | 0.08                    | 70.8                                | 28                              | 0.45          | MALREKA00AA115L00K                |
|              | 2.2                           | 5 x 11                                              | 0.08                    | 48.3                                | 34                              | 0.45          | MALREKA00AA122L00K                |
|              | 3.3                           | 5 x 11                                              | 0.08                    | 32.2                                | 42                              | 0.45          | MALREKA00AA133L00K                |
|              | 4.7                           | 5 x 11                                              | 0.08                    | 22.6                                | 50                              | 0.45          | MALREKA00AA147L00K                |
|              | 6.8                           | 5 x 11                                              | 0.08                    | 15.6                                | 60                              | 0.45          | MALREKA00AA168L00K                |
|              | 10                            | 5 x 11                                              | 0.08                    | 10.6                                | 76                              | 0.45          | MALREKA00AA210L00K                |
|              | 15                            | 6.3 x 11                                            | 0.08                    | 7.08                                | 89                              | 0.48          | MALREKA00BA215L00K                |
|              | 22                            | 6.3 x 11                                            | 0.08                    | 4.83                                | 124                             | 0.48          | MALREKA00BA222L00K                |
|              | 33                            | 8 x 11.5                                            | 0.08                    | 3.22                                | 178                             | 1.20          | MALREKA00PB233L00K                |
|              | 47                            | 8 x 11.5                                            | 0.08                    | 2.26                                | 222                             | 1.20          | MALREKA00PB247L00K                |
|              | 68                            | 10 x 12.5                                           | 0.08                    | 1.56                                | 293                             | 1.85          | MALREKA00DC268L00K                |
|              | 100                           | 10 x 16                                             | 0.08                    | 1.06                                | 388                             | 2.30          | MALREKA00DD310L00K                |
|              | 150                           | 10 x 20                                             | 0.08                    | 0.71                                | 528                             | 2.80          | MALREKA00DE315L00K                |
|              | 220                           | 12.5 x 20                                           | 0.08                    | 0.48                                | 737                             | 4.10          | MALREKA00FE322L00K                |
|              | 330                           | 12.5 x 25                                           | 0.08                    | 0.32                                | 1002                            | 5.60          | MALREKA00FG333L00K                |
|              | 470                           | 16 x 25                                             | 0.08                    | 0.23                                | 1328                            | 7.50          | MALREKA00JG347L00K                |
|              | 680                           | 16 x 31.5                                           | 0.08                    | 0.16                                | 1643                            | 9.50          | MALREKA00JS368L00K                |
|              | 1000                          | 18 x 31.5                                           | 0.08                    | 0.11                                | 1965                            | 12.0          | MALREKA00KS410L00K                |
| 160          | 3.3                           | 6.3 x 11                                            | 0.15                    | 60.3                                | 45                              | 0.48          | MALREKA00BA133M00K                |
|              | 4.7                           | 6.3 x 11                                            | 0.15                    | 42.3                                | 53                              | 0.48          | MALREKA00BA147M00K                |
|              | 6.8                           | 8 x 11.5                                            | 0.15                    | 29.3                                | 76                              | 1.20          | MALREKA00PB168M00K                |
|              | 15                            | 10 x 12.5                                           | 0.15                    | 13.3                                | 131                             | 1.85          | MALREKA00DC215M00K                |
|              | 22                            | 10 x 12.5                                           | 0.15                    | 9.05                                | 156                             | 1.85          | MALREKA00DC222M00K                |
| 160          | 33                            | 10 x 16                                             | 0.15                    | 6.03                                | 209                             | 2.30          | MALREKA00DD233M00K                |
|              | 68                            | 12.5 x 20                                           | 0.15                    | 2.93                                | 391                             | 4.10          | MALREKA00FE268M00K                |
|              | 100                           | 12.5 x 25                                           | 0.15                    | 1.99                                | 516                             | 5.60          | MALREKA00FG310M00K                |
|              | 150                           | 16 x 20                                             | 0.15                    | 1.33                                | 632                             | 5.70          | MALREKA00JE315M00K                |
|              | 220                           | 16 x 25                                             | 0.15                    | 0.90                                | 873                             | 7.50          | MALREKA00JG322M00K                |
|              | 330                           | 16 x 35.5                                           | 0.15                    | 0.60                                | 1152                            | 10.5          | MALREKA00JL333M00K                |
|              | 470                           | 18 x 40                                             | 0.15                    | 0.42                                | 1434                            | 16.0          | MALREKA00KK347M00K                |
| 200          | 10                            | 8 x 11.5                                            | 0.15                    | 19.9                                | 96                              | 1.20          | MALREKA00PB210S00K                |
|              | 47                            | 10 x 20                                             | 0.15                    | 4.23                                | 293                             | 2.80          | MALREKA00DE247S00K                |
|              | 68                            | 12.5 x 25                                           | 0.15                    | 2.93                                | 426                             | 5.60          | MALREKA00FG268S00K                |
|              | 150                           | 16 x 25                                             | 0.15                    | 1.33                                | 691                             | 7.50          | MALREKA00JG315S00K                |
|              | 220                           | 18 x 31.5                                           | 0.15                    | 0.90                                | 962                             | 12.0          | MALREKA00KS322S00K                |
|              | 330                           | 18 x 35.5                                           | 0.15                    | 0.60                                | 1206                            | 13.0          | MALREKA00KL333S00K                |
| 250          | 3.3                           | 6.3 x 11                                            | 0.15                    | 60.3                                | 48                              | 0.48          | MALREKA00BA133N00K                |
|              | 4.7                           | 6.3 x 11                                            | 0.15                    | 42.3                                | 57                              | 0.48          | MALREKA00BA147N00K                |
|              | 6.8                           | 8 x 11.5                                            | 0.15                    | 29.3                                | 76                              | 1.20          | MALREKA00PB168N00K                |
|              | 15                            | 10 x 16                                             | 0.15                    | 13.3                                | 143                             | 2.30          | MALREKA00DD215N00K                |
|              | 22                            | 10 x 16                                             | 0.15                    | 9.05                                | 170                             | 2.30          | MALREKA00DD222N00K                |
|              | 33                            | 10 x 20                                             | 0.15                    | 6.03                                | 247                             | 2.80          | MALREKA00DE233N00K                |
|              | 47                            | 12.5 x 20                                           | 0.15                    | 4.23                                | 319                             | 4.10          | MALREKA00FE247N00K                |
|              | 68                            | 16 x 20                                             | 0.15                    | 2.93                                | 425                             | 5.70          | MALREKA00JE268N00K                |
|              | 100                           | 16 x 25                                             | 0.15                    | 1.99                                | 564                             | 7.50          | MALREKA00JG310N00K                |
|              | 150                           | 16 x 31.5                                           | 0.15                    | 1.33                                | 726                             | 9.50          | MALREKA00JS315N00K                |
|              | 220                           | 18 x 35.5                                           | 0.15                    | 0.90                                | 988                             | 13.0          | MALREKA00KL322N00K                |
| 350          | 4.7                           | 8 x 11.5                                            | 0.20                    | 56.5                                | 66                              | 1.20          | MALREKA00PB147O00K                |
|              | 10                            | 10 x 12.5                                           | 0.20                    | 26.5                                | 107                             | 1.85          | MALREKA00DC210O00K                |
|              | 15                            | 10 x 20                                             | 0.20                    | 17.7                                | 156                             | 2.80          | MALREKA00DE215O00K                |
|              | 47                            | 16 x 20                                             | 0.20                    | 5.65                                | 353                             | 5.70          | MALREKA00JE247O00K                |
|              | 68                            | 16 x 25                                             | 0.20                    | 3.90                                | 465                             | 7.50          | MALREKA00JG268O00K                |
|              | 100                           | 18 x 31.5                                           | 0.20                    | 2.65                                | 592                             | 12.0          | MALREKA00KS310O00K                |

**ELECTRICAL DATA AND ORDERING INFORMATION**

| $U_R$<br>(V) | $C_R$<br>120 Hz<br>( $\mu$ F) | NOMINAL<br>CASE SIZE<br>$\varnothing$ D x L<br>(mm) | $\tan \delta$<br>120 Hz | $R_{ESR}$<br>120 Hz<br>( $\Omega$ ) | $I_R$<br>120 Hz / 85 °C<br>(mA) | WEIGHT<br>(g) | CATALOG<br>NUMBER<br>(Long Leads) |
|--------------|-------------------------------|-----------------------------------------------------|-------------------------|-------------------------------------|---------------------------------|---------------|-----------------------------------|
| 400          | 6.8                           | 10 x 12.5                                           | 0.20                    | 39.0                                | 87                              | 1.85          | MALREKA00DC168X00K                |
|              | 10                            | 10 x 16                                             | 0.20                    | 26.5                                | 115                             | 2.30          | MALREKA00DD210X00K                |
|              | 22                            | 12.5 x 20                                           | 0.20                    | 12.1                                | 218                             | 4.10          | MALREKA00FE222X00K                |
|              | 33                            | 12.5 x 25                                           | 0.20                    | 8.04                                | 296                             | 5.60          | MALREKA00FG233X00K                |
|              | 47                            | 16 x 25                                             | 0.20                    | 5.65                                | 387                             | 7.50          | MALREKA00JG247X00K                |
|              | 68                            | 16 x 31.5                                           | 0.20                    | 3.90                                | 488                             | 9.50          | MALREKA00JS268X00K                |
|              | 100                           | 18 x 35.5                                           | 0.20                    | 2.65                                | 667                             | 13.0          | MALREKA00KL310X00K                |
|              | 150                           | 18 x 40                                             | 0.20                    | 1.77                                | 863                             | 16.0          | MALREKA00KK315X00K                |
| 450          | 1.0                           | 8 x 11.5                                            | 0.20                    | 265                                 | 26                              | 1.20          | MALREKA00PB110P00K                |
|              | 1.5                           | 8 x 11.5                                            | 0.20                    | 177                                 | 32                              | 1.20          | MALREKA00PB115P00K                |
|              | 2.2                           | 8 x 11.5                                            | 0.20                    | 121                                 | 33                              | 1.20          | MALREKA00PB122P00K                |
|              | 3.3                           | 8 x 11.5                                            | 0.20                    | 80.4                                | 50                              | 1.20          | MALREKA00PB133P00K                |
|              | 4.7                           | 10 x 12.5                                           | 0.20                    | 56.5                                | 72                              | 1.85          | MALREKA00DC147P00K                |
|              | 6.8                           | 10 x 16                                             | 0.20                    | 39.0                                | 86                              | 2.30          | MALREKA00DD168P00K                |
|              | 10                            | 10 x 20                                             | 0.20                    | 26.5                                | 115                             | 2.80          | MALREKA00DE210P00K                |
|              | 15                            | 12.5 x 20                                           | 0.20                    | 17.7                                | 164                             | 4.10          | MALREKA00FE215P00K                |
|              | 22                            | 12.5 x 25                                           | 0.20                    | 12.1                                | 217                             | 5.60          | MALREKA00FG222P00K                |
|              | 33                            | 16 x 25                                             | 0.20                    | 8.04                                | 294                             | 7.50          | MALREKA00JG233P00K                |
|              | 47                            | 16 x 31.5                                           | 0.20                    | 5.65                                | 384                             | 9.50          | MALREKA00JS247P00K                |
|              | 68                            | 16 x 35.5                                           | 0.20                    | 3.90                                | 503                             | 10.5          | MALREKA00JL268P00K                |
|              | 100                           | 18 x 40                                             | 0.20                    | 2.65                                | 546                             | 16.0          | MALREKA00KK310P00K                |

**LOW TEMPERATURE BEHAVIOR** (at 120 Hz)

| IMPEDANCE RATIO<br>$Z(T_2)/Z(T_1)$ | RATED VOLTAGE<br>(V) |    |    |    |    |          |     |           |           |
|------------------------------------|----------------------|----|----|----|----|----------|-----|-----------|-----------|
| $T_2/T_1$                          | 6.3                  | 10 | 16 | 25 | 35 | 50 ~ 100 | 160 | 200 ~ 350 | 400 ~ 450 |
| -25 °C / +20 °C                    | 5                    | 4  | 3  | 2  | 2  | 2        | 4   | 6         | 12        |
| -40 °C / +20 °C                    | 12                   | 10 | 8  | 5  | 4  | 3        | 6   | 8         | -         |

**ADDITIONAL ELECTRICAL DATA**

| PARAMETER                                           | CONDITIONS                                     | VALUE                                                  |
|-----------------------------------------------------|------------------------------------------------|--------------------------------------------------------|
| <b>Current</b>                                      |                                                |                                                        |
| Leakage current<br>(test conditions: $U_R$ , 20 °C) | After 1 min at $U_R$                           | $I_{L1} \leq 0.03 \times C_R \times U_R$ or 4 $\mu$ A  |
|                                                     | After 2 min at $U_R$                           | $I_{L2} \leq 0.01 \times C_R \times U_R$ or 3 $\mu$ A  |
|                                                     | After 5 min at $U_R$                           | $I_{L5} \leq 0.02 \times C_R \times U_R$ or 15 $\mu$ A |
| <b>Resistance</b>                                   |                                                |                                                        |
| Equivalent series resistance (ESR)                  | Calculated from $\tan \delta_{max.}$ and $C_R$ | $ESR = \tan \delta / 2 \pi f C_R$                      |

**MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY**

| FREQUENCY<br>(Hz) | $I_R$ MULTIPLIER FOR $U_R \leq 100$ V |                                 |                       |
|-------------------|---------------------------------------|---------------------------------|-----------------------|
|                   | $C_R \leq 47 \mu$ F                   | $C_R = 68 \mu$ F to 680 $\mu$ F | $C_R \geq 1000 \mu$ F |
| 50                | 0.75                                  | 0.80                            | 0.85                  |
| 120               | 1.00                                  | 1.00                            | 1.00                  |
| 300               | 1.35                                  | 1.25                            | 1.10                  |
| 1000              | 1.55                                  | 1.35                            | 1.15                  |
| $\geq 10\,000$    | 2.00                                  | 1.50                            | 1.15                  |

**MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY**

| FREQUENCY<br>(Hz) | $I_R$ MULTIPLIER FOR $U_R$ 160 V to $\leq$ 450 V |                            |
|-------------------|--------------------------------------------------|----------------------------|
|                   | $C_R = 47 \mu\text{F}$ to $220 \mu\text{F}$      | $C_R \geq 330 \mu\text{F}$ |
| 50                | 0.80                                             | 0.90                       |
| 120               | 1.00                                             | 1.00                       |
| 300               | 1.25                                             | 1.10                       |
| 1000              | 1.40                                             | 1.13                       |
| $\geq 10\,000$    | 1.60                                             | 1.15                       |

**TEST PROCEDURES AND REQUIREMENTS**

| TEST       | PROCEDURE<br>(quick reference)                                                                                                                                       | REQUIREMENTS                                                                                                               |
|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| Load life  | $T_{\text{amb}} = 85\text{ }^{\circ}\text{C}$<br>$U_R$ and $I_R$ applied<br>After 2000 h                                                                             | $\Delta C/C: \pm 25\%$ of initial value<br>$I_L \leq \text{spec. limit}$<br>$\tan \delta \leq 2 \times \text{spec. limit}$ |
| Shelf life | $T_{\text{amb}} = 85\text{ }^{\circ}\text{C}$<br>No voltage applied<br>After 1000 h<br>After test: $U_R$ to be applied for 30 min<br>24 h to 48 h before measurement | $\Delta C/C: \pm 20\%$ of initial value<br>$I_L \leq \text{spec. limit}$<br>$\tan \delta \leq 2 \times \text{spec. limit}$ |

Statements about product lifetime are based on calculations and internal testing. They should only be interpreted as estimations. Also due to external factors, the lifetime in the field application may deviate from the calculated lifetime. In general, nothing stated herein shall be construed as a guarantee of durability.



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