

## Aluminum Capacitors Radial Style



### FEATURES

- Polarized aluminum electrolytic capacitor
- High ripple current
- High load life up to 10 000 h
- Temperature range up to 105 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)


**RoHS**  
COMPLIANT

### APPLICATIONS

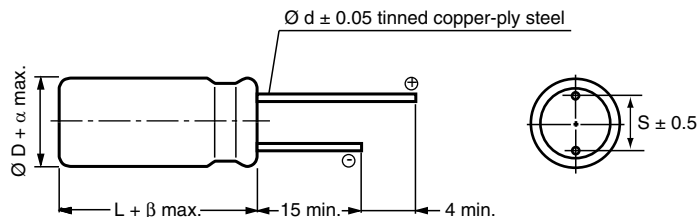
- For electronic lighting ballast
- Power supply

### QUICK REFERENCE DATA

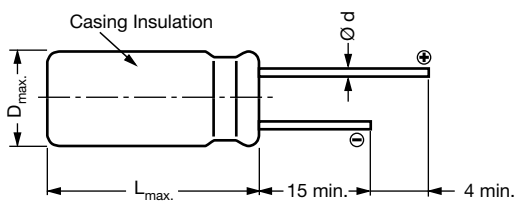
| DESCRIPTION                            | UNIT | VALUE                  |
|----------------------------------------|------|------------------------|
| Nominal case size (Ø D x L)            | mm   | 10 x 12.5 to 18 x 31.5 |
| Rated capacitance range C <sub>R</sub> | µF   | 1.0 to 150             |
| Capacitance tolerance                  | %    | ± 20                   |
| Rated voltage range                    | V    | 200 to 450             |
| Category temperature range             | °C   | -25 to 105             |
| Load life                              | h    | 10 000                 |
| Based on sectional specification       |      | IEC 60384-4 / EN130300 |
| Climatic category IEC 60068            |      | 25 / 105 / 56          |

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

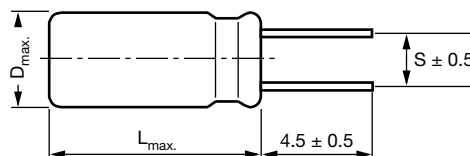
| C <sub>R</sub><br>(µF) | RATED VOLTAGE (V) |           |           |           |           |
|------------------------|-------------------|-----------|-----------|-----------|-----------|
|                        | 200               | 250       | 350       | 400       | 450       |
| 1.0                    | →                 | →         | →         | 10 x 12.5 | -         |
| 2.2                    | →                 | →         | →         | 10 x 12.5 | 10 x 16   |
| 3.3                    | →                 | →         | 10 x 12.5 | →         | 10 x 16   |
| 4.7                    | →                 | →         | →         | 10 x 16   | 10 x 20   |
| 6.8                    | →                 | 10 x 12.5 | →         | 10 x 16   | 10 x 20   |
| 10                     | 10 x 16           | →         | →         | 10 x 20   | 12.5 x 20 |
| 22                     | 10 x 20           | →         | 12.5 x 20 | 12.5 x 25 | 16 x 25   |
| 33                     | →                 | 12.5 x 20 | 16 x 20   | 16 x 25   | 18 x 25   |
| 47                     | 12.5 x 20         | 12.5 x 25 | 16 x 25   | 18 x 25   | 18 x 31.5 |
| 68                     | 12.5 x 25         | 16 x 25   | 18 x 25   | -         | -         |
| 100                    | 16 x 25           | 18 x 25   | -         | -         | -         |
| 150                    | 18 x 25           | -         | -         | -         | -         |

**RADIAL STYLE: DIMENSIONS** in millimeters


| Ø D | 5   | 6.3 | 8   | 10  | 12.5 | 16  | 18  | 22   | 25   |
|-----|-----|-----|-----|-----|------|-----|-----|------|------|
| S   | 2.0 | 2.5 | 3.5 | 5.0 | 5.0  | 7.5 | 7.5 | 10.0 | 12.5 |
| Ø d | 0.5 | 0.5 | 0.6 | 0.6 | 0.6  | 0.8 | 0.8 | 1.0  | 1.0  |
| β   | 1.5 |     |     | 2.0 |      |     |     |      |      |
| α   | 0.5 |     |     |     |      |     |     | 1.0  |      |

**DIMENSIONS** in millimeters **AND AVAILABLE FORMS**


Ø D ≤ 18 long leads MALREKV00...



Ø D ≤ 18 shortened leads MALREKV05...  
(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                                        |
| $R_{ESR}$     | Max. equivalent series resistance at 120 Hz                              |
| $I_R$         | Rated alternating current (RMS) at 120 Hz and upper category temperature |

**Note**

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

**ORDERING EXAMPLE**

EKV 22  $\mu\text{F}$  / 450 V,  $\pm 20\%$ , size: 16 mm x 25 mm

Leads: long

Ordering code: MALREKV00JG222P00K

Leads: short

Ordering code: MALREKV05JG222P00K

| ELECTRICAL DATA AND ORDERING INFORMATION |                               |                                           |                         |                                     |                                   |               |                                |
|------------------------------------------|-------------------------------|-------------------------------------------|-------------------------|-------------------------------------|-----------------------------------|---------------|--------------------------------|
| $U_R$<br>(V)                             | $C_R$<br>120 Hz<br>( $\mu$ F) | DIMENSIONS<br>$\varnothing$ D x L<br>(mm) | $\tan \Delta$<br>120 Hz | $R_{ESR}$<br>120 Hz<br>( $\Omega$ ) | $I_R$<br>100 kHz / 105 °C<br>(mA) | WEIGHT<br>(g) | CATALOG NUMBER<br>(Long Leads) |
| 200                                      | 10                            | 10 x 16                                   | 0.15                    | 19.9                                | 250                               | 2.3           | MALREKV00DD210S00K             |
|                                          | 22                            | 10 x 20                                   | 0.15                    | 9.04                                | 500                               | 2.8           | MALREKV00DE222S00K             |
|                                          | 47                            | 12.5 x 20                                 | 0.15                    | 4.23                                | 660                               | 3.8           | MALREKV00FE247S00K             |
|                                          | 68                            | 12.5 x 25                                 | 0.15                    | 2.93                                | 760                               | 5.1           | MALREKV00FG268S00K             |
|                                          | 100                           | 16 x 25                                   | 0.15                    | 1.99                                | 1120                              | 7.1           | MALREKV00JG310S00K             |
|                                          | 150                           | 18 x 25                                   | 0.15                    | 1.33                                | 1360                              | 9.5           | MALREKV00KG315S00K             |
| 250                                      | 6.8                           | 10 x 12.5                                 | 0.15                    | 29.3                                | 120                               | 1.9           | MALREKV00DC168N00K             |
|                                          | 33                            | 12.5 x 20                                 | 0.15                    | 6.03                                | 600                               | 3.8           | MALREKV00FE233N00K             |
|                                          | 47                            | 12.5 x 25                                 | 0.15                    | 4.23                                | 720                               | 5.1           | MALREKV00FG247N00K             |
|                                          | 68                            | 16 x 25                                   | 0.15                    | 2.93                                | 920                               | 7.1           | MALREKV00JG268N00K             |
|                                          | 100                           | 18 x 25                                   | 0.15                    | 1.99                                | 1200                              | 9.5           | MALREKV00KG310N00K             |
| 350                                      | 3.3                           | 10 x 12.5                                 | 0.20                    | 80.4                                | 100                               | 1.9           | MALREKV00DC133O00K             |
|                                          | 22                            | 12.5 x 20                                 | 0.20                    | 12.1                                | 350                               | 3.8           | MALREKV00FE222O00K             |
|                                          | 33                            | 16 x 20                                   | 0.20                    | 8.04                                | 500                               | 6.3           | MALREKV00JE233O00K             |
|                                          | 47                            | 16 x 25                                   | 0.20                    | 5.64                                | 660                               | 7.1           | MALREKV00JG247O00K             |
|                                          | 68                            | 18 x 25                                   | 0.20                    | 3.90                                | 840                               | 9.5           | MALREKV00KG268O00K             |
| 400                                      | 1.0                           | 10 x 12.5                                 | 0.24                    | 318                                 | 90                                | 1.9           | MALREKV00DC110X00K             |
|                                          | 2.2                           | 10 x 12.5                                 | 0.24                    | 145                                 | 100                               | 1.9           | MALREKV00DC122X00K             |
|                                          | 4.7                           | 10 x 16                                   | 0.24                    | 67.7                                | 180                               | 2.3           | MALREKV00DD147X00K             |
|                                          | 6.8                           | 10 x 16                                   | 0.24                    | 46.8                                | 200                               | 2.3           | MALREKV00DD168X00K             |
|                                          | 10                            | 10 x 20                                   | 0.20                    | 26.5                                | 280                               | 2.8           | MALREKV00DE210X00K             |
|                                          | 22                            | 12.5 x 25                                 | 0.20                    | 12.1                                | 430                               | 5.1           | MALREKV00FG222X00K             |
|                                          | 33                            | 16 x 25                                   | 0.20                    | 8.04                                | 640                               | 7.1           | MALREKV00JG233X00K             |
|                                          | 47                            | 18 x 25                                   | 0.20                    | 5.64                                | 840                               | 9.5           | MALREKV00KG247X00K             |
| 450                                      | 2.2                           | 10 x 16                                   | 0.24                    | 145                                 | 120                               | 2.3           | MALREKV00DD122P00K             |
|                                          | 3.3                           | 10 x 16                                   | 0.24                    | 96.5                                | 140                               | 2.3           | MALREKV00DD133P00K             |
|                                          | 4.7                           | 10 x 20                                   | 0.24                    | 67.7                                | 180                               | 2.8           | MALREKV00DE147P00K             |
|                                          | 6.8                           | 10 x 20                                   | 0.24                    | 46.8                                | 200                               | 2.8           | MALREKV00DE168P00K             |
|                                          | 10                            | 12.5 x 20                                 | 0.20                    | 26.5                                | 320                               | 3.8           | MALREKV00FE210P00K             |
|                                          | 22                            | 16 x 25                                   | 0.20                    | 12.1                                | 560                               | 7.1           | MALREKV00JG222P00K             |
|                                          | 33                            | 18 x 25                                   | 0.20                    | 8.04                                | 700                               | 9.5           | MALREKV00KG233P00K             |
|                                          | 47                            | 18 x 31.5                                 | 0.20                    | 5.64                                | 880                               | 12.0          | MALREKV00KS247P00K             |

| LOW TEMPERATURE BEHAVIOUR (at 120 Hz) |                   |     |     |     |     |
|---------------------------------------|-------------------|-----|-----|-----|-----|
| IMPEDANCE RATIO<br>$Z(T_2)/Z(T_1)$    | RATED VOLTAGE (V) |     |     |     |     |
| $T_2/T_1$                             | 200               | 250 | 350 | 400 | 450 |
| -25 °C / +20 °C                       | 3                 | 3   | 4   | 6   | 6   |

| ADDITIONAL ELECTRICAL DATA                          |                                     |                                                     |
|-----------------------------------------------------|-------------------------------------|-----------------------------------------------------|
| PARAMETER                                           | CONDITIONS                          | VALUE                                               |
| <b>Current</b>                                      |                                     |                                                     |
| Leakage current<br>(test conditions: $U_R$ , 20 °C) | After 5 min at $U_R$                | $I_{L5} \leq 0.02 \times C_R \times U_R + 25 \mu A$ |
| <b>Resistance</b>                                   |                                     |                                                     |
| Equivalent series resistance (ESR)                  | Calculated from $\tan \delta_{max}$ | $ESR = \tan \delta / 2 \pi f C_R$                   |

| MULTIPLIER OF RIPPLE CURRENT ( $I_R$ ) AS A FUNCTION OF FREQUENCY |                                       |                                       |
|-------------------------------------------------------------------|---------------------------------------|---------------------------------------|
| FREQUENCY<br>(Hz)                                                 | $I_R$ MULTIPLIER                      |                                       |
|                                                                   | 1.0 $\mu\text{F}$ ~ 4.7 $\mu\text{F}$ | 6.8 $\mu\text{F}$ ~ 150 $\mu\text{F}$ |
| 60                                                                | 0.25                                  | 0.35                                  |
| 120                                                               | 0.30                                  | 0.50                                  |
| 300                                                               | 0.45                                  | 0.60                                  |
| 1000                                                              | 0.60                                  | 0.80                                  |
| 10 000                                                            | 0.80                                  | 0.90                                  |
| $\geq 100\,000$                                                   | 1.00                                  | 1.00                                  |

| TEST PROCEDURES AND REQUIREMENTS |                                                                                                                                                      |                                                                                                                              |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| TEST                             | PROCEDURE<br>(quick reference)                                                                                                                       | REQUIREMENTS                                                                                                                 |
| Load life                        | $T_{\text{amb}} = 105\,^{\circ}\text{C}$<br>$U_R$ and $I_R$ applied<br>After 5000 h $\leq 6.8\,\mu\text{F}$<br>After 10 000 h $\geq 10\,\mu\text{F}$ | $\Delta C/C: \pm 20\,\%$ of initial value<br>$I_L \leq \text{spec. limit}$<br>$\tan \delta \leq 2 \times \text{spec. limit}$ |
| Shelf life                       | 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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