

Aluminum Capacitors Radial Standard Miniature

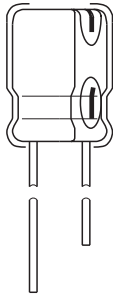
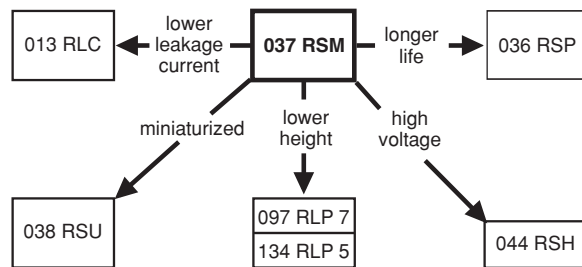


Fig.1 Component outline.



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case, insulated with a blue vinyl sleeve
- Pressure relief for case $\varnothing D \geq 6.3$ mm
- Charge and discharge proof
- Miniaturized, high CV-product per unit volume.

APPLICATIONS

- General purpose, industrial, automotive and audio-video
- Coupling, decoupling, timing, smoothing, filtering, buffering in SMPS
- Portable and mobile equipment (small size, low mass).

MARKING

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

- Rated capacitance (in μF).
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (M for $\pm 20\%$).
- Rated voltage (in V).
- Date code in accordance with IEC 60062.
- Code indicating factory of origin.
- Name of manufacturer.
- Negative terminal identification.
- Series number (037).

QUICK REFERENCE DATA

| DESCRIPTION | VALUE |
|------------------------------------------------------|------------------------------------|
| Nominal case sizes ($\varnothing D \times L$ in mm) | 5 × 11 to 16 × 31 |
| Rated capacitance range, C_R | 0.47 to 10000 μF |
| Tolerance on C_R | $\pm 20\%$; $\pm 10\%$ on request |
| Rated voltage range, U_R | 6.3 to 100 V |
| Category temperature range | -40 to +85 °C |
| Endurance test at 85 °C | 2000 hours |
| Useful life at 85 °C | 2500 hours |
| Useful life at 40 °C, $1.4 \times I_R$ applied | 70000 hours |
| Shelf life at 0 V, 85 °C | 500 hours |
| Based on sectional specification | IEC 60384-4/EN130300 |
| Climatic category IEC 60068 | 40/085/56 |

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

| C_R (μF) | U_R (V) | | | | | | | | |
|----------------------------|-----------|----------|----------|----------|---------|---------|----------|----------|-----------|
| | 6.3 | 10 | 16 | 25 | 35 | 40 | 50 | 63 | 100 |
| 0.47 | - | - | - | - | - | - | - | 5 × 11 | 5 × 11 |
| 1.0 | - | - | - | - | - | - | - | 5 × 11 | 5 × 11 |
| 2.2 | - | - | - | - | - | - | - | 5 × 11 | 5 × 11 |
| 3.3 | - | - | - | - | - | - | - | 5 × 11 | 5 × 11 |
| 4.7 | - | - | - | - | - | - | - | 5 × 11 | 5 × 11 |
| 10 | - | - | - | - | - | - | 5 × 11 | 5 × 11 | 6.3 × 11 |
| 22 | - | - | - | - | - | - | 5 × 11 | 6.3 × 11 | 8 × 12 |
| 33 | - | - | - | - | 5 × 11 | - | - | 6.3 × 11 | 10 × 12 |
| 47 | - | - | - | 5 × 11 | - | - | 6.3 × 11 | 8 × 12 | 10 × 16 |
| 68 | - | - | 5 × 11 | 6.3 × 11 | - | - | 8 × 12 | 10 × 12 | - |
| 100 | - | 5 × 11 | 6.3 × 11 | 6.3 × 11 | - | - | 8 × 12 | 10 × 12 | 10 × 20 |
| 150 | - | 6.3 × 11 | - | 8 × 12 | - | 10 × 12 | - | 10 × 16 | - |
| 220 | - | 6.3 × 11 | 8 × 12 | 8 × 12 | 10 × 12 | - | 10 × 16 | 10 × 20 | 12.5 × 25 |

| SELECTION CHART FOR C_R , U_R AND RELEVANT NOMINAL CASE SIZES ($\varnothing D \times L$ in mm) | | | | | | | | | |
|-----------------------------------------------------------------------------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|
| C_R (μF) | U_R (V) | | | | | | | | |
| | 6.3 | 10 | 16 | 25 | 35 | 40 | 50 | 63 | 100 |
| 330 | 6.3 x 1 | - | 8 x 12 | 10 x 12 | 10 x 16 | - | 10 x 20 | 12.5 x 20 | 16 x 25 |
| 470 | - | 8 x 12 | 10 x 12 | 10 x 16 | 10 x 20 | 12.5 x 20 | 12.5 x 20 | 12.5 x 25 | 16 x 31 |
| 680 | - | - | 10 x 16 | - | 12.5 x 20 | 12.5 x 25 | 12.5 x 25 | 16 x 25 | - |
| 1000 | 10 x 12 | 10 x 16 | 10 x 20 | 12.5 x 20 | 12.5 x 25 | 16 x 25 | 16 x 25 | 16 x 31 | - |
| 1500 | 10 x 20 | - | 12.5 x 20 | 12.5 x 25 | 16 x 25 | - | - | - | - |
| 2200 | 12.5 x | 12.5 x 20 | 12.5 x 25 | 16 x 25 | 16 x 31 | - | - | - | - |
| 3300 | 12.5 x | 12.5 x 25 | 16 x 25 | 16 x 31 | - | - | - | - | - |
| 4700 | - | 16 x 25 | 16 x 31 | - | - | - | - | - | - |
| 6800 | - | 16 x 31 | - | - | - | - | - | - | - |
| 10000 | 16 x 31 | - | - | - | - | - | - | - | - |

DIMENSIONS in millimeters **AND AVAILABLE FORMS**

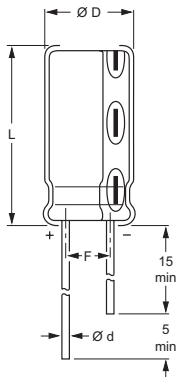


Fig.2 Form CA:
Long leads.

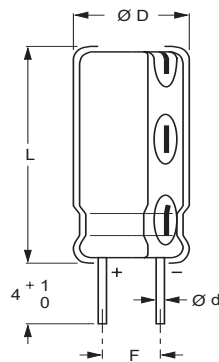
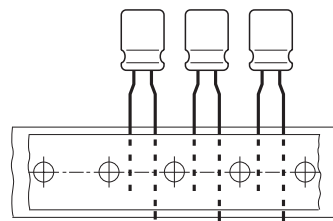
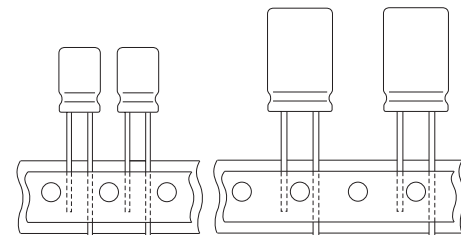


Fig.3 Form CB:
Cut leads.



Case $\varnothing D = 5$ to 8 mm; pitch $F = 5$ mm.



Pitch F see tables 1 and 2.

Table 1

| DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES | | | | | | | | | |
|----------------------------------------------------------|-----------|-----------------|-----------------------|-----------|----------|----------|----------------------|---------|---------------|
| NOMINAL CASE SIZE $\varnothing D \times L$ | CASE code | $\varnothing d$ | $\varnothing D_{max}$ | L_{max} | F | MASS (g) | PACKAGING QUANTITIES | | |
| | | | | | | | FORM CA | FORM CB | FORM TFA, TNA |
| 5 x 11 | 11 | 0.5 | 5.5 | 12.5 | 2.0 ±0.5 | ≈0.4 | 3000 | - | 2000 |
| 6.3 x 11 | 12 | 0.5 | 6.8 | 12.5 | 2.5 ±0.5 | ≈0.6 | 2000 | - | 2000 |
| 8 x 12 | 13 | 0.6 | 8.5 | 13.0 | 3.5 ±0.5 | ≈1.1 | 1000 | - | 1000 |
| 10 x 12 | 14 | 0.6 | 10.5 | 13.5 | 5.0 ±0.5 | ≈1.6 | 1000 | 1000 | 500 |
| 10 x 16 | 15 | 0.6 | 10.5 | 17.5 | 5.0 ±0.5 | ≈1.9 | 1000 | 1000 | 500 |
| 10 x 20 | 16 | 0.6 | 10.5 | 22.0 | 5.0 ±0.5 | ≈2.2 | 1000 | 500 | 500 |
| 12.5 x 20 | 17 | 0.6 | 13.0 | 22.0 | 5.0 ±0.5 | ≈4.0 | 1000 | 2000 | 500 |
| 12.5 x 25 | 18 | 0.6 | 13.0 | 27.0 | 5.0 ±0.5 | ≈5.0 | 500 | 2000 | 500 |
| 16 x 25 | 19 | 0.8 | 16.5 | 27.0 | 7.5 ±0.5 | ≈8.0 | 500 | 1000 | 250 |
| 16 x 31 | 20 | 0.8 | 16.5 | 33.5 | 7.5 ±0.5 | ≈9.0 | 200 | 1000 | 250 |

Note

1. Detailed tape dimensions see section 'PACKAGING'.



| ELECTRICAL DATA | |
|-----------------|---------------------------------------------------|
| SYMBOL | DESCRIPTION |
| C_R | rated capacitance at 100 Hz, tolerance $\pm 20\%$ |
| I_R | rated RMS ripple current at 100 Hz, 85 °C |
| I_{L1} | max. leakage current after 1 minute at U_R |
| Tan δ | max. dissipation factor at 100 Hz |
| Z | max. impedance at 10 kHz |

ORDERING EXAMPLE

Electrolytic capacitor 037 series
 1000 $\mu\text{F}/16\text{ V}$; $\pm 20\%$
 Nominal case size: $\varnothing 10 \times 20\text{ mm}$; Form TFA
 Catalog number: 2222 037 35102.

Note

- Unless otherwise specified, all electrical values in Table 2 apply at $T_{\text{amb}} = 20\text{ °C}$, $P = 86\text{ to }106\text{ kPa}$, $\text{RH} = 45\text{ to }75\%$.

Table 2

| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | | | | | | |
|------------------------------------------|--------------------------------------|----------------------------------------------------------|----------------------------------|----------------------------------------|------------------------|-----------------------------|-------------------------------|-----------|------------|-----------|----------------|-----------|-------------|-----------|--|
| U_R (V) | C_R 100 Hz (μF) | NOMINAL CASE SIZE $\varnothing D \times L$ (mm) | I_R 100 Hz 85 °C (mA) | I_{L1} 1 min (μA) | Tan δ 100 Hz | Z 10 kHz (Ω) | CATALOG NUMBER 2222 037 | | | | | | | | |
| | | | | | | | BULK PACKAGING | | | | TAPED AMMOPACK | | | | |
| | | | | | | | LONG LEADS | | CUT LEADS | | FORM TFA | | FORM TNA | | |
| | | | | | | | FORM CA | F (mm) | FORM CB | F (mm) | FORM TFA | F (mm) | FORM TNA | F (mm) | |
| 6.3 | 330 | 6.3 × 11 | 280 | 24 | 0.24 | 1.8 | 90021 | 2.5 | – | – | 90027 | 5.0 | 90028 | 2.5 | |
| | 1000 | 10 × 12 | 530 | 66 | 0.24 | 0.6 | 53102 | 5.0 | 63102 | 5.0 | 33102 | 5.0 | – | – | |
| | 1500 | 10 × 20 | 730 | 98 | 0.25 | 0.4 | 53152 | 5.0 | 63152 | 5.0 | 33152 | 5.0 | – | – | |
| | 2200 | 12.5 × 20 | 990 | 140 | 0.26 | 0.27 | 53222 | 5.0 | 63222 | 5.0 | 33222 | 5.0 | – | – | |
| | 3300 | 12.5 × 20 | 1150 | 210 | 0.28 | 0.18 | 53332 | 5.0 | 63332 | 5.0 | 33332 | 5.0 | – | – | |
| | 10000 | 16 × 31 | 2250 | 630 | 0.42 | 0.07 | 53103 | 7.5 | 63103 | 7.5 | 33103 | 7.5 | – | – | |
| 10 | 100 | 5 × 11 | 140 | 13 | 0.20 | 4.5 | 54101 | 2.0 | – | – | 34101 | 5.0 | 74101 | 2.5 | |
| | 150 | 6.3 × 11 | 180 | 18 | 0.20 | 3.0 | 54151 | 2.5 | – | – | 34151 | 5.0 | 74151 | 2.5 | |
| | 220 | 6.3 × 11 | 250 | 25 | 0.20 | 2.0 | 90029 | 2.5 | – | – | 90036 | 5.0 | 90037 | 2.5 | |
| | 470 | 8 × 12 | 410 | 50 | 0.20 | 0.96 | 54471 | 3.5 | – | – | 34471 | 5.0 | 74471 | 3.5 | |
| | 1000 | 10 × 16 | 630 | 100 | 0.20 | 0.45 | 54102 | 5.0 | 64102 | 5.0 | 34102 | 5.0 | – | – | |
| | 2200 | 12.5 × 20 | 1050 | 220 | 0.22 | 0.20 | 54222 | 5.0 | 64222 | 5.0 | 34222 | 5.0 | – | – | |
| | 3300 | 12.5 × 25 | 1350 | 330 | 0.24 | 0.14 | 54332 | 5.0 | 64332 | 5.0 | 34332 | 5.0 | – | – | |
| | 4700 | 16 × 25 | 1800 | 470 | 0.28 | 0.10 | 54472 | 7.5 | 64472 | 7.5 | 34472 | 7.5 | – | – | |
| | 6800 | 16 × 31 | 2200 | 680 | 0.32 | 0.07 | 54682 | 7.5 | 64682 | 7.5 | 34682 | 7.5 | – | – | |
| 16 | 68 | 5 × 11 | 130 | 14 | 0.16 | 4.7 | 55689 | 2.0 | – | – | 35689 | 5.0 | 75689 | 2.5 | |
| | 100 | 6.3 × 11 | 180 | 19 | 0.16 | 3.2 | 55101 | 2.5 | – | – | 35101 | 5.0 | 75101 | 2.5 | |
| | 220 | 8 × 12 | 300 | 38 | 0.16 | 1.5 | 55221 | 3.5 | – | – | 35221 | 5.0 | 75221 | 3.5 | |
| | 330 | 8 × 12 | 370 | 56 | 0.16 | 0.97 | 90038 | 3.5 | – | – | 90045 | 5.0 | 90046 | 3.5 | |
| | 470 | 10 × 12 | 420 | 78 | 0.16 | 0.68 | 55471 | 5.0 | 65471 | 5.0 | 35471 | 5.0 | – | – | |
| | 680 | 10 × 16 | 520 | 110 | 0.16 | 0.47 | 55681 | 5.0 | 65681 | 5.0 | 35681 | 5.0 | – | – | |
| | 1000 | 10 × 20 | 740 | 160 | 0.16 | 0.32 | 55102 | 5.0 | 65102 | 5.0 | 35102 | 5.0 | – | – | |
| | 1500 | 12.5 × 20 | 900 | 240 | 0.17 | 0.21 | 55152 | 5.0 | 65152 | 5.0 | 35152 | 5.0 | – | – | |
| | 2200 | 12.5 × 25 | 1200 | 360 | 0.18 | 0.15 | 55222 | 5.0 | 65222 | 5.0 | 35222 | 5.0 | – | – | |
| | 3300 | 16 × 25 | 1650 | 530 | 0.20 | 0.10 | 55332 | 7.5 | 65332 | 7.5 | 35332 | 7.5 | – | – | |
| | 4700 | 16 × 31 | 2100 | 760 | 0.24 | 0.07 | 55472 | 7.5 | 65472 | 7.5 | 35472 | 7.5 | – | – | |



| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | | | | | | |
|------------------------------------------|----------------------------------|----------------------------------------|-------------------------------------------|----------------------------------|-----------------|--------------------|-------------------------------|-----------|------------|-----------|----------------|-----------|-------------|-----------|-----|
| U _R (V) | C _R 100 Hz (μF) | NOMINAL CASE SIZE ØD x L (mm) | I _R 100 Hz 85 °C (mA) | I _{L1} 1 min (μA) | Tan δ 100 Hz | Z 10 kHz (Ω) | CATALOG NUMBER 2222 037 | | | | | | | | |
| | | | | | | | BULK PACKAGING | | | | TAPED AMMOPACK | | | | |
| | | | | | | | LONG LEADS | | CUT LEADS | | FORM TFA | F (mm) | FORM TNA | F (mm) | |
| | | | | | | | FORM CA | F (mm) | FORM CB | F (mm) | | | | | |
| 25 | 47 | 5 × 11 | 120 | 15 | 0.14 | 4.7 | 56479 | 2.0 | - | - | 36479 | 5.0 | 76479 | 2.5 | |
| | 68 | 6.3 × 11 | 130 | 20 | 0.14 | 3.2 | 56689 | 2.5 | - | - | 36689 | 5.0 | 76689 | 2.5 | |
| | 100 | 6.3 × 11 | 190 | 28 | 0.14 | 2.2 | 90047 | 2.5 | - | - | 90054 | 5.0 | 90055 | 2.5 | |
| | 150 | 8 × 12 | 230 | 41 | 0.14 | 1.5 | 56151 | 3.5 | - | - | 36151 | 5.0 | 76151 | 3.5 | |
| | 220 | 8 × 12 | 320 | 58 | 0.14 | 1.0 | 56221 | 3.5 | - | - | 36221 | 5.0 | 76221 | 3.5 | |
| | 330 | 10 × 12 | 410 | 86 | 0.14 | 0.67 | 56331 | 5.0 | 66331 | 5.0 | 36331 | 5.0 | - | - | |
| | 470 | 10 × 16 | 510 | 120 | 0.14 | 0.47 | 56471 | 5.0 | 66471 | 5.0 | 36471 | 5.0 | - | - | |
| | 1000 | 12.5 × 20 | 910 | 250 | 0.14 | 0.22 | 56102 | 5.0 | 66102 | 5.0 | 36102 | 5.0 | - | - | |
| | 1500 | 12.5 × 25 | 1100 | 380 | 0.15 | 0.15 | 56152 | 5.0 | 66152 | 5.0 | 36152 | 5.0 | - | - | |
| | 2200 | 16 × 25 | 1500 | 550 | 0.16 | 0.10 | 56222 | 7.5 | 66222 | 7.5 | 36222 | 7.5 | - | - | |
| | 3300 | 16 × 31 | 1900 | 830 | 0.18 | 0.07 | 56332 | 7.5 | 66332 | 7.5 | 36332 | 7.5 | - | - | |
| | 35 | 33 | 5 × 11 | 110 | 15 | 0.12 | 4.5 | 50339 | 2.0 | - | - | 30339 | 5.0 | 70339 | 2.5 |
| | | 220 | 10 × 12 | 330 | 80 | 0.12 | 0.68 | 50221 | 5.0 | 60221 | 5.0 | 30221 | 5.0 | - | - |
| 330 | | 10 × 16 | 450 | 120 | 0.12 | 0.45 | 50331 | 5.0 | 60331 | 5.0 | 30331 | 5.0 | - | - | |
| 470 | | 10 × 20 | 590 | 170 | 0.12 | 0.32 | 50471 | 5.0 | 60471 | 5.0 | 30471 | 5.0 | - | - | |
| 680 | | 12.5 × 20 | 830 | 240 | 0.12 | 0.22 | 50681 | 5.0 | 60681 | 5.0 | 30681 | 5.0 | - | - | |
| 1000 | | 12.5 × 25 | 1050 | 350 | 0.12 | 0.15 | 50102 | 5.0 | 60102 | 5.0 | 30102 | 5.0 | - | - | |
| 1500 | | 16 × 25 | 1400 | 530 | 0.13 | 0.10 | 50152 | 7.5 | 60152 | 7.5 | 30152 | 7.5 | - | - | |
| 2200 | | 16 × 31 | 1750 | 770 | 0.14 | 0.07 | 50222 | 7.5 | 60222 | 7.5 | 30222 | 7.5 | - | - | |
| 40 | | 150 | 10 × 12 | 250 | 63 | 0.12 | 0.87 | 57151 | 5.0 | 67151 | 5.0 | 37151 | 5.0 | - | - |
| | 470 | 12.5 × 20 | 670 | 190 | 0.12 | 0.28 | 57471 | 5.0 | 67471 | 5.0 | 37471 | 5.0 | - | - | |
| | 680 | 12.5 × 25 | 850 | 280 | 0.12 | 0.19 | 57681 | 5.0 | 67681 | 5.0 | 37681 | 5.0 | - | - | |
| | 1000 | 16 × 25 | 1200 | 400 | 0.12 | 0.13 | 57102 | 7.5 | 67102 | 7.5 | 37102 | 7.5 | - | - | |
| 50 | 10 | 5 × 11 | 65 | 8 | 0.10 | 9.5 | 51109 | 2.0 | - | - | 31109 | 5.0 | 71109 | 2.5 | |
| | 22 | 5 × 11 | 95 | 14 | 0.10 | 4.3 | 90056 | 2.0 | - | - | 90063 | 5.0 | 90064 | 2.5 | |
| | 47 | 6.3 × 11 | 150 | 27 | 0.10 | 2.0 | 90065 | 2.5 | - | - | 90072 | 5.0 | 90073 | 2.5 | |
| | 68 | 8 × 12 | 190 | 37 | 0.10 | 1.4 | 51689 | 3.5 | - | - | 31689 | 5.0 | 71689 | 3.5 | |
| | 100 | 8 × 12 | 260 | 53 | 0.10 | 0.95 | 51101 | 3.5 | - | - | 31101 | 5.0 | 71101 | 3.5 | |
| | 220 | 10 × 16 | 400 | 110 | 0.10 | 0.43 | 51221 | 5.0 | 61221 | 5.0 | 31221 | 5.0 | - | - | |
| | 330 | 10 × 20 | 580 | 170 | 0.10 | 0.29 | 51331 | 5.0 | 61331 | 5.0 | 31331 | 5.0 | - | - | |
| | 470 | 12.5 × 20 | 740 | 240 | 0.10 | 0.20 | 51471 | 5.0 | 61471 | 5.0 | 31471 | 5.0 | - | - | |
| | 680 | 12.5 × 25 | 950 | 340 | 0.10 | 0.14 | 51681 | 5.0 | 61681 | 5.0 | 31681 | 5.0 | - | - | |
| | 1000 | 16 × 25 | 1350 | 500 | 0.10 | 0.10 | 51102 | 7.5 | 61102 | 7.5 | 31102 | 7.5 | - | - | |
| | 63 | 0.47 | 5 × 11 | 11 | 3.3 | 0.09 | 170 | 58477 | 2.0 | - | - | 38477 | 5.0 | 78477 | 2.5 |
| 1.0 | | 5 × 11 | 16 | 3.6 | 0.09 | 80 | 58108 | 2.0 | - | - | 38108 | 5.0 | 78108 | 2.5 | |
| 2.2 | | 5 × 11 | 29 | 4.4 | 0.09 | 36 | 58228 | 2.0 | - | - | 38228 | 5.0 | 78228 | 2.5 | |
| 3.3 | | 5 × 11 | 35 | 5.1 | 0.09 | 24 | 58338 | 2.0 | - | - | 38338 | 5.0 | 78338 | 2.5 | |
| 4.7 | | 5 × 11 | 45 | 6.0 | 0.09 | 17 | 58478 | 2.0 | - | - | 38478 | 5.0 | 78478 | 2.5 | |
| 10 | | 5 × 11 | 70 | 9.3 | 0.09 | 8.0 | 58109 | 2.0 | - | - | 38109 | 5.0 | 78109 | 2.5 | |
| 22 | | 6.3 × 11 | 110 | 17 | 0.09 | 3.6 | 58229 | 2.5 | - | - | 38229 | 5.0 | 78229 | 2.5 | |
| 33 | | 6.3 × 11 | 140 | 24 | 0.09 | 2.4 | 90074 | 2.5 | - | - | 90081 | 5.0 | 90082 | 2.5 | |
| 47 | | 8 × 12 | 190 | 33 | 0.09 | 1.7 | 58479 | 3.5 | - | - | 38479 | 5.0 | 78479 | 3.5 | |
| 68 | | 10 × 12 | 200 | 46 | 0.09 | 1.2 | 58689 | 5.0 | 68689 | 5.0 | 38689 | 5.0 | - | - | |
| 100 | | 10 × 12 | 260 | 66 | 0.09 | 0.80 | 58101 | 5.0 | 68101 | 5.0 | 38101 | 5.0 | - | - | |
| 150 | | 10 × 16 | 320 | 98 | 0.09 | 0.53 | 58151 | 5.0 | 68151 | 5.0 | 38151 | 5.0 | - | - | |
| 220 | | 10 × 20 | 460 | 140 | 0.09 | 0.36 | 58221 | 5.0 | 68221 | 5.0 | 38221 | 5.0 | - | - | |
| 330 | | 12.5 × 20 | 650 | 210 | 0.09 | 0.24 | 58331 | 5.0 | 68331 | 5.0 | 38331 | 5.0 | - | - | |
| 470 | | 12.5 × 25 | 850 | 300 | 0.09 | 0.17 | 58471 | 5.0 | 68471 | 5.0 | 38471 | 5.0 | - | - | |
| 680 | | 16 × 25 | 1150 | 430 | 0.09 | 0.12 | 58681 | 7.5 | 68681 | 7.5 | 38681 | 7.5 | - | - | |
| 1000 | 16 × 31 | 1550 | 630 | 0.09 | 0.08 | 58102 | 7.5 | 68102 | 7.5 | 38102 | 7.5 | - | - | | |
| 100 | 0.47 | 5 × 11 | 12 | 3.5 | 0.07 | 130 | 59477 | 2.0 | - | - | 39477 | 5.0 | 79477 | 2.5 | |
| | 1.0 | 5 × 11 | 22 | 4 | 0.07 | 60 | 59108 | 2.0 | - | - | 39108 | 5.0 | 79108 | 2.5 | |
| | 2.2 | 5 × 11 | 33 | 5.2 | 0.07 | 27 | 59228 | 2.0 | - | - | 39228 | 5.0 | 79228 | 2.5 | |
| | 3.3 | 5 × 11 | 40 | 6.3 | 0.07 | 18 | 59338 | 2.0 | - | - | 39338 | 5.0 | 79338 | 2.5 | |
| | 4.7 | 5 × 11 | 48 | 7.7 | 0.07 | 13 | 59478 | 2.0 | - | - | 39478 | 5.0 | 79478 | 2.5 | |
| | 10 | 6.3 × 11 | 80 | 13 | 0.07 | 6.0 | 59109 | 2.5 | - | - | 39109 | 5.0 | 79109 | 2.5 | |
| | 22 | 8 × 12 | 130 | 25 | 0.07 | 2.7 | 59229 | 3.5 | - | - | 39229 | 5.0 | 79229 | 3.5 | |
| | 33 | 10 × 12 | 160 | 36 | 0.07 | 1.8 | 59339 | 5.0 | 69339 | 5.0 | 39339 | 5.0 | - | - | |
| | 47 | 10 × 16 | 210 | 50 | 0.07 | 1.3 | 59479 | 5.0 | 69479 | 5.0 | 39479 | 5.0 | - | - | |
| | 100 | 10 × 20 | 350 | 100 | 0.07 | 0.60 | 59101 | 5.0 | 69101 | 5.0 | 39101 | 5.0 | - | - | |
| | 220 | 12.5 × 25 | 580 | 220 | 0.07 | 0.27 | 59221 | 5.0 | 69221 | 5.0 | 39221 | 5.0 | - | - | |
| | 330 | 16 × 25 | 710 | 330 | 0.07 | 0.18 | 59331 | 7.5 | 69331 | 7.5 | 39331 | 7.5 | - | - | |
| | 470 | 16 × 31 | 900 | 470 | 0.07 | 0.13 | 59471 | 7.5 | 69471 | 7.5 | 39471 | 7.5 | - | - | |

| ADDITIONAL ELECTRICAL DATA | | |
|------------------------------------|-------------------------------------------------------------|----------------------------------------------------|
| PARAMETER | CONDITIONS | VALUE |
| Voltage | | |
| Surge voltage | | $U_s \leq 1.15 \times U_R$ |
| Reverse voltage | | $U_{rev} \leq 1 \text{ V}$ |
| Current | | |
| Leakage current | after 1 minute at U_R | $I_{L1} \leq 0.01 C_R \times U_R + 3 \mu\text{A}$ |
| | after 5 minutes at U_R | $I_{L5} \leq 0.002 C_R \times U_R + 3 \mu\text{A}$ |
| Inductance | | |
| Equivalent series inductance (ESL) | case $\varnothing D \leq 8 \text{ mm}$ | typ. 13 nH |
| | case $\varnothing D = 10 \text{ mm}$ | typ. 16 nH |
| | case $\varnothing D \geq 12.5 \text{ mm}$ | typ. 18 nH |
| Resistance | | |
| Equivalent series resistance (ESR) | calculated from $\tan \delta_{max}$ and C_R (see Table 2) | $ESR = \tan \delta / 2\pi f C_R$ |

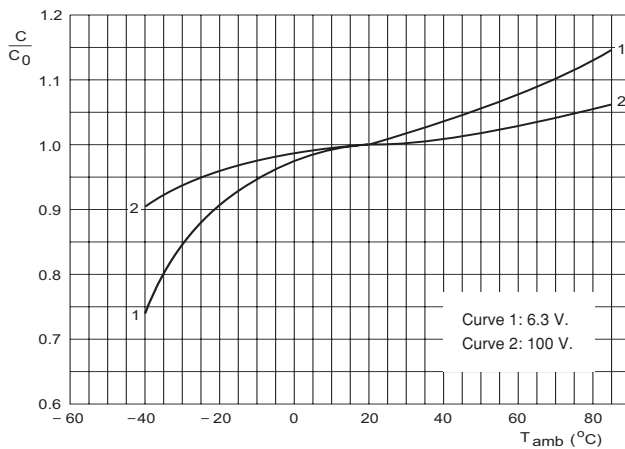
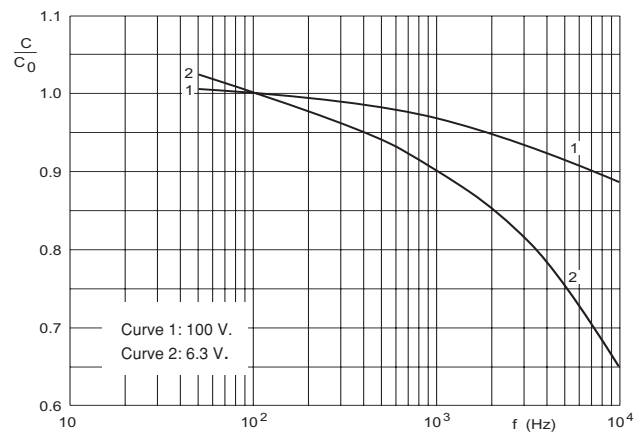
CAPACITANCE (C)

 C_0 = capacitance at 20 °C, 100Hz.

Fig.6 Typical multiplier of capacitance as a function of ambient temperature.


 C_0 = capacitance at 20 °C, 100Hz.

 $T_{amb} = 20 \text{ }^\circ\text{C}$.

Fig.7 Typical multiplier of capacitance as a function of frequency.

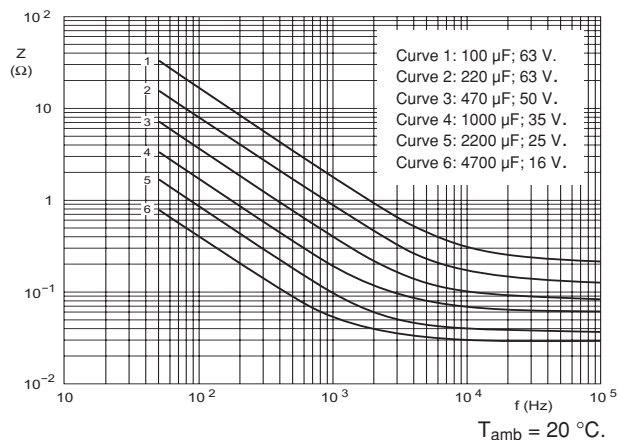
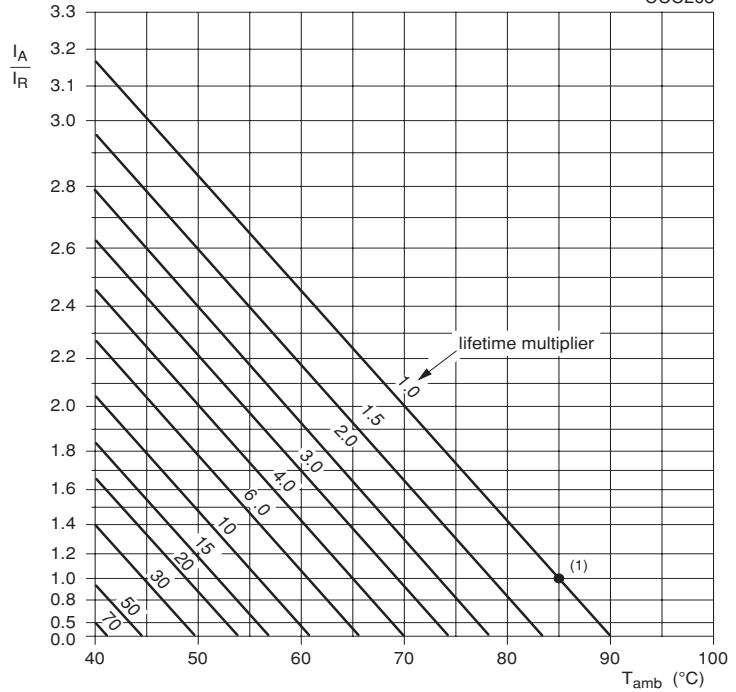
IMPEDANCE (Z)

 $T_{amb} = 20 \text{ }^\circ\text{C}$.

Fig.8 Typical impedance as a function of frequency.



RIPPLE CURRENT AND USEFUL LIFE

CCC205



I_A = actual ripple current at 100 Hz.
 I_R = rated ripple current at 100 Hz, 85 °C.
 (1) Useful life at 85 °C and I_R applied: 2500 hours.

Fig.9 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 | | |
| | $U_R = 6.3$ to 10 V | $U_R = 16$ to 35 V | $U_R = 40$ to 100 V |
| 50 | 0.90 | 0.85 | 0.80 |
| 100 | 1.00 | 1.00 | 1.00 |
| 500 | 1.12 | 1.20 | 1.25 |
| 1000 | 1.20 | 1.30 | 1.40 |
| 3000 | 1.25 | 1.35 | 1.50 |
| ≥ 10000 | 1.30 | 1.40 | 1.60 |

Table 4

| TEST PROCEDURES AND REQUIREMENTS | | | |
|------------------------------------------|--------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TEST | | PROCEDURE (quick reference) | REQUIREMENTS |
| Name of test | Reference | | |
| Endurance | IEC 60384-4/ EN130300 subclause 4.13 | $T_{amb} = 85$ °C; U_R applied; 2000 hours | $U_R \leq 6.3$ V; $\Delta C/C$: +15/-30% $U_R > 6.3$ V; $\Delta C/C$: $\pm 20\%$ $\tan \delta \leq 1.5 \times$ spec. limit $Z \leq 3 \times$ spec. limit $I_{L5} \leq$ spec. limit |
| Useful life | CECC 30301 subclause 1.8.1 | $T_{amb} = 85$ °C; U_R and I_R applied; 2500 hours | $U_R \leq 6.3$ V; $\Delta C/C$: +45/-50% $U_R > 6.3$ V; $\Delta C/C$: $\pm 50\%$ $\tan \delta \leq 3 \times$ spec. limit $Z \leq 3 \times$ spec. limit $I_{L5} \leq$ spec. limit no short or open circuit total failure percentage: $\leq 3\%$ |
| Shelf life (storage at high temperature) | IEC 60384-4/ EN130300 subclause 4.17 | $T_{amb} = 85$ °C; no voltage applied; 500 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement | $\Delta C/C$, $\tan \delta$, Z : for requirements see 'Endurance test' above $I_{L5} \leq 2 \times$ spec. limit |