

Aluminum Capacitors Radial Low Profile, 5 mm

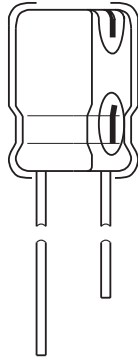
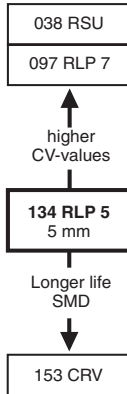


Fig.1 Component outline



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case, insulated with a blue vinyl sleeve
- Charge and discharge proof
- Very low profile, 5 mm height
- Extremely miniaturized
- Lead (Pb)-free versions are RoHS compliant


**RoHS
COMPLIANT**

APPLICATIONS

General purpose, industrial, automotive and audio-video

- Coupling, decoupling, smoothing, filtering and timing
- High mounting density
- Portable and mobile equipment (very small size and very low mass), low profile equipment

MARKING

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

- Rated capacitance (in μF)
- Rated voltage (in V)
- Negative terminal identification
- Code indicating factory of origin
- Name of manufacturer
- Date code, in accordance with IEC 60062
- Series number (134)

| QUICK REFERENCE DATA | |
|--|--------------------------|
| DESCRIPTION | VALUE |
| Nominal case sizes ($\varnothing D \times L$ in mm) | 4 x 5 to 6.3 x 5 |
| Rated capacitance range, C_R | 1.0 to 100 μF |
| Tolerance on C_R | $\pm 20\%$ |
| Rated voltage range, U_R | 6.3 to 50 V |
| Category temperature range | - 40 to + 85 °C |
| Endurance test at 85 °C | 1000 hours |
| Useful life at 85 °C | 1500 hours |
| Useful life at 40 °C, 1.4 x I_R applied | 40 000 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 | 50 |
| 1.0 | - | - | - | - | - | 4 x 5 |
| 2.2 | - | - | - | - | - | 4 x 5 |
| 3.3 | - | - | - | - | - | 4 x 5 |
| 4.7 | - | - | - | - | 4 x 5 | 5 x 5 |
| 10 | - | - | 4 x 5 | - | 5 x 5 | 6.3 x 5 |
| 22 | 4 x 5 | - | 5 x 5 | - | 6.3 x 5 | - |
| 33 | - | 5 x 5 | - | 6.3 x 5 | - | - |
| 47 | 5 x 5 | - | 6.3 x 5 | - | - | - |
| 100 | 6.3 x 5 | - | - | - | - | - |

DIMENSIONS in millimeters **AND AVAILABLE FORMS**

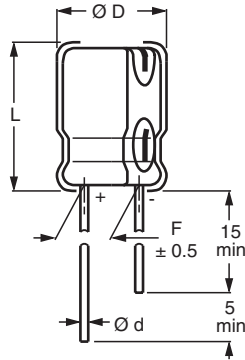
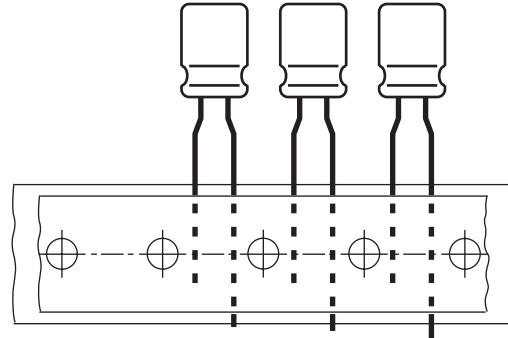
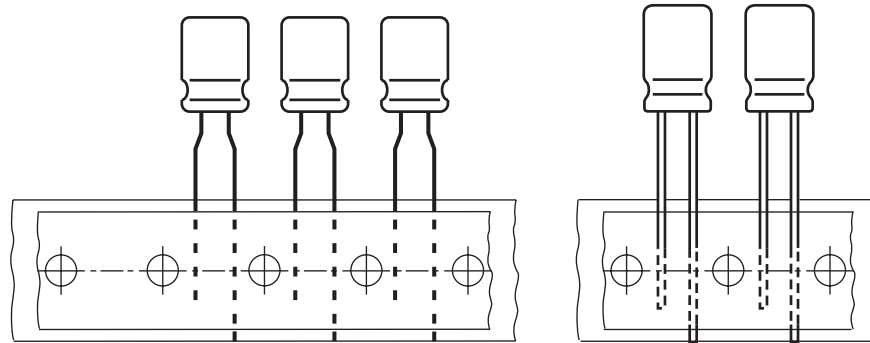


Fig.2 **Form CA:** Long leads



Case Ø D = 4 to 6.3 mm; pitch F = 5 mm

Fig.3 **Form TFA:** Taped in box (ammopack)



pitch F = 2.5 mm
Case Ø D = 4 to 6.3 mm

Fig.4 **Form TNA:** Taped in box (ammopack)

Table 1

| DIMENSIONS in millimeters AND PACKAGING QUANTITIES | | | | | | | | |
|--|--------------|------|---------------------|-------------------|-----------|----------------------|-------------|-------------|
| NOMINAL CASE SIZE Ø D x L | CASE CODE | Ø d | Ø D _{max.} | L _{max.} | F | PACKAGING QUANTITIES | | |
| | | | | | | FORM CA | FORM TFA | FORM TNA |
| 4 x 5 | 53 | 0.45 | 4.5 | 6.0 | 1.5 ± 0.5 | 2000 | 2000 | 2000 |
| 5 x 5 | 54 | 0.45 | 5.5 | 6.0 | 2.0 ± 0.5 | 2000 | 2000 | 2000 |
| 6.3 x 5 | 55 | 0.45 | 6.8 | 6.0 | 2.5 ± 0.5 | 2000 | 2000 | 2000 |

Note

Detailed tape dimensions see section 'PACKAGING'.

| ELECTRICAL DATA | |
|-----------------|---|
| SYMBOL | DESCRIPTION |
| C_R | rated capacitance at 120 Hz, tolerance $\pm 20\%$ |
| I_R | rated RMS ripple current at 120 Hz, 85 °C |
| I_{L2} | max. leakage current after 2 minutes at U_R |
| $\tan \delta$ | max. dissipation factor at 120 Hz |
| Z | max. impedance at 100 kHz |

Note

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

ORDERING EXAMPLE

Electrolytic capacitor 134 series

22 $\mu\text{F}/16\text{ V}$; $\pm 20\%$

Nominal case size: $\varnothing 5 \times 5\text{ mm}$; Form TFA

Ordering Code: MAL213435229E3

Former 12NC: 2222 134 35229

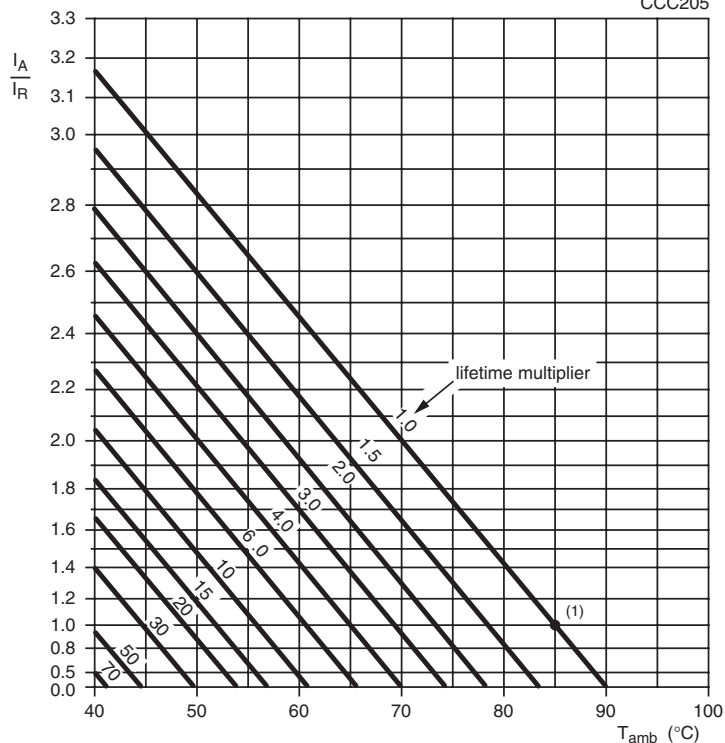
| ELECTRICAL DATA AND ORDERING INFORMATION | | | | | | | | | | | | |
|--|--------------------------------------|--|----------------------------------|--|-------------------------|--------------------------------|-------------------------------|-----------|-------------------|-----------|-------------|-----------|
| U_R (V) | C_R 120 Hz (μF) | NOMINAL CASE SIZE $\varnothing D \times L$ (mm) | I_R 120 Hz 85 °C (mA) | I_{L2} 2 min (μA) | $\tan \delta$ 120 Hz | Z 100 kHz (Ω) | ORDERING CODE MAL2134..... | | | | | |
| | | | | | | | BULK LONG LEADS | | TAPED AMMOPACK | | | |
| | | | | | | | FORM CA | F (mm) | FORM TFA | F (mm) | FORM TNA | F (mm) |
| 6.3 | 22 | 4 x 5 | 23 | 3 | 0.24 | 11 | 53229E3 | 1.5 | 33229E3 | 5.0 | 73229E3 | 2.5 |
| | 47 | 5 x 5 | 38 | 3 | 0.24 | 5.2 | 53479E3 | 2.0 | 33479E3 | 5.0 | 73479E3 | 2.5 |
| | 100 | 6.3 x 5 | 60 | 7 | 0.24 | 3.4 | 53101E3 | 2.5 | 33101E3 | 5.0 | 73101E3 | 2.5 |
| 10 | 33 | 5 x 5 | 35 | 4 | 0.20 | 6.0 | 54339E3 | 2.0 | 34339E3 | 5.0 | 74339E3 | 2.5 |
| 16 | 10 | 4 x 5 | 20 | 3 | 0.16 | 12 | 95105E3 | 1.5 | 95103E3 | 5.0 | 95107E3 | 2.5 |
| | 22 | 5 x 5 | 32 | 4 | 0.16 | 6.4 | 55229E3 | 2.0 | 35229E3 | 5.0 | 75229E3 | 2.5 |
| | 47 | 6.3 x 5 | 50 | 8 | 0.16 | 4.2 | 55479E3 | 2.5 | 35479E3 | 5.0 | 75479E3 | 2.5 |
| 25 | 33 | 6.3 x 5 | 45 | 9 | 0.14 | 4.6 | 56339E3 | 2.5 | 36339E3 | 5.0 | 76339E3 | 2.5 |
| 35 | 4.7 | 4 x 5 | 15 | 3 | 0.12 | 27 | 50478E3 | 1.5 | 30478E3 | 5.0 | 70478E3 | 2.5 |
| | 10 | 5 x 5 | 25 | 4 | 0.12 | 17 | 50109E3 | 2.0 | 30109E3 | 5.0 | 70109E3 | 2.5 |
| | 22 | 6.3 x 5 | 40 | 8 | 0.12 | 11 | 50229E3 | 2.5 | 30229E3 | 5.0 | 70229E3 | 2.5 |
| 50 | 1.0 | 4 x 5 | 7.5 | 3 | 0.10 | 28 | 91105E3 | 1.5 | 91103E3 | 5.0 | 91107E3 | 2.5 |
| | 2.2 | 4 x 5 | 12 | 3 | 0.10 | 26 | 91225E3 | 1.5 | 91223E3 | 5.0 | 91227E3 | 2.5 |
| | 3.3 | 4 x 5 | 14 | 3 | 0.10 | 25 | 51338E3 | 1.5 | 31338E3 | 5.0 | 71338E3 | 2.5 |
| | 4.7 | 5 x 5 | 19 | 3 | 0.10 | 22 | 51478E3 | 2.0 | 31478E3 | 5.0 | 71478E3 | 2.5 |
| | 10 | 6.3 x 5 | 29 | 5 | 0.10 | 14 | 51109E3 | 2.5 | 31109E3 | 5.0 | 71109E3 | 2.5 |

| 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 2 minutes at U_R | $I_{L2} \leq 0.01 C_R \times U_R$ or $3\ \mu\text{A}$ (whichever is greater) |
| Resistance | | |
| Equivalent series resistance (ESR) | Calculated from $\tan \delta_{max.}$ and C_R (see Table 3) | $ESR = \tan \delta / 2 \pi f C_R$ |



RIPPLE CURRENT AND USEFUL LIFE

CCC205



I_A = actual ripple current at 120 Hz

I_R = rated ripple current at 120 Hz, 85 °C

(1) Useful life at 85 °C and I_R applied: 1500 hours

Fig.5 Multiplier of useful life as a function of ambient temperature and ripple current load

Table 2

| MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY | |
|---|------------------|
| FREQUENCY (Hz) | I_R MULTIPLIER |
| 50 | 0.60 |
| 120 | 1.00 |
| 400 | 1.20 |
| 800 | 1.30 |
| ≥ 2000 | 1.40 |

Table 3

| TEST PROCEDURES AND REQUIREMENTS | | | |
|--|---|---|--|
| TEST | | PROCEDURE (quick reference) | REQUIREMENTS |
| NAME OF TEST | REFERENCE | | |
| Endurance | IEC 60384-4/ EN130300, subclause 4.13 | $T_{amb} = 85\text{ °C}$; U_R applied; 1000 hours | $\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ |
| Useful life | CECC 30301, subclause 1.8.1 | $T_{amb} = 85\text{ °C}$; U_R and I_R applied; 1500 hours | $\Delta C/C: \pm 50\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 3\%$ |
| Shelf life (storage at high temperature) | IEC 60384-4/ EN130300, subclause 4.17 | $T_{amb} = 85\text{ °C}$; 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 $I_{L2} \leq \text{spec. limit}$ |



Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.