

## Aluminum Capacitors Radial Low Profile, 5 mm

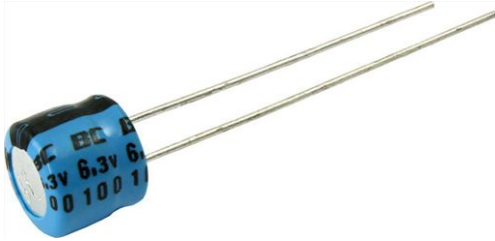


Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case sizes (Ø D x L in mm)	4 x 5 to 6.3 x 5
Rated capacitance range, C <sub>R</sub>	1.0 µF to 100 µF
Tolerance on C <sub>R</sub>	± 20 %
Rated voltage range, U <sub>R</sub>	6.3 V to 50 V
Category temperature range	- 40 °C to + 85 °C
Endurance test at 85 °C	1000 h
Useful life at 85 °C	1500 h
Useful life at 40 °C, 1.4 x I <sub>R</sub> applied	40 000 h
Shelf life at 0 V, 85 °C	500 h
Based on sectional specification	IEC 60384-4/EN 130300
Climatic category IEC 60068	40/085/56

### FEATURES

- Useful life: 1500 h at 85 °C
- Very low profile, 5 mm height
- Extremely miniaturized
- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case, insulated with a blue sleeve
- Charge and discharge proof
- 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, 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)

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> (µF)	U <sub>R</sub> (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	-	-	-	-	-

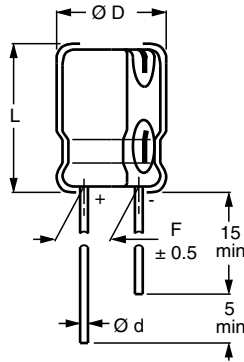
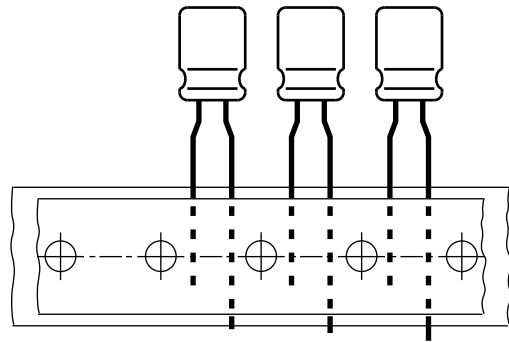
**DIMENSIONS in millimeters AND AVAILABLE FORMS**

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

 Case  $\varnothing D = 4 \text{ mm to } 6.3 \text{ mm}$ ; pitch  $F = 5 \text{ mm}$ 

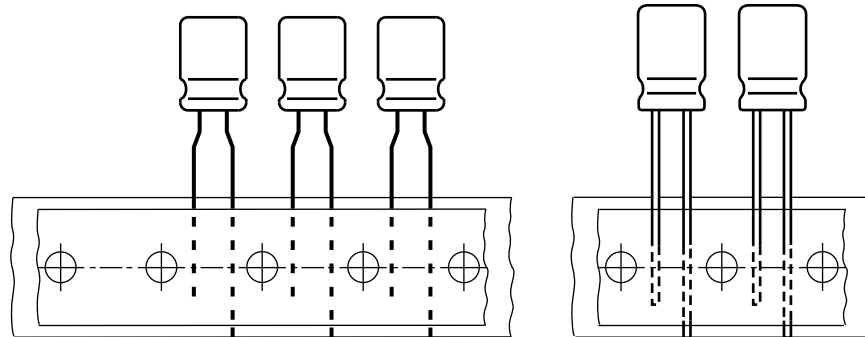
 Fig. 3 - **Form TFA:** Taped in box (ammopack)

 Pitch  $F = 2.5 \text{ mm}$   
 Case  $\varnothing D = 4 \text{ mm to } 6.3 \text{ mm}$ 

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

**Table 1**

<b>DIMENSIONS in millimeters AND PACKAGING QUANTITIES</b>								
NOMINAL CASE SIZE $\varnothing D \times L$	CASE CODE	$\varnothing d$	$\varnothing D_{max.}$	$L_{max.}$	F	PACKAGING QUANTITIES		
						FORM CA	FORM TFA	FORM TNA
4 x 5	53	0.45	4.5	6.0	$1.5 \pm 0.5$	2000	2000	2000
5 x 5	54	0.45	5.5	6.0	$2.0 \pm 0.5$	2000	2000	2000
6.3 x 5	55	0.45	6.8	6.0	$2.5 \pm 0.5$	2000	2000	2000

**Note**

- For detailed tape dimensions please see [www.vishay.com/doc?28360](http://www.vishay.com/doc?28360)



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 min 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 2 apply at  $T_{amb} = 20\text{ °C}$ ,  $P = 86\text{ kPa}$  to  $106\text{ kPa}$ ,  $RH = 45\%$  to  $75\%$

**ORDERING EXAMPLE**

Electrolytic capacitor 134 series

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

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

Ordering code: MAL213435229E3

Former 12NC: 2222 134 35229

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION												
$U_R$ (V)	$C_R$ 120 Hz ( $\mu\text{F}$ )	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	$I_R$ 120 Hz 85 °C (mA)	$I_{L2}$ 2 min ( $\mu\text{A}$ )	$\tan \delta$ 120 Hz	Z 100 kHz ( $\Omega$ )	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
<b>Voltage</b>		
Surge voltage		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1\text{ V}$
<b>Current</b>		
Leakage current	After 2 min at $U_R$	$I_{L2} \leq 0.01 C_R \times U_R$ or $3\ \mu\text{A}$ (whichever is greater)
<b>Resistance</b>		
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**

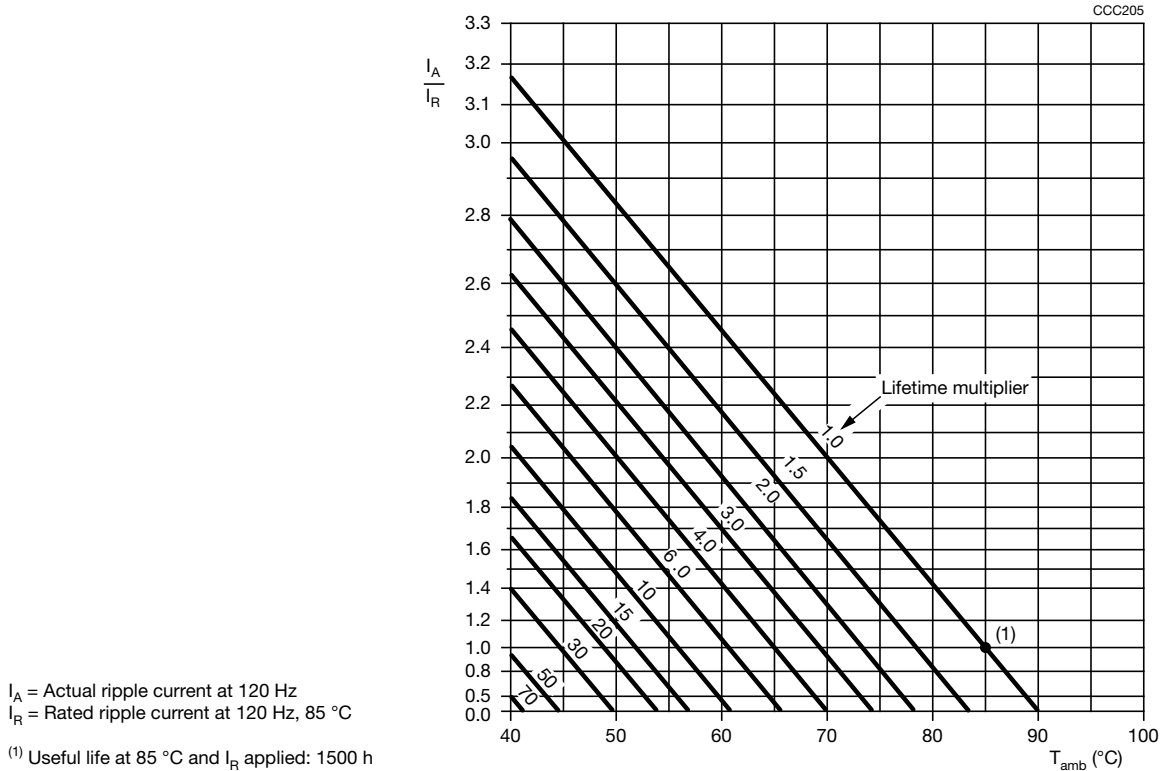


Fig. 5 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 3

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

Table 4

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4/ EN 130300, subclause 4.13	$T_{amb} = 85\text{ °C}$ ; $U_R$ applied; 1000 h	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$
Useful life	CECC 30301, subclause 1.8.1	$T_{amb} = 85\text{ °C}$ ; $U_R$ and $I_R$ applied; 1500 h	$\Delta C/C: \pm 50\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 3\%$
Shelf life (storage at high temperature)	IEC 60384-4/ EN 130300, subclause 4.17	$T_{amb} = 85\text{ °C}$ ; no voltage applied; 500 h After test: $U_R$ to be applied for 30 min, 24 h to 48 h before measurement	$\Delta C/C, \tan \delta, Z$ : For requirements see "Endurance test" above $I_{L2} \leq \text{spec. limit}$



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