

## Aluminum Capacitors Radial Low Profile, 7 mm

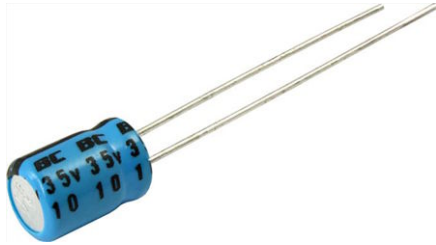


Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case sizes (Ø D x L in mm)	4 x 7 to 6.3 x 7
Rated capacitance range, C <sub>R</sub>	0.1 µF to 220 µF
Tolerance on C <sub>R</sub>	± 20 %
Rated voltage, U <sub>R</sub>	6.3 V to 63 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
- Low profile, 7 mm height
- Miniaturized, high CV-product per unit volume
- 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

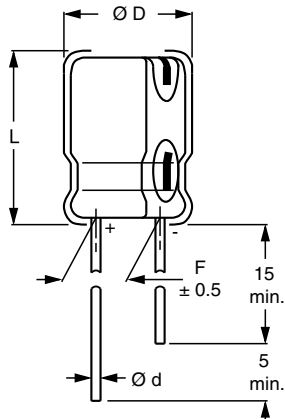
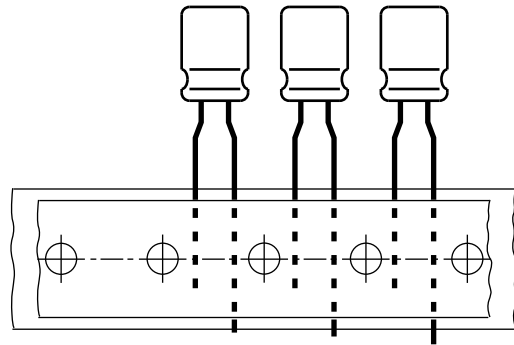
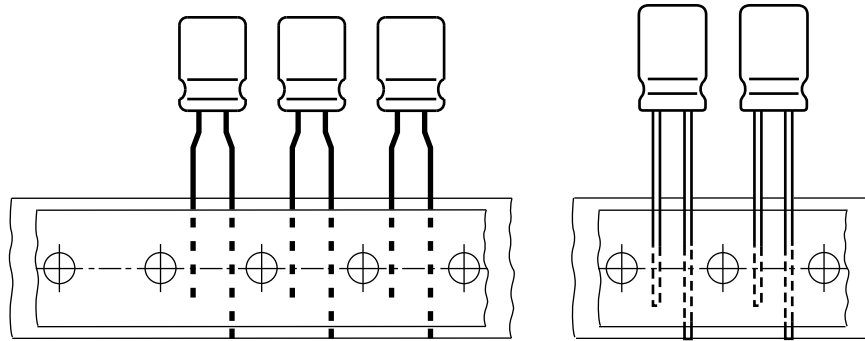
- General purpose; industrial, automotive and audio-video
- Low surface demand on printed-circuit board
- Coupling, decoupling, smoothing, filtering and timing
- Portable and mobile equipment (small size, low mass), low profile equipment

### 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 (097)

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	63
0.10	-	-	-	-	-	-	4 x 7
0.22	-	-	-	-	-	-	4 x 7
0.47	-	-	-	-	-	-	4 x 7
1.0	-	-	-	-	-	-	4 x 7
2.2	-	-	-	-	-	-	4 x 7
3.3	-	-	-	-	-	4 x 7	5 x 7
4.7	-	-	-	-	4 x 7	5 x 7	6.3 x 7
10	-	-	4 x 7	-	5 x 7	6.3 x 7	6.3 x 7
22	4 x 7	-	5 x 7	-	6.3 x 7	6.3 x 7	-
33	-	5 x 7	-	6.3 x 7	6.3 x 7	-	-
47	5 x 7	-	6.3 x 7	6.3 x 7	-	-	-
100	-	6.3 x 7	6.3 x 7	-	-	-	-
220	6.3 x 7	-	-	-	-	-	-

**DIMENSIONS in millimeters AND AVAILABLE FORMS**

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

 Fig. 3 - **Form TFA:** Taped in box (ammopack), formed leads, pitch  $F = 5$  mm

 Fig. 4 - **Form TNA:** Taped in box (ammopack), pitch  $F = 2.5$  mm

<b>DIMENSIONS in millimeters AND PACKAGING QUANTITIES</b>								
NOMINAL CASE SIZE $\text{Ø } D \times L$	CASE CODE	$\text{Ø } d$	$\text{Ø } D_{\text{max.}}$	$L_{\text{max.}}$	F	PACKAGING QUANTITIES		
						FORM CA	FORM TFA	FORM TNA
4 x 7	71	0.45	4.5	8	$1.5 \pm 0.5$	2000	2000	2000
5 x 7	72	0.45	5.5	8	$2.0 \pm 0.5$	1000	2000	2000
6.3 x 7	73	0.45	6.8	8	$2.5 \pm 0.5$	1000	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

**ORDERING EXAMPLE**

Electrolytic capacitor 097 series  
 100  $\mu\text{F}/16\text{ V}; \pm 20\%$   
 Nominal case size:  $\varnothing 6.3\text{ mm} \times 7\text{ mm}$ ; form TFA  
 Ordering code: MAL209735101E6  
 Former 12NC: 2222 097 35101

**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  $75\%$ .

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 MAL2097.....					
							BULK LONG LEADS		TAPED AMMOPACK			
							FORM CA	F (mm)	FORM TFA	F (mm)	FORM TNA	F (mm)
6.3	22	4 x 7	31	3	0.24	8.4	53229E6	1.5	33229E6	5.0	73229E6	2.5
	47	5 x 7	47	3	0.24	4.6	53479E6	2.0	33479E6	5.0	73479E6	2.5
	220	6.3 x 7	90	14	0.24	1.8	53221E6	2.5	33221E6	5.0	73221E6	2.5
10	33	5 x 7	43	4	0.20	3.7	54339E6	2.0	34339E6	5.0	74339E6	2.5
	100	6.3 x 7	80	10	0.20	2.2	54101E6	2.5	34101E6	5.0	74101E6	2.5
16	10	4 x 7	25	3	0.16	10.0	55109E6	1.5	35109E6	5.0	75109E6	2.5
	22	5 x 7	39	4	0.16	5.0	55229E6	2.0	35229E6	5.0	75229E6	2.5
	47	6.3 x 7	59	8	0.16	3.5	55479E6	2.5	35479E6	5.0	75479E6	2.5
	100	6.3 x 7	90	16	0.16	2.5	55101E6	2.5	35101E6	5.0	75101E6	2.5
25	33	6.3 x 7	53	9	0.14	2.6	56339E6	2.5	36339E6	5.0	76339E6	2.5
	47	6.3 x 7	65	12	0.14	1.9	56479E6	2.5	36479E6	5.0	76479E6	2.5
35	4.7	4 x 7	20	3	0.12	10.0	50478E6	1.5	30478E6	5.0	70478E6	2.5
	10	5 x 7	30	4	0.12	5.6	50109E6	2.0	30109E6	5.0	70109E6	2.5
	22	6.3 x 7	47	8	0.12	3.0	50229E6	2.5	30229E6	5.0	70229E6	2.5
	33	6.3 x 7	60	12	0.12	2.6	50339E6	2.5	30339E6	5.0	70339E6	2.5
50	3.3	4 x 7	18	3	0.10	14.0	51338E6	1.5	31338E6	5.0	71338E6	2.5
	4.7	5 x 7	23	3	0.10	10.0	51478E6	2.0	31478E6	5.0	71478E6	2.5
	10	6.3 x 7	34	5	0.10	5.5	51109E6	2.5	31109E6	5.0	71109E6	2.5
	22	6.3 x 7	53	11	0.10	2.9	51229E6	2.5	31229E6	5.0	71229E6	2.5
63	0.10	4 x 7	1.3	3	0.08	170.0	58107E6	1.5	38107E6	5.0	78107E6	2.5
	0.22	4 x 7	2.9	3	0.08	110.0	58227E6	1.5	38227E6	5.0	78227E6	2.5
	0.47	4 x 7	7.9	3	0.08	66.0	58477E6	1.5	38477E6	5.0	78477E6	2.5
	1.0	4 x 7	11	3	0.08	36.0	58108E6	1.5	38108E6	5.0	78108E6	2.5
	2.2	4 x 7	17	3	0.08	19.0	58228E6	1.5	38228E6	5.0	78228E6	2.5
	3.3	5 x 7	21	3	0.08	14.0	58338E6	2.0	38338E6	5.0	78338E6	2.5
	4.7	6.3 x 7	26	3	0.08	10.0	58478E6	2.5	38478E6	5.0	78478E6	2.5
10	6.3 x 7	40	7	0.08	5.5	58109E6	2.5	38109E6	5.0	78109E6	2.5	



ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
<b>Voltage</b>		
Surge voltage		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1 V$
<b>Current</b>		
Leakage current	After 2 min at $U_R$	$I_{L2} \leq 0.01 C_R \times U_R$ or $3 \mu A$ (whichever is greater)
<b>Resistance</b>		
Equivalent series resistance (ESR)	Calculated from $\tan \delta_{max}$ and $C_R$ (see Table 2)	$ESR = \tan \delta / 2 \pi f C_R$

**RIPPLE CURRENT AND USEFUL LIFE**

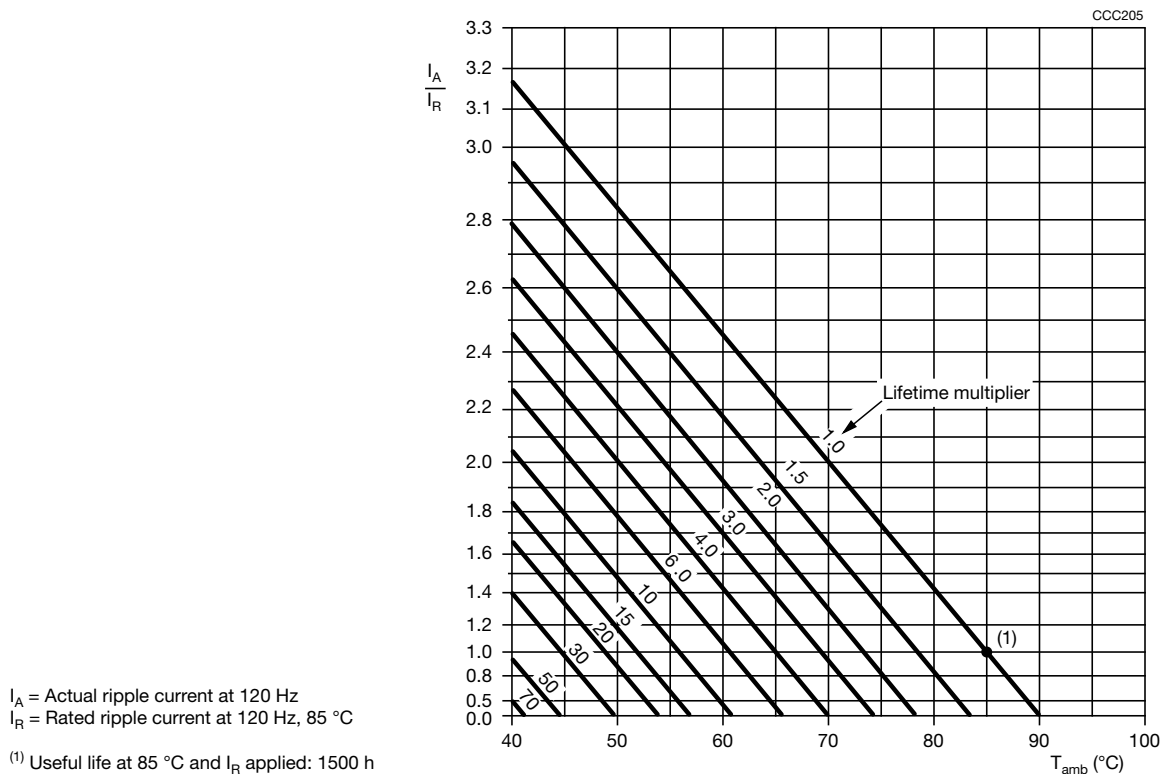


Fig. 5 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 1

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
$\geq 2000$	1.40



Table 2

<b>TEST PROCEDURES AND REQUIREMENTS</b>			
<b>TEST</b>		<b>PROCEDURE (quick reference)</b>	<b>REQUIREMENTS</b>
<b>NAME OF TEST</b>	<b>REFERENCE</b>		
Endurance	IEC 60384-4/ EN 130300, subclause 4.13	$T_{amb} = 85\text{ }^{\circ}\text{C}$ , $U_R$ 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	$T_{amb} = 85\text{ }^{\circ}\text{C}$ , $U_R$ 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	$T_{amb} = 85\text{ }^{\circ}\text{C}$ ; 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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