

Aluminum Electrolytic Capacitors Radial Low Profile, 7 mm


**RoHS
COMPLIANT**

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

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)

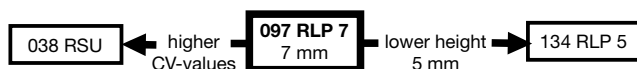
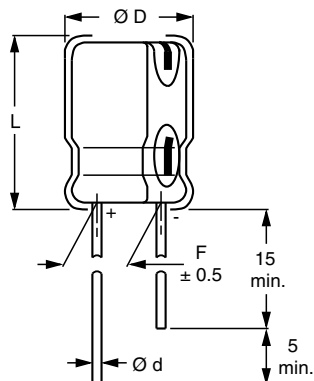
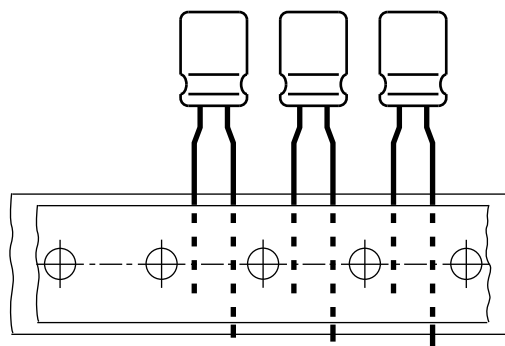
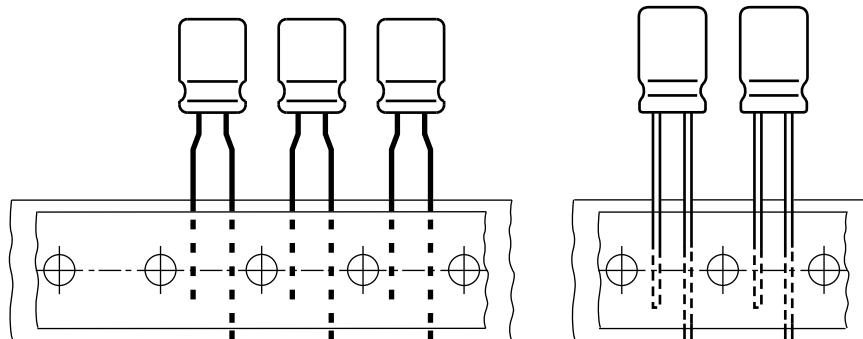


Fig. 1

QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case sizes (\varnothing D x L in mm)	4 x 7 to 6.3 x 7
Rated capacitance range, C_R	1.0 μF to 220 μF
Tolerance on C_R	$\pm 20 \%$
Rated voltage, U_R	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_R 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

SELECTION CHART FOR C_R , U_R , AND RELEVANT NOMINAL CASE SIZES (\varnothing D x L in mm)							
C_R (μF)	U_R (V)						
	6.3	10	16	25	35	50	63
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 $F = 5\text{ mm}$

Fig. 4 - **Form TNA:** Taped in box (ammopack), pitch $F = 2.5\text{ mm}$
Table 1

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

Note

- For detailed tape dimensions please see 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 $T_{\text{amb}} = 20\text{ °C}$, $P = 86\text{ kPa}$ to 106 kPa , $RH = 45\%$ to 75% .

ORDERING EXAMPLE

Electrolytic capacitor 097 series

100 μF / 16 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



Table 2

ELECTRICAL DATA AND ORDERING INFORMATION												
U _R (V)	C _R 120 Hz (μF)	NOMINAL CASE SIZE Ø D x L (mm)	I _R 120 Hz 85 °C (mA)	I _{L2} 2 min (μA)	tan δ 120 Hz	Z 100 kHz (Ω)	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	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
Voltage		
Surge voltage		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
Current		
Leakage current	After 2 min at U_R	$I_{L2} \leq 0.01 C_R \times U_R$ or 3 μA (whichever is greater)
Resistance		
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

Table 3

ENDURANCE TEST DURATION AND USEFUL LIFE	
ENDURANCE AT 85 °C (h)	USEFUL LIFE AT 85 °C (h)
1000	1500

Note

- Multiplier of useful life code: CCC205

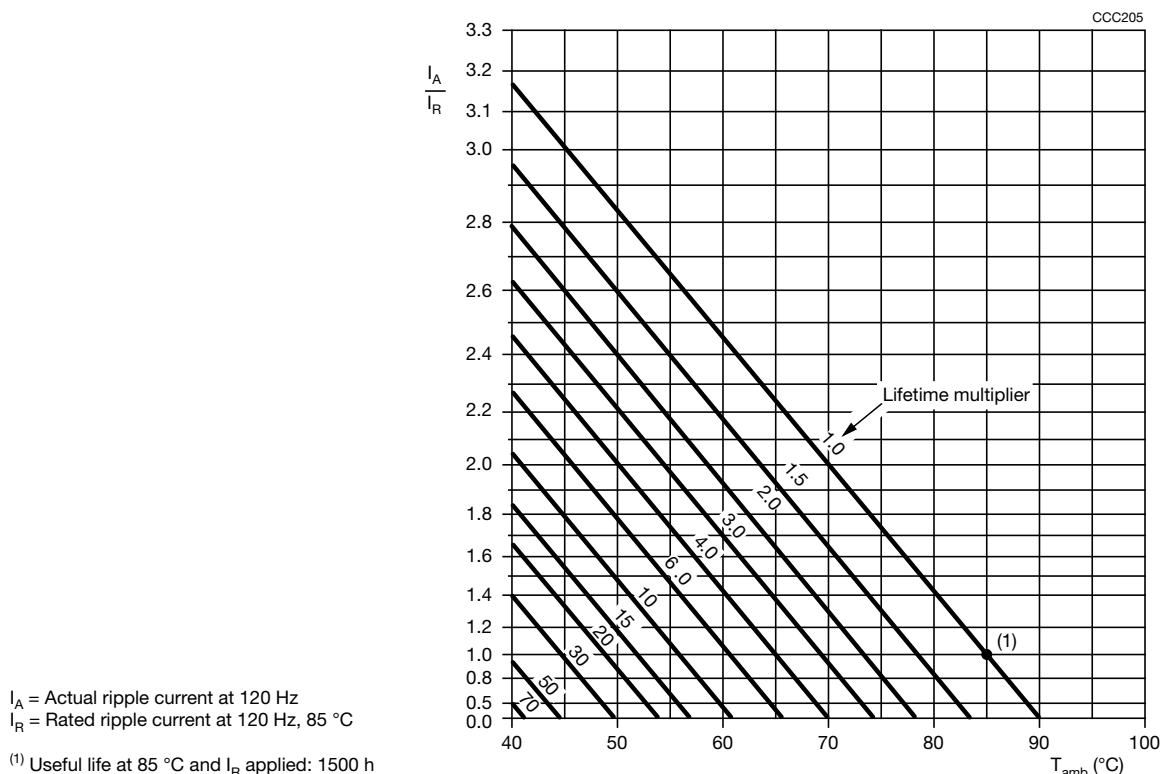


Fig. 5 - Multiplier of useful life as a function of ambient temperature and ripple current load

Table 4

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

Table 5

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 $I_{L2} \leq \text{spec. limit}$

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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