

Aluminum Electrolytic Capacitors Radial Low Profile, 7 mm

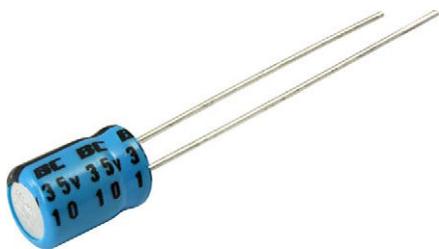


Fig. 1

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 μ F to 220 μ F
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

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



RoHS
COMPLIANT

APPLICATIONS

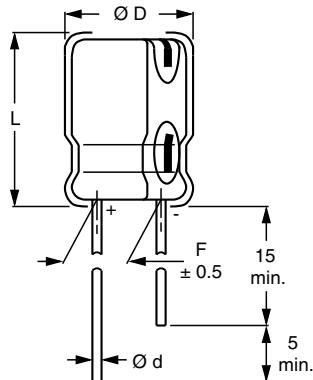
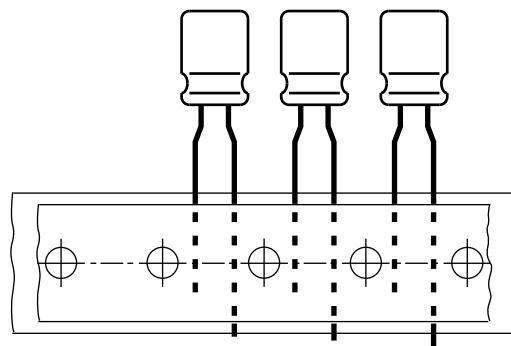
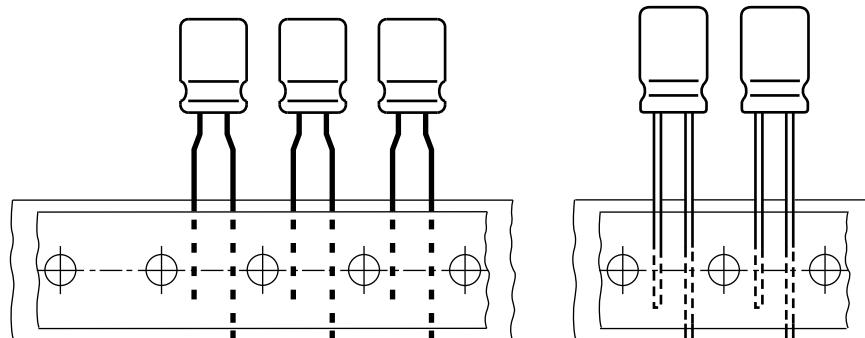
- General purpose; industrial, automotive and audio-video
- Low surface demand on printed-circuit board
- Coupling, decoupling, smoothing, filtering and timing
- Portable and mobile equipment (small size, low mass), low profile equipment

MARKING

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

- Rated capacitance (in μ F)
- 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_R , U_R , AND RELEVANT NOMINAL CASE SIZES (\varnothing D x L in mm)							
C_R (μ F)	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 mm

Fig. 4 - Form TNA: Taped in box (ammopack), pitch F = 2.5 mm
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 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 ± 20 %
I _R	Rated RMS ripple current at 120 Hz, 85 °C
I _{L2}	Max. leakage current after 2 min at U _R
tan δ	Max. dissipation factor at 120 Hz
Z	Max. impedance at 100 kHz

ORDERING EXAMPLE

Electrolytic capacitor 097 series

100 µF / 16 V; ± 20 %

Nominal case size: Ø 6.3 mm x 7 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 °C, P = 86 kPa to 106 kPa, RH = 45 % to 75 %.

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			$I_{L2} \leq 0.01 C_R \times U_R \text{ or } 3 \mu\text{A} \text{ (whichever is greater)}$		
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

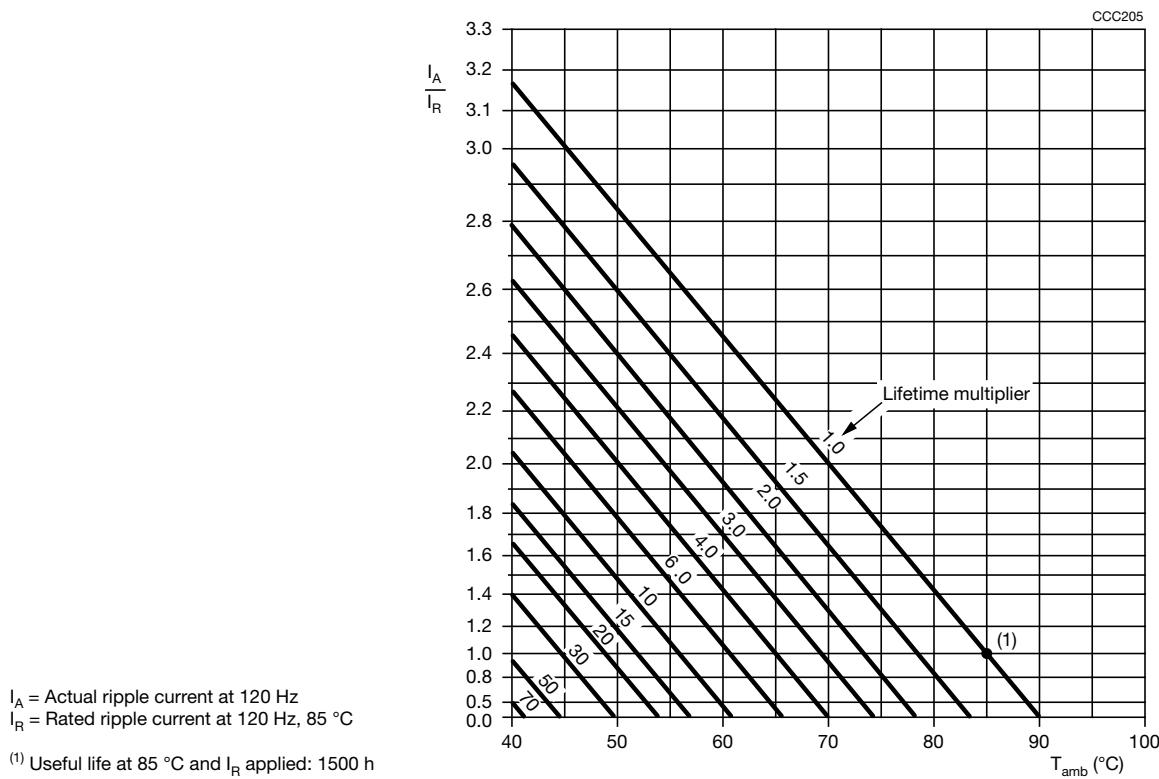


Fig. 5 - Multiplier of useful life as a function of ambient temperature and ripple current load

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	NAME OF TEST	PROCEDURE (quick reference)	REQUIREMENTS
	Endurance	$T_{amb} = 85$ $^{\circ}$ C, U_R applied; 1000 h	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times$ spec. limit $I_{L2} \leq$ spec. limit
	Useful life	$T_{amb} = 85$ $^{\circ}$ C, U_R and I_R applied; 1500 h	$\Delta C/C: \pm 50\%$ $\tan \delta \leq 3 \times$ spec. limit $Z \leq 3 \times$ spec. limit $I_{L2} \leq$ spec. limit no short or open circuit total failure percentage: $\leq 3\%$
	Shelf life (storage at high temperature)	$T_{amb} = 85$ $^{\circ}$ 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 $I_{L2} \leq$ 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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