

Aluminum Capacitors

Power Miniaturized General Purpose Snap-in

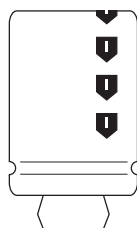
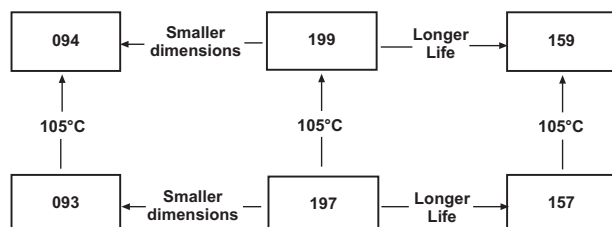


Fig.1 Component outline.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case size ($\varnothing D \times L$ in mm)	22 × 25 to 35 × 50
Rated capacitance range (E6/E12 series), C_R	47 to 820 μF
Tolerance on C_R	±20%
Rated voltage range, U_R	400 V; 450 V
Category temperature range	−25 to +85 °C
Useful life at 85 °C	2000 hours
Useful life at 40 °C and $1.4 \times I_R$ applied	36000 hours
Shelf life at 0 V, 85 °C	500 hours
Based on sectional specification	IEC 60384-4/EN130300/W of JISC5141

FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, miniaturized dimensions, cylindrical aluminum case insulated with a blue sleeve
- Useful life: 2000 hours at 85 °C.



RoHS
COMPLIANT

APPLICATIONS

- Consumer electronics.
- Whitegood motor control
- Electronic drives
- smps/ups

MARKING

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

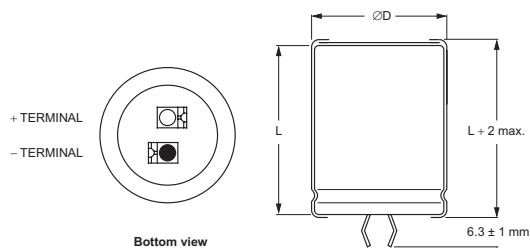
- Rated capacitance (in μF).
- Tolerance on rated capacitance, code letter in accordance with IEC 60062 (M for ±20%).
- Rated voltage (in V).
- Date code.
- Name of manufacturer.
- ‘−’ sign to identify the negative terminal, visible from the top and side of the capacitor.
- Code number (last 8 digits).
- Maximum operating temperature.

SELECTION CHART FOR C_R , U_R AND RELEVANT NOMINAL CASE SIZES ($\varnothing D \times L$ in mm)

C_R (μF)	U_R (V)		
	400	420	450
68	22 × 25	—	—
82	—	—	22 × 25
100	—	22 × 25	—
120	22 × 25	22 × 25	22 × 30
	—	—	25 × 25
150	22 × 30	22 × 30	22 × 35
	25 × 25	25 × 25	—
	22 × 35	22 × 35	22 × 40
180	25 × 30	25 × 30	25 × 30
	—	—	30 × 25
220	22 × 40	22 × 40	22 × 50
	25 × 30	25 × 35	25 × 35
	30 × 25	30 × 25	30 × 25
270	22 × 50	22 × 50	—
	25 × 35	—	25 × 40
	30 × 25	30 × 30	30 × 30
	—	—	35 × 25
330	22 × 50	25 × 50	25 × 50
	25 × 40	30 × 35	—
	30 × 30	35 × 30	35 × 30
	35 × 25	—	—

SELECTION CHART FOR C_R , U_R AND RELEVANT NOMINAL CASE SIZES ($\varnothing D \times L$ in mm)

C_R (μF)	U_R (V)		
	400	420	450
390	25 × 50	—	30 × 40
	30 × 35	—	35 × 35
	35 × 30	35 × 30	—
470	30 × 40	35 × 35	35 × 40
	35 × 30	—	—
560	30 × 45	30 × 50	—
	35 × 35	35 × 40	35 × 45
680	—	35 × 45	35 × 50
	35 × 40	—	—
820	35 × 50	—	—

DIMENSIONS in millimeters **AND AVAILABLE FORMS**

The minus and/or plus terminal can be marked with an imprinted sign.

Fig.2 Two terminal snap-in.

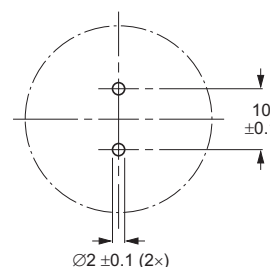


Fig.3 Mounting hole diagram.

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES					
NOMINAL CASE SIZE $\varnothing D \times L$	$\varnothing D_{max}$	L_{max}	MASS (g)	PACKAGING QUANTITIES	CARDBOARD BOX DIMENSIONS $L \times W \times H$
22 × 25	22.5	25.5	≈12	216	280 × 240 × 140
22 × 30	22.5	30.5	≈16	216	280 × 240 × 140
22 × 35	22.5	35.5	≈20	216	280 × 240 × 140
22 × 40	22.5	40.5	≈23	144	280 × 240 × 105
22 × 45	22.5	45.5	≈26	144	280 × 240 × 140
22 × 50	22.5	50.5	≈29	144	280 × 240 × 140
25 × 25	25.5	25.5	≈20	216	280 × 240 × 140
25 × 30	25.5	32.0	≈22	216	280 × 240 × 140
25 × 35	25.5	35.5	≈24	216	280 × 240 × 140
25 × 40	25.5	40.5	≈27	144	280 × 240 × 105
25 × 45	25.5	45.5	≈32	144	280 × 240 × 140
25 × 50	25.5	50.5	≈38	144	280 × 240 × 140
30 × 25	30.5	27.5	≈25	168	280 × 240 × 140
30 × 30	30.5	32.5	≈30	168	280 × 240 × 140
30 × 35	30.5	37.5	≈35	168	280 × 240 × 140
30 × 40	30.5	41.5	≈40	112	280 × 240 × 105
30 × 45	30.5	46.5	≈45	112	280 × 240 × 140
30 × 50	30.5	51.5	≈50	112	280 × 240 × 140
35 × 25	35.5	25.5	≈33	126	280 × 240 × 140
35 × 30	35.5	32.5	≈40	126	280 × 240 × 140
35 × 35	35.5	35.5	≈48	126	280 × 240 × 140
35 × 40	35.5	41.5	≈55	84	280 × 240 × 105
35 × 45	35.5	46.5	≈63	84	280 × 240 × 140
35 × 50	35.5	51.5	≈72	84	280 × 240 × 140

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Vishay BCcomponents

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	rated capacitance at 120 Hz
I_R	rated RMS ripple current at 120 Hz, 85 °C
I_{L5}	max. leakage current after 5 minutes at U_R
ESR	max. equivalent series resistance at 120 Hz; note 1

Note

- ESR at 100 Hz is approximately $1.05 \times$ ESR 120 Hz.
- Unless otherwise specified, all electrical values in Table 2 apply at
 $T_{amb} = 20\text{ °C}$, $P = 86$ 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 $\varnothing D \times L$ (mm)	I_R 120 Hz 85 °C (A)	I_{L5} 5 min (mA)	MAX. ESR 120 ⁽¹⁾ (Ω)	MAX. Z10K (Ω)	CATALOG NUMBER 2222 093
400	68	22 x 25	0.80	0.54	2.80	1.98	56689
	120	22 x 25	0.95	0.96	2.76	2.15	56121
	150	22 x 30	1.11	1.20	2.21	1.72	56151
	150	25 x 25	1.10	1.20	2.21	1.74	46151
	180	22 x 35	1.26	1.44	1.84	1.43	56181
	180	25 x 30	1.27	1.44	1.84	1.44	46181
	220	22 x 40	1.46	1.50	1.51	1.17	56221
	220	25 x 30	1.38	1.50	1.51	1.19	46221
	220	30 x 25	1.43	1.50	1.51	1.21	36221
	270	22 x 50	1.58	1.50	1.23	0.95	56271
	270	25 x 35	1.58	1.50	1.23	0.97	46271
	270	30 x 25	1.53	1.50	1.23	1.01	36271
	330	22 x 50	1.74	1.50	1.01	0.76	56331
	330	25 x 40	1.82	1.50	1.01	0.77	46331
	330	30 x 30	1.77	1.50	1.01	0.80	36331
	330	35 x 25	1.77	1.50	1.01	0.85	26331
	390	25 x 50	2.21	1.50	0.85	0.65	46391
	390	30 x 35	1.98	1.50	0.85	0.68	36391
	390	35 x 30	2.10	1.50	0.85	0.69	26391
	470	30 x 40	2.20	1.50	0.71	0.66	36471
	470	35 x 30	2.14	1.50	0.71	0.69	26471
	560	30 x 45	2.48	1.50	0.59	0.55	36561
	560	35 x 35	2.35	1.50	0.59	0.59	26561
	680	35 x 40	2.68	1.50	0.49	0.48	26681
	820	35 x 50	3.18	1.50	0.40	0.39	26821
420	100	22 x 25	0.89	0.84	3.32	2.31	54101
	150	22 x 30	1.12	1.26	2.21	1.55	54151
	150	25 x 25	1.11	1.26	2.21	1.58	44151
	180	22 x 35	1.29	1.50	1.84	1.29	54181
	180	25 x 30	1.29	1.50	1.84	1.30	44181
	220	22 x 40	1.49	1.50	1.51	1.06	54221
	220	25 x 35	1.47	1.50	1.51	1.07	44221
	220	30 x 25	1.44	1.50	1.51	1.10	34221
	270	22 x 50	1.61	1.50	1.23	0.86	54271
	270	30 x 30	1.67	1.50	1.23	0.89	34271
	330	25 x 50	1.47	1.50	1.01	0.71	44331
	330	30 x 35	1.88	1.50	1.01	0.74	34331
	330	35 x 30	2.01	1.50	1.01	0.75	24331
	390	35 x 30	2.05	1.50	0.85	0.74	24391
	470	35 x 35	2.27	1.50	0.71	0.63	24471
	560	30 x 50	2.66	1.50	0.59	0.50	34561
	560	35 x 40	2.57	1.50	0.59	0.52	24561
	680	35 x 45	2.87	1.50	0.49	0.43	24681

ORDERING EXAMPLE

Electrolytic capacitor 093 series

330 μF /400 V; $\pm 20\%$ Nominal case size: $\varnothing 25 \times 40\text{ mm}$

Catalog number: 2222 093 46331.

ELECTRICAL DATA AND ORDERING INFORMATION							
U_R (V)	C_R 120 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	I_R 120 Hz 85 °C (A)	I_{L5} 5 min (mA)	MAX. ESR 120 ⁽¹⁾ (Ω)	MAX. Z10K (Ω)	CATALOG NUMBER 2222 093
450	82	22 x 25	0.80	0.74	4.05	3.05	57829
	120	22 x 30	1.00	1.08	2.76	2.09	57121
	120	25 x 25	1.00	1.08	2.76	2.11	47121
	150	22 x 35	1.17	1.35	2.21	1.67	57151
	180	22 x 40	1.34	1.50	1.84	1.40	57181
	180	25 x 30	1.27	1.50	1.84	1.41	47181
	180	30 x 25	1.32	1.50	1.84	1.43	37181
	220	22 x 50	1.45	1.50	1.51	1.14	57221
	220	25 x 35	1.45	1.50	1.51	1.16	47221
	220	30 x 25	1.42	1.50	1.51	1.20	37221
	270	25 x 40	1.67	1.50	1.23	0.95	47271
	270	30 x 30	1.64	1.50	1.23	0.97	37271
	270	35 x 25	1.66	1.50	1.23	1.03	27271
	330	25 x 50	2.07	1.50	1.01	0.73	47331
	330	35 x 30	1.98	1.50	1.01	0.77	27331
	390	30 x 40	2.11	1.50	0.85	0.64	37391
	390	35 x 35	2.18	1.50	0.85	0.66	27391
	470	35 x 40	2.47	1.50	0.71	0.54	27471
	560	35 x 45	2.74	1.50	0.59	0.46	27561
	680	35 x 50	3.07	1.50	0.49	0.38	27681

Note

1. ESR at 100 Hz is approximately $1.05 \times$ ESR 120 Hz.

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage	≥ 400 V versions	$U_S = 1.1 \times U_R$
Reverse voltage	≤ 1 V	–
Current		
Leakage current	after 5 minutes at U_R	$I_{L5} \leq 0.02 C_R \times U_R$ or 1.5 mA, whichever is smaller

Table 3

LOW TEMPERATURE CHARACTERISTIC (at 120 Hz)			
DESCRIPTION		U_R (V) ⁽¹⁾	
		400	450
Impedance ratio	$Z(-25\text{ °C})/Z(+20\text{ °C})$	4	4

Note

1. Impedance ratio shall not exceed the given values.

RIPPLE CURRENT AND USEFUL LIFE

I_A = actual ripple current at 120 Hz.

I_R = rated ripple current at 120 Hz and 85 °C.

(1) Useful life at 85 °C and I_R applied: 2000 hours.

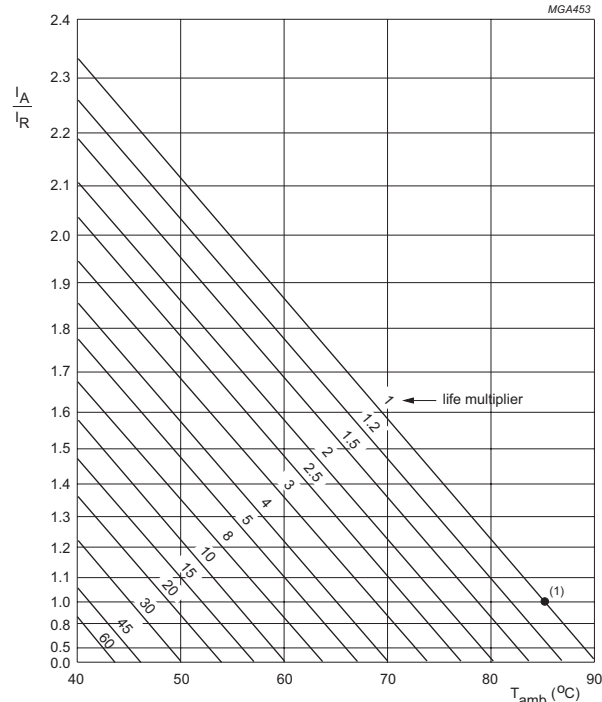


Fig.4 Multiplier of useful life as a function of ambient temperature and ripple current load.

Table 4

MULTIPLIER OF RIPPLE CURRENT (I_R) AS A FUNCTION OF FREQUENCY	
FREQUENCY (Hz)	I_R MULTIPLIER
	400 and 450 V
60	0.90
100	0.95
120	1.00
500	1.20
1000	1.30
≥10000	1.40

Table 5

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ °C}$; U_R and I_R applied: 2000 hours	$\Delta C/C: \pm 30\%$ $ESR \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage 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	$\Delta C/C: \pm 20\%$ $ESR \leq 2 \times \text{spec. limit}$ $I_{L5} \leq 1 \times \text{spec. limit}$