

Aluminum Capacitors

Power Ultra Miniature Snap-In

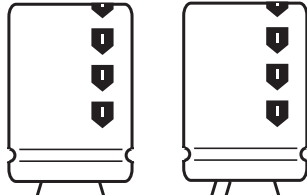
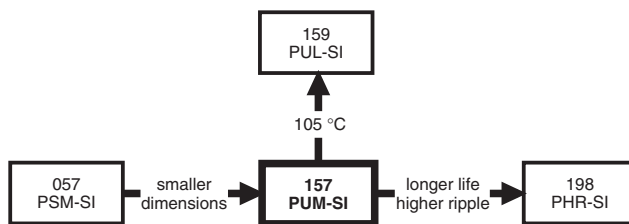


Fig.1 Component outlines.



FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, very small dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Useful life: 5000 hours at 85 °C
- Keyed polarity version available
- Lead (Pb)-free versions are RoHS compliant.


RoHS*
COMPLIANT

APPLICATIONS

- General purpose, industrial and audio/video systems
- Smoothing and filtering
- Standard and switched mode power supplies
- Energy storage in pulse systems.

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 $\pm 20\%$).
- Rated voltage (in V).
- Date code (YYMM).
- Name of manufacturer.
- Code for factory of origin.
- ‘-’ sign to identify the negative terminal, visible from the top and side of the capacitor
- Code number.
- Climatic category in accordance with IEC 60068.

QUICK REFERENCE DATA	
DESCRIPTION	VALUE
Nominal case sizes ($\varnothing D \times L$ in mm)	22 × 25 to 35 × 60
Rated capacitance range (E6/E12 series), C_R	56 to 2200 μF
Tolerance on C_R	$\pm 20\%$
Rated voltage range, U_R	200 V, 250 V 400 V, 450 V
Category temperature range	-40 to +85 °C -25 to +85 °C
Endurance test at 85 °C	3000 hours
Load life at 85 °C	3000 hours
Useful life at 85 °C	5000 hours
Useful life at 40 °C, $1.4 \times I_R$ applied	90000 hours
Shelf life at 0 V, 85 °C	1000 hours
Based on sectional specification	IEC 60384-4/EN130300
Climatic category IEC 60068	40/085/56 25/085/56

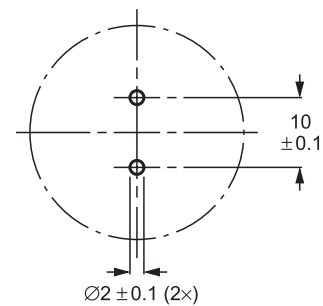
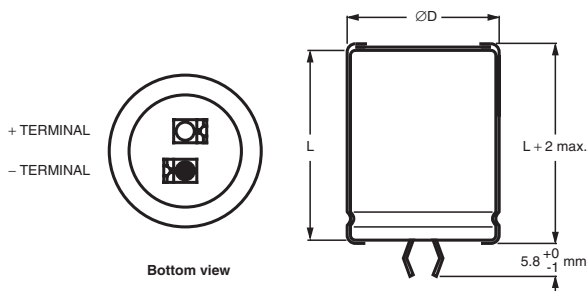
SELECTION CHART FOR C_R , U_R AND RELEVANT NOMINAL CASE SIZES ($\varnothing D \times L$ in mm)				
C_R (μF)	U_R (V)			
	200	250	400	450
56	-	-	-	22 × 25
68	-	-	22 × 25	22 × 30
82	-	-	22 × 25	22 × 30
	-	-	-	25 × 25
100	-	-	22 × 30	22 × 35
	-	-	-	25 × 30
120	-	-	22 × 30	22 × 40
	-	-	-	25 × 30
	-	-	-	30 × 25

* Pb containing terminations are not RoHS compliant, exemptions may apply

SELECTION CHART FOR C_R, U_R AND RELEVANT NOMINAL CASE SIZES (∅D × L in mm)				
C _R (μF)	U _R (V)			
	200	250	400	450
150	-	-	22 × 35	25 × 35
	-	-	25 × 30	25 × 40
	-	-	-	30 × 30
180	-	-	22 × 40	25 × 40
	-	-	25 × 35	30 × 35
	-	-	-	35 × 25
220	-	22 × 30	25 × 40	25 × 50
	-	-	30 × 30	30 × 40
	-	-	35 × 25	35 × 30
270	22 × 25	22 × 30	25 × 45	30 × 45
	-	25 × 25	30 × 35	35 × 35
	-	-	35 × 30	-
330	22 × 30	22 × 35	30 × 40	30 × 50
	-	25 × 30	35 × 30	35 × 40
390	22 × 30	22 × 40	30 × 45	35 × 45
	-	30 × 25	35 × 35	-
470	22 × 35	25 × 35	30 × 50	35 × 50
	25 × 30	30 × 30	35 × 40	-
560	22 × 40	25 × 40	35 × 45	-
	25 × 35	30 × 30	-	-
	30 × 25	35 × 25	-	-
680	25 × 40	25 × 45	35 × 50	35 × 60
	30 × 30	30 × 35	-	-
	35 × 25	35 × 30	-	-
820	25 × 45	30 × 40	35 × 60	-
	30 × 35	35 × 35	-	-
	35 × 30	-	-	-
1000	30 × 40	30 × 45	-	-
	35 × 30	35 × 40	-	-
1200	30 × 45	35 × 45	-	-
	35 × 35	-	-	-
1500	30 × 50	35 × 50	-	-
	35 × 40	-	-	-
1800	35 × 45	-	-	-
2200	35 × 50	-	-	-

DIMENSIONS in millimeters AND AVAILABLE FORMS

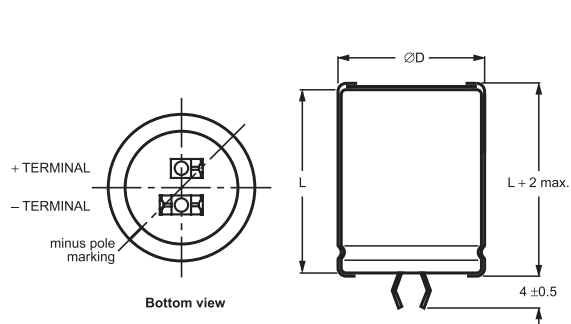
TWO TERMINAL SNAP-IN



The minus terminal can be marked with a black dot or with an imprinted '-' sign.

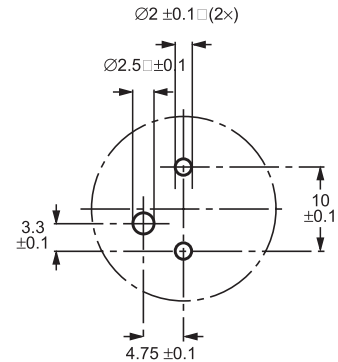
Fig.2 Two terminal snap-in.

Fig.3 Mounting hole diagram.

THREE TERMINAL SNAP-IN


The negative terminal has **TWO** pins which are **BOTH** electrically connected.

Fig.4 Three terminal snap-in.



The 10 mm spacing of the 2 pin snap-in is used as the base layout and a third hole is added.

The third hole is closer to the negative primary hole so that polarization is always maintained, together with added mechanical stability.

Fig.5 Mounting hole diagram.

Table 1

DIMENSIONS in millimeters, MASS AND PACKAGING QUANTITIES					
NOMINAL CASE SIZE ØD × L	ØD _{MAX}	L _{MAX}	MASS (g)	PACKAGING QUANTITIES (UNITS PER BOX)	CARDBOARD BOX DIMENSIONS L × W × H
22 × 25	23	27	≈12	100	260 × 250 × 39
22 × 30	23	32	≈16	100	260 × 250 × 44
22 × 35	23	37	≈20	100	260 × 250 × 49
22 × 40	23	42	≈23	100	260 × 250 × 54
25 × 25	26	27	≈20	100	290 × 280 × 39
25 × 30	26	32	≈22	100	290 × 280 × 44
25 × 35	26	37	≈24	100	290 × 280 × 49
25 × 40	26	42	≈27	100	290 × 280 × 54
25 × 45	26	47	≈32	100	290 × 280 × 59
25 × 50	26	52	≈38	100	290 × 280 × 64
30 × 25	31	27	≈25	100	340 × 330 × 39
30 × 30	31	32	≈30	100	340 × 330 × 44
30 × 35	31	37	≈35	100	340 × 330 × 49
30 × 40	31	42	≈40	100	340 × 330 × 54
30 × 45	31	47	≈45	100	340 × 330 × 59
30 × 50	31	52	≈50	100	340 × 330 × 64
35 × 25	36	27	≈33	50	390 × 198 × 39
35 × 30	36	32	≈40	50	390 × 198 × 44
35 × 35	36	37	≈48	50	390 × 198 × 49
35 × 40	36	42	≈55	50	390 × 198 × 54
35 × 45	36	47	≈63	50	390 × 198 × 59
35 × 50	36	52	≈72	50	390 × 198 × 64
35 × 60	36	62	≈82	50	390 × 198 × 74

ELECTRICAL DATA	
SYMBOL	DESCRIPTION
C_R	rated capacitance at 100/120 Hz
I_R	rated RMS ripple current at 120 Hz, 85 °C
I_{L5}	max. leakage current after 5 minutes at U_R
ESR	typ./max. equivalent series resistance at 100 Hz; note 1
Z	typ./max. impedance at 10 kHz

Note

- ESR at 120 Hz is approximately $0.95 \times$ ESR 100 Hz.
- Unless otherwise specified, all electrical values in Table 2 apply at $T_{amb} = 20$ °C, $P = 86$ to 106 kPa, $RH = 45$ to 75 %.

ORDERING EXAMPLES*

Electrolytic capacitor 157 series

1000 μ F/200 V; ± 20 %Nominal case size: $\varnothing 30 \times 40$ mm

2-terminal snap-in:

Catalogue number: 2222 157 52102.

3-terminal snap-in:

Catalogue number: 2222 157 72102.

*Note: To ensure delivery of lead (Pb)-free parts during the transition period, please contact your Vishay sales agent.

Table 2

ELECTRICAL DATA AND ORDERING INFORMATION										
U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	I_R 120 Hz 85 °C (A)	I_{L5} 5 MIN (mA)	TYP. ESR 100 Hz ⁽¹⁾ (M Ω)	MAX. ESR 100 Hz ⁽¹⁾ (M Ω)	TYP. Z 10 kHz (M Ω)	MAX. Z 10 kHz (M Ω)	CATALOG NUMBER 2222 157	
									2-TERM.	3-TERM.
200	270	22 \times 25	1.15	0.54	550	880	420	700	52271	72271
	330	22 \times 30	1.36	0.66	430	720	300	500	52331	72331
	390	22 \times 30	1.46	0.78	390	650	295	490	52391	72391
	470	22 \times 35	1.68	0.94	350	580	240	400	32471	12471
	470	25 \times 30	1.67	0.94	350	580	240	400	52471	72471
	560	22 \times 40	1.91	1.12	255	425	235	390	42561	22561
	560	25 \times 35	1.91	1.12	255	425	235	390	32561	12561
	560	30 \times 25	1.89	1.12	255	425	235	390	52561	72561
	680	25 \times 40	2.18	1.36	210	350	205	340	42681	22681
	680	30 \times 30	2.04	1.36	210	350	205	340	52681	72681
	680	35 \times 25	2.06	1.36	210	350	205	340	62681	82681
	820	25 \times 45	2.46	1.64	170	290	145	240	62821	82821
	820	30 \times 35	2.35	1.64	170	290	145	240	32821	12821
	820	35 \times 30	2.29	1.64	170	290	145	240	52821	72821
	1000	30 \times 40	2.66	2.00	140	235	135	225	52102	72102
	1000	35 \times 30	2.33	2.00	140	235	135	225	62102	82102
	1200	30 \times 45	2.98	2.40	120	200	110	190	32122	12122
1200	35 \times 35	2.69	2.40	120	200	110	190	62122	82122	
1500	30 \times 50	3.31	3.00	110	180	95	155	42152	22152	
1500	35 \times 40	3.04	3.00	110	180	95	155	52152	72152	
1800	35 \times 45	3.36	3.60	100	160	80	130	42182	22182	
2200	35 \times 50	3.68	4.40	90	150	65	105	52222	72222	
250	220	22 \times 30	1.23	0.55	600	1080	420	700	53221	73221
	270	22 \times 30	1.32	0.67	490	880	335	560	43271	23271
	270	25 \times 25	1.23	0.67	490	880	335	560	53271	73271
	330	22 \times 35	1.53	0.82	400	720	255	430	33331	13331
	330	25 \times 30	1.56	0.82	400	720	255	430	53331	73331



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Power Ultra Miniature Snap-In

Vishay BCcomponents

ELECTRICAL DATA AND ORDERING INFORMATION										
U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	I _R 120 Hz 85 °C (A)	I _{L5} 5 MIN (mA)	TYP. ESR 100 Hz ⁽¹⁾ (MΩ)	MAX. ESR 100 Hz ⁽¹⁾ (MΩ)	TYP. Z 10 kHz (MΩ)	MAX. Z 10 kHz (MΩ)	CATALOG NUMBER 2222 157	
									2-TERM.	3-TERM.
250	390	22 × 40	1.74	0.97	330	610	250	425	43391	23391
	390	30 × 25	1.58	0.97	330	610	250	425	53391	73391
	470	25 × 35	1.87	1.17	280	505	190	320	33471	13471
	470	30 × 30	1.89	1.17	280	505	190	320	53471	73471
	560	25 × 40	2.12	1.40	240	425	185	310	43561	23561
	560	30 × 30	1.97	1.40	240	425	185	310	53561	73561
	560	35 × 25	1.80	1.40	240	425	185	310	63561	83561
	680	25 × 45	2.29	1.70	200	350	155	260	63681	83681
	680	30 × 35	2.28	1.70	200	350	155	260	33681	13681
	680	35 × 30	2.20	1.70	200	350	155	260	53681	73681
	820	30 × 40	2.57	2.05	160	290	125	210	53821	73821
	820	35 × 35	2.54	2.05	160	290	125	210	63821	83821
	1000	30 × 45	2.88	2.50	140	235	105	180	33102	13102
	1000	35 × 40	2.86	2.50	140	235	105	180	53102	73102
	1200	35 × 45	3.17	3.00	120	200	95	160	43122	23122
	1500	35 × 50	3.49	3.75	90	160	85	140	53152	73152
400	68	22 × 25	0.71	0.27	1400	2800	1170	1950	56689	76689
	82	22 × 25	0.77	0.33	1250	2500	970	1620	56829	76829
	100	22 × 30	0.94	0.40	1125	2250	750	1220	56101	76101
	120	22 × 30	0.97	0.48	990	1980	700	1140	56121	76121
	150	22 × 35	1.13	0.60	750	1500	540	900	36151	16151
	150	25 × 30	1.16	0.60	750	1500	540	900	56151	76151
	180	22 × 40	1.29	0.72	630	1260	435	725	46181	26181
	180	25 × 35	1.35	0.72	630	1260	435	725	36181	16181
	220	25 × 40	1.54	0.88	520	1040	355	590	46221	26221
	220	30 × 30	1.50	0.88	520	1040	355	590	56221	76221
	220	35 × 25	1.42	0.88	520	1040	355	590	66221	86221
	270	25 × 45	1.72	1.08	430	860	335	560	66271	86271
	270	30 × 35	1.74	1.08	430	860	335	560	36271	16271
	270	35 × 30	1.71	1.08	430	860	335	560	56271	76271
	330	30 × 40	1.97	1.32	350	700	315	525	56331	76331
	330	35 × 30	1.76	1.32	350	700	315	525	66331	86331
	390	30 × 45	2.19	1.56	300	610	250	420	56391	76391
	390	35 × 35	2.04	1.56	300	610	250	420	36391	16391
	470	30 × 50	2.40	1.88	250	505	210	350	46471	26471
	470	35 × 40	2.30	1.88	250	505	210	350	56471	76471
	560	35 × 45	2.55	2.24	210	425	180	305	46561	26561
	680	35 × 50	2.79	2.72	190	380	160	265	56681	76681
820	35 × 60	3.33	3.28	155	315	115	215	56821	76821	

ELECTRICAL DATA AND ORDERING INFORMATION										
U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	I _R 120 Hz 85 °C (A)	I _{L5} 5 MIN (mA)	TYP. ESR 100 Hz ⁽¹⁾ (MΩ)	MAX. ESR 100 Hz ⁽¹⁾ (MΩ)	TYP. Z 10 kHz (MΩ)	MAX. Z 10 kHz (MΩ)	CATALOG NUMBER 2222 157	
									2-TERM.	3-TERM.
450	56	22 × 25	0.68	0.25	1650	3300	1120	1880	57569	77569
	68	22 × 30	0.80	0.30	1400	2800	920	1530	57689	77689
	82	22 × 30	0.87	0.36	1200	2400	780	1290	47829	27829
	82	25 × 25	0.85	0.36	1200	2400	780	1290	57829	77829
	100	22 × 35	1.00	0.45	1000	2000	630	1050	37101	17101
	100	25 × 30	1.02	0.45	1000	2000	630	1050	57101	77101
	120	22 × 40	1.15	0.54	800	1600	530	885	47121	27121
	120	25 × 30	1.09	0.54	800	1600	530	885	57121	77121
	120	30 × 25	1.10	0.54	800	1600	530	885	67121	87121
	150	25 × 40	1.35	0.67	650	1300	420	705	47151	27151
	150	25 × 35	1.27	0.67	650	1300	420	705	67151	87151
	150	30 × 30	1.32	0.67	650	1300	420	705	57151	77151
	180	25 × 40	1.45	0.81	570	1150	360	605	47181	27181
	180	30 × 35	1.49	0.81	570	1150	360	605	57181	77181
	180	35 × 25	1.35	0.81	570	1150	360	605	67181	87181
	220	25 × 50	1.73	0.99	450	900	315	525	47221	27221
	220	30 × 40	1.72	0.99	450	900	315	525	57221	77221
	220	35 × 30	1.61	0.99	450	900	315	525	67221	87221
	270	30 × 45	1.95	1.21	380	770	270	450	37271	17271
	270	35 × 35	1.86	1.21	380	770	270	450	67271	87271
330	30 × 50	2.19	1.48	300	600	230	390	47331	27331	
330	35 × 40	2.10	1.48	300	600	230	390	57331	77331	
390	35 × 45	2.34	1.75	250	500	190	340	47391	27391	
470	35 × 50	2.60	2.11	210	420	170	290	57471	77471	
680	35 × 60	3.15	3.06	150	300	110	200	57681	77681	

Note

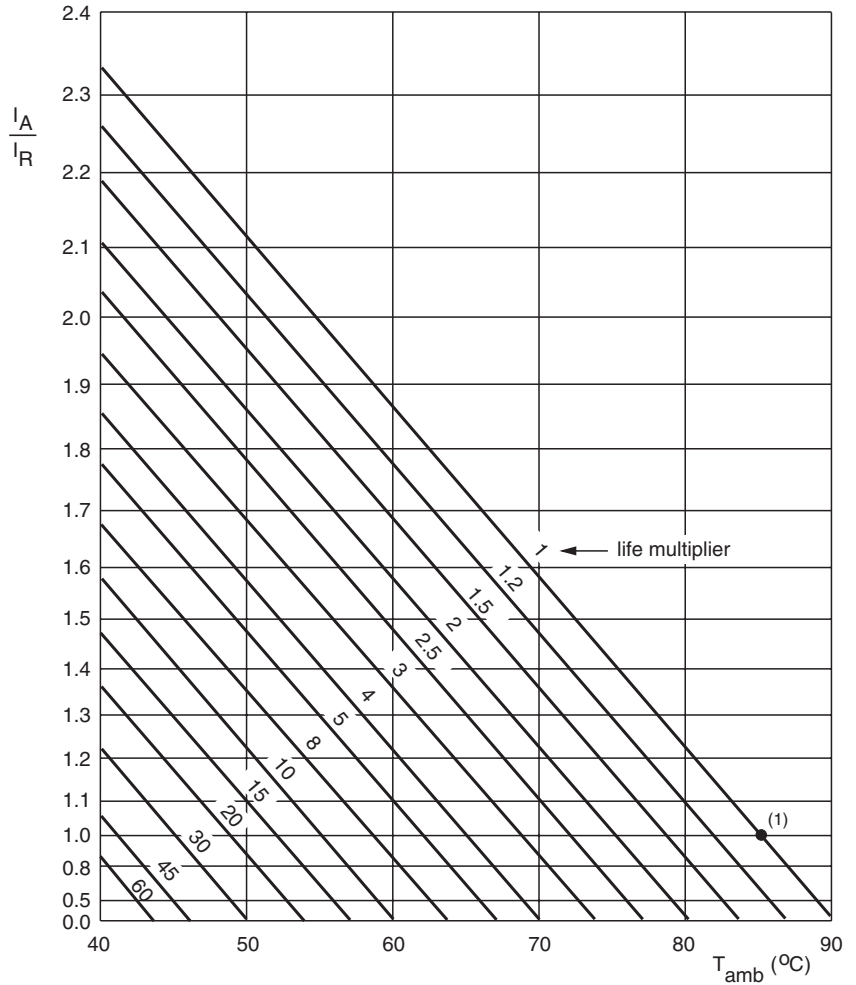
1. ESR at 120 Hz is approximately 0.95 × ESR 100 Hz.

ADDITIONAL ELECTRICAL DATA		
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage	≥ 400 V versions	U _s = 1.1 × U _R
	≤ 250 V versions	U _s = 1.15 × U _R
Reverse voltage		≤ 1 V
Current		
Leakage current	after 5 minutes at U _R	I _{L5} ≤ 0.01 C _R × U _R
Inductance		
Equivalent series inductance (ESL)	all case sizes	typ. 19 nH
		max. 25 nH



RIPPLE CURRENT AND USEFUL LIFE

MGA453



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: 5000 hours.

Fig.6 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	0.90
100	0.95
120	1.00
200	1.15
1000	1.30
≥10000	1.40

Table 4

TEST PROCEDURES AND REQUIREMENTS			
TEST		PROCEDURE (QUICK REFERENCE)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 60384-4/ EN130300 subclause 4.13	$T_{amb} = 85\text{ }^{\circ}\text{C}$; U_R applied; 3000 hours	$\Delta C/C: \pm 10\%$ $ESR \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Load life		$T_{amb} = 85\text{ }^{\circ}\text{C}$; U_R and I_R applied; 3000 hours	$\Delta C/C: \pm 20\%$ $ESR \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ }^{\circ}\text{C}$; U_R and I_R applied; 5000 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	$T_{amb} = 85\text{ }^{\circ}\text{C}$; no voltage applied; 1000 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C: \pm 15\%$ $ESR \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq 1 \times \text{spec. limit}$



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