

Aluminium electrolytic capacitors
Power Ultra Miniature Snap-in

157 PUM-SI

FEATURES

- Polarized aluminium electrolytic capacitors, non-solid
- Large types, very small dimensions, cylindrical aluminium case, insulated with a blue sleeve
- Pressure relief on the top of the aluminium case
- Charge and discharge proof
- Useful life: 2 500 hours at 85 °C.

APPLICATIONS

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

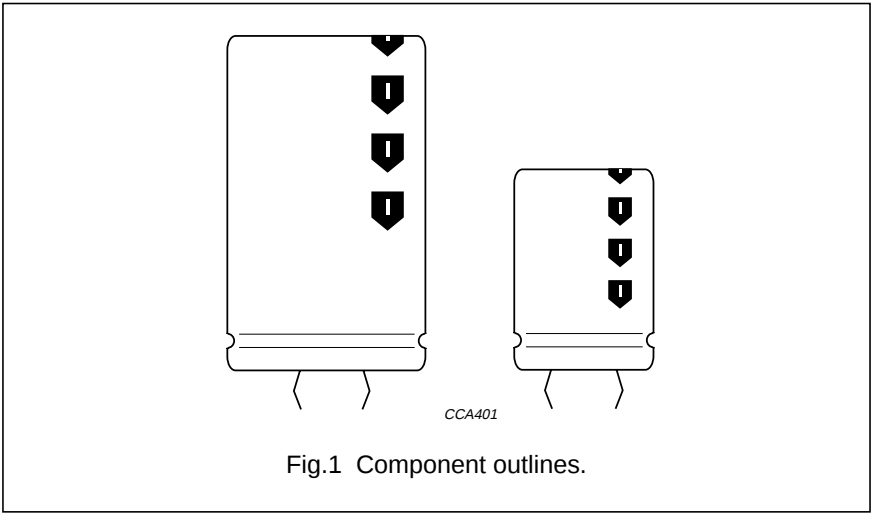
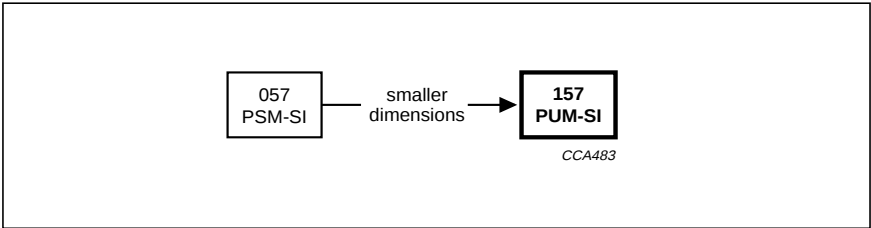


Fig.1 Component outlines.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Case size ($\varnothing D_{nom} \times L_{nom}$ in mm)	22 × 25 to 35 × 50
Rated capacitance range (E6/E12 series), C_R	56 to 2200 μF
Tolerance on C_R	±20%
Rated voltage range, U_R	200 V, 250 V, 400 V, 450 V
Category temperature range	−25 to +85 °C
Endurance test at 85 °C	2000 hours
Load life at 85 °C	2000 hours
Useful life at 85 °C	2500 hours
Useful life at 40 °C and $1.4 \times I_R$ applied	45000 hours
Shelf life at 0 V, 85 °C	1000 hours
Based on sectional specification	IEC 384-4-1/CECC 30300
Climatic category IEC 68	25/085/56

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Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D \times L$ in mm); preferred types in bold

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
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	—
	30 × 30	30 × 35	—	—
	35 × 25	35 × 30	—	—
820	25 × 45	30 × 40	—	—
	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	—	—	—

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MARKING

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

- Rated capacitance (in μF)
- Tolerance code on rated capacitance (M for $\pm 20\%$)
- Rated voltage (in V)
- Climatic category in accordance with "IEC 68"
- Date code (year and week) in accordance with "IEC 62"
- Code for factory of origin
- Name of manufacturer
- '-' sign to indicate the negative terminal, visible from the top and side of the capacitor
- Code number (last 8 digits)
- Code for basic specification in accordance with "IEC 384-4-1" and "CECC 30301".

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MECHANICAL DATA AND PACKAGING QUANTITIES

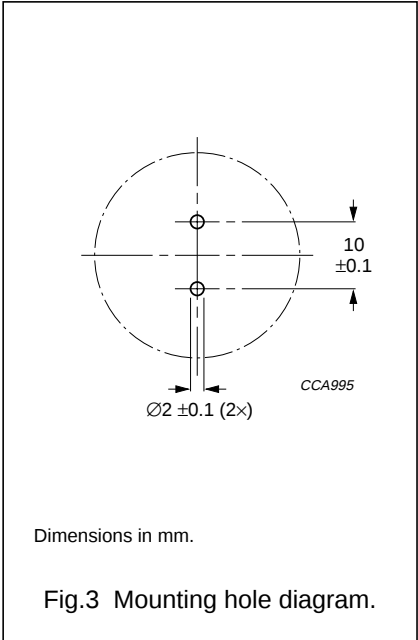
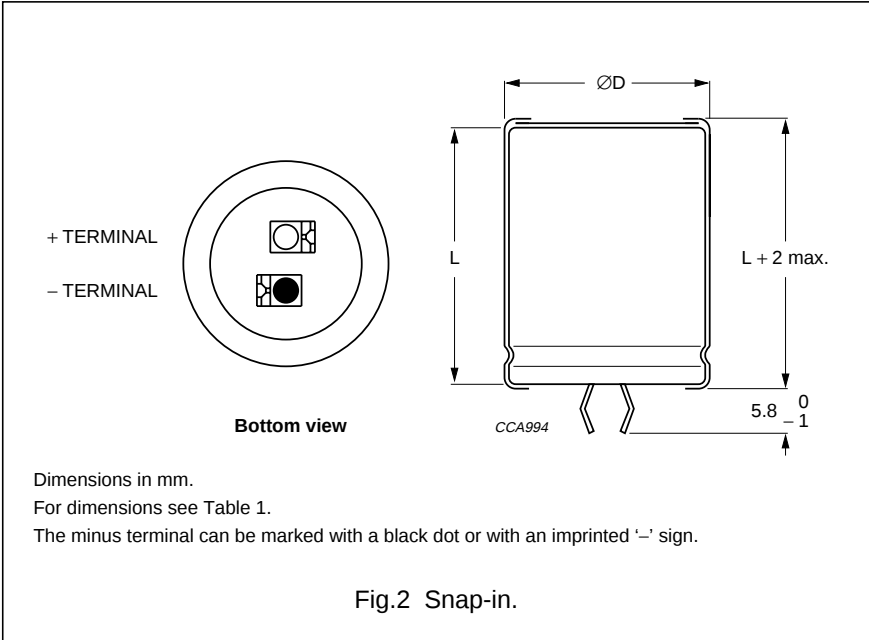


Table 1 Physical dimensions, mass and packaging information; see Fig.2

NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	ØD _{max} (mm)	L _{max} (mm)	MASS (g)	PACKAGING QUANTITIES (units per box)	CARDBOARD BOX DIMENSIONS l × w × h (mm)
22 × 25	2225	23	27	≈12	100	260 × 250 × 39
22 × 30	2230	23	32	≈16	100	260 × 250 × 44
22 × 35	2235	23	37	≈20	100	260 × 250 × 49
22 × 40	2240	23	42	≈23	100	260 × 250 × 54
25 × 25	2525	26	27	≈20	100	290 × 280 × 39
25 × 30	2530	26	32	≈22	100	290 × 280 × 44
25 × 35	2535	26	37	≈24	100	290 × 280 × 49
25 × 40	2540	26	42	≈27	100	290 × 280 × 54
25 × 45	2545	26	47	≈32	100	290 × 280 × 59
25 × 50	2550	26	52	≈38	100	290 × 280 × 64
30 × 25	3025	31	27	≈25	100	340 × 330 × 39
30 × 30	3030	31	32	≈30	100	340 × 330 × 44
30 × 35	3035	31	37	≈35	100	340 × 330 × 49
30 × 40	3040	31	42	≈40	100	340 × 330 × 54
30 × 45	3045	31	47	≈45	100	340 × 330 × 59
30 × 50	3050	31	52	≈50	100	340 × 330 × 64
35 × 25	3525	36	27	≈33	50	390 × 198 × 39
35 × 30	3530	36	32	≈40	50	390 × 198 × 44
35 × 35	3535	36	37	≈48	50	390 × 198 × 49
35 × 40	3540	36	42	≈55	50	390 × 198 × 54
35 × 45	3545	36	47	≈63	50	390 × 198 × 59
35 × 50	3550	36	52	≈72	50	390 × 198 × 64

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ELECTRICAL DATA AND ORDERING INFORMATION

Unless otherwise specified, all electrical values in Table 2 apply at
 $T_{amb} = 20\text{ }^{\circ}\text{C}$, $P = 86\text{ to }106\text{ kPa}$, $RH = 45\text{ to }75\%$.

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

Ordering example

Electrolytic capacitor 157 series

1000 μF /200 V; $\pm 20\%$ Nominal case size: $\varnothing 30 \times 40\text{ mm}$

Catalogue number: 2222 157 52102.

Note

- ESR at 120 Hz is approximately $0.95 \times \text{ESR } 100\text{ Hz}$.

Table 2 Electrical data and ordering information; preferred types in **bold**

U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 120 Hz $85\text{ }^{\circ}\text{C}$ (A)	I_{L5} 5 min (mA)	TYP. ESR 100 Hz ⁽¹⁾ (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
200	270	22 $\times$ 25	2225	1.15	0.54	280	700	157 52271
	330	22 $\times$ 30	2230	1.36	0.66	260	500	157 52331
	390	22 $\times$ 30	2230	1.46	0.78	230	490	157 52391
	470	22 $\times$ 35	2235	1.68	0.94	190	400	157 32471
	560	25 $\times$ 30	2530	1.67	0.94	200	400	157 52471
		22 $\times$ 40	2240	1.91	1.12	190	390	157 42561
		25 $\times$ 35	2535	1.91	1.12	160	390	157 32561
		30 $\times$ 25	3025	1.89	1.12	160	390	157 52561
	680	25 $\times$ 40	2540	2.18	1.36	170	340	157 42681
		30 $\times$ 30	3030	2.04	1.36	170	340	157 52681
		35 $\times$ 25	3525	2.06	1.36	170	340	157 62681
		25 $\times$ 45	2545	2.46	1.64	120	240	157 62821
	820	30 $\times$ 35	3035	2.35	1.64	140	240	157 32821
		35 $\times$ 30	3530	2.29	1.64	160	240	157 52821
		30 $\times$ 40	3040	2.66	2.00	120	225	157 52102
		35 $\times$ 30	3530	2.33	2.00	160	225	157 62102
	1200	30 $\times$ 45	3045	2.98	2.40	100	190	157 32122
		35 $\times$ 35	3535	2.69	2.40	130	190	157 62122
		30 $\times$ 50	3050	3.31	3.00	90	155	157 42152
		35 $\times$ 40	3540	3.04	3.00	110	155	157 52152
	1800	35 $\times$ 45	3545	3.36	3.60	90	130	157 42182
	2200	35 $\times$ 50	3550	3.68	4.40	80	105	157 52222

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U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	I _R 120 Hz 85 °C (A)	I _{L5} 5 min (mA)	TYP. ESR 100 Hz ⁽¹⁾ (mΩ)	Z 10 kHz (mΩ)	CATALOGUE NUMBER 2222
250	220	22 × 30	2230	1.23	0.55	340	700	157 53221
	270	22 × 30	2230	1.32	0.67	280	560	157 43271
		25 × 25	2525	1.23	0.67	280	560	157 53271
	330	22 × 35	2235	1.53	0.82	230	430	157 33331
		25 × 30	2530	1.56	0.82	230	430	157 53331
	390	22 × 40	2240	1.74	0.97	190	425	157 43391
		30 × 25	3025	1.58	0.97	230	425	157 53391
	470	25 × 35	2535	1.87	1.17	180	320	157 33471
		30 × 30	3030	1.89	1.17	190	320	157 53471
	560	25 × 40	2540	2.12	1.40	160	360	157 43561
		30 × 30	3030	1.97	1.40	180	360	157 53561
		35 × 25	3525	1.80	1.40	180	360	157 63561
	680	25 × 45	2545	2.29	1.70	130	260	157 63681
		30 × 35	3035	2.28	1.70	160	260	157 33681
		35 × 30	3530	2.20	1.70	170	260	157 53681
	820	30 × 40	3040	2.57	2.05	120	210	157 53821
		35 × 35	3535	2.54	2.05	140	210	157 63821
	1000	30 × 45	3045	2.88	2.50	110	180	157 33102
		35 × 40	3540	2.86	2.50	120	180	157 53102
	1200	35 × 45	3545	3.17	3.00	100	160	157 43122
	1500	35 × 50	3550	3.49	3.75	90	140	157 53152

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U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	I _R 120 Hz 85 °C (A)	I _{L5} 5 min (mA)	TYP. ESR 100 Hz ⁽¹⁾ (mΩ)	Z 10 kHz (mΩ)	CATALOGUE NUMBER 2222
400	68	22 × 25	2225	0.71	0.27	1180	1950	157 56689
	82	22 × 25	2225	0.77	0.33	990	1620	157 56829
	100	22 × 30	2230	0.94	0.40	930	1220	157 56101
	120	22 × 30	2230	0.97	0.48	870	1140	157 56121
	150	22 × 35	2235	1.13	0.60	700	900	157 36151
		25 × 30	2530	1.16	0.60	680	900	157 56151
	180	22 × 40	2240	1.29	0.72	590	725	157 46181
		25 × 35	2535	1.35	0.72	550	725	157 36181
	220	25 × 40	2540	1.54	0.88	520	590	157 46221
		30 × 30	3030	1.50	0.88	470	590	157 56221
		35 × 25	3525	1.42	0.88	470	590	157 66221
	270	25 × 45	2545	1.72	1.08	400	560	157 66271
		30 × 35	3035	1.74	1.08	380	560	157 36271
		35 × 30	3530	1.71	1.08	400	560	157 56271
	330	30 × 40	3040	1.97	1.32	320	525	157 56331
		35 × 30	3530	1.76	1.32	370	525	157 66331
	390	30 × 45	3045	2.19	1.56	270	420	157 56391
		35 × 35	3535	2.04	1.56	300	420	157 36391
	470	30 × 50	3050	2.40	1.88	240	350	157 46471
		35 × 40	3540	2.30	1.88	250	350	157 56471
	560	35 × 45	3545	2.55	2.24	210	305	157 46561
	680	35 × 50	3550	2.79	2.72	190	265	157 56681

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U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	I _R 120 Hz 85 °C (A)	I _{L5} 5 min (mA)	TYP. ESR 100 Hz ⁽¹⁾ (mΩ)	Z 10 kHz (mΩ)	CATALOGUE NUMBER 2222
450	56	22 × 25	2225	0.68	0.25	1200	1880	157 57569
	68	22 × 30	2230	0.80	0.30	1230	1530	157 57689
	82	22 × 30	2230	0.87	0.36	1030	1290	157 47829
		25 × 25	2525	0.85	0.36	1030	1290	157 57829
	100	22 × 35	2235	1.00	0.45	840	1050	157 37101
		25 × 30	2530	1.02	0.45	860	1050	157 57101
	120	22 × 40	2240	1.15	0.54	710	885	157 47121
		25 × 30	2530	1.09	0.54	710	885	157 57121
		30 × 25	3025	1.10	0.54	710	885	157 67121
	150	25 × 40	2540	1.35	0.67	570	705	157 47151
		25 × 35	2535	1.27	0.67	600	705	157 67151
		30 × 30	3030	1.32	0.67	600	705	157 57151
	180	25 × 40	2540	1.45	0.81	480	605	157 47181
		30 × 35	3035	1.49	0.81	490	605	157 57181
		35 × 25	3525	1.35	0.81	490	605	157 67181
	220	25 × 50	2550	1.73	0.99	400	525	157 47221
		30 × 40	3040	1.72	0.99	410	525	157 57221
		35 × 30	3530	1.61	0.99	440	525	157 67221
	270	30 × 45	3045	1.95	1.21	340	450	157 37271
		35 × 35	3535	1.86	1.21	360	450	157 67271
	330	30 × 50	3050	2.19	1.48	280	390	157 47331
		35 × 40	3540	2.10	1.48	300	390	157 57331
	390	35 × 45	3545	2.34	1.75	250	340	157 47391
	470	35 × 50	3550	2.60	2.11	210	290	157 57471

Note

1. ESR at 120 Hz is approximately $0.95 \times \text{ESR } 100 \text{ Hz}$.

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Additional electrical data

PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage for short periods	≥400 V versions	$U_s = 1.1 \times U_R$
	≤250 V versions	$U_s = 1.15 \times U_R$
Reverse voltage		not allowed
Current		
Leakage current	after 5 minutes at U_R	$I_{L5} \leq 0.01 C_R \times U_R$
Inductance		
Equivalent series inductance (ESL)	all case sizes	typ. 19 nH
		max. 25 nH
Dissipation factor		
Tangent of loss angle	all types	$\tan \delta \leq 0.15$

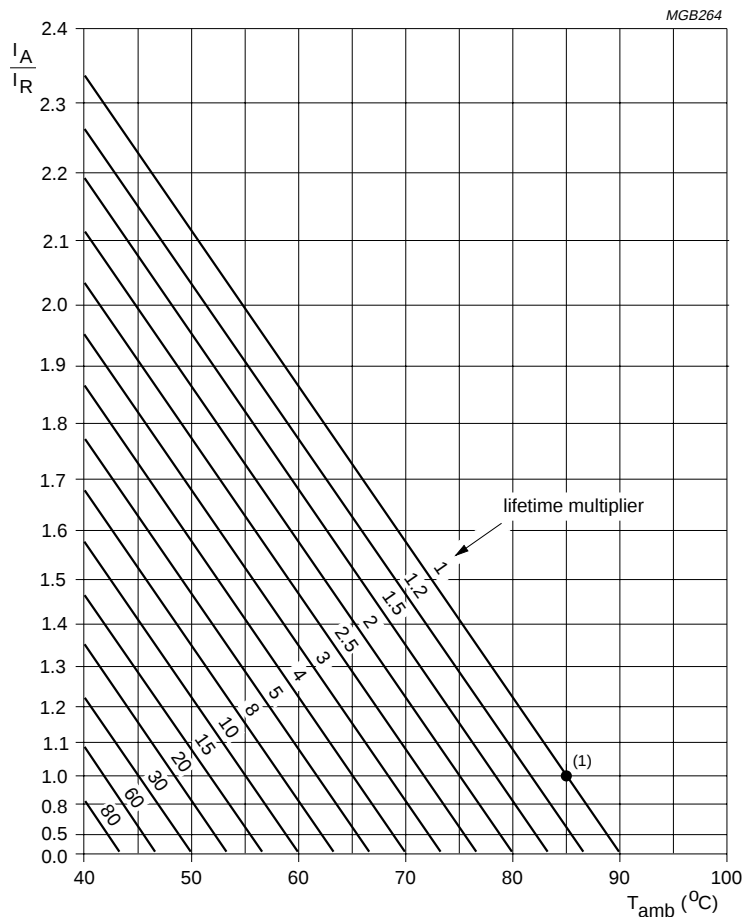
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RIPPLE CURRENT AND USEFUL LIFE

Table 3 Multiplier of ripple current (I_R) as a function of frequency

FREQUENCY (Hz)	I_R MULTIPLIER
50	0.9
100	0.95
120	1.0
200	1.15
1000	1.3
≥ 10000	1.4



I_A = actual ripple current at 120 Hz and 85 °C.
 I_R = rated ripple current at 120 Hz and 85 °C.
(1) Useful life at 85 °C and I_R applied: 2500 hours.

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

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SPECIFIC TESTS AND REQUIREMENTS

General tests and requirements are specified in this handbook, Section *"Tests and Requirements"*.

Table 4 Test procedures and requirements

TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 384-4/ CECC 30300 subclause 4.13	$T_{amb} = 85\text{ °C}$; U_R applied; 2000 hours	$\Delta C/C: \pm 10\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Load life		$T_{amb} = 85\text{ °C}$; U_R and I_R applied; 2000 hours	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ °C}$; U_R and I_R applied; 2500 hours	$\Delta C/C: \pm 30\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage: $\leq 3\%$
Shelf life (storage at high temperature)	IEC 384-4/ CECC 30300 subclause 4.17	$T_{amb} = 85\text{ °C}$; no voltage applied; 1000 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C: \pm 15\%$ $\tan \delta \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq 1 \times \text{spec. limit}$