

DATA SHEET

157 PUM-SI

Aluminum electrolytic capacitors
Power Ultra Miniature Snap-in

Product specification
Supersedes data of 18th January 2000
File under BCcomponents, BC01

2000 Nov 06

Aluminum electrolytic capacitors Power Ultra Miniature Snap-in

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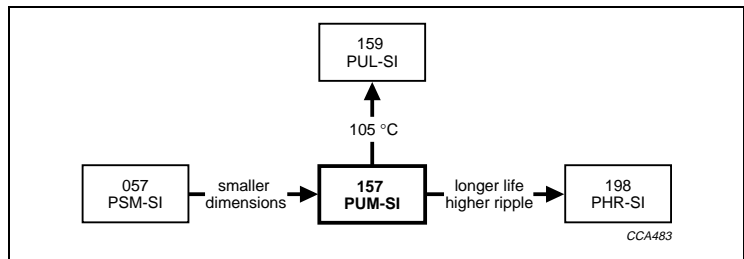
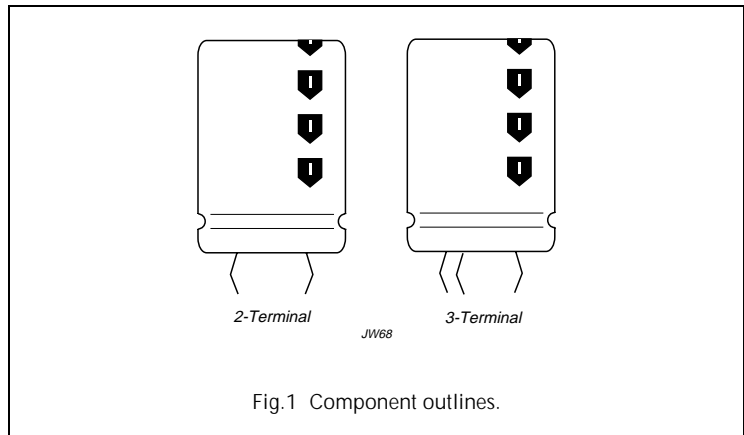
FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Large types, very small dimensions, cylindrical aluminum case, insulated with a blue sleeve
- Pressure relief on the top of the aluminum case⁽¹⁾
- Charge and discharge proof
- Useful life: 2 500 hours at 85 °C
- Keyed polarity version available.

APPLICATIONS

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

(1)Pressure relief in the side, for case size 35 × 60 mm



QUICK REFERENCE DATA

DESCRIPTION	VALUE	
Case size ($\varnothing D_{nom} \times L_{nom}$ in mm)	22 × 25 to 35 × 60	
Rated capacitance range (E6/E12 series), C_R	56 to 2 200 μF	
Tolerance on C_R	±20%	
Rated voltage range, U_R ; note 1	200 V, 250 V	400 V, 450 V
Category temperature range	-40 to +85 °C	-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 60384-4-1/EN130300	
Climatic category IEC 60068	40/085/56	25/085/56

Note

1. 160 volt and 420 V ranges are available on request.

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Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D \times L$ in mm); preferred types (2-terminals) 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	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	–	–	–

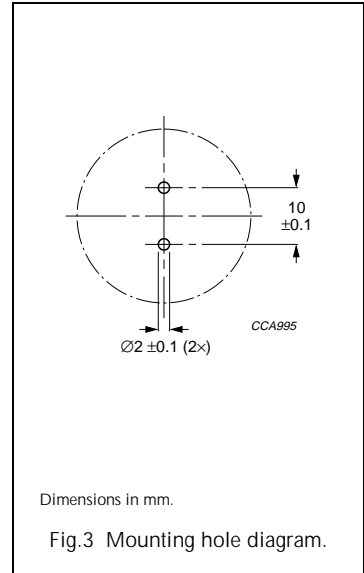
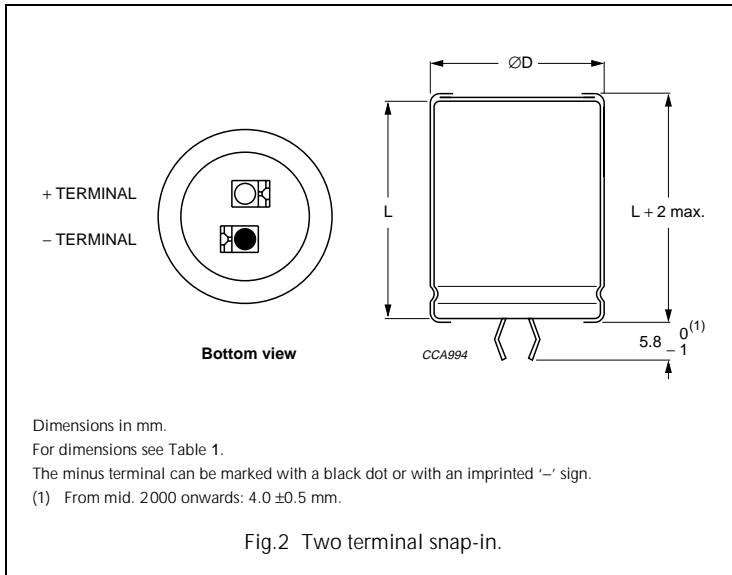
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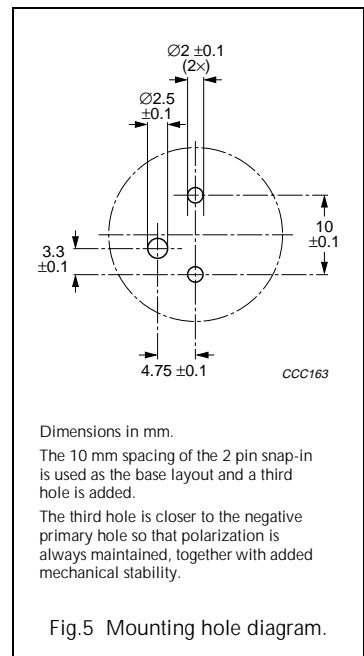
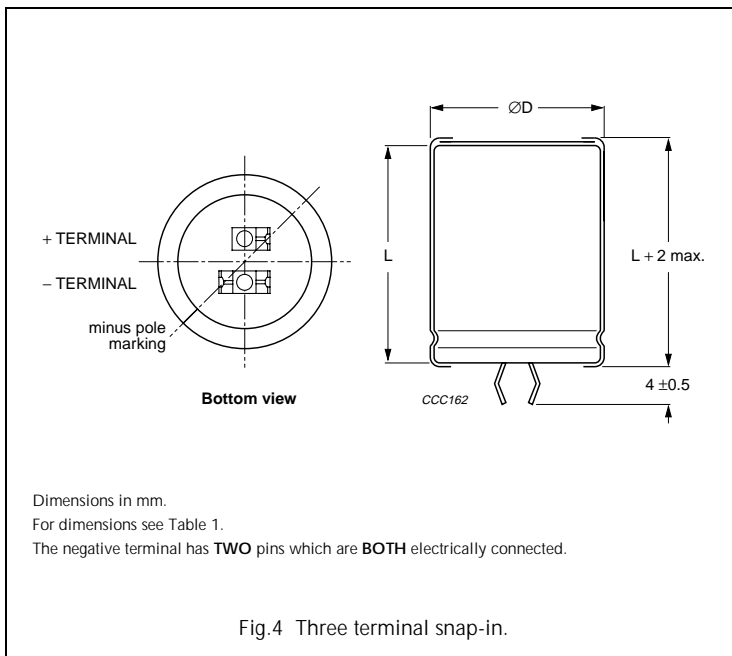
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MECHANICAL DATA AND PACKAGING QUANTITIES

Two terminal snap-in



Three terminal snap-in



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Table 1 Physical dimensions, mass and packaging information; see Figs 2 and 4

NOMINAL CASE SIZE ∅D × L (mm)	∅D _{max} (mm)	L _{max} (mm)	MASS (g)	PACKAGING QUANTITIES (units per box)	CARDBOARD BOX DIMENSIONS l × w × h (mm)
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

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 60068"
- Date code (year and week) in accordance with "IEC 60062"
- 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 60384-4-1" and "CECC 30301".

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ELECTRICAL DATA AND ORDERING INFORMATION

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% .

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

Ordering examples

Electrolytic capacitor 157 series

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

2-TERMINAL SNAP-IN:

Catalogue number: 2222 157 52102.

3-TERMINAL SNAP-IN:

Catalogue number: 2222 157 72102.

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)	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)	CATALOGUE NUMBER 2222 157	
									2-TERM.	3-TERM.
200	270	22 × 25	1.15	0.54	550	880	420	700	52271	72271
	330	22 × 30	1.36	0.66	430	720	300	500	52331	72331
	390	22 × 30	1.46	0.78	390	650	295	490	52391	72391
	470	22 × 35	1.68	0.94	350	580	240	400	32471	12471
	470	25 × 30	1.67	0.94	350	580	240	400	52471	72471
	560	22 × 40	1.91	1.12	255	425	235	390	42561	22561
	560	25 × 35	1.91	1.12	255	425	235	390	32561	12561
	560	30 × 25	1.89	1.12	255	425	235	390	52561	72561
	680	25 × 40	2.18	1.36	210	350	205	340	42681	22681
	680	30 × 30	2.04	1.36	210	350	205	340	52681	72681
	680	35 × 25	2.06	1.36	210	350	205	340	62681	82681
	820	25 × 45	2.46	1.64	170	290	145	240	62821	82821
	820	30 × 35	2.35	1.64	170	290	145	240	32821	12821
	820	35 × 30	2.29	1.64	170	290	145	240	52821	72821
	1000	30 × 40	2.66	2.00	140	235	135	225	52102	72102
	1000	35 × 30	2.33	2.00	140	235	135	225	62102	82102
	1200	30 × 45	2.98	2.40	120	200	110	190	32122	12122
	1200	35 × 35	2.69	2.40	120	200	110	190	62122	82122
	1500	30 × 50	3.31	3.00	110	180	95	155	42152	22152
	1500	35 × 40	3.04	3.00	110	180	95	155	52152	72152
	1800	35 × 45	3.36	3.60	100	160	80	130	42182	22182
	2200	35 × 50	3.68	4.40	90	150	65	105	52222	72222

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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)	CATALOGUE NUMBER 2222 157	
									2-TERM.	3-TERM.
250	220	22 × 30	1.23	0.55	600	1080	420	700	53221	73221
	270	22 × 30	1.32	0.67	490	880	335	560	43271	23271
	270	25 × 25	1.23	0.67	490	880	335	560	53271	73271
	330	22 × 35	1.53	0.82	400	720	255	430	33331	13331
	330	25 × 30	1.56	0.82	400	720	255	430	53331	73331
	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	

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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)	CATALOGUE NUMBER 2222 157	
									2-TERM.	3-TERM.
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	

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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)	CATALOGUE 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 $0.95 \times$ ESR 100 Hz.

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Additional electrical data

PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage	≥400 V versions	$U_s = 1.1 \times U_R$
	≤250 V versions	$U_s = 1.15 \times U_R$
Reverse voltage		≤1 V
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

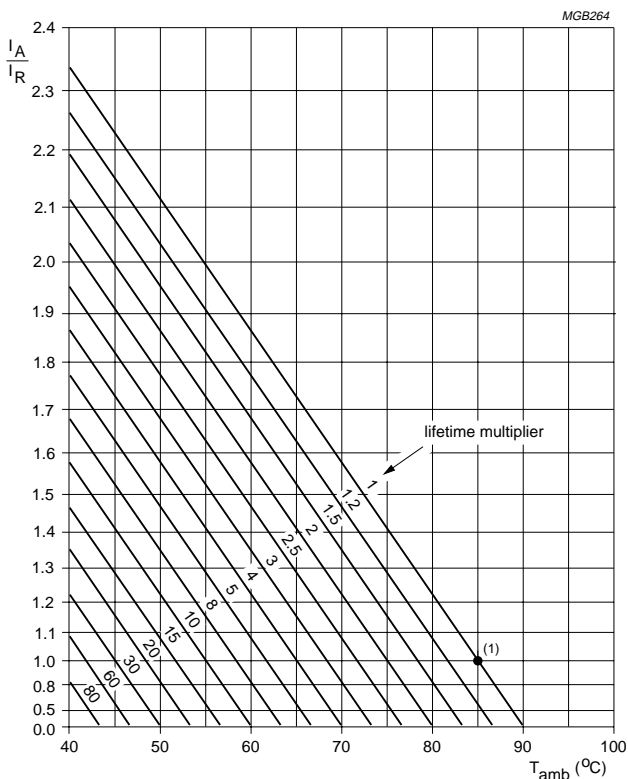
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RIPPLE CURRENT AND USEFUL LIFE

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.6 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 60384-4/ EN130300 subclause 4.13	$T_{amb} = 85\text{ °C}$; U_R applied; 2000 hours	$\Delta C/C: \pm 10\%$ $ESR \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Load life		$T_{amb} = 85\text{ °C}$; U_R and I_R applied; 2000 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	$T_{amb} = 85\text{ °C}$; U_R and I_R applied; 2500 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; 1000 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C: \pm 15\%$ $ESR \leq 1.5 \times \text{spec. limit}$ $I_{L5} \leq 1 \times \text{spec. limit}$