

DATA SHEET

120 ATC

**Aluminum electrolytic capacitors
Axial High Temperature High Ripple
Current**

Preliminary specification
Supersedes data of 24th August 2000
File under BCcomponents, BC01

2001 Jan 18

Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

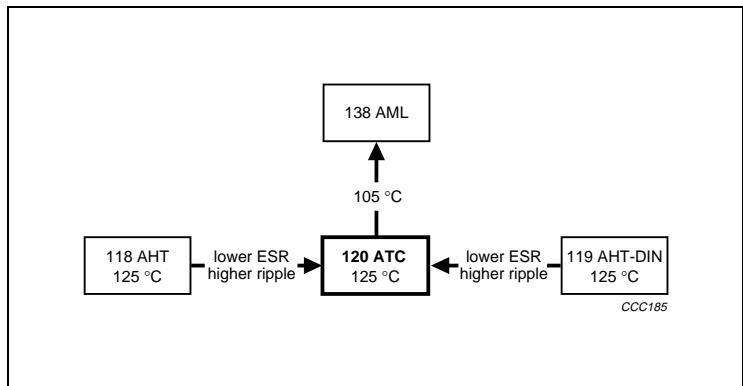
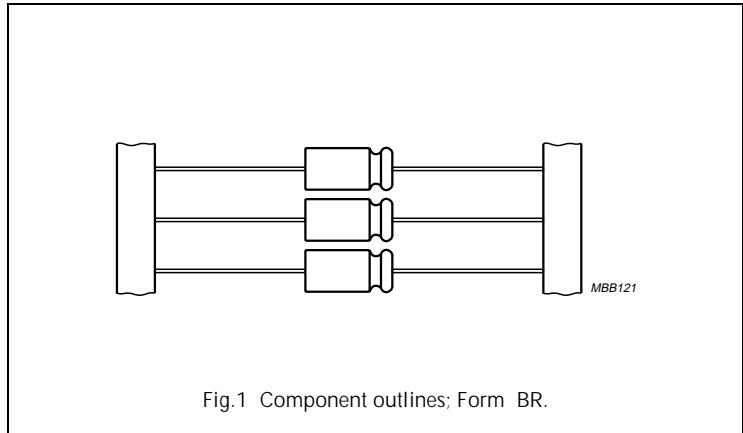
120 ATC

FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Axial leads, cylindrical aluminium case, insulated with a blue sleeve
- Taped versions available for automatic insertion
- Charge and discharge proof
- Extra long useful life: up to 8000 hours at 125 °C, high reliability
- Lowest ESR levels providing very high ripple current capability
- Extended temperature range: usable up to 150 °C
- Miniaturized, high CV-product per unit volume
- Lead diameter $\varnothing d = 1.0 \text{ mm}$, available on request.

APPLICATIONS

- Automotive, industrial and telecommunication
- Smoothing, filtering, buffering
- Low mounting height applications, vibration and shock resistant
- SMPS and standard power supplies.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Case sizes ($\varnothing D_{nom} \times L_{nom}$ in mm)	10 × 30 to 21 × 40
Rated capacitance range, C_R	47 to 6800 μF
Tolerance on C_R	$\pm 20\%$
Rated voltage range, U_R	16 to 100 V
Category temperature range	-40 to +125 °C
Endurance test at 150 °C	1000 hours
Endurance test at 125 °C	4000 hours
Useful life at 125 °C	8000 hours
Useful life at 85 °C, $1.4 \times I_R$ applied	40000 hours
Shelf life at 0 V, 125 °C	1000 hours (100 V: 500 hours)
Shelf life at 0 V, 150 °C	$\leq 63 \text{ V}$: 500 hours
Based on sectional specification	IEC 60384-4/EN130300
Climatic category IEC 60068	40/125/56

Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

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

Preferred types in **bold**.

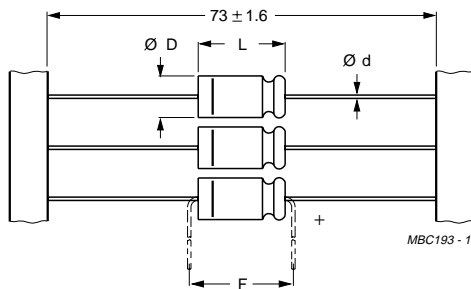
C_R (μF)	U_R (V)				
	16	25	40	63	100
47	–	–	–	–	10 × 30
68	–	–	–	–	12.5 × 30
100	–	–	–	10 × 30	12.5 × 30
150	–	–	–	12.5 × 30	15 × 30
220	–	–	10 × 30	12.5 × 30	18 × 30
330	–	–	12.5 × 30	15 × 30	18 × 40
470	–	10 × 30	12.5 × 30	18 × 30	21 × 40
680	10 × 30	12.5 × 30	15 × 30	18 × 40	–
1000	12.5 × 30	12.5 × 30	18 × 30	21 × 40	–
1500	12.5 × 30	15 × 30	18 × 40	–	–
2200	15 × 30	18 × 30	21 × 40	–	–
3300	18 × 30	18 × 40	–	–	–
4700	18 × 40	21 × 40	–	–	–
6800	21 × 40	–	–	–	–

Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

MECHANICAL DATA, AVAILABLE FORMS AND PACKAGING QUANTITIES



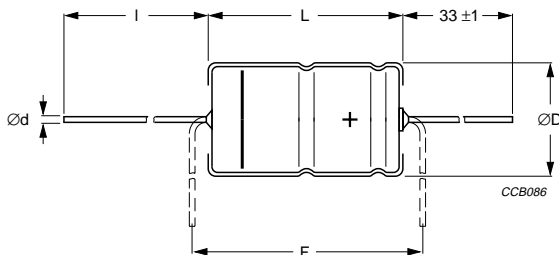
Dimensions in mm.

Form BR: Taped on reel,
case $\varnothing D \times L = 10 \times 30$ to 15×30 mm.

For dimensions see Table 1.

Tape dimensions are specified in this handbook, section "Packaging".

Fig.2 Dimensional outline; Form BR.



Dimensions in mm.

Form AA: Axial in box,
case $\varnothing D \times L = 10 \times 30$ to 21×40 mm.

For case $\varnothing D \times L = 18 \times 40$ and 21×40 mm, the stated limit may be exceeded by 0.7 mm.

For dimensions see Table 1.

Fig.3 Dimensional outline; Form AA.

Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

Table 1 Axial: physical dimensions, mass and packaging quantities; see Figs 2 and 3

NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	AXIAL: FORM AA and BR					MASS (g)	PACKAGING QUANTITIES	
	$\varnothing d^{(1)}$ (mm)	l (mm)	$\varnothing D_{\max}$ (mm)	L_{\max} (mm)	F_{\min} (mm)		FORM AA	FORM BR
10 × 30	0.8	55 ±1	10.5	30.5	35	≈4.8	200	500
12.5 × 30	0.8	55 ±1	13.0	30.5	35	≈7.4	200	400
15 × 30	0.8	55 ±1	15.5	30.5	35	≈11.7	200	250
18 × 30	0.8	55 ±1	18.5	30.5	35	≈12.9	200	–
18 × 40	0.8	34 ±1	18.5	41.5	45	≈19.4	100	–
21 × 40	0.8	34 ±1	21.5	41.5	45	≈24.7	100	–

Note

1. Lead diameter $\varnothing d = 1.0$ mm, available on request.

Aluminum electrolytic capacitors Axial High Temperature High Ripple Current

120 ATC

Ordering example

Electrolytic capacitor 120 series

1000 μ F/16 V; \pm 20%

Nominal case size: \varnothing 12.5 \times 30 mm; Form BR

Catalogue number: 2222 120 25102.

ELECTRICAL DATA AND ORDERING INFORMATION

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

C_R	rated capacitance at 100 Hz, tolerance \pm 20%
I_R	rated RMS ripple current at 10 kHz, 125 $^{\circ}\text{C}$
I_{L1}	max. leakage current after 1 minute at U_R
I_{L5}	max. leakage current after 5 minutes at U_R
ESR	equivalent series resistance at 100 Hz (calculated from $\tan \delta_{max}$ and C_R)
Z	max. impedance at 10 kHz

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

U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	I_R 10 kHz 125 $^{\circ}\text{C}$ (mA)	I_{L1} 1 min (μ A)	I_{L5} 5 min (μ A)	TYP. ESR 100 Hz (m Ω)	MAX. ESR 100 Hz (m Ω)	TYP. ESR 10 kHz (m Ω)	MAX. ESR 10 kHz (m Ω)	Z MAX. 10 kHz (m Ω)	CATALOGUE NUMBER 2222	
											AXIAL	
											IN BOX FORM AA	TAPED ON REEL FORM BR
16	680	10 \times 30	2100	85	46	106	177	44	74	78	120 15681	120 25681
	1000	12.5 \times 30	2550	116	52	77	128	35	58	61	120 15102	120 25102
	1500	12.5 \times 30	2650	164	68	60	100	32	53	53	120 15152	120 25152
	2200	15 \times 30	2940	231	90	48	79	28	46	46	120 15222	120 25222
	3300	18 \times 30	3430	337	126	41	68	26	43	43	120 15332	–
	4700	18 \times 40	4350	471	166	27	45	18	29	29	120 15472	–
	6800	21 \times 40	4590	673	236	26	43	18	29	29	120 15682	–
25	470	10 \times 30	2100	91	44	112	187	45	74	84	120 16471	120 26471
	680	12.5 \times 30	2550	122	54	81	136	35	59	64	120 16681	120 26681
	1000	12.5 \times 30	2600	170	70	64	107	32	53	55	120 16102	120 26102
	1500	15 \times 30	2890	245	95	49	82	28	46	46	120 16152	120 26152
	2200	18 \times 30	3310	350	126	43	71	27	44	44	120 16222	–
	3300	18 \times 40	4350	515	186	28	47	18	29	29	120 16332	–
	4700	21 \times 40	4470	725	256	27	44	18	29	29	120 16472	–

Aluminum electrolytic capacitors Axial High Temperature High Ripple Current

120 ATC

U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ØD × L (mm)	I _R 10 kHz 125 °C (mA)	I _{L1} 1 min (μA)	I _{L5} 5 min (μA)	TYP. ESR 100 Hz (mΩ)	MAX. ESR 100 Hz (mΩ)	TYP. ESR 10 kHz (mΩ)	MAX. ESR 10 kHz (mΩ)	Z MAX. 10 kHz (mΩ)	CATALOGUE NUMBER 2222	
											AXIAL	
											IN BOX FORM AA	TAPED ON REEL FORM BR
40	220	10 × 30	1990	73	38	192	320	52	87	124	120 17221	120 27221
	330	12.5 × 30	2430	99	46	130	216	37	62	83	120 17331	120 27331
	470	12.5 × 30	2550	133	58	101	169	35	58	70	120 17471	120 27471
	680	15 × 30	2840	183	74	75	125	30	50	55	120 17681	120 27681
	1000	18 × 30	3150	260	100	59	99	28	47	49	120 17102	–
	1500	18 × 40	4130	380	136	39	65	19	31	32	120 17152	–
	2200	21 × 40	4170	548	196	34	56	19	31	31	120 17222	–
63	100	10 × 30	1560	58	33	297	495	92	154	249	120 18101	120 28101
	150	12.5 × 30	2050	77	39	195	325	61	102	162	120 18151	120 28151
	220	12.5 × 30	2150	103	48	149	249	55	92	126	120 18221	120 28221
	330	15 × 30	2510	145	62	105	175	44	73	91	120 18331	120 28331
	470	18 × 30	2860	198	79	81	135	38	64	74	120 18471	–
	680	18 × 40	3720	277	106	55	92	26	43	49	120 18681	–
	1000	21 × 40	3780	399	146	44	74	25	41	43	120 18102	–
100	47	10 × 30	760	49	29	760	1269	349	581	720	120 19479	120 29479
	68	12.5 × 30	1030	61	34	531	885	246	410	503	120 19689	120 29689
	100	12.5 × 30	1140	80	40	389	648	196	327	381	120 19101	120 29101
	150	15 × 30	1480	110	50	266	443	137	229	262	120 19151	120 29151
	220	18 × 30	1960	152	64	181	302	95	158	179	120 19221	–
	330	18 × 40	2550	218	86	120	200	62	104	117	120 19331	–
	470	21 × 40	2800	302	114	92	154	52	86	94	120 19471	–

Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

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 1 minute at U_R	$I_{L1} \leq 0.006C_R \times U_R + 20 \mu\text{A}$
	after 5 minutes at U_R	$I_{L5} \leq 0.002C_R \times U_R + 20 \mu\text{A}$
Inductance		
Equivalent series inductance (ESL)	case $\varnothing D \times L$ mm:	
	10 × 30	typ. 38 nH
	12.5 × 30	typ. 46 nH
	15 × 30	typ. 48 nH
	18 × 30	typ. 50 nH
	18 × 40	typ. 54 nH
	21 × 40	typ. 59 nH

MARKING

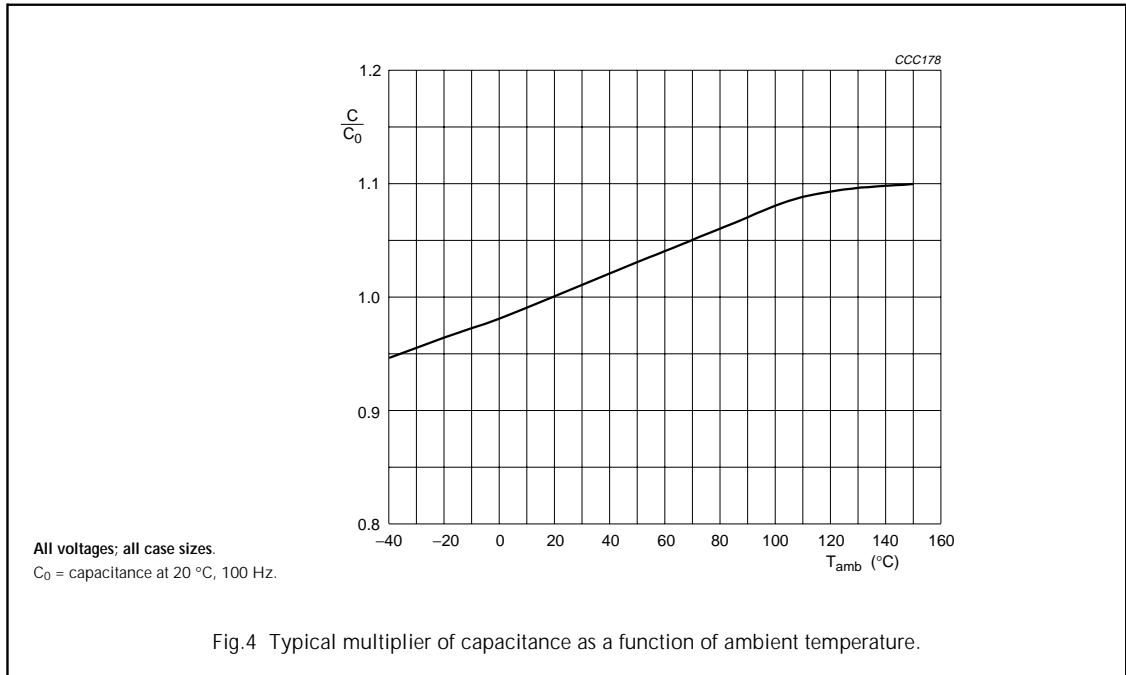
The capacitors are marked (where possible) with the following information:

- Rated capacitance (in μF)
- Tolerance on rated capacitance, code letter in accordance with "IEC 60062"
- Rated voltage (in V) at 125 °C
- Group number (120)
- Name of manufacturer
- Date code, in accordance with "IEC 60062"
- Code indicating factory of origin
- Band to identify the negative terminal
- '+' sign to identify the positive terminal.

Aluminum electrolytic capacitors Axial High Temperature High Ripple Current

120 ATC

Capacitance (C)

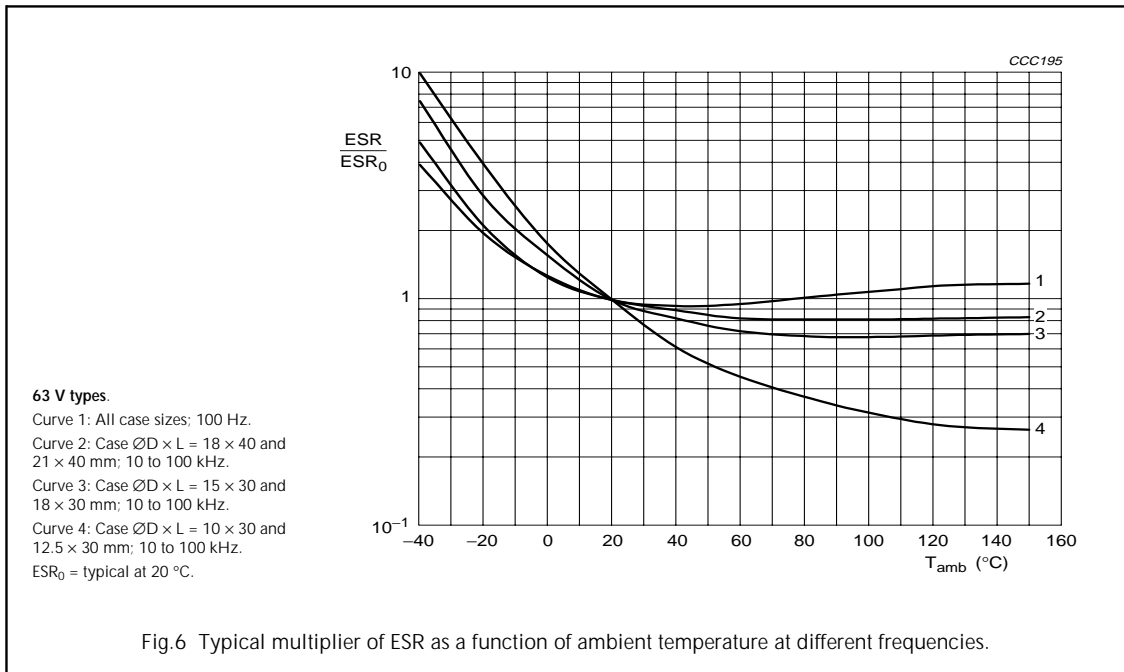
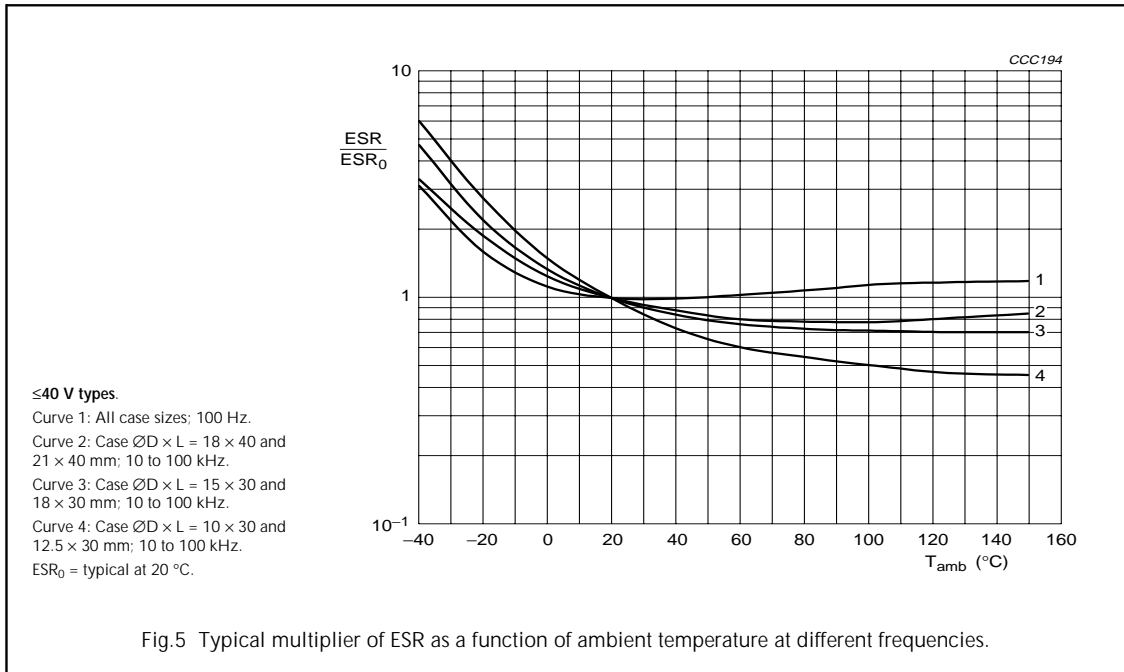


Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

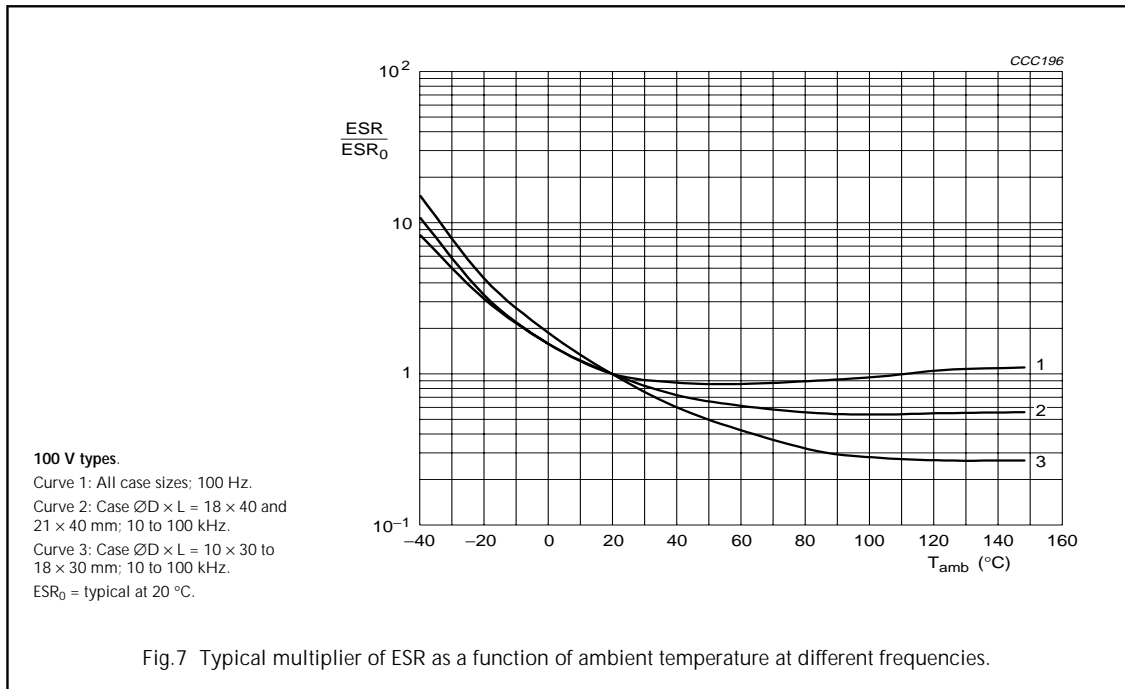
Equivalent series resistance (ESR)



Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

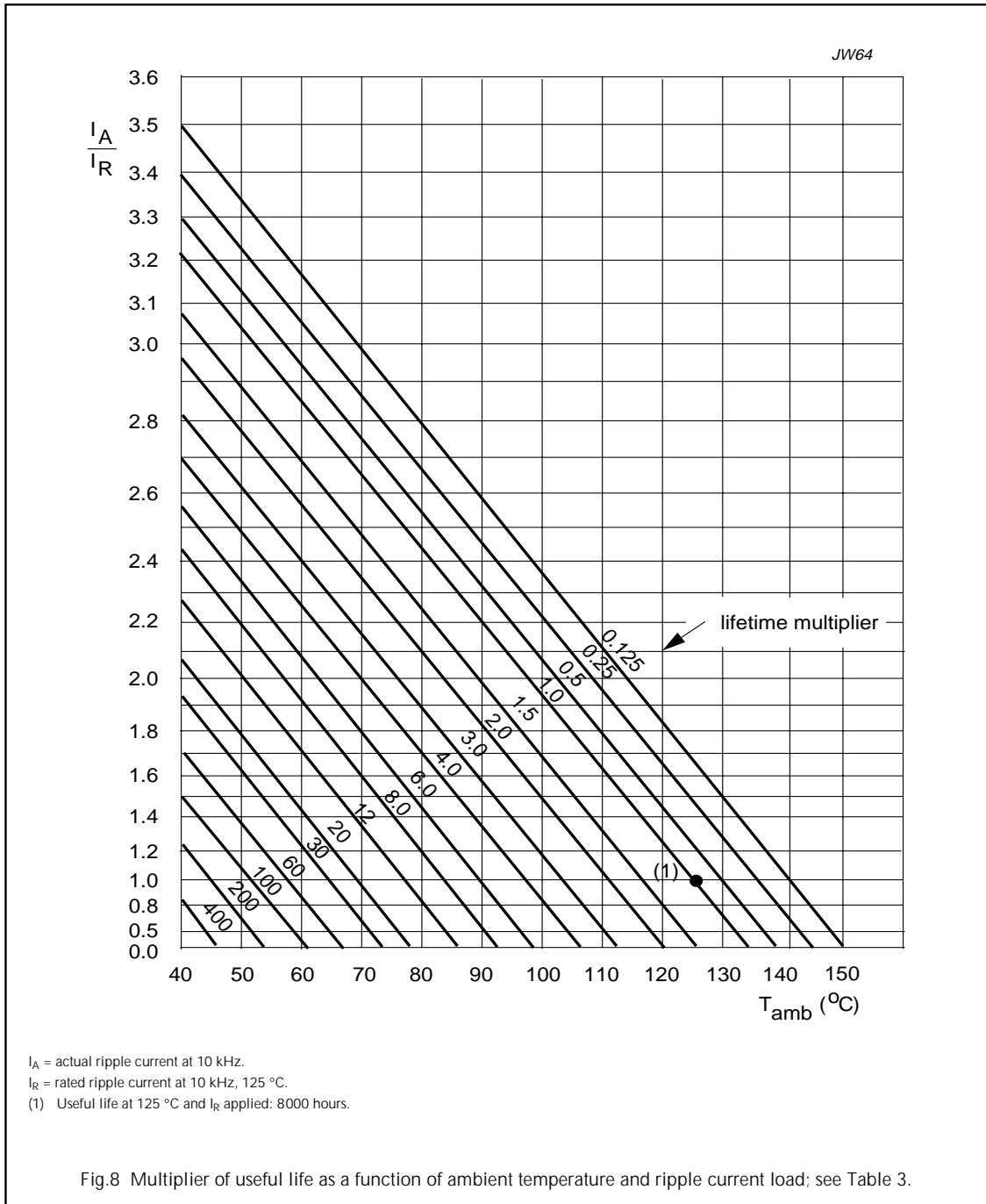


Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

RIPPLE CURRENT AND USEFUL LIFE



Aluminum electrolytic capacitors

Axial High Temperature High Ripple Current

120 ATC

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

FREQUENCY (Hz)	I_R MULTIPLIER			
	$U_R = 16$ to 40 V case sizes 10×30 to 15×30 mm	$U_R = 16$ to 40 V case sizes 18×30 to 21×40 mm	$U_R = 63$ and 100 V case sizes 10×30 to 15×30 mm	$U_R = 63$ and 100 V case sizes 18×30 to 21×40 mm
50	0.37	0.54	0.23	0.44
100	0.48	0.63	0.32	0.56
300	0.69	0.75	0.53	0.76
1000	0.86	0.81	0.77	0.88
3000	0.96	0.87	0.93	0.94
≥ 10000	1.0	1.0	1.0	1.0

Aluminum electrolytic capacitors

Axial High Temperature High Ripple

120 ATC

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	$T_{amb} = 125\text{ °C}$; U_R applied; 4000 hours	$\Delta C/C: \pm 15\%$ $\tan \delta \leq 1.3 \times \text{spec. limit}$ $Z \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 125\text{ °C}$; U_R and I_R applied; 8000 hours	$\Delta C/C: \pm 45\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 1\%$
Shelf life (storage at high temperature)	IEC 60384-4/ EN130300 subclause 4.17	$T_{amb} = 125\text{ °C}$; no voltage applied; 1000 hours (100 V: 500 hours) $T_{amb} = 150\text{ °C}$; no voltage applied; 500 hours for voltages: $\leq 63\text{ V}$ after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C$, $\tan \delta$, Z : for requirements see 'Endurance test' above $I_{L5} \leq 2 \times \text{spec. limit}$
Reverse voltage	IEC 60384-4/ EN130300 subclause 4.15	$T_{amb} = 125\text{ °C}$: 125 hours at $U = -1\text{ V}$ followed by 125 hours at U_R	$\Delta C/C: \pm 20\%$ $\tan \delta \leq \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Vibration	IEC 60068-2 subclause 4.15 test method Fc	case size 10×30 to 18×30 : 10 to 2000 Hz; 1.5 mm or 20 g (whichever is less severe); in 3 directions; 2.5 hours per direction case size 18×40 and 21×40 : 10 to 500 Hz; 0.75 mm or 10 g (whichever is less severe); in 3 directions; 2 hours per direction	no visible damage; no leakage of electrolyte; markings legible $\Delta C/C: \pm 5\%$ with respect to initial measurement