

# DATA SHEET

O21 ASM

**Aluminum electrolytic capacitors**  
**Axial Standard Miniature**

Product specification  
Supersedes data of March 1998  
File under BCcomponents, BC01

2000 Jan 18

# Aluminum electrolytic capacitors

## Axial Standard Miniature

021 ASM

### FEATURES

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Axial leads, cylindrical aluminum case, insulated with a blue sleeve
- Mounting ring version (single ended) not insulated
- Charge and discharge proof
- Taped versions up to case  $\varnothing 15 \times 30$  mm available for automatic insertion
- Miniaturized, high CV-product per unit volume.

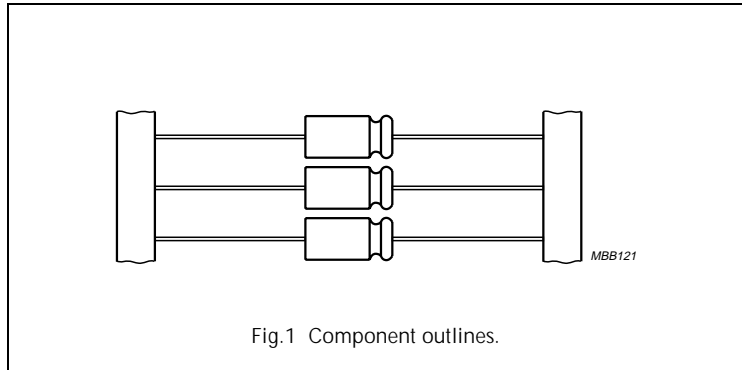
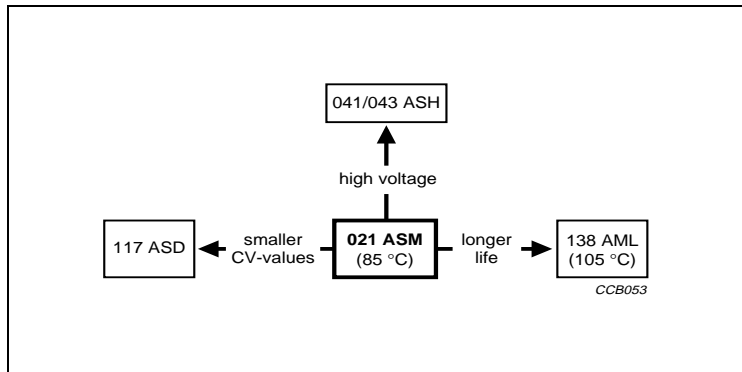


Fig.1 Component outlines.

### APPLICATIONS

- General purpose, industrial, automotive, audio-video
- Coupling, decoupling, smoothing, filtering, buffering and timing
- Portable and mobile equipment (small size, low mass)
- Low mounting height boards, vibration and shock resistant.



### QUICK REFERENCE DATA

DESCRIPTION	VALUE	
Case sizes ( $\varnothing D_{nom} \times L_{nom}$ in mm)	4.5 × 10 to 10 × 25	10 × 30 to 21 × 40
Rated capacitance range, $C_R$	0.47 to 15000 $\mu$ F	
Tolerance on $C_R$	±20%	
Rated voltage range, $U_R$	6.3 to 100 V	
Category temperature range	-40 to +85 °C	
Endurance test at 85 °C:		
$U_R = 6.3$ to 25 V	1 000 hours	5 000 hours
$U_R = 40$ to 100 V	2 000 hours	5 000 hours
Useful life at 85 °C	2 500 hours	8 000 hours
Useful life at 40 °C, $1.4 \times I_R$ applied	70 000 hours	200 000 hours
Shelf life at 0 V, 85 °C	500 hours	500 hours
Based on sectional specification	IEC 60384-4/EN130300	
Climatic category IEC 60068	40/085/56	

# Aluminum electrolytic capacitors

## Axial Standard Miniature

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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**.

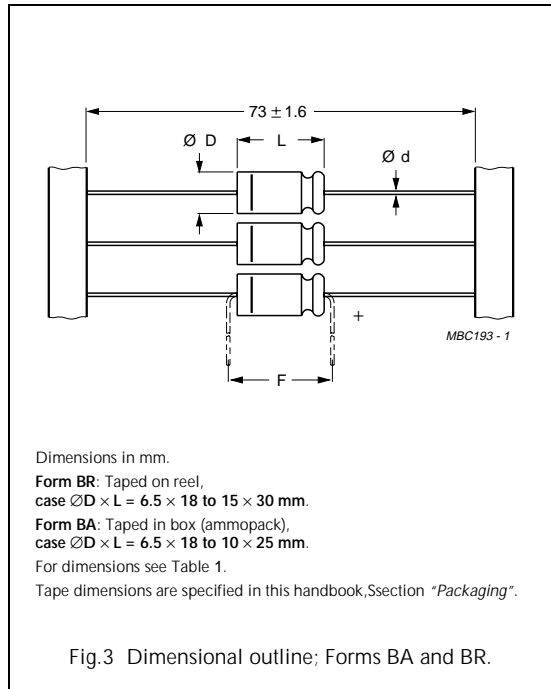
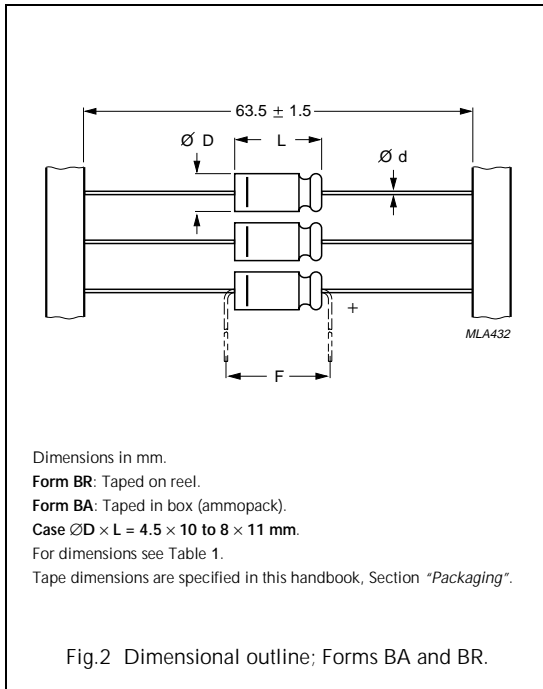
$C_R$ ( $\mu F$ )	$U_R$ (V)						
	6.3	10	16	25	40	63	100
0.47	–	–	–	–	–	4.5 × 10	–
<b>1</b>	–	–	–	–	–	<b>4.5 × 10</b>	4.5 × 10
<b>2.2</b>	–	–	–	–	–	<b>4.5 × 10</b>	4.5 × 10
3.3	–	–	–	–	–	4.5 × 10	–
<b>4.7</b>	–	–	–	–	–	<b>4.5 × 10</b>	4.5 × 10
<b>10</b>	–	–	–	–	–	<b>4.5 × 10</b>	6 × 10
15	–	–	–	–	–	4.5 × 10	8 × 11
	–	–	–	–	–	–	6.5 × 18
<b>22</b>	–	–	–	–	<b>4.5 × 10</b>	<b>6 × 10</b>	8 × 11
	–	–	–	–	–	–	6.5 × 18
33	–	–	–	–	–	6 × 10	6.5 × 18
<b>47</b>	–	–	–	<b>4.5 × 10</b>	<b>6 × 10</b>	8 × 11	8 × 18
	–	–	–	–	–	<b>6.5 × 18</b>	–
68	–	–	4.5 × 10	–	–	8 × 11	10 × 18
	–	–	–	–	–	6.5 × 18	–
<b>100</b>	–	<b>4.5 × 10</b>	–	<b>6 × 10</b>	8 × 11	<b>8 × 18</b>	10 × 25
	–	–	–	–	<b>6.5 × 18</b>	–	<b>10 × 30</b>
150	–	–	6 × 10	8 × 11	8 × 18	10 × 18	12.5 × 30
	–	–	–	6.5 × 18	–	–	–
<b>220</b>	–	<b>6 × 10</b>	8 × 11	<b>6.5 × 18</b>	<b>10 × 18</b>	10 × 25	<b>12.5 × 30</b>
	–	–	–	–	–	<b>10 × 30</b>	–
330	–	8 × 11	6.5 × 18	8 × 18	10 × 25	12.5 × 30	15 × 30
<b>470</b>	<b>8 × 11</b>	<b>6.5 × 18</b>	8 × 18	<b>10 × 18</b>	10 × 25	<b>12.5 × 30</b>	<b>18 × 30</b>
	–	–	–	–	<b>10 × 30</b>	–	–
680	–	8 × 18	10 × 18	10 × 25	12.5 × 30	15 × 30	18 × 40
	–	–	–	10 × 30	–	–	–
<b>1000</b>	8 × 18	<b>10 × 18</b>	<b>10 × 25</b>	<b>12.5 × 30</b>	<b>12.5 × 30</b>	<b>18 × 30</b>	<b>21 × 40</b>
	–	–	<b>10 × 30</b>	–	–	–	–
1500	–	10 × 25	12.5 × 30	12.5 × 30	15 × 30	18 × 40	–
	–	10 × 30	–	–	–	–	–
<b>2200</b>	10 × 25	<b>12.5 × 30</b>	<b>12.5 × 30</b>	<b>15 × 30</b>	<b>18 × 30</b>	<b>21 × 40</b>	–
3300	–	12.5 × 30	15 × 30	18 × 30	18 × 40	–	–
<b>4700</b>	–	<b>15 × 30</b>	<b>18 × 30</b>	<b>18 × 40</b>	<b>21 × 40</b>	–	–
6800	–	18 × 30	18 × 40	21 × 40	–	–	–
<b>10000</b>	–	<b>18 × 40</b>	<b>21 × 40</b>	–	–	–	–
15000	–	21 × 40	–	–	–	–	–

# Aluminum electrolytic capacitors

## Axial Standard Miniature

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**MECHANICAL DATA, AVAILABLE FORMS AND PACKAGING QUANTITIES**



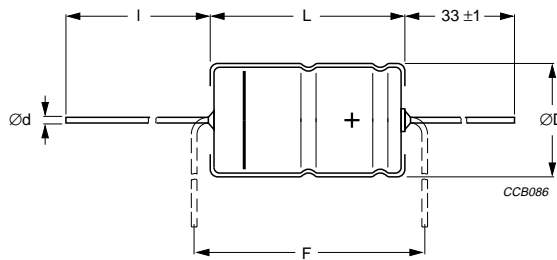
**Table 1 Axial;** physical dimensions, mass and packaging quantities; see Figs 2, 3 and 4

NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	AXIAL: FORM AA, BA, and BR					MASS (g)	PACKAGING QUANTITIES		
		$\varnothing d$	l	$\varnothing D_{max}$ (mm)	$L_{max}$ (mm)	$F_{min}$ (mm)		FORM AA	FORM BA	FORM BR
4.5 × 10	2	0.6	–	5.0	10.5	15	≈0.50	–	1000	3000
6 × 10	3	0.6	–	6.3	10.5	15	≈0.70	–	1000	1000
8 × 11	5a	0.6	–	8.5	11.5	15	≈1.1	–	500	500
6.5 × 18	4	0.8	–	6.9	18.5	25	≈1.3	–	1000	1000
8 × 18	5	0.8	–	8.5	18.5	25	≈1.7	–	500	500
10 × 18	6	0.8	–	10.5	18.5	25	≈2.5	–	500	500
10 × 25	7	0.8	–	10.5	25.0	30	≈3.3	–	500	500
10 × 30	00	0.8	55 ±1	10.5	30.5	35	≈4.8	200	–	500
12.5 × 30	01	0.8	55 ±1	13.0	30.5	35	≈7.4	200	–	400
15 × 30	02	0.8	55 ±1	15.5	30.5	35	≈11.7	200	–	250
18 × 30	03	0.8	55 ±1	18.5	30.5	35	≈12.9	200	–	–
18 × 40	04	0.8	34 ±1	18.5	41.5	45	≈19.4	100	–	–
21 × 40	05	0.8	34 ±1	21.5	41.5	45	≈24.7	100	–	–

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Dimensions in mm.

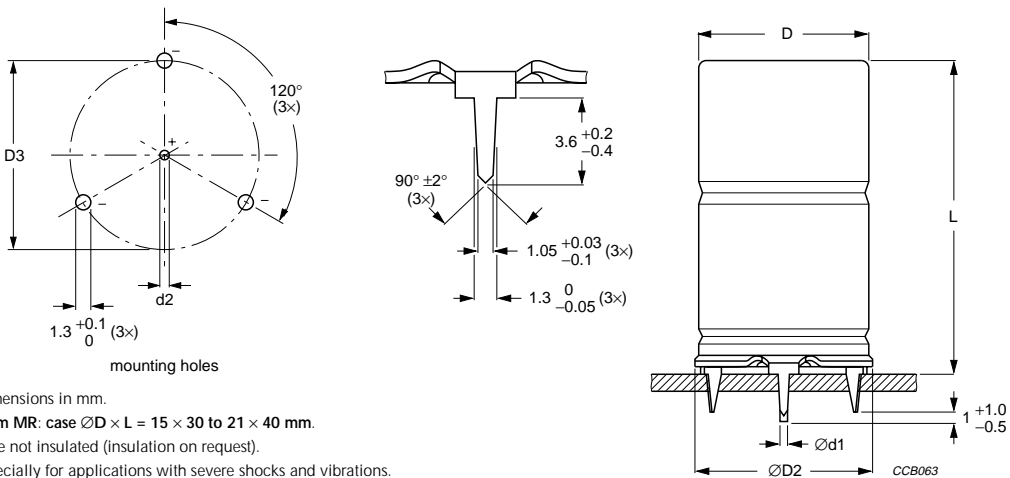
**Form AA:** Axial in box.

Case  $\text{ØD} \times \text{L} = 10 \times 30$  and  $21 \times 40$  mm.

For case  $\text{ØD} \times \text{L} = 18 \times 40$  and  $21 \times 40$  mm, the stated L may be exceeded by 0.7 mm.

For dimensions see Table 1.

Fig.4 Dimensional outline; Form AA.



Dimensions in mm.

**Form MR:** case  $\text{ØD} \times \text{L} = 15 \times 30$  to  $21 \times 40$  mm.

Case not insulated (insulation on request).

Especially for applications with severe shocks and vibrations.

For dimensions see Table 2.

Fig.5 Mounting hole diagram and outline; Form MR; single ended with mounting ring and pins.

**Table 2 Single ended;** mass and packaging quantities; see Fig.5

NOMINAL CASE SIZE $\text{ØD} \times \text{L}$ (mm)	CASE CODE	SINGLE ENDED WITH MOUNTING RING: FORM MR					MASS (g)	PACKAGING QUANTITIES
		$\text{Ød1}$ (mm)	$\text{Ød2}$ (mm)	$\text{ØD2}_{\text{max}}$ (mm)	D3 (mm)	$L_{\text{max}}$ (mm)		
15 × 30	02	0.8	1.0 +0.4	17.5	16.5 ±0.2	33	≈11.7	200
18 × 30	03	0.8	1.0 +0.4	19.5	18.5 ±0.2	33	≈12.9	200
18 × 40	04	0.8	1.0 +0.4	19.5	18.5 ±0.2	45	≈19.4	100
21 × 40	05	0.8	1.0 +0.4	22.5	21.5 ±0.2	45	≈24.7	100

**ELECTRICAL DATA AND ORDERING INFORMATION**

Unless otherwise specified, all electrical values in Table 3 apply at  $T_{amb} = 20\text{ °C}$ ,  $P = 86$  to  $106\text{ kPa}$ ,  $RH = 45$  to  $75\%$ .

SYMBOL	DESCRIPTION
$C_R$	rated capacitance at 100 Hz, tolerance $\pm 20\%$
$I_R$	rated RMS ripple current at 100 Hz, $85\text{ °C}$
$I_{L1}$	max. leakage current after 1 minute at $U_R$
$I_{L5}$	max. leakage current after 5 minutes at $U_R$
$\tan \delta$	max. dissipation factor at 100 Hz
ESR	equivalent series resistance at 100 Hz (calculated from $\tan \delta$ max. and $C_R$ )
Z	max. impedance at 10 kHz

**Ordering example**

Electrolytic capacitor 021 series

1000  $\mu\text{F}/16\text{ V}$ ;  $\pm 20\%$

Nominal case size:  $\varnothing 10 \times 25\text{ mm}$ ; Form BA

Catalogue number: 2222 021 90518.

**Table 3** Electrical data and ordering Information; preferred types in **bold**

$U_R$ (V)	$C_R$ 100 Hz ( $\mu\text{F}$ )	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	$I_R$ 100 H z $85\text{ °C}$ (mA)	$I_{L1}$ 1 min ( $\mu\text{A}$ )	$I_{L5}$ 5 min ( $\mu\text{A}$ )	$\tan \delta$ 100 Hz	ESR 100 Hz ( $\Omega$ )	Z 10 kHz ( $\Omega$ )	CATALOGUE NUMBER 2222 ... ..			
										AXIAL			SINGLE ENDED
										IN BOX FORM AA	TAPED ON REEL FORM BR	TAPED IN BOX FORM BA	MOUNTING RING FORM MR
6.3	<b>470</b>	<b>8 × 11</b>	<b>5a</b>	260	22	10	0.25	0.85	0.64	–	021 23471	<b>021 33471</b>	–
	1000	8 × 18	5	440	42	17	0.25	0.4	0.5	–	021 23102	021 33102	–
	2200	10 × 25	7	710	87	32	0.29	0.21	0.16	–	021 90588	021 90589	–
10	<b>100</b>	<b>4.5 × 10</b>	<b>2</b>	100	10	6	0.20	3.2	2.0	–	021 24101	<b>021 34101</b>	–
	<b>220</b>	<b>6 × 10</b>	<b>3</b>	160	17	8.4	0.20	1.5	0.91	–	021 24221	<b>021 34221</b>	–
	330	8 × 11	5a	230	24	11	0.20	1.0	0.61	–	021 24331	021 34331	–
	<b>470</b>	<b>6.5 × 18</b>	<b>4</b>	310	32	13	0.20	0.68	0.43	–	021 24471	<b>021 34471</b>	–
	680	8 × 18	5	400	45	18	0.20	0.47	0.29	–	021 24681	021 34681	–
	<b>1000</b>	<b>10 × 18</b>	<b>6</b>	550	64	24	0.20	0.32	0.20	–	021 24102	<b>021 34102</b>	–
	1500	10 × 25	7	690	94	34	0.23	0.25	0.18	–	021 90524	021 90525	–
	1500	10 × 30	00	740	94	34	0.23	0.245	0.18	021 14152	021 24152	–	–
	<b>2200</b>	<b>12.5 × 30</b>	<b>01</b>	980	136	48	0.25	0.177	0.095	<b>021 14222</b>	<b>021 24222</b>	–	–
	3300	12.5 × 30	01	1090	202	70	0.27	0.128	0.095	021 14332	021 24332	–	–
	<b>4700</b>	<b>15 × 30</b>	<b>02</b>	1320	286	98	0.29	0.100	0.07	<b>021 14472</b>	<b>021 24472</b>	–	<b>021 44472</b>
	6800	18 × 30	03	1590	412	140	0.34	0.079	0.065	021 14682	–	–	021 44682
	<b>10000</b>	<b>18 × 40</b>	<b>04</b>	2090	604	204	0.40	0.064	0.04	<b>021 14103</b>	–	–	<b>021 44103</b>
15000	21 × 40	05	2250	904	304	0.50	0.054	0.035	021 14153	–	–	021 44153	

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U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I <sub>R</sub> 100 H z 85 °C (mA)	I <sub>L1</sub> 1 min (μA)	I <sub>L5</sub> 5 min (μA)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)	CATALOGUE NUMBER 2222 ... ..			
										AXIAL			SINGLE ENDED
										IN BOX FORM AA	TAPED ON REEL FORM BR	TAPED IN BOX FORM BA	MOUNTING RING FORM MR
16	68	4.5 × 10	2	90	11	6.2	0.16	3.8	2.4	–	021 25689	021 35689	–
	150	6 × 10	3	140	18	8.8	0.16	1.7	1.1	–	021 25151	021 35151	–
	220	8 × 11	5a	210	25	11	0.16	1.2	0.73	–	021 25221	021 35221	–
	330	6.5 × 18	4	290	36	15	0.16	0.77	0.48	–	021 25331	021 35331	–
	470	8 × 18	5	380	49	19	0.16	0.55	0.34	–	021 25471	021 35471	–
	680	10 × 18	6	500	69	26	0.16	0.38	0.24	–	021 25681	021 35681	–
	<b>1000</b>	<b>10 × 25</b>	<b>7</b>	660	100	36	0.16	0.26	0.18	–	021 90517	<b>021 90518</b>	–
	<b>1000</b>	<b>10 × 30</b>	<b>00</b>	700	100	36	0.16	0.260	0.175	<b>021 15102</b>	<b>021 25102</b>	–	–
	1500	12.5 × 30	01	950	148	52	0.19	0.205	0.095	021 15152	021 25152	–	–
	<b>2200</b>	<b>12.5 × 30</b>	<b>01</b>	1040	216	74	0.21	0.150	0.095	<b>021 15222</b>	<b>021 25222</b>	–	–
	3300	15 × 30	02	1290	321	110	0.23	0.111	0.07	021 15332	021 25332	–	021 45332
	<b>4700</b>	<b>18 × 30</b>	<b>03</b>	1560	455	154	0.25	0.087	0.065	<b>021 15472</b>	–	–	<b>021 45472</b>
	6800	18 × 40	04	2040	656	222	0.30	0.070	0.04	021 15682	–	–	021 45682
	<b>10000</b>	<b>21 × 40</b>	<b>05</b>	2170	964	324	0.36	0.058	0.035	<b>021 15103</b>	–	–	<b>021 45103</b>
25	<b>47</b>	<b>4.5 × 10</b>	<b>2</b>	80	11	6.4	0.14	4.8	2.6	–	021 26479	<b>021 36479</b>	–
	<b>100</b>	<b>6 × 10</b>	<b>3</b>	150	19	9	0.14	2.3	1.2	–	021 26101	<b>021 36101</b>	–
	150	8 × 11	5a	190	27	12	0.14	1.5	0.80	–	021 90534	021 90535	–
	150	6.5 × 18	4	210	27	12	0.14	1.5	0.80	–	021 26151	021 36151	–
	<b>220</b>	<b>6.5 × 18</b>	<b>4</b>	250	37	15	0.14	1.0	0.55	–	021 26221	<b>021 36221</b>	–
	330	8 × 18	5	340	54	21	0.14	0.68	0.36	–	021 26331	021 36331	–
	<b>470</b>	<b>10 × 18</b>	<b>6</b>	450	75	28	0.14	0.48	0.26	–	021 26471	<b>021 36471</b>	–
	680	10 × 25	7	560	106	38	0.14	0.33	0.18	–	021 90527	021 90528	–
	680	10 × 30	00	640	106	38	0.14	0.323	0.175	021 16681	021 26681	–	–
	<b>1000</b>	<b>12.5 × 30</b>	<b>01</b>	840	154	54	0.14	0.220	0.095	<b>021 16102</b>	<b>021 26102</b>	–	–
	1500	12.5 × 30	01	950	229	79	0.17	0.179	0.095	021 16152	021 26152	–	–
	<b>2200</b>	<b>15 × 30</b>	<b>02</b>	1180	334	114	0.19	0.132	0.07	<b>021 16222</b>	<b>021 26222</b>	–	<b>021 46222</b>
	3300	18 × 30	03	1470	499	169	0.21	0.099	0.065	021 16332	–	–	021 46332
	<b>4700</b>	<b>18 × 40</b>	<b>04</b>	1920	709	239	0.23	0.079	0.04	<b>021 16472</b>	–	–	<b>021 46472</b>
6800	21 × 40	05	2070	1024	344	0.28	0.064	0.035	021 16682	–	–	021 46682	

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U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I <sub>R</sub> 100 H z 85 °C (mA)	I <sub>L1</sub> 1 min (μA)	I <sub>L5</sub> 5 min (μA)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)	CATALOGUE NUMBER 2222 ... ..			
										AXIAL			SINGLE ENDED
										IN BOX FORM AA	TAPED ON REEL FORM BR	TAPED IN BOX FORM BA	MOUNTING RING FORM MR
40	<b>22</b>	<b>4.5 × 10</b>	<b>2</b>	60	9	5.8	0.11	8.0	3.2	–	021 27229	<b>021 37229</b>	–
	<b>47</b>	<b>6 × 10</b>	<b>3</b>	110	15	7.8	0.11	3.8	1.5	–	021 27479	<b>021 37479</b>	–
	100	8 × 11	5a	170	28	12	0.11	1.8	0.70	–	021 90537	021 90538	–
	<b>100</b>	<b>6.5 × 18</b>	<b>4</b>	190	28	12	0.11	1.8	0.70	–	021 27101	<b>021 37101</b>	–
	150	8 × 18	5	250	40	16	0.11	1.1	0.47	–	021 27151	021 37151	–
	<b>220</b>	<b>10 × 18</b>	<b>6</b>	330	57	22	0.11	0.8	0.32	–	021 27221	<b>021 37221</b>	–
	330	10 × 25	7	430	83	30	0.11	0.53	0.21	–	021 27331	021 37331	–
	470	10 × 25	7	520	117	42	0.11	0.37	0.18	–	021 90514	021 90515	–
	<b>470</b>	<b>10 × 30</b>	<b>00</b>	590	117	42	0.12	0.404	0.175	<b>021 17471</b>	<b>021 27471</b>	–	–
	680	12.5 × 30	01	800	167	58	0.12	0.297	0.110	021 17681	021 27681	–	–
	<b>1000</b>	<b>12.5 × 30</b>	<b>01</b>	900	244	84	0.12	0.190	0.110	<b>021 17102</b>	<b>021 27102</b>	–	–
	1500	15 × 30	02	1120	364	124	0.15	0.159	0.07	021 17152	021 27152	–	021 47152
	<b>2200</b>	<b>18 × 30</b>	<b>03</b>	1390	532	180	0.17	0.118	0.065	<b>021 17222</b>	–	–	<b>021 47222</b>
	3300	18 × 40	04	1810	796	268	0.19	0.090	0.04	021 17332	–	–	021 47332
	<b>4700</b>	<b>21 × 40</b>	<b>05</b>	1940	1132	380	0.21	0.072	0.035	<b>021 17472</b>	–	–	<b>021 47472</b>
63	0.47	4.5 × 10	2	8	4.2	4.1	0.09	310	120	–	021 28477	021 38477	–
	<b>1</b>	<b>4.5 × 10</b>	<b>2</b>	12	4.4	4.1	0.09	150	55	–	021 28108	<b>021 38108</b>	–
	<b>2.2</b>	<b>4.5 × 10</b>	<b>2</b>	21	4.8	4.3	0.09	65	25	–	021 28228	<b>021 38228</b>	–
	3.3	4.5 × 10	2	25	5.2	4.4	0.09	44	17	–	021 28338	021 38338	–
	<b>4.7</b>	<b>4.5 × 10</b>	<b>2</b>	31	5.8	4.6	0.09	31	12	–	021 28478	<b>021 38478</b>	–
	<b>10</b>	<b>4.5 × 10</b>	<b>2</b>	50	7.8	5.3	0.08	13	5.5	–	021 28109	<b>021 38109</b>	–
	15	4.5 × 10	2	55	9.5	5.9	0.08	8.5	3.7	–	021 28159	021 38159	–
	<b>22</b>	<b>6 × 10</b>	<b>3</b>	90	12	6.8	0.08	5.8	2.5	–	021 28229	<b>021 38229</b>	–
	33	6 × 10	3	100	16	8.2	0.08	3.9	1.7	–	021 28339	021 38339	–
	47	8 × 11	5a	140	22	10	0.08	2.7	1.2	–	021 90541	021 90542	–
	<b>47</b>	<b>6.5 × 18</b>	<b>4</b>	150	22	10	0.08	2.7	1.2	–	021 28479	<b>021 38479</b>	–
	68	8 × 11	5a	160	30	13	0.08	1.9	0.81	–	021 90544	021 90545	–
	68	6.5 × 18	4	170	30	13	0.08	1.9	0.81	–	021 28689	021 38689	–
	<b>100</b>	<b>8 × 18</b>	<b>5</b>	250	42	17	0.08	1.3	0.55	–	021 28101	<b>021 38101</b>	–



# Aluminum electrolytic capacitors

## Axial Standard Miniature

### O21 ASM

U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I <sub>R</sub> 100 H z 85 °C (mA)	I <sub>L1</sub> 1 min (μA)	I <sub>L5</sub> 5 min (μA)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)	CATALOGUE NUMBER 2222 ... ..			
										AXIAL			SINGLE ENDED
										IN BOX FORM AA	TAPED ON REEL FORM BR	TAPED IN BOX FORM BA	MOUNTING RING FORM MR
63	150	10 × 18	6	320	61	23	0.08	0.85	0.37	–	021 28151	021 38151	–
	220	10 × 25	7	430	88	32	0.08	0.60	0.25	–	021 90511	021 90512	–
	<b>220</b>	<b>10 × 30</b>	<b>00</b>	480	88	32	0.08	0.614	0.26	<b>021 18221</b>	<b>021 28221</b>	–	–
	330	12.5 × 30	01	610	129	46	0.08	0.409	0.19	021 18331	021 28331	–	–
	<b>470</b>	<b>12.5 × 30</b>	<b>01</b>	700	182	63	0.08	0.287	0.13	<b>021 18471</b>	<b>021 28471</b>	–	–
	680	15 × 30	02	890	261	90	0.08	0.199	0.095	021 18681	021 28681	–	021 48681
	<b>1000</b>	<b>18 × 30</b>	<b>03</b>	1170	382	130	0.08	0.135	0.075	<b>021 18102</b>	–	–	<b>021 48102</b>
	1500	18 × 40	04	1530	571	193	0.11	0.122	0.045	021 18152	–	–	021 48152
	<b>2200</b>	<b>21 × 40</b>	<b>05</b>	1780	836	281	0.13	0.099	0.040	<b>021 18222</b>	–	–	<b>021 48222</b>
100	1	4.5 × 10	2	14	4.6	4.2	0.08	130	90	–	021 29108	021 39108	–
	2.2	4.5 × 10	2	20	5.3	4.4	0.08	58	41	–	021 29228	021 39228	–
	4.7	4.5 × 10	2	30	7	4.9	0.08	27	19	–	021 29478	021 39478	–
	10	6 × 10	3	65	10	6	0.08	13	9	–	021 29109	021 39109	–
	15	8 × 11	5a	77	13	7	0.08	8.5	6	–	021 90547	021 90548	–
	15	6.5 × 18	4	85	13	7	0.08	8.5	6	–	021 29159	021 39159	–
	22	8 × 11	5a	95	17	8.4	0.08	5.8	4.1	–	021 90551	021 90552	–
	22	6.5 × 18	4	100	17	8.4	0.08	5.8	4.1	–	021 29229	021 39229	–
	33	6.5 × 18	4	120	24	10.6	0.08	3.9	2.7	–	021 29339	021 39339	–
	47	8 × 18	5	160	32	13.4	0.08	2.7	1.9	–	021 29479	021 39479	–
	68	10 × 18	6	220	45	17.6	0.08	1.9	1.3	–	021 29689	021 39689	–
	100	10 × 25	7	300	64	24	0.08	1.3	0.9	–	021 90531	021 90532	–
	<b>100</b>	<b>10 × 30</b>	<b>00</b>	340	64	24	0.07	1.150	1.0	<b>021 19101</b>	<b>021 29101</b>	–	–
	150	12.5 × 30	01	490	94	34	0.07	0.645	0.61	021 19151	021 29151	–	–
	<b>220</b>	<b>12.5 × 30</b>	<b>01</b>	560	136	48	0.08	0.610	0.56	<b>021 19221</b>	<b>021 29221</b>	–	–
	330	15 × 30	02	740	202	70	0.09	0.420	0.40	021 19331	021 29331	–	021 49331
	<b>470</b>	<b>18 × 30</b>	<b>03</b>	980	286	98	0.09	0.310	0.29	<b>021 19471</b>	–	–	<b>021 49471</b>
	680	18 × 40	04	1260	412	140	0.09	0.195	0.18	021 19681	–	–	021 49681
	<b>1000</b>	<b>21 × 40</b>	<b>05</b>	1470	604	204	0.10	0.160	0.15	<b>021 19102</b>	–	–	<b>021 49102</b>

# Aluminum electrolytic capacitors

## Axial Standard Miniature

### O21 ASM

#### Additional electrical data

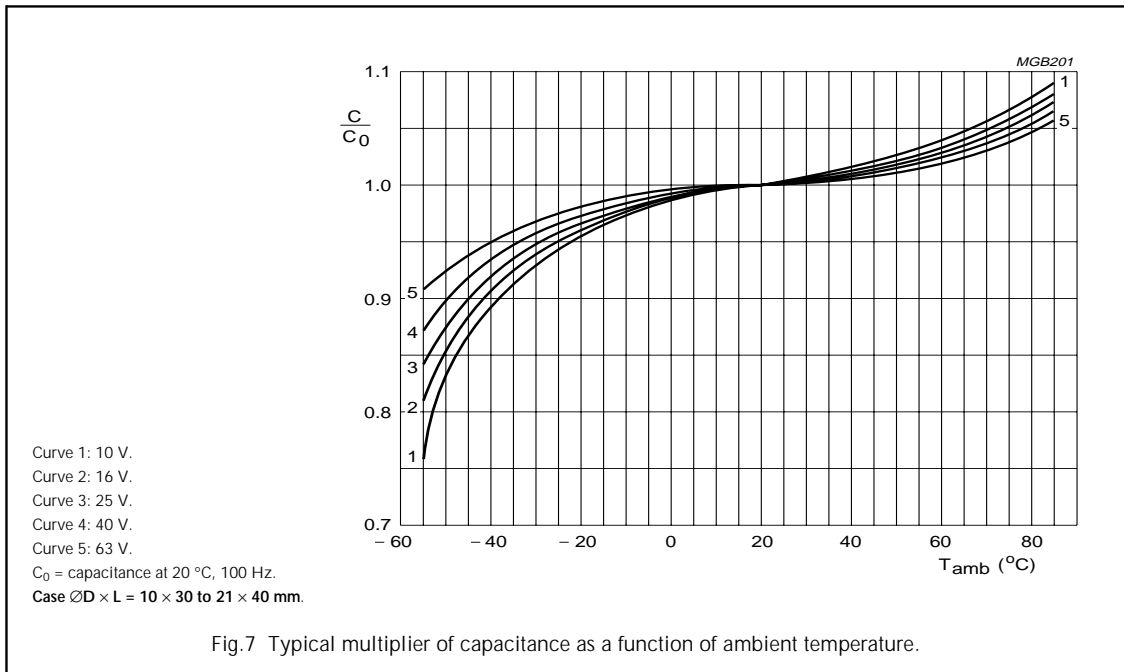
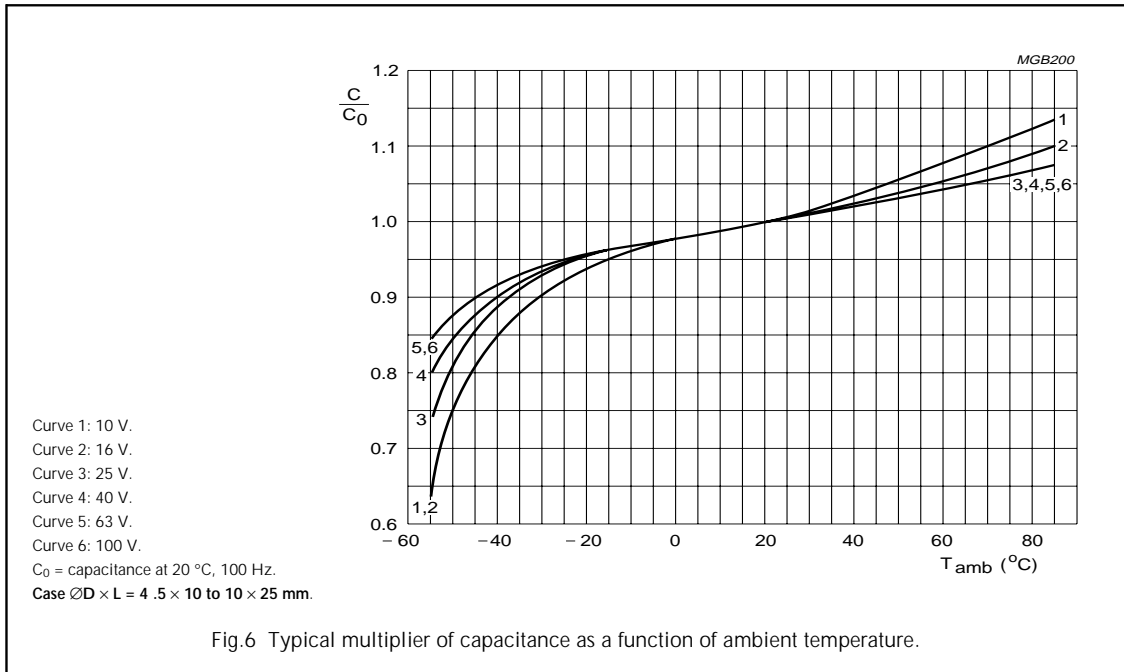
PARAMETER	CONDITIONS	VALUE	
		AXIAL	SINGLE ENDED
<b>Voltage</b>			
Surge voltage		$U_S \leq 1.15 \times U_R$	
Reverse voltage		$U_{rev} \leq 1 \text{ V}$	
<b>Current</b>			
Leakage current	after 1 minute at $U_R$	$I_{L1} \leq 0.006C_R \times U_R + 4 \mu\text{A}$	
	after 5 minutes at $U_R$ : $U_R = 6.3 \text{ V to } 100 \text{ V}$	$I_{L5} \leq 0.002C_R \times U_R + 4 \mu\text{A}$	
<b>Inductance</b>			
Equivalent series inductance (ESL)	case $\varnothing D \times L$ mm:		
	4.5 × 10	typ. 10 nH	–
	6 × 10	typ. 22 nH	–
	8 × 11	typ. 85 nH	–
	6.5 × 18	typ. 25 nH	–
	8 × 18	typ. 40 nH	–
	10 × 18	typ. 61 nH	–
	10 × 25	typ. 38 nH	–
	10 × 30	typ. 38 nH	–
	12.5 × 30	typ. 46 nH	–
	15 × 30	typ. 48 nH	typ. 39 nH
	18 × 30	typ. 50 nH	typ. 39 nH
	18 × 40	typ. 54 nH	typ. 39 nH
21 × 40	typ. 59 nH	typ. 39 nH	

# Aluminum electrolytic capacitors

## Axial Standard Miniature

**O21 ASM**

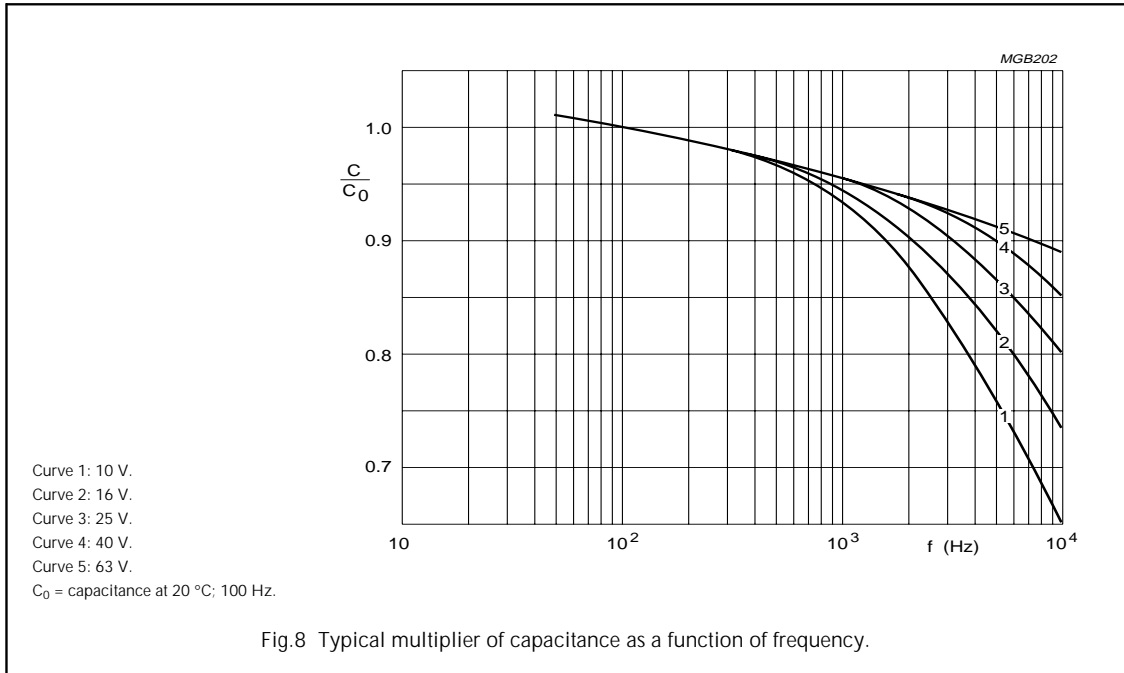
**Capacitance (C)**



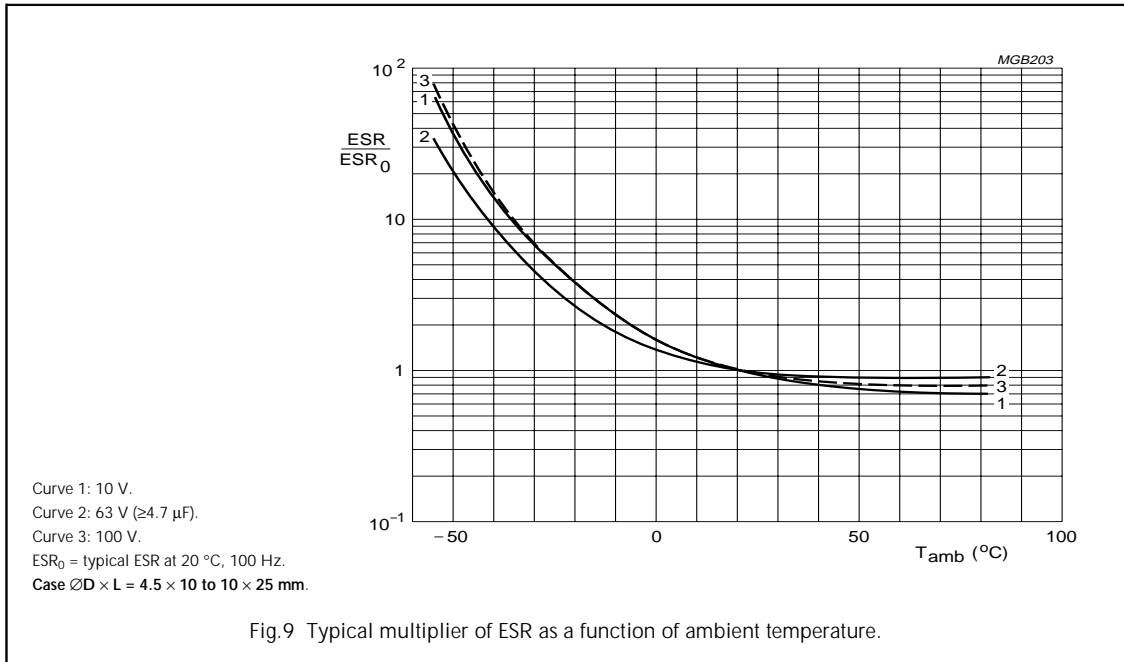
# Aluminum electrolytic capacitors

## Axial Standard Miniature

**O21 ASM**



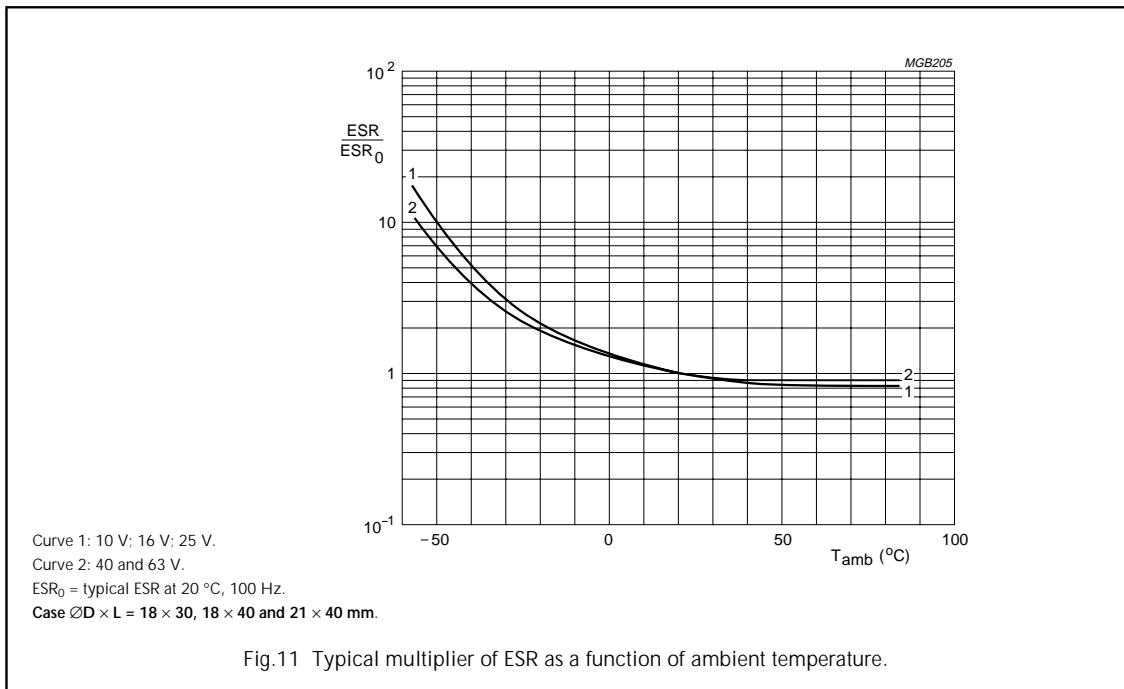
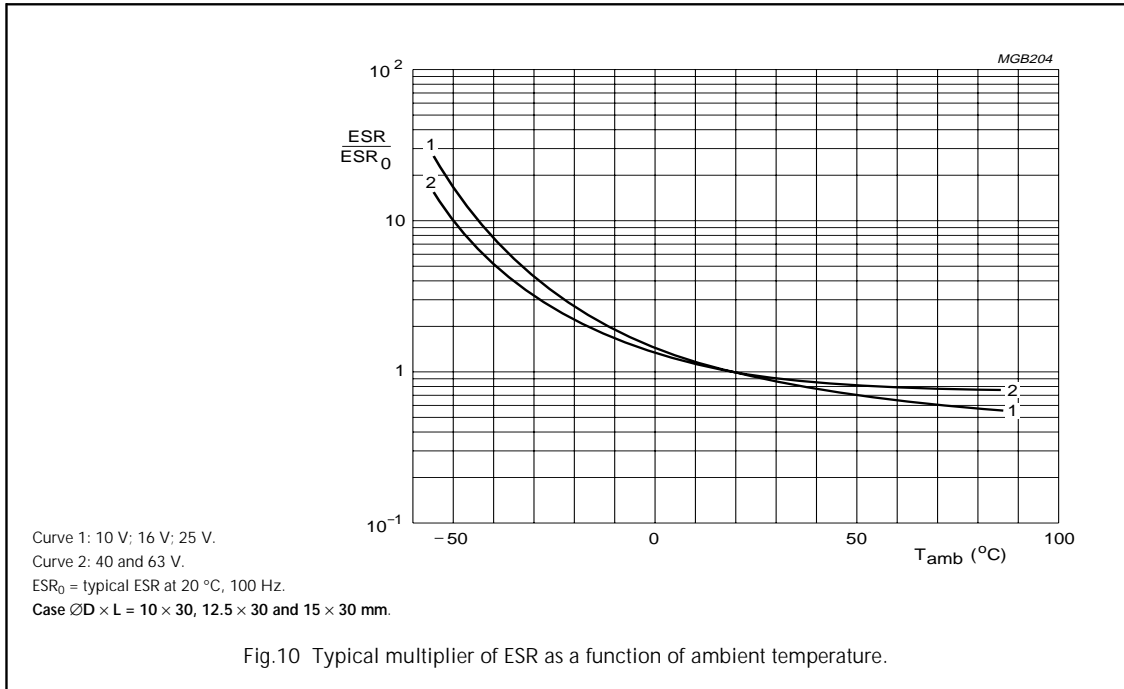
### Equivalent series resistance (ESR)



# Aluminum electrolytic capacitors

## Axial Standard Miniature

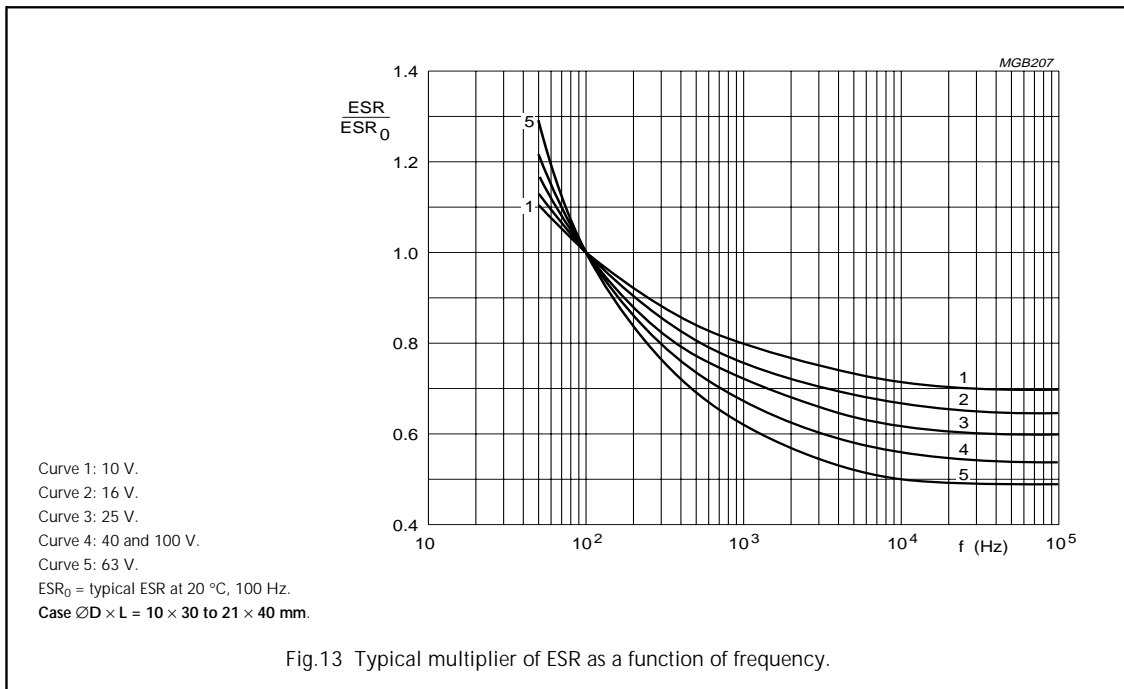
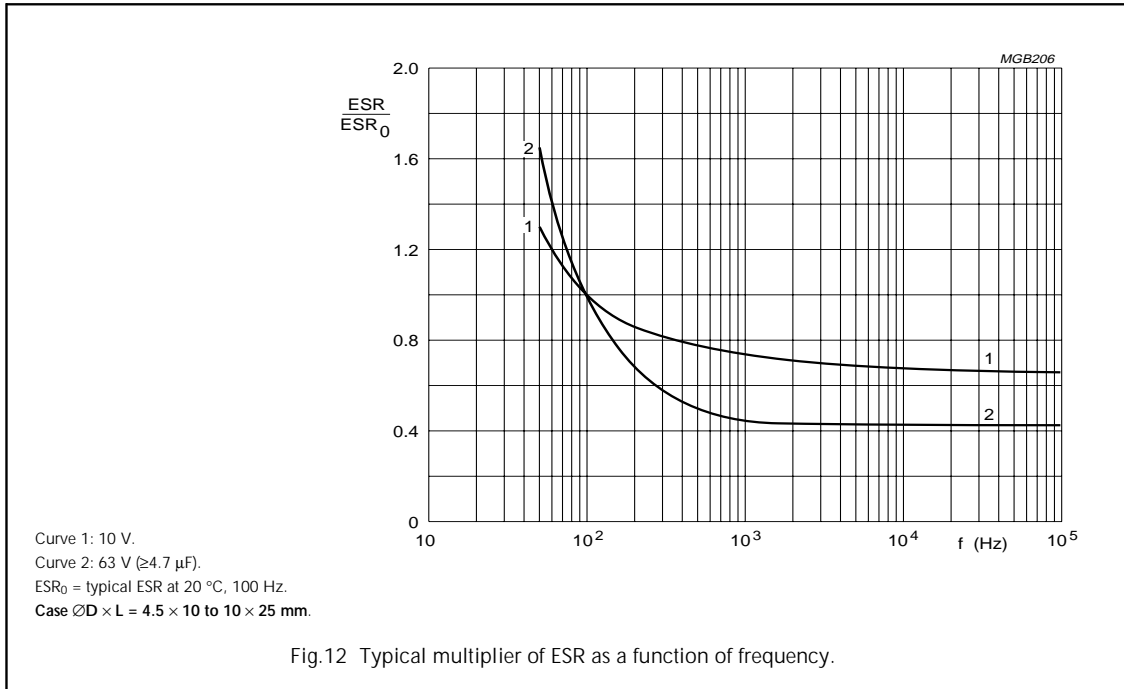
**O21 ASM**



# Aluminum electrolytic capacitors

## Axial Standard Miniature

**O21 ASM**



# Aluminum electrolytic capacitors

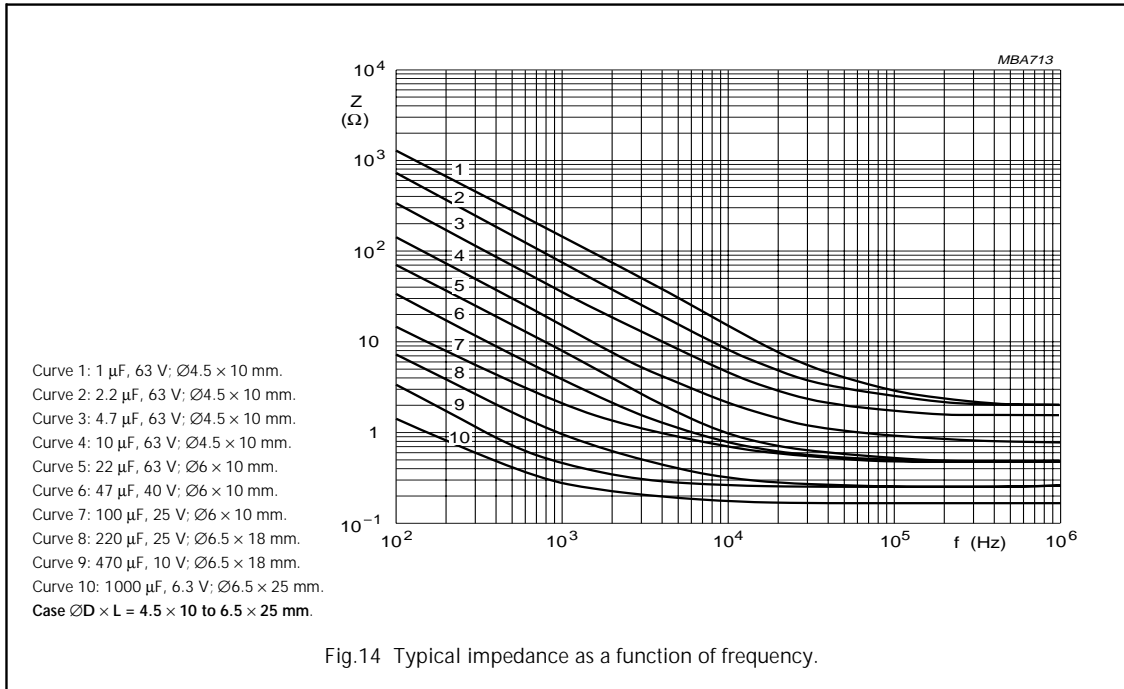
## Axial Standard Miniature

**O21 ASM**

**Impedance (Z)**

**Table 4** Impedance × capacitance values (case ØD × L = 4.5 × 10 to 10 × 25 mm)

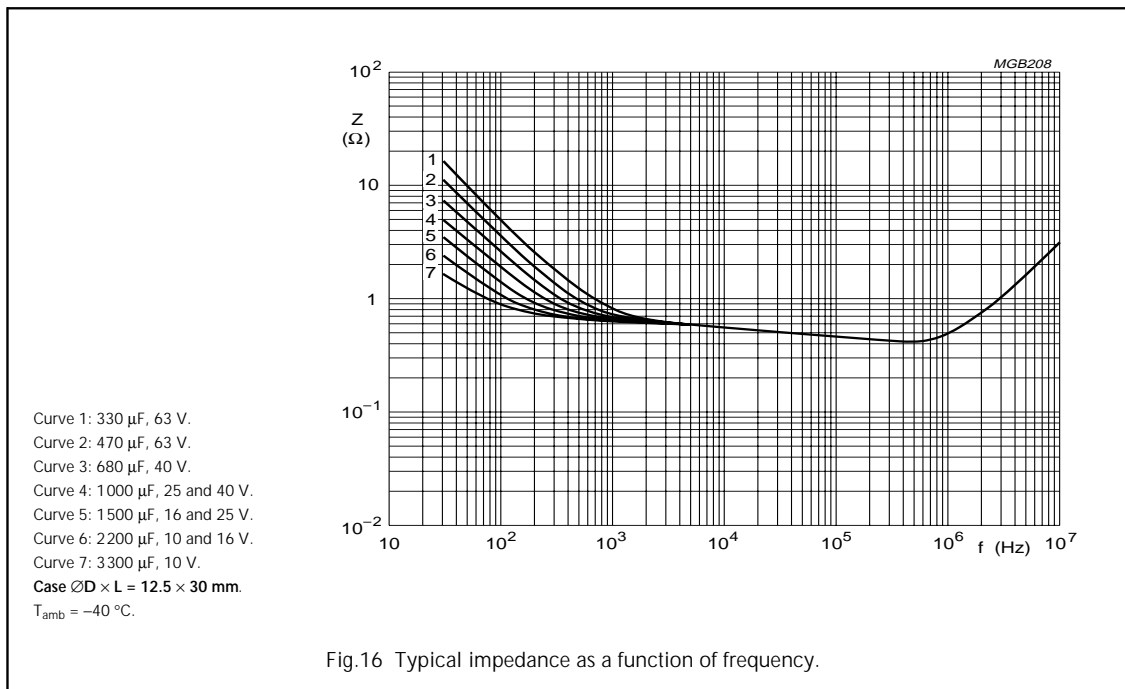
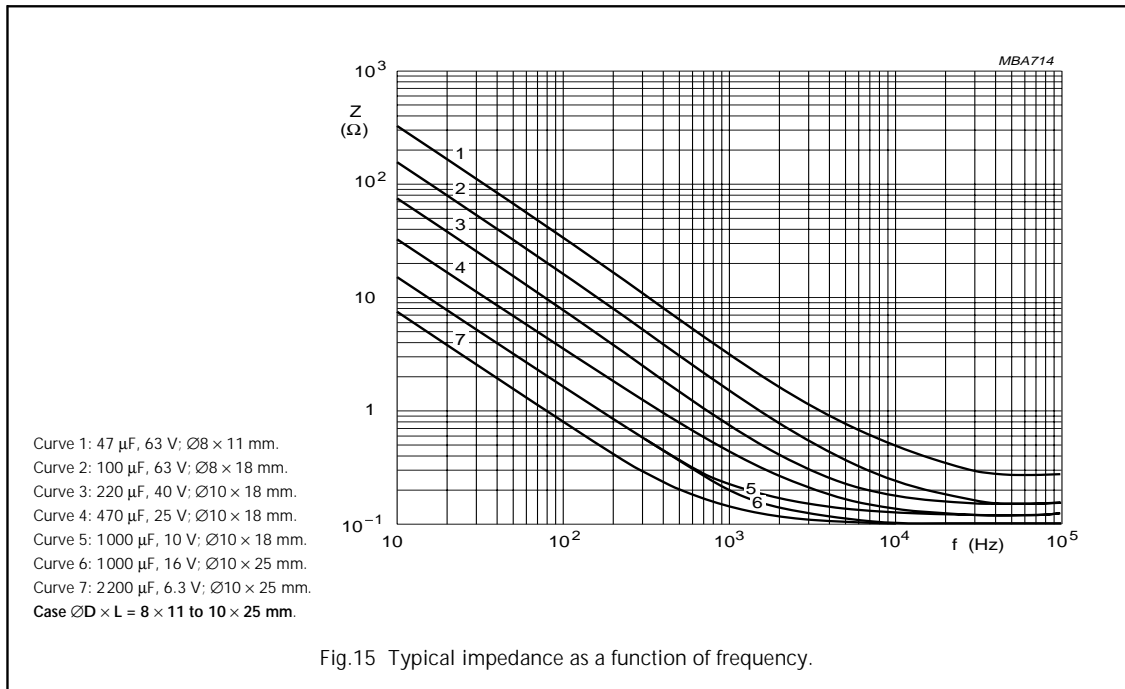
T <sub>amb</sub>	Z × C <sub>R</sub> (Ω × μF) at 10 kHz						
	6.3 V	10 V	16 V	25 V	40 V	63 V	100 V
+20 °C	≤300	≤200	≤160	≤120	≤70	≤55	≤90
-25 °C	≤2000	≤1200	≤750	≤560	≤300	≤180	≤600
-40 °C	≤5500	≤3200	≤2000	≤1500	≤900	≤500	≤1600



# Aluminum electrolytic capacitors

## Axial Standard Miniature

**O21 ASM**

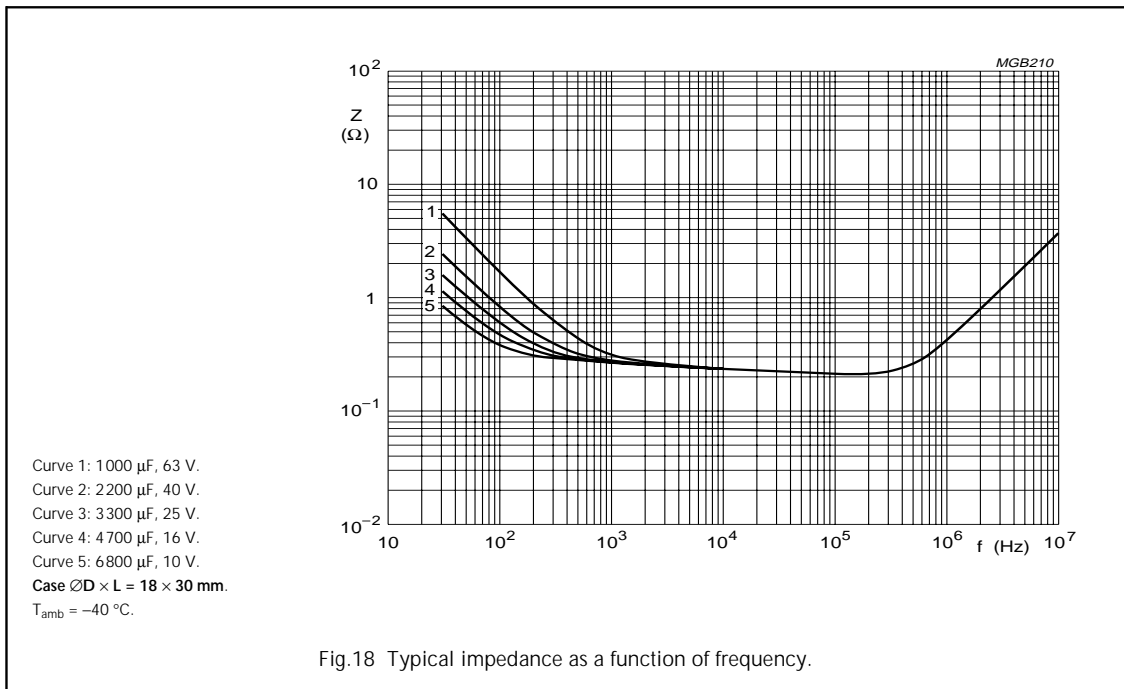
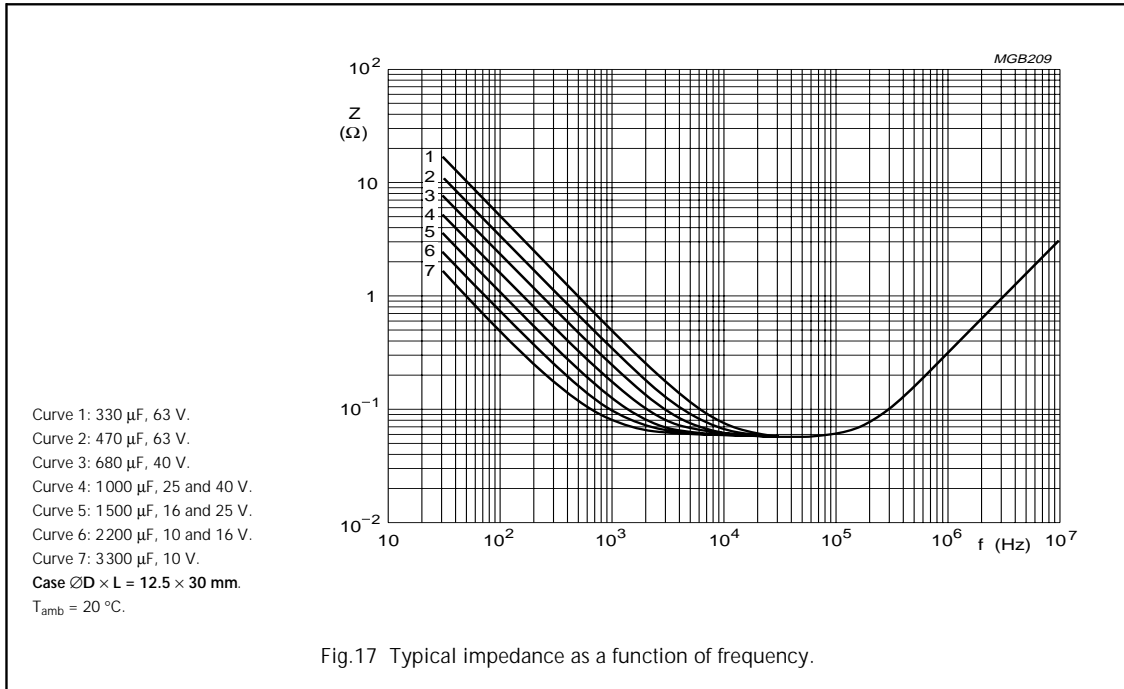




# Aluminum electrolytic capacitors

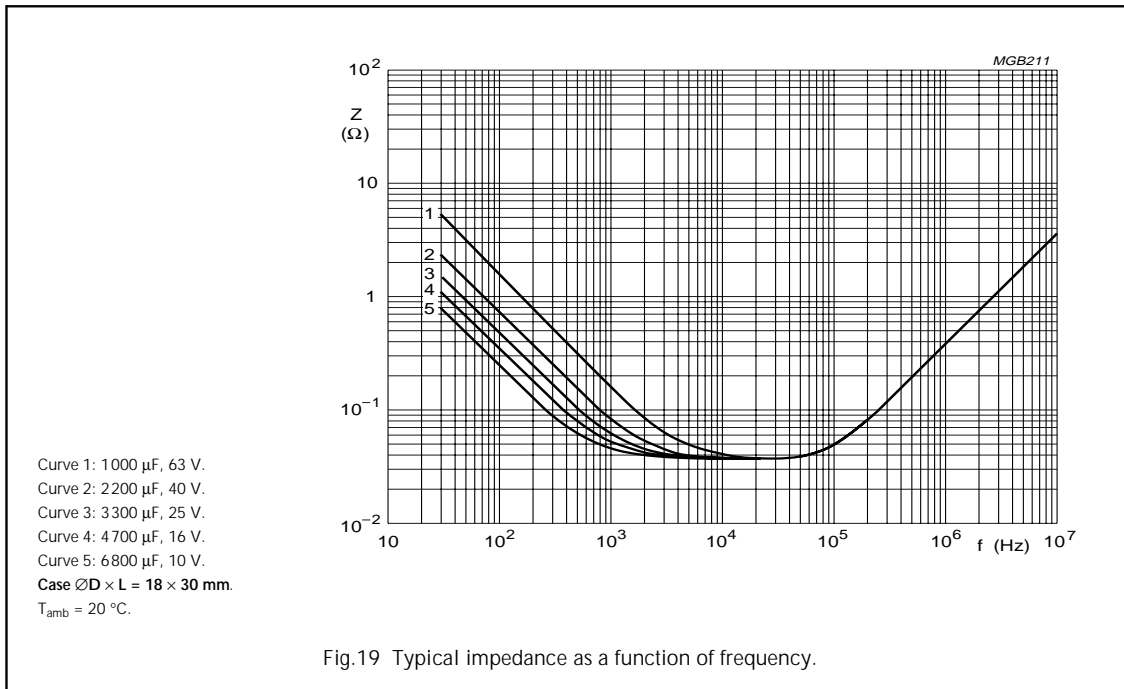
## Axial Standard Miniature

**021 ASM**



# Aluminum electrolytic capacitors

## Axial Standard Miniature

**O21 ASM**


### MARKING

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

- Rated capacitance (in  $\mu\text{F}$ )
- Tolerance on nominal capacitance (in accordance with "IEC 60062")
- Rated voltage (in V)
- Group number (O21)
- Name of manufacturer
- Date code in accordance with "IEC 60062"
- Code for factory of origin
- Band to indicate the negative terminal
- '+' sign to identify the positive terminal (not for case sizes  $L < 18$  mm).

# Aluminum electrolytic capacitors

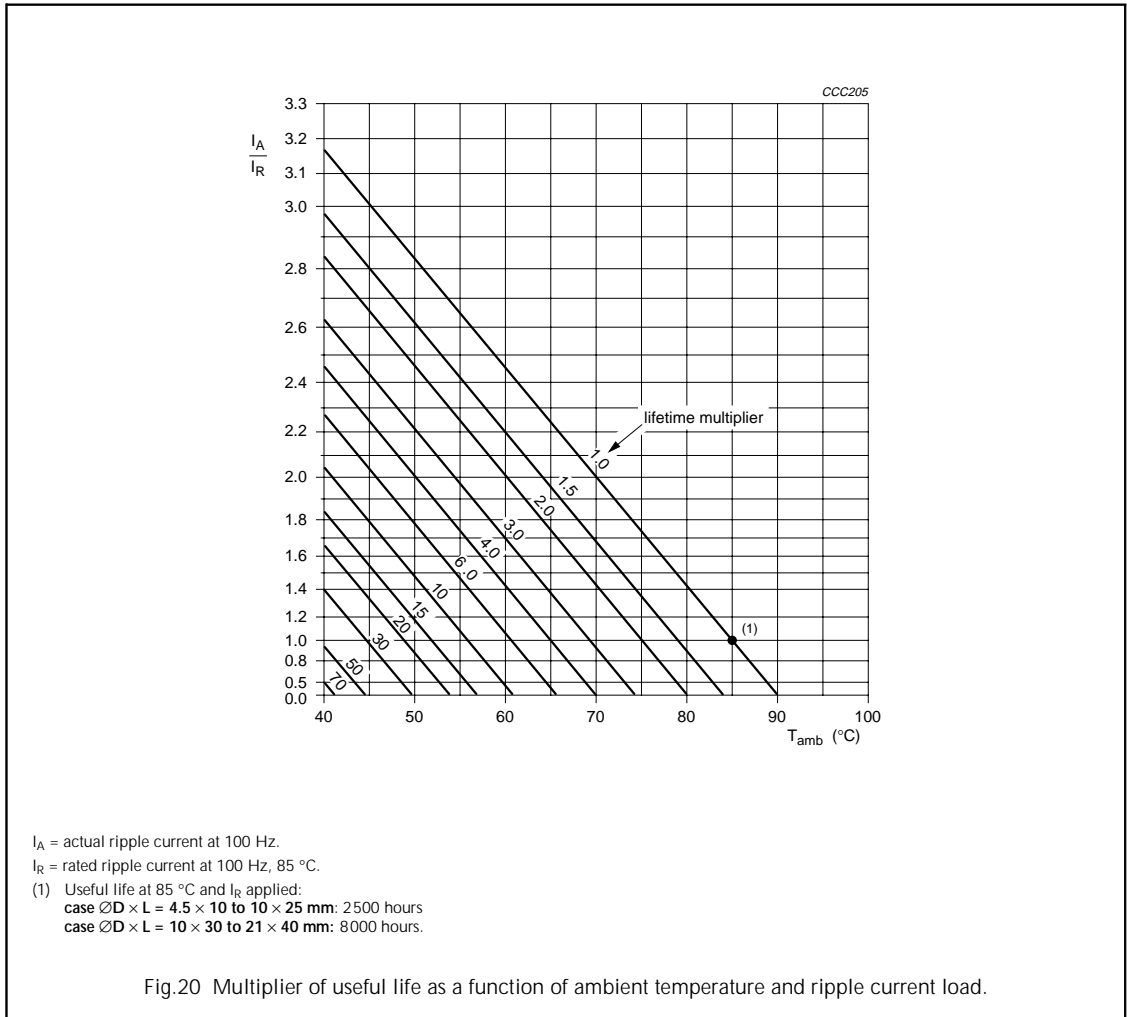
## Axial Standard Miniature

**021 ASM**

### RIPPLE CURRENT AND USEFUL LIFE

**Table 5** Multiplier of ripple current ( $I_R$ ) as a function of frequency

FREQUENCY (Hz)	$I_R$ MULTIPLIER		
	$U_R = 6.3$ to $16$ V	$U_R = 25$ to $40$ V	$U_R = 63$ to $100$ V
50	0.95	0.9	0.85
100	1	1	1
300	1.07	1.12	1.2
1000	1.12	1.2	1.3
3000	1.15	1.25	1.35
$\geq 10000$	1.2	1.3	1.4



# Aluminum electrolytic capacitors

## Axial Standard Miniature

**O21 ASM**

### SPECIFIC TESTS AND REQUIREMENTS

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

**Table 6** 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; case $\varnothing D \times L = 4.5 \times 10$ to $10 \times 25$ mm: $U_R = 6.3$ to $25$ V: 1000 hours; $U_R = 40$ to $100$ V: 2000 hours; case $\varnothing D \times L = 10 \times 30$ to $21 \times 40$ mm: $U_R = 6.3$ to $100$ V: 5000 hours	$U_R \leq 6.3$ V; $\Delta C/C$ : +15/-30% $U_R > 6.3$ V; $\Delta C/C$ : $\pm 15\%$ $\tan \delta \leq 1.3 \times$ spec. limit $Z \leq 2 \times$ spec. limit $I_{L5} \leq$ spec. limit
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ °C}$ ; $U_R$ and $I_R$ applied; case $\varnothing D \times L = 4.5 \times 10$ to $10 \times 25$ mm: 2500 hours; case $\varnothing D \times L = 10 \times 30$ to $21 \times 40$ mm: 8000 hours	$U_R \leq 6.3$ V; $\Delta C/C$ : +45/-50% $U_R > 6.3$ V; $\Delta C/C$ : $\pm 45\%$ $\tan \delta \leq 3 \times$ spec. limit $Z \leq 3 \times$ spec. limit $I_{L5} \leq$ 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	$T_{amb} = 85\text{ °C}$ ; no voltage applied; 500 hours  after test: $U_R$ to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C$ , $\tan \delta$ , $Z$ : for requirements see 'Endurance test' above $I_{L5} \leq 2 \times$ spec. limit