

# DATA SHEET

O37 RSM  
**Aluminum electrolytic capacitors**  
**Radial Standard Miniature**

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

2000 Jan 18

# Aluminum electrolytic capacitors Radial Standard Miniature

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**FEATURES**

- Polarized aluminum electrolytic capacitors, non-solid electrolyte
- Radial leads, cylindrical aluminum case, insulated with a blue vinyl sleeve
- Pressure relief for case  $\varnothing D \geq 6.3$  mm
- Charge and discharge proof
- Miniaturized, high CV-product per unit volume.

**APPLICATIONS**

- General purpose, industrial, automotive and audio-video
- Coupling, decoupling, timing, smoothing, filtering, buffering in SMPS
- Portable and mobile equipment (small size, low mass).

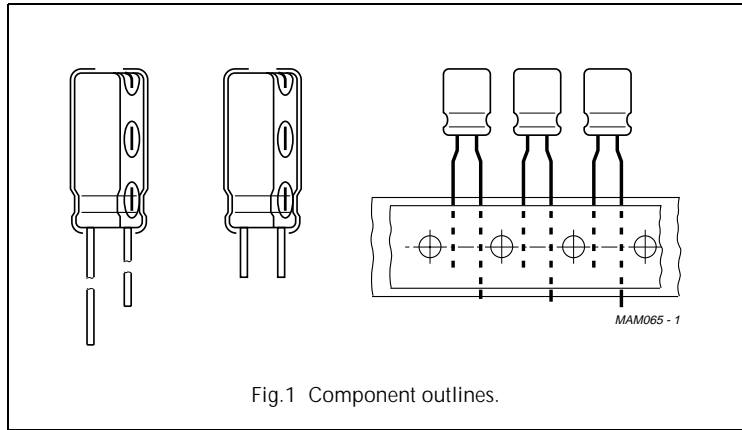
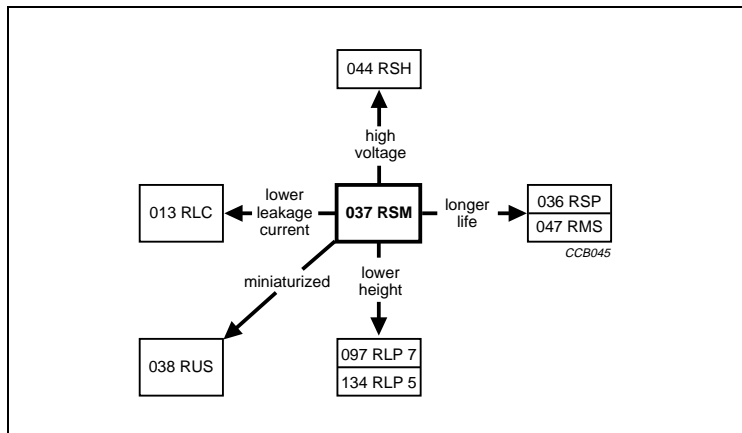


Fig.1 Component outlines.



**QUICK REFERENCE DATA**

DESCRIPTION	VALUE
Case sizes ( $\varnothing D_{nom} \times L_{nom}$ in mm)	5 × 11 to 16 × 31
Rated capacitance range, $C_R$	0.47 to 10000 $\mu F$
Tolerance on $C_R$	$\pm 20\%$ ; $\pm 10\%$ on request
Rated voltage range, $U_R$	6.3 to 100 V
Category temperature range	-40 to +85 °C
Endurance test at 85 °C	2000 hours
Useful life at 85 °C	2500 hours
Useful life at 40 °C, $1.4 \times I_R$ applied	70000 hours
Shelf life at 0 V, 85 °C	500 hours
Based on sectional specification	IEC 60384-4/EN130300
Climatic category IEC 60068	40/085/56

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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**.

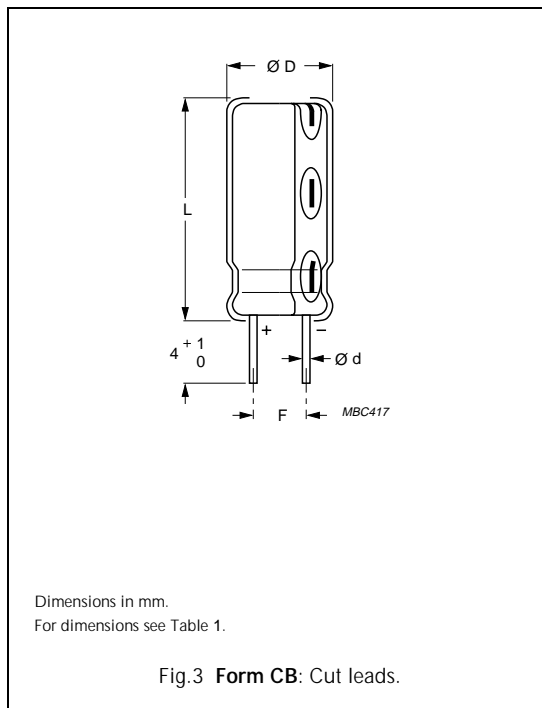
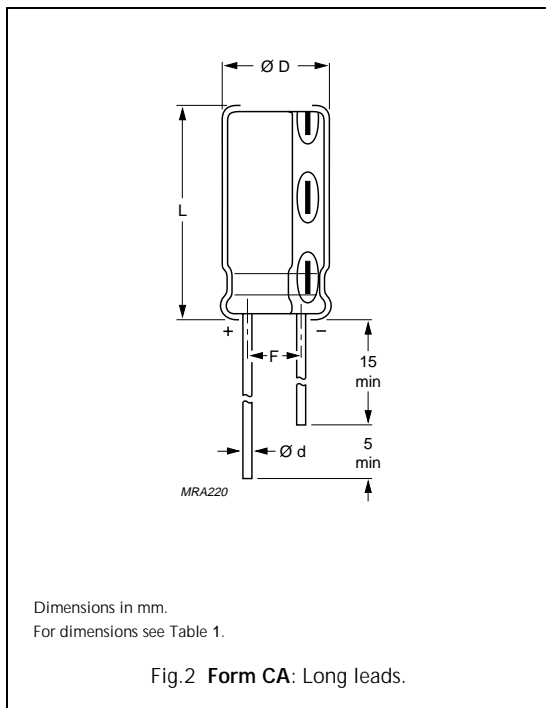
$C_R$ ( $\mu F$ )	$U_R$ (V)								
	6.3	10	16	25	35	40	50	63	100
0.47	–	–	–	–	–	–	–	5 × 11	5 × 11
1.0	–	–	–	–	–	–	–	<b>5 × 11</b>	<b>5 × 11</b>
2.2	–	–	–	–	–	–	–	<b>5 × 11</b>	5 × 11
3.3	–	–	–	–	–	–	–	5 × 11	5 × 11
4.7	–	–	–	–	–	–	–	<b>5 × 11</b>	5 × 11
10	–	–	–	–	–	–	<b>5 × 11</b>	<b>5 × 11</b>	<b>6.3 × 11</b>
22	–	–	–	–	–	–	<b>5 × 11</b>	<b>6.3 × 11</b>	<b>8 × 12</b>
33	–	–	–	–	5 × 11	6.3 × 11	–	6.3 × 11	10 × 12
47	–	–	–	<b>5 × 11</b>	–	6.3 × 11	<b>6.3 × 11</b>	<b>8 × 12</b>	10 × 16
68	–	–	5 × 11	6.3 × 11	–	–	8 × 12	10 × 12	–
100	–	<b>5 × 11</b>	6.3 × 11	<b>6.3 × 11</b>	–	–	<b>8 × 12</b>	<b>10 × 12</b>	10 × 20
150	–	6.3 × 11	–	8 × 12	–	10 × 12	–	10 × 16	–
220	–	6.3 × 11	8 × 12	<b>8 × 12</b>	<b>10 × 12</b>	–	<b>10 × 16</b>	<b>10 × 20</b>	12.5 × 25
330	6.3 × 11	–	8 × 12	10 × 12	10 × 16	–	10 × 20	12.5 × 20	16 × 25
470	–	<b>8 × 12</b>	<b>10 × 12</b>	<b>10 × 16</b>	<b>10 × 20</b>	12.5 × 20	<b>12.5 × 20</b>	<b>12.5 × 25</b>	16 × 31
680	–	–	10 × 16	–	12.5 × 20	12.5 × 25	12.5 × 25	16 × 25	–
1000	10 × 12	<b>10 × 16</b>	<b>10 × 20</b>	<b>12.5 × 20</b>	<b>12.5 × 25</b>	16 × 25	<b>16 × 25</b>	<b>16 × 31</b>	–
1500	10 × 20	–	12.5 × 20	12.5 × 25	16 × 25	–	–	–	–
2200	12.5 × 20	12.5 × 20	<b>12.5 × 25</b>	<b>16 × 25</b>	<b>16 × 31</b>	–	–	–	–
3300	12.5 × 20	12.5 × 25	16 × 25	<b>16 × 31</b>	–	–	–	–	–
4700	–	<b>16 × 25</b>	16 × 31	–	–	–	–	–	–
6800	–	16 × 31	–	–	–	–	–	–	–
10000	16 × 31	–	–	–	–	–	–	–	–

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



**Table 1** Physical dimensions, mass and packaging quantities; see Figs 2 and 3

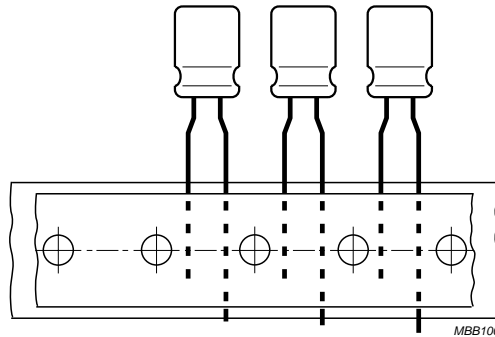
NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	Ød (mm)	ØD <sub>max</sub> (mm)	L <sub>max</sub> (mm)	F (mm)	MASS (g)	PACKAGING QUANTITIES		
							FORM CA	FORM CB	FORM TFA, TNA
5 × 11	11	0.5	5.5	12.5	2.0 ±0.5	≈0.4	3000	–	2000
6.3 × 11	12	0.5	6.8	12.5	2.5 ±0.5	≈0.6	2000	–	2000
8 × 12	13	0.6	8.5	13.0	3.5 ±0.5	≈1.1	1000	–	1000
10 × 12	14	0.6	10.5	13.5	5.0 ±0.5	≈1.6	1000	1000	500
10 × 16	15	0.6	10.5	17.5	5.0 ±0.5	≈1.9	1000	1000	500
10 × 20	16	0.6	10.5	22.0	5.0 ±0.5	≈2.2	1000	500	500
12.5 × 20	17	0.6	13.0	22.0	5.0 ±0.5	≈4.0	1000	2000	500
12.5 × 25	18	0.6	13.0	27.0	5.0 ±0.5	≈5.0	500	2000	500
16 × 25	19	0.8	16.5	27.0	7.5 ±0.5	≈8.0	500	1000	250
16 × 31	20	0.8	16.5	33.5	7.5 ±0.5	≈9.0	200	1000	250

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#### Taped products

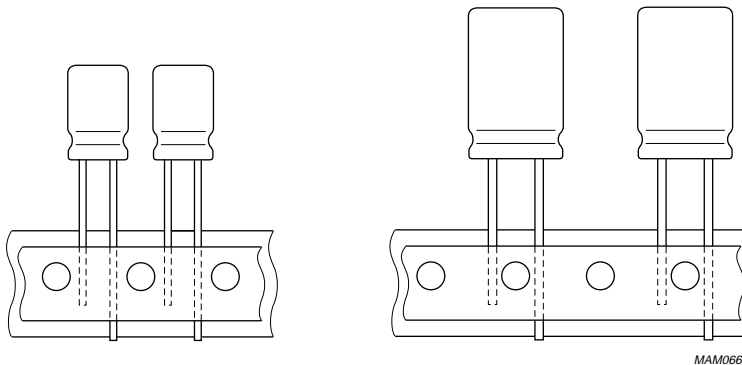


**Form TFA:**

Case  $\varnothing D = 5$  to  $8$  mm; pitch  $F = 5$  mm.

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

Fig.4 Taped in box (ammopack), formed.



**Form TNA:**

Case  $\varnothing D = 5$  mm; pitch  $F = 2.5$  mm (leads slightly bent).

Case  $\varnothing D = 6.3$  mm; pitch  $F = 2.5$  mm.

Case  $\varnothing D = 8$  mm; pitch  $F = 3.5$  mm.

**Form TFA:**

Case  $\varnothing D = 10$  and  $12.5$  mm; pitch  $F = 5$  mm.

Case  $\varnothing D = 16$  mm; pitch  $F = 7.5$  mm.

Fig.5 Taped in box (ammopack), straight leads.

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#### ELECTRICAL DATA

Unless otherwise specified, all electrical values in Tables 2, 4, 6 and 8 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

**Table 2** Electrical data; 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 Hz $85\text{ °C}$ (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 ( $\Omega$ )
6.3	330	$6.3 \times 11$	12	280	24	7.2	0.24	1.2	1.8
	1000	$10 \times 12$	14	530	66	16	0.24	0.38	0.6
	1500	$10 \times 20$	16	730	98	22	0.25	0.27	0.4
	2200	$12.5 \times 20$	17	990	140	31	0.26	0.19	0.27
	3300	$12.5 \times 20$	17	1150	210	45	0.28	0.14	0.18
	10000	$16 \times 31$	20	2250	630	130	0.42	0.07	0.07
10	<b>100</b>	<b><math>5 \times 11</math></b>	<b>11</b>	140	13	5	0.20	3.2	4.5
	150	$6.3 \times 11$	12	180	18	6	0.20	2.1	3.0
	220	$6.3 \times 11$	12	250	25	7.4	0.20	1.4	2.0
	<b>470</b>	<b><math>8 \times 12</math></b>	<b>13</b>	410	50	12	0.20	0.68	0.96
	<b>1000</b>	<b><math>10 \times 16</math></b>	<b>15</b>	630	100	23	0.20	0.32	0.45
	2200	$12.5 \times 20$	17	1050	220	47	0.22	0.16	0.20
	3300	$12.5 \times 25$	18	1350	330	69	0.24	0.12	0.14
	<b>4700</b>	<b><math>16 \times 25</math></b>	<b>19</b>	1800	470	97	0.28	0.09	0.10
	6800	$16 \times 31$	20	2200	680	140	0.32	0.07	0.07

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#### ORDERING INFORMATION

##### Ordering example

Electrolytic capacitor 037 series

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

Nominal case size:  $\varnothing 10 \times 20$  mm; Form TFA

Catalogue number: 2222 037 35102.

**Table 3** Ordering information; preferred types in **bold**

$U_R$ (V)	$C_R$ 100 Hz ( $\mu\text{F}$ )	CASE CODE	CATALOGUE NUMBER 2222 . . . . .							
			BULK PACKAGING				TAPED AMMOPACK			
			LONG LEADS		CUT LEADS					
			FORM CA	F (mm)	FORM CB	F (mm)	FORM TFA	F (mm)	FORM TNA	F (mm)
6.3	330	12	037 90021	2.5	–	–	037 90027	5.0	037 90028	2.5
	1000	14	037 53102	5.0	037 63102	5.0	037 33102	5.0	–	–
	1500	16	037 53152	5.0	037 63152	5.0	037 33152	5.0	–	–
	2200	17	037 53222	5.0	037 63222	5.0	037 33222	5.0	–	–
	3300	17	037 53332	5.0	037 63332	5.0	037 33332	5.0	–	–
	10000	20	037 53103	7.5	037 63103	7.5	037 33103	7.5	–	–
10	<b>100</b>	<b>11</b>	<b>037 54101</b>	2.0	–	–	<b>037 34101</b>	5.0	037 74101	2.5
	150	12	037 54151	2.5	–	–	037 34151	5.0	037 74151	2.5
	220	12	037 90029	2.5	–	–	037 90036	5.0	037 90037	2.5
	<b>470</b>	<b>13</b>	<b>037 54471</b>	3.5	–	–	<b>037 34471</b>	5.0	037 74471	3.5
	<b>1000</b>	<b>15</b>	037 54102	5.0	<b>037 64102</b>	5.0	<b>037 34102</b>	5.0	–	–
	2200	17	037 54222	5.0	037 64222	5.0	037 34222	5.0	–	–
	3300	18	037 54332	5.0	037 64332	5.0	037 34332	5.0	–	–
	<b>4700</b>	<b>19</b>	037 54472	7.5	<b>037 64472</b>	7.5	<b>037 34472</b>	7.5	–	–
	6800	20	037 54682	7.5	037 64682	7.5	037 34682	7.5	–	–

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#### ELECTRICAL DATA (continued)

**Table 4** Electrical data continued; 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 Hz 85 °C (mA)	$I_{L1}$ 1 min ( $\mu\text{A}$ )	$I_{L5}$ 5 min ( $\mu\text{A}$ )	$\text{Tan } \delta$ 100 Hz	ESR 100 Hz ( $\Omega$ )	Z 10 kHz ( $\Omega$ )
16	68	5 × 11	11	130	14	5.2	0.16	3.7	4.7
	100	6.3 × 11	12	180	19	6.2	0.16	2.5	3.2
	220	8 × 12	13	300	38	10	0.16	1.2	1.5
	330	8 × 12	13	370	56	14	0.16	0.77	0.97
	<b>470</b>	<b>10 × 12</b>	<b>14</b>	420	78	18	0.16	0.54	0.68
	680	10 × 16	15	520	110	25	0.16	0.37	0.47
	<b>1000</b>	<b>10 × 20</b>	<b>16</b>	740	160	35	0.16	0.25	0.32
	1500	12.5 × 20	17	900	240	51	0.17	0.18	0.21
	<b>2200</b>	<b>12.5 × 25</b>	<b>18</b>	1200	360	73	0.18	0.13	0.15
	3300	16 × 25	19	1650	530	109	0.20	0.10	0.10
4700	16 × 31	20	2100	760	150	0.24	0.08	0.07	
25	<b>47</b>	<b>5 × 11</b>	<b>11</b>	120	15	5.4	0.14	4.7	4.7
	68	6.3 × 11	12	130	20	6.4	0.14	3.3	3.2
	<b>100</b>	<b>6.3 × 11</b>	<b>12</b>	190	28	8	0.14	2.2	2.2
	150	8 × 12	13	230	41	11	0.14	1.5	1.5
	<b>220</b>	<b>8 × 12</b>	<b>13</b>	320	58	14	0.14	1.0	1.0
	330	10 × 12	14	410	86	20	0.14	0.68	0.67
	<b>470</b>	<b>10 × 16</b>	<b>15</b>	510	120	26	0.14	0.47	0.47
	<b>1000</b>	<b>12.5 × 20</b>	<b>17</b>	910	250	53	0.14	0.22	0.22
	1500	12.5 × 25	18	1100	380	78	0.15	0.16	0.15
	<b>2200</b>	<b>16 × 25</b>	<b>19</b>	1500	550	110	0.16	0.12	0.10
	<b>3300</b>	<b>16 × 31</b>	<b>20</b>	1900	830	170	0.18	0.09	0.07
35	33	5 × 11	11	110	15	5.3	0.12	5.8	4.5
	<b>220</b>	<b>10 × 12</b>	<b>14</b>	330	80	18	0.12	0.87	0.68
	330	10 × 16	15	450	120	26	0.12	0.58	0.45
	<b>470</b>	<b>10 × 20</b>	<b>16</b>	590	170	36	0.12	0.41	0.32
	680	12.5 × 20	17	830	240	51	0.12	0.28	0.22
	<b>1000</b>	<b>12.5 × 25</b>	<b>18</b>	1050	350	73	0.12	0.19	0.15
	1500	16 × 25	19	1400	530	110	0.13	0.14	0.10
	<b>2200</b>	<b>16 × 31</b>	<b>20</b>	1750	770	160	0.14	0.10	0.07



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#### ORDERING INFORMATION (continued)

**Table 5** Ordering information continued; preferred types in **bold**

U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (μF)	CASE CODE	CATALOGUE NUMBER 2222 . . . . .							
			BULK PACKAGING				TAPED AMMOPACK			
			LONG LEADS		CUT LEADS		FORM TFA	F (mm)	FORM TNA	F (mm)
			FORM CA	F (mm)	FORM CB	F (mm)				
16	68	11	037 55689	2.0	–	–	037 35689	5.0	037 75689	2.5
	100	12	037 55101	2.5	–	–	037 35101	5.0	037 75101	2.5
	220	13	037 55221	3.5	–	–	037 35221	5.0	037 75221	3.5
	330	13	037 90038	3.5	–	–	037 90045	5.0	037 90046	3.5
	<b>470</b>	<b>14</b>	037 55471	5.0	<b>037 65471</b>	5.0	<b>037 35471</b>	5.0	–	–
	680	15	037 55681	5.0	037 65681	5.0	037 35681	5.0	–	–
	<b>1000</b>	<b>16</b>	037 55102	5.0	<b>037 65102</b>	5.0	<b>037 35102</b>	5.0	–	–
	1500	17	037 55152	5.0	037 65152	5.0	037 35152	5.0	–	–
	<b>2200</b>	<b>18</b>	037 55222	5.0	<b>037 65222</b>	5.0	<b>037 35222</b>	5.0	–	–
	3300	19	037 55332	7.5	037 65332	7.5	037 35332	7.5	–	–
4700	20	037 55472	7.5	037 65472	7.5	037 35472	7.5	–	–	
25	<b>47</b>	<b>11</b>	<b>037 56479</b>	2.0	–	–	<b>037 36479</b>	5.0	037 76479	2.5
	68	12	037 56689	2.5	–	–	037 36689	5.0	037 76689	2.5
	<b>100</b>	<b>12</b>	<b>037 90047</b>	2.5	–	–	<b>037 90054</b>	5.0	037 90055	2.5
	150	13	037 56151	3.5	–	–	037 36151	5.0	037 76151	3.5
	<b>220</b>	<b>13</b>	<b>037 56221</b>	3.5	–	–	<b>037 36221</b>	5.0	037 76221	3.5
	330	14	037 56331	5.0	037 66331	5.0	037 36331	5.0	–	–
	<b>470</b>	<b>15</b>	037 56471	5.0	<b>037 66471</b>	5.0	<b>037 36471</b>	5.0	–	–
	<b>1000</b>	<b>17</b>	037 56102	5.0	<b>037 66102</b>	5.0	<b>037 36102</b>	5.0	–	–
	1500	18	037 56152	5.0	037 66152	5.0	037 36152	5.0	–	–
	<b>2200</b>	<b>19</b>	037 56222	7.5	<b>037 66222</b>	7.5	<b>037 36222</b>	7.5	–	–
<b>3300</b>	<b>20</b>	037 56332	7.5	<b>037 66332</b>	7.5	<b>037 36332</b>	7.5	–	–	
35	33	11	037 50339	2.0	–	–	037 30339	5.0	037 70339	2.5
	<b>220</b>	<b>14</b>	037 50221	5.0	<b>037 60221</b>	5.0	<b>037 30221</b>	5.0	–	–
	330	15	037 50331	5.0	037 60331	5.0	037 30331	5.0	–	–
	<b>470</b>	<b>16</b>	037 50471	5.0	<b>037 60471</b>	5.0	<b>037 30471</b>	5.0	–	–
	680	17	037 50681	5.0	037 60681	5.0	037 30681	5.0	–	–
	<b>1000</b>	<b>18</b>	037 50102	5.0	<b>037 60102</b>	5.0	<b>037 30102</b>	5.0	–	–
	1500	19	037 50152	7.5	037 60152	7.5	037 30152	7.5	–	–
	<b>2200</b>	<b>20</b>	037 50222	7.5	<b>037 60222</b>	7.5	<b>037 30222</b>	7.5	–	–

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#### ELECTRICAL DATA (continued)

**Table 6** Electrical data continued; 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 Hz 85 °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 ( $\Omega$ )
40	33	6.3 × 11	12	110	16	5.6	0.12	5.8	3.9
	47	6.3 × 11	12	130	22	6.8	0.12	4.1	2.8
	150	10 × 12	14	250	63	15	0.12	1.3	0.87
	470	12.5 × 20	17	670	190	41	0.12	0.41	0.28
	680	12.5 × 25	18	850	280	57	0.12	0.28	0.19
	1000	16 × 25	19	1200	400	83	0.12	0.19	0.13
50	<b>10</b>	<b>5 × 11</b>	<b>11</b>	65	8	4	0.10	16	9.5
	<b>22</b>	<b>5 × 11</b>	<b>11</b>	95	14	5.2	0.10	7.2	4.3
	<b>47</b>	<b>6.3 × 11</b>	<b>12</b>	150	27	7.7	0.10	3.4	2.0
	68	8 × 12	13	190	37	10	0.10	2.3	1.4
	<b>100</b>	<b>8 × 12</b>	<b>13</b>	260	53	13	0.10	1.6	0.95
	<b>220</b>	<b>10 × 16</b>	<b>15</b>	400	110	25	0.10	0.72	0.43
	330	10 × 20	16	580	170	36	0.10	0.48	0.29
	<b>470</b>	<b>12.5 × 20</b>	<b>17</b>	740	240	50	0.10	0.34	0.20
	680	12.5 × 25	18	950	340	71	0.10	0.23	0.14
	<b>1000</b>	<b>16 × 25</b>	<b>19</b>	1350	500	100	0.10	0.16	0.10

# Aluminum electrolytic capacitors

## Radial Standard Miniature

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#### ORDERING INFORMATION (continued)

**Table 7** Ordering information continued; preferred types in **bold**

U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (μF)	CASE CODE	CATALOGUE NUMBER 2222 . . . . .							
			BULK PACKAGING				TAPED AMMOPACK			
			LONG LEADS		CUT LEADS					
			FORM CA	F (mm)	FORM CB	F (mm)	FORM TFA	F (mm)	FORM TNA	F (mm)
40	33	12	037 57339	2.5	–	–	037 37339	5.0	037 77339	2.5
	47	12	037 57479	2.5	–	–	037 37479	5.0	037 77479	2.5
	150	14	037 57151	5.0	037 67151	5.0	037 37151	5.0	–	–
	470	17	037 57471	5.0	037 67471	5.0	037 37471	5.0	–	–
	680	18	037 57681	5.0	037 67681	5.0	037 37681	5.0	–	–
	1000	19	037 57102	7.5	037 67102	7.5	037 37102	7.5	–	–
50	<b>10</b>	<b>11</b>	<b>037 51109</b>	2.0	–	–	<b>037 31109</b>	5.0	037 71109	2.5
	<b>22</b>	<b>11</b>	<b>037 90056</b>	2.0	–	–	<b>037 90063</b>	5.0	037 90064	2.5
	<b>47</b>	<b>12</b>	<b>037 90065</b>	2.5	–	–	<b>037 90072</b>	5.0	037 90073	2.5
	68	13	037 51689	3.5	–	–	037 31689	5.0	037 71689	3.5
	<b>100</b>	<b>13</b>	<b>037 51101</b>	3.5	–	–	<b>037 31101</b>	5.0	037 71101	3.5
	<b>220</b>	<b>15</b>	037 51221	5.0	<b>037 61221</b>	5.0	<b>037 31221</b>	5.0	–	–
	330	16	037 51331	5.0	037 61331	5.0	037 31331	5.0	–	–
	<b>470</b>	<b>17</b>	037 51471	5.0	<b>037 61471</b>	5.0	<b>037 31471</b>	5.0	–	–
	680	18	037 51681	5.0	037 61681	5.0	037 31681	5.0	–	–
	<b>1000</b>	<b>19</b>	037 51102	7.5	<b>037 61102</b>	7.5	<b>037 31102</b>	7.5	–	–

# Aluminum electrolytic capacitors

## Radial Standard Miniature

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#### ELECTRICAL DATA (continued)

**Table 8** Electrical data continued; 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 Hz 85 °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 ( $\Omega$ )
63	0.47	5 × 11	11	11	3.3	3.1	0.09	300	170
	<b>1.0</b>	<b>5 × 11</b>	<b>11</b>	16	3.6	3.1	0.09	140	80
	<b>2.2</b>	<b>5 × 11</b>	<b>11</b>	29	4.4	3.3	0.09	65	36
	3.3	5 × 11	11	35	5.1	3.4	0.09	43	24
	<b>4.7</b>	<b>5 × 11</b>	<b>11</b>	45	6.0	3.6	0.09	30	17
	<b>10</b>	<b>5 × 11</b>	<b>11</b>	70	9.3	4.3	0.09	14	8.0
	<b>22</b>	<b>6.3 × 11</b>	<b>12</b>	110	17	5.8	0.09	6.5	3.6
	33	6.3 × 11	12	140	24	7.2	0.09	4.3	2.4
	<b>47</b>	<b>8 × 12</b>	<b>13</b>	190	33	8.9	0.09	3.0	1.7
	68	10 × 12	14	200	46	12	0.09	2.1	1.2
	<b>100</b>	<b>10 × 12</b>	<b>14</b>	260	66	16	0.09	1.4	0.80
	150	10 × 16	15	320	98	22	0.09	0.95	0.53
	<b>220</b>	<b>10 × 20</b>	<b>16</b>	460	140	31	0.09	0.65	0.36
	330	12.5 × 20	17	650	210	45	0.09	0.43	0.24
<b>470</b>	<b>12.5 × 25</b>	<b>18</b>	850	300	62	0.09	0.30	0.17	
680	16 × 25	19	1150	430	89	0.09	0.21	0.12	
<b>1000</b>	<b>16 × 31</b>	<b>20</b>	1550	630	130	0.09	0.14	0.08	
100	0.47	5 × 11	11	12	3.5	3.1	0.07	237	130
	<b>1.0</b>	<b>5 × 11</b>	<b>11</b>	22	4	3.2	0.07	111	60
	2.2	5 × 11	11	33	5.2	3.4	0.07	51	27
	3.3	5 × 11	11	40	6.3	3.7	0.07	34	18
	4.7	5 × 11	11	48	7.7	3.9	0.07	24	13
	<b>10</b>	<b>6.3 × 11</b>	<b>12</b>	80	13	5	0.07	11	6.0
	<b>22</b>	<b>8 × 12</b>	<b>13</b>	130	25	7.4	0.07	5.1	2.7
	33	10 × 12	14	160	36	9.6	0.07	3.4	1.8
	47	10 × 16	15	210	50	12	0.07	2.4	1.3
	100	10 × 20	16	350	100	23	0.07	1.1	0.60
	220	12.5 × 25	18	580	220	47	0.07	0.51	0.27
	330	16 × 25	19	710	330	69	0.07	0.34	0.18
	470	16 × 31	20	900	470	97	0.07	0.24	0.13

# Aluminum electrolytic capacitors

## Radial Standard Miniature

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**ORDERING INFORMATION (continued)**

**Table 9** Ordering information continued; preferred types in **bold**

U <sub>R</sub> (V)	C <sub>R</sub> 100 Hz (µF)	CASE CODE	CATALOGUE NUMBER 2222 . . . . .							
			BULK PACKAGING				TAPED AMMOPACK			
			LONG LEADS		CUT LEADS					
			FORM CA	F (mm)	FORM CB	F (mm)	FORM TFA	F (mm)	FORM TNA	F (mm)
63	0.47	11	037 58477	2.0	–	–	037 38477	5.0	037 78477	2.5
	<b>1.0</b>	<b>11</b>	<b>037 58108</b>	2.0	–	–	<b>037 38108</b>	5.0	037 78108	2.5
	<b>2.2</b>	<b>11</b>	<b>037 58228</b>	2.0	–	–	<b>037 38228</b>	5.0	037 78228	2.5
	3.3	11	037 58338	2.0	–	–	037 38338	5.0	037 78338	2.5
	<b>4.7</b>	<b>11</b>	<b>037 58478</b>	2.0	–	–	<b>037 38478</b>	5.0	037 78478	2.5
	<b>10</b>	<b>11</b>	<b>037 58109</b>	2.0	–	–	<b>037 38109</b>	5.0	037 78109	2.5
	<b>22</b>	<b>12</b>	<b>037 58229</b>	2.5	–	–	<b>037 38229</b>	5.0	037 78229	2.5
	33	12	037 90074	2.5	–	–	037 90081	5.0	037 90082	2.5
	<b>47</b>	<b>13</b>	<b>037 58479</b>	3.5	–	–	<b>037 38479</b>	5.0	037 78479	3.5
	68	14	037 58689	5.0	037 68689	5.0	037 38689	5.0	–	–
	<b>100</b>	<b>14</b>	037 58101	5.0	<b>037 68101</b>	5.0	<b>037 38101</b>	5.0	–	–
	150	15	037 58151	5.0	037 68151	5.0	037 38151	5.0	–	–
	<b>220</b>	<b>16</b>	037 58221	5.0	<b>037 68221</b>	5.0	<b>037 38221</b>	5.0	–	–
	330	17	037 58331	5.0	037 68331	5.0	037 38331	5.0	–	–
	<b>470</b>	<b>18</b>	037 58471	5.0	<b>037 68471</b>	5.0	<b>037 38471</b>	5.0	–	–
	680	19	037 58681	7.5	037 68681	7.5	037 38681	7.5	–	–
<b>1000</b>	<b>20</b>	037 58102	7.5	<b>037 68102</b>	7.5	<b>037 38102</b>	7.5	–	–	
100	0.47	11	037 59477	2.0	–	–	037 39477	5.0	037 79477	2.5
	<b>1.0</b>	<b>11</b>	<b>037 59108</b>	2.0	–	–	<b>037 39108</b>	5.0	037 79108	2.5
	2.2	11	037 59228	2.0	–	–	037 39228	5.0	037 79228	2.5
	3.3	11	037 59338	2.0	–	–	037 39338	5.0	037 79338	2.5
	4.7	11	037 59478	2.0	–	–	037 39478	5.0	037 79478	2.5
	<b>10</b>	<b>12</b>	<b>037 59109</b>	2.5	–	–	<b>037 39109</b>	5.0	037 79109	2.5
	<b>22</b>	<b>13</b>	<b>037 59229</b>	3.5	–	–	<b>037 39229</b>	5.0	037 79229	3.5
	33	14	037 59339	5.0	037 69339	5.0	037 39339	5.0	–	–
	47	15	037 59479	5.0	037 69479	5.0	037 39479	5.0	–	–
	100	16	037 59101	5.0	037 69101	5.0	037 39101	5.0	–	–
	220	18	037 59221	5.0	037 69221	5.0	037 39221	5.0	–	–
	330	19	037 59331	7.5	037 69331	7.5	037 39331	7.5	–	–
	470	20	037 59471	7.5	037 69471	7.5	037 39471	7.5	–	–

# Aluminum electrolytic capacitors

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#### ELECTRICAL DATA (continued)

##### Additional electrical data

PARAMETER	CONDITIONS	VALUE
<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 $U_R$	$I_{L1} \leq 0.01C_R \times U_R + 3 \mu\text{A}$
	after 5 minutes at $U_R$	$I_{L5} \leq 0.002C_R \times U_R + 3 \mu\text{A}$
<b>Inductance</b>		
Equivalent series inductance (ESL)	case $\varnothing D \leq 8 \text{ mm}$	typ. 13 nH
	case $\varnothing D = 10 \text{ mm}$	typ. 16 nH
	case $\varnothing D \geq 12.5 \text{ mm}$	typ. 18 nH

# Aluminum electrolytic capacitors

## Radial Standard Miniature

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### Capacitance (C)

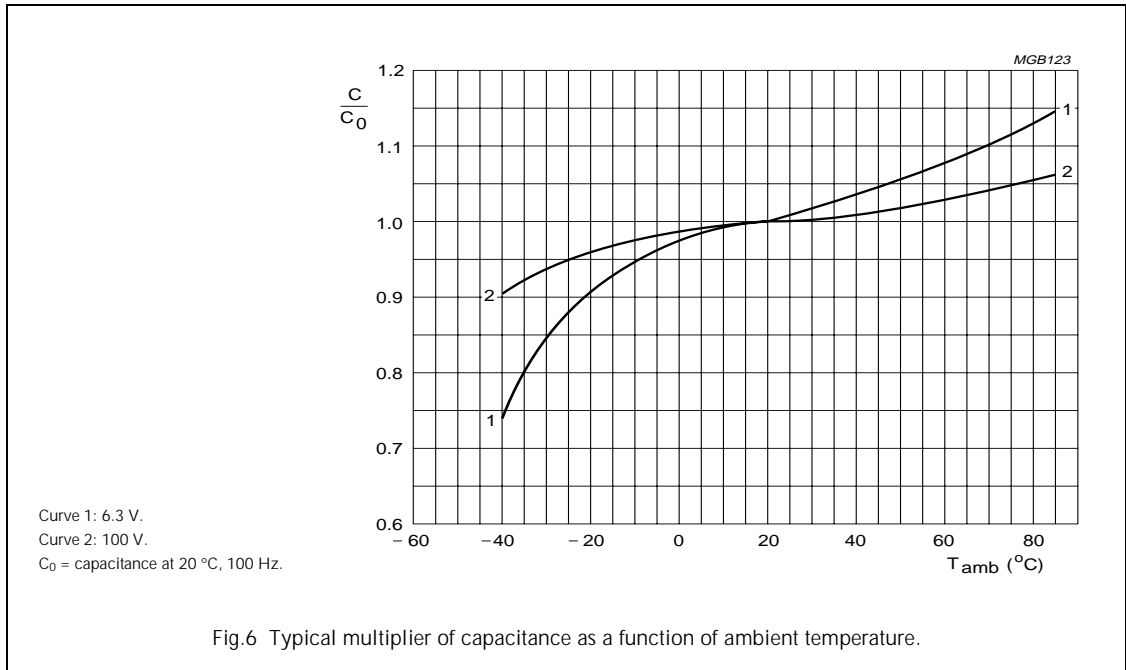


Fig.6 Typical multiplier of capacitance as a function of ambient temperature.

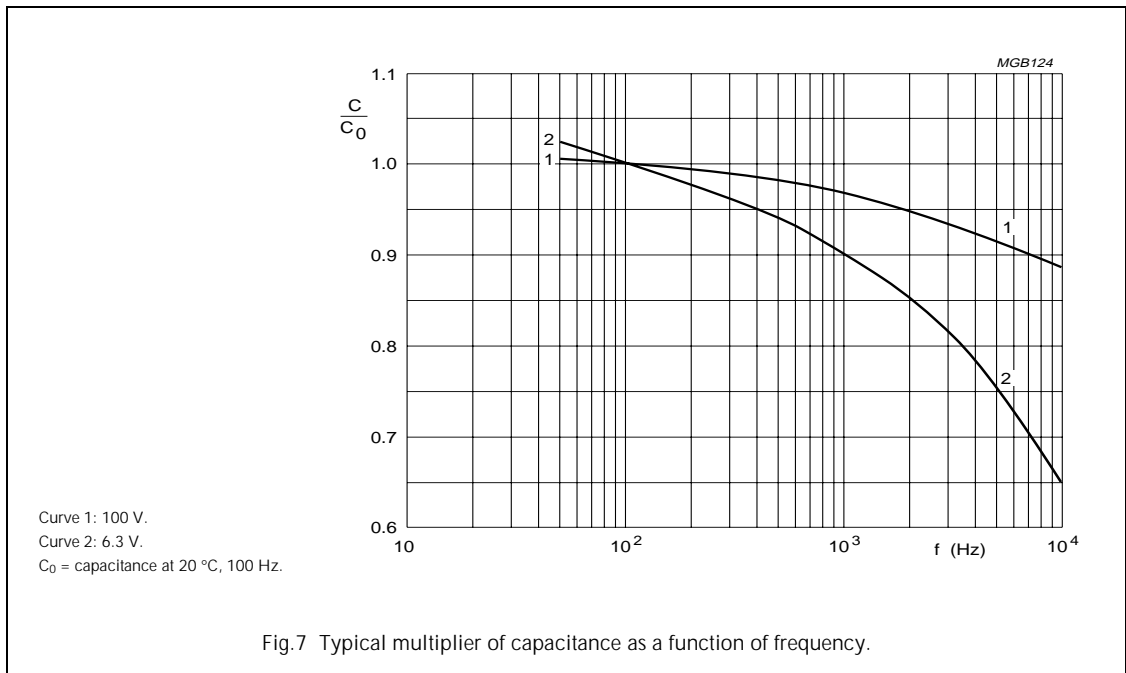


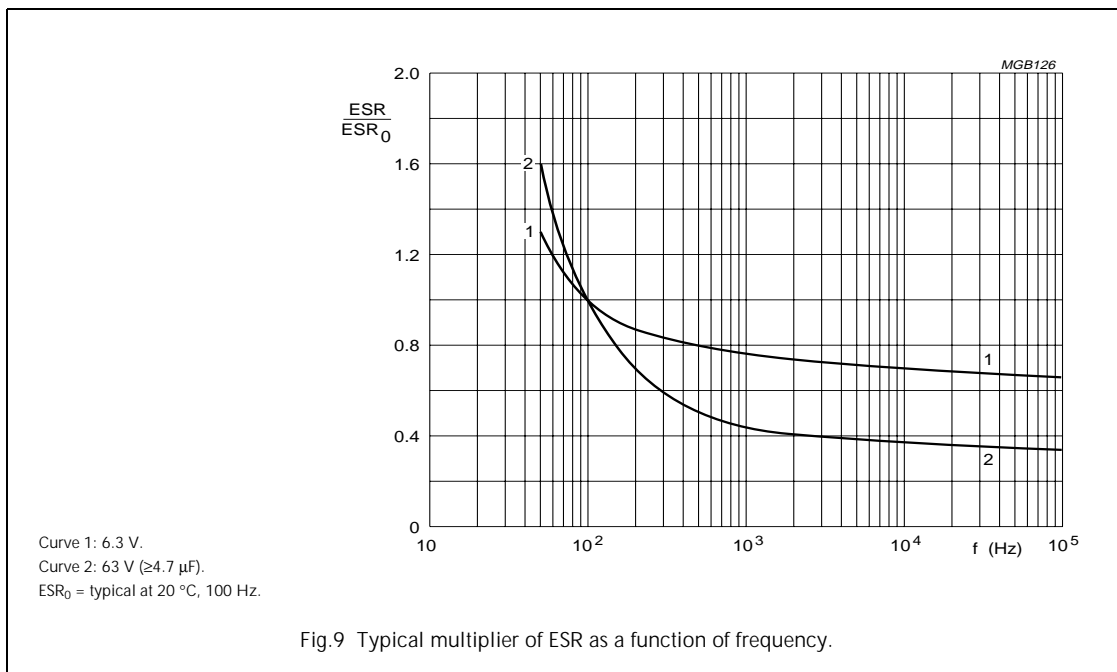
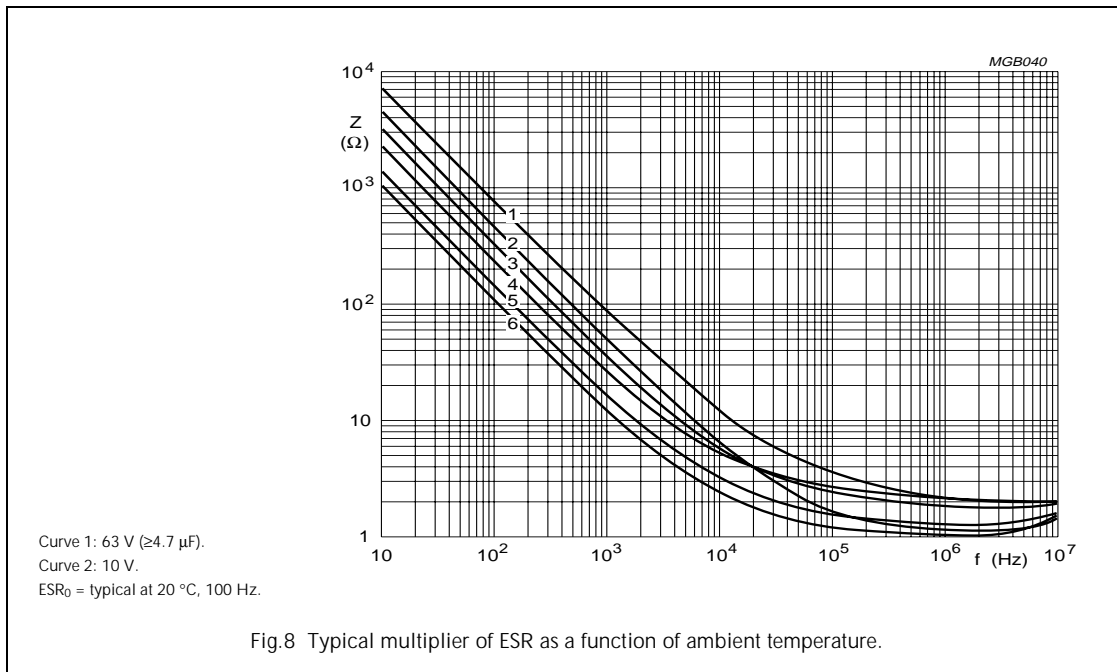
Fig.7 Typical multiplier of capacitance as a function of frequency.

# Aluminum electrolytic capacitors

## Radial Standard Miniature

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### Equivalent series resistance (ESR)



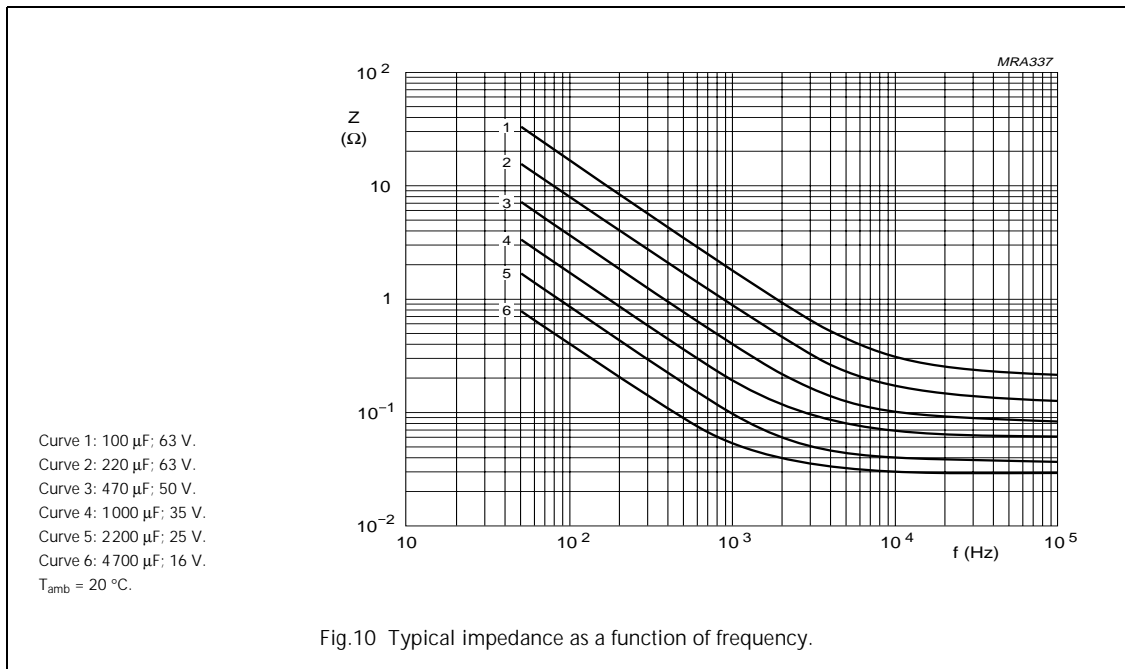


# Aluminum electrolytic capacitors

## Radial Standard Miniature

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#### Impedance (Z)



#### MARKING

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

- Rated capacitance (in  $\mu\text{F}$ )
- Tolerance on rated capacitance, code letter in accordance with "IEC 60062"
- Rated voltage (in V)
- Group number (037)
- Name of manufacturer
- Date code, in accordance with "IEC 60062"
- Code indicating factory of origin
- Negative terminal identification.

# Aluminum electrolytic capacitors

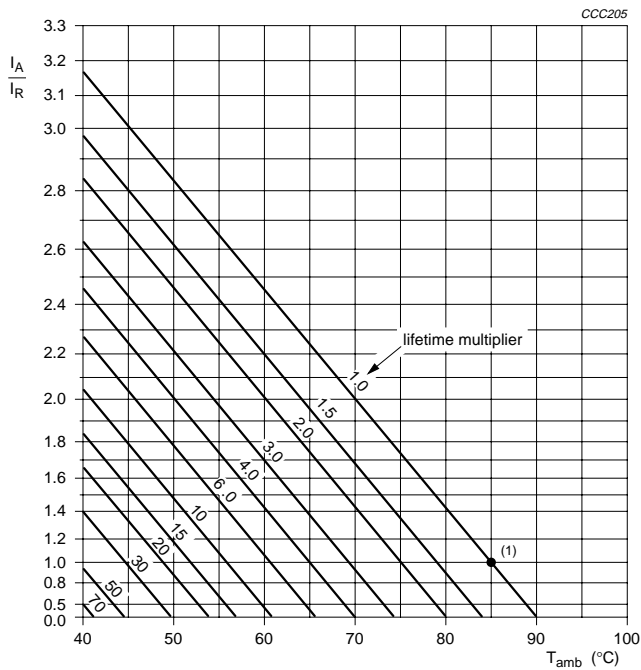
## Radial Standard Miniature

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### RIPPLE CURRENT AND USEFUL LIFE

**Table 10** Multiplier of ripple current ( $I_R$ ) as a function of frequency

FREQUENCY (Hz)	$I_R$ MULTIPLIER		
	$U_R = 6.3$ to $10$ V	$U_R = 16$ to $35$ V	$U_R = 40$ to $100$ V
50	0.9	0.85	0.8
100	1.0	1.0	1.0
300	1.12	1.2	1.25
1000	1.2	1.3	1.4
3000	1.25	1.35	1.5
$\geq 10000$	1.3	1.4	1.6



$I_A$  = actual ripple current at 100 Hz.  
 $I_R$  = rated ripple current at 100 Hz, 85 °C.  
 (1) Useful life at 85 °C and  $I_R$  applied: 2500 hours.

Fig.11 Multiplier of useful life as a function of ambient temperature and ripple current load.

# Aluminum electrolytic capacitors

## Radial Standard Miniature

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#### SPECIFIC TESTS AND REQUIREMENTS

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

**Table 11** 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	$U_R \leq 6.3\text{ V}$ ; $\Delta C/C$ : +15/–30% $U_R > 6.3\text{ V}$ ; $\Delta C/C$ : $\pm 20\%$ $\tan \delta \leq 1.5 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 85\text{ °C}$ ; $U_R$ and $I_R$ applied; 2500 hours	$U_R \leq 6.3\text{ V}$ ; $\Delta C/C$ : +45/–50% $U_R > 6.3\text{ V}$ ; $\Delta C/C$ : $\pm 50\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 3\%$
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 $I_{L5} \leq 2 \times \text{spec. limit}$