

Aluminium electrolytic capacitors Radial Standard Miniature

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FEATURES

- Polarized aluminium electrolytic capacitors, non-solid
- Radial leads, cylindrical aluminium 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).

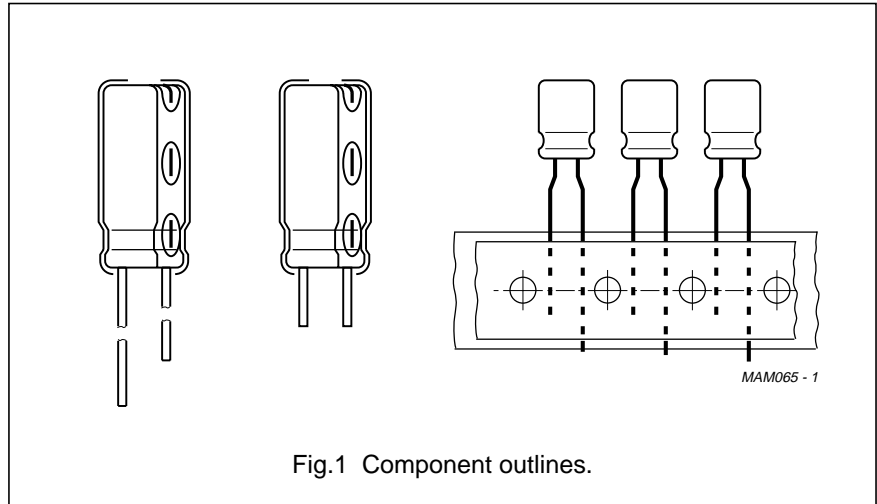
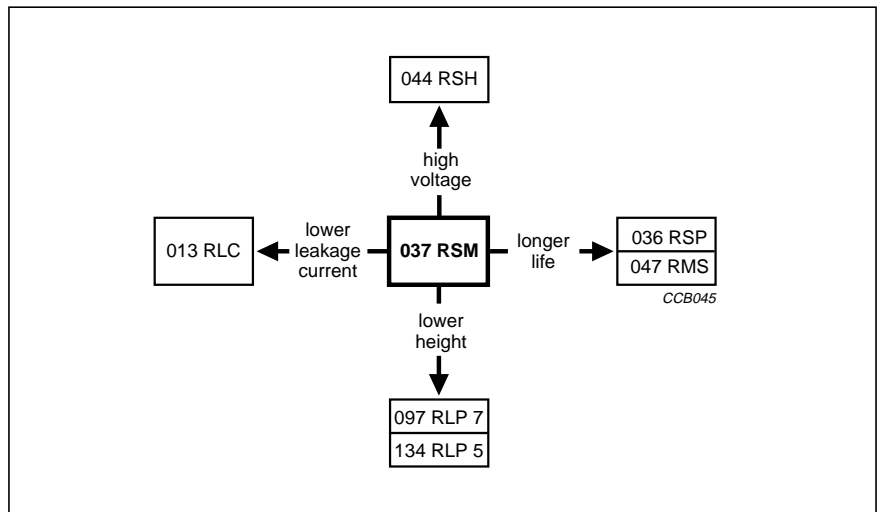


Fig.1 Component outlines.



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 μF
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 384-4/CECC 30300
Climatic category IEC 68	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 (μF)	U_R (V)								
	6.3	10	16	25	35	40	50	63	100
0.47	–	–	–	–	–	–	–	5 × 11	5 × 11
1.0	–	–	–	–	–	–	–	5 × 11	5 × 11
2.2	–	–	–	–	–	–	–	5 × 11	5 × 11
3.3	–	–	–	–	–	–	–	5 × 11	5 × 11
4.7	–	–	–	–	–	–	–	5 × 11	5 × 11
10	–	–	–	–	–	–	5 × 11	5 × 11	6.3 × 11
22	–	–	–	–	–	–	5 × 11	6.3 × 11	8 × 12
33	–	–	–	–	5 × 11	6.3 × 11	–	6.3 × 11	10 × 12
47	–	–	–	5 × 11	–	6.3 × 11	6.3 × 11	8 × 12	10 × 16
68	–	–	5 × 11	6.3 × 11	–	–	8 × 12	10 × 12	–
100	–	5 × 11	6.3 × 11	6.3 × 11	–	–	8 × 12	10 × 12	10 × 20
150	–	6.3 × 11	–	8 × 12	–	10 × 12	–	10 × 16	–
220	–	6.3 × 11	8 × 12	8 × 12	10 × 12	–	10 × 16	10 × 20	12.5 × 25
330	6.3 × 11	–	8 × 12	10 × 12	10 × 16	–	10 × 20	12.5 × 20	16 × 25
470	–	8 × 12	10 × 12	10 × 16	10 × 20	12.5 × 20	12.5 × 20	12.5 × 25	16 × 31
680	–	–	10 × 16	–	12.5 × 20	12.5 × 25	12.5 × 25	16 × 25	–
1000	10 × 12	10 × 16	10 × 20	12.5 × 20	12.5 × 25	16 × 25	16 × 25	16 × 31	–
1500	10 × 20	–	12.5 × 20	12.5 × 25	16 × 25	–	–	–	–
2200	12.5 × 20	12.5 × 20	12.5 × 25	16 × 25	16 × 31	–	–	–	–
3300	12.5 × 20	12.5 × 25	16 × 25	16 × 31	–	–	–	–	–
4700	–	16 × 25	16 × 31	–	–	–	–	–	–
6800	–	16 × 31	–	–	–	–	–	–	–
10000	16 × 31	–	–	–	–	–	–	–	–

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MECHANICAL DATA, AVAILABLE FORMS AND PACKAGING QUANTITIES

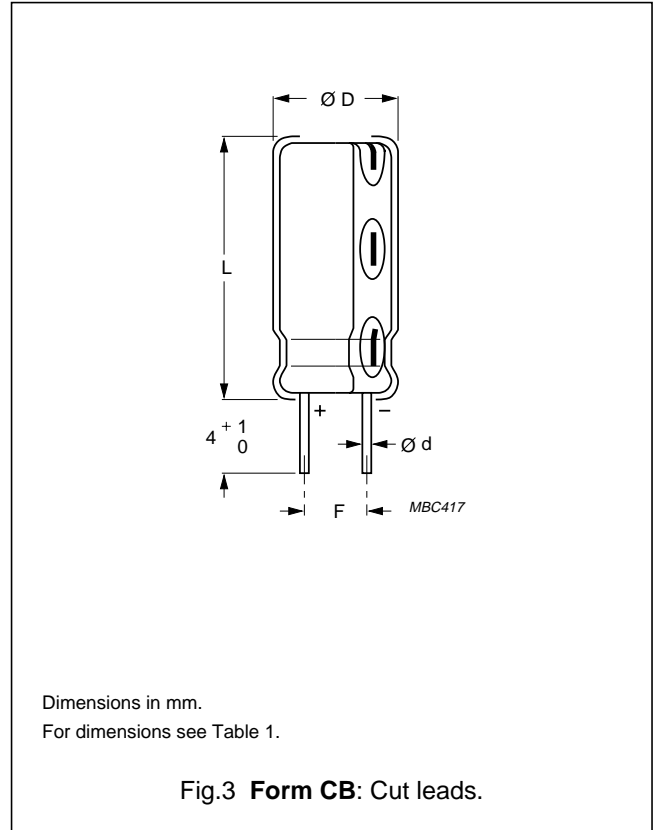
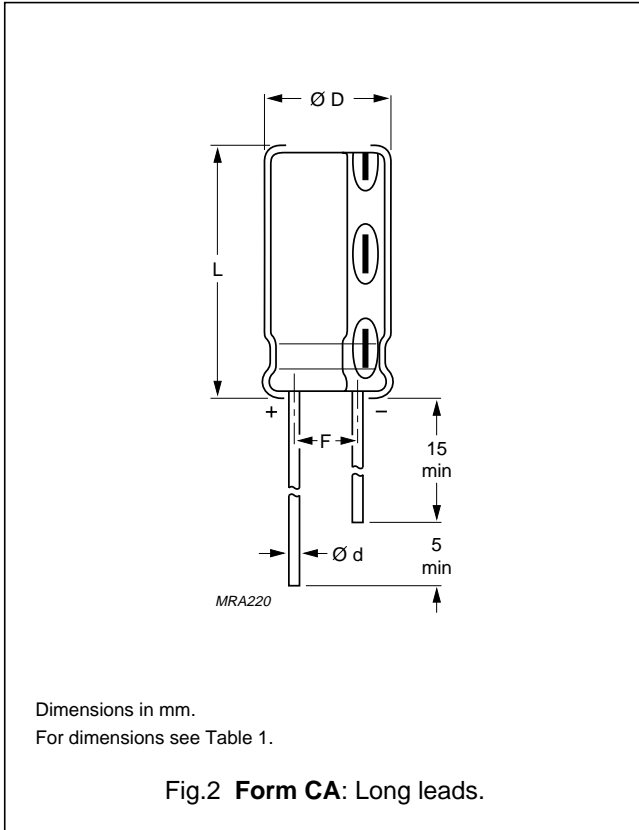


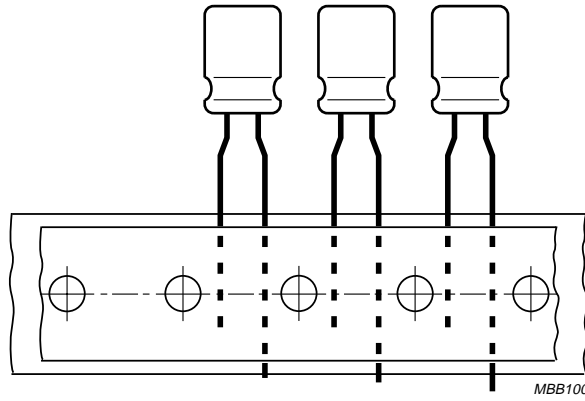
Table 1 Physical dimensions, mass and packaging quantities; see Figs 2 and 3

NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	Ød (mm)	ØD _{max} (mm)	L _{max} (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

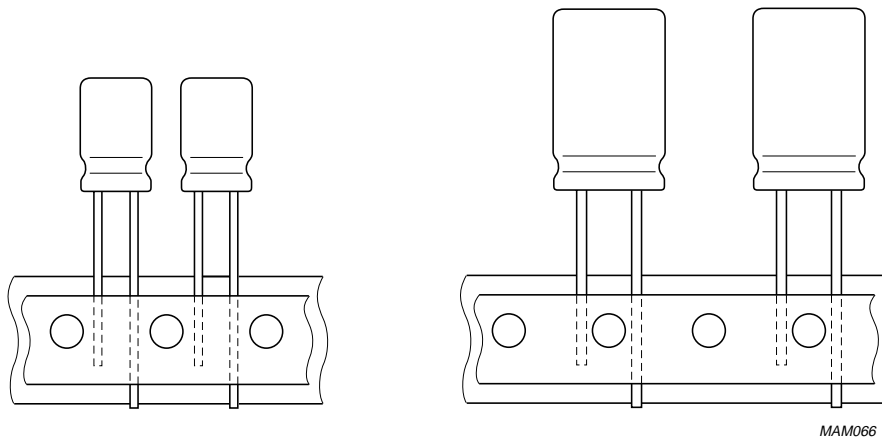


Form TFA:

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 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 °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 (μF)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 85 °C (mA)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	$\tan \delta$ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)
6.3	330	6.3 × 11	12	280	24	7.2	0.24	1.2	1.8
	1000	10 × 12	14	530	66	16	0.24	0.38	0.6
	1500	10 × 20	16	730	98	22	0.25	0.27	0.4
	2200	12.5 × 20	17	990	140	31	0.26	0.19	0.27
	3300	12.5 × 20	17	1150	210	45	0.28	0.14	0.18
	10000	16 × 31	20	2250	630	130	0.42	0.07	0.07
10	100	5 × 11	11	140	13	5	0.20	3.2	4.5
	150	6.3 × 11	12	180	18	6	0.20	2.1	3.0
	220	6.3 × 11	12	250	25	7.4	0.20	1.4	2.0
	470	8 × 12	13	410	50	12	0.20	0.68	0.96
	1000	10 × 16	15	630	100	23	0.20	0.32	0.45
	2200	12.5 × 20	17	1050	220	47	0.22	0.16	0.20
	3300	12.5 × 25	18	1350	330	69	0.24	0.12	0.14
	4700	16 × 25	19	1800	470	97	0.28	0.09	0.10
	6800	16 × 31	20	2200	680	140	0.32	0.07	0.07

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ORDERING INFORMATION

Ordering example

Electrolytic capacitor 037 series

1000 µF/16 V; ±20%

Nominal case size: Ø10 × 20 mm; Form TFA

Catalogue number: 2222 037 35102.

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

U _R (V)	C _R 100 Hz (µF)	CASE CODE	CATALOGUE NUMBER 2222							
			BULK PACKAGING				TAPED AMMOPACK			
			LONG LEADS		CUT LEADS		FORM TFA		FORM TNA	
			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	100	11	037 54101	2.0	–	–	037 34101	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
	470	13	037 54471	3.5	–	–	037 34471	5.0	037 74471	3.5
	1000	15	037 54102	5.0	037 64102	5.0	037 34102	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	–	–
	4700	19	037 54472	7.5	037 64472	7.5	037 34472	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 (μF)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 85 °C (mA)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)
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
	470	10 × 12	14	420	78	18	0.16	0.54	0.68
	680	10 × 16	15	520	110	25	0.16	0.37	0.47
	1000	10 × 20	16	740	160	35	0.16	0.25	0.32
	1500	12.5 × 20	17	900	240	51	0.17	0.18	0.21
	2200	12.5 × 25	18	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	47	5 × 11	11	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
	100	6.3 × 11	12	190	28	8	0.14	2.2	2.2
	150	8 × 12	13	230	41	11	0.14	1.5	1.5
	220	8 × 12	13	320	58	14	0.14	1.0	1.0
	330	10 × 12	14	410	86	20	0.14	0.68	0.67
	470	10 × 16	15	510	120	26	0.14	0.47	0.47
	1000	12.5 × 20	17	910	250	53	0.14	0.22	0.22
	1500	12.5 × 25	18	1100	380	78	0.15	0.16	0.15
	2200	16 × 25	19	1500	550	110	0.16	0.12	0.10
3300	16 × 31	20	1900	830	170	0.18	0.09	0.07	
35	33	5 × 11	11	110	15	5.3	0.12	5.8	4.5
	220	10 × 12	14	330	80	18	0.12	0.87	0.68
	330	10 × 16	15	450	120	26	0.12	0.58	0.45
	470	10 × 20	16	590	170	36	0.12	0.41	0.32
	680	12.5 × 20	17	830	240	51	0.12	0.28	0.22
	1000	12.5 × 25	18	1050	350	73	0.12	0.19	0.15
	1500	16 × 25	19	1400	530	110	0.13	0.14	0.10
	2200	16 × 31	20	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 _R (V)	C _R 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)
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
	470	14	037 55471	5.0	037 65471	5.0	037 35471	5.0	–	–
	680	15	037 55681	5.0	037 65681	5.0	037 35681	5.0	–	–
	1000	16	037 55102	5.0	037 65102	5.0	037 35102	5.0	–	–
	1500	17	037 55152	5.0	037 65152	5.0	037 35152	5.0	–	–
	2200	18	037 55222	5.0	037 65222	5.0	037 35222	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	47	11	037 56479	2.0	–	–	037 36479	5.0	037 76479	2.5
	68	12	037 56689	2.5	–	–	037 36689	5.0	037 76689	2.5
	100	12	037 90047	2.5	–	–	037 90054	5.0	037 90055	2.5
	150	13	037 56151	3.5	–	–	037 36151	5.0	037 76151	3.5
	220	13	037 56221	3.5	–	–	037 36221	5.0	037 76221	3.5
	330	14	037 56331	5.0	037 66331	5.0	037 36331	5.0	–	–
	470	15	037 56471	5.0	037 66471	5.0	037 36471	5.0	–	–
	1000	17	037 56102	5.0	037 66102	5.0	037 36102	5.0	–	–
	1500	18	037 56152	5.0	037 66152	5.0	037 36152	5.0	–	–
	2200	19	037 56222	7.5	037 66222	7.5	037 36222	7.5	–	–
	3300	20	037 56332	7.5	037 66332	7.5	037 36332	7.5	–	–
35	33	11	037 50339	2.0	–	–	037 30339	5.0	037 70339	2.5
	220	14	037 50221	5.0	037 60221	5.0	037 30221	5.0	–	–
	330	15	037 50331	5.0	037 60331	5.0	037 30331	5.0	–	–
	470	16	037 50471	5.0	037 60471	5.0	037 30471	5.0	–	–
	680	17	037 50681	5.0	037 60681	5.0	037 30681	5.0	–	–
	1000	18	037 50102	5.0	037 60102	5.0	037 30102	5.0	–	–
	1500	19	037 50152	7.5	037 60152	7.5	037 30152	7.5	–	–
	2200	20	037 50222	7.5	037 60222	7.5	037 30222	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 (μF)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 85 °C (mA)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)
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	10	5 × 11	11	65	8	4	0.10	16	9.5
	22	5 × 11	11	95	14	5.2	0.10	7.2	4.3
	47	6.3 × 11	12	150	27	7.7	0.10	3.4	2.0
	68	8 × 12	13	190	37	10	0.10	2.3	1.4
	100	8 × 12	13	260	53	13	0.10	1.6	0.95
	220	10 × 16	15	400	110	25	0.10	0.72	0.43
	330	10 × 20	16	580	170	36	0.10	0.48	0.29
	470	12.5 × 20	17	740	240	50	0.10	0.34	0.20
	680	12.5 × 25	18	950	340	71	0.10	0.23	0.14
	1000	16 × 25	19	1350	500	100	0.10	0.16	0.10

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ORDERING INFORMATION (continued)**Table 7** Ordering information continued; preferred types in **bold**

U _R (V)	C _R 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	10	11	037 51109	2.0	–	–	037 31109	5.0	037 71109	2.5
	22	11	037 90056	2.0	–	–	037 90063	5.0	037 90064	2.5
	47	12	037 90065	2.5	–	–	037 90072	5.0	037 90073	2.5
	68	13	037 51689	3.5	–	–	037 31689	5.0	037 71689	3.5
	100	13	037 51101	3.5	–	–	037 31101	5.0	037 71101	3.5
	220	15	037 51221	5.0	037 61221	5.0	037 31221	5.0	–	–
	330	16	037 51331	5.0	037 61331	5.0	037 31331	5.0	–	–
	470	17	037 51471	5.0	037 61471	5.0	037 31471	5.0	–	–
	680	18	037 51681	5.0	037 61681	5.0	037 31681	5.0	–	–
	1000	19	037 51102	7.5	037 61102	7.5	037 31102	7.5	–	–

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ELECTRICAL DATA (continued)**Table 8** Electrical data continued; preferred types in **bold**

U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 85 °C (mA)	I_{L1} 1 min (μ A)	I_{L5} 5 min (μ A)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)
63	0.47	5 × 11	11	11	3.3	3.1	0.09	300	170
	1.0	5 × 11	11	16	3.6	3.1	0.09	140	80
	2.2	5 × 11	11	29	4.4	3.3	0.09	65	36
	3.3	5 × 11	11	35	5.1	3.4	0.09	43	24
	4.7	5 × 11	11	45	6.0	3.6	0.09	30	17
	10	5 × 11	11	70	9.3	4.3	0.09	14	8.0
	22	6.3 × 11	12	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
	47	8 × 12	13	190	33	8.9	0.09	3.0	1.7
	68	10 × 12	14	200	46	12	0.09	2.1	1.2
	100	10 × 12	14	260	66	16	0.09	1.4	0.80
	150	10 × 16	15	320	98	22	0.09	0.95	0.53
	220	10 × 20	16	460	140	31	0.09	0.65	0.36
	330	12.5 × 20	17	650	210	45	0.09	0.43	0.24
	470	12.5 × 25	18	850	300	62	0.09	0.30	0.17
	680	16 × 25	19	1150	430	89	0.09	0.21	0.12
1000	16 × 31	20	1550	630	130	0.09	0.14	0.08	
100	0.47	5 × 11	11	12	3.5	3.1	0.07	237	130
	1.0	5 × 11	11	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
	10	6.3 × 11	12	80	13	5	0.07	11	6.0
	22	8 × 12	13	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

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ORDERING INFORMATION (continued)**Table 9** Ordering information continued; preferred types in **bold**

U _R (V)	C _R 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
	1.0	11	037 58108	2.0	–	–	037 38108	5.0	037 78108	2.5
	2.2	11	037 58228	2.0	–	–	037 38228	5.0	037 78228	2.5
	3.3	11	037 58338	2.0	–	–	037 38338	5.0	037 78338	2.5
	4.7	11	037 58478	2.0	–	–	037 38478	5.0	037 78478	2.5
	10	11	037 58109	2.0	–	–	037 38109	5.0	037 78109	2.5
	22	12	037 58229	2.5	–	–	037 38229	5.0	037 78229	2.5
	33	12	037 90074	2.5	–	–	037 90081	5.0	037 90082	2.5
	47	13	037 58479	3.5	–	–	037 38479	5.0	037 78479	3.5
	68	14	037 58689	5.0	037 68689	5.0	037 38689	5.0	–	–
	100	14	037 58101	5.0	037 68101	5.0	037 38101	5.0	–	–
	150	15	037 58151	5.0	037 68151	5.0	037 38151	5.0	–	–
	220	16	037 58221	5.0	037 68221	5.0	037 38221	5.0	–	–
	330	17	037 58331	5.0	037 68331	5.0	037 38331	5.0	–	–
	470	18	037 58471	5.0	037 68471	5.0	037 38471	5.0	–	–
	680	19	037 58681	7.5	037 68681	7.5	037 38681	7.5	–	–
	1000	20	037 58102	7.5	037 68102	7.5	037 38102	7.5	–	–
100	0.47	11	037 59477	2.0	–	–	037 39477	5.0	037 79477	2.5
	1.0	11	037 59108	2.0	–	–	037 39108	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
	10	12	037 59109	2.5	–	–	037 39109	5.0	037 79109	2.5
	22	13	037 59229	3.5	–	–	037 39229	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	–	–

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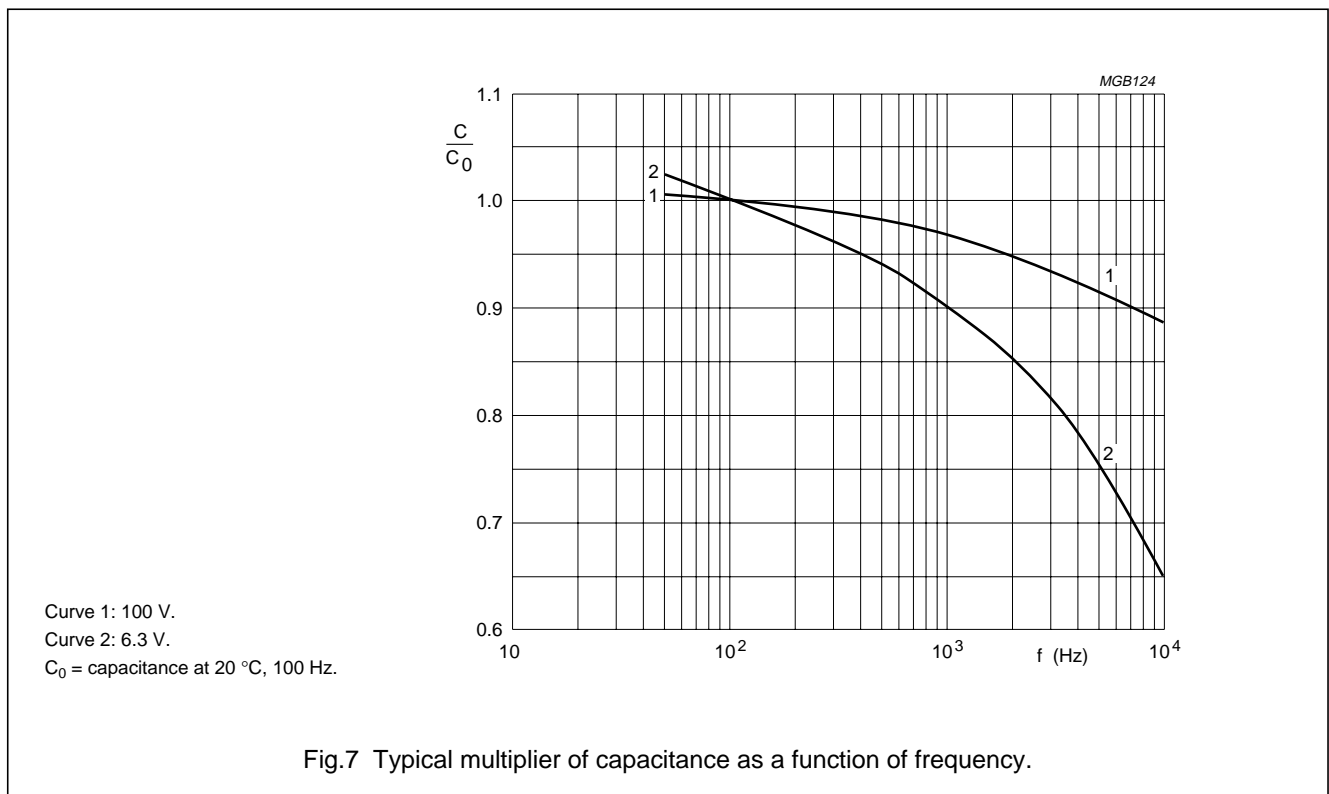
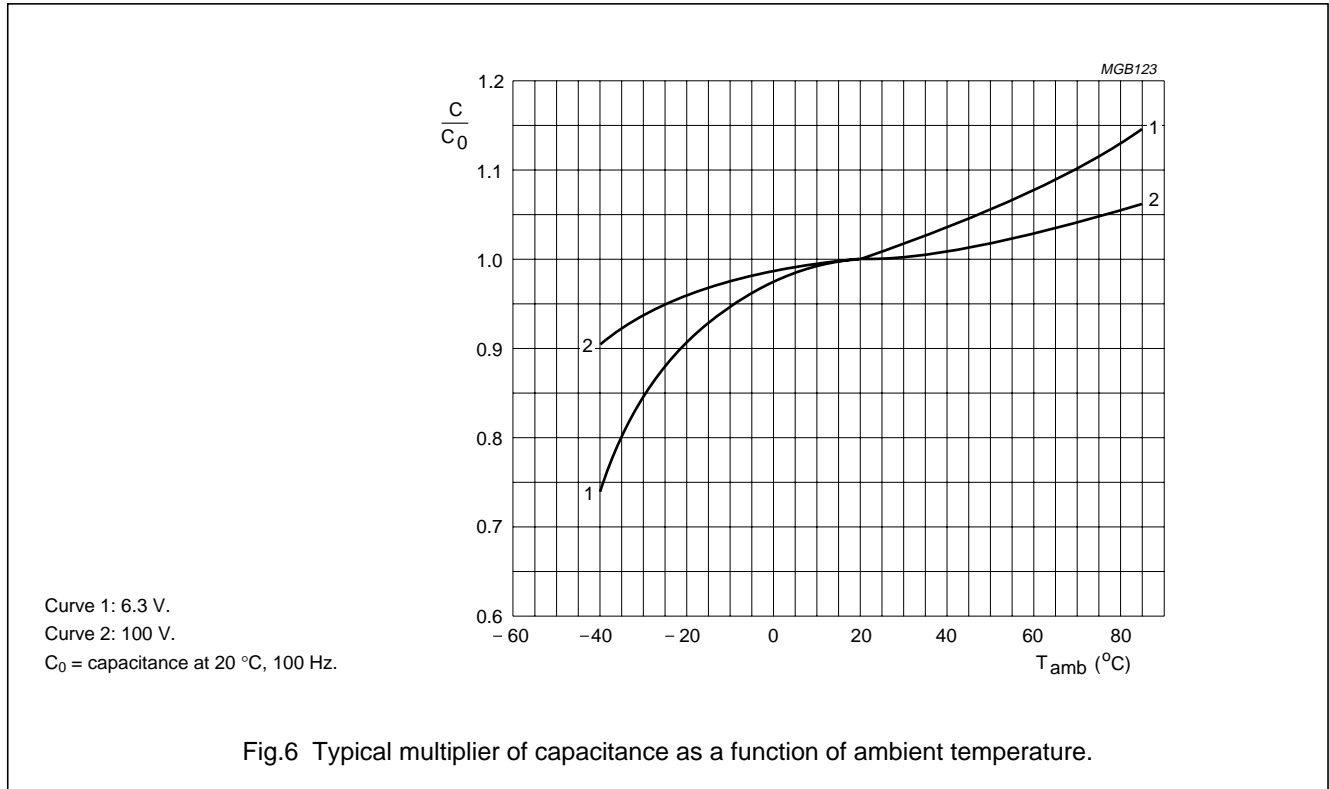
ELECTRICAL DATA (continued)**Additional electrical data**

PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage for short periods		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
Current		
Leakage current	after 1 minute at U_R	$I_{L1} \leq 0.01C_R \times U_R + 3 \mu\text{A}$
	after 5 minutes at U_R	$I_{L5} \leq 0.002C_R \times U_R + 3 \mu\text{A}$
Inductance		
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

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Capacitance (C)

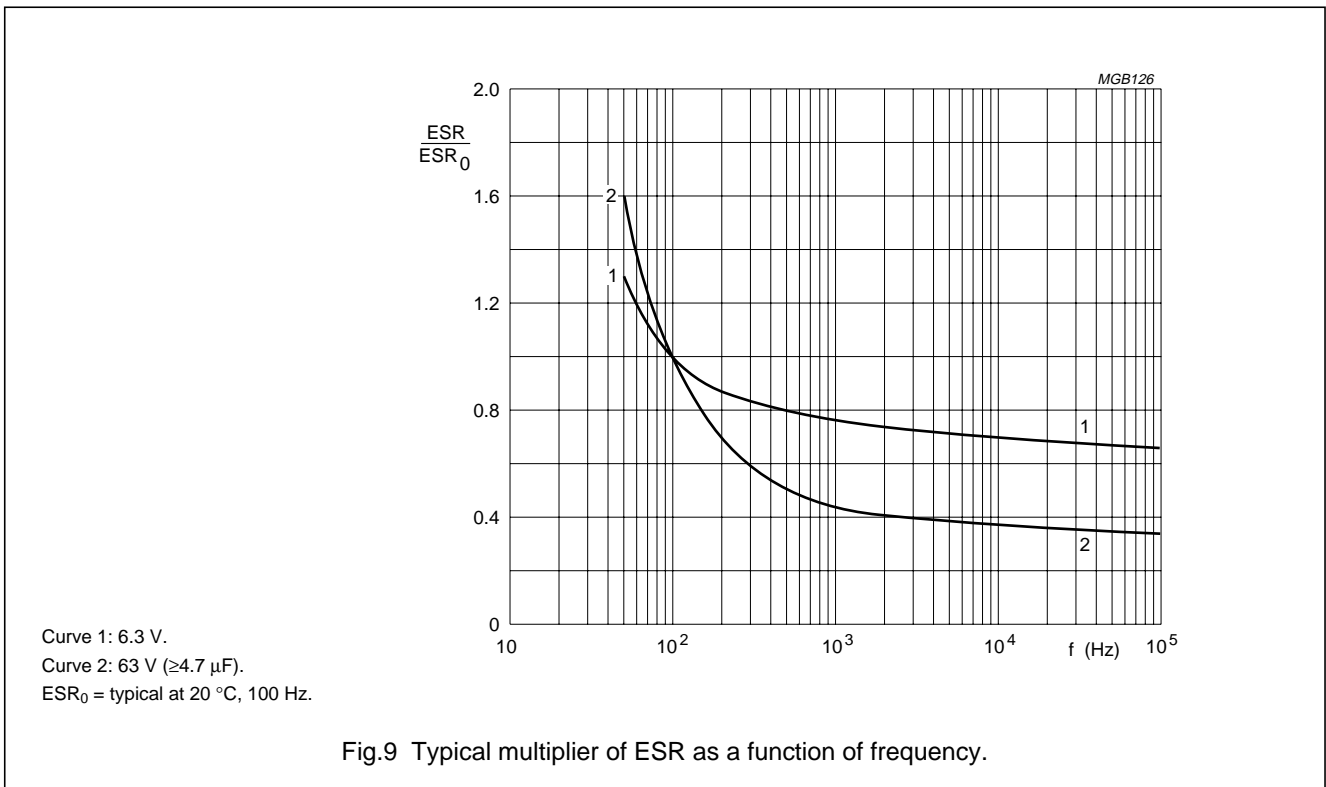
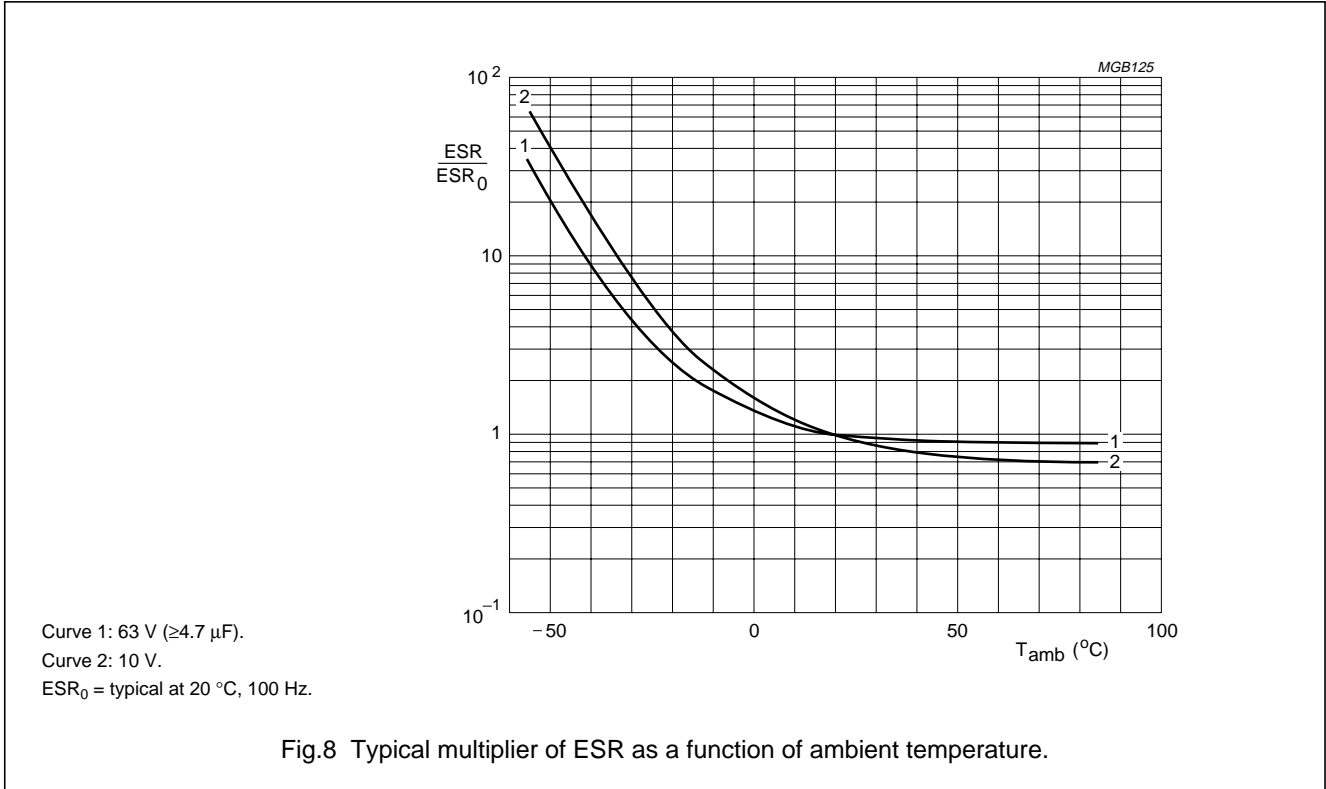


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Equivalent series resistance (ESR)

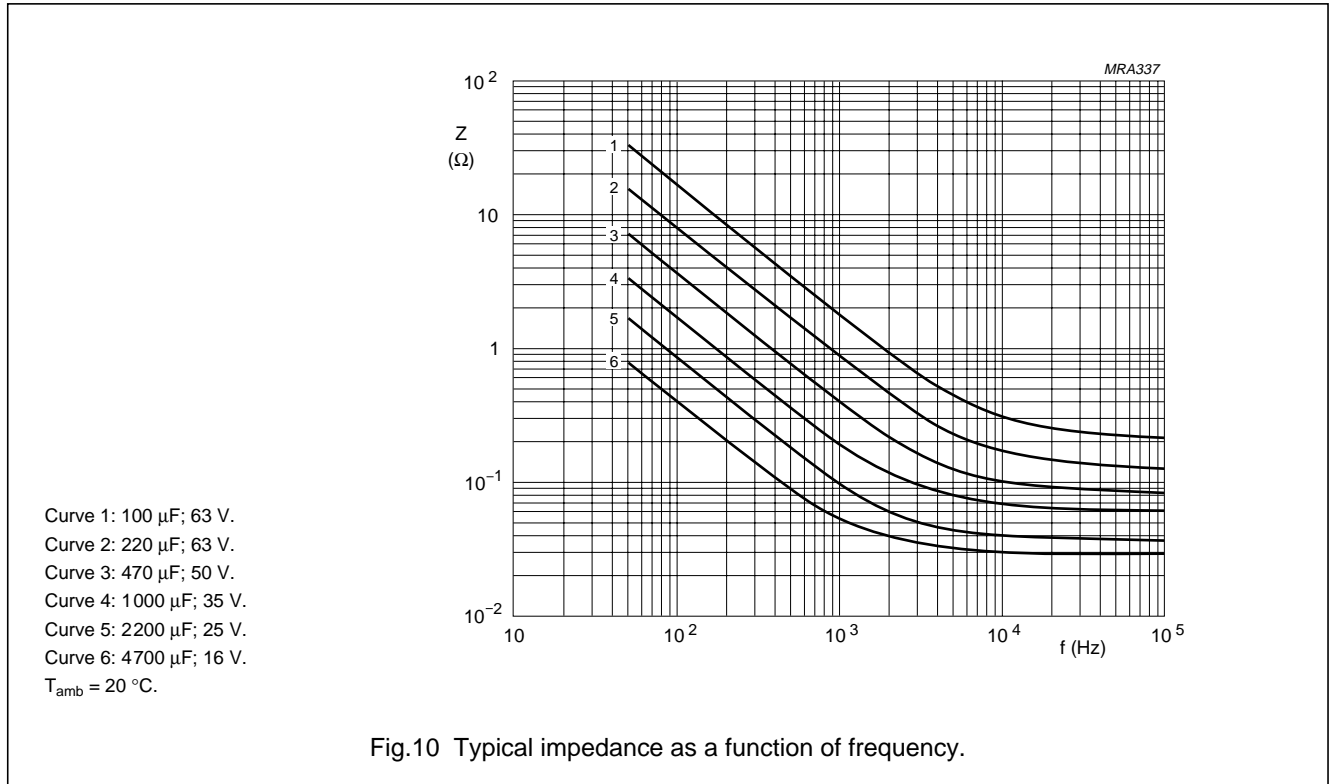


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Impedance (Z)



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 62"
- Rated voltage (in V)
- Group number (037)
- Name of manufacturer (PHILIPS)
- Date code, in accordance with "IEC 62"
- Code indicating factory of origin
- Negative terminal identification.

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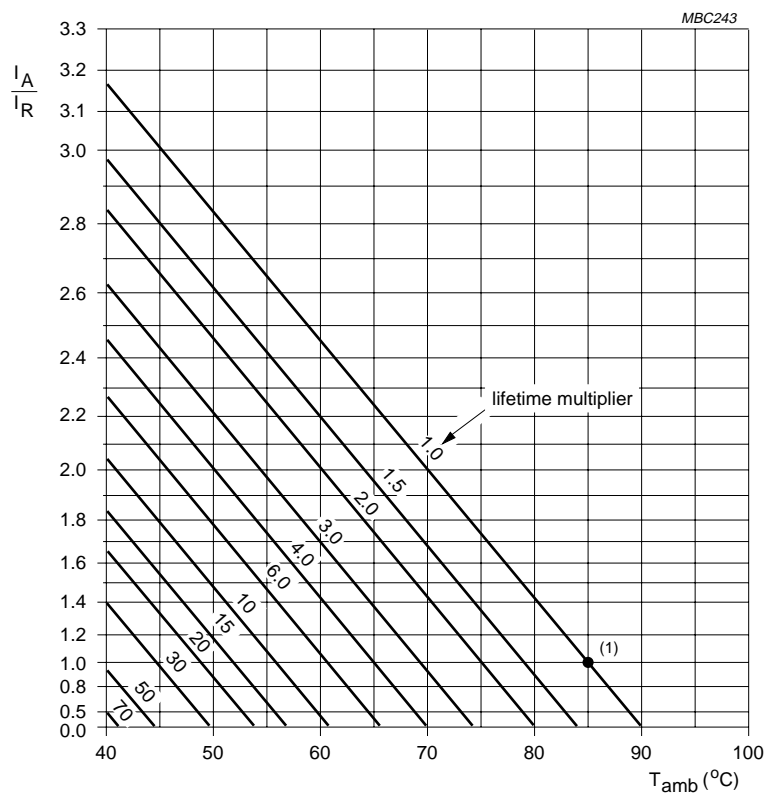
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RIPPLE CURRENT AND USEFUL LIFE

Table 10 Multiplier of ripple current (I_R/I_{R0}) as a function of frequency; I_{R0} = ripple current at 100 Hz

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
≥ 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.

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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 384-4/ CECC 30300 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 384-4/ CECC 30300 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 $I_{L5} \leq 2 \times \text{spec. limit}$

R