

Aluminium electrolytic capacitors

Radial, Very Low Impedance

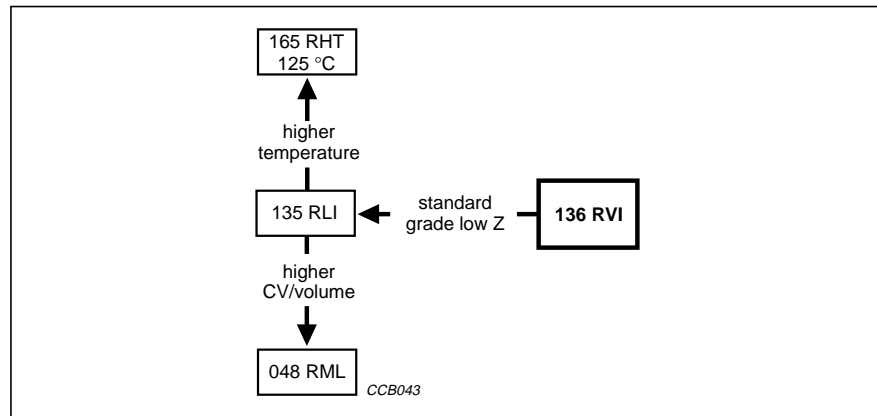
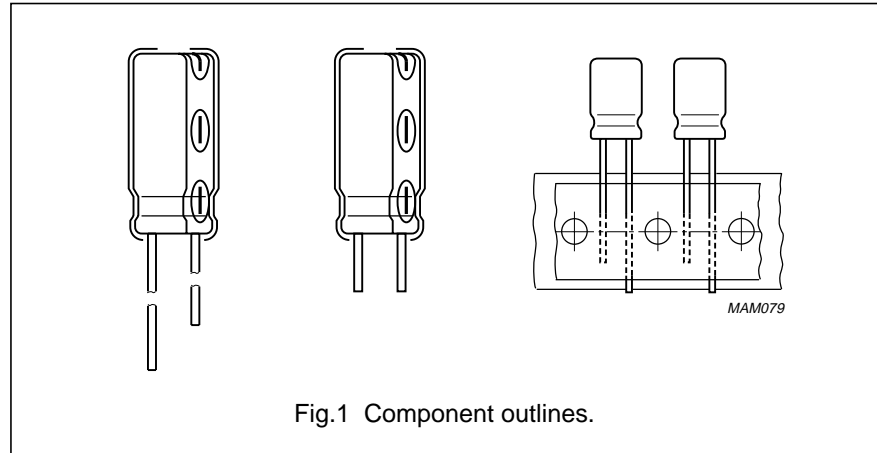
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FEATURES

- Polarized aluminium electrolytic capacitors, non-solid
- Radial leads, cylindrical aluminium case with pressure relief, insulated with a blue vinyl sleeve
- Charge and discharge proof
- Very long useful life: 4000 to 10000 hours at 105 °C, very high reliability
- Very low impedance or ESR respectively, which is significantly lower than the RLI 135 series
- Excellent ripple current capability.

APPLICATIONS

- Power supplies (SMPS, DC/DC converters) for general industrial, EDP, audio-video, automotive and telecommunications
- Smoothing, filtering, buffering.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Case sizes ($\varnothing D_{nom} \times L_{nom}$ in mm)	10 × 12 to 18 × 35
Rated capacitance range, C_R	22 to 10000 μF
Tolerance on C_R	$\pm 20\%$
Rated voltage range, C_R	10 to 100 V
Category temperature range	-55 to +105 °C
Endurance test at 105 °C	3000 to 5000 hours (dependent on case size)
Useful life at 105 °C	4000 to 10000 hours (dependent on case size)
Useful life at 40 °C, $1.8 \times I_R$ applied	200000 to 500000 hours (dependent on case size)
Shelf life at 0 V, 105 °C	1000 hours
Based on sectional specification	IEC 384-4/CECC 30300
Climatic category IEC 68	55/105/56

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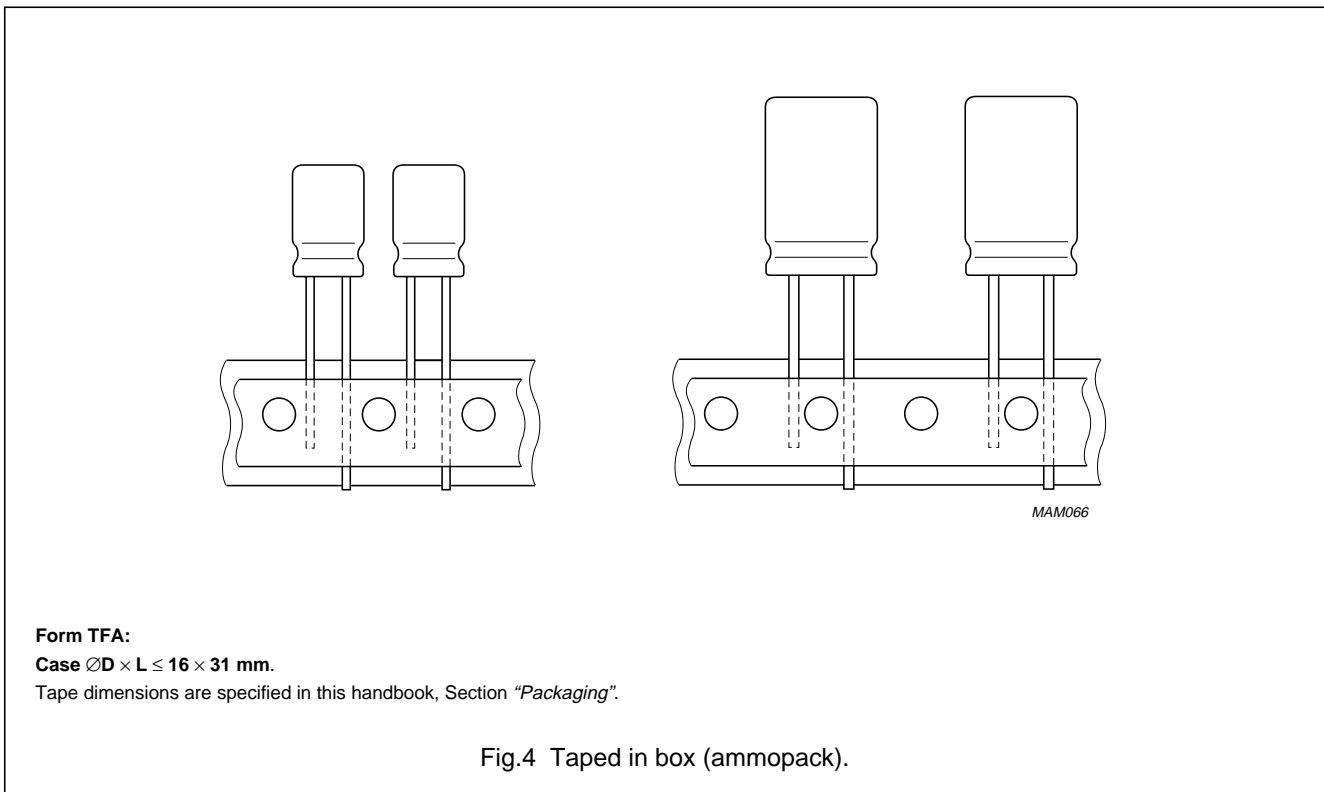
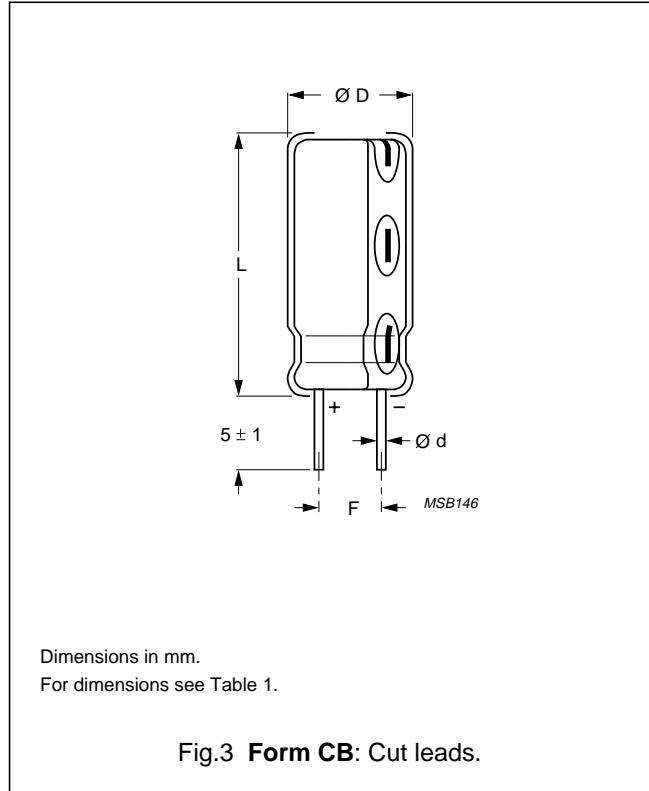
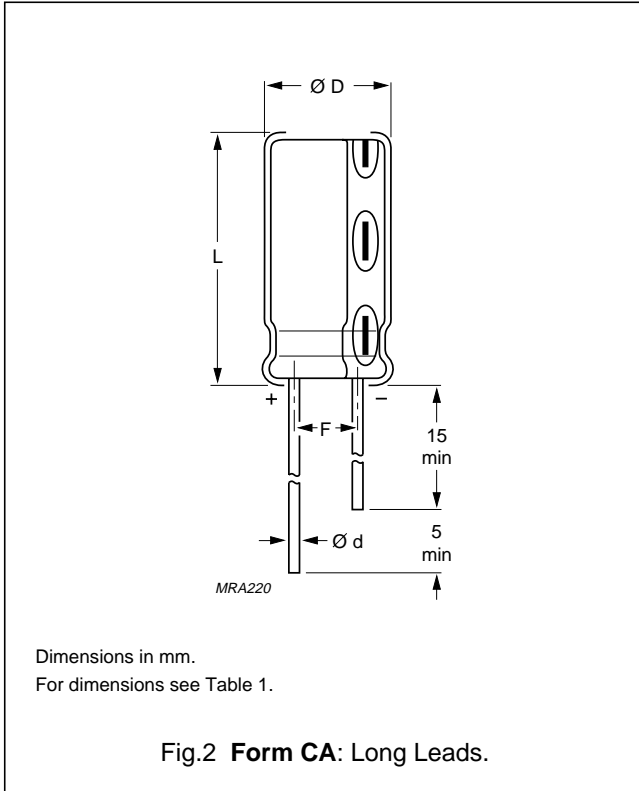
Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D_{nom} \times L_{nom}$ in mm). Preferred types in bold.

C_R (μF)	U_R (V)						
	10	16	25	35	50	63	100
22	–	–	–	–	–	–	10 × 12
33	–	–	–	–	–	–	10 × 12
47	–	–	–	–	–	10 × 12	10 × 16
56	–	–	–	–	–	10 × 12	–
68	–	–	–	–	–	10 × 16	10 × 20
82	–	–	–	–	10 × 12	–	–
100	–	–	–	–	10 × 12	10 × 16	12.5 × 20
120	–	–	–	10 × 12	10 × 16	10 × 20	–
	–	–	–	–	–	12.5 × 16	–
150	–	–	–	10 × 12	10 × 20	10 × 25	16 × 20
180	–	–	10 × 12	–	10 × 20	10 × 30	–
	–	–	–	–	12.5 × 16	–	–
220	–	–	10 × 12	10 × 16	10 × 25	12.5 × 20	16 × 25
270	–	10 × 12	–	–	–	12.5 × 25	–
330	–	10 × 12	10 × 16	10 × 20	10 × 30	16 × 20	16 × 31
	–	–	–	12.5 × 16	12.5 × 20	–	–
390	10 × 12	–	–	10 × 25	–	12.5 × 31	–
470	10 × 12	10 × 16	10 × 20	12.5 × 20	12.5 × 25	16 × 25	16 × 35
	–	–	12.5 × 16	–	–	–	18 × 31
560	–	–	10 × 25	10 × 30	12.5 × 31	–	–
	–	–	–	12.5 × 20	–	–	–
680	10 × 16	10 × 20	–	12.5 × 25	16 × 20	16 × 31	18 × 35
	–	12.5 × 16	–	–	–	18 × 25	–
820	–	10 × 25	10 × 30	–	16 × 25	16 × 35	–
	–	–	12.5 × 20	–	–	–	–
1000	10 × 20	12.5 × 20	12.5 × 25	12.5 × 31	16 × 31	18 × 31	–
	12.5 × 16	–	–	16 × 20	18 × 20	–	–
1200	10 × 25	10 × 30	–	16 × 25	16 × 35	–	–
	–	12.5 × 20	–	–	–	–	–
1500	10 × 30	12.5 × 25	12.5 × 31	16 × 25	18 × 31	18 × 35	–
	12.5 × 20	–	16 × 20	–	–	–	–
1800	12.5 × 20	–	16 × 25	16 × 31	–	–	–
2200	12.5 × 25	12.5 × 31	16 × 31	16 × 35	18 × 35	–	–
	–	16 × 20	18 × 20	18 × 31	–	–	–
2700	12.5 × 31	16 × 25	16 × 31	–	–	–	–
	16 × 20	16 × 25	16 × 35	18 × 35	–	–	–
3300	–	–	18 × 31	–	–	–	–
	–	–	–	–	–	–	–
3900	16 × 25	16 × 31	–	–	–	–	–
4700	16 × 31	16 × 35	18 × 35	–	–	–	–
	–	18 × 31	–	–	–	–	–
5600	16 × 31	–	–	–	–	–	–
	18 × 25	–	–	–	–	–	–
6800	16 × 35	18 × 35	–	–	–	–	–
	18 × 31	–	–	–	–	–	–
10000	18 × 35	–	–	–	–	–	–

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MECHANICAL DATA, AVAILABLE FORMS AND PACKAGING QUANTITIES



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Table 1 Physical dimensions mass and packaging quantities; see Figs 2, 3 and 4

NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	$\varnothing d$ (mm)	$\varnothing D_{\max}$ (mm)	L_{\max} (mm)	F (mm)	MASS (g)	PACKAGING QUANTITIES		
							FORM CA	FORM CB	FORM TFA
10 × 12	14	0.6	10.5	13.5	5.0 ±0.5	≈1.6	1000	500	800
10 × 16	15	0.6	10.5	17.5	5.0 ±0.5	≈1.9	500	500	800
10 × 20	16	0.6	10.5	22.0	5.0 ±0.5	≈2.2	500	500	800
10 × 25	16L	0.6	10.5	27.0	5.0 ±0.5	≈3.0	1000	1500	800
10 × 30	16LL	0.6	10.5	32.0	5.0 ±0.5	≈3.5	1000	750	–
12.5 × 16	17a	0.6	13.0	17.5	5.0 ±0.5	≈2.7	1000	1500	500
12.5 × 20	17	0.6	13.0	22.0	5.0 ±0.5	≈4.0	500	500	500
12.5 × 25	18	0.6	13.0	27.0	5.0 ±0.5	≈5.0	250	250	500
12.5 × 31	18L	0.6	13.0	33.5	5.0 ±0.5	≈5.5	1000	750	–
16 × 20	19a	0.8	16.5	22.0	7.5 ±0.5	≈6.0	250	250	250
16 × 25	19	0.8	16.5	27.0	7.5 ±0.5	≈8.0	250	250	250
16 × 31	20	0.8	16.5	33.5	7.5 ±0.5	≈9.0	100	100	250
16 × 35	21	0.8	16.5	37.5	7.5 ±0.5	≈11.0	100	100	–
18 × 20	1820	0.8	18.5	22.0	7.5 ±0.5	≈8.0	100	100	–
18 × 25	1825	0.8	18.5	27.0	7.5 ±0.5	≈10.0	100	100	–
18 × 31	1831	0.8	18.5	33.5	7.5 ±0.5	≈12.5	100	100	–
18 × 35	22	0.8	18.5	37.5	7.5 ±0.5	≈14.5	100	100	–

MARKING

The capacitors are marked with the following information:

- Rated capacitance (in μF)
- Tolerance on rated capacitance, code letter in accordance with "IEC 62" (M for $\pm 20\%$)
- Rated voltage (in V)
- Upper category temperature (105 °C)
- Group number (136)
- Code indicating factory of origin
- Name of manufacturer, PHILIPS
- Date code, in accordance with "IEC 62"
- Negative terminal identification.

ELECTRICAL DATA AND ORDERING INFORMATION

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

SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz, tolerance $\pm 20\%$
I_R	rated RMS ripple current at 100 kHz, 105 °C
I_{L2}	max. leakage current after 2 minutes at U_R
Tan δ	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 100 kHz and +20 or -10 °C

Ordering example

Electrolytic capacitor

1000 $\mu\text{F}/25\text{ V}$; $\pm 20\%$

Nominal case size: \varnothing

Catalogue number: 2

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)	CASE CODE	I_R 100 kHz 105 °C (mA)	I_{L2} 2 min (μA)	Tan δ 100 Hz	ESR 100 Hz (m Ω)	Z 100 kHz +20 °C (m Ω)	Z 100 kHz -10 °C (m Ω)	CATALOG 2222	
										BULK PACKAG	
										FORM CA	FO
10	390	10 × 12	14	630	39	0.19	780	120	240	136 54391	13
	470	10 × 12	14	630	47	0.19	640	120	240	136 54471	13
	680	10 × 16	15	830	68	0.19	450	84	170	136 54681	13
	1000	10 × 20	16	1000	100	0.19	300	62	130	136 54102	13
	1000	12.5 × 16	17a	940	100	0.19	300	76	160	136 94105	13
	1200	10 × 25	16L	1300	120	0.19	250	52	110	136 54122	13
	1500	10 × 30	16LL	1400	150	0.19	200	44	88	136 94155	13
	1500	12.5 × 20	17	1300	150	0.19	200	46	92	136 54152	13
	1800	12.5 × 20	17	1340	180	0.19	170	46	92	136 54182	13
	2200	12.5 × 25	18	1700	220	0.21	150	34	68	136 54222	13
	2700	12.5 × 31	18L	2000	270	0.21	120	30	60	136 54272	13
	3300	16 × 20	19a	1600	330	0.23	110	38	76	136 54332	13
	3900	16 × 25	19	2100	390	0.23	94	28	56	136 54392	13
	4700	16 × 31	20	2400	470	0.25	85	25	50	136 54472	13
	5600	16 × 31	20	2400	560	0.27	77	25	50	136 54562	13
	5600	18 × 25	1825	2270	560	0.27	77	25	50	136 94565	13

U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I _R 100 kHz 105 °C (mA)	I _{L2} 2 min (μA)	Tan δ 100 Hz	ESR 100 Hz (mΩ)	Z 100 kHz +20 °C (mΩ)	Z 100 kHz -10 °C (mΩ)	CATALOG 2222	
										BULK PACKAG	
										FORM CA	FO
10	6800	16 × 35	21	2600	680	0.29	68	22	44	136 54682	13
	6800	18 × 31	1831	2760	680	0.29	68	23	46	136 94685	13
	10000	18 × 35	22	3 180	1000	0.31	49	21	42	136 54103	13
16	270	10 × 12	14	630	43	0.16	940	120	240	136 55271	13
	330	10 × 12	14	630	53	0.16	770	120	240	136 55331	13
	470	10 × 16	15	830	75	0.16	540	84	170	136 55471	13
	680	10 × 20	16	1000	110	0.16	380	62	130	136 55681	13
	680	12.5 × 16	17a	940	110	0.16	380	76	160	136 95685	13
	820	10 × 25	16L	1300	130	0.16	310	52	110	136 55821	13
	1000	12.5 × 20	17	1300	160	0.16	260	48	96	136 55102	13
	1200	10 × 30	16LL	1400	190	0.16	210	44	88	136 95125	13
	1200	12.5 × 20	17	1300	190	0.16	210	46	92	136 55122	13
	1500	12.5 × 25	18	1700	240	0.16	170	34	68	136 55152	13
	2200	12.5 × 31	18L	2000	350	0.18	130	30	60	136 95225	13
	2200	16 × 20	19a	1600	350	0.18	130	38	76	136 55222	13
	2700	16 × 25	19	2100	430	0.18	110	28	56	136 55272	13
	3300	16 × 25	19	2100	530	0.20	97	28	56	136 55332	13
	3900	16 × 31	20	2400	620	0.20	82	25	50	136 55392	13
	4700	16 × 35	21	2600	750	0.22	75	22	44	136 55472	13
	4700	18 × 31	1831	2560	750	0.22	75	23	46	136 95475	13
6800	18 × 35	22	3000	1090	0.24	56	21	42	136 55682	13	

U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I _R 100 kHz 105 °C (mA)	I _{L2} 2 min (μA)	Tan δ 100 Hz	ESR 100 Hz (mΩ)	Z 100 kHz +20 °C (mΩ)	Z 100 kHz -10 °C (mΩ)	CATALOG 2222		
										BULK PACKAG		
										FORM CA	FO	
25	180	10 × 12	14	630	45	0.14	1200	120	240	136 56181	13	
	220	10 × 12	14	630	55	0.14	1000	120	240	136 56221	13	
	330	10 × 16	15	830	83	0.14	680	84	170	136 56331	13	
	470	10 × 20	16	1000	120	0.14	470	62	130	136 56471	13	
	470	12.5 × 16	17a	940	120	0.14	470	76	160	136 96475	13	
	560	10 × 25	16L	1300	140	0.14	400	52	110	136 56561	13	
	820	10 × 30	16LL	1400	210	0.14	270	44	88	136 96825	13	
	820	12.5 × 20	17	1300	210	0.14	270	46	92	136 56821	13	
	1000	12.5 × 25	18	1700	250	0.14	220	34	68	136 56102	13	
	1500	12.5 × 31	18L	2000	380	0.14	150	30	60	136 96155	13	
	1500	16 × 20	19a	1700	380	0.14	150	38	76	136 56152	13	
	1800	16 × 25	19	2100	450	0.14	120	28	56	136 56182	13	
	2200	16 × 31	20	2400	550	0.16	120	25	50	136 56222	13	
	2200	18 × 20	1820	1680	550	0.16	116	28	56	136 96225	13	
	2700	16 × 31	20	2400	680	0.16	94	25	50	136 56272	13	
	3300	16 × 35	21	2600	830	0.18	87	22	44	136 56332	13	
	3300	18 × 31	1831	2490	830	0.18	87	27	54	136 96335	13	
	4700	18 × 35	22	3000	1180	0.20	68	21	42	136 56472	13	
	35	120	10 × 12	14	630	42	0.12	1600	120	240	136 50121	13
		150	10 × 12	14	630	53	0.12	1300	120	240	136 50151	13
220		10 × 16	15	830	77	0.12	870	84	170	136 50221	13	
330		10 × 20	16	1000	120	0.12	580	62	130	136 50331	13	
330		12.5 × 16	17a	940	120	0.12	580	76	160	136 90335	13	
390		10 × 25	16L	1300	140	0.12	490	52	110	136 50391	13	
470		12.5 × 20	17	1300	170	0.12	410	48	96	136 50471	13	
560		10 × 30	16LL	1400	200	0.12	340	44	88	136 90565	13	
560		12.5 × 20	17	1300	200	0.12	340	46	92	136 50561	13	
680		12.5 × 25	18	1700	240	0.12	280	34	68	136 50681	13	
1000		12.5 × 31	18L	2000	350	0.12	190	30	60	136 90105	13	

U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I _R 100 kHz 105 °C (mA)	I _{L2} 2 min (μA)	Tan δ 100 Hz	ESR 100 Hz (mΩ)	Z 100 kHz +20 °C (mΩ)	Z 100 kHz -10 °C (mΩ)	CATALOG 2222	
										BULK PACKAG	
										FORM CA	FO
35	1000	16 × 20	19a	1700	350	0.12	190	38	76	136 50102	13
	1200	16 × 25	19	2100	420	0.12	160	28	56	136 50122	13
	1500	16 × 25	19	2100	530	0.12	130	28	56	136 50152	13
	1800	16 × 31	20	2400	630	0.12	110	25	50	136 50182	13
	2200	16 × 35	21	2600	770	0.14	100	22	44	136 50222	13
	2200	18 × 31	1831	2320	770	0.14	101	27	54	136 90225	13
	3300	18 × 35	22	2890	1160	0.16	77	21	42	136 50332	13
50	82	10 × 12	14	480	41	0.10	1900	200	400	136 51829	13
	100	10 × 12	14	480	50	0.10	1600	200	400	136 51101	13
	120	10 × 16	15	760	60	0.10	1300	100	200	136 51121	13
	150	10 × 20	16	850	75	0.10	1100	90	180	136 51151	13
	180	10 × 20	16	950	90	0.10	880	75	150	136 51181	13
	180	12.5 × 16	17a	780	90	0.10	880	110	120	136 91185	13
	220	10 × 25	16L	1200	110	0.10	720	63	130	136 51221	13
	330	10 × 30	16LL	1300	170	0.10	480	54	110	136 91335	13
	330	12.5 × 20	17	1200	170	0.10	480	59	120	136 51331	13
	470	12.5 × 25	18	1500	240	0.10	340	44	88	136 51471	13
	560	12.5 × 31	18L	1700	280	0.10	280	39	78	136 51561	13
	680	16 × 20	19a	1400	340	0.10	230	50	100	136 51681	13
	820	16 × 25	19	1900	410	0.10	190	34	68	136 51821	13
	1000	16 × 31	20	2200	500	0.10	160	30	60	136 51102	13
	1000	18 × 20	1820	1510	500	0.10	159	41	82	136 91105	13
	1200	16 × 35	21	2300	600	0.10	130	27	54	136 51122	13
	1500	18 × 31	1831	2200	750	0.10	106	31	62	136 51152	13
2200	18 × 35	22	2650	1100	0.12	87	27	54	136 51222	13	

U _R (V)	C _R 100 Hz (μF)	NOMINAL CASE SIZE ∅D × L (mm)	CASE CODE	I _R 100 kHz 105 °C (mA)	I _{L2} 2 min (μA)	Tan δ 100 Hz	ESR 100 Hz (mΩ)	Z 100 kHz +20 °C (mΩ)	Z 100 kHz -10 °C (mΩ)	CATALOG 2222		
										BULK PACKAG		
										FORM CA	FO	
63	47	10 × 12	14	380	30	0.10	3400	300	750	136 58479	13	
	56	10 × 12	14	420	35	0.10	2800	270	680	136 58569	13	
	68	10 × 16	15	520	43	0.10	2300	210	530	136 58689	13	
	100	10 × 16	15	580	63	0.10	1600	190	480	136 58101	13	
	120	10 × 20	16	650	76	0.10	1300	160	400	136 58121	13	
	120	12.5 × 16	17a	610	76	0.10	1300	180	450	136 98125	13	
	150	10 × 25	16L	780	95	0.10	1100	130	330	136 58151	13	
	180	10 × 30	16LL	960	110	0.10	880	100	250	136 58181	13	
	220	12.5 × 20	17	870	140	0.10	720	110	280	136 58221	13	
	270	12.5 × 25	18	1200	170	0.10	590	74	190	136 58271	13	
	330	16 × 20	19a	1100	210	0.10	480	85	220	136 58331	13	
	390	12.5 × 31	18L	1300	250	0.10	410	68	170	136 58391	13	
	470	16 × 25	19	1500	300	0.10	340	55	140	136 58471	13	
	680	16 × 31	20	1700	430	0.10	230	46	120	136 58681	13	
	680	18 × 25	1825	1470	430	0.10	234	54	108	136 98685	13	
	820	16 × 35	21	1900	520	0.10	190	40	100	136 58821	13	
	1000	18 × 31	1831	1950	630	0.10	159	39	78	136 58102	13	
	1500	18 × 35	22	2350	950	0.10	106	33	66	136 58152	13	
	100	22	10 × 12	14	300	22	0.07	5100	450	2300	136 59229	13
		33	10 × 12	14	320	33	0.07	3400	390	2000	136 59339	13
47		10 × 16	15	450	47	0.07	2400	320	1600	136 59479	13	
68		10 × 20	16	520	68	0.07	1600	240	1200	136 59689	13	
100		12.5 × 20	17	800	100	0.07	1100	150	750	136 59101	13	
150		16 × 20	19a	1000	150	0.07	740	110	550	136 59151	13	
220		16 × 25	19	1300	220	0.07	510	81	400	136 59221	13	
330		16 × 31	20	1600	330	0.07	340	58	290	136 59331	13	
470		16 × 35	21	1800	470	0.07	240	45	230	136 59471	13	
470		18 × 31	1831	1800	470	0.07	240	45	230	136 99475	13	
680	18 × 35	22	2000	680	0.07	160	39	200	136 59681	13		

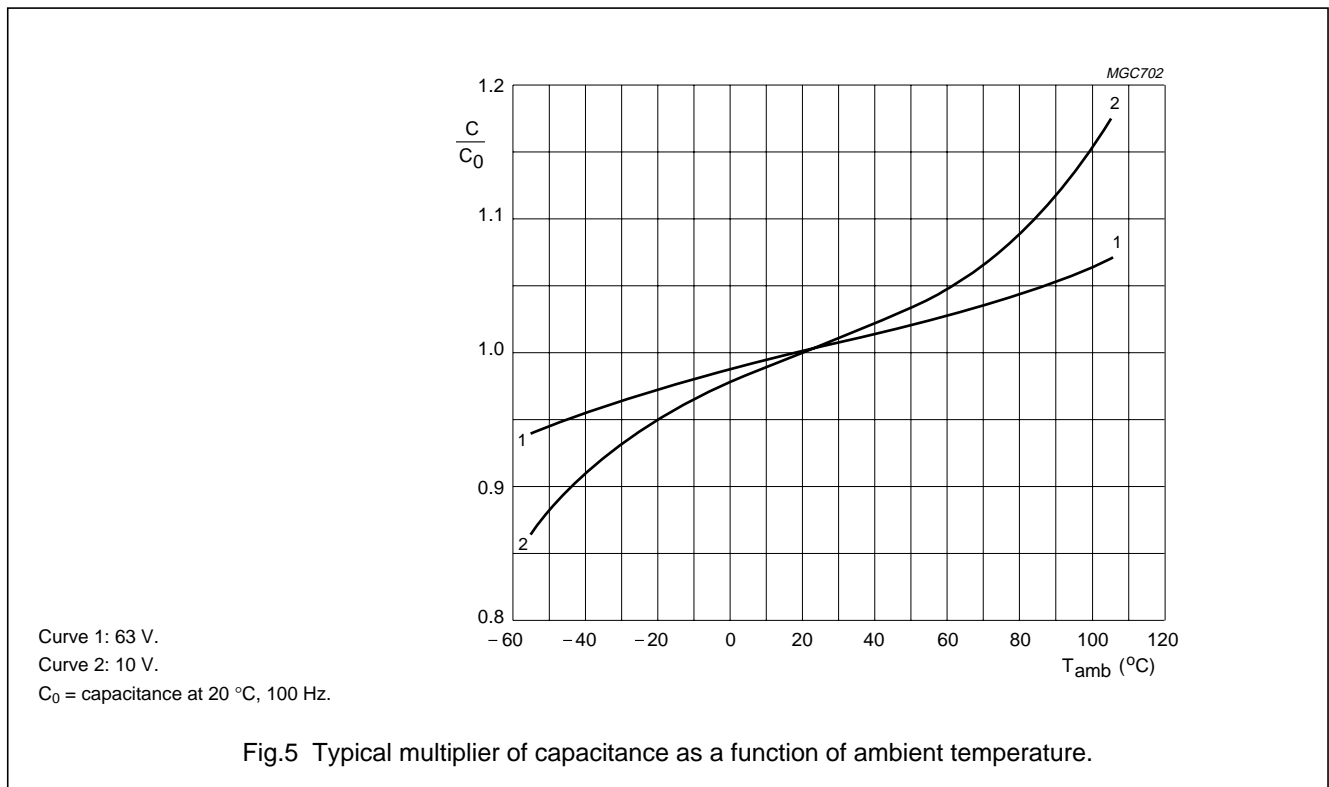
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Additional electrical data

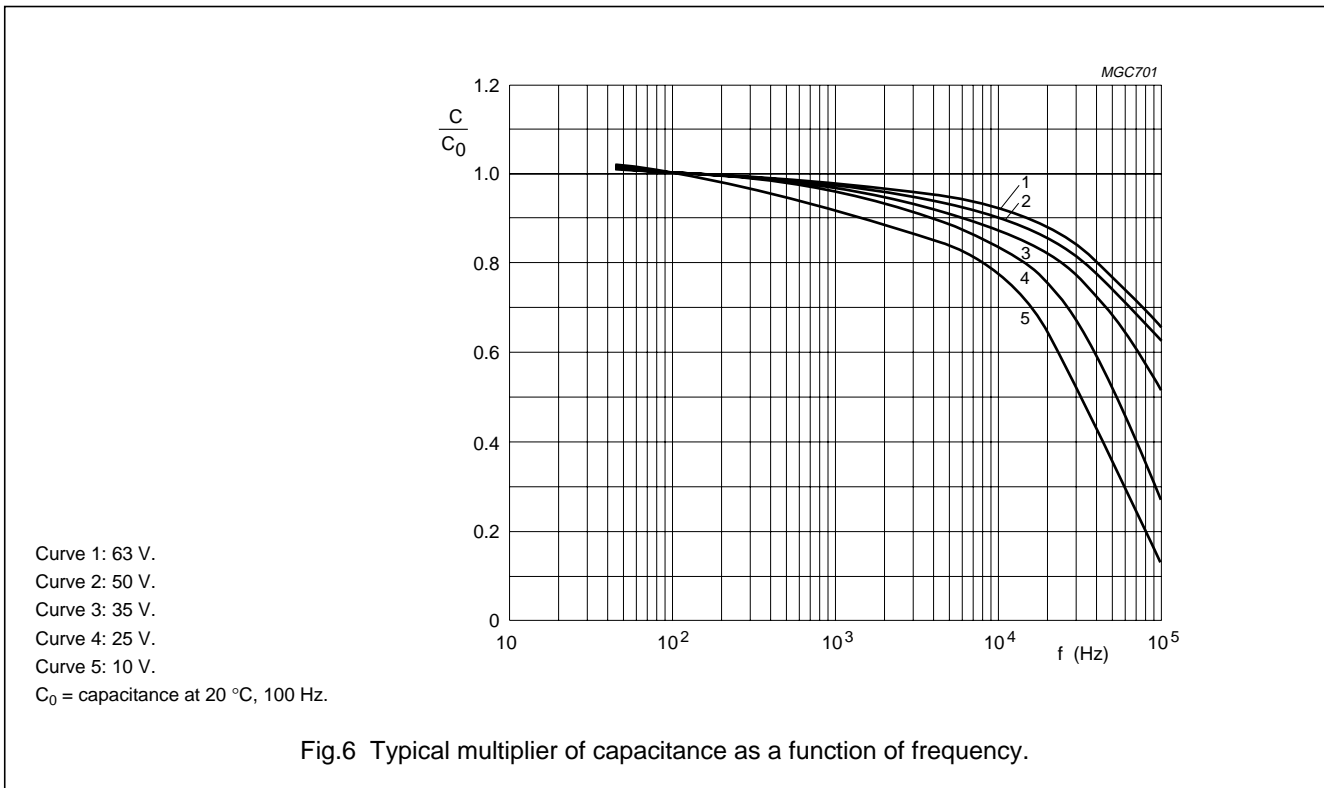
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage for short periods		$U_s \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
Current		
Leakage current	after 2 minutes at U_R	$I_{L2} \leq 0.01C_R \times U_R$ or $3 \mu\text{A}$, whichever is greater
Inductance		
Equivalent series inductance (ESL)	case $\varnothing D = 10 \text{ mm}$	typ. 16 nH
	case $\varnothing D \geq 12.5 \text{ mm}$	typ. 18 nH

Capacitance (C)

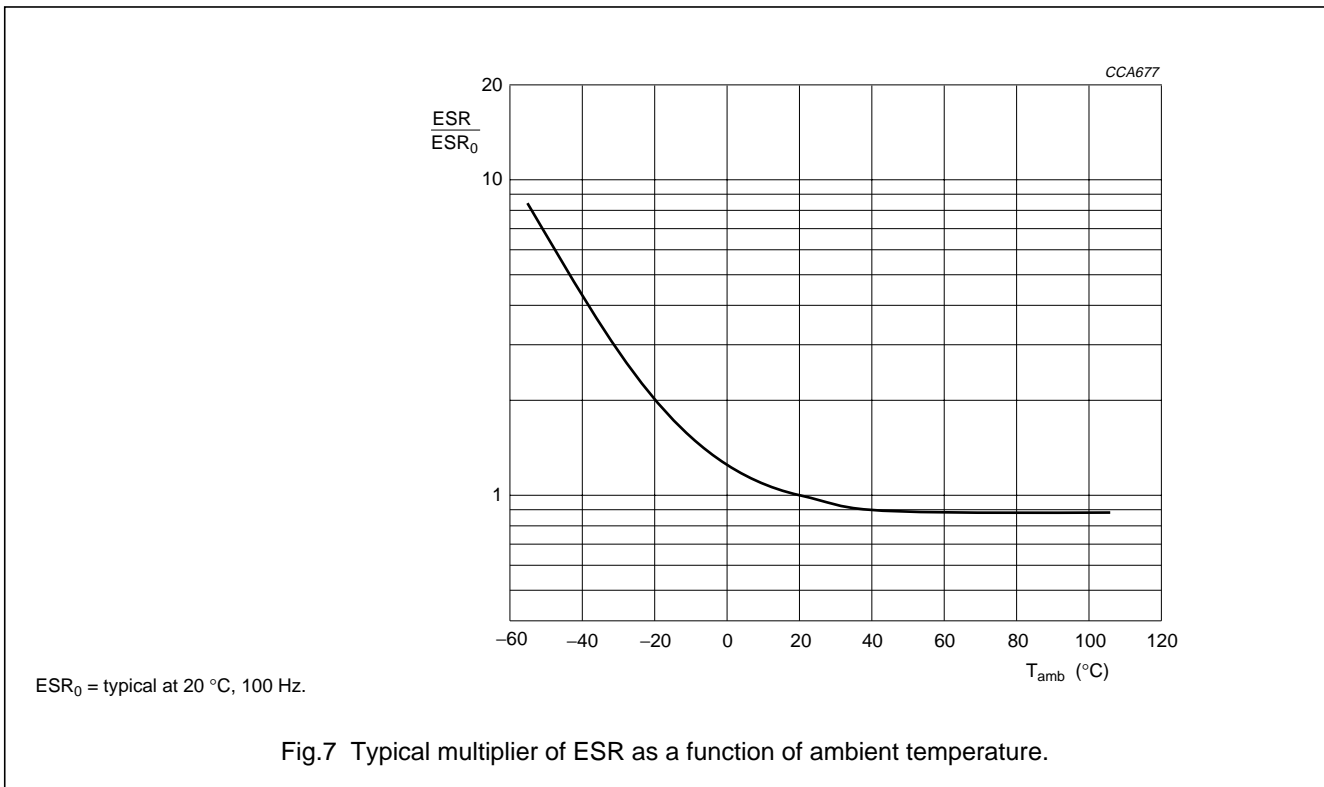


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Equivalent series resistance (ESR)



R

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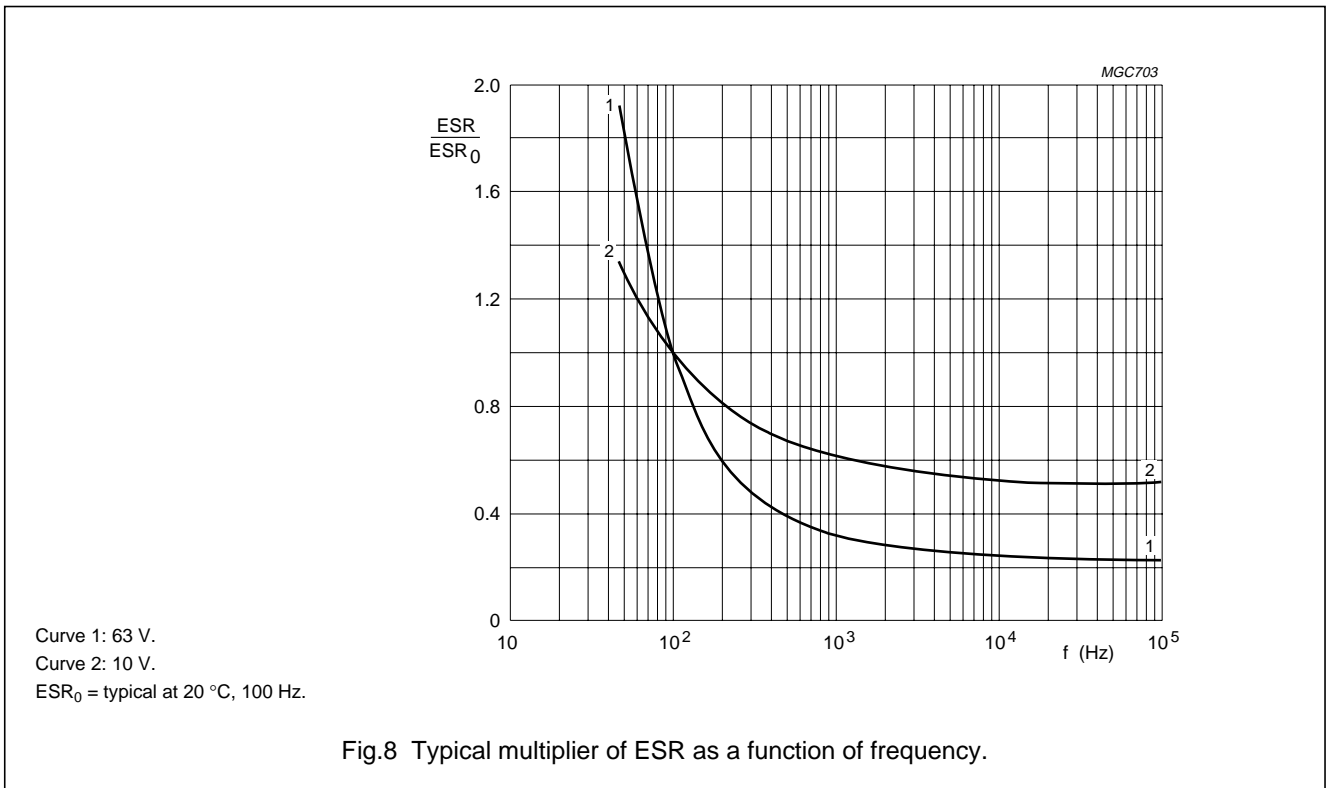


Fig.8 Typical multiplier of ESR as a function of frequency.

Impedance (Z)

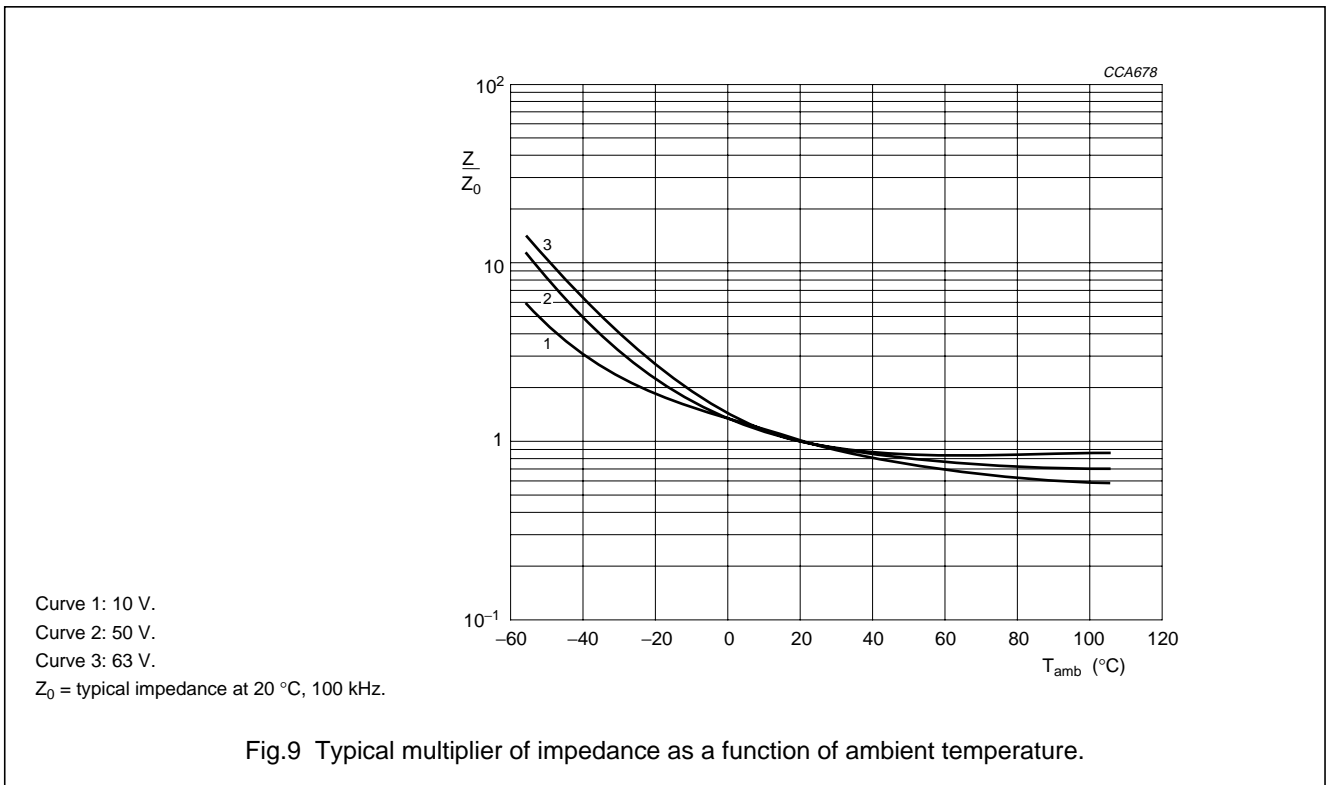


Fig.9 Typical multiplier of impedance as a function of ambient temperature.

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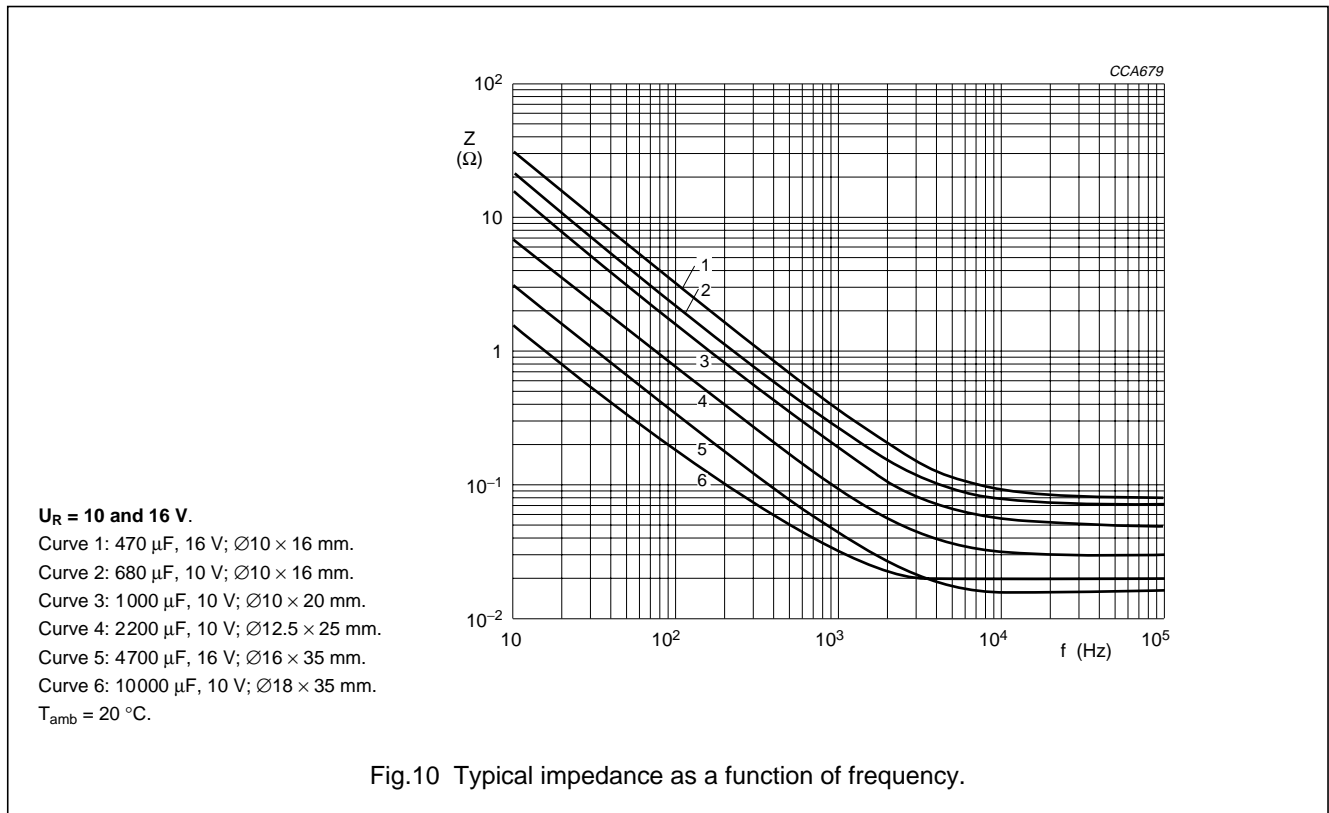


Fig.10 Typical impedance as a function of frequency.

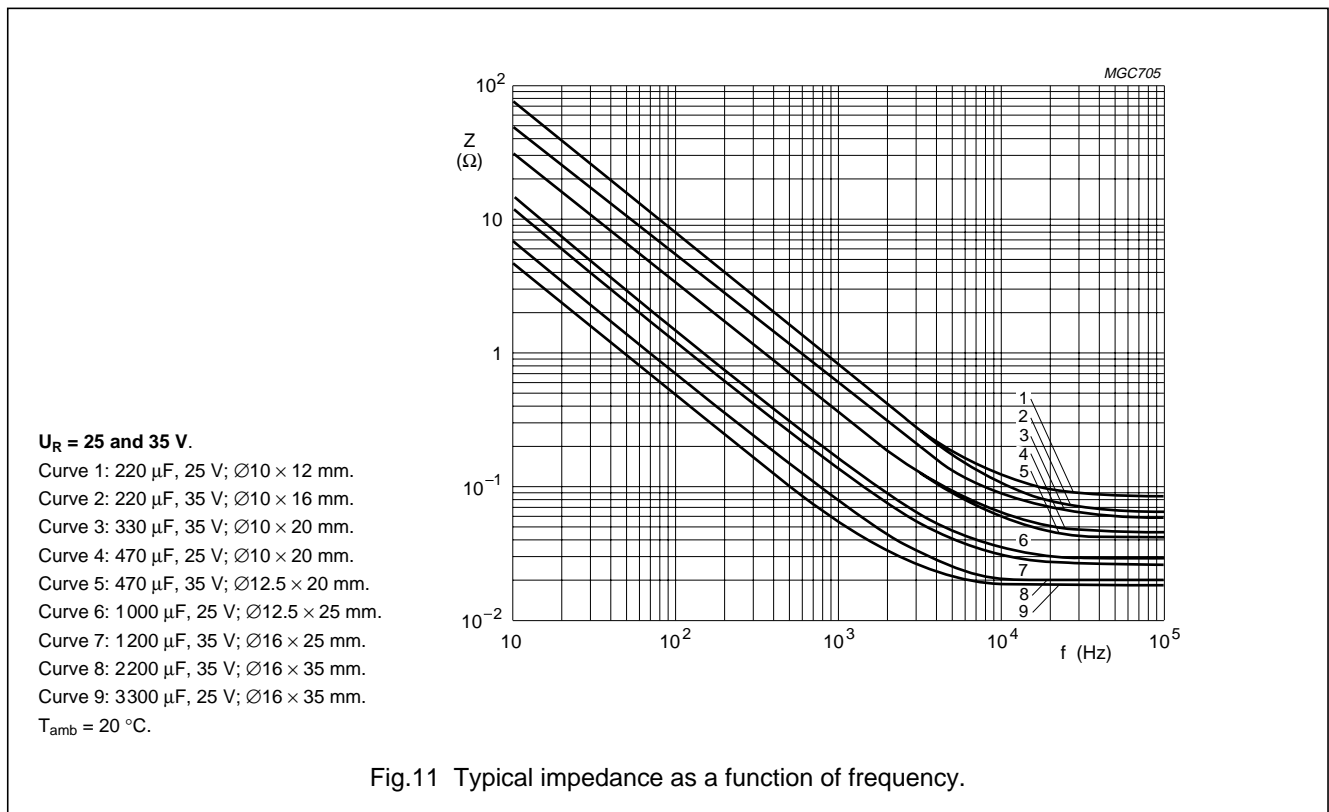
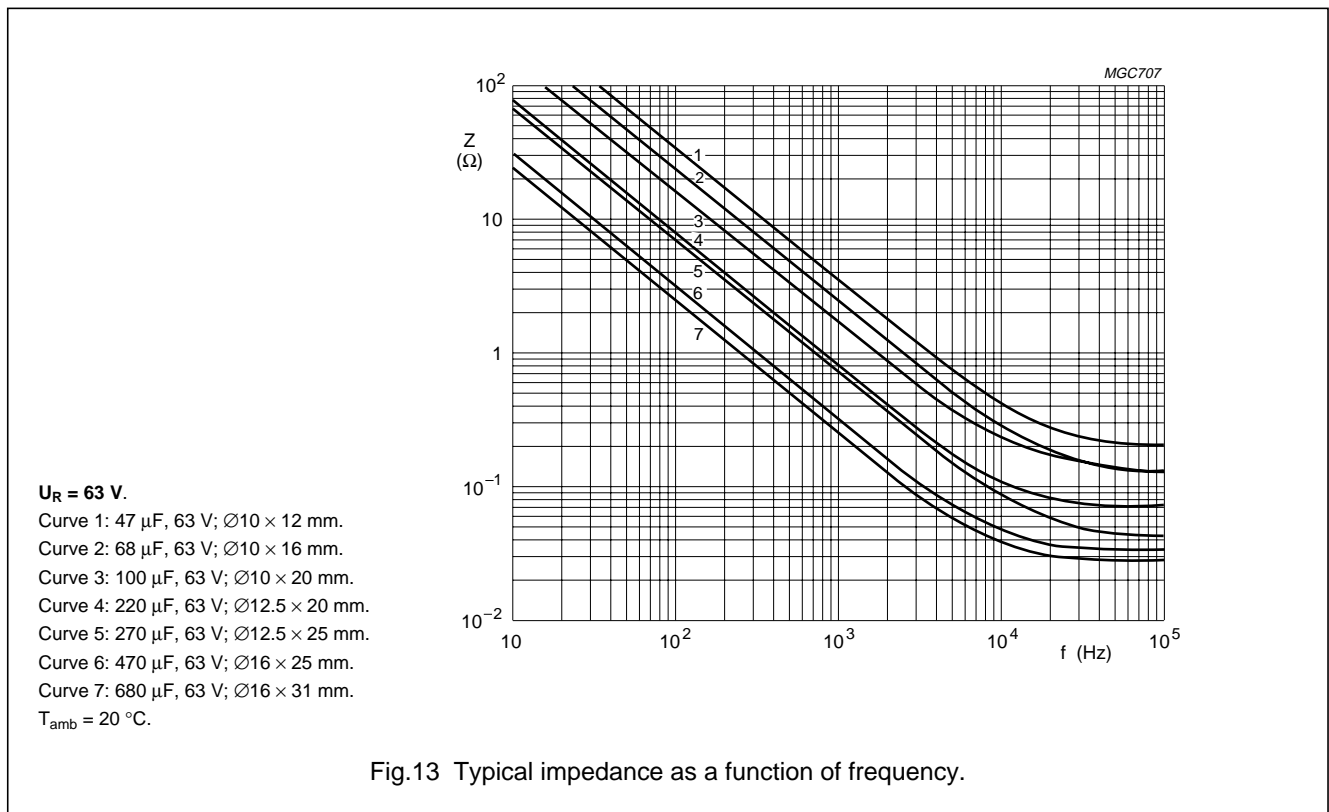
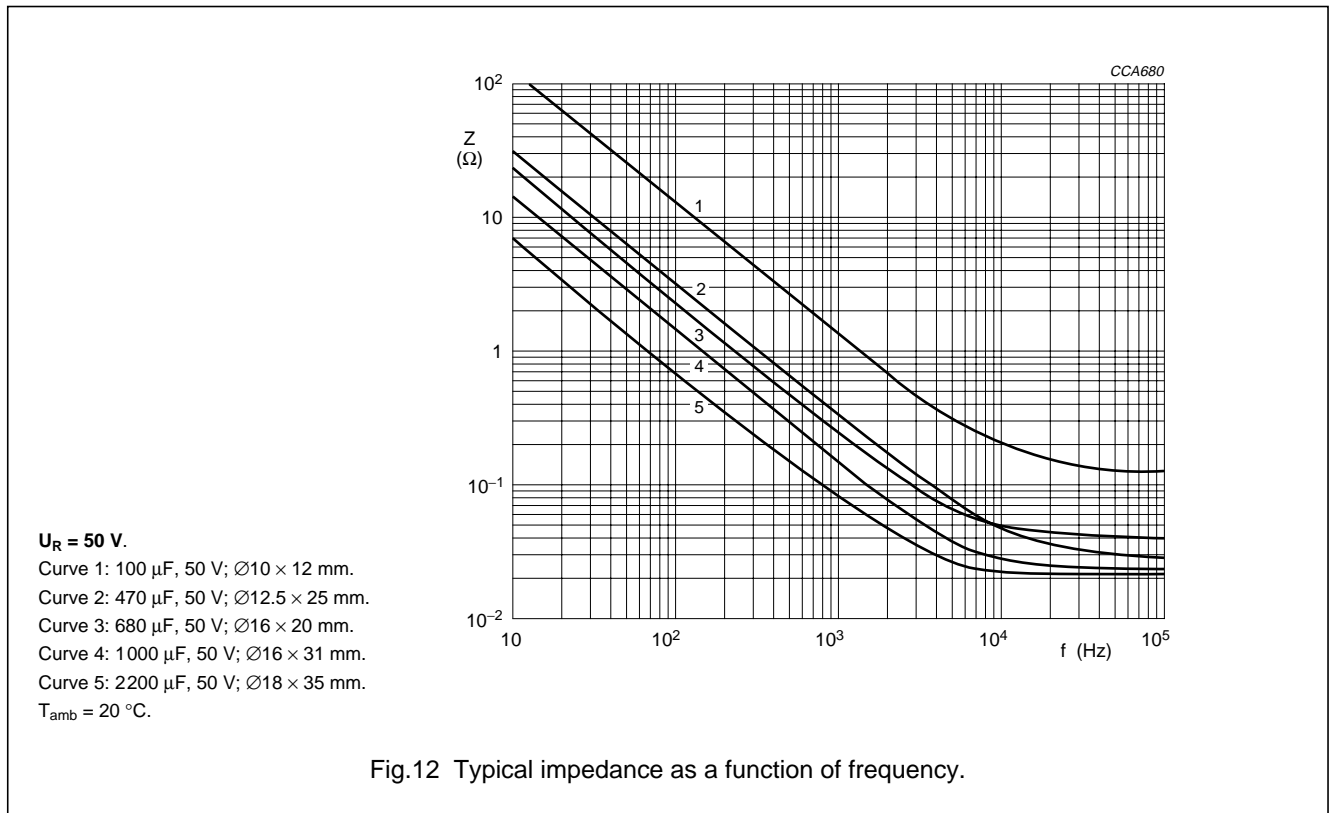


Fig.11 Typical impedance as a function of frequency.

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RIPPLE CURRENT AND USEFUL LIFE

Table 3 Multiplier of ripple current (I_R/I_{R0}) as a function of frequency; I_{R0} = ripple current at 100 kHz

FREQUENCY (Hz)	I_R MULTIPLIER							
	$U_R = 10\text{ V}$		$U_R = 16\text{ and }25\text{ V}$		$U_R = 35\text{ and }50\text{ V}$		$U_R = 63\text{ and }100\text{ V}$	
	$\varnothing \leq 12.5$	$\varnothing \geq 16$	$\varnothing \leq 12.5$	$\varnothing \geq 16$	$\varnothing \leq 12.5$	$\varnothing \geq 16$	$\varnothing \leq 12.5$	$\varnothing \geq 16$
100	0.7	0.83	0.63	0.69	0.5	0.6	0.35	0.5
300	0.8	0.9	0.72	0.79	0.61	0.71	0.51	0.64
1000	0.88	0.95	0.8	0.87	0.72	0.8	0.66	0.74
3000	0.92	0.98	0.88	0.92	0.81	0.88	0.76	0.83
10000	0.96	0.99	0.92	0.96	0.88	0.93	0.85	0.9
30000	0.99	1.0	0.98	0.99	0.94	0.96	0.92	0.95
100000	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

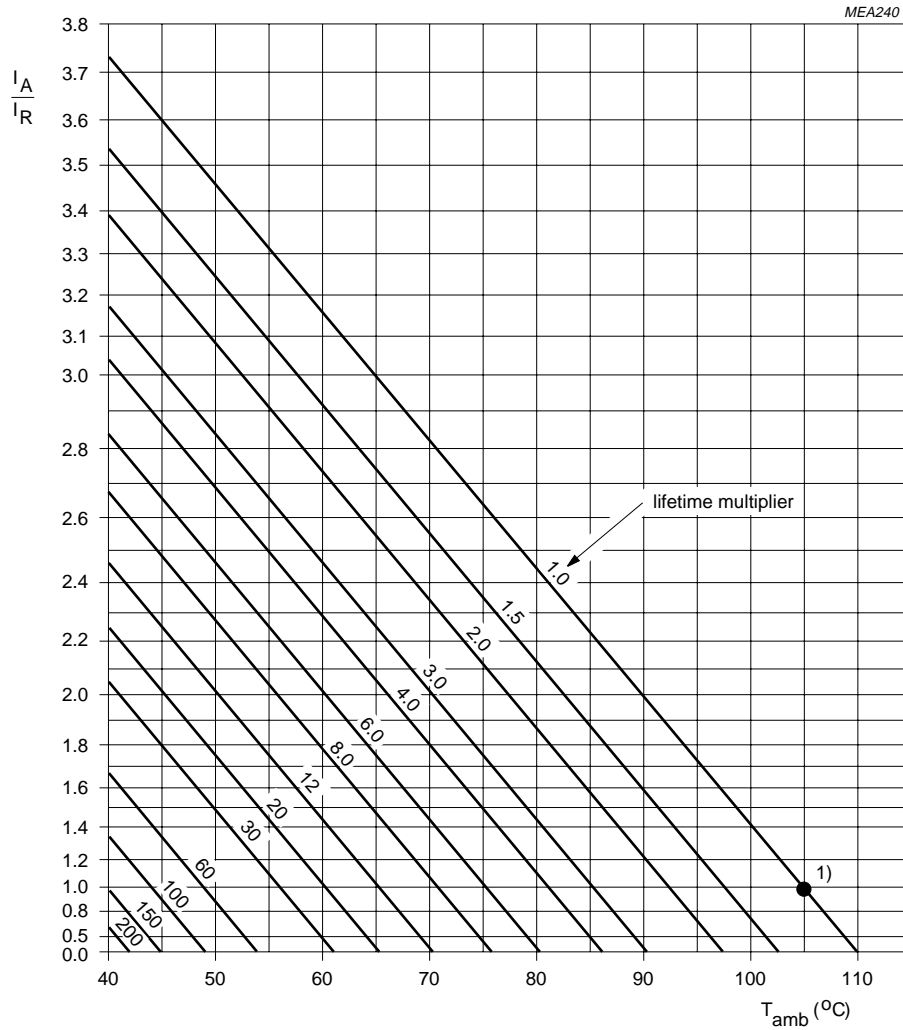
Table 4 Endurance test duration and useful life as a function of case size; see Fig.14

NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	ENDURANCE TEST at 105 °C (hours)	USEFUL LIFE at 105 °C (hours)
10 × 12	14	3000	4000
10 × 16	15	3000	6000
10 × 20	16	3000	6000
10 × 25	16L	5000	7000
10 × 30	16LL	5000	7000
12.5 × 16	17a	3000	5000
12.5 × 20	17	3000	7000
12.5 × 25	18	5000	8000
12.5 × 31	18L	5000	8000
16 × 20	19a	3000	7000
16 × 25	19	5000	10000
16 × 31	20	5000	10000
16 × 35	21	5000	10000
18 × 20	1820	3000	7000
18 × 25	1825	5000	10000
18 × 31	1831	5000	10000
18 × 35	22	5000	10000

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I_A = actual ripple current at 100 kHz.
 I_R = rated ripple current at 100 kHz, 105 °C.
 (1) Useful life at 105 °C and I_R applied; see Table 4.

Fig.14 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 5 Test procedures and requirements

TEST		PROCEDURE (quick reference)	REQUIREMENTS
NAME OF TEST	REFERENCE		
Endurance	IEC 384-4/ CECC 30300 subclause 4.13	$T_{amb} = 105\text{ °C}$; U_R applied; for test duration see Table 4	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 105\text{ °C}$; U_R and I_R applied; for test duration see Table 4	$\Delta C/C: \pm 30\%$ $\tan \delta \leq 3 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 1\%$
Shelf life (storage at high temperature)	IEC 384-4/ CECC 30300 subclause 4.17	$T_{amb} = 105\text{ °C}$; no voltage applied; 1000 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C: \pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$

R

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