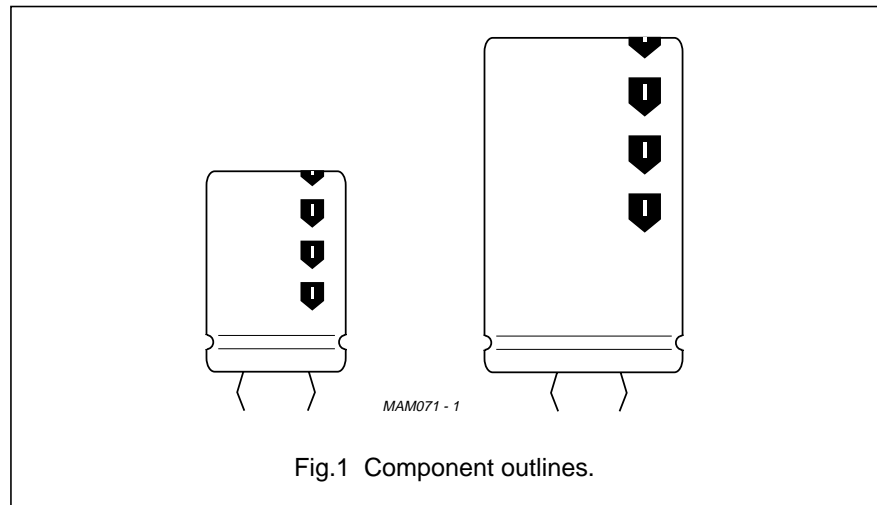


Aluminium electrolytic capacitors Power Long Life Snap-in

058/059 PLL-SI

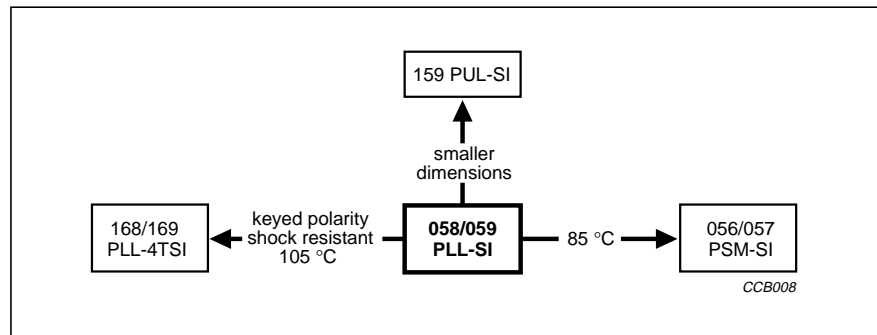
FEATURES

- Polarized aluminium electrolytic capacitors, non-solid
- Large types, minimized dimensions, cylindrical aluminium case, insulated with a blue sleeve
- Pressure relief on the top of the aluminium case
- Charge and discharge proof
- Very long useful life: up to 10000 hours at 105 °C
- Extended temperature range: 105 °C
- Low ESR, high ripple current capability.



APPLICATIONS

- Computer, telecommunication and industrial systems
- Smoothing and filtering applications
- Standard and switched mode power supplies
- Energy storage in pulse systems.



QUICK REFERENCE DATA

DESCRIPTION	VALUE	
	058	059
Case size ($\varnothing D_{nom} \times L_{nom}$ in mm)	22 × 25 to 35 × 50	
Rated capacitance range (E6 series), C_R	33 to 47000 μF	
Tolerance on C_R	±20%	
Rated voltage range, U_R	10 to 100 V	200 to 400 V
Category temperature range	-40 to +105 °C	
Endurance test at 105 °C	≤50 V: 2000 hours; ≥63 V: 5000 hours	
Useful life at 105 °C	≤50 V: 5000 hours; ≥63 V: 10000 hours	
Useful life at 40 °C and $1.9 \times I_R$ applied	≤50 V: 125000 hours; ≥63 V: 250000 hours	
Shelf life at 0 V, 105 °C	500 hours	
Based on sectional specification	IEC 384-4/CECC 30300	
Detail specification	CECC 30301-807	
Climatic category IEC 68	40/105/56	

Aluminium electrolytic capacitors

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Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D \times L$ in mm) for 058 series

Preferred types in **bold**.

C_R (μF)	U_R (V)						
	10	16	25	40	50	63	100
330	–	–	–	–	–	–	22 × 25
470	–	–	–	–	–	–	22 × 30
680	–	–	–	–	–	22 × 25	25 × 30
	–	–	–	–	–	–	22 × 40
1000	–	–	–	–	22 × 25	22 × 30	30 × 30
	–	–	–	–	–	–	25 × 40
1500	–	–	–	22 × 25	22 × 30	25 × 30	30 × 40
	–	–	–	–	–	22 × 40	25 × 50
2200	–	–	22 × 25	22 × 30	25 × 30	30 × 30	35 × 40
	–	–	–	–	22 × 40	25 × 40	30 × 50
3300	–	22 × 25	22 × 30	25 × 30	30 × 30	30 × 40	35 × 50
	–	–	–	22 × 40	25 × 40	25 × 50	–
4700	22 × 25	22 × 30	25 × 30	30 × 30	30 × 40	35 × 40	–
	–	–	22 × 40	25 × 40	25 × 50	30 × 50	–
6800	22 × 30	25 × 30	30 × 30	30 × 40	35 × 40	35 × 50	–
	–	22 × 40	25 × 40	25 × 50	30 × 50	–	–
10000	25 × 30	30 × 30	30 × 40	35 × 40	35 × 50	–	–
	22 × 40	25 × 40	25 × 50	30 × 50	–	–	–
15000	30 × 30	30 × 40	35 × 40	35 × 50	–	–	–
	25 × 40	25 × 50	30 × 50	–	–	–	–
22000	30 × 40	35 × 40	35 × 50	–	–	–	–
	25 × 50	30 × 50	–	–	–	–	–
33000	35 × 40	35 × 50	–	–	–	–	–
	30 × 50	–	–	–	–	–	–
47000	35 × 50	–	–	–	–	–	–

Aluminium electrolytic capacitors

Power Long Life Snap-in

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Selection chart for C_R , U_R and relevant nominal case sizes ($\varnothing D \times L$ in mm) for 059 series

Preferred types in **bold**.

C_R (μF)	U_R (V)			
	200	250	385	400
33	–	–	22 × 25	–
47	–	–	22 × 30	22 × 30
68	–	22 × 25	22 × 35	22 × 35
	–	–	25 × 30	25 × 30
100	22 × 25	22 × 30	30 × 30	30 × 30
	–	–	25 × 40	25 × 40
150	22 × 30	22 × 35	25 × 50	30 × 35
	–	25 × 30	30 × 40	25 × 50
220	22 × 35	30 × 30	35 × 40	35 × 40
	25 × 30	25 × 35	30 × 50	30 × 50
330	30 × 30	30 × 35	35 × 50	35 × 50
	25 × 40	25 × 50	–	–
470	30 × 35	35 × 35	–	–
	25 × 50	30 × 45	–	–
680	35 × 35	35 × 45	–	–
	30 × 45	–	–	–
1000	35 × 50	–	–	–

MARKING

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

- Rated capacitance (in μF)
- Tolerance code on rated capacitance (M for $\pm 20\%$)
- Rated voltage (in V)
- Climatic category in accordance with "IEC 68"
- Date code (year and week) in accordance with "IEC 62"
- Code for factory of origin
- Name of manufacturer
- Minus-sign to indicate the negative terminal, visible from the top and side of the capacitor
- Code number (last 8 digits)
- Code for basic specification in accordance with "IEC 384-4-1" and "CECC 30301".

Aluminium electrolytic capacitors Power Long Life Snap-in

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MECHANICAL DATA AND PACKAGING QUANTITIES

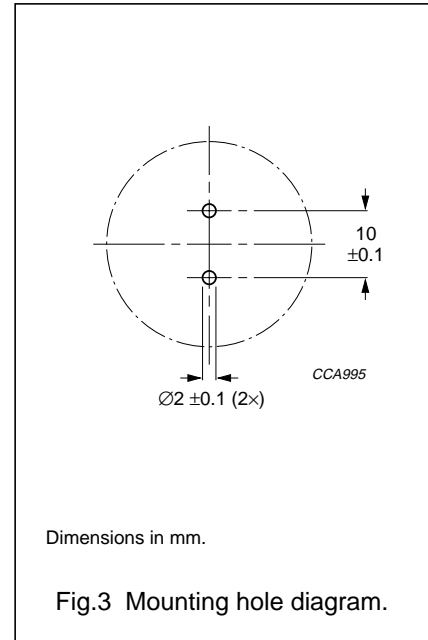
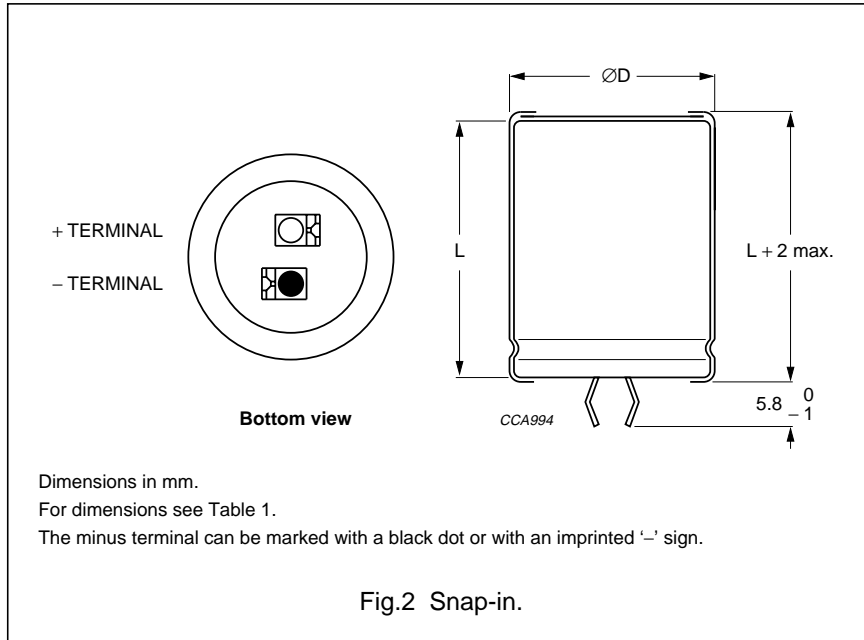


Table 1 Physical dimensions, mass and packaging information; see Fig.2

NOMINAL CASE SIZE ØD × L (mm)	CASE CODE	ØD _{max} (mm)	L _{max} (mm)	MASS (g)	PACKAGING QUANTITIES (units per box)	CARDBOARD BOX DIMENSIONS l × w × h (mm)
22 × 25	2225	23	27	≈12	100	260 × 250 × 39
22 × 30	2230	23	32	≈16	100	260 × 250 × 44
22 × 35	2235	23	37	≈20	100	260 × 250 × 49
22 × 40	2240	23	42	≈23	100	260 × 250 × 54
25 × 30	2530	26	32	≈22	100	290 × 280 × 44
25 × 35	2535	26	37	≈24	100	290 × 280 × 49
25 × 40	2540	26	42	≈27	100	290 × 280 × 54
25 × 50	2550	26	52	≈38	100	290 × 280 × 64
30 × 30	3030	31	32	≈30	100	340 × 330 × 44
30 × 35	3035	31	37	≈35	100	340 × 330 × 49
30 × 40	3040	31	42	≈40	100	340 × 330 × 54
30 × 45	3045	31	47	≈45	100	340 × 330 × 59
30 × 50	3050	31	52	≈50	100	340 × 330 × 64
35 × 35	3535	36	37	≈48	50	390 × 198 × 49
35 × 40	3540	36	42	≈55	50	390 × 198 × 54
35 × 45	3545	36	47	≈63	50	390 × 198 × 59
35 × 50	3550	36	52	≈72	50	390 × 198 × 64

Aluminium electrolytic capacitors Power Long Life Snap-in

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ELECTRICAL DATA AND ORDERING INFORMATION

Unless otherwise specified, all electrical values in Tables 2 and 3 apply at $T_{amb} = 20\text{ }^{\circ}\text{C}$, $P = 86\text{ to }106\text{ kPa}$, $RH = 45\text{ to }75\%$.

SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz
I_R	rated RMS ripple current at 100 Hz or $\geq 10\text{ kHz}$ and $105\text{ }^{\circ}\text{C}$
I_{L1}	max. leakage current after 1 minute at U_R
I_{L5}	max. leakage current after 5 minutes at U_R
ESR	max. equivalent series resistance at 100 Hz
Z	max. impedance at 10 kHz

Ordering example

Electrolytic capacitor 058 series

10000 $\mu\text{F}/25\text{ V}$; $\pm 20\%$

Nominal case size: $\varnothing 30 \times 40\text{ mm}$

Catalogue number: 2222 058 56103.

Table 2 Electrical data and ordering information for **058** series; 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 $105\text{ }^{\circ}\text{C}$ (A)	I_R $\geq 10\text{ kHz}$ $105\text{ }^{\circ}\text{C}$ (A)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	ESR 100 Hz ($\text{m}\Omega$)	Z 10 kHz ($\text{m}\Omega$)	CATALOGUE NUMBER 2222
10	4700	22 x 25	2225	1.95	2.30	286	98	82	57	058 54472
	6800	22 x 30	2230	2.44	2.88	412	140	61	44	058 54682
	10000	25 x 30	2530	2.81	3.32	604	204	54	42	058 54103
	10000	22 x 40	2240	3.29	3.88	604	204	43	32	058 44103
	15000	30 x 30	3030	3.53	4.17	904	304	42	34	058 54153
	15000	25 x 40	2540	3.78	4.46	904	304	38	30	058 44153
	22000	30 x 40	3040	4.62	5.45	1324	444	31	25	058 54223
	22000	25 x 50	2550	4.68	5.52	1324	444	31	24	058 44223
	33000	35 x 40	3540	5.15	6.08	1984	664	30	24	058 54333
	33000	30 x 50	3050	5.70	6.73	1984	664	24	21	058 44333
47000	35 x 50	3550	6.23	7.35	2824	944	24	21	058 54473	
16	3300	22 x 25	2225	1.90	2.24	321	110	86	57	058 55332
	4700	22 x 30	2230	2.36	2.78	455	154	65	44	058 55472
	6800	25 x 30	2530	2.75	3.25	657	222	56	42	058 55682
	6800	22 x 40	2240	3.18	3.75	657	222	46	32	058 45682
	10000	30 x 30	3030	3.44	4.06	964	324	44	34	058 55103
	10000	25 x 40	2540	3.66	4.32	964	324	40	30	058 45103
	15000	30 x 40	3040	4.55	5.37	1444	484	32	25	058 55153
	15000	25 x 50	2550	4.55	5.37	1444	484	32	24	058 45153
	22000	35 x 40	3540	5.07	5.98	2116	708	31	24	058 55223
	22000	30 x 50	3050	5.67	6.69	2116	708	25	21	058 45223
	33000	35 x 50	3550	6.23	7.35	3172	1060	25	21	058 55333



Aluminium electrolytic capacitors

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U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 105 °C (A)	I_R ≥ 10 kHz 105 °C (A)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	ESR 100 Hz (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
25	2200	22 × 25	2225	1.76	2.08	334	114	100	57	058 56222
	3300	22 × 30	2230	2.23	2.63	499	169	73	44	058 56332
	4700	25 × 30	2530	2.60	3.07	709	239	62	42	058 56472
	4700	22 × 40	2240	3.00	3.54	709	239	52	32	058 46472
	6800	30 × 30	3030	3.26	3.85	1024	344	49	34	058 56682
	6800	25 × 40	2540	3.49	4.12	1024	344	44	30	058 46682
	10000	30 × 40	3040	4.37	5.16	1504	504	35	25	058 56103
	10000	25 × 50	2550	4.37	5.16	1504	504	35	24	058 46103
	15000	35 × 40	3540	4.91	5.79	2254	754	33	24	058 56153
	15000	30 × 50	3050	5.43	6.41	2254	754	27	21	058 46153
	22000	35 × 50	3550	6.07	7.16	3304	1104	27	21	058 56223
40	1500	22 × 25	2225	1.65	2.01	364	124	114	65	058 57152
	2200	22 × 30	2230	2.04	2.49	532	180	87	50	058 57222
	3300	25 × 30	2530	2.43	2.99	796	268	71	45	058 57332
	3300	22 × 40	2240	2.78	3.39	796	268	60	37	058 47332
	4700	30 × 30	3030	2.96	3.61	1132	380	59	40	058 57472
	4700	25 × 40	2540	3.26	3.90	1132	380	51	32	058 47472
	6800	30 × 40	3040	3.94	4.81	1636	548	42	29	058 57682
	6800	25 × 50	2550	4.10	5.00	1636	548	39	26	058 47682
	10000	35 × 40	3540	4.18	5.10	2404	804	46	29	058 57103
	10000	30 × 50	3050	4.98	6.08	2404	804	36	24	058 47103
	15000	35 × 50	3550	5.21	6.36	3604	1204	36	24	058 57153
50	1000	22 × 25	2225	1.50	1.83	304	104	138	69	058 51102
	1500	22 × 30	2230	1.88	2.29	454	154	102	54	058 51152
	2200	25 × 30	2530	2.27	2.77	664	124	82	47	058 51222
	2200	22 × 40	2240	2.55	3.11	664	124	71	38	058 41222
	3300	30 × 30	3030	2.81	3.43	994	334	66	41	058 51332
	3300	25 × 40	2540	3.07	3.75	994	334	57	33	058 41332
	4700	30 × 40	3040	3.77	4.60	1414	474	47	30	058 51472
	4700	25 × 50	2550	3.85	4.70	1414	474	43	27	058 41472
	6800	35 × 40	3540	4.01	4.89	2044	684	49	30	058 51682
	6800	30 × 50	3050	4.74	5.78	2044	684	38	24	058 41682
	10000	35 × 50	3550	5.04	6.15	3004	1004	38	24	058 51103

Aluminium electrolytic capacitors

Power Long Life Snap-in

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U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 105 °C (A)	I_R ≥ 10 kHz 105 °C (A)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	ESR 100 Hz (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
63	680	22 × 25	2225	1.17	1.43	261	90	228	150	058 58681
	1000	22 × 30	2230	1.46	1.78	382	130	170	115	058 58102
	1500	25 × 30	2530	1.76	2.15	571	193	137	85	058 58152
	1500	22 × 40	2240	2.00	2.44	571	193	115	85	058 48152
	2200	30 × 30	3030	2.27	2.77	836	281	101	70	058 58222
	2200	25 × 40	2540	2.40	2.93	836	281	94	70	058 48222
	3300	30 × 40	3040	3.07	3.75	1251	420	70	50	058 58332
	3300	25 × 50	2550	3.07	3.75	1251	420	70	50	058 48332
	4700	35 × 40	3540	3.65	4.45	1781	596	60	45	058 58472
	4700	30 × 50	3050	3.88	4.73	1781	596	53	45	058 48472
	6800	35 × 50	3550	4.58	5.59	2574	861	46	35	058 58682
100	330	22 × 25	2225	0.92	1.12	202	70	370	250	058 59331
	470	22 × 30	2230	1.14	1.39	286	98	280	190	058 59471
	680	25 × 30	2530	1.35	1.65	412	140	232	140	058 59681
	680	22 × 40	2240	1.57	1.92	412	140	190	140	058 49681
	1000	30 × 30	3030	1.79	2.40	604	204	163	115	058 59102
	1000	25 × 40	2540	1.85	2.26	604	204	158	115	058 49102
	1500	30 × 40	3040	2.45	2.99	904	304	111	85	058 59152
	1500	25 × 50	2550	2.38	2.90	904	304	116	85	058 49152
	2200	35 × 40	3540	3.05	3.72	1324	444	86	65	058 59222
	2200	30 × 50	3050	3.13	3.82	1324	444	82	65	058 49222
	3300	35 × 50	3550	3.84	4.68	1984	664	64	50	058 59332

Aluminium electrolytic capacitors

Power Long Life Snap-in

058/059 PLL-SI

Table 3 Electrical data and ordering information for **059** series; 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 105 °C (A)	I_{L1} 1 min (μ A)	I_{L5} 5 min (μ A)	ESR 100 Hz (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
200	100	22 × 25	2225	0.53	124	44	1280	730	059 52101
	150	22 × 30	2230	0.67	184	64	850	540	059 52151
	220	22 × 35	2235	0.86	268	92	610	430	059 32221
	220	25 × 30	2530	0.87	268	92	610	430	059 52221
	330	30 × 30	3030	1.12	400	136	435	300	059 52331
	330	25 × 40	2540	1.12	400	136	435	300	059 42331
	470	30 × 35	3035	1.46	568	192	335	225	059 32471
	470	25 × 50	2550	1.25	568	192	335	225	059 42471
	680	30 × 45	3045	1.87	820	276	235	155	059 32681
	680	35 × 35	3535	1.85	820	276	235	155	059 62681
	1000	35 × 50	3550	2.45	1204	404	160	125	059 52102
250	68	22 × 25	2225	0.49	106	38	1640	760	059 53689
	100	22 × 30	2230	0.62	154	54	1110	570	059 53101
	150	22 × 35	2235	0.82	229	79	795	440	059 33151
	150	25 × 30	2530	0.82	229	79	795	440	059 53151
	220	25 × 35	2535	1.03	334	114	540	300	059 33221
	220	30 × 30	3030	1.06	334	114	540	300	059 53221
	330	30 × 35	3035	1.43	499	169	385	225	059 33331
	330	25 × 50	2550	1.40	499	169	385	225	059 43331
	470	30 × 45	3045	1.79	709	239	270	155	059 33471
	470	35 × 35	3535	1.79	709	239	270	155	059 63471
	680	35 × 45	3545	2.25	1024	344	190	125	059 43681
385	33	22 × 25	2225	0.32	80	29	3860	3000	059 58339
	47	22 × 30	2230	0.41	113	40	2710	2100	059 58479
	68	22 × 35	2235	0.53	161	56	1870	1460	059 38689
	68	25 × 30	2530	0.52	161	56	1870	1460	059 58689
	100	30 × 30	3030	0.72	235	81	1270	1010	059 58101
	100	25 × 40	2540	0.72	235	81	1270	1010	059 48101
	150	30 × 40	3040	0.99	351	119	850	675	059 58151
	150	25 × 50	2550	0.99	351	119	850	675	059 48151
	220	35 × 40	3540	1.31	512	173	580	465	059 58221
	220	30 × 50	3050	1.31	512	173	580	465	059 48221
	330	35 × 50	3550	1.75	766	258	390	320	059 58331

Aluminium electrolytic capacitors
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U_R (V)	C_R 100 Hz (μ F)	NOMINAL CASE SIZE $\varnothing D \times L$ (mm)	CASE CODE	I_R 100 Hz 105 °C (A)	I_{L1} 1 min (μ A)	I_{L5} 5 min (μ A)	ESR 100 Hz (m Ω)	Z 10 kHz (m Ω)	CATALOGUE NUMBER 2222
400	47	22 × 30	2230	0.30	117	42	4260	3490	059 56479
	68	22 × 35	2235	0.38	167	58	2950	2420	059 36689
	68	25 × 30	2530	0.41	167	58	2950	2420	059 56689
	100	30 × 30	3030	0.55	244	84	2020	1660	059 56101
	100	25 × 40	2540	0.55	244	84	2020	1660	059 46101
	150	30 × 35	3035	0.68	364	124	1350	1110	059 36151
	150	25 × 50	2550	0.78	364	124	1350	1110	059 46151
	220	35 × 40	3540	0.94	532	180	930	760	059 56221
	220	30 × 50	3050	0.94	532	180	930	760	059 46221
	330	35 × 50	3550	1.25	796	260	620	510	059 56331

Additional electrical data

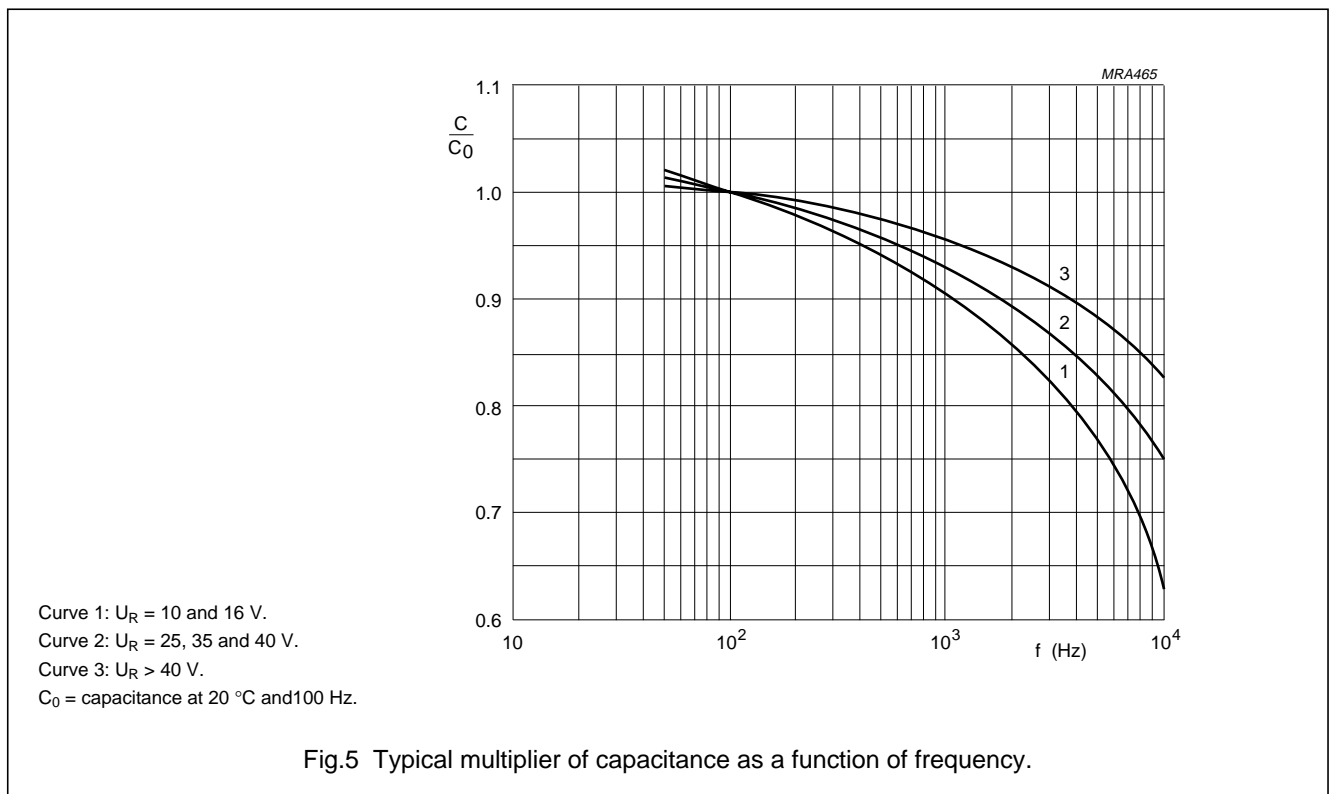
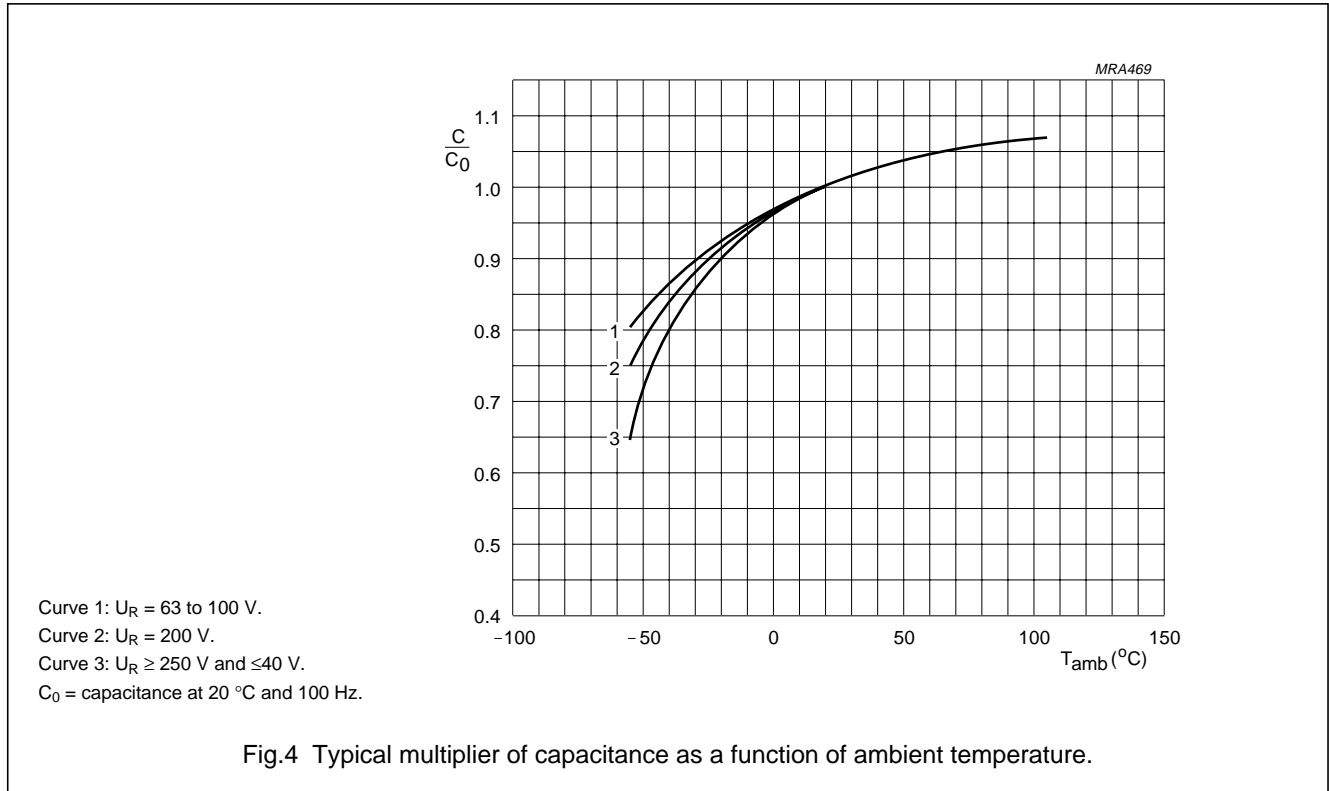
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage for short periods	≤250 V versions	$U_s = 1.15 \times U_R$
	≥385 V versions	$U_s = 1.1 \times U_R$
Reverse voltage		$U_{rev} \leq 1 \text{ V}$
Current		
Leakage current	after 1 minute at U_R	$I_{L1} \leq 0.006C_R \times U_R + 4 \mu\text{A}$
	after 5 minutes at U_R	$I_{L5} \leq 0.002C_R \times U_R + 4 \mu\text{A}$
Inductance		
Equivalent series inductance (ESL)	all case sizes	typ. 19 nH
		max. 25 nH



Aluminium electrolytic capacitors
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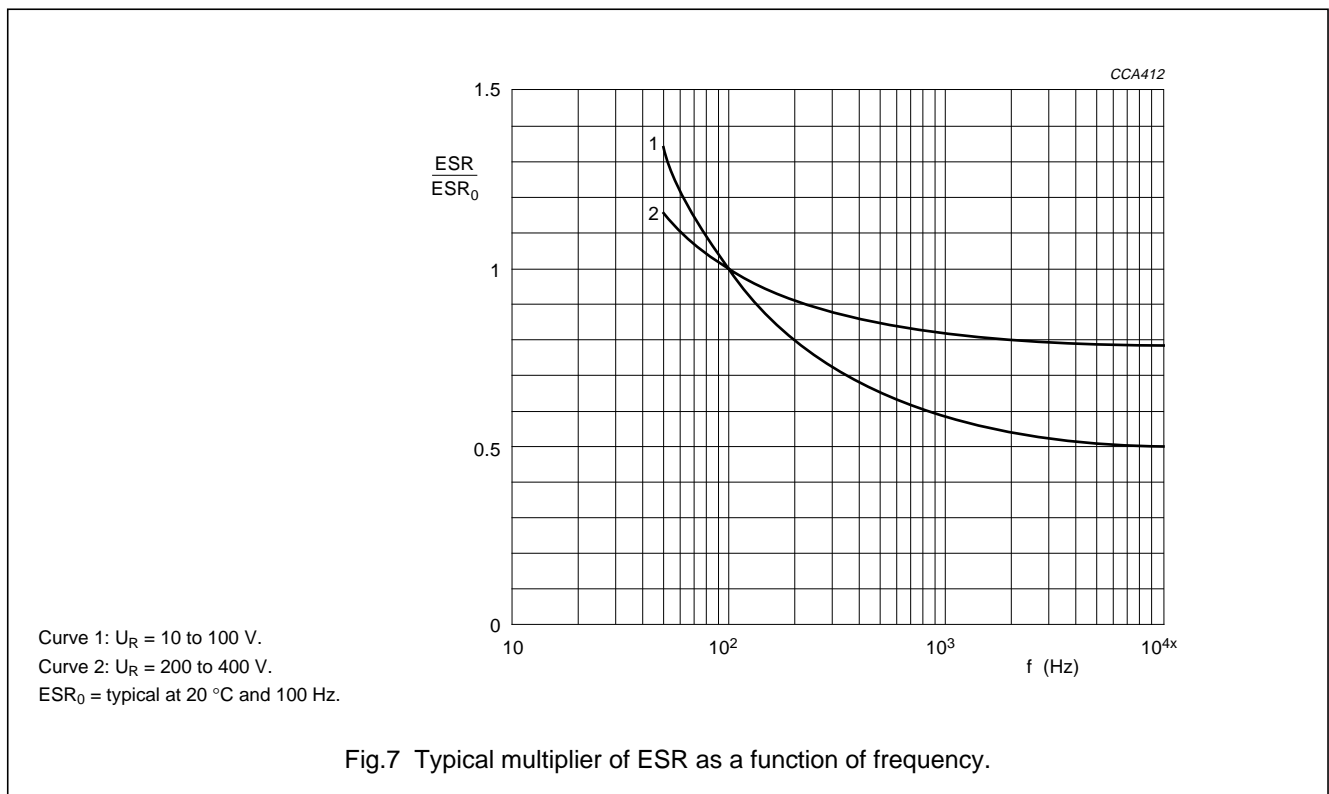
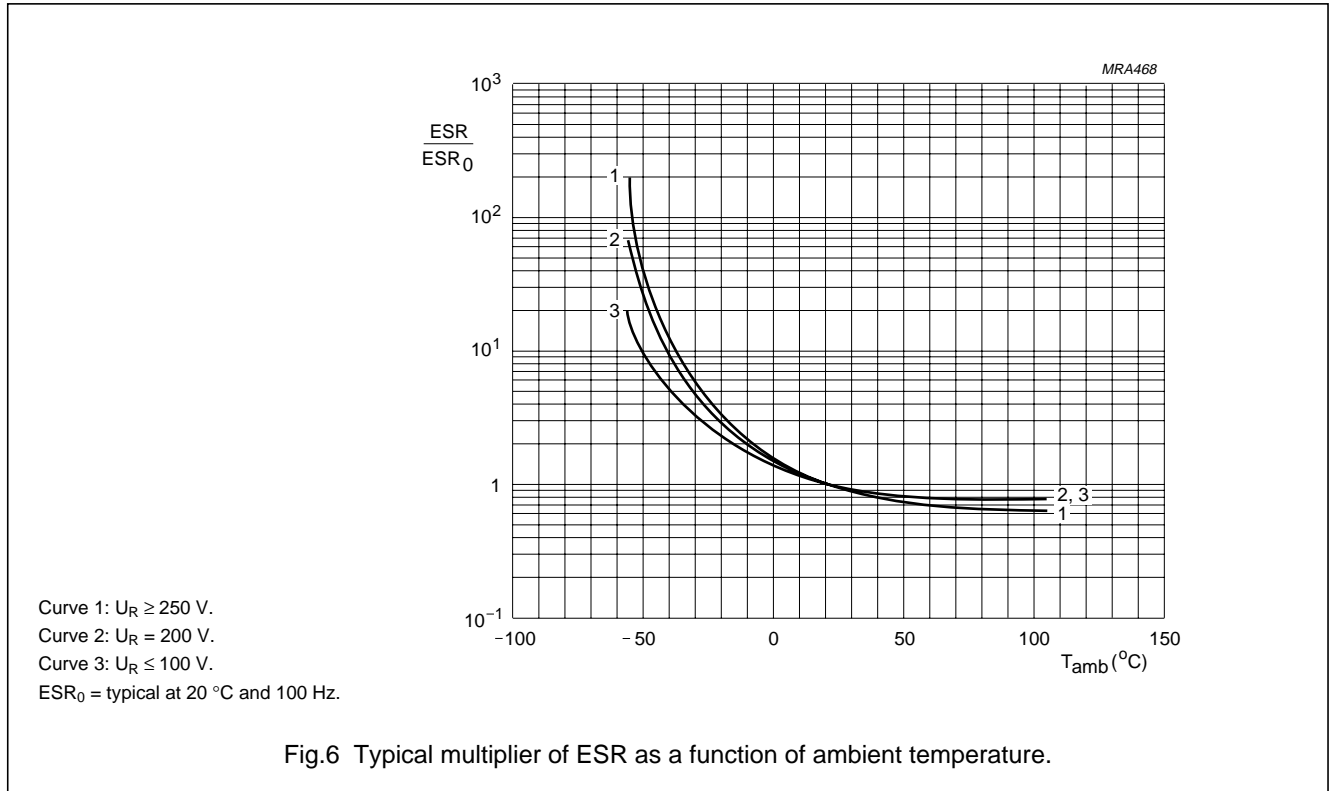
Capacitance (C)



Aluminium electrolytic capacitors
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Equivalent series resistance (ESR)

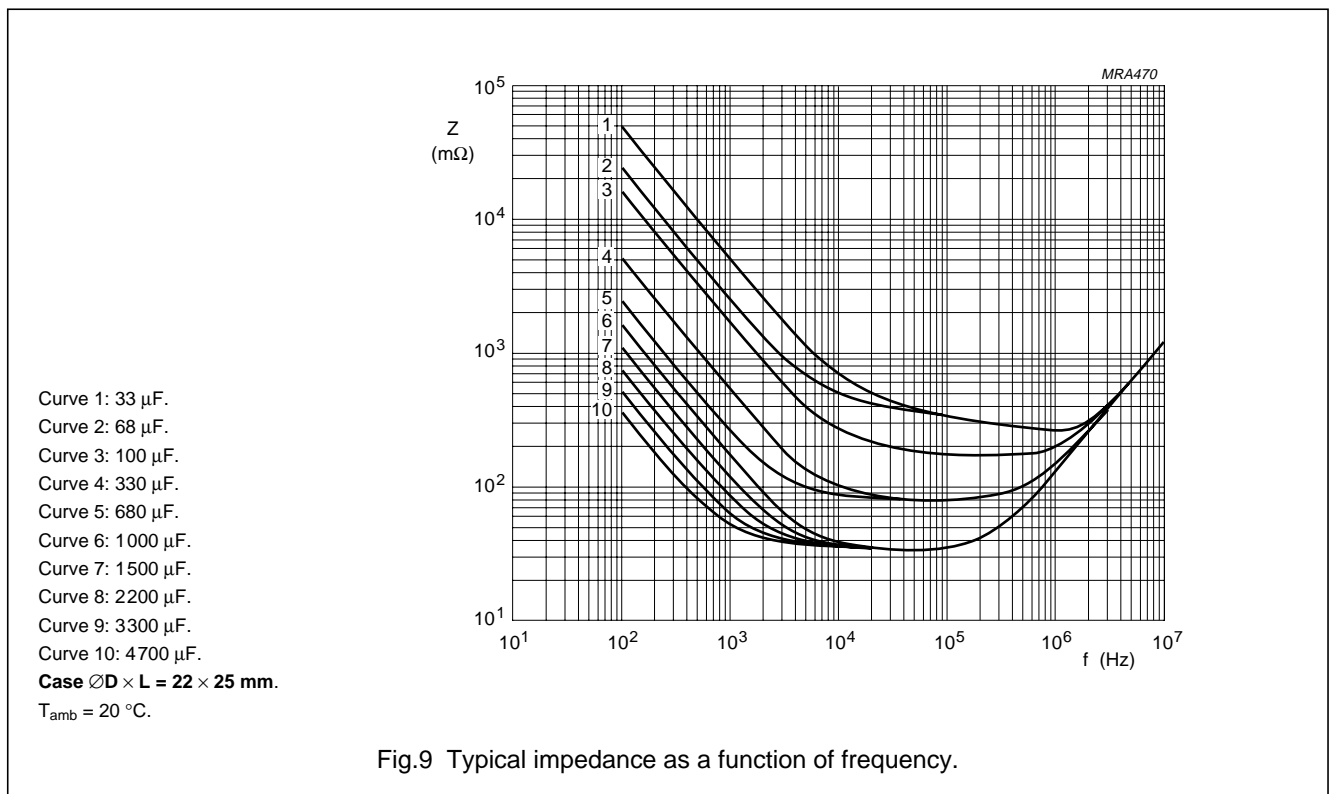
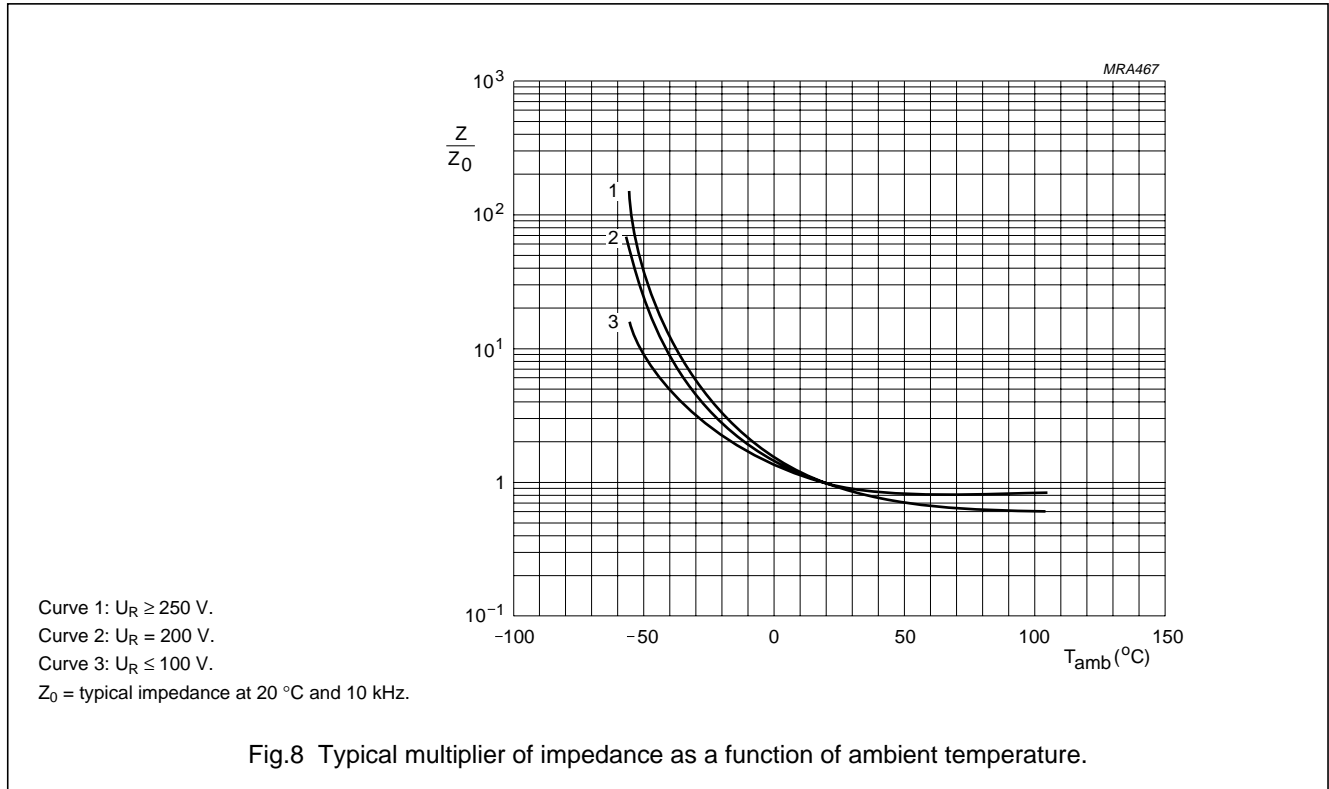


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Aluminium electrolytic capacitors
Power Long Life Snap-in

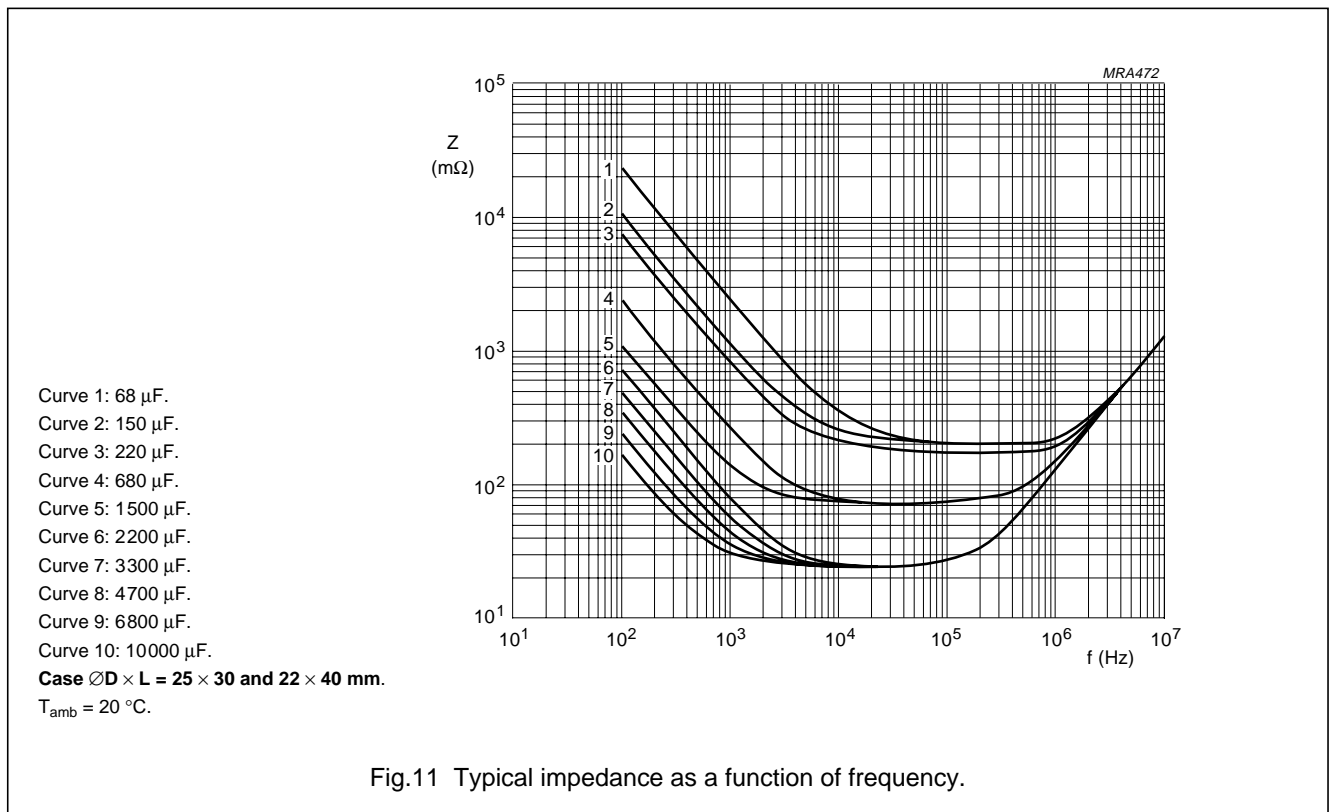
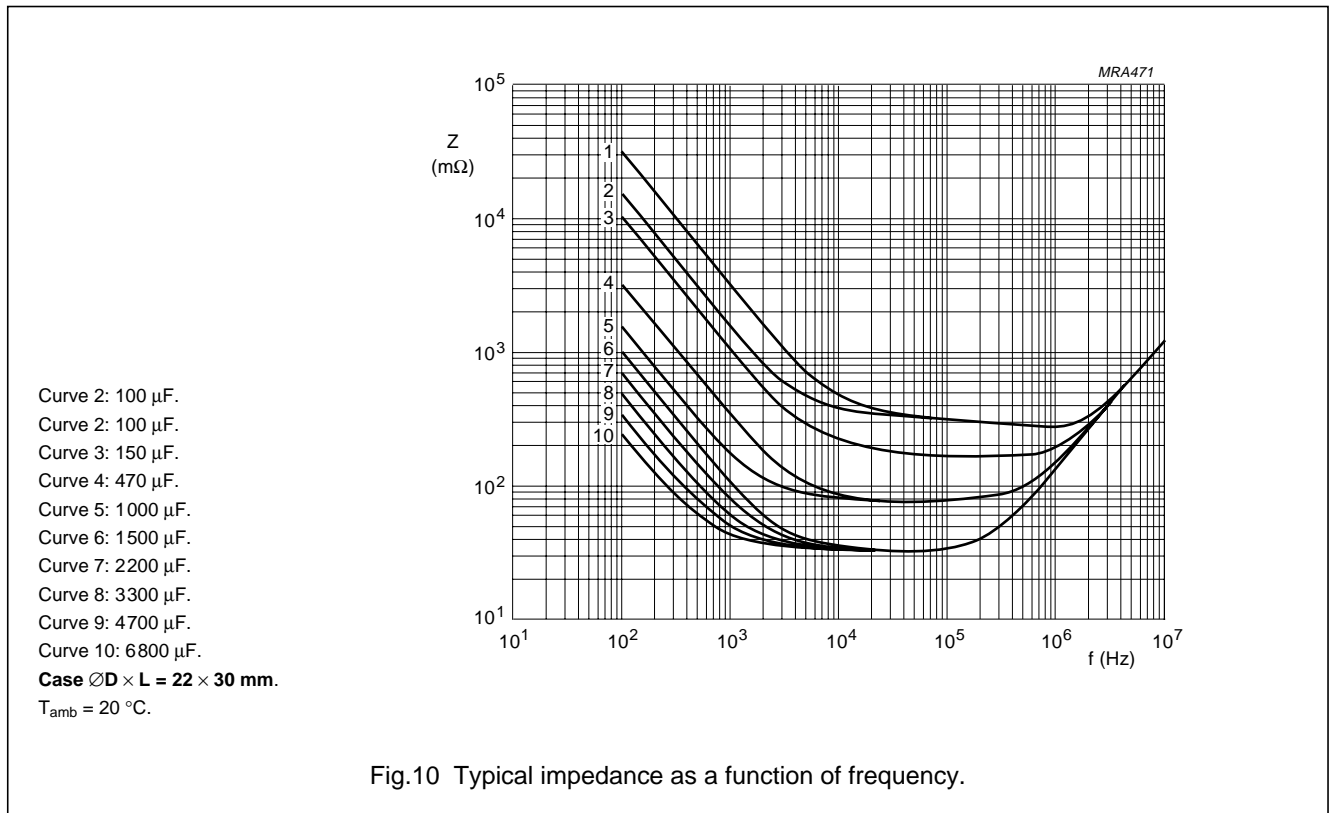
058/059 PLL-SI

Impedance (Z)



Aluminium electrolytic capacitors
Power Long Life Snap-in

058/059 PLL-SI



L

Aluminium electrolytic capacitors
Power Long Life Snap-in

058/059 PLL-SI

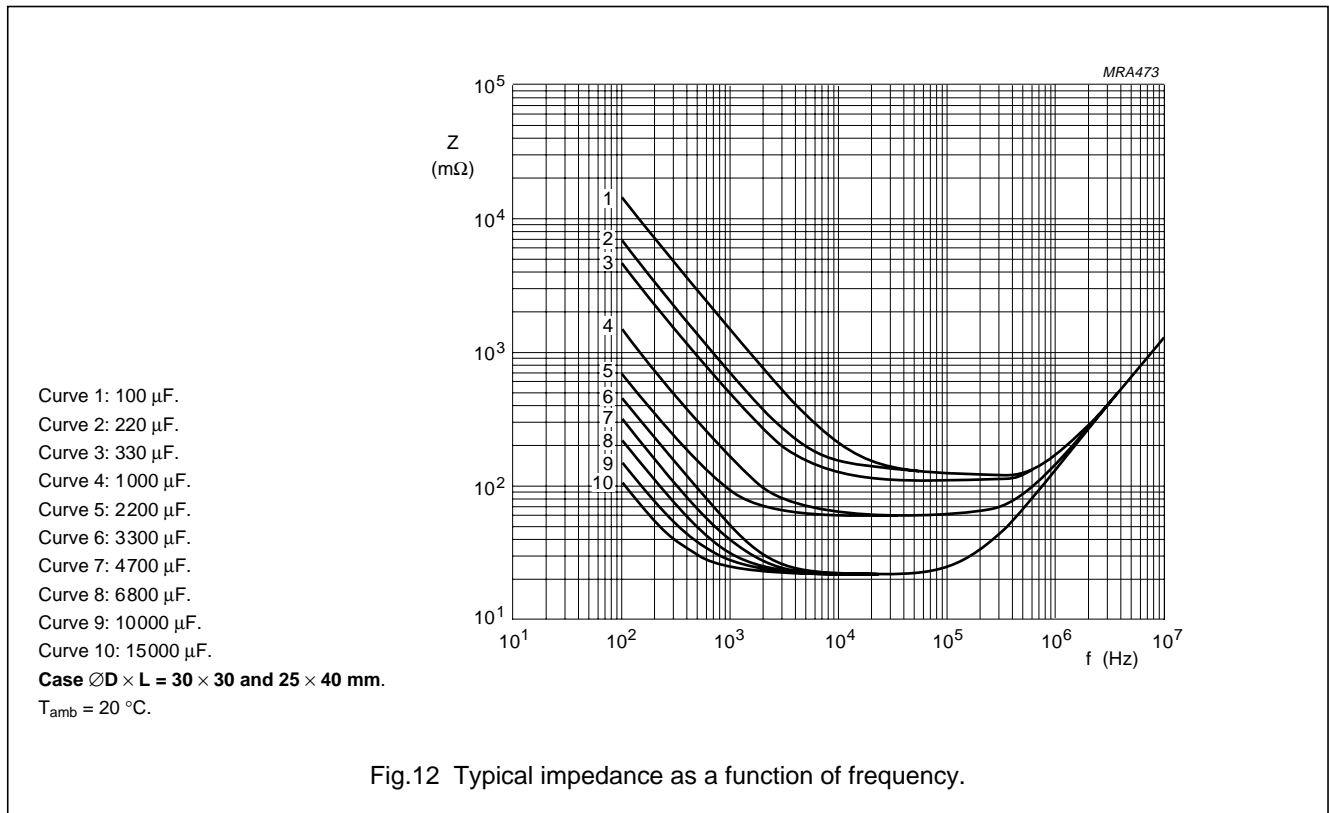


Fig.12 Typical impedance as a function of frequency.

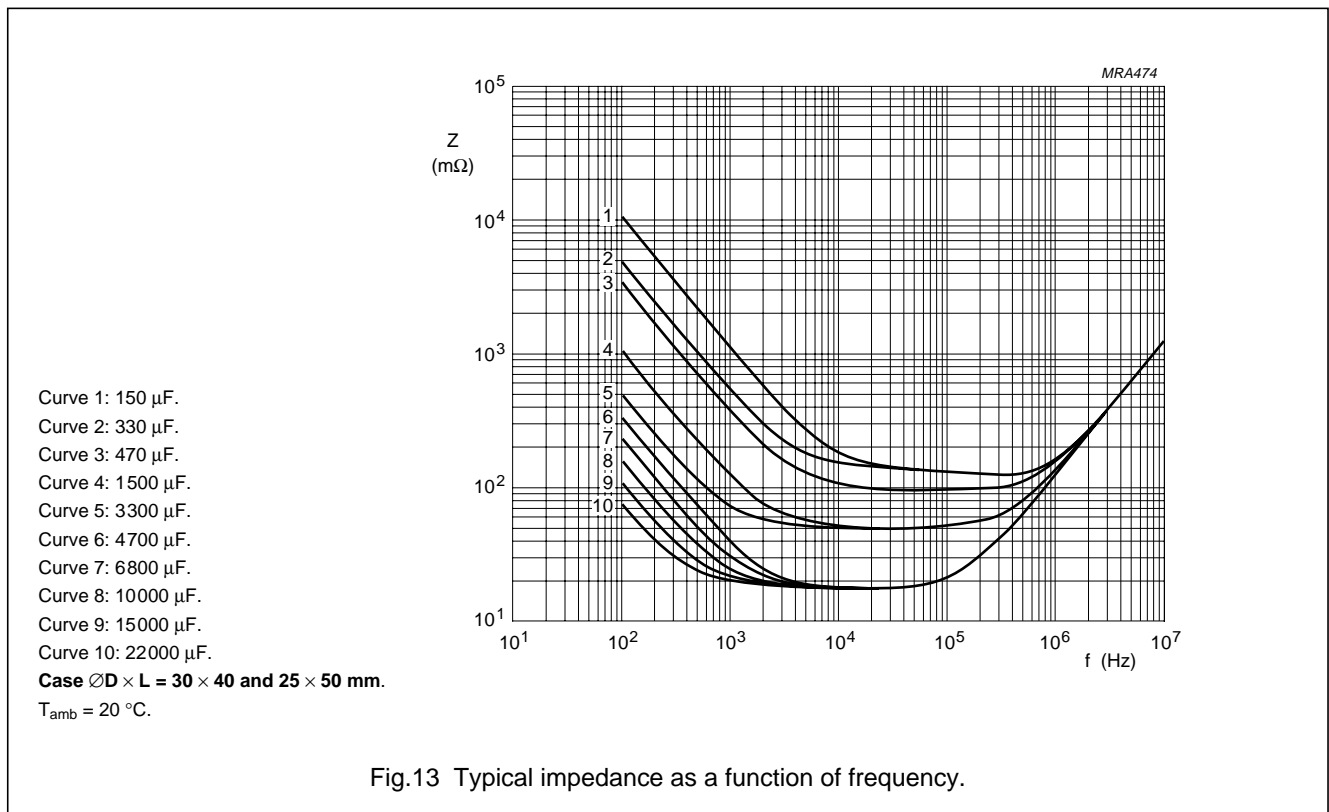
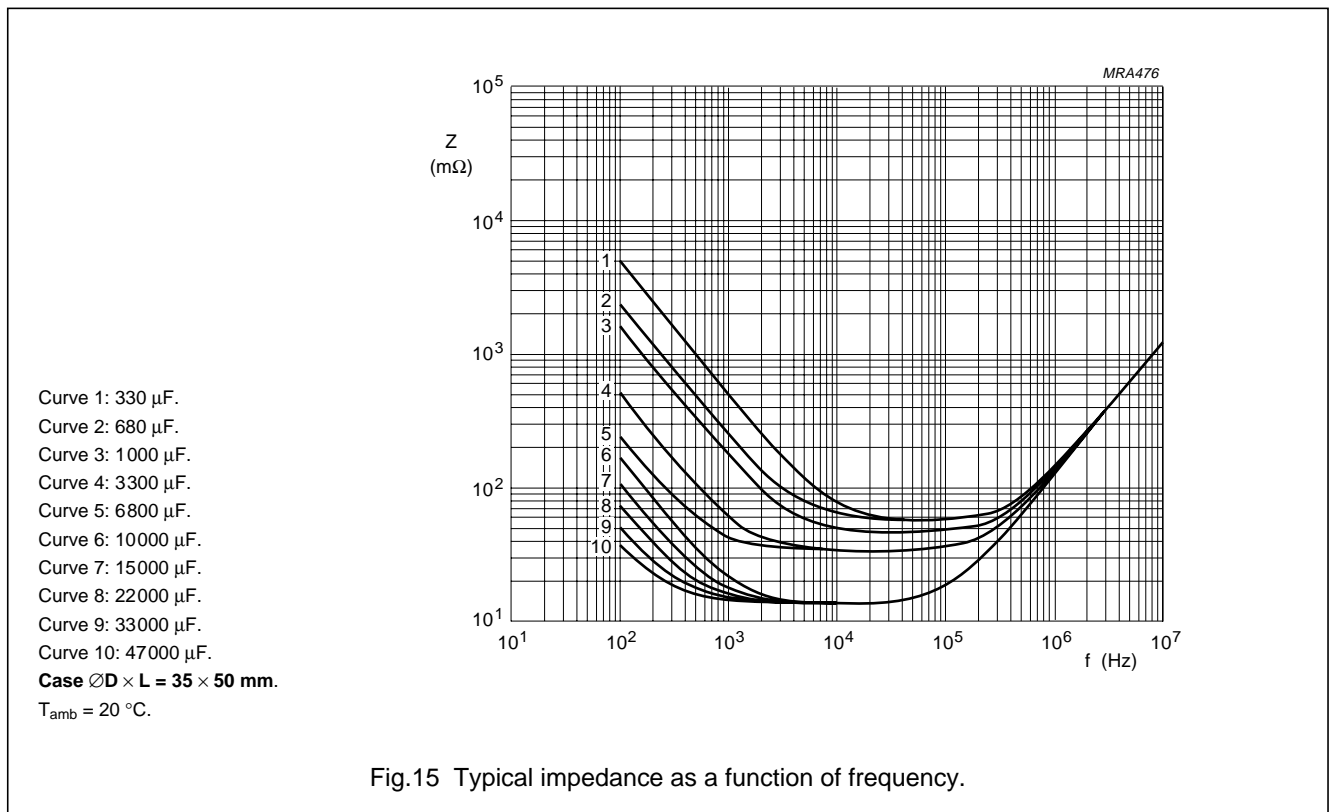
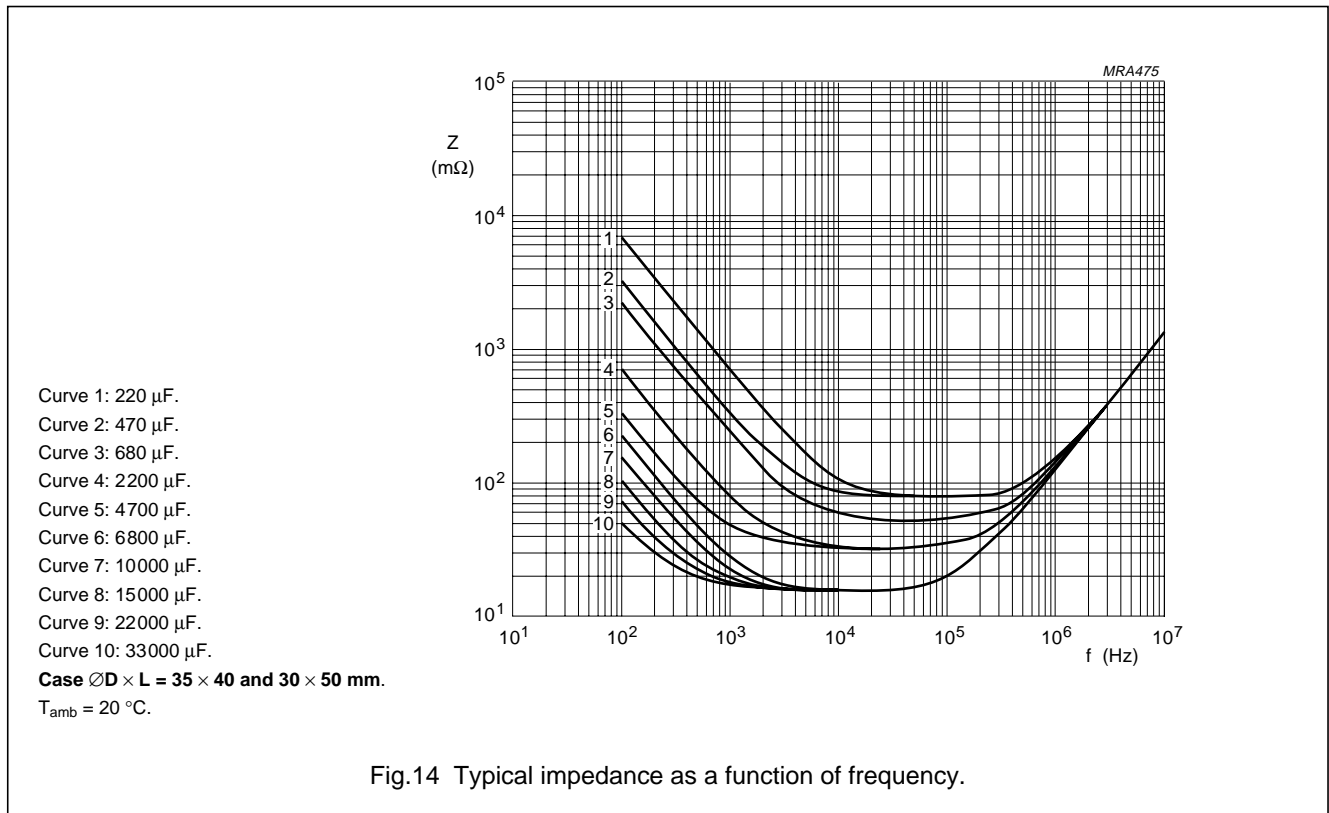


Fig.13 Typical impedance as a function of frequency.

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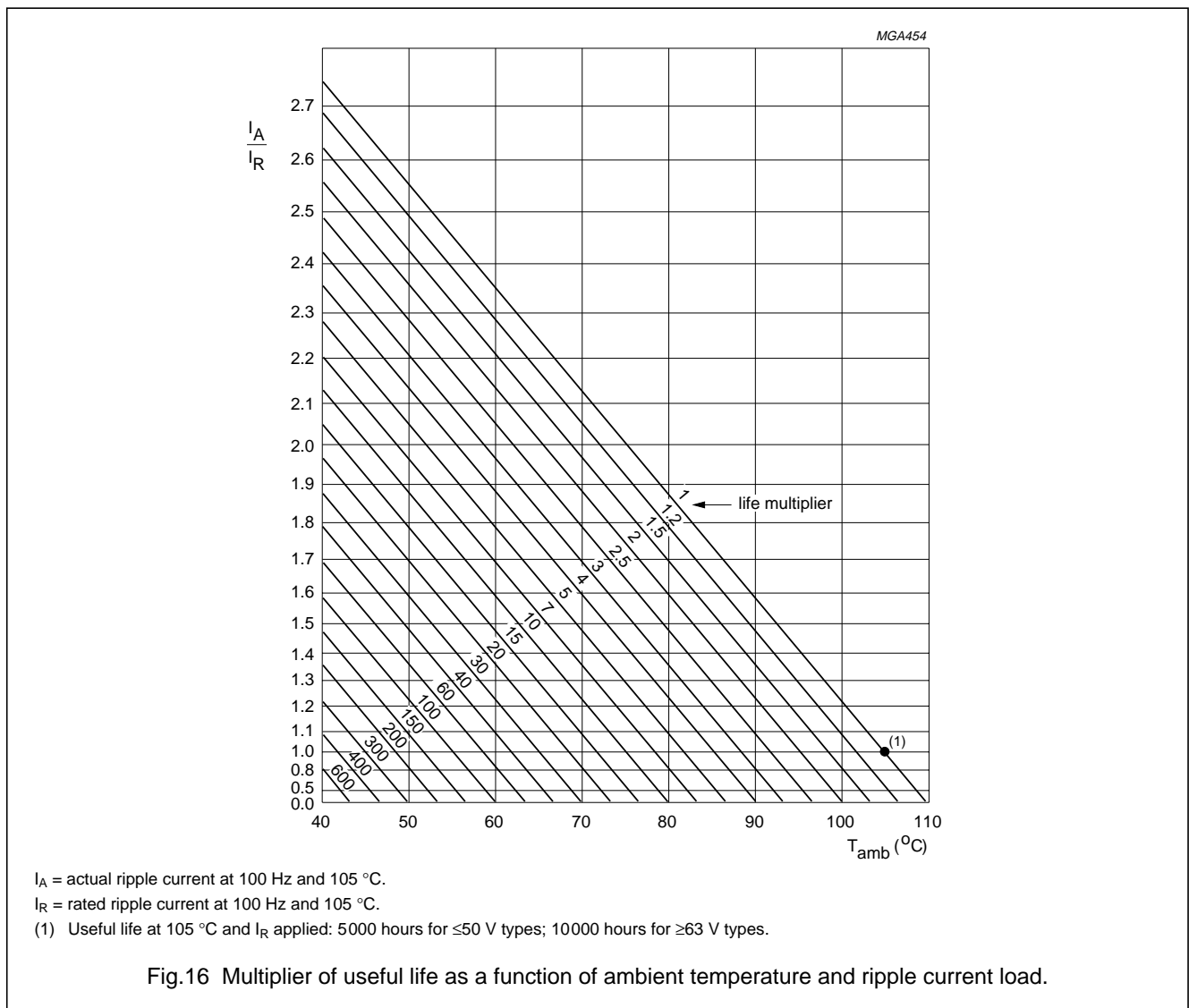
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RIPPLE CURRENT AND USEFUL LIFE

Table 4 Multiplier of ripple current (I_R) as a function of frequency

FREQUENCY (Hz)	I_R MULTIPLIER		
	$U_R = 10$ to 25 V	$U_R = 40$ to 100 V	$U_R > 100$ V
50	0.93	0.91	0.86
100	1.00	1.00	1.00
200	1.04	1.05	1.13
400	1.07	1.09	1.21
1000	1.11	1.13	1.29
2000	1.13	1.15	1.32
4000	1.15	1.18	1.35
≥ 10000	1.18	1.22	1.40



Aluminium electrolytic capacitors

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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; $\leq 50\text{ V}$ types: 2000 hours; $\geq 63\text{ V}$ types: 5000 hours	$U_R \leq 100\text{ V}$; $\Delta C/C$: $\pm 15\%$ $U_R > 100\text{ V}$; $\Delta C/C$: $\pm 10\%$ $Z \leq 2 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$
Useful life	CECC 30301 subclause 1.8.1	$T_{amb} = 105\text{ °C}$; U_R and I_R applied; $\leq 50\text{ V}$ types: 5000 hours; $\geq 63\text{ V}$ types: 10000 hours	$U_R \leq 100\text{ V}$; $\Delta C/C$: $\pm 45\%$ $U_R > 100\text{ V}$; $\Delta C/C$: $\pm 30\%$ $Z \leq 3 \times \text{spec. limit}$ $I_{L5} \leq \text{spec. limit}$ no short or open circuit, no visible damage total failure percentage: $U_R \leq 100\text{ V}$: $\leq 1\%$; $U_R > 100\text{ V}$: $\leq 3\%$
Shelf life (storage at high temperature)	IEC 384-4/ CECC 30300 subclause 4.17	$T_{amb} = 105\text{ °C}$; no voltage applied; 500 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C$: $\pm 10\%$ $I_{L5} \leq 2 \times \text{spec. limit}$