Non-solid Al - electrolytic capacitors SMD (Chip) Long Life

CLL 139

FEATURES

- Polarized aluminium electrolytic capacitors, non-solid, self healing
- Extended voltage and capacitance range
- SMD-version, fully moulded, insulated
- Flexible terminals, reflow and wave solderable
- Compact, rectangular shape
- Charge and discharge proof, no peak current limitation
- Supplied in blister tape on reel.

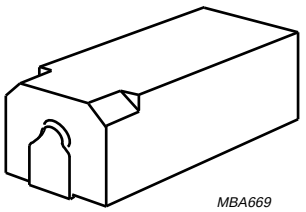
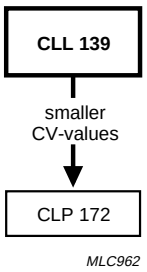


Fig.1 Component outline.

APPLICATIONS

- SMD technology
- Industrial and professional applications
- Telecommunications, automotive, EDP general industrial
- Coupling, decoupling, smoothing, filtering, buffering, timing.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case sizes (L × W × H in mm)	14.3 × 6.2 × 6.9 and 14.3 × 7.6 × 8.2
Rated capacitance range, C_R	1.0 to 220 uF
Tolerance on C_R	±20%
Rated voltage range, U_R	6.3 to 100 V
Category temperature range	–55 to +105 °C
Endurance test at 105 °C	1000 hours
Useful life at 105 °C	2000 hours
Useful life at 40 °C; 1.3 × I_R applied	200000 hours
Shelf life at 0 V, 105 °C	500 hours
Resistance to soldering heat test	immersion in solder: 10 s at 260 °C or 40 s at 215 °C
Based on sectional specification	IEC 384-18/CECC 32300
Climatic category IEC 68 (DIN 40040)	55/105/56 (FMF)

Selection chart for C_R, U_R and relevant nominal case sizes (L × W × H in mm)

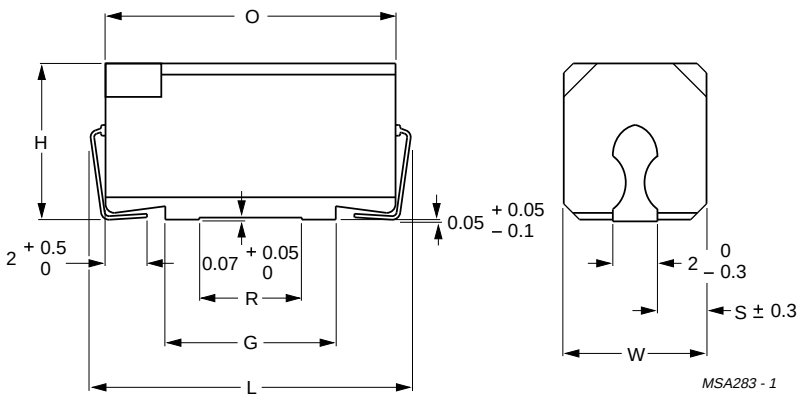
Preferred types in **bold**.

C_R (μF)	U_R (V)							
	6.3	**10**	**16**	**25**	**40**	**50**	**63**	**100**
1(1)	–	–	–	–	–	–	–	**14.3 × 6.2 × 6.9**
2.2	–	–	–	–	–	–	14.3 × 6.2 × 6.9	**14.3 × 6.2 × 6.9**
3.3	–	–	–	–	–	–	14.3 × 6.2 × 6.9	14.3 × 7.6 × 8.2
4.7	–	–	–	–	–	–	**14.3 × 6.2 × 6.9**	**14.3 × 7.6 × 8.2**
10	–	–	–	14.3 × 6.2 × 6.9	–	**14.3 × 6.2 × 6.9**	14.3 × 7.6 × 8.2	–
15	–	–	–	–	14.3 × 6.2 × 6.9	14.3 × 7.6 × 8.2	–	–
22	–	–	–	**14.3 × 6.2 × 6.9**	–	**14.3 × 7.6 × 8.2**	–	–
33	–	–	–	**14.3 × 6.2 × 6.9**	**14.3 × 7.6 × 8.2**	–	–	–
47	–	–	**14.3 × 6.2 × 6.9**	**14.3 × 7.6 × 8.2**	–	–	–	–
68	–	14.3 × 6.2 × 6.9	–	–	–	–	–	–
100	**14.3 × 6.2 × 6.9**	–	**14.3 × 7.6 × 8.2**	–	–	–	–	–
150	–	14.3 × 7.6 × 8.2	–	–	–	–	–	–
220	**14.3 × 7.6 × 8.2**	–	–	–	–	–	–	–

Note

1. For lower CV-values see *“data sheet CLP 172”.*

MECHANICAL DATA



Dimensions in mm.
For dimensions see Table 1.

Fig.2 Dimensional outline.

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

NOMINAL CASE SIZE L × W × H (mm)	CASE CODE	L_{max} (mm)	W_{max} (mm)	H_{max} (mm)	O_{max} (mm)	S (mm)	G_{max} (mm)	R_{min} (mm)	MASS (g)	PACKAGING QUANTITIES PER REEL
14.3 × 6.2 × 6.9	2	14.5	6.3	7.05	13.0	2.15	7.5	4.7	≈0.95	700
14.3 × 7.6 × 8.2	3	14.5	7.7	8.35	13.0	2.85	7.5	4.7	≈1.3	700

MARKING

- Rated capacitance (in μF)
- Rated voltage (in V)
- Series number (139)
- Name of manufacturer (PHILIPS)
- Date code (year and month) in accordance with *"IEC 62"*
- '–' sign indicating the cathode. The anode is identified by bevelled edges.

MOUNTING

The capacitors are designed for automatic placement on to printed-circuit boards or hybrid circuits.

Optimum dimensions of soldering pads depend amongst others on soldering method, mounting accuracy, print lay-out and/or adjacent components.

For recommended soldering pad dimensions, refer to Fig.3 and Table 2.

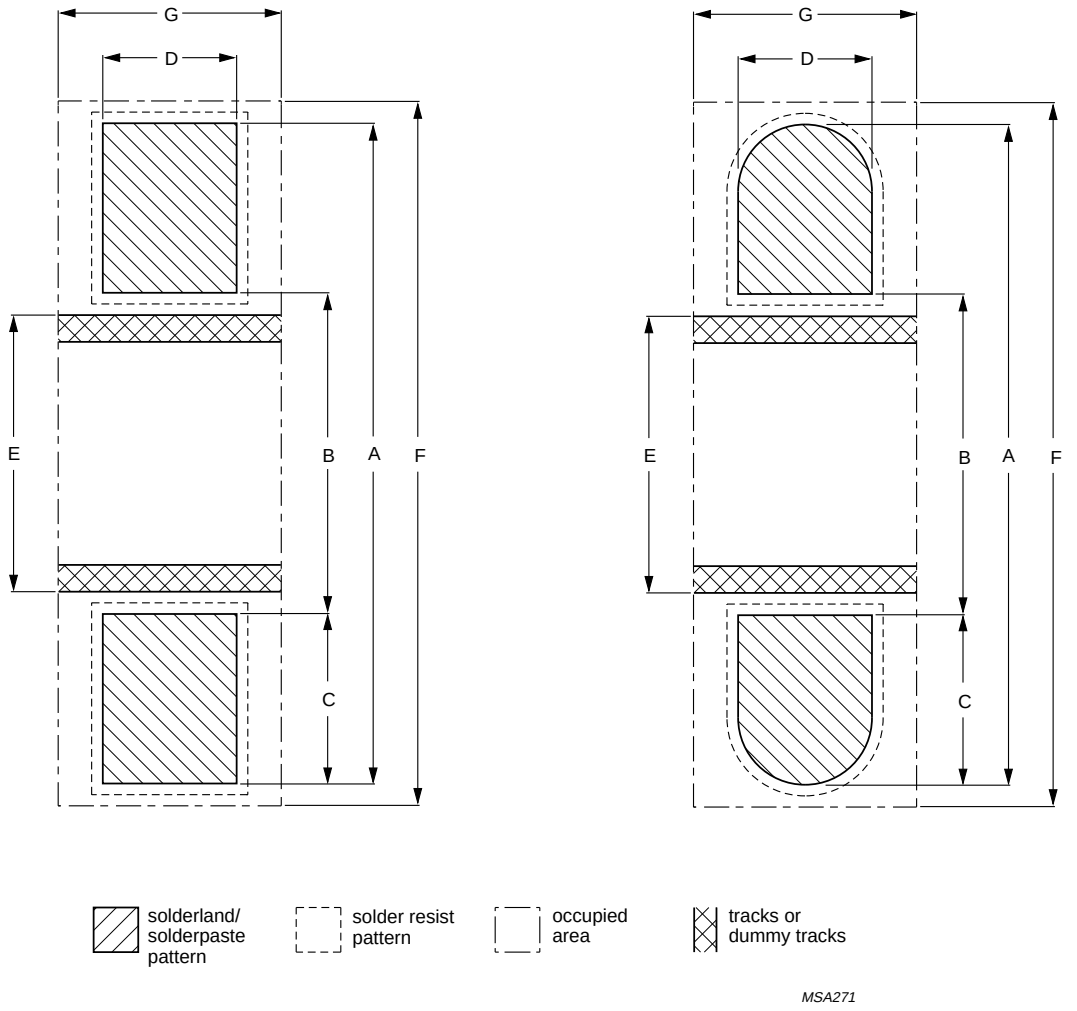


Fig.3 Recommended pad dimensions for reflow and wave soldering; see Table 2.

Table 2 Recommended soldering pad dimensions in **mm** (placement accuracy ±0.25 mm); see Fig.3

NOMINAL CASE SIZE L × W × H (mm)	FOR REFLOW SOLDERING							FOR WAVE SOLDERING						
	A	B	C	D	E	F	G	A	B	C	D	E	F	G
14.3 × 6.2 × 6.9	15.8	8.8	3.5	2.8	8.0	16.2	7.7	18.6	10.0	4.3	5.0	8.8	20.5	11.5
14.3 × 7.6 × 8.2	15.8	8.8	3.5	2.8	8.0	16.2	9.1	18.6	10.0	4.3	6.0	8.8	21.5	13.0

Soldering

Soldering conditions are defined by the curve, temperature versus time, where the temperature is that measured on the soldering pad during processing.

For maximum conditions of different soldering methods see Figs 4, 5 and 6.

Any temperature versus time curve may be applied which does not exceed the specified maximum curves.

AS A GENERAL PRINCIPLE, TEMPERATURE AND DURATION SHALL BE THE **MINIMUM** NECESSARY REQUIRED TO ENSURE GOOD SOLDERING CONNECTIONS.

Maximum temperature load

Table 3 Curing conditions for SMD-glue

MAX. T_{amb} (°C)	MAX. EXPOSURE TIME (minutes)
125	30
140	10
150	5
160	2

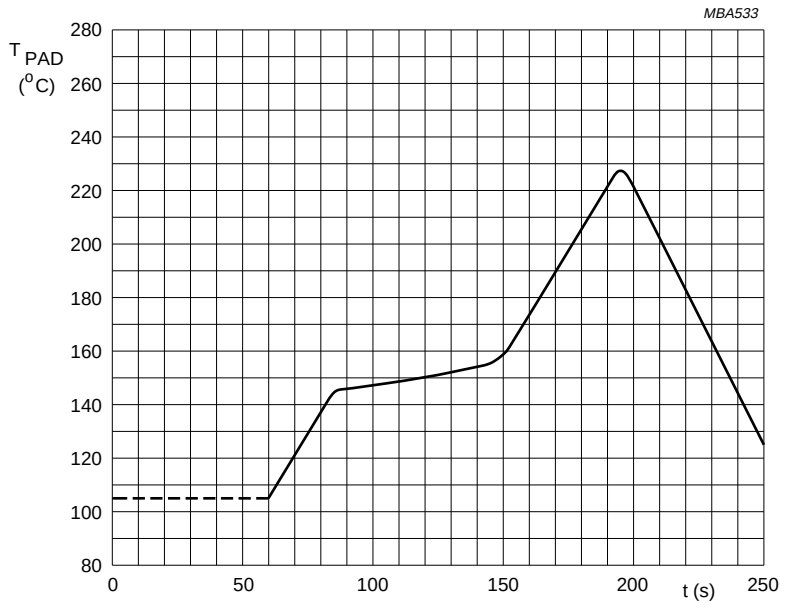


Fig.4 Maximum temperature load during infrared reflow soldering.

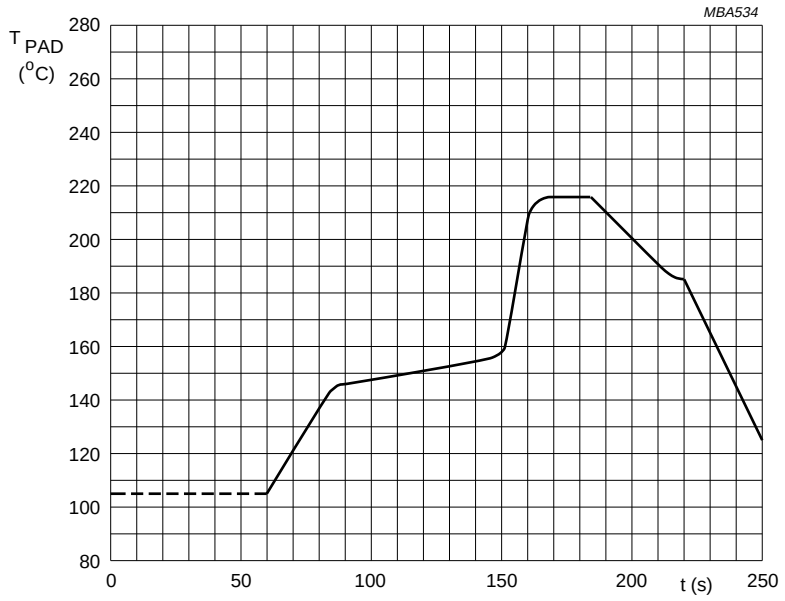


Fig.5 Maximum temperature load during vapour phase reflow soldering.

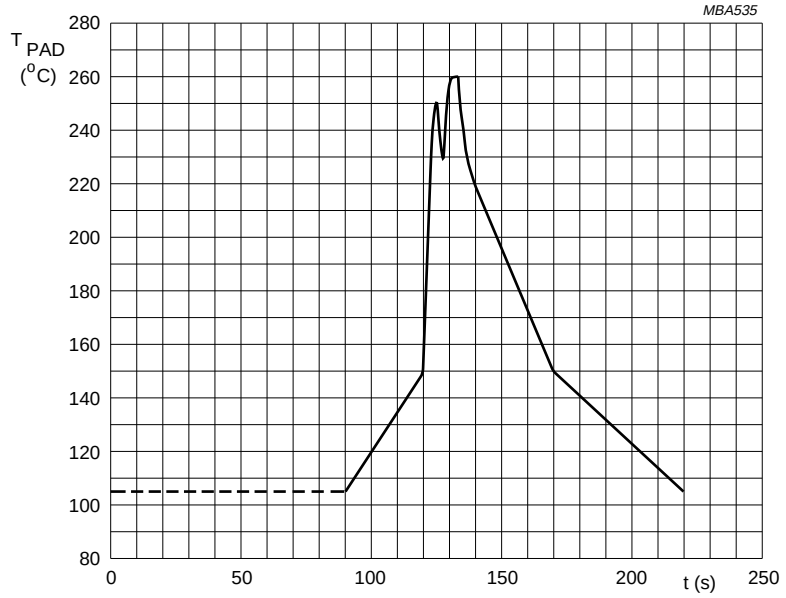


Fig.6 Maximum temperature load during (double-) wave soldering.

ELECTRICAL DATA AND ORDERING INFORMATION

Unless otherwise specified, all electrical values in Table 4 apply at T_{amb} = 20 °C, P = 86 to 106 kPa, RH = 45 to 75%.

SYMBOL	DESCRIPTION
C_R	rated capacitance at 100 Hz, tolerance ±20%
I_R	rated RMS ripple current at 100 Hz,105 °C
I_{L1}	max. leakage current after 1 minute at U_R
I_{L5}	max. leakage current after 5 minutes at U_R
Tan δ	max. dissipation factor at 100 Hz
ESR	equivalent series resistance at 100 Hz (calculated from tan δ_{max} and C_R)
Z	max. impedance at 10 kHz

Ordering example

Electrolytic capacitor CLL 139

100 μF/16 V; ±20%

Nominal case size:
14.3 × 7.6 × 8.2 mm; taped on reel

Catalogue number: 2222 139 65101.

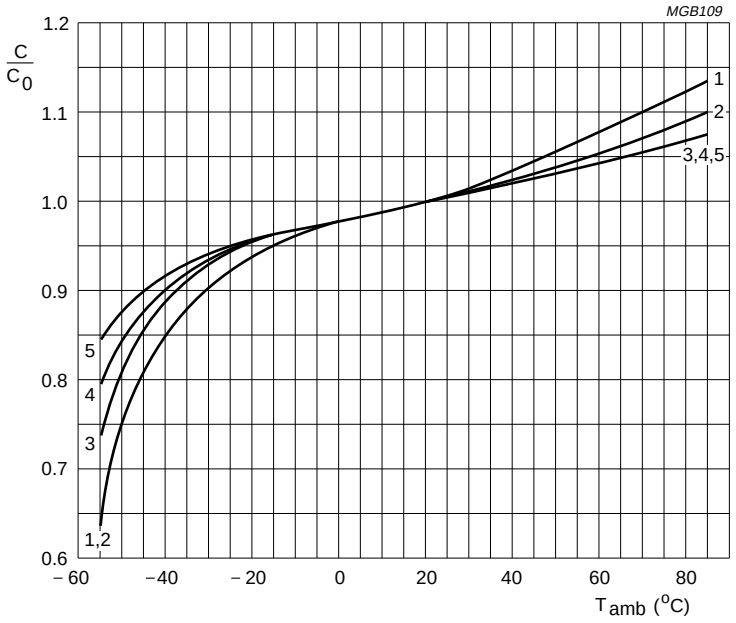
Table 4 Electrical data and ordering information; preferred types in **bold**

U_R (V)	C_R 100 Hz (μF)	NOMINAL CASE SIZE L × W × H (mm)	CASE CODE	I_R 100 Hz 105 °C (mA)	I_{L1} 1 min (μA)	I_{L5} 5 min (μA)	Tan δ 100 Hz	ESR 100 Hz (Ω)	Z 10 kHz (Ω)	CATALOGUE NUMBER 2222 ... .
6.3	**100**	**14.3 × 6.2 × 6.9**	**2**	79	16	4.3	0.24	3.8	3.0	**139 63101**
	220	**14.3 × 7.6 × 8.2**	**3**	120	32	5.8	0.24	1.7	1.4	**139 63221**
10	68	14.3 × 6.2 × 6.9	2	71	17	4.4	0.20	4.7	2.9	139 64689
	150	14.3 × 7.6 × 8.2	3	110	33	6.0	0.20	2.1	1.3	139 64151
16	**47**	**14.3 × 6.2 × 6.9**	**2**	66	18	4.5	0.16	5.4	3.4	**139 65479**
	100	**14.3 × 7.6 × 8.2**	**3**	100	35	6.2	0.16	2.5	1.6	**139 65101**
25	10	14.3 × 6.2 × 6.9	2	40	8	3.5	0.09	14	12	139 66109
	22	**14.3 × 6.2 × 6.9**	**2**	48	14	4.1	0.14	10	5.5	**139 66229**
	33	**14.3 × 6.2 × 6.9**	**2**	59	19	4.7	0.14	6.8	3.7	**139 66339**
	47	**14.3 × 7.6 × 8.2**	**3**	79	27	5.4	0.14	4.7	2.6	**139 66479**
40	15	14.3 × 6.2 × 6.9	2	45	15	4.2	0.11	12	6	139 67159
	33	**14.3 × 7.6 × 8.2**	**3**	75	29	5.6	0.11	5.3	2.7	**139 67339**
50	**10**	**14.3 × 6.2 × 6.9**	**2**	40	13	4.0	0.09	14	7	**139 61109**
	15	14.3 × 7.6 × 8.2	3	56	18	4.5	0.09	9.5	4.7	139 61159
	22	**14.3 × 7.6 × 8.2**	**3**	67	25	5.2	0.09	6.5	3.2	**139 61229**
63	2.2	14.3 × 6.2 × 6.9	2	19	6	3.3	0.09	65	25	139 68228
	3.3	14.3 × 6.2 × 6.9	2	23	7	3.4	0.09	43	21	139 68338
	4.7	**14.3 × 6.2 × 6.9**	**2**	28	9	3.6	0.09	30	17	**139 68478**
	10	14.3 × 7.6 × 8.2	3	48	16	4.3	0.08	13	8	139 68109
100	**1.0**	**14.3 × 6.2 × 6.9**	**2**	12	5	3.2	0.09	140	55	**139 69108**
	2.2	**14.3 × 6.2 × 6.9**	**2**	19	7	3.4	0.09	65	29	**139 69228**
	3.3	14.3 × 7.6 × 8.2	3	27	10	3.7	0.08	39	17	139 69338
	4.7	**14.3 × 7.6 × 8.2**	**3**	33	12	3.9	0.08	27	11	**139 69478**

Additional electrical data

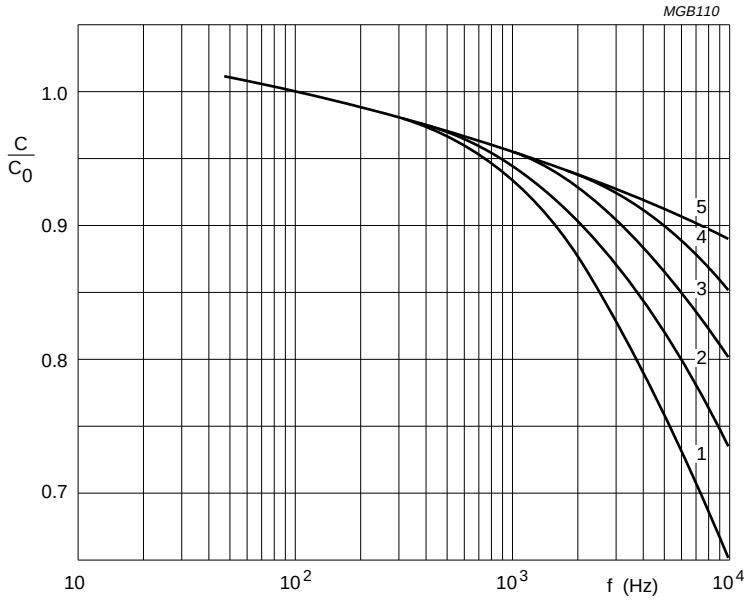
PARAMETER	CONDITIONS	VALUE
Voltage		
Surge voltage for short periods		$U_S \leq 1.15 \times U_R$
Reverse voltage		$U_{rev} \leq 1$ V
Current		
Leakage current	after 1 minute at U_R	$I_{L1} \leq 0.02C_R \times U_R + 3$ µA
	after 5 minutes at U_R	$I_{L5} \leq 0.002C_R \times U_R + 3$ µA
Inductance		
Equivalent series inductance (ESL)	nominal case size $14.3 \times 6.2 \times 6.9$ mm	typ. 18 nH
	nominal case size $14.3 \times 7.6 \times 8.2$ mm	typ. 28 nH

Capacitance (C)



Curve 1: 6.3 V.
Curve 2: 10 V.
Curve 3: 16 V.
Curve 4: 25 V.
Curve 5: 40 V to 100 V.
C_0 = capacitance at 20 °C, 100 Hz.

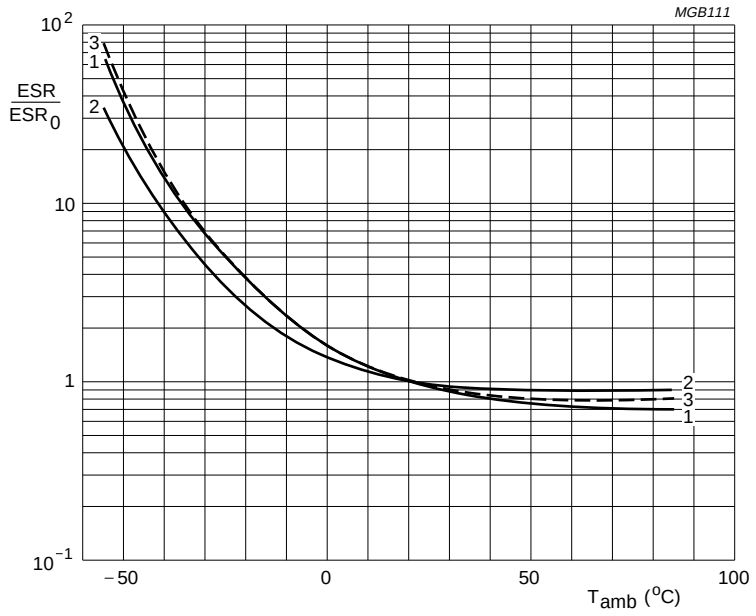
Fig.7 Typical multiplier of capacitance as a function of ambient temperature.



Curve 1: 6.3 V.
Curve 2: 10 V.
Curve 3: 16 V.
Curve 4: 25 V.
Curve 5: 40 V to 100 V.
C_0 = capacitance at 20 °C, 100 Hz.

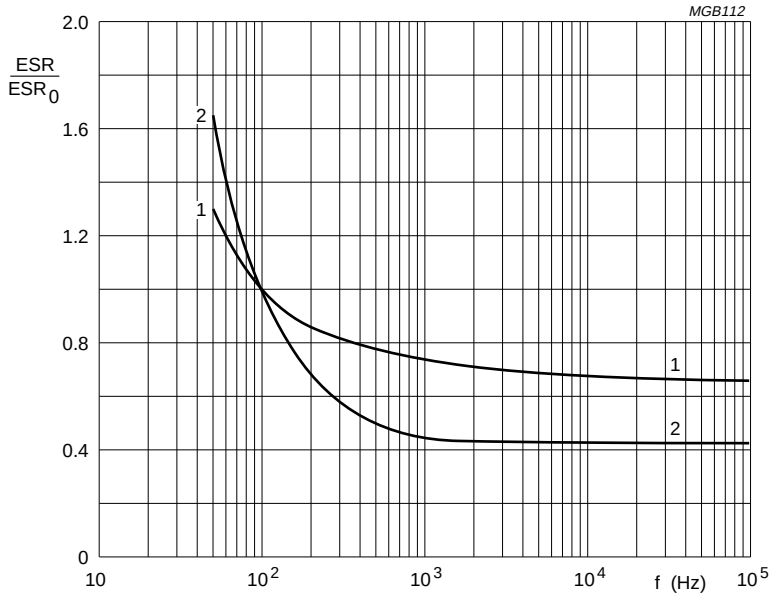
Fig.8 Typical multiplier of capacitance as a function of frequency.

Equivalent series resistance (ESR)



Curve 1: 6.3 V.
Curve 2: 40 V to 50 V.
Curve 3: 63 V to 100 V.
ESR_0 = typical at 20 °C, 100 Hz.

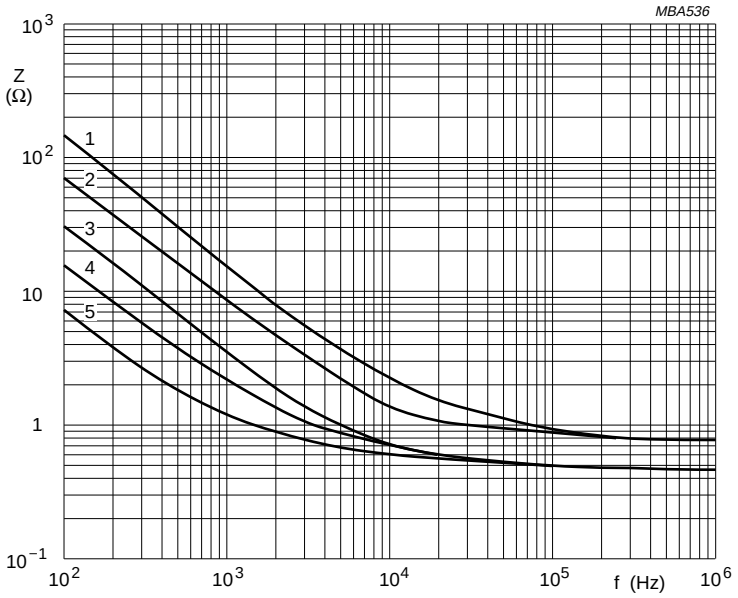
Fig.9 Typical multiplier of ESR as a function of ambient temperature.



Curve 1: 6.3 V.
Curve 2: 40 V to 50 V.
ESR_0 = typical at 20 °C, 100 Hz.

Fig.10 Typical multiplier of ESR as a function of frequency.

Impedance (Z)



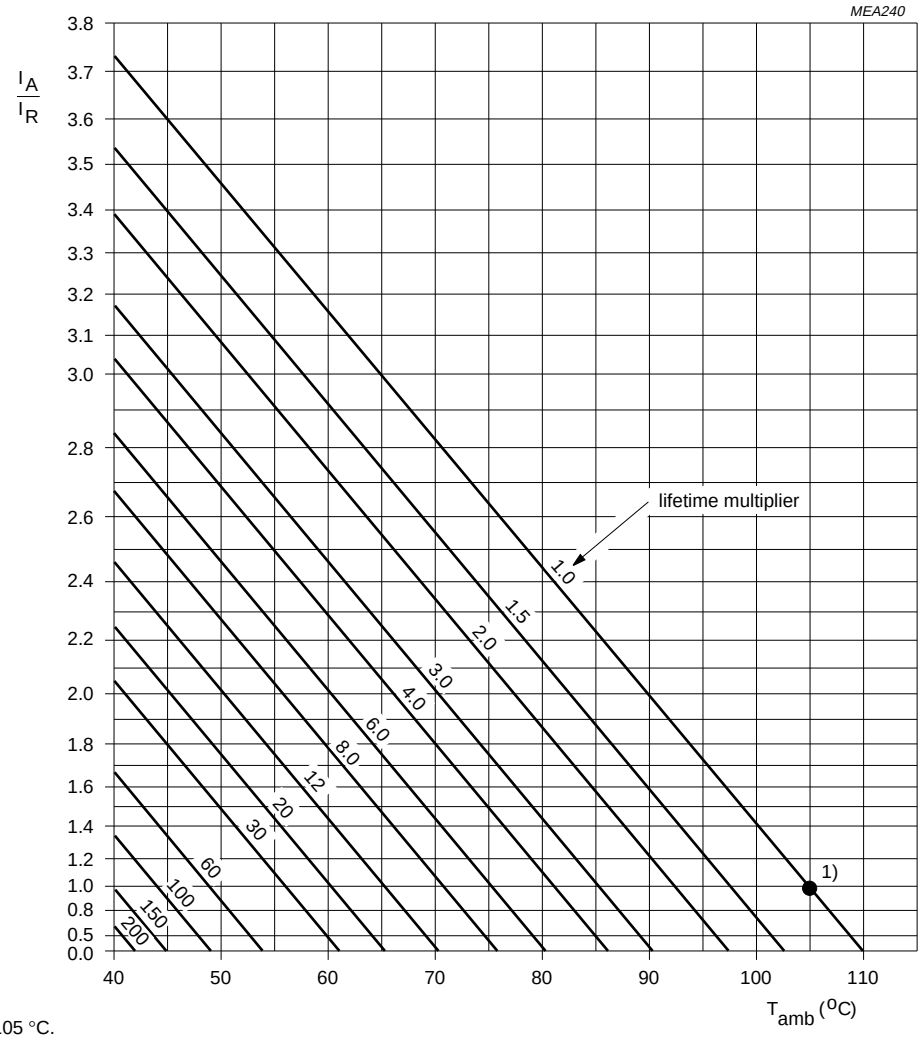
Curve 1: 10 μF, 50 V.
Curve 2: 22 μF, 25 V.
Curve 3: 47 μF, 25 V.
Curve 4: 100 μF, 16 V.
Curve 5: 220 μF, 6.3 V.
T_{amb} = 20 °C.

Fig.11 Typical impedance as a function of frequency.

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 50 V	U_R = 63 to 100 V
50	0.95	0.9	0.85
100	1.0	1.0	1.0
300	1.07	1.12	1.2
1000	1.12	1.2	1.3
3000	1.15	1.25	1.35
≥10000	1.2	1.3	1.4



I_A = actual ripple current at 100 Hz.
I_R = rated ripple current at 100 Hz, 105 °C.
(1) Useful life at 105 °C and I_R applied: 2000 hours.

Fig.12 Multiplier of useful life as a function of ambient temperature and ripple current load.

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**		
Mounting	IEC 384-18, subclause 4.3	shall be performed prior to tests mentioned below; reflow or (double-) wave soldering; for maximum temperature load refer to Chapter "Mounting"	$\Delta C/C$: ±5% tan $\delta \leq$ spec. limit $I_{L5} \leq$ spec limit
Endurance	IEC 384-18/ CECC 32300, subclause 4.15	T_{amb} = 105 °C; U_R applied; 1000 hours	$U_R \leq$ 6.3 V; $\Delta C/C$: +15/–30% U_R = 10 to 100 V; $\Delta C/C$: ±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} = 105 °C; U_R and I_R applied; 2000 hours	$U_R \leq$ 6.3 V; $\Delta C/C$: +45/–50% U_R = 10 to 100 V; $\Delta C/C$: ±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: ≤1%
Shelf life (storage at high temperature)	IEC 384-18/ CECC 32300, subclause 4.17	T_{amb} = 105 °C; no voltage applied; 500 hours after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	for requirements see 'Endurance' test above