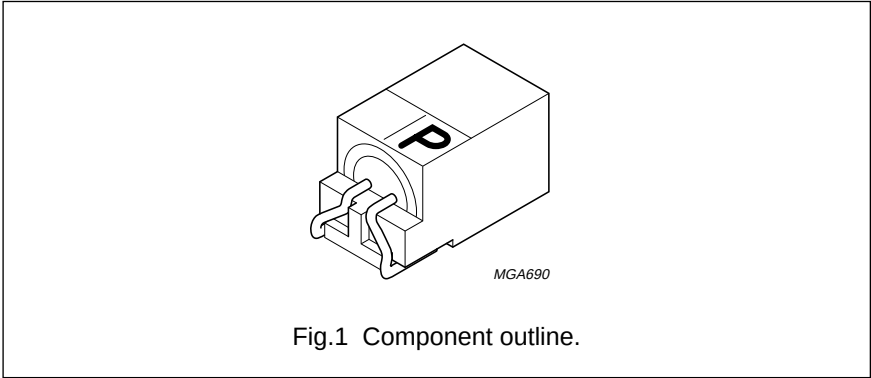


Non-solid Al - electrolytic capacitors
SMD (Chip) Low Profile

CLP 172

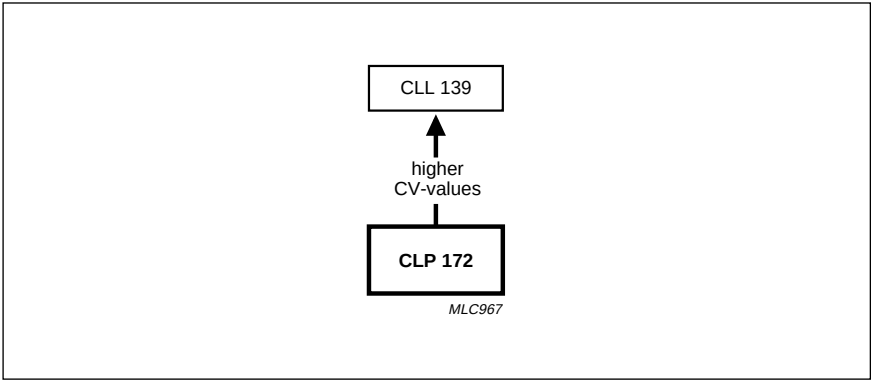
FEATURES

- Polarized aluminium electrolytic capacitors, non-solid, self healing
- SMD-version, for reflow soldering
- Miniaturized, high CV per unit volume, low height
- Charge and discharge proof, no peak current limitation
- Compact, rectangular shape
- Supplied in blister tape on reel.



APPLICATIONS

- SMD technology, boards/hybrids with restricted mounting height
- Coupling, decoupling, smoothing, filtering, buffering, timing
- Telecommunications, automotive, general industrial, low-profile and lightweight equipment.



QUICK REFERENCE DATA

DESCRIPTION	VALUE
Nominal case sizes (L × W × H in mm)	6.3 × 3.5 × 3.5 to 8.3 × 4.5 × 4.5
Rated capacitance range, C _R	1.0 to 33 μF
Tolerance on C _R	±20%
Rated voltage range, U _R	6.3 to 50 V
Category temperature range	−40 to +105 °C
Useful life at 105 °C	1000 hours
Useful life at 40 °C; 1.3 × I _R applied	100000 hours
Shelf life at 0 V, 105 °C	500 hours
Based on sectional specification	IEC 384-18/CECC 32300
Climatic category IEC 68 (DIN 40040)	40/105/56 (GMF)

Non-solid Al - electrolytic capacitors

SMD (Chip) Low Profile

CLP 172

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

Preferred types in **bold**.

C_R (mF)	U_R (V)					
	6.3	10	16	25	35	50
1.0	–	–	–	–	–	6.3 × 3.5 × 3.5
2.2	–	–	–	–	6.3 × 3.5 × 3.5	6.3 × 4.0 × 4.0
3.3	–	–	–	6.3 × 3.5 × 3.5	–	6.3 × 4.5 × 4.5
4.7	–	–	6.3 × 3.5 × 3.5	6.3 × 4.0 × 4.0	6.3 × 4.5 × 4.5	8.3 × 4.5 × 4.5
6.8	–	6.3 × 3.5 × 3.5	–	6.3 × 4.5 × 4.5	8.3 × 4.5 × 4.5	–
10	6.3 × 3.5 × 3.5	–	6.3 × 4.0 × 4.0	8.3 × 4.5 × 4.5	–	–
15	–	6.3 × 4.5 × 4.5	8.3 × 4.5 × 4.5	–	–	–
22	6.3 × 4.5 × 4.5	8.3 × 4.5 × 4.5	–	–	–	–
33	8.3 × 4.5 × 4.5	–	–	–	–	–

Non-solid Al - electrolytic capacitors

SMD (Chip) Low Profile

CLP 172

MECHANICAL DATA

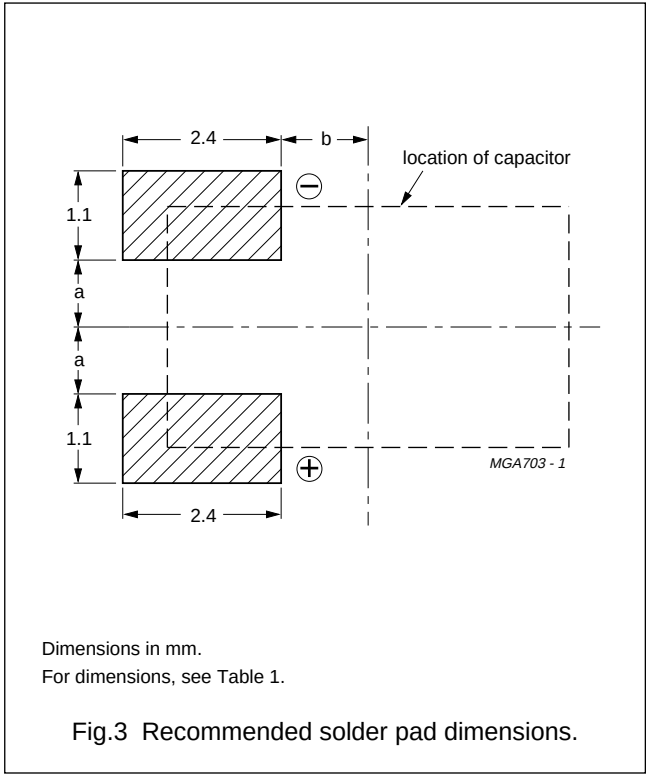
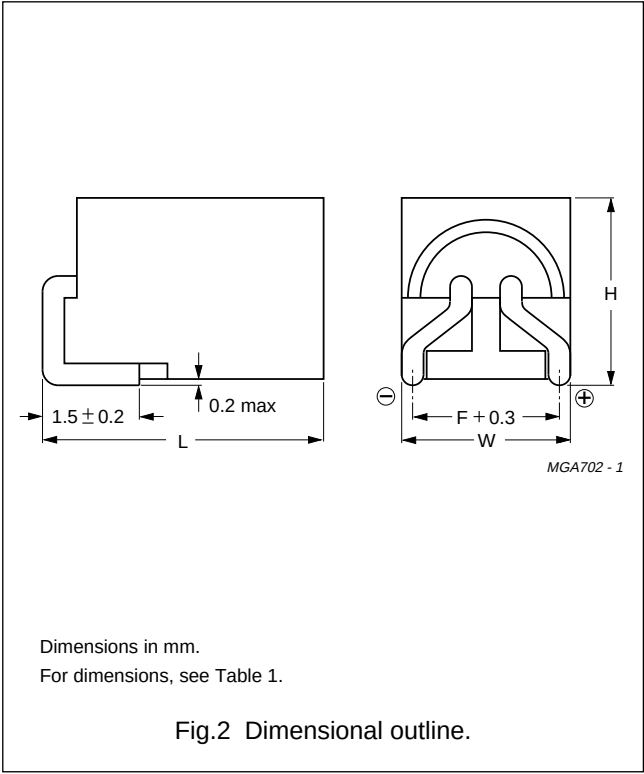


Table 1 Physical and recommended soldering pad dimensions, mass and packaging quantities; see Figs 2 and 3

NOMINAL CASE SIZE L × W × H (mm)	CASE CODE	L _{max} (mm)	W _{max} (mm)	H _{max} (mm)	F (mm)	a (mm)	b (mm)	MASS (g)	PACKAGING QUANTITIES PER REEL
6.3 × 3.5 × 3.5	63	6.5	3.8	3.7	3.0	1.0	1.2	≈0.13	3000
6.3 × 4.0 × 4.0	64	6.5	4.3	4.2	3.5	1.3	1.2	≈0.17	2500
6.3 × 4.5 × 4.5	65	6.5	4.8	4.7	4.0	1.5	1.2	≈0.20	2500
8.3 × 4.5 × 4.5	85	8.5	4.8	4.7	4.0	1.5	2.2	≈0.25	2500

Non-solid Al - electrolytic capacitors

SMD (Chip) Low Profile

CLP 172

MARKING

- Rated capacitance (in μF)
 - special capacitance markings:
 $R2 = 0.22 \mu\text{F}$
 $R4 = 0.47 \mu\text{F}$
- Rated voltage
- Name of manufacturer
(P for PHILIPS)
- “–” sign indicating the cathode terminal.

MOUNTING

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

Optimum dimensions of soldering pads are dependent upon soldering method, mounting accuracy, print lay-out and/or adjacent components.

For recommended pad dimensions, refer to Fig.3 and Table 1.

Soldering

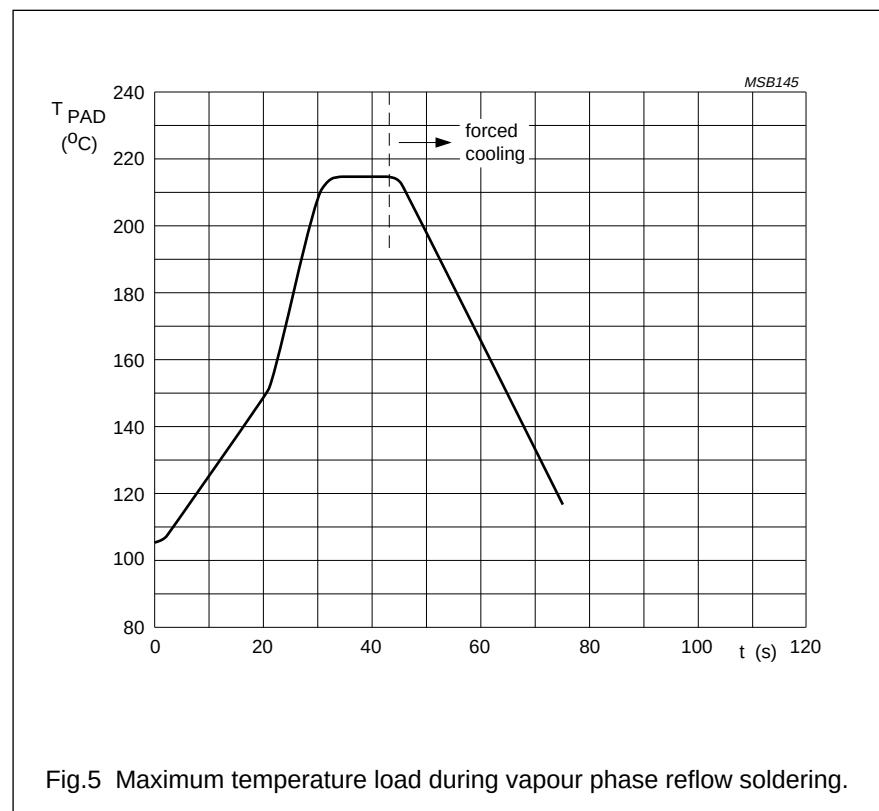
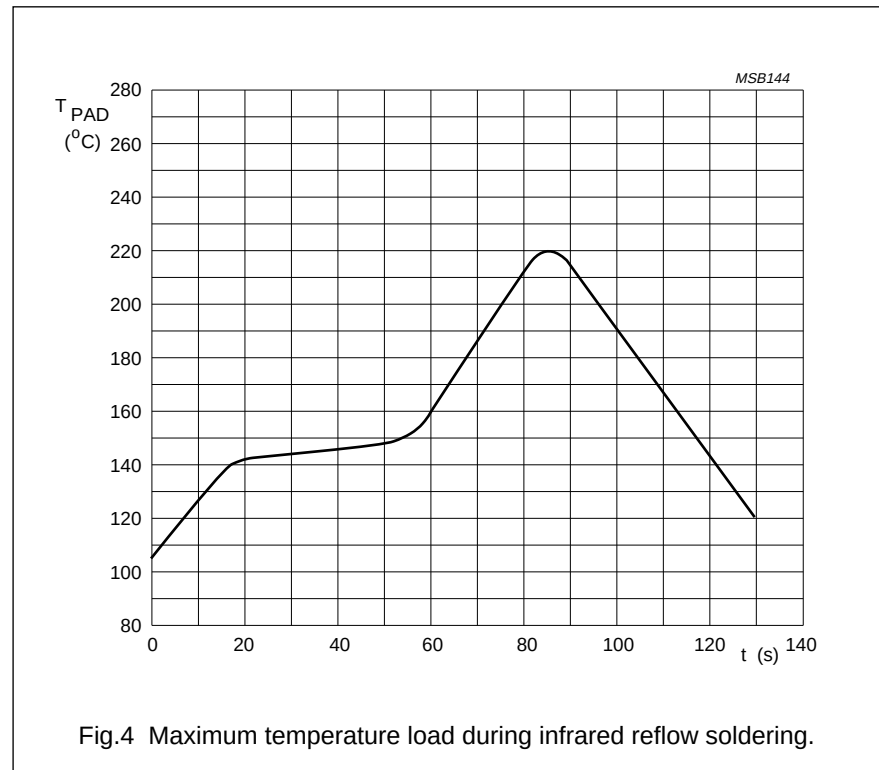
Soldering conditions are defined by the curve, temperature as a function of time. The temperature is that measured on the soldering pad during processing.

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

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



Non-solid Al - electrolytic capacitors

SMD (Chip) Low Profile

CLP 172

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 120 Hz, tolerance $\pm 20\%$
I_R	rated RMS ripple current at 120 Hz, 105 °C
I_{L2}	max. leakage current after 2 minutes at U_R
$\tan \delta$	max. dissipation factor at 120 Hz
ESR	equivalent series resistance at 120 Hz (calculated from $\tan \delta_{max}$ and C_R)

Ordering example

Electrolytic capacitor CLP 172

10 μF /16 V; $\pm 20\%$

Nominal case size:

6.3 $\times$ 4.0 $\times$ 4.0 mm; taped on reel

Catalogue number: 2222 172 65109

Table 2 Electrical data and ordering information; preferred types in **bold**

U_R (V)	C_R 120 Hz (μF)	NOMINAL CASE SIZE L $\times$ W $\times$ H (mm)	CASE CODE	I_R 120 Hz 105 °C (mA)	I_{L2} 2 min (μA)	$\tan \delta$ 120 Hz	ESR 120 Hz (Ω)	CATALOGUE NUMBER 2222
6.3	10	6.3 $\times$ 3.5 $\times$ 3.5	63	11	3	0.38	50	172 63109
	22	6.3 $\times$ 4.5 $\times$ 4.5	65	20	3	0.32	19	172 63229
	33	8.3 $\times$ 4.5 $\times$ 4.5	85	27	3	0.32	13	172 63339
10	6.8	6.3 $\times$ 3.5 $\times$ 3.5	63	10	3	0.30	59	172 64688
	15	6.3 $\times$ 4.5 $\times$ 4.5	65	19	3	0.28	25	172 64159
	22	8.3 $\times$ 4.5 $\times$ 4.5	85	25	3	0.28	17	172 64229
16	4.7	6.3 $\times$ 3.5 $\times$ 3.5	63	9	3	0.24	68	172 65478
	10	6.3 $\times$ 4.0 $\times$ 4.0	64	14	3	0.24	32	172 65109
	15	8.3 $\times$ 4.5 $\times$ 4.5	85	23	3	0.24	21	172 65159
25	3.3	6.3 $\times$ 3.5 $\times$ 3.5	63	8.3	3	0.18	72	172 66338
	4.7	6.3 $\times$ 4.0 $\times$ 4.0	64	11	3	0.18	51	172 66478
	6.8	6.3 $\times$ 4.5 $\times$ 4.5	65	16	3	0.16	31	172 66688
	10	8.3 $\times$ 4.5 $\times$ 4.5	85	21	3	0.16	21	172 66109
35	2.2	6.3 $\times$ 3.5 $\times$ 3.5	63	7.2	3	0.16	96	172 60228
	4.7	6.3 $\times$ 4.5 $\times$ 4.5	65	14	3	0.14	40	172 60478
	6.8	8.3 $\times$ 4.5 $\times$ 4.5	85	18	3	0.14	27	172 60688
50	1.0	6.3 $\times$ 3.5 $\times$ 3.5	63	5.2	3	0.14	190	172 61108
	2.2	6.3 $\times$ 4.0 $\times$ 4.0	64	8.4	3	0.14	84	172 61228
	3.3	6.3 $\times$ 4.5 $\times$ 4.5	65	13	3	0.12	48	172 61338
	4.7	8.3 $\times$ 4.5 $\times$ 4.5	85	16	3	0.12	34	172 61478

Non-solid Al - electrolytic capacitors

SMD (Chip) Low Profile

CLP 172

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	$I_{L2} \leq 0.01 C_R \times U_R$ or $3 \mu\text{A}$, whichever is greater

Impedance (Z)**Table 3** Ratio of impedance at 120 Hz, between -25 and $+20$ °C

NOMINAL CASE SIZE $L \times W \times H$ (mm)	$Z_{-25\text{ °C}}/Z_{+20\text{ °C}}$ at U_R					
	6.3 V	10 V	16 V	25 V	35 V	50 V
$6.3 \times 3.5 \times 3.5$	6	4	3	2	2	2
$6.3 \times 4.0 \times 4.0$						
$6.3 \times 4.5 \times 4.5$	4	3	2	2	2	2
$8.3 \times 4.5 \times 4.5$						

Table 4 Ratio of impedance at 120 Hz, between -40 and $+20$ °C

NOMINAL CASE SIZE $L \times W \times H$ (mm)	$Z_{-40\text{ °C}}/Z_{+20\text{ °C}}$ at U_R					
	6.3 V	10 V	16 V	25 V	35 V	50 V
$6.3 \times 3.5 \times 3.5$	12	9	7	5	4	4
$6.3 \times 4.0 \times 4.0$						
$6.3 \times 4.5 \times 4.5$	10	8	6	4	3	3
$8.3 \times 4.5 \times 4.5$						

Non-solid Al - electrolytic capacitors

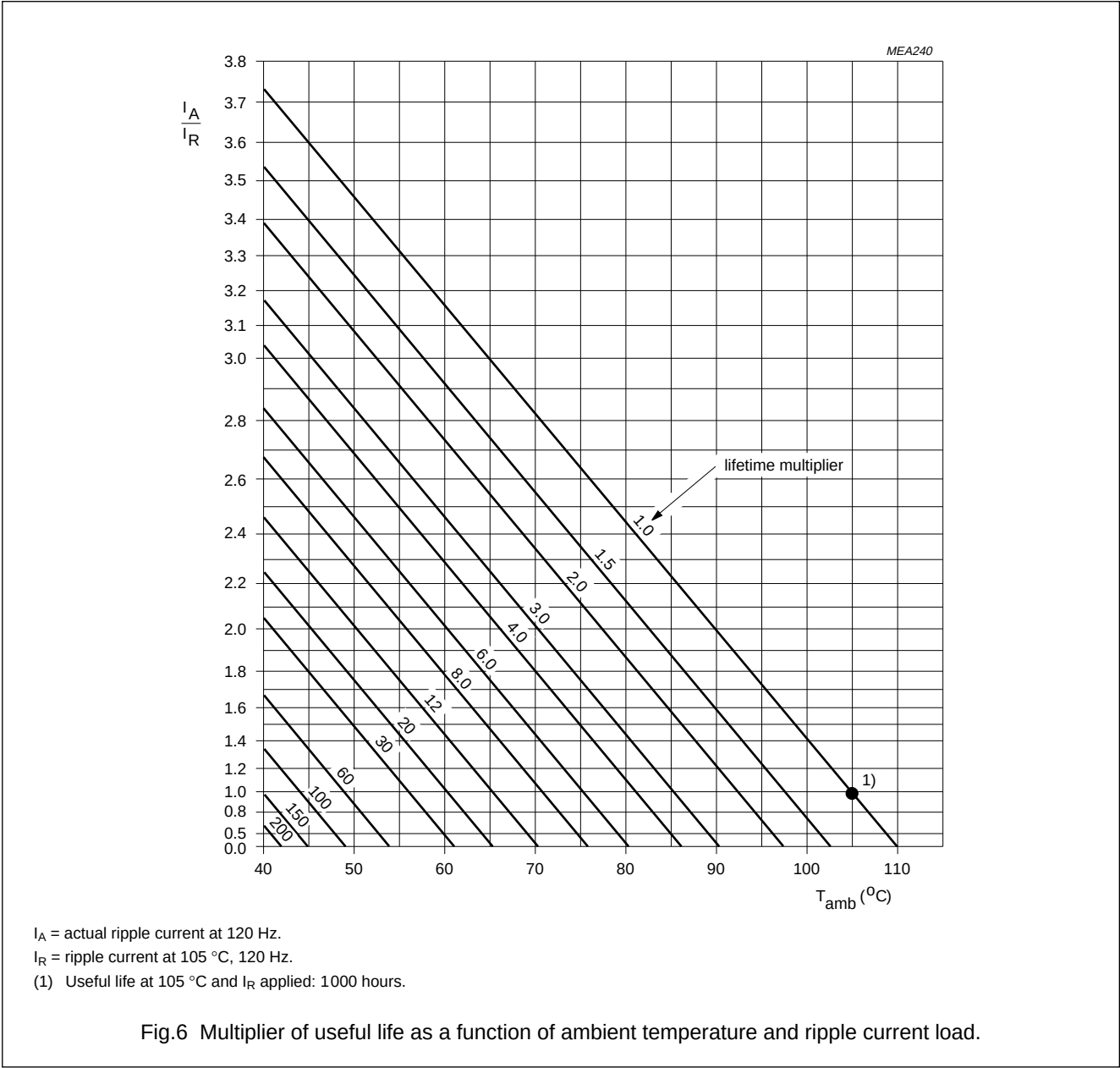
SMD (Chip) Low Profile

CLP 172

RIPPLE CURRENT AND USEFUL LIFE

Table 5 Multiplier of ripple current (I_R) as a function of frequency

FREQUENCY (Hz)	I_R MULTIPLIER
50	0.6
120	1.0
400	1.2
800	1.3
≥ 2000	1.4



Non-solid Al - electrolytic capacitors

SMD (Chip) Low Profile

CLP 172

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 'Useful life' and 'Shelf life' as mentioned below; reflow soldering; for maximum temperature load refer to Chapter "Mounting"	$\Delta C/C: \pm 8\%$ $\tan \delta \leq \text{spec. limit}$ $I_{L2} \leq 2 \times \text{spec. limit}$
Useful life	CECC 30301, subclause 1.8.1	$T_{\text{amb}} = 105\text{ }^{\circ}\text{C}$; U_R and I_R applied; 1000 hours	$\Delta C/C$: case codes 63 and 64: $\pm 25\%$ case codes 65 and 85: $\pm 20\%$ $\tan \delta \leq 2 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$ no short or open circuit total failure percentage: $\leq 1\%$
Shelf life (storage at high temperature)	IEC 384-18/ CECC 32300, subclause 4.17	$T_{\text{amb}} = 105\text{ }^{\circ}\text{C}$; no voltage applied; 500 hours; after test: U_R to be applied for 30 minutes, 24 to 48 hours before measurement	$\Delta C/C$: case codes 63 and 64: $\pm 25\%$ case codes 65 and 85: $\pm 15\%$ $\tan \delta$: case codes 63 and 64: $\leq 2 \times \text{spec. limit}$ case codes 65 and 85: $\leq 1.5 \times \text{spec. limit}$ $I_{L2} \leq \text{spec. limit}$