

**General-purpose grade capacitors**

**Applications**

- For general-purpose applications in the entertainment industry

**Features**

- RoHS-compatible
- Load life of 2000 hours at 105 °C
- Wide temperature range (–55 °C ... +105 °C)

**Construction**

- Surface mounting device
- Minus pole marking on the case

**Delivery mode**

- Taped and reeled

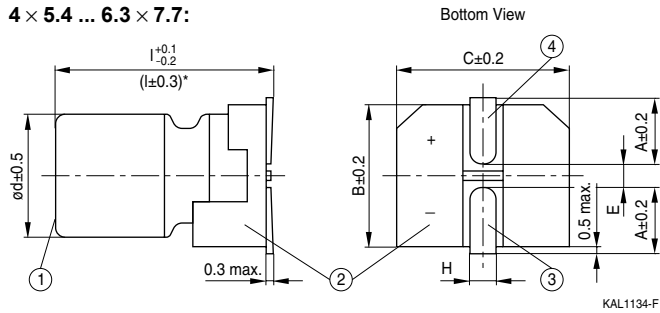
**Specifications and characteristics in brief**

Rated voltage $V_R$	4 ... 50 V DC							
Operating temperature range	–55 °C ... +105 °C							
Rated capacitance $C_R$ (20 °C, 120 Hz)	0.1 ... 1500 $\mu$ F							
Capacitance tolerance	$\pm 20\% \triangleq M$							
Load life (105 °C, $V_R$ )	2000 h	Requirements: $\Delta C/C \leq \pm 20\%$ of initial value ( $\leq 16$ V: within $\pm 25\%$ of the initial value) $\tan \delta \leq 2$ times initial specified limit $I_{leak} \leq$ initial specified limit						
Leakage current $I_{leak}$ (20 °C, after 2 minutes)	$I_{leak} \leq 0.01 \mu A \cdot \left( \frac{C_R}{\mu F} \cdot \frac{V_R}{V} \right)$ or 3 $\mu A$ , whichever is greater							
Low temperature stability (impedance ratio) (120 Hz)	$V_R$ (V DC)	4	6.3	10	16	25	35	50
	$\frac{Z(-25 \text{ °C})}{Z(+20 \text{ °C})}$	7	4	3	2	2	2	2
	$\frac{Z(-40 \text{ °C})}{Z(+20 \text{ °C})}$	15	8	8	4	4	3	3
Shelf life	After storage for 1000 h at 105 °C, the capacitors shall meet the requirement of load life test after reforming process. After test: $V_R$ to be applied for 30 minutes, 24 to 48 hours before measurement.							
Frequency multiplier for rated ripple current	50 Hz	120 Hz	300 Hz		1 kHz	$\geq 10$ kHz		
	0.70	1.00	1.17		1.36	1.50		

**Dimensional drawing**

**d × l (mm)**

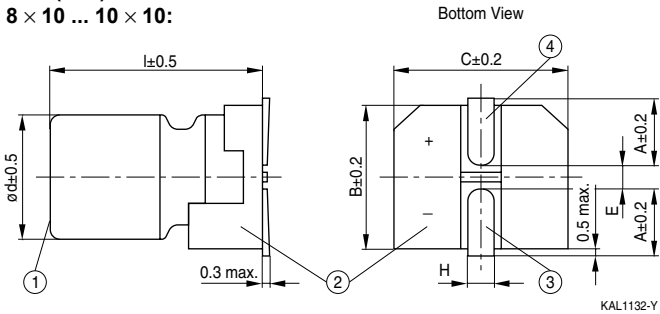
**4 × 5.4 ... 6.3 × 7.7:**



\* Applies to 6.3 × 5.8 mm and 6.3 × 7.7 mm

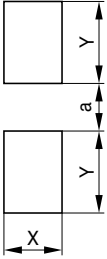
**d × l (mm)**

**8 × 10 ... 10 × 10:**



①	Case
②	Terminal base board
③	Minus pole
④	Plus pole

Case dimensions d × l (mm)	4 × 5.4	5 × 5.4	6.3 × 5.4	6.3 × 5.8	6.3 × 7.7	8 × 10	10 × 10
A	1.8	2.1	2.4	2.4	2.4	2.9	3.2
B	4.3	5.3	6.6	6.6	6.6	8.3	10.3
C	4.3	5.3	6.6	6.6	6.6	8.3	10.3
E	1.0	1.3	2.2	2.2	2.2	3.1	4.5
H	0.5 ... 0.8					0.8 ... 1.1	

**Layout recommendation**


KAL1109-Z

$d \times l$ (mm)	X	Y	a
$4.0 \times 5.4$	1.6	2.6	1.0
$5.0 \times 5.4$	1.6	3.0	1.4
$6.3 \times 5.4$	1.6	3.5	2.1
$6.3 \times 5.8$	1.6	3.5	2.1
$6.3 \times 7.7$	1.6	3.5	2.1
$8.0 \times 10.0$	2.5	3.5	3.0
$10.0 \times 10.0$	2.5	4.0	4.0

**Overview of available types**

V <sub>R</sub> (V DC)	4	6.3	10	16	25	35	50
	Case dimensions d × l (mm)						
C <sub>R</sub> (μF)							
0.1							4 × 5.4
0.22							4 × 5.4
0.33							4 × 5.4
0.47							4 × 5.4
1.0							4 × 5.4
2.2						4 × 5.4	4 × 5.4
3.3						4 × 5.4	4 × 5.4
4.7					4 × 5.4	4 × 5.4	5 × 5.4
10				4 × 5.4	5 × 5.4	5 × 5.4	6.3 × 5.4 6.3 × 5.8
22	4 × 5.4	4 × 5.4	5 × 5.4	5 × 5.4	6.3 × 5.4	6.3 × 5.4 6.3 × 5.8	6.3 × 7.7
33	5 × 5.4	5 × 5.4	5 × 5.4	6.3 × 5.4	6.3 × 5.4 6.3 × 5.8	6.3 × 7.7	6.3 × 7.7
47	5 × 5.4	5 × 5.4	6.3 × 5.4	6.3 × 5.4	6.3 × 7.7	6.3 × 7.7	6.3 × 7.7
100	6.3 × 5.4 6.3 × 5.8	6.3 × 5.4 6.3 × 5.8	6.3 × 5.4 6.3 × 5.8	6.3 × 5.4 6.3 × 5.8	6.3 × 7.7	6.3 × 7.7	8 × 10
150	6.3 × 7.7	6.3 × 7.7	6.3 × 7.7	6.3 × 7.7	8 × 10	8 × 10	10 × 10
220	6.3 × 7.7	6.3 × 7.7	6.3 × 7.7	6.3 × 7.7	8 × 10	8 × 10	10 × 10
330	6.3 × 7.7	6.3 × 7.7	8 × 10	8 × 10	8 × 10	10 × 10	
470	8 × 10	8 × 10	8 × 10	8 × 10	10 × 10		
680	8 × 10	8 × 10	10 × 10	10 × 10			
1000	8 × 10	8 × 10	10 × 10				
1500	10 × 10	10 × 10					

**Technical data and ordering codes**

$V_R$	$C_R$ 120 Hz 20 °C	Case dimensions d × l mm	$\tan \delta_{\max}$ 120 Hz 20 °C	$I_{AC,R}$ 120 Hz 105 °C mA	Ordering code
V DC	μF				
4	22	4 × 5.4	0.40	22	B41124A1226M000
	33	5 × 5.4	0.40	30	B41124A1336M000
	47	5 × 5.4	0.40	36	B41124A1476M000
	100	6.3 × 5.4	0.40	60	B41124A1107M000
	100	6.3 × 5.8	0.40	62	B41124B1107M000
	150	6.3 × 7.7	0.40	86	B41124A1157M000
	220	6.3 × 7.7	0.40	102	B41124A1227M000
	330	6.3 × 7.7	0.40	105	B41124A1337M000
	470	8 × 10	0.40	210	B41124A1477M000
	680	8 × 10	0.40	210	B41124A1687M000
	1000	8 × 10	0.40	230	B41124A1108M000
	1500	10 × 10	0.40	310	B41124A1158M000
	6.3	22	4 × 5.4	0.30	22
33		5 × 5.4	0.30	30	B41124A2336M000
47		5 × 5.4	0.30	36	B41124A2476M000
100		6.3 × 5.4	0.30	60	B41124A2107M000
100		6.3 × 5.8	0.30	62	B41124B2107M000
150		6.3 × 7.7	0.30	86	B41124A2157M000
220		6.3 × 7.7	0.30	102	B41124A2227M000
330		6.3 × 7.7	0.30	105	B41124A2337M000
470		8 × 10	0.30	210	B41124A2477M000
680		8 × 10	0.30	210	B41124A2687M000
1000		8 × 10	0.30	230	B41124A2108M000
1500		10 × 10	0.30	310	B41124A2158M000
10		22	5 × 5.4	0.24	27
	33	5 × 5.4	0.24	35	B41124A3336M000
	47	6.3 × 5.4	0.24	46	B41124A3476M000
	100	6.3 × 5.4	0.24	60	B41124A3107M000
	100	6.3 × 5.8	0.24	62	B41124B3107M000
	150	6.3 × 7.7	0.24	86	B41124A3157M000
	220	6.3 × 7.7	0.24	105	B41124A3227M000
	330	8 × 10	0.24	195	B41124A3337M000
	470	8 × 10	0.24	210	B41124A3477M000
	680	10 × 10	0.24	310	B41124A3687M000
	1000	10 × 10	0.24	310	B41124A3108M000

**Technical data and ordering codes**

$V_R$	$C_R$ 120 Hz 20 °C	Case dimensions d × l mm	$\tan \delta_{max}$ 120 Hz 20 °C	$I_{AC,R}$ 120 Hz 105 °C mA	Ordering code
V DC	$\mu F$				
16	10	4 × 5.4	0.20	18	B41124A4106M000
	22	5 × 5.4	0.20	30	B41124A4226M000
	33	6.3 × 5.4	0.20	40	B41124A4336M000
	47	6.3 × 5.4	0.20	50	B41124A4476M000
	100	6.3 × 5.4	0.20	60	B41124A4107M000
	100	6.3 × 5.8	0.20	62	B41124B4107M000
	150	6.3 × 7.7	0.20	95	B41124A4157M000
	220	6.3 × 7.7	0.20	105	B41124A4227M000
	330	8 × 10	0.20	195	B41124A4337M000
	470	8 × 10	0.20	230	B41124A4477M000
	680	10 × 10	0.20	310	B41124A4687M000
25	4.7	4 × 5.4	0.16	13	B41124A5475M000
	10	5 × 5.4	0.16	23	B41124A5106M000
	22	6.3 × 5.4	0.16	38	B41124A5226M000
	33	6.3 × 5.4	0.16	48	B41124A5336M000
	33	6.3 × 5.8	0.16	49	B41124B5336M000
	47	6.3 × 7.7	0.16	66	B41124A5476M000
	100	6.3 × 7.7	0.16	91	B41124A5107M000
	150	8 × 10	0.16	140	B41124A5157M000
	220	8 × 10	0.16	155	B41124A5227M000
	330	8 × 10	0.16	190	B41124A5337M000
	470	10 × 10	0.16	300	B41124A5477M000
35	2.2	4 × 5.4	0.14	7.5	B41124A7225M000
	3.3	4 × 5.4	0.14	9.0	B41124A7335M000
	4.7	4 × 5.4	0.14	15	B41124A7475M000
	10	5 × 5.4	0.14	25	B41124A7106M000
	22	6.3 × 5.4	0.14	42	B41124A7226M000
	22	6.3 × 5.8	0.14	43	B41124B7226M000
	33	6.3 × 7.7	0.14	59	B41124A7336M000
	47	6.3 × 7.7	0.14	63	B41124A7476M000
	100	6.3 × 7.7	0.14	84	B41124A7107M000
	150	8 × 10	0.14	155	B41124A7157M000
	220	8 × 10	0.14	190	B41124A7227M000
	330	10 × 10	0.14	300	B41124A7337M000

**Technical data and ordering codes**

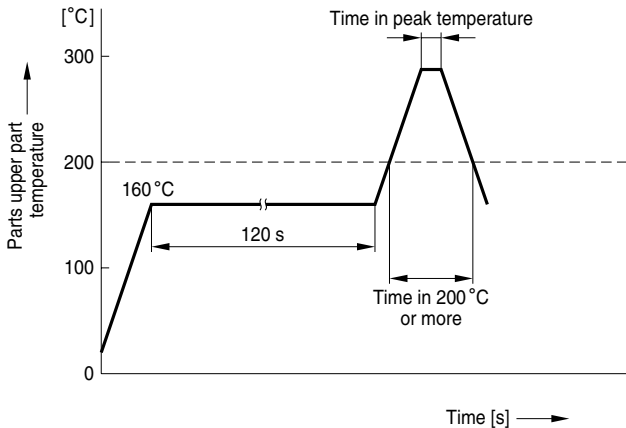
$V_R$	$C_R$ 120 Hz 20 °C V DC $\mu\text{F}$	Case dimensions $d \times l$ mm	$\tan \delta_{\max}$ 120 Hz 20 °C	$I_{AC,R}$ 120 Hz 105 °C mA	Ordering code
50	0.1	4 × 5.4	0.14	1.0	B41124A6104M000
	0.22	4 × 5.4	0.14	2.6	B41124A6224M000
	0.33	4 × 5.4	0.14	3.2	B41124A6334M000
	0.47	4 × 5.4	0.14	3.8	B41124A6474M000
	1.0	4 × 5.4	0.14	6.3	B41124A6105M000
	2.2	4 × 5.4	0.14	11	B41124A6225M000
	3.3	4 × 5.4	0.14	14	B41124A6335M000
	4.7	5 × 5.4	0.14	19	B41124A6475M000
	10	6.3 × 5.4	0.14	30	B41124A6106M000
	10	6.3 × 5.8	0.14	31	B41124B6106M000
	22	6.3 × 7.7	0.14	51	B41124A6226M000
	33	6.3 × 7.7	0.14	60	B41124A6336M000
	47	6.3 × 7.7	0.14	63	B41124A6476M000
	100	8 × 10	0.14	140	B41124A6107M000
	150	10 × 10	0.14	180	B41124A6157M000
	220	10 × 10	0.14	220	B41124A6227M000

## Soldering

### Recommended conditions

For reflow, use thermal conduction systems such as infrared radiation (IR) or hot blast. Vapor heat transfer systems (VPS) are not recommended.

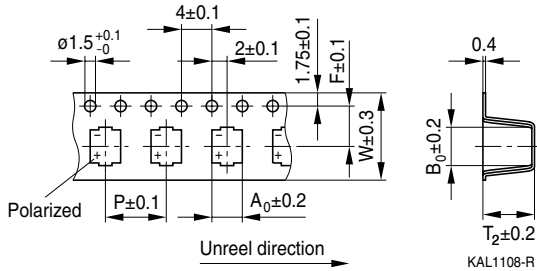
- Observe proper soldering conditions (temperature, time, etc.).
- Do not exceed the specified limits.
- Temperature measuring method: Measure temperature in assuming quantitative production, by sticking the thermo-couple to the capacitor upper part with epoxy adhesives.
- Consult use for additional reflow restrictions.



### Lead-free reflow

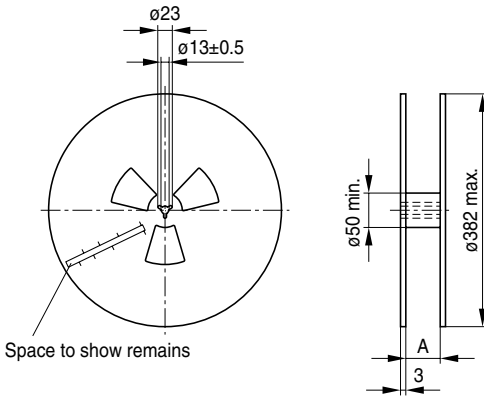
d (mm)	4 ... 6.3	8 ... 10
Peak temperature	250 °C	235 °C
Time in peak temperature	5 s	5 s
Time in 200 °C or more	60 s	60 s
Time of reflow	1 time	1 time



**Taping of SMD capacitors**


Case dimensions $d \times l$ (mm)	4 × 5.4	4 × 5.8	5 × 5.4	5 × 5.8	6.3 × 5.4
W	12.0	12.0	12.0	12.0	16.0
P	8.0	8.0	12.0	12.0	12.0
F	5.5	5.5	5.5	5.5	7.5
$A_0$	5.0	5.0	6.0	6.0	7.0
$B_0$	5.0	5.0	6.0	6.0	7.0
$T_2$	5.8	6.3	5.8	6.3	5.8

Case dimensions $d \times l$ (mm)	6.3 × 5.8	6.3 × 7.7	8 × 6.2	8 × 10	10 × 10
W	16.0	16.0	16.0	24.0	24.0
P	12.0	12.0	12.0	16.0	16.0
F	7.5	7.5	7.5	11.5	11.5
$A_0$	7.0	7.0	8.7	8.7	10.7
$B_0$	7.0	7.0	8.7	8.7	10.7
$T_2$	6.3	8.2	6.8	11.0	11.0

**Reel packing**


KAL1110-3

Capacitor dimensions $d \times l$ (mm)	Quantity per reel pcs.
$4 \times l$	2000 pcs.
$5 \times l, 6.3 \times l, 8 \times 6.2$	1000 pcs.
$8 \times 10, 10 \times l$	500 pcs.

$d \times l$ (mm)	$4 \times l, 5 \times l$	$6.3 \times l, 8 \times 6.2$	$8 \times 10, 10 \times l$
A	14	18	26

## Cautions and warnings

### General

Also see "Important notes" on page 14.

- 1 Aluminum electrolytic capacitors have a bi-polar structure. This is marked on the body of the capacitor. A capacitor must not be mounted with reversed polarity. The application of an AC or reverse voltage may cause a short circuit or damage the capacitor. Bi-polar capacitors must not be used in AC applications, where the polarity may be reversed in the circuits or is unknown.
- 2 The DC voltage applied to the capacitor terminal must not exceed its rated operating voltage, as this will result in a rapid increase of the leakage current and may damage the capacitor. It is recommended to operate the capacitor at 70–80% of its rated voltage to optimize its service life.
- 3 The ripple current applied to the capacitor must be within the permitted range. An excessive ripple current leads to impaired electrical properties and may damage the capacitor. Note that the sum of the peak values of the ripple voltage and the DC operating voltage must not exceed the rated DC voltage.
- 4 Capacitors must be used within their permitted range of operating temperature. Operation at room temperature optimizes their service life.
- 5 Capacitors with case diameter  $\geq 8$  mm are equipped with a safety vent. In capacitors fitted with a lead or soldering lug, the safety vent is usually located at the base of the case. It needs sufficient space around it to operate optimally. The following dimensions are recommended: for case diameter  $d = 8$  to 16 mm, more than 2 mm; for  $d = 18$  to 35 mm, more than 3 mm; and for  $d = 42$  mm or more, more than 5 mm.
- 6 Capacitors should not be mounted with the safety vent face down on the board. Do not locate any wire or copper trace near the safety vent. Do not reverse the voltage, as this may result in excess pressure and the leakage of electrolyte.
- 7 Gas is released through the safety vent when the pressure inside the capacitor is too high. A gaseous liquid around the safety vent does not indicate a leakage of electrolyte.
- 8 The capacitor should be stored under conditions of normal temperature and in a non-acid, non-alkali environment of normal humidity. Exposure to high temperatures, for example under direct sunlight, will reduce its operating life. If the capacitor is stored in an environment containing acids or alkalis, the solderability of the leads may be affected.
- 9 The leakage current of an aluminum electrolytic capacitor may increase after a long period of storage. After such storage, the capacitor must be aged by applying the rated operating voltage for 6–8 hours before use.
- 10 Manual soldering:
  - a Soldering must be performed within the specified conditions.  
Bit temperature: 350 °C; application time of soldering iron: 3 seconds.
  - b Ensure that the soldering iron does not touch any part of the capacitor body.

## Cautions and warnings

- 11 Do not apply excessive force to the leads and terminals. Do not move the capacitor after soldering it onto the PC board and do not carry the PC board by gripping the capacitor. Observe the following rules to prevent undue stress to the capacitor:
  - a Do not tilt or bend the capacitor after soldering.
  - b Ensure that the terminal spacing matches the corresponding hole spacing on the PC board.
- 12 The aluminum case is not insulated from the cathode. Do not place a conductor under the aluminum capacitors on the PC board as this may cause a short circuit. The case and top of capacitors used in switched mode power supplies have a high-voltage-resistant heat shrink sleeve to ensure safe usage.
- 13 The leads of capacitors with a case diameter exceeding 14 mm cannot be used for fixing.

## Important notes

The following applies to all products named in this publication:

1. Some parts of this publication contain **statements about the suitability of our products for certain areas of application**. These statements are based on our knowledge of typical requirements that are often placed on our products in the areas of application concerned. We nevertheless expressly point out **that such statements cannot be regarded as binding statements about the suitability of our products for a particular customer application**. As a rule, EPCOS is either unfamiliar with individual customer applications or less familiar with them than the customers themselves. For these reasons, it is always ultimately incumbent on the customer to check and decide whether an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
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