Aluminum Electrolytic Capacitors

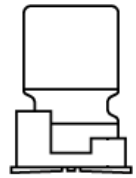
Alu-X Product Line

Series/Type: **SMD**
Ordering code: **B41112**

Date: October 2006
Version: 1

SMD

General-purpose grade capacitors



Applications

- For general-purpose applications in the entertainment industry

Features

- Miniaturized dimensions
- RoHS-compatible
- Load life of 2000 h at 85 °C

Construction

- Surface mounting device
- Suitable for reflow soldering
- Minus pole identification on case

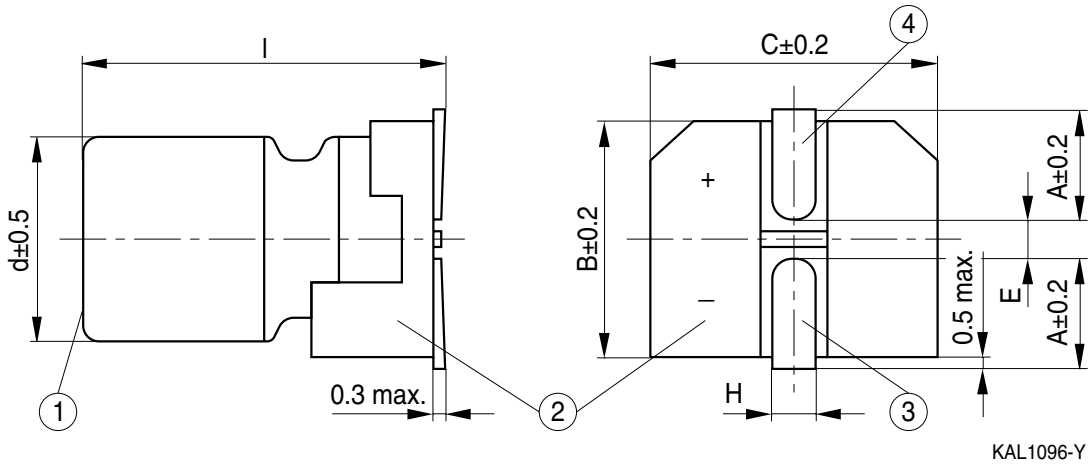
Delivery mode

- Taped and reeled

Specifications and characteristics in brief

Rated voltage V_R	4 … 100 V DC										
Operating temperature range	–40 °C … +85 °C										
Rated capacitance C_R (20 °C, 120 Hz)	0.1 … 1500 µF										
Capacitance tolerance	±20% ≙ M										
Load life (85 °C; V_R)	2000 h	Post test requirements: ΔC/C ≤ ±20% of initial value (4 V: within ±25% of the initial value) tan δ ≤2 times initial specified value I_{leak} ≤ initial specified limit									
Leakage current I_{leak} (20 °C, after 2 minutes)	$I_{leak} \leq 0.01\ C_R\ V_R$ or 3 (µA), whichever is greater										
Low temperature stability (impedance ratio) (120 Hz)	V_R (V DC)		4	6.3	10	16	25	35	50	63	100
	Z(–25 °C)/ Z(+20 °C)	<∅8	7	4	3	2	2	2	2	2	2
		≥∅8	7	5	4	3	2	2	2	2	2
	Z(–40 °C)/ Z(+20 °C)	<∅8	15	10	8	6	4	3	3	3	3
		≥∅8	15	8	8	4	4	3	3	3	3
Shelf life	After storage for 1000 h at 85 °C, the capacitors shall meet the requirement of load life above.										
Frequency multiplier for rated ripple current	Frequency	50 Hz	120 Hz	300 Hz	1 kHz	≥10 kHz					
	Multiplier	0.70	1.00	1.17	1.36	1.50					

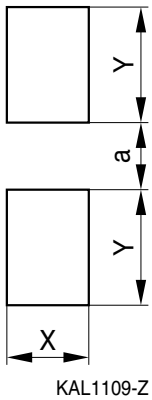
Dimensions



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	8 × 10	10 × 10
A	1.8	2.1	2.4	2.9	3.2
B	4.3	5.3	6.6	8.3	10.3
C	4.3	5.3	6.6	8.3	10.3
E	1.0	1.3	2.2	3.1	4.5
H	0.5 … 0.8			0.8 … 1.1	

Recommended land size



d (mm)	X	Y	a
4	1.6	2.6	1.0
5	1.6	3.0	1.4
6.3	1.6	3.5	2.1
8	2.5	3.5	3.0
10	2.5	4.0	4.0

Overview of available types

V_R (V DC)	4	6.3	10	16	25	35	50	63	100
	Case dimensions d × l (mm)								
C_R (µF)									
0.1							4 × 5.4	4 × 5.4	
0.22							4 × 5.4	4 × 5.4	
0.33							4 × 5.4	4 × 5.4	
0.47							4 × 5.4	4 × 5.4	
1.0							4 × 5.4	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	4 × 5.4 5 × 5.4	4 × 5.4	
10				4 × 5.4	4 × 5.4 5 × 5.4	4 × 5.4 5 × 5.4	5 × 5.4 6.3 × 5.4	6.3 × 5.4	8 × 10
22		4 × 5.4	4 × 5.4 5 × 5.4	4 × 5.4 5 × 5.4	5 × 5.4 6.3 × 5.4	5 × 5.4 6.3 × 5.4	6.3 × 5.4	8 × 10	8 × 10 10 × 10
33	4 × 5.4	4 × 5.4 5 × 5.4	4 × 5.4 5 × 5.4	5 × 5.4 6.3 × 5.4	5 × 5.4 6.3 × 5.4	6.3 × 5.4	8 × 10	8 × 10	10 × 10
47	4 × 5.4	4 × 5.4 5 × 5.4	5 × 5.4 6.3 × 5.4	5 × 5.4 6.3 × 5.4	6.3 × 5.4	6.3 × 5.4	8 × 10 10 × 10	8 × 10	
56	5 × 5.4							10 × 10	
100	5 × 5.4	5 × 5.4 6.3 × 5.4	5 × 5.4 6.3 × 5.4	6.3 × 5.4	8 × 10	8 × 10 10 × 10	8 × 10 10 × 10		
220	6.3 × 5.4	6.3 × 5.4		8 × 10	8 × 10 10 × 10	8 × 10 10 × 10	10 × 10		
330	6.3 × 5.4		8 × 10	8 × 10 10 × 10	8 × 10 10 × 10	10 × 10			
470		8 × 10	8 × 10 10 × 10	8 × 10 10 × 10	10 × 10				
680	8 × 10	8 × 10	10 × 10	10 × 10					
1000	8 × 10	8 × 10 10 × 10	10 × 10						
1500	10 × 10								

Technical data and ordering codes

V_R V DC	C_R 120 Hz 20 °C µF	Case dimensions d × l mm	tan δ_{max} 120 Hz 20 °C	$I_{AC,R}$ 120 Hz 85 °C mA	Ordering code
4	33	4 × 5.4	0.35	28	B41112A1336M000
	47	4 × 5.4	0.35	33	B41112A1476M000
	56	5 × 5.4	0.35	42	B41112A1566M000
	100	5 × 5.4	0.35	56	B41112A1107M000
	220	6.3 × 5.4	0.35	96	B41112A1227M000
	330	6.3 × 5.4	0.50	98	B41112A1337M000
	680	8 × 10	0.35	284	B41112A1687M000
	1000	8 × 10	0.35	344	B41112A1108M000
	1500	10 × 10	0.35	347	B41112A1158M000
6.3	22	4 × 5.4	0.26	28	B41112A2226M000
	33	4 × 5.4	0.35	34	B41112A2336M000
	33	5 × 5.4	0.26	37	B41112B2336M000
	47	4 × 5.4	0.35	40	B41112A2476M000
	47	5 × 5.4	0.26	45	B41112B2476M000
	100	5 × 5.4	0.35	47	B41112A2107M000
	100	6.3 × 5.4	0.26	70	B41112B2107M000
	220	6.3 × 5.4	0.35	86	B41112A2227M000
	470	8 × 10	0.35	265	B41112A2477M000
	680	8 × 10	0.35	318	B41112A2687M000
	1000	8 × 10	0.35	372	B41112A2108M000
	1000	10 × 10	0.35	400	B41112B2108M000
10	22	4 × 5.4	0.30	30	B41112A3226M000
	22	5 × 5.4	0.20	33	B41112B3226M000
	33	4 × 5.4	0.30	34	B41112A3336M000
	33	5 × 5.4	0.20	41	B41112B3336M000
	47	5 × 5.4	0.30	47	B41112A3476M000
	47	6.3 × 5.4	0.26	52	B41112B3476M000
	100	5 × 5.4	0.30	54	B41112A3107M000
	100	6.3 × 5.4	0.26	76	B41112B3107M000
	330	8 × 10	0.26	240	B41112A3337M000
	470	8 × 10	0.26	290	B41112A3477M000
	470	10 × 10	0.26	327	B41112B3477M000
	680	10 × 10	0.26	393	B41112A3687M000
	1000	10 × 10	0.26	454	B41112A3108M000

Technical data and ordering codes

V_R V DC	C_R 120 Hz 20 °C µF	Case dimensions d × l mm	tan δ_{max} 120 Hz 20 °C	$I_{AC,R}$ 120 Hz 85 °C mA	Ordering code
16	10	4 × 5.4	0.16	23	B41112A4106M000
	22	4 × 5.4	0.26	30	B41112A4226M000
	22	5 × 5.4	0.16	37	B41112B4226M000
	33	5 × 5.4	0.26	44	B41112A4336M000
	33	6.3 × 5.4	0.16	49	B41112B4336M000
	47	5 × 5.4	0.26	52	B41112A4476M000
	47	6.3 × 5.4	0.16	58	B41112B4476M000
	100	6.3 × 5.4	0.26	86	B41112A4107M000
	220	8 × 10	0.20	215	B41112A4227M000
	330	8 × 10	0.20	270	B41112A4337M000
	330	10 × 10	0.20	380	B41112B4337M000
	470	8 × 10	0.20	307	B41112A4477M000
	470	10 × 10	0.20	330	B41112B4477M000
	680	10 × 10	0.20	396	B41112A4687M000
25	4.7	4 × 5.4	0.14	16	B41112A5475M000
	10	4 × 5.4	0.14	24	B41112A5106M000
	10	5 × 5.4	0.12	27	B41112B5106M000
	22	5 × 5.4	0.20	38	B41112A5226M000
	22	6.3 × 5.4	0.14	42	B41112B5226M000
	33	5 × 5.4	0.20	46	B41112A5336M000
	33	6.3 × 5.4	0.14	52	B41112B5336M000
	47	6.3 × 5.4	0.20	60	B41112A5476M000
	100	8 × 10	0.16	180	B41112A5107M000
	220	8 × 10	0.16	232	B41112A5227M000
	220	10 × 10	0.16	250	B41112B5227M000
	330	8 × 10	0.16	284	B41112A5337M000
	330	10 × 10	0.16	305	B41112B5337M000
	470	10 × 10	0.16	393	B41112A5477M000
35	4.7	4 × 5.4	0.12	18	B41112A7475M000
	10	4 × 5.4	0.16	24	B41112A7106M000
	10	5 × 5.4	0.12	29	B41112B7106M000
	22	5 × 5.4	0.16	39	B41112A7226M000
	22	6.3 × 5.4	0.12	46	B41112B7226M000
	33	6.3 × 5.4	0.16	53	B41112A7336M000
	47	6.3 × 5.4	0.16	70	B41112A7476M000
	100	8 × 10	0.14	175	B41112A7107M000
	100	10 × 10	0.14	210	B41112B7107M000
	220	8 × 10	0.14	246	B41112A7227M000
	220	10 × 10	0.14	265	B41112B7227M000
	330	10 × 10	0.14	324	B41112A7337M000

Technical data and ordering codes

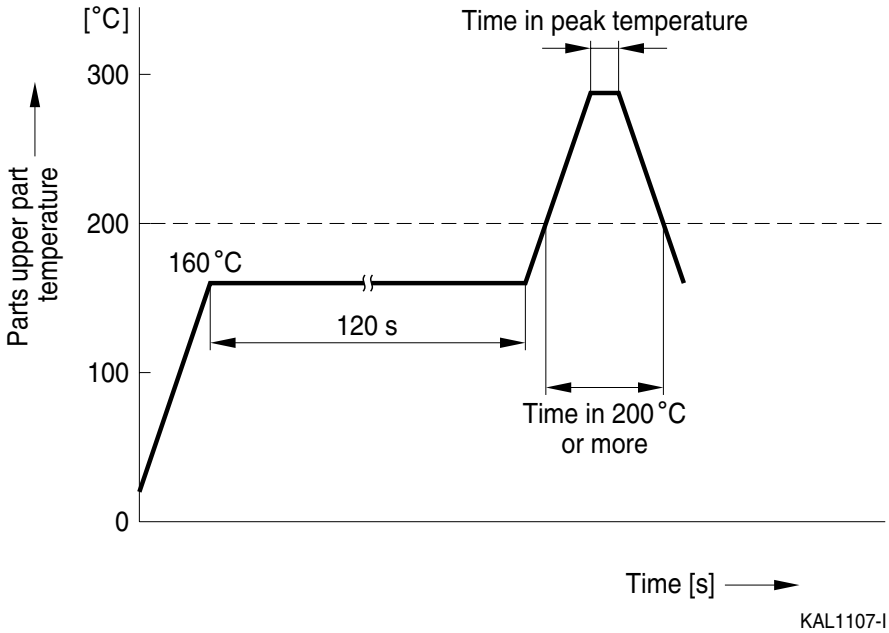
V_R V DC	C_R 120 Hz 20 °C µF	Case dimensions d × l mm	tan δ_{max} 120 Hz 20 °C	$I_{AC,R}$ 120 Hz 85 °C mA	Ordering code
50	0.1	4 × 5.4	0.12	1.0	B41112A6104M000
	0.22	4 × 5.4	0.12	2.0	B41112A6224M000
	0.33	4 × 5.4	0.12	2.8	B41112A6334M000
	0.47	4 × 5.4	0.12	4.0	B41112A6474M000
	1.0	4 × 5.4	0.12	8.4	B41112A6105M000
	2.2	4 × 5.4	0.12	13	B41112A6225M000
	3.3	4 × 5.4	0.12	17	B41112A6335M000
	4.7	4 × 5.4	0.14	18	B41112A6475M000
	4.7	5 × 5.4	0.12	20	B41112B6475M000
	10	5 × 5.4	0.14	30	B41112A6106M000
	10	6.3 × 5.4	0.12	33	B41112B6106M000
	22	6.3 × 5.4	0.14	43	B41112A6226M000
	33	8 × 10	0.12	110	B41112A6336M000
	47	8 × 10	0.12	132	B41112A6476M000
	47	10 × 10	0.12	146	B41112B6476M000
	100	8 × 10	0.12	181	B41112A6107M000
	100	10 × 10	0.12	195	B41112B6107M000
	220	10 × 10	0.12	289	B41112A6227M000
63	0.1	4 × 5.4	0.18	1.0	B41112A8104M000
	0.22	4 × 5.4	0.18	2.3	B41112A8224M000
	0.33	4 × 5.4	0.18	3.5	B41112A8334M000
	0.47	4 × 5.4	0.18	5.0	B41112A8474M000
	1.0	4 × 5.4	0.18	10	B41112A8105M000
	2.2	4 × 5.4	0.18	15	B41112A8225M000
	3.3	4 × 5.4	0.18	20	B41112A8335M000
	4.7	4 × 5.4	0.18	23	B41112A8475M000
	10	6.3 × 5.4	0.18	34	B41112A8106M000
	22	8 × 10	0.18	78	B41112A8226M000
	33	8 × 10	0.18	160	B41112A8336M000
	47	8 × 10	0.18	170	B41112A8476M000
	100	10 × 10	0.18	280	B41112A8107M000
100	10	8 × 10	0.18	85	B41112A9106M000
	22	8 × 10	0.18	90	B41112A9226M000
	22	10 × 10	0.18	120	B41112B9226M000
	33	10 × 10	0.18	190	B41112A9336M000

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.

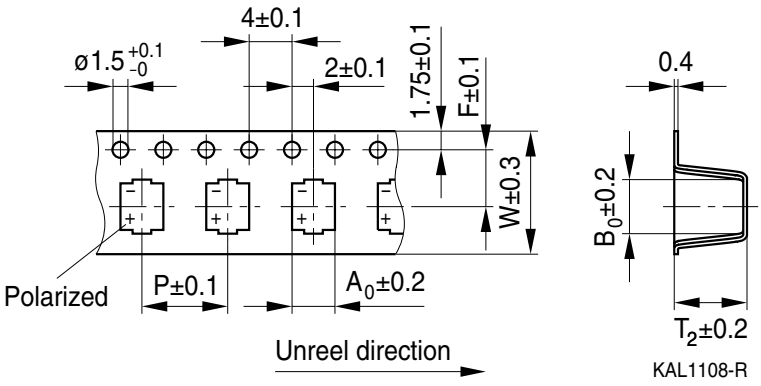
- Observe proper soldering conditions (temperature, time, etc.).
- Do not exceed the specified limits.
- Temperature measuring method: Measure temperature in assuming quantitative production, by sticking the thermo-couple to the capacitor upper part with epoxy adhesives.
- Reflow should be performed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



Lead-free reflow

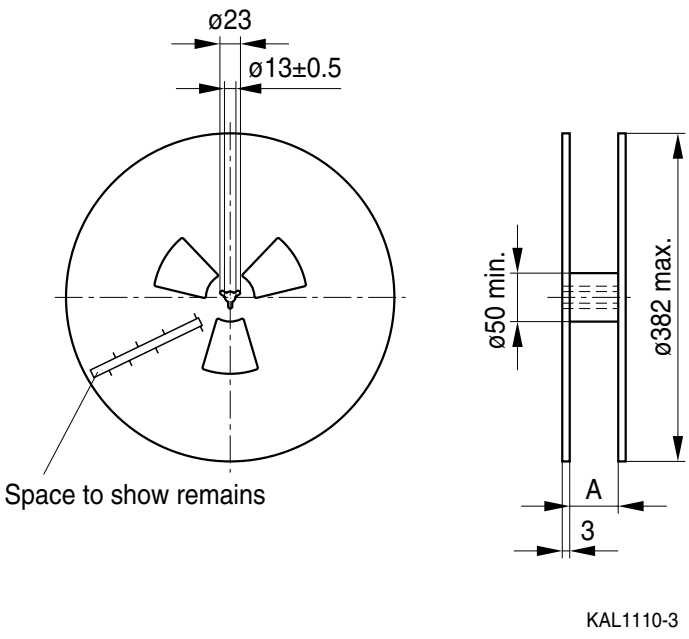
d (mm)	4 … 6.3	8 … 10
Peak temperature	250 °C	235 °C
Time in peak temperature	5 s	5 s
Time in 200 °C or more	60 s	60 s
Time of reflow	1 time	1 time

Taping of SMD capacitors



Case dimensions d × l (mm)	4 × 5.4	5 × 5.4	6.3 × 5.4	8 × 10	10 × 10
W	12.0	12.0	16.0	24.0	24.0
P	8.0	12.0	12.0	16.0	16.0
F	5.5	5.5	7.5	11.5	11.5
A_0	5.0	6.0	7.0	8.7	10.7
B_0	5.0	6.0	7.0	8.7	10.7
T_2	5.8	5.8	5.8	11.0	11.0

Reel packing



d (mm)	Quantity/reel
4	2000 pcs.
5, 6.3	1000 pcs.
8, 10	500 pcs.

d (mm)	4	5	6.3	8	10
A	14	14	18	26	26

Cautions and warnings

General

Also see “Important notes” on next page.

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 ≥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 6 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.
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.
2. We also point out that **in individual cases, a malfunction of electronic components or failure before the end of their usual service life cannot be completely ruled out in the current state of the art, even if they are operated as specified.** In customer applications requiring a very high level of operational safety and especially in customer applications in which the malfunction or failure of an electronic component could endanger human life or health (e.g. in accident prevention or life-saving systems), it must therefore be ensured by means of suitable design of the customer application or other action taken by the customer (e.g. installation of protective circuitry or redundancy) that no injury or damage is sustained by third parties in the event of malfunction or failure of an electronic component.
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