

## **Aluminum electrolytic capacitors**

Axial-lead and soldering star capacitors,  
ultra compact – up to 140°C

**Series/Type:**            **B41699, B41799**

**Date:**                      October 2024

### Applications

- Automotive electronics

### Features

- Vibration stability up to 60 g available upon request
- Ultra compact design
- High ripple current capability
- Useful life, 4000 h at up to 125 °C
- Low ESR at high frequency
- SIKOREL design – storage for up to 15 years at a temperature of up to 35 °C
- RoHS-compatible



### Construction

- Charge/discharge-proof, polar
- Aluminum case without sleeve
- Negative pole connected to case
- Version with PET sleeve available upon request

### Terminals

- Axial leads, welded to capacitor case and cover disc
- Soldering star option for upright mounting on PCB or welding to busbar
- Alternative axial-lead design with double-sided plates for horizontal mounting available upon request

### Taping and packing

- Axial-lead capacitors will be delivered in pallet package  
Capacitors with  $d \times l \leq 16 \times 39$  mm are also available taped on reel
- Soldering star capacitors are packed in blister trays

**Specifications and characteristics in brief**

Rated voltage $V_R$ Surge voltage $V_S$	25 ... 35 V DC $1.15 \cdot V_R$					
Rated capacitance $C_R$ Capacitance tolerance	1800 ... 13000 $\mu\text{F}$ $-10/+30\% \triangleq Q$					
Leakage current $I_{\text{leak}}$ (5 min, 20 °C)	$I_{\text{leak}} \leq 0.006 \mu\text{A} \cdot \left( \frac{C_R}{\mu\text{F}} \cdot \frac{V_R}{V} \right) + 4 \mu\text{A}$					
Self-inductance ESL <sup>1)</sup>	Diameter d (mm)		16	18	21	
	Terminals		Length l (mm)			
	axial		Approx. ESL (nH)			
			25	26	30	–
			30	29	34	39
			35	31	36	41
			39	33	38	45
			49	–	–	50
	soldering star		25	7	8	–
			30	8	10	11
			35	9	10.5	12
			39	9	11	13
		49	–	–	14	
Useful life <sup>2)</sup> $T_A = 125 \text{ °C}; V_R; I_{AC,R}$ $T_C = 125 \text{ °C}; V_R; I_{AC,max}$	> 4000 h > 2000 h		Requirements: $ \Delta C/C  \leq 30\%$ of initial value ESR $\leq 3$ times initial specified limit <sup>3)</sup> $I_{\text{leak}} \leq$ initial specified limit			
Voltage endurance test 125 °C; $V_R$	4000 h for $V_R \leq 35$ V DC		Post test requirements: $ \Delta C/C  \leq 10\%$ of initial value ESR $\leq 1.3$ times initial specified limit <sup>3)</sup> $I_{\text{leak}} \leq$ initial specified limit			
Vibration resistance test	To IEC 60068-2-6:2007, test Fc: Frequency range 10 Hz ... 2 kHz, displacement amplitude max. 1.5 mm, acceleration max. 20 g, duration 3 x 2 h. Capacitor rigidly clamped by the aluminum case e.g. using our standard fixture.					
IEC climatic category	To IEC 60068-1:2013: 55/125/56 (–55 °C/+125 °C/56 days damp heat test)					
Sectional specification	IEC 60384-4:2016 <sup>4)</sup>					
Reference standard	AEC-Q200 REV D <sup>5)</sup>					

1) If optimum circuit design is used, the values are lower by 30%.

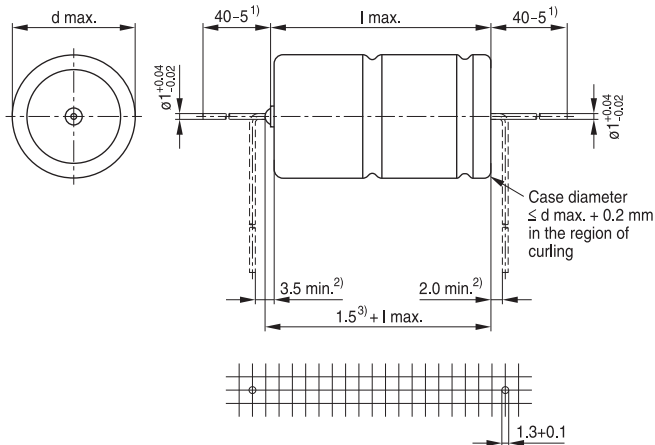
2) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.

3)  $ESR_{\text{max}}$  at 100 Hz, 20 °C

4) Refer to chapter "General technical information, 2 Standards and specifications" for further details.

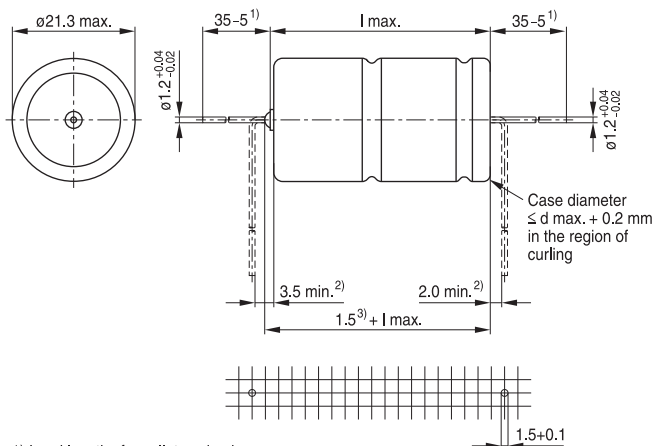
5) Refer to chapter "General technical information, 2.3 AEC-Q200 standard" for further details.

**B41699, Axial-lead capacitors**
**Dimensional drawing**

 For  $d \leq 18$  mm:


- 1) Lead lengths for pallet packaging
- 2) Minimum bending distance recommended per wire
- 3) Maximum length of welding projection

KAL1783-A-E

 For  $d = 21$  mm:


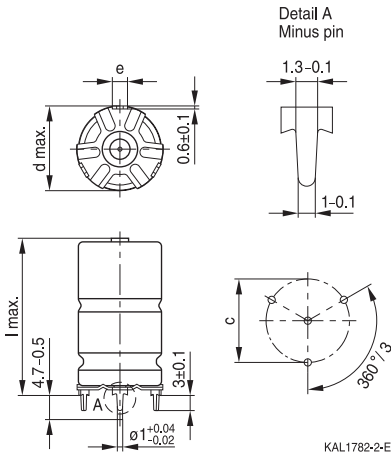
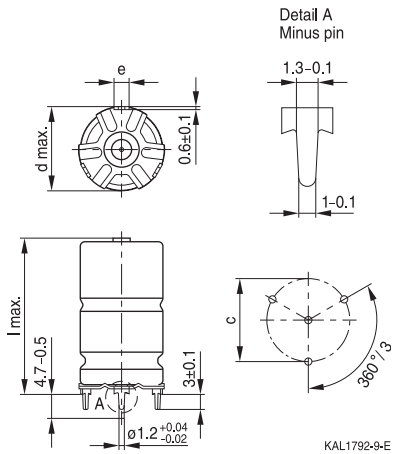
- 1) Lead lengths for pallet packaging
- 2) Minimum bending distance recommended per wire
- 3) Maximum length of welding projection

KAL1869-G-E

**Dimensions, weights and packaging units**

d x l mm	d <sub>max</sub> x l <sub>max</sub> mm	Approx. weight g	Packing units (pcs.)	
			Pallet	Reel
16 x 25	16.3 x 25.4	7.4	180	250
16 x 30	16.3 x 30.4	8.9	180	250
16 x 35	16.3 x 35.4	10.4	180	250
16 x 39	16.3 x 39.9	11.7	180	250
18 x 25	18.3 x 25.4	9.3	160	–
18 x 30	18.3 x 30.4	11.1	160	–
18 x 35	18.3 x 35.4	12.8	160	–
18 x 39	18.3 x 39.9	14.7	160	–
21 x 30	21.3 x 30.4	16.5	140	–
21 x 35	21.3 x 35.4	17.0	140	–
21 x 39	21.3 x 39.9	20.0	140	–
21 x 49	21.3 x 49.9	25.0	110	–

**B41799, Soldering star capacitors**
**Dimensional drawings**

 Mounting holes  $d = 16 \text{ mm} \dots 18 \text{ mm}$ 

 Mounting holes  $d = 21 \text{ mm}$ 

**Dimensions, weights and packaging units**

$d \times l$ mm	$d_{\max} \times l_{\max}$ mm	$c \pm 0.1$ mm	$e \pm 0.1$ mm	Approx. weight g	Packing units pcs.
16 x 25	17.5 x 27	16.5	3.0	7.9	300
16 x 30	17.5 x 32	16.5	3.0	9.4	300
16 x 35	17.5 x 37	16.5	3.0	10.9	200
16 x 39	17.5 x 41.5	16.5	3.0	12.2	200
18 x 25	19.5 x 27	18.5	3.0	9.9	300
18 x 30	19.5 x 32	18.5	3.0	11.8	300
18 x 35	19.5 x 37	18.5	3.0	13.2	200
18 x 39	19.5 x 41.5	18.5	3.0	15.4	200
21 x 30	22.5 x 32	21.5	3.5	17.5	468
21 x 35	22.5 x 37	21.5	3.5	18.3	324
21 x 39	22.5 x 41.5	21.5	3.5	21.0	324
21 x 49	22.5 x 51.5	21.5	3.5	26.0	264

**Overview of available types**

$V_R$ (V DC)	25	35
	Case dimensions d x l (mm)	
$C_R$ ( $\mu\text{F}$ )		
1800		16 x 25
2400		16 x 30 18 x 25
2700	16 x 25	
3100		16 x 35
3300		18 x 30
3500	18 x 25	
3600	16 x 30	16 x 39
4100		18 x 35
4500	16 x 35	
4700	18 x 30	21 x 30
4900		18 x 39
5400	16 x 39	
5900	18 x 35	21 x 35
6700	21 x 30	
7000	18 x 39	21 x 39
8500	21 x 35	
9400		21 x 49
10000	21 x 39	
13000	21 x 49	

**Case dimensions and ordering codes**

$C_R$ 100 Hz 20 °C $\mu\text{F}$	Case dimensions d x l mm	Ordering code Axial pallet	Ordering code Axial reel	Ordering code Soldering star
$V_R = 25 \text{ V}$				
2700	16 x 25	B41699A5278Q001	B41699A5278Q003	B41799A5278Q001
3500	18 x 25	B41699A5358Q001		B41799A5358Q001
3600	16 x 30	B41699A5368Q001	B41699A5368Q003	B41799A5368Q001
4500	16 x 35	B41699A5458Q001	B41699A5458Q003	B41799A5458Q001
4700	18 x 30	B41699A5478Q001		B41799A5478Q001
5400	16 x 39	B41699A5548Q001	B41699A5548Q003	B41799A5548Q001
5900	18 x 35	B41699A5598Q001		B41799A5598Q001
6700	21 x 30	B41699A5678Q001		B41799A5678Q001
7000	18 x 39	B41699A5708Q001		B41799A5708Q001
8500	21 x 35	B41699A5858Q001		B41799A5858Q001
10000	21 x 39	B41699A5109Q001		B41799A5109Q001
13000	21 x 49	B41699A5139Q001		B41799A5139Q001
$V_R = 35 \text{ V}$				
1800	16 x 25	B41699A7188Q001	B41699A7188Q003	B41799A7188Q001
2400	16 x 30	B41699A7248Q001	B41699A7248Q003	B41799A7248Q001
2400	18 x 25	B41699B7248Q001		B41799B7248Q001
3100	16 x 35	B41699A7318Q001	B41699A7318Q003	B41799A7318Q001
3300	18 x 30	B41699A7338Q001		B41799A7338Q001
3600	16 x 39	B41699A7368Q001	B41699A7368Q003	B41799A7368Q001
4100	18 x 35	B41699A7418Q001		B41799A7418Q001
4700	21 x 30	B41699A7478Q001		B41799A7478Q001
4900	18 x 39	B41699A7498Q001		B41799A7498Q001
5900	21 x 35	B41699A7598Q001		B41799A7598Q001
7000	21 x 39	B41699A7708Q001		B41799A7708Q001
9400	21 x 49	B41699A7948Q001		B41799A7948Q001



**Technical data**

$C_R$ 100 Hz 20 °C µF	Case dimensions d x l mm	$ESR_{max}$ 100 Hz 20 °C mΩ	$ESR_{max}$ 100 Hz -40 °C mΩ	$ESR_{max}$ 10 kHz 20 °C mΩ	$I_{AC,R}$ 10 kHz $T_A$ 125 °C A	$I_{AC,max}^{1) 2)}$ 10 kHz $T_C$ 125 °C A
<b><math>V_R = 25</math> V</b>						
2700	16 x 25	115	426	36	6.0	16.9
3500	18 x 25	75	380	32	7.0	20.9
3600	16 x 30	86	317	27	7.5	20.1
4500	16 x 35	67	252	21	9.0	22.9
4700	18 x 30	56	283	24	9.0	24.9
5400	16 x 39	58	213	18	10.0	25.0
5900	18 x 35	44	225	19	10.0	28.2
6700	21 x 30	55	285	24	8.7	24.5
7000	18 x 39	37	190	16	12.0	30.9
8500	21 x 35	44	227	19	10.0	27.6
10000	21 x 39	39	196	17	11.5	29.8
13000	21 x 49	28	144	12	14.4	34.6
<b><math>V_R = 35</math> V</b>						
1800	16 x 25	115	426	36	6.0	16.9
2400	16 x 30	86	317	27	7.5	20.1
2400	18 x 25	75	380	32	7.0	20.9
3100	16 x 35	67	252	21	9.0	22.9
3300	18 x 30	56	283	24	9.0	24.9
3600	16 x 39	58	213	18	10.0	25.0
4100	18 x 35	44	225	19	10.0	28.2
4700	21 x 30	55	285	24	8.7	24.5
4900	18 x 39	37	190	16	12.0	30.9
5900	21 x 35	44	227	19	10.0	27.6
7000	21 x 39	39	196	17	11.5	29.8
9400	21 x 49	28	144	12	14.4	34.6

- 1) Maximum ripple current at 125 °C capacitor case temperature  $T_C$  (measurement at aluminum case surface), when mounted to a heat sink. Further details available upon request.
- 2) To achieve the maximum listed current, special care must be taken in the connection of the capacitor to the circuit as it depends on user assembly.

**Useful life<sup>3)</sup>**

Calculations of useful life are performed on request, based on operational conditions stated by the customer.

- 3) Refer to chapter "General technical information, 5 Useful life" on how to interpret useful life.

## Cautions and warnings

### Personal safety

The electrolytes used have been optimized both with a view to the intended application and with regard to health and environmental compatibility. They do not contain any solvents that are detrimental to health, e.g. dimethyl formamide (DMF) or dimethyl acetamide (DMAC). Furthermore, some of the high-voltage electrolytes used are self-extinguishing.

As far as possible, we do not use any dangerous chemicals or compounds to produce operating electrolytes, although in exceptional cases, such materials must be used in order to achieve specific physical and electrical properties because no alternative materials are currently known.

We do, however, restrict the amount of dangerous materials used in our products to an absolute minimum.

Materials and chemicals used in our aluminum electrolytic capacitors are continuously adapted in compliance with the TDK Electronics Corporate Environmental Policy and the latest EU regulations and guidelines such as RoHS, REACH/SVHC, GADSL, and ELV.

MDS (Material Data Sheets) are available on our website for all types listed in the data book. MDS for customer specific capacitors are available upon request.

Nevertheless, the following rules should be observed when handling aluminum electrolytic capacitors: No electrolyte should come into contact with eyes or skin. If electrolyte does come into contact with the skin, wash the affected areas immediately with running water. If the eyes are affected, rinse them for 10 minutes with plenty of water. If symptoms persist, seek medical treatment. Avoid inhaling electrolyte vapor or mists. Workplaces and other affected areas should be well ventilated. Clothing that has been contaminated by electrolyte must be changed and rinsed in water.

### Product safety

The table below summarizes the safety instructions that must be observed without fail. A detailed description can be found in the relevant sections of separate file chapter "General technical information".

Topic	Safety information	Reference chapter "General technical information"
Polarity	Make sure that polar capacitors are connected with the right polarity.	1 "Basic construction of aluminum electrolytic capacitors"
Reverse voltage	Voltages of opposite polarity should be prevented by connecting a diode.	3.1.6 "Reverse voltage"
Mounting position of capacitors with screw or multi-pin terminals	Multi-pin capacitors with pressure relief vent on the can base must not be mounted with terminals facing up unless otherwise specified.	11.1 "Mounting positions of capacitors with screw or multi-pin terminals"
Robustness of terminals	The following maximum tightening torques must not be exceeded when connecting screw terminals: M5: 2.5 Nm M6: 4.0 Nm	11.2 "Mounting torques"
Mounting of single-ended capacitors	The internal structure of single-ended capacitors might be damaged if excessive force is applied to the lead wires. Avoid any compressive, tensile or flexural stress. Do not move the capacitor after soldering to PC board. Do not pick up the PC board by the soldered capacitor. Do not insert the capacitor on the PC board with a hole space different to the lead space specified.	11.3 "Mounting considerations for single-ended capacitors"
Soldering	Do not exceed the specified time or temperature limits during soldering.	11.5 "Soldering"
Soldering, cleaning agents	Do not allow halogenated hydrocarbons to come into contact with aluminum electrolytic capacitors.	11.6 "Cleaning agents"
Upper category temperature	Do not exceed the upper category temperature.	7.2 "Maximum permissible operating temperature"
Passive flammability	Avoid external energy, e.g. fire.	8.1 "Passive flammability"

Topic	Safety information	Reference chapter "General technical information"
Active flammability	Avoid overload of the capacitors.	8.2 "Active flammability"
Maintenance	Make periodic inspections of the capacitors. Before the inspection, make sure that the power supply is turned off and carefully discharge the capacitors. Do not apply excessive mechanical stress to the capacitor terminals when mounting.	10 "Maintenance"
Storage	Do not store capacitors at high temperatures or high humidity. Capacitors should be stored at +5 to +35 °C and a relative humidity of $\leq 75\%$ .	7.3 "Shelf life and storage conditions"
		Reference chapter "Capacitors with screw terminals"
Breakdown strength of insulating sleeves	Do not damage the insulating sleeve, especially when ring clips are used for mounting.	"Screw terminals – accessories"

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Detailed information can be found on the Internet under [www.tdk-electronics.tdk.com/orderingcodes](http://www.tdk-electronics.tdk.com/orderingcodes).

**Symbols and terms**

Symbol	English	German
C	Capacitance	Kapazität
$C_R$	Rated capacitance	Nennkapazität
$C_S$	Series capacitance	Serienkapazität
$C_{S,T}$	Series capacitance at temperature T	Serienkapazität bei Temperatur T
$C_f$	Capacitance at frequency f	Kapazität bei Frequenz f
d	Case diameter, nominal dimension	Gehäusedurchmesser, Nennmaß
$d_{max}$	Maximum case diameter	Maximaler Gehäusedurchmesser
ESL	Self-inductance	Eigeninduktivität
ESR	Equivalent series resistance	Ersatzserienwiderstand
$ESR_f$	Equivalent series resistance at frequency f	Ersatzserienwiderstand bei Frequenz f
$ESR_T$	Equivalent series resistance at temperature T	Ersatzserienwiderstand bei Temperatur T
f	Frequency	Frequenz
I	Current	Strom
$I_{AC}$	Alternating current (ripple current)	Wechselstrom
$I_{AC,RMS}$	Root-mean-square value of alternating current	Wechselstrom, Effektivwert
$I_{AC,f}$	Ripple current at frequency f	Wechselstrom bei Frequenz f
$I_{AC,max}$	Maximum permissible ripple current	Maximal zulässiger Wechselstrom
$I_{AC,R}$	Rated ripple current	Nennwechselstrom
$I_{leak}$	Leakage current	Reststrom
$I_{leak,op}$	Operating leakage current	Betriebsreststrom
l	Case length, nominal dimension	Gehäuselänge, Nennmaß
$l_{max}$	Maximum case length (without terminals and mounting stud)	Maximale Gehäuselänge (ohne Anschlüsse und Gewindebolzen)
R	Resistance	Widerstand
$R_{ins}$	Insulation resistance	Isolationswiderstand
$R_{symm}$	Balancing resistance	Symmetrierwiderstand
T	Temperature	Temperatur
$\Delta T$	Temperature difference	Temperaturdifferenz
$T_A$	Ambient temperature	Umgebungstemperatur
$T_B$	Capacitor base temperature	Temperatur des Gehäusebodens
$T_C$	Case temperature	Gehäusetemperatur
t	Time	Zeit
$\Delta t$	Period	Zeitraum
$t_b$	Service life (operating hours)	Brauchbarkeitsdauer (Betriebszeit)
V	Voltage	Spannung
$V_F$	Forming voltage	Formierspannung
$V_{op}$	Operating voltage	Betriebsspannung
$V_R$	Rated voltage, DC voltage	Nennspannung, Gleichspannung
$V_S$	Surge voltage	Spitzenspannung
$X_C$	Capacitive reactance	Kapazitiver Blindwiderstand

Symbol	English	German
$X_L$	Inductive reactance	Induktiver Blindwiderstand
$Z$	Impedance	Scheinwiderstand
$Z_T$	Impedance at temperature T	Scheinwiderstand bei Temperatur T
$\tan \delta$	Dissipation factor	Verlustfaktor
$\lambda$	Failure rate	Ausfallrate
$\epsilon_0$	Absolute permittivity	Elektrische Feldkonstante
$\epsilon_r$	Relative permittivity	Dielektrizitätszahl
$\omega$	Angular frequency; $2 \cdot \pi \cdot f$	Kreisfrequenz; $2 \cdot \pi \cdot f$

**Note:**

All dimensions are given in mm.

## 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 we are 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 a 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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