



Aluminum electrolytic capacitors

Large-size capacitors

Series/Type: B43649
Date: September 2019

Long-life grade capacitors

Applications

- Onboard chargers

Features

- Extremely high CV product, ultra compact
- High reliability
- High ripple current capability
- RoHS-compatible
- Qualification based on the AEC-Q200 standard

Construction

- Charge/discharge-proof, polar
- Aluminum case, insulated with PET sleeve without insulation sheet at the can bottom
- Snap-in solder pins
- Minus pole marking on case surface
- Minus pole not insulated from case
- Overload protection by safety vent on the base

Terminals

- Standard version with 3 terminals, protection against polarity reversal: length 4.5 mm
- Version with 2 terminals with 2 different lengths available: 6.3 and 4.5 mm




Specifications and characteristics in brief

Rated voltage V_R	450 V DC							
Surge voltage V_S	$1.10 \cdot V_R$							
Rated capacitance C_R	100 ... 820 μF							
Capacitance tolerance	$\pm 20\% \triangleq M$							
Dissipation factor $\tan \delta$ (20 °C, 120 Hz)	$\tan \delta \leq 0.20$							
Leakage current I_{leak} (5 min, 20 °C)	$I_{\text{leak}} \leq 0.3 \mu\text{A} \cdot \left(\frac{C_R}{\mu\text{F}} \cdot \frac{V_R}{V} \right)^{0.7} + 4 \mu\text{A}$							
Self-inductance ESL	Approx. 20 nH							
Useful life ¹⁾ 105 °C; V_R ; $I_{AC,R}$	> 3000 h	Requirements: $ \Delta C/C \leq 20\%$ of initial value $\tan \delta \leq 2$ times initial specified limit $I_{\text{leak}} \leq$ initial specified limit						
Voltage endurance test 105 °C; V_R	2000 h	Post test requirements: $ \Delta C/C \leq 10\%$ of initial value $\tan \delta \leq 1.3$ times initial specified limit $I_{\text{leak}} \leq$ initial specified limit						
Vibration resistance test	To IEC 60068-2-6, test Fc: Frequency range 10 Hz ... 2 kHz, displacement amplitude max. 0.375 mm, acceleration max. 5 g, duration 3×4 h. Capacitor rigidly clamped by the case, e.g. using our standard fixture.							
Characteristics at low temperature	Max. impedance ratio at 100 Hz <table border="1" data-bbox="734 1332 1173 1478"> <tr> <td>V_R</td> <td>450</td> </tr> <tr> <td>$Z_{-25^\circ\text{C}} / Z_{20^\circ\text{C}}$</td> <td>5</td> </tr> <tr> <td>$Z_{-40^\circ\text{C}} / Z_{20^\circ\text{C}}$</td> <td>14</td> </tr> </table>	V_R	450	$Z_{-25^\circ\text{C}} / Z_{20^\circ\text{C}}$	5	$Z_{-40^\circ\text{C}} / Z_{20^\circ\text{C}}$	14	
V_R	450							
$Z_{-25^\circ\text{C}} / Z_{20^\circ\text{C}}$	5							
$Z_{-40^\circ\text{C}} / Z_{20^\circ\text{C}}$	14							
IEC climatic category	To IEC 60068-1: 25/105/56 (–25 °C/+105 °C/56 days damp heat test) The capacitors can be operated in the temperature range of –40 °C to +105 °C but the impedance at –40 °C must be taken into consideration.							
Sectional specification	IEC 60384-4							
Reference standard	AEC-Q200 ²⁾							

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

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

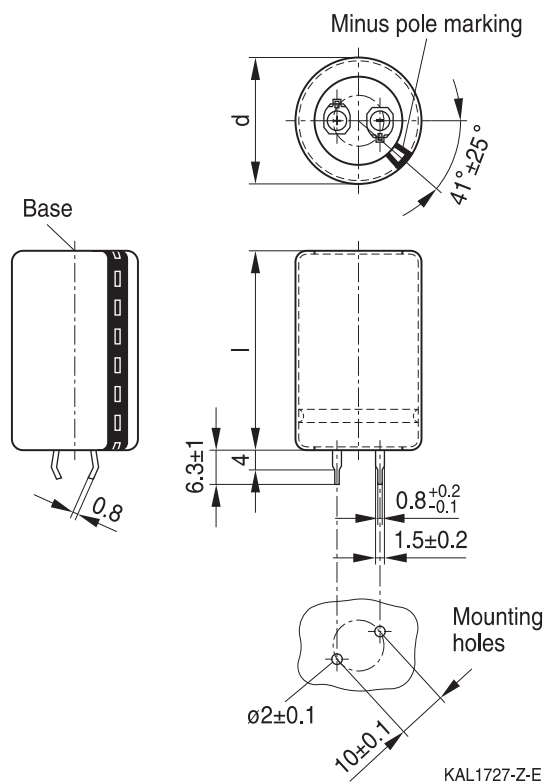


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Ultra compact – 105 °C

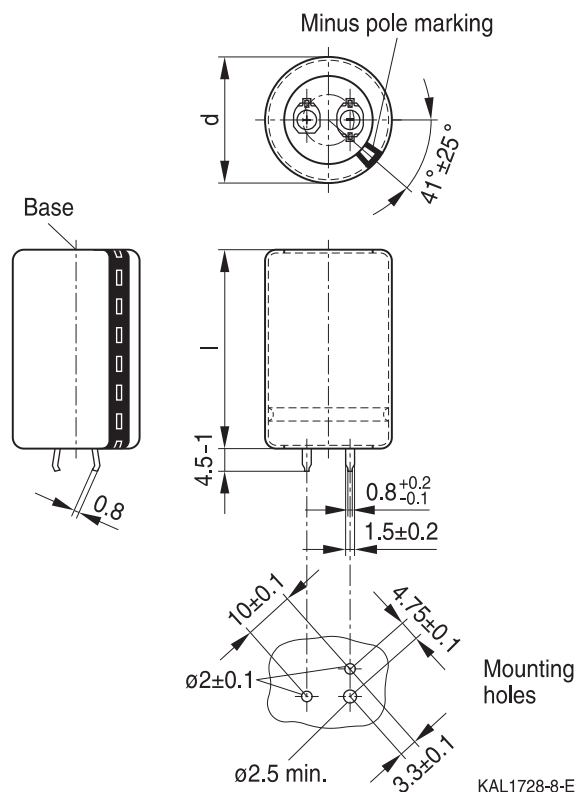
Dimensional drawings

Large-size capacitor, snap-in version with PET insulation sleeve



Large-size capacitors, snap-in terminals, length (6.3 ± 1) mm.
Also available in a shorter version with a length of (4.5 - 1) mm. Safety vent on the base.

Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l ±2		
22	25	9	160
22	30	12	160
22	35	15	160
22	40	18	160
22	45	20	160
22	50	24	160
<hr/>			
25	25	13	130
25	30	17	130
25	35	19	130
25	40	22	130
25	45	25	130
25	50	29	130
25	55	32	130



Large-size capacitors, snap-in version with 3 terminals (length (4.5 - 1) mm).
Safety vent on the base.

Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l ±2		
30	25	17	80
30	30	23	80
30	35	29	80
30	40	36	80
30	45	41	80
30	50	46	80
30	55	53	80
<hr/>			
Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l +2.5/-2.0		
35	25	22	60
35	30	29	60
35	35	36	60
35	40	41	60
35	45	56	60
35	50	70	60
35	55	81	60



Packing example of large-size capacitors



For ecological reasons the packing is pure cardboard.

Ordering codes for terminal styles

Identification in 3rd block of ordering code

Large-size capacitors

Terminal version	Insulation
	PET sleeve
3 terminals 4.5 mm	M052
2 terminals 4.5 mm	M057
2 terminals 6.3 mm	M050

Ordering examples:

B43649A5157M052 } large-size capacitor, snap-in version with 3 terminals 4.5 mm and PET sleeve

B43649A5157M057 } large-size capacitor, snap-in version with 2 terminals 4.5 mm and PET sleeve



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Technical data and ordering codes

C_R 100 Hz 20 °C μF	Case dimensions $d \times l$ mm	ESR_{typ} 120 Hz 20 °C $\text{m}\Omega$	ESR_{typ} 360 Hz 60 °C $\text{m}\Omega$	Z_{max} 10 kHz 20 °C $\text{m}\Omega$	$I_{\text{AC,max}}$ 120 Hz 60 °C A	$I_{\text{AC,max}}$ 120 Hz 85 °C A	$I_{\text{AC,R}}$ 120 Hz 105 °C A	Ordering code (composition see below)
$V_R = 450 \text{ V DC}$								
100	22 × 25	1010	250	1610	1.60	1.20	0.70	B43649A5107M05#
120	22 × 30	840	210	1340	1.85	1.39	0.81	B43649A5127M05#
150	22 × 30	680	170	1080	2.22	1.66	0.96	B43649A5157M05#
150	25 × 25	690	180	1090	2.11	1.58	0.91	B43649B5157M05#
180	22 × 35	570	140	900	2.58	1.93	1.12	B43649A5187M05#
180	25 × 30	570	150	910	2.43	1.82	1.06	B43649B5187M05#
220	22 × 45	460	110	730	3.07	2.30	1.33	B43649A5227M05#
220	25 × 35	470	120	740	2.86	2.15	1.25	B43649B5227M05#
220	30 × 25	480	140	770	2.64	1.98	1.15	B43649C5227M05#
270	22 × 50	380	95	600	3.66	2.74	1.59	B43649A5277M05#
270	25 × 40	380	100	610	3.39	2.54	1.47	B43649B5277M05#
270	30 × 30	390	110	630	3.10	2.32	1.35	B43649C5277M05#
330	25 × 45	310	80	500	4.02	3.00	1.74	B43649A5337M05#
330	30 × 35	320	90	510	3.64	2.73	1.58	B43649B5337M05#
330	35 × 25	340	120	560	3.26	2.44	1.41	B43649C5337M05#
390	25 × 55	260	70	420	4.66	3.49	2.02	B43649A5397M05#
390	30 × 40	270	75	430	4.12	3.07	1.72	B43649B5397M05#
390	35 × 30	290	90	460	3.72	2.77	1.55	B43649C5397M05#
470	30 × 45	230	65	360	4.79	3.56	1.99	B43649A5477M05#
470	35 × 35	240	75	380	4.32	3.21	1.80	B43649B5477M05#
560	30 × 50	190	55	310	5.53	4.11	2.29	B43649A5567M05#
560	35 × 40	200	65	320	4.95	3.68	2.06	B43649B5567M05#
680	35 × 45	170	55	270	5.74	4.26	2.38	B43649A5687M05#
820	35 × 50	140	50	230	6.62	4.91	2.74	B43649A5827M05#

Composition of ordering code

= Terminal style

- 0 = snap-in 2 terminals (6.3 mm)
- 2 = snap-in 3 terminals (4.5 mm)
- 7 = snap-in 2 terminals (4.5 mm)

Other voltage and capacitance ratings are also available upon request.



Useful life¹⁾

For useful life calculations, please use our web-based "AlCap Useful Life Calculation Tool", which can be found on the Internet under the following link:

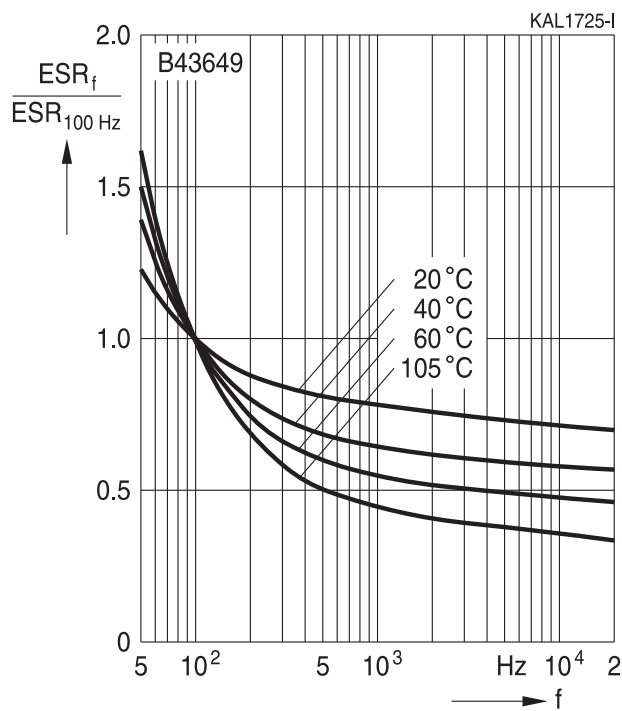
www.tdk-electronics.tdk.com/alcap

The AlCap Useful Life Calculation Tool provides calculations of useful life as well as additional data for selected capacitor types under operating conditions defined by the user.

In addition, it is possible to calculate useful life expectancies based on temperatures measured by the user in the application.

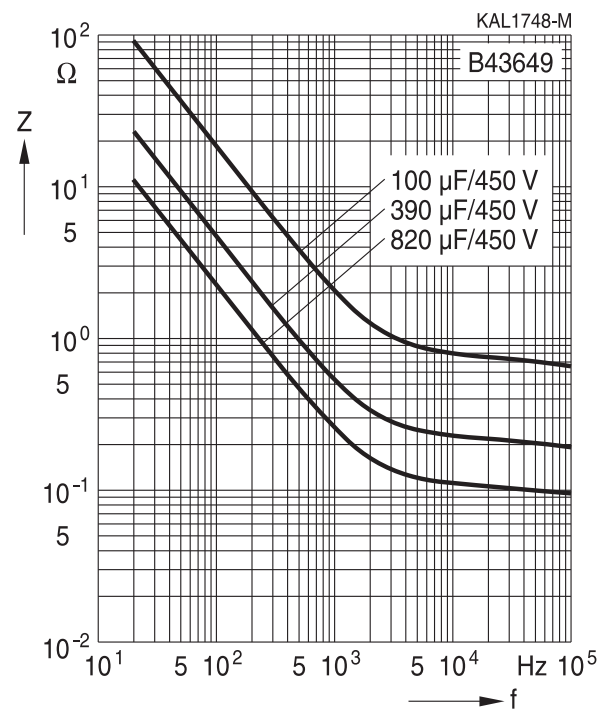
Frequency characteristics of ESR

Typical behavior



Impedance Z versus frequency f

Typical behavior at 20 °C



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



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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.

MSDS (Material Safety Data Sheets) are available for our electrolytes 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 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 screw-terminal capacitors	Screw terminal capacitors must not be mounted with terminals facing down unless otherwise specified.	11.1. "Mounting positions of capacitors with screw 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	11.3 "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.	11.4 "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"



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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 ≤ 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"

Display of ordering codes for TDK Electronics products

The ordering code for one and the same product can be represented differently in data sheets, data books, other publications, on the company website, or in order-related documents such as shipping notes, order confirmations and product labels. The varying representations of the ordering codes are due to different processes employed and do not affect the specifications of the respective products.

Detailed information can be found on the Internet under 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
ΔT	Temperature difference	Temperaturdifferenz
T_A	Ambient temperature	Umgebungstemperatur
T_C	Case temperature	Gehäusetemperatur
T_B	Capacitor base temperature	Temperatur des Gehäusebodens
t	Time	Zeit
Δt	Period	Zeitraum
t_b	Service life (operating hours)	Brauchbarkeitsdauer (Betriebszeit)



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Symbol	English	German
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
X_L	Inductive reactance	Induktiver Blindwiderstand
Z	Impedance	Scheinwiderstand
Z_T	Impedance at temperature T	Scheinwiderstand bei Temperatur T
$\tan \delta$	Dissipation factor	Verlustfaktor
λ	Failure rate	Ausfallrate
ϵ_0	Absolute permittivity	Elektrische Feldkonstante
ϵ_r	Relative permittivity	Dielektrizitätszahl
ω	Angular velocity; $2 \cdot \pi \cdot f$	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 lifesaving 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.
3. **The warnings, cautions and product-specific notes must be observed.**
4. In order to satisfy certain technical requirements, **some of the products described in this publication may contain substances subject to restrictions in certain jurisdictions (e.g. because they are classed as hazardous)**. Useful information on this will be found in our Material Data Sheets on the Internet (www.tdk-electronics.tdk.com/material). Should you have any more detailed questions, please contact our sales offices.
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Important notes

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