

# Aluminum electrolytic capacitors

## Large-size capacitors

**Series/Type:**            **B43649**

**Date:**                    August 2022

## 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 covered with PET sleeve without bottom disc
- Snap-in solder pins
- Minus pole marking on PET sleeve
- Minus pole not insulated from case
- Overload protection by pressure relief device on the base

### Terminals

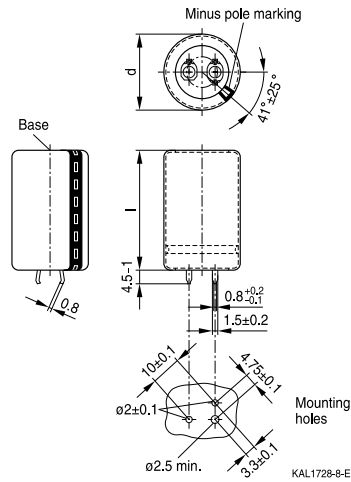
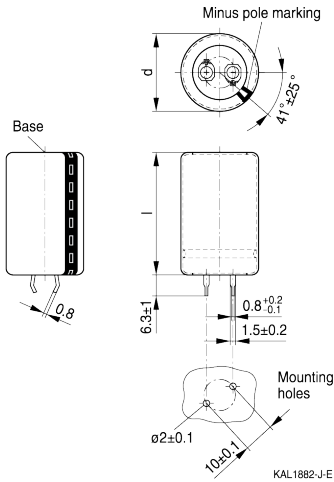
- Standard version with 3 terminals protection against polarity reversal: length 4.5 mm
- Version with 2 terminals with 2 different lengths available: 6.3 and 4.5 mm
- Vibration-resistant version with 2 terminals: length 4.5 mm

**Specifications and characteristics in brief**

Rated voltage $V_R$ Surge voltage $V_S$	450 ... 500 V DC $1.10 \cdot V_R$											
Rated capacitance $C_R$ Capacitance tolerance	100 ... 820 $\mu$ F $\pm 20\% \triangleq M$											
Dissipation factor $\tan \delta$ (20 °C, 120 Hz)	$\leq 0.20$											
Leakage current $I_{leak}$ (5 min, 20 °C)	$I_{leak} \leq 0.3 \mu A \cdot \left( \frac{C_R}{\mu F} \cdot \frac{V_R}{V} \right)^{0.7} + 4 \mu A$											
Self-inductance ESL	Approx. 20 nH											
Useful life <sup>1)</sup> 105 °C; $V_R$ ; $I_{AC,R}$	> 3000 h	Requirements: $I\Delta C/CI$ $\leq 20\%$ of initial value $\tan \delta$ $\leq 2$ times initial specified limit $I_{leak}$ $\leq$ initial specified limit										
Voltage endurance test 105 °C; $V_R$	2000 h	Post test requirements: $I\Delta C/CI$ $\leq 10\%$ of initial value $\tan \delta$ $\leq 1.3$ times initial specified limit $I_{leak}$ $\leq$ initial specified limit										
Vibration resistance test	To IEC 60068-2-6:2007, test Fc: Frequency range 10Hz ... 2 kHz, displacement amplitude max. 0.375 mm, acceleration max. 5 g, duration 3 x 4 h. Capacitor mounted by its body which is rigidly clamped to the work surface											
Characteristics at low temperature	Max. impedance ratio at 100 Hz	<table border="1"> <tr> <td><math>\bar{V}_R</math></td> <td>450 V</td> <td><math>\geq 475</math> V</td> </tr> <tr> <td><math>\bar{Z}_{-25\text{ °C}} / Z_{20\text{ °C}}</math></td> <td>5</td> <td>5</td> </tr> <tr> <td><math>\bar{Z}_{-40\text{ °C}} / Z_{20\text{ °C}}</math></td> <td>14</td> <td>11</td> </tr> </table>	$\bar{V}_R$	450 V	$\geq 475$ V	$\bar{Z}_{-25\text{ °C}} / Z_{20\text{ °C}}$	5	5	$\bar{Z}_{-40\text{ °C}} / Z_{20\text{ °C}}$	14	11	
$\bar{V}_R$	450 V	$\geq 475$ V										
$\bar{Z}_{-25\text{ °C}} / Z_{20\text{ °C}}$	5	5										
$\bar{Z}_{-40\text{ °C}} / Z_{20\text{ °C}}$	14	11										
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 60384-4:2016											
Reference standard	AEC-Q200 REV D <sup>2)</sup>											

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.

**Dimensional drawings**
**Large-size capacitor, snap-in version with PET sleeve**


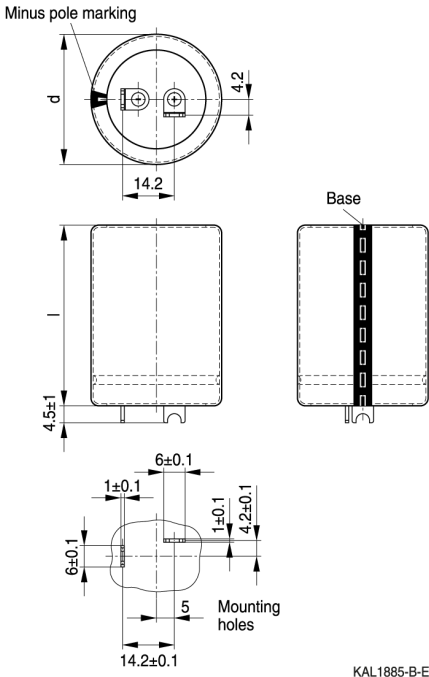
Large-size capacitors, snap-in terminals, length (6.3±1) mm. Also available in a shorter version with a length of (4.5–1) mm. Pressure relief device on the base.

Large-size capacitors, snap-in version with 3 terminals length (4.5–1) mm. Pressure relief device 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
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

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
30	60	58	60

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
35	60	90	36

**Large-size capacitor, vibration-resistant terminal version with PET sleeve**


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
30	60	58	60
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
35	60	90	36

Large-size capacitors, vibration-resistant terminals, length (4.5±1) mm.  
Pressure relief device on the base.

**Packing example of large-size capacitors**


For ecological reasons the packing is cardboard.

**Ordering codes for terminal styles**
**Large-size capacitors**

Terminal version	Identification in 3 <sup>rd</sup> block of ordering code
3 terminals 4.5 mm	M052
2 terminals 4.5 mm	M057
2 terminals 6.3 mm	M050
2 vibration-resistant terminals 4.5 mm	M058

**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

**Overview of available types**

The capacitance and voltage ratings listed below are available in different case sizes upon request. Other voltage and capacitance ratings are also available upon request.

$V_R$ (V DC)	450	475	500
	Case dimensions d x l (mm)		
$C_R$ ( $\mu$ F)			
100	22 x 25		25 x 25
120	22 x 30	25 x 25	25 x 30
150	22 x 30 25 x 25	25 x 30	25 x 35 30 x 25
180	22 x 35 25 x 30	25 x 35 30 x 25	25 x 40 30 x 30
220	22 x 45 25 x 35 30 x 25	25 x 40 30 x 30 35 x 25	25 x 45 30 x 35 35 x 25
270	22 x 50 25 x 40 30 x 30	25 x 50 30 x 35 35 x 30	25 x 55 30 x 40 35 x 30
330	25 x 45 30 x 35 35 x 25	25 x 55 30 x 40 35 x 30	30 x 45 35 x 35
390	25 x 55 30 x 40 35 x 30	30 x 45 35 x 35	30 x 50 35 x 40
470	30 x 45 35 x 35	30 x 55 35 x 40	30 x 60 35 x 45
560	30 x 50 35 x 40	30 x 60 35 x 45	35 x 55
680	35 x 45	35 x 55	35 x 60
820	35 x 50	35 x 60	

**Technical data and ordering codes**

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

7 = snap-in 2 terminals (4.5 mm)

8 = 2 vibration-resistant terminals (4.5 mm) - available in diameter 30 and 35 mm



**Technical data and ordering codes**

$C_R$ 100 Hz 20 °C μF	Case dimensions d x l mm	$ESR_{typ}$ 120 Hz 20 °C mΩ	$ESR_{typ}$ 360 Hz 60 °C mΩ	$Z_{max}$ 10 kHz 20 °C mΩ	$I_{AC,max}$ 120 Hz 60 °C A	$I_{AC,max}$ 120 Hz 85 °C A	$I_{AC,R}$ 120 Hz 105 °C A	Ordering code (composition see below)
$V_R = 475$ V DC								
120	25 x 25	680	190	1020	1.95	1.47	0.74	B43649A0127M05#
150	25 x 30	540	150	820	2.32	1.75	0.88	B43649A0157M05#
180	25 x 35	450	130	680	2.69	2.03	1.02	B43649A0187M05#
180	30 x 25	460	140	710	2.49	1.88	0.95	B43649B0187M05#
220	25 x 40	370	110	560	3.18	2.40	1.21	B43649A0227M05#
220	30 x 30	380	120	580	2.92	2.20	1.11	B43649B0227M05#
220	35 x 25	390	130	600	2.77	2.09	1.06	B43649C0227M05#
270	25 x 50	300	85	460	3.80	2.87	1.45	B43649A0277M05#
270	30 x 35	310	95	470	3.43	2.59	1.30	B43649B0277M05#
270	35 x 30	320	100	480	3.24	2.45	1.17	B43649C0277M05#
330	25 x 55	250	70	380	4.50	3.39	1.71	B43649A0337M05#
330	30 x 40	250	80	390	4.02	3.04	1.44	B43649B0337M05#
330	35 x 30	270	95	410	3.66	2.76	1.31	B43649C0337M05#
390	30 x 45	220	65	330	4.61	3.48	1.65	B43649A0397M05#
390	35 x 35	230	80	350	4.19	3.16	1.50	B43649B0397M05#
470	30 x 55	180	55	270	5.43	4.10	1.95	B43649A0477M05#
470	35 x 40	190	65	290	4.84	3.65	1.73	B43649B0477M05#
560	30 x 60	150	50	230	6.28	4.73	2.25	B43649A0567M05#
560	35 x 45	160	55	250	5.55	4.18	1.99	B43649B0567M05#
680	35 x 55	130	45	200	6.57	4.96	2.36	B43649A0687M05#
820	35 x 60	110	40	170	7.59	5.72	2.71	B43649A0827M05#

**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)

8 = 2 vibration-resistant terminals (4.5 mm) - available in diameter 30 and 35 mm

**Technical data and ordering codes**

$C_R$ 100 Hz 20 °C μF	Case dimensions d x l mm	$ESR_{typ}$ 120 Hz 20 °C mΩ	$ESR_{typ}$ 360 Hz 60 °C mΩ	$Z_{max}$ 10 kHz 20 °C mΩ	$I_{AC,max}$ 120 Hz 60 °C A	$I_{AC,max}$ 120 Hz 85 °C A	$I_{AC,R}$ 120 Hz 105 °C A	Ordering code (composition see below)
$V_R = 500$ V DC								
100	25 x 25	770	220	1150	1.79	1.35	0.68	B43649A6107M05#
120	25 x 30	640	180	960	2.07	1.56	0.79	B43649A6127M05#
150	25 x 35	510	140	770	2.48	1.87	0.94	B43649A6157M05#
150	30 x 25	520	160	790	2.32	1.75	0.88	B43649B6157M05#
180	25 x 40	430	120	640	2.88	2.17	1.09	B43649A6187M05#
180	30 x 30	430	130	650	2.67	2.01	1.01	B43649B6187M05#
220	25 x 45	350	100	530	3.41	2.57	1.29	B43649A6227M05#
220	30 x 35	350	110	540	3.12	2.36	1.19	B43649B6227M05#
220	35 x 25	380	130	570	2.90	2.18	1.10	B43649C6227M05#
270	25 x 55	280	80	430	4.08	3.08	1.55	B43649A6277M05#
270	30 x 40	290	90	440	3.68	2.77	1.32	B43649B6277M05#
270	35 x 30	300	100	460	3.40	2.56	1.22	B43649C6277M05#
330	30 x 45	240	75	360	4.32	3.26	1.55	B43649A6337M05#
330	35 x 35	250	85	380	3.97	2.99	1.42	B43649B6337M05#
390	30 x 50	200	65	310	4.96	3.74	1.77	B43649A6397M05#
390	35 x 40	210	70	320	4.53	3.41	1.62	B43649B6397M05#
470	30 x 60	170	50	260	5.85	4.41	2.09	B43649A6477M05#
470	35 x 45	180	60	270	5.23	3.94	1.87	B43649B6477M05#
560	35 x 55	150	50	220	6.10	4.61	2.19	B43649A6567M05#
680	35 x 60	120	45	190	7.10	5.35	2.54	B43649A6687M05#

**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)

8 = 2 vibration-resistant terminals (4.5 mm) - available in diameter 30 and 35 mm

Other voltage and capacitance ratings are also available upon request.

**Remark:**

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](http://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.

## 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 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"

### 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](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.
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](http://www.tdk-electronics.tdk.com/material)). Should you have any more detailed questions, please contact our sales offices.
5. We constantly strive to improve our products. Consequently, **the products described in this publication may change from time to time**. The same is true of the corresponding product specifications. Please check therefore to what extent product descriptions and specifications contained in this publication are still applicable before or when you place an order.  
We also **reserve the right to discontinue production and delivery of products**. Consequently, we cannot guarantee that all products named in this publication will always be available. The aforementioned does not apply in the case of individual agreements deviating from the foregoing for customer-specific products.
6. Unless otherwise agreed in individual contracts, **all orders are subject to our General Terms and Conditions of Supply**.



## Important notes

7. **Our manufacturing sites serving the automotive business apply the IATF 16949 standard.**  
The IATF certifications confirm our compliance with requirements regarding the quality management system in the automotive industry. Referring to customer requirements and customer specific requirements (“CSR”) TDK always has and will continue to have the policy of respecting individual agreements. Even if IATF 16949 may appear to support the acceptance of unilateral requirements, we hereby like to emphasize that **only requirements mutually agreed upon can and will be implemented in our Quality Management System.** For clarification purposes we like to point out that obligations from IATF 16949 shall only become legally binding if individually agreed upon.
8. The trade names EPCOS, CarXield, CeraCharge, CeraDiode, CeraLink, CeraPad, CeraPlas, CSMP, CTVS, DeltaCap, DigiSiMic, ExoCore, FilterCap, FormFit, InsuGate, LeaXield, MiniBlue, MiniCell, MKD, MKK, ModCap, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, ThermoFuse, WindCap, XieldCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at [www.tdk-electronics.tdk.com/trademarks](http://www.tdk-electronics.tdk.com/trademarks).

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