Aluminum electrolytic capacitors

Axial-lead and soldering star capacitors,
very high ripple current – up to 150 °C

Series/Type: **B41687, B41787**

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Applications

- Automotive electronics

Features

- Very high ripple current capability, optimized for heat-sink applications
- Vibration stability up to 60 *g* available upon request
- 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 x l ≤ 16 x 39 mm are also available taped on reel
- Soldering star capacitors are packed in blister trays

Specifications and characteristics in brief

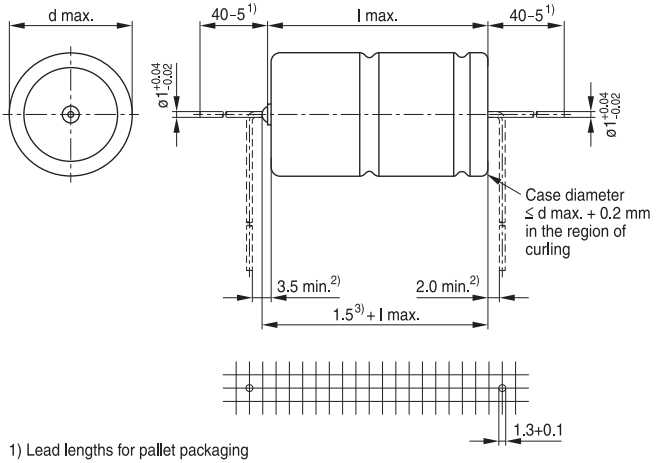
Rated voltage V_R Surge voltage V_S	25 ... 63 V DC 1.15 · V_R				
Rated capacitance C_R Capacitance tolerance	510 ... 4800 µF –10/+30% ≙ Q				
Leakage current I_{leak} (5 min, 20 °C)	$I_{leak} \leq 0.006\ \mu A \cdot \left(\frac{C_R}{\mu F} \cdot \frac{V_R}{V}\right) + 4\ \mu A$				
Self-inductance ESL[1]	Diameter d (mm)		16	18	21
	Terminals	Length l (mm)	Approx. ESL (nH)		
	axial	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[2] T_A = 125 °C; V_R; $I_{AC,R}$ T_C = 125 °C; V_R; $I_{AC,max}$	 > 4000 h > 2000 h	Requirements: $\|\Delta C/C\|$ ≤ 30% of initial value ESR ≤ 3 times initial specified limit[3] I_{leak} ≤ initial specified limit			
Voltage endurance test 125 °C; V_R	4000 h for $V_R \leq 35$ V DC 3000 h for V_R = 63 V DC	Post test requirements: $\|\Delta C/C\|$ ≤ 10% of initial value ESR ≤ 1.3 times initial specified limit[3] I_{leak} ≤ 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[4]				
Reference standard	AEC-Q200 REV D[5]				

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_{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.

B41687, Axial-lead capacitors

Dimensional drawing

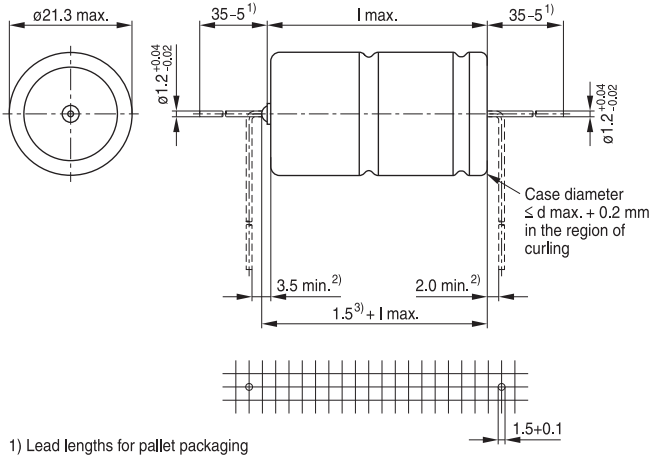
For d ≤ 18 mm:



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

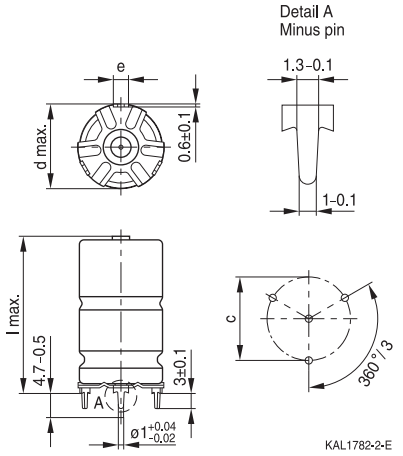
Dimensions, weights and packaging units

d x l	d_{max} x l_{max}	Approx. weight	Packing units (pcs.)	
mm	mm	g	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	–

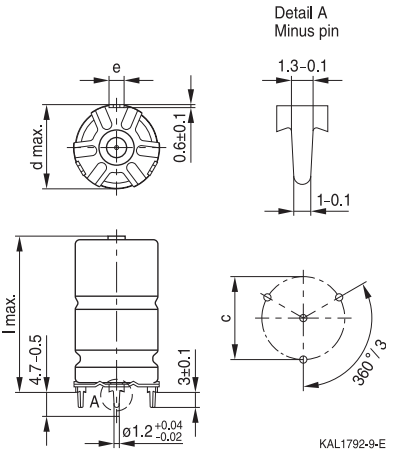
B41787, Soldering star capacitors

Dimensional drawings

Mounting holes d = 16 mm ... 18 mm



Mounting holes d = 21 mm



Dimensions, weights and packaging units

d x l	d_{max} x l_{max}	c ±0.1	e ±0.1	Approx. weight	Packing units
mm	mm	mm	mm	g	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	63
	Case dimensions d x l (mm)		
C_R (µF)			
510			16 x 25
620			16 x 25
680			16 x 30 18 x 25
750		16 x 25	18 x 25
820			16 x 30 16 x 35
910		18 x 25	18 x 30
1000	16 x 25	16 x 30	16 x 35 16 x 39 18 x 30
1100			18 x 35
1200		16 x 35	16 x 39
1300	16 x 30 18 x 25	18 x 30	18 x 35 18 x 39 21 x 30
1500		16 x 39	18 x 39 21 x 30
1600		18 x 35	
1700	16 x 35 18 x 30		21 x 35
1800		21 x 30	
1900		18 x 39	21 x 35 21 x 39
2000	16 x 39		
2100	18 x 35		
2200		21 x 35	21 x 39
2400	21 x 30		
2500	18 x 39		
2600			21 x 49
2700		21 x 39	
3000	21 x 35		21 x 49
3600	21 x 39	21 x 49	
4800	21 x 49		

Case dimensions and ordering codes

C_R 100 Hz 20 °C µF	Case dimensions d x l mm	Ordering code Axial pallet	Ordering code Axial reel	Ordering code Soldering star
V_R = 25 V DC				
1000	16 x 25	B41687A5108Q001	B41687A5108Q003	B41787A5108Q001
1300	16 x 30	B41687A5138Q001	B41687A5138Q003	B41787A5138Q001
1300	18 x 25	B41687B5138Q001		B41787B5138Q001
1700	16 x 35	B41687A5178Q001	B41687A5178Q003	B41787A5178Q001
1700	18 x 30	B41687B5178Q001		B41787B5178Q001
2000	16 x 39	B41687A5208Q001	B41687A5208Q003	B41787A5208Q001
2100	18 x 35	B41687A5218Q001		B41787A5218Q001
2400	21 x 30	B41687A5248Q001		B41787A5248Q001
2500	18 x 39	B41687A5258Q001		B41787A5258Q001
3000	21 x 35	B41687A5308Q001		B41787A5308Q001
3600	21 x 39	B41687A5368Q001		B41787A5368Q001
4800	21 x 49	B41687A5488Q001		B41787A5488Q001
V_R = 35 V DC				
750	16 x 25	B41687A7757Q001	B41687A7757Q003	B41787A7757Q001
910	18 x 25	B41687A7917Q001		B41787A7917Q001
1000	16 x 30	B41687A7108Q001	B41687A7108Q003	B41787A7108Q001
1200	16 x 35	B41687A7128Q001	B41687A7128Q003	B41787A7128Q001
1300	18 x 30	B41687A7138Q001		B41787A7138Q001
1500	16 x 39	B41687A7158Q001	B41687A7158Q003	B41787A7158Q001
1600	18 x 35	B41687A7168Q001		B41787A7168Q001
1800	21 x 30	B41687A7188Q001		B41787A7188Q001
1900	18 x 39	B41687A7198Q001		B41787A7198Q001
2200	21 x 35	B41687A7228Q001		B41787A7228Q001
2700	21 x 39	B41687A7278Q001		B41787A7278Q001
3600	21 x 49	B41687A7368Q001		B41787A7368Q001

C_R 100 Hz 20 °C µF	Case dimensions d x l mm	Ordering code Axial pallet	Ordering code Axial reel	Ordering code Soldering star
V_R = 63 V DC				
510	16 x 25	B41687E8517Q001	B41687E8517Q003	B41787E8517Q001
620	16 x 25	B41687G8627Q001	B41687G8627Q003	B41787G8627Q001
680	16 x 30	B41687E8687Q001	B41687E8687Q003	B41787E8687Q001
680	18 x 25	B41687F8687Q001		B41787F8687Q001
750	18 x 25	B41687G8757Q001		B41787G8757Q001
820	16 x 30	B41687G8827Q001	B41687G8827Q003	B41787G8827Q001
820	16 x 35	B41687E8827Q001	B41687E8827Q003	B41787E8827Q001
910	18 x 30	B41687E8917Q001		B41787E8917Q001
1000	16 x 35	B41687G8108Q001	B41687G8108Q003	B41787G8108Q001
1000	16 x 39	B41687E8108Q001	B41687E8108Q003	B41787E8108Q001
1000	18 x 30	B41687H8108Q001		B41787H8108Q001
1100	18 x 35	B41687E8118Q001		B41787E8118Q001
1200	16 x 39	B41687G8128Q001	B41687G8128Q003	B41787G8128Q001
1300	18 x 35	B41687G8138Q001		B41787G8138Q001
1300	18 x 39	B41687E8138Q001		B41787E8138Q001
1300	21 x 30	B41687F8138Q001		B41787F8138Q001
1500	18 x 39	B41687G8158Q001		B41787G8158Q001
1500	21 x 30	B41687H8158Q001		B41787H8158Q001
1700	21 x 35	B41687E8178Q001		B41787E8178Q001
1900	21 x 35	B41687G8198Q001		B41787G8198Q001
1900	21 x 39	B41687E8198Q001		B41787E8198Q001
2200	21 x 39	B41687G8228Q001		B41787G8228Q001
2600	21 x 49	B41687E8268Q001		B41787E8268Q001
3000	21 x 49	B41687G8308Q001		B41787G8308Q001

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
V_R = 25 V DC						
1000	16 x 25	98	565	30	5.9	14.1
1300	16 x 30	75	435	23	7.3	16.8
1300	18 x 25	80	470	26	7.0	17.1
1700	16 x 35	65	377	18	8.6	18.9
1700	18 x 30	57	332	19	8.5	20.2
2000	16 x 39	55	314	16	9.6	20.7
2100	18 x 35	52	304	16	10.0	22.8
2400	21 x 30	46	256	15	10.9	26.9
2500	18 x 39	44	257	14	11.1	24.7
3000	21 x 35	37	204	12	12.6	30.2
3600	21 x 39	31	172	11	14.1	32.8
4800	21 x 49	23	126	8	17.3	37.3
V_R = 35 V DC						
750	16 x 25	119	580	30	5.9	14.1
910	18 x 25	97	479	26	7.0	17.1
1000	16 x 30	92	450	23	7.3	16.8
1200	16 x 35	80	393	18	8.5	18.9
1300	18 x 30	72	354	19	8.5	20.2
1500	16 x 39	67	324	16	9.6	20.7
1600	18 x 35	58	287	16	10.0	22.8
1800	21 x 30	53	249	15	10.9	26.9
1900	18 x 39	49	242	14	11.1	24.7
2200	21 x 35	42	198	12	12.6	30.2
2700	21 x 39	36	167	11	14.1	32.8
3600	21 x 49	26	124	8	17.3	37.3

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.

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
V_R = 63 V DC						
510	16 x 25	157	575	49	5.7	17.6
620	16 x 25	157	575	49	5.6	16.5
680	16 x 30	128	474	40	6.7	20.0
680	18 x 25	106	389	33	7.4	23.6
750	18 x 25	106	389	33	6.7	20.5
820	16 x 30	128	474	40	6.5	19.6
820	16 x 35	100	371	31	8.0	23.0
910	18 x 30	87	319	27	8.7	26.9
1000	16 x 35	100	371	31	7.9	22.3
1000	16 x 39	80	290	25	9.3	26.0
1000	18 x 30	87	319	27	8.2	24.4
1100	18 x 35	71	256	22	10.0	29.8
1200	16 x 39	80	290	25	9.1	24.4
1300	18 x 35	71	256	22	9.7	27.7
1300	18 x 39	58	218	18	11.4	32.9
1300	21 x 30	74	271	23	9.8	31.0
1500	18 x 39	58	218	18	10.9	30.3
1500	21 x 30	74	271	23	9.0	27.7
1700	21 x 35	61	223	19	11.2	34.2
1900	21 x 35	61	223	19	10.5	30.9
1900	21 x 39	52	183	16	12.5	37.3
2200	21 x 39	52	183	16	12.0	34.1
2600	21 x 49	36	133	11	16.0	43.0
3000	21 x 49	36	133	11	15.2	38.0

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[3)]

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.

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 and Hybrid Polymer 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 types listed on the product information site of TDK.
MDS for customer specific capacitors are available upon request.

Nevertheless, the following rules should be observed when handling Aluminum Electrolytic Capacitors and Hybrid Polymer 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 seperate 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”
Operating temperature range	Do not exceed the temperature limits specified in the product data sheet. Useful life and reliability depend to a large extent on the capacitor's temperature.	7.1, 7.2 “Minimum and maximum permissible operating temperatures”
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”
Mounting of capacitors	The internal and external structure of capacitors might be damaged if excessive force is applied to their terminals. 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 “Mounting”
Mounting position of capacitors	The position of the pressure relief device must be taken into consideration when designing the application layout. As a rule, the function of the pressure relief device must not be impaired or blocked by the mounting. Screw terminal capacitors, with pressure relief device in the cover disk, must not be mounted with terminals facing down unless otherwise specified. Multi-pin capacitors with pressure relief device on the can base must not be mounted with terminals facing up unless otherwise specified.	11.1 “Mounting positions of capacitors”

Topic	Safety information	Reference chapter “General technical information”
Robustness of terminals	Unless otherwise specified, 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”
Potting and gluing	If applied, potting and gluing materials must not impair the function of the capacitor’s pressure relief device.	11.4 “Potting and gluing”
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 or Hybrid Polymer Capacitors.	11.6 “Cleaning agents”
Passive flammability	Avoid external energy, e.g. fire.	8.1 “Passive flammability”
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”
		Reference chapter “Capacitors with screw terminals”
Breakdown strength of shrinking sleeve	Do not damage the shrinking 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
ΔC	Capacitance difference	Kapazitätsdifferenz
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_B	Capacitor base temperature	Temperatur des Gehäusebodens
T_C	Case temperature	Gehäusetemperatur
t	Time	Zeit
Δt	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

Symbol	English	German
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 δ	Dissipation factor	Verlustfaktor
λ	Failure rate	Ausfallrate
ε_0	Absolute permittivity	Elektrische Feldkonstante
ε_r	Relative permittivity	Dielektrizitätszahl
ω	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). 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**.

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, FilterCap, FormFit, InsuGate, LeaXield, MediPlas, MiniBlue, MiniCell, MKD, MKK, ModCap, MotorCap, PCC, PhaseCap, PhaseCube, PhaseMod, PhiCap, PiezoBrush, PlasmaBrush, PowerHap, PQSine, PQvar, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SiMic, SIMID, SineFormer, SIOV, SurfIND, 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.

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