



# Aluminum electrolytic capacitors

## Large-size capacitors

**Series/Type:** B43654

**Date:** November 2020

## Long-life grade capacitors

### Applications

- Onboard chargers

### Features

- Very high CV product, very compact
- High reliability
- Long useful life
- High ripple current capability
- RoHS-compatible
- Qualification based on the AEC-Q200 standard

### Construction

- Aluminum case, fully insulated with PET
- Charge/discharge-proof, polar
- Snap-in solder pins
- Minus pole marking on the insulating sleeve
- Overload protection by safety vent on the base

### Terminals

- Standard version with 2 terminals,  
2 lengths available: 6.3 and 4.5 mm
- 3 terminals to ensure correct insertion: length 4.5 mm
- Vibration-resistant version with 2 terminals: length 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 $C_R$	82 ... 680 $\mu\text{F}$	
Capacitance tolerance	$\pm 20\% \triangleq M$	
Dissipation factor $\tan \delta$ (20 °C, 120 Hz)	$\tan \delta \leq 0.2$	
Leakage current $I_{\text{leak}}$ (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 <sup>1)</sup> 105 °C; $V_R$ ; $I_{AC,R}$	> 5000 h	<b>Requirements:</b> $ \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	<b>Post test requirements:</b> $ \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 $3 \times 4$ h. Capacitor mounted by its body which is rigidly clamped to the work surface.	
Characteristics at low temperature	Max. impedance ratio at 100 Hz	$V_R$ 450
		$Z_{-25\text{ °C}} / Z_{20\text{ °C}}$ 5
		$Z_{-40\text{ °C}} / Z_{20\text{ °C}}$ 10
IEC climatic category	To IEC 60068-1: 40/105/56 (–40 °C/+105 °C/56 days damp heat test)	
Sectional specification	IEC 60384-4	
Reference standard	AEC-Q200 <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.

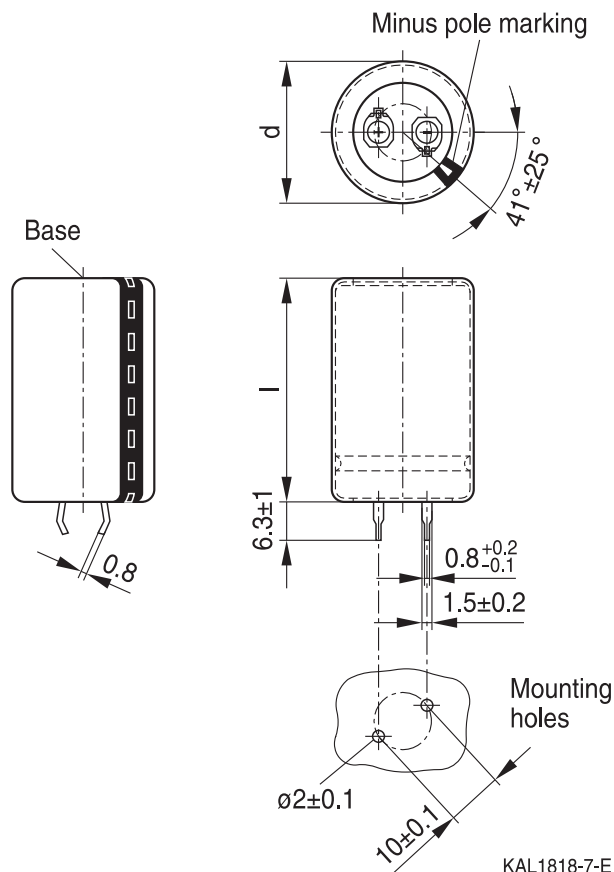


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Very compact, long useful life – 105 °C

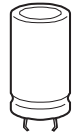
### Dimensional drawings

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

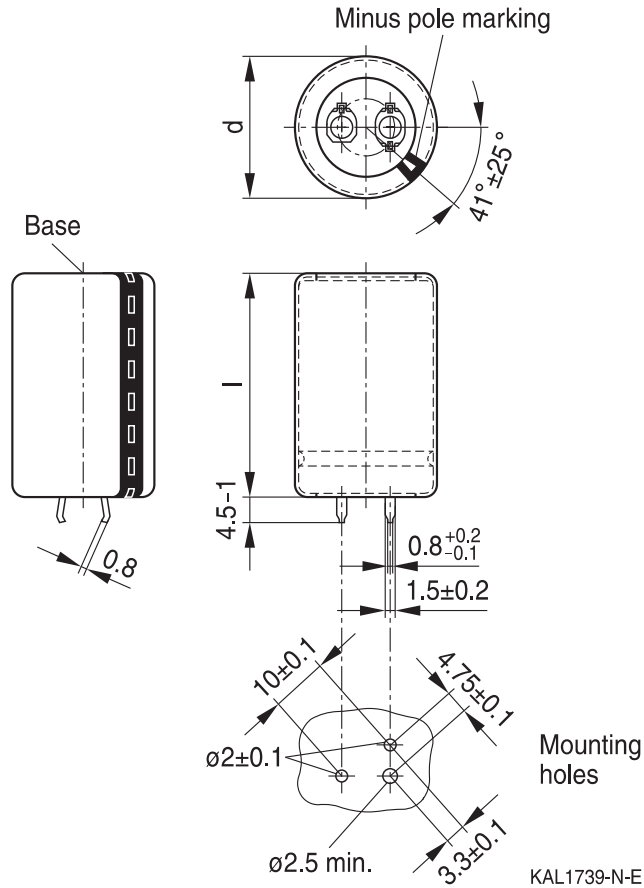


Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l ±2		
22	25	9	160
22	30	12	160
22	35	15	160
22	40	18	160
22	45	20	160
22	50	24	160
Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l ±2		
25	25	13	130
25	30	17	130
25	35	19	130
25	40	22	130
25	45	25	130
25	50	29	130
25	55	32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

Large-size capacitors, snap-in 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.



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



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
Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l ±2		
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

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

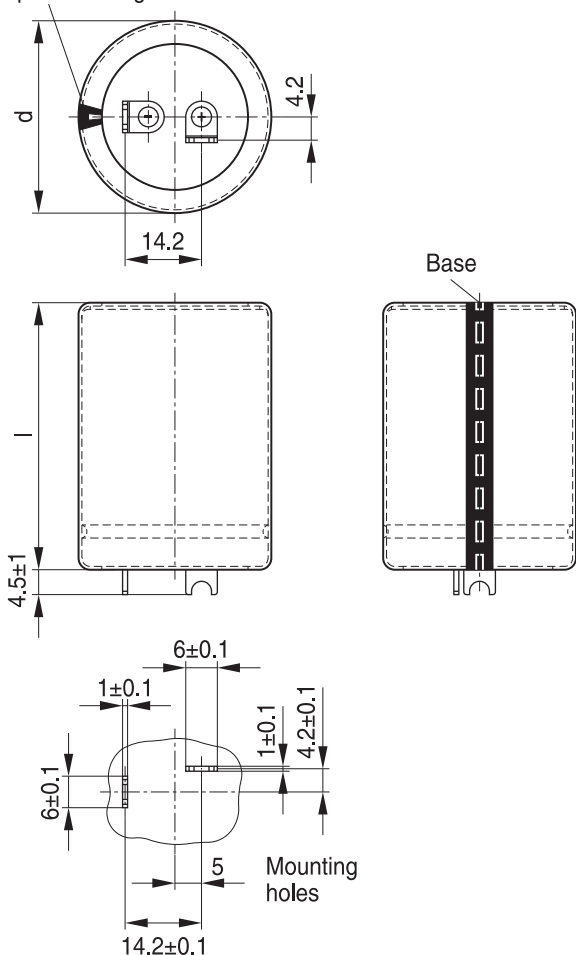


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**Large-size capacitor, vibration-resistant terminal version with PET insulation**

Minus pole marking



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

Dimensions (mm)		Approx. weight (g)	Packing units (pcs.)
d +1	l ±2		
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

KAL1819-F-E

Large-size capacitors, vibration-resistant terminals (length  $(4.5 \pm 1)$  mm).  
Safety vent on the base.



### Packing example of large-size capacitors



For ecological reasons the packing is pure cardboard.

### Ordering codes for terminal styles

Identification in 3<sup>rd</sup> block of ordering code

Large-size capacitors

Terminal version	Insulation
	PET
3 terminals 4.5 mm	M062
2 terminals 4.5 mm	M067
2 terminals 6.3 mm	M060
2 vibration-resistant terminals 4.5 mm	M068

Ordering examples:

B43654A5107M062 } large-size capacitor, snap-in version with 3 terminals 4.5 mm and PET insulation

B43654A5107M067 } large-size capacitor, snap-in version with 2 terminals 4.5 mm and PET insulation



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### 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
	Case dimensions $d \times l$ (mm)
$C_R$ ( $\mu\text{F}$ )	
82	22 × 25
100	22 × 30
120	22 × 35 25 × 25
150	22 × 40 25 × 30
180	22 × 45 25 × 35 30 × 25
220	22 × 50 25 × 40 30 × 30 35 × 25
270	25 × 45 30 × 35 35 × 30
330	25 × 55 30 × 40 35 × 30
390	30 × 45 35 × 35
470	30 × 50 35 × 40
560	35 × 45
680	35 × 55




**Technical data and ordering codes**

$C_R$ 100 Hz 20 °C $\mu\text{F}$	Case dimensions $d \times l$ mm	$\text{ESR}_{\text{typ}}$ 100 Hz 20 °C $\text{m}\Omega$	$\text{ESR}_{\text{typ}}$ 300 Hz 60 °C $\text{m}\Omega$	$Z_{\text{max}}$ 10 kHz 20 °C $\text{m}\Omega$	$I_{\text{AC,max}}$ 100 Hz 60 °C A	$I_{\text{AC,max}}$ 100 Hz 85 °C A	$I_{\text{AC,R}}$ 100 Hz 105 °C A	Ordering code (composition see below)
<b><math>V_R = 450 \text{ V DC}</math></b>								
82	22 × 25	1240	320	1870	1.46	1.09	0.59	B43654A5826M06#
100	22 × 30	1010	260	1530	1.69	1.26	0.68	B43654A5107M06#
120	22 × 35	850	220	1280	1.94	1.46	0.79	B43654A5127M06#
120	25 × 25	860	230	1300	1.91	1.43	0.77	B43654B5127M06#
150	22 × 40	680	170	1020	2.33	1.74	0.94	B43654A5157M06#
150	25 × 30	680	180	1040	2.25	1.68	0.90	B43654B5157M06#
180	22 × 45	560	140	850	2.72	2.03	1.09	B43654A5187M06#
180	25 × 35	570	150	860	2.59	1.93	1.04	B43654B5187M06#
180	30 × 25	590	170	890	2.49	1.86	1.00	B43654C5187M06#
220	22 × 50	460	120	700	3.22	2.40	1.29	B43654A5227M06#
220	25 × 40	470	120	710	3.04	2.27	1.22	B43654B5227M06#
220	30 × 30	480	140	730	2.87	2.15	1.16	B43654C5227M06#
220	35 × 25	490	150	750	2.79	2.08	1.12	B43654D5227M06#
270	25 × 45	380	100	580	3.61	2.69	1.44	B43654A5277M06#
270	30 × 35	390	110	590	3.35	2.50	1.35	B43654B5277M06#
270	35 × 30	400	120	610	3.22	2.41	1.39	B43654C5277M06#
330	25 × 55	310	85	470	4.26	3.18	1.71	B43654A5337M06#
330	30 × 40	320	90	490	3.91	2.92	1.68	B43654B5337M06#
330	35 × 30	330	110	520	3.66	2.73	1.57	B43654C5337M06#
390	30 × 45	270	80	410	4.47	3.34	1.92	B43654A5397M06#
390	35 × 35	280	90	430	4.16	3.10	1.79	B43654B5397M06#
470	30 × 50	220	65	350	5.21	3.88	2.23	B43654A5477M06#
470	35 × 40	230	75	360	4.78	3.57	2.05	B43654B5477M06#
560	35 × 45	200	65	310	5.46	4.08	2.34	B43654A5567M06#
680	35 × 55	160	50	250	6.40	4.78	2.75	B43654A5687M06#

**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-resistance terminals (4.5 mm) – (available in diameter 30 and 35 mm)



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### Useful life<sup>1)</sup>

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:

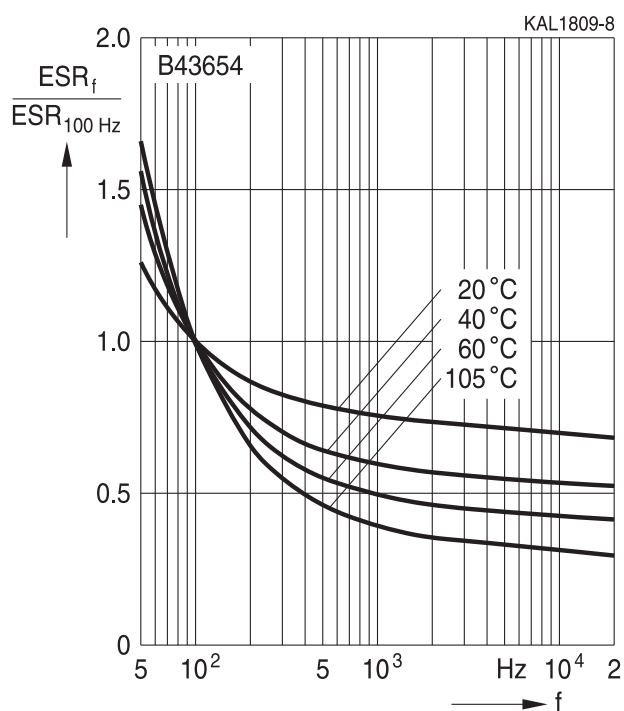
[www.tdk-electronics.tdk.com/alcap](http://www.tdk-electronics.tdk.com/alcap)

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.

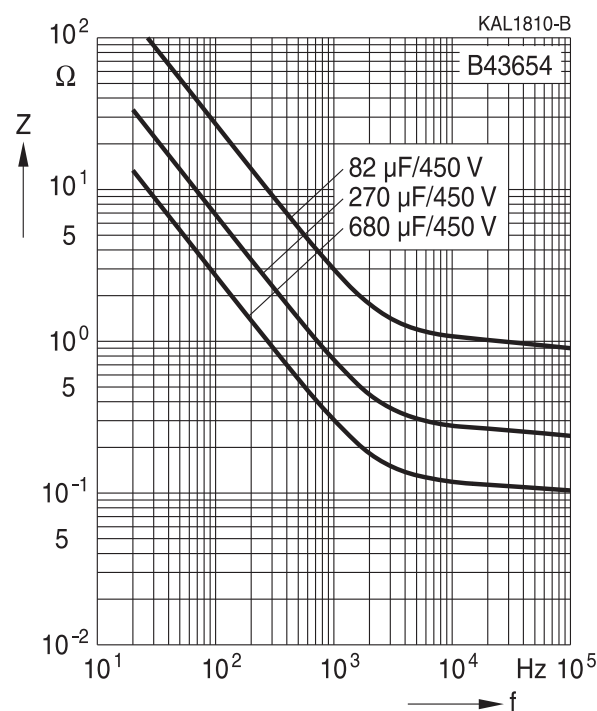
### Frequency characteristics of ESR

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.



## 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.



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## 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 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"



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](http://www.tdk-electronics.tdk.com/orderingcodes).



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## 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
$T_C$	Case temperature	Gehäusetemperatur
$T_B$	Capacitor base temperature	Temperatur des Gehäusebodens
t	Time	Zeit
$\Delta t$	Period	Zeitraum
$t_b$	Service life (operating hours)	Brauchbarkeitsdauer (Betriebszeit)



Symbol	English	German
V	Voltage	Spannung
V <sub>F</sub>	Forming voltage	Formierspannung
V <sub>op</sub>	Operating voltage	Betriebsspannung
V <sub>R</sub>	Rated voltage, DC voltage	Nennspannung, Gleichspannung
V <sub>S</sub>	Surge voltage	Spitzenspannung
X <sub>C</sub>	Capacitive reactance	Kapazitiver Blindwiderstand
X <sub>L</sub>	Inductive reactance	Induktiver Blindwiderstand
Z	Impedance	Scheinwiderstand
Z <sub>T</sub>	Impedance at temperature T	Scheinwiderstand bei Temperatur T
tan δ	Dissipation factor	Verlustfaktor
λ	Failure rate	Ausfallrate
ε <sub>0</sub>	Absolute permittivity	Elektrische Feldkonstante
ε <sub>r</sub>	Relative permittivity	Dielektrizitätszahl
ω	Angular velocity; 2 · π · f	Kreisfrequenz; 2 · π · 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.**
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