# Film Capacitors

## Metallized Polyester Film Capacitors (MKT-S)

**Series/Type:** **B32537**

Date: May 2009

## Typical applications

- Measurement equipment
- Rough environments
- High-rel circuits in industrial electronics

## Climatic

- Max. operating temperature: 125 °C
- Climatic category (IEC 60068-1): 55/100/56

## Features

- Optimum self-healing capability
- Excellent short circuit protection
- Very high reliability

## Construction

- Dielectric: polyethylene terephthalate (polyester, PET)
- Construction with structured metallization
- Tubular winding
- Encapsulated in metal tube
- Insulating sleeve
- Face ends sealed with epoxy resin

## Terminals

- Central axial leads, lead-free tinned

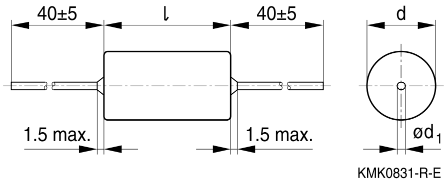
## Marking

Manufacturer's logo, style (MKT-S),
rated capacitance (coded)
capacitance tolerance (code letter)
rated voltage, date of manufacture (coded)

## Delivery mode

Bulk (untaped)
For notes on taping, refer to chapter "Taping and packing“.

## Dimensional drawing




Dimensions in mm

| Diameter d | <8.5 | 8.5 ... 16 | >16 |
|---|---|---|---|
| Lead diameter $d_1$ | 0.6 | 0.8 | 1.0 |

When bending leads take care to leave a clearance of 1 mm to the capacitor body.

## Overview of types

| Type | B32537 | | | | |
|---|---|---|---|---|---|
| $V_R$ (V DC) | 50 | 100 | 160 | 250 | 630 |
| $V_{RMS}$ (V AC) | 20 | 35 | 60 | 90 | 200 |
| $C_R$ (µF) | | | | | |
| 0.033 | | | | | |
| 0.047 | | | | | |
| 0.068 | | | | | |
| 0.10 | | | | | |
| 0.15 | | | | | |
| 0.22 | | | | | |
| 0.33 | | | | | |
| 0.47 | | | | | |
| 0.68 | | | | | |
| 1.0 | | | | | |
| 1.5 | | | | | |
| 2.2 | | | | | |
| 3.3 | | | | | |
| 4.7 | | | | | |
| 6.8 | | | | | |
| 10 | | | | | |
| 22 | | | | | |
| 47 | | | | | |
| 100 | | | | | |

## Ordering codes and packing units

| $V_R$<br><br>V DC | $V_{RMS}$<br>f ≤60 Hz<br>V AC | $C_R$<br><br>µF | Max. dimensions<br>d × l<br>mm | Ordering code<br>(composition see<br>below) | Untaped<br><br>pcs./MOQ |
|---|---|---|---|---|---|
| 50 | 20 | 0.47 | 7.4 × 18.5 | B32537B5474+000 | 200 |
| | | 0.68 | 7.4 × 18.5 | B32537B5684+000 | 200 |
| | | 1.0 | 7.4 × 18.5 | B32537B5105+000 | 200 |
| | | 1.5 | 7.4 × 18.5 | B32537B5155+000 | 200 |
| | | 2.2 | 8.4 × 21.0 | B32537B5225+000 | 200 |
| | | 3.3 | 9.4 × 21.0 | B32537B5335+000 | 80 |
| | | 4.7 | 10.7 × 21.0 | B32537B5475+000 | 80 |
| | | 6.8 | 11.7 × 21.0 | B32537B5685+000 | 80 |
| | | 10 | 12.7 × 21.0 | B32537B5106+000 | 80 |
| 100 | 35 | 0.10 | 7.4 × 18.5 | B32537B1104+000 | 200 |
| | | 0.15 | 7.4 × 18.5 | B32537B1154+000 | 200 |
| | | 0.22 | 7.4 × 18.5 | B32537B1224+000 | 200 |
| | | 0.33 | 7.4 × 18.5 | B32537B1334+000 | 200 |
| | | 0.47 | 7.4 × 18.5 | B32537B1474+000 | 200 |
| | | 0.68 | 7.4 × 18.5 | B32537B1684+000 | 200 |
| | | 1.0 | 8.4 × 21.0 | B32537B1105+000 | 200 |
| | | 1.5 | 8.4 × 21.0 | B32537B1155+000 | 200 |
| | | 2.2 | 9.4 × 21.0 | B32537B1225+000 | 80 |
| | | 3.3 | 9.4 × 21.0 | B32537B1335+000 | 80 |
| | | 4.7 | 11.7 × 21.0 | B32537B1475+000 | 80 |
| | | 6.8 | 10.7 × 34.0 | B32537B1685+000 | 80 |
| | | 10 | 10.7 × 34.0 | B32537B1106+000 | 80 |
| | | 22 | 15.7 × 34.0 | B32537B1226+000 | 80 |
| | | 47 | 20.7 × 34.0 | B32537B1476+000 | 80 |
| | | 100 | 29.7 × 34.0 | B32537B1107+000 | 80 |

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

**Composition of ordering code**

\+ = Capacitance tolerance code:
K = ±10%
J = ±5%

## Ordering codes and packing units

| $V_R$<br><br>V DC | $V_{RMS}$<br>f ≤60 Hz<br>V AC | $C_R$<br><br>µF | Max. dimensions<br>d × l<br>mm | Ordering code<br>(composition see<br>below) | Untaped<br><br>pcs./MOQ |
|---|---|---|---|---|---|
| 160 | 60 | 0.10 | 7.4 × 18.5 | B32537B2104+000 | 200 |
| | | 0.15 | 7.4 × 18.5 | B32537B2154+000 | 200 |
| | | 0.22 | 7.4 × 18.5 | B32537B2224+000 | 200 |
| | | 0.33 | 7.4 × 18.5 | B32537B2334+000 | 200 |
| | | 0.47 | 8.4 × 21.0 | B32537B2474+000 | 200 |
| | | 0.68 | 8.4 × 21.0 | B32537B2684+000 | 200 |
| | | 1.0 | 9.4 × 21.0 | B32537B2105+000 | 80 |
| | | 1.5 | 10.7 × 21.0 | B32537B2155+000 | 80 |
| | | 2.2 | 11.7 × 21.0 | B32537B2225+000 | 80 |
| | | 3.3 | 10.7 × 34.0 | B32537B2335+000 | 80 |
| | | 4.7 | 12.7 × 34.0 | B32537B2475+000 | 80 |
| | | 6.8 | 12.7 × 34.0 | B32537B2685+000 | 80 |
| | | 10 | 15.7 × 34.0 | B32537B2106+000 | 80 |
| 250 | 90 | 0.10 | 7.4 × 18.5 | B32537B3104+000 | 200 |
| | | 0.15 | 7.4 × 18.5 | B32537B3154+000 | 200 |
| | | 0.22 | 7.4 × 18.5 | B32537B3224+000 | 200 |
| | | 0.33 | 8.4 × 21.0 | B32537B3334+000 | 200 |
| | | 0.47 | 9.4 × 21.0 | B32537B3474+000 | 80 |
| | | 0.68 | 9.4 × 21.0 | B32537B3684+000 | 80 |
| | | 1.0 | 11.7 × 21.0 | B32537B3105+000 | 80 |
| | | 1.5 | 12.7 × 21.0 | B32537B3155+000 | 80 |
| | | 2.2 | 13.7 × 21.0 | B32537B3225+000 | 80 |
| | | 3.3 | 12.7 × 34.0 | B32537B3335+000 | 80 |
| | | 4.7 | 15.7 × 34.0 | B32537B3475+000 | 80 |
| | | 6.8 | 17.7 × 34.0 | B32537B3685+000 | 80 |
| | | 10 | 20.7 × 34.0 | B32537B3106+000 | 80 |

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

**Composition of ordering code**

+ = Capacitance tolerance code:
K = ±10%
J = ±5%

## Ordering codes and packing units

| $V_R$<br>V DC | $V_{RMS}$<br>f ≤60 Hz<br>V AC | $C_R$<br>µF | Max. dimensions<br>d × l<br>mm | Ordering code<br>(composition see below) | Untaped<br>pcs./MOQ |
|---|---|---|---|---|---|
| 630 | 200 | 0.033 | 7.4 × 18.5 | B32537B8333+000 | 200 |
| | | 0.047 | 7.4 × 18.5 | B32537B8473+000 | 200 |
| | | 0.068 | 8.4 × 21.0 | B32537B8683+000 | 200 |
| | | 0.10 | 9.4 × 21.0 | B32537B8104+000 | 80 |
| | | 0.15 | 9.4 × 21.0 | B32537B8154+000 | 80 |
| | | 0.22 | 11.7 × 21.0 | B32537B8224+000 | 80 |
| | | 0.33 | 12.7 × 21.0 | B32537B8334+000 | 80 |
| | | 0.47 | 13.7 × 21.0 | B32537B8474+000 | 80 |
| | | 0.68 | 12.7 × 34.0 | B32537B8684+000 | 80 |
| | | 1.0 | 15.7 × 34.0 | B32537B8105+000 | 80 |
| | | 1.5 | 17.7 × 34.0 | B32537B8155+000 | 80 |
| | | 2.2 | 20.7 × 34.0 | B32537B8225+000 | 80 |
| | | 3.3 | 25.7 × 34.0 | B32537B8335+000 | 80 |
| | | 4.7 | 29.7 × 34.0 | B32537B8475+000 | 80 |

MOQ = Minimum Order Quantity, consisting of 4 packing units.
Further E series and intermediate capacitance values on request.

**Composition of ordering code**

+ = Capacitance tolerance code:
K = ±10%
J = ±5%

## Technical data

| | | |
|---|---|---|
| Operating temperature range | Max. operating temperature $T_{op,max}$ | +125 °C |
| | Upper category temperature $T_{max}$ | +100 °C |
| | Lower category temperature $T_{min}$ | −55 °C |
| | Rated temperature $T_R$ | +85 °C |

| Dissipation factor tan δ (in $10^{-3}$) at 20 °C (upper limit values) | $C_R$ (µF) | ≤ 0.47 | 0.47 < $C_R$ ≤4.7 | 4.7 < $C_R$ ≤10.0 | > 10.0 |
|---|---|---|---|---|---|
| | at 1 kHz | 7 | 8 | 8 | 10 |
| | at 10 kHz | 15 | 22 | 25 | – |

| Insulation resistance $R_{ins}$ or time constant $\tau = C_R \cdot R_{ins}$ at 20 °C, rel. humidity ≤ 65% (minimum as-delivered values) | $C_R$ | |
|---|---|---|
| | ≤ 0.33 µF | > 15000 MΩ |
| | > 0.33 µF | > 5000 s |

| | |
|---|---|
| DC test voltage | $1.4 \cdot V_R$, 2 s |

| Category voltage $V_C$ (continuous operation with $V_{DC}$ or $V_{AC}$ at f ≤ 60 Hz) | $T_A$ (°C) | DC voltage derating | AC voltage derating |
|---|---|---|---|
| | $T_A \leq 85$ | $V_C = V_R$ | $V_{C,RMS} = V_{RMS}$ |
| | $85 < T_A \leq 100$ | $V_C = V_R \cdot (165 - T_A)/80$ | $V_{C,RMS} = V_{RMS} \cdot (165 - T_A)/80$ |

| Operating voltage $V_{op}$ for short operating periods ($V_{DC}$ or $V_{AC}$ at f ≤ 60 Hz) | $T_A$ (°C) | DC voltage (max. hours) | AC voltage (max. hours) |
|---|---|---|---|
| | $T_A \leq 100$ | $V_{op} = 1.25 \cdot V_C$ (2000 h) | $V_{op} = 1.0 \cdot V_{C,RMS}$ (2000 h) |
| | $100 < T_A \leq 125$ | $V_{op} = 0.5 \cdot V_R$ (1000 h) | $V_{op} = 0.5 \cdot V_{RMS}$ (1000 h) |

| | | |
|---|---|---|
| Damp heat test | 56 days/40 °C/93% relative humidity | |
| Limit values after damp heat test | Capacitance change \|ΔC/C\| | ≤ 5% |
| | Dissipation factor change Δ tan δ | $\leq 5 \cdot 10^{-3}$ (at 1 kHz) |
| | Insulation resistance $R_{ins}$ | ≥ 50% of minimum as-delivered values |

| | | |
|---|---|---|
| Reliability: Failure rate λ | 1 fit ($\leq 1 \cdot 10^{-9}$/h) at $0.5 \cdot V_R$, 40 °C | |
| Service life $t_{SL}$ | 200 000 h at $1.0 \cdot V_R$, 85 °C<br>For conversion to other operating conditions and temperatures, refer to chapter "Quality, 2 Reliability". | |
| Failure criteria: | | |
| Total failure | Short circuit or open circuit | |
| Failure due to variation of parameters | Capacitance change \|ΔC/C\| | > 10% |
| | Dissipation factor tan δ | > 1.5 · upper limit value |
| | Insulation resistance $R_{ins}$ | < 150 MΩ ($C_R \leq 0.33$ µF) |
| | or time constant $\tau = C_R \cdot R_{ins}$ | < 50 s ($C_R > 0.33$ µF) |

## Pulse handling capability

"dV/dt" represents the maximum permissible voltage change per unit of time for non-sinusoidal voltages, expressed in V/µs.

"$k_0$" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in $V^2$/µs.

*Note:*
*The values of dV/dt and $k_0$ provided below must not be exceeded in order to avoid damaging the capacitor.*

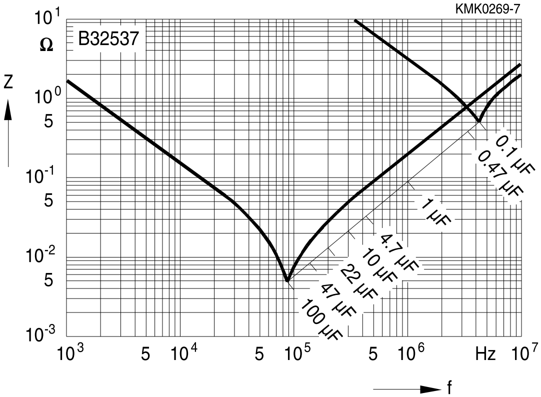
### dV/dt values

| Length of capacitor | | 18.5 mm | 21 mm | 34 mm |
|---|---|---|---|---|
| $V_R$<br>V DC | $V_{RMS}$<br>V AC | dV/dt in V/µs | | |
| 50 | 20 | 2.5 | 1.5 | – |
| 100 | 35 | 13 | 9 | 6 |
| 160 | 60 | 20 | 12 | 8 |
| 250 | 90 | 23 | 16 | 10 |
| 630 | 200 | 40 | 26 | 18 |

### $k_0$ values

| Length of capacitor | | 18.5 mm | 21 mm | 34 mm |
|---|---|---|---|---|
| $V_R$<br>V DC | $V_{RMS}$<br>V AC | $k_0$ in $V^2$/µs | | |
| 50 | 20 | 250 | 150 | – |
| 100 | 35 | 2 600 | 1 800 | 1 200 |
| 160 | 60 | 6 400 | 3 840 | 2 560 |
| 250 | 90 | 11 500 | 8 000 | 5 000 |
| 630 | 200 | 50 400 | 32 800 | 22 700 |

**Impedance Z versus frequency f**
(typical values)




**Permissible AC voltage $V_{RMS}$ versus frequency f**
Values can be obtained on request. In specific cases please provide a scaled voltage/ time graph and state operating conditions.

## Mounting guidelines

## 1 Soldering

### 1.1 Solderability of leads

The solderability of terminal leads is tested to IEC 60068-2-20, test Ta, method 1.

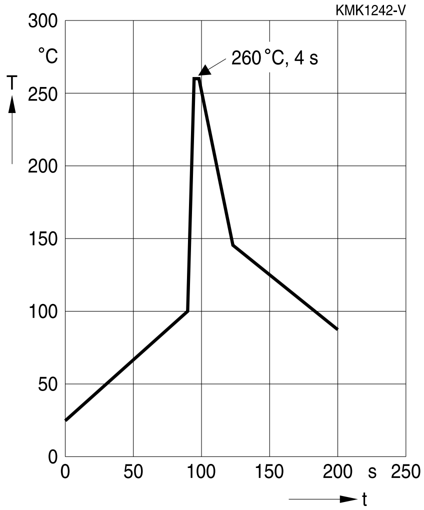
Before a solderability test is carried out, terminals are subjected to accelerated ageing (to IEC 60068-2-2, test Ba: 4 h exposure to dry heat at 155 °C). Since the ageing temperature is far higher than the upper category temperature of the capacitors, the terminal wires should be cut off from the capacitor before the ageing procedure to prevent the solderability being impaired by the products of any capacitor decomposition that might occur.

| | |
|---|---|
| Solder bath temperature | 235 ±5 °C |
| Soldering time | 2.0 ±0.5 s |
| Immersion depth | 2.0 +0/−0.5 mm from capacitor body or seating plane |
| Evaluation criteria:<br>Visual inspection | Wetting of wire surface by new solder ≥90%, free-flowing solder |

### 1.2 Resistance to soldering heat

Resistance to soldering heat is tested to IEC 60068-2-20, test Tb, method 1A.
Conditions:

| Series | | Solder bath temperature | Soldering time |
|---|---|---|---|
| MKT | boxed (except 2.5 × 6.5 × 7.2 mm)<br>coated<br>uncoated (lead spacing > 10 mm) | 260 ±5 °C | 10 ±1 s |
| MFP<br>MKP | <br>(lead spacing > 7.5 mm) | | |
| MKT | boxed (case 2.5 × 6.5 × 7.2 mm) | | 5 ±1 s |
| MKP<br>MKT | (lead spacing ≤ 7.5 mm)<br>uncoated (lead spacing ≤ 10 mm)<br>insulated (B32559) | | < 4 s<br>recommended soldering profile for MKT uncoated (lead spacing ≤ 10 mm) and insulated (B32559) |




| | |
|---|---|
| Immersion depth | 2.0 +0/−0.5 mm from capacitor body or seating plane |
| Shield | Heat-absorbing board, (1.5 ±0.5) mm thick, between capacitor body and liquid solder |
| Evaluation criteria: | |
| Visual inspection | No visible damage |
| $\Delta C/C_0$ | 2% for MKT/MKP/MFP<br>5% for EMI suppression capacitors |
| tan δ | As specified in sectional specification |

### 1.3 General notes on soldering

Permissible heat exposure loads on film capacitors are primarily characterized by the upper category temperature $T_{max}$. Long exposure to temperatures above this type-related temperature limit can lead to changes in the plastic dielectric and thus change irreversibly a capacitor's electrical characteristics. For short exposures (as in practical soldering processes) the heat load (and thus the possible effects on a capacitor) will also depend on other factors like:

- Pre-heating temperature and time
- Forced cooling immediately after soldering
- Terminal characteristics:
  diameter, length, thermal resistance, special configurations (e.g. crimping)
- Height of capacitor above solder bath
- Shadowing by neighboring components
- Additional heating due to heat dissipation by neighboring components
- Use of solder-resist coatings

The overheating associated with some of these factors can usually be reduced by suitable countermeasures. For example, if a pre-heating step cannot be avoided, an additional or reinforced cooling process may possibly have to be included.

EPCOS recommends the following conditions:

- Pre-heating with a maximum temperature of 110 °C
- Temperature inside the capacitor should not exceed the following limits:
  - MKP/MFP 110 °C
  - MKT 160 °C
- When SMD components are used together with leaded ones, the leaded film capacitors should not pass into the SMD adhesive curing oven. The leaded components should be assembled after the SMD curing step.
- Leaded film capacitors are not suitable for reflow soldering.

**Uncoated capacitors**

For uncoated MKT capacitors with lead spacings ≤10 mm (B32560/B32561) the following measures are recommended:

- pre-heating to not more than 110 °C in the preheater phase
- rapid cooling after soldering

## 2 Cleaning

To determine whether the following solvents, often used to remove flux residues and other substances, are suitable for the capacitors described, refer to the table below:

<table>
<tr><th>Type</th><th>Ethanol,<br>isopropanol,<br>n-propanol</th><th>n-propanol-water mixtures,<br>water with surface tension-reducing tensides (neutral)</th><th>Solvent from table A (see next page)</th><th>Solvent from table B (see next page)</th></tr>
<tr><td>MKT<br>(uncoated)</td><td rowspan="2">Suitable</td><td>Unsuitable</td><td>In part suitable</td><td rowspan="2">Unsuitable</td></tr>
<tr><td>MKT, MKP, MFP<br>(coated/boxed)</td><td>Suitable</td><td>Suitable</td></tr>
</table>

Even when suitable solvents are used, a reversible change of the electrical characteristics may occur in uncoated capacitors immediately after they are washed. Thus it is always recommended to dry the components (e.g. 4 h at 70 °C) before they are subjected to subsequent electrical testing.

**Table A**

Manufacturers' designations for trifluoro-trichloro-ethane-based cleaning solvents (selection)

| Trifluoro-trichloro-ethane | Mixtures of trifluoro-trichloro-ethane with ethanol and isopropanol | Manufacturer |
|---|---|---|
| Freon TF | Freon TE 35; Freon TP 35; Freon TES | Du Pont |
| Frigen 113 TR | Frigen 113 TR-E; Frigen 113 TR-P; Frigen TR-E 35 | Hoechst |
| Arklone P | Arklone A; Arklone L; Arklone K | ICI |
| Kaltron 113 MDR | Kaltron 113 MDA; Kaltron 113 MDI; Kaltron 113 MDI 35 | Kali-Chemie |
| Flugene 113 | Flugene 113 E; Flugene 113 IPA | Rhone-Progil |

**Table B (worldwide banned substances)**

Manufacturers' designations for unsuitable cleaning solvents (selection)

| Mixtures of chlorinated hydrocarbons and ketones with fluorated hydrocarbons | Manufacturer |
|---|---|
| Freon TMC; Freon TA; Freon TC | Du Pont |
| Arklone E | ICI |
| Kaltron 113 MDD; Kaltron 113 MDK | Kali-Chemie |
| Flugene 113 CM | Rhone-Progil |

## 3 Embedding of capacitors in finished assemblies

In many applications, finished circuit assemblies are embedded in plastic resins. In this case, both chemical and thermal influences of the embedding ("potting") and curing processes must be taken into account.

Our experience has shown that the following potting materials can be recommended: non-flexible epoxy resins with acid-anhydride hardeners; chemically inert, non-conducting fillers; maximum curing temperature of 100 °C.

**Caution:**
Consult us first if you wish to embed uncoated types!

## Cautions and warnings

- Do not exceed the upper category temperature (UCT).
- Do not apply any mechanical stress to the capacitor terminals.
- Avoid any compressive, tensile or flexural stress.
- Do not move the capacitor after it has been soldered to the PC board.
- Do not pick up the PC board by the soldered capacitor.
- Do not place the capacitor on a PC board whose PTH hole spacing differs from the specified lead spacing.
- Do not exceed the specified time or temperature limits during soldering.
- Avoid external energy inputs, such as fire or electricity.
- Avoid overload of the capacitors.

The table below summarizes the safety instructions that must always be observed. A detailed description can be found in the relevant sections of the chapters "General technical information" and "Mounting guidelines".

| Topic | Safety information | Reference chapter "General technical information" |
|---|---|---|
| Storage conditions | Make sure that capacitors are stored within the specified range of time, temperature and humidity conditions. | 4.5<br>"Storage conditions" |
| Flammability | Avoid external energy, such as fire or electricity (passive flammability), avoid overload of the capacitors (active flammability) and consider the flammability of materials. | 5.3<br>"Flammability" |
| Resistance to vibration | Do not exceed the tested ability to withstand vibration. The capacitors are tested to IEC 60068-2-6.<br>EPCOS offers film capacitors specially designed for operation under more severe vibration regimes such as those found in automotive applications. Consult our catalog "Film Capacitors for Automotive Electronics". | 5.2<br>"Resistance to vibration" |

| Topic | Safety information | Reference chapter "Mounting guidelines" |
| --- | --- | --- |
| Soldering | Do not exceed the specified time or temperature limits during soldering. | 1 "Soldering" |
| Cleaning | Use only suitable solvents for cleaning capacitors. | 2 "Cleaning" |
| Embedding of capacitors in finished assemblies | When embedding finished circuit assemblies in plastic resins, chemical and thermal influences must be taken into account.<br>Caution: Consult us first, if you also wish to embed other uncoated component types! | 3 "Embedding of capacitors in finished assemblies" |

## Symbols and terms

| Symbol | English | German |
|---|---|---|
| $\alpha$ | Heat transfer coefficient | Wärmeübergangszahl |
| $\alpha_C$ | Temperature coefficient of capacitance | Temperaturkoeffizient der Kapazität |
| A | Capacitor surface area | Kondensatoroberfläche |
| $\beta_C$ | Humidity coefficient of capacitance | Feuchtekoeffizient der Kapazität |
| C | Capacitance | Kapazität |
| $C_R$ | Rated capacitance | Nennkapazität |
| $\Delta C$ | Absolute capacitance change | Absolute Kapazitätsänderung |
| $\Delta C/C$ | Relative capacitance change (relative deviation of actual value) | Relative Kapazitätsänderung (relative Abweichung vom Ist-Wert) |
| $\Delta C/C_R$ | Capacitance tolerance (relative deviation from rated capacitance) | Kapazitätstoleranz (relative Abweichung vom Nennwert) |
| dt | Time differential | Differentielle Zeit |
| $\Delta t$ | Time interval | Zeitintervall |
| $\Delta T$ | Absolute temperature change (self-heating) | Absolute Temperaturänderung (Selbsterwärmung) |
| $\Delta \tan \delta$ | Absolute change of dissipation factor | Absolute Änderung des Verlustfaktors |
| $\Delta V$ | Absolute voltage change | Absolute Spannungsänderung |
| dV/dt | Time differential of voltage function (rate of voltage rise) | Differentielle Spannungsänderung (Spannungsflankensteilheit) |
| $\Delta V/\Delta t$ | Voltage change per time interval | Spannungsänderung pro Zeitintervall |
| E | Activation energy for diffusion | Aktivierungsenergie zur Diffusion |
| ESL | Self-inductance | Eigeninduktivität |
| ESR | Equivalent series resistance | Ersatz-Serienwiderstand |
| f | Frequency | Frequenz |
| $f_1$ | Frequency limit for reducing permissible AC voltage due to thermal limits | Grenzfrequenz für thermisch bedingte Reduzierung der zulässigen Wechselspannung |
| $f_2$ | Frequency limit for reducing permissible AC voltage due to current limit | Grenzfrequenz für strombedingte Reduzierung der zulässigen Wechselspannung |
| $f_r$ | Resonant frequency | Resonanzfrequenz |
| $F_D$ | Thermal acceleration factor for diffusion | Therm. Beschleunigungsfaktor zur Diffusion |
| $F_T$ | Derating factor | Deratingfaktor |
| i | Current (peak) | Stromspitze |
| $I_C$ | Category current (max. continuous current) | Kategoriestrom (max. Dauerstrom) |

| Symbol | English | German |
|---|---|---|
| $I_{RMS}$ | (Sinusoidal) alternating current, root-mean-square value | (Sinusförmiger) Wechselstrom |
| $i_z$ | Capacitance drift | Inkonstanz der Kapazität |
| $k_0$ | Pulse characteristic | Impulskennwert |
| $L_S$ | Series inductance | Serieninduktivität |
| $\lambda$ | Failure rate | Ausfallrate |
| $\lambda_0$ | Constant failure rate during useful service life | Konstante Ausfallrate in der Nutzungsphase |
| $\lambda_{test}$ | Failure rate, determined by tests | Experimentell ermittelte Ausfallrate |
| $P_{diss}$ | Dissipated power | Abgegebene Verlustleistung |
| $P_{gen}$ | Generated power | Erzeugte Verlustleistung |
| Q | Heat energy | Wärmeenergie |
| $\rho$ | Density of water vapor in air | Dichte von Wasserdampf in Luft |
| R | Universal molar constant for gases | Allg. Molarkonstante für Gas |
| R | Ohmic resistance of discharge circuit | Ohmscher Widerstand des Entladekreises |
| $R_i$ | Internal resistance | Innenwiderstand |
| $R_{ins}$ | Insulation resistance | Isolationswiderstand |
| $R_P$ | Parallel resistance | Parallelwiderstand |
| $R_S$ | Series resistance | Serienwiderstand |
| S | severity (humidity test) | Schärfegrad (Feuchtetest) |
| t | Time | Zeit |
| T | Temperature | Temperatur |
| $\tau$ | Time constant | Zeitkonstante |
| $\tan \delta$ | Dissipation factor | Verlustfaktor |
| $\tan \delta_D$ | Dielectric component of dissipation factor | Dielektrischer Anteil des Verlustfaktors |
| $\tan \delta_P$ | Parallel component of dissipation factor | Parallelanteil des Verlfustfaktors |
| $\tan \delta_S$ | Series component of dissipation factor | Serienanteil des Verlustfaktors |
| $T_A$ | Ambient temperature | Umgebungstemperatur |
| $T_{max}$ | Upper category temperature | Obere Kategorietemperatur |
| $T_{min}$ | Lower category temperature | Untere Kategorietemperatur |
| $t_{OL}$ | Operating life at operating temperature and voltage | Betriebszeit bei Betriebstemperatur und -spannung |
| $T_{op}$ | Operating temperature | Beriebstemperatur |
| $T_R$ | Rated temperature | Nenntemperatur |
| $T_{ref}$ | Reference temperature | Referenztemperatur |
| $t_{SL}$ | Reference service life | Referenz-Lebensdauer |
| $V_{AC}$ | AC voltage | Wechselspannung |

| Symbol | English | German |
|---|---|---|
| $V_C$ | Category voltage | Kategoriespannung |
| $V_{C,RMS}$ | Category AC voltage | (Sinusförmige) Kategorie-Wechselspannung |
| $V_{CD}$ | Corona-discharge onset voltage | Teilentlade-Einsatzspannung |
| $V_{ch}$ | Charging voltage | Ladespannung |
| $V_{DC}$ | DC voltage | Gleichspannung |
| $V_{FB}$ | Fly-back capacitor voltage | Spannung (Flyback) |
| $V_i$ | Input voltage | Eingangsspannung |
| $V_o$ | Output voltage | Ausgangssspannung |
| $V_{op}$ | Operating voltage | Betriebsspannung |
| $V_p$ | Peak pulse voltage | Impuls-Spitzenspannung |
| $V_{pp}$ | Peak-to-peak voltage Impedance | Spannungshub |
| $V_R$ | Rated voltage | Nennspannung |
| $\hat{v}_R$ | Amplitude of rated AC voltage | Amplitude der Nenn-Wechselspannung |
| $V_{RMS}$ | (Sinusoidal) alternating voltage, root-mean-square value | (Sinusförmige) Wechselspannung |
| $V_{SC}$ | S-correction voltage | Spannung bei Anwendung "S-correction" |
| $V_{sn}$ | Snubber capacitor voltage | Spannung bei Anwendung "Beschaltung" |
| Z | Impedance | Scheinwiderstand |
| $\boxed{e}$ | Lead spacing | Rastermaß |

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