Film Capacitors

Metallized Polypropylene Film Capacitors (MKP)

Series/Type: **B32774 ... B32778**

Date: May 2009

Typical applications

For compact design of:

- Frequency converters
- Industrial and high-end power supplies
- Solar inverters

Climatic

- Max. operating temperature: 105 °C (case)
- Climatic category (IEC 60068-1): 40/85/56

Construction

- Dielectric: polypropylene (MKP)
- Plastic case (UL 94 V-0)
- Epoxy resin sealing (UL 94 V-0)

Features

- Capacitance values up to 110 µF
- High CV product, compact
- Excellent self-healing properties
- Overvoltage capability
- Low losses with high current capability
- High reliability
- Long useful life

Terminals

- Parallel wire leads, lead-free tinned
- 2-pin and 4-pin versions
- Standard lead lengths: 6 −1 mm
- Special lead lengths are available on request

Marking

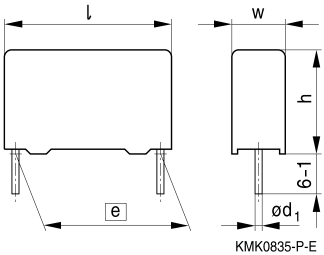
Manufacturer's logo, lot number,
date code, rated capacitance (coded),
capacitance tolerance (code letter),
rated DC voltage

Delivery mode

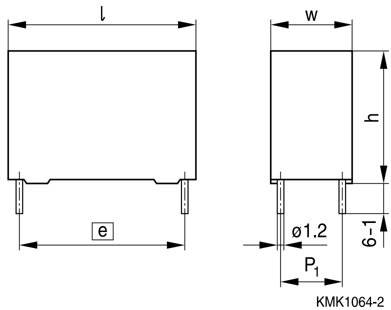
Bulk (untaped, lead length 6 −1 mm)

Dimensional drawings

2-pin version



4-pin version



Dimensions in mm

Version	Lead spacing e ±0.4	Lead diameter d_1	Type
2-pin	27.5	0.8	B32774D
2-pin	37.5	1.0	B32776E
4-pin	37.5	1.2	B32776G
4-pin	52.5	1.2	B32778G

Overview of available types

Lead spacing	27.5 mm				37.5 mm				52.5 mm			
Type	B32774				B32776				B32778			
Page	4				5				7			
V_R (V DC)	450	800	1100	1300	450	800	1100	1300	450	800	1100	1300
C_R (µF)												
1.5												
2.0												
3.0												
5.0												
7.0												
8.0												
10												
12												
14												
15												
16												
20												
22												
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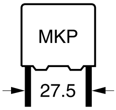
80												
100												
110												



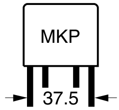
Ordering codes and packing units (lead spacing 27.5 mm)

C_R	Max. dimensions w × h × l	P_1	Ordering code (composition see below)	$I_{RMS,max}$ 70 °C 10 kHz	$I_{RMS,max}$ 70 °C 20 kHz	ESR_{typ} 70 °C 10 kHz	Untaped
µF	mm	mm		A	A	mΩ	pcs./MOQ
$V_{R,70\,°C}$ = 450 V DC, $V_{op,85\,°C}$ = 450 V DC							
5.0	11.0 × 21.0 × 31.5	–	B32774D4505+000	5.0	4.5	8.5	2352
10	15.0 × 24.5 × 31.5	–	B32774D4106+000	6.5	6.0	7.5	1680
22	22.0 × 36.5 × 31.5	–	B32774D4226+000	10.0	9.0	5.0	784
$V_{R,70\,°C}$ = 800 V DC, $V_{op,85\,°C}$ = 700 V DC							
3.0	11.0 × 21.0 × 31.5	–	B32774D8305+000	5.0	4.5	7.0	2352
5.0	14.0 × 24.5 × 31.5	–	B32774D8505+000	5.0	4.5	7.0	1848
12	22.0 × 36.5 × 31.5	–	B32774D8126+000	6.0	5.5	6.5	784
$V_{R,70\,°C}$ = 1100 V DC, $V_{op,85\,°C}$ = 920 V DC							
2.0	12.5 × 21.5 × 31.5	–	B32774D0205+000	4.0	3.5	7.0	2100
5.0	19.0 × 30.0 × 31.5	–	B32774D0505+000	6.5	6.0	6.0	896
7.0	22.0 × 36.5 × 31.5	–	B32774D0705+000	7.5	7.0	5.5	784
$V_{R,70\,°C}$ = 1300 V DC, $V_{op,85\,°C}$ = 1100 V DC							
1.5	12.5 × 21.5 × 31.5	–	B32774D1155+000	4.5	4.0	7.5	2100
3.0	18.0 × 27.5 × 31.5	–	B32774D1305+000	6.0	5.5	6.5	1428
5.0	22.0 × 36.5 × 31.5	–	B32774D1505+000	8.0	7.0	6.0	784

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%



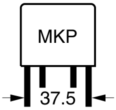
Ordering codes and packing units (lead spacing 37.5 mm)

C_R µF	Max. dimensions w × h × l mm	P_1 mm	Ordering code (composition see below)	$I_{RMS,max}$ 70 °C 10 kHz A	$I_{RMS,max}$ 70 °C 20 kHz A	ESR_{typ} 70 °C 10 kHz mΩ	Untaped pcs./MOQ
$V_{R,70\,°C}$ = 450 V DC, $V_{op,85\,°C}$ = 450 V DC							
30	20.0 × 39.5 × 41.5	10.2	B32776G4306+000	12.5	11.5	8.0	640
30	20.0 × 39.5 × 41.5	–	B32776E4306+000	11.5	10.5	9.0	640
35	28.0 × 37.0 × 42.0	10.2	B32776G4356+000	13.5	12.5	8.0	440
35	28.0 × 37.0 × 42.0	–	B32776E4356+000	12.5	11.5	9.0	440
40	28.0 × 37.0 × 42.0	10.2	B32776G4406+000	14.5	13.5	5.0	440
40	28.0 × 37.0 × 42.0	–	B32776E4406+000	13.5	12.5	5.5	440
50	28.0 × 42.5 × 41.5	20.3	B32776G4506+000	16.0	15.0	4.0	440
50	28.0 × 42.5 × 41.5	–	B32776E4506+000	15.0	14.0	4.0	440
60	30.0 × 45.0 × 42.0	–	B32776E4606+000	16.5	15.0	3.0	400
$V_{R,70\,°C}$ = 800 V DC, $V_{op,85\,°C}$ = 700 V DC							
14	18.0 × 32.5 × 41.5	–	B32776E8146+000	10.0	9.0	4.5	720
15	20.0 × 39.5 × 41.5	10.2	B32776G8156+000	10.5	9.5	7.0	640
20	28.0 × 37.0 × 42.0	10.2	B32776G8206+000	12.0	11.0	5.5	440
20	28.0 × 37.0 × 42.0	–	B32776E8206+000	11.5	10.5	6.5	440
22	28.0 × 37.0 × 42.0	10.2	B32776G8226+000	13.0	12.0	5.0	440
25	28.0 × 42.5 × 41.5	–	B32776E8256+000	13.5	12.5	4.5	440
30	30.0 × 45.0 × 42.0	20.3	B32776G8306+000	15.0	14.0	3.5	400
30	30.0 × 45.0 × 42.0	–	B32776E8306+000	14.0	13.0	5.0	400
$V_{R,70\,°C}$ = 1100 V DC, $V_{op,85\,°C}$ = 920 V DC							
12	20.0 × 39.5 × 41.5	10.2	B32776G0126+000	11.0	10.0	6.5	640
12	20.0 × 39.5 × 41.5	–	B32776E0126+000	10.0	9.0	7.0	640
14	28.0 × 37.0 × 42.0	10.2	B32776G0146+000	13.0	12.0	5.5	440
14	28.0 × 37.0 × 42.0	–	B32776E0146+000	12.0	11.0	6.0	440
16	28.0 × 42.5 × 41.5	10.2	B32776G0166+000	13.0	12.0	5.0	440
16	28.0 × 42.5 × 41.5	–	B32776E0166+000	12.0	11.0	5.5	440
20	30.0 × 45.0 × 42.0	20.3	B32776G0206+000	15.0	13.0	3.0	400
20	30.0 × 45.0 × 42.0	–	B32776E0206+000	13.0	12.0	3.5	400

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%



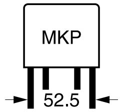
Ordering codes and packing units (lead spacing 37.5 mm)

C_R µF	Max. dimensions w × h × l mm	P_1 mm	Ordering code (composition see below)	$I_{RMS,max}$ 70 °C 10 kHz A	$I_{RMS,max}$ 70 °C 20 kHz A	ESR_{typ} 70 °C 10 kHz mΩ	Untaped pcs./MOQ
$V_{R,70\,°C}$ = 1300 V DC, $V_{op,85\,°C}$ = 1100 V DC							
8.0	20.0 × 39.5 × 41.5	10.2	B32776G1805+000	9.0	8.0	8.0	640
10	28.0 × 37.0 × 42.0	10.2	B32776G1106+000	12.0	11.0	6.5	440
10	28.0 × 37.0 × 42.0	–	B32776E1106+000	11.0	10.0	7.0	440
12	28.0 × 42.5 × 41.5	20.3	B32776G1126+000	13.0	12.0	5.5	440
14	30.0 × 45.0 × 42.0	–	B32776E1146+000	13.0	12.0	5.0	400

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 (lead spacing 52.5 mm)

C_R	Max. dimensions w × h × l	P_1	Ordering code (composition see below)	$I_{RMS,max}$ 70 °C 10 kHz	$I_{RMS,max}$ 70 °C 20 kHz	ESR_{typ} 70 °C 10 kHz	Untaped
µF	mm	mm		A	A	mΩ	pcs./MOQ
$V_{R,70\,°C}$ = 450 V DC, $V_{op,85\,°C}$ = 450 V DC							
75	30.0 × 45.0 × 57.5	20.3	B32778G4756+000	16.0	15.5	5.5	280
80	30.0 × 45.0 × 57.5	20.3	B32778G4806+000	16.5	16.0	5.0	280
100	35.0 × 50.0 × 57.5	20.3	B32778G4107+000	18.0	18.0	4.0	108
110	35.0 × 50.0 × 57.5	20.3	B32778G4117+000	19.0	19.0	4.0	108
$V_{R,70\,°C}$ = 800 V DC, $V_{op,85\,°C}$ = 700 V DC							
45	30.0 × 45.0 × 57.5	20.3	B32778G8456+000	16.0	15.0	3.0	280
55	35.0 × 50.0 × 57.5	20.3	B32778G8556+000	17.0	16.0	3.5	108
60	35.0 × 50.0 × 57.5	20.3	B32778G8606+000	19.0	18.0	3.0	108
$V_{R,70\,°C}$ = 1100 V DC, $V_{op,85\,°C}$ = 920 V DC							
30	30.0 × 45.0 × 57.5	20.3	B32778G0306+000	16.0	14.0	4.0	280
40	35.0 × 50.0 × 57.5	20.3	B32778G0406+000	20.0	20.0	3.5	108
$V_{R,70\,°C}$ = 1300 V DC, $V_{op,85\,°C}$ = 1100 V DC							
20	30.0 × 45.0 × 57.5	20.3	B32778G1206+000	14.0	13.0	5.5	280
25	35.0 × 50.0 × 57.5	20.3	B32778G1256+000	17.0	16.0	4.5	108
27	35.0 × 50.0 × 57.5	20.3	B32778G1276+000	17.5	16.0	4.0	108

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

Reference standard: IEC 61071. All data given at T = 20 °C, unless otherwise specified.

Operating temperature range (case)		Max. operating temperature, $T_{op,max}$ +105 °C Upper category temperature T_{max} +85 °C Lower category temperature T_{min} –40 °C
ESR (at 10 kHz)	LS 27.5 LS 37.5 LS 52.5	$< 3.0 \cdot ESR_{typ}$ $< 2.5 \cdot ESR_{typ}$ $< 1.5 \cdot ESR_{typ}$
Insulation Resistance R_{ins} given as time constant $\tau = C_R \cdot R_{ins}$, rel. humidity ≤ 65% (minimum as-delivered values)		30 000 s
DC test voltage between terminals (10 s)		$1.5 \cdot V_R$
DC test voltage terminal to case (10 s)		2110 V AC, 50 Hz
Maximum peak current (A)		$I_{P,max} = C_R \cdot \frac{dV}{dt}$
Damp heat test Limit values after damp heat test		56 days/40 °C/93% relative humidity Capacitance change | ΔC/C | ≤ 5% Dissipation factor change Δ tan δ $\leq 1.5 \cdot 10^{-3}$ (at 1 kHz) Insulation resistance R_{ins} ≥ 50% of minimum as-delivered values
Reliability:	Failure rate λ Service life t_{SL}	50 fit ($\leq 1 \cdot 10^{-9}$/h) at $0.5 \cdot V_R$, 40 °C 100 000 h at V_R and 70 °C For conversion to other operating conditions, refer to chapter "Quality, 2 Reliability".

V_R (V DC)	450	800	1100	1300
Continuous operation voltage V_{op} (V DC) at 70 °C	450	800	1100	1300
Continuous operation voltage V_{op} (V DC) at 85 °C	450	700	920	1100
For temperatures between 70 °C and 85 °C	1%/°C of derating respect V_{op} at 70 °C (no derating at 450 V DC series)			

Pulse handling capability

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

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

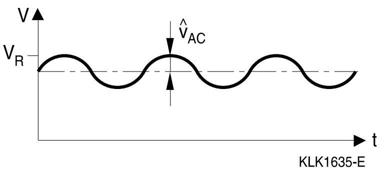
dV/dt values

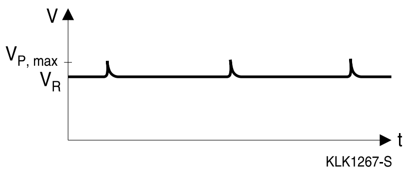
Lead spacing	27.5 mm				37.5 mm				52.5 mm			
Type	B32774				B32776				B32778			
V_R (V DC)	450	800	1100	1300	450	800	1100	1300	450	800	1100	1300
C_R (µF)	dV/dt in V/µs											
1.5	–	–	–	100	–	–	–	–	–	–	–	–
2.0	–	–	75	–	–	–	–	–	–	–	–	–
3.0	–	40	–	100	–	–	–	–	–	–	–	–
5.0	30	40	75	100	–	–	–	–	–	–	–	–
7.0	–	–	75	–	–	–	–	–	–	–	–	–
8.0	–	–	–	–	–	–	–	73	–	–	–	–
10	30	–	–	–	–	–	–	73	–	–	–	–
12	–	40	–	–	–	–	54	73	–	–	–	–
14	–	–	–	–	–	22	54	73	–	–	–	–
15	–	–	–	–	–	22	–	–	–	–	–	–
16	–	–	–	–	–	–	54	–	–	–	–	–
20	–	–	–	–	–	22	54	–	–	–	–	50
22	30	–	–	–	–	22	–	–	–	–	–	–
25	–	–	–	–	–	22	–	–	–	–	–	50
27	–	–	–	–	–	–	–	–	–	–	–	50
30	–	–	–	–	21	22	–	–	–	–	35	–
35	–	–	–	–	21	–	–	–	–	–	–	–
40	–	–	–	–	21	–	–	–	–	–	35	–
45	–	–	–	–	–	–	–	–	–	15	–	–
50	–	–	–	–	21	–	–	–	–	–	–	–
55	–	–	–	–	–	–	–	–	–	15	–	–
60	–	–	–	–	21	–	–	–	–	15	–	–
75	–	–	–	–	–	–	–	–	14	–	–	–
80	–	–	–	–	–	–	–	–	14	–	–	–
100	–	–	–	–	–	–	–	–	14	–	–	–
110	–	–	–	–	–	–	–	–	14	–	–	–

ESL values

		ESL
2-pin	B32774D	25 nH
	B32776E	10 nH
4-pin	B32776G	15 nH
	B32778G	15 nH

Typical waveforms





Restrictions:
$\mathbf{V_R}$: Maximum operating peak voltage of either polarity but of a non-reversing waveform, for which the capacitor has been designed for continuous operation.
$\hat{v}_{AC} \leq \mathbf{0.2 \cdot V_R}$
$\mathbf{V_{P,max}}$: Maximum permissible recurrent voltage that may appear for 2% of the period.

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.

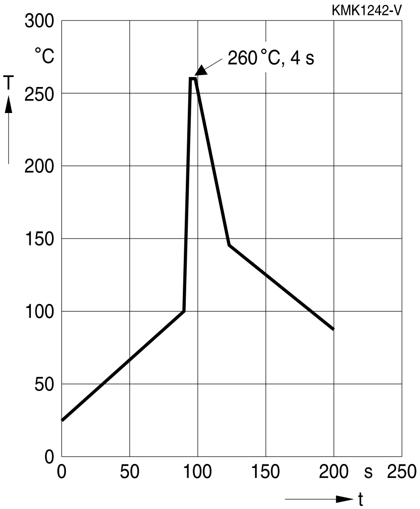
Before a solderability test is carried out, terminals are subjected to accelerated ageing (to IEC 60068-2-2, test Ba: 4 h exposure to dry heat at 155 °C). Since the ageing temperature is far higher than the upper category temperature of the capacitors, the terminal wires should be cut off from the capacitor 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: 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) coated uncoated (lead spacing > 10 mm)	260 ±5 °C	10 ±1 s
MFP MKP	 (lead spacing > 7.5 mm)		
MKT	boxed (case 2.5 × 6.5 × 7.2 mm)		5 ±1 s
MKP MKT	(lead spacing ≤ 7.5 mm) uncoated (lead spacing ≤ 10 mm) insulated (B32559)		< 4 s 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 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:

Type	Ethanol, isopropanol, n-propanol	n-propanol-water mixtures, water with surface tension-reducing tensides (neutral)	Solvent from table A (see next page)	Solvent from table B (see next page)
MKT (uncoated)	Suitable	Unsuitable	In part suitable	Unsuitable
MKT, MKP, MFP (coated/boxed)		Suitable	Suitable	

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 "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 "Flammability"
Resistance to vibration	Do not exceed the tested ability to withstand vibration. The capacitors are tested to IEC 60068-2-6. 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 "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. 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
α	Heat transfer coefficient	Wärmeübergangszahl
α_C	Temperature coefficient of capacitance	Temperaturkoeffizient der Kapazität
A	Capacitor surface area	Kondensatoroberfläche
β_C	Humidity coefficient of capacitance	Feuchtekoeffizient der Kapazität
C	Capacitance	Kapazität
C_R	Rated capacitance	Nennkapazität
ΔC	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
Δt	Time interval	Zeitintervall
ΔT	Absolute temperature change (self-heating)	Absolute Temperaturänderung (Selbsterwärmung)
$\Delta \tan \delta$	Absolute change of dissipation factor	Absolute Änderung des Verlustfaktors
ΔV	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
λ	Failure rate	Ausfallrate
λ_0	Constant failure rate during useful service life	Konstante Ausfallrate in der Nutzungsphase
λ_{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
ρ	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
τ	Time constant	Zeitkonstante
tan δ	Dissipation factor	Verlustfaktor
tan δ_D	Dielectric component of dissipation factor	Dielektrischer Anteil des Verlustfaktors
tan δ_P	Parallel component of dissipation factor	Parallelanteil des Verlfustfaktors
tan δ_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

EPCOS

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The following applies to all products named in this publication:

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