Film Capacitors

MKP Snubbers – axial type

Series/Type:	**B32669Y**
Ordering code:	
Date:	Nov. 2008
Version:	1

Typical applications

- IGBT
- Snubbering

Climatic

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

Construction

- Dielectric: Polypropylene (PP)
- Wound capacitor technology with internal series connection
- Insulating sleeve, flame retardant (UL 94 V-0)
- Face ends sealed with epoxy resin (UL 94 V-0)

Features

- High pulse strength and high contact reliability
- Very low inductance

Terminals

- Central axial wire leads with lead form, tinned.

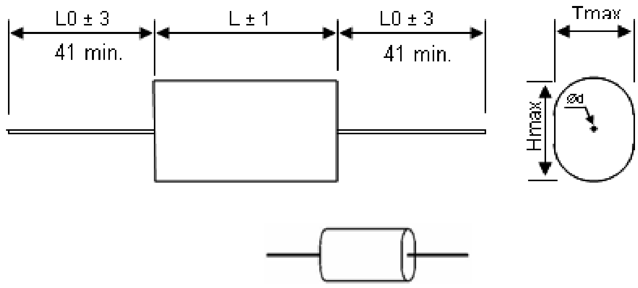
Marking

- Manufacturer's logo and lot number, ordering code, style (MKP)
  rated capacitance (coded), cap. tolerance (code letter),
  rated DC voltage, date of manufacture (coded)

Delivery mode

- Bulk (untapped)

Dimensional drawing



Dimension in mm

CHARACTERISTICS AND ORDERING CODES

C_R µF	Max. dimensions L× H × T mm	Ordering code	ϕ d mm	dv/dt V/us	ESR m Ω	ESL nH	Ipk A	Irms 100KHZ Arms
V_R = 600 VDC / V_{rms} = 350VAC								
0.33	21 x 17 x 10	B32669Y6334+***	0.8	200	7	18	66	3.8
0.47	21 x 18.5 x 12.5	B32669Y6474+***	0.8	200	6	20	94	5.5
0.68	27 x 18.5 x 12	B32669Y6684+***	0.8	200	5	21	136	7.3
1.0	32 x 19 x 12.5	B32669Y6105+***	0.8	150	5	21	150	8.7
1.5	32 x 23 x 15	B32669Y6155+***	1.0	150	4	23	225	10.5
2.2	37 x 24 x 16	B32669Y6225+***	1.0	150	4	25	330	11.7
3.0	37 x 27.5 x 18.5	B32669Y6305+***	1.2	100	3	27	300	12.4
3.3	37 x 29 x 20	B32669Y6335+***	1.2	100	3	29	330	15.6
V_R = 1000 VDC / V_{rms} = 525 VAC								
0.022	21 x 17 x 10.5	B32669Y0223+***	0.8	1100	11	19	24.2	5
0.047	21 x 17 x 10.5	B32669Y0473+***	0.8	1100	11	19	51.7	5.8
0.068	27 x 16 x 9	B32669Y0683+***	0.8	1100	11	18	74.8	3.8
0.1	32 x 15 x 9	B32669Y0104+***	0.8	1100	10	20	110	5.5
0.22	32 x 20 x 12	B32669Y0224+***	1.0	1000	7	21	220	7.3
0.33	32 x 26 x 15.5	B32669Y0334+***	1.0	1000	6	21	330	8.7
0.47	32 x 27.5 x 18	B32669Y0474+***	1.2	1000	5	23	470	10.5
0.68	44 x 25 x 15.5	B32669Y0684+***	1.2	900	5	25	612	11.7
1.0	44 x 33.4 x 22.2	B32669Y0105+***	1.2	900	4	27	900	12.4
1.5	44 x 31 x 20	B32669Y0155+***	1.2	900	4	29	1350	15.6
2.2	44 x 42 x 29	B32669Y0225+***	1.2	900	3	32	1980	19.5
3.0	57 x 45 x 32	B32669Y0305+***	1.2	800	3	34	2400	22.2
3.3	57 x 47 x 34	B32669Y0335+***	1.2	800	3	35	2640	23.4
V_R = 1200 VDC / V_{rms} = 550 VAC								
0.022	21 x 17 x 10.5	B32669Y7223+***	0.8	1300	11	19	28.6	5
0.047	21 x 16.5 x 10.0	B32669Y7473+***	0.8	1300	11	19	61.1	5.8
0.068	27 x 16 x 9	B32669Y7683+***	0.8	1300	11	18	88.4	4
0.1	32 x 16 x 9	B32669Y7104+***	0.8	1300	10	20	130	6
0.22	32 x 22 x 14	B32669Y7224+***	1.0	1200	7	22	264	8.3
0.33	32 x 26 x 16	B32669Y7334+***	1.0	1200	7	23	396	9.0
0.47	44 x 23.2 x 15.2	B32669Y7474+***	1.2	1200	7	26	564	9.8
0.68	44 x 30 x 19	B32669Y7684+***	1.2	1200	6	27	816	11.7
1.0	44 x 33.4 x 22.2	B32669Y7105+***	1.2	1100	5	28	1100	14.3
1.5	44 x 38 x 27	B32669Y7155+***	1.2	1100	4	30	1650	17.7
2.2	57 x 40 x 29	B32669Y7225+***	1.2	1000	4	35	2200	18.9
3.0	57 x 47 x 34	B32669Y7305+***	1.2	1000	4	37	3000	19.7
3.3	57 x 49 x 36	B32669Y7335+***	1.2	1000	3	38	3300	21.8

C_R	Max. dimensions L× H × T	Ordering code	ϕ d	dv/dt	ESR	ESL	Ipk	Irms 100KHZ
µF	mm		mm	V/us	m Ω	nH	A	Arms
V_R = 1700 VDC / V_{rms} = 600 VAC								
0.022	21 x 17 x 10.5	B32669Y1223+***	0.8	1300	11	19	28.6	5
0.047	27 x 16.5 x 10	B32669Y1473+***	0.8	1300	11	19	61.1	5.8
0.068	27 x 18.5 x 12	B32669Y1683+***	0.8	1300	11	19	88.4	6.1
0.1	32 x 17 x 10	B32669Y1104+***	0.8	1300	10	21	130	7.5
0.22	32 x 22.5 x 16	B32669Y1224+***	1.2	1200	7	23	264	9.3
0.33	32 x 27.5 x 18	B32669Y1334+***	1.2	1200	6	24	396	9.9
0.47	37 x 28 x 20	B32669Y1474+***	1.2	1200	6	26	564	11.8
0.68	44 x 31 x 20	B32669Y1684+***	1.2	1100	5	27	748	13.0
1.0	44 x 37 x 24.5	B32669Y1105+***	1.2	1100	5	29	1100	16.1
1.5	44 x 44 x 31	B32669Y1155+***	1.2	1100	4	30	1650	20.0
2.2	57 x 43 x 30	B32669Y1225+***	1.2	1000	4	34	2200	22.0
3.0	57 x 49 x 36	B32669Y1305+***	1.2	1000	4	38	3000	23.8
V_R = 2000 VDC / V_{rms} = 700 VAC								
0.022	21 x 17 x 10.5	B32669Y2223+***	0.8	1600	10	20	35.2	5
0.047	27 x 18 x 11.5	B32669Y2473+***	0.8	1600	10	20	75.2	5.8
0.068	27 x 22 x 14	B32669Y2683+***	1.0	1600	10	20	108.8	6.9
0.1	37 x 18.5 x 12	B32669Y2104+***	1.0	1600	9	22	160	8.2
0.22	37 x 24.5 x 16.5	B32669Y2224+***	1.2	1500	8	27	330	9.1
0.33	32 x 29 x 21	B32669Y2334+***	1.2	1500	8	28	495	10.2
0.47	37 x 35.6 x 23	B32669Y2474+***	1.2	1500	7	29	705	13.0
0.68	44 x 37.6 x 25	B32669Y2684+***	1.2	1400	6	32	952	14.2
1.0	57 x 36.6 x 24	B32669Y2105+***	1.2	1400	5	35	1400	17.5
1.5	57 x 43 x 30	B32669Y2155+***	1.2	1300	5	37	1950	21.1
2.2	57 x 51 x 38	B32669Y2225+***	1.2	1300	5	39	2860	22.0

Intermediate capacitance values are available on request.

Composition of ordering code

+ = Capacitance tolerance code

M = ±20%

K = ±10%

J = ±5%

TECHNICAL DATA

<table>
<tr><td rowspan="4">Operating temperature range</td><td colspan="4">Max. operating temperature $T_{op,max}$ +100℃</td></tr>
<tr><td colspan="4">Upper category temperature T_{max} +100℃</td></tr>
<tr><td colspan="4">Lower category temperature T_{min} -40℃</td></tr>
<tr><td colspan="4">Rated temperature T_R +85℃</td></tr>
<tr><td rowspan="4">Dissipation factor tan δ (in 10^{-3}) at 20℃
(upper limit values)</td><td>at</td><td>$C_R \leq 0.1$ µF</td><td>0.1 µF < $C_R \leq 1$ µF</td><td>$C_R > 1$ µF</td></tr>
<tr><td>1 KHz</td><td>-</td><td>0.5</td><td>0.5</td></tr>
<tr><td>10 KHz</td><td>-</td><td>0.8</td><td>1.5</td></tr>
<tr><td>100 KHz</td><td>5.0</td><td>-</td><td>-</td></tr>
<tr><td rowspan="2">Insulation Resistance R_{INS}, given as time constant $\tau = C_R \cdot R_{INS}$, rel. humidity ≤ 65% (minimum as-delivered values)</td><td colspan="2">$C_R \leq 0.33$ µF</td><td colspan="2">$C_R > 0.33$ µF</td></tr>
<tr><td colspan="2">100 GΩ</td><td colspan="2">30000 s</td></tr>
<tr><td>DC test voltage</td><td colspan="4">$1.5 \cdot V_R$, 2s</td></tr>
<tr><td rowspan="2">Category voltage V_C (continuous operation with V_{DC} or V_{AC} at f ≤ 1 KHz)</td><td>T_A (ºC)</td><td colspan="2">DC voltage derating</td><td>AC voltage derating</td></tr>
<tr><td>$T_A \leq 85$
$85 < T_A \leq 100$</td><td colspan="2">$V_C = V_R$
$V_C = V_R \frac{165 - T_A}{80}$</td><td>$V_{C,rms} = V_{rms}$
$V_{C,rms} = V_{C,rms} \frac{165 - T_A}{80}$</td></tr>
<tr><td rowspan="2">Operating voltage V_{op} for short operation periods (V_{DC} or V_{AC} at f ≤ 60 Hz)</td><td>T_A (ºC)</td><td colspan="2">DC voltage (max. hours)</td><td>AC voltage (max. hours)</td></tr>
<tr><td>$T_A \leq 85$
$85 < T_A \leq 100$</td><td colspan="2">$V_{op} = 1.25 \cdot V_C$ (2000 h)
$V_{op} = 1.25 \cdot V_C$ (1000 h)</td><td>$V_{op} = 1.0 \cdot V_{C,rms}$ (2000 h)
$V_{op} = 1.25 \cdot V_{C,rms}$ (1000 h)</td></tr>
<tr><td>Damp heat test
Limit values after damp heat test</td><td colspan="4">56 days / 40ºC / 93% relative humidity
Capacitance change $|\Delta C/C|$ ≤ 3%
Dissipation factor change, $\Delta \tan\delta$ $\leq 0.5 \cdot 10^{-3}$ (at 1KHz)
$\leq 1.0 \cdot 10^{-3}$ (at 10 KHz)
Insulation Resistance R_{ins} ≥ 50% of minimum
or time constant $\tau = C_R \cdot R_{ins}$ as-delivered values</td></tr>
<tr><td>Reliability:
Failure rate λ
Service life t_{SL}

Failure criteria:
Total failure
Failure due to variation of parameters</td><td colspan="4">1 fit ($\leq 1 \cdot 10^{-9}$) at $0.5 \cdot V_R$, 40ºC
Up to 200.000 h @ V_R and 40ºC
For conversion to other operating conditions, refer to chapter “Quality assurance”, data book 2005 “Film capacitors”, page 390

Short circuit or open circuit
Capacitance change $|\Delta C/C|$ ≥ 10%
Dissipation factor tanδ ≥ 4 times upper limit value
Insulation Resistance R_{ins} ≥ 1500 MΩ ($C_R \leq 0.33$ µF)
or time constant $\tau = C_R \cdot R_{ins}$ < 500 s ($C_R > 0.33$ µF)</td></tr>
</table>

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 hole space differs from the specified lead space.
- 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.

Resistance to soldering heat

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

Series	Solder bath temp.	Soldering time
MKT boxed (except 2.5 x 6.5 x 7.2 mm); coated; MKP/MFP	260 ±5 °C	10 ±1 s
MKT boxed (case 2.5 x 6.5 x 7.2 mm)	260 ±5 °C	5 ±1 s

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 irreversibly change a capacitor's electrical characteristics. For short exposure times (as in practical soldering processes), the heat load (and thus the possible effects on the capacitor) will also depend on other factors such as:

- The pre-heating temperature and time.
- The forced cooling immediately after soldering.
- The terminal characteristics: diameter, length, thermal resistance, special configurations (e.g. crimping).
- The height of the capacitor above the solder bath.
- Shadowing by neighboring components.
- Additional heating due to heat dissipation by neighboring components.
- Use of solder-resistant 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 have to be included.

Cleaning

To determine whether a particular solvent, often used to remove flux residues and other substances, is suitable for the capacitors described, please refer to data book 2005 "Film Capacitors", in which this information is available. Even when suitable solvents are used, a reversible change of the electrical characteristics may occur in uncoated capacitors immediately after they have been 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.

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 considering maximum curing temperature 100 °C:

- Non-flexible epoxy resins with acid-anhydride hardeners
- Chemically inert, non-conducting fillers

Caution: Consult us first if you also wish to embed other uncoated component types!

Storage conditions

All capacitors listed in this product profile can be stored for short periods at any temperature within the entire range of category temperatures . For long storage periods, however, the following conditions should be observed:

- Storage temperature –40 to +40 °C
- Maximum relative humidity 80%, no dew allowed on the capacitor
- Maximum duration 24 months (12 months for taped components)

Resistance to vibration

A capacitor's ability to withstand vibration (e.g. such as that occurring in applications involving rotating machinery) is tested to IEC 60068-2-6. The test procedure used here involves continuous sinusoidal vibration along three orthogonal axes, with a continuously varying frequency (10 … 500 Hz), an acceleration amplitude of 10 *g*, a displacement amplitude of 0.75 mm and a duration of 360 minutes for each axis. 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".

Passive flammability

The passive flammability test is applied to ensure that components bearing the corresponding qualification contribute less energy to the combustion behavior of their immediate vicinity than is required to ignite them. This measure is designed to contain any localized fire that may occur. In the respective tests, the capacitors are subjected to a standardized flame to evaluate their combustion behavior by checking whether the flame persists for longer than a maximum permissible period or not. The severity of the test is determined essentially by the test flame and exposure time in accordance with various international standards (IEC 60040 CO 752 (amendment to IEC 60384-1), IEC 60695-2-2 and UL 1414). Unless the detail specifications stipulate otherwise, EMI suppression capacitors are tested to IEC 60384-14, section 4.17, test severity categories B and C.

EPCOS

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, EPCOS is 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 an EPCOS product with the properties described in the product specification is suitable for use in a particular customer application.
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