

November 30, 2007

## Product innovation Humidity resistant X2 EMI suppression capacitors

EPCOS has developed a new series of X2 EMI suppression capacitors (B32922\*7xx ... B32924\*7xx, 305 V AC), which are suitable for high relative humidity conditions.

These X2 capacitors are intended to be connected in series with the main power supply (see "typical applications"). The highly reliable safety components are designed for equipment that operates under high relative humidity conditions (see "tests conditions").

To comply with international safety regulations this new series has been approved according to the most important international standards (IEC, UL, CSA).

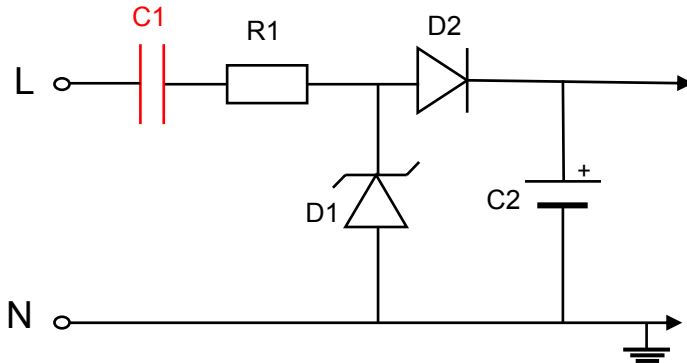
Data sheets for the new EMI suppression capacitors are available online under [www.epcos.com/emi\\_capacitors](http://www.epcos.com/emi_capacitors).

Samples may be ordered immediately.

### Technical data

<b>EMI suppression capacitors (X2 Class)</b>	
Technology	MKP wound
Capacitance range	0.1 µF ... 2.2 µF
Rated AC voltage (IEC 60384-14)	305 V AC (50/60 Hz)
Maximum operating temperature	105 °C
Passive flammability category	B
Lead spacing	15 mm ... 27.5 mm
Standards	IEC 60384-14 / EN 132400 UL1414 / CSA 22.2 No. 1 UL1283 / CSA 22.2 No. 8

## Typical applications



Example of connection in series with the main power supply (C1).  
Typical applications include energy meters, household appliances, etc.

## Test conditions

Damp heat test	1. Temperature : +40 °C ±2 °C Relative humidity (RH) : 93% ±2% Test duration : 1000 hours
	-----or----- 2. Temperature : +85 °C ±2 °C Relative humidity (RH) : 85% ±2% Test duration : 200 hours Voltage value : 240 V AC, 50 Hz
	-----or----- 3. Temperature : + 40 °C ± 2 °C Relative humidity (RH) : 93% ± 2% Test duration : 500 hours Voltage value : 240 V AC, 50 Hz
Limit values after damp heat test	Capacitance change ( $\Delta C/C$ ) ≤ 5% Dissipation factor change ( $\Delta \tan \delta$ ) ≤ 0.5 · 10 <sup>-3</sup> (at 1 kHz) ≤ 1.0 · 10 <sup>-3</sup> (at 10 kHz) Insulation resistance R <sub>ins</sub> ≥ 50% of minimum as-delivered values or time constant $\tau = C_R \cdot R_{ins}$

**Enclosure** Data sheet

**Contact** Steve Elliot, FK DC PM, Mch M/Ku

EPCOS AG  
Corporate Center  
St.-Martin-Strasse 53  
81669 Munich  
P.O.Box 80 17 09  
81617 Munich  
Germany

Headquarters:  
Munich  
  
Commercial register  
of the local court  
(Amtsgericht): Munich  
HRB 127250

Chairman of the Supervisory  
Board: Klaus Ziegler  
  
Management Board:  
Gerhard Pegam, President & CEO  
Helmut Koenig  
Dr. Werner Faber

**Film Capacitors**  
  
Distribution:  
internal  
  
748FK1e



## Film capacitors

EMI suppression capacitors (MKP), X2 / 305 V AC

**Series/Type:** B32922\*7xx ... B32924\*7xx

**Date:** 2007-11-28

**Version:** 1

## Film capacitors

### EMI suppression capacitors (MKP), X2 / 305 V AC

B32922\*7xx ... B32924\*7xx

#### Typical applications

- For connection in series with the mains
- For severe ambient conditions

#### Climatic

- Maximum operating temperature: 105 °C
- Climatic category (IEC 60068-1): 40/105/56

#### Construction

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

#### Features

- Very small dimensions
- Self-healing properties

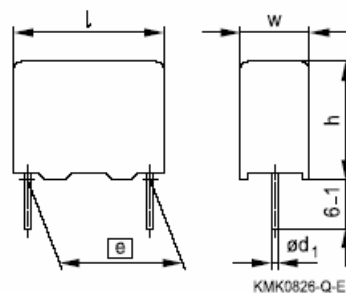
#### Terminals

- Parallel wire leads, lead-free tinned
- Standard lead lengths: 6-1mm
- Special lead lengths available on request

#### Marking

Manufacturer's logo and lot number, date code, rated capacitance (coded), capacitance tolerance (code letter, rated AC voltage, series number, sub-class (X2), dielectric code (MKP), climatic category, passive flammability category, approvals.

#### Dimensional drawing



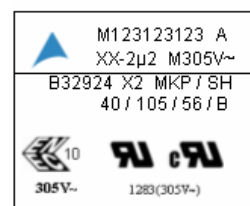
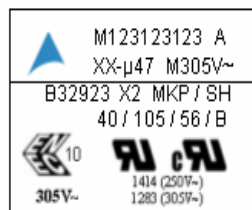
#### Dimensions in mm

Lead spacing $e$ ±0.4	Lead diameter d1	Type
15 ... 27.5	0.8	B32922 ... 24




#### Marking examples

27.5 ≥  $e$  ≥ 15 mm  
C<sub>R</sub> ≤ 1 μF

27.5 ≥  $e$  ≥ 22.5 mm  
C<sub>R</sub> > 1 μF



#### Approvals

Marks of Conformity	Standards	Certificate
	EN 132400 / IEC 60384-14	40005536 / 40010694
	UL1414 / UL1283	E97863 / E157153
	CSA C22.2 No.1 / CSA C22.2 No.8	E97863 / E157153



## Film capacitors

EMI suppression capacitors (MKP), X2 / 305 V AC

B32922\*7xx ... B32924\*7xx

### Ordering codes and packing units

Lead spacing mm	C <sub>R</sub> μF	Max dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
15	0.100	5.0 × 10.5 × 18.0	B32922C3104+***	1170	1300	1000
	0.150	6.0 × 12.0 × 18.0	B32922C3154+***	960	1100	1000
	0.220	7.0 × 12.5 × 18.0	B32922C3224+***	830	900	1000
	0.330	8.0 × 14.0 × 18.0	B32922C3334M***	730	750	500
	0.330	8.5 × 14.5 × 18.0	B32922D3334+***	680	700	500
	0.470	9.0 × 17.5 × 18.0	B32922C3474+***	640	700	500
22.5	0.33	6.0 × 15.0 × 26.5	B32923C3334M***	680	700	720
	0.33	7.0 × 16.0 × 26.5	B32923D3334+***	580	600	630
	0.47	8.5 × 16.5 × 26.5	B32923C3474+***	480	500	510
	0.68	10.5 × 16.5 × 26.5	B32923C3684+***	390	400	540
	0.82	10.5 × 18.5 × 26.5	B32923C3824M***	390	400	540
	1.00	11.0 × 20.5 × 26.5	B32923C3105+***	370	350	510
	1.50	12.0 × 22.0 × 26.5	B32923C3155M***	–	–	450
27.5	0.68	11.0 × 19.0 × 31.5	B32924C3684+***	–	350	320
	0.82	11.0 × 19.0 × 31.5	B32924C3824+***	–	350	320
	1.00	11.0 × 19.0 × 31.5	B32924C3105+***	–	350	320
	1.50	12.5 × 21.5 × 31.5	B32924C3155+***	–	300	280
	2.20	14.0 × 24.5 × 31.5	B32924C3225+***	–	–	260

Intermediate capacitance values are available on request.

#### Composition of ordering code

+ = Capacitance tolerance code

M = ±20%

K = ±10%

\*\*\* =Packaging code:

783 = 3.2 ±0.3 mm leads

784 = 4.0 ±0.3 mm leads

786 = 5.5 ±0.5 mm leads

787 = 26.0 ±2.0 mm leads

788 = Reel pack

789 = Ammo pack

**Film capacitors**
**EMI suppression capacitors (MKP), X2 / 305 V AC**
**B32922\*7xx ... B32924\*7xx**
**Technical data**

Maximum operating temperature $T_{op,max}$	105 °C		
Dissipation factor $\tan \delta$ (in $10^{-3}$ ) at 20 °C (upper limit values)		$C_R \leq 0.1 \mu\text{F}$	$0.1 \mu\text{F} < C_R \leq 2.2 \mu\text{F}$
	at 1 kHz 100 kHz	1.0 5	1.0 –
Insulation resistance $R_{ins}$ or time constant $\tau = C_R \cdot R_{ins}$ at 20 °C, rel. humidity $\leq 65\%$ (minimum as-delivered values)	$C_R \leq 0.33 \mu\text{F}$		$C_R > 0.33 \mu\text{F}$
	100 000 M $\Omega$		30 000 s
DC test voltage	2000 V, 2 s		
Passive flammability category to IEC 40 (CO) 752	B		
Capacitance tolerances (measured at 1 kHz)	$\pm 10\%$ (K), $\pm 20\%$ (M)		
Rated AC voltage (IEC 60384-14)	305 V (50/60 Hz)		
Maximum continuous DC voltage (V DC)	630 V		
Operating AC voltage $V_{op}$ at high temperature	$T_A \leq 105 \text{ °C}$		$V_{op} = 1.25 \cdot V_{AC}$ (1000 h)
Damp heat test	Test conditions 1. Temperature: +40 °C $\pm 2$ °C Relative humidity (RH): 93% $\pm 2\%$ Test duration: 1000 hours or 2. Temperature: +85 °C $\pm 2$ °C Relative humidity (RH): 85% $\pm 2\%$ Test duration: 200 hours Voltage value: 240 V AC, 50 Hz or 3. Temperature: +40 °C $\pm 2$ °C Relative humidity (RH): 93% $\pm 2\%$ Test duration: 500 hours Voltage value: 240 V AC, 50 Hz		
Limit values after damp heat test	Capacitance change ( $\Delta C/C$ ): $\leq 5\%$ Dissipation factor change ( $\Delta \tan \delta$ ): $\leq 0.5 \cdot 10^{-3}$ (at 1 kHz) $\leq 1.0 \cdot 10^{-3}$ (at 10 kHz) Insulation resistance $R_{ins}$ or time constant $\tau = C_R \cdot R_{ins}$ : $\geq 50\%$ of minimum as-delivered values		

**dV/dt and  $k_0$  values**

Lead spacing (mm)	10	15	22.5	27.5
Version	C / D	C / D	C / D	C / D
dV/dt in (V/ $\mu\text{s}$ )	475	340	170	120
$K_0$ in (V <sup>2</sup> / $\mu\text{s}$ )	408500	292400	146200	103200

Note: The maximum values of dV/dt and  $K_0$  must not be exceeded in order to avoid overheating of the capacitor.

## 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.
2. We also point out that **in individual cases, a malfunction of passive 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 a passive 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 a passive 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.epcos.com/material](http://www.epcos.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 the current version of the "General Terms of Delivery for Products and Services in the Electrical Industry" published by the German Electrical and Electronics Industry Association (ZVEI)**.
7. The trade names EPCOS, BAOKE, Alu-X, CeraDiode, CSSP, MiniBlue, MKK, MLSC, MotorCap, PCC, PhaseCap, PhaseMod, SIFERRIT, SIFI, SIKOREL, SilverCap, SIMDAD, SIMID, SineFormer, SIOV, SIP5D, SIP5K, ThermoFuse, WindCap are **trademarks registered or pending** in Europe and in other countries. Further information will be found on the Internet at [www.epcos.com/trademarks](http://www.epcos.com/trademarks).