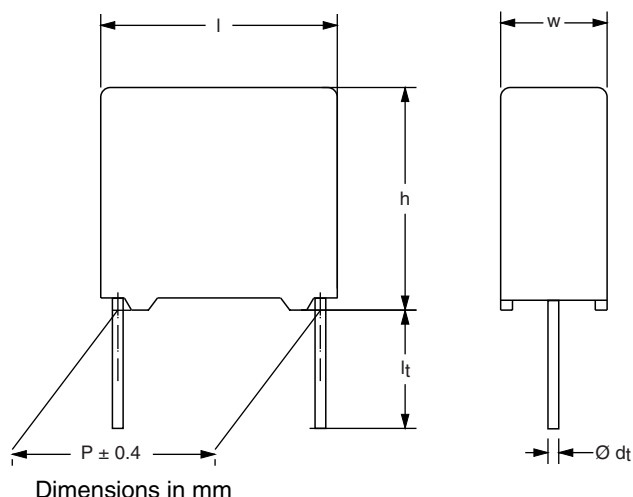


## Interference Suppression Film Capacitors MKP Radial Potted Type



**NO FOCUS PRODUCT: USE MKP 3381 X1**

### APPLICATIONS

X1 class

For X1 electromagnetic interference suppression in across the line applications (50/60 Hz) with a maximum mains voltage of 275 V(AC)

For application limitations please refer to section "Application notes"

### REFERENCE STANDARDS

"IEC 60384-14 2nd edition and EN 132400"

"IEC 60065, pass. flamm. class B"

250 V: CSA-C22.2 No 1; UL1414

275 V: UL1283; ENEC

### MARKING

C-value; tolerance; rated voltage; sub-class; manufacturer's type designation; code for dielectric material, only for pitch  $\geq 15$  mm; manufacturer location; year and week

### DIELECTRIC

Polypropylene film

### ELECTRODES

Metallized film

### CONSTRUCTION

Mono construction

### FEATURES

15 to 27.5 mm lead pitch. Supplied loose in box, taped on reel

Lead (Pb)-free product

RoHS-compliant product



**RoHS**  
COMPLIANT

### RATED VOLTAGE

AC 275 V; 50 to 60 Hz

### PERMISSIBLE DC VOLTAGE

DC 630 V

### ENCAPSULATION

Plastic case, epoxy resin sealed, flame retardant  
UL-class 94 V-0

### CLIMATIC TESTING CLASS ACC. TO EN 60068-1

55/105/56/B

### CAPACITANCE RANGE (E12 SERIES)

E12 series 0.01 to 1  $\mu$ F

Preferred values acc. to E6

### CAPACITANCE TOLERANCE

$\pm 20\%$ ;  $\pm 10\%$ ;  $\pm 5\%$

### LEADS

Tinned wire

### RATED TEMPERATURE

105 °C

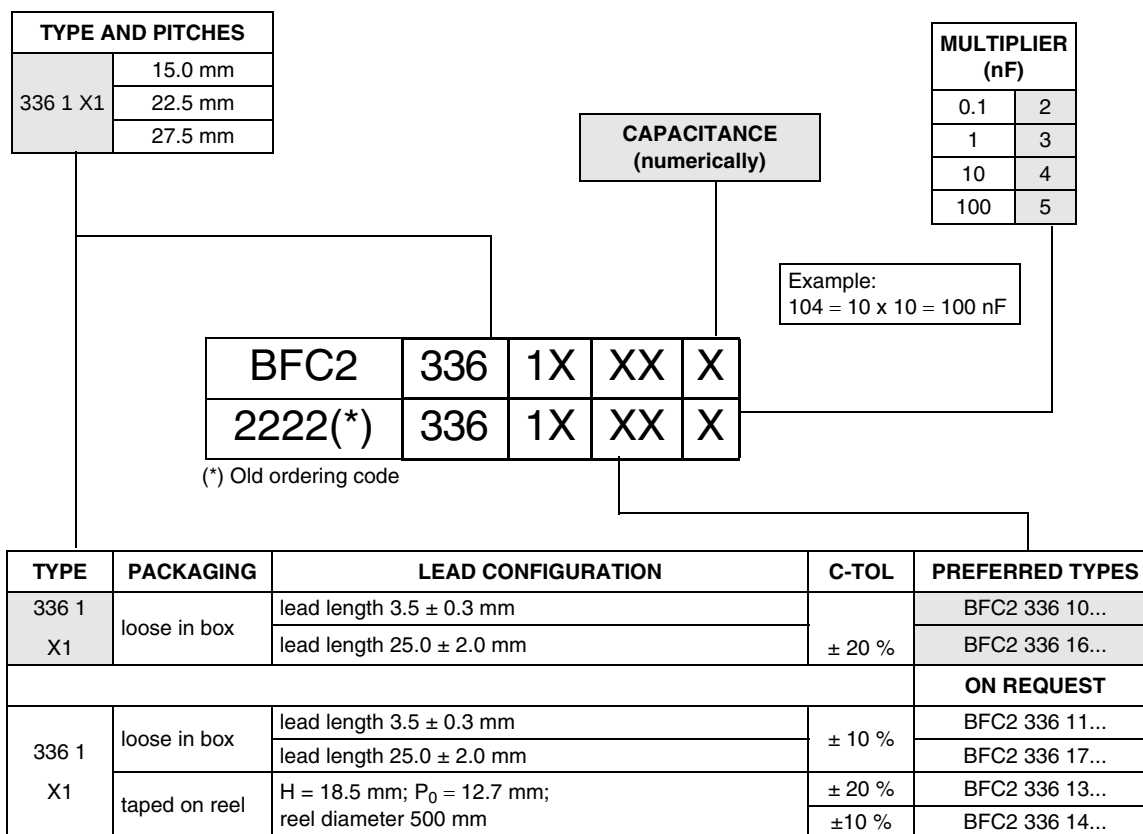
### MAXIMUM APPLICATION TEMPERATURE

105 °C

### DETAIL SPECIFICATION

For more detailed data and test requirements contact:

[rfi@vishay.com](mailto:rfi@vishay.com)

**COMPOSITION OF CATALOG NUMBER****Note**(1) For detailed tape specifications refer to Packaging information [www.vishay.com/docs/28139/packinfo.pdf](http://www.vishay.com/docs/28139/packinfo.pdf)**SPECIFIC REFERENCE DATA MKP 336 1 275 VAC**

| DESCRIPTION                                                          | VALUE                   |
|----------------------------------------------------------------------|-------------------------|
| Tangent of loss angle:                                               | at 10 kHz               |
| C ≤ 100 nF                                                           | ≤ 10 x 10 <sup>-4</sup> |
| 100 nF < C ≤ 470 nF                                                  | ≤ 20 x 10 <sup>-4</sup> |
| C > 470 nF                                                           | ≤ 70 x 10 <sup>-4</sup> |
| Rated voltage pulse slope (dU/dt) <sub>R</sub> at 385 V (DC):        |                         |
| P = 15 mm                                                            | 250 V/μs                |
| P = 22.5 mm                                                          | 150 V/μs                |
| P = 27.5 mm                                                          | 100 V/μs                |
| R between leads, for C ≤ 0.33 μF at 100 V; 1 min                     | > 15 000 MΩ             |
| RC between leads, for C > 0.33 μF at 100 V; 1 min                    | > 5000 s                |
| R between leads and case; 100 V; 1 min                               | > 30 000 MΩ             |
| Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s | 3400 V; 1 min           |
| Withstanding (AC) voltage between leads and case                     | 2050 V; 1 min           |

## MKP 336 1 GENERAL DATA

$U_{Rac} = 275 \text{ V}$ ;  $C\text{-tol} = \pm 20 \%$

| C<br>( $\mu\text{F}$ )                                           | DIMENSIONS<br>W x H x L<br>(mm) | MASS<br>(g <sup>(1)</sup> ) | CATALOG NUMBER BFC2 336 1 ..... AND PACKAGING |      |                                    |      |                                              |      |
|------------------------------------------------------------------|---------------------------------|-----------------------------|-----------------------------------------------|------|------------------------------------|------|----------------------------------------------|------|
|                                                                  |                                 |                             | LOOSE IN BOX                                  |      |                                    |      | REEL                                         |      |
|                                                                  |                                 |                             | $l_t = 3.5 \pm 0.3$                           |      | $l_t = 25.0 \pm 2.0 \text{ mm}$    |      | $H = 18.5 \text{ mm}; P_0 = 12.7 \text{ mm}$ |      |
|                                                                  |                                 |                             | Last 5 digits of<br>catalog number            | SPQ  | Last 5 digits of<br>catalog number | SPQ  | Last 5 digits of<br>catalog number           | SPQ  |
| Pitch = $15.0 \pm 0.4 \text{ mm}; d_t = 0.6 \pm 0.06 \text{ mm}$ |                                 |                             |                                               |      |                                    |      |                                              |      |
| 0.01                                                             | 5.0 x 11.0 x 17.5               | 1                           | 19001                                         | 1000 | 19007                              | 1000 | 19002                                        | 1100 |
| 0.015                                                            |                                 |                             | 10153                                         |      | 16153                              |      | 13153                                        |      |
| 0.022                                                            |                                 |                             | 10223                                         |      | 16223                              |      | 13223                                        |      |
| 0.033                                                            | 6.0 x 12.0 x 17.5               | 1.4                         | 10333                                         |      | 16333                              |      | 13333                                        | 900  |
| Pitch = $15.0 \pm 0.4 \text{ mm}; d_t = 0.8 \pm 0.08 \text{ mm}$ |                                 |                             |                                               |      |                                    |      |                                              |      |
| 0.047                                                            | 7.0 x 13.5 x 17.5               | 1.8                         | 10473                                         | 1000 | 16473                              | 500  | 13473                                        | 800  |
| 0.068                                                            | 8.5 x 15.0 x 17.5               | 2.4                         | 10683                                         |      | 16683                              |      | 13683                                        | 650  |
| 0.1                                                              | 10.0 x 16.5 x 17.5              | 3                           | 10104                                         | 500  | 16104                              |      | 13104                                        | 600  |
| Pitch = $22.5 \pm 0.4 \text{ mm}; d_t = 0.8 \pm 0.08 \text{ mm}$ |                                 |                             |                                               |      |                                    |      |                                              |      |
| 0.1                                                              | 7.0 x 16.5 x 26.0               | 2.9                         | 19003                                         | 200  | 19008                              | 500  | 19004                                        | 550  |
| 0.15                                                             | 8.5 x 18.0 x 26.0               | 3.8                         | 10154                                         |      | 16154                              |      | 13154                                        | 450  |
| 0.22                                                             | 10.0 x 19.5 x 26.0              | 6.8                         | 10224                                         |      | 16224                              |      | 13224                                        | 400  |
| Pitch = $27.5 \pm 0.4 \text{ mm}; d_t = 0.8 \pm 0.08 \text{ mm}$ |                                 |                             |                                               |      |                                    |      |                                              |      |
| 0.22                                                             | 11.0 x 21.0 x 31.0              | 7.4                         | 19005                                         | 100  | 19009                              | 125  |                                              |      |
| 0.33                                                             | 13.0 x 23.0 x 31.0              | 9.2                         | 10334                                         |      | 16334                              |      |                                              |      |
| 0.47                                                             | 15.0 x 25.0 x 31.0              | 12.3                        | 10474                                         |      | 16474                              |      |                                              |      |
| 0.68                                                             | 18.0 x 28.0 x 31.0              | 16.1                        | 10684                                         |      | 16684                              |      |                                              |      |
| 1                                                                | 21.0 x 31.0 x 31.0              | 20.3                        | 10105                                         | 50   | 16105                              | 75   |                                              |      |

### Notes

1. Weight for short lead product only



$U_{RAC} = 275 \text{ V}$ ;  $C\text{-TOL} = \pm 10 \%$

| C<br>( $\mu$ F)                                               | DIMENSIONS<br>W x H x L<br>(mm) | MASS<br>(g) <sup>(1)</sup> | CATALOG NUMBER BFC2 336 1..... AND PACKAGING |       |                        |      |                                       |      |
|---------------------------------------------------------------|---------------------------------|----------------------------|----------------------------------------------|-------|------------------------|------|---------------------------------------|------|
|                                                               |                                 |                            | LOOSE IN BOX                                 |       |                        |      | REEL                                  |      |
|                                                               |                                 |                            | It = 3.5 $\pm$ 0.3 m                         |       | It = 25.0 $\pm$ 2.0 mm |      | H = 18.5 mm; P <sub>0</sub> = 12.7 mm |      |
|                                                               |                                 |                            | last 5 digits                                | SPQ   | last 5 digits          | SPQ  | last 5 digits                         | SPQ  |
| Pitch = 15.0 $\pm$ 0.4 mm; d <sub>t</sub> = 0.6 $\pm$ 0.06 mm |                                 |                            |                                              |       |                        |      |                                       |      |
| 0.01                                                          | 5.0 x 11.0 x 17.5               | 1                          | 11103                                        | 1000  | 17103                  | 1000 | 14103                                 | 1100 |
| 0.012                                                         |                                 |                            | 11123                                        |       | 17123                  |      | 14123                                 |      |
| 0.015                                                         |                                 |                            | 11153                                        |       | 17153                  |      | 14153                                 |      |
| 0.018                                                         |                                 |                            | 11183                                        |       | 17183                  |      | 14183                                 |      |
| 0.022                                                         | 6.0 x 12.0 x 17.5               | 1.4                        | 11223                                        |       | 17223                  |      | 14223                                 | 900  |
| 0.027                                                         |                                 |                            | 11273                                        |       | 17273                  |      | 14273                                 |      |
| Pitch = 15.0 $\pm$ 0.4 mm; dt = 0.8 $\pm$ 0.08 mm             |                                 |                            |                                              |       |                        |      |                                       |      |
| 0.033                                                         | 7.0 x 13.5 x 17.5               | 1.8                        | 11333                                        | 1000  | 17333                  | 500  | 14333                                 | 800  |
| 0.039                                                         |                                 |                            | 11393                                        |       | 17393                  |      | 14393                                 |      |
| 0.047                                                         | 8.5 x 15.0 x 17.5               | 2.4                        | 11473                                        |       | 17473                  |      | 14473                                 | 650  |
| 0.056                                                         |                                 |                            | 11563                                        |       | 17563                  |      | 14563                                 |      |
| 0.068                                                         | 10.0 x 16.5 x 17.5              | 3                          | 11683                                        | 500   | 17683                  |      | 14683                                 | 600  |
| 0.082                                                         |                                 |                            | 11823                                        |       | 17823                  |      | 14823                                 |      |
| Pitch = 22.5 $\pm$ 0.4 mm; dt = 0.8 $\pm$ 0.08 mm             |                                 |                            |                                              |       |                        |      |                                       |      |
| 0.1                                                           | 7.0 x 16.5 x 26.0               | 2.9                        | 11104                                        | 200   | 17104                  | 500  | 14104                                 | 550  |
| 0.12                                                          | 8.5 x 18.0 x 26.0               | 3.8                        | 11124                                        |       | 17124                  | 250  | 14124                                 | 450  |
| 0.15                                                          |                                 |                            | 11154                                        |       | 17154                  |      | 14154                                 |      |
| 0.18                                                          | 10.0 x 19.5 x 26.0              | 6.8                        | 11184                                        |       | 17184                  | 500  | 14184                                 | 400  |
| Pitch = 27.5 $\pm$ 0.4 mm; dt = 0.8 $\pm$ 0.08 m              |                                 |                            |                                              |       |                        |      |                                       |      |
| 0.22                                                          | 11.0 x 21.0 x 31.0              | 7.4                        | 11224                                        | 100   | 17224                  | 125  |                                       |      |
| 0.27                                                          |                                 |                            | 11274                                        |       | 17274                  |      |                                       |      |
| 0.33                                                          | 13.0 x 23.0 x 31.0              | 9.2                        | 11334                                        |       | 17334                  |      |                                       |      |
| 0.39                                                          | 15.0 x 25.0 x 31.0              | 12.3                       | 11394                                        |       | 17394                  |      |                                       |      |
| 0.47                                                          |                                 |                            | 11474                                        | 17474 |                        |      |                                       |      |
| 0.56                                                          | 18.0 x 28.0 x 31.0              | 16.1                       | 11564                                        | 50    | 17564                  | 75   |                                       |      |
| 0.68                                                          |                                 |                            | 11684                                        |       | 17684                  |      |                                       |      |
| 0.82                                                          | 21.0 x 31.0 x 31.0              | 20.3                       | 11824                                        |       | 17824                  |      |                                       |      |

### Note

- Weight for short lead product only

| SAFETY APPROVALS X1                                                                                                                                                                                                                                                                                                                                         | VOLTAGE    | VALUE              | FILE NUMBERS |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------|--------------|
| EN132400                                                                                                                                                                                                                                                                                                                                                    | 275 V (AC) | 10 nF to 1 $\mu$ F | FI 2006020   |
| UL1414                                                                                                                                                                                                                                                                                                                                                      | 250 V (AC) | 10 nF to 1 $\mu$ F | E112471      |
| UL1283                                                                                                                                                                                                                                                                                                                                                      | 275V (AC)  | 10 nF to 1 $\mu$ F | E109565      |
| CSA-C22.2 No.1                                                                                                                                                                                                                                                                                                                                              | 250 V (AC) | 10 nF to 1 $\mu$ F | 1104860      |
| The Enec-approval together with the CB-Certificate replace all national marks of the following countries (they have already signed the ENEC-Agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway; Portugal; Slovenian; Spain; Switzerland and United Kingdom. |            |                    |              |
|                                                                                                        |            |                    |              |

## MOUNTING

### Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to "Packaging information".

### Specific Method of Mounting to Withstand Vibration and Shock

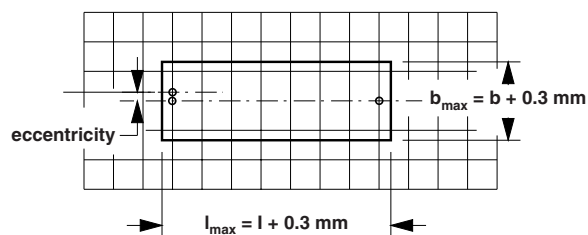
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- For pitches  $\leq 15$  mm capacitors shall be mechanically fixed by the leads
- For longer pitches the capacitors shall be mounted in the same way and the body clamped

### Space Requirements on printed Circuit Board

The maximum length and width of film capacitors is shown in Figure:

- Eccentricity as in figure. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned
- Product height with seating plane as given by "IEC 60717" as reference:  $h_{\max} \leq h + 0.3$  mm



CBA116

### Storage Temperature

- Storage temperature:  $T_{\text{stg}} = 25$  to  $+40$  °C with RH maximum 80 % without condensation

### Ratings and Characteristics Reference Conditions

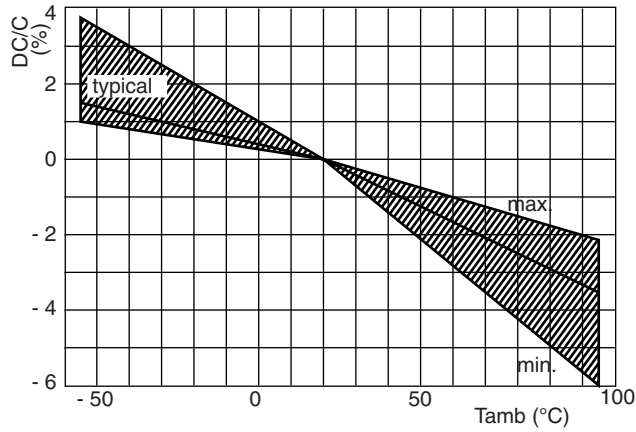
Unless otherwise specified, all electrical values apply to an ambient temperature of  $23 \pm 1$  °C, an atmospheric pressure of 86 to 106 kPa and a relative humidity of  $50 \pm 2$  %.

For reference testing, a conditioning period shall be applied over  $96 \pm 4$  hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

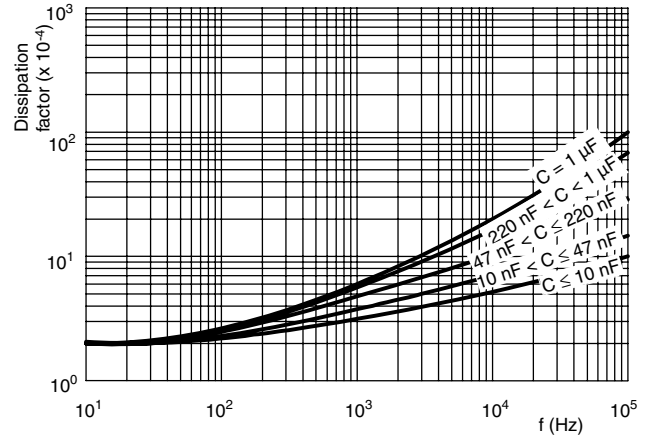


### CHARACTERISTICS

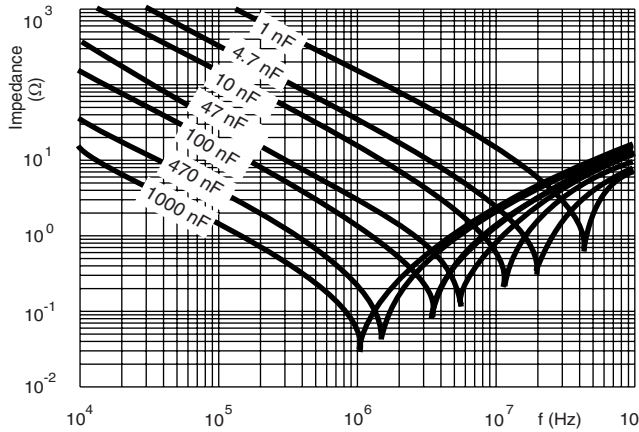
#### Capacitance



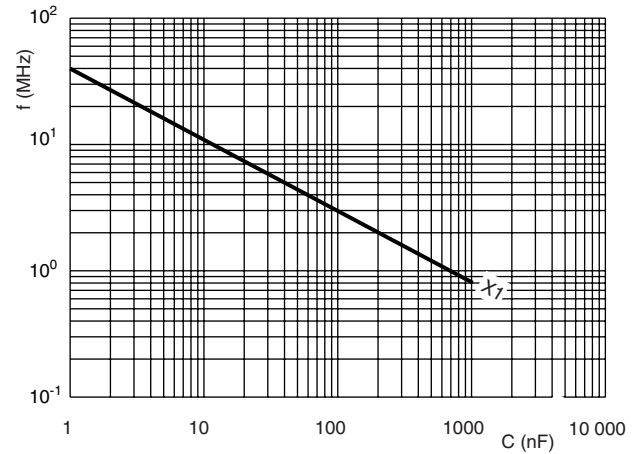
#### Tangent of loss angle



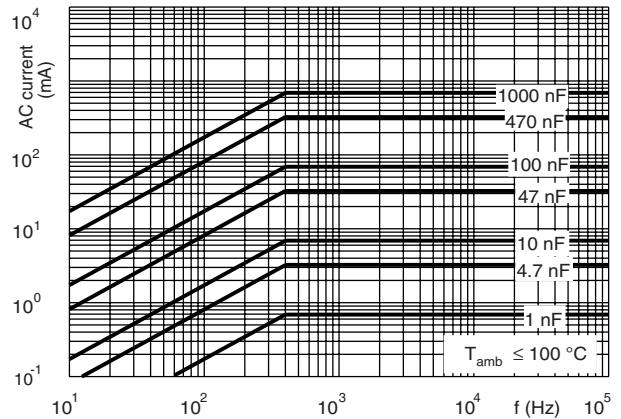
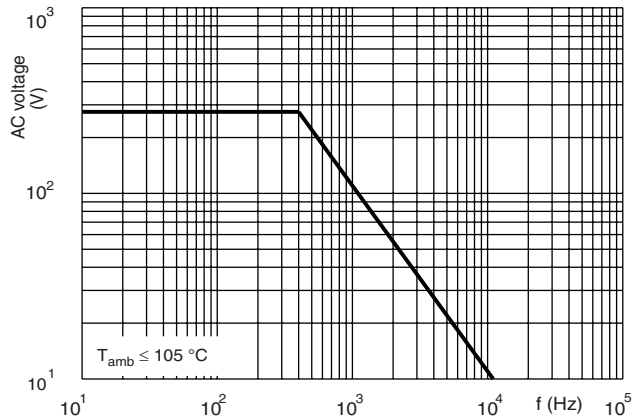
#### Impedance

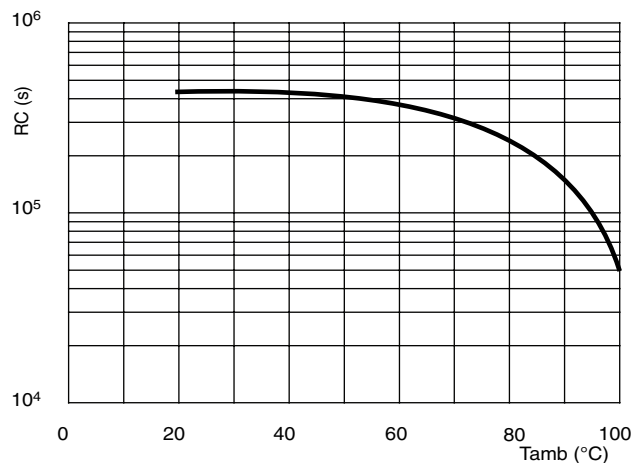


#### Resonant frequency



#### Max RMS voltage and AC current (sinewave)



**CHARACTERISTICS****Capacitance****APPLICATION NOTES**

- For X1 electromagnetic interference suppression in **across the line applications** (50/60 Hz) with a maximum mains voltage of 275 V (AC).
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse programs must be used.
- These capacitors are not intended for series impedance application. For these situations in case safety approvals are requested, please refer to our special capacitors of 1772 series with internal series connection.
- The maximum ambient temperature must not exceed 105 °C.
- Rated voltage pulse slope:  
If the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by 385 V (DC) and divided by the applied voltage.

**INSPECTION REQUIREMENTS****General Notes:**

1. Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, IEC-publication EN 132400 (IEC 60384-14) and section One of this specification”.
2. In this table:    D = destructive  
                          ND = non destructive

**Group C inspection requirements**

| SUB - CLAUSE NUMBER<br>AND TEST                 | D<br>OR<br>ND | CONDITIONS                                                                                                                          | PERFORMANCE REQUIREMENTS                                                                                                                                                                             |
|-------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB-GROUP C1A PART OF SAMPLE<br>OF SUB-GROUP C1 | D             |                                                                                                                                     |                                                                                                                                                                                                      |
| 4.1 Dimensions (detail)                         |               |                                                                                                                                     | As specified in Chapters “General data”<br>of this specification                                                                                                                                     |
| Initial measurements                            |               | Capacitance<br>Tangent of loss angle:<br>For $C \leq 470$ nF at 100 kHz<br>For $C > 470$ nF at 10 kHz                               |                                                                                                                                                                                                      |
| 4.3 Robustness of<br>terminations               |               | Tensile: load 10 N; 10 s<br>Bending: load 5 N; 4 x 90°                                                                              | No visible damage                                                                                                                                                                                    |
| 4.4 Resistance to soldering heat                |               | No pre-drying<br>Method: 1A<br>Solder bath: 260 °C<br>Duration: 10 s                                                                |                                                                                                                                                                                                      |
| 4.19 Component solvent<br>resistance            |               | Isopropylalcohol at room temperature<br>Method: 2<br>Immersion time: $5 \pm 0.5$ min<br>Recovery time:<br>Min. 1 hour, max. 2 hours |                                                                                                                                                                                                      |
| 4.4.2 Final measurements                        |               | Visual examination                                                                                                                  | No visible damage<br>Legible marking                                                                                                                                                                 |
|                                                 |               | Capacitance                                                                                                                         | $ \Delta C/C  \leq 5$ % of the value measured<br>initially                                                                                                                                           |
|                                                 |               | Tangent of loss angle                                                                                                               | Increase of $\tan \delta$ :<br>$\leq 0.0100$ for: $C \leq 100$ nF or<br>$\leq 0.0200$ for: $100$ nF $< C \leq 470$ nF or<br>$\leq 0.0080$ for: $C > 470$ nF<br>Compared to values measured initially |
|                                                 |               | Insulation resistance                                                                                                               | As specified in Section “Insulation<br>Resistance” of this specification                                                                                                                             |

**Interference Suppression Film Capacitors    Vishay BCcomponents**  
**MKP Radial Potted Type**

| SUB - CLAUSE NUMBER<br>AND TEST                                                | D<br>OR<br>ND | CONDITIONS                                                                                                                                                                                                                                           | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                   |
|--------------------------------------------------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| SUB - GROUP C1B PART OF SAMPLE<br>OF SUB - GROUP C1                            | D             |                                                                                                                                                                                                                                                      |                                                                                                                                                                                                                            |
| Initial measurements                                                           |               | Capacitance<br>Tangent of loss angle:<br>For $C \leq 470$ nF at 100 kHz<br>For $C > 470$ nF at 10 kHz                                                                                                                                                | No visible damage<br>Legible marking                                                                                                                                                                                       |
| 4.20 Solvent resistance of the marking:<br>see Section "General notes"; item 5 |               | Isopropylalcohol at room temperature<br>Method: 1<br>Rubbing material: cotton wool<br>Immersion time: $5 \pm 0.5$ min                                                                                                                                | No visible damage                                                                                                                                                                                                          |
| 4.6 Rapid change of temperature                                                |               | $\theta A = - 55$ °C<br>$\theta B = + 105$ °C<br>5 cycles                                                                                                                                                                                            |                                                                                                                                                                                                                            |
| 4.6.1 Inspection                                                               |               | Duration $t = 30$ min                                                                                                                                                                                                                                |                                                                                                                                                                                                                            |
| 4.7 Vibration (see note 3.1)                                                   |               | Visual examination<br>Mounting: see Section "Mounting" of this<br>specification<br>Procedure B4:<br>Frequency range: 10 to 55 Hz<br>Amplitude: 0.75 mm or<br>Acceleration $98 \text{ m/s}^2$<br>(whichever is less severe)<br>Total duration 6 hours | No visible damage                                                                                                                                                                                                          |
| 4.7.2 Final inspection                                                         |               | Visual examination                                                                                                                                                                                                                                   | No visible damage                                                                                                                                                                                                          |
| 4.9 Shock (see note 3)                                                         |               | Mounting: see Section "Mounting" for<br>more information<br>Pulse shape: half sine<br>Acceleration: $490 \text{ m/s}^2$<br>Duration of pulse: 11 ms                                                                                                  |                                                                                                                                                                                                                            |
| 4.9.2 Final measurements                                                       |               | Visual examination                                                                                                                                                                                                                                   | No visible damage                                                                                                                                                                                                          |
|                                                                                |               | Capacitance                                                                                                                                                                                                                                          | $ \Delta C/C  \leq 5$ % of the value measured<br>initially                                                                                                                                                                 |
|                                                                                |               | Tangent of loss angle                                                                                                                                                                                                                                | Increase of $\tan \delta$ :<br>$\leq 0.0100$ for: $C \leq 100$ nF or<br>$\leq 0.0200$ for: $100 \text{ nF} < C \leq 470 \text{ nF}$ or<br>$\leq 0.0080$ for: $C > 470 \text{ nF}$<br>Compared to values measured initially |
|                                                                                |               | Insulation resistance                                                                                                                                                                                                                                | As specified in Section "Insulation<br>Resistance" of this specification                                                                                                                                                   |



Interference Suppression Film Capacitors Vishay BCcomponents  
MKP Radial Potted Type

| SUB - CLAUSE NUMBER AND TEST                                                                                                                                                                         | D OR ND | CONDITIONS                                                                                                                                                                                                                                                                                                                                                          | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUB - GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB - GROUPS C1A AND C1B</b>                                                                                                                       | D       |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4.11 Climatic sequence<br>4.11.1 Initial measurements<br><br>4.11.2 Dry heat<br>4.11.3 Damp heat cyclic<br>Test Db<br>4.11.4 Cold<br>4.11.5 Damp heat cyclic<br>Test Db<br>4.11.6 Final measurements |         | Capacitance<br>Measured in 4.4.2 and 4.9.2<br>Tangent of loss angle:<br>Measured initially in C1A and C1B<br>Temperature: 105 °C<br>Duration: 16 hours<br><br>Temperature: - 55 °C<br>Duration: 2 hours<br><br>Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Voltage proof<br>1200 V (DC); 1 min between term.<br>Insulation resistance | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 5\%$ of the value measured in 4.11.1.<br><br>Increase of $\tan \delta$ :<br>$\leq 0.0100$ for: $C \leq 100$ nF or<br>$\leq 0.0200$ for: $100$ nF < $C \leq 470$ nF or<br>$\leq 0.0080$ for: $C > 470$ nF<br>Compared to values measured in 4.11.1<br>No permanent breakdown or flash-over<br><br>$\geq 50\%$ of values specified in Section "Insulation resistance" of this specification |
| <b>SUB - GROUP C2</b>                                                                                                                                                                                | D       |                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 4.12 Damp heat steady state<br><br>4.12.1 Initial measurements<br><br>4.12.3 Final measurements                                                                                                      |         | 56 days, 40 °C, 90 to 95 % RH, no load<br>Capacitance<br><br>Tangent of loss angle at 10 kHz<br><br>Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br>Voltage proof<br>1200 V (DC); 1 min between term.<br>Insulation resistance                                                                                                            | No visible damage<br>Legible marking<br><br>$ \Delta C/C  \leq 5\%$ of the value measured in 4.12.1.<br><br>Increase of $\tan \delta$ :<br>$\leq 0.0080$<br>Compared to values measured in 4.12.1.<br>No permanent breakdown or flash-over<br><br>$\geq 50\%$ of values specified in Section "Insulation resistance" of this specification                                                                                                               |

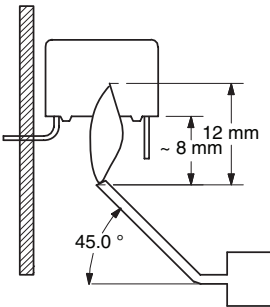


**Interference Suppression Film Capacitors Vishay BCcomponents**  
**MKP Radial Potted Type**

| SUB - CLAUSE NUMBER<br>AND TEST | D<br>OR<br>ND | CONDITIONS                                                                                                                                                                                                            | PERFORMANCE REQUIREMENTS                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUB GROUP C3</b>             | D             |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.13.1 Initial measurements     |               | Capacitance<br>Tangent of loss angle:<br>For C ≤ 470 nF at 100 kHz<br>For C > 470 nF at 10 kHz                                                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.13 Impulse voltage            |               | 3 successive impulses, full wave, peak voltage:<br>X1: 4 kV                                                                                                                                                           | No selfhealing breakdowns or flashover                                                                                                                                                                                                                                                                                                                                                             |
| 4.14 Endurance                  |               | Max. 24 pulses<br>Duration: 1000 hours<br>1.25 U <sub>Rac</sub> at 105 °C<br>Once in every hour the voltage is increased to 1000 V (RMS) for 0.1 s via resistor of 47 Ω ± 5 %                                         |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.14.7 Final measurements       |               | Visual examination<br><br>Capacitance<br><br>Tangent of loss angle<br><br><br>Voltage proof<br>1200 V (DC); 1 min between terminations.<br>2050 V (DC); 1 min between terminations and case.<br>Insulation resistance | No visible damage<br>Legible marking<br> ΔC/C  ≤ 10 % compared to values measured in 4.13.1.<br>Increase of tan δ:<br>≤ 0.0100 for: C ≤ 100 nF or<br>≤ 0.0200 for: 100 nF < C ≤ 470 nF or<br>≤ 0.0080 for: C > 470 nF<br>Compared to values measured in 4.13.1.<br>No permanent breakdown or flash-over<br><br>≥ 50 % of values specified in Section "Insulation resistance" of this specification |
| <b>SUB - GROUP C 4</b>          | D             |                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.15 Charge and discharge       |               | 10 000 cycles<br>(50 c/s) charge to UR half sinewave<br>Duration: 5 ms<br>Discharge resistance:                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                    |
|                                 |               | $R = \frac{385 \text{ Vdc}}{1.5 \times C((dU)/(dt))}$<br>R <sub>min</sub> = 2.2                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.15.1 Initial measurements     |               | Capacitance<br>Tangent of loss angle<br>For C ≤ 470 nF at 100 kHz<br>For C > 470 nF at 10 kHz                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.15.3 Final measurements       |               | Capacitance<br><br>Tangent of loss angle<br><br><br>Insulation resistance                                                                                                                                             | ΔC/C  ≤ 10 % compared to values measured in 4.15.1.<br>Increase of tan d:<br>≤ 0.0100 for: C ≤ 100 nF or<br>≤ 0.0200 for: 100 nF < C ≤ 470 nF or<br>≤ 0.0080 for: C > 470 nF<br>Compared to values measured in 4.15.1<br>≥ 50 % of values specified in Section "Insulation resistance" of this specification                                                                                       |

# Interference Suppression Film Capacitors Vishay BCcomponents

## MKP Radial Potted Type

| SUB - CLAUSE NUMBER AND TEST         | D OR ND | CONDITIONS                                                                                                                                                                                                                                                                                                                                                                                                                                      | PERFORMANCE REQUIREMENTS                                                                                                                             |
|--------------------------------------|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SUB - GROUP C5</b>                | D       |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                      |
| 4.16 Radio frequency characteristic  |         | Resonance frequency                                                                                                                                                                                                                                                                                                                                                                                                                             | As specified in Section "Resonant frequency" of this specification. $\pm 10\%$                                                                       |
| <b>SUB - GROUP C6</b>                | D       |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                      |
| 4.17 Passive flammability<br>Class B |         | <p>Bore of gas jet: <math>\varnothing 0.5</math> mm<br/>           Fuel: butane<br/>           Test duration for actual volume V in mm<sup>3</sup>:<br/> <math>V \leq 250</math>: 10 s<br/> <math>250 &lt; V \leq 500</math>: 20 s<br/> <math>500 &lt; V \leq 1750</math>: 30 s<br/> <math>V &gt; 1750</math>: 60 s<br/>           One flame application</p>  | After removing test flame from capacitor, the capacitor must not continue to burn for more than 10 s. No burning particle must drop from the sample. |
| <b>SUB - GROUP C7</b>                | D       |                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                      |
| 4.18 Active flammability             |         | 20 x 4 kV discharges on the test capacitor connected to UR                                                                                                                                                                                                                                                                                                                                                                                      | The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required.                                         |



### Disclaimer

All product specifications and data are subject to change without notice.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, "Vishay"), disclaim any and all liability for any errors, inaccuracies or incompleteness contained herein or in any other disclosure relating to any product.

Vishay disclaims any and all liability arising out of the use or application of any product described herein or of any information provided herein to the maximum extent permitted by law. The product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein, which apply to these products.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay.

The products shown herein are not designed for use in medical, life-saving, or life-sustaining applications unless otherwise expressly indicated. Customers using or selling Vishay products not expressly indicated for use in such applications do so entirely at their own risk and agree to fully indemnify Vishay for any damages arising or resulting from such use or sale. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

Product names and markings noted herein may be trademarks of their respective owners.