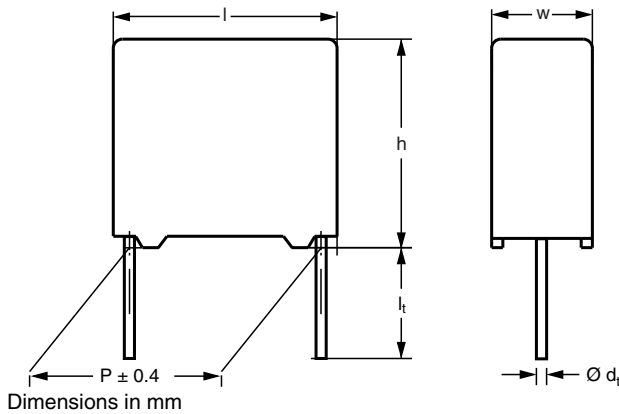


Interference Suppression Film Capacitors MKP Radial Potted Type



NO FOCUS PRODUCT: USE MKP 338 6 Y2

APPLICATIONS

Y2 class

For Y2 electromagnetic interference suppression between line and ground applications (50 Hz/60 Hz) with a maximum mains voltage of 300 V_{AC}.

For application limitations refer to section "Application Notes"

REFERENCE STANDARDS

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

"IEC 60065 requires, pass. flamm. class B"

250 V: UL 1414; CSA-C22.2 No 1;

300 V: UL 1283; ENEC

MARKING

C-value; tolerance; rated voltage; sub-class; manufacturer's type designation; code for dielectric material; manufacturer location; year and week

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized film

CONSTRUCTION

Series construction (for > 10 mm pitch)



Triple construction (for > 7.5 mm and 10 mm pitch)



RATED VOLTAGE

AC 300 V; 50 Hz to 60 Hz

FEATURES

- 10 mm to 15 mm lead pitch. Supplied loose in box, taped on reel
- Compliant to RoHS Directive 2002/95/EC

PERMISSIBLE DC VOLTAGE

DC 1000 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 0.001 µF to 0.047 µF

Preferred values acc. to E6

CAPACITANCE TOLERANCE

± 20 %; ± 10 %

LEADS

Tinned wire

MAXIMUM APPLICATION TEMPERATURE

105 °C

DETAIL SPECIFICATION

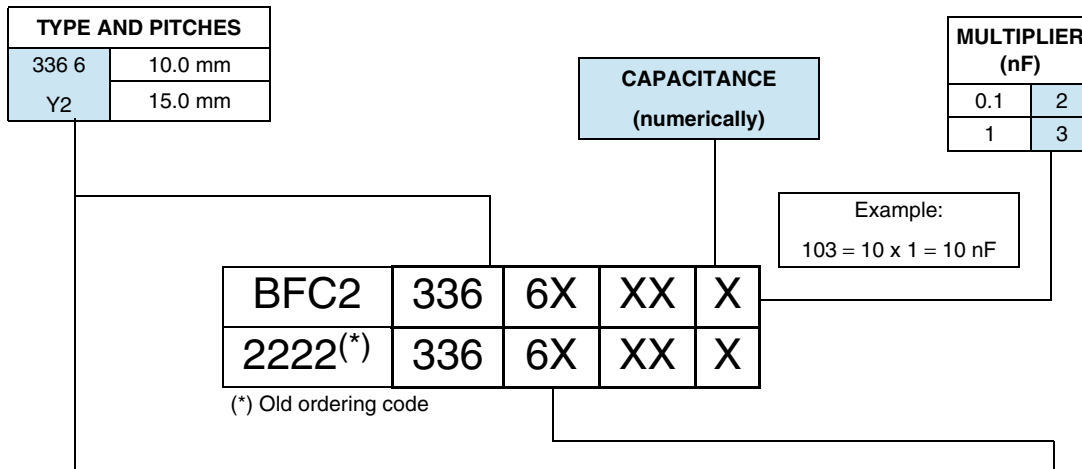
For more detailed data and test requirements contact:

RFI@vishay.com



RoHS
COMPLIANT

COMPOSITION OF CATALOG NUMBER



| TYPE | PACKAGING | LEAD CONFIGURATION | C-TOL | PREFERRED TYPES |
|-------------|------------------------------|--|--------|-------------------|
| 336 6 Y2 | loose in box | lead length 3.5 mm + 1 mm/- 0.5 mm (pitch = 10 mm) or 3.5 mm ± 0.3 mm (pitch = 15 mm) | ± 20 % | BFC2 336 60... |
| | | lead length 25.0 mm ± 2.0 mm | | BFC2 336 66... |
| | | | | ON REQUEST |
| 336 6 Y2 | loose in box | lead length 3.5 mm + 1 mm/- 0.5 mm (pitch = 10 mm) or 3.5 mm ± 0.3 mm (pitch = 15 mm) | ± 10 % | BFC2 336 61... |
| | | lead length 25.0 mm ± 2.0 mm | | BFC2 336 67... |
| | taped on reel ⁽¹⁾ | H = 18.5 mm; P ₀ = 12.7 mm; reel diameter 500 mm | ± 20 % | BFC2 336 63... |
| | | | ± 10 % | BFC2 336 64... |

Note

⁽¹⁾ For detailed tape specification refer to Packaging Information: www.vishay.com/docs/28139/packinfo.pdf

SPECIFIC REFERENCE DATA

| DESCRIPTION | VALUE |
|---|-------------------------|
| Rated AC voltage (U _{RAC}) | 300 V |
| Permissible DC voltage (U _{RDC}) | 1000 V |
| Tangent of loss angle | at 10 kHz |
| | ≤ 10 x 10 ⁻⁴ |
| Rated voltage pulse slope (dU/dt) _R at 420 V _{DC} | 200 V/μs |
| R between leads, for C ≤ 0.33 μF at 100 V; 1 min | > 15 000 MΩ |
| R between leads and case; 100 V; 1 min | > 30 000 MΩ |
| Withstanding (DC) voltage (cut off current 10 mA) ⁽¹⁾ ; rise time ≤ 1000 V/s | 3400 V; 1 min |
| Withstanding (AC) voltage between leads and case | 2100 V; 1 min |

Note

⁽¹⁾ See "Voltage Proof Test for Metalized Film Capacitors": www.vishay.com/doc?28169



MKP 336 6 GENERAL DATA

$U_{RAC} = 300 V$; C-tol. = $\pm 20 \%$

| C (μF) | DIMENSIONS w x h x l (mm) | MASS (g) ⁽³⁾ | CATALOG NUMBER BFC2 336 6..... AND PACKAGING | | | | | |
|---|---------------------------------|----------------------------|--|------|--|------|--|------|
| | | | LOOSE IN BOX | | | | REEL (500 mm) ⁽¹⁾⁽²⁾ | |
| | | | $L_t = 3.5 \text{ mm} + 1 \text{ mm} / - 0.5 \text{ mm}$ (10 mm) or $3.5 \text{ mm} \pm 0.3 \text{ mm}$ (= 15 mm) | | $l_t = 25.0 \text{ mm} \pm 2.0 \text{ mm}$ | | H = 18.5 mm; P ₀ = 12.7 mm | |
| | | | Last 5 digits of catalog number | SPQ | Last 5 digits of catalog number | SPQ | Last 5 digits of catalog number | SPQ |
| Pitch = 10.0 mm \pm 0.4 mm; $d_t = 0.6 \text{ mm} \pm 0.06 \text{ mm}$ | | | | | | | | |
| 0.001 | 4.0 x 10.0 x 12.5 | 0.6 | 60102 | 1000 | 66102 | 1250 | 63102 | 1400 |
| 0.0015 | | | 60152 | | 66152 | | 63152 | |
| 0.0022 | | | 60222 | | 66222 | | 63222 | |
| 0.0033 | | | 60332 | | 66332 | | 63332 | |
| 0.0047 | 5.0 x 11.0 x 12.5 | 0.82 | 60472 | 1000 | 66472 | 1000 | 63472 | 1100 |
| 0.0068 | | | 60682 | | 66682 | | 63682 | |
| Pitch = 15.0 mm \pm 0.4 mm; $d_t = 0.6 \text{ mm} \pm 0.06 \text{ mm}$ | | | | | | | | |
| 0.0068 | 5.0 x 11.0 x 17.5 | 1.0 | 69005 | 1000 | 69009 | 1000 | 69006 | 1100 |
| 0.01 | | | 60103 | | 66103 | | 63103 | |
| 0.015 | 6.0 x 12.0 x 17.5 | 1.4 | 60153 | | 66153 | | 63153 | |
| Pitch = 15.0 mm \pm 0.4 mm; $d_t = 0.8 \text{ mm} \pm 0.08 \text{ mm}$ | | | | | | | | |
| 0.022 | 7.0 x 13.5 x 17.5 | 1.8 | 60223 | 750 | 66223 | 500 | 63223 | 800 |
| 0.033 | 8.5 x 15.0 x 17.5 | 2.4 | 60333 | | 66333 | | 63333 | 650 |
| 0.047 | 10.0 x 16.5 x 17.5 | 3.0 | 60473 | 500 | 66473 | 450 | 63473 | 600 |

Note

- SPQ = Standard packing quantity
- (1) H = in-tape height; P₀ = sprocket hole distance; for detailed specifications refer to "Packaging Information"
- (2) Reel diameter = 365 mm is available on request
- (3) Weight for short lead product only

MKP 336 6 GENERAL DATA

$U_{RAC} = 300 \text{ V}$; C-tol. = $\pm 10 \%$

| C (μF) | DIMENSIONS w x h x l (mm) | MASS (g) ⁽¹⁾ | CATALOG NUMBER BFC2 336 6..... AND PACKAGING | | | | | |
|--|---------------------------------|----------------------------|--|------|--|------|--|------|
| | | | LOOSE IN BOX | | | | REEL (500 mm) ⁽¹⁾⁽²⁾ | |
| | | | $L_t = 3.5 \text{ mm} + 1 \text{ mm} - 0.5 \text{ mm}$ (10 mm) or $3.5 \text{ mm} \pm 0.3 \text{ mm}$ (= 15 mm) | | $l_t = 25.0 \text{ mm} \pm 2.0 \text{ mm}$ | | H = 18.5 mm; P ₀ = 12.7 mm | |
| | | | Last 5 digits of catalog number | SPQ | Last 5 digits of catalog number | SPQ | Last 5 digits of catalog number | SPQ |
| Pitch = 10.0 mm \pm 0.4 mm; $d_t = 0.6 \text{ mm} \pm 0.06 \text{ mm}$ | | | | | | | | |
| 0.001 | 4.0 x 10.0 x 12.5 | 0.6 | 61102 | 1000 | 67102 | 1250 | 64102 | 1400 |
| 0.0012 | | | 61122 | | 67122 | | 64122 | |
| 0.0015 | | | 61152 | | 67152 | | 64152 | |
| 0.0018 | | | 61182 | | 67182 | | 64182 | |
| 0.0022 | | | 61222 | | 67222 | | 64222 | |
| 0.0027 | | | 61272 | | 67272 | | 64272 | |
| 0.0033 | | | 61332 | | 67332 | | 64332 | |
| 0.0039 | | | 61392 | | 67392 | | 64392 | |
| 0.0047 | 5.0 x 11.0 x 12.5 | 1.1 | 61472 | 1000 | 67472 | 1000 | 64472 | 1100 |
| 0.0056 | | | 61562 | | 67562 | | 64562 | |
| Pitch = 15.0 mm \pm 0.4 mm; $d_t = 0.80 \text{ mm} \pm 0.08 \text{ mm}$ | | | | | | | | |
| 0.0056 | 5.0 x 11.0 x 17.5 | 1.0 | 69001 | 1000 | 69007 | 1000 | 69003 | 1100 |
| 0.0068 | | | 61682 | | 67682 | | 64682 | |
| 0.0082 | | | 61822 | | 67822 | | 64822 | |
| 0.01 | | | 61103 | | 67103 | | 64103 | |
| 0.012 | | | 61123 | | 67123 | | 64123 | |
| 0.015 | 6.0 x 12.0 x 17.5 | 1.4 | 61153 | 1000 | 67153 | 1000 | 61153 | 900 |
| 0.018 | | | 61183 | | 67183 | | 64183 | |
| Pitch = 15.0 mm \pm 0.4 mm; $d_t = 0.80 \text{ mm} \pm 0.08 \text{ mm}$ | | | | | | | | |
| 0.022 | 7.0 x 13.5 x 17.5 | 1.8 | 61223 | 750 | 67223 | 500 | 64223 | 800 |
| 0.027 | 8.5 x 15.0 x 17.5 | 2.4 | 61273 | | 67273 | | 64273 | 650 |
| 0.033 | | | 61333 | | 67333 | | 64333 | |
| 0.039 | 10.0 x 16.5 x 17.5 | 3.0 | 61393 | 500 | 67393 | 450 | 61393 | 600 |
| 0.047 | | | 61473 | | 67473 | | 64473 | |

Note

- SPQ = Standard packing quantity

⁽¹⁾ H = in-tape height; P₀ = sprocket hole distance; for detailed specifications refer to "Packaging Information"

⁽²⁾ Reel diameter = 365 mm is available on request

⁽³⁾ Weight for short lead product only

| SAFETY APPROVALS Y2 | VOLTAGE | VALUE | FILE NUMBERS |
|---|---------------------|---------------|--------------|
| EN 132400 | 300 V _{AC} | 1 nF to 47 nF | FI 2008059 |
| UL1414 and CSA-C 22.2 No 1 antenna coupling | 250 V _{AC} | 1 nF to 47 nF | E112471 |
| UL1283 | 300 V _{AC} | 1 nF to 47 nF | E109565 |
| CB-Test-certificate | 300 V _{AC} | 1 nF to 47 nF | FI 5255 A2 |

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: www.vishay.com/doc?28139

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:

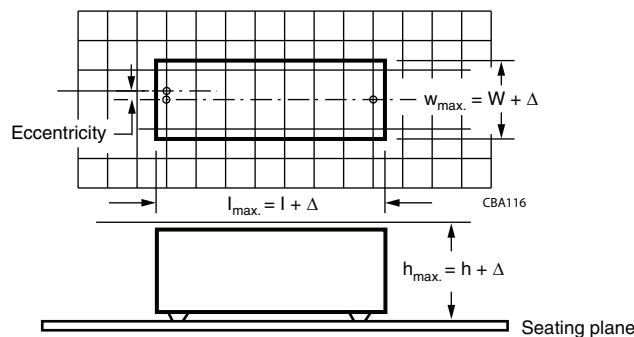
- The capacitors shall be mechanically fixed by the leads

Space Requirements on Printed Circuit Board

The maximum space for length ($l_{max.}$), width ($w_{max.}$) and height ($h_{max.}$) of film capacitors to take in account on the printed circuit board is shown in the drawings.

- For products with pitch ≤ 15 mm, $\Delta w = \Delta l = 0.3$ mm; $\Delta h = 0.1$ mm

Eccentricity defined as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.



SOLDERING CONDITIONS

For general soldering conditions and wave soldering profile, we refer to the application note:

“Soldering Guidelines for Film Capacitors”: www.vishay.com/doc?28171

Storage Temperature

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

Ratings and Characteristics Reference Conditions

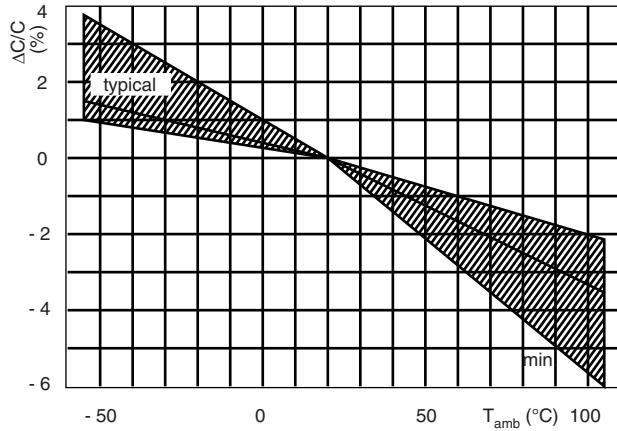
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of 50 % ± 2 %.

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

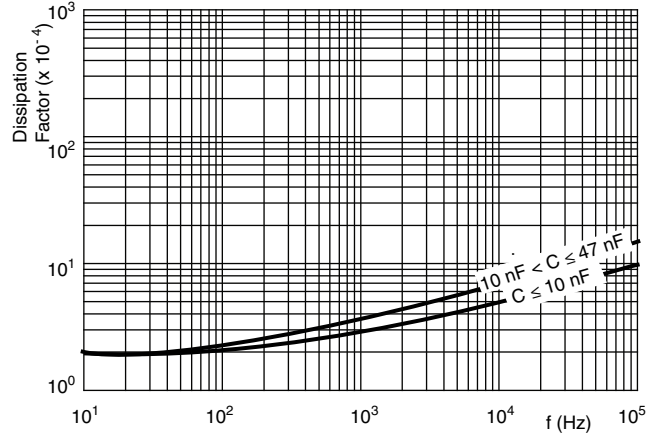


CHARACTERISTICS

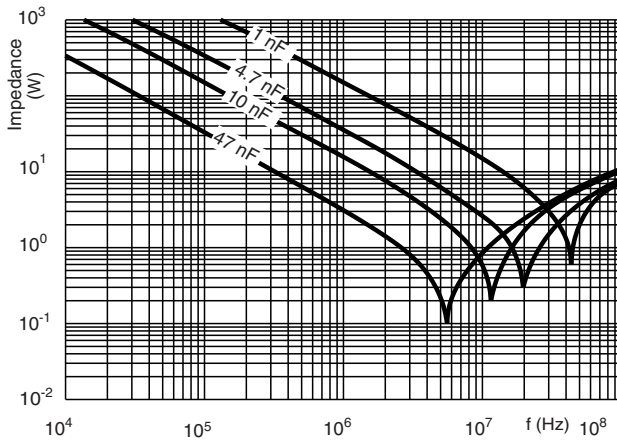
Capacitance as a function of ambient temperature (typical curve)



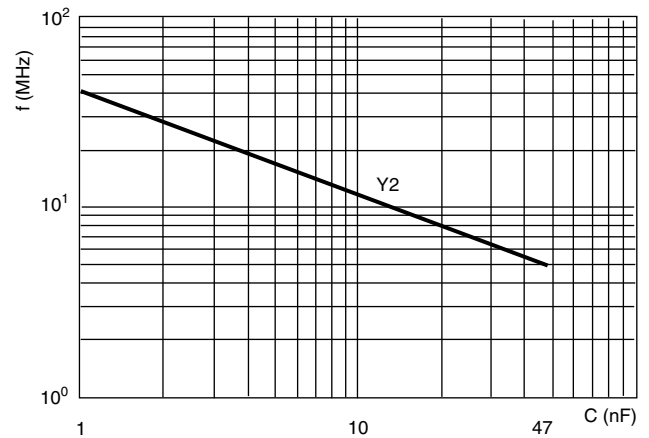
Tangent of loss angle as a function of frequency (typical curve)



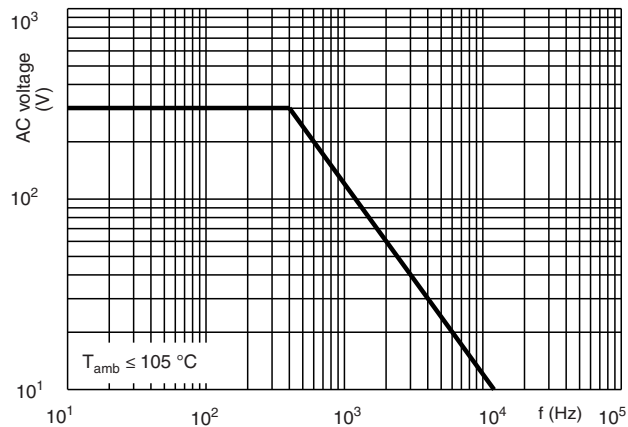
Impedance as a function of frequency (typical curve)



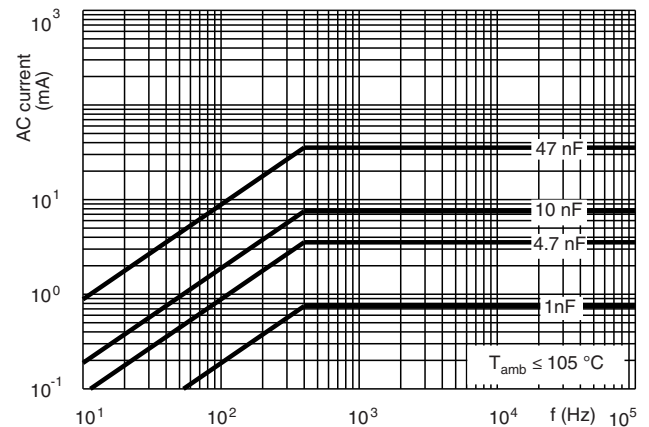
Resonant frequency as a function of capacitance (typical curve)



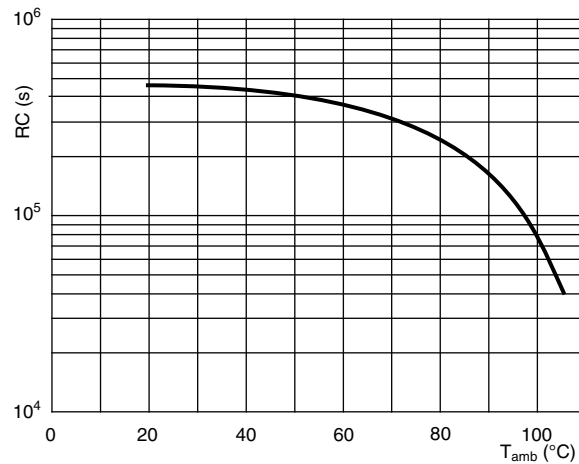
Max. RMS voltage as a function of frequency



Max. RMS current as a function of frequency



Insulation resistance as a function of ambient temperature (typical curve)



APPLICATION NOTES

- For Y2 electromagnetic interference suppression between line and ground (50 Hz/60 Hz) with a maximum mains voltage of 300 V_{AC} ± 10 % instability.
- For capacitors connected in parallel, normally the proof voltage and possibly the rated voltage must be reduced. For information depending of the capacitance value and the number of parallel connections contact: dc-film@vishay.com
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse program must be used.
- 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 420 V_{DC} and divided by the applied voltage.

INSPECTION REQUIREMENTS

General Notes

- 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”.
- In this table: D = destructive
ND = non destructive

Group C inspection requirements

| SUB - CLAUSE NUMBER AND TEST | D OR ND | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|----------|--|---|
| Group C inspection (periodic) see section “General notes” item 3 | | | |
| SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1 | D | | |
| 4.1 Dimensions (detail) Initial measurements | | Capacitance Tangent of loss angle at 10 kHz | As specified in chapters “General data” of this specification |
| 4.3 Robustness of terminations | | Tensile: load 10 N; 10 s Bending: load 5 N; 4 x 90° | No visible damage |
| 4.4 Resistance to soldering heat | | No pre-drying Method: 1A Solder bath: 260 °C Duration: 10 s | |
| 4.19 Component solvent resistance | | Isopropylalcohol at room temperature Method: 2 Immersion time: 5 min ± 0.5 min Recovery time: Min. 1 h, max. 2 h | |
| 4.4.2 Final measurements | | Visual examination Capacitance Tangent of loss angle Insulation resistance | No visible damage Legible marking $ \Delta C/C \leq 5\%$ of the value measured initially Increase of tan δ : ≤ 0.008 Compared to values measured initially As specified in section “Insulation Resistance” of this specification |
| SUB - GROUP C1B PART OF SAMPLE OF SUB - GROUP C1 | D | | |
| Initial measurements | | Capacitance Tangent of loss angle at 10 kHz | |
| 4.20 Solvent resistance of the marking: see Section “General notes”; item 5 | | Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 min ± 0.5 min | No visible damage Legible marking |
| 4.6 Rapid change of temperature | | $\theta A = - 55\text{ °C}$ $\theta B = + 105\text{ °C}$ 5 cycles | |
| 4.6.1 Inspection | | Duration t = 30 min | |

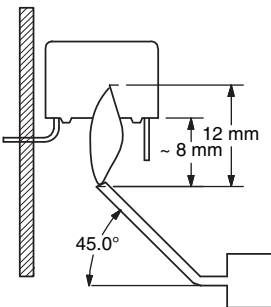


Interference Suppression Film Capacitors
MKP Radial Potted Type

Vishay BCcomponents

| SUB - CLAUSE NUMBER AND TEST | D OR ND | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|----------|---|---|
| 4.7 Vibration (see note 3) 4.7.2 Final inspection 4.9 Shock (see note 3) 4.9.2 Final measurements | | Visual examination Mounting: see section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz. Amplitude: 0.75 mm or Acceleration 98 m/s ² (whichever is less severe) Total duration 6 h Visual examination Mounting: see section "Mounting" for more information Pulse shape: half sine Acceleration: 490 m/s ² Duration of pulse: 11 ms Visual examination Capacitance Tangent of loss angle Insulation resistance | No visible damage No visible damage No visible damage $ \Delta C/C \leq 5\%$ of the value measured initially Increase of $\tan \delta$: ≤ 0.008 Compared to values measured initially As specified in section "Insulation Resistance" of this specification |
| SUB - GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB - GROUPS C1A AND C1B | D | | |
| 4.11 Climatic sequence 4.11.1 Initial measurements 4.11.2 Dry heat 4.11.3 Damp heat cyclic Test Db First cycle 4.11.4 Cold 4.11.5 Damp heat cyclic Test Db remaining cycles 4.11.6 Final measurements | | Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B Temperature: 105 °C Duration: 16 h Temperature: - 55 °C Duration: 2 h Visual examination Capacitance Tangent of loss angle Voltage proof 2250 V _{DC} ; 1 min between term. Insulation resistance | No visible damage Legible marking $ \Delta C/C \leq 5\%$ of the value measured in 4.11.1. Increase of $\tan \delta$: ≤ 0.008 Compared to values measured in 4.11.1. No permanent breakdown or flash-over $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |

| SUB - CLAUSE NUMBER AND TEST | D OR ND | CONDITIONS | PERFORMANCE REQUIREMENTS |
|--|----------|--|---|
| SUB - GROUP C2 | D | | |
| 4.12 Damp heat steady state 4.12.1 Initial measurements 4.12.3 Final measurements | | 56 days, 40 °C, 90 % to 95 % RH no load capacitance Capacitance Tangent of loss angle at 10 kHz Visual examination Capacitance Tangent of loss angle Voltage proof 2250 V _{DC} ; 1 min between term. Insulation resistance | No visible damage Legible marking $ \Delta C/C \leq 5\%$ of the value measured in 4.12.1. Increase of tan δ : ≤ 0.007 Compared to values measured in 4.12.1. No permanent breakdown or flash-over $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| SUB- GROUP C3 | D | | |
| 4.13.1 Initial measurements 4.13 Impulse voltage 4.14 Endurance 4.14.7 Final measurements | | Capacitance Tangent of loss angle at 10 kHz 3 successive impulses, full wave, peak voltage: 5 kV Max. 24 pulses Duration: 1000 h 1.7 U _{RAC} at 105 °C Once in every hour the voltage is increased to 1000 V _{RMS} for 0.1 s via resistor of $47 \Omega \pm 5\%$ Visual examination Capacitance Tangent of loss angle Voltage proof 2250 V _{DC} ; 1 minute between terminations Insulation resistance | No selfhealing breakdowns or flashover No visible damage Legible marking $ \Delta C/C \leq 10\%$ compared to values measured in 4.13.1. Increase of tan δ : ≤ 0.007 Compared to values measured in 4.13.1. No permanent breakdown or flash-over $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |

| SUB - CLAUSE NUMBER AND TEST | D OR ND | CONDITIONS | PERFORMANCE REQUIREMENTS |
|---|----------|---|--|
| SUB - GROUP C 4 | D | | |
| 4.15 Charge and discharge 4.15.1 Initial measurements 4.15.3 Final measurements | | 10 000 cycles (50 c/s) charge to U_R half sinewave Duration: 5 ms Discharge resistance: $R = \frac{420 V_{DC}}{1.5 \times C((dU)/(dt))}$ $R_{min.} = 2.2 \Omega$ Capacitance Tangent of loss angle at 10 kHz Capacitance Tangent of loss angle Insulation resistance | $ \Delta C/C \leq 10\%$ compared to values measured in 4.15.1. Increase of $\tan \delta$: ≤ 0.008 Compared to values measured in 4.15.1. $\geq 50\%$ of values specified in section "Insulation resistance" of this specification |
| SUB - GROUP C5 | D | | |
| 4.16 Radio frequency characteristic | | Resonance frequency | As specified in section "Resonant frequency" of this specification. $\pm 10\%$ |
| SUB - GROUP C6 | D | | |
| 4.17 Passive flammability Class B | | Bore of gas jet: $\varnothing 0.5$ mm Fuel: butane Test duration for actual volume V in mm^3 : $V \leq 250$: 10 s $250 < V \leq 500$: 20 s $500 < V \leq 1750$: 30 s $V > 1750$: 60 s One flame application  | 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. |
| SUB - GROUP C7 | D | | |
| 4.18 Active flammability | | 20 x 5 kV discharges on the test capacitor connected to U_R | The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required. |



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