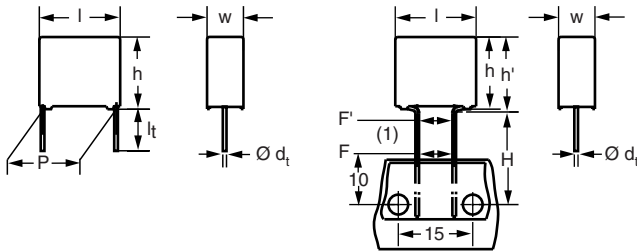


## Interference Suppression Film Capacitors MKP Radial Potted Type



Dimensions in mm

**Note**

(1)  $|F - F'| < 0.3 \text{ mm}$   
 $F = 7.5 + 0.6/-0.1 \text{ mm}$

**APPLICATIONS**

For standard across the line X1 applications.  
 See also Application Note:  
[www.vishay.com/doc?28153](http://www.vishay.com/doc?28153)

**REFERENCE STANDARDS**

"IEC 60384-14 ed-3 and EN 60384-14"  
 "IEC 60065, pass. flamm. class B"  
 UL1414; UL1283; CSA-C22.2 No. 8

**MARKING**

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

**DIELECTRIC**

Polypropylene film

**ELECTRODES**

Metallized film

**CONSTRUCTION**

Mono construction

**RATED VOLTAGE**

AC 440 V; 50 to 60 Hz

**FEATURES**

15 to 27.5 mm lead pitch and 15 mm bent back to 7.5 mm.  
 Supplied loose in box, taped on ammpack or reel  
 RoHS compliant product



**RoHS**  
COMPLIANT

**PERMISSIBLE DC VOLTAGE**

DC 1000 V

**ENCAPSULATION**

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

**CLIMATIC TESTING CLASS ACC. TO IEC 60068-1**

55/105/56/B

**CAPACITANCE RANGE (E12 SERIES)**

E12 series 0.01 to 1  $\mu\text{F}$   
 Preferred values acc. to E6

**CAPACITANCE TOLERANCE**

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

**LEADS**

Tinned wire

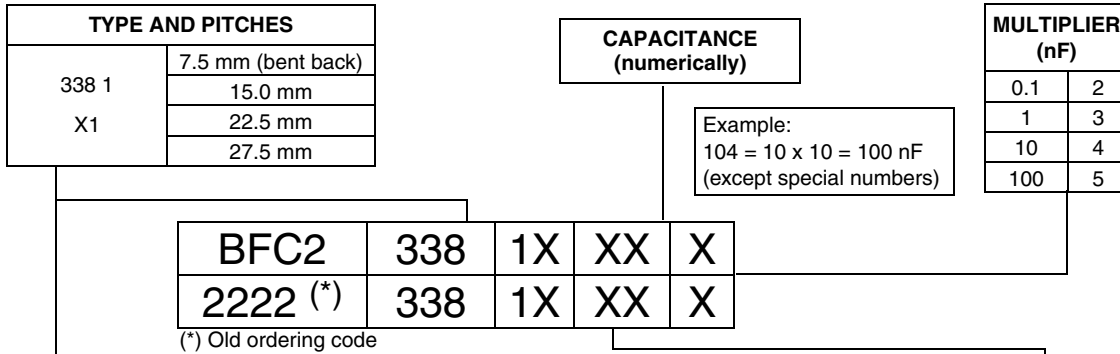
**MAXIMUM APPLICATION TEMPERATURE**

105 °C

**DETAIL SPECIFICATION**

For more detailed data and test requirements contact:  
[RFI@vishay.com](mailto:RFI@vishay.com)

## COMPOSITION OF CATALOG NUMBER



TYPE	PACKAGING	LEAD CONFIGURATION	C-TOL	PREFERRED TYPES
338 1 X1	Loose in box	Lead length 3.5 ± 0.3 mm	± 20 %	BFC2 338 10 ...
		Lead length 5.0 ± 1.0 mm		BFC2 338 12 ...
		Lead length 25.0 ± 2.0 mm		BFC2 338 14 ...
	Taped on reel (1)	Bent back to 7.5 mm; H = 16.0 mm; P <sub>0</sub> = 15.0 mm; reel diameter = 500 mm		BFC2 338 16 ...
<b>ALTERNATIVE TAPED VERSIONS</b>				
338 1 X1 X1	Taped on reel (1)	H = 18.5 mm; for P <sub>0</sub> = 12.7 mm; reel diameter = 500 mm	± 20 %	BFC2 338 17 ...
<b>ALTERNATIVE C-TOL.</b>				
338 1 X1	Loose in box	Lead length 3.5 ± 0.3 mm	± 10 %	See tables for detail
			± 5 %	
		Lead length 5.0 ± 1.0 mm	± 10 %	
	± 5 %			
	Taped on reel (1)	Lead length 25.0 ± 2.0 mm	± 10 %	
			± 5 %	
Bent back to 7.5 mm; H = 16.0 mm; P <sub>0</sub> = 15.0 mm; reel diameter = 500 mm			± 10 %	
	H = 18.5 mm; P <sub>0</sub> = 12.7 mm; reel diameter = 500 mm	± 5 %		

### Note

(1) For detailed tape specification refer to Packaging Information: [www.vishay.com/doc?28139](http://www.vishay.com/doc?28139) or end of catalog

## SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE
Rated AC voltage (U <sub>Rac</sub> )	440 V
Permissible DC voltage (U <sub>Rdc</sub> )	1000 V
Tangent of loss angle:	at 1 kHz      at 10 kHz
C ≤ 470 nF	≤ 10 x 10 <sup>-4</sup> ≤ 20 x 10 <sup>-4</sup>
C > 470 nF	≤ 20 x 10 <sup>-4</sup> ≤ 70 x 10 <sup>-4</sup>
Rated voltage pulse slope (dU/dt) <sub>R</sub> at 615 Vdc	
Pitch = 15 mm and 7.5 mm (bent back)	250 V/μs
Pitch = 22.5 mm	150 V/μs
Pitch = 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	2380 V, 1 min
Maximum application temperature	105 °C



Interference Suppression Film Capacitors Vishay BCcomponents  
MKP Radial Potted Type

C - tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) <sup>(1)</sup>	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX				TAPED		
			Short leads			Long leads		Reel diameter = 500 mm	
			$l_t =$ 3.5 ± 0.3 mm	$l_t =$ 5.0 ± 1.0 mm	SPQ	$l_t =$ 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P <sub>0</sub> = 12.7 mm	SPQ
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>									
0.01	5.0 x 11.0 x 17.5	1.0	10103	12103	1000	14103	1000	17103	1100
0.012			10123	12123		14123		17123	
0.015			10153	12153		14153		17153	
0.018			10183	12183		14183		17183	
0.022			10223	12223		14223		17223	
0.027	6.0 x 12.0 x 17.5	1.4	10273	12273	1000	14273	1000	17273	900
0.033			10333	12333		14333		17333	
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.039	7.0 x 13.5 x 17.5	1.8	10393	12393	750	14393	500	17393	800
0.047			10473	12473		14473		17473	
0.056	8.5 x 15.0 x 17.5	2.4	10563	12563	750	14563	500	17563	650
0.068			10683	12683		14683		17683	
0.082	10.0 x 16.5 x 17.5	3.0	10823	12823	500	14823	450	17823	600
0.1			10104	12104		14104		17104	
<b>Pitch = 22.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.12	8.5 x 18.0 x 26.0	3.8	10124	12124	200	14124	250	17124	450
0.15			10154	12154		14154		17154	
0.18	10.0 x 19.5 x 26.0	6.8	10184	12184	200	14184	200	17184	350
0.22			10224	12224		14224		17224	
<b>Pitch = 27.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.27	11.0 x 21.0 x 31.0	7.4	10274	12274	100	14274	125		
0.33	13.0 x 23.0 x 31.0	9.2	10334	12334	100	14334	125		
0.39	15.0 x 25.0 x 31.0	12.3	10394	12394	100	14394	125		
0.47			10474	12474		14474			
0.56	18.0 x 28.0 x 31.0	16.1	10564	12564	100	14564	100		
0.68			10684	12684		14684			
0.82	21.0 x 31.0 x 31.0	20.3	10824	12824	50	14824	75		
1.00			10105	12105		14105			

Notes

- (1) Weight for short lead products only
- SPQ = Standard Packing Quantity

Bent back pitch 7.5 mm (only taped); C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) <sup>(2)</sup>	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX				TAPED		
			Short leads			Long leads		Reel diameter = 500 mm <sup>(1)</sup>	
			$l_t =$ 3.5 ± 0.3 mm	$l_t =$ 5.0 ± 1.0 mm	SPQ	$l_t =$ 25.0 ± 2.0 mm	SPQ	H = 16.0 mm; P <sub>0</sub> = 15.0 mm	SPQ
<b>Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>									
0.010	5.0 x 13.0 x 17.5	1.0						16103	950
0.012								16123	
0.015								16153	
0.018								16183	
0.022								16223	
0.027	6.0 x 14.0 x 17.5	1.4						16273	800
0.033								16333	
<b>Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.039	7.0 x 15.5 x 17.5	1.8						16393	700
0.047								16473	
0.056	8.5 x 17.0 x 17.5	1.4						16563	550
0.068								16683	
0.082	10.0 x 18.5 x 17.5	3.0						16823	500
0.100								16104	

Notes

- (1) Weight for short lead products only
- SPQ = Standard Packing Quantity

# MKP 338 1 X1



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

C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) <sup>(1)</sup>	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm <sup>(1)</sup>	
			$l_t =$ 3.5 ± 0.3 mm	$l_t =$ 5.0 ± 1.0 mm	SPQ	$l_t =$ 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P <sub>0</sub> = 12.7 mm	SPQ
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>									
0.010	5.0 x 11.0 x 17.5	1.0	18114	18314	1000	18514	1000	18914	1100
0.012			18115	18315		18515		18915	
0.015			18116	18316		18516		18916	
0.018			18117	18317		18517		18917	
0.022	6.0 x 12.0 x 17.5	1.4	18118	18318	1000	18518	1000	18918	900
0.027			18119	18319		18519		18919	
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.033	7.0 x 13.5 x 17.5	1.8	18121	18321	750	18521	500	18921	800
0.039			18122	18322		18522		18922	
0.047	8.5 x 15.0 x 17.5	2.4	18123	18323	750	18523	500	18923	650
0.056			18124	18324		18524		18924	
0.068	10.0 x 16.5 x 17.5	3.0	18125	18325	500	18525	450	18925	600
0.082			18126	18326		18526		18926	
<b>Pitch = 22.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.10	7.0 x 16.5 x 26.0	2.9	18127	18327	200	18527	250	18927	550
0.12	8.5 x 18.0 x 26.0	3.8	18128	18328	200	18528	250	18928	450
0.15			18129	18329		18529		18929	
0.18	10.0 x 19.5 x 26.0	6.8	18131	18331	200	18531	200	18931	350
<b>Pitch = 27.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.22	11.0 x 21.0 x 31.0	7.4	18132	18332	100	18532	125	18932	500
0.27			18133	18333		18533			
0.33	13.0 x 23.0 x 31.0	9.2	18134	18334	100	18534	125		
0.39	15.0 x 25.0 x 31.0	12.3	18135	18335	100	18535	125		
0.47			18136	18336		18536			
0.56	18.0 x 28.0 x 31.0	16.1	18137	18337	100	18537	100		
0.68			18138	18338		18538			
0.82	21.0 x 31.0 x 31.0	20.3	18139	18339	50	18539	75		

### Notes

- <sup>(1)</sup> Weight for short lead products only
- SPQ = Standard Packing Quantity

Bent back pitch 7.5 mm (only taped); C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) <sup>(2)</sup>	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm <sup>(1)</sup>	
			$l_t =$ 3.5 ± 0.3 mm	$l_t =$ 5.0 ± 1.0 mm	SPQ	$l_t =$ 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P <sub>0</sub> = 12.7 mm	SPQ
<b>Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>									
0.010	5.0 x 13.0 x 17.5	1.0						18714	950
0.012								18715	
0.015								18716	
0.018								18717	
0.022	6.0 x 14.0 x 17.5	1.4						18718	800
0.027								18719	
<b>Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.033	7.0 x 15.5 x 17.5	1.8						18721	700
0.039								18722	
0.047	8.5 x 17.0 x 17.5	2.4						18723	550
0.056								18724	
0.068	10.0 x 18.5 x 17.5	3.0						18725	500
0.082								18726	

### Notes

- <sup>(1)</sup> Reel diameter = 356 mm is available on request
- <sup>(2)</sup> Weight for short lead products only
- SPQ = Standard Packing Quantity



Interference Suppression Film Capacitors Vishay BCcomponents  
MKP Radial Potted Type

C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) <sup>(1)</sup>	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX				TAPED		
			Short leads			Long leads		Reel diameter = 500 mm	
			$l_t =$ 3.5 ± 0.3 mm	$l_t =$ 5.0 ± 1.0 mm	SPQ	$l_t =$ 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P <sub>0</sub> = 12.7 mm	SPQ
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>									
0.010	5.0 x 11.0 x 17.5	1.0	18214	18414	1000	18614	1000	18934	1100
0.012			18215	18415		18615		18935	
0.015			18216	18416		18616		18936	
0.018			18217	18417		18617		18937	
0.022	6.0 x 12.0 x 17.5	1.4	18218	18418	1000	18618	1000	18938	900
0.027			18219	18419		18619		18939	
<b>Pitch = 15.0 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.033	7.0 x 13.5 x 17.5	1.8	18221	18421	750	18621	500	18941	800
0.039			18222	18422		18622		18942	
0.047	8.5 x 15.0 x 17.5	2.4	18223	18423	750	18623	500	18943	650
0.056			18224	18424		18624		18944	
0.068	10.0 x 16.5 x 17.5	3.0	18225	18425	500	18625	450	18945	600
0.082			18226	18426		18626		18946	
<b>Pitch = 22.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.10	8.5 x 18.0 x 26.0	3.8	18227	18427	200	18627	250	18947	450
0.12			18228	18428		18628		18948	
0.15	10.0 x 19.5 x 26.0	4.4	18229	18429	200	18629	200	18949	350
0.18			18231	18431		18631		18951	
<b>Pitch = 27.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.22	11.0 x 21.0 x 31.0	7.4	18232	18432	100	18632	125		
0.27	13.0 x 23.0 x 31.0	9.2	18233	18433	100	18633	125		
0.33			18234	18434		18634			
0.39	15.0 x 25.0 x 31.0	12.3	18235	18435	100	18635	125		
0.47			18236	18436		18636			
0.56	18.0 x 28.0 x 31.0	16.1	18237	18437	100	18637	100		
0.68			18238	18438		18638			
0.82	21.0 x 31.0 x 31.0	20.3	18239	18439	50	18639	75		

Notes

- (1) Weight for short lead products only
- SPQ = Standard Packing Quantity

Bent back pitch (only taped); C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) <sup>(2)</sup>	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX				TAPED		
			Short leads			Long leads		Reel diameter = 500 mm <sup>(1)</sup>	
			$l_t =$ 3.5 ± 0.3 mm	$l_t =$ 5.0 ± 1.0 mm	SPQ	$l_t =$ 25.0 ± 2.0 mm	SPQ	H = 16.0 mm; P <sub>0</sub> = 15.0 mm	SPQ
<b>Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d<sub>t</sub> = 0.60 ± 0.06 mm</b>									
0.010	5.0 x 13.0 x 17.5	1.0						18814	950
0.012								18815	
0.015								18816	
0.018								18817	
0.022	6.0 x 14.0 x 17.5	1.4						18818	800
0.027								18819	
<b>Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d<sub>t</sub> = 0.80 ± 0.08 mm</b>									
0.033	7.0 x 15.5 x 17.5	1.8						18821	700
0.039								18822	
0.047	8.5 x 17.0 x 17.5	2.4						18823	550
0.056								18824	
0.068	10.0 x 18.5 x 17.5	3.0						18825	500
0.082								18826	



Notes

- (1) Reel diameter = 356 mm is available on request
- (2) Weight for short lead products only
- SPQ = Standard Packing Quantity

## APPROVALS

SAFETY APPROVALS X1	VOLTAGE	VALUE	FILE NUMBERS
EN 60384-14 (ENEC) (= IEC 60384-14 ed-3)	440 Vac	10 nF to 1 $\mu$ F	F1 2008060
UL1414	250 Vac	10 nF to 1 $\mu$ F	E112471
UL1283	440 Vac	10 nF to 100 nF	E109565
UL1283 and (CSA-C22.2 No. 8)	440 Vac	100 nF to 1 $\mu$ F	E109565
CB-Test Certificate	440 Vac	10 nF to 1 $\mu$ F	F1 5256

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](http://www.vishay.com/doc?28139) or end of catalog

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

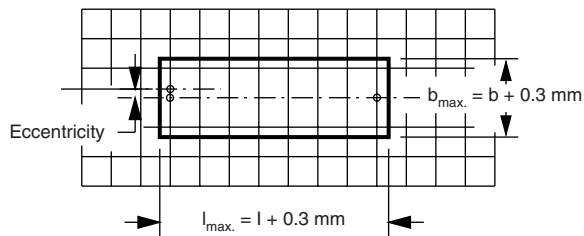
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- 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 drawing:

- Eccentricity as in drawing. 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 or  $h_{max.} \leq h' + 0.3$  mm



CBA116

### 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  $\pm 1$  °C, an atmospheric pressure of 86 to 106 kPa and a relative humidity of  $50$  %  $\pm 2$  %.

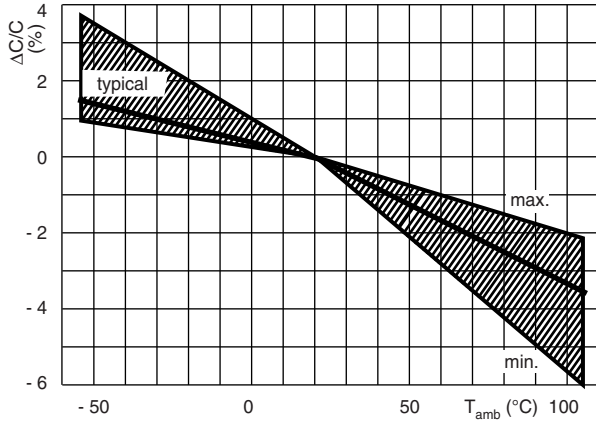
For reference testing, a conditioning period shall be applied over  $96$  h  $\pm 4$  h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.



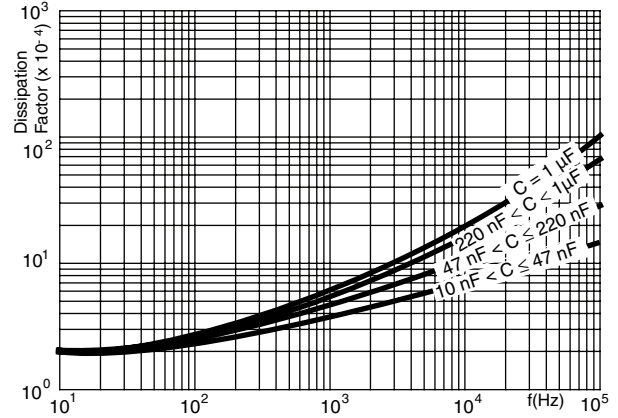
Interference Suppression Film Capacitors Vishay BCcomponents  
MKP Radial Potted Type

CHARACTERISTICS

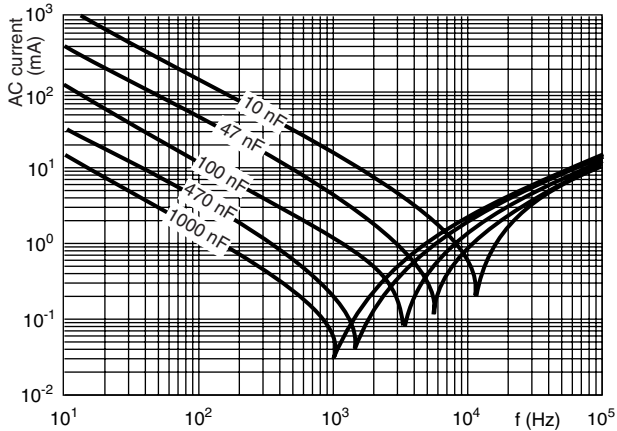
Capacitance as a function of ambient temperature (typical curve)



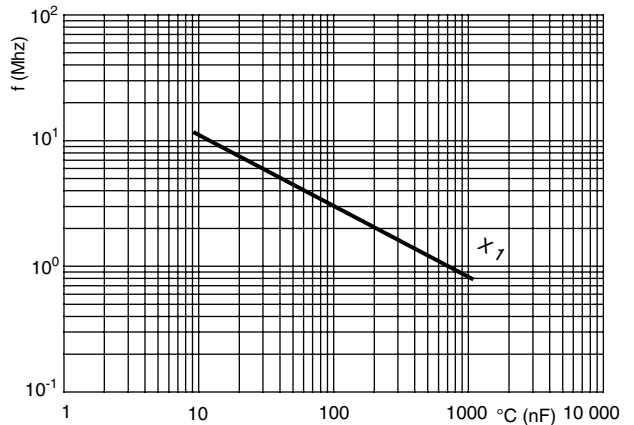
Tangent of loss angle as a function of frequency (typical curve)



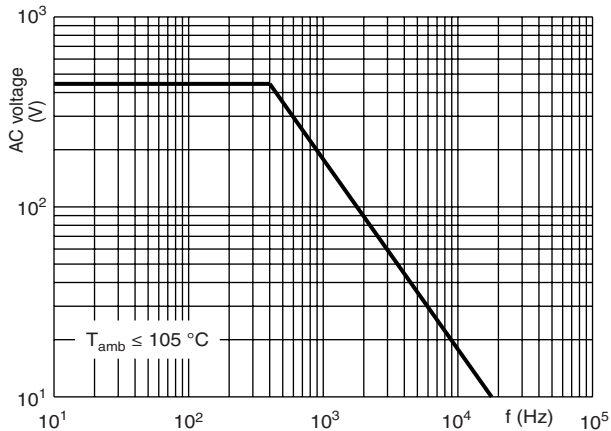
Impedance as a function of frequency (typical curve)



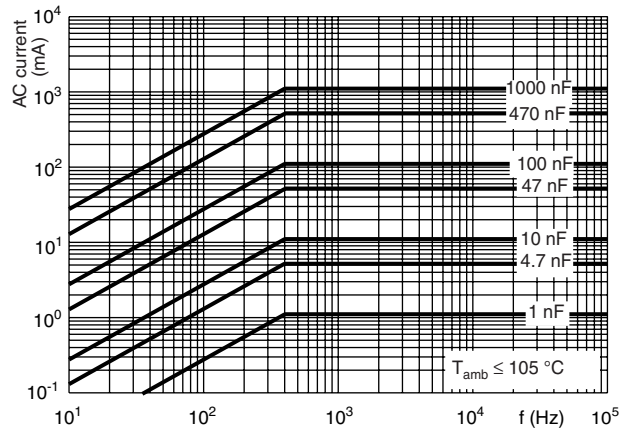
Resonant frequency as a function of capacitance (typical curve)



Max. RMS voltage as a function of frequency

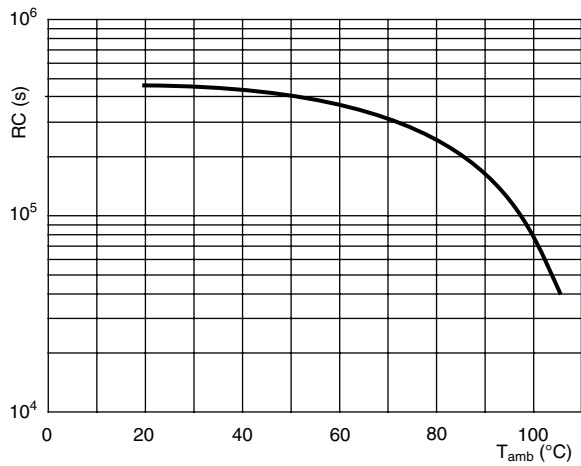


Max. RMS current as a function of frequency





Insulation resistance as a function of ambient temperature



## APPLICATION NOTES

- For X1 electromagnetics interference suppression in **standard across the line applications** (50/60 Hz) with a maximum mains voltage of 440 Vac.
- For series impedance applications we refer to Application Note [www.vishay.com/doc?28153](http://www.vishay.com/doc?28153)
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse programs 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 615 Vdc and divided by the applied voltage.





**INSPECTION REQUIREMENTS**

**General Notes:**

1. Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-14 ed-3 and Specific Reference Data.”

**Group C Inspection Requirements**

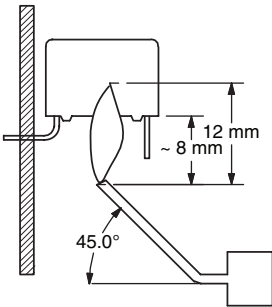
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
<b>SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1</b>		
4.1 Dimensions (detail)  Initial measurements	Capacitance Tangent of loss angle at 10 kHz	As specified in chapters “General data” of this specification
4.3 Robustness o terminations	Tensile: 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: 280 °C ± 5 °C Duration: 10 s	
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 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 $\tan \delta \leq 0.008$ Compared to values measured initially  As specified in section “Insulation resistance” of this specification
<b>SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1</b>		
Initial measurements	Capacitance Tangent of loss angle at 10 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	0A = - 55 °C 0B = + 105 °C 5 cycles  Duration t = 30 min	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.6.1 Inspection 4.7 Vibration  4.7.2 Final inspection 4.9 Shock  4.9.2 Final measurements	Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s <sup>2</sup> (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 <sup>2</sup> 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 $\tan \delta \leq 0.008$ Compared to values measured initially  As specified in section "Insulation Resistance" of this specification
<b>SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B</b>		
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 1900 Vdc; 1 min between terminations  Insulation resistance	No visible damage Legible marking  $ \Delta C/C  \leq 5\%$ of the value measured in 4.11.1.  Increase of $\tan \delta \leq 0.008$ 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



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SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
<b>SUB-GROUP C2</b>		
4.12 Damp heat steady state	56 days, 40 °C, 90 to 95 % RH No load	
4.12.1 Initial measurements  4.12.3 Final measurements	Capacitance Tangent of loss angle at 1 kHz  Visual examination  Capacitance  Tangent of loss angle  Voltage proof 1900 Vdc; 1 min between terminations  Insulation resistance	No visible damage Legible marking  $ \Delta C/C  \leq 5\%$ of the value measured in 4.12.1.  Increase of $\tan \delta \leq 0.008$ 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
<b>SUB-GROUP C3</b>		
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: X1: 4 kV Max. 24 pulses  Duration: 1000 h $1.25 \times U_{RAC}$ 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 1900 Vdc; 1 min between terminations 2380 Vac; 1 min between terminations and case.  Insulation resistance	No self healing breakdowns or flash-over      No visible damage Legible marking  $ \Delta C/C  \leq 10\%$ compared to values measured in 4.13.1.  Increase of $\tan \delta \leq 0.008$ 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
<b>SUB-GROUP C4</b>		
4.15 Charge and discharge  4.15.1 Initial measurements	10 000 cycles  Charged to 615 Vdc Discharge resistance: $R = \frac{615 \text{ Vdc}}{1.5 \times C (dU/dt)}$  Capacitance Tangent of loss angle at 10 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.15.3 Final measurements	Capacitance  Tangent of loss angle  Insulation resistance	$ \Delta C/C  \leq 10\%$ compared to values measured in 4.15.1.  Increase of $\tan \delta \leq 0.008$ Compared to values measured in 4.15.1.  $\geq 50\%$ of values specified in section "Insulation resistance" of this specification
<b>SUB-GROUP C5</b>		
4.16 Radio frequency characteristic	Resonance frequency	$\geq 0.9$ times value as specified in section "Resonant frequency" of this specification
<b>SUB-GROUP C6</b>		
4.17 Passive flammability Class B	Bore of gas jet: $\varnothing 0.5$ mm Fuel: Butane Test duration for actual volume $V$ in $\text{mm}^3$ : $V \leq 250$ : 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.
<b>SUB-GROUP C7</b>		
4.18 Active flammability	20 cycles of 4 kV discharges on the test capacitor connected to $U_{\text{Rac}}$	The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required.



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