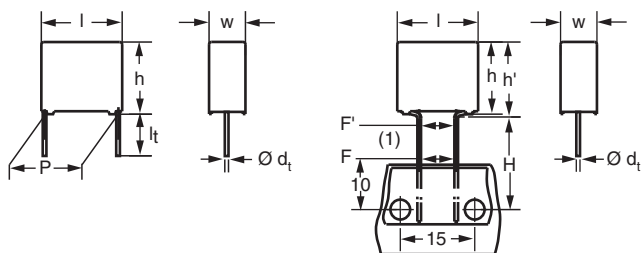


Interference Suppression Film Capacitors MKP Radial Potted Type



Dimensions in mm

Note

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

APPLICATIONS

For standard across the line X1 applications.

See also Application Note:

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 Hz to 60 Hz

FEATURES

- 15 mm to 27.5 mm lead pitch and 15 mm bent back to 7.5 mm
 Supplied loose in box, taped on ammpack or reel
- Compliant to RoHS Directive 2002/95/EC



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 μF to 1 μF

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES		CAPACITANCE (numerically)					MULTIPLIER (nF)	
338 1 X1	7.5 mm (bent back)	Example: 104 = 10 x 10 = 100 nF (except special numbers)					0.1	2
	15.0 mm						1	3
	22.5 mm						10	4
	27.5 mm						100	5
		BFC2	338	1X	XX	X		
		2222 (*)	338	1X	XX	X		
		(*) Old ordering code						
TYPE	PACKAGING	LEAD CONFIGURATION				C-TOL	PREFERRED TYPES	
338 1 X1	Loose in box	Lead length 3.5 mm ± 0.3 mm				± 20 %	BFC2 338 10 ...	
		Lead length 5.0 mm ± 1.0 mm					BFC2 338 12 ...	
		Lead length 25.0 mm ± 2.0 mm					BFC2 338 14 ...	
	Taped on reel ⁽¹⁾	Bent back to 7.5 mm; H = 16.0 mm; P ₀ = 15.0 mm; reel diameter = 500 mm					BFC2 338 16 ...	
		ALTERNATIVE TAPED VERSIONS					ON REQUEST	
338 1 X1 X1	Taped on reel ⁽¹⁾	H = 18.5 mm; for P ₀ = 12.7 mm; reel diameter = 500 mm				± 20 %	BFC2 338 17 ...	
		ALTERNATIVE C-TOL.					ON REQUEST	
338 1 X1	Loose in box	Lead length 3.5 mm ± 0.3 mm				± 10 %	See tables for detail	
						± 5 %		
		Lead length 5.0 mm ± 1.0 mm				± 10 %		
						± 5 %		
	Taped on reel ⁽¹⁾	Lead length 25.0 mm ± 2.0 mm				± 10 %		
						± 5 %		
		Bent back to 7.5 mm; H = 16.0 mm; P ₀ = 15.0 mm; reel diameter = 500 mm				± 10 %		
						± 5 %		
		H = 18.5 mm; P ₀ = 12.7 mm; reel diameter = 500 mm				± 10 %		
				± 5 %				

Note

⁽¹⁾ For detailed tape specification refer to Packaging Information: www.vishay.com/doc?28139

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE	
Rated AC voltage (U _{RAC})	440 V	
Permissible DC voltage (U _{RDC})	1000 V	
Tangent of loss angle:	at 1 kHz	at 10 kHz
C ≤ 470 nF	≤ 10 x 10 ⁻⁴	≤ 20 x 10 ⁻⁴
C > 470 nF	≤ 20 x 10 ⁻⁴	≤ 70 x 10 ⁻⁴
Rated voltage pulse slope (dU/dt) _R at 615 V _{DC}	250 V/μs	
Pitch = 15 mm and 7.5 mm (bent back)	150 V/μs	
Pitch = 22.5 mm	100 V/μs	
Pitch = 27.5 mm		
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 ≤ 1000 V/s	3400 V, 1 min	
Withstanding (AC) voltage between leads and case	2380 V, 1 min	
Maximum application temperature	105 °C	

Note

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

**Interference Suppression Film Capacitors Vishay BCcomponents**
MKP Radial Potted Type**C-tol. = ± 20 %**

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾⁽²⁾	
			$l_t =$ 3.5 mm \pm 0.3 mm	$l_t =$ 5.0 mm \pm 1.0 mm	SPQ	$l_t =$ 25.0 mm \pm 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ
Pitch = 15.0 mm \pm 0.4 mm; d _t = 0.60 mm \pm 0.06 mm									
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	
Pitch = 15.0 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
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	
Pitch = 22.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
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	
Pitch = 27.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
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 31.5	12.3	10394	12394	100	14394	125		
0.47			10474	12474		14474			
0.56	18.0 x 28.0 x 31.5	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

- SPQ = Standard Packing Quantity

⁽¹⁾ H = in-tape height; P₀ = sprocket hole distance; for detailed specifications refer to "Packaging Information"⁽²⁾ Reel diameter = 356 mm is available on request⁽³⁾ Weight for short lead product only

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

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾⁽²⁾	
			l _t = 3.5 mm ± 0.3 mm	l _t = 5.0 mm ± 1.0 mm	SPQ	l _t = 25.0 mm ± 2.0 mm	SPQ	H = 16.0 mm; P ₀ = 15.0 mm	SPQ
Original pitch = 15.0 mm; bent back pitch = 7.5 mm ± 0.4 mm; d _t = 0.60 mm ± 0.06 mm									
0.010 0.012 0.015 0.018 0.022	5.0 x 13.0 x 17.5	1.0						16103 16123 16153 16183 16223	950
0.027 0.033	6.0 x 14.0 x 17.5	1.4						16273 16333	800
Original pitch = 15.0 mm; bent back pitch = 7.5 mm ± 0.4 mm; d _t = 0.80 mm ± 0.08 mm									
0.039 0.047	7.0 x 15.5 x 17.5	1.8						16393 16473	700
0.056 0.068	8.5 x 17.0 x 17.5	1.4						16563 16683	550
0.082 0.100	10.0 x 18.5 x 17.5	3.0						16823 16104	500

Notes

- SPQ = Standard Packing Quantity

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

⁽²⁾ Reel diameter = 356 mm is available on request

⁽³⁾ Weight for short lead product only

C-tol. = $\pm 10\%$

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾⁽²⁾	
			l _t = 3.5 mm ± 0.3 mm	l _t = 5.0 mm ± 1.0 mm	SPQ	l _t = 25.0 mm ± 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ
Pitch = 15.0 mm ± 0.4 mm; d _t = 0.60 mm ± 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 11.0 x 17.5	1.0	18114 18115 18116 18117	18314 18315 18316 18317	1000	18514 18515 18516 18517	1000	18914 18915 18916 18917	1100
0.022 0.027	6.0 x 12.0 x 17.5	1.4	18118 18119	18318 18319	1000	18518 18519	1000	18918 18919	900
Pitch = 15.0 mm ± 0.4 mm; d _t = 0.80 mm ± 0.08 mm									
0.033 0.039	7.0 x 13.5 x 17.5	1.8	18121 18122	18321 18322	750	18521 18522	500	18921 18922	800
0.047 0.056	8.5 x 15.0 x 17.5	2.4	18123 18124	18323 18324	750	18523 18524	500	18923 18924	650
0.068 0.082	10.0 x 16.5 x 17.5	3.0	18125 18126	18325 18326	500	18525 18526	450	18925 18926	600



Interference Suppression Film Capacitors Vishay BCcomponents MKP Radial Potted Type

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾⁽²⁾	
			$l_t =$ 3.5 mm \pm 0.3 mm	$l_t =$ 5.0 mm \pm 1.0 mm	SPQ	$l_t =$ 25.0 mm \pm 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ
Pitch = 22.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
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
Pitch = 27.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
0.22	11.0 x 21.0 x 31.0	7.4	18132	18332	100	18532	125		
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

- SPQ = Standard Packing Quantity

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

⁽²⁾ Reel diameter = 356 mm is available on request

⁽³⁾ Weight for short lead product only

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

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾⁽²⁾	
			$l_t =$ 3.5 mm \pm 0.3 mm	$l_t =$ 5.0 mm \pm 1.0 mm	SPQ	$l_t =$ 25.0 mm \pm 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ
Original pitch = 15.0 mm; bent back pitch = 7.5 mm \pm 0.4 mm; d _t = 0.60 mm \pm 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 13.0 x 17.5	1.0					18714 18715 18716 18717	950	
0.022 0.027	6.0 x 14.0 x 17.5	1.4					18718 18719	800	
Original pitch = 15.0 mm; bent back pitch = 7.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
0.033 0.039	7.0 x 15.5 x 17.5	1.8					18721 18722	700	
0.047 0.056	8.5 x 17.0 x 17.5	2.4					18723 18724	550	
0.068 0.082	10.0 x 18.5 x 17.5	3.0					18725 18726	500	

Notes

- SPQ = Standard Packing Quantity

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

⁽²⁾ Reel diameter = 356 mm is available on request

⁽³⁾ Weight for short lead product only

C-tol. = $\pm 5\%$

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾⁽²⁾	
			$l_t =$ 3.5 mm \pm 0.3 mm	$l_t =$ 5.0 mm \pm 1.0 mm	SPQ	$l_t =$ 25.0 mm \pm 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ
Pitch = 15.0 mm \pm 0.4 mm; d _t = 0.60 mm \pm 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 11.0 x 17.5	1.0	18214 18215 18216 18217	18414 18415 18416 18417	1000	18614 18615 18616 18617	1000	18934 18935 18936 18937	1100
0.022 0.027	6.0 x 12.0 x 17.5	1.4	18218 18219	18418 18419	1000	18618 18619	1000	18938 18939	900
Pitch = 15.0 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
0.033 0.039	7.0 x 13.5 x 17.5	1.8	18221 18222	18421 18422	750	18621 18622	500	18941 18942	800
0.047 0.056	8.5 x 15.0 x 17.5	2.4	18223 18224	18423 18424	750	18623 18624	500	18943 18944	650
0.068 0.082	10.0 x 16.5 x 17.5	3.0	18225 18226	18425 18426	500	18625 18626	450	18945 18946	600
Pitch = 22.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
0.10 0.12	8.5 x 18.0 x 26.0	3.8	18227 18228	18427 18428	200	18627 18628	250	18947 18948	450
0.15 0.18	10.0 x 19.5 x 26.0	6.8	18229 18231	18429 18431	200	18629 18631	200	18949 18951	350
Pitch = 27.5 mm \pm 0.4 mm; d _t = 0.80 mm \pm 0.08 mm									
0.22	11.0 x 21.0 x 31.0	7.4	18232	18432	100	18632	125		
0.27 0.33	13.0 x 23.0 x 31.0	9.2	18233 18234	18433 18434	100	18633 18634	125		
0.39 0.47	15.0 x 25.0 x 31.5	12.3	18235 18236	18435 18436	100	18635 18636	125		
0.56 0.68	18.0 x 28.0 x 31.5	16.1	18237 18238	18437 18438	100	18637 18638	100		
0.82	21.0 x 31.0 x 31.0	20.3	18239	18439	50	18639	75		

Notes

- SPQ = Standard Packing Quantity

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

(2) Reel diameter = 356 mm is available on request

(3) Weight for short lead product only

Bent back pitch (only taped); C-tol. = $\pm 5\%$

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾	
			$l_t =$ 3.5 mm \pm 0.3 mm	$l_t =$ 5.0 mm \pm 1.0 mm	SPQ	$l_t =$ 25.0 mm \pm 2.0 mm	SPQ	H = 16.0 mm; P ₀ = 15.0 mm	SPQ
Original pitch = 15.0 mm; bent back pitch = 7.5 \pm 0.4 mm; d _t = 0.60 \pm 0.06 mm									
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	
Original pitch = 15.0 mm; bent back pitch = 7.5 \pm 0.4 mm; d _t = 0.80 \pm 0.08 mm									
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




- SPQ = Standard Packing Quantity

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

(2) Reel diameter = 356 mm is available on request

(3) Weight for short lead product only

APPROVALS

SAFETY APPROVALS X1	VOLTAGE	VALUE	FILE NUMBERS
EN 60384-14 (ENEC) (= IEC 60384-14 ed-3)	440 V _{AC}	10 nF to 1 µF	FI 2008060 A1
UL1414	250 V _{AC}	10 nF to 1 µF	E112471
UL1283	440 V _{AC}	10 nF to 100 nF	E109565
UL1283 and (CSA-C22.2 No. 8)	440 V _{AC}	100 nF to 1 µF	E109565
CB-Test Certificate	440 V _{AC}	10 nF to 1 µF	FI 5256 A1
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:

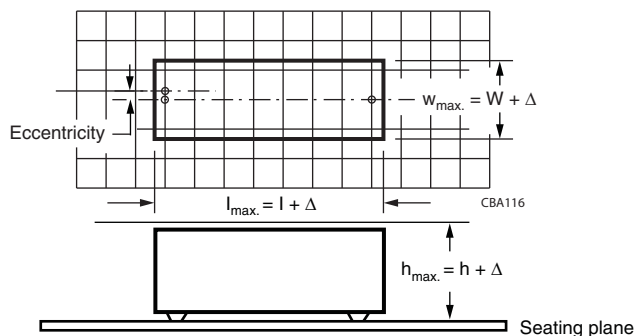
- For pitches ≤ 15 mm capacitors shall be mechanically fixed by the leads
- For longer pitches the capacitors shall be mounted in the same way and the body clamped

Space Requirements on Printed Circuit Board

The maximum 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

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

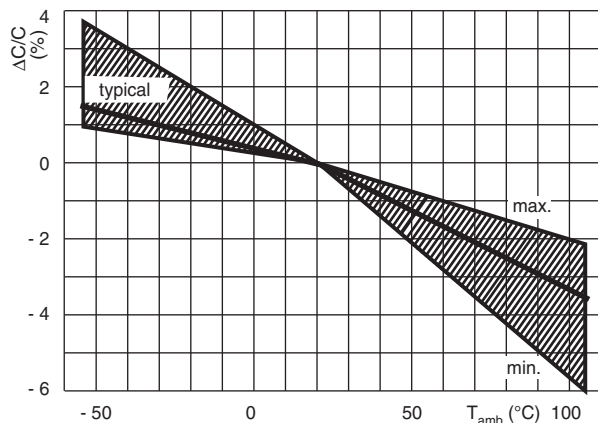
Ratings and Characteristics Reference Conditions

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 %.

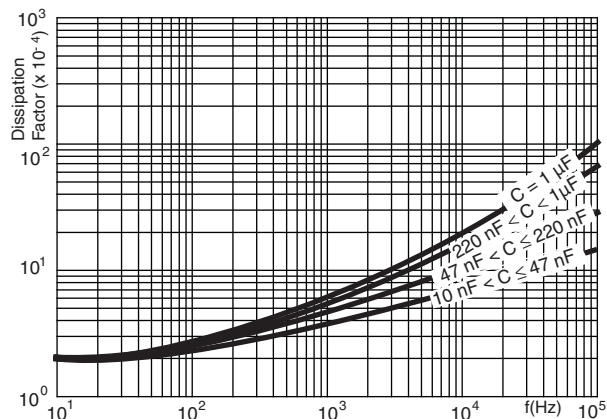
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

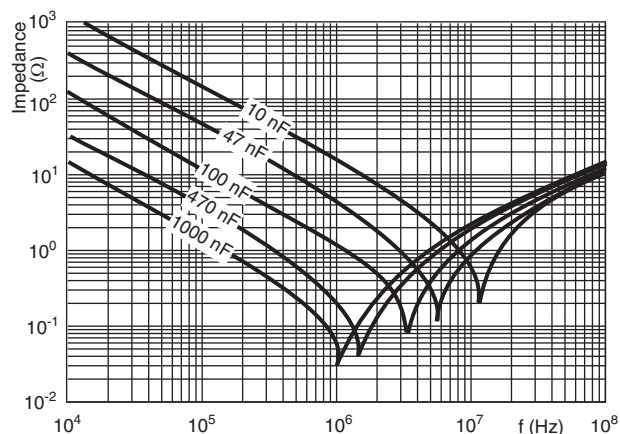
Capacitance as a function of ambient temperature (typical curve)



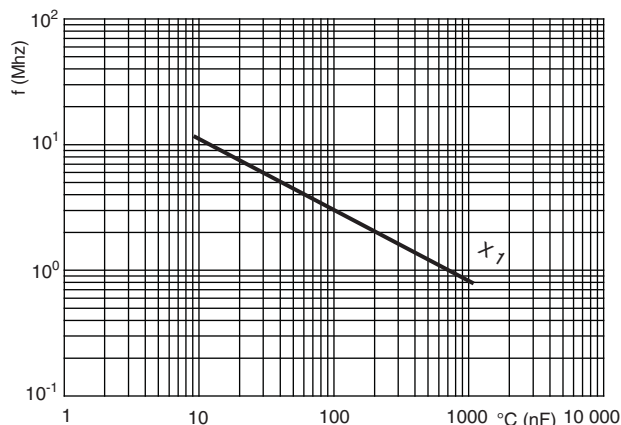
Tangent of loss angle as a function of frequency (typical curve)



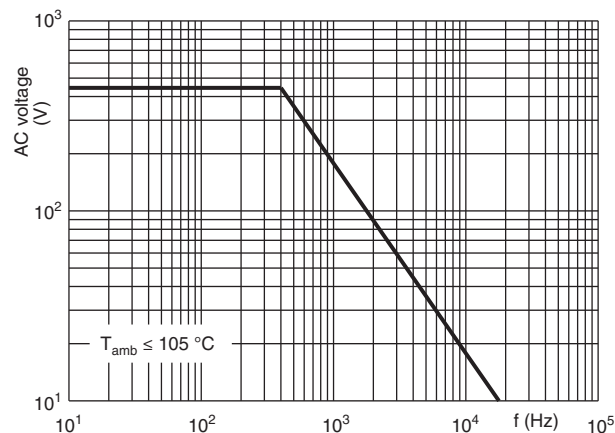
Impedance as a function of frequency (typical curve)



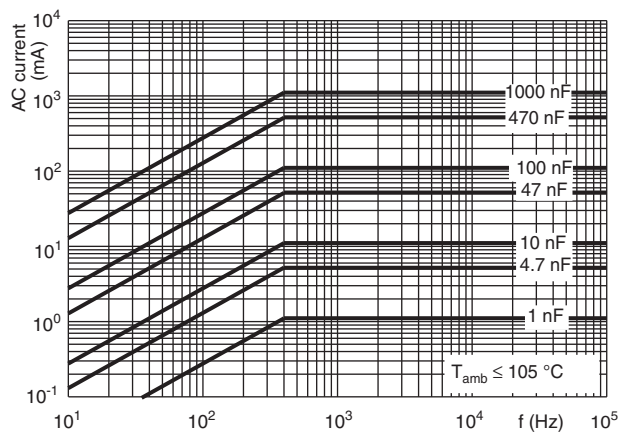
Resonant frequency as a function of capacitance (typical curve)



Max. RMS voltage as a function of frequency

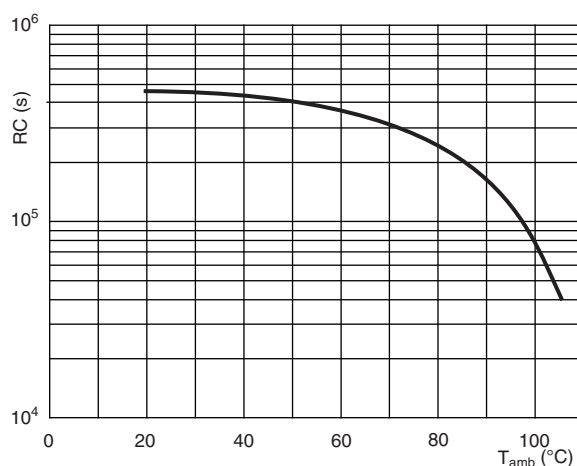


Max. RMS current as a function of frequency



Interference Suppression Film Capacitors Vishay BCcomponents MKP Radial Potted Type

Insulation resistance as a function of ambient temperature



APPLICATION NOTES

- For X1 electromagnetics interference suppression in **standard across the line applications** (50 Hz/60 Hz) with a maximum mains voltage of 440 V_{AC}.
- For series impedance applications we refer to Application Note www.vishay.com/doc?28153
- 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 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 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, Publication IEC 60384-14 ed-3 and Specific Reference Data."

Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters "General data" of this specification
Initial measurements	Capacitance Tangent of loss angle at 10 kHz	
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 min ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$ \Delta C/C \leq 5\%$ of the value measured initially
	Tangent of loss angle	Increase of $\tan \delta \leq 0.008$ Compared to values measured initially
	Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
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 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 Duration t = 30 min	

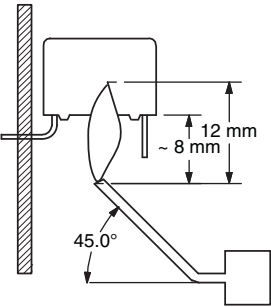
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SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.6.1 Inspection 4.7 Vibration	Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s ² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2 Final inspection	Visual examination	No visible damage
4.9 Shock	Mounting: See section "Mounting" for more information Pulse shape: half sine Acceleration: 490 m/s ² Duration of pulse: 11 ms	
4.9.2 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	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
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
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 V _{DC} ; 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

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C2		
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 V _{DC} ; 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
SUB-GROUP C3		
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 x 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 Ω ± 5 % Visual examination Capacitance Tangent of loss angle Voltage proof 1900 V _{DC} ; 1 min between terminations 2380 V _{AC} ; 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
SUB-GROUP C4		
4.15 Charge and discharge 4.15.1 Initial measurements	10 000 cycles Charged to 615 V _{DC} Discharge resistance: $R = \frac{615 V_{DC}}{1.5 \times C (dU/dt)}$ Capacitance Tangent of loss angle at 10 kHz	

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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
SUB-GROUP C5		
4.16 Radio frequency characteristic	Resonance frequency	≥ 0.9 times value as specified in section "Resonant Frequency" of this specification
SUB-GROUP C6		
4.17 Passive flammability Class B	<p>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</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.
SUB-GROUP C7		
4.18 Active flammability	20 cycles of 4 kV discharges on the test capacitor connected to U_{RAC}	The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required.



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