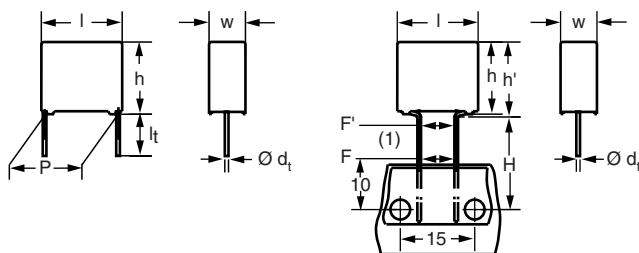


Interference Suppression Film Capacitors MKP Radial Potted Type



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

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

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 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



RoHS
COMPLIANT

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES		CAPACITANCE (numerically)			MULTIPLIER (nF)	
338 1	7.5 mm (bent back)				0.1	2
X1	15.0 mm	1	3			
	22.5 mm	10	4			
	27.5 mm	100	5			
		Example: 104 = 10 x 10 = 100 nF (except special numbers)				
		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 ± 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 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 ± 0.3 mm	± 10 %	See tables for detail
			± 5 %	
		Lead length 5.0 ± 1.0 mm	± 10 %	
			± 5 %	
		Lead length 25.0 ± 2.0 mm	± 10 %	
			± 5 %	
	Taped on reel (1)	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 or end of catalog

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 Vdc Pitch = 15 mm and 7.5 mm (bent back) Pitch = 22.5 mm Pitch = 27.5 mm	250 V/μs 150 V/μs 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) ⁽¹⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm	
			$l_t = 3.5 \pm 0.3$ mm	$l_t = 5.0 \pm 1.0$ mm	SPQ	$l_t = 25.0 \pm 2.0$ mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d _t = 0.60 ± 0.06 mm									
0.01 0.012 0.015 0.018 0.022	5.0 x 11.0 x 17.5	1.0	10103 10123 10153 10183 10223	12103 12123 12153 12183 12223	1000	14103 14123 14153 14183 14223	1000	17103 17123 17153 17183 17223	1100
0.027 0.033	6.0 x 12.0 x 17.5	1.4	10273 10333	12273 12333	1000	14273 14333	1000	17273 17333	900
Pitch = 15.0 ± 0.4 mm; d _t = 0.80 ± 0.08 mm									
0.039 0.047	7.0 x 13.5 x 17.5	1.8	10393 10473	12393 12473	750	14393 14473	500	17393 17473	800
0.056 0.068	8.5 x 15.0 x 17.5	2.4	10563 10683	12563 12683	750	14563 14683	500	17563 17683	650
0.082 0.1	10.0 x 16.5 x 17.5	3.0	10823 10104	12823 12104	500	14823 14104	450	17823 17104	600
Pitch = 22.5 ± 0.4 mm; d _t = 0.80 ± 0.08 mm									
0.12 0.15	8.5 x 18.0 x 26.0	3.8	10124 10154	12124 12154	200	14124 14154	250	17124 17154	450
0.18 0.22	10.0 x 19.5 x 26.0	6.8	10184 10224	12184 12224	200	14184 14224	200	17184 17224	350
Pitch = 27.5 ± 0.4 mm; d _t = 0.80 ± 0.08 mm									
0.27 0.33	11.0 x 21.0 x 31.0 13.0 x 23.0 x 31.0	7.4 9.2	10274 10334	12274 12334	100 100	14274 14334	125 125		
0.39 0.47	15.0 x 25.0 x 31.0	12.3	10394 10474	12394 12474	100	14394 14474	125		
0.56 0.68	18.0 x 28.0 x 31.0	16.1	10564 10684	12564 12684	100	14564 14684	100		
0.82 1.00	21.0 x 31.0 x 31.0	20.3	10824 10105	12824 12105	50	14824 14105	75		

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) ⁽²⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING													
			LOOSE IN BOX					TAPED								
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾								
			$l_t = 3.5 \pm 0.3$ mm	$l_t = 5.0 \pm 1.0$ mm	SPQ	$l_t = 25.0 \pm 2.0$ mm	SPQ	H = 16.0 mm; P ₀ = 15.0 mm	SPQ							
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d _t = 0.60 ± 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 ± 0.4 mm; d _t = 0.80 ± 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⁽¹⁾ Weight for short lead products only

• SPQ = Standard Packing Quantity

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

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽¹⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING							
			LOOSE IN BOX					TAPED		
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾		
			$l_t =$ 3.5 $\pm$ 0.3 mm	$l_t =$ 5.0 $\pm$ 1.0 mm	SPQ	$l_t =$ 25.0 $\pm$ 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ	
Pitch = 15.0 $\pm$ 0.4 mm; d _t = 0.60 $\pm$ 0.06 mm										
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		
Pitch = 15.0 $\pm$ 0.4 mm; d _t = 0.80 $\pm$ 0.08 mm										
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		
Pitch = 22.5 $\pm$ 0.4 mm; d _t = 0.80 $\pm$ 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 $\pm$ 0.4 mm; d _t = 0.80 $\pm$ 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⁽¹⁾ Weight for short lead products only

• SPQ = Standard Packing Quantity

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

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽²⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING							
			LOOSE IN BOX					TAPED		
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾		
			$l_t =$ 3.5 $\pm$ 0.3 mm	$l_t =$ 5.0 $\pm$ 1.0 mm	SPQ	$l_t =$ 25.0 $\pm$ 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ	
Original pitch = 15.0 mm; bent back pitch = 7.5 $\pm$ 0.4 mm; d _t = 0.60 $\pm$ 0.06 mm										
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		
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						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⁽¹⁾ Reel diameter = 356 mm is available on request⁽²⁾ Weight for short lead products only

• SPQ = Standard Packing Quantity

**Interference Suppression Film Capacitors Vishay BCcomponents**
MKP Radial Potted Type**C-tol. = ± 5 %**

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽¹⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING							
			LOOSE IN BOX					TAPED		
			Short leads			Long leads		Reel diameter = 500 mm		
			$l_t =$ 3.5 $\pm$ 0.3 mm	$l_t =$ 5.0 $\pm$ 1.0 mm	SPQ	$l_t =$ 25.0 $\pm$ 2.0 mm	SPQ	H = 18.5 mm; P ₀ = 12.7 mm	SPQ	
Pitch = 15.0 $\pm$ 0.4 mm; d _t = 0.60 $\pm$ 0.06 mm										
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		
Pitch = 15.0 $\pm$ 0.4 mm; d _t = 0.80 $\pm$ 0.08 mm										
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		
Pitch = 22.5 $\pm$ 0.4 mm; d _t = 0.80 $\pm$ 0.08 mm										
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		
Pitch = 27.5 $\pm$ 0.4 mm; d _t = 0.80 $\pm$ 0.08 mm										
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) ⁽²⁾	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING													
			LOOSE IN BOX					TAPED								
			Short leads			Long leads		Reel diameter = 500 mm ⁽¹⁾								
			$l_t =$ 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 ₀ = 15.0 mm	SPQ							
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d _t = 0.60 ± 0.06 mm																
0.010 0.012 0.015 0.018	5.0 x 13.0 x 17.5	1.0						18814 18815 18816 18817	950							
0.022 0.027	6.0 x 14.0 x 17.5	1.4						18818 18819		800						
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d _t = 0.80 ± 0.08 mm																
0.033 0.039	7.0 x 15.5 x 17.5	1.8											18821 18822	700		
0.047 0.056	8.5 x 17.0 x 17.5	2.4	18823 18824	550												
0.068 0.082	10.0 x 18.5 x 17.5	3.0	18825 18826		500											

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 μ F	F1 2008060
UL1414	250 Vac	10 nF to 1 μ F	E112471
UL1283	440 Vac	10 nF to 100 nF	E109565
UL1283 and (CSA-C22.2 No. 8)	440 Vac	100 nF to 1 μ F	E109565
CB-Test Certificate	440 Vac	10 nF to 1 μ 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 or end of catalog

Specific Method of Mounting to Withstand Vibration and Shock

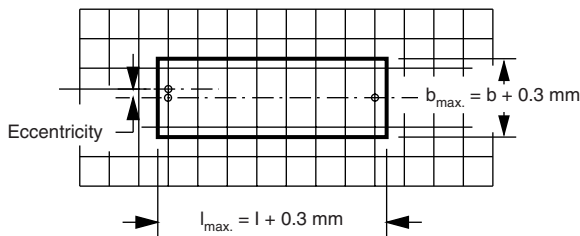
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

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

Ratings and Characteristics Reference Conditions

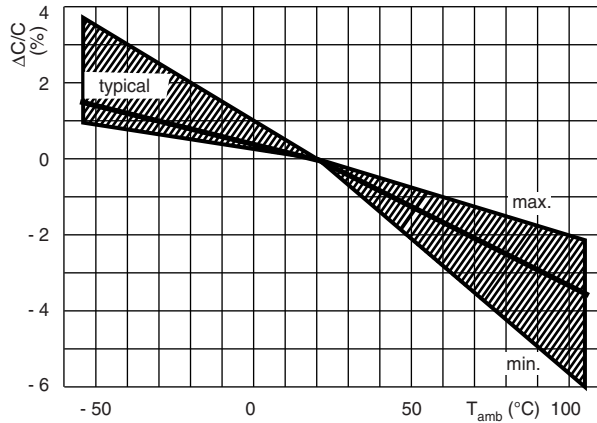
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 °C ± 1 °C, an atmospheric pressure of 86 to 106 kPa and a relative humidity of 50 % ± 2 %.

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 %.

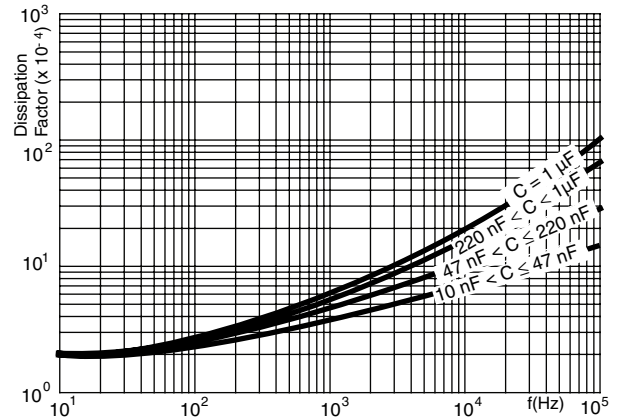


CHARACTERISTICS

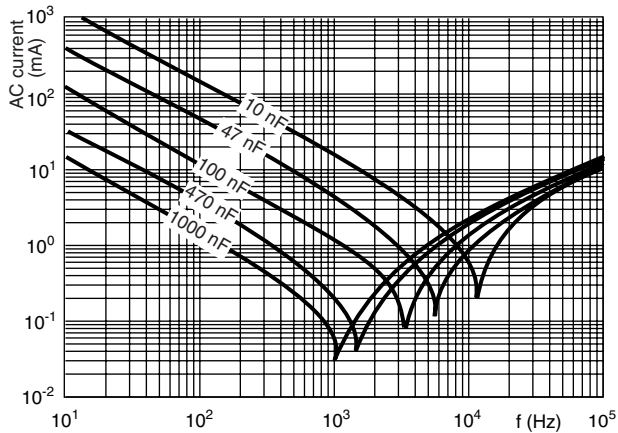
Capacitance as a function of ambient temperature (typical curve)



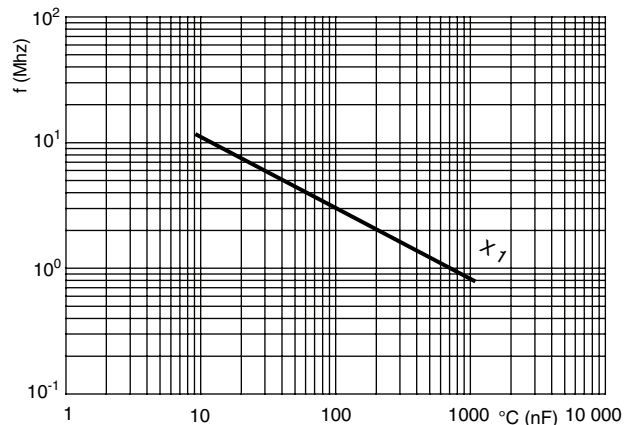
Tangent of loss angle as a function of frequency (typical curve)



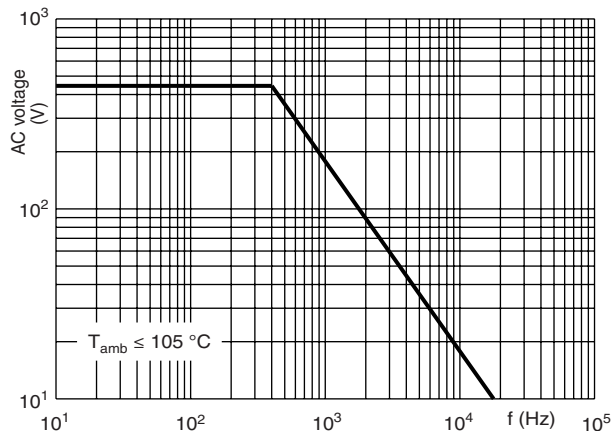
Impedance as a function of frequency (typical curve)



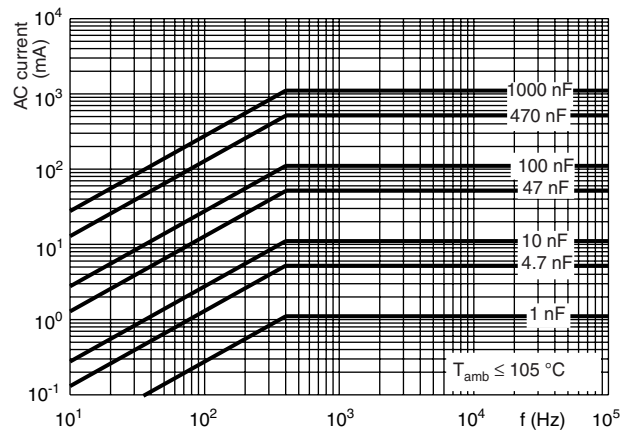
Resonant frequency as a function of capacitance (typical curve)



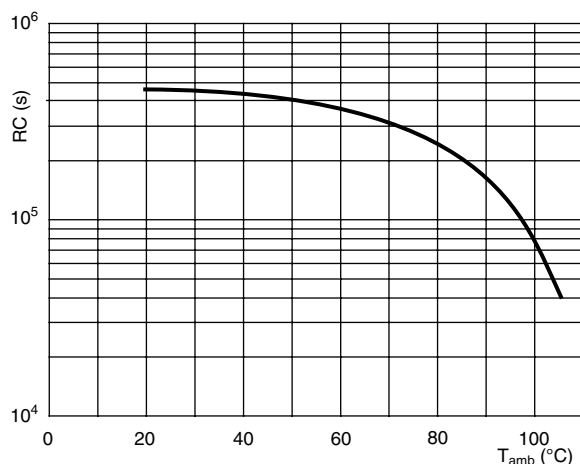
Max. RMS voltage as a function of frequency



Max. RMS current as a function of frequency



Insulation resistance as a function of ambient temperature



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
- 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."

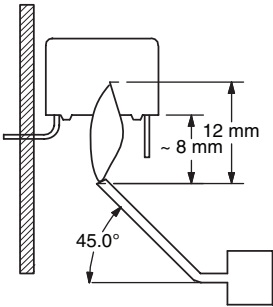
Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
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
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 ± 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	

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 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 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
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 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
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 $47 \Omega \pm 5\%$ 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
SUB-GROUP C4		
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
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	Bore of gas jet: $\varnothing 0.5$ mm Fuel: Butane Test duration for actual volume V in mm³: $V \leq 250$: 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		
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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