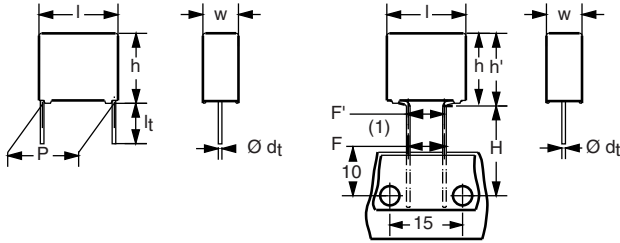


Interference Suppression Film Capacitors MKP Radial Potted Type



Dimensions in mm
 (1) $|F - F'| < 0.3$ mm
 $F = 7.5 + 0.6/-0.1$ mm

NO FOCUS PRODUCT: USE F1778 3 X2

APPLICATIONS

X2 class

For X2 electromagnetic interference suppression in across the line applications (50 Hz/60 Hz) with a maximum mains voltage of 300 V_{AC} or 305 V_{AC} for pitch ≥ 37.5 mm.

For application limitations please refer page 7.

REFERENCE STANDARDS

“IEC 60384-14 2nd edition and EN 132400”
 “IEC 60065, pass. flamm. class B”
 UL1283; ENEC; 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 emblem; year and week

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized film

CONSTRUCTION

Mono construction

RATED VOLTAGE

AC 300 V; 50 to 60 Hz (for pitch < 37.5 mm)

AC 305 V; 50 to 60 Hz (for pitch ≥ 37.5 mm)

FEATURES

- 15 mm to 55 mm lead pitch and 15 mm bent back to 7.5 mm. Supplied loose in box, taped on reel
- Compliant to RoHS Directive 2002/95/EC



RoHS
COMPLIANT

PERMISSIBLE DC VOLTAGE

800 V_{DC} at 85 °C
 630 V_{DC} at 110 °C

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 μ F to 10 μ F
 Preferred values acc. to E6

CAPACITANCE TOLERANCE

± 20 %; ± 10 %

LEADS

Tinned wire

RATED TEMPERATURE

105 °C

MAXIMUM APPLICATION TEMPERATURE

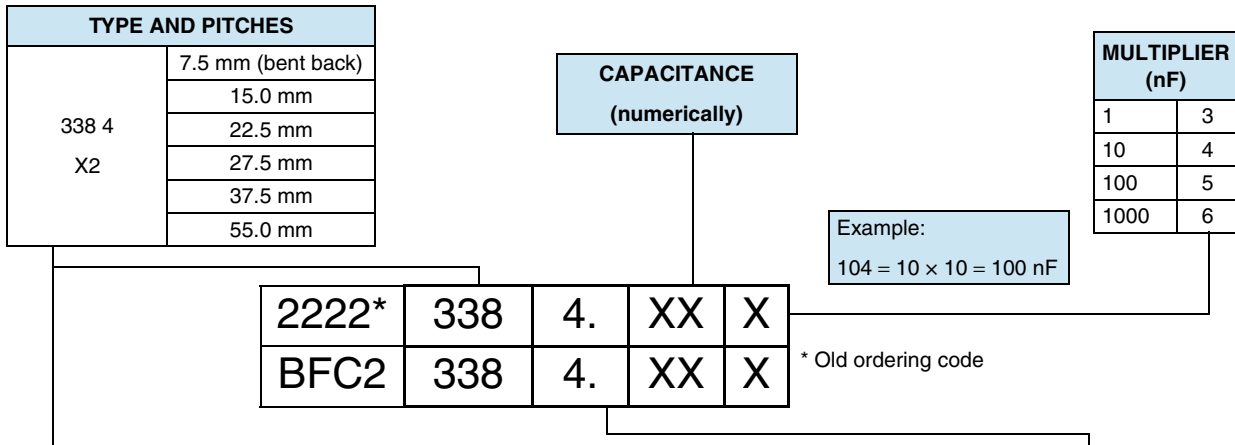
105 °C

DETAIL SPECIFICATION

For more detailed data and test requirements contact:
rfi@vishay.com



COMPOSITION OF CATALOG NUMBER



TYPE	PACKAGING	STANDARD DIMENSIONS	C-TOL.	PREFERRED TYPES	
338 4 X2	loose in box	lead length 3.5 ± 0.3 mm	± 20 %	BFC2 338 44 ...	
		lead length 5.0 ± 1.0 mm		BFC2 338 40 ...	
		lead length 25.0 ± 2.0 mm		BFC2 338 41 ...	
	taped ⁽¹⁾⁽²⁾	15.0 mm bent back to 7.5 mm			BFC2 338 4. ...
		ALTERNATIVE PITCH SIZES		C-TOL.	ON REQUEST
	loose in box	lead length 3.5 ± 0.3 mm	± 20 %	see tables for details	
		lead length 5.0 ± 1.0 mm			
		lead length 25.0 ± 2.0 mm			
		ALTERNATIVE TAPED VERSION		C-TOL.	ON REQUEST
	taped ⁽¹⁾⁽²⁾	H = 18.5 mm; for P ₀ = 12.7 mm	± 20 %	see tables for details	
		ALTERNATIVE C-TOL		C-TOL.	ON REQUEST
	loose in box	lead length 3.5 ± 0.3 mm	± 10 %	see tables for details	
lead length 5.0 ± 1.0 mm					
lead length 25.0 ± 2.0 mm					
15.0 mm bent back to 7.5 mm					
H = 18.5 mm; P ₀ = 12.7 mm					
taped ⁽¹⁾⁽²⁾					

Notes

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

(2) Tape on reel pitch = 27.5 mm is not available

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE		
	at 1 kHz	at 10 kHz	at 100 kHz
Tangent of loss angle:			
pitch = 7.5 mm (bent back); 15 mm; 22.5 mm and 27.5 mm for C ≤ 470 nF	≤ 10 × 10 ⁻⁴	≤ 20 × 10 ⁻⁴	≤ 100 × 10 ⁻⁴
pitch = 7.5 mm (bent back); 15 mm; 22.5 mm and 27.5 mm for 470 nF < C ≤ 1 μF	≤ 20 × 10 ⁻⁴	≤ 70 × 10 ⁻⁴	-
pitch = 7.5 mm (bent back); 15 mm; 22.5 mm and 27.5 mm for 1 μF < C ≤ 3.3 μF	≤ 30 × 10 ⁻⁴	-	-
pitch = 37.5 mm and 55 mm for 2.2 μF < C ≤ 4.7 μF	≤ 50 × 10 ⁻⁴	-	-
pitch = 37.5 mm and 55 mm for 4.7 μF < C ≤ 10 μF	≤ 100 × 10 ⁻⁴	-	-
Rated voltage pulse slope (dU/dt) _R at 420 V _{DC}	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 minute	> 30 000 MΩ		
Withstanding (DC) voltage (cut off current 10 mA) ⁽¹⁾ ; rise time ≤ 1000 V/s:			
C ≤ 1 μF	2200 V; 1 min		
1 μF < C ≤ 3.3 μF (not pitch = 37.5 mm)	1850 V; 1 min		
pitch = 37.5 mm and 55 mm	1400 V; 1 min		
Withstanding (AC) voltage between leads and case	2200 V; 1 min		

Note

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



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

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 338 AND PACKAGING						
			LOOSE IN BOX					REEL	
			SHORT LEADS			LONG LEADS		SPQ	
			$l_t = 3.5 \pm 0.3\text{ mm}$	$l_t = 5.0 \pm 1.0\text{ mm}$	SPQ	$l_t = 25.0 \pm 2.0\text{ mm}$	SPQ		
Pitch = $15.0 \pm 0.4\text{ mm}$; $d_t = 0.60 \pm 0.06\text{ mm}$								reel: $\varnothing = 500\text{ mm}$ $H = 18.5\text{ mm}$; $P_0 = 12.7\text{ mm}$	
0.01 0.015 0.022 0.033 0.047 0.068	5.0 x 11.0 x 17.5	1.0	44103 44153 44223 44333 44473 44683	40103 40153 40223 40333 40473 40683	1000	41103 41153 41223 41333 41473 41683	1000	48127 48128 48129 48131 48132 48133	1000
0.1	6.0 x 12.0 x 17.5	1.4	44104	40104	1000	41104	1000	48134	1000
Original pitch = 15.0 mm; bent back pitch = $7.5 \pm 0.4\text{ mm}$; $d_t = 0.60 \pm 0.06\text{ mm}$								reel: $\varnothing = 500\text{ mm}^{(1)}$ $H = 16.0\text{ mm}$; $P_0 = 15.0\text{ mm}$	
0.01 0.015 0.022 0.033 0.047 0.068	5.0 x 11.0 (13.0) x 17.5	1.1						48001 48002 48003 48004 48005 48006	950
0.1	6.0 x 12.0 (14.0) x 17.5	1.4						48007	800
Pitch = $15.0 \pm 0.4\text{ mm}$; $d_t = 0.80 \pm 0.08\text{ mm}$								reel: $\varnothing = 500\text{ mm}$ $H = 18.5\text{ mm}$; $P_0 = 12.7\text{ mm}$	
0.15 0.22 0.33	7.0 x 13.5 x 17.5 8.5 x 15.0 x 17.5 10.0 x 16.5 x 17.5	1.8 2.4 3.0	44154 44224 44334	40154 40224 40334	750 750 500	41154 41224 41334	500 500 450	48135 48136 48137	500 500 600
Original pitch = 15.0 mm; bent back pitch = $7.5 \pm 0.4\text{ mm}$; $d_t = 0.80 \pm 0.08\text{ mm}$								reel: $\varnothing = 500\text{ mm}^{(1)}$ $H = 16.0\text{ mm}$; $P_0 = 15.0\text{ mm}$	
0.15 0.22	7.0 x 13.5 (15.5) x 17.5 8.5 x 15.0 (17.0) x 17.5	1.8 2.4						48008 48009	700 550
0.33	10.0 x 16.5 (18.5) x 17.5	3.0						48011	500
Pitch = $22.5 \pm 0.4\text{ mm}$; $d_t = 0.80 \pm 0.08\text{ mm}$								reel: $\varnothing = 500\text{ mm}$ $H = 18.5\text{ mm}$; $P_0 = 12.7\text{ mm}$	
0.22 0.33 0.47 0.68 1.0	7.0 x 16.5 x 26.0 8.5 x 18.0 x 26.0 10.0 x 19.5 x 26.0 12.0 x 22.0 x 26.0	2.9 3.8 6.8 7.8	48101 48103 44474 44684 44105	48109 48112 40474 40684 40105	200 200 200 150	48118 48121 41474 41684 41105	250 250 200 200		
Pitch = $27.5 \pm 0.4\text{ mm}$; $d_t = 0.80 \pm 0.08\text{ mm}$								reel: $\varnothing = 500\text{ mm}$ $H = 18.5\text{ mm}$; $P_0 = 12.7\text{ mm}$	
0.47 0.68 1.0 1.5 2.2 3.3	9.0 x 19.0 x 31.0 11.0 x 21.0 x 31.0 15.0 x 25.0 x 31.0 18.0 x 28.0 x 31.0 21.0 x 31.0 x 31.0	5.5 7.4 12.3 16.1 20.3	48104 48106 48108 44155 44225 44335	48113 48115 48117 40155 40225 40335	100 100 100 100 50	48122 48124 48126 41155 41225 41335	150 150 125 100 75		

Notes

- SPQ = Standard Packing Quantity
- ⁽¹⁾ H = in-tape height; P_0 = 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

MKP338 4 X2

Vishay

Interference Suppression Film Capacitors



$U_{RAC} = 305 \text{ V}$; C-tol = $\pm 20 \%$

C (μF)	DIMENSIONS w x h x l (mm)	Mass (g) (1)	CATALOG NUMBER BFC2 338 AND PACKAGING					
			LOOSE IN BOX				REEL	
			SHORT LEADS			LONG LEADS		
			$l_t =$ 3.5 \pm 0.3 mm	$l_t =$ 5.0 \pm 1.0 mm	SPQ	$l_t =$ 25.0 \pm 2.0 mm	SPQ	SPQ
Pitch = 37.5 \pm 0.7 mm; dt = 1.0 \pm 0.1 mm								
4.7	18.5 x 35.5 x 43.0	29.0		40475	105	41475	105	not available
6.8	21.5 x 38.5 x 43.0	35.0		40685	91	41685	91	
10	30.0 x 46.0 x 44.0	55.0		48159	63	48161	63	
Pitch = 55.0 \pm 1.0 mm; dt = 1.0 \pm 0.1 mm								
10	21.5 x 38.5 x 61.0	50.0		40106	65	41106	65	not available

Notes

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

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

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 338 AND PACKAGING						
			LOOSE IN BOX				REEL		
			SHORT LEADS			LONG LEADS			
			$l_t =$ 3.5 \pm 0.3 mm	$l_t =$ 5.0 \pm 1.0 mm	SPQ	$l_t =$ 25.0 \pm 2.0 mm	SPQ	SPQ	
Pitch = 15.0 \pm 0.4 mm; dt = 0.60 \pm 0.06 mm									
0.01	5.0 x 11.0 x 17.5	1.0	45103	42103	1000	43103	1000	48138	1000
0.015			45153	42153		43153		48141	
0.022			45223	42223		43223		48143	
0.033			45333	42333		43333		48145	
0.047			45473	42473		43473		48147	
0.068			45683	42683		43683		48149	
0.1	6.0 x 12.0 x 17.5	1.4	45104	42104	1000	43104	1000	48153	1000
Original pitch = 15.0 mm; bent back pitch = 7.5 \pm 0.4 mm; dt = 0.60 \pm 0.06 mm									
0.01	5.0 x 11.0 (13.0) x 17.5	1.0						48012	950
0.015								48014	
0.022								48016	
0.033								48018	
0.047								48021	
0.068								48023	
0.1	6.0 x 12.0 (14.0) x 17.5	1.4						48025	800
Pitch = 15.0 \pm 0.4 mm; dt = 0.80 \pm 0.08 mm									
0.12	7.0 x 13.5 x 17.5	1.8	45124	42124	750	43124	500	48154	500
0.15			45154	42154		43154		48155	
0.18	8.5 x 15.0 x 17.5	2.4	45184	42184	750	43184	500	48156	500
0.22			45224	42224		43224		48157	
0.27	10.0 x 16.5 x 17.5	3.0	45274	42274	500	43274	450	48158	600
Original pitch = 15.0 mm; bent back pitch = 7.5 \pm 0.4 mm; dt = 0.80 \pm 0.08 mm									
0.15	7.0 x 13.5 (15.5) x 17.5	1.8						48027	700
0.22	8.5 x 15.0 (17.0) x 17.5	2.4						48029	550



C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽³⁾	CATALOG NUMBER BFC2 338 AND PACKAGING							
			LOOSE IN BOX					REEL		
			SHORT LEADS			LONG LEADS				SPQ
			$l_t =$ 3.5 \pm 0.3 mm	$l_t =$ 5.0 \pm 1.0 mm	SPQ	$l_t =$ 25.0 \pm 2.0 mm	SPQ			
Pitch = 22.5 \pm 0.4 mm; $d_t = 0.80 \pm 0.08$ mm							reel: $\varnothing = 500$ mm H = 18.5 mm; $P_0 = 12.7$ mm			
0.33	8.5 x 18.0 x 26.0	3.8	45334	42334	200	43334	250			
0.47	10.0 x 19.5 x 26.0	6.8	45474	42474	200	43474	200			
0.68	12.0 x 22.0 x 26.0	7.8	45684	42684	150	43684	200			
Pitch = 27.5 \pm 0.4 mm; $d_t = 0.80 \pm 0.08$ mm							reel: $\varnothing = 500$ mm H = 18.5 mm; $P_0 = 12.7$ mm			
1.0	13.0 x 23.0 x 31.0	9.2	45105	42105	100	43105	125			
1.5	15.0 x 25.0 x 31.0	12.3	45155	42155	100	43155	125			
2.2	21.0 x 31.0 x 31.0	20.3	45225	42225	50	43225	75			

Notes

- SPQ = Standard Packing Quantity
- (1) H = in-tape height; P_0 = 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

$U_{RAC} = 305$ V; C-tol = ± 10 %

C (μ F)	DIMENSIONS w x h x l (mm)	MASS (g) ⁽¹⁾	CATALOG NUMBER BFC2 338 AND PACKAGING							
			LOOSE IN BOX					REEL		
			SHORT LEADS			LONG LEADS				SPQ
			$l_t =$ 3.5 \pm 0.3 mm	$l_t =$ 5.0 \pm 1.0 mm	SPQ	$l_t =$ 25.0 \pm 2.0 mm	SPQ			
Pitch = 37.5 \pm 0.7 mm; $d_t = 1.0 \pm 0.1$ mm										
3.3	18.5 x 35.5 x 43.0	32.0	42335	105	105	43335	105	not available		
3.9			42395			43395				
4.7	21.5 x 38.5 x 43.0	39.0	42475	91	91	43475	91			
5.6			42565			43565				
6.8	30.0 x 46.0 x 44.0	55.0	48162	63	63	48165	63			
8.2	30.0 x 46.0 x 44.0		48163			48166				
10	30.0 x 46.0 x 44.0		48164			48167				
Pitch = 55.0 \pm 1.0 mm; $d_t = 1.0 \pm 0.1$ mm										
6.8	21.5 x 38.5 x 61.0	50.0	42685	65	65	43685	65	not available		
8.2			42825			43825				
10			42106			43106				



Note

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

APPROVALS

SAFETY APPROVALS X2	VOLTAGE	VALUE	FILE NUMBERS
EN 60384-14 (ENEC) (= IEC 60384-14 ed 3)	300 V _{AC}	10 nF to 10 μF	FI 2008038 A1
UL1283; CSA-C22.2 No.8	300 V _{AC}	10 nF to 10 μF	E109565
UL 1283	300 V _{AC}	3.3 nF to 10 μF	E109565
CB-test certificate	300 V _{AC}	10 nF to 10 μF	FI 5257 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; Sweden; 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:

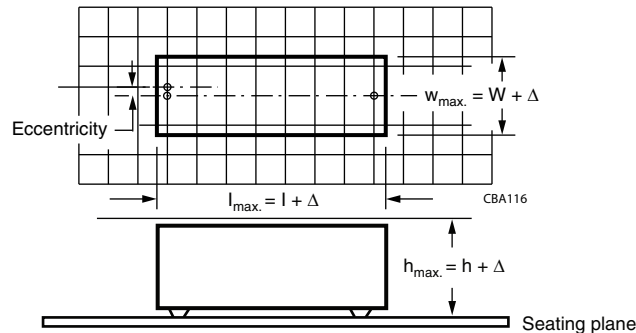
- For pitches ≤ 15 mm capacitors shall be mechanically fixed by the leads
- For longer pitches the capacitors shall be mounted in the same way and the body clamped

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
- For products with 15 mm < pitch ≤ 27.5 mm, $\Delta w = \Delta l = 0.5$ mm; $\Delta h = 0.1$ mm
- For products with 15 mm < pitch ≤ 37.5 mm, $\Delta w = \Delta l = 0.7$ mm; $\Delta h = 0.5$ mm
- For products with 15 mm < pitch ≤ 52.5 mm, $\Delta w = \Delta l = 1.0$ mm; $\Delta h = 0.5$ 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

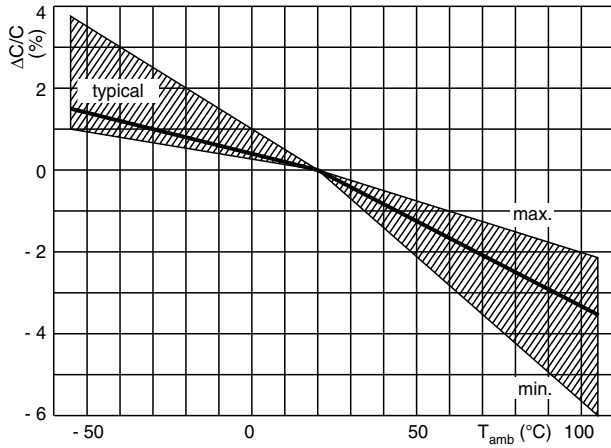
Ratings and Characteristics Reference Conditions

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 %.

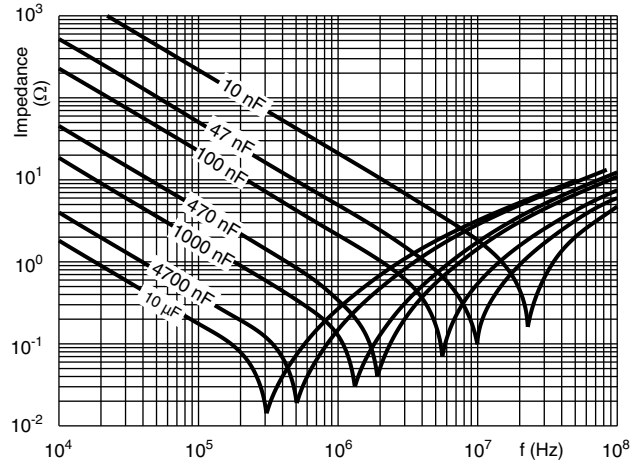
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

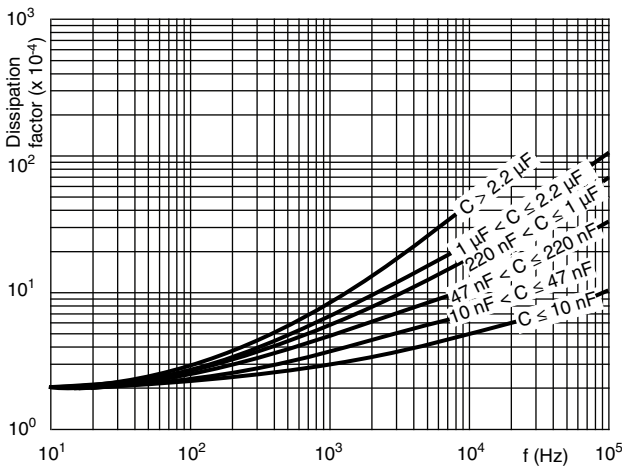
Capacitance as a function of ambient temperature (typical curve)



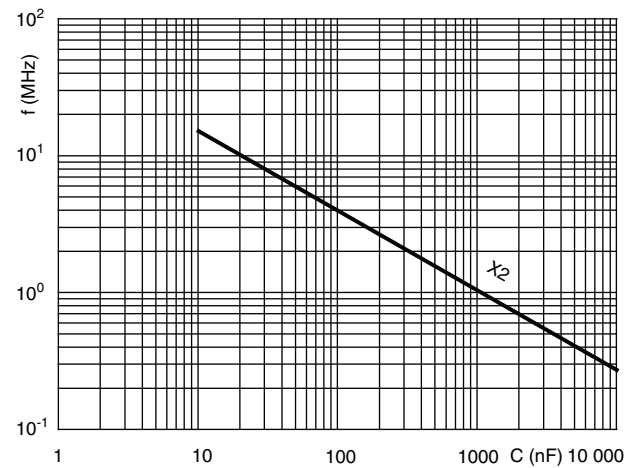
Impedance as a function of frequency (typical curve)



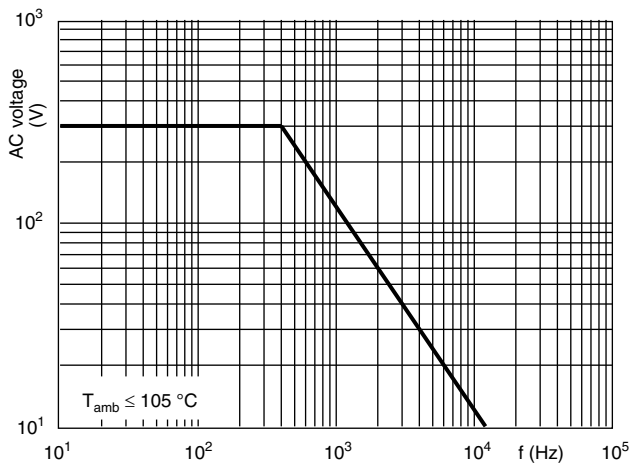
Tangent of loss angle as a function of frequency (typical curve)



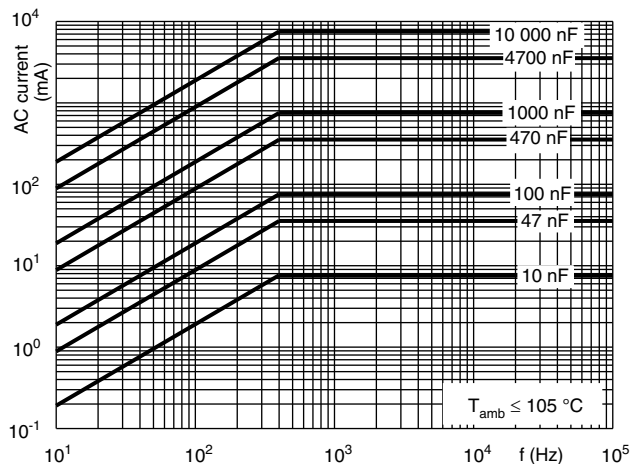
Resonant frequency as a function of capacitance (typical curve)

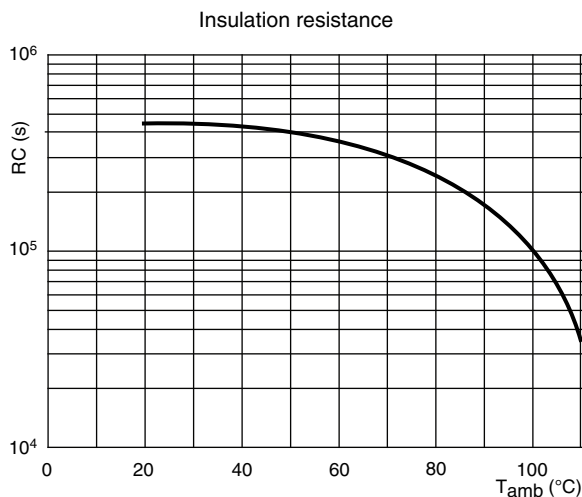


Max. RMS as a function of frequency



Max. RMS current as a function of frequency





APPLICATION NOTES

- For X2 electromagnetics interference suppression in **standard across the line applications** (50 Hz/60 Hz) with a maximum mains voltage of 300 V_{AC} for pitch 7.5 mm to 2.5 mm and 305 V_{AC} for pitch 37.5 mm to 55 mm.
- 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 435 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, Publication IEC 60384-14 ed-3 and Specific Reference Data.”

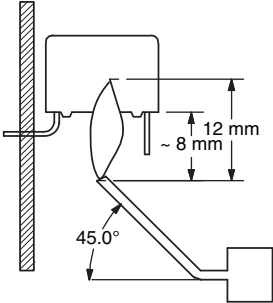
Group C Inspection Requirements

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: For wire diameter = 0.6 mm and 0.8 mm: load 10 N; 10 s For wire diameter = 1 mm: load 20 N; 10 s Bending: For wire diameter = 0.6 mm and 0.8 mm: load 5 N; 4 x 90° For wire diameter = 1 mm: load 10 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 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 for : C $\leq 1 \mu\text{F}$ or ≤ 0.005 for : C $> 1 \mu\text{F}$ Compared to values measured initially As specified in chapters “General data” of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: For C $\leq 1 \mu\text{F}$ at 10 kHz For C $> 1 \mu\text{F}$ at 1 kHz	No visible damage Legible marking
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 min. ± 0.5 min	
4.6 Rapid change of temperature	$\theta A = -55 \text{ }^\circ\text{C}$ $\theta B = +105 \text{ }^\circ\text{C}$ 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 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 for : $C \leq 1 \mu\text{F}$ or ≤ 0.005 for : $C > 1 \mu\text{F}$ Compared to values measured initially Increase of $\tan \delta \leq 0.008$ Compared to values measured initially As specified in chapters "General data" 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 1290 V _{DC} ; pitch ≤ 27.5 mm 1320 V _{DC} ; pitch > 27.5 mm 1 min between terminals 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 for : $C \leq 1 \mu\text{F}$ or ≤ 0.005 for : $C > 1 \mu\text{F}$ Compared to values measured in 4.11.1 No permanent breakdown or flash-over $\geq 50\%$ of values specified in chapters "General data" 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 1290 V _{DC} ; pitch ≤ 27.5 mm 1320 V _{DC} ; pitch > 27.5 mm 1 min between terminals Insulation resistance	No visible damage Legible marking $ \Delta C/C \leq 5\%$ of the value measured in 4.12.1. Increase of tan δ : ≤ 0.008 for : C ≤ 1 μF or ≤ 0.005 for : C > 1 μF Compared to values measured in 4.12.1 No permanent breakdown or flash-over ≥ 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: For C ≤ 1 μF at 10 kHz For C > 1 μF at 1 kHz 3 successive impulses, full wave, peak voltage: X2: 2.5 kV for C ≤ 1 μF X2: 2.5 kV for C > 1 μF 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 1290 V _{DC} ; pitch ≤ 27.5 mm 1320 V _{DC} ; pitch > 27.5 mm 1 min between terminals 2200 V _{AC} ; 1 min between terminals 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 δ : ≤ 0.008 for : C ≤ 1 μF or ≤ 0.005 for : C > 1 μF Compared to values measured in 4.13.1 No permanent breakdown or flash-over ≥ 50 % of values specified in chapters "General data" of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C4		
4.15 Charge and discharge 4.15.1 Initial measurements	10 000 cycles Charged to 420 V _{DC} Discharge resistance: $R = \frac{420 V_{DC}}{1.5 \times C (dU/dt)}$ Capacitance Tangent of loss angle at 10 kHz	
4.15.3 Final measurements	Capacitance Tangent of loss angle Insulation resistance	ΔC/C ≤ 10 % compared to values measured in 4.15.1. Increase of tan δ: ≤ 0.008 for : C ≤ 1 μF or ≤ 0.005 for : C > 1 μF Compared to values measured in 4.15.1 ≥ 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: Ø 0.5 mm Fuel: Butane Test duration for actual volume V in mm ³ : V ≤ 250: 10 s 250 < V ≤ 500: 20 s 500 < V ≤ 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.



Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and/or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk and agree to fully indemnify and hold Vishay and its distributors harmless from and against any and all claims, liabilities, expenses and damages arising or resulting in connection with such use or sale, including attorneys fees, even if such claim alleges that Vishay or its distributor was negligent regarding the design or manufacture of the part. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.