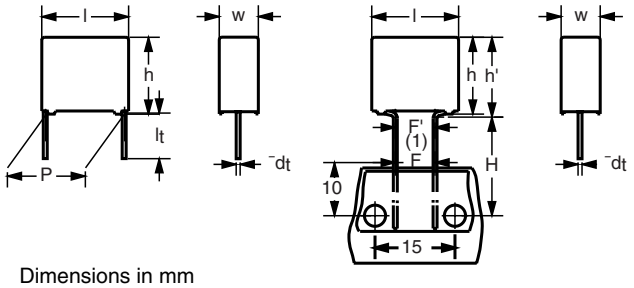
AC and Pulse Double Metallized Polypropylene Film Capacitors
MMKP Radial Potted Type



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

APPLICATIONS

Where steep pulses occur e.g. SMPS (switch mode power supplies). Electronic lighting e.g. Ballast. Motor control circuits. S-correction. For flyback applications please use 1400 V series.

REFERENCE SPECIFICATIONS

IEC 60384-17

MARKING

C-value; tolerance; rated voltage; sub-class; manufacturer's type; code for dielectric material; code for factory of origin; manufacturer; year and week of manufacture

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized

ENCAPSULATION

Flame retardant plastic case and epoxy resin

CONSTRUCTION

Internal serial construction

RATED (DC) VOLTAGE

250 V, 400 V, 630 V, 1000 V, 1400 V, 1600 V, 2000 V, 2500 V

RATED (AC) VOLTAGE

125 V, 200 V, 220 V, 350 V, 500 V, 550 V, 700 V, 900 V

RATED PEAK-TO-PEAK VOLTAGE

350 V, 560 V, 630 V, 1000 V, 1400 V, 1600 V, 2000 V, 2500 V

FEATURES

Pb-free
e3
RoHS COMPLIANT

7.5 mm bent back pitch. 15 mm to 27.5 mm lead pitch. Low contact resistance. Low loss dielectric. Small dimensions for high density packaging. Supplied loose in box and taped on reel
RoHS compliant product

ENCAPSULATION

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

CLIMATIC CATEGORY

55/105/56

CAPACITANCE RANGE (E24 SERIES)

0.001 µF to 2.7 µF

CAPACITANCE TOLERANCE

± 5 %

LEADS

Tinned wire

RATED (DC) TEMPERATURE

85 °C

RATED (AC) TEMPERATURE

105 °C

MAXIMUM APPLICATION TEMPERATURE

105 °C

DETAIL SPECIFICATION

For more detailed data and test requirements contact: dc-film@vishay.com

MMKP 383

Vishay BCcomponents AC and Pulse Double Metallized Polypropylene Film Capacitors MMKP Radial Potted Type

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
383	15.0 mm/7.5 mm
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

Example:
104 = 10 x 10 = 100 nF

MULTIPLIER (nF)	
0.1	2
1	3
10	4
100	5

BFC2	383	XX	YY	Y
2222 (1)	383	XX	YY	Y

(1) Old ordering code

TYPE	PACKAGING	LEAD CONFIGURATION	C-TOL.	250 V	400 V	630 V	1000 V	1400 V	1600 V	2000 V	2500 V
			PREFERRED TYPES								
383	Loose in box	Lead length 3.5 mm ± 0.3 mm	± 5 %	00	10	20	30	40	50	60	70
	Taped on reel (bent back to 7.5 mm) (1)	H = 16.0 mm; P_0 = 15.0 mm reel diameter = 500 mm	± 5 %	03	13	23	33	43	53	63	-
				Dimensions of this code numbers stay between brackets							
			ON REQUEST								
383	Loose in box	Lead length 5.0 mm ± 1.0 mm	± 5 %	01	11	21	31	41	51	61	71
		Lead length 25.0 mm ± 2.0 mm	± 5 %	04	14	24	34	44	54	64	74
	Taped on reel (1)	H = 18.5 mm; P_0 = 12.7 mm	± 5 %	02	12	22	32	42	52	62	72
	Taped on reel (bent back to 7.5 mm) (1)	H = 16.0 mm; P_0 = 15.0 mm reel diameter = 356 mm	± 5 %	05	15	25	35	45	55	65	-
				Dimensions of this code numbers stay between brackets							
	Taped on reel (bent back to 10.0 mm) (1)	H = 16.0 mm; P_0 = 15.0 mm reel diameter = 500 mm	± 5 %	08	18	28	38	48	58	68	-

Note

(1) For detailed tape specifications refer to “Packaging Information” www. vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA (250 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.15 µF	≤ 5 x 10^{-4}	≤ 20 x 10^{-4}
0.15 µF < C ≤ 0.39 µF	≤ 5 x 10^{-4}	≤ 25 x 10^{-4}
0.39 µF < C ≤ 0.56 µF	≤ 10 x 10^{-4}	≤ 25 x 10^{-4}
0.56 µF < C ≤ 0.82 µF	≤ 10 x 10^{-4}	≤ 40 x 10^{-4}
0.82 µF < C ≤ 1.2 µF	≤ 10 x 10^{-4}	≤ 50 x 10^{-4}
1.2 µF < C ≤ 1.8 µF	≤ 10 x 10^{-4}	≤ 65 x 10^{-4}
1.8 µF < C ≤ 2.2 µF	≤ 15 x 10^{-4}	≤ 75 x 10^{-4}
2.2 µF < C ≤ 2.7 µF	≤ 15 x 10^{-4}	≤ 85 x 10^{-4}
Rated voltage pulse slope (dU/d_t)R:		
C ≤ 0.15 µF	450 V/µs	
0.15 µF < C ≤ 0.39 µF	900 V/µs	
0.39 µF < C ≤ 0.82 µF	290 V/µs	
0.82 µF < C ≤ 2 µF	190 V/µs	
2 µF < C ≤ 2.7 µF	130 V/µs	
R between leads, for C ≤ 1 µF at 100 V, 1 min	> 100 000 MΩ	
RC between leads, for C >1 µF at 100 V, 1 min	> 100 000 s	
R between leads and case, 100 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 50 pC peak discharge	> 220 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	400 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 250 V; U_{Rac} = 125 V; U_{pp} = 350 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					
			LOOSE IN BOX		REEL			C-VALUE
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		
						Ø 500 mm	Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.082 0.091 0.1	5.0 x 11.0 (13.0) x 17.5	1.1	**00…** (1250)	**04…** (1000)	**02…** (1100)	**03…** (950)	**05…** (550)	**823** **913** **104**
0.11 0.12 0.13 0.15	6.0 x 12.0 (14.0) x 17.5	1.4	**00…** (1000)	**04…** (1000)	**02…** (900)	**03…** (800)	**05…** (450)	**114** **124** **134** **154**
0.16 0.18 0.2	7.0 x 13.5 (15.5) x 17.5	1.8	**00…** (750)	**04…** (500)	**02…** (800)	**03…** (700)	**05…** (400)	**164** **184** **204**
0.22 0.24 0.27 0.3	8.5 x 15.0 (17.0) x 17.5	2.6	**00…** (750)	**04…** (500)	**02…** (650)	**03…** (550)	**05…** (300)	**224** **244** **274** **304**
0.33 0.36 0.39	10.0 x 16.5 (18.5) x 17.5	3.3	**00…** (500)	**04…** (450)	**02…** (600)	**03…** (500)	**05…** (250)	**334** **364** **394**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

U_{Rdc} = 250 V; U_{Rac} = 125 V; U_{pp} = 350 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING			
			LOOSE IN BOX		REEL	C-VALUE
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 22.5 mm**	
0.43	7.0 x 116.5 x 26.0	3.0	**00…** (200)	**04…** (250)	**02…** (550)	**434**
0.47 0.51 0.56 0.62	8.5 x 18.0 x 26.0	4.2	**00…** (200)	**04…** (250)	**02…** (450)	**474** **514** **564** **624**
0.68 0.75 0.82	10.0 x 19.5 x 26.0	5.3	**00…** (200)	**04…** (200)	**02…** (350)	**684** **754** **824**
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**	
0.91 1.0 1.1 1.2	11.0 x 21.0 x 31.0	8.0	**00…** (750)	**04…** (125)	-	**914** **105** **115** **125**
1.3 1.5 1.6	13.0 x 23.0 x 31.0	9.7	**00…** (500)	**04…** (125)		**135** **155** **165**
1.8 2.0	15.0 x 25.0 x 31.0	12.6	**00…** (100)	**00…** (125)		**185** **205**
2.2 2.4 2.7	18.0 x 28.0 x 31.0	16.3	**00…** (100)	**00…** (100)		**225** **245** **275**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (400 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.22 µF	≤ 5 x 10^{-4}	≤ 20 x 10^{-4}
0.22 µF < C ≤ 0.33 µF	≤ 10 x 10^{-4}	≤ 35 x 10^{-4}
0.33 µF < C ≤ 0.43 µF	≤ 10 x 10^{-4}	≤ 40 x 10^{-4}
0.43 µF < C ≤ 0.68 µF	≤ 10 x 10^{-4}	≤ 50 x 10^{-4}
0.68 µF < C ≤ 0.82 µF	≤ 10 x 10^{-4}	≤ 55 x 10^{-4}
0.82 µF < C ≤ 1.2 µF	≤ 10 x 10^{-4}	≤ 60 x 10^{-4}
1.2 µF < C ≤ 1.5 µF	≤ 10 x 10^{-4}	≤ 65 x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$:		
C ≤ 0.082 µF	600 V/µs	
0.082 µF < C ≤ 0.22 µF	1200 V/µs	
0.22 µF < C ≤ 0.43 µF	410 V/µs	
0.42 µF < C ≤ 1.1 µF	260 V/µs	
1.1 µF < C ≤ 1.5 µF	180 V/µs	
R between leads, for C ≤ 1 µF at 100 V, 1 min	> 100 000 MΩ	
RC between leads, for C >1 µF at 100 V, 1 min	> 100 000 s	
R between leads and case, 100 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 50 pC peak discharge	> 220 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	560 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum aplication temperature	105 °C	

U_{Rdc} = 400 V; U_{Rac} = 200 V; U_{pp} = 560 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					C-VALUE
			LOOSE IN BOX		REEL			
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.047	5.0 x 11.0 (13.0) x 17.5	1.1	**10…** (1250)	**14…** (1000)	**12…** (1100)	**13…** (950)	**15…** (550)	**473**
0.051								**513**
0.056								**563**
0.062	6.0 x 12.0 (14.0) x 17.5	1.4	**10…** (1000)	**14…** (1000)	**12…** (900)	**13…** (800)	**15…** (450)	**623**
0.068								**683**
0.075								**753**
0.082								**823**
0.091	7.0 x 13.5 (15.5) x 17.5	1.8	**10…** (750)	**14…** (500)	**12…** (800)	**13…** (700)	**15…** (400)	**913**
0.1								**104**
0.11								**114**
0.12	8.5 x 15.0 (17.0) x 17.5	2.5	**10…** (750)	**14…** (500)	**12…** (650)	**13…** (550)	**15…** (300)	**124**
0.13								**134**
0.15								**154**
0.16								**164**
0.18	10.0 x 16.5 (18.5) x 17.5	3.3	**10…** (500)	**14…** (450)	**12…** (600)	**13…** (500)	**15…** (250)	**184**
0.2								**204**
0.22								**224**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

U_{Rdc} = 400 V; U_{Rac} = 200 ; U_{p-p} = 560 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING			
			LOOSE IN BOX		REEL	C-VALUE
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 22.5 mm**	
0.24	7.0 x 116.5 x 26.0	3.0	**10…** (200)	**14…** (250)	**12…** (550)	**244**
0.27 0.30 0.33	8.5 x 18.0 x 26.0	4.2	**10…** (200)	**14…** (250)	**12…** (450)	**274** **304** **334**
0.36 0.39 0.43	10.0 x 19.5 x 26.0	5.3	**10…** (200)	**14…** (200)	**12…** (350)	**364** **394** **434**
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**	
0.47 0.51 0.56 0.62	11.0 x 21.0 x 31.0	8.0	**10…** (100)	**14…** (125)	-	**474** **514** **564** **624**
0.68 0.75 0.82	13.0 x 23.0 x 31.0	9.7	**10…** (100)	**14…** (125)		**684** **754** **824**
0.91 1. 1.1	15.0 x 25.0 x 31.0	12.6	**10…** (100)	**14…** (125)	-	**914** **105** **115**
1.2 1.3 1.5	18.0 x 28.0 x 31.0	16.3	**10…** (100)	**14…** (100)		**125** **135** **155**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (630 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.15 µF	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
0.15 µF < C ≤ 0.22 µF	≤ 8 x 10^{-4}	≤ 25 x 10^{-4}
0.22 µF < C ≤ 0.3 µF	≤ 8 x 10^{-4}	≤ 30 x 10^{-4}
0.3 µF < C ≤ 0.47 µF	≤ 10 x 10^{-4}	≤ 40 x 10^{-4}
0.47 µF < C ≤ 0.68 µF	≤ 10 x 10^{-4}	≤ 45 x 10^{-4}
0.68 µF < C ≤ 1.0 µF	≤ 10 x 10^{-4}	≤ 50 x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$:		
C ≤ 0.056 µF	700 V/µs	
0.056 µF < C ≤ 0.15 µF	1400 V/µs	
0.15 µF < C ≤ 0.3 µF	470 V/µs	
0.3 µF < C ≤ 0.75 µF	300 V/µs	
0.75 µF < C ≤ 1.0 µF	210 V/µs	
R between leads, for C ≤ 1 µF at 100 V, 1 min	> 100 000 MΩ	
R between leads and case, 100 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 50 pC peak discharge	> 250 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	1000 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 630 V; U_{Rac} = 220 V; U_{p-p} = 630 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					
			LOOSE IN BOX		REEL			C-VALUE
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.03 0.033 0.036	5.0 x 11.0 (13.0) x 17.5	1.1	**20…** (1250)	**24…** (1000)	**22…** (2200)	**23…** (950)	**25…** (550)	**303** **333** **363**
0.039 0.043 0.047 0.051 0.056	6.0 x 12.0 (14.0) x 17.5	1.4	**20…** (1000)	**24…** (1000)	**22…** (900)	**23…** (800)	**25…** (450)	**393** **433** **473** **513** **563**
0.062 0.068 0.075	7.0 x 13.5 (15.5) x 17.5	1.8	**20…** (750)	**24…** (500)	**22…** (800)	**23…** (700)	**25…** (400)	**623** **683** **753**
0.082 0.091 0.1 0.11	8.5 x 15.0 (17.0) x 17.5	2.5	**20…** (750)	**24…** (500)	**22…** (650)	**23…** (550)	**25…** (300)	**823** **913** **104** **114**
0.12 0.13 0.15	10.0 x 16.5 (18.5) x 17.5	3.3	**20…** (500)	**24…** (450)	**22…** (600)	**23…** (500)	**25…** (250)	**124** **134** **154**
Pitch = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 22.5 mm**			
0.16 0.18 0.2 0.22	8.5 x 18.0 x 26.0	4.2	**20…** (200)	**24…** (250)	**22…** (450)	-	-	**164** **184** **204** **224**
0.24 0.27 0.3	10.0 x 19.5 x 26.0	5.3	**20…** (200)	**24…** (200)	**22…** (350)	-	-	**174** **304**
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**			
0.33 0.36 0.39 0.43	11.0 x 21.0 x 31.0	8.0	**20…** (750)	**24…** (125)				**334** **364** **394** **434**
0.47 0.51 0.56	13.0 x 23.0 x 31.0	9.7	**20…** (500)	**24…** (125)		-		**474** **514** **564**
0.62 0.68 0.75	15.0 x 25.0 x 31.0	12.6	**20…** (100)	**24…** (125)				**624** **684** **754**
0.82 0.91 1.0	18.0 x 28.0 x 31.0	16.3	**20…** (100)	**24…** (100)				**824** **914** **105**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (1000 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.062 µF	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
0.062 µF < C ≤ 0.13 µF	≤ 6 x 10^{-4}	≤ 20 x 10^{-4}
0.13 µF < C ≤ 0.22 µF	≤ 8 x 10^{-4}	≤ 25 x 10^{-4}
0.22 µF < C ≤ 0.33 µF	≤ 8 x 10^{-4}	≤ 30 x 10^{-4}
0.33 µF < C ≤ 0.47 µF	≤ 8 x 10^{-4}	≤ 35 x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$:		
C ≤ 0.024 µF	1700 V/µs	
0.024 µF < C ≤ 0.062 µF	3300 V/µs	
0.062 µF < C ≤ 0.13 µF	1200 V/µs	
0.13 µF < C ≤ 0.33 µF	700 V/µs	
0.33 µF < C ≤ 0.47 µF	470 V/µs	
R between leads, for C ≤ 1 µF at 500 V, 1 min	> 100 000 MΩ	
R between leads and case, 500 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 50 pC peak discharge	> 440 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	1600 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 1000 V; U_{Rac} = 350 V; U_{p-p} = 1000 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					C-VALUE
			LOOSE IN BOX		REEL			
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.0043	5.0 x 11.0 (13.0) x 17.5	1.1	**30…** (1250)	**34…** (1000)	**32…** (1100)	**33…** (950)	**35…** (550)	**432**
0.0047								**472**
0.0051								**512**
0.0056								**562**
0.0062								**622**
0.0068								**682**
0.0075								**752**
0.0082								**822**
0.0091								**912**
0.01								**103**
0.011								**113**
0.012								**123**
0.013								**133**
0.015								**153**
0.016								**163**
0.018	6.0 x 12.0 (14.0) x 17.5	1.4	**30…** (1000)	**34…** (1000)	**32…** (900)	**33…** (800)	**35…** (450)	**183**
0.02								**203**
0.022								**223**
0.024								**243**
0.027	7.0 x 13.5 (15.5) x 17.5	1.8	**30…** (750)	**34…** (500)	**32…** (800)	**33…** (700)	**35…** (400)	**273**
0.030								**303**
0.033								**333**
0.036	8.5 x 15.0 (17.0) x 17.5	2.5	**30…** (750)	**34…** (500)	**32…** (650)	**33…** (550)	**35…** (300)	**363**
0.039								**393**
0.043								**433**
0.047								**473**
0.051	10.0 x 16.5 (18.5) x 17.5	3.3	**30…** (500)	**34…** (450)	**32…** (600)	**33…** (500)	**35…** (250)	**513**
0.056								**563**
0.062								**623**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING			
			LOOSE IN BOX		REEL	C-VALUE
			Leads	Leads	Original pitch	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch 22.5 mm**	
0.068	7.0 x 16.5 x 26.5	3.0	**30 ...** (200)	**34...** (250)	**32...** (550)	**683**
0.075 0.082 0.091	8.5 x 18.0 x 26.0	4.2	**30...** (200)	**34...** (250)	**32...** (450)	**753** **823** **913**
0.1 0.11 0.12 0.13	10.0 x 19.5 x 26.0	5.3	**30...** (200)	**34...** (200)	**32...** (350)	**104** **114** **124** **134**
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**	
0.15 0.16 0.18	11.0 x 21.0 x 31.0	8.0	**30...** (100)	**34...** (125)	-	**154** **164** **184**
0.2 0.22 0.24	13.0 x 23.0 x 31.0	9.7	**30...** (100)	**34...** (125)		**204** **224** **244**
0.27 0.3 0.33	15.0 x 25.0 x 31.0	12.6	**30...** (100)	**34...** (125)		**274** **304** **334**
0.36 0.39 0.43 0.47	18.0 x 28.0 x 31.0	16.3	**30...** (100)	**34...** (100)		**364** **394** **434** **474**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (1400 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.016 µF	≤ 5 x 10^{-4}	≤ 10 x 10^{-4}
0.016 µF < C ≤ 0.039 µF	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
0.039 µF < C ≤ 0.13 µF	≤ 5 x 10^{-4}	≤ 20 x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$:		
C ≤ 0.0056 µF	8000 V/µs	
0.0056 µF < C ≤ 0.016 µF	15 000 V/µs	
0.016 µF < C ≤ 0.039 µF	4000 V/µs	
0.039 µF < C ≤ 0.1 µF	2100 V/µs	
0.1 µF < C ≤ 0.13 µF	1500 V/µs	
R between leads, for C ≤ 1 µF at 500 V, 1 min	> 100 000 MΩ	
R between leads and case, 500 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 20 pC peak discharge	> 500 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	2250 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 1400 V; U_{Rac} = 500 V; U_{p-p} = 1400 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					C-VALUE
			LOOSE IN BOX		REEL			
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.0022 0.0024 0.0027 0.003 0.0033 0.0036 0.0039	5.0 x 11.0 (13.0) x 17.5	1.1	**40...** (1250)	**44...** (1000)	**42...** (1100)	**43...** (950)	**45...** (550)	**222** **242** **272** **302** **332** **362** **392**
0.0043 0.0047 0.0051 0.0056	6.0 x 12.0 (14.0) x 17.5	1.4	**40...** (1000)	**44...** (1000)	**42...** (900)	**43...** (800)	**45...** (450)	**432** **472** **512** **562**
0.0062 0.0068 0.0075 0.0082	7.0 x 13.5 (15.5) x 17.5	1.8	**40...** (750)	**44...** (500)	**42...** (800)	**43...** (700)	**45...** (400)	**622** **682** **752** **822**
0.0091 0.01 0.011 0.012	8.5 x 15.0 (17.0) x 17.5	2.5	**40...** (750)	**44...** (500)	**42...** (650)	**43...** (550)	**45...** (300)	**912** **103** **113** **123**
0.013 0.015 0.016	10.0 x 16.5 (18.5) x 17.5	3.3	**40...** (500)	**44...** (450)	**42...** (600)	**43...** (500)	**45...** (250)	**133** **153** **163**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 22.5 mm**			
0.018 0.02	7.0 x 16.5 x 26.0	3	**40...** (200)	**44...** (250)	**42...** (550)	-	-	**183** **203**
0.022 0.024 0.027	8.5 x 18.0 x 26.0	4.2	**40...** (200)	**44...** (250)	**42...** (450)	-	-	**223** **243** **273**
0.03 0.033 0.036 0.039	10.0 x 19.5 x 26.0	5.3	**40...** (200)	**44...** (200)	**42...** (350)	-	-	**303** **333** **363** **393**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**			
0.043 0.047 0.051 0.056	11.0 x 21.0 x 31.0	8	**40...**	**44...**				**433** **473** **513** **563**
0.062 0.068 0.075	13.0 x 23.0 x 31.0	9.7	**40...** (100)	**44...** (125)		-		**623** **683** **753**
0.082 0.091 0.1	15.0 x 25.0 x 31.0	12.6	**40...** (100)	**44...** (125)				**823** **913** **104**
0.11 0.12 0.13	18.0 x 28.0 x 31.0	16.3	**40...** (100)	**44...** (100)				**114** **124** **134**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (1600 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
$C \leq 0.015$ µF	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
0.015 µF < C ≤ 0.15 µF	$\leq 5 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$:		
$C \leq 0.0056$ µF	8000 V/µs	
0.0056 µF < C ≤ 0.0075 µF	15 000 V/µs	
0.0075 µF < C ≤ 0.039 µF	3100 V/µs	
0.039 µF < C ≤ 0.1 µF	1800 V/µs	
0.1 µF < C ≤ 0.15 µF	1200 V/µs	
R between leads, for C ≤ 1 µF at 500 V, 1 min	> 100 000 MΩ	
R between leads and case, 500 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 20 pC peak discharge	> 660 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	2560 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum aplication temperature	105 °C	

U_{Rdc} = 1600 V; U_{Rac} = 550 V; U_{p-p} = 1600 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					C-VALUE
			LOOSE IN BOX		REEL			
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.0027	5.0 x 11.0 (13.0) x 17.5	1.1	**50…** (1250)	**54…** (1000)	**52…** (1100)	**53…** (950)	**55…** (550)	**272**
0.003								**302**
0.0033								**332**
0.0036								**362**
0.0039								**392**
0.0043	6.0 x 12.0 (14.0) x 17.5	1.4	**50…** (1000)	**54…** (1000)	**52…** (900)	**53…** (800)	**55…** (450)	**432**
0.0047								**472**
0.0051								**512**
0.0056								**562**
0.0062	7.0 x 13.5 (15.5) x 17.5	1.8	**50…** (750)	**54…** (500)	**52…** (800)	**53…** (700)	**55…** (400)	**622**
0.0068								**682**
0.0075								**752**
0.0082	8.5 x 15.0 (17.0) x 17.5	2.5	**50…** (750)	**54…** (500)	**52…** (650)	**53…** (550)	**55…** (300)	**822**
0.0091								**912**
0.01								**103**
0.011								**113**
0.012	10.0 x 16.5 (18.5) x 17.5	3.3	**50…** (500)	**54…** (450)	**52…** (600)	**53…** (500)	**55…** (250)	**123**
0.013								**133**
0.015								**153**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 22.5 mm**			
0.016	7.0 x 16.5 x 26.0	3.0	**50…** (200)	**54…** (250)	**52…** (550)	-	-	**163**
0.018								**183**
0.02								**203**
0.022	8.5 x 18.0 x 26.0	4.2	**50…** (200)	**54…** (250)	**52…** (450)	-	-	**223**
0.024								**243**
0.027								**273**
0.03								**303**
0.033	10.0 x 19.5 x 26.0	5.3	**50…** (200)	**54…** (200)	**52…** (350)	-	-	**333**
0.036								**363**
0.039								**393**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

U_{Rdc} = 1600 V; U_{Rac} = 550 V; U_{p-p} = 1600 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					C-VALUE
			LOOSE IN BOX		REEL			
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 27.5 ± 0.4 mm; d_t= 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**			
0.043 0.047 0.051 0.056	11.0 x 21.0 x 31.0	8	**50…** (100)	**54…** (125)				**433** **473** **513** **563**
0.062 0.068 0.075	13.0 x 23.0 x 31.0	9.7	**50…** (100)	**54…** (125)				**623** **683** **753**
0.082 0.091 0.1	15.0 x 25.0 x 31.0	12.6	**50…** (100)	**54…** (125)				**823** **913** **104**
0.11 0.12 0.13 0.15	18.0 x 28.0 x 31.0	16.3	**50…** (100)	**54…** (100)				**114** **124** **134** **154**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (2000 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.01 µF	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
0.01 µF < C ≤ 0.1 µF	≤ 10 x 10^{-4}	≤ 18 x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$:		
C ≤ 0.0036 µF	11 000 V/µs	
0.0036 µF < C ≤ 0.01 µF	20 000 V/µs	
0.01 µF < C ≤ 0.024 µF	4400 V/µs	
0.024 µF < C ≤ 0.068 µF	2500 V/µs	
0.068 µF < C ≤ 0.1 µF	1800 V/µs	
R between leads, for C ≤ 1 µF at 500 V, 1 min	> 100 000 MΩ	
R between leads and case, 500 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 20 pC peak discharge	> 750 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	3200 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 2000 V; U_{Rac} = 700 V; U_{p-p} = 2000 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					C-VALUE
			LOOSE IN BOX		REEL			
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back)		
						Ø 500 mm	Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.001	5.0 x 11.0 (13.0) x 17.5	1.1	**60…** (1250)	**64…** (1000)	**62…** (1100)	**63…** (950)	**65…** (550)	**102**
0.0011								**112**
0.0012								**122**
0.0013								**132**
0.0015								**152**
0.0016								**162**
0.0018								**182**
0.002								**202**
0.0022								**222**
0.0024								**242**
0.0027	6.0 x 12.0 (14.0) x 17.5	1.4	**60…** (1000)	**64…** (1000)	**62…** (900)	**63…** (800)	**65…** (450)	**272**
0.003								**302**
0.0033								**332**
0.0036								**362**
0.0039	7.0 x 13.5 (15.5) x 17.5	1.8	**60…** (750)	**64…** (500)	**62…** (800)	**63…** (700)	**65…** (400)	**392**
0.0043								**432**
0.0047								**472**
0.0051	8.5 x 15.0 (17.0) x 17.5	2.5	**60…** (750)	**64…** (500)	**62…** (650)	**63…** (550)	**65…** (300)	**512**
0.0056								**562**
0.0062								**622**
0.0068								**682**
0.0075	10.0 x 16.5 (18.5) x 17.5	3.3	**60…** (500)	**64…** (450)	**62…** (600)	**63…** (500)	**65…** (250)	**752**
0.0082								**822**
0.0091								**912**
0.01								**103**
Pitch = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 22.5 mm**			
0.011	7.0 x 16.5 x 26.0	3.0	**60…** (200)	**64…** (250)	**62…** (550)	-	-	**113**
0.012								**123**
0.013								**133**
0.015	8.5 x 18.0 x 26.0	4.2	**60…** (200)	**64…** (250)	**62…** (450)	-	-	**153**
0.016								**163**
0.018								**183**
0.02	10.0 x 19.5 x 26.0	5.3	**60…** (200)	**64…** (200)	**62…** (350)	-	-	**203**
0.022								**223**
0.024								**243**
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**			
0.027	11.0 x 21.0 x 31.0	8.0	**60…** (100)	**64…** (125)	-			**273**
0.03								**303**
0.033								**333**
0.036								**363**
0.039								**393**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

C (µF)	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING					
			LOOSE IN BOX		REEL			C-VALUE
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
						Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm					**Pitch = 27.5 mm**			
0.043 0.047 0.051	13.0 x 23.0 x 31.0	9.7	**60…** (100)	**64…** (125)				**433** **473** **513**
0.056 0.062 0.068	15.0 x 25.0 x 31.0	12.6	**60…** (100)	**64…** (125)		-		**563** **623** **683**
0.075 0.082 0.091 0.10	18.0 x 28.0 x 31.0	16.3	**60…** (100)	**64…** (100)				**753** **823** **913** **104**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

SPECIFIC REFERENCE DATA (2500 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
C ≤ 0.015 µF	≤ 5 x 10^{-4}	≤ 10 x 10^{-4}
0.015 µF < C ≤ 0.056 µF	≤ 5 x 10^{-4}	≤ 15x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$:		
C ≤ 0.015 µF	13 000 V/µs	
0.015 µF < C ≤ 0.043 µF	6000 V/µs	
0.043 µF < C ≤ 0.056 µF	4200 V/µs	
R between leads, for C ≤ 1 µF at 500 V, 1 min	> 100 000 MΩ	
R between leads and case, 500 V, 1 min	> 30 000 MΩ	
Ionization (AC) voltage (typical value) at 20 pC peak discharge	> 1000 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	3500 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 2500 V; U_{Rac} = 900 V; $U_{p=p}$ = 2500 V; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 383 XXYYY AND PACKAGING			
			LOOSE IN BOX		REEL	C-VALUE
			Leads 3.5 ± 0.3 mm	Leads 25.0 ± 2.0 mm	H = 18.5 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 22.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm						
0.001	6.0 x 15.5 x 26.0	2.4	**70…** (200)	**74…** (250)	**72…** (600)	**102**
0.0011						**112**
0.0012						**122**
0.0013						**132**
0.0015						**152**
0.0016						**162**
0.0018						**182**
0.002						**202**
0.0022						**222**
0.0024						**242**
0.0027						**272**
0.003						**302**
0.0033						**332**
0.0036						**362**
0.0039						**392**
0.0043						**432**
0.0047						**472**
0.0051						**512**
0.0056	7.0 x 16.5 x 26.0	3.0	**70…** (200)	**74…** (250)	**72…** (550)	**562**
0.0062						**622**
0.0068						**682**
0.0075						**752**
0.0082	8.5 x 18.0 x 26.0	4.2	**70…** (200)	**74…** (250)	**72…** (450)	**822**
0.0091						**912**
0.01						**103**
0.011						**113**
0.012	10.0 x 19.5 x 26.0	5.3	**70…** (200)	**74…** (200)	**72…** (350)	**123**
0.013						**133**
0.015						**153**
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 mm ± 0.08 mm						
0.016	9.0 x 19.0 x 31.0	5.9	**70…**	**74…**	-	**163**
0.018	11.0 x 21.0 x 31.0	8.0	**70…** (100)	**74…** (125)		**183**
0.02						**203**
0.022						**223**
0.024						**243**
0.027	13.0 x 23.0 x 31.0	9.7	**70…** (100)	**74…** (125)		**273**
0.03						**303**
0.033						**333**
0.036	15.0 x 25.0 x 31.0	12.6	**70…** (100)	**74…** (125)		**363**
0.039						**393**
0.043						**433**
0.047	18.0 x 28.0 x 31.0	16.3	**70…** (100)	**74…** (100)		**473**
0.051						**513**
0.056						**563**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting on printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to “Packaging Information” www.vishay.com/docs?28139

Specific Method of Mounting to Withstand Vibration and Shock

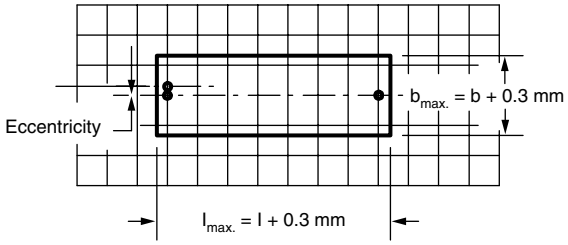
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- For original pitch = 15 mm the capacitors shall be mechanically fixed by the leads
- For larger 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 the 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



Storage Temperature

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

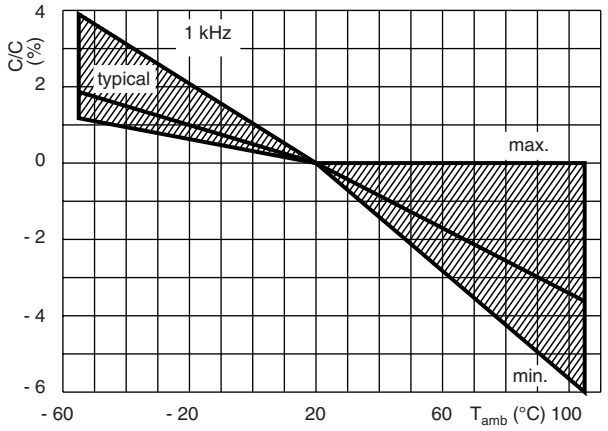
Ratings and Characteristics Reference Conditions

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

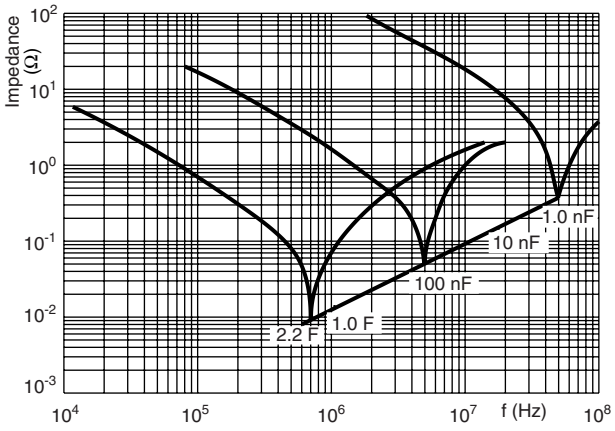
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

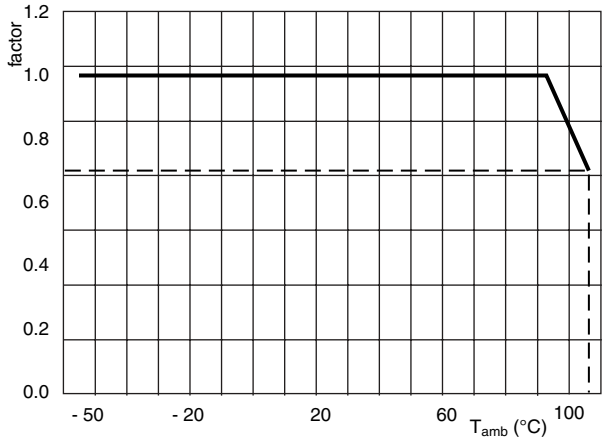
Capacitance as a function of ambient temperature (typical curve) (1 kHz)



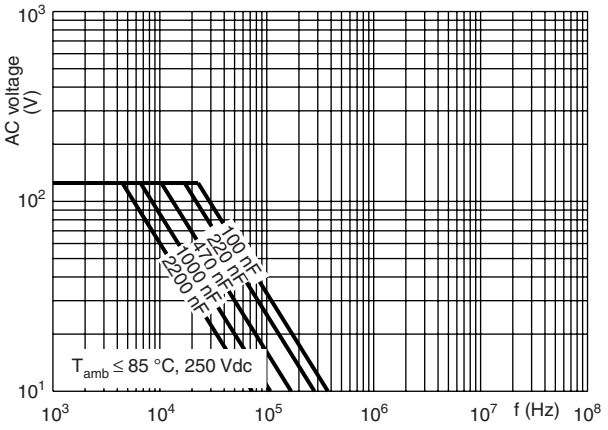
Impedance as a function of frequency (typical curve)



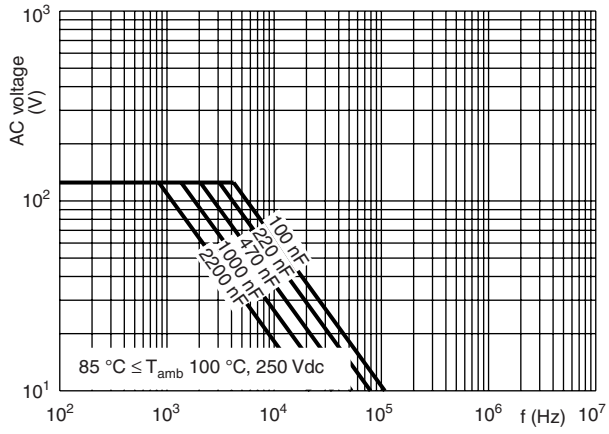
Max. DC and AC voltage as function of temperature



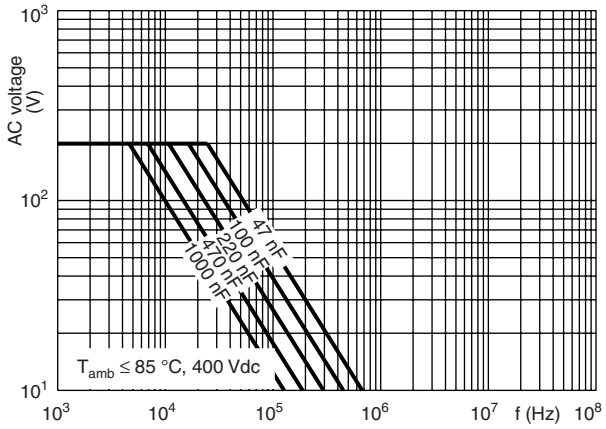
Max. RMS voltage as a function of frequency



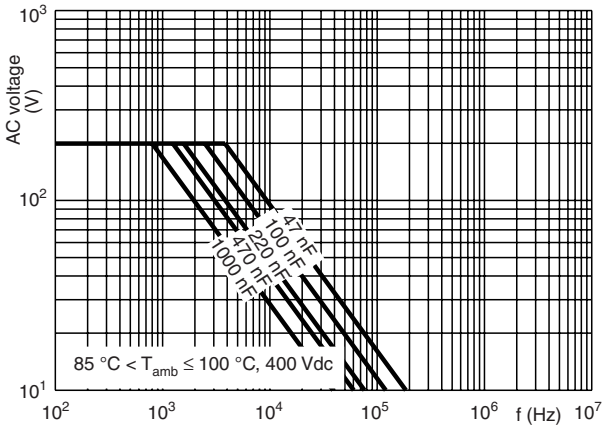
Max. RMS voltage as a function of frequency



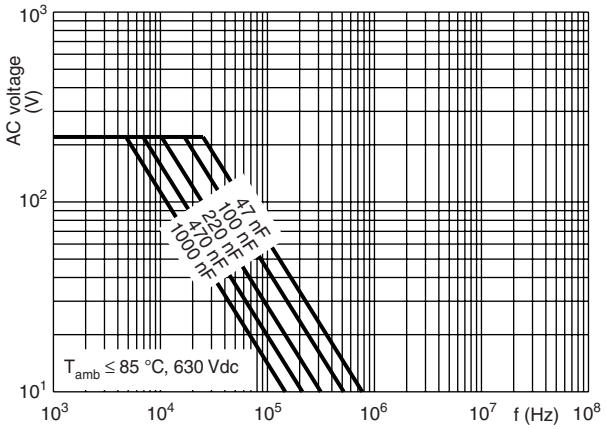
Max. RMS voltage as a function of frequency



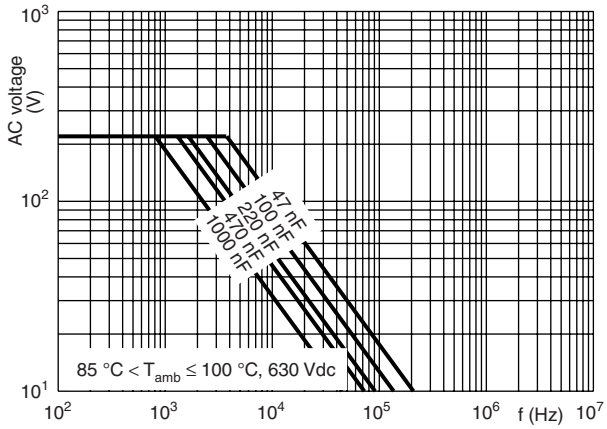
Max. RMS voltage as a function of frequency



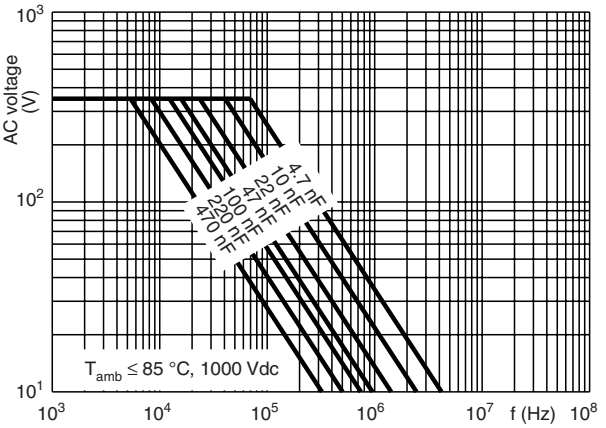
Max. RMS voltage as a function of frequency



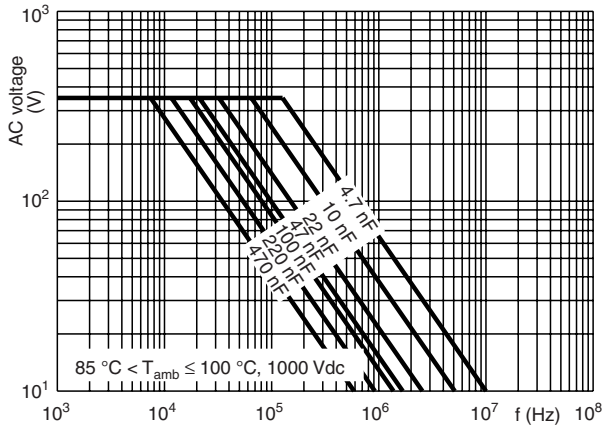
Max. RMS voltage as a function of frequency



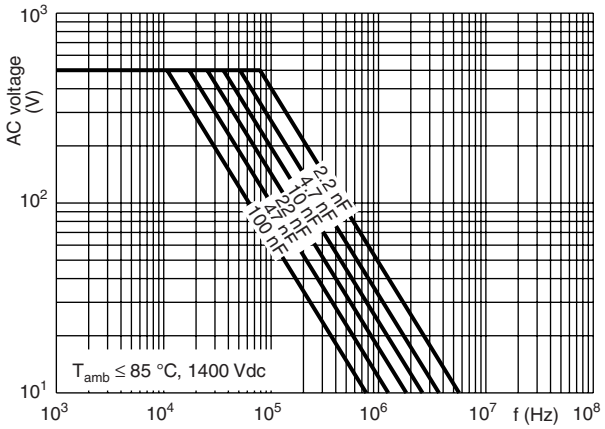
Max. RMS voltage as a function of frequency



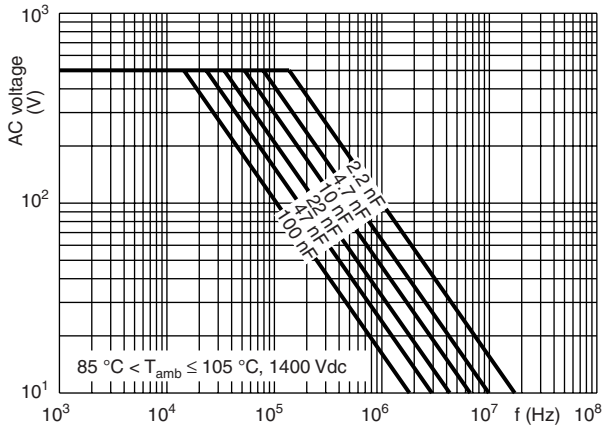
Max. RMS voltage as a function of frequency



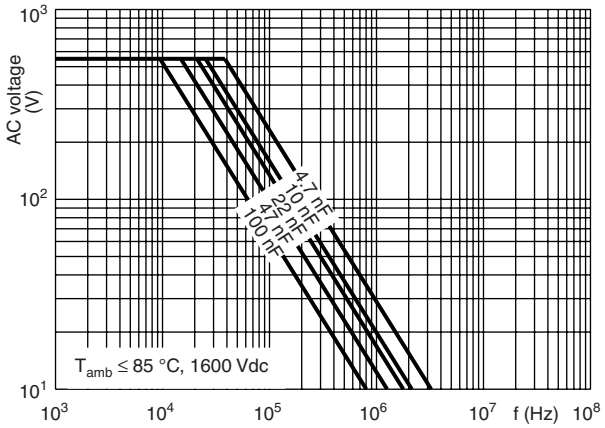
Max. RMS voltage as a function of frequency



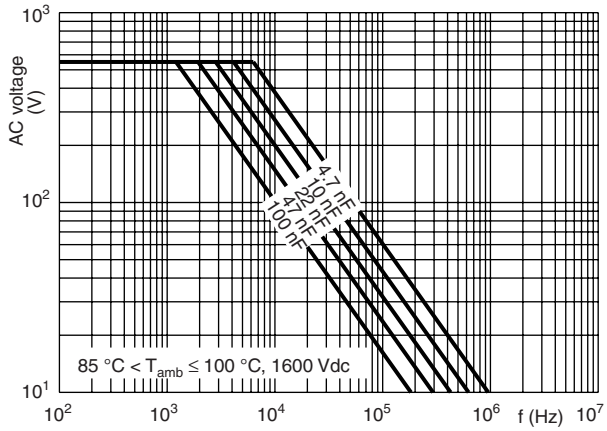
Max. RMS voltage as a function of frequency



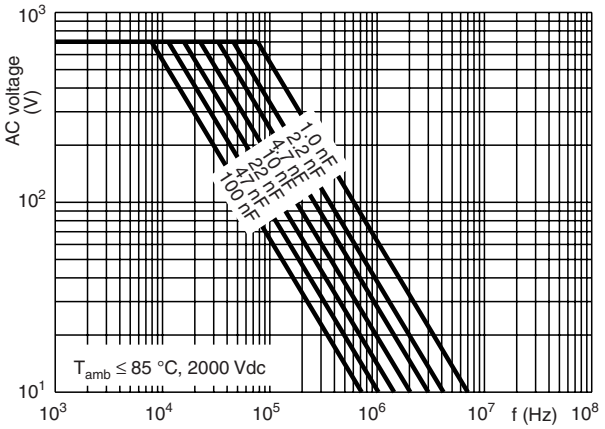
Max. RMS voltage as a function of frequency



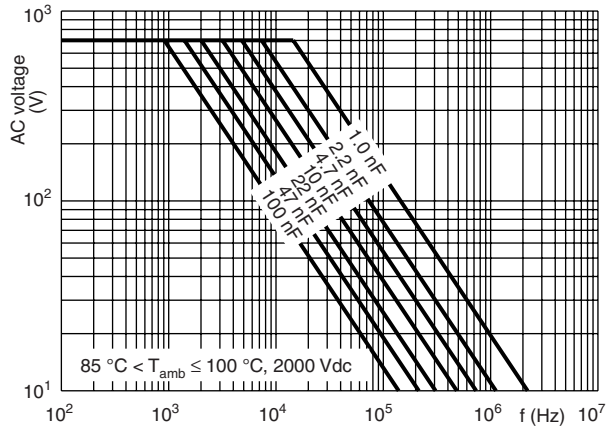
Max. RMS voltage as a function of frequency



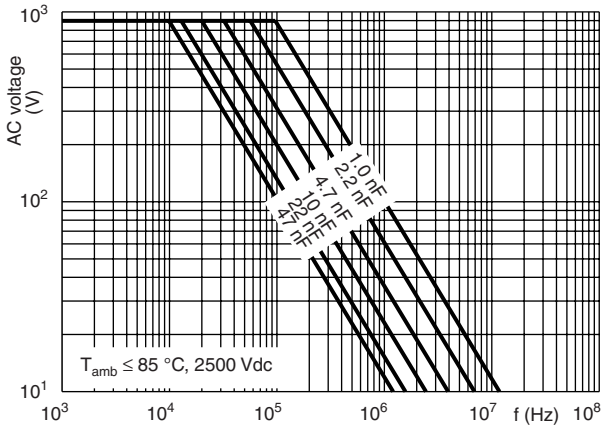
Max. RMS voltage as a function of frequency



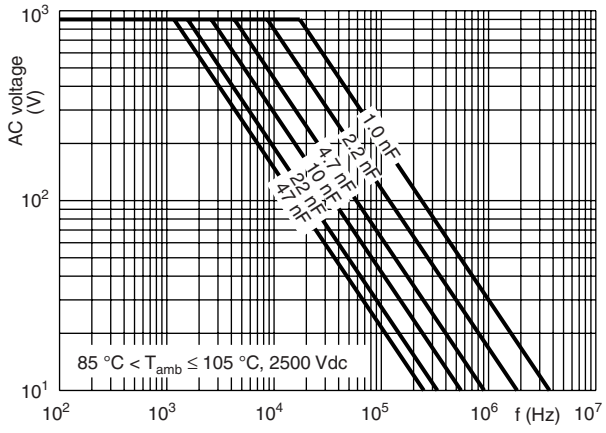
Max. RMS voltage as a function of frequency



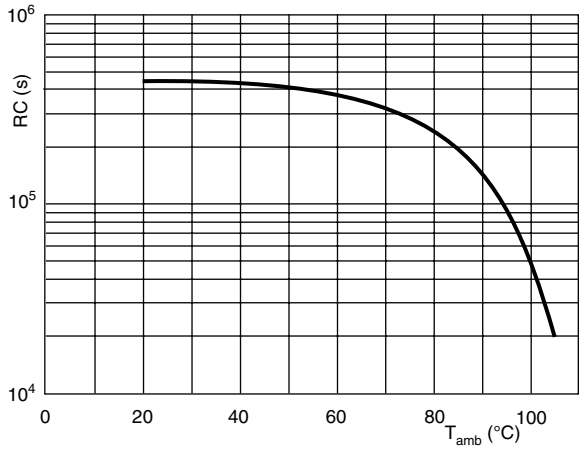
Max. RMS voltage as a function of frequency



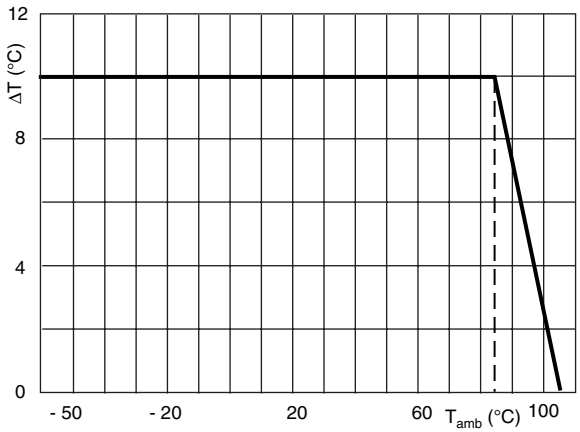
Max. RMS voltage as a function of frequency



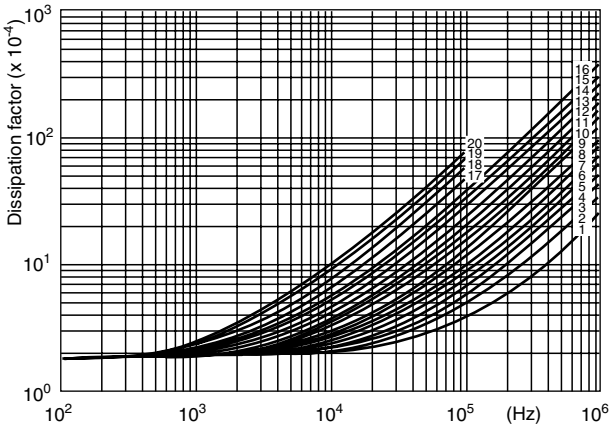
Insulation resistance as a function of ambient temperature



Max. allowed component temperature rise (ΔT) as a function of the ambient temperature (T_{amb})



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



250 V	400 V	630 V	1000 V
C ≤ 0.091 µF, curve 8	C ≤ 0.047 µF, curve 5	C ≤ 0.033 µF, curve 4	C ≤ 0.01 µF, curve 2
C ≤ 0.015 µF, curve 9	C ≤ 0.068 µF, curve 6	C ≤ 0.068 µF, curve 5	C ≤ 0.027 µF, curve 3
C ≤ 0.022 µF, curve 10	C ≤ 0.1 µF, curve 7	C ≤ 0.1 µF, curve 6	C ≤ 0.047 µF, curve 4
C ≤ 0.027 µF, curve 11	C ≤ 0.2 µF, curve8	C ≤ 0.15 µF, curve 7	C ≤ 0.062 µF, curve 5
C ≤ 0.033 µF, curve 12	C ≤ 0.24 µF, curve 12	C ≤ 0.22 µF, curve 11	C ≤ 0.075 µF, curve 6
C ≤ 0.056 µF, curve 15	C ≤ 0.36 µF, curve 13	C ≤ 0.27 µF, curve 12	C ≤ 0.1 µF, curve 7
C ≤ 0.082 µF, curve 16	C ≤ 0.43 µF, curve 14	C ≤ 0.47 µF, curve 15	C ≤ 0.15 µF, curve 8
C ≤ 1.2 µF, curve 18	C ≤ 0.56 µF, curve 16	C ≤ 0.68 µF, curve 16	C ≤ 0.22 µF, curve 9
C ≤ 1.61 µF, curve 19	C ≤ 1.1 µF, curve 17		C ≤ 0.3 µF, curve 10
C ≤ 2.21 µF, curve 20			C ≤ 0.39 µF, curve 11
			C ≤ 0.47 µF, curve 12

140 V	1600 V	2000 V	2500 V
C ≤ 0.0047 µF, curve 1	C ≤ 0.0047 µF, curve 3	C ≤ 0.0047 µF, curve 2	C ≤ 0.0047 µF, curve 1
C ≤ 0.016 µF, curve 2	C ≤ 0.0091 µF, curve 4	C ≤ 0.033 µF, curve 3	C ≤ 0.015 µF, curve 2
C ≤ 0.033 µF, curve 3	C ≤ 0.068 µF, curve 5	C ≤ 0.1 µF, curve 4	C ≤ 0.056 µF, curve 3
C ≤ 0.051 µF, curve 4	C ≤ 0.01 µF, curve 6		
C ≤ 0.068 µF, curve 5	C ≤ 0.15 µF, curve 7		
C ≤ 0.082 µF, curve 6			
C ≤ 0.1 µF, curve 7			

HEAT CONDUCTIVITY (G) AS A FUNCTION OF (ORIGINAL) PITCH AND CAPACITOR BODY THICKNESS IN mW/°C

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)		
	PITCH 15 mm	PITCH 22.5 mm	PITCH 27.5 mm
4.0	-	-	-
5.0	10	-	-
6.0	11	19	-
7.0	12	21	-
8.5	16	25	-
10.0	18	28	-
11.0	-	-	36
13.0	-	-	42
15.0	-	-	48
18.0	-	-	57

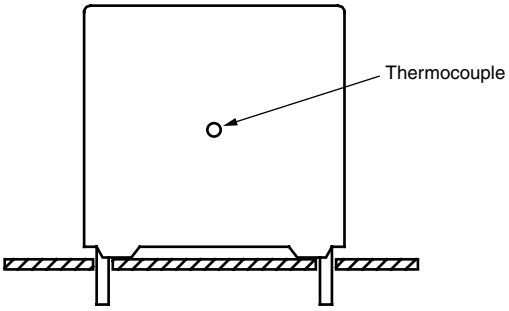
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.
The power dissipation can be calculated according type detail specification “HQN-384-01/101: Technical Information Film Capacitors”.
The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by ΔT = P/G:

- ΔT = Component temperature rise (°C)
- P = Power dissipation of the component (mW)
- G = Heat conductivity of the component (mW/°C)

MEASURING THE COMPONENT TEMPERATURE

A thermocouple must be attached to the capacitor body as in:



The temperature is measured in unloaded (T_{amb}) and maximum loaded condition (T_C).
The temperature rise is given by $\Delta T = T_C - T_{amb}$.
To avoid radiation or convection, the capacitor should be tested in a wind-free box.

APPLICATION NOTE AND LIMITING CONDITIONS

These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection, as described hereunder. These mains applications are strictly regulated in safety standards and therefore electromagnetic interference suppression capacitors conforming the standards must be used.

To select the capacitor for a certain application, the following conditions must be checked:

1. The peak voltage (U_P) shall not be greater than the rated DC voltage (U_{Rdc})
2. The peak-to-peak voltage (U_{P-P}) shall not be greater than $2\sqrt{2} \times U_{Rac}$ to avoid the ionisation inception level
3. The voltage pulse slope (dU/dt) shall not exceed the rated voltage pulse slope in an RC-circuit at rated voltage and without ringing. If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by U_{Rdc} and divided by the applied voltage.
   For all other pulses following equation must be fulfilled:

$$2 \times \int_0^T \left(\frac{dU}{dt}\right)^2 \times dt < U_{Rdc} \times \left(\frac{dU}{dt}\right)_{rated}$$

   T is the pulse duration.

4. The maximum component surface temperature rise must be lower than the limits (see graph max. allowed component temperature rise).
5. Since in circuits used at voltages over 280 V peak-to-peak the risk for an intrinsically active flammability after a capacitor breakdown (short circuit) increases, it is recommended that the power to the component is limited to 100 times the values mentioned in the table: “Heat Conductivity”

6. When using these capacitors as across-the-line capacitor in the input filter for mains applications or as series connected with an impedance to the mains the applicant must guarantee that the following conditions are fulfilled in any case (spikes and surge voltages from the mains included).

Voltage Conditions for 6 Above

ALLOWED VOLTAGES	$T_{amb} \leq 85$ °C	85 °C < $T_{amb} \leq 105$ °C
Maximum continuous RMS voltage	U_{Rac}	U_{Rac}
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	1.25 x U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.1 x U_{Rdc}

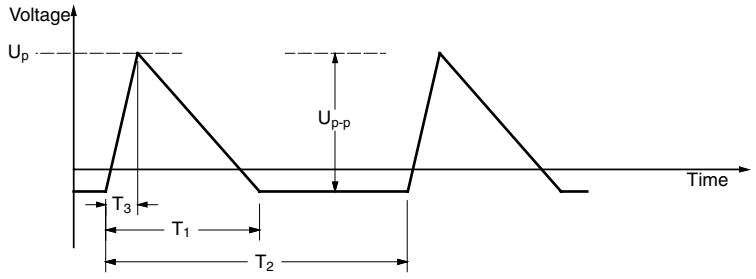
EXAMPLE

C = 4 nF - 1600 V used for the voltage signal shown in next drawing.
U_{P-P} = 1000 V; U_P = 900 V; T_1 = 12 µs; T_2 = 64 µs; T_3 = 4 µs
The ambient temperature is 80 °C. In case of failure, the oscillation is blocked.

Checking conditions:

1. The peak voltage U_P = 900 V is lower than 1600 Vdc
2. The peak-to-peak voltage 1000 V is lower than $2\sqrt{2}$ x 550 Vac = 1600 U_{P-P}
3. The voltage pulse slope (dU/dt) = 1000 V/4 µs = 250 V/µs
   This is lower than 8000 V/µs (see specific reference data for each version)
4. The dissipated power is 35 mW as calculated with fourier terms and typical tgd.
   The temperature rise for $W_{max.}$ = 6.0 mm and pitch = 15 mm will be 35 mW/11 mW/°C = 3.2 °C
   This is lower than 10 °C temperature rise at 80 °C, according graph.
5. Oscillation is blocked
6. Not applicable

Voltage Signal



INSPECTION REQUIREMENTS

General Notes:

Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-17 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
4.3.1	Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 100 kHz or for C > 1 µF at 10 kHz	
4.3	Robustness of terminations	Tensile: Load 10 N; 10 s Bending: Load 5 N; 4 x 90°	No visible damage
4.4	Resistance to soldering heat	Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.14	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	$\lvert\Delta C/C\rvert \leq 1$ % of the value measured initially
		Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: C ≤ 100 nF or ≤ 0.001 for: 100 nF < C ≤ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.3.1
SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1			
4.6.1	Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 100 kHz or for C > 1 µF at 10 kHz	
4.15	Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool	No visible damage Legible marking
4.6	Rapid change of temperature	Immersion time: 5.0 min ± 0.5 min θA = - 55 °C θB = + 105 °C 5 cycles Duration t = 30 min	
4.7	Vibration	Visual examination Mounting: see section “Mounting” for more information Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage

SUB-CLAUSE NUMBER AND TEST		CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1			
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/s² Duration of pulse: 11 ms	
4.9.3	Final measurements	Visual examination	No visible damage
		Capacitance	$\lvert\Delta C/C\rvert \leq 1$ % of the value measured in 4.6.1
		Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: C ≤ 100 nF or ≤ 0.001 for: 100 nF < C ≤ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.6.1
		Insulation resistance	As specified in section “Insulation Resistance” of this specification
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B			
4.10	Climatic sequence		
4.10.2	Dry heat	Temperature: + 105 °C Duration: 16 h	
4.10.3	Damp heat cyclic Test Db, first cycle		
4.10.4	Cold	Temperature: - 55 °C Duration: 2 h	
4.10.6	Damp heat cyclic Test Db, remaining cycles		
4.10.6.2	Final measurements	Voltage proof = U_{Rdc} for 1 min within 15 min after removal from testchamber	No breakdown of flash-over
		Visual examination	No visible damage Legible marking
		Capacitance	For original pitch = 22.5 mm and 27.5 mm: $\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.4.2 or 4.9.3
		Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: C ≤ 100 nF or ≤ 0.001 for: 100 nF < C ≤ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.3.1 or 4.6.1
		Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C2			
4.11	Damp heat steady state	56 days, 40 °C, 90 % to 95 % RH no load	
4.11.1	Initial measurements	Capacitance Tangent of loss angle at 1 kHz	
4.11.3	Final measurements	Voltage proof = U_{Rdc} for 1 min within 15 min after removal from testchamber	No breakdown of flash-over
		Visual examination	No visible damage Legible marking
		Capacitance	$\lvert\Delta C/C\rvert \leq 1$ % of the value measured in 4.11.1.
		Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: C ≤ 100 nF or ≤ 0.001 for: 100 nF < C ≤ 470 nF or ≤ 0.0015 for: C ≤ 470 nF Compared to values measured in 4.11.1
		Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C3A		
4.12.1 Endurance test at 50 Hz alternating voltage	Duration: 2000 h 1.25 x U_{Rdc} at 105 °C	
4.12.1.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 100 kHz or for C > 1 µF at 10 kHz	
4.12.1.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	|ΔC/C| ≤ 5 % compared to values measured in 4.12.1.1
	Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: C ≤ 100 nF or ≤ 0.001 for: 100 nF < C ≤ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.12.1.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C4		
4.2.6 Temperature charcteristics Initial measurements Intermediate measurements Final measurements	Capacitance Capacitance at - 55 °C Capacitance at 20 °C Capacitance at + 105 °C Capacitance Insulation resistance	For - 55 °C to + 20 °C: + 1 % ≤ |ΔC/C| ≤ 3.75 % or for 20 °C to 105 °C: - 6 % ≤ |ΔC/C| ≤ 0 % As specified in section “Capacitance” of this specification. As specified in section “Insulation Resistance” of this specification
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_{Rdc}}{5 \times C \times (2.5 \times dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 100 kHz or for C > 1 µF at 10 kHz	
4.13.3 Final measurements	Capacitance	|ΔC/C| ≤ 1 % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: C ≤ 100 nF or ≤ 0.001 for: 100 nF < C ≤ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification

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