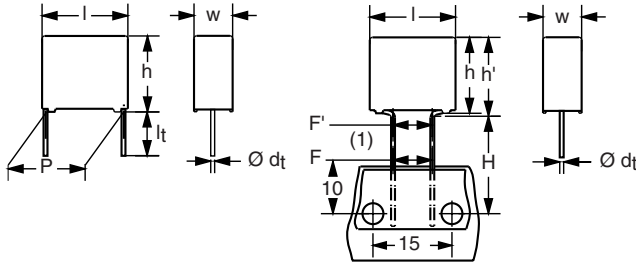


Interference Suppression Film Capacitors MKP Radial Potted Type



Dimensions in mm

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

APPLICATIONS

For standard across the line X2 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"
 CSA-C22.2 No. 1; UL1414
 CSA-E384-14; UL1283; CQC

MARKING

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

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized film

CONSTRUCTION

Mono construction

FEATURES

7.5 mm to 37.5 mm lead pitch
 Supplied loose in box, taped on ammpack or reel
 RoHS compliant product

RATED VOLTAGE

AC 310 V; 50 Hz to 60 Hz

PERMISSIBLE DC VOLTAGE

DC 630 V

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/110/56/B

CAPACITANCE RANGE (E12 SERIES)

E12 series 0.001 μF to 4.7 μF
 Preferred values acc. to E6

CAPACITANCE TOLERANCE

$\pm 20 \%$; $\pm 10 \%$; ($\pm 5 \%$: on request)

LEADS

Tinned wire

MAXIMUM APPLICATION TEMPERATURE

$C \leq 470 \text{ nF}$: 110 °C (125 °C for less than 1000 h)
 $C > 470 \text{ nF}$: 110 °C

DETAIL SPECIFICATION

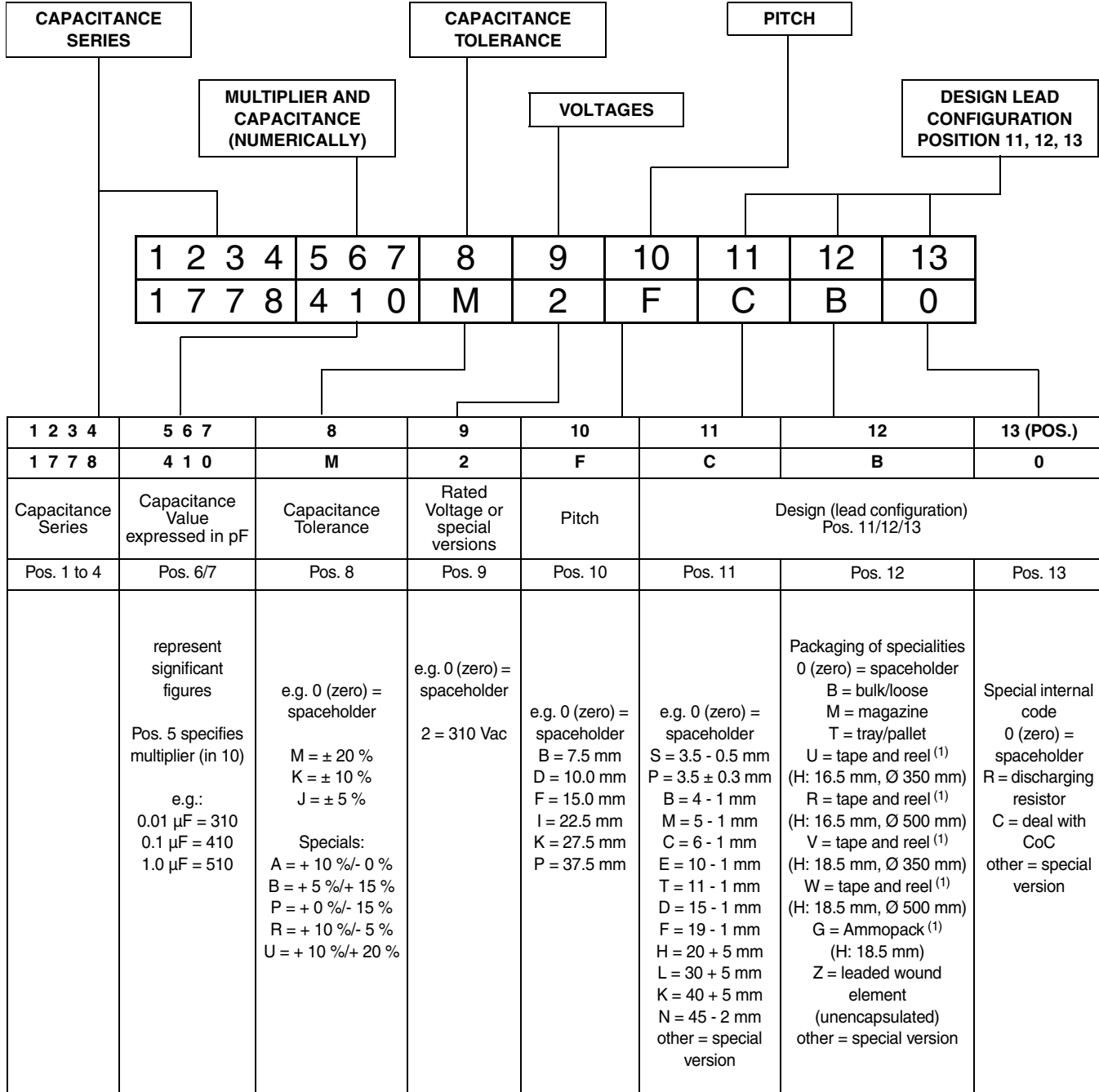
For more detailed data and test requirements contact:
RFI@vishay.com



RoHS
COMPLIANT

RFI FILM CAPACITORS SERIES 1778 (AC 310 V)

The new RFI Film Capacitor Code is made up 13 digit code (example)



Note

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



Interference Suppression Film Capacitors
MKP Radial Potted Type

Vishay Roederstein

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE
Rated AC voltage (U_{Rac})	310 V
Permissible DC voltage (U_{Rdc})	630 V
Tangent of loss angle:	at 1 kHz at 10 kHz
C < 470 nF	$\leq 10 \times 10^{-4}$ $\leq 20 \times 10^{-4}$
470 nF \leq C \leq 1 μ F	$\leq 20 \times 10^{-4}$ $\leq 70 \times 10^{-4}$
C > 1 μ F	$\leq 30 \times 10^{-4}$ -
Rated voltage pulse slope (dU/dt) _R at 435 Vdc	
Pitch = 7.5 mm	600 V/ μ s
Pitch = 10 mm	600 V/ μ s
Pitch = 15 mm and 7.5 mm (bent back)	400 V/ μ s
Pitch = 22.5 mm	150 V/ μ s
Pitch = 27.5 mm	100 V/ μ s
Pitch = 37.5 mm	100 V/ μ s
R between leads, for C \leq 0.33 μ F at 100 V; 1 min	> 15 000 M Ω
RC between leads, for C > 0.33 μ F at 100 V; 1 min	> 5000 s
R between leads and case; 100 V; 1 min	> 30 000 M Ω
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s:	
C \leq 1 μ F	2200 V; 1 min
C > 1 μ F	1800 V; 1 min
Withstanding (AC) voltage between leads and case	2120 V; 1 min
Max. application temperature for 0.001 μ F \leq C \leq 0.47 μ F	110 °C (125 °C less than 1000 h)
Max. application temperature for C > 0.47 μ F	110 °C

Capacitance μ F Pos. 5 to 7	Tolerance Code Pos. 8 J = \pm 5 % K = \pm 10 % M = \pm 20 %	Dimensions Max. w x h x l (mm)	Mass (g) ⁽³⁾	SPQ ⁽⁴⁾ Short Leads (pieces)	Ordering Code ⁽²⁾					
					Type	C-Value	Tolerance	Voltage	Pitch	Lead Length Design
					1 to 4	5 to 7	8	9	10	11 to 13 ⁽¹⁾
Pitch 7.5 \pm 0.4 mm; d_t = 0.50 \pm 0.05 mm										
0.001	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	210	.	2	B	..0
0.0012	K	4.0 x 9.0 x 10.0	0.45	1500	1778	212	K	2	B	..0
0.0015	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	215	.	2	B	..0
0.0018	K	4.0 x 9.0 x 10.0	0.45	1500	1778	218	K	2	B	..0
0.0022	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	222	.	2	B	..0
0.0027	K	4.0 x 9.0 x 10.0	0.45	1500	1778	227	K	2	B	..0
0.0033	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	233	.	2	B	..0
0.0039	K	4.0 x 9.0 x 10.0	0.45	1500	1778	239	K	2	B	..0
0.0047	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	247	.	2	B	..0
0.0056	K	4.0 x 9.0 x 10.0	0.45	1500	1778	256	K	2	B	..0
0.0068	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	268	.	2	B	..0
0.0082	K	4.0 x 9.0 x 10.0	0.45	1500	1778	282	K	2	B	..0
0.01	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	310	.	2	B	..0
0.012	K	4.0 x 9.0 x 10.0	0.45	1500	1778	312	K	2	B	..0
0.015	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	315	.	2	B	..0
0.018	K	4.0 x 9.0 x 10.0	0.45	1500	1778	318	K	2	B	..0
0.022	K/M	4.0 x 9.0 x 10.0	0.45	1500	1778	322	.	2	B	..0
0.027	K	4.0 x 9.0 x 10.0	0.45	1500	1778	327	K	2	B	..0
0.033	K	5.0 x 10.5 x 10.0	0.6	1000	1778	333	K	2	B	..0
0.033	M	4.0 x 9.0 x 10.0	0.45	1500	1778	333	M	2	B	..0
0.039	K	5.0 x 10.5 x 10.0	0.6	1000	1778	339	K	2	B	.B0
0.047	K	5.0 x 10.5 x 10.0	0.6	1000	1778	347	K	2	B	.B0
0.047	M	5.0 x 10.5 x 10.0	0.4	1000	1778	347	M	2	B	..0
0.056	K	6.0 x 11.5 x 10.0	0.8	750	1778	356	K	2	B	..0
0.068	M	6.0 x 11.5 x 10.0	0.8	750	1778	368	M	2	B	..0

Capacitance µF Pos. 5 to 7	Tolerance Code Pos. 8 J = ± 5 % K = ± 10 % M = ± 20 %	Dimensions Max. w x h x l (mm)	Mass (g) ⁽³⁾	SPQ ⁽⁴⁾ Short Leads (pieces)	Ordering Code ⁽²⁾					
					Type	C-Value	Tolerance	Voltage	Pitch	Lead Length Design
					1 to 4	5 to 7	8	9	10	11 to 13 ⁽¹⁾
Pitch 10 ± 0.4 mm; d_t = 0.60 ± 0.06 mm										
0.001	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	210	.	2	D	.. 0
0.0012	K	4.0 x 10.0 x 12.5	0.6	1500	1778	212	K	2	D	.. 0
0.0015	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	215	.	2	D	.. 0
0.0018	K	4.0 x 10.0 x 12.5	0.6	1500	1778	218	K	2	D	.. 0
0.0022	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	222	.	2	D	.. 0
0.0027	K	4.0 x 10.0 x 12.5	0.6	1500	1778	227	K	2	D	.. 0
0.0033	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	233	.	2	D	.. 0
0.0039	K	4.0 x 10.0 x 12.5	0.6	1500	1778	239	K	2	D	.. 0
0.0047	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	247	.	2	D	.. 0
0.0056	K	4.0 x 10.0 x 12.5	0.6	1500	1778	256	K	2	D	.. 0
0.0068	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	268	.	2	D	.. 0
0.0082	K	4.0 x 10.0 x 12.5	0.6	1500	1778	282	K	2	D	.. 0
0.01	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	310	.	2	D	.. 0
0.012	K	4.0 x 10.0 x 12.5	0.6	1500	1778	312	K	2	D	.. 0
0.015	K/M	4.0 x 10.0 x 12.5	0.6	1500	1778	315	.	2	D	.. 0
0.018	K	4.0 x 10.0 x 12.5	0.6	1250	1778	318	K	2	D	.. 0
0.022	K/M	4.0 x 10.0 x 12.5	0.6	1250	1778	322	.	2	D	.. 0
0.027	K	4.0 x 10.0 x 12.5	0.6	1250	1778	327	K	2	D	.. 0
0.033	K/M	4.0 x 10.0 x 12.5	0.6	1000	1778	333	.	2	D	.. 0
0.039	K	4.0 x 10.0 x 12.5	0.6	1000	1778	339	K	2	D	.. 0
0.047	K	4.0 x 10.0 x 12.5	0.6	750	1778	347	K	2	D	.. 0
0.047	M	4.0 x 10.0 x 12.5	0.6	1000	1778	347	M	2	D	.. 0
0.056	K	5.0 x 11.0 x 12.5	0.82	1000	1778	356	K	2	D	.. 0
0.068	K/M	5.0 x 11.0 x 12.5	0.82	750	1778	368	.	2	D	.. 0
0.082	K	6.0 x 12.0 x 12.5	1.10	750	1778	382	K	2	D	.. 0
0.1	K/M	6.0 x 12.0 x 12.5	1.10	750	1778	410	.	2	D	.. 0
Pitch 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm										
0.01	K/M	5.0 x 11.0 x 17.5	1.0	750	1778	310	.	2	F	.. 0
0.012	K	5.0 x 11.0 x 17.5	1.0	750	1778	312	K	2	F	.. 0
0.015	K/M	5.0 x 11.0 x 17.5	1.0	750	1778	315	.	2	F	.. 0
0.018	K	5.0 x 11.0 x 17.5	1.0	750	1778	318	K	2	F	.. 0
0.022	K/M	5.0 x 11.0 x 17.5	1.0	750	1778	322	.	2	F	.. 0
0.027	K	5.0 x 11.0 x 17.5	1.0	750	1778	327	K	2	F	.. 0
0.033	K/M	5.0 x 11.0 x 17.5	1.0	750	1778	333	.	2	F	.. 0
0.039	K	5.0 x 11.0 x 17.5	1.0	750	1778	339	K	2	F	.. 0
0.047	K/M	5.0 x 11.0 x 17.5	1.0	750	1778	347	.	2	F	.. 0
0.056	K	5.0 x 11.0 x 17.5	1.0	750	1778	356	K	2	F	.. 0
0.068	K/M	5.0 x 11.0 x 17.5	1.0	750	1778	368	.	2	F	.. 0
0.082	K	5.0 x 11.0 x 17.5	1.0	750	1778	382	K	2	F	.. 0
0.1	K	5.0 x 11.0 x 17.5	1.0	600	1778	410	K	2	F	.. 0
0.1	M	5.0 x 11.0 x 17.5	1.0	750	1778	410	M	2	F	.. 0
0.12	K	6.0 x 12.0 x 17.5	1.4	600	1778	412	K	2	F	.. 0
0.15	K	6.0 x 12.0 x 17.5	1.4	450	1778	415	K	2	F	.. 0
0.15	M	6.0 x 12.0 x 17.5	1.4	600	1778	415	M	2	F	.. 0



Interference Suppression Film Capacitors
MKP Radial Potted Type





Vishay Roederstein

Capacitance μF Pos. 5 to 7	Tolerance Code Pos. 8 J = ± 5 % K = ± 10 % M = ± 20 %	Dimensions Max. w x h x l (mm)	Mass (g) ⁽³⁾	SPQ ⁽⁴⁾ Short Leads (pieces)	Ordering Code ⁽²⁾					
					Type	C-Value	Tolerance	Voltage	Pitch	Lead Length Design
					1 to 4	5 to 7	8	9	10	11 to 13 ⁽¹⁾
Pitch 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm										
0.18	K	7.0 x 13.5 x 17.5	1.8	450	1778	418	K	2	F	..0
0.22	K/M	7.0 x 13.5 x 17.5	1.8	300	1778	422	.	2	F	..0
0.27	K	8.5 x 15.0 x 17.5	2.4	240	1778	427	K	2	F	..0
0.33	K/M	8.5 x 15.0 x 17.5	2.4	240	1778	433	.	2	F	..0
0.39	K	10.0 x 16.5 x 17.5	3	225	1778	439	K	2	F	..0
0.47	K/M	10.0 x 16.5 x 17.5	3	225	1778	447	.	2	F	..0
0.56	K/M	10.0 x 18.5 x 18.0	4.3	225	1778	456	.	2	F	..0
0.68	M	11.0 x 18.5 x 18.0	5.5	225	1778	468	M	2	F	..0
Pitch 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm										
0.12	K	6.0 x 15.5 x 26.0	2.4	260	1778	412	K	2	I	..0
0.15	K/M	6.0 x 15.5 x 26.0	2.4	260	1778	415	.	2	I	..0
0.18	K	6.0 x 15.5 x 26.0	2.4	260	1778	418	K	2	I	..0
0.22	K/M	6.0 x 15.5 x 26.0	2.4	260	1778	422	.	2	I	..0
0.27	K	6.0 x 15.5 x 26.0	2.4	200	1778	427	K	2	I	..0
0.33	K	6.0 x 15.5 x 26.0	2.4	190	1778	433	K	2	I	..0
0.33	M	6.0 x 15.5 x 26.0	2.4	235	1778	433	M	2	I	..0
0.39	K	7.0 x 16.5 x 26.0	2.9	200	1778	439	K	2	I	..0
0.47	K	7.0 x 16.5 x 26.0	2.9	190	1778	447	K	2	I	..0
0.47	M	7.0 x 16.5 x 26.0	2.9	200	1778	447	M	2	I	..0
0.56	K	8.5 x 18.0 x 26.0	3.8	150	1778	456	K	2	I	..0
0.68	K	10.0 x 19.5 x 26.0	6.8	150	1778	468	K	2	I	..0
0.68	M	8.5 x 18.0 x 26.0	3.8	170	1778	468	M	2	I	..0
0.82	K	10.0 x 19.5 x 26.0	6.8	200	1778	482	K	2	I	..0
1	K	12.0 x 22.0 x 26.0	7.8	150	1778	510	K	2	I	..0
1	M	10.0 x 19.5 x 26.0	6.8	135	1778	510	M	2	I	..0
1.5	M	12.5 x 22.5 x 26.5	10	140	1778	515	M	2	I	..0
Pitch 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm										
0.47	K/M	9.0 x 19.0 x 31.5	5.5	160	1778	447	.	2	K	..0
0.56	K	9.0 x 19.0 x 31.5	5.5	160	1778	456	K	2	K	..0
0.68	K/M	9.0 x 19.0 x 31.5	5.5	160	1778	468	.	2	K	..0
0.82	K	11.0 x 21.0 x 31.0	7.4	125	1778	482	K	2	K	..0
1	K/M	11.0 x 21.0 x 31.0	7.4	125	1778	510	.	2	K	..0
1.2	K	11.0 x 21.0 x 31.0	7.4	110	1778	512	K	2	K	..0
1.5	K/M	13.0 x 23.0 x 31.0	9.2	110	1778	515	.	2	K	..0
1.8	K	15.0 x 25.0 x 31.5	12.3	85	1778	518	K	2	K	..0
2.2	K/M	15.0 x 25.0 x 31.5	12.3	85	1778	522	.	2	K	..0
2.7	K	18.0 x 28.0 x 31.5	16.1	100	1778	527	K	2	K	..0
3.3	K	21.0 x 31.0 x 31.0	20.3	70	1778	533	K	2	K	..0
3.3	M	18.0 x 28.0 x 31.5	16.1	80	1778	533	M	2	K	..0
3.9	K	21.0 x 31.0 x 31.0	20.3	50	1778	539	K	2	K	..0
4.7	M	21.0 x 31.0 x 31.0	20.3	50	1778	547	M	2	K	..0
Pitch 37.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm										
2.2	K/M	14.5 x 24.5 x 41.5	19.0	80	1778	522	.	2	P	..0
3.3	M	16.0 x 28.5 x 41.5	25.0	70	1778	533	M	2	P	..0
4.7	M	18.0 x 32.5 x 41.5	31.6	60	1778	547	M	2	P	..0

Notes

- (1) Further information about packaging quantities with different lead length and/or taped versions see Document No. 26535 (Packaging quantities)
- (2) These capacitors can be delivered on continuous tape and reel (Refer Document No. 26535)
- (3) Weight for short lead product only
- (4) SPQ = Standard Packing Quantity

APPROVALS

SAFETY APPROVALS X2	VOLTAGE	VALUE	FILE NUMBERS
Pitch 7.5 mm to 27.5 mm			
EN 60384-14 (ENEC) (= IEC 60384-14 ed-3)	310 Vac	1 nF to 4.7 μF	FI 2008038
UL1414 and CSA-C22.2 No. 1	250 Vac	1 nF to 1 μF	E112471
UL1283	305 Vac	1 nF to 4.7 μF	E109565
CSA-E384-14	310 Vac	1 nF to 4.7 μF	2123580
CQC	310 Vac	1 nF to 4.7 μF	CQC08001026060 (F) CQC08001026061 (L) CQC08001026062 (S)
CB Test Certificate	310 Vac	1 nF to 4.7 μF	FI 5123
Pitch 37.5 mm			
EN 60384-14 (ENEC) (= IEC 60384-14 ed-3)	305 Vac	2.2 μF to 4.7 μF	40000787
UL1283	275 Vac	2.2 μF to 4.7 μF	E76297
CSA-C22.2 No. 8	250 Vac	2.2 μF to 4.7 μF	1114383
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 or end of catalog

Specific Method of Mounting to Withstand Vibration and Shock

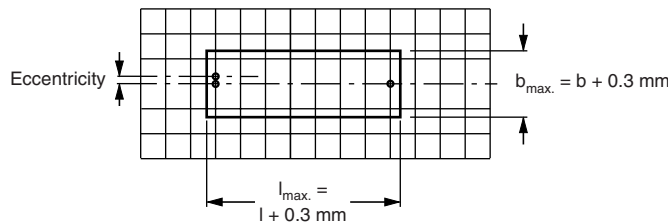
In order to withstand vibration and shock tests, it must be insured that the stand-off pips are in good contact with the printed-circuit board:

- For pitches ≤ 15 mm capacitors shall be mechanically fixed by the leads
- For 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: $h_{max.} \leq h + 0.3 \text{ mm}$ or $h_{max.} \leq h' + 0.3 \text{ mm}$.



Storage Temperature

- Storage temperature: $T_{stg} = -25 \text{ }^\circ\text{C}$ to $+40 \text{ }^\circ\text{C}$ with RH maximum 80 % without condensation

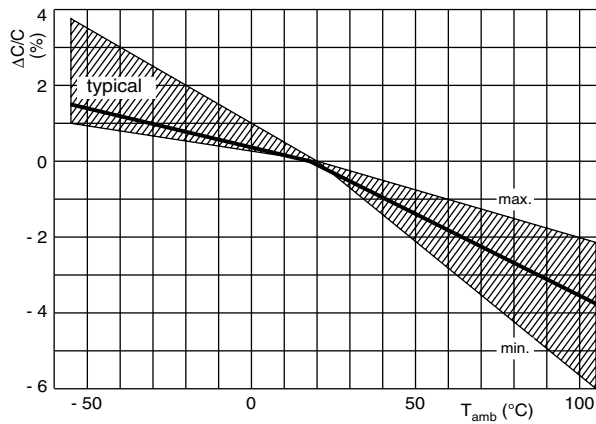
Ratings and Characteristics Reference Conditions

Unless otherwise specified, all electrical values apply to an ambient temperature of $23 \text{ }^\circ\text{C} \pm 1 \text{ }^\circ\text{C}$, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of $50 \% \pm 2 \%$.

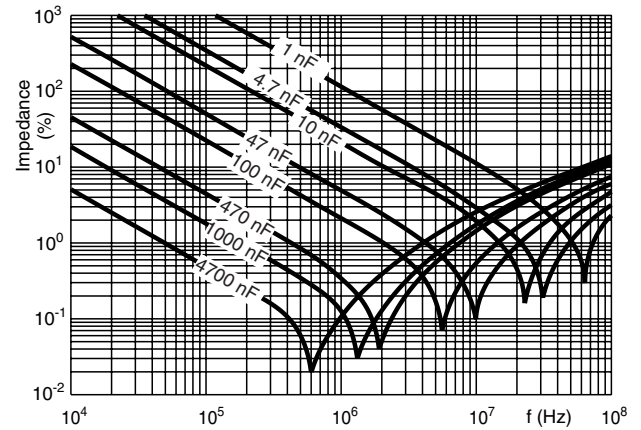
For reference testing, a conditioning period shall be applied over 96 hours \pm 4 hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

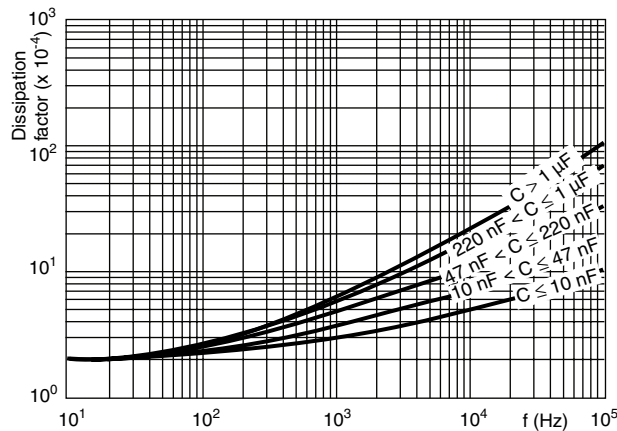
Capacitance as a function of ambient temperature (typical curve)



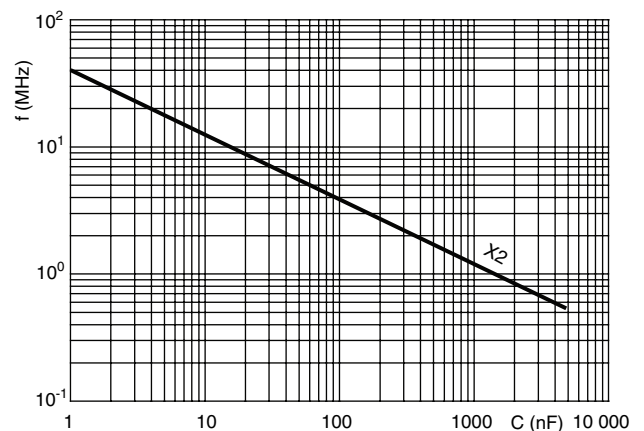
Impedance as a function of frequency (typical curve)



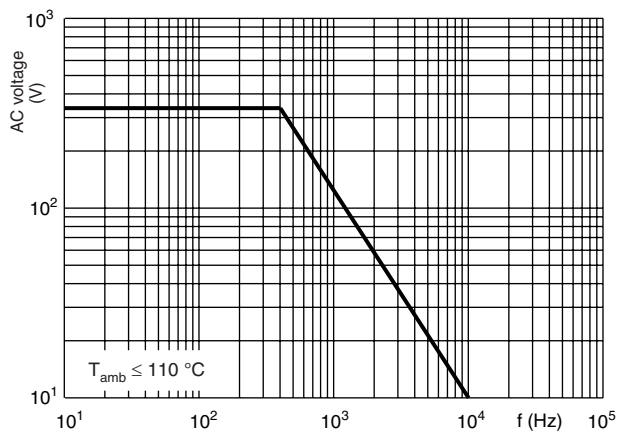
Tangent of loss angle as a function of frequency (typical curve)



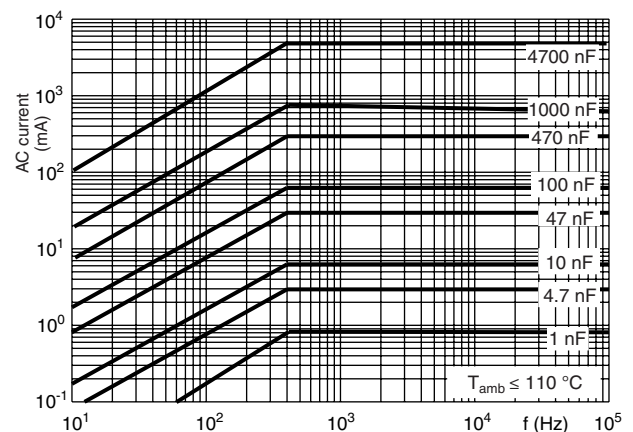
Resonant frequency as a function of capacitance (typical curve)



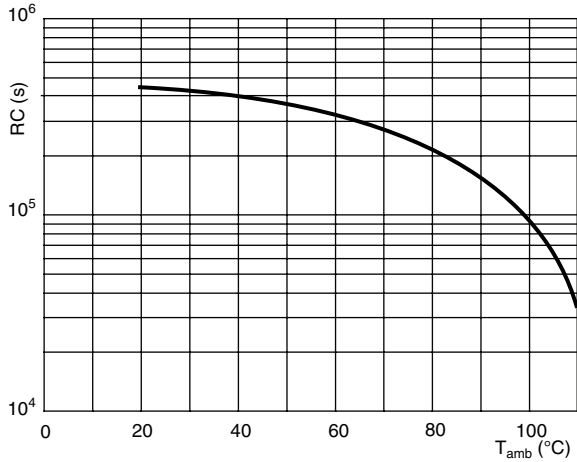
Max. RMS voltage as a function of frequency (typical curve)



Max. RMS current as a function of frequency (typical curve)



Insulation resistance as a function of ambient temperature
(typical curve)



APPLICATION NOTES

- For X2 electromagnetic interference suppression in **standard across the line applications** (50 Hz/60 Hz) with a maximum mains voltage of 310 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 110 °C (125 °C for less than 1000 h) for C ≤ 470 nF and 110 °C for C > 470 nF.
- 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 Vdc and divided by the applied voltage.

INSPECTION REQUIREMENTS

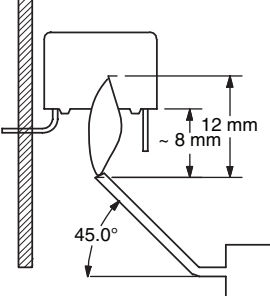
General Notes:

- Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, IEC 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: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	As specified in section “General Data” of this specification
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	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	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.11.5 Damp heat cyclic Test Db Remaining cycles 4.11.6 Final measurements	Duration: 2 h Visual examination Capacitance Tangent of loss angle Voltage proof 1350 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 $\tan \delta$: ≤ 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 section "Insulation Resistance" of this specification
SUB GROUP C2		
4.12 Damp heat steady state 4.12.1 Initial measurements 4.12.3 Final measurements	56 days; 40 °C; 90 % to 95 % RH no load Capacitance Tangent of loss angle: at 1 kHz Visual examination Capacitance Tangent of loss angle Voltage proof 1350 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 $\tan \delta$: ≤ 0.008 for: $C \leq 1 \mu\text{F}$ or ≤ 0.005 for: $C > 1 \mu\text{F}$ 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: For $C \leq 1 \mu\text{F}$ at 10 kHz For $C > 1 \mu\text{F}$ at 1 kHz 3 successive impulses, full wave, peak voltage: X2: 2.5 kV for $C \leq 1 \mu\text{F}$ X2: 2.5 kV/ \sqrt{C} for $C > 1 \mu\text{F}$ Max. 24 pulses Duration: 1000 h 1.25 x U_{RAC} at 110 °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 1350 Vdc; 1 min between terminations 2120 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 $\tan \delta$: ≤ 0.008 for: $C \leq 1 \mu\text{F}$ or ≤ 0.005 for: $C > 1 \mu\text{F}$ 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-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C4		
4.15 Charge and discharge	10 000 cycles Charged to 435 Vdc Discharge resistance: $R = \frac{435 \text{ Vdc}}{1.25 \times C (dU/dt)}$	
4.15.1 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	
4.15.3 Final measurements	Capacitance Tangent of loss angle Insulation resistance	$ \Delta C/C_i \leq 10\%$ compared to values measured in 4.15.1. 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 4.15.1. $\geq 50\%$ of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C5		
4.16 Radio frequency characteristic	Resonance frequency	≥ 0.9 times the value as specified in section "Resonant Frequency" of this specification.
SUB-GROUP C6		
4.17 Passive flammability Class B	Bore of gas jet: $\varnothing 0.5 \text{ mm}$ Fuel: butane Test duration for actual volume V in mm^3 : $V \leq 250$: 10 s $250 < V \leq 500$: 20 s $500 < V \leq 1750$: 30 s $V > 1750$: 60 s One flame application 	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 2.5 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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