VISHAY INTERTECHNOLOGY, INC.

INTERACTIVE

data book

VISHAY FILM CAPACITORS

VISHAY

VSE-DB0110-0901

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   a) Click on the Vishay logo on any datasheet to go to the Contents page for that section. Click on the Vishay logo on any Contents page to go to the main Table of Contents page.
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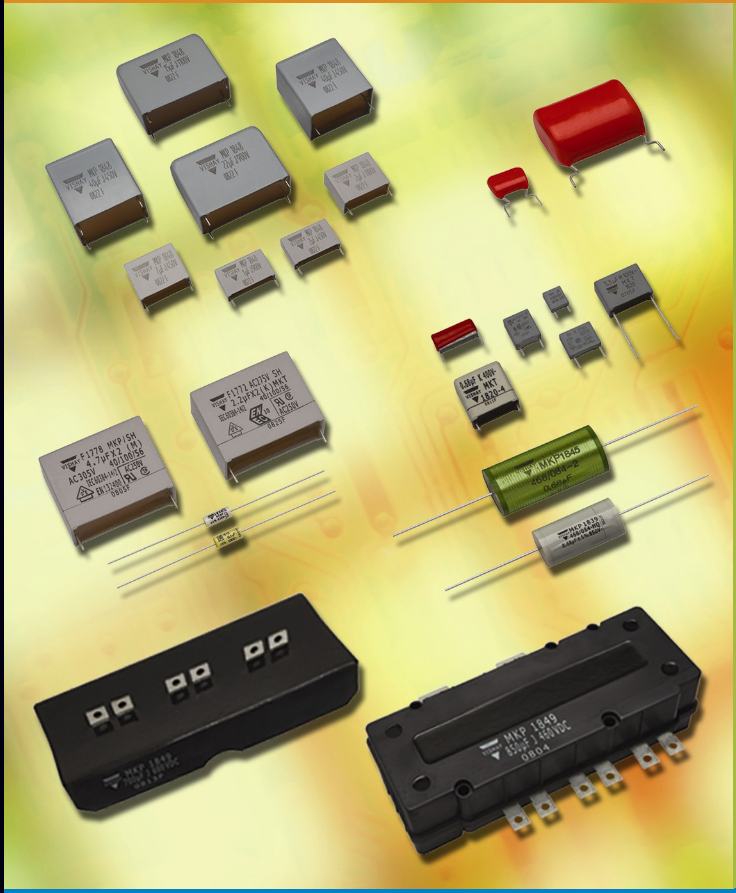
VISHAY INTERTECHNOLOGY, INC.



DATA BOOK

VISHAY FILM CAPACITORS

www.vishay.com

SEMICONDUCTORS

RECTIFIERS
- Schottky (single, dual)
- Standard, Fast, and Ultra-Fast Recovery (single, dual)
- Bridge
- Superectifier®
- Sinterglass Avalanche Diodes

HIGH-POWER DIODES AND THYRISTORS
- High-Power Fast-Recovery Diodes
- Phase-Control Thyristors
- Fast Thyristors

SMALL-SIGNAL DIODES
- Schottky and Switching (single, dual)
- Tuner/Capacitance (single, dual)
- Bandswitching
- PIN

ZENER AND SUPPRESSOR DIODES
- Zener (single, dual)
- TVS (TransZorb®, Automotive, ESD, Arrays)

FETs
- Low-Voltage TrenchFET® Power MOSFETs
- High-Voltage TrenchFET® Power MOSFETs
- High-Voltage Planar MOSFETs
- JFETs

OPTOELECTRONICS
- IR Emitters and Detectors, and IR Receiver Modules
- Optocouplers and Solid-State Relays
- Optical Sensors
- LEDs and 7-Segment Displays
- Infrared Data Transceiver Modules
- Custom Products

ICs
- Power ICs
- Analog Switches
- RF Transmitter and Receiver Modules
- ICs for Optoelectronics

MODULES
- Power Modules (contain power diodes, thyristors, MOSFETs, IGBTs)
- DC/DC Converters

PASSIVE COMPONENTS

RESISTIVE PRODUCTS
- Foil Resistors
- Film Resistors
  - Metal Film Resistors
  - Thin Film Resistors
  - Thick Film Resistors
  - Metal Oxide Film Resistors
  - Carbon Film Resistors
- Wirewound Resistors
- Power Metal Strip® Resistors
- Chip Fuses
- Variable Resistors
  - Cermet Variable Resistors
  - Wirewound Variable Resistors
  - Conductive Plastic Variable Resistors
- Networks/Arrays
- Non-Linear Resistors
  - NTC Thermistors
  - PTC Thermistors
  - Varistors

MAGNETICS
- Inductors
- Transformers

CAPACITORS
- Tantalum Capacitors
  - Molded Chip Tantalum Capacitors
  - Coated Chip Tantalum Capacitors
  - Solid Through-Hole Tantalum Capacitors
  - Wet Tantalum Capacitors
- Ceramic Capacitors
  - Multilayer Chip Capacitors
  - Disc Capacitors
- Film Capacitors
- Power Capacitors
- Heavy-Current Capacitors
- Aluminum Capacitors
- Silicon RF Capacitors

STRAIN GAGE TRANSDUCERS AND STRESS ANALYSIS SYSTEMS
- PhotoStress®
- Strain Gages
- Load Cells
- Force Transducers
- Instruments
- Weighing Systems
- Specialized Strain Gage Systems

Vishay Film Capacitors

BCcomponents

Roederstein

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Film Capacitors

Characteristics and Definitions used for Film Capacitors

COMMON FILM DIELECTRICS USED IN FILM CAPACITORS PRODUCTS

PARAMETER	DIELECTRIC (1)				UNIT
	KT	KN	KI	KP	
Dielectric constant 1 kHz	3.3	3	3	2.2	-
Dissipation factor 1 kHz	50	40	3	1	10^{-4}
Dissipation factor 10 kHz	110	70	6	2	10^{-4}
Dissipation factor 100 kHz	170	100	12	2	10^{-4}
Dissipation factor 1 MHz	200	150	18	4	10^{-4}
Volume resistivity	10^{+17}	10^{+17}	10^{+17}	10^{+18}	Ωcm
Dielectric strength	400	300	250	600	V/µm
Maximum application temperature	125	150	160	125	°C
Power density at 10 kHz	50	40	2.5	0.6	W/cm^3
Dielectric absorption	0.2	1.2	0.05	0.01	%

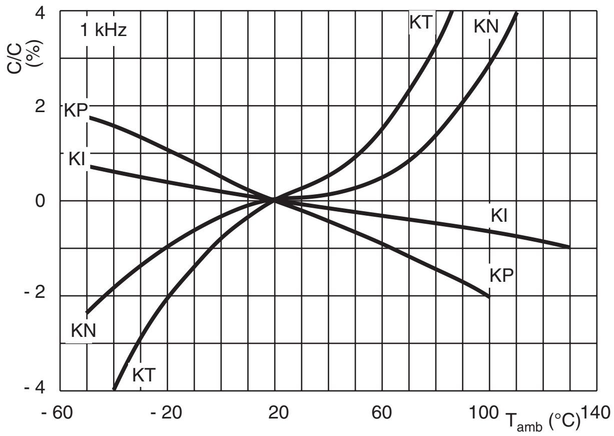
Notes

(1) According to *"IEC 60062"*: KT = polyethylene terephthalate (PETP)
KN = polyethylene naphtalate (PEN)
KI = polyphenylene sulfide (PPS)
KP = polypropylene (PP)

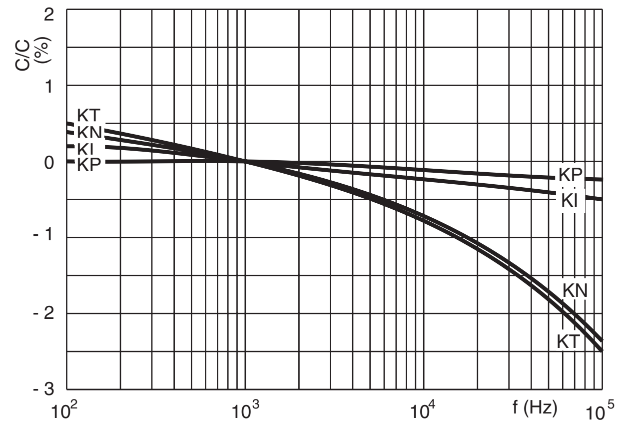
- Polyethylene terephthalate (PETP) and polyethylene naphtalate (PEN) films are generally used in general purpose capacitors for applications typically with small bias DC voltages and/or small AC voltages at low frequencies.
- Polyethylene terephthalate (PETP) has as its most important property, high capacitance per volume due to its high dielectric constant and availability in thin gauges.
- Polyethylene naphtalate (PEN) is used when a higher temperature resistance is required compared to PET.
- Polyphenylene sulfide (KI) film can be used in applications where high temperature is needed eventually in combination with low dissipation factor.
- Polypropylene (KP) films are used in high frequency or high voltage applications due to their very low dissipation factor and high dielectric strength. These films are used in AC and pulse capacitors and interference suppression capacitors for mains applications.
- Typical properties as functions of temperature or frequency are illustrated in the following chapters: "Capacitance", "Dissipation factor", and "Insulation resistance."

CAPACITANCE

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

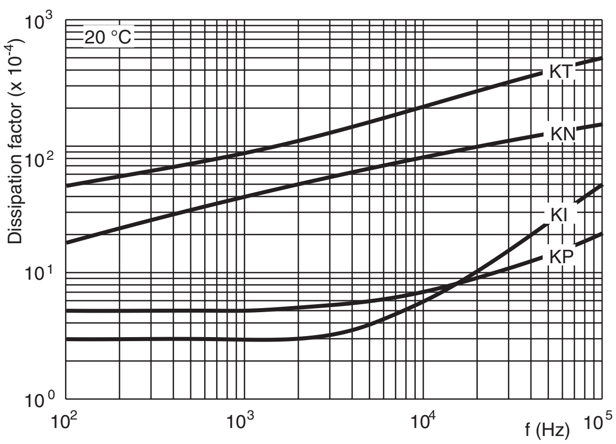


Capacitance change at 1 kHz as a function of frequency at room temperature (typical curve)

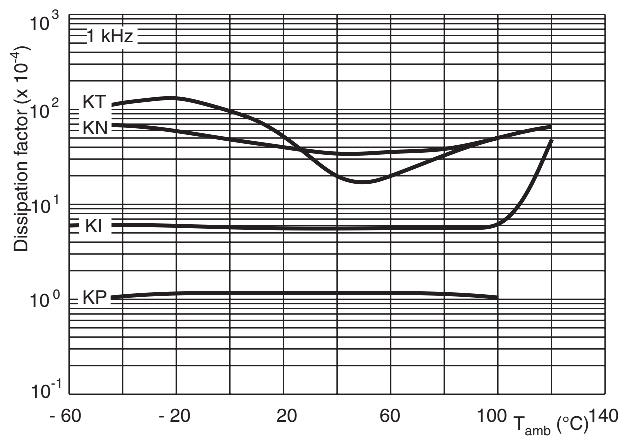


DISSIPATION FACTOR

Dissipation factor as a function of frequency at room temperature (typical curve)

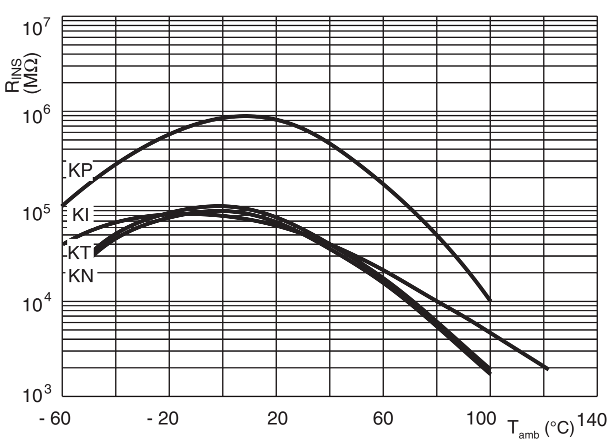


Dissipation factor as a function of temperature (typical curve)



INSULATION RESISTANCE

Insulation resistance as a function of temperature (typical curve)



CONSTRUCTION OF CAPACITORS CELLS

Film capacitors are build up by two electrodes (the capacitor plates) with plastic dielectric material in between.
The type of electrode used determines whether the capactor is a metalized film or film/foil type. In metalized types, the very thin electrode is evaporated on the plastic dielectric material. The thin metalized electrodes have a thickness of approximately 10 nm to 50 nm. The electrodes of film/foil capacitors have discrete metal foils with thicknesses of approximately 5 µm to 10 µm.
Metalized capacitors have a self-healing behavior as an intrinsic characteristic. Self healing is the ability to recover after a dielectric breakdown.
Due to their construction, very thick electrodes, film/foil capacitors can carry higher currents than metalized types, but are much larger in volume. These capacitors can not recover after a breakdown.
Therefore In some constructions double side metalized plastic film is used as electrode to replace the foil. The plastic material has only the function of carrier: the self healing properties are maintained and the current carrying capability is increased a lot in comparison with single metalized types.

Depending on the AC voltage in the application, single or series constructions are used. In a series construction two or more sections are placed internally in series in one capacitor. Single section capacitors are normally used for products with an AC rating up to 300 Vac. Series construtions are used for higher voltages.
The end connection of the capacitor cell to the outside circuit is realized by metal sprayed end connections wherein lead wires or tabs are welded.

ENCAPSULATION

Finally the capacitor cells can be protected for severe environmental conditions or to withstand passive flammability. Encapsulation with epoxy materials in plastic boxes is common used for fixed outline dimensions. Epoxy dipped capacitors have a more rounded and easy to handle shape. All these encapsulations are flame retardant materials fulfilling the UL 94 classification system.
Axial types are typically of the wrapped end construction. An extra wrapped film and epoxy at the end connections protects the cell.

GENERAL DEFINITIONS

Rated DC voltage (U_{Rdc})
The maximum DC voltage (in V) which may be continuously applied to a capacitor at any operating ambient temperature below the rated temperature.

Category voltage (U_C)
The maximum AC voltage (or DC voltage) that may be applied continuously to a capacitor at its upper category temperature.

Rated AC voltage (U_{Rac})
The maximum RMS voltage (in V) at specified frequency (mostly 50 Hz), that may be continuously applied to a capacitor at any operating ambient temperature below the rated temperature.

Corona starting voltage (Ionization)

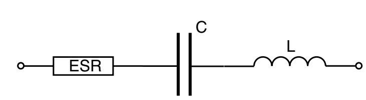
In AC voltage applications or in rapid changing DC voltages (pulses) air can be ionized and partially break down.
The corona starting voltage is defined as the AC voltage at which electrical discharges resulting from the ionization of air on the surface or between the capacitor plates can be detected . Its value is dependent upon the internal design of the capacitor element, the dielectric material, and the thickness of the film. The usage of series wound capacitors increases the corona voltage level.
Where applicable the corona starting voltage is typically defined with a certain sensitivity in pC (Pico-Coulomb).

Impulse voltage

An impulse voltage is an a-periodic transient voltage of a defined waveform as described in IEC 60060-1

Capacitance

The capacitance of a capacitor is the capacitive part of the equivalent circuit composed of capacitance, series resistance and inductance.



Rated capacitance

The rated capacitance, normally marked on the product, is the value for which the capacitor has been designed.

Capacitance tolerance

The percentage of the allowed deviation of the capacitance from the rated capacitance. This is measured at a free air ambient temperature of 23 ± 1 °C and RH of 50 ± 2 %.

Tolerance coding in accordance with *"IEC 60062"*

PERCENTAGE OF DEVIATION	LETTER CODE
± 1.0 %	F
± 2.0 %	G
± 5.0 %	J
± 10.0 %	K
± 20.0 %	M

A letter "A" indicates that the tolerance is deviasting from the standard definitions in the type specification or customer detail specification.

Temperature coefficient and cyclic drift of capacitance

The terms characterizing these two properties apply to capacitors for which the variations of capacitance as a function of temperature are linear, or approximately linear, and can be expressed with a certain precision.

Temperature coefficient of capacitance

The rate of capacitance change with temperature, measured over the specified temperature range. It is normally expressed in parts per million per Kelvin (10^{-6}/K).

Temperature cyclic drift of capacitance

The maximum irreversible variation of capacitance observed at room temperature during or after the completion of a number of specified temperature cycles. It is usually expressed as a percentage of the capacitance related to a reference temperature. This is normally 20 °C.

Rated voltage pulse slope (dU/dt)

The maximum voltage pulse slope that the capacitor can withstand with a pulse voltage equal to the rated voltage. For pulse voltages other than the rated voltage, the maximum voltage pulse slope may be multiplied by U_{Rdc} and divided by the applied voltage or:

$$U_{signal} \times (dU/dt)_{signal} < U_{Rdc} \times (dU/dt)_R$$

For complex signals with ringing it is always a must to use following formula:

The voltage pulse slope multiplied by the capacitance gives

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

the peak current for the capacitor.

Dissipation factor and equivalent series resistance

The dissipation factor or tangent of loss angle (tan δ) is the power loss of the capacitor divided by the reactive power of the capacitor at a sinusoidal voltage of specified frequency.

The equivalent series resistance (ESR) is the resistive part of the equivalent circuit composed of capacitance, series resistance and inductance.

The tan δ reflects the polarization losses of the dielectric film and the losses caused by the internal contact resistances (terminal, metal spray, electrodes) of the capacitor. Parallel losses cam in general be neglected at frequencies higher than 1 kHz, due to the high insulation resistance. The tan δ is temperature and frequency dependant.

The reciprocal value of tan δ is also known as Q-factor.

$$Q = 1/\tan \delta$$

Insulation resistance and time constant

The insulation resistance (R_{ins}) is defined by the applied DC voltage divided by the leakage current after a well defined minimum time.

The time constant is the product (in s) of the nominal capacitance and the insulation resistance between the leads.

Equivalent self inductance

The equivalent self inductance defined at resonance frequency, is calculated as the:

$$1/4 \times \pi \times f_{res}^2 \times C$$

Resonance frequency

The lowest frequency at which the impedance of the capacitor is a minimum when applying a sinusoidal voltage.

Ambient free air temperature

The ambient free air temperature is the temperature of the air surrounding the component.

Climatic category

The climatic category code (e.g. 50/100/56) indicates to which climatic category a film capacitor type belongs. The category is indicated by a series of three sets of digits separated by oblique strokes corresponding to the minimum ambient temperature of operation, the maximum temperature of operation, and the number of days of exposure to damp heat (steady state-test Ca) respectively that they will withstand.

Category temperature range

The range of ambient temperatures for which the capacitor has been designed to operate continuously. This is defined by the temperature limits of the appropriate category.

Upper category temperature

The maximum ambient temperature for which a capacitor has been designed to operate continuously at category voltage.

Lower category temperature

The minimum ambient temperature for which a capacitor has been designed to operate continuously.

Rated temperature

The maximum ambient temperature at which the rated voltage may be applied continuously.

Maximum application temperature

The equivalent of the upper category temperature.

Self-healing

The process by which the electrical properties of a metalized capacitor, after a local breakdown, are rapidly and essentially restored to the values before the breakdown.

Temperature characteristic of capacitance

The term characterizing this property applies mainly to capacitors for which the variations of capacitance as a function of temperature, linear or non-linear, cannot be expressed with precision and certainty.

The temperature characteristic of capacitance is the maximum reversible variation of capacitance, produced over a given temperature range within the category temperature range.

It is expressed normally as a percentage of the capacitance related to a reference temperature of 20 °C.

Storage temperature

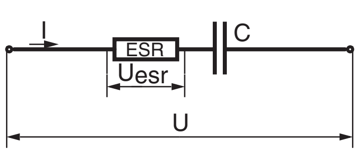
The temperature range with relative humidity RH of maximum 80 % without condensation at which the initial characteristics can be guaranteed for at least 2 years.

Maximum power dissipation

The power dissipated by a capacitor is a function of the voltage (U_{esr}) across or the current (I) through the equivalent series resistance ESR and is expressed by:

$$P = \frac{U_{esr}^2}{ESR}$$

$$P = ESR \times I^2$$



$$U_{esr}^2 = \frac{ESR^2}{ESR^2 + 1/\omega^2 C^2} \times U^2$$

Given that for film capacitors $\tan\delta = \omega^2 \times C \times ESR \ll 0.1$ the formula can be simplified to:

$$U_{esr}^2 = ESR^2 \times \omega^2 \times C^2 \times U^2$$

or with $ESR = \tan\delta/\omega C$

the formula becomes:

$$P = \omega \times C \times \tan\delta \times U^2$$

$$P = \frac{\tan\delta}{\omega \times C} \times I^2$$

For the $\tan\delta$ we take the typical value found in the specification, C is in farads and $\omega = 2\pi f$. U or I are assumed to be known.

In applications where sinewaves occur, we have to take for U the RMS-voltage or for I the RMS-current of the sinewave.

In applications where periodic signals occur, the signal has to be expressed in Fourier terms:

$$U = U_0 + \sum_{k=1}^{\infty} U_k \times \sin(k\omega t + \Phi k)$$

$$I = \sum_{k=1}^{\infty} I_k \times \sin(k\omega t + \Phi k)$$

with U_0 the DC voltage, U_k and I_k (the voltage and current of the k-th harmonic respectively) the formula for the dissipated power becomes:

$$P = \sum_{k=1}^{\infty} \frac{\tan\delta_k \times I_k^2}{2 \times k \times \omega \times C}$$

$$P = \sum_{k=1}^{\infty} k \times \omega \times C \times \tan\delta_k \times \frac{U_k^2}{2}$$

and $\tan\delta_k$ is the $\tan\delta$ at the k-th harmonic.

TEST INFORMATION

Robustness of leads

Tensile strength of leads (Ua) (load in lead axis direction)
Lead diameter 0.5 mm, 0.6 mm and 0.8 mm: load 10 N, 10 s.

Bending (Ub)
Lead diameter 0.5 mm, 0.6 mm and 0.8 mm: load 5 N, 4 x 90°.
Lead diameter 1.0 mm: load 10 N, 4 x 90°.

Torsion (Uc) (for axial capacitors only)
Severity 1: three rotations of 360°.
Severity 2: two rotations of 180°.

Rapid change of temperature (Na)

The rapid change of temperature test is intended to determine the effect on capacitors of a succession of temperature changes and consists of 5 cycles of 30 min at lower category temperature and 30 min at higher category temperature.

Dry heat (Ba)

This test determines the ability of the capacitors to be used or stored at high temperature. The standard test is 16 h at upper category temperature.

Damp heat cyclic (Db)

This test determines the suitability of capacitors for use and storage under conditions of high humidity when combined with cyclic temperature changes and, in general, producing condensation on the surface of the capacitor.
One cycle consists of 24 h exposure to 55 °C and 95 % to 100 % relative humidity (RH).

Cold (Aa)

This test determines the ability of the capacitors to be used or stored at low temperature. The standard test is 2 h at the lower category temperature.

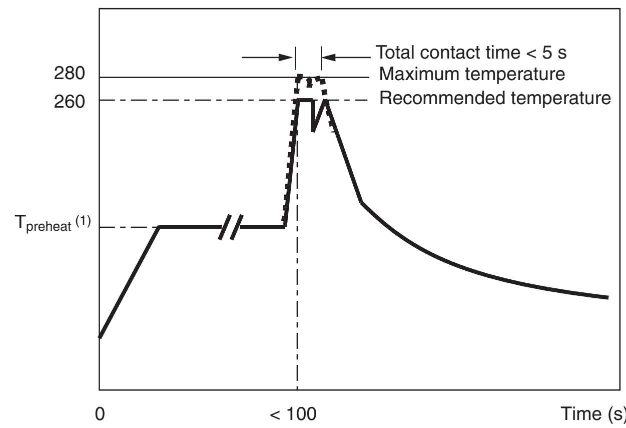
Damp heat steady state (Ca)

This test determines the suitability of capacitors for use and storage under conditions of high humidity.
The test is primarily intended to permit observation of the effects of high humidity at constant temperature over a specified period.
The capacitors are exposed to a damp heat environment, which is maintained at a temperature of 40 °C and an RH of 90 % to 95 % for the number of days specified by the third set of digits of the climatic category code.

Soldering conditions and recommended wave soldering profile

With regard to the resistance to soldering heat and the solderability, our products comply with *"IEC 60384-1"* and the additional type specifications.
For precision capacitors where capacitance stability is important, we refer to the paragraph "Soldering Conditions" in the type specification.
Recommended wave soldering profile for our leaded components:

Temperature (°C)



Note

(1) The preheating temperature must be restricted to the maximum application temperature of the component

Solvent resistance of components

Soldered capacitors may be cleaned using appropriate cleansing agents, such as alcohol, fluorhydro-carbons or their mixtures. Solvents or cleansing agents based on chlorohydrocarbons or ketones should not to be used, as they may attack the capacitor or the encapsulation.
After cleaning it is always recommended to dry the components carefully.

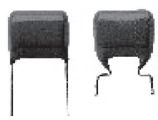
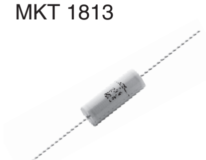
Passive flamability

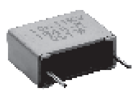
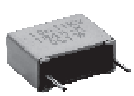
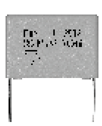
The ability of a capacitor to burn with a flame as a consequence of the application of an external source of heat according to IEC 60384-1 and IEC 60695-2-2.

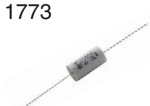
Category of flammability	Severities flame exposure time (s) for capacitor volume (V) (mm^3)				Maximum permitted burning time (s)	Additional requiremented
	V = 250	250 < V = 500	500 = < V = 1750	V = 1750		Burning droplets or glowing parts falling down shall not ignite the tissue paper
A	15	20	60	120	3	
B	10	20	30	60	10	
C	5	10	20	30	30	

Active flammability

The ability of the capacitor to burn with a flame as a consequence of electrical loading (self heating effect).

OVERVIEW FOCUS PRODUCTS VISHAY FILM CAPACITORS									
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)	PAGE
			Vdc	Vac	min.	max.			
MKT 365, MKT366, MKT367 	Polyester general applications	47 nF to 1.0 µF	63	40	- 55	105	10, 5	5.0 to 7.5	29
		10 nF to 470 nF	100	100	- 55	105	10, 5	5.0 to 7.5	
		18 nF to 150 nF	250	160	- 55	105	10, 5	5.0 to 7.5	
		3.3 nF to 56 nF	400	220	- 55	105	10, 5	5.0 to 7.5	
MKT 467,MKT 468, MKT469 	Polyester general applications	56 nF to 10 µF	100	100	- 55	105	10, 5	10.0 to 27.5	51
		27 nF to 5.6 µF	250	160	- 55	105	10, 5	10.0 to 27.5	
		1.0 nF to 2.2 µF	400	220	- 55	105	10, 5	10.0 to 27.5	
		10 nF to 820 nF	630	250	- 55	105	10, 5	10.0 to 27.5	
		15 nF to 220 nF	1000	400	- 55	105	10, 5	10.0 to 27.5	
MKT 370, MKT 371 MKT 372, MKT 373 	Polyester general applications	56 nF to 1.5 µF	63	40	- 55	100	10, 5	5.0 to 27.5	94
		1.0 nF to 15 µF	100	63	- 55	100	10, 5	5.0 to 27.5	
		1.0 nF to 4.7 µF	250	160	- 55	100	10, 5	5.0 to 27.5	
		1.0 nF to 2.2 µF	400	220	- 55	100	10, 5	5.0 to 27.5	
		10 nF to 1.5 µF	630	250	- 55	100	10, 5	10.0 to 27.5	
MKT 370 compact		120 nF - 560 nF	100	40	- 55	100	10, 5	5	77
		22 nF to 220 nF	250	63	- 55	100	10, 5	5	
		10 nF to 100 nF	400	160	- 55	100	10, 5	5	
		680 pF to 33 nF	630	220	- 55	100	10, 5	5	
MKT 373 M		100 nF to 10 µF	250	63	- 55	100	10, 5	10.0 to 27.5	121
		82 nF to 3.9 µF	400	100	- 55	100	10, 5	10.0 to 27.5	
		10 nF to 1.2 µF	630	160	- 55	100	10, 5	10.0 to 27.5	
MKT 1820 	Polyester high temperature Automotive for limited time 150 °C	220 nF to 15 µF	63	40	- 55	125	10, 5	10.0 to 27.5	134
		68 nF to 15 µF	100	100	- 55	125	10, 5	10.0 to 27.5	
		22 nF to 4.7 µF	250	250	- 55	125	10, 5	10.0 to 27.5	
		10 nF to 2.2 µF	400	400	- 55	125	10, 5	10.0 to 27.5	
		1.0 nF to 1.0 µF	630	630	- 55	125	10, 5	10.0 to 27.5	
		1.0 nF to 470 nF	1000	220	- 55	125	10, 5	10.0 to 27.5	
MKT 1813 	Polyester general applications	150 nF to 22 µF	63	40	- 55	100	20, 10, 5	axial	17
		68 nF to 15 µF	100	63	- 55	100	20, 10, 5	axial	
		15 nFto 10 µF	250	160	- 55	100	20, 10, 5	axial	
		6.8 nF to 2.2 µF	400	200	- 55	100	20, 10, 5	axial	
		470 pF to 1.0 µF	630	220	- 55	100	20, 10, 5	axial	
		1.5 nF to 470 nF	1000	220	- 55	100	20, 10, 5	axial	

OVERVIEW FOCUS PRODUCTS VISHAY FILM CAPACITORS									
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)	PAGE
			Vdc	Vac	min.	max.			
MKP 1840M 	Polypropylene high voltage high frequency	10 nF to 6.8 µF	250	160	- 55	100	5, 2.5	5.0 to 37.5	147
		6.8 nF to 6.8 µF	400	220	- 55	100	5, 2.5	5.0 to 37.5	
		1 nF to 4.7 µF	630	250	- 55	100	5, 2.5	5.0 to 37.5	
		10 nF to 1.0 µF	630	400	- 55	100	5, 2.5	10.0 to 27.5	
		4.7 nF to 1.5 µF	1000	500	- 55	100	5, 2.5	10.0 to 37.5	
MKP 385 	Polypropylene high frequency snubber	2.0 nF to 33 nF	1600	550	- 55	125	5, 2.5	10.0 to 15.0	159
		470 pF to 20 nF	2000	700	- 55	125	5, 2.5	10.0 to 15.0	
MMKP 1841 MMKP 1841M 	Polypropylene high voltage high frequency	10 nF to 6.8 µF	160	100	- 55	100	10, 5	7.5 to 37.5	173
		10 nF to 4.7 µF	250	160	- 55	100	10, 5	7.5 to 37.5	
		6.8 nF to 2.2 µF	400	220	- 55	100	10, 5	7.5 to 37.5	
		680 pF to 47 nF	630	250	- 55	100	10, 5	7.5 to 10.0	
		15 nF to 680 nF	630	400	- 55	100	10, 5	15 to 27.5	
		4.7 nF to 470 nF	1000	600	- 55	100	10, 5	15 to 37.5	
		3.3 nF to 220 nF	1600	650	- 55	100	10, 5	15 to 37.5	
		470 pF to 220 nF	2000	700	- 55	100	10, 5	15 to 37.5	
MMKP 383 	Polypropylene high frequency snubber	82 nF to 2.7 µF	250	125	- 55	105	5	15.0 to 27.5	187
		47 nF to 1.5 µF	400	200	- 55	105	5	15.0 to 27.5	
		30 nF to 1.0 µF	630	220	- 55	105	5	15.0 to 27.5	
		4.3 nF to 470 nF	1000	350	- 55	105	5	15.0 to 27.5	
		2.2 nF to 130 nF	1400	500	- 55	105	5	15.0 to 27.5	
		2.7 nF to 150 nF	1600	550	- 55	105	5	15.0 to 27.5	
		1.0 nF to 100 nF	2000	700	- 55	105	5	15.0 to 27.5	
		1.0 nF to 56 nF	2500	900	- 55	105	5	22.5 to 27.5	
KP 1830 	Polypropylene film/foil precision	2.4 nF to 22 nF	63	40	- 55	100	10, 5, 2.5, 1	5.0	212
		2.0 nF to 15 nF	250	160	- 55	100	10, 5, 2.5, 1	5.0	
		100 pF to 10 nF	630	250	- 55	100	10, 5, 2.5, 1	5.0	
KP/MKP 375 	Polypropylene film/foil high voltage	680 pF to 270 nF	630	300	- 55	105	5, 3.5	10.0 to 27.5	221
		100 pF to 150 nF	1000	400	- 55	105	5, 3.5	10.0 to 27.5	
		680 pF to 39 nF	1600	500	- 55	105	5, 3.5	15.0 to 27.5	
		100 pF to 22 nF	2000	600	- 55	105	5, 3.5	15.0 to 27.5	
MKP 1839 MKP 1839HQ 	Polypropylene high frequency precision	33 nF to 22 µF	160	100	- 55	100	10, 5, 2.5, 1	axial	248 258
		10 nF to 22 µF	250	160	- 55	100	10, 5, 2.5, 1	axial	
		6.8 nF to 2.2 µF	400	220	- 55	100	10, 5, 2.5, 1	axial	
		47 pF to 3.3 µF	630	250	- 55	100	10, 5, 2.5, 1	axial	
		220 nF to 1.0 µF	850	400	- 55	110	5	axial	
		100 nF to 1.0 nF	1250	450	- 55	110	5	axial	
		100 nF to 680 nF	1600	600	- 55	110	5	axial	

OVERVIEW FOCUS PRODUCTS VISHAY FILM CAPACITORS									
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)	PAGE
			Vdc	Vac	min.	max.			
MKP 1848 	Polypropylene DC link	1 µF to 200 µF	450	-	- 40	105	5	27.5 to 52.5	281
		1 µF to 160 µF	700	-	- 40	105	5	27.5 to 52.5	
		1 µF to 100 µF	900	-	- 40	105	5	27.5 to 52.5	
		1 µF to 60 µF	1100	-	- 40	105	5	27.5 to 52.5	
		1 µF to 60 µF	1200	-	- 40	105	5	27.5 to 52.5	
MMKP 386 MMKP 386 M 	Polypropylene snubber tab terminals	330 nF to 4.7 µF	630	220	- 55	85	10, 5	tab terminals	269
		220 nF to 2.7 µF	850	300	- 55	85	10, 5	tab terminals	
		330 nF to 1.8 µF	1000	350	- 55	85	10, 5	tab terminals	
		150 nF to 1.0 µF	1250	425	- 55	85	10, 5	tab terminals	
		100 nF to 680 nF	1400	500	- 55	85	10, 5	tab terminals	
		100 nF to 560 nF	1600	550	- 55	85	10, 5	tab terminals	
		100 nF to 470 nF	2000	700	- 55	85	10, 5	tab terminals	
		100 nF to 270 nF	2500	700	- 55	85	10, 5	tab terminals	
MKP 339 	X2 polypropylene across the lines	1.0 nF to 4.7 µF	-	310	- 55	110	20, 10, 5	7.5 to 27.5	304
MKP 339 T 	High temperature X2 polypropylene across the lines	1.0 nF to 2.2 µF	-	310	- 55	125	20, 10, 5	7.5 to 27.5	324
MKP 338 1 	X1 polypropylene across the lines	10 nF to 1.0 µF	-	440	- 55	105	20, 10, 5	7.5 to 27.5	383
			330 Vac series under development!						
MKP 338 6 	Y2 polypropylene line to earth	1.0 nF to 470 nF	-	300	- 55	105	20, 10, 5	7.5 to 27.5	364
F 1772 2 	X2 polyester across the lines series impedance	10 nF to 2.2 µF	-	310	- 40	100	20, 10	10 to 37.5	343
F 1773 	X2 polyester across the lines	10 nF to 2.2 µF	-	253	- 40	100 for $C \leq 1\ \mu F$ 85 for $C > 1\ \mu F$	20, 10	axial	354

OVERVIEW OTHER PRODUCTS VISHAY FILM CAPACITORS								
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)
			Vdc	Vac	MIN.	MAX.		
MKT 303	Polyester general applications low building height	100 nF to 10 µF	250	63	- 55	105	20, 10, 5	10.0 to 27.5
		100 nF to 2.2 µF	400	100	- 55	105	20, 10, 5	10.0 to 27.5
		10 nF to 680 nF	630	160	- 55	105	20, 10, 5	10.0 to 27.5
MKT 1817	Polyester general applications	100 nF to 1.0 µF	63	40	- 55	100	20, 10, 5	5
		22 nF to 330 nF	100	63	- 55	100	20, 10, 5	5
		3.3 nF to 100 nF	250	160	- 55	100	20, 10, 5	5
		1.0 nF to 22 nF	400	200	- 55	100	20, 10, 5	5
MKT 1818	Polyester general applications	100 nF to 1.0 µF	63	40	- 55	100	20, 10, 5	7.5
		22 nF to 470 nF	100	63	- 55	100	20, 10, 5	7.5
		10 nF to 100 nF	250	160	- 55	100	20, 10, 5	7.5
		3.3 nF to 10 nF	400	200	- 55	100	20, 10, 5	7.5
		1.0 nF to 3.3 nF	630	220	- 55	100	20, 10, 5	7.5
MKT 1822	Polyester general applications	220 nF to 15 µF	63	40	- 55	100	20, 10, 5	10 to 27.5
		68 nF to 15 µF	100	63	- 55	100	20, 10, 5	10 to 27.5
		33 nF to 3.3 µF	250	160	- 55	100	20, 10, 5	10 to 27.5
		1 nF to 1.5 µF	400	200	- 55	100	20, 10, 5	10 to 27.5
		1 nF to 1.0 µF	630	220	- 55	100	20, 10, 5	10 to 27.5
		1 nF to 470 nF	1000	220	- 55	100	20, 10, 5	10 to 27.5
MKT 470	Polyester general applications 125 °C	68 nF to 1.2 nF	63	40	- 55	125	10, 5	5
		22 nF to 470 nF	100	63	- 55	125	10, 5	5
		10 nF to 120 nF	250	160	- 55	125	10, 5	5
		1 nF to 47 nF	400	200	- 55	125	10, 5	5
MKP 338 2 X2	Polypropylene interference suppression X2	1 nF to 3.3 µF		310	- 55	110	20, 10, 5	7.5 to 27.5
MKP 336 2 X2	Polypropylene interference suppression X2	1 nF to 2.2 µF		310	- 55	110	20, 10, 5	10 to 27.5
MKP 338 4 X2	Polypropylene interference suppression X2	10 nF to 10 µF		300 pitch < 37.5 305 pitch ≥ 37.5	- 55	105	20, 10	15 to 55
F 1778 X2	Polypropylene interference suppression X2	1 nF to 4.7 µF		310	- 55	110	20, 10, 5	7.5 to 37.5
F 1772 3 X2	Polyester interference suppression X2	10 nF to 2.2 µF		300	- 40	100	20, 10	15 to 37.5
F 1772 4 X2	Polyester interference suppression X2	10 nF to 1 µF		440	- 40	100	20, 10	15 to 37.5
F 1776 RC X2	Polyester interference suppression RC X2	68 nF to 0.68 µF		250	- 25	85	20	22.5 to 37.5
MKP 336 1 X1	Polypropylene interference suppression X1	10 nF to 1 µF		275	- 55	105	20, 10, 5	15 to 27.5
MKP 336 6 X1	Polypropylene interference suppression Y2	1 nF to 47 nF		300	- 55	105	20, 10	10 to 15

OVERVIEW OTHER PRODUCTS VISHAY FILM CAPACITORS								
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)
			Vdc	Vac	MIN.	MAX.		
F 1710-3 Y2 (X1)	Polyester interference suppression Y2	1 nF to 0.1 µF		305	- 40	105	20	10 to 27.5
F 1710-1 Y2 (X1)	Polyester interference suppression Y2	1 nF to 0.1 µF		250	- 40	100	20	15 to 27.5
MKP 1842	Polypropylene axial AC capacitors	10 nF to 680 nF		400	- 25	85	20	22.5 to 45
MKP 1844	Polypropylene AC capacitors	10 nF to 1 µF		400	- 25	85	20, 10, 5	10 to 37.5
F 1774 X2	Polyester insulated leads interference suppression X2	10 nF to 2.2 µF		275, 300, 440	- 40	100	20, 10	15 to 37.5
F 1779 X2	Polypropylene insulated leads interference suppression X2	47 nF to 2.2 µF		275	- 40	100	20, 10	15 to 27.5
MKP 1837	MKP	10 nF to 100 nF	160	100	- 55	100	5, 2.5, 1	5
MKP 1840	MKP	4.7 nF to 100 nF	100	63	- 55	100	5	5
		33 nF to 10 µF	160	100	- 55	100	5	7.5 to 37.5
		10 nF to 10 µF	250	160	- 55	100	5	7.5 to 37.5
		10 nF to 4.7 µF	400	220	- 55	100	5	10 to 37.5
		10 nF to 2.2 µF	630	250	- 55	100	5	10 to 37.5
MKP 1841	MMKP	10 nF to 6.8 µF	160	100	- 55	100	5	7.5 to 37.5
		6.8 nF to 4.7 µF	250	160	- 55	100	5	7.5 to 37.5
		4.7 nF to 2.2 µF	400	220	- 55	100	5	7.5 to 37.5
		470 pF to 3.3 nF	630	250	- 55	100	5	7.5
		4.7 nF to 680 nF	630	400	- 55	100	5	15 to 37.5
		2.2 nF to 470 nF	1000	600	- 55	100	5	15 to 37.5
		1 nF to 220 nF	1600	650	- 55	100	5	15 to 37.5
		470 pF to 100 nF	2000	700	- 55	100	5	15 to 37.5
MKP 1845	MMKP axial	33 nF to 4.7 µF	160	100	- 55	100	5	axial
		22 nF to 3.3 µF	250	160	- 55	100	5	axial
		10 nF to 2.2 µF	400	220	- 55	100	5	axial
		10 nF to 680 nF	630	400	- 55	100	5	axial
		10 nF to 220 nF	1000	600	- 55	100	5	axial
		10 nF to 220 nF	1600	650	- 55	100	5	axial
		1 nF to 100 nF	2000	700	- 55	100	5	axial
MKP 379	MKP	75 nF to 6.2 µF	160	100	- 55	85	5	10 to 27.5
		47 nF to 3.9 µF	250	160	- 55	85	5	10 to 27.5
		22 nF to 2 µF	400	200	- 55	85	5	10 to 27.5
		10 nF to 1µF	630	250	- 55	85	5	10 to 27.5
MKP 380	MKP	18 nF to 100 nF	100	63	- 55	85	10, 5	5
		13 nF to 68 nF	160	100	- 55	85	10, 5	5
		9.1 nF to 43 nF	250	160	- 55	85	10, 5	5
		4.3 nF to 20 nF	400	200	- 55	85	10, 5	5
		1.5 nF to 9.1 nF	630	200	- 55	85	10, 5	5
MKP 416-420 MKP 420	416	36 nF to 270 nF	63	25	- 55	85	5, 2	5 to 10
	417	24 nF to 240 nF	160	63	- 55	85	5, 2	5 to 10
	418	10 nF to 130 nF	250	100	- 55	85	5, 2	5 to 10
	419	1.5 nF to 68 nF	400	125	- 55	85	5, 2	5 to 10
	420	1.5 nF to 47 nF	630	160	- 55	85	5, 2	5 to 10
MKP 422	MKP	1.0 nF to 47 nF	630	160	- 55	85	5, 2	5 to 10

OVERVIEW MAINTENANCE PRODUCTS VISHAY FILM CAPACITORS								
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)
			Vdc	Vac	MIN.	MAX.		
MKT 304	Polyester general applications low building height	100 nF to 1.8 µF	250	63	- 55	105	10, 5	7.5
		100 nF to 2.2 µF	400	100	- 55	105	10, 5	7.5
		10 nF to 680 nF	630	160	- 55	105	10, 5	7.5
MKT 465	Polyester	10 nF to 270 nF	100	63	- 55	105	10, 5	5
		10 nF to 150 nF	250	160	- 55	105	10, 5	5
		10 nF to 56 nF	400	200	- 55	105	10, 5	5
MKT 466	Polyester	12 nF to 47 nF	100	63	- 55	105	10, 5	5
		10 nF to 150 nF	250	160	- 55	105	10, 5	5
		10 nF to 56 nF	400	200	- 55	105	10, 5	5
KT 347	Polyester	15 nF to 470 nF	100	50	- 40	100	20, 10	10.0 to 22.5
		8.2 nF to 270 nF	250	80	- 40	100	20, 10	10.0 to 22.5
		4.7 nF to 150 nF	400	125	- 40	100	20, 10	10.0 to 22.5
		1 nF to 68 nF	630	200	- 40	100	20, 10	10.0 to 22.5
MKT 368	Polyester general applications kinked leads	220 nF to 1 µF	63	40	- 55	105	10, 5	10.0 to 27.5
		56 nF to 3.3 µF	100	63	- 55	105	10, 5	10.0 to 27.5
		27 nF to 2.2 µF	250	160	- 55	105	10, 5	10.0 to 27.5
		1 nF to 1 µF	400	220	- 55	105	10, 5	10.0 to 27.5
		10 nF to 470 nF	630	250	- 55	105	10, 5	10.0 to 27.5
MKT 369	Polyester general applications straight leads	220 nF to 1 µF	63	40	- 55	105	10, 5	10
		56 nF to 220 nF	100	63	- 55	105	10, 5	10
		27 nF to 100 nF	250	160	- 55	105	10, 5	10
		1 nF to 33 nF	400	220	- 55	105	10, 5	10
		10 nF to 22 nF	630	250	- 55	105	20, 10, 5	10
KC 1850	Polycarbonate	3.3 nF to 10 nF	63	40	- 55	100	20, 10, 5	5
		1.5 nF to 2.2 nF	100	63	- 55	100	20, 10, 5	5
		0.22 nF to 2.2 nF	160	100	- 55	100	20, 10, 5	5
MKC 1858	Polycarbonate	47 nF to 330 nF	63	40	- 55	100	20, 10, 5	5
		10 nF to 33 nF	100	63	- 55	100	20, 10, 5	5
MKC 1860	Polycarbonate	220 nF to 10 µF	63	40	- 55	100	20, 10, 5	axial
		100 nF to 10 µF	100	63	- 55	100	20, 10, 5	axial
		47 nF to 2.2 µF	250	160	- 55	100	20, 10, 5	axial
		10 nF to 1 µF	400	200	- 55	100	20, 10, 5	axial
MKC 1862	Polycarbonate		63	40	- 55	100	20, 10, 5	10 to 27.5
			100	63	- 55	100	20, 10, 5	11 to 27.5
			250	160	- 55	100	20, 10, 5	12 to 27.5
			400	200	- 55	100	20, 10, 5	13 to 27.5
MKP 335 5 X2	Polypropylene interference suppression X2	10 nF to 470 nF		275	- 55	100	20, 10	15 to 22.5
KP 1836	KP/MKP	2.7 nF to 220 nF	630	300	- 55	100	5	15 to 37.5
		1.8 nF to 220 nF	1000	350	- 55	100	5	15 to 37.5
		1.2 nF to 220 nF	1250	400	- 55	100	5	15 to 37.5
		680 pF to 100 nF	1600	500	- 55	100	5	15 to 37.5
		100 pF to 47 nF	2000	600	- 55	100	5	15 to 37.5
MKP 1846	MMKP	6.8 nF to 680 nF	630	400	- 55	100	5	15 to 37.5
		3.3 nF to 220 nF	1000	600	- 55	100	5	15 to 27.5
		1 nF to 220 nF	1600	650	- 55	100	5	15 to 37.5
		1 nF to 100 nF	2000	700	- 55	100	5	22.5 to 37.5
KP/MKP 376	KP/MKP	6.8 nF to 270 nF	630	300	- 55	100	5, 3.5	15 to 27.5
		4.7 nF to 180 nF	1000	400	- 55	100	5, 3.5	15 to 27.5

OVERVIEW MAINTENANCE PRODUCTS VISHAY FILM CAPACITORS								
TYPE	PRODUCT DESCRIPTION	CAPACITANCE RANGE	VOLTAGE		TEMPERATURE RATING (°C)		TOLERANCE (%)	PITCH (mm)
			Vdc	Vac	MIN.	MAX.		
MKP 378	MKP	330 nF to 3.3 µF	250	160	- 55	85	5	22.5 to 27.5
		180 nF to 2 µF	400	200	- 55	85	5	22.5 to 27.5
		15 nF to 680 nF	630	300	- 55	85	5	15 to 27.5
		3 nF to 220 nF	1000	400	- 55	85	5	15 to 27.5
		5.6 nF to 100 nF	1600	500	- 55	85	5	22.5 to 27.5
		3.3 nF to 51 nF	2000	600	- 55	85	5	22.5 to 27.5
MKP 479	MKP	7.5 nF to 3.9 µF	160	100	- 55	105	5	10 to 27.5
		47 nF to 3 µF	250	160	- 55	105	5	10 to 27.5
		22 nF to 1.2 µF	400	200	- 55	105	5	10 to 27.5
		10 nF to 680 nF	630	200	- 55	105	5	10 to 27.5

Remarks

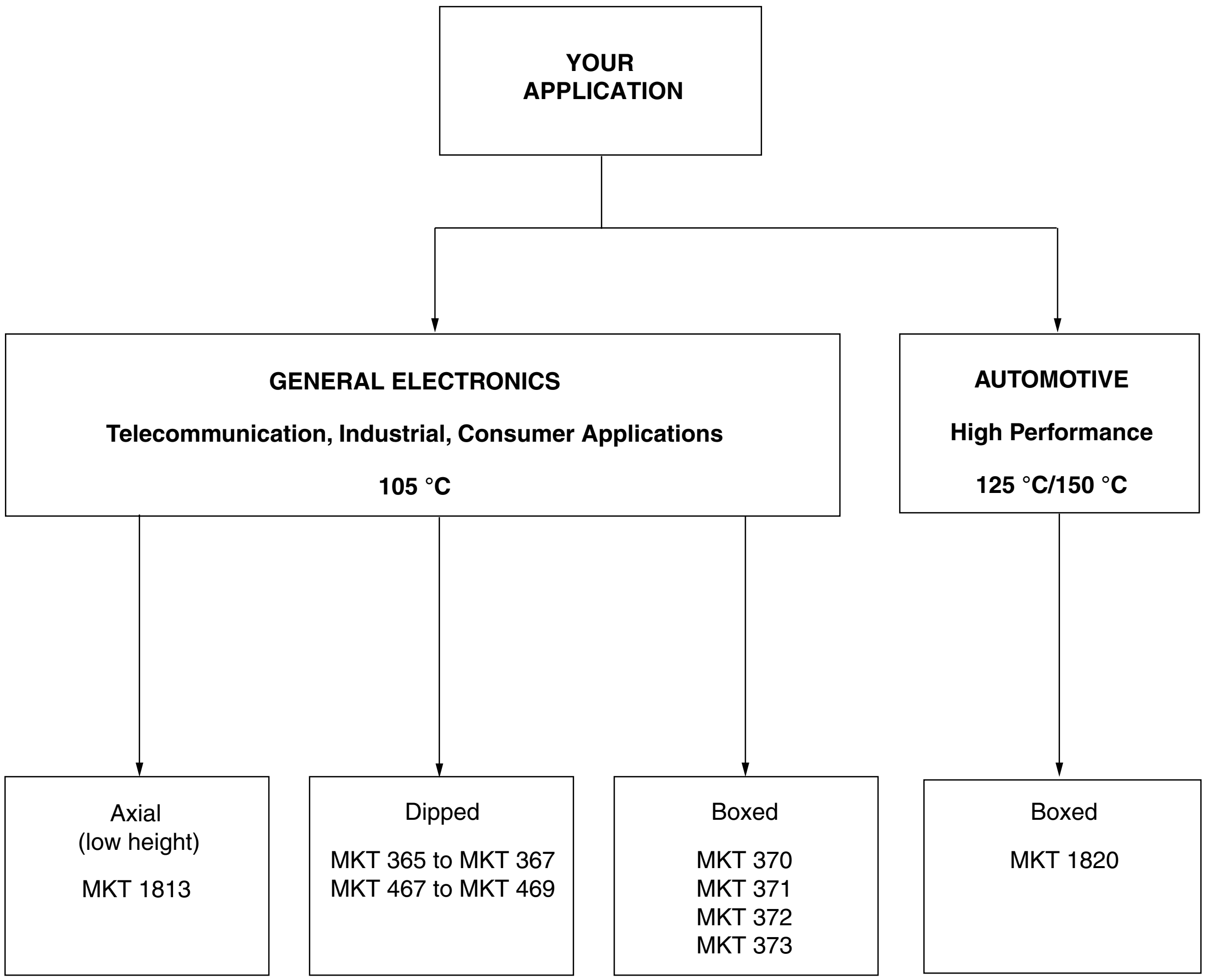
The valid datasheets for these products you will find under: www.vishay.com

Maintenance or other products does not mean that customer has to expect EOL!
We only want to inform that these capacitors are no more in the focus of R&D and Marketing!
We want to ask our customers to do not use these capacitors for new designs. If you need a suitable alternative part, please contact Vishay, we will give you the necessary support.

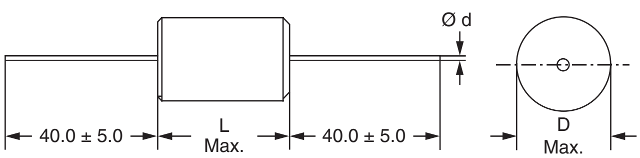
DC Film Capacitors

Contents

Film Capacitors



DC Film Capacitors
MKT Axial Type



Dimensions in mm

LEAD DIAMETER d (mm)	D (mm)
0.6	≤ 5.0
0.7	> 5.0 ≤ 7.0
0.8	> 7.0 < 16.5
1.0	≥ 16.5

MAIN APPLICATIONS
Blocking, bypassing, filtering, timing, coupling and decoupling, interference suppression in low voltage applications

REFERENCE STANDARDS
IEC 60384-2

MARKING
C-value; tolerance; rated voltage; manufacturer's type; code for dielectric material; manufacturer location; manufacturer's logo; year and week

DIELECTRIC
Polyester film

ELECTRODES
Metallized

CONSTRUCTION
Mono and internal series construction

RATED (DC) VOLTAGE
63 V, 100 V, 250 V, 400 V, 630 V, 1000 V

RATED (AC) VOLTAGE
40 V, 63 V, 160 V, 200 V, 220 V

FEATURES
Supplied loose in box, taped on ammopack or reel
RoHS compliant

Pb
Pb-free

e3

RoHS
COMPLIANT

ENCAPSULATION
Plastic-wrapped, epoxy resin sealed, flame retardant

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/100/56

CAPACITANCE RANGE (E12 SERIES)
470 pF to 22 µF

CAPACITANCE TOLERANCE
± 20 %, ± 10 %, ± 5 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
100 °C

PULL TEST ON LEADS
Minimum 20 N in direction of leads according to IEC 60068-2-21

BENT TEST ON LEADS
2 bends trough 90° combined with 10 N tensile strength

RELIABILITY
Operational life > 300 000 h (40 °C/0.5 U_R)
Failure rate < 2 FIT (40 °C/0.5 U_R)

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

COMPOSITION OF CATALOG NUMBER

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

CAPACITANCE (numerically)

Example:
468 = 680 nF

MKT	1813	X	XX	25	X	X
TYPE		MULTIPLIER	CAPACITANCE	Un	TOLERANCE	SPECIAL LETTER FOR TAPED

Un
Un = 06 = 63 V
Un = 01 = 100 V
Un = 25 = 250 V
Un = 40 = 400 V
Un = 63 = 630 V
Un = 10 = 1000 V

TOLERANCE	
4	± 5 %
5	± 10 %
6	± 20 %

SPECIAL LETTER FOR TAPED	
	Bulk
R	Reel
G	Ammopack

Note

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

SPECIFIC REFERENCE DATA

DESCRIPTION				VALUE		
Tangent of loss angle:				at 1 kHz	at 10 kHz	at 100 kHz
C = 0.1 µF				80×10^{-4}	150×10^{-4}	250×10^{-4}
0.1 µF ≤ C = 1.0 µF				80×10^{-4}	150×10^{-4}	-
C ≥ 1.0 µF				100×10^{-4}	-	-
Capacitor length (mm)	Maximum pulse rise time $(dU/dt)_R$ [V/µs]					
	63 Vdc	100 Vdc	250 Vdc	400 Vdc	630 Vdc	1000 Vdc
11	12	18	32	56	84	-
14	11	13	22	37	66	175
19	7	8	13	21	33	65
26.5	4	5	8	13	19	34
31.5	3	4	6	10	15	25
41.5	2	3	5	7	10	17
If the maximum pulse voltage is less than the rated voltage higher dU/dt values can be permitted.						
R between leads, for C ≤ 0.33 µF and U_R ≤ 100 V					> 15 000 MΩ	
R between leads, for C ≤ 0.33 µF and U_R > 100 V					> 30 000 MΩ	
RC between leads, for C > 0.33 µF and U_R ≤ 100 V					> 5000 s	
RC between leads, for C > 0.33 µF and U_R > 100 V					> 10 000 s	
R between leads and case, 100 V; (foil method)					> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s					1.6 x U_{Rdc}, 1 min	
Maximum application temperature					100 °C	

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 06 63 Vdc/ 40 Vac		VOLTAGE CODE 01 100 Vdc/ 63 Vac		VOLTAGE CODE 25 250 Vdc/ 160 Vac		VOLTAGE CODE 40 400 Vdc/ 200 Vac		VOLTAGE CODE 63 (1) 630 Vdc/ 220 Vac		VOLTAGE CODE 10 (1) 1000 Vdc/ 220 Vac	
		D	L	D	L	D	L	D	L	D	L	D	L
470 pF	147	-	-	-	-	-	-	-	-	5.0	11.0	-	-
680 pF	168	-	-	-	-	-	-	-	-	5.0	11.0	-	-
1000 pF	210	-	-	-	-	-	-	-	-	5.0	11.0	5.5	14.0
1500 pF	215	-	-	-	-	-	-	-	-	5.0	11.0	6.0	14.0
2200 pF	222	-	-	-	-	-	-	-	-	5.0	11.0	6.0	14.0
3300 pF	233	-	-	-	-	-	-	-	-	5.0	11.0	7.0	14.0
4700 pF	247	-	-	-	-	-	-	-	-	5.0	11.0	6.0	19.0
6800 pF	268	-	-	-	-	-	-	5.0	11.0	6.0	14.0	6.0	19.0
0.01 µF	310	-	-	-	-	-	-	5.0	11.0	6.0	14.0	6.5	19.0
0.015 µF	315	-	-	-	-	5.0	11.0	6.0	14.0	6.5	14.0	7.5	19.0
0.022 µF	322	-	-	-	-	5.0	11.0	6.0	14.0	7.5	14.0	9.0	19.0
0.033 µF	333	-	-	-	-	5.0	11.0	6.0	14.0	6.5	19.0	10.5	19.0
0.047 µF	347	-	-	-	-	6.0	14.0	7.0	14.0	7.5	19.0	12.0	19.0
0.068 µF	368	-	-	5.0	11.0	6.0	14.0	8.0	14.0	8.5	19.0	11.0	26.5
0.1 µF	410	-	-	5.0	11.0	6.0	14.0	7.0	19.0	10.5	19.0	13.0	26.5
		-	-	-	-	-	-	-	-	9.5	19.0 (2)	-	-
0.15 µF	415	5.0	11.0	5.5	11.0	7.0	14.0	8.5	19.0	10.0	26.5	13.5	31.5
0.22 µF	422	5.0	11.0	6.0	14.0	7.0	19.0	8.0	26.5	11.5	26.5	16.0	31.5
		-	-	-	-	-	-	8.0	19.0 (2)	-	-	-	-
0.33 µF	433	6.0	14.0	6.0	19.0	8.0	19.0	9.5	26.5	13.5	26.5	16.0	41.5
		-	-	-	-	-	-	9.5	19.0 (2)	-	-	-	-
0.47 µF	447	7.0	14.0	6.5	19.0	9.0	19.0	11.0	26.5	14.5	31.5	19.0	41.5
		-	-	-	-	-	-	-	-	14.0	26.5 (2)	-	-
0.68 µF	468	6.5	19.0	7.0	19.0	8.5	26.5	11.5	31.5	14.5	41.5	-	-
		-	-	-	-	9.0	19.0 (2)	-	-	-	-	-	-
1.0 µF	510	7.5	19.0	8.5	19.0	10.0	26.5	13.5	31.5	16.5	41.5	-	-
1.5 µF	515	8.5	19.0	8.0	26.5	11.0	31.5	14.0	41.5	-	-	-	-
		-	-	8.0	19.0 (2)	-	-	13.0	31.5 (2)	-	-	-	-
2.2 µF	522	8.5	26.5	9.5	26.5	13.0	31.5	16.5	41.5	-	-	-	-
		7.5	19.0 (2)	9.5	19.0 (2)	-	-	-	-	-	-	-	-
3.3 µF	533	10.0	26.5	11.5	26.5	15.5	31.5	-	-	-	-	-	-
		8.5	19.0 (2)	-	-	14.0	26.5 (2)	-	-	-	-	-	-
4.7 µF	547	11.5	26.5	12.0	31.5	15.5	41.5	-	-	-	-	-	-
		-	-	-	-	14.5	31.5 (2)	-	-	-	-	-	-
6.8 µF	568	12.0	31.5	14.0	31.5	17.5	41.5	-	-	-	-	-	-
10.0 µF	610	14.5	31.5	16.5	31.5	21.0	41.5	-	-	-	-	-	-
		-	-	13.5	31.5 (2)	-	-	-	-	-	-	-	-
15.0 µF	615	18.0	31.5	20.5	31.5	-	-	-	-	-	-	-	-
22.0 µF	622	17.5	41.5	-	-	-	-	-	-	-	-	-	-

Notes
- Pitch = L + 3.5

(1) Not suitable for mains applications
(2) For the smaller size please add “-M” at the end of the type designation (e.g. MKT 1813-510/255-M)

RECOMMENDED PACKAGING

PACKAGING CODE	TYPE OF PACKAGING	REEL DIAMETER (mm)	ORDERING CODE EXAMPLES	
G	Ammo	-	MKT 1813-422-014-G	x
R	Reel	350	MKT 1813-422-014-R	x
-	Bulk	-	MKT 1813-422-014	x

Note
- Attention: Capacitors with L > 31.5 mm only as bulk available

EXAMPLE OF ORDERING CODE

TYPE	CAPACITANCE CODE	VOLTAGE CODE	TOLERANCE CODE (1)	PACKAGING CODE
MKT 1813	410	06	5	G

Note
(1) **Tolerance Codes: 4** = 5 % (J); **5** = 10 % (K); **6** = 20 % (M)

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to Packaging information: www.vishay.com/doc?28139 or end of catalog.

Specific Method of Mounting to Withstand Vibration and Shock

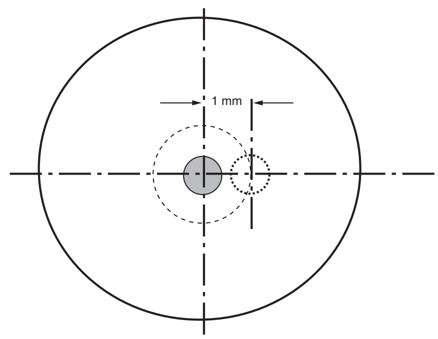
In order to withstand vibration and shock tests, it must be ensured that the capacitor body is in good contact with the printed-circuit board:

- For L ≤ 19 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
- The maximum diameter and length of the capacitors are specified in the dimensions table
- Eccentricity as shown in the drawing below

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: $h_{max.} \leq h + 0.4$ mm or $h_{max.} \leq h' + 0.4$ mm



Storage Temperature

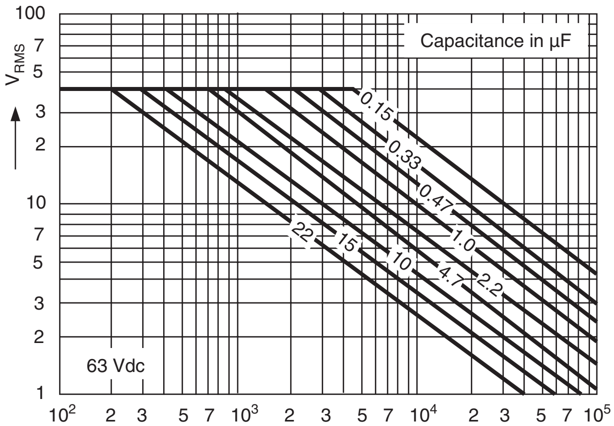
- Storage temperature: T_{stg} = - 25 °C to + 40 °C with RH maximum 80 % without condensation

Ratings and Characteristics Reference Conditions

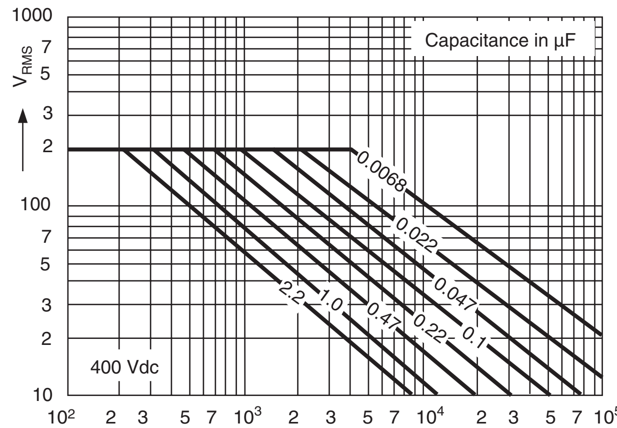
Unless otherwise specified, all electrical values apply to an ambient temperature of 23 ± 1 °C, an atmospheric pressure of 86 kPa to 106 kPa and a relative humidity of 50 ± 2 %.

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

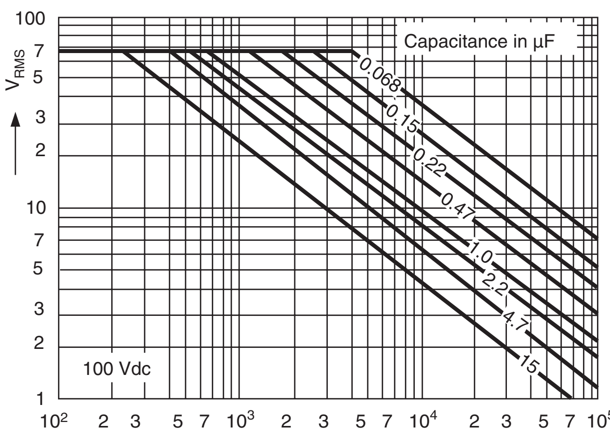
CHARACTERISTICS



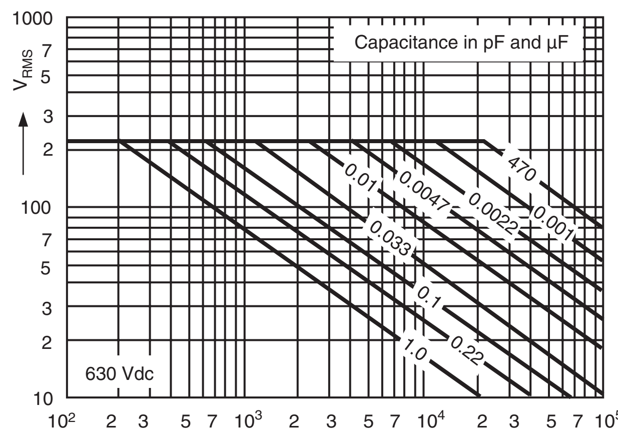
Permissible AC Voltage vs. Frequency



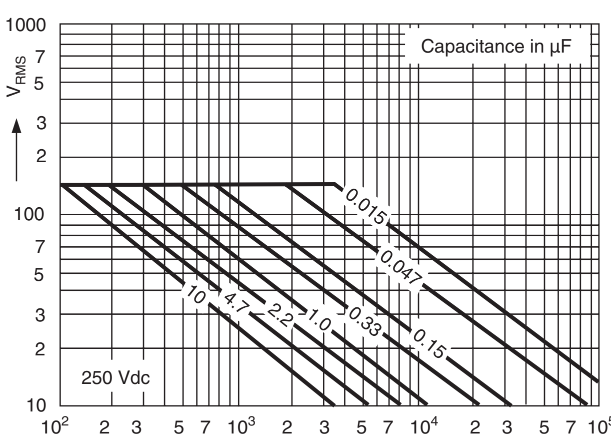
Permissible AC Voltage vs. Frequency



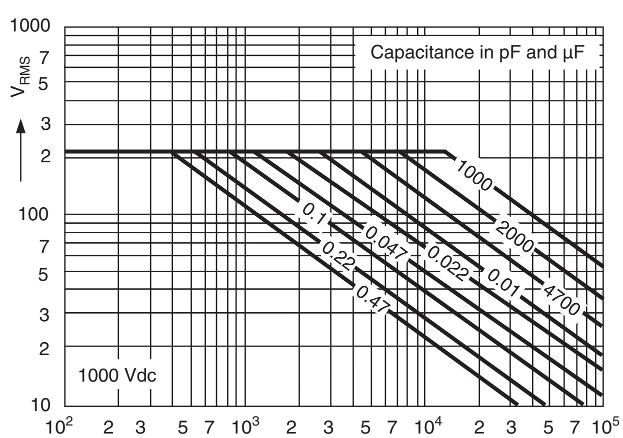
Permissible AC Voltage vs. Frequency



Permissible AC Voltage vs. Frequency

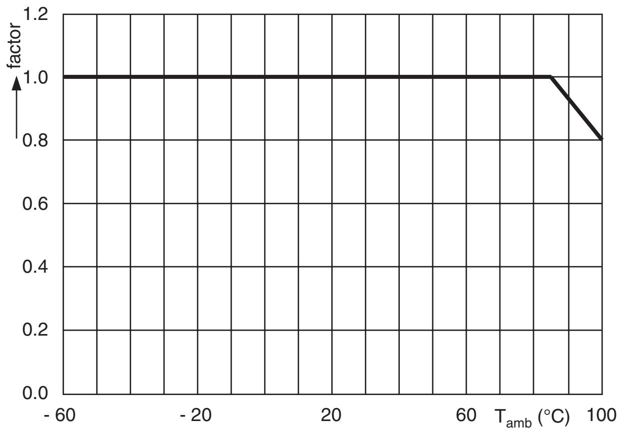


Permissible AC Voltage vs. Frequency

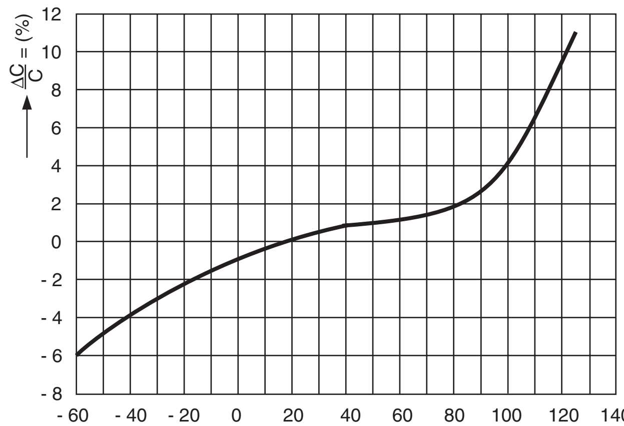


Permissible AC Voltage vs. Frequency

Nominal voltage (AC and DC) as a function of temperature
$U = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$

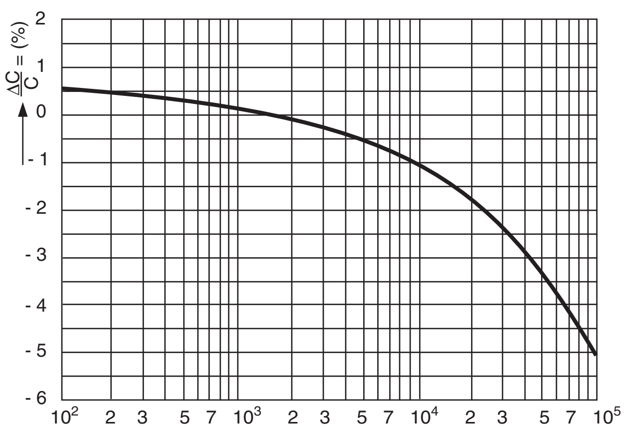


Capacitance as a function of temperature
$\Delta C/C = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$



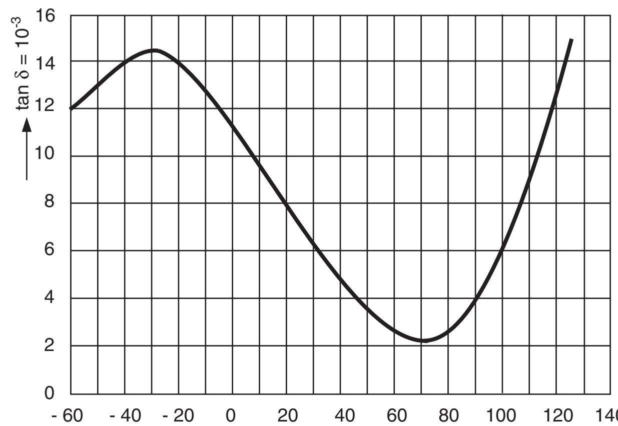
Capacitance vs. Temperature $\Delta C/C = f(\vartheta)$ → T_{amb} (°C)

Capacitance as function of frequency
$\Delta C/C = f(f)$, 100 Hz $\leq f \leq$ 1 MHz



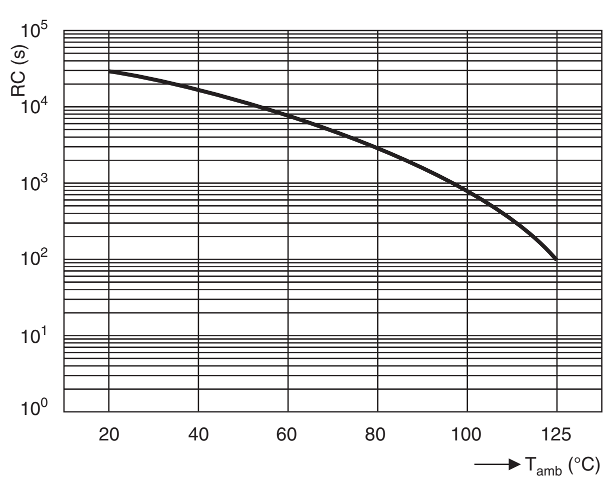
Capacitance Change vs. Frequency $\frac{\Delta C}{C} = f(f)$ → f (Hz)

Dissipation factor as function of temperature
$\Delta\tan\delta/\tan\delta = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$

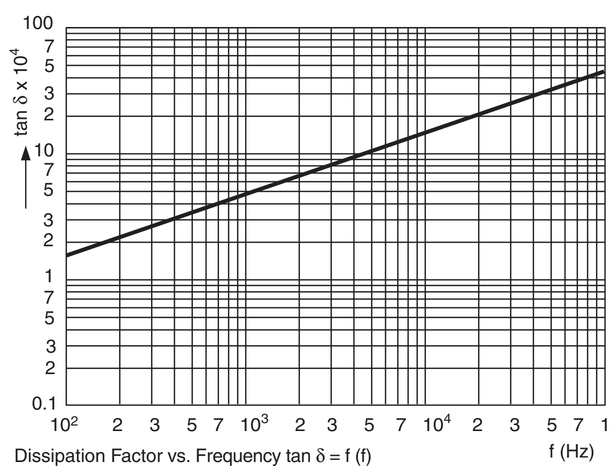


Dissipation Factor (1 kHz) vs. Temperature $\tan\delta = f(\vartheta)$ → T_{amb} (°C)

Insulation resistance as a function of temperature
$R_{is} = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$

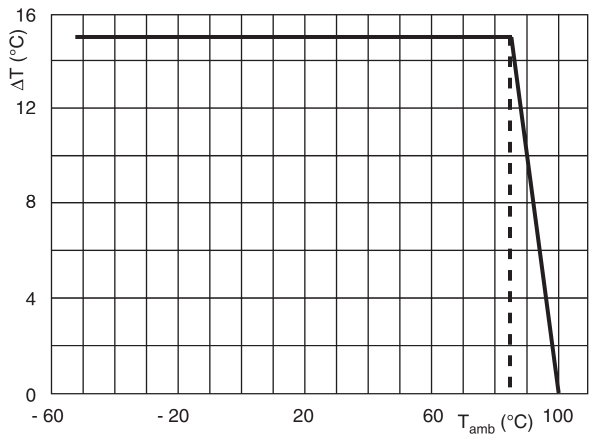


Dissipation factor as a function of frequency
$\Delta\tan\delta/\tan\delta = f(f)$, 100 Hz $\leq f \leq$ 1 MHz_L



Dissipation Factor vs. Frequency $\tan\delta = f(f)$

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



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

$D_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)					
	L = 11 mm	L = 14 mm	L = 19 mm	L = 26.5 mm	L = 31.5 mm	L = 41.5 mm
5.0	2	-	-	-	-	-
5.5	2	3	-	-	-	-
6.0	-	3	4	-	-	-
6.5	-	3	5	-	-	-
7.0	-	4	5	-	-	-
7.5	-	-	6	-	-	-
8.0	-	4	-	8	-	-
8.5	-	-	6	9	-	-
9.0	-	-	7	-	-	-
9.5	-	-	-	10	-	-
10.0	-	-	-	11	-	-
10.5	-	-	8	-	-	-
11.0	-	-	-	12	14	-
11.5	-	-	-	13	15	-
12.0	-	-	9	-	16	-
12.5	-	-	-	-	-	-
13.0	-	-	-	14	17	-
13.5	-	-	-	15	18	-
14.0	-	-	-	16	19	-
14.5	-	-	-	-	19	-
15.0	-	-	-	-	-	-
15.5	-	-	-	-	21	-
16.0	-	-	-	-	-	29
16.5	-	-	-	-	22	30
17.0	-	-	-	-	-	-
17.5	-	-	-	-	-	31
18.0	-	-	-	-	24	-
18.5	-	-	-	-	-	-
19.0	-	-	-	-	-	34
20.0	-	-	-	-	-	-
20.5	-	-	-	-	28	-
21.0	-	-	-	-	-	38

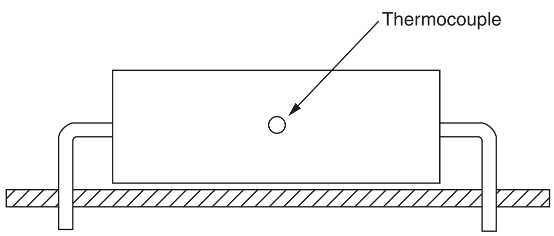
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free 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 $\Delta T = P/G$:

- 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 peak 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
   The rated voltage pulse slope is valid for ambient temperatures up to 85 °C. For higher temperatures a derating factor of 3 % per K shall be applied.
4. The maximum component surface temperature rise must be lower than the limits (see figure 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 < $T_{amb} \leq 100$ °C
Maximum continuous RMS voltage	U_{Rac}	0.8 x U_{Rac}
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}

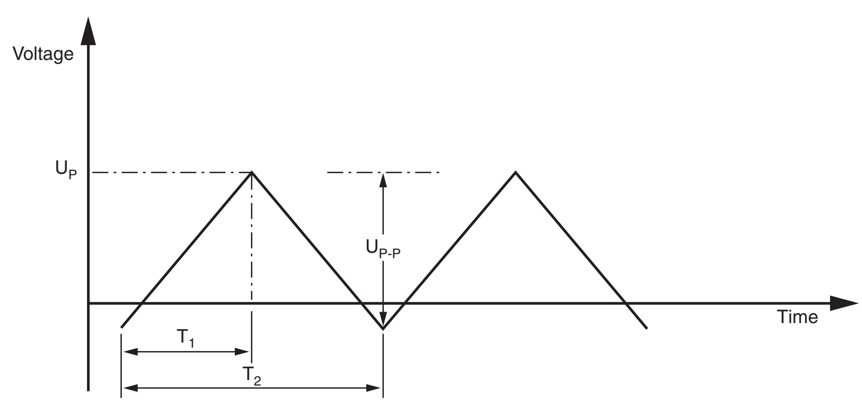
EXAMPLE

C = 3300 nF - 100 V used for the voltage signal shown in next figure.
U_{P-P} = 80 V; U_P = 70 V; T_1 = 0.5 ms; T_2 = 1 ms
The ambient temperature is 35 °C

Checking conditions:

1. The peak voltage U_P = 70 V is lower than 100 Vdc
2. The peak-to-peak voltage 80 V is lower than $2\sqrt{2}$ x 63 Vac = 178 U_{P-P}
3. The voltage pulse slope (dU/dt) = 80 V/500 µs = 0.16 V/µs
   This is lower than 8 V/µs (see specific reference data for each version)
4. The dissipated power is 60 mW as calculated with fourier terms
   The temperature rise for $W_{max.}$ = 11.5 mm and pitch = 26.5 mm will be 60 mW/13 mW/°C = 4.6 °C
   This is lower than 15 °C temperature rise at 35 °C, according figure max. allowed component temperature rise
5. Not applicable
6. Not applicable

Voltage Signal



INSPECTION REQUIREMENTS

General Notes:

Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

Group C Inspection Requirements

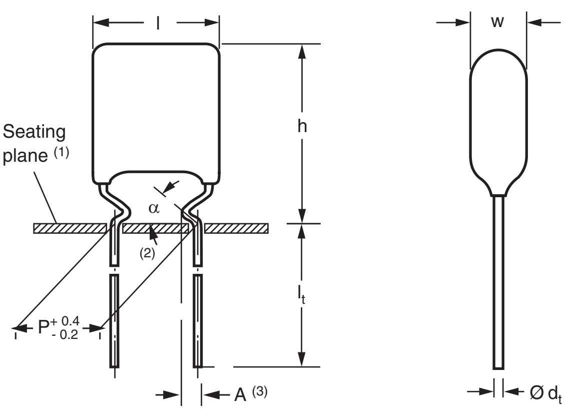
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in Chapters “General data” of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF 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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.6 Rapid change of temperature	θA = - 55 °C θB = + 100 °C 5 cycles Duration t = 30 min Visual examination	No visible damage
4.7 Vibration	Mounting: See section “Mounting” of this specification 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	
4.7.2 Final inspection	Visual examination	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9 Shock	Mounting: See section "Mounting" of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq 220$ nF or ≤ 0.015 for: 220 nF $< C \leq 470$ nF and ≤ 0.003 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: + 100 °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	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ ≤ 0.007 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq 220$ nF or ≤ 0.015 for: 220 nF $< C \leq 470$ nF and ≤ 0.005 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	
4.11.1 Initial measurements	Capacitance Tangent of loss angle at 1 kHz	

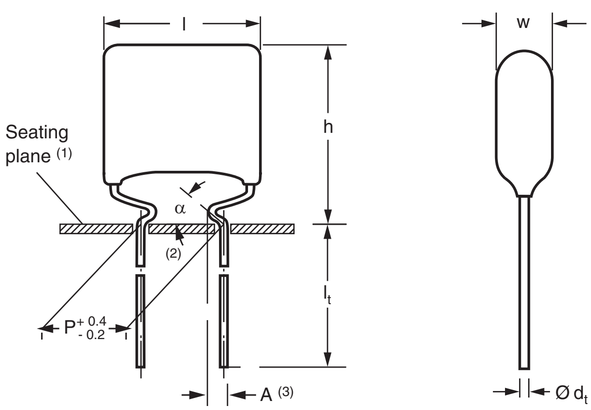
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.11.3 Final measurements	Voltage proof = U_{Rdc} for 1 min within 15 min after removal from testchamber	No breakdown of flash-over
	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.005$ Compared to values measured in 4.11.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 1.0 x U_{Rdc} at 100 °C	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 470$ nF at 100 kHz or for $C > 470$ nF at 10 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq$ 220 nF or ≤ 0.015 for: 220 nF $< C \leq$ 470 nF and ≤ 0.003 for: $C > 470$ nF Compared to values measured in 4.12.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 470$ nF at 100 kHz or for $C > 470$ nF at 10 kHz	
4.13.3 Final measurements	Capacitance	$\|\Delta C/C\| \leq 3$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq$ 220 nF or ≤ 0.015 for: 220 nF $< C \leq$ 470 nF and ≤ 0.003 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

DC Film Capacitors
MKT Radial Lacquered Type

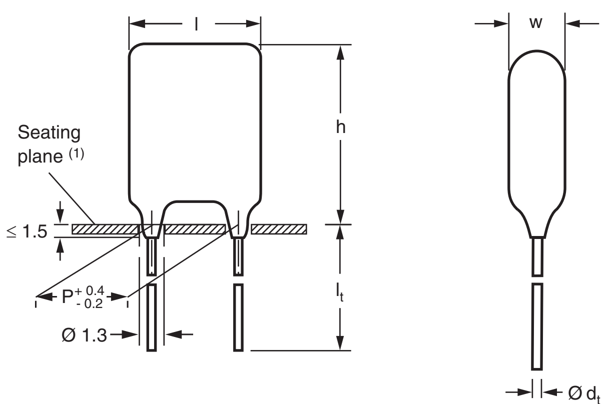
365, 366 Kinked Leads



365 Bent Back Leads



367 Straight Leads



Notes

(1) Hole Ø 1.0 for d_t = 0.5 mm

(2) $0 \le \alpha < 50°$

(3) A = 1.7 ± 0.3 mm

FEATURES
Available taped and loose in box

RoHS compliant

APPLICATIONS
Blocking and coupling, bypass and energy reservoir.

REFERENCE STANDARDS
IEC 60384-2

MARKING
C-value; rated voltage; tolerance

DIELECTRIC
Polyester film

ELECTRODES
Metallized

CONSTRUCTION
Mono construction

RATED (DC) VOLTAGE
63 V, 100 V, 250 V, 400 V

RATED (AC) VOLTAGE
40 V, 63 V, 160 V, 220 V

COATING ENCAPSULATION
Flame retardant epoxy material (UL-class 94 V-0)

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/105/56

RATED TEMPERATURE
85 °C

CAPACITANCE RANGE (E12 SERIES)
365: 0.01 µF to 1.0 µF

366: 0.0033 µF to 1.0 µF

367: 0.0033 µF to 1.0 µF

CAPACITANCE TOLERANCE
± 10 %, ± 5 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
105 °C

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

COMPOSITION OF CATALOG NUMBER: 365

TYPE AND PITCHES	
365	5.0 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	365	XX	YY	Y
2222 (*)	365	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	63 V	100 V	250 V	400 V
365	Ammopack	Kinked leads; H = 16.0 mm; P_0 = 12.7 mm	± 10 %	75	85	-	-
			± 5 %	76	86	-	-
		Bent back leads; H = 16.0 mm; P_0 = 12.7 mm	± 10 %	15	25	45	55
			± 5 %	16	26	46	56
			Dimensions of these code numbers stay between brackets				
	Taped on reel [(1)]	Kinked leads; H = 16.0 mm; P_0 = 12.7 mm	± 10 %	71	81	-	-
			± 5 %	72	82	-	-
		Bent back leads; H = 16.0 mm; P_0 = 12.7 mm	± 10 %	11	21	41	51
			± 5 %	12	22	42	52
			Dimensions of these code numbers stay between brackets				

Note
(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 365

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 225 x 10^{-4}	
C > 0.47 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	-	
Rated voltage pulse slope $(dU/dt)_R$ at	63 Vdc	100 Vdc	250 Vdc	400 Vdc
	110 V/µs	110 V/µs	130 V/µs	170 V/µs
R between leads, for C ≤ 0.33 µF				
at 10 V; 1 min	> 15 000 MΩ			
at 100 V; 1 min		> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads, for C > 0.33 µF at 10 V; 1 min	> 5000 s		-	
R between interconnecting leads and casing, 100 V; 1 min	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	100 V; 1 min	160 V; 1 min	400 V; 1 min	640 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 63 V; U_{Rac} = 40 V (kinked leads)

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 365 XXYYY AND PACKAGING				
			AMMOPACK		REEL		C-VALUE
			H = 16.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.50 ± 0.05 mm							
0.047 0.056 0.068 0.082 0.1 0.12	4.0 x 12.5 x 7.3	0.25	**75...** (1500)	**76...** (1500)	**71...** (1500)	**72...** (1500)	**473** **563** **683** **823** **104** **124**
0.15	4.0 x 13.0 x 7.3	0.27	**75...** (1500)	**76...** (1500)	**71...** (1500)	**72...** (1500)	**154**
0.18	4.0 x 13.5 x 7.3	0.29	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**184**
0.22	4.2 x 13.5 x 7.3	0.31	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**224**
0.27	4.5 x 14.0 x 7.3	0.33	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**274**
0.33 0.39	4.5 x 14.5 x 7.3	0.35	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**334** **394**
0.47	4.5 x 15.5 x 7.3	0.37	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**474**
0.56	5.0 x 14.0 x 7.3	0.39	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**564**
0.68	5.5 x 14.5 x 7.3	0.41	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**684**
0.82	5.5 x 15.0 x 7.3	0.43	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**824**
1.0	5.5 x 15.5 x 7.3	0.45	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**105**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 63 V; U_{Rac} = 40 V (bent back leads)

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 365 XXYYY AND PACKAGING				
			AMMOPACK		REEL		C-VALUE
			H = 16.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm							
0.12 0.15 0.18 0.22	4.0 x 13.5 x 10.0	0.35	**15...** (1500)	**16...** (1500)	**11...** (1500)	**12...** (1500)	**124** **154** **184** **224**
0.27	4.5 x 14.0 x 10.0	0.39	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**274**
0.33 0.39	5.0 x 14.5 x 10.0	0.45	**15...** (1500)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**334** **394**
0.47 0.56 0.68 0.82 1.0	5.5 x 15.0 x 10.0	0.55	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**474** **564** **684** **824** **105**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V (kinked leads)

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 365 XXYYY AND PACKAGING				
			AMMOPACK		REEL		C-VALUE
			H = 16.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.50 ± 0.05 mm							
0.01 0.012 0.015 0.018 0.022 0.027 0.033 0.039	4.0 x 12.5 x 7.3	0.25	**85...** (1500)	**86...** (1500)	**81...** (1500)	**82...** (1500)	**103 123 153 183 223 273 333 393**
0.047 0.056 0.068	4.5 x 12.5 x 7.3	0.28	**85...** (1500)	**86...** (1500)	**81...** (1500)	**82...** (1500)	**473 563 683**
0.082	4.5 x 13.0 x 7.3	0.30	**85...** (1500)	**86...** (1500)	**81...** (1500)	**82...** (1500)	**823**
0.1 0.12 0.15 0.18 0.22	4.5 x 13.5 x 7.3	0.31	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	**104 124 154 184 224**
0.27	4.5 x 14.0 x 7.3	0.33	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	**274**

Notes

(1) Net weight for short lead products only

- SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V (bent back leads)

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 365 XXYYY AND PACKAGING				
			AMMOPACK		REEL		C-VALUE
			H = 16.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm							
0.039 0.047 0.056 0.068 0.082 0.1	4.0 x 13.5 x 10.0	0.35	**25...** (1500)	**26...** (1500)	**21...** (1500)	**22...** (1500)	**393 473 563 683 823 104**
0.12	4.5 x 14.0 x 10.5	0.40	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**124**
0.15 0.18	5.0 x 14.5 x 10.5	0.45	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**154 184**
0.22	5.5 x 15.0 x 10.5	0.57	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**224**
0.27 0.33 0.39 0.47	6.0 x 15.5 x 10.5	0.60	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**274 334 394 474**

Notes

(1) Net weight for short lead products only

- SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V (bent back leads)

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 365 XXYYY AND PACKAGING				
			AMMOPACK H = 16.0 mm		REEL H = 16.0 mm		C-VALUE
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm							
0.018 0.022 0.027 0.033 0.039 0.047 0.056	4.0 x 13.5 x 10.0	0.35	**45...** (1500)	**46...** (1500)	**41...** (1500)	**42...** (1500)	**183 223 273 333 393 473 563**
0.068	4.5 x 14.0 x 10.0	0.39	**45...** (1250)	**46...** (1250)	**41...** (1000)	**42...** (1000)	**683**
0.082	4.5 x 13.0 x 10.0	0.38	**45...** (1250)	**46...** (1250)	**41...** (1250)	**42...** (1250)	**823**
0.1	5.0 x 13.5 x 10.0	0.40	**45...** (1000)	**46...** (1000)	**41...** (1250)	**42...** (1250)	**104**
0.12	5.5 x 14.0 x 10.0	0.50	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**124**
0.15	5.5 x 15.5 x 10.0	0.58	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**154**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V (bent back leads)

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 365 XXYYY AND PACKAGING				
			AMMOPACK H = 16.0 mm		REEL H = 16.0 mm		C-VALUE
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm							
0.0033 0.0039 0.0047 0.0056 0.0068 0.0082 0.01 0.012 0.015	4.0 x 13.5 x 10.0	0.35	**55...** (1500)	**56...** (1500)	**51...** (1500)	**52...** (1500)	**332 392 472 562 682 822 103 123 153**
0.018	4.5 x 13.0 x 10.0	0.38	**55...** (1250)	**56...** (1250)	**51...** (1250)	**52...** (1250)	**183**
0.022	5.0 x 13.5 x 10.0	0.0	**55...** (1000)	**56...** (1000)	**51...** (1250)	**52...** (1250)	**223**
0.027	4.0 x 12.5 x 10.0	0.35	**55...** (1500)	**56...** (1500)	**51...** (1500)	**52...** (1500)	**273**
0.033	4.5 x 13.0 x 10.0	0.38	**55...** (1200)	**56...** (1250)	**51...** (1250)	**52...** (1250)	**333**
0.039 0.047	5.0 x 13.5 x 10.0	0.40	**55...** (1000)	**56...** (1000)	**51...** (1250)	**52...** (1250)	**393 473**
0.056	5.5 x 14.0 x 10.0	0.50	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**563**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

COMPOSITION OF CATALOG NUMBER: 366

TYPE AND PITCHES	
366	5.0/7.5 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	366	XX	YY	Y
2222 (*)	366	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	63 V	100 V	250 V	400 V
366	Loose in box	Kinked; Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	75	85	-	-
			± 5 %	76	86	-	-
		Kinked; Lead length 17.0 ± 4.0 mm	± 10 %	71	81	-	-
			± 5 %	72	82	-	-
Pitch = 7.5 mm							
366	Loos in box	Kinked; Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	15	25	45	55
			± 5 %	16	26	46	56
		Kinked; Lead length 17.0 ± 4.0 mm	± 10 %	11	21	41	51
			± 5 %	12	22	42	52
	Ammopack (1)	Kinked; H = 16.0 mm; P_0 = 12.7 mm	± 10 %	13	23	43	53
			± 5 %	17	27	47	57

Note

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 366

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz		at 10 kHz	at 100 kHz
C ≤ 0.47 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	≤ 225 x 10^{-4}
C > 0.47 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	-
Rated voltage pulse slope $(dU/dt)_R$ at	63 Vdc	100 Vdc	250 Vdc	400 Vdc
	110 V/µs	110 V/µs	130 V/µs	170 V/µs
R between leads, for C ≤ 0.33 µF				
at 10 V; 1 min	> 15 000 MΩ			
at 100 V; 1 min		> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads, for C > 0.33 µF at 10 V; 1 min	> 5000 s		-	
R between interconnecting leads and casing, 100 V; 1 min	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	100 V; 1 min	160 V; 1 min	400 V; 1 min	640 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 63 V; U_{Rac} = 40 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 366 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 17.0 ± 4.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.50 ± 0.05 mm									
0.047 0.056 0.068 0.082 0.1 0.12	4.0 x 12.5 x 7.3	0.25	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**473** **563** **683** **823** **104** **124**
0.15	4.0 x 13.0 x 7.3	0.27	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**154**
0.18	4.0 x 13.5 x 7.3	0.29	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**184**
0.22	4.2 x 13.5 x 7.3	0.31	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**224**
0.27	4.5 x 14.0 x 7.3	0.33	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**274**
0.33 0.39	4.5 x 14.5 x 7.3	0.35	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**334** **394**
0.47	4.5 x 15.5 x 7.3	0.37	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**474**
0.56	5.0 x 14.0 x 7.3	0.39	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**564**
0.68	5.5 x 14.5 x 7.3	0.41	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**684**
0.82	5.5 x 15.0 x 7.3	0.43	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**824**
1.0	5.5 x 15.5 x 7.3	0.45	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	-		**105**
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.12 0.15 0.18 0.22	4.0 x 12.0 x 10.0	0.30	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1500)	**17...** (1500)	**124** **154** **184** **224**
0.27	4.5 x 13.0 x 10.5	0.38	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1250)	**17...** (1250)	**274**
0.33 0.39	5.0 x 13.5 x 10.5	0.43	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**334** **394**
0.47	5.5 x 14.0 x 10.5	0.53	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**474**
0.56 0.68 0.82 1.0	5.5 x 14.5 x 10.5	0.54	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**564** **684** **824** **105**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 366 XXYYY AND PACKAGING						C-VALUE
			LOOSE IN BOX				AMMOPACK		
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 17.0 ± 4.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.50 ± 0.05 mm									
0.01 0.012 0.015 0.018 0.022 0.027 0.033 0.039 0.047 0.056 0.068	4.5 x 12.5 x 7.3	0.28	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	-		**103 123 153 183 223 273 333 393 473 563 683**
0.082	4.5 x 13.0 x 7.3	0.30	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	-		**823**
0.1 0.12 0.15 0.18 0.22	4.5 x 13.5 x 7.3	0.31	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	-		**104 124 154 184 224**
0.27	4.5 x 14.0 x 7.3	0.33	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	-		**274**
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.039 0.047 0.056 0.068 0.082	4.0 x 12.0 x 10.0	0.30	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1500)	**27...** (1500)	**393 473 563 683 823**
0.1	4.0 x 13.0 x 10.0	0.26	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1500)	**27...** (1500)	**104**
0.12	4.5 x 13.0 x 10.5	0.38	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1250)	**27...** (1250)	**124**
0.15	5.0 x 13.0 x 15.0	0.40	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**154**
0.18	5.0 x 13.5 x 10.5	0.43	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**184**
0.22	5.5 x 13.5 x 10.5	0.50	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**224**
0.27	6.0 x 14.5 x 10.5	0.55	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**274**
0.33 0.39 0.47	6.0 x 15.0 x 10.5	0.58	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**334 394 474**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 366 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 17.0 ± 4.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.018 0.022 0.027 0.033 0.039 0.047	4.0 x 13.0 x 10.0	0.26	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1500)	**47...** (1500)	**183 223 273 333 393 473**
0.056	4.0 x 14.0 x 10.0	0.35	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1500)	**47...** (1500)	**563**
0.068	4.5 x 14.0 x 10.0	0.39	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1250)	**47...** (1250)	**683**
0.082	4.5 x 13.0 x 10.0	0.38	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1250)	**47...** (1250)	**823**
0.1	5.0 x 13.5 x 10.0	0.40	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1000)	**47...** (1000)	**104**
0.12	5.5 x 14.0 x 10.0	0.50	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1000)	**47...** (1000)	**124**
0.15	5.5 x 15.5 x 10.0	0.58	**45...** (1000)	**46...** (1000)	**41...** (1000)	**42...** (1000)	**43...** (1000)	**47...** (1000)	**154**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 366 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 17.0 ± 4.0 mm		H = 16.0 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.0033 0.0039 0.0047	4.0 x 12.0 x 10.0	0.30	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1500)	**57...** (1500)	**332 392 472**
0.0056 0.0068 0.0082 0.01 0.012 0.015	4.0 x 13.0 x 10.0	0.26	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1500)	**57...** (1500)	**562 682 822 103 123 153**
0.018	4.0 x 13.5 x 10.0	0.35	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1250)	**57...** (1250)	**183**
0.022	5.0 x 14.0 x 10.0	0.45	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1000)	**57...** (1000)	**223**
0.027	4.0 x 12.5 x 10.0	0.35	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1500)	**57...** (1500)	**273**
0.033	4.5 x 13.0 x 10.0	0.38	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1250)	**57...** (1250)	**333**
0.039 0.047	5.0 x 13.5 x 10.0	0.40	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1000)	**57...** (1000)	**393 473**
0.056	5.5 x 14.0 x 10.0	0.50	**55...** (1000)	**56...** (1000)	**51...** (1000)	**52...** (1000)	**53...** (1000)	**57...** (1000)	**563**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packing Quantity

COMPOSITION OF CATALOG NUMBER: 367

TYPE AND PITCHES	
367	5.0/7.5 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	367	XX	YY	Y
2222 (*)	367	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	63 V	100 V	250 V	400 V
367	Ammopack (1)	Straight; H = 18.5 mm; P_0 = 12.7 mm	± 10 %	73	83	-	-
			± 5 %	77	87	-	-
	Loose in box	Straight; Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	75	85	-	-
			± 5 %	76	86	-	-
		Straight; Lead length 22.0 ± 4.0 mm	± 10 %	71	81	-	-
			± 5 %	72	82	-	-
Pitch = 7.5 mm							
367	Loos in box	Straight; Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	15	25	45	55
			± 5 %	16	26	46	56
		Straight; Lead length 22.0 ± 4.0 mm	± 10 %	11	21	41	51
			± 5 %	12	22	42	52
	Ammopack (1)	Straight; H = 18.5 mm; P_0 = 12.7 mm	± 10 %	13	23	43	53
			± 5 %	17	27	47	57

Note
(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 367

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 225 x 10^{-4}	
C > 0.47 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	-	
Rated voltage pulse slope $(dU/dt)_R$ at	63 Vdc	100 Vdc	250 Vdc	400 Vdc
	110 V/µs	110 V/µs	130 V/µs	170 V/µs
R between leads, for C ≤ 0.33 µF				
at 10 V; 1 min	> 15 000 MΩ			
at 100 V; 1 min		> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads, for C > 0.33 µF at 10 V; 1 min	> 5000 s		-	
R between interconnecting leads and casing, 100 V; 1 min	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	100 V; 1 min	160 V; 1 min	400 V; 1 min	640 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 63 V; U_{Rac} = 40 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 367 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.50 ± 0.05 mm									
0.047 0.056 0.068 0.082 0.1 0.12 0.15 0.18	4.0 x 9.5 x 7.3	0.23	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1500)	**77...** (1500)	**473 563 683 823 104 124 154 184**
0.22	4.2 x 9.7 x 7.3	0.24	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1000)	**77...** (1000)	**224**
0.27	4.5 x 10.0 x 7.3	0.26	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1000)	**77...** (1000)	**274**
0.33 0.39 0.47	4.5 x 11.0 x 7.3	0.27	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1000)	**77...** (1000)	**334 394 474**
0.56	5.0 x 10.5 x 7.3	0.28	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1000)	**77...** (1000)	**564**
0.68	5.5 x 11.0 x 7.3	0.35	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1000)	**77...** (1000)	**684**
0.82 1.0	5.5 x 12.0 x 7.3	0.38	**75...** (1000)	**76...** (1000)	**71...** (1000)	**72...** (1000)	**73...** (1000)	**77...** (1000)	**824 105**
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.12 0.15 0.18 0.22	4.0 x 9.5 x 10.0	0.23	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1500)	**17...** (1500)	**124 154 184 224**
0.27	4.5 x 10.0 x 10.5	0.37	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**274**
0.33 0.39	5.0 x 10.5 x 10.5	0.39	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**334 394**
0.47	5.5 x 11.0 x 10.5	0.44	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**474**
0.56 0.68 0.82 1.0	5.5 x 12.0 x 10.5	0.46	**15...** (1000)	**16...** (1000)	**11...** (1000)	**12...** (1000)	**13...** (1000)	**17...** (1000)	**564 684 824 105**

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 367 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.0 + 0.4/- 0.2 mm; d_t = 0.50 ± 0.05 mm									
0.01 0.012 0.015 0.018 0.022 0.027 0.033 0.039	4.0 x 9.5 x 7.3	0.23	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	**83...** (1500)	**87...** (1500)	**103 123 153 183 223 273 333 393**
0.047 0.056 0.068 0.082 0.1 0.12 0.15 0.18	4.5 x 10.0 x 7.3	0.26	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	**83...** (1500)	**87...** (1500)	**473 563 683 823 104 124 154 184**
0.22 0.27	4.5 x 10.0 x 7.3	0.26	**85...** (1000)	**86...** (1000)	**81...** (1000)	**82...** (1000)	**83...** (1000)	**87...** (1000)	**224 274**
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.039 0.047 0.056 0.068 0.082 0.1	4.0 x 9.5 x 10.0	0.23	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1500)	**27...** (1500)	**393 473 563 683 823 104**
0.12	4.5 x 10.0 x 10.5	0.37	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**124**
0.15 0.18	5.0 x 10.5 x 10.5	0.39	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**154 184**
0.22	5.5 x 11.5 x 10.5	0.44	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**224**
0.27 0.33 0.39 0.47	6.0 x 12.5 x 10.5	0.55	**25...** (1000)	**26...** (1000)	**21...** (1000)	**22...** (1000)	**23...** (1000)	**27...** (1000)	**274 334 394 474**

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 367 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0mm		H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.018 0.022 0.027 0.033 0.039 0.047 0.056	4.0 x 9.5 x 10.0	0.23	45... (1000)	46... (1000)	41... (1000)	42... (1000)	43... (1500)	47... (1500)	183 223 273 333 393 473 563
0.068 0.082	4.5 x 10.0 x 10.0	0.37	45... (1000)	46... (1000)	41... (1000)	42... (1000)	43... (1000)	47... (1000)	683 823
0.1	5.0 x 10.5 x 10.0	0.39	45... (1000)	46... (1000)	41... (1000)	42... (1000)	43... (1000)	47... (1000)	104
0.12	5.5 x 11.0 x 10.0	0.42	45... (1000)	46... (1000)	41... (1000)	42... (1000)	43... (1000)	47... (1000)	124
0.15	5.5 x 12.5 x 10.0	0.48	45... (1000)	46... (1000)	41... (1000)	42... (1000)	43... (1000)	47... (1000)	154

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 367 XXYYY AND PACKAGING						
			LOOSE IN BOX				AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 7.5 + 0.4/- 0.2 mm; d_t = 0.60 ± 0.06 mm									
0.0033 0.0039 0.0047 0.0056 0.0068 0.0082 0.01 0.012 0.015	4.0 x 9.5 x 10.0	0.23	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1500)	57... (1500)	332 392 472 562 682 822 103 123 153
0.018	4.5 x 10.0 x 10.0	0.37	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1000)	57... (1000)	183
0.022	5.0 x 10.5 x 10.0	0.39	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1000)	57... (1000)	223
0.027	4.0 x 9.5 x 10.0	0.23	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1500)	57... (1500)	273
0.033	4.5 x 10.0 x 10.0	0.37	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1000)	57... (1000)	333
0.039 0.047	5.0 x 10.5 x 10.0	0.39	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1000)	57... (1000)	393 473
0.056	5.5 x 11.0 x 10.0	0.42	55... (1000)	56... (1000)	51... (1000)	52... (1000)	53... (1000)	57... (1000)	563

Notes
(1) Net weight for short lead products only
• SPQ = Standard Packing Quantity

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog.

Specific Method of Mounting to Withstand Vibration and Shock

In order to withstand vibration and shock tests, it must be ensured that the underside and the kinks 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

Storage Temperature

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

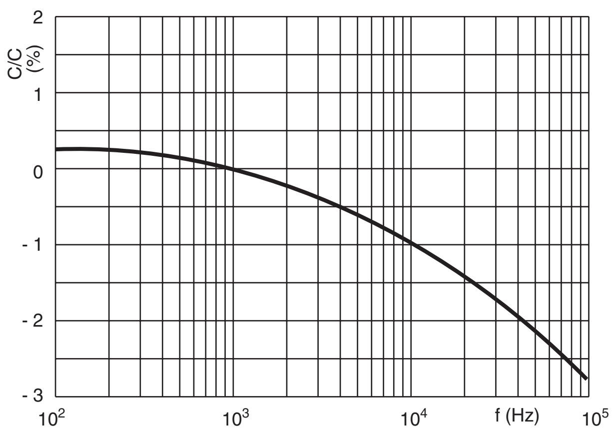
Ratings and Characteristics Reference Conditions

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

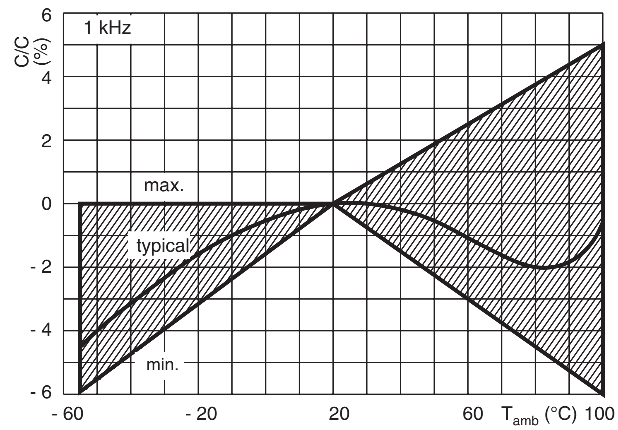
For reference testing, a conditioning period shall be applied over 96 ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

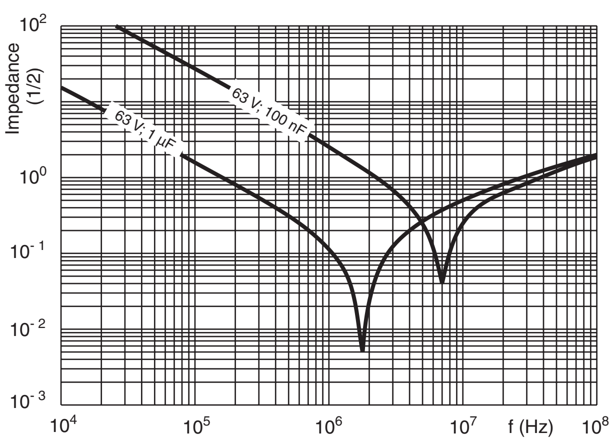
Capacitance as a function of frequency (typical curve)



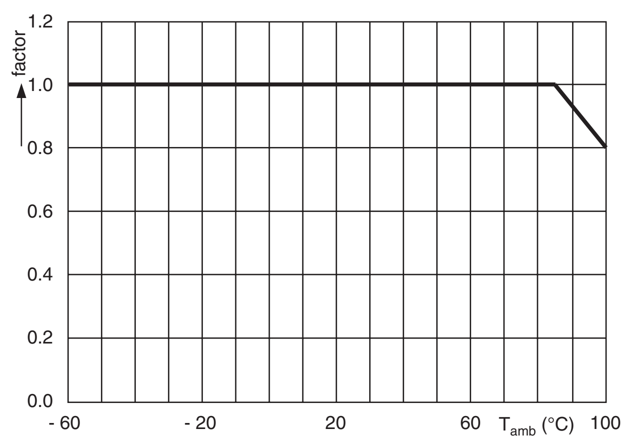
Capacitance as a function of ambient temperature (typical curve)



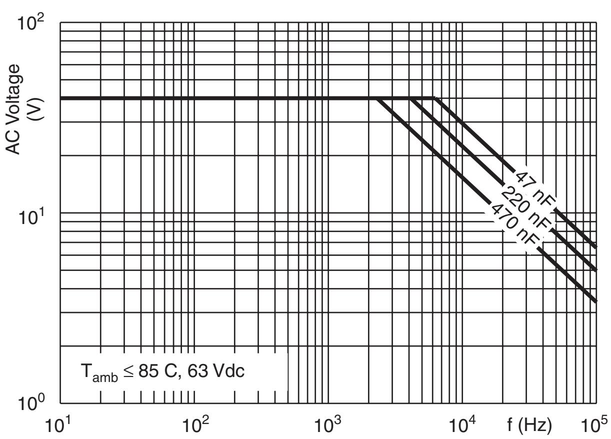
Impedance as a function of frequency (typical curve)



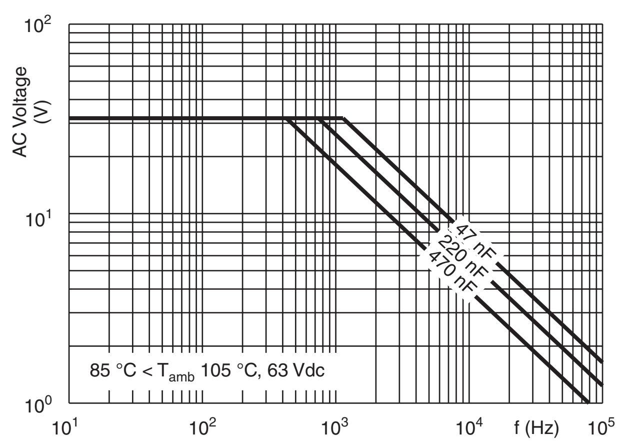
Max. DC and AC voltage as a function of temperature



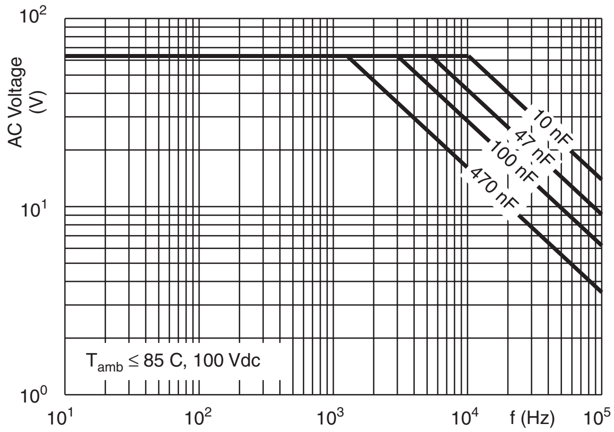
Max. RMS voltage as a function of frequency



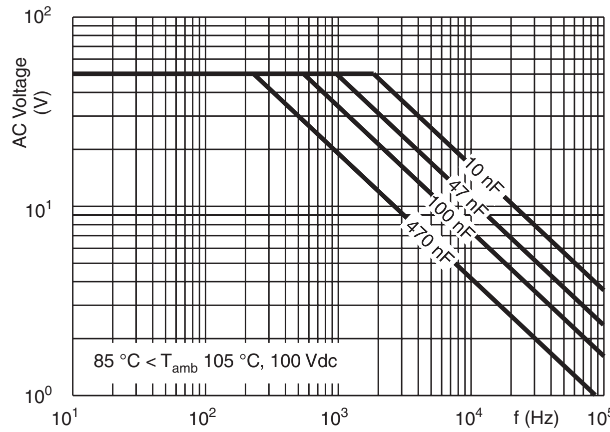
Max. RMS voltage as a function of frequency



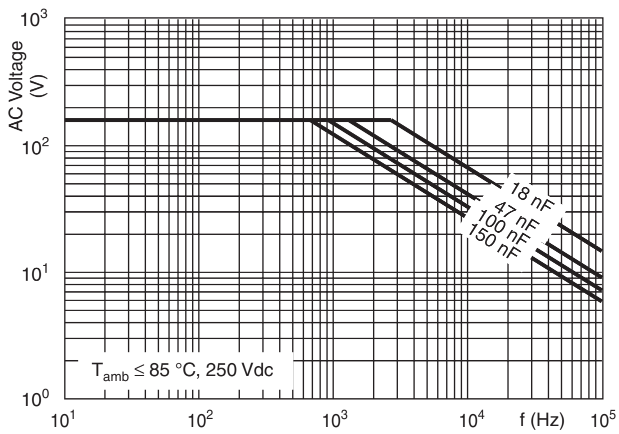
Max. RMS voltage as a function of frequency



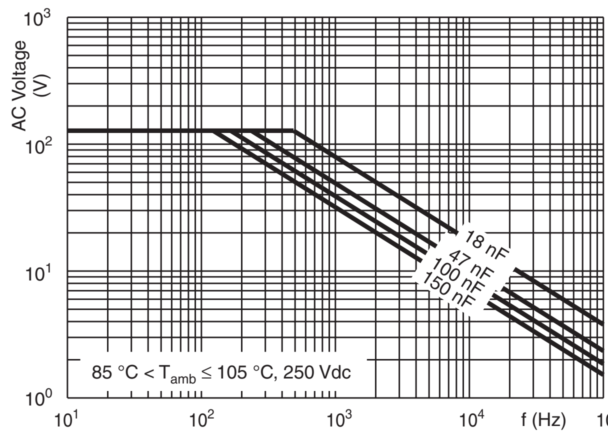
Max. RMS voltage as a function of frequency



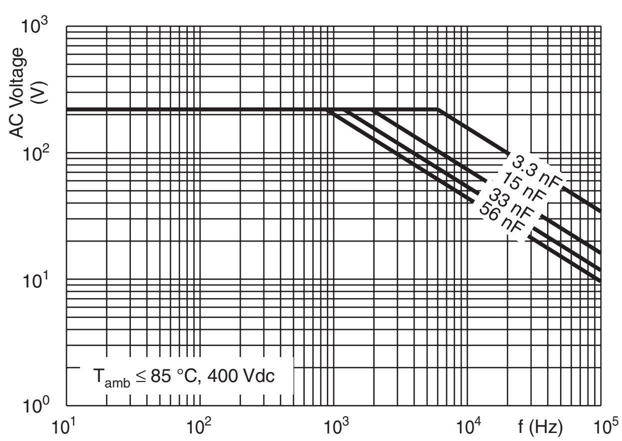
Max. RMS voltage as a function of frequency



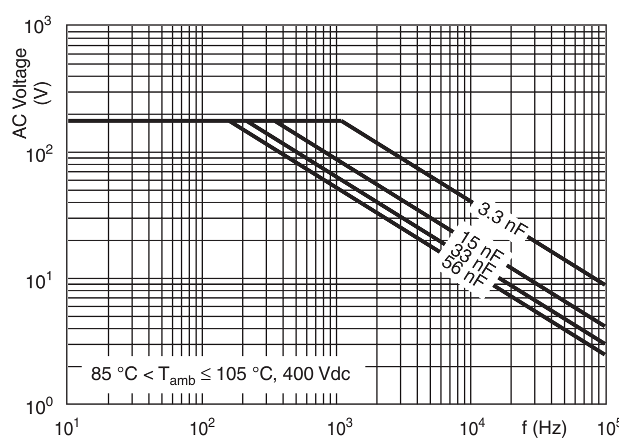
Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency

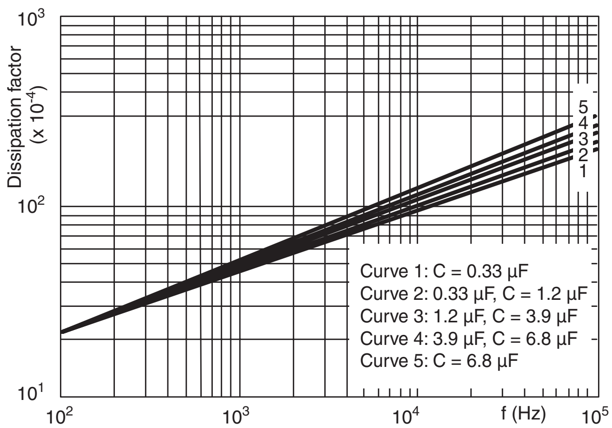


Maximum RMS current (sinewave) as a function of frequency

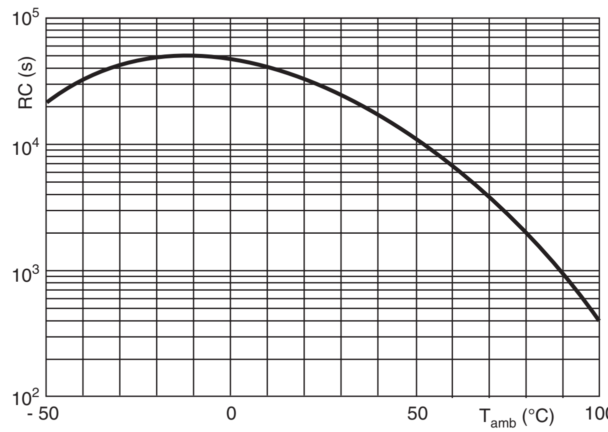
The maximum RMS current is defined by $I_{ac} = \omega \times C \times U_{ac}$

U_{ac} is the maximum AC voltage depending on the ambient temperature in the curves "Max. RMS voltage and AC current as a function of frequency".

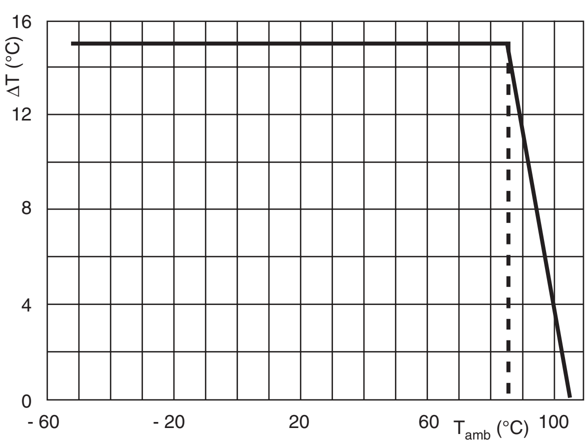
Tangent of loss angle as a function of frequency



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



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



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)	
	PITCH 5 mm	PITCH 7.5 mm
3.5	1.5	3.0
4.0	2.0	3.5
4.5	2.5	3.5
5.0	2.5	4.0
5.5	3.0	4.0
6.0	3.5	4.5
6.5	-	5.0

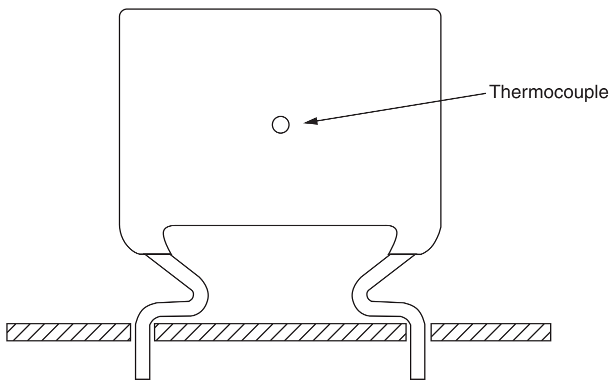
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free 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 $\Delta T = P/G$:

- 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.
   The rated voltage pulse slope is valid for ambient temperatures up to 85 °C. For higher temperatures a derating factor of 3 % per K shall be applied.

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}	0.8 x U_{Rac}
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}

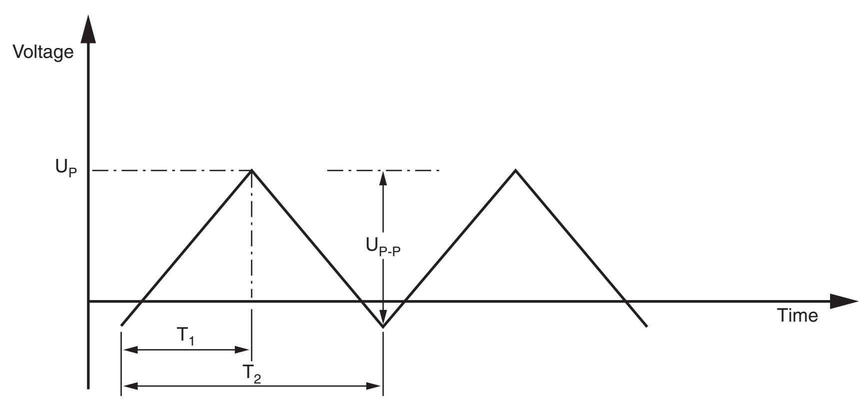
EXAMPLE

C = 330 nF - 63 V used for the voltage signal shown in next drawing.
U_{P-P} = 40 V; U_P = 35 V; T_1 = 100 µs; T_2 = 200 µs
The ambient temperature is 35 °C

Checking conditions:

1. The peak voltage U_P = 35 V is lower than 63 Vdc
2. The peak-to-peak voltage 40 V is lower than $2\sqrt{2}$ x 40 Vac = 113 U_{P-P}
3. The voltage pulse slope (dU/dt) = 40 V/100 µs = 0.4 V/µs
   This is lower than 110 V/µs (see specific reference data for each version)
4. The dissipated power is 16.2 mW as calculated with fourier terms
   The temperature rise for $W_{max.}$ = 4.5 mm and pitch = 5 mm will be 16.2 mW/2.5 mW/°C = 6.5 °C
   This is lower than 15 °C temperature rise at 35 °C, according figure max. allowed component temperature rise
5. Not applicable
6. Not applicable

Voltage Signal



INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

Group C Inspection Requirements

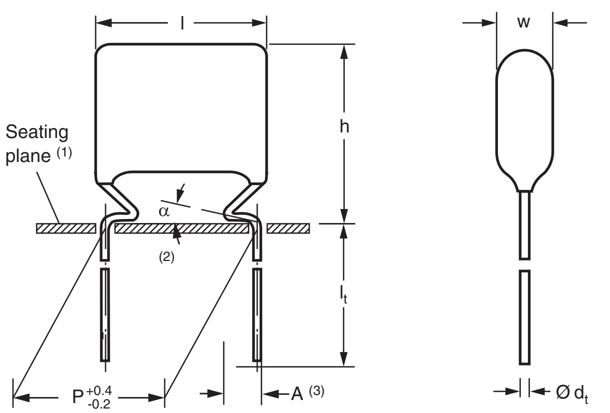
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters “General Data” of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF 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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	No visible damage
4.6 Rapid change of temperature	θA = - 55 °C θB = + 100 °C 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2 Final inspection	Visual examination	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9 Shock	Mounting: See section “Mounting” of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C $\leq$ 100 nF or ≤ 0.010 for: 100 nF < C $\leq$ 220 nF or ≤ 0.015 for: 220 nF < C $\leq$ 470 nF and ≤ 0.003 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	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ ≤ 0.007 for: C $\leq$ 100 nF or ≤ 0.010 for: 100 nF < C $\leq$ 220 nF or ≤ 0.015 for: 220 nF < C $\leq$ 470 nF and ≤ 0.005 for: C > 470 nF Compared to values measured in 4.3.1 or 4.6.1
	Insulation resistance	$\geq$ 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	
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	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.005$ Compared to values measured in 4.11.1
	Insulation resistance	$\geq$ 50 % of values specified in section “Insulation Resistance” of this specification
SUB GROUP C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 1.0 x U_{Rdc} at 105 °C	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 470$ nF at 100 kHz or for $C > 470$ nF at 10 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq 220$ nF or ≤ 0.015 for: 220 nF $< C \leq 470$ nF and ≤ 0.003 for: $C > 470$ nF Compared to values measured in 4.12.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_R V_{dc} Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 470$ nF at 100 kHz or for $C > 470$ nF at 10 kHz	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq 220$ nF or ≤ 0.015 for: 220 nF $< C \leq 470$ nF and ≤ 0.003 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

DC Film Capacitors
MKT Radial Lacquered Type

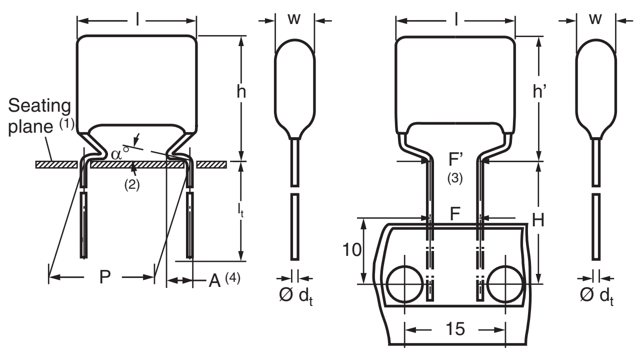
467



Notes

(1) Hole Ø 1.0 for d_t = 0.6 mm
(2) $0 \leq \alpha < 50°$
(3) A = 2.0 ± 0.5 mm

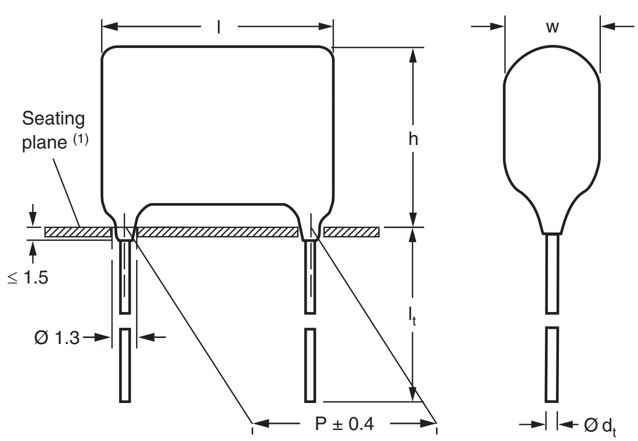
468



Notes

(1) Hole Ø 1.0 for d_t = 0.8 mm
(2) $0 \leq \alpha < 50°$
(3) |F - F'| < 0.3 mm
F = 7.5 + 0.6/- 0.1
(4) A = 2.5 + 1.4/- 0.5 ± 0.3 mm

469 Straight Leads



Note

(1) Hole Ø 1.0 for d_t = 0.6 mm

FEATURES
Available taped and loose in box
RoHS compliant

APPLICATIONS
Blocking and coupling, bypass and energy reservoir.

REFERENCE STANDARDS
IEC 60384-2

MARKING
C-value; tolerance; rated voltage; code for manufacturer; manufacturer's type; manufacturer's logo

DIELECTRIC
Polyester film

ELECTRODES
Metallized

CONSTRUCTION
Mono construction

RATED (DC) VOLTAGE
100 V, 250 V, 400 V, 630 V

RATED (AC) VOLTAGE
63 V, 160 V, 220 V, 250 V

ENCAPSULATION
Flame retardant epoxy material (UL-class 94 V-0)

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/105/56

RATED TEMPERATURE
85 °C

CAPACITANCE RANGE (E12 SERIES)
467: 0.001 µF to 1.0 µF
468: 0.001 µF to 10.0 µF
469: 0.001 µF to 1.0 µF

CAPACITANCE TOLERANCE
± 10 %, ± 5 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
105 °C

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

COMPOSITION OF CATALOG NUMBER: 467

TYPE AND PITCHES	
467	10.0 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	467	XX	YY	Y
2222 (*)	467	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	100 V	250 V	400 V	630 V
467	Loose in box	Lead length 3.5 + 1.0/- 0.5 mm	± 10 %	04	16	28	40
			± 5 %	05	17	29	41
		Lead length 19.0 ± 4.0 mm	± 10 %	51	53	55	57
			± 5 %	52	54	56	58
	Taped on reel (1)	H = 16.0 mm; P_0 = 12.7 mm Reel diameter = 500 mm	± 10 %	06	18	30	42
			± 5 %	07	19	31	43

Note

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 467

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
C ≤ 0.1 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	≤ 200 x 10^{-4}
0.1 µF < C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	≤ 225 x 10^{-4}
0.47 µF < C ≤ 1.0 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	-

DESCRIPTION	VALUE			
Rated voltage pulse slope $(dU/dt)_R$ at $I_{max.}$ = 12.5 mm	100 Vdc	250 Vdc	400 Vdc	630 Vdc
	30 V/µs	120 V/µs	170 V/µs	120 V/µs
R between leads, for C ≤ 0.33 µF at 100 V; 1 min at 500 V; 1 min	> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
R between leads, for C > 0.33 µF at 100 V; 1 min at 500 V; 1 min	> 5000 s	> 10 000 s	> 10 000 s	> 10 000 s
R between interconnecting leads and casing, at 100 V; 1 min at 500 V; 1 min	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	160 V; 1 min	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	500 V; 1 min	800 V; 1 min	1260 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 467 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 3.5 + 1.0/- 0.5 mm		l_t = 19.0 ± 4.0 mm		H = 16.0 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.056 0.068 0.082 0.1	4.0 x 14.0 x 12.5	0.37	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**563** **683** **823** **104**
0.12	4.3 x 14.3 x 12.5	0.40	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**124**
0.15	4.0 x 14.0 x 12.5	0.37	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**154**
0.18	4.2 x 14.2 x 12.5	0.39	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**184**
0.22	4.5 x 14.6 x 12.5	0.43	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1300)	**07...** (1300)	**224**
0.27	4.2 x 14.2 x 12.5	0.39	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**274**
0.33	4.6 x 14.6 x 12.5	0.44	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1300)	**07...** (1300)	**334**
0.39	4.0 x 14.0 x 12.5	0.37	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**394**
0.47	4.2 x 14.2 x 12.5	0.39	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1500)	**07...** (1500)	**474**
0.56	4.6 x 14.6 x 12.5	0.44	**04...** (2000)	**05...** (2000)	**51...** (1500)	**52...** (1500)	**06...** (1300)	**07...** (1300)	**564**
0.68	5.0 x 15.0 x 12.5	0.50	**04...** (1500)	**05...** (1500)	**51...** (1250)	**52...** (1250)	**06...** (1200)	**07...** (1200)	**684**
0.82	5.5 x 15.5 x 12.5	0.60	**04...** (1500)	**05...** (1500)	**51...** (1000)	**52...** (1000)	**06...** (1100)	**07...** (1100)	**824**
1.0	6.0 x 16.0 x 12.5	0.75	**04...** (1250)	**05...** (1250)	**51...** (1000)	**52...** (1000)	**06...** (1000)	**07...** (1000)	**105**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 467 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 3.5 + 1.0/- 0.5 mm		l_t = 19.0 ± 4.0 mm		H = 16.0 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.027	4.2 x 14.2 x 12.5	0.39	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**273**
0.033	4.6 x 14.6 x 12.5	0.44	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1300)	**19...** (1300)	**333**
0.039	4.0 x 14.0 x 12.5	0.37	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**393**
0.047	4.1 x 14.1 x 12.5	0.38	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**473**
0.056	4.0 x 14.0 x 12.5	0.37	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**563**
0.068	4.1 x 14.1 x 12.5	0.38	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**683**
0.082	4.4 x 14.4 x 12.5	0.41	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**823**
0.1	4.0 x 14.0 x 12.5	0.37	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**104**
0.12	4.3 x 14.3 x 12.5	0.40	**16...** (2000)	**17...** (2000)	**53...** (1500)	**54...** (1500)	**18...** (1500)	**19...** (1500)	**124**
0.15	4.8 x 14.8 x 12.5	0.48	**16...** (2000)	**17...** (2000)	**53...** (1250)	**54...** (1250)	**18...** (1300)	**19...** (1300)	**154**
0.18	5.2 x 15.2 x 12.5	0.52	**16...** (1500)	**17...** (1500)	**53...** (1000)	**54...** (1000)	**18...** (1200)	**19...** (1200)	**184**
0.22	5.8 x 15.8 x 12.5	0.67	**16...** (1500)	**17...** (1500)	**53...** (1000)	**54...** (1000)	**18...** (1100)	**19...** (1100)	**224**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 467 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 3.5 + 1.0/- 0.5 mm		l_t = 19.0 ± 4.0 mm		H = 16.0 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.001 0.0012 0.0015 0.0018	4.5 x 14.5 x 12.5	0.43	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	102 122 152 182
0.0022	4.0 x 14.0 x 12.5	0.37	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	222
0.0027	4.3 x 14.3 x 12.5	0.40	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	272
0.0033	4.6 x 14.6 x 12.5	0.44	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	332
0.0039	4.0 x 14.0 x 12.5	0.37	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	393
0.0047	4.1 x 14.2 x 12.5	0.38	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	472
0.0056	4.6 x 14.6 x 12.5	0.44	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	562
0.0068	4.2 x 14.2 x 12.5	0.39	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	682
0.0082	4.6 x 14.6 x 12.5	0.44	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	822
0.01	4.1 x 14.1 x 12.5	0.38	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	103
0.012	4.5 x 14.5 x 12.5	0.43	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	123
0.015	4.1 x 14.1 x 12.5	0.38	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	153
0.018	4.5 x 14.5 x 12.5	0.43	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	183
0.022	4.0 x 14.0 x 12.5	0.37	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	223
0.027	4.2 x 14.2 x 12.5	0.39	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	273
0.033	4.6 x 14.7 x 12.5	0.44	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1300)	31... (1300)	333
0.039	5.0 x 14.9 x 12.5	0.50	28... (1500)	29... (1500)	55... (1250)	56... (1250)	30... (1200)	31... (1200)	393
0.047	4.1 x 14.1 x 12.5	0.38	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	473
0.056	4.4 x 14.4 x 12.5	0.41	28... (2000)	29... (2000)	55... (1500)	56... (1500)	30... (1500)	31... (1500)	563
0.068	4.8 x 14.8 x 12.5	0.48	28... (2000)	29... (2000)	55... (1250)	56... (1250)	30... (1300)	31... (1300)	683
0.082	5.4 x 15.3 x 12.5	0.57	28... (1500)	29... (1500)	55... (1000)	56... (1000)	30... (1200)	31... (1200)	823
0.1	5.7 x 15.7 x 12.5	0.64	28... (1500)	29... (1500)	55... (1000)	56... (1000)	30... (1100)	31... (1100)	104

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 250 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 467 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 3.5 + 1.0/- 0.5 mm		l_t = 19.0 ± 4.0 mm		H = 16.0 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	4.1 x 14.1 x 12.5	0.38	**40...** (2000)	**41...** (2000)	**57...** (1500)	**58...** (1500)	**42...** (1500)	**43...** (1500)	**103**
0.012	4.5 x 14.5 x 12.5	0.43	**40...** (2000)	**41...** (2000)	**57...** (1500)	**58...** (1500)	**42...** (1300)	**43...** (1300)	**123**
0.015	4.9 x 14.9 x 12.5	0.49	**40...** (2000)	**41...** (2000)	**57...** (1250)	**58...** (1250)	**42...** (1200)	**43...** (1200)	**153**
0.018	5.4 x 15.4 x 12.5	0.57	**40...** (1500)	**41...** (1500)	**57...** (1000)	**58...** (1000)	**42...** (1100)	**43...** (1100)	**183**
0.022	4.8 x 14.8 x 12.5	0.48	**40...** (2000)	**41...** (2000)	**57...** (1250)	**58...** (1250)	**42...** (1300)	**43...** (1300)	**223**
0.027	5.3 x 15.3 x 12.5	0.55	**40...** (2000)	**41...** (2000)	**57...** (1000)	**58...** (1000)	**42...** (1200)	**43...** (1200)	**273**
0.033	5.9 x 15.9 x 12.5	0.70	**40...** (1500)	**41...** (1500)	**57...** (1000)	**58...** (1000)	**42...** (1100)	**43...** (1100)	**333**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

COMPOSITION OF CATALOG NUMBER: 468

TYPE AND PITCHES	
468	15.0/7.5 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	468	XX	YY	Y
2222 (*)	468	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	**100 V**	**250 V**	**400 V**	**630 V**
468	Loose in box	Lead length 3.5 + 1.0/- 0.5 mm (Pitch 10 and 15 mm) Lead length 3.5 ± 0.5 mm (Pitch 22.5 and 27.5 mm)	± 10 %	04	16	28	40
			± 5 %	05	17	29	41
		Long leads: 19.0 ± 4.0 mm for lead pitch = 15.0 mm 25.0 ± 4.0 mm for lead pitch = 22.5 mm 24.0 ± 4.0 mm for lead pitch = 27.5 mm	± 10 %	51	53	55	57
			± 5 %	52	54	56	58
	Taped on reel (1) (bent back)	H = 16.0 mm; P_0 = 15.0 mm Reel diameter = 500 mm (2)	± 10 %	61	63	65	67
			± 5 %	62	64	66	68
			Dimensions of these code numbers stay between brackets				
	Taped on reel (1)	H = 16.0 mm; P_0 = 12.7 mm Reel diameter = 500 mm	± 10 %	06	18	30	42
			5 %	07	19	31	43

Notes

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

(2) Small reel diameter = 356 mm is available on request

SPECIFIC REFERENCE DATA: 468

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
C ≤ 0.1 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	≤ 200 x 10^{-4}	
0.1 µF < C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	≤ 225 x 10^{-4}	
0.47 µF < C ≤ 10 µF	≤ 75 x 10^{-4}	≤ 150 x 10^{-4}	-	
Rated voltage pulse slope $(dU/dt)_R$ at	100 Vdc	250 Vdc	400 Vdc	630 Vdc
$l_{max.}$ = 12.5 mm	30 V/µs	120 V/µs	170 V/µs	120 V/µs
$l_{max.}$ = 17.5 mm	20 V/µs	45 V/µs	65 V/µs	90 V/µs
$l_{max.}$ = 26.0 mm	10 V/µs	20 V/µs	30 V/µs	35 V/µs
$l_{max.}$ = 30.0 mm		15 V/µs	25 V/µs	30 V/µs
R between leads, for C ≤ 0.33 µF				
at 100 V; 1 min	> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	
at 500 V; 1 min				> 30 000 MΩ
R between leads, for C > 0.33 µF				
at 100 V; 1 min	> 5000 s	> 10 000 s	> 10 000 s	
at 500 V; 1 min				> 10 000 s
R between interconnecting leads and casing,				
at 100 V; 1 min	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	
at 500 V; 1 min				> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	160 V; 1 min	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	500 V; 1 min	800 V; 1 min	1260 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS $w_{max.}$ x h (h')$_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 467 XXYYY AND PACKAGING								
			LOOSE IN BOX				REEL H = 16.0 mm				C-VALUE
							Original pitch		Bent back pitch		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 + 1.0/- 0.5 mm		**l_t = 19.0 ± 4.0 mm**		**P = 15 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
1.2	5.5 x 14.5 (16.0) x 17.5	0.90	**04...** (2000)	**05...** (2000)	**51...** (1250)	**52...** (1250)	**06...** (1100)	**07...** (1100)	**61...** (900)	**62...** (900)	**125**
1.5	6.0 x 15.0 (16.5) x 17.5	1.00	**04...** (2000)	**05...** (2000)	**51...** (1250)	**52...** (1250)	**06...** (1000)	**07...** (1000)	**61...** (800)	**62...** (800)	**155**
1.8	6.5 x 15.5 (17.0) x 17.5	1.15	**04...** (1500)	**05...** (1500)	**51...** (1000)	**52...** (1000)	**06...** (900)	**07...** (900)	**61...** (750)	**62...** (750)	**185**
2.2	7.0 x 16.0 (17.5) x 17.5	1.25	**04...** (1250)	**05...** (1250)	**51...** (1000)	**52...** (1000)	**06...** (800)	**07...** (800)	**61...** (700)	**62...** (700)	**225**
2.7	8.0 x 17.0 (18.5) x 17.5	1.50	**04...** (1000)	**05...** (1000)	**51...** (1000)	**52...** (1000)	**06...** (750)	**07...** (750)	**61...** (600)	**62...** (600)	**275**
3.3	8.5 x 17.5 (19.0) x 17.5	1.70	**04...** (1000)	**05...** (1000)	**51...** (1000)	**52...** (1000)	**06...** (700)	**07...** (700)	**61...** (550)	**62...** (550)	**335**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 25.0 ± 4.0 mm**		**P = 22.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
3.9	6.5 x 18.5 x 26.0	2.1	**04...** (1000)	**05...** (1000)	**51...** (750)	**52...** (750)	**06...** (650)	**07...** (650)	-		**395**
4.7	7.0 x 19.5 x 26.0	2.3	**04...** (900)	**05...** (900)	**51...** (700)	**52...** (700)	**06...** (550)	**07...** (550)			**475**
5.6	7.5 x 20.0 x 26.0	2.5	**04...** (750)	**05...** (750)	**51...** (600)	**52...** (600)	**06...** (500)	**07...** (500)			**565**
6.8	8.5 x 21.5 x 26.0	3.2	**04...** (750)	**05...** (750)	**51...** (500)	**52...** (500)	**06...** (450)	**07...** (450)			**685**
8.2	9.5 x 22.5 x 26.0	3.4	**04...** (700)	**05...** (700)	**51...** (500)	**52...** (500)	**06...** (400)	**07...** (400)			**825**
10.0	10.5 x 23.5 x 26.0	3.8	**04...** (500)	**05...** (500)	**51...** (400)	**52...** (400)	**06...** (350)	**07...** (350)			**106**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS $w_{max.}$ x h (h')$_{max.}$ x $l_{max.}$ (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 468 XXYYY AND PACKAGING								
			LOOSE IN BOX				REEL H = 16.0 mm				C-VALUE
							Original pitch		Bent back pitch		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 + 1.0/- 0.5 mm		**l_t = 19.0 ± 4.0 mm**		**P = 15 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
0.27	5.0 x 14.0 (15.5) x 17.5	0.80	**16...** (2000)	**17...** (2000)	**53...** (1250)	**54...** (1250)	**18...** (1200)	**19...** (1200)	**63...** (1000)	**64...** (1000)	**274**
0.33	5.5 x 14.5 (16.0) x 17.5	0.90	**16...** (2000)	**17...** (2000)	**53...** (1250)	**54...** (1250)	**18...** (1100)	**19...** (1100)	**63...** (900)	**64...** (900)	**334**
0.39	6.0 x 15.0 (16.5) x 17.5	1.00	**16...** (2000)	**17...** (2000)	**53...** (1250)	**54...** (1250)	**18...** (1000)	**19...** (1000)	**63...** (800)	**64...** (800)	**394**
0.47	6.5 x 15.5 (17.0) x 17.5	1.15	**16...** (1500)	**17...** (1500)	**53...** (1000)	**54...** (1000)	**18...** (900)	**19...** (900)	**63...** (750)	**64...** (750)	**474**
0.56	7.5 x 16.5 (18.0) x 17.5	1.30	**16...** (1250)	**17...** (1250)	**53...** (1000)	**54...** (1000)	**18...** (800)	**19...** (800)	**63...** (650)	**64...** (650)	**564**
0.68	8.0 x 17.0 (18.5) x 17.5	1.50	**16...** (1000)	**17...** (1000)	**53...** (1000)	**54...** (1000)	**18...** (750)	**19...** (750)	**63...** (600)	**64...** (600)	**684**
0.82	8.5 x 17.5 (19.0) x 17.5	1.70	**16...** (1000)	**17...** (1000)	**53...** (1000)	**54...** (1000)	**18...** (700)	**19...** (700)	**63...** (550)	**64...** (550)	**824**
1.0	8.0 x 20.0 (21.5) x 17.5	2.10	**16...** (1000)	**17...** (1000)	**53...** (900)	**54...** (900)	**18...** (750)	**19...** (750)	**63...** (600)	**64...** (600)	**105**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 25.0 ± 4.0 mm**		**P = 22.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
1.2	7.0 x 19.0 x 26.0	2.3	**16...** (1000)	**17...** (1000)	**53...** (700)	**54...** (700)	**18...** (550)	**19...** (550)			**125**
1.5	8.0 x 21.0 x 26.0	2.8	**16...** (750)	**17...** (750)	**53...** (500)	**54...** (500)	**18...** (500)	**19...** (500)			**155**
1.8	9.0 x 22.0 x 26.0	3.3	**16...** (750)	**17...** (750)	**53...** (500)	**54...** (500)	**18...** (450)	**19...** (450)			**185**
2.2	9.8 x 23.0 x 26.0	3.4	**16...** (750)	**17...** (750)	**53...** (450)	**54...** (450)	**18...** (400)	**19...** (400)	-		**225**
2.7	11.0 x 24.0 x 26.0	4.0	**16...** (500)	**17...** (500)	**53...** (400)	**54...** (400)	**18...** (350)	**19...** (350)			**275**
3.3	12.5 x 25.5 x 26.0	4.5	**16...** (500)	**17...** (500)	**53...** (300)	**54...** (300)	**18...** (350)	**19...** (350)			**335**
3.9	13.5 x 26.5 x 26.0	5.5	**16...** (400)	**17...** (400)	**53...** (300)	**54...** (300)	**18...** (300)	**19...** (300)			**395**
4.7	14.9 x 28.0 x 26.0	6.3	**16...** (250)	**17...** (250)	**53...** (250)	**54...** (250)	**18...** (250)	**19...** (250)			**475**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm; A = 2.5 + 1.4/- 0.5 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 24.0 ± 4.0 mm**		**P = 27.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
5.6	15.0 x 28.0 x 30.0	7.5	**16...** (300)	**17...** (300)	**53...** (200)	**54...** (200)	-		-		**565**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS $w_{max.}$ x h (h')$_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 468 XXYYY AND PACKAGING								
			LOOSE IN BOX				REEL H = 16.0 mm				C-VALUE
							Original pitch		Bent back pitch		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**..YYY**
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 + 1.0/- 0.5 mm		**l_t = 19.0 ± 4.0 mm**		**P = 15 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
0.12	5.0 x 14.0 (15.5) x 17.5	0.80	**28...** (2000)	**29...** (2000)	**55...** (1250)	**56...** (1250)	**30...** (1200)	**31...** (1200)	**65...** (1000)	**66...** (1000)	**124**
0.15	5.8 x 15.0 (16.5) x 17.5	0.95	**28...** (1750)	**29...** (1750)	**55...** (1250)	**56...** (1250)	**30...** (1100)	**31...** (1100)	**65...** (850)	**66...** (850)	**154**
0.18	6.5 x 15.5 (17.0) x 17.5	1.15	**28...** (1500)	**29...** (1500)	**55...** (1000)	**56...** (1000)	**30...** (900)	**31...** (900)	**65...** (750)	**66...** (750)	**184**
0.22	7.0 x 16.0 (17.5) x 17.5	1.25	**28...** (1500)	**29...** (1500)	**55...** (1000)	**56...** (1000)	**30...** (800)	**31...** (800)	**65...** (700)	**66...** (700)	**224**
0.27	7.4 x 16.5 (18.0) x 17.5	1.28	**28...** (1250)	**29...** (1250)	**55...** (1250)	**56...** (1250)	**30...** (800)	**31...** (800)	**65...** (650)	**66...** (650)	**274**
0.33	8.5 x 17.5 (19.0) x 17.5	1.70	**28...** (1000)	**29...** (1000)	**55...** (1000)	**56...** (1000)	**30...** (700)	**31...** (700)	**65...** (550)	**66...** (550)	**334**
0.39	7.4 x 19.5 (21.0) x 17.5	2.00	**28...** (1000)	**29...** (1000)	**55...** (1000)	**56...** (1000)	**30...** (800)	**31...** (800)	**65...** (650)	**66...** (650)	**394**
0.47	8.4 x 20.5 (22.0) x 17.5	2.10	**28...** (750)	**29...** (750)	**55...** (850)	**56...** (850)	**30...** (700)	**31...** (700)	**65...** (550)	**66...** (550)	**474**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 25.0 ± 4.0 mm**		**P = 22.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
0.56	7.0 x 19.5 x 26.0	2.5	**28...** (1000)	**29...** (1000)	**55...** (650)	**56...** (650)	**30...** (550)	**28...** (550)	-		**564**
0.68	8.0 x 21.0 x 26.0	2.8	**28...** (750)	**29...** (750)	**55...** (500)	**56...** (500)	**30...** (500)	**28...** (500)			**684**
0.82	9.0 x 22.0 x 26.0	3.3	**28...** (750)	**29...** (750)	**55...** (500)	**56...** (500)	**30...** (450)	**28...** (450)			**824**
1.0	9.9 x 23.0 x 26.0	3.5	**28...** (750)	**29...** (750)	**55...** (450)	**56...** (450)	**30...** (400)	**28...** (400)			**105**
1.2	11.0 x 24.0 x 26.0	4.0	**28...** (500)	**29...** (500)	**55...** (400)	**56...** (400)	**30...** (350)	**28...** (350)			**125**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm; A = 2.5 + 1.4/- 0.5 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 24.0 ± 4.0 mm**		**P = 27.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
1.5	11.5 x 24.5 x 30.0	5.8	**28...** (450)	**29...** (450)	**55...** (300)	**56...** (300)	-		-		**155**
1.8	12.5 x 25.5 x 30.0	6.4	**28...** (350)	**29...** (350)	**55...** (250)	**56...** (250)					**185**
2.2	14.0 x 27.0 x 30.0	7.3	**28...** (300)	**29...** (300)	**55...** (200)	**56...** (200)					**225**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 250 V

C (µF)	DIMENSIONS $w_{max.}$ x h (h')$_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 468 XXYYY AND PACKAGING								
			LOOSE IN BOX				REEL H = 16.0 mm				C-VALUE
							Original pitch		Bent back pitch		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 + 1.0/- 0.5 mm		**l_t = 19.0 ± 4.0 mm**		**P = 15 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
0.039	5.0 x 14.0 (15.5) x 17.5	0.80	40... (2000)	41... (2000)	57... (1250)	58... (1250)	42... (1200)	43... (1200)	67... (1000)	68... (1000)	393
0.047	5.5 x 14.5 (16.0) x 17.5	0.90	40... (2000)	41... (2000)	57... (1250)	58... (1250)	42... (1100)	43... (1100)	67... (900)	68... (900)	473
0.056	5.9 x 15.0 (16.5) x 17.5	0.95	40... (1750)	41... (1750)	57... (1250)	58... (1250)	42... (1000)	43... (1000)	67... (850)	68... (850)	563
0.068	6.5 x 16.0 (17.5) x 17.5	1.15	40... (1500)	41... (1500)	57... (1000)	58... (1000)	42... (800)	43... (800)	67... (750)	68... (750)	683
0.082	7.3 x 16.5 (18.0) x 17.5	1.27	40... (1500)	41... (1500)	57... (1000)	58... (1000)	42... (800)	43... (800)	67... (650)	68... (650)	823
0.1	7.9 x 17.0 (18.5) x 17.5	1.48	40... (1250)	41... (1250)	57... (1000)	58... (1000)	42... (750)	43... (750)	67... (600)	68... (600)	104
0.12	7.5 x 19.5 (21.0) x 17.5	2.00	40... (1250)	41... (1250)	57... (1000)	58... (1000)	42... (800)	43... (800)	67... (650)	68... (650)	124
0.15	8.5 x 20.5 (22.0) x 17.5	2.20	40... (1000)	41... (1000)	57... (850)	58... (850)	42... (700)	43... (700)	67... (550)	68... (550)	154
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 25.0 ± 4.0 mm**		**P = 22.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
0.18	7.5 x 19.5 x 26.0	2.5	40... (1000)	41... (1000)	57... (650)	58... (650)	42... (550)	43... (550)			184
0.22	8.0 x 21.0 x 26.0	2.8	40... (750)	41... (750)	57... (500)	58... (500)	42... (500)	43... (500)			224
0.27	9.0 x 22.0 x 26.0	3.3	40... (750)	41... (750)	57... (500)	58... (500)	42... (450)	43... (450)			274
0.33	10.0 x 23.0 x 26.0	3.5	40... (700)	41... (700)	57... (450)	58... (450)	42... (400)	43... (400)			334
0.39	11.5 x 24.0 x 26.0	4.2	40... (600)	41... (600)	57... (400)	58... (400)	42... (350)	43... (350)	-		394
0.47	12.5 x 25.5 x 26.0	4.5	40... (500)	41... (500)	57... (300)	58... (300)	42... (350)	43... (350)			474
0.56	13.5 x 26.6 x 26.0	5.5	40... (450)	41... (450)	57... (300)	58... (300)	42... (300)	43... (300)			564
0.68	15.0 x 28.0 x 26.0	6.5	40... (400)	41... (400)	57... (250)	58... (250)	42... (250)	43... (250)			684
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm; A = 2.5 + 1.4/- 0.5 mm											
			l_t = 3.5 ± 0.5 mm		**l_t = 24.0 ± 4.0 mm**		**P = 27.5 mm P_0 = 12.7 mm**		**P = 7.5 mm P_0 = 15.0 mm**		
0.82	15.0 x 28.0 x 30.0	7.5	40... (300)	41... (300)	57... (200)	58... (200)	-		-		-

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

COMPOSITION OF CATALOG NUMBER: 469

TYPE AND PITCHES	
469	10.0 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	469	XX	YY	Y
2222 (*)	469	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	100 V	250 V	400 V	630 V
469	Loose in box	Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	25	45	55	65
			± 5 %	26	46	56	66
		Lead length 22.0 ± 4.0 mm	± 10 %	21	41	51	61
			± 5 %	22	42	52	62
	Taped on reel (1)	H = 18.5 mm; P_0 = 12.7 mm Reel diameter = 500 mm	± 10 %	28	48	58	68
			± 5 %	29	49	59	69

Note

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 469

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
$C \leq 0.1$ µF	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 200 \times 10^{-4}$	
0.1 µF < $C \leq 0.47$ µF	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	$\leq 225 \times 10^{-4}$	
0.47 µF < $C \leq 1.0$ µF	$\leq 75 \times 10^{-4}$	$\leq 120 \times 10^{-4}$	-	
Rated voltage pulse slope $(dU/dt)_R$ at $I_{max.}$ = 12.5 mm	100 Vdc	250 Vdc	400 Vdc	630 Vdc
	30 V/µs	120 V/µs	170 V/µs	120 V/µs
R between leads, for $C \leq 0.33$ µF at 100 V; 1 min	> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	
at 500 V; 1 min				> 30 000 MΩ
R between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s	> 10 000 s	> 10 000 s	
at 500 V; 1 min				> 10 000 s
R between interconnecting leads and casing, at 100 V; 1 min	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	
at 500 V; 1 min				> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	160 V; 1 min	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	500 V; 1 min	840 V; 1 min	1260 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 469 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.056 0.068 0.082 0.1	4.0 x 11.0 x 12.5	0.35	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	563 683 823 104
0.12	4.3 x 11.3 x 12.5	0.38	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	124
0.15	3.9 x 10.9 x 12.5	0.34	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	154
0.18	4.2 x 11.2 x 12.5	0.37	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	184
0.22	4.5 x 11.5 x 12.5	0.40	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1300)	29... (1300)	224
0.27	4.2 x 11.2 x 12.5	0.37	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	274
0.33	4.6 x 11.6 x 12.5	0.41	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1300)	29... (1300)	334
0.39	4.0 x 11.0 x 12.5	0.35	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	394
0.47	4.2 x 11.2 x 12.5	0.37	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1500)	29... (1500)	474
0.56	4.6 x 11.6 x 12.5	0.41	25... (2000)	26... (2000)	21... (1500)	22... (1500)	28... (1300)	29... (1300)	564
0.68	5.0 x 12.0 x 12.5	0.44	25... (1500)	26... (1500)	21... (1250)	22... (1250)	28... (1200)	29... (1200)	684
0.82	5.5 x 12.5 x 12.5	0.47	25... (1500)	26... (1500)	21... (1000)	22... (1000)	28... (1100)	29... (1100)	824
1.0	6.0 x 13.0 x 12.5	0.55	25... (1250)	26... (1250)	21... (1000)	22... (1000)	28... (1000)	29... (1000)	105

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 469 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.027	4.2 x 11.2 x 12.5	0.37	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	273
0.033	4.6 x 11.6 x 12.5	0.41	45... (2000)	467... (2000)	41... (1500)	42... (1500)	48... (1300)	49... (1300)	333
0.039	4.0 x 11.0 x 12.5	0.35	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	393
0.047	4.1 x 11.1 x 12.5	0.36	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	473
0.056	4.0 x 11.0 x 12.5	0.35	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	563
0.068	4.1 x 11.1 x 12.5	0.36	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	683
0.082	4.4 x 11.4 x 12.5	0.39	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	823
0.1	4.0 x 11.0 x 12.5	0.35	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	104
0.12	4.3 x 11.3 x 12.5	0.38	45... (2000)	46... (2000)	41... (1500)	42... (1500)	48... (1500)	49... (1500)	124
0.15	4.8 x 11.8 x 12.5	0.42	45... (2000)	46... (2000)	41... (1250)	42... (1250)	48... (1300)	49... (1300)	154
0.18	5.2 x 12.2 x 12.5	0.45	45... (1500)	46... (1500)	41... (1000)	42... (1000)	48... (1200)	49... (1200)	184
0.22	5.8 x 12.8 x 12.5	0.50	45... (1500)	46... (1500)	41... (1000)	42... (1000)	48... (1100)	49... (1100)	224

Notes
[(1)] Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 469 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.001 0.0012 0.0015 0.0018	4.5 x 11.5 x 12.5	0.40	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	102 122 152 182
0.0022	4.0 x 11.0 x 12.5	0.35	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	222
0.0027	4.3 x 11.3 x 12.5	0.38	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	272
0.0033	4.6 x 11.6 x 12.5	0.41	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	332
0.0039	4.0 x 11.0 x 12.5	0.35	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	392
0.0047	4.1 x 11.1 x 12.5	0.36	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	472
0.0056	4.6 x 11.6 x 12.5	0.41	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	562
0.0068	4.2 x 11.2 x 12.5	0.37	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	682
0.0082	4.6 x 11.6 x 12.5	0.41	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	822
0.01	4.1 x 11.1 x 12.5	0.36	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	103
0.012	4.5 x 11.5 x 12.5	0.40	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	123
0.015	4.1 x 11.1 x 12.5	0.36	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	153
0.018	4.5 x 11.5 x 12.5	0.40	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	183
0.022	4.0 x 11.0 x 12.5	0.35	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	223
0.027	4.2 x 11.2 x 12.5	0.37	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	273
0.033	4.6 x 11.6 x 12.5	0.41	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1300)	59... (1300)	333
0.039	5.0 x 12.0 x 12.5	0.44	55... (1500)	56... (1500)	51... (1250)	52... (1250)	58... (1200)	59... (1200)	393
0.047	4.1 x 11.1 x 12.5	0.36	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	473
0.056	4.4 x 11.4 x 12.5	0.39	55... (2000)	56... (2000)	51... (1500)	52... (1500)	58... (1500)	59... (1500)	563
0.068	4.8 x 11.8 x 12.5	0.42	55... (2000)	56... (2000)	51... (1250)	52... (1250)	58... (1300)	59... (1300)	683
0.082	5.4 x 12.4 x 12.5	0.46	55... (1500)	56... (1500)	51... (1000)	52... (1000)	58... (1200)	59... (1200)	823
0.1	5.7 x 12.7 x 12.5	0.48	55... (1500)	56... (1500)	51... (1000)	52... (1000)	58... (1100)	59... (1100)	104

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 250 V

C (µF)	DIMENSIONS $w_{max.}$ x $h_{max.}$ x $l_{max.}$ (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 469 XXYYY AND PACKAGING						
			LOOSE IN BOX				REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 22.0 ± 4.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	4.1 x 11.1 x 12.5	0.36	65... (2000)	66... (2000)	61... (1500)	62... (1500)	68... (1500)	69... (1500)	103
0.012	4.5 x 11.5 x 12.5	0.40	65... (2000)	66... (2000)	61... (1500)	62... (1500)	68... (1300)	69... (1300)	123
0.015	4.9 x 11.9 x 12.5	0.43	65... (2000)	66... (2000)	61... (1250)	62... (1250)	68... (1200)	69... (1200)	153
0.018	5.4 x 12.4 x 12.5	0.46	65... (1500)	66... (1500)	61... (1000)	62... (1000)	68... (1100)	69... (1100)	183
0.022	4.8 x 11.8 x 12.5	0.42	65... (2000)	66... (2000)	61... (1250)	62... (1250)	68... (1300)	69... (1300)	223
0.027	5.3 x 12.3 x 12.5	0.46	65... (2000)	66... (2000)	61... (1000)	62... (1000)	68... (1200)	69... (1200)	273
0.033	5.9 x 12.9 x 12.5	0.52	65... (1500)	66... (1500)	61... (1000)	62... (1000)	68... (1100)	69... (1100)	333

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

Specific Method of Mounting to Withstand Vibration and Shock

In order to withstand vibration and shock tests, it must be ensured that the underside and the kinks 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

Storage Temperature

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

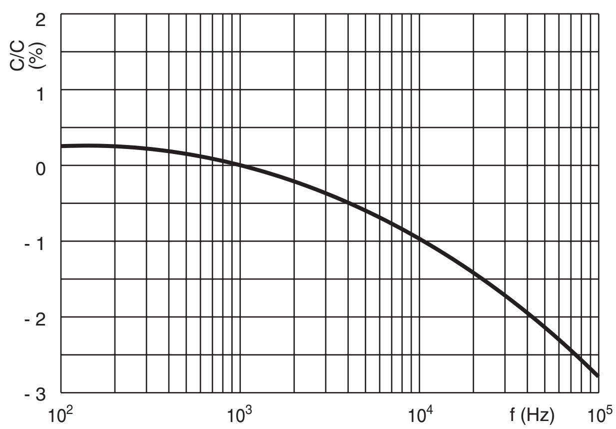
Ratings and Characteristics Reference Conditions

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

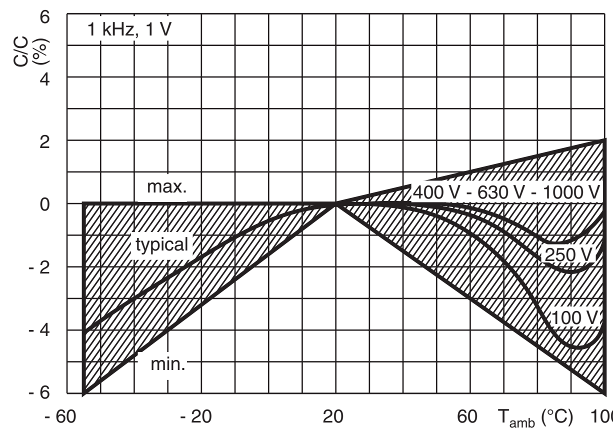
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

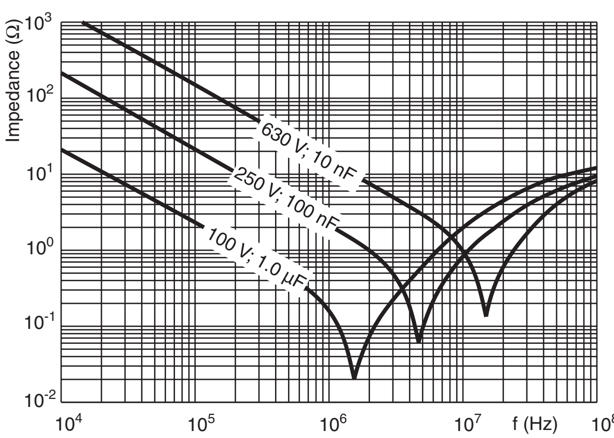
Capacitance as a function of frequency (typical curve)



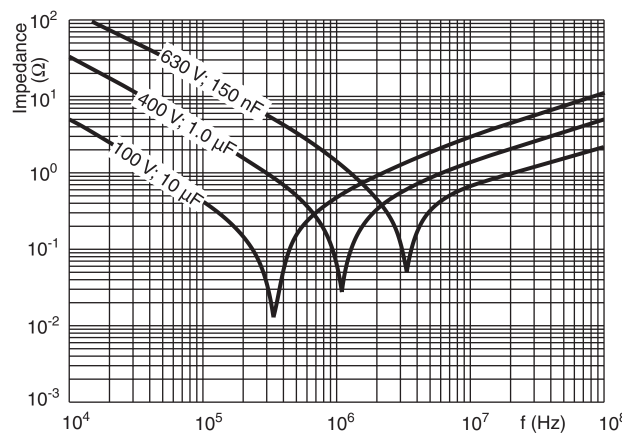
Capacitance as a function of ambient temperature (typical curve)



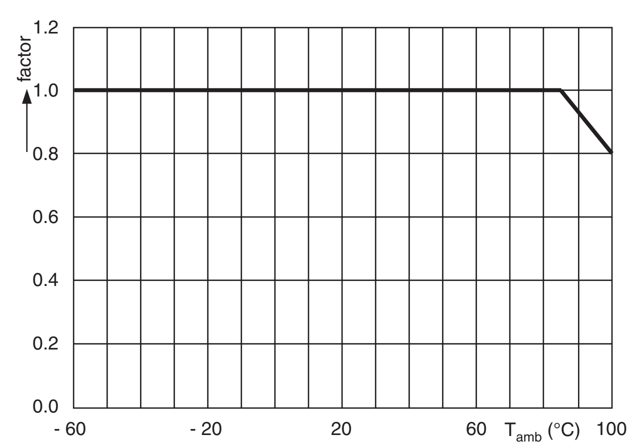
467, 469 - Impedance as a function of frequency (typical curve)



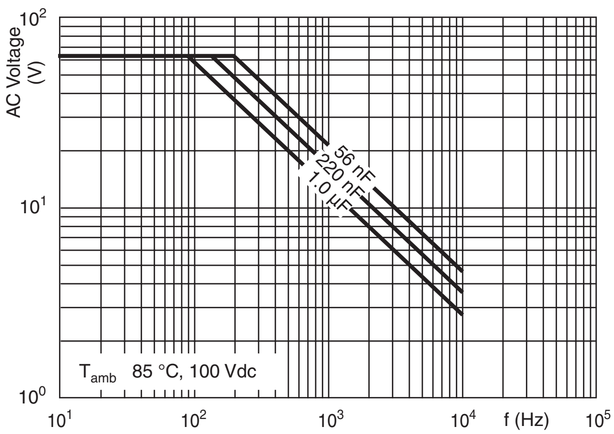
468 - Impedance as a function of frequency (typical curve)



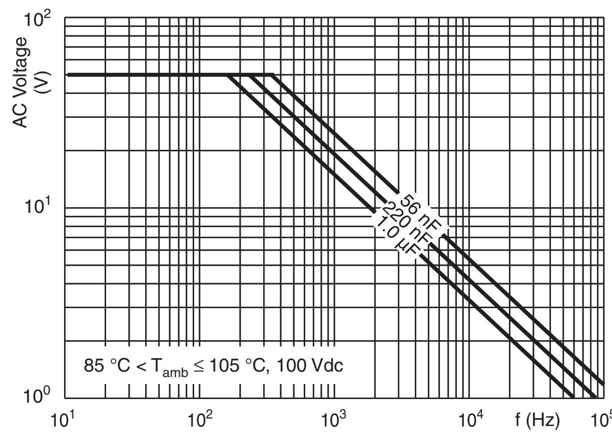
Max. DC and AC voltage as a function of temperature



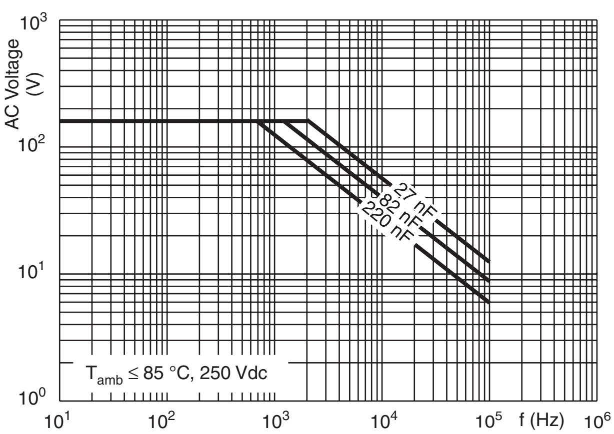
467, 469 - Max. RMS voltage as a function of frequency



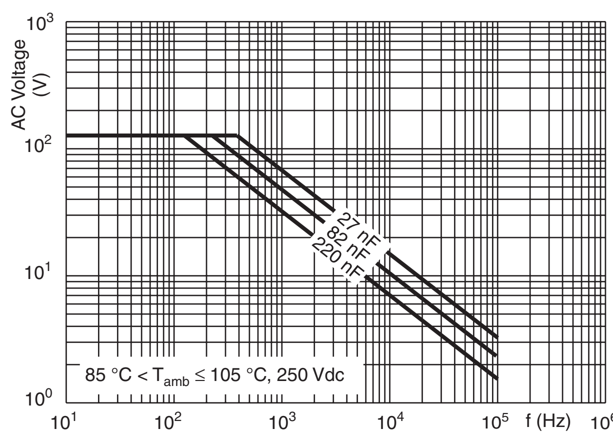
467, 469 - Max. RMS voltage as a function of frequency



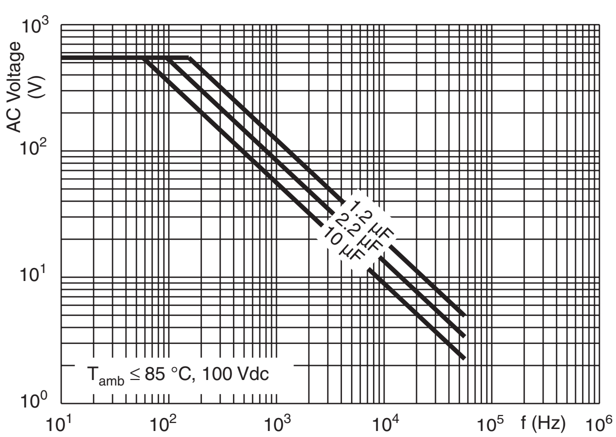
467, 469 - Max. RMS voltage as a function of frequency



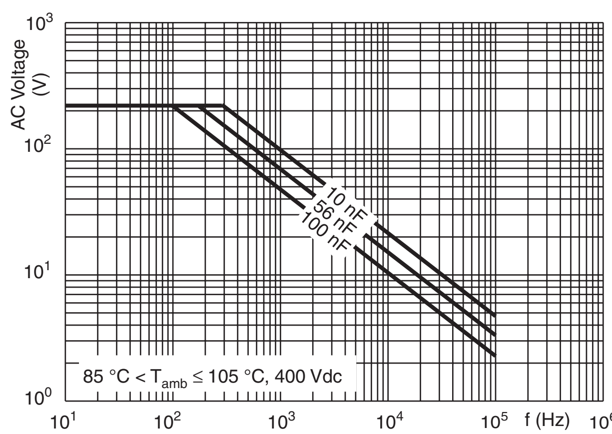
467, 469 - Max. RMS voltage as a function of frequency



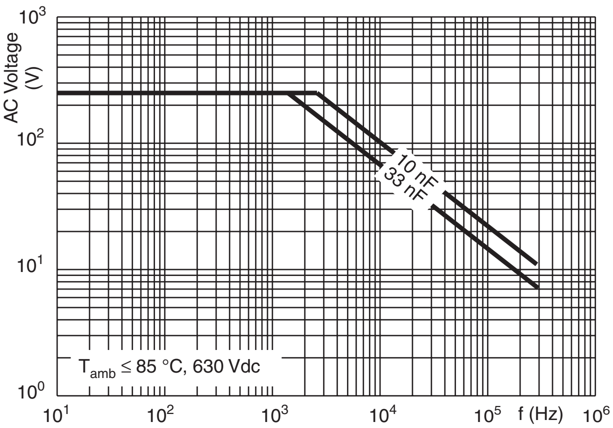
467, 469 - Max. RMS voltage as a function of frequency



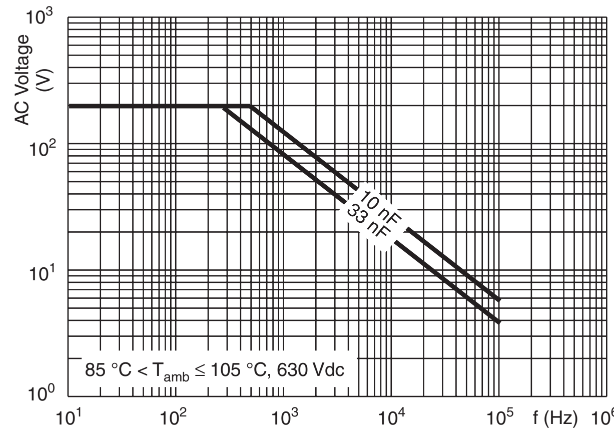
467, 469 - Max. RMS voltage as a function of frequency



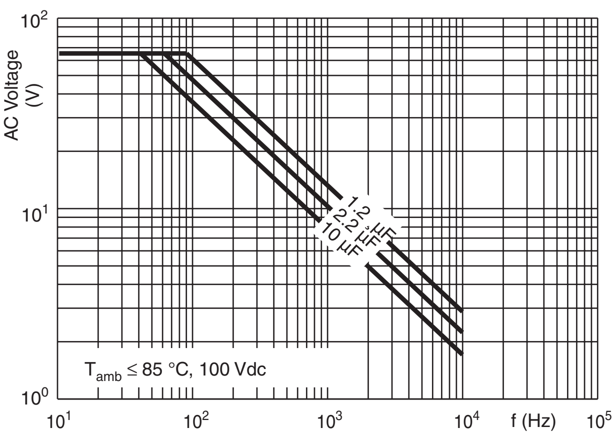
467, 469 - Max. RMS voltage as a function of frequency



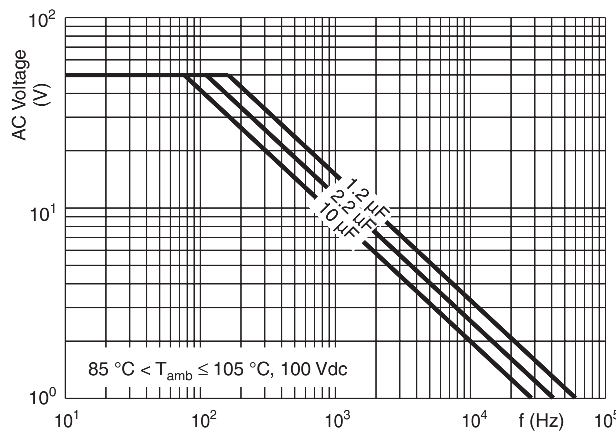
467, 469 - Max. RMS voltage as a function of frequency



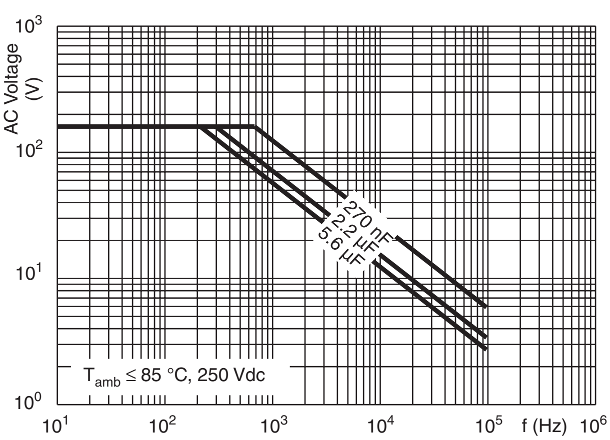
468 - Max. RMS voltage as a function of frequency



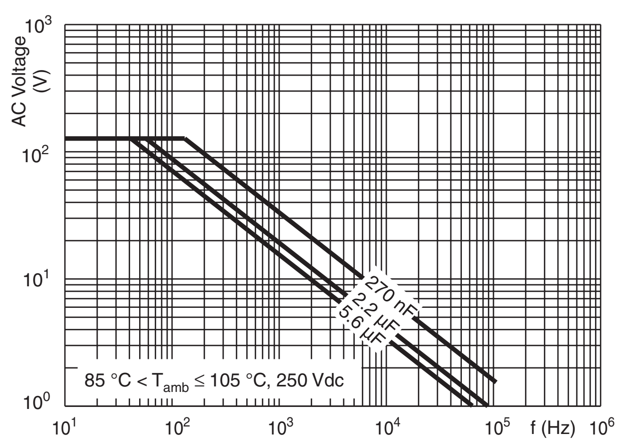
468 - Max. RMS voltage as a function of frequency



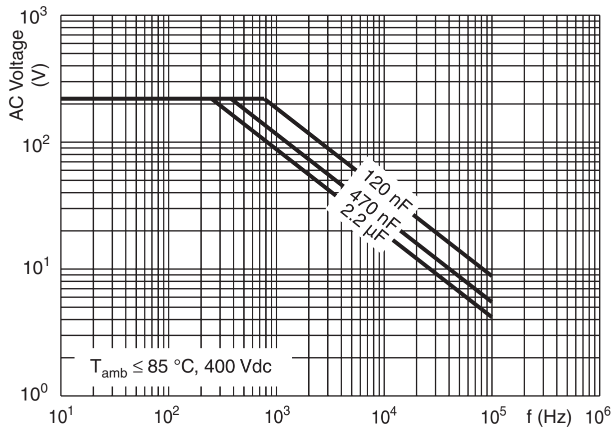
468 - Max. RMS voltage as a function of frequency



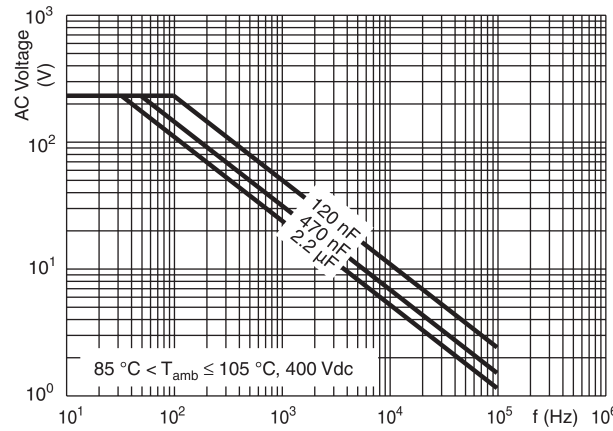
468 - Max. RMS voltage as a function of frequency



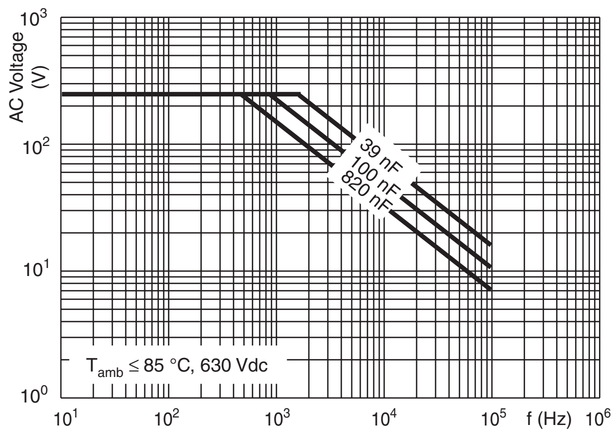
468 - Max. RMS voltage as a function of frequency



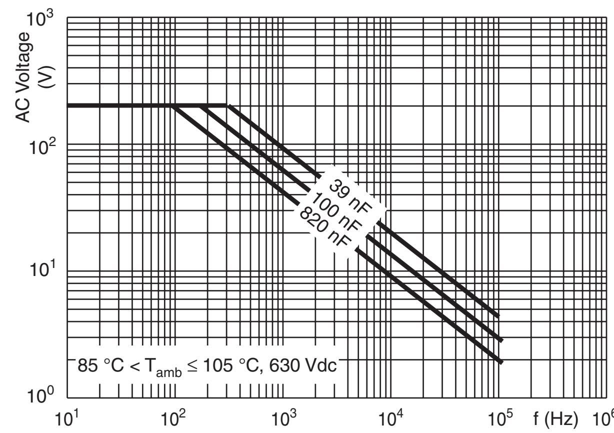
468 - Max. RMS voltage as a function of frequency



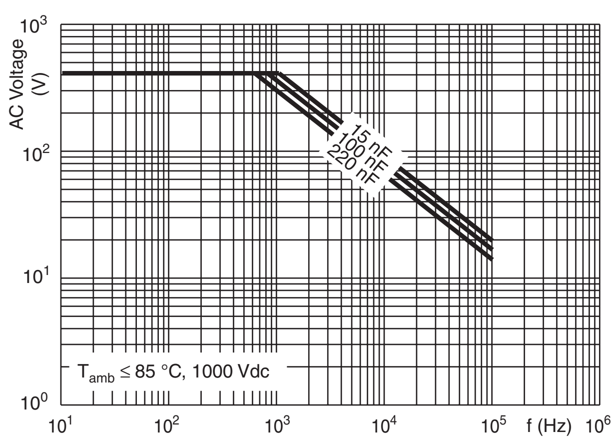
468 - Max. RMS voltage as a function of frequency



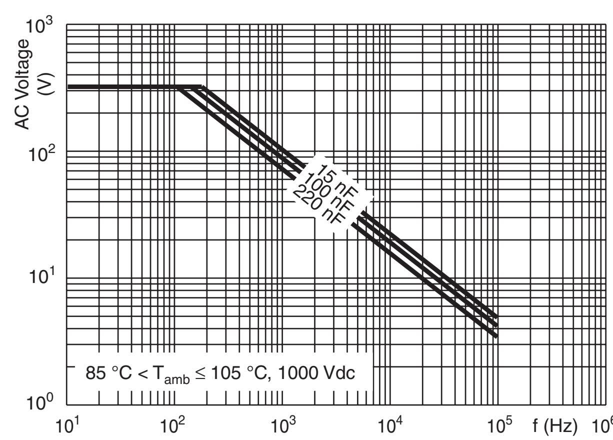
468 - Max. RMS voltage as a function of frequency



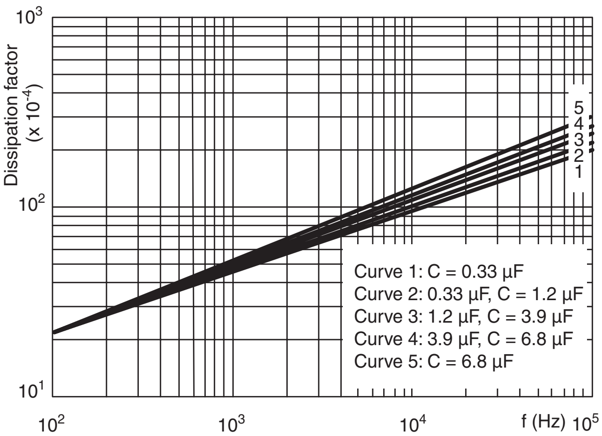
468 - Max. RMS voltage as a function of frequency



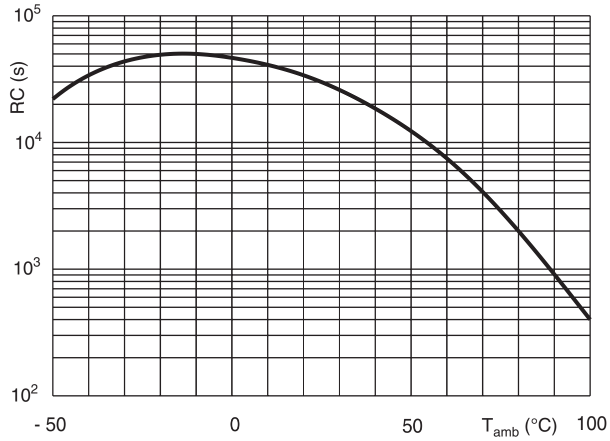
468 - Max. RMS voltage as a function of frequency



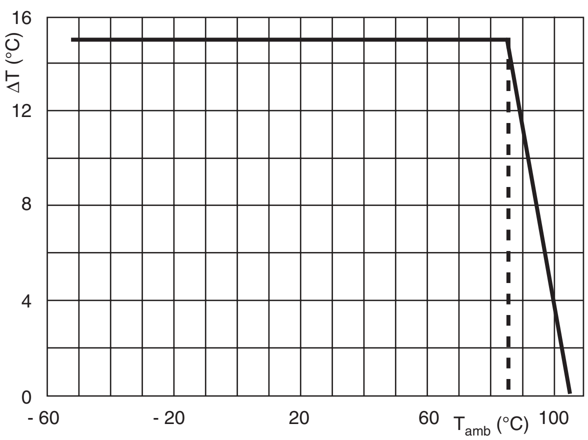
Tangent of loss angle as a function of frequency (typical curve)



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



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



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)			
	PITCH 10 mm	PITCH 15.5 mm	PITCH 22.5 mm	PITCH 27.5 mm
4.0	4.0	5.0	-	-
4.5	4.5	6.0	-	-
5.0	5.0	6.0	12.0	13.0
5.5	6.0	6.5	13.0	15.0
6.0	6.0	6.5	13.0	15.0
6.5	6.5	8.0	15.0	17.0
7.0	-	8.0	15.0	17.0
7.5	-	9.0	17.0	18.0
8.0	-	9.0	17.0	20.0
8.5	-	11.0	18.0	20.0
9.0	-	11.0	18.0	22.0
9.5	-	12.0	20.0	22.0
10.0	-	12.0	20.0	23.0
10.5	-	-	22.0	25.0
11.0	-	-	-	25.0
11.5	-	-	-	27.0

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)			
	PITCH 10 mm	PITCH 15.5 mm	PITCH 22.5 mm	PITCH 27.5 mm
12.0	-	-	-	27.0
12.5	-	-	-	30.0
13.0	-	-	-	30.0
13.5	-	-	-	30.0
14.0	-	-	-	30.0
14.5	-	-	-	33.0
15.0	-	-	-	33.0
15.5	-	-	-	37.0
16.0	-	-	-	37.0

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 ambient temperature.

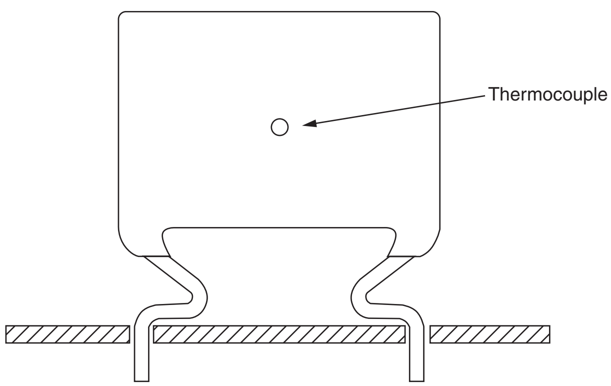
The power dissipation can be calculated according type detail specification “HQN-384-01/101: Technical Information Film Capacitors”.

The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- 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.
   The rated voltage pulse slope is valid for ambient temperatures up to 85 °C. For higher temperatures a derating factor of 3 % per K shall be applied.
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}	0.8 x U_{Rac}
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}

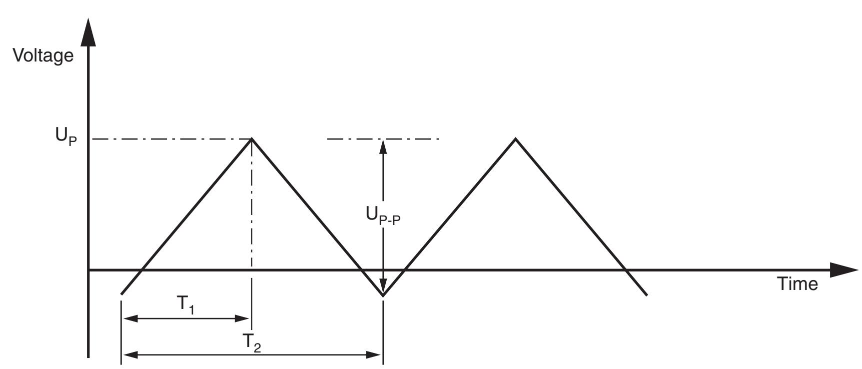
EXAMPLE

C = 330 nF - 100 V used for the voltage signal shown in next drawing.
U_{P-P} = 80 V; U_P = 70 V; T_1 = 0.5 ms; T_2 = 1 ms
The ambient temperature is 35 °C

Checking conditions:

1. The peak voltage U_P = 70 V is lower than 100 Vdc
2. The peak-to-peak voltage 80 V is lower than $2\sqrt{2}$ x 63 Vac = 178 U_{P-P}
3. The voltage pulse slope (dU/dt) = 80 V/500 µs = 0.16 V/µs
   This is lower than 20 V/µs (see specific reference data for each version)
4. The dissipated power is 60 mW as calculated with fourier terms
   The temperature rise for $W_{max.}$ = 8.5 mm and pitch = 15 mm will be 60mW/11 mW/°C = 5.5 °C
   This is lower than 15 °C temperature rise at 35 °C, according figure max. allowed component temperature rise
5. Not applicable
6. Not applicable

Voltage Signal



INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the "Sectional Specification, Publication IEC 60384-2 and Specific Reference Data".

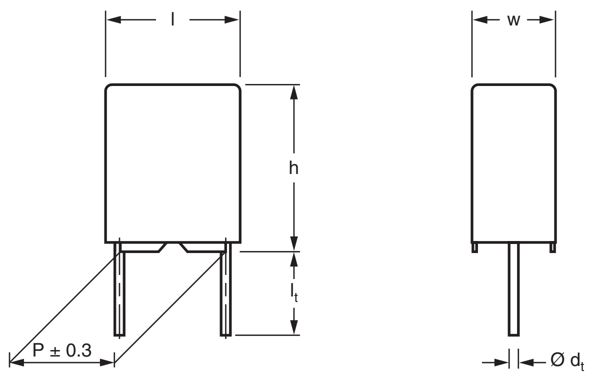
Group C Inspection Requirements

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 ≤ 470 nF at 100 kHz or for C > 470 nF 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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2	Final measurements	Visual examination	No visible damage Legible marking
		Capacitance	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured initially
		Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1			
4.6.1	Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	No visible damage
4.6	Rapid change of temperature	θA = - 55 °C θB = + 100 °C 5 cycles Duration t = 30 min	
4.7	Vibration	Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2	Final inspection	Visual examination	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9 Shock	Mounting: See section "Mounting" of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C $\leq$ 100 nF or ≤ 0.010 for: 100 nF < C $\leq$ 220 nF or ≤ 0.015 for: 220 nF < C $\leq$ 470 nF and ≤ 0.003 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	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ ≤ 0.007 for: C $\leq$ 100 nF or ≤ 0.010 for: 100 nF < C $\leq$ 220 nF or ≤ 0.015 for: 220 nF < C $\leq$ 470 nF and ≤ 0.005 for: C > 470 nF Compared to values measured in 4.3.1 or 4.6.1
	Insulation resistance	$\geq$ 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	
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	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.005$ Compared to values measured in 4.11.1
	Insulation resistance	$\geq$ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 1.0 x U_{Rdc} at 105 °C	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 470$ nF at 100 kHz or for $C > 470$ nF at 10 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq$ 220 nF or ≤ 0.015 for: 220 nF $< C \leq$ 470 nF and ≤ 0.003 for: $C > 470$ nF Compared to values measured in 4.12.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 470$ nF at 100 kHz or for $C > 470$ nF at 10 kHz	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: $C \leq 100$ nF or ≤ 0.010 for: 100 nF $< C \leq$ 220 nF or ≤ 0.015 for: 220 nF $< C \leq$ 470 nF and ≤ 0.003 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

DC Film Capacitors
MKT Radial Potted Type



Dimensions in mm

FEATURES
Available taped and loose in box
RoHS compliant

ENCAPSULATION
Flame retardant plastic case and epoxy resin (UL-class 94 V-0)

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/100/56

CAPACITANCE RANGE (E12 SERIES)
0.00068 µF to 1.5 µF

CAPACITANCE TOLERANCE
± 10 %, ± 5 %

LEADS
Tinned wire

RATED TEMPERATURE
85 °C

MAXIMUM APPLICATION TEMPERATURE
100 °C

PERFORMANCE GRADE
Grade 1 (long life)

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

APPLICATIONS
Blocking and coupling, bypass and energy reservoir, telecom, industrial, consumer

REFERENCE STANDARDS
IEC 60384-2

MARKING
C-value; tolerance; rated voltage; manufacturer's symbol; year and week of manufacturer; manufacturer's type

DIELECTRIC
Polyester film

ELECTRODES
Metallized

CONSTRUCTION
Mono construction
Series construction for 630 V 0.00068 µF ~ 0.0018 µF

RATED (DC) VOLTAGE
Standard size: 63 V, 100 V, 250 V, 400 V
Compact size: 100 V, 250 V, 400 V, 630 V

RATED (AC) VOLTAGE
Standard size: 40 V, 63 V, 160 V, 220 V
Compact size: 40 V, 63 V, 160 V, 220 V

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
370	5.08 mm

CAPACITANCE (numerically)

Example:
104 = 10 x 10 = 100 nF

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

BFC2	370	XX	YY	Y
2222 (*)	370	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	63 V	100 V	250 V	400 V
370 (standard size)	Loose in box	Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	11	21	41	51
			± 5 %	12	22	42	52
		Lead length 26.0 ± 2.0 mm	± 10 %	15	25	45	55
			± 5 %	16	26	46	56
	Taped on reel (1)	H = 18.5 mm; P_0 = 12.7 mm; Reel diameter = 356 mm	± 10 %	18	28	48	58
			± 5 %	19	29	49	59
	Ammopack (1)	H = 18.5 mm; P_0 = 12.7 mm	± 10 %	75	85	35	65
			± 5 %	76	86	36	66

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	100 V	250 V	400 V	630 V
370 (compact size)	Loose in box	Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	CE	EE	FE	GE
			± 5 %	CF	EF	FF	GF
		Lead length 26.0 ± 2.0 mm	± 10 %	CH	EH	FH	GH
			± 5 %	CI	EI	FI	GI
	Taped on reel (1)	H = 18.5 mm; P_0 = 12.7 mm; Reel diameter = 356 mm	± 10 %	CL	EL	FL	GL
			± 5 %	CM	EM	FM	GM
	Ammopack (1)	H = 18.5 mm; P_0 = 12.7 mm	± 10 %	CB	EB	FB	GB
			± 5 %	CC	EC	FC	GC

Note

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA (STANDARD SIZE)

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz		at 10 kHz	at 100 kHz
C ≤ 0.1 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	≤ 250 x 10^{-4}
0.1 µF < C ≤ 0.47 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	≤ 300 x 10^{-4}
0.47 µF < C ≤ 1.5 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	-
Rated voltage pulse slope $(dU/dt)_R$ at	63 Vdc	100 Vdc	250 Vdc	400 Vdc
	60 V/µs	110 V/µs	330 V/µs	630 V/µs
R between leads, for C ≤ 0.33 µF				
at 10 V; 1 min	> 15 000 MΩ			
at 100 V; 1 min		> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads				
0.33 µF < C ≤ 1.0 µF at 10 V; 1 min	> 5000 s			
C > 1.0 µF at 10 V; 1 min	> 1000 s			
C > 0.33 µF at 100 V; 1 min		> 5000 s		
R between interconnecting leads and case (foil method)	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA);	100 V; 1 min	160 V; 1 min	400 V; 1 min	640 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	200 V; 1 min	500 V; 1 min	800 V; 1 min
Maximum application temperature	100 °C			

SPECIFIC REFERENCE DATA (COMPACT SIZE)

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz		at 10 kHz	at 100 kHz
C ≤ 0.1 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	≤ 250 x 10^{-4}
0.1 µF < C ≤ 0.47 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	≤ 300 x 10^{-4}
C > 0.47 µF	≤ 75 x 10^{-4}		≤ 130 x 10^{-4}	-
Rated voltage pulse slope $(dU/dt)_R$ at	100 Vdc	250 Vdc	400 Vdc	630 Vdc
	37 V/µs	44 V/µs	200 V/µs	540 V/µs
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads C > 0.33 µF at 100 V; 1 min	> 5000 s			
R between interconnecting leads and case (foil method)	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA);	160 V; 1 min	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	500 V; 1 min	800 V; 1 min	1260 V; 1 min
Maximum application temperature	100 °C			

U_{Rdc} = 63 V; U_{Rac} = 40 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								C-VALUE
			AMMOPACK		LOOSE IN BOX				REEL		
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.056 0.068 0.082 0.1 0.12 0.15 0.18	2.5 x 6.5 x 7.2	0.18	**75...** (2000)	**76...** (2000)	**11...** (2000)	**12...** (2000)	**15...** (1000)	**16...** (1000)	**18...** (2000)	**19...** (2000)	**563** **683** **823** **104** **124** **154** **184**
0.22 0.27 0.33 0.39 0.47	3.5 x 8.0 x 7.2	0.3	**75...** (1500)	**76...** (1500)	**11...** (2000)	**12...** (2000)	**15...** (1000)	**16...** (1000)	**18...** (1500)	**19...** (1500)	**224** **274** **334** **394** **474**
0.56 0.68	4.5 x 9.0 x 7.2	0.42	**75...** (1000)	**76...** (1000)	**11...** (2000)	**12...** (2000)	**15...** (1000)	**16...** (1000)	**18...** (1000)	**19...** (1000)	**564** **684**
0.82 1.0	6.0 x 11.0 x 7.2	0.64	**75...** (750)	**76...** (750)	**11...** (2000)	**12...** (2000)	**15...** (1000)	**16...** (1000)	**18...** (1000)	**19...** (1000)	**824** **105**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V (standard size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.001											**102**
0.0012											**122**
0.0015											**152**
0.0018											**182**
0.0022											**222**
0.0027											**272**
0.0033											**332**
0.0039											**392**
0.0047											**472**
0.0056											**562**
0.0068											**682**
0.0082											**822**
0.010	2.5 x 6.5 x 7.2	0.18	**85...** (2000)	**86...** (2000)	**21...** (2000)	**22...** (2000)	**25...** (1000)	**26...** (1000)	**28...** (2000)	**29...** (2000)	**103**
0.012											**123**
0.015											**153**
0.018											**183**
0.022											**223**
0.027											**273**
0.033											**333**
0.039											**393**
0.047											**473**
0.056											**563**
0.068											**683**
0.082											**823**
0.10											**104**
0.12											**124**
0.15	3.5 x 8.0 x 7.2	0.30	**85...** (1500)	**86...** (1500)	**21...** (2000)	**22...** (2000)	**25...** (1000)	**26...** (1000)	**28...** (1500)	**29...** (1500)	**154**
0.18											**184**
0.22											**224**
0.27	4.5 x 9.0 x 7.2	0.42	**85...** (1000)	**86...** (1000)	**21...** (2000)	**22...** (2000)	**25...** (1000)	**26...** (1000)	**28...** (1000)	**29...** (1000)	**274**
0.33											**334**
0.39	6.0 x 11.0 x 7.2	0.64	**85...** (750)	**86...** (750)	**21...** (2000)	**22...** (2000)	**25...** (1000)	**26...** (1000)	**28...** (1000)	**29...** (1000)	**394**
0.47											**474**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 40 V (compact size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.12 0.15 0.18 0.22 0.27 0.33	3.5 x 8.0 x 7.2	0.30	**CB...** (1500)	**CC...** (1500)	**CE...** (2000)	**CF...** (2000)	**CH...** (1000)	**CI...** (1000)	**CL...** (1500)	**CM...** (1500)	**124** **154** **184** **224** **274** **334**
0.39 0.47	4.5 x 9.0 x 7.2	0.42	**CB...** (1000)	**CC...** (1000)	**CE...** (2000)	**CF...** (2000)	**CH...** (1000)	**CI...** (1000)	**CL...** (1000)	**CM...** (1000)	**394** **474**
0.56	6.0 x 11.0 x 7.2	0.64	**CB...** (750)	**CC...** (750)	**CE...** (2000)	**CF...** (2000)	**CH...** (1000)	**CI...** (1000)	**CL...** (1000)	**CM...** (1000)	**564**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V (standard size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.001 0.0012 0.0015 0.0018 0.0022 0.0027 0.0033 0.0039 0.0047 0.0056 0.0068 0.0082 0.010 0.012 0.015 0.018	2.5 x 6.5 x 7.2	0.18	**35...** (2000)	**36...** (2000)	**41...** (2000)	**42...** (2000)	**45...** (1000)	**46...** (1000)	**48...** (2000)	**49...** (2000)	**102** **122** **152** **182** **222** **272** **332** **392** **472** **562** **682** **822** **103** **123** **153** **183**
0.022 0.027 0.033	3.5 x 8.0 x 7.2	0.30	**35...** (1500)	**36...** (1500)	**41...** (2000)	**42...** (2000)	**45...** (1000)	**46...** (1000)	**48...** (1500)	**49...** (1500)	**223** **273** **333**
0.039 0.047 0.056	4.5 x 9.0 x 7.2	0.42	**35...** (1000)	**36...** (1000)	**41...** (2000)	**42...** (2000)	**45...** (1000)	**46...** (1000)	**48...** (1000)	**49...** (1000)	**393** **473** **563**
0.068 0.082 0.10	6.0 x 11.0 x 7.2	0.64	**35...** (750)	**36...** (750)	**41...** (2000)	**42...** (2000)	**45...** (1000)	**46...** (1000)	**48...** (1000)	**49...** (1000)	**683** **823** **104**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 63 V (compact size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.022	2.5 x 6.5 x 7.2	0.18	EB... (2000)	EC... (2000)	EE... (2000)	EF... (2000)	EH... (1000)	EI... (1000)	EL... (2000)	EM... (2000)	223
0.027											273
0.033	3.5 x 8.0 x 7.2	0.30	EB... (1500)	EC... (1500)	EE... (2000)	EF... (2000)	EH... (1000)	EI... (1000)	EL... (1500)	EM... (1500)	333
0.039											393
0.047											473
0.056											563
0.068											683
0.082	4.5 x 9.0 x 7.2	0.42	EB... (1000)	EC... (1000)	EE... (2000)	EF... (2000)	EH... (1000)	EI... (1000)	EL... (1000)	EM... (1000)	823
0.10											104
0.12	6.0 x 11.0 x 7.2	0.64	EB... (750)	EC... (750)	EE... (2000)	EF... (2000)	EH... (1000)	EI... (1000)	EL... (1000)	EM... (1000)	124
0.15											154
0.18											184
0.22											224

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V (standard size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.001	2.5 x 6.5 x 7.2	0.18	65... (2000)	66... (2000)	51... (2000)	52... (2000)	55... (1000)	56... (1000)	58... (2000)	59... (2000)	102
0.0012											122
0.0015											152
0.0018											182
0.0022											222
0.0027											272
0.0033											332
0.0039											392
0.0047											472
0.0056											562
0.0068											682
0.0082											822
0.010	3.5 x 8.0 x 7.2	0.30	65... (1500)	66... (1500)	51... (2000)	52... (2000)	55... (1000)	56... (1000)	58... (1500)	59... (1500)	103
0.012											123
0.015											153
0.018	4.5 x 9.0 x 7.2	0.42	65... (1000)	66... (1000)	51... (2000)	52... (2000)	55... (1000)	56... (1000)	58... (1000)	59... (1000)	183
0.022											223
0.027											273
0.033	6.0 x 11.0 x 7.2	0.64	65... (750)	66... (750)	51... (2000)	52... (2000)	55... (1000)	56... (1000)	58... (1000)	59... (1000)	333
0.039											393
0.047											473

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 160 V (compact size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.01 0.012 0.015 0.018	2.5 x 6.5 x 7.2	0.18	FB... (2000)	FC... (2000)	FE... (2000)	FF... (2000)	FH... (1000)	FI... (1000)	FL... (2000)	FM... (2000)	103 123 153 183
0.022 0.027 0.033 0.039	3.5 x 8.0 x 7.2	0.30	FB... (1500)	FC... (1500)	FE... (2000)	FF... (2000)	FH... (1000)	FI... (1000)	FL... (1500)	FM... (1500)	223 273 333 393
0.047 0.056	4.5 x 9.0 x 7.2	0.42	FB... (1000)	FC... (1000)	FE... (2000)	FF... (2000)	FH... (1000)	FI... (1000)	FL... (1000)	FM... (1000)	473 563
0.068 0.082 0.10	6.0 x 11.0 x 7.2	0.64	FB... (750)	FC... (750)	FE... (2000)	FF... (2000)	FH... (1000)	FI... (1000)	FL... (1000)	FM... (1000)	683 823 104

Notes

[(1)] Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 220 V (compact size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 370 XXYYY AND PACKAGING								
			AMMOPACK		LOOSE IN BOX				REEL		C-VALUE
			H = 18.5 mm; P_0 = 12.7 mm		Short leads		Long leads				
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 5.08 ± 0.30 mm; d_t = 0.50 ± 0.05 mm											
0.00068 0.00082 0.001 0.0012 0.0015 0.0018 0.002 0.0022 0.0024 0.0027 0.0033 0.0039 0.0047 0.0056 0.0068 0.0082 0.01	3.5 x 8.0 x 7.2	0.35	GB... (1500)	GC... (1500)	GE... (2000)	GF... (2000)	GH... (1000)	GI... (1000)	GL... (1500)	GM... (1500)	681 821 102 122 152 182 202 222 242 272 332 392 472 562 682 822 103
0.012 0.015	4.5 x 9.0 x 7.2	0.45	GB... (1000)	GC... (1000)	GE... (2000)	GF... (2000)	GH... (1000)	GI... (1000)	GL... (1000)	GM... (1000)	123 153
0.018 0.022 0.027 0.033	6.0 x 11.0 x 7.2	0.65	GB... (750)	GC... (750)	GE... (2000)	GF... (2000)	GH... (1000)	GI... (1000)	GL... (1000)	GM... (1000)	183 223 273 333

Notes

[(1)] Net weight for short lead product only

• SPQ = Standard Packing Quantity

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog.

Specific Method of Mounting to Withstand Vibration and Shock

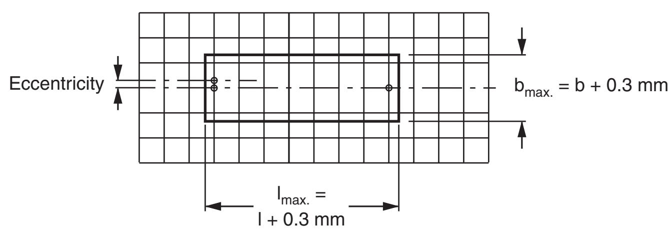
In order to withstand vibration and shock tests, it must be ensured that stand-off pips are in good contact with the printed-circuit board:

- 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: $h_{max.} \leq h + 0.3$ mm



Storage Temperature

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

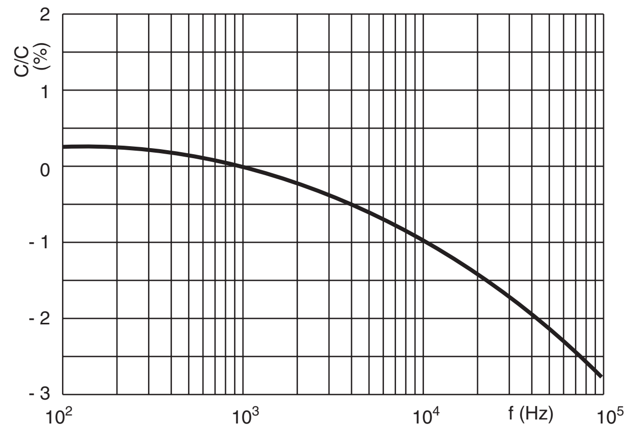
Ratings and Characteristics Reference Conditions

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

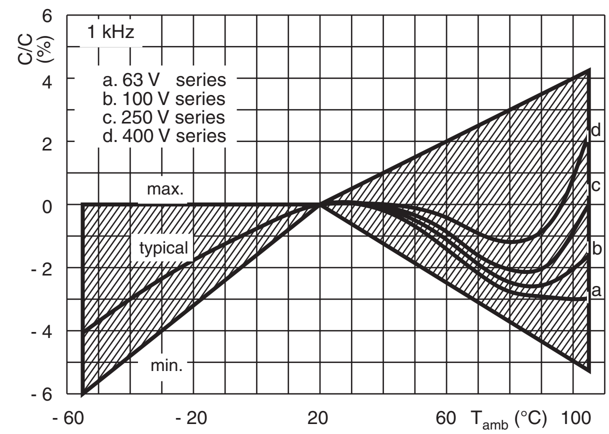
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

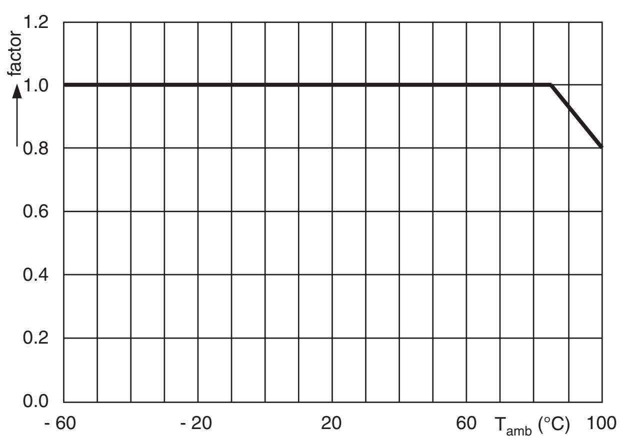
Capacitance as a function of frequency (typical curve)



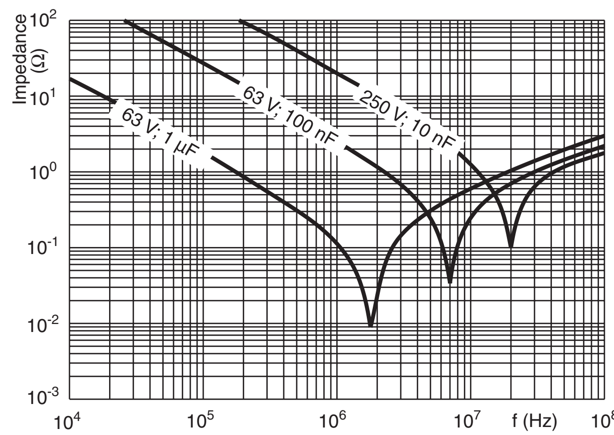
Capacitance as a function of temperature (typical curve)



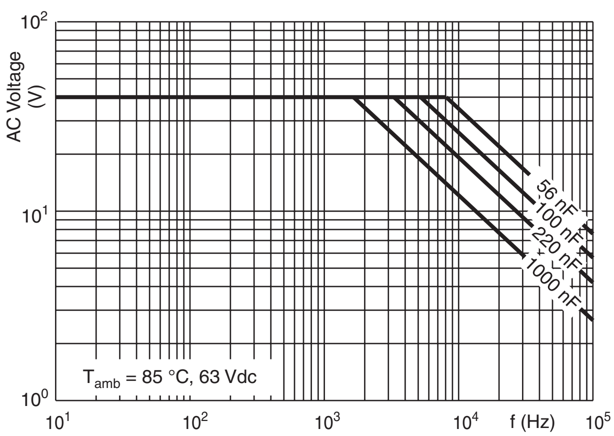
Max. DC and AC voltage as a function of temperature



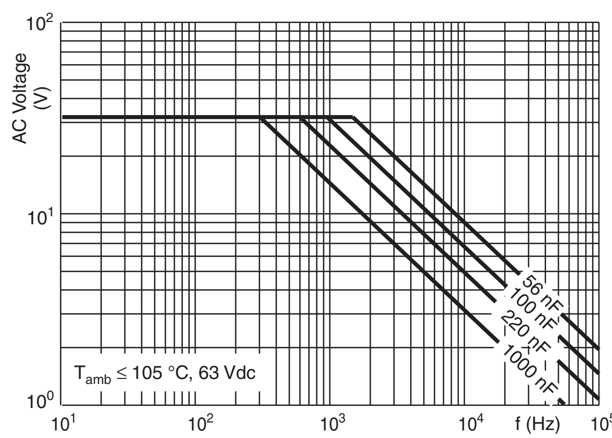
Impedance as a function of frequency



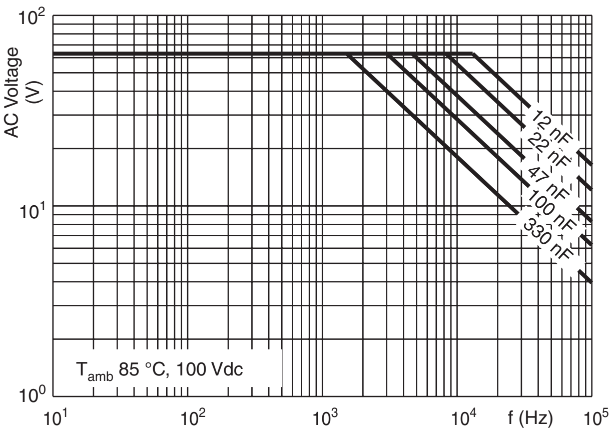
Max. AC voltage as a function of frequency



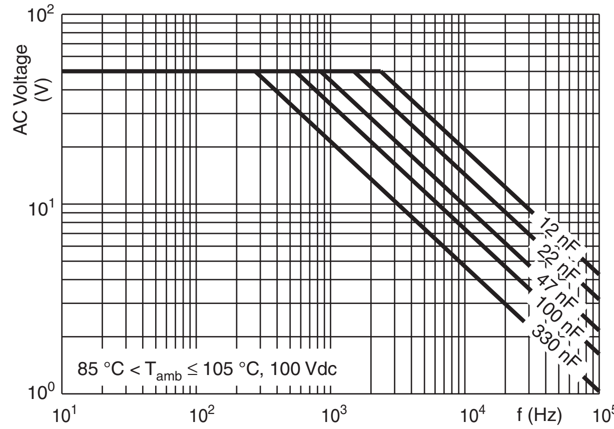
Max. AC voltage as a function of frequency



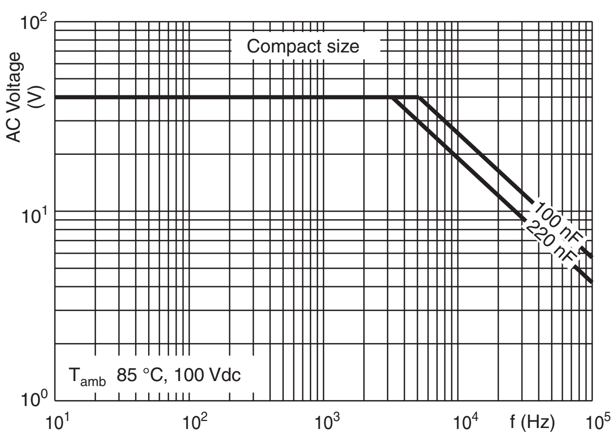
Max. AC voltage as a function of frequency



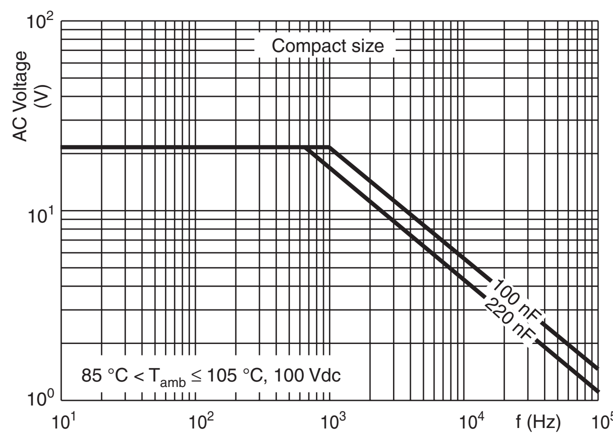
Max. AC voltage as a function of frequency



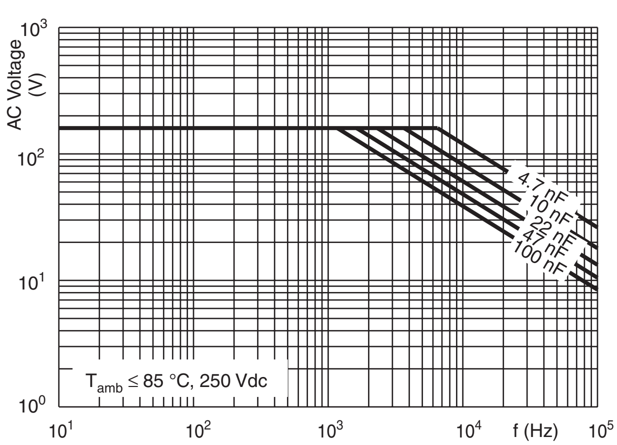
Max. AC voltage as a function of frequency



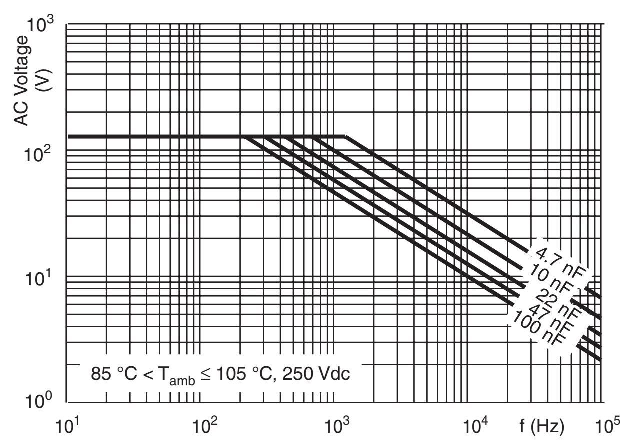
Max. AC voltage as a function of frequency



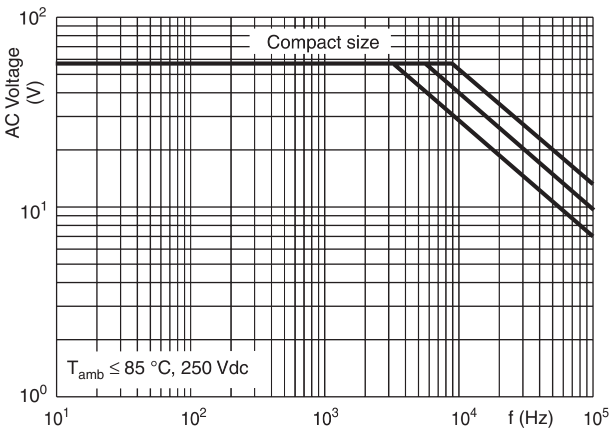
Max. AC voltage as a function of frequency



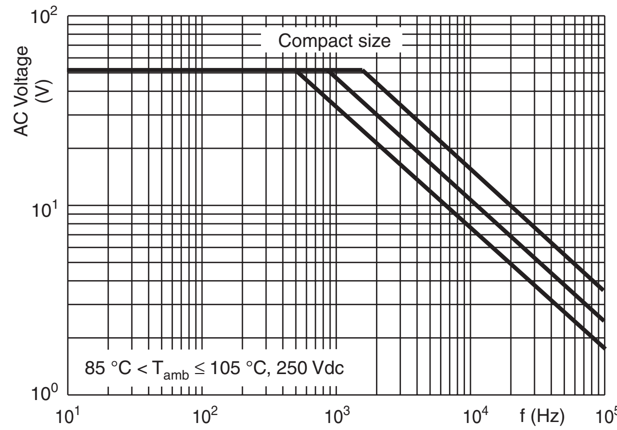
Max. AC voltage as a function of frequency



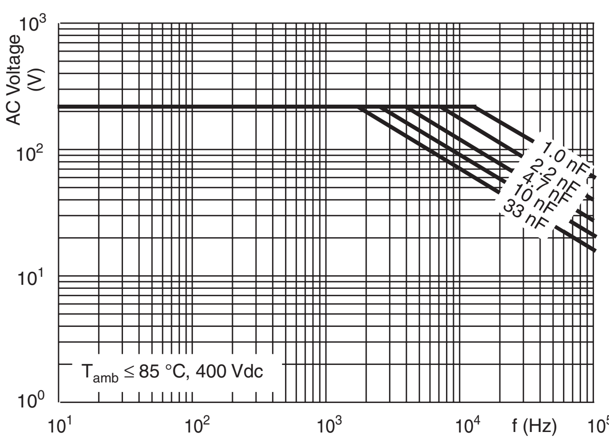
Max. AC voltage as a function of frequency



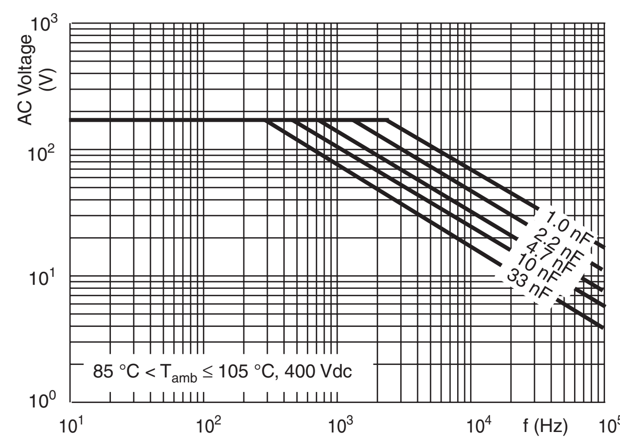
Max. AC voltage as a function of frequency



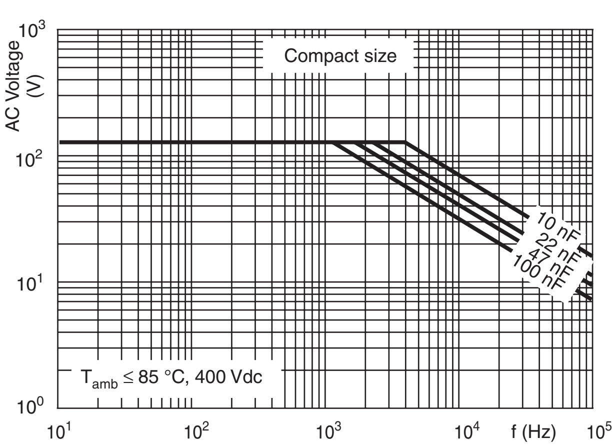
Max. AC voltage as a function of frequency



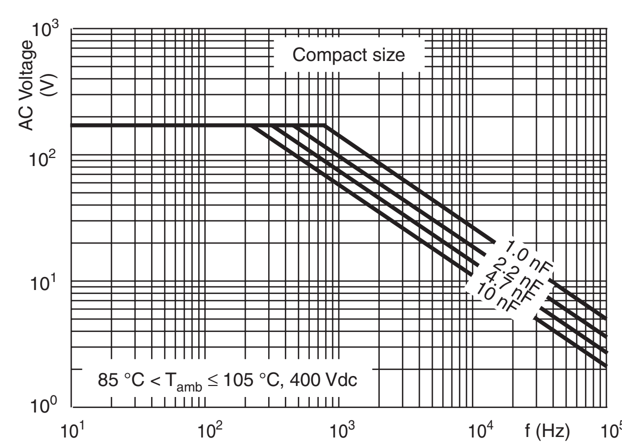
Max. AC voltage as a function of frequency



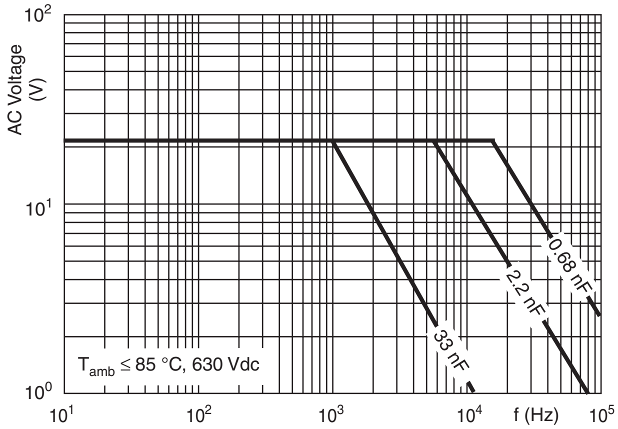
Max. AC voltage as a function of frequency



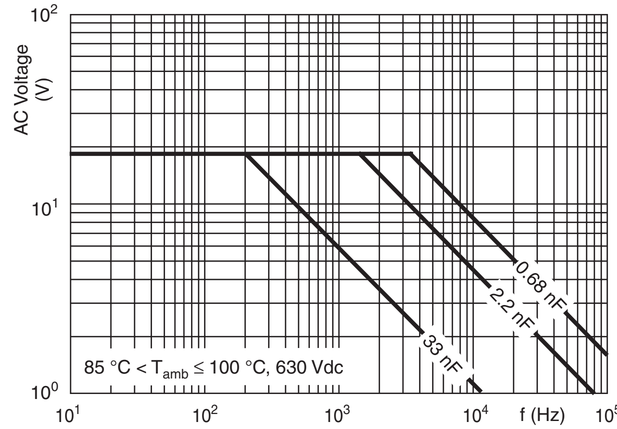
Max. AC voltage as a function of frequency



Max. AC voltage as a function of frequency



Max. AC voltage as fa unction of frequency

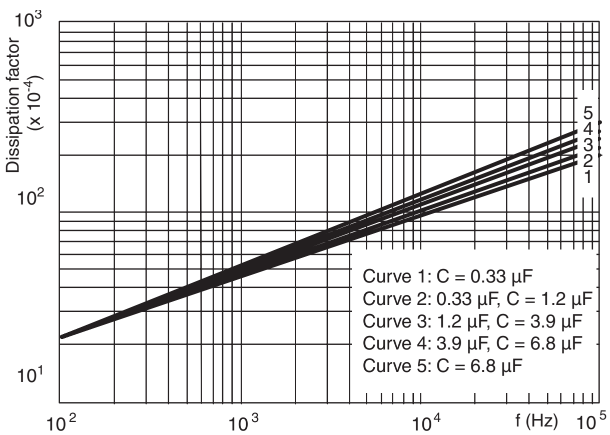


Maximum RMS current (sinewave) as a function of frequency

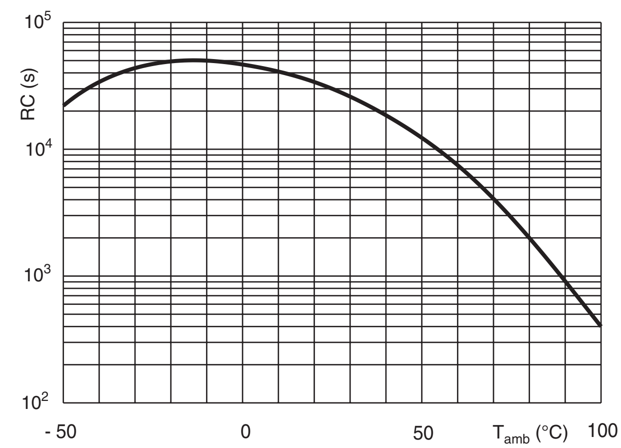
The maximum RMS current is defined by $I_{ac} = \omega \times C \times U_{ac}$.

U_{ac} is the maximum AC voltage depending on the ambient temperature in the curves "Max. RMS voltage and AC current as a function of frequency".

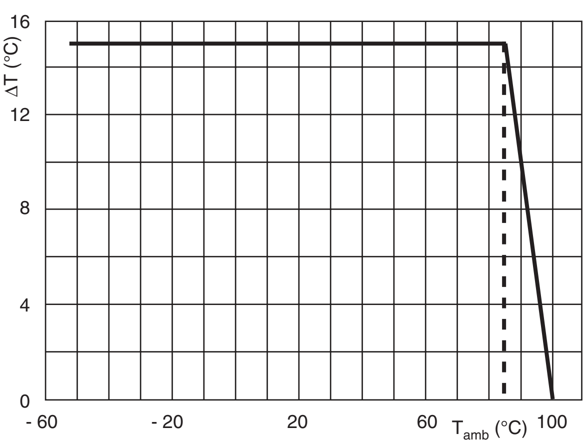
Tangent of loss angle as a function of frequency
(typical curve)



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



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



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C) PITCH 5 mm
2.5	2.5
3.5	3.0
4.5	4.0
6.0	5.5

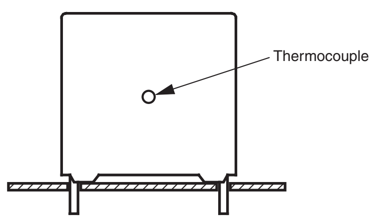
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free 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 $\Delta T = P/G$:

- 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 peak 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 figure 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 < $T_{amb} \leq 100$ °C**
Maximum continuous RMS voltage	U_{Rac}	See "Max. AC voltage as function of temperature CBB952" per characteristics
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}

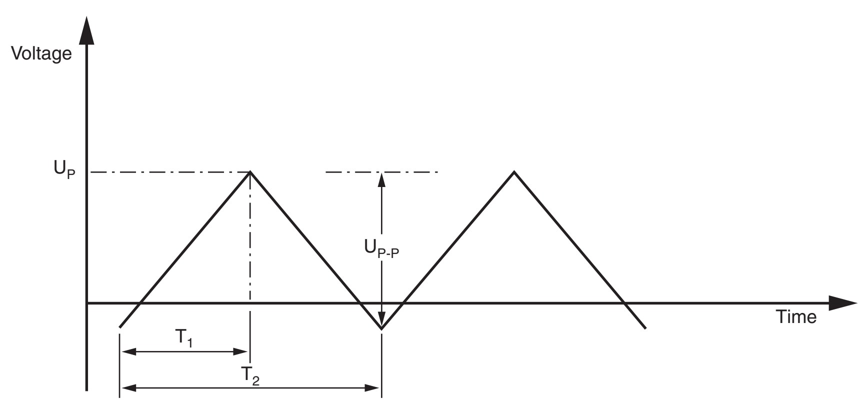
EXAMPLE

C = 330 nF - 63 V used for the voltage signal shown in next drawing.
U_{P-P} = 40 V; U_P = 35 V; T_1 = 100 µs; T_2 = 200 µs
The ambient temperature is 35 °C

Checking conditions:

1. The peak voltage U_P = 35 V is lower than 63 Vdc
2. The peak-to-peak voltage 40 V is lower than $2\sqrt{2}$ x 40 Vac = 113 U_{P-P}
3. The voltage pulse slope (dU/dt) = 40 V/100 µs = 0.4 V/µs
   This is lower than 60 V/µs (see specific reference data for each version)
4. The dissipated power is 16.2 mW as calculated with fourier terms
   The temperature rise for $W_{max.}$ = 3.5 mm and pitch = 5 mm will be 16.2 mW/3.0 mW/°C = 5.4 °C
   This is lower than 15 °C temperature rise at 35 °C, according figure max. allowed component temperature rise
5. Not applicable
6. Not applicable

Voltage Signal



INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the "Sectional Specification, Publication IEC 60384-2 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 "MKT 370 General Data" of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.3 Robustness of terminations	Tensile and bending	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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.6 Rapid change of temperature	θA = - 55 °C θB = + 100 °C 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2 Final inspection	Visual examination	No visible damage

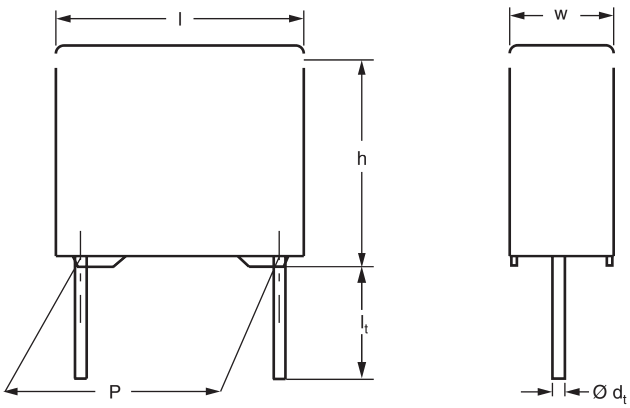
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9 Shock	Mounting: See section "Mounting" of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan δ ≤ 0.010 for: $C \leq 220$ nF or ≤ 0.015 for: 220 nF $< C \leq$ 470 nF and ≤ 0.003 for: $C >$ 470 nF Compared to values measured in 4.6.1
	Insulation resistance	As specified in section "Specific Reference Data 370" 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: + 100 °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	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ ≤ 0.010 for: $C \leq 220$ nF or ≤ 0.015 for: 220 nF $< C \leq$ 470 nF and ≤ 0.005 for: $C >$ 470 nF Compared to values measured in 4.3.1 or 4.6.1
	Insulation resistance	≥ 50 % of values specified in section "Specific Reference Data 370" of this specification
SUB-GROUP C2		
4.11 Damp heat steady state	56 days, 40 °C, 90 % to 95 % RH	
4.11.1 Initial measurements	Capacitance Tangent of loss angle at 1 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
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	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.005$ Compared to values measured in 4.11.1
	Insulation resistance	≥ 50 % of values specified in section "Specific Reference Data 370" of this specification
SUB-GROUP C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 0.8 x 1.25 U_{Rdc} at 100 °C	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for at 85 °C ≤ 0.010 for at 100 °C for: C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.12.1
	Insulation resistance	≥ 50 % of values specified in section "Specific Reference Data 370" of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.13.3 Final measurements	Capacitance	$\|\Delta C/C\| \leq 3$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section "Specific Reference Data 370" of this specification

VISHAY

DC Film Capacitors
MKT Radial Potted Type

371



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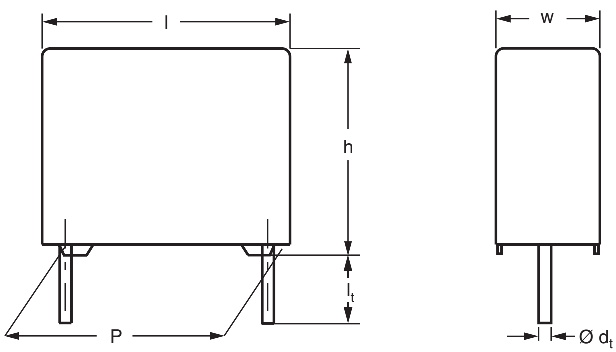
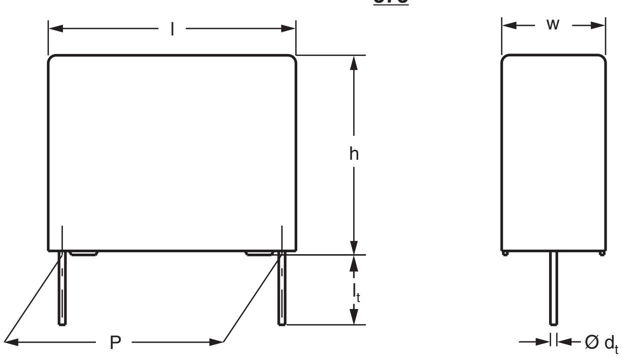


373



APPLICATIONS

Blocking and coupling, bypass and energy reservoir.

REFERENCE STANDARDS

IEC 60384-2

MARKING

C-value; tolerance; rated voltage; manufacturer's symbol; year and week of manufacturer; manufacturer's type

FEATURES

371: 7.62 mm lead pitch. Supplied loose in box and taped on reel or ammopack
372: 10 mm lead pitch. Supplied loose in box and taped on reel or ammopack
373: 15 mm to 27.5 mm lead pitch. Supplied loose in box and taped on reel.
RoHS compliant

Pb-free

e3

RoHS COMPLIANT

DIELECTRIC

Polyester film

ELECTRODES

Metallized

CONSTRUCTION

Mono construction

RATED (DC) VOLTAGE

371: 63 V, 100 V, 250 V, 400 V
372, 373: 100 V, 250 V, 400 V, 630 V

RATED (AC) VOLTAGE

371: 40 V, 63 V, 160 V, 220 V
372, 373: 63 V, 160 V, 220 V, 250 V

ENCAPSULATION

Flame retardant plastic case and epoxy resin (UL-class 94 V-0)

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/105/56

CAPACITANCE RANGE (E12 SERIES)

371: 0.0039 µF to 1.5 µF
372: 0.0047 µF to 0.68 µF
373: 0.047 µF to 15 µF

CAPACITANCE TOLERANCE

± 10 %, ± 5 %

LEADS

Tinned wire

RATED TEMPERATURE

85 °C

MAXIMUM APPLICATION TEMPERATURE

105 °C

PERFORMANCE GRADE

Grade 1 (long life)

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER: 371

TYPE AND PITCHES	
371	7.62 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	371	XX	YY	Y
2222 (*)	371	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	63 V	100 V	250 V	400 V
371	Loose in box	Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	11	21	41	51
			± 5 %	12	22	42	52
		Lead length 26.0 ± 2.0 mm	± 10 %	15	25	45	55
			± 5 %	16	26	46	56
	Taped on reel (1)	H (1) = 18.5 mm P_0 = 12.7 mm	± 10 %	35	65	75	85
			± 5 %	36	66	76	86
	Ammopack (1)	H (1) = 18.5 mm P_0 = 12.7 mm	± 10 %	38	68	78	88
			± 5 %	39	69	79	89

Note
(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
C ≤ 0.1 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 250 x 10^{-4}	
0.1 µF < C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 250 x 10^{-4}	
0.47 µF < C ≤ 1.5 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	-	
Rated voltage pulse slope $(dU/dt)_R$ at	63 Vdc	100 Vdc	250 Vdc	400 Vdc
	18 V/µs	36 V/µs	70 V/µs	190 V/µs
R between leads, for C ≤ 0.33 µF at 10 V; 1 min	> 15 000 MΩ			
at 100 V; 1 min		> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads, for C > 0.33 µF at 10 V; 1 min	> 5000 s			
at 100 V; 1 min		> 5000 s	-	-
R between interconnecting leads and case (foil method)	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	100 V; 1 min	160 V; 1 min	400 V; 1 min	640 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	20 V; 1 min	500 V; 1 min	800 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 63 V; U_{Rac} = 40 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 371 XXYYY AND PACKAGING								
			LOOSE IN BOX				AMMOPACK		REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 26.0 ± 2.0 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**..YYY**
Pitch = 7.62 + 0.30/- 0.40 mm; d_t = 0.50 ± 0.05 mm											
0.056 0.068 0.082 0.1	2.5 x 6.5 x 10.0	0.24	**11...** (1000)	**12...** (1000)	**15...** (1000)	**16...** (1000)	**38...** (2000)	**39...** (2000)	**35...** (2000)	**36...** (2000)	**563 683 823 104**
0.12 0.15 0.18 0.22	3.0 x 8.0 x 10.0	0.34	**11...** (1000)	**12...** (1000)	**15...** (1000)	**16...** (1000)	**38...** (1500)	**39...** (1500)	**35...** (1500)	**36...** (1500)	**124 154 184 224**
0.27 0.33 0.39 0.47 0.56 0.68	4.0 x 9.0 x 10.0	0.51	**11...** (1000)	**12...** (1000)	**15...** (1000)	**16...** (1000)	**38...** (1000)	**39...** (1000)	**35...** (1500)	**36...** (1500)	**274 334 394 474 564 684**
0.82 1.0	5.0 x 10.5 x 10.0	0.73	**11...** (1000)	**12...** (1000)	**15...** (1000)	**16...** (1000)	**38...** (1000)	**39...** (1000)	**35...** (1000)	**36...** (1000)	**824 105**
1.2 1.5	6.0 x 11.5 x 10.0	1.0	**11...** (750)	**12...** (750)	**15...** (1000)	**16...** (1000)	**38...** (500)	**39...** (500)	**35...** (500)	**36...** (500)	**125 155**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 371 XXYYY AND PACKAGING								
			LOOSE IN BOX				AMMOPACK		REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 26.0 ± 2.0 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**..YYY**
Pitch = 7.62 + 0.30/- 0.40 mm; d_t = 0.50 ± 0.05 mm											
0.018 0.022 0.027 0.033 0.039 0.047	2.5 x 6.5 x 10.0	0.24	**21...** (1000)	**22...** (1000)	**25...** (1000)	**26...** (1000)	**68...** (2000)	**69...** (2000)	**65...** (2000)	**66...** (2000)	**183 223 273 333 393 473**
0.056 0.068 0.082 0.1	3.0 x 8.0 x 10.0	0.34	**21...** (1000)	**22...** (1000)	**25...** (1000)	**26...** (1000)	**68...** (1500)	**69...** (1500)	**65...** (1500)	**66...** (1500)	**563 683 823 104**
0.12 0.15 0.18 0.22	4.0 x 9.0 x 10.0	0.51	**21...** (1000)	**22...** (1000)	**25...** (1000)	**26...** (1000)	**68...** (1000)	**69...** (1000)	**65...** (1500)	**66...** (1500)	**124 154 184 224**
0.27 0.33 0.39 0.47	5.0 x 10.5 x 10.0	0.73	**21...** (1000)	**22...** (1000)	**25...** (1000)	**26...** (1000)	**68...** (1000)	**69...** (1000)	**65...** (1000)	**66...** (1000)	**274 334 394 474**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 371 XXYYY AND PACKAGING								
			LOOSE IN BOX				AMMOPACK		REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 26.0 ± 2.0 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 7.62 + 0.30/- 0.40 mm; d_t = 0.50 ± 0.05 mm											
0.082 0.01 0.012 0.015	2.5 x 6.5 x 10.0	0.24	**41...** (1000)	**42...** (1000)	**45...** (1000)	**46...** (1000)	**78...** (2000)	**79...** (2000)	**75...** (2000)	**76...** (2000)	**822** **103** **123** **153**
0.018 0.022 0.027 0.033 0.039 0.047	3.0 x 8.0 x 10.0	0.34	**41...** (1000)	**42...** (1000)	**45...** (1000)	**46...** (1000)	**78...** (1500)	**79...** (1500)	**75...** (1500)	**76...** (1500)	**183** **223** **273** **333** **393** **473**
0.056 0.068 0.082 0.1	4.0 x 9.0 x 10.0	0.51	**41...** (1000)	**42...** (1000)	**45...** (1000)	**46...** (1000)	**78...** (1000)	**79...** (1000)	**75...** (1500)	**76...** (1500)	**563** **683** **823** **104**
0.12	5.0 x 10.5 x 10.0	0.73	**41...** (1000)	**42...** (1000)	**45...** (1000)	**46...** (1000)	**78...** (1000)	**79...** (1000)	**75...** (1000)	**76...** (1000)	**124**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 371 XXYYY AND PACKAGING								
			LOOSE IN BOX				AMMOPACK		REEL		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		l_t = 26.0 ± 2.0 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 7.62 + 0.30/- 0.40 mm; d_t = 0.50 ± 0.05 mm											
0.0039 0.0047 0.0056 0.0068	2.5 x 6.5 x 10.0	0.24	**51...** (1000)	**52...** (1000)	**55...** (1000)	**56...** (1000)	**88...** (2000)	**89...** (2000)	**85...** (2000)	**86...** (2000)	**392** **472** **562** **682**
0.0082 0.01	3.0 x 8.0 x 10.0	0.34	**51...** (1000)	**52...** (1000)	**55...** (1000)	**56...** (1000)	**88...** (1500)	**89...** (1500)	**85...** (1500)	**86...** (1500)	**822** **103**
0.012 0.015	4.0 x 9.0 x 10.0	0.51	**51...** (1000)	**52...** (1000)	**55...** (1000)	**56...** (1000)	**88...** (1000)	**89...** (1000)	**85...** (1500)	**86...** (1500)	**123** **153**
0.018 0.022 0.027 0.033 0.039	5.0 x 10.5 x 10.0	0.73	**51...** (1000)	**52...** (1000)	**55...** (1000)	**56...** (1000)	**88...** (1000)	**89...** (1000)	**85...** (1000)	**86...** (1000)	**183** **223** **273** **333** **393**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

COMPOSITION OF CATALOG NUMBER: 372

TYPE AND PITCHES	
372	10.00 mm

CAPACITANCE (numerically)

MULTIPLIER (nF)	
0.1	2
1	3
10	4

Example:
104 = 10 x 10 = 100 nF

BFC2	372	XX	YY	Y
2222 (*)	372	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	100 V	250 V	400 V	630 V
372	Loose in box	Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	21	41	51	61
			± 5 %	22	42	52	62
	Taped on reel (1)	H (1) = 18.5 mm P_0 = 12.7 mm	± 10 %	25	45	55	65
			± 5 %	26	46	56	66
	Ammopack (1)	H (1) = 18.5 mm P_0 = 12.7 mm	± 10 %	28	48	58	68
			± 5 %	29	49	59	69

Note
(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
C ≤ 0.1 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 250 x 10^{-4}	
0.1 µF < C ≤ 0.68 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 250 x 10^{-4}	
Rated voltage pulse slope $(dU/dt)_R$ at	100 Vdc	250 Vdc	400 Vdc	630 Vdc
	34 V/µs	50 V/µs	80 V/µs	120 V/µs
R between leads, for C ≤ 0.33 µF at 10 V; 1 min	> 15 000 MΩ			
at 100 V; 1 min		> 15 000 MΩ	> 30 000 MΩ	> 30 000 MΩ
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s			
R between interconnecting leads and case (foil method)	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	160 V; 1 min	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	500 V; 1 min	800 V; 1 min	1260 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 100 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 372 XXYYY AND PACKAGING						
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.1 0.12 0.15 0.18 0.22 0.27 0.33	4.0 x 10.0 x 12.5	0.65	21... (1000)	22... (1000)	25... (1400)	26... (1400)	28... (750)	29... (750)	104 124 154 184 224 274 334
0.39 0.47	5.0 x 11.0 x 12.5	0.87	21... (1000)	22... (1000)	25... (1100)	26... (1100)	28... (600)	29... (600)	394 474
0.56 0.68	6.0 x 12.0 x 12.5	1.15	21... (750)	22... (750)	25... (900)	26... (900)	28... (500)	29... (500)	564 684

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 372 XXYYY AND PACKAGING						
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.047 0.056 0.068 0.082 0.1	4.0 x 10.0 x 12.5	0.65	41... (1000)	42... (1000)	45... (1400)	46... (1400)	48... (750)	49... (750)	473 563 683 823 104
0.12 0.15	5.0 x 11.0 x 12.5	0.87	41... (1000)	42... (1000)	45... (1100)	46... (1100)	48... (600)	49... (600)	124 154
0.18 0.22	6.0 x 12.0 x 12.5	1.15	41... (750)	42... (750)	45... (900)	46... (900)	48... (500)	49... (500)	184 224

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 372 XXYYY AND PACKAGING						
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.0047 0.0056 0.0068 0.0082 0.01 0.012 0.015 0.018 0.022 0.027 0.033	4.0 x 10.0 x 12.5	0.65	**51...** (1000)	**52...** (1000)	**55...** (1400)	**56...** (1400)	**58...** (750)	**59...** (750)	**472 562 682 822 103 123 153 183 223 273 333**
0.039 0.047 0.056	5.0 x 11.0 x 12.5	0.87	**51...** (1000)	**52...** (1000)	**55...** (1100)	**56...** (1100)	**58...** (600)	**59...** (600)	**393 473 563**
0.068 0.082	6.0 x 12.0 x 12.5	1.15	**51...** (750)	**52...** (750)	**55...** (900)	**56...** (900)	**58...** (500)	**59...** (500)	**683 823**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 250 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 372 XXYYY AND PACKAGING						
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01 0.012 0.015 0.018 0.022	4.0 x 10.0 x 12.5	0.65	**61...** (1000)	**62...** (1000)	**65...** (1400)	**66...** (1400)	**68...** (750)	**69...** (750)	**103 123 153 183 223**
0.027 0.033	5.0 x 11.0 x 12.5	0.87	**61...** (1000)	**62...** (1000)	**65...** (1100)	**66...** (1100)	**68...** (600)	**69...** (600)	**273 333**
0.039 0.047	6.0 x 12.0 x 12.5	1.15	**61...** (750)	**62...** (750)	**65...** (900)	**66...** (900)	**68...** (500)	**69...** (500)	**393 473**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

COMPOSITION OF CATALOG NUMBER: 373

TYPE AND PITCHES	
373	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	373	XX	YY	Y
2222 (*)	373	XX	YY	Y

(*) Old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	100 V	250 V	400 V	630 V
373 compact	Loose in box	Lead length 5.0 ± 1.0 mm	± 10 %	23	43	53	63
			± 5 %	24	44	54	64
	Taped on reel (1)	H (1) = 18.5 mm P_0 = 12.7 mm Reel diameter = 356 mm	± 10 %	27	47	57	67
			± 5 %	28	48	58	68
373 standard	Loose in box	Lead length 5.0 ± 1.0 mm	± 10 %	21	41	51	-
			± 5 %	22	42	52	
	Taped on reel (1)	H (1) = 18.5 mm P_0 = 12.7 mm Reel diameter = 356 mm	± 10 %	25	45	55	
			± 5 %	26	46	56	

Note

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
C ≤ 0.1 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 250 x 10^{-4}
0.1 µF < C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	≤ 300 x 10^{-4}
0.47 µF < C ≤ 1.0 µF	≤ 75 x 10^{-4}	≤ 130 x 10^{-4}	-
1.0 µF < C ≤ 10 µF	≤ 75 x 10^{-4}	≤ 150 x 10^{-4}	-
C > 10 µF	≤ 75 x 10^{-4}	-	-

DESCRIPTION	VALUE			
Rated voltage pulse slope $(dU/dt)_R$ at	63 Vdc	100 Vdc	250 Vdc	400 Vdc
P = 15 mm	14 V/µs	16 V/µs	34 V/µs	90 V/µs
P = 22.5 mm	5 V/µs	7 V/µs	14 V/µs	35 V/µs
P = 27.5 mm	4 V/µs	6 V/µs	12 V/µs	30 V/µs
R between leads, for C ≤ 0.33 µF				
at 100 V; 1 min	> 15 000 MΩ	> 15 000 MΩ	> 30 000 MΩ	
at 500 V; 1 min				> 30 000 MΩ
RC between leads, for C > 0.33 µF				
at 100 V; 1 min	> 5000 s	> 10 000 s	> 10 000 s	
at 500 V; 1 min				> 10 000 s
R between interconnecting leads and case (foil method)	> 30 000 MΩ			
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	160 V; 1 min	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case	200 V; 1 min	500 V; 1 min	800 V; 1 min	1260 V; 1 min
Maximum application temperature	105 °C			

U_{Rdc} = 100 V; U_{Rac} = 63 V (compact size)

<table>
<tr><th rowspan="4">C
(µF)</th><th rowspan="4">DIMENSIONS
w x h x l
(mm)</th><th rowspan="4">MASS
(g) (1)</th><th colspan="5">CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING</th></tr>
<tr><th colspan="2">LOOSE IN BOX</th><th colspan="2">REEL</th><th rowspan="3">C-VALUE</th></tr>
<tr><th colspan="2">l_t = 5.0 ± 1.0 mm</th><th colspan="2">H = 18.5 mm;
P_0 = 12.7 mm</th></tr>
<tr><th>C-tol. =
± 10 %</th><th>C-tol. =
± 5 %</th><th>C-tol. =
± 10 %</th><th>C-tol. =
± 5 %</th></tr>
<tr><th></th><th></th><th></th><th>XX
(SPQ)</th><th>XX
(SPQ)</th><th>XX
(SPQ)</th><th>XX
(SPQ)</th><th>..YYY</th></tr>
<tr><td colspan="8">Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm</td></tr>
<tr><td>0.33
0.39
0.47
0.56
0.68
0.82
1
1.2
1.5
1.8</td><td>5.0 x 11.0 x 17.5</td><td>1.1</td><td>23...
(1000)</td><td>24...
(1000)</td><td>27...
(1100)</td><td>28...
(1100)</td><td>334
394
474
564
684
824
105
125
155
185</td></tr>
<tr><td>2.2</td><td>6.0 x 12.0 x 17.5</td><td>1.5</td><td>23...
(1000)</td><td>24...
(1000)</td><td>27...
(900)</td><td>28...
(900)</td><td>225</td></tr>
<tr><td colspan="8">Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm</td></tr>
<tr><td>2.7
3.3</td><td>7.0 x 13.5 x 17.5</td><td>2.0</td><td>23...
(1000)</td><td>24...
(1000)</td><td>27...
(800)</td><td>28...
(800)</td><td>275
335</td></tr>
<tr><td>3.9
4.7</td><td>8.5 x 15.0 x 17.5</td><td>2.7</td><td>23...
(1000)</td><td>24...
(1000)</td><td>27...
(650)</td><td>28...
(650)</td><td>395
475</td></tr>
</table>

Notes
(1) Net weight for short lead product only
- SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V (compact size)

<table>
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(µF)</th><th rowspan="4">DIMENSIONS
w x h x l
(mm)</th><th rowspan="4">MASS
(g) (1)</th><th colspan="5">CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING</th></tr>
<tr><th colspan="2">LOOSE IN BOX</th><th colspan="2">REEL</th><th rowspan="3">C-VALUE</th></tr>
<tr><th colspan="2">l_t = 5.0 ± 1.0 mm</th><th colspan="2">H = 18.5 mm;
P_0 = 12.7 mm</th></tr>
<tr><th>C-tol. =
± 10 %</th><th>C-tol. =
± 5 %</th><th>C-tol. =
± 10 %</th><th>C-tol. =
± 5 %</th></tr>
<tr><th></th><th></th><th></th><th>XX
(SPQ)</th><th>XX
(SPQ)</th><th>XX
(SPQ)</th><th>XX
(SPQ)</th><th>..YYY</th></tr>
<tr><td colspan="8">Pitch = 15.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm</td></tr>
<tr><td>0.15
0.18
0.22
0.27
0.32</td><td>5.0 x 11.0 x 17.5</td><td>1.1</td><td>43...
(1000)</td><td>44...
(1000)</td><td>47...
(1100)</td><td>48...
(1100)</td><td>154
184
224
274
334</td></tr>
<tr><td>0.39
0.47</td><td>6.0 x 12.0 x 17.5</td><td>1.5</td><td>43...
(1000)</td><td>44...
(1000)</td><td>47...
(900)</td><td>48...
(900)</td><td>394
474</td></tr>
<tr><td colspan="8">Pitch = 15.0 ± 0.40 mm; d_t = 0.80 ± 0.08 mm</td></tr>
<tr><td>0.56
0.68</td><td>7.0 x 13.5 x 17.5</td><td>2.0</td><td>43...
(1000)</td><td>44...
(1000)</td><td>47...
(800)</td><td>48...
(800)</td><td>564
684</td></tr>
<tr><td>0.82
1</td><td>8.5 x 15.0 x 17.5</td><td>2.7</td><td>43...
(1000)</td><td>44...
(1000)</td><td>47...
(650)</td><td>48...
(650)</td><td>824
105</td></tr>
<tr><td>1.2</td><td>10.0 x 16.5 x 17.5</td><td>3.5</td><td>43...
(500)</td><td>44...
(500)</td><td>47...
(600)</td><td>48...
(600)</td><td>125</td></tr>
<tr><td colspan="8">Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm</td></tr>
<tr><td>1.5
1.8</td><td>8.5 x 18.0 x 26.0</td><td>4.5</td><td>43...
(200)</td><td>44...
(200)</td><td>47...
(450)</td><td>48...
(450)</td><td>155
185</td></tr>
<tr><td>2.2
2.7</td><td>10.0 x 19.5 x 26.0</td><td>5.7</td><td>43...
(200)</td><td>44...
(200)</td><td>47...
(350)</td><td>48...
(350)</td><td>225
275</td></tr>
<tr><td colspan="8">Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm</td></tr>
<tr><td>3.3</td><td>11.0 x 21.0 x 31.0</td><td>8.2</td><td>43...
(100)</td><td>44...
(100)</td><td>-</td><td>-</td><td>335</td></tr>
<tr><td>3.9
4.7</td><td>13.0 x 23.0 x 31.0</td><td>10.2</td><td>43...
(100)</td><td>44...
(100)</td><td>-</td><td>-</td><td>395
475</td></tr>
</table>

Notes
(1) Net weight for short lead product only
- SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V (compact size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING				
			LOOSE IN BOX		REEL		C-VALUE
			l_t = 5.0 ± 1.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm							
0.047 0.056 0.068 0.082 0.1 0.12 0.15	5.0 x 11.0 x 17.5	1.1	**53...** (1000)	**54...** (1000)	**57...** (1100)	**58...** (1100)	**473 563 683 823 104 124 154**
0.18 0.22	6.0 x 12.0 x 17.5	1.5	**53...** (1000)	**54...** (1000)	**57...** (900)	**58...** (900)	**184 224**
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.27 0.33	7.0 x 13.5 x 17.5	2.0	**53...** (1000)	**54...** (1000)	**57...** (800)	**58...** (800)	**274 334**
0.39 0.47	8.5 x 15.0 x 17.5	2.7	**53...** (1000)	**54...** (1000)	**57...** (650)	**58...** (650)	**394 474**
0.56	10.0 x 16.5 x 17.5	3.5	**53...** (500)	**54...** (500)	**57...** (600)	**58...** (600)	**564**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.68 0.82	8.5 x 18.0 x 26.0	4.5	**53...** (200)	**54...** (200)	**57...** (450)	**58...** (450)	**684 824**
1 1.2	10.0 x 19.5 x 26.0	5.7	**53...** (200)	**54...** (200)	**57...** (350)	**58...** (350)	**105 125**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
1.5	11.0 x 21.0 x 31.0	8.2	**53...** (100)	**54...** (100)	-	-	**155**
1.8 2.2	13.0 x 23.0 x 31.0	10.2	**53...** (100)	**54...** (100)	-	-	**185 225**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 250 V (compact size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING				
			LOOSE IN BOX		REEL		C-VALUE
			l_t = 5.0 ± 1.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm							
0.047 0.056	5.0 x 11.0 x 17.5	1.1	**63...** (1000)	**64...** (1000)	**67...** (1100)	**68...** (1100)	**473** **563**
0.068 0.082	6.0 x 12.0 x 17.5	1.5	**63...** (1000)	**64...** (1000)	**67...** (900)	**68...** (900)	**683** **823**
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.1 0.12	7.0 x 13.5 x 17.5	2.0	**63...** (1000)	**64...** (1000)	**67...** (800)	**68...** (800)	**104** **124**
0.15 0.18	8.5 x 15.0 x 17.5	2.7	**63...** (1000)	**64...** (1000)	**67...** (650)	**68...** (650)	**154** **184**
0.22	10.0 x 16.5 x 17.5	3.5	**63...** (500)	**64...** (500)	**67...** (600)	**68...** (600)	**224**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.27 0.33	8.5 x 18.0 x 26.0	4.5	**63...** (200)	**64...** (200)	**67...** (450)	**68...** (450)	**274** **334**
0.39 0.47	10.0 x 19.5 x 26.0	5.7	**63...** (200)	**64...** (200)	**67...** (350)	**68...** (350)	**394** **474**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.56	11.0 x 21.0 x 31.0	8.2	**63...** (100)	**64...** (100)	-	-	**564**
0.68 0.82	13.0 x 23.0 x 31.0	10.2	**63...** (100)	**64...** (100)			**684** **824**
1	15.0 x 25.0 x 31.0	13.4	**63...** (100)	**64...** (100)			**105**

Notes

(1) Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 100 V; U_{Rac} = 63 V (standard size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING				
			LOOSE IN BOX		REEL		C-VALUE
			l_t = 5.0 ± 1.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**XX** (SPQ)	**..YYY**
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm							
0.33 0.39 0.47 0.56 0.68	5.0 x 11.0 x 17.5	1.1	**21...** (1000)	**22...** (1000)	**25...** (1100)	**26...** (1100)	**334** **394** **474** **565** **684**
0.82 1	6.0 x 12.0 x 17.5	1.5	**21...** (1000)	**22...** (1000)	**25...** (900)	**26...** (900)	**824** **105**
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
1.2 1.5	7.0 x 13.5 x 17.5	2.0	**21...** (1000)	**22...** (1000)	**25...** (800)	**26...** (800)	**125** **155**
1.8 2.2	8.5 x 15.0 x 17.5	2.7	**21...** (1000)	**22...** (1000)	**25...** (650)	**26...** (650)	**185** **225**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
2.7 3.3	8.5 x 18.0 x 26.0	4.5	**21...** (200)	**22...** (200)	**25...** (450)	**26...** (450)	**275** **335**
3.9 4.7	10.0 x 19.5 x 26.0	5.7	**21...** (200)	**22...** (200)	**25...** (350)	**26...** (350)	**395** **475**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
5.6 6.8	11.0 x 21.0 x 31.0	8.2	**21...** (100)	**22...** (100)	-	-	**565** **685**
8.2 10	13.0 x 23.0 x 31.0	10.2	**21...** (100)	**22...** (100)			**825** **106**
12 15	15.0 x 25.0 x 31.0	18.4	**21...** (100)	**22...** (100)			**126** **156**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

Available on request

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING					
			LOOSE IN BOX			REEL		
			l_t = 5.0 ± 1.0 mm			H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	SPQ	C-tol. = ± 10 %	C-tol. = ± 5 %	SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm								
1.5	6.0 x 15.5 x 26.0	2.7	90012	90013	300	90018	90019	600
1.8 2.2	7.0 x 16.5 x 26.0	3.3	90022 90002	90023 90003	200	90028 90008	90029 90009	550
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm								
4.7	9.0 x 19.0 x 31.0	6.1	90032	90033	100	-		

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 250 V; U_{Rac} = 160 V (standard size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING				
			LOOSE IN BOX		REEL		C-VALUE
			l_t = 5.0 ± 1.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm							
0.15 0.18 0.22	5.0 x 11.0 x 17.5	1.1	**41...** (1000)	**42...** (1000)	**45...** (1100)	**46...** (1100)	**154 184 224**
0.27 0.33 0.39 0.47	6.0 x 12.0 x 17.5	1.5	**41...** (1000)	**42...** (1000)	**45...** (900)	**46...** (900)	**274 334 394 474**
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.56 0.68	7.0 x 13.5 x 17.5	2.0	**41...** (1000)	**42...** (1000)	**45...** (800)	**46...** (800)	**564 684**
0.82 1	8.5 x 15.0 x 17.5	2.7	**41...** (1000)	**42...** (1000)	**45...** (650)	**46...** (650)	**824 105**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
1.2 1.5	8.5 x 18.0 x 26.0	4.5	**41...** (200)	**42...** (200)	**45...** (450)	**46...** (450)	**125 155**
1.8 2.2	10.0 x 19.5 x 26.0	5.7	**41...** (200)	**42...** (200)	**45...** (350)	**46...** (350)	**185 225**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
2.7 3.3	13.0 x 23.0 x 31.0	10.2	**41...** (100)	**42...** (100)	-	-	**275 335**
3.9 4.7	15.0 x 28.0 x 31.0	13.4	**41...** (100)	**42...** (100)			**395 475**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

Available on request

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING					
			LOOSE IN BOX			REEL		
			l_t = 5.0 ± 1.0 mm			H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	SPQ	C-tol. = ± 10 %	C-tol. = ± 5 %	SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm								
0.47 0.56 0.67	6.0 x 15.5 x 26.0	2.7	90042 90052 90062	90046 90053 90063	300	90048 90058 90068	90049 90059 90069	600
0.85 1	7.0 x 16.5 x 26.0	3.3	90072 90082	90073 90083	200	90078 90088	90079 90089	550
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm								
1.2 1.5	9.0 x 19.0 x 31.0	6.1	90172 90092	90173 90093	100	-		
1.8 2.2	9.0 x 21.0 x 31.0	8.2	90102 90112	90103 90113	100			

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 220 V (standard size)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING				
			LOOSE IN BOX		REEL		C-VALUE
			l_t = 5.0 ± 1.0 mm		H = 18.5 mm; P_0 = 12.7 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm							
0.047 0.056 0.068 0.082 0.1	5.0 x 11.0 x 17.5	1.1	**51...** (1000)	**52...** (1000)	**55...** (1100)	**56...** (1100)	**473** **563** **683** **823** **104**
0.12 0.15	6.0 x 12.0 x 17.5	1.5	**51...** (1000)	**52...** (1000)	**55...** (900)	**56...** (900)	**124** **154**
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.18 0.22	7.0 x 13.5 x 17.5	2.0	**51...** (1000)	**52...** (1000)	**55...** (800)	**56...** (800)	**184** **224**
0.27 0.33	8.5 x 15.0 x 17.5	2.7	**51...** (1000)	**52...** (1000)	**55...** (650)	**56...** (650)	**274** **334**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.39 0.47	8.5 x 18.0 x 26.0	4.5	**51...** (200)	**52...** (200)	**55...** (450)	**56...** (450)	**394** **474**
0.56 0.68	10.0 x 19.5 x 26.0	5.7	**51...** (200)	**52...** (200)	**55...** (350)	**56...** (350)	**564** **684**
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.82 1	13.0 x 23.0 x 31.0	10.2	**51...** (100)	**52...** (100)	-	-	**824** **105**
1.2 1.5	15.0 x 28.0 x 31.0	13.4	**51...** (100)	**52...** (100)			**125** **155**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

Available on request

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 373 XXYYY AND PACKAGING					
			LOOSE IN BOX			REEL		
			l_t = 5.0 ± 1.0 mm			H = 18.5 mm		
			C-tol. = ± 10 %	C-tol. = ± 5 %	SPQ	C-tol. = ± 10 %	C-tol. = ± 5 %	SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm								
0.22	6.0 x 15.5 x 26.0	2.7	90122	90123	300	90128	90129	600
0.27 0.33	7.0 x 16.5 x 26.0	3.3	90132 90142	90133 90143	200	90138 90148	90139 90149	550
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm								
0.68	9.0 x 19.0 x 31.0	6.1	90152	90153	100	-		

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog.

Specific Method of Mounting to Withstand Vibration and Shock

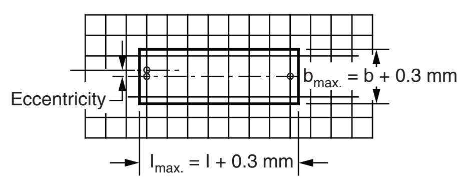
In order to withstand vibration and shock tests, it must be ensured that stand-off pips are in good contact with the printed-circuit board.

- For L ≤ 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: $h_{max.} \leq h + 0.3$ mm



Storage Temperature

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

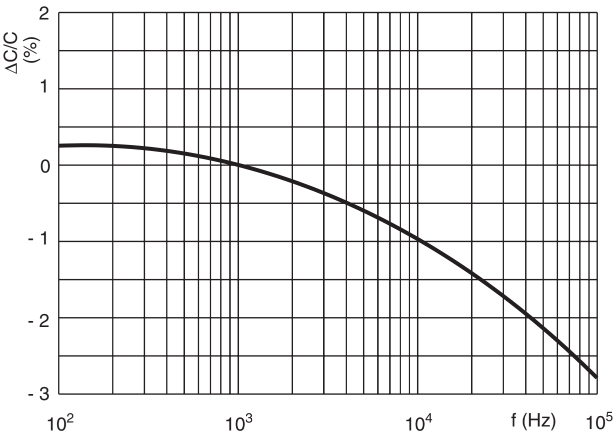
Ratings and Characteristics Reference Conditions

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

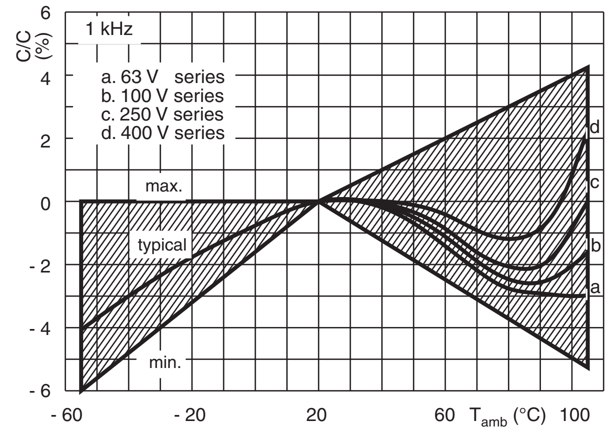
For reference testing, a conditioning period shall be applied over 96 ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

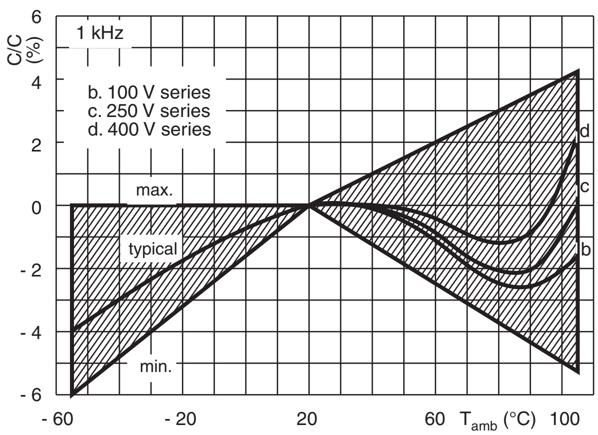
371, 372, 373 - Capacitance as a function of frequency



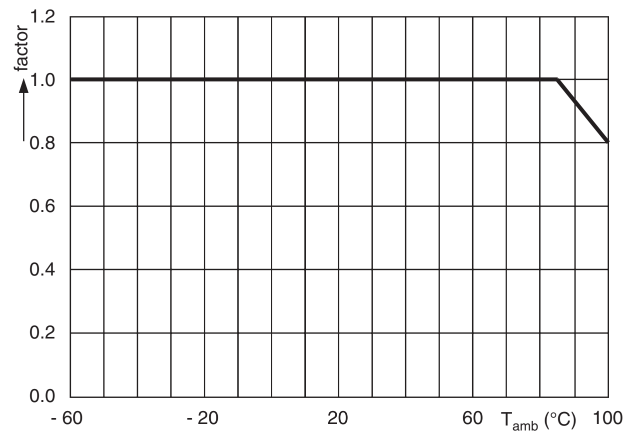
371 - Capacitance as a function of ambient temperature



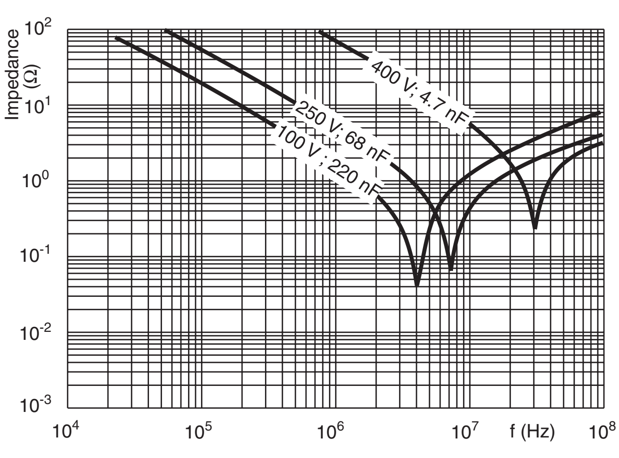
372, 373 - Capacitance as a function of ambient temperature



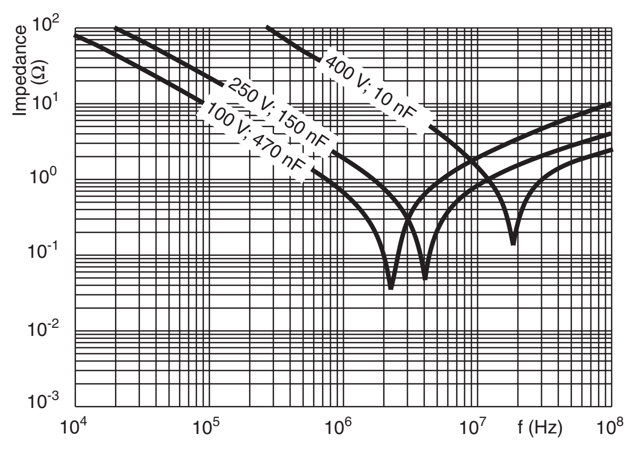
371, 372, 373 - Max. DC and AC Voltage as a function of temperature



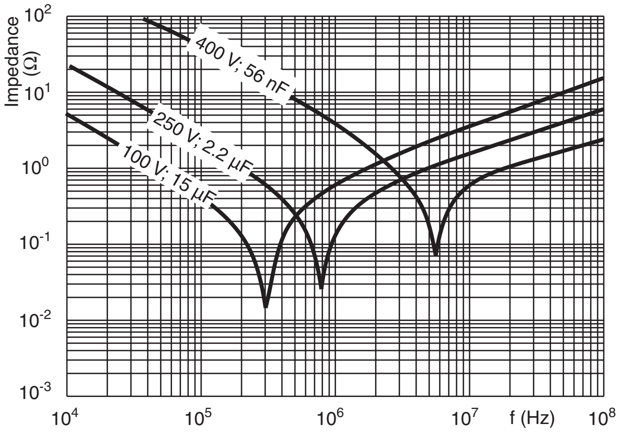
371 - Impedance as a function of frequency



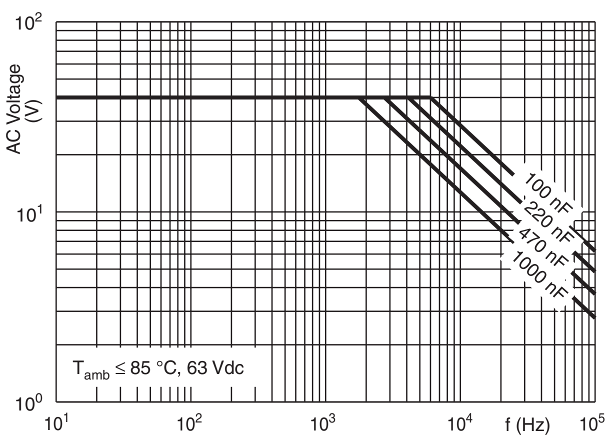
372 - Impedance as a function of frequency



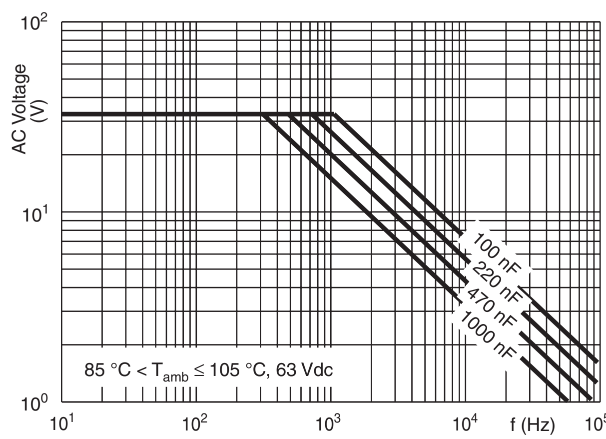
373 - Impedance as a function of frequency



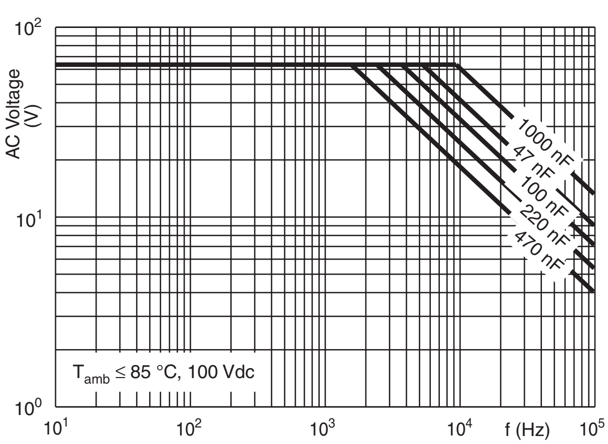
371 - Max. AC voltage as a function of temperature



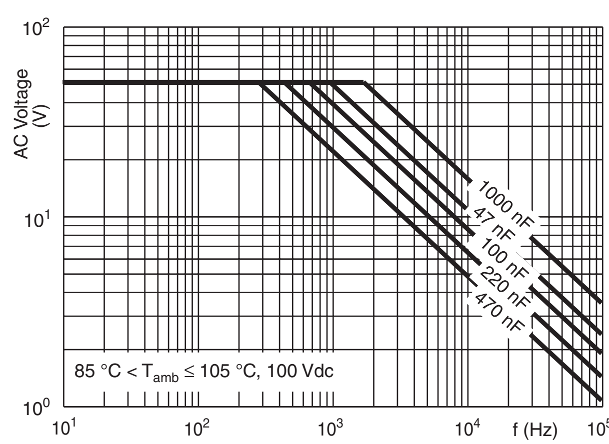
371 - Max. AC voltage as a function of frequency



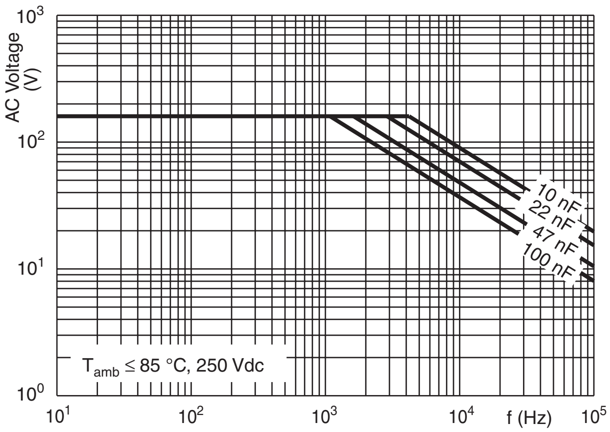
371 - Max. AC voltage as a function of frequency



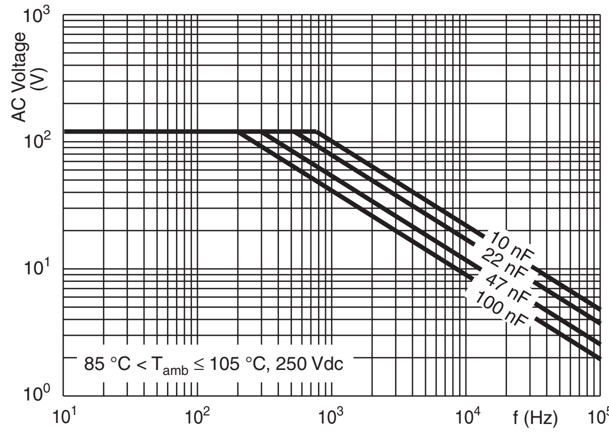
371 - Max. AC voltage as a function of frequency



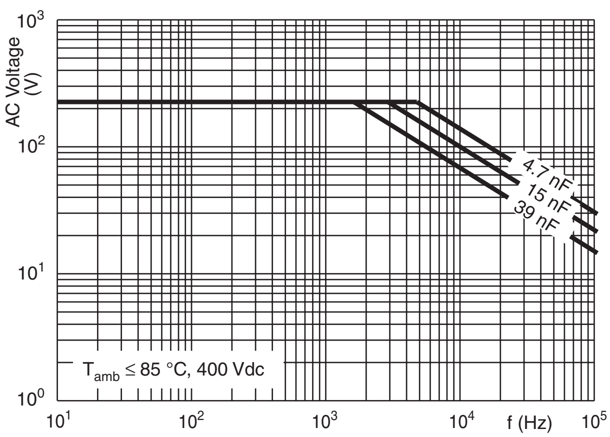
371 - Max. AC voltage as a function of frequency



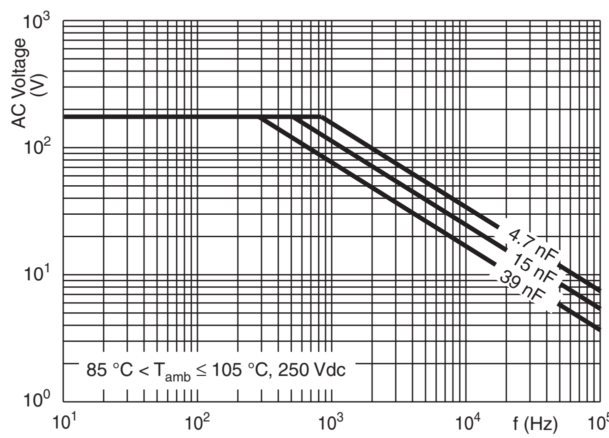
371 - Max. AC voltage as a function of frequency



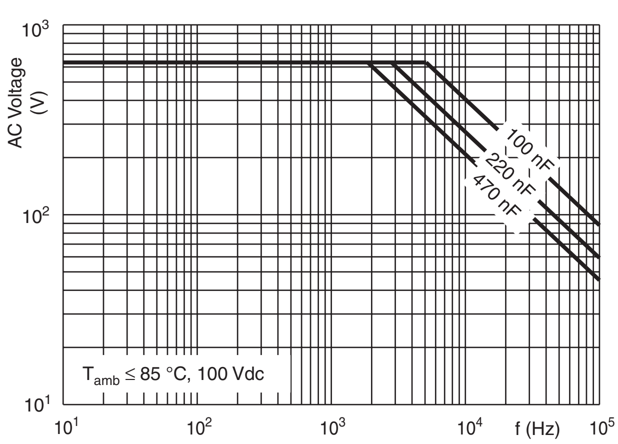
371 - Max. AC voltage as a function of frequency



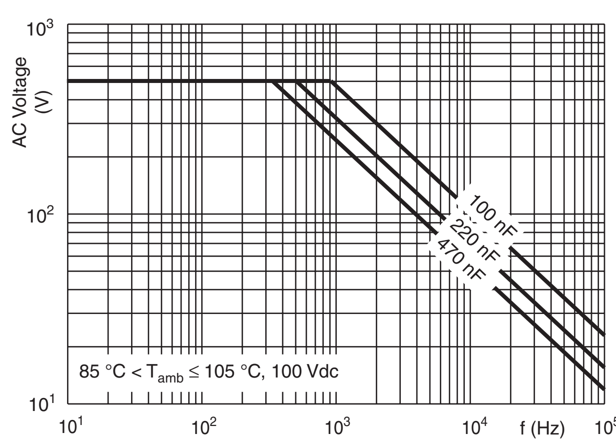
371 - Max. AC voltage as a function of frequency



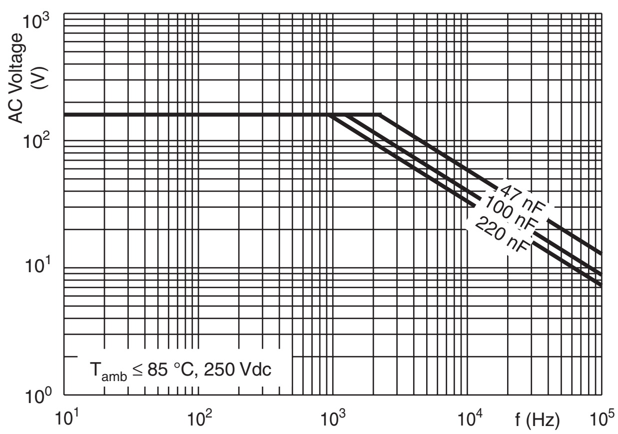
372 - Max. AC voltage as a function of temperature



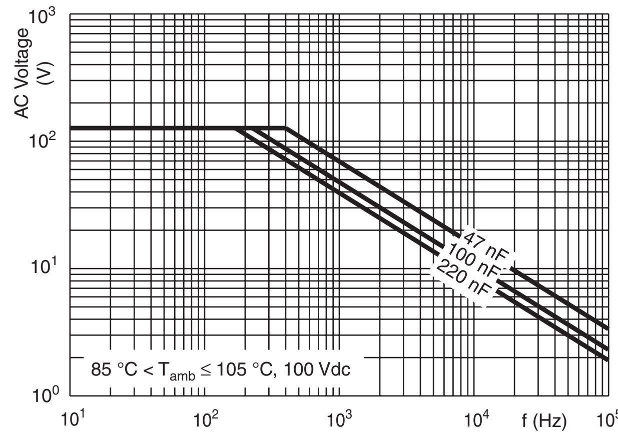
373 - Max. AC voltage as a function of temperature



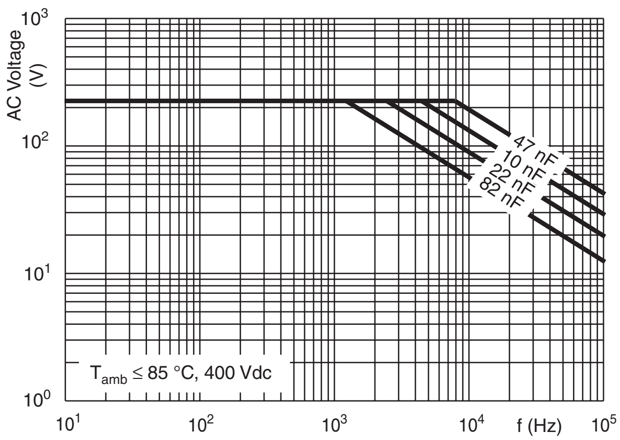
374 - Max. AC voltage as a function of frequency



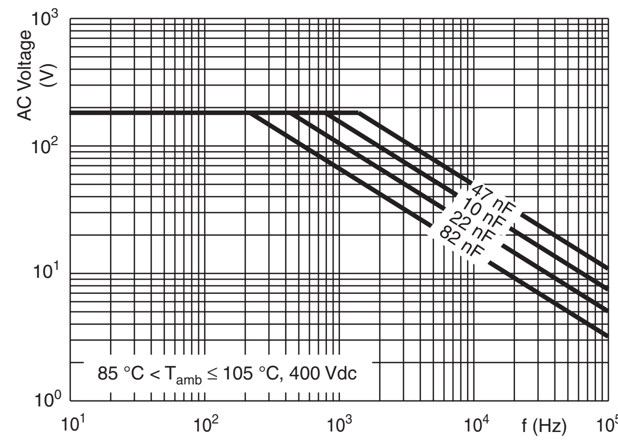
375 - Max. AC voltage as a function of frequency



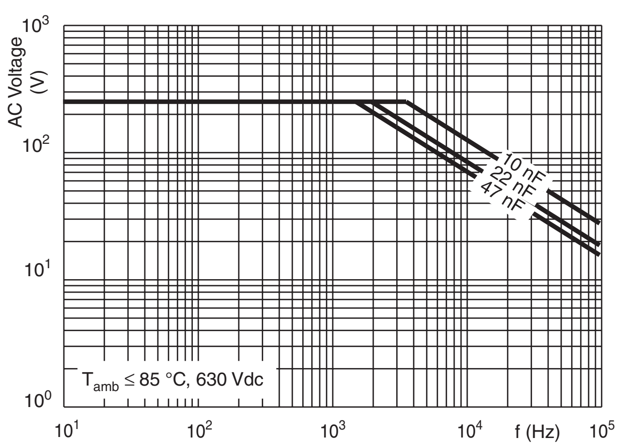
376 - Max. AC voltage as a function of frequency



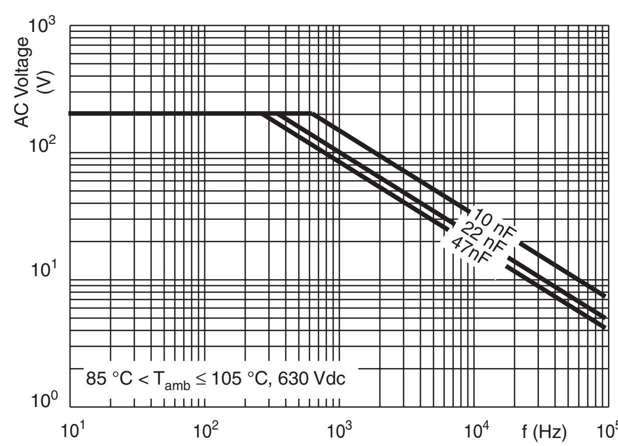
377 - Max. AC voltage as a function of frequency



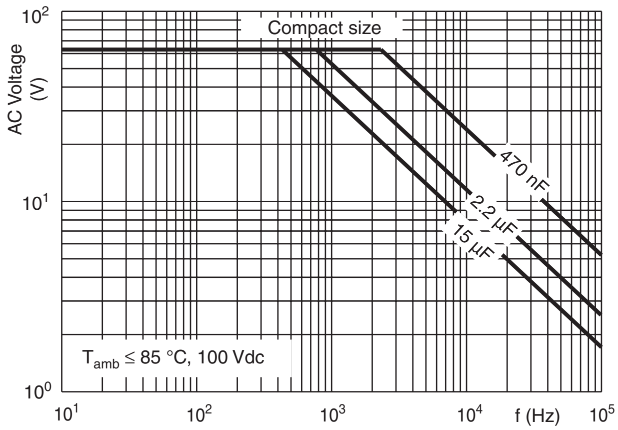
378 - Max. AC voltage as a function of frequency



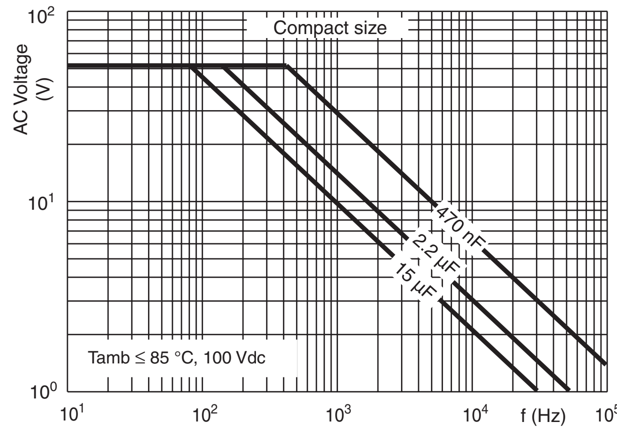
379 - Max. AC voltage as a function of frequency



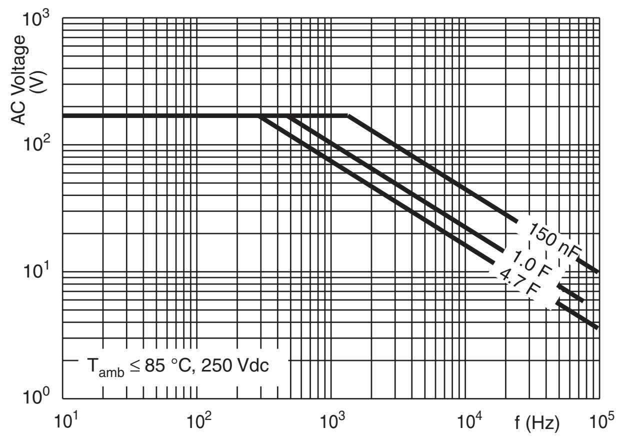
373 - Max. AC voltage as a function of temperature



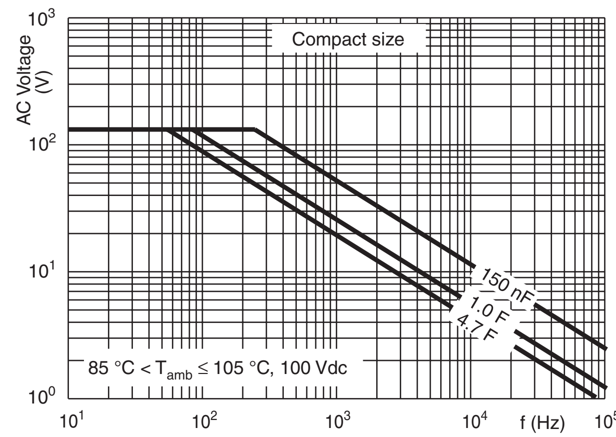
373 - Max. AC voltage as a function of frequency



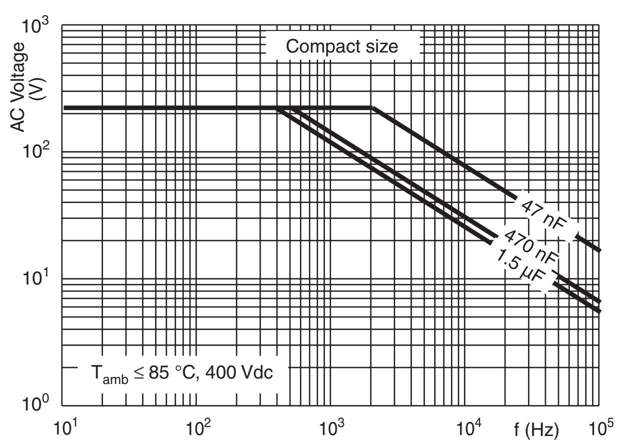
373 - Max. AC voltage as a function of frequency



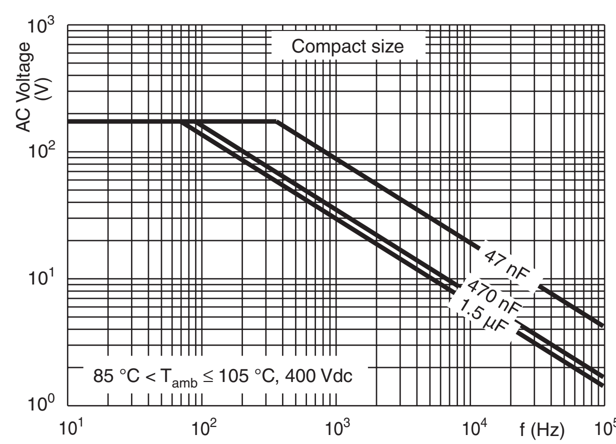
373 - Max. AC voltage as a function of frequency



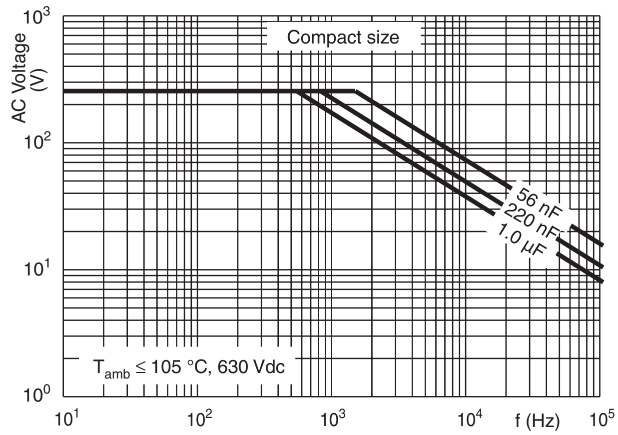
373 - Max. AC voltage as a function of frequency



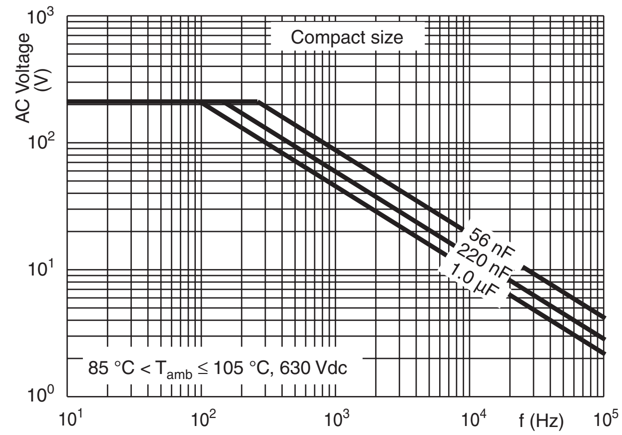
373 - Max. AC voltage as a function of frequency



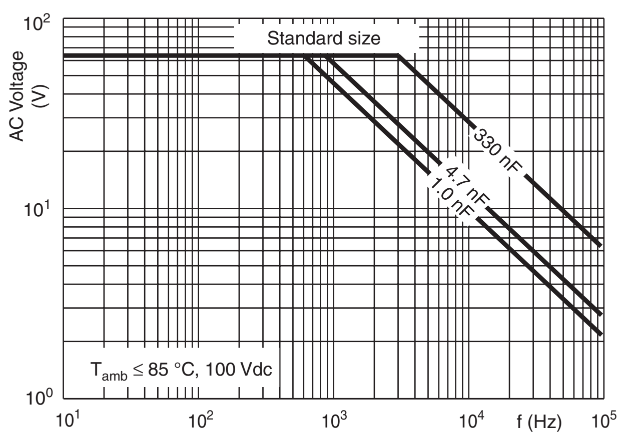
373 - Max. AC voltage as a function of frequency



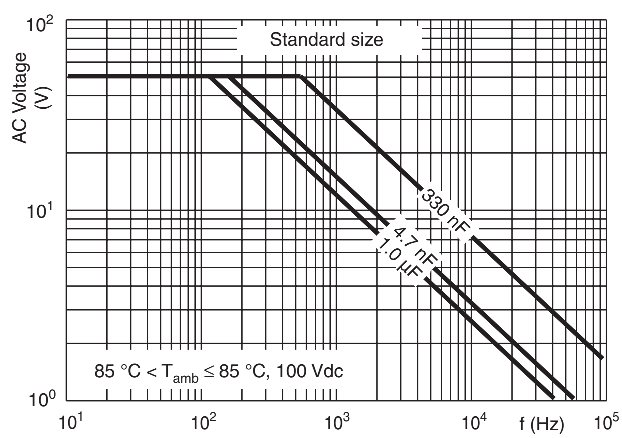
373 - Max. AC voltage as a function of frequency



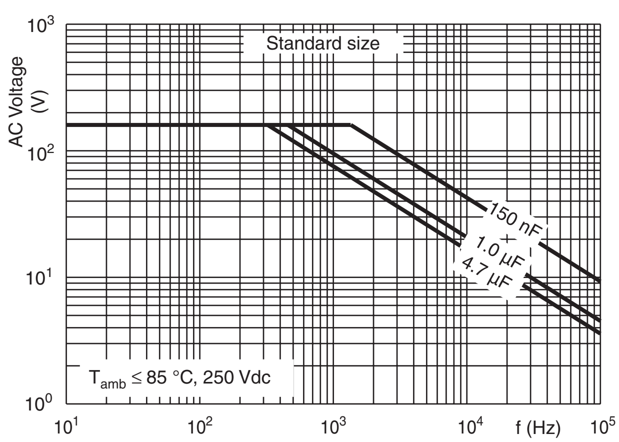
373 - Max. AC voltage as a function of frequency



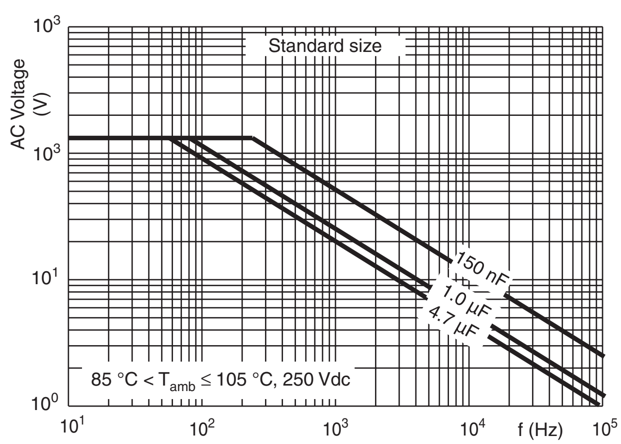
373 - Max. AC voltage as a function of frequency



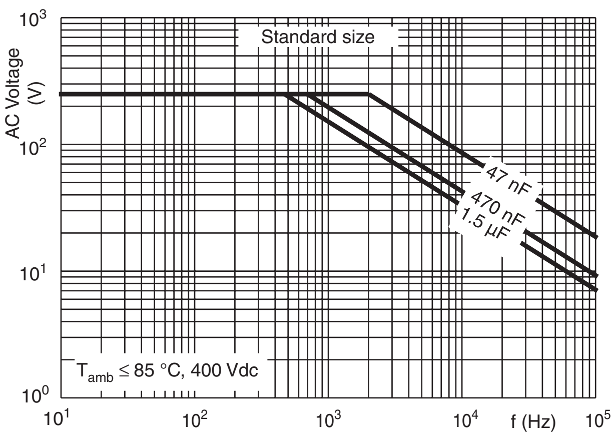
373 - Max. AC voltage as a function of frequency



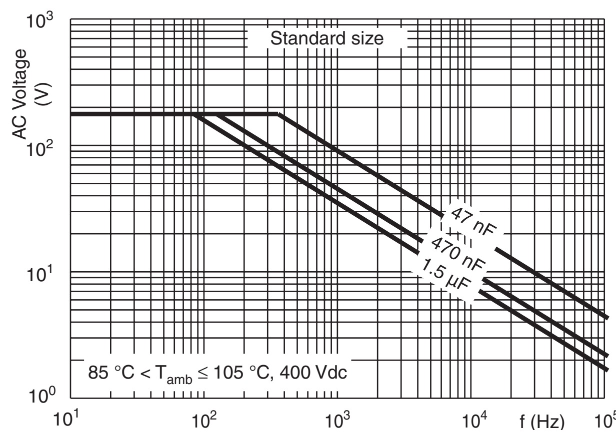
373 - Max. AC voltage as a function of frequency



373 - Max. AC voltage as a function of frequency



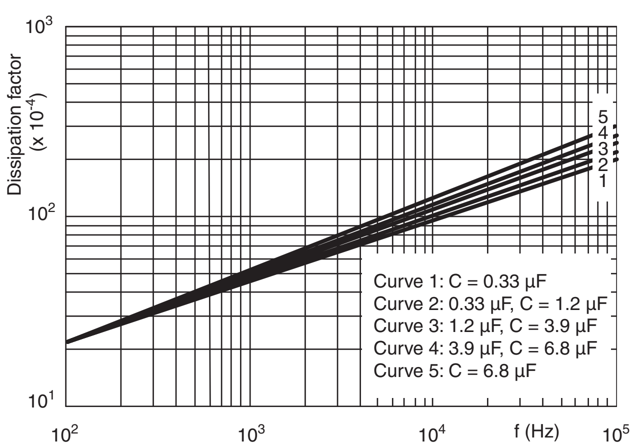
373 - Max. AC voltage as a function of frequency



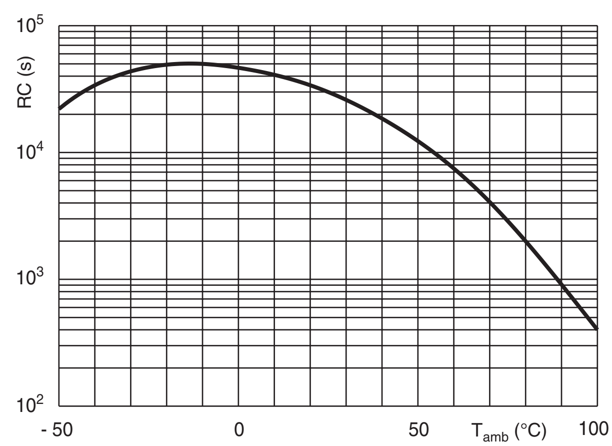
Maximum RMS current (sinewave) as a function of frequency

U_{ac} is the maximum AC voltage depending on the ambient temperature in the curves "Max. RMS voltage and AC current as a function of frequency".

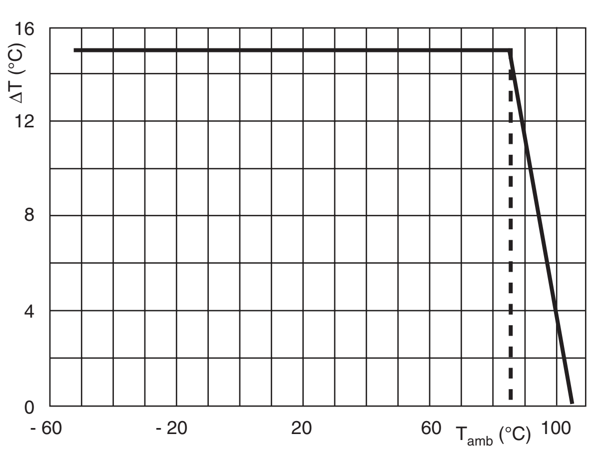
371, 372, 373 - Tangent of loss angle as a function of frequency



371, 372, 373 - Insulation resistance as a function of the ambient temperature (typical curve)



Maximum allowed component temperature rise (DT) as a funtion of the ambient temperature T_{amb} (°C)



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)				
	PITCH 7.62 mm	PITCH 10.0 mm	PITCH 15.0 mm	PITCH 22.5 mm	PITCH 27.5 mm
2.5	3	-	-	-	-
3.0	4	-	-	-	-
3.5	-	-	-	-	-
4.0	5	6.0	-	-	-
4.5	-	-	-	-	-
5.0	6	7.5	10	-	-
6.0	7	9.0	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 ambient temperature.

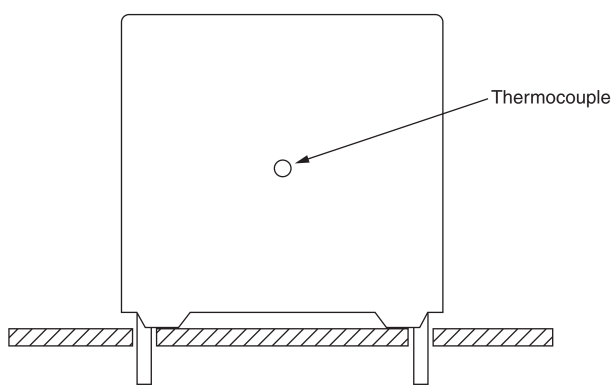
The power dissipation can be calculated according type detail specification “HQN-384-01/101: Technical Information Film Capacitors”.

The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- 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 $2\sqrt{2}$ x U_{Rac} to avoid the ionisation inception level
3. The voltage peak 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}	See “Max. AC voltage as function of temperature CBB952” per characteristics
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}

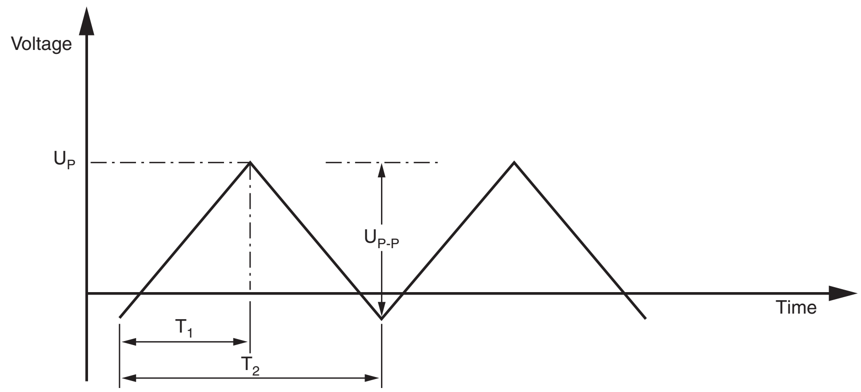
EXAMPLE

C = 330 nF - 63 V used for the voltage signal shown in next drawing.
U_{P-P} = 40 V; U_P = 35 V; T_1 = 100 µs; T_2 = 200 µs
The ambient temperature is 35 °C

Checking conditions:

1. The peak voltage U_P = 35 V is lower than 63 Vdc
2. The peak-to-peak voltage 40 V is lower than $2\sqrt{2}$ x 40 Vac = 113 U_{P-P}
3. The voltage pulse slope (dU/dt) = 40 V/100 µs = 0.4 V/µs
   This is lower than 60 V/µs (see specific reference data for each version)
4. The dissipated power is 16.2 mW as calculated with fourier terms
   The temperature rise for $W_{max.}$ = 3.5 mm and pitch = 5 mm will be 16.2 mW/3.0 mW/°C = 5.4 °C
   This is lower than 15 °C temperature rise at 35 °C, according figure max. allowed component temperature rise
5. Not applicable
6. Not applicable

Voltage Signal



INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

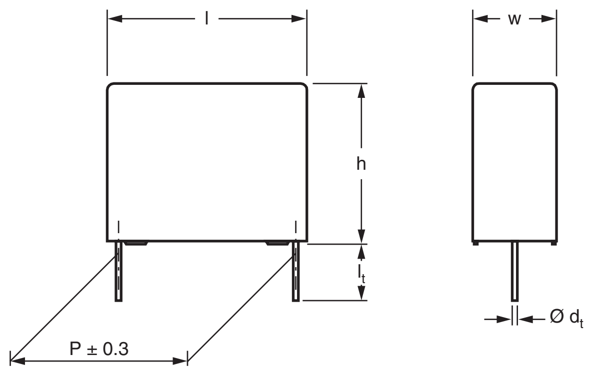
Group C Inspection Requirements

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 ≤ 470 nF at 100 kHz for 470 nF < C ≤ 10 µF at 10 kHz for C > 10 µF at 1 kHz	
4.3 Robustness of terminations	Tensile and bending	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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.3.1

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz for 470 nF < C ≤ 10 µF at 10 kHz for C > 10 µF at 1 kHz	No visible damage
4.6 Rapid change of temperature	θA = - 55 °C θB = + 105 °C 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2 Final inspection	Visual examination	No visible damage
4.9 Shock	Mounting: See section “Mounting” of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	|ΔC/C| ≤ 3 % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan δ ≤ 0.010 (370 and 371) ≤ 0.005 (372 and 373) for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 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	|ΔC/C| ≤ 3 % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ ≤ 0.010 (370 and 371) ≤ 0.005 (372 and 373) for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.005 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-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C2		
4.11 Damp heat steady state	56 days, 40 °C, 90 % to 95 % RH	
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	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.005$ Compared to values measured in 4.11.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB GROUP C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 0.8 x 1.25 U_{Rdc} at 105 °C	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz for 470 nF < C ≤ 10 µF at 10 kHz for C > 10 µF at 1 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 at 85 °C (370 and 371) ≤ 0.010 at 100 °C (370 and 371) ≤ 0.005 (372 and 373) for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.12.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 470 nF at 100 kHz for 470 nF < C ≤ 10 µF at 10 kHz for C > 10 µF at 1 kHz	
4.13.3 Final measurements	Capacitance	$\|\Delta C/C\| \leq 3$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 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

DC Film Capacitors
MKT Radial Potted Type



FEATURES

RoHS compliant
10 mm to 27.5 mm lead pitch
Supplied loose in box, taped on ammopack or reel

ENCAPSULATION

Flame retardant plastic case and epoxy resin (UL-class 94 V-0)

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/105/56

APPLICATIONS

Blocking, coupling, and decoupling, bypass and energy reservoir, industrial, consumer, lighting

REFERENCE STANDARDS

IEC 60384-2

MARKING

C-value; tolerance; rated voltage; manufacturer's symbol; year and week of manufacturer; manufacturer's type designation

DIELECTRIC

Polyester film

ELECTRODES

Metallized

CONSTRUCTION

Wound mono construction

RATED (DC) VOLTAGE

250 V, 400 V, 630 V

RATED (AC) VOLTAGE

63 V, 100 V, 160 V

CAPACITANCE RANGE (E12 SERIES)

0.01 µF to 10 µF

CAPACITANCE TOLERANCE

± 10 %, ± 5 %

LEADS

Tinned wire

RATED TEMPERATURE

85 °C

MAXIMUM APPLICATION TEMPERATURE

105 °C

PERFORMANCE GRADE

Grade 1 (long life)

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
373 M	10.0 mm
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

Example:
104 = 10 x 10 = 100 nF

MULTIPLIER (nF)	
1	3
10	4
100	5
1000	6

BFC2	373	XX	YY	Y	M	Z
2222 (*)	373	XX	YY	Y	M	Z

(*) Old ordering number

PITCH (mm)	CODE
10	D
15	F
22.5	I
27.5	K

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES			
			C-TOL.	250 V	400 V	630 V
373 M	Loose in box	Lead length 4.0 + 1.0/- 0.5 mm	± 10 %	EE	FE	GE
			± 5 %	EF	FF	GF
	Taped on reel (1)	H = 18.5 mm; P_0 = 12.7 mm; Reel diameter = 356 mm	± 10 %	EL	FL	GL
			± 5 %	EM	FM	GM
	Ammopack (1)	H = 18.5 mm; P_0 = 12.7 mm	± 10 %	EB	FB	GB
			± 5 %	EC	FC	GC

Note

(1) For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
C ≤ 0.47 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	≤ 225 x 10^{-4}
C > 0.47 µF	≤ 75 x 10^{-4}	≤ 120 x 10^{-4}	-
Rated voltage pulse slope $(dU/dt)_R$ at	250 Vdc	400 Vdc	630 Vdc
$L_{max.}$ = 12.5 mm	20 V/µs	45 V/µs	137 V/µs
$L_{max.}$ = 17.5 mm	11 V/µs	20 V/µs	44 V/µs
$L_{max.}$ = 26.0 mm	7 V/µs	10 V/µs	17 V/µs
$L_{max.}$ = 30.0 mm	5 V/µs	8 V/µs	12 V/µs
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 30 000 MΩ	> 30 000 MΩ	-
R between leads, for C ≤ 0.33 µF at 500 V; 1 min	-	-	> 30 000 MΩ
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 10 000 s	> 10 000 s	-
RC between leads, for C > 0.33 µF at 500 V; 1 min	-	-	> 10 000 s
R between interconnecting leads and casing, 100 V; 1 min	> 30 000 MΩ		
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s for	250 Vdc	400 Vdc	630 Vdc
	400 V; 1 min	640 V; 1 min	1008 V; 1 min
Withstanding (DC) voltage between leads and case for	250 Vdc	400 Vdc	630 Vdc
	500 V; 1 min	800 V; 1 min	1260 V; 1 min
Maximum application temperature	105 °C		

U_{Rdc} = 250 V; U_{Rac} = 63 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 373 XXYYYMZ AND PACKAGING							
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE	Pcm mm CODE MZ
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm			
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %		
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY	
Pitch = 10.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm										
0.1	4.0 x 10.0 x 12.5	0.65	EE... (1000)	EF... (1000)	EL... (1400)	EM... (1400)	EB... (750)	EC... (750)	104	MD
0.12									124	MD
0.15									154	MD
0.18									184	MD
0.22									224	MD
0.27									274	MD
0.33	5.0 x 11.0 x 12.5	0.87	EE... (1000)	EF... (1000)	EL... (1100)	EM... (1100)	EB... (600)	EC... (600)	334	MD
0.39									394	MD
0.47	6.0 x 12.0 x 12.5	1.15	EE... (750)	EF... (750)	EL... (900)	EM... (900)	EB... (500)	EC... (500)	474	MD
0.56									564	MD
Pitch = 15.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm										
0.56	5.0 x 11.0 x 17.5	1.1	EE... (1000)	EF... (1000)	EL... (1100)	EM... (1100)	Not available		564	MF
0.68	6.0 x 12.0 x 17.5	1.5	EE... (1000)	EF... (1000)	EL... (900)	EM... (900)			684	MF
0.82									824	MF
Pitch = 15.0 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
1.0	7.0 x 13.5 x 17.5	2.0	EE... (1000)	EF... (1000)	EL... (800)	EM... (800)	Not available		105	MF
1.2	8.5 x 15.0 x 17.5	2.7	EE... (1000)	EF... (1000)	EL... (650)	EM... (650)			125	MF
1.5									155	MF
1.8	10.0 x 16.5 x 17.5	3.5	EE... (500)	EF... (500)	EL... (600)	EM... (600)			185	MF
Pitch = 22.5 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
2.2	8.5 x 18.0 x 26.0	4.5	EE... (200)	EF... (200)	EL... (450)	EM... (450)	Not available		225	MI
2.7									275	MI
3.3									335	MI
3.9	10.0 x 19.5 x 26.0	5.7	EE... (200)	EF... (200)	EL... (350)	EM... (350)			395	MI
4.7									475	MI
5.6									565	MI
6.8	12.0 x 22.0 x 26.0	7.8	EE... (150)	EF... (150)	EL... (300)	EM... (300)			685	MI
8.2									825	MI
Pitch = 27.5 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
6.8	13.0 x 23.0 x 31.0	10.4	EE... (100)	EF... (100)	Not available		Not available		685	MK
8.2	15.0 x 25.0 x 31.0	12.8	EE... (100)	EF... (100)					825	MK
10.0									106	MK

Notes

[1] Net weight for short lead product only

- SPQ = Standard Packing Quantity

U_{Rdc} = 400 V; U_{Rac} = 100 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 373 XXYYYMZ AND PACKAGING							
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE	Pcm mm CODE MZ
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm			
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %		
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY	
Pitch = 10.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm										
0.082	4.0 x 10.0 x 12.5	0.65	**FE...** (1000)	**FF...** (1000)	**FL...** (1400)	**FM...** (1400)	**FB...** (750)	**FC...** (750)	**823**	**MD**
0.1									**104**	**MD**
0.12									**124**	**MD**
0.15									**154**	**MD**
0.18	5.0 x 11.0 x 12.5	0.87	**FE...** (1000)	**FF...** (1000)	**FL...** (1100)	**FM...** (1100)	**FB...** (600)	**FC...** (600)	**184**	**MD**
0.22									**224**	**MD**
0.27									**274**	**MD**
0.33	6.0 x 12.0 x 12.5	1.15	**FE...** (750)	**FF...** (750)	**FL...** (900)	**FM...** (900)	**FB...** (500)	**FC...** (500)	**334**	**MD**
Pitch = 15.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm										
0.27	5.0 x 11.0 x 17.5	1.1	**FE...** (1000)	**FF...** (1000)	**FL...** (1100)	**FM...** (1100)	Not available		**274**	**MF**
0.33									**334**	**MF**
0.39									**394**	**MF**
0.47	6.0 x 12.0 x 17.5	1.5	**FE...** (1000)	**FF...** (1000)	**FL...** (900)	**FM...** (900)			**474**	**MF**
0.56									**564**	**MF**
Pitch = 15.0 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
0.68	7.0 x 13.5 x 17.5	2.0	**FE...** (1000)	**FF...** (1000)	**FL...** (800)	**FM...** (800)	Not available		**684**	**MF**
0.82	8.5 x 15.0 x 17.5	2.7	**FE...** (1000)	**FF...** (1000)	**FL...** (650)	**FM...** (650)			**824**	**MF**
1.0									**105**	**MF**
1.2									**125**	**MF**
1.5	10.0 x 16.5 x 17.5	3.5	**FE...** (500)	**FF...** (500)	**FL...** (600)	**FM...** (600)			**155**	**MF**
Pitch = 22.5 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
1.0	7.0 x 16.5 x 26.0	3.3	**FE...** (200)	**FF...** (200)	**FL...** (450)	**FM...** (450)	Not available		**105**	**MI**
1.2									**125**	**MI**
1.5									**155**	**MI**
1.8	8.5 x 18.0 x 26.0	4.5	**FE...** (200)	**FF...** (200)	**FL...** (450)	**FM...** (450)			**185**	**MI**
2.2									**225**	**MI**
2.7	10.0 x 19.5 x 26.0	5.7	**FE...** (200)	**FF...** (200)	**FL...** (350)	**FM...** (350)			**275**	**MI**
3.3									**335**	**MI**
3.9	12.0 x 22.0 x 26.0	7.8	**FE...** (150)	**FF...** (150)	**FL...** (300)	**FM...** (300)			**395**	**MI**
Pitch = 27.5 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
2.7	9.0 x 19.0 x 31.0	5.5	**FE...** (100)	**FF...** (100)	Not available		Not available		**275**	**MK**
3.3	11.0 x 21.0 x 31.0	7.8	**FE...** (100)	**FF...** (100)					**335**	**MK**
3.9	13.0 x 23.0 x 31.0	10.4	**FE...** (100)	**FF...** (100)					**395**	**MK**

Notes

[1] Net weight for short lead product only

• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 160 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 373 XXYYYMZ AND PACKAGING							
			LOOSE IN BOX		REEL		AMMOPACK		C-VALUE	Pcm mm CODE MZ
			l_t = 4.0 + 1.0/- 0.5 mm		H = 18.5 mm; P_0 = 12.7 mm		H = 18.5 mm; P_0 = 12.7 mm			
			C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %	C-tol. = ± 10 %	C-tol. = ± 5 %		
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY	
Pitch = 10.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm										
0.01	4.0 x 10.0 x 12.5	0.65	GE... (1000)	GF... (1000)	GL... (1400)	GM... (1400)	GB... (750)	GC... (750)	103	MD
0.012									123	MD
0.015									153	MD
0.018									183	MD
0.022									223	MD
0.027									273	MD
0.033									333	MD
0.039									393	MD
0.047									473	MD
0.056									563	MD
0.068	5.0 x 11.0 x 12.5	0.87	GE... (1000)	GF... (1000)	GL... (1100)	GM... (1100)	GB... (600)	GC... (600)	683	MD
0.082									823	MD
0.100	6.0 x 12.0 x 12.5	1.15	GE... (750)	GF... (750)	GL... (900)	GM... (900)	GB... (500)	GC... (500)	104	MD
Pitch = 15.0 ± 0.40 mm; d_t = 0.60 ± 0.06 mm										
0.082	5.0 x 11.0 x 17.5	1.1	GE... (1000)	GF... (1000)	GL... (1100)	GM... (1100)	Not available		823	MF
0.100									104	MF
0.120									124	MF
0.150	6.0 x 12.0 x 17.5	1.5	GE... (1000)	GF... (1000)	GL... (900)	GM... (900)			154	MF
0.180									184	MF
Pitch = 15.0 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
0.22	7.0 x 13.5 x 17.5	2.0	GE... (1000)	GF... (1000)	GL... (800)	GM... (800)	Not available		224	MF
0.27	8.5 x 15.0 x 17.5	2.7	GE... (1000)	GF... (1000)	GL... (650)	GM... (650)			274	MF
0.33									334	MF
0.39									394	MF
0.47	10.0 x 16.5 x 17.5	3.5	GE... (500)	GF... (500)	GL... (600)	GM... (600)			474	MF
Pitch = 22.5 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
0.33	8.5 x 18.0 x 26.0	4.5	GE... (200)	GF... (200)	GL... (450)	GM... (450)	Not available		331	MI
0.39									394	MI
0.47									474	MI
0.56									564	MI
0.68									684	MI
0.82									824	MI
1.00	10.0 x 19.5 x 26.0	5.7	GE... (200)	GF... (200)	GL... (350)	GM... (350)			105	MI
1.20	12.0 x 22.0 x 26.0	7.8	GE... (150)	GF... (150)	GL... (300)	GM... (300)			125	MI
Pitch = 27.5 ± 0.40 mm; d_t = 0.80 ± 0.08 mm										
0.82	9.0 x 19.0 x 31.0	5.5	GE... (100)	GF... (100)	Not available		Not available		824	MK
1.00	11.0 x 21.0 x 31.0	7.8	GE... (100)	GF... (100)					105	MK
1.20									125	MK

Notes

[(1)] Net weight for short lead product only

• SPQ = Standard Packing Quantity

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 type detail information: www.vishay.com/doc?28139 or end of the catalog.

Specific Method of Mounting to Withstand Vibration and Shock

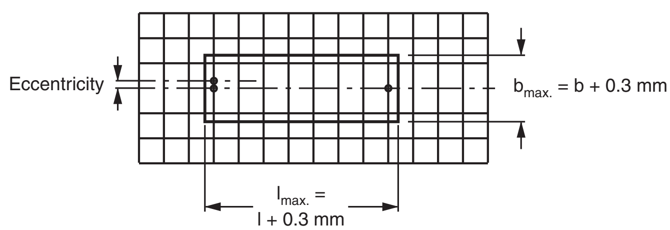
In order to withstand vibration and shock tests, it must be ensured that the underside of this product is in good contact with the printed-circuit board:

- 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 figure:

- Eccentricity as in figure. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.
- Product height with seating plane as given by "IEC 60717" as reference: $h_{max.} \leq h + 0.3$ mm or $h_{max.} \leq h' + 0.3$ mm



Storage Temperature

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

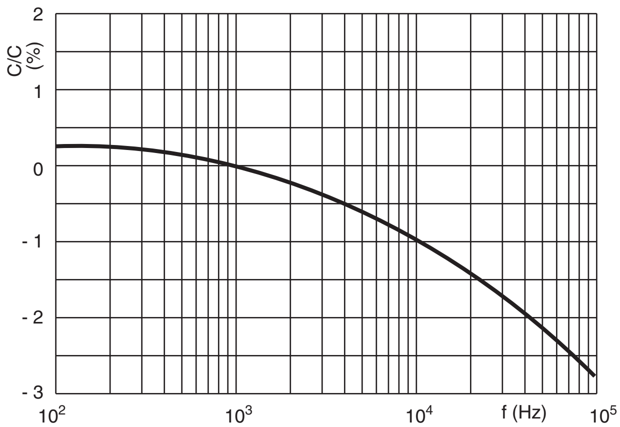
Ratings and Characteristics Reference Conditions

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

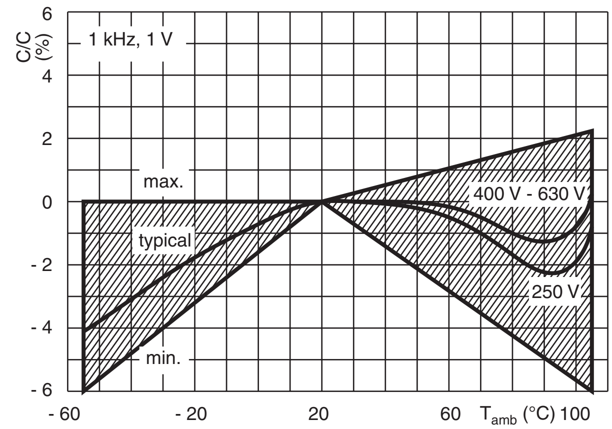
For reference testing, a conditioning period shall be applied over 96 ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

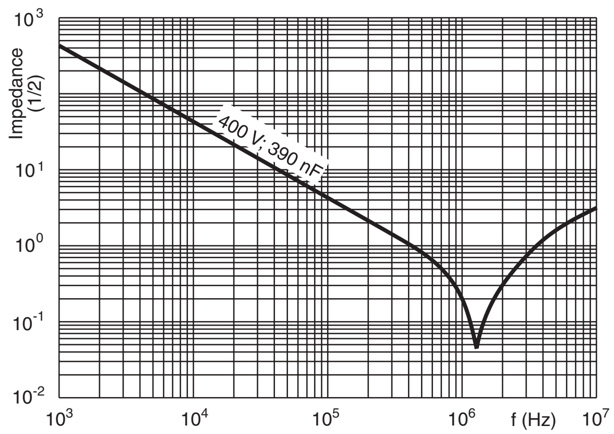
Capacitance as a function of frequency



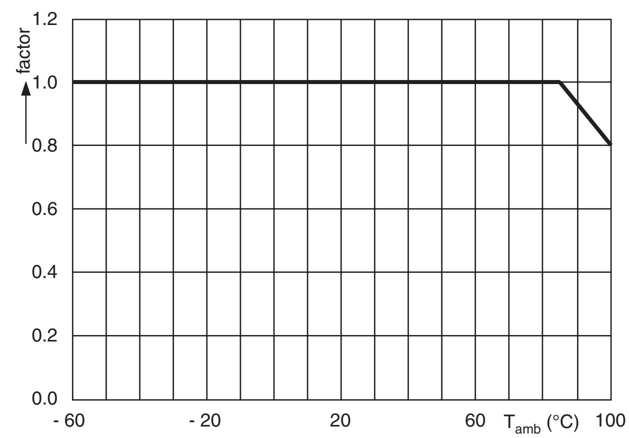
Capacitance as a function of ambient temperature



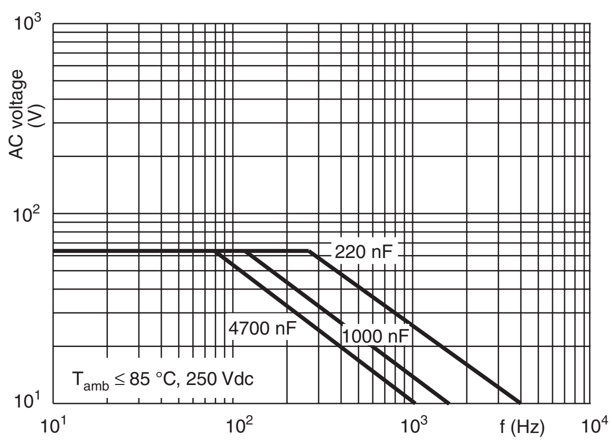
Impedance as a function of frequency



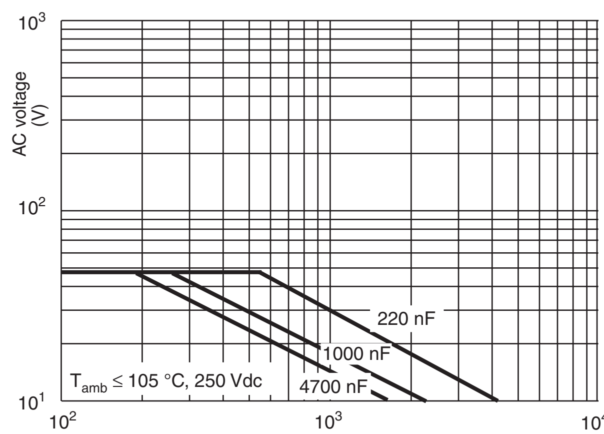
Max. DC and AC voltage as a function of temperature



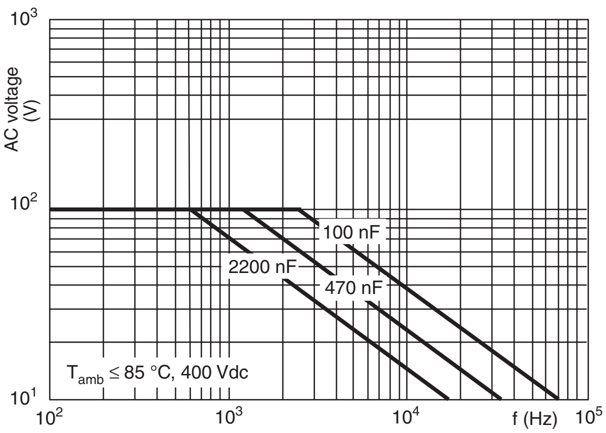
Max. RMS voltage and AC current (sinewave)



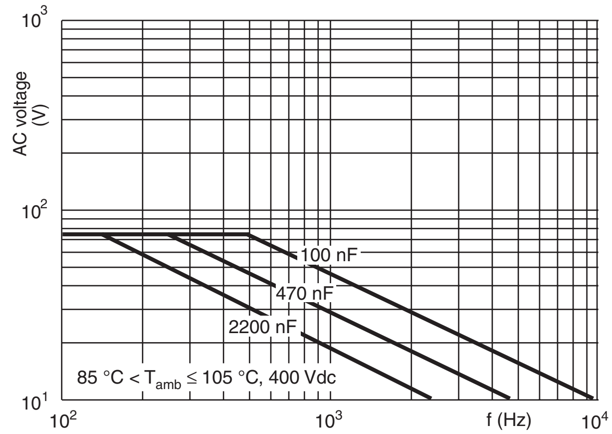
Max. RMS voltage and AC current (sinewave)



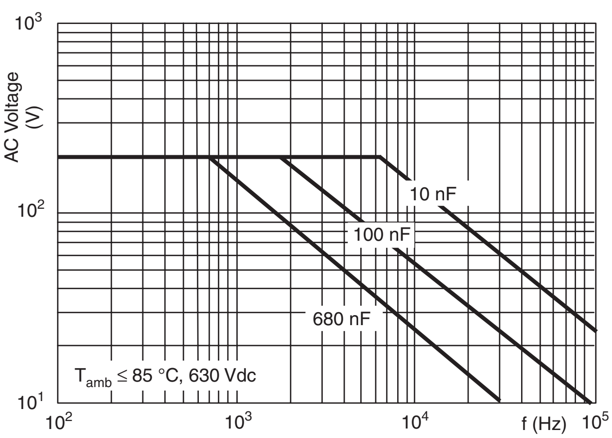
Max. RMS voltage and AC current (sinewave)



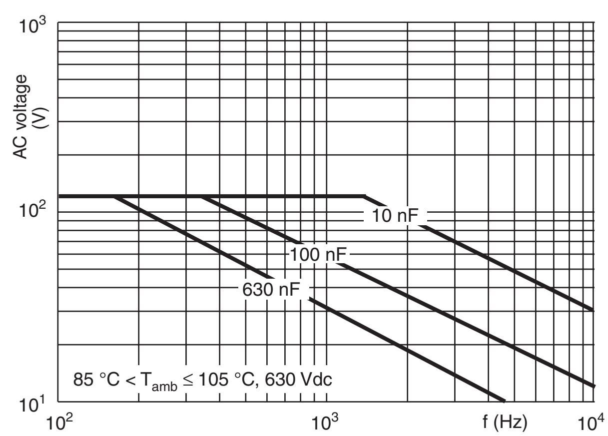
Max. RMS voltage and AC current (sinewave)



Max. RMS voltage and AC current (sinewave)



Max. RMS voltage and AC current (sinewave)

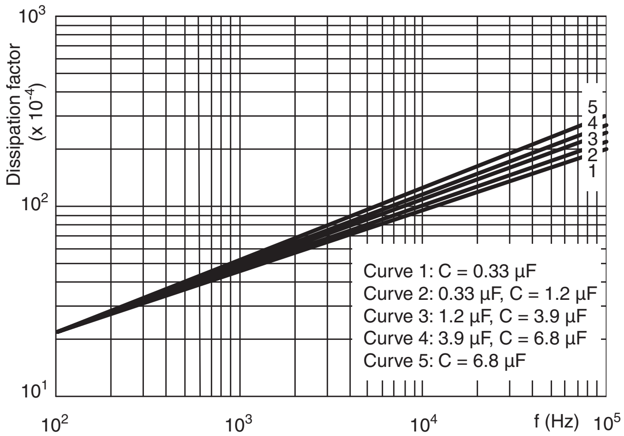


Maximum RMS current (sinewave) as a function of frequency

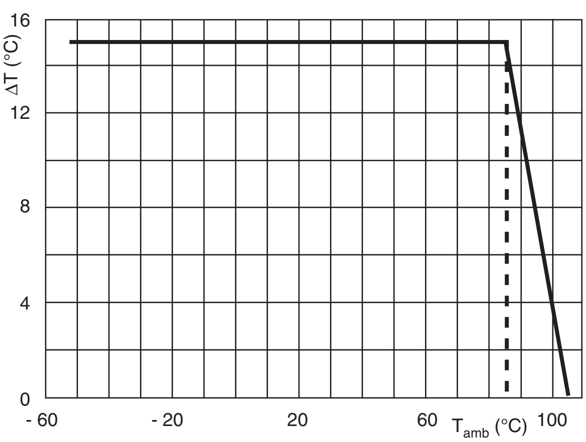
The maximum RMS current is defined by $I_{ac} = \omega \times C \times U_{ac}$.

U_{ac} is the maximum AC voltage depending on the ambient temperature in the curves “Max. RMS voltage and AC current as a function of frequency”.

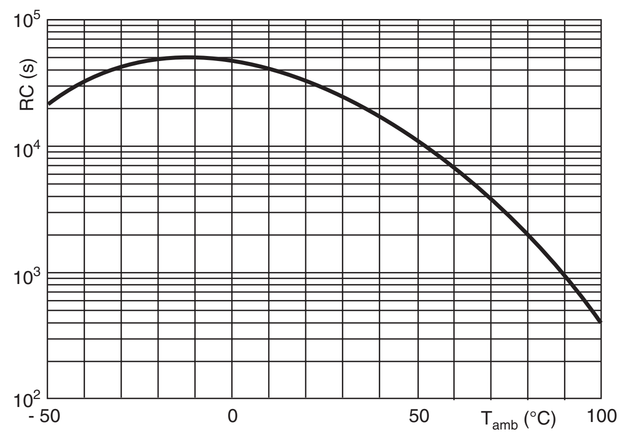
Tangent of loss angle as a function of frequency (typical curve)



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



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



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)			
	PITCH 10 mm	PITCH 15 mm	PITCH 22.5 mm	PITCH 27.5 mm
4.0	6.0	-	-	-
4.5	-	-	-	-
5.0	7.5	10	-	-
6.0	9.0	11	19	-
7.0	-	12	21	-
8.5	-	16	25	-
10.0	-	18	28	-
11.0	-	-	-	36
12.0	-	-	34	-
13.0	-	-	-	42
15.0	-	-	-	48
18.0	-	-	-	57

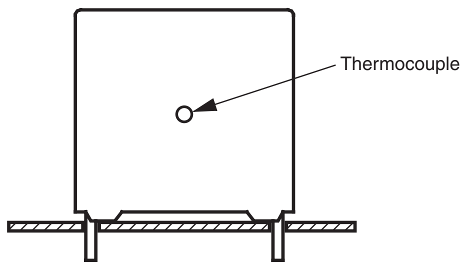
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free ambient temperature.
The power dissipation can be calculated according chapter “Introduction”, section “Maximum power dissipation”.
The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- 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.

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 peak 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
   The rated voltage pulse slope is valid for ambient temperatures up to 85 °C. For higher temperatures a derating factor of 3 % per K shall be applied.
4. The maximum component surface temperature rise must be lower than the limits (see figure 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}	0.8 x U_{Rac}
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	1.0 x U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

Group C Inspection Requirements

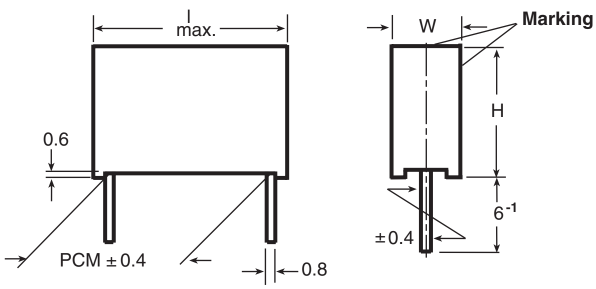
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters “General Data” of this specification
4.3.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.3 Robustness of terminations	Tensile and bending	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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.005 for: C ≤ 100 nF or ≤ 0.010 for: 100 nF < C ≤ 220 nF or ≤ 0.015 for: 220 nF < C ≤ 470 nF and ≤ 0.003 for: C > 470 nF Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle: For C ≤ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.6 Rapid change of temperature	θA = Lower category temperature θB = Upper category temperature 5 cycles Duration t = 30 min Visual examination	No visible damage

SUB-CLAUSE NUMBER AND TEST		CONDITIONS	PERFORMANCE REQUIREMENTS
a.	Vibration	Mounting: See section “Mounting” of this specification 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	
4.7.2	Final inspection	Visual examination	No visible damage
4.9	Shock	Mounting: See section “Mounting” of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3	Final measurements	Visual examination	No visible damage
		Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.6.1
		Tangent of loss angle	Increase of tan δ $\leq$ 0.005 for: C $\leq$ 100 nF or $\leq$ 0.010 for: 100 nF < C $\leq$ 220 nF or $\leq$ 0.015 for: 220 nF < C $\leq$ 470 nF and $\leq$ 0.003 for: C > 470 nF Compared to values measured in 4.6.1
		Insulation resistance	As specified in section “Specific Reference Data” 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: Upper category temperature Duration: 16 h	
4.10.3	Damp heat cyclic Test Db, first cycle		
4.10.4	Cold	Temperature: Lower category temperature Duration: 2 h	
4.10.6	Damp heat cyclic Test Db, remaining cycles		
4.10.6.2	Final measurements	Visual examination	No visible damage Legible marking
		Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.4.2 or 4.9.3
		Tangent of loss angle	Increase of tan δ $\leq$ 0.007 for: C $\leq$ 100 nF or $\leq$ 0.010 for: 100 nF < C $\leq$ 220 nF or $\leq$ 0.015 for: 220 nF < C $\leq$ 470 nF and $\leq$ 0.005 for: C > 470 nF Compared to values measured in 4.3.1 or 4.6.1
		Insulation resistance	$\geq$ 50 % of values specified in section “Specific Reference Data” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C2		
4.11 Damp heat steady state	56 days, 40 °C, 90 % to 95 % RH	
4.11.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle at 1 kHz	
4.11.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq$ 5 % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq$ 0.005 Compared to values measured in 4.11.1
	Insulation resistance	$\geq$ 50 % of values specified in section “Specific Reference Data” of this specification
SUB-GROUP C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 1.0 x U_{Rdc} at 105 °C	
4.12.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle: For C $\leq$ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq$ 5 % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ $\leq$ 0.005 for: C $\leq$ 100 nF or $\leq$ 0.010 for: 100 nF < C $\leq$ 220 nF or $\leq$ 0.015 for: 220 nF < C $\leq$ 470 nF and $\leq$ 0.003 for: C > 470 nF Compared to values measured in 4.12.1
	Insulation resistance	$\geq$ 50 % of values specified in section “Specific Reference Data” of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle: For C $\leq$ 470 nF at 100 kHz or for C > 470 nF at 10 kHz	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq$ 3 % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ $\leq$ 0.005 for: C $\leq$ 100 nF or $\leq$ 0.010 for: 100 nF < C $\leq$ 220 nF or $\leq$ 0.015 for: 220 nF < C $\leq$ 470 nF and $\leq$ 0.003 for: C > 470 nF Compared to values measured in 4.13.1
	Insulation resistance	$\geq$ 50 % of values specified in section “Specific Reference Data” of this specification

DC Film Capacitors
MKT Radial Potted Type

Dimensions in millimeters



MAIN APPLICATIONS
Blocking, bypassing, filtering, timing, coupling and decoupling circuits, interference suppression in low voltage applications. High temperature operations.
Automotive applications

REFERENCE STANDARDS
IEC 60384-2

MARKING
C-value; tolerance; rated voltage; manufacturer's type; code for dielectric material; manufacturer location; manufacturer's logo; year and week

DIELECTRIC
Polyester film

ELECTRODES
Metallized

CONSTRUCTION
Mono and series construction

RATED (DC)VOLTAGE
63 V, 100 V, 250 V, 400 V, 630 V, 1000 V

RATED (AC)VOLTAGE
40 V, 63 V, 160 V, 200 V, 220 V

FEATURES
10 mm to 27.5 mm lead pitch
Supplied loose in box, taped on reel and ammo pack
RoHS compliant

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/125/56

CAPACITANCE RANGE (E12 SERIES)
1000 pF to 15 µF

CAPACITANCE TOLERANCE
± 20 %, ± 10 %, ± 5 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
125 °C

MAXIMUM OPERATING TEMPERATURE FOR LIMITED TIME
150 °C at 0.3 U_R for maximum 200 h

RELIABILITY
Operational life > 300 000 h (40 °C/0.5 x U_R)
Failure rate < 2 FIT (40 °C/0.5 x U_R)

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

COMPOSITION OF CATALOG NUMBER

MKT	1820	X	XX	25	X	X

TYPE: MKT 1820

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

CAPACITANCE (numerically)

Example:
468 = 680 nF

Rated voltage
Un = 06 = 63 V
Un = 01 = 100 V
Un = 25 = 250 V
Un = 40 = 400 V
Un = 63 = 630 V
Un = 10 = 1000 V

TOLERANCE	
4	± 5 %
5	± 10 %
6	± 20 %

SPECIAL LETTER FOR TAPED	
	Bulk
W	Reel diameter 350 mm
V	Reel diameter 500 mm
G	Ammopack

Note

For detailed tape specifications refer to "Packaging Information" www.vishay.com/docs?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION				VALUE		
Tangent of loss angle:				at 1 kHz	at 10 kHz	at 100 kHz
C x 0.1 µF				80×10^{-4}	150×10^{-4}	250×10^{-4}
0.1 µF ≤ C x 1.0 µF				80×10^{-4}	150×10^{-4}	-
C ≥ 1.0 µF				100×10^{-4}	-	-
Pitch (mm)	Maximum pulse rise time $(dU/dt)_R$ [V/µs]					
	63 Vdc	100 Vdc	250 Vdc	400 Vdc	630 Vdc	1000 Vdc
10	12	18	36	52	70	260
15	8	10	20	32	66	130
22.5	5	6	12	18	38	68
27.5	-	5	10	14	28	50
If the maximum pulse voltage is less than the rated voltage higher dU/dt values can be permitted.						
R between leads, for C ≤ 0.33 µF and U_R ≤ 100 V					> 15 000 MΩ	
R between leads, for C ≤ 0.33 µF and U_R > 100 V					> 30 000 MΩ	
RC between leads, for C > 0.33 µF and U_R ≤ 100 V					> 5000 s	
RC between leads, for C > 0.33 µF and U_R > 100 V					> 10 000 s	
R between leads and case, 100 V; (foil method)					> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s					1.6 x U_{Rdc}, 1 min	
Withstanding (DC) leads and case					2 x U_{Rdc}, 1 min	
Maximum application temperature					125 °C	

DC Film Capacitors
MKT Radial Potted Type

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 06 63 Vdc/40 Vac				VOLTAGE CODE 01 100 Vdc/63 Vac				VOLTAGE CODE 25 250 Vdc/160 Vac			
		w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)
d_t = 0.80 mm ± 0.8 mm													
1000 pF	-210	-	-	-	-	-	-	-	-	-	-	-	-
1500 pF	-215	-	-	-	-	-	-	-	-	-	-	-	-
2200 pF	-222	-	-	-	-	-	-	-	-	-	-	-	-
3300 pF	-233	-	-	-	-	-	-	-	-	-	-	-	-
4700 pF	-247	-	-	-	-	-	-	-	-	-	-	-	-
6800 pF	-268	-	-	-	-	-	-	-	-	-	-	-	-
0.01 µF	-310	-	-	-	-	-	-	-	-	-	-	-	-
0.015 µF	-315	-	-	-	-	-	-	-	-	-	-	-	-
0.022 µF	-322	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0
0.033 µF	-333	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0
0.047 µF	-347	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0
0.068 µF	-368	-	-	-	-	3.5	8.0	13.0	10.0	3.5	8.0	13.0	10.0
0.10 µF	-410	-	-	-	-	3.5	8.0	13.0	10.0	4.5	9.5	13.0	10.0
0.15 µF	-415	-	-	-	-	3.5	8.0	13.0	10.0	5.5	10.5	13.0	10.0
0.22 µF	-422	3.5	8.0	13.0	10.0	3.5	8.0	13.0	10.0	6.5	11.5	13.0	10.0
0.33 µF	-433	3.5	8.0	13.0	10.0	4.0	9.0	13.0	10.0	5.5	10.5	18.0	15.0
0.47 µF	-447	3.5	8.0	13.0	10.0	4.5	9.5	13.0	10.0	6.5	12.5	18.0	15.0
0.68 µF	-468	4.0	9.0	13.0	10.0	5.5	10.5	13.0	10.0	7.5	13.5	18.0	15.0
1.0 µF	-510	4.5	9.5	13.0	10.0	5.5	10.5	18.0	15.0	8.5	14.5	18.0	15.0
1.5 µF	-515	5.5	10.5	13.0	10.0	6.5	12.5	18.0	15.0	8.5	16.5	26.5	22.5
2.2 µF	-522	6.5	11.5	13.0	10.0	6.5	12.5	18.0	15.0	10.5	18.5	26.5	22.5
3.3 µF	-533	6.5	12.5	18.0	15.0	8.5	14.5	18.0	15.0	12.5	20.0	26.5	22.5
4.7 µF	-547	7.5	13.5	18.0	15.0	7.5	15.5	26.5	22.5	13.5	23.5	31.5	27.5
6.8 µF	-568	8.5	14.5	18.0	15.0	8.5	16.5	26.5	22.5	-	-	-	-
10.0 µF	-610	8.5	17.5	18.0	15.0	10.5	18.5	26.5	22.5	-	-	-	-
15.0 µF	-615	8.5	16.5	26.5	22.5	11.5	20.5	31.5	27.5	-	-	-	-

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 40 400 Vdc/200 Vac				VOLTAGE CODE 63 630 Vdc/220 Vac				VOLTAGE CODE 10 1000 Vdc/220 Vac			
		w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)
d_t = 0.80 mm ± 0.8 mm													
1000 pF	-210	-	-	-	-	3.5	8.0	13.0	10.0	4.0	9.0	13.0	10.0
1500 pF	-215	-	-	-	-	3.5	8.0	13.0	10.0	4.0	9.0	13.0	10.0
2200 pF	-222	-	-	-	-	3.5	8.0	13.0	10.0	4.0	9.0	13.0	10.0
3300 pF	-233	-	-	-	-	3.5	8.0	13.0	10.0	4.0	9.0	13.0	10.0
4700 pF	-247	-	-	-	-	3.5	8.0	13.0	10.0	5.5	10.5	13.0	10.0
6800 pF	-268	-	-	-	-	3.5	8.0	13.0	10.0	6.5	11.5	13.0	10.0
0.01 µF	-310	3.5	8.0	13.0	10.0	4.0	9.0	13.0	10.0	5.5	10.5	18.0	15.0
0.015 µF	-315	3.5	8.0	13.0	10.0	4.5	9.5	13.0	10.0	6.5	12.5	18.0	15.0
0.022 µF	-322	3.5	8.0	13.0	10.0	5.5	10.5	13.0	10.0	7.5	13.5	18.0	15.0
0.033 µF	-333	4.0	9.0	13.0	10.0	5.5	10.5	18	15.0	6.5	14.5	26.5	22.5
0.047 µF	-347	4.5	9.5	13.0	10.0	6.5	12.5	18	15.0	7.5	15.5	26.5	22.5
0.068 µF	-368	5.5	10.5	13.0	10.0	7.5	13.5	18	15.0	8.5	16.5	26.5	22.5
0.10 µF	-410	6.5	11.5	13.0	10.0	6.5	14.5	26.5	22.5	10.5	18.5	26.5	22.5
0.15 µF	-415	6.5	12.5	18.0	15.0	7.5	15.5	26.5	22.5	11.5	20.5	31.5	27.5
0.22 µF	-422	6.5	12.5	18.0	15.0	8.5	16.5	26.5	22.5	13.5	23.5	31.5	27.5
0.33 µF	-433	7.5	13.5	18.0	15.0	11.5	20.5	31.5	27.5	16.5	29.5	31.5	27.5
0.47 µF	-447	8.5	17.5	18.0	15.0	11.5	20.5	31.5	27.5	20.0	35.0	31.5	27.5
0.68 µF	-468	8.5	16.5	26.5	22.5	13.5	23.5	31.5	27.5	-	-	-	-
1.0 µF	-510	10.5	18.5	26.5	22.5	15.0	24.5	31.5	27.5	-	-	-	-
1.5 µF	-515	11.5	20.5	31.5	27.5	-	-	-	-	-	-	-	-
2.2 µF	-522	13.5	23.5	31.5	27.5	-	-	-	-	-	-	-	-
3.3 µF	-533	15.0	24.5	31.5	27.5	-	-	-	-	-	-	-	-
4.7 µF	-547	18.0	28.0	31.5	27.5	-	-	-	-	-	-	-	-

For technical questions, contact: dc-film@vishay.com
Document Number: 26011
Revision: 10-Dec-08

RECOMMENDED PACKAGING

PACKAGING CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)	REEL DIAMETER (m)	ORDERING CODE EXAMPLES	PITCH 10	PITCH 15	PITCH 22.5 TO 27.5
G	Ammo	18.5	S (1)	MKT 1820-410/405-G	x	x	-
W	Reel	18.5	350	MKT 1820-410/405-W	x	x	-
V	Reel	18.5	500	MKT 1820-422/635-V	-	x	x
G	Ammo	18.5	L (2)	MKT 1820-422/635-G	-	-	x
-	Bulk	-	-	MKT 1820-515/405	x	x	x

Notes
(1) S = box size 55 x 210 x 340 mm (w x h x l)
(2) L = box size 60 x 360 x 510 mm (w x h x l)

EXAMPLE OF ORDERING CODE

TYPE	CAPACITANCE CODE	VOLTAGE CODE	TOLERANCE CODE (1)	PACKAGING CODE
MKT 1820	410	06	5	G

Note
(1) **Tolerance Codes: 4** = 5 % (J); **5** = 10 % (K); **6** = 20 % (M)

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

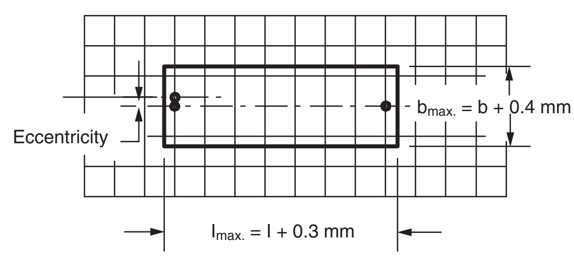
Specific Method of Mounting to Withstand Vibration and Shock

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 pitches ≤ 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: $h_{max.} \leq h + 0.4$ mm or $h_{max.} \leq h' + 0.4$ mm



Storage Temperature

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

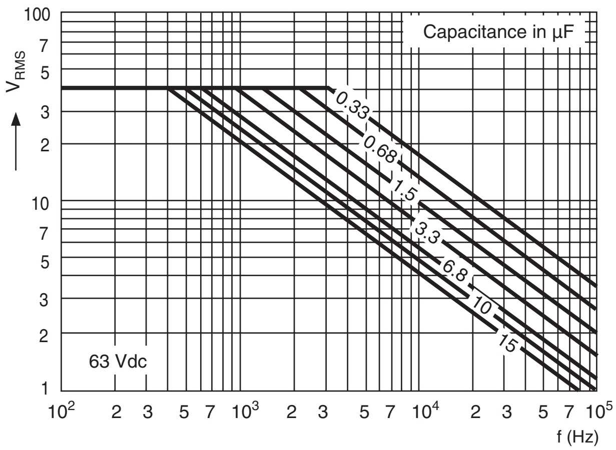
Ratings and Characteristics Reference Conditions

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

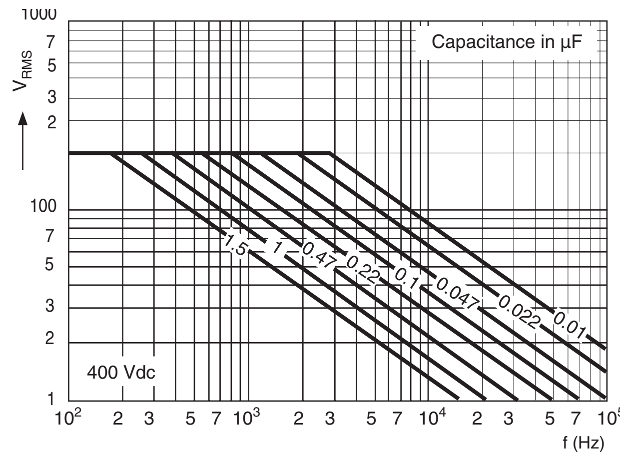
For reference testing, a conditioning period shall be applied over 96 ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

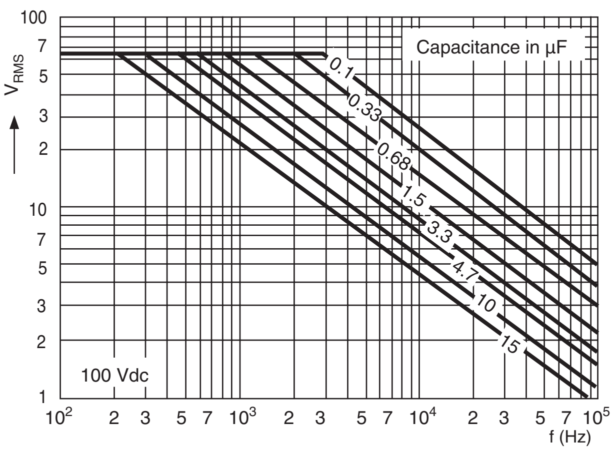
Permissible AC voltage vs. frequency at $T_{amb} \leq 85$ °C



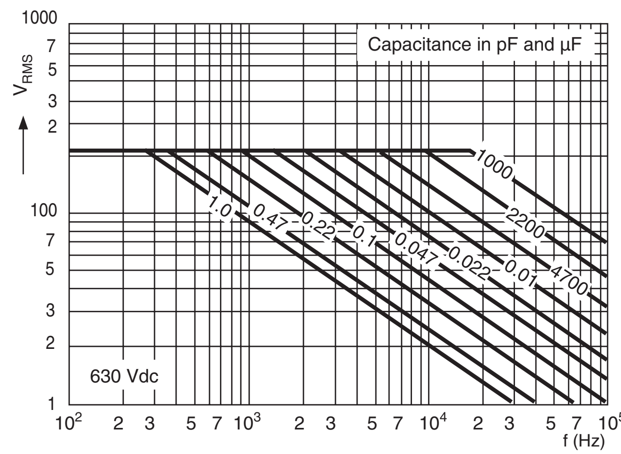
Permissible AC voltage vs. frequency at $T_{amb} \leq 85$ °C



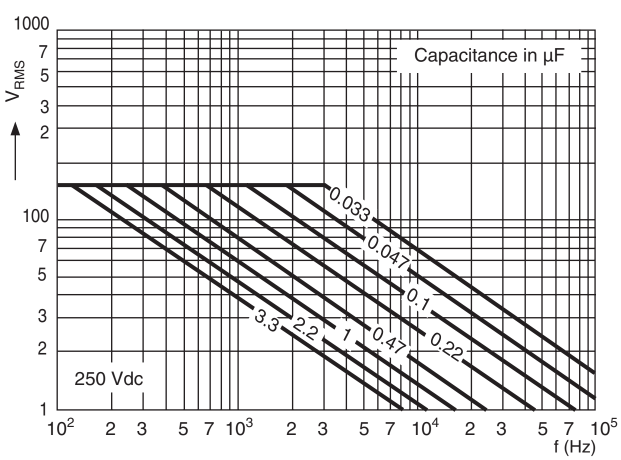
Permissible AC voltage vs. frequency at $T_{amb} \leq 85$ °C



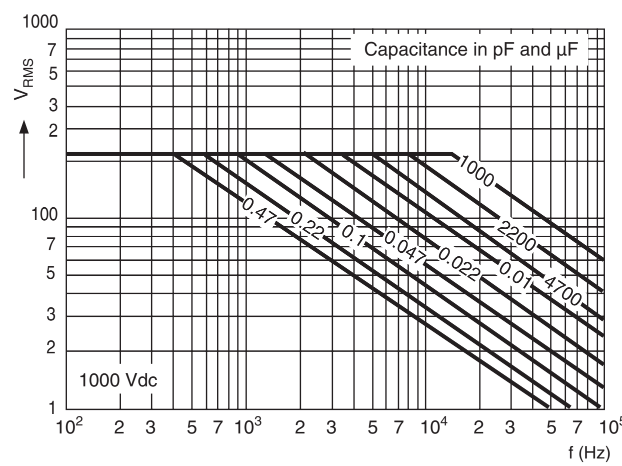
Permissible AC voltage vs. frequency at $T_{amb} \leq 85$ °C



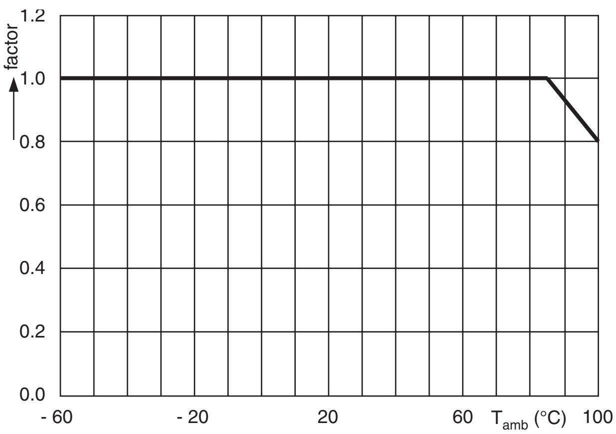
Permissible AC voltage vs. frequency at $T_{amb} \leq 85$ °C



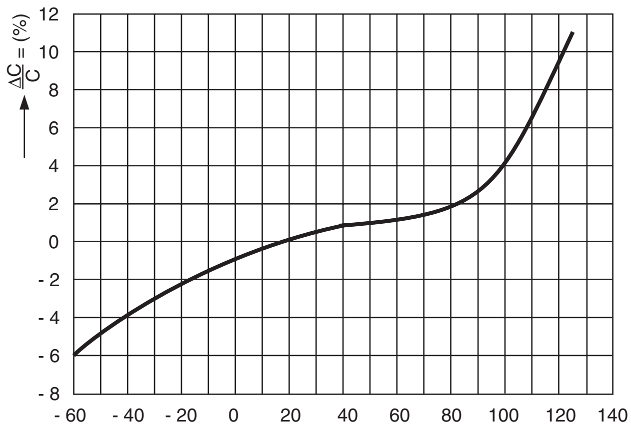
Permissible AC voltage vs. frequency at $T_{amb} \leq 85$ °C



Nominal voltage (AC and DC) as a function of temperature
$U = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$

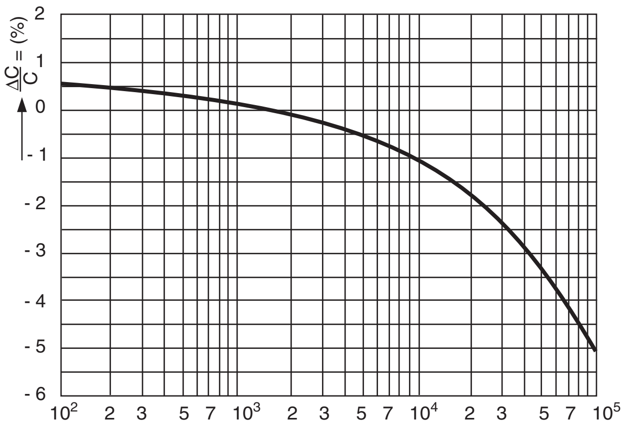


Capacitance as a function of temperature
$\Delta C/C = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$



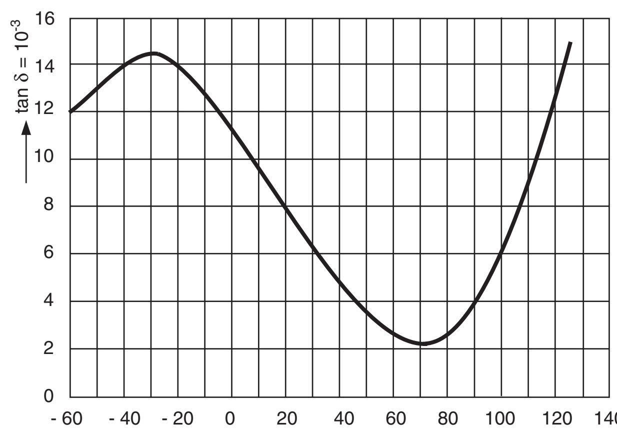
Capacitance vs. Temperature $\Delta C/C = f(\vartheta)$ T_{amb} (°C)

Capacitance as function of frequency
$\Delta C/C = f(f)$, 100 Hz $\leq f \leq$ 1 MHz



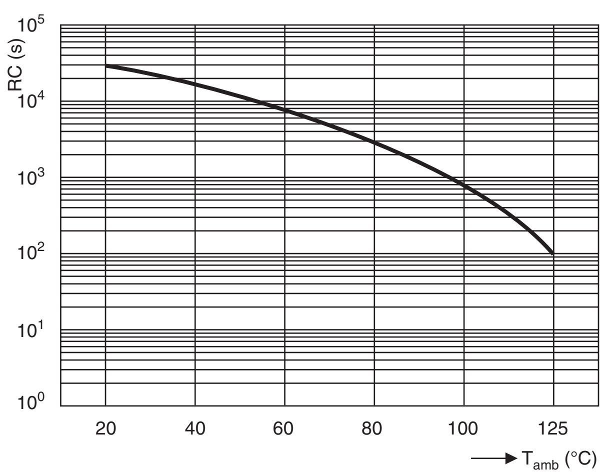
Capacitance Change vs. Frequency $\frac{\Delta C}{C} = f(f)$ f (Hz)

Dissipation factor as function of temperature
$\Delta\tan\delta/\tan\delta = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$

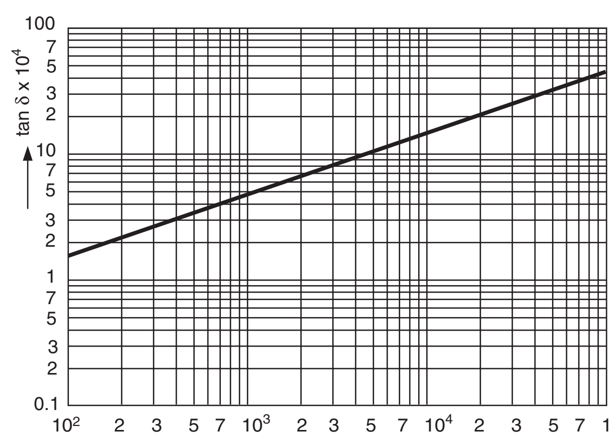


Dissipation Factor (1 kHz) vs. Temperature $\tan\delta = f(\vartheta)$ T_{amb} (°C)

Insulation resistance as a function of temperature
$R_{is} = f(T_A)$, $T_{LL} \leq T_A \leq T_{UL}$

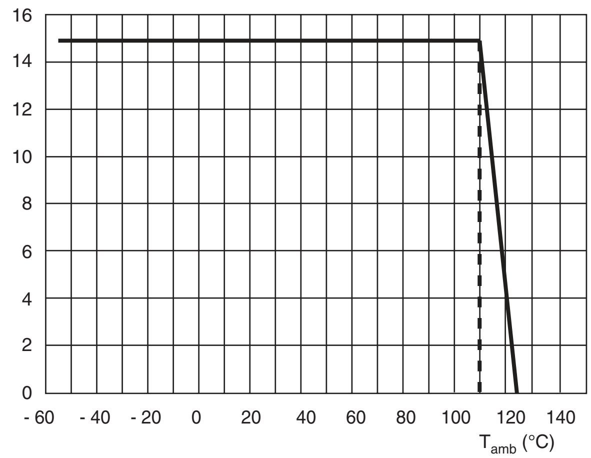


Dissipation factor as a function of frequency
$\Delta\tan\delta/\tan\delta = f(f)$,100 Hz $\leq f \leq$ 1 MHz_L



Dissipation Factor vs. Frequency $\tan\delta = f(f)$ f (Hz)

Maximum allowed component temperature rise (ΔT) as function of ambient temperature (T_{amb})



$W_{max.}$	HEAT CONDUCTIVITY (mW/°C)			
(mm)	**PITCH 10.0 mm**	**PITCH 15.0 mm**	**PITCH 22.5 mm**	**PITCH 27.5 mm**
3.5	5.0	-	-	-
4.0	6.0	-	-	-
4.5	6.5	-	-	-
5.5	8.0	10.0	-	-
6.5	9.5	12.5	19.0	-
7.5	-	14.5	22.0	-
8.5	-	16.0	24.0	-
10.5	-	-	29.0	-
11.5	-	-	-	37.5
12.5	-	-	33.5	-
13.5	-	-	-	44.5
15.0	-	-	-	48.5
16.5	-	-	-	58.0
18.0	-	-	-	58.5
20.0	-	-	-	73.0

POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

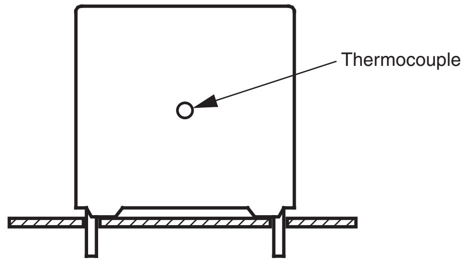
The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.
The power dissipation can be calculated according type detail specification "HQN-384-01/101: Technical Information Film Capacitors" with the typical tgd of the curves.

The component temperature rise (ΔT) can be measured (see section "Measuring the Component Temperature" for more details) or calculated by $\Delta T = P/G$:

- 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 the maximum (U_{p-p}) to avoid the ionisation inception level
3. The voltage peak 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 < $T_{amb} \leq 100$ °C	100 °C < $T_{amb} \leq 125$ °C
Maximum continuous RMS voltage	U_{Rac}	0.8 x U_{Rac}	0.5 x U_{Rac}
Maximum temperature RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	U_{Rac}	0.6 x U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.3 x U_{Rdc}	0.5 x U_{Rdc}

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the "Sectional Specification, Publication IEC 60384-2 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 chapter "General Data" of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.3 Robustness of terminations	Tensile and bending	No visible damage
4.4 Resistance to soldering heat	Method: 1A Solder bath: 280 °C ± 5 °C Duration: 5 s	
4.14 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.003 for C ≤ 1 µF or ≤ 0.002 for C > 1 µF Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	No visible damage
4.6 Rapid change of temperature	θA = - 55 °C θB = + 125 °C 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage Legible marking
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	

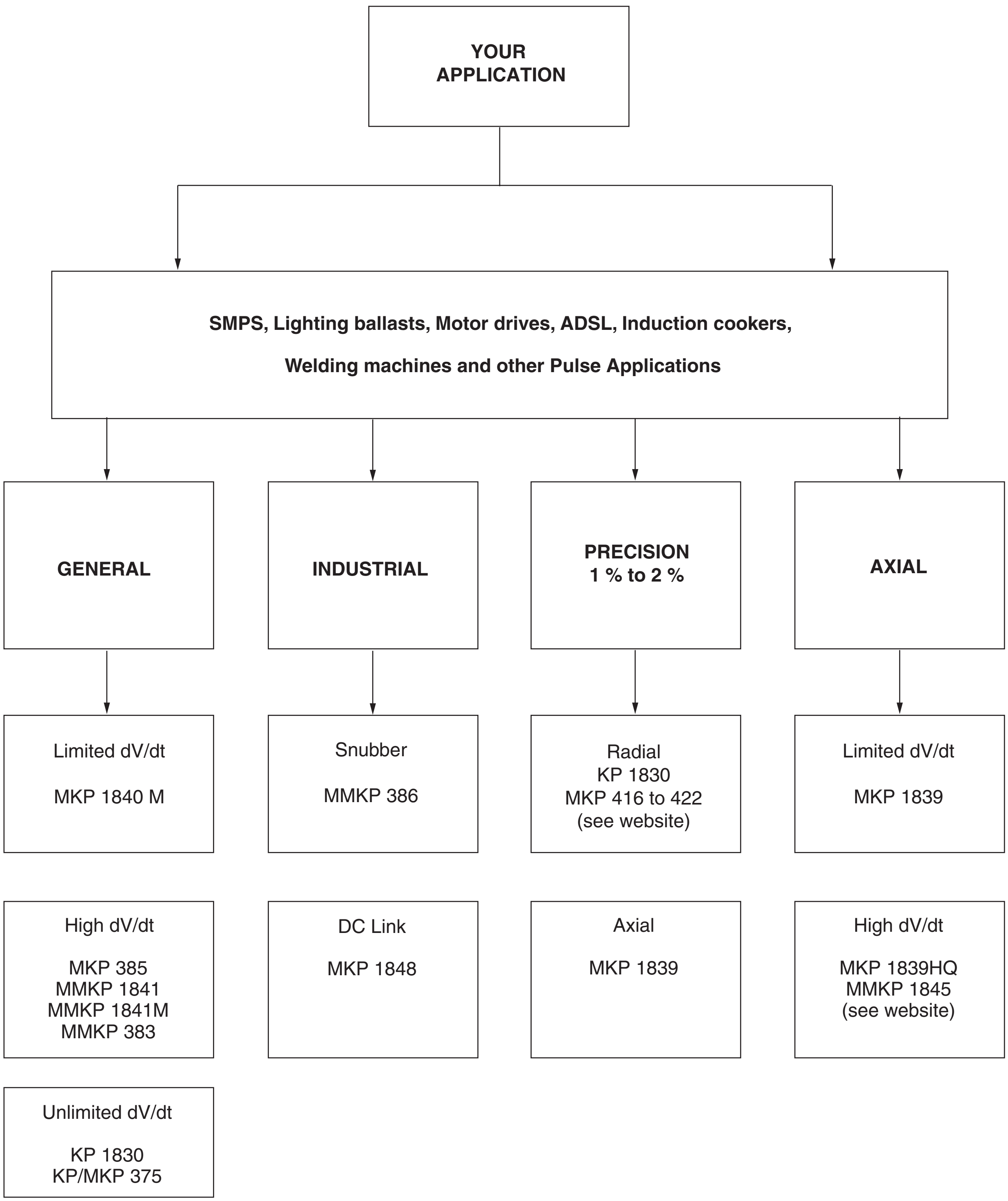
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.9.3 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	No visible damage $\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.6.1 Increase of tan δ ≤ 0.003 for $C \leq 1$ µF or ≤ 0.002 for $C > 1$ µF Compared to values measured in 4.6.1 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: + 125 °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 or flashover
	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ: ≤ 0.005 for $C \leq 1$ µF or ≤ 0.003 for $C > 1$ µF 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	
4.11.1 Initial measurements	Capacitance	
	Tangent of loss angle at 1 kHz	No breakdown or flashover
	Voltage proof = U_{Rdc} for 1 min within 15 min after removal from testchamber	
4.11.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.005$ 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 C3		
4.12 Endurance	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 1.0 x U_{Rdc} at 100 °C 0.6 U_{Rdc} at 125 °C Duration: 200 h 0.3 x U_{Rdc} at 150 °C	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % compared to values measured in 4.12.1
	Tangent of loss angle	Increase of tan δ: ≤ 0.003 for C ≤ 1 µF or ≤ 0.002 for C > 1 µF Compared to values measured in 4.12.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{C \times 5 \times (dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.13.1 Increase of tan δ: ≤ 0.003 for C ≤ 1 µF or ≤ 0.002 for C > 1 µF Compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification

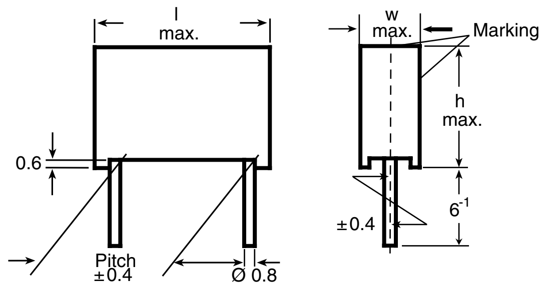
AC/Pulse Capacitors and Precision Capacitors

Contents

Film Capacitors



AC and Pulse Metallized Polypropylene Film Capacitors MKP Radial Potted Type



Dimensions in millimeters

LEAD DIAMETER dt (mm)	W (mm)	PITCH (mm)
0.5 ± 0.05	-	5
0.6 ± 0.06	-	7.5 - 10
0.8 ± 0.08	< 16	15 - 37.5
1.0 ± 0.1	≥ 16.5	15 - 37.5

APPLICATIONS

High frequency and pulse operations. Deflection circuits in TV-sets (S-correction), SMPS, loudspeaker crossover networks, electronic ballast, storage, filter, timing and sample and hold circuits.

REFERENCE STANDARDS

IEC 60384-16

MARKING

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

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized

CONSTRUCTION

Mono and internal series construction

RATED DC VOLTAGES

250 V, 400 V, 630 V, 1000 V

RATED AC VOLTAGES

160 V, 220 V, 250 V, 400 V, 500 V

FEATURES

5 mm to 37.5 mm lead pitch.
Supplied loose in box, taped on reel and ammopack.
RoHS compliant

Pb-free

e3

RoHS
COMPLIANT

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO EN 60068-1

55/100/56

CAPACITANCE RANGE

1000 pF to 6.8 µF

CAPACITANCE TOLERANCE

± 5 % , ± 2 % , ± 2.5 %

LEADS

Tinned wire

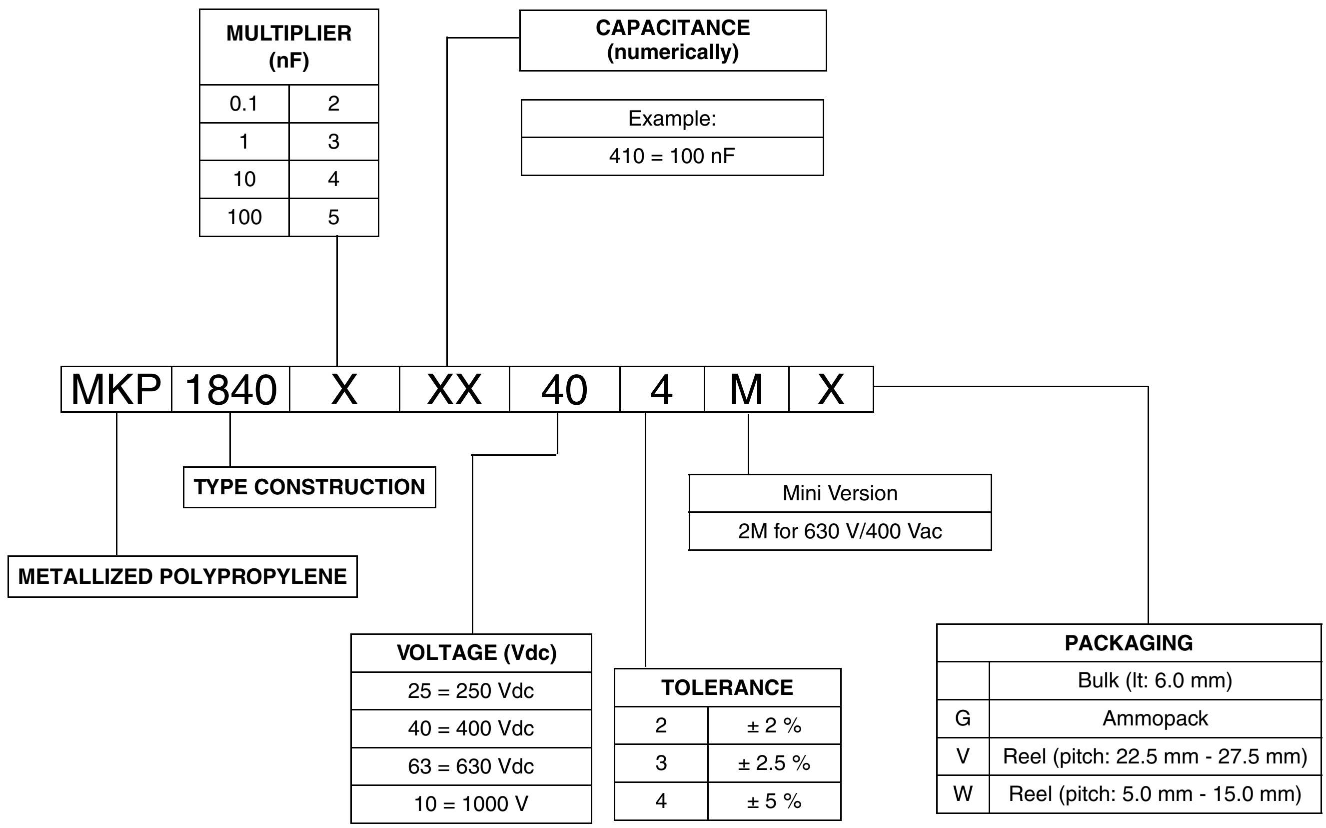
MAXIMUM APPLICATION TEMPERATURE

100 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER



Note

For detailed tape specifications refer to "Packaging Information" www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION		VALUE		
Tangent of loss angle:		at 1 kHz	at 10 kHz	at 100 kHz
C ≤ 0.1 µF		4×10^{-4}	6×10^{-4}	40×10^{-4}
0.1 µF < C ≤ 1.0 µF		4×10^{-4}	6×10^{-4}	-
C > 1.0 µF		10×10^{-4}	-	-
Pitch (mm)		Maximum pulse rise time $(dU/dt)_R$ [V/µs]		
	250 Vdc	400 Vdc	630 Vdc	1000 Vdc
5	360	540	1080	-
7.5	215	325	510	-
10	150	240	340	1365
15	90	135	185	680
22.5	55	80	110	370
27.5	40	65	85	285
37.5	30	45	60	195
R between leads, for C ≤ 1.0 µF at 100 V, 1 min				> 100 000 MΩ
RC between leads, for C 1.0 µF at 100 V, 1 min				> 100 000 s
RC between leads and case, 100 V, 1 min				> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA)rise time 100 V/s				$1.6 \times U_{Rdc}$, 1 min
Withstanding (DC) voltage between leads and case				500 V, 1 min
Maximum application temperature				100 °C

METALLIZED POLYPROPYLENE FILM CAPACITOR, MINI VERSION (M)

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 25 250 Vdc/160 Vac				VOLTAGE CODE 40 400 Vdc/220 Vac [2]				VOLTAGE CODE 63 630 Vdc/250 Vac [2]			
		w (mm)	h (mm)	l (mm)	PITCH (mm)	w (mm)	h (mm)	l (mm)	PITCH (mm)	w (mm)	h (mm)	l (mm)	PITCH (mm)
1000 pF	-210	-	-	-	-	-	-	-	-	3.0	6.5	7.5	5.0
1500 pF	-215	-	-	-	-	-	-	-	-	3.0	6.5	7.5	5.0
2200 pF	-222	-	-	-	-	-	-	-	-	3.5	8.5	7.5	5.0
3300 pF	-233	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
4700 pF	-247	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
6800 pF	-268	-	-	-	-	3.0	6.5	7.5	5.0	3.0	8.5	10.0	7.5
0.01 µF	-310	3.0	6.5	7.5	5.0	3.5	8.5	7.5	5.0	4.0	9.0	10.0	7.5
0.015 µF	-315	3.0	6.5	7.5	5.0	3.0	8.5	10.0	7.5	4.5	9.5	10.3	7.5
0.022 µF	-322	3.5	8.5	7.5	5.0	4.0	9.0	10.0	7.5	4.5	9.5	13.0	10.0
0.033 µF	-333	3.5	8.5	7.5	5.0	4.5	9.5	10.3	7.5	5.5	10.5	13.0	10.0
0.047 µF	-347	4.0	9.0	10.0	7.5	5.0	10.5	10.3	7.5	6.5	11.5	13.0	10.0
0.068 µF	-368	4.0	9.0	10.0	7.5	5.7	11.5	10.3	7.5	6.0	12.0	18.0	15.0
0.10 µF	-410	5.0	10.5	10.3	7.5	5.5	10.5	18.0	15.0	6.0	12.0	18.0	15.0
0.15 µF	-415	5.5	10.5	13.0	10.0	6.0	12.0	18.0	15.0	8.5	14.5	18.0	15.0
0.22 µF	-422	6.5	11.5	13.0	10.0	7.5	13.5	18.0	15.0	8.5	17.5	18.0	15.0
0.33 µF	-433	6.5	12.5	18.0	15.0	8.5	17.5	18.0	15.0	9.0	17.0	26.5	22.5
0.47 µF	-447	7.5	13.5	18.0	15.0	7.5	15.5	26.5	22.5	10.5	18.5	26.5	22.5
0.68 µF	-468	8.5	14.5	18.0	15.0	10.5	18.5	26.5	22.5	11.5	20.5	31.5	27.5
1.0 µF	-510	8.5	16.5	16.5	22.5	11.0	21.0	26.5	22.5	13.5	23.5	31.5	27.5
1.5 µF	-515	10.5	18.5	26.5	22.5	13.5	23.5	31.5	27.5	16.5	29.5	31.5	27.5
2.2 µF	-522	11.0	21.0	26.5	22.5	15.0	24.5	31.5	27.5	18.0	33.0	31.5	27.5
3.3 µF	-533	13.5	23.5	31.5	27.5	18.0	28.0	31.5	27.5	20.0	40.0	42.5	37.5
4.7 µF	-547	15.0	24.5	31.5	27.5	18.0	32.5	41.5	37.5	20.0	40.0	42.5	37.5
6.8 µF	-568	14.5	24.5	41.5	37.5	20.0	40.0	42.5	37.5	-	-	-	-

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 63 630 Vdc/400 Vac [2]				VOLTAGE CODE 10 1000 Vdc/500 Vac [2]			
		w (mm)	h (mm)	l (mm)	PITCH (mm)	w (mm)	h (mm)	l (mm)	PITCH (mm)
1000 pF	-210	-	-	-	-	-	-	-	-
1500 pF	-215	-	-	-	-	-	-	-	-
2200 pF	-222	-	-	-	-	-	-	-	-
3300 pF	-233	-	-	-	-	-	-	-	-
4700 pF	-247	-	-	-	-	4.0	9.0	13.0	10.0
6800 pF	-268	-	-	-	-	4.0	9.0	13.0	10.0
0.01 µF	-310	4.5	9.5	13.0	10.0 [1]	5.5	10.5	13.0	10.0
0.015 µF	-315	5.5	10.5	13.0	10.0 [1]	6.5	11.5	13.0	10.0
0.022 µF	-322	6.5	11.5	13.0	10.0 [1]	5.5	10.5	18.0	15.0
0.033 µF	-333	5.5	10.5	18.0	15.0 [1]	6.0	12.0	18.0	15.0
0.047 µF	-347	6.5	12.5	18.0	15.0 [1]	7.5	13.5	18.0	15.0
0.068 µF	-368	7.5	13.5	18.0	15 .0 [1]	8.5	14.5	18.0	15.0
0.10 µF	-410	6.5	14.5	26.5	22.5 [1]	7.5	15.5	26.5	22.5
0.15 µF	-415	7.5	15.5	26.5	22.5 [1]	9.0	17.0	26.5	22.5
0.22 µF	-422	8.5	16.5	26.5	22.5 [1]	10.5	18.5	26.5	22.5
0.33 µF	-433	11.0	21.0	26.5	22.5 [1]	11.5	20.5	31.5	27.5
0.47 µF	-447	11.5	20.5	31.5	27.5 [1]	13.5	23.5	31.5	27.5
0.68 µF	-468	13.5	23.5	31.5	27.5 [1]	16.5	29.5	31.5	27.5
1.0 µF	-510	16.5	29.5	31.5	27.5 [1]	18.0	33.0	31.5	27.5
1.5 µF	-515	-	-	-	-	18.0	32.5	41.5	37.5

Notes
[1] Ordering code -2M (e.g. MKP 1840 410 635-2M)
[2] Not suitable for mains applications
• Further C-values upon request
• Please refer to X-capacitors in our catalog “RFI Suppression Components”

RECOMMENDED PACKAGING

LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)	REEL DIAMETER (mm)	ORDERING CODE EXAMPLES	PITCH ≤ 15	PITCH 22.5 - 27.5	PITCH 37.5
G	Ammo	18.5	S [(1)]	MKP 1840-410-404-G	x	-	-
W	Reel	18.5	350	MKP 1840-410-404-W	x	-	-
V	Reel	18.5	500	MKP 1840-510-254-V	-	x	-
G	Ammo	18.5	L [(2)]	MKP 1840-510-254-G	-	x	-
-	Bulk	-	-	MKP 1840-510-254-M	x	x	x

Notes
[(1)] S = box size 55 x 210 x 340 mm (w x h x l)
[(2)] L = box size 60 x 360 x 510 mm (w x h x l)

EXAMPLE OF ORDERING CODE

TYPE	CAPACITANCE CODE	VOLTAGE CODE	TOLERANCE CODE	MINI	PACKAGING CODE
MKP 1840	447	63	4	M	G
Tolerance codes: **4** = 5 % (J); **3** = 2.5 % (H)					

METALLIZED POLYPROPYLENE FILM CAPACITOR, MKP 1840 PCM5, MINI VERSION (-5M)

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 25 250 Vdc/160 Vac				VOLTAGE CODE 40 400 Vdc/220 Vac [(1)]				VOLTAGE CODE 63 630 Vdc/250 Vac [(1)]			
		w (mm)	h (mm)	l (mm)	PITCH (mm)	w (mm)	h (mm)	l (mm)	PITCH (mm)	w (mm)	h (mm)	l (mm)	PITCH (mm)
d_t = 0.5 ± 0.05													
3300 pF	-233	-	-	-	-	-	-	-	-	3.5	8.5	7.5	5.0
4700 pF	-247	-	-	-	-	-	-	-	-	3.5	8.5	7.5	5.0
6800 pF	-268	-	-	-	-	-	-	-	-	4.5	9.5	7.5	5.0
0.01 µF	-310	-	-	-	-	-	-	-	-	4.5	9.5	7.5	5.0
0.015 µF	-315	-	-	-	-	4.5	9.5	7.5	5.0	5.5	11.5	7.5	5.0
0.022 µF	-322	-	-	-	-	4.5	9.5	7.5	5.0	-	-	-	-
0.033 µF	-333	-	-	-	-	5.5	11.5	7.5	5.0	-	-	-	-
0.047 µF	-347	4.5	9.5	7.5	5	5.5	11.5	7.5	5.0	-	-	-	-
0.068 µF	-368	5.0	10.0	7.5	5	-	-	-	-	-	-	-	-
0.10 µF	-410	5.5	11.5	7.5	5	-	-	-	-	-	-	-	-

LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)	REEL DIAMETER (mm)	ORDERING CODE EXAMPLE	PITCH 5
G	Ammo	18.5	S [(2)]	MKP 1840-310/404-5MG	X
W	Reel	18.5	350	MKP 1840-310/404-5MW	X
-	Bulk	-	-	MKP 1840-310/404-5M	X

Notes
[(1)] Not suitable for mains applications
[(2)] S = box size 55 x 210 x 340 mm (w x h x l)
- Further C-values upon request

EXAMPLE OF ORDERING CODE

TYPE	CAPACITANCE CODE	VOLTAGE CODE	TOLERANCE CODE	MINI	PACKAGING CODE
MKP 1840	347	25	4	5M	G
Tolerance codes: **4** = 5 % (J); **3** = 2.5 % (H)					

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

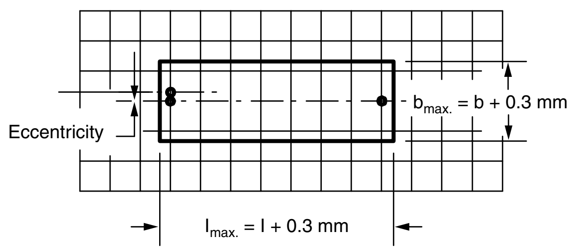
In order to withstand vibration and shock tests, it must be ensure that the stand-off pips are in good contact with the printed-circuit board:

- 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: $h_{max.} \leq h + 0.4$ mm or $h_{max.} \leq h' + 0.4$ mm



Storage Temperature

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

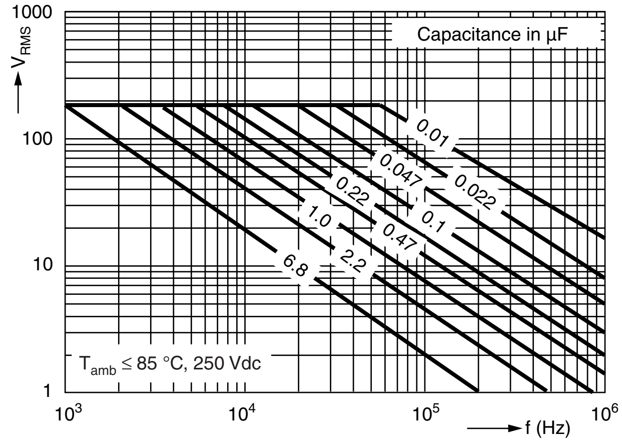
Ratings and Characteristics Reference Conditions

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

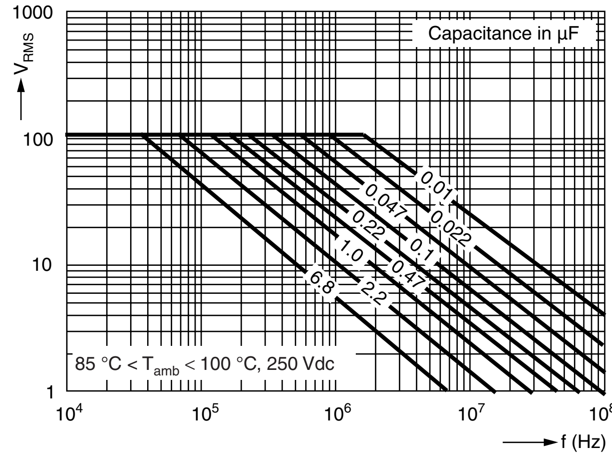
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

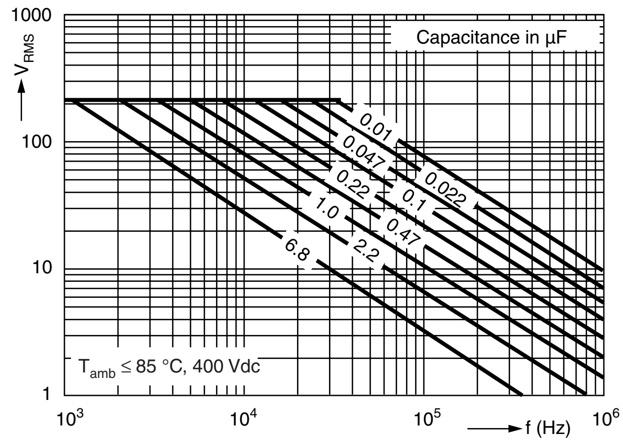
Max. RMS voltage as a function of frequency



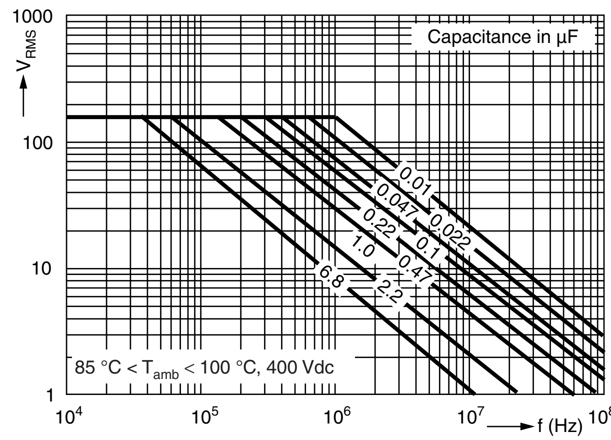
Max. RMS voltage as a function of frequency



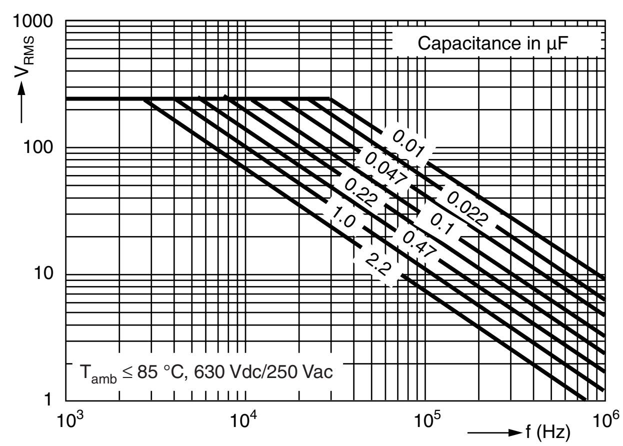
Max. RMS voltage as a function of frequency



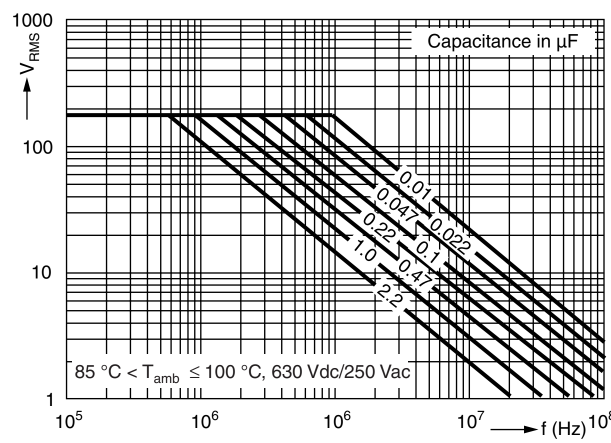
Max. RMS voltage as a function of frequency



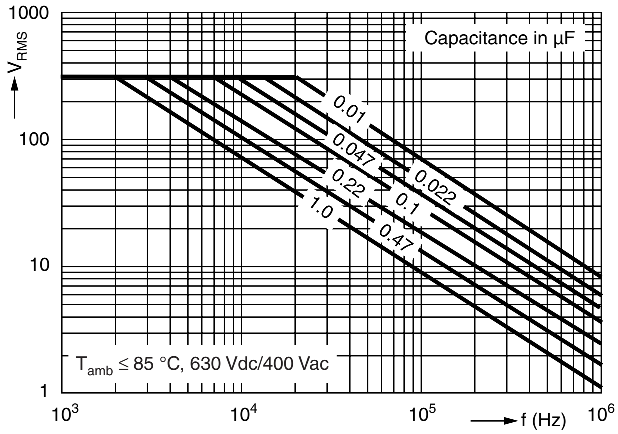
Max. RMS voltage as a function of frequency



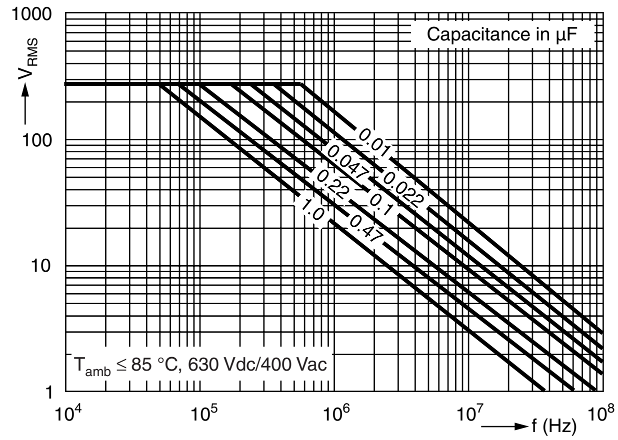
Max. RMS voltage as a function of frequency



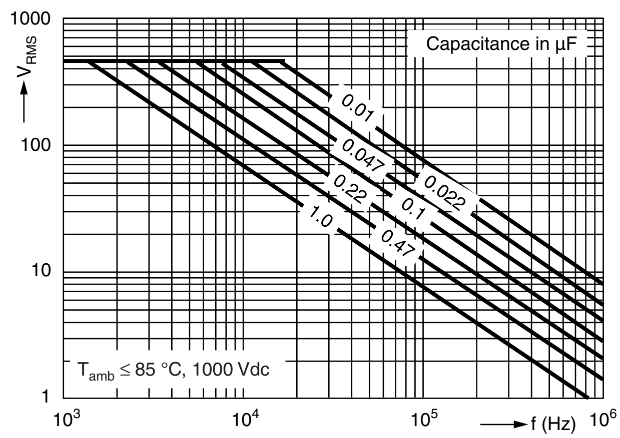
Max. RMS voltage as a function of frequency



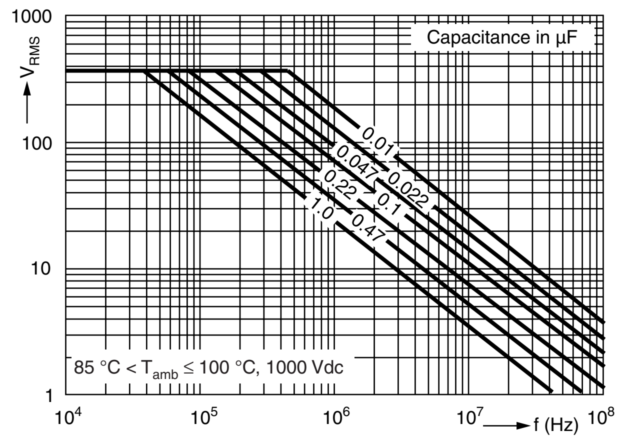
Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)						
	PITCH 5 mm	PITCH 7.5 mm	PITCH 10 mm	PITCH 15 mm	PITCH 22.5 mm	PITCH 27.5 mm	PITCH 37.5 mm
3.0	2.5	4.0	-	-	-	-	-
3.5	3.5	-	-	-	-	-	-
4.0	-	5.0	6.0	-	-	-	-
4.5	4.5	5.5	6.5	-	-	-	-
5.0	5.0	6.5	-	-	-	-	-
5.5	6.5	-	7.5	9.0	-	-	-
5.7	-	7.5	-	-	-	-	-
6.0	-	-	-	10.5	-	-	-
6.5	-	-	9.0	11.5	17.0	-	-
7.5	-	-	-	13.5	19.0	-	-
8.5	-	-	-	15.0	16.5	-	-
9.0	-	-	-	-	22.5	-	-
10.5	-	-	-	-	26.5	-	-
11.0	-	-	-	-	30.5	-	-
11.5	-	-	-	-	-	33.5	-
13.5	-	-	-	-	-	41.0	-
14.5	-	-	-	-	-	-	52.0
15.0	-	-	-	-	-	45.0	-
16.5	-	-	-	-	-	57.0	-
18.0	-	-	-	-	-	57.0	-
18.0	-	-	-	-	-	67.0	-
18.0	-	-	-	-	-	-	75.5
20.0	-	-	-	-	-	-	99.0

POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

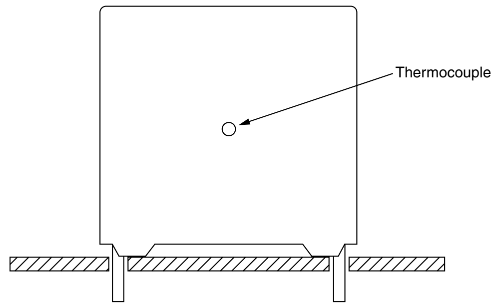
The power dissipation must be limited in order not to exceed the maximum allowed component temperature rise as a function of the free air ambient temperature.
The power dissipation can be calculated according type detail specification "HQN-384-01/101: Technical Information Film Capacitors" with the typical tgd of the curves.

The component temperature rise (ΔT) can be measured (see section "Measuring the Component Temperature" for more details) or calculated by $\Delta T = P/G$:

- 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 the maximum (U_{p-p}) to avoid the ionisation inception level
3. The voltage peak 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 < $T_{amb} \leq 100$ °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}

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-2 and Specific Reference Data”.

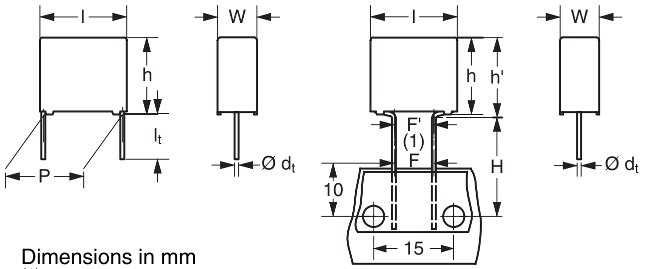
Group C Inspection Requirements

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 chapter “General Data” of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle at 10 kHz	
4.3 Robustness of terminations	Tensile and bending	No visible damage
4.4 Resistance to soldering heat	Method: 1A Solder bath: 280 °C ± 5 °C Duration: 5 s	
4.14 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.002 Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle: at 100 kHz	No visible damage
4.15 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = lower category temperature θB = upper category temperature 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage Legible marking
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	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.9.3 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	No visible damage $\lvert\Delta C/C\rvert \leq 2$ % of the value measured in 4.6.1 Increase of tan $\delta \leq 0.002$ Compared to values measured in 4.6.1 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 4.10.3 Damp heat cyclic Test Db, first cycle 4.10.4 Cold 4.10.6 Damp heat cyclic Test Db, remaining cycles 4.10.6.2 Final measurements	 Temperature: upper category temperature Duration: 16 h Temperature: lower category temperature Duration: 2 h Visual examination Capacitance Tangent of loss angle Insulation resistance	 No visible damage Legible marking $\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.4.2 or 4.9.3 Increase of tan δ: ≤ 0.003 Compared to values measured in 4.3.1 or 4.6.1 ≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C2		
4.11 Damp heat steady state 4.11.1 Initial measurements 4.11.3 Final measurements	Capacitance Tangent of loss angle at 1 kHz Visual examination Capacitance Tangent of loss angle Insulation resistance	 No visible damage Legible marking $\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.11.1. Increase of tan $\delta \leq 0.002$ Compared to values measured in 4.11.1 ≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C3		
4.12 Endurance 4.12.1 Initial measurements 4.12.5 Final measurements	Duration: 2000 h x U_{Rdc} at 85 °C 0.875 x U_{Rdc} at 100 °C Capacitance Tangent of loss angle at 100 kHz Visual examination Capacitance Tangent of loss angle Insulation resistance	 No visible damage Legible marking $\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.12.1 Increase of tan δ: ≤ 0.004 Compared to values measured in 4.12.1 ≥ 50 % of values specified in section “Insulation Resistance” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C4		
4.2.6 Temperature characteristics		
Initial measurements	Capacitance	
Intermediate measurements	Capacitance at lower category temperature Capacitance at 20 °C Capacitance at upper category temperature	For - 55 °C to + 20 °C: 0 % ≤ |ΔC/C| ≤ 2 % or For 20 °C to 85 °C - 3 % ≤ |ΔC/C| ≤ 0 % As specified in section " Capacitance" of this specification
Final measurements	Capacitance Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_R}{2.5 \times C \times (dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.13.3 Final measurements	Capacitance	|ΔC/C| ≤ 3 % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.005 Compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification

AC and Pulse Metallized Polypropylene Film Capacitors MKP 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.

REFERENCE SPECIFICATIONS

IEC 60384-17

MARKING

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

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized

CONSTRUCTION

Internal serial construction

RATED (DC) VOLTAGE

1600 V, 2000 V

RATED (AC) VOLTAGE

550 V, 700 V

RATED PEAK-TO-PEAK VOLTAGE

1600 V, 2000 V

FEATURES

7.5 mm bent back pitch, 10 mm and 15 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

Flame retardant plastic case and epoxy resin
UL-class 94 V-0

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/110/56

CAPACITANCE RANGE (E24 SERIES)

0.00047 to 0.033 µF

CAPACITANCE TOLERANCE

± 5 %

LEADS

Tinned wire

RATED (DC) TEMPERATURE

85 °C

RATED (AC) TEMPERATURE

85 °C

MAXIMUM APPLICATION TEMPERATURE

110 °C

MAXIMUM OPERATING TEMPERATURE FOR LIMITED TIME

125 °C

PERFORMANCE GRADE

Grade 1 (long life)

STABILITY GRADE

Grade 2

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
385	10.0/7.5 mm
	15.0/7.5 mm
	10.0 mm
	15.0 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	385	XX	YY	Y
2222[(1)]	385	XX	YY	Y

[(1)] old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	1600 V		2000 V	
385	Loose in box	lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 5 %	00	50	60	80
	Taped on reel [(1)]	H = 18.5 mm; P_0 = 12.7 mm reel diameter = 500 mm	± 5 %	02	52	62	82
	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	53	63	83
	Ammopack [(1)]	H = 18.5 mm; P_0 = 12.7 mm	± 5 %	06	56	66	86
	Ammopack (bent back to 7.5 mm) [(1)]	H = 16.0 mm; P_0 = 15.0 mm	± 5 %	08	58	68	88
					ON REQUEST		
385	Loose in box	lead length 5.0 ± 1.0 mm	± 5 %	01	51	61	81
	Loose in box	lead length 25.0 ± 2.0 mm	± 5 %	04	54	64	84
	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	55	65	85
	Loose in box	lead length 3.2 + 0.3/- 0.6 mm	± 5 %	07	57	67	87

Note
[(1)] For detailed tape specifications refer to "Packaging Information" www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA (1600 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
Rated voltage pulse slope $(dU/d_t)_R$ P = 10 mm and 10 mm bent back to 7.5 mm P = 15 mm and 15 mm bent back to 7.5 mm	 > 4000 V/µs > 2000 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	> 600 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 application temperature	110 °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 385 XXYYY AND PACKAGING							
			LOOSE IN BOX		REEL			AMMOPACK		C VALUE
			Leads 3.5 + 1/ - 0.5 mm [(2)]	Leads 25.0 ± 2.0 mm	Original Pitch	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 365 mm	Original pitch	Pitch = 7.5 mm (bent back)	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10 ± 0.4 mm; d_t = 0.60 ± 0.06 mm					Pitch = 10.0 mm	Pitch = 7.5 mm (bent back)		Pitch = 10.0 mm	Pitch = 7.5 mm (bent back)	
0.002	4.0 x 10.0 (12.0) x 12.5	0.66	50... (1000)	54... (1250)	52... (1400)	53... (2000)	-	56... (950)	58... (1300)	202
0.0022										222
0.0024										242
0.0027										272
0.003										302
0.0033	5.0 x 11.0 (13.0) x 12.5	0.90	50... (1000)	54... (1250)	52... (1000)	53... (1900)	-	56... (750)	58... (1000)	332
0.0036										362
0.0039										392
0.0043										432
0.0047	6.0 x 12.0 (14.0) x 12.5	1.1	50... (750)	54... (750)	52... (900)	53... (1500)	-	56... (600)	58... (850)	472
0.0051										512
0.0056										562
0.0062										622
0.0068										682
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm					Pitch = 15.0 mm	Pitch = 7.5 mm (bent back)				
0.0039	5.0 x 11.0 (13.0) x 17.5	1.1	00... (1250)	04... (1000)	02... (1100)	03... 950)	05... (550)	-		392
0.0043										432
0.0047										472
0.0051										512
0.0056										562
0.0062										622
0.0068										682
0.0075			50... (1250)	54... (1000)	52... (1100)	53... (950)	55... (550)			752
0.0082										822
0.0091	6.0 x 12.0 (14.0) x 17.5	1.4	50... (1000)	54... (1000)	52... (900)	53... (800)	55... (450)			912
0.010										103
0.011										113
0.012										123
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm					Pitch = 15.0 mm	Pitch = 7.5 mm (bent back)				
0.013	7.0 x 13.5 (15.5) x 17.5	2.0	50... (1000)	54... (500)	52... (800)	53... (700)	55... (400)	-		133
0.015										153
0.016										163
0.018	8.5 x 15.0 (17.0) x 17.5	2.5	50... (1000)	54... (500)	52... (650)	53... (550)	55... (300)			183
0.020										203
0.022										223
0.024										243
0.027	10.0 x 16.5 (18.5) x 17.5	3.3	50... (500)	54... (500)	52... (600)	53... (500)	55... (250)			273
0.030										303
0.033										333

Notes

(1) Net weight for short lead component

(2) l_t = 3.5 ± 0.3 mm for pitch = 15 mm

• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA (2000 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle:	at 10 kHz	at 100 kHz
	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
Rated voltage pulse slope $(dU/d_t)_R$ P = 10 mm and 10 mm bent back to 7.5 mm P = 15 mm and 15 mm bent back to 7.5 mm	 > 4000 V/µs > 2000 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	110 °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 385 XXYYY AND PACKAGING							
			LOOSE IN BOX		REEL			AMMOPACK		C VALUE
			Leads 3.5 + 1/ - 0.5 mm (2)	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 365 mm	Original pitch	Pitch = 7.5 mm (bent back)	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 10 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						Pitch = 10.0 mm	Pitch = 7.5 mm (bent back)		Pitch = 10.0 mm	Pitch = 7.5 mm
0.00047	4.0 x 10.0 (12.0) x 12.5	0.66	60... (1000)	64... (1250)	62... (1400)	63... (2000)	-	66... (950)	68... (1300)	471
0.00051										511
0.00056										561
0.00062										621
0.00068										681
0.00075										751
0.00082										821
0.00091										911
0.001										102
0.0011										112
0.0012										122
0.0013										132
0.0015										152
0.0016										162
0.0018	5.0 x 11.0 (13.0) x 12.5	0.90	60... (1000)	64... (1000)	62... (1100)	63... (1900)	-	66... (750)	68... (1000)	182
0.002										202
0.0022										222
0.0024										242
0.0027	6.0 x 12.0 (14.0) x 12.5	1.1	60... (750)	64... (750)	62... (900)	63... (1500)	-	66... (600)	68... (850)	272
0.003										302
0.0033										332
0.0036										362

Notes

(1) Net weight for short lead component

(2) l_t = 3.5 ± 0.3 mm for pitch = 15 mm

• SPQ = Standard Packing Quantity

C (µF)	Dimensions w x h (h') x l (mm)	Mass (g) [1]	CATALOG NUMBER BFC2 385 XXYYY AND PACKAGING							
			LOOSE IN BOX		REEL			AMMOPACK		C VALUE
			Leads 3.5 + 1/ - 0.5 mm [2]	Leads 25.0 ± 2.0 mm	Original pitch	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 365 mm	Original pitch	Pitch = 7.5 mm (bent back)	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	..YYY
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm					**Pitch = 15.0**	**Pitch = 7.5 mm (bent back)**				
0.00047	5.0 x 11.0 (13.0) x 17.5	1.1	**80...** (1250)	**84...** (1000)	**82...** (1100)	**83...** (950)	**85...** (550)	-		**471**
0.00051										**511**
0.00056										**561**
0.00062										**621**
0.00068										**681**
0.00075										**751**
0.00082										**821**
0.00091										**911**
0.0010										**102**
0.0011										**112**
0.0012										**122**
0.0013										**132**
0.0015										**152**
0.0016										**162**
0.0018										**182**
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm					**Pitch = 15.0**	**Pitch = 7.5 mm (bent back)**				
0.0020	5.0 x 11.0 (13.0) x 17.5	1.1	**80…** (1250)	**84…** (1000)	**82…** (1100)	**83…** (950)	**85…** (550)	-		**202**
0.0022										**222**
0.0024										**242**
0.0027										**272**
0.0030										**302**
0.0033										**332**
0.0036										**362**
0.0039			**60…** (1250)	**64…** (1000)	**62…** (1100)	**63…** (950)	**65…** (550)			**392**
0.0043										**432**
0.0047										**472**
0.0051	6.0 x 12.0 (14.0) x 17.5	1.4	**60…** (1000)	**64…** (1000)	**62…** (900)	**63…** (800)	**65…** (450)			**512**
0.0056										**562**
0.0062										**622**
0.0068										**682**
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm					**Pitch = 15.0**	**Pitch = 7.5 mm (bent back)**				
0.0075	7.0 x 13.5 (15.5) x 17.5	2	**60…** (1000)	**64…** (500)	**62…** (800)	**63…** (700)	**65…** (400)	-		**752**
0.0082										**822**
0.0091										**912**
0.010										**103**
0.011	8.5 x 15.0 (17.0) x 17.5	2.5	**60…** (1000)	**64…** (500)	**62…** (650)	**63…** (550)	**65…** (300)			**113**
0.012										**123**
0.013										**133**
0.015	10.0 x 16.5 (18.5) x 17.5	3.3	**60…** (500)	**64…** (500)	**62…** (600)	**63…** (500)	**65…** (250)			**153**
0.016										**163**
0.018										**183**
0.020										**203**

Notes

(1) Net weight for short lead component

(2) l_t = 3.5 ± 0.3 mm for pitch = 15 mm

• SPQ = Standard Packing 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/doc?28139 or end of catalog

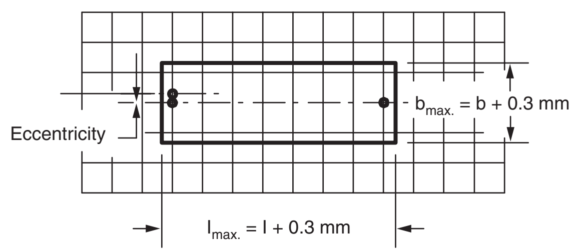
Specific Method of Mounting to Withstand Vibration and Shock

In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board. The capacitors shall be mechanically fixed by the leads.

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

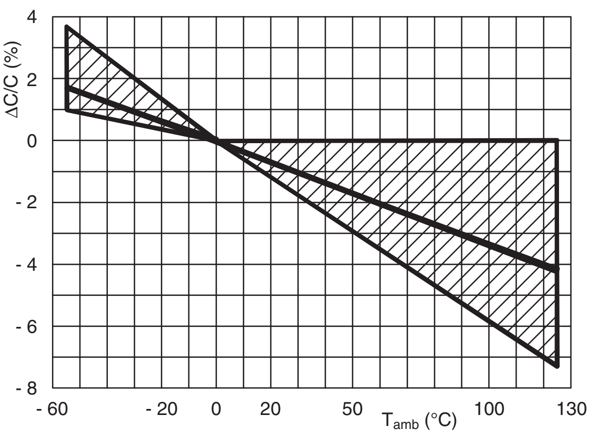
Ratings and Characteristics Reference Conditions

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 %.

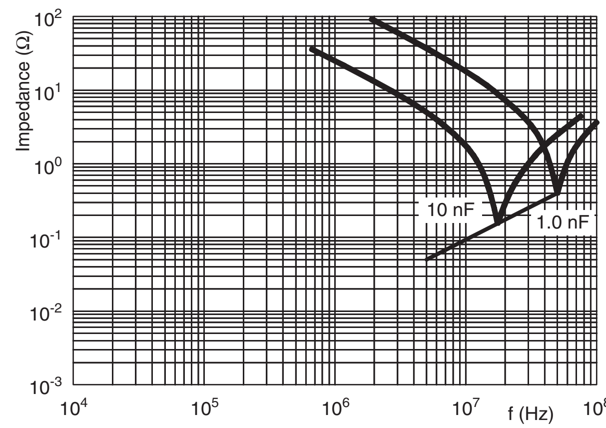
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

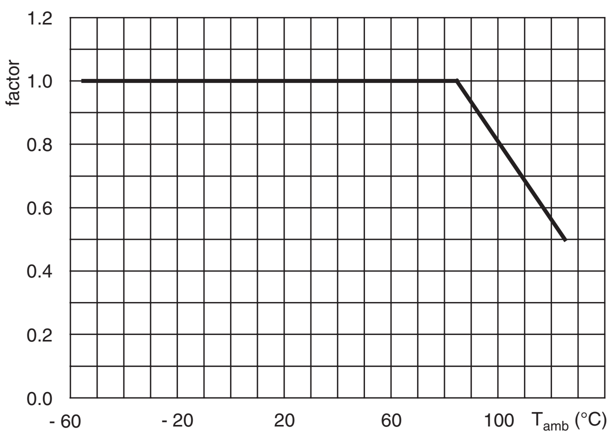
Capacitance as a function of ambient temperature (typical curve) (1 kHz)



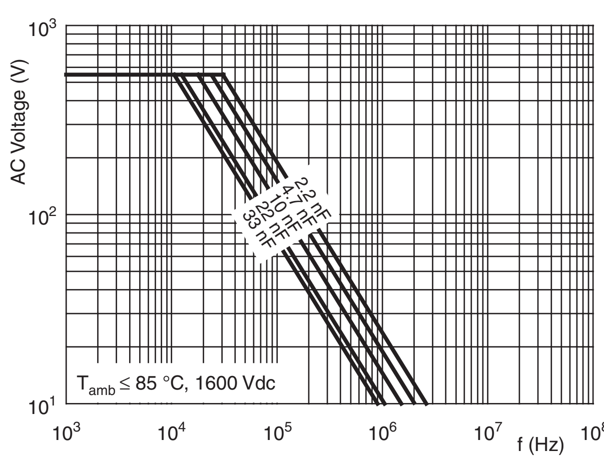
Impedance as a function of frequency (typical curve)



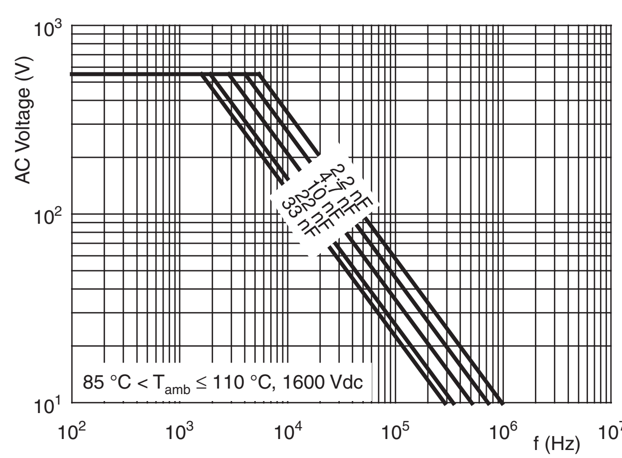
Max. DC and AC voltage as a function of temperature



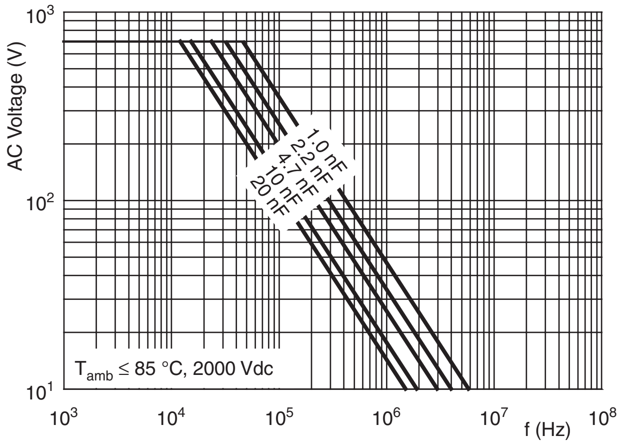
Max. RMS voltage as a function of frequency



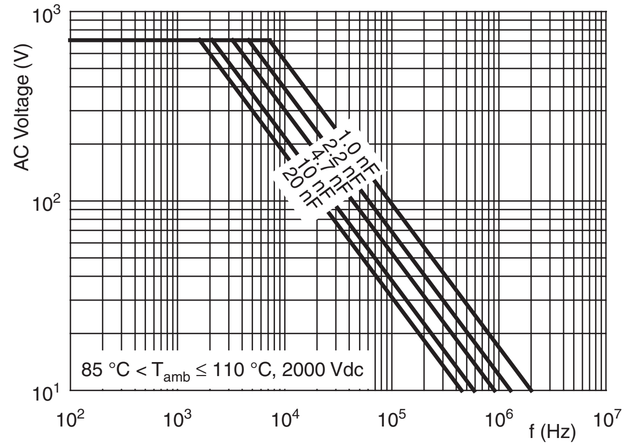
Max. RMS voltage as a function of frequency



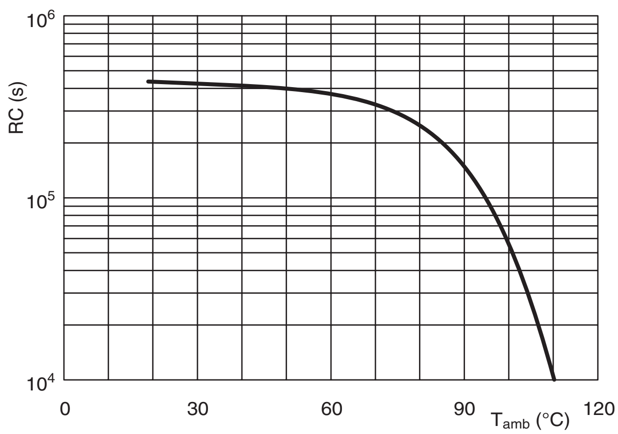
Max. RMS voltage as a function of frequency



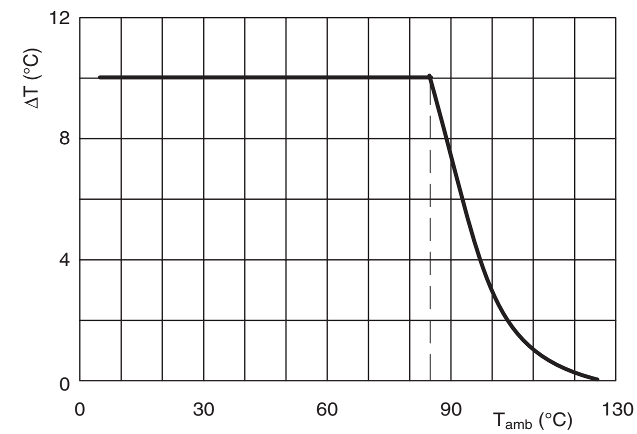
Max. RMS voltage as a function of frequency



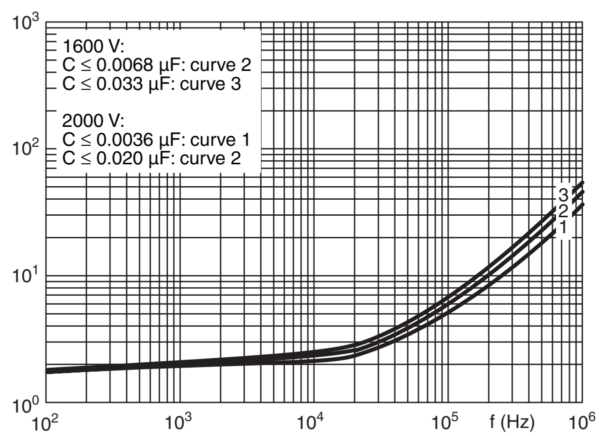
Insulation resistance as a function of ambient temperature (typical curve)



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



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



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)	
	PITCH 10 mm	PITCH 15 mm
4.0	6.5	-
5.0	7.5	10
6.0	9.0	11
7.0	-	12
8.5	-	16
10.0	-	18

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.

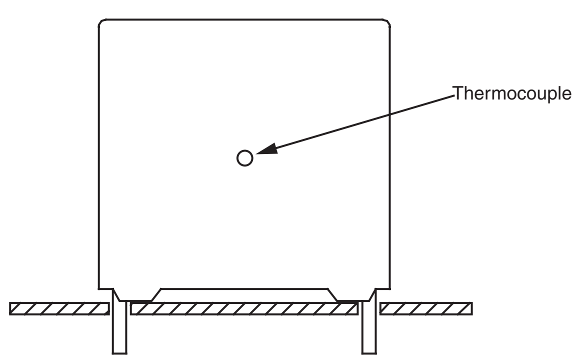
The power dissipation can be calculated according type detail specification “HQN-384-01/101: Technical Information Film Capacitors” with the typical tgd of the curves.

The component temperature rise (ΔT) can be measured (see section “Measuring the Component Temperature” for more details) or calculated by $\Delta T = P/G$:

- 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 the maximum (U_{p-p}) to avoid the ionisation inception level
3. The voltage peak slope (dU/d_t) 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:

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

   T is the pulse duration
4. The maximum component surface temperature rise must be lower than the limits (see figure max allowed component temp 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	$T_{amb} \le 85$ °C	85 °C < $T_{amb} \le 110$ °C	110 °C < $T_{amb} \le 125$ °C
Maximum continuous RMS voltage	U_{Rac}	0.7 x U_{Rac}	0.5 x U_{Rac}
Maximum temporary RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	0.875 x U_{Rac}	0.625 x U_{Rac}
Maximum peak voltage (V_{o-p}) (< 2 s)	1.6 x U_{Rdc}	1.1 x U_{Rdc}	0.8 x U_{Rdc}

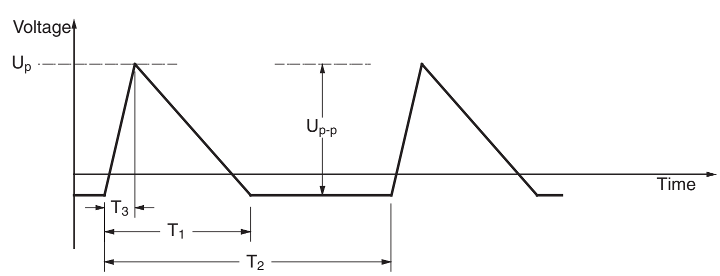
EXAMPLE

C = 4n7 1600 V used for the voltage signal shown in next figure.
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 the 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 4000 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 and pitch = 10 mm will be 35 mW/9 mW/°C = 3.9 °C
   This is lower than 10 °C temperature rise at 80 °C, acc. figure.
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

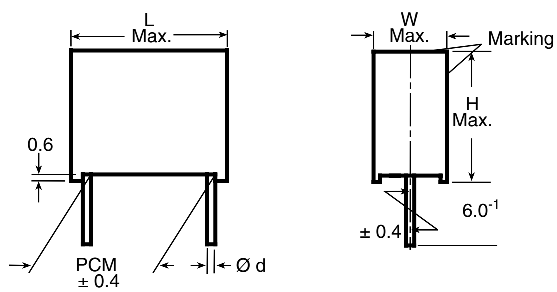
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters “General Data” of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.3 Robustness of terminations	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 ± 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 % + 5 pF of the value measured initially
	Tangent of loss angle	Increase of tan δ: $\leq$ 0.0005 Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.15 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 105 °C 5 cycles Duration t = 30 min	
4.6.1 Inspection	Visual examination	
4.7 Vibration	Mounting: See section “Mounting” of this specification 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
4.7.2 Final inspection	Visual examination	No visible damage
4.9 Shock	Mounting: See section “Mounting” of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	For C $\lvert\Delta C/C\rvert \leq 2$ % or of the value measured in 4.6.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.0005 Compared to values measured in 4.6.1
	Insulation resistance	As specified in section “Insulating 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	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ: ≤ 0.005 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	$\lvert\Delta C/C\rvert \leq 1$ % + 5 pF of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.0005$ 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	Duration: 2000 h Temperature: 85 °C Voltage: 1.25 x U_{Rac} V_{rms}, 50 Hz Duration: 2000 h Temperature: 105 °C	
4.12.1.1 Initial measurements	Voltage: 0.875 x U_{Rac} V_{rms}, 50 Hz Capacitance Tangent of loss angle at 100 kHz	
4.12.1.3 Final measurements	Visual examination	No visible damage Legible marking Temperature: 85 °C
	Capacitance	$\|\Delta C/C\| \leq 5$ % for C > 10 nF $\|\Delta C/C\| \leq 8$ % for C ≤ 10 nF compared to values measured in 4.12.1.1
	Tangent of loss angle	Increase of tan δ: ≤ 0.005 Compared to values measured in 4.12.1.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB GROUP C3B		
4.12.2 Endurance test at 50 Hz alternating voltage	Duration: 500 h Voltage:	
4.12.2.1 Initial measurements	0.625 x U_{Rac} at 125 °C Capacitance Tangent of loss angle:	
4.12.2.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 10$ % for C + 100 pF compared values measured in 4.42.2.1
	Tangent of loss angle	Increase of tan δ: ≤ 0.0005 Compared to values measured in 4.12.2.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C4		
4.2.6 Temperature characteristics Initial measurements Intermediate measurements	Capacitance Capacitance at - 55 °C Capacitance at - 20 °C Capacitance at + 125 °C	For - 55 °C to + 20 °C: + 1 % ≤ $\|\Delta C/C\|$ ≤ 3.75 % or for 20 °C to 125 °C - 7.5 % ≤ $\|\Delta C/C\|$ ≤ 0 % compared to values measured in 4.12.1.1
Final measurement	Capacitance Insulation resistance	As specified in section “Capacitance” of this specification As specified in chapters “Insulation Resistance” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C4		
4.13 Charge and discharge	10 000 cycles Charged to U_R Vdc Discharge resistance: $R = \frac{U_R}{C \times 2.5 \times (dU/dt)_R}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle: at 100 kHz or	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 1$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ: ≤ 0.0005 Compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP ADD 1		
A.1 Ignition of lamp test		
A.1.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
A.1. 2 Ignition of lamp test	Temperature: 85 °C 1000 cycles: 1 s ON 29 s OFF Frequency: 60 kHz Voltage: 1600 V type: 2800 V_{pp} 2000 V type: 3000 V_{pp}	
A.1. 2 Final measurements	Visual examination Capacitance	No visible damage $\lvert\Delta C/C\rvert \leq 5$ % of the value measured in
	Tangent of loss angle at 100 kHz	A.1.1Increase of tan δ: ≤ 0.0005 Compared to values measured in A.1.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification

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



Dimensions in millimeters

PITCH (mm)	W (mm)	Ø d_t (mm)
7.5 and 10	-	0.6 ± 0.06
15 and 37.5	< 16.0	0.8 ± 0.08
15 and 37.5	≥ 16.0	1.0 ± 0.1

APPLICATIONS
High voltage, high current and high pulse operations. Protection circuits in SMPS's, snubber and electronic ballast circuits.

REFERENCE STANDARDS
IEC 60384-16

MARKING
C-value; tolerance; rated voltage; manufacturer's type; code for dielectric material; manufacturer location; manufacturer's logo; year and week

DIELECTRIC
Polypropylene film

ELECTRODES
Metallized

CONSTRUCTION
Internal series construction

RATED DC VOLTAGES
250 V, 400 V, 630 V, 1000 V, 1600 V, 2000 V

RATED AC VOLTAGES
160 V, 220 V, 250 V, 400 V, 600 V, 650 V, 700 V

FEATURES
7.5 mm to 37.5 mm lead pitch, supplied loose in box, taped on reel and ammopack.
RoHS compliant

RECOMMENDED SERIES

PITCH	TYPE
7.5	1841
10	1841M
15	see 383
22.5	see 383
27.5	see 383
37.5	1841M

Vdc/Vac	TYPE
630 /400	1841M

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

CLIMATIC TESTING CLASS ACC. TO EN 60068-1
55/100/56

CAPACITANCE RANGE
470 pF to 4.7 µF

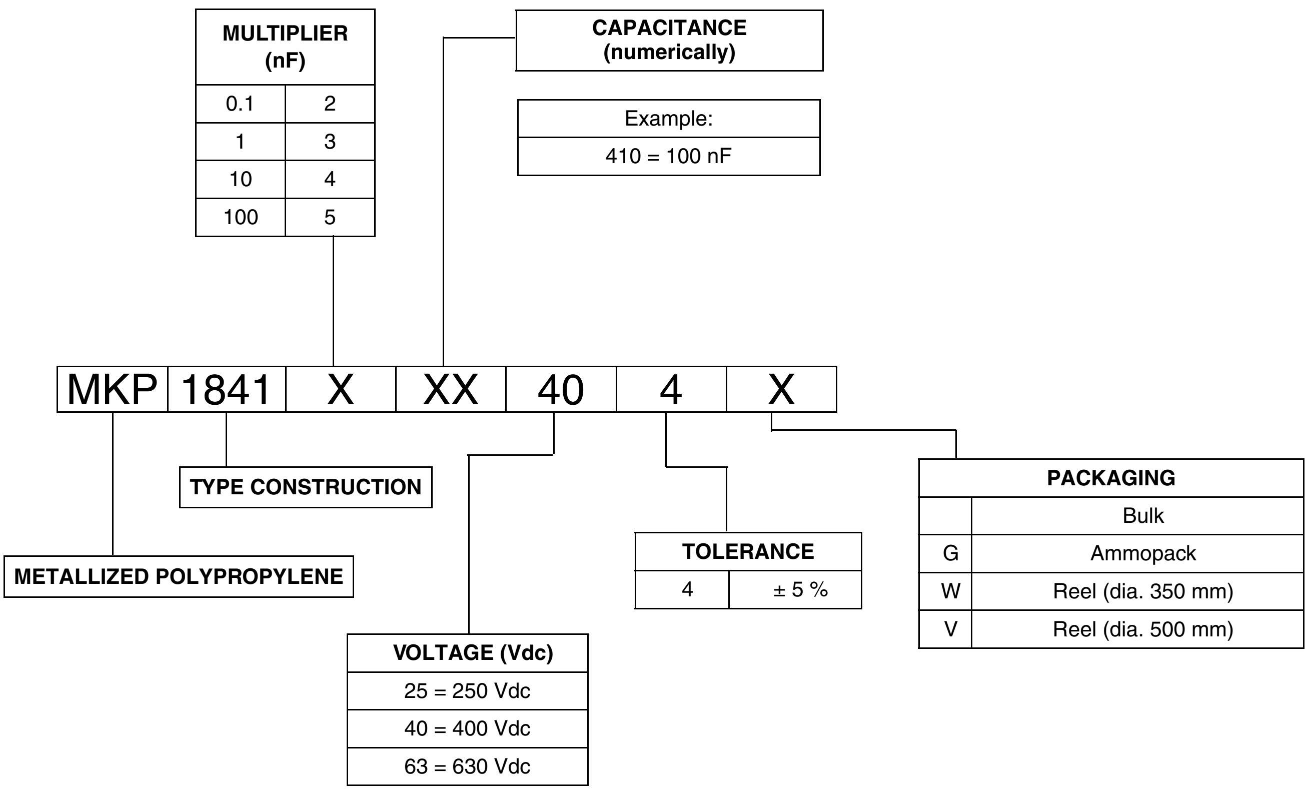
CAPACITANCE TOLERANCE
± 5 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
100 °C

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

COMPOSITION OF CATALOG NUMBER



Note

For detailed tape specifications refer to "Packaging Information" www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 1841

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
C ≤ 0.1 µF	3×10^{-4}	4×10^{-4}	15×10^{-4}
0.1 µF < C ≤ 1.0 µF	3×10^{-4}	5×10^{-4}	-
C > 1.0 µF	3×10^{-4}	-	-
Pitch (mm)	Maximum pulse rise time $(dU/dt)_R$ [V/µs]		
	250 Vdc	400 Vdc	630 Vdc/250 Vac
7.5	1800	2200	3600
R between leads, for C ≤ 0.33 µF at 100 V; 1 min			> 100 000 MΩ
RC between leads and case; 100 V; 1 min			> 30 000 MΩ
Withstanding (DC) voltage between leads and case			2840 V; 1 min
Maximum application temperature			100 °C

Tables 1841

CAP.	CAP. CODE	VOLTAGE CODE 25 250 Vdc/160 Vac				VOLTAGE CODE 40 400 Vdc/220 Vac				VOLTAGE CODE 63 630 Vdc/250 Vac			
		w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)
470 pF	147	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
680 pF	168	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
1000 pF	210	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
1500 pF	215	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
2200 pF	222	-	-	-	-	-	-	-	-	3.0	8.5	10.0	7.5
3300 pF	233	-	-	-	-	-	-	-	-	4.0	9.0	10.0	7.5
4700 pF	247	-	-	-	-	4.5	9.5	10	7.5	-	-	-	-
6800 pF	268	4.0	9.0	10.0	7.5	5.0	10.5	10.3	7.5	-	-	-	-
0.010 µF	310	4.5	9.5	10.0	7.5	-	-	-	-	-	-	-	-
0.015 µF	315	4.5	9.5	10.0	7.5	-	-	-	-	-	-	-	-

RECOMMENDED PACKAGING

LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)	REEL DIAMETER (mm)	ORDERING CODE EXAMPLES
G	Ammo	18.5	-	MKP 1841-247/404-G
W	Reel	18.5	350	MKP 1841-247/404-W
-	Bulk	-	-	MKP 1841-247/404

COMPOSITION OF CATALOG NUMBER: 1841M

MKP	1841	X	XX	40	4	M	X

MULTIPLIER (nF)

0.1	2
1	3
10	4
100	5

CAPACITANCE (numerically)

Example:
410 = 100 nF

METALLIZED POLYPROPYLENE

TYPE CONSTRUCTION

VOLTAGE (Vdc)

VOLTAGE (Vdc)
25 = 250 Vdc
40 = 400 Vdc
63 = 630 Vdc
10 = 1000 V
13 = 1600 V
20 = 2000 V

TOLERANCE

TOLERANCE	
4	± 5 %

MINI VERSION

PACKAGING

PACKAGING	
	Bulk
G	Ammopack
W	Reel (dia. 350 mm)
V	Reel (dia. 500 mm)

Note

For detailed tape specifications refer to "Packaging Information" www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA: 1841M

DESCRIPTION					VALUE		
Tangent of loss angle:					at 1 kHz	at 10 kHz	at 100 kHz
$C \leq 0.1$ µF					3×10^{-4}	4×10^{-4}	15×10^{-4}
0.1 µF $< C \leq 1.0$ µF					3×10^{-4}	5×10^{-4}	-
$C > 1.0$ µF					3×10^{-4}	-	-
Pitch (mm)	Maximum pulse rise time $(dU/dt)_R$ [V/µs]						
	250 Vdc	400 Vdc	630 Vdc/250 Vac	630 Vdc/400 Vac	1000 Vdc	1600 Vdc	2000 Vdc
10	865	1297	2162	-	-	-	-
15	-	-	-	2703	-	-	-
22.5	-	-	-	1441	-	-	-
27.5	-	-	-	1081	-	-	-
37.5	133	200	-	-	1044	1313	1602
R between leads, for $C \leq 0.33$ µF at 100 V; 1 min						> 100 000 MΩ	
RC between leads and case; for $C \leq 0.33$ µF at 100 V; 1 min						> 30 000 MΩ	
RC between leads and case: 100 V; 1 min						> 30 000 MΩ	
Withstanding (DC) voltage between leads and case						2840 V; 1 min	
Maximum application temperature						100 °C	

Tables 1841

Cap.	Cap. Code	VOLTAGE CODE 25 250 Vdc/160 Vac				VOLTAGE CODE 40 400 Vdc/220 Vac				VOLTAGE CODE 63 630 Vdc/250 Vac				VOLTAGE CODE 63 630 Vdc/400 Vac			
		w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)
470 pF	147	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0	-	-	-	-
680 pF	168	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0	-	-	-	-
1000 pF	210	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0	-	-	-	-
1500 pF	215	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0	-	-	-	-
2200 pF	222	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0	-	-	-	-
3300 pF	233	-	-	-	-	-	-	-	-	3.5	8.0	13.0	10.0	-	-	-	-
4700 pF	247	-	-	-	-	-	-	-	-	4.0	9.0	13.0	10.0	-	-	-	-
6800 pF	268	-	-	-	-	-	-	-	-	4.5	9.5	13.0	10.0	-	-	-	-
0.01 µF	310	-	-	-	-	4.0	9.0	13.0	10.0	5.5	10.5	13.0	10.0	-	-	-	-
0.015 µF	315	-	-	-	-	4.0	9.0	13.0	10.0	6.5	11.5	13.0	10.0	5.5	10.5	18.0	15 (1)
0.022 µF	322	4.0	9.0	13.0	10.0	5.5	10.5	13.0	10.0	9.0	15.5	13.0	10.0	6.5	12.5	18.0	15 (1)
0.033 µF	333	4.5	9.5	13.0	10.0					9.0	15.5	13.0	10.0	7.5	13.5	18.0	15 (1)
0.047 µF	347	5.5	10.5	13.0	10.0					10.5	17.5	13.0	10.0	8.5	14.5	18.0	15 (1)
0.068 µF	368	6.5	11.5	13.0	10.0									7.5	15.5	26.5	22.5
0.10 µF	410													8.5	16.5	26.5	22.5
0.15 µF	415					For remaining information check website MKP 1841M, for new designs select MMKP383				For remaining information check website MKP 1841M, for new designs select MMKP 383				10.5	18.5	26.5	22.5
0.22 µF	422													11.5	20.5	31.5	27.5
0.33 µF	433	For remaining information check website MKP 1841M, for new designs select MMKP 383												13.5	23.5	31.5	27.5
0.47 µF	447													18.0	28.0	31.5	27.5
0.68 µF	468													18.0	33.0	31.5	27.5
1.0 µF	510													-	-	-	-
1.5 µF	515									-	-	-	-	-	-	-	-
2.2 µF	522					16.0	28.5	41.5	37.5	-	-	-	-	-	-	-	-
3.3 µF	533					-	-	-	-	-	-	-	-	-	-	-	-
4.7 µF	547	18.0	32.5	41.5	37.5	-	-	-	-	-	-	-	-	-	-	-	-

Note

(1) Ordering code -2M for pitch 15 (e.g. MKP 1841-322/634-2M)

Cap.	Cap. Code	VOLTAGE CODE 10 1000 Vdc/600 Vac				VOLTAGE CODE 13 1600 Vdc/650 Vac				VOLTAGE CODE 20 2000 Vdc/700 Vac			
		w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)	w (mm)	h (mm)	l (mm)	Pitch (mm)
470 pF	147	-	-	-	-	-	-	-	-				
680 pF	168	-	-	-	-	-	-	-	-				
1000 pF	210	-	-	-	-	-	-	-	-				
1500 pF	215	-	-	-	-	-	-	-	-				
2200 pF	222	-	-	-	-	-	-	-	-				
3300 pF	233	-	-	-	-					For remaining information check website MKP 1841M, for new designs select MMKP 383			
4700 pF	247												
6800 pF	268												
0.01 µF	310												
0.015 µF	315					For remaining information check website MKP 1841M, for new designs select MMKP 383							
0.022 µF	322												
0.033 µF	333	For remaining information check website MKP 1841M, for new designs select MMK P383											
0.047 µF	347												
0.068 µF	368												
0.10 µF	410									14.5	24.5	41.5	37.5
0.15 µF	415									16.0	28.5	41.5	37.5
0.22 µF	422					16.0	28.5	41.5	37.5	18.0	32.5	41.5	37.5
0.33 µF	433					-	-	-	-	-	-	-	-
0.47 µF	447	18.0	32.5	41.5	37.5	-	-	-	-	-	-	-	-

RECOMMENDED PACKAGING

LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)	REEL DIAMETER (mm)	ORDERING CODE EXAMPLES	PITCH ≤ 15	PITCH 22.5 TO 27.5	PITCH 37.5
G	Ammo	18.5	-	MKP 1841-310/404-MG	X	-	-
W	Reel	18.5	350	MKP 1841-310/404-MW	X	-	-
V	Reel	18.5	500	MKP 1841-410/634-MV	-	X	-
G	Ammo	18.5	-	MKP 1841-410/634-MG	-	X	-
-	Reel	-	-	MKP 1841-410/634-M	X	X	X

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

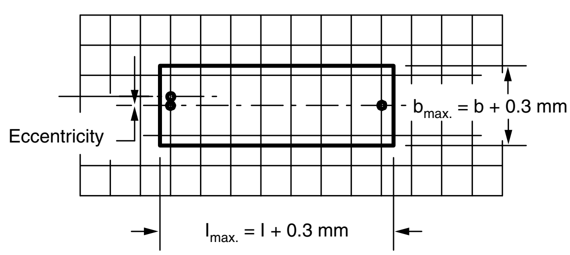
In order to withstand vibration and shock tests, it must be ensure that the stand-off pips are in good contact with the printed-circuit board:

- 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:

- Product height with seating plane as given by "IEC 60717" as reference: $h_{max.} \leq h + 0.3$ mm
- Eccentricity as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned



Storage Temperature

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

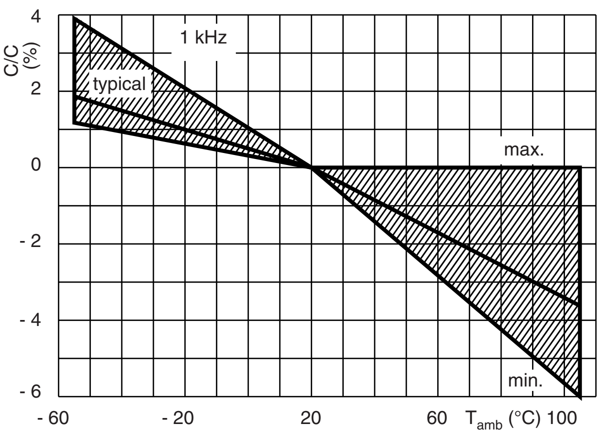
Ratings and Characteristics Reference Conditions

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 %.

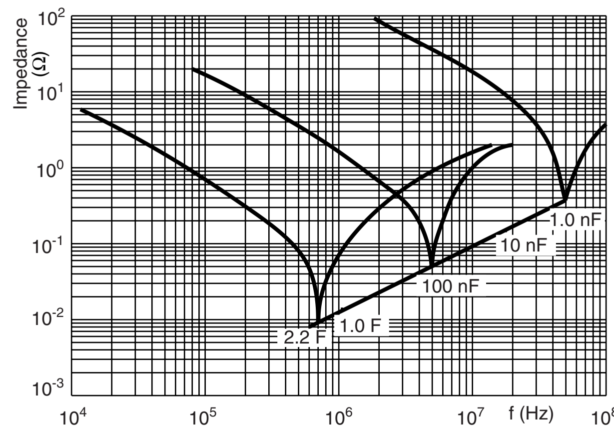
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

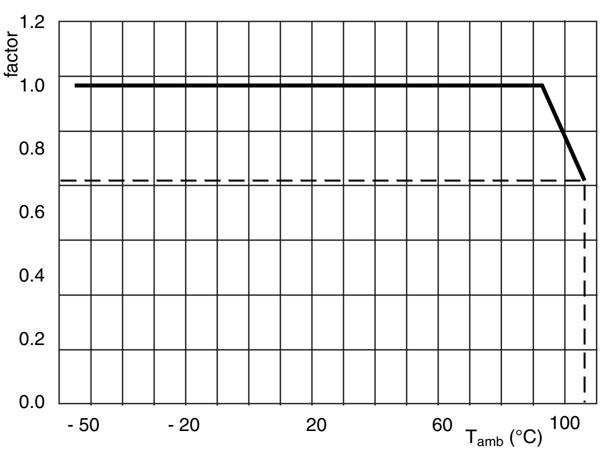
Capacitance as a function of ambient temperature (typical curve) (1 kHz)



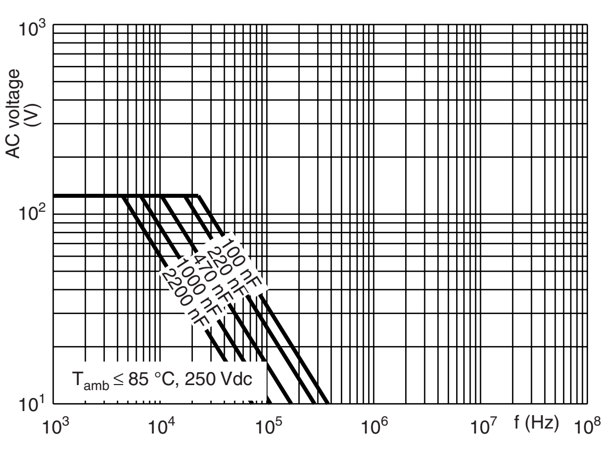
Impedance as a function of frequency (typical curve)



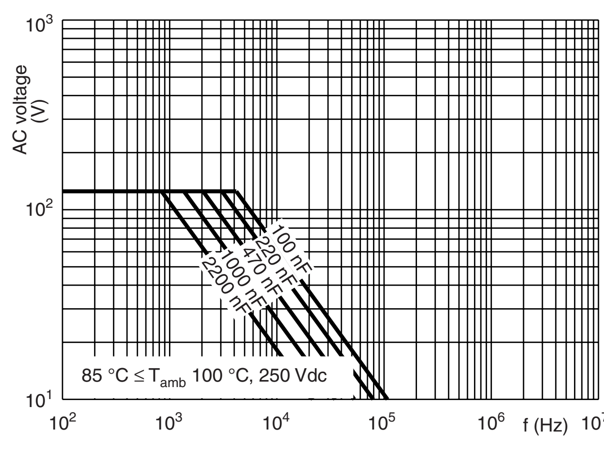
Max. DC and AC voltage as function of temperature



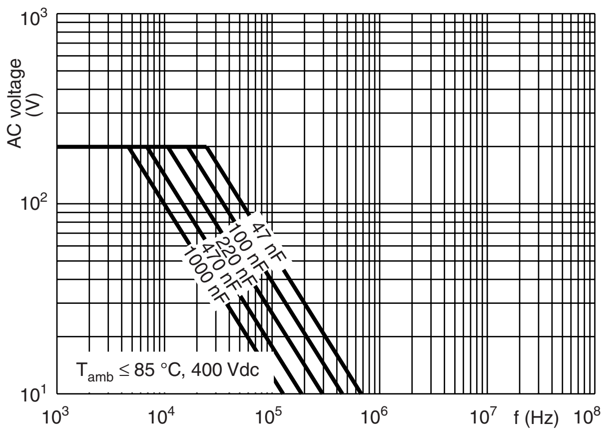
Max. RMS voltage as a function of frequency



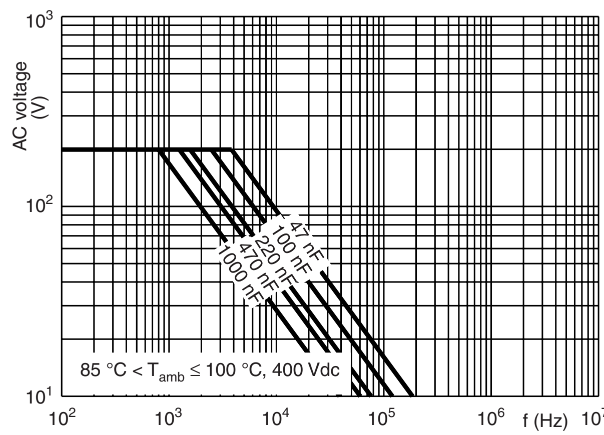
Max. RMS voltage as a function of frequency



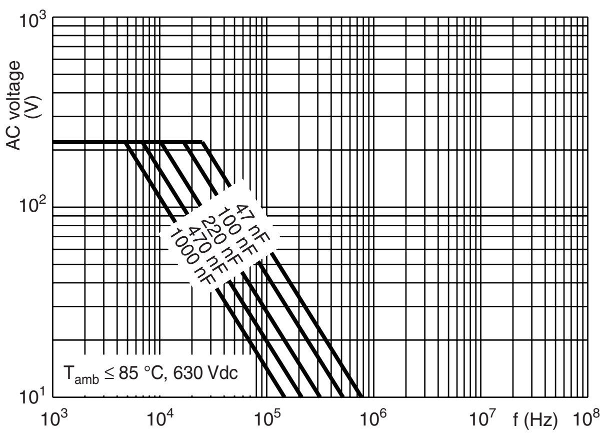
Max. RMS voltage as a function of frequency



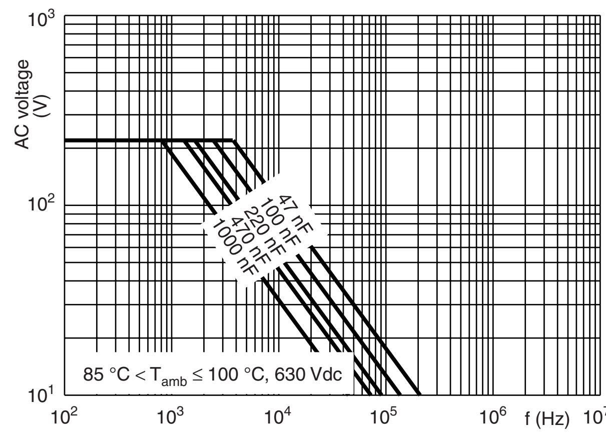
Max. RMS voltage as a function of frequency



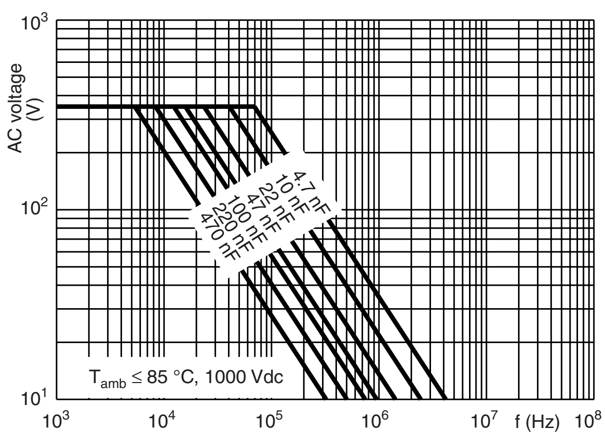
Max. RMS voltage as a function of frequency



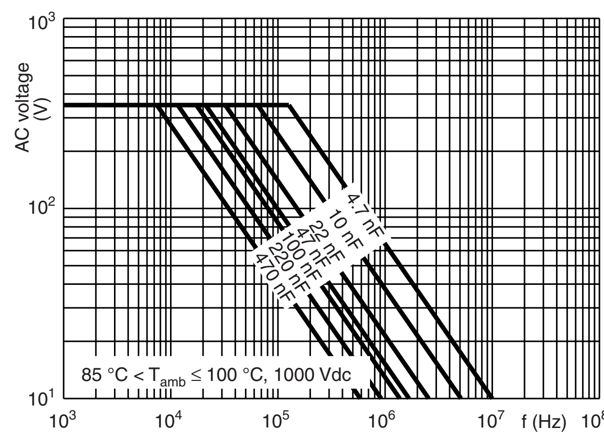
Max. RMS voltage as a function of frequency



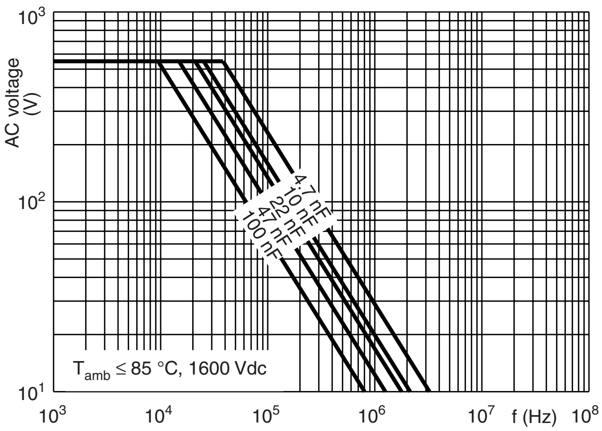
Max. RMS voltage as a function of frequency



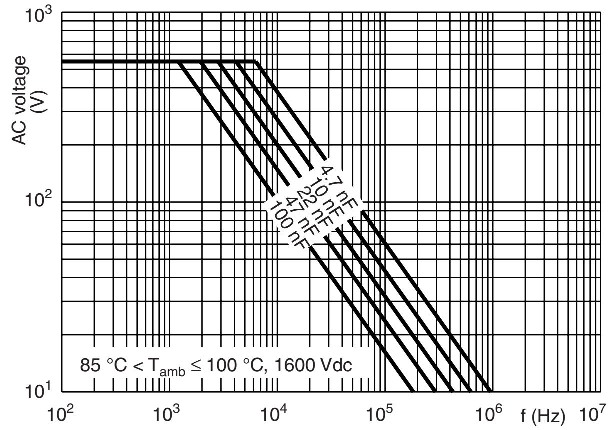
Max. RMS voltage as a function of frequency



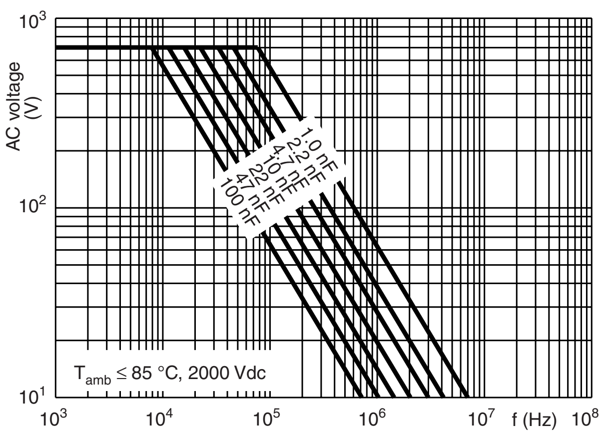
Max. RMS voltage as a function of frequency



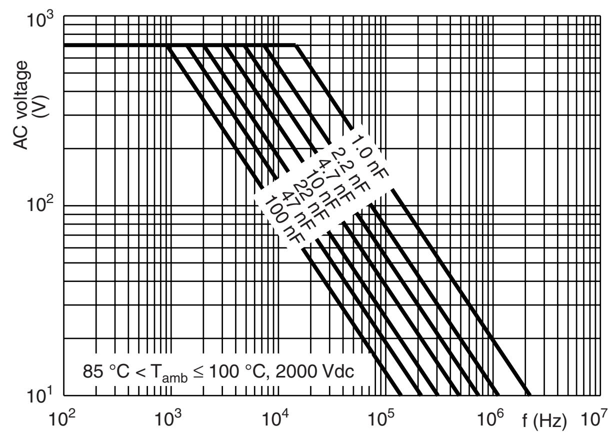
Max. RMS voltage as a function of frequency



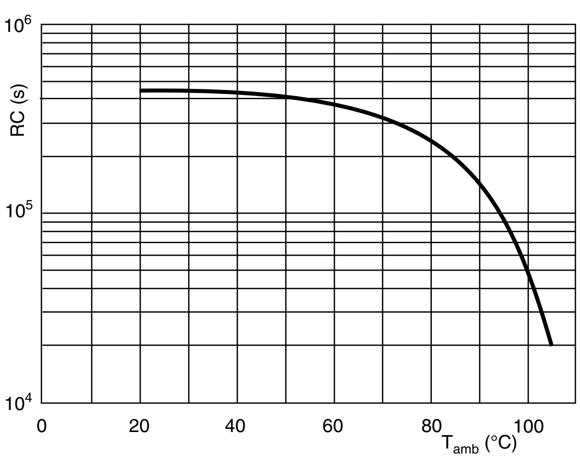
Max. RMS voltage as a function of frequency



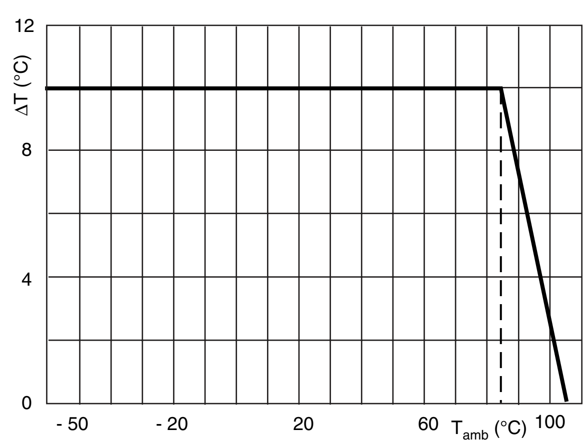
Max. RMS voltage as a function of frequency



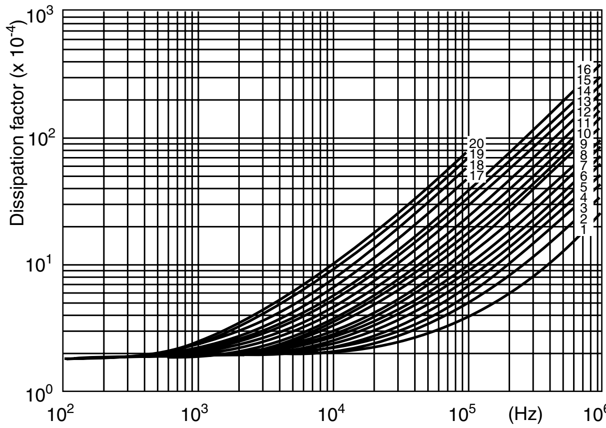
Insulation resistance as a function of ambient temperature



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	1600 V	2000 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 ≤ 0.0047 µF, curve 3	C ≤ 0.0047 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 ≤ 0.0091 µF, curve 4	C ≤ 0.033 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 ≤ 0.068 µF, curve 5	C ≤ 0.1 µF, curve 4
C ≤ 0.027 µF, curve 11	C ≤ 0.2 µF, curve 8	C ≤ 0.15 µF, curve 7	C ≤ 0.062 µF, curve 5	C ≤ 0.01 µF, curve 6	
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 ≤ 0.15 µF, curve 7	
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 ≤ 0.47 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 ≤ 1.6 µF, curve 19	C ≤ 1.1 µF, curve 17		C ≤ 0.3 µF, curve 10		
C ≤ 2.2 µF, curve 20			C ≤ 0.39 µF, curve 11		

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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)					
	PITCH 7.5 mm	PITCH 10 mm	PITCH 15 mm	PITCH 22.5 mm	PITCH 27.5 mm	PITCH 37.5 mm
3.0	4	-	-	-	-	-
4.0	5	6	-	-	-	-
4.5	5	7	-	-	-	-
5.0	6	-	-	-	-	-
5.5	-	8	10	-	-	-
6.5	-	9	13	20	-	-
7.5	-	-	14	22	-	-
8.5	-	-	16	24	-	-
9.0	-	-	-	25	31	-
10.5	-	-	-	29	-	-
11.0	-	-	-	32	-	-
11.5	-	-	-	-	37	-
12.5	-	-	-	-	-	51
13.5	-	-	-	-	44	-
14.5	-	-	-	-	-	59
15.0	-	-	-	-	48	-
16.0	-	-	-	-	-	68
16.5	-	-	-	-	58	-
18.0	-	-	-	-	66	80
20.0	-	-	-	-	73	101

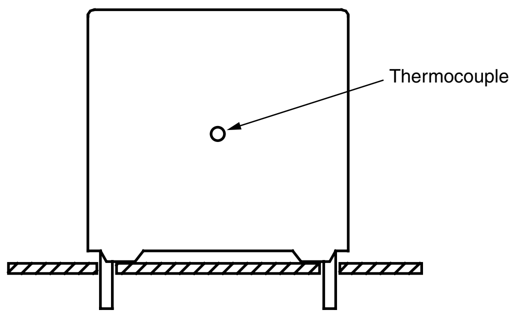
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 $\Delta T = P/G$:

- 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 the maximum (U_{p-p})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 < $T_{amb} \leq 100$ °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}

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-16 and Specific Reference Data”.

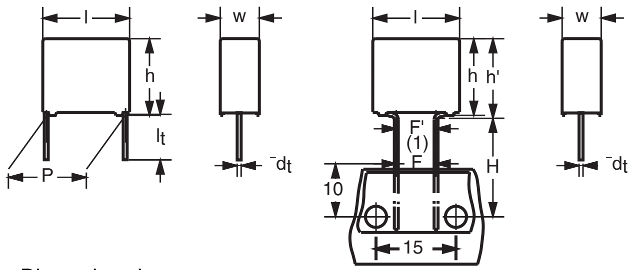
Group C Inspection Requirements

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 at 100 kHz Tensile and bending	
4.3 Robustness of terminations		No visible damage
4.4 Resistance to soldering heat	Method: 1A Solder bath: 280 °C ± 5 °C Duration: 5 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	$\|\Delta C/C\| \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: ≤ 0.002 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 at 100 kHz	
4.15 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5.0 min ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = lower category temperature θB = upper category temperature 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	|ΔC/C| ≤ 2 % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan δ ≤ 0.002 Compared to values measured in 4.6.1
	Insulation resistance	≥ 50 % of values 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	Visual examination	
	Capacitance	No visible damage Legible marking
	Tangent of loss angle	|ΔC/C| ≤ 3 % of the value measured initially 4.11.1
	Insulation resistance	Increase of tan δ : ≤ 0.003 Compared to values measured in 4.3.1. or 4.6.1
		≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C2		
4.11 Damp heat steady state	Capacitance	
4.11.1 Initial measurements	Tangent of loss angle at 1 kHz Visual examination	No visible damage Legible marking
4.11.3 Final measurements	Capacitance	|ΔC/C| ≤ 3 % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.002 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 C3		
4.12 Endurance DC	Duration: 2000 h x U_{Rdc} at 85 °C 0.857 x U_{Rdc} at 100 °C	
4.12.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.12.1.1
	Tangent of loss angle	Increase of tan δ: ≤ 0.004 Compared to values measured in 4.12.1
	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 atlower category temperature Capacitance at 20 °C Capacitance at upper category temperature Capacitance Insulation resistance	 For - 55 °C to + 20 °C: 0 % $\leq \lvert\Delta C/C\rvert \leq 2$ % or for 20 °C to 85 °C: - 3 % $\leq \lvert\Delta C/C\rvert \leq 0$ % 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: $R = \frac{U_{Rdc}}{1.5 \text{ x } C(dU/dt)}$	
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	$\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ: ≤ 0.005 compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification

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

FEATURES

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 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

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

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)

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

Example:

104 = 10 x 10 = 100 nF

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

(1) Old ordering code

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES								
			C-TOL.	250 V	400 V	630 V	1000 V	1400 V	1600 V	2000 V	2500 V
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	± 5 %	01	11	21	31	41	51	61	71
		Lead length 25.0 mm ± 2.0	± 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)		..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 ± 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 ± 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 ± 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					
			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	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 ± 0.08 mm					Pitch = 15 mm	Pitch = 7.5 mm (bent back)		
0.047 0.051 0.056	5.0 x 11.0 (13.0) x 17.5	1.1	**10...** (1250)	**14...** (1000)	**12...** (1100)	**13...** (950)	**15...** (550)	**473** **513** **563**
0.062 0.068 0.075 0.082	6.0 x 12.0 (14.0) x 17.5	1.4	**10...** (1000)	**14...** (1000)	**12...** (900)	**13...** (800)	**15...** (450)	**623** **683** **753** **823**
0.091 0.1 0.11	7.0 x 13.5 (15.5) x 17.5	1.8	**10...** (750)	**14...** (500)	**12...** (800)	**13...** (700)	**15...** (400)	**913** **104** **114**
0.12 0.13 0.15 0.16	8.5 x 15.0 (17.0) x 17.5	2.5	**10...** (750)	**14...** (500)	**12...** (650)	**13...** (550)	**15...** (300)	**124** **134** **154** **164**
0.18 0.2 0.22	10.0 x 16.5 (18.5) x 17.5	3.3	**10...** (500)	**14...** (450)	**12...** (600)	**13...** (500)	**15...** (250)	**184** **204** **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 ± 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 ± 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 ≤ 0.024 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 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	> 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	

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

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 ± 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 ± 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 ± 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
$C \leq 0.062$ µF	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
0.062 µF $< C \leq$ 0.13 µF	$\leq 6 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
0.13 µF $< C \leq$ 0.22 µF	$\leq 8 \times 10^{-4}$	$\leq 25 \times 10^{-4}$
0.22 µF $< C \leq$ 0.33 µF	$\leq 8 \times 10^{-4}$	$\leq 30 \times 10^{-4}$
0.33 µF $< C \leq$ 0.47 µF	$\leq 8 \times 10^{-4}$	$\leq 35 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$:		
$C \leq 0.024$ µF	1700 V/µs	
0.024 µF $< C \leq$ 0.062 µF	3300 V/µs	
0.062 µF $< C \leq$ 0.13 µF	1200 V/µs	
0.13 µF $< C \leq$ 0.33 µF	700 V/µs	
0.33 µF $< C \leq$ 0.47 µF	470 V/µs	
R between leads, for $C \leq 1$ 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					
			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	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 ± 0.08 mm					Pitch = 15 mm	Pitch = 7.5 mm (bent back)		
0.0043 0.0047 0.0051 0.0056 0.0062 0.0068 0.0075 0.0082 0.0091 0.01 0.011 0.012 0.013 0.015 0.016	5.0 x 11.0 (13.0) x 17.5	1.1	30... (1250)	34... (1000)	32... (1100)	33... (950)	35... (550)	432 472 512 562 622 682 752 822 912 103 113 123 133 153 163
0.018 0.02 0.022 0.024	6.0 x 12.0 (14.0) x 17.5	1.4	30... (1000)	34... (1000)	32... (900)	33... (800)	35... (450)	183 203 223 243
0.027 0.030 0.033	7.0 x 13.5 (15.5) x 17.5	1.8	30... (750)	34... (500)	32... (800)	33... (700)	35... (400)	273 303 333
0.036 0.039 0.043 0.047	8.5 x 15.0 (17.0) x 17.5	2.5	30... (750)	34... (500)	32... (650)	33... (550)	35... (300)	363 393 433 473
0.051 0.056 0.062	10.0 x 16.5 (18.5) x 17.5	3.3	30... (500)	34... (450)	32... (600)	33... (500)	35... (250)	513 563 623

Notes

(1) Net weight for short lead products only

• SPQ = Standard Packaging Quantity

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

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 ± 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 ± 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
$C \leq 0.016\ \mu F$	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
$0.016\ \mu F < C \leq 0.039\ \mu F$	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
$0.039\ \mu F < C \leq 0.13\ \mu F$	$\leq 5 \times 10^{-4}$	$\leq 20 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$:		
$C \leq 0.0056\ \mu F$	8000 V/µs	
$0.0056\ \mu F < C \leq 0.016\ \mu F$	15 000 V/µs	
$0.016\ \mu F < C \leq 0.039\ \mu F$	4000 V/µs	
$0.039\ \mu F < C \leq 0.1\ \mu F$	2100 V/µs	
$0.1\ \mu F < C \leq 0.13\ \mu F$	1500 V/µs	
R between leads, for $C \leq 1\ \mu F$ 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; $U_{p\text{-}p}$ = 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					
			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	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 ± 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 ± 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 ± 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 ≤ 0.015 µF	≤ 5 x 10^{-4}	≤ 15 x 10^{-4}
0.015 µF < C ≤ 0.15 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 ≤ 0.0075 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					
			LOOSE IN BOX		REEL			C-VALUE
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 ± 0.08 mm					**Pitch = 15 mm**	**Pitch = 7.5 mm (bent back)**		
0.0027 0.003 0.0033 0.0036 0.0039	5.0 x 11.0 (13.0) x 17.5	1.1	**50...** (1250)	**54...** (1000)	**52...** (1100)	**53...** (950)	**55...** (550)	**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	**50...** (1000)	**54...** (1000)	**52...** (900)	**53...** (800)	**55...** (450)	**432** **472** **512** **562**
0.0062 0.0068 0.0075	7.0 x 13.5 (15.5) x 17.5	1.8	**50...** (750)	**54...** (500)	**52...** (800)	**53...** (700)	**55...** (400)	**622** **682** **752**
0.0082 0.0091 0.01 0.011	8.5 x 15.0 (17.0) x 17.5	2.5	**50...** (750)	**54...** (500)	**52...** (650)	**53...** (550)	**55...** (300)	**822** **912** **103** **113**
0.012 0.013 0.015	10.0 x 16.5 (18.5) x 17.5	3.3	**50...** (500)	**54...** (450)	**52...** (600)	**53...** (500)	**55...** (250)	**123** **133** **153**
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm					**Pitch = 22.5 mm**			
0.016 0.018 0.02	7.0 x 16.5 x 26.0	3.0	**50...** (200)	**54...** (250)	**52...** (550)	-	-	**163** **183** **203**
0.022 0.024 0.027 0.03	8.5 x 18.0 x 26.0	4.2	**50...** (200)	**54...** (250)	**52...** (450)	-	-	**223** **243** **273** **303**
0.033 0.036 0.039	10.0 x 19.5 x 26.0	5.3	**50...** (200)	**54...** (200)	**52...** (350)	-	-	**333** **363** **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					
			LOOSE IN BOX		REEL			C-VALUE
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 27.5 ± 0.4 mm; d_t= 0.80 ± 0.08 mm					Pitch = 27.5 mm			
0.043	11.0 x 21.0 x 31.0	8	50... (100)	54... (125)	-			433
0.047								473
0.051								513
0.056								563
0.062	13.0 x 23.0 x 31.0	9.7	50... (100)	54... (125)				623
0.068								683
0.075								753
0.082	15.0 x 25.0 x 31.0	12.6	50... (100)	54... (125)				823
0.091								913
0.1								104
0.11	18.0 x 28.0 x 31.0	16.3	50... (100)	54... (100)				114
0.12								124
0.13								134
0.15								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
$C \leq 0.01$ µF	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
0.01 µF $< C \leq$ 0.1 µF	$\leq 10 \times 10^{-4}$	$\leq 18 \times 10^{-4}$
Rated voltage pulse slope $(dU/dt)_R$:		
$C \leq$ 0.0036 µF	11 000 V/µs	
0.0036 µF $< C \leq$ 0.01 µF	20 000 V/µs	
0.01 µF $< C \leq$ 0.024 µF	4400 V/µs	
0.024 µF $< C \leq$ 0.068 µF	2500 V/µs	
0.068 µF $< C \leq$ 0.1 µF	1800 V/µs	
R between leads, for $C \leq$ 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					
			LOOSE IN BOX		REEL			C-VALUE
			Leads 3.5 ± 0.3	Leads 25.0 ± 2.0	Original pitch	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 15 mm ± 0.4 mm; d_t = 0.80 ± 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 ± 0.4 mm; d_t = 0.80 ± 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 ± 0.4 mm; d_t = 0.80 ± 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) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
Pitch = 27.5 mm ± 0.4 mm; d_t = 0.80 ± 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
$C \leq 0.015$ µF	$\leq 5 \times 10^{-4}$	$\leq 10 \times 10^{-4}$
0.015 µF < C ≤ 0.056 µF	$\leq 5 \times 10^{-4}$	$\leq 15 \times 10^{-4}$
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	

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

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 ± 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 ± 0.4 mm; d_t = 0.80 ± 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

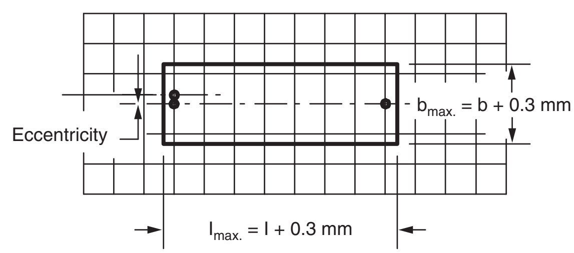
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

- 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

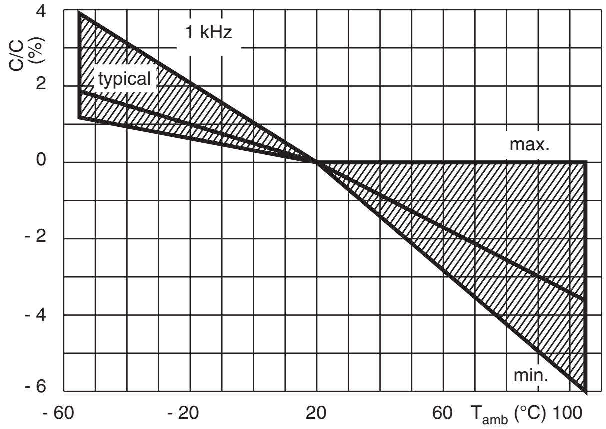
Ratings and Characteristics Reference Conditions

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 %.

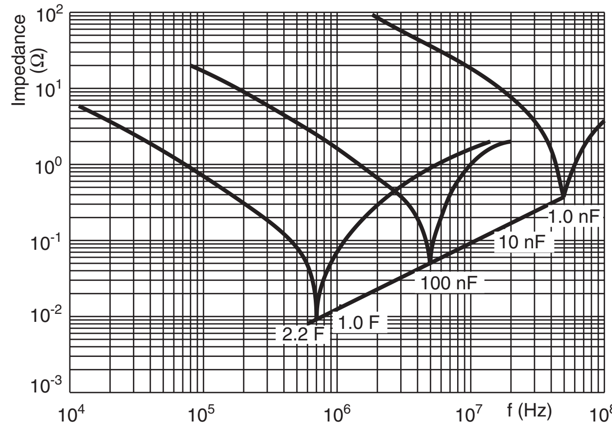
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

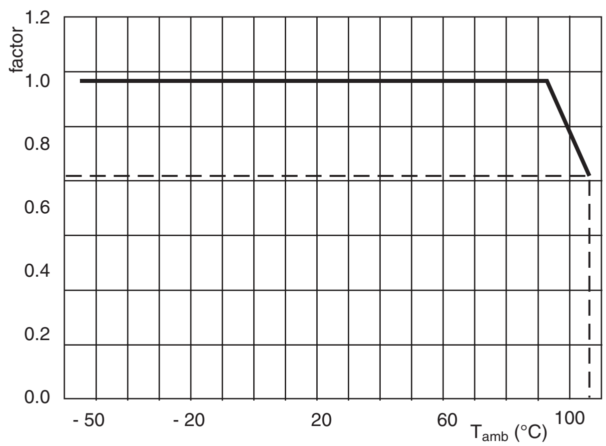
Capacitance as a function of ambient temperature (typical curve) (1 kHz)



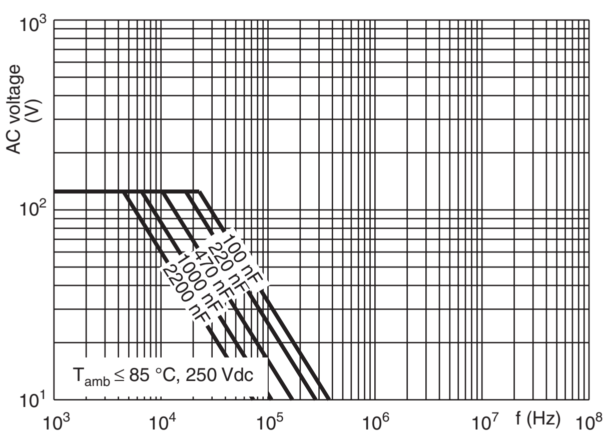
Impedance as a function of frequency (typical curve)



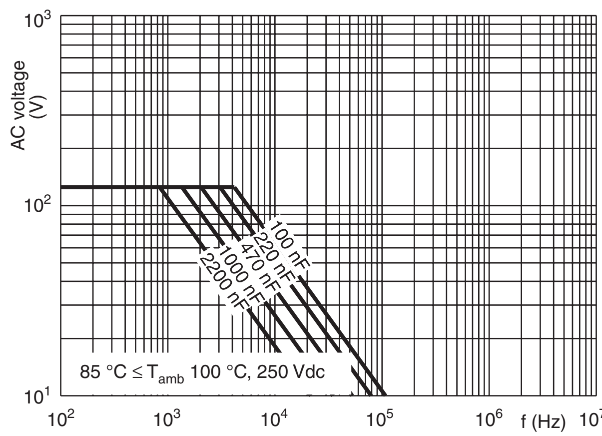
Max. DC and AC voltage as function of temperature



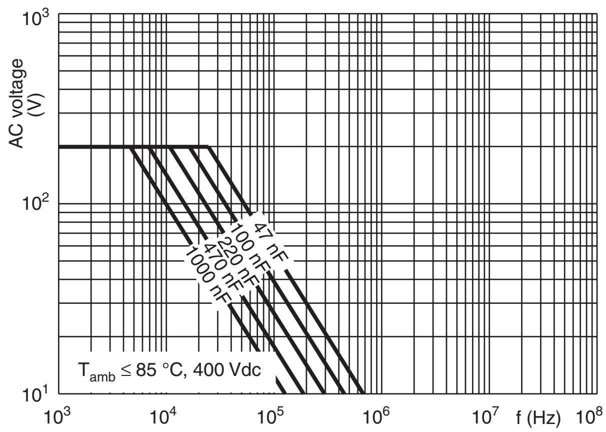
Max. RMS voltage as a function of frequency



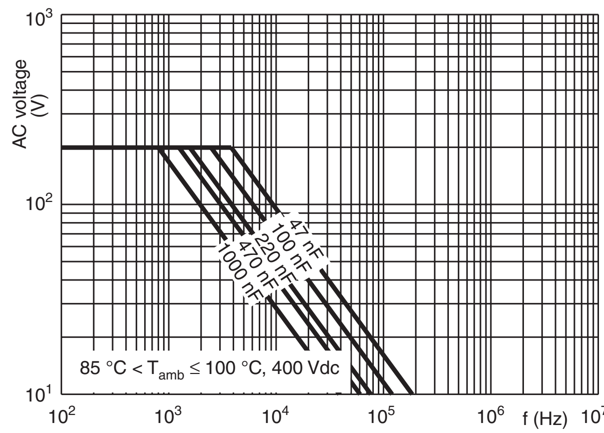
Max. RMS voltage as a function of frequency



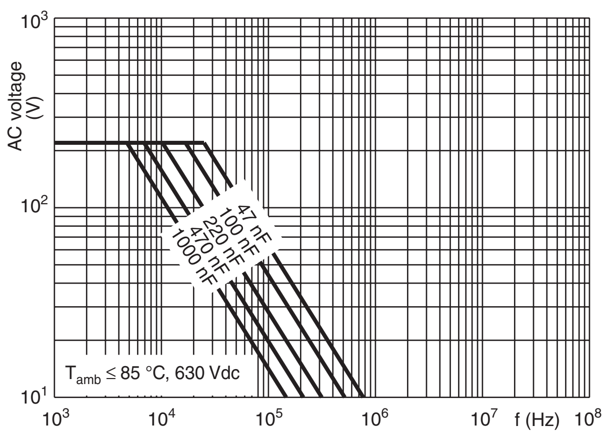
Max. RMS voltage as a function of frequency



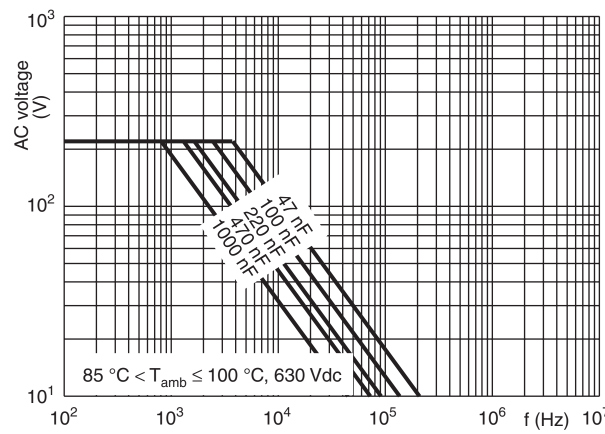
Max. RMS voltage as a function of frequency



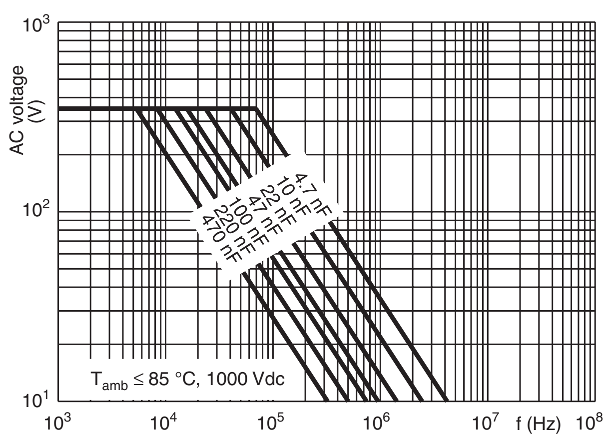
Max. RMS voltage as a function of frequency



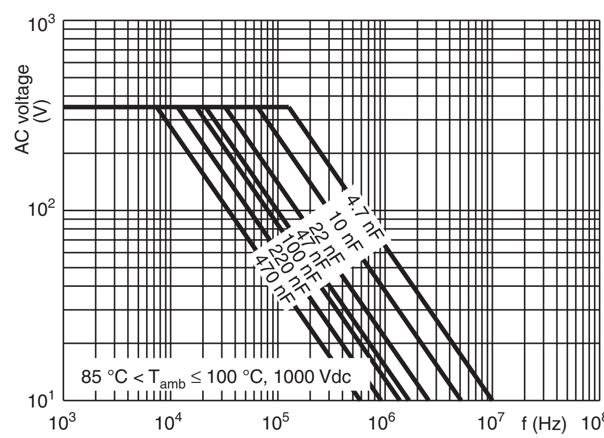
Max. RMS voltage as a function of frequency



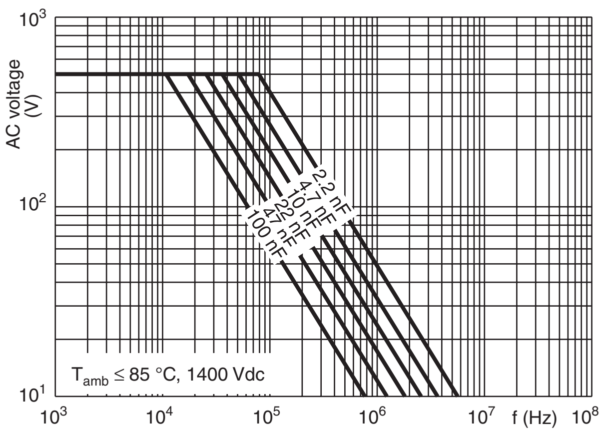
Max. RMS voltage as a function of frequency



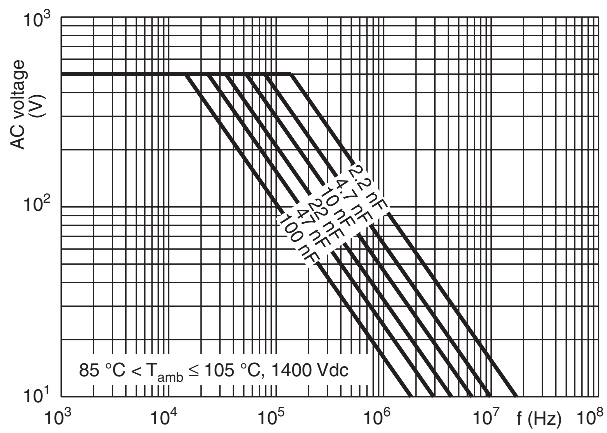
Max. RMS voltage as a function of frequency



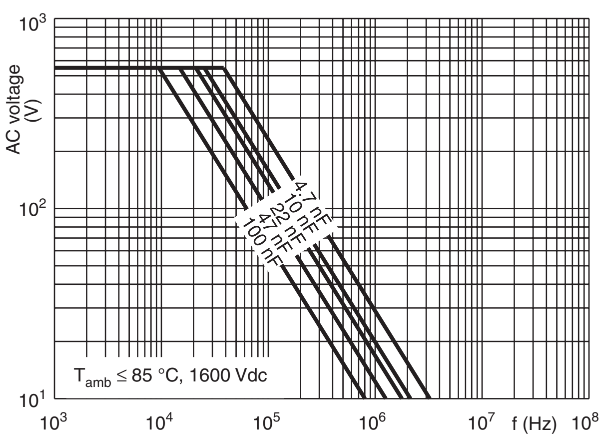
Max. RMS voltage as a function of frequency



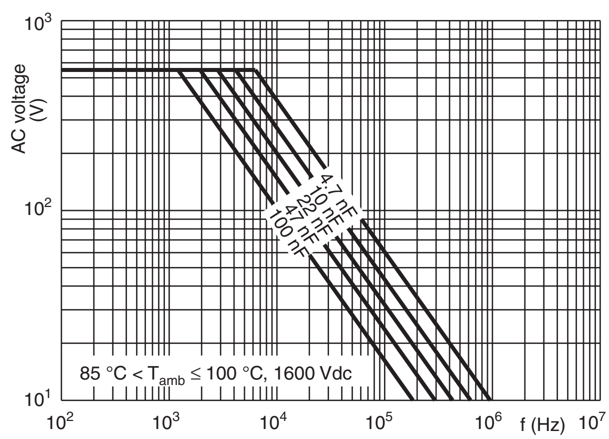
Max. RMS voltage as a function of frequency



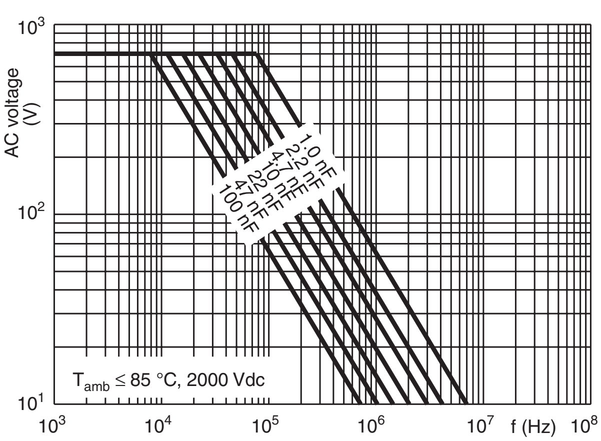
Max. RMS voltage as a function of frequency



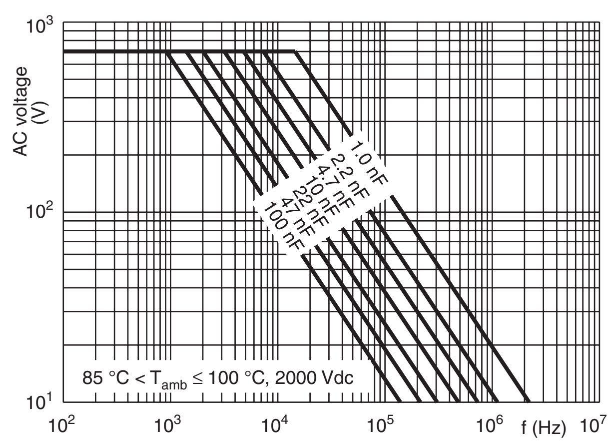
Max. RMS voltage as a function of frequency



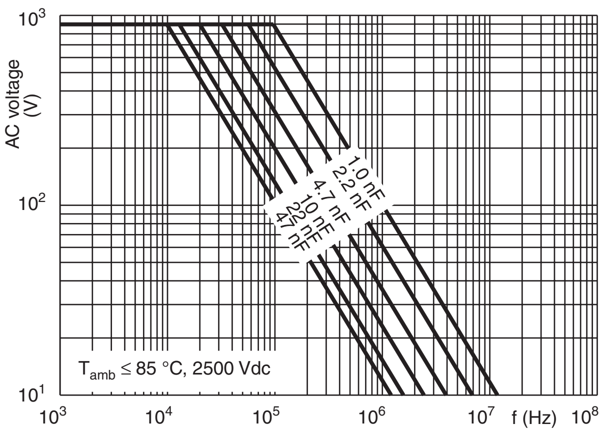
Max. RMS voltage as a function of frequency



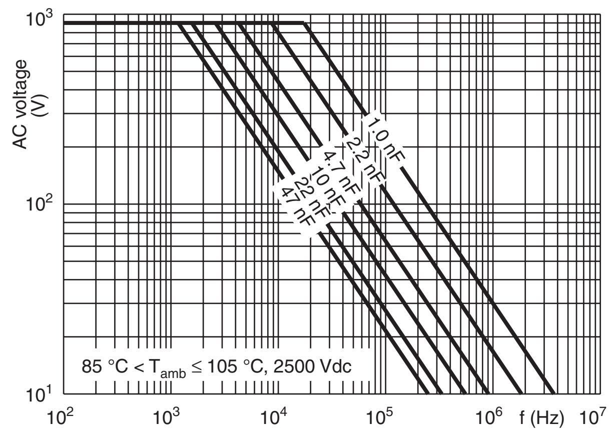
Max. RMS voltage as a function of frequency



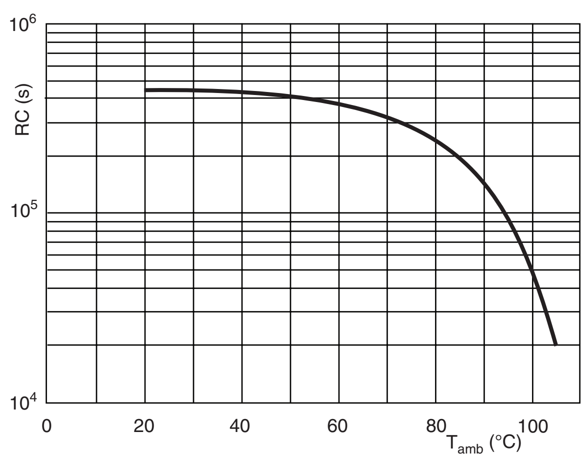
Max. RMS voltage as a function of frequency



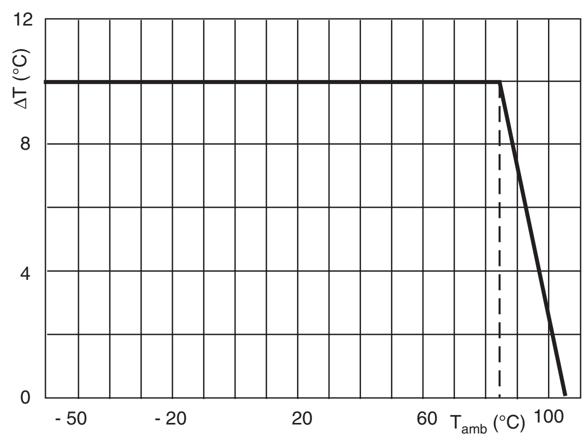
Max. RMS voltage as a function of frequency



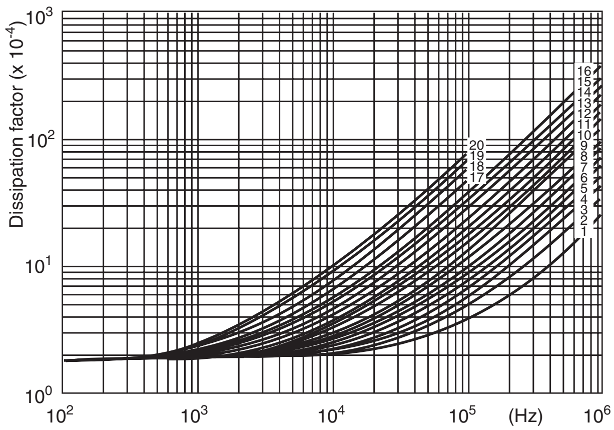
Insulation resistance as a function of ambient temperature



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.

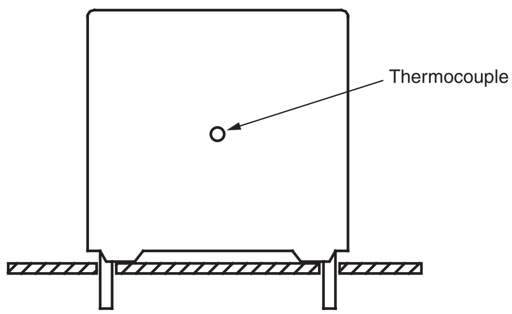
The power dissipation can be calculated according type detail specification "HQN-384-01/101: Technical Information Film Capacitors".

The component temperature rise (ΔT) can be measured (see section "Measuring the component temperature" for more details) or calculated by $\Delta T = P/G$:

- 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}

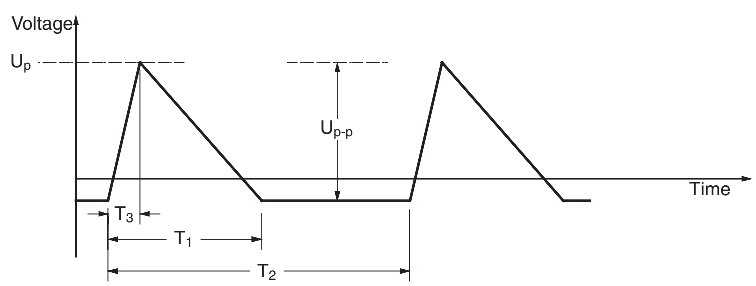
EXAMPLE

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”.

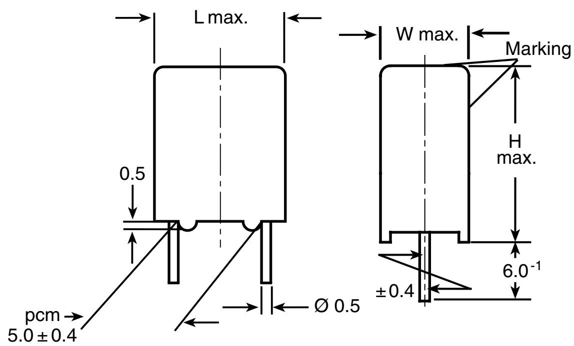
Group C Inspection Requirements

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 $C \leq 1$ 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	$\|\Delta C/C\| \leq 1$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.0005 for: $C \leq 100$ nF or ≤ 0.001 for: 100 nF $< C \leq 470$ 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 $C \leq 1$ 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 $\theta A = -55$ °C $\theta B = +105$ °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 $\leq$ 100 nF or ≤ 0.001 for: 100 nF < C $\leq$ 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 $\leq$ 100 nF or ≤ 0.001 for: 100 nF < C $\leq$ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.3.1 or 4.6.1
	Insulation resistance	$\geq$ 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 $\leq$ 100 nF or ≤ 0.001 for: 100 nF < C $\leq$ 470 nF or ≤ 0.0015 for: C $\leq$ 470 nF Compared to values measured in 4.11.1
	Insulation resistance	$\geq$ 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	$\lvert\Delta C/C\rvert \leq 5$ % 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 % ≤ $\lvert\Delta C/C\rvert$ ≤ 3.75 % or for 20 °C to 105 °C: - 6 % ≤ $\lvert\Delta C/C\rvert$ ≤ 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	$\lvert\Delta C/C\rvert \leq 1$ % 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

AC and Pulse Film Foil Capacitors KP Radial Potted Type



Dimensions in millimeters

MAIN APPLICATIONS

Oscillator, timing and LC/RC filter circuits, high frequency coupling of fast digital and analog IC's.

REFERENCE STANDARDS

IEC 60384-13

MARKING

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

DIELECTRIC

Polypropylene film

ELECTRODES

Aluminum foil

CONSTRUCTION

Mono construction

RATED DC VOLTAGES

63 V, 250 V, 630 V

RATED AC VOLTAGES

40 V, 160 V, 250 V

FEATURES

5 mm lead pitch, supplied loose in box taped in ammopack or reel
RoHS compliant

Pb-free
e3
RoHS COMPLIANT

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/100/56

CAPACITANCE RANGE

100 pF to 0.022 µF

CAPACITANCE TOLERANCE

± 10 % , ± 5 %, ± 2.5 %, ± 2 %, ± 1 %

LEADS

Tinned wire

MAXIMUM APLICATION TEMPERATURE

100 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

MULTIPLIER (nF)	
0.01	1
0.1	2
1	3

CAPACITANCE (numerically)

Example:		
110	0.1 nF	100 pF
210	1.0 nF	1.0 nF
310	10 nF	10 nF

KP	1830	2	10	63	4	G

TYPE CONSTRUCTION

VOLTAGE CODE
06 = 63 Vdc
25 = 250 Vdc
63 = 630 Vdc

TOLERANCE CODE	
1	± 1 %
2	± 2 %
3	± 2.5 %
4	± 5 %
5	± 10 %

PACKAGING CODE	
	Bulk
G	Ammo (H = 18.5)
W	Reel (H = 18.5)

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	at 1 MHz
C ≤ 1000 pF	-	5 x 10^{-4}	-	10 x 10^{-4}
1000 pF < C ≤ 5000 pF	-	5 x 10^{-4}	10 x 10^{-4}	-
5000 pF < C ≤ 20 000 pF	-	10 x 10^{-4}	15 x 10^{-4}	-
20 000 pF < C < 33 000 pF	-	15 x 10^{-4}	25 x 10^{-4}	-
Pitch (mm)	Maximum pulse rise time $(dU/dt)_R$ [V/µs]			
5	> 10 000			
R between leads, for C ≤ 0.33 µF at 100 V, 1 min			> 500 000 MΩ	
R between leads and case, 100 V, 1 min			> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s			1.6 x U_{Rdc}, 1 min	
Withstanding (DC) voltage between leads and case			2 x U_{Rdc}, 1 min	
Maximum application temperature			100 °C	

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 06 63 Vdc/40 Vac			VOLTAGE CODE 25 250 Vdc/160 Vac			VOLTAGE CODE 63 630 Vdc/250 Vac		
		W	H (mm)	L (mm)	W	H (mm)	L (mm)	W	H (mm)	L (mm)
100 pF	-110	-	-	-	-	-	-	4.5	6.0	7.2
110 pF	-111	-	-	-	-	-	-	4.5	6.0	7.2
120 pF	-112	-	-	-	-	-	-	4.5	6.0	7.2
130 pF	-113	-	-	-	-	-	-	4.5	6.0	7.2
150 pF	-115	-	-	-	-	-	-	4.5	6.0	7.2
160 pF	-116	-	-	-	-	-	-	4.5	6.0	7.2
180 pF	-118	-	-	-	-	-	-	4.5	6.0	7.2
200 pF	-120	-	-	-	-	-	-	4.5	6.0	7.2
220 pF	-122	-	-	-	-	-	-	4.5	6.0	7.2
240 pF	-124	-	-	-	-	-	-	4.5	6.0	7.2
270 pF	-127	-	-	-	-	-	-	4.5	6.0	7.2
300 pF	-130	-	-	-	-	-	-	4.5	6.0	7.2
330 pF	-133	-	-	-	-	-	-	4.5	6.0	7.2
360 pF	-136	-	-	-	-	-	-	4.5	6.0	7.2
390 pF	-139	-	-	-	-	-	-	4.5	6.0	7.2
430 pF	-143	-	-	-	-	-	-	4.5	6.0	7.2
470 pF	-147	-	-	-	-	-	-	4.5	6.0	7.2
510 pF	-151	-	-	-	-	-	-	4.5	6.0	7.2
560 pF	-156	-	-	-	-	-	-	4.5	6.0	7.2
620 pF	-162	-	-	-	-	-	-	4.5	6.0	7.2
680 pF	-168	-	-	-	-	-	-	4.5	6.0	7.2
750 pF	-175	-	-	-	-	-	-	4.5	6.0	7.2
820 pF	-185	-	-	-	-	-	-	4.5	6.0	7.2
910 pF	-191	-	-	-	-	-	-	4.5	6.0	7.2
1000 pF	-210	-	-	-	-	-	-	4.5	6.0	7.2
1100 pF	-211	-	-	-	-	-	-	4.5	6.0	7.2
1200 pF	-212	-	-	-	-	-	-	4.5	6.0	7.2
1300 pF	-213	-	-	-	-	-	-	4.5	6.0	7.2
1500 pF	-215	-	-	-	-	-	-	4.5	6.0	7.2
1600 pF	-216	-	-	-	-	-	-	4.5	6.0	7.2
1800 pF	-218	-	-	-	-	-	-	4.5	6.0	7.2
2000 pF	-220	-	-	-	4.5	6.0	7.2	5.5	7.0	7.2
2200 pF	-222	-	-	-	4.5	6.0	7.2	5.5	7.0	7.2
2400 pF	-224	4.5	6.0	7.2	4.5	6.0	7.2	5.5	7.0	7.2
2700 pF	-227	4.5	6.0	7.2	4.5	6.0	7.2	5.5	7.0	7.2
3000 pF	-230	4.5	6.0	7.2	5.5	7.0	7.2	5.5	7.0	7.2
3300 pF	-233	4.5	6.0	7.2	5.5	7.0	7.2	5.5	7.0	7.2
3600 pF	-236	4.5	6.0	7.2	5.5	7.0	7.2	7.5	7.0	7.2
3900 pF	-239	4.5	6.0	7.2	5.5	7.0	7.2	7.5	9.0	7.2
4300 pF	-243	4.5	6.0	7.2	5.5	7.0	7.2	7.5	9.0	7.2
4700 pF	-247	4.5	6.0	7.2	5.5	7.0	7.2	7.5	9.0	7.2
5100 pF	-251	4.5	6.0	7.2	7.5	9.0	7.2	7.5	9.0	7.2
5600 pF	-256	4.5	6.0	7.2	7.5	9.0	7.2	7.5	9.0	7.2
6200 pF	-262	4.5	6.0	7.2	7.5	9.0	7.2	7.5	9.0	7.2
6800 pF	-268	4.5	6.0	7.2	7.5	9.0	7.2	7.5	9.0	7.2
7500 pF	-275	5.5	7.0	7.2	7.5	9.0	7.2	9.0	10.0	7.2
8200 pF	-282	5.5	7.0	7.2	7.5	9.0	7.2	9.0	10.0	7.2
9100 pF	-291	5.5	7.0	7.2	7.5	9.0	7.2	9.0	10.0	7.2
0.01 µF	-310	5.5	7.0	7.2	7.5	9.0	7.2	9.0	10.0	7.2
0.011 µF	-311	5.5	7.0	7.2	9.0	10.0	7.2	-	-	-
0.012 µF	-312	5.5	7.0	7.2	9.0	10.0	7.2	-	-	-
0.013 µF	-313	5.5	7.0	7.2	9.0	10.0	7.2	-	-	-
0.015 µF	-315	5.5	7.0	7.2	9.0	10.0	7.2	-	-	-
0.016 µF	-316	9.0	10.0	7.2	-	-	-	-	-	-
0.018 µF	-318	9.0	10.0	7.2	-	-	-	-	-	-
0.020 µF	-320	9.0	10.0	7.2	-	-	-	-	-	-
0.022 µF	-322	7.5	9.0	7.2	-	-	-	-	-	-

Note
Further C-values upon request

RECOMMENDED PACKAGING

LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)	REEL DIAMETER (mm)	ORDERING CODE EXAMPLE	PITCH 5
G	Ammo	18.5	S [(1)]	KP 1830-310-065-G	X
W	Reel	18.5	350	KP 1830-310-065-W	X
-	Bulk	-	-	KP 1830-310-065	X

Note
[(1)] S = Box size 55 mm x 210 mm x 340 mm (W x H x L)

EXAMPLE OF ORDERING CODE

TYPE	CAPACITANCE CODE	VOLTAGE CODE	TOLERANCE CODE	PACKAGING CODE
KP 1830	210	63	1	G
Tolerance codes: 1 = 1 % (F); 2 = 2 % (G); 3 = 2.5 % (H); 4 = 5 % (J); 5 = 10 % (K)				

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

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/doc?28139 or end of catalog

Specific Method of Mounting of Withstand Vibration and Shock

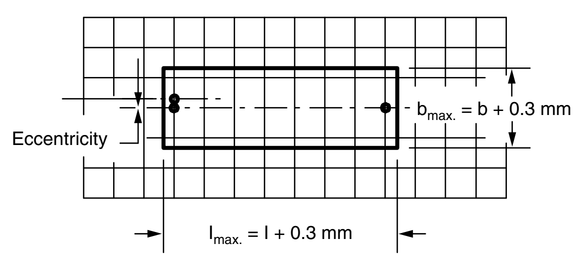
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board.

- For pitches ≤ 15 mm 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: $h_{max.} \leq h + 0.4$ mm or $h_{max.} \leq h' + 0.4$ mm



Storage Temperature

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

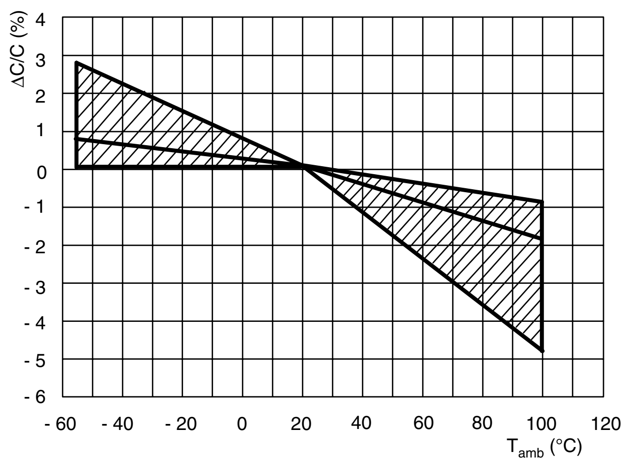
Ratings and Characteristics Reference Conditions

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 %.

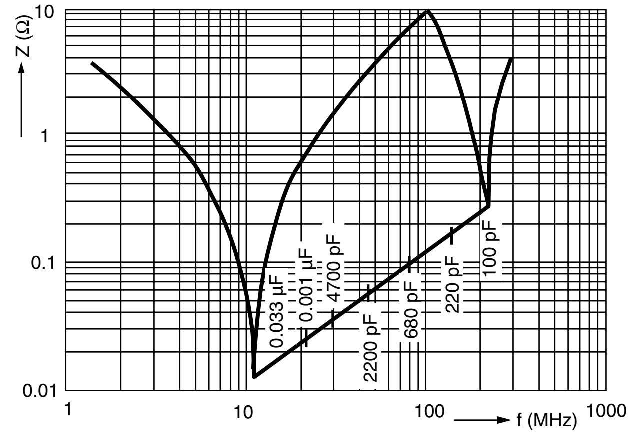
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

Capacitance as a function of ambient temperature (typical curve)

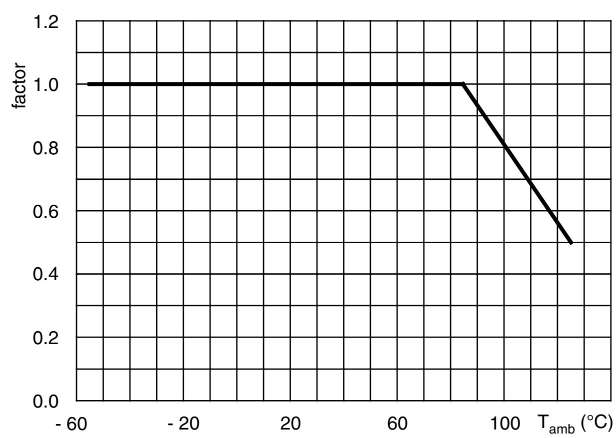


Impedance as a function of frequency (typical curve)

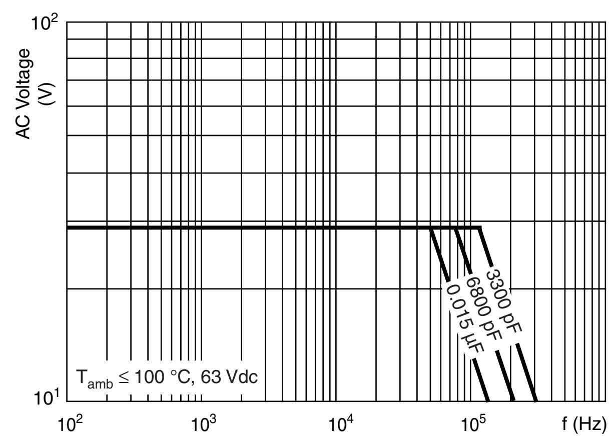


Impedance versus Frequency Z = f (f) (Lead length 2.0 mm)

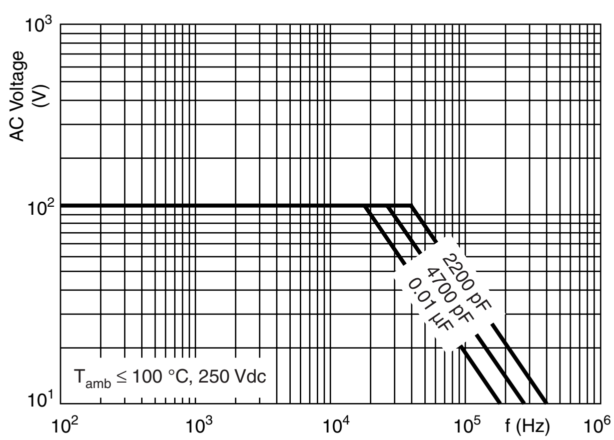
Max. DC and AC voltage as a function of temperature



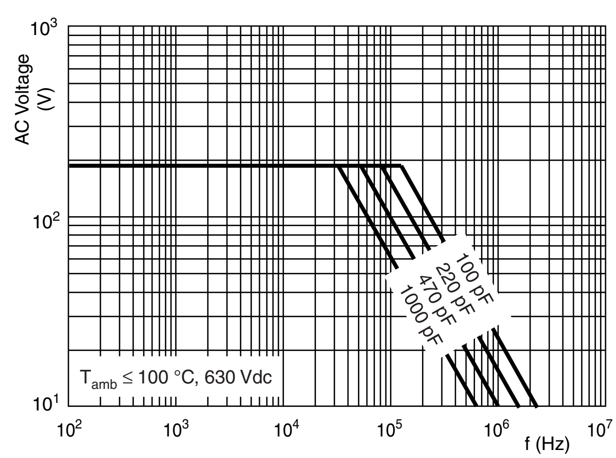
Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)
	PITCH 5 mm
4.5	3
5.5	4
7.5	6
9.0	7

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" with the typical tgd of the curves.

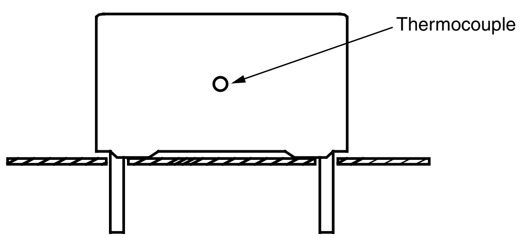
The component temperature rise (ΔT) can be measured (see section "Measuring the component temperature" for more details) or calculated by $\Delta T = P/G$:

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

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 the maximum (U_{p-p}) to avoid the ionisation inception level
3. The maximum component surface temperature rise must be lower than the limits
4. The maximum application temperature must be lower than 105 °C
5. There is no limit for the voltage pulse slope in the application

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-13 and Specific Reference Data”.

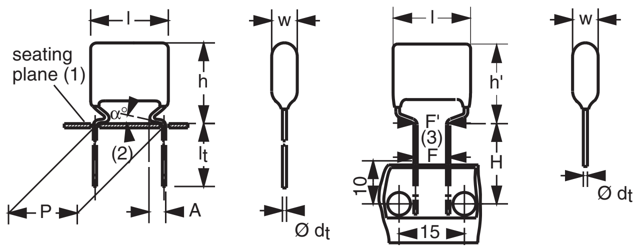
Group C Inspection Requirements

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 at 1 kHz Tangent of loss angle at 100 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	No predrying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 5 s	
4.14 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5.0 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	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle at 100 kHz	
4.14 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5.0 min ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 105 °C 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.7.2 Final inspection	Visual examination Capacitance	No visible damage $\lvert\Delta C/C\rvert \le 2$ % of the value measured in 4.6.1
	Tangent of loss angle	As specified in section "Tangent of loss angle" of this specification
4.9 Shock	Mounting: See section "Mounting" of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \le 2$ % of the value measured in 4.6.1.
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.10 Climatic sequence		
4.10.2 Dry heat	Temperature: + 100 °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	Recovery 1 h to 2 h	
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	$\lvert\Delta C/C\rvert \le 2$ % of the value measured in 4.10.2
	Tangent of loss angle	As specified in section "Tangent of loss angle" of this specification or ≤ 1.4 times the value measured in 4.3.1 whichever is greater
	Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification
SUB-GROUP C2		
4.11 Damp heat steady state		
4.11.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle at 1 kHz Voltage proof = U_{Rdc} for 1 min within 15 min after removal from testchamber	No breakdown of flash-over
4.11.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \le 1$ % of the value measured in 4.11.1.
	Tangent of loss angle	As specified in section "Tangent of loss angle" of this specification or ≤ 1.4 times the value measured in 4.11.1whichever is greater
	Insulation resistance	≥ 50 % of values specified in section "Insulation resistance" of this specification

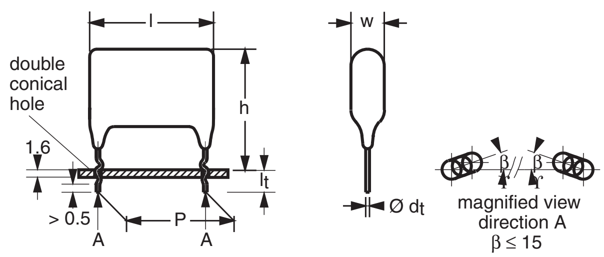
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB GROUP C3		
4.12 Endurance	Duration: 2000 h 1.5 x U_{Rdc} at 85 °C 1.05 x U_{Rdc} at 100 °C	
4.12.1 Initial measurements	Capacitance at 1 kHz Tangent of loss angle at 100 kHz	
4.12.5 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured in 4.12.1
	Tangent of loss angle	As specified in section “Tangent of loss angle” of this specification or ≤ 1.4 times the value measured in 4.12.1 whichever is greater
	Insulation resistance	As specified in section “Insulation resistance” of this specification

AC and Pulse Metallized Polypropylene Film Capacitors KP/MKP Radial Lacquered Type



Dimensions in mm

(1) Hole Ø 1.3 for $d_t = 0.8$ mm
(2) $0 \leq \alpha < 50°$
(3) $|F - F'| < 0.3$ mm
F = 7.5 + 0.6/- 0.1 mm
(4) A = 2.0 + 1.0/- 0.5 mm for 10 mm pitch
A = 2.5 + 1.5/- 0.5 mm for 15 mm pitch
A = 2.5 + 1.4/- 0.5 mm for pitch > 22.5 mm



Dimensions in mm

APPLICATIONS
Where high currents and steep pulses occur. For deflection circuits in television sets.

REFERENCE SPECIFICATIONS
IEC 60384-17

MARKING
C-value; tolerance; rated voltage; manufacturer's type; manufacturer's location

DIELECTRIC
Polypropylene film

ELECTRODES
Metallized and aluminum

CONSTRUCTION
Internal serial construction

RATED (DC) VOLTAGE
630 V, 1000 V, 1600 V, 2000 V

RATED (AC) VOLTAGE
300 V, 400 V, 500 V, 600 V

RATED PEAK-TO-PEAK VOLTAGE
850 V, 1100 V, 1400 V, 1700 V

FEATURES
10 mm to 27.5 mm pitch.
Supplied loose in box (including lock lead versions) and taped
Bent back version for automatic insertion available
RoHS compliant

ENCAPSULATION
Flame retardant epoxy material
(UL-class 94 V-0)

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/105/56

CAPACITANCE RANGE (E24 SERIES)
0.1 nF to 270 nF

CAPACITANCE TOLERANCE
± 5 %; ± 3.5 %

LEADS
Tinned wire

RATED TEMPERATURE
85 °C

MAXIMUM APPLICATION TEMPERATURE
105 °C

PERFORMANCE GRADE
for C > 5.6 nF: grade 1 (long life)
for C ≤ 5.6 nF: grade 2

STABILITY GRADE
Grade 2

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
375	10.0 mm/7.5 mm
	15.0 mm/7.5 mm
	10.0 mm
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically; but not for lock lead)

MULTIPLIER (nF)	
0.01	1
0.1	2
1	3
10	4

Example:
104 = 10 x 10 = 100 nF

BFC2	375	XX	YY	Y
2222 (1)	375	XX	YY	Y

(1) old ordering number

TYPE	PACKAGING	LEAD CONFIGURATION	PREFERRED TYPES				
			C-TOL.	630 V	1000 V	1600 V	2000 V
375	Loose in box	Lead length 5.0 ± 1.0 mm	± 5 %	14	24	34	44
		Lock lead 4.0 + 1.0/- 0.5 mm	± 5 %	90	90	90	90
	Taped on reel (2) (bent back)	H = 16.0 mm; P_0 = 15.0 mm; Reel diameter 500 mm	± 5 %	16	26	36	46
				Dimensions of this code numbers stays between brackets			
				ON REQUEST			
375	Loose in box	Lead length 5.0 ± 1.0 mm	± 3.5 %	15	25	35	45
		Lead length 3.5 ± 0.5 mm	± 5 %	10	20	30	40
			± 3.5 %	11	21	31	41
	Taped on reel (2)	H = 16.0 mm; P_0 = 12.7 mm; Reel diameter = 500 mm	± 5 %	12	22	32	42
			± 3.5 %	13	23	33	43
	Taped on reel (2) (bent back)	H = 16.0 mm; P_0 = 15.0 mm; Reel diameter = 500 mm	± 3.5 %	17	27	37	47
				Dimensions of this code numbers stays between brackets			
		H = 16.0 mm; P_0 = 15.0 mm; Reel diameter = 356 mm	± 5 %	18	28	38	48

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

SPECIFIC REFERENCE DATA (630 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle at (x 10^{-4})	10 kHz	100 kHz
Pitch = 10 mm, 15 mm and 7.5 mm (bent back)	≤ 6	≤ 10
Pitch = 22.5 mm	≤ 8	≤ 15
Pitch = 27.5 mm	≤ 8	≤ 20
Rated voltage pulse slope $(dU/dt)_R$:		
Pitch = 10 mm	15 000 V/µs	
Pitch = 15 mm and 7.5 mm (bent back)	8000 V/µs	
Pitch = 22.5 mm	2800 V/µs	
Pitch = 27.5 mm	1900 V/µs	
R between leads at 500 V, 1 min	> 100 000 MΩ	
R between interconnected leads and case, 500 V, 1 min	> 100 000 MΩ	
Ionisation (AC) voltage (typical value) at 50 pC peak discharge	> 400 V	
at 50 pC peak dicharge		
at 20 pC peak dicharge		
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	1008 V, 1 min	
For C ≤ 47 nF		
For C > 47 nF		
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 630 V; U_{Rac} = 300 V; U_{p-p} = 850 V (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
				Ø 500 mm	Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (pF)	Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm			Pitch = 10.0 mm	Pitch = 7.5 mm (bent back)		
680	5.0 x 13.0 x 14.5	0.65	**14...** (2000)	**12...** (1200)			**681**
750							**751**
820	5.5 x 13.5 x 14.5	0.70	**14...** (2000)	**12...** (1100)			**821**
910							**911**
1000							**102**
1100		0.75					**112**
1200							**122**
1300							**132**
1500		0.80					**152**
1600		0.85					**162**
1800	6.0 x 14.0 x 14.5	0.80	**14...** (1750)	**12...** (1000)			**182**
2000		0.85					**202**
2200		0.90					**222**
2400		1.0					**242**
2700	6.5 x 14.5 x 14.5	1.1	**14...** (1500)	**12...** (900)			**272**

Note
- SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 300 V; U_{p-p} = 850 (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		
				Ø 500 mm	Ø 500 mm	Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (pF)	**Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**				**Pitch = 7.5 mm (bent back)**		
3000 3300	5.0 x 14.0 (16.0) x 18.5	1.0	**14...** (2000)	**12...** (1200)	**16 ...** (1000)	**18 ...** (550)	**302** **332**
3600 3900 4300 4700 5100 5600	5.5 x 14.5 (16.0) x 18.5	1.1	**14...** (2000)	**12...** (1100)	**16 ...** (900)	**18 ...** (500)	**362** **392** **432** **472** **512** **562**
6200 6800 7500 8200 9100 10 000 11 000 12 000 13 000 15 000 16 000	6.0 x 15.0 (16.0) x 18.5	**1.2**	**14...** (2000)	**12...** (1000)	**16 ...** (800)	**18 ...** (450)	**622** **682** **752** **822** **912** **103** **113** **123** **133** **153** **163**
18 000 20 000	6.5 x 15.5 (17.0) x 18.5	1.3	**14…** (1500)	**12…** (900)	**16…** (750)	**18…** (400)	**183** **203**
22 000	7.0 x 16.0 (17.5) x 18.5	1.5	**14…** (1500)	**12…** (800)	**16…** (700)	**18…** (400)	**223**
24 000	7.5 x 16.5 (18.0) x 18.5	1.6	**14…** (1250)	**12…** (800)	**16…** (650)	**18…** (350)	**243**
27 000 30 000	8.0 x 17.0 (18.5) x 18.5	1.9	**14…** (1250)	**12…** (750)	**16…** (600)	**18…** (350)	**273** **303**
33 000	8.5 x 17.5 (19.0) x 18.5	2	**14…** (1000)	**12…** (700)	**16…** (550)	**18…** (300)	**333**
36 000 39 000	9.0 x 18.5 (20.0) x 18.5	2.3	**14…** (900)	**12…** (600)	**16…** (500)	**18…** (300)	**ON REQUEST**
C (µF)	**Pitch = 22.5 ± 0.4 mm; dt = 0.80 ± 0.08 mm**			**Pitch = 22.5 mm**	**Pitch = 7.5 mm (bent back)**		
0.036 0.039 0.043 0.047 0.056 0.062	7.0 x 20.0 x 26.0	2.7	**14…** (650)	-	-		**363** **393** **433** **473** **563** **623**
0.068	7.5 x 20.5 x 26.0	3	**14…** (600)	-	-		**683**
0.075 0.082	8.0 x 21.0 x 26.0	3.3	**14…** (550)	-	-		**753** **823**
0.091	8.5 x 21.5 x 26.0	3.8	**14…** (500)	-	-		**913**
0.1	9.0 x 22.0 x 26.0	4	**14…** (450)	-	-		**104**

Note
- SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 300 V; U $_{p-p}$ = 850 (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
				Ø 500 mm	Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (µF)	**Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 22.5 mm**	**Pitch = 7.5 mm (bent back)**		
0.11	9.5 x 22.5 x 26.0	4.3	**14...** (400)	-	-		**114**
0.12	10.0 x 23.0 x 26.0	4.7	**14...** (400)				**124**
C (µF)	**Pitch = 27.5 ± 0.5 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 27.5mm**	**Pitch = 7.5 mm (bent back)**		
0.13	9.5 x 22.5 x 30.0	4.7	**14...** (500)	-	-		**134**
0.15	10.0 x 23.0 x 30.0	5.2	**14...** (500)				**154**
0.16	10.5 x 23.5 x 30.0	5.5	**14...** (450)				**164**
0.18	11.0 x 24.0 x 30.0	6	**14...** (400)				**184**
0.2	11.5 x 24.5 x 30.0	6.6	**14...** (400)				**204**
0.22	12.5 x 25.5 x 30.0	7.1	**14...** (350)				**224**
0.24	13.0 x 26.0 x 30.0	7.7	**14...** (300)				**244**
0.27	13.5 x 26.5 x 30.0	8.5	**14...** (300)				**274**

Notes
(1) Net weight for short lead product only
(2) Loose in box, all lengths have same SPQ
• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 300 V; U_{p-p} = 850 V (lock lead); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING	
			LOOSE IN BOX	
			l_t = 4.0 + 1.0/- 0.5 mm	
				(SPQ)
C (pF)	**Pitch = 10.0 ± 1.0 mm; d_t = 0.60 ± 0.06 mm**			
680 750	5.0 x 16.0 x 14.5	0.65	**90308** **90309**	(2000)
820 910 1000 1100 1300 1500 1600	5.5 x 16.5 x 14.5	0.7 0.7 0.7 0.75 0.75 0.80 0.85	**90311** **90312** **90313** **90314** **90316** **90317** **90318**	(2000)
1800 2000 2200 2400	6.0 x 17.0 x 14.5	0.80 0.85 0.90 1.0	**90319** **90321** **90322** **90323**	(1750)
2700	6.5 x 17.5 x 14.5	1.1	**90324**	(1500)

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rdc} = 630 V; U_{Rac} = 300 V; U_{p-p} = 850 V (lock lead); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING LOOSE IN BOX l_t = 4.0 + 1.0/- 0.5 mm	(SPQ)
C (pF)	**Pitch = 15.0 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
3000	5.0 x 17.0 x 18.5	1	**90325**	(2000)
3300			**90326**	
3600	5.5 x 17.5 x 18.5	1.1	**90327**	(2000)
3900			**90328**	
4300			**90329**	
4700			**90331**	
5100			**90332**	
5600			**90333**	
6200	6.0 x 18.0 x 18.5	1.3	**90334**	(2000)
6800			**90335**	
7500			**90336**	
8200			**90337**	
9100			**90338**	
10 000			**90339**	
11 000			**90236**	
12 000			**90341**	
13 000			**90342**	
15 000			**90343**	
16 000			**90344**	
18 000	6.5 x 18.5 x 18.5	1.4	**90218**	(1750)
20 000			**90345**	
22 000	7.0 x 19.0 x 18.5	1.5	**90219**	(1500)
24 000	7.5 x 19.5 x 18.5	1.6	**90221**	(1400)
27 000	8.0 x 20.0 x 18.5	1.9	**90223**	(1250)
30 000			**90346**	
33 000	8.5 x 20.5 x 18.5	2	**90347**	(1200)
36 000	9.0 x 21.5 x 18.5	2.3	**ON REQUEST**	(1000)
39 000				
C (µF)	**Pitch = 22.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.036	7.0 x 23.0 x 26.0	2.7	**90348**	(600)
0.039			**90349**	
0.043			**90351**	
0.047			**90352**	
0.051			**90353**	
0.056			**90354**	
0.062			**90355**	
0.068	7.5 x 23.5 x 26.0	3	**90356**	(550)
0.075	8.0 x 24.0 x 26.0	3.3	**90357**	(500)
0.082			**90358**	
0.091	8.5 x 24.5 x 26.0	3.8	**90359**	(450)

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING LOOSE IN BOX l_t = 4.0 + 1.0/- 0.5 mm	
				(SPQ)
C (µF)	**Pitch = 22.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.1	9.0 x 25.0 x 26.0	4.0	**90361**	(450)
0.11	9.5 x 25.5 x 26.0	4.3	**90362**	(400)
0.12	10.0 x 26.0 x 26.0	4.7	**90363**	(350)
C (µF)	**Pitch = 27.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.13	9.5 x 25.5 x 30.0	4.7	**90364**	(450)
0.15	10.0 x 26.0 x 30.0	5.2	**90365**	(400)
0.16	10.5 x 26.5 x 30.0	5.5	**90366**	(350)
0.18	11.0 x 27.0 x 30.0	6.0	**90367**	(350)
0.2	11.5 x 27.5 x 30.0	6.6	**90368**	(350)
0.22	12.5 x 28.5 x 30.0	7.1	**90369**	(300)
0.24	13.0 x 29.0 x 30.0	7.7	**90371**	(250)
0.27	13.5 x 29.5 x 30.0	8.5	**90372**	(250)

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA (1000 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle at (x 10^{-4})	10 kHz	100 kHz
Pitch = 10 mm, 15 mm and 7.5 mm (bent back)	≤ 6	≤ 10
Pitch = 22.5 mm	≤ 8	≤ 15
Pitch = 27.5 mm	≤ 8	≤ 20
Rated voltage pulse slope (dU/d_t):		
Pitch = 10 mm	27 000 V/µs	
Pitch = 15 mm and 7.5 mm (bent back)	15 000 V/µs	
Pitch = 22.5 mm	5000 V/µs	
Pitch = 27.5 mm	3300 V/µs	
R between leads at 500 V, 1 min	> 100 000 MΩ	
R between interconnected leads and case, 500 V, 1 min	> 100 000 MΩ	
Ionisation (AC) voltage (typical value) at 50 pC peak discharge at 20 pC peak discharge	> 500 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s		
For C ≤ 47 nF	1600 V, 1 min	
For C > 47 nF	[1.6 - (0.0364 x (C- 47))] x 1000 V, 1 min	
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

AC and Pulse Metallized Polypropylene Film Capacitors
KP/MKP Radial Lacquered Type

U_{Rdc} = 1000 V; U_{Rac} = 400 V; U_{p-p} = 1100 V (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (pF)	**Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm**			**Pitch = 10.0 mm**	**Pitch = 7.5 mm (bent back)**		
100	5.0 x 13.0 x 14.5	0.5	**24…** (2000)	**22…** (1200)	-		**101**
110							**111**
120							**121**
130							**131**
150	5.5 x 13.5 x 14.5	0.55	**24…** (2000)	**22…** (1100)	-		**151**
160		0.55					**161**
180		0.55					**181**
200		0.55					**201**
220		0.60					**221**
240		0.60					**241**
270		0.60					**271**
300		0.60					**301**
330		0.60					**331**
360		0.60					**361**
390		0.65					**391**
430		0.70					**431**
470		0.75					**471**
510		0.75					**511**
560		0.80					**561**
620		0.80					**621**
680		0.80					**681**
750		0.70					**751**
820		0.70					**821**
910		0.70					**911**
1000	6.0 x 14.0 x 14.5	0.75	**24…** (1750)	**22…** (1000)	-		**102**
1100		0.85					**112**
1200		0.90					**122**
1300		0.85					**132**
1500		0.90					**152**
C (pF)	**Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 15.0 mm**	**Pitch = 7.5 mm (bent back)**		
1600	5.5 x 14.5 (16.0) x 18.5	1.1	**24…** 2000)	**22…** (1100)	**26…** (900)	**28…** (500)	**162**
1800							**182**
2000							**202**
2200							**222**
2400							**242**
2700	6.0 x 15.0 (16.5) x 18.5	1.2	**24…** (2000)	**22…** (1000)	**26…** (800)	**28…** (450)	**272**
3000							**302**
3300							**332**
3600							**362**
3900							**392**
4300							**432**
4700							**472**
5100							**512**
5600							**562**

Notes
(1) Net weight for short lead product only
(2) Loose in box, all lengths have same SPQ
• SPQ = Standard Packing Quantity

U_{Rdc} = 1000 V; U_{Rac} = 400 V; U_{p-p} = 1100 V (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
				Ø 500 mm	Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (pF)	**Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 15.0 mm**	**Pitch = 7.5 mm (bent back)**		
6200 6800	6.0 x 15.0 (16.5) x 18.5	1.2	**24…** (2000)	**22…** (1000)	**26…** (800)	**28…** (450)	**622** **682**
7500 8200 9100	7.0 x 16.0 (17.5) x 18.5	1.4	**24…** (1500)	**22…** (800)	**26…** (700)	**28…** (400)	**752** **822** **912**
10 000	7.5 x 16.5 (18.0) x 18.5	1.6	**24…** (1250)	**22…** (800)	**26…** (650)	**28…** (350)	**103**
11 000 12 000	8.0 x 17.0 (18.5) x 18.5	1.8	**24…** (1250)	**22…** (750)	**26…** (600)	**28…** (350)	**113** **123**
13 000	8.5 x 17.5 (19.0) x 18.5	1.9	**24…** (1000)	**22…** (700)	**26…** (550)	**28…** (300)	**133**
15 000	9.0 x 18.5 (19.5) x 18.5	2.1	**24…** (1000)	**22…** (650)	**26…** (550)	**28…** (300)	**153**
C (µF)	**Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 22.5 mm**	**Pitch = 7.5 mm (bent back)**		
0.016 0.018	6.0 x 19.0 x 26.0	2.2	**24…** (800)	-	-		**163** **183**
0.02 0.022	6.5 x 19.5 x 26.0	2.5	**24…** (750)				**203** **223**
0.024	7.0 x 20.0 x 26.0	2.7	**24…**				**243**
0.027 0.03	7.5 x 20.5 x 26.0	3.1	**24…** (600)				**273** **303**
0.033	8.0 x 21.0 x 26.0	3.4	**24…** (550)				**333**
0.036 0.039	8.5 x 21.5 x 26.0	3.7	**24…** (500)				**363** **393**
0.043	9.0 x 22.0 x 26.0	4.1	**24…** (450)				**433**
C (µF)	**Pitch = 27.5 ± 0.5 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 27.5 mm**	**Pitch = 7.5 mm (bent back)**		
0.047	7.0 x 20.0 x 30.0	3.1	**24…** (100)	-	-		**473**
0.051 0.056	7.5 x 20.5 x 30.0	3.4	**24…** (750)				**513** **563**
0.062	8.0 x 21.0 x 30.0	3.8	**24…** (650)				**623**
0.068	8.5 x 21.5 x 30.0	4.0	**24…** (550)				**683**
0.075	9.0 x 22.0 x 30.0	4.4	**24…** (550)				**753**
0.082	9.5 x 22.5 x 30.0	4.7	**24…** (500)				**823**
0.091	10.0 x 23.0 x 30.0	5.1	**24…** (500)				**913**
0.10	10.5 x 23.5 x 30.0	5.5	**24…** (450)				**104**
0.11	11.0 x 24.0 x 30.0	5.9	**24…** (400)				**114**
0.12	11.5 x 24.5 x 30.0	6.3	**24…** (400)				**124**
0.13	12.0 x 25.0 x 30.0	6.8	**24 ...** (350)				**134**
0.15	12.5 x 25.5 x 30.0	7.6	**24 ...** (350)				**154**

Notes

(1) Net weight for short lead product only

(2) Loose in box, all lengths have same SPQ

• SPQ = Standard Packing Quantity

U_{Rdc} = 1000 V; U_{Rac} = 400 V; U_{p-p} = 1100 V (lock lead); C-tol = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) [(1)]	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING LOOSE IN BOX l_t = 4.0 + 1.0/- 0.5 mm	(SPQ)
C (pF)	**Pitch = 10.0 ± 1.0 mm; d_t = 0.60 ± 0.06 mm**			
100	5.0 x 16.0 x 14.5	0.5	**90373**	(2000)
110			**90374**	
120			**90375**	
130			**90376**	
150	5.5 x 16.5 x 14.5	0.55	**90377**	(2000)
160		0.55	**90378**	
180		0.55	**90379**	
200		0.55	**90281**	
220		0.60	**90382**	
240		0.60	**90383**	
270		0.60	**90384**	
300		0.60	**90385**	
330		0.60	**90386**	
360		0.60	**90387**	
390		0.65	**90388**	
430		0.70	**90389**	
470		0.75	**90391**	
510		0.75	**90392**	
560		0.80	**90393**	
620		0.80	**90394**	
680		0.80	**90395**	
750		0.70	**90396**	
820		0.70	**90397**	
910		0.70	**90398**	
1000	6.0 x 17.0 x 14.5	0.75	**90399**	(1750)
1100		0.85	**90401**	
1200		0.90	**90402**	
1300		0.85	**90403**	
1500		0.90	**90404**	
C (pF)	**Pitch = 15.0 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
1600	5.5 x 17.5 x 18.5	1.1	**90405**	(2000)
1800			**90406**	
2000			**90407**	
2200			**90408**	
2400			**90409**	
2700	6.0 x 18.0 x 18.5	1.2	**90411**	(2000)
3000			**90412**	
3300			**90413**	
3600			**90414**	
3900			**90415**	
4300			**90416**	
4700			**90417**	
5100			**90418**	
5600			**90419**	
6200			**90421**	
6800			**90422**	

Notes
[(1)] Net weight for short lead product only
• SPQ = Standard Packing Quantity

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING LOOSE IN BOX l_t = 4.0 + 1.0/- 0.5 mm	(SPQ)
C (pF)	**Pitch = 15.0 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
7500	7.0 x 19.0 x 18.5	1.5	**90232**	(1500)
8200			**90423**	
9100			**90424**	
10 000	7.5 x 19.5 x 18.5	1.6	**90425**	(1400)
11 000	8.0 x 20.0 x 18.5	1.8	**90426**	(1250)
12 000			**90427**	
13000	8.5 x 20.5 x 18.5	1.9	**90428**	(1200)
15000	9.0 x 21.0 x 18.5	2.1	**90429**	(1100)
C (µF)	**Pitch = 22.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.016	6.0 x 22.0 x 26.0	2.2	**90431**	(750)
0.018			**90432**	
0.02	6.5 x 22.5 x 26.0	2.5	**90433**	(700)
0.022			**90434**	
0.024	7.0 x 23.0 x 26.0	2.7	**90435**	(600)
0.027	7.5 x 23.5 x 26.0	3.1	**90436**	(550)
0.03			**90437**	
0.033	8.0 x 24.0 x 26.0	3.4	**90438**	(500)
0.036	8.5 x 24.5 x 26.0	3.8	**90439**	(450)
0.039			**90224**	
0.043	9.0 x 25.0 x 26.0	4.1	**90441**	(450)
C (µF)	**Pitch = 27.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.047	7.0 x 23.0 x 30.0	3.1	**90442**	(800)
0.051	7.5 x 23.5 x 30.0	3.4	**90443**	(600)
0.056			**90444**	
0.062	8.0 x 24.0 x 30.0	3.8	**90445**	(550)
0.068	8.5 x 24.5 x 30.0	4.0	**90446**	(550)
0.075	9.0 x 25.0 x 30.0	4.4	**90447**	(450)
0.082	9.5 x 25.5 x 30.0	4.7	**90448**	(450)
0.091	10.0 x 26.0 x 30.0	5.1	**90449**	(400)
0.1	10.5 x 26.5 x 30.0	5.5	**90451**	(350)
0.11	11.0 x 27.0 x 30.0	5.9	**90452**	(350)
0.12	11.5 x 27.5 x 30.0	6.3	**90453**	(350)
0.13	12.0 x 28.0x 30.0	6.8	**90454**	(350)
0.15	12.0 x 28.5x 30.0	7.6	**90455**	(300)

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA (1600 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle at (x 10^{-4}):	10 kHz	100 kHz
Pitch = 10 mm, 15 mm and 7.5 mm (bent back)	≤ 6	≤ 10
Pitch = 22.5 mm	≤ 6	≤ 15
Pitch = 27.5 mm	≤ 6	≤ 20
Rated voltage pulse slope (dU/d_t):		
Pitch = 10 mm		
Pitch = 15 mm and 7.5 mm (bent back)	21 000 V/µs	
Pitch = 22.5 mm	7000 V/µs	
Pitch = 27.5 mm	4700 V/µs	
R between leads at 500 V, 1 min	> 100 000 MΩ	
R between interconnected leads and case, 500 V, 1 min	> 100 000 MΩ	
Ionisation (AC) voltage (typical value)		
at 50 pC peak discharge	> 550 V	
at 10 pC peak discharge		
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s		
For C ≤ 47 nF	2560 V, 1 min	
For C > 47 nF		
Withstanding (DC) voltage between leads and case	2840 V, 1 min	
Maximum application temperature	105 °C	

U_{Rdc} = 1600 V; U_{Rac} = 500 V; U_{p-p} = 1400 V (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		
				Ø 500 mm	Ø 500 mm	Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (pF)	Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm			Pitch = 15.0 mm	Pitch = 7.5 mm (bent back)		
680							**681**
750	5.5 x 14.5 (15.0) x 18.5	0.75	**34…** (2000)	**32…** (1100)	**36…** (900)	**38…** (500)	**751**
820							**821**
910		0.8					**911**
1000		0.85					**102**
1100	6.0 x 15.0 (15.5) x 18.5	0.85	**34…**(2000)	**32…** (1000)	**36…** (800)	**38…** (450)	**112**
1200		0.90					**122**
1300		0.95					**132**
1500	5.5 x 14.5 (16.0) x 18.5	1.1	**34…** (2000)	**32…** (1100)	**36…** (900)	**38…** (500)	**152**
1600							**162**
1800	6.0 x 15.0 (16.5) x 18.5	1.2	**34…** (2000)	**32…** (1000)	**36…** (800)	**38…** (450)	**182**
2000	6.5 x 15.5 (17.0) x 18.5	1.3	**34…** (1500)	**32…** (900)	**36…** (750)	**38…** (400)	**202**
2200							**222**
2400	7.0 x 16.0 (17.5) x 18.5	1.4	**34…** (1500)	**32…** (800)	**36…** (700)	**38…** (400)	**242**
2700	7.5 x 16.5 (18.0) x 18.5	1.6	**34…** (1250)	**32…** (800)	**36…** (650)	**38…** (350)	**272**
3000							**302**
3300	8.0 x 17.0 (18.5) x 18.5	1.7	**34…** (1250)	**32…** (750)	**36…** (600)	**38…** (350)	**332**
3600	8.5 x 17.5 (19.0) x 18.5	1.8	**34…** (1000)	**32…** (700)	**36…** (550)	**38…** (300)	**362**
3900	9.0 x 18.5 (19.5) x 18.5	2.0	**34…** (1000)	**32…** (650)	**36…** (550)	**38…** (300)	**392**
4300							**432**

Notes
(1) Net weight for short lead product only
(2) Loose in box, all lengths have same SPQ
• SPQ = Standard Packing Quantity

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 500 mm	Pitch = 7.5 mm (bent back) Ø 356 mm	..YYY
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (µF)	Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm			Pitch = 22.5 mm	Pitch = 7.5 mm (bent back)		
0.0047	6.0 x 19.0 x 26.0	2.0	34... (800)	-	-	-	472
0.0051							512
0.0056							562
0.0062	6.5 x 19.5 x 26.0	2.1	34... (750)				622
0.0068							682
0.0075	7.0 x 20.0 x 26.0	2.3	34... (650)				752
0.0082							822
0.0091	7.5 x 20.5 x 26.0	2.5	34... (600)				912
0.01	8.0 x 21.0 x 26.0	2.6	34... (550)				103
0.011	8.5 x 21.5 x 26.0	2.9	34... (500)				113
0.012							123
0.013	9.0 x 22.0 x 26.0	3.1	34... (450)				133
0.015	9.5 x 22.5 x 26.0	3.5	34... (400)				153
0.016	10.0 x 23.0 x 26.0	3.6	34... (400)				163
0.018	10.5 x 23.5 x 26.0	4.0	34... (350)				183
C (µF)	Pitch = 27.5 ± 0.5 mm; d_t = 0.80 ± 0.08 mm			Pitch = 27.5 mm	Pitch = 7.5 mm (bent back)		
0.02	9.0 x 22.0 x 30.0	4.2	34... (550)	-	-	-	203
0.022	9.5 x 22.5 x 30.0	4.4	34... (500)				223
0.024	10.0 x 23.0 x 30.0	4.7	34... (500)				243
0.027	10.5 x 23.5 x 30.0	5.2	34... (450)				273
0.03	11.0 x 24.0 x 30.0	5.6	34... (400)				303
0.033	11.5 x 24.5 x 30.0	6.0	34... (400)				333
0.036	12.0 x 25.0 x 30.0	6.5	34... (350)				363
0.039	12.5 x 25.5 x 30.0	6.9	34... (350)				393

Notes
(1) Net weight for short lead product only
(2) Loose in box, all lengths have same SPQ
• SPQ = Standard Packing Quantity

U_{Rdc} = 1600 V; U_{Rac} = 500 V; U_{p-p} = 1400 V (lock lead); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING LOOSE IN BOX l_t = 4.0 + 1.0/- 0.5 mm	(SPQ)
C (pF)	**Pitch = 15.0 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
680 750 820	5.5 x 17.5 x 18.5	0.75	**90456** **90457** **90458**	(2000)
910 1000 1100 1200 1300	6.0 x 18.0 x 18.5	0.80 0.85 0.85 0.90 0.95	**90459** **90461** **90462** **90463** **90464**	(2000)
1500 1600	5.5 x 17.5 x 18.5	1.1	**90465** **90466**	(2000)
1800	6.0 x 18.0 x 18.5	1.2	**90467**	(2000)
2000 2200	6.5 x 18.5 x 18.5	1.3	**90468** **90469**	(1750)
2400	7.0 x 19.0 x 18.5	1.4	**90471**	(1500)
2700 3000	7.5 x 19.5 x 18.5	1.6	**90472** **90473**	(1400)
3300	8.0 x 20.0 x 18.5	1.9	**90141**	(1250)
3600	8.5 x 20.5 x 18.5	2.3	**90142**	(1200)
3900 4300	9.0 x 21.5 x 18.5	2.5	**90143** **90144**	(1100)
C (µF)	**Pitch = 22.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.0047 0.0051 0.0056	6.0 x 22.0 x 26.0	2.4	**90145** **90146** **90147**	(750)
0.0062 0.0068	6.5 x 22.5 x 26.0	2.6	**90148** **90149**	(700)
0.0075 0.0082 0.0083	7.0 x 23.0 x 26.0	2.8	**90151** **90152** **90202**	(600)
0.0091	7.5 x 23.5 x 26.0	2.9	**90153**	(550)
0.01	8.0 x 24.0 x 26.0	3.2	**90154**	(500)
0.011 0.012	8.5 x 24.5 x 26.0	3.4	**90155** **90156**	(450)
0.013	9.0 x 25.0 x 26.0	3.6	**90157**	(450)
0.015	9.5 x 25.5 x 26.0	4.0	**90158**	(400)
0.016	10.0 x 26.0 x 26.0	4.3	**90159**	(350)
0.018	10.5 x 26.5 x 26.0	4.7	**90161**	(350)
C (µF)	**Pitch = 27.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.02	9.0 x 25.0 x 30.0	4.2	**90474**	(450)
0.022	9.5 x 25.5 x 30.0	4.4	**90475**	(450)
0.024	10.0 x 26.0 x 30.0	4.7	**90476**	(400)
0.027	10.5 x 26.5 x 30.0	5.2	**90477**	(350)
0.03	11.0 x 27.0 x 30.0	5.6	**90478**	(350)
0.033	11.5 x 27.5 x 30.0	6.0	**90479**	(350)
0.036	12.0 x 28.0 x 30.0	6.5	**90481**	(300)
0.039	12.5 x 28.5 x 30.0	6.9	**90482**	(300)

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA (2000 Vdc)

DESCRIPTION	VALUE	
Tangent of loss angle at (x 10^{-4}):	10 kHz	100 kHz
Pitch = 10 mm, 15 mm and 7.5 mm (bent back)	≤ 6	≤ 10
Pitch = 22.5 mm	≤ 6	≤ 10
Pitch = 27.5 mm	≤ 6	≤ 15
Rated voltage pulse slope (dU/d_t):		
Pitch = 10 mm		
Pitch = 15 mm and 7.5 mm (bent back)	30 000 V/µs	
Pitch = 22.5 mm	10 000 V/µs	
Pitch = 27.5 mm	6700 V/µs	
R between leads at 500 V, 1 min	> 100 000 MΩ	
R between interconnected leads and case, 500 V, 1 min	> 100 000 MΩ	
Ionisation (AC) voltage (typical value) at 50 pC peak discharge at 20 pC peak discharge	> 600 V	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s For C ≤ 47 nF For C > 47 nF	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} = 600 V; U_{p-p} = 1700 (kinked); C-tol. = ± 5 %

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING: LOOSE IN BOX, Leads 5 ± 1.0 mm, XX (SPQ)	REEL, Original pitch, Ø 500 mm, XX (SPQ)	REEL, Pitch = 7.5 mm (bent back), Ø 500 mm, XX (SPQ)	REEL, Pitch = 7.5 mm (bent back), Ø 356 mm, XX (SPQ)	C VALUE ..YYY
C (pF)	Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm			Pitch = 15.0 mm	Pitch = 7.5 mm (bent back)		
100	5.5 x 14.5 (15.0) x 18.5	0.75	44… (2000)	42… (1100)	46… (900)	48… (500)	**101**
110		0.75					**111**
120		0.75					**121**
130		0.75					**131**
150		0.75					**151**
160		0.75					**161**
180		0.75					**181**
200		0.75					**201**
220		0.75					**221**
240		0.75					**241**
270		0.75					**271**
300		0.75					**301**
330		0.75					**331**
360		0.75					**361**
390		0.75					**391**
430		0.75					**431**
470		0.80					**471**
510		0.80					**511**
560		0.80					**561**

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
				Ø 500 mm	Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (pF)	**Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 15.0 mm**	**Pitch = 7.5 mm (bent back)**		
620 680 750	6.0 x 15.0 (15.5) x 18.5	0.85 0.85 0.90	**44...** (2000)	**42...** (1000)	**46...** (800)	**48...** (450)	**621** **681** **751**
820	6.5 x 15.5 (16.0) x 18.5	0.95	**44...** (1500)	**42...** (900)	**46...** (750)	**48...** (400)	**821**
910	5.5 x 14.5 (16.0) x 18.5	1.1	**44...** (2000)	**42...** (420)	**46...** (900)	**48...** (500)	**911**
1000 1100 1200	6.0 x 15.0 (16.5) x 18.5	1.2	**44...** (2000)	**42...** (1000)	**46...** (800)	**48...** (450)	**102** **112** **122**
1300	6.5 x 15.5 (17.0) x 18.5	1.3	**44...** (1500)	**42...** (900)	**46...** (750)	**48...** (400)	**132**
1500	7.0 x 16.0 (17.5) x 18.5	1.4	**44...** (1500)	**42...** (800)	**46...** (700)	**48...** (400)	**152**
1600 1800	7.5 x 16.5 (18.0) x 18.5	1.5	**44...** (1250)	**42...** (800)	**46...** (650)	**48...** (350)	**162** **182**
2000	8.0 x 17.0 (18.5) x 18.5	1.6	**44...** (1250)	**42...** (750)	**46...** (600)	**48...** (350)	**202**
2200	8.5 x 17.5 (19.0) x 18.5	1.7	**44...** (1000)	**42...** (700)	**46...** (550)	**48...** (300)	**222**
2400	9.0 x 18.0 (19.5) x 18.5	1.8	**44...** (1000)	**42...** (650)	**46...** (550)	**48...** (300)	**242**
2700	9.5 x 18.5 (20.0) x 18.5	2.0	**44...** (900)	**42...** (600)	**46...** (500)	**48...** (300)	**272**
C (µF)	**Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm**			**Pitch = 22.5 mm**	**Pitch = 7.5 mm (bent back)**		
0.003 0.0033 0.0036 0.0039	6.0 x 19.0 x 26.0	2.1	**44...** (800)	-	-	-	**302** **332** **362** **392**
0.0043 0.0047	6.5 x 19.5 x 26.0	2.3	**44...** (750)				**432** **472**
0.0051 0.0056	7.0 x 20.0 x 26.0	2.6	**44...** (650)				**512** **562**
0.0062	7.5 x 20.5 x 26.0	2.8	**44...** (600)				**622**
0.0068 0.0075	8.0 x 21.0 x 26.0	3.0	**44...** (550)				**682** **752**
0.0082	8.5 x 21.5 x 26.0	3.3	**44...** (500)				**822**
0.0091	9.0 x 22.0 x 26.0	3.6	**44...** (450)				**912**
0.01	9.5 x 22.5 x 26.0	3.8	**44...** (400)				**103**

Notes

[1] Net weight for short lead product only

• SPQ = Standard Packing Quantity

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING				
			LOOSE IN BOX	REEL			C VALUE
			Leads 5 ± 1.0 mm	Original pitch	Pitch = 7.5 mm (bent back)		..YYY
				Ø 500 mm	Ø 500 mm	Ø 356 mm	
			XX (SPQ)	XX (SPQ)	XX (SPQ)	XX (SPQ)	
C (μF)	Pitch = 27.5 ± 0.5 mm; d_t = 0.80 ± 0.08 mm			Pitch = 27.5 mm	Pitch = 7.5 mm (bent back)		
0.011	9.0 x 22.0 x 30.0	3.8	44... (550)	-	-	-	113
0.012	9.5 x 22.5 x 30.0	4.1	44... (500)				123
0.013	10.0 x 23.0 x 30.0	4.4	44... (500)				133
0.015	10.5 x 23.5 x 30.0	4.9	44... (450)				153
0.016	11.0 x 24.0 x 30.0	5.1	44... (400)				163
0.018	11.5 x 24.5 x 30.0	5.6	44... (400)				183
0.02	12.5 x 25.5 x 30.0	6.1	44... (350)				203
0.022	13.0 x 26.0 x 30.0	6.5	44... (300)				223

Notes
(1) Net weight for short lead product only
(2) Loose in box, all lengths have same SPQ
• SPQ = Standard Packing Quantity

U_{Rdc} = 2000 V; U_{Rac} = 600 V; U_{p-p} = 1700 V (lock lead)

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING	
			LOOSE IN BOX	
			l_t = 4.0 + 1.0/- 0.5 mm	
				(SPQ)
C (pF)	Pitch = 15.0 ± 1.0 mm; d_t = 0.80 ± 0.08 mm			
100	5.5 x 17.5 x 18.5	0.75	90483	(2000)
110		0.75	90484	
120		0.75	90485	
130		0.75	90486	
150		0.75	90487	
160		0.75	90488	
180		0.75	90489	
200		0.75	90491	
220		0.75	90276	
240		0.75	90492	
270		0.75	90493	
300		0.75	90494	
330		0.75	90495	
360		0.75	90496	
390		0.75	90188	
430		0.75	90497	
470		0.80	90498	
510		0.80	90499	
560		0.80	90501	

Note
• SPQ = Standard Packing Quantity

AC and Pulse Metallized Polypropylene Film Capacitors
KP/MKP Radial Lacquered Type

C	DIMENSIONS w x h (h') x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 375 XXYYY AND PACKAGING	
			LOOSE IN BOX	
			l_t = 4.0 + 1.0/- 0.5 mm	
				(SPQ)
C (pF)	**Pitch = 15.0 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
620	6.0 x 18.0 x 18.5	0.85	**90502**	(2000)
680		0.85	**90229**	
750		0.90	**90503**	
820	6.5 x 18.5 x 18.5	0.95	**90504**	(1750)
910	5.5 x 17.5 x 18.5	1.1	**90505**	(2000)
1000	6.0 x 18.0 x 18.5	1.3	**90225**	(2000)
1100			**90506**	
1200			**90226**	
1300	6.5 x 18.5 x 18.5	1.3	**90507**	(1750)
1500	7.0 x 19.0 x 18.5	1.5	**90266**	(1500)
1600	7.5 x 19.5 x 18.5	1.7	**90508**	(1400)
1800			**90237**	
2000	8.0 x 20.0 x 18.5	1.7	**90509**	(1250)
2200	8.5 x 20.5 x 18.5	2.3	**90227**	(1200)
2400	9.0 x 21.0 x 18.5	1.8	**90511**	(1100)
2700	9.5 x 21.5 x 18.5	2.7	**90228**	(1000)
C (µF)	**Pitch = 22.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.003	6.0 x 22.0 x 26.0	2.2	**90512**	(750)
0.0033			**90162**	
0.0036			**90163**	
0.0039			**90164**	
0.0043	6.5 x 22.5 x 26.0	2.4	**90165**	(700)
0.0047			**90166**	
0.0051	7.0 x 23.0 x 26.0	2.6	**90167**	(600)
0.0056			**90168**	
0.0062	7.5 x 23.5 x 26.0	2.8	**90169**	(550)
0.0068	8.0 x 24.0 x 26.0	3.0	**90171**	(500)
0.0075			**90172**	
0.0082	8.5 x 24.5 x 26.0	3.2	**90173**	(450)
0.0091	9.0 x 25.0 x 26.0	3.5	**90174**	(450)
0.01	9.5 x 25.5 x 26.0	3.8	**90175**	(400)
C (µF)	**Pitch = 27.5 ± 1.0 mm; d_t = 0.80 ± 0.08 mm**			
0.011	9.0 x 25.0 x 30.0	4.4	**90176**	(450)
0.012	9.5 x 25.5 x 30.0	4.6	**90177**	(450)
0.013	10.0 x 26.0 x 30.0	5.0	**90178**	(400)
0.015	10.5 x 26.5 x 30.0	5.4	**90179**	(350)
0.016	11.0 x 27.0 x 30.0	5.8	**90181**	(350)
0.018	11.5 x 27.5 x 30.0	6.2	**90182**	(350)
0.02	12.5 x 28.5 x 30.0	6.1	**90513**	(300)
0.022	13.0 x 29.0 x 30.0	6.5	**90514**	(250)

Notes
(1) Net weight for short lead product only
• SPQ = Standard Packing Quantity

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in pinted-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

- 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

Storage Temperature

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

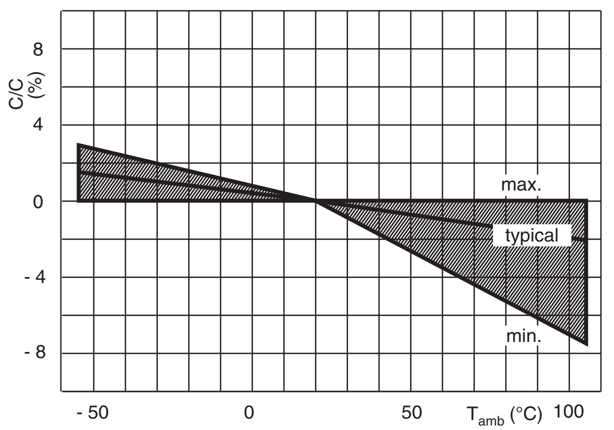
Ratings and Characteristics Reference Conditions

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 %.

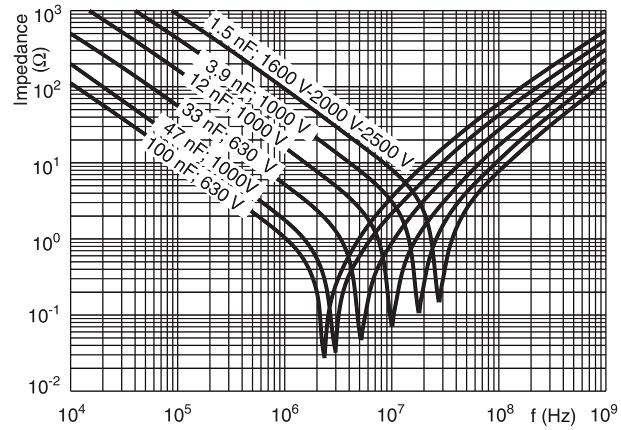
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

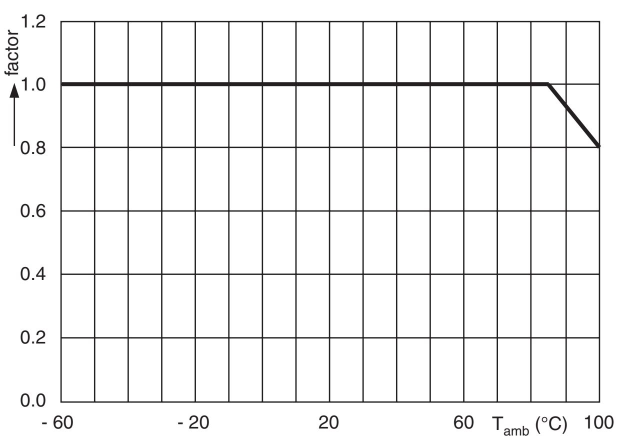
Capacitance as a function of ambient temperature
(typical curve)



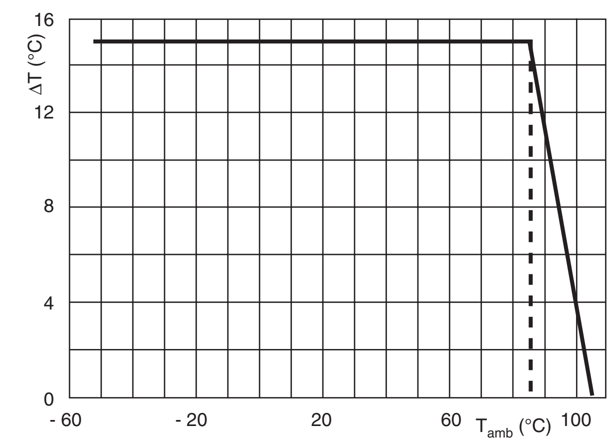
Impedance as a function of frequency
(typical curve)



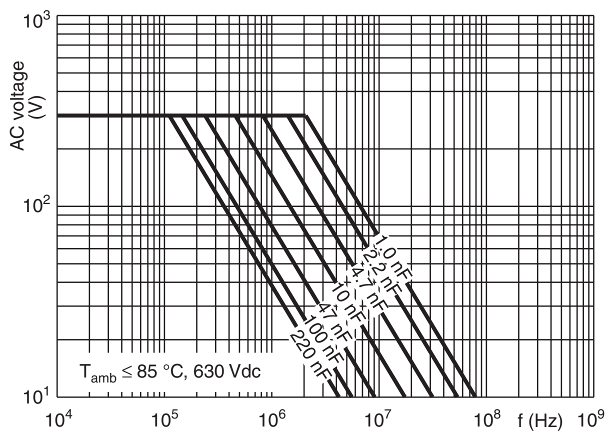
Max. DC voltage as a function of temperature



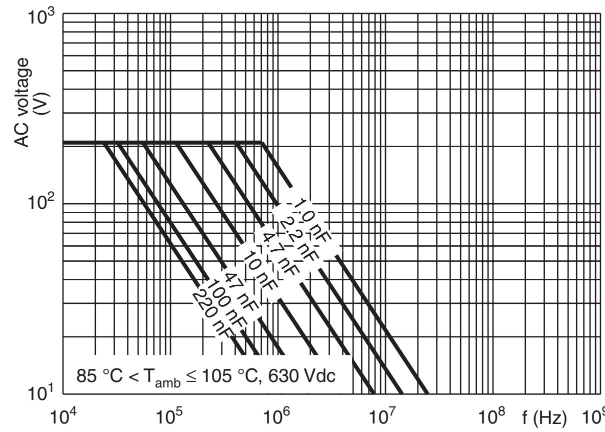
Max. allowed component temperature rise
as a function of ambient temperature



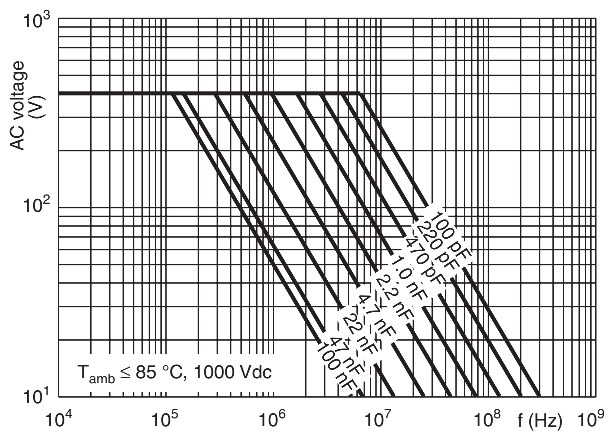
Max. RMS voltage (sinewave) as a function of frequency



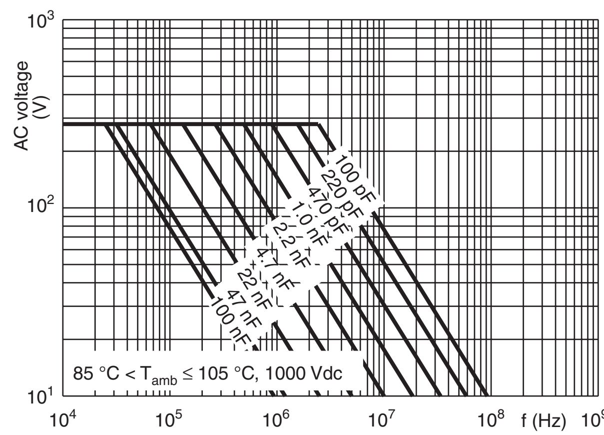
Max. RMS voltage (sinewave) as a function of frequency



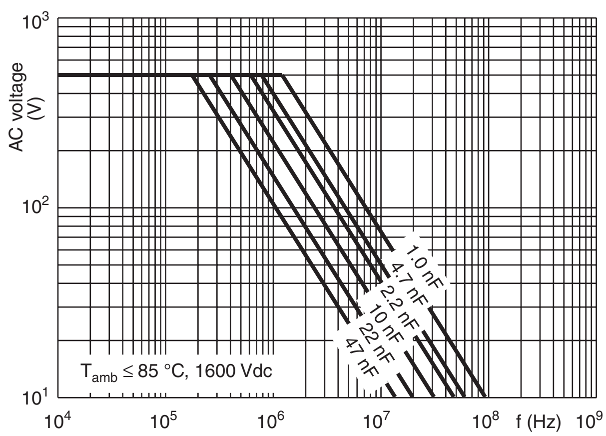
Max. RMS voltage (sinewave) as a function of frequency



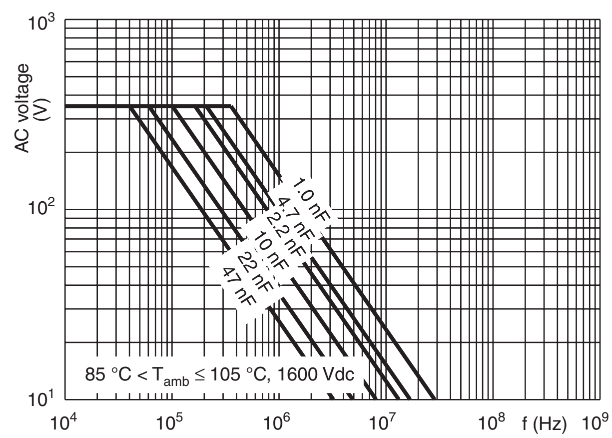
Max. RMS voltage (sinewave) as a function of frequency



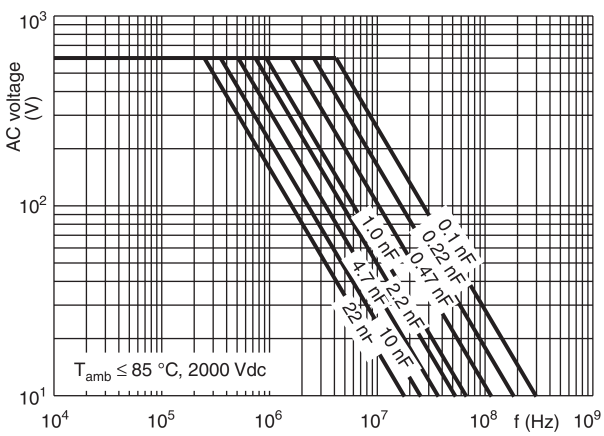
Max. RMS voltage (sinewave) as a function of frequency



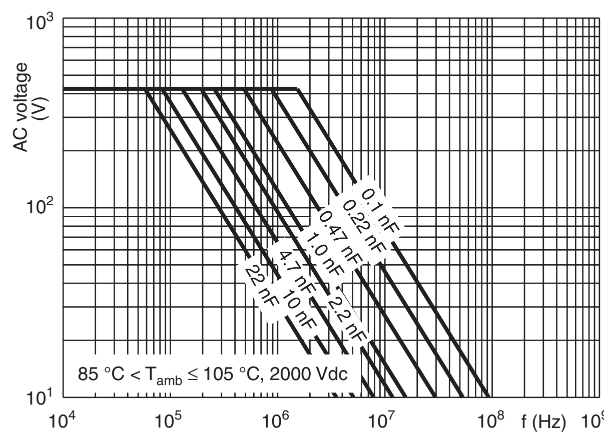
Max. RMS voltage (sinewave) as a function of frequency



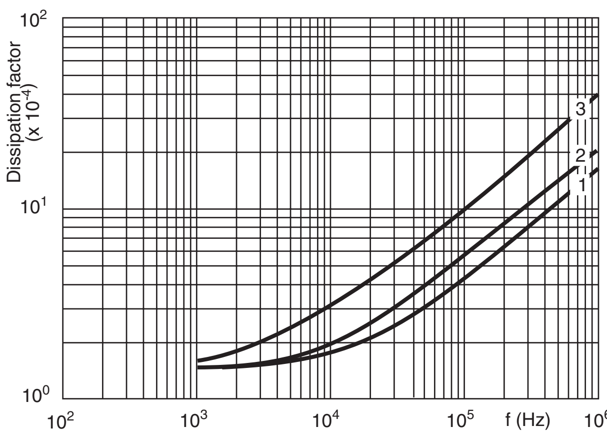
Max. RMS voltage (sinewave) as a function of frequency



Max. RMS voltage (sinewave) as a function of frequency

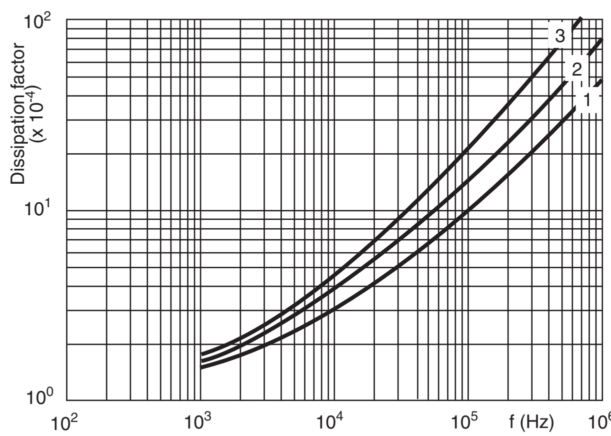


Tangent of loss angle (typical curve)



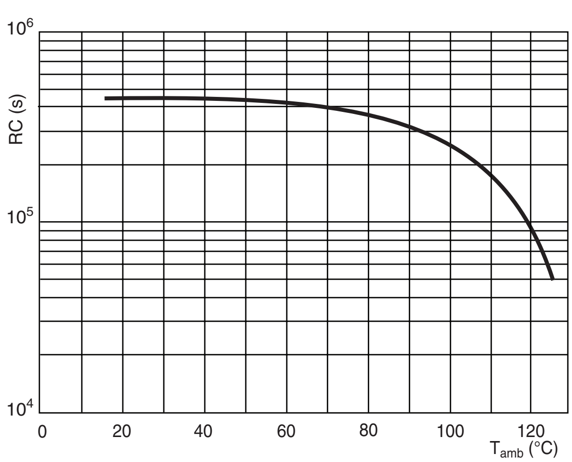
1. KP/MPK 10.0 mm and 15 mm pitch all versions
   22.5 mm pitch, 1000 V, 1600 V, 2000 V and 2500 V versions
2. KP/MPK 22.5 mm pitch, 630 V versions
   27.5 mm pitch, 1000 V, 1600 V and 2000 V versions
3. KP/MPK 27.5 mm pitch, 630 V versions

Maximum curves



1. KP/MPK 10.0 mm and 15 mm pitch all versions
   22.5 mm pitch, 1000 V, 1600 V, 2000 V and 2500 V versions
2. KP/MPK 22.5 mm pitch, 630 V versions
   27.5 mm pitch, 1000 V, 1600 V and 2000 V versions
3. KP/MPK 27.5 mm pitch, 630 V versions

Insulation resistance as a function of ambient temperature



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)			
	PITCH 10 mm	PITCH 15 mm	PITCH 22.5 mm	PITCH 27.5 mm
4.0	4.0	5.0	-	-
4.5	4.5	6.0	-	-
5.0	5.0	6.0	12.0	13.0
5.5	6.0	6.5	13.0	15.0
6.0	6.0	6.5	13.0	15.0
6.5	6.5	8.0	15.0	17.0
7.0	-	8.0	15.0	17.0
7.5	-	9.0	17.0	18.0
8.0	-	9.0	17.0	20.0
8.5	-	11.0	18.0	20.0
9.0	-	11.0	18.0	22.0
9.5	-	12.0	20.0	22.0
10.0	-	12.0	20.0	23.0
10.5	-	-	22.0	25.0
11.0	-	-	22.0	25.0
11.5	-	-	23.0	27.0
12.0	-	-	-	27.0
12.5	-	-	-	30.0
13.0	-	-	-	30.0
13.5	-	-	-	30.0
14.0	-	-	-	30.0
14.5	-	-	-	33.0
15.0	-	-	-	33.0
15.5	-	-	-	37.0
16.0	-	-	-	37.0

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 ambient temperature.

The power dissipation can be calculated according Type detail specification "HQN-384-01/101: Technical Information Film Capacitors

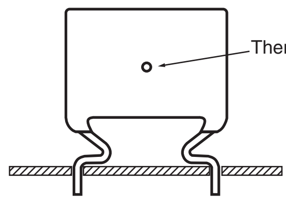
The component temperature rise (ΔT) can be measured (see section "Measuring the component temperature" for more details) or calculated by

$\Delta T = P/G$:

- 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

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 the maximum (U_{p-p}) 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:

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

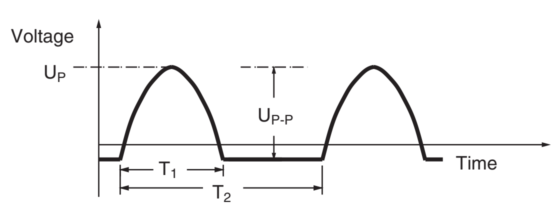
   T is the pulse duration.
4. The maximum component surface temperature rise must be lower than the limits

EXAMPLE

C = 10 nF 1600 V, KP/MPK
This is a signal as in the drawing below
U_{P-P} = 1200 V; U_P = 1100 V; T_1 = 12 µs; T_2 = 64 µs
The ambient temperature is 50 °C

Checking conditions:

1. The peak voltage U_P = 1100 V is lower than 1600 Vdc
2. The peak-to-peak voltage 1200 V is lower than $2\sqrt{2}$ x 550 Vac = 1414 U_{P-P}
3. The voltage pulse slope (dU/dt) = 320 V is much lower than 7000 V/µs
4. The dissipated power is 170 mW as calculated with fourier terms
   This gives a temperature rise of 170 mW/(17 mW/°C) = 10 °C which is allowed acc. fig. “max. allowed temperature rise as a function of ambient temperature” for an ambient temperature of 50 °C



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”.

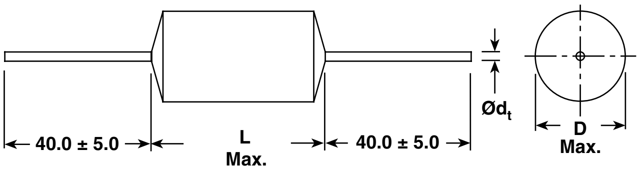
Group C Inspection Requirements

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 at 100 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 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert \Delta C/C \rvert \leq 1\ \% + 5$ pF of the value measured initially
	Tangent of loss angle	Increase of tan δ: ≤ 0.0005 Compared to values measured in 4.3.1
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.15 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	$\theta A = -55$ °C $\theta B = +105$ °C 5 cycles Duration t = 30 min	
4.7 Vibration	Visual examination Mounting: See section “Mounting” of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.7.2 Final inspection	Visual examination	No visible damage
4.9 Shock	Mounting: See section “Mounting” of this specification Pulse shape: Half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.3 Final measurements	Visual examination	No visible damage
	Capacitance	For C > 0.027µF: $\|\Delta C/C\| \leq 2$ % or for C ≤ 0.027µF: $\|\Delta C/C\| \leq 3$ % + 5 pF of the value measured in 4.6.1.
	Tangent of loss angle	Increase of tan δ: ≤ 0.0005 Compared to values measured in 4.6.1
	Insulation resistance	As specified in chapter “General data” 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	$\|\Delta C/C\| \leq 3$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan δ: ≤ 0.001 Compared to values measured in 4.3.1 or 4.6.1
	Insulation resistance	≥ 50 % of values specified in chapters “General data” of this specification
SUB-GROUP C2		
4.11 Damp heat steady state	56 days, 40 °C, 90 % to 95 % RH	
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	$\|\Delta C/C\| \leq 1$ % + 5 pF of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.0005$ 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 C3		
4.12.1 Endurance	Duration: 2000 h Temperature: 85 °C Voltage: 1.25 x max. U_{Rdc} V_{rms}, 50 Hz Duration: 2000 h Temperature: 105 °C	
4.12.1.1 Initial measurements	Voltage: 0.875 x max. U_{Rdc} V_{rms}, 50 Hz Capacitance Tangent of loss angle at 100 kHz	
4.12.1.3 Final measurements	Visual examination	No visible damage Legible marking Temperature: 85 °C
	Capacitance	For C > 0.056 µF: $\|\Delta C/C\| \leq 2$ % + 5 pF or for C > 0.056 µF: $\|\Delta C/C\| \leq 3$ % + 5 pF of the value measured in 4.12.1.1 Temperature: 105 °C $\|\Delta C/C\| \leq 5$ % + 5 pF
	Tangent of loss angle	Increase of tan δ: ≤ 0.001 Compared to values measured in 4.12.1
	Insulation resistance	$\geq$ 50 % of values specified in chapters "General data" of this specification
SUB-GROUP C4		
4.2.6 Temperature characteristics	Capacitance	
	Insulation resistance	As specified in section "Capacitance" of this specification As specified in chapters "General data" of this specification

AC and Pulse Metallized Polypropylene Film Capacitors MKP Axial Type



LEAD DIAMETER d_t (mm)	D (mm)	L (mm)
0.6 ± 0.06	≤ 9.0	≤ 19.0
0.8 ± 0.08	< 16.5	> 26.5
1.0 ± 0.1	> 16.5	> 26.5

APPLICATIONS
Pulse operations, SMPS and thyristor circuits, storage, filter, timing and sample and hold circuits.

REFERENCE STANDARDS
IEC 60384-16

MARKING
C-value; tolerance; rated voltage; manufacturer's type; code for dielectric material; manufacturer location; manufacturer's logo; year and week

DIELECTRIC
Polypropylene film

ELECTRODES
Metallized

CONSTRUCTION
Mono construction

RATED (DC) VOLTAGE
160 V, 250 V, 400 V, 630 V

RATED (AC) VOLTAGE
100 V, 160 V, 220 V, 250 V

FEATURES
Supplied loose in box, taped on ammopack or reel
RoHS compliant

Pb-free
e3
RoHS
COMPLIANT

ENCAPSULATION
Plastic-wrapped, epoxy resin sealed. Flame retardant.

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1
55/100/56

CAPACITANCE RANGE (E12 SERIES)
47 pF to 22 µF

CAPACITANCE TOLERANCE
± 10 %, ± 5 %, ± 2.5 %, ± 2 %, ± 1 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
100 °C

PULL TEST ON LEADS
≥ 20 N in direction of leads according to IEC 60068-2-21

BENT TEST ON LEADS
2 bends trough 90° with half of the force used in pull test

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

COMPOSITION OF CATALOG NUMBER

MKP	1839	X	XX	16	X	X

TYPE: MKP 1839

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

CAPACITANCE (numerically)

Example:
468 = 680 nF

SPECIAL LETTER FOR TAPED	
	Bulk
R	Reel
G	Ammopack

VOLTAGE (Vdc)
16 = 160 V
25 = 250 V
40 = 400 V
63 = 630 V

TOLERANCE	
1	± 1 %
2	± 2 %
3	± 2.5 %
4	± 5 %
5	± 10 %

Note

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

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE		
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz
C ≤ 0.1 µF	4×10^{-4}	6×10^{-4}	40×10^{-4}
0.1 µF < C ≤ 1.0 µF	4×10^{-4}	6×10^{-4}	-
C > 1.0 µF	10×10^{-4}	-	-

Capacitor length (mm)	Maximum pulse rise time $(dU/dt)_R$ [V/µs]			
	160 Vdc	250 Vdc	400 Vdc	630 Vdc
11	240	300	515	700
14	175	220	380	510
19	100	125	200	280
26.5	60	75	120	160
31.5	45	60	95	120
41.5	30	40	65	85

If the maximum pulse voltage is less than the rated voltage higher dU/dt values can be permitted.

R between leads, for C ≤ 0.33 µF at 100 V, 1 min	> 100 000 MΩ
RC between leads, for C > 0.33 µF at 100 V, 1 min	> 30 000 s
R between leads and case, 100 V, 1 min	> 30 000 MΩ
Withstanding (DC) voltage between leads and wrapped film ($1.4 \times U_{Rac} + 2000$)	2840 V, 1 min
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	$1.6 \times U_{Rdc}$, 1 min
Maximum application temperature	100 °C

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 16 160 Vdc/100Vac		VOLTAGE CODE 25 250 Vdc/160Vac		VOLTAGE CODE 40 400 Vdc/220Vac (1)		VOLTAGE CODE 63 630 Vdc/250Vac (1)	
		D (mm)	L (mm)	D (mm)	L (mm)	D (mm)	L (mm)	D (mm)	L (mm)
47 pF	047	-	-	-	-	-	-	5.0	11.0
51 pF	051	-	-	-	-	-	-	5.0	11.0
56 pF	056	-	-	-	-	-	-	5.0	11.0
62 pF	056	-	-	-	-	-	-	5.0	11.0
68 pF	068	-	-	-	-	-	-	5.5	11.0
75 pF	075	-	-	-	-	-	-	5.5	11.0
82 pF	082	-	-	-	-	-	-	5.5	11.0
91 pF	091	-	-	-	-	-	-	6.0	11.0
100 pF	110	-	-	-	-	-	-	6.0	11.0
110 pF	111	-	-	-	-	-	-	6.0	11.0
120 pF	112	-	-	-	-	-	-	6.0	11.0
130 pF	113	-	-	-	-	-	-	6.0	11.0
150 pF	115	-	-	-	-	-	-	6.0	11.0
160 pF	116	-	-	-	-	-	-	6.0	11.0
180 pF	118	-	-	-	-	-	-	6.0	11.0
200 pF	120	-	-	-	-	-	-	6.0	11.0
220 pF	122	-	-	-	-	-	-	5.0	11.0
240 pF	124	-	-	-	-	-	-	5.0	11.0
270 pF	127	-	-	-	-	-	-	5.0	11.0
300 pF	130	-	-	-	-	-	-	5.0	11.0
330 pF	133	-	-	-	-	-	-	5.0	11.0
360 pF	136	-	-	-	-	-	-	5.0	11.0
390 pF	139	-	-	-	-	-	-	5.0	11.0
430 pF	143	-	-	-	-	-	-	5.0	11.0
470 pF	147	-	-	-	-	-	-	5.0	11.0
510 pF	151	-	-	-	-	-	-	5.0	11.0
560 pF	156	-	-	-	-	-	-	5.5	11.0
620 pF	162	-	-	-	-	-	-	5.5	11.0
680 pF	168	-	-	-	-	-	-	5.5	11.0
750 pF	175	-	-	-	-	-	-	5.5	11.0
820 pF	182	-	-	-	-	-	-	5.0	11.0
910 pF	191	-	-	-	-	-	-	5.0	11.0
1000 pF	210	-	-	-	-	-	-	5.0	11.0
1100 pF	211	-	-	-	-	-	-	5.0	11.0
1200 pF	212	-	-	-	-	-	-	5.0	11.0
1300 pF	213	-	-	-	-	-	-	5.0	11.0
1500 pF	215	-	-	-	-	-	-	5.0	11.0
1600 pF	216	-	-	-	-	-	-	5.0	11.0
1800 pF	218	-	-	-	-	-	-	5.0	11.0
2000 pF	220	-	-	-	-	-	-	5.0	11.0
2200 pF	222	-	-	-	-	-	-	5.0	11.0
2400 pF	224	-	-	-	-	-	-	5.0	11.0
2700 pF	227	-	-	-	-	-	-	5.0	11.0
3000 pF	230	-	-	-	-	-	-	5.0	11.0
3300 pF	233	-	-	-	-	-	-	5.0	11.0
3600 pF	236	-	-	-	-	-	-	5.0	11.0
3900 pF	239	-	-	-	-	-	-	5.0	11.0
4300 pF	243	-	-	-	-	-	-	5.0	11.0
4700 pF	247	-	-	-	-	-	-	5.0	11.0
6200 pF	262	-	-	-	-	-	-	5.5	11.0
6800 pF	268	-	-	-	-	5.0	11.0	5.5	11.0

CAPACITANCE	CAPACITANCE CODE	VOLTAGE CODE 16 160 Vdc/100Vac		VOLTAGE CODE 25 250 Vdc/160Vac		VOLTAGE CODE 40 400 Vdc/220Vac (1)		VOLTAGE CODE 63 630 Vdc/250Vac (1)	
		D (mm)	L (mm)	D (mm)	L (mm)	D (mm)	L (mm)	D (mm)	L (mm)
8200 pF	282	-	-	-	-	5.0	11.0	6.0	11
0.01 µF	310	-	-	5.0	11.0	5.5	11.0	5.5	14.0
0.015 µF	315	-	-	5.0	11.0	6.0	11.0	6.5	14.0
0.022 µF	322	-	-	5.0	11.0	6.5	14.0	7.5	14.0
0.033 µF	333	5.0	11.0	5.5	11.0	7.0	14.0	7.0	19.0
0.047 µF	347	5.5	11.0	6.0	14.0	8.0	14.0	8.0	19.0
0.068 µF	368	6.0	11.0	6.5	14.0	8.5	19.0	9.0	19.0
0.1 µF	410	6.5	14.0	7.5	14.0	9.0	19.0	8.5	26.5
0.15 µF	415	7.5	14.0	7.0	19.0	8.0	26.5	10.5	26.5
0.22 µF	422	7.0	19.0	8.5	19.0	9.5	26.5	12.0	26.5
0.33 µF	433	8.0	19.0	8.0	26.5	11.5	26.5	14.5	26.5
0.47 µF	447	9.0	19.0	9.0	26.5	13.5	26.5	15.0	31.5
0.68 µF	468	8.5	26.5	11.0	26.5	14.0	31.5	18.0	31.5
1.0 µF	510	10.5	26.5	12.5	26.5	17.0	31.5	18.0	41.5
1.5 µF	515	12.0	26.5	13.0	31.5	20.5	31.5	22.0	41.5
2.2 µF	522	13.0	31.5	16.0	31.5	21.0	41.5	-	-
3.3 µF	533	15.5	31.5	19.0	31.5	-	-	-	-
4.7 µF	547	15.5	41.5	19.5	41.5	-	-	-	-
6.8 µF	568	18.5	41.5	23.0	41.5	-	-	-	-
10 µF	610	22.0	41.5	22.0	41.5	-	-	-	-
15 µF	615	24.5	41.5	24.5	41.5	-	-	-	-
22 µF	622	28.5	41.5	28.5	41.5	-	-	-	-

Notes

(1) Not suitable for mains applications

- Pitch = L + 3.5 mm

RECOMMENDED PACKAGING

PACKAGING CODE	TYPE OF PACKAGING	REEL DIAMETER (mm)	ORDERING CODE EXAMPLES	
G	Ammo	-	MKP 1839-422-403-G	x
R	Reel	350	MKP 1839-422-403-R	x
-	Bulk for L > 31.5 mm	-	MKP 1839-522-403	x

Note

- For detailed tape specifications refer to “Packaging Information”: www.vishay.com/doc?28139

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 capacitors body is in good contact with the printed-circuit board.

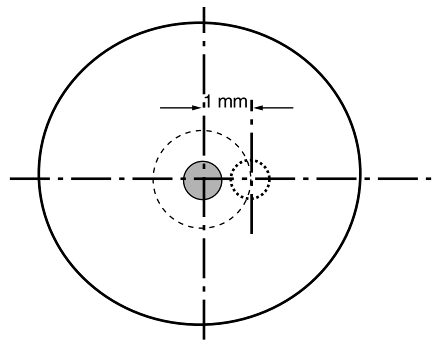
- For L < 19 mm capacitors shall be mechanically fixed by the leads
- For larger pitches the capacitors shall be mounted in the same way and the body clamped
- The maximum diameter and length of the capacitors are specified in the dimensions table
- Eccentricity as shown in the drawing on next page

AC and Pulse Metallized Polypropylene Film Capacitors
MKP Axial Type

Space Requirements on Printed-Circuit Board

The maximum length and width of film capacitors is shown in drawing:

- Eccentricity as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned.
- Product height with seating plane as given by IEC 60717 as reference: $h_{max.} \leq h + 0.4$ mm or $h_{max.} \leq h' + 0.4$ mm



Storage Temperature

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

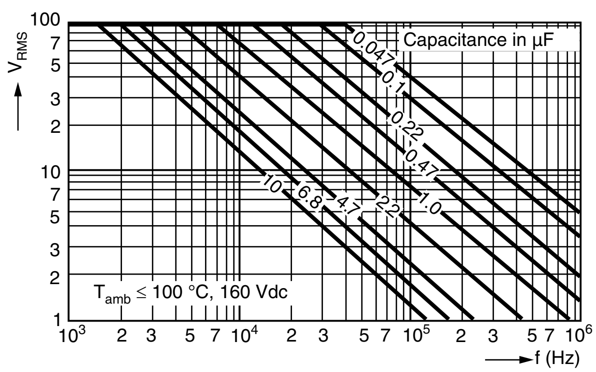
Ratings and Characteristics Reference Conditions

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

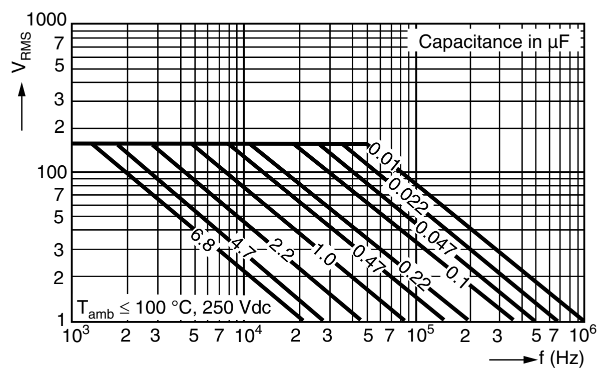
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

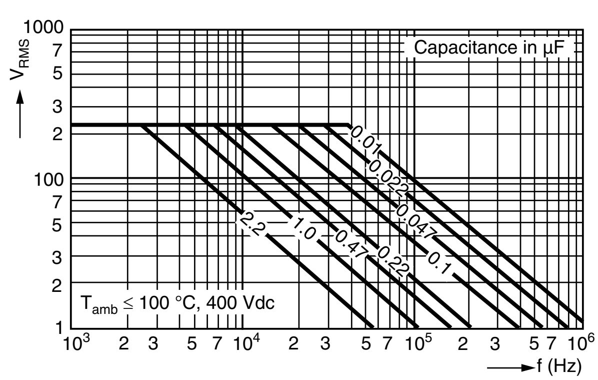
Max. RMS voltage as a function of frequency (typical curve)



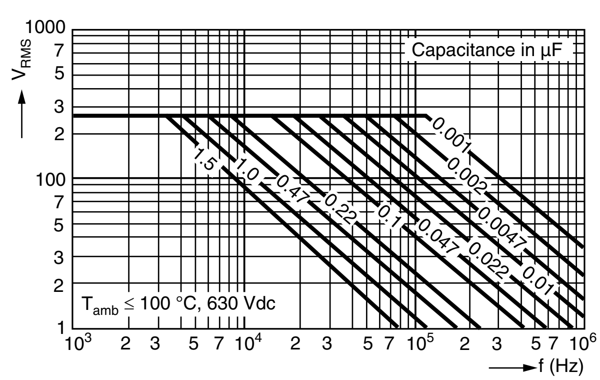
Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



Max. RMS voltage as a function of frequency



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

DIAMETER (mm)	HEAT CONDUCTIVITY (mW/°C)					
	L 11 mm	L 14 mm	L 19 mm	L 26.5 mm	L 31.5 mm	L 41.5 mm
5.0	2	3	4	5	6	8
5.5	3	3	4	6	7	9
6.0	3	4	5	7	8	10
6.5	3	4	5	7	9	11
7.0	4	5	6	8	9	12
7.5	4	5	7	9	10	13
8.0	4	5	7	10	11	15
8.5	5	6	8	10	12	16
9.0	5	6	8	11	13	17
9.5	6	7	9	12	14	18
10.0	6	7	10	13	15	19
10.5	7	8	10	14	16	20
11.0	7	8	11	14	17	21
11.5	8	9	12	15	18	23
12.0	8	10	12	16	19	24
12.5	9	10	13	17	20	25
13.0	9	11	14	18	21	26
13.5	10	11	14	19	22	28
14.0	10	12	15	20	23	29
14.5	11	13	16	21	24	30
15.0	11	13	16	21	25	31
15.5	12	14	17	22	26	33
16.0	12	14	18	23	27	34
16.5	13	15	19	24	28	35
17.0	14	16	20	25	29	37
17.5	14	17	20	26	30	38
18.0	15	17	21	27	31	39
18.5	15	18	22	28	32	41
19.0	16	19	23	29	34	42
19.5	17	19	24	30	35	43
20.0	17	20	25	31	36	45
20.5	18	21	25	32	37	46
21.0	19	22	26	33	38	48
21.5	20	22	27	35	39	49
22.0	20	23	28	36	41	50
22.5	21	24	29	37	42	52
23.0	22	25	30	38	43	53
23.5	23	26	31	39	44	55
24.0	23	27	32	40	46	56
24.5	24	27	33	41	47	58
25.0	25	28	34	42	48	59
25.5	26	29	35	44	49	61
26.0	27	30	36	45	51	62
26.5	27	31	37	46	52	64
27.0	28	32	38	47	53	66
27.5	29	33	39	48	55	67
28.0	30	34	40	50	56	69
28.5	31	35	41	51	57	70

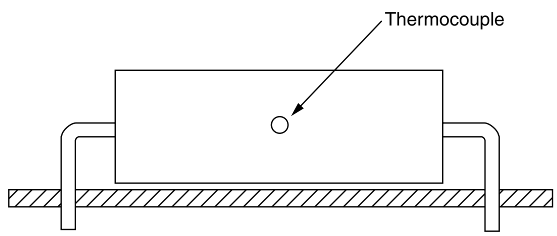
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 with the typical tgd of the curves”.
The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- 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 the maximum (U_{P-P}) to avoid the ionisation inception level
3. The voltage peak 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 < $T_{amb} \leq 100$ °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}

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-16 and Specific Reference Data”.

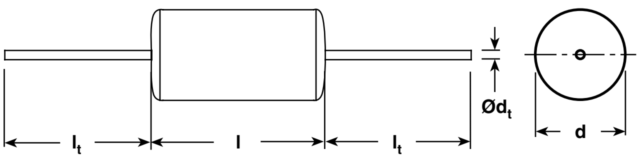
Group C Inspection Requirements

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 chapter “General Data” of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.3 Robustness of terminations	Tensile and bending	No visible damage
4.4 Resistance to soldering heat	Method: 1A Solder bath: 280 °C ± 5 °C Duration: 5 s	
4.14 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert \Delta C/C \rvert \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan $\delta \leq 0.002$ 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 10 kHz For C > 1 µF at 1 kHz	
4.15 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = Lower category temperature θB = Upper category temperature 5 cycles Duration t = 30 min	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
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
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	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured in 4.6.1
	Tangent of loss angle	Increase of tan $\delta \leq 0.002$ 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: Upper category temperature Duration: 16 h	
4.10.3 Damp heat cyclic Test Db, first cycle		
4.10.4 Cold	Temperature: Lower category temperature Duration: 2 h	
4.10.6 Damp heat cyclic Test Db, remaining cycles	Visual examination	No visible damage Legible marking
4.10.6.2 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.4.2 or 4.9.3
	Tangent of loss angle	Increase of tan $\delta \leq 0.003$ 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	Capacitance	
4.11.1 Initial measurements	Tangent of loss angle at 1 kHz	
4.11.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.001$ Compared to values measured in 4.11.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C3		
4.12 Endurance DC	Duration: 2000 h 1.25 x U_{Rdc} at 85 °C 0.875 x U_{Rdc} at 100 °C	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.12.5 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	No visible damage Legible marking $\lvert\Delta C/C\rvert \leq 3$ % compared to values measured in 4.12.1 Increase of tan $\delta \leq 0.002$ Compared to values measured in 4.12.1 ≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.2.6 Temperature characteristics Initial measurement Intermediate Intermediate measurements	Capacitance Capacitance at lower category temperature Capacitance at 20 °C Capacitance at upper category temperature	For - 55 °C to + 20 °C: 0 **%** $\leq \lvert\Delta C/C\rvert \leq 2$ % or for 20 °C to 85 °C: **- 3 %** $\leq \lvert\Delta C/C\rvert \leq 0$ %
Final measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz Insulation resistance	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: $R = \frac{U_{Rdc}}{2.5 \times C(dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.13.3 Final measurements	Capacitance Tangent of loss angle Insulation resistance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.13.1 Increase of tan $\delta \leq 0.003$ Compared to values measured in 4.13.1 ≥ 50 % of values specified in section "Insulation Resistance" of this specification

AC and Pulse Metallized Polypropylene Film Capacitors MKP Axial Type



APPLICATIONS

High current and high pulse operations

REFERENCE STANDARDS

IEC 60384-17

MARKING

Manufacturer's logo; code for dielectric material; manufacturer's type designation; C-code; rated voltage-code; tolerance-code; special n °C-value; tolerance; rated voltage; year and week; manufacturer's location

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized

CONSTRUCTION

Series construction

RATED (DC) VOLTAGE

630 V, 850 V, 1250 V, 1600 V

RATED (AC) VOLTAGE

300 V, 400 V, 450 V, 600 V

FEATURES

Supplied loose in box, taped on ammopack or reel available on request
RoHS compliant

ENCAPSULATION

Plastic-wrapped, epoxy resin sealed. Flame retardant.

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/110/56

CAPACITANCE RANGE (E12 SERIES)

0.1 µF to 3.3 µF

CAPACITANCE TOLERANCE

± 5 %

LEADS

Tinned wire

RATED TEMPERATURE

85 °C

MAXIMUM APPLICATION TEMPERATURE

At 85 °C: $U_C = 1.0\ U_R$
at 110 °C: $U_C = 0.7\ U_R$

PULL TEST ON LEADS

≥ 20 N in direction of leads according to IEC 60068-2-21

BENT TEST ON LEADS

2 bends trough 90° with half of the force used in pull test

RELIABILITY

Operation life > 300 000 h
Failure rate < 5 FIT (40 °C and 0.5 x U_R)

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

MKP	1839	X	XX	08	X	HQ	X

TYPE: MKP 1839

MULTIPLIER (nF)

0.1	2
1	3
10	4
100	5

CAPACITANCE (numerically)

Example:
468 = 680 nF

VOLTAGE (Vdc)

63 = 630 V
08 = 850 V
12 = 1250 V
13 = 1600 V

TOLERANCE

4	± 5 %

HIGH QUALITY CAPACITOR: HQ

SPECIAL LETTER FOR TAPED

	Bulk
R	Reel
G	Ammopack
(1)	Special

Note

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

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE			
Tangent of loss angle:	at 1 kHz	at 10 kHz	at 100 kHz	
$0.1\ \mu F < C \leq 0.47\ \mu F$	$\leq 3 \times 10^{-4}$	$\leq 5 \times 10^{-4}$	$\leq 35 \times 10^{-4}$	
$0.47\ \mu F < C \leq 1\ \mu F$	$\leq 3 \times 10^{-4}$	$\leq 8 \times 10^{-4}$	$\leq 50 \times 10^{-4}$	
$1\ \mu F < C \leq 3.3\ \mu F$	$\leq 3 \times 10^{-4}$	$\leq 10 \times 10^{-4}$	$\leq 60 \times 10^{-4}$	
Rated voltage pulse slope $(dU/dt)_R$ at U_{Rdc}	630 Vdc	850 Vdc	1250 Vdc	1600 Vdc
	500 V/µs	1000 V/µs	1000 V/µs	1000 V/µs
U_{P-P} peak-to-peak voltage	700 V	1130 V	1400 V	1600 V
R between leads, for C ≤ 0.33 µF at 500 V, 1 min	> 100 GΩ			
RC between leads, for C > 0.33 µF at 500 V, 1 min	> 30 000 s			
R between interconnecting and wrapped film at 500 V, 1 min	> 100 GΩ			
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	1008 V	1360 V	2000 V	2560 V
	1 min			
Withstanding (DC) voltage between leads and wrapped film ($1.4 \times U_{Rac} + 2000$)	2840 V, 1 min			
Maximum application temperature	110 °C			

CAPACITANCE	VOLTAGE CODE 63 630 Vdc/300 Vac					VOLTAGE CODE 08 850 Vdc/400 Vac				
	DIMENSIONS max. (mm)		MASS	d_t ± 0.08 mm	SPQ (1)	DIMENSIONS max. (mm)		MASS	d_t ± 0.08 mm	SPQ (1)
(µF)	D	L	(g)	(mm)	Pieces	D	L	(g)	(mm)	Pieces
0.1	7	26.5	0.9	0.8	2000	8.5	31.5	1.6	0.8	1500
0.15	8	26.5	1.2	0.8	1750	10	31.5	2.3	0.8	1000
0.18	8.5	26.5	1.4	0.8	1500	11	31.5	2.7	0.8	850
0.22	9.5	26.5	1.6	0.8	1250	11.5	31.5	3.2	0.8	750
0.27	10	26.5	1.9	0.8	1000	13	31.5	3.9	0.8	600
0.33	11	26.5	2.3	0.8	900	14	31.5	4.6	0.8	500
0.39	10.5	31.5	2.6	0.8	900	15	31.5	5.4	0.8	1000
0.47	11	31.5	3.0	0.8	750	16.5	31.5	6.5	0.8	900
0.56	12	31.5	3.5	0.8	650	15	31.5	5.4	0.8	1000
0.68	13	31.5	4.2	0.8	500	16.5	31.5	6.5	0.8	850
0.82	14	31.5	5.1	0.8	1000	18	31.5	7.8	1.0	750
1	16	31.5	6.1	0.8	900	19.5	31.5	9.4	1.0	600
1.5	19	31.5	9.0	1.0	600	24	31.5	13.9	1.0	400
2.2	23	31.5	13.1	1.0	450	-	-	-	-	-
3.3	28	31.5	19.5	1.0	300	-	-	-	-	-

CAPACITANCE	VOLTAGE CODE 12 1250 Vdc/450 Vac					VOLTAGE CODE 13 1600 Vdc/600 Vac				
	DIMENSIONS max. (mm)		MASS	d_t ± 0.08 mm	SPQ (1)	DIMENSIONS max. (mm)		MASS	d_t ± 0.08 mm	SPQ (1)
(µF)	D	L	(g)	(mm)	Pieces	D	L	(g)	(mm)	Pieces
0.1	8.5	31.5	1.6	0.8	1500	10.5	31.5	2.7	0.8	1000
0.15	10	31.5	2.3	0.8	1000	12.5	31.5	3.9	0.8	600
0.18	11	31.5	2.7	0.8	1000	13.5	31.5	4.6	0.8	500
0.22	11.5	31.5	3.2	0.8	800	15	31.5	5.5	0.8	500
0.27	13	31.5	3.9	0.8	650	16.5	31.5	6.7	0.8	900
0.33	14	31.5	4.6	0.8	500	18	31.5	8.1	1.0	750
0.39	15	31.5	5.4	0.8	1000	19.5	31.5	9.5	1.0	600
0.47	16.5	31.5	6.5	0.8	900	21.5	31.5	11.3	1.0	500
0.56	18	31.5	7.7	1.0	750	23.5	31.5	13.4	1.0	400
0.68	20	31.5	9.2	1.0	600	25.5	31.5	16.2	1.0	350
0.82	21.5	31.5	11.1	1.0	500	-	-	-	-	-
1	23.5	31.5	13.4	1.0	400	-	-	-	-	-
1.5	-	-	-	-	-	-	-	-	-	-
2.2	-	-	-	-	-	-	-	-	-	-
3.3	-	-	-	-	-	-	-	-	-	-

Note

(1) SPQ = Standard Packing Quantity

MOUNTING

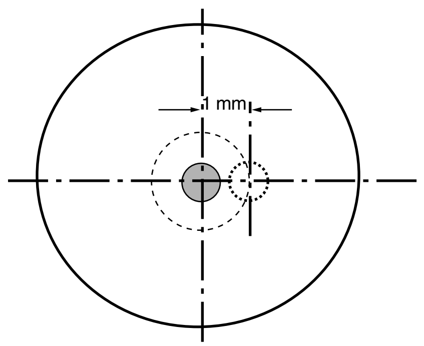
Normal Use

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.

Specific Method of Mounting to Withstand Vibration and Shock

In order to withstand vibration and shock tests, it must be ensured that the capacitor body is in good contact with the printed-circuit board.

- For L ≤ 19 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
- The maximum diameter and length of the capacitors are specified in the dimensions table
- Eccentricity as shown in the drawing below:



Storage Temperature

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

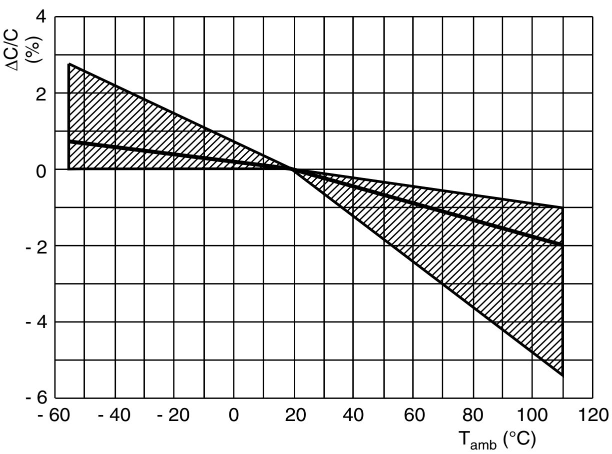
Ratings and Characteristics Reference Conditions

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

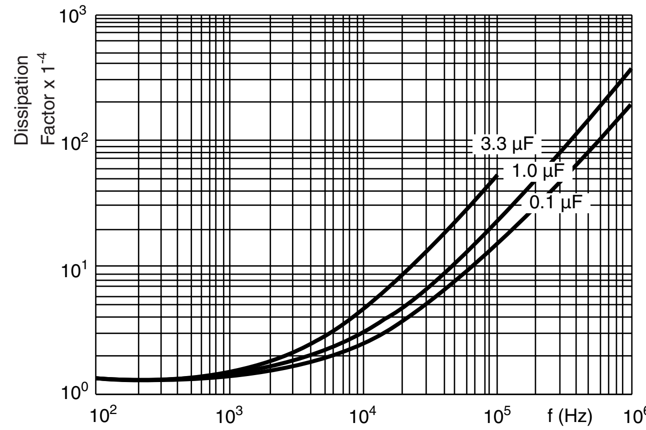
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

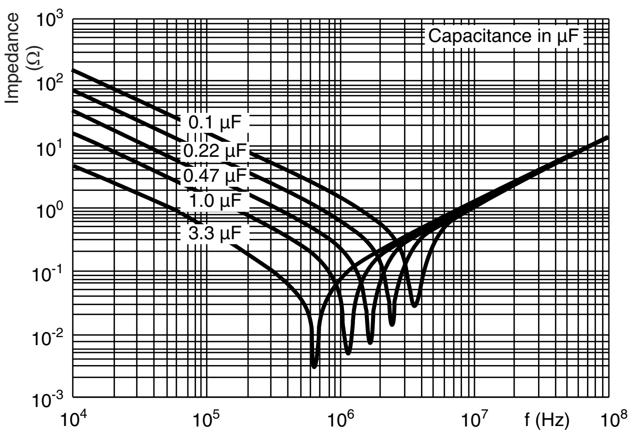
Capacitance as a function of ambient temperature (typical curve)



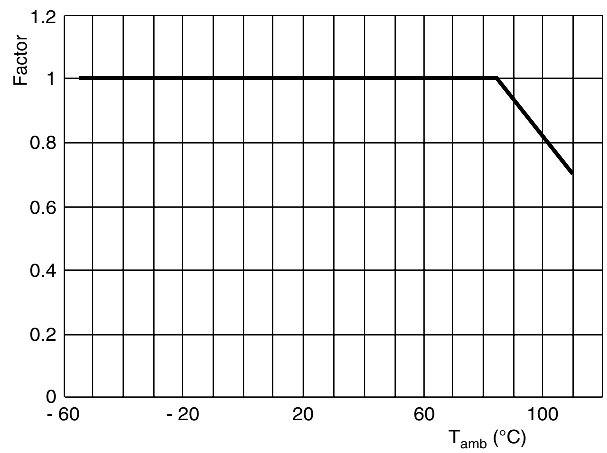
Tangent of loss angle as a function of frequency (typical curve)



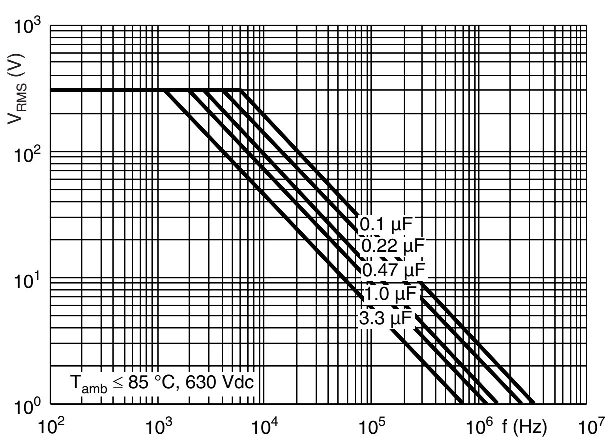
Impedance as a function of frequency (typical curve)



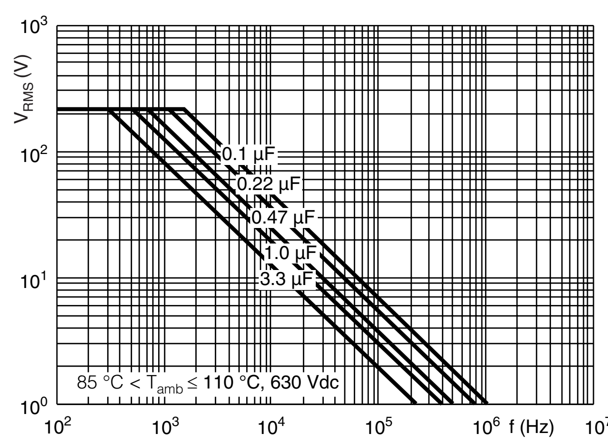
Max. DC and AC voltage as a function of temperature



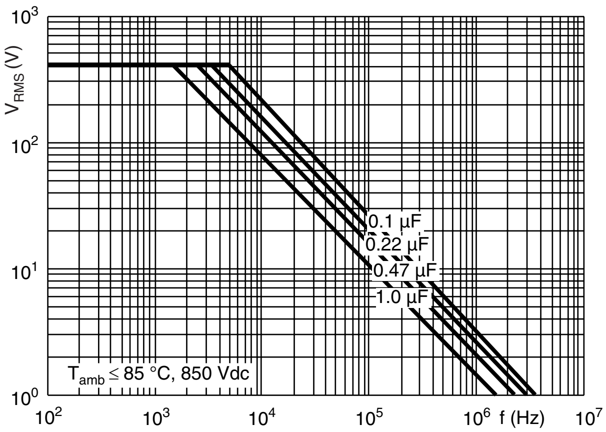
Max. RMS Voltage (sinewave) as a function of frequency



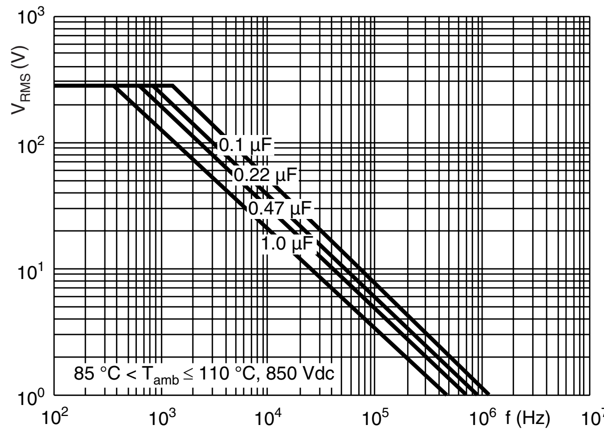
Max. RMS Voltage (sinewave) as a function of frequency



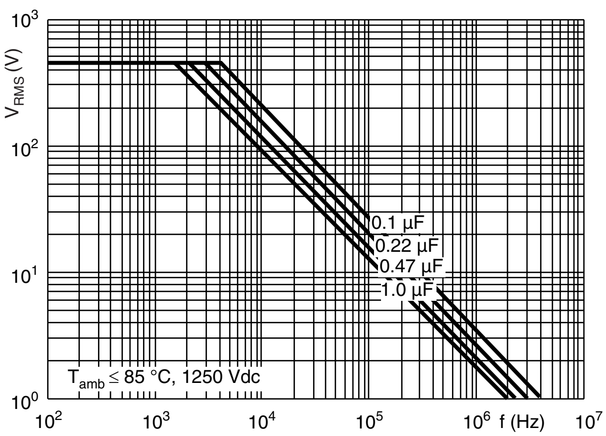
Max. RMS Voltage (sinewave) as a function of frequency



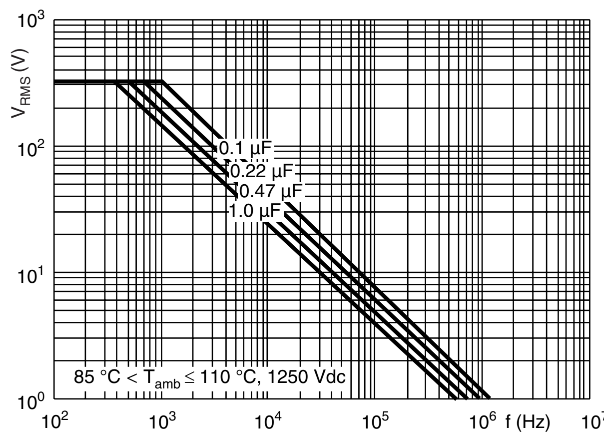
Max. RMS Voltage (sinewave) as a function of frequency



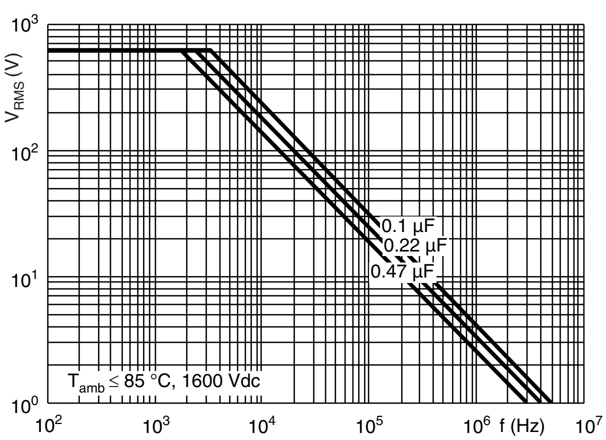
Max. RMS Voltage (sinewave) as a function of frequency



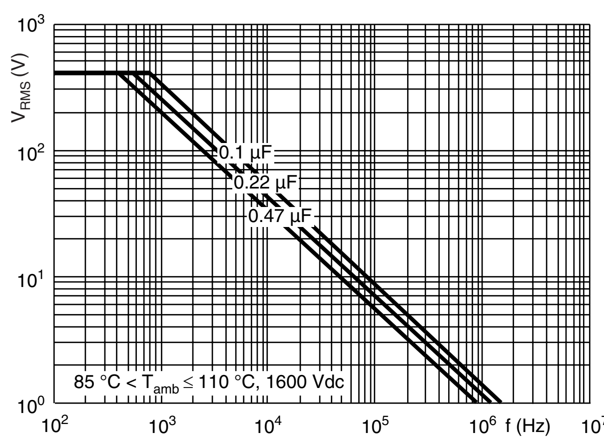
Max. RMS Voltage (sinewave) as a function of frequency



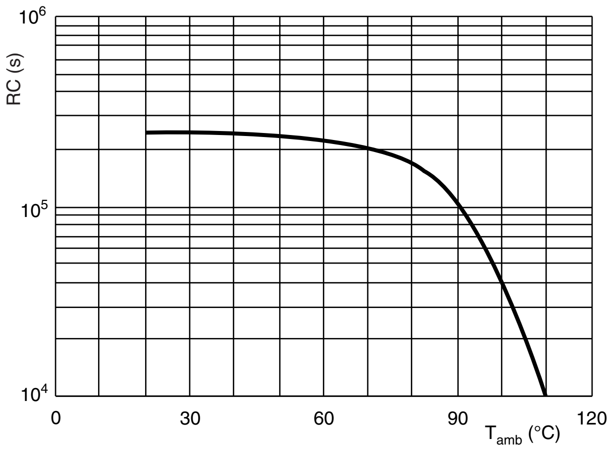
Max. RMS Voltage (sinewave) as a function of frequency



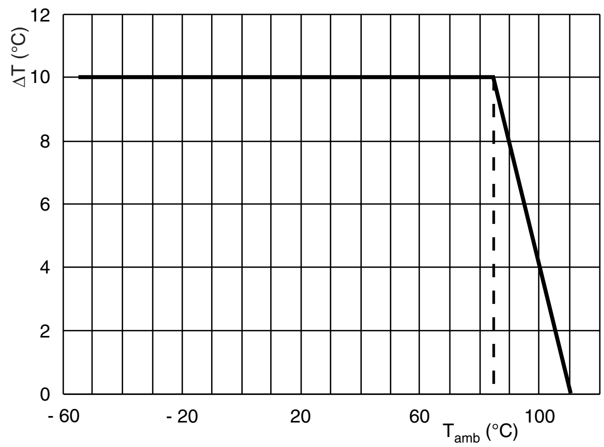
Max. RMS Voltage (sinewave) as a function of frequency



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



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



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

DIAMETER (mm)	HEAT CONDUCTIVITY (mW/°C)	
	PITCH 26.5 mm	PITCH 31.5 mm
7.0	8	-
8.0	10	-
8.5	11	12
9.5	12	-
10.0	13	15
10.5	-	16
11.0	15	17
11.5	-	18
12.0	-	19
12.5	-	20
13.0	-	21
13.5	-	22
14.0	-	23
15.0	-	25
16.0	-	28
16.5	-	29
18.0	-	32
19.0	-	34
19.5	-	36
20.0	-	37
21.5	-	40
23.0	-	44
23.5	-	45
24.0	-	47
25.5	-	51
28.0	-	57

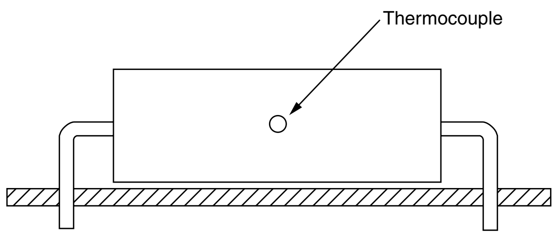
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 with the typical tgd of the curves”.
The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- 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.

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 the maximum (U_{P-P}) 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 figure 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 < $T_{amb} \leq 110$ °C
Maximum continuous RMS voltage	U_{Rac}	See "Maximum AC voltage as a function of temperature par. characteristics"
Maximum temporary RMS-overvoltage (< 24 h)	1.25 x U_{Rac}	0.875 x U_{Rac}
Maximum peak voltage (V_{O-P}) (< 2 s)	1.6 x U_{Rdc}	1.1 x U_{Rdc}

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".

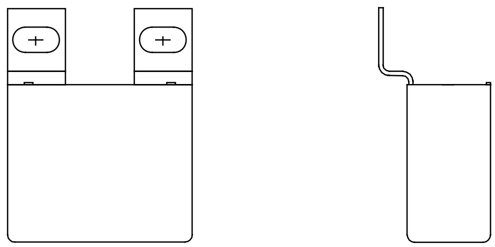
Group C Inspection Requirements

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 chapter "General Data" of this specification
4.3.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.3 Robustness of terminations	Tensile: Load 30 N; 10 s Bending: Load 15 N; 90°	No visible damage
4.4 Resistance to soldering heat	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 2$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: For C ≤ 470 nF ≤ 0.001 (10 x 10^{-4}) For C > 470 nF ≤ 0.0015 (15 x 10^{-4}) Compared to values measured initially
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
4.14 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.6 Rapid change of temperature	θA = - 55 °C θB = + 110 °C 5 cycles Duration t = 30 min	
	Visual examination	No visible damage

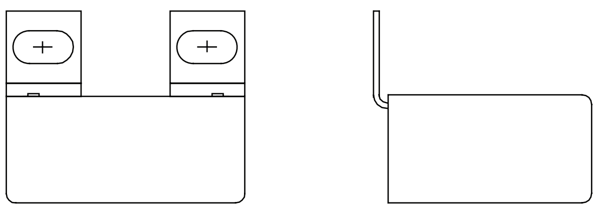
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.7 Vibration	Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 Hz to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	
4.7.2 Final inspection	Visual examination	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	$\lvert\Delta C/C\rvert \leq 2$ % of the value measured initally
	Tangent of loss angle	Increase of tan δ: For C ≤ 470 nF ≤ 0.001 (10 x 10^{-4}) For C > 470 nF ≤ 0.0015 (15 x 10^{-4}) Compared to values measured initially
	Insulation resistance	≥ 50 % of values 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: 110 °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 testchambers	No breakdown or flashover
	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: For C ≤ 470 nF ≤ 0.001 (10 x 10^{-4}) For C > 470 nF ≤ 0.0015 (15 x 10^{-4}) Compared to values measured in 4.3.1 or 4.6.1 as applicable
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C2		
4.11 Damp heat steady state	Capacitance	
4.11.1 Initial measurements	Tangent of loss angle at 1 kHz	
	Visual examination	No visible damage Legible marking
4.11.3 Final measurements	Voltage proof = U_{Rdc} for 1 min within 15 min after removal from testchamber	No breakdown or flashover
	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan δ: For C ≤ 470 nF ≤ 0.001 (10 x 10^{-4}) For C > 470 nF ≤ 0.0015 (15 x 10^{-4}) 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 C3 A		
4.12.1 Endurance test at 50 Hz alternative voltage	Duration: 2000 h x U_{Rdc} at 85 °C 0.875 x U_{Rdc} at 110 °C	
4.12.1.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.12.1.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % compared to values measured in 4.12.1.1
	Tangent of loss angle	Increase of tan δ: For C ≤ 470 nF ≤ 0.001 (10 x 10^{-4}) For C > 470 nF ≤ 0.0015 (15 x 10^{-4}) 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 characteristics Initial measurement Intermediate measurements	Capacitance Capacitance at - 55 °C Capacitance at 20 °C Capacitance at 110 °C	For - 55 °C to 20 °C 0 % ≤ $\lvert\Delta C/C\rvert$ ≤ 2.75 % or for 20 °C to 110 °C: - 5.5 % ≤ $\lvert\Delta C/C\rvert$ ≤ 0 % As specified in section “Capacitance” of this specification
4.13 Charge and discharge	10 000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_n(Vdc)}{2.5 \times C(dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 3$ % of the value measured in 4.13.1
	Tangent of loss angle	Increase of tan δ: For C ≤ 470 nF ≤ 0.001 (10 x 10^{-4}) For C > 470 nF ≤ 0.0015 (15 x 10^{-4}) Compared to values measured in 4.13.1
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification

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



Horizontally Mounted



Vertically Mounted

APPLICATIONS

Industrial motor control circuits, mounted directly on the IGBT or GTO.

REFERENCE SPECIFICATIONS

IEC 60384-17

MARKING

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

DIELECTRIC

Polypropylene film

ELECTRODES

Double metallized

CONSTRUCTION

Mono construction for 630 V version
Internal serial construction from 850 Vdc on

RATED (DC) VOLTAGE

630 V, 850 V, 1000 V, 1250 V, 1400 V, 1600 V, 2000 V, 2500 V

RATED (AC) VOLTAGE

220 V, 300 V, 350 V, 425 V, 500 V, 550 V, 700 V, 900 V

RATED PEAK-TO-PEAK VOLTAGE

630 V, 850 V, 1000 V, 1250 V, 1400 V, 1600 V, 2000 V, 2500 V

FEATURES

- Low inductive construction
- Low loss dielectric
- Double sided metallized for high pulse ratings
- RoHS compliant

ENCAPSULATION

Flame retardant plastic case (UL-class 94 V-0) and epoxy resin

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/085/56

CAPACITANCE RANGE (E24 SERIES)

0.1 to 4.7 µF

CAPACITANCE TOLERANCE

± 5 %; ± 10 %

TABS

Tinned coated copper

RATED (DC) TEMPERATURE

85 °C

RATED (AC) TEMPERATURE

85 °C

MAXIMUM APPLICATION TEMPERATURE

85 °C

PERFORMANCE GRADE

Grade 1 (long life)

STABILITY GRADE

Grade 2

DETAIL SPECIFICATION

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

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

COMPOSITION OF CATALOG NUMBER

TYPE
386

CAPACITANCE (numerically)

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

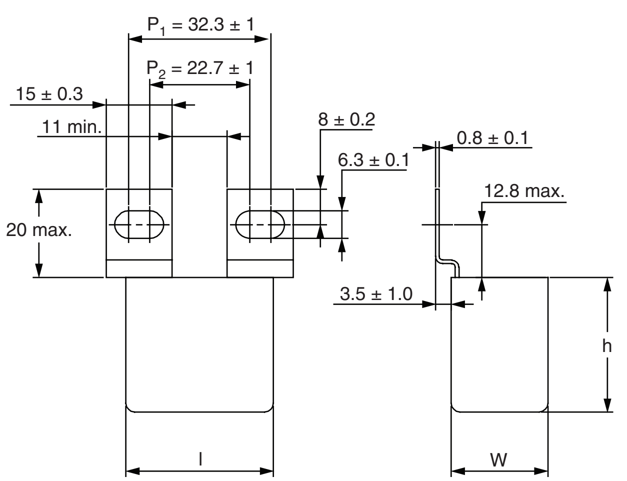
Example:
104 = 10 x 10 = 100 nF

BFC2	386	XX	XX	X
2222 (1)	386	XX	XX	X

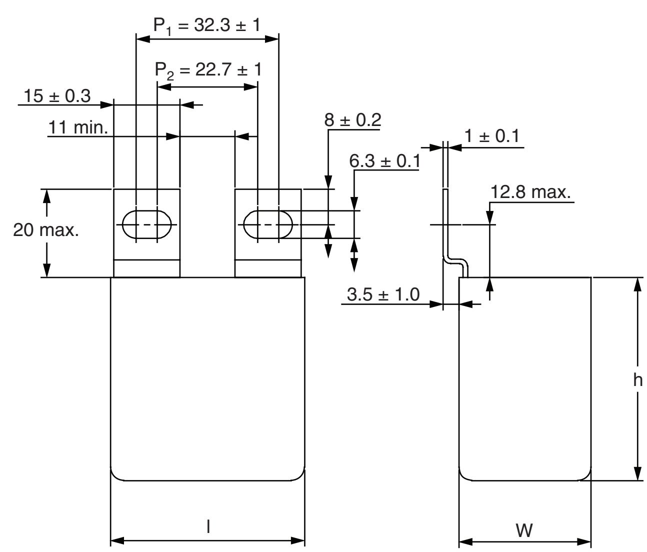
(1) Old ordering code

TYPE	PACKAGING	MOUNTING CONFIGURATION	PREFERRED TYPES								
			C-TOL.	630 V	850 V	1000 V	1250 V	1400 V	1600 V	2000 V	2500 V
386	Loose in box	Horizontally mounted	± 10 %	20	00	30	80	40	50	60	70
		Vertically mounted	± 10 %	22	02	32	82	42	52	62	72
			ON REQUEST								
386	Loose in box	Horizontally mounted	± 5 %	21	01	31	81	41	51	61	71
		Vertically mounted	± 5 %	23	03	33	83	43	53	63	73

Horizontally Mounted



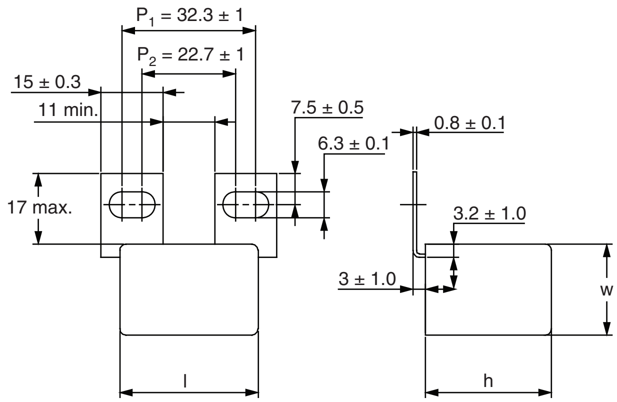
Drawing A



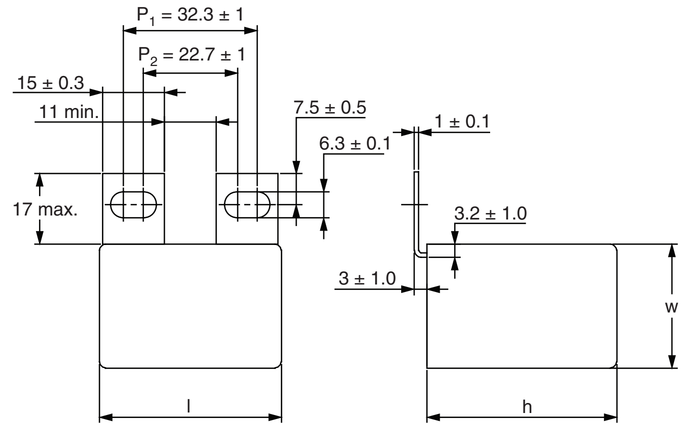
Drawing B

P_1 = Pitch 1
P_2 = Pitch 2

Vertically Mounted



Drawing A



Drawing B

P_1 = Pitch 1
P_2 = Pitch 2

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE							
	630 V	850 V	1000 V	1250 V	1400 V	1600 V	2000 V	2500 V
Capacitance range	0.33 µF to 4.7 µF	0.22 µF to 2.7 µF	0.33 µF to 1.8 µF	0.15 µF to 0.82 µF	0.1 µF to 0.68 µF	0.1 µF to 0.56 µF	0.1 µF to 0.47 µF	0.1 µF to 0.27 µF
Maximum operating DC voltage	630 V	850 V	1000 V	1250 V	1400 V	1600 V	2000 V	2500 V
Maximum operating AC voltage	220 V	300 V	350 V	425 V	500 V	550 V	700 V	900 V
Tangent of loss angle	≤ 0.47 µF		0.56 µF ≤ C ≤ 1.0 µF			C > 1.0 F		
at 1 kHz	< 5 x 10^{-4}		< 5 x 10^{-4}			< 10 x 10^{-4}		
at 10 kHz	< 10 x 10^{-4}		< 10 x 10^{-4}			< 20 x 10^{-4}		
at 100 kHz	< 12 x 10^{-4}		< 25 x 10^{-4}					
R between terminals at 500 V; 1 min	> 5000 MΩ							
R between terminals and case; 500 V; 1 min	> 30 000 MΩ							
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	1000 V; 1 min	1360 V; 1 min	1600 V; 1 min	2000 V; 1 min	2240 V; 1 min	2560 V; 1 min	3200 V; 1 min	4000 V; 1 min
Withstanding (DC) voltage between terminals and case	2840 V; 1 min							
Maximum dU/dt (V/µs)	630 V	850 V	1000 V	1250 V	1400 V	1600 V	2000 V	2500 V
w x h x l = 22.0 x 30.5 x 33.5	250	650	1000	1500	2000	2400	2500	5500
w x h x l = 22.0 x 38.0 x 44.0	100	350	500	750	900	1000	1000	2000
w x h x l = 30.0 x 46.0 x 44.0	75	260	350	550	650	750	750	1500
ESR at 100 kHz	6 mΩ							
ESL	Typical 15 nH							
Temperature range	- 55 °C to + 85 °C							

U_{Rdc} = 630 V; U_{Rac} = 220 V/U_{pp} = 630 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.33	22.0 x 30.5 x 33.5	39	20334	56
0.39		38	20394	
0.47		38	20474	
0.56		37	20564	
0.68		37	20684	
0.82		36	20824	
1		35	20105	
1.2		35	20125	
Drawing B				
1.5	22.0 x 38.0 x 44.0	60	20155	42
1.8		58	20185	
2.2		56	20225	
2.7		54	20275	
3.3	30.0 x 46.0 x 44.0	86	20335	36
3.9		83	20395	
4.7		80	20475	

• SPQ = Standard Packing Quantity

U_{Rdc} = 850 V; U_{Rac} = 300 V/U_{pp} = 850 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.22	22.0 x 30.5 x 33.5	39	00224	56
0.27		39	00274	
0.33		38	00334	
0.39		38	00394	
0.47		37	00474	
0.56		37	00564	
0.68		36	00684	
0.82		35	00824	
Drawing B				
1.0	22.0 x 38.0 x 44.0	61	00105	42
1.2		59	00125	
1.5		58	00155	
1.8	30.0 x 46.0 x 44.0	91	00185	36
2.2		88	00225	
2.7		85	00275	

• SPQ = Standard Packing Quantity

U_{Rdc} = 1000 V; U_{Rac} = 350 V/U_{pp} = 1000 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.33	22.0 x 30.5 x 33.5	36	30334	56
0.39		35	30394	
0.47		34	30474	
Drawing B				
0.56	22.0 x 38.0 x 44.0	60	30564	42
0.68		59	30684	
0.82		57	30824	
1.0		55	30105	
1.2	30.0 x 46.0 x 44.0	88	30125	36
1.5		84	30155	
1.8		80	30185	

• SPQ = Standard Packing Quantity

U_{Rdc} = 1250 V; U_{Rac} = 425 V/U_{pp} = 1250 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.15 0.18 0.22 0.27	22.0 x 30.5 x 33.5	37 35 34 33	80154 80184 80224 80274	56
Drawing B				
0.33 0.39 0.47	22.0 x 38.0 x 44.0	59 58 57	80334 80394 80474	42
0.56 0.68 0.82	30.0 x 46.0 x 44.0	89 85 82	80564 80684 80824	36

• SPQ = Standard Packing Quantity

U_{Rdc} = 1400 V; U_{Rac} = 500 V/U_{pp} = 1400 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.1 0.12 0.15	22.0 x 30.5 x 33.5	37 36 35	40104 40124 40154	56
Drawing B				
0.18 0.22 0.27 0.33	22.0 x 38.0 x 44.0	61 59 57 56	40184 40224 40274 40334	42
0.39 0.47 0.56 0.68	30.0 x 46.0 x 44.0	89 85 82 79	40394 40474 40564 40684	36

• SPQ = Standard Packing Quantity

U_{Rdc} = 1600 V; U_{Rac} = 550 V/U_{pp} = 1600 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.1 0.12 0.15	22.0 x 30.5 x 33.5	37 36 35	50104 50124 40154	56
Drawing B				
0.18 0.22 0.27 0.33	22.0 x 38.0 x 44.0	61 59 58 57	50184 50224 50274 50334	42
0.39 0.47 0.56	30.0 x 46.0 x 44.0	90 87 84	50394 50474 50564	36

• SPQ = Standard Packing Quantity

U_{Rdc} = 2000 V; U_{Rac} = 700 V/U_{pp} = 2000 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing A				
0.1 0.12	22.0 x 30.5 x 33.5	36 35	60104 60124	56
Drawing B				
0.15 0.18 0.22 0.27	22.0 x 38.0 x 44.0	61 59 58 57	60154 60184 60224 60274	42
0.33 0.39 0.47	30.0 x 46.0 x 44.0	89 86 84	60334 60394 60474	36

• SPQ = Standard Packing Quantity

U_{Rdc} = 2500 V; U_{Rac} = 700 V/U_{pp} = 2500 V

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g)	CATALOG NUMBER BFC2 386 XXXXX AND PACKAGING	
			TRAY PACKAGING	
			C-tol. = ± 10 %	SPQ
Drawing B				
0.1 0.12 0.15 0.18	22.0 x 38.0 x 44.0	60 59 57 55	70104 70124 70154 70184	42
0.22 0.27	30.0 x 46.0 x 44.0	87 83	70224 70274	36

• SPQ = Standard Packing Quantity

MOUNTING

Normal Use

The capacitors are designed for direct mounting on IGBT or GTO.

Specific Method of Mounting to Withstand Vibration and Shock

In order to withstand vibration and shock tests, it must be ensured that the tabs are screwed tightly on the test board.

Storage Temperature

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

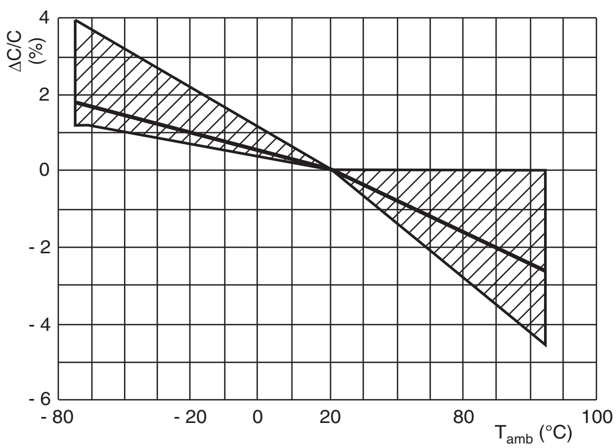
Ratings and Characteristics Reference Conditions

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 %.

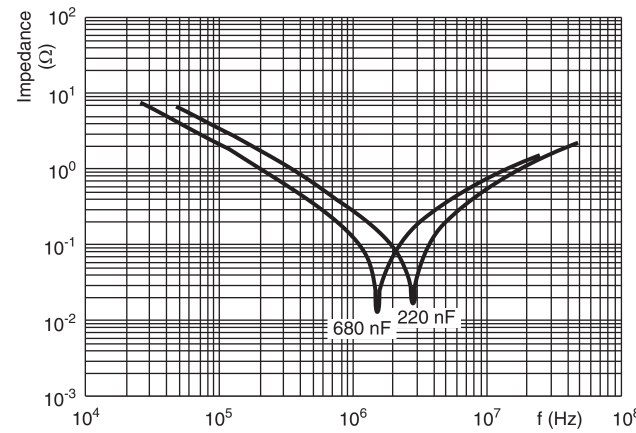
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

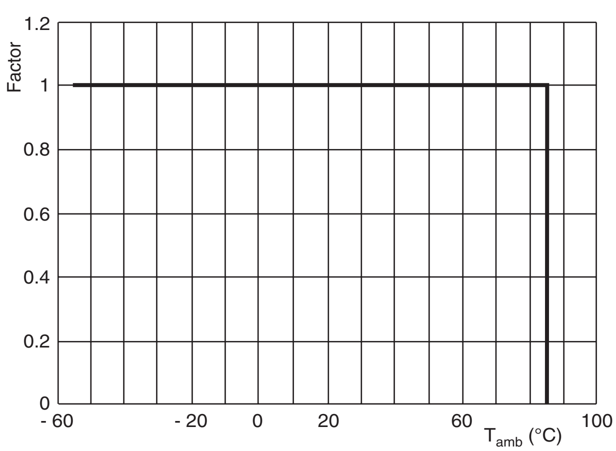
Capacitance as a function of ambient temperature (typical curve)



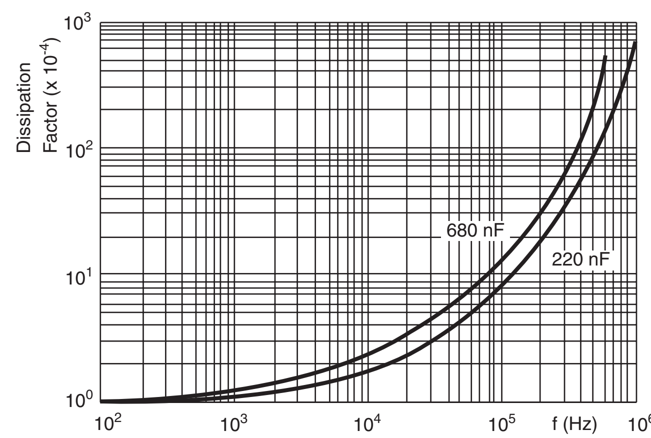
Impedance as a function of frequency (typical curve)



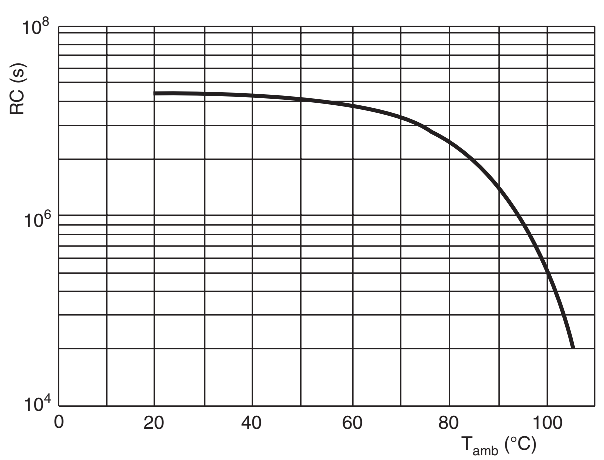
Max. DC and AC voltage as function of temperature



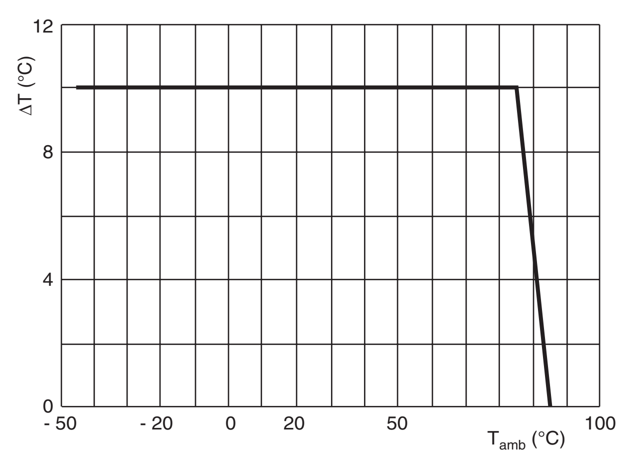
Tangent of loss angle as a function of frequency (typical curve)



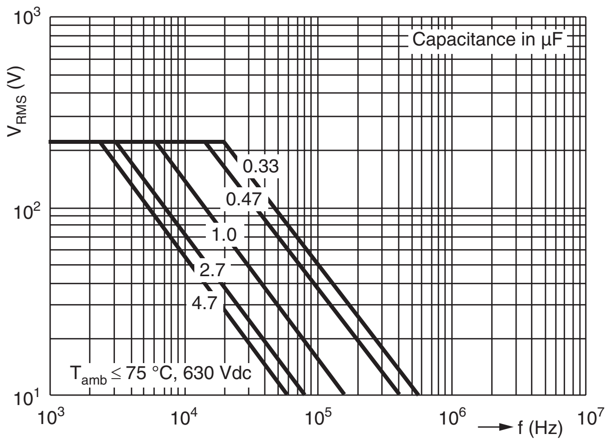
Insulation resistance as a function of ambient temperature (typical curve)



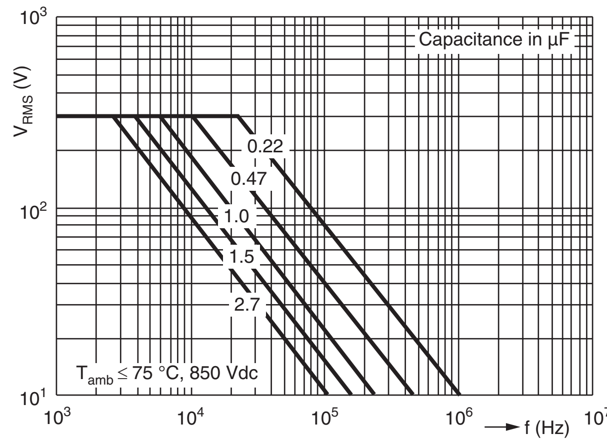
Max. allowed component temperature as a function of ambient temperature



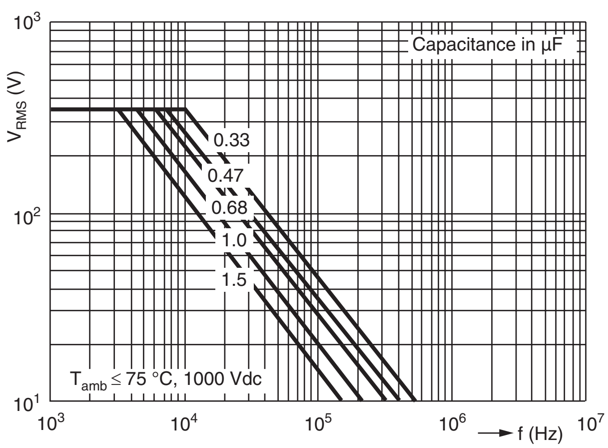
Max. AC voltage as a function of frequency



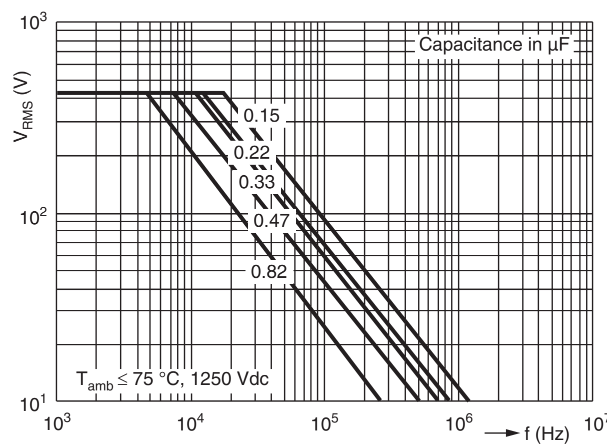
Max. AC voltage as a function of frequency



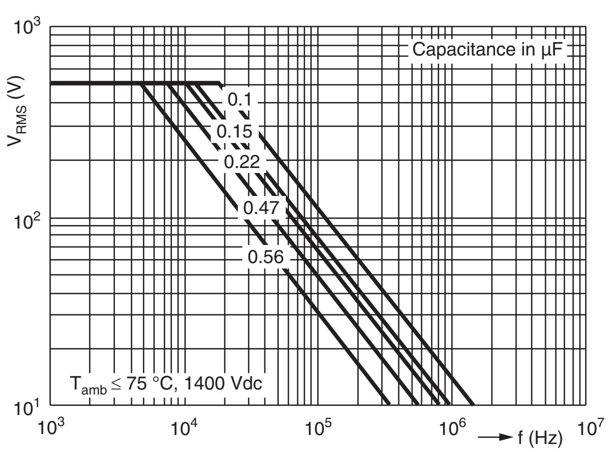
Max. AC voltage as a function of frequency



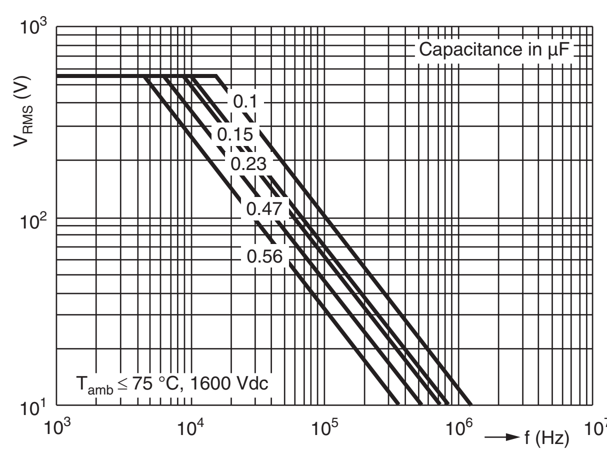
Max. AC voltage as a function of frequency



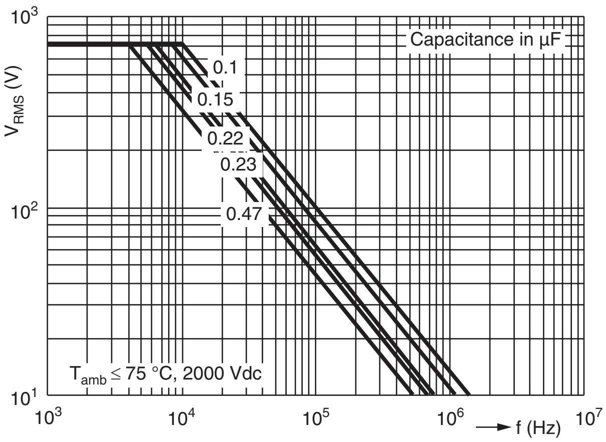
Max. AC voltage as a function of frequency



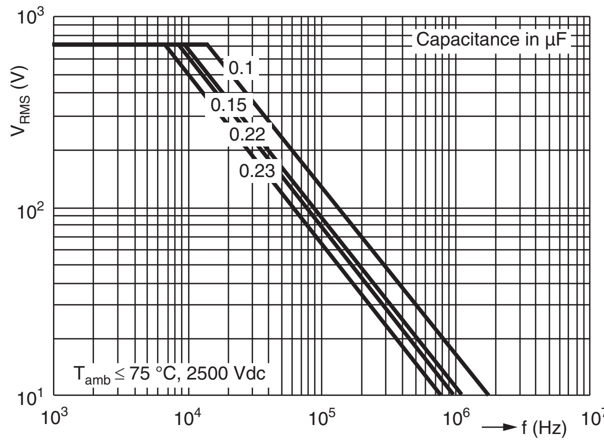
Max. AC voltage as a function of frequency



Max. AC voltage as a function of frequency



Max. AC voltage as a function of frequency



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

$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)	
	BOX LENGTH 33.5 mm	BOX LENGTH 44.0 mm
22.0	75	100
30.0	-	140

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.

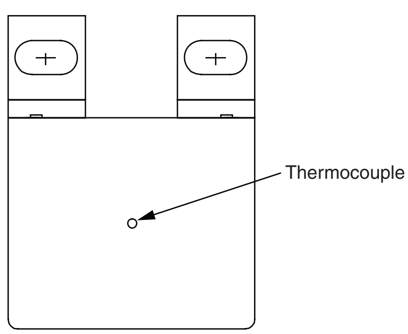
The power dissipation can be calculated according type detail specification “HQN-384-0/101: Technical Information Film Capacitors”.

The component temperature rise (ΔT) can be measured (see section “Measuring the component temperature” for more details) or calculated by $\Delta T = P/G$:

- 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.

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

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 the maximum U_{P-P} 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.
   The rated voltage pulse slope is valid for ambient temperatures up to 85 °C.
4. The maximum component surface temperature rise must be lower than the limits (see figure).
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"

Voltage Conditions

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

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".

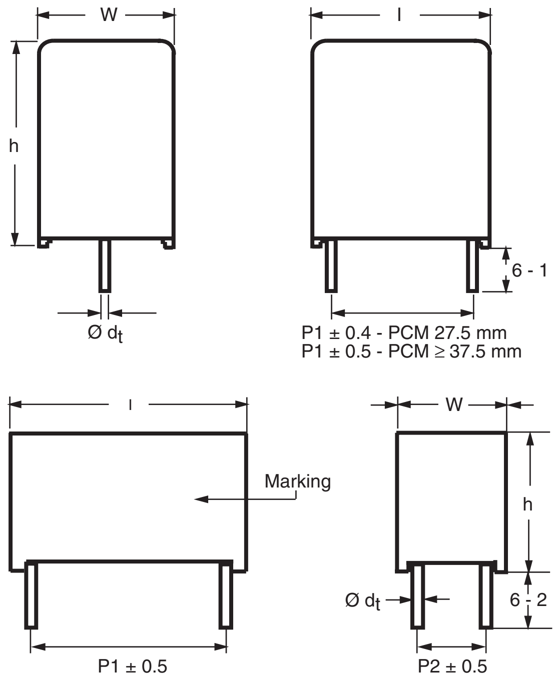
Group C Inspection Requirements

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 at 100 kHz	
4.14 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	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 ≤ 0.001 for: 100 nF < C $\leq$ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.3.1

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B OTHER PART OF SAMPLE OF SUB-GROUP C1		
4.6.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.15 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5.0 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 85 °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
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 Capacitance Tangent of loss angle Insulation resistance	No visible damage $\|\Delta C/C\| \leq 1$ % of the value measured in 4.6.1 Increase of tan δ ≤ 0.001 for: 100 nF < C $\leq$ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.6.1 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: + 85 °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 Visual examination Capacitance Tangent of loss angle Insulation resistance	No breakdown of flashover No visible damage Legible marking $\|\Delta C/C\| \leq 2$ % of the value measured in 4.4.2 or 4.9.3 Increase of tan δ ≤ 0.001 for: 100 nF < C $\leq$ 470 nF or ≤ 0.0015 for: C > 470 nF Compared to values measured in 4.3.1. or 4.6.1 ≥ 50 % of values specified in section “Insulation Resistance” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
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 flashover
	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 1$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan δ ≤ 0.001 for: 100 nF < C $\leq$ 470 nF or ≤ 0.0015 for: C $\leq$ 470 nF Compared to values measured in 4.11.1
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C3A		
4.12.1 Endurance test at 50 Hz alternating voltage	Duration: 2000 h Voltage: 1.25 x U_{Rac} at 85 °C	
4.12.1.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.12.1.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % compared to values measured in 4.12.1.1
	Tangent of loss angle	Increase of tan δ ≤ 0.001 for: 100 nF < C $\leq$ 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 characteristics Initial measurements Intermediate measurements Final measurements	Capacitance Capacitance at - 55 °C Capacitance at 20 °C Capacitance at + 85 °C Capacitance Insulation resistance	For - 55 °C to + 20 °C: + 1 % $\leq \|\Delta C/C\| \leq$ 3.75 % or for 20 °C to 105 °C: - 6 % $\leq \|\Delta C/C\| \leq$ 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: $R = \frac{U_{Rdc}}{5 \times C\ (dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.13.3 Final measurements	Capacitance	$\|\Delta C/C\| \leq 1$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.001 for: 100 nF < C $\leq$ 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

Metallized Polypropylene Film Capacitors DC Capacitor MKP Type



Dimensions in millimeters
Ø d_t ± 10 % of standard diameter specified

APPLICATIONS
High performance DC filtering applications

REFERENCE STANDARDS
IEC 61071
IEC 60068

MARKING
C-value; tolerance; rated voltage; code for dielectric material; code for manufacturing origin; manufacturer's type designation; manufacturer's logo; year and week of manufacture

DIELECTRIC
Polypropylene film

ELECTRODES
Metallized dielectric capacitor

CONSTRUCTION
Mono construction

ENCAPSULATION
Plastic case, sealed with resin
Flame retardant

TERMINALS
Tinned wires

FEATURES
Lead (Pb)-free product
RoHS compliant product

RATED CAPACITANCE
1 µF to 400 µF

CAPACITANCE TOLERANCE
± 5 %

DC VOLTAGE RATING

85 °C	450 V	700 V	900 V	1100 V	1200 V
70 °C	500 V	800 V	1100 V	1350 V	1500 V
105 °C	300 V	500 V	650 V	800 V	850 V

INSULATION RESISTANCE
RC between leads, after 1 min > 10 000 s
For U_{Ndc} ≤ 500 V measuring voltage 100 V
For U_{Ndc} > 500 V measuring voltage 500 V

SELF INDUCTANCE (Ls)
< 1 nH per mm of lead spacing

TEST VOLTAGE BETWEEN TERMINALS
1.5 U_{Ndc} for 10 s

CLIMATIC TESTING CLASS
40/85/56

MAXIMUM APPLICATION TEMPERATURE
85 °C

MAXIMUM OPERATING TEMPERATURE (CASE)
105 °C

LIFETIME EXPECTANCY
Operation life time > 100 000 h
FIT: < 10 x 10^{-9}/h (10 per 10^9 component h) at 0.5 x U_{Ndc}; 40 °C

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

COMPOSITION OF CATALOG NUMBER

MKP	1848	6	12	09	4	P	4

METALLIZED POLYPROPYLENE (MKP)

TYPE CONSTRUCTION (1848)

MULTIPLIER (nF)	
10	4
100	5
1000	6
10 000	7

CAPACITANCE (numerically)

Example:		
512	1200 nF	1.2 µF
612	12 000 nF	12 µF
712	120 000 nF	120 µF

VOLTAGE
U_n = 45 = 450 V
U_n = 70 = 700 V
U_n = 09 = 900 V
U_n = 91 = 1100 V
U_n = 92 = 1200 V

TOLERANCE	
4	± 5 %

P1 (mm)	PITCH CODE
27.5	K
37.5	P
52.5	Y

SPECIAL CODE FOR TERMINAL	
2	2 pins
4	4 pins P2 = 10.2 mm
5	4 pins P2 = 20.3 mm
(1)	Customized

Note

(1) Tabs terminals or customized terminals are available on request

SPECIFIC REFERENCE DATA 450 Vdc

U_{Ndc} = 450 V, $U_{Ndc70\ °C}$ = 500 V, $U_{Ndc105\ °C}$ = 300 V

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(µF)	W	H	L	(mm)	(mm)	(mm)	(V/µs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
1	9.0	19.0	32.0	27.5	-	0.8	75	75	1.5	-	115	-	11.0	-	100	-	6.8	160	MKP1848510454K2
2	9.0	19.0	32.0	27.5	-	0.8	75	150	2.5	-	57.5	-	11.0	-	100	-	6.0	160	MKP1848520454K2
3	11.0	21.0	32.0	27.5	-	0.8	75	225	3.0	-	38.5	-	11.0	-	100	-	9.2	130	MKP1848530454K2
4	11.0	21.0	32.0	27.5	-	0.8	75	300	3.5	-	30.0	-	11.0	-	100	-	8.4	130	MKP1848540454K2
5	13.0	23.0	32.0	27.5	-	0.8	75	375	4.0	-	23.0	-	11.0	-	100	-	10.7	115	MKP1848550454K2
6	15.0	25.0	32.0	27.5	-	0.8	75	450	4.5	-	19.0	-	11.0	-	100	-	12.5	100	MKP1848560454K2
7	15.0	25.0	32.0	27.5	-	0.8	75	525	5.0	-	16.5	-	11.0	-	100	-	11.7	100	MKP1848570454K2
8	18.0	28.0	32.0	27.5	-	0.8	75	600	6.0	-	14.0	-	11.0	-	100	-	17.2	80	MKP1848580454K2
9	18.0	28.0	32.0	27.5	-	0.8	75	675	6.5	-	13.0	-	11.0	-	100	-	16.3	80	MKP1848590454K2
10	18.0	28.0	32.0	27.5	-	0.8	75	750	7.0	-	11.5	-	11.0	-	100	-	15.4	80	MKP1848610454K2
12	21.0	31.0	32.0	27.5	-	0.8	75	900	8.0	-	10.0	-	11.0	-	100	-	22.2	65	MKP1848612454K2
10	18.5	35.5	43.0	37.5	10.2	1.0	40	400	6.0	6.5	23.0	20.5	22.0	20.0	200	185	37.5	105	MKP1848610454P*
12	18.5	35.5	43.0	37.5	10.2	1.0	40	480	7.0	7.5	19.0	17.0	22.0	20.0	200	185	36.1	105	MKP1848612454P*
15	18.5	35.5	43.0	37.5	10.2	1.0	40	600	7.5	8.0	15.0	13.0	22.0	20.0	200	185	33.9	105	MKP1848615454P*
20	21.5	38.5	43.0	37.5	10.2	1.0	40	800	9.0	10	11.5	13.5	22.0	20.0	200	185	41.6	91	MKP1848620454P*
22	21.5	38.5	43.0	37.5	10.2	1.0	40	880	9.5	10.0	10.5	9.5	22.0	20.0	200	185	40.1	91	MKP1848622454P*
25	21.5	38.5	43.0	37.5	10.2	1.0	40	1000	10.0	10.5	9.5	8.5	22.0	20.0	200	185	37.8	91	MKP1848625454P*
30	24.0	44.0	42.0	37.5	10.2	1.0	40	1200	11.0	12.0	7.5	8.0	22.0	20.0	200	185	50	77	MKP1848630454P*

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/dt	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(μF)	W	H	L	(mm)	(mm)	(mm)	(V/μs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
35	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	40	1400	14.0	15.0	6.5	5.9	22.0	20.0	200	185	67	63	MKP1848635454P*
40	30.0	45.0	42.0	37.5	10.2 / 20.3	1.0	40	1600	14.5	15.5	6.0	5.0	22.0	20.0	200	185	63	63	MKP1848640454P*
40	25.0	45.0	57.5	52.5	20.3	1.2	20	800	11.0	12.0	11.5	10.0	40.0	36.0	400	370	77	55	MKP1848640454Y*
45	25.0	45.0	57.5	52.5	20.3	1.2	20	900	12.0	13.0	10.0	9.0	40.0	36.0	400	370	73	55	MKP1848645454Y*
50	30.0	45.0	57.5	52.5	20.3	1.2	20	1000	13.0	14.0	9.0	8.5	40.0	36.0	400	370	104	45	MKP1848650454Y*
55	30.0	45.0	57.5	52.5	20.3	1.2	20	1100	14.0	15.0	8.5	7.5	40.0	36.0	400	370	100	45	MKP1848655454Y*
60	30.0	45.0	57.5	52.5	20.3	1.2	20	1200	14.5	15.5	7.5	6.5	40.0	36.0	400	370	95	45	MKP1848660454Y*
65	35.0	50.0	57.5	52.5	20.3	1.2	20	1300	16.0	17.0	7.0	6.0	40.0	36.0	400	370	119	40	MKP1848665454Y*
70	35.0	50.0	57.5	52.5	20.3	1.2	20	1400	17.0	18.0	6.5	6.0	40.0	36.0	400	370	117	40	MKP1848670454Y*
75	35.0	50.0	57.5	52.5	20.3	1.2	20	1500	17.5	18.5	6.0	5.5	40.0	36.0	400	370	113	40	MKP1848675454Y*
80	35.0	50.0	57.5	52.5	20.3	1.2	20	1600	18.0	19.0	5.5	5.0	40.0	36.0	400	370	106	40	MKP1848680454Y*
90	45.0	45.0	57.5	52.5	20.3	1.2	20	1800	-	15.5	-	4.5	-	36.0	-	370	192	30	MKP1848690454Y5
95	45.0	45.0	57.5	52.5	20.3	1.2	20	1900	-	15.5	-	4.0	-	36.0	-	370	192	30	MKP1848695454Y5
100	45.0	45.0	57.5	52.5	20.3	1.2	20	2000	-	16.0	-	4.0	-	36.0	-	370	192	30	MKP1848710454Y5
200	70.0	60.0	57.5	52.5	20.3	1.2	20	2000	-	38.0	-	2.0	-	36.0	-	370	451	20	MKP1848720454Y5
400	130.0	60.0	57.5	52.5	20.3	1.2	10	4000	-	68.0	-	1.0	-	36.0	-	370	946	10	MKP1848740454Y5

Notes

(1) Change the * symbol with special code for the terminals
(2) Maximum rms current at 10 kHz, + 85 °C, Cap. tol. ≤ ± 5 %
(3) Equivalent series resistance typical values at 10 kHz
(4) Standard dimension
(5) Intermediate capacitance values available on request.
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA 700 Vdc

U_{Ndc} = 700 V, $U_{Ndc70\ °C}$ = 800 V, $U_{Ndc105\ °C}$ = 500 V

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(μF)	W	H	L	(mm)	(mm)	(mm)	(V/μs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
1	9.0	19.0	32.0	27.5	-	0.8	65	65	1.5	-	94.0	-	10.0	-	85	-	6.6	160	MKP1848510704K2
2	9.0	19.0	32.0	27.5	-	0.8	65	130	2.5	-	47.0	-	10.0	-	85	-	5.6	160	MKP1848520704K2
3	11.0	21.0	32.0	27.5	-	0.8	65	195	3.0	-	31.5	-	10.0	-	85	-	8.5	130	MKP1848530704K2
4	13.0	23.0	32.0	27.5	-	0.8	65	260	4.0	-	23.5	-	10.0	-	85	-	10.5	115	MKP1848540704K2
5	15.0	25.0	32.0	27.5	-	0.8	65	325	4.5	-	19.0	-	10.0	-	85	-	12.1	100	MKP1848550704K2
6	18.0	28.0	32.0	27.5	-	0.8	65	390	6.0	-	16.0	-	10.0	-	85	-	17.4	80	MKP1848560704K2
7	18.0	28.0	32.0	27.5	-	0.8	65	455	6.5	-	13.5	-	10.0	-	85	-	16.2	80	MKP1848570704K2
8	18.0	28.0	32.0	27.5	-	0.8	65	520	7.0	-	12.0	-	10.0	-	85	-	15.1	80	MKP1848580704K2
9	21.0	31.0	32.0	27.5	-	0.8	65	585	7.5	-	10.5	-	10.0	-	85	-	22.5	65	MKP1848590704K2
10	21.0	31.0	32.0	27.5	-	0.8	65	650	8.5	-	9.5	-	10.0	-	85	-	21.3	65	MKP1848610704K2
10	18.5	35.5	43.0	37.5	10.2	1.0	30	300	7.0	7.5	19.5	17.5	19.0	17.0	170	160	35.5	105	MKP1848610704P*
12	18.5	35.5	43.0	37.5	10.2	1.0	30	360	7.5	8.0	16.5	15.0	19.0	17.0	170	160	33.7	105	MKP1848612704P*
15	18.5	35.5	43.0	37.5	10.2	1.0	30	450	8.0	9.0	13.0	11.5	19.0	17.0	170	160	30.8	105	MKP1848615704P*
20	21.5	38.5	43.0	37.5	10.2	1.0	30	600	10.0	11.0	10.0	9.0	19.0	17.0	170	160	37.3	91	MKP1848620704P*
22	24.0	44.0	42.0	37.5	10.2	1.0	30	660	11.0	12.0	9.0	8.0	19.0	17.0	170	160	51	77	MKP1848622704P*
25	24.0	44.0	42.0	37.5	10.2	1.0	30	750	12.0	13.0	8.0	7.0	19.0	17.0	170	160	48	77	MKP1848625704P*
30	30.0	45.0	42.0	37.5	10.2 /	1.0	30	900	14.0	14.5	6.5	6.0	19.0	17.0	170	160	64	63	MKP1848630704P*
35	30.0	45.0	42.0	37.5	10.2 /	1.0	30	1050	15.0	15.5	5.5	5.0	19.0	17.0	170	160	58	63	MKP1848635704P*
30	25.0	45.0	57.5	52.5	20.3	1.2	15	450	10.5	11.5	13.0	11.5	35.0	33.0	350	320	78	55	MKP1848630704Y*
35	25.0	45.0	57.5	52.5	20.3	1.2	15	525	11.5	12.0	11.0	10.0	35.0	33.0	350	320	73	55	MKP1848635704Y*
40	25.0	45.0	57.5	52.5	20.3	1.2	15	600	12.0	12.5	10.0	9.0	35.0	33.0	350	320	68	55	MKP1848640704Y*

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(µF)	W	H	L	(mm)	(mm)	(mm)	(V/µs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
45	30.0	45.0	57.5	52.5	20.3	1.2	15	675	13.5	14.5	9.0	7.5	35.0	33.0	350	320	99	45	MKP1848645704Y*
50	30.0	45.0	57.5	52.5	20.3	1.2	15	750	14.5	15.5	8.0	7.0	35.0	33.0	350	320	92	45	MKP1848650704Y*
55	35.0	50.0	57.5	52.5	20.3	1.2	15	825	16.0	17.0	7.0	6.5	35.0	33.0	350	320	117	40	MKP1848655704Y*
60	35.0	50.0	57.5	52.5	20.3	1.2	15	900	17.0	18.0	6.5	6.0	35.0	33.0	350	320	112	40	MKP1848660704Y*
65	35.0	50.0	57.5	52.5	20.3	1.2	15	975	17.5	18.5	6.0	5.5	35.0	33.0	350	320	104	40	MKP1848665704Y*
70	45.0	45.0	57.5	52.5	20.3	1.2	15	1050	-	20.0	-	5.0	-	33.0	-	320	192	30	MKP1848670704Y5
75	45.0	45.0	57.5	52.5	20.3	1.2	15	1125	-	21.0	-	4.5	-	33.0	-	320	192	30	MKP1848675704Y5
80	45.0	45.0	57.5	52.5	20.3	1.2	15	1200	-	21.5	-	4.5	-	33.0	-	320	192	30	MKP1848680704Y5
160	70.0	60.0	57.5	52.5	20.3	1.2	15	2400	-	38.0	-	2.2	-	33.0	-	320	451	20	MKP1848716704Y5
320	130.0	60.0	57.5	52.5	20.3	1.2	15	4800	-	65.0	-	1.0	-	33.0	-	320	821	10	MKP1848732704Y5

Notes

(1) Change the * symbol with special code for the terminals
(2) Maximum rms current at 10 kHz, + 85 °C, Cap. tol. ≤ ± 5 %
(3) Equivalent series resistance typical values at 10 kHz
(4) Standard dimension
(5) Intermediate capacitance values are available on request.
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA 900 Vdc

U_{Ndc} = 900 V, $U_{Ndc70\ °C}$ = 1100 V, $U_{Ndc105\ °C}$ = 650 V

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(µF)	W	H	L	(mm)	(mm)	(mm)	(V/µs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
1.0	9.0	19.0	32.0	27.5	-	0.8	80	80	2.0	-	88.0	-	8.0	-	65	-	5.9	160	MKP1848510094K2
2.0	13.0	23.0	32.0	27.5	-	0.8	80	160	2.5	-	44.0	-	8.0	-	65	-	11.3	115	MKP1848520094K2
3.0	15.0	25.0	32.0	27.5	-	0.8	80	240	3.5	-	29.5	-	8.0	-	65	-	12.1	100	MKP1848530094K2
4.0	18.0	28.0	32.0	27.5	-	0.8	80	320	4.0	-	22.0	-	8.0	-	65	-	16.7	80	MKP1848540094K2
5.0	21.0	31.0	32.0	27.5	-	0.8	80	400	5.0	-	18.0	-	8.0	-	65	-	23.3	65	MKP1848550094K2
6.0	21.0	31.0	32.0	27.5	-	0.8	80	480	5.5	-	15.0	-	8.0	-	65	-	21.4	65	MKP1848560094K2
5.0	18.5	35.5	43.0	37.5	10.2	1.0	40	200	4.0	4.5	36.5	32.0	15.0	13	140	125	37.1	105	MKP1848550094P*
6.0	18.5	35.5	43.0	37.5	10.2	1.0	40	240	4.5	5.0	30.0	27.0	15.0	13	140	125	35.6	105	MKP1848560094P*
7.0	18.5	35.5	43.0	37.5	10.2	1.0	40	280	5.0	5.5	26.0	23.5	15.0	13	140	125	34.1	105	MKP1848570094P*
8.0	18.5	35.5	43.0	37.5	10.2	1.0	40	320	5.0	5.5	22.5	20.5	15.0	13	140	125	32.5	105	MKP1848580094P*
9.0	18.5	35.5	43.0	37.5	10.2	1.0	40	360	5.5	6.0	20.0	18.5	15.0	13	140	125	30.9	105	MKP1848590094P*
10.0	21.5	38.5	43.0	37.5	10.2	1.0	40	400	6.0	6.5	18.5	16.5	15.0	13	140	125	40.7	91	MKP1848610094P*
12.0	21.5	38.5	43.0	37.5	10.2	1.0	40	480	6.5	7.0	15.0	13.5	15.0	13	140	125	37.5	91	MKP1848612094P*
15.0	24.0	44.0	42.0	37.5	10.2	1.0	40	600	8.0	8.5	12.5	11.0	15.0	13	140	125	48.9	77	MKP1848615094P*
16.0	24.0	44.0	42.0	37.5	10.2	1.0	40	640	8.0	8.5	11.5	10.5	15.0	13	140	125	47.2	77	MKP1848616094P*
20.0	30.0	45.0	42.0	37.5	10.2 /	1.0	40	800	9.5	10.0	9.5	8.5	15.0	13	140	125	60	63	MKP1848620094P*
15.0	25.0	45.0	57.5	52.5	20.3	1.2	20	300	6.5	7.5	24.5	22.0	30.0	25	275	250	83	55	MKP1848615094Y*
20.0	25.0	45.0	57.5	52.5	20.3	1.2	20	400	7.0	8.0	18.5	16.5	30.0	25	275	250	75	55	MKP1848620094Y*
22.0	25.0	45.0	57.5	52.5	20.3	1.2	20	440	7.5	8.5	16.5	15.0	30.0	25	275	250	72	55	MKP1848622094Y*
25.0	30.0	45.0	57.5	52.5	20.3	1.2	20	500	8.5	9.5	14.5	13.5	30.0	25	275	250	102	45	MKP1848625094Y*
30.0	30.0	45.0	57.5	52.5	20.3	1.2	20	600	9.5	10.5	12.5	11.0	30.0	25	275	250	92	45	MKP1848630094Y*
35.0	35.0	50.0	57.5	52.5	20.3	1.2	20	700	10.5	11.5	10.5	9.5	30.0	25	275	250	114	40	MKP1848635094Y*
40.0	35.0	50.0	57.5	52.5	20.3	1.2	20	800	12.0	13.0	9.5	8.5	30.0	25	275	250	103	40	MKP1848640094Y*
45.0	45.0	45.0	57.5	52.5	20.3	1.2	20	900	-	14.0	-	7.5	-	25	-	250	192	30	MKP1848645094Y5
50.0	45.0	45.0	57.5	52.5	20.3	1.2	20	1000	-	14.5	-	6.5	-	25	-	250	191	30	MKP1848650094Y5
100.0	70.0	60.0	57.5	52.5	20.3	1.2	20	2000	-	25.0	-	3.5	-	25	-	250	452	20	MKP1848710094Y5

Notes

(1) Change the * symbol with special code for the terminals
(2) Maximum rms current at 10 kHz, + 85 °C, Cap. tol. ≤ ± 5 %
(3) Equivalent series resistance typical values at 10 kHz
(4) Standard dimension
(5) Intermediate capacitance values are available on request.
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA 1100 Vdc

U_{Ndc} = 1100 V, $U_{Ndc70\ °C}$ = 1350 V, $U_{Ndc150\ °C}$ = 800 V

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(µF)	W	H	L	(mm)	(mm)	(mm)	(V/µs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
1	11.0	21.0	32.0	27.5	-	0.8	95	95	2.5	-	62.0	-	7.0	-	55	-	9.1	130	MKP1848510914K2
2	15.0	25.0	32.0	27.5	-	0.8	95	190	3.5	-	31.0	-	7.0	-	55	-	12.3	100	MKP1848520914K2
3	18.0	28.0	32.0	27.5	-	0.8	95	285	5.0	-	21.0	-	7.0	-	55	-	16.0	80	MKP1848530914K2
4	21.0	31.0	32.0	27.5	-	0.8	95	380	6.5	-	15.5	-	7.0	-	55	-	21.8	65	MKP1848540914K2
5	18.5	35.5	43.0	37.5	10.2	1.0	45	225	5.5	6.0	25.5	23.0	13.0	12.0	115	105	33.7	105	MKP1848550914P*
6	18.5	35.5	43.0	37.5	10.2	1.0	45	270	6.0	6.5	21.5	19.0	13.0	12.0	115	105	31.4	105	MKP1848560914P*
7	21.5	38.5	43.0	37.5	10.2	1.0	45	315	7.0	7.5	18.5	16.5	13.0	12.0	115	105	40.5	91	MKP1848570914P*
8	21.5	38.5	43.0	37.5	10.2	1.0	45	360	4.5	5.0	16.0	14.5	13.0	12.0	115	105	38.2	91	MKP1848580914P*
9	24.0	44.0	42.0	37.5	10.2	1.0	45	405	8.5	9.0	14.0	13.0	13.0	12.0	115	105	52	77	MKP1848590914P*
10	24.0	44.0	42.0	37.5	10.2	1.0	45	450	9.0	9.5	13.0	11.5	13.0	12.0	115	105	49	77	MKP1848610914P*
12	30.0	45.0	42.0	37.5	10.2 /	1.0	45	540	10.5	11.0	10.5	9.5	13.0	12.0	115	105	66	63	MKP1848612914P*
10	25.0	45.0	57.5	52.5	20.3	1.2	23	230	7.5	8.5	25.5	23.0	25.0	22.0	230	210	84	55	MKP1848610914Y*
12	25.0	45.0	57.5	52.5	20.3	1.2	23	276	8.0	9.0	21.5	19.5	25.0	22.0	230	210	80	55	MKP1848612914Y*
15	25.0	45.0	57.5	52.5	20.3	1.2	23	345	9.0	10.0	17.0	15.5	25.0	22.0	230	210	73	55	MKP1848615914Y*
20	30.0	45.0	57.5	52.5	20.3	1.2	23	460	11.0	12.0	12.5	11.5	25.0	22.0	230	210	94	45	MKP1848620914Y*
22	35.0	50.0	57.5	52.5	20.3	1.2	23	506	12.5	13.5	11.5	10.5	25.0	22.0	230	210	119	40	MKP1848622914Y*
25	35.0	50.0	57.5	52.5	20.3	1.2	23	575	13.5	14.5	10.5	9.0	25.0	22.0	230	210	112	40	MKP1848625914Y*
30	45.0	45.0	57.5	52.5	20.3	1.2	23	720	-	16.5	-	7.5	-	22.0	-	210	192	30	MKP1848630914Y5
60	70.0	60.0	57.5	52.5	20.3	1.2	23	1500	-	30.0	-	3.5	-	22.0	-	210	452	20	MKP1848660914Y5

Notes

(1) Change the * symbol with special code for the terminals
(2) Maximum rms current at 10 kHz, + 85 °C, Cap. tol. ≤ ± 5 %
(3) Equivalent series resistance typical values at 10 kHz
(4) Standard dimension
(5) Intermediate capacitance values are available on request.
• SPQ = Standard Packing Quantity

SPECIFIC REFERENCE DATA 1200 Vdc

U_{Ndc} = 1200 V, $U_{Ndc70\ °C}$ = 1500 V, $U_{Ndc150\ °C}$ = 850 V

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A) (2)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(µF)	W	H	L	(mm)	(mm)	(mm)	(V/µs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
1	11.0	21.0	32.0	27.5	-	0.8	100	100	2.5	-	60.0	-	6.0	-	54	-	8.8	130	MKP1848510924K2
2	15.0	25.0	32.0	27.5	-	0.8	100	200	4.0	-	30.0	-	6.0	-	54	-	11.7	100	MKP1848520924K2
3	18.0	28.0	32.0	27.5	-	0.8	100	300	5.0	-	20.0	-	6.0	-	54	-	15.2	80	MKP1848530924K2
4	21.0	31.0	32.0	27.5	-	0.8	100	400	6.5	-	15.0	-	6.0	-	54	-	20.6	65	MKP1848540924K2
5	18.5	35.5	43.0	37.5	10.2	1.0	48	240	6.0	6.5	24.5	22.0	12.0	11.0	110	100	32.5	105	MKP1848550924P*
6	18.5	35.5	43.0	37.5	10.2	1.0	48	288	6.5	7.0	20.0	18.5	12.0	11.0	110	100	30.0	105	MKP1848560924P*
7	21.5	38.5	43.0	37.5	10.2	1.0	48	336	7.5	8.0	17.5	15.5	12.0	11.0	110	100	38.9	91	MKP1848570924P*
8	21.5	38.5	43.0	37.5	10.2	1.0	48	384	8.0	8.5	15.5	14.0	12.0	11.0	110	100	36.3	91	MKP1848580924P*
9	24.0	44.0	42.0	37.5	10.2	1.0	48	432	9.0	9.5	13.5	12.5	12.0	11.0	110	100	50	77	MKP1848590924P*
10	24.0	44.0	42.0	37.5	10.2	1.0	48	480	9.5	10.0	12.5	11.0	12.0	11.0	110	100	47	77	MKP1848610924P*
12	30.0	45.0	42.0	37.5	10.2 /	1.0	48	576	11.0	11.5	10.0	9.0	12.0	11.0	110	100	63	63	MKP1848612924P*
10	25.0	45.0	57.5	52.5	20.3	1.2	24	240	7.5	8.5	24.5	21.5	23.0	21.0	220	200	82	55	MKP1848610924Y*
12	25.0	45.0	57.5	52.5	20.3	1.2	24	288	8.5	9.5	20.5	18.5	23.0	21.0	220	200	77	55	MKP1848612924Y*

CAP. (5)	DIMENSIONS (mm) (4)			P1	P2	Ø d_t	dV/d_t	I_{PEAK}	I_{RMS} (A)		ESR (mΩ) (3)		tan δ 1 kHz < (10^{-4})		tan δ 10 kHz < (10^{-4})		MASS	SPQ	PART NUMBER (1)
(µF)	W	H	L	(mm)	(mm)	(mm)	(V/µs)	(A)	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	2 pins	4 pins	(g)	(pcs)	
15	25.0	45.0	57.5	52.5	20.3	1.2	24	360	9.5	10.5	16.5	14.5	23.0	21.0	220	200	69	55	MKP1848615924Y*
20	35.0	50.0	57.5	52.5	20.3	1.2	24	480	12.5	13.5	12.5	11.0	23.0	21.0	220	200	119	40	MKP1848620924Y*
22	35.0	50.0	57.5	52.5	20.3	1.2	24	528	13.0	14.0	11.0	10.0	23.0	21.0	220	200	114	40	MKP1848622924Y*
25	35.0	50.0	57.5	52.5	20.3	1.2	24	600	14.0	15.0	10.0	9.0	23.0	21.0	220	200	104	40	MKP1848625924Y*
30	45.0	45.0	57.5	52.5	20.3	1.2	24	750	-	17.0	-	7.0	-	21.0	-	200	191	30	MKP1848630924Y5
60	70.0	60.0	57.5	52.5	20.3	1.2	24	1560	-	28.5	-	3.5	-	21.0	-	200	450	15	MKP1848660924Y5

Notes

(1) Change the * symbol with special code for the terminals
(2) Maximum rms current at 10 kHz, + 85 °C, Cap. tol. ≤ ± 5 %
(3) Equivalent series resistance typical values at 10 kHz
(4) Standard dimension
(5) Intermediate capacitance values are available on request.
• SPQ = Standard Packing Quantity

CONSTRUCTION

Description

Low inductive wound cell elements of metallised polypropylene film, potted with resin in a flame retardant case.

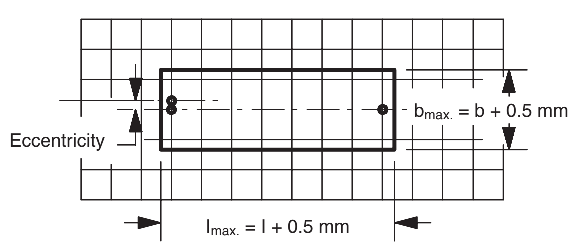
MOUNTING

The capacitors unit is designed for mounting on PCB. The capacitors shall be mechanically fixed by the leads and body must be clamped to withstand vibration and shock.

Space Requirements on Printed-Circuit Board

The maximum length and width of film capacitors is shown in the figure:

- Eccentricity as in figure. 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: $h_{max.} \leq h + 0.5$ mm



Storage temperature

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

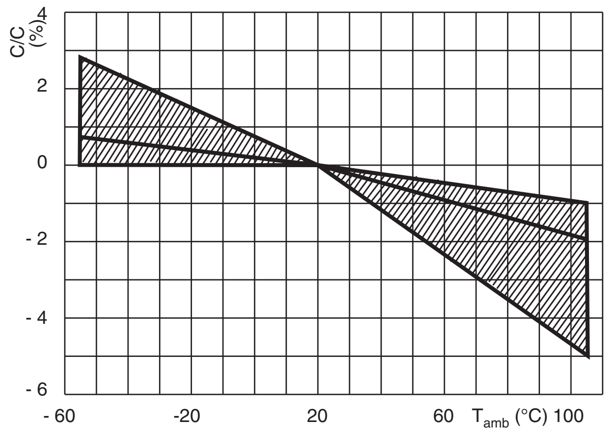
Ratings and Characteristics Reference Conditions

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 %.

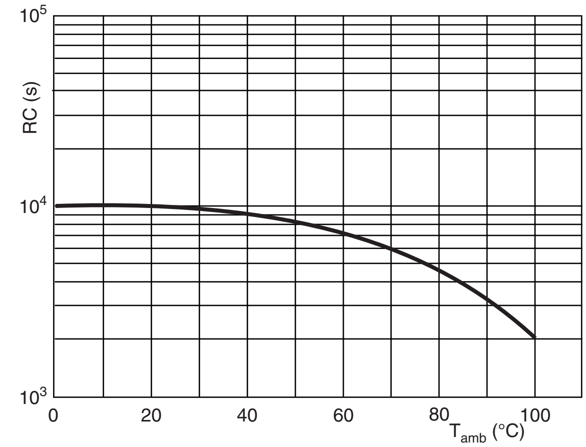
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

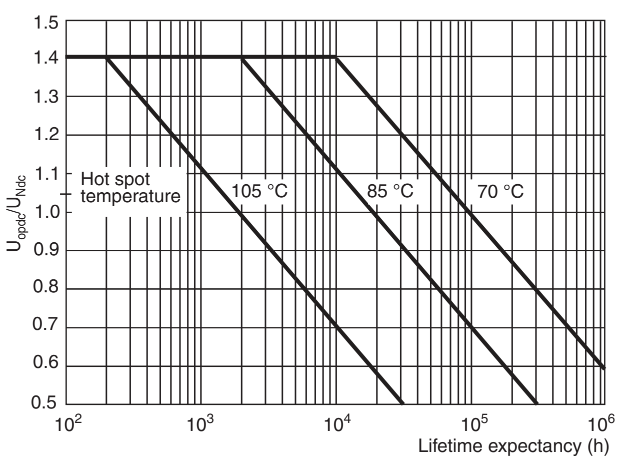
Capacitance (typical curve)



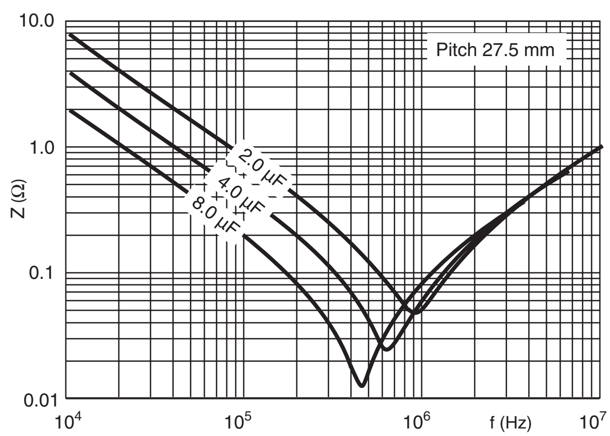
Insulation resistance (typical curve)



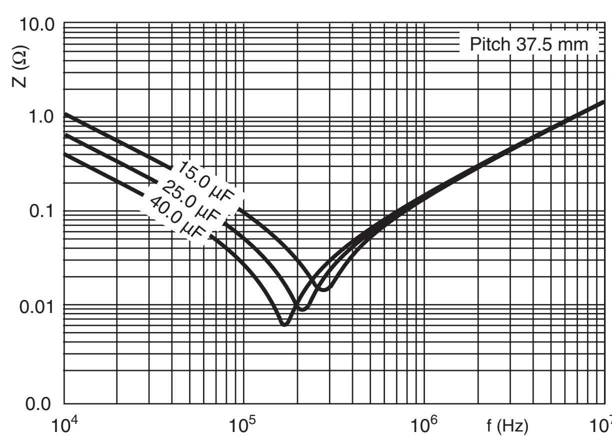
Lifetime expectancy (typical curve)



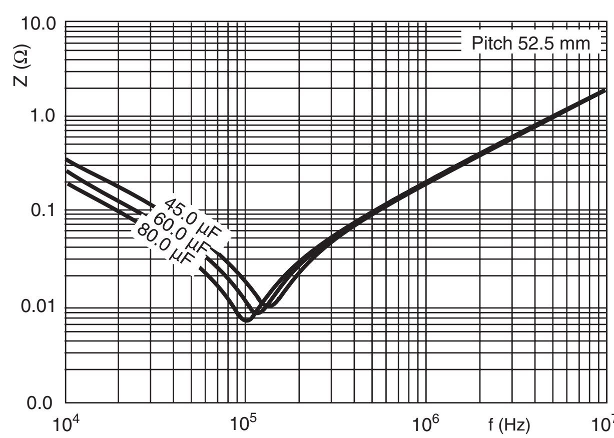
Impedance vs. frequency (typical curve)



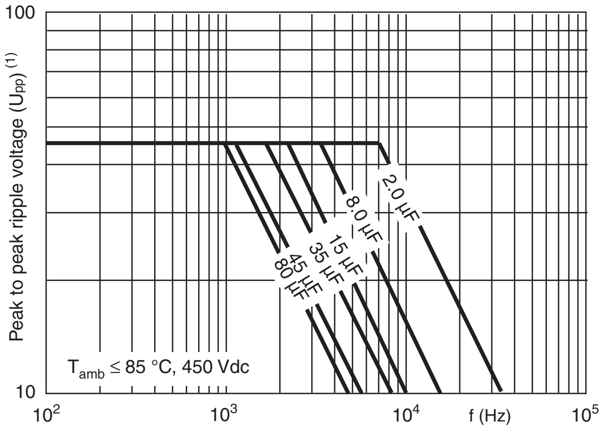
Impedance vs. frequency (typical curve)



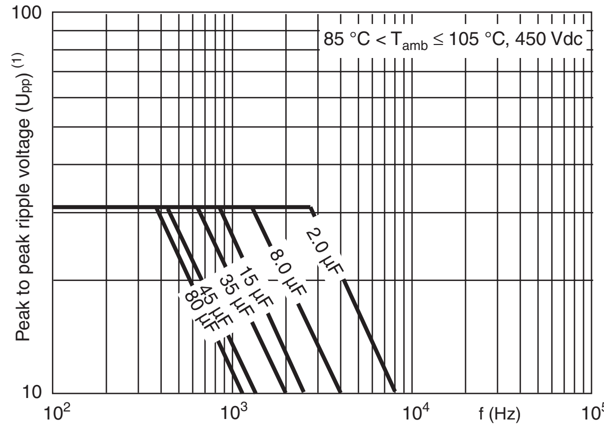
Impedance vs. frequency (typical curve)



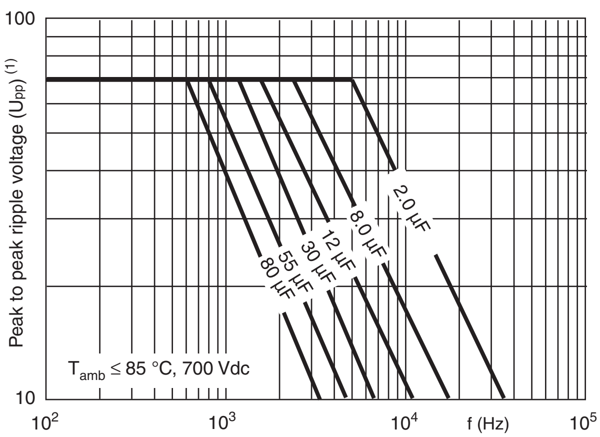
MAXIMUM PEAK TO PEAK RIPPLE VOLTAGE AS A FUNCTION OF FREQUENCY



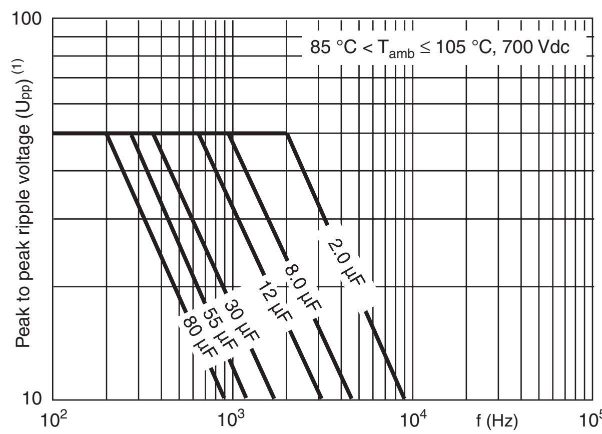
(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}



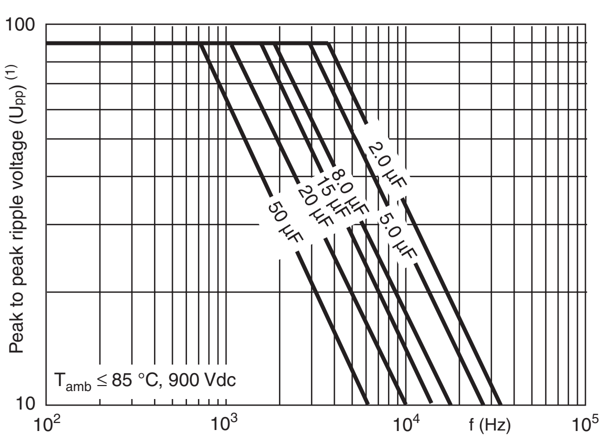
(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}



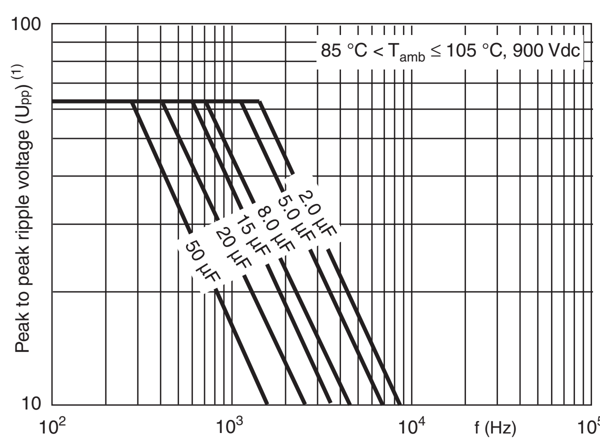
(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}



(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}

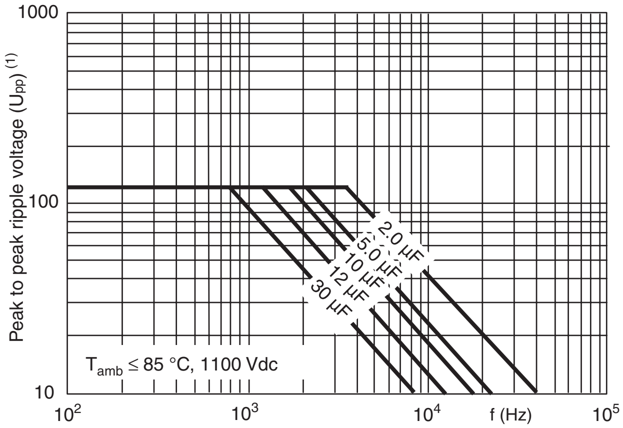


(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}

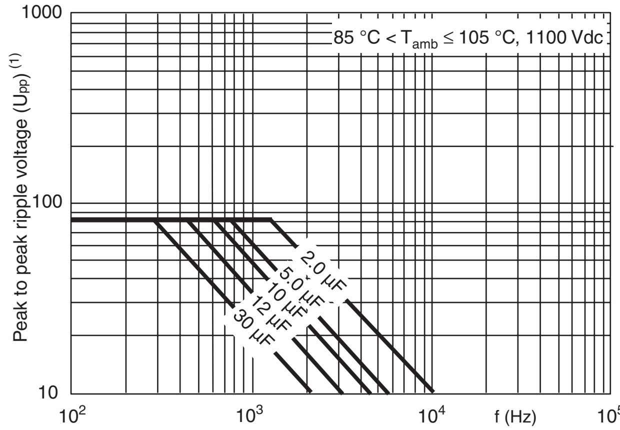


(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}

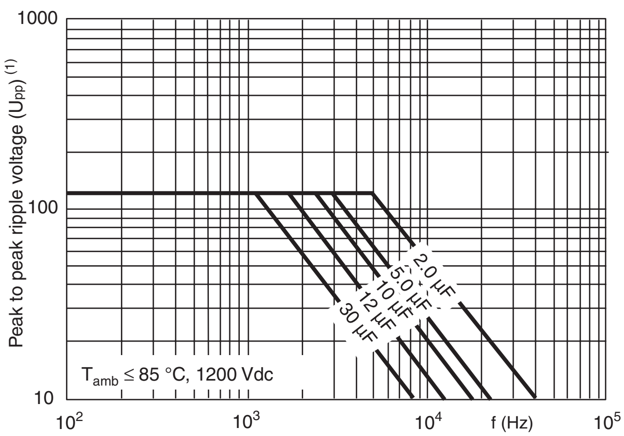
MAXIMUM PEAK TO PEAK RIPPLE VOLTAGE AS A FUNCTION OF FREQUENCY



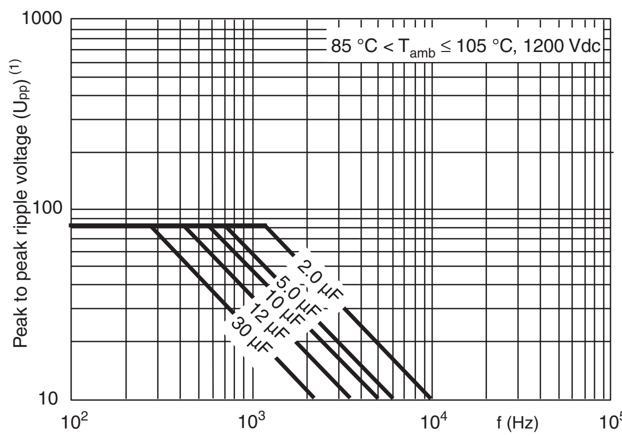
(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}



(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}



(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}



(1) Limited by maximum ripple voltage 0.1 x U_{Ndc}

HEAT CONDUCTIVITY AND HOT SPOT TEMPERATURE

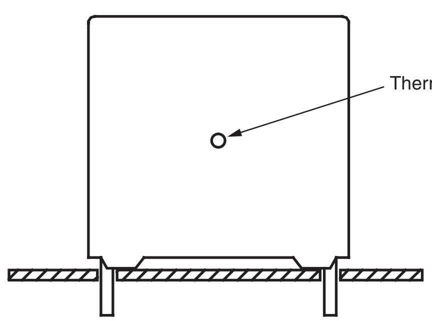
$W_{max.}$ (mm)	HEAT CONDUCTIVITY (mW/°C)		
	PITCH 27.5 mm	PITCH 37.5 mm	PITCH 52.5 mm
9.0	31	-	-
11.0	37	-	-
13.0	42	-	-
15.0	48	-	-
18.0	58	-	-
18.5	-	89	-
21.0	68	-	-
21.5	-	102	-
24.0	-	116	-
25.0	-	-	152
30.0	-	134	181
35.0	-	-	197
45.0	-	-	213
87.0	-	-	341

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 component temperature rise (ΔT) can be measured or calculated by $\Delta T = P/G$:

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

MEASURING THE COMPONENT TEMPERATURE



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 thermal radiation or convection, the capacitor must be tested in a closed area from air circulation.

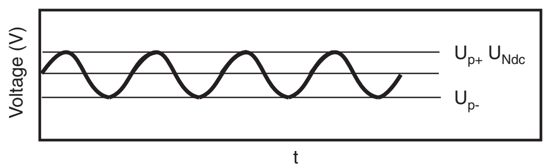
APPLICATION NOTE AND LIMITING CONDITIONS

These capacitors are not suitable for mains applications as across-the-line capacitors without additional protection. 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_{Ndc})
2. The peak-to-peak ripple voltage (U_{P-P}) shall not be greater than 0.1 x (U_{Ndc})

Non reversing recurrent waveform



3. The voltage peak slope (dU/dt) shall not exceed the pulse slope at the DC voltage rating.
   If the pulse voltage is lower than the rated DC voltage, the rated voltage pulse slope may be multiplied by U_{Ndc} and divided by the applied voltage.
   For all other pulses following equation must be fulfilled:

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

   T is the pulse duration
4. The maximum component surface temperature rise must be lower than 15 °C.

MAXIMUM REPETITIVE PEAK VOLTAGES

The capacitor unit may be subjected to the following surge without any significant reduction of lifetime expectancy

REPETITIVE SURGE VOLTAGE	MAXIMUM DURATION PER DAY
1.1 x U_{Ndc}	30 % on load duration
1.15 x U_{Ndc}	30 min
1.2 x U_{Ndc}	5 min
1.3 x U_{Ndc}	1 min
1.5 x U_{Ndc}	110 ms

INSPECTION REQUIREMENTS

General Notes:
Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 61071.

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
ROUTINE TEST-FINAL INSPECTION		
5.14.2.1 External inspection, visual examination		Legible marking as specified
5.14.2.2 Dimensions		See specification drawing
5.3.1 Capacitance	1 kHz at room temperature	See specific reference data
5.3.2 tan δ	1 kHz at room temperature 10 kHz at room temperature	See specific reference data
5.5.1.2 Voltage test between terminal	1.5 x U_{Ndc} at T_{amb}. Duration 10 s	No visible damage or puncture No flashover
5.7 Insulation resistance	$U_{Ndc} \leq 500$ V measuring voltage 100 V at room temperature $U_{Ndc} > 500$ V m,easuring voltage 500 V at room temperature Duration 1 min	See specific reference data
TYPE TESTS		
5.14.2 External inspection	Check for finish, marking and overall dimensions	Legible marking and finish as specified Dimensions: see specific drawing
5.14.0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.14.1.1.4 Robustness of terminations IEC 60068-2-21	Tensile Ua1 Wire diameter / section / load ≤ 0.8 mm / ≤ 0.5 mm^2 / 10 N ≤ 1.25 mm / ≤ 1.2 mm^2 / 20 N Duration 10 s ± 1 s Bending Ub method 1 Wire diameter / section / load ≤ 0.8 mm / ≤ 0.05 mm^3 / 10 N ≤ 1.25 mm / ≤ 0.019 mm^3 / 20 N 4 x 90 °, Duration 2 s to 3 s/bend	
5.14.1.6 Resistance to soldering heat IEC 60068-2-20	No predrying, Method 1A Solder bath: 260 °C ± 5 °C	
5.14.4 Final measurements	Capacitance tan δ	$\lvert\Delta C/C\rvert \leq 0.5$ % Increase of tan $\delta \leq 0.0050$ Compared to values measured in 5.14.0
5.14.0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.14.3.1 Vibration IEC 60068-2-6	10 Hz to 55 Hz: amplitude ± 0.35 mm or acceleration 98 m/s^2 Test duration: 10 frequency cycles, 3 axes offset from each other by 90° 1 octave/min	No visible damage
5.14.3.2 Shock or impact IEC 60068-2-6	Pulse shape: half sine Acceleration: 490 m/s^2 Duration t of pulse: 11 ms Visual examination	No visible damage
5.14.4 Final measurements	Capacitance tan δ	$\lvert\Delta C/C\rvert \leq 0.5$ % Increase of tan $\delta \leq 0.0050$ Compared to values measured in 5.14.0

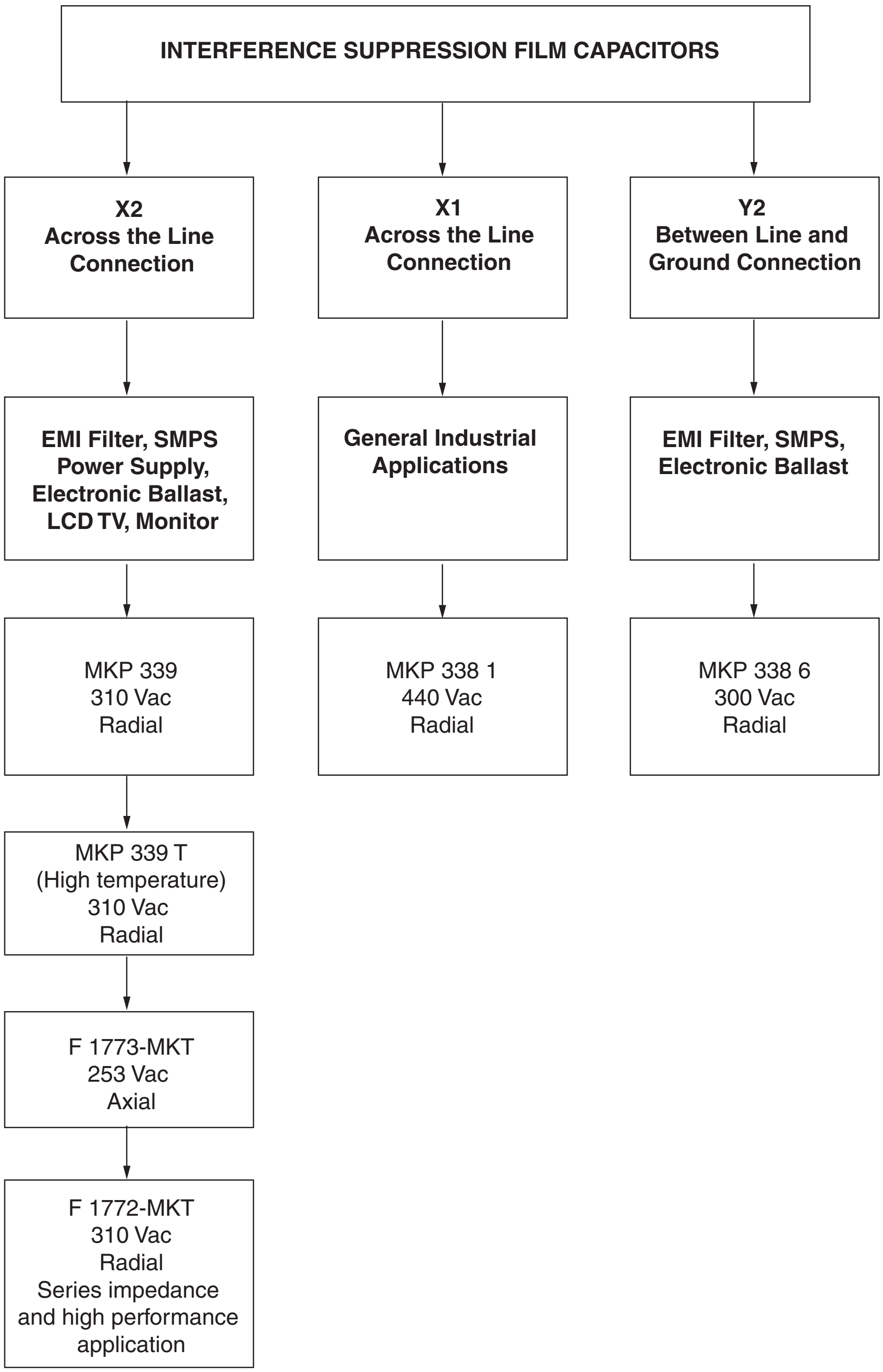
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
5.5.3.1 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz R insulation	
5.5.3.2 Voltage test between terminal	1.5 x U_{Ndc} at $T_{amb.}$ Duration 60 s	
5.5.3.3 Final measurements	Capacitance tan δ R insulation	$\lvert\Delta C/C\rvert \leq 0.5$ % Increase of tan $\delta \leq 1.2$ initial tan $\delta + 0.0001$ R insulation ≥ 50 % of specified values
5.9.1 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.9.2 Surge discharge test	1.1 x U_{Ndc} Number of discharges: 5 Time lapse: every 2 min (10 min total)	
5.9.3 Voltage test between terminal	Within 5 min after the surge discharge test Duration 60 s 1.5 x U_{Ndc} at $T_{amb.}$	
5.9.3 Final measurements	Capacitance tan δ at 10 kHz	$\lvert\Delta C/C\rvert \leq 1.0$ % tan $\delta \leq 1.2$ initial tan $\delta + 0.0001$ Compared to values measured in 5.9.1
5.11.1 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.11.2 Self healing test	1.5 x U_{Ndc} Duration 10 s Number of clearings ≤ 5 Clearing = voltage drop of 5 % increase the voltage at 100 V/s till 5 clearings occur with a max. of 2.5 x U_{Ndc} for a duration of 10 s	
5.11.3 Final measurements	Capacitance tan δ	$\lvert\Delta C/C\rvert \leq 0.5$ % tan $\delta \leq 1.2$ x initial tan $\delta + 0.0001$ Compared to values measured in 5.11.1
5.13.0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.13.1 Change of temperature acc to IEC 60068-2-14	Test Nb $T_{max.} = 85$ °C $T_{min.} = -40$ °C Transition time: 1 h, equivalent to 1 °C/min 5 cycles	
5.13.2 Damp heat steady state Acc. to IEC 60068-2-78	Test Ca $T_{max.} = 40 \pm 2$ °C RH = 93 ± 3 % Duration 56 days	
5.5.3.2 Voltage test between terminal	1.5 x U_{Ndc} at ambient temperature Duration 60 s	
5.13.3 Final measurements	Visual examination Capacitance tan δ at 1 U_{rms} 10 kHz	No puncturing or flashover Self healing punctures are permitted $\lvert\Delta C/C\rvert \leq 2.0$ % Increase of tan $\delta \leq 0.0150$ Compared to values measured in 5.13.0
5.10.0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.10.1 Thermal stability test under overload conditions	Natural cooling $T_{amb} \pm 5$ °C 1.21 x $P_{max.} = (U_2/2)$ x W_2 x C x tan δ = 121 x ($I^2{}_{max.}/W_2$ x c) x tan δ_2 with $W_2 = 2$ x p x f_2 for $I_{max.}$ (see specific reference data) $f_2 = 10$ kHz Duration 48 h	
5.10.2 Final measurements	Measure the temperature every 1.5 h during the last 6 h Capacitance tan δ at 10 kHz	temperature rise < 1 °C $\lvert\Delta C/C\rvert \leq 2$ % Increase of tan $\delta \leq 1.2$ x initial $\delta + 0.0150$

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
5.12 Resonance frequency measurement	Impedance analyser at T_{amb}	< 0.9 times the value as specified in typical curve "Resonant frequency" of this specification
5.10.0 Initial measurements	Capacitance at 1 kHz tan δ at 10 kHz	
5.15.1 Endurance test between terminals	Sequence 1.4 x U_{Ndc} at $T_{max.}$ = 85 °C Duration 250 h 1000 x discharge at 1.4 x I (maximum repetitive peak current in continuous operation) 1.4 x U_{Ndc} at $T_{max.}$ = 85 °C Duration 250 h	
5.15.2 Final measurements	Capacitance tan δ	|ΔC/C| ≤ 3 % Increase of tan δ ≤ 0.0150 Compared to values measured in 5.15.0
5.16.3.0 Initial measurements	Capacitance at 1 kHz	
5.16.3.1 Destruction test sequence DC voltage with superimposed AC voltage switched to high DC voltage	at $T_{max.}$ = 85 °C 1.3 x U_{Ndc} with superimposed AC voltage at 1.1 x in (I_{rms}) Duration = 5 min Switch to high DC voltage = 2 x U_{Ndc} Duration 10 s Apply number of cycles till capacitance drop (open circuit) occur.	Capacitance value < 10 % of measured in 5.16.3.0
5.5.3 Voltage test between terminal	1.5 x U_{Ndc} at T_{amb} Duration 60 s	
5.16.3.2 Final measurements	Visual examination	No puncturing or flashover Self healing punctures are permitted

RFI Capacitors

Contents

Film Capacitors



For technical questions, contact: RFI@vishay.com
Document Number: 28144
Revision: 05-Dec-08

Radio Interference Suppression Capacitors

INTERFERENCE

There are two main sources of radio interference:

- Devices, which due to their construction produce RF energy. These include generators for use in industry, medicine and science, as well as oscillators, radio and TV receivers etc.
- Devices, which produce a wide spectrum of frequencies, due to rapid variations in electrical current intensity. These include devices with switching components, thyristors, triacs, commutators and similar.

Interference from source to receiver is spread in three ways:

- Along wiring
- By coupling
- By radiation

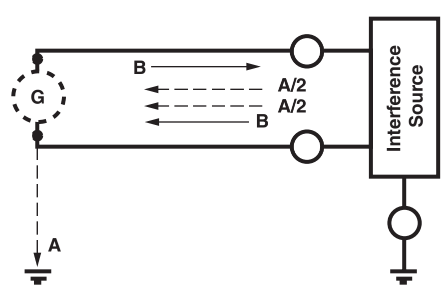
To frequencies of 30 MHz approximately, interference is spread mainly along the installed electrical wiring. In this range inductive and capacitive coupling also occurs between the wiring and other metal parts of the devices acting as supports of interference transfer.

Frequencies higher than 30 MHz are spread by radiation since interference source dimensions and terminal wiring are in order of size to the wave length of the radiated interference. The metal parts therefore act as antennas.

The device connected to the mains supply produces two kinds of interference currents, running along wiring as seen in figure A. Symmetrical interference current B runs in different directions in the phase and neutral wires.

Asymmetrical interference current A runs in the same direction in both leads and ends in the same device via the earthing connection. An earthing connection can either be an earthing wire or capacitance between the device and the surrounding.

Interference on long or medium radio waves is generally greater if the device is earthed. In this case impedance to the surrounding is short circuited and the asymmetrical interference current increases.



A) Asymmetric Terminal Voltage/Current **B) Symmetric Terminal Voltage/Current**

RADIO INTERFERENCE SUPPRESSION CAPACITORS

Classification

The suppression capacitor is the most effective interference component. Its impedance decreases with the frequency, so that we have a short circuit between the mains terminals and/or between the terminals and ground at high frequency. Capacitors for applications between the mains terminals are called:

X-Capacitors

X-capacitors, also called across the line capacitors, are capacitors with unlimited capacitance for use where their failure due to a short circuit would not lead to the danger of an electric shock.
Capacitors for applications between terminals and ground are called:

Y-Capacitors

Y-capacitors, also called line bypass capacitors, are capacitors, which serves to reduce the asymmetrical interference voltage, and are located between a live conductor and the metal case which may be touched.

In fulfilling their technical function in electrical equipment, machines and installations, Y-capacitors bridge industrial insulating systems whose reliability, in conjunction with an additional protection measure prevents danger to human beings and animals.

They are intended for use in circumstances where failure of the protection measures of the equipment could lead to a danger of electric shocks.

Normally X- and Y-capacitors can also be combined in the same case and are called:

XY-Capacitors

SAFETY STANDARDS

Before radio interference suppression capacitors can be used in a mains application, they must fulfill safety standards defined by national authorities.

The basic world standard for these components is the IEC 60384-14 (ed.3).

According to these rules capacitors are subdivided into two classes, class X and class Y.

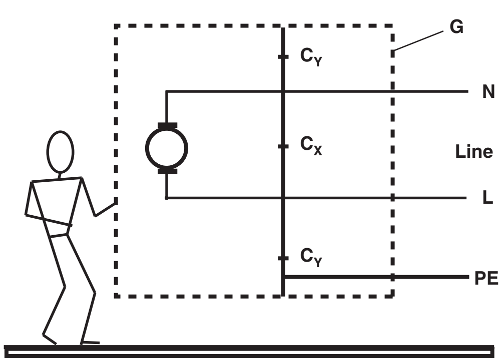


Figure a)
An example of radio interference suppression with X- and Y- capacitors used in equipment belonging to protection class I.

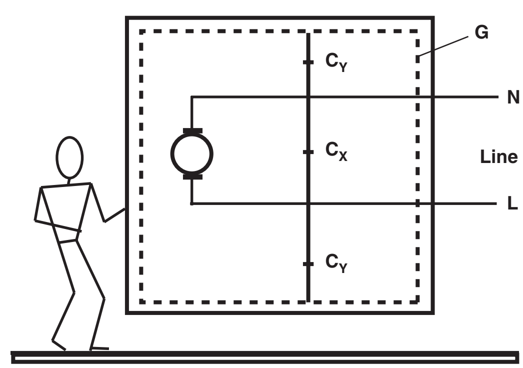


Figure b)
An example of radio interference suppression with X- and Y- capacitors used in equipment belonging to protection class II.

CLASS X-CAPACITORS

Class X-capacitors, X-capacitors for short, are subdivided into three subclasses, class X1, class X2 and class X3 corresponding to the peak voltages of the impulses superimposed on the mains voltage to which they may be subjected to in services. Such impulses may arise from lighting strikes on outside lines, from switching in neighbouring equipment, or switching in the equipment in which the capacitor is used.

SUBCLASS	PEAK IMPULSE VOLTAGE IN SERVICE	IEC. 664 INST. CATEGORY	APPLICATION	PEAK IMPULSE VOLTAGE U_P APPLIED BEFORE ENDURANCE TEST
X1	> 2.5 kV ≤ 4.0 kV	III	High pulse application	When $C_R \leq 1$ µF $U_P = 4$ kV When $C_R \geq 1$ µF $U_P = 4/\sqrt{C_R}$ in kV
X2	≤ 2.5 kV	II	General purpose	When $C_R > 1$ µF $U_P = 2.5$ kV When $C_R \leq 1$ µF $U_P = 2.5/\sqrt{C_R}$ in kV
X3	≤ 1.2 kV	-	General purpose	None

Note
- C_R is in µF

CLASS Y-CAPACITORS

Class Y-capacitors are further subdivided into four subclasses Y1, Y2, Y3 and Y4

SUBCLASS	TYPE OF INSULATING BRIDGES	RANGE OF RATED VOLTAGES	PEAK IMPULSE VOLTAGE U_P APPLIED BEFORE ENDURANCE TEST
Y1	Double Insulation or Reinforced Insulation	≤ 250 V	8.0 kV
Y2	Basic Insulating or Supplementary Insulation	≥ 150 V ≤ 250 V	5.0 kV
Y3	Basic Insulating or Supplementary Insulation	≤ 150 V ≥ 250 V	None
Y4	Basic Insulating or Supplementary Insulation	≤ 150 V	2.5 kV

In Europe the safety standard EN 60384-14: 2005 is applicable, which is fully in line with IEC 60384-14 (ed.3). The safety mark for this is the ENEC mark.

For China the standard GB/T14472, controlled by the CQC mark, and in Canada the standard E-384-14, controlled by the CSA mark are applicable and are also in line with IEC 60384-14 ed 3.

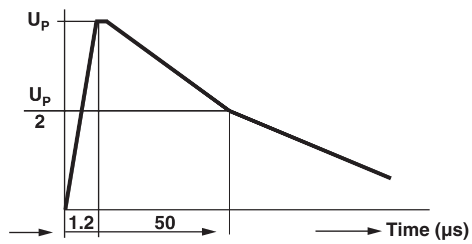
The USA has still different classifications and standards, UL1414 and UL1283, with the applicable UL mark.

In the product datasheets it can be found for which standard the capacitors are approved and are allowed to bear their safety approval marks.

ADDITIONAL DEFINITIONS FOR RFI CAPACITORS

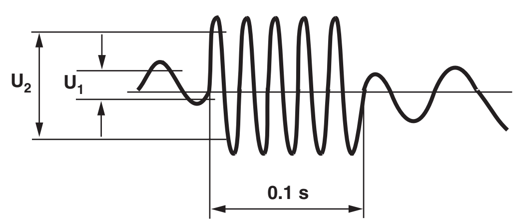
Impulse Voltage

RFI capacitors must withstand an impulse voltage with peak value U_P, rise time 1.2 µs and half pulse time of 50 µs according the graph below. U_P is defined per capacitor class.



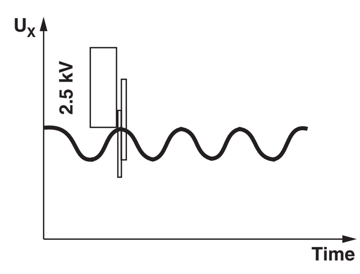
Endurance Test

All capacitors have to be tested for 1000 h at the upper category temperature with a voltage of 1.25 times rated voltage (U_R) for X-class capacitors and 1.7 times rated voltage (U_R) for Y-class capacitors. Every hour the test voltage has to be increase up to 1000 V_{RMS} for a time period of 0.1 s.



Active Flammability Test

All capacitors have to be tested with the rated voltage (U_R). at the frequency 50 Hz with superimposed 20 pulses at U_P with an interval between the successive discharges of 5 s. The capacitor shall be individually wrapped in at least one but not more than two complete layers of specified cheese-cloth. After finishing the test, the cheese-cloth shall not burn with a flame.



Insertion Loss

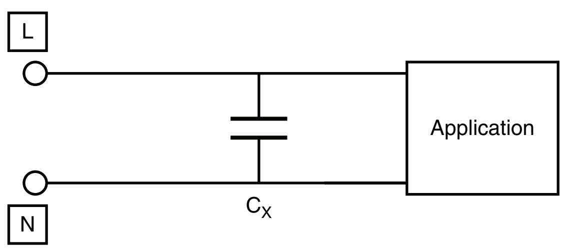
The ratio of the voltage before and after insertion of the suppressor as measured at the terminations.

AC Film Capacitors in Connection with the Mains

Because of the high energy availability and the severe environment of surge voltages and pulses, applications of capacitors in connection with the mains must be chosen carefully. Two kinds of connections and thus two kinds of applications can be distinguished. One is where the capacitor is directly connected in parallel with the mains without any other impedance or circuit protection, and another where the capacitor is connected to the mains in series with another circuitry.

CAPACITORS DIRECTLY CONNECTED IN PARALLEL WITH THE MAINS WITHOUT ANY OTHER IMPEDANCE OR CIRCUIT PROTECTION (ACROSS THE LINE OR X CLASS CAPACITORS)

To help reducing emission and increasing the immunity of radio interference, electromagnetic interference suppression film capacitors (EMI capacitors) are playing a major role in all kind of applications. These capacitors are put directly parallel over the mains at the input of the appliances.



Several functions are combined in these small components: excellent high frequency properties for short circuiting radio interference, being continuously stressed by the AC mains voltage and not at least having the ability to sustain transient voltages, caused by for example lightning strikes, switching, superimposed on this line.

For EMI capacitors it is a very difficult job to keep fulfilling the stringent requirements for safety and at the same time to miniaturize for offering customers benefits in terms of costs, functionality and mounting possibilities.

Five main characteristics can be seen for EMI-capacitors:

- Excellent capacitive filter: low inductance and equivalent series resistance are preferred
- Withstanding pulse loads: uncontrolled mains switching must be sustained
- Continuous biased by the mains voltage: a powerful energy supply is always available
- Withstanding surge voltages: high energy surge voltages could destroy the capacitors
- Safe end of life behavior

It has been noted by several national authorities that safety is top priority for these components. Therefore international safety standards have been developed like IEC 60384-14 (world standard) and UL1414 (US standard). National authorities prescribe that EMI capacitors to be connected directly in parallel with the mains must be proved to fulfill these standards. Approved products receive safety certificates and are allowed to have following safety marks:

COUNTRY	SAFETY STANDARD	APPROVAL MARK
U.S.A.	UL 1283 and/or UL 1414	
Canada	CSA-C22.2 No. 8 and/or No. 1	
U.S.A. and Canada	Combination Mark	C US
China	CQC	CQC
Europe	EN 60384-14 and IEC 60384-14	EN EC 16

AC Film Capacitors in Connection with the Mains

Based on many years of experience VISHAY has brought several EMI product series fulfilling these strong safety standards for across the line applications.

Depending on the customer's application needs following product series are recommended:

CLASS	X2	X1
VOLTAGE	**≤ 310 V_{AC}**	**≤ 440 V_{AC}**
Standard across the line applications, stability grade as per IEC 60384-14 (2)	339 336 2 338 2 1778	338 1
For continuous across the line operation, higher stability grade than per IEC 60384-14 (2)	1772	new 338 1 (1)

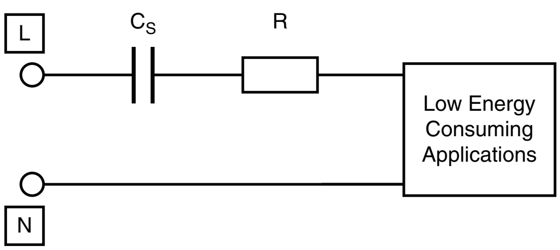
Notes

(1) Presently in development; expected 1st half 2009

(2) IEC 60384-14 endurance test conditions require ± 10 % capacitance change after 1000 h testing

CAPACITORS CONNECTED TO THE MAINS IN SERIES WITH ANOTHER CIRCUITRY (SERIES IMPEDANCE APPLICATION)

In many appliances a low voltage supply is needed for simple low energy consuming functions like sensing, phase detection,… To reduce the voltage, reactive impedances are used like film capacitors.



In this case the capacitors are connected in series with the application to the mains and now the functions to be fulfilled are:

- Stable voltage dropper: a stable capacitance must be guaranteed over the total lifetime of the application
- An adjusted tolerance: to guarantee a well defined current supply
- Continuous biased by almost the mains voltage: internal ionization must be avoided

But what about withstanding surge voltages? And what about safety?

As these caps are connected through another circuitry, the equivalent impedance of this circuit can protect the capacitor. A film capacitor could be destroyed when a high energy pulse is applied and the self healing properties are failing (self healing is the ability to recover after a breakdown). As general rule for standard capacitors, not approved according international standards for EMI capacitors, this can happen if surges occur higher than the guaranteed proof voltage. This is in general 1.6 times the rated DC voltage or 4.3 times the rated AC voltage. As it is generally accepted that surge voltage (1.2 µs rise time/50 µs duration) can occur at the entrance of appliances being 2.5 kV for installation category II and 4 kV for installation category III (IEC 60664-1), it must be verified by the customer that the impedance in series with the capacitor limits the over-voltage to these values. In general this will be the case because it can easily be calculated that equivalent impedances will be in the range of 220 Ω to a few kΩ depending on the low voltage application and by this the surge will be topped off to a few hundred volts maximum.

In all other conditions still an approved safety component must be used, but here the extra functions as stable capacitance and adjusted tolerance must be fulfilled as well. This can only be guaranteed by a different capacitor construction wherein two capacitor sections are internally connected in series.

Also for these series impedance applications VISHAY can offer a wide range of products fulfilling customer's needs and requirements:

CLASS	WITHOUT SAFETY APPROVALS (1)	WITH SAFETY APPROVALS	
VOLTAGE	**≤ 275 V_{AC}**	**≤ 310 V_{AC}**	**≤ 440 V_{AC}**
Standard and continuous in series with the mains operation	(3)	1772	new 338 1 (2)

Notes

(1) The applicant must guarantee that the maximum continuous mains voltage is lower than the rated AC voltage and that maximum temporary over-voltages (< 2 s) are lower than 1.6 rated DC voltage or 4.3 times AC rated voltage. Instructions can be found in the application notes and limiting conditions in the detail specifications.

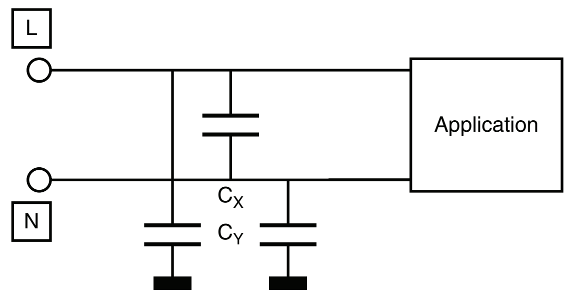
(2) Presently in development; expected 1st half 2009

(3) For the right choice of the component, contact RFI@vishay.com

AC Film Capacitors in Connection with the Mains

CAPACITORS DIRECTLY CONNECTED IN PARALLEL BETWEEN THE MAINS AND GROUND (LINE BYPASS OR Y CLASS CAPACITORS)

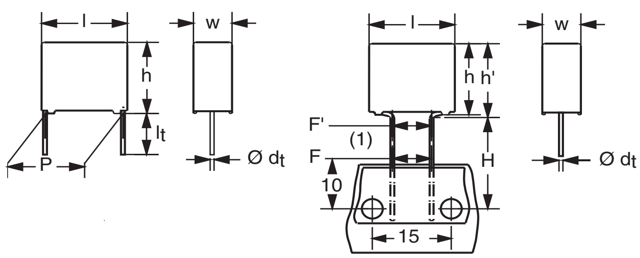
To help reducing common mode electromagnetic interference, capacitors are connected between mains and ground. For these applications only approved safety components are allowed. Different safety classes and standards are defined in the same IEC 60384-14 and UL1414 standards.



Vishay has following products in its film capacitor portfolio, adapted for the specific customers need:

CLASS	**Y2**
VOLTAGE	**≤ 305 V_{AC}**
Standard line bypass applications	1710
Line bypass application for continuous operation	338 6

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

APPLICATIONS
For standard across the line X2 applications.
See also application note:
www.vishay.com/docs/28153/anaccaps.pdf

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 to 27.5 mm lead pitch. Supplied loose in box, taped on ammopack or reel

RoHS compliant product

RATED VOLTAGE
AC 310 V; 50 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 to 4.7 µF
Preferred values acc. to E6

CAPACITANCE TOLERANCE
± 20 %; ± 10 %; ± 5 %

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
C ≤ 470 nF: 110 °C (125 °C for less than 1000 h)
C > 470 nF: 110 °C

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
339 X2	7.5 mm
	7.5 mm (bent back)
	10.0 mm
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF

BFC2	339	XX	XX	X
2222 (*)	339	XX	XX	X

(*) old ordering code

TYPE	PACKAGING	STANDARD DIMENSIONS	C-TOL	CODE NUMBER
339 X2	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 20 %	BFC2 339 20...
		Lead length 5.0 ± 1.0 mm		BFC2 339 22...
		Lead length 25.0 ± 2.0 mm		BFC2 339 24...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339 26...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339 28...
		Reel: pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339 56...
		Ammopack: pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339 58...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 10 %	BFC2 339 10...
		Lead length 5.0 ± 1.0 mm		BFC2 339 12...
		Lead length 25.0 ± 2.0 mm		BFC2 339 14...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339 16...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339 18...
		Reel: pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339 66...
		Ammopack: pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339 68...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 5 %	BFC2 339 50...
		Lead length 5.0 ± 1.0 mm		BFC2 339 52...
		Llead length 25.0 ± 2.0 mm		BFC2 339 54...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339 36...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339 38...
		Reel: pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339 76...
		Ammopack: pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339 78...
	PACKAGING	**ALTERNATIVE LARGER PITCH SIZES**	**C-TOL**	**CODE NUMBER**
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 20 %	BFC2 339 21...
		Lead length 5.0 ± 1.0 mm		BFC2 339 23...
		Lead length 25.0 ± 2.0 mm		BFC2 339 25...
	Taped (1)	Reel or ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339 27...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 10 %	BFC2 339 11...
		Lead length 5.0 ± 1.0 mm		BFC2 339 13...
		Lead length 25.0 ± 2.0 mm		BFC2 339 15...
	Taped (1)	Reel or ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339 17...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 5 %	BFC2 339 51...
		Lead length 5.0 ± 1.0 mm		BFC2 339 53...
		Lead length 25.0 ± 2.0 mm		BFC2 339 55...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339 46...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339 48...

Note

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

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE	
Rated AC voltage (U_{Rac})	310 V	
Permissible DC voltage (U_{Rdc})	630 V	
Tangent of loss angle:	at 1 kHz	at 10 kHz
C < 470 nF	≤ 10 x 10^{-4}	≤ 20 x 10^{-4}
470 nF ≤ C ≤ 1 µF	≤ 20 x 10^{-4}	≤ 70 x 10^{-4}
C > 1 µF	≤ 30 x 10^{-4}	-
Rated voltage pulse slope $(dU/dt)_R$ at 435 Vdc	100 V/µs	
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ	
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s	
R between leads and case; 100 V; 1 min	> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s:		
C ≤ 1 µF	2200 V; 1 min	
C > 1 µF	1800 V; 1 min	
Withstanding (AC) voltage between leads and case	2120 V; 1 min	
Max. application temperature for 0.001 µF ≤ C ≤ 0.47 µF	110 °C (125 °C for less than 1000 h)	
Max. application temperature for C > 0.47 µF	110 °C	

Pitch: 7.5 mm; C-tol. = 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					AMMOPACK (1)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm									
0.001	4.0 x 9.0 x 10.0	0.4	20102	22102	1500	24102	1000	28102	1250
0.0015			20152	22152		24152		28152	
0.0022			20222	22222		24222		28222	
0.0033			20332	22332		24332		28332	
0.0047			20472	22472		24472		28472	
0.0068			20682	22682		24682		28682	
0.01			20103	22103		24103		28103	
0.015			20153	22153		24153		28153	
0.022			20223	22223		24223		28223	
0.033			20333	22333		24333		28333	
0.047	5.0 x 10.5 x 10.0	0.4	20473	22473	1000	24473	1250	28473	1000
0.068	6.0 x 11.5 x 10.0	0.8	20683	22683	750	24683	1000	28683	750

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to packaging information

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 7.5 mm bent back (only taped); C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h' x l (mm)	MASS (g) [2]	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING			
			LOOSE IN BOX			
			AMMOPACK		REEL (500 mm) [1]	
			H = 16.0 mm P_0 = 15.0 mm	SPQ	H = 16.0 mm P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.1	6.0 x 14.0 x 12.5	1.1	58104	1000	56104	1500
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.15	6.0 x 14.0 x 17.5	1.4	-	-	56154	800
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.22	7.0 x 15.5 x 17.5	1.8	-	-	56224	700
0.33	8.5 x 17.0 x 17.5	2.4	-	-	56334	550
0.47	10.0 x 18.5 x 17.5	3.0	-	-	56474	500

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to packaging information

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 7.5 mm; C-tol. = 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [2]	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					AMMOPACK [1]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm									
0.001	4.0 x 9.0 x 10.0	0.45	10102	12102	1500	14102	1000	18102	1250
0.0012			10122	12122		14122		18122	
0.0015			10152	12152		14152		18152	
0.0018			10182	12182		14182		18182	
0.0022			10222	12222		14222		18222	
0.0027			10272	12272		14272		18272	
0.0033			10332	12332		14332		18332	
0.0039			10392	12392		14392		18392	
0.0047			10472	12472		14472		18472	
0.0056			10562	12562		14562		18562	
0.0068			10682	12682		14682		18682	
0.0082			10822	12822		14822		18822	
0.01			10103	12103		14103		18103	
0.012			10123	12123		14123		18123	
0.015			10153	12153		14153		18153	
0.018			10183	12183		14183		18183	
0.022			10223	12223		14223		18223	
0.027			10273	12273		14273		18273	
0.033	5.0 x 10.5 x 10.0	0.6	10333	12333	1000	14333	1250	18333	1000
0.039			10393	12393		14393		18393	
0.047			10473	12473		14473		18473	
0.056	6.0 x 11.5 x 10.0	0.8	10563	12563	750	14563	1000	18563	750

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to packaging information

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

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

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING			
			LOOSE IN BOX			
			AMMOPACK		REEL (500 mm) (1)	
			H = 16.0 mm P_0 = 15.0 mm	SPQ	H = 16.0 mm P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.068	5.0 x 13.0 x 12.5	0.9	68683	1300	66683	1900
0.082 0.1	6.0 x 14.0 x 12.5	1.1	68823 68104	1000	66823 66104	1500
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.12 0.15	6.0 x 14.0 x 17.5	1.4	-	-	66124 66154	800
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm						
0.18 0.22	7.0 x 15.5 x 17.5	1.8	-	-	66184 66224	700
0.27 0.33	8.5 x 17.0 x 17.5	2.4	-	-	66274 66334	550
0.39 0.47	10.0 x 18.5 x 17.5	3.0	-	-	66394 66474	500

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to packaging information

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 7.5 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					AMMOPACK (1)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm									
0.001			50102	52102		54102		38102	
0.0012			50122	52122		54122		38122	
0.0015			50152	52152		54152		38152	
0.0018			50182	52182		54182		38182	
0.0022			50222	52222		54222		38222	
0.0027			50272	52272		54272		38272	
0.0033			50332	52332		54332		38332	
0.0039			50392	52392		54392		38392	
0.0047	4.0 x 9.0 x 10.0	0.45	50472	52472	1500	54472	1000	38472	1250
0.0056			50562	52562		54562		38562	
0.0068			50682	52682		54682		38682	
0.0082			50822	52822		54822		38822	
0.01			50103	52103		54103		38103	
0.012			50123	52123		54123		38123	
0.015			50153	52153		54153		38153	
0.018			50183	52183		54183		38183	
0.022			50223	52223		54223		38223	
0.027			50273	52273		54273		38273	
0.033 0.039	5.0 x 10.5 x 10.0	0.6	50333 50393	52333 52393	1000	54333 54393	1250	38333 38393	1000
0.047 0.056	6.0 x 11.5 x 10.0	0.8	50473 50563	52473 52563	750	54473 54563	1000	38473 38563	750

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to packaging information

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

Bent back pitch: 7.5 mm (only taped); C-tol. = ± 5 %

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING			
			LOOSE IN BOX			
			AMMOPACK		REEL (500 mm) (1)	
			H = 16.0 mm P_0 = 15.0 mm	SPQ	H = 16.0 mm P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.068	5.0 x 13.0 x 12.5	0.9	78683	1300	76683	1900
0.082	6.0 x 14.0 x 12.5	1.1	78823	1000	76823	1500
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.1	5.0 x 13.0 x 17.5	1.0	78104	1250	76104	1100
0.12	6.0 x 14.0 x 17.5	1.4			76124	
0.15			-	-	76154	800
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm						
0.18	7.0 x 15.5 x 17.5	1.8	-	-	76184	700
0.22					76224	
0.27	8.5 x 17.0 x 17.5	2.4	-	-	76274	550
0.33					76334	
0.39	10.0 x 18.5 x 17.5	3.0	-	-	76394	500

Notes

(1) Reel diameter = 356 mm, is available on request
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 10.0 mm; C-tol. = ± 20 %

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK (1)		LARGE REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm		H = 18.5.mm P_0 = 15.0 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ		SPQ
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001			21102	23102		25102		27102			
0.0015			21152	23152		25152		27152			
0.0022			21222	23222		25222		27222			
0.0033			21332	23332		25332		27332			
0.0047			21472	23472		25472		27472			
0.0068	4.0 x 10.0 x 12.5	0.6	21682	23682	1000	25682	1250	27682	950	-	
0.01			21103	23103		25103		27103			
0.015			21153	23153		25153		27153			
0.022			21223	23223		25223		27223			
0.033			21333	23333		25333		27333			
0.047			21473	23473		25473		27473			
0.068	5.0 x 11.0 x 12.5	0.82	21683	23683	1000	25683	1000	27683	750		
0.1	6.0 x 12.0 x 12.5	1.1	20104	22104	750	24104	750	28104	600	26104	1500

Notes

(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
• SPQ = Standard Packing Quantity

Pitch: 10.0 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK (1)		LARGE REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm		H = 18.5 mm P_0 = 15.0 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ		SPQ
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001			11102	13102		15102		17102			
0.0012			11122	13122		15122		17122			
0.0015			11152	13152		15152		17152			
0.0018			11182	13182		15182		17182			
0.0022			11222	13222		15222		17222			
0.0027			11272	13272		15272		17272			
0.0033			11332	13332		15332		17332			
0.0039			11392	13392		15392		17392			
0.0047			11472	13472		15472		17472			
0.0056			11562	13562		15562		17562			
0.0068	4.0 x 10.0 x 12.5	0.6	11682	13682	1000	15682	1250	17682	950	-	
0.0082			11822	13822		15822		17822			
0.01			11103	13103		15103		17103			
0.012			11123	13123		15123		17123			
0.015			11153	13153		15153		17153			
0.018			11183	13183		15183		17183			
0.022			11223	13223		15223		17223			
0.027			11273	13273		15273		17273			
0.033			11333	13333		15333		17333			
0.039			11393	13393		15393		17393			
0.047			11473	13473		15473		17473			
0.056	5.0 x 11.0 x 12.5	0.82	11563	13563	1000	15563	1000	17563	750		
0.068			10683	12683		14683		18683		16683	1900
0.082	6.0 x 12.0 x 12.5	1.1	10823	12823	750	14823	750	18823	600	16823	1500
0.1			10104	12104		14104		18104		16104	

Notes

(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
• SPQ = Standard Packing Quantity

Pitch: 10.0 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK [1]		LARGE REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm		H = 18.5.mm P_0 = 15.0 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ		SPQ
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001			51102	53102		55102		48102			
0.0012			51122	53122		55122		48122			
0.0015			51152	53152		55152		48152			
0.0018			51182	53182		55182		48182			
0.0022			51222	53222		55222		48222			
0.0027			51272	53272		55272		48272			
0.0033			51332	53332		55332		48332			
0.0039			51392	53392		55392		48392			
0.0047			51472	53472		55472		48472			
0.0056			51562	53562		55562		48562			
0.0068	4.0 x 10.0 x 12.5	0.6	51682	53682	1000	55682	1250	48682	950	-	
0.0082			51822	53822		55822		48822			
0.01			51103	53103		55103		48103			
0.012			51123	53123		55123		48123			
0.015			51153	53153		55153		48153			
0.018			51183	53183		55183		48183			
0.022			51223	53223		55223		48223			
0.027			51273	53273		55273		48273			
0.033			51333	53333		55333		48333			
0.039			51393	53393		55393		48393			
0.047			51473	53473		55473		48473			
0.056	5.0 x 11.0 x 12.5	0.82	51563	53563	1000	55563	1000	48563	750	46563	1900
0.068			50683	52683		54683		38683		36683	
0.082	6.0 x 12.0 x 12.5	1.1	50823	52823	750	54823	750	38823	600	36823	1500

Notes

(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

• SPQ = Standard Packing Quantity

Pitch: 15.0 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5.mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	5.0 x 11.0 x 17.5	1	90001	90007	1250	90014	1000	90021	1100
0.015			90002	90008		90015		90022	
0.022			90003	90009		90016		90023	
0.033			90004	90011		90017		90024	
0.047			90005	90012		90018		90025	
0.068			90006	90013		90019		90026	
0.1			21104	23104		25104		27104	
0.15	6.0 x 12.0 x 17.5	1.4	20154	22154	1000	24154	1000	26154	900
Pitch = 15 ± 0.4 mm; d_t= 0.80 ± 0.08 mm									
0.22	7.0 x 13.5 x 17.5	1.8	20224	22224	750	24224	500	26224	800
0.33	8.5 x 15.0 x 17.5	2.4	20334	22334	750	24334	500	26334	650
0.47	10.0 x16.5 x 17.5	3	20474	22474	500	24474	450	26474	600
0.47	8.5 x 17.5 x 17.8	3.1	90165	90166	300	90143	500	-	-
0.56	10.0 x 18.5 x 17.8	4.3	90174	90175	225	90176	350	-	-
0.68	11.0 x 18.5 x 17.8	5.5	90168	90169	225	90145	350	-	-

Notes

(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
• SPQ = Standard Packing Quantity

Pitch: 15.0 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01			90027	90039		90052		90064	
0.012			90028	90041		90053		90065	
0.015			90029	90042		90054		90066	
0.018			90031	90043		90055		90067	
0.022			90032	90044		90056		90068	
0.027			90033	90045		90057		90069	
0.033	5.0 x 11.0 x 17.5	1.0	90034	90046	1250	90058	1000	90071	1100
0.039			90035	90047		90059		90072	
0.047			90036	90048		90061		90073	
0.056			90037	90049		90062		90074	
0.068			11683	13683		15683		17683	
0.082			11823	13823		15823		17823	
0.1			11104	13104		15104		17104	
0.12	6.0 x 12.0 x 17.5	1.4	10124	12124	1000	14124	1000	16124	900
0.15			10154	12154		14154		16154	
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.18	7.0 x 13.5 x 17.5	1.8	10184	12184	750	14184	500	16184	800
0.22			10224	12224		14224		16224	
0.27	8.5 x 15.0 x 17.5	2.4	10274	12274	750	14274	500	16274	650
0.33			10334	12334		14334		16334	
0.33	9.3 x 14.0 x 18.3	2.9	-	-	-	74334	500	-	-
0.39	10.0 x 16.5 x 17.5	3.0	10394	12394	500	14394	450	16394	600
0.47			10474	12474		14474		16474	
0.56	10.0 x 18.5 x 17.8	4.3	90167	90157	225	90144	400	-	-

Notes

[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
• SPQ = Standard Packing Quantity

Pitch: 15.0 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01			90221	90232		90243		90254	
0.012			90222	90233		90244		90255	
0.015			90223	90234		90245		90256	
0.018			90224	90235		90246		90257	
0.022			90225	90236		90247		90258	
0.027			90226	90237		90248		90259	
0.033	5.0 x 11.0 x 17.5	1.0	90227	90238	1250	90249	1000	90261	1100
0.039			90228	90239		90251		90262	
0.047			90229	90241		90252		90263	
0.056			90231	90242		90253		90264	
0.068			51683	53683		55683		46683	
0.082			51823	53823		55823		46823	
0.1			50104	52104		54104		36104	
0.12	6.0 x 12.0 x 17.5	1.4	50124	52124	1000	54124	1000	36124	900
0.15			50154	52154		54154		36154	
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.18	7.0 x 13.5 x 17.5	1.8	50184	52184	750	54184	500	36184	800
0.22			50224	52224		54224		36224	
0.27	8.5 x 15.0 x 17.5	2.4	50274	52274	750	54274	500	36274	650
0.33			50334	52334		54334		36334	
0.39	10.0 x 16.5 x 17.5	3.0	50394	52394	500	54394	450	36394	600

Notes

[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
• SPQ = Standard Packing Quantity

Pitch: 22.5 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.15			21154	23154		25154		27154	
0.22	6.0 x 15.5 x 26.0	2.4	21224	23224	300	25224	250	27224	600
0.33			21334	23334		25334		27334	
0.47	7.0 x 16.5 x 26.0	2.9	21474	23474	200	25474	250	27474	500
0.68	8.5 x 18.0 x 26.0	3.8	20684	22684	200	24684	250	26684	450
1.0	10.0 x 19.5 x 26.0	6.8	20105	22105	200	24105	200	26105	350
1.5	12.3 x 22.3 x 26.3	10	90103	90138	140	90139	400	90141	300

Notes

[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
• SPQ = Standard Packing Quantity

Pitch: 22.5 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.12	6.0 x 15.5 x 26.0	2.4	11124	13124	300	15124	250	17124	600
0.15			11154	13154		15154		17154	
0.18			11184	13184		15184		17184	
0.22			11224	13224		15224		17224	
0.27			11274	13274		15274		17274	
0.33			11334	13334		15334		17334	
0.33	8.4 x 14.0 x 26.3	3.6	-	-	-	75334	800	-	-
0.39	7.0 x 16.5 x 26.0	2.9	11394	13394	200	15394	250	17394	500
0.47			11474	13474		15474		17474	
0.47	8.4 x 14.0 x 26.3	3.6	-	-	-	75474	800	-	-
0.56	8.5 x 18.0 x 26.0	3.8	10564	12564	200	14564	250	16564	450
0.68	10.0 x 19.5 x 26.0	6.8	10684	12684	200	14684	200	16684	350
0.82			10824	12824		14824		16824	
1.0	12.0 x 22.0 x 26.0	7.8	10105	12105	150	14105	200	16105	300

Notes

(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
• SPQ = Standard Packing Quantity

Pitch: 22.5 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.12	6.0 x 15.5 x 26.0	2.4	51124	53124	300	55124	250	46124	600
0.15			51154	53154		55154		46154	
0.18			51184	53184		55184		46184	
0.22			51224	53224		55224		46224	
0.27			51274	53274		55274		46274	
0.33	7.0 x 16.5 x 26.0	2.9	51334	53334	200	55334	250	46334	500
0.39			51394	53394		55394		46394	
0.47	8.5 x 18.0 x 26.0	3.8	51474	53474	200	55474	250	46474	450
0.56			50564	52564		54564		36564	
0.68	10.0 x 19.5 x 26.0	6.8	50684	52684	200	54684	200	36684	350
0.82			50824	52824		54824		36824	
1.0	12.0 x 22.0 x 26.0	7.8	50105	52105	150	54105	200	36105	300

Notes

(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
• SPQ = Standard Packing Quantity

Pitch: 27.5 mm; C-tol = ± 20 %

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING				
			LOOSE IN BOX				
			Short leads			Long leads	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ
Pitch = 27.5 ± 0.4 mm; dt= 0.80 ± 0.08 mm							
0.47	9.0 x 19.0 x 31.0	5.5	90076	90078	100	90081	150
0.68			21684	23684		25684	
1.0	11.0 x 21.0 x 31.0	7.4	21105	23105	100	25105	125
1.5	13.0 x 23.0 x 31.0	9.2	20155	22155	100	24155	125
2.2	15.0 x 25.0 x 31.0	12.3	20225	22225	100	24225	125
3.3	18.0 x 28.0 x 31.0	16.1	20335	22335	100	24335	100
4.7	21.0 x 31.0 x 31.0	20.3	20475	22475	50	24475	75

Notes

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

Pitch: 27.5 mm; C-tol = ± 10 %

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING				
			LOOSE IN BOX				
			Short leads			Long leads	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ
Pitch = 27.5 ± 0.4 mm; dt = 0.80 ± 0.08 mm							
0.68	9.0 x 19.0 x 31.0	5.5	11684	13684	100	15684	150
0.82	11.0 x 21.0 x 31.0	7.4	11824	13824	100	15824	125
1.0			11105	13105		15105	
1.2			10125	12125		14125	
1.5	13.0 x 23.0 x 31.0	9.2	10155	12155	100	14155	125
1.8	15.0 x 25.0 x 31.0	12.3	10185	12185	100	14185	125
2.2			10225	12225		14225	
2.7	18.0 x 28.0 x 31.0	16.1	10275	12275	100	14275	100
3.3	21.0 x 31.0 x 31.0	20.3	10335	12335	50	14335	75
3.9			10395	12395		14395	

Notes

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

Pitch: 27.5 mm; C-tol = ± 5 %

C (μF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 339 XXXXX AND PACKAGING				
			LOOSE IN BOX				
			Short leads			Long leads	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.68	9.0 x 19.0 x 31.0	5.5	51684	53684	100	55684	150
0.82	11.0 x 21.0 x 31.0	7.4	51824	53824	100	55824	125
1.0			51105	53105		55105	
1.2	13.0 x 23.0 x 31.0	9.2	50125	52125	100	54125	125
1.5			50155	52155		54155	
1.8	15.0 x 25.0 x 31.0	12.3	50185	52185	100	54185	125
2.2	18.0 x 28.0 x 31.0	16.1	50225	52225	100	54225	100
2.7			50275	52275		54275	
3.3	21.0 x 31.0 x 31.0	20.3	50335	52335	50	54335	75

Notes

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

APPROVALS

SAFETY APPROVALS X2	VOLTAGE	VALUE	FILE NUMBERS
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	pending
CQC	310Vac	1 nF to 4.7 µF	CQC 07001021281 (L) CQC03001006960 (s) CQC 06001018290 (F)
CB Test Certificate	310 Vac	1 nF to 4.7 µF	FI 5123
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

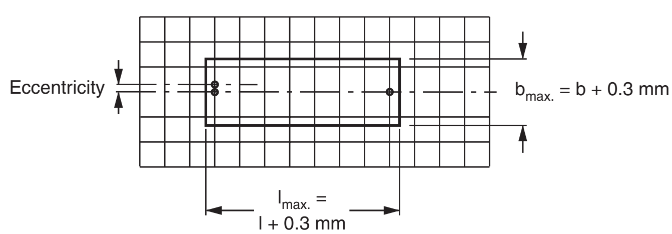
In order to withstand vibration and shock tests, it must be insured that the stand-off pips are in good contact with the printed-circuit board:

- 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: $h_{max.} \leq h + 0.3$ mm or $h_{max.} \leq h' + 0.3$ mm.



Storage Temperature

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

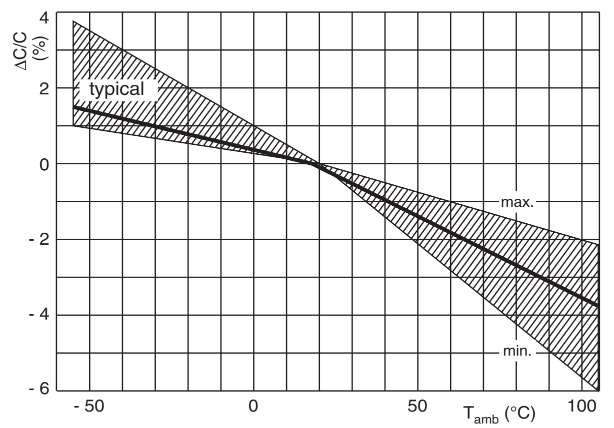
Ratings and Characteristics Reference Conditions

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

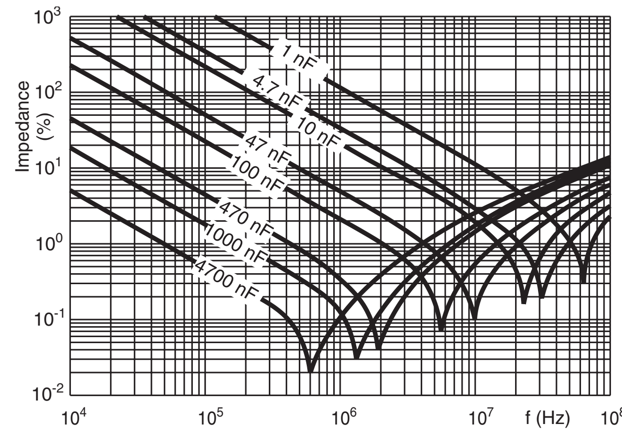
For reference testing, a conditioning period shall be applied over 96 h ± 4 hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

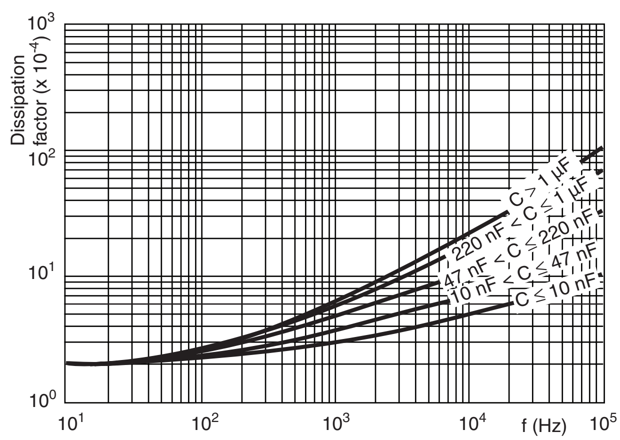
Capacitance as a function of ambient temperature (typical curve)



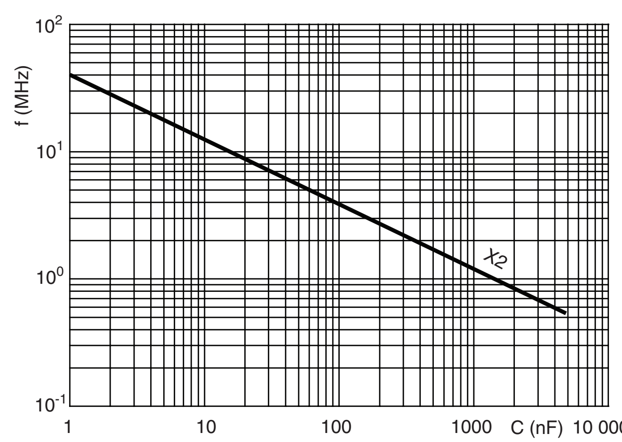
Impedance as a function of frequency (typical curve)



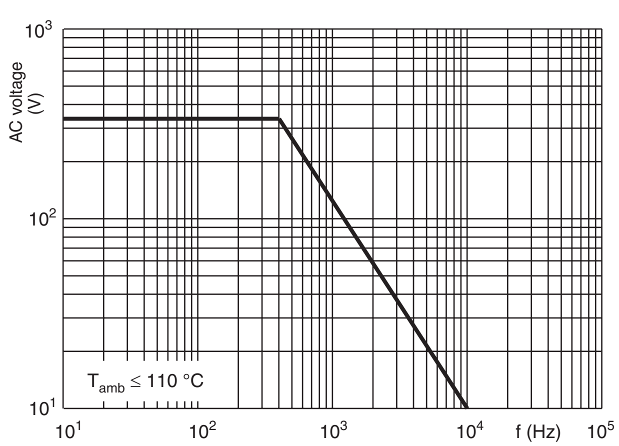
Tangent of loss angle as a function of frequency (typical curve)



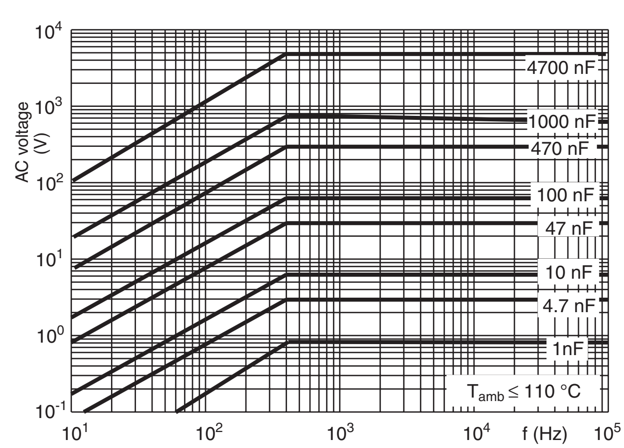
Resonant frequency as a function of capacitance (typical curve)



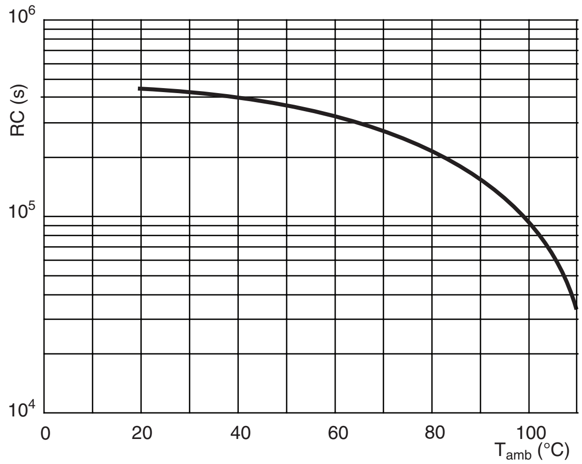
Max. RMS voltage as a function of frequency (typical curve)



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** (50/60 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 application. 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:

1. 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

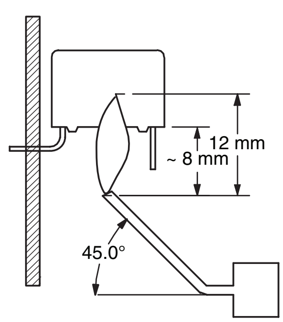
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in section “General data” of this specification
Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.3 Robustness of terminations	Tensile: load 10 N; 10 s Bending: load 5 N; 4 x 90°	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.4 Resistance to soldering heat	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	¦ΔC/C¦ ≤ 5 % of the value measured initially.
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured initially
	Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 110 °C 5 cycles Duration t = 30 min	
4.6.1 Inspection	Visual examination	No visible damage
4.7 Vibration	Mounting: see section "Mounting" of this specification Procedure B4 Frequency range: 10 to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	
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	

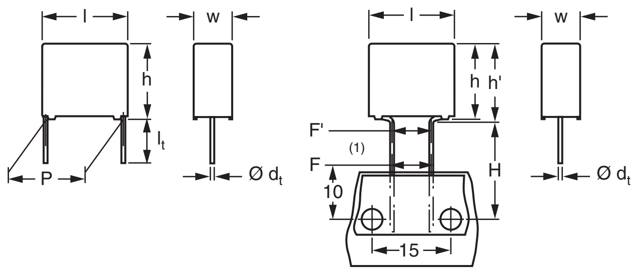
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9.2 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	No visible damage ¦ΔC/C¦ ≤ 5 % of the value measured initially. Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured initially As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.11 Climatic sequence 4.11.1 Initial measurements 4.11.2 Dry heat 4.11.3 Damp heat cyclic Test Db First cycle 4.11.4 Cold 4.11.5 Damp heat cyclic Test Db remaining cycles 4.11.6 Final measurements	 Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B Temperature: 110 °C Duration: 16 h Temperature: - 55 °C 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 ¦ΔC/C¦ ≤ 5 % of the value measured in 4.11.1. Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured in 4.11.1. No permanent breakdown or flash-over ≥ 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	56 days; 40 °C; 90 to 95 % RH no load Capacitance Tangent of loss angle: at 1 kHz	

Interference Suppression Film Capacitors
MKP Radial Potted Type

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.12.1.
	Tangent of loss angle	Increase of tan δ: $\leq$ 0.008 for: C $\leq$ 1 µF or $\leq$ 0.005 for: C > 1 µF Compared to values measured in 4.12.1.
	Voltage proof 1350 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C $\leq$ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X2: 2.5 kV for C $\leq$ 1 µF X2: 2.5 kV/$\sqrt{C}$ for C > 1 µF Max. 24 pulses	No self healing breakdowns or flash-over
4.14 Endurance	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 Ω ± 5 %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.13.1.
	Tangent of loss angle	Increase of tan δ: $\leq$ 0.008 for: C $\leq$ 1 µF or $\leq$ 0.005 for: C > 1 µF Compared to values measured in 4.13.1.
	Voltage proof 1350 Vdc; 1 min between terminations. 2120 Vac; 1 min between terminations and case.	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 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 ≤ 1 µF at 10 kHz For C > 1 µF at 1 kHz	
4.15.3 Final measurements	Capacitance	¦ΔC/C¦ ≤ 10 % compared to values measured in 4.15.1.
	Tangent of loss angle	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.
	Insulation resistance	≥ 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: Ø 0.5 mm Fuel: butane Test duration for actual volume V in mm³: 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 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.

Interference Suppression Film Capacitors MKP Radial Potted Type



Dimensions in mm

Note

(1) |F - F'| < 0.3 mm
F = 7.5 + 0.6/- 0.1 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 27.5 mm lead pitch
Supplied loose in box, taped: ammopack or reel
RoHS compliant

RATED VOLTAGE

AC 310 V; 50 Hz to 60 Hz

PERMISSIBLE DC VOLTAGE

DC 630 V (T_{amb} ≤ 110 °C)
DC voltage degrade 12.7 V/°C (110 °C < T_{amb} ≤ 125 °C)
DC 440 V (T_{amb} = 125 °C)

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/125/56/B

CAPACITANCE RANGE (E12 SERIES)

E12 series 0.001 µF to 2.2 µF
Preferred values acc. to E6

CAPACITANCE TOLERANCE

± 20 %; ± 10 %; ± 5 %

LEADS

Tinned wire

MAXIMUM APPLICATION TEMPERATURE

125 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
339T X2	7.5 mm
	7.5 mm (bent back)
	10.0 mm
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

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

Example:

104 = 10 x 10 = 100 nF

BFC2	339T	XX	XX	X
2222 (*)	339T	XX	XX	X

(*) old ordering code

TYPE	PACKAGING	STANDARD DIMENSIONS	C-TOL.	CODE NUMBER
339T X2	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 20 %	BFC2 339T 20...
		Lead length 5.0 ± 1.0 mm		BFC2 339T 22...
		Lead length 25.0 ± 2.0 mm		BFC2 339T 24...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339T 26...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339T 28...
		Reel: Pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339T 56...
		Ammopack: Pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339T 58...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 10 %	BFC2 339T 10...
		Lead length 5.0 ± 1.0 mm		BFC2 339T 12...
		Lead length 25.0 ± 2.0 mm		BFC2 339T 14...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339T 16...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339T 18...
		Reel: Pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339T 66...
		Ammopack: Pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339T 68...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 5 %	BFC2 339T 50...
		Lead length 5.0 ± 1.0 mm		BFC2 339T 52...
		Lead length 25.0 ± 2.0 mm		BFC2 339T 54...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339T 36...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339T 38...
		Reel: Pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339T 76...
		Ammopack: Pitch 7.5 mm (bent back), H = 16.0 mm; P_0 = 15.0 mm		BFC2 339T 78...
	PACKAGING	**ALTERNATIVE LARGER PITCH SIZES**	**C-TOL.**	**CODE NUMBER**
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 20 %	BFC2 339T 21...
		Lead length 5.0 ± 1.0 mm		BFC2 339T 23...
		Lead length 25.0 ± 2.0 mm		BFC2 339T 25...
	Taped (1)	Reel or ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339T 27...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 10 %	BFC2 339T 11...
		Lead length 5.0 ± 1.0 mm		BFC2 339T 13...
		Lead length 25.0 ± 2.0 mm		BFC2 339T 15...
	Taped (1)	Reel or ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339T 17...
	Loose in box	Lead length 3.5 + 1/- 0.5 mm or 3.5 ± 0.3 mm	± 5 %	BFC2 339T 51...
		Lead length 5.0 ± 1.0 mm		BFC2 339T 53...
		Lead length 25.0 ± 2.0 mm		BFC2 339T 55...
	Taped (1)	Reel: H = 18.5 mm; P_0 = 12.7 mm or 15.0 mm		BFC2 339T 46...
		Ammopack: H = 18.5 mm; P_0 = 12.7 mm		BFC2 339T 48...

Note

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

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE	
Rated AC voltage (U_{Rac})	310 V	
Permissible DC voltage (U_{Rdc})	630 V	
Tangent of loss angle:	at 1 kHz	at 10 kHz
C < 470 nF	≤ 10 x 10^{-4}	≤ 20 x 10^{-4}
470 nF ≤ C ≤ 1 µF	≤ 20 x 10^{-4}	≤ 70 x 10^{-4}
C > 1 µF	≤ 30 x 10^{-4}	-
Rated voltage pulse slope $(dU/dt)_R$ at 435 Vdc	100 V/µs	
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ	
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s	
R between leads and case; 100 V; 1 min	> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s:		
C ≤ 1 µF	2200 V; 1 min	
C > 1 µF	1800 V; 1 min	
Withstanding (AC) voltage between leads and case	2120 V; 1 min	
Maximum application temperature	125 °C	

Pitch: 7.5 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					AMMOPACK (1)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm									
0.001	4.0 x 9.0 x 10.0	0.45	20102	22102	1500	24102	1000	28102	1250
0.0015			20152	22152		24152		28152	
0.0022			20222	22222		24222		28222	
0.0033			20332	22332		24332		28332	
0.0047			20472	22472		24472		28472	
0.0068			20682	22682		24682		28682	
0.01			20103	22103		24103		28103	
0.015			20153	22153		24153		28153	
0.022			20223	22223		24223		28223	
0.033	5.0 x 10.5 x 10.0	0.60	20333	22333	1000	24333	1250	28333	1000
0.047	6.0 x 11.5 x 10.0	0.80	20473	22473	750	24473	1000	28473	750

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 7.5 mm bent back (only taped); C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h' x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING			
			LOOSE IN BOX			
			AMMOPACK		REEL (500 mm) (1)	
			H = 16.0 mm P_0 = 15.0 mm	SPQ	H = 16.0 mm P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.068 0.1	6.0 x 14.0 x 12.5	1.1	58683 58104	1000	56683 56104	1500
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm						
0.15	7.0 x 15.5 x 17.5	1.8	-	-	56154	700
0.22	8.5 x 17.0 x 17.5	2.4	-	-	56224	550
0.33	10.0 x 18.5 x 17.5	3.0	-	-	56334	500

Notes

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

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 7.5 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					AMMOPACK (1)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm									
0.001	4.0 x 9.0 x 10.0	0.45	10102	12102	1500	14102	1000	18102	1250
0.0012			10122	12122		14122		18122	
0.0015			10152	12152		14152		18152	
0.0018			10182	12182		14182		18182	
0.0022			10222	12222		14222		18222	
0.0027			10272	12272		14272		18272	
0.0033			10332	12332		14332		18332	
0.0039			10392	12392		14392		18392	
0.0047			10472	12472		14472		18472	
0.0056			10562	12562		14562		18562	
0.0068			10682	12682		14682		18682	
0.0082			10822	12822		14822		18822	
0.01			10103	12103		14103		18103	
0.012			10123	12123		14123		18123	
0.015			10153	12153		14153		18153	
0.018			10183	12183		14183		18183	
0.022			10223	12223		14223		18223	
0.027 0.033	5.0 x 10.5 x 10.0	0.60	10273 10333	12273 12333	1000	14273 14333	1250	18273 18333	1000
0.039 0.047	6.0 x 11.5 x 10.0	0.80	10393 10473	12393 12473	750	14393 14473	1000	18393 18473	750

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139

(2) Weight for short lead product only

• SPQ = Standard Packing Quantity

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

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING			
			LOOSE IN BOX			
			AMMOPACK		REEL (500 mm) (1)	
			H = 16.0 mm P_0 = 15.0 mm	SPQ	H = 16.0 mm P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.056	5.0 x 13.0 x 12.5	0.9	68563	1300	66563	1900
0.068	6.0 x 14.0 x 12.5	1.1	68683	1000	66683	1500
0.082			68823		66823	
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.1	6.0 x 14.0 x 17.5	1.4	-	-	66104	800
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm						
0.12	7.0 x 15.5 x 17.5	1.8	-		66124	700
0.15	8.5 x 17.0 x 17.5	2.4	-	-	66154	550
0.18					66184	
0.22	10.0 x 18.5 x 17.5	3.0	-	-	66224	500
0.27					66274	

Notes

(1) Reel diameter = 356 mm is available on request
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 7.5 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					AMMOPACK (1)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm									
0.001			50102	52102		54102		38102	
0.0012			50122	52122		54122		38122	
0.0015			50152	52152		54152		38152	
0.0018			50182	52182		54182		38182	
0.0022			50222	52222		54222		38222	
0.0027			50272	52272		54272		38272	
0.0033			50332	52332		54332		38332	
0.0039			50392	52392		54392		38392	
0.0047	4.0 x 9.0 x 10.0	0.45	50472	52472	1500	54472	1000	38472	1250
0.0056			50562	52562		54562		38562	
0.0068			50682	52682		54682		38682	
0.0082			50822	52822		54822		38822	
0.01			50103	52103		54103		38103	
0.012			50123	52123		54123		38123	
0.015			50153	52153		54153		38153	
0.018			50183	52183		54183		38183	
0.022			50223	52223		54223		38223	
0.027	5.0 x 10.5 x 10.0	0.60	50273	52273	1000	54273	1250	38273	1000
0.033			50333	52333		54333		38333	
0.039	6.0 x 11.5 x 10.0	0.80	50393	52393	750	54393	1000	38393	750
0.047			50473	52473		54473		38473	

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

Bent back pitch: 7.5 mm (only taped); C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h' x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING			
			AMMOPACK		REEL (500 mm) (1)	
			H = 16.0 mm P_0 = 15.0 mm	SPQ	H = 16.0 mm P_0 = 15.0 mm	SPQ
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm						
0.056	5.0 x 13.0 x 12.5	0.9	78563	1300	76563	1900
0.068 0.082	6.0 x 14.0 x 12.5	1.1	78683 78823	1000	76683 76823	1500
0.1	6.0 x 14.0 x 17.5	1.4	-	-	76104	800
Bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm						
0.12	7.0 x 15.5 x 17.5	1.8	-	-	76124	700
0.15 0.18	8.5 x 17.0 x 17.5	2.4	-	-	76154 76184	550
0.22 0.27	10.0 x 18.5 x 17.5	3.0	-	-	76224 76274	500

Notes

(1) Reel diameter = 356 mm is available on request
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 10.0 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK (1)		LARGE REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm		H = 18.5 mm P_0 = 15.0 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ		SPQ
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001 0.0015 0.0022 0.0033 0.0047 0.0068 0.01 0.015 0.022 0.033	4.0 x 10.0 x 12.5	0.60	21102 21152 21222 21332 21472 21682 21103 21153 21223 21333	23102 23152 23222 23332 23472 23682 23103 23153 23223 23333	1000	25102 25152 25222 25332 25472 25682 25103 25153 25223 25333	1250	27102 27152 27222 27332 27472 27682 27103 27153 27223 27333	950	-	
0.047	5.0 x 11.0 x 12.5	0.82	21473	23473	1000	25473	1000	27473	750	26473	1900
0.068 0.1	6.0 x 12.0 x 12.5	1.10	21683 20104	23683 22104	750	25683 24104	750	27683 28104	600	26683 26104	1500

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139
(2) Reel diameter = 356 mm is available on request
(3) Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 10.0 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK [1]		LARGE REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm		H = 18.5 mm P_0 = 15.0 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ		SPQ
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 10.0 x 12.5	0.60	11102	13102	1000	15102	1250	17102	950	-	
0.0012			11122	13122		15122		17122			
0.0015			11152	13152		15152		17152			
0.0018			11182	13182		15182		17182			
0.0022			11222	13222		15222		17222			
0.0027			11272	13272		15272		17272			
0.0033			11332	13332		15332		17332			
0.0039			11392	13392		15392		17392			
0.0047			11472	13472		15472		17472			
0.0056			11562	13562		15562		17562			
0.0068			11682	13682		15682		17682			
0.0082			11822	13822		15822		17822			
0.01			11103	13103		15103		17103			
0.012			11123	13123		15123		17123			
0.015			11153	13153		15153		17153			
0.018			11183	13183		15183		17183			
0.022			11223	13223		15223		17223			
0.027			11273	13273		15273		17273			
0.033			11333	13333		15333		17333			
0.039			11393	13393		15393		17393			
0.047	5.0 x 11.0 x 12.5	0.82	11473	13473	1000	15473	1000	17473	750	16473	1900
0.056			11563	13563		15563		17563		16563	
0.068	6.0 x 12.0 x 12.5	1.10	10683	12683	750	14683	750	18683	600	16683	1500
0.082			10823	12823		14823		18823		16823	

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139

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

(3) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 10.0 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK (1)		LARGE REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm		H = 18.5 mm P_0 = 15.0 mm	
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ		SPQ
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 10.0 x 12.5	0.60	51102	53102	1000	55102	1250	48102	950	-	
0.0012			51122	53122		55122		48122			
0.0015			51152	53152		55152		48152			
0.0018			51182	53182		55182		48182			
0.0022			51222	53222		55222		48222			
0.0027			51272	53272		55272		48272			
0.0033			51332	53332		55332		48332			
0.0039			51392	53392		55392		48392			
0.0047			51472	53472		55472		48472			
0.0056			51562	53562		55562		48562			
0.0068			51682	53682		55682		48682			
0.0082			51822	53822		55822		48822			
0.01			51103	53103		55103		48103			
0.012			51123	53123		55123		48123			
0.015			51153	53153		55153		48153			
0.018			51183	53183		55183		48183			
0.022			51223	53223		55223		48223			
0.027			51273	53273		55273		48273			
0.033			51333	53333		55333		48333			
0.039	5.0 x 11.0 x 12.5	0.82	51393	53393	1000	55393	1000	48393	750	36393	1900
0.047			51473	53473		55473		48473		36473	
0.056			51563	53563		55563		48563		36563	
0.068	6.0 x 12.0 x 12.5	1.10	50683	52683	750	54683	750	38683	600	36683	1500
0.082			50823	52823		54823		38823		36823	

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139

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

(3) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 15.0 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	5.0 x 11.0 x 17.5	1.0	90001	90007	1250	90014	1000	90021	1100
0.015			90002	90008		90015		90022	
0.022			90003	90009		90016		90023	
0.033			90004	90011		90017		90024	
0.047			90005	90012		90018		90025	
0.068			90006	90013		90019		90026	
0.1	6.0 x 12.0 x 17.5	1.4	21104	23104	1000	25104	1000	27104	900
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.15	7.0 x 13.5 x 17.5	1.8	20154	22154	750	24154	500	26154	800
0.22	8.5 x 15.0 x 17.5	2.4	20224	22224	750	24224	500	26224	650
0.33	10.0 x 16.5 x 17.5	3.0	20334	22334	500	24334	450	26334	600

Notes

[1] H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to “Packaging Information” www.vishay.com/doc?28139
[2] Reel diameter = 356 mm is available on request
[3] Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 15.0 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	5.0 x 11.0 x 17.5	1.0	90027	90039	1250	90052	1000	90064	1100
0.012			90028	90041		90053		90065	
0.015			90029	90042		90054		90066	
0.018			90031	90043		90055		90067	
0.022			90032	90044		90056		90068	
0.027			90033	90045		90057		90069	
0.033			90034	90046		90058		90071	
0.039			90035	90047		90059		90072	
0.047			90036	90048		90061		90073	
0.056			90037	90049		90062		90074	
0.068			11683	13683		15683		17683	
0.082	6.0 x 12.0 x 17.5	1.4	11823	13823	1000	15823	1000	17823	900
0.1			11104	13104		15104		17104	
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.12	7.0 x 13.5 x 17.5	1.8	10124	12124	750	14124	500	16124	800
0.15	8.5 x 15.0 x 17.5	2.4	10154	12154	750	14154	500	16154	650
0.18			10184	12184		14184		16184	
0.22	10.0 x 16.5 x 17.5	3.0	10224	12224	500	14224	450	16224	600
0.27			10274	12274		14274		16274	

Notes

[1] H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to “Packaging Information” www.vishay.com/doc?28139
[2] Reel diameter = 356 mm is available on request
[3] Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 15.0 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 15 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	5.0 x 11.0 x 17.5	1	90221	90232	1250	90243	1000	90254	1100
0.012			90222	90233		90244		90255	
0.015			90223	90234		90245		90256	
0.018			90224	90235		90246		90257	
0.022			90225	90236		90247		90258	
0.027			90226	90237		90248		90259	
0.033			90227	90238		90249		90261	
0.039			90228	90239		90251		90262	
0.047			90229	90241		90252		90263	
0.056			90231	90242		90253		90264	
0.068			51683	53683		55683		46683	
0.082 0.1	6.0 x 12.0 x 17.5	1.4	51823 50104	53823 52104	1000	55823 54104	1000	46823 46104	900
Pitch = 15 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.12	7.0 x 13.5 x 17.5	1.8	50124	52124	750	54124	500	36124	800
0.15 0.18	8.5 x 15.0 x 17.5	2.4	50154 50184	52154 52184	750	54154 54184	500	36154 36184	650
0.22 0.27	10.0 x 16.5 x 17.5	3	50224 50274	52224 52274	500	54224 54274	450	36224 36274	600

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139
(2) Reel diameter = 356 mm is available on request
(3) Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 22.5 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (3)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) (1) (2)	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.15 0.22	6.0 x 15.5 x 26.0	2.4	21154 21224	23154 21224	300	25154 25224	250	27154 27224	600
0.33 0.47	8.5 x 18.0 x 26.0	3.8	21334 21474	23334 23474	200	25334 25474	250	27334 27474	450
0.68	12.0 x 22.0 x 26.0	7.8	20684	22684	150	24684	200	26684	300

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139
(2) Reel diameter = 356 mm is available on request
(3) Weight for short lead product only
• SPQ = Standard Packing Quantity

Pitch: 22.5 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
Pitch = 22.5 ± 0.4 mm; dt = 0.80 ± 0.08 mm									
0.12	6.0 x 15.5 x 26.0	2.4	11124	13124	300	15124	250	17124	600
0.15			11154	13154		15154		17154	
0.18			11184	13184		15184		17184	
0.22	7.0 x 16.5 x 26.0	2.9	11224	13224	200	15224	250	17224	500
0.27			11274	13274		15274		17274	
0.33	8.5 x 18.0 x 26.0	3.8	11334	13334	200	15334	250	17334	450
0.39			11394	13394		15394		17394	
0.47	10.0 x 19.5 x 26.0	6.8	10474	12474	200	14474	200	16474	350
0.56			10564	12564		14564		16564	
0.68	12.0 x 22.0 x 26.0	7.8	10684	12684	150	14684	200	16684	300

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139

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

(3) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 22.5 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [3]	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING						
			LOOSE IN BOX					REEL (500 mm) [1] [2]	
			Short leads			Long leads		H = 18.5 mm P_0 = 12.7 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ		SPQ
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.12	6.0 x 15.5 x 26.0	2.4	51124	53124	300	55124	250	46124	600
0.15			51154	53154		55154		46154	
0.18			51184	53184		55184		46184	
0.22	7.0 x 16.5 x 26.0	2.9	51224	53224	200	55224	250	46224	500
0.27	8.5 x 18.0 x 26.0	3.8	51274	53274	200	55274	250	46274	450
0.33			51334	53334		55334		46334	
0.39			51394	53394		55394		46394	
0.47	10.0 x 19.5 x 26.0	6.8	50474	52474	200	54474	200	36474	350
0.56			50564	52564		54564		36564	
0.68	12.0 x 22.0 x 26.0	7.8	50684	52684	150	54684	200	36684	300

Notes

(1) H = In-tape height; P_0 = Sprocket hole distance; for detailed specifications refer to "Packaging Information" www.vishay.com/doc?28139

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

(3) Weight for short lead product only

• SPQ = Standard Packing Quantity

Pitch: 27.5 mm; C-tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING				
			LOOSE IN BOX				
			Short leads			Long leads	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.47	9.0 x 19.0 x 31.0	5.5	21474	23474	100	25474	150
0.68	11.0 x 21.0 x 31.0	7.4	21684	23684	100	25684	125
1.0	13.0 x 23.0 x 31.0	9.2	21105	23105	100	25105	125
1.5	15.0 x 25.0 x 31.0	12.3	20155	22155	100	24155	125
2.2	21.0 x 31.0 x 31.0	20.3	20225	22225	50	24225	75

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

Pitch: 27.5 mm; C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING				
			LOOSE IN BOX				
			Short leads			Long leads	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.39 0.47	9.0 x 19.0 x 31.0	5.5	11394 11474	13394 13474	100	15394 15474	150
0.56 0.68	11.0 x 21.0 x 31.0	7.4	11564 11684	13564 13684	100	15564 15684	125
0.82 1.0	13.0 x 23.0 x 31.0	9.2	11824 11105	13824 13105	100	15824 15105	125
1.2	15.0 x 25.0 x 31.0	12.3	10125	12125	100	14125	125
1.5 1.8	18.0 x 28.0 x 31.0	16.1	10155 10185	12155 12185	100	14155 14185	100
2.2	21.0 x 31.0 x 31.0	20.3	10225	12225	50	14225	75

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

Pitch: 27.5 mm; C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 339T XXXXX AND PACKAGING				
			LOOSE IN BOX				
			Short leads			Long leads	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm							
0.39 0.47	9.0 x 19.0 x 31.0	5.5	51394 51474	53394 53474	100	55394 55474	150
0.56 0.68	11.0 x 21.0 x 31.0	7.4	51564 51684	53564 53684	100	55564 55684	125
0.82	13.0 x 23.0 x 31.0	9.2	51824	53824	100	55824	125
1.0 1.2	15.0 x 25.0 x 31.0	12.3	51105 50125	53105 52125	100	55105 54125	125
1.5 1.8	18.0 x 28.0 x 31.0	16.1	50155 50185	52155 52185	100	54155 54185	100
2.2	21.0 x 31.0 x 31.0	20.3	50225	52225	50	54225	75

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

Interference Suppression Film Capacitors
MKP Radial Potted Type

APPROVALS: Approvals will be available by 31 Dec 2008

SAFETY APPROVALS X2	VOLTAGE	VALUE	FILE NUMBERS
EN *60384-14* (ENEC) (= IEC *60384-14 ed-3*)	310 Vac	1 nF to 2.2 µF	FI 2008071
UL1414 and CSA-C22.2 No. 1	250 Vac	1 nF to 1 µF	pending
UL1283	305 Vac	1 nF to 2.2 µF	pending
CSA-E384-14	310 Vac	1 nF to 2.2 µF	pending
CQC	310 Vac	1 nF to 2.2 µF	pending
CB - Test Certificate	310 Vac	1 nF to 2.2 µF	FI 5367
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

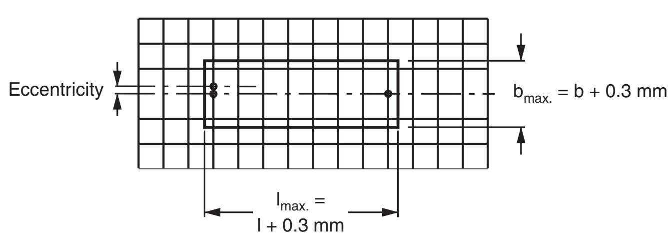
In order to withstand vibration and shock tests,it must be insured that the stand-off pips are in good contact with the printed-circuit board:

- 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: $h_{max.} \leq h + 0.3$ mm or $h_{max.} \leq h' + 0.3$ mm



Storage Temperature

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

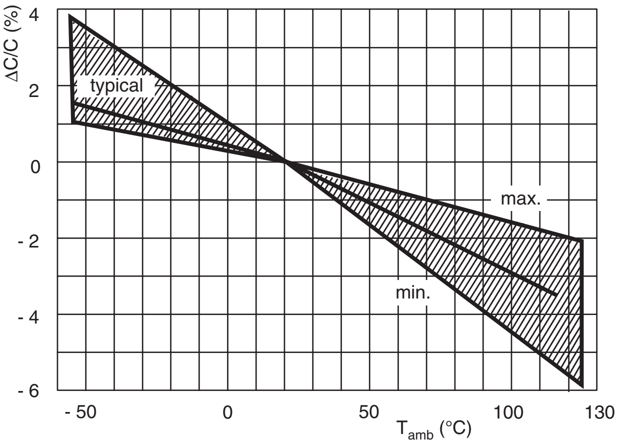
Ratings and Characteristics Reference Conditions

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

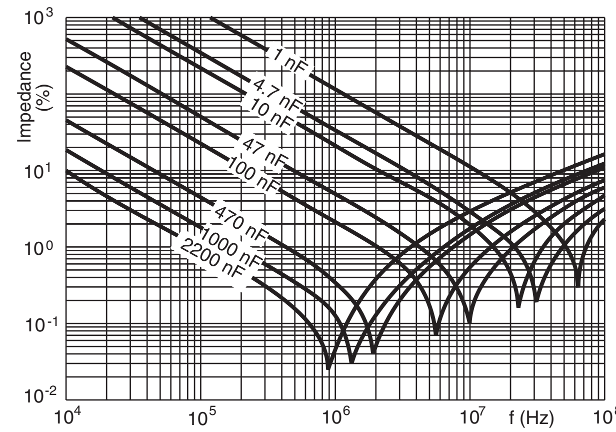
For reference testing, a conditioning period shall be applied over 96 ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

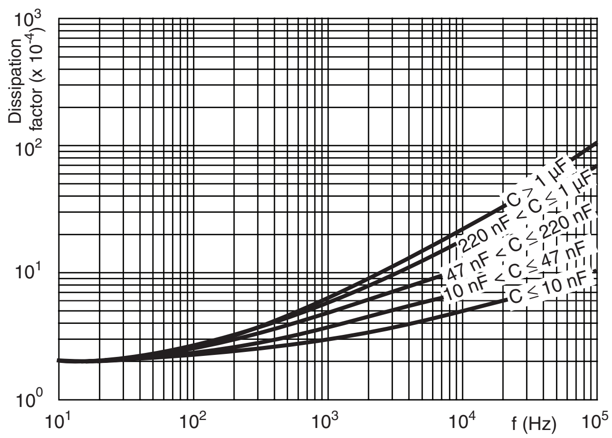
Capacitance as a function of ambient temperature (typical curve)



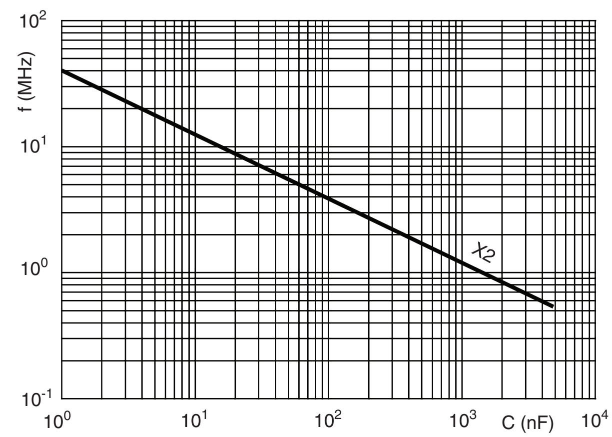
Impedance as a function of frequency (typical curve)



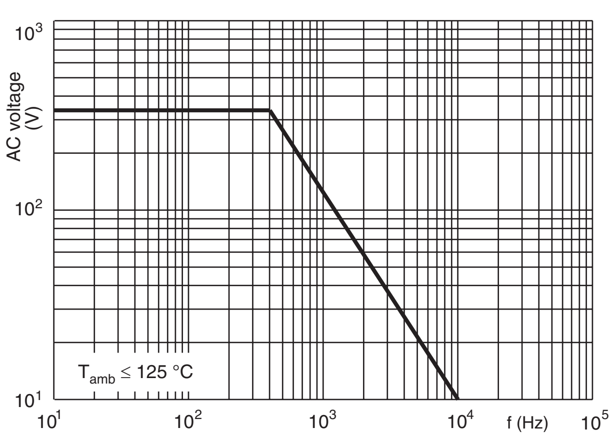
Tangent of loss angle as a function of frequency (typical curve)



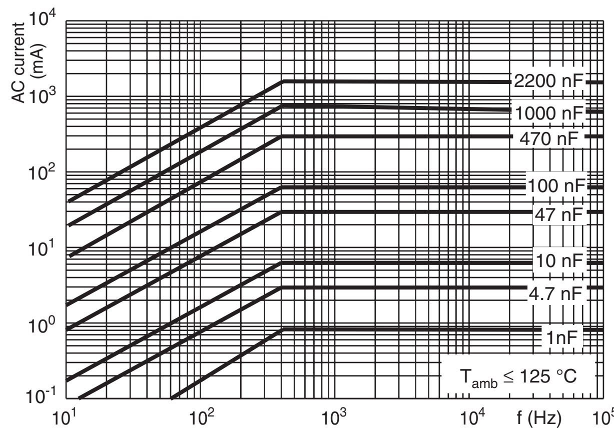
Resonant frequency as a function of capacitance (typical curve)



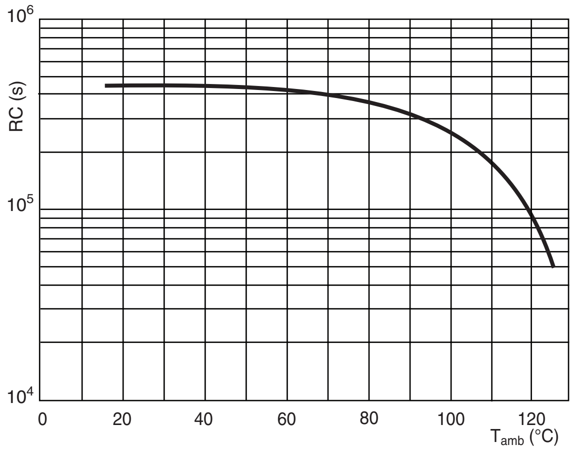
Max. RMS voltage as a function of frequency (typical curve)



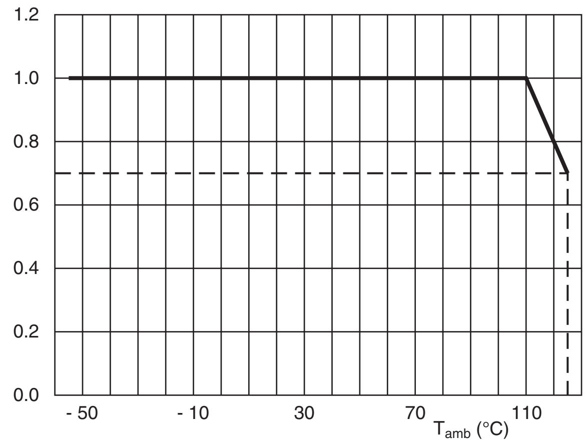
Max. RMS current as a function of frequency (typical curve)



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



Max. permissible DC voltage as a function of temperature factor



APPLICATION NOTES

- For X2 electromagnetic interference suppression in **standard across the line applications** (50/60 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 application. For these situations capacitors of the AC and pulse programs must be used.
- The maximum ambient temperature must not exceed 125 °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 Vdc and divided by the applied voltage.

INSPECTION REQUIREMENTS

General Notes

1. Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, IEC Publication IEC 60384-14 ed-3 and Specific Reference Data.

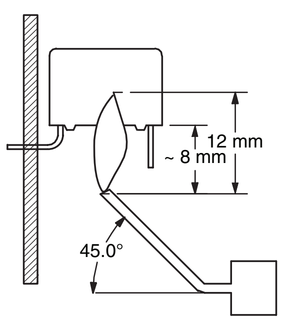
Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters “General data” of this specification
Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz or for C > 1 µF at 1 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	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	

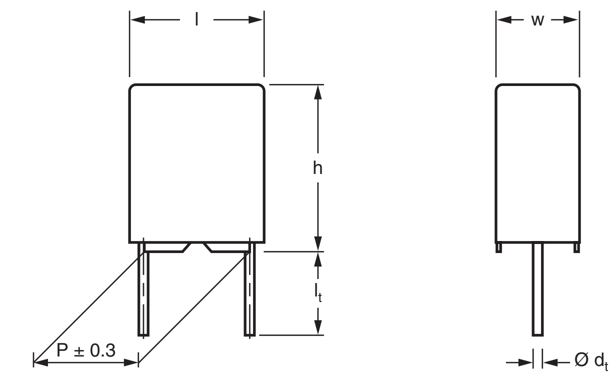
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: $\leq$ 0.008 for: C $\leq$ 1 µF or $\leq$ 0.005 for: C > 1 µF Compared to values measured initially
	Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: For C $\leq$ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 125 °C 5 cycles Duration t = 30 min	
4.6.1 Inspection	Visual examination	No visible damage
4.7 Vibration	Mounting: See section "Mounting" of this specification 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	
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	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9.2 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	No visible damage $\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially. Increase of tan δ: ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured initially As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1 **COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B**		
4.11 Climatic sequence		
4.11.1 Initial measurements	Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B	
4.11.2 Dry heat	Temperature: 125 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db First cycle		
4.11.4 Cold	Temperature: - 55 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db Remaining cycles		
4.11.6 Final measurements	Visual examination Capacitance Tangent of loss angle Voltage proof 1350 Vdc; 1 min between terminations Insulation resistance	No visible damage Legible marking $\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.11.1. Increase of tan δ: ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.11.1. No permanent breakdown or flash-over ≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C2		
4.12 Damp heat steady state	56 days; 40 °C; 90 to 95 % RH no load	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: at 1 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.12.1.
	Tangent of loss angle	Increase of tan δ: $\leq$ 0. 008 for: C $\leq$ 1 µF or $\leq$ 0. 005 for: C > 1 µF Compared to values measured in 4.12.1.
	Voltage proof 1350 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C $\leq$ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X2: 2.5 kV for C $\leq$ 1 µF X2: 2.5 kV/$\sqrt{C}$ for C > 1 µF Max. 24 pulses	No self healing breakdowns or flash-over
4.14 Endurance	Duration: 1000 h 1.25 x U_{Rac} at 125 °C Once in every hour the voltage is increased to 1000 V_{RMS} for 0.1 s via resistor of 47 Ω ± 5 %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.13.1.
	Tangent of loss angle	Increase of tan δ: $\leq$ 0.008 for: C $\leq$ 1 µF or $\leq$ 0.005 for: C > 1 µF Compared to values measured in 4.13.1.
	Voltage proof 1350 Vdc; 1 min between terminations 2120 Vac; 1 min between terminations and case	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 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 ≤ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	
4.15.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq$ 10 % compared to values measured in 4.15.1.
	Tangent of loss angle	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.
	Insulation resistance	≥ 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: Ø 0.5 mm Fuel: Butane Test duration for actual volume V in mm³: 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 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.

Interference Suppression Film Capacitors MKT Radial Potted Type



Dimensions in mm

FEATURES

15 to 37.5 mm lead pitch.
Supplied loose in box, taped on reel
RoHS compliant

PERMISSIBLE DC VOLTAGE

DC 630 V

ENCAPSULATION

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

APPLICATIONS

High stability grade for continuous 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
UL 1283
UL 1414 and CSA-C22.2 No. 1
CSA-E384-14

MARKING

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

DIELECTRIC

Polyester film

ELECTRODES

Metallized

CONSTRUCTION

Series construction

RATED VOLTAGE

310 V; 50 Hz to 60 Hz

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

40/110/56/C

CAPACITANCE RANGE (E12 SERIES)

E12 series 0.01 to 2.2 µF
Preferred values acc. to E6

CAPACITANCE TOLERANCE

± 10 %, ± 20 % (± 5 % on request)

LEADS

Tinned wire

MAXIMUM APPLICATION TEMPERATURE

110 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

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

CAPACITANCE (numerically)

Example:
468 = 680 nF

F	1772	X	XX	X X X X

TYPE

PACKAGING (Taped on reel)		
Code	Code details	Tolerance
2290	H: 16.5 mm	± 20 %
2291	H: 18.5 mm	± 20 %
2960	H: 16.5 mm	± 20 %
2261	H: 18.5 mm	± 20 %
2900	H: 16.5 mm	± 10 %
2901	H: 18.5 mm	± 10 %

PACKAGING (Loose)		
Code	Code details	Tolerance
2004	Lead length 4 - 1 mm	± 10 %
2000	Lead length 6 - 1 mm	± 10 %
2015	Lead length 15 - 1 mm	± 10 %
2030	Lead length 30 + 5 mm	± 10 %
2204/2264	Lead length 4 - 1 mm	± 20 %
2200/2260	Lead length 6 - 1 mm	± 20 %
2215/2265	Lead length 15 - 1 mm	± 20 %
2230/2263	Lead length 30 + 5 mm	± 20 %

Note

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

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE
Rated AC voltage (U_{Rac})	310 V
Permissible DC voltage (U_{Rdc})	630 V
Tangent of loss angle	≤ 100 x 10^{-4} at 1 kHz
Rated voltage pulse slope at $(dU/dt)_R$ 435 Vdc	100 V/µs
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ
RC between leads, C > 0.33 µF at 100 V; 1 min	> 5000 s
R between leads and case; 100 V; 1 min	> 30 000 MΩ
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	2150 V for 1 min
Withstanding (AC) voltage between leads and case	2120 V; 1 min
Maximum application temperature	110 °C

C-tol. = ± 10 %

CAPACITANCE (μF)	PITCH (mm)	DIMENSIONS w x h x l (mm)	MASS (g)	SPQ (pieces) SHORT LEAD	ORDERING CODE (1)
0.01	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-310-20..
0.012	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-312-20..
0.015	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-315-20..
0.018	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-318-20..
0.022	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-322-20..
0.027	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-327-20..
0.033	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-333-20..
0.039	15	6.0 x 12.0 x 17.5	2.0	500	F 1772-339-20..
0.047	15	6.0 x 12.0 x 17.5	2.0	500	F 1772-347-20..
0.056	15	6.0 x 12.0 x 17.5	2.0	500	F 1772-356-20..
0.068	15	7.0 x 13.5 x 17.5	2.4	450	F 1772-368-20..
0.082	15	8.5 x 15.0 x 17.5	2.7	300	F 1772-382-20..
0.10	15	8.5 x 15.0 x 17.5	2.7	300	F 1772-410-20..
0.12	15	8.5 x 15.0 x 17.5	2.7	300	F 1772-412-20..
0.15	22.5	7.0 x 16.5 x 26.0	4.1	235	F 1772-415-20..
0.18	22.5	7.0 x 16.5 x 26.0	4.1	235	F 1772-418-20..
0.22	22.5	8.5 x 18.0 x 26.0	4.6	200	F 1772-422-20..
0.27	22.5	10.0 x 19.5 x 26.0	6.7	170	F 1772-427-20..
0.33	22.5	10.0 x 19.5 x 26.0	6.7	170	F 1772-433-20..
0.39	27.5	11.0 x 21.0 x 31.0	9.1	125	F 1772-439-20..
0.47	27.5	11.0 x 21.0 x 31.0	9.1	125	F 1772-447-20..
0.56	27.5	11.0 x 21.0 x 31.0	9.1	125	F 1772-456-20..
0.68	27.5	13.0 x 23.0 x 31.0	12.9	110	F 1772-468-20..
0.82	27.5	13.0 x 23.0 x 31.0	12.9	110	F 1772-482-20..
1.0	27.5	15.0 x 25.0 x 31.0	15	100	F 1772-510-20..
1.2	37.5	14.5 x 24.5 x 41.5	18.9	80	F 1772-512-20..
1.5	37.5	15.5 x 28.5 x 41.5	24	70	F 1772-515-20..
1.8	37.5	15.5 x 28.5 x 41.5	24	70	F 1772-518-20..
2.2	37.5	18.0 x 32.5 x 41.5	31.6	60	F 1772-522-20..

Notes

(1) These capacitors can be delivered on continuous tape and reel.
The ordering code is:
F 1772-...-2900 at H = 16.5 mm
F 1772-...-2901 at H = 18.5 mm

- SPQ = Standard Packing Quantity
- For detailed tape specifications refer to “Packaging Information” www.vishay.com/doc?28139 or end of catalog

C-tol. = ± 20 %

CAPACITANCE (μF)	PITCH (mm)	DIMENSIONS w x h x l (mm)	MASS (g)	SPQ (pieces) SHORT LEAD	ORDERING CODE (1)
0.01	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-310-22..
0.015	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-310-22..
0.022	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-322-22..
0.033	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-333-22..
0.047	15	5.0 x 11.0 x 17.5	1.4	750	F 1772-347-22..
0.068	15	6.0 x 12.0 x 17.5	2.0	600	F 1772-368-22..
0.10	15	6.0 x 12.0 x 17.5	2.0	600	F 1772-410-22..
0.15	15	8.5 x 15.0 x 17.5	2.7	300	F 1772-415-226..
0.15	22.5	6.0 x 15.5 x 26.0	3.3	260	F 1772-415-22...
0.22	15	10.0 x 16.5 x 17.5	4.5	235	F 1772-422-226..
0.22	22.5	7.0 x 16.5 x 26.0	4.1	235	F 1772-422-22...
0.33	22.5	8.5 x 18.0 x 26.0	5.3	190	F 1772-433-22..
0.47	22.5	10.0 x 19.5 x 26.0	6.7	170	F 1772-447-226..
0.47	27.5	9.0 x 19.0 x 31.0	6.8	160	F 1772-447-22..
0.68	27.5	11.0 x 21.0 x 31.0	12.9	125	F 1772-468-22..
1.0	27.5	15.0 x 25.0 x 31.0	15	100	F 1772-510-22..
1.5	37.5	14.5 x 24.5 x 41.5	18.9	80	F 1772-515-22..
2.2	27.5	21.0 x 31.0 x 31.0	28	70	F 1772-522-226.
2.2	37.5	15.5 x 24.5 x 41.5	24	70	F 1772-522-22..

Notes

(1) These capacitors can be delivered on continuous tape and reel
The ordering code is:
F 1772-...-2290 at H = 16.5 mm
F 1772-...-2291 at H = 18.5 mm
F 1772-...-2960 at H = 16.5 mm
F 1772-...-2961 at H = 18.5 mm

- SPQ = Standard Packing Quantity
- For detailed tape specifications refer to Packaging Information: www.vishay.com/doc?28139

APPROVALS

SAFETY APPROVALS X2	VOLTAGE	VALUE	FILE NUMBERS
EN 60384-14 (ENEC) (= IEC 60384-14 ed 3)	310 Vac	0.01 - 2.2 μF X2	40005079
UL 1414	250 Vac	0.01 - 1.0 μF X2	E 100682
UL 1283	250 Vac	0.01 - 2.2 μF X2	E 76297
CSA-E 384-14	310 Vac	0.01 - 2.2 μF X2	Pending
CB TEST-CERTIFICATE	310 Vac	0.01 - 2.2 μF X2	DE 1-40110/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".

Specific Method of Mounting to Withstand Vibration and Shock

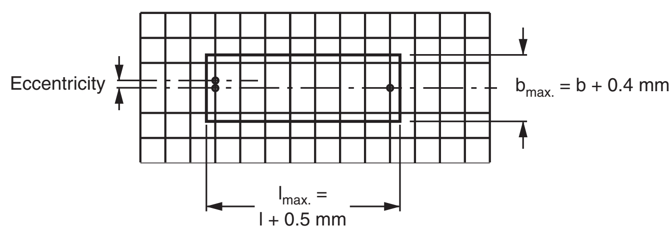
In order to withstand vibration and shock tests, it must be ensured that stand-off pips are in good contact with the printed-circuit board:

- 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: $h_{max.} \leq h + 0.4$ mm or $h_{max.} \leq h' + 0.4$ mm



Storage Temperature

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

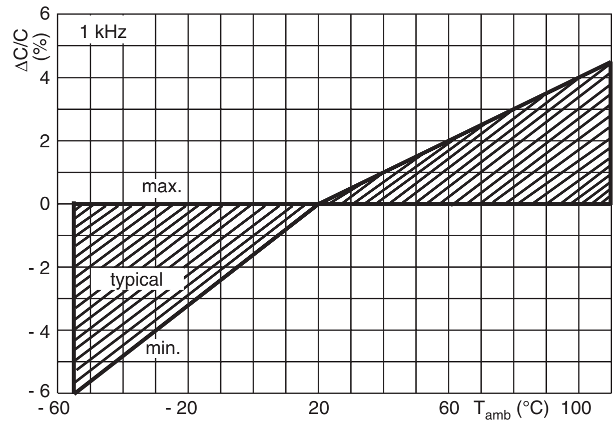
Ratings and Characteristics Reference Conditions

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

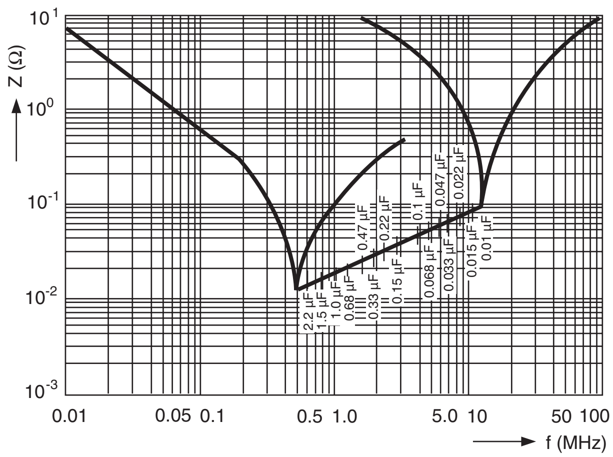
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

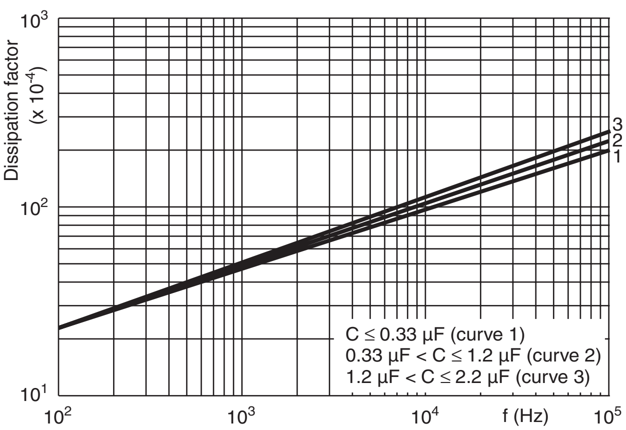
Capacitance as a function of ambient temperature (typical curve)



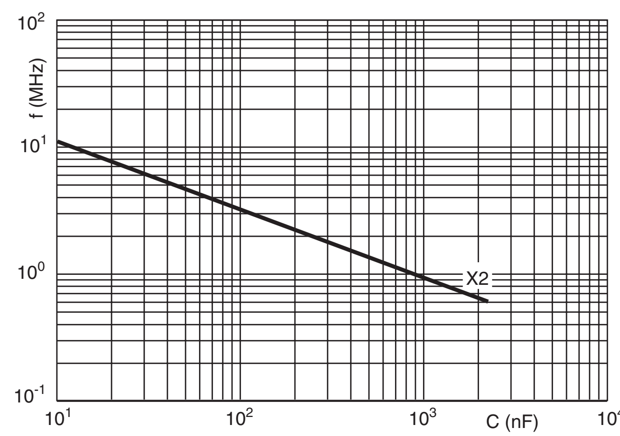
Impedance as a function of frequency (typical curve)



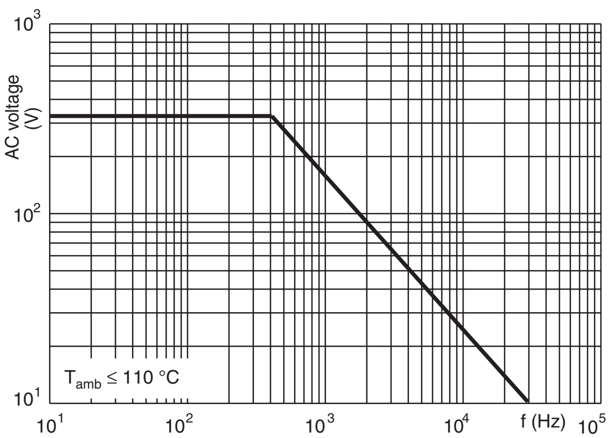
Tangent of loss angle as a function of frequency (typical curve)



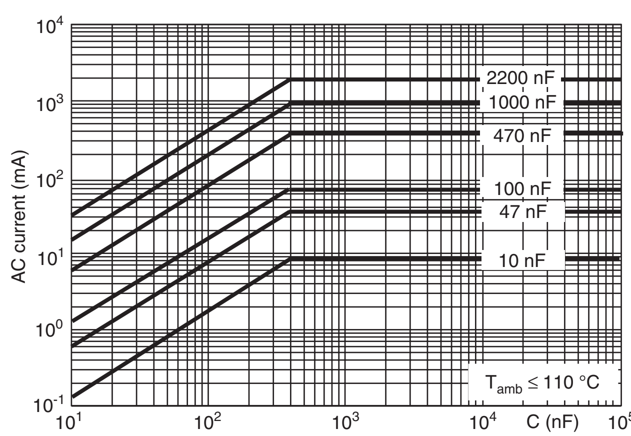
Resonant frequency as a function of capacitance (typical curve)



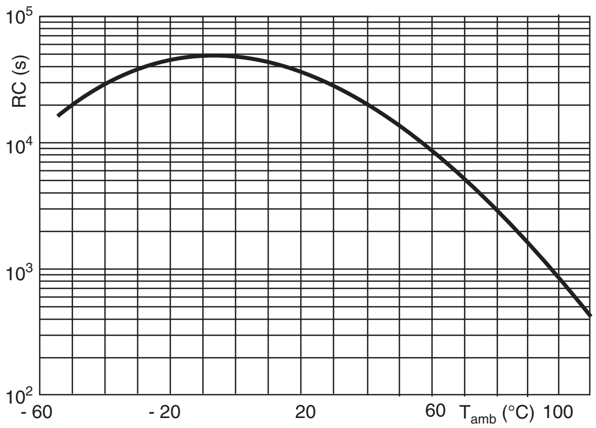
Max. RMS voltage as a function of frequency



Max. RMS current as a function of frequency



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



APPLICATION NOTES AND LIMITING CONDITIONS

- For X2 electromagnetic interference suppression where a higher stabililty grade is needed for **continuous across the line applications** (50/60 Hz) with a maximum mains voltage of 310 Vac.
- These capacitors are not intended for continuous pulse application. For these situations capacitors of the AC and pulse programs must be used.
- For series impedance applications we refer to application note: www.vishay.com/doc?28153
- The maximum ambient temperature must not exceed 110 °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 Vdc 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”.

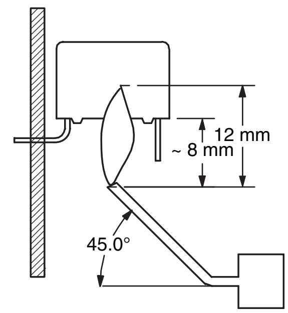
Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapter “General Data” of this specification
Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz For C > 1 µF at 1 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	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	

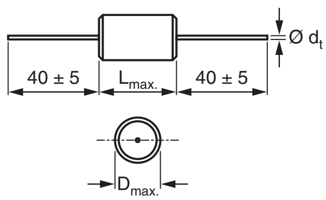
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured initially
	Insulation resistance	As specified in section “Insulation Resistance” of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: For $C \leq 1$ µF at 10 kHz For $C > 1$ µF at 1 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 40 °C θB = + 110 °C 5 cycles Duration t = 30 min	
4.6.1 Inspection	Visual examination	No visible damage
4.7 Vibration	Mounting: See section “Mounting” of this specification 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	
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	
4.9.2 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initally
	Tangent of loss angle	Increase of tan δ ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured initially
	Insulation resistance	As specified in section “Specific Reference” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.11 Climatic sequence	Capacitance	
4.11.1 Initial measurements	Measured in 4.4.2 and 4.9.2 Tangent of loss angle Measured initally in C1A and C1B	
4.11.2 Dry heat	Temperature: 110 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db, first cycle		
4.11.4 Cold	Temperature: - 40 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db, remaining cycles		
4.11.6 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.11.1
	Tangent of loss angle	Increase of tan δ ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.11.1
	Voltage proof 1350 Vdc 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C2		
4.12 Damp heat steady state	56 days, 40 °C, 90 % to 95 % RH No load	
4.12.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 1$ µF at 10 kHz For $C > 1$ µF at 1 kHz	
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.12.1
	Tangent of loss angle	Increase of tan δ ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.12.1
	Voltage proof 1350 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation Resistance” of this specification
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 1$ µF at 10 kHz For $C > 1$ µF at 1 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X2: 2.5 kV for $C \leq 1$ µF X2: 2.5 kV/$\sqrt{C}$ for $C > 1$ µF Max. 24 pulses	No self healing breakdowns or flash-over

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C3		
4.14 Endurance	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 Ω ± 5 %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % compared to values measured in 4.13.1
	Tangent of loss angle	Increase of tan δ ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.13.1
	Voltage proof 1350 Vdc; 1 min between terminations 2120 Vac; 1 min between terminations and case	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section "Insulation Resistance" of this specification
SUB-GROUP C4		
4.15 Charge and discharge	10 000 cycles Charged to 435 Vdc Discharge resistance: $R = \frac{435\ \text{Vdc}}{1.5 \times C(dU/dt)}$	
4.15.1 Initial measurements	Capacitance Tangent of loss angle: For $C \leq 1$ µF at 10 kHz For $C > 1$ µF at 1 kHz	
4.13.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.15.1
	Tangent of loss angle	Increase of tan δ ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured in 4.15.1
	Insulation resistance	≥ 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-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C6		
4.17 Passive flammability Class C	Bore of gas jet: Ø 0.5 mm Fuel: Butane Test duration for actual volume V in mm^3: $V \leq 250$: 5 s $250 < V \leq 500$: 10 s $500 < V \leq 1750$: 20 s $V > 1750$: 30 s One flame application 	After removing test flame from capacitor, the capacitor must not continue to burn for more than 30 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

AC Capacitors, Suppression Capacitors Class X2 AC 253 V (MKT) - Axial Type



Dimensions in mm

LEAD DIAMETER d_t (mm)	D (mm)
0.7 ± 0.07	≤ 7
0.8 ± 0.08	> 7 to < 16.5
1.0 ± 0.1	≥ 16.5

APPLICATIONS

High stabililty grade for continuous across the line X2 applications.

See also application note:
www.vishay.com/docs/28153/anaccaps.pdf

REFERENCE STANDARDS

IEC 60384-14 ed-3 and EN 60384-14

UL 1283

CSA

MARKING

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

DIELECTRIC

Polyester film

ELECTRODES

Metallized

CONSTRUCTION

Series construction

FEATURES

Supplied loose in box, taped on reel or ammopack

RoHS compliant

RATED VOLTAGE

AC 253 V; 50 Hz to 60 Hz

PERMISSIBLE DC VOLTAGE

DC 630 V

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

C ≤ 1.0 µF = 40/100/21/C
C > 1.0 µF = 40/085/21/C

CAPACITANCE RANGE (E12 SERIES)

E12 series 0.01 µF X2 to 2.2 µF X2

Preferred values acc. to E6

CAPACITANCE TOLERANCE

0.01 µF to ≤ 0.1 µF: ± 20 %

0.12 µF to ≤ 2.2 µF: ± 10 %

LEADS

Tinned wire

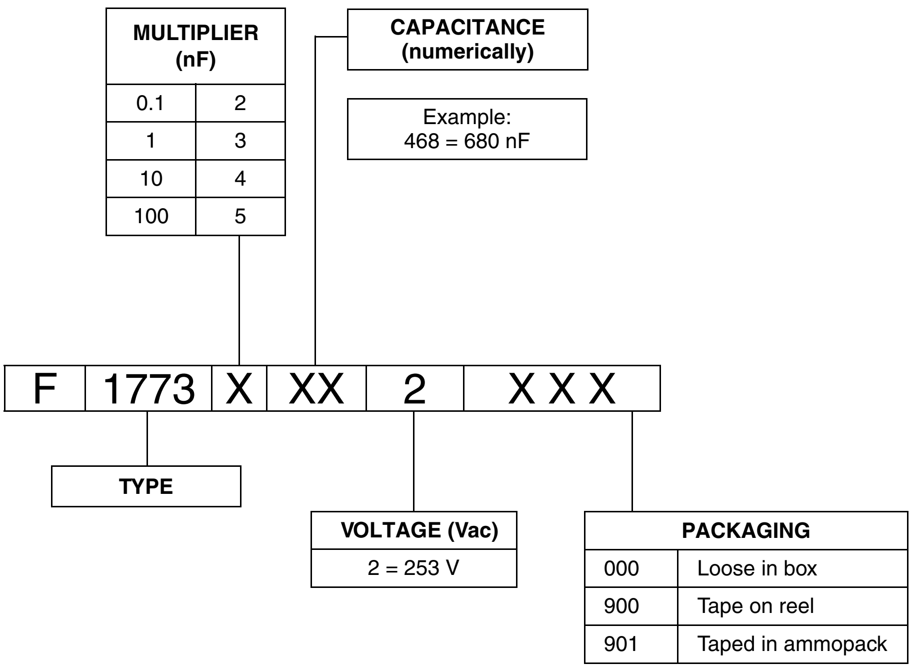
MAXIMUM APPLICATION TEMPERATURE

100 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER



Note

- For detailed tape specifications refer to “Packaging information” www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE
Rated AC voltage (U_{Rac})	253 V
Permissible DC voltage (U_{Rdc})	630 V
Tangent of loss angle	≤ 100 x 10^{-4} at 1 kHz
Rated voltage pulse slope $(dU/d_t)_R$ at 350 Vdc L 19 mm L 26.5 mm L 31.5 mm L 41.5 mm	 200 V/µs 150 V/µs 100 V/µs 100 V/µs
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s
R between leads and case; 100 V; 1 min	> 30 000 MΩ
Withstanding (AC) voltage between leads and cover	2000 V; - 1 min
Withstanding (DC) voltage (cut off current 10 mA); rise time 100 V/s	1200 V; 1 min
Maximum application temperature	100 °C

CAPACITANCE (µF)	TOLERANCE (%)	PITCH (mm)	DIMENSIONS D x L (mm)	MASS (g)	SPQ (1) (pieces)	ORDERING CODE (2)
d_t = 0.70 ± 0.07 mm						
0.01	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-310-2...
0.012	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-312-2...
0.015	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-315-2...
0.018	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-318-2...
0.022	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-322-2...
0.027	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-327-2...
0.033	± 20	22.5	6.0 x 19.0	0.9	1500	F 1773-333-2...
0.039	± 20	22.5	6.5 x 19.0	1.0	1500	F 1773-339-2...
0.047	± 20	22.5	7.0 x 19.0	1.1	1500	F 1773-347-2...
d_t = 0.80 ± 0.08 mm						
0.056	± 20	22.5	8.0 x 19.0	1.6	1500	F 1773-356-2...
0.068	± 20	22.5	8.0 x 19.0	1.6	1500	F 1773-368-2...
0.082	± 20	22.5	9.0 x 19.0	1.8	1500	F 1773-382-2...
0.1	± 20	22.5	9.5 x 19.0	2.0	1000	F 1773-410-2...
0.12	± 10	22.5	10.5 x 19.0	2.2	1000	F 1773-412-2...
0.15	± 10	30.0	8.5 x 26.5	2.2	1000	F 1773-415-2...
0.18	± 10	30.0	9.5 x 26.5	2.6	1000	F 1773-418-2...
0.22	± 10	30.0	10.0 x 26.5	2.8	1000	F 1773-422-2...
0.27	± 10	30.0	11.0 x 26.5	3.3	750	F 1773-427-2...
0.33	± 10	30.0	12.0 x 26.5	3.8	750	F 1773-433-2...
0.39	± 10	30.0	13.0 x 26.5	4.7	750	F 1773-439-2...
0.47	± 10	30.0	14.0 x 26.5	5.5	1250	F 1773-447-2...
0.56	± 10	35.0	14.0 x 31.5	6.2	1000	F 1773-456-2...
0.68	± 10	35.0	15.0 x 31.5	6.7	1000	F 1773-468-2...
d_t = 1.0 ± 0.1 mm						
0.82	± 10	35.0	16.5 x 31.5	8.3	750	F 1773-482-2...
1.0	± 10	35.0	18.0 x 31.5	9.5	750	F 1773-510-2...
1.2	± 10	35.0	19.5 x 31.5	11.0	500	F 1773-512-2...
1.5	± 10	45.0	18.0 x 41.5	13.5	500	F 1773-515-2...
1.8	± 10	45.0	19.5 x 41.5	15.7	450	F 1773-518-2...
2.2	± 10	45.0	21.5 x 41.5	17.8	400	F 1773-522-2...

Notes

(1) SPQ = Standard Packing Quantity

(2) These capacitors can be delivered on continuous tape and reel; the ordering code is F 1773-...-2900 taped on reel, F 1773-...-2901 taped ammopack

- For detailed tape specifications refer to packaging information: www.vishay.com/doc?28139 or end of catalog

APPROVALS

SAFETY APPROVALS X2	VOLTAGE	VALUE	FILE NUMBERS
EN 60384-14 (ENEC) (= IEC 60384-14 ed-3)	253 Vac	0.01 µF to 2.2 µF X2	40005089
UL1283	250 Vac	0.01 µF to 2.2 µF X	E 76297
CSA	253 Vac	0.01 µF to 1.0 µF X2	1913342
CB Test-Certificate	253 Vac	0.01 µF to 2.2 µF X2	DE 1-7470
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

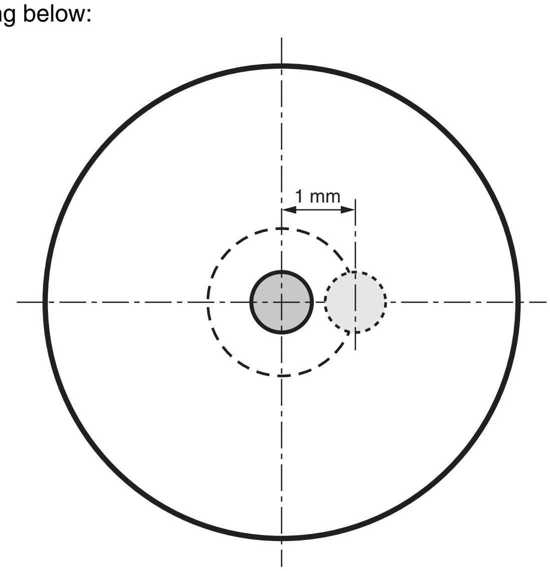
Normal Use

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 ensured that capacitor body is in good contact with the printed-circuit board:

- For L ≤ 19 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
- The maximum diameter and length of the capacitors are specified in the dimensions table
- Eccentricity as shown in the drawing below:



Storage Temperature

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

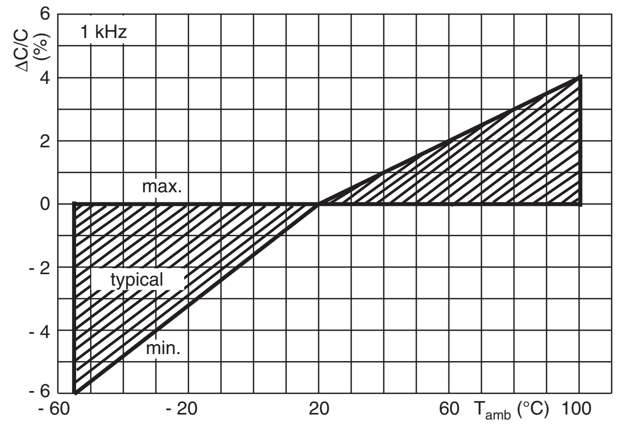
Ratings and Characteristics Reference Conditions

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 %.

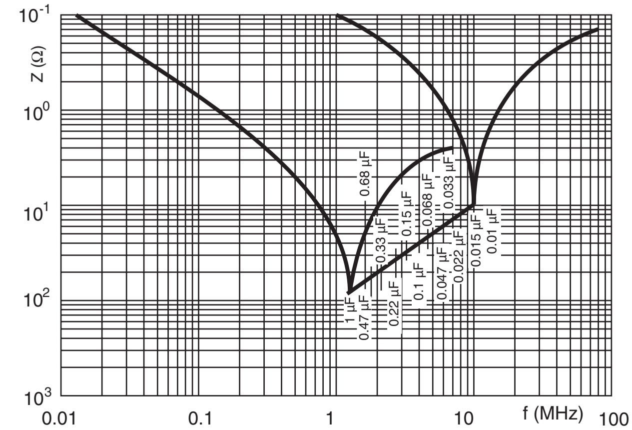
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

Capacitance as a function of ambient temperature (typical curve)

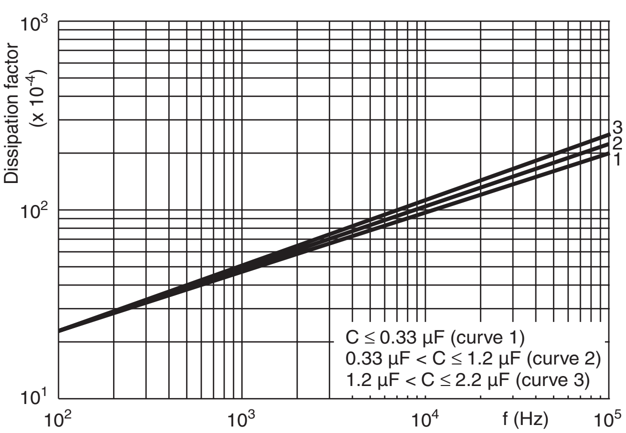


Impedance as a function of frequency (typical curve)

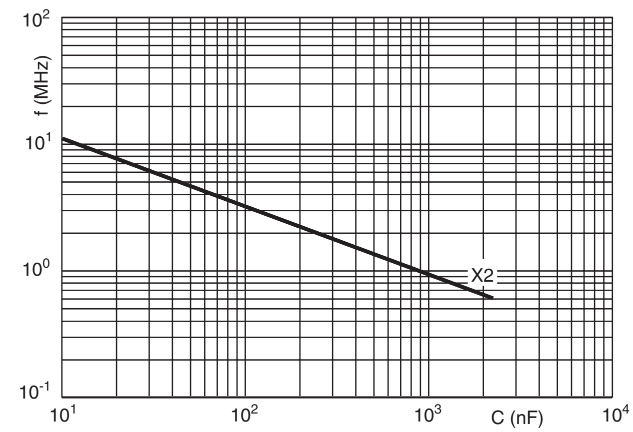


Impedance (Z) as a function of frequency (f)
at T_a = 20 °C (average)
Measurement with length 6 mm

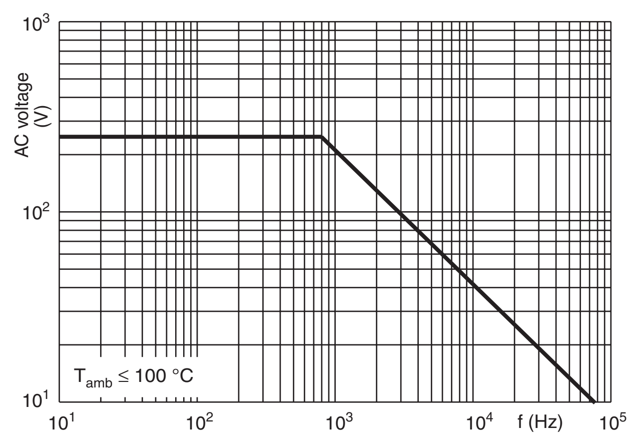
Tangent of loss angle as a function of frequency (typical curve)



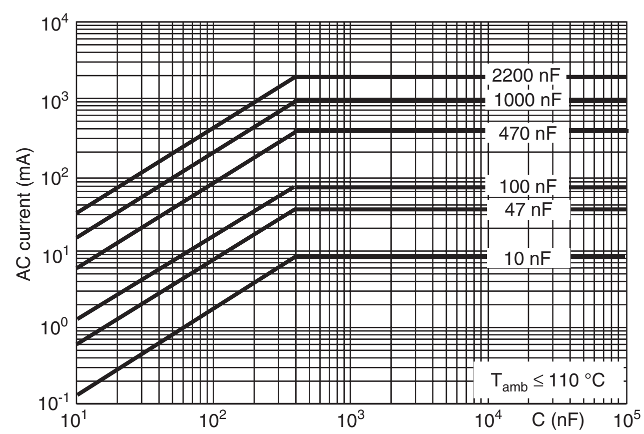
Resonant frequency as a function of capacitance (typical curve)



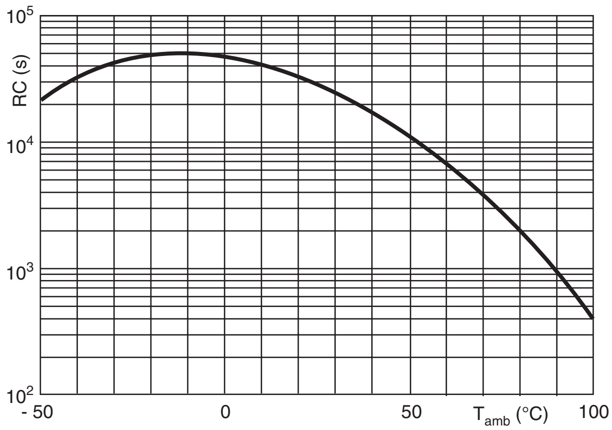
Max. RMS voltage as a function of frequency



Max. RMS current as a function of frequency



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



APPLICATION NOTES AND LIMITING CONDITIONS

- For X2 electromagnetic interference suppression where a higher stabililty grade is needed for **continuous across the line applications** (50/60 Hz) with a maximum mains voltage of 253 Vac.
- These capacitors are not intended for continuous pulse application. For these situations capacitors of the AC and pulse programs must be used.
- For series impedance applications we refer to application note: www.vishay.com/doc?28153
- The maximum ambient temperature must not exceed 100 °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 350 Vdc 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”.

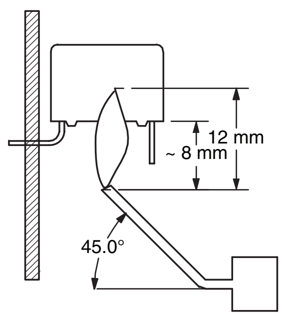
Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters “General data” of this specification
Initial measurements	Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	
4.3 Robustness of terminations	Tensile: Load 10 N; 10 s Bending: Load 5 N; 4 x 90°	No visible damage

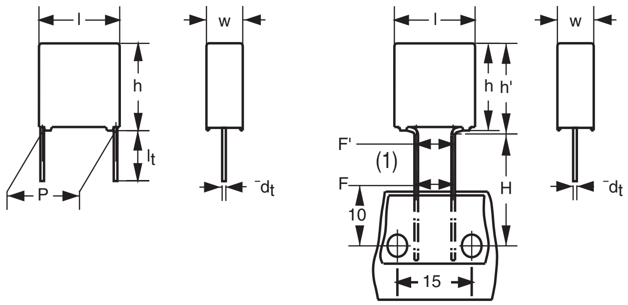
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.4 Resistance to soldering heat	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert \Delta C/C \rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan δ: ≤ 0.008 for: $C \leq 1$ µF or ≤ 0.005 for: $C > 1$ µF Compared to values measured initially
	Insulation resistance	As specified in section "Insulation resistance" of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: For $C \leq 1$ µF at 10 kHz or for $C > 1$ µF at 1 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: Cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 40 °C θB = + 100 °C 5 cycles Duration t = 30 min	
4.6.1 Inspection	Visual examination	No visible damage
4.7 Vibration	Mounting: See section "Mounting" of this specification 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	
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	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.9.2 Final measurements	Visual examination Capacitance Tangent of loss angle Insulation resistance	No visible damage $\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured initially As specified in section "Insulation resistance" of this specification
SUB-GROUP C1 **COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B**		
4.11 Climatic sequence 4.11.1 Initial measurements	 Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B	
4.11.2 Dry heat	Temperature: 100 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db First cycle		
4.11.4 Cold	Temperature: - 40 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db remaining cycles		
4.11.6 Final measurements	Visual examination Capacitance Tangent of loss angle Voltage proof 1200 Vdc; 1 min between terminations Insulation resistance	No visible damage Legible marking $\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.11.1. Increase of tan δ: ≤ 0.008 for: C ≤ 1 µF or ≤ 0.005 for: C > 1 µF Compared to values measured in 4.11.1. No permanent breakdown or flash-over ≥ 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	21 days; 40 °C; 90 % to 95 % RH no load Capacitance Tangent of loss angle: For C ≤ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.12.1.
	Tangent of loss angle	Increase of tan δ: $\leq$ 0. 008 for: C $\leq$ 1 µF or $\leq$ 0. 005 for: C > 1 µF Compared to values measured in 4.12.1.
	Voltage proof 1200 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle: For C $\leq$ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X2: 2.5 kV for C $\leq$ 1 µF X2: 2.5 kV/$\sqrt{C}$ for C > 1 µF Max. 24 pulses	No self healing breakdowns or flash-over
4.14 Endurance	Duration: 1000 h 1.25 x U_{Rac} at 100 °C for C $\leq$ 1 µF 1.25 x U_{Rac} at 85 °C for C > 1 µF Once in every hour the voltage is increased to 1000 V_{RMS} for 0.1 s via resistor of 47 $\Omega \pm 5$ %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.13.1.
	Tangent of loss angle	Increase of tan δ: $\leq$ 0.008 for: C $\leq$ 1 µF or $\leq$ 0.005 for: C > 1 µF Compared to values measured in 4.13.1.
	Voltage proof 1200 Vdc; 1 min between terminations 2000 Vac; 1 min between terminations and case	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C4		
4.15 Charge and discharge	10 000 cycles Charged to 350 Vdc Discharge resistance: $R = \frac{350\ \text{Vdc}}{2 \times C\ (dU/dt)}$	
4.15.1 Initial measurements	Capacitance Tangent of loss angle: For C $\leq$ 1 µF at 10 kHz or for C > 1 µF at 1 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.15.3 Final measurements	Capacitance Tangent of loss angle Insulation resistance	$\lvert\Delta C/C\rvert \leq 10$ % 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 the value as specified in section "Resonant frequency" of this specification
SUB-GROUP C6		
4.17 Passive flammability Class C	Bore of gas jet: Ø 0.5 mm Fuel: Butane Test duration for actual volume V in mm^3: V $\leq$ 250: 5 s 250 < V $\leq$ 500: 10 s 500 < V $\leq$ 1750: 20 s V > 1750: 30 s One flame application  	After removing test flame from capacitor, the capacitor must not continue to burn for more than 30 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.

Interference Suppression Film Capacitors
MKP Radial Potted Type



Dimensions in mm

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

APPLICATIONS

For standard line bypass (between line and ground) Y2 applications
See also application note:
www.vishay.com/doc?28153

REFERENCE STANDARDS

“IEC 60384-14 ed-3 and EN 60384-14”
“IEC 60065 requires, pass. flamm. class B”
UL1414; CSA - C22.2 No. 1;
UL1283; ENEC; CSA E 384-14-95

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

Series and triple construction

RATED VOLTAGE

AC 300 V; 50 to 60 Hz

FEATURES

7.5 to 27.5 mm lead pitch, 15 mm and 10 mm bent back to 7.5 mm, supplied loose in box, taped on ammopack or reel
RoHS compliant product

PERMISSIBLE DC VOLTAGE

DC 1000 V

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/105/56/B

CAPACITANCE RANGE (E12 SERIES)

E12 series 0.001 to 0.47 µF
Preferred values acc. to E6

CAPACITANCE TOLERANCE

± 20 %; ± 10 %; ± 5 %

LEADS

Tinned wire

MAXIMUM APPLICATION TEMPERATURE

105 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
338 6 Y2	7.5 mm
	7.5 mm (bent back)
	10.0 mm
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

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

Example:
104 = 10 x 10 = 100 nF
(except special numbers)

BFC2	338	6X	XX	X
2222 (*)	338	6X	XX	X

(*) old ordering code

TYPE	PACKAGING	STANDARD DIMENSIONS	C-TOL	PREFERRED TYPES
338 6 Y2	Loose in box	Lead length 3.5 + 1/- 0.5 mm (pitch 7.5 and 10 mm) Lead length 3.5 ± 0.3 mm (pitch > 10 mm)	± 20 %	BFC2 338 60
		Lead length 5.0 ± 1.0 mm		BFC2 338 62
		Lead length 25.0 ± 2.0 mm		BFC2 338 64
	Taped ammo	Pitch = 7.5 mm H = 18.5 mm; P_0 = 12.7 mm		BFC2 338 66
		ALTERNATIVE PITCH SIZES		**ON REQUEST**
338 6 Y2	Loose in box	Lead length 3.5 + 1/- 0.5 mm (pitch 7.5 and 10 mm) Lead length 3.5 ± 0.3 mm (pitch > 10 mm)	± 20 %	See tables for details
		Lead length 5.0 ± 1.0 mm		
		Lead length 25.0 ± 2.0 mm		
		ALTERNATIVE TAPED VERSION		**ON REQUEST**
338 6 Y2	Taped reel (1)	Pitch = 7.5 and 10.0 mm H = 18.5 mm; for P_0 = 12.7 mm; reel diameter = 500 mm	± 20 %	See tables for details
		Pitch bent back to 7.5 mm H = 16.0 mm; P_0 = 15.0 mm; reel diameter = 500 mm		
		ALTERNATIVE C-TOL		**ON REQUEST**
338 6 Y2	Loose in box	Lead length 3.5 + 1/- 0.5 mm (pitch 7.5 and 10 mm)	± 10 %	See tables for details
		Lead length 3.5 ± 0.3 mm (pitch > 10 mm)	± 5 %	
		Lead length 5.0 ± 1.0 mm	± 10 %	
			± 5 %	
		Lead length 25.0 ± 2.0 mm	± 10 %	
			± 5 %	
	Taped ammo (1)	Pitch = 7.5 mm H = 18.5 mm; for P_0 = 12.7 mm	± 10 %	
			± 5 %	
	Taped reel (1)	Pitch bent back to 7.5 mm	± 10 %	
		H = 16.0 mm; P_0 = 15.0 mm; reel diameter = 500 mm	± 5 %	
		Pitch = 7.5 mmand 10.0 mm	± 10 %	
		H = 18.5 mm; P_0 = 12.7 mm; reel diameter = 500 mm	± 5 %	

Note
(1) For detailed tape specification refer to "Packaging Information" www.vishay.com/doc?28139 or end of catalog

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE	
Rated AC voltage (U_{Rac})	300 V	
Permissible DC voltage (U_{Rdc})	1000 V	
Tangent of loss angle	at 1 kHz	at 10 kHz
C ≤ 470 nF	≤ 10 x 10^{-4}	≤ 20 x 10^{-4}
Rated voltage pulse slope (dU/dt)R at 420 Vdc	100 V/µs	
R between leads, for C ≤ 0.33 µF at 100 V; 1 min	> 15 000 MΩ	
RC between leads, for C > 0.33 µF at 100 V; 1 min	> 5000 s	
R between leads and case; 100 V; 1 min	> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA); max. rise time 100 V/s	3400 V; 1 min	
Withstanding (AC) voltage between leads and case	2100 V; 1 min	
Maximum application temperature	105 °C	

U_{Rac} = 300 V; C-tol = ± 20 % (U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm											
0.001	4.0 x 9.0 x 10.0	0.4	60102	62102	1500	64102	1000	66102	1250	68129	2500
0.0012			60122	62122		64122		66122		68131	
0.0015			60152	62152		64152		66152		68132	
0.0018			60182	62182		64182		66182		68133	
0.0022			60222	62222		64222		66222		68134	
0.0027			60272	62272		64272		66272		68135	
0.0033	5.0 x 10.5 x 10.0	0.4	60332	62332	1000	64332	1250	66332	1000	68136	2000
0.0039			60392	62392		64392		66392		68137	
0.0047	6.0 x 11.5 v 10.0	0.8	60472	62472	750	64472	1000	66472	750	68138	1900
0.0056			60562	62562		64562		66562		68139	
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 10.0 x 12.5	0.6	68392	68401	1000	68409	1250			68418	1400
0.0012			68393	68402		68411				68419	
0.0015			68394	68403		68412				68421	
0.0018			68395	68404		68413				68422	
0.0022			68396	68405		68414				68423	
0.0027			68397	68406		68415				68424	
0.0033			68398	68407		68416				68425	
0.0039			68399	68408		68417				68426	
0.0047	5.0 x 11.0 x 12.5	0.82	68101	68106	1000	68112	1000			68141	1100
0.0056			68102	68107		68113				68142	
0.0068			68103	68108		68114				68143	
0.0082	6.0 x 12.0 x 12.5	1.1	68104	68109	750	68115	750			68144	900
0.01			68105	68111		68116				68145	

Note

[1] Weight for short lead product only

• SPQ = Standard Packing Quantity

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.0068	5.0 x 11.0 x 17.5	1.0	60682	62682	1000	64682	1000			68146	1100
0.0082			60822	62822		64822				68147	
0.01			60103	62103		64103				68148	
0.012			60123	62123		64123				68149	
0.015	6.0 x 12.0 x 17.5	1.4	60153	62153	1000	64153	1000			68151	900
0.018			60183	62183		64183				68152	
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.022	7.0 x 13.5 x 17.5	1.8	60223	62223	750	64223	500			68153	800
0.027			60273	62273		64273				68154	
0.033	8.5 x 15.0 x 17.5	2.4	60333	62333	750	64333	500			68155	650
0.039			60393	62393		64393				68156	
0.047	10.0 x 16.5 x 17.5	3.0	60473	62473	500	64473	450			68157	600
0.056			60563	62563		64563				68158	
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.047	7.0 x 16.5 x 26.0	2.9	68123	68125	200	68127	250				
0.056			68124	68126		68128					
0.068	8.5 x 18.0 x 26.0	3.8	60683	62683	200	64683	250				
0.082			60823	62823		64823					
0.1	10.0 x 19.5 x 26.0	6.8	60104	62104	200	64104	200				
0.12	12.0 x 22.0 x 26.0	7.8	60124	62124	150	64124	200				
0.15			60154	62154		64154					
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.18	13.0 x 23.0 x 31.0	9.2	60184	62184	100	64184	125				
0.22			60224	62224		64224					
0.27	15.0 x 25.0 x 31.0	12.3	60274	62274	100	64274	125				
0.33	18.0 x 28.0 x 31.0	16.1	60334	62334	100	64334	100				
0.39			60394	62394		64394					
0.47	21.0 x 31.0 x 31.0	20.3	60474	62474	50	64474	75				

Note
[1] Weight for short lead product only
• SPQ = Standard Packing Quantity

Interference Suppression Film Capacitors
MKP Radial Potted Type

Bent back pitch 7.5 mm

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Original pitch = 10.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 12.0 x 12.5	0.6						68525	1300	68427	2000
0.0012								68526		68428	
0.0015								68527		68429	
0.0018								68528		68431	
0.0022								68529		68432	
0.0027								68531		68433	
0.0033								68532		68434	
0.0039								68533		68435	
0.0047	5.0 x 13.0 x 12.5	0.82						68534	1000	68117	1900
0.0056								68535		68118	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.0068	5.0 x 13.0 x 17.5	1.1								66682	950
0.0082										66822	
0.01										66103	
0.012										66123	
0.015	6.0 x 14.0 x 17.5	1.4								66153	800
0.018										66183	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.022	7.0 x 15.5 x 17.5	1.8								66223	700
0.027										66273	
0.033	8.5 x 17.0 x 17.5	2.4								66333	550
0.039										66393	
0.047	10.0 x 18.5 x 17.5	3.0								66473	500
0.056										66563	

Notes
(1) Reel diameter = 356 mm is available on request
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rac} = 300 V; C-Tol = 10 % (U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm											
0.001	4.0 x 9.0 x 10.0	0.4	61102	63102	1500	65102	1000	67102	1250	68179	2500
0.0012			61122	63122		65122		67122		68181	
0.0015			61152	63152		65152		67152		68182	
0.0018			61182	63182		65182		67182		68183	
0.0022			61222	63222		65222		67222		68184	
0.0027			61272	63272		65272		67272		68185	
0.0033	5.0 x 10.5 x 10.0	0.4	61332	63332	1000	65332	1250	67332	1000	68186	2000
0.0039			61392	63392		65392		67392		68187	
0.0047	6.0 x 11.5 x 10.0	0.8	61472	63472	750	65472	1000	67472	750	68188	1900
0.0056			61562	63562		65562		67562		68189	
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 10.0 x 12.5	0.6	68436	68445	1000	68454	1250			68463	1400
0.0012			68437	68446		68455				68464	
0.0015			68438	68447		68456				68465	
0.0018			68439	68448		68457				68466	
0.0022			68441	68449		68458				68467	
0.0027			68442	68451		68459				68468	
0.0033			68443	68452		68461				68469	
0.0039			68444	68453		68462				68471	
0.0047	5.0 x 11.0 x 12.5	0.82	68159	68164	1000	68168	1000			68191	1100
0.0056			68161	68165		68169				68193	
0.0068	6.0 x 12.0 x 12.5	1.1	68162	68166	750	68171	750			68193	900
0.0082			68163	68167		68172				68194	

Note

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

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.0068	5.0 x 11.0 x 17.5	1	61682	63682	1000	65682	1000			68202	1100
0.0082			61822	63822		65822				68203	
0.01			61103	63103		65103				68204	
0.012			61123	63123		65123				68205	
0.015	6.0 x 12.0 x 17.5	1.4	61153	63153		65153				68206	900
0.018			61183	63183		65183				68207	
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.022	7.0 x 13.5 x 17.5	1.8	61223	63223	750	65223	500			68208	800
0.027	8.5 x 15.0 x 17.5	2.4	61273	63273		65273				68209	650
0.033			61333	63333		65333				68211	
0.039	10.0 x 16.5 x 17.5	3	61393	63393	500	65393	450			68212	600
0.047			61473	63473		65473				68213	
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.047	7.0 x 16.5 x 26.0	2.9	68173	68175	200	68177	250				
0.056	8.5 x 18.0 x 26.0	3.8	68174	68176		68178					
0.068			61683	63683		65683					
0.082	10.0 x 19.5 x 26.0	6.8	61823	63823		65823	200				
0.1			61104	63104		65104					
0.12	12.0 x 22.0 x 26.0	7.8	61124	63124	150	65124	200				
0.15			61154	63154		65154					
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.18	13.0 x 23.0 x 31.0	9.2	61184	63184	100	65184	125				
0.22	15.0 x 25.0 x 31.0	12.3	61224	63224		65224					
0.27	18.0 x 28.0 x 31.0	16.1	61274	63274		65274	100				
0.33			61334	63334		65334					
0.39	21.0 x 31.0 x 31.0	20.3	61394	63394	50	65394	75				
0.47			61474	63474		65474					

Note

[1] Weight for short lead product only

• SPQ = Standard Packing Quantity

Bent back pitch 7.5 mm

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Original pitch = 10.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 12.0 x 12.5	0.6						68539	1300	68472	2000
0.0012								68541		68473	
0.0015								68542		68474	
0.0018								68543		68475	
0.0022								68544		68476	
0.0027								68545		68477	
0.0033								68546		68478	
0.0039								68547		68479	
0.0047	5.0 x 13.0 x 12.5	1.1						68548	1000	68196	1900
0.0056								68549		68197	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.0068	5.0 x 13.0 x 17.5	1.0								67682	950
0.0082										67822	
0.01										67103	
0.012										67123	
0.015	6.0 x 14.0 x 17.5	1.4								67153	800
0.018										67183	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.022	7.0 x 15.5 x 17.5	1.8								67223	700
0.027	8.5 x 17.0 x 17.5	2.4								67273	550
0.033										67333	
0.039	10.0 x 18.5 x 17.5	3.0								67393	500
0.047										67473	

Notes
(1) Reel diameter = 356 mm is available on request
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

U_{Rac} = 300 V; C-tol = 5 % (U_{Rdc} = 1000 V)

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 7.5 ± 0.4 mm; d_t = 0.50 ± 0.05 mm											
0.001	4.0 x 9.0 x 10.0	0.4	68215	68225	1500	68235	1000	68335	1250	68346	2500
0.0012			68216	68226		68236		68336		68347	
0.0015			68217	68227		68237		68337		68348	
0.0018			68218	68228		68238		68338		68349	
0.0022			68219	68229		68239		68339		68351	
0.0027	5.0 x 10.5 x 10.0	0.4	68221	68231	1000	68241	1250	68341	1000	68352	2000
0.0033			68222	68232		68242		68342		68353	
0.0039	6.0 x 11.5 x 10.0	0.8	68223	68233	750	68243	1000	68343	750	68354	1900
0.0047			68224	68234		68244		68344		68355	
Pitch = 10.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 10.0 x 12.5	0.6	68481	68489	1000	68498	1250			68507	1400
0.0012			68482	68491		68499				68508	
0.0015			68483	68492		68501				68509	
0.0018			68484	68493		68502				68511	
0.0022			68485	68494		68503				68512	
0.0027			68486	68495		68504				68513	
0.0033			68487	68496		68505				68514	
0.0039			68488	68497		68506				68515	
0.0047	5.0 x 11.0 x 12.5	0.82	68245	68249	1000	68254	1000			68357	1100
0.0056			68246	68251		68255				68358	
0.0068	6.0 x 12.0 x 12.5	1.1	68247	68252	750	68256	750			68359	900
0.0082			68248	68253		68257				68361	

Note

(1) Weight for short lead product only

• SPQ = Standard Packing Quantity

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.0068	5.0 x 11.0 x 17.5	1.0	68258	68284	1000	68309	1000			68381	1100
0.0082			68259	68285		68311				68382	
0.01			68261	68286		68312				68383	
0.012	6.0 x 12.0 x 17.5	1.4	68262	68287		68313				68384	900
0.015			68263	68288		68314				68385	
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.018	7.0 x 13.5 x 17.5	1.8	68264	68289	750	68315	500			68386	800
0.022			68265	68291		68316				68387	
0.027	8.5 x 15.0 x 17.5	2.4	68266	68292		68317				68388	650
0.033			68267	68293		68318				68389	
0.039	10.0 x 16.5 x 17.5	3.0	68268	68294	500	68319	450			68391	600
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.047	7.0 x 16.5 x 26.0	2.9	68269	68295	200	68321	250				
0.056	8.5 x 18.0 x 26.0	3.8	68271	68296		68322					
0.068			68272	68297		68323					
0.082	10.0 x 19.5 x 26.0	6.8	68273	68298		68324	200				
0.1	12.0 x 22.0 x 26.0	7.8	68274	68299	150	68325					
0.12			68275	68301		68326					
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.15	13.0 x 23.0 x 31.0	9.2	68276	68302	100	68327	125				
0.18			68277	68303		68328					
0.22	15.0 x 25.0 x 31.0	12.3	68278	68304		68329					
0.27	18.0 x 28.0 x 31.0	16.1	68279	68305		68331	100				
0.33			68281	68306		68332					
0.39	21.0 x 31.0 x 31.0	20.3	68282	68307	50	68333	75				

Notes

(1) Weight for short lead product only

• SPQ = Standard Packing Quantity

Bent back pitch = 7.5 mm

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 6X XXX AND PACKAGING								
			LOOSE IN BOX					AMMOPACK		REEL	
			Short leads			Long leads					
			l_t = 3.5 + 1/- 0.5 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ	REEL: Ø = 500 mm H = 18.5 mm; P_0 = 12.7 mm	SPQ
Original pitch = 10.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.001	4.0 x 12.0 x 12.5	0.6						68553	1300	68516	2000
0.0012								68554		68517	
0.0015								68555		68518	
0.0018								68556		68519	
0.0022								68557		68521	
0.0027								68558		68522	
0.0033								68559		68523	
0.0039								68561		68524	
0.0047	5.0 x 13.0 x 12.5	0.82						68562	1000	68363	1900
0.0056								68563		68364	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm											
0.0068	5.0 x 13.0 x 17.5	1.1								68368	950
0.0082										68369	
0.01										68371	
0.012	6.0 x 14.0 x 17.5	1.4								68372	800
0.015										68373	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm											
0.018	7.0 x 15.5 x 17.5	1.8								68374	700
0.022										68375	
0.027	8.5 x 17.0 x 17.5	2.4								68376	550
0.033										68377	
0.039	10.0 x 18.5 x 17.5	3								68378	500

Notes
(1) Reel diameter = 356 mm is available on request
(2) Weight for short lead product only
• SPQ = Standard Packing Quantity

APPROVALS

SAFETY APPROVALS Y2	VOLTAGE	VALUE	FILE NUMBERS
EN *60384-14* (ENEC) (= IEC *60384-14 ed-3*)	300 Vac	1 nF to 470 nF	FI 2008062
UL1414 and CSA-C22.2 No 1 antenna coupling	250 Vac	1 nF to 470 nF	E112471
UL1283	300 Vac	1 nF to 470 nF	E109565
CSA-E384-14-95	300 Vac	1 nF to 470 nF	1377022
CB-Test Certificate	300 Vac	1 nF to 470 nF	FI 5265
The Enec-approval together with the CB-Certificate replace all national marks of the following countries (they have already signed the ENEC-Agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway; Portugal; Slovenian; Spain; Switzerland and United Kingdom.			
16	c US		

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to
"Packaging information". www.vishay.com/doc?28139 or end of catalog

Specific Method of Mounting to Withstand Vibration and Shock

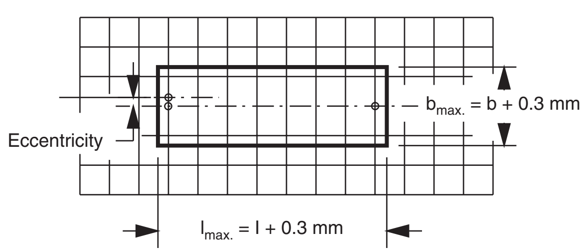
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

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

Space Requirements on Printed Circuit-Board

The maximum length and width of film capacitors is shown in drawing:

- Eccentricity as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned
- Product height with seating plane as given by "IEC 60717" as reference: $h_{max.} \leq h + 0.3$ mm or
  $h_{max.} \leq h' + 0.3$ mm



CBA116

Storage Temperature

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

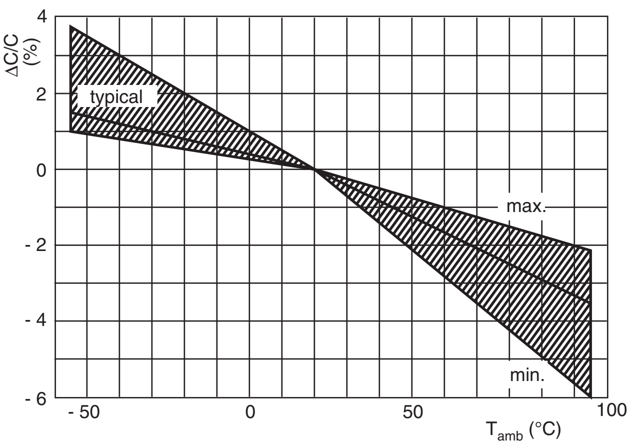
Ratings and Characteristics Reference Conditions

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

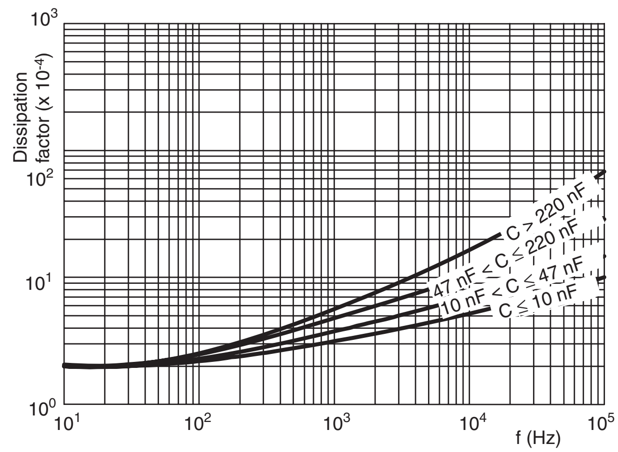
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

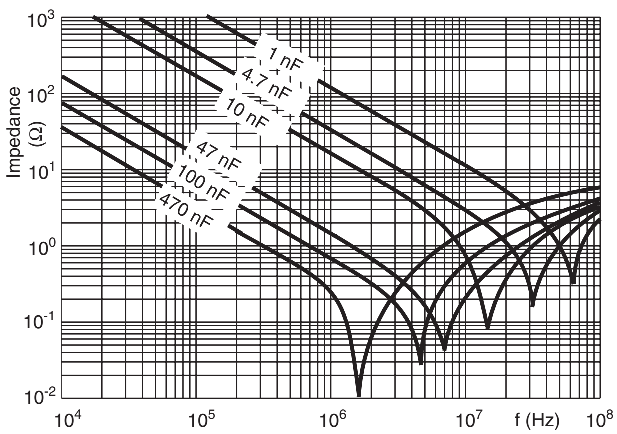
Capacitance as a function of ambient temperature (typical curve)



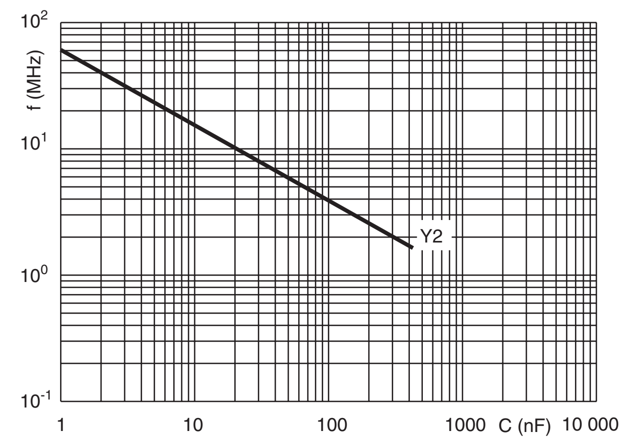
Tangent of loss angle as a function of frequency (typical curve)



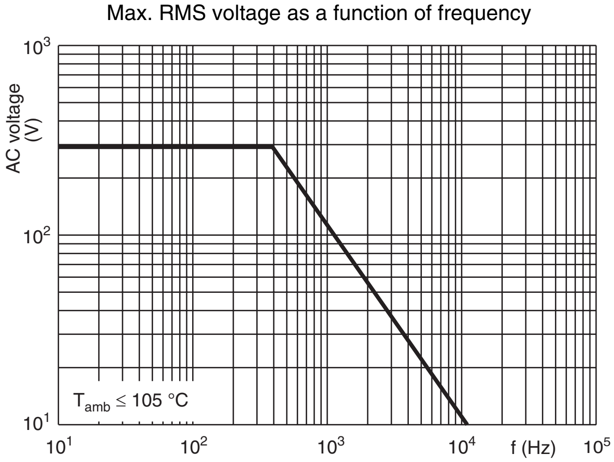
Impedance as a function of frequency (typical curve)



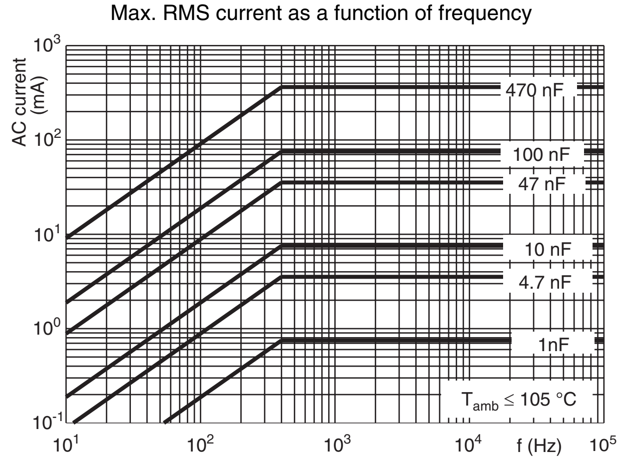
Resonant frequency as a function of capacitance (typical curve)



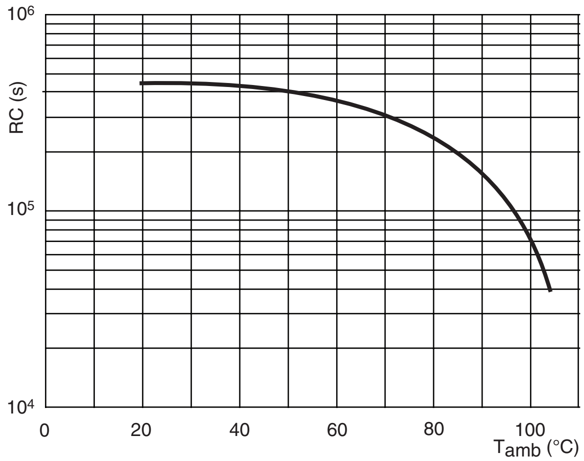
Max. RMS voltage as a function of frequency



Max. RMS current as a function of frequency



Insulation resistance as a function of ambient temperature



APPLICATION NOTES

- For Y2 electromagnetic interference suppression in, **standard line bypass applications (between line and ground)** (50/60 Hz) with a maximum mains voltage of 300 Vac
- For series impedance applications we refer to application note www.vishay.com/doc?28153
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse programs must be used.
- The maximum ambient temperature must not exceed 105 °C
- Rated voltage pulse slope:
  If the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by 420 Vdc and divided by the applied voltage.

INSPECTION REQUIREMENTS

General Notes:

1. Sub-clause numbers of tests and performance requirements refer to the "Sectional Specification, Publication IEC 60384-14 ed-3 and Specific Reference Data.

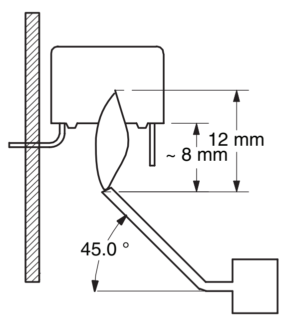
Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in Chapters "General data" of this specification
Initial measurements	Capacitance Tangent of loss angle: 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	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max. 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured initially
	Insulation resistance	As specified in Section "Insulation Resistance" of this specification

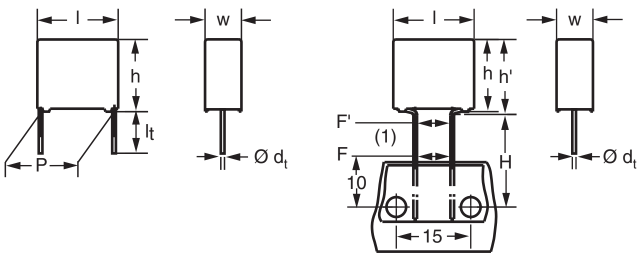
SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle: at 10 kHz	
4.20 Solvent resistance of the marking:	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 105 °C 5 cycles Duration t = 30 min	
4.6.1 Inspection	Visual examination	No visible damage
4.7 Vibration	Mounting: see Section “Mounting” of this specification Procedure B4: Frequency range: 10 to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	
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	
4.9.2 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert \Delta C/C \rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured initially
	Insulation resistance	As specified in Section “Insulation Resistance” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.11 Climatic sequence		
4.11.1 Initial measurements	Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B	
4.11.2 Dry heat	Temperature: 105 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db First cycle		
4.11.4 Cold	Temperature: - 55 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db remaining cycles		
4.11.6 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.11.1
	Voltage proof 2250 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in Section “Insulation resistance” of this specification
SUB-GROUP C2		
4.12 Damp heat steady state	56 days, 40 °C, 90 to 95 % RH, no load Capacitance	
4.12.1 Initial measurements	Tangent of loss angle at 1 kHz	
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\|\Delta C/C\| \leq 5$ % of the value measured in 4.12.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.007$ Compared to values measured in 4.12.1.
	Voltage proof 2250 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in Section “Insulation resistance” of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle: at 10 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X1: 5 kV Max. 24 pulses	No selfhealing breakdowns or flash-over
4.14 Endurance	Duration: 1000 h 1.7 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 %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.13.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.13.1.
	Voltage proof 2250 Vdc; 1 min between terminations 2100 Vac; 1 min between terminations and case	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in Section "Insulation resistance" of this specification
SUB-GROUP C4		
4.15 Charge and discharge	10 000 cycles charged to 420 Vdc Discharge resistance: $R = \frac{420\text{ Vdc}}{1.5 \times C\text{ (dU/dt)}}$	
4.15.1 Initial measurements	Capacitance Tangent of loss angle: at 10 kHz	
4.15.3 Final measurements	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.15.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.15.1.
	Insulation resistance	≥ 50 % of values specified in Section "Insulation resistance" of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
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: Ø 0.5 mm Fuel: butane Test duration for actual volume V in mm^3: $V \leq 250$: 10 s $250 < V \leq 500$: 20 s $500 < V \leq 1750$: 30 s $V > 1750$: 60 s One flame application  	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 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.

Interference Suppression Film Capacitors MKP Radial Potted Type



Dimensions in mm

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

APPLICATIONS

For standard across the line X1 applications.
See also Application Note:
www.vishay.com/doc?28153

REFERENCE STANDARDS

"IEC 60384-14 ed-3 and EN 60384-14"
"IEC 60065, pass. flamm. class B"
UL1414; UL1283; CSA-C22.2 No. 8

MARKING

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

DIELECTRIC

Polypropylene film

ELECTRODES

Metallized film

CONSTRUCTION

Mono construction

RATED VOLTAGE

AC 440 V; 50 to 60 Hz

FEATURES

15 to 27.5 mm lead pitch and 15 mm bent back to 7.5 mm.
Supplied loose in box, taped on ammopack or reel

RoHS compliant product

PERMISSIBLE DC VOLTAGE

DC 1000 V

ENCAPSULATION

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

CLIMATIC TESTING CLASS ACC. TO IEC 60068-1

55/105/56/B

CAPACITANCE RANGE (E12 SERIES)

E12 series 0.01 to 1 µF
Preferred values acc. to E6

CAPACITANCE TOLERANCE

± 20 %; ± 10 %; ± 5 %

LEADS

Tinned wire

MAXIMUM APPLICATION TEMPERATURE

105 °C

DETAIL SPECIFICATION

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

COMPOSITION OF CATALOG NUMBER

TYPE AND PITCHES	
338 1 X1	7.5 mm (bent back)
	15.0 mm
	22.5 mm
	27.5 mm

CAPACITANCE (numerically)

Example:
104 = 10 x 10 = 100 nF
(except special numbers)

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

BFC2	338	1X	XX	X
2222 (*)	338	1X	XX	X

(*) Old ordering code

TYPE	PACKAGING	LEAD CONFIGURATION	C-TOL	PREFERRED TYPES
338 1 X1	Loose in box	Lead length 3.5 ± 0.3 mm	± 20 %	BFC2 338 10 ...
		Lead length 5.0 ± 1.0 mm		BFC2 338 12 ...
		Lead length 25.0 ± 2.0 mm		BFC2 338 14 ...
	Taped on reel (1)	Bent back to 7.5 mm; H = 16.0 mm; P_0 = 15.0 mm; reel diameter = 500 mm		BFC2 338 16 ...
		ALTERNATIVE TAPED VERSIONS		**ON REQUEST**
338 1 X1 X1	Taped on reel (1)	H = 18.5 mm; for P_0 = 12.7 mm; reel diameter = 500 mm	± 20 %	BFC2 338 17 ...
		ALTERNATIVE C-TOL.		**ON REQUEST**
338 1 X1	Loose in box	Lead length 3.5 ± 0.3 mm	± 10 %	See tables for detail
			± 5 %	
		Lead length 5.0 ± 1.0 mm	± 10 %	
			± 5 %	
		Lead length 25.0 ± 2.0 mm	± 10 %	
			± 5 %	
	Taped on reel (1)	Bent back to 7.5 mm; H = 16.0 mm; P_0 = 15.0 mm; reel diameter = 500 mm	± 10 %	
			± 5 %	
		H = 18.5 mm; P_0 = 12.7 mm; reel diameter = 500 mm	± 10 %	
			± 5 %	

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

SPECIFIC REFERENCE DATA

DESCRIPTION	VALUE	
Rated AC voltage (U_{Rac})	440 V	
Permissible DC voltage (U_{Rdc})	1000 V	
Tangent of loss angle:	at 1 kHz	at 10 kHz
C ≤ 470 nF	≤ 10 x 10^{-4}	≤ 20 x 10^{-4}
C > 470 nF	≤ 20 x 10^{-4}	≤ 70 x 10^{-4}
Rated voltage pulse slope $(dU/dt)_R$ at 615 Vdc		
Pitch = 15 mm and 7.5 mm (bent back)	250 V/µs	
Pitch = 22.5 mm	150 V/µs	
Pitch = 27.5 mm	100 V/µs	
R between leads, for C ≤ 0.33 µF at 100 V, 1 min	> 15 000 MΩ	
RC between leads, for C > 0.33 µF at 100 V, 1 min	> 5000 s	
R between leads and case, 100 V, 1 min	> 30 000 MΩ	
Withstanding (DC) voltage (cut off current 10 mA), rise time 100 V/s	3400 V, 1 min	
Withstanding (AC) voltage between leads and case	2380 V, 1 min	
Maximum application temperature	105 °C	

C - tol. = ± 20 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [1]	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.01	5.0 x 11.0 x 17.5	1.0	10103	12103	1000	14103	1000	17103	1100
0.012			10123	12123		14123		17123	
0.015			10153	12153		14153		17153	
0.018			10183	12183		14183		17183	
0.022			10223	12223		14223		17223	
0.027	6.0 x 12.0 x 17.5	1.4	10273	12273	1000	14273	1000	17273	900
0.033			10333	12333		14333		17333	
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.039	7.0 x 13.5 x 17.5	1.8	10393	12393	750	14393	500	17393	800
0.047			10473	12473		14473		17473	
0.056	8.5 x 15.0 x 17.5	2.4	10563	12563	750	14563	500	17563	650
0.068			10683	12683		14683		17683	
0.082	10.0 x 16.5 x 17.5	3.0	10823	12823	500	14823	450	17823	600
0.1			10104	12104		14104		17104	
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.12	8.5 x 18.0 x 26.0	3.8	10124	12124	200	14124	250	17124	450
0.15			10154	12154		14154		17154	
0.18	10.0 x 19.5 x 26.0	6.8	10184	12184	200	14184	200	17184	350
0.22			10224	12224		14224		17224	
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.27	11.0 x 21.0 x 31.0	7.4	10274	12274	100	14274	125		
0.33	13.0 x 23.0 x 31.0	9.2	10334	12334	100	14334	125		
0.39	15.0 x 25.0 x 31.0	12.3	10394	12394	100	14394	125		
0.47			10474	12474		14474			
0.56	18.0 x 28.0 x 31.0	16.1	10564	12564	100	14564	100		
0.68			10684	12684		14684			
0.82	21.0 x 31.0 x 31.0	20.3	10824	12824	50	14824	75		
1.00			10105	12105		14105			

Notes

[1] Weight for short lead products only

• SPQ = Standard Packing Quantity

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

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) [2]	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm [1]	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 16.0 mm; P_0 = 15.0 mm	SPQ
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.010	5.0 x 13.0 x 17.5	1.0						16103	950
0.012								16123	
0.015								16153	
0.018								16183	
0.022								16223	
0.027	6.0 x 14.0 x 17.5	1.4						16273	800
0.033								16333	
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.039	7.0 x 15.5 x 17.5	1.8						16393	700
0.047								16473	
0.056	8.5 x 17.0 x 17.5	1.4						16563	550
0.068								16683	
0.082	10.0 x 18.5 x 17.5	3.0						16823	500
0.100								16104	

Notes

[1] Weight for short lead products only

• SPQ = Standard Packing Quantity

C-tol. = ± 10 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm (1)	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 11.0 x 17.5	1.0	18114 18115 18116 18117	18314 18315 18316 18317	1000	18514 18515 18516 18517	1000	18914 18915 18916 18917	1100
0.022 0.027	6.0 x 12.0 x 17.5	1.4	18118 18119	18318 18319	1000	18518 18519	1000	18918 18919	900
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.033 0.039	7.0 x 13.5 x 17.5	1.8	18121 18122	18321 18322	750	18521 18522	500	18921 18922	800
0.047 0.056	8.5 x 15.0 x 17.5	2.4	18123 18124	18323 18324	750	18523 18524	500	18923 18924	650
0.068 0.082	10.0 x 16.5 x 17.5	3.0	18125 18126	18325 18326	500	18525 18526	450	18925 18926	600
Pitch = 22.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.10	7.0 x 16.5 x 26.0	2.9	18127	18327	200	18527	250	18927	550
0.12 0.15	8.5 x 18.0 x 26.0	3.8	18128 18129	18328 18329	200	18528 18529	250	18928 18929	450
0.18	10.0 x 19.5 x 26.0	6.8	18131	18331	200	18531	200	18931	350
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.22 0.27	11.0 x 21.0 x 31.0	7.4	18132 18133	18332 18333	100	18532 18533	125		
0.33	13.0 x 23.0 x 31.0	9.2	18134	18334	100	18534	125		
0.39 0.47	15.0 x 25.0 x 31.0	12.3	18135 18136	18335 18336	100	18535 18536	125		
0.56 0.68	18.0 x 28.0 x 31.0	16.1	18137 18138	18337 18338	100	18537 18538	100		
0.82	21.0 x 31.0 x 31.0	20.3	18139	18339	50	18539	75		

Notes

(1) Weight for short lead products only

• SPQ = Standard Packing Quantity

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

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED Reel diameter = 500 mm (1)	
			Short leads			Long leads			
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 13.0 x 17.5	1.0						18714 18715 18716 18717	950
0.022 0.027	6.0 x 14.0 x 17.5	1.4						18718 18719	800
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.033 0.039	7.0 x 15.5 x 17.5	1.8						18721 18722	700
0.047 0.056	8.5 x 17.0 x 17.5	2.4						18723 18724	550
0.068 0.082	10.0 x 18.5 x 17.5	3.0						18725 18726	500

Notes

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

(2) Weight for short lead products only

• SPQ = Standard Packing Quantity

C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (1)	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 18.5 mm; P_0 = 12.7 mm	SPQ
Pitch = 15.0 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 11.0 x 17.5	1.0	18214 18215 18216 18217	18414 18415 18416 18417	1000	18614 18615 18616 18617	1000	18934 18935 18936 18937	1100
0.022 0.027	6.0 x 12.0 x 17.5	1.4	18218 18219	18418 18419	1000	18618 18619	1000	18938 18939	900
Pitch = 15.0 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.033 0.039	7.0 x 13.5 x 17.5	1.8	18221 18222	18421 18422	750	18621 18622	500	18941 18942	800
0.047 0.056	8.5 x 15.0 x 17.5	2.4	18223 18224	18423 18424	750	18623 18624	500	18943 18944	650
0.068 0.082	10.0 x 16.5 x 17.5	3.0	18225 18226	18425 18426	500	18625 18626	450	18945 18946	600
Pitch = 22.5 ±0.4 mm; d_t = 0.80 ± 0.08 mm									
0.10 0.12	8.5 x 18.0 x 26.0	3.8	18227 18228	18427 18428	200	18627 18628	250	18947 18948	450
0.15 0.18	10.0 x 19.5 x 26.0	4.4	18229 18231	18429 18431	200	18629 18631	200	18949 18951	350
Pitch = 27.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.22	11.0 x 21.0 x 31.0	7.4	18232	18432	100	18632	125		
0.27 0.33	13.0 x 23.0 x 31.0	9.2	18233 18234	18433 18434	100	18633 18634	125		
0.39 0.47	15.0 x 25.0 x 31.0	12.3	18235 18236	18435 18436	100	18635 18636	125		
0.56 0.68	18.0 x 28.0 x 31.0	16.1	18237 18238	18437 18438	100	18637 18638	100		
0.82	21.0 x 31.0 x 31.0	20.3	18239	18439	50	18639	75		

Notes
(1) Weight for short lead products only
• SPQ = Standard Packing Quantity

Bent back pitch (only taped); C-tol. = ± 5 %

C (µF)	DIMENSIONS w x h x l (mm)	MASS (g) (2)	CATALOG NUMBER BFC2 338 1XXXX AND PACKAGING						
			LOOSE IN BOX					TAPED	
			Short leads			Long leads		Reel diameter = 500 mm (1)	
			l_t = 3.5 ± 0.3 mm	l_t = 5.0 ± 1.0 mm	SPQ	l_t = 25.0 ± 2.0 mm	SPQ	H = 16.0 mm; P_0 = 15.0 mm	SPQ
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.60 ± 0.06 mm									
0.010 0.012 0.015 0.018	5.0 x 13.0 x 17.5	1.0						18814 18815 18816 18817	950
0.022 0.027	6.0 x 14.0 x 17.5	1.4						18818 18819	800
Original pitch = 15.0 mm; bent back pitch = 7.5 ± 0.4 mm; d_t = 0.80 ± 0.08 mm									
0.033 0.039	7.0 x 15.5 x 17.5	1.8						18821 18822	700
0.047 0.056	8.5 x 17.0 x 17.5	2.4						18823 18824	550
0.068 0.082	10.0 x 18.5 x 17.5	3.0						18825 18826	500

Notes
(1) Reel diameter = 356 mm is available on request
(2) Weight for short lead products only
• SPQ = Standard Packing Quantity

Interference Suppression Film Capacitors
MKP Radial Potted Type

APPROVALS

SAFETY APPROVALS X1	VOLTAGE	VALUE	FILE NUMBERS
EN *60384-14* (ENEC) (= IEC *60384-14 ed-3*)	440 Vac	10 nF to 1 µF	F1 2008060
UL1414	250 Vac	10 nF to 1 µF	E112471
UL1283	440 Vac	10 nF to 100 nF	E109565
UL1283 and (CSA-C22.2 No. 8)	440 Vac	100 nF to 1 µF	E109565
CB-Test Certificate	440 Vac	10 nF to 1 µF	F1 5256
The Enec-approval together with the CB-Certificate replace all national marks of the following countries (they have already signed the ENEC-Agreement): Austria; Belgium; Czech. Republic; Denmark; Finland; France; Germany; Greece; Hungary; Ireland; Italy; Luxembourg; Netherlands; Norway; Portugal; Slovenian; Spain; Switzerland and United Kingdom.			

MOUNTING

Normal Use

The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.

For detailed tape specifications refer to:
"Packaging Information": www.vishay.com/doc?28139 or end of catalog

Specific Method of Mounting to Withstand Vibration and Shock

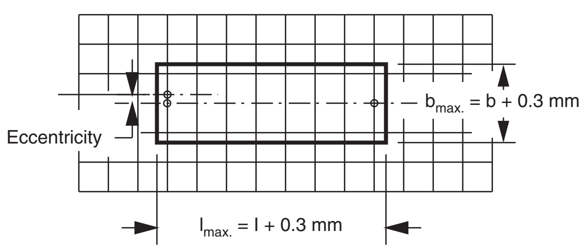
In order to withstand vibration and shock tests, it must be ensured that the stand-off pips are in good contact with the printed-circuit board:

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

Space Requirements on Printed-Circuit Board

The maximum length and width of film capacitors is shown in drawing:

- Eccentricity as in drawing. The maximum eccentricity is smaller than or equal to the lead diameter of the product concerned
- Product height with seating plane as given by "IEC 60717" as reference: $h_{max.} \leq h + 0.3$ mm or $h_{max.} \leq h' + 0.3$ mm



Storage Temperature

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

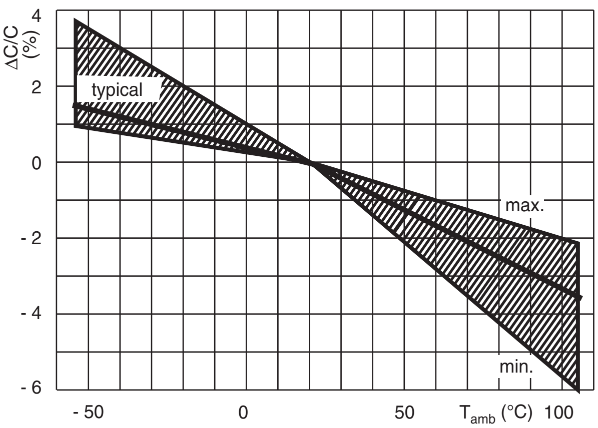
Ratings and Characteristics Reference Conditions

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

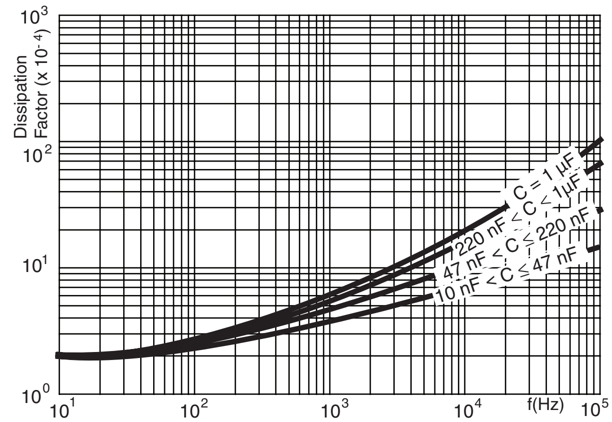
For reference testing, a conditioning period shall be applied over 96 h ± 4 h by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20 %.

CHARACTERISTICS

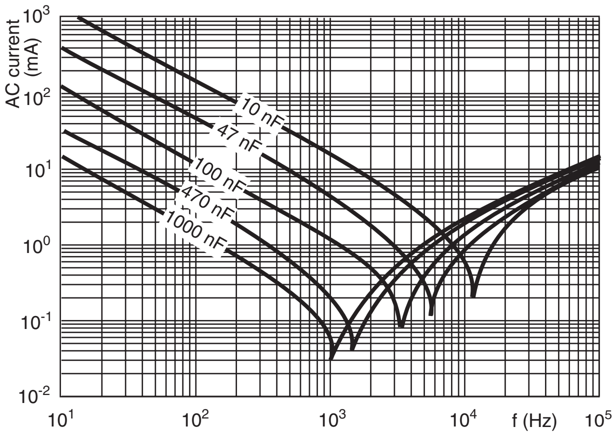
Capacitance as a function of ambient temperature (typical curve)



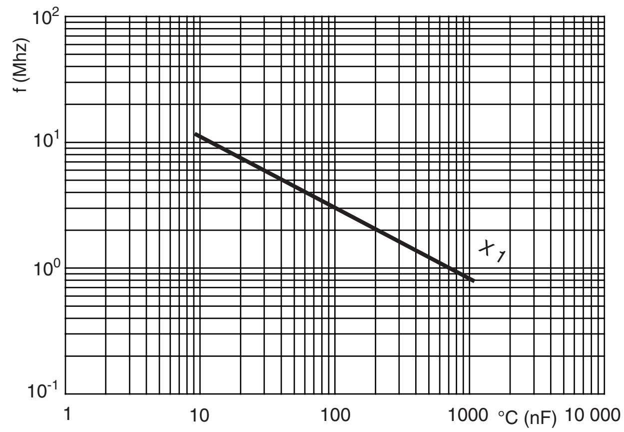
Tangent of loss angle as a function of frequency (typical curve)



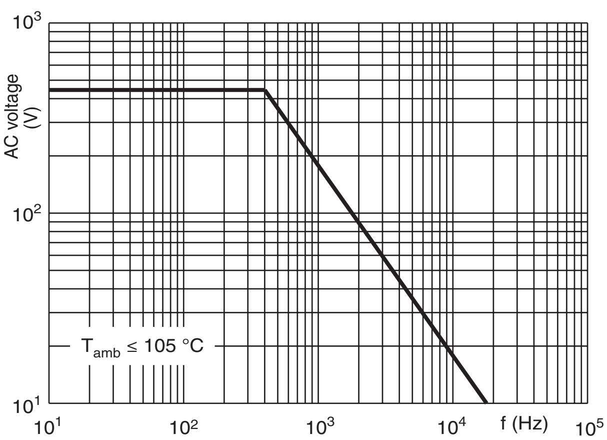
Impedance as a function of frequency (typical curve)



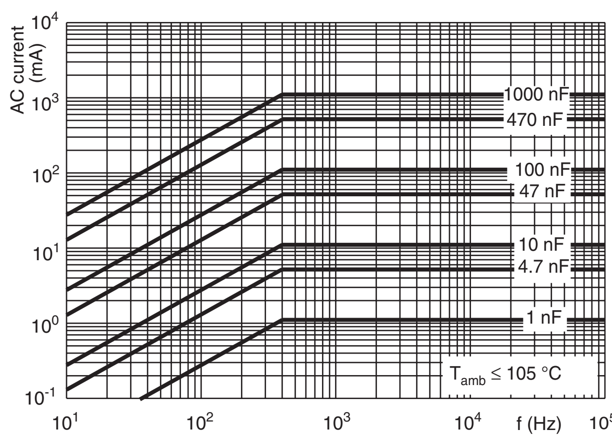
Resonant frequency as a function of capacitance (typical curve)



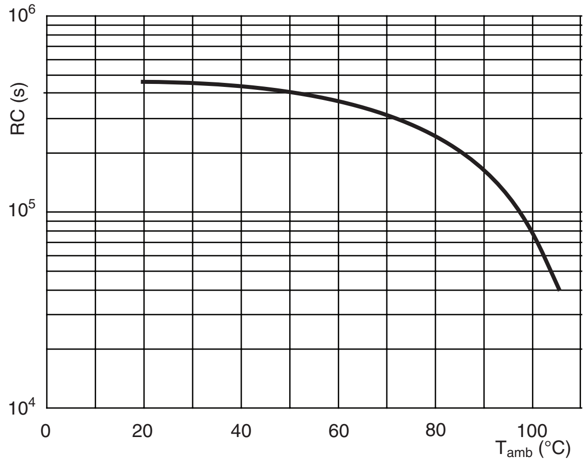
Max. RMS voltage as a function of frequency



Max. RMS current as a function of frequency



Insulation resistance as a function of ambient temperature



APPLICATION NOTES

- For X1 electromagnetics interference suppression in **standard across the line applications** (50/60 Hz) with a maximum mains voltage of 440 Vac.
- For series impedance applications we refer to Application Note www.vishay.com/doc?28153
- These capacitors are not intended for continuous pulse applications. For these situations, capacitors of the AC and pulse programs must be used.
- The maximum ambient temperature must not exceed 105 °C.
- Rated voltage pulse slope:
  If the pulse voltage is lower than the rated voltage, the values of the specific reference data can be multiplied by 615 Vdc and divided by the applied voltage.

INSPECTION REQUIREMENTS

General Notes:

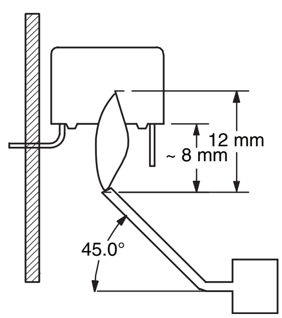
1. Sub-clause numbers of tests and performance requirements refer to the “Sectional Specification, Publication IEC 60384-14 ed-3 and Specific Reference Data.”

Group C Inspection Requirements

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C1A PART OF SAMPLE OF SUB-GROUP C1		
4.1 Dimensions (detail)		As specified in chapters “General data” of this specification
Initial measurements	Capacitance Tangent of loss angle at 10 kHz	
4.3 Robustness o terminations	Tensile: load 10 N; 10 s Bending: load 5 N; 4 x 90°	No visible damage
4.4 Resistance to soldering heat	No pre-drying Method: 1A Solder bath: 280 °C ± 5 °C Duration: 10 s	
4.19 Component solvent resistance	Isopropylalcohol at room temperature Method: 2 Immersion time: 5 ± 0.5 min Recovery time: Min. 1 h, max 2 h	
4.4.2 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured initially
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured initially
	Insulation resistance	As specified in section “Insulation resistance” of this specification
SUB-GROUP C1B PART OF SAMPLE OF SUB-GROUP C1		
Initial measurements	Capacitance Tangent of loss angle at 10 kHz	
4.20 Solvent resistance of the marking	Isopropylalcohol at room temperature Method: 1 Rubbing material: cotton wool Immersion time: 5 ± 0.5 min	No visible damage Legible marking
4.6 Rapid change of temperature	θA = - 55 °C θB = + 105 °C 5 cycles Duration t = 30 min	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.6.1 Inspection 4.7 Vibration	Visual examination Mounting: See section "Mounting" of this specification Procedure B4 Frequency range: 10 to 55 Hz Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 h	No visible damage
4.7.2 Final inspection	Visual examination	No visible damage
4.9 Shock	Mounting: See section "Mounting" for more information Pulse shape: half sine Acceleration: 490 m/s² Duration of pulse: 11 ms	
4.9.2 Final measurements	Visual examination	No visible damage
	Capacitance	$\lvert\Delta C/C\rvert \leq$ 5 % of the value measured initially
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured initially
	Insulation resistance	As specified in section "Insulation Resistance" of this specification
SUB-GROUP C1 COMBINED SAMPLE OF SPECIMENS OF SUB-GROUPS C1A AND C1B		
4.11 Climatic sequence		
4.11.1 Initial measurements	Capacitance Measured in 4.4.2 and 4.9.2 Tangent of loss angle: Measured initially in C1A and C1B	
4.11.2 Dry heat	Temperature: 105 °C Duration: 16 h	
4.11.3 Damp heat cyclic Test Db First cycle		
4.11.4 Cold	Temperature: - 55 °C Duration: 2 h	
4.11.5 Damp heat cyclic Test Db Remaining cycles		
4.11.6 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq$ 5 % of the value measured in 4.11.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.11.1.
	Voltage proof 1900 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	$\geq$ 50 % of values specified in section "Insulation resistance" of this specification

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
SUB-GROUP C2		
4.12 Damp heat steady state	56 days, 40 °C, 90 to 95 % RH No load	
4.12.1 Initial measurements	Capacitance Tangent of loss angle at 1 kHz	
4.12.3 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 5$ % of the value measured in 4.12.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.12.1.
	Voltage proof 1900 Vdc; 1 min between terminations	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C3		
4.13.1 Initial measurements	Capacitance Tangent of loss angle at 10 kHz	
4.13 Impulse voltage	3 successive impulses, full wave, peak voltage: X1: 4 kV Max. 24 pulses	No self healing breakdowns or flash-over
4.14 Endurance	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 %	
4.14.7 Final measurements	Visual examination	No visible damage Legible marking
	Capacitance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.13.1.
	Tangent of loss angle	Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.13.1.
	Voltage proof 1900 Vdc; 1 min between terminations 2380 Vac; 1 min between terminations and case.	No permanent breakdown or flash-over
	Insulation resistance	≥ 50 % of values specified in section “Insulation resistance” of this specification
SUB-GROUP C4		
4.15 Charge and discharge	10 000 cycles Charged to 615 Vdc Discharge resistance: $R = \frac{615\text{ Vdc}}{1.5 \text{ x } C\ (dU/dt)}$	
4.15.1 Initial measurements	Capacitance Tangent of loss angle at 10 kHz	

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
4.15.3 Final measurements	Capacitance Tangent of loss angle Insulation resistance	$\lvert\Delta C/C\rvert \leq 10$ % compared to values measured in 4.15.1. Increase of tan $\delta \leq 0.008$ Compared to values measured in 4.15.1. ≥ 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 mm³: $V \leq 250$: 10 s $250 < V \leq 500$: 20 s $500 < V \leq 1750$: 30 s $V > 1750$: 60 s One flame application 	After removing test flame from capacitor, the capacitor must not continue to burn for more than 10 s. No burning particle must drop from the sample.
SUB-GROUP C7		
4.18 Active flammability	20 cycles of 4 kV discharges on the test capacitor connected to U_{Rac}	The cheese cloth around the capacitors shall not burn with a flame. No electrical measurements are required.

General Information

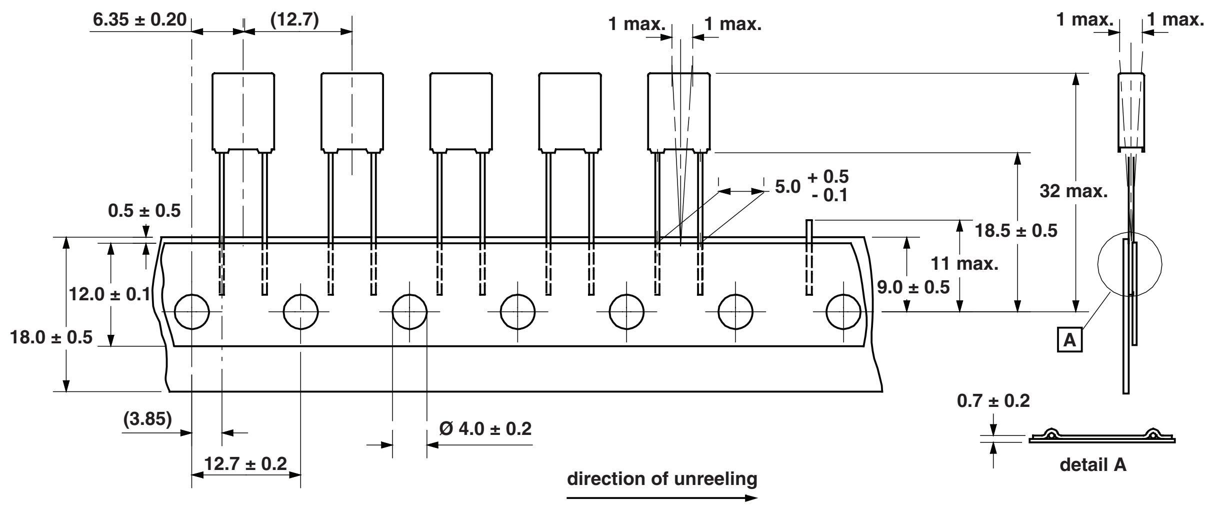
Contents

1. TAPING INFORMATION

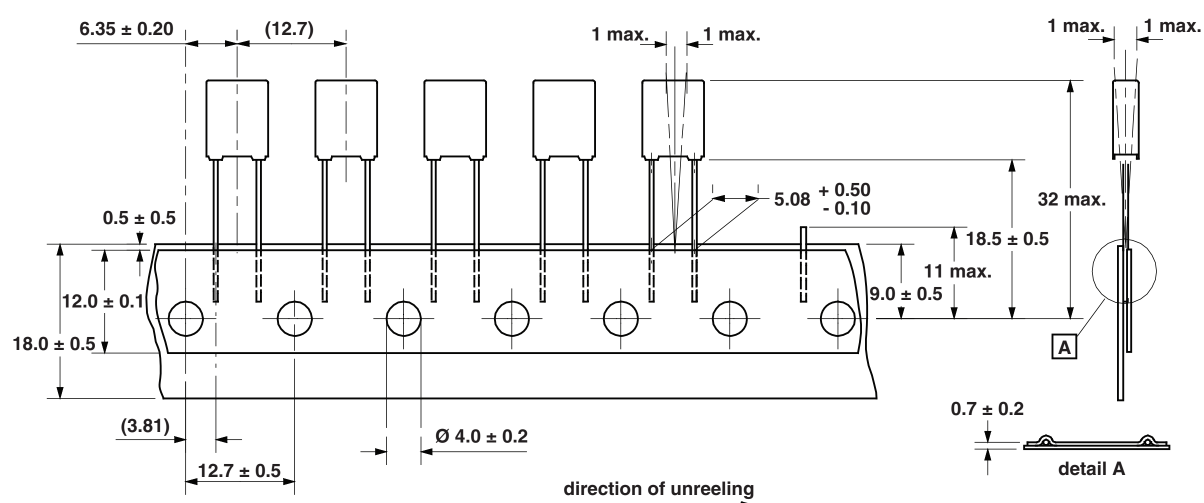
1.1. RADIAL POTTED FILM CAPACITORS (dimensions in mm)

1.1.1. RADIAL POTTED STRAIGHT LEADS

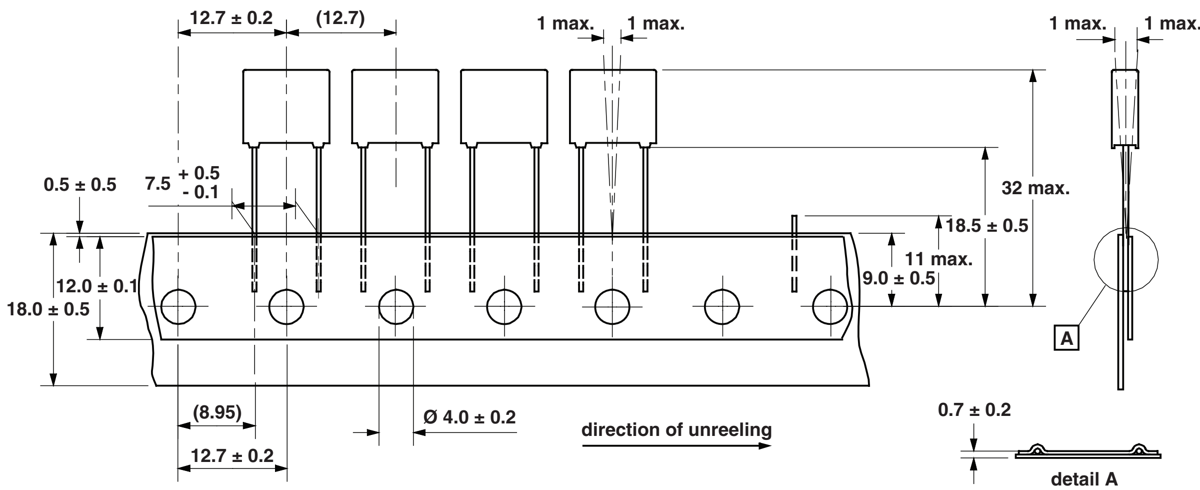
PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H)



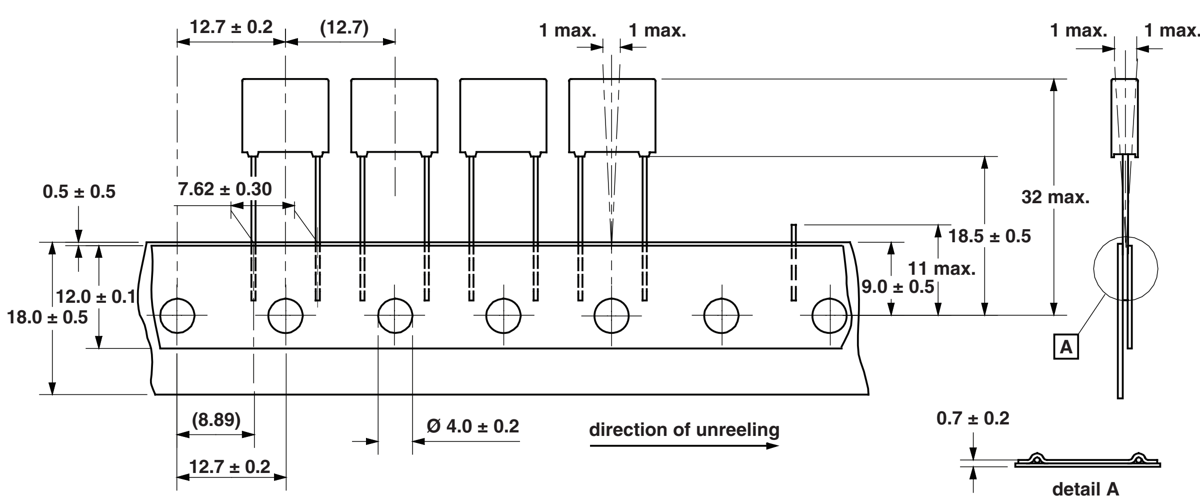
PITCH = 5.08 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H)



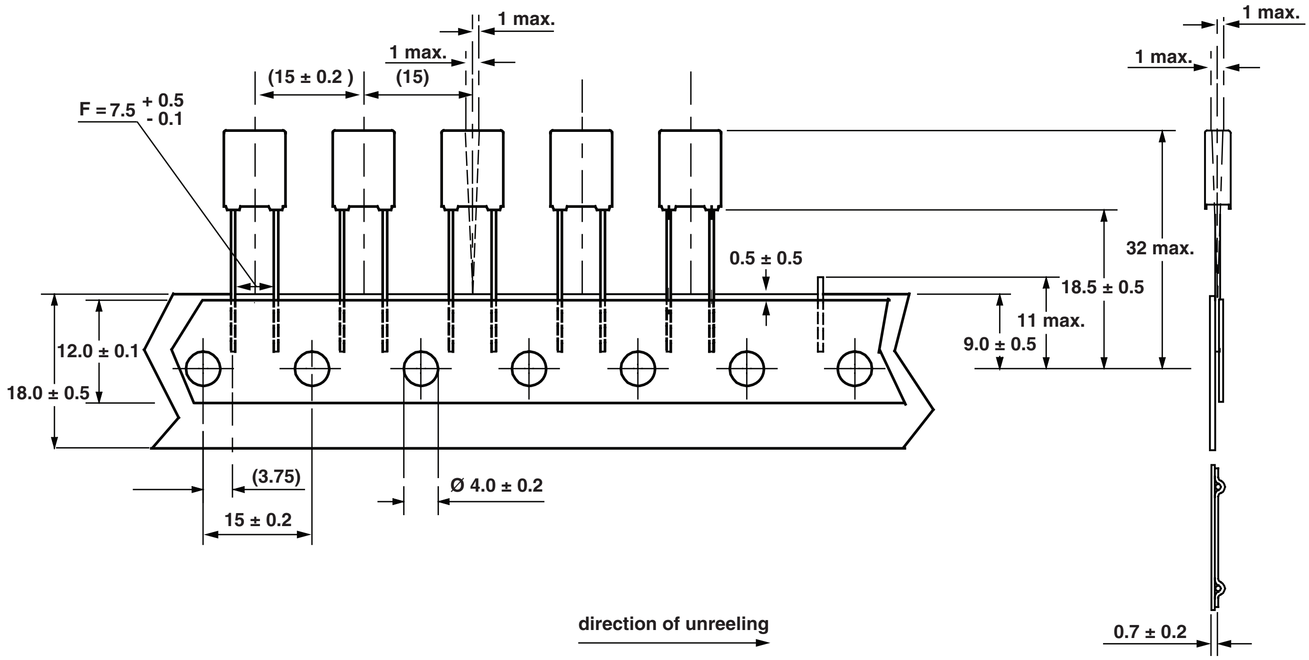
PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H)



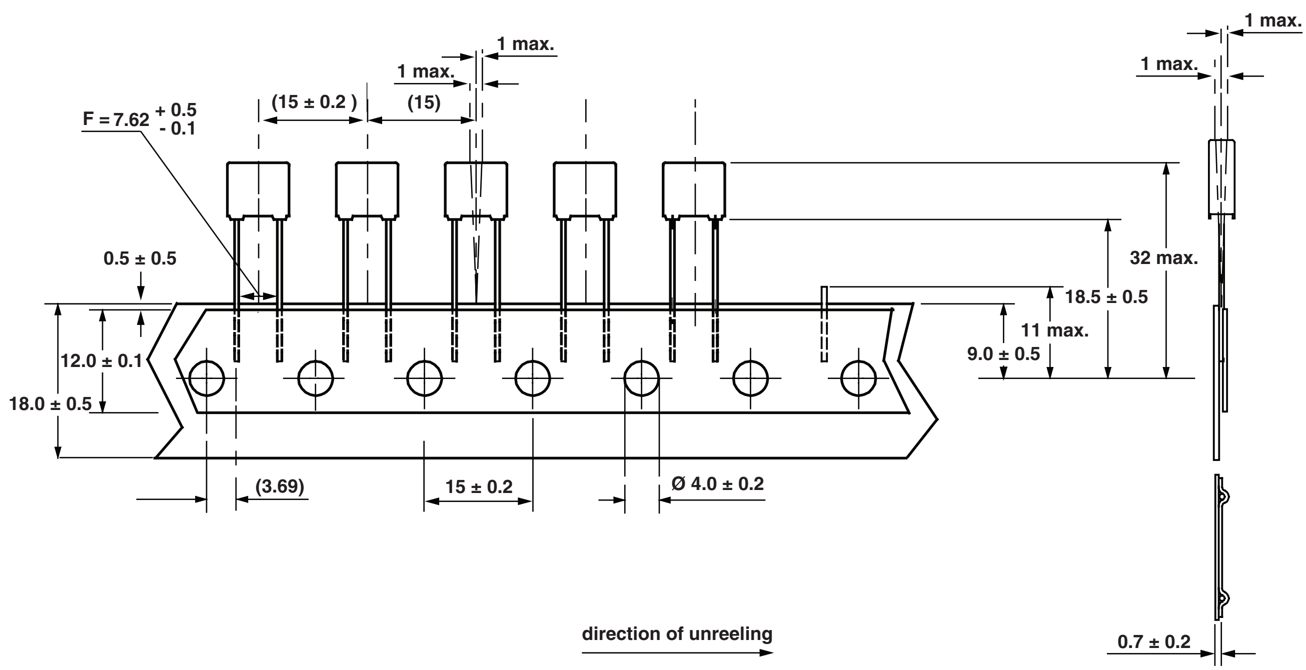
PITCH = 7.62 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H)



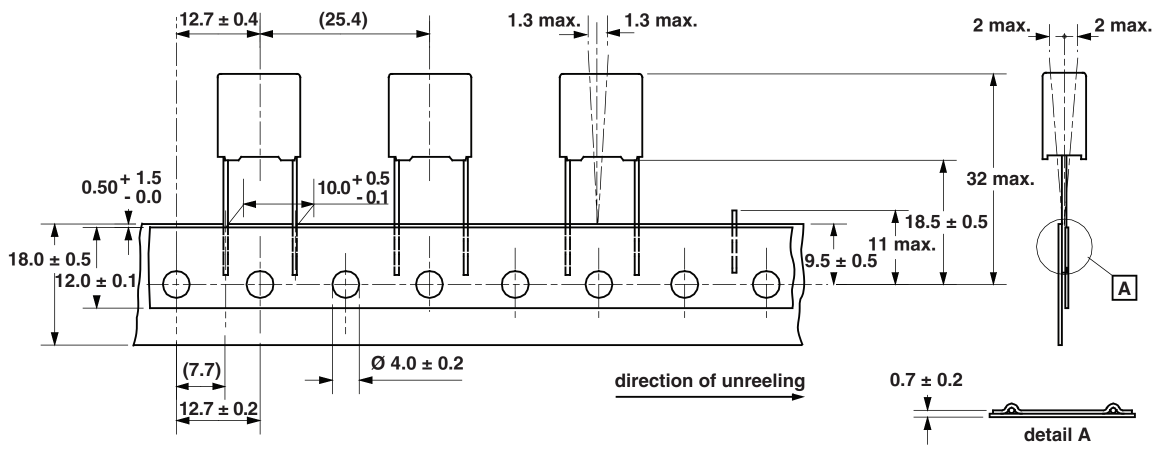
PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 18.5 mm (H)



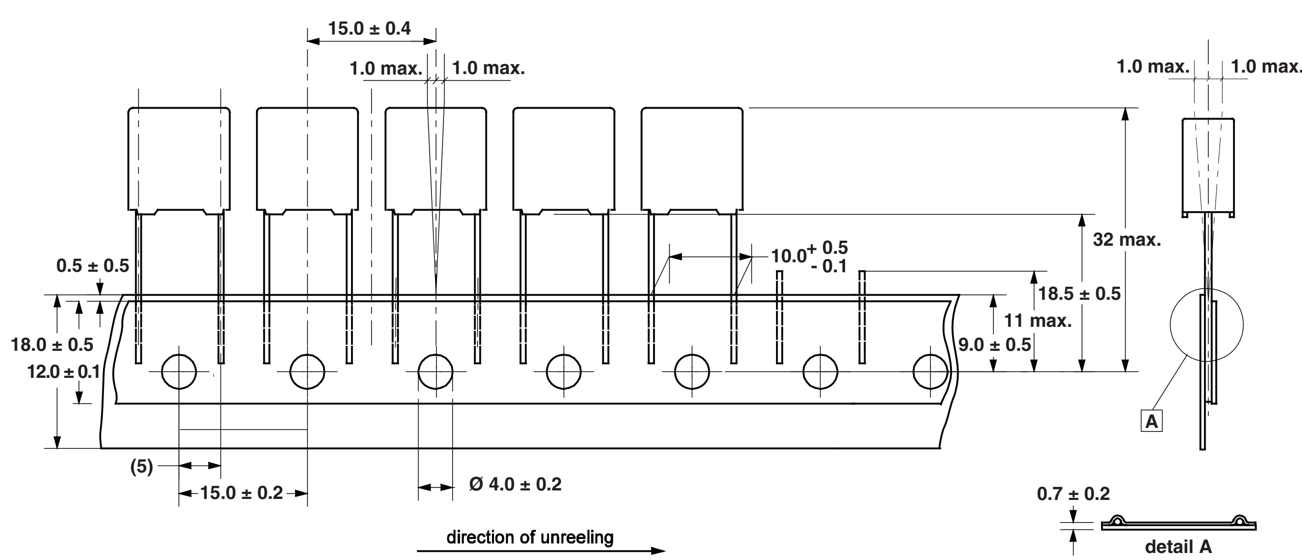
PITCH = 7.62 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 18.5 mm (H)



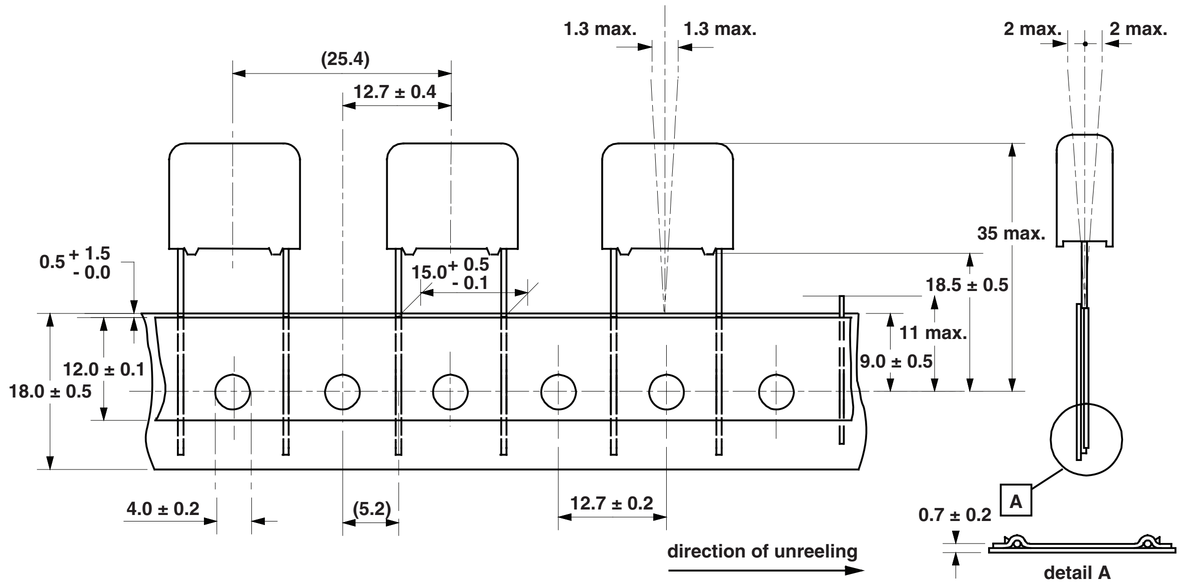
PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H)



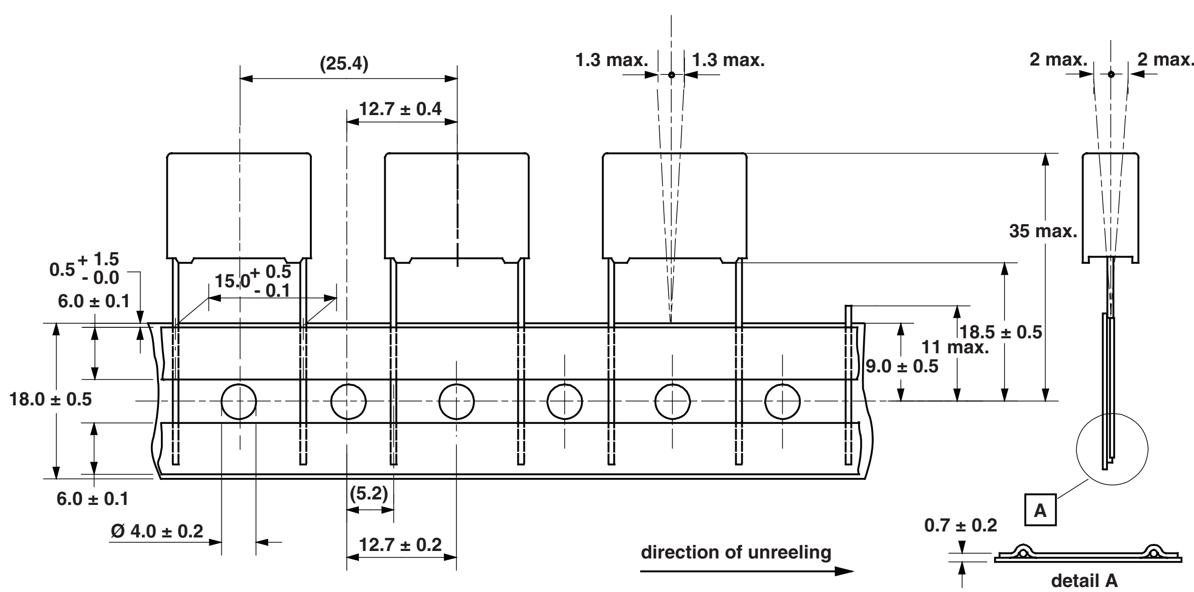
PITCH = 10.0 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 18.5 mm (H)



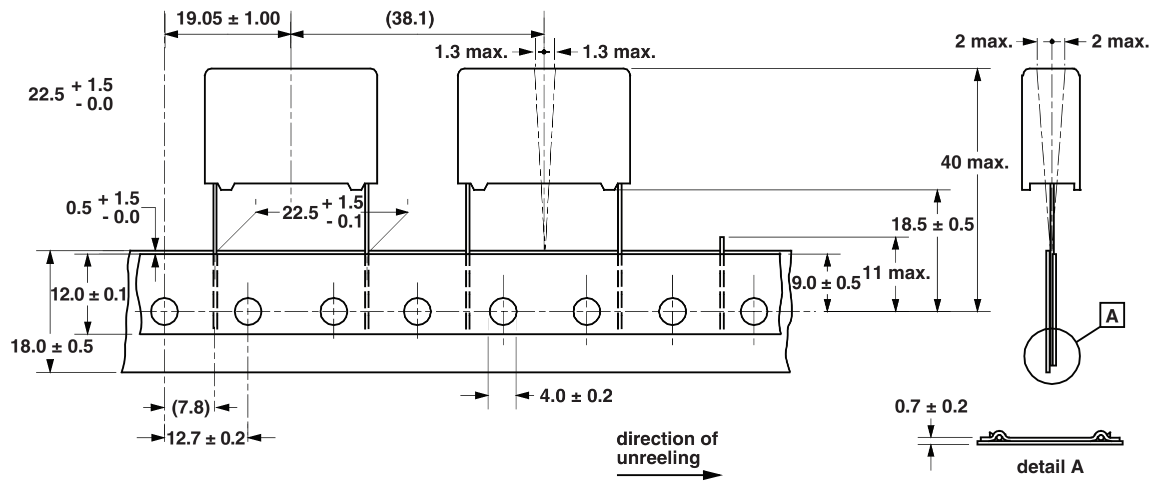
PITCH = 15.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H); ONE TAPE



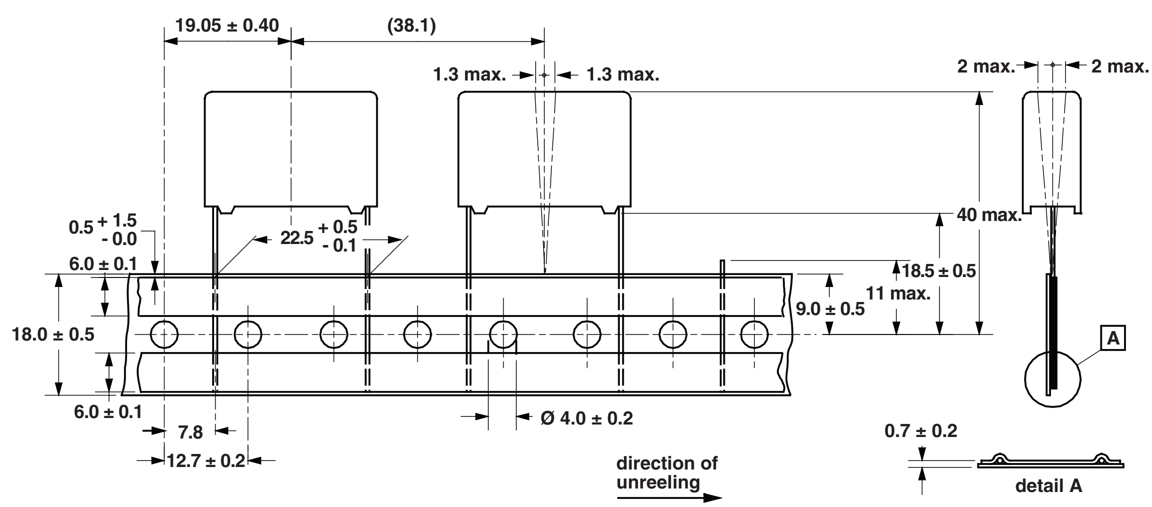
PITCH = 15.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H); TWO TAPES



PITCH = 22.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H); ONE TAPE

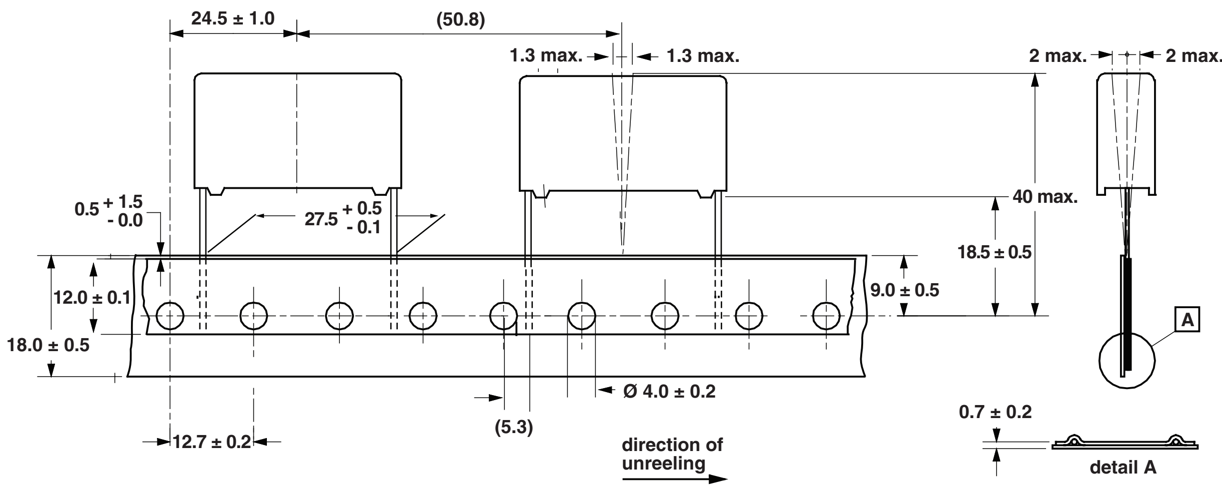


PITCH = 22.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H); TWO TAPES



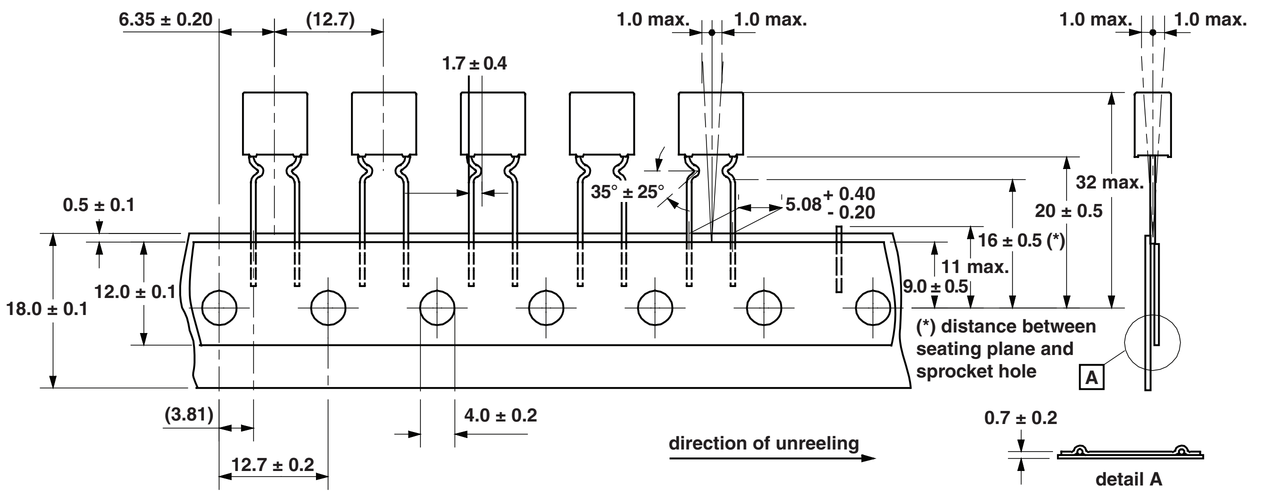
PACKAGING INFORMATION: VISHAY ROEDERSTEIN ONLY

PITCH = 27.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.5 mm (H); ONE TAPE



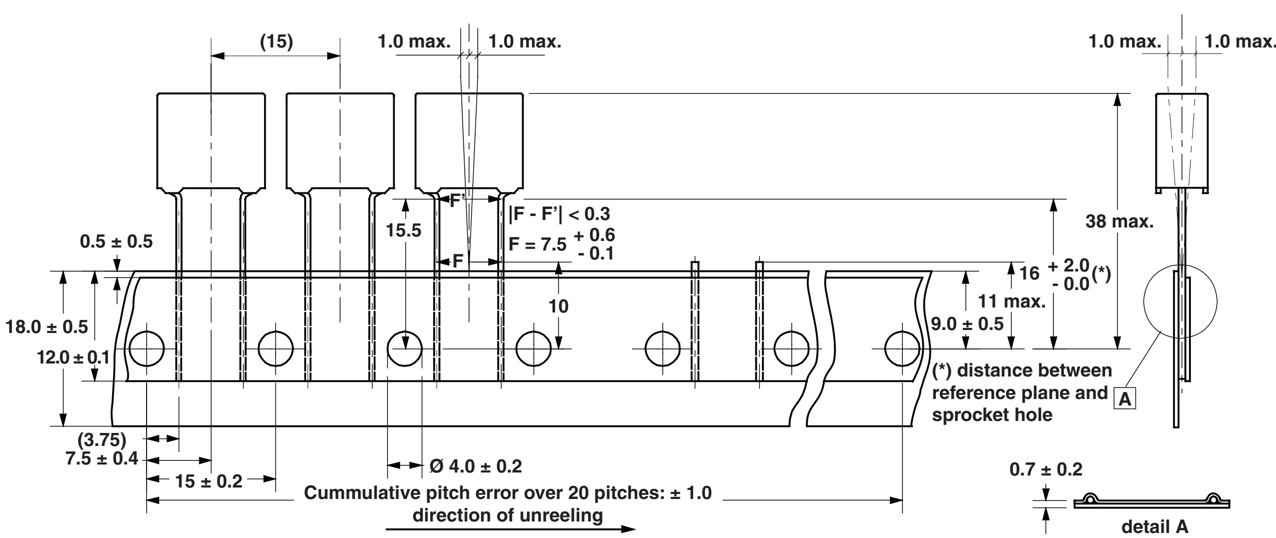
1.1.2. RADIAL POTTED KINKED LEADS

PITCH = 5.08 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H)

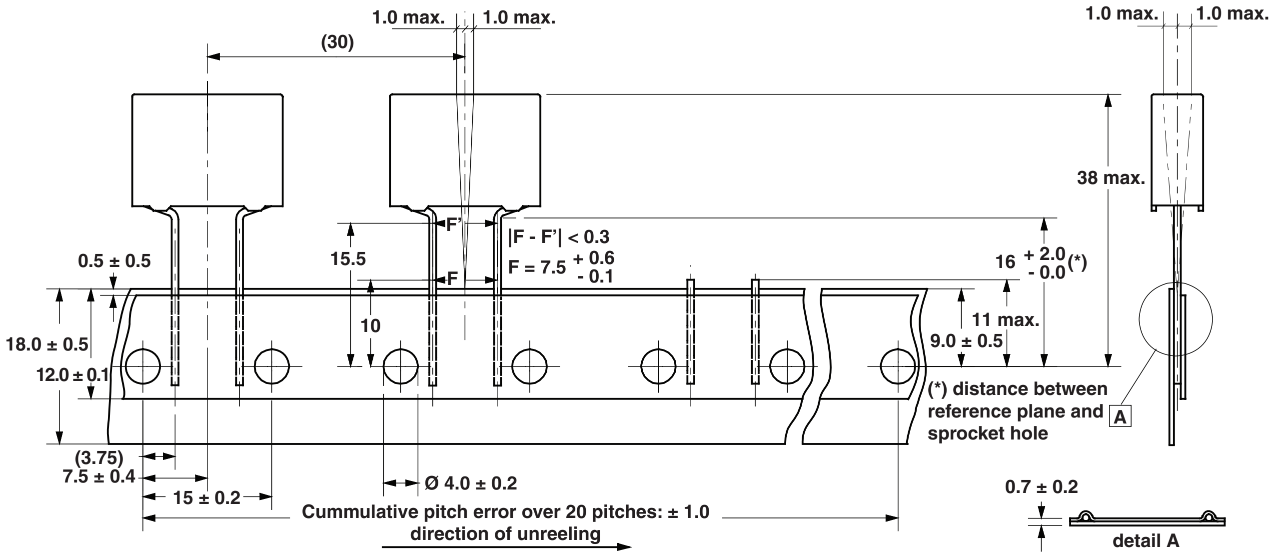


1.1.3. RADIAL POTTED BENT BACK LEADS

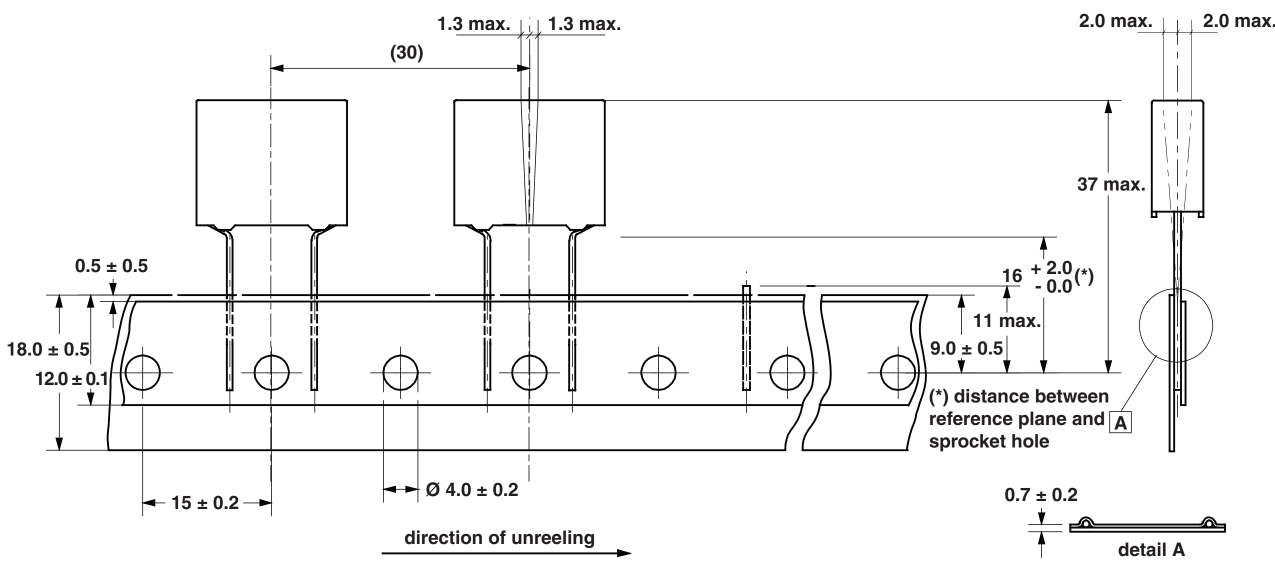
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H)
(original pitch = 10.0 mm)



BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H)
(original pitch = 15.0 mm)



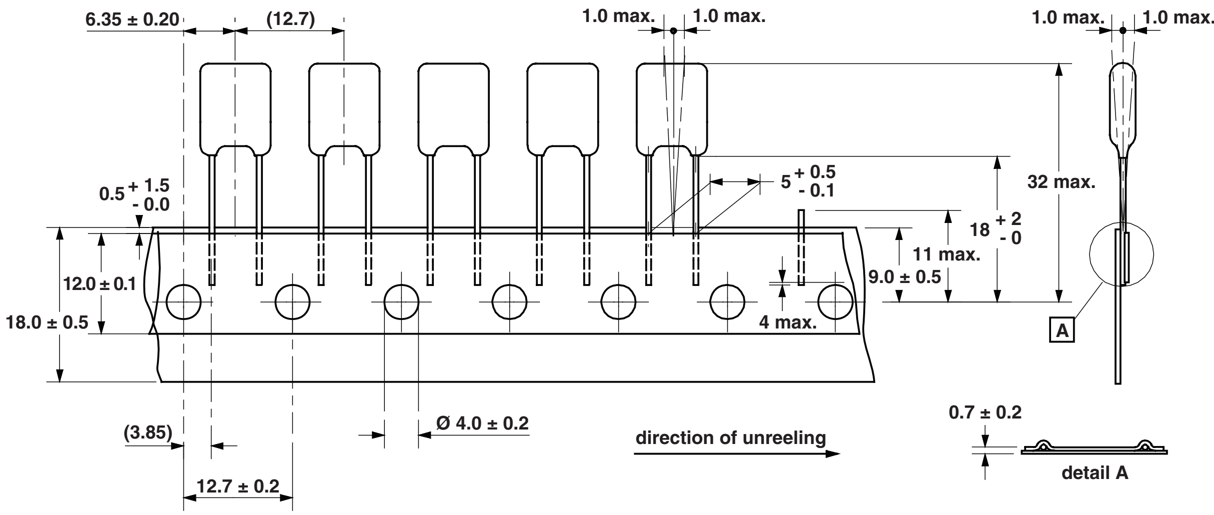
BENT BACK PITCH = 10 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H)
(original pitch = 15.0 mm)



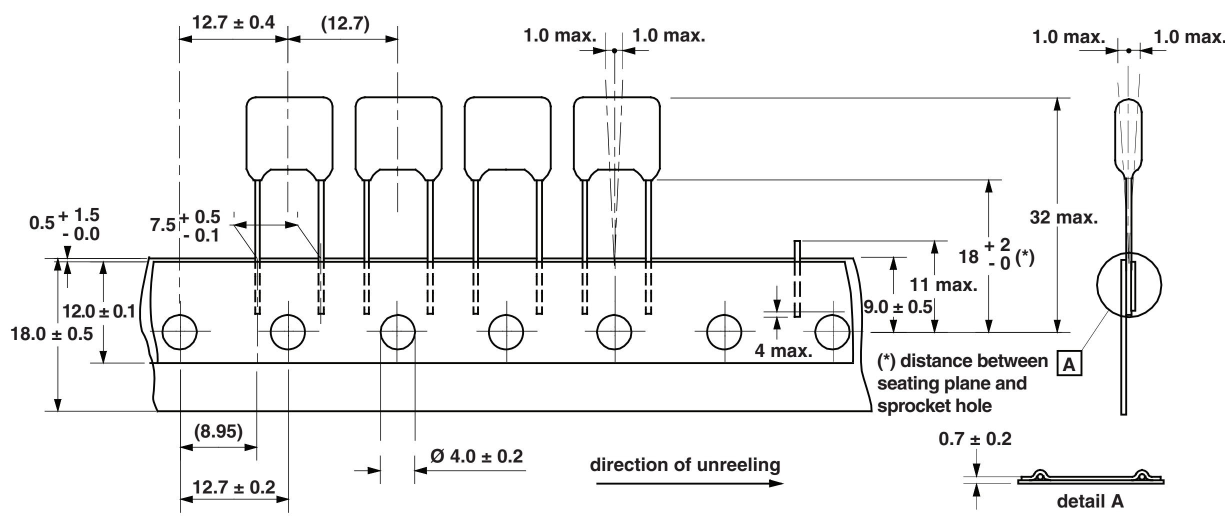
1.2. RADIAL LACQUERED FILM CAPACITORS

1.2.1. RADIAL LACQUERED STRAIGHT LEADS

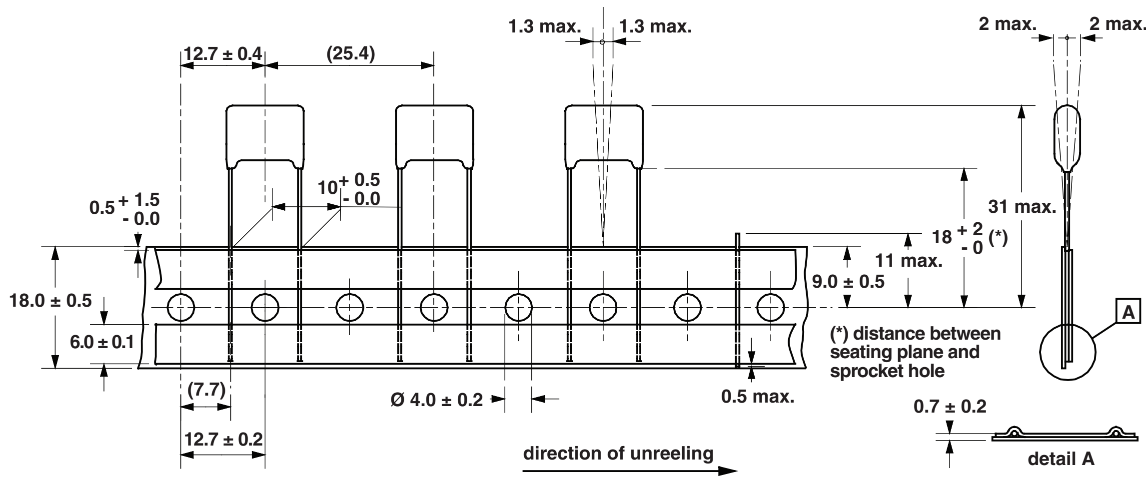
PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P0); TAPING HEIGHT 18.0 mm (H)



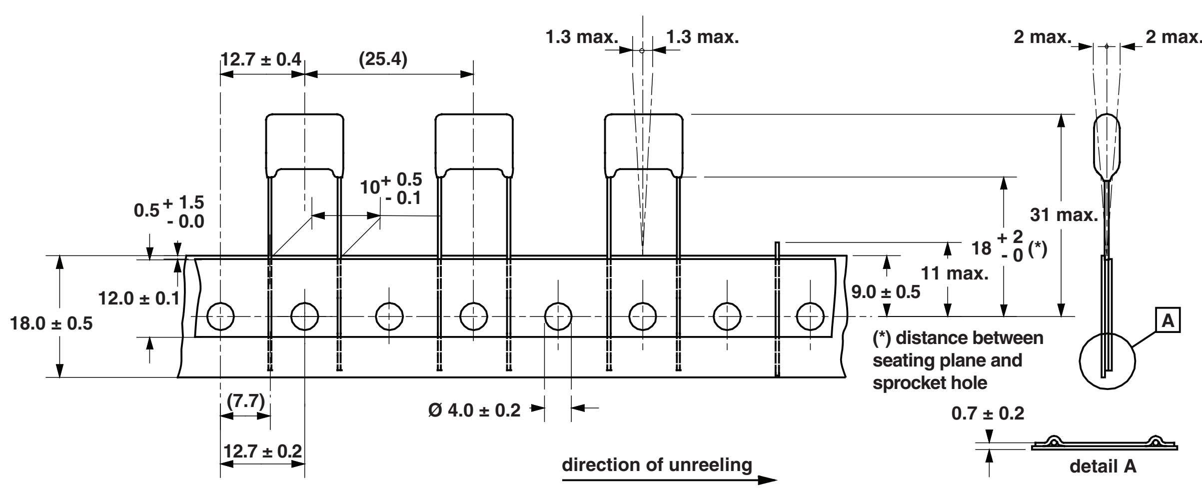
PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.0 mm (H)



PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.0 mm (H); TWO TAPES

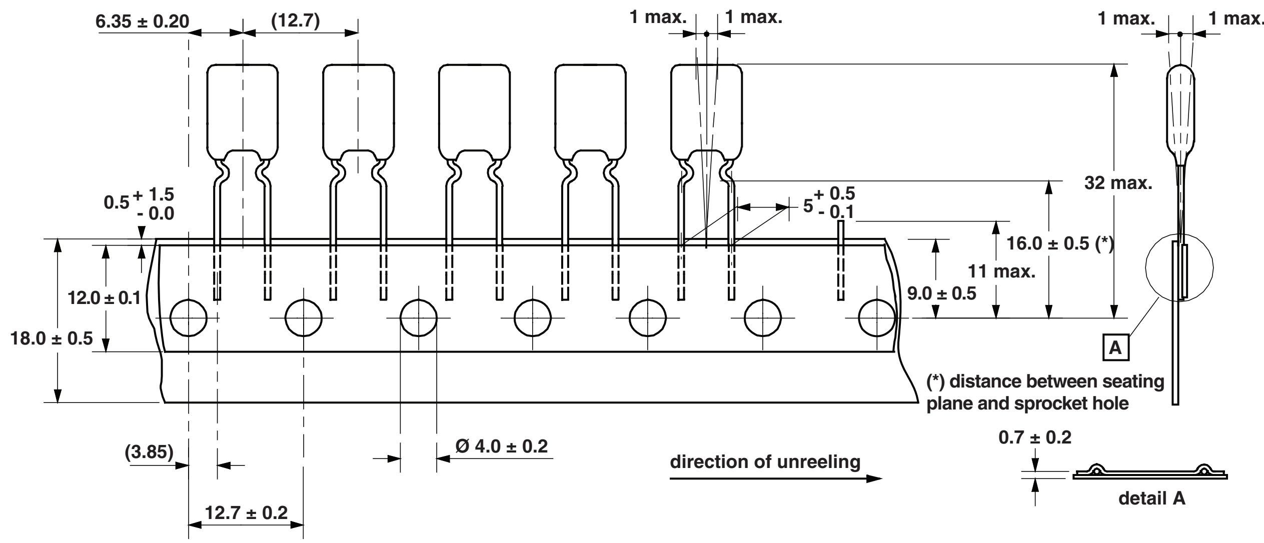


PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 18.0 mm (H); ONE TAPE

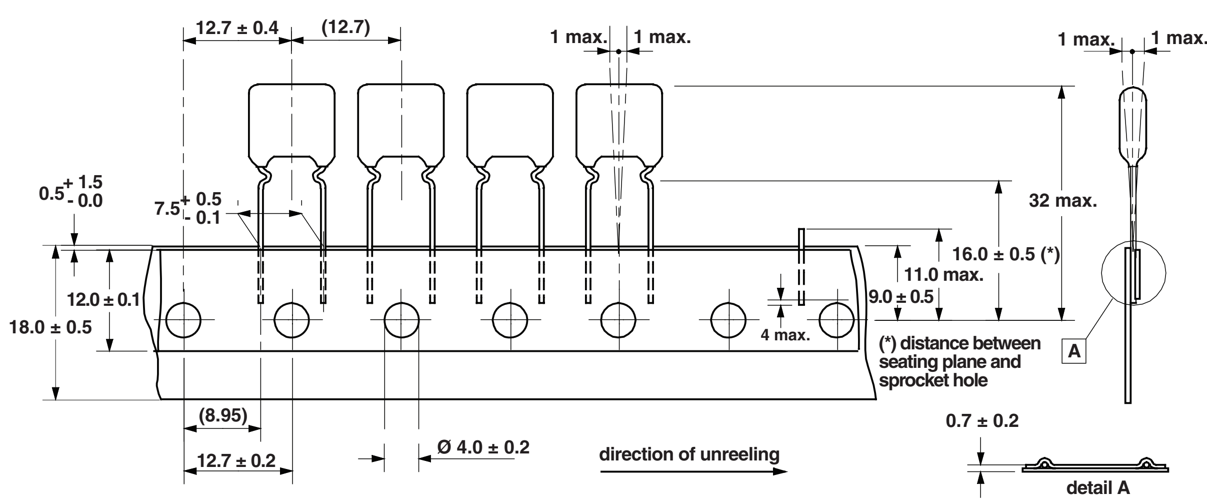


1.2.2. RADIAL LACQUERED FILM CAPACITORS

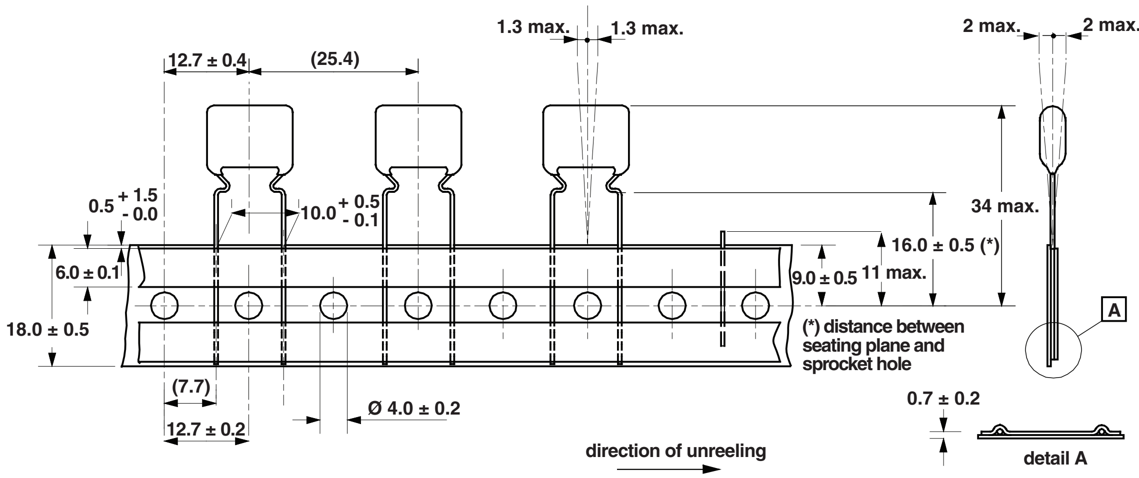
PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H)



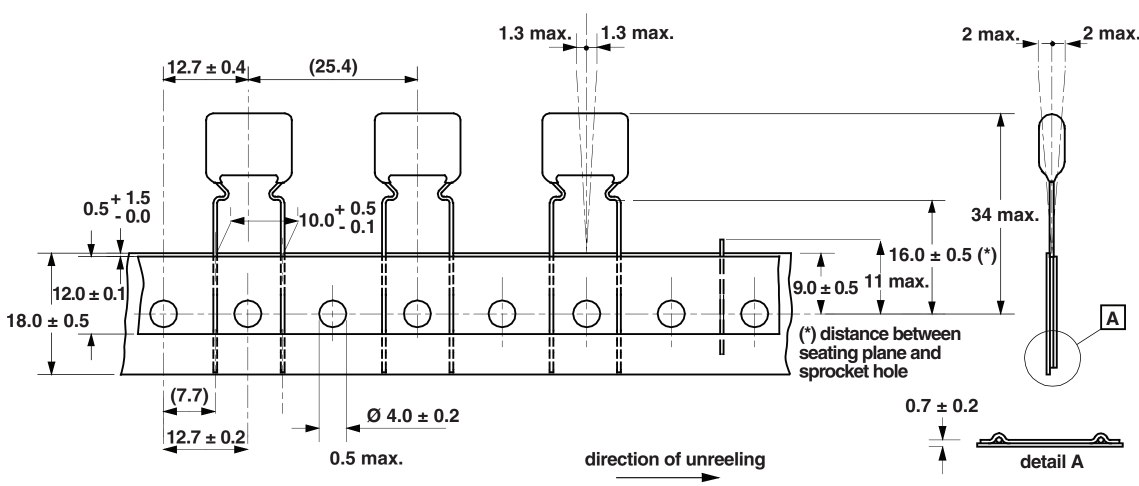
PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H)



PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); TWO TAPES

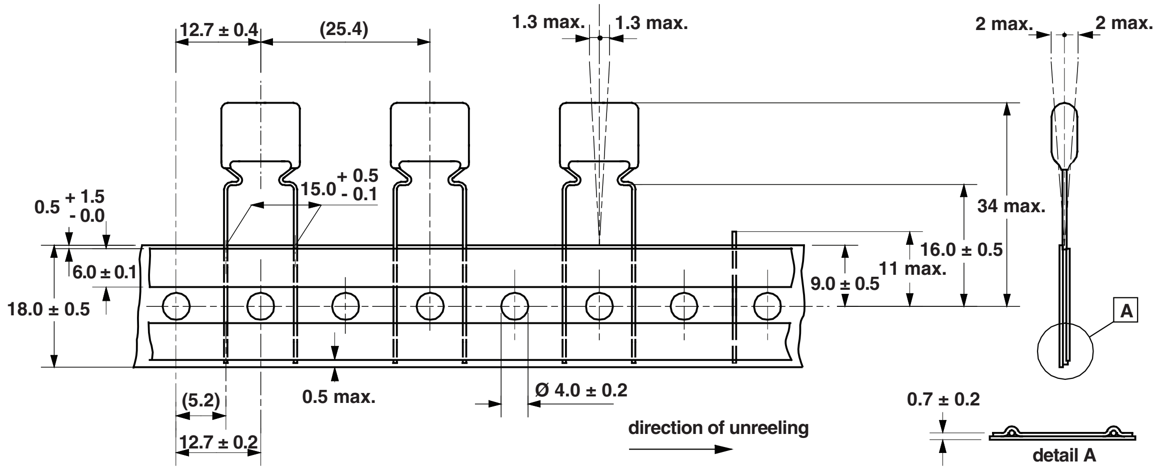


PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE

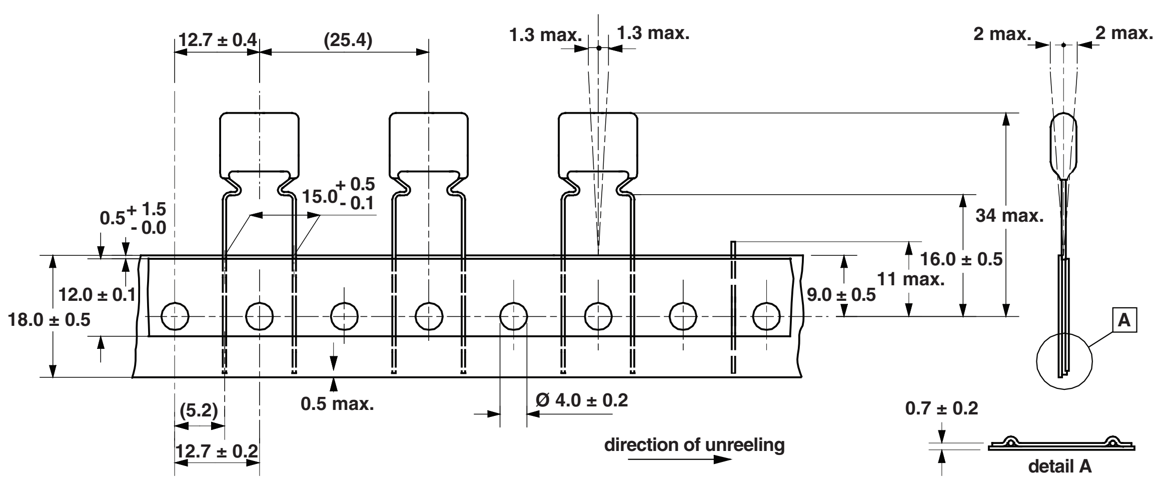


For technical questions, contact: dc-film@vishay.com
Document Number: 28139
Revision: 12-Dec-08

PITCH = 15.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); TWO TAPE

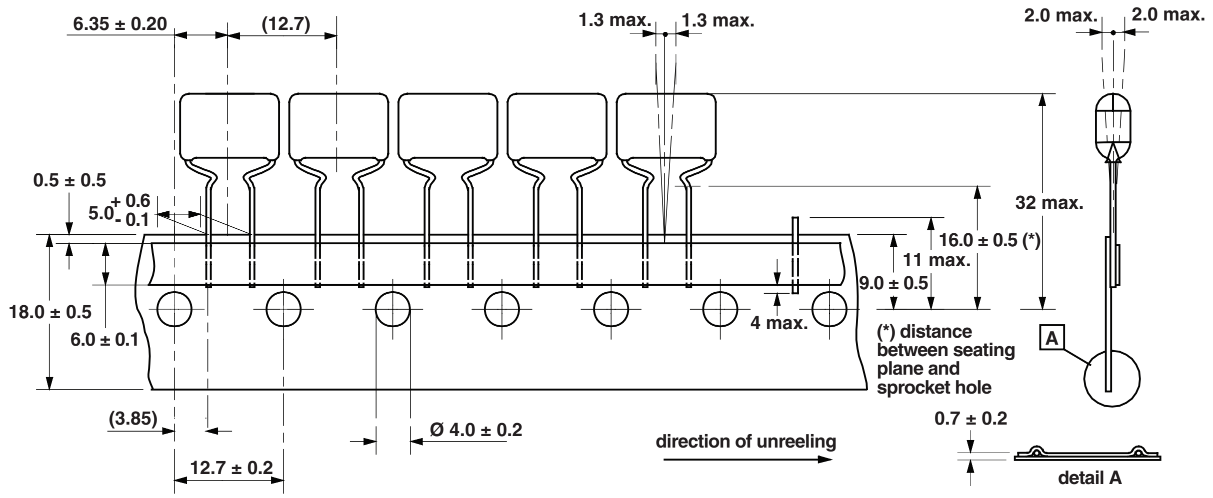


PITCH = 15.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE

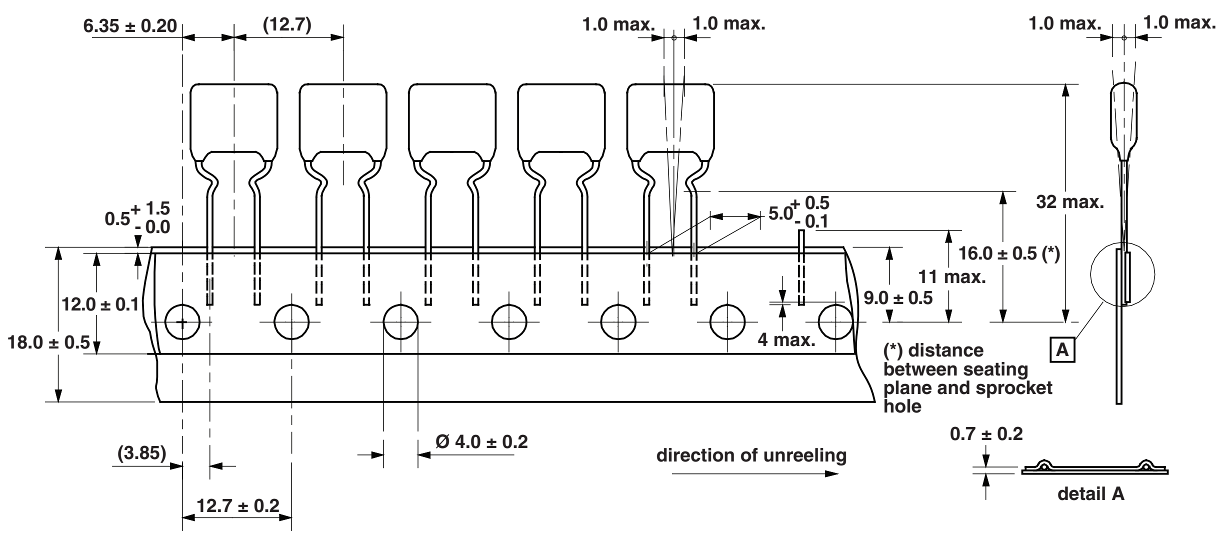


1.2.3. RADIAL LACQUERED BENT BACK LEADS

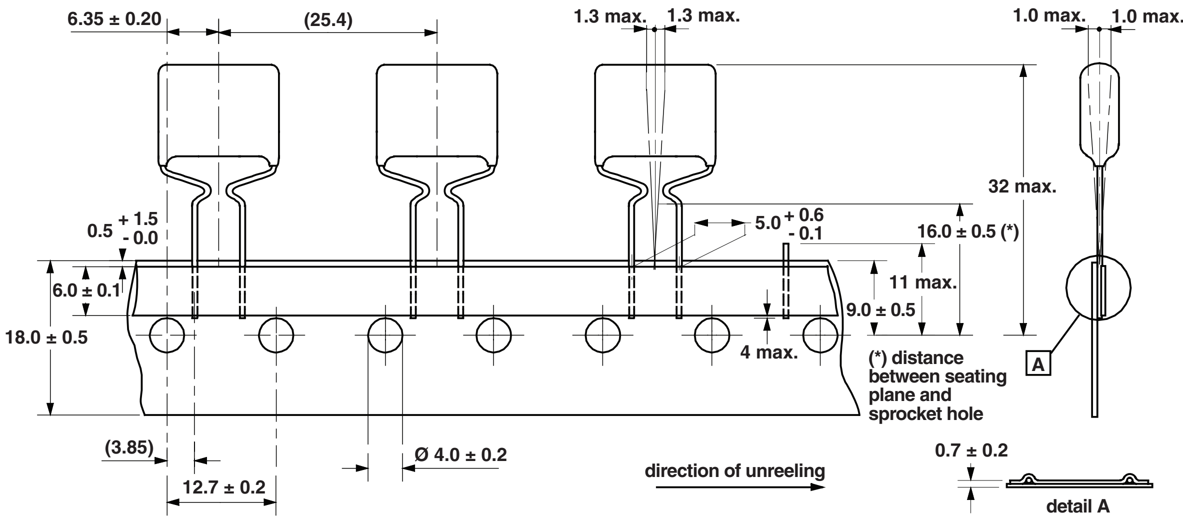
BENT BACK PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); 6 mm TAPE
(original pitch = 7.5 mm)



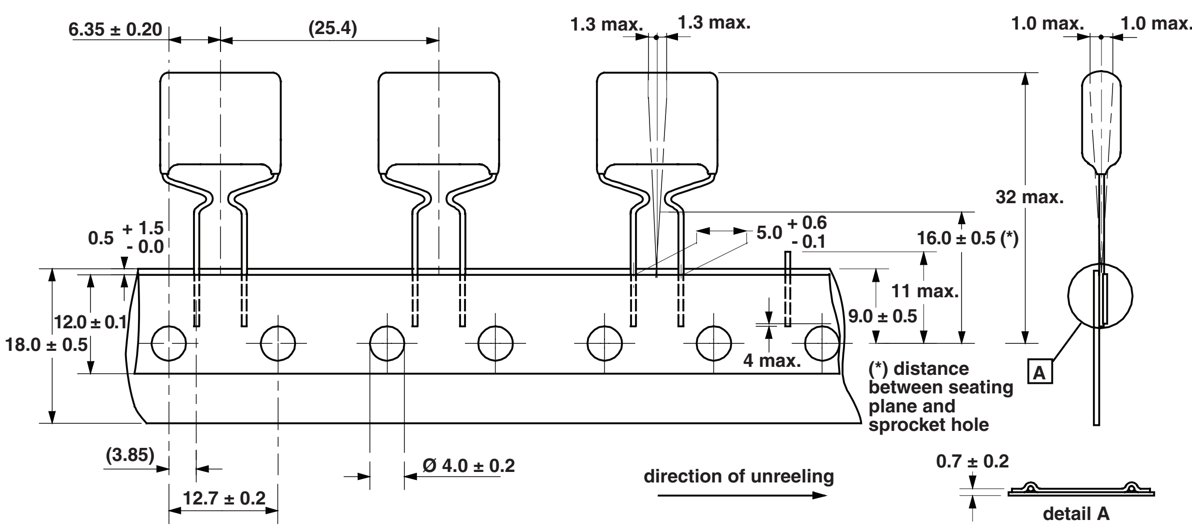
BENT BACK PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); 12 mm TAPE
(original pitch = 7.5 mm)



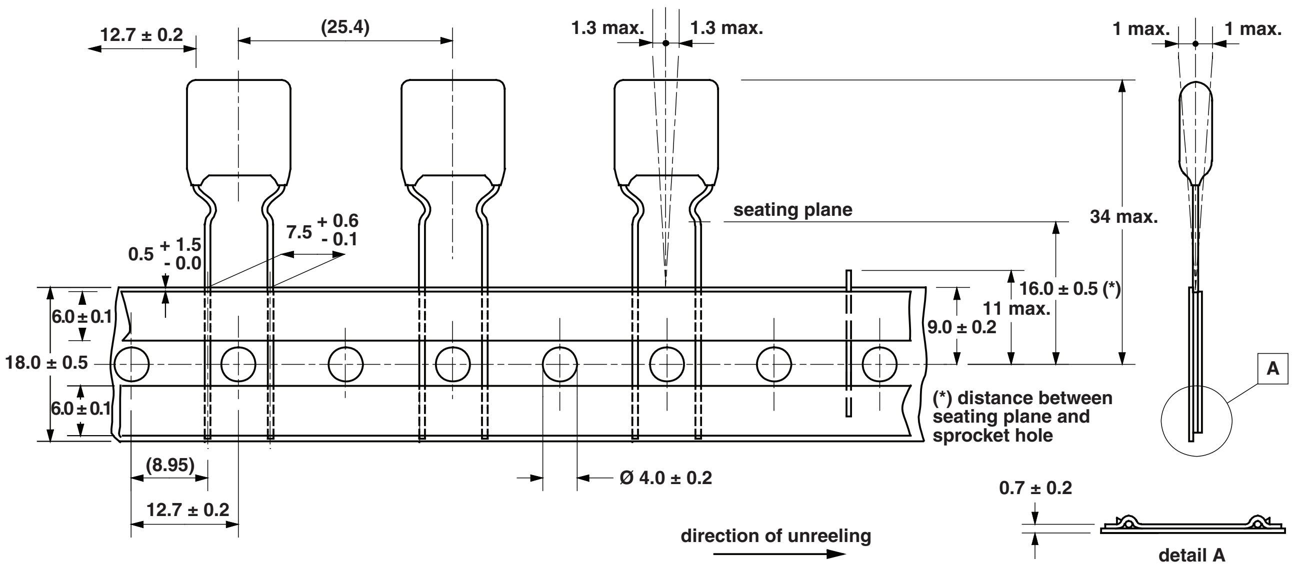
BENT BACK PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); 6 mm TAPE
(original pitch = 10.0 mm)



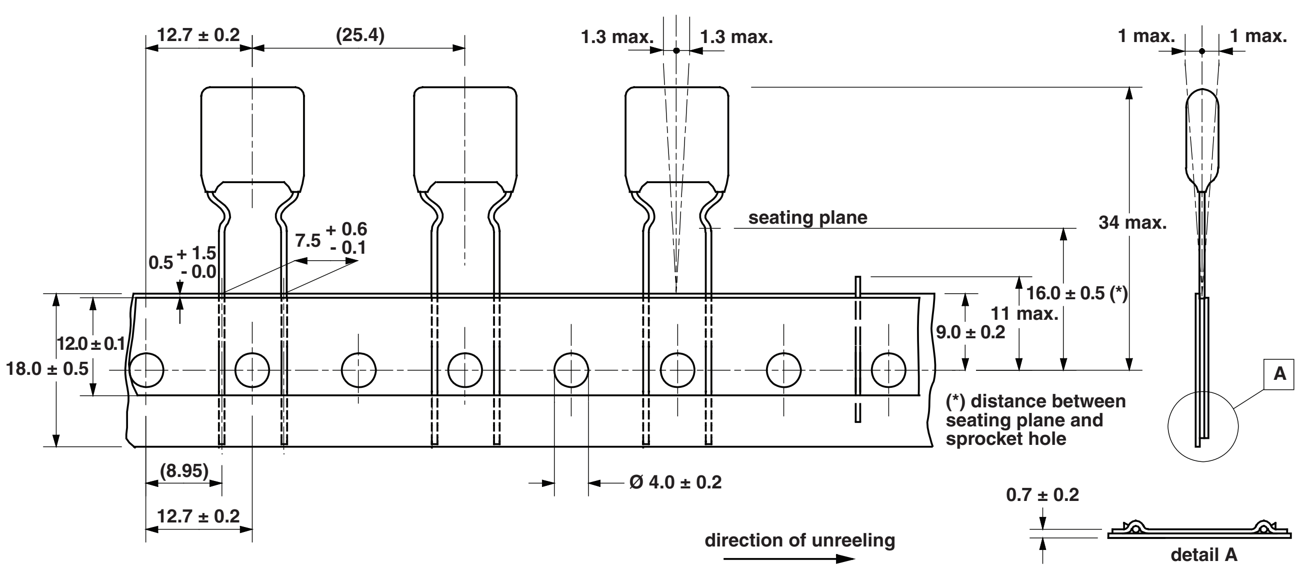
BENT BACK PITCH = 5.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); 12 mm TAPE
(original pitch = 10.0 mm)



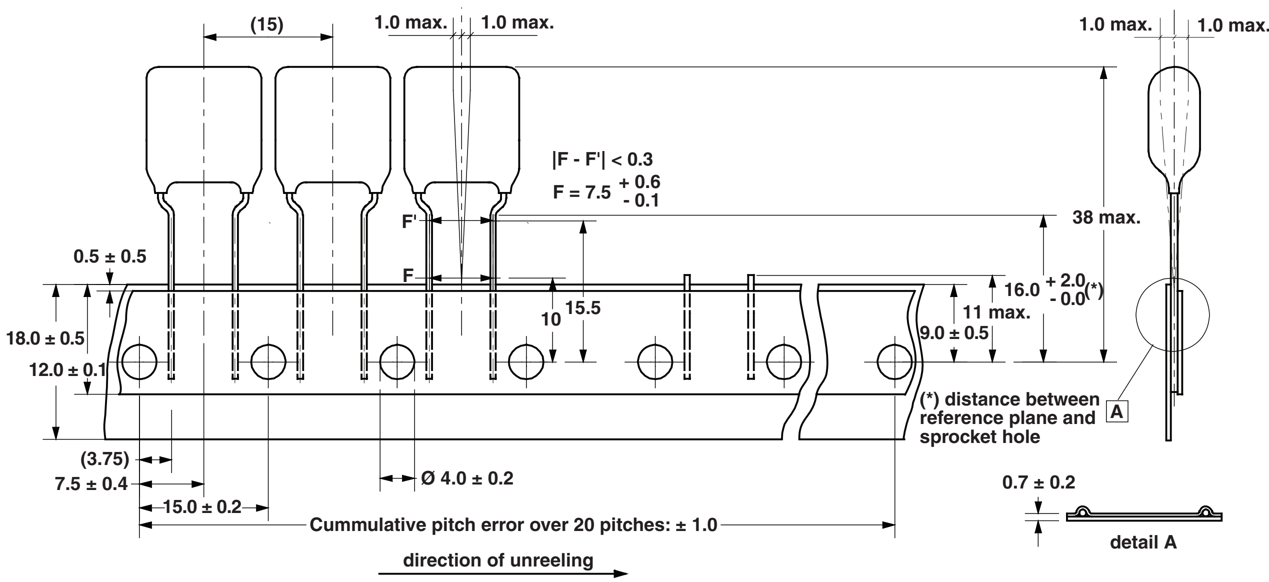
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); TWO TAPES
(original pitch = 10.0 mm)



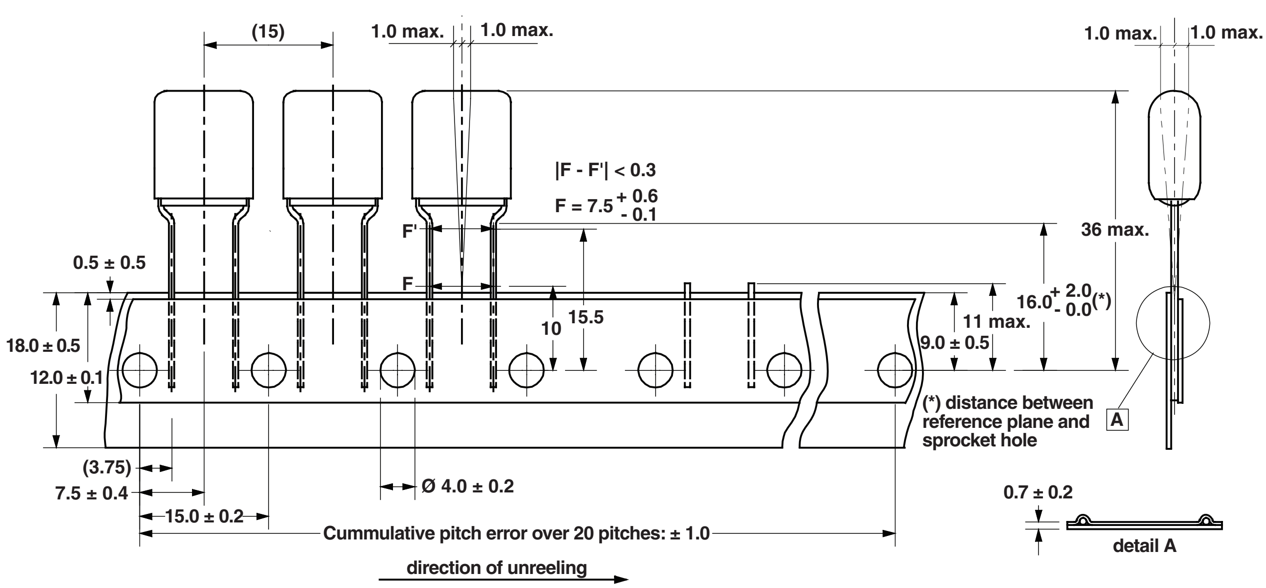
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE
(original pitch = 10.0 mm)



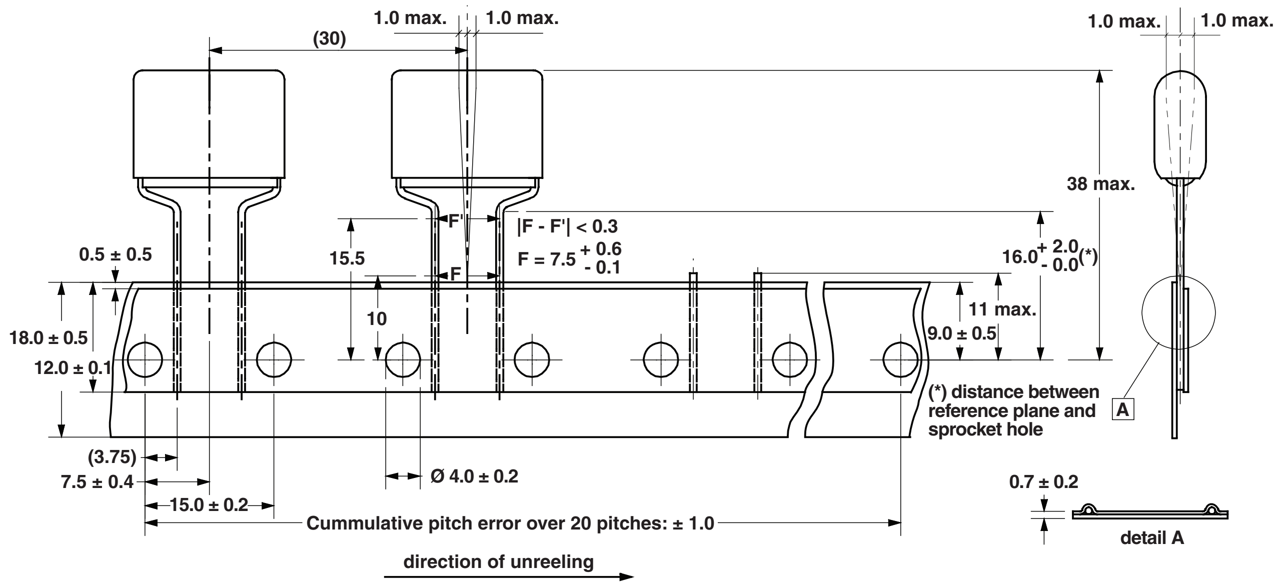
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H)
(original pitch = 10.0 mm)



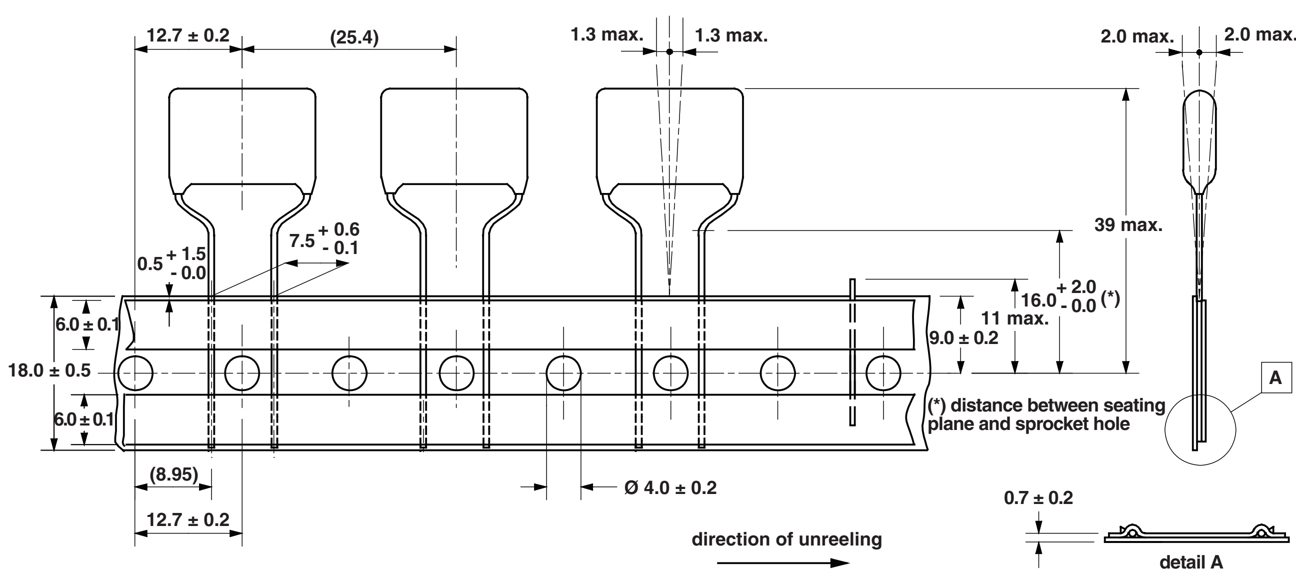
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H); NAKED BELLY
(original pitch = 10.0 mm)



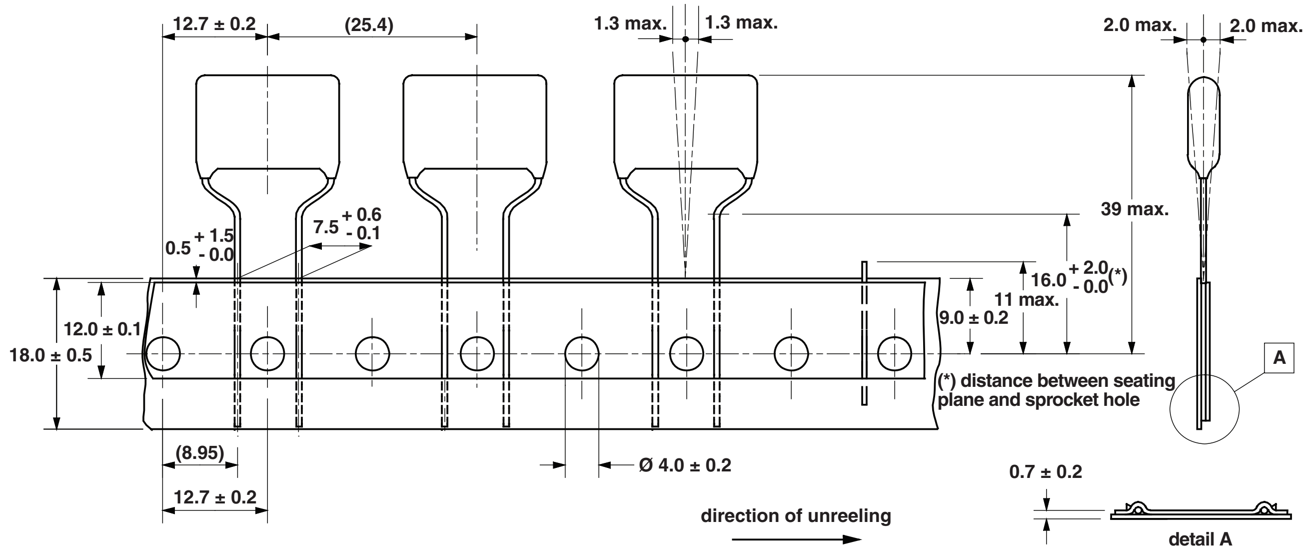
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H); NAKED BELLY
(original pitch = 15.0 mm)



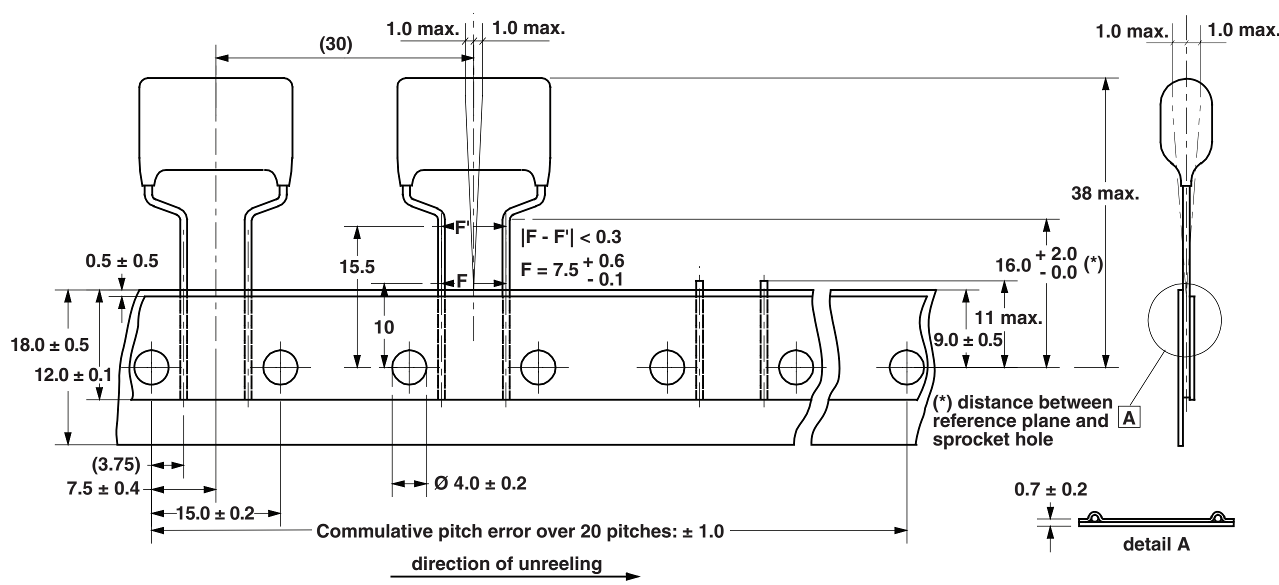
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); TWO TAPES
(original pitch = 15.0 mm)



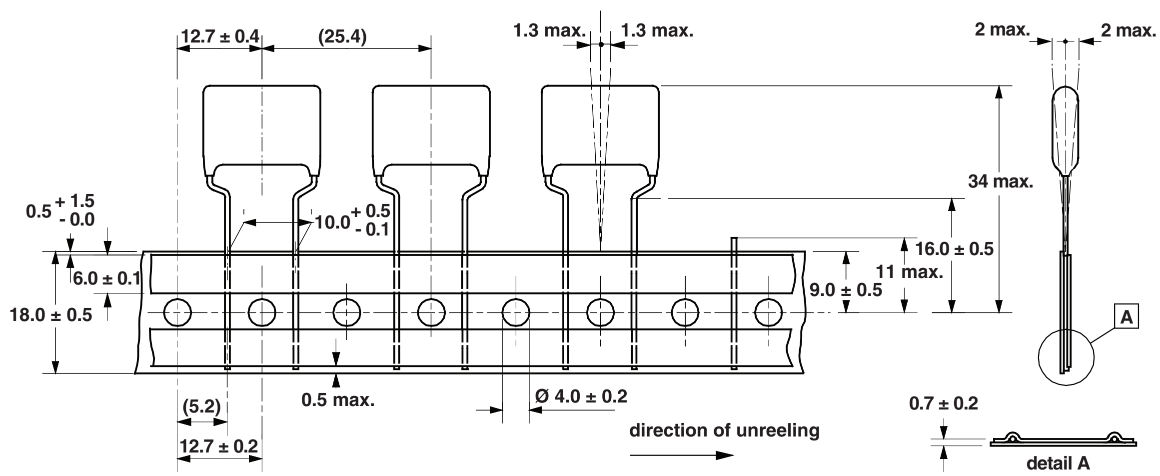
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE
(original pitch = 15.0 mm)



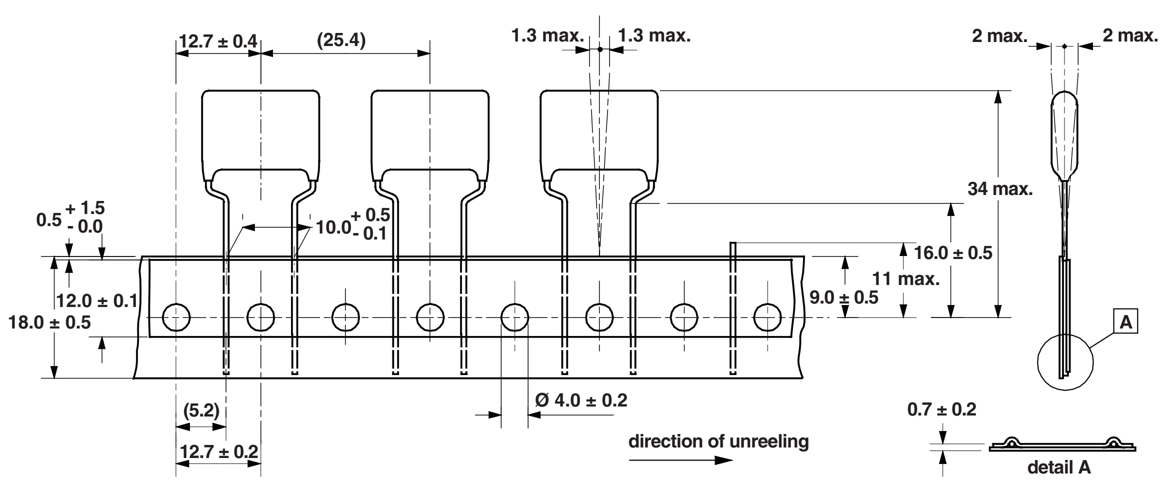
BENT BACK PITCH = 7.5 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE
(original pitch = 15.0 mm)



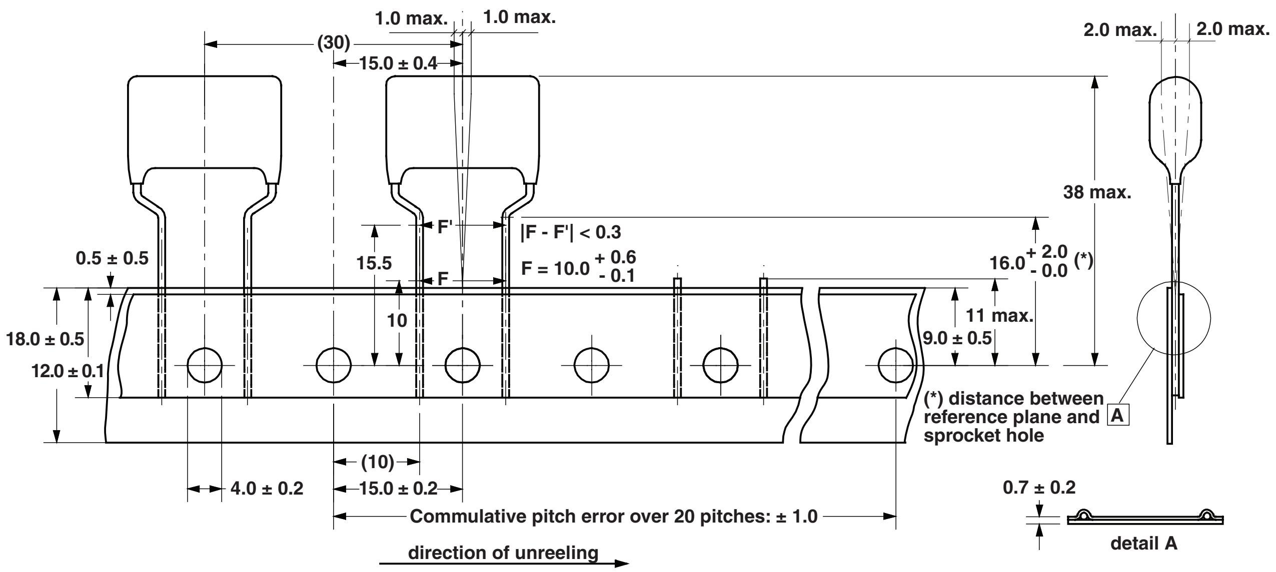
BENT BACK PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); TWO TAPES
(original pitch = 15.0 mm)



BENT BACK PITCH = 10.0 mm (P); SPROCKET HOLE 12.7 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE
(original pitch = 15.0 mm)



BENT BACK PITCH = 10.0 mm (P); SPROCKET HOLE 15.0 mm (P_0); TAPING HEIGHT 16.0 mm (H); ONE TAPE
(original pitch = 15.0 mm)



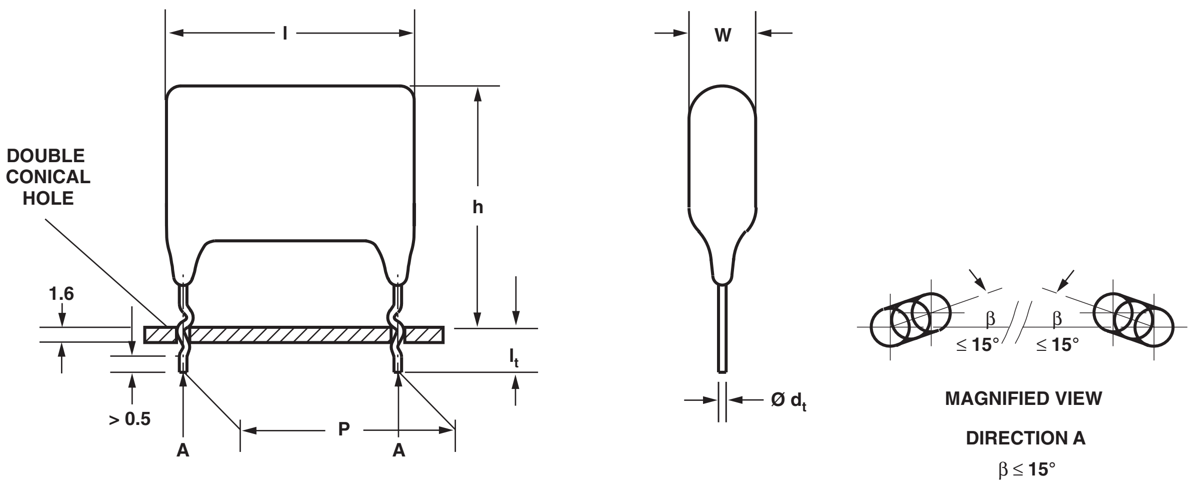
1.3. TAPING CHARACTERISTICS FOR RADIAL POTTED AND LACQUERED FILM CAPACITORS

RADIAL LEADS	
DESCRIPTION	**VALUE**
Pull-out force of the component	≥ 5 N
Peel-off force of adhesive tape	≥ 6 N
Tearing force of tape	≥ 15 N
Storage conditions	
Storage temperature	- 25 to + 40 °C
Maximum relative humidity without condensation	80 %

2. SPECIAL KINKING INFORMATION

RADIAL LACQUERED FILM CAPACITORS WITH DOUBLE KINK

General data



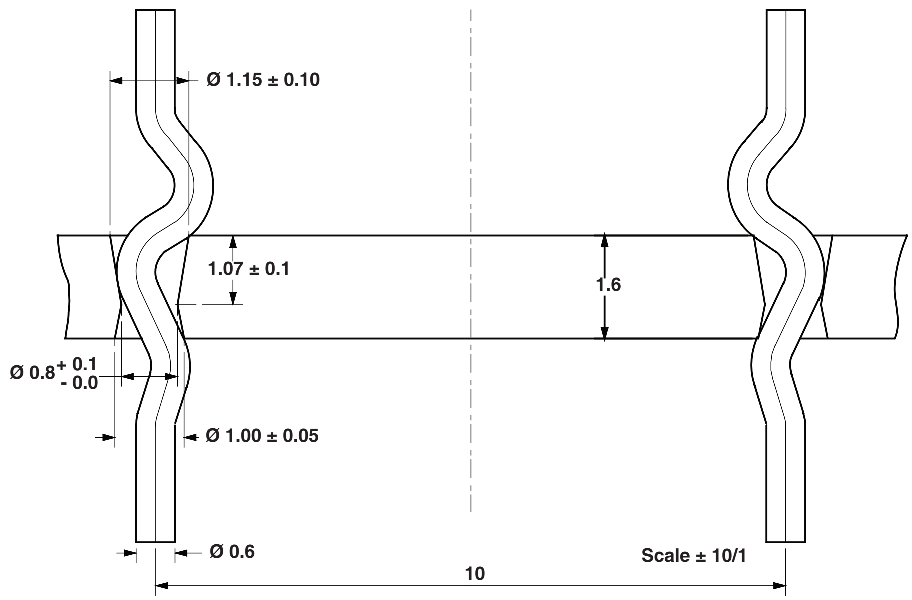
DOUBLE KINK CAPACITORS

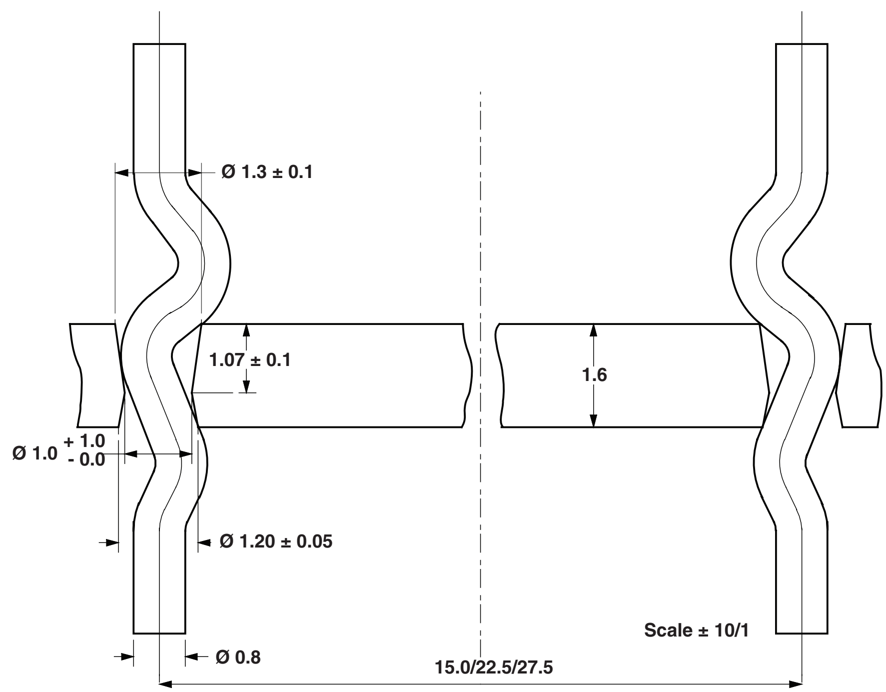
PITCH (mm)	LEAD DIAMETER (mm)
10.0 ± 1.0	0.6
15.0 ± 1.0	0.8
22.5 ± 1.0	0.8
27.5 ± 1.0	0.8

The capacitors are usable for radial manual insertion on PCB. The fixation on the board by double kinked leads prevents that the component jumps out of the PCB during transport.

The components with lead diameter of 0.6 mm are usable for being inserted in punched holes with nominal diameter of 0.8 mm and the components with lead diameter of 0.8 mm are usable for being inserted in punched holes with nominal diameter of 1.0 mm.

The pitch is specified on the top of the leads. After manufacturing, the products meet the specification. Although special care is taken to the packaging, deviations may occur due to transport.





3. PACKAGING INFORMATION

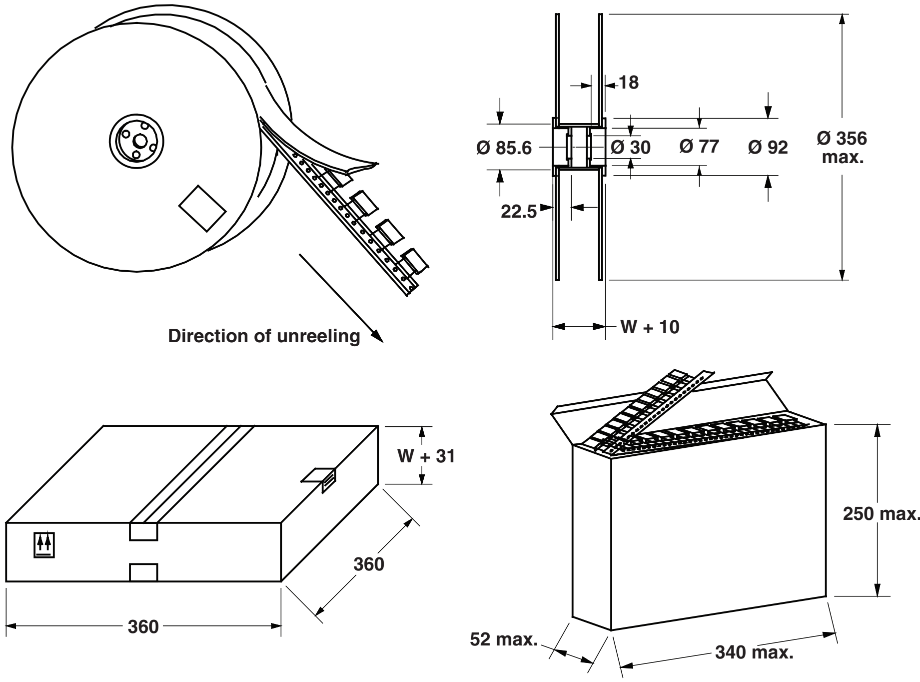
3.1. LOOSE IN BOX

3.1.1. Lacquered capacitors (all pitches) and potted capacitors (pitch ≤ 15 mm: all; pitch > 15 mm: long leads)
“Loose in box” capacitors are packed in carton boxes. For quantities per box see detail specifications.

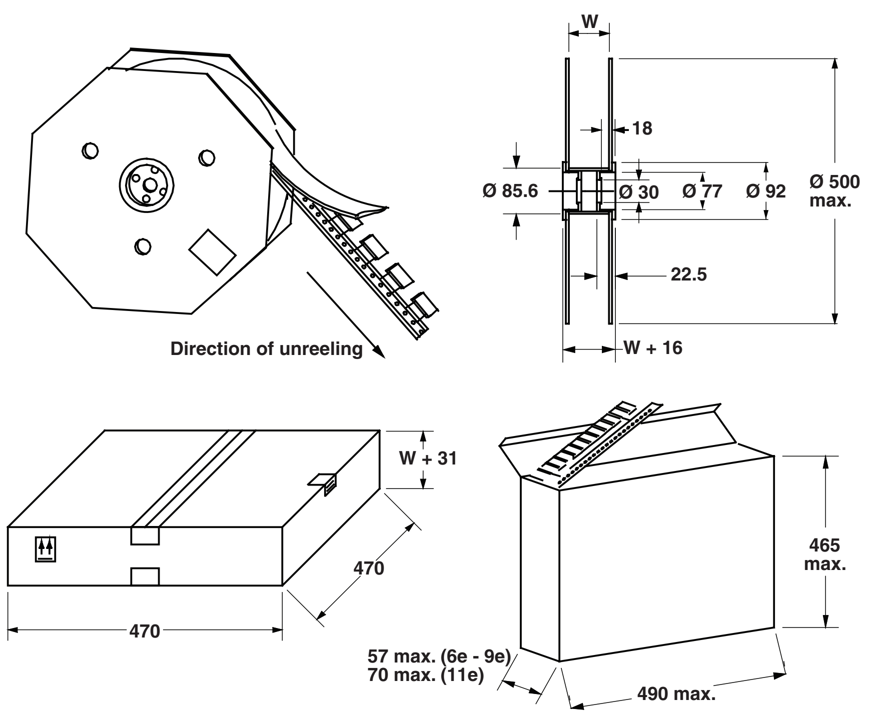
3.1.2. Potted capacitors (pitch > 15 mm, short leads)
“Loose in box” capacitors are packed in tray form. For quantities per box see detail specifications.

3.2 TAPED ON REEL

3.2.1 SMALL REELS (356 mm)/AMMOPACK



3.2.2 LARGE REELS (500 mm)/AMMOPACK



W AS A FUNCTION OF PRODUCT HEIGHT

h (mm)	W ± 2 mm
≤ 9.0	40
10.0 up to and including 15.0	45
15.5 up to and including 19.5	50
21.0 up to and including 23.0	55
25.0 up to and including 28.0	60
31.0	65

The cumulative pitch error is: 1.0 mm per 20 pitches.
The maximum number of empty positions per reel shall not exceed 0.5 % [(1)] of the total number of components per reel, but no more than 2 consecutive positions may be vacant provided this gap is followed by 6 consecutive components.

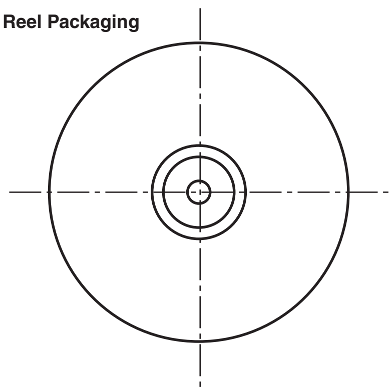
Note

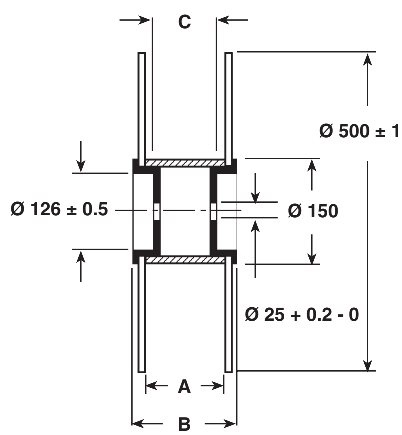
1. Potted: this 5 % for capacitors in ammopack (exept for capacitors with w = 2.5 or 3.5 mm and l = 7.2 mm)
   lacquered for pitches 15 and 22.5 mm: 5 % for capacitors in ammopack (exept for capacitors with w = 2.5 or 3.5 mm and l = 7.2 mm)

PACKAGING INFORMATION LARGE REELS (500 mm)/AMMOPACK: VISHAY ROEDERSTEIN ONLY

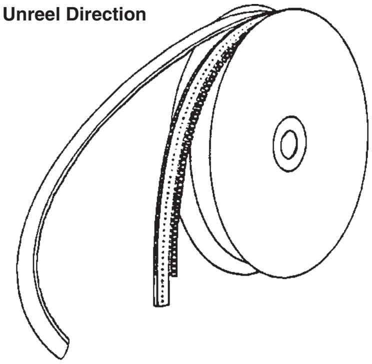
RADIAL PLASTIC (ROBOTIC INSERTION)

Reel Packaging

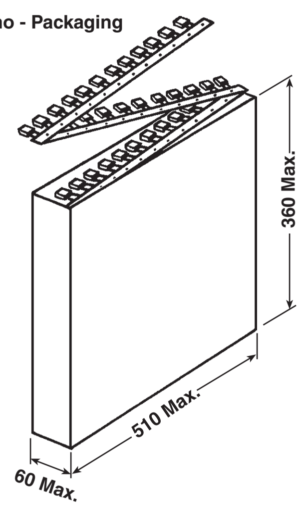




Unreel Direction



Ammo - Packaging



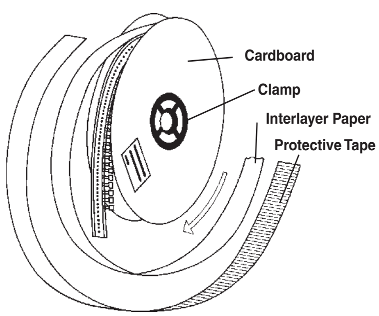
MAX. CAP. HEIGHT	**REEL - DIMENSIONS** in millimeters		
H	A	B	C
20	52	70	28
25	57	75	33
30	82	80	38
35	67	85	43
40	72	90	48

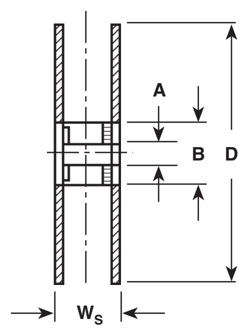
PACKAGING INFORMATION SMALL REELS (350 mm)/AMMOPACK: VISHAY ROEDERSTEIN ONLY

LETTER CODES FOR TAPING OF RADIAL LEADED CAPACITORS (Pitch 5 mm to 15 mm)

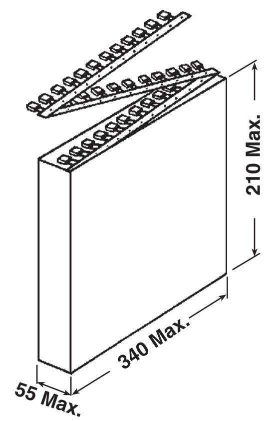
LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (mm)
D	AMMO	16.5
G	AMMO	18.5
F	REEL	16.5
W	REEL	18.5

REEL FOR RADIALLY TAPED CAPACITORS
(Box size 50 mm x 370 mm x 370 mm)





CARDBOARD BOX FOR RADIALLY TAPED CAPACITORS (Ammo - Packaging)



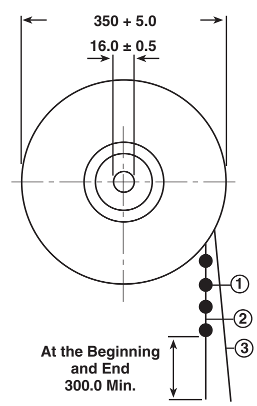
DIMENSIONS (mm)
D = Ø 350
A = Ø 30
B = Ø 85
W_S = 52 Max.

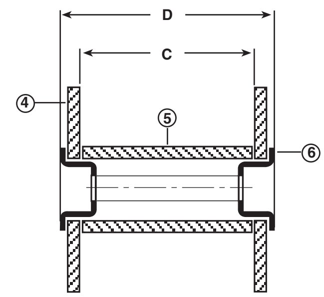
PACKAGING INFORMATION AXIAL TYPES; VISHAY ROEDERSTEIN ONLY

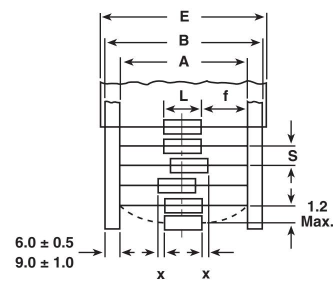
AXIAL FILM CAPACITORS ACC. TO EN/IEC 60286-1

1. Capacitor
2. Tape
3. Kraft paper layers between components for protection
4. Flange (3.0mm thick)
5. Reel
6. Plastic hub

A. Inner spacing of tapes
B. Outer spacing of tapes
C. Inner reel width
D. Outer reel width
E. Width of kraft paper layers
F. Width of outer kraft paper layers
S. Component spacing
T. Permissible deviation over 10 spaces
L. Body length of capacitor
f. ≥ 19.0 mm
x. ± 0.5 for $L_{max.}$ ≤ 26 mm
x. ± 0.7 for $L_{max.}$ > 26 mm







Note:
The capacitors can also be supplied in cardboard box (Ammopack)

WIDTH OF ADHESIVE TAPE:
6.0 ± 0.5 mm for class I, II and III (S = 10.0 ± 0.5)
9.0 ± 1.0 mm for class III (S = 15.0 ± 0.5) and IV

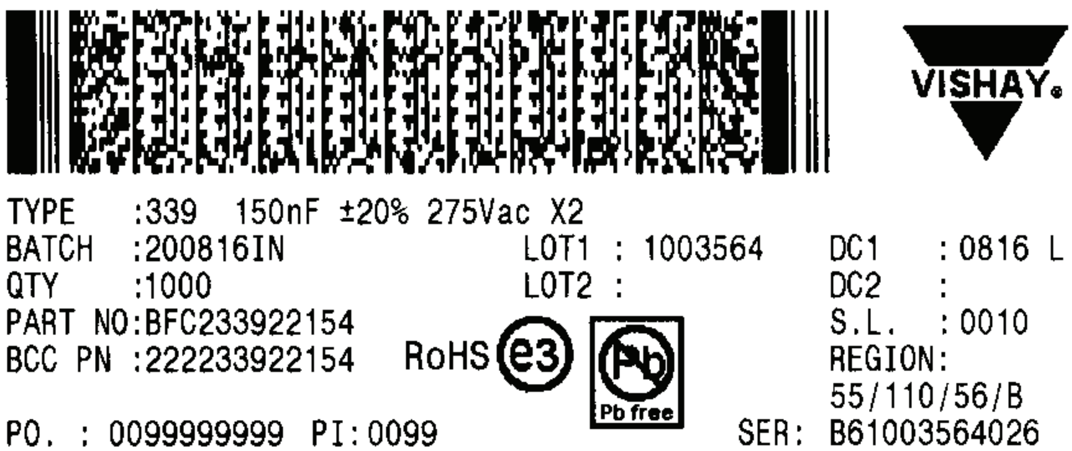
MKT 1813, MKP 1839, MKP 1845, MKC 1860

CAP. DIM. Ø D		$L_{max.}$	Input Class	A mm	S mm	T mm	B mm	C mm	$D_{max.}$ mm	E mm
≤ 5.0	11.5	6	I	53 ± 2	5 ± 0.5	± 2	65 ± 2	70^{-1}	80	68^{-1}
> 5.0 ≤ 7.0	11.5	6	I	53 ± 2	10 ± 0.5	± 2	65 ± 2	70^{-1}	80	68^{-1}
> 5.0 ≤ 9.5	22.0	6	II	63 ± 2	10 ± 0.5	± 2	75 ± 2	85^{-1}	95	83^{-1}
> 5.0 ≤ 9.5	31.5	6	III	73 ± 2	10 ± 0.5	± 2	85 ± 2	100^{-1}	110	98^{-1}
> 9.5 ≤ 13.5	31.5	9	III	73 ± 2	15 ± 0.75	± 3	91 ± 2	100^{-1}	110	98^{-1}
> 13.5 ≤ 18.0	31.5	9	IV	73 ± 2	20 ± 1	± 4	91 ± 2	100^{-1}	110	98^{-1}
> 13.5	41.5	9	IV	73 ± 2	20 ± 1	± 4	91 ± 2	100^{-1}	110	98^{-1}
(1)	41.5	9	IV	73 ± 2	30 ± 1	± 4	91 ± 2	100^{-1}	110	98^{-1}

Note:
(1) Taping for $L_{max.}$ = 41.5 mm upon request

4. LABELLING INFORMATION

2D LABEL



EXPLANATION:

LINE	
1	2D barcode and manufacturer's logo
2	Type description Capacitance value Tolerance Voltage Class (if applicable)
3	Batch number Lot number Date code Factory code
4	Quantity
5	Part number SAP number RoHS symbols S.L.: Stocking location
6	Vishay catalog number REGION: Plant number
7	Climatic category (if applicable)
8	PO: Production order PI: Production item SER.N. box number

ONLINE INFORMATION

For product information and a current list of sales offices, representatives and distributors, visit our website:

www.vishay.com

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