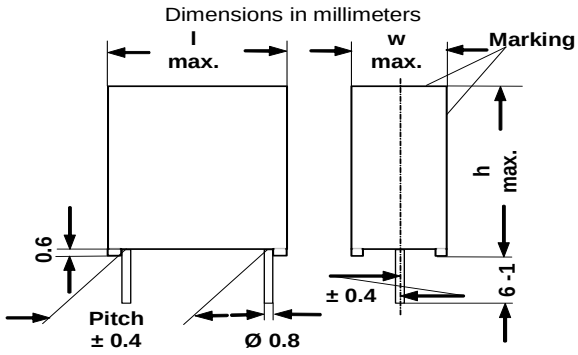
Metallized Polypropylene Capacitor-Mini Version (M)
MKP Radial Potted Type



Pb-free

e3

RoHS
Compliant

Lead diameter d_t (mm)	w (mm)	Pitch (mm)
0.5 ± 0.05	-	5
0.6 ± 0.06	-	7.5 - 10
0.8 ± 0.08	-	15 - 27.5
0.8 ± 0.08	< 16	37.5
1.0 ± 0.1	≥ 16	

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 contruction

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 to 37.5 mm lead pitch.Supplied loose in box, taped on reel and Ammopack
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

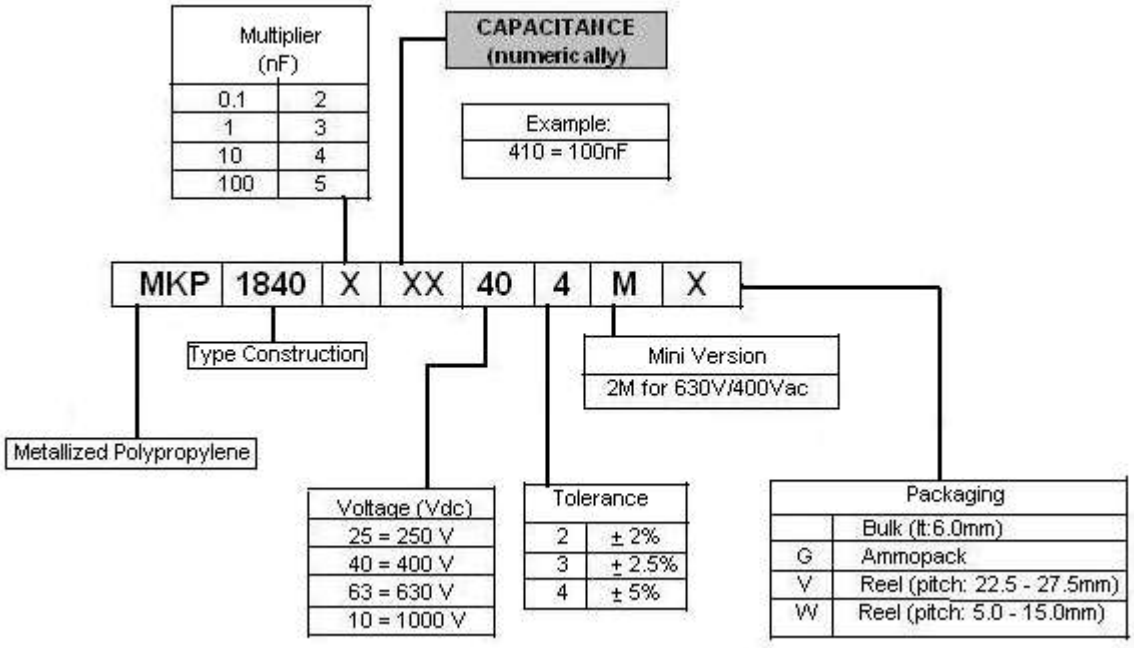
CAPACITANCE TOLERANCE
±5%, ±2.5%, ± 2%

LEADS
Tinned wire

MAXIMUM APPLICATION TEMPERATURE
100°C

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

COMPOSITION OF CATALOGUE NUMBER



Notes

1. For detailed tape specifications refer to Packaging information" www.vishay.com/doc?28139

SPECIFIC REFERENCE DATA

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

Pitch (mm)	Maximum pulse rise time $(dU/dt)_R$ [V /µs]			
	250 V dc	400 V dc	630 V dc	1000 V dc
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
If the max. pulse voltage is less than the rated voltage higher dU/dt values can be permitted.				

R between leads, for C ≤ 1.0 µF at 100 V; 1 minute	> 100000 MΩ
RC between leads, for C 1.0 µF at 100 V; 1 minute	> 100000 s
R between leads and case; 100 V; 1 minute	> 30000 MΩ
Withstanding (DC) voltage (Cut off current 10mA) rise time 100 V/S	1.6 X U_{Rdc}, 1 Minute
Withstanding (DC) voltage between leads and case	500 V; 1 Minute
Maximum application temperature	100°C

Metalized Polypropylene Film capacitor ,Mini Version (-M)

Capacitance	Capacitance Code	VOLTAGE CODE 25 250 V dc/160 V ac				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)
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	-	-	-	-

* Ordering code –2M (e.g. MKP 1840 410 635-2M)

Capacitance	Capacitance Code	VOLTAGE CODE 63 630 Vdc /400 Vac**				VOLTAGE CODE 10 1000 Vdc /500 Vac **			
		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
6800 pF	-268	-	-	-	-	4.0	9.0	13.0	10
0.01 µF	-310	4.5	9.5	13.0	10*	5.5	10.5	13.0	10
0.015 µF	-315	5.5	10.5	13.0	10*	6.5	11.5	13.0	10
0.022 µF	-322	6.5	11.5	13.0	10*	5.5	10.5	18.0	15
0.033 µF	-333	5.5	10.5	18.0	15*	6.0	12.0	18.0	15
0.047 µF	-347	6.5	12.5	18.0	15*	7.5	13.5	18.0	15
0.068 µF	-368	7.5	13.5	18.0	15*	8.5	14.5	18.0	15
0.10 µF	-410	6.5	14.5	26.5	22.5*	7.5	15.5	26.5	22.5
0.15 µF	-415	7.5	15.5	26.5	22.5*	9.0	17.0	26.5	22.5
0.22 µF	-422	8.5	16.5	26.5	22.5*	10.5	18.5	26.5	22.5
0.33 µF	-433	11.0	21.0	26.5	22.5*	11.5	20.5	31.5	27.5
0.47 µF	-447	11.5	20.5	31.5	27.5*	13.5	23.5	31.5	27.5
0.68 µF	-468	13.5	23.5	31.5	27.5*	16.5	29.5	31.5	27.5
1.0 µF	-510	16.5	29.5	31.5	27.5*	18.0	33.0	31.5	27.5

Further C-values upon request

Other PCM on request
**Not suitable for mains applications.
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 EXAMPLE	Pitch ≤ 15	Pitch 22,5-27,5	Pitch 37,5
G	AMMO	18.5	S*	MKP 1840- 410 /404- MG	x	-	-
W	REEL	18.5	350	MKP 1840- 410 /404- MW	x	-	-
V	REEL	18.5	500	MKP 1840- 510 /254- MV	-	x	-
G	AMMO	18.5	L*	MKP 1840- 510 /254- MG	-	x	-
-	BULK	-	-	MKP 1840- 510 /254- M	x	x	x

*S = box size 55 x 210 x 340mm (W x H x L)

*L = box size 60 x 360 x 510mm (W x H x L)

*S = box size 55 x 210 x 340mm (W x H x L)

*L = box size 60 x 360 x 510mm (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 V dc/160 V ac				VOLTAGE CODE 40 400 V dc/220 V ac*				VOLTAGE CODE 63 630 V dc/250 V ac*			
		w (mm)	h (mm)	l (mm)	Pitch (mm)	w (m	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
4700 pF	-247	-	-	-	-	-	-	-	-	3.5	8.5	7.5	5
6800 pF	-268	-	-	-	-	-	-	-	-	4.5	9.5	7.5	5
0.01 µF	-310	-	-	-	-	-	-	-	-	4.5	9.5	7.5	5
0.015 µF	-315	-	-	-	-	4.5	9.5	7.5	5	5.5	11.5	7.5	5
0.022 µF	-322	-	-	-	-	4.5	9.5	7.5	5	-	-	-	-
0.033 µF	-333	-	-	-	-	5.5	11.5	7.5	5	-	-	-	-
0.047 µF	-347	4.5	9.5	7.5	5	5.5	11.5	7.5	5	-	-	-	-
0.068 µF	-368	5.0	10.0	7.5	5	-	-	-	-	-	-	-	-
0.1 µF	-410	5.5	11.5	7.5	5	-	-	-	-	-	-	-	-

Further C-values upon request

*Not suitable for mains applications.

* S = box size 55 x 210 x 340mm (wx h x l)

LETTER CODE	TYPE OF PACKAGING	HEIGHT (H) (MM)	REEL DIAMETER (MM)	ORDERING CODE EXAMPLE	Pitch 5
G	AMMO	18.5	S*	MKP 1840- 310 /404- 5MG	X
W	REEL	18.5	350	MKP 1840- 310 /404- 5MW	X
-	BULK	-	-	MKP 1840- 310 /404- 5M	X

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

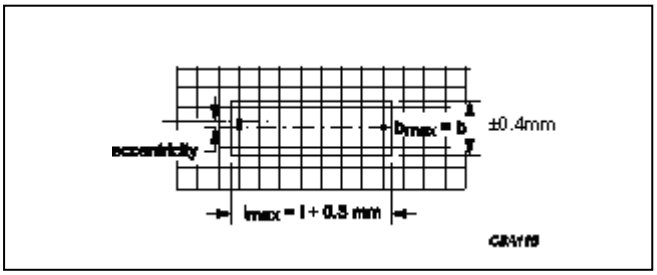
NORMAL USE
The capacitors are designed for mounting on printed-circuit boards. The capacitors packed in bandoliers are designed for mounting in printed-circuit boards by means of automatic insertion machines.
For detailed tape specifications refer to Packaging information www.vishay.com/doc?28139

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 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: hmax ≤ h +0.4 mm or hmax ≤ h' + 0.4 mm.



STORAGE TEMPERATURE

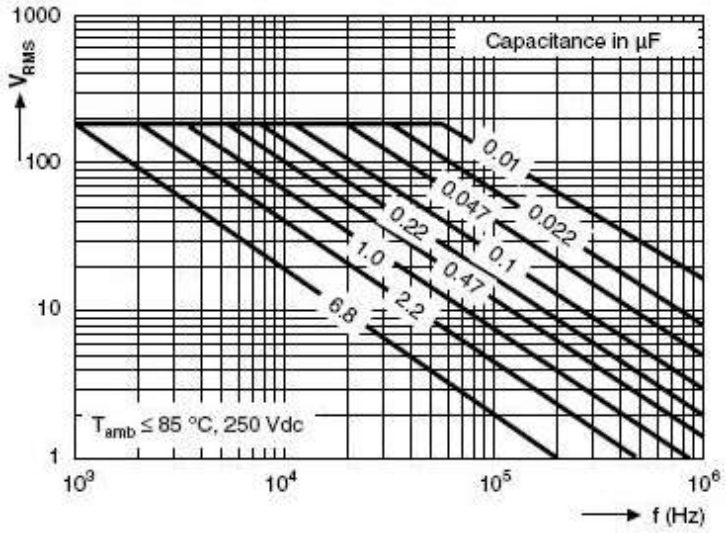
- Storage temperature: Tstg = - 25 to +40 °C with RH maximum 80% without condensation

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 to 106 kPa and a relative humidity of 50 ± 2%.

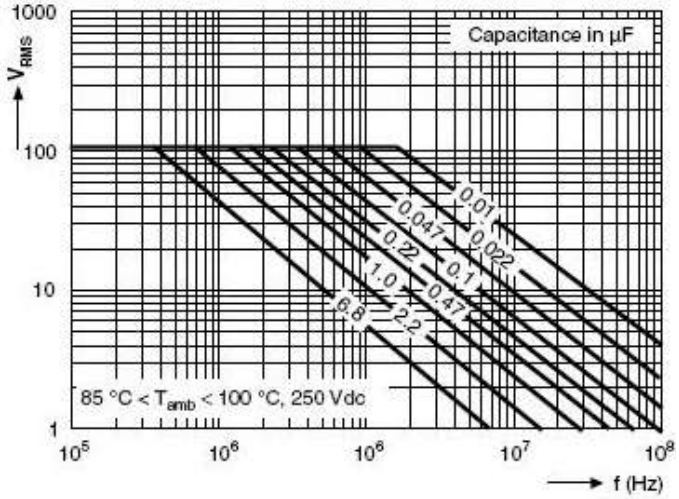
For reference testing, a conditioning period shall be applied over 96 ± 4 hours by heating the products in a circulating air oven at the rated temperature and a relative humidity not exceeding 20%.

CHARACTERISTICS

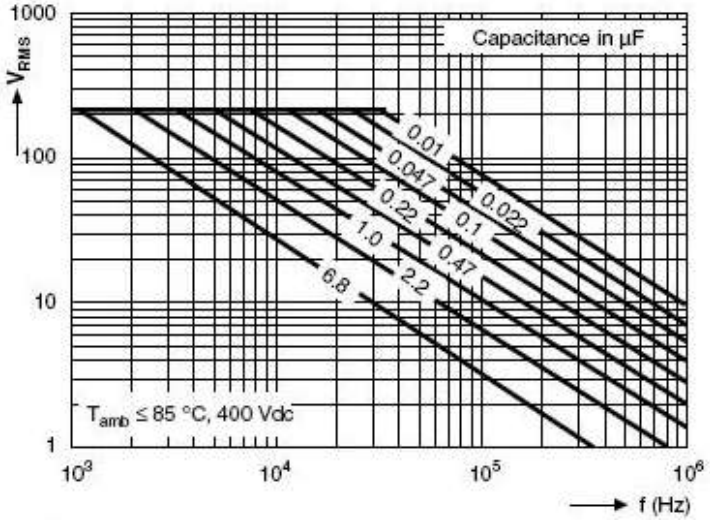
Max RMS voltage as a function of frequency



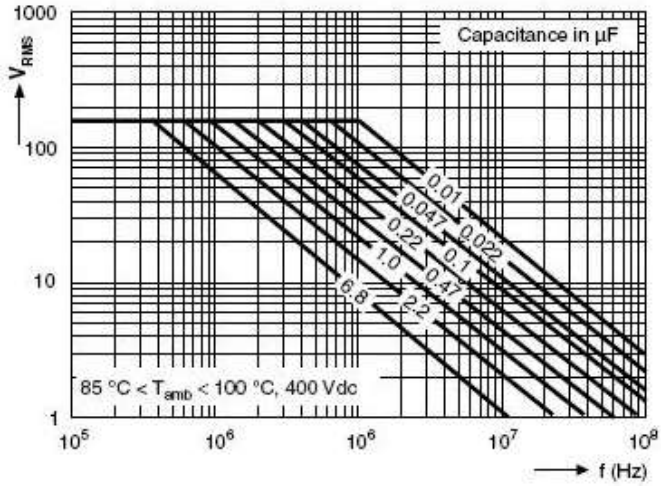
Max RMS voltage as a function of frequency



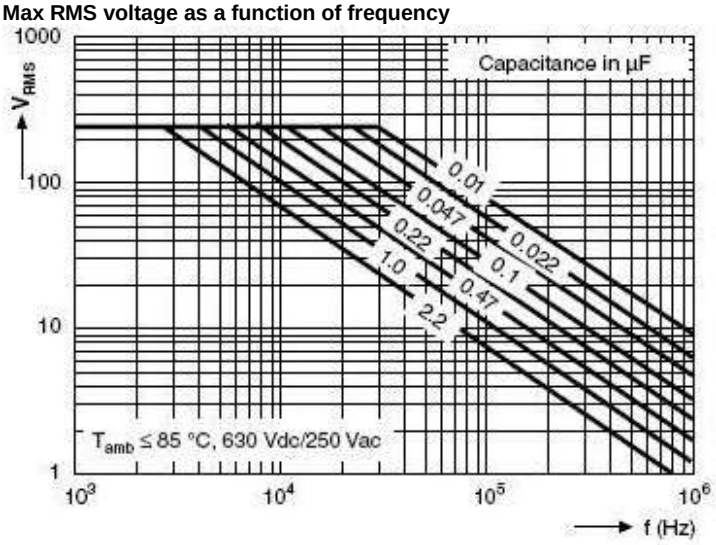
Max RMS voltage as a function of frequency



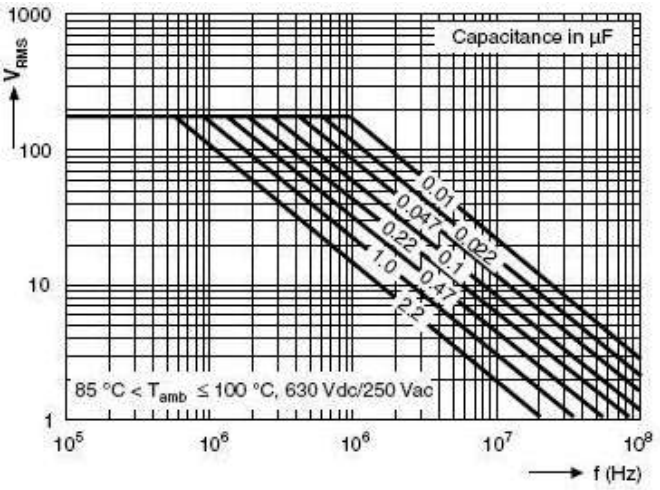
Max RMS voltage as a function of frequency



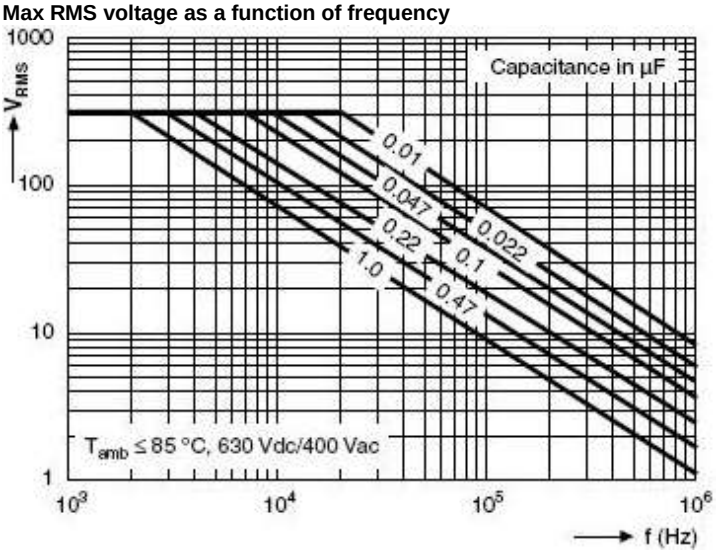
Max RMS voltage as a function of frequency



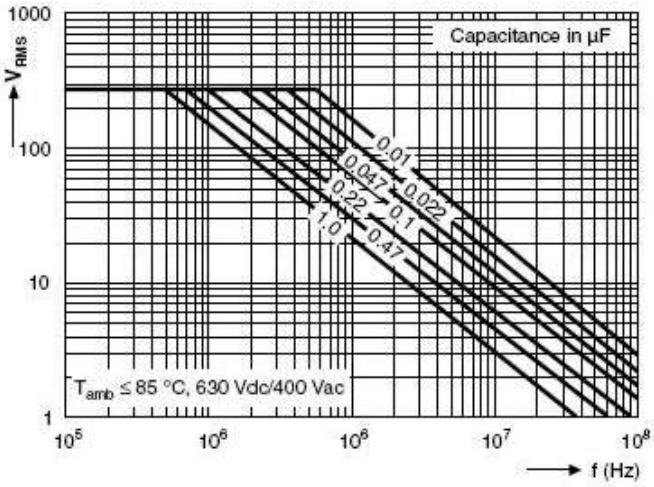
Max RMS voltage as a function of frequency



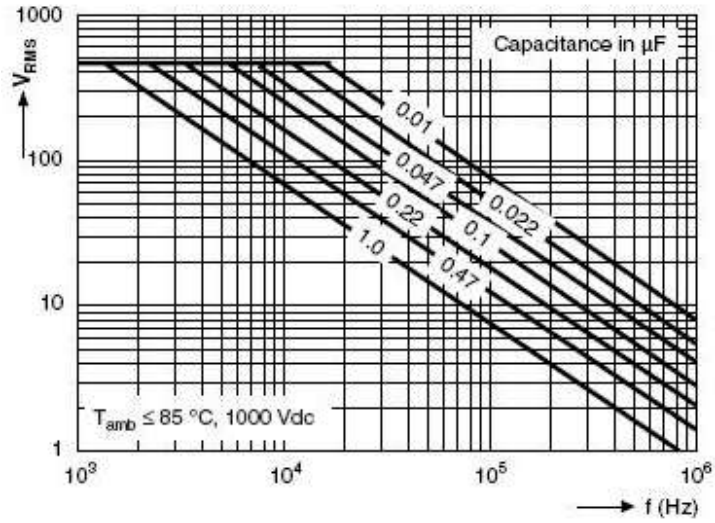
Max RMS voltage as a function of frequency



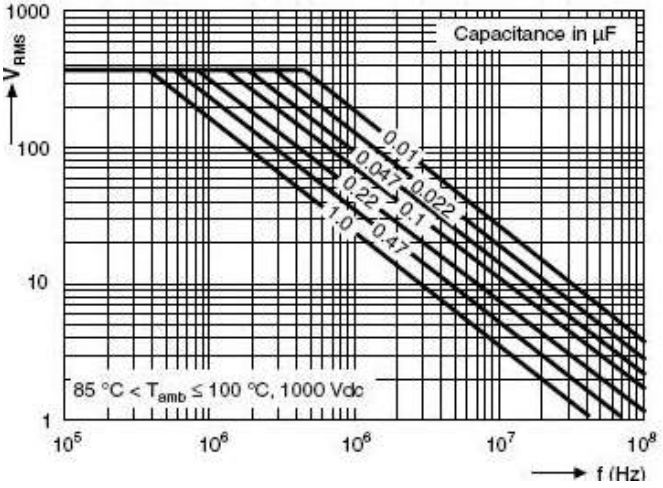
Max RMS voltage as a function of frequency



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

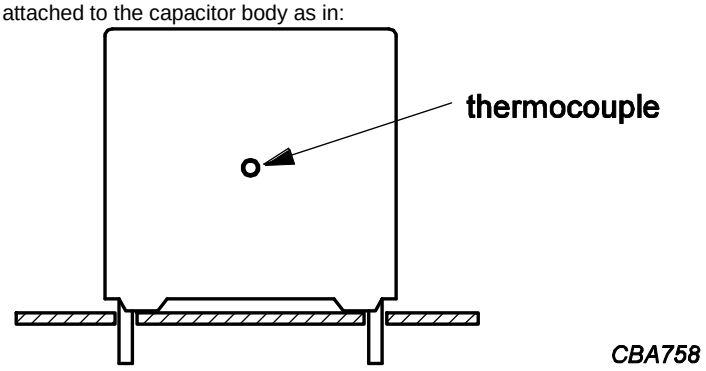
POWER DISSIPATION AND MAXIMUM COMPONENT TEMPERATURE RISE

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 ΔT = P/G:

- ΔT = component temperature rise (°C)
- P = power dissipation of the component (mW)
- G = heat conductivity of the component (mW/°C)

MEASURING THE COMPONENT TEMPERATURE

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



CBA758

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 temp rise)
5. Since in circuits used at voltages over 280V 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-over voltage (<24 hours)	1.25 x U_{Rac}	1.25 x U_{Rac}
Maximum peak voltage (V_{o-p}) (<2s)	1.6 x U_{Rdc}	1.1 x U_{Rdc}

INSPECTION REQUIREMENTS

General note:
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 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 hour, max 2 hours	
4.4.2 Final measurements	Visual examination Capacitance Tangent of loss angle	No visible damage Legible marking $\lvert \Delta C/C \rvert \leq 2\%$ of the value measured initially. 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 ± 0.5 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 to 55 Hz. Amplitude: 0.75 mm or Acceleration 98 m/s² (whichever is less severe) Total duration 6 hours.	No visible damage
4.7.2 Final inspection 4.9 Shock	Visual examination Mounting: see Section “Mounting” for more information Pulse shape: half sine Acceleration: 490 m/s² Duration of pulse: 11 ms.	No visible damage

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
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 δ: ≤ 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 hours Temperature: lower category temperature Duration: 2 hours 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 δ: ≤ 0.002 Compared to values measured in 4.11.1. ≥ 50% of values specified in Section "Insulation resistance" of this specification
SUB-GROUP C3A		
4.12 Endurance DC 4.12.1 Initial measurements 4.12.5 Final measurements	Duration: 2000h 1.25 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% of the value 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-GROUP C4 4.2.6 Temperature characteristics Initial measurements Intermediate measurements	 Capacitance Capacitance at lower category temperature Capacitance at 20 °C	 For -55 °C to +20 °C: 0% ≤ $\lvert \Delta C/C \rvert \leq$ 2% or

SUB-CLAUSE NUMBER AND TEST	CONDITIONS	PERFORMANCE REQUIREMENTS
	Capacitance at upper category temperature	for 20 °C to 85 °C: -3% ≤ | ΔC/C | ≤ 0%
Final measurements	Capacitance	As specified in Section "Capacitance" of this specification
	Insulation resistance	As specified in Section "Insulation Resistance" of this specification
4.13 Charge and discharge	10000 cycles Charged to U_{Rdc} Discharge resistance: $R = \frac{U_{Rdc}}{2.5xC\,(dU/dt)}$	
4.13.1 Initial measurements	Capacitance Tangent of loss angle at 100 kHz	
4.13.3 Final measurements	Capacitance	| ΔC/C | ≤ 3% of the value 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.