Film Capacitors

Metallized Polypropylene Film Capacitors (MKP)

Series/Type: **B32671 ... B32672**
Date: August 2004

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Typical applications

- Electronic ballasts (resonant circuits)
- SMPS
- High-frequency AC loads
- Pulse circuits

Climatic

- Max. operating temperature: 125 °C
- Climatic category (IEC 60068-1): 55/110/56

Construction

- Dielectric: metallized polypropylene (PP)
- Wound capacitor technology
- Plastic case (UL 94 V-0)
- Epoxy resin coating

Features

- Very high AC voltages for all frequency ranges
- Very small dimensions
- High peak voltage for short time periods
- High peak current
- High pulse withstand capability

Terminals

- Parallel wire leads, lead-free tinned
- Special lead lengths available on request

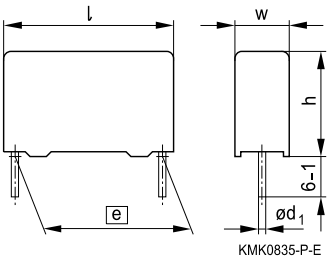
Marking

Manufacturer's logo, lot number, type number,
rated capacitance (coded),
capacitance tolerance (code letter),
rated AC voltage, date of manufacture (coded)

Delivery mode

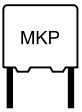
Bulk (untaped)
Taped (Ammo pack or reel)
For notes on taping, refer to chapter "Taping and packing“.

Dimensional drawing



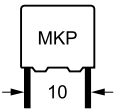
Dimensions in mm

Lead spacing e ±0.4	Lead diameter d_1	Type
10	0.6	B32671
15	0.8	B32672



Overview of available types

Lead spacing	10 mm		15 mm	
Type	B32671		B32672	
Page	4		5	
V_{rms} (VAC)	500	600	600	700
V_R (VDC)	1000	1600	1600	2000
C_R (nF)				
1.0				
1.2				
1.5				
2.2				
2.7				
3.3				
3.9				
4.10				
4.7				
5.6				
6.2				
6.8				
8.2				
10				
12				
15				
22				
33				



B32671

High VAC, high temperature (wound)

Ordering codes and packing units (lead spacing 10 mm)

V_{rms} f ≤1 kHz VAC	V_R VDC	C_R nF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
500	1000	3.3	4.0 × 9.0 × 13.0	B32671L0332+***	1000	1700	1000
		3.9	4.0 × 9.0 × 13.0	B32671L0392+***	1000	1700	1000
		4.1	4.0 × 9.0 × 13.0	B32671L0412+***	1000	1700	1000
		4.7	4.0 × 9.0 × 13.0	B32671L0472+***	1000	1700	1000
		5.6	5.0 × 11.0 × 13.0	B32671L0562+***	830	1300	1000
		6.2	5.0 × 11.0 × 13.0	B32671L0622+***	830	1300	1000
		6.8	5.0 × 11.0 × 13.0	B32671L0682+***	830	1300	1000
		8.2	5.0 × 11.0 × 13.0	B32671L0822+***	830	1300	1000
		10	6.0 × 12.0 × 13.0	B32671L0103+***	680	1100	1000
		12	6.0 × 12.0 × 13.0	B32671L0123+***	680	1100	1000
600	1600	1.2	4.0 × 9.0 × 13.0	B32671L1122+***	1000	1700	1000
		1.5	5.0 × 11.0 × 13.0	B32671L1152+***	830	1300	1000
		2.2	5.0 × 11.0 × 13.0	B32671L1222+***	830	1300	1000
		2.7	5.0 × 11.0 × 13.0	B32671L1272+***	830	1300	1000
		3.3	6.0 × 12.0 × 13.0	B32671L1332+***	680	1100	1000
		3.9	6.0 × 12.0 × 13.0	B32671L1392+***	680	1100	1000
		4.1	6.0 × 12.0 × 13.0	B32671L1412+***	680	1100	1000

Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%
- A = ±3.5%
- H = ±2.5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)

Ordering codes and packing units (lead spacing 15 mm)

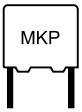
V_{rms} $f \leq 1$ kHz VAC	V_R VDC	C_R nF	Max. dimensions w × h × l mm	Ordering code (composition see below)	Ammo pack pcs./unit	Reel pcs./unit	Untaped pcs./unit
600	1600	6.2	5.0 × 10.5 × 18.0	B32672L1622+***	1170	1300	1000
		6.8	5.0 × 10.5 × 18.0	B32672L1682+***	1170	1300	1000
		8.2	6.0 × 11.0 × 18.0	B32672L1822+***	960	1100	1000
		10	6.0 × 11.0 × 18.0	B32672L1103+***	960	1100	1000
		12	6.0 × 12.0 × 18.0	B32672L1123+***	960	1100	1000
		15	7.0 × 12.5 × 18.0	B32672L1153+***	830	900	1000
		22	8.5 × 14.5 × 18.0	B32672L1223+***	680	700	500
		33	9.0 × 17.5 × 18.0	B32672L1333+***	640	700	500
700	2000	1.0	5.0 × 10.5 × 18.0	B32672L8102+***	1170	1300	1000
		1.2	5.0 × 10.5 × 18.0	B32672L8122+***	1170	1300	1000
		1.5	5.0 × 10.5 × 18.0	B32672L8152+***	1170	1300	1000
		2.2	5.0 × 10.5 × 18.0	B32672L8222+***	1170	1300	1000
		2.7	5.0 × 10.5 × 18.0	B32672L8272+***	1170	1300	1000
		3.3	5.0 × 10.5 × 18.0	B32672L8332+***	1170	1300	1000
		3.9	5.0 × 10.5 × 18.0	B32672L8392+***	1170	1300	1000
		4.1	5.0 × 10.5 × 18.0	B32672L8412+***	1170	1300	1000
		4.7	5.0 × 10.5 × 18.0	B32672L8472+***	1170	1300	1000
		5.6	6.0 × 11.0 × 18.0	B32672L8562+***	960	1100	1000
		6.2	6.0 × 11.0 × 18.0	B32672L8622+***	960	1100	1000
		6.8	6.0 × 11.0 × 18.0	B32672L8682+***	960	1100	1000
		8.2	6.0 × 12.0 × 18.0	B32672L8822+***	960	1100	1000
		10	7.0 × 12.5 × 18.0	B32672L8103+***	830	900	1000
		12	8.5 × 14.5 × 18.0	B32672L8123+***	680	700	500
		15	8.5 × 14.5 × 18.0	B32672L8153+***	680	700	500
		22	9.0 × 17.5 × 18.0	B32672L8223+***	640	700	500

Further E series and intermediate capacitance values on request.

Composition of ordering code

+ = Capacitance tolerance code:
- M = ±20%
- K = ±10%
- J = ±5%
- A = ±3.5%
- H = ±2.5%

*** = Packaging code:
- 289 = Ammo pack
- 189 = Reel
- 000 = Untaped (lead length 6 −1 mm)



B32671 ... B32672

High VAC, high temperature (wound)

Technical data

Operating temperature range	Max. operating temperature $T_{op,max}$		+125 °C
	Upper category temperature T_{max}		+110 °C
	Lower category temperature T_{min}		−55 °C
	Rated temperature T_R		+85 °C
Dissipation factor tan δ (in 10^{-3})	at	Typical	Upper limit
at 20 °C	10 kHz	0.3	0.6
(upper limit values)	100 kHz	0.3	1.0
Insulation resistance R_{ins}	> 100 GΩ		
at 20 °C, rel. humidity ≤ 65%			
(minimum as-delivered values)			
DC test voltage	1.6 · V_R, 2 s		
Category voltage V_C	T_A (°C)	DC voltage derating	AC voltage derating
(continuous operation with V_{DC}	$T_A \leq 85$	$V_C = V_R$	$V_{C,rms} = V_{rms}$
or V_{AC} at f ≤ 1 kHz)	$85<T_A\leq110$	$V_C = V_R \cdot (165-T_A)/80$	$V_{C,rms}=V_{rms} \cdot (165-T_A)/80$
Operating voltage V_{op} for	T_A (°C)	DC voltage (max. hours)	AC voltage (max. hours)
short operating periods	$T_A \leq 100$	$V_{op} = 1.25 \cdot V_C$ (2000 h)	$V_{op} = 1.0 \cdot V_{C,rms}$ (2000 h)
(V_{DC} or V_{AC} at f ≤ 1 kHz)	$100<T_A\leq125$	$V_{op} = 1.25 \cdot V_C$ (1000 h)	$V_{op} = 1.0 \cdot V_{C,rms}$ (1000 h)
Damp heat test	56 days/40 °C/93% relative humidity		
Limit values after damp	Capacitance change |ΔC/C|		≤ 2%
heat test	Dissipation factor change Δ tan δ		≤ 1.0 · 10^{-3} (at 1 kHz)
	Insulation resistance R_{ins}		≥ 50 GΩ
Reliability:			
Failure rate λ	1 fit (≤ 1 · 10^{-9}/h) at 0.5 · V_R, 40 °C		
Service life t_{SL}	200 000 h at 1.0 · V_R, 40 °C		
	For conversion to other operating conditions and temperatures, refer to chapter "Quality assurance", page .		
Failure criteria:			
Total failure	Short circuit or open circuit		
Failure due to variation	Capacitance change |ΔC/C|		> 10%
of parameters	Dissipation factor tan δ		> 4 · upper limit values
	Insulation resistance R_{ins}		< 1500 MΩ

Pulse handling capability

"dV/dt" represents the maximum permissible voltage change per unit of time for non-sinusoidal voltages, expressed in V/µs.

"k_0" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in $V^2/\mu s$.

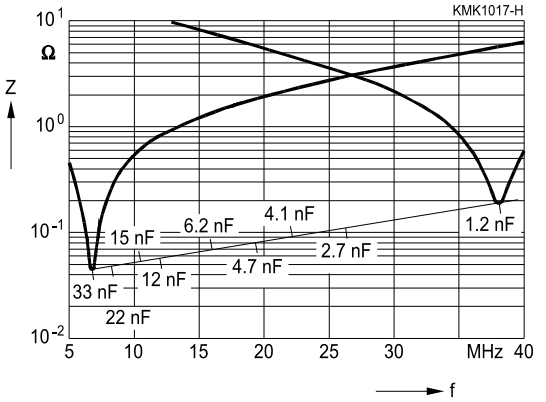
Note:
The values of dV/dt and k_0 provided below must not be exceeded in order to avoid damaging the capacitor.

dV/dt and k_0 values

Lead spacing	10 mm				15 mm			
Type	B32671				B32672			
V_{rms} (VAC)	500		600		600		700	
V_R (VDC)	1000		1600		1600		2000	
C_R nF	dV/dt V/µs	k_0 $V^2/\mu s$	dV/dt V/µs	k_0 $V^2/\mu s$	dV/dt V/µs	k_0 $V^2/\mu s$	dV/dt V/µs	k_0 $V^2/\mu s$
1.0	–	–	–	–	–	–	6 500	10 000 000
1.2	–	–	6 000	14 400 000	–	–	6 250	9 700 000
1.5	–	–	5 600	14 000 000	–	–	6 000	9 500 000
2.2	–	–	5 200	13 800 000	–	–	5 000	9 200 000
2.7	–	–	5 000	13 600 000	–	–	4 750	9 000 000
3.3	4 700	16 000 000	4 700	13 300 000	–	–	4 500	8 900 000
3.9	4 300	13 600 000	4 500	13 100 000	–	–	4 000	8 300 000
4.1	4 100	12 300 000	4 400	13 000 000	–	–	3 800	8 000 000
4.7	3 800	9 900 000	–	–	–	–	3 600	7 800 000
5.6	3 400	8 400 000	–	–	–	–	3 300	7 400 000
6.2	3 200	7 700 000	–	–	3 600	18 600 000	3 100	7 200 000
6.8	3 100	7 400 000	–	–	3 500	17 400 000	3 000	7 000 000
8.2	2 700	7 200 000	–	–	3 100	15 400 000	2 800	6 700 000
10	2 500	7 000 000	–	–	2 800	13 800 000	2 600	6 300 000
12	2 300	6 400 000	–	–	2 600	12 600 000	2 400	6 000 000
15	–	–	–	–	2 300	12 300 000	2 200	5 900 000
22	–	–	–	–	2 000	11 800 000	1 900	5 300 000
33	–	–	–	–	1 700	11 000 000	–	–

Impedance Z versus frequency f

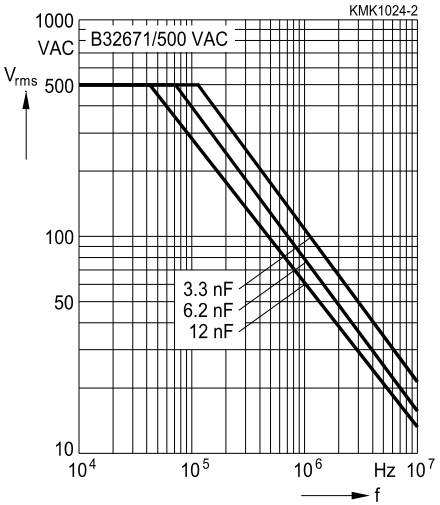
(typical values)



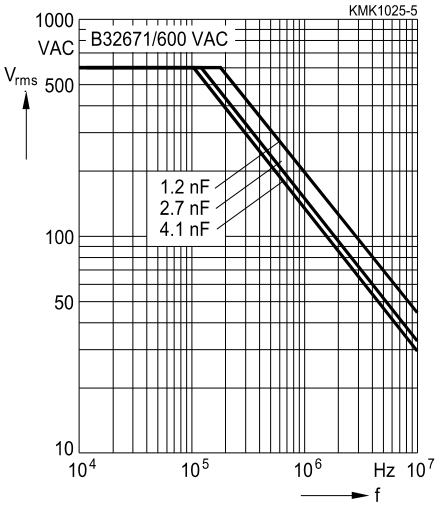
Permissible AC voltage V_{rms} versus frequency f (for sinusoidal waveforms $T_A \leq 100$ °C)
For T_A >100 °C, please refer to "General technical information", section 3.2.3.

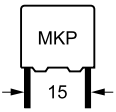
Lead spacing 10 mm

500 VAC/1000 VDC



600 VAC/1600 VDC





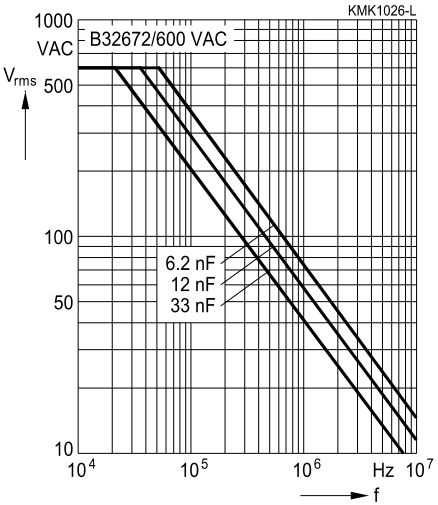
B32672

High VAC, high temperature (wound)

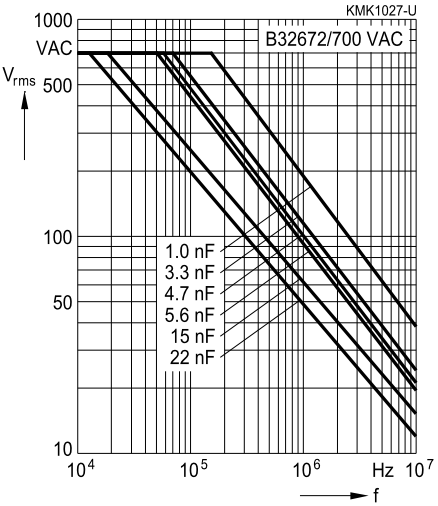
Permissible AC voltage V_{rms} versus frequency f (for sinusoidal waveforms $T_A \leq 100$ °C)
For T_A >100 °C, please refer to "General technical information", section 3.2.3.

Lead spacing 15 mm

600 VAC/1600 VDC

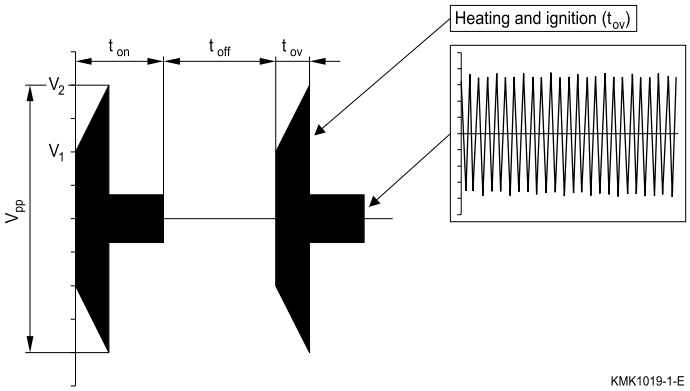


700 VAC/2000 VDC



Operation at overvoltages during heating and ignition of lamps ($T_A \leq 40$ °C)

In lighting applications, the capacitors can be subjected to overvoltages during the heating and ignition periods. An overvoltage occurs when the operation voltage exceeds the permissible AC voltage at the resonant frequency f_r.



For a repetitive application of on/off switching pulses (as for example in the life tests applied by electronic ballast manufacturers), limits have to be imposed on the time periods under overvoltage and on the duty cycle, in order to keep the capacitance value within the required margins:

- The overvoltage time t_{OV} should be less than 1 sec.
- The maximum duty cycle of the overvoltage is given by

$$\frac{t_{OV}}{t_{on} + t_{off}} \leq \left(\frac{V_{rms}}{V_{rms,OV}}\right)^2 \cdot 0.5$$

where $V_{rms,ov}$ is the RMS voltage during period t_{OV}.

$$V_{rms,OV} = \sqrt{\frac{V_1^2 + V_1 \cdot V_2 + V_2^2}{6}}$$

and V_{rms} is the permissible AC voltage for continuous operation at the resonant frequency f_r (given by the “permissible AC voltage versus frequency f” graphics in theprevious pages).

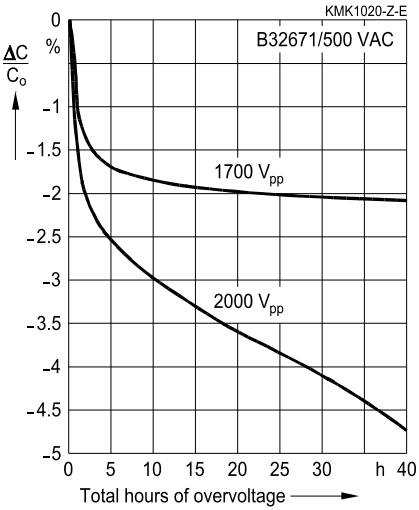
- The drift of capacitance depends on the V_{pp}attained, and the total time under overvoltage, which is calculated in hours as follows:
  $(N_i \cdot t_{OV}) / 3600$
  where N_i is the number of overvoltage impulses and t_{OV} is expressed in seconds.

The maximum drift of capacitance as a function of both parameters is provided graphically in the following pages.

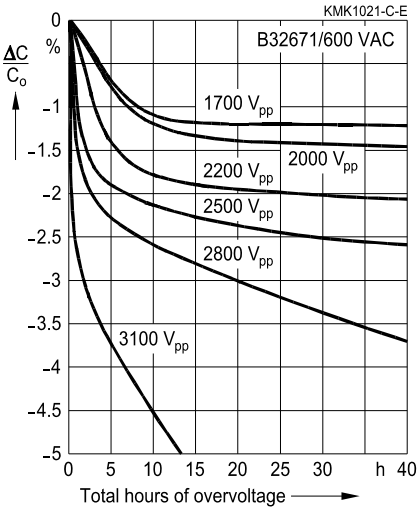
Estimation of the maximum drift of capacitance value in function of the number of total hours overvoltage

Lead spacing 10 mm

500 VAC/1000 VDC



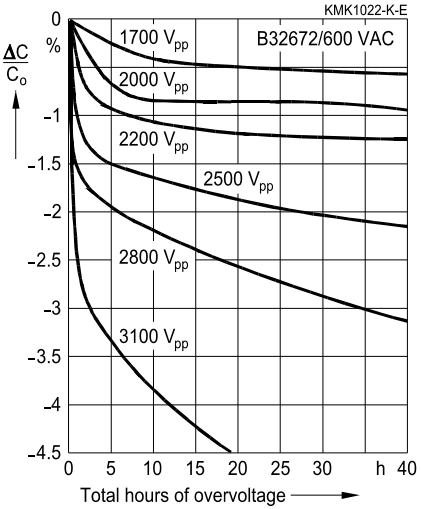
600 VAC/1600 VDC



Estimation of the maximum drift of capacitance value in function of the number of total hours overvoltage

Lead spacing 15 mm

600 VAC/1600 VDC



700 VAC/2000 VDC