



## Film Capacitors

### Metallized Polypropylene Film Capacitors (MFP)

**Series/Type:** B32686A  
**Date:** August 2004

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## High pulse (wound)

### Typical applications

- Smoothing
- Snubbing
- High-frequency AC loads

### Climatic

- Max. operating temperature: 100 °C
- Climatic category (IEC 60068-1): 55/100/56

### Construction

- Dielectric: polypropylene (PP)
- Film metallized on one side and metal foils internally connected in series
- Plastic case (UL 94 V-0)
- Epoxy resin sealing (UL 94 V-0)

### Features

- Very high pulse strength
- Highest possible contact reliability
- Self-healing properties

### Terminals

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

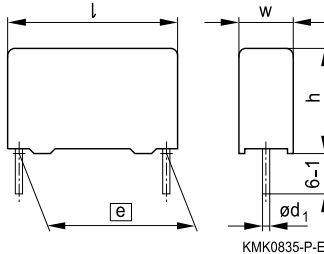
### Marking

Manufacturer's logo,  
series number,  
style (MFP),  
rated capacitance,  
capacitance tolerance (code letter),  
rated DC voltage,  
date of manufacture (coded)

### Delivery mode

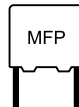
Bulk (untaped)

### Dimensional drawing



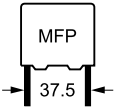
Dimensions in mm

| Lead spacing | Lead diameter | Type    |
|--------------|---------------|---------|
| $e \pm 0.4$  | $d_1$         |         |
| 37.5         | 1.0           | B32686A |



### Overview of available types

|                 |         |      |      |      |
|-----------------|---------|------|------|------|
| Lead spacing    | 37.5 mm |      |      |      |
| Type            | B32686A |      |      |      |
| $V_R$ (VDC)     | 1000    | 1250 | 1600 | 2000 |
| $V_{rms}$ (VAC) | 400     | 450  | 450  | 500  |
| $C_R$ (nF)      |         |      |      |      |
| 22              |         |      |      |      |
| 33              |         |      |      |      |
| 47              |         |      |      |      |
| 68              |         |      |      |      |
| 100             |         |      |      |      |
| 150             |         |      |      |      |
| 220             |         |      |      |      |
| 330             |         |      |      |      |
| 470             |         |      |      |      |


**B32686A**
**High pulse (wound)**
**Ordering codes and packing units (lead spacing 37.5 mm)**

| $V_R$ | $V_{rms}$<br>$f \leq 1 \text{ kHz}$ | $C_R$ | Max. dimensions<br>$w \times h \times l$<br>mm | Ordering code<br>(composition see<br>below) | Untaped<br>pcs./unit |
|-------|-------------------------------------|-------|------------------------------------------------|---------------------------------------------|----------------------|
| VDC   | VAC                                 | nF    |                                                |                                             |                      |
| 1000  | 400                                 | 68    | $12.0 \times 22.5 \times 42.0$                 | B32686A0683+000                             | 72                   |
|       |                                     | 100   | $12.0 \times 22.5 \times 42.0$                 | B32686A0104+000                             | 72                   |
|       |                                     | 150   | $14.0 \times 25.0 \times 42.0$                 | B32686A0154+000                             | 56                   |
|       |                                     | 220   | $16.0 \times 28.5 \times 42.0$                 | B32686A0224+000                             | 48                   |
|       |                                     | 330   | $20.0 \times 39.5 \times 42.0$                 | B32686A0334+000                             | 32                   |
|       |                                     | 470   | $20.0 \times 39.5 \times 42.0$                 | B32686A0474+000                             | 32                   |
| 1250  | 450                                 | 68    | $12.0 \times 22.5 \times 42.0$                 | B32686A7683+000                             | 72                   |
|       |                                     | 100   | $14.0 \times 25.0 \times 42.0$                 | B32686A7104+000                             | 56                   |
|       |                                     | 150   | $16.0 \times 28.5 \times 42.0$                 | B32686A7154+000                             | 48                   |
|       |                                     | 220   | $18.0 \times 32.5 \times 42.0$                 | B32686A7224+000                             | 48                   |
|       |                                     | 330   | $20.0 \times 39.5 \times 42.0$                 | B32686A7334+000                             | 32                   |
| 1600  | 450                                 | 47    | $12.0 \times 22.5 \times 42.0$                 | B32686A1473+000                             | 72                   |
|       |                                     | 68    | $14.0 \times 25.0 \times 42.0$                 | B32686A1683+000                             | 56                   |
|       |                                     | 100   | $18.0 \times 32.5 \times 42.0$                 | B32686A1104+000                             | 48                   |
|       |                                     | 150   | $20.0 \times 39.5 \times 42.0$                 | B32686A1154+000                             | 32                   |
| 2000  | 500                                 | 22    | $12.0 \times 22.5 \times 42.0$                 | B32686A2223+000                             | 72                   |
|       |                                     | 33    | $14.0 \times 25.0 \times 42.0$                 | B32686A2333+000                             | 56                   |
|       |                                     | 47    | $16.0 \times 28.5 \times 42.0$                 | B32686A2473+000                             | 48                   |
|       |                                     | 68    | $18.0 \times 32.5 \times 42.0$                 | B32686A2683+000                             | 48                   |
|       |                                     | 100   | $20.0 \times 39.5 \times 42.0$                 | B32686A2104+000                             | 32                   |

Further E series and intermediate capacitance values on request.

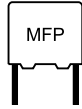
**Composition of ordering code**

+ = Capacitance tolerance code:

M =  $\pm 20\%$

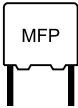
K =  $\pm 10\%$

J =  $\pm 5\%$



## Technical data

|                                                                                                                                                        |                                                                                                                                                                                  |                                    |                                            |
|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|--------------------------------------------|
| Operating temperature range                                                                                                                            | Max. operating temperature $T_{op,max}$ +100 °C<br>Upper category temperature $T_{max}$ +100 °C<br>Lower category temperature $T_{min}$ −55 °C<br>Rated temperature $T_R$ +85 °C |                                    |                                            |
| Dissipation factor $\tan \delta$ (in $10^{-3}$ )<br>at 20 °C<br>(upper limit values)                                                                   | at                                                                                                                                                                               | $C_R \leq 0.1 \mu F$               | $C_R > 0.1 \mu F$                          |
|                                                                                                                                                        | 1 kHz                                                                                                                                                                            | —                                  | 0.4                                        |
|                                                                                                                                                        | 10 kHz                                                                                                                                                                           | 0.4                                | 0.5                                        |
|                                                                                                                                                        | 100 kHz                                                                                                                                                                          | 1.0                                | —                                          |
| Insulation resistance $R_{ins}$<br>or time constant $\tau = C_R \cdot R_{ins}$<br>at 20 °C, rel. humidity $\leq 65\%$<br>(minimum as-delivered values) | $C_R \leq 0.33 \mu F$                                                                                                                                                            | $C_R > 0.33 \mu F$                 |                                            |
|                                                                                                                                                        | 100 G $\Omega$                                                                                                                                                                   | 30 000 s                           |                                            |
| DC test voltage                                                                                                                                        | 2.0 · $V_R$ , 2 s                                                                                                                                                                |                                    |                                            |
| Category voltage $V_C$<br>(continuous operation with $V_{DC}$<br>or $V_{AC}$ at $f \leq 1$ kHz)                                                        | $T_A$ (°C)                                                                                                                                                                       | DC voltage derating                | AC voltage derating                        |
|                                                                                                                                                        | $T_A \leq 85$                                                                                                                                                                    | $V_C = V_R$                        | $V_{C,rms} = V_{rms}$                      |
|                                                                                                                                                        | $85 < T_A \leq 100$                                                                                                                                                              | $V_C = V_R \cdot (165 - T_A)/80$   | $V_{C,rms} = V_{rms} \cdot (165 - T_A)/80$ |
| Operating voltage $V_{op}$<br>for short operating periods<br>$V_{DC}$ or $V_{AC}$ at $f \leq 1$ kHz)                                                   | $T_A$ (°C)                                                                                                                                                                       | DC voltage (max. hours)            | AC voltage (max. hours)                    |
|                                                                                                                                                        | $T_A \leq 85$                                                                                                                                                                    | $V_{op} = 1.25 \cdot V_C$ (2000 h) | $V_{op} = 1.0 \cdot V_{C,rms}$ (2000 h)    |
|                                                                                                                                                        | $85 < T_A \leq 100$                                                                                                                                                              | $V_{op} = 1.25 \cdot V_C$ (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<br>heat test                                                                                                                   | Capacitance change $ \Delta C/C $                                                                                                                                                |                                    | $\leq 2\%$                                 |
|                                                                                                                                                        | Dissipation factor change $\Delta \tan \delta$                                                                                                                                   |                                    | $\leq 1.0 \cdot 10^{-3}$ (at 10 kHz)       |
|                                                                                                                                                        | Insulation resistance $R_{ins}$                                                                                                                                                  |                                    | $\geq 50\%$ of minimum                     |
|                                                                                                                                                        | or time constant $\tau = C_R \cdot R_{ins}$                                                                                                                                      |                                    | as-delivered values                        |
| Reliability:                                                                                                                                           |                                                                                                                                                                                  |                                    |                                            |
| Failure rate $\lambda$                                                                                                                                 | 1 fit ( $\leq 1 \cdot 10^{-9}/h$ ) 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,<br>refer to chapter "Quality assurance", page .                                                                   |                                    |                                            |
| Failure criteria:                                                                                                                                      |                                                                                                                                                                                  |                                    |                                            |
| Total failure                                                                                                                                          | Short circuit or open circuit                                                                                                                                                    |                                    |                                            |
| Failure due to variation<br>of parameters                                                                                                              | Capacitance change $ \Delta C/C $                                                                                                                                                |                                    | $> 10\%$                                   |
|                                                                                                                                                        | Dissipation factor $\tan \delta$                                                                                                                                                 |                                    | 4 · upper limit value                      |
|                                                                                                                                                        | Insulation resistance $R_{ins}$                                                                                                                                                  |                                    | $< 1500 M\Omega$ ( $C_R \leq 0.33 \mu F$ ) |
|                                                                                                                                                        | or time constant $\tau = C_R \cdot R_{ins}$                                                                                                                                      |                                    | $< 500$ s ( $C_R > 0.33 \mu F$ )           |



**B32686A**

**High pulse (wound)**

### Pulse handling capability

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

"k<sub>0</sub>" represents the maximum permissible pulse characteristic of the waveform applied to the capacitor, expressed in V<sup>2</sup>/μs.

*Note:*

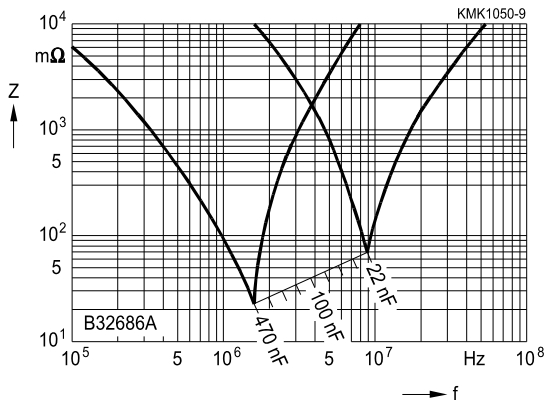
*The values of dV/dt and k<sub>0</sub> provided below must not be exceeded in order to avoid damaging the capacitor.*

### dV/dt and k<sub>0</sub> values

| Lead spacing         |                        | 37.5 mm       |                                      |
|----------------------|------------------------|---------------|--------------------------------------|
| V <sub>R</sub> (VDC) | V <sub>rms</sub> (VAC) | dV/dt in V/μs | k <sub>0</sub> in V <sup>2</sup> /μs |
| 1000                 | 400                    | 2 000         | 4 000 000                            |
| 1250                 | 450                    | 2 800         | 7 000 000                            |
| 1600                 | 450                    | 3 500         | 11 000 000                           |
| 2000                 | 500                    | 4 500         | 18 000 000                           |

### Impedance Z versus frequency f

(typical values)

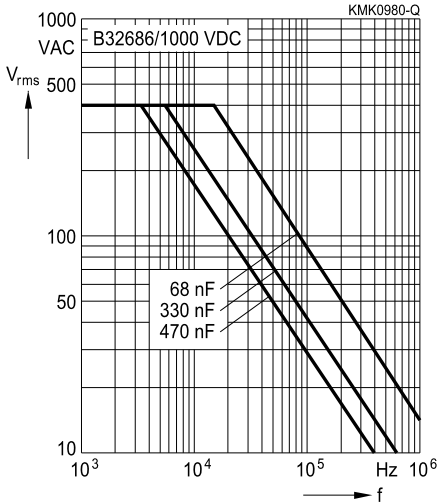


Permissible AC voltage  $V_{rms}$  versus frequency  $f$  (for sinusoidal waveforms,  $T_A \leq 90^\circ\text{C}$ )

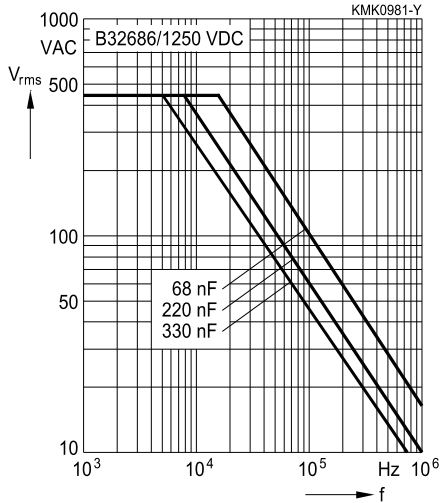
For  $T_A > 90^\circ\text{C}$ , please refer to "General technical information", section 3.2.3.

Lead spacing 37.5 mm

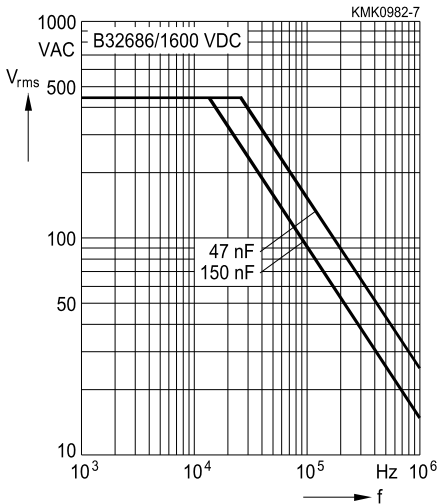
1000 VDC/400 VAC



1250 VDC/450 VAC



1600 VDC/450 VAC



2000 VDC/500 VAC

